

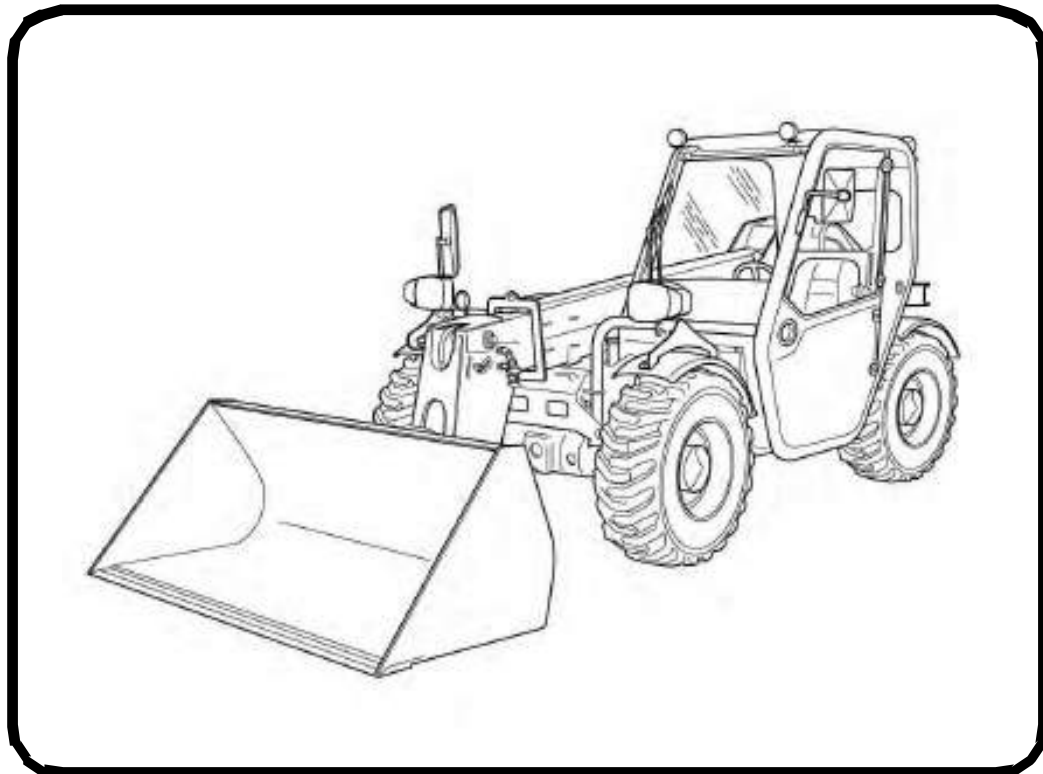


Bobcat[®]

Service Manual

T2250 Telescopic Handler

S/N AC1911000 & Above



Dealer Copy -- Not for Resale



MAINTENANCE SAFETY

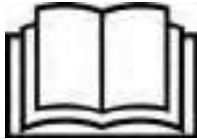


WARNING

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, Operator's Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death.

W-2003-0807

CORRECT



P-90216

⚠ Never service the Bobcat VersaHANDLER without instructions.



Safety Alert Symbol: This symbol with a warning statement, means: "Warning, be alert! Your safety is involved!" Carefully read the message that follows.

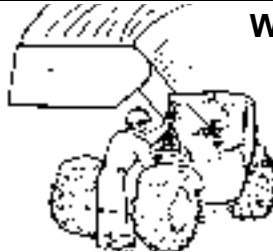
CORRECT



B-16082

⚠ Cleaning and maintenance are required daily.

WRONG



B-16080

⚠ Disconnecting or loosening any hydraulic tubeline, hose, fitting, component or a part failure can cause boom to drop. Do not go under boom when raised unless supported by an approved boom stop. Replace if damaged.

WRONG



B-16079

⚠ Never work on VersaHANDLER with boom up unless boom is held by an approved boom stop. Replace if damaged.
⚠ Never modify equipment or add attachments not approved by Bobcat Company.

WRONG



B-16081

⚠ Have good ventilation when welding or grinding painted parts.
⚠ Wear dust mask when grinding painted parts. Toxic dust and gas can be produced.
⚠ Avoid exhaust fume leaks which can kill without warning. Exhaust system must be tightly sealed.

WRONG



B-16078

⚠ Keep body, jewelry and clothing away from moving parts, electrical contact, hot parts and exhaust.
⚠ Wear eye protection to guard from battery acid, compressed springs, fluids under pressure and flying debris when engines are running or tools are used. Use eye protection approved for type of welding.

WRONG



B-6589

⚠ Lead-acid batteries produce flammable and explosive gases.
⚠ Keep arcs, sparks, flames and lighted tobacco away from batteries.
⚠ Batteries contain acid which burns eyes or skin on contact. Wear protective clothing. If acid contacts body, flush well with water. For eye contact flush well and get immediate medical attention.

Maintenance procedures which are given in the Operation & Maintenance Manual can be performed by the owner/operator without any specific technical training. Maintenance procedures which are **not** in the Operation & Maintenance Manual must be performed **ONLY BY QUALIFIED BOBCAT SERVICE PERSONNEL**. Always use **genuine Bobcat replacement parts**.

MSW12-0409

Dealer Copy -- Not for Resale



Bobcat[®]

CONTENTS

SAFETY AND MAINTENANCE	10-01
HYDRAULIC SYSTEM	20-01
HYDROSTATIC SYSTEM	30-01
DRIVE SYSTEM	40-01
MAIN FRAME	50-01
ELECTRICAL SYSTEM AND ANALYSIS	60-01
ENGINE SERVICE	70-01
HEATING, VENTILATION, AIR CONDITIONING	80-01
SPECIFICATIONS	SPEC-01
ALPHABETICAL INDEX	INDEX-01

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

FOREWORD

FOREWORD 1-7

SAFETY INSTRUCTIONS 1-9

FIRE PREVENTION 1-10

 Maintenance 1-10

 Operation 1-10

 Electrical 1-10

 Hydraulic System 1-11

 Fueling 1-11

 Starting 1-11

 Spark Arrestor Exhaust System 1-11

 Welding And Grinding 1-11

 Fire Extinguishers 1-11

SERIAL NUMBER LOCATION 1-12

 VersaHANDLER Serial Number 1-12

 Engine Serial Number 1-12

 Other Serial Numbers 1-12

DELIVERY REPORT 1-13

BOBCAT VERSAHANDLER IDENTIFICATION 1-14

Dealer Copy -- Not for Resale












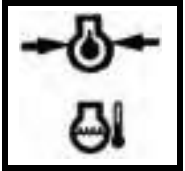



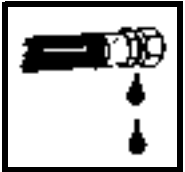
Bobcat®

Dealer Copy -- Not for Resale

FOREWORD

This manual is for the Bobcat telescopic handler mechanic. It provides necessary servicing and adjustment procedures for the Bobcat telescopic handler and its component parts and systems. Refer to the Operation & Maintenance Manual for operating instructions, starting procedure, daily checks, etc.

A general inspection of the following items must be made after the telescopic handler has had service or repair:

- | | | | |
|--|---|---|---|
| <p>1. Check that ROPS/FOPS (including right side window) is in good condition and is not modified.</p> |  | <p>8. The parking brake must function correctly.</p> |  |
| <p>2. Check that ROPS mounting hardware is tightened and is Bobcat approved.</p> |  | <p>9. Enclosure door latches must open and close freely.</p> |  |
| <p>3. The seat belt must be correctly installed, functional and in good condition.</p> |  | <p>10. Attachment locking pins must function correctly and be in good condition. Bob-Tach wedges and linkages (if equipped) must function correctly and be in good condition.</p> |  |
| <p>4. Check boom stop, replace if damaged.</p> |  | <p>11. Safety treads must be in good condition.</p> |  |
| <p>5. Machine signs (decals) must be legible and in the correct location.</p> |  | <p>12. Check for correct function of indicator lamps and gauges.</p> |  |
| <p>6. Joystick control lever and foot pedals must return to neutral.</p> |  | <p>13. Check hydraulic fluid level, engine oil level and fuel supply.</p> |  |
| <p>7. Check for correct function of the work lights.</p> |  | <p>14. Inspect for fuel, oil or hydraulic fluid leaks.</p> |  |

Dealer Copy -- Not for Resale

15. Lubricate the telescopic handler.



20. Inspect for loose or broken parts or connections.



16. Check the condition of the battery and cables.



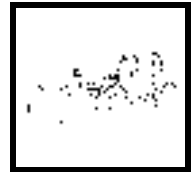
21. Check for any field modification not completed.



17. Inspect the air cleaner for damage or leaks. Check the condition of the element.



22. Operate the machine and check all functions.



18. Check the electrical charging system.



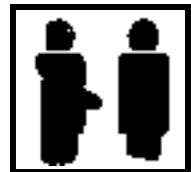
23. Check function or condition of all equipped options and accessories (examples: back-up alarm, fire extinguisher, rotating beacon, front stabilizers, etc.).



19. Check tires for wear and pressure. Use only approved tires.



24. Recommend to the owner that all necessary corrections be made before the machine is returned to service.



Dealer Copy -- Not for Resale

SAFETY INSTRUCTIONS



Safety Alert Symbol

This symbol with a warning statement means: "Warning, be alert! Your safety is involved!" Carefully read the message that follows.



WARNING

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, Operator's Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death.

W-2003-0807

IMPORTANT

This notice identifies procedures which must be followed to avoid damage to the machine.

I-2019-0284



DANGER

The signal word DANGER on the machine and in the manuals indicates a hazardous situation which, if not avoided, will result in death or serious injury.

D-1002-1107



WARNING

The signal word WARNING on the machine and in the manuals indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

W-2044-1107

The following publications provide information on the safe use and maintenance of the Bobcat machine and attachments:

- The Delivery Report is used to assure that complete instructions have been given to the new owner and that the machine is in safe operating condition.
- The Operation & Maintenance Manual delivered with the machine or attachment contains operating information as well as routine maintenance and service procedures. It is a part of the machine and can be stored in a container provided on the machine. Replacement Operation & Maintenance Manuals can be ordered from your Bobcat dealer.
- Machine signs (decals) instruct on the safe operation and care of your Bobcat machine or attachment. The signs and their locations are shown in the Operation & Maintenance Manual. Replacement signs are available from your Bobcat dealer.
- An Operator's Handbook fastened to the operator cab. It's brief instructions are convenient to the operator. The handbook is available from your dealer in an English edition or one of many other languages. See your Bobcat dealer for more information on translated versions.
- The AEM Safety Manual delivered with the machine gives general safety information.
- The Service Manual and Parts Manual are available from your dealer for use by mechanics to do shop-type service and repair work.
- The Telescopic Handler Operator Training Course is available through your local dealer or at www.training.bobcat.com or www.bobcat.com. This course is intended to provide rules and practices of correct operation of the Telescopic Handler.
- The Telescopic Handler Safety Video is available from your Bobcat dealer or at www.training.bobcat.com or www.bobcat.com.

The dealer and owner / operator review the recommended uses of the product when delivered. If the owner / operator will be using the machine for a different application(s) he or she must ask the dealer for recommendations on the new use.

Dealer Copy -- Not for Resale

SI VH EMEA-0409 SM

SAFETY INSTRUCTIONS (CONT'D)



Cutting or drilling concrete containing sand or rock containing quartz may result in exposure to silica dust. Use a respirator, water spray or other means to control dust.

FIRE PREVENTION



Maintenance

The machine and some attachments have components that are at high temperatures under normal operating conditions. The primary source of high temperatures is the engine and exhaust system. The electrical system, if damaged or incorrectly maintained, can be a source of arcs or sparks.

Flammable debris (leaves, straw, etc.) must be removed regularly. If flammable debris is allowed to accumulate, it can cause a fire hazard. Clean often to avoid this accumulation. Flammable debris in the engine compartment is a potential fire hazard.

The operator's area, engine compartment and engine cooling system must be inspected every day and cleaned if necessary to prevent fire hazards and overheating.

All fuels, most lubricants and some coolants mixtures are flammable. Flammable fluids that are leaking or spilled onto hot surfaces or onto electrical components can cause a fire.

Operation

Do not use the machine where exhaust, arcs, sparks or hot components can contact flammable material, explosive dust or gases.

Electrical



Check all electrical wiring and connections for damage. Keep the battery terminals clean and tight. Repair or replace any damaged part or wires that are loose or frayed.

Battery gas can explode and cause serious injury. Use the procedure in the Operation & Maintenance Manual for connecting the battery and for jump starting. Do not jump start or charge a frozen or damaged battery. Keep any open flames or sparks away from batteries. Do not smoke in battery charging area.

SI VH EMEA-0409 SM

FIRE PREVENTION (CONT'D)

Hydraulic System

Check hydraulic tubes, hoses and fittings for damage and leakage. Never use open flame or bare skin to check for leaks. Hydraulic tubes and hoses must be properly routed and have adequate support and secure clamps. Tighten or replace any parts that show leakage.

Always clean fluid spills. Do not use gasoline or diesel fuel for cleaning parts. Use commercial nonflammable solvents.

Fueling



Stop the engine and let it cool before adding fuel. No smoking! Do not refuel a machine near open flames or sparks. Fill the fuel tank outdoors.

Starting

Do not use ether or starting fluids on any engine that has glow plugs. These starting aids can cause explosion and injure you or bystanders.

Use the procedure in the Operation & Maintenance Manual for connecting the battery and for jump starting.

Spark Arrestor Exhaust System

The spark arrestor exhaust system is designed to control the emission of hot particles from the engine and exhaust system, but the muffler and the exhaust gases are still hot.

Check the spark arrestor exhaust system regularly to make sure it is maintained and working properly. Use the procedure in the Operation & Maintenance Manual for cleaning the spark arrestor muffler (if equipped).

Welding And Grinding

Always clean the machine and attachment, disconnect the battery, and disconnect the wiring from the Bobcat controllers before welding. Cover rubber hoses, battery and all other flammable parts. Keep a fire extinguisher near the machine when welding.

Have good ventilation when grinding or welding painted parts. Wear dust mask when grinding painted parts. Toxic dust or gas can be produced.

Dust generated from repairing nonmetallic parts such as hoods, fenders or covers can be flammable or explosive. Repair such components in a well ventilated area away from open flames or sparks.

Fire Extinguishers



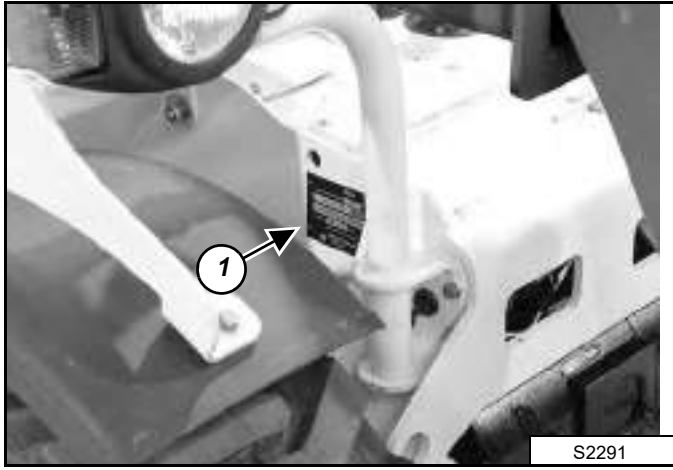
Know where fire extinguishers and first aid kits are located and how to use them. Inspect the fire extinguisher and service the fire extinguisher regularly. Obey the recommendations on the instructions plate.

Dealer Copy Not for Resale

SERIAL NUMBER LOCATION

Always use the serial number of the telescopic handler when requesting service information or when ordering parts.

Figure 1

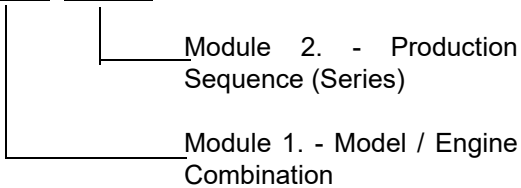


Telescopic Handler Serial Number

The telescopic handler serial number plate is located on the right side of the chassis in front **[Figure 1]**.

Explanation of telescopic handler serial number:

XXXX XXXXX

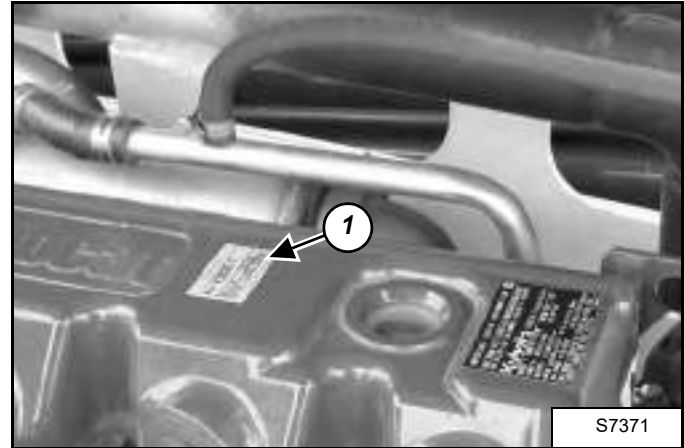


1. The four digit Model/Engine Combination Module number identifies the model number and engine combination.

2. The five digit Production Sequence Number identifies the order which the telescopic handler is produced.

Engine Serial Number

Figure 2



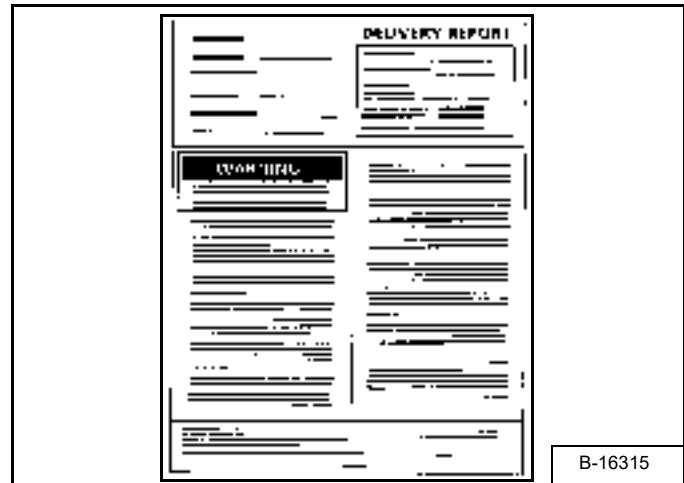
The engine serial number can be found on top of the valve cover (Item 1) **[Figure 2]**. Always use the full number when ordering replacement parts.

Other Serial Numbers

Other components may also have serial numbers and an identification plate. Always use these serial numbers when ordering parts.

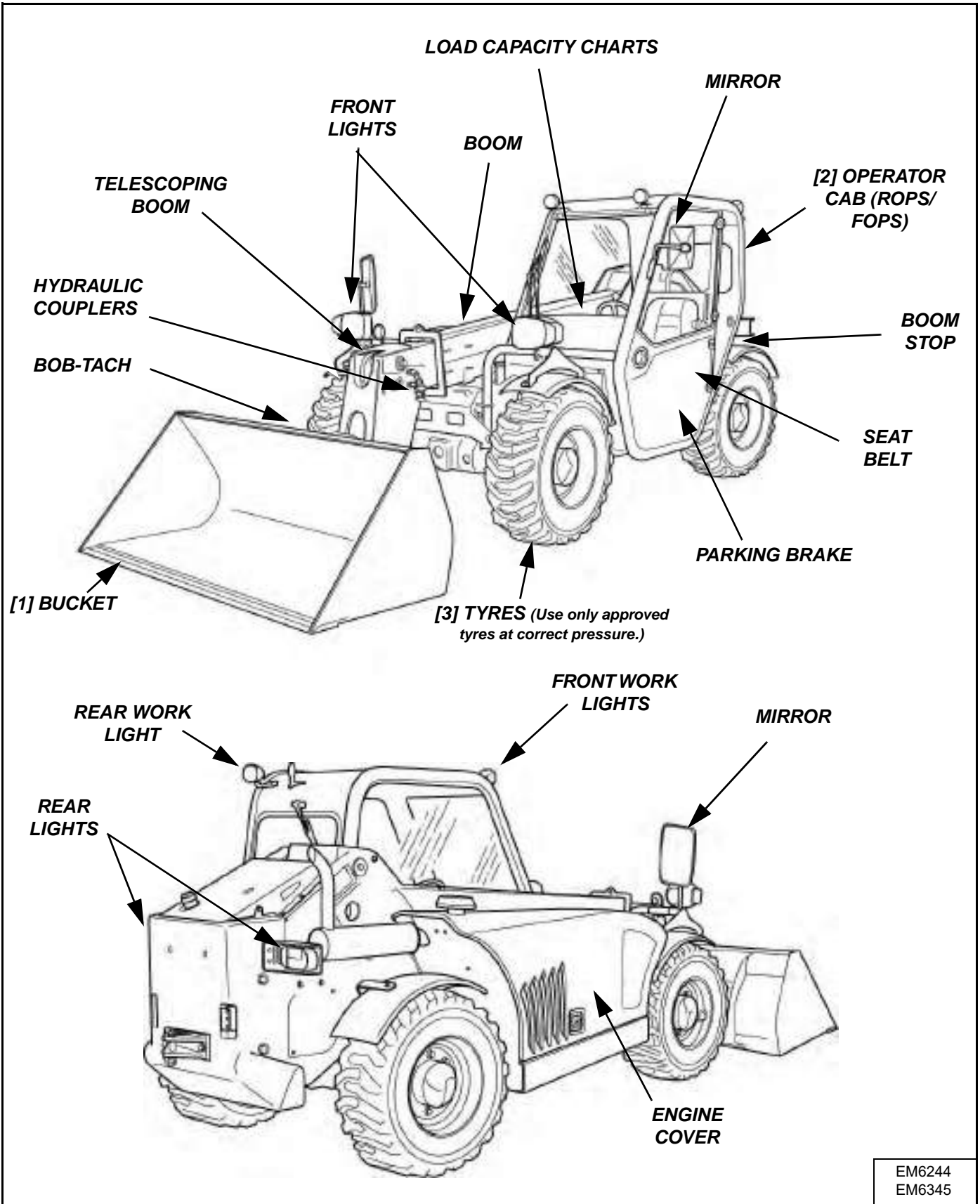
DELIVERY REPORT

Figure 3



The delivery report must be completed by the dealer and signed by the owner or operator when the Bobcat telescopic handler is delivered. An explanation of the form must be given to the owner. Make sure it is complete **[Figure 3]**.

BOBCAT TELESCOPIC HANDLER IDENTIFICATION



Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

SAFETY AND MAINTENANCE

LIFTING AND BLOCKING THE TELESCOPIC HANDLER	10-10-1
Procedure	10-10-1
OPERATOR CAB (ROPS / FOPS)	10-20-1
Emergency Exit	10-20-1
Cab Door	10-20-2
Cab Door Window	10-20-2
TRANSPORTING THE TELESCOPIC HANDLER ON A TRAILER	10-30-1
Loading And Unloading	10-30-1
Fastening	10-30-1
TOWING THE TELESCOPIC HANDLER	10-40-1
Releasing The Brake Discs	10-40-1
Towing	10-40-2
Engaging The Brake Discs	10-40-2
SERVICE SCHEDULE	10-50-1
Chart	10-50-1
AIR CLEANER SERVICE	10-60-1
Replacing The Filter Element	10-60-1
ENGINE COOLING SYSTEM	10-70-1
Cleaning	10-70-1
Removing And Replacing The Coolant	10-70-2
Checking Level	10-70-3
FUEL SYSTEM	10-80-1
Fuel Specifications	10-80-1
Filling The Fuel Tank	10-80-1
Fuel Filter	10-80-2
ENGINE LUBRICATION SYSTEM	10-90-1
Checking Engine Oil	10-90-1
Oil Chart	10-90-1
Replacing Oil And Filter	10-90-1
HYDRAULIC / HYDROSTATIC SYSTEM	10-100-1
Checking And Adding Fluid	10-100-1
Replacing The Hydraulic / Hydrostatic Filters	10-100-1
Replacing Hydraulic Fluid	10-100-2
ATTACHMENT CARRIER	10-110-1
Inspection And Maintenance	10-110-1
BOB-TACH (HAND LEVER) (IF EQUIPPED)	10-110-1
Inspection And Maintenance	10-110-1

Dealer Copy -- Not for Resale

AXLES (FRONT AND REAR)	10-130-1
Checking Oil Level (Planetary Carrier)	10-130-1
Draining Oil (Planetary Carrier)	10-130-1
Checking Oil Level (Rear Differential)	10-130-2
Draining Oil (Rear Differential)	10-130-2
Checking Oil Level (Front Differential)	10-130-3
Draining Oil (Front Differential)	10-130-3
 LUBRICATING THE TELESCOPING HANDLER	 10-140-1
Procedure	10-140-1
 TIRE MAINTENANCE	 10-150-1
Wheel Nuts	10-150-1
Tire Mounting	10-150-1
Tire Rotation	10-150-1
Tire Pressure	10-150-1
 APPROVED BOOM STOP (IF EQUIPPED)	 10-160-1
Installing The Approved Boom Stop	10-160-1
Removing The Approved Boom Stop	10-160-1
 ENGINE COVER	 10-170-1
Opening And Closing The Engine Cover	10-170-1
 REMOTE START	 10-180-1
Connecting to the Telescopic Handler	10-180-1
Remote Start Procedure (For Tools MEL1563 and MEL1565)	10-180-3
Remote Start Procedure (For Tool Kit P/N 6689779)	10-180-4
 TELESCOPIC HANDLER STORAGE AND RETURN TO SERVICE	 10-190-1
Storage	10-190-1
Return to Service	10-190-1
 STOPPING THE ENGINE AND LEAVING THE TELESCOPIC HANDLER	 10-200-1
Procedure	10-200-1
 EMERGENCY EXIT	 10-210-1
Rear Window	10-210-1

LIFTING AND BLOCKING THE TELESCOPIC HANDLER

Procedure



Put jackstands under the front axles and rear corners of the frame before running the engine for service. Failure to use jackstands can allow the machine to fall or move and cause injury or death.

W-2017-0286

Figure 10-10-1



Always park the machine on a level surface.

STOP the engine. Put the floor jack under the center of the front axle. Lift the Telescopic Handler and install jackstands **[Figure 10-10-1]**.

Figure 10-10-2



Put the floor jack under the center of the rear axle. Lift the Telescopic Handler and install jackstands **[Figure 10-10-2]**.

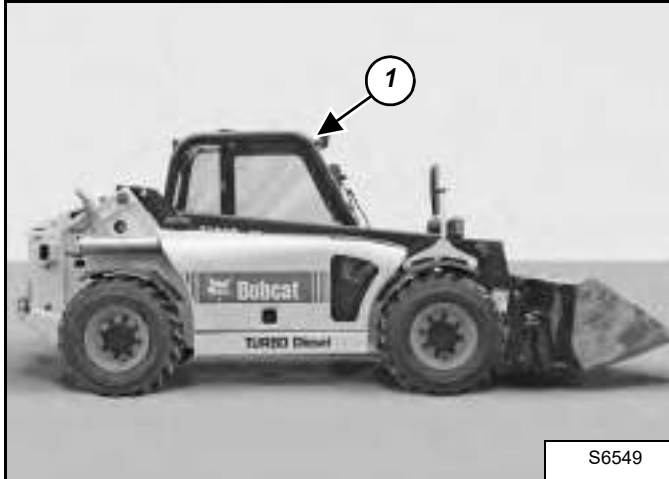


Bobcat®

Dealer Copy -- Not for Resale

OPERATOR CAB (ROPS / FOPS)

Figure 10-20-1



The Telescopic Handler has an operator cab (ROPS and FOPS) (Item 1) [Figure 10-20-1] to protect the operator from rollover and falling objects. Check with your dealer if the operator cab has been damaged. Never operate without right window. The seat belt must be worn for roll over protection.

ROPS/FOPS - Roll Over Protective Structure per SAE J1040 and ISO 3471, and Falling Object Protective Structure per SAE J1043 and ISO 3449.

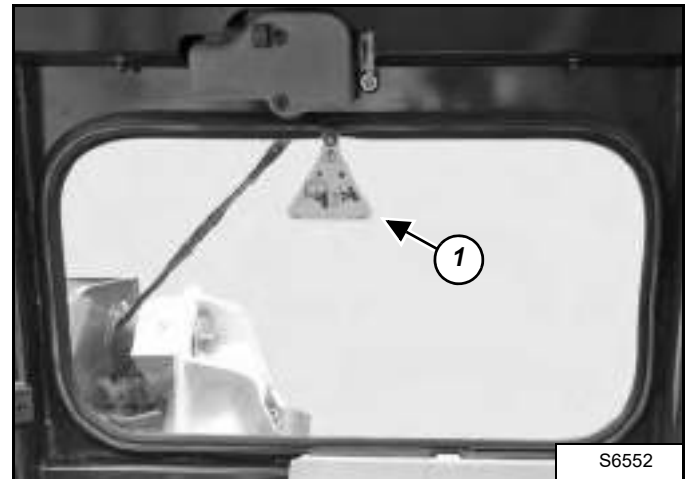


Never modify operator cab by welding, grinding, drilling holes or adding attachments unless instructed to do so by Bobcat Company. Do not operate without right window. Changes to the cab can cause loss of operator protection from rollover and falling objects, and result in serious injury or death.

W-2906-0211

Emergency Exit

Figure 10-20-2



Pull the tag on top of the rear window (Item 1) [Figure 10-20-2] to remove the rubber cord.

Push the rear window out of the rear of the operator cab. (Models with enclosed cab only.)

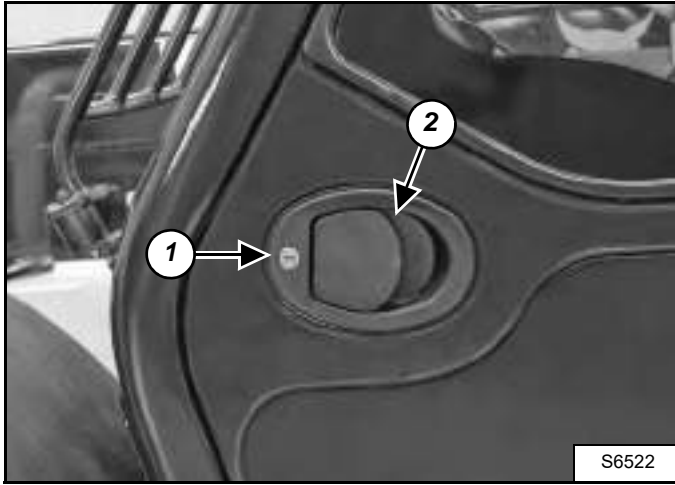
Exit through the rear of the operator cab.

Dealer Copy -- Not for Resale

OPERATOR CAB (ROPS / FOPS) (CONT'D)

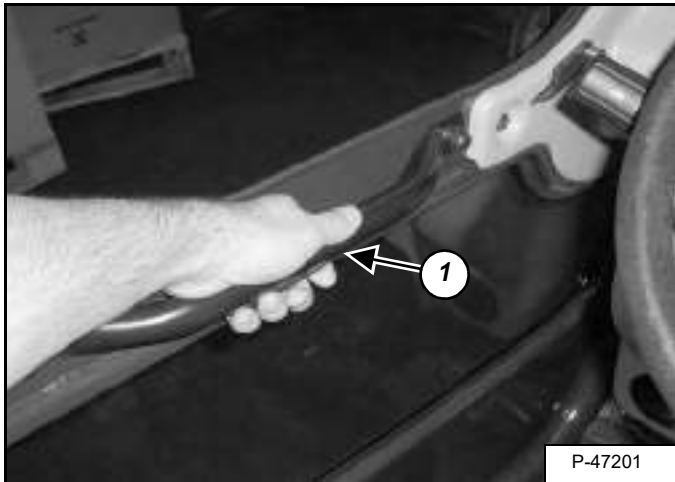
Cab Door

Figure 10-20-3



The cab door can be locked (Item 1) [Figure 10-20-3] with the start key.

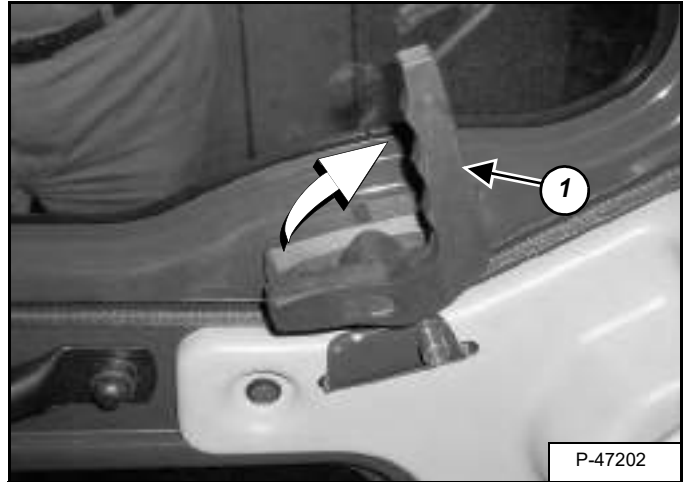
Figure 10-20-4



The cab door can be opened from the outside of the cab using the latch (Item 2) [Figure 10-20-3] and from the inside of the cab by squeezing the latch (Item 1) [Figure 10-20-4] (as shown).

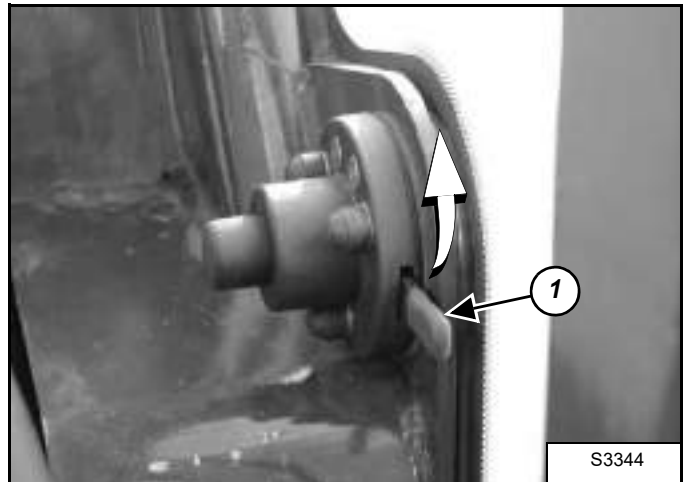
Cab Door Window

Figure 10-20-5



Turn the handle (Item 1) [Figure 10-20-5] (as shown). Push the window open fully until it latches against the cab.

Figure 10-20-6



Pull up the lever (Item 1) [Figure 10-20-6] inside the cab to disengage the latch and close the window.

TRANSPORTING THE TELESCOPIC HANDLER ON A TRAILER

Loading And Unloading

Figure 10-30-1



The telescopic handler must be loaded backward on the trailer.

The rear of the trailer must be blocked or supported (Item 1) [Figure 10-30-1] when loading or unloading the telescopic handler to prevent the front end of the trailer from raising up.

Be sure the transport and towing vehicles are of adequate size and capacity. For the weight of telescopic handler, see "Performance" on page 2.

WARNING

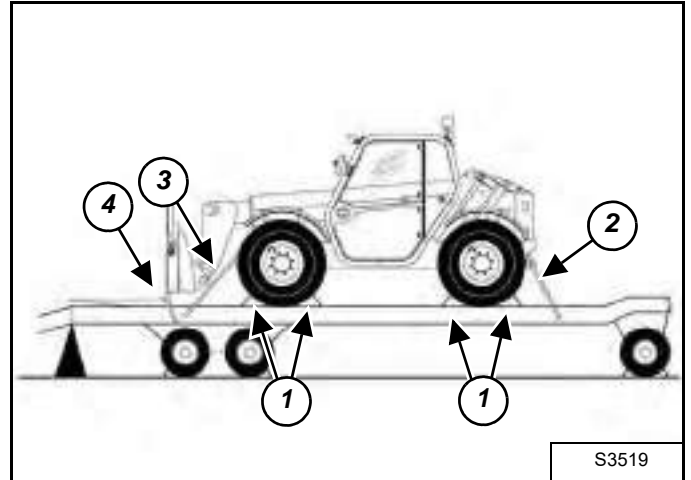
AVOID SERIOUS INJURY OR DEATH

Adequately designed ramps of sufficient strength are needed to support the weight of the machine when loading onto a transport vehicle. Wood ramps can break and cause personal injury.

W-2058-0807

Fastening

Figure 10-30-2



Fasten the telescopic handler to the transport vehicle to prevent it from moving during sudden stops or when going up or down slopes.

- Block the wheels (Item 1) [Figure 10-30-2].
- Fasten the machine frame to the transport vehicle (Items 2 and 3) [Figure 10-30-2].
- Attach the forks or bucket attachment to the transport vehicle (Item 4) [Figure 10-30-2].

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

TOWING THE TELESCOPIC HANDLER

The Telescopic Handler can be towed a short distance such as removing it from mud or loading it onto a transport vehicle.



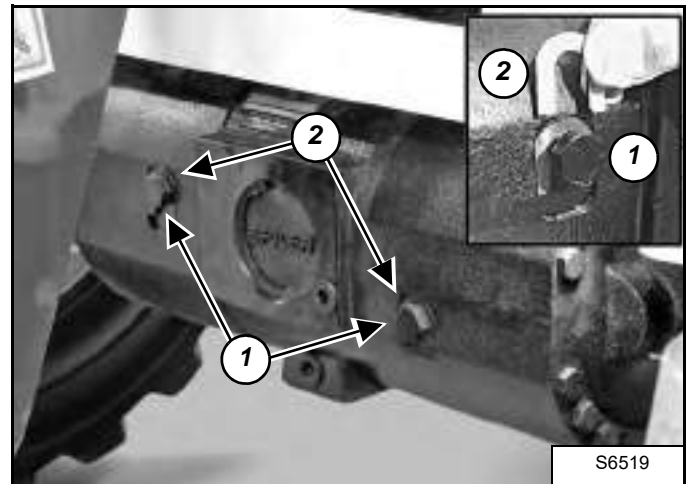
Block the wheels to prevent the machine from rolling.

Releasing The Brake Discs

The brakes are engaged by spring pressure and released by hydraulic pressure. The parking brake must be released manually before towing (if the engine can not be started to release the brakes or there is no hydraulic pressure). Only the front axle has brakes.

The following procedure describes how to release the brakes:

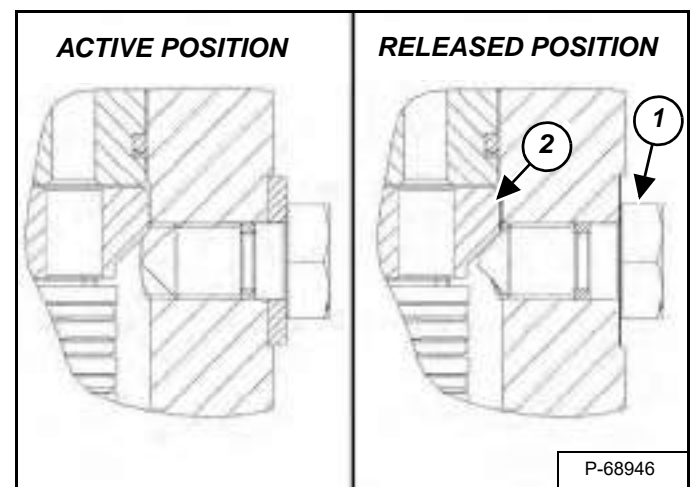
Figure 10-40-1



Loosen the four bolts (Item 1) until the slotted spacers (Item 2) [Figure 10-40-1] can be removed from under the bolt heads (the bolts and spacers are located on both the front and rear side of the front axle).

Remove the spacers (Item 2) [Figure 10-40-1] and save for reuse.

Figure 10-40-2



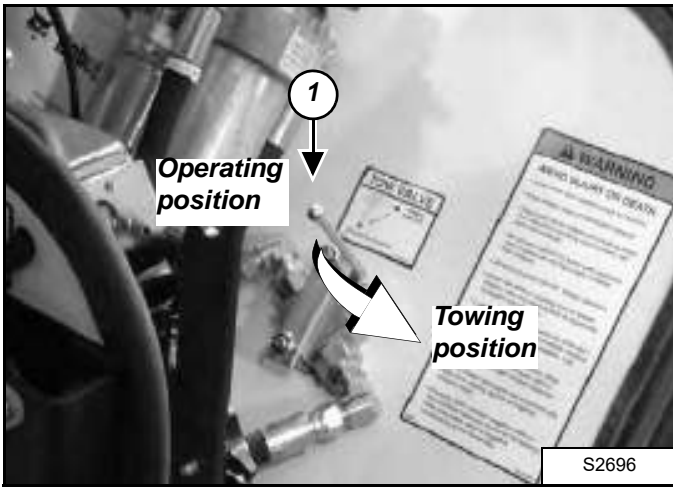
After removing the spacers, evenly tighten the front and rear bolts (Item 1) to hold the parking brake piston (Item 2) [Figure 10-40-2] in the released position.

Dealer Copy -- Not for Resale

TOWING THE TELESCOPIC HANDLER (CONT'D)

Towing

Figure 10-40-3

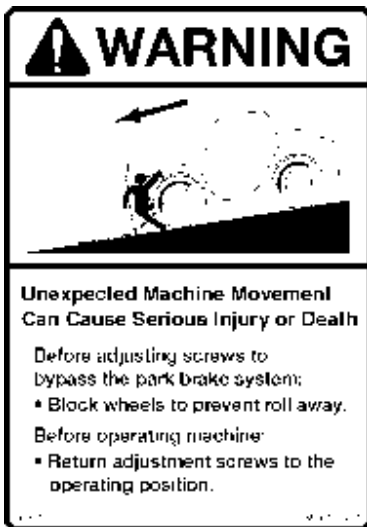


Raise the engine cover.

Turn the tow valve (Item 1) [Figure 10-40-3] counterclockwise 90 degrees to TOWING POSITION.

Tow the Telescopic Handler at a slow speed.

NOTE: The vehicle will not be able to brake until the four bolts (Item 1) [Figure 10-40-3] & [Figure 10-40-3] are returned to their original position.



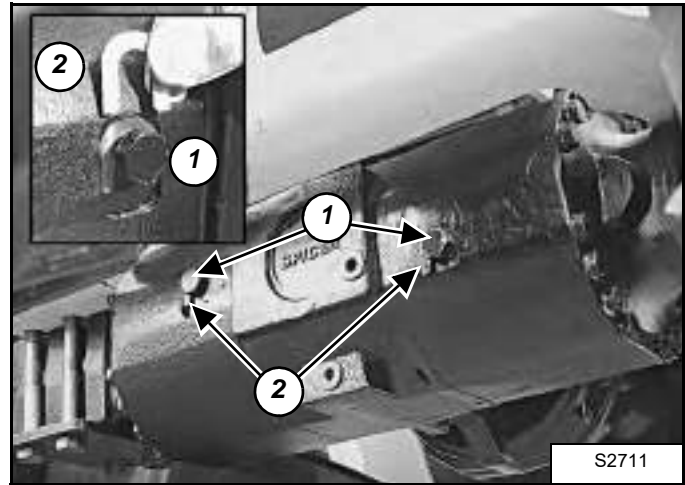
Block the wheels to prevent the machine from rolling.

After towing is completed, turn the tow valve (Item 1) [Figure 10-40-3] clockwise 90 degrees to the OPERATING POSITION.

NOTE: If the tow valve is not returned to the operating position, the machine will not be able to be driven forward or backward.

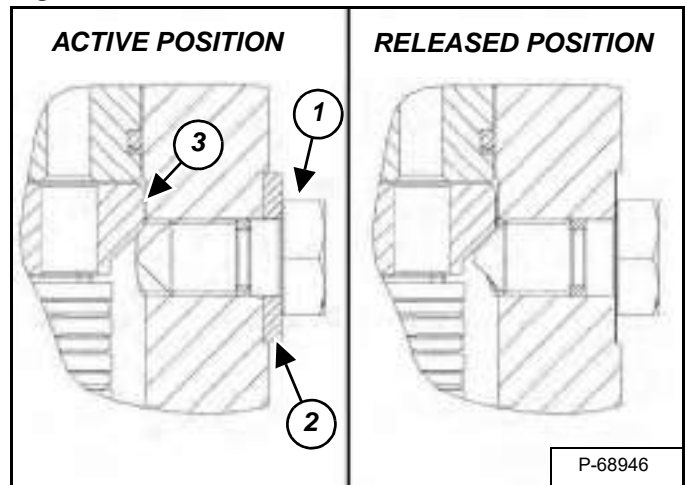
Engaging The Brake Discs

Figure 10-40-4



Loosen the four bolts (Item 1) until the spacers (Item 2) [Figure 10-40-4] can be installed under the bolt heads (the bolts and washers are located on both the front and rear side of front axle).

Figure 10-40-5



Evenly tighten the front and rear bolts (Item 1) to hold the spacers (Item 2) [Figure 10-40-4] & [Figure 10-40-5].

Tighten the bolts to 95-115 N•m (70-85 ft-lb) torque.

This will allow the parking brake piston (Item 3) [Figure 10-40-5] to be active again.

SERVICE SCHEDULE

Chart

Maintenance work must be done at regular intervals. Failure to do so will result in excessive wear and early failures. The service schedule is a guide for correct maintenance of the Bobcat telescopic handler.



WARNING

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death.

W-2003-EN-0903

SERVICE SCHEDULE		HOURS					
		10	50	100	250	[5] 500	[6] 1000
ITEM	SERVICE REQUIRED						
Engine Oil	Check the oil level and add as needed. Do not overfill.						
Hydraulic Fluid	Check the fluid level and add as needed.						
Safety Signs, Safety Tread and Mirrors	Check for damaged signs (decals), safety treads, load charts and mirrors. Replace if damaged or missing.						
Fuel Filter	Remove the trapped water.						
Tyres	Check for damaged tyres and correct air pressure. Inflate to MAXIMUM pressure shown on sidewall of the tyre.						
Seat Belt	Check condition. Check mounting hardware.						
Brakes and Controls	Check for function. Service as necessary.						
Gauges, Horn and Backup Alarm	Check for correct operation. Repair or replace as needed.						
General	Check for loose or broken parts, damaged cab, seat belt and instrument operations. Check for installation of right hand cab window. Clean mirrors and windows. Repair or replace as needed.						
Engine Cooling System	Check oil cooler, radiator and air conditioner condenser. Check coolant level COLD in reservoir. Add premixed coolant as necessary. (See ENGINE COOLING SYSTEM.) Check cooling system for leaks.						
Engine Air Filter	Check condition indicator. Service only when required. Do not use compressed air to clean elements. Empty dust cup.						
Engine Air Intake System	Check for leaks and damaged components.						
Bob-Tach Pivot, Wedges, Cylinder and Link Pin Pivots	Lubricate with multipurpose lithium based grease.						
Axle Steering Pivot Points	Lubricate with multipurpose lithium based grease.						
Rear Axle Pivots	Lubricate with multipurpose lithium based grease.						
Boom and Cylinder Pivots	Lubricate with multipurpose lithium based grease.						
Hydraulic Hoses, Tubelines and Connections	Check for damage and leaks. Repair or replace as needed.						
Universal Joints and Slip Yoke on Drive Shaft	Lubricate with multipurpose lithium based grease.						
Cab Filter	Clean dust out of the cab filter. Replace every 500 hours.						
Battery	Check cables and connections						
Wheel Nuts	Check wheel nut torque. Tighten as needed [360 N•m (265 ft-lb)].	[1]					
Fuel Filter	Replace the fuel filter element. Use the genuine Bobcat Filter.		[2]				
Engine / Hydro. Drive Belt	Check for wear or damage. Check tension and adjust or replace as needed.						
Alt. and Air Cond. Belt (If Equipped)	Check condition. Replace as needed.						
Door hinges	Lubricate door hinges with multipurpose lithium based grease.						
Hydraulic/Hydrostatic Oil Filters	Replace the hydraulic/hydrostatic oil filter elements. Use a genuine Bobcat filter.		[2]				
Engine Oil and Filter	Replace the engine oil and filter. Use a genuine Bobcat filter.		[2]				
Cab Filter	Replace the cab filter.						
Planetary Carriers	Replace the fluid. See SPECIFICATIONS for correct oil type and capacities.				[3]		
Axle Fluid, Differential Fluid, Gear Box Fluid	Replace the fluid. See SPECIFICATIONS for correct oil type and capacities.			[3]		[2]	
Hydraulic Fluid	Replace the hydraulic fluid.						
Telescopic Boom Wear Blocks	Check for wear and adjust as needed. Replace if necessary.						
Pivot Pins and Bushings	Check for wear on the pivot pins and bushings.						
Breathers	Clean gear box, axle housing, and hydraulic tank breathers. Replace as needed.						
Engine Coolant	Check freeze protection of antifreeze -30°C (-34°F). Flush cooling system and replace with premixed coolant						Every 2 years

[1] Check wheel nut torque every 8 hours for the first 24 hours.

[2] Perform service first time, then as indicated in chart.

[3] Check level.

[4] Replace fluid first time, then as indicated in chart.

[5] or every 6 months.

[6] or every 12 months.



Bobcat®

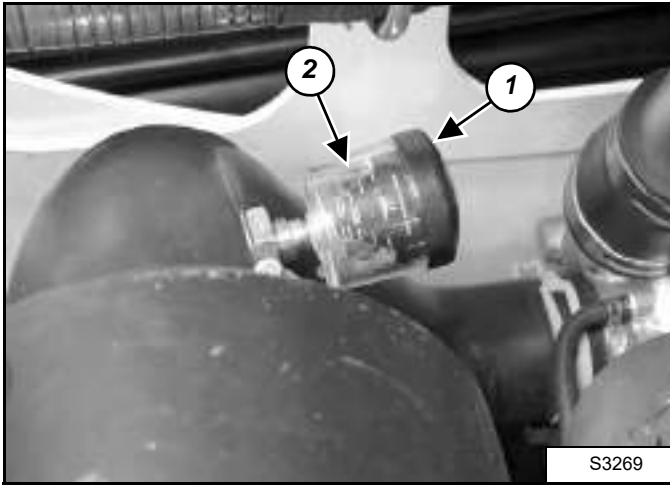
Dealer Copy -- Not for Resale

AIR CLEANER SERVICE

Replacing The Filter Element

Outer filter

Figure 10-60-1

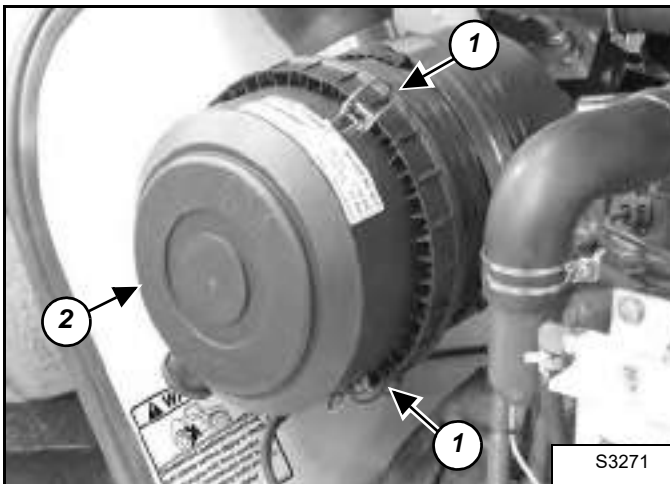


Replace the large (outer) filter element only when the red ring shows in the window of the condition indicator (Item 1) [Figure 10-60-1].

NOTE: Before replacing the filter element, push the button on the condition indicator (Item 2) [Figure 10-60-1]. Start the engine. If the red ring does not show, do not replace the filter element.

Replace the inner filter every third time the outer filter is replaced or when the red ring still shows in the indicator window after the outer filter has been replaced.

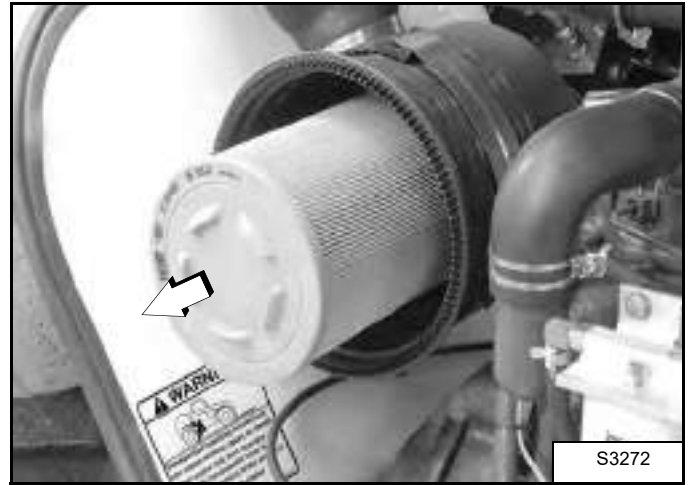
Figure 10-60-2



Loosen the filter housing clamps (Item 1) [Figure 10-60-2].

Release the fastener and remove the cover (Item 2) [Figure 10-60-2].

Figure 10-60-3

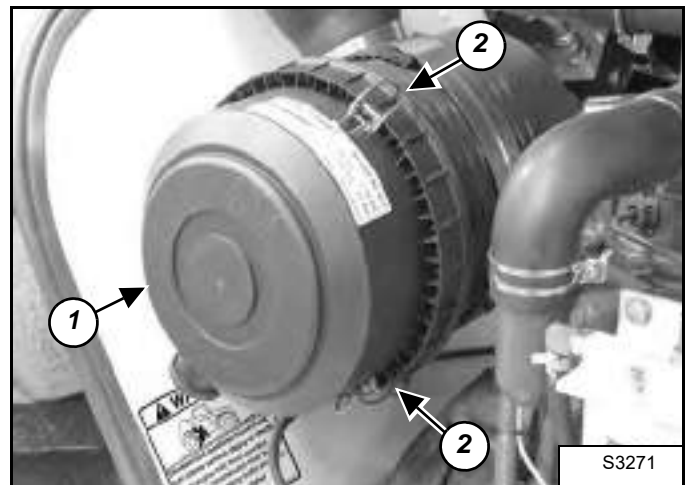


Pull the element straight out [Figure 10-60-3].

NOTE: Make sure all sealing surfaces are free of dirt and debris. Do not use compressed air to remove dirt or debris.

Install a new outer element.

Figure 10-60-4



Install the dust cover (Item 1) [Figure 10-60-4] and fasten.

Connect the filter housing clamps (Item 2) [Figure 10-60-4].

Dealer Copy -- Not for Resale

AIR CLEANER SERVICE (CONT'D)

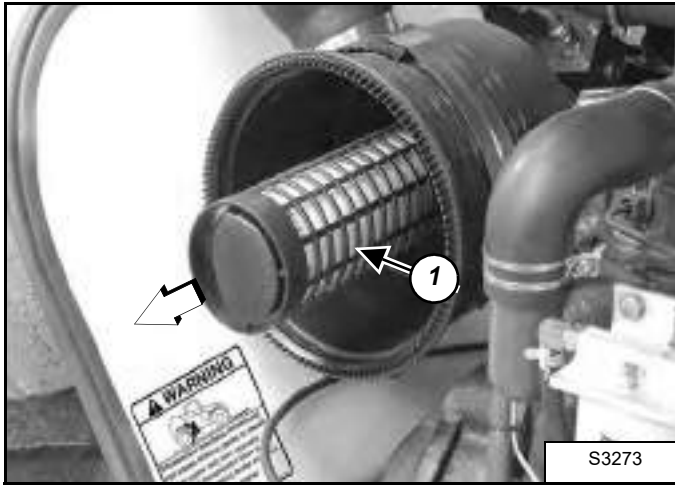
Replacing The Filter Element (Cont'd)

Inner Filter

Remove the outer element.

NOTE: Make sure all sealing surfaces are free of dirt and debris. Do not use compressed air to remove dirt or debris

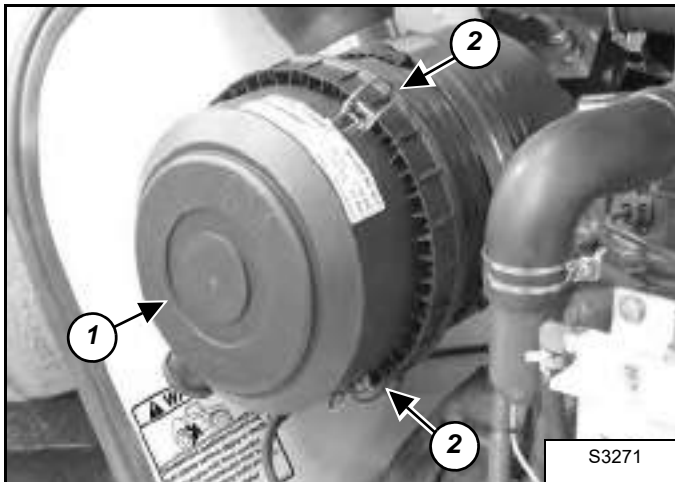
Figure 10-60-5



Remove the inner filter (Item 1) [Figure 10-60-5] and install a new element.

Install the outer element.

Figure 10-60-6



Install the dust cover (Item 1) [Figure 10-60-6] and fasten.

Connect the filter housing clamps (Item 2) [Figure 10-60-6].

ENGINE COOLING SYSTEM

Check the cooling system every day to prevent overheating, loss of performance or engine damage. (See SERVICE SCHEDULE on Page 10-50-1.)

WARNING

AVOID INJURY OR DEATH

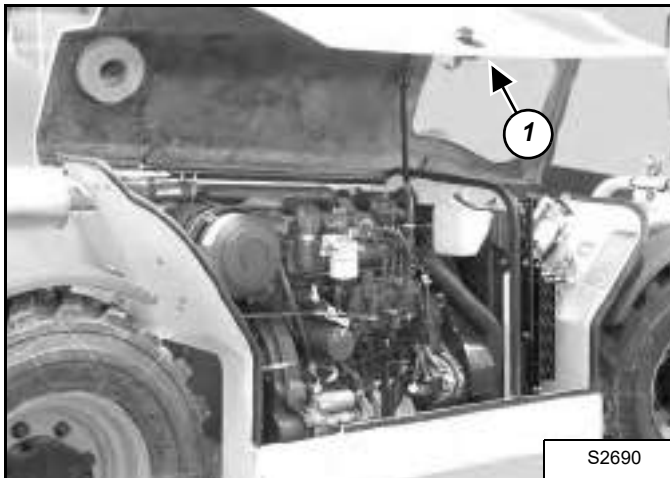
Wear safety glasses to prevent eye injury when any of the following conditions exist:

- **When fluids are under pressure.**
- **Flying debris or loose material is present.**
- **Engine is running.**
- **Tools are being used.**

W-2019-0907

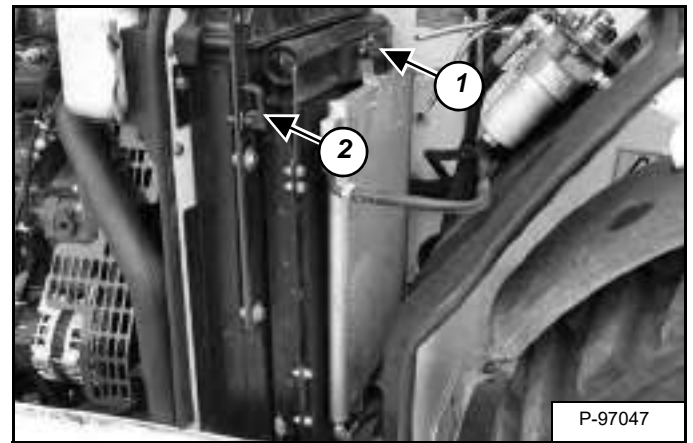
Cleaning

Figure 10-70-1



Open the engine cover (Item 1) **[Figure 10-70-1]**.

Figure 10-70-2



Loosen the knob (Item 1) **[Figure 10-70-2]** and tilt the condenser (if equipped) forward.

Loosen the knob (Item 2) **[Figure 10-70-2]** and tilt the oil cooler forward.

Use low air pressure or water pressure to clean the condenser (if equipped), oil cooler and radiator.

Reposition the oil cooler and tighten the knob (Item 2) **[Figure 10-70-2]**.

Reposition the condenser and tighten the knob (Item 1) **[Figure 10-70-2]** (if equipped).

Dealer Copy -- Not for Resale

ENGINE COOLING SYSTEM (CONT'D)

Removing And Replacing The Coolant

! WARNING

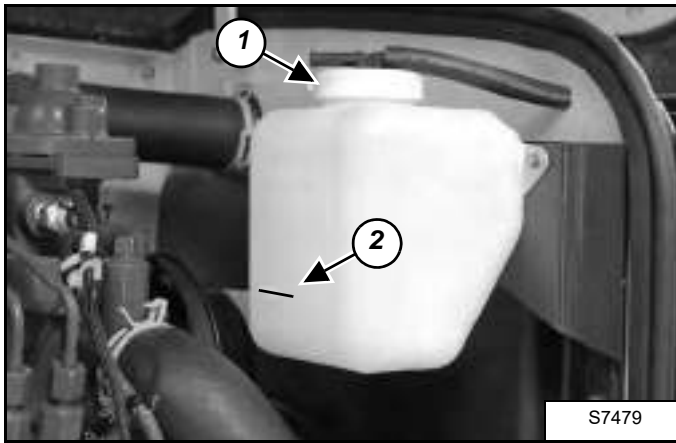
AVOID BURNS

Do not remove radiator cap when the engine is hot. You can be seriously burned.

W-2070-1203

Open the engine cover.

Figure 10-70-3



Remove the cap (Item 1) [Figure 10-70-3] from the coolant reservoir.

IMPORTANT

AVOID ENGINE DAMAGE

Always use the correct ratio of water to antifreeze.

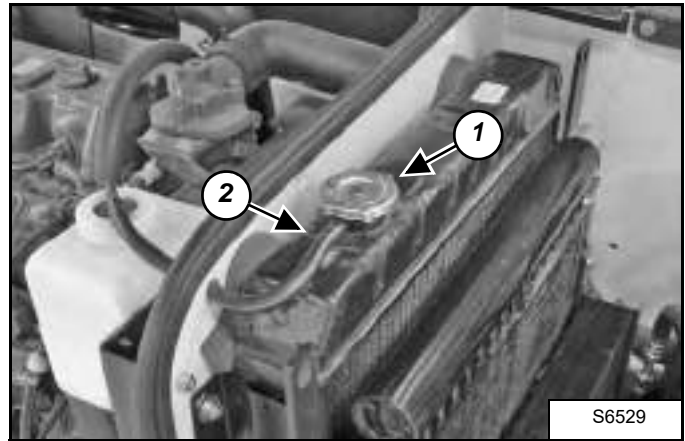
Too much antifreeze reduces cooling system efficiency and may cause serious premature engine damage.

Too little antifreeze reduces the additives which protect the internal engine components; reduces the boiling point and freeze protection of the system.

Always add a premixed solution. Adding full strength concentrated coolant can cause serious premature engine damage.

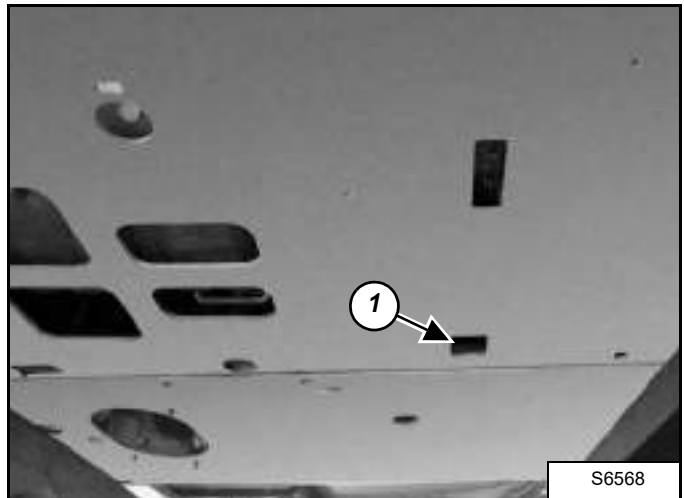
I-2124-0497

Figure 10-70-4



Remove the radiator cap (Item 1) [Figure 10-70-4].

Figure 10-70-5



Open the radiator drain valve (Item 1) [Figure 10-70-5] at the bottom of the engine compartment.

Drain the coolant into a container. Recycle or dispose of coolant in an environmentally safe manner.

Close the drain valve (Item 1) [Figure 10-70-5].

ENGINE COOLING SYSTEM (CONT'D)

Removing And Replacing The Coolant (Cont'd)

Mix the coolant in a separate container.

NOTE: The cooling system is factory filled with ethylene glycol (EG) coolant. DO NOT mix ethylene glycol with propylene glycol.

Use a refractometer to check the condition of ethylene glycol in your cooling system.

Add premixed coolant to the reservoir if the coolant level is low. (See Operation And Maintenance Manual for more information.)

Add coolant to the radiator. The coolant level must be right below the connection with the overflow bottle (Item 2) [Figure 10-70-4].

When using concentrated coolant instead of a ready-to-use premix: mix the coolant in a separate container with 50% ethylene glycol and 50% water.

Install the radiator cap.

Add coolant to the overflow bottle as needed.

Run the engine until it is at operating temperature.

Stop the engine.

Check the coolant level when the engine is cold and add coolant as needed until it is at the mark (Item 1) [Figure 10-70-3] on the overflow bottle.

IMPORTANT

AVOID ENGINE DAMAGE

Always use the correct ratio of water to antifreeze.

Too much antifreeze reduces cooling system efficiency and may cause serious premature engine damage.

Too little antifreeze reduces the additives which protect the internal engine components; reduces the boiling point and freeze protection of the system.

Always add a premixed solution. Adding full strength concentrated coolant can cause serious premature engine damage.

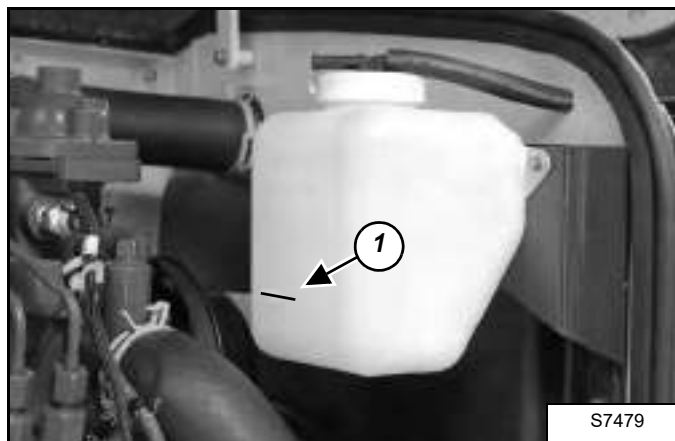
I-2124-0497

Checking Level

Open the engine cover.

Check the coolant level in the coolant reservoir.

Figure 10-70-6



The coolant level must be at or slightly above the minimum (min) mark (Item 1) [Figure 10-70-6] on the coolant reservoir when the engine is cold.

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

FUEL SYSTEM

Fuel Specifications

Use only clean, high quality diesel fuel, Grade No. 2 or Grade No. 1.

The following is one suggested blending guideline which should prevent fuel gelling problems in cold temperatures:

TEMP. Cx (Fx)	NO. 2	NO. 1
+9x (15x)	100%	0%
Down to -29x (-20x)	50%	50%
Below -29° (-20°)	0%	100%

At a minimum, Low Sulfur (500 ppm sulfur) Diesel Fuel must be used in this machine.



The following fuels may also be used in this machine:

- Ultra Low Sulfur (15 ppm sulfur) Diesel Fuel.
- Biodiesel Blend Fuel - Must contain no more than five percent biodiesel mixed with low sulfur or ultra low sulfur petroleum based diesel. This is commonly marketed as B5 blended diesel fuel.

Filling The Fuel Tank



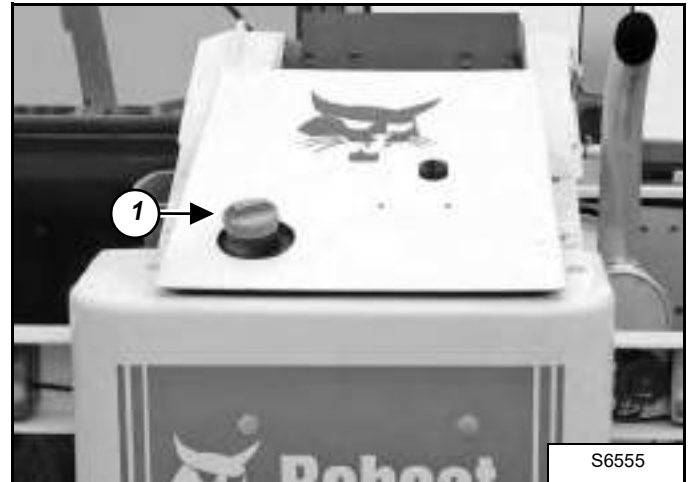
WARNING

AVOID INJURY OR DEATH

Stop and cool the engine before adding fuel. NO SMOKING! Failure to obey warnings can cause an explosion or fire.

W-2063-0807

Figure 10-80-1



Remove the fuel fill cap (Item 1) [Figure 10-80-1].

Use a clean, approved safety container to add fuel of the correct specifications. Add fuel only in an area that has free movement of air and no open flames or sparks. **NO SMOKING!**

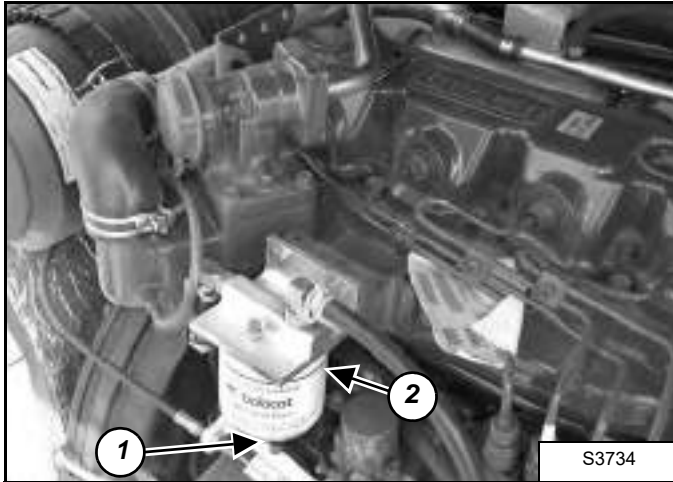
Install and tighten the fuel fill cap [Figure 10-80-1].

Dealer Copy -- Not for Resale

FUEL SYSTEM (CONT'D)

Fuel Filter

Figure 10-80-2



For the correct service interval. (See SERVICE SCHEDULE on Page 10-50-1.)

Loosen the drain (Item 1) [Figure 10-80-2] at the bottom of the filter element to remove water from the filter.

Remove the filter element (Item 2) [Figure 10-80-2].

Clean the area around the filter housing. Put clean oil on the seal of the new filter element. Install the fuel filter, and hand tighten.

WARNING

AVOID INJURY OR DEATH

Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire.

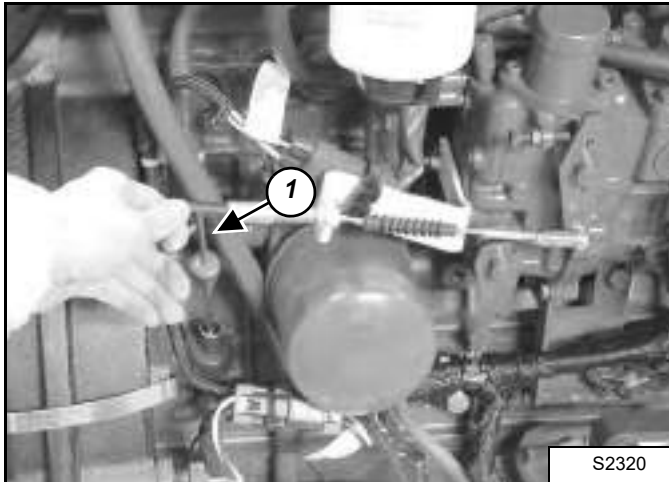
W-2103-0508

ENGINE LUBRICATION SYSTEM

Checking Engine Oil

Check the engine oil level every day before starting the engine for the work shift.

Figure 10-90-1

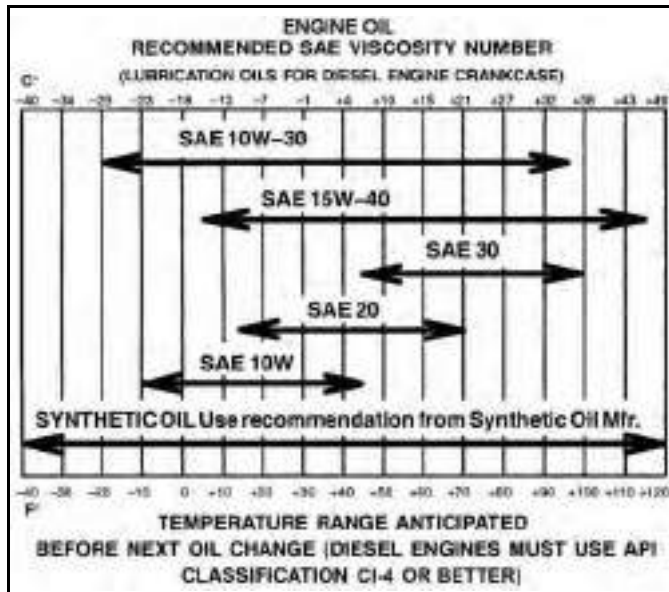


Open the engine cover and remove the dipstick (Item 1) [Figure 10-90-1].

Keep the oil level between the marks on the dipstick.

Oil Chart

Figure 10-90-2



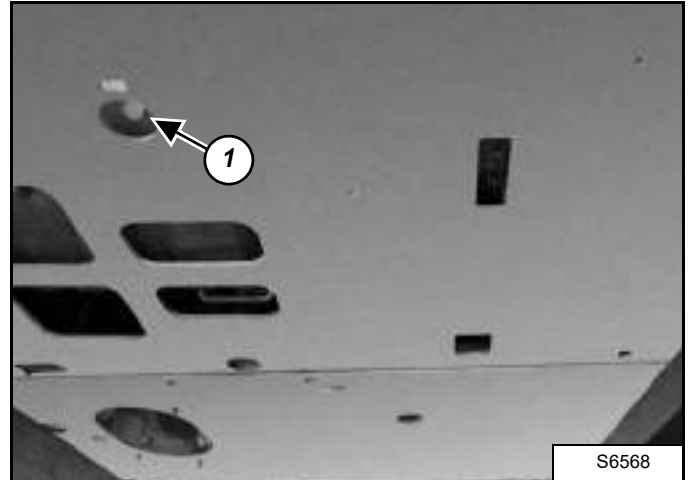
Use good quality motor oil that meets API Service Classification of CI-4 or better (See Oil Chart, [Figure 10-90-2]).

Replacing Oil And Filter

For the correct service interval for replacing the engine oil and filter. (See SERVICE SCHEDULE on Page 10-50-1.)

Run the engine until it is at operating temperature. Stop the engine.

Figure 10-90-3



Remove the oil plug (Item 1) [Figure 10-90-3] at the bottom of the engine compartment.

Drain the oil into a container and recycle or dispose of used oil in an environmentally safe manner.

NOTE: Oil at engine operating temperature is extremely hot. Take all necessary precautions to avoid injury and make sure the container is heat resistant.

Install the oil plug (Item 1) [Figure 10-90-3].



AVOID INJURY OR DEATH

Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire.

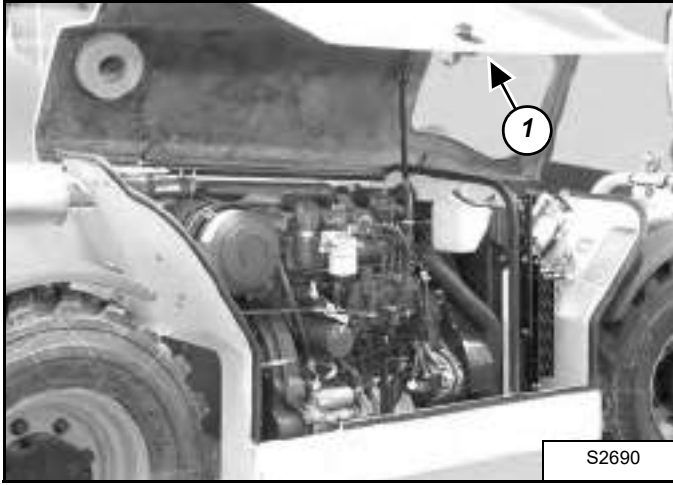
W-2103-0508

Dealer Copy -- Not for Resale

ENGINE LUBRICATION SYSTEM (CONT'D)

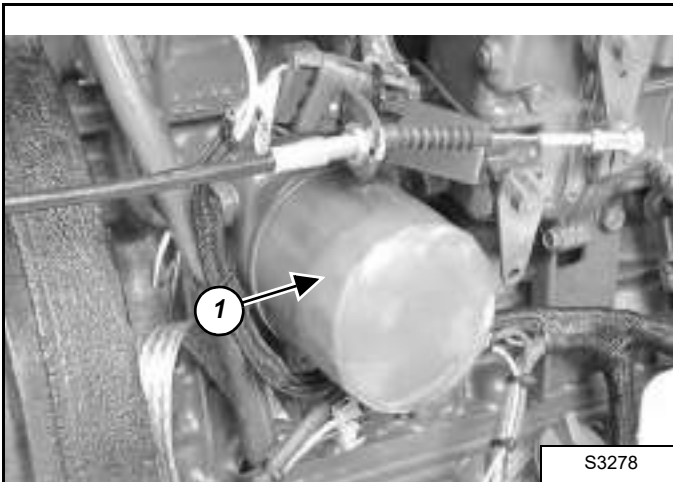
Replacing Oil And Filter (Cont'd)

Figure 10-90-4



Open the engine cover (Item 1) [Figure 10-90-4].

Figure 10-90-5

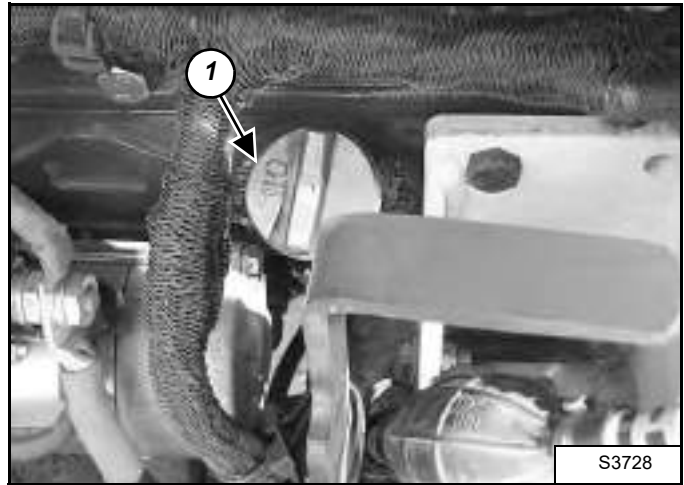


Remove the oil filter (Item 1) [Figure 10-90-5].

Clean the filter housing surface.

Put clean oil on the new oil filter gasket. Install the filter and hand tighten.

Figure 10-90-6



Remove the fill cap (Item 1) [Figure 10-90-6].

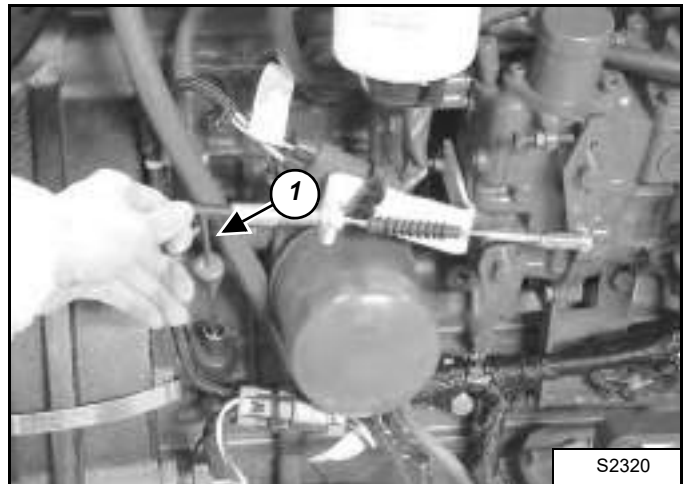
Put oil in the engine. (See Fluid Capacities on Page SPEC-10-4.) (See Oil Chart on Page 10-90-1.)

Install the fill cap, start the engine and let it run for several minutes.

Stop the engine, and check for leaks at the oil filter.

Let the engine cool.

Figure 10-90-7



Remove the dipstick (Item 1) [Figure 10-90-7] and check the oil level. Add oil as needed if it is not at the top mark on the dipstick.

Recycle or dispose of the fluid in an environmentally safe manner. Reinstall the dipstick.

HYDRAULIC / HYDROSTATIC SYSTEM

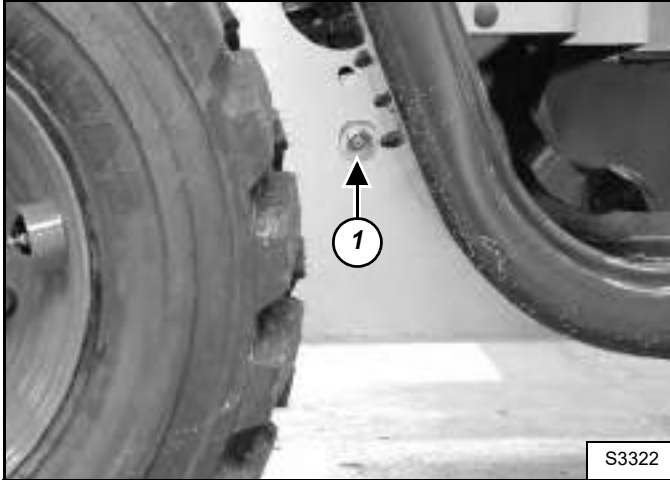
Checking And Adding Fluid

Use only recommended fluid in the hydraulic system. (See HYDRAULIC/HYDROSTATIC FLUID SPECIFICATIONS on Page SPEC-50-1.)

Stop the machine on a level surface. Lower the boom all the way and tilt the Bob-Tach fully back.

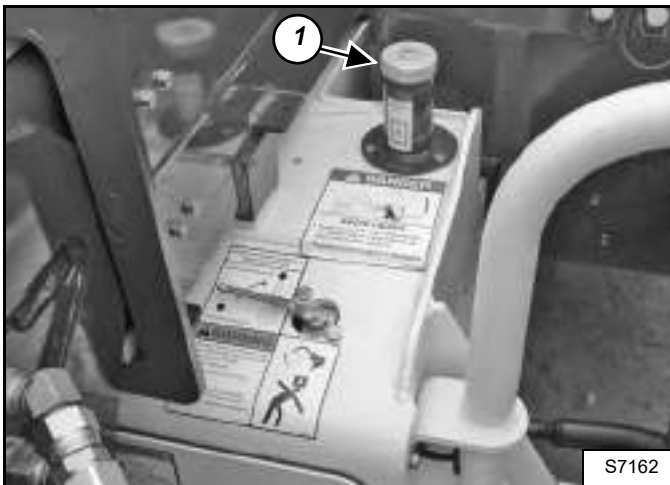
Stop the engine.

Figure 10-100-1



Check the fluid level at the sight gauge (Item 1) [Figure 10-100-1] behind the front left wheel.

Figure 10-100-2



Clean the area around the hydraulic fill cap.

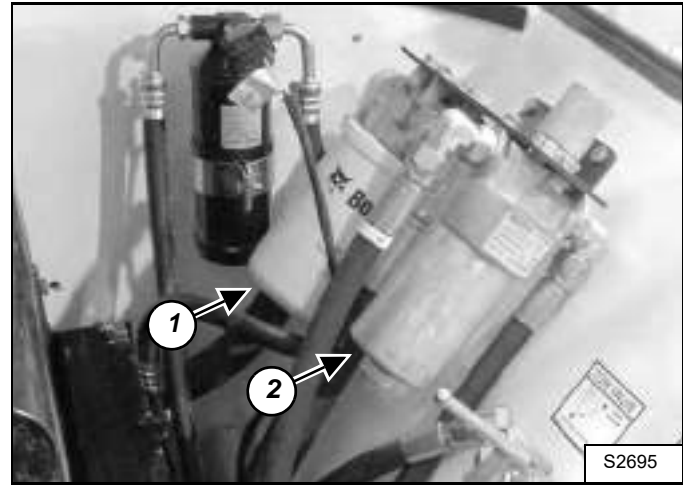
Remove the fill cap (Item 1) [Figure 10-100-2] at the front left side of the Telescopic Handler and add hydraulic fluid until visible in the sight gauge.

Install the fill cap.

Replacing The Hydraulic / Hydrostatic Filters

For the correct service interval for replacing the hydraulic / hydrostatic filters. (See SERVICE SCHEDULE on Page 10-50-1.)

Figure 10-100-3



Stop the engine and open the engine cover.

Remove the two filter elements (Items 1 & 2) [Figure 10-100-3].

Clean the surface of the filter housings where the filter seals contacts the housings.

Put clean oil on the seals of the new filters. Install and hand tighten the two new filter elements.

WARNING

AVOID INJURY OR DEATH

Diesel fuel or hydraulic fluid under pressure can penetrate skin or eyes, causing serious injury or death. Fluid leaks under pressure may not be visible. Use a piece of cardboard or wood to find leaks. Do not use your bare hand. Wear safety goggles. If fluid enters skin or eyes, get immediate medical attention from a physician familiar with this injury.

W-2072-0807

Dealer Copy -- Not for Resale

HYDRAULIC/HYDROSTATIC SYSTEM (CONT'D)

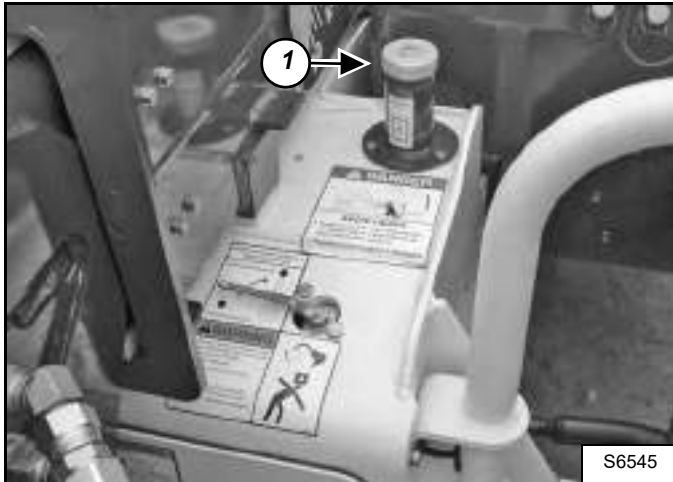
Replacing Hydraulic Fluid

Use only recommended fluid in the hydraulic system. (See HYDRAULIC/HYDROSTATIC FLUID SPECIFICATIONS on Page SPEC-50-1.)

Stop the machine on a level surface. Lower the boom all the way and tilt the Bob-Tach fully back.

Stop the engine.

Figure 10-100-4



Remove the fill cap (Item 1) [Figure 10-100-4] at the front left side of the Telescopic Handler.

WARNING

AVOID INJURY OR DEATH

Diesel fuel or hydraulic fluid under pressure can penetrate skin or eyes, causing serious injury or death. Fluid leaks under pressure may not be visible. Use a piece of cardboard or wood to find leaks. Do not use your bare hand. Wear safety goggles. If fluid enters skin or eyes, get immediate medical attention from a physician familiar with this injury.

W-2072-0807

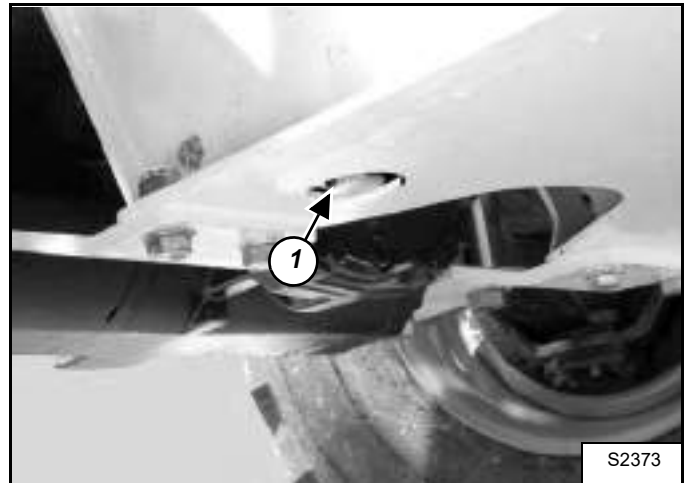
WARNING

AVOID INJURY OR DEATH

Always clean up spilled fuel or oil. Keep heat, flames, sparks or lighted tobacco away from fuel and oil. Failure to use care around combustibles can cause explosion or fire.

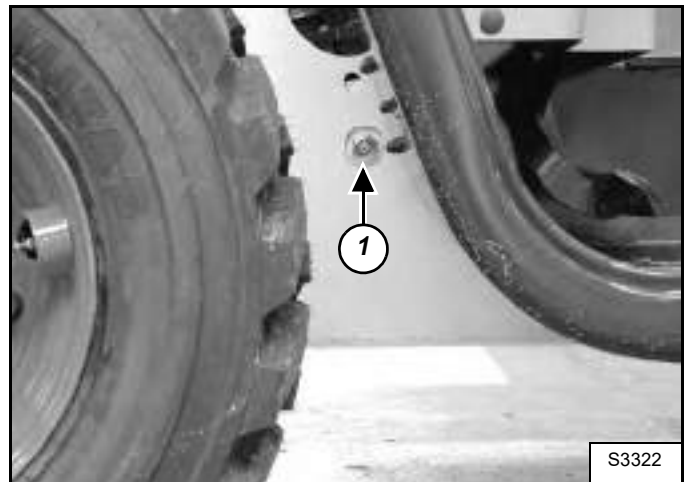
W-2103-0508

Figure 10-100-5



Remove the reservoir drain plug (Item 1) [Figure 10-100-5] behind the right front tire and drain the fluid into a container. Recycle or dispose of the fluid in an environmentally safe manner. Reinstall the drain plug and tighten.

Figure 10-100-6



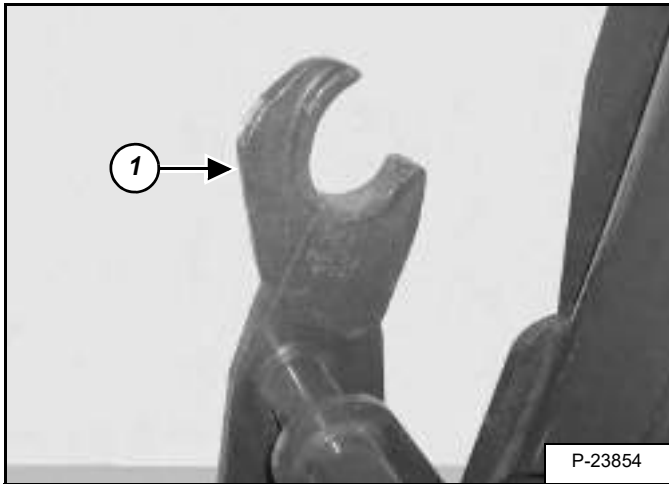
Add fluid until visible in the sight gauge (Item 1) [Figure 10-100-6] behind the front left tire.

Install the fill cap (Item 1) [Figure 10-100-4].

ATTACHMENT CARRIER

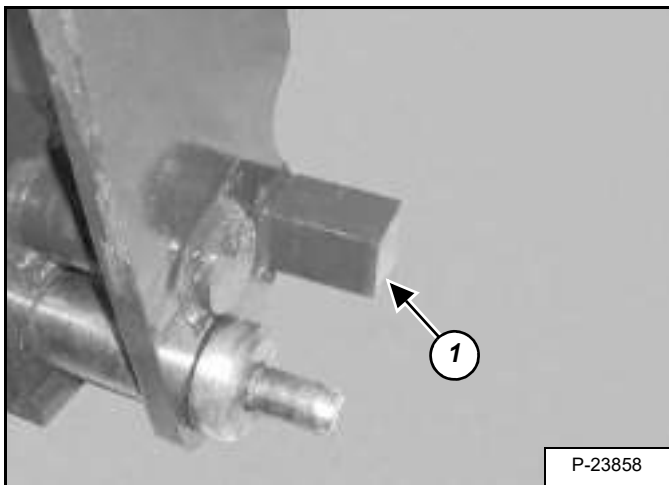
Inspection And Maintenance

Figure 10-110-1



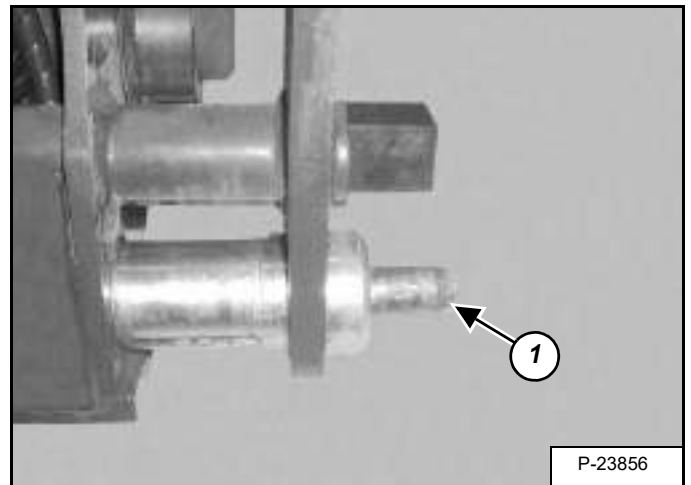
The telescopic handler mounting hooks (Item 1) [Figure 10-110-1] must not be damaged. Check for cracked or broken hooks.

Figure 10-110-2



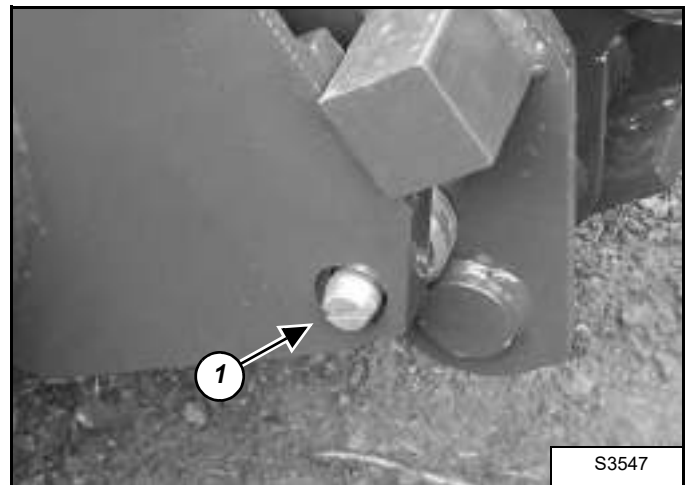
The stop blocks (Item 1) [Figure 10-110-2] must not be damaged. Check for bent or broken stop blocks.

Figure 10-110-3



The telescopic handler attachment locking pins (if equipped) (Item 1) [Figure 10-110-3] must move freely. The pins must not be bent or the ends deformed.

Figure 10-110-4



The pins (if equipped) must extend through the holes in the attachment mounting frame (Item 1) [Figure 10-110-4].

Lubricate the attachment carrier. (See SERVICE SCHEDULE on Page 10-50-1.) (See LUBRICATING THE TELESCOPING HANDLER on Page 10-140-1.)

Dealer Copy -- Not for Resale



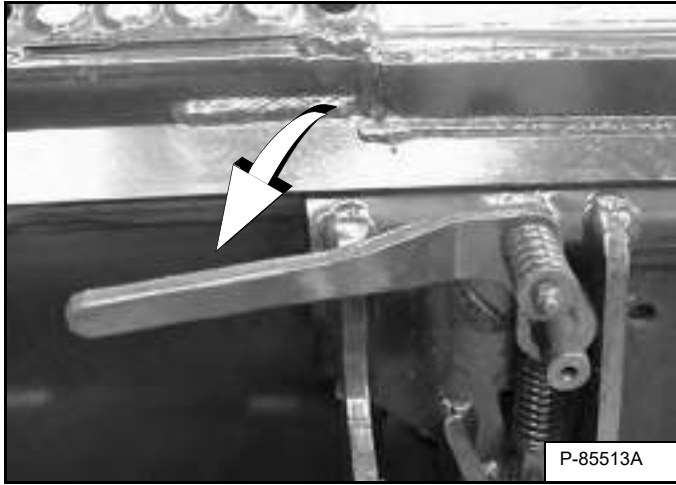
Bobcat®

Dealer Copy -- Not for Resale

BOB-TACH (HAND LEVER) (IF EQUIPPED)

Inspection And Maintenance

Figure 10-110-1



Move the Bob-Tach levers down to engage the wedges [Figure 10-110-1].

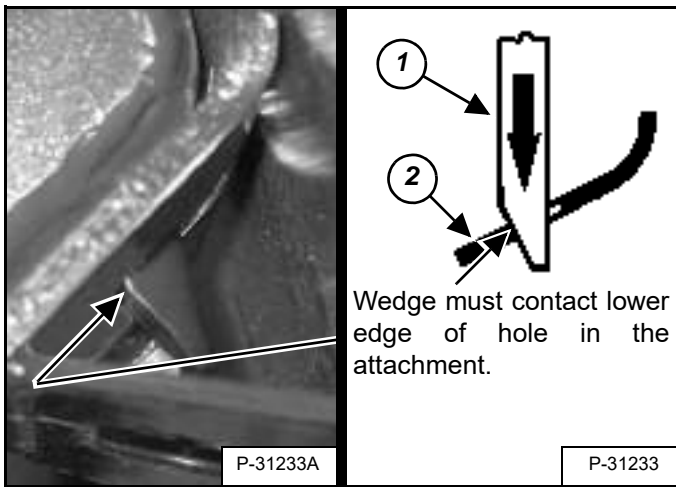
The levers and wedges must move freely.

WARNING

Bob-Tach wedges must extend through the holes in attachment. Lever(s) must be fully down and locked. Failure to secure wedges can allow attachment to come off and cause injury or death.

W-2102-0497

Figure 10-110-2

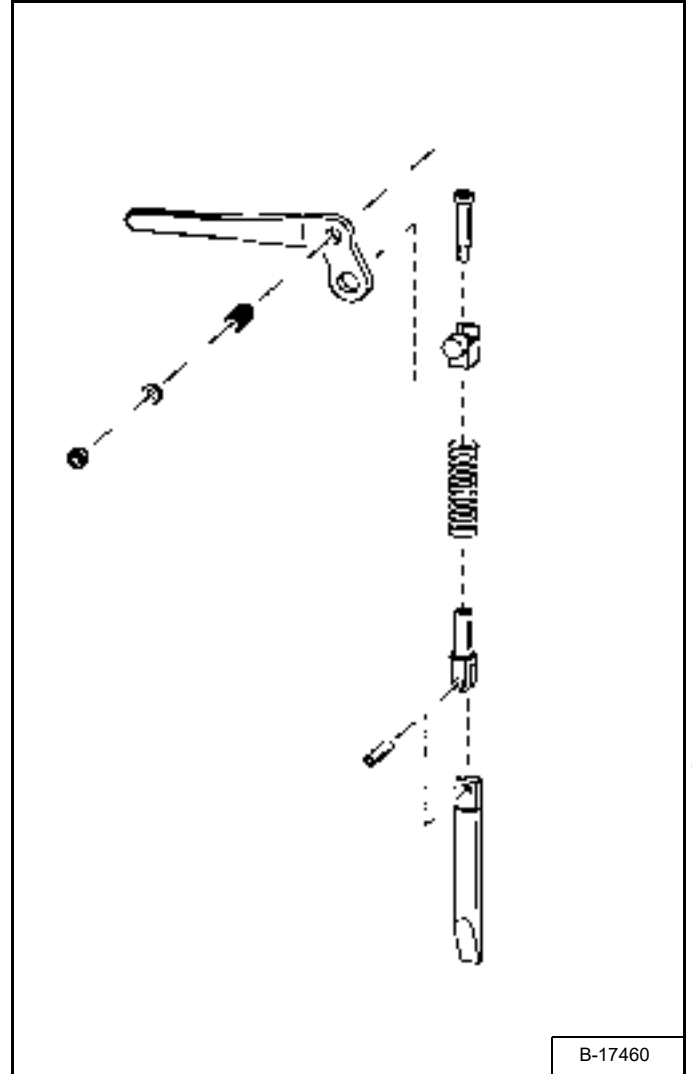


The wedges (Item 1) [Figure 10-110-2] must extend through the holes in the attachment mounting frame.

The spring loaded wedge (Item 1) must contact the lower edge of the hole in the attachment (Item 2) [Figure 10-110-2].

If the wedge does not contact the lower edge of the hole [Figure 10-110-2], the attachment will be loose and can come off the Bob-Tach.

Figure 10-110-3



Inspect the mounting frame on the attachment and Bob-Tach, linkages and wedges for excessive wear or damage [Figure 10-110-3]. Replace any parts that are damaged, bent or missing. Keep all fasteners tight.

Look for cracked welds. Contact your Bobcat dealer for repair or replacement parts.

Lubricate the wedges. (See SERVICE SCHEDULE on Page 10-50-1.)



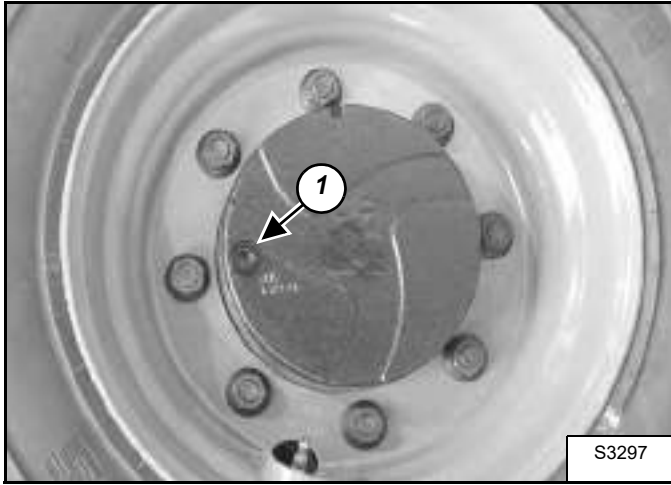
Bobcat®

Dealer Copy -- Not for Resale

AXLES (FRONT AND REAR)

Checking Oil Level (Planetary Carrier)

Figure 10-130-1



Put the machine on a level surface with the plug (Item 1) **[Figure 10-130-1]** positioned as shown.

Remove the plug (Item 1) **[Figure 10-130-1]**. The oil level should be at the bottom edge of the plug hole.

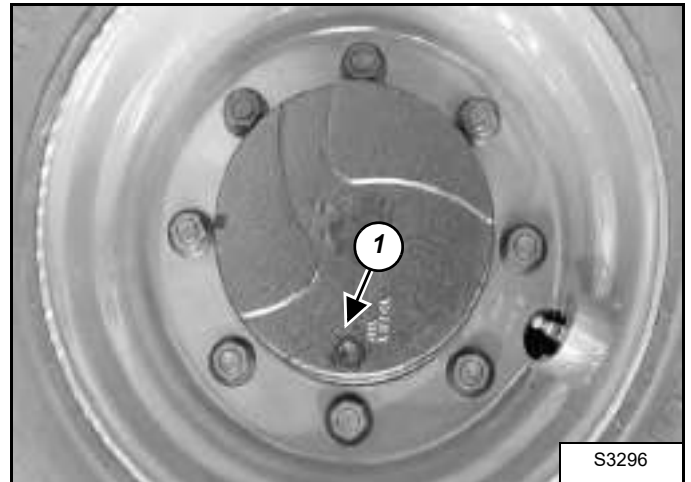
Add gear lube through the hole if the oil level is below the hole. (See Fluid Capacities on Page SPEC-10-4.)

Install and tighten the plug.

Repeat the procedure for the other side.

Draining Oil (Planetary Carrier)

Figure 10-130-2



For the correct service interval. (See SERVICE SCHEDULE on Page 10-50-1.)

Put the machine on a level surface with the plug (Item 1) **[Figure 10-130-2]** positioned as shown.

Remove the plug (Item 1) **[Figure 10-130-2]** and drain into a container. Recycle or dispose of the used lubricant in an environmentally safe manner.

Reposition the plug hole (Item 1) **[Figure 10-130-1]** and add gear lube until the lube level is at the bottom edge of the plug hole.

Install and tighten the plug.

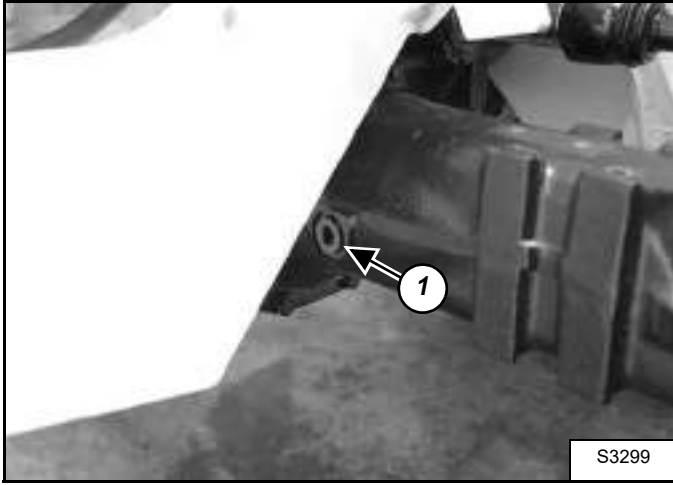
Repeat the procedure for the other side.

Dealer Copy -- Not for Resale

AXLES (FRONT AND REAR) (CONT'D)

Checking Oil Level (Rear Differential)

Figure 10-130-3



With the machine on a level surface, remove the fill plug (Item 1) **[Figure 10-130-3]**. The oil level should be at the bottom edge of the plug hole.

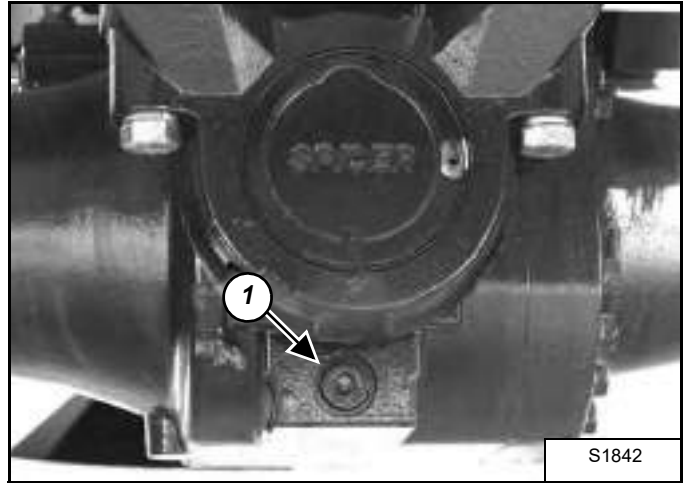
Add oil through the hole if the oil level is at the bottom edge of the hole. (See Fluid Capacities on Page SPEC-10-4.)

Install and tighten the fill plug.

Draining Oil (Rear Differential)

For the correct service interval. (See SERVICE SCHEDULE on Page 10-50-1.)

Figure 10-130-4



With the machine on a level surface remove the drain plug (Item 1) **[Figure 10-130-4]** and drain into a container.

Recycle or dispose of the used lubricant in an environmentally safe manner.

Install and tighten the drain plug.

Remove the fill plug (Item 1) **[Figure 10-130-3]**.

Add oil through the hole until the oil level is at the bottom edge of the plug hole.

Install and tighten the fill plug.

AXLES (FRONT AND REAR) (CONT'D)

Checking Oil Level (Front Differential)

Figure 10-130-5

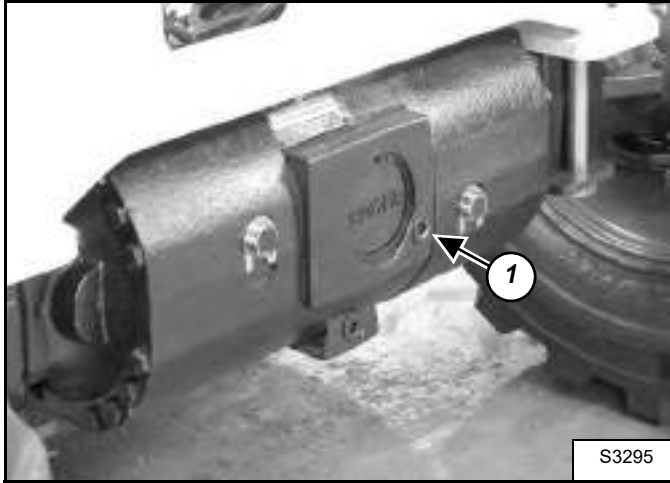
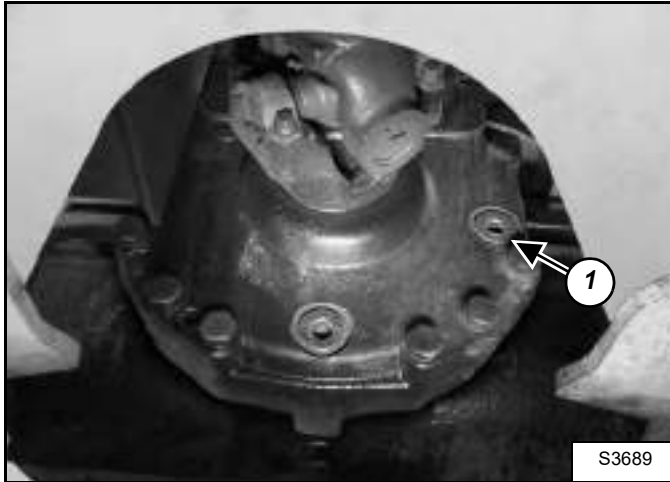


Figure 10-130-6



With the machine on a level surface, remove the fill plugs (Item 1) [Figure 10-130-5] & [Figure 10-130-6]. The oil level should be at the bottom edge of the plug holes.

Add oil through the holes if the oil level is below the holes. (See Fluid Capacities on Page SPEC-10-4.)

Install and tighten the fill plugs.

Draining Oil (Front Differential)

For the correct service interval. (See SERVICE SCHEDULE on Page 10-50-1.)

Figure 10-130-7

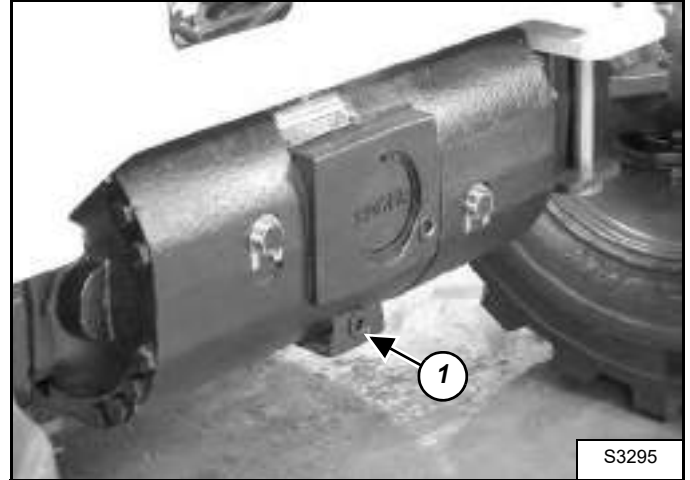
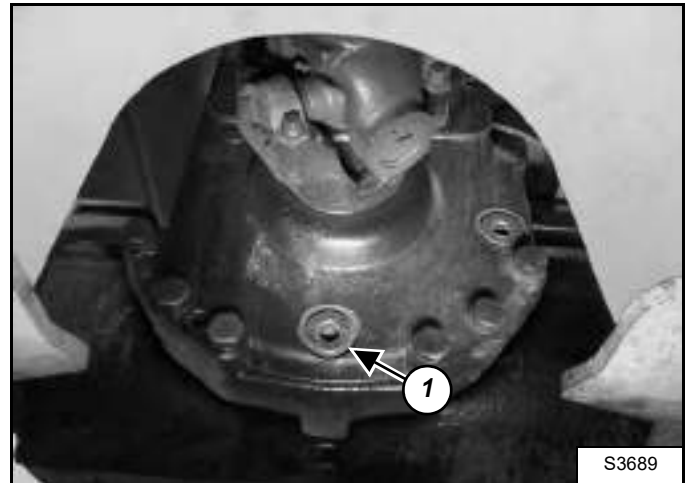


Figure 10-130-8



With the machine on a level surface, remove the drain plugs (Item 1) [Figure 10-130-7] & [Figure 10-130-8] and drain into a container.

Recycle or dispose of the used lubricant in an environmentally safe manner.

Install and tighten the drain plugs.

Remove the fill plugs (Item 1) [Figure 10-130-5] & [Figure 10-130-6].

Add oil through the holes until the oil level is at the bottom edge of the plug holes.

Install and tighten the fill plugs.

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

LUBRICATING THE TELESCOPING HANDLER

Procedure

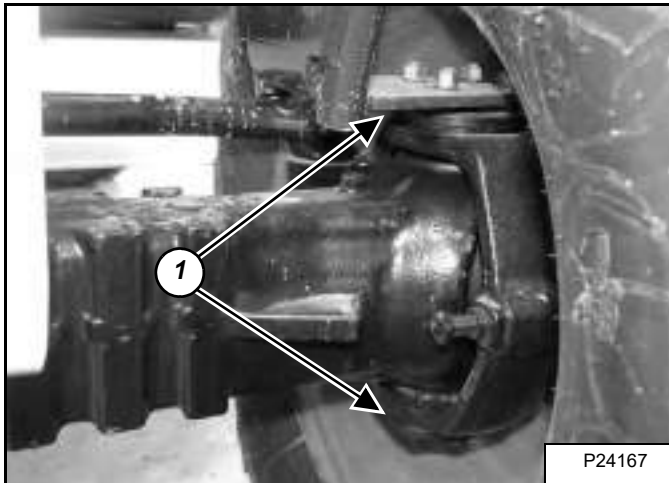
Lubricate as specified (See SERVICE SCHEDULE on Page 10-50-1.) for the best performance of the machine.

Record the operating hours each time you lubricate so that it is performed at the correct interval.

Always use a good quality lithium based multi-purpose grease. Apply lubricant until extra grease shows.

Lubricate the following locations on the Telescopic Handler:

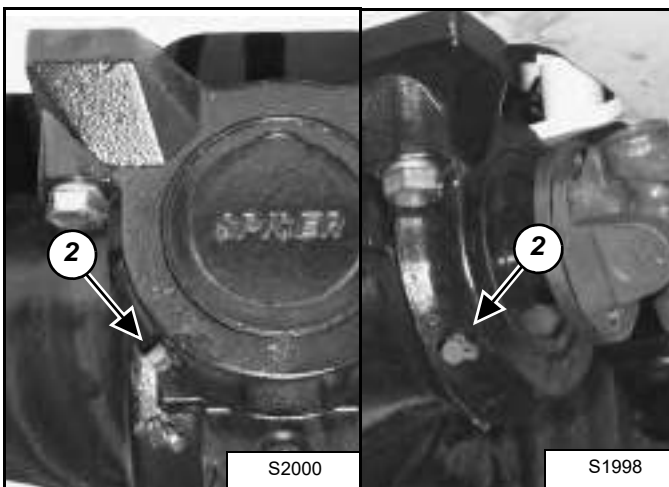
Figure 10-140-1



Ref. Description (# of Fittings)

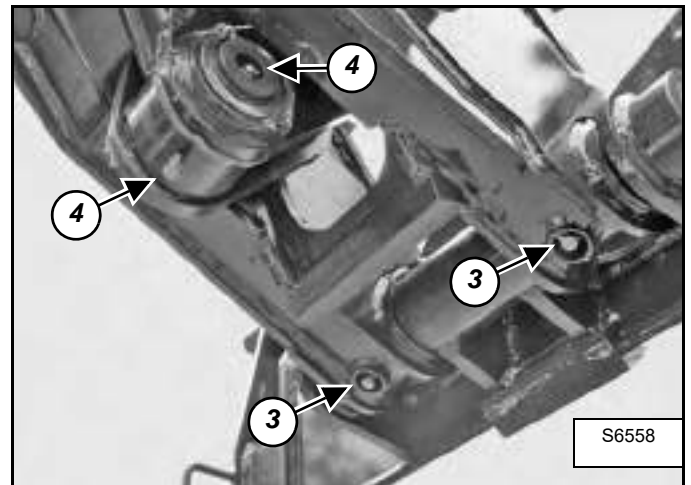
1. Axle Pivots - Top and bottom (2) [Figure 10-140-1] of all four wheels.

Figure 10-140-2



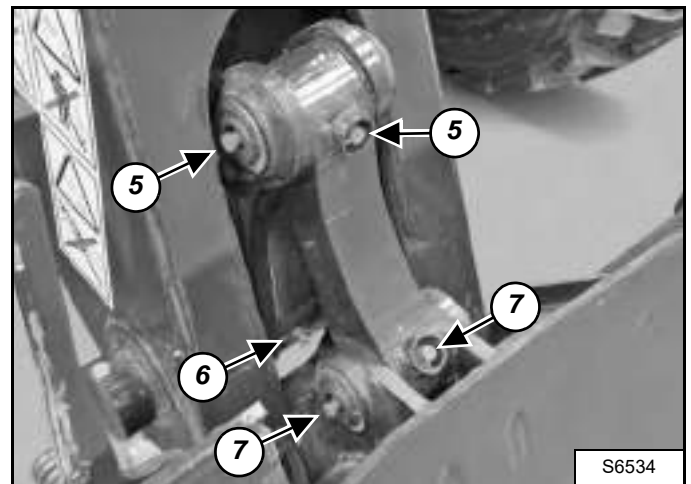
2. Axle Oscillation, Rear Axle - Front and Back (2) [Figure 10-140-2].

Figure 10-140-3



3. Bob-Tach Frame Pivot - Both sides (2) [Figure 10-140-3].
4. Tilt Cylinder, Rod End - Both sides and middle (3) [Figure 10-140-3].

Figure 10-140-4

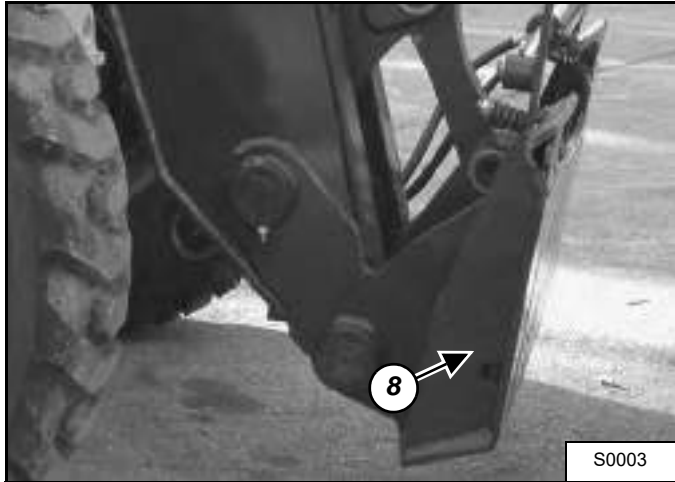


5. Link Pivot - Both sides and middle (3) [Figure 10-140-4].
6. Link Pivot - Middle (1) [Figure 10-140-4].
7. Link Pivot - Both sides and middle (3) [Figure 10-140-4].

Dealer Copy -- Not for Resale

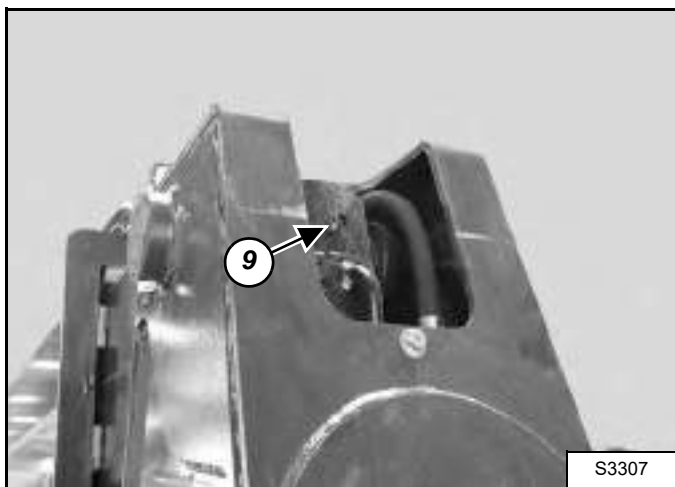
**LUBRICATING THE TELESCOPING HANDLER
(CONT'D)**

Figure 10-140-5



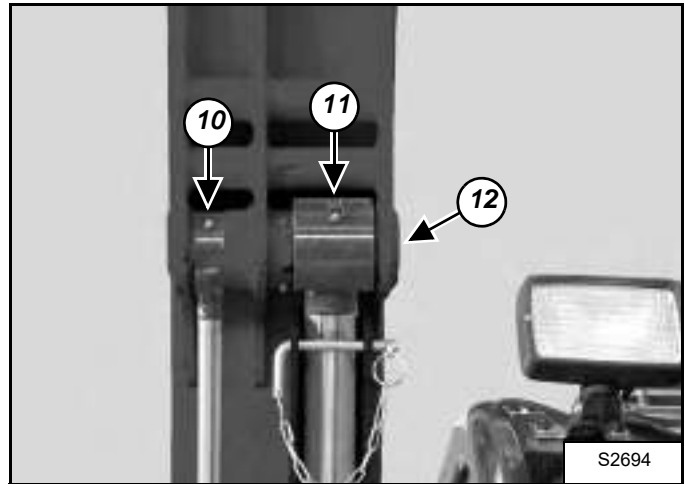
8. Bob-Tach Wedge - Both sides (2) [Figure 10-140-5].

Figure 10-140-6



9. Tilt Cylinder, Base End (1) [Figure 10-140-6].

Figure 10-140-7



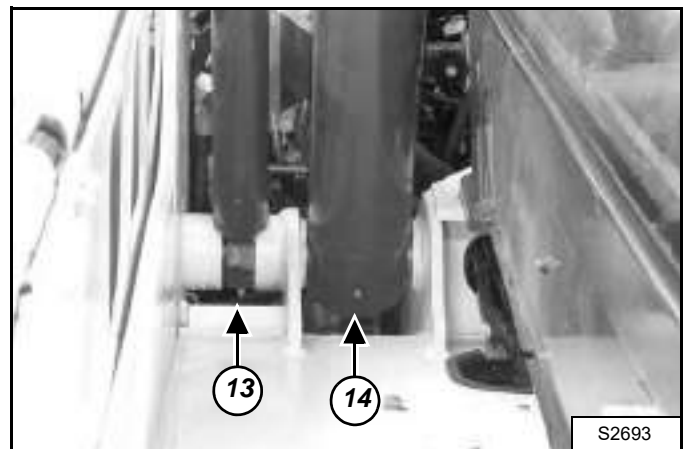
NOTE: Raise the boom and install the approved Boom Stop (See Installing The Approved Boom Stop on Page 10-160-1.) before lubricating the Lift and Slave Cylinders.

10. Slave Cylinder, Rod End (1) [Figure 10-140-7].

11. Lift Cylinder, Rod End (1) [Figure 10-140-7].

12. Lift Cylinder, Pivot (1) [Figure 10-140-7].

Figure 10-140-8



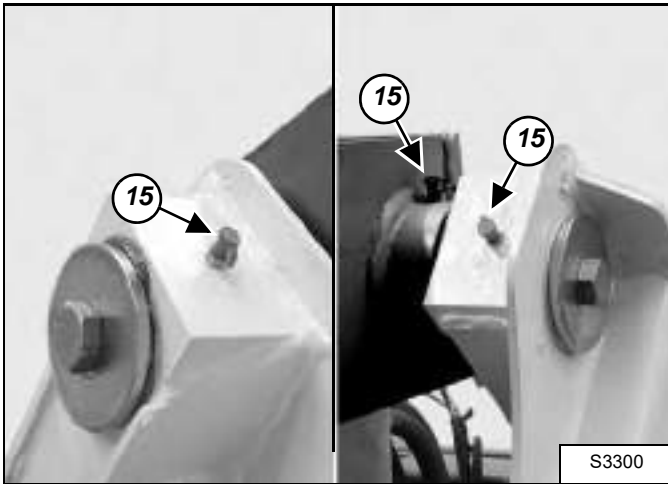
13. Slave Cylinder, Base End (1) [Figure 10-140-8].

14. Lift Cylinder, Base End (1) [Figure 10-140-8].

Dealer Copy -- Not for Resale

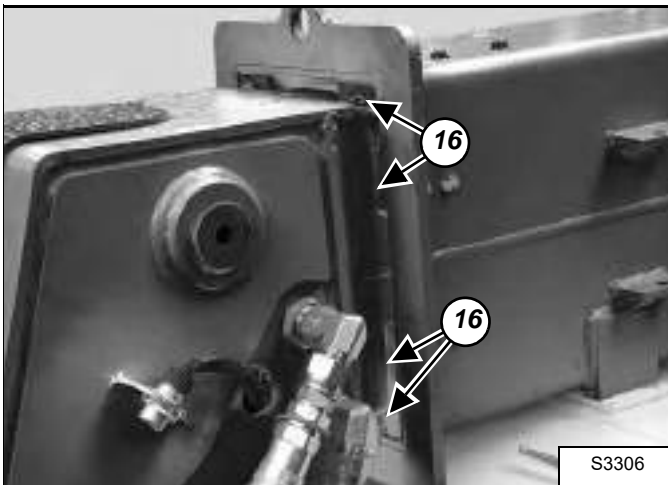
**LUBRICATING THE TELESCOPING HANDLER
(CONT'D)**

Figure 10-140-9



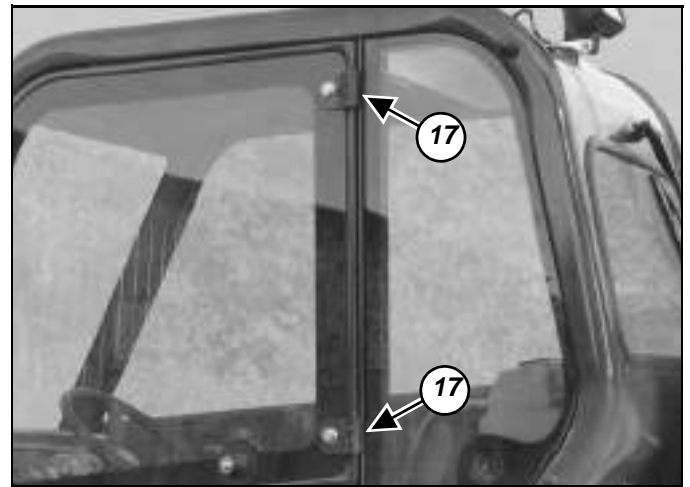
15. Boom Pivot (3) [Figure 10-140-9].

Figure 10-140-10



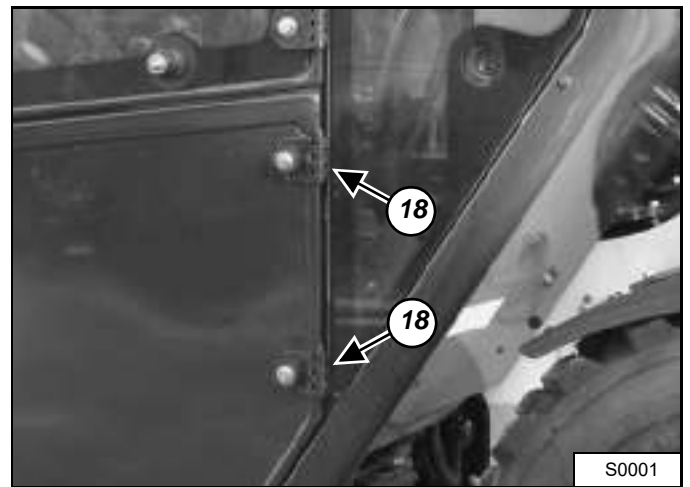
16. Boom Slide - Both sides, top, and bottom (8) [Figure 10-140-10].

Figure 10-140-11



17. Cab Door Hinges - Upper (17) [Figure 10-140-11].

Figure 10-140-12



18. Cab Door Hinges - Lower (18) [Figure 10-140-12].

Dealer Copy -- Not for Resale



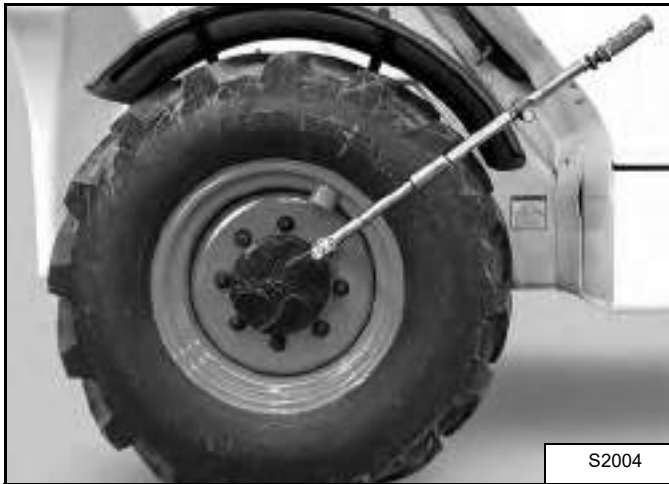
Bobcat®

Dealer Copy -- Not for Resale

TIRE MAINTENANCE

Wheel Nuts

Figure 10-150-1



For the correct service interval to check the wheel nuts (See SERVICE SCHEDULE on Page 10-50-1.).

The correct torque is 360 N•m (265 ft-lb) torque [**Figure 10-150-1**].

Tire Mounting

Tires are to be repaired only by an authorized person using the correct procedures and type of equipment.

Tires and rims must always be checked for correct size before mounting. Check rim and tire bead for damage. The rim flange must be cleaned and free of rust. The tire bead and rim flange must be lubricated with a rubber lubricant before mounting the tire.

Avoid excessive pressure which can rupture the tire and cause serious injury or death.

During inflation of the tire, check the tire pressure frequently to avoid over inflation.

Tire Rotation

Check the tires regularly for wear, damage and pressure. For the correct tire pressure, (See Traction on Page SPEC-10-3.)

Rear tires usually wear faster than front tires. To keep the wear even, move the front tires to the rear and rear tires to the front.

It is important to keep the same size tires on each side of the Telescopic Handler. If different sizes are used, each tire will be turning at a different rate and cause excessive wear and loss of stability. The tread bars of all the tires must face the same direction.

Recommended tire pressure must be maintained to avoid excessive tire wear and loss of stability and handling capacity. Check for the correct pressure before operating the Telescopic Handler.

Tire Pressure

For correct inflation: (See Traction on Page SPEC-10-3.)

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

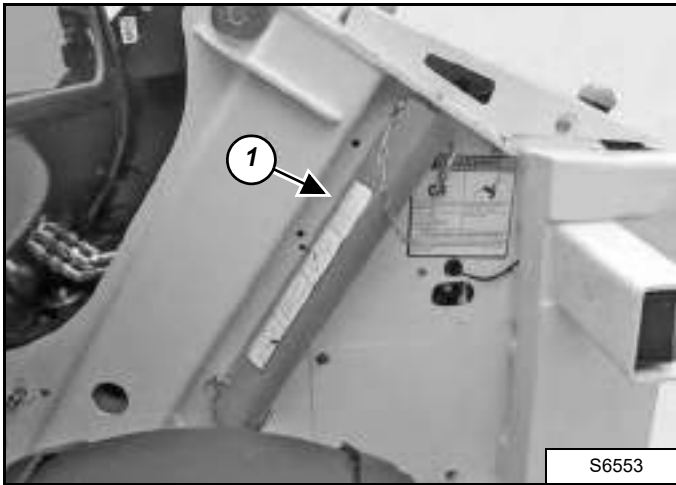
APPROVED BOOM STOP (IF EQUIPPED)

If the boom is raised for service or maintenance, use the following procedure to install and remove the approved boom stop.

Installing The Approved Boom Stop

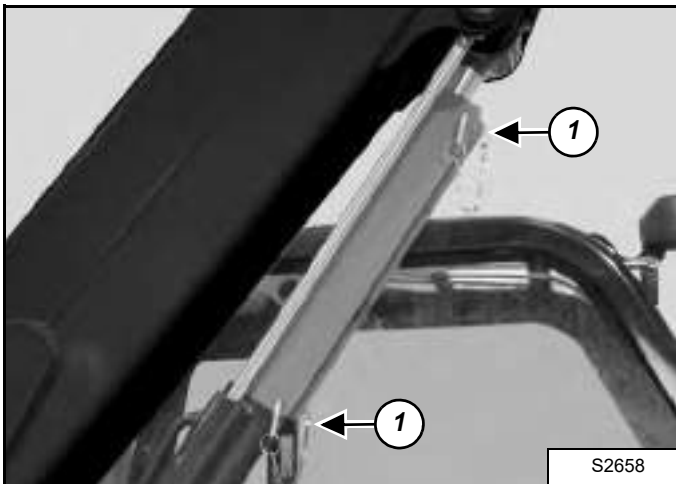
- Put the Telescopic Handler on a flat, solid and level surface.
- With the operator in the seat, the seat belt fastened, Travel Direction Control in neutral and the parking brake engaged, start the engine and raise the boom fully. Stop the engine.

Figure 10-160-1



- Remove the boom stop (Item 1) [Figure 10-160-1] from the storage position.

Figure 10-160-2



- Position the boom stop over the boom cylinder rod and install the pins and secure with fasteners (Item 1) [Figure 10-160-2].
- Start the engine and lower the boom slowly [Figure 10-160-2] so that the boom stop is held securely.

Removing The Approved Boom Stop

- Start the engine and raise the boom. Stop the engine.
- Remove the fasteners, pins and boom stop.



Bobcat®

Dealer Copy -- Not for Resale

ENGINE COVER

Opening And Closing The Engine Cover

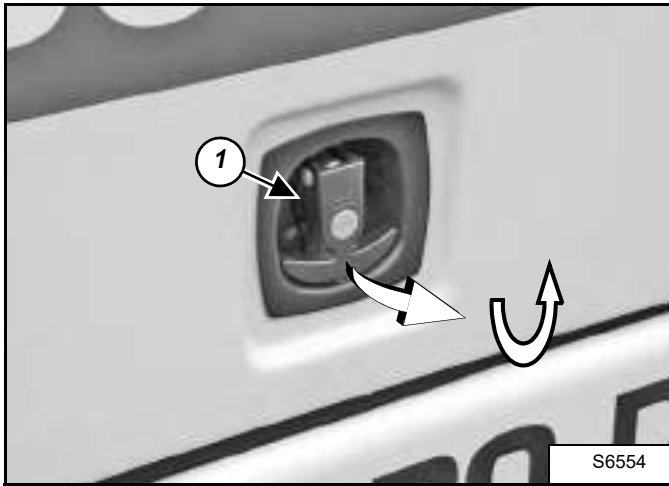
WARNING

AVOID INJURY OR DEATH

Never service or adjust the machine when the engine is running unless instructed to do so in the manual.

W-2012-0497

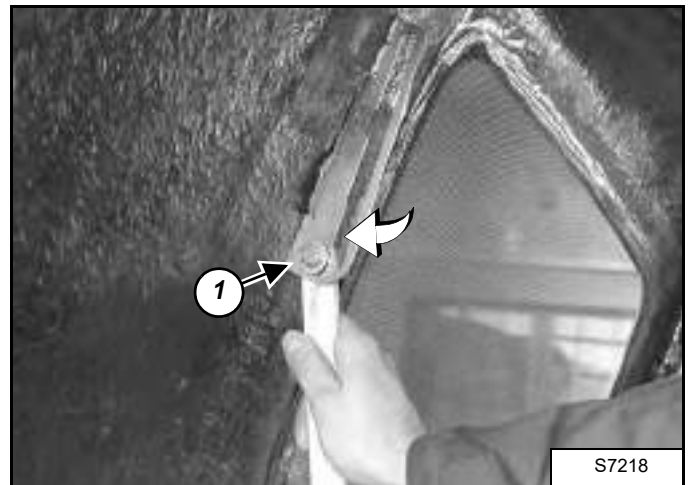
Figure 10-170-1



Pull the latch handle (Item 1) [Figure 10-170-1] out and rotate it counterclockwise. Raise the engine cover to provide access for maintenance.

Close the engine cover before operating the Telescopic Handler.

Figure 10-170-2



Raise the engine cover until the hold open latch (Item 1) [Figure 10-170-2] is in the secure position.

To make sure the latch (Item 1) [Figure 10-170-2] is fully engaged into secure position, push forward on the bottom of the latch while holding the engine cover up.

Close the engine cover before operating the Telescopic Handler.

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

REMOTE START

Connecting to the Telescopic Handler

Tools that will be needed to complete the following steps are:

Order from Bobcat Parts P/N: 6689779 - Remote Start Tool (Service Tool) Kit

Kit P/N 6689779 Includes:

6689778 - Remote Start Tool (Service Tool)

6689747 - Service Tool Harness

6689746 - Computer Service Tool Harness

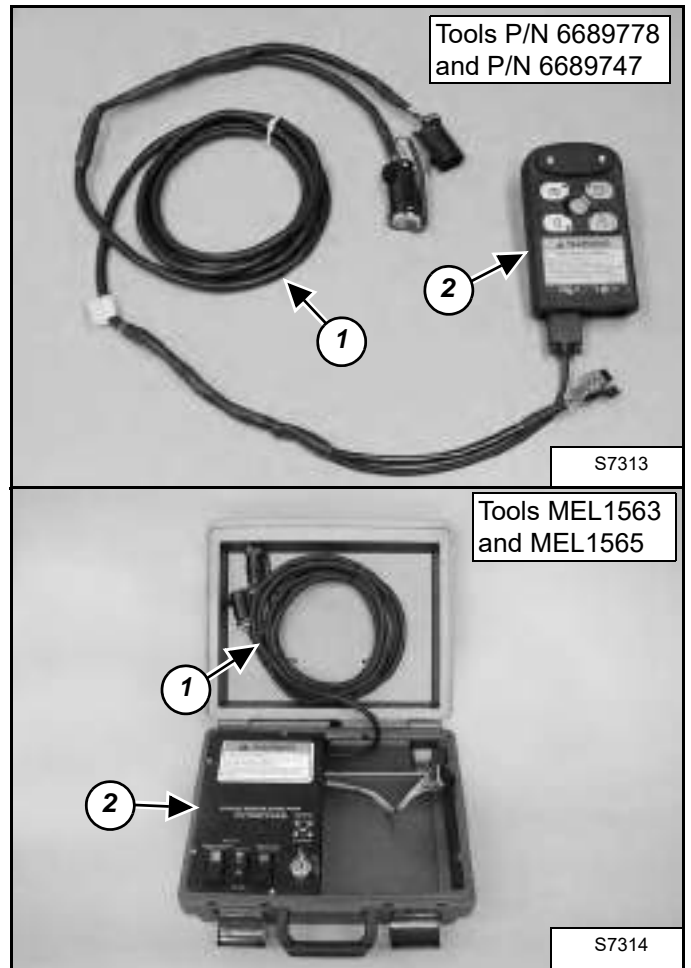
6689745 - BOSS® Service Tool Harness

OR, instead of kit P/N 6689779, the following two tools can be used:

MEL1563 - Remote Start Tool

MEL1565 - Service Tool Harness Control

Figure 10-180-1



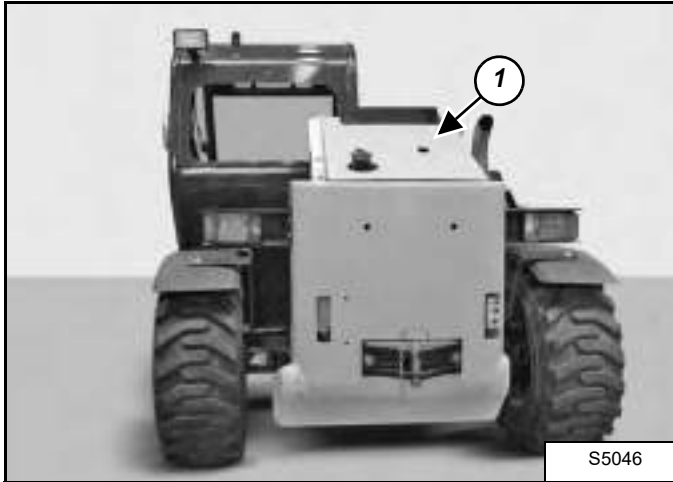
The service tool harness control (Item 1) is used to connect the remote start tool (Item 2) [Figure 10-180-1] to the electrical system on the Telescopic Handler.

Dealer Copy -- Not for Resale

REMOTE START (CONT'D)

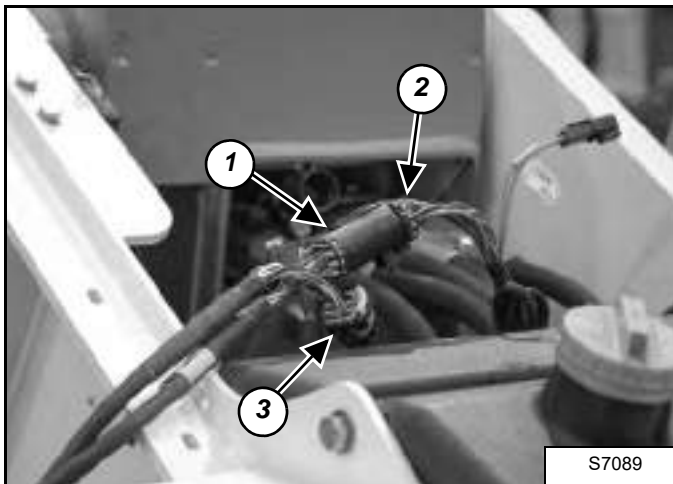
Connecting to the Telescopic Handler (Cont'd)

Figure 10-180-2



Remove the rear cover (Item 1) [Figure 10-180-2] from the Telescopic Handler.

Figure 10-180-3



Connect the main connector (Item 1) of the Service Tool Harness Control to the machine frame harness connector (Item 2) [Figure 10-180-3], located in the rear of the machine.

For machines with an attachment control harness, the attachment harness must first be disconnected from the Telescopic Handler harness.

NOTE: The remote start tool connection harness has two connectors (Item 1) and (Item 3). The main connector (Item 1) is always used for connection to the engine harness [Figure 10-180-3].

The second connector (Item 3) [Figure 10-180-3] is used for attachment ACD upgrades or attachment operational diagnostics only. This connector has a cap attached to it to prevent damage or corrosion when not in use.

NOTE: The key switch on the machine operator panel must be in the off position or the Remote Start Kit will not operate.

REMOTE START (CONT'D)

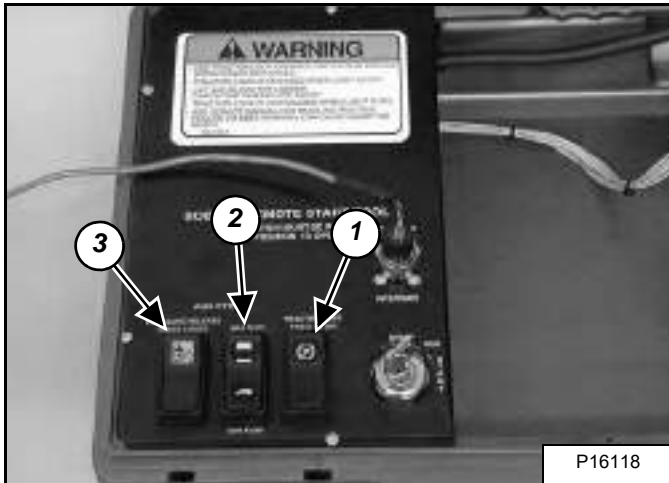
Remote Start Procedure (For Tools MEL1563 and MEL1565)

Figure 10-180-4



The remote start tool (Item 1) [Figure 10-180-4] has three rocker switches.

Figure 10-180-5



The traction lock switch (Item 1) [Figure 10-180-5] is used to turn traction lock on or off. Push the switch to the override position. The switch will illuminate to indicate traction lock OVERRIDE, in this position the wheels are able to turn.

The maximum flow/variable flow switch (Item 2) [Figure 10-180-5] is used to activate the auxiliary hydraulics. Pressing the switch once will activate variable flow. Pressing the switch again will activate maximum flow. The switch will illuminate to indicate which flow rate is active. Pressing the switch a third time will turn the flow OFF. The switch is used when checking pressures and flow rate.

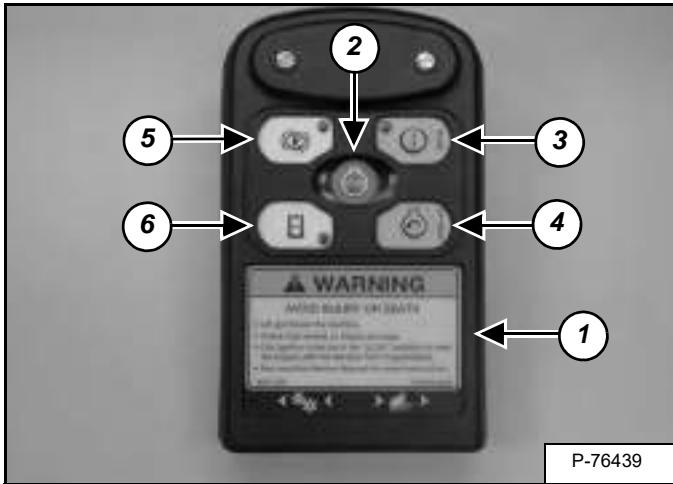
The auxiliary pressure release (Item 3) [Figure 10-180-5] is used to release hydraulic pressure to the front and/or rear auxiliary couplers. To release pressure; push and hold the switch for three seconds.

NOTE: With the engine running; pushing and holding the pressure release switch will cause the engine to stop in three seconds. To relieve the pressure; continue to press the switch after the engine has stopped.

REMOTE START (CONT'D)

Remote Start Procedure (For Tool Kit P/N 6689779)

Figure 10-180-6



The Remote Start Tool (Service Tool) (Item 1) [Figure 10-180-6] has five buttons.

The STOP button (Item 2) [Figure 10-180-6] is used to stop the Remote Start Tool (Service Tool) from communicating and stop the Telescopic Handler engine.

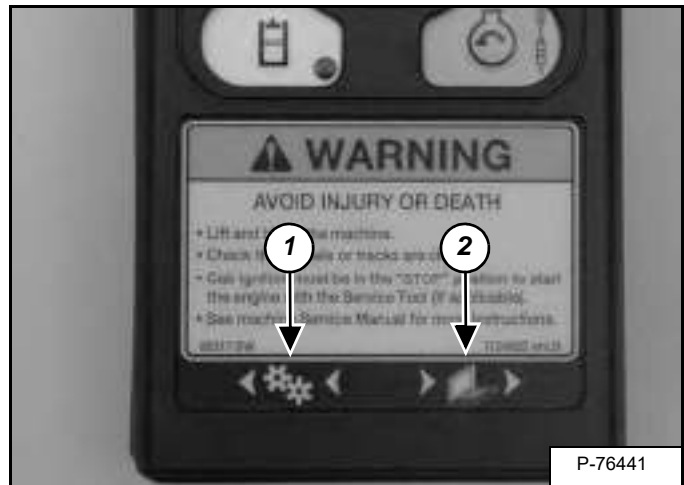
The RUN button (Item 3) [Figure 10-180-6] is used to turn the Remote Start Tool (Service Tool) on and activates the ignition power. The button will illuminate to indicate the service tool is active.

The START button (Item 4) [Figure 10-180-6] is used to start the engine.

The traction lock button (Item 5) [Figure 10-180-6] is used to turn traction lock ON or OFF. Push the button and the button will illuminate indicating the traction lock is disabled in which the wheels or tracks are able to turn.

The auxiliary button (Item 6) [Figure 10-180-6] is used to activate the auxiliary hydraulics. The button will illuminate to indicate the auxiliary hydraulics are active. Pressing the button a second time will turn the flow OFF. The button is used when checking pressures and flow rate.

Figure 10-180-7



The gear icon with the left facing arrows (Item 1) [Figure 10-180-7] will illuminate and blink when the RUN key is pressed and the Telescopic Handler is communicating with the service tool.

The computer icon with the right facing arrows (Item 2) [Figure 10-180-7] will illuminate and blink when the Remote Start Tool (Service Tool) is transmitting data to and from the computer.

NOTE: To relieve the pressure at the rear or secondary front auxiliary, (if equipped) press the RUN button on the remote start tool. Then press the auxiliary (AUX) hydraulics button on the remote start tool and move the AUXILIARY Hydraulic Switch on the to the right and left several times.

TELESCOPIC HANDLER STORAGE AND RETURN TO SERVICE

Storage

Sometimes it may be necessary to store your Bobcat telescopic handler for an extend period of time. Below is a list of items to perform before storage.

- Thoroughly clean the telescopic handler including the engine compartment.
- Lubricate the telescopic handler.
- Replace worn or damaged parts.
- Park the telescopic handler in a dry protected shelter.
- Lower the boom all the way and put the attachment (if equipped) flat on the ground.
- Put grease on any exposed cylinder rods.
- Put fuel stabiliser in the fuel tank and run the engine a few minutes to circulate the stabiliser to the pump and fuel injectors.
- Drain and flush the cooling system. Refill with premixed coolant.
- Replace all fluids and filters (engine, hydraulic / hydrostatic).
- Replace air cleaner, heater and air conditioning filters.
- Put all controls in neutral position.
- Remove the battery. Be sure the electrolyte level is correct then charge the battery. Store it in a cool dry place above freezing temperatures and charge it periodically during storage.
- Cover the exhaust pipe opening.
- Tag the machine to indicate that it is in storage condition.

Return to Service

After the Bobcat telescopic handler has been in storage, it is necessary to follow a list of items to return the telescopic handler to service.

- Check the engine and hydraulic fluid levels; check coolant level.
- Install a fully charged battery.
- Remove grease from exposed cylinder rods.
- Check all belt tensions.
- Be sure all shields and guards are in place.
- Lubricate the telescopic handler.
- Check tyre inflation and remove blocks from under frame.
- Remove cover from exhaust pipe opening.
- Start the engine and let run for a few minutes while observing the instrument panels and systems for correct operation.
- Operate machine, check for correct function.
- Stop the engine and check for leaks. Repair as needed.



Bobcat®

Dealer Copy -- Not for Resale

STOPPING THE ENGINE AND LEAVING THE TELESCOPIC HANDLER

Procedure

- Stop the telescopic handler on solid, flat and level ground.
- Put the Travel Direction Control Lever and Joystick in neutral.
- Engage the parking brake. (See Operation & Maintenance Manual for more information.)

Figure 10-200-1



- Retract and lower the boom and attachment flat on the ground **[Figure 10-200-1]**.
- Turn the key switch to STOP and unfasten the seat belt.
- Use grab handles, safety tread and steps when getting off.

DO NOT JUMP

WARNING

Before you leave the operator's position:

- **Put the travel Direction Control Lever and the Joystick in neutral.**
- **Engage the parking brake.**
- **Retract and lower the boom and attachment flat on the ground.**
- **Stop the engine. Raise the restraint bar (if equipped).**

SEE THE MACHINE OPERATION & MAINTENANCE MANUAL FOR MORE INFORMATION.

W-2637-0607

Dealer Copy -- Not for Resale



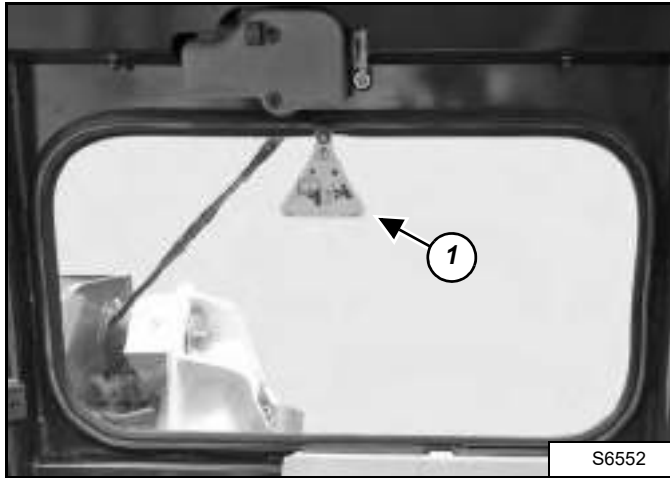
Bobcat®

Dealer Copy -- Not for Resale

EMERGENCY EXIT

Rear Window

Figure 10-210-1



Pull the tag on top of the rear window (Item 1) **[Figure 10-210-1]** to remove the rubber cord.

Push the rear window out of the rear of the operator cab.

Exit through the rear of the operator cab.



Bobcat®

Dealer Copy -- Not for Resale

HYDRAULIC SYSTEM

HYDRAULIC SYSTEM INFORMATION	20-10-1
Troubleshooting Chart	20-10-4
Tightening Procedures	20-10-5
LIFT CYLINDER	20-20-1
Removal And Installation	20-20-1
Parts Identification	20-20-5
Disassembly	20-20-6
Assembly	20-20-10
BUCKET POSITIONING CYLINDER	20-30-1
Removal And Installation	20-30-1
Parts Identification	20-30-5
Disassembly	20-30-6
Assembly	20-30-9
EXTENSION CYLINDER	20-40-1
Cylinder Group Removal And Installation	20-40-1
Upper Tubeline Removal	20-40-3
Upper Tubeline Installation	20-40-4
Extension Cylinder Removal And Installation	20-40-5
Tubeline Tray Disassembly	20-40-6
Tubeline Tray Assembly	20-40-8
Parts Identification	20-40-10
Disassembly	20-40-11
Assembly	20-40-15
TILT CYLINDER	20-50-1
Removal And Installation	20-50-1
Parts Identification	20-50-3
Disassembly	20-50-4
Assembly	20-50-7
STEERING CYLINDER (FRONT)	20-60-1
Removing the Steering Cylinder	20-60-1
Installing the Steering Cylinder	20-60-2
Parts Identification	20-60-4
Disassembling the Steering Cylinder	20-60-5
Assembling the Steering Cylinder	20-60-6
STEERING CYLINDER (REAR)	20-61-1
Removing The Steering Cylinder	20-61-1
Parts Identification	20-61-4
Disassembling the Steering Cylinder	20-61-5
Assembling the Steering Cylinder	20-61-6

Dealer Copy -- Not for Resale

DRIVE BOX	20-70-1
Parts Identification	20-70-1
Disassembly	20-70-2
Assembly	20-70-6
Special Tools	20-70-9
 MAIN RELIEF VALVE	 20-80-1
Testing And Adjustment	20-80-1
Removal And Installation	20-80-2
 PORT RELIEF VALVES	 20-90-1
Parts Identification	20-90-1
Adjustment Procedure	20-90-2
 STEERING MODE VALVE BLOCK	 20-100-1
Removal And Installation	20-100-1
Parts Identification	20-100-2
Disassembly	20-100-3
Solenoid Testing	20-100-5
Assembly	20-100-5
 BRAKE VALVE	 20-110-1
Removal And Installation	20-110-1
Disassembly And Assembly	20-110-2
 GEAR PUMP	 20-120-1
Removal And Installation	20-120-1
Parts Identification	20-120-3
Disassembly And Assembly	20-120-4
 HYDRAULIC FLUID RESERVOIR	 20-130-1
Removal And Installation	20-130-1
 STEERING VALVE	 20-140-1
Removal And Installation	20-140-1
Parts Identification	20-140-2
Disassembly	20-140-3
Inspection	20-140-6
Assembly	20-140-6
 HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251)	 20-150-1
Troubleshooting Chart (Controllers)	20-150-1
Telescoping Valve Section Troubleshooting	20-150-2
Auxiliary Valve Section Troubleshooting	20-150-6
Troubleshooting Chart (Control Valve)	20-150-10
Removal And Installation	20-150-11
Parts Identification	20-150-15
Disassembly And Assembly	20-150-16
End Housing Disassembly And Assembly	20-150-16
Telescoping and Auxiliary Valve Section Disassembly And Assembly	20-150-17

Lifting and Tilting Valve Section Disassembly And Assembly	20-150-19
Inlet-Outlet Valve Section Disassembly And Assembly	20-150-20
HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE)	20-151-1
Troubleshooting Chart (Controllers)	20-151-1
Telescoping Valve Section Troubleshooting	20-151-2
Auxiliary Valve Section Troubleshooting	20-151-6
Troubleshooting Chart (Control Valve)	20-151-10
Removal And Installation	20-151-11
Parts Identification	20-151-17
Disassembly And Assembly	20-151-18
End Housing Disassembly And Assembly	20-151-18
Telescoping and Auxiliary Valve Section Disassembly And Assembly	20-151-19
Lifting and Tilting Valve Section Disassembly And Assembly	20-151-21
Inlet-Outlet Valve Section Disassembly And Assembly	20-151-22
JOYSTICK	20-160-1
Removal And Installation	20-160-1
PARKING BRAKE	20-170-1
Parking Brake Valve Removal And Installation	20-170-1
Parking Brake Valve Disassembly And Assembly	20-170-2
WORKGROUP LOCKOUT VALVE	20-180-1
Testing	20-180-1
Removal And Installation	20-180-2
Disassembly And Assembly	20-180-3
TOW VALVE	20-190-1
Removal And Installation	20-190-1
Disassembly And Assembly	20-190-2
FRONT AUXILIARY HYDRAULIC PRESSURE RELEASE VALVE	20-200-1
Removal And Installation	20-200-1
Disassembly And Assembly	20-200-2
MANIFOLD (FOR S/N AC1911001 - 11251)	20-210-1
Removal And Installation	20-210-1
Disassembly	20-210-3
MANIFOLD (FOR S/N AC1911252 & ABOVE)	20-211-1
Removal And Installation	20-211-1
Disassembly	20-211-2

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

HYDRAULIC/HYDROSTATIC SCHEMATIC T2250 (S/N AC1911001 – AC1911999)

[Printable Version Click Here](#)

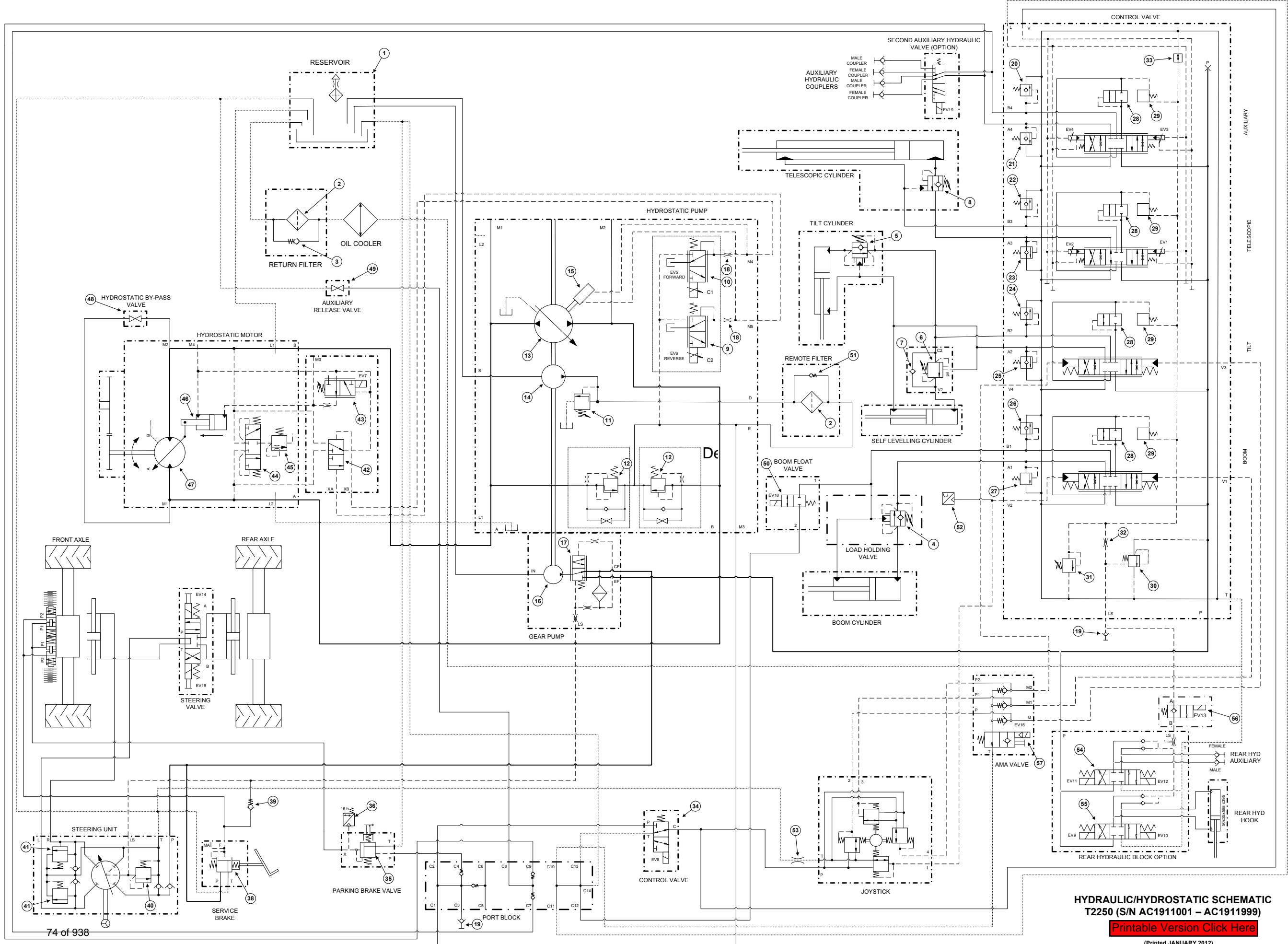
(Printed January 2012)

V-1323legend

LEGEND

- | | | | |
|--|--|---|---|
| <p>① RESERVOIR:
Reservoir Capacity 29 L (7.7 U.S. gal)
System Capacity 61 L (16.1 U.S. gal)</p> <p>② FILTER - Hydraulic</p> <p>③ SPRING LOADED FILTER BYPASS VALVE: 350 kPa (3,5 bar) (51 psi)</p> <p>④ BOOM CYLINDER LOCK VALVE - Lock Pressure: 32500 kPa (325 bar) (4714 psi)</p> <p>⑤ TILT CYLINDER LOCK VALVE: 28000 kPa (280 bar) (4061 psi)</p> <p>⑥ BUCKET LEVELLING CYLINDER LOCK VALVE: 25000 kPa (250 bar) (3626 psi)</p> <p>⑦ CHECK VALVE</p> <p>⑧ TELESCOPIC CYLINDER LOCK VALVE: 7500 kPa (75 bar) (1088 psi)</p> <p>⑨ SOLENOID - Reverse Drive</p> <p>⑩ SOLENOID - Forward Drive</p> <p>⑪ RELIEF VALVE – Charge: 3000 kPa (30 bar) (435 psi)</p> <p>⑫ RELIEF/REPLENISHING VALVE - HIGH PRESSURE (2): 42000 kPa (420 bar) (6092 psi)</p> <p>⑬ VARIABLE CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC PUMP</p> <p>⑭ CHARGE PUMP: 32 L/min (8.5 U.S. gpm) @ High Engine Idle</p> <p>⑮ SERVO PISTON - Swash Plate</p> <p>⑯ HYDRAULIC PUMP - Gear type 80 L/min (21.1 U.S. gpm) @ High Engine Idle</p> | <p>⑰ PRIORITY VALVE</p> <p>⑱ ORIFICE: 1,3 mm (0.05 in)</p> <p>⑲ TEST PORT</p> <p>⑳ ANTICAVITATION/WORK PORT RELIEF VALVE – Auxiliary Hydraulic Coupler: 22000 kPa (220 bar) (3191 psi)</p> <p>㉑ ANTICAVITATION/WORK PORT RELIEF VALVE – Auxiliary Hydraulic Coupler: 22000 kPa (220 bar) (3191 psi)</p> <p>㉒ ANTICAVITATION/WORK PORT RELIEF VALVE – Telescopic Cylinder: 21000 kPa (210 bar) (3045 psi)</p> <p>㉓ ANTICAVITATION/WORK PORT RELIEF VALVE – Telescopic Cylinder: 17500 kPa (175 bar) (3538 psi)</p> <p>㉔ ANTICAVITATION/WORK PORT RELIEF VALVE – Tilt Cylinder: 24500 kPa (245 bar) (3553 psi)</p> <p>㉕ ANTICAVITATION/WORK PORT RELIEF VALVE – Tilt Cylinder: 19000 kPa (190 bar) (2756 psi)</p> <p>㉖ ANTICAVITATION/WORK PORT RELIEF VALVE – Boom Cylinder: 22000 kPa (220 bar) (3191 ps)</p> <p>㉗ PORT RELIEF VALVE – Boom Cylinder: 28000 kPa (280 bar) (4061 psi)</p> <p>㉘ COMPENSATOR</p> <p>㉙ SHUTTLE VALVE</p> <p>㉚ RELIEF VALVE: 1400 kPa (14 bar) (203 psi)</p> <p>㉛ RELIEF VALVE: 23500 kPa (235 bar) (3408 psi)</p> <p>㉜ ORIFICE</p> | <p>㉝ LOAD SENSE BLEED VALVE: 1 L/min (0.26 U.S. gpm)</p> <p>㉞ SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE – JOYSTICK LOCKOUT VALVE</p> <p>㉟ RELIEF VALVE: 2700 kPa (27 bar) (391 psi)</p> <p>㊱ PRESSURE SWITCH: 1600 kPa (16 bar) (232 psi)</p> <p>㊲ NOT USED FOR THIS MODEL</p> <p>㊳ SERVICE BRAKE VALVE: 6000 kPa (60 bar) (870 psi)</p> <p>㊴ CHECK VALVE</p> <p>㊵ RELIEF VALVE: 17500 kPa (175 bar) (2538 psi)</p> <p>㊶ RELIEF VALVE (2): 22000 kPa (220 bar) (3190 psi)</p> <p>㊷ SHUTTLE VALVE - Drive Pressure</p> <p>㊸ SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE – MOTOR DISPLACEMENT CONTROL SPOOL: 24000 kPa (240 bar) (3481 psi)</p> <p>㊹ SHUTTLE VALVE - Drain</p> <p>㊺ FLUSHING VALVE: 11 L/min (2.9 U.S. gpm)</p> <p>㊻ SERVO PISTON - Swash Plate</p> <p>㊼ VARIABLE CAPACITY DISPLACEMENT BIDIRECTIONAL HYDROSTATIC MOTOR</p> <p>㊽ TOW VALVE</p> <p>㊾ AUXILIARY PRESSURE RELEASE VALVE</p> <p>㊿ SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE – BOOM FLOAT</p> | <p>① SPRING LOADED FILTER BYPASS VALVE: 700 kPa (7,0 bar) (101 psi)</p> <p>② PRESSURE SENSOR – BOOM FLOAT DISENGAGE</p> <p>③ ORIFICE - 1,0 mm (0.039 in)</p> <p>④ SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE – Rear Auxiliary (OPTION)</p> <p>⑤ SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE – Rear Hydraulic Hook (OPTION)</p> <p>⑥ SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE – Rear Hydraulic (OPTION)</p> <p>⑦ SOLENOID ACTIVATED DIRECTIONAL CONTROL VALVE – AMA Valve</p> |
|--|--|---|---|

NOTE: Unless otherwise specified springs have NO significant pressure value.



HYDRAULIC/HYDROSTATIC SCHEMATIC

[Printable Version Click Here](#)

T2250 (S/N AC1912001 – AC1914999)

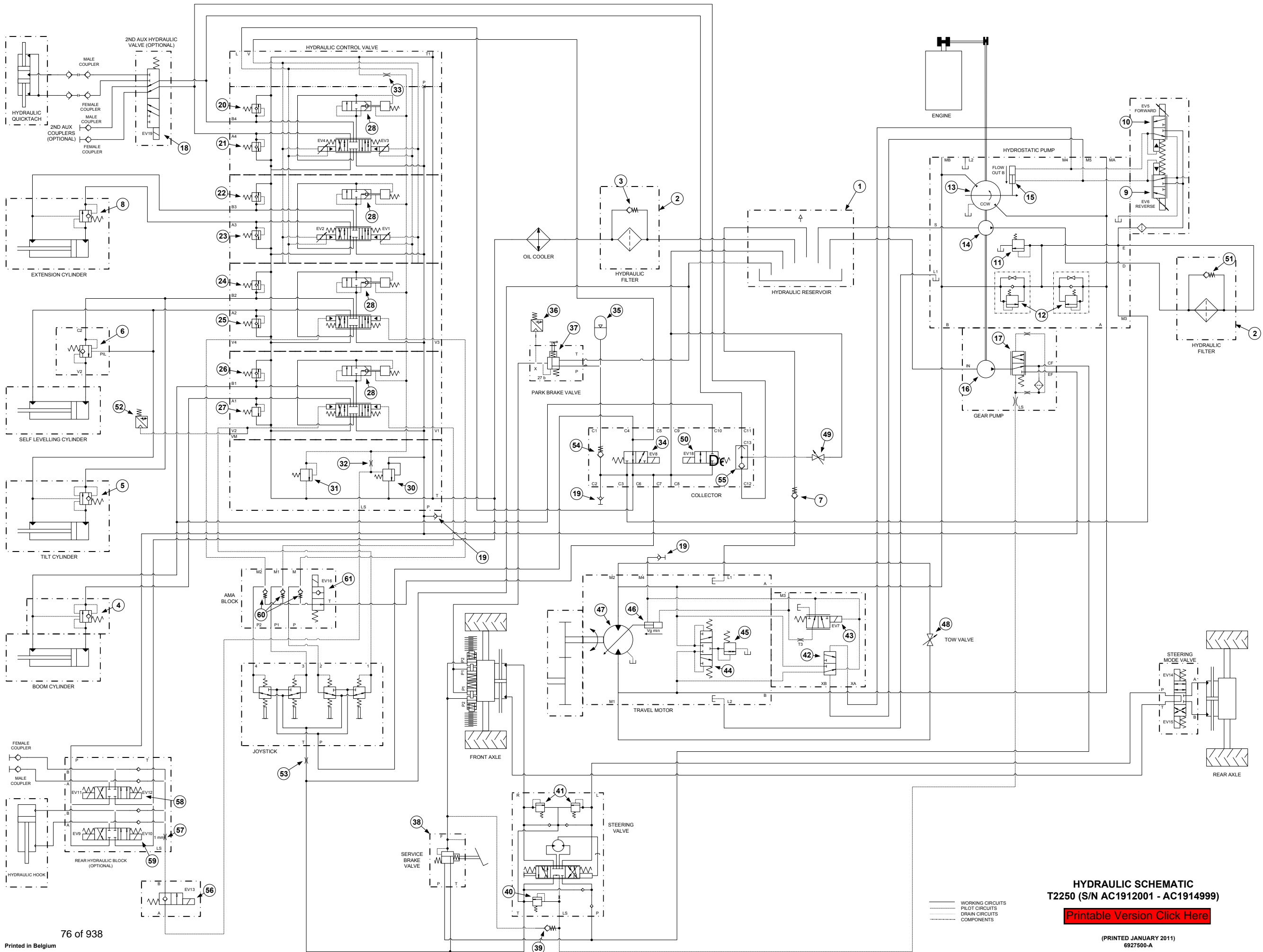
(Printed JANUARY 2012)

6927500-A legend

LEGEND

- | | | | |
|---|--|--|---|
| ① RESERVOIR:
Reservoir Capacity 29 L (7.7 U.S.gal)
System Capacity 61 L (16.1 U.S. gal) | ①⑦ PRIORITY VALVE | ③③ LOAD SENSE BLEED VALVE:
1 L/m (0.26 U.S. gpm) | ⑤① SPRING LOADED FILTER BYPASS
VALVE: 700 kPa (7,0 bar) (101 psi) |
| ② FILTER - Hydraulic | ①⑧ SOLENOID ACTIVATED DIRECTIONAL
CONTROL VALVE – Second Auxiliary Hydraulic
Valve (Optional) | ③④ SOLENOID ACTIVATED DIRECTIONAL
CONTROL VALVE – LORS LOCKOUT VALVE | ⑤② PRESSURE SENSOR – BOOM
FLOAT DISENGAGE |
| ③ SPRING LOADED FILTER BYPASS
VALVE: 350 kPa (3,5 bar) (51 psi) | ①⑨ TEST PORT | ③⑤ ACCUMULATOR – Park Brake 0.5 L (0.5 qt) –
1500 kPa (15 bar) (217 psi) | ⑤③ ORIFICE - 1,0 mm (0.039 in) |
| ④ BOOM CYLINDER LOCK VALVE - Lock
Pressure: 32500 kPa (325 bar) (4714 psi) | ②⑩ ANTICAVITATION/WORK PORT RELIEF
VALVE – Auxiliary Hydraulic Coupler:
22000 kPa (220 bar) (3191 psi) | ③⑥ PRESSURE SWITCH: 1600 kPa (16 bar) (232 psi) | ⑤④ CHECK VALVE |
| ⑤ TILT CYLINDER LOCK VALVE:
28000 kPa (280 bar) (4061 psi) | ②① ANTICAVITATION/WORK PORT RELIEF
VALVE – Auxiliary Hydraulic Coupler:
22000 kPa (220 bar) (3191 psi) | ③⑦ CONTROL VALVE – Lever Actuated Parking Brake | ⑤⑤ SHUTTLE VALVE |
| ⑥ BUCKET LEVelling CYLINDER LOCK
VALVE: 25000 kPa (250 bar) (3626 psi) | ②② ANTICAVITATION/WORK PORT RELIEF
VALVE – Telescopic Cylinder:
21000 kPa (210 bar) (3045 psi) | ③⑧ SERVICE BRAKE VALVE: 6000 kPa (60 bar)
(870 psi) | ⑤⑥ SOLENOID ACTIVATED DIRECTIONAL
CONTROL VALVE – LS VALVE (Optional)
(Only used with rear hydraulic valve) |
| ⑦ CHECK VALVE: 100 kPa (1 bar) (14 psi) | ②③ ANTICAVITATION/WORK PORT RELIEF
VALVE – Telescopic Cylinder:
17500 kPa (175 bar) (3538 psi) | ③⑨ CHECK VALVE | ⑤⑦ ORIFICE - 1,0 mm (0.039 in) |
| ⑧ TELESCOPIC CYLINDER LOCK
VALVE: 7500 kPa (75 bar) (1088 psi) | ②④ ANTICAVITATION/WORK PORT RELIEF VALVE ^{Dc}
– Tilt Cylinder: 24500 kPa (245 bar) (3553 psi) | ④① RELIEF VALVE (2): 22000 kPa (220 bar) (3190 psi) | ⑤⑧ SOLENOID ACTIVATED DIRECTIONAL
CONTROL VALVE – Rear Auxiliary
Hydraulic (Optional) |
| ⑨ SOLENOID - Reverse Drive | ②⑤ ANTICAVITATION/WORK PORT RELIEF VALVE
– Tilt Cylinder: 21000 kPa (210 bar) (3045 psi) | ④② SHUTTLE VALVE - Drive Pressure | ⑤⑨ SOLENOID ACTIVATED DIRECTIONAL
CONTROL VALVE – Secondary Auxiliary
Hydraulic (Optional) |
| ⑩ SOLENOID - Forward Drive | ②⑥ ANTICAVITATION/WORK PORT RELIEF VALVE –
Boom Cylinder: 22000 kPa (220 bar) (3191 psi) | ④③ SOLENOID ACTIVATED DIRECTIONAL CONTROL
VALVE – MOTOR DISPLACEMENT CONTROL
SPOOL: 24000 kPa (240 bar) (3481 psi) | ⑥① CHECK VALVE |
| ⑪ RELIEF VALVE – Charge:
3000 kPa (30 bar) (435 psi) | ②⑦ PORT RELIEF VALVE – Boom Cylinder:
26000 kPa (260 bar) (3771 psi) | ④④ SHUTTLE VALVE - Drain | ⑥② SOLENOID ACTIVATED DIRECTIONAL
CONTROL VALVE – AMA Valve |
| ⑫ RELIEF/REPLENISHING VALVE - HIGH
PRESSURE (2): 42000 kPa (420 bar) (6092 psi) | ②⑧ COMPENSATOR | ④⑤ FLUSHING VALVE: 11 L/min (2.9 U.S. gpm) | |
| ⑬ VARIABLE CAPACITY DISPLACEMENT
BIDIRECTIONAL HYDROSTATIC PUMP | ②⑨ NOT USED ON THIS MODEL | ④⑥ SERVO PISTON - Swash Plate | |
| ⑭ CHARGE PUMP
32 L/m (8.5 U.S. gpm) @ High Engine Idle | ③① RELIEF VALVE: 1400 kPa (14 bar) (203 psi) | ④⑦ VARIABLE CAPACITY DISPLACEMENT
BIDIRECTIONAL HYDROSTATIC MOTOR | |
| ⑮ SERVO PISTON - Swash Plate | ③② RELIEF VALVE: 23500 kPa (235 bar) (3408 psi) | ④⑧ TOW VALVE | |
| ⑯ HYDRAULIC PUMP - Gear type
80 L/m (21.1 U.S. gpm) @ High Engine Idle | ③③ ORIFICE | ④⑨ AUXILIARY PRESSURE RELEASE
VALVE | |
| | | ⑤① SOLENOID ACTIVATED DIRECTIONAL
CONTROL VALVE – BOOM FLOAT | |

NOTE: Unless otherwise specified
springs have NO significant
pressure value.



HYDRAULIC SCHEMATIC
T2250 (S/N AC1912001 - AC1914999)

[Printable Version Click Here](#)

HYDRAULIC/HYDROSTATIC SCHEMATIC

[Printable Version Click Here](#)

T2250 (S/N AC1915001 AND ABOVE)

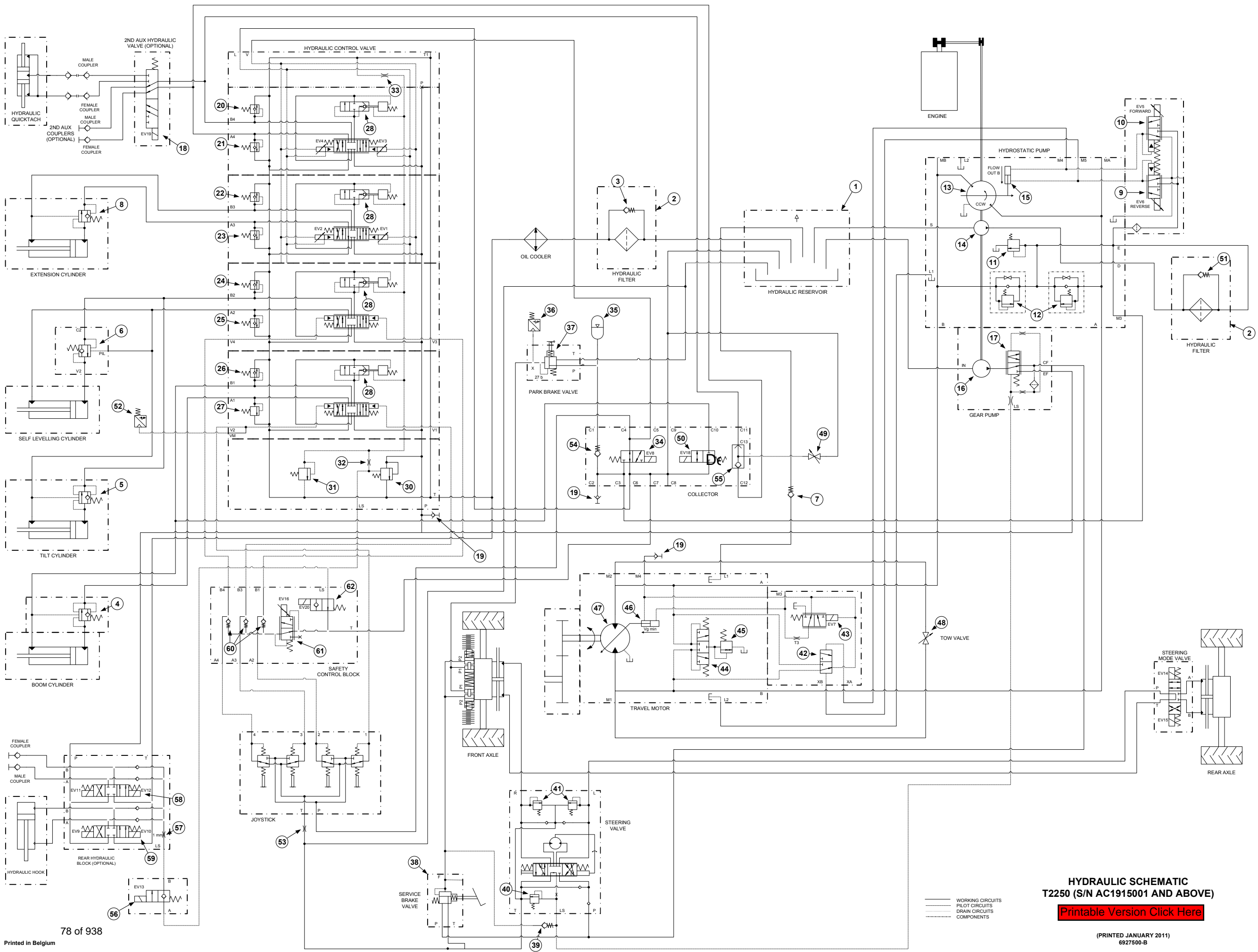
(Printed JANUARY 2012)

6927500-B legend

LEGEND

- | | | | |
|--|--|--|---|
| ① RESERVOIR:
Reservoir Capacity 29 L (7.7 U.S. gal)
System Capacity 61 L (16.1 U.S. gal) | ①⑦ PRIORITY VALVE | ③③ LOAD SENSE BLEED VALVE:
1 L/m (0.26 U.S. gpm) | ⑤① SPRING LOADED FILTER BYPASS
VALVE: 700 kPa (7,0 bar) (101 psi) |
| ② FILTER - Hydraulic | ①⑧ SOLENOID ACTIVATED DIRECTIONAL
CONTROL VALVE – Second Auxiliary Hydraulic
Valve (Optional) | ③④ SOLENOID ACTIVATED DIRECTIONAL
CONTROL VALVE – JOYSTICK LOCKOUT
VALVE | ⑤② PRESSURE SENSOR – BOOM
FLOAT DISENGAGE |
| ③ SPRING LOADED FILTER BYPASS
VALVE: 350 kPa (3,5 bar) (51 psi) | ①⑨ TEST PORT | ③⑤ ACCUMULATOR – Park Brake 0.5 L (0.5 qt) –
1500 kPa (15 bar) (217 psi) | ⑤③ ORIFICE - 1,0 mm (0.039 in) |
| ④ BOOM CYLINDER LOCK VALVE - Lock
Pressure: 32500 kPa (325 bar) (4714 psi) | ②⑩ ANTICAVITATION/WORK PORT RELIEF
VALVE – Auxiliary Hydraulic Coupler:
22000 kPa (220 bar) (3191 psi) | ③⑥ PRESSURE SWITCH: 1600 kPa (16 bar) (232 psi) | ⑤④ CHECK VALVE |
| ⑤ TILT CYLINDER LOCK VALVE:
28000 kPa (280 bar) (4061 psi) | ②① ANTICAVITATION/WORK PORT RELIEF
VALVE – Auxiliary Hydraulic Coupler:
22000 kPa (220 bar) (3191 psi) | ③⑦ CONTROL VALVE – Lever Actuated Parking Brake | ⑤⑤ SHUTTLE VALVE |
| ⑥ BUCKET LEVELLING CYLINDER LOCK
VALVE: 25000 kPa (250 bar) (3626 psi) | ②② ANTICAVITATION/WORK PORT RELIEF
VALVE – Telescopic Cylinder:
21000 kPa (210 bar) (3045 psi) | ③⑧ SERVICE BRAKE VALVE: 6000 kPa (60 bar)
(870 psi) | ⑤⑥ SOLENOID ACTIVATED DIRECTIONAL
CONTROL VALVE – LS VALVE (Optional)
(Only used with rear hydraulic valve) |
| ⑦ CHECK VALVE: 100 kPa (1 bar) (14 psi) | ②③ ANTICAVITATION/WORK PORT RELIEF
VALVE – Telescopic Cylinder:
17500 kPa (175 bar) (3538 psi) | ③⑨ CHECK VALVE | ⑤⑦ ORIFICE - 1,0 mm (0.039 in) |
| ⑧ TELESCOPIC CYLINDER LOCK
VALVE: 7500 kPa (75 bar) (1088 psi) | ②④ ANTICAVITATION/WORK PORT RELIEF VALVE ^{Dc}
– Tilt Cylinder: 24500 kPa (245 bar) (3553 psi) | ④① RELIEF VALVE (2): 22000 kPa (220 bar) (3190 psi) | ⑤⑧ SOLENOID ACTIVATED DIRECTIONAL
CONTROL VALVE – Rear Auxiliary
Hydraulic (Optional) |
| ⑨ SOLENOID - Reverse Drive | ②⑤ ANTICAVITATION/WORK PORT RELIEF VALVE
– Tilt Cylinder: 21000 kPa (210 bar) (3045 psi) | ④② SHUTTLE VALVE - Drive Pressure | ⑤⑨ SOLENOID ACTIVATED DIRECTIONAL
CONTROL VALVE – Secondary Auxiliary
Hydraulic (Optional) |
| ⑩ SOLENOID - Forward Drive | ②⑥ ANTICAVITATION/WORK PORT RELIEF VALVE –
Boom Cylinder: 22000 kPa (220 bar) (3191 psi) | ④③ SOLENOID ACTIVATED DIRECTIONAL CONTROL
VALVE – MOTOR DISPLACEMENT CONTROL
SPOOL: 24000 kPa (240 bar) (3481 psi) | ⑥① CHECK VALVE |
| ⑪ RELIEF VALVE – Charge:
3000 kPa (30 bar) (435 psi) | ②⑦ PORT RELIEF VALVE – Boom Cylinder:
26000 kPa (260 bar) (3771 psi) | ④④ SHUTTLE VALVE - Drain | ⑥② PROPORTIONAL REDUCER VALVE –
LLMC Valve |
| ⑫ RELIEF/REPLENISHING VALVE - HIGH
PRESSURE (2): 42000 kPa (420 bar) (6092 psi) | ②⑧ COMPENSATOR | ④⑤ FLUSHING VALVE: 11 L/min (2.9 U.S. gpm) | ⑥③ SOLENOID ACTIVATED DIRECTIONAL
CONTROL VALVE – LLMC Valve |
| ⑬ VARIABLE CAPACITY DISPLACEMENT
BIDIRECTIONAL HYDROSTATIC PUMP | ②⑨ NOT USED ON THIS MODEL | ④⑥ SERVO PISTON - Swash Plate | |
| ⑭ CHARGE PUMP
32 L/m (8.5 U.S. gpm) @ High Engine Idle | ③① RELIEF VALVE: 1400 kPa (14 bar) (203 psi) | ④⑦ VARIABLE CAPACITY DISPLACEMENT
BIDIRECTIONAL HYDROSTATIC MOTOR | |
| ⑮ SERVO PISTON - Swash Plate | ③② RELIEF VALVE: 23500 kPa (235 bar) (3408 psi) | ④⑧ TOW VALVE | |
| ⑯ HYDRAULIC PUMP - Gear type
80 L/m (21.1 U.S. gpm) @ High Engine Idle | ③③ ORIFICE | ④⑨ AUXILIARY PRESSURE RELEASE
VALVE | |
| | | ⑤① SOLENOID ACTIVATED DIRECTIONAL
CONTROL VALVE – BOOM FLOAT | |

NOTE: Unless otherwise specified
springs have NO significant
pressure value.



——— WORKING CIRCUITS
 - - - - - PILOT CIRCUITS
 ······ DRAIN CIRCUITS
 - - - - - COMPONENTS

**HYDRAULIC SCHEMATIC
T2250 (S/N AC1915001 AND ABOVE)**

Printable Version Click Here

(PRINTED JANUARY 2011)
6927500-B


GLOSSARY OF HYDRAULIC/HYDROSTATIC SYMBOLS


SYMBOL DESCRIPTION


SYMBOL DESCRIPTION


FLOW LINES and CONNECTIONS


BASIC and MISCELLANEOUS SYMBOLS


 WORKING CIRCUITS - Continuous Supply Line - Working (Main) Line, Return Line (line conducting fluid from working devices to the reservoir) and Suck Line (from the conductor)


 RESTRICTION - Line with Fixed Restriction - Affected by viscosity (properties of resistance to flowing fluid)


 Pilot Pressure - Dashed Line Pilot Line (line which conducts control fluid)


 VARIABLE ADJUSTMENT RESTRICTION - Regulated or Variable Restriction

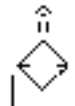
 BRAIN CIRCUITS - Different Drain Line (drain or bleed line - line conducting fluid from a component leading to the reservoir)


 THERMAL CONTROL - (indication of temperature)


 TEMPERATURE INDICATOR - (temperature measurement thermometer)


 COMPONENT - Long Chain - Enclosure outline for several components assembled in one unit

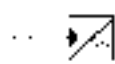
 FILTER (strainer or screen) - For fluid conditioning

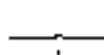
 VENTED AND FILTERED RESERVOIR - Reservoir open to atmosphere


 MECHANICAL CONNECTIONS - Double line (Shift, Lever, Piston Rod)

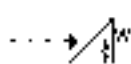
 OIL COOLER (heat exchanger) - The arrows in the diamond indicate the inlet and outlet of heat transfer direction


 CONNECTED JUNCTION OF CIRCUITS (flow line connected)


 PRESSURE SENSOR - Supplies electrical signal with pressure

 OVERLAPPING LINES Connected

 DIFFERENTIAL PRESSURE SWITCH - Switch actives when pressure difference reaches specified level

 PRESSURE SWITCH - Switch actives when pressure reaches specified level

 COUPLER - Quick-Release Coupling (uncoupled - closed by regeneration valve)

 MUFFLER (silencer) - Reduces noise

Dealer Copy -- Not for Resale

HYDRAULIC SYSTEM INFORMATION (CONT'D)

GLOSSARY OF HYDRAULIC/HYDROSTATIC SYMBOLS

SYMBOL **DESCRIPTION**

CYLINDER: Equipment to convert hydraulic energy into linear energy and in which the fluid pressure operates alternately in both directions (forward and backward strokes).



DOUBLE-ACTING HYDRAULIC CYLINDER UNEQUAL DISPLACEMENT -
With single piston rod



DOUBLE-ACTING HYDRAULIC CYLINDER UNEQUAL DISPLACEMENT and CUSHIONING ON ONE END - With single piston rod

PUMP: To convert mechanical energy into hydraulic energy



FIXED CAPACITY DISPLACEMENT HYDRAULIC PUMP - With one direction of flow



VARIABLE CAPACITY DISPLACEMENT BIDIRECTIONAL - HYDRAULIC PUMP -
With two directions of flow (bidirectional)

MOTOR: To convert hydraulic energy into rotary mechanical energy



FIXED CAPACITY DISPLACEMENT BIDIRECTIONAL HYDRAULIC MOTOR - With two directions of flow (bidirectional)

SYMBOL **DESCRIPTION**

CONTROL MECHANISMS



CONTROL VALVE WITH PILOT (Pilot device for monitoring a given position function)



CONTROL VALVE ACTIVATED BY A PUSH-BUTTON (manual)



CONTROL VALVE ACTIVATED BY A PUSH-BUTTON (manual)



CONTROL VALVE ACTIVATED BY A LEVER (manual)



CONTROL VALVE ACTIVATED BY A SOL. (electrical)



CONTROL VALVE WITH SPRING RETURN (mechanical)



CONTROL VALVE ACTIVATED BY AN ELECTRIC SOLENOID (electrical)



CONTROL VALVE ACTIVATED BY PILOT PRESSURE (direct control, pilot actuated by application of pressure)

Dealer Copy -- Not for Resale

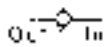
GLOSSARY OF HYDRAULIC/HYDROSTATIC SYMBOLS

SYMBOL DESCRIPTION

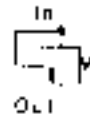
SYMBOL DESCRIPTION

NON RETURN VALVE, SHUTTLE VALVE Valve which allows free flow in one direction only

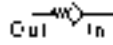
PRESSURE CONTROL VALVE Valve ensuring the control of pressure



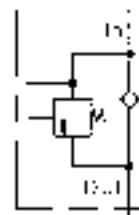
NON RETURN VALVE (Check Valve) - Used as Replenishing Valve, Load Check Valve or Anti cavitation Valve - Opens if the Inlet pressure is higher than the Outlet pressure. Other contains internal spring which has NO significant pressure value



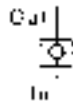
RELIEF VALVE - When the inlet pressure overcomes the opposing force of the spring, the valve opens permitting flow from the Outlet port.



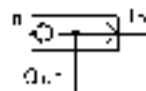
SPRING LOADED VALVE (Check Valve) - Opens if the Inlet pressure is greater than the Outlet pressure plus the spring pressure



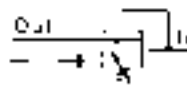
RELIEF/REPLENISHING VALVE or RELIEF/ANTI CAVITATION VALVE - When the inlet pressure overcomes the opposing force of the spring, the valve opens permitting flow from the Outlet port - Allows free flow in the opposite direction



PILOT CONTROLLED NON-RETURN VALVE - It is possible to open the valve by pilot pressure



SHUTTLE VALVE - The inlet port connected to the higher pressure is automatically connected to the Outlet port while the other inlet port is closed



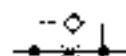
DUAL PRESSURE RELIEF VALVE - When the inlet pressure overcomes the opposing force of the spring, the valve opens permitting flow from the Outlet port. Pilot pressure provides a second pressure value

DIRECTIONAL CONTROL VALVE Valve providing for the opening (fully or restricted) or the closing of one or more flow paths (represented by several squares)

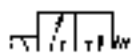
FLOW CONTROL VALVE Valve controlling the flow in one or both directions



4 PORTS and CLOSED FLOW PATHS



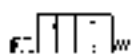
ONE WAY RESTRICTOR VALVE (Non Return Valve with Restriction) - Let it allowing free flow in one direction but restricted flow in the other direction



SOLENOID ACTUATED DIRECTIONAL CONTROL VALVE (Two Position) - controlled by electric current with return spring



UW VALVE - Normally closed position



PILOT ACTUATED DIRECTIONAL CONTROL VALVE (Two Position) - controlled by pressure with return signal

HYDRAULIC SYSTEM INFORMATION (CONT'D)

Troubleshooting Chart

The following troubleshooting chart is provided for assistance in locating and correcting problems which are most common. Many of the recommended procedures must be done by authorized Bobcat Service Personnel only.



WARNING

Check for correct function after adjustments, repairs or service. Failure to make correct repairs or adjustments can cause injury or death.

W-2004-1285

PROBLEM	CAUSE
The hydraulic system will not operate.	1, 2, 3, 6
The hydraulic fluid temperature warning light comes ON when hydraulics are operating.	1, 2
Slow hydraulic system action.	1, 2, 4, 8
Hydraulic action is not smooth.	1, 3, 4, 5
Boom goes up slowly at full engine RPM.	1, 2, 4, 5, 6, 7
The boom comes down with the lever in neutral position.	7, 8, 9

KEY TO CORRECT THE CAUSE

1. The fluid level is not correct..
2. The hydraulic pump has damage.
3. Relief valve is not at the correct pressure.
4. Suction leak on the inlet side of the hydraulic pump.
5. Fluid is cold. Wrong viscosity fluid. ((See HYDRAULIC/HYDROSTATIC FLUID SPECIFICATIONS on Page SPEC-50-1.))
6. Using the machine for more than its rated capacity.
7. Internal leak in the lift cylinder.
8. External leak from the cylinder(s).
9. Damaged lift spool.

Dealer Copy -- Not for Resale

HYDRAULIC SYSTEM INFORMATION (CONT'D)

Tightening Procedures

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

To tighten the hydraulic fittings, tubelines etc. (See HYDRAULIC CONNECTION SPECIFICATIONS on Page SPEC-40-1.), for the correct procedure and torque.

WARNING

Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a physician familiar with this injury is not received immediately.

W-2145-0290

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

LIFT CYLINDER

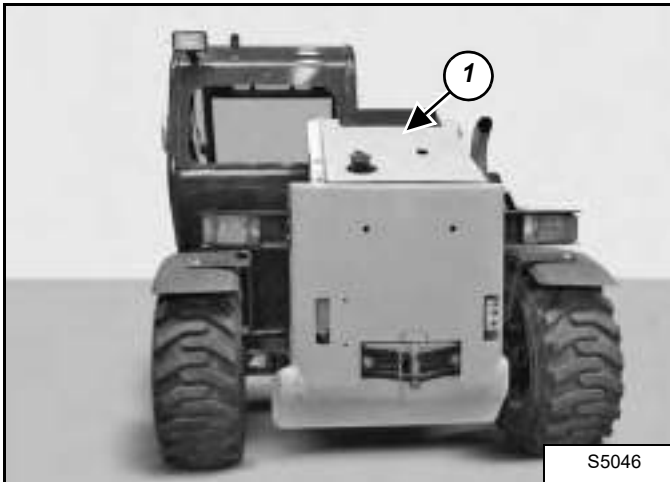
Removal And Installation

Figure 20-20-1



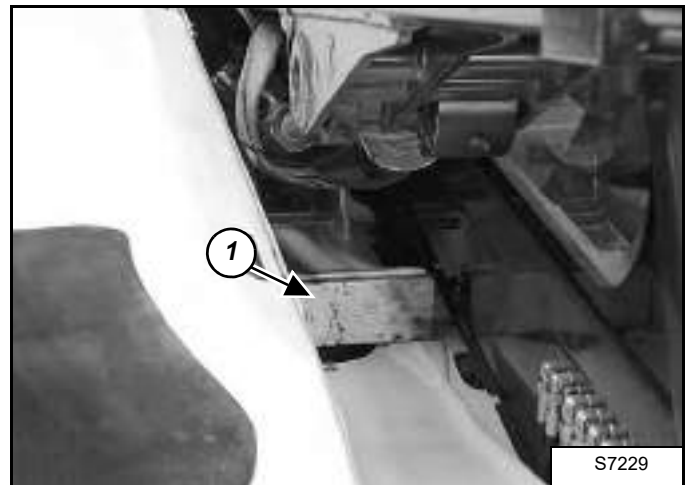
Lower the boom onto adequate stands or blocks as shown [Figure 20-20-1].

Figure 20-20-2



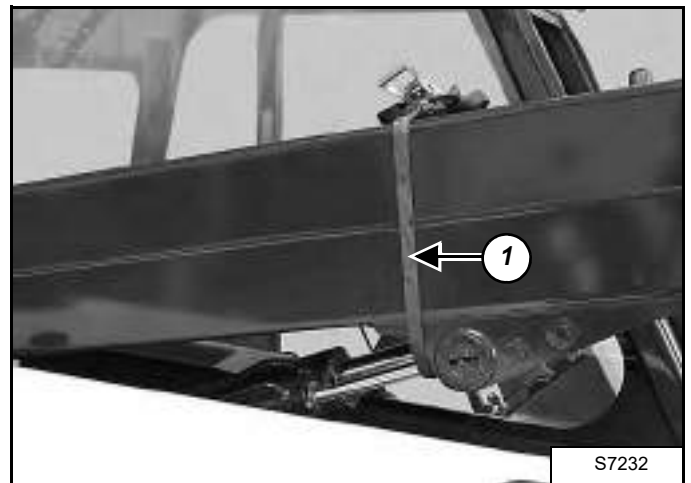
Remove the rear cover (Item 1) [Figure 20-20-2] from the Telescopic Handler.

Figure 20-20-3



Place a wood block (Item 1) [Figure 20-20-3] under the lift cylinder / bucket positioning cylinder.

Figure 20-20-4



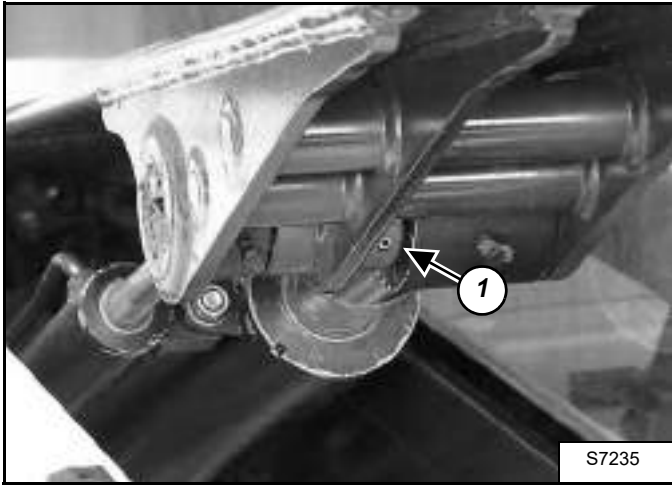
Support the two cylinders using a cinch strap (Item 1) [Figure 20-20-4].

Dealer Copy -- Not for Resale

LIFT CYLINDER (CONT'D)

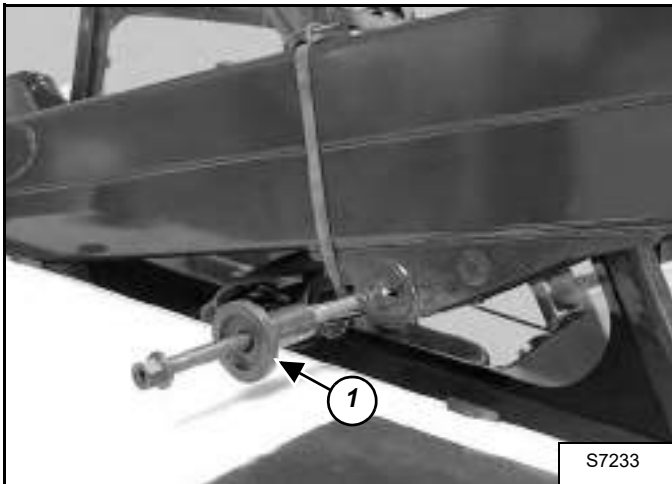
Removal And Installation (Cont'd)

Figure 20-20-5



Remove the pivot pin retainer bolt (Item 1) [Figure 20-20-5] from the lift cylinder / bucket positioning cylinder.

Figure 20-20-6



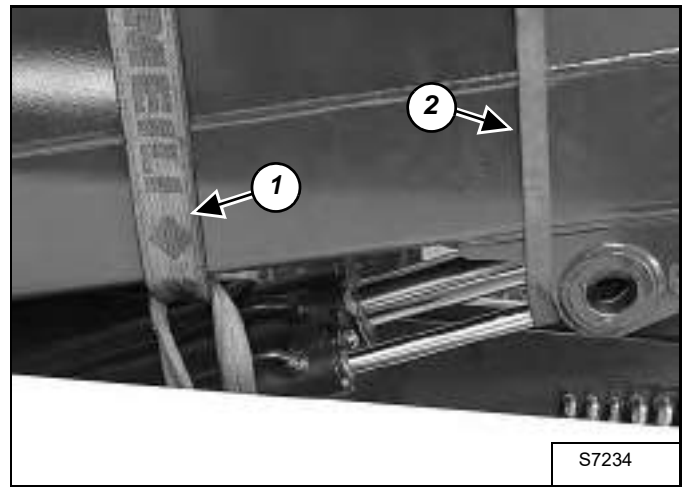
Remove the upper pivot pin using a pin removal tool (Item 1) [Figure 20-20-6].

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

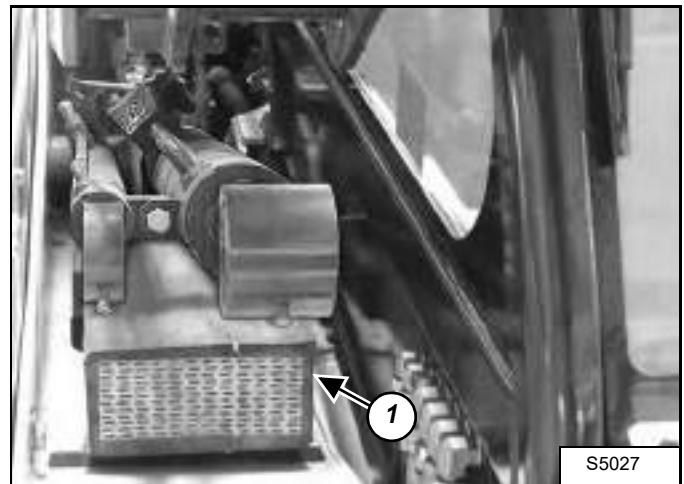
I-2003-0888

Figure 20-20-7



Lift and support the cylinders using a hoist and lifting strap (Item 1). Remove the cinch strap (Item 2) [Figure 20-20-7].

Figure 20-20-8



Lower the two cylinders onto the wood block (Item 1) [Figure 20-20-8].

LIFT CYLINDER (CONT'D)

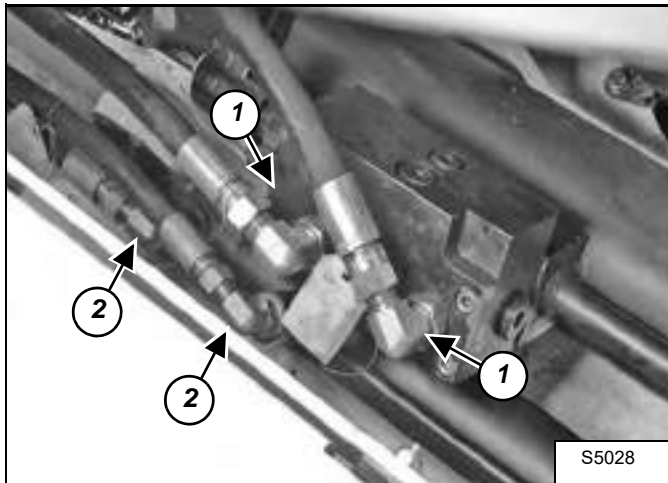
Removal And Installation (Cont'd)

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Figure 20-20-9

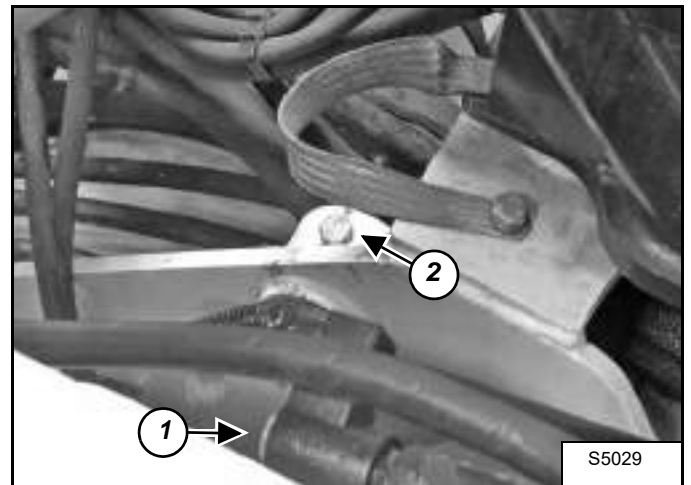


Remove the two hoses (Item 1) [Figure 20-20-9] from the load lock.

Remove the two hoses (Item 2) [Figure 20-20-9] from the bucket positioning cylinder.

NOTE: Mark the hoses for correct installation.

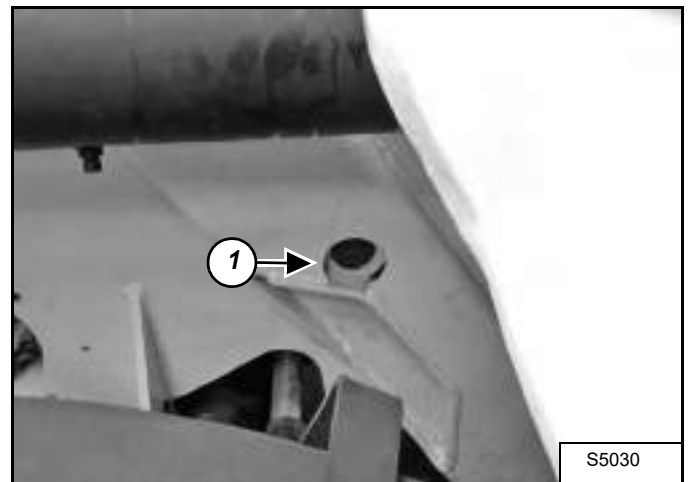
Figure 20-20-10



Remove the Load Lock Solenoid (Item 1) [Figure 20-20-10].

Remove the base end pivot pin retainer bolt (Item 2) [Figure 20-20-10].

Figure 20-20-11



Remove the base end pivot pin (Item 1) [Figure 20-20-11].

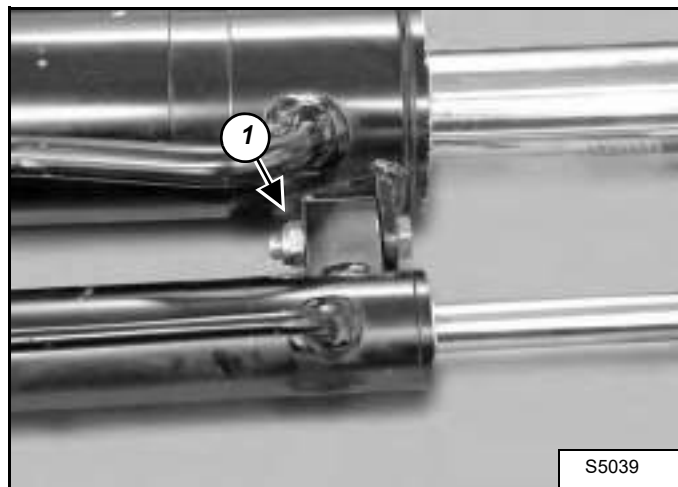
Carefully remove the two cylinders.

Dealer Copy -- Not for Resale

LIFT CYLINDER (CONT'D)

Removal And Installation (Cont'd)

Figure 20-20-12

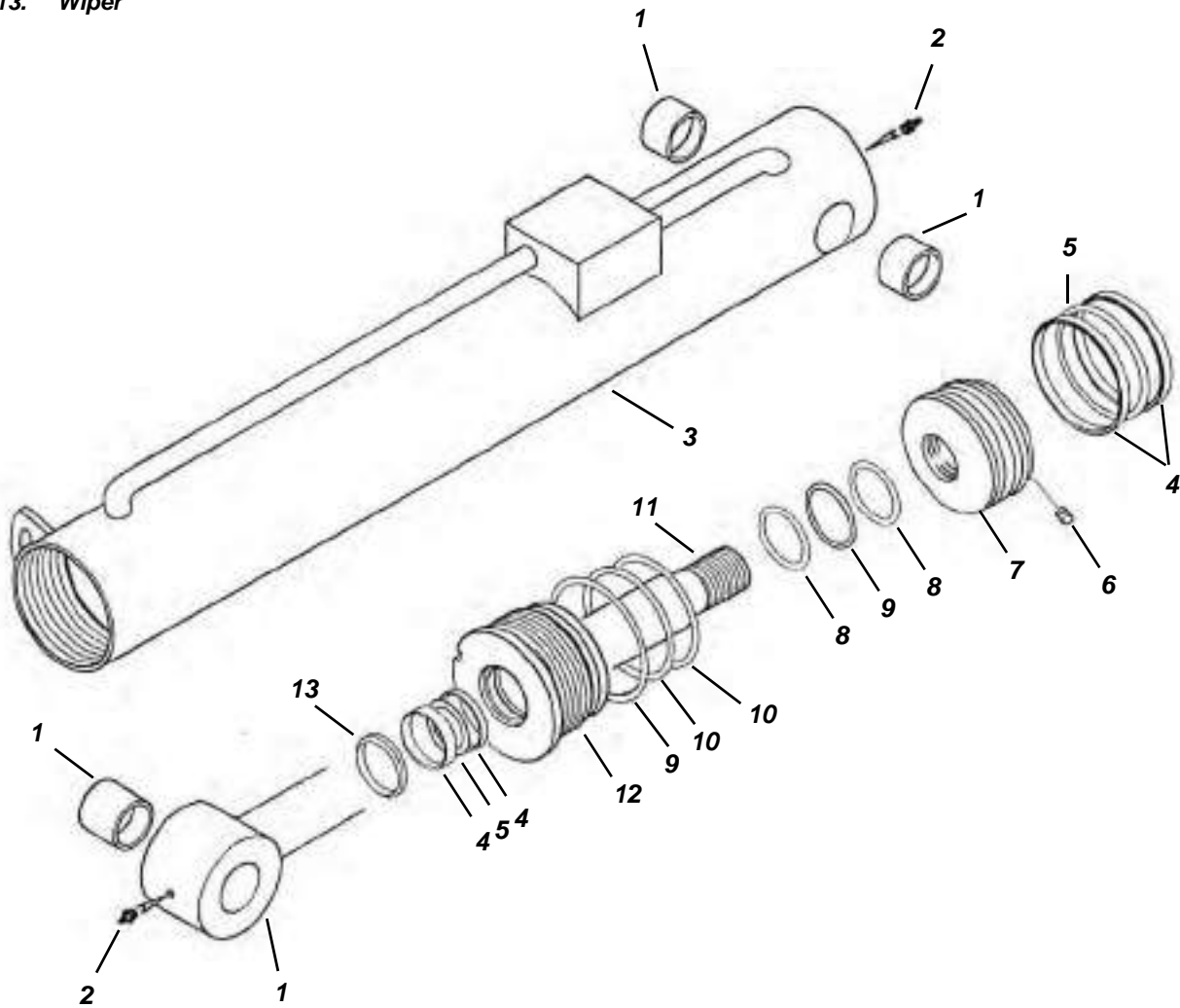


Remove the bolt and nut (Item 1) [Figure 20-20-12] and separate the lift cylinder and bucket positioning cylinder.

LIFT CYLINDER (CONT'D)

Parts Identification

- 1. Bushing
- 2. Grease Fitting
- 3. Housing
- 4. Wear Ring
- 5. Expander O-ring
- 6. Set Screw
- 7. Piston
- 8. Backup Ring
- 9. O-Ring
- 10. Backup Ring
- 11. Rod
- 12. Head Gland
- 13. Wiper



S7307

Dealer Copy -- Not for Resale

LIFT CYLINDER (CONT'D)

Disassembly

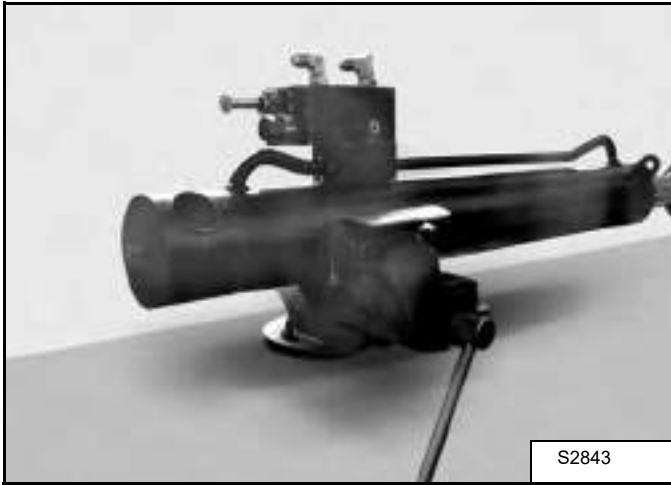
Use the following tools to disassemble the cylinder:

MEL1074-O-ring Seal Hook
MEL1033-Rod Seal Installation Tool
MEL1353-Cylinder Gland Nut Wrench

Clean the outside of the lift cylinder before disassembly.

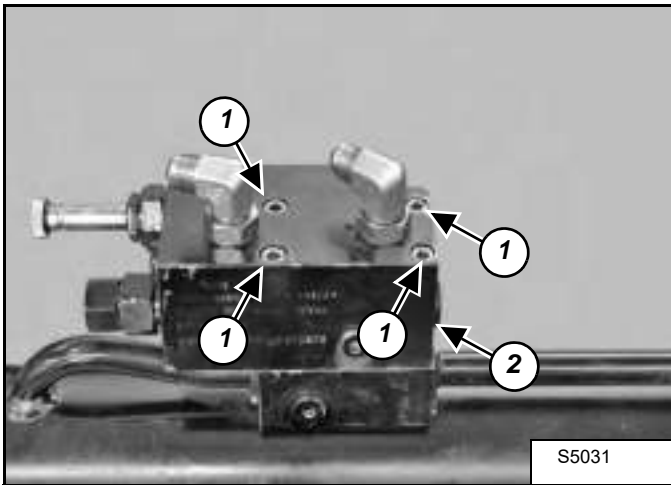
Clean all parts in solvent and dry with compressed air.

Figure 20-20-13



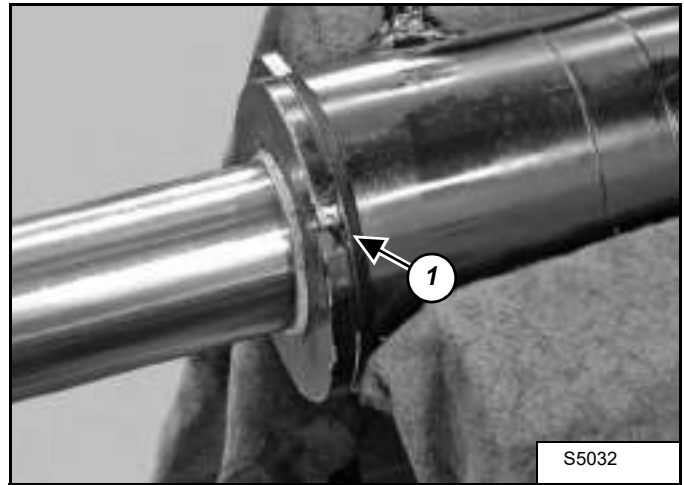
Put the cylinder in a vise [Figure 20-20-13].

Figure 20-20-14



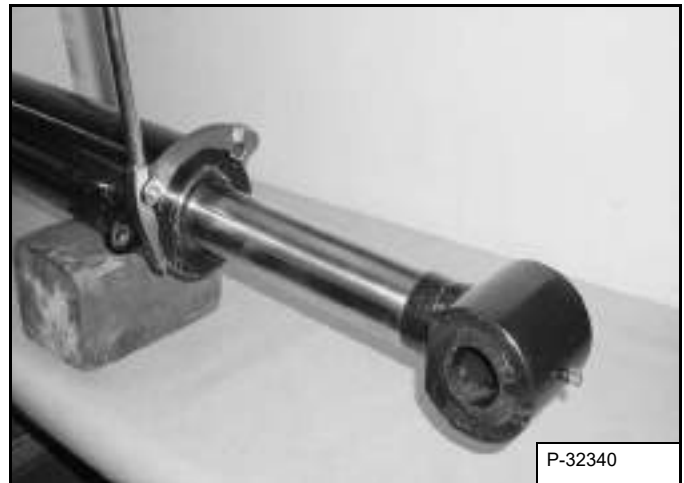
Remove the four bolts (Item 1) and remove the load lock (Item 2) [Figure 20-20-14].

Figure 20-20-15



Carefully peen the lock ring from the head gland [Figure 20-20-15].

Figure 20-20-16

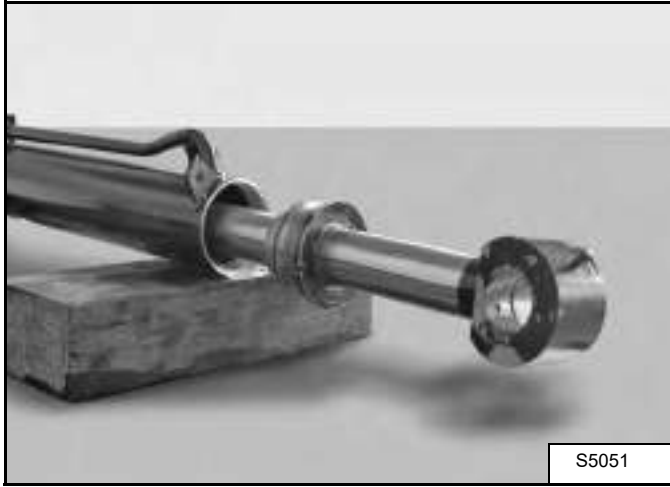


Loosen the head gland [Figure 20-20-16].

LIFT CYLINDER (CONT'D)

Disassembly (Cont'd)

Figure 20-20-17



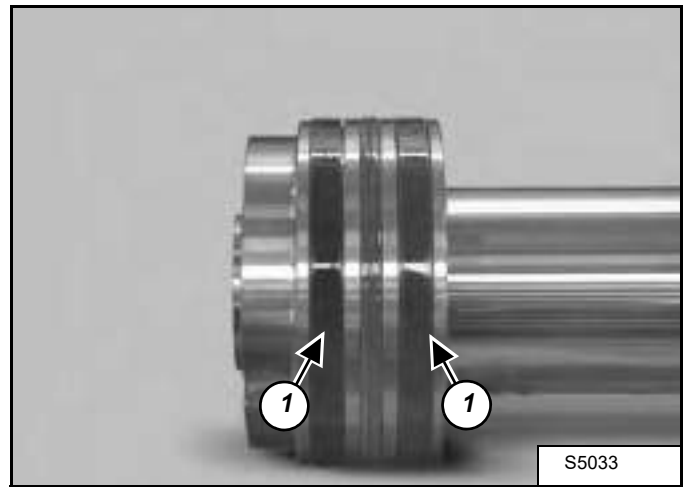
Remove the rod assembly (Item 1) [Figure 20-20-17] from the housing.

Figure 20-20-18



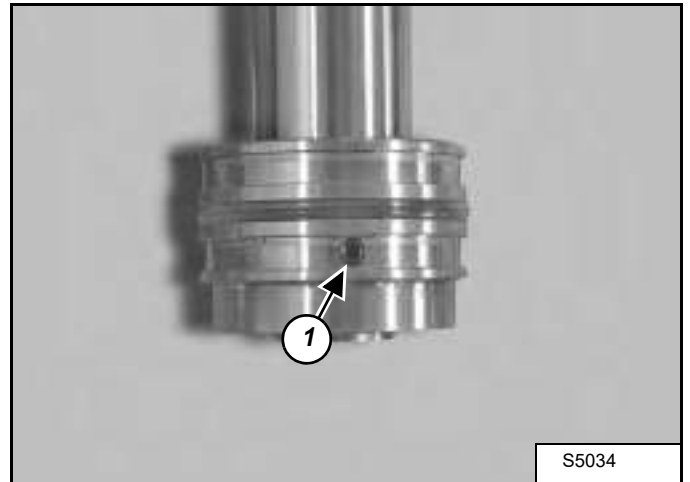
Put the rod end of the cylinder rod in a vise [Figure 20-20-18].

Figure 20-20-19



Remove the two wear rings (Item 1) [Figure 20-20-19] from the piston.

Figure 20-20-20



Remove the set screw (Item 1) [Figure 20-20-20] from the piston.

Dealer Copy -- Not for Resale

LIFT CYLINDER (CONT'D)

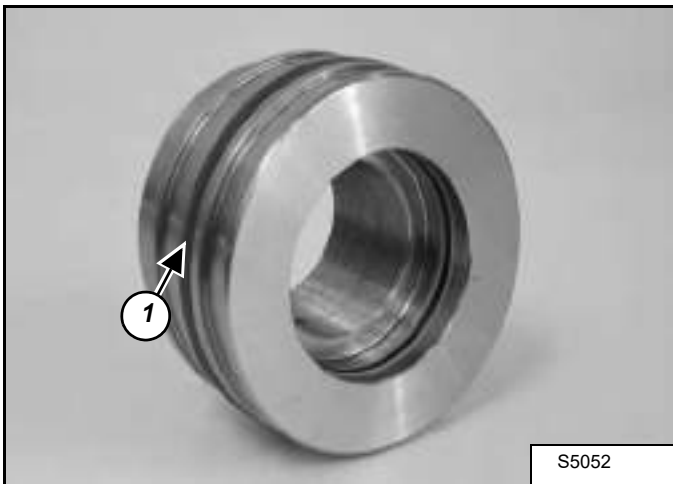
Disassembly (Cont'd)

Figure 20-20-21



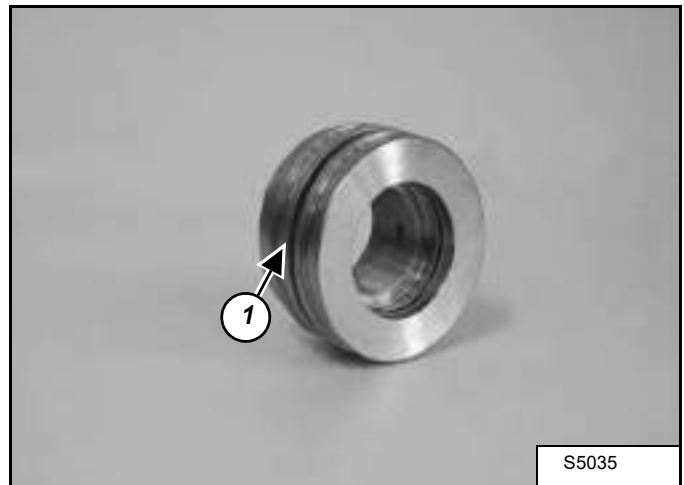
Support the cylinder rod on a wood block and remove the piston [Figure 20-20-21].

Figure 20-20-22



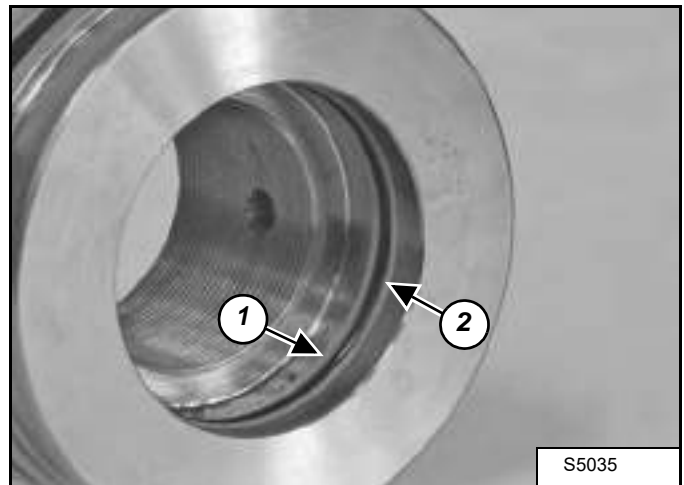
Remove the seal (Item 1) [Figure 20-20-22] from the piston.

Figure 20-20-23



Remove the expander O-ring (Item 1) [Figure 20-20-23].

Figure 20-20-24

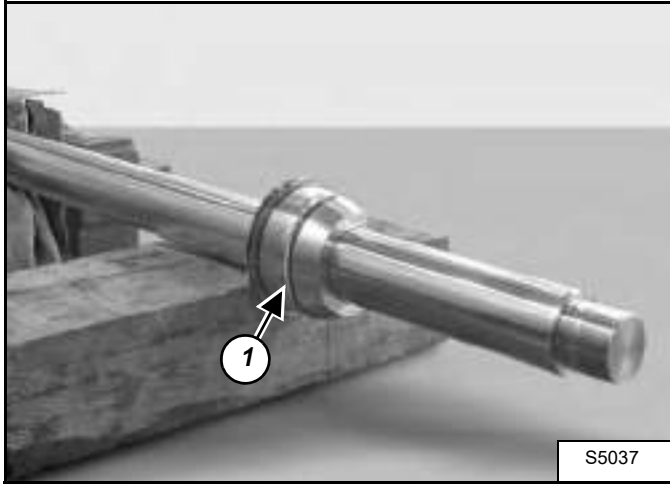


Remove the black O-ring (Item 1) and two backup rings (Item 2) [Figure 20-20-24] from the piston.

LIFT CYLINDER (CONT'D)

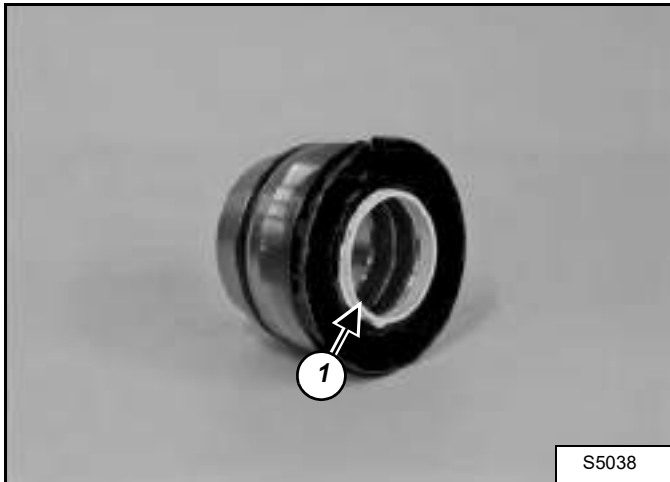
Disassembly (Cont'd)

Figure 20-20-25



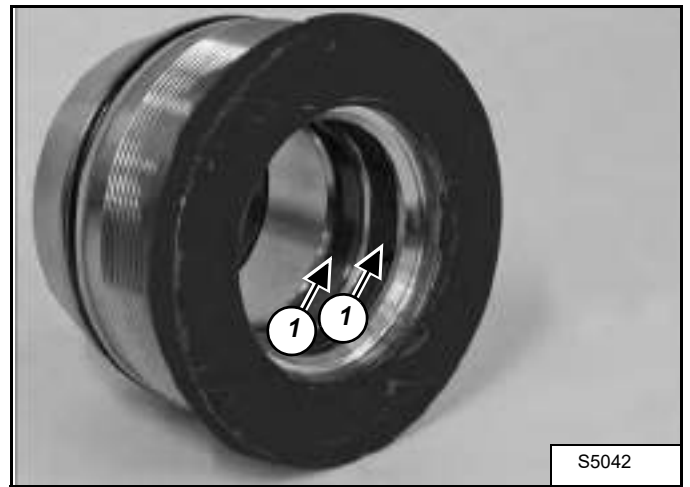
Remove the head gland (Item 1) [Figure 20-20-25] from the rod.

Figure 20-20-26



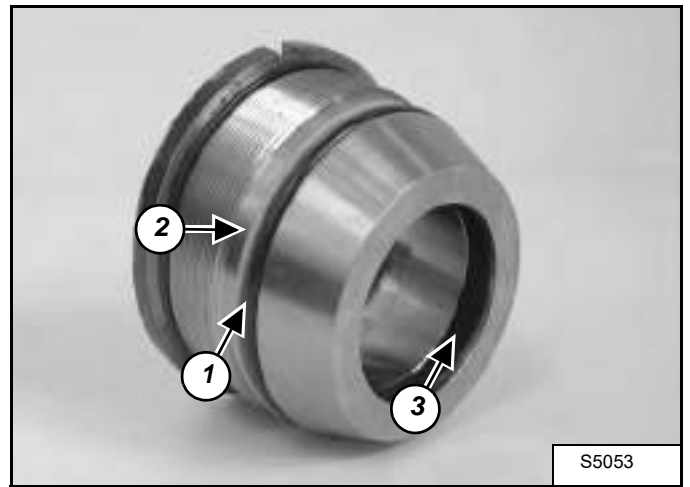
Remove the wiper seal (Item 1) [Figure 20-20-26] from the head gland.

Figure 20-20-27



Remove the wear rings (Item 1) [Figure 20-20-27].

Figure 20-20-28



Remove the seal (Item 1), backup ring (Item 2) and wear ring (Item 3) [Figure 20-20-28].

Dealer Copy -- Not for Resale

LIFT CYLINDER (CONT'D)

Assembly

Use the following tools to assemble the cylinder:

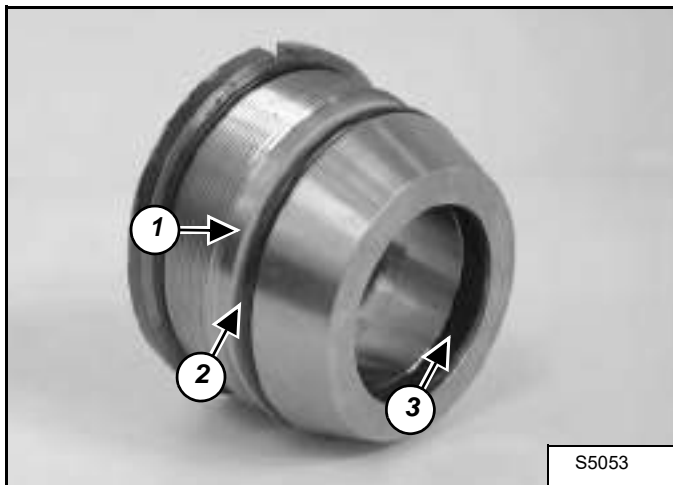
MEL1074-O-ring Seal Hook
MEL1033-Rod Seal Installation Tool
MEL1353-Cylinder Gland Nut Wrench

Clean all parts in solvent and dry with compressed air.

Inspect all parts for wear or damage. Replace any worn or damaged parts.

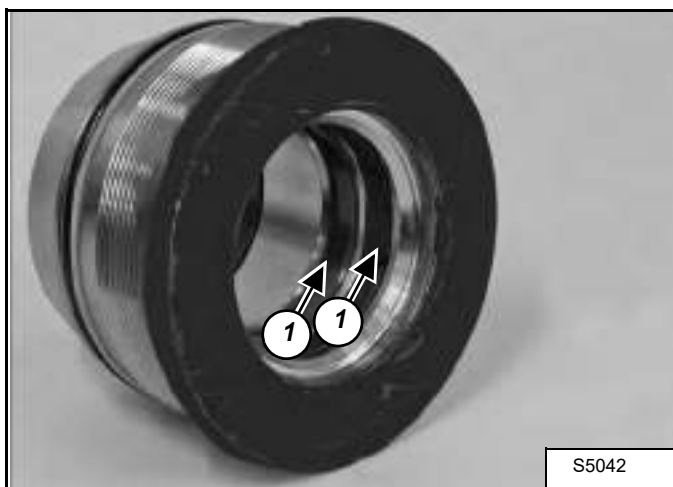
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 20-20-29



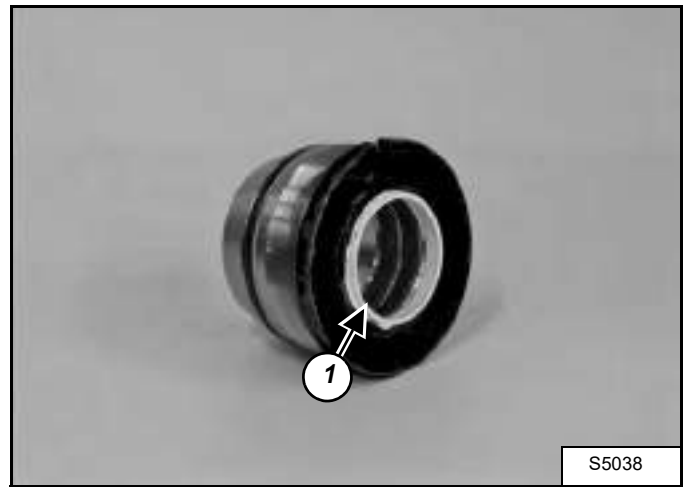
Install the backup ring (Item 1), seal (Item 2) and wear ring (Item 3) [Figure 20-20-29].

Figure 20-20-30



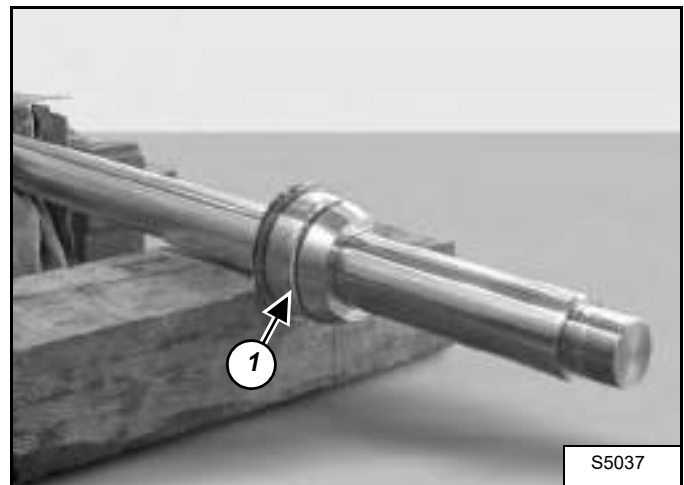
Install the wear rings (Item 1) [Figure 20-20-30].

Figure 20-20-31



Install the wiper seal (Item 1) [Figure 20-20-31] from the head gland.

Figure 20-20-32

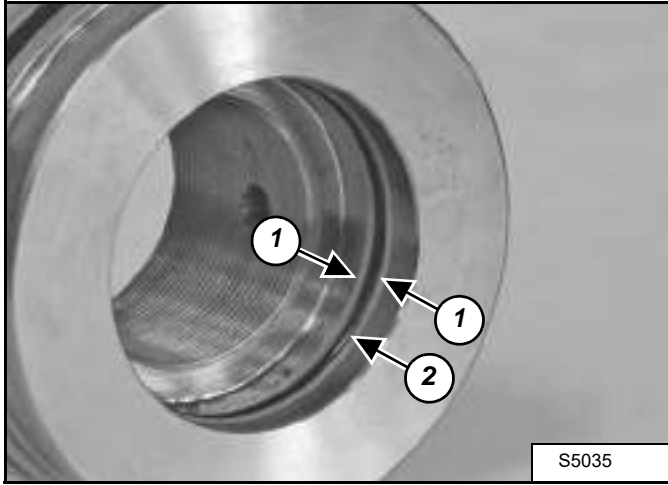


Install the head gland (Item 1) [Figure 20-20-32] onto the rod.

LIFT CYLINDER (CONT'D)

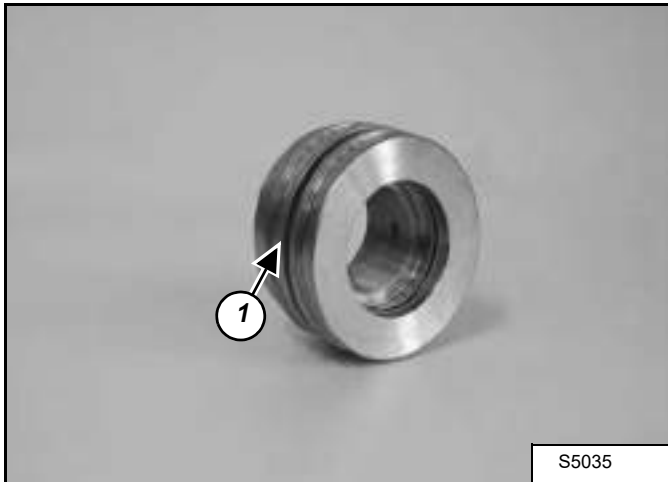
Assembly (Cont'd)

Figure 20-20-33



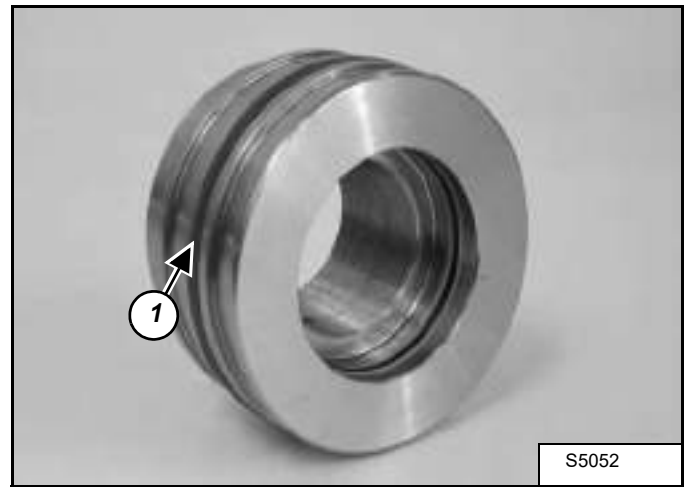
Install the two backup rings (Item 1) and black O-ring (Item 2) [Figure 20-20-33] onto the piston.

Figure 20-20-34



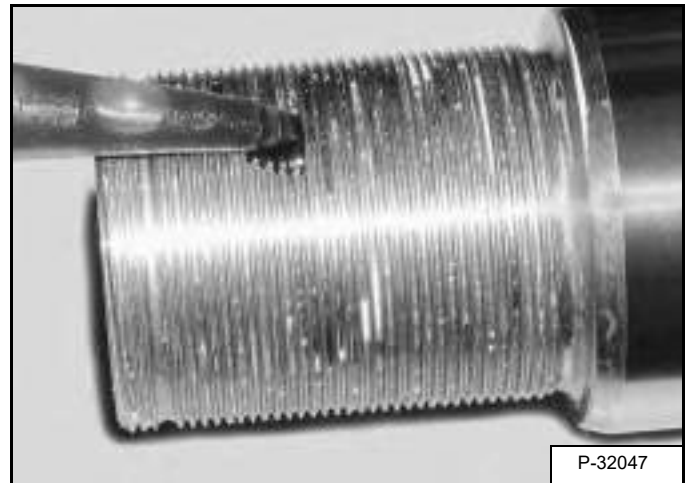
Install the expander O-ring (Item 1) [Figure 20-20-34].

Figure 20-20-35



Install the seal (Item 1) [Figure 20-20-35] onto the piston.

Figure 20-20-36



Clean off any old residue, and apply LOCTITE 242 or equivalent to the threads on the rod [Figure 20-20-36].

Dealer Copy -- Not for Resale

LIFT CYLINDER (CONT'D)

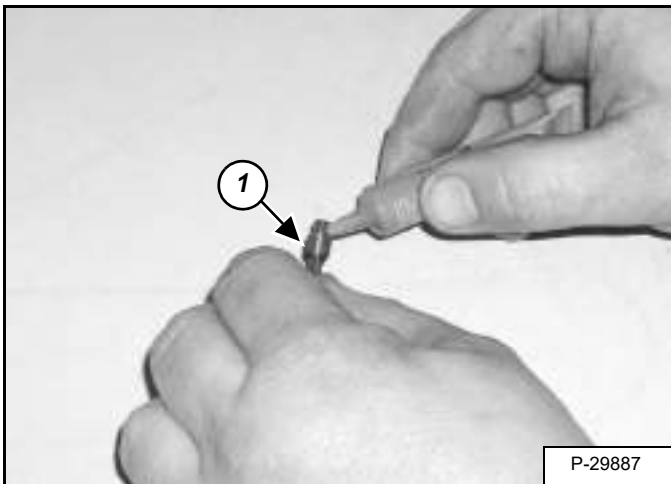
Assembly (Cont'd)

Figure 20-20-37



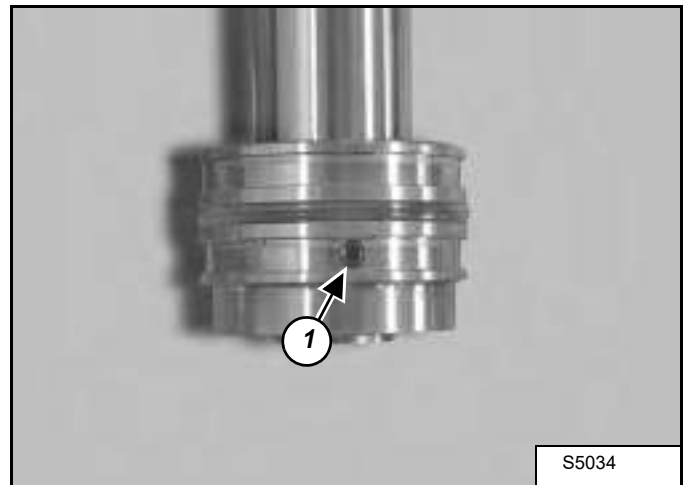
Use the cylinder wrench to install the piston [Figure 20-20-37].

Figure 20-20-38



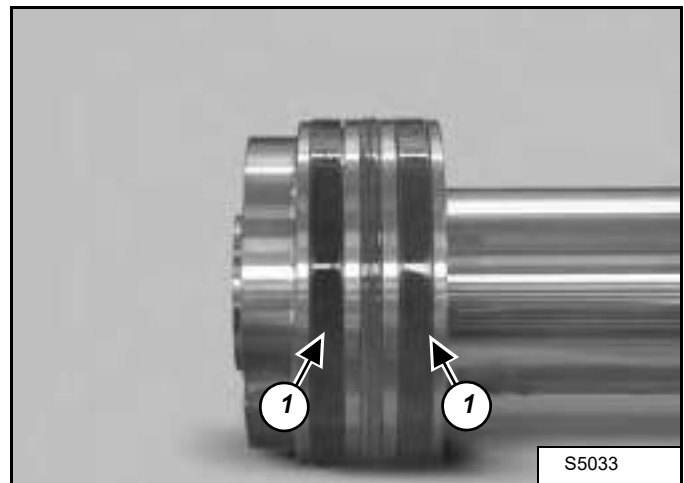
Apply LOCTITE 242 or equivalent to the set screw (Item 1) [Figure 20-20-38].

Figure 20-20-39



Install the set screw (Item 1) [Figure 20-20-39] from the piston.

Figure 20-20-40

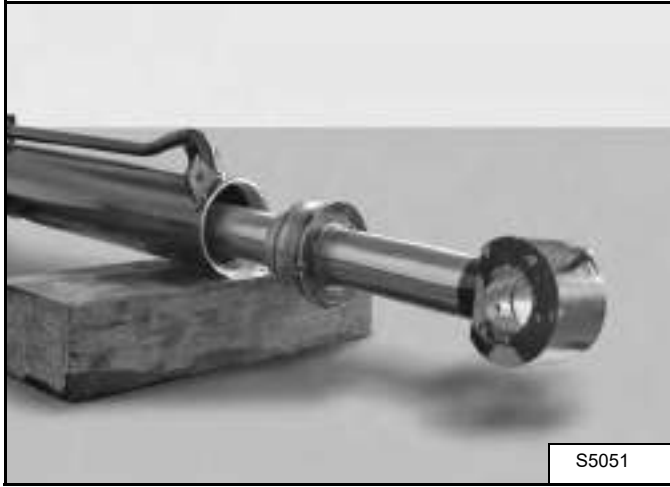


Install the two wear rings (Item 1) [Figure 20-20-40] onto the piston.

LIFT CYLINDER (CONT'D)

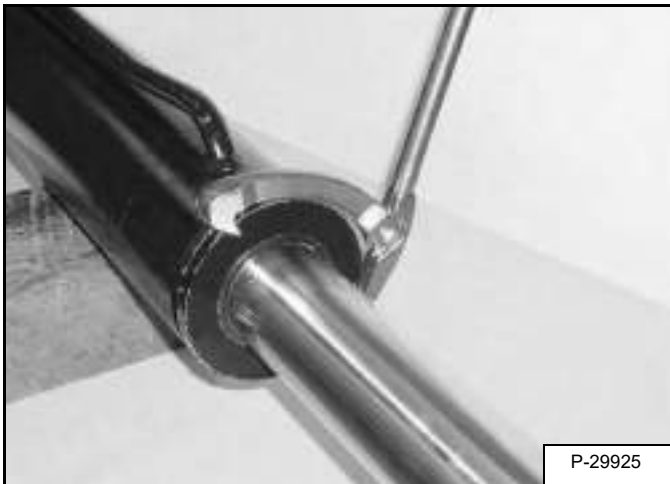
Assembly (Cont'd)

Figure 20-20-41



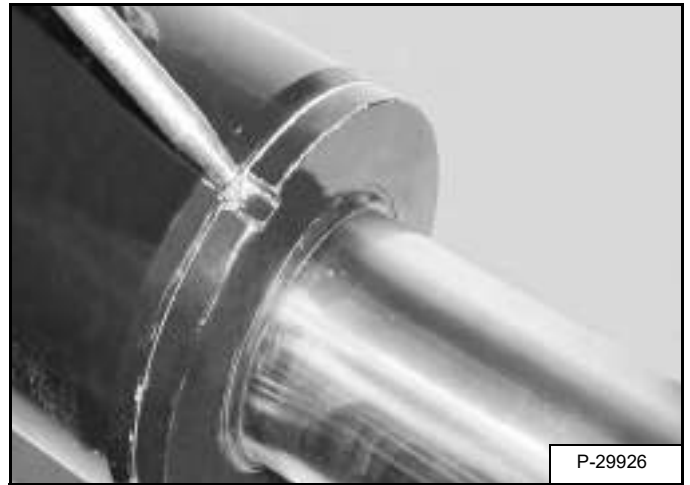
Install the rod assembly (Item 1) [Figure 20-20-41] into the housing.

Figure 20-20-42



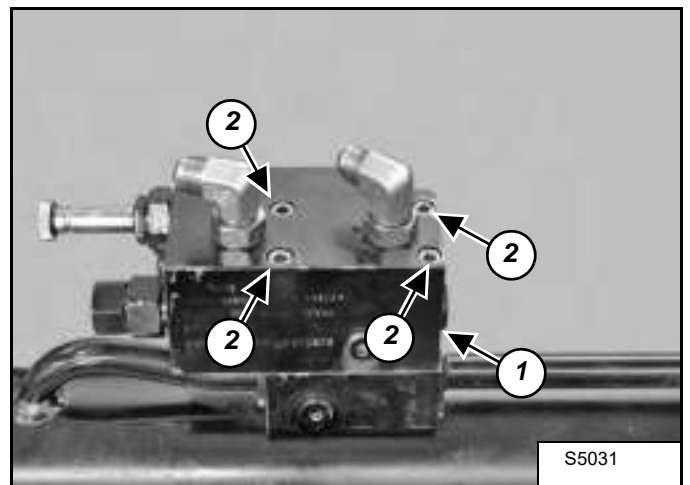
Use the spanner wrench to tighten the head gland [Figure 20-20-42].

Figure 20-20-43



Peen the lock ring into the groove in the head gland [Figure 20-20-43].

Figure 20-20-44



Install the load lock (Item 1) and install the four bolts (Item 2) [Figure 20-20-44].

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

BUCKET POSITIONING CYLINDER

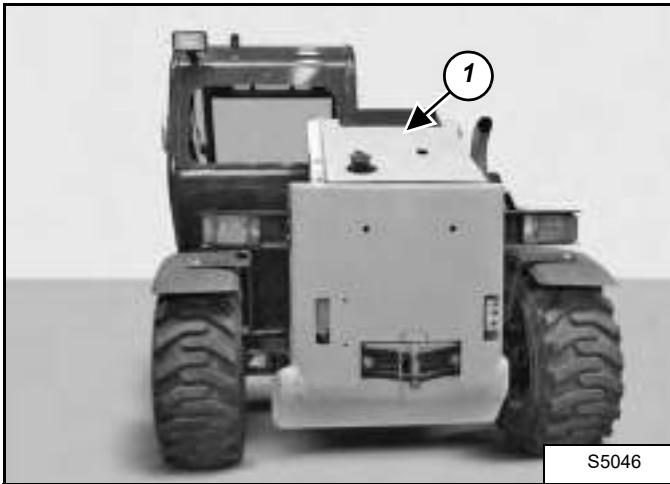
Removal And Installation

Figure 20-30-1



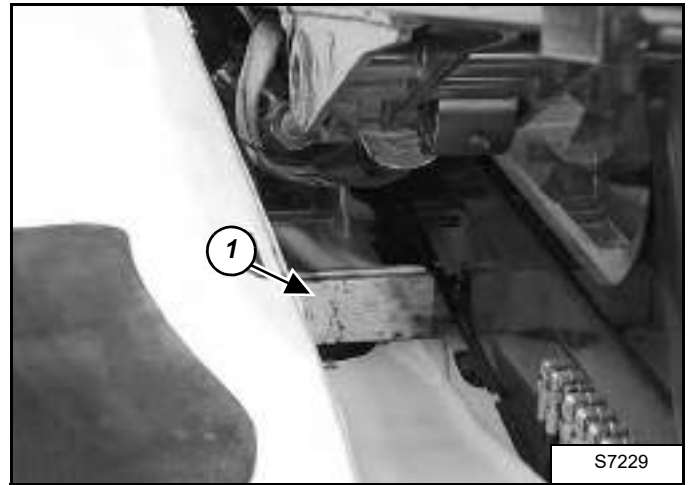
Lower the boom onto adequate stands or blocks as shown [Figure 20-30-1].

Figure 20-30-2



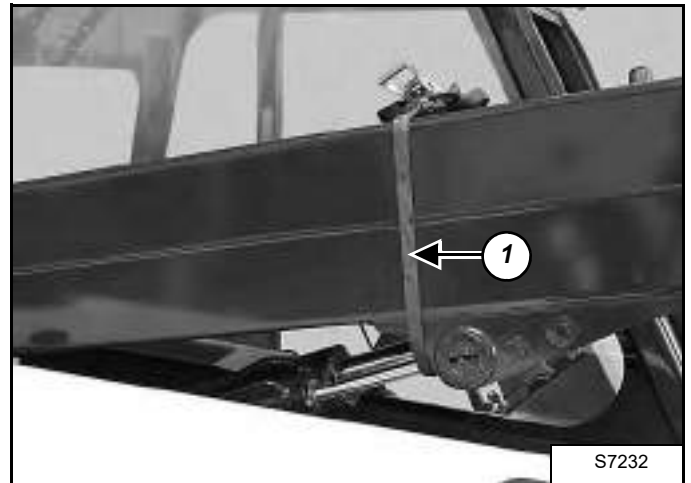
Remove the rear cover (Item 1) [Figure 20-30-2] from the Telescopic Handler.

Figure 20-30-3



Place a wood block (Item 1) [Figure 20-30-3] under the lift cylinder/bucket positioning cylinder.

Figure 20-30-4



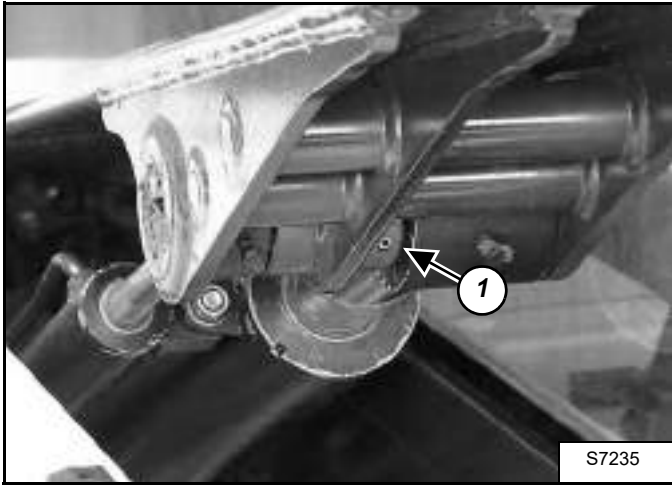
Support the two cylinders using a cinch strap (Item 1) [Figure 20-30-4].

Dealer Copy -- Not for Resale

BUCKET POSITIONING CYLINDER (CONT'D)

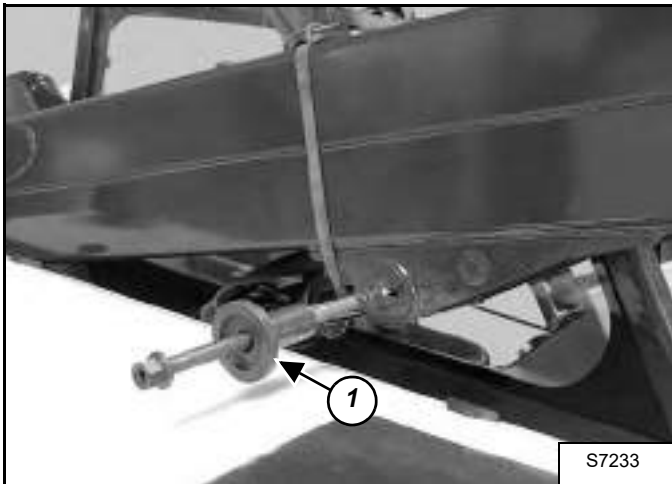
Removal And Installation (Cont'd)

Figure 20-30-5



Remove the pivot pin retainer bolt (Item 1) [Figure 20-30-5] from the lift cylinder/bucket positioning cylinder.

Figure 20-30-6



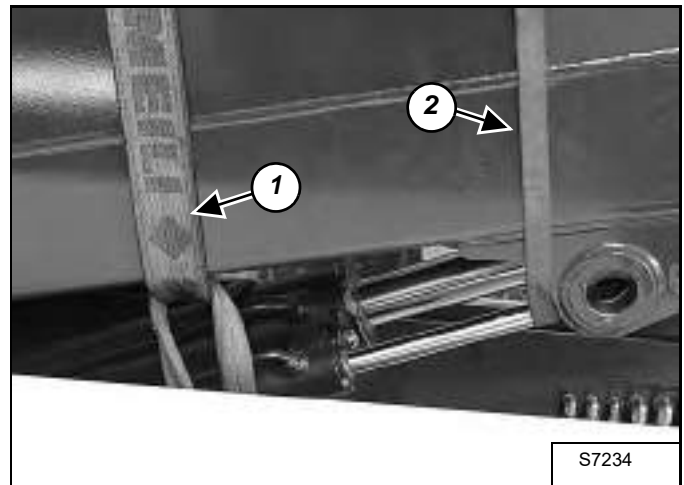
Remove the upper pivot pin using a pin removal tool (Item 1) [Figure 20-30-6].

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

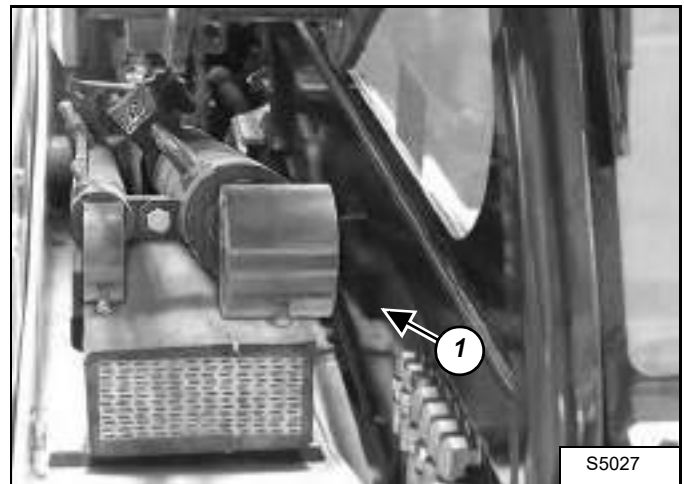
I-2003-0888

Figure 20-30-7



Lift and support the cylinders using a hoist and lifting strap (Item 1). Remove the cinch strap (Item 2) [Figure 20-30-7].

Figure 20-30-8



Lower the two cylinders onto the wood block (Item 1) [Figure 20-30-8].

BUCKET POSITIONING CYLINDER (CONT'D)

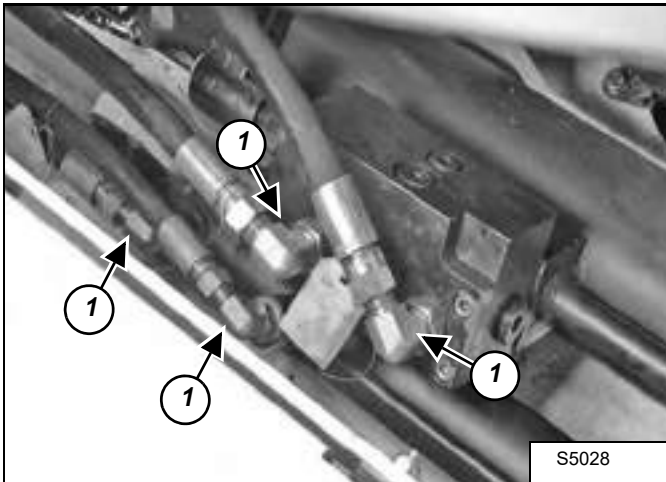
Removal And Installation (Cont'd)

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Figure 20-30-9

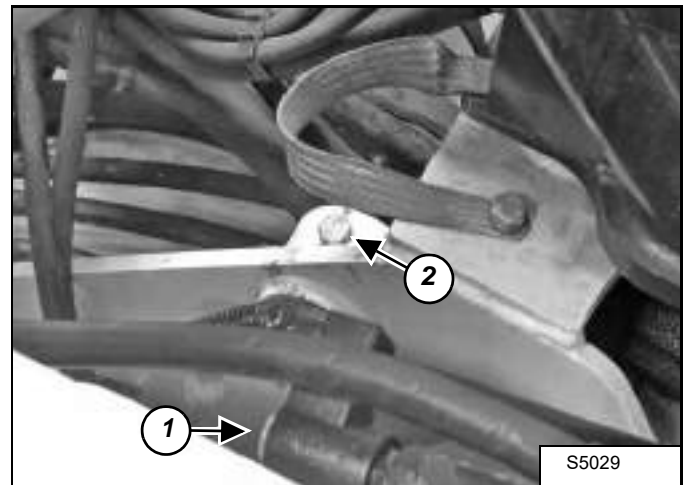


Remove the two hoses (Item 1) [Figure 20-30-9] from the load lock.

Remove the two hoses (Item 1) [Figure 20-30-9] from the cylinder.

NOTE: Mark the hoses for correct installation.

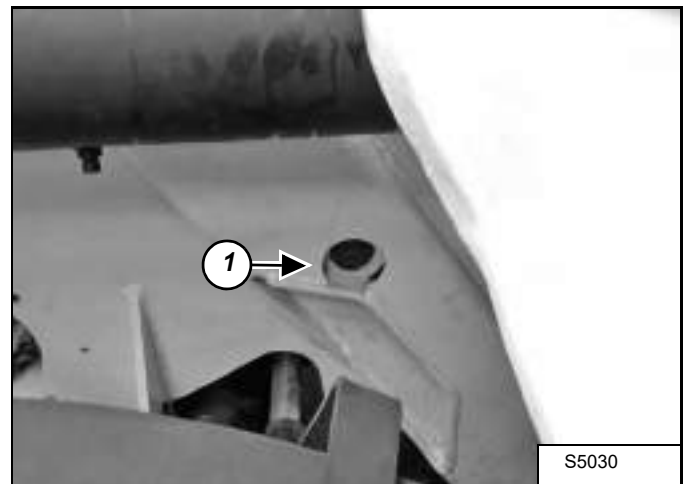
Figure 20-30-10



Remove the Load Lock Solenoid (Item 1) [Figure 20-30-10].

Remove the base end pivot pin retainer bolt (Item 2) [Figure 20-30-10].

Figure 20-30-11



Remove the base end pivot pin (Item 1) [Figure 20-30-11].

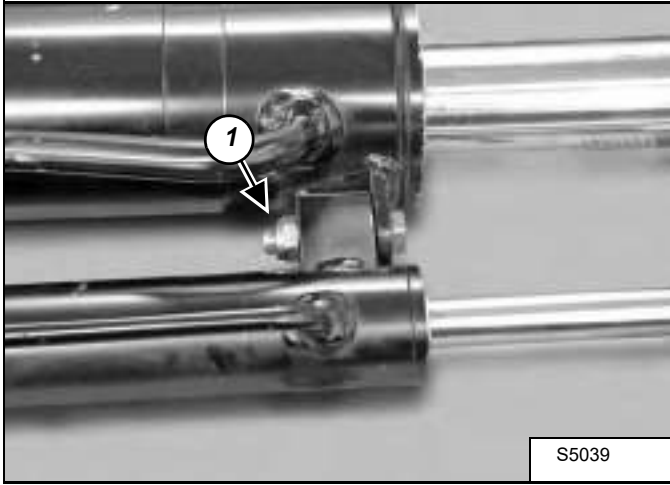
Carefully remove the two cylinders.

Dealer Copy -- Not for Resale

BUCKET POSITIONING CYLINDER (CONT'D)

Removal And Installation (Cont'd)

Figure 20-30-12

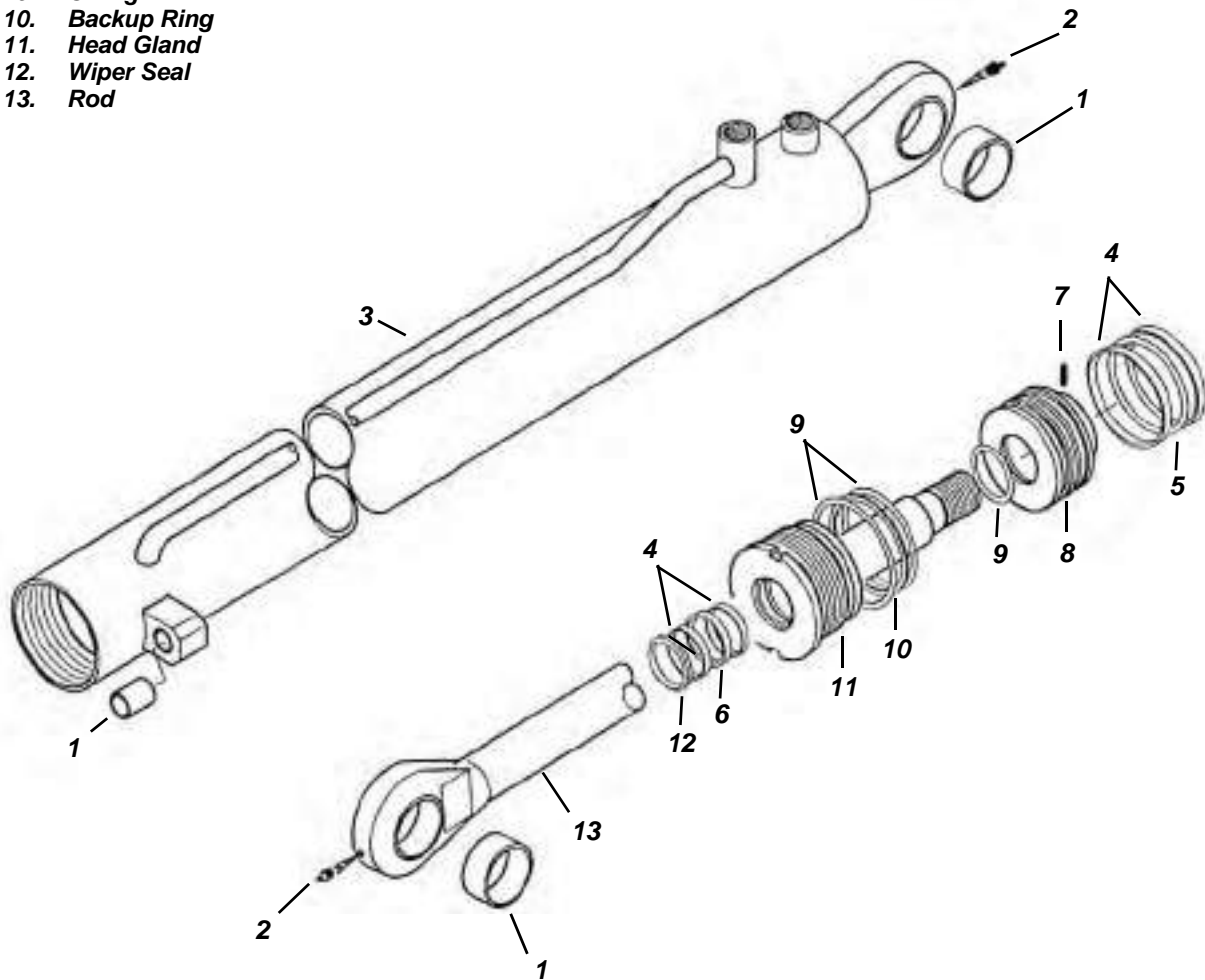


Remove the bolt and nut (Item 1) **[Figure 20-30-12]** and separate the lift cylinder and bucket positioning cylinder.

BUCKET POSITIONING CYLINDER (CONT'D)

Parts Identification

- 1. Bushing
- 2. Grease Fitting
- 3. Housing
- 4. Wear Ring
- 5. Seal
- 6. Seal
- 7. Set Screw
- 8. Piston
- 9. O-ring
- 10. Backup Ring
- 11. Head Gland
- 12. Wiper Seal
- 13. Rod



B-16230

Dealer Copy -- Not for Resale

BUCKET POSITIONING CYLINDER (CONT'D)

Disassembly

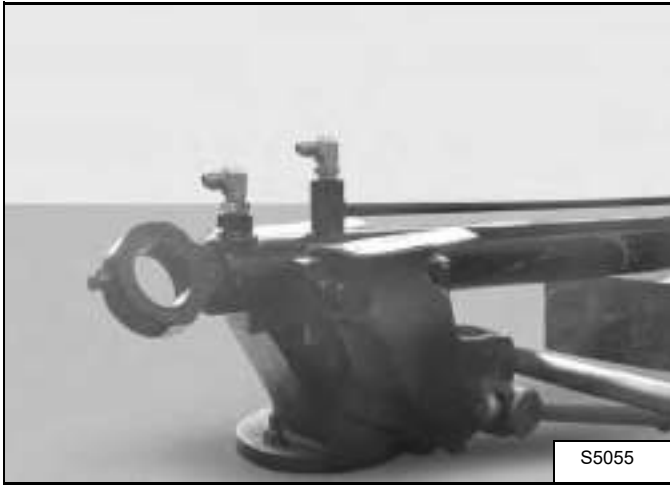
Use the following tools to disassemble the cylinder:

MEL1074-O-ring Seal Hook

MEL1353-Cylinder Gland Nut Wrench

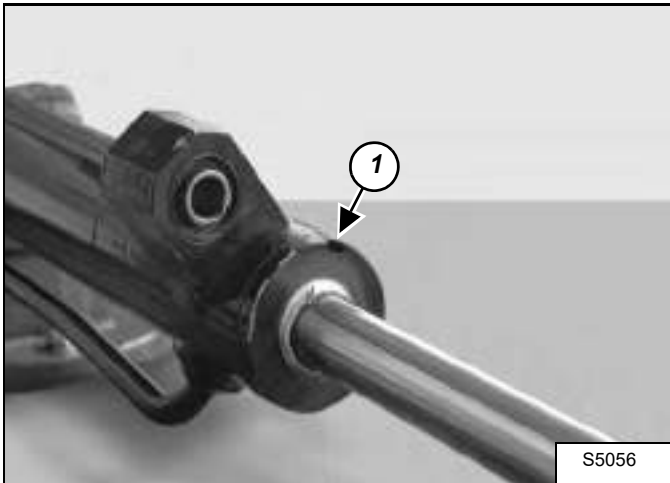
Clean the outside of the bucket positioning cylinder before disassembly.

Figure 20-30-13



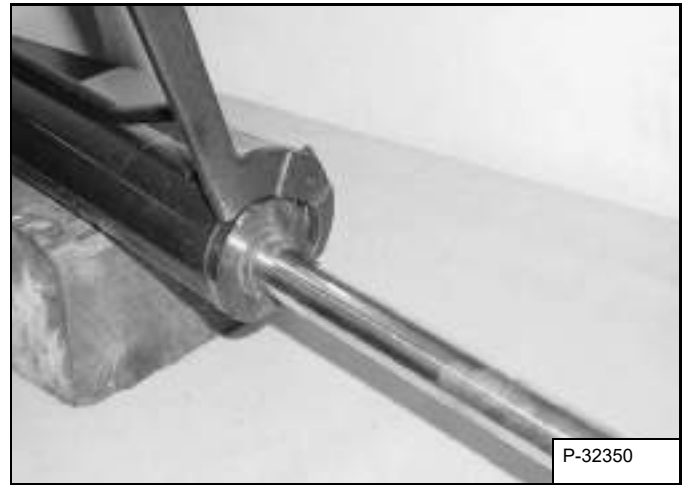
Put the cylinder in a vise [Figure 20-30-13].

Figure 20-30-14



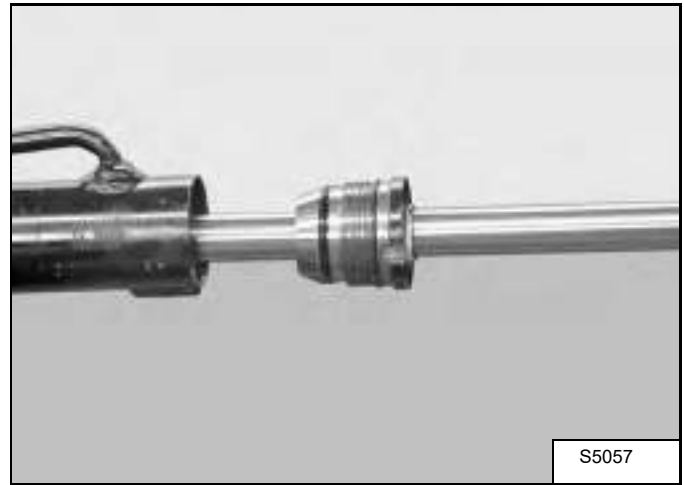
Carefully peen the lock from the head gland (Item 1) [Figure 20-30-14].

Figure 20-30-15



Remove the head gland [Figure 20-30-15].

Figure 20-30-16

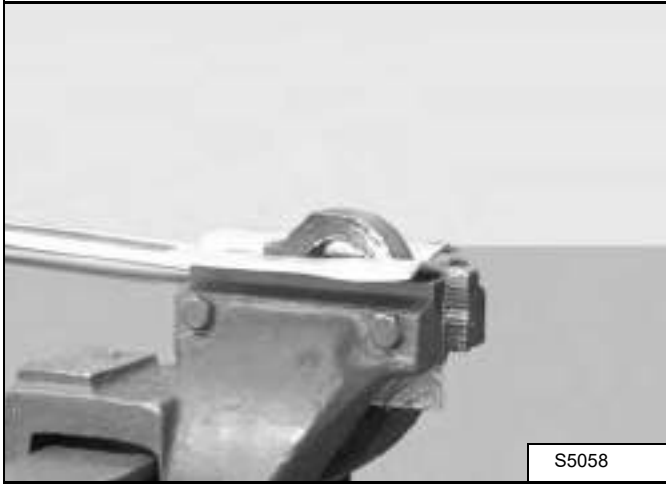


Remove the rod assembly (Item 1) [Figure 20-30-16] from the housing.

BUCKET POSITIONING CYLINDER (CONT'D)

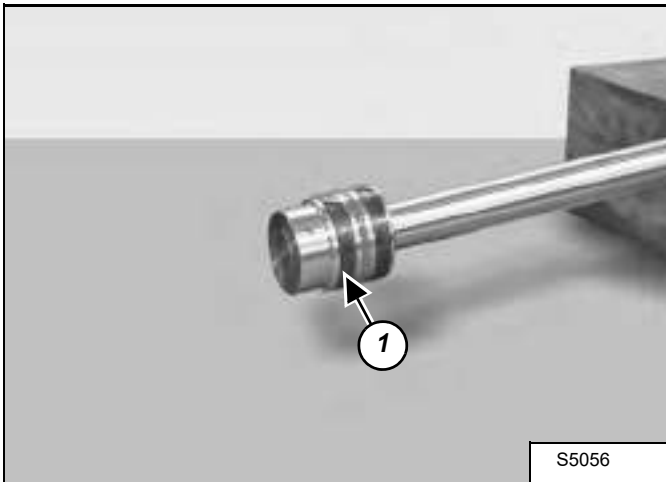
Disassembly (Cont'd)

Figure 20-30-17



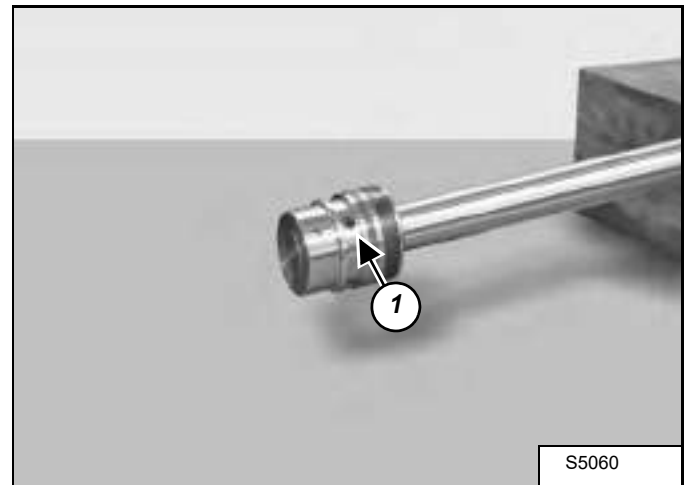
Put the rod end of the cylinder in a vise [Figure 20-30-17].

Figure 20-30-18



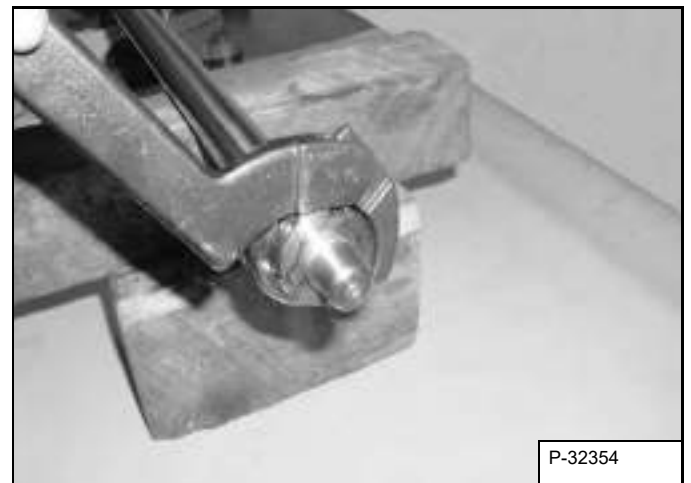
Remove the wear ring (Item 1) [Figure 20-30-18] from the piston.

Figure 20-30-19



Support the cylinder rod on a wood block and remove the set screw (Item 1) [Figure 20-30-19] from the piston.

Figure 20-30-20



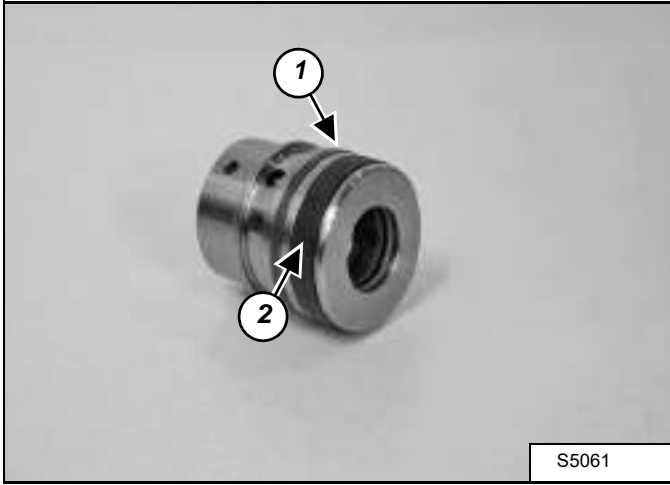
Remove the piston assembly (Item 1) [Figure 20-30-20] from the rod.

Dealer Copy -- Not for Resale

BUCKET POSITIONING CYLINDER (CONT'D)

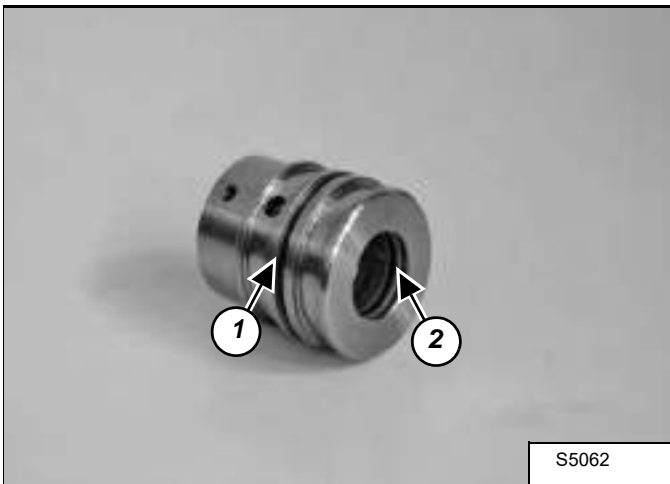
Disassembly (Cont'd)

Figure 20-30-21



Remove the seal (Item 1) and the wear ring (Item 2) [Figure 20-30-21].

Figure 20-30-22

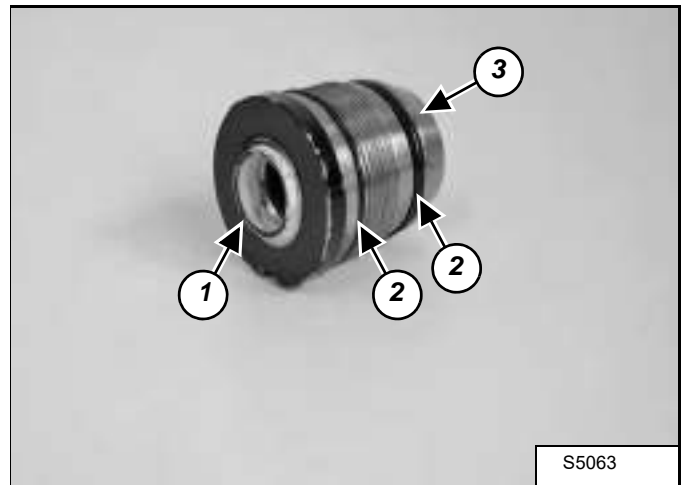


Remove the expander O-ring (Item 1) [Figure 20-30-22] from the piston.

Remove the internal O-ring and its backup rings (Item 2) [Figure 20-30-22].

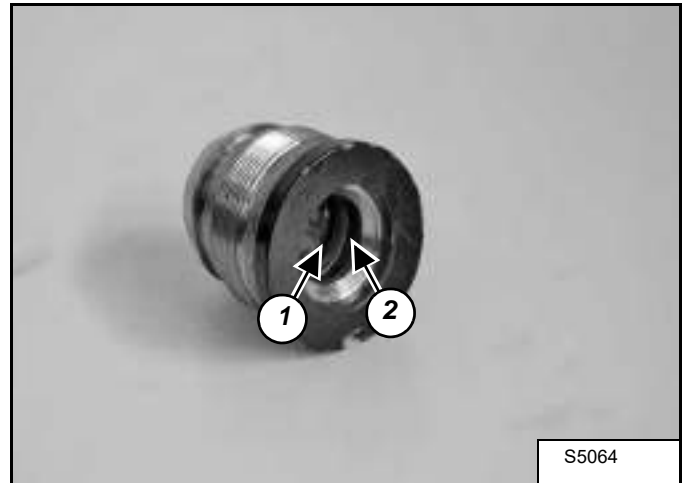
Remove the head gland from the rod.

Figure 20-30-23



Remove the center seal (Item 1), the O-rings (Item 2) and the backup ring (Item 2) [Figure 20-30-23].

Figure 20-30-24



Remove the central seal (Item 1) and wipers (Item 2) [Figure 20-30-24], one on either side...

Remove any residue from the threads on the cylinder rod.

BUCKET POSITIONING CYLINDER (CONT'D)

Assembly

Use the following tool to assemble the cylinder:

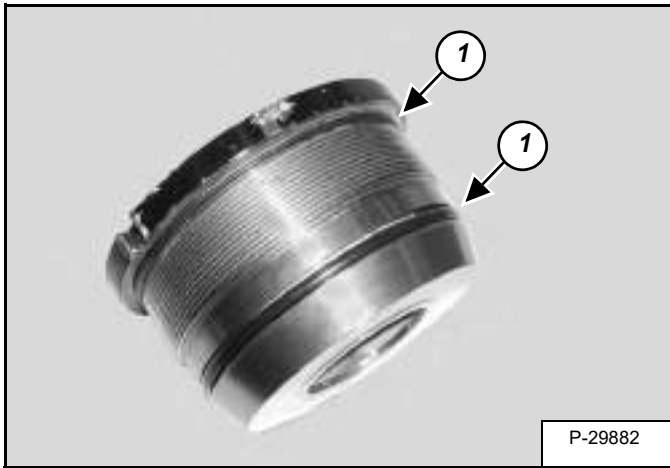
MEL1033-Rod Seal Installation Tool
MEL1353-Cylinder Gland Nut Wrench

Wash the cylinder parts in solvent and dry with compressed air.

Inspect the cylinder parts for nicks, scratches or other damage. Replace any damaged parts.

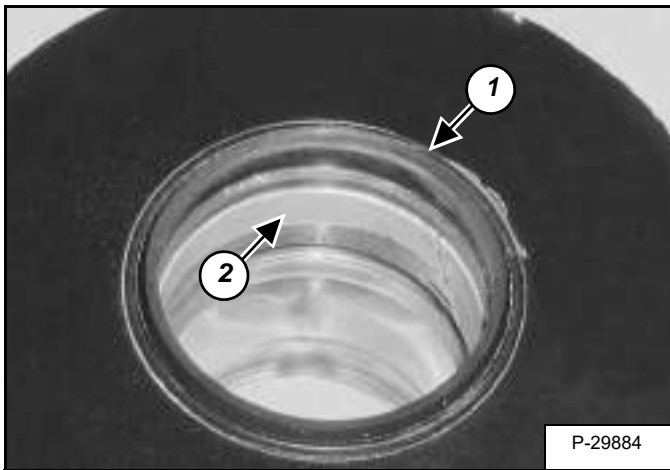
Lubricate all O-rings and seals with hydraulic fluid during installation.

Figure 20-30-25



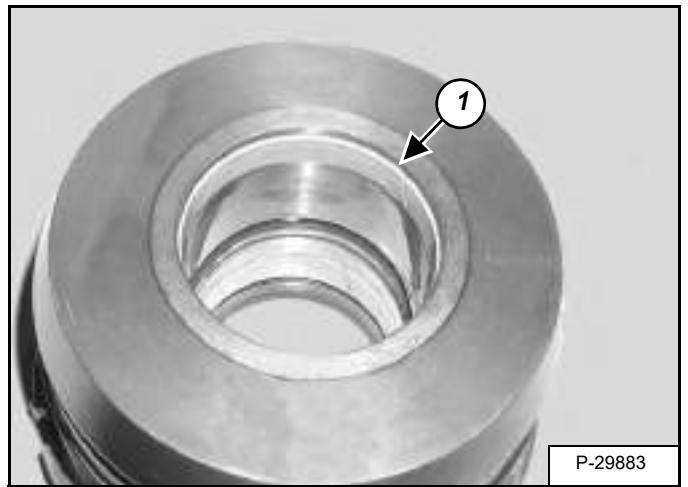
Install the two O-rings (Item 1) [Figure 20-30-25] onto the head gland.

Figure 20-30-26



Install the wiper (Item 1) and wear ring (Item 2) [Figure 20-30-26].

Figure 20-30-27



Install the wear ring (Item 1) [Figure 20-30-27].

Figure 20-30-28



Install the center seal (Item 1) [Figure 20-30-28].

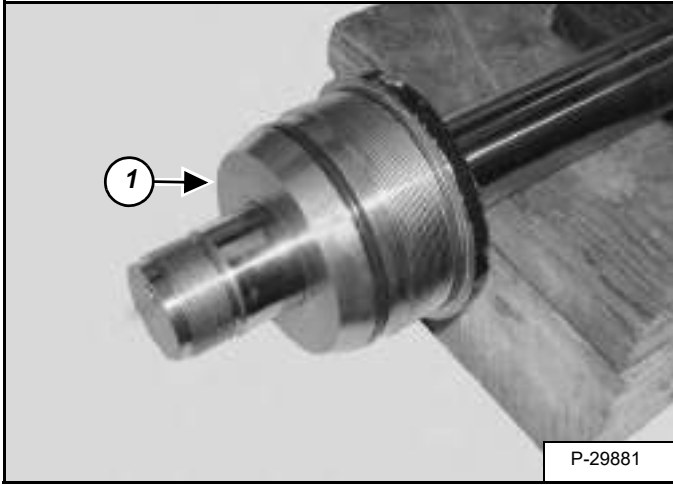
NOTE: The groove in the seal must point away from the wiper seal (Item 1) [Figure 20-30-26].

Dealer Copy -- Not for Resale

BUCKET POSITIONING CYLINDER (CONT'D)

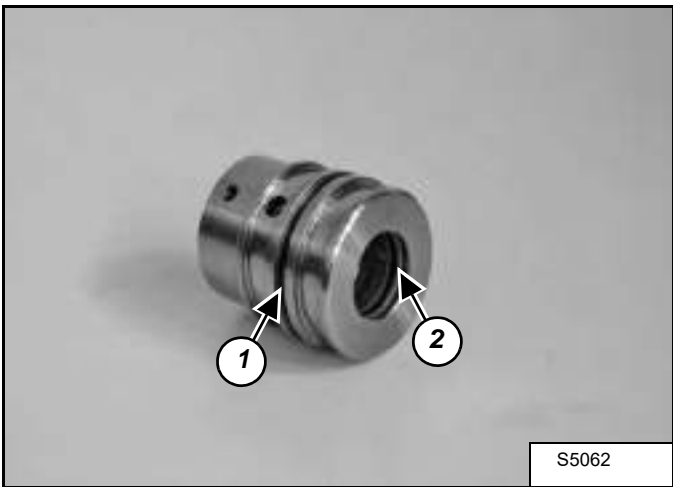
Assembly (Cont'd)

Figure 20-30-29



Install the head gland (Item 1) [Figure 20-30-29] onto the rod.

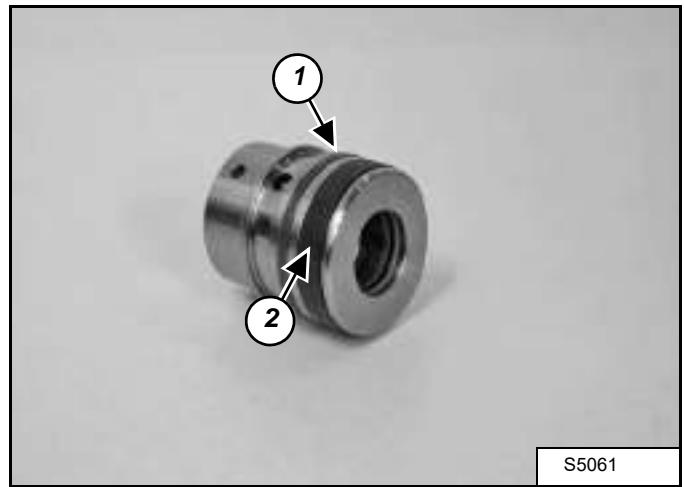
Figure 20-30-30



Install the expander O-ring (Item 1) [Figure 20-30-30] onto the piston.

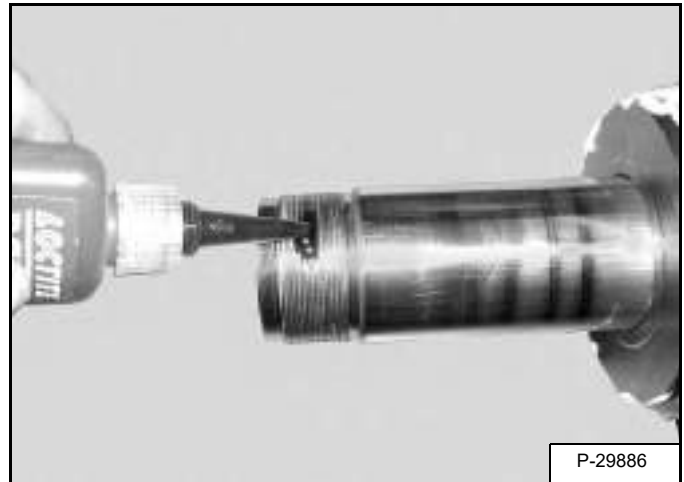
Install the internal O-ring and its backup rings (Item 2) [Figure 20-30-30].

Figure 20-30-31



Install the seal (Item 1) and the wear ring (Item 2) [Figure 20-30-31].

Figure 20-30-32



Apply LOCTITE 242 or equivalent to the threads on the rod [Figure 20-30-32].

Dealer Copy -- Not for Resale

BUCKET POSITIONING CYLINDER (CONT'D)

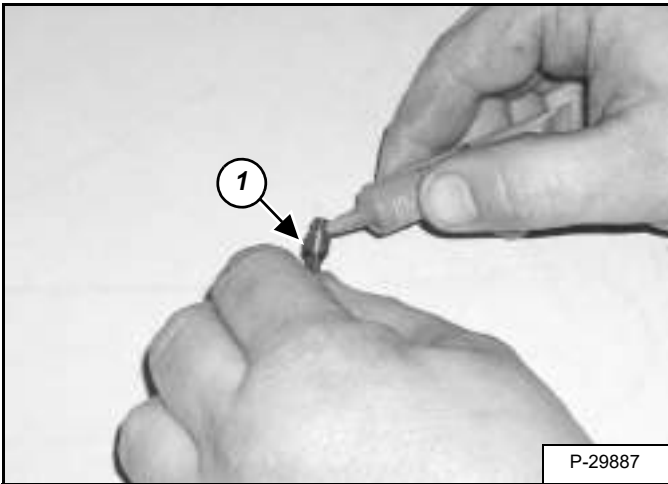
Assembly (Cont'd)

Figure 20-30-33



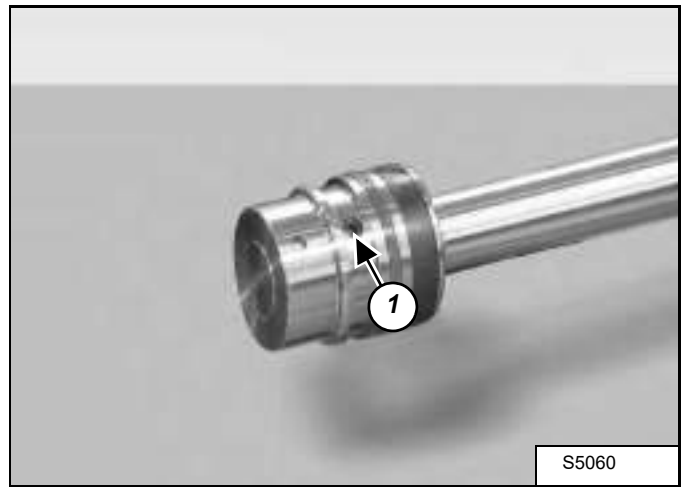
Install the piston assembly (Item 1) [Figure 20-30-33] onto the rod.

Figure 20-30-34



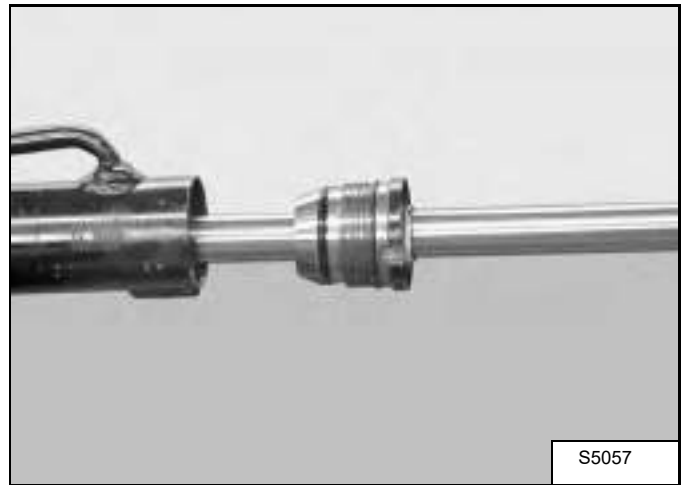
Apply LOCTITE 242 or equivalent to the set screw (Item 1) [Figure 20-30-34].

Figure 20-30-35



Install the set screw (Item 1) [Figure 20-30-35] into the piston and tighten.

Figure 20-30-36



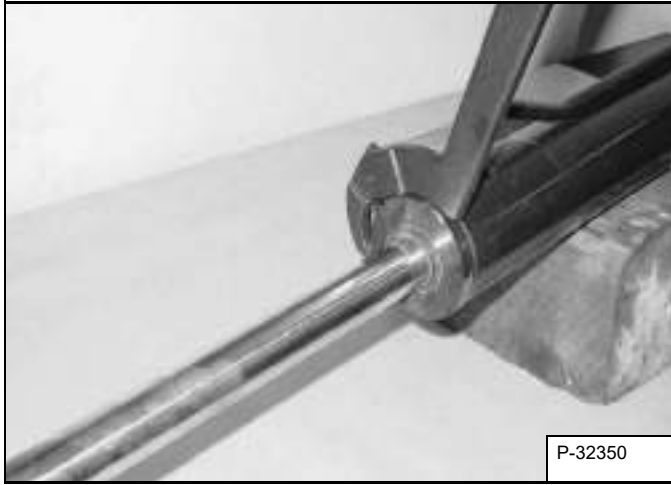
Install the rod assembly (Item 1) [Figure 20-30-36] into the housing.

Dealer Copy -- Not for Resale

BUCKET POSITIONING CYLINDER (CONT'D)

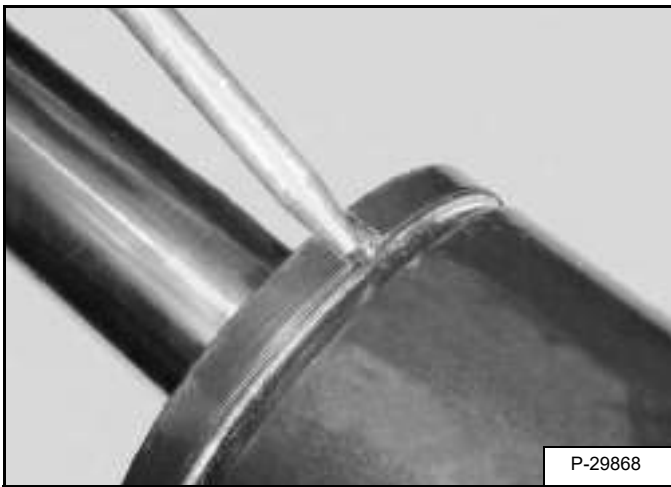
Assembly (Cont'd)

Figure 20-30-37



Use the spanner wrench to tighten the head gland [Figure 20-30-37].

Figure 20-30-38

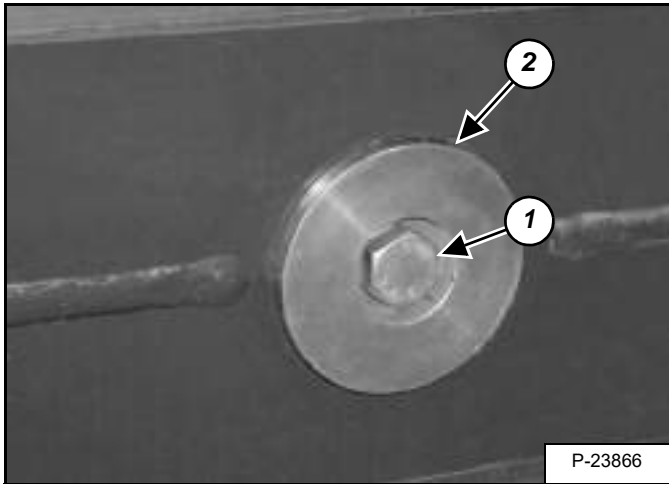


Carefully peen the lock ring over and into the nut [Figure 20-30-38].

EXTENSION CYLINDER

Cylinder Group Removal And Installation

Figure 20-40-1

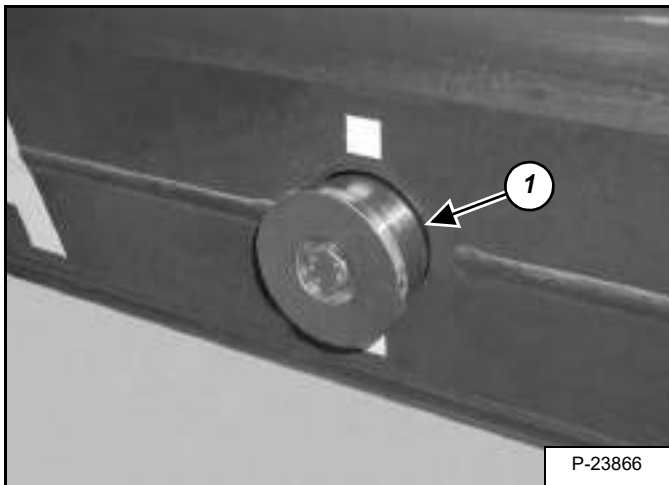


Remove the inner boom. (See Removal on Page 50-40-1.)

Remove the bolt (Item 1) and washer (Item 2) [Figure 20-40-1] from one side of the cylinder pin.

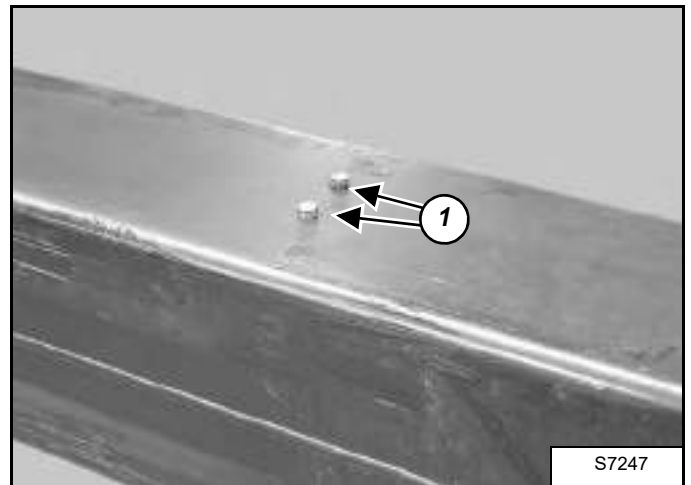
Installation: Tighten the bolt to 255-285 N•m (188-210 ft-lb) torque.

Figure 20-40-2



Remove the pin assembly (Item 1) [Figure 20-40-2] from the opposite side.

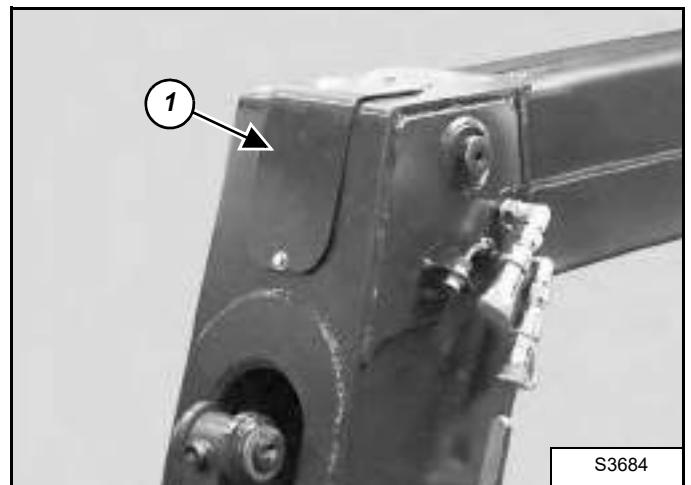
Figure 20-40-3



Remove the two bolts (Item 1) [Figure 20-40-3] from the top of the inner boom.

Installation: Tighten the bolts to 24 N•m (18 ft-lb) torque.

Figure 20-40-4



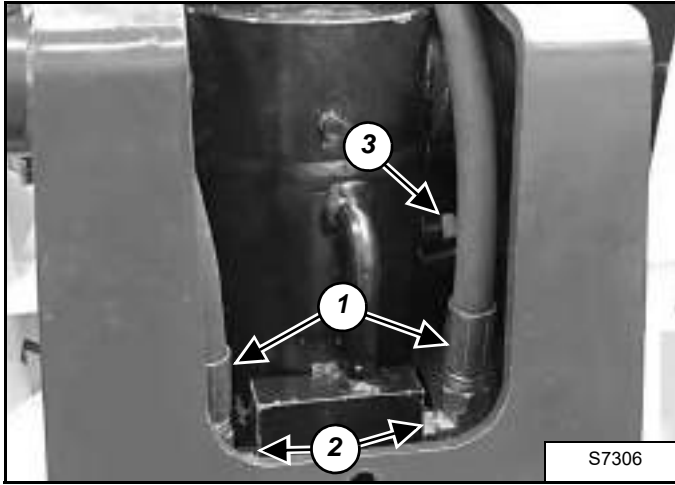
Remove the cover (Item 1) [Figure 20-40-4] from the boom head.

Dealer Copy -- Not for Resale

EXTENSION CYLINDER (CONT'D)

Cylinder Group Removal And Installation (Cont'd)

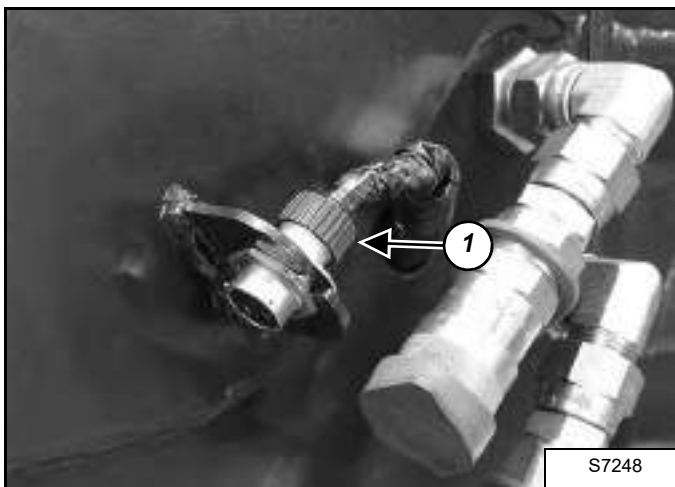
Figure 20-40-5



Remove the two hoses (Item 1) and fittings (Item 2) [Figure 20-40-5] from the tubelines.

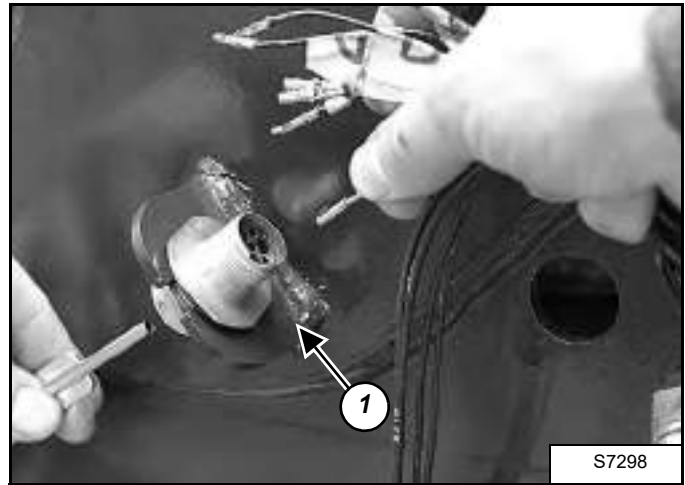
Remove the two hoses (Item 3) [Figure 20-40-5] from the bulkhead fittings.

Figure 20-40-6



Remove the retainer ring (Item 1) [Figure 20-40-6] (if equipped) from the support.

Figure 20-40-7



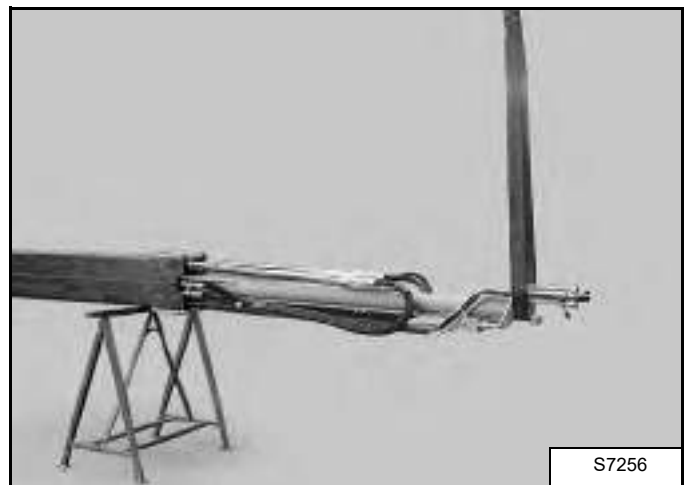
Disassemble the electrical connector (Item 1) [Figure 20-40-7].

NOTE: Mark the connector wirings housing for correct installation.

Pull the electrical harness into the boom.

Installation: For ease of installation temporarily tie a rope onto the two hoses and electrical harness.

Figure 20-40-8

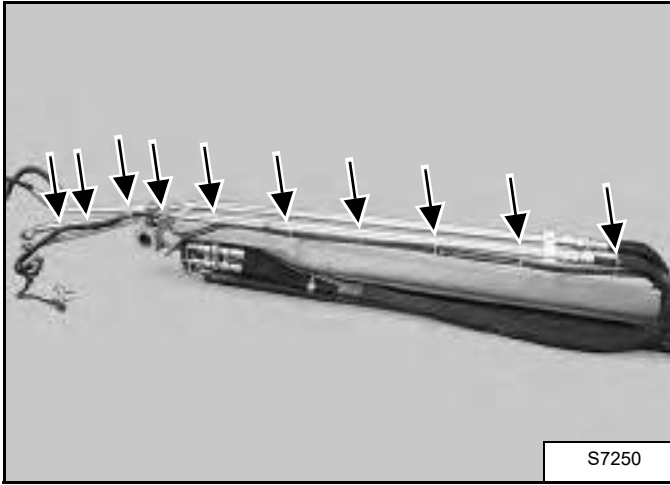


Remove the extension cylinder assembly from the inner boom [Figure 20-40-8].

EXTENSION CYLINDER (CONT'D)

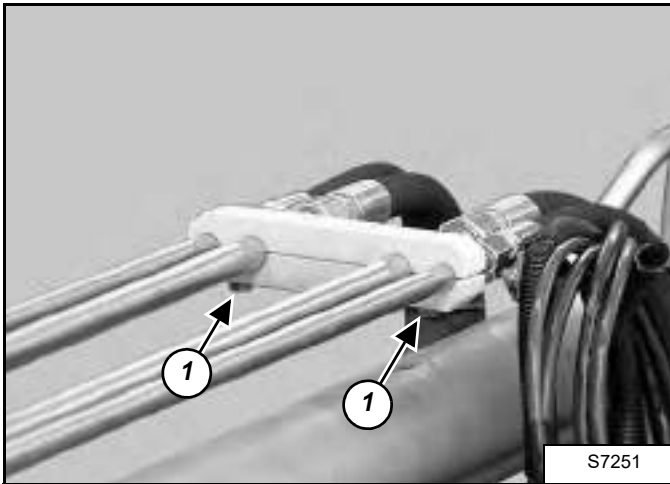
Upper Tubeline Removal

Figure 20-40-9



With the extension cylinder group supported on a work surface, remove the tie straps from the electrical harness [Figure 20-40-9].

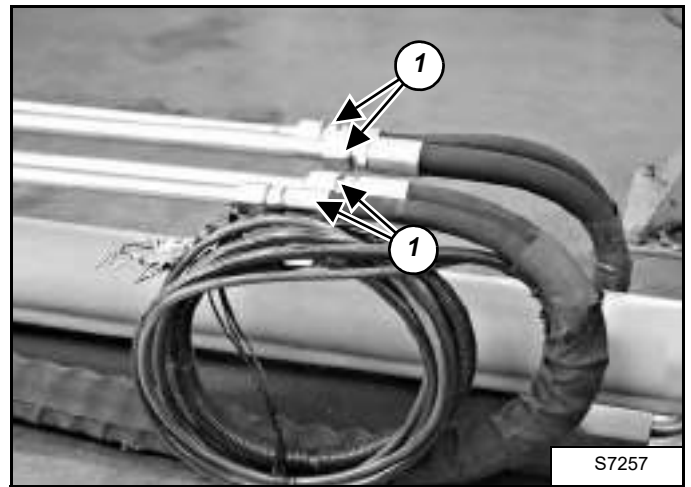
Figure 20-40-10



Loosen the tubeline clamp mounting bolts (Item 1) [Figure 20-40-10].

NOTE: Mark the location of the tubelines for correct assembly.

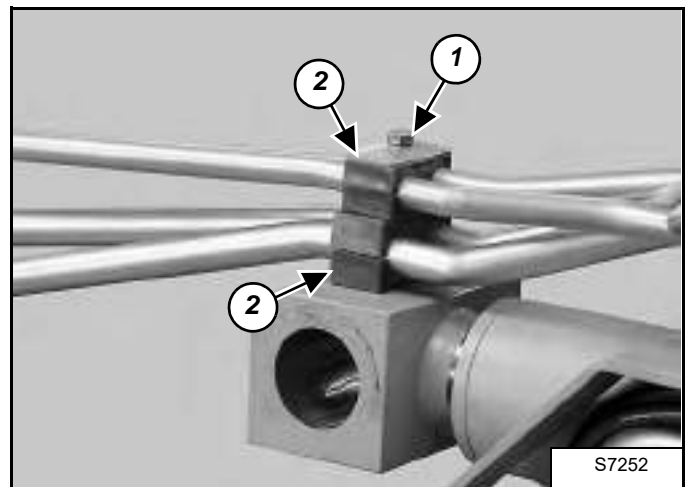
Figure 20-40-11



Remove the four hoses (Item 1) [Figure 20-40-11] from the tubelines.

NOTE: Mark the hoses for correct assembly.

Figure 20-40-12



Remove the bolt (Item 1) from the tubeline clamps (Item 2) [Figure 20-40-12] on the rod end of the cylinder.

Lift and remove the tubelines from the top of the cylinder.

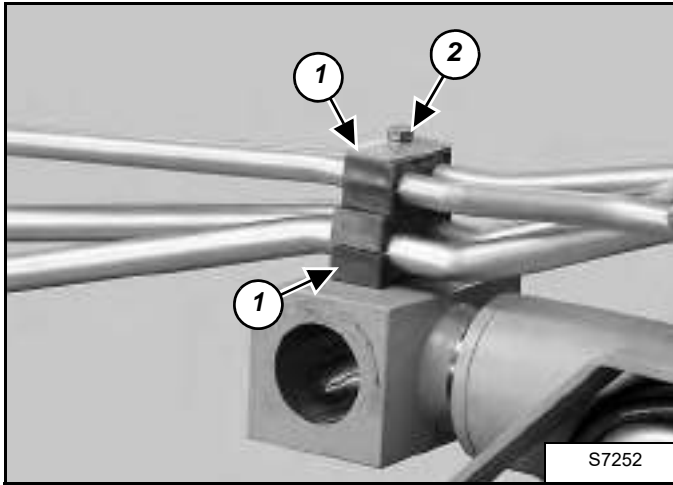
Dealer Copy -- Not for Resale

EXTENSION CYLINDER (CONT'D)

Upper Tubeline Installation

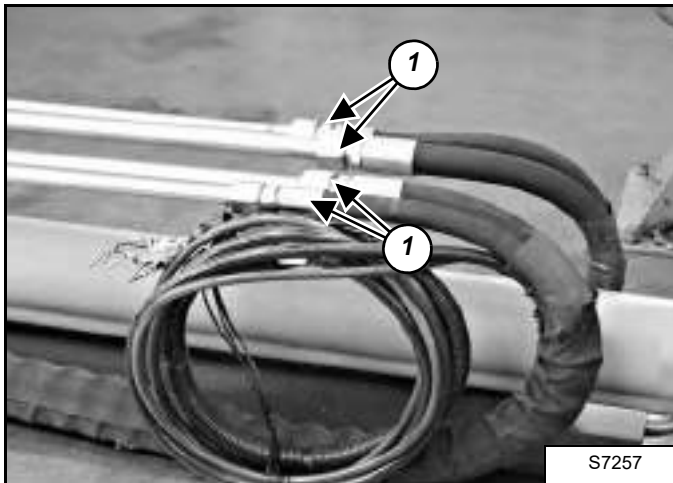
Set the tubeline assembly onto the extension cylinder.

Figure 20-40-13



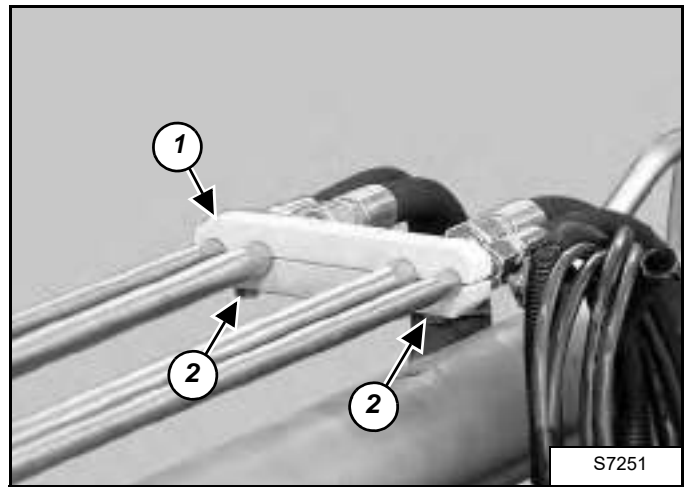
Install the tubeline clamps (Item 1) and bolt (Item 2) [Figure 20-40-13] on the rod end of the cylinder.

Figure 20-40-14



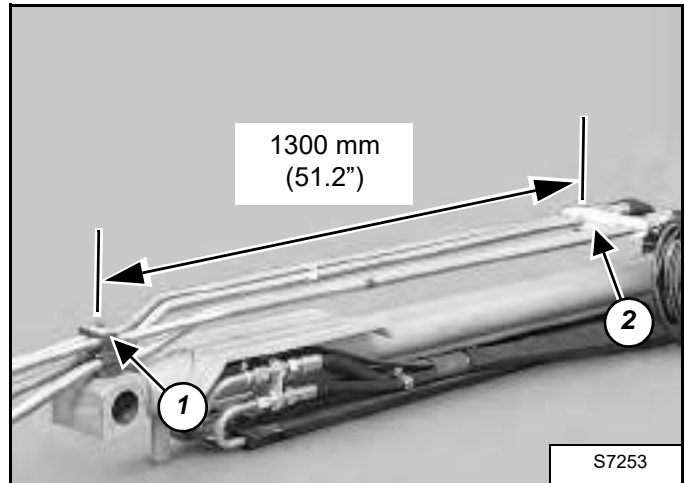
Install the four hoses (Item 1) [Figure 20-40-14] on the tubelines.

Figure 20-40-15



Install the tubeline clamp (Item 1) and mounting bolts (Item 2) [Figure 20-40-15] on the base end of the cylinder.

Figure 20-40-16



Measure the distance from the center of the tubeline nut (Item 1) to the center of the tubeline clamp (Item 2) [Figure 20-40-16].

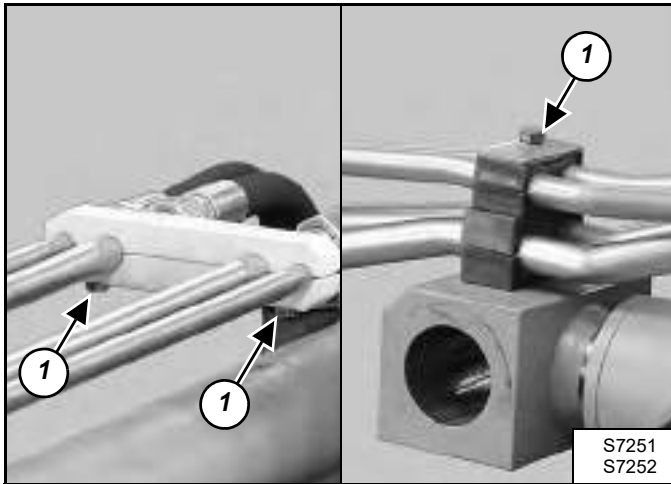
The correct distance between clamps must be 1300 mm (51.2 in) for all four tubelines.

Dealer Copy -- Not for Resale

EXTENSION CYLINDER (CONT'D)

Upper Tubeline Installation (Cont'd)

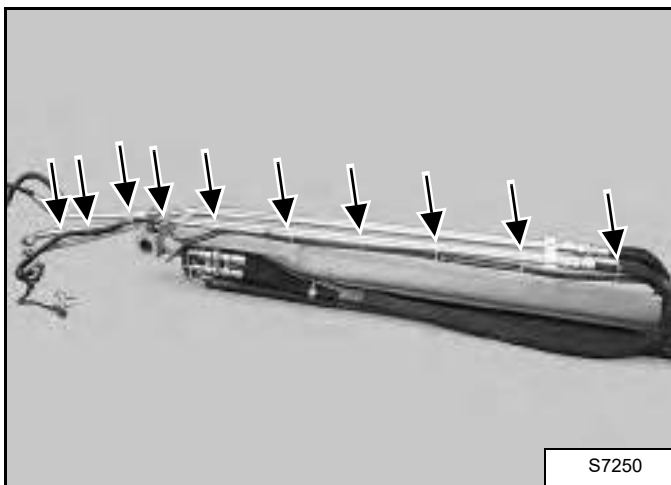
Figure 20-40-17



Loosen the bolts (Item 1) [Figure 20-40-17] to move and adjust the tubeline clamps.

When the tubeline clamps are in the correct position tighten the bolts.

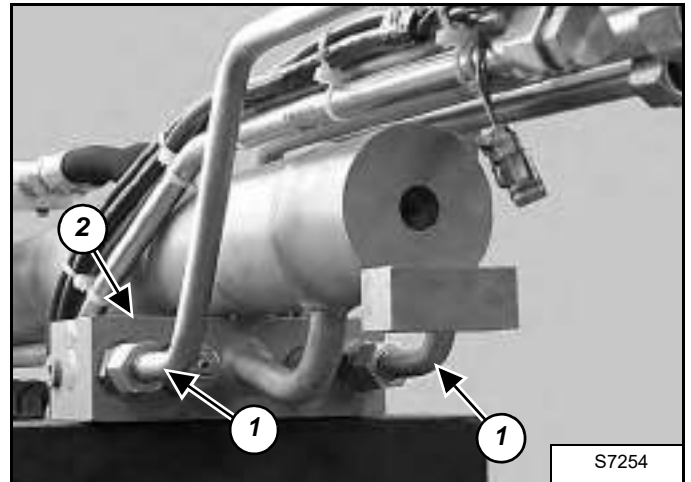
Figure 20-40-18



Secure the electrical harness to the inner tubeline using tie straps [Figure 20-40-18] approximately every 152-203 mm (6-8 in).

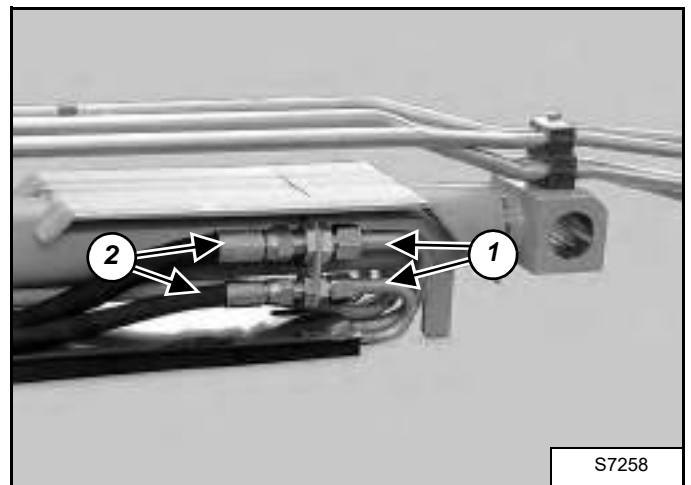
Extension Cylinder Removal And Installation

Figure 20-40-19



Remove the two tubelines (Item 1) from the load lock (Item 2) [Figure 20-40-19].

Figure 20-40-20



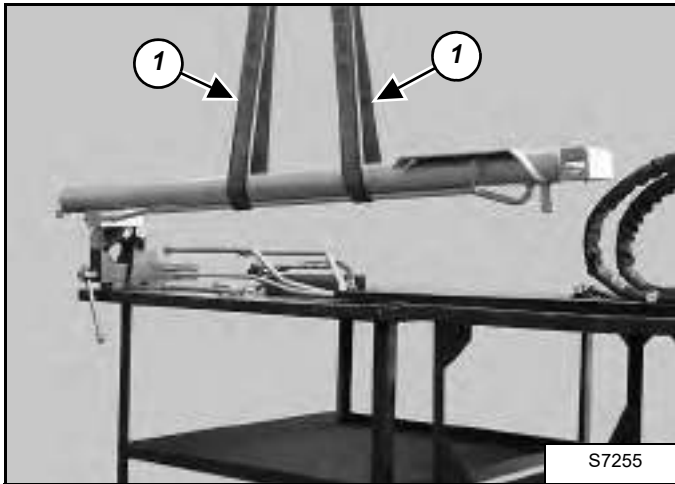
Remove the two tubelines (Item 1) and two hoses (Item 2) [Figure 20-40-20] from both sides of the cylinder.

Dealer Copy -- Not for Resale

EXTENSION CYLINDER (CONT'D)

Extension Cylinder Removal And Installation (Cont'd)

Figure 20-40-21

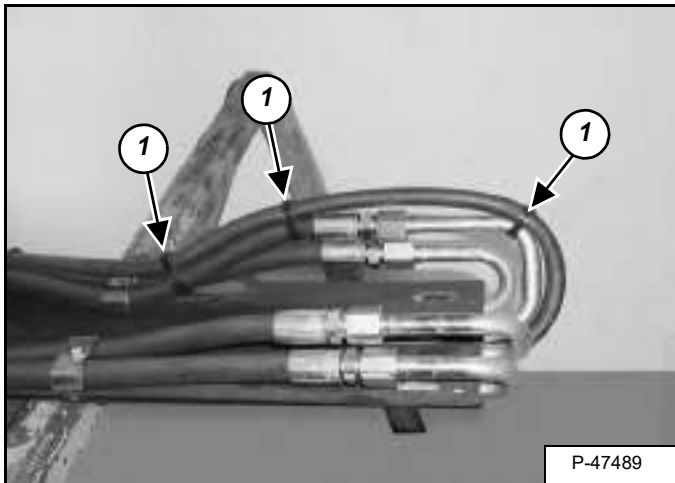


Install a hoist (Item 1) [Figure 20-40-21] to lift and support the extension cylinder.

Slide the extension cylinder through the tubelines [Figure 20-40-21] and remove the cylinder.

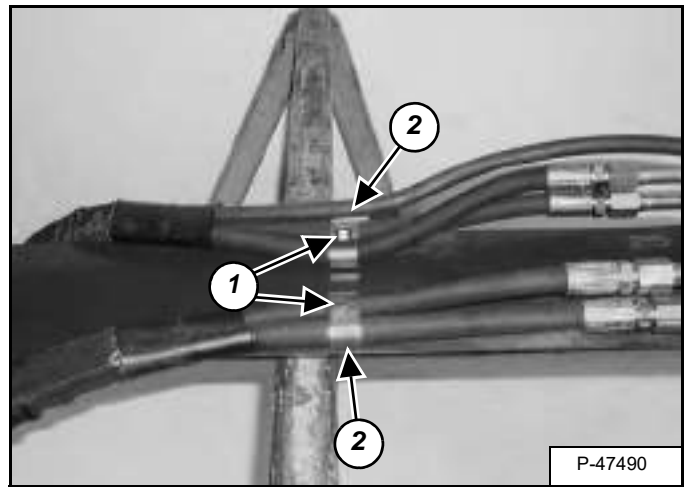
Tubeline Tray Disassembly

Figure 20-40-22



Remove the tie straps (Item 1) [Figure 20-40-22] securing the electrical harness to the hoses.

Figure 20-40-23

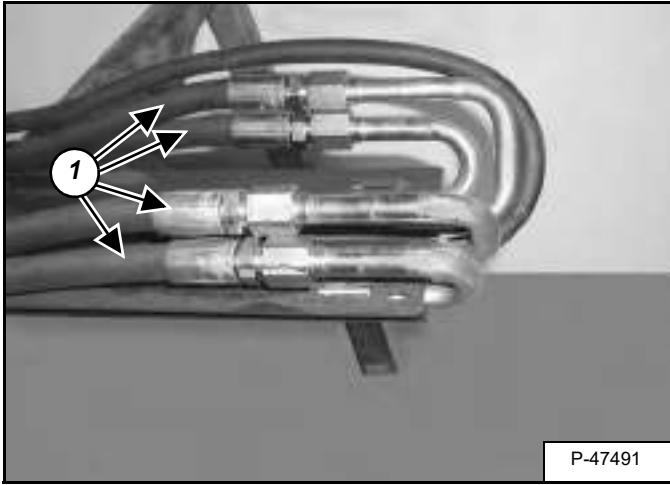


Remove the two bolts (Item 1) and tubeline mounting brackets (Item 2) [Figure 20-40-23].

EXTENSION CYLINDER (CONT'D)

Tubeline Tray Disassembly (Cont'd)

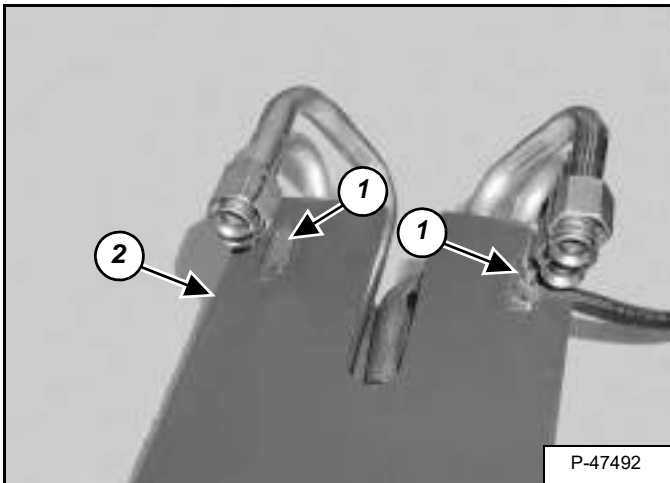
Figure 20-40-24



Remove the four hoses (Item 1) [Figure 20-40-24] from the tubelines.

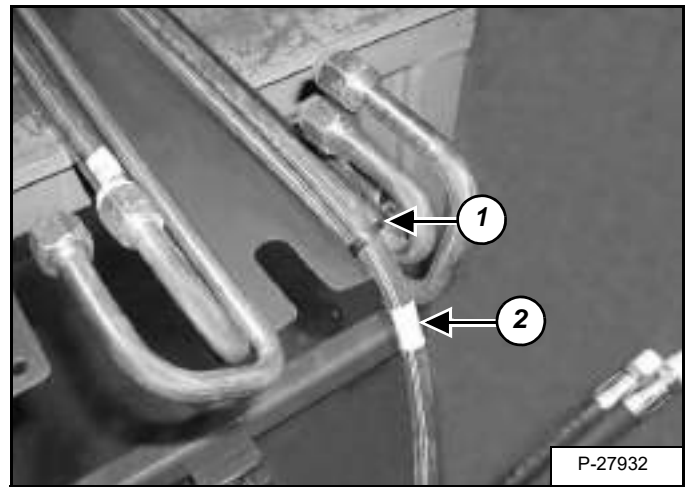
NOTE: Mark the hoses for correct assembly.

Figure 20-40-25



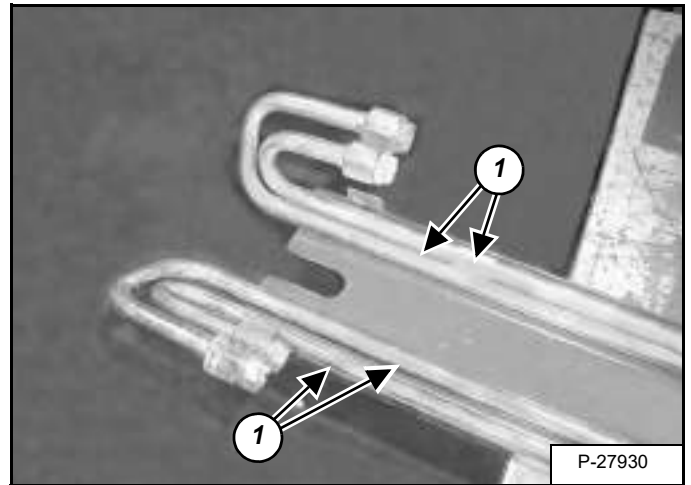
Straighten the two tabs (Item 1) (both ends) and remove the cover (Item 2) [Figure 20-40-25].

Figure 20-40-26



Remove the tie strap (Item 1) from both ends of the electrical harness (Item 2) [Figure 20-40-26]. Remove the electrical harness.

Figure 20-40-27



Remove the tubelines (Item 1) [Figure 20-40-27].

Dealer Copy -- Not for Resale

EXTENSION CYLINDER (CONT'D)

Tubeline Tray Assembly

Figure 20-40-28

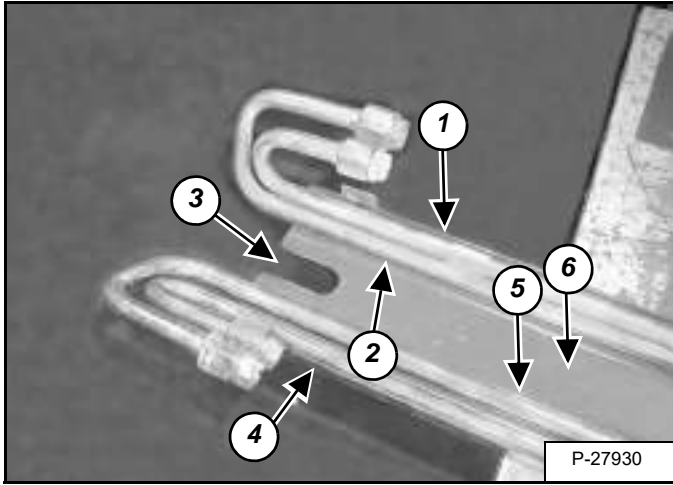
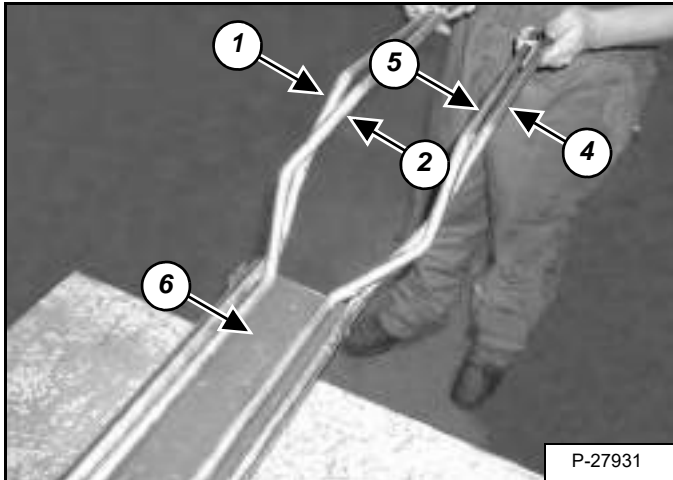


Figure 20-40-29

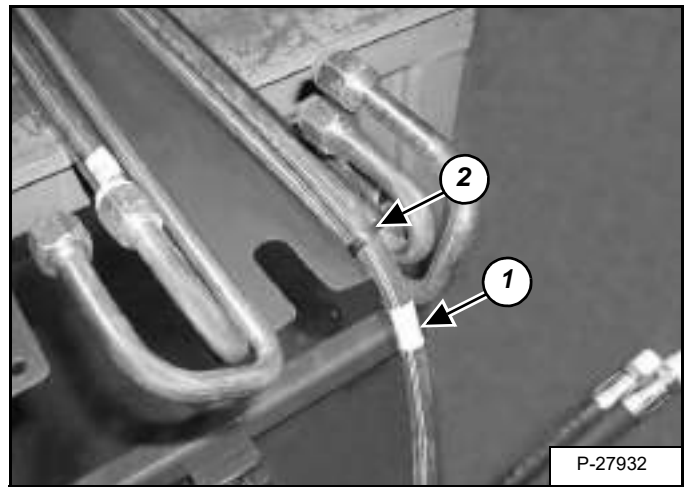


Place the tubelines (Item 1) and (Item 2) next to each other on the right side of the tray (Item 6) [Figure 20-40-28] & [Figure 20-40-29].

NOTE: The notch (Item 3) [Figure 20-40-28] represents the front of the tray.

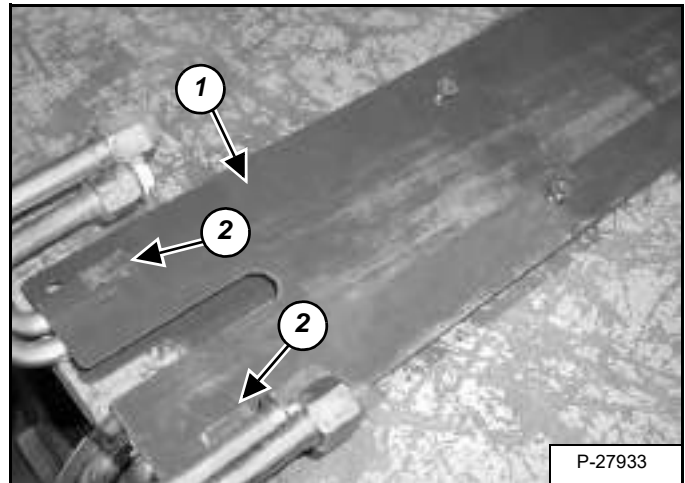
Place the tubelines (Item 4) and (Item 5) next to each other on the left side of the tray (Item 6) [Figure 20-40-28] & [Figure 20-40-29].

Figure 20-40-30



Place the electrical harness (Item 1) in the center of the two tubelines on the left side and secure using a tie strap (Item 2) [Figure 20-40-30] on each end of the tubelines.

Figure 20-40-31

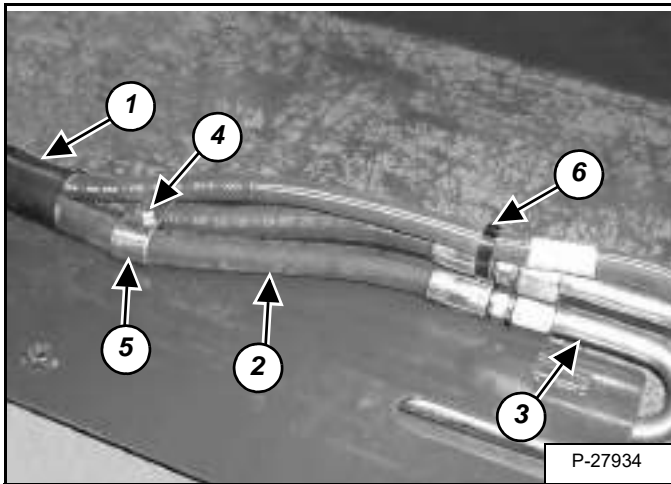


With the tubelines held in position, install the tray cover (Item 1) on the tray. Bend the two tabs (Item 2) [Figure 20-40-31] on each end of the tray cover.

EXTENSION CYLINDER (CONT'D)

Tubeline Tray Assembly (Cont'd)

Figure 20-40-32



Install the hose/harness assembly (Item 1) [Figure 20-40-32] on the tubelines on the left side of the tray.

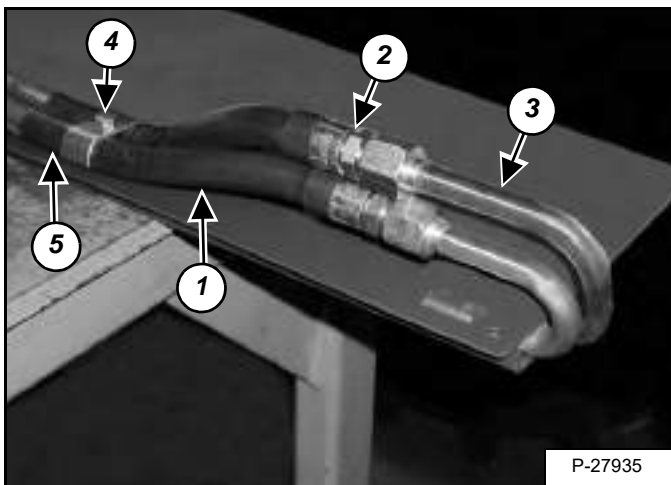
NOTE: The hose (Item 2) must be connected to the outside tubeline (Item 3) [Figure 20-40-32].

Apply LOCTITE #271 onto the bolt (Item 4) and install the hose bracket (Item 5) [Figure 20-40-32].

NOTE: Do not overtighten the bolt or damage will be done to the tubelines below.

Install a tie strap (Item 6) [Figure 20-40-32] on the electrical harness.

Figure 20-40-33



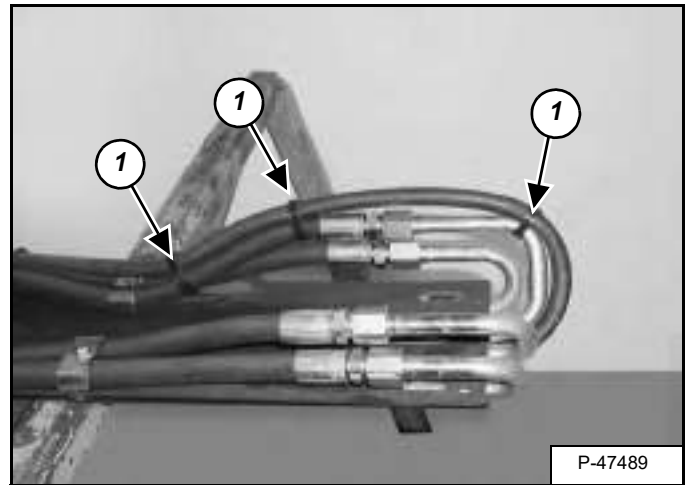
Install the hose assembly (Item 1) [Figure 20-40-33] on the two tubelines on the right side of the tray.

NOTE: The hose (Item 2) must be connected to the inside tubeline (Item 3) [Figure 20-40-33].

Apply LOCTITE #271 on the bolt (Item 4) and install the hose bracket (Item 5) [Figure 20-40-33].

NOTE: Do not overtighten the bolt or damage will be done to the tubelines below.

Figure 20-40-34



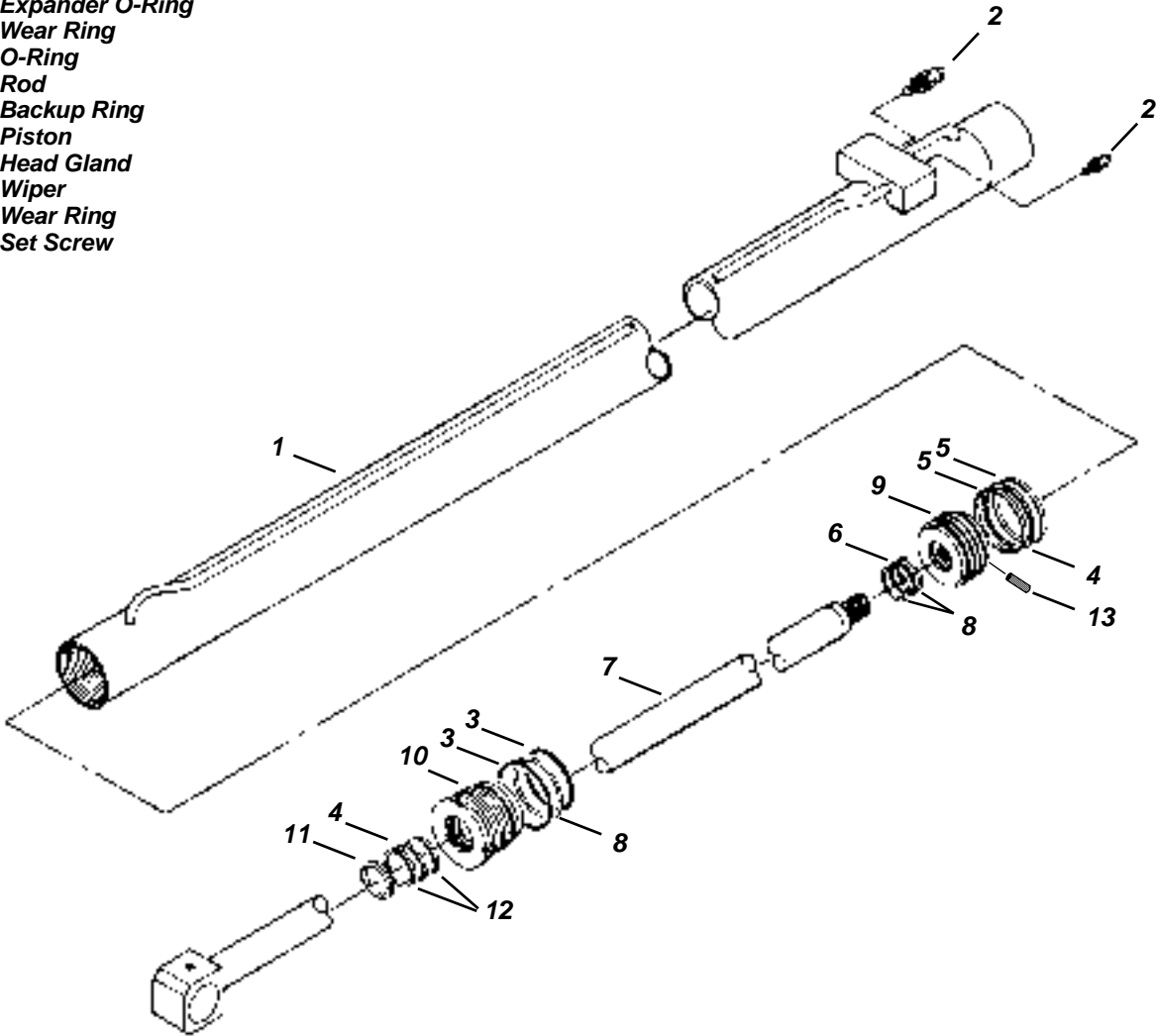
Install tie straps (Item 1) [Figure 20-40-34] approximately every 152-203 mm (6-8 in) to secure the electrical harness to the hose.

Dealer Copy -- Not for Resale

EXTENSION CYLINDER (CONT'D)

Parts Identification

- 1. Housing
- 2. Relief Valve
- 3. O-Ring
- 4. Expander O-Ring
- 5. Wear Ring
- 6. O-Ring
- 7. Rod
- 8. Backup Ring
- 9. Piston
- 10. Head Gland
- 11. Wiper
- 12. Wear Ring
- 13. Set Screw



S7274

Dealer Copy -- Not for Resale

EXTENSION CYLINDER (CONT'D)

Disassembly

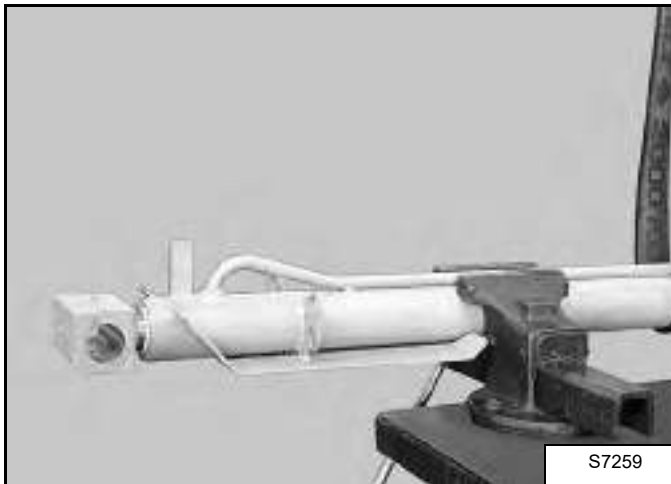
Use the following tool to disassemble the cylinder:

MEL1074-O-ring Seal Hook

Clean the outside of the extension cylinder before disassembly.

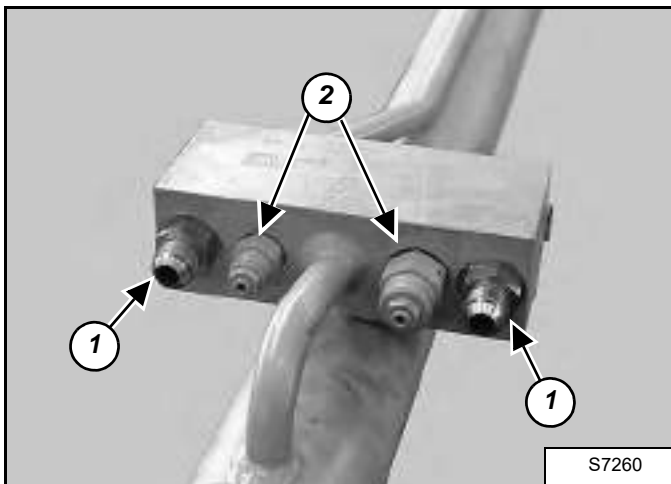
Mark the outside of the extension cylinder for ease of assembly.

Figure 20-40-35



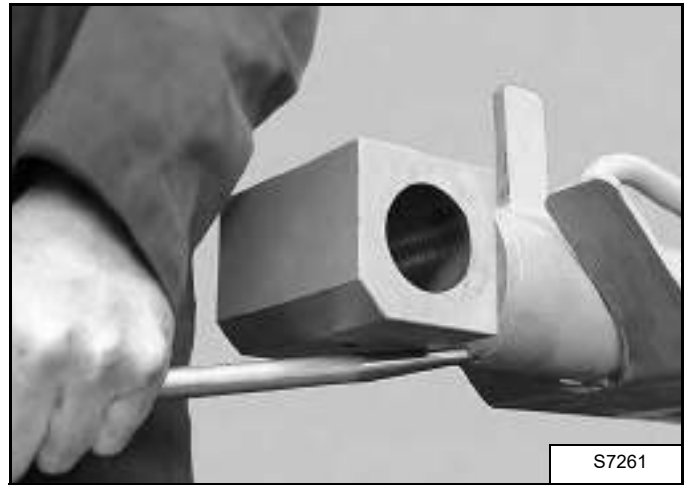
Put the cylinder in a vise **[Figure 20-40-35]**.

Figure 20-40-36



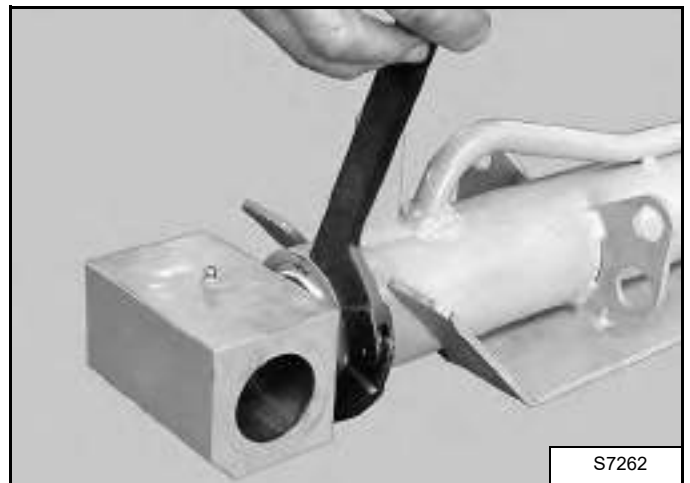
Remove the two fittings (Item 1) and relief valves (Item 2) **[Figure 20-40-36]**.

Figure 20-40-37



Carefully peel the lock ring from the head gland **[Figure 20-40-37]**.

Figure 20-40-38



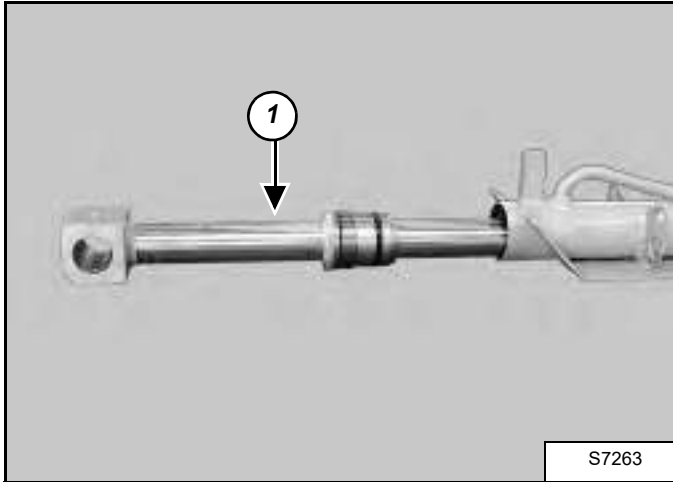
Loosen the head gland **[Figure 20-40-38]**.

Dealer Copy -- Not for Resale

EXTENSION CYLINDER (CONT'D)

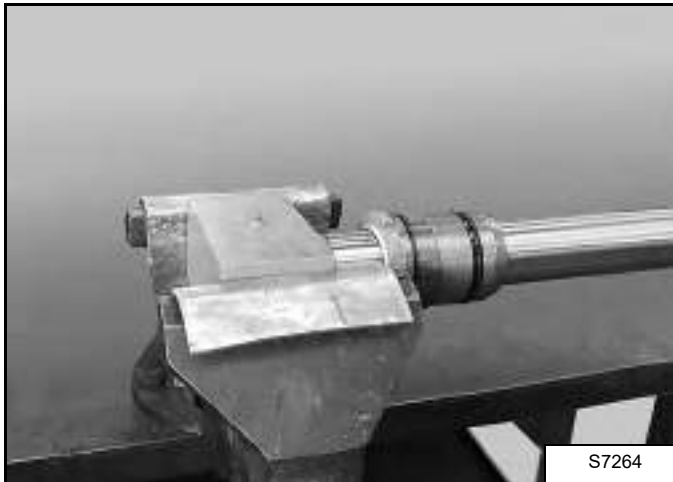
Disassembly (Cont'd)

Figure 20-40-39



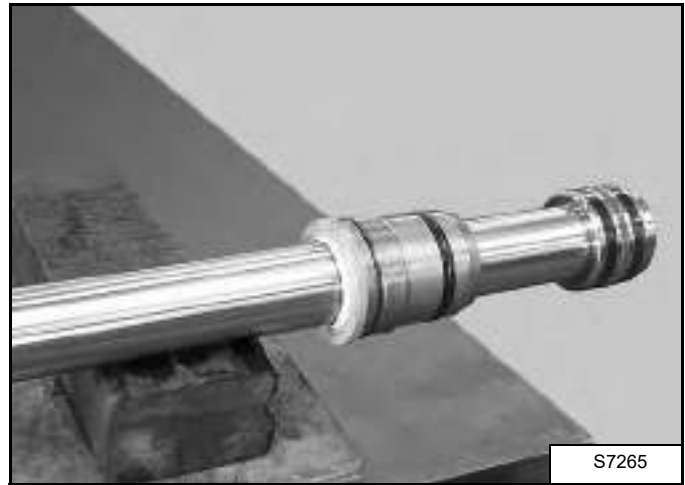
Remove the rod assembly (Item 1) [Figure 20-40-39] from the housing.

Figure 20-40-40



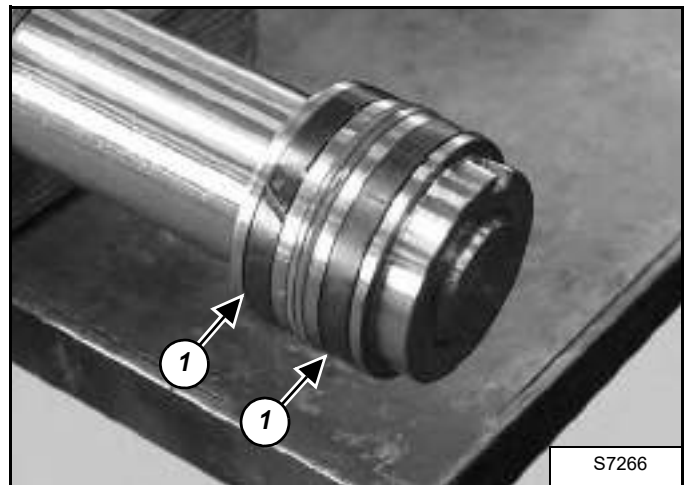
Put the rod end of the cylinder in a vise [Figure 20-40-40].

Figure 20-40-41



Support the cylinder rod on a wood block [Figure 20-40-41].

Figure 20-40-42

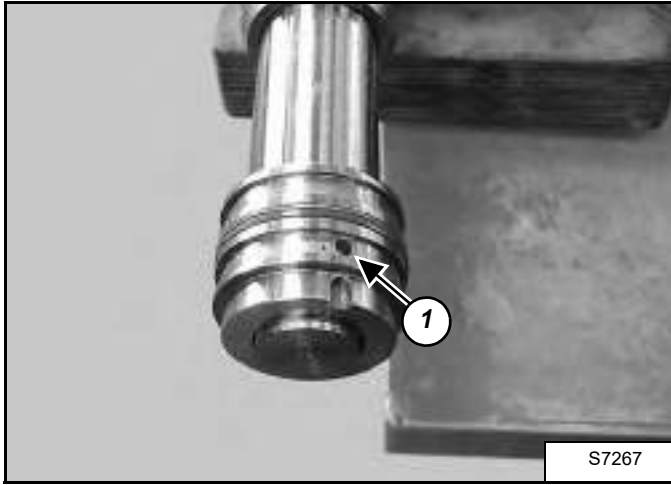


Remove the two wear rings (Item 1) [Figure 20-40-42] from the piston.

EXTENSION CYLINDER (CONT'D)

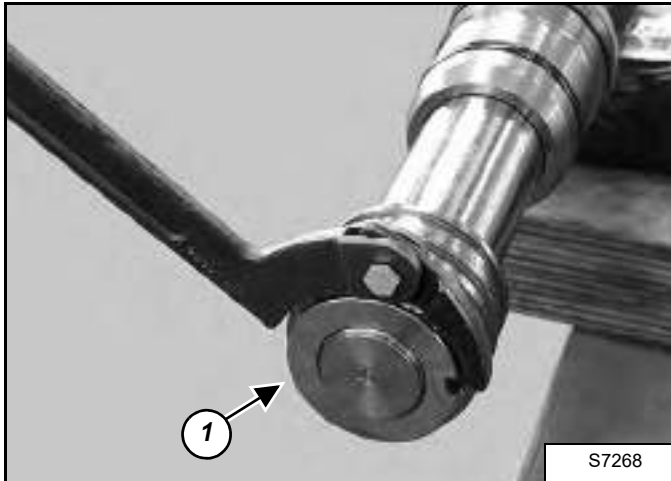
Disassembly (Cont'd)

Figure 20-40-43



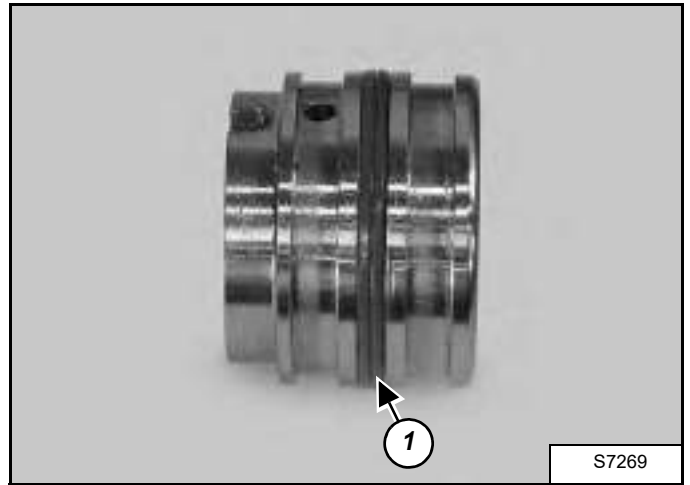
Loosen the set screw (Item 1) [Figure 20-40-43].

Figure 20-40-44



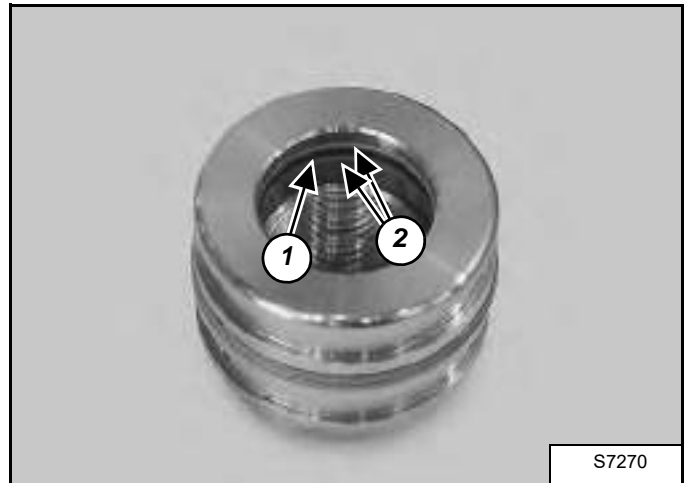
Remove the piston assembly (Item 1) [Figure 20-40-44] from the rod.

Figure 20-40-45



Remove the expander O-ring (Item 1) [Figure 20-40-45] from the piston.

Figure 20-40-46



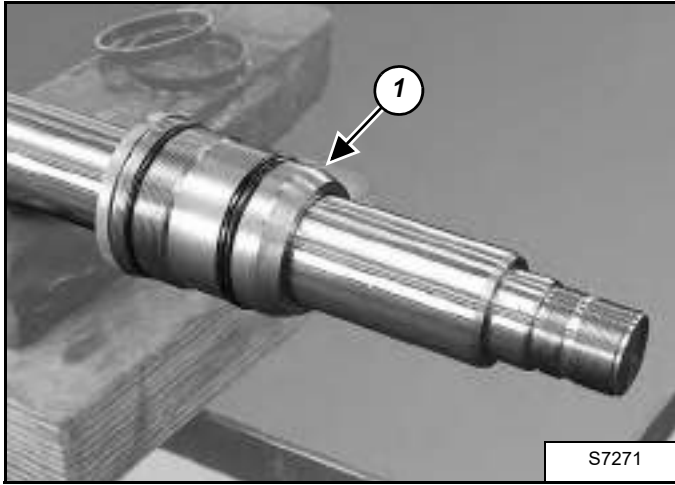
Remove the seal (Item 1) and two backup rings (Item 2) [Figure 20-40-46] from the piston.

Dealer Copy -- Not for Resale

EXTENSION CYLINDER (CONT'D)

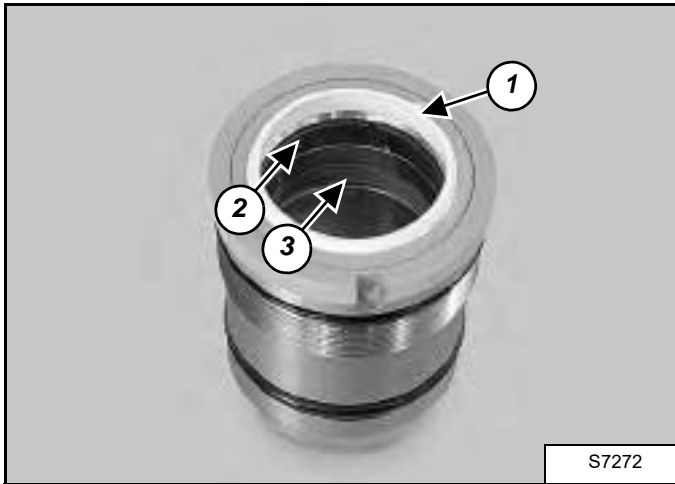
Disassembly (Cont'd)

Figure 20-40-47



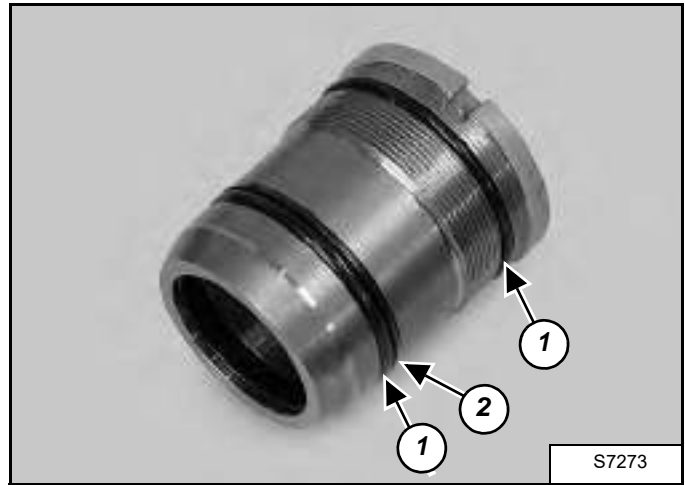
Remove the head gland (Item 1) [Figure 20-40-47] from the rod.

Figure 20-40-48



Remove the wiper (Item 1), two wear rings (top & bottom) (Item 2) and seal (Item 3) [Figure 20-40-48] from the head gland.

Figure 20-40-49



Remove the two O-rings (Item 1) and backup ring (Item 2) [Figure 20-40-49].

EXTENSION CYLINDER (CONT'D)

Assembly

Clean all parts in solvent and dry with compressed air.

Inspect all parts for wear or damage. Replace any worn or damaged parts.

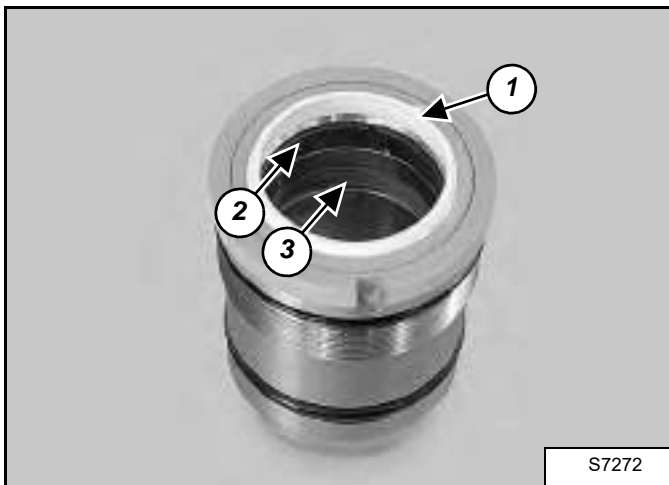
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 20-40-50



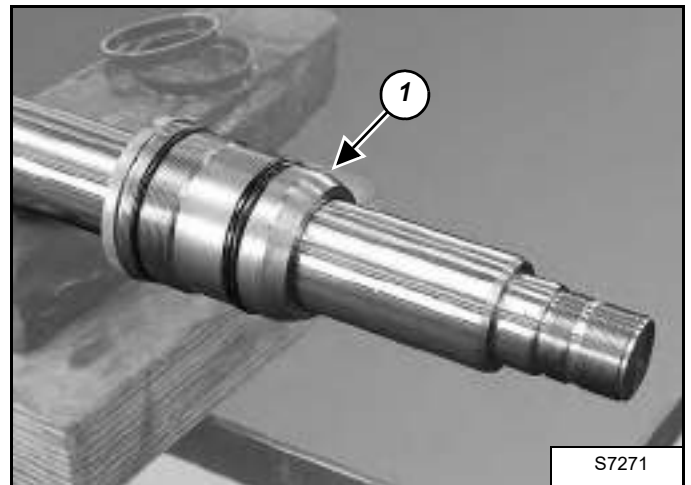
Install the two O-rings (Item 1) and backup ring (Item 2) [Figure 20-40-50] on the head gland.

Figure 20-40-51



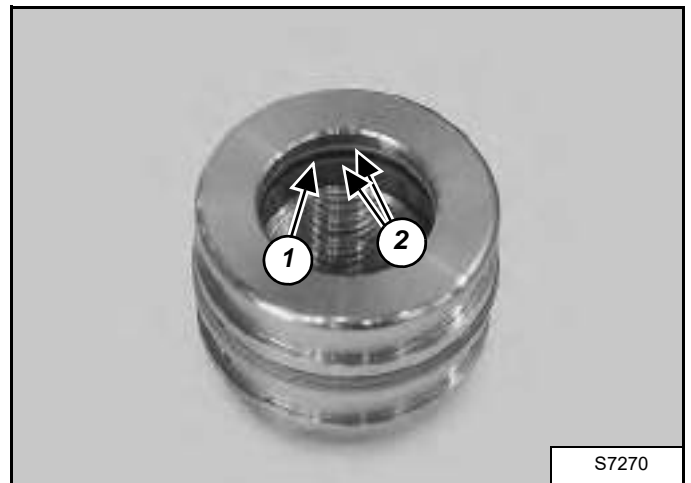
Install the wiper (Item 1), two wear rings (top & bottom) (Item 2) and seal (Item 3) [Figure 20-40-51].

Figure 20-40-52



Install the head gland (Item 1) [Figure 20-40-52] onto the cylinder rod.

Figure 20-40-53



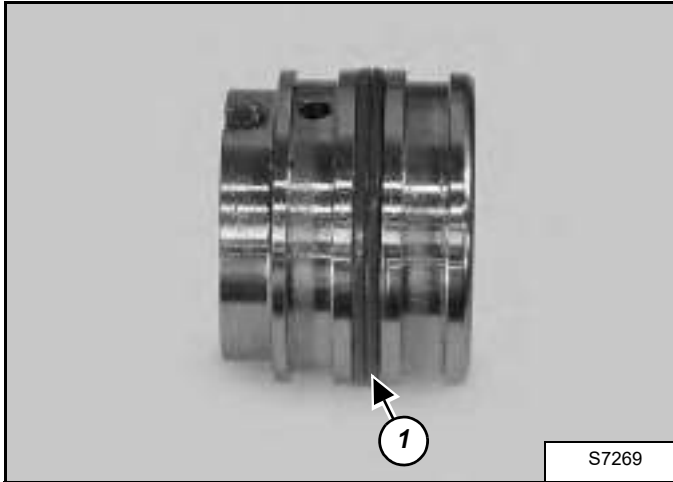
Install the O-ring (Item 1) and two backup rings (Item 2) [Figure 20-40-53] in the piston.

Dealer Copy -- Not for Resale

EXTENSION CYLINDER (CONT'D)

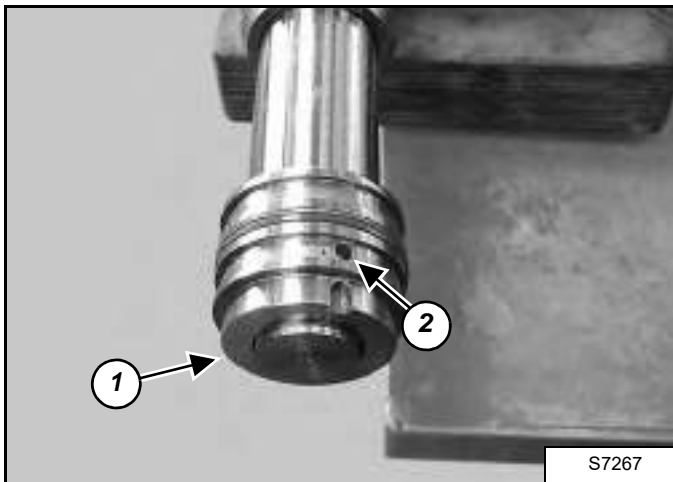
Assembly (Cont'd)

Figure 20-40-54



Install the expander O-ring (Item 1) [Figure 20-40-54].

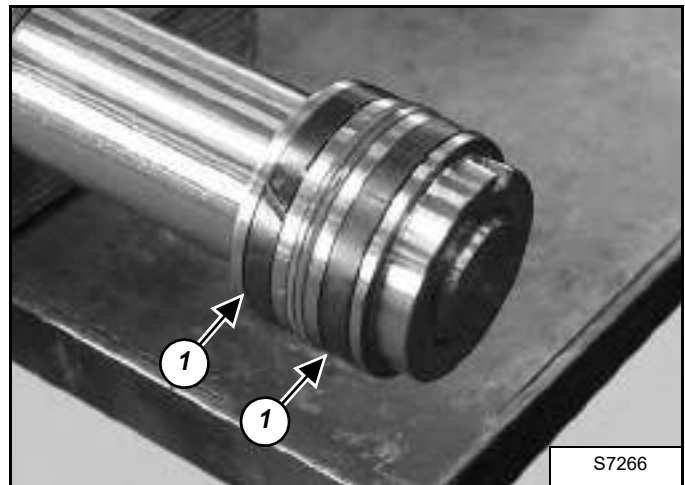
Figure 20-40-55



Install the piston (Item 1) [Figure 20-40-55] onto the rod and hand tighten.

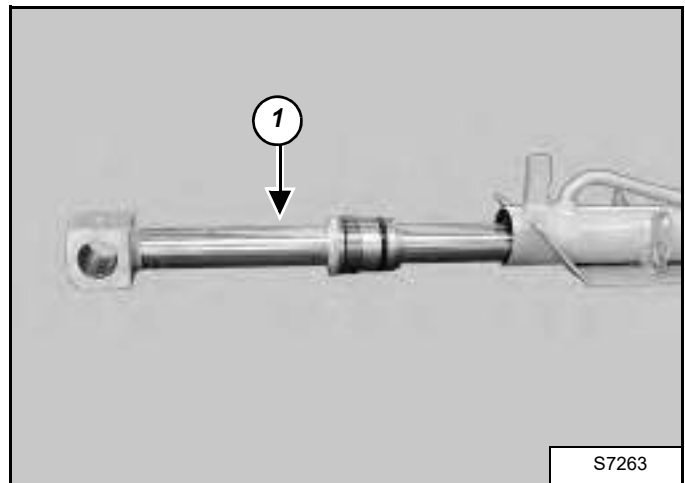
Tighten the set screw (Item 2) [Figure 20-40-55].

Figure 20-40-56



Install the two wear rings (Item 1) [Figure 20-40-56] onto the piston.

Figure 20-40-57

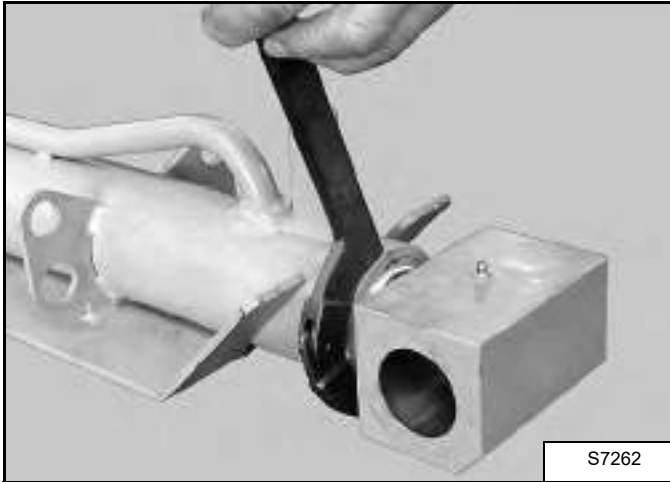


Install the rod assembly (Item 1) [Figure 20-40-57] into the housing.

EXTENSION CYLINDER (CONT'D)

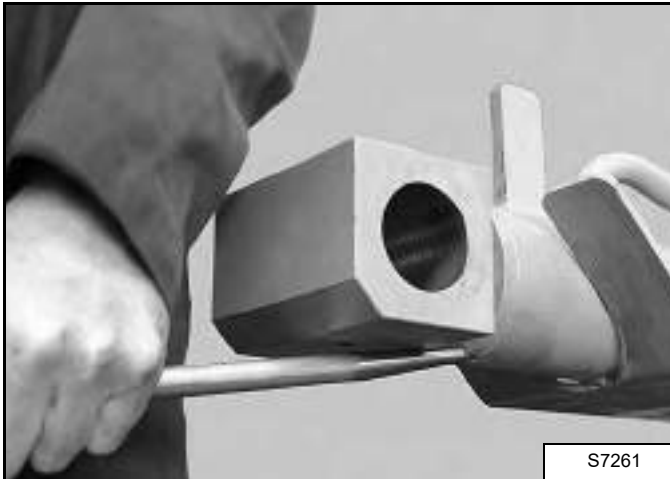
Assembly (Cont'd)

Figure 20-40-58



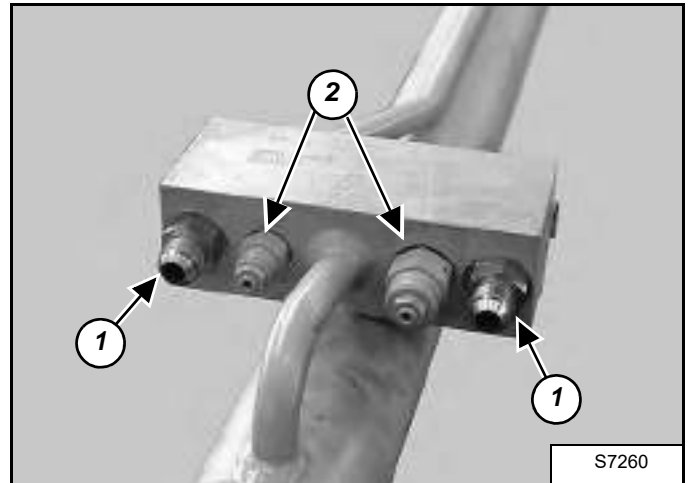
Tighten the head gland **[Figure 20-40-58]**.

Figure 20-40-59



Using a punch seat the lock ring to keep the head gland from turning **[Figure 20-40-59]**.

Figure 20-40-60



Install the two fittings (Item 1) and two relief valves (Item 2) **[Figure 20-40-60]**.



Bobcat®

Dealer Copy -- Not for Resale

TILT CYLINDER

Removal And Installation

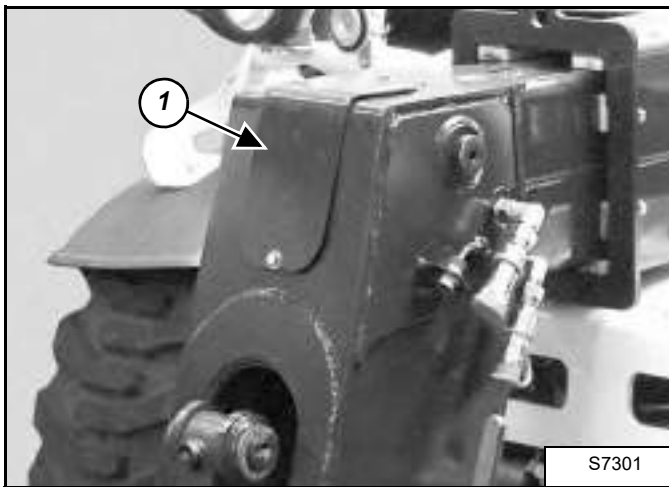
Fully lower and retract the boom.

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

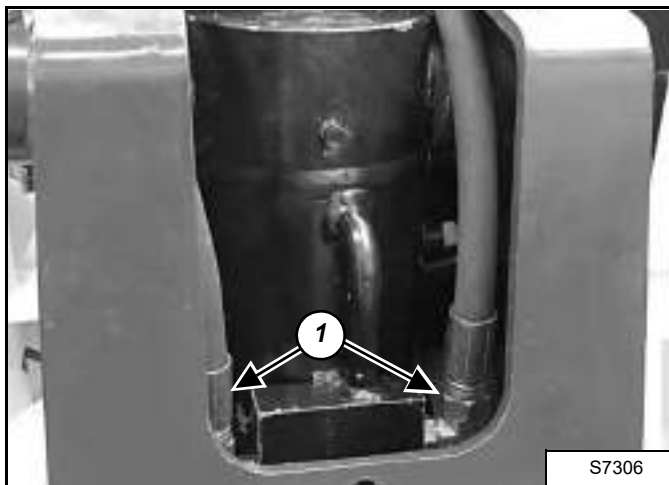
I-2003-0888

Figure 20-50-1



Remove the cover (Item 1) [Figure 20-50-1].

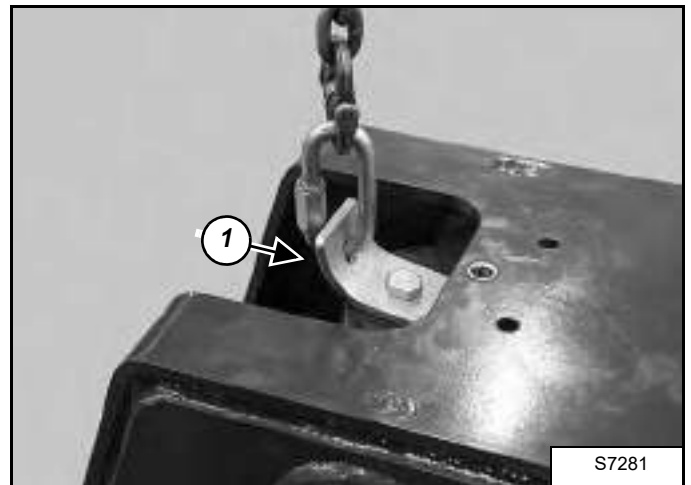
Figure 20-50-2



Remove the two hoses (Item 1) [Figure 20-50-2] from the tubelines.

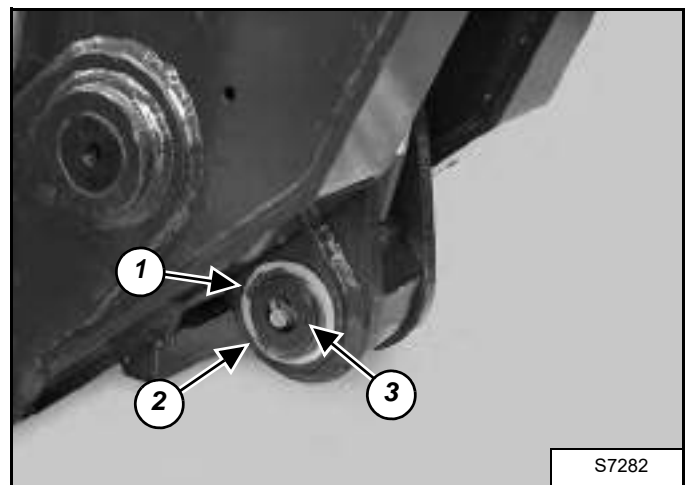
NOTE: Mark the hoses for correct installation.

Figure 20-50-3



Install a lifting ring (Item 1) [Figure 20-50-3] and hoist to the top of the cylinder.

Figure 20-50-4



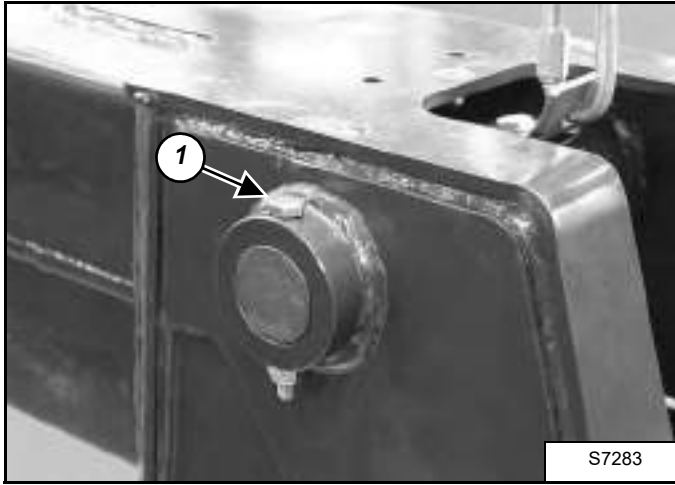
Remove the snap ring (Item 1) and washer (Item 2) and remove the pivot pin (Item 3) [Figure 20-50-4].

Dealer Copy -- Not for Resale

TILT CYLINDER (CONT'D)

Removal And Installation (Cont'd)

Figure 20-50-5



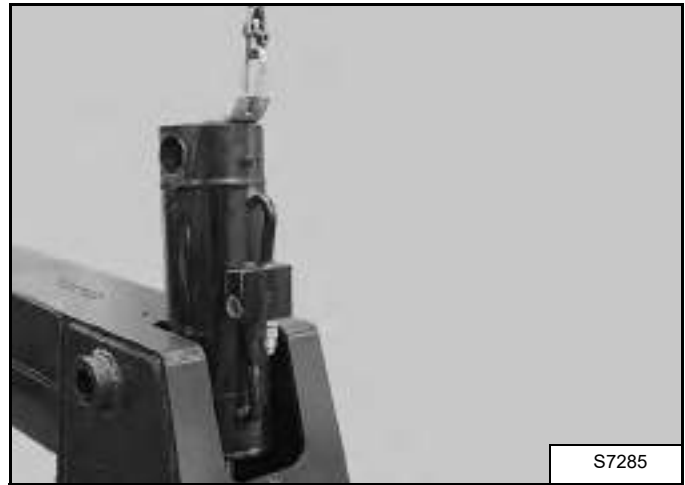
Remove the pivot pin retainer bolt (Item 1) **[Figure 20-50-5]**.

Figure 20-50-6



Remove the pivot pin **[Figure 20-50-6]**.

Figure 20-50-7

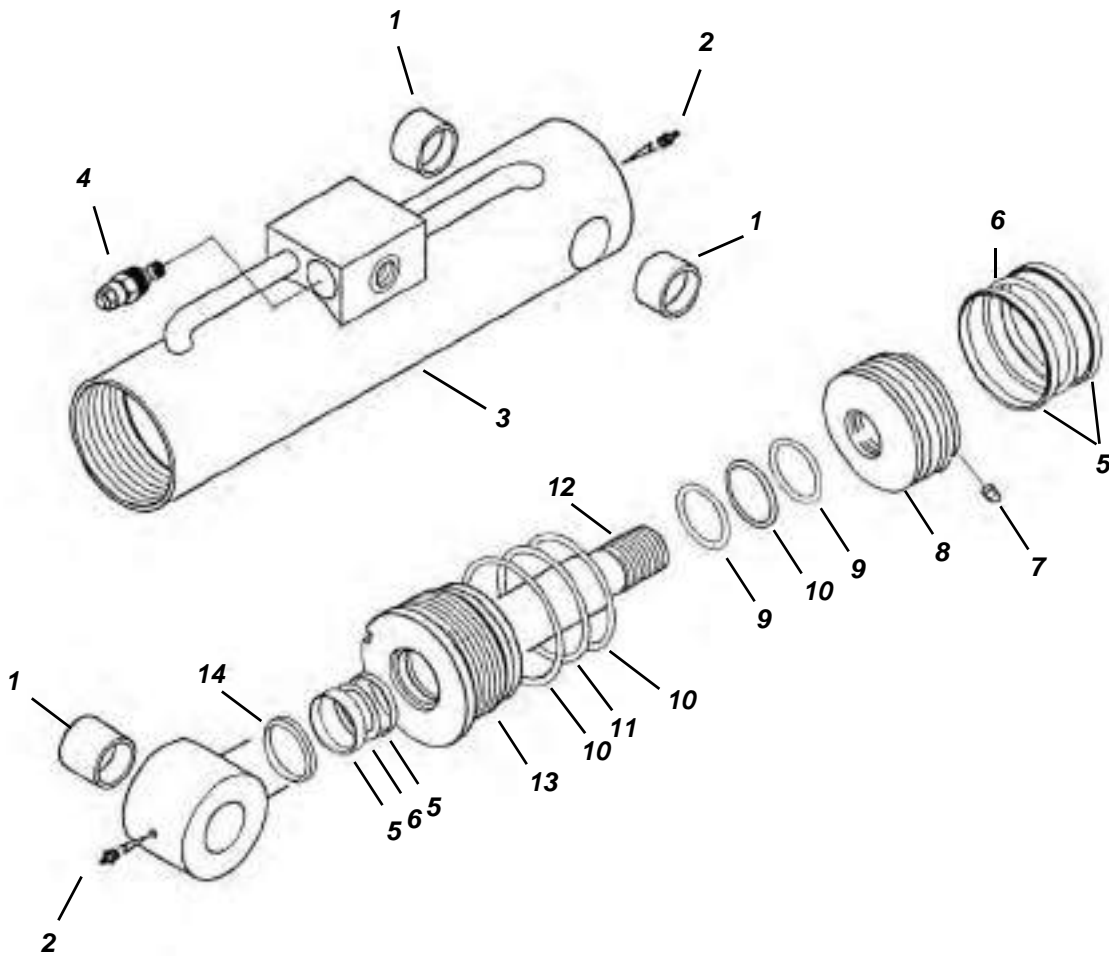


Lift the cylinder from the boom and remove **[Figure 20-50-7]**.

TILT CYLINDER (CONT'D)

Parts Identification

- 1. Bushing
- 2. Grease Fitting
- 3. Housing
- 4. Relief Cartridge
- 5. Wear Ring
- 6. Expander O-ring
- 7. Set Screw
- 8. Piston
- 9. Backup Ring
- 10. O-Ring
- 11. Backup Ring
- 12. Rod
- 13. Head Gland
- 14. Wiper



S7286

Dealer Copy -- Not for Resale

TILT CYLINDER (CONT'D)

Disassembly

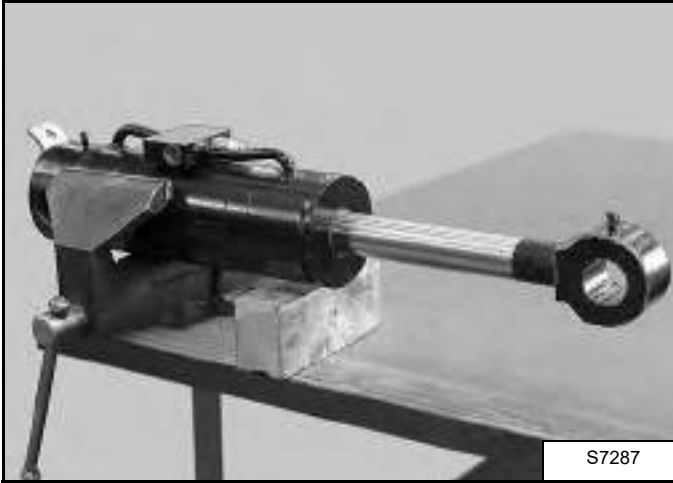
Use the following tools to disassemble the cylinder:

MEL1074-O-ring Seal Hook

MEL1353-Cylinder Gland Nut Wrench

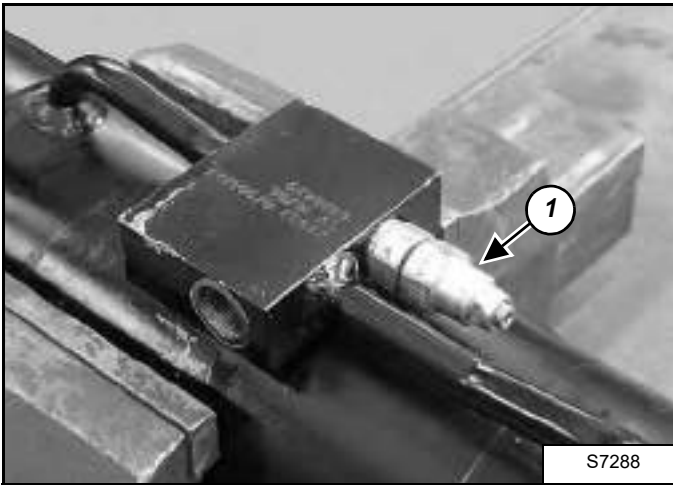
Clean the outside of the tilt cylinder before disassembly.

Figure 20-50-8



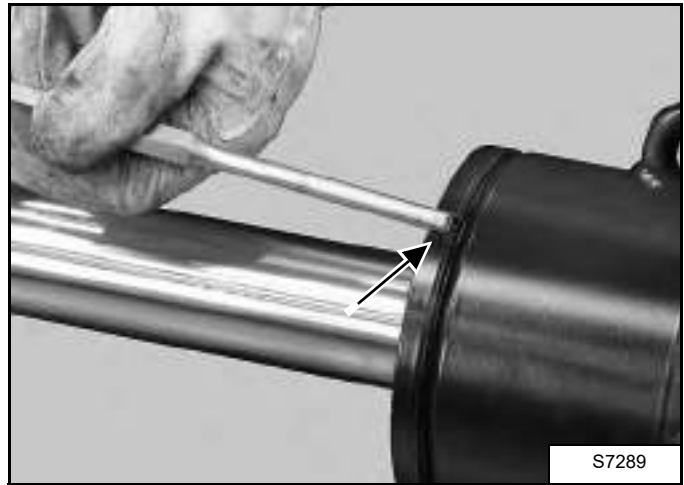
Put the cylinder in a vise [Figure 20-50-8].

Figure 20-50-9



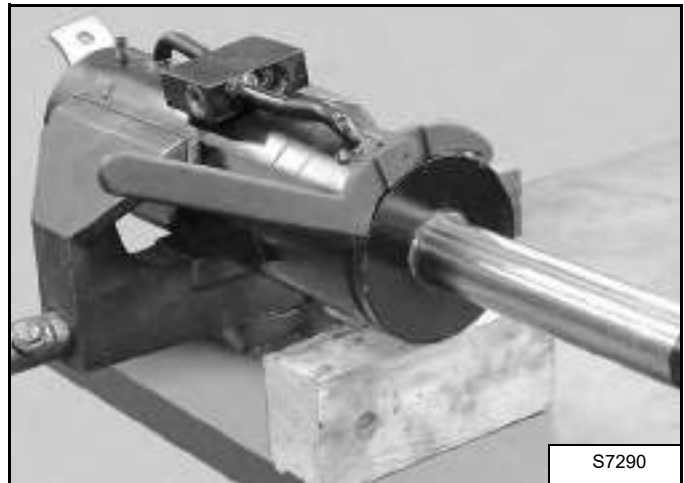
Remove the relief cartridge (Item 1) [Figure 20-50-9].

Figure 20-50-10



Carefully peen the lock ring from the head gland [Figure 20-50-10].

Figure 20-50-11

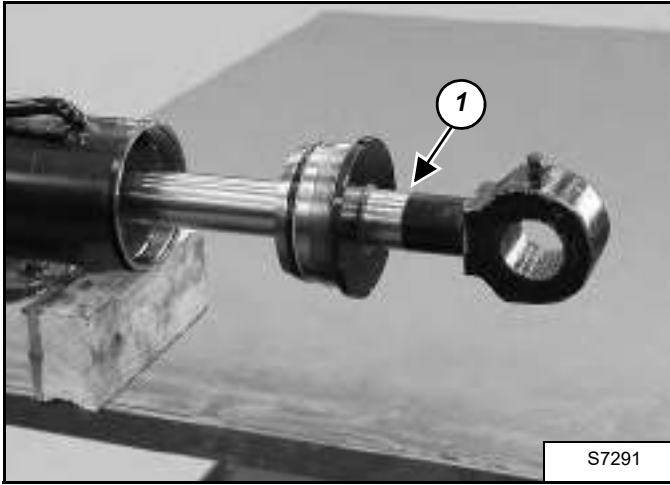


Loosen the head gland [Figure 20-50-11].

TILT CYLINDER (CONT'D)

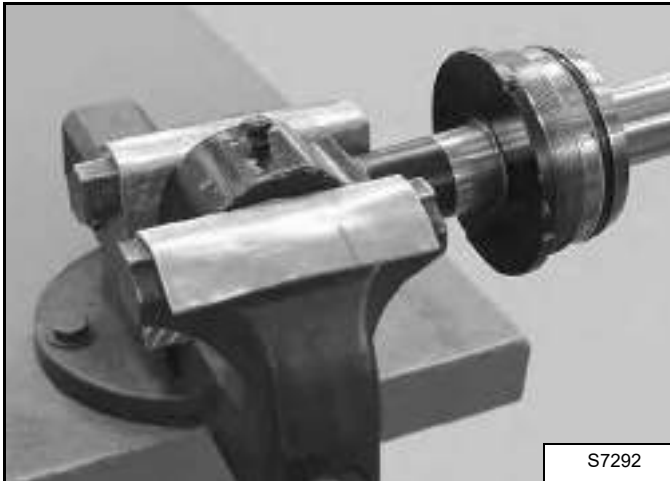
Disassembly (Cont'd)

Figure 20-50-12



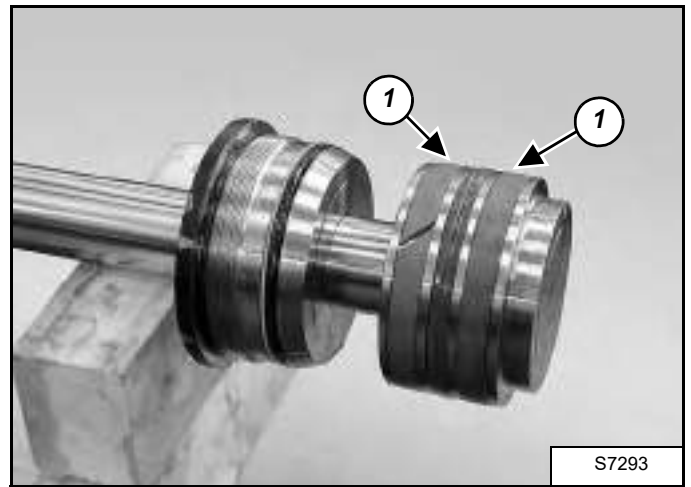
Remove the rod assembly (Item 1) [Figure 20-50-12].

Figure 20-50-13



Put the rod end of the cylinder in a vise [Figure 20-50-13].

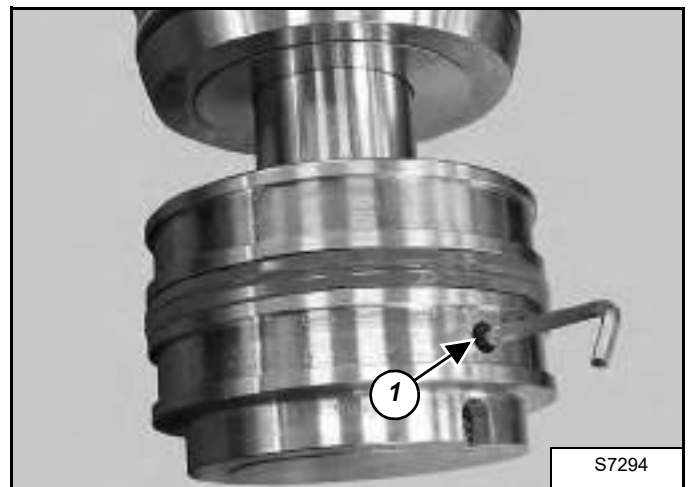
Figure 20-50-14



Support the cylinder rod on a wood block [Figure 20-50-14].

Remove the two wear rings (Item 1) [Figure 20-50-14].

Figure 20-50-15



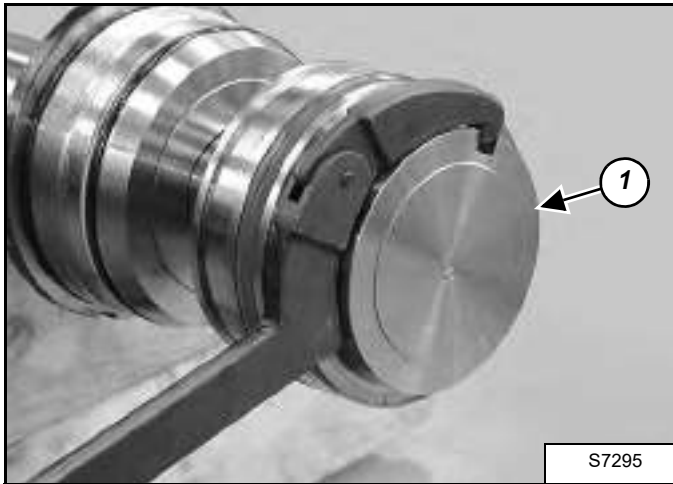
Loosen the set screw (Item 1) [Figure 20-50-15].

Dealer Copy -- Not for Resale

TILT CYLINDER (CONT'D)

Disassembly (Cont'd)

Figure 20-50-16



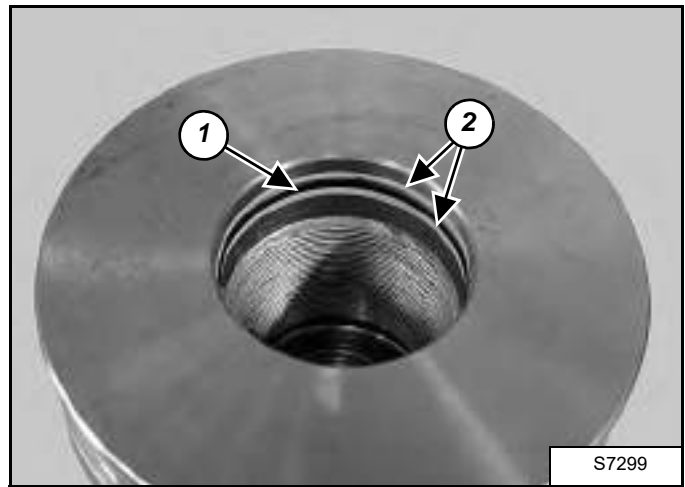
Remove the piston (Item 1) [Figure 20-50-16] from the rod.

Figure 20-50-17



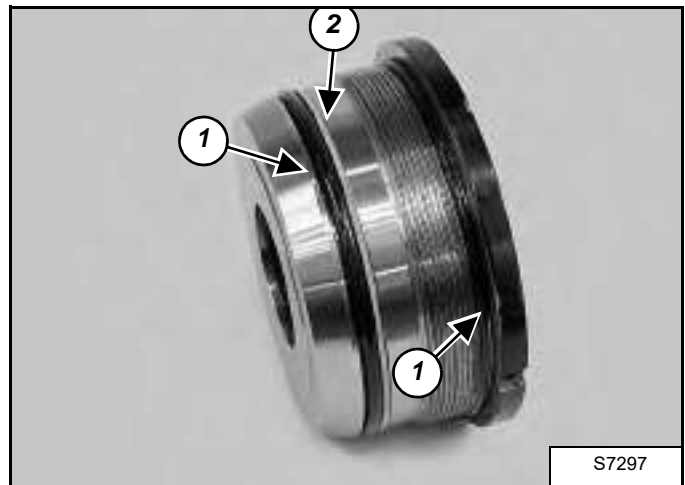
Remove the expander O-ring (Item 1) [Figure 20-50-17] from the piston.

Figure 20-50-18



Remove the seal (Item 1) and two backup rings (Item 2) [Figure 20-50-18] from the piston.

Figure 20-50-19



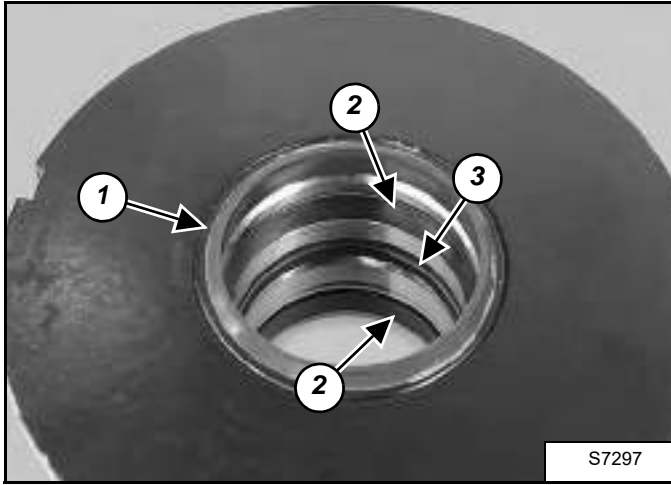
Remove the two O-rings (Item 1) and backup ring (Item 2) [Figure 20-50-19] from the head gland.

Dealer Copy -- Not for Resale

TILT CYLINDER (CONT'D)

Disassembly (Cont'd)

Figure 20-50-20



Remove the wiper (Item 1), two wear rings (Item 2) and seal (Item 3) [Figure 20-50-20] from the head gland.

Assembly

Use the following tool to assemble the cylinder:

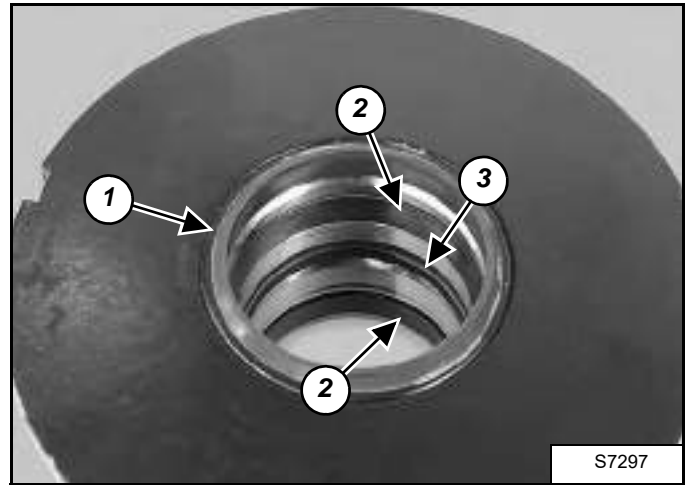
MEL1353-Cylinder Gland Nut Wrench

Clean all parts in solvent and dry with compressed air.

Inspect all parts for wear or damage. Replace any worn or damaged parts.

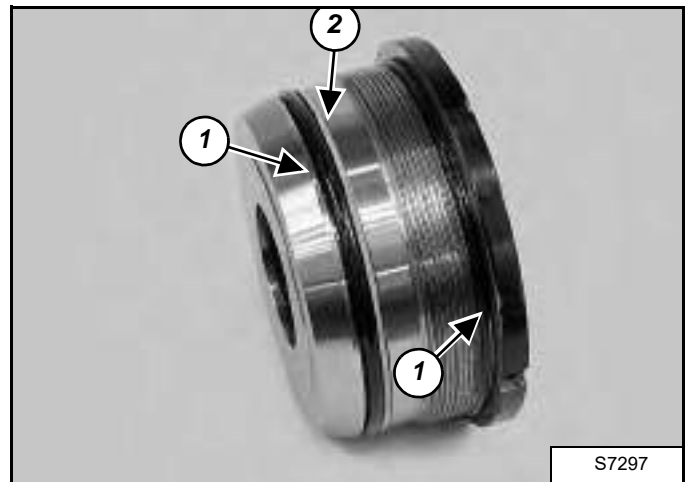
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 20-50-21



Install the wiper (Item 1), two wear rings (Item 2) and seal (Item 3) [Figure 20-50-21] into the head gland.

Figure 20-50-22



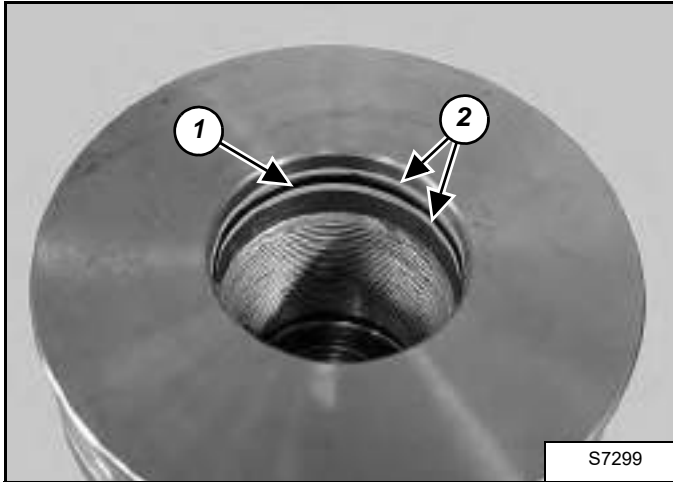
Install the two O-rings (Item 1) and backup ring (Item 2) [Figure 20-50-22] onto the head gland.

Dealer Copy -- Not for Resale

TILT CYLINDER (CONT'D)

Assembly (Cont'd)

Figure 20-50-23



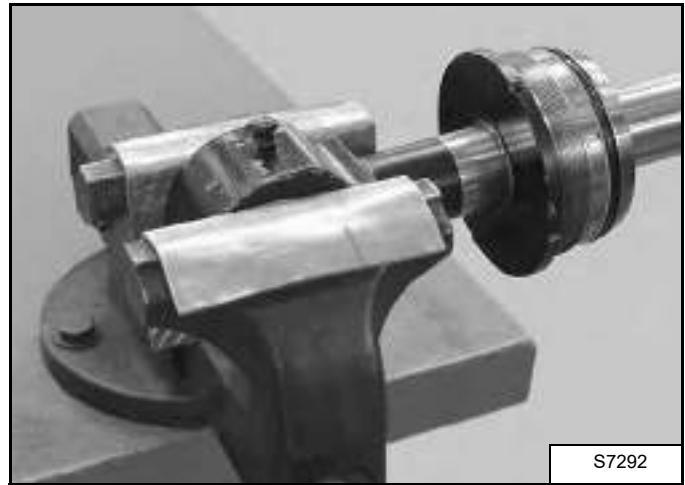
Install the seal (Item 1) and two backup rings (Item 2) [Figure 20-50-23] into the piston.

Figure 20-50-24



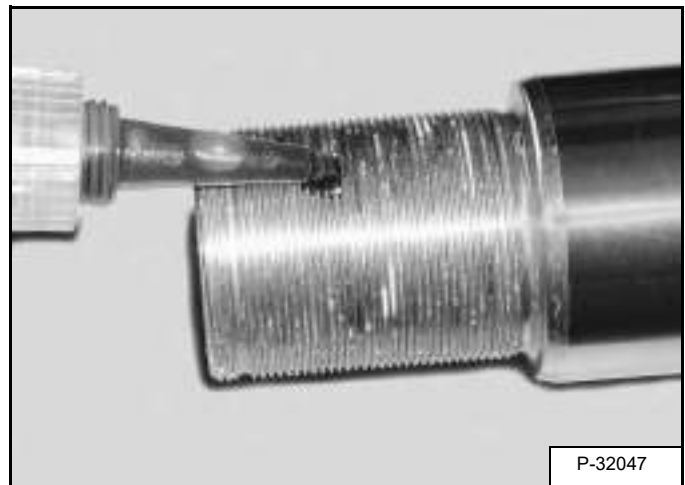
Install the expander O-ring (Item 1) [Figure 20-50-24] onto the piston.

Figure 20-50-25



Install the head gland on the rod and put the rod end of the cylinder in a vise [Figure 20-50-25].

Figure 20-50-26

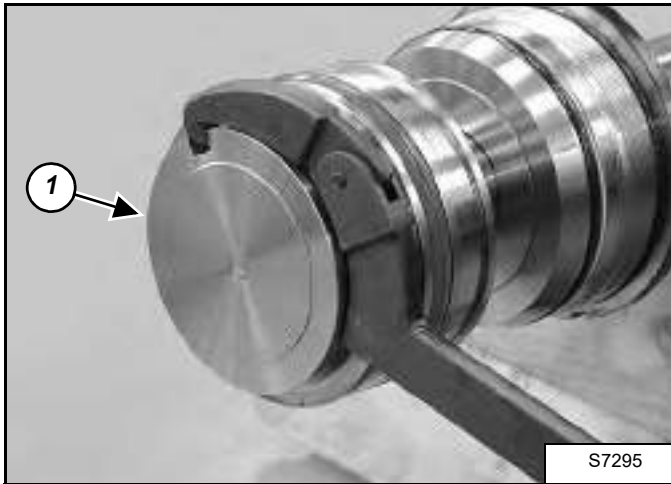


Clean off any old residue, and apply LOCTITE 242 or equivalent to the threads on the rod [Figure 20-50-26].

TILT CYLINDER (CONT'D)

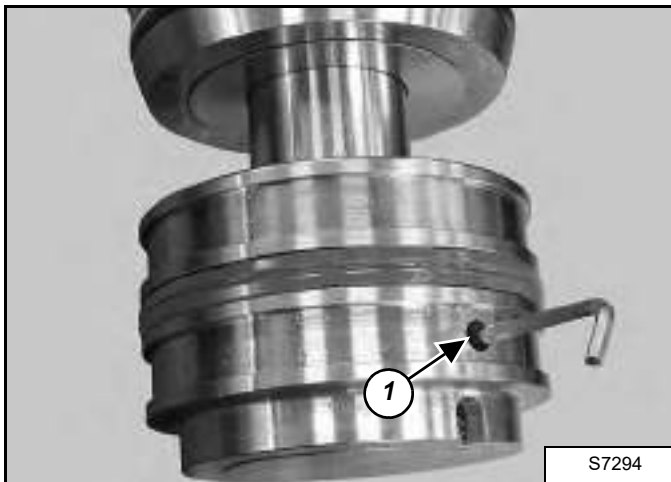
Assembly (Cont'd)

Figure 20-50-27



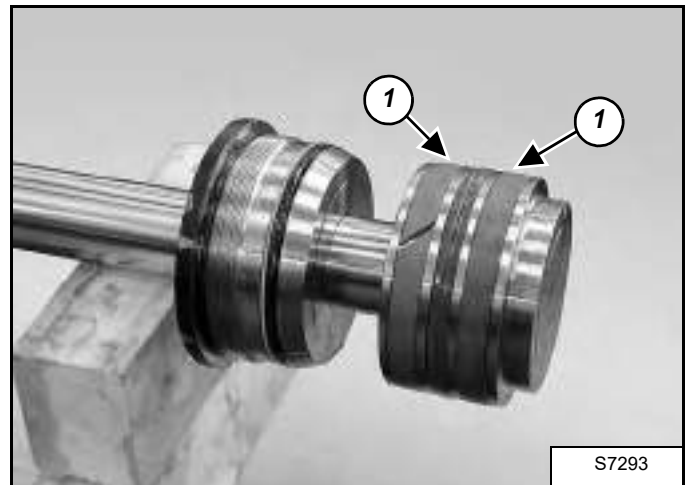
Install the piston (Item 1) [Figure 20-50-27] onto the rod.

Figure 20-50-28



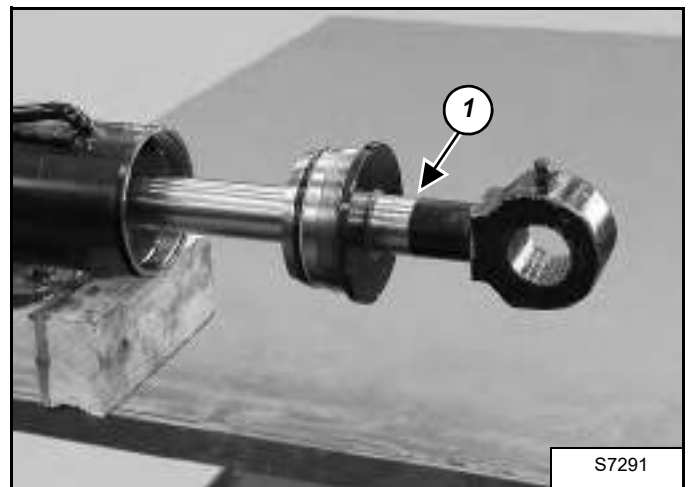
Tighten the set screw (Item 1) [Figure 20-50-28].

Figure 20-50-29



Install the two wear rings (Item 1) [Figure 20-50-29].

Figure 20-50-30



Install the rod assembly (Item 1) [Figure 20-50-30] in the cylinder.

Dealer Copy -- Not for Resale

TILT CYLINDER (CONT'D)

Assembly (Cont'd)

Figure 20-50-31



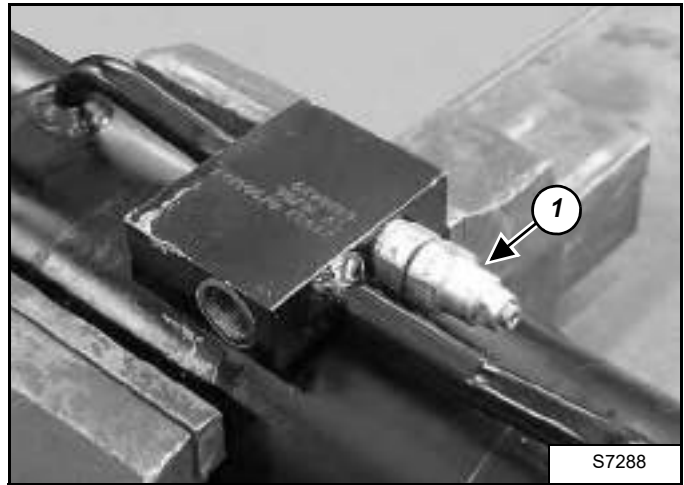
Install the head gland **[Figure 20-50-31]**.

Figure 20-50-32



Carefully lock the head gland ring **[Figure 20-50-32]**.

Figure 20-50-33



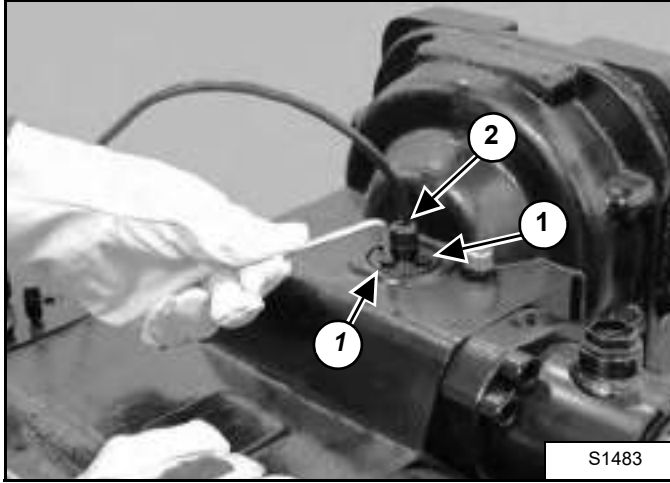
Before installation, inspect the relief cartridge for contamination or visible damage. Clean eventual contaminations or replace if damaged.

Install the relief cartridge (Item 1) **[Figure 20-50-33]**.

STEERING CYLINDER (FRONT)

Removing the Steering Cylinder

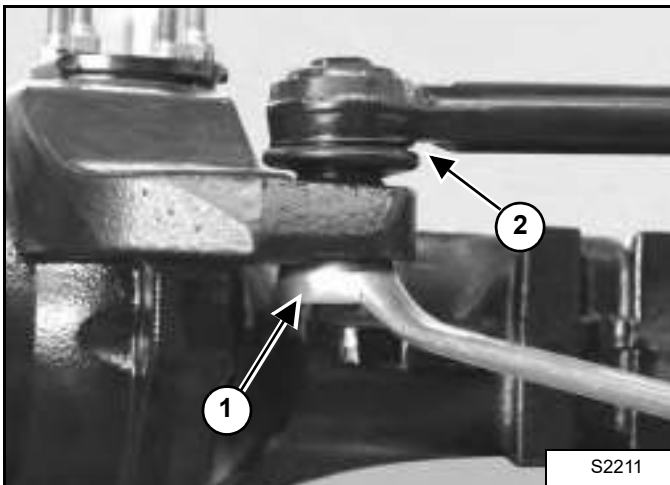
Figure 20-60-1



Remove the three bolts (Item 1) and remove the centering sensor (Item 2) [Figure 20-60-1].

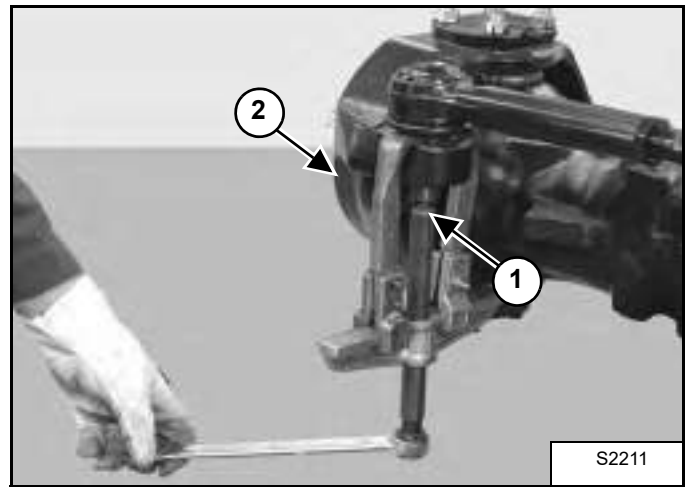
NOTE: The axle is shown removed from the machine for photo clarity.

Figure 20-60-2



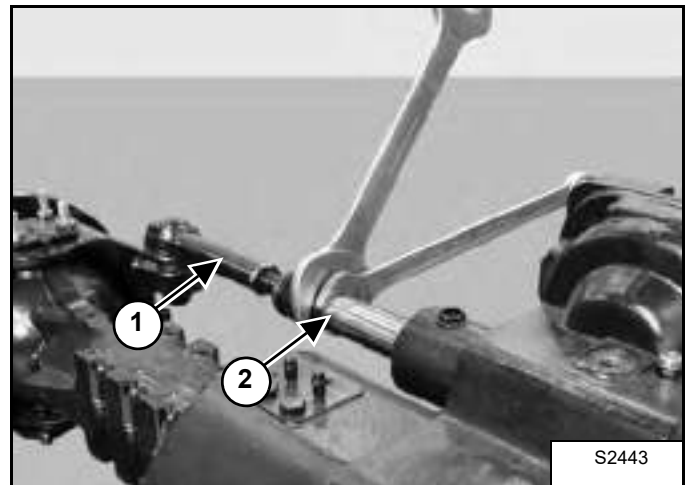
Loosen and remove the tie rod nut (Item 1) from the tie rod end (Item 2) [Figure 20-60-2].

Figure 20-60-3



Remove the tie rod (Item 1) from the steering case (Item 2) [Figure 20-60-3] by means of a puller.

Figure 20-60-4



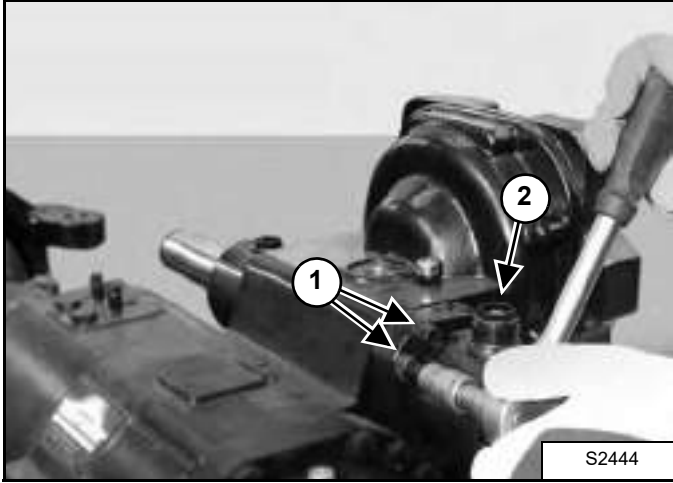
Disconnect the left and right tie rods (Item 1) from the piston (Item 2) [Figure 20-60-4].

Dealer Copy -- Not for Resale

STEERING CYLINDER (FRONT) (CONT'D)

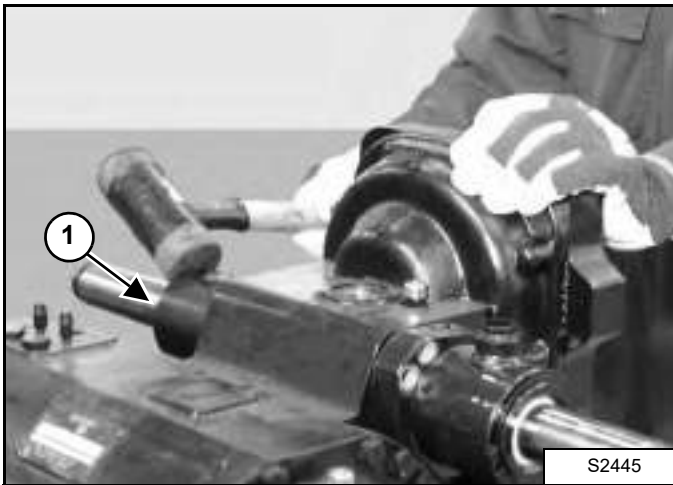
Removing the Steering Cylinder (Cont'd)

Figure 20-60-5



Remove the four bolts (Item 1) from the steering cylinder (Item 2) [Figure 20-60-5].

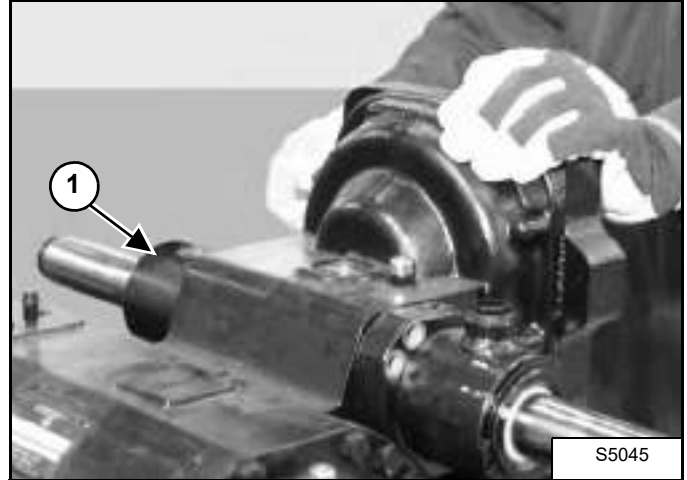
Figure 20-60-6



Extract the cylinder (Item 1) [Figure 20-60-6] using a plastic hammer.

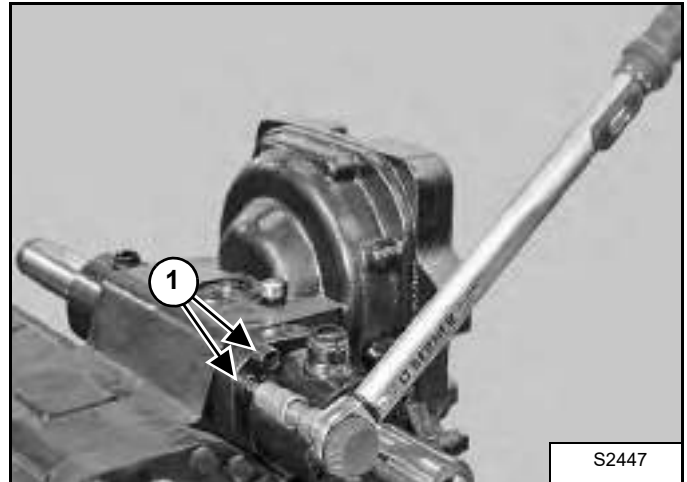
Installing the Steering Cylinder

Figure 20-60-7



Lubricate the seats of the seals and fit the steering cylinder (Item 1) [Figure 20-60-7] into its seat.

Figure 20-60-8

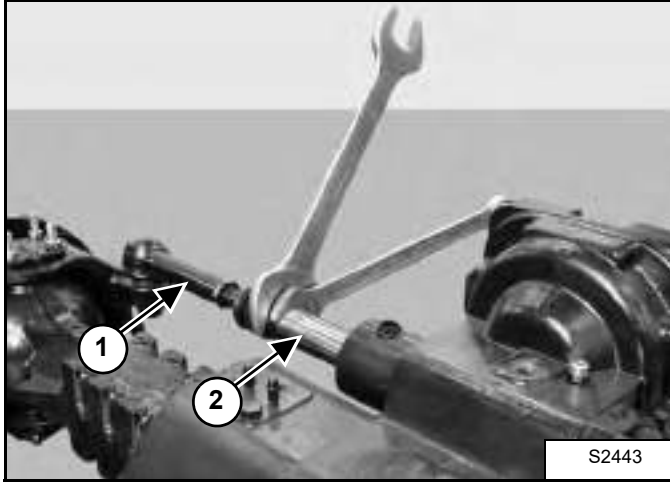


Tighten the four bolts (Item 1) [Figure 20-60-8] to 90-100 N•m (66-74 ft.-lb.) torque.

STEERING CYLINDER (FRONT) (CONT'D)

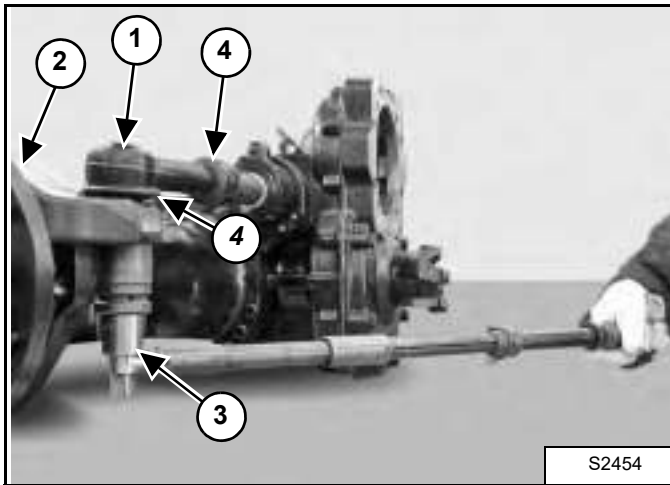
Installing the Steering Cylinder (Cont'd)

Figure 20-60-9



Connect the left and right tie rods (Item 1) by screwing them onto the piston (Item 2) [Figure 20-60-9] using a torque wrench setting of 240 - 270 N•m (177-200 ft.-lb.).

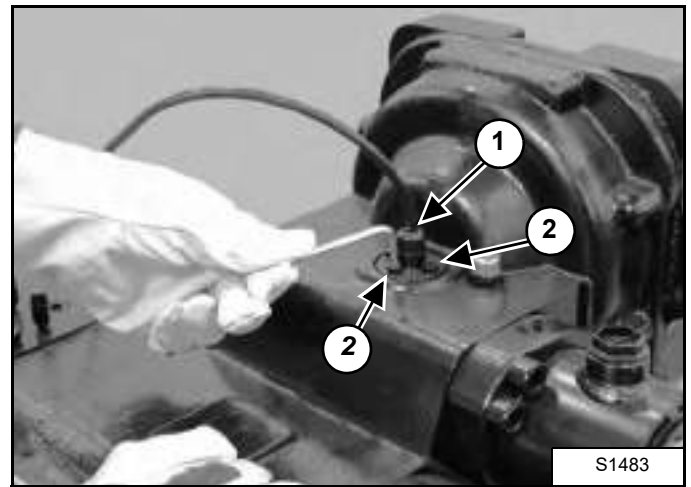
Figure 20-60-10



Insert the tapered pins of the tie rod (Item 1) in the steering case (Item 2) and tighten the tie rod nut (Item 3) [Figure 20-60-10] to 270-300 N•m (200-222 ft.-lb.) torque.

NOTE: Check that the rubber guards (Item 4) [Figure 20-60-10] are intact.

Figure 20-60-11



Install the centering sensor (Item 1) [Figure 20-60-11] for checking piston centering.

Tighten the three bolts (Item 2) [Figure 20-60-11] to 5 - 6 N•m (44-53 in-lb) torque.

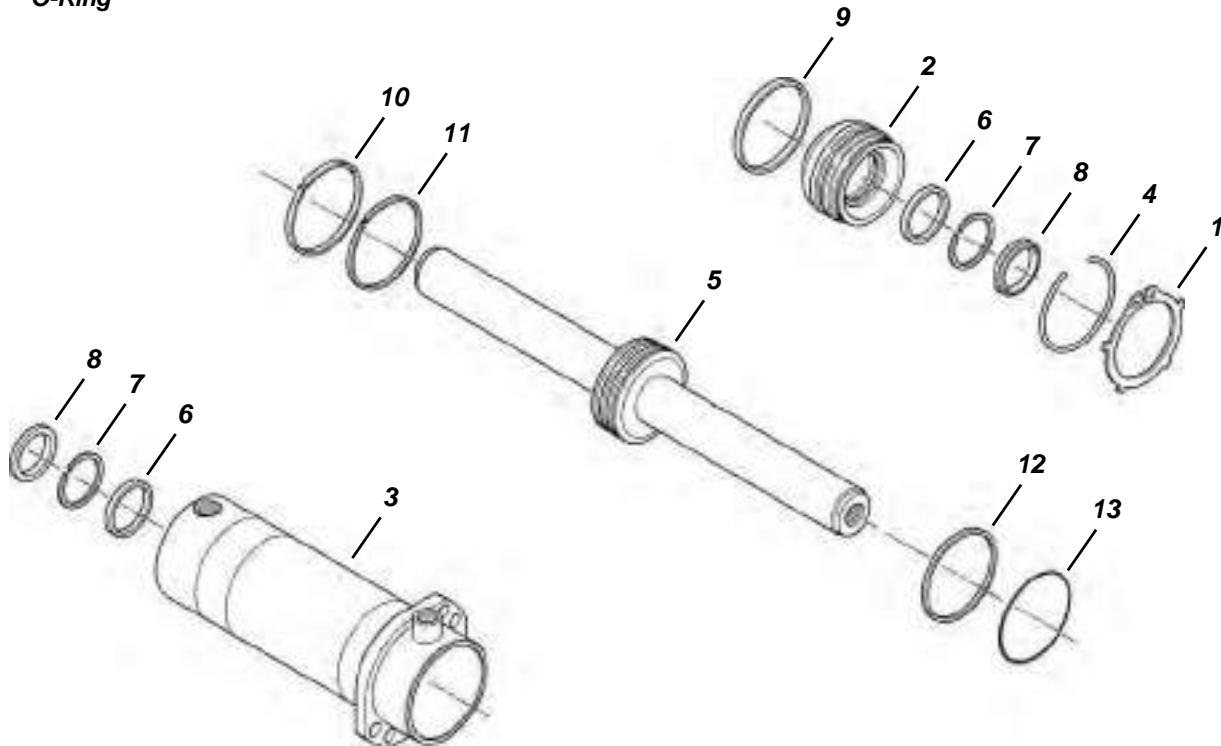
Perform the axle toe-in procedure. (See AXLE TOE-IN on Page 40-40-1.)

Dealer Copy -- Not for Resale

STEERING CYLINDER (FRONT) (CONT'D)

Parts Identification

1. Snap Ring
2. Gland Head
3. Cylinder
4. Stop Ring
5. Piston
6. Seal
7. Anti-extrusion Ring
8. Wiper
9. Seal
10. Wear Ring
11. Magnetic Ring
12. Seal
13. O-Ring



S7274

Dealer Copy -- Not for Resale

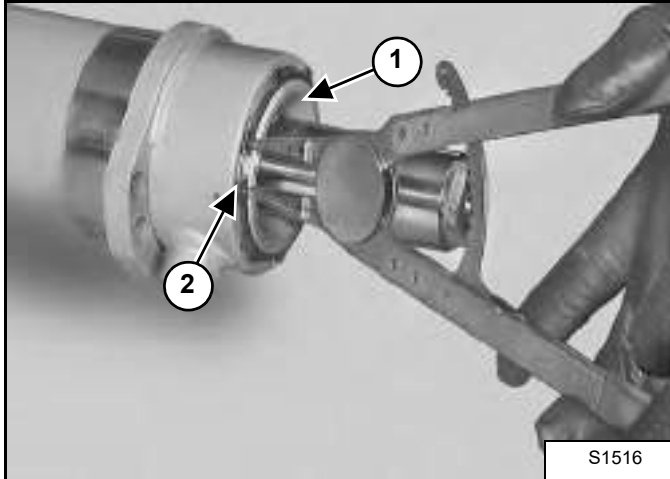
STEERING CYLINDER (FRONT) (CONT'D)

Disassembling the Steering Cylinder

IMPORTANT

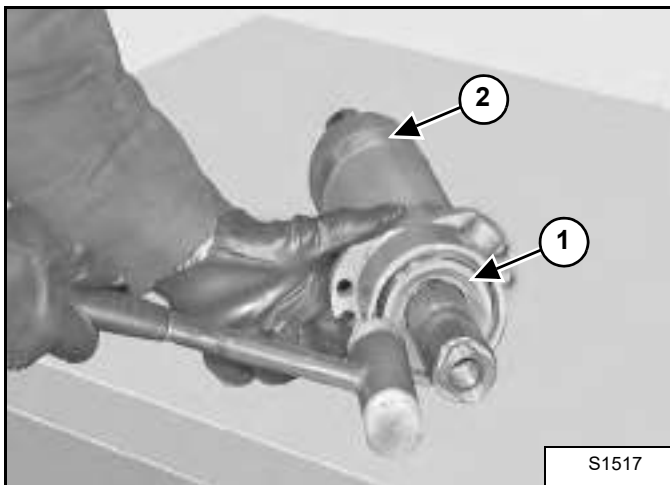
Before disassembling the unit, drain the oil in the cylinder chambers completely.

Figure 20-60-12



Remove the snap ring (Item 1) from the gland head (Item 2) [Figure 20-60-12],

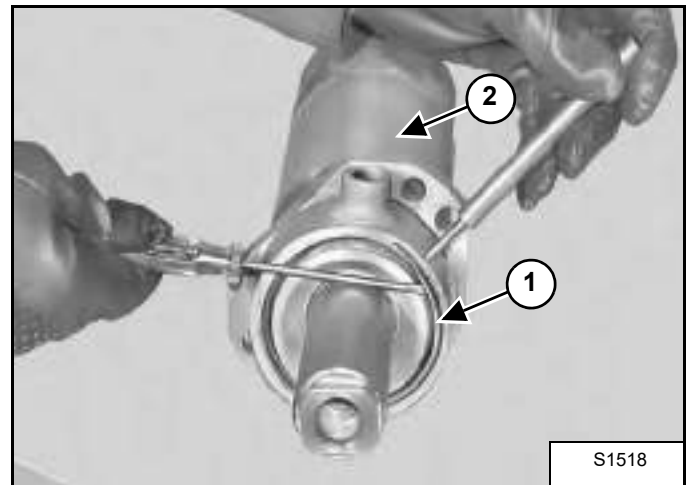
Figure 20-60-13



With the help of a plastic hammer, push the head (Item 1) inside the cylinder (Item 2) [Figure 20-60-13],

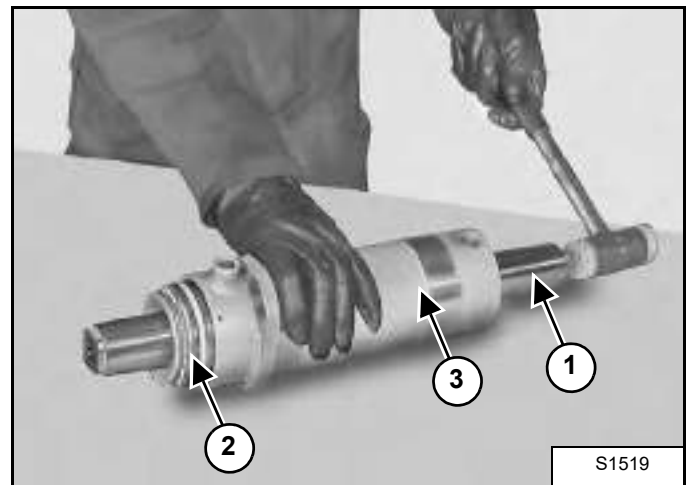
NOTE: The head should line up with the edge of the cylinder.

Figure 20-60-14



With the help of a drift, apply pressure to the stop ring (Item 1) that is placed inside the cylinder (Item 2) [Figure 20-60-14] and extract the ring using a screwdriver.

Figure 20-60-15



Hammer the piston (Item 1) on the rear of the gland head (Item 2) [Figure 20-60-15] using a plastic hammer.

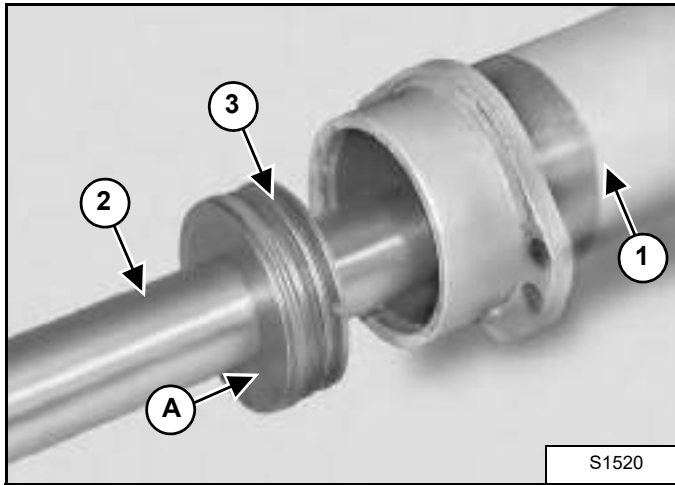
Continue hammering until the gland head (Item 2) is ejected from the cylinder (Item 3) [Figure 20-60-15].

Dealer Copy -- Not for Resale

STEERING CYLINDER (FRONT) (CONT'D)

Disassembling the Steering Cylinder (Cont'd)

Figure 20-60-16



Disassemble the cylinder unit (Item 1) by extracting first the rod (Item 2) then the piston (Item 3) [Figure 20-60-16].

NOTE: Note the assembly side of the piston (Item 3). The beveled part "A" of the piston is oriented towards the head (Item 2) [Figure 20-60-16].

Figure 20-60-17

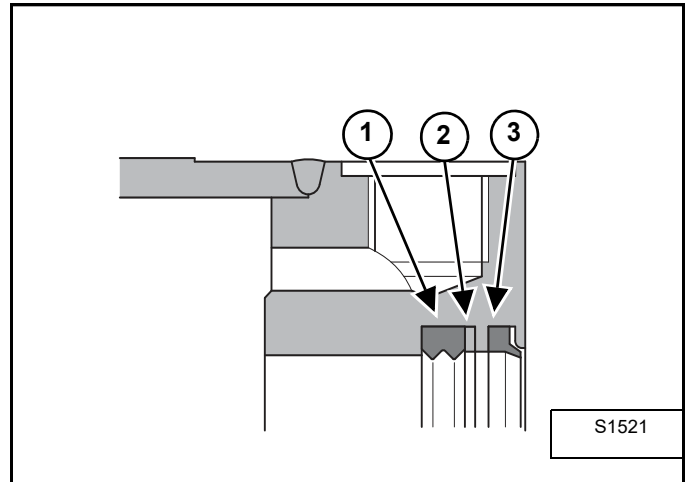


Remove all seals, anti-extrusion rings and wipers from head, cylinder and piston.

NOTE: 1) All seals must be replaced every time the unit is disassembled.
2) Particular attention must be paid not to damage the seats of both seals and piston slide.

Assembling the Steering Cylinder

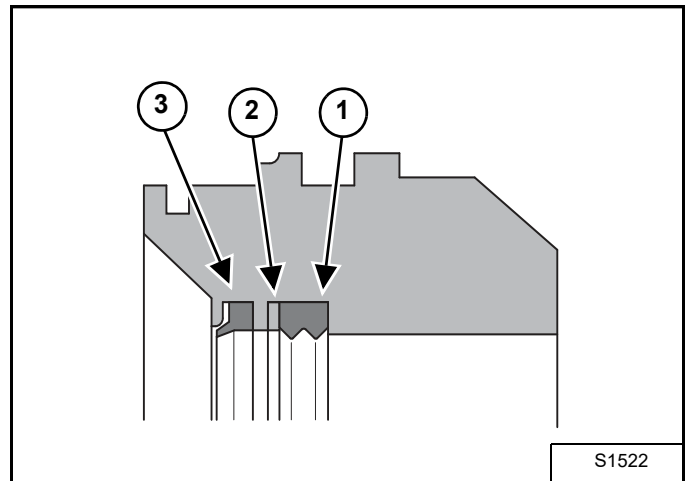
Figure 20-60-18



After applying grease, install the sealing ring (Item 1) on the cylinder housing, the anti-extrusion ring (Item 2) and the wiper (Item 3) inside the cylinder (Item 3) [Figure 20-60-18].

NOTE: Make sure the anti extrusion ring (Item 2) is positioned on the correct side of the sealing ring (Item 1) [Figure 20-60-18], as shown.

Figure 20-60-19



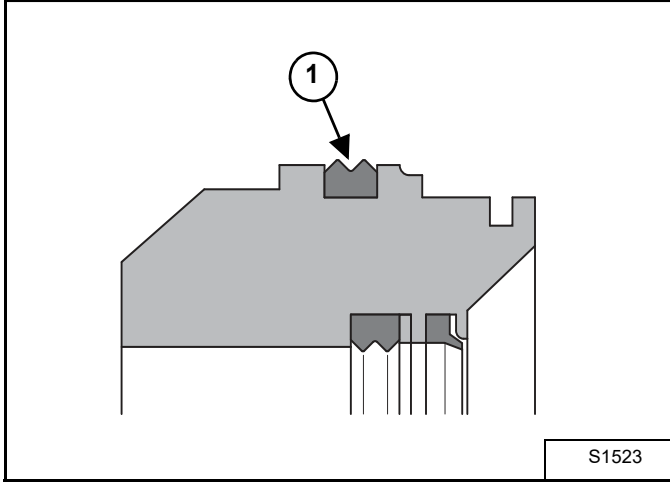
After applying grease, install the seal (Item 1) on the housing, the anti-extrusion ring (Item 2) and the wiper (Item 3) [Figure 20-60-19] in the piston (Item 3) [Figure 20-60-16].

NOTE: Make sure the anti extrusion ring (Item 2) is positioned on the correct side of the sealing ring (Item 1) [Figure 20-60-19], as shown.

STEERING CYLINDER (FRONT) (CONT'D)

Assembling the Steering Cylinder (Cont'd)

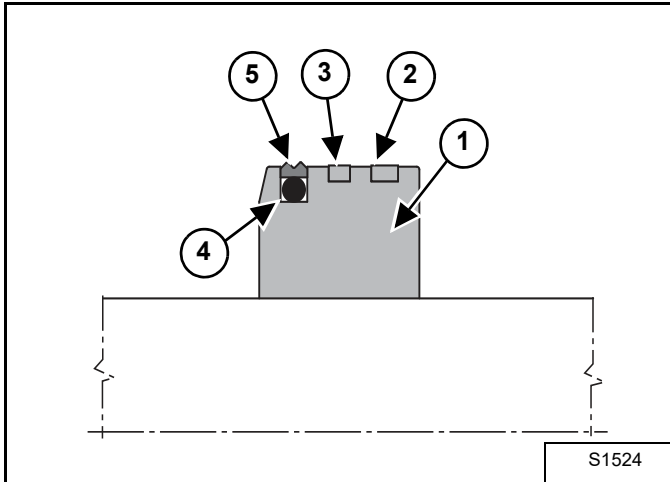
Figure 20-60-20



Fit the seal (Item 1) [Figure 20-60-20] onto the outside of the gland head.

NOTE: In order to facilitate assembly, apply grease to the outer surface of the gland head. Do not roll the seal (Item 1) [Figure 20-60-20].

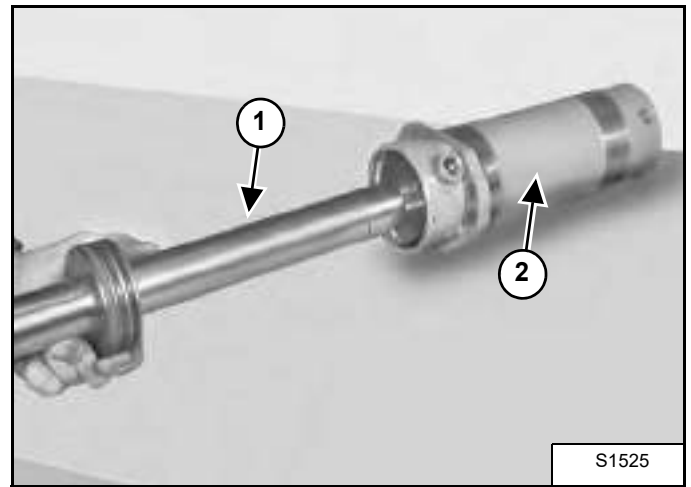
Figure 20-60-21



Prepare the piston (Item 1) by fitting it with the wear ring (Item 2), the magnetic ring (Item 3), the O-ring (Item 4) and the seal (Item 5) [Figure 20-60-21].

NOTE: In order to facilitate assembly, apply grease.

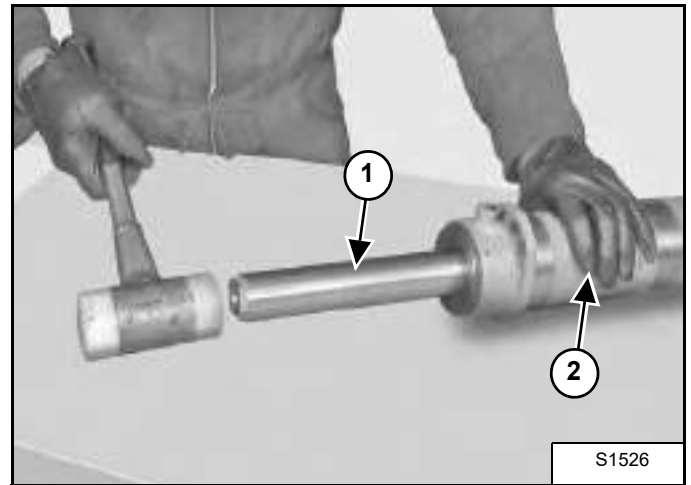
Figure 20-60-22



Install the rod (Item 1) into the cylinder housing (Item 2) [Figure 20-60-22].

NOTE: Apply a little grease to seals and cylinder.

Figure 20-60-23



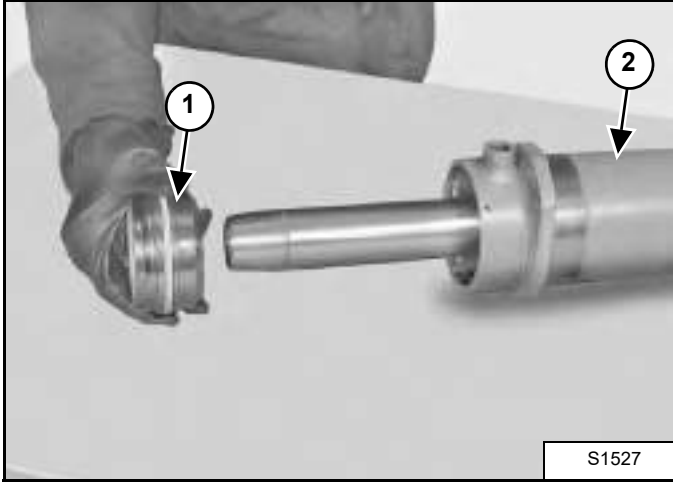
Push the rod (Item 1) into the cylinder (Item 2) [Figure 20-60-23] for 100 mm (3.93 in) using a plastic hammer.

Dealer Copy -- Not for Resale

STEERING CYLINDER (FRONT) (CONT'D)

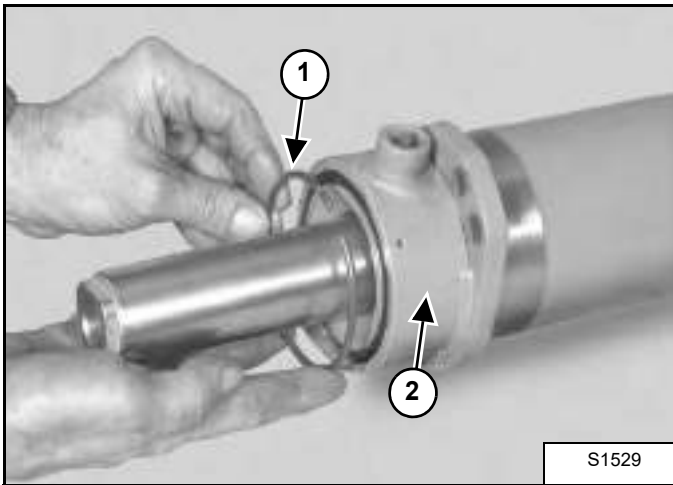
Assembling the Steering Cylinder (Cont'd)

Figure 20-60-24



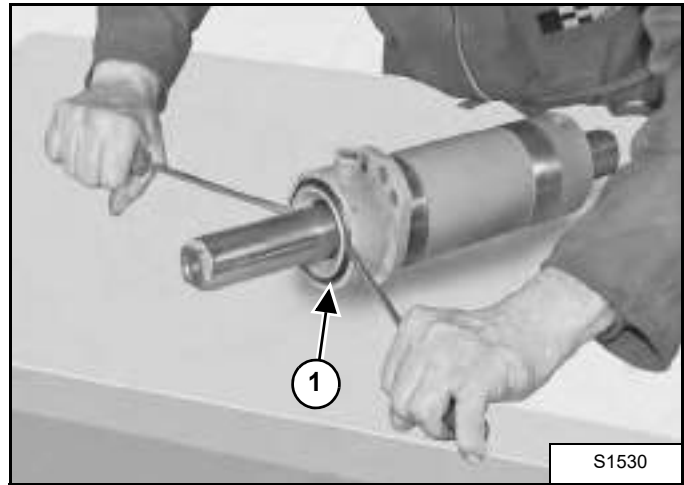
Apply grease to the gland head seals (Item 1), fit the head onto the piston and push in into the cylinder (Item 2) [Figure 20-60-24] using a plastic hammer.

Figure 20-60-25



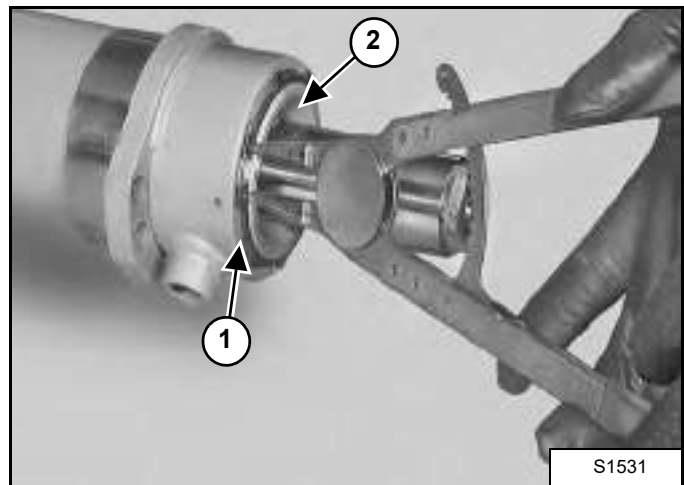
Insert the stop ring (Item 1) ensuring that it fits into the seat of the cylinder (Item 2) [Figure 20-60-25].

Figure 20-60-26



Apply pressure to the head using two screwdrivers or levers until the head is fastened onto the stop ring (Item 1) [Figure 20-60-26].

Figure 20-60-27



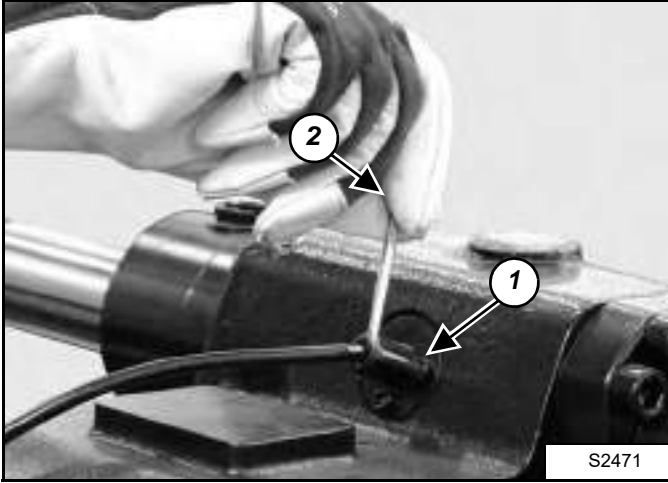
Fit the snap ring (Item 1) on the head (Item 2) [Figure 20-60-27].

NOTE: Make sure that the snap ring (Item 1) [Figure 20-60-27] is securely fastened in its seat. If necessary, force it into its seat using a drift and a hammer.

STEERING CYLINDER (REAR)

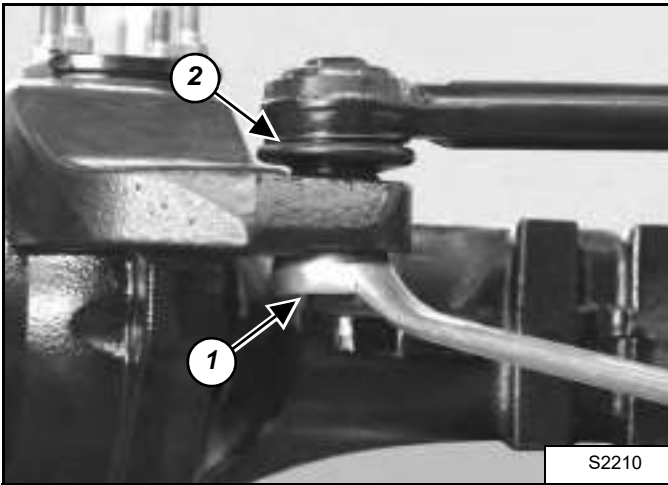
Removing The Steering Cylinder

Figure 20-61-1



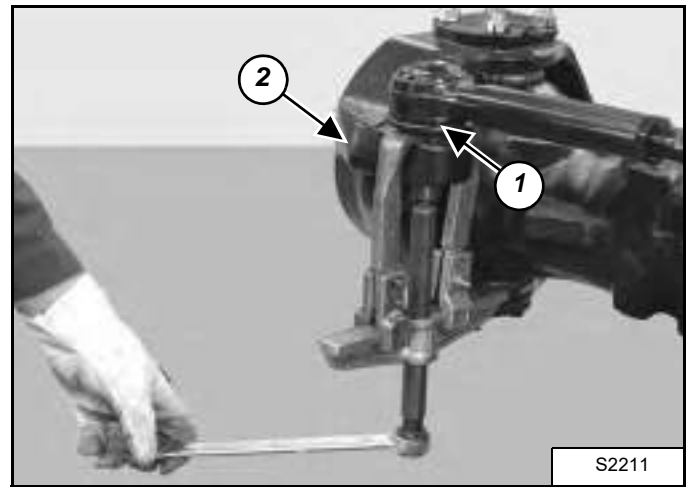
Remove the centering sensor (Item 1) [Figure 20-61-1] of the steering piston.

Figure 20-61-2



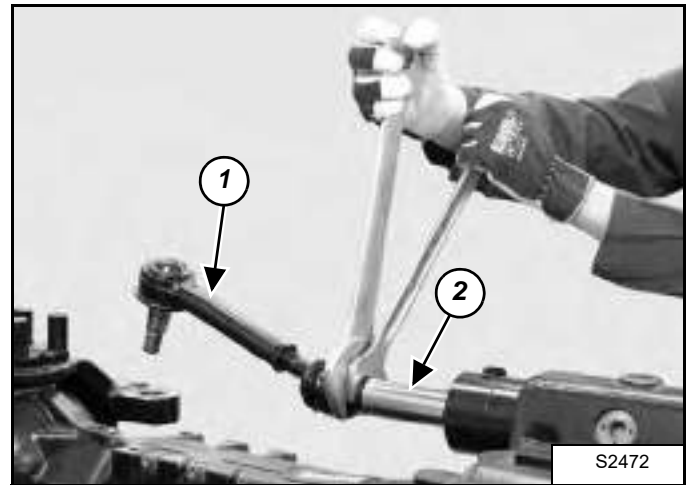
Remove the nuts (Item 1) that lock the pivot pins (Item 2) [Figure 20-61-2].

Figure 20-61-3



Disconnect the tapered pins of the tie rod (Item 1) from the steering case (Item 2) [Figure 20-61-3] by means of a puller.

Figure 20-61-4



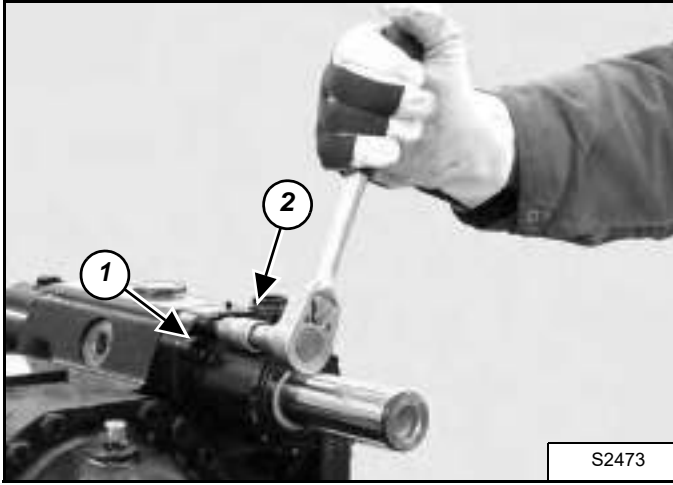
Disconnect the left and right steering bars (Item 1) from the piston (Item 2) [Figure 20-61-4].

Dealer Copy -- Not for Resale

STEERING CYLINDER (REAR) (CONT'D)

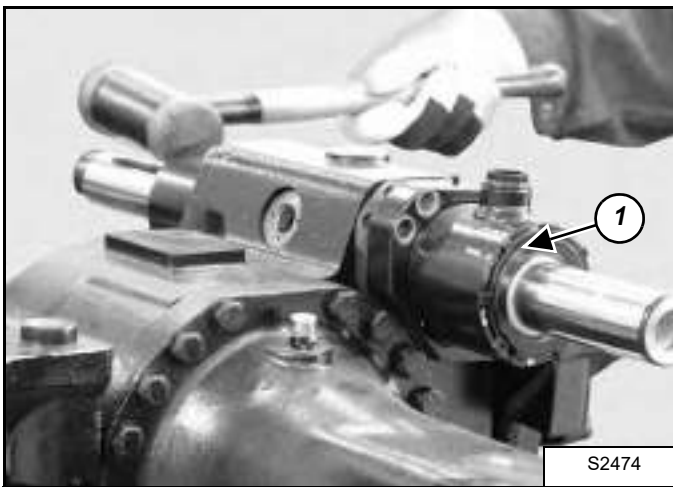
Removing The Steering Cylinder (Cont'd)

Figure 20-61-5



Remove the four securing bolts (Item 1) from the steering cylinder (Item 2) [Figure 20-61-5].

Figure 20-61-6

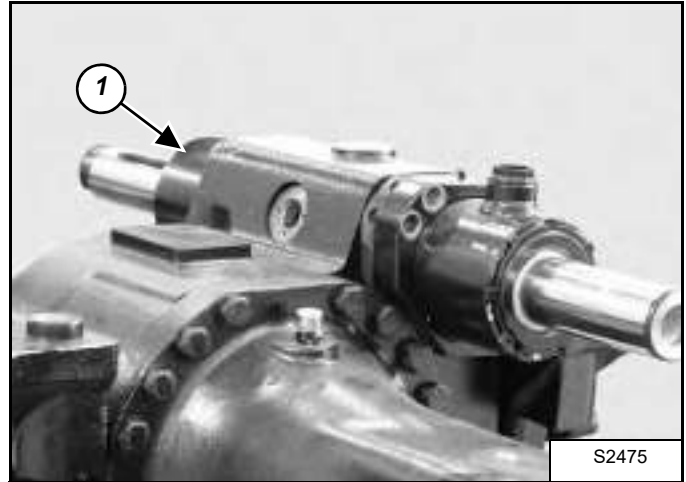


Extract the cylinder (Item 1) [Figure 20-61-6] using a plastic hammer.

NOTE: For cylinder disassembly, (See Disassembling the Steering Cylinder on Page 20-61-5.).

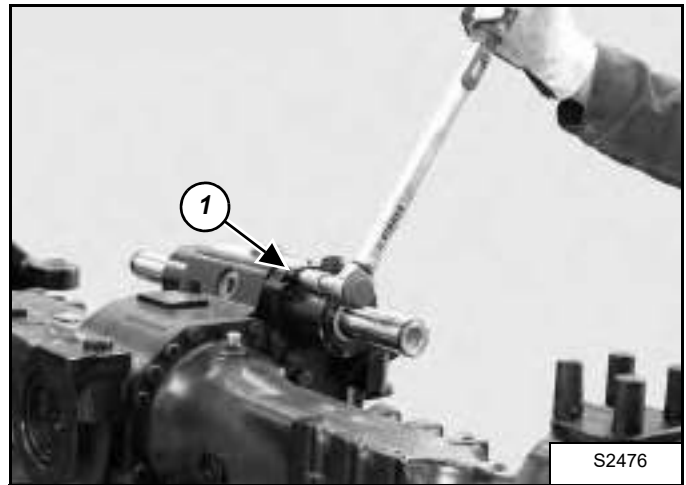
Installing The Steering Cylinder

Figure 20-61-7



Lubricate the seats of the seals and fit the steering cylinder (Item 1) [Figure 20-61-7] into its seat.

Figure 20-61-8



Lock the cylinder by cross-tightening the four bolts (Item 1) [Figure 20-61-8], apply a torque of 90 - 100 N•m (66-74 ft.-lb.).

STEERING CYLINDER (REAR) (CONT'D)

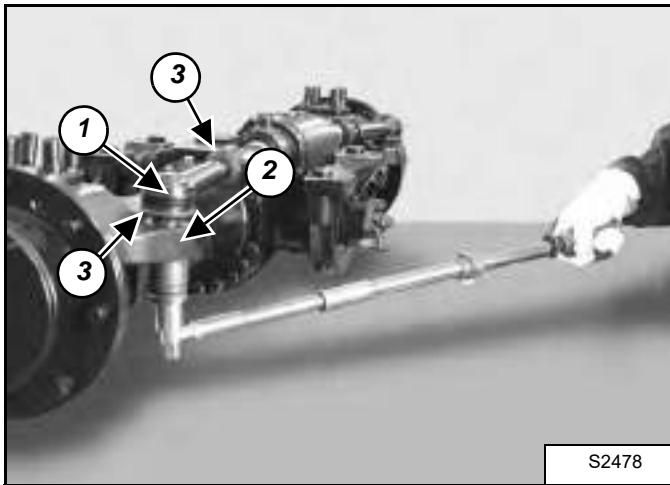
Installing The Steering Cylinder (Cont'd)

Figure 20-61-9



Connect the left and right tie rods (Item 1) by screwing them onto the piston (Item 2) [Figure 20-61-9] using a torque wrench setting of 240 - 270 N•m (177-200 ft.-lb.).

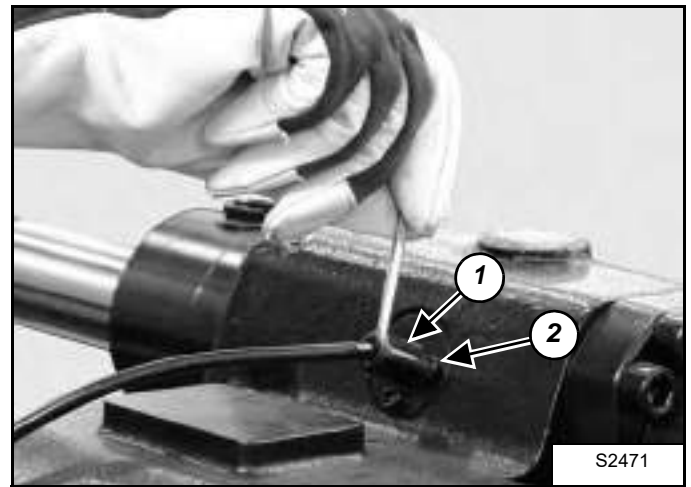
Figure 20-61-10



Insert the pins (Item 1) in the steering case (Item 2) [Figure 20-61-10] and lock into position using a torque wrench setting of 270 - 300 N•m (200-224 ft.-lb.).

NOTE: Check that the rubber guards (Item 3) [Figure 20-61-10] are intact.

Figure 20-61-11



Install the proximity sensor (Item 1) for checking piston centering.

Tighten the bolts (Item 2) [Figure 20-61-11] to 5 - 6 N•m (44-53 in-lb) torque.

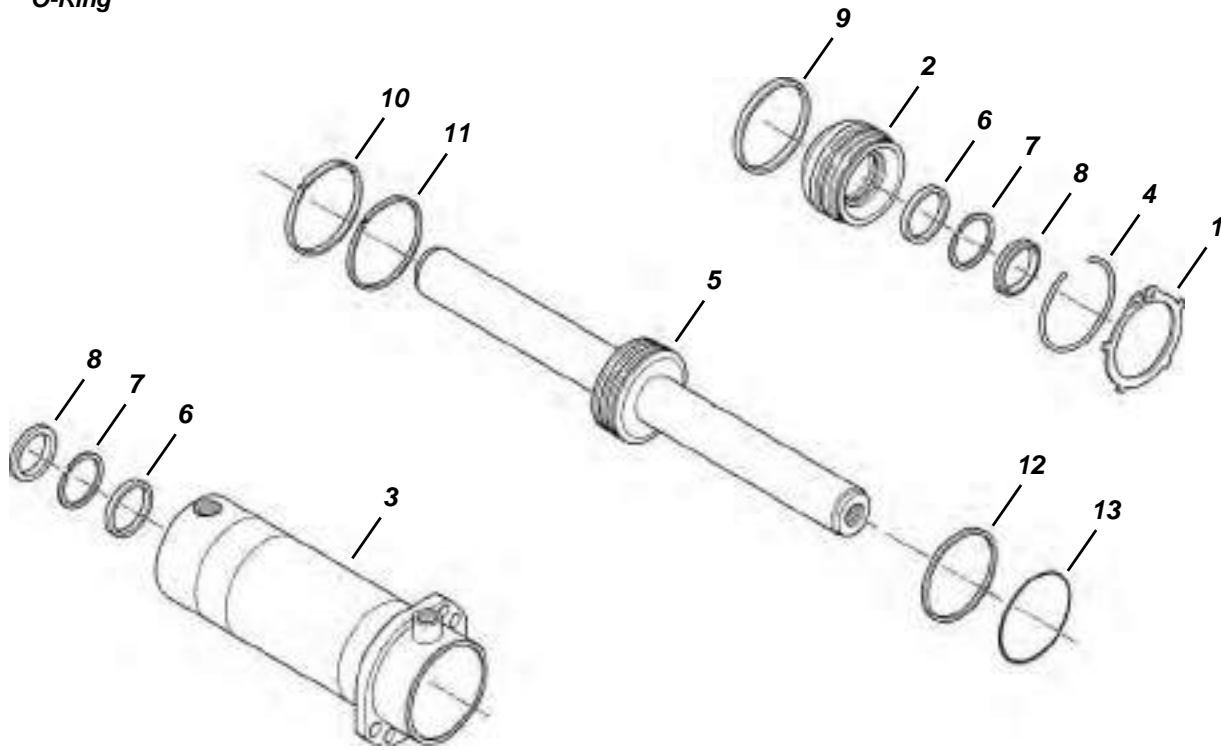
Perform the axle toe-in procedure. (See AXLE TOE-IN on Page 40-40-1.)

Dealer Copy -- Not for Resale

STEERING CYLINDER (REAR) (CONT'D)

Parts Identification

1. Snap Ring
2. Gland Head
3. Cylinder
4. Stop Ring
5. Piston
6. Seal
7. Anti-extrusion Ring
8. Wiper
9. Seal
10. Wear Ring
11. Magnetic Ring
12. Seal
13. O-Ring



S7274

Dealer Copy -- Not for Resale

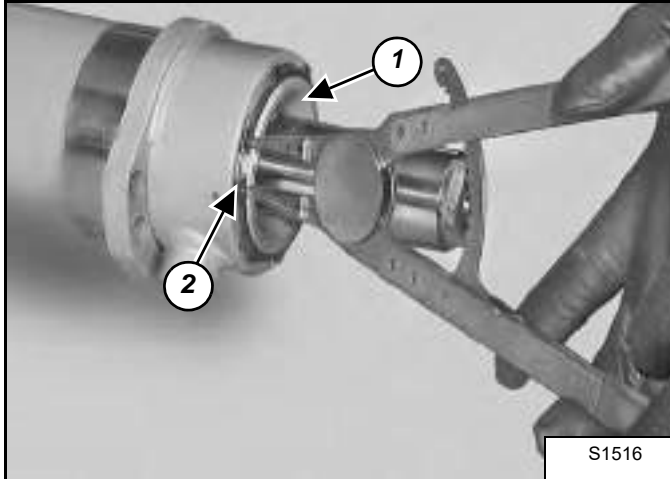
STEERING CYLINDER (REAR) (CONT'D)

Disassembling the Steering Cylinder

IMPORTANT

Before disassembling the unit, drain the oil in the cylinder chambers completely.

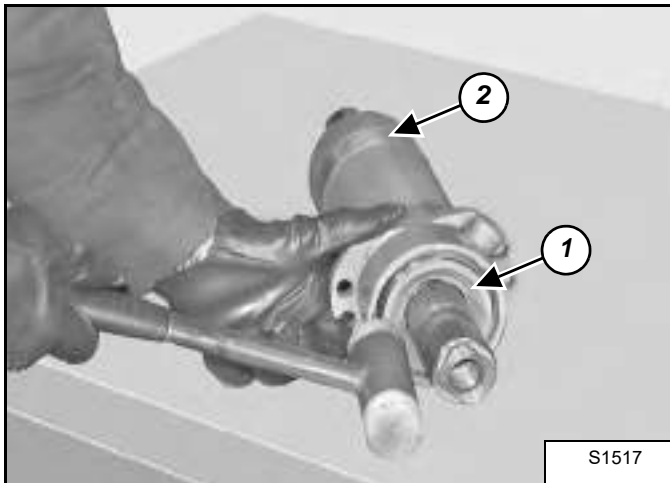
Figure 20-61-12



NOTE: Before disassembling the unit, drain the oil in the cylinder chambers completely.

Remove the snap ring (Item 1) from the gland head (Item 2) [Figure 20-61-12],

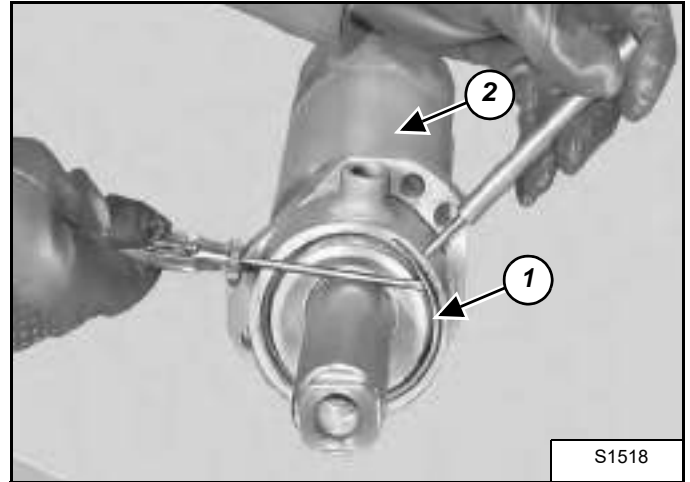
Figure 20-61-13



With the help of a plastic hammer, push the head (Item 1) inside the cylinder (Item 2) [Figure 20-61-13],

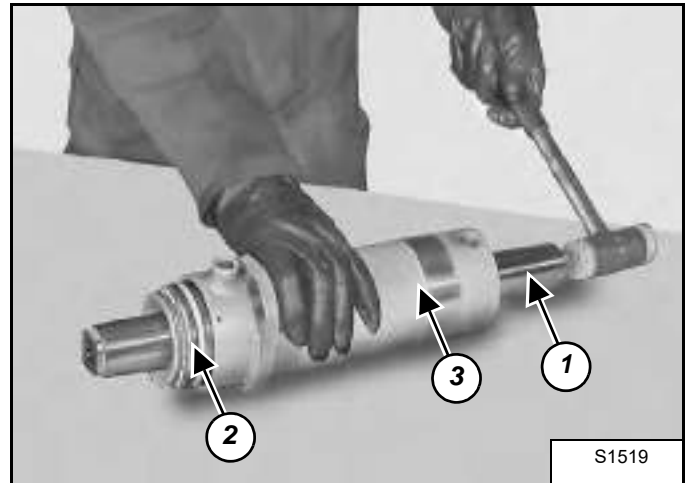
NOTE: The gland head should line up with the edge of the cylinder.

Figure 20-61-14



With the help of a drift, apply pressure to the stop ring (Item 1) that is placed inside the cylinder (Item 2) [Figure 20-61-14] and extract the ring using a screwdriver.

Figure 20-61-15



Hammer the piston (Item 1) on the rear of the gland head (Item 2) [Figure 20-61-15] using a plastic hammer.

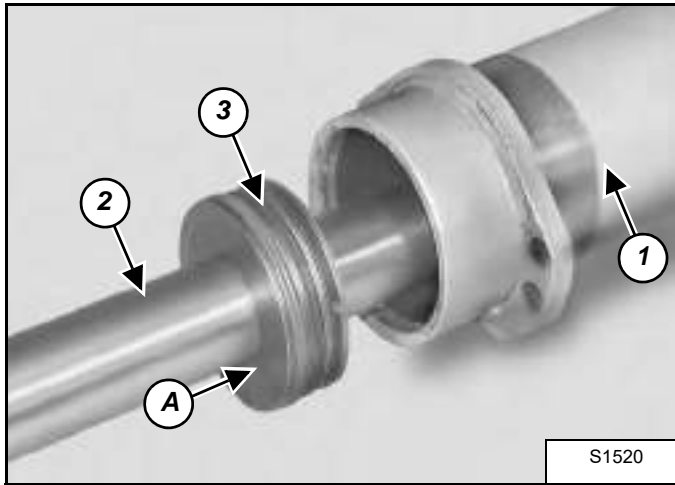
Continue hammering until the gland head (Item 2) is ejected from the cylinder (Item 3) [Figure 20-61-15].

Dealer Copy -- Not for Resale

STEERING CYLINDER (REAR) (CONT'D)

Disassembling the Steering Cylinder (Cont'd)

Figure 20-61-16



Disassemble the cylinder unit (Item 1) by extracting first the rod (Item 2) then the piston (Item 3) [Figure 20-61-16].

NOTE: Mark the assembly side of the piston (Item 3) [Figure 20-61-16]. The bevelled part "A" of the piston is oriented towards the head (Item 2) [Figure 20-61-16].

Figure 20-61-17

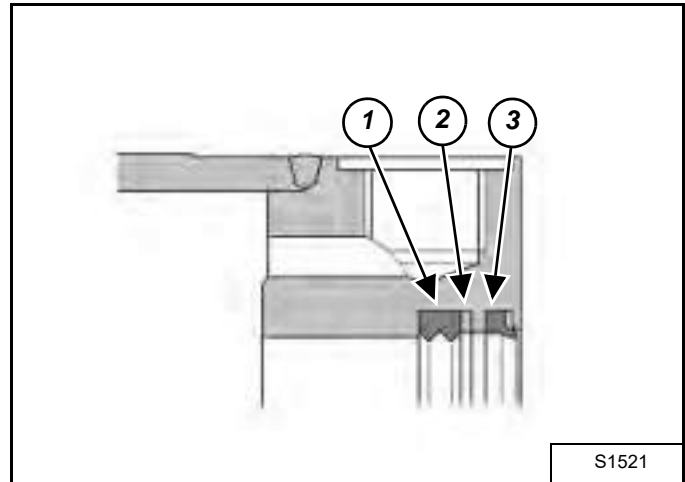


Remove all seals, anti-extrusion rings and wipers from head (Item 1), cylinder (Item 2) and piston (Item 3) [Figure 20-61-17].

NOTE: 1) All seals must be replaced every time the unit is disassembled.
2) Particular attention must be paid not to damage the seats of both seals and piston slide.

Assembling the Steering Cylinder

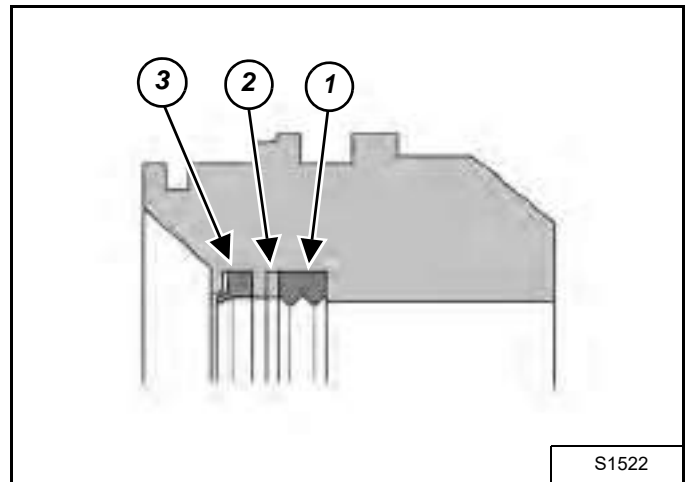
Figure 20-61-18



After applying grease, install the sealing ring (Item 1) on the cylinder housing, the anti-extrusion ring (Item 2) and the wiper (Item 3) inside the cylinder (Item 3) [Figure 20-61-18].

NOTE: Make sure the anti-extrusion ring (Item 2) is positioned on the correct side of the sealing ring (Item 1) [Figure 20-61-18], as shown.

Figure 20-61-19

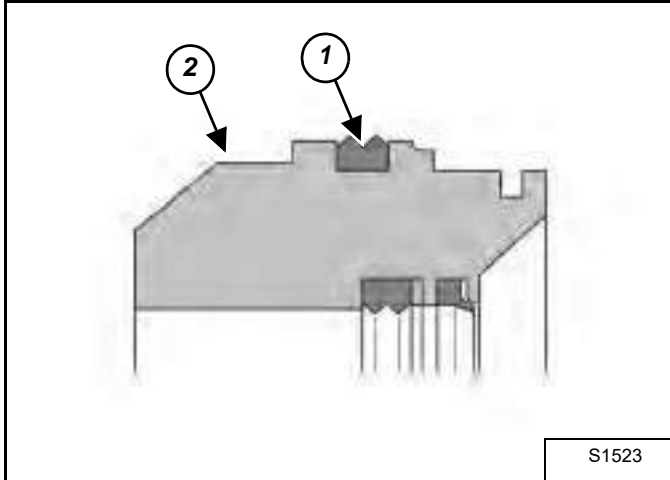


After applying grease, install the sealing ring (Item 1) on the head, the anti-extrusion ring (Item 2) and the wiper (Item 3) [Figure 20-61-19].

NOTE: Make sure the anti extrusion ring (Item 2) is positioned on the correct side of the sealing ring (Item 1) [Figure 20-61-19], as shown.

STEERING CYLINDER (REAR) (CONT'D)

Figure 20-61-20

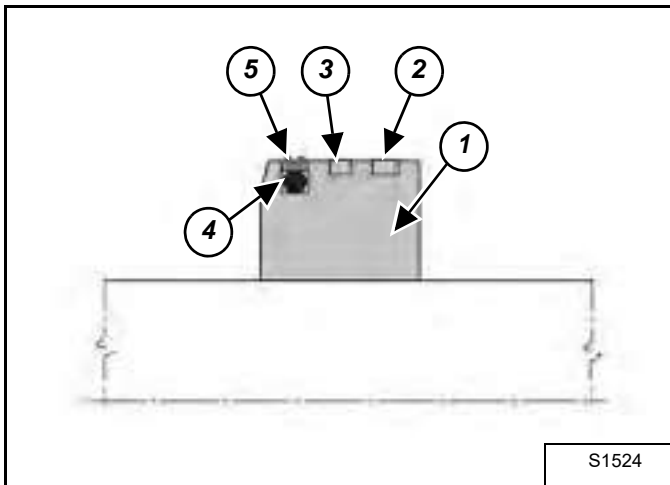


Fit the seal (Item 1) onto the outside of the head (Item 2) [Figure 20-61-20].

NOTE: In order to facilitate assembly, apply grease to the outer surface of the head.

NOTE: Do not roll the seal (Item 1) [Figure 20-61-20]

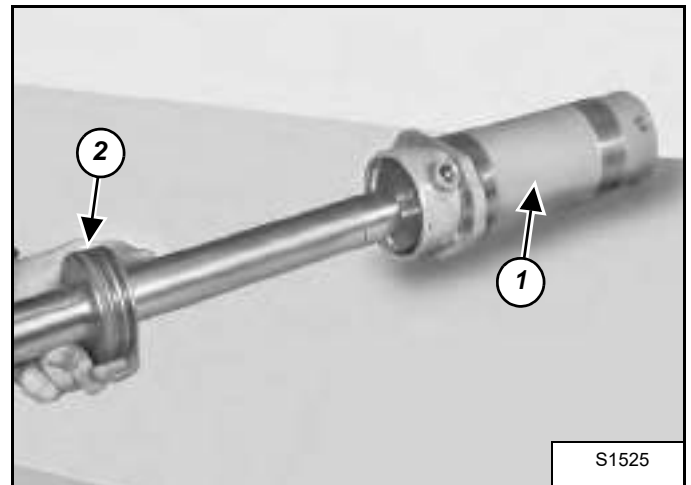
Figure 20-61-21



Prepare the piston (Item 1) by fitting it with the wear ring (Item 2), the magnetic ring (Item 3), the O-ring (Item 4) and the seal (Item 5) [Figure 20-61-21].

NOTE: In order to facilitate assembly, apply grease to the seals.

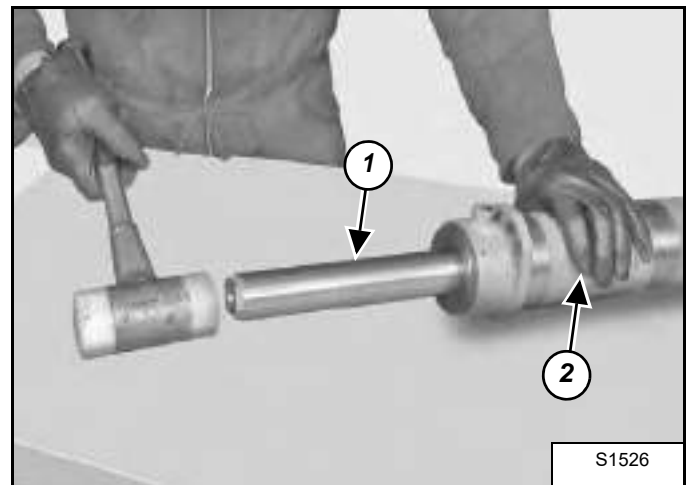
Figure 20-61-22



Install the rod (Item 1) into the cylinder housing (Item 2) [Figure 20-61-22].

NOTE: Apply a little grease to seals and cylinder.

Figure 20-61-23



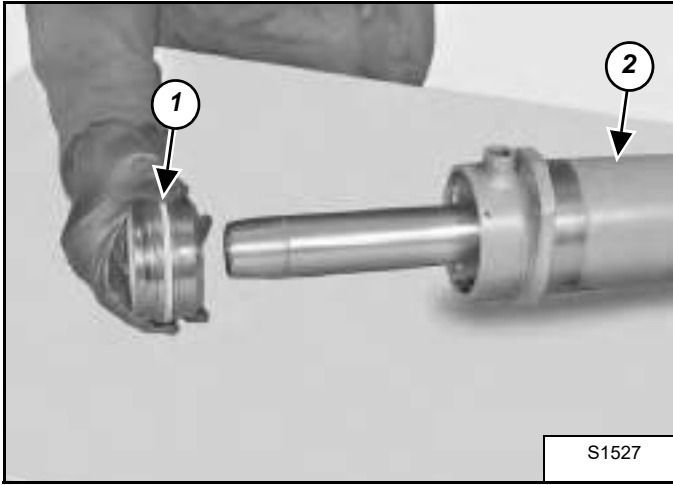
Push the rod (Item 1) into the cylinder (Item 2) [Figure 20-61-23] for 100 mm (3.93 in) using a plastic hammer.

Dealer Copy -- Not for Resale

STEERING CYLINDER (REAR) (CONT'D)

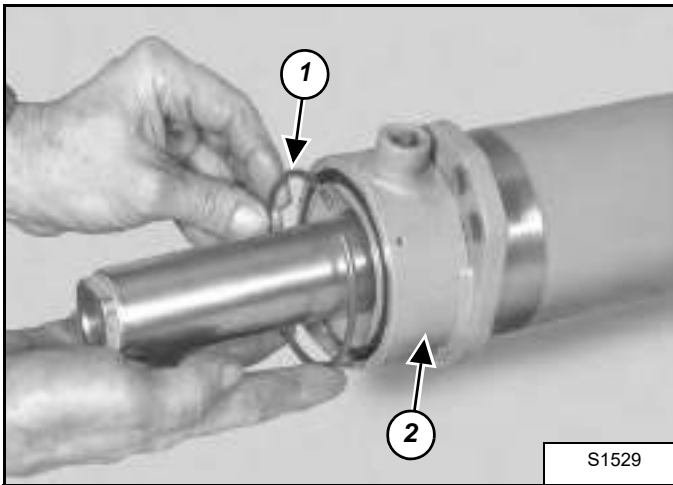
Assembling the Steering Cylinder (Cont'd)

Figure 20-61-24



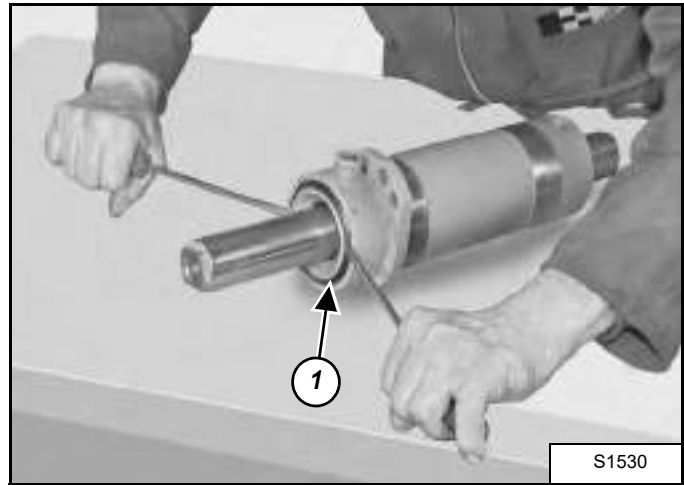
Apply grease to the gland head seals (Item 1), fit the head onto the piston and push in into the cylinder (Item 2) [Figure 20-61-24] using a plastic hammer.

Figure 20-61-25



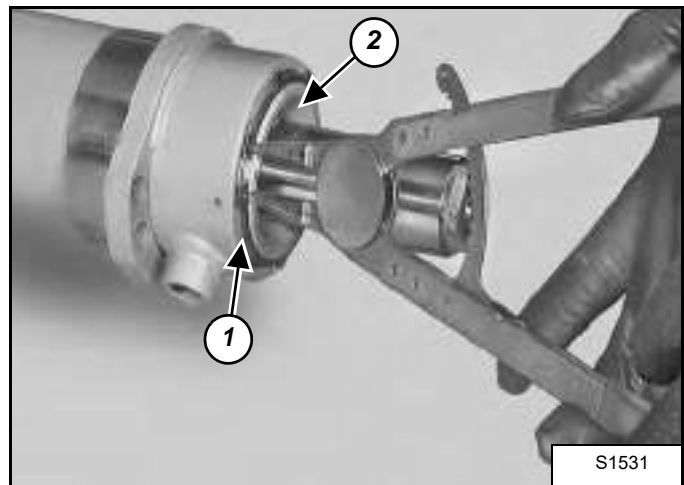
Insert the stop ring (Item 1) ensuring that it fits into the seat of the cylinder (Item 2) [Figure 20-61-25].

Figure 20-61-26



Apply pressure to the head using two screwdrivers or levers until the head is fastened onto the stop ring (Item 1) [Figure 20-61-26].

Figure 20-61-27



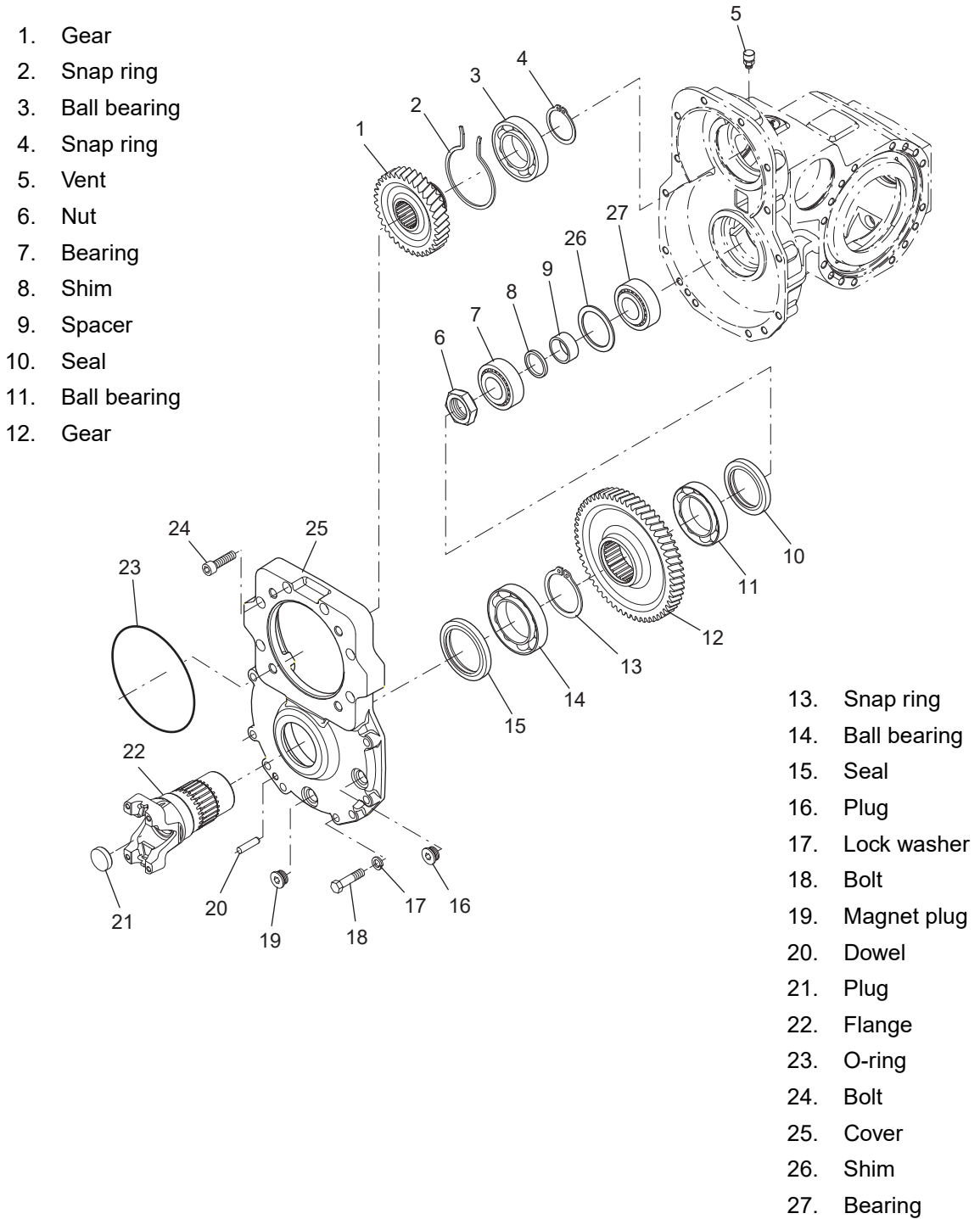
Fit the snap ring (Item 1) on the head (Item 2) [Figure 20-61-27].

NOTE: Make sure that the snap ring (Item 1) [Figure 20-61-27] is securely fastened in its seat. If necessary, force it into its seat using a drift and a hammer.

DRIVE BOX

Parts Identification

Figure 20-70-1



Dealer Copy -- Not for Resale

S2500

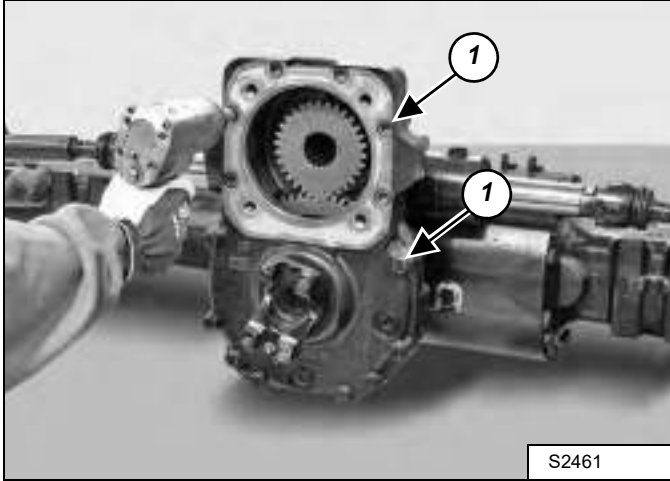
DRIVE BOX (CONT'D)

Disassembly

Remove the front axle (See Removal on Page 40-30-1.).

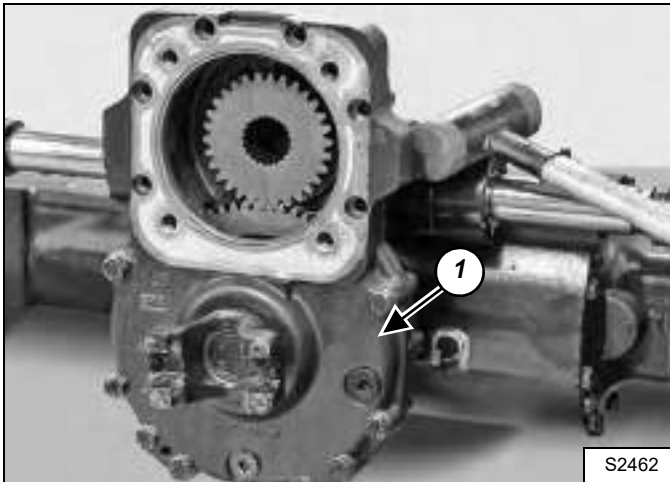
Remove the drive motor. (See Removal And Installation on Page 30-30-1.).

Figure 20-70-2



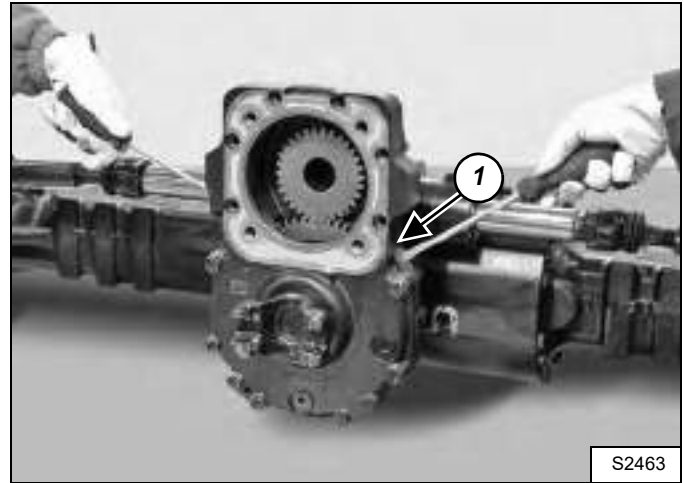
Loosen the securing bolts (Item 1) [Figure 20-70-2] only so that later when you pry the drive side flange cover loose, it does not fall.

Figure 20-70-3



Loosen the drive side flange cover (Item 1) [Figure 20-70-3] using a plastic hammer.

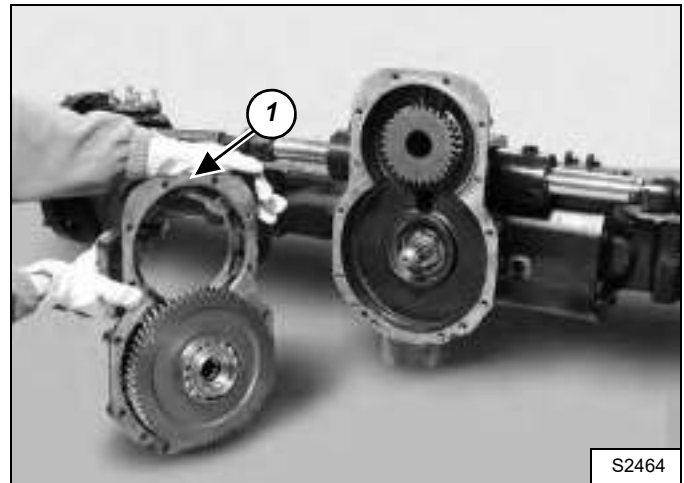
Figure 20-70-4



Take off the drive side flange cover (Item 1) [Figure 20-70-4] by alternatively forcing a screwdriver into the appropriate slots.

NOTE: Be careful not to damage the surfaces.

Figure 20-70-5

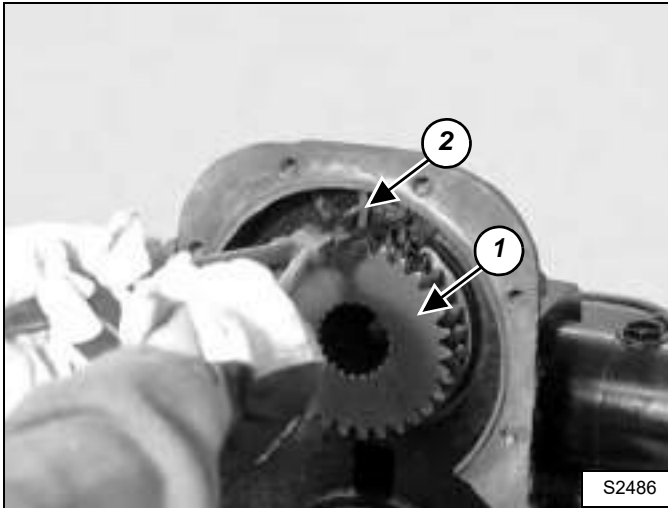


Remove the securing bolts and lift off the cover (Item 1) [Figure 20-70-5].

DRIVE BOX (CONT'D)

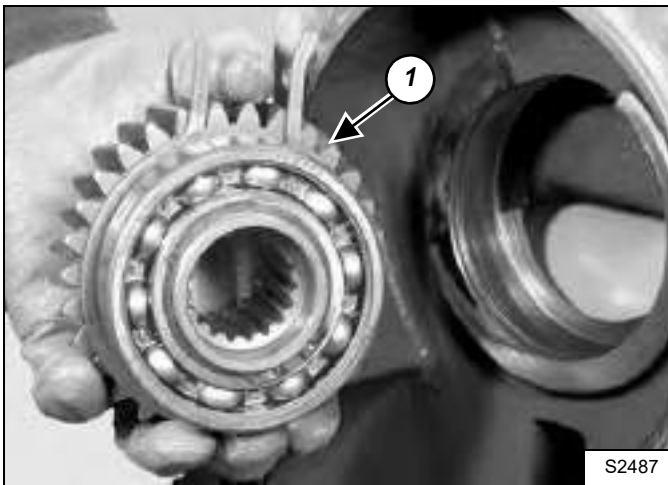
Disassembly (Cont'd)

Figure 20-70-6



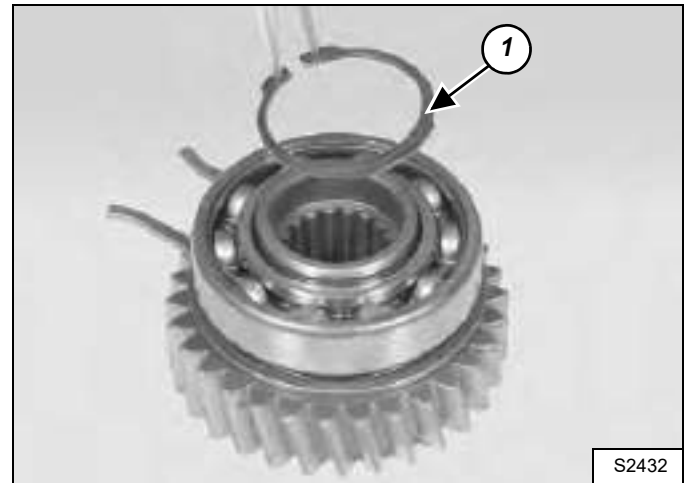
To remove the drive side shaft (Item 1), remove the snap ring (Item 2) [Figure 20-70-6].

Figure 20-70-7



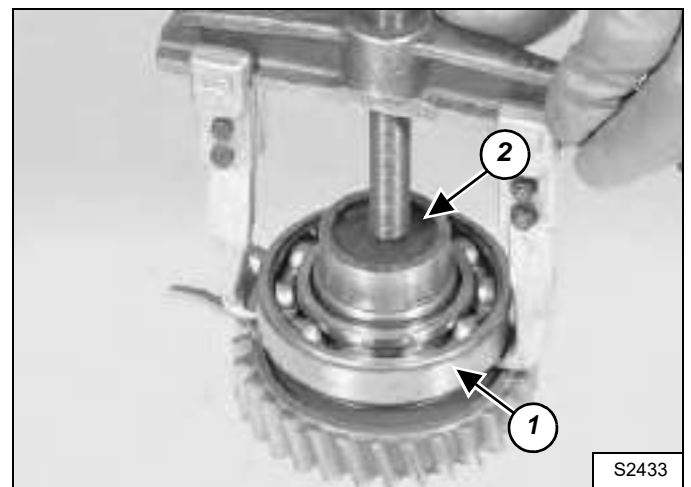
Using two levers, remove the drive side shaft (Item 1) [Figure 20-70-7].

Figure 20-70-8



Remove the snap ring (Item 1) [Figure 20-70-8].

Figure 20-70-9



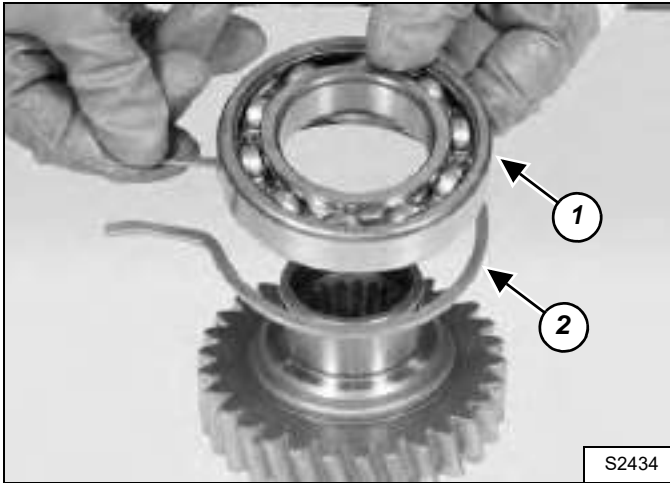
With a puller, remove the bearing (Item 1) from the input shaft (Item 2) [Figure 20-70-9].

Dealer Copy -- Not for Resale

DRIVE BOX (CONT'D)

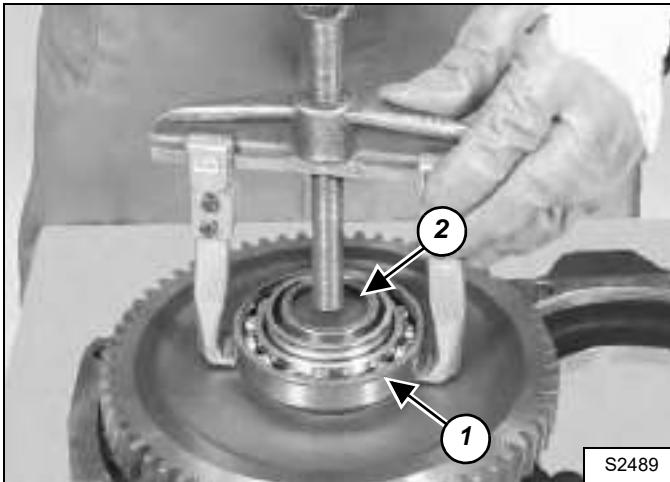
Disassembly (Cont'd)

Figure 20-70-10



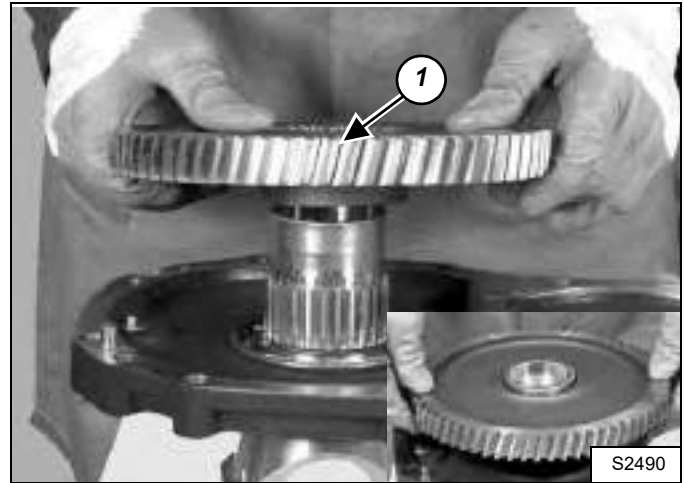
Remove the bearing (Item 1) and the snap ring (Item 2) [Figure 20-70-10].

Figure 20-70-11



With a puller, remove the bearing (Item 1) from the flange shaft (Item 2) [Figure 20-70-11].

Figure 20-70-12



Remove the secondary gear (Item 1) [Figure 20-70-12] using two levers.

Figure 20-70-13

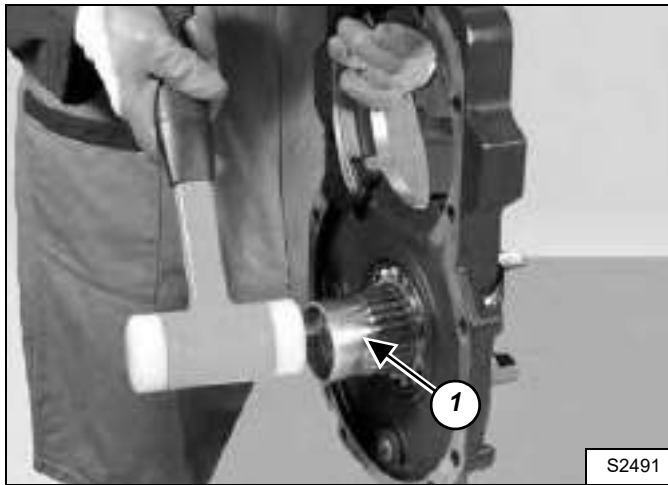


Remove the snap ring (Item 1) [Figure 20-70-13].

DRIVE BOX (CONT'D)

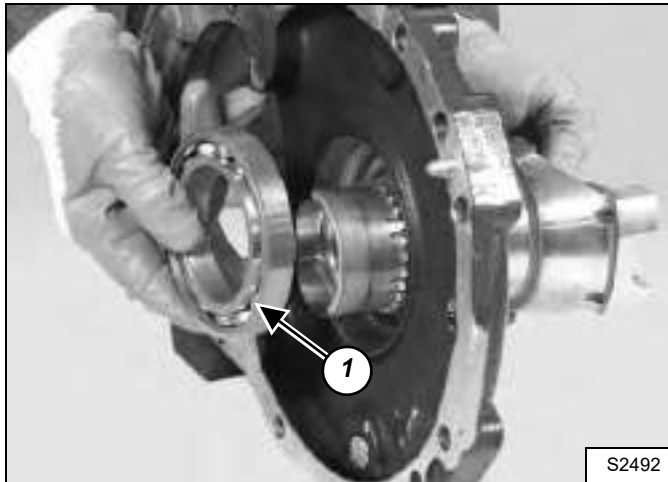
Disassembly (Cont'd)

Figure 20-70-14



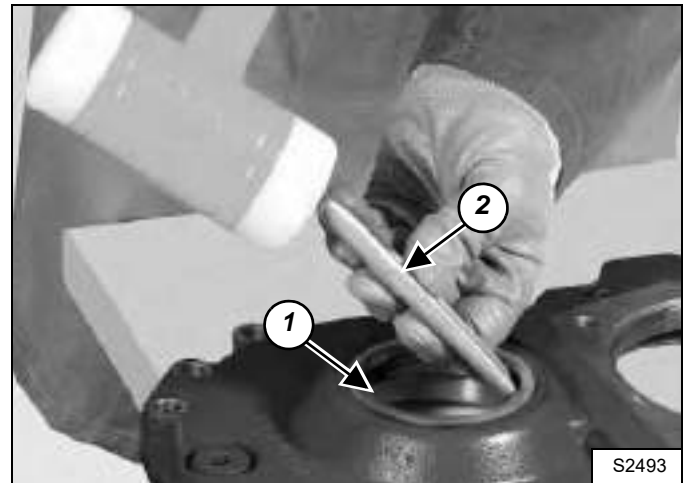
Remove the flange (Item 1) [Figure 20-70-14] by means of a plastic hammer.

Figure 20-70-15



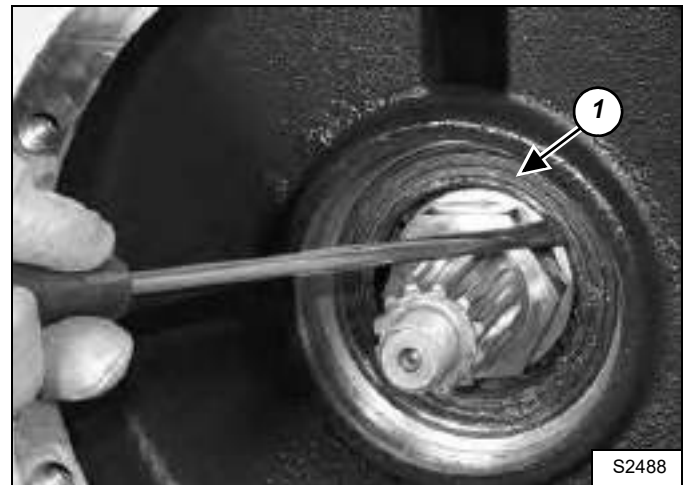
Remove the internal bearing (Item 1) [Figure 20-70-15].

Figure 20-70-16



Remove the seal (Item 1) by using a drift (Item 2) [Figure 20-70-16].

Figure 20-70-17



Using a lever, remove the flange sealing ring (Item 1) [Figure 20-70-17].

Dealer Copy -- Not for Resale

DRIVE BOX (CONT'D)

Assembly

Figure 20-70-18



Insert the sealing ring using a seal installation tool (Bobcat part number 6912179) (Item 1) [Figure 20-70-18].

NOTE: Bring the sealing ring just to the end stop, apply grease to the sealing lips.

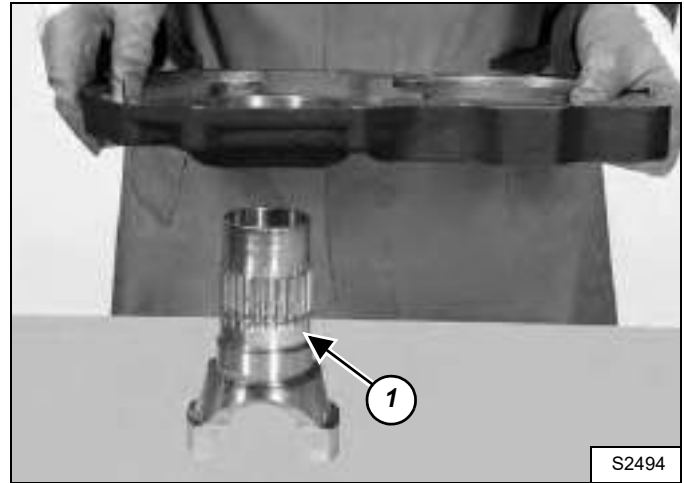
Figure 20-70-19



Insert the sealing ring (Item 1) [Figure 20-70-19] with a normal tool.

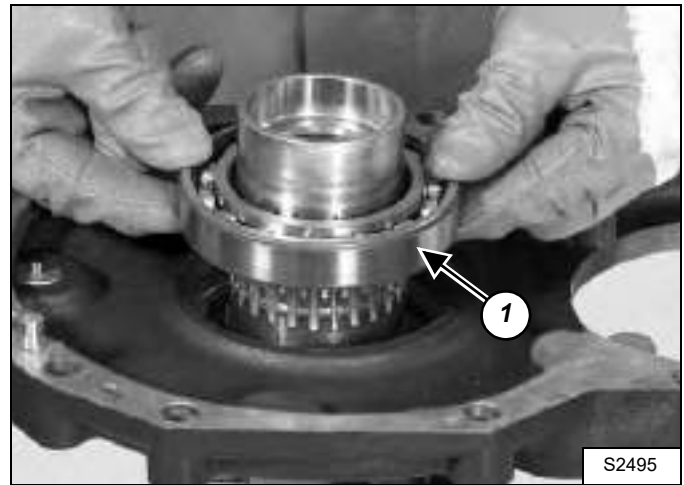
NOTE: Bring the sealing ring just to the end stop, apply grease to the sealing lips.

Figure 20-70-20



Fit the flange (Item 1) [Figure 20-70-20] in the cover.

Figure 20-70-21

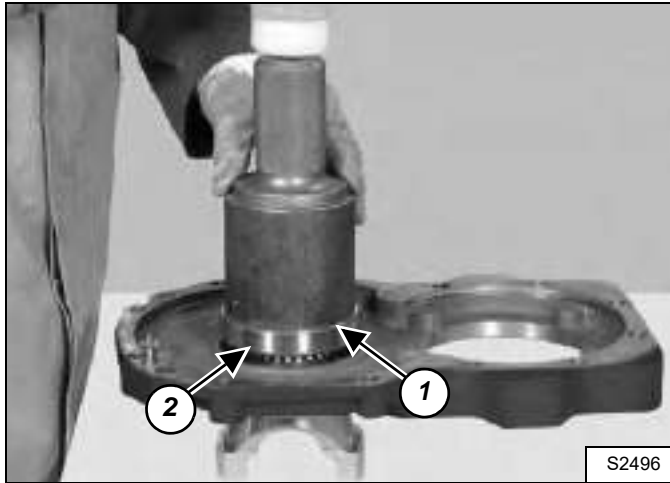


Insert the bearing (Item 1) [Figure 20-70-21].

DRIVE BOX (CONT'D)

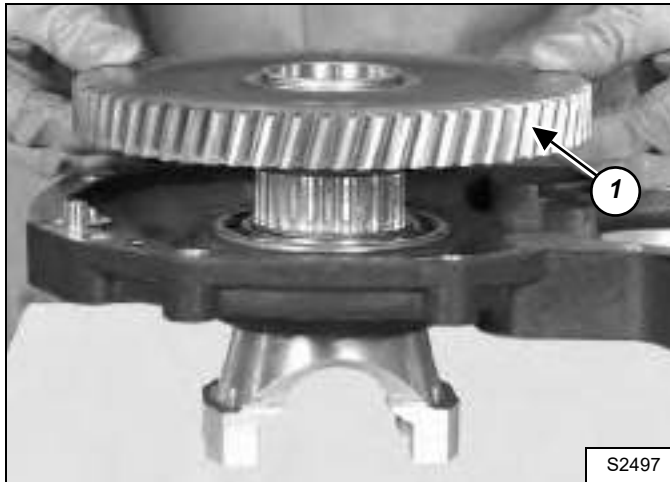
Assembly (Cont'd)

Figure 20-70-22



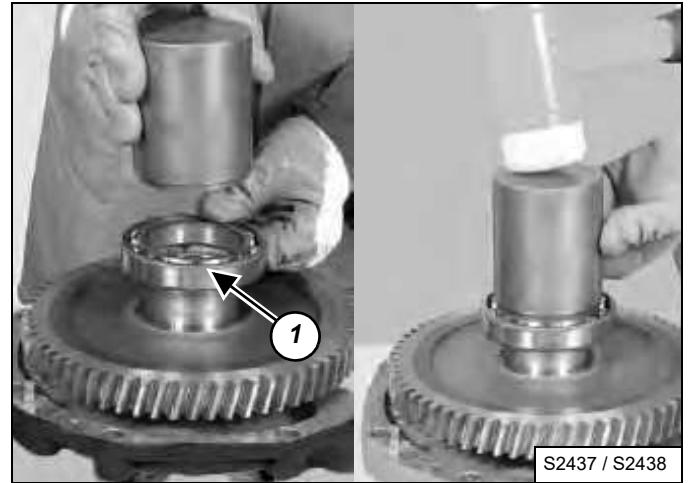
Using a normal tool insert the bearing (Item 1) and snap ring (Item 2) [Figure 20-70-22].

Figure 20-70-23



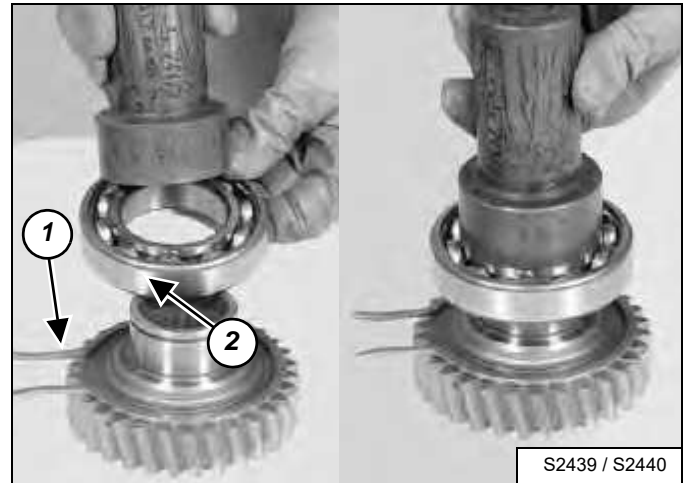
Install the secondary gear (Item 1) [Figure 20-70-23] with a plastic hammer.

Figure 20-70-24



Using a normal tool insert the bearing (Item 1) [Figure 20-70-24].

Figure 20-70-25



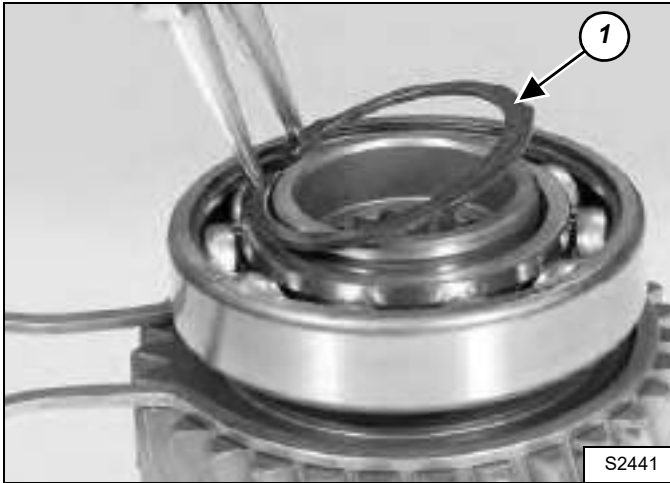
Insert the snap ring (Item 1) and using a normal tool insert the bearing (Item 2) [Figure 20-70-25].

Dealer Copy -- Not for Resale

DRIVE BOX (CONT'D)

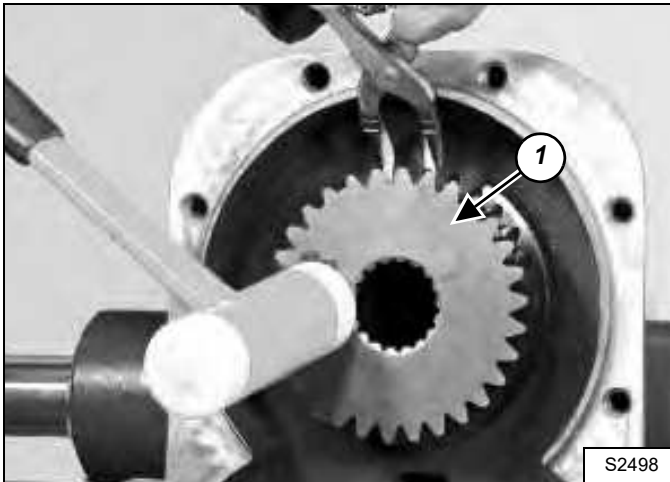
Assembly (Cont'd)

Figure 20-70-26



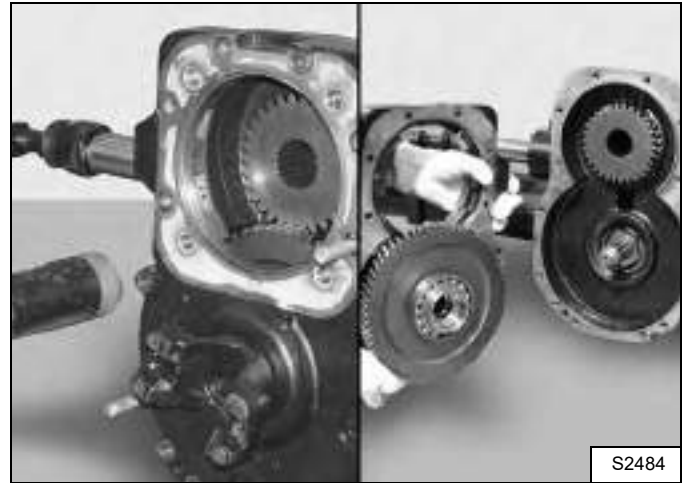
Fix the bearing with the snap ring (Item 1) [Figure 20-70-26].

Figure 20-70-27



Hold the drive side shaft (Item 1) [Figure 20-70-27] using a plier and install the drive side shaft with a plastic hammer.

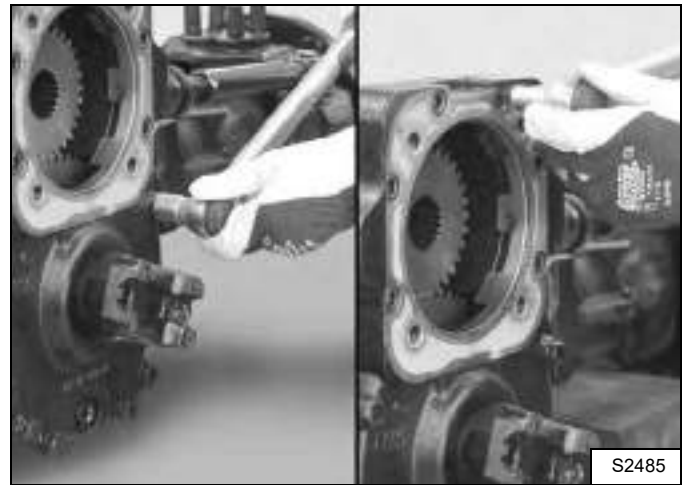
Figure 20-70-28



Apply sealant to the drive side flange cover.

Install drive side flange cover, apply LOCTITE 510 to the bolts [Figure 20-70-28].


Figure 20-70-29



Tighten the bolts with a torque wrench setting of 80-90 N•m (59-66 ft-lb) [Figure 20-70-29].

DRIVE BOX (CONT'D)

Special Tools

BOBCAT PN	IMAGE	DESCRIPTION
6912179		Seal installation tool

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

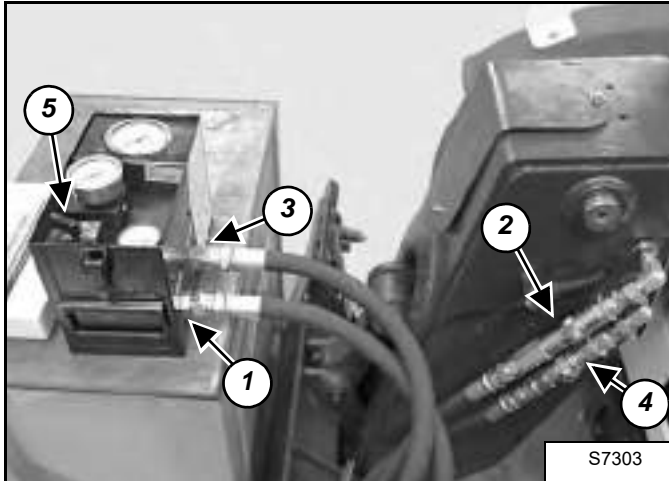
MAIN RELIEF VALVE

Testing And Adjustment

The following tool will be needed to do the following procedure:

MEL10003-Hydraulic Tester.

Figure 20-80-1



Connect the inlet hose (Item 1) from the tester to the front coupler (Item 2) **[Figure 20-80-1]**.

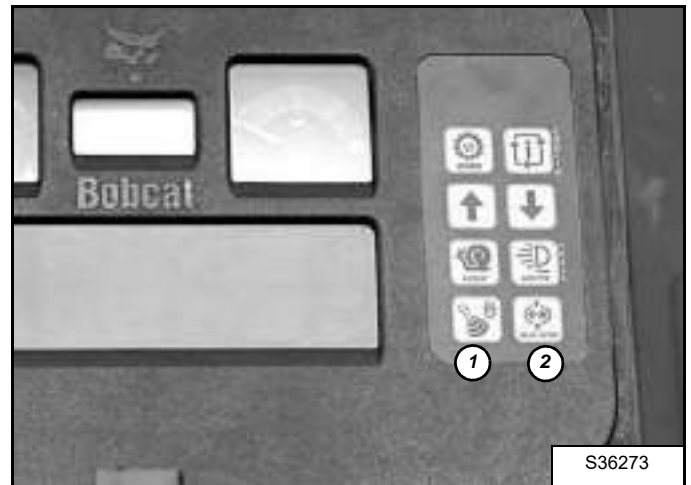
Connect the outlet hose (Item 3) from the tester to the rear coupler (Item 4) **[Figure 20-80-1]**.

IMPORTANT

The hydraulic tester must be in the fully open position before you start the engine.

I-2024-0284

Figure 20-80-2



Fasten the seat belt, then start the engine and run at low idle RPM. Press the hydraulic control lockout Button (Item 1) and front auxiliary hydraulics button (Item 2) **[Figure 20-80-2]**. Make sure the tester is connected correctly. If no flow is indicated on the tester, the hoses are connected wrong. with the hoses connected correctly, increase the engine speed to 2400 RPM.

Warm the fluid to 60°C (140°F) by turning the restrictor control (Item 5) **[Figure 20-80-1]** on the tester to about 6,9 MPa (69 bar) (1000 psi). DO NOT exceed system relief pressure. Open the restrictor control knob and record the free flow (GPM) at 2400 RPM.

There should be at least 55 L/min (13 U.S. gpm) free flow. Turn the restrictor control (Item 5) **[Figure 20-80-1]** on the tester until the main relief opens. The correct pressure should be 23,5 MPa (235 bar) (3408 psi).

If adjustment is needed: (See Testing And Adjustment on Page 20-80-1.)

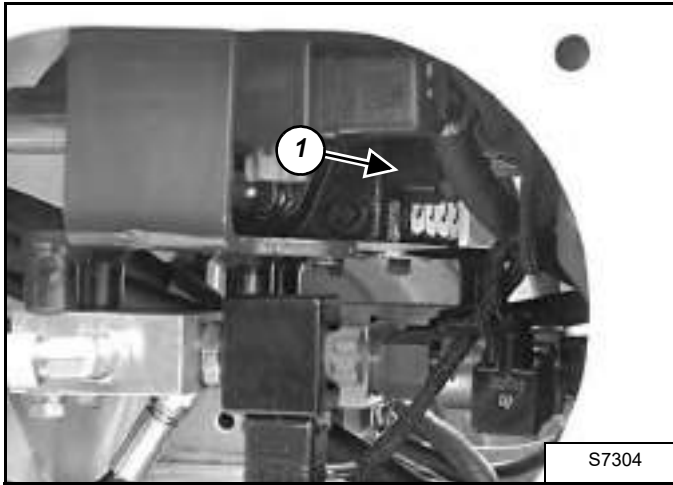
Dealer Copy -- Not for Resale

MAIN RELIEF VALVE (CONT'D)

Testing And Adjustment (Cont'd)

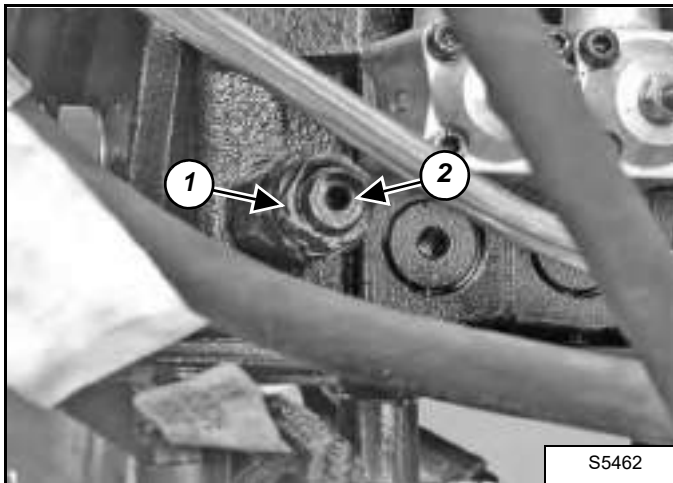
Remove the rear left side cover.

Figure 20-80-3



Locate the main relief valve (Item 1) [Figure 20-80-3] on the rear left side of the control valve.

Figure 20-80-4



Loosen the lock nut (Item 1) and turn the adjustment screw (Item 2) [Figure 20-80-4] clockwise to increase the pressure or counterclockwise to decrease the pressure.

NOTE: A 1/4 of a turn = 1034 KPa (10.34 bar) (150 psi).

Retest the main relief valve after adjustment.

Removal And Installation

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Remove the rear left side cover.

Locate the main relief valve (Item 1) [Figure 20-80-3] on the rear left side of the control valve.

Clean the area around the control valve.

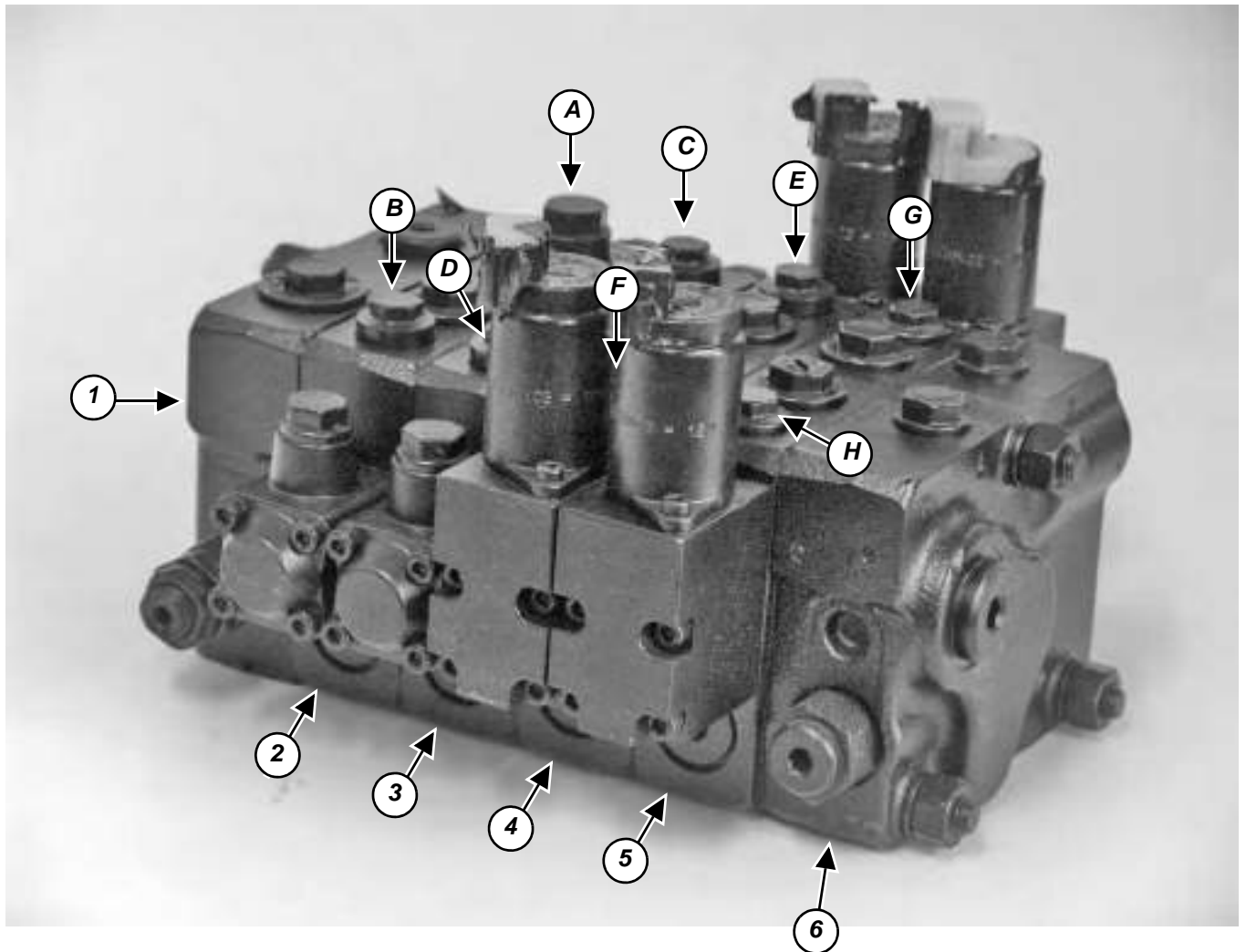
Remove the main relief valve (Item 1) [Figure 20-80-4].

Installation: Tighten the main relief valve to 45 N•m (33 ft-lb) torque.

PORT RELIEF VALVES

Parts Identification

- | | | | |
|----|----------------------------|---|---|
| 1. | Inlet-Outlet Valve Section | A | Port Relief Valve 26 MPa (260 bar) (3771 psi) |
| 2. | Lifting Valve Section | B | Port Relief Valve 22 MPa (220 bar) (3191 psi) |
| 3. | Tilting Valve Section | C | Port Relief Valve 19 MPa (190 bar) (2756 psi) |
| 4. | Telescoping Valve Section | D | Port Relief Valve 24,5 MPa (245 bar) (3554 psi) |
| 5. | Auxiliary Valve Section | E | Port Relief Valve 17,5 MPa (175 bar) (2538 psi) |
| 6. | End Housing | F | Port Relief Valve 21 MPa (210 bar) (3046 psi) |
| | | G | Port Relief Valve 22 MPa (220 bar) (3191 psi) |
| | | H | Port Relief Valve 22 MPa (220 bar) (3191 psi) |



Dealer Copy -- Not for Resale

PORT RELIEF VALVES (CONT'D)

Adjustment Procedure

IMPORTANT

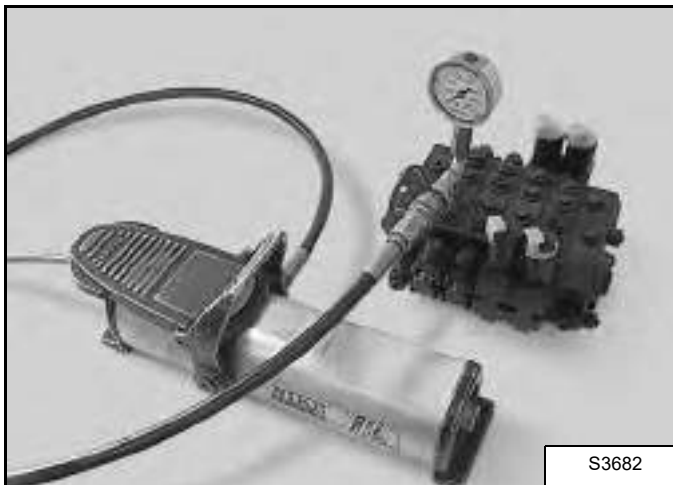
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

A portable hand pump will be used to test the work port relief valves. Use only Bobcat hydraulic fluid in the hand pump.

NOTE: The valve is shown removed from the machine for photo clarity.

Figure 20-90-1



Install the hand pump, hose and a pressure gauge minimum of 34,5 MPa (345 bar) (5000 psi) into the valve section work port in which the port relief valve is located [Figure 20-90-1]. Pressurize this section with the pump until the port relief valve opens and record the pressure reading.

Test results:

PORT RELIEF VALVE	PRESSURE
A	26 MPa (260 bar) (3771 psi)
B	22 MPa (220 bar) (3191 psi)
C	19 MPa (190 bar) (2756 psi)
D	24,5 MPa (245 bar) (3554 psi)
E	17,5 MPa (175 bar) (2538 psi)
F	21 MPa (210 bar) (3046 psi)
G	22 MPa (220 bar) (3191 psi)
H	22 MPa (220 bar) (3191 psi)

If the port relief pressure reading is not according to specifications, replace the spring on the port relief valve.

STEERING MODE VALVE BLOCK

Removal And Installation

⚠ WARNING

Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a physician familiar with this injury is not received immediately.

W-2145-0290

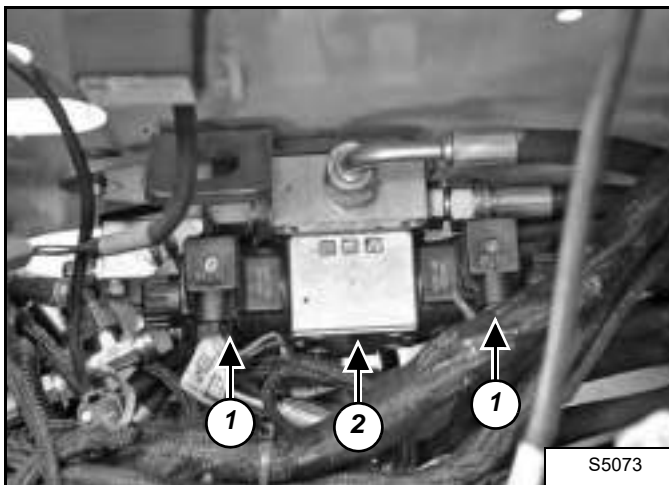
IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Remove the rear cover from the machine.

Figure 20-100-1

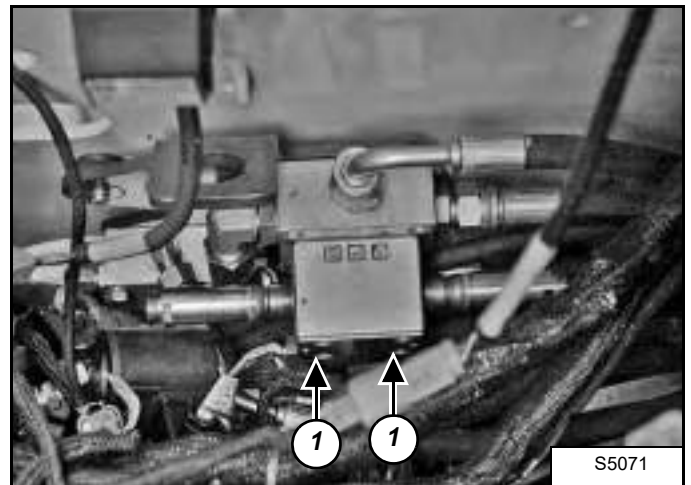


Remove the solenoids (Item 1) [Figure 20-100-1].

NOTE: Mark the location of the wire connectors for correct installation.

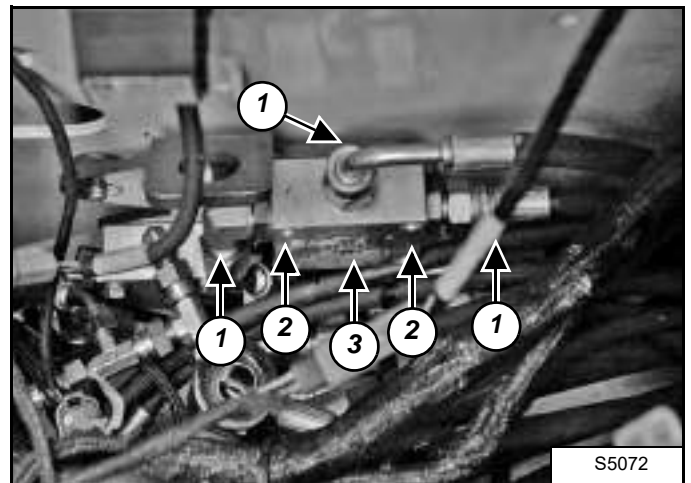
Remove the housing (Item 2) [Figure 20-100-1].

Figure 20-100-2



Remove the four Allen screws (Item 1) [Figure 20-100-2].

Figure 20-100-3



Remove the hydraulic hoses (Item 1) [Figure 20-100-3] from the block.

Remove the four Allen screws (Item 2) [Figure 20-100-3].

Installation: Install bolts with torque of 9,0-10,2 N•m (80-90 in-lb).

NOTE: Mark the location of the valve on the block.

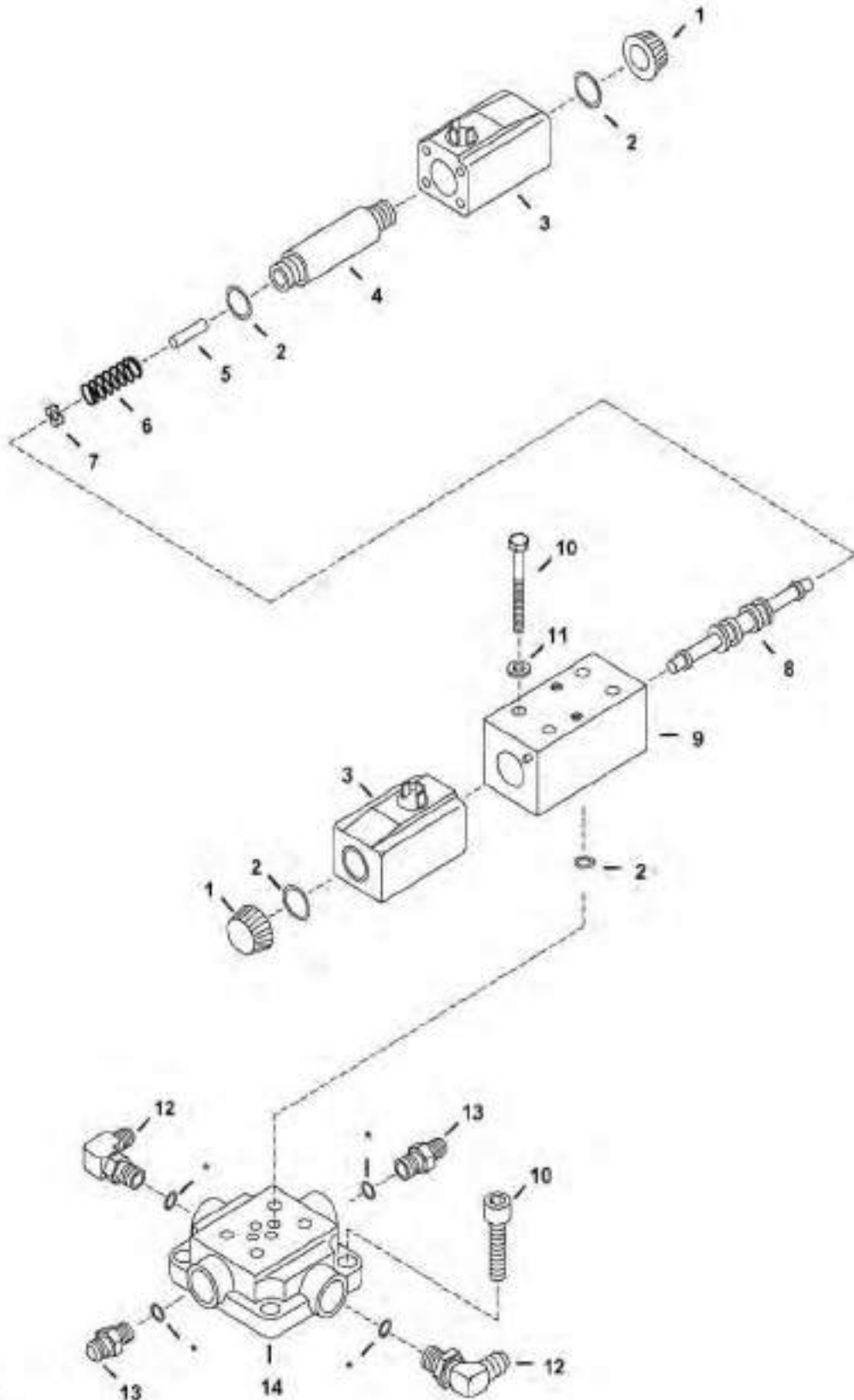
Remove the block (Item 3) [Figure 20-100-3].

Dealer Copy -- Not for Resale

STEERING MODE VALVE BLOCK (CONT'D)

Parts Identification

- 1. Nut
- 2. O-Ring
- 3. Solenoid
- 4. Shaft
- 5. Pin
- 6. Spring
- 7. Retainer
- 8. Spool
- 9. Housing
- 10. Bolt
- 11. Washer
- 12. Elbow
- 13. Adapter
- 14. Housing



* Supplied with fitting.

S5074

Dealer Copy -- Not for Resale

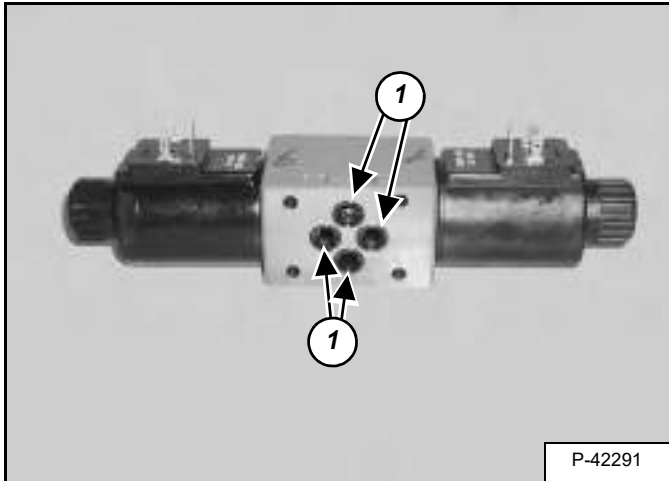
STEERING MODE VALVE BLOCK (CONT'D)

Disassembly

Clean the outside of the valve block before disassembly.

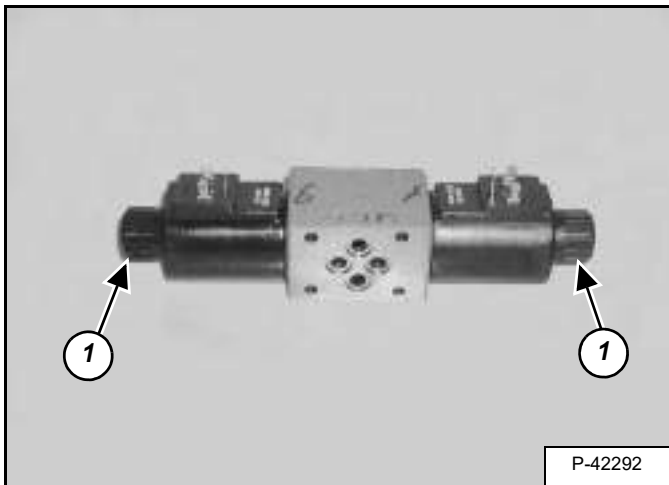
Mark the outside of the valve block for ease of assembly.

Figure 20-100-4



Remove the four O-rings (Item 1) [Figure 20-100-4] from the housing.

Figure 20-100-5



Remove the nut (Item 1) [Figure 20-100-5] from each solenoid.

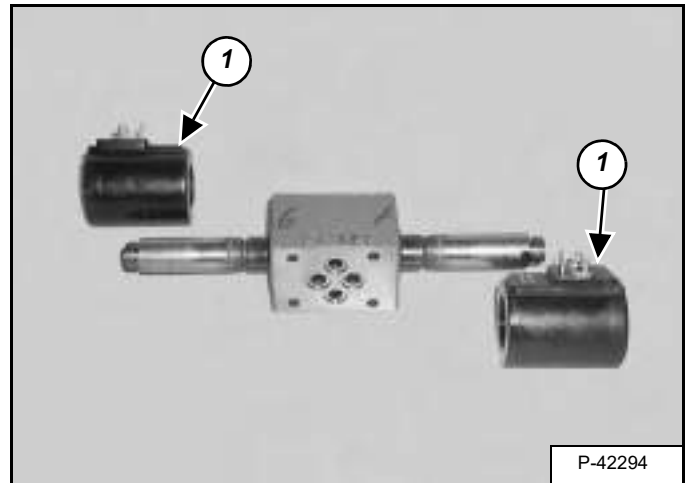
NOTE: Mark the location of the solenoids.

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

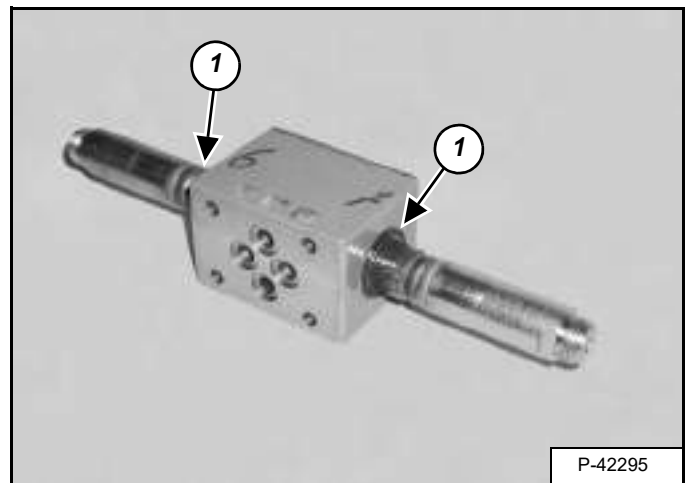
I-2003-0888

Figure 20-100-6



Remove the solenoids (Item 1) [Figure 20-100-6] from the solenoid shafts.

Figure 20-100-7



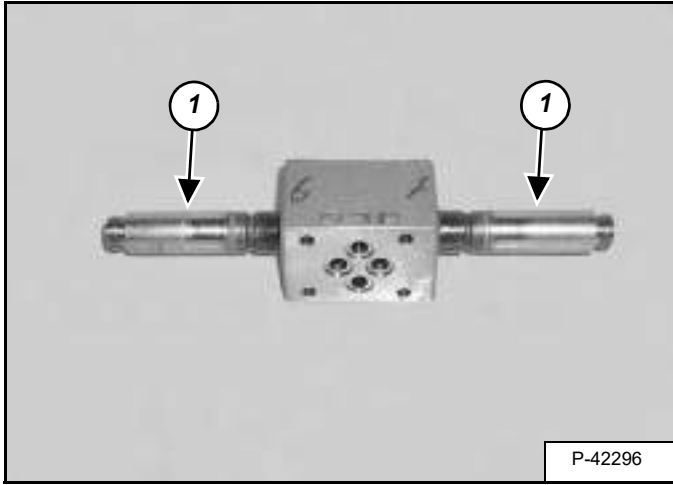
Remove the O-ring (Item 1) [Figure 20-100-7] from the two shafts.

Dealer Copy -- Not for Resale

STEERING MODE VALVE BLOCK (CONT'D)

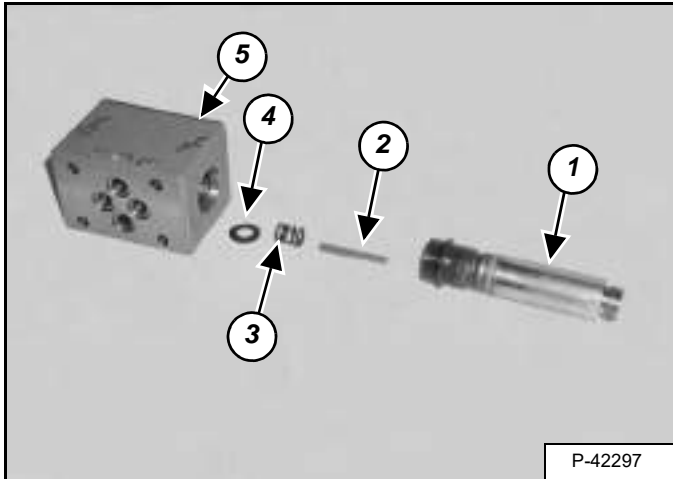
Disassembly (Cont'd)

Figure 20-100-8



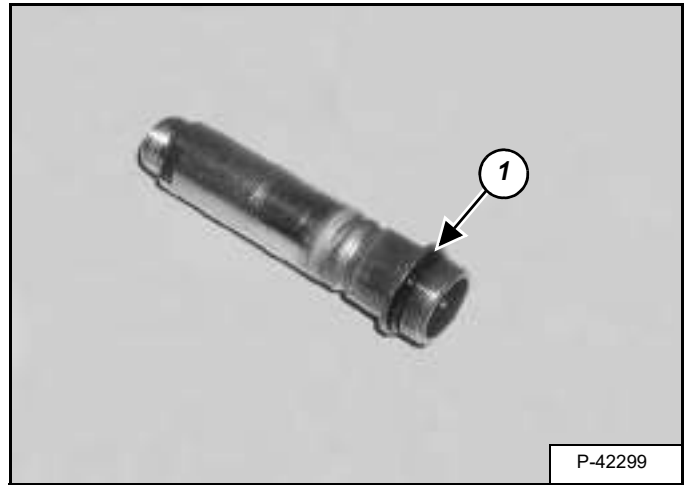
Loosen the shafts (Item 1) [Figure 20-100-8].

Figure 20-100-9



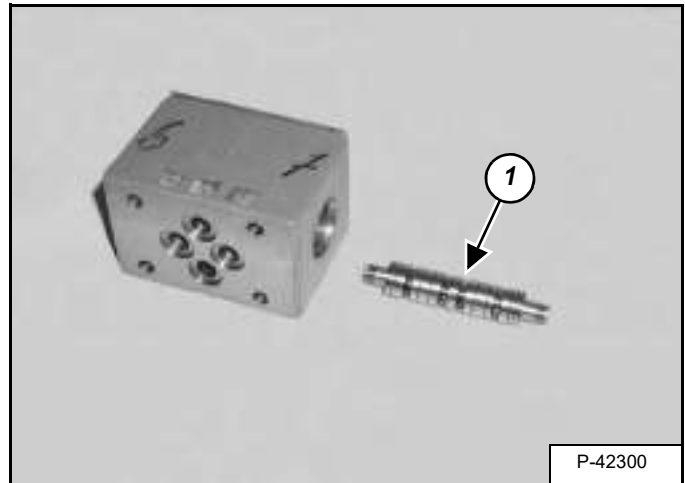
Remove the shaft (Item 1), pin (Item 2), spring (Item 3) and spring retainer (Item 4) from the housing (Item 5) [Figure 20-100-9] (both sides).

Figure 20-100-10



Remove the O-ring (Item 1) [Figure 20-100-10] from each shaft.

Figure 20-100-11



Carefully remove the spool (Item 1) [Figure 20-100-11] from the housing.

STEERING MODE VALVE BLOCK (CONT'D)

Solenoid Testing

Figure 20-100-12



Use a circuit tester, touch one probe to the prong and the other probe to the other prong [Figure 20-100-12], there must be continuity. If there is no continuity, replace the solenoid.

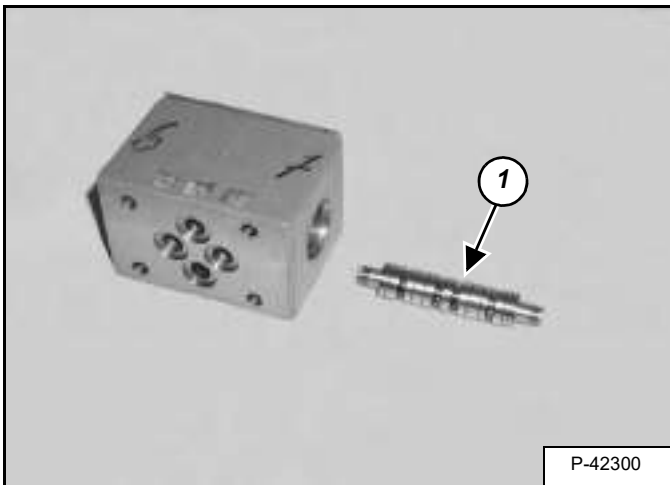
Assembly

Clean all parts in solvent and dry with compressed air.

Inspect all parts for wear or damage. Replace any worn or damaged parts.

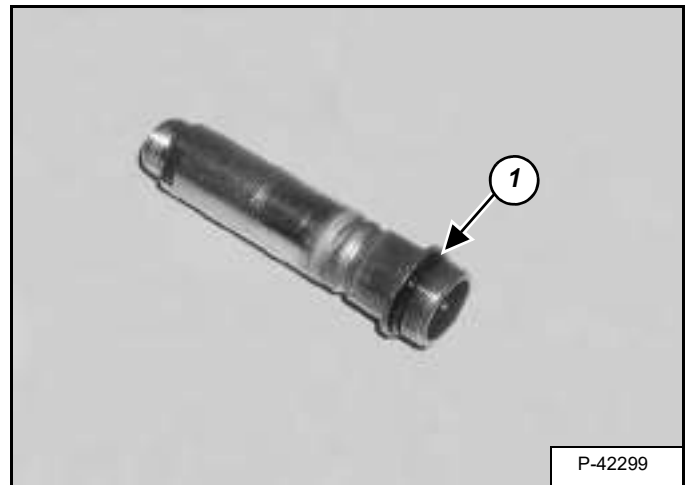
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 20-100-13



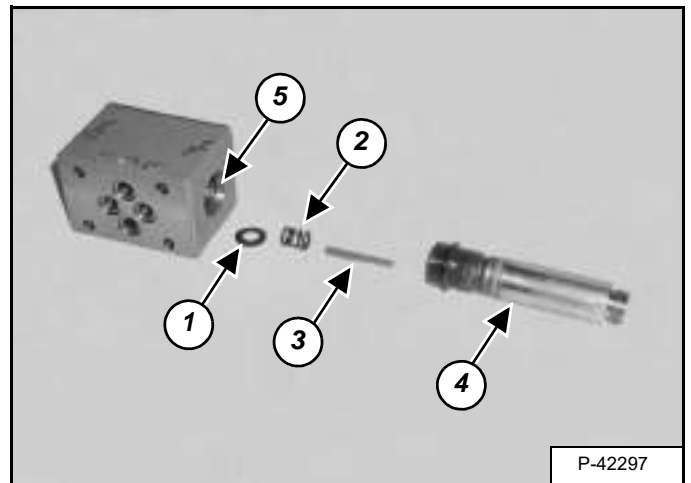
Carefully install the spool (Item 1) [Figure 20-100-13].

Figure 20-100-14



Install a new O-ring (Item 1) [Figure 20-100-14] on each shaft.

Figure 20-100-15



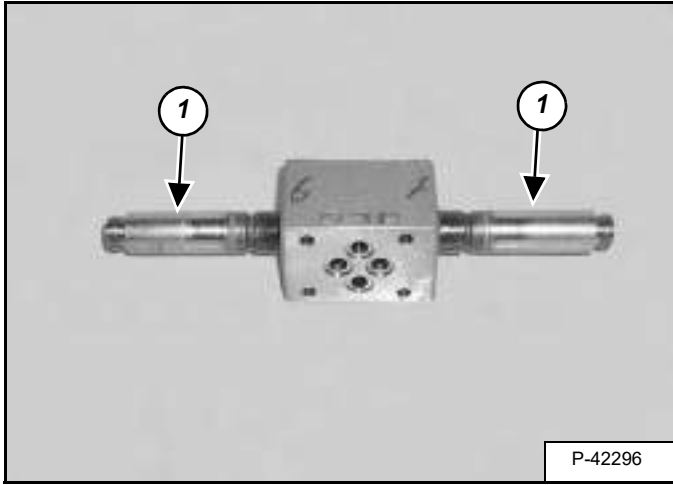
Install the spring retainer (Item 1), spring (Item 2), pin (Item 3) and shaft (Item 4) in the housing (Item 5) [Figure 20-100-15] (both sides).

Dealer Copy -- Not for Resale

STEERING MODE VALVE BLOCK (CONT'D)

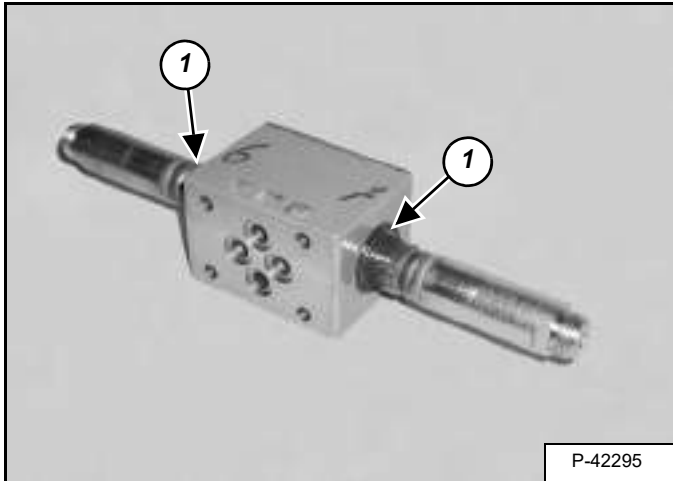
Assembly (Cont'd)

Figure 20-100-16



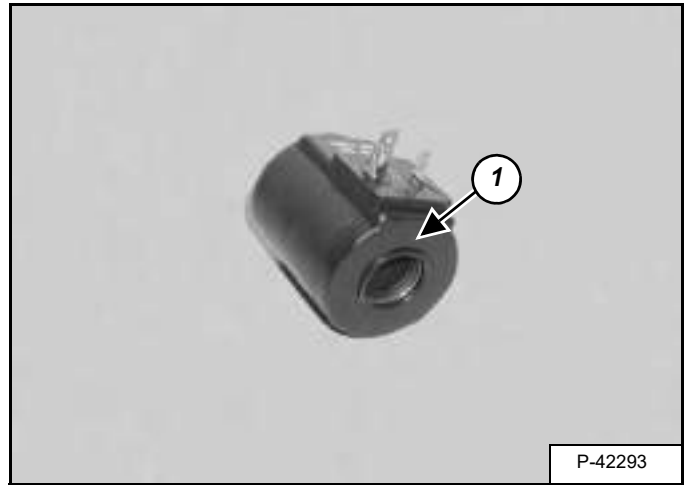
Tighten each shaft (Item 1) [Figure 20-100-16].

Figure 20-100-17



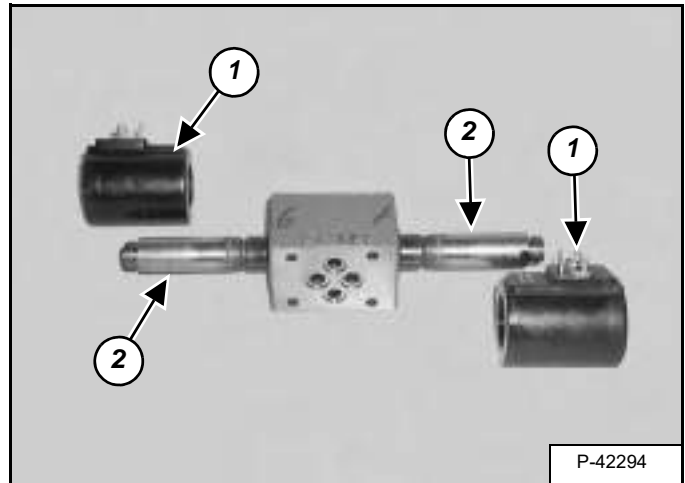
Install an O-ring (Item 1) [Figure 20-100-17] on each shaft.

Figure 20-100-18



Install the O-ring (Item 1) [Figure 20-100-18] on the two solenoids.

Figure 20-100-19

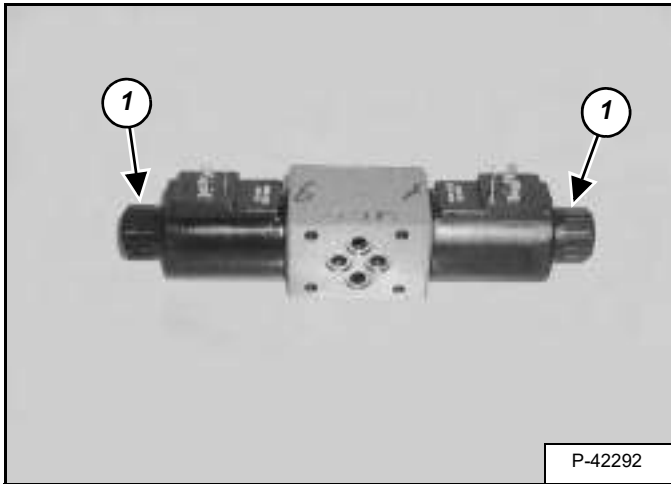


Install the solenoids (Item 1) on the shafts (Item 2) [Figure 20-100-19].

STEERING MODE VALVE BLOCK (CONT'D)

Assembly (Cont'd)

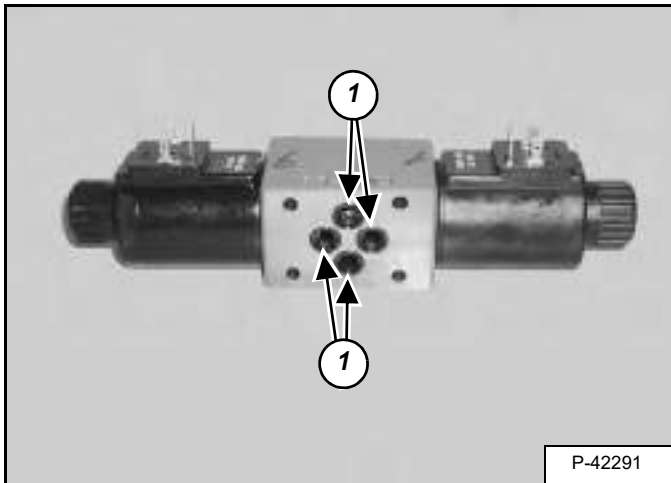
Figure 20-100-20



Install the nuts (Item 1) [Figure 20-100-20] on each shaft and hand tighten.

NOTE: Do not overtighten the nuts.

Figure 20-100-21



Install the four O-rings (Item 1) [Figure 20-100-21] on the housing.



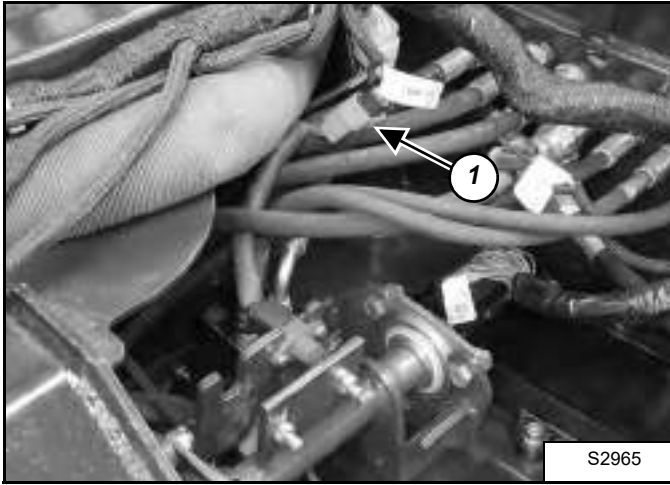
Bobcat®

Dealer Copy -- Not for Resale

BRAKE VALVE

Removal And Installation

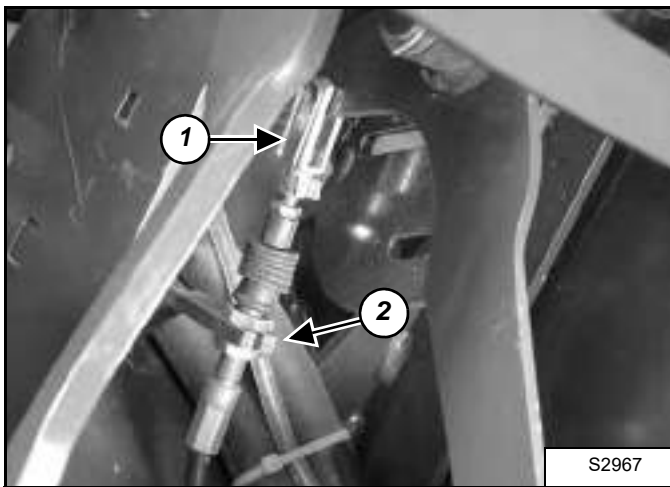
Figure 20-110-1



Remove the dash cover / column cover. (See "Dash Cover Removal And Installation" on page 50-120--2.)

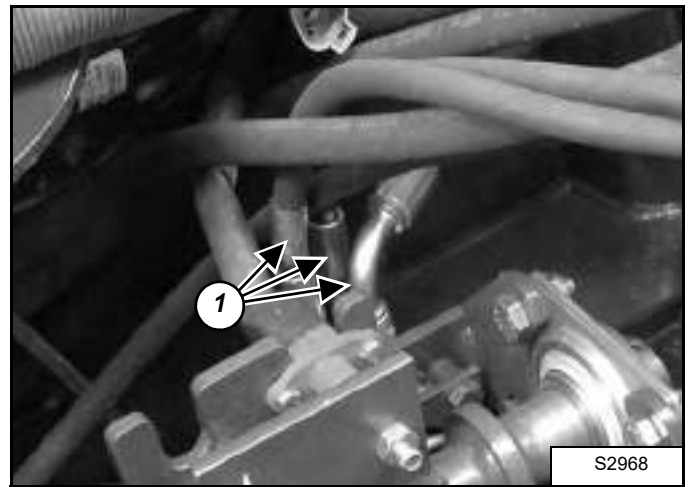
Disconnect the harness connector (Item 1) [Figure 20-110-1] from the inching switch.

Figure 20-110-2



Remove the accelerator cable (Item 1) from the pedal and mounting bracket (Item 2) [Figure 20-110-2].

Figure 20-110-3



Remove the three hoses (Item 1) [Figure 20-110-3] from the brake valve.

NOTE: Mark hoses for correct installation.

IMPORTANT

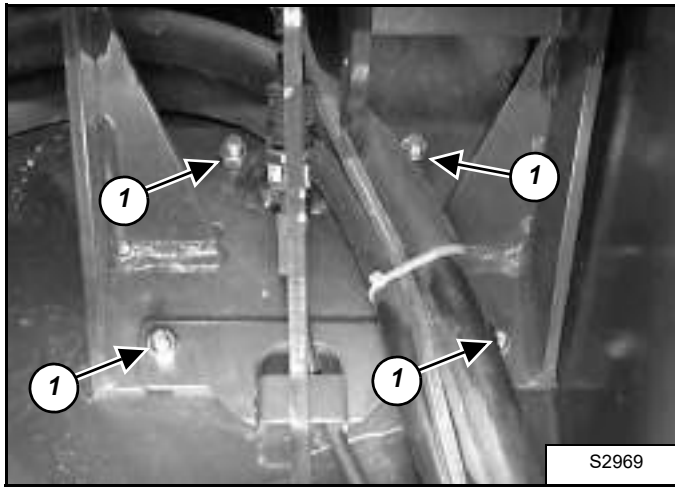
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

BRAKE VALVE (CONT'D)

Removal And Installation (Cont'd)

Figure 20-110-4

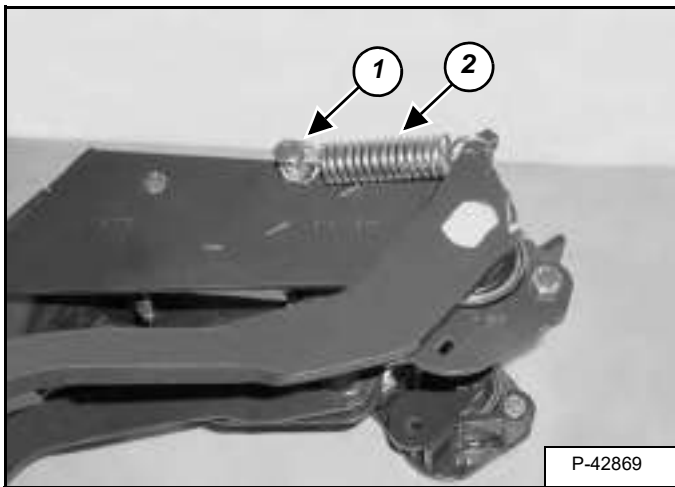


Remove the mounting bolts (Item 1) [Figure 20-110-4].

Remove the pedal assembly.

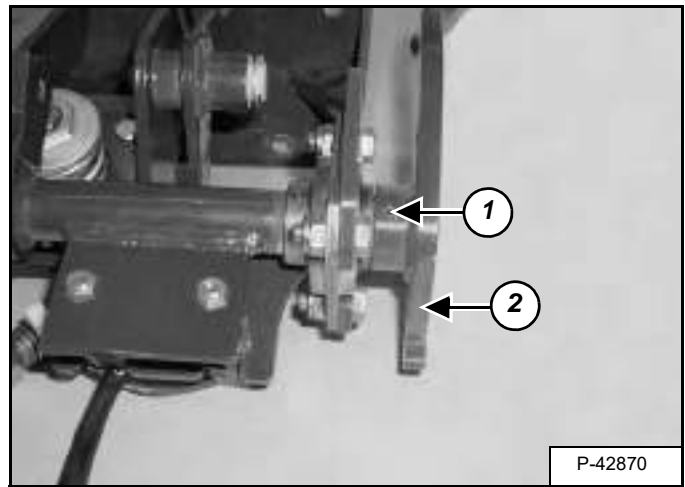
Disassembly And Assembly

Figure 20-110-5



Remove the bolt (Item 1) and spring (Item 2) [Figure 20-110-5].

Figure 20-110-6

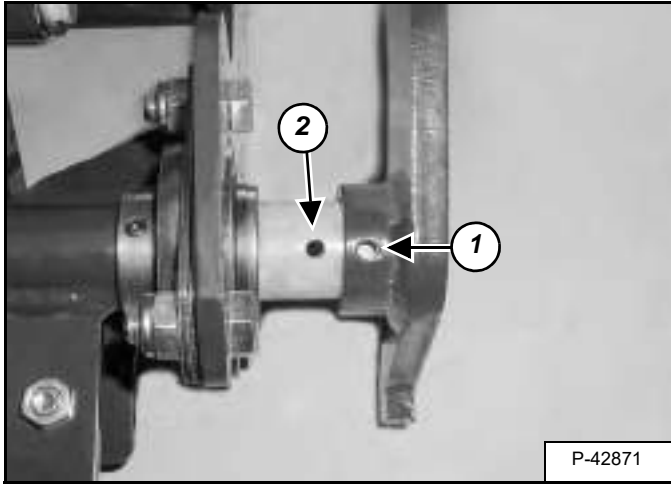


Remove the roll pin (Item 1) and pedal (Item 2) [Figure 20-110-6].

BRAKE VALVE (CONT'D)

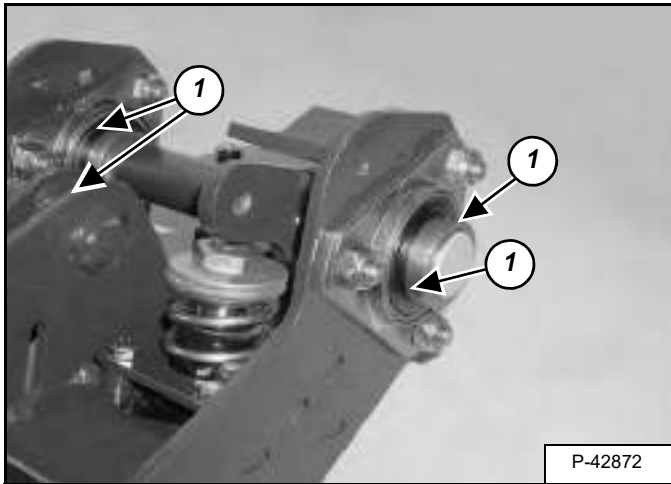
Disassembly And Assembly (Cont'd)

Figure 20-110-7



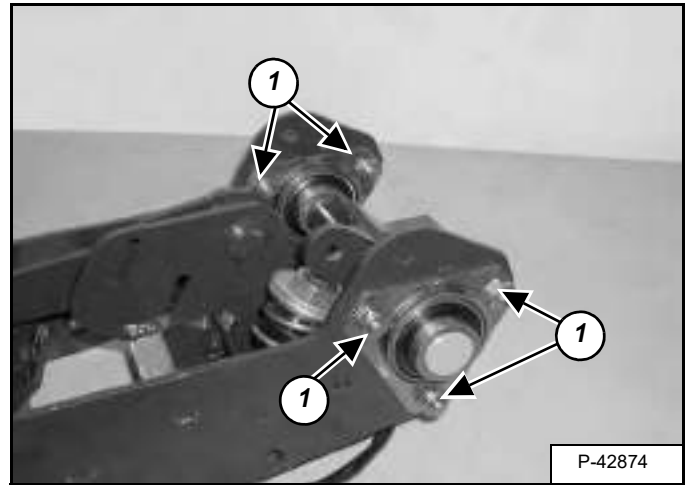
Assembly: Align the hole (Item 1) in the pedal with the hole (Item 2) [Figure 20-110-7] in the shaft.

Figure 20-110-8



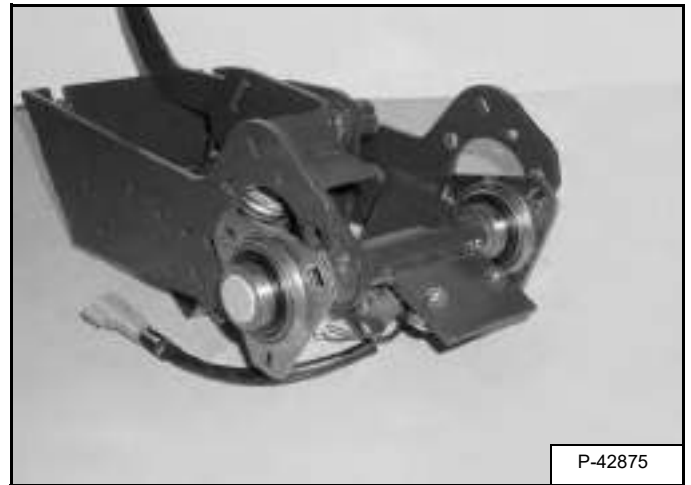
Loosen the two set screws (Item 1) [Figure 20-110-8] on the two bearings.

Figure 20-110-9



Remove the three bolts (Item 1) [Figure 20-110-9] from both bearing flanges.

Figure 20-110-10



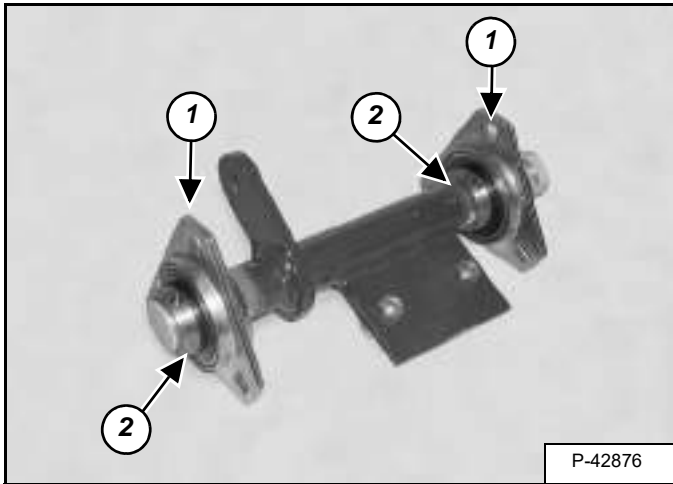
Remove the shaft and bearing assembly [Figure 20-110-10].

Dealer Copy -- Not for Resale

BRAKE VALVE (CONT'D)

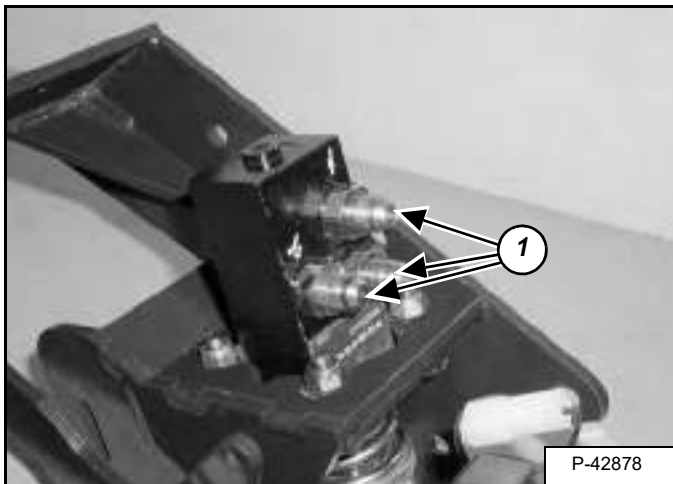
Disassembly And Assembly (Cont'd)

Figure 20-110-11



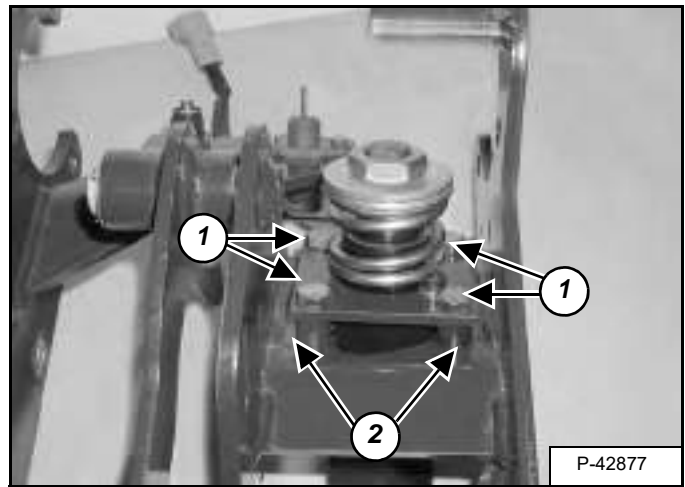
Remove the flanges (Item 1) and bearings (Item 2) [Figure 20-110-11].

Figure 20-110-12



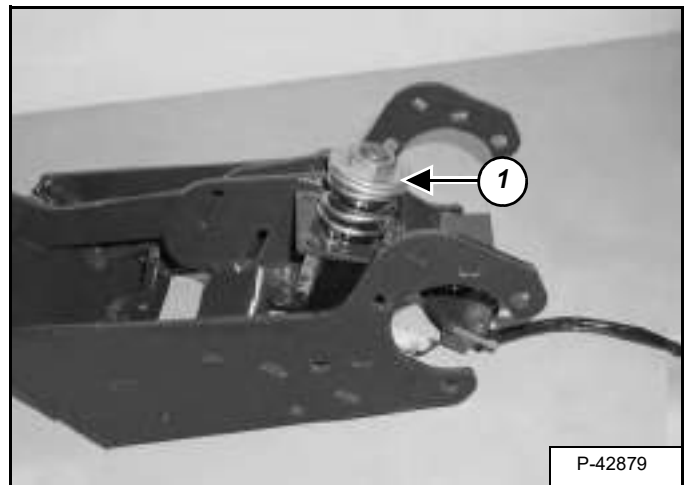
Remove the three fittings (Item 1) [Figure 20-110-12] from the brake valve.

Figure 20-110-13



Remove the four bolts (Item 1), spacers (Item 2) [Figure 20-110-13] and nuts from the brake valve.

Figure 20-110-14



Remove the brake valve (Item 1) [Figure 20-110-14].

Inspect the brake valve assembly for wear or damage. Replace the brake valve assembly if necessary.

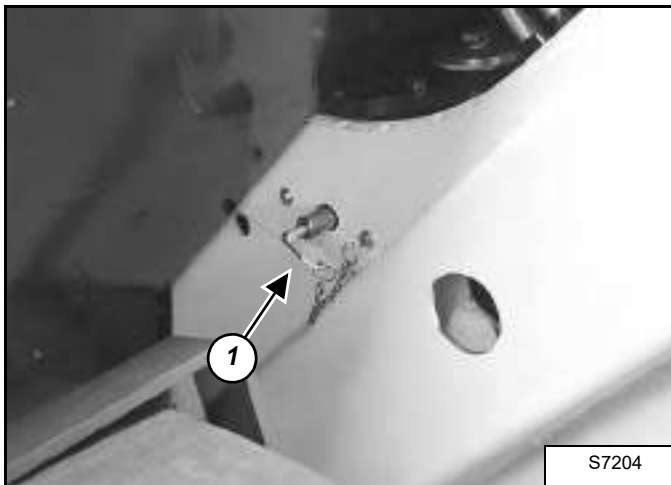
Note: The brake valve assembly is not serviceable.

GEAR PUMP

Removal And Installation

Raise the boom and install the boom stop. (See "Installing The Approved Boom Stop" on page 10-150-1.)

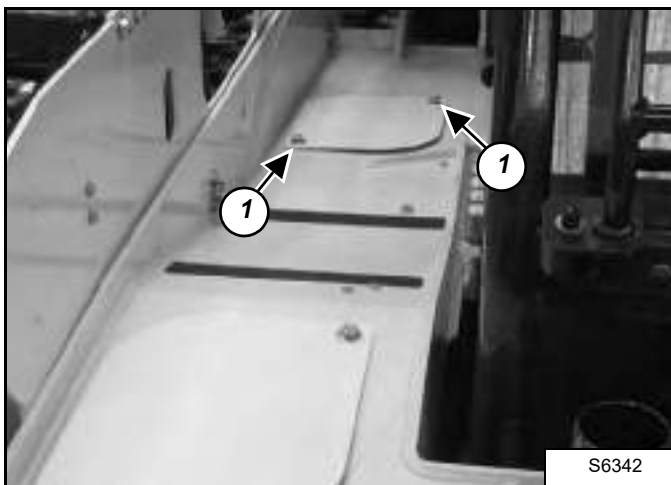
Figure 20-120-1



Rotate the battery disconnect switch (Item 1) [Figure 20-120-1] to the right, to disconnect the power supply from the battery.

Drain the hydraulic reservoir.

Figure 20-120-1



Remove the covers by removing the bolts (Item 1) [Figure 20-120-1].

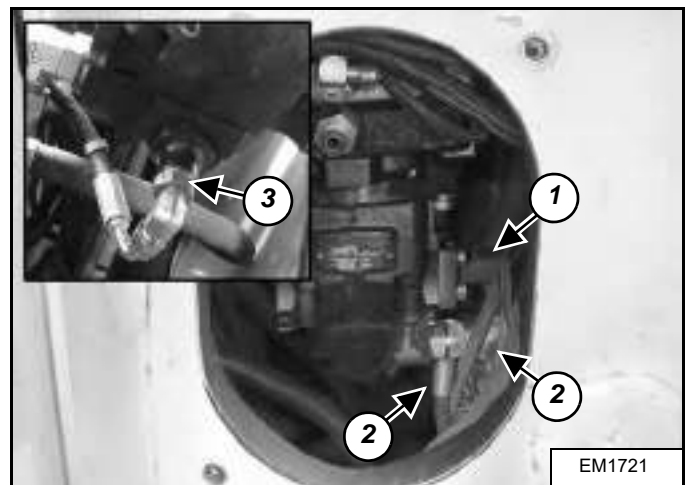
IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

NOTE: Mark all electrical connectors, hoses and tubelines for correct assembly.

Figure 20-120-2



Remove the inlet tube (Item 1) [Figure 20-120-2] by removing the four flange bolts.

Remove the two hoses (Item 2) [Figure 20-120-2] from the gear pump.

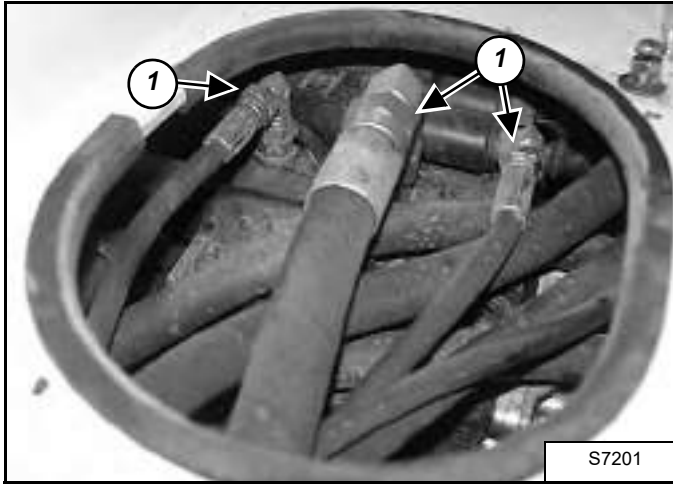
Remove the small diameter hose at the bottom side of the gear pump (Item 3) [Figure 20-120-2].

Dealer Copy -- Not for Resale

GEAR PUMP (CONT'D)

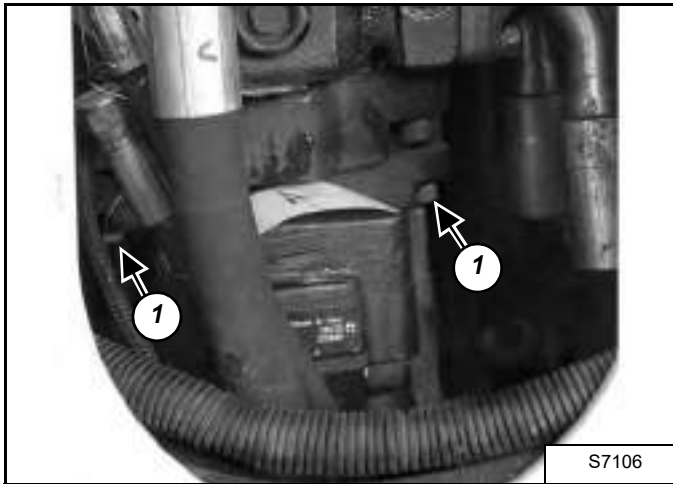
Removal And Installation (Cont'd)

Figure 20-120-3



For easier access to the gear pump, loosen the three hoses connections (Item 1) [Figure 20-120-3] from the hydrostatic pump.

Figure 20-120-4



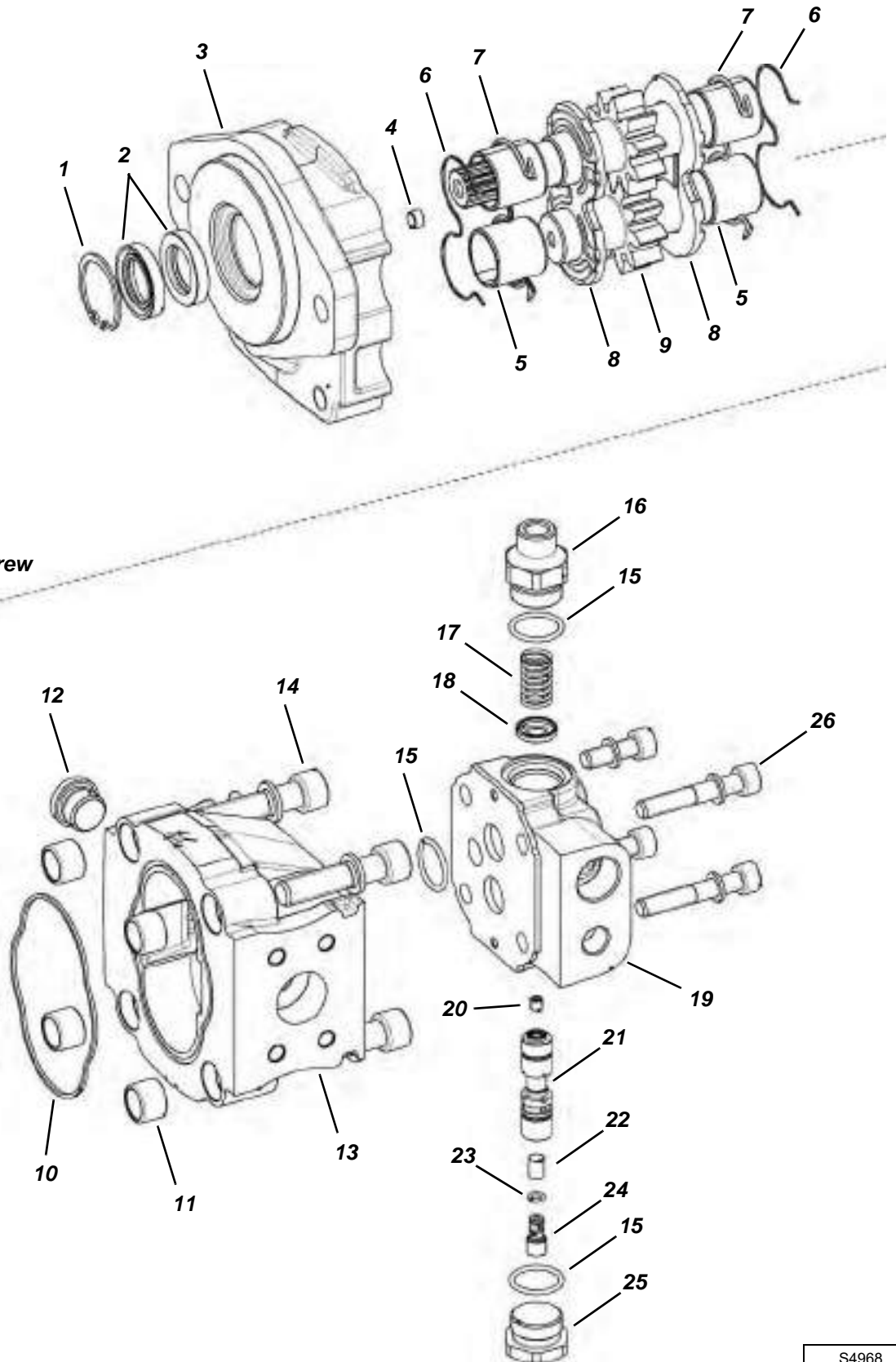
Remove the two gear pump mounting hex bolts (Item 1) [Figure 20-120-4]. Remove the gear pump.

Installation: Tighten the mounting bolts to 70,8 - 80 N•m (52 - 59 ft-lb) torque.

GEAR PUMP (CONT'D)

Parts Identification

1. Snap Ring
2. Seal Ring
3. Mount Plate
4. Set Screw
5. Bearing
6. Backup Ring
7. Seal Ring
8. Thrust Plate
9. Gear
10. Seal Ring
11. Bushing
12. Plug
13. Housing
14. Screw
15. O-ring
16. Fitting
17. Spring
18. Spring Seat
19. End Cover
20. Set Screw
21. Spool
22. Screen
23. O-ring
24. Adjustment Screw
25. Plug
26. Screw



S4968

Dealer Copy -- Not for Resale

GEAR PUMP (CONT'D)

Disassembly And Assembly

Clean all parts in solvent and dry with compressed air.

Inspect all parts for wear or damage. Replace any worn or damaged parts.

Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Clean the outside of the gear pump before disassembly.

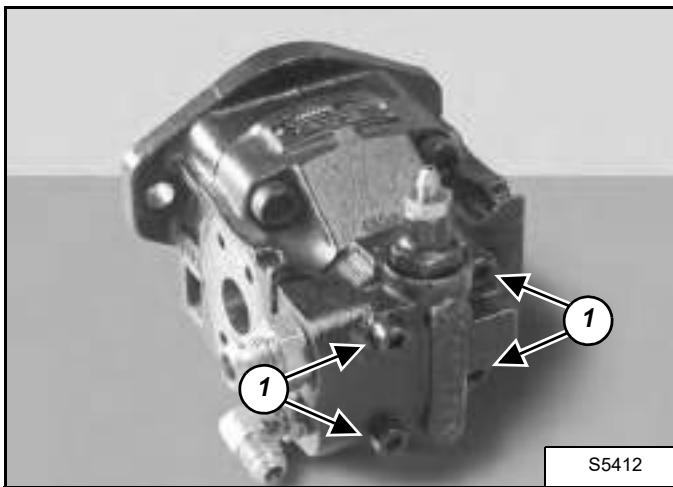
Mark the outside of the gear pump for ease of assembly.

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

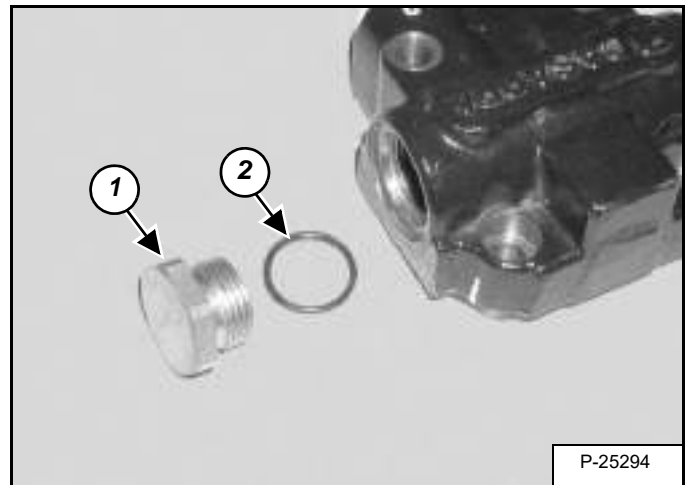
Figure 20-120-5



Remove the four bolts (Item 1) [Figure 20-120-5] and remove the end cover from the housing.

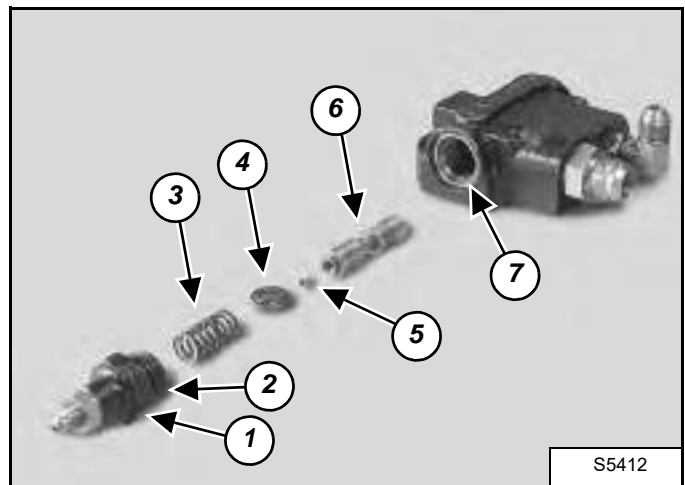
Assembly: Tighten the bolts to 70 N•m (51 ft-lb) torque.

Figure 20-120-6



Remove the plug (Item 1) and O-ring (Item 2) [Figure 20-120-6] from the housing.

Figure 20-120-7



Remove the plug (Item 1), O-ring (Item 2), spring (Item 3), spring seat (Item 4), set screw (Item 5), spool assembly (Item 6) and O-ring from the housing (Item 7) [Figure 20-120-7].

NOTE: Always use new O-rings.

Dealer Copy -- Not for Resale

GEAR PUMP (CONT'D)

Disassembly And Assembly (Cont'd)

Figure 20-120-8

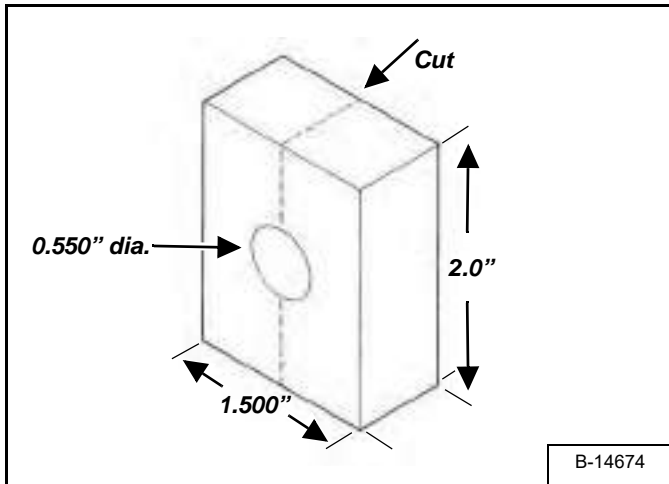
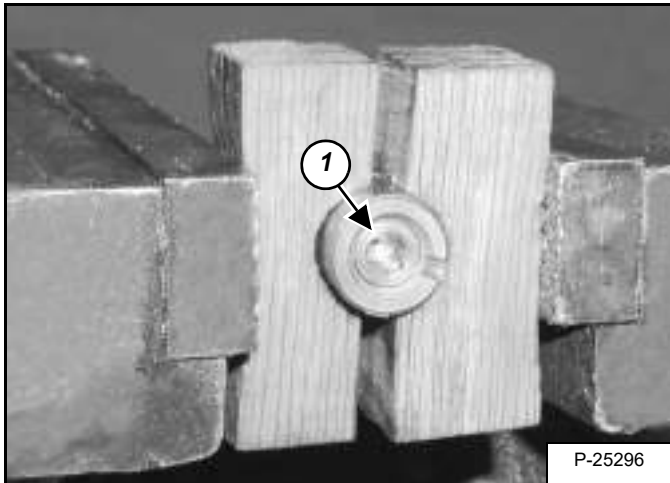


Figure 20-120-9



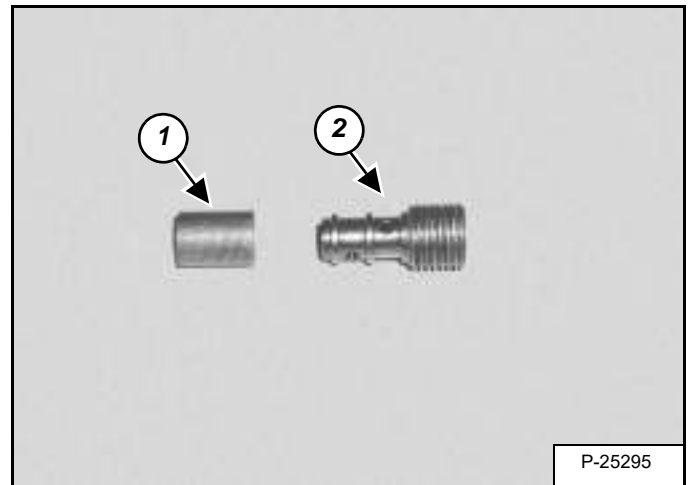
To remove the orifice assembly (Item 6) [Figure 20-120-7] from the spool, a holding fixture will have to be made from a 19 mm thick x 38 mm wide x 50 mm long (0.750 in thick x 1.500 in wide x 2.0 in long) piece of hardwood. Drill a 14 mm (0.550 in) hole in the center of the hardwood block. Cut the block lengthwise [Figure 20-120-8].

Place both halves of the hardwood block around the spool. Clamp the blocks in a vise [Figure 20-120-9].

NOTE: Do not use anything other than hardwood blocks to grip the spool, or the spool will be damaged.

Remove the orifice assembly.

Figure 20-120-10



Remove the screen (Item 1) from the orifice (Item 2) [Figure 20-120-10] and clean.

Figure 20-120-11



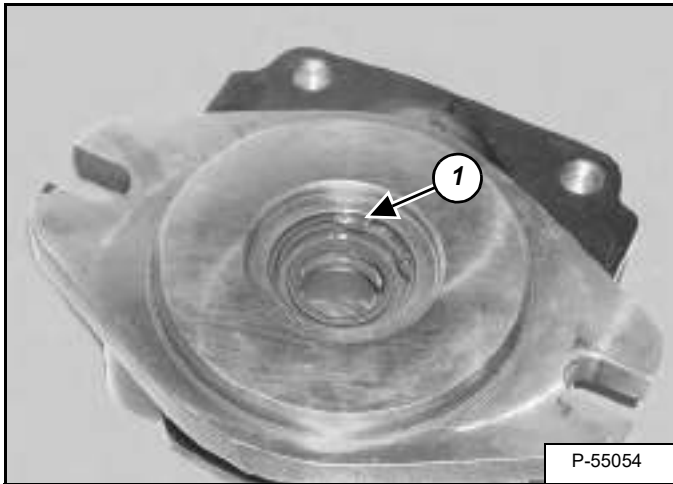
Turn the housing over and remove the mount plate [Figure 20-120-11].

Dealer Copy -- Not for Resale

GEAR PUMP (CONT'D)

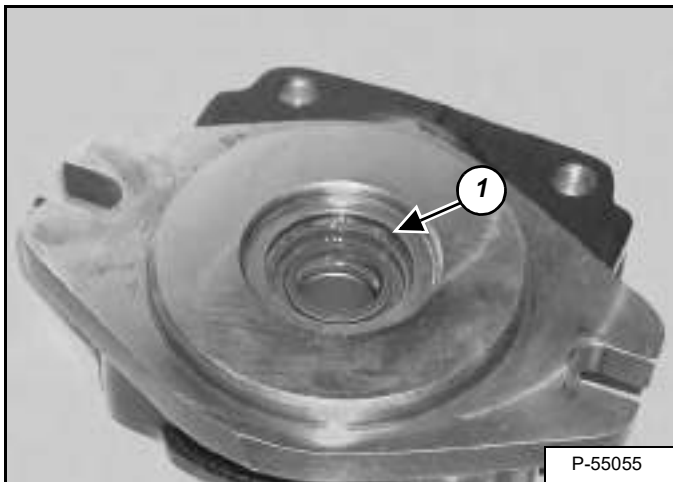
Disassembly And Assembly (Cont'd)

Figure 20-120-12



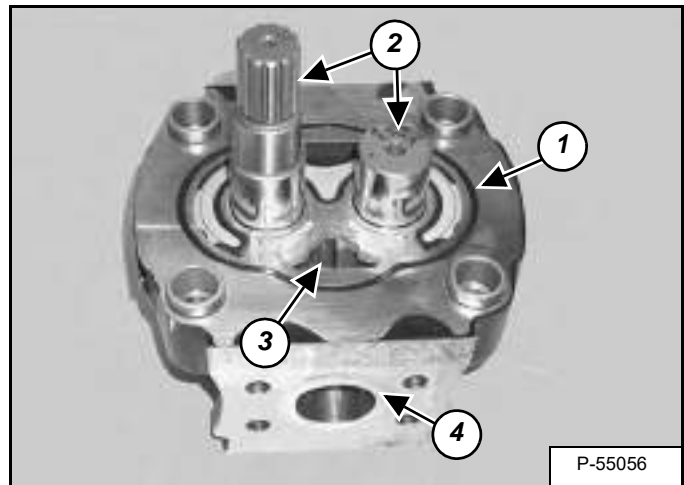
Remove the snap ring (Item 1) [Figure 20-120-12].

Figure 20-120-13



Remove the shaft seal (Item 1) [Figure 20-120-13].

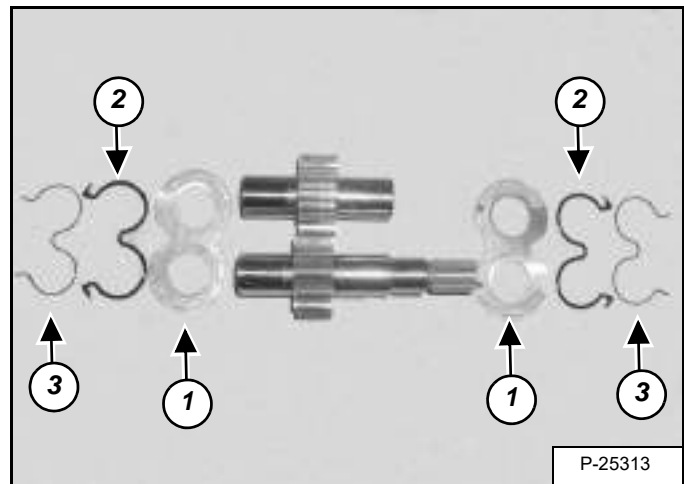
Figure 20-120-14



Remove the O-ring (Item 1) and gear assembly (Item 2) [Figure 20-120-14] from the housing.

Assembly: The position of the V portion (Item 3) on the thrust plate must point towards the larger port (Item 4) [Figure 20-120-14] on the housing.

Figure 20-120-15



Remove the two thrust plates (Item 1), seal ring (Item 2) and backup ring (Item 3) [Figure 20-120-15] from the gears.

Assembly: The seal ring (Item 2) will be installed on the thrust plate (Item 1) first followed by the backup ring (Item 3) [Figure 20-120-15].

Dealer Copy -- Not for Resale

HYDRAULIC FLUID RESERVOIR

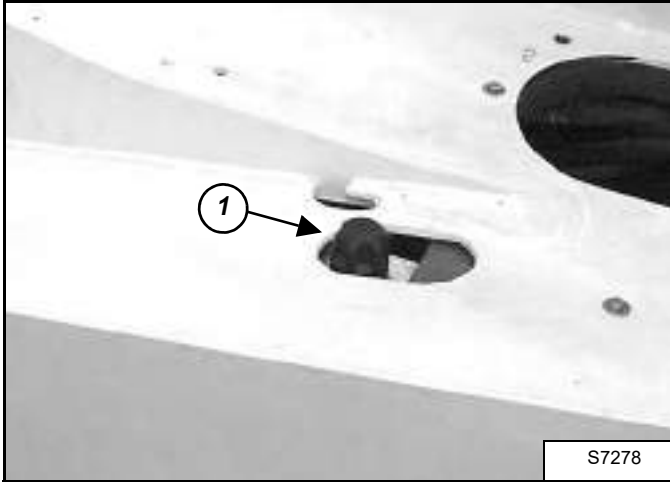
Removal And Installation

Drain the oil reservoir. (See “Replacing Hydraulic Fluid” on page 10-100-2.)

Remove the operator cab/canopy. (Cab: See “Removal And Installation” on page 50-10-1 ; Canopy: See “Removal And Installation” on page 50-111.)

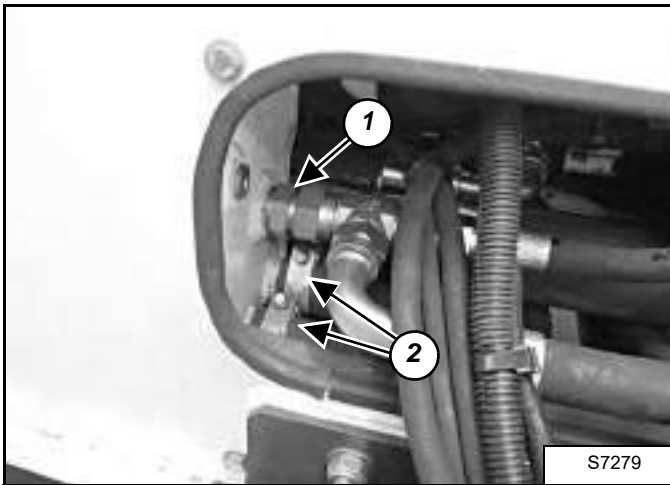
Remove the front axle. (See “Removal” on page 50-111.)

Figure 20-130-1



Remove the vent (Item 1) [Figure 20-130-1] from the tank.

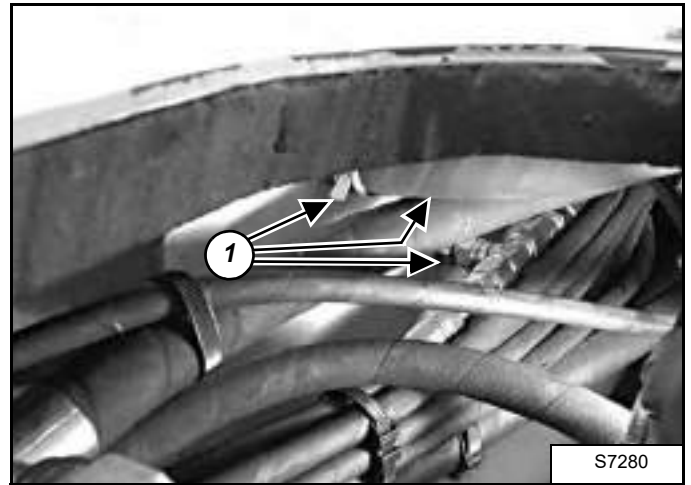
Figure 20-130-2



Remove the hydraulic connection (Item 1) [Figure 20-130-2] from the tank.

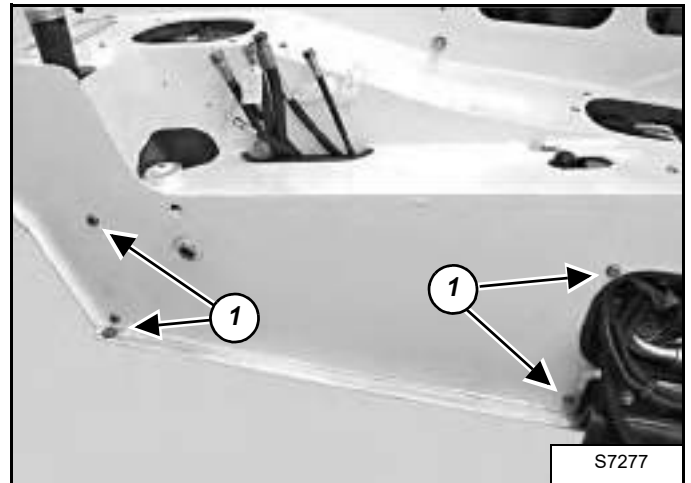
Remove the two hoses (Item 2) [Figure 20-130-2] from the tank.

Figure 20-130-3



Remove all hydraulic connections (Item 1) [Figure 20-130-3] from the side of the tank (inside the frame).

Figure 20-130-4



Remove the four tank mounting bolts (Item 1) [Figure 20-130-4].

Installation: Torque bolts to 47-54 N•m (35-40 ft-lb).

Tip the hydraulic reservoir over on its side and remove through the frame opening where the axle / hydrostatic motor assembly was installed.

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

STEERING VALVE

Removal And Installation

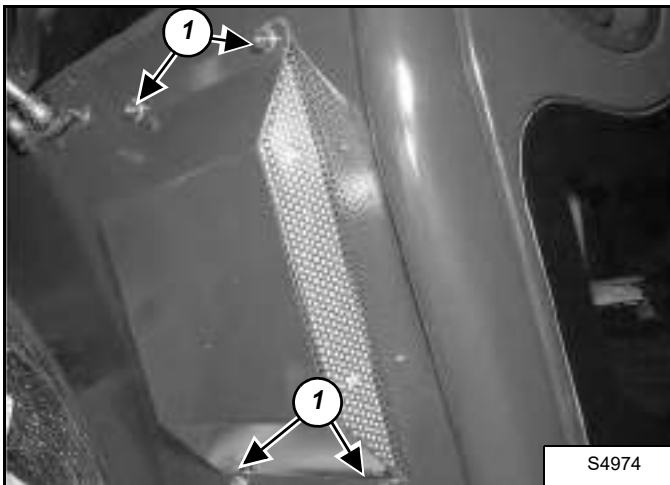
Remove the Dash / Steering cover.

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

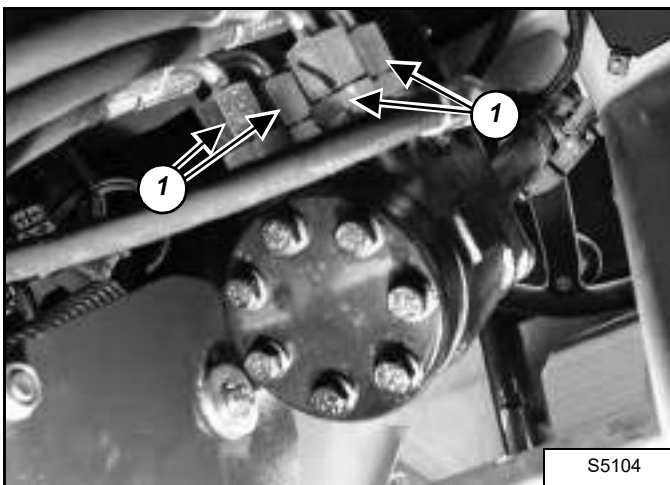
I-2003-0888

Figure 20-140-1



Remove the four mount bolts (Item 1) [Figure 20-140-1] from the fresh air filter cover at the front of the cab.

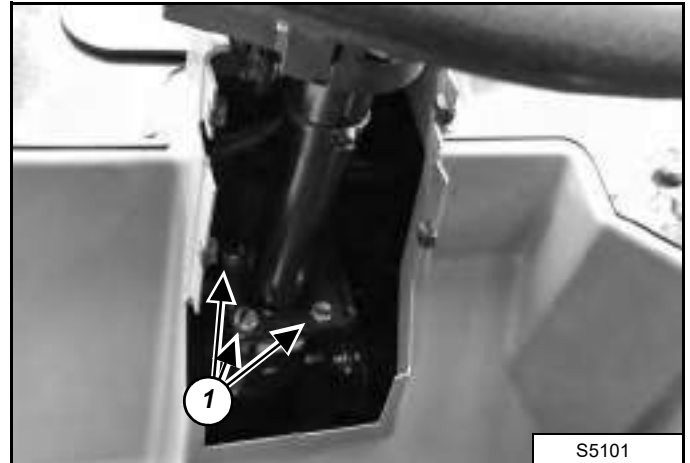
Figure 20-140-2



Remove the four hoses (Item 1) [Figure 20-140-2] from the steering valve.

NOTE: Mark hoses for correct installation.

Figure 20-140-3



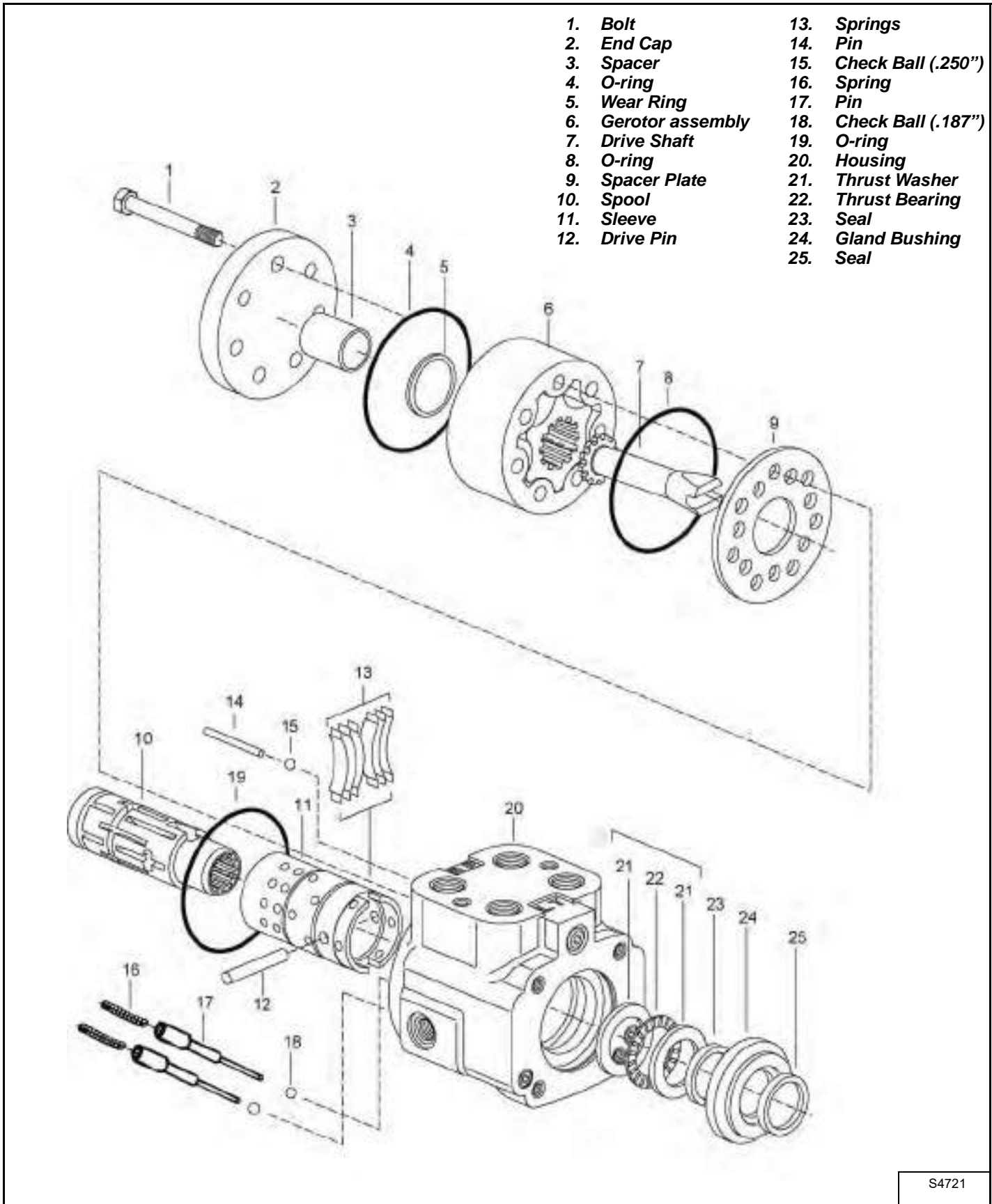
Remove the four bolts (Item 1) [Figure 20-140-3] and remove the steering valve.

Installation: Torque bolts to 30 N•m (22 ft-lb).

Dealer Copy -- Not for Resale

STEERING VALVE (CONT'D)

Parts Identification



Dealer Copy -- Not for Resale

S4721

STEERING VALVE (CONT'D)

Disassembly

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

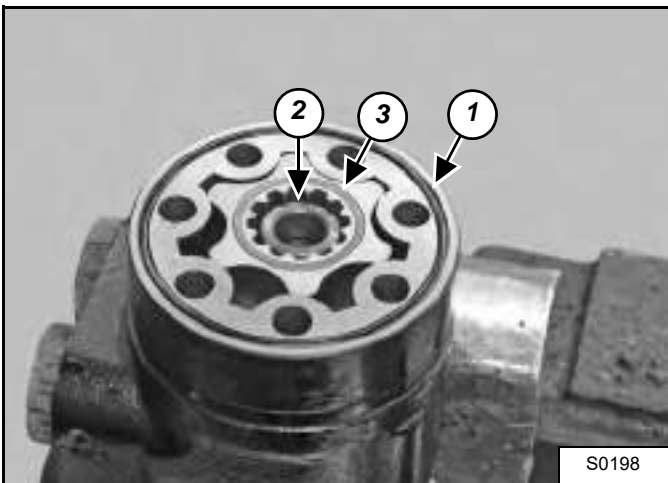
Remove the hydraulic fittings from the steering valve.

Figure 20-140-4



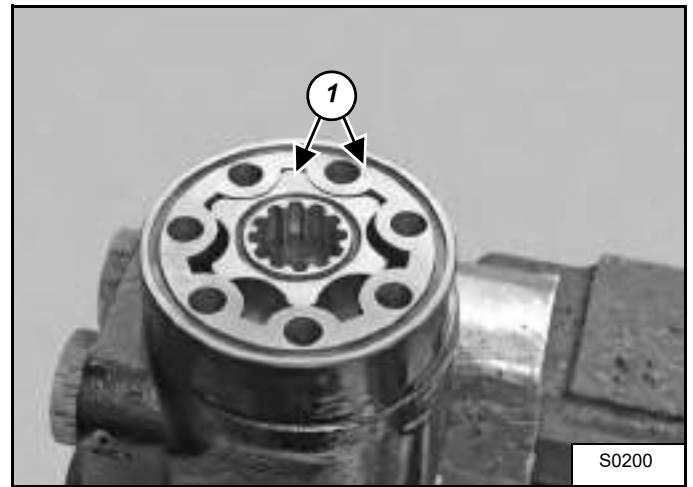
Remove the seven end cap bolts [Figure 20-140-4].

Figure 20-140-5



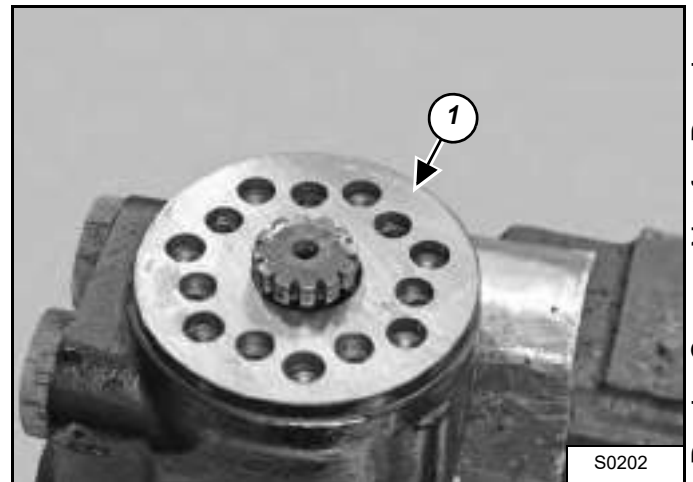
Remove the O-ring (Item 1), spacer (Item 2) and wear ring (Item 3) [Figure 20-140-5].

Figure 20-140-6



Remove the gerotor assembly (Item 1) [Figure 20-140-6] and the O-ring beneath.

Figure 20-140-7



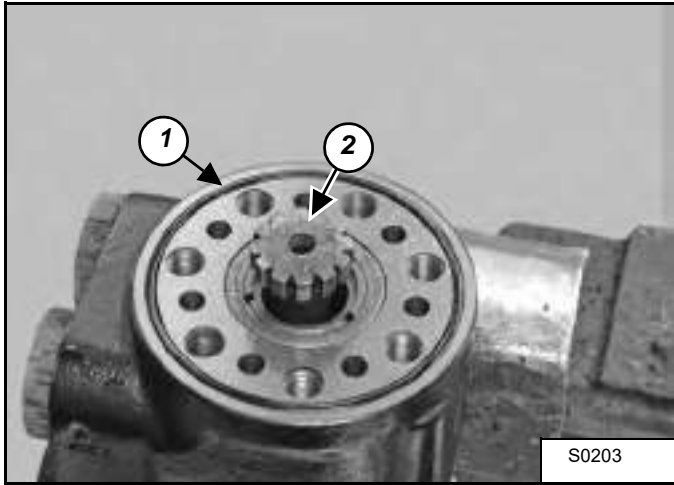
Remove the spacer plate (Item 1) [Figure 20-140-7].

Dealer Copy -- Not for Resale

STEERING VALVE (CONT'D)

Disassembly (Cont'd)

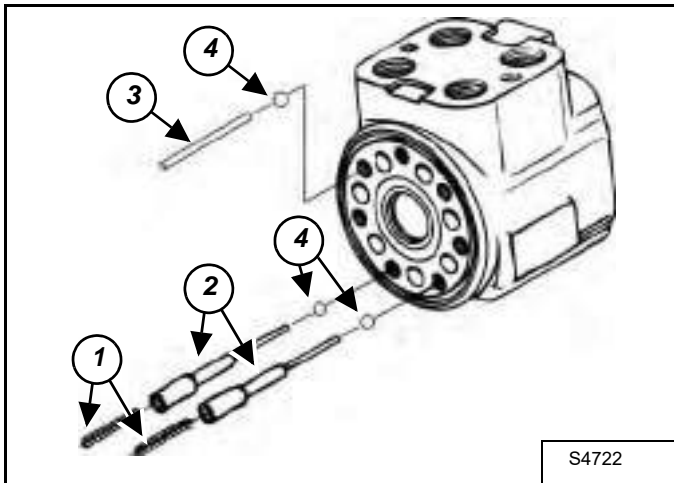
Figure 20-140-8



Remove the O-ring (Item 1) [Figure 20-140-8].

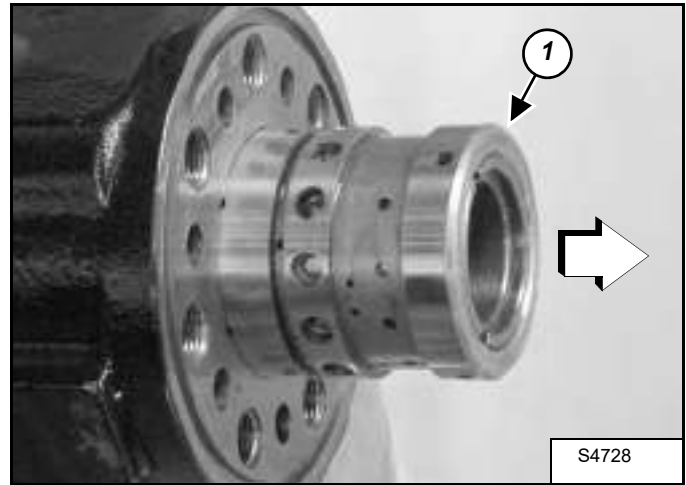
Remove the drive shaft (Item 2) [Figure 20-140-8], while holding the steering valve upright.

Figure 20-140-9



Carefully remove the two springs (Item 1), two pins (Item 2), pin (Item 3) and balls (Item 4) [Figure 20-140-9] from each port.

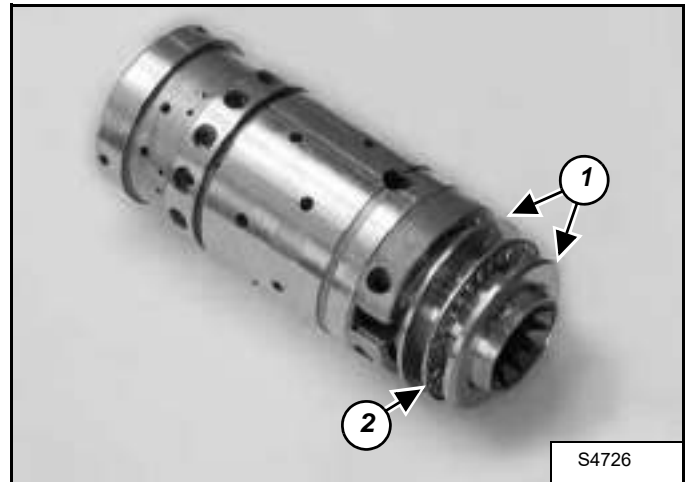
Figure 20-140-10



Tip the housing onto the port face and remove the spool and sleeve assembly (Item 1) [Figure 20-140-10].

NOTE: Do not bind spool and sleeve in housing. Rotate spool and sleeve assembly slowly when removing it from housing.

Figure 20-140-11

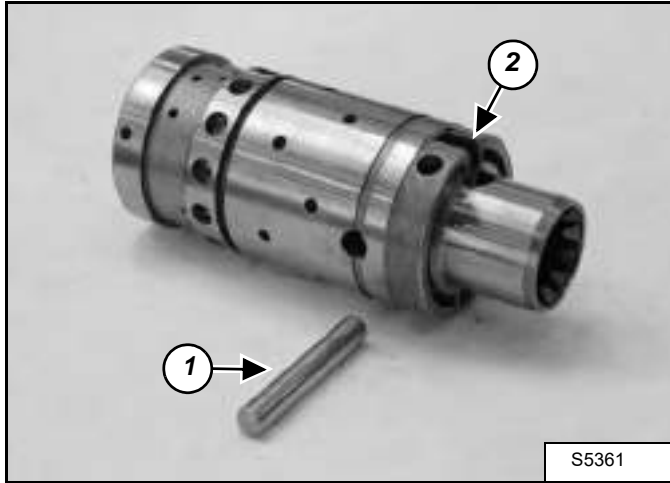


Remove the two bearing washers (Item 1) and thrust bearing (Item 2) [Figure 20-140-11].

STEERING VALVE (CONT'D)

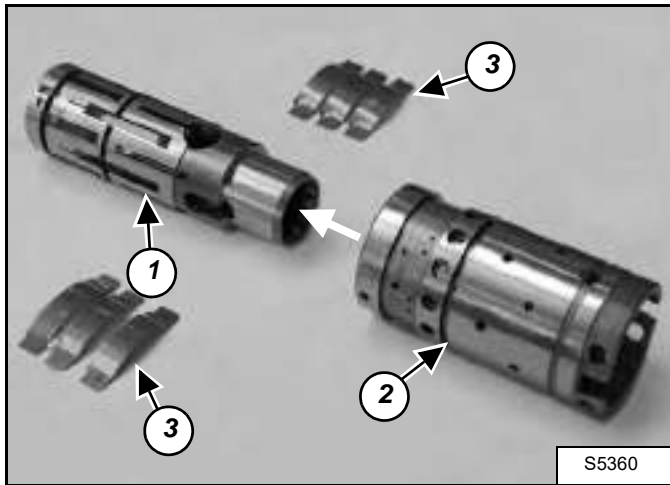
Disassembly (Cont'd)

Figure 20-140-12



Remove the pin (Item 1), then remove the six springs (Item 2) by partially sliding out the spool. [Figure 20-140-12].

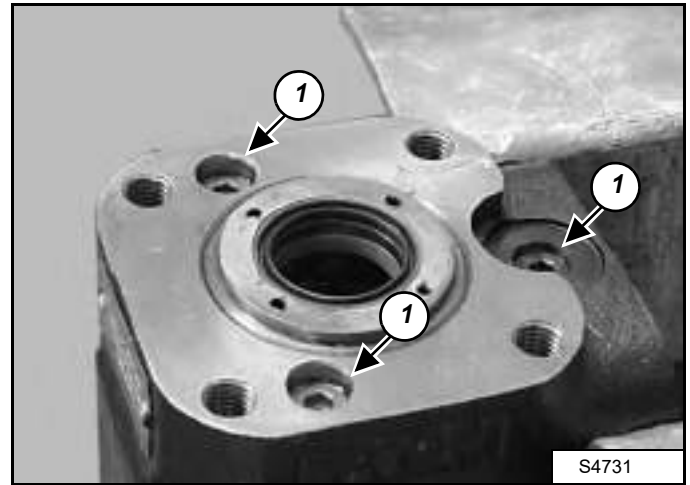
Figure 20-140-13



Remove the control spool (Item 1) from the sleeve (Item 2) [Figure 20-140-13].

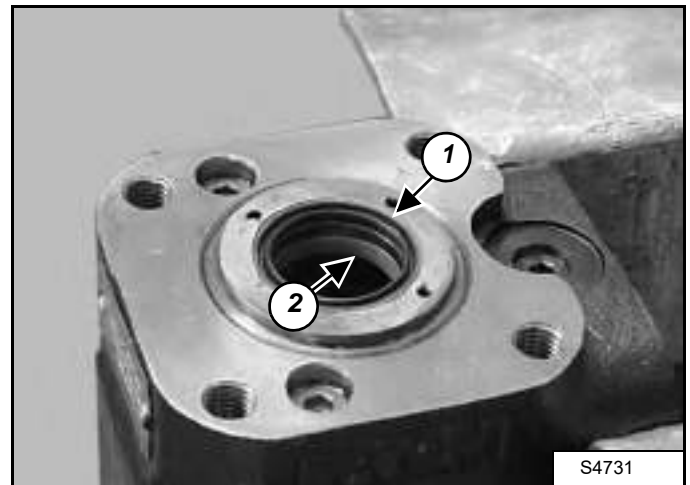
Check the condition of the six (two sets of three) springs (Item 3) [Figure 20-140-13].

Figure 20-140-14



The housing valves (Item 1) [Figure 20-140-14] are factory adjusted and are not to be changed. The housing with specified valve pressure settings, the mating spool and sleeve are not practical replacement parts.

Figure 20-140-15



Remove the seals (Items 1 and 2) [Figure 20-140-15] from the gland bushing.

NOTE: Gland bushing removal requires a special 4-pin tool. Do not attempt to remove without this tool as damage to the bushing could occur.

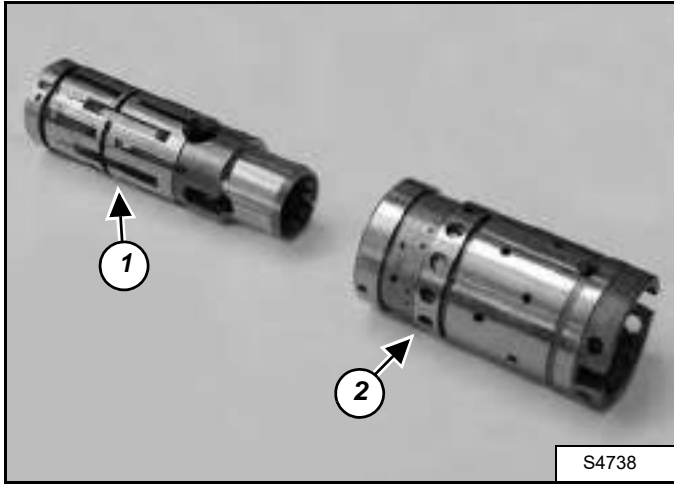
It is not required to remove the bushing for seal replacement.

Dealer Copy -- Not for Resale

STEERING VALVE (CONT'D)

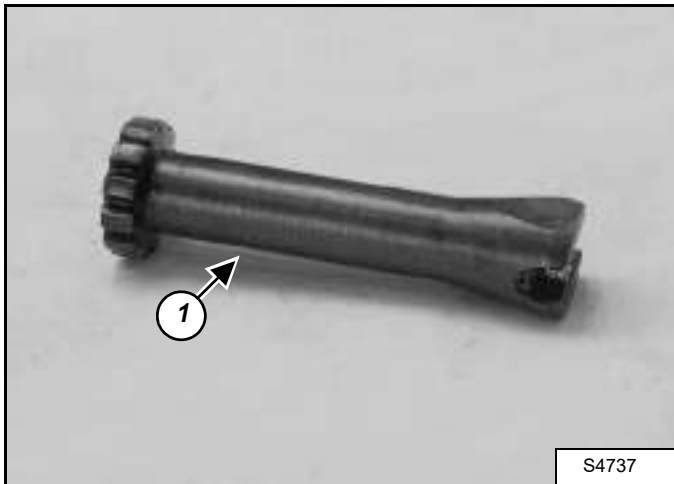
Inspection

Figure 20-140-16



Inspect the spool (Item 1) and sleeve (Item 2) [Figure 20-140-16] for any damage or wear. Replace as needed.

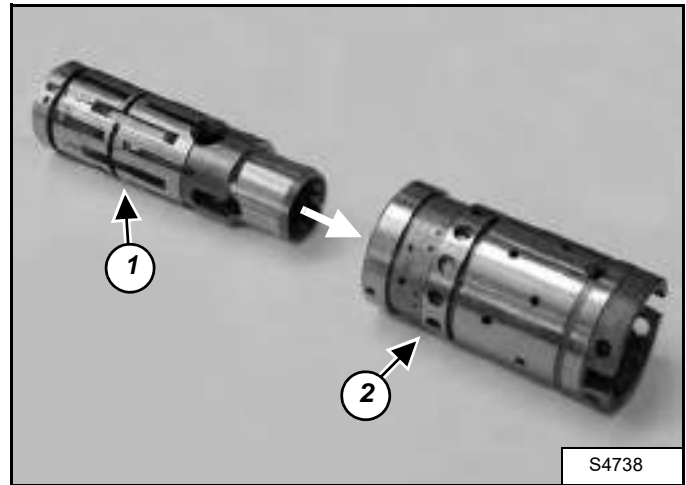
Figure 20-140-17



Inspect the drive shaft (Item 1) [Figure 20-140-17] for any damage or wear. Replace as needed.

Assembly

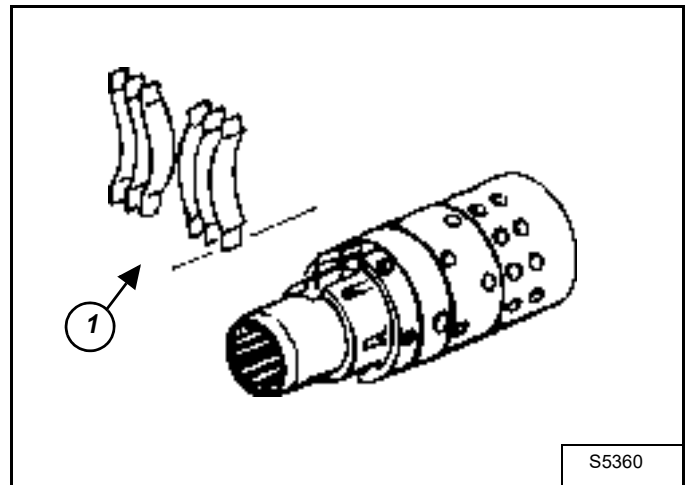
Figure 20-140-18



Assemble the spool (Item 1) and sleeve (Item 2) [Figure 20-140-18] carefully so that spring slots line up at the same end. Rotate the spool while sliding parts together.

NOTE: Test for free rotation. The spool should rotate smoothly in the sleeve with fingertip force applied at splined end.

Figure 20-140-19



Install the six springs (Item 1) [Figure 20-140-19] onto the spool and sleeve.

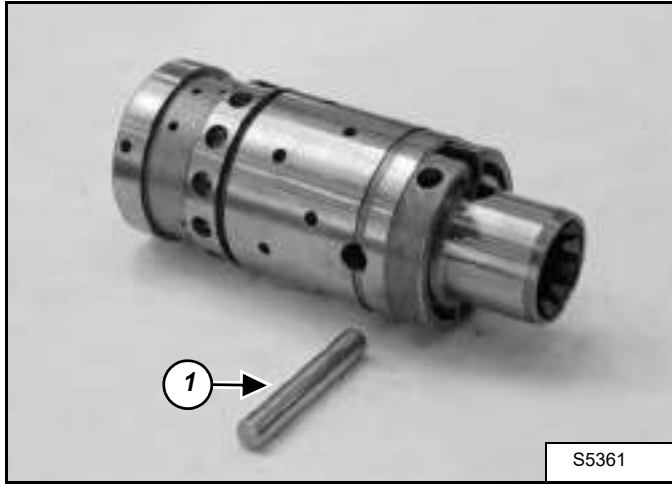
Center spring set in spring slots. Seat springs down evenly and flush with upper surface of spool and sleeve.

NOTE: There are six springs and should be positioned three per side and back to back.

STEERING VALVE (CONT'D)

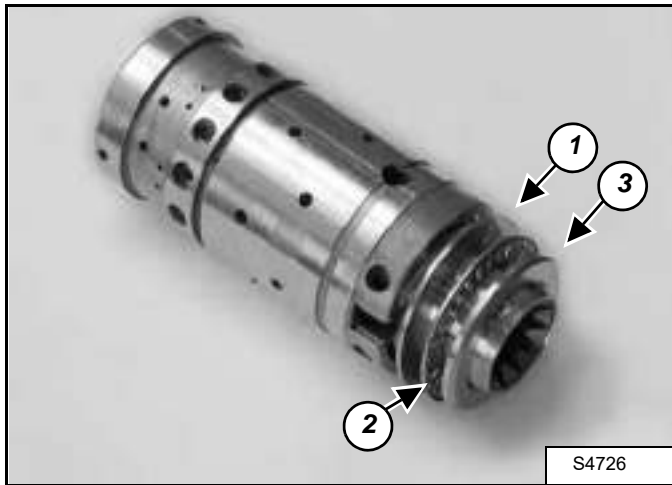
Assembly (Cont'd)

Figure 20-140-20



Insert pin (Item 1) [Figure 20-140-20] through the spool and sleeve assembly until the pin is flush at both sides of the sleeve.

Figure 20-140-21

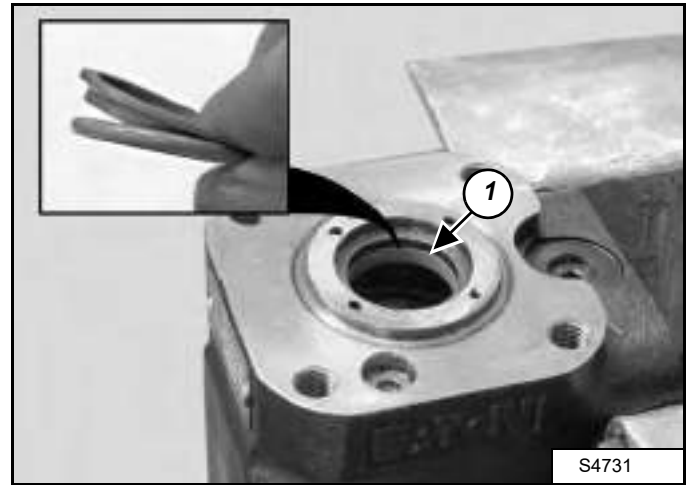


Install the big diameter bearing washer (Item 1) [Figure 20-140-21] with the chamfered side towards the sleeve.

Install the thrust bearing (Item 2) [Figure 20-140-21].

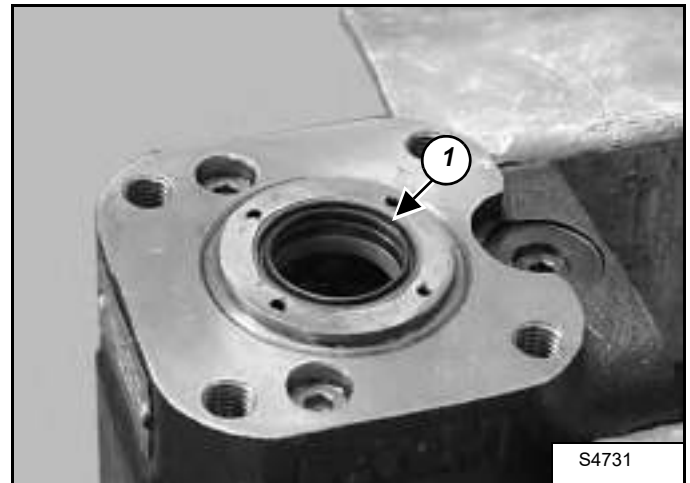
Install the small diameter bearing washer (Item 3) [Figure 20-140-21] with the chamfered side facing the outside of the bearing assembly.

Figure 20-140-22



Install the seal (Item 1) [Figure 20-140-22] in the gland bushing, with smooth side of the seal facing towards bushing.

Figure 20-140-23



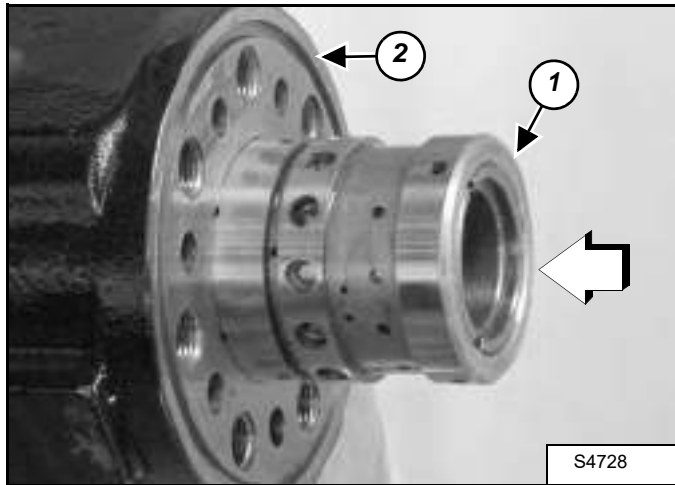
Install the seal (Item 1) [Figure 20-140-23] in the gland bushing.

Dealer Copy -- Not for Resale

STEERING VALVE (CONT'D)

Assembly (Cont'd)

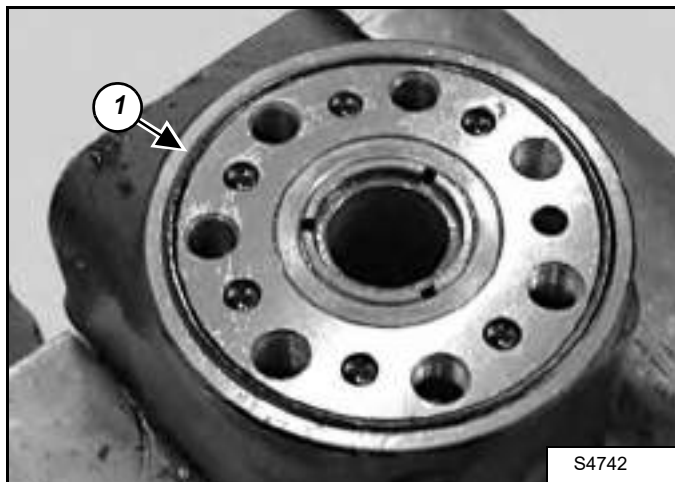
Figure 20-140-24



Put some clean oil on the spool and sleeve assembly (Item 1) and fully insert it into the housing (Item 2) [Figure 20-140-24] such that the splined end of the spool enters the housing first. Mind the correct position of the bearing and washers inside the housing.

NOTE: To prevent the cross pin from dropping into the discharge groove of the housing, do not pull the spool assembly beyond this point. With the spool assembly in this flush position, check for free rotation within housing by turning assembly with fingertip force at the splined end.

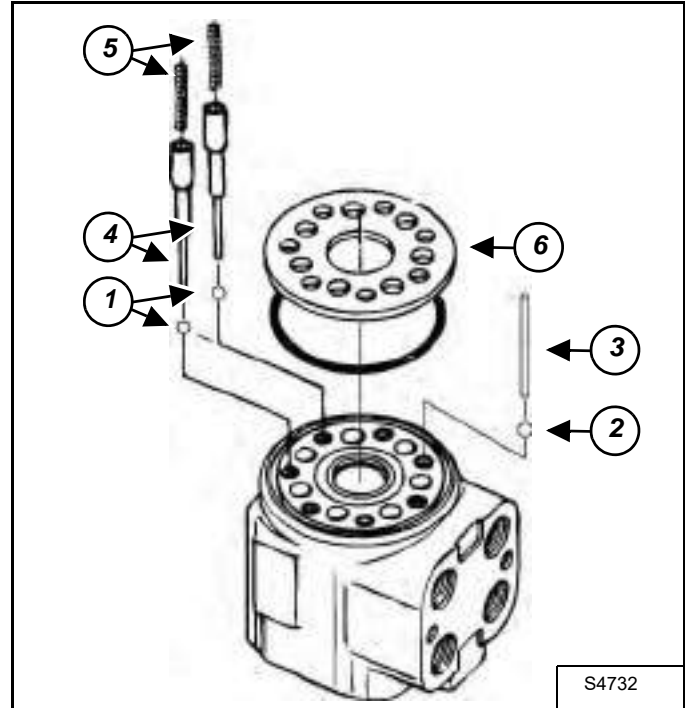
Figure 20-140-25



Install the O-ring (Item 1) [Figure 20-140-25] into the housing.

Assembly (Cont'd)

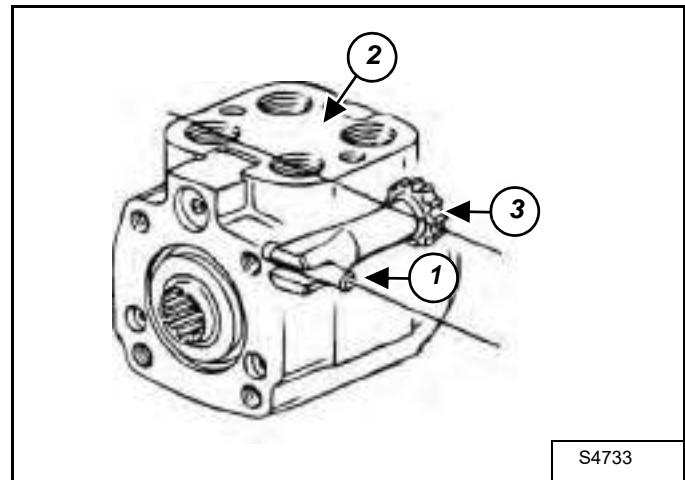
Figure 20-140-26



Install the two .187" balls (Item 1), .250" ball (Item 2), pin (Item 3), two pins (Item 4) and springs (Item 5) [Figure 20-140-26] in the holes as shown.

Install the spacer plate (Item 6) [Figure 20-140-26]. Align the bolt holes in the spacer plate with tapped holes in the housing.

Figure 20-140-27



Rotate the spool and sleeve assembly until the pin (Item 1) is parallel with the port face (Item 2) [Figure 20-140-27].

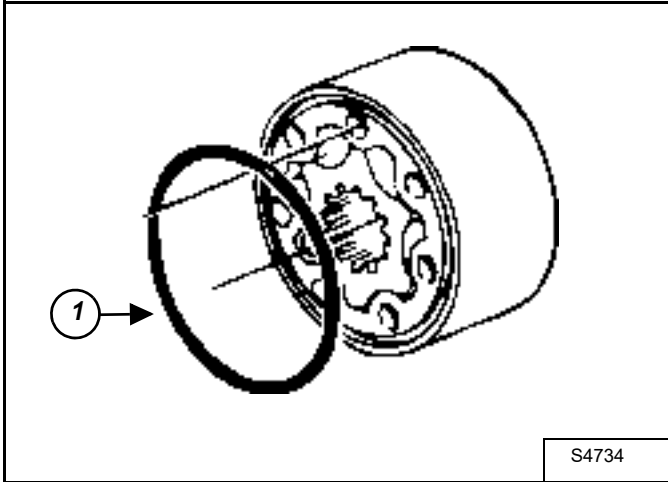
Install the drive (Item 3) [Figure 20-140-27] making sure the drive is engaged with the pin.

Mark the drive according to the parallel line.

STEERING VALVE (CONT'D)

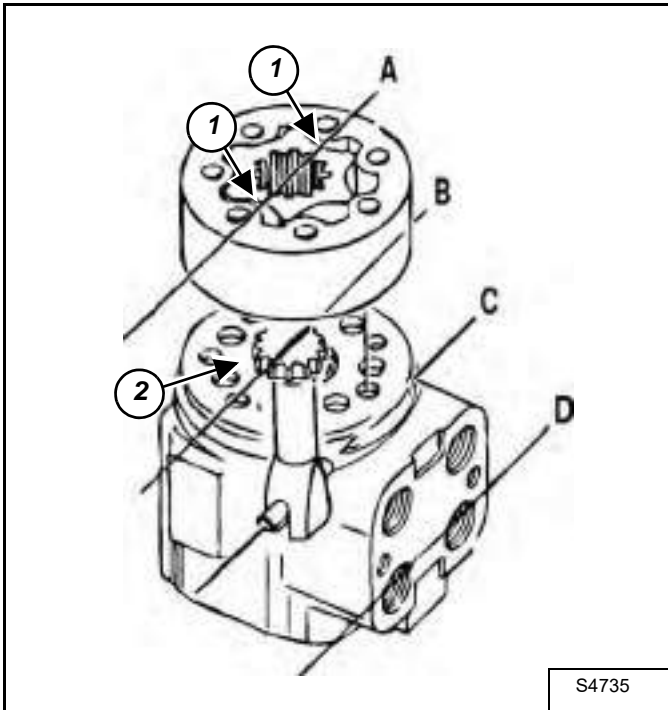
Assembly (Cont'd)

Figure 20-140-28



Install the O-ring (Item 1) [Figure 20-140-28] in the gerotor (on the spacer plate side).

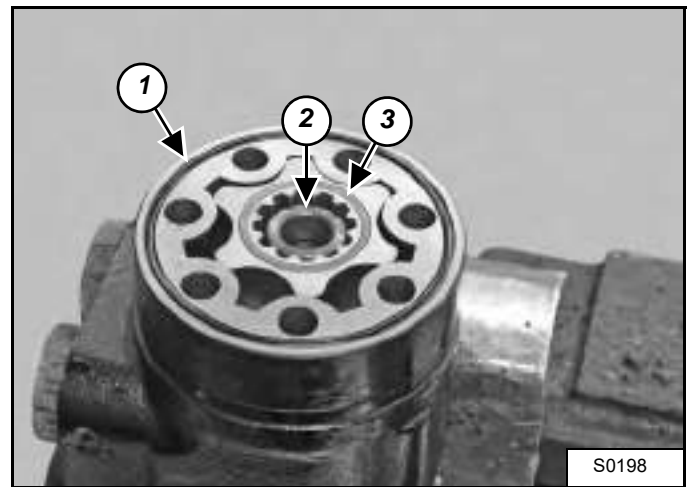
Figure 20-140-29



Align the star valleys (Items 1) (Reference A) to the marked drive (Item 2) (Reference B) [Figure 20-140-29]. This way the valleys are aligned with the pin.

NOTE: Keep in mind the parallel relationship of reference lines A, B, C, and D in [Figure 20-140-29].

Figure 20-140-30



Install the O-ring (Item 1), spacer (Item 2) and wear ring (Item 3) [Figure 20-140-30].

Figure 20-140-31



Install the seven end cap bolts [Figure 20-140-31]. Pretighten to 17 N•m (12.5 ft-lb), then torque screws to 26-30 N•m (19-22 ft-lb).

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251)

Troubleshooting Chart (Controllers)

The following troubleshooting chart is provided for assistance in locating and correcting problems which are most common. Many of the recommended procedures must be done by authorized Bobcat Service Personnel.



Check for correct function after adjustments, repairs or service. Failure to make correct repairs or adjustments can cause injury or death.

W-2004-1285

PROBLEM	CAUSE	CORRECTION
None of the controllers work	Insufficient power supply	Check battery voltage
	Insufficient pilot pressure	Check pilot pressure
Only one controller works	No actuation signal	Check diagnostic service codes
	Unsuitable actuation signal	Check diagnostic service codes
One controller not working or jerky	Friction or jamming of the plunger	Replace controller
One controller not working or jerky in one direction	Contamination of the proportional valve in the controller	Replace controller
Controller creeps	Neutral position incorrect	Calibrate neutral adjustment
Oil leakage between control valve and controller	Faulty seals	Replace seal
Oil leakage between controllers	Faulty controller couplers	Replace controller couplers

Dealer Copy -- Not for Resale

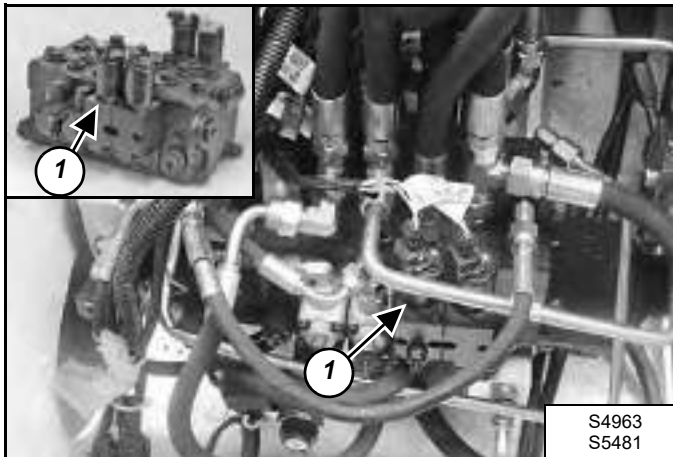
HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251) (CONT'D)

Telescoping Valve Section Troubleshooting

Remove the rear cover from machine.

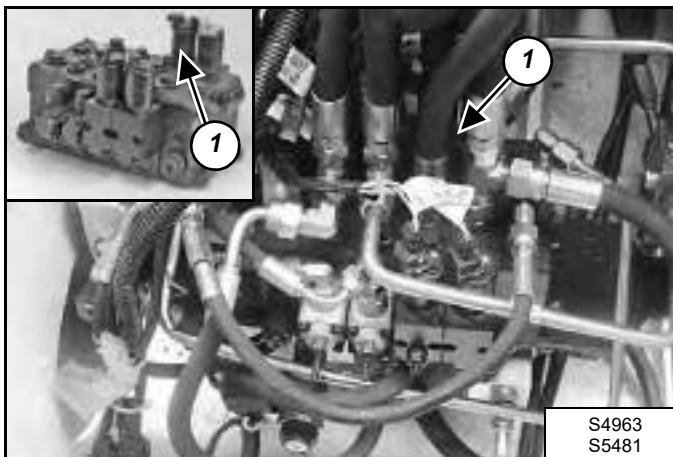
1. Check for diagnostic service codes. (See "Viewing Service Codes" on page 60-180-1.)
When no service code is read, go to step 11.
2. If code 50-02 or 50-03 appears: error in joystick or wiring of joystick to main controller device.
Code 50-04 requires joystick (re)calibration.

Figure 20-150-1



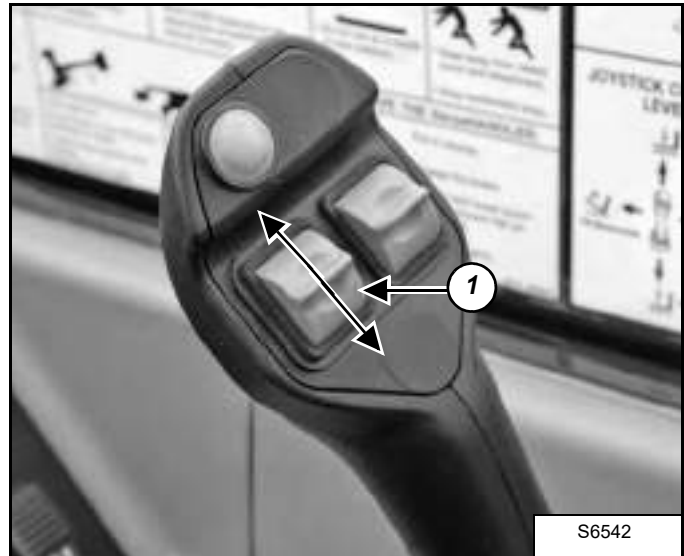
3. If code 50-66 or 50-67 appears: error on boom extension valve (base), which is located at the back side of the control valve. (Item 1) [Figure 20-150-1].

Figure 20-150-2



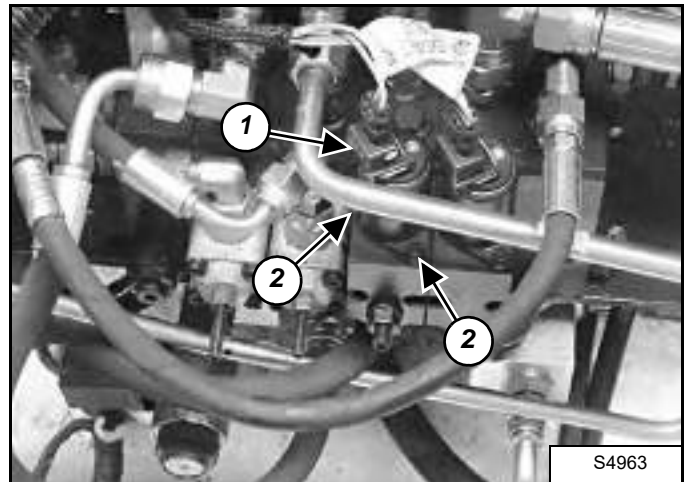
4. If code 50-45 or 50-46 appears: error on boom retraction valve (rod), which is located at the front side of the control valve. (Item 1) [Figure 20-150-2]
5. Unplug the valve controller connector of the valve which has been diagnosed and plug back in.

Figure 20-150-3



6. With adequate room in front of the machine, start the engine and run the engine at 2200 RPM. equipped), then start the engine and run at low idle RPM. Move the telescoping control switch (Item 1) [Figure 20-150-3] forward and back to see if this function works. Stop the engine.

Figure 20-150-4



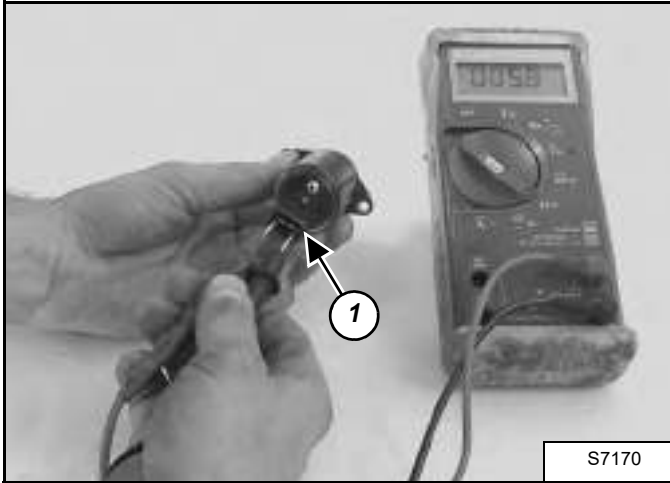
7. Unplug the connector (extension controller connector shown in picture) (Item 1) [Figure 20-150-4] of the valve controller which controls the diagnosed valve.
8. Remove the two screws (extension controller shown in picture) (Item 2) [Figure 20-150-4] and pull out the controller.

NOTE: Install a cap on the valve opening to prevent dust penetration.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251) (CONT'D)

Telescoping Valve Section Troubleshooting (Cont'd)

Figure 20-150-5



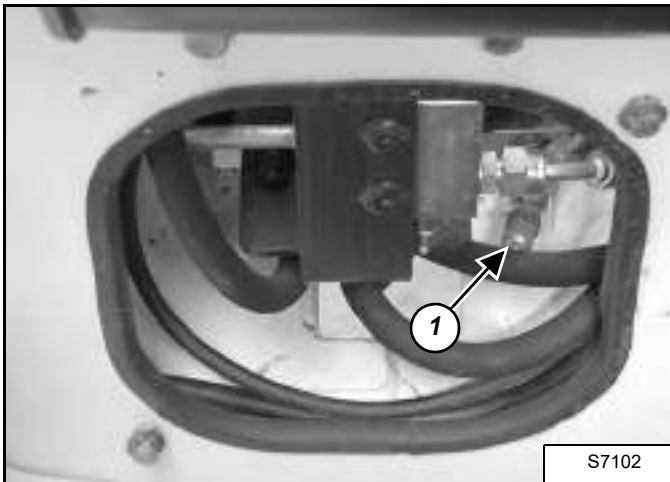
9. Use an ohmmeter to check the controller solenoid. The reading between both electrical connector terminals must be approximately 5.8 ohms (Item 1) **[Figure 20-150-5]**.

If the controller solenoid measurement is correct, the error could be located in wiring/connectors to the valve controller.

10. Reinstall the controller.

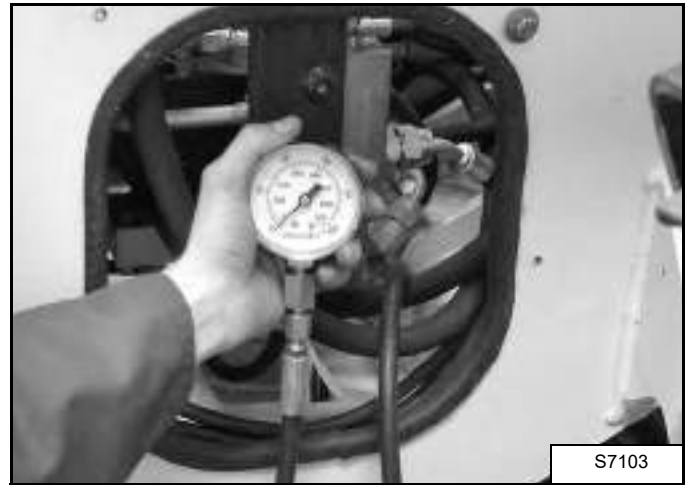
Checking Pilot Pressure

Figure 20-150-6



11. Locate the test fitting (Item 1) **[Figure 20-150-6]**, through the right side frame hole, below the control valve and remove the cap.

Figure 20-150-7



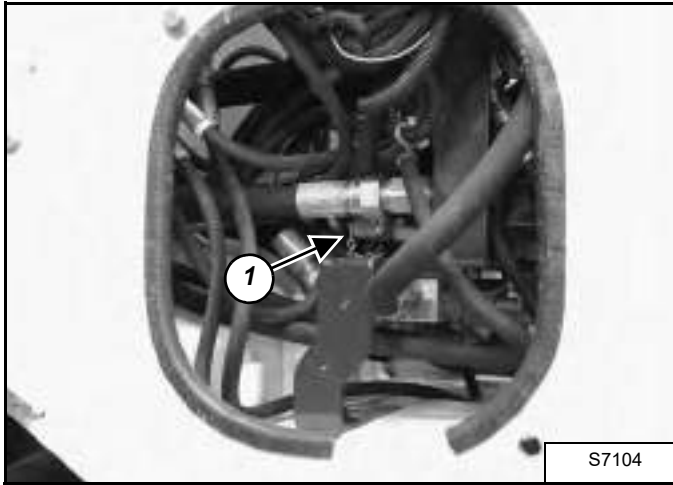
12. Install a 7 MPa (70 bar) (1000 psi) gauge on the test fitting **[Figure 20-150-7]**.
13. Start the engine and run the engine at 2200 RPM. Record the pressure. The pressure at the gauge should be 3,5 MPa (35 bar) (508 psi) maximum.
14. Remove the gauge.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251) (CONT'D)

Telescoping Valve Section Troubleshooting (Cont'd)

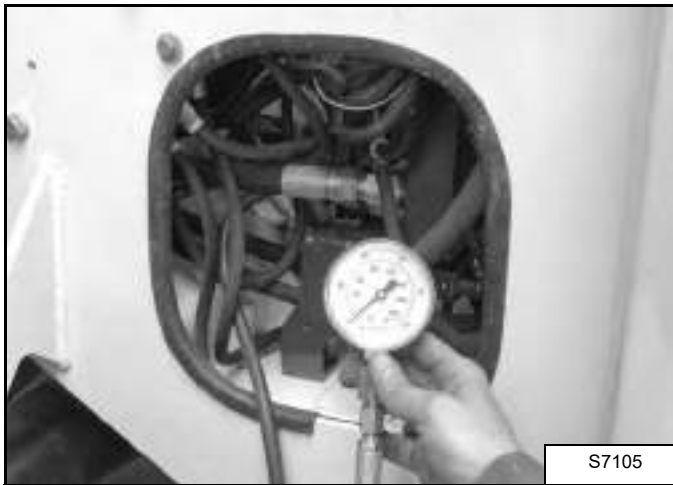
Checking Drain Pressure

Figure 20-150-8



15. Locate the test fitting (Item 1) [Figure 20-150-8] behind the control valve and remove the cap.

Figure 20-150-9



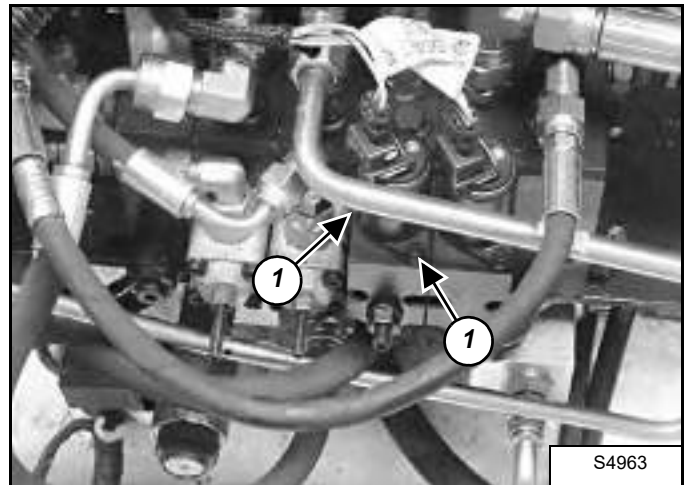
16. Install a 3,5 MPa (35 bar) (508 psi) gauge on the test fitting [Figure 20-150-9].
17. Start the engine and run the engine at 2200 RPM. Record the pressure. The pressure at the gauge should be 150 KPa (1,5 bar) (22 psi) maximum.
18. Remove the gauge.

Figure 20-150-10



19. With adequate room in front of the machine, start the engine and run the engine at 2200 RPM. Move the telescoping control switch (Item 1) [Figure 20-150-10] forward and back to see if this function works. Stop the engine.

Figure 20-150-11



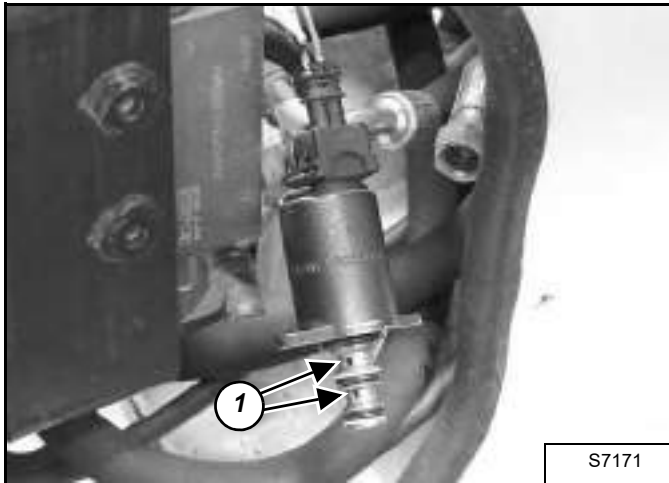
20. If the telescoping function does not work, remove the two screws (Item 1) [Figure 20-150-11] on each controller (front and back) and remove them.

NOTE: Install a cap on each valve opening to prevent dust penetration.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251) (CONT'D)

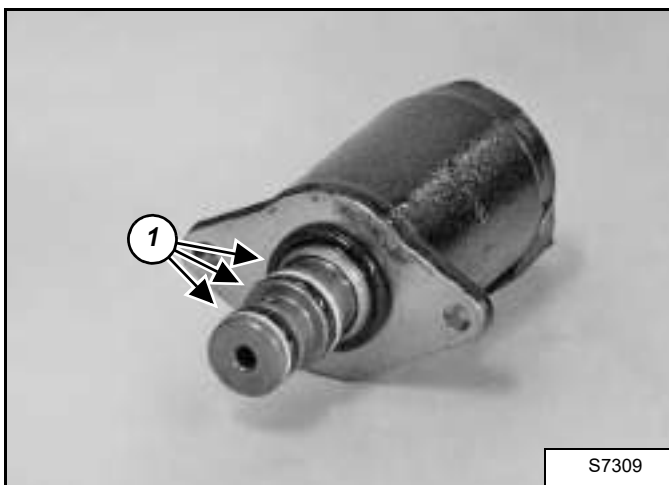
Telescoping Valve Section Troubleshooting (Cont'd)

Figure 20-150-12



21. Turn the ignition key switch ON, but DO NOT start the engine. Check the function of each controller by having another person move the telescopic control switch (Item 1) [Figure 20-150-10]. The controller piston, which can be seen through the controller orifices (Item 1) [Figure 20-150-12] must be moving according to the switch movement.
22. If a controller does not function properly, the controller must be replaced.

Figure 20-150-13



23. Check the seals (Item 1) [Figure 20-150-13] of each controller. Clean or replace if necessary.
24. Put clean oil onto the seals and reinstall the two controllers.

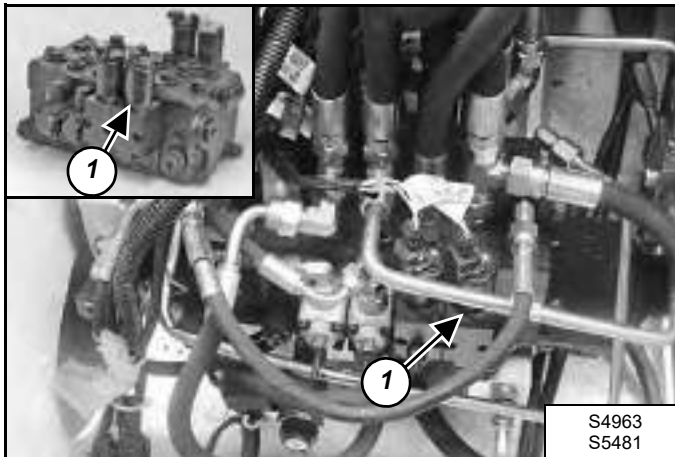
HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251) (CONT'D)

Auxiliary Valve Section Troubleshooting

Remove the rear cover from machine.

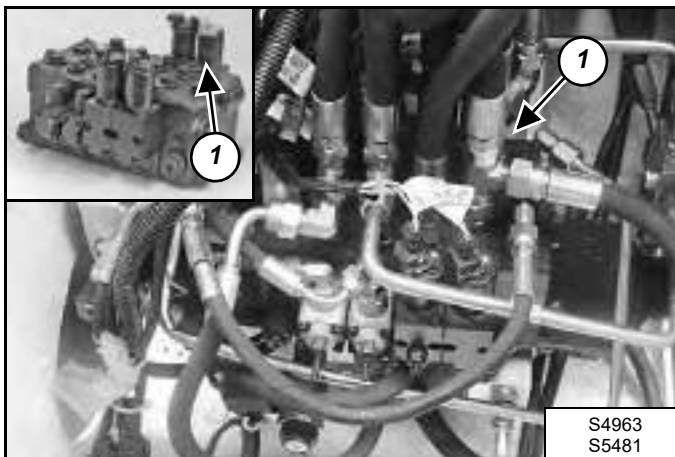
1. Check for diagnostic service codes. (See "Viewing Service Codes" on page 60-180-1.)
When no service code is read, go to step 11.
2. If code 50-05 or 50-06 appears: error in joystick or wiring of joystick to main controller device.
Code 50-07 requires joystick (re)calibration.

Figure 20-150-14



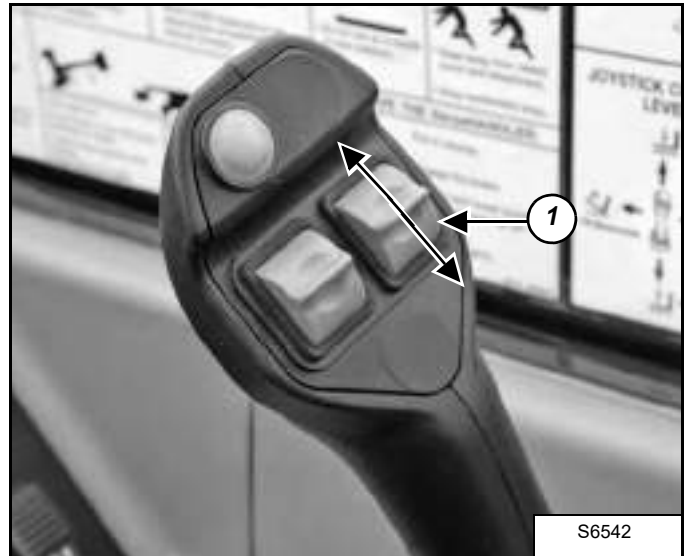
3. If code 50-72 or 50-73 appears: error on auxiliary valve (rod), which is located at the back side of the control valve. (Item 1) [Figure 20-150-14]

Figure 20-150-15



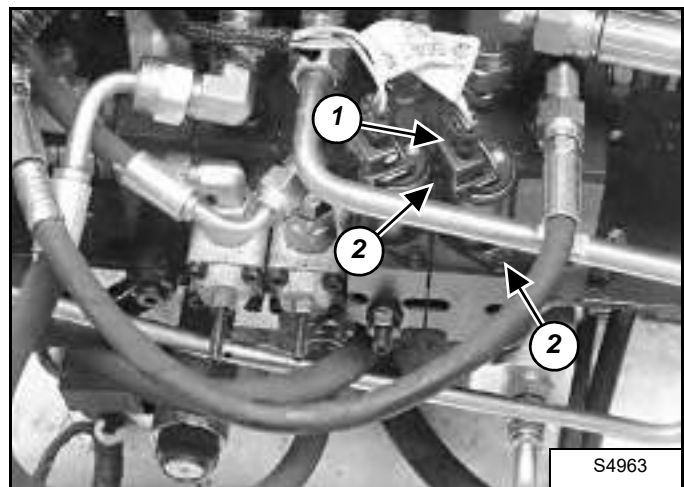
4. If code 50-45 or 50-46 appears: error on auxiliary valve (base), which is located at the front side of the control valve. (Item 1) [Figure 20-150-15]
5. Unplug the valve controller connector of the valve which has been diagnosed and plug back in.

Figure 20-150-16



6. With the attachment installed to the front auxiliary hydraulics, start the engine and run the engine at 2200 RPM. Press the hydraulic control lockout button and front auxiliary hydraulics button. Move the auxiliary control switch (Item 1) [Figure 20-150-16] forward and back to see if this function works. Stop the engine.

Figure 20-150-17



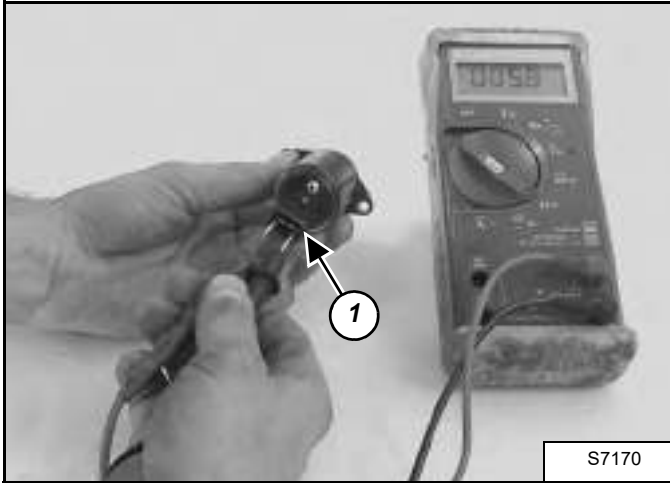
7. Unplug the connector (auxiliary controller connector shown in picture) (Item 1) [Figure 20-150-17] of the valve controller which controls the diagnosed valve.
8. Remove the two screws (auxiliary controller shown in picture) (Item 2) [Figure 20-150-17] and pull out the controller.

NOTE: Install a cap on the valve opening to prevent dust penetration.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251) (CONT'D)

Auxiliary Valve Section Troubleshooting (Cont'd)

Figure 20-150-18



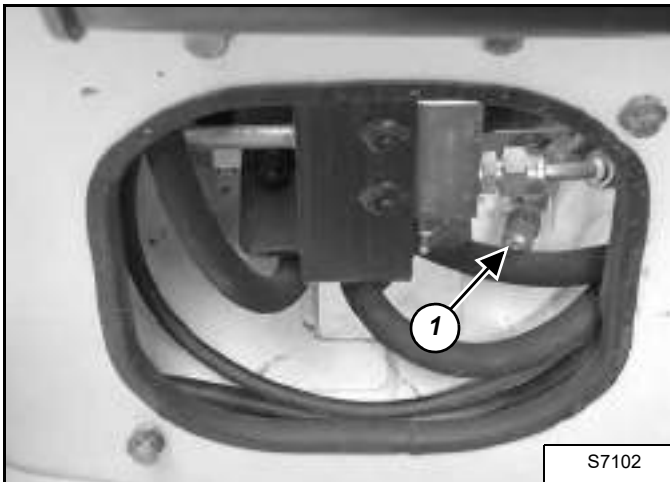
9. Use an ohmmeter to check the controller solenoid. The reading between both electrical connector terminals must be approximately 5.8 ohms (Item 1) **[Figure 20-150-18]**.

If the controller solenoid measurement is correct, the error could be located in wiring/connectors to the valve controller.

10. Reinstall the controller.

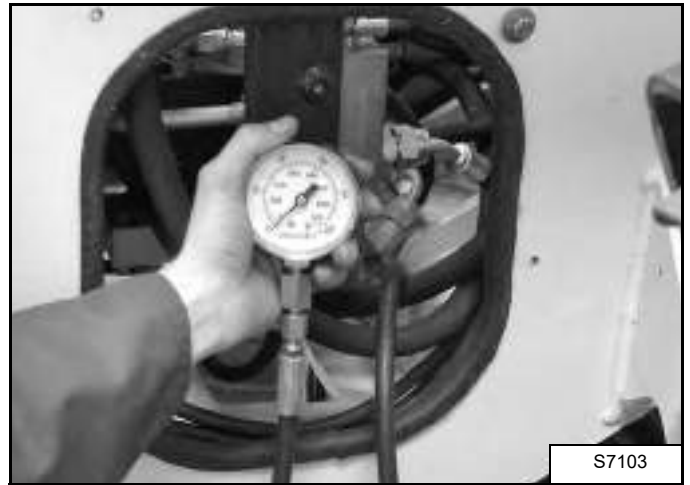
Checking Pilot Pressure

Figure 20-150-19



11. Locate the test fitting (Item 1) **[Figure 20-150-19]**, through the right side frame hole, below the control valve and remove the cap.

Figure 20-150-20



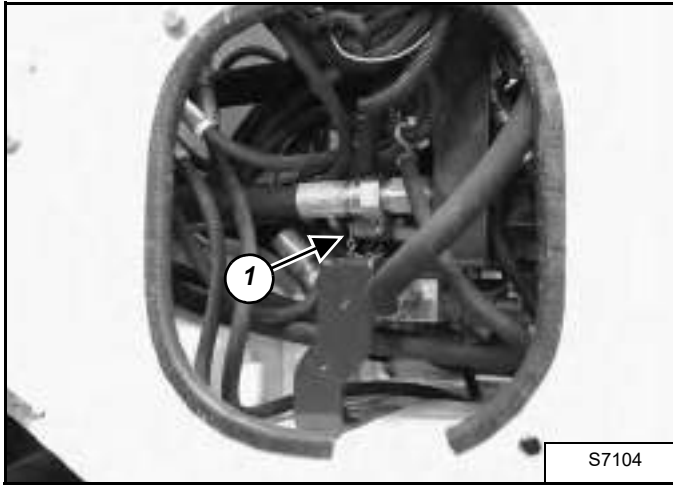
12. Install a 7 MPa (70 bar) (1000 psi) gauge on the test fitting **[Figure 20-150-20]**.
13. Start the engine and run the engine at 2200 RPM. Record the pressure. The pressure at the gauge should be 3,5 MPa (35 bar) (508 psi) maximum.
14. Remove the gauge.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251) (CONT'D)

Auxiliary Valve Section Troubleshooting (Cont'd)

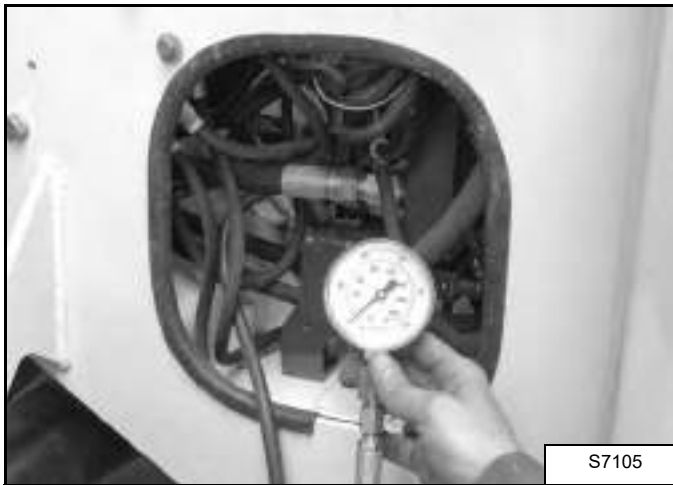
Checking Drain Pressure

Figure 20-150-21



15. Locate the test fitting (Item 1) [Figure 20-150-21] behind the control valve and remove the cap.

Figure 20-150-22



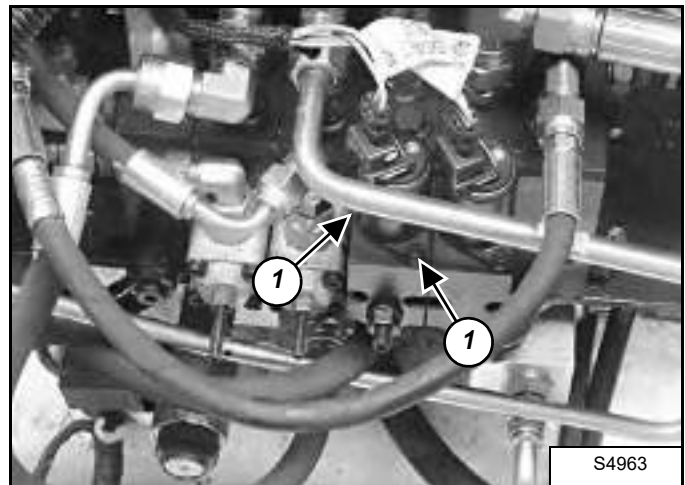
16. Install a 3,5 MPa (35 bar) (508 psi) gauge on the test fitting [Figure 20-150-22].
17. Start the engine and run the engine at 2200 RPM. Record the pressure. The pressure at the gauge should be 150 KPa (1,5 bar) (22 psi) maximum.
18. Remove the gauge.

Figure 20-150-23



19. With the attachment installed to the front auxiliary hydraulics, start the engine and run the engine at 2200 RPM. Press the hydraulic control lockout button and front auxiliary hydraulics button. Move the auxiliary control switch (Item 1) [Figure 20-150-23] forward and back to see if this function works. Stop the engine.

Figure 20-150-24



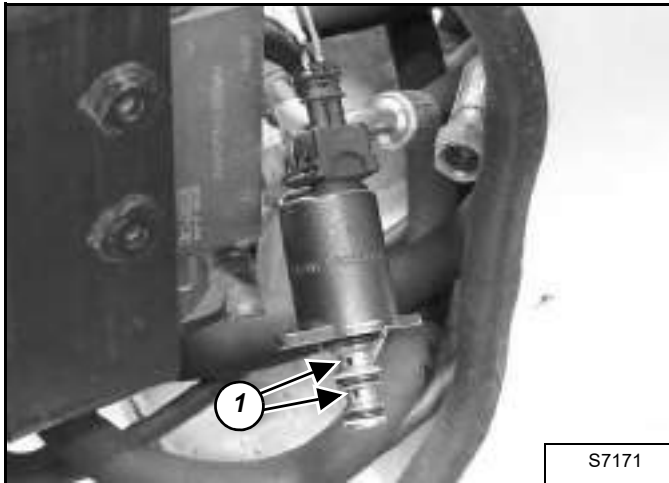
20. If the auxiliary function does not work, remove the two screws (Item 1) [Figure 20-150-24] on each controller (front and back) and remove them.

NOTE: Install a cap on each valve opening to prevent dust penetration.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251) (CONT'D)

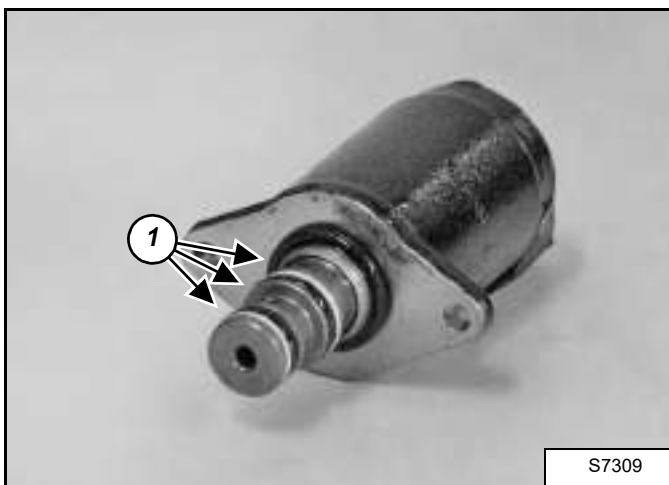
Auxiliary Valve Section Troubleshooting (Cont'd)

Figure 20-150-25



21. Turn the ignition key switch ON, but DO NOT start the engine. Check the function of each controller by having another person move the auxiliary control switch (Item 1) **[Figure 20-150-23]**. The controller piston, which can be seen through the controller orifices (Item 1) **[Figure 20-150-25]** must be moving according to the switch movement.
22. If a controller does not function properly, the controller must be replaced.

Figure 20-150-26



23. Check the seals (Item 1) **[Figure 20-150-26]** of each controller. Clean or replace if necessary.
24. Put clean oil onto the seals and reinstall the two controllers.

Troubleshooting Chart (Control Valve)

The following troubleshooting chart is provided for assistance in locating and correcting problems which are most common. Many of the recommended procedures must be done by authorized Bobcat Service Personnel



Check for correct function after adjustments, repairs or service. Failure to make correct repairs or adjustments can cause injury or death.

W-2004-1285

PROBLEM	CAUSE	CORRECTION
Lack of strength at all actuators	Load sense relief cartridge defective	Replace relief cartridge
	Load sense relief cartridge out of adjustment	Make necessary adjustments
Lack of force on one actuator only	Secondary relief valve out of adjustment	Reset to original pressure
	Secondary relief valve blocked open	Replace relief valve
Lack of load hold	Load check valve failure	Replace load check valve
	Excessive clearance between housing and spool	Replace housing and spool
Simultaneous movement of controls	Blockage of individual compensator orifice	Remove and clean orifice
	Individual pressure compensator blocked	Replace housing and compensator
	Load sense line leakage	Replace load sense regulator
Engine remains under load after spools are returned to neutral	Flow regulator blocked	Replace flow regulator
	Flow regulator filter clogged	Replace filter
Detent malfunction	Controller defective	Replace controller
Spool return difficult	Tie rod bolts too tight	Re-torque tie rod bolts
Spool leaking oil	Defective spool seal	Replace spool seal
Oil leakage between valve section	Defective seals	Replace seals

Dealer Copy -- Not for Resale

HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251) (CONT'D)

Removal And Installation

Relieve hydraulic pressure. Drain the hydraulic reservoir. (See Contents Page 10-01.)



Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a physician familiar with this injury is not received immediately.

W-2145-0290



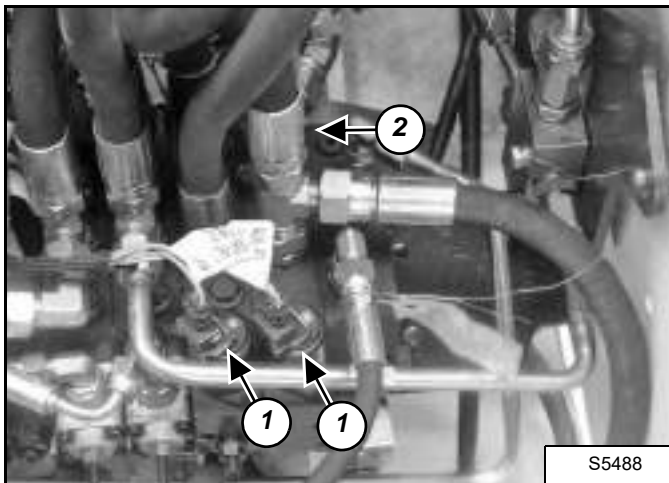
When making repairs on hydraulic system, clean the work area before disassemble and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2056-0793

Remove the fuel tank. (See Contents, Page 50-01.)

NOTE: *Rear Weights have been removed for picture clarity.*

Figure 20-150-27

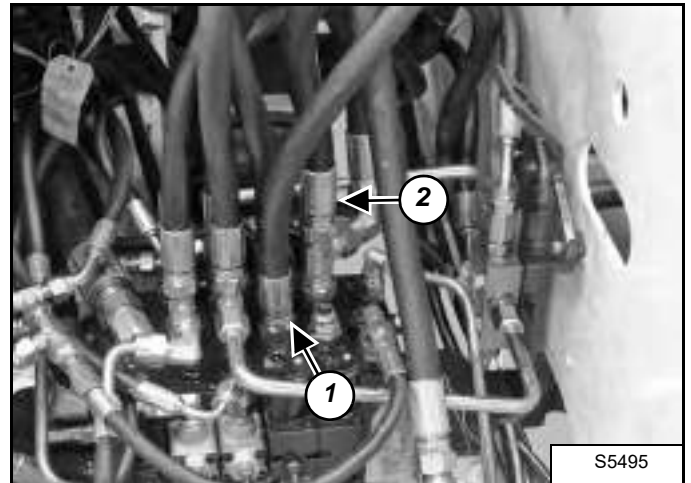


Remove the electric connectors (Item 1) as well as the ones on the other side of the tubelines (Item 2) **[Figure 20-150-27]**.

Remove the tubeline (Item 2) **[Figure 20-150-27]**.

NOTE: *Mark all hoses and tubelines for correct installation.*

Figure 20-150-28



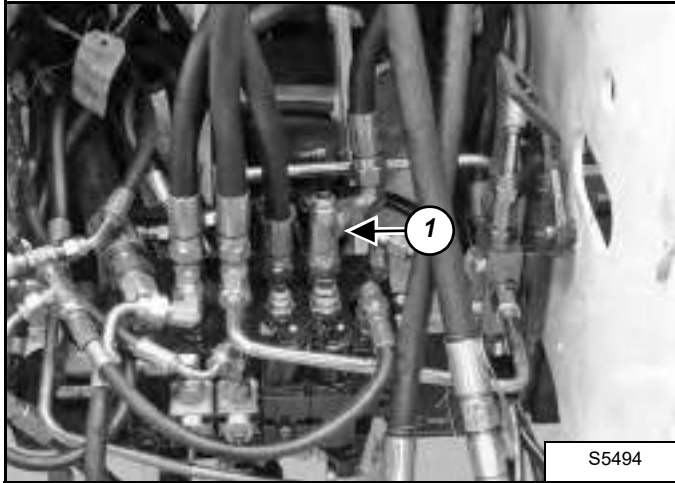
Remove the hoses (Item 1 and 2) **[Figure 20-150-28]**.

Dealer Copy -- Not for Resale

HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251) (CONT'D)

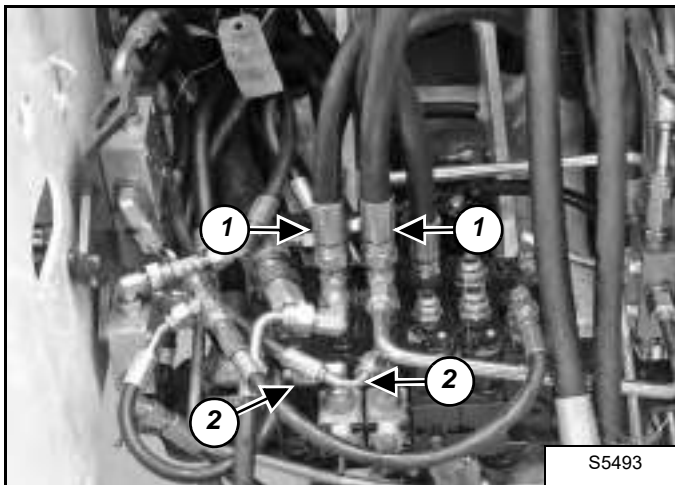
Removal And Installation (Cont'd)

Figure 20-150-29



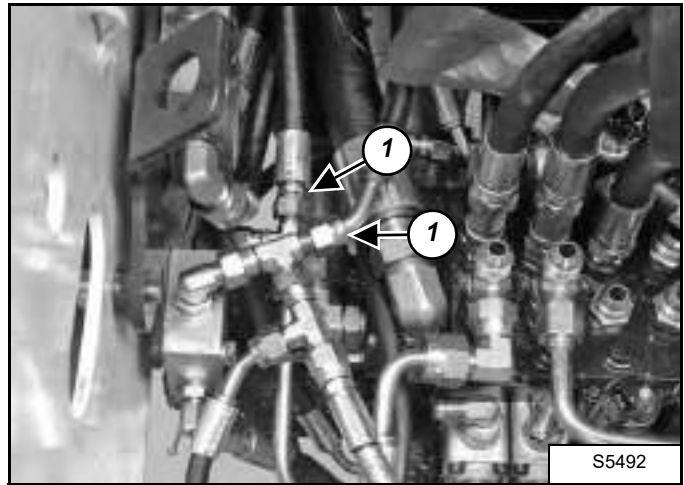
Remove the hose and tee fitting (Item 1) [Figure 20-150-29].

Figure 20-150-30



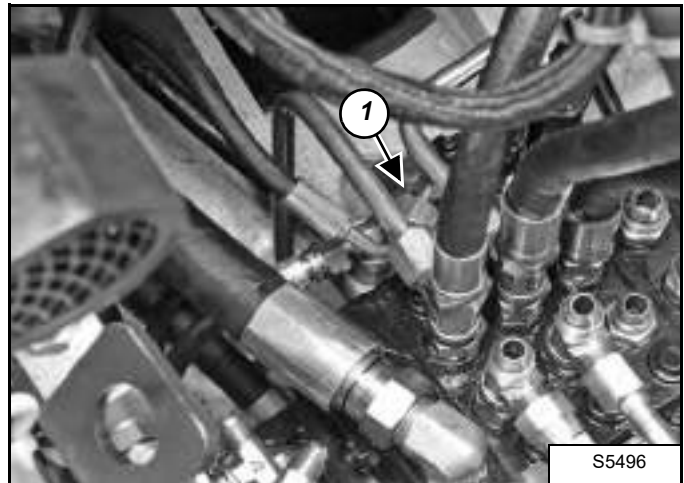
Remove the hoses (Item 1) and (Item 2) [Figure 20-150-30].

Figure 20-150-31



Remove the hoses (Item 1) [Figure 20-150-31] from the control valve.

Figure 20-150-32



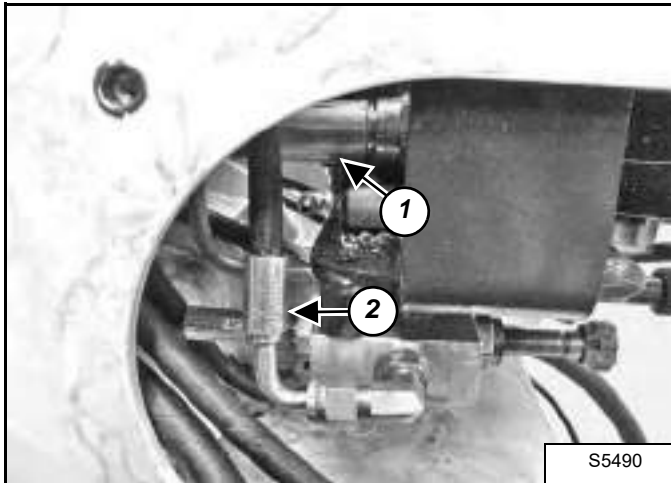
Remove the tubeline (Item 1) [Figure 20-150-32].

Dealer Copy -- Not for Resale

HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251) (CONT'D)

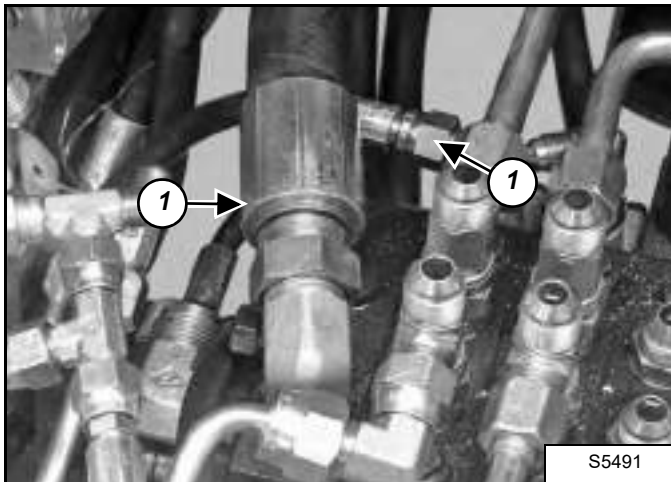
Removal And Installation (Cont'd)

Figure 20-150-33



Remove hoses (Item 1 and 2) [Figure 20-150-33].

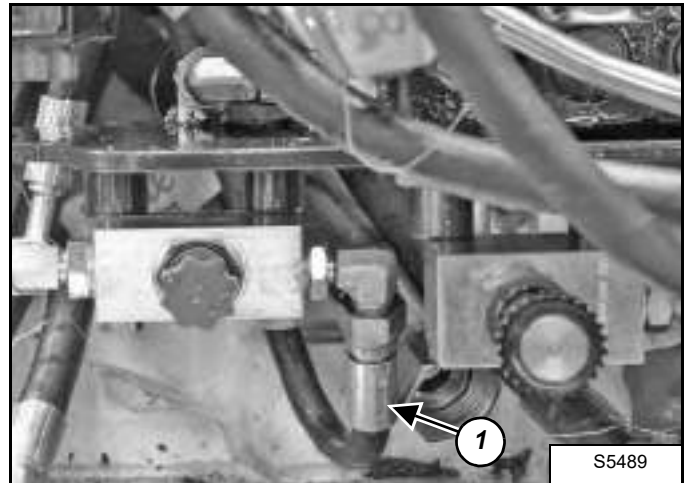
Figure 20-150-34



Disconnect the hoses (Item 1 and 2) [Figure 20-150-34].

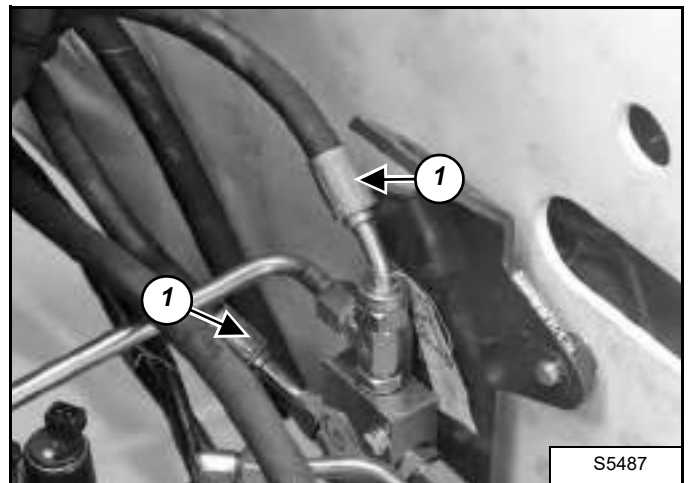
NOTE: Mark the location of the connectors for correct installation.

Figure 20-150-35



Remove the hose (Item 1) [Figure 20-150-35] from the front right hand side of the control valve.

Figure 20-150-36



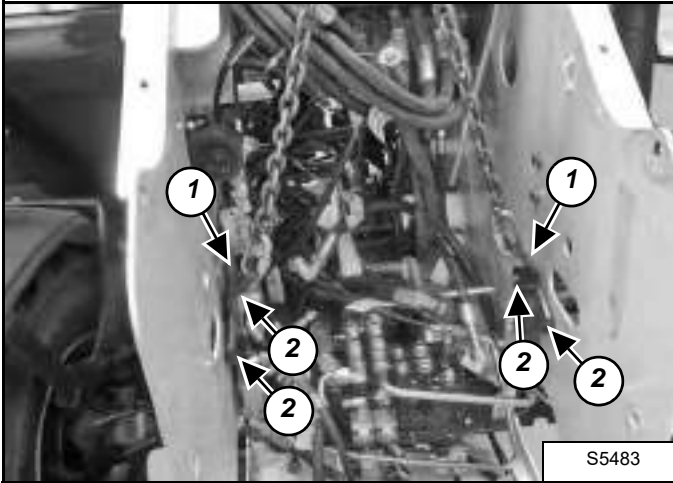
Remove the hoses (Item 1) [Figure 20-150-36].

Dealer Copy -- Not for Resale

HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251) (CONT'D)

Removal And Installation (Cont'd)

Figure 20-150-37

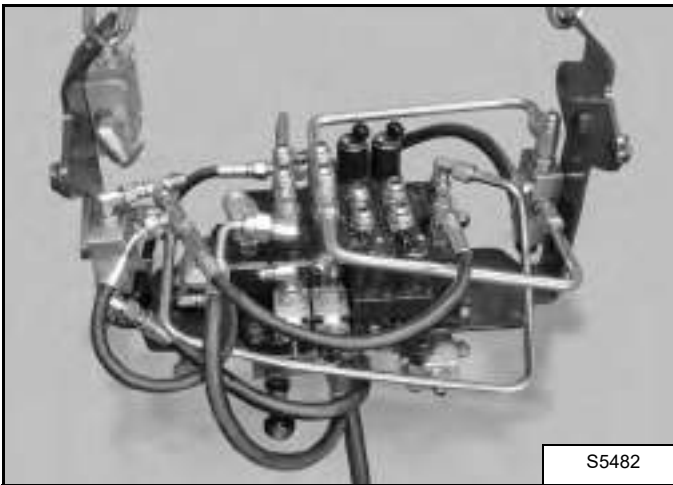


Attach a chain to the lifting holes (Item 1) **[Figure 20-150-37]** of the control valve.

Remove the bolts (Item 2) **[Figure 20-150-37]**.

Installation: Tighten the mounting bolts to 24-26 N•m (18-19 ft-lb) torque.

Figure 20-150-38

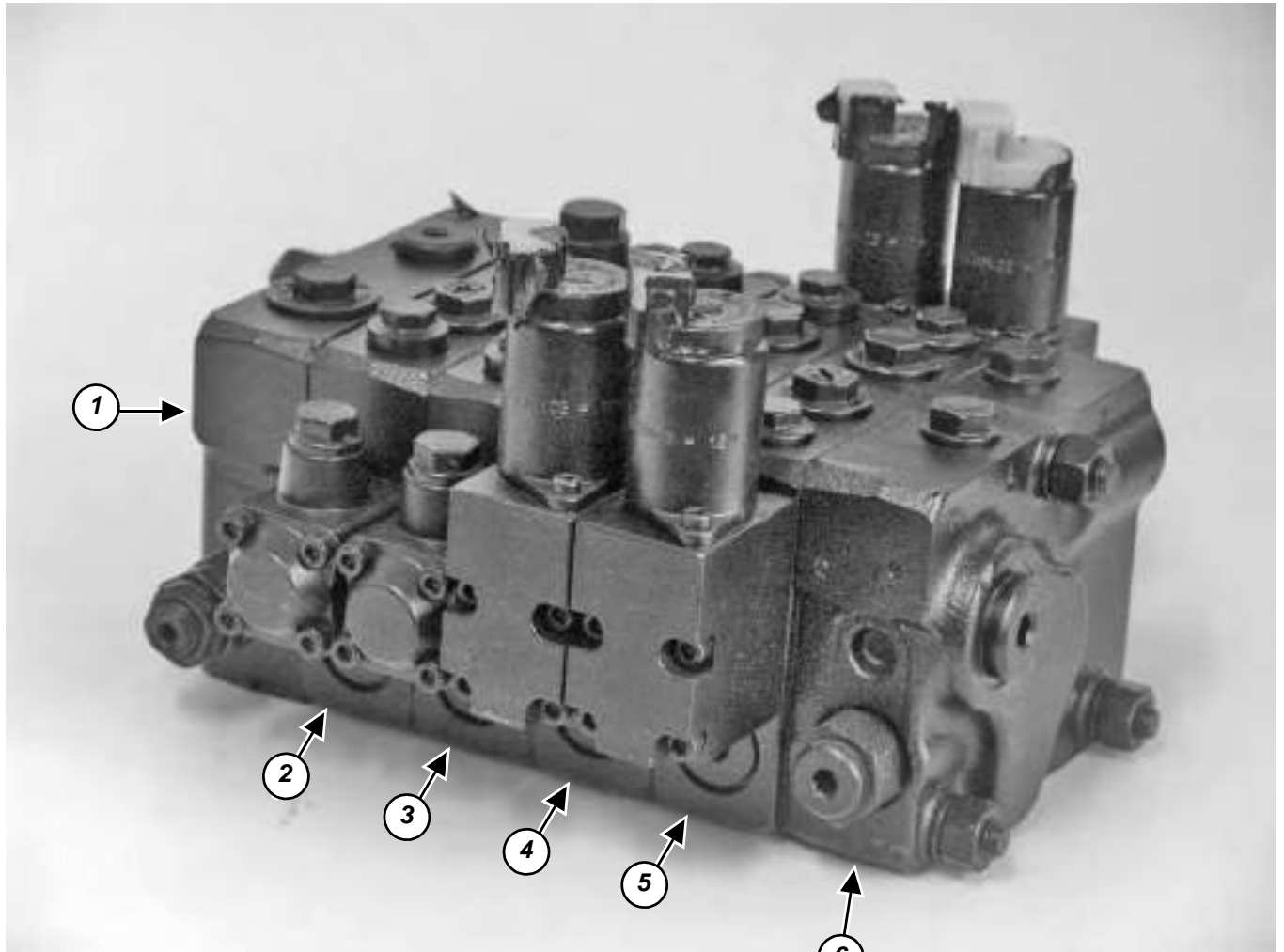


Remove the control valve from the machine **[Figure 20-150-38]**.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251) (CONT'D)

Parts Identification

1. Inlet-Outlet Valve Section
2. Lifting Valve Section
3. Tilting Valve Section
4. Telescoping Valve Section
5. Auxiliary Valve Section
6. End Housing



S5481

Dealer Copy -- Not for Resale

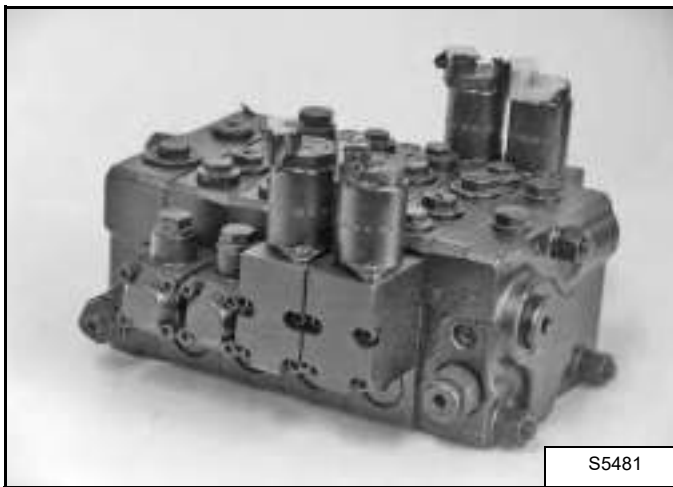
Disassembly And Assembly

IMPORTANT

When making repairs on hydraulic system, clean the work area before disassemble and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2056-0793

Figure 20-150-39



Clean the outside of the control valve [Figure 20-150-39] before disassembly.

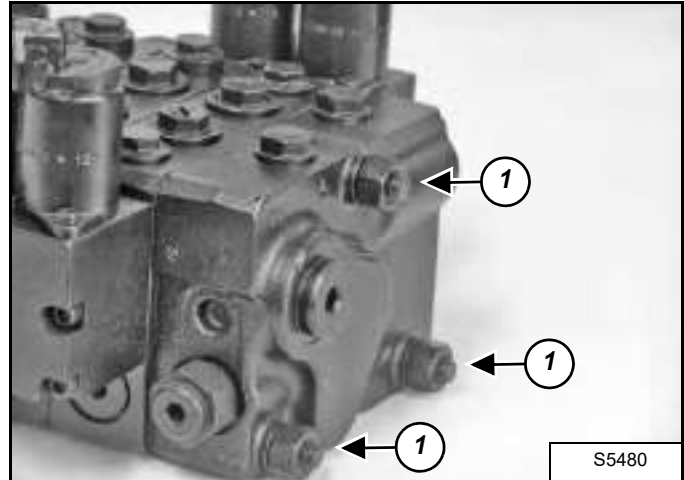
Mark the outside of the control valve [Figure 20-150-39] for ease of assembly.

NOTE: Plugs have been installed on all tubeline ports.

NOTE: Sections will be processed from right to left as depicted in [Figure 20-150-39].

End Housing Disassembly And Assembly

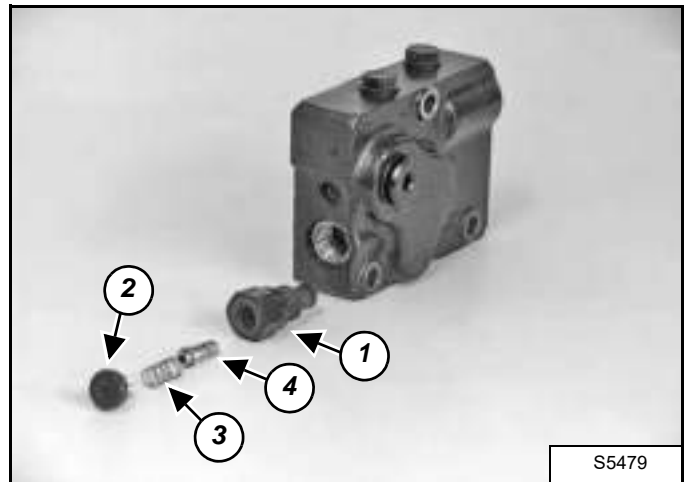
Figure 20-150-40



Loosen the three nuts from the tie bolts (Item 1) [Figure 20-150-40].

Installation: Tighten the nuts to 42 N•m (31 ft-lb) torque.

Figure 20-150-41



Remove the relief cartridge (Item 1) [Figure 20-150-41].

Remove the plug (Item 2), spring (Item 3) and spool (Item 4) [Figure 20-150-41].

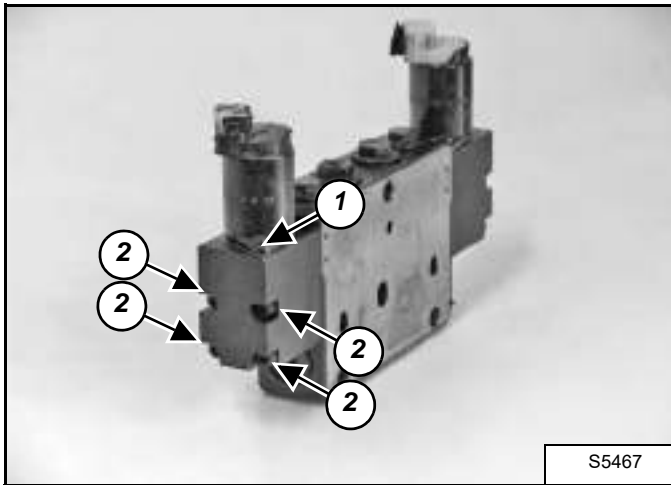
Installation: Tighten cartridge to 42 N•m (31 ft-lb) torque.

Replace all O-rings.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251) (CONT'D)

**Telescoping and Auxiliary Valve Section
Disassembly And Assembly**

Figure 20-150-42

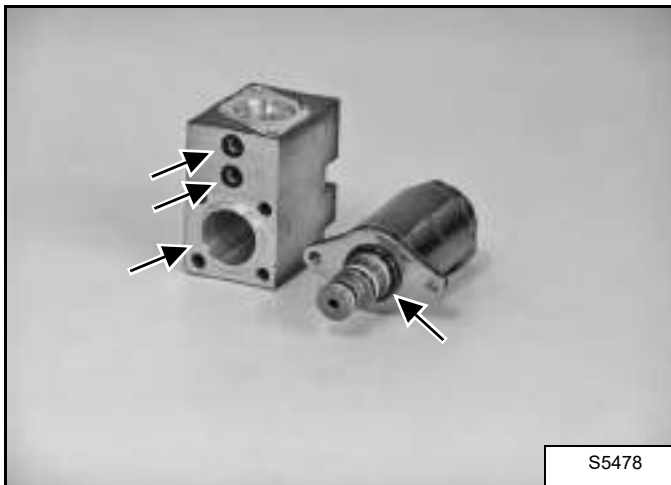


Loosen the two bolts (Item 1) [Figure 20-150-42] and remove the controller.

Loosen the four bolts (Item 2) [Figure 20-150-42] and remove the port block.

Installation: Tighten the bolts to 6,6 N•m (58.4 in-lb) torque.

Figure 20-150-43



Replace all O-rings [Figure 20-150-43].

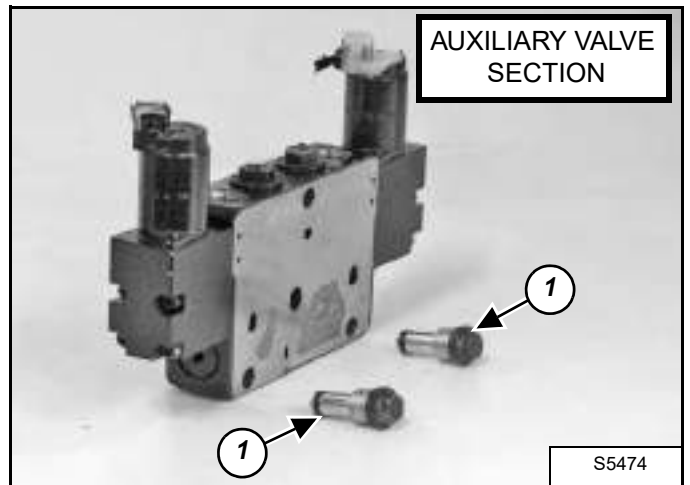
Figure 20-150-44



Remove the spool [Figure 20-150-44].

For Auxiliary Valve Section:

Figure 20-150-45



Remove the two plugs (Item 1) [Figure 20-150-45] on the top side of the valve section.

Replace all O-rings.

Installation: Tighten the plugs to 24 N•m (17.7 ft-lb) torque.

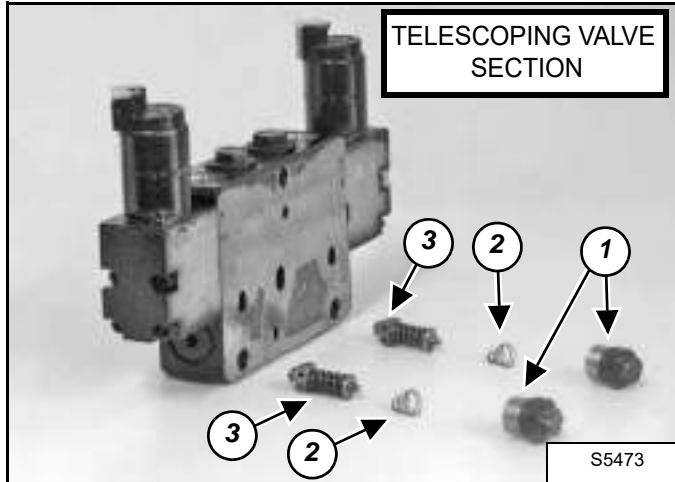
Dealer Copy -- Not for Resale

HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251) (CONT'D)

**Telescoping and Auxiliary Valve Section
Disassembly And Assembly (Cont'd)**

For Telescoping Valve Section:

Figure 20-150-46



Remove the two plugs (Item 1), two springs (Item 2) and two port relief valves (Item 3) [Figure 20-150-46] on the top side of the valve section.

Replace all O-rings.

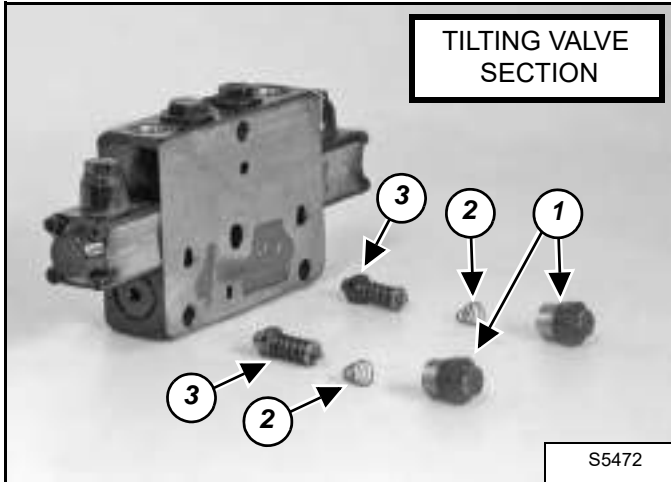
Installation: Tighten the plugs to 24 N•m (17.7 ft-lb) torque.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251) (CONT'D)

Lifting and Tilting Valve Section Disassembly And Assembly

For Tilting Valve Section:

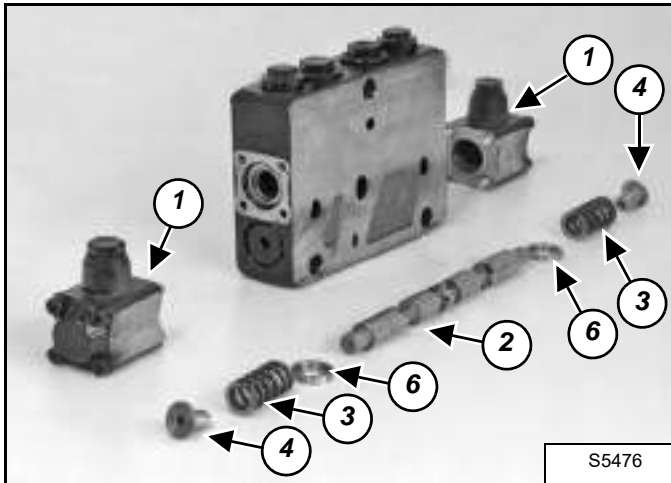
Figure 20-150-47



Remove the two plugs (Item 1), two springs (Item 2) and two port relief valves (Item 3) [Figure 20-150-47] on top side of the valve section.

Installation: Tighten the plugs to 24 N•m (17.7 ft-lb) torque.

Figure 20-150-48



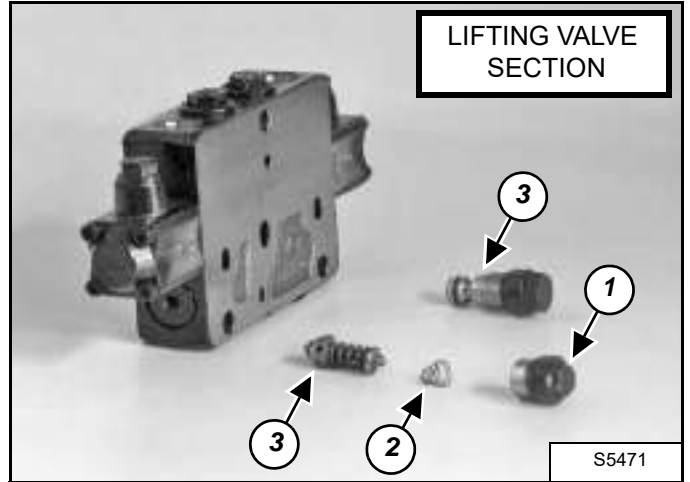
Loosen the front and rear cover (Item 1), and remove the rod (Item 2), springs (Item 3), spring retainers (Item 4) and washers (Item 6) [Figure 20-150-48].

Replace all O-rings.

Installation: Tighten the cover bolts to 6,6 N•m (58.4 in-lb) torque.

For Lifting Valve Section:

Figure 20-150-49



Remove the plug (Item 1), spring (Item 2) and two relief valves (Item 3) [Figure 20-150-49].

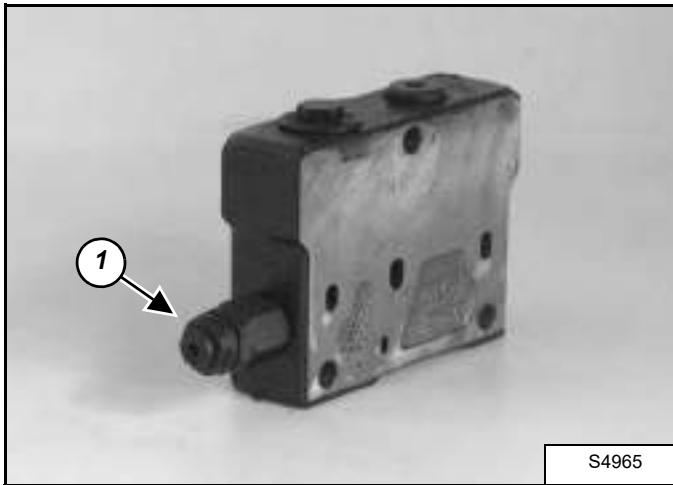
Installation: Tighten the plugs to 24 N•m (17.7 ft-lb) torque.

Dealer Copy -- Not for Resale

HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251) (CONT'D)

Inlet-Outlet Valve Section Disassembly And Assembly

Figure 20-150-50



Remove and disassemble the main relief valve (Item 1) [Figure 20-150-50] from the valve section.

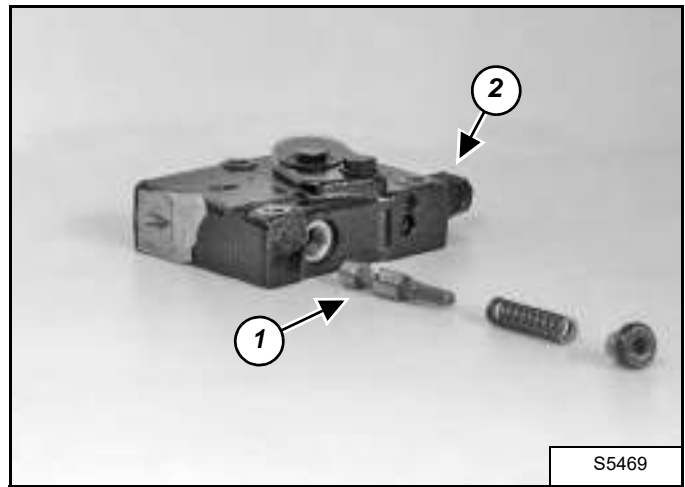
Installation: Tighten the valve to 24 N•m (17.7 ft-lb) torque.

Figure 20-150-51



Replace all O-rings in the main relief valve [Figure 20-150-51].

Figure 20-150-52



Remove the plugs (Item 1 and 2) [Figure 20-150-52] from the valve section.

Installation: Tighten the plugs to 24 N•m (17.7 ft-lb) torque.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE)

Troubleshooting Chart (Controllers)

The following troubleshooting chart is provided for assistance in locating and correcting problems which are most common. Many of the recommended procedures must be done by authorized Bobcat Service Personnel.



Check for correct function after adjustments, repairs or service. Failure to make correct repairs or adjustments can cause injury or death.

W-2004-1285

PROBLEM	CAUSE	CORRECTION
None of the controllers work	Insufficient power supply	Check battery voltage
	Insufficient pilot pressure	Check pilot pressure
Only one controller works	No actuation signal	Check diagnostic service codes
	Unsuitable actuation signal	Check diagnostic service codes
One controller not working or jerky	Friction or jamming of the plunger	Replace controller
One controller not working or jerky in one direction	Contamination of the proportional valve in the controller	Replace controller
Controller creeps	Neutral position incorrect	Calibrate neutral adjustment
Oil leakage between control valve and controller	Faulty seals	Replace seal
Oil leakage between controllers	Faulty controller couplers	Replace controller couplers

Dealer Copy -- Not for Resale

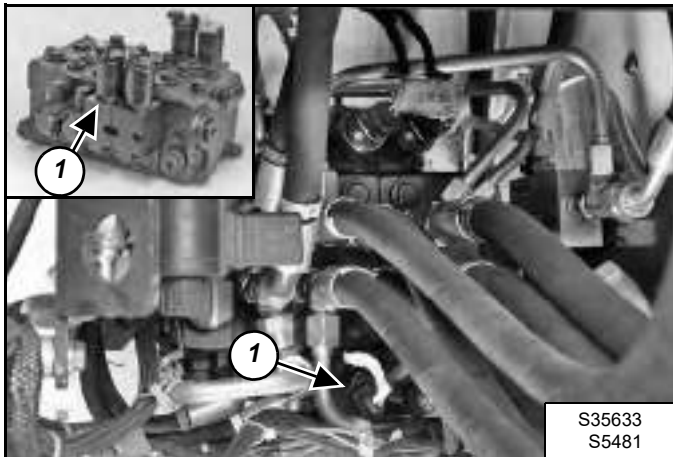
HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

Telescoping Valve Section Troubleshooting

Remove the rear cover from machine.

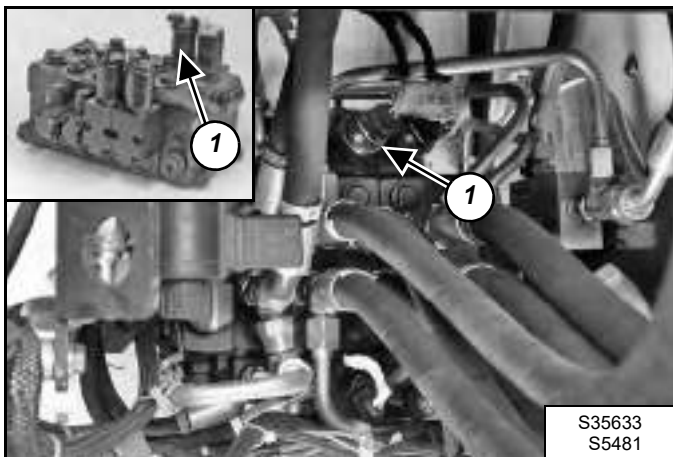
1. Check for diagnostic service codes. (See Viewing Service Codes on Page 60-160-1.)
When no service code is read, go to step 11.
2. If code 50-02 or 50-03 appears: error in joystick or wiring of joystick to main controller device.
Code 50-04 requires joystick (re)calibration.

Figure 20-151-1



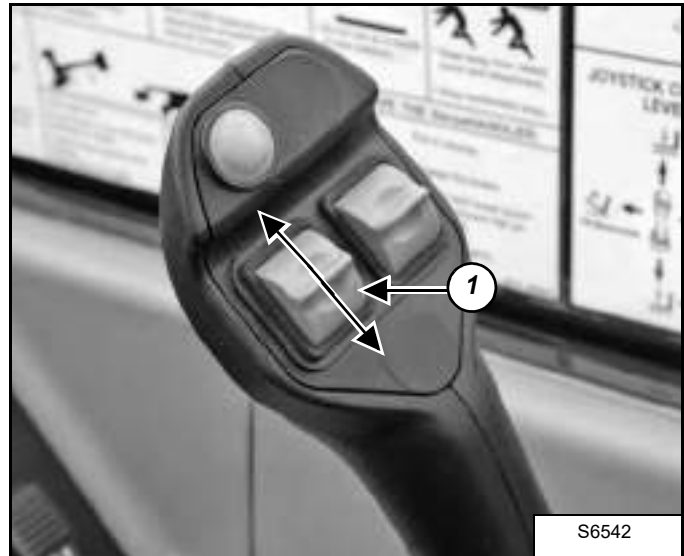
3. If code 50-45 or 50-46 appears: error on boom retraction valve (rod), which is located at the back side of the control valve. (Item 1) **[Figure 20-151-1]**.

Figure 20-151-2



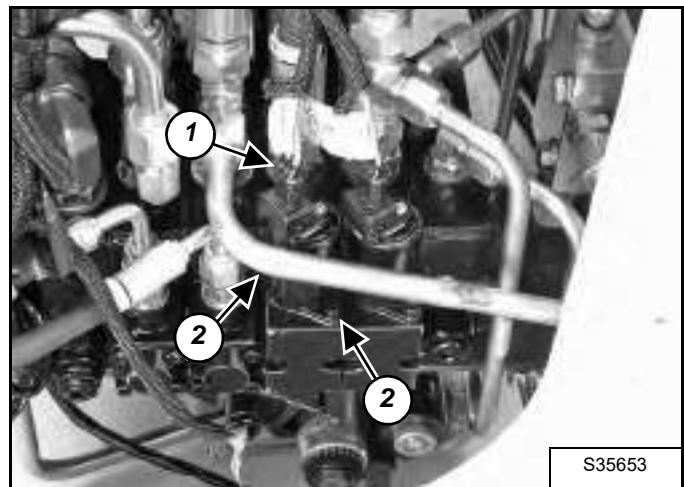
4. If code 50-66 or 50-67 appears: error on boom extension valve (base), which is located at the front side of the control valve. (Item 1) **[Figure 20-151-2]**
5. Unplug the valve controller connector of the valve which has been diagnosed and plug back in.

Figure 20-151-3



6. With adequate room in front of the machine, start the engine, lower the restraint bar (if equipped) and run the engine at 2200 RPM. Move the telescopic control switch (Item 1) **[Figure 20-151-3]** forward and back to see if this function works. Stop the engine.

Figure 20-151-4



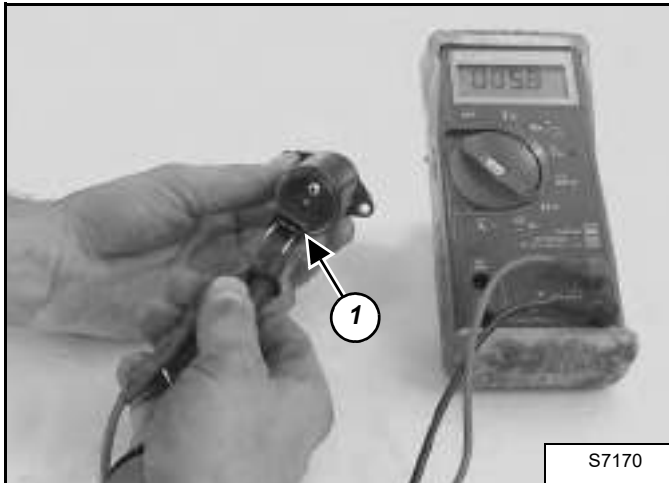
7. Unplug the connector (extension controller connector shown in picture) (Item 1) **[Figure 20-151-4]** of the valve controller which controls the diagnosed valve.
8. Remove the two screws (extension controller shown in picture) (Item 2) **[Figure 20-151-4]** and pull out the controller.

NOTE: Install a cap on the valve opening to prevent dust penetration.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

Telescoping Valve Section Troubleshooting (Cont'd)

Figure 20-151-5



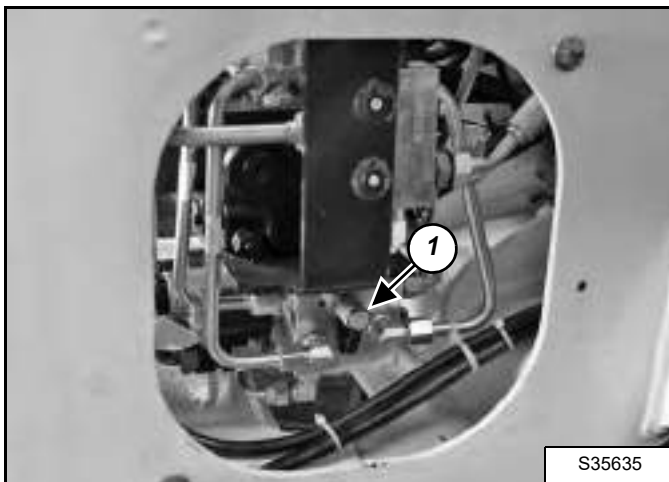
9. Use an ohmmeter to check the controller solenoid. The reading between both electrical connector terminals must be approximately 5.8 ohms (Item 1) **[Figure 20-151-5]**.

If the controller solenoid measurement is correct, the error could be located in wiring/connectors to the valve controller.

10. Reinstall the controller.

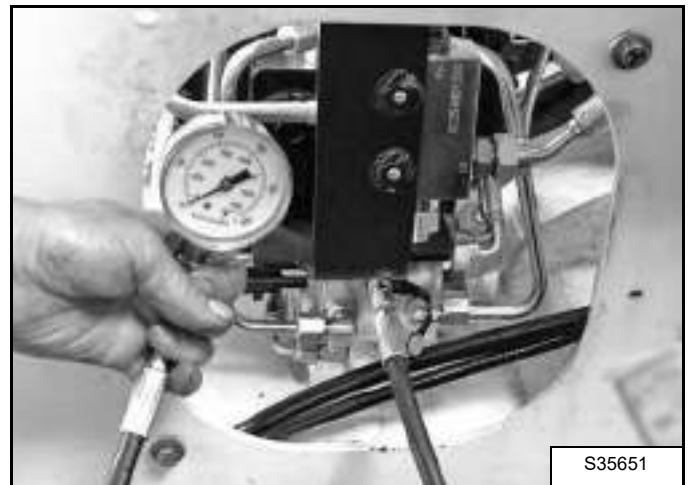
Checking Pilot Pressure

Figure 20-151-6



11. Locate the test fitting (Item 1) **[Figure 20-151-6]**, through the right side frame hole, below the control valve and remove the cap.

Figure 20-151-7



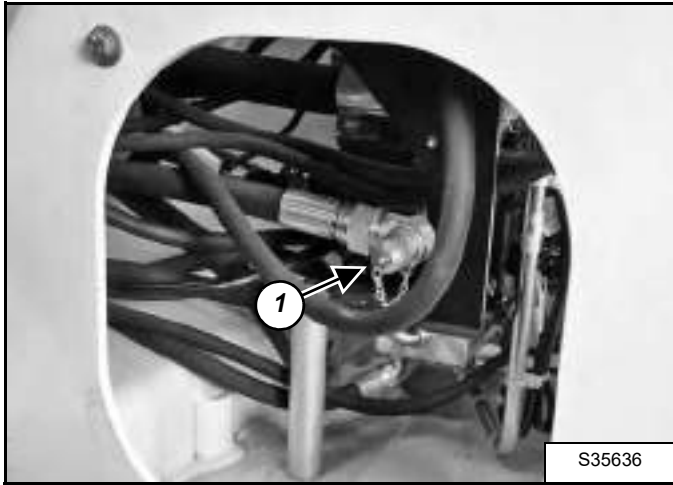
12. Install a 7 MPa (70 bar) (1000 psi) gauge on the test fitting **[Figure 20-151-7]**.
13. Start the engine, lower the restraint bar (if equipped) and run the engine at 2200 RPM. Record the pressure. The pressure at the gauge should be 3,5 MPa (35 bar) (508 PSI) maximum.
14. Remove the gauge.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

Telescoping Valve Section Troubleshooting (Cont'd)

Checking Drain Pressure

Figure 20-151-8



15. Locate the test fitting (Item 1) [Figure 20-151-8] behind the control valve and remove the cap.

Figure 20-151-9



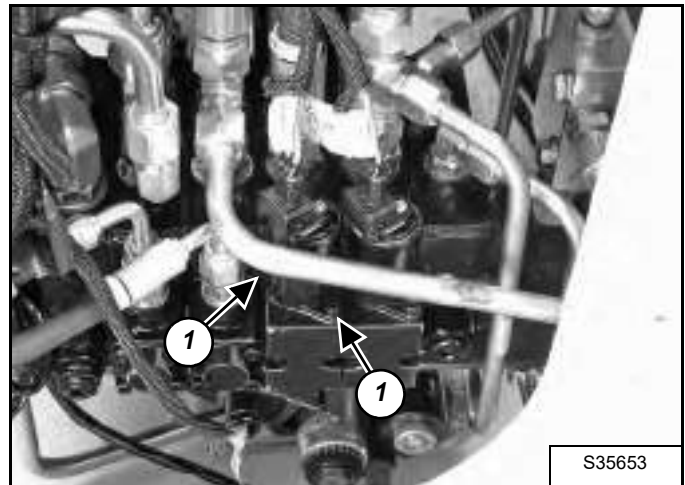
16. Install a 3,5 MPa (35 bar) (508 psi) gauge on the test fitting [Figure 20-151-9].
17. Start the engine, lower the restraint bar (if equipped) and run the engine at 2200 RPM. Record the pressure. The pressure at the gauge should be 150 KPa (1,5 bar) (22 psi) maximum.
18. Remove the gauge.

Figure 20-151-10



19. With adequate room in front of the machine, start the engine, lower the restraint bar (if equipped) and run the engine at 2200 RPM. Move the telescopic control switch (Item 1) [Figure 20-151-10] forward and back to see if this function works. Stop the engine.

Figure 20-151-11



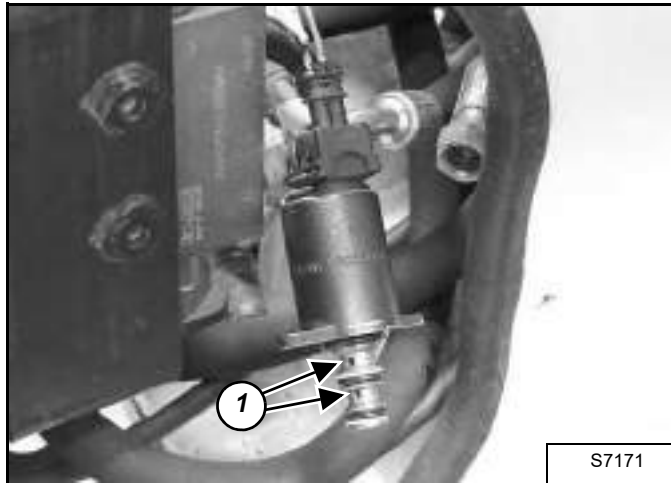
20. If the telescopic function does not work, remove the two screws (Item 1) [Figure 20-151-11] on each controller (front and back) and remove them.

NOTE: Install a cap on each valve opening to prevent dust penetration.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

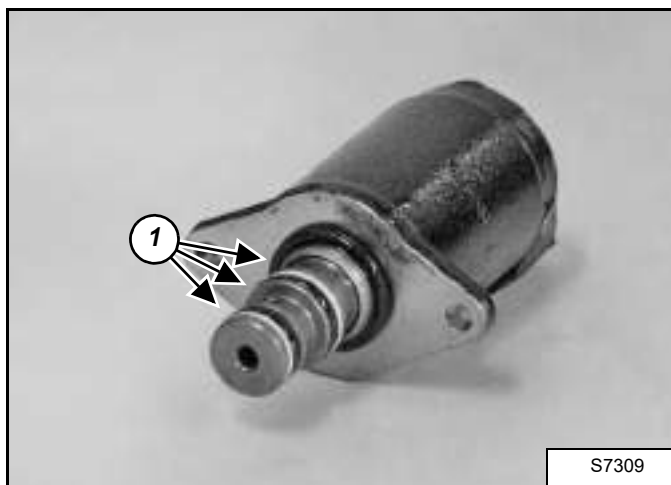
Telescoping Valve Section Troubleshooting (Cont'd)

Figure 20-151-12



21. Turn the ignition key switch ON, but DO NOT start the engine. Check the function of each controller by having another person move the telescopic control switch (Item 1) [Figure 20-151-10]. The controller piston, which can be seen through the controller orifices (Item 1) [Figure 20-151-12] must be moving according to the switch movement.
22. If a controller does not function properly, the controller must be replaced.

Figure 20-151-13



23. Check the seals (Item 1) [Figure 20-151-13] of each controller. Clean or replace if necessary.
24. Put clean oil onto the seals and reinstall the two controllers.

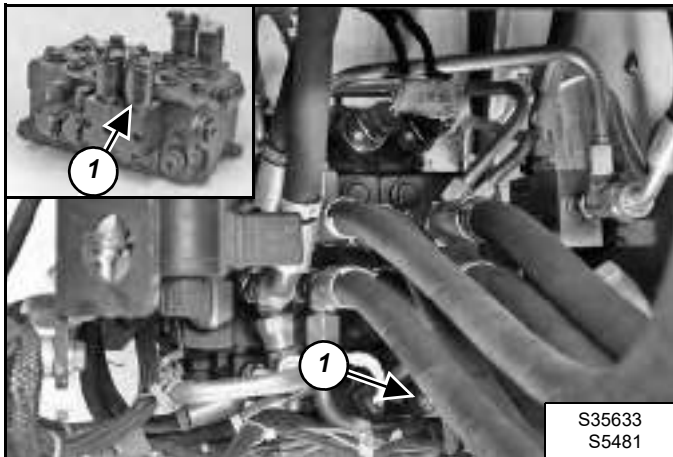
HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

Auxiliary Valve Section Troubleshooting

Remove the rear cover from machine.

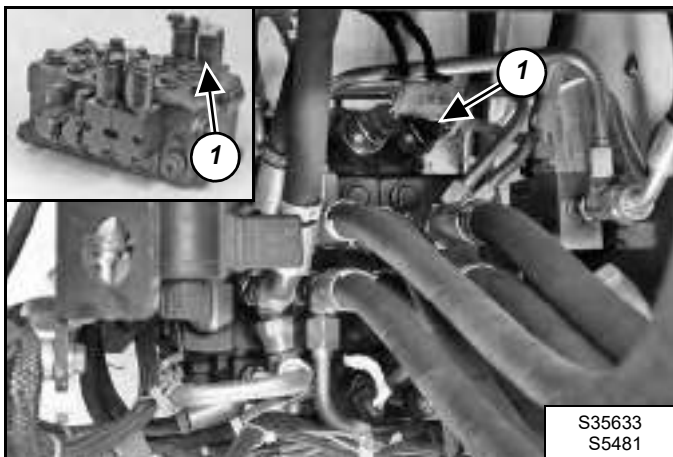
1. Check for diagnostic service codes. (See Viewing Service Codes on Page 60-160-1.)
When no service code is read, go to step 11.
2. If code 50-05 or 50-06 appears: error in joystick or wiring of joystick to main controller device.
Code 50-07 requires joystick (re)calibration.

Figure 20-151-14



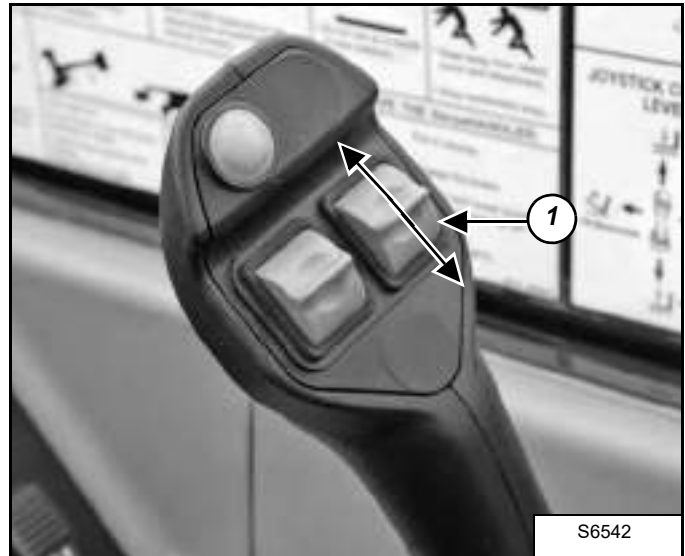
3. If code 50-72 or 50-73 appears: error on auxiliary valve (rod), which is located at the back side of the control valve. (Item 1) [Figure 20-151-14]

Figure 20-151-15



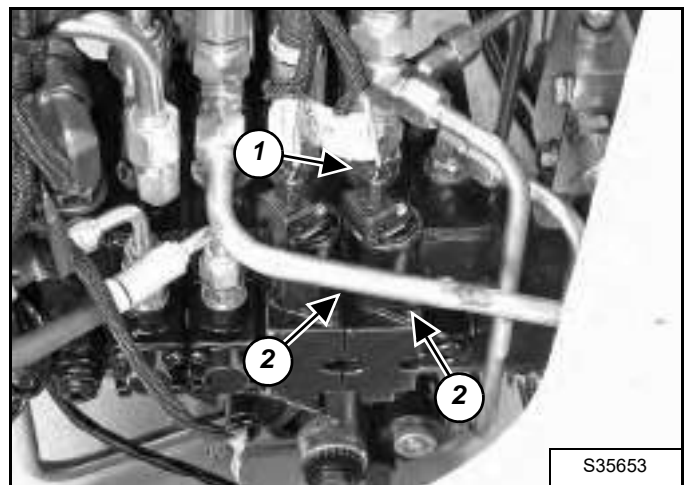
4. If code 50-45 or 50-46 appears: error on auxiliary valve (base), which is located at the front side of the control valve. (Item 1) [Figure 20-151-15]
5. Unplug the valve controller connector of the valve which has been diagnosed and plug back in.

Figure 20-151-16



6. With the attachment installed to the front auxiliary hydraulics, start the engine, lower the restraint bar (if equipped) and run the engine at 2200 RPM. Move the auxiliary control switch (Item 1) [Figure 20-151-16] forward and back to see if this function works. Stop the engine.

Figure 20-151-17



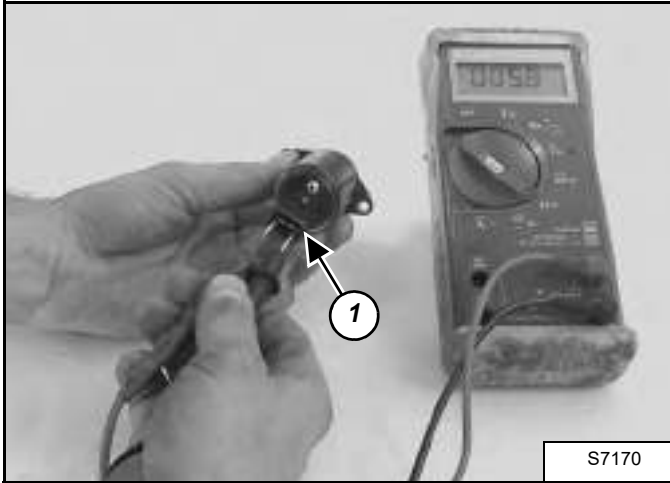
7. Unplug the connector (auxiliary controller connector shown in picture) (Item 1) [Figure 20-151-17] of the valve controller which controls the diagnosed valve.
8. Remove the two screws (auxiliary controller shown in picture) (Item 2) [Figure 20-151-17] and pull out the controller.

NOTE: Install a cap on the valve opening to prevent dust penetration.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

Auxiliary Valve Section Troubleshooting (Cont'd)

Figure 20-151-18



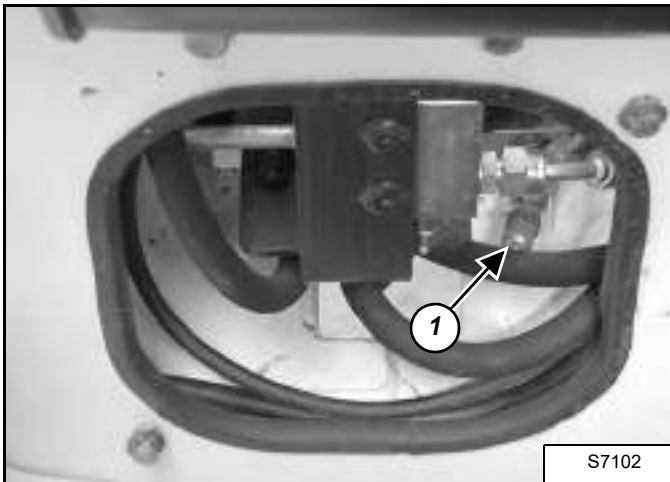
9. Use an ohmmeter to check the controller solenoid. The reading between both electrical connector terminals must be approximately 5.8 ohms (Item 1) **[Figure 20-151-18]**.

If the controller solenoid measurement is correct, the error could be located in wiring/connectors to the valve controller.

10. Reinstall the controller.

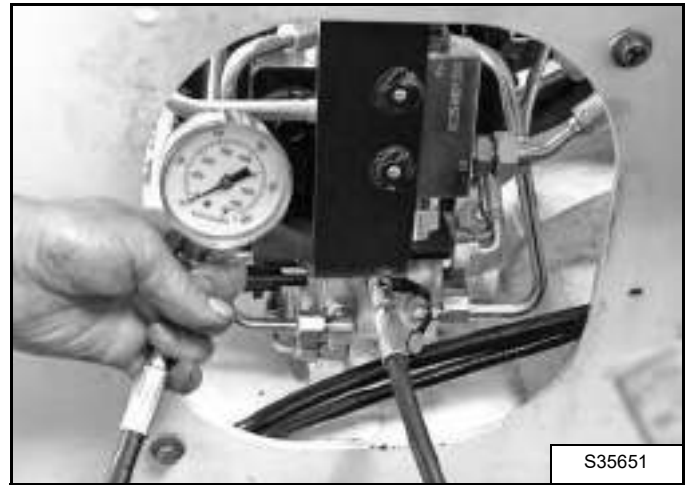
Checking Pilot Pressure

Figure 20-151-19



11. Locate the test fitting (Item 1) **[Figure 20-151-19]**, through the right side frame hole, below the control valve and remove the cap.

Figure 20-151-20



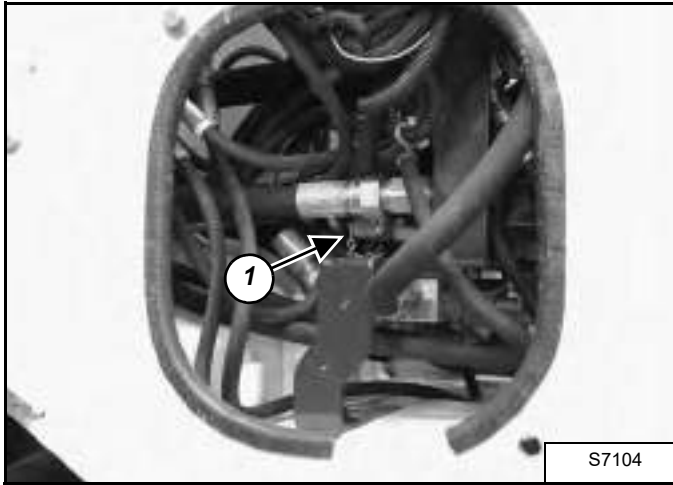
12. Install a 7 MPa (70 bar) (1000 psi) gauge on the test fitting **[Figure 20-151-20]**.
13. Start the engine, lower the restraint bar (if equipped) and run the engine at 2200 RPM. Record the pressure. The pressure at the gauge should be 3,5 MPa (35 bar) (508 psi) maximum.
14. Remove the gauge.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

Auxiliary Valve Section Troubleshooting (Cont'd)

Checking Drain Pressure

Figure 20-151-21



15. Locate the test fitting (Item 1) [Figure 20-151-21] behind the control valve and remove the cap.

Figure 20-151-22



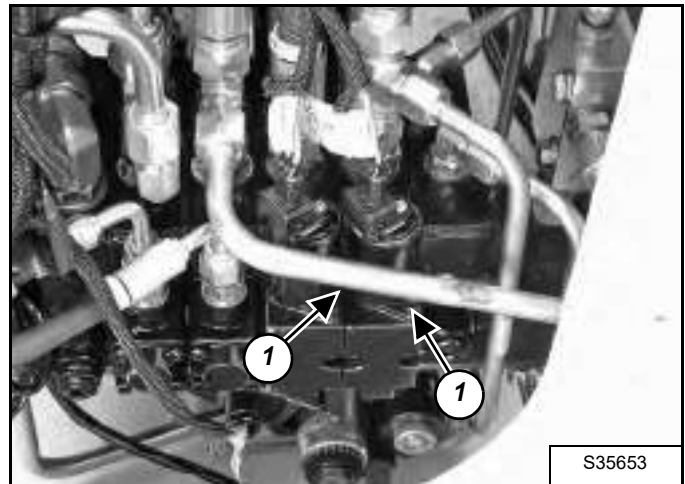
16. Install a 3,5 MPa (35 bar) (508 psi) gauge on the test fitting [Figure 20-151-22].
17. Start the engine, lower the restraint bar (if equipped) and run the engine at 2200 RPM. Record the pressure. The pressure at the gauge should be 150 KPa (1,5 bar) (22 psi) maximum.
18. Remove the gauge.

Figure 20-151-23



19. With the attachment installed to the front auxiliary hydraulics, start the engine, lower the restraint bar (if equipped) and run the engine at 2200 RPM. Move the auxiliary control switch (Item 1) [Figure 20-151-23] forward and back to see if this function works. Stop the engine.

Figure 20-151-24



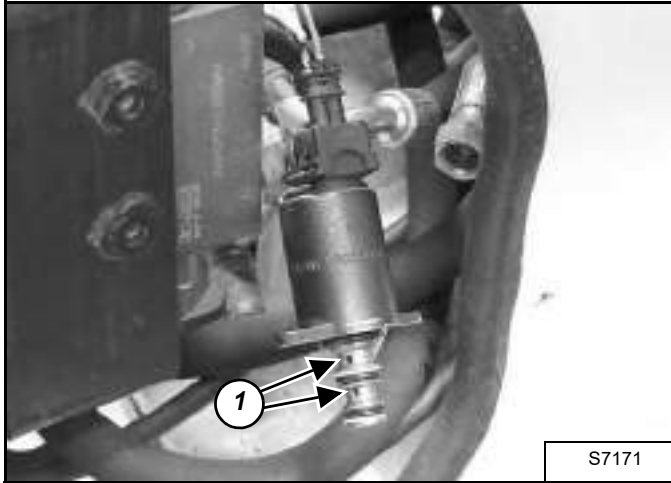
20. If the auxiliary function does not work, remove the two screws (Item 1) [Figure 20-151-24] on each controller (front and back) and remove them.

NOTE: Install a cap on each valve opening to prevent dust penetration.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

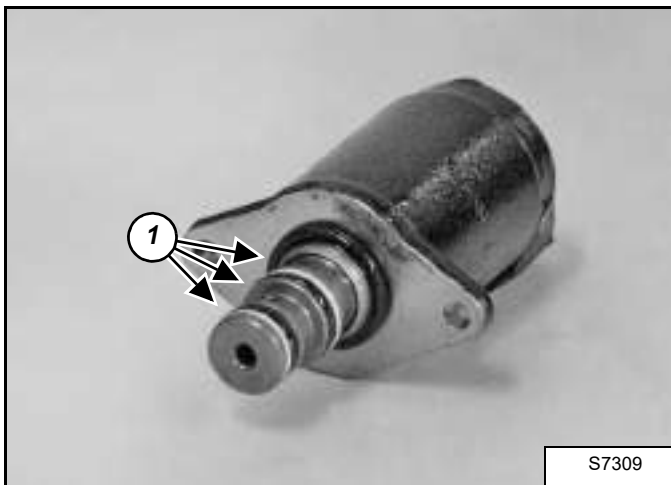
Auxiliary Valve Section Troubleshooting (Cont'd)

Figure 20-151-25



21. Turn the ignition key switch ON, but DO NOT start the engine. Check the function of each controller by having another person move the auxiliary control switch (Item 1) **[Figure 20-151-23]**. The controller piston, which can be seen through the controller orifices (Item 1) **[Figure 20-151-25]** must be moving according to the switch movement.
22. If a controller does not function properly, the controller must be replaced.

Figure 20-151-26



23. Check the seals (Item 1) **[Figure 20-151-26]** of each controller. Clean or replace if necessary.
24. Put clean oil onto the seals and reinstall the two controllers.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

Troubleshooting Chart (Control Valve)

The following troubleshooting chart is provided for assistance in locating and correcting problems which are most common. Many of the recommended procedures must be done by authorized Bobcat Service Personnel



Check for correct function after adjustments, repairs or service. Failure to make correct repairs or adjustments can cause injury or death.

W-2004-1285

PROBLEM	CAUSE	CORRECTION
Lack of strength at all actuators	Load sense relief cartridge defective	Replace relief cartridge
	Load sense relief cartridge out of adjustment	Make necessary adjustments
Lack of force on one actuator only	Secondary relief valve out of adjustment	Reset to original pressure
	Secondary relief valve blocked open	Replace relief valve
Lack of load hold	Load check valve failure	Replace load check valve
	Excessive clearance between housing and spool	Replace housing and spool
Simultaneous movement of controls	Blockage of individual compensator orifice	Remove and clean orifice
	Individual pressure compensator blocked	Replace housing and compensator
	Load sense line leakage	Replace load sense regulator
Engine remains under load after spools are returned to neutral	Flow regulator blocked	Replace flow regulator
	Flow regulator filter clogged	Replace filter
Detent malfunction	Controller defective	Replace controller
Spool return difficult	Tie rod bolts too tight	Re-torque tie rod bolts
Spool leaking oil	Defective spool seal	Replace spool seal
Oil leakage between valve section	Defective seals	Replace seals

Dealer Copy -- Not for Resale

HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

Removal And Installation

Relieve hydraulic pressure. Drain the hydraulic reservoir. (See Contents Page 10-01.)



Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a physician familiar with this injury is not received immediately.

W-2145-0290



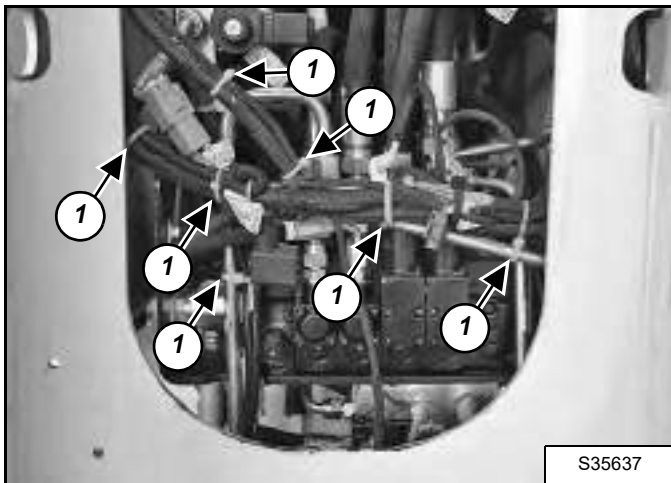
When making repairs on hydraulic system, clean the work area before disassemble and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2056-0793

Remove fuel tank. (See FUEL TANK on Page 50-70-1.)

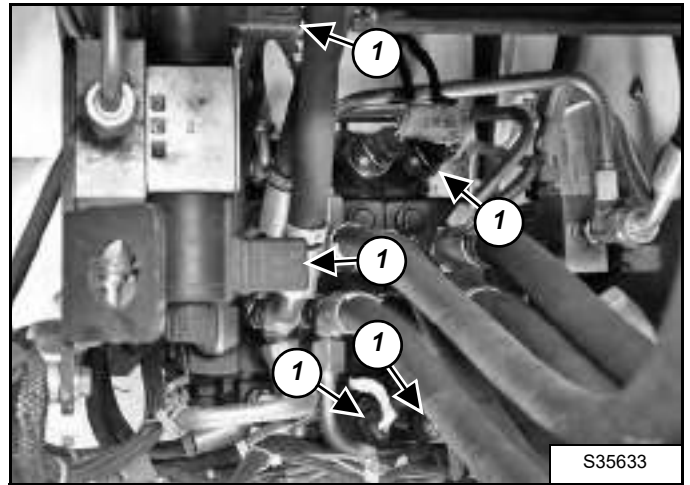
NOTE: Rear Weight has been removed for picture clarity.

Figure 20-151-27



Remove tie straps [Figure 20-151-28].

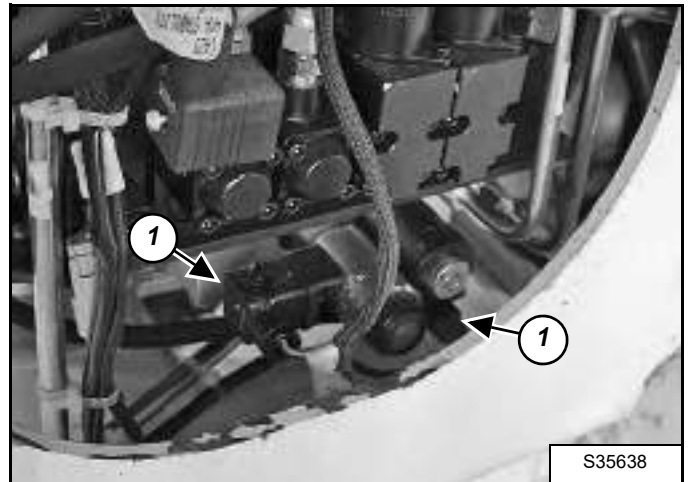
Figure 20-151-28



Disconnect electric connectors (Item 1) [Figure 20-151-28] from the control valve and the steering mode valve block.

NOTE: Mark all connectors for correct installation.

Figure 20-151-29



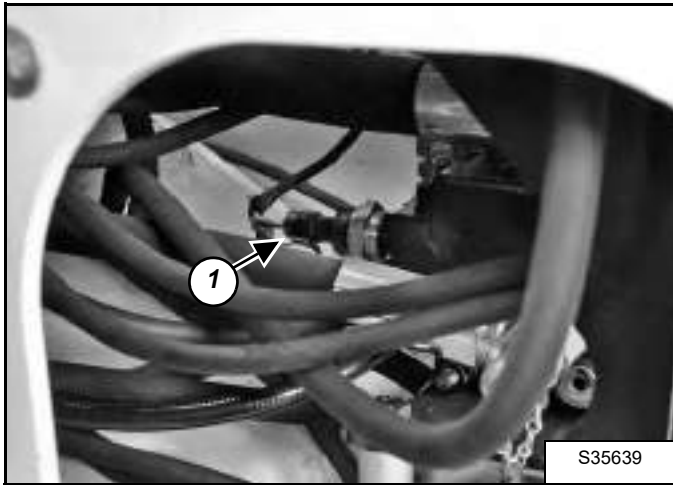
Disconnect electric connectors (Item 1) [Figure 20-151-28] from the boom float solenoid and the workgroup lockout solenoid.

Dealer Copy -- Not for Resale

HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

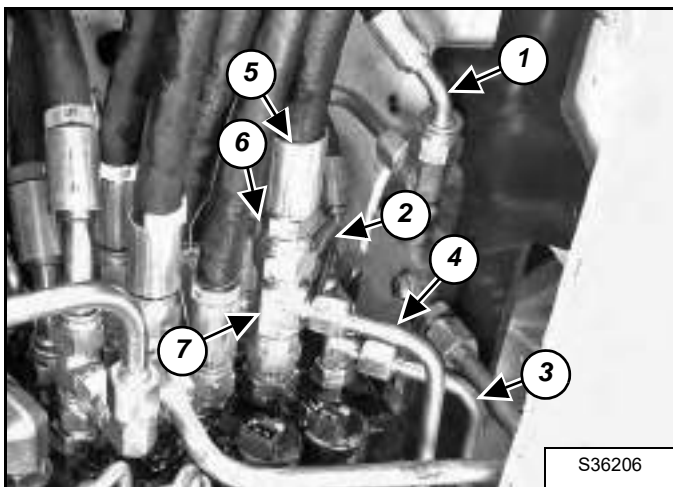
Removal And Installation (Cont'd)

Figure 20-151-30



Remove boom float pressure sensor connector (Item 1) [Figure 20-151-30].

Figure 20-151-31



Remove hose (Item 1) [Figure 20-151-31].

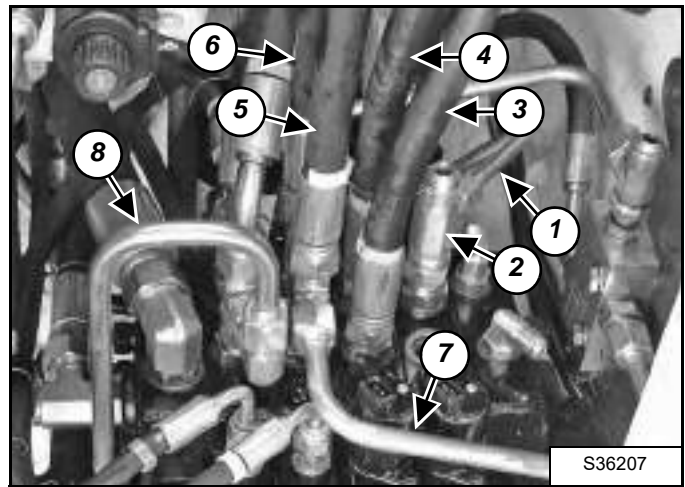
Remove 7 tubelines (Items 2 to 4) [Figure 20-151-31].

Remove both auxiliary valve section hoses (Items 5 & 6) [Figure 20-151-31].

Remove tee fitting (Item 7) [Figure 20-151-31].

NOTE: Mark all hoses and tubelines for correct installation.

Figure 20-151-32



Remove hose (Item 1) [Figure 20-151-32].

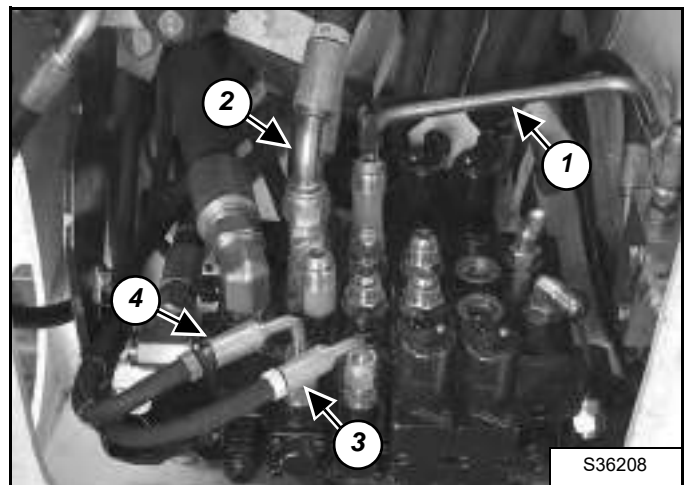
Remove both tilting valve section hoses (Items 5 & 6) [Figure 20-151-32].

Remove both telescoping valve section hoses (Items 5 & 6) [Figure 20-151-32].

Remove tubelines (Items 7 & 8) [Figure 20-151-32].

NOTE: Mark all hoses and tubelines for correct installation.

Figure 20-151-33



Remove the tubeline (Item 1) [Figure 20-151-33].

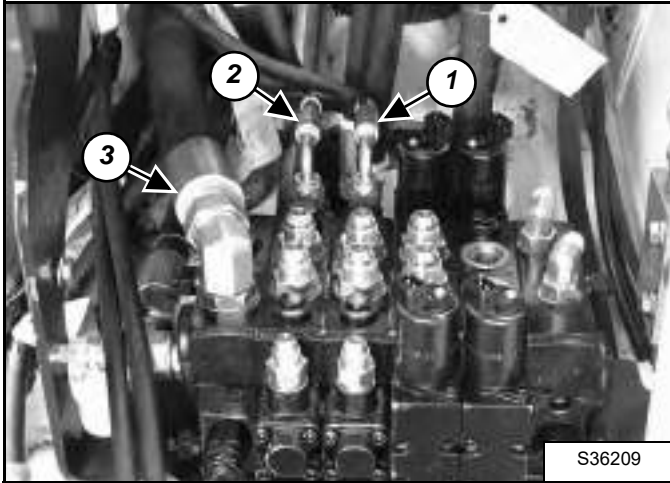
Remove the hoses (Items 2 to 4) [Figure 20-151-33].

NOTE: Remove any hose clamps if necessary.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

Removal And Installation (Cont'd)

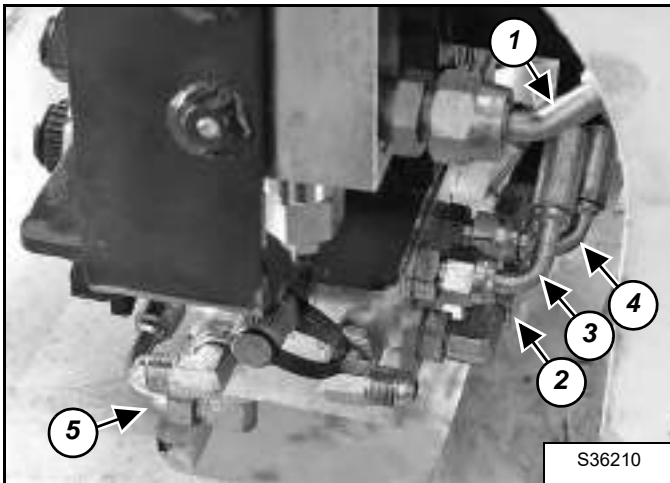
Figure 20-151-34



Remove the pilot hoses (Items 1 & 2) [Figure 20-151-34].

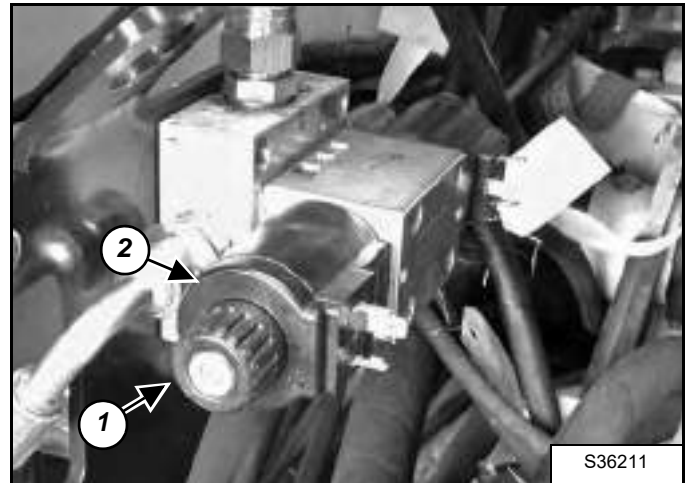
Remove the hose (Item 3) [Figure 20-151-34].

Figure 20-151-35



Remove the hoses (Items 1 to 5) [Figure 20-151-35].

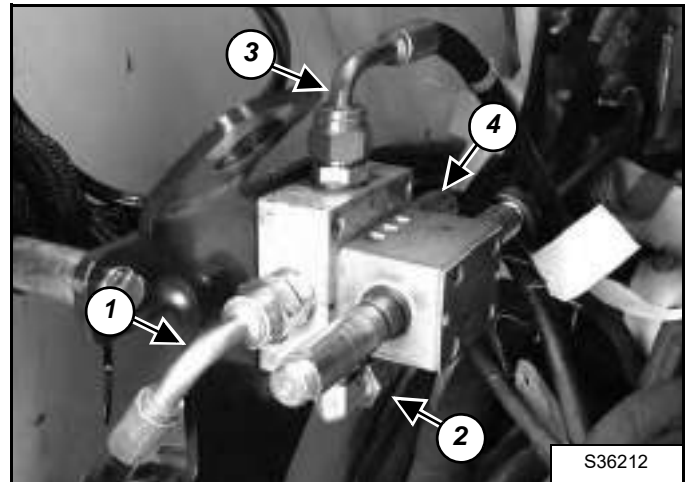
Figure 20-151-36



Remove the nut (Item 1) and solenoid (Item 2) [Figure 20-151-36] from the steering mode valve block.

Repeat for the other side of the steering mode valve block.

Figure 20-151-37



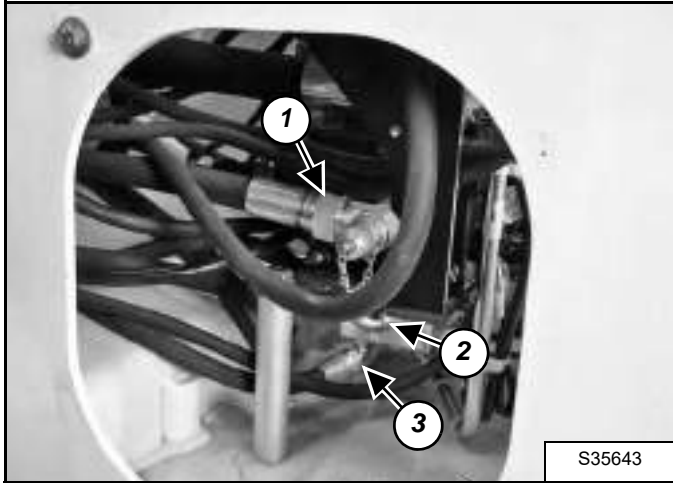
Remove the four hoses (Items 1 to 4) [Figure 20-151-36] from the steering mode valve block.

Dealer Copy -- Not for Resale

HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

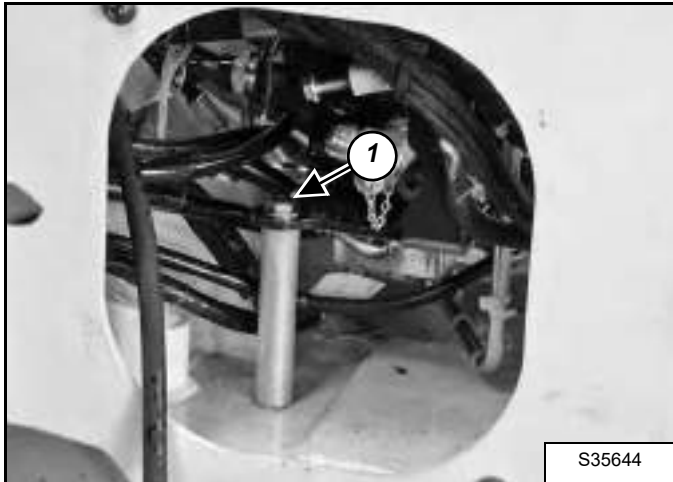
Removal And Installation (Cont'd)

Figure 20-151-38



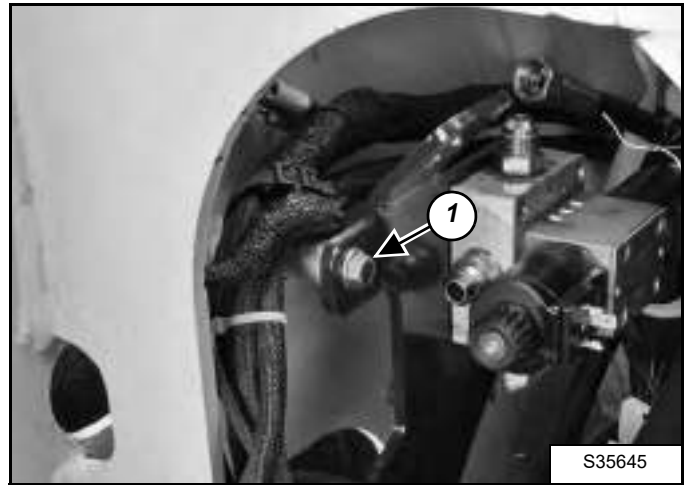
Remove the hoses (Items 1, 2 & 3) [Figure 20-151-38].

Figure 20-151-39



Remove the bolt (Item 1) [Figure 20-151-39].

Figure 20-151-40

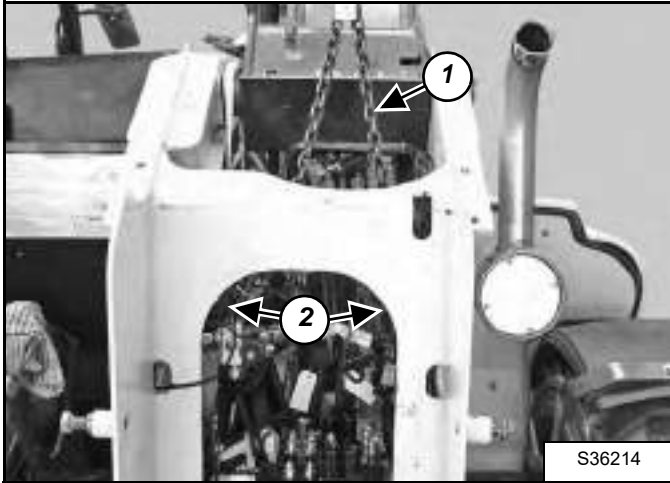


Remove the bolt (Item 1) [Figure 20-151-40].

HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

Removal And Installation (Cont'd)

Figure 20-151-41



Attach a chain (Item 1) to the lifting holes (Item 2) [Figure 20-151-41] of the control valve assembly.

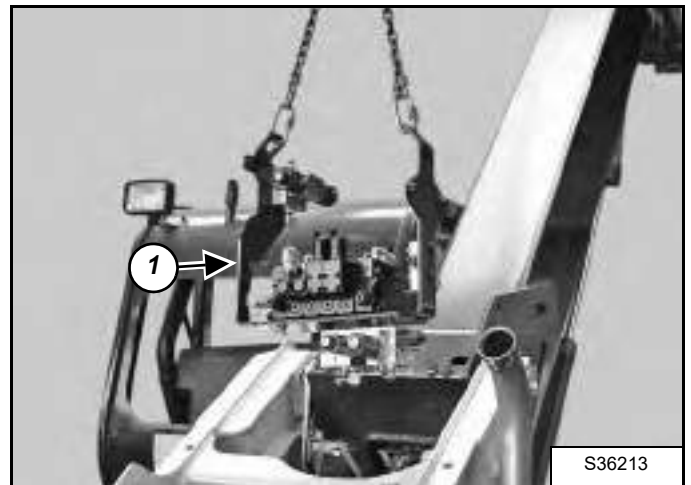
Figure 20-151-42



Remove the bolts (Item 2) [Figure 20-151-42].

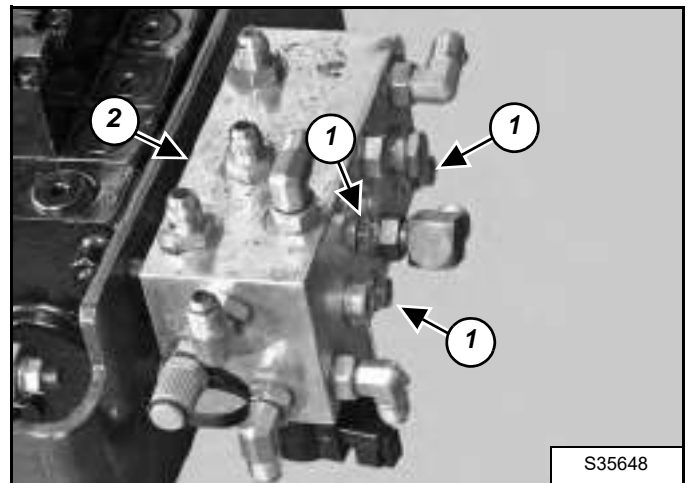
Installation: Tighten the mounting bolts to 24-26 N•m (18-19 ft-lb) torque.

Figure 20-151-43



Lift the control valve assembly (Item 1) [Figure 20-151-43] out of the machine.

Figure 20-151-44



Remove the three bolts (Item 1) [Figure 20-151-44] from the manifold.

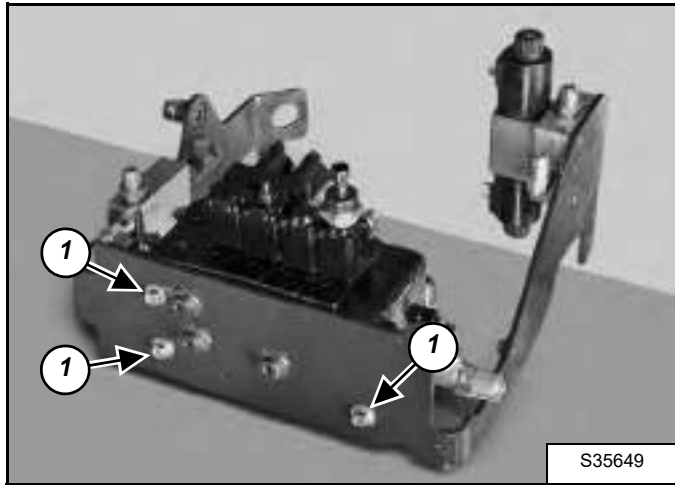
Remove the manifold (Item 2) [Figure 20-151-44]

Dealer Copy -- Not for Resale

**HYDRAULIC CONTROL VALVE (FOR S/N AC1911252
& ABOVE) (CONT'D)**

Removal And Installation (Cont'd)

Figure 20-151-45

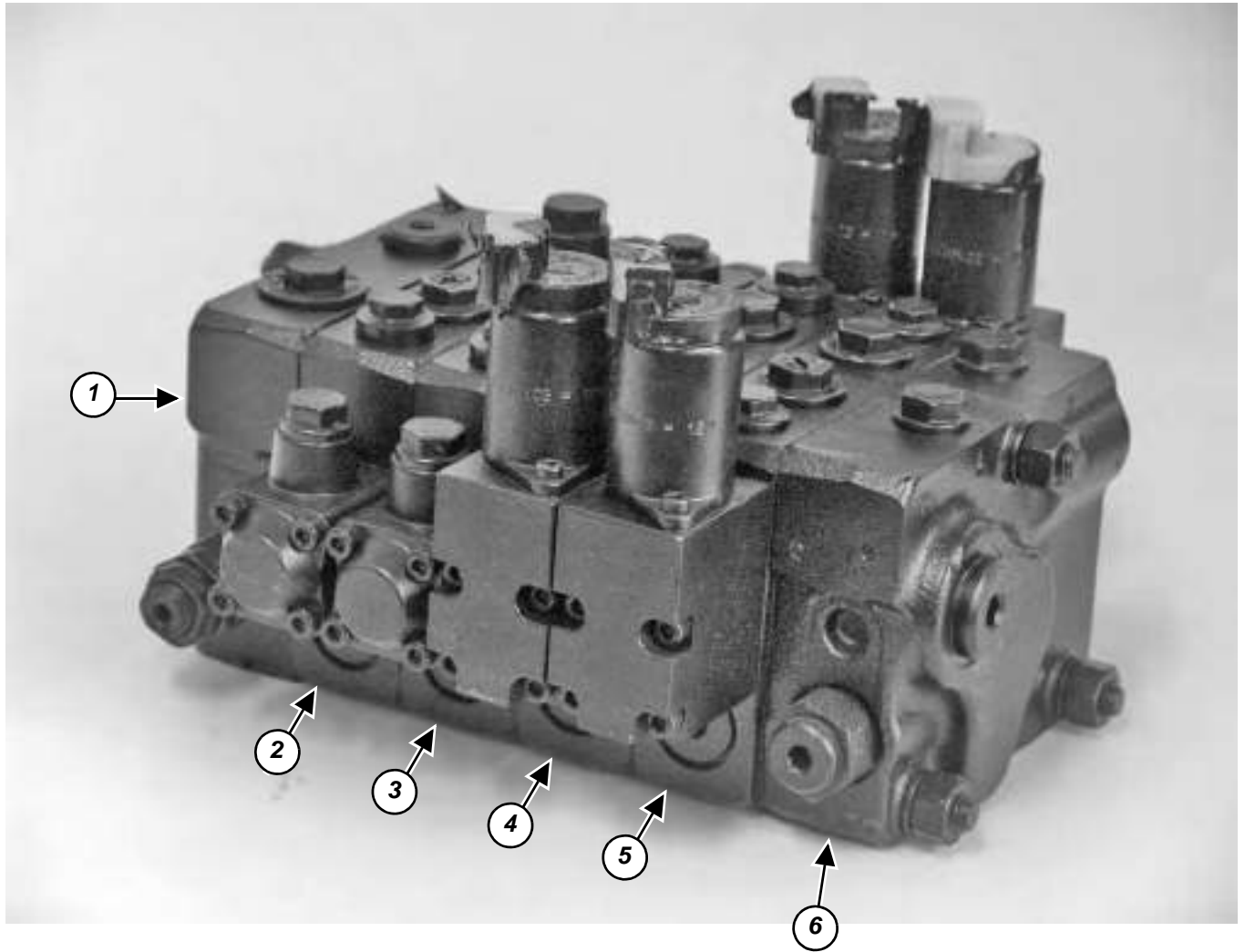


Remove the three bolts (Item 1) **[Figure 20-151-45]** and remove the hydraulic control valve.

**HYDRAULIC CONTROL VALVE (FOR S/N AC1911252
& ABOVE) (CONT'D)**

Parts Identification

1. Inlet-Outlet Valve Section
2. Lifting Valve Section
3. Tilting Valve Section
4. Telescoping Valve Section
5. Auxiliary Valve Section
6. End Housing



S5481

Dealer Copy -- Not for Resale

HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

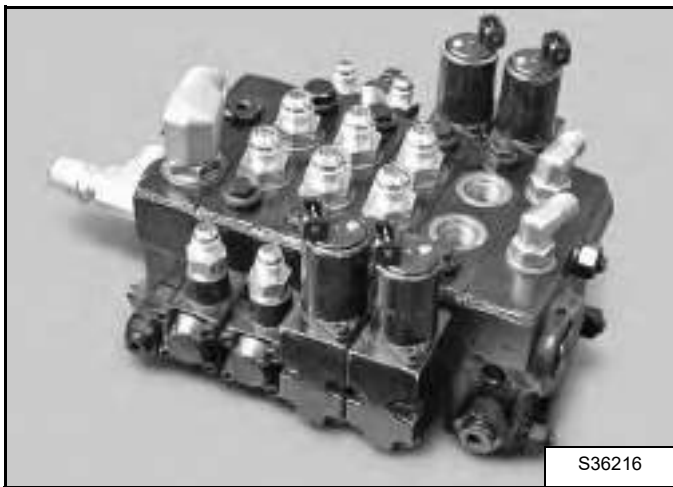
Disassembly And Assembly

IMPORTANT

When making repairs on hydraulic system, clean the work area before disassemble and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2056-0793

Figure 20-151-46



Remove all hydraulic fittings [Figure 20-151-46].

Figure 20-151-47



Clean the outside of the control valve [Figure 20-151-47] before disassembly.

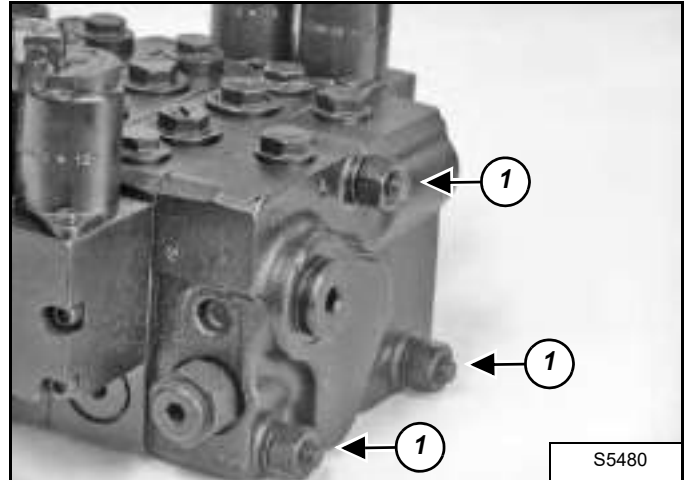
Mark the outside of the control valve [Figure 20-151-47] for ease of assembly.

NOTE: Plugs have been installed on all tubeline ports.

NOTE: Sections will be processed from right to left as depicted in [Figure 20-151-47].

End Housing Disassembly And Assembly

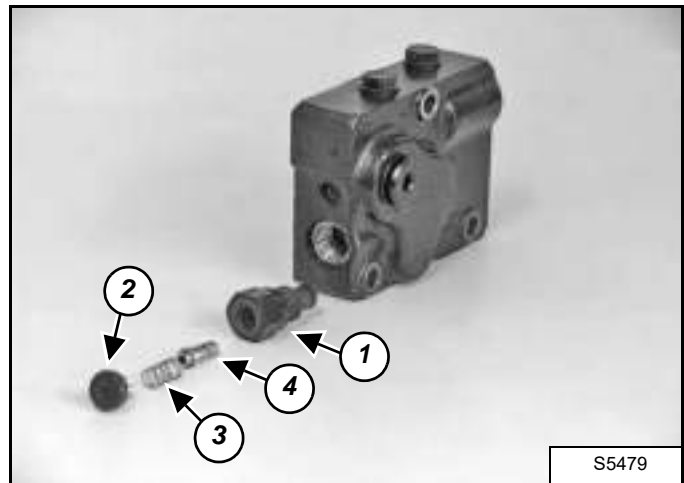
Figure 20-151-48



Loosen the three nuts from the tie bolts (Item 1) [Figure 20-151-48].

Installation: Tighten the nuts to 42 N•m (31 ft-lb) torque.

Figure 20-151-49



Remove the relief cartridge (Item 1) [Figure 20-151-49].

Remove the plug (Item 2), spring (Item 3) and spool (Item 4) [Figure 20-151-49].

Installation: Tighten cartridge to 42 N•m (31 ft-lb) torque.

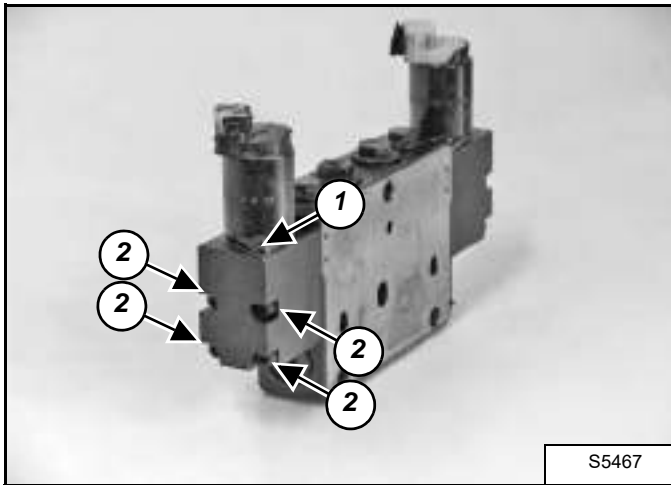
Replace all O-rings.

Dealer Copy -- Not for Resale

HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

Telescoping and Auxiliary Valve Section Disassembly And Assembly

Figure 20-151-50

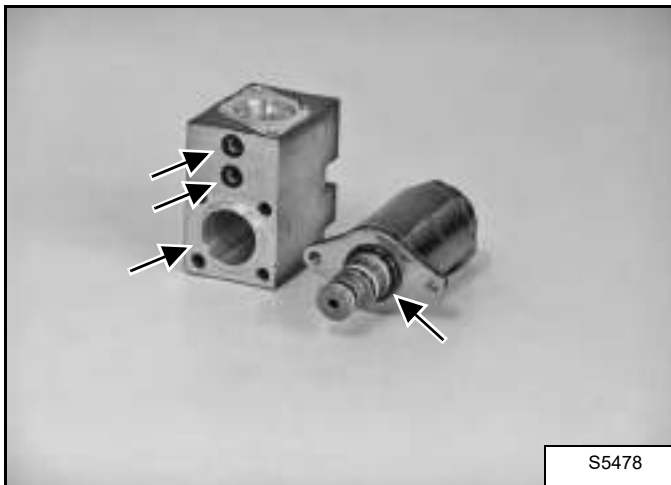


Loosen the two bolts (Item 1) [Figure 20-151-50] and remove the controller.

Loosen the four bolts (Item 2) [Figure 20-151-50] and remove the port block.

Installation: Tighten the bolts to 6,6 N•m (58.4 in-lb) torque.

Figure 20-151-51



Replace all O-rings [Figure 20-151-51].

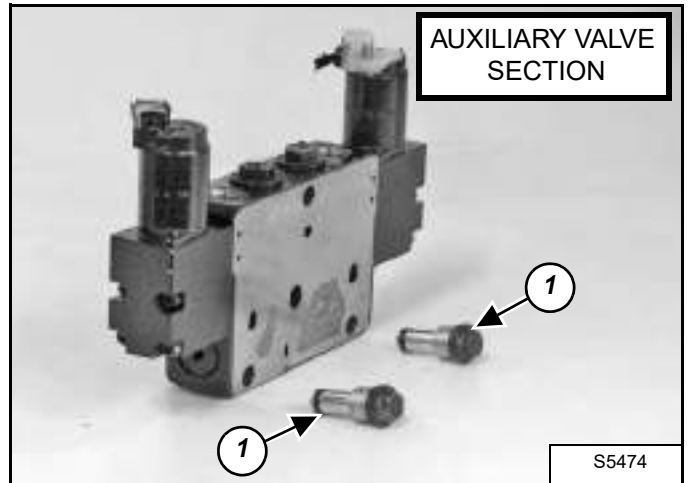
Figure 20-151-52



Remove the spool [Figure 20-151-52].

For Auxiliary Valve Section:

Figure 20-151-53



Remove the two plugs (Item 1) [Figure 20-151-53] on the top side of the valve section.

Replace all O-rings.

Installation: Tighten the plugs to 24 N•m (17.7 ft-lb) torque.

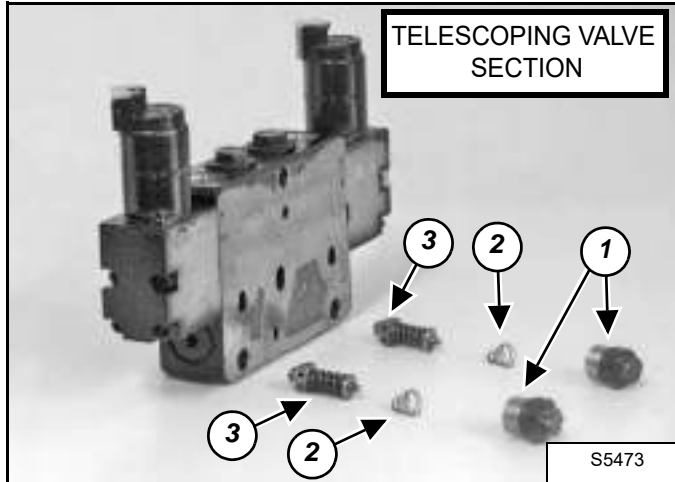
Dealer Copy -- Not for Resale

HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

**Telescoping and Auxiliary Valve Section
Disassembly And Assembly (Cont'd)**

For Telescoping Valve Section:

Figure 20-151-54



Remove the two plugs (Item 1), two springs (Item 2) and two port relief valves (Item 3) [Figure 20-151-54] on the top side of the valve section.

Replace all O-rings.

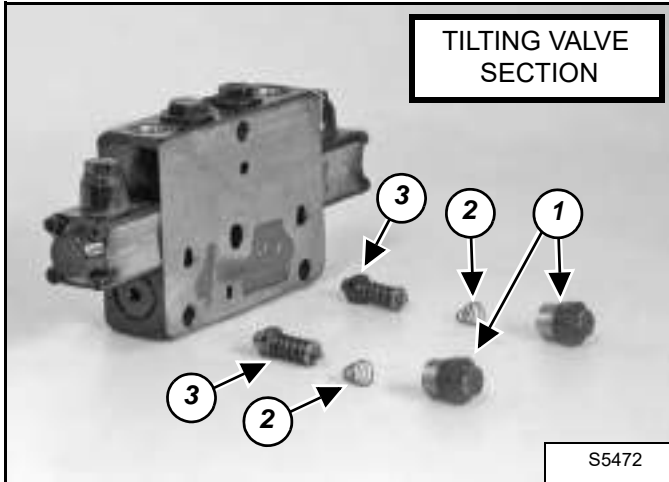
Installation: Tighten the plugs to 24 N•m (17.7 ft-lb) torque.

HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

Lifting and Tilting Valve Section Disassembly And Assembly

For Tilting Valve Section:

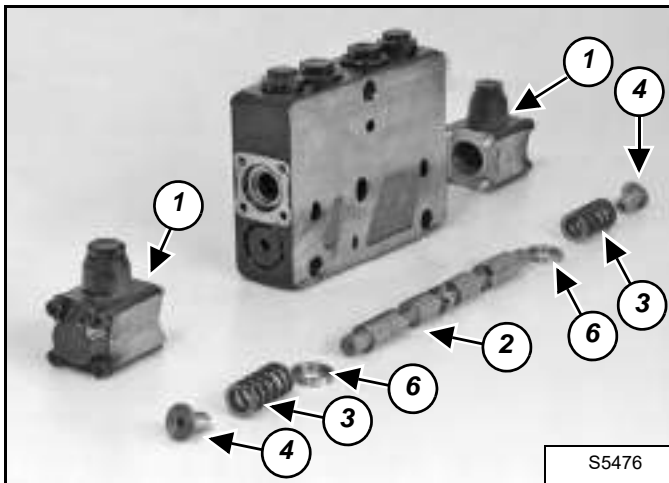
Figure 20-151-55



Remove the two plugs (Item 1), two springs (Item 2) and two port relief valves (Item 3) [Figure 20-151-55] on top side of the valve section.

Installation: Tighten the plugs to 24 N•m (17.7 ft-lb) torque.

Figure 20-151-56



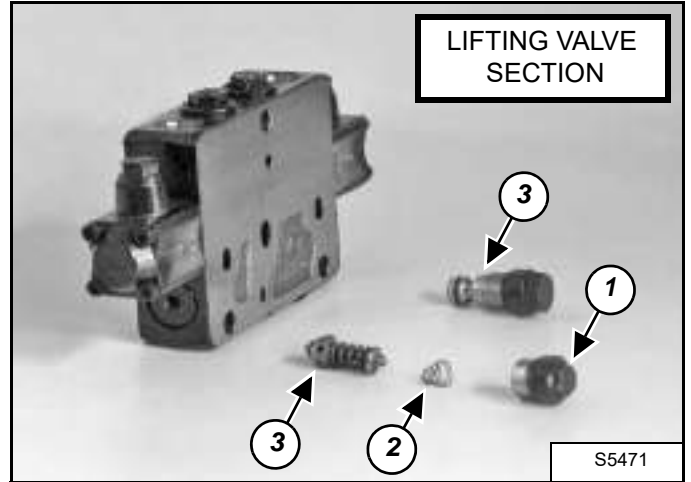
Loosen the front and rear cover (Item 1), and remove the rod (Item 2), springs (Item 3), spring retainers (Item 4) and washers (Item 6) [Figure 20-151-56].

Replace all O-rings.

Installation: Tighten the cover bolts to 6,6 N•m (58.4 in-lb) torque.

For Lifting Valve Section:

Figure 20-151-57



Remove the plug (Item 1), spring (Item 2) and two relief valves (Item 3) [Figure 20-151-57].

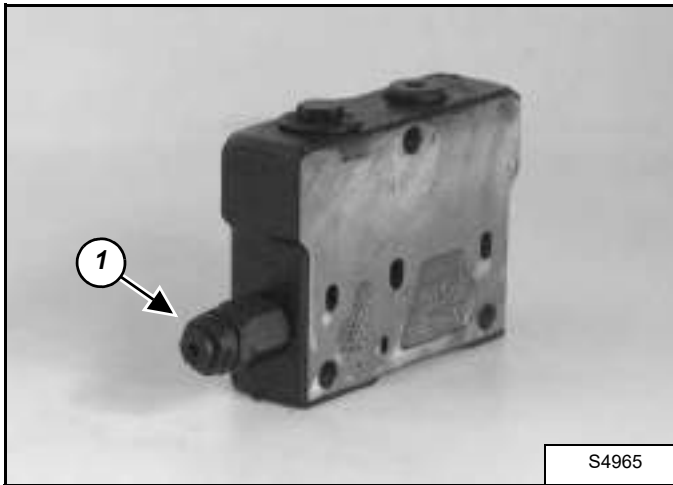
Installation: Tighten the plugs to 24 N•m (17.7 ft-lb) torque.

Dealer Copy -- Not for Resale

HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE) (CONT'D)

Inlet-Outlet Valve Section Disassembly And Assembly

Figure 20-151-58



Remove and disassemble the main relief valve (Item 1) [Figure 20-151-58] from the valve section.

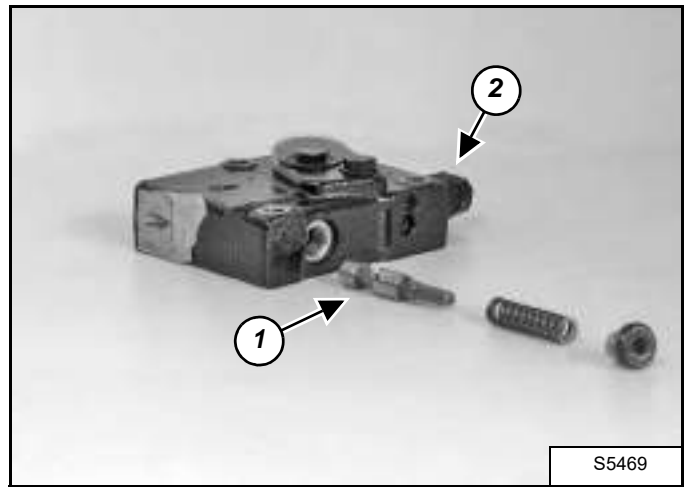
Installation: Tighten the valve to 24 N•m (17.7 ft-lb) torque.

Figure 20-151-59



Replace all O-rings in the main relief valve [Figure 20-151-59].

Figure 20-151-60



Remove the plugs (Item 1 and 2) [Figure 20-151-60] from the valve section.

Installation: Tighten the plugs to 24 N•m (17.7 ft-lb) torque.

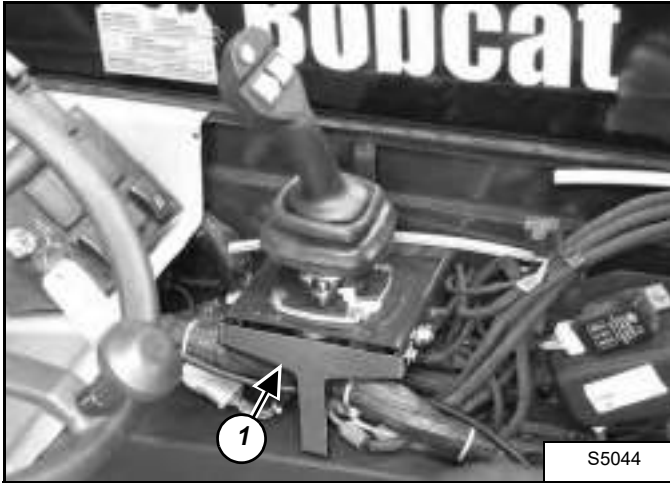
JOYSTICK

Removal And Installation

Remove the joystick panel. (See “JOYSTICK PANEL (S/N AC1912999 & bELOW)” on page 50-120-1.)

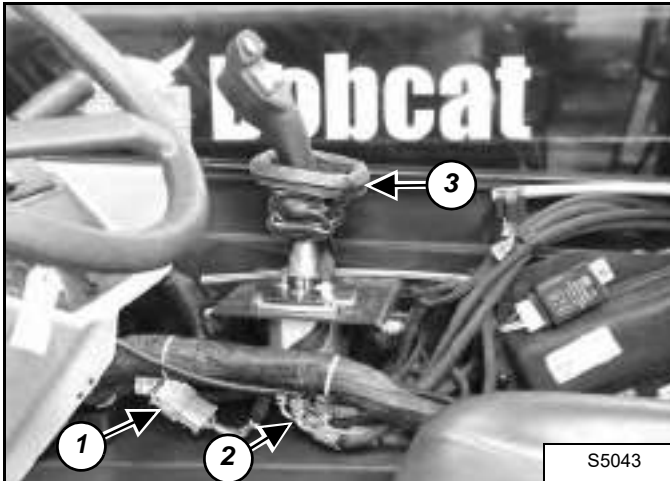
NOTE: The joystick is not serviceable and must be replaced as a complete unit.

Figure 20-160-1



Remove the bracket (Item 1) [Figure 20-160-1]

Figure 20-160-2



Disconnect the electrical connector (Item 1) [Figure 20-160-2].

Mark the five hydraulic hoses (Item 2) [Figure 20-160-2] for correct assembly. Remove the hoses from the joystick.

Raise the dust boot (Item 3) [Figure 20-160-2].

WARNING

Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a physician familiar with this injury is not received immediately.

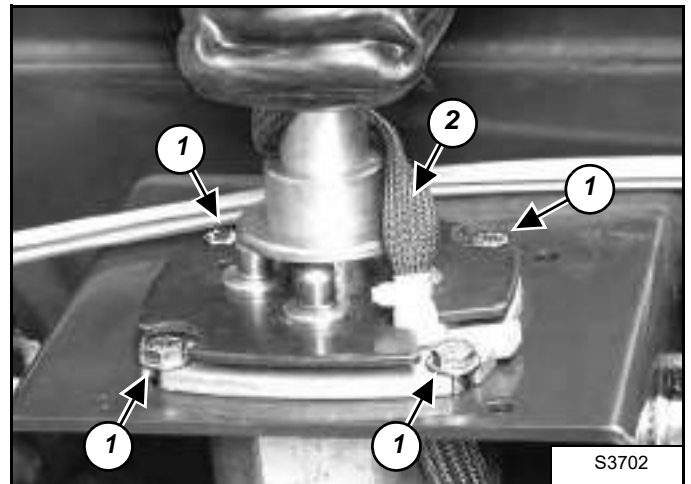
W-2145-0290

IMPORTANT

When making repairs on hydraulic system, clean the work area before disassemble and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2056-0793

Figure 20-160-3



Remove the four mounting bolts (Item 1) [Figure 20-160-3].

Installation: Tighten the bolts to 10 N•m (88.5 in-lb) torque.

Remove the joystick assembly.

Installation: The joystick harness (Item 2) [Figure 20-160-3] must spiral around the joystick base as shown.

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

PARKING BRAKE

Parking Brake Valve Removal And Installation

Remove the battery access cover. (See "Removal And Installation" on page 60-20--1).

Relieve the hydraulic pressure.

WARNING

Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a physician familiar with this injury is not received immediately.

W-2145-0290

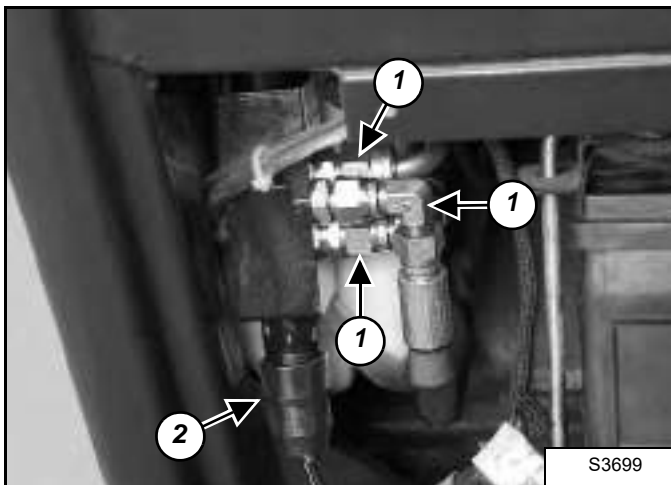
IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

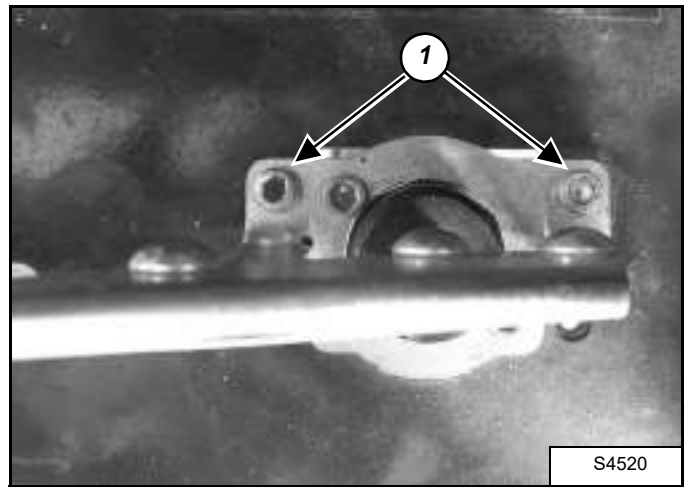
Mark all hoses and electrical connectors for correct installation.

Figure 20-170-1



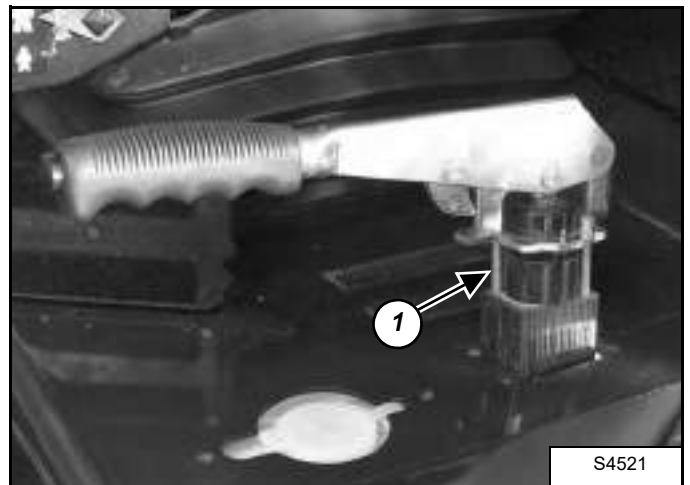
Remove the three hoses (Item 1). Unplug the electrical connector (Item 2) [Figure 20-170-1].

Figure 20-170-2



Remove the two screws (Item 1) [Figure 20-170-2] in order to loosen the parking brake lever.

Figure 20-170-3



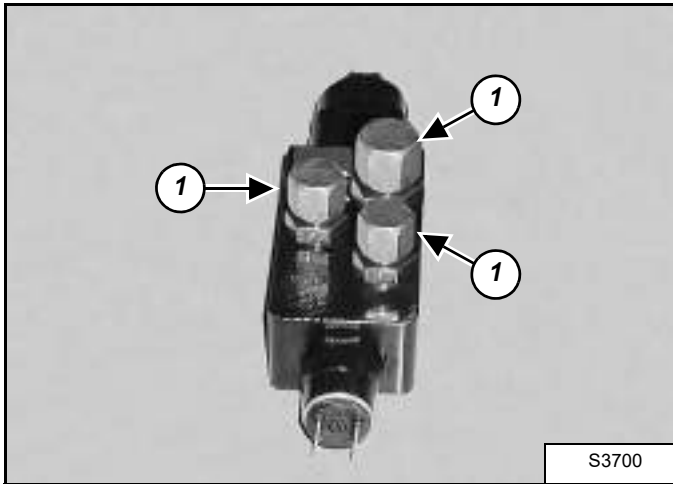
Lift the parking brake lever and valve (Item 1) [Figure 20-170-3] out the frame.

Dealer Copy -- Not for Resale

PARKING BRAKE (CONT'D)

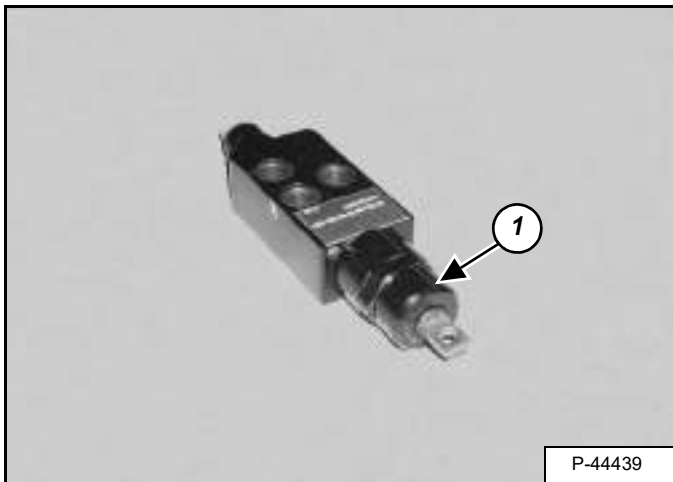
Parking Brake Valve Disassembly And Assembly

Figure 20-170-4



Remove the fittings (Item 1) [Figure 20-170-4].

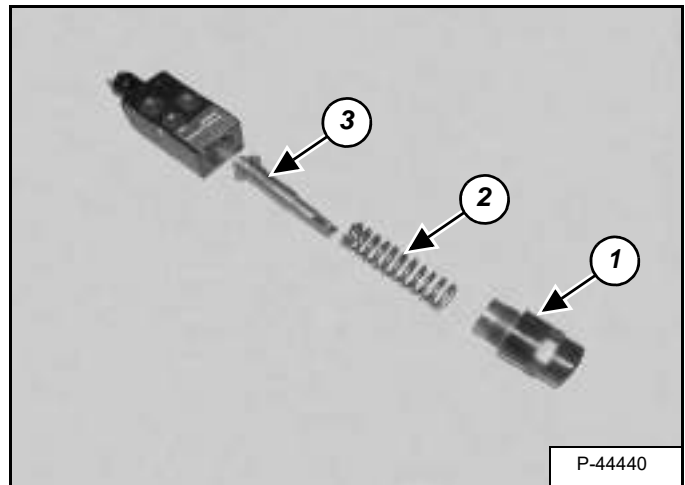
Figure 20-170-5



Loosen the collar (Item 1) [Figure 20-170-5].

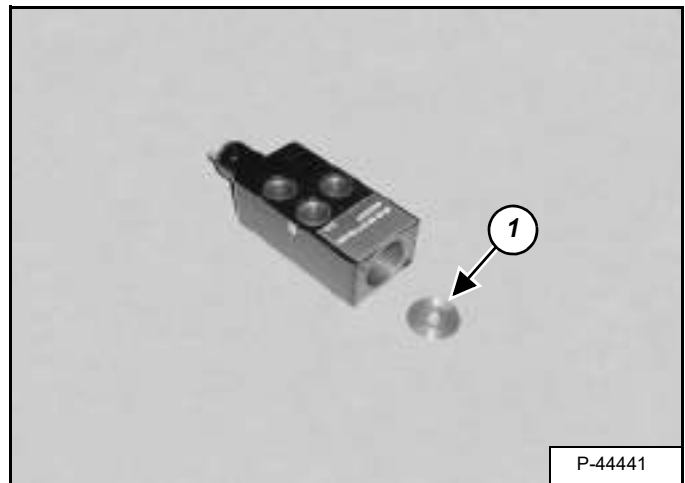
NOTE: Use care removing the collar. The collar is under spring pressure.

Figure 20-170-6



Remove the collar (Item 1), spring (Item 2) and shaft (Item 3) [Figure 20-170-6] from the housing.

Figure 20-170-7



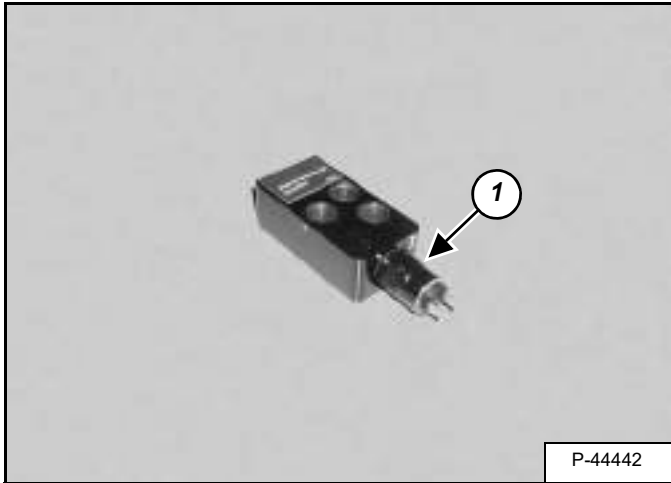
Remove the washer (Item 1) [Figure 20-170-7] from the housing.

Dealer Copy -- Not for Resale

PARKING BRAKE (CONT'D)

**Parking Brake Valve Disassembly And Assembly
(Cont'd)**

Figure 20-170-8



Remove the electrical connector (Item 1) **[Figure 20-170-8]** from the housing.



Bobcat®

Dealer Copy -- Not for Resale

WORKGROUP LOCKOUT VALVE

Testing

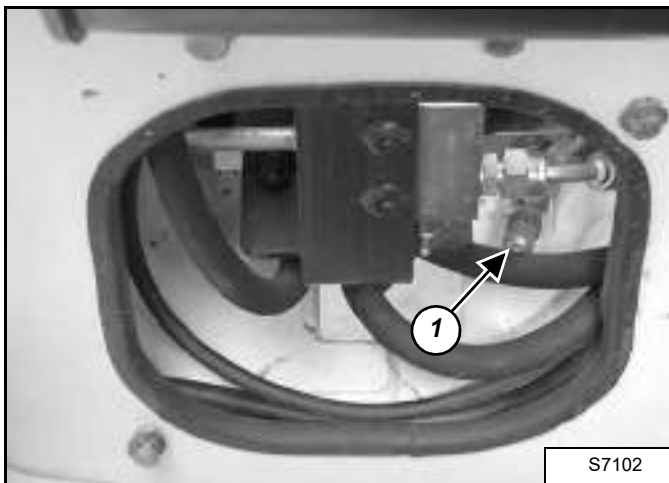
Raise the boom and install the boom stop. (See Installing The Approved Boom Stop on Page 10-160-1.)

Figure 20-180-1



Remove the rear cover (Item 1) [Figure 20-180-1].

Figure 20-180-2



Locate the test fitting (Item 1) [Figure 20-180-2], through the right side frame hole, below the control valve and remove the cap.

Figure 20-180-3



Install a 7 MPa (70 bar) (1000 psi) gauge on the test fitting [Figure 20-180-3].

Start the engine, lower the restraint bar (if equipped) and run engine at 2400 RPM.

Record the pressure. The pressure at the gauge should be 3 MPa (30 bar) (435 psi).

The workgroup lockout valve is not adjustable. If the pressure is incorrect, replace the workgroup lockout valve. (See Removal And Installation on Page 20-180-2.)

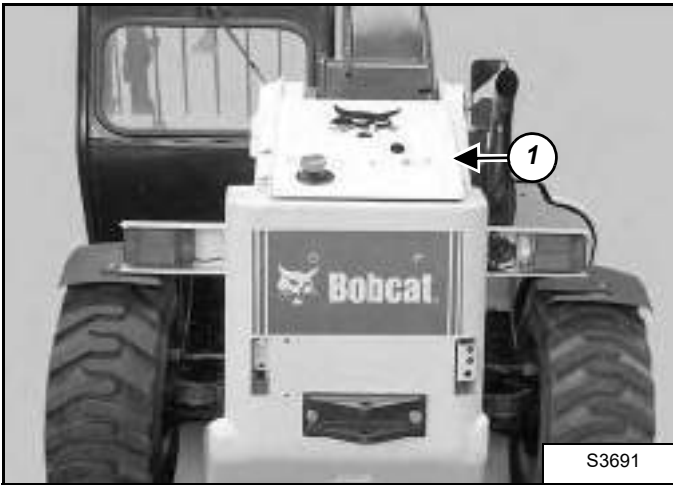
Dealer Copy -- Not for Resale

WORKGROUP LOCKOUT VALVE (CONT'D)

Removal And Installation

Relieve hydraulic pressure. Drain the hydraulic reservoir. (See Replacing Hydraulic Fluid on Page 10-100-2.)

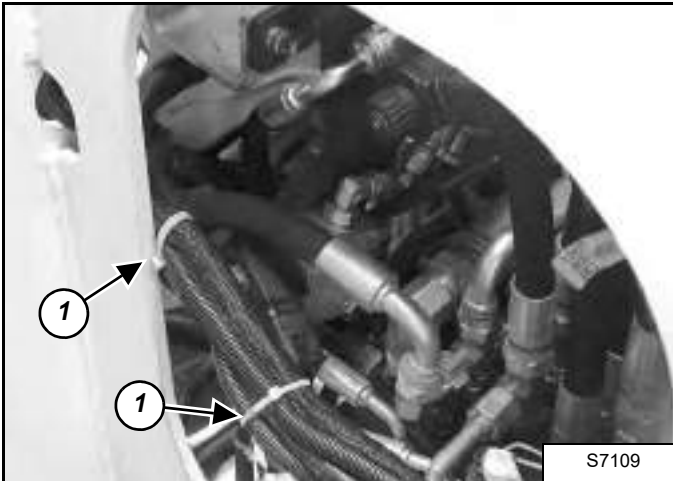
Figure 20-180-4



Remove the rear cover (Item 1) [Figure 20-180-4].

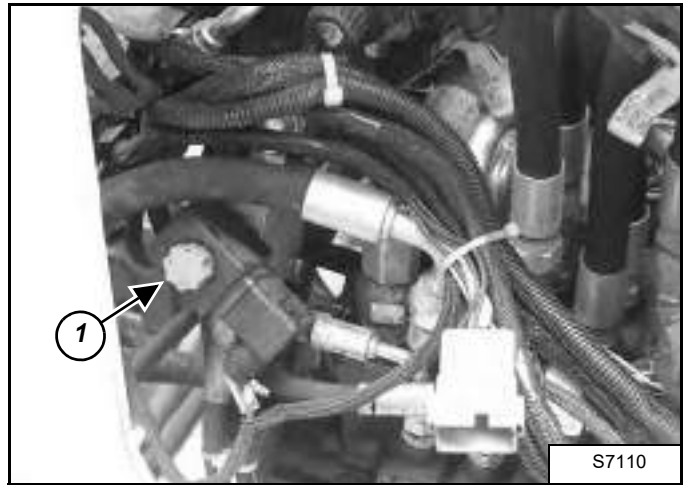
Remove the fuel tank (See Removal And Installation on Page 50-80-1.).

Figure 20-180-5



Remove the tie straps (Item 1) [Figure 20-180-5] from the harness.

Figure 20-180-6



Remove the solenoid (Item 1) [Figure 20-180-6] from the valve.

Mark the hoses and electrical connectors for correct installation.

WARNING

Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a physician familiar with this injury is not received immediately.

W-2145-0290

IMPORTANT

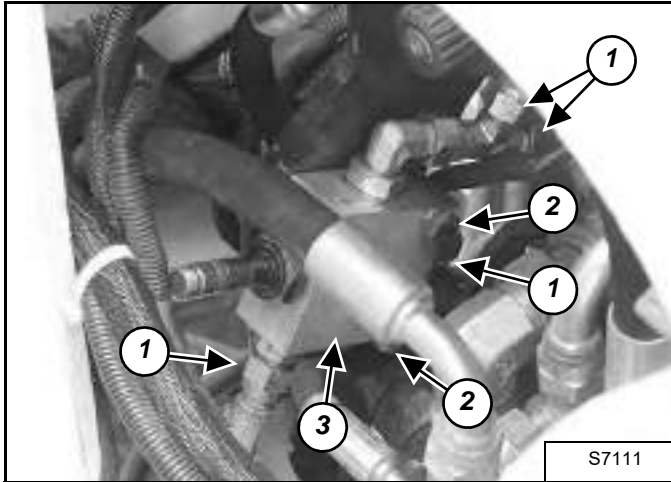
When making repairs on hydraulic system, clean the work area before disassemble and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2056-0793

WORKGROUP LOCKOUT VALVE (CONT'D)

Removal And Installation (Cont'd)

Figure 20-180-7

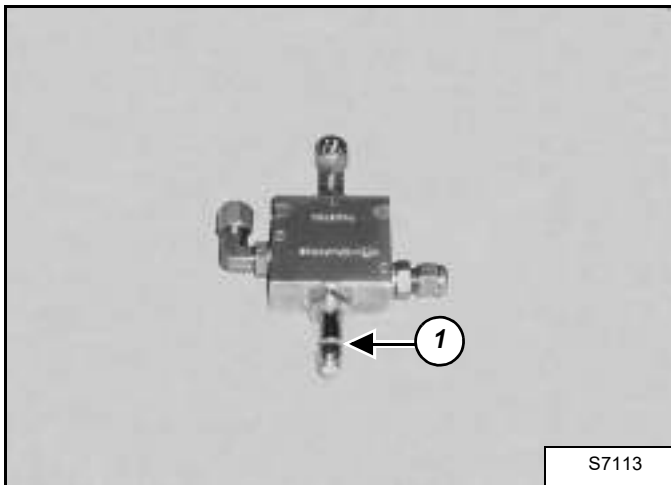


Remove the four hoses (Item 1) [Figure 20-180-7].

Remove the two mounting bolts (Item 2) and remove the workgroup lockout valve (Item 3) [Figure 20-180-7].

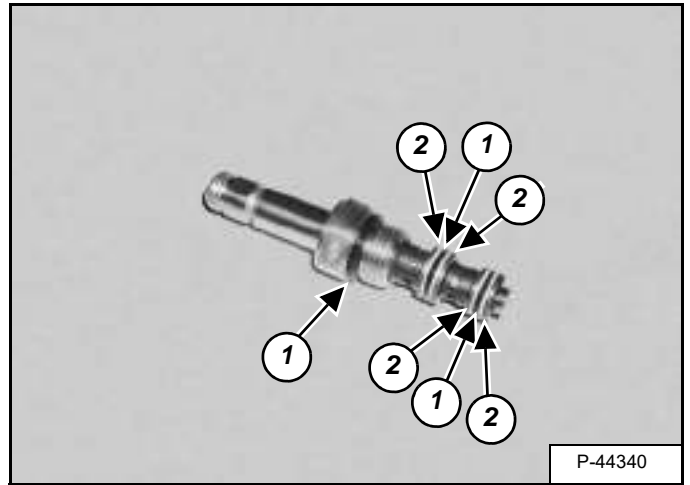
Disassembly And Assembly

Figure 20-180-8



Remove the spool (Item 1) [Figure 20-180-8].

Figure 20-180-9

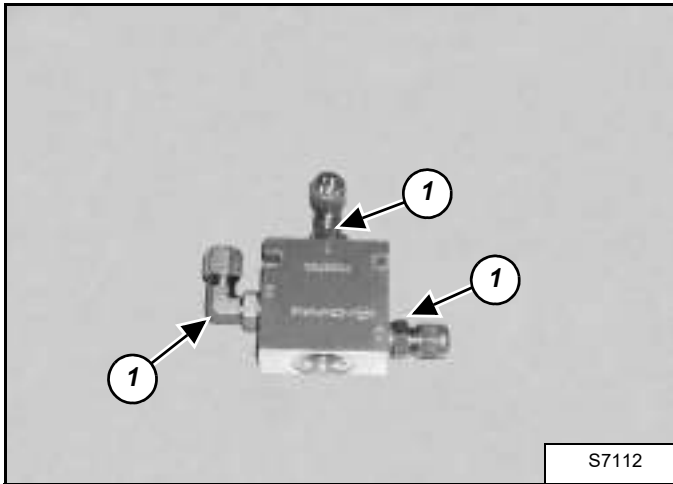


Remove the three O-rings (Item 1) and four backup rings (Item 2) [Figure 20-180-9] from the spool.

WORKGROUP LOCKOUT VALVE (CONT'D)

Disassembly And Assembly (Cont'd)

Figure 20-180-10



Remove the fittings (Item 1) [Figure 20-180-10].

Wash the valve in clean solvent and dry with compressed air. Check the components for wear or damage. Replace any worn or damaged components. Always use new O-rings and backup rings.

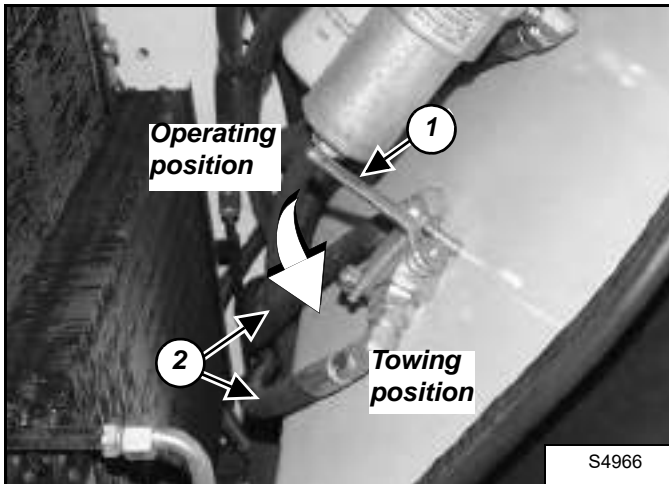
Apply clean hydraulic fluid to the components during assembly.

TOW VALVE

Removal And Installation

Open the engine cover.

Figure 20-190-1



Position the tow valve (Item 1) [Figure 20-190-1] to towing position to relieve hydraulic pressure.

Mark the hoses for correct installation. Remove the two hoses (Item 2) [Figure 20-190-1].

WARNING

Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a physician familiar with this injury is not received immediately.

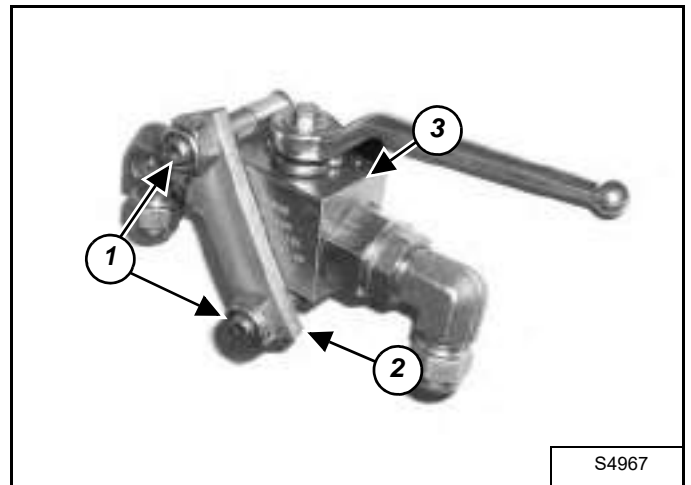
W-2145-0290

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Figure 20-190-2



Remove the two nuts, bolts (Item 1) and strap (Item 2). Remove the tow valve (Item 3) [Figure 20-190-2].

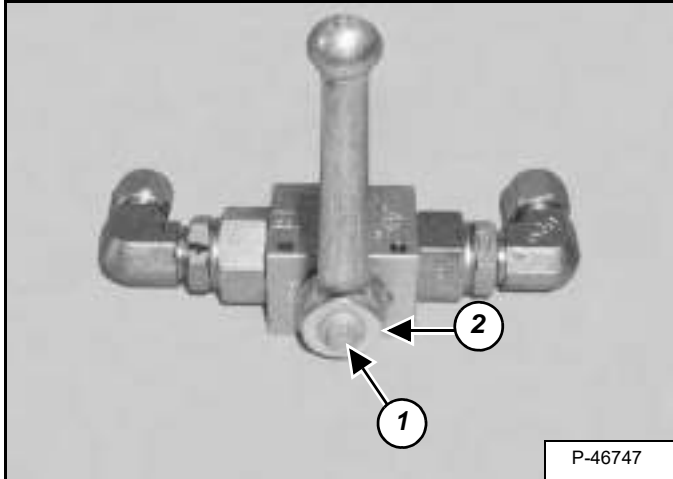
TOW VALVE (CONT'D)

Disassembly And Assembly

Clean the outside of the tow valve before disassembly.

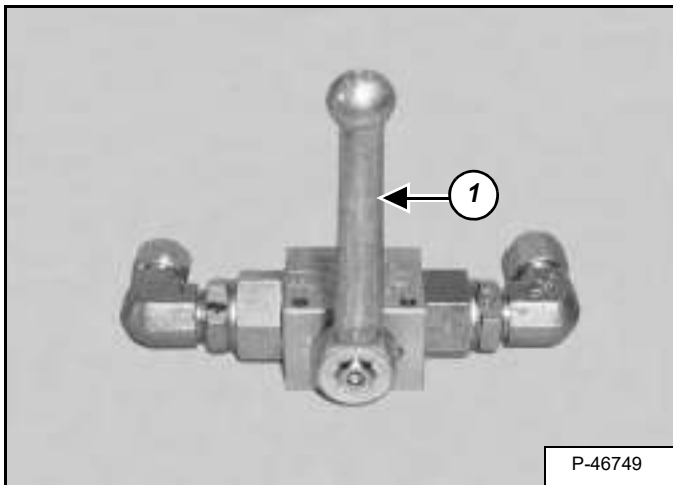
Mark the outside of the tow valve for ease of assembly.

Figure 20-190-3



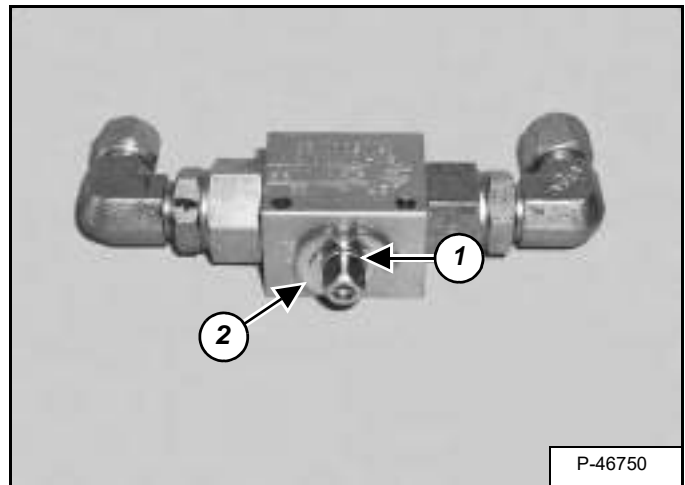
Remove the screw (Item 1) and washer (Item 2) [Figure 20-190-3].

Figure 20-190-4



Remove the handle (Item 1) [Figure 20-190-4].

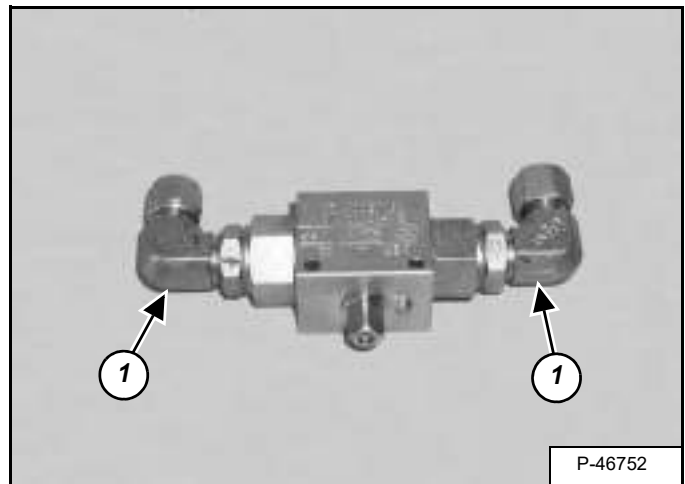
Figure 20-190-5



Remove the retainer (Item 1) and stop plate (Item 2) [Figure 20-190-5].

NOTE: Record the position of the stop plate for proper assembly.

Figure 20-190-6

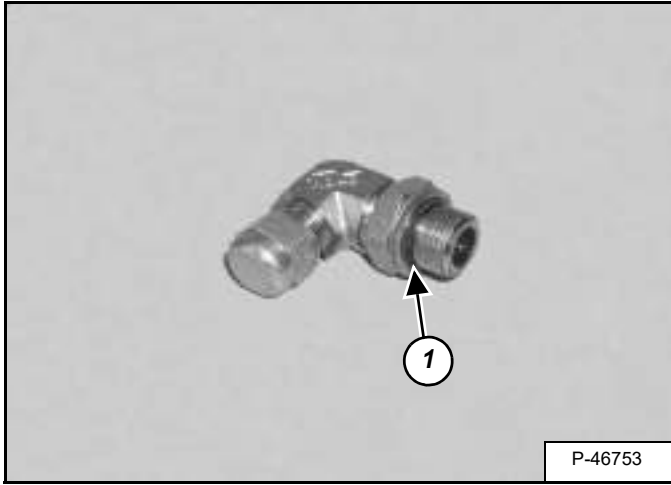


Remove the two fittings (Item 1) [Figure 20-190-6].

TOW VALVE (CONT'D)

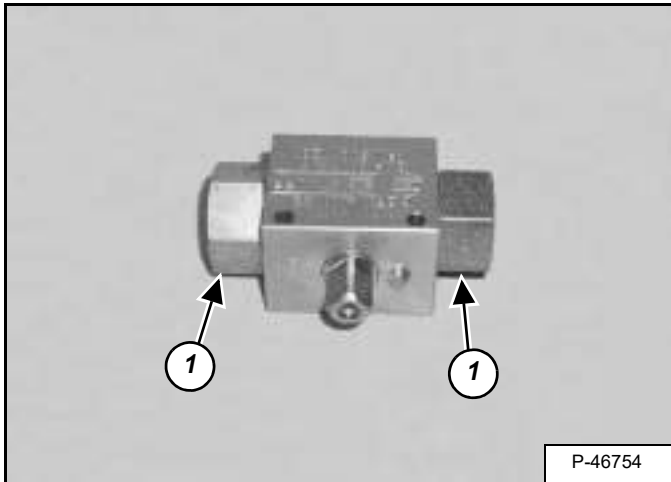
Disassembly And Assembly (Cont'd)

Figure 20-190-7



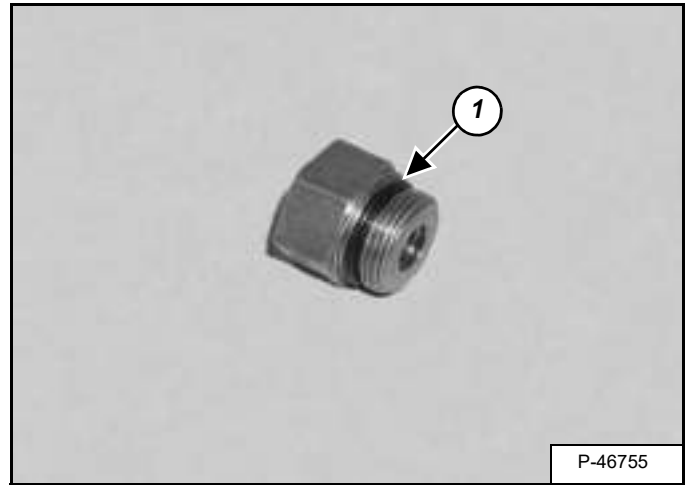
Remove the O-ring (Item 1) [Figure 20-190-7] from the fittings.

Figure 20-190-8



Remove the two adapters (Item 1) [Figure 20-190-8].

Figure 20-190-9



Remove the O-ring (Item 1) [Figure 20-190-9] from the adapters.

TOW VALVE (CONT'D)

Disassembly And Assembly (Cont'd)

Figure 20-190-10

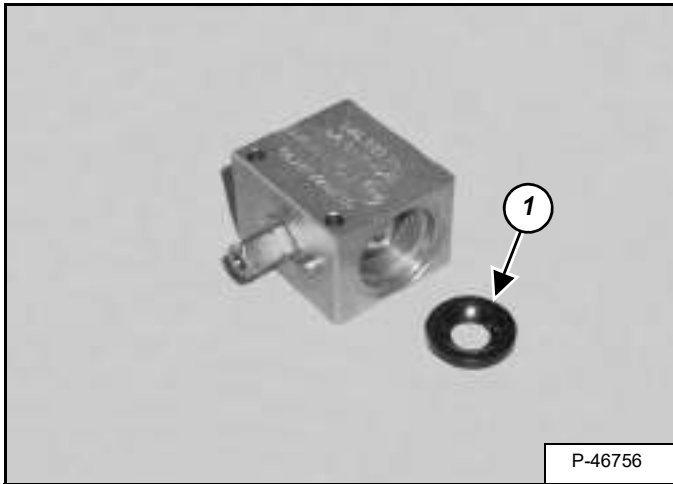
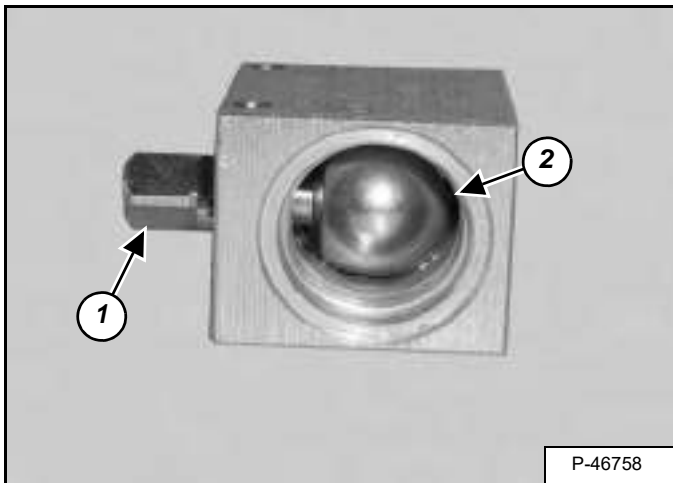


Figure 20-190-11



Remove the seal (Item 1) [Figure 20-190-10] from the valve. (Both sides)

Assembly: The concave side of the seal (Item 1) [Figure 20-190-10] fits over the ball (Item 2) [Figure 20-190-11].

Turn the shaft (Item 1) until the shaft and ball (Item 2) [Figure 20-190-11] are in the position shown. Remove the ball.

Assembly: Record the position of the shaft and ball for proper assembly.

Figure 20-190-12

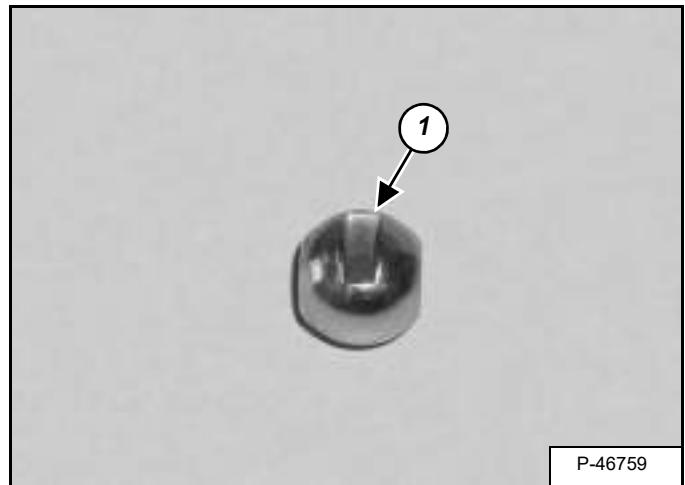
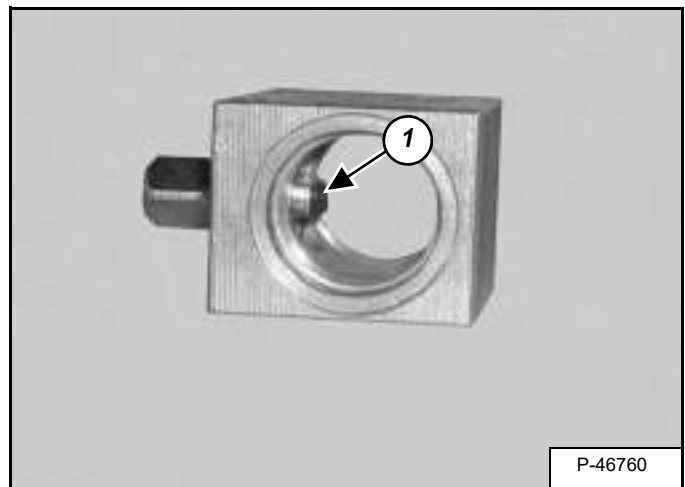


Figure 20-190-13

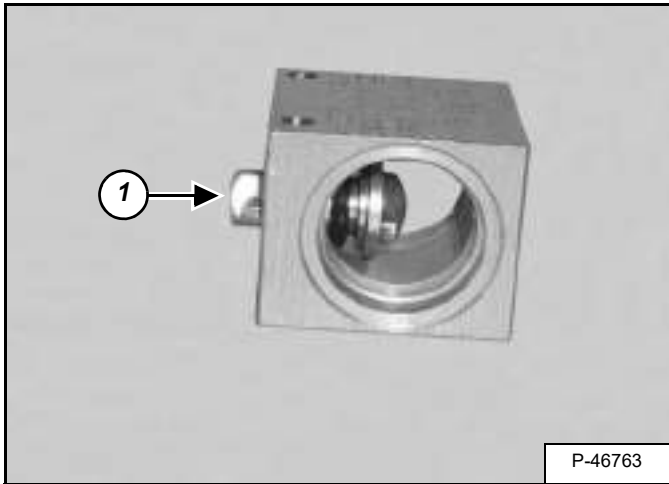


Assembly: Align the slot (Item 1) [Figure 20-190-12] with the notch (Item 1) [Figure 20-190-13] in the shaft.

TOW VALVE (CONT'D)

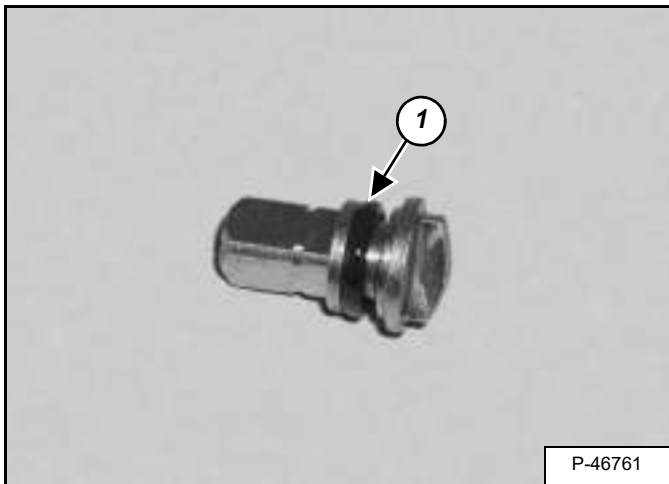
Disassembly And Assembly (Cont'd)

Figure 20-190-14



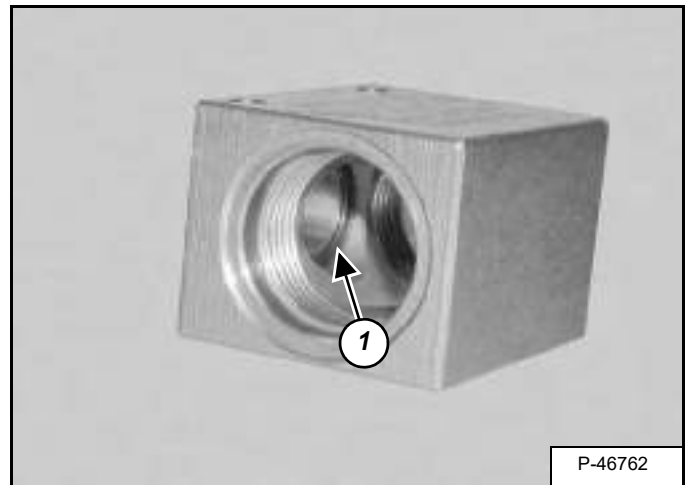
Remove the shaft (Item 1) **[Figure 20-190-14]** by pressing the shaft into the housing.

Figure 20-190-15



Remove the O-ring (Item 1) **[Figure 20-190-15]** from the shaft.

Figure 20-190-16



Remove the seal (Item 1) **[Figure 20-190-16]** from the housing.

Clean all parts in solvent and dry with compressed air.

Inspect all parts for wear or damage. Replace any worn or damaged parts.

Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

FRONT AUXILIARY HYDRAULIC PRESSURE RELEASE VALVE

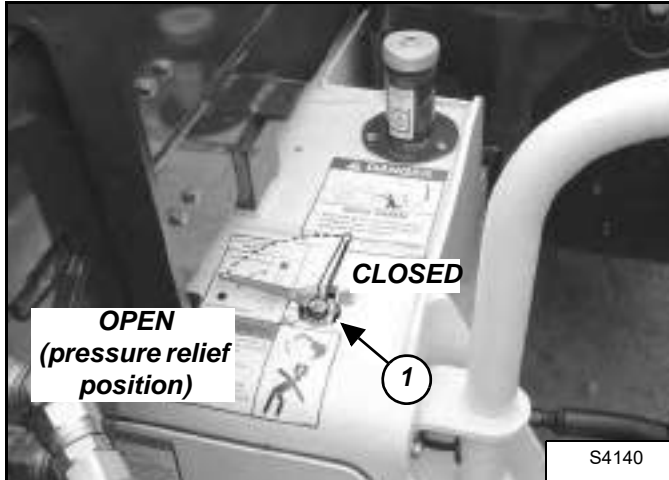
Removal And Installation

Stop the engine.

Engage the parking brake.

Exit the machine.

Figure 20-200-1



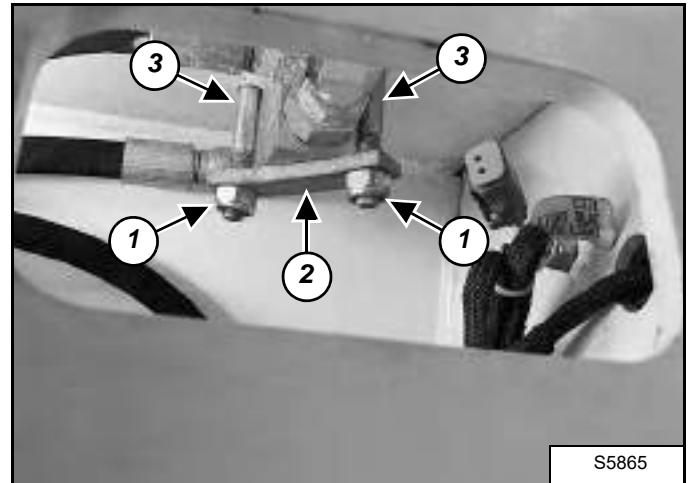
Turn the handle (Item 1) [Figure 20-200-1] to relieve hydraulic pressure (OPEN position).

WARNING

Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a physician familiar with this injury is not received immediately.

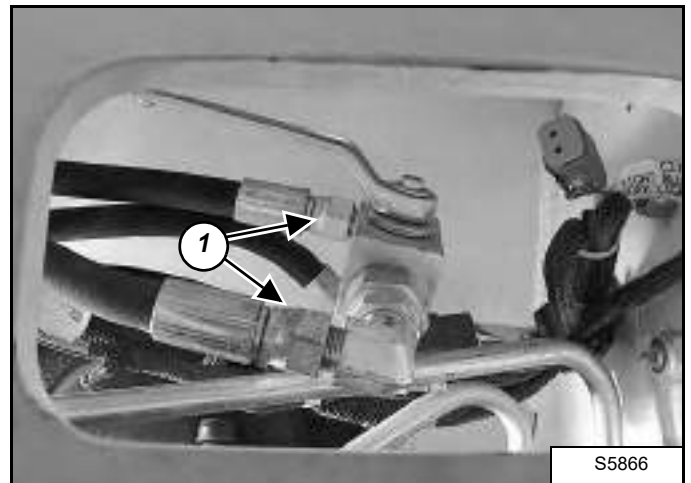
W-2145-0290

Figure 20-200-2



Remove the two nuts (Item 1), strap (Item 2) and two bolts (Item 3) [Figure 20-200-2].

Figure 20-200-3



Mark and remove the two hoses (Item 1) [Figure 20-200-3] from the valve.

Remove the valve.

Dealer Copy -- Not for Resale

**FRONT AUXILIARY HYDRAULIC PRESSURE
RELEASE VALVE (CONT'D)**

Disassembly And Assembly

IMPORTANT

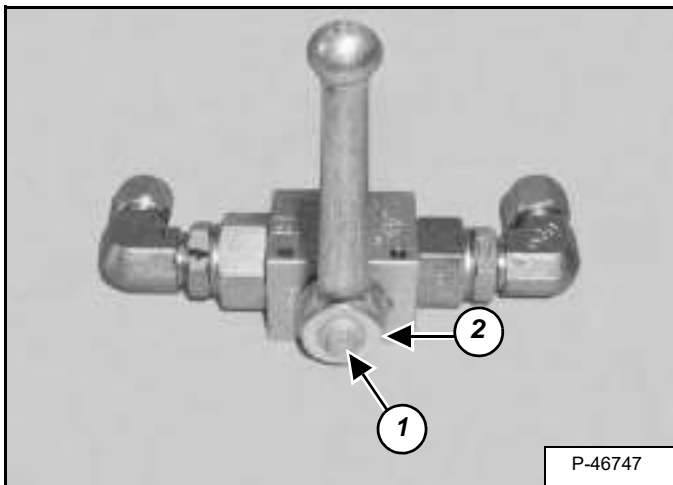
When making repairs on hydraulic system, clean the work area before disassemble and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2056-0793

Clean the outside of the pressure release valve before disassembly.

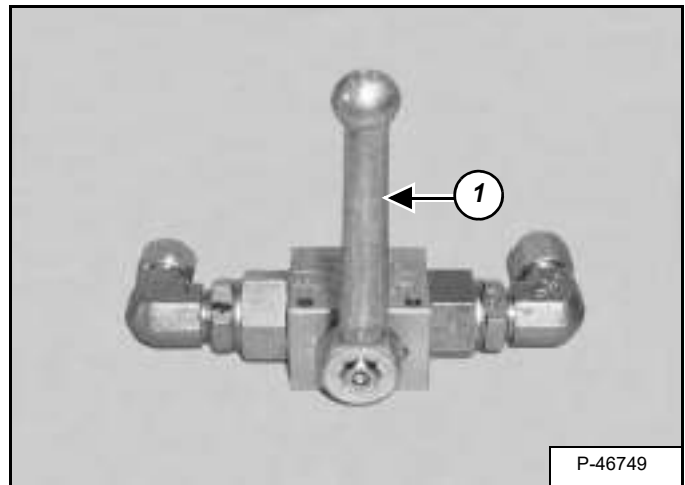
Mark the outside of the pressure release valve for ease of assembly.

Figure 20-200-4



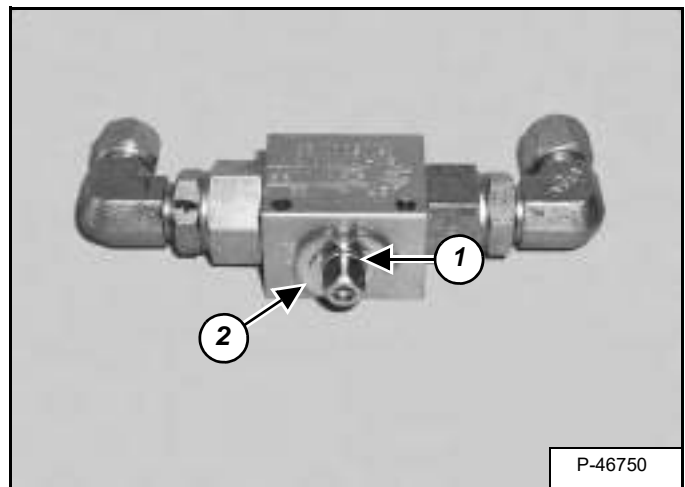
Remove the screw (Item 1) and washer (Item 2) [Figure 20-200-4].

Figure 20-200-5



Remove the handle (Item 1) [Figure 20-200-5].

Figure 20-200-6



Remove the retainer (Item 1) and stop plate (Item 2) [Figure 20-200-6].

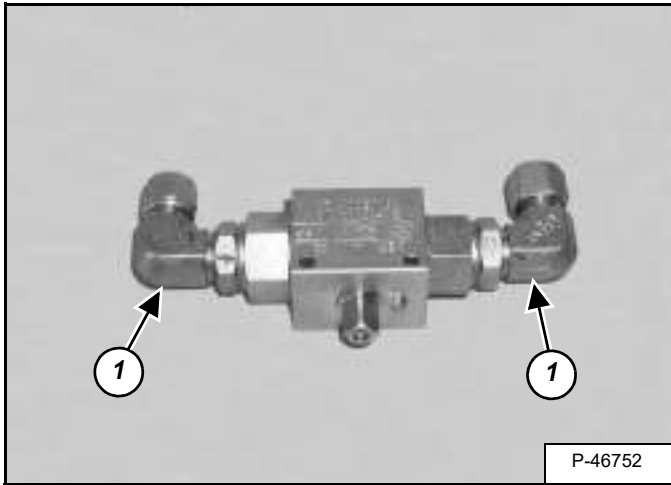
NOTE: Record the position of the stop plate for proper assembly.

Dealer Copy -- Not for Resale

**FRONT AUXILIARY HYDRAULIC PRESSURE
RELEASE VALVE (CONT'D)**

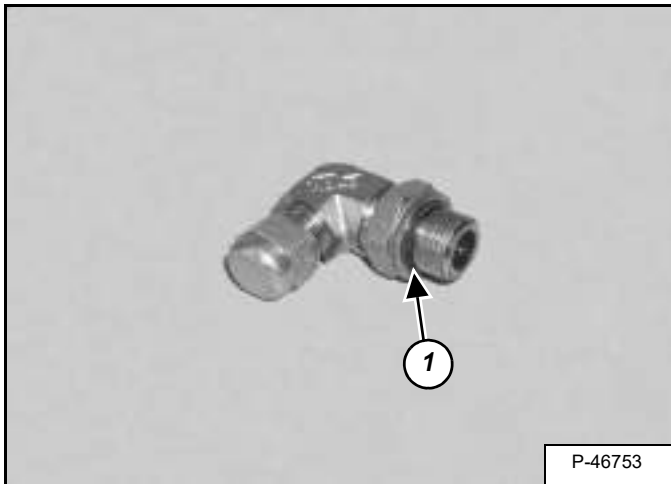
Disassembly And Assembly (Cont'd)

Figure 20-200-7



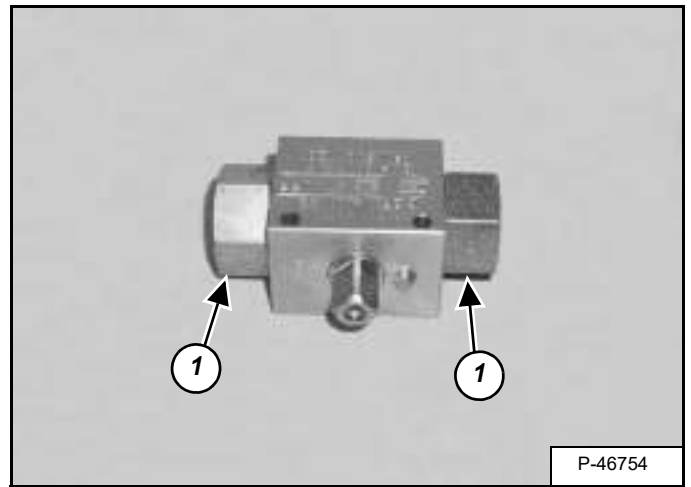
Remove the two fittings (Item 1) [Figure 20-200-7].

Figure 20-200-8



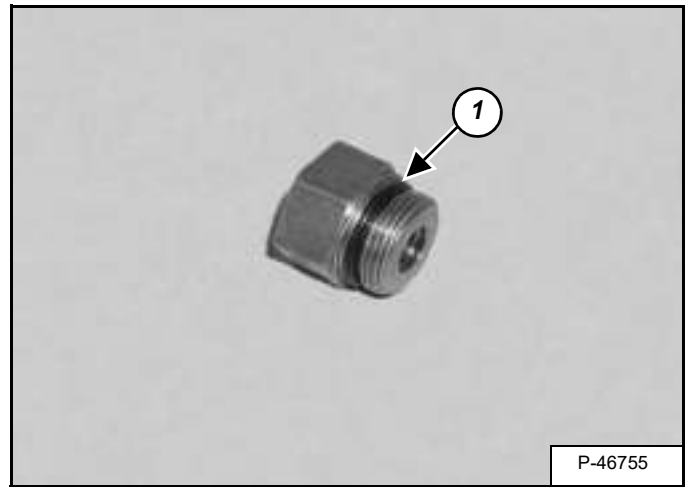
Remove the O-ring (Item 1) [Figure 20-200-8] from the fittings.

Figure 20-200-9



Remove the two adapters (Item 1) [Figure 20-200-9].

Figure 20-200-10



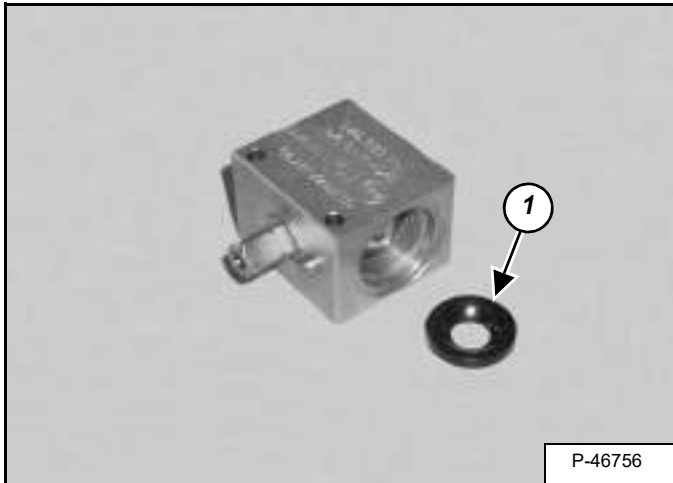
Remove the O-ring (Item 1) [Figure 20-200-10] from the adapters.

Dealer Copy -- Not for Resale

**FRONT AUXILIARY HYDRAULIC PRESSURE
RELEASE VALVE (CONT'D)**

Disassembly And Assembly (Cont'd)

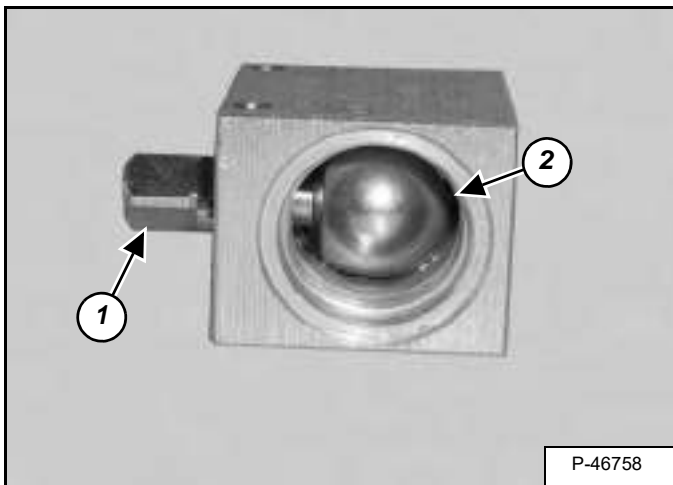
Figure 20-200-11



Remove the seal (Item 1) [Figure 20-200-11] from the valve. (Both sides)

Assembly: The concave side of the seal (Item 1) [Figure 20-200-11] fits over the ball (Item 2) [Figure 20-200-12].

Figure 20-200-12



Turn the shaft (Item 1) until the shaft and ball (Item 2) [Figure 20-200-12] are in the position shown.

Gently push the ball (Item 2) [Figure 20-200-12] out of the housing.

Figure 20-200-13

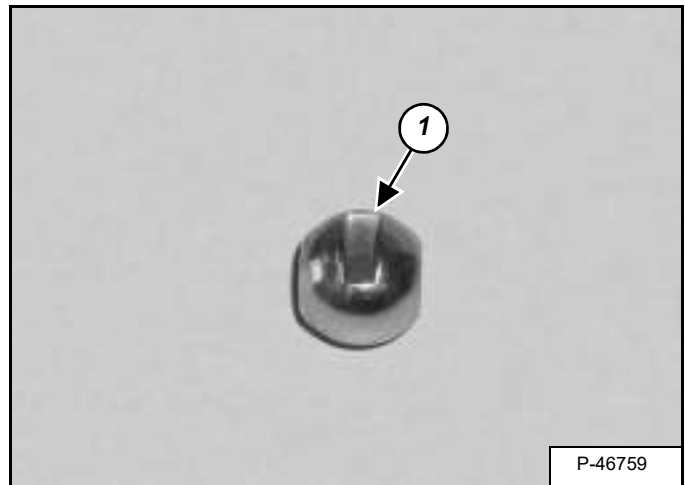
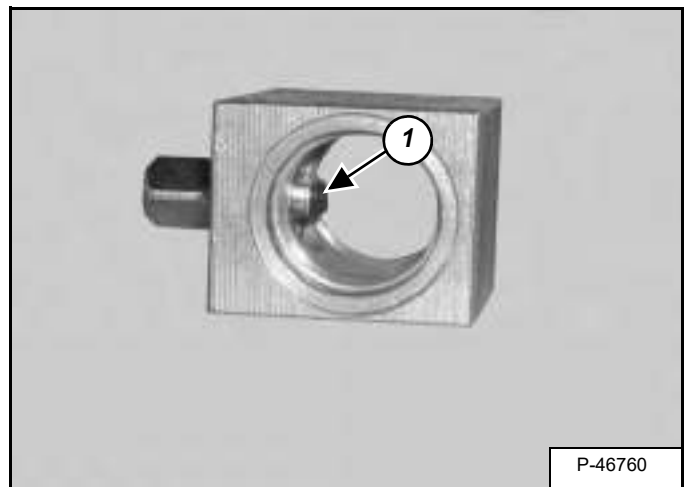


Figure 20-200-14

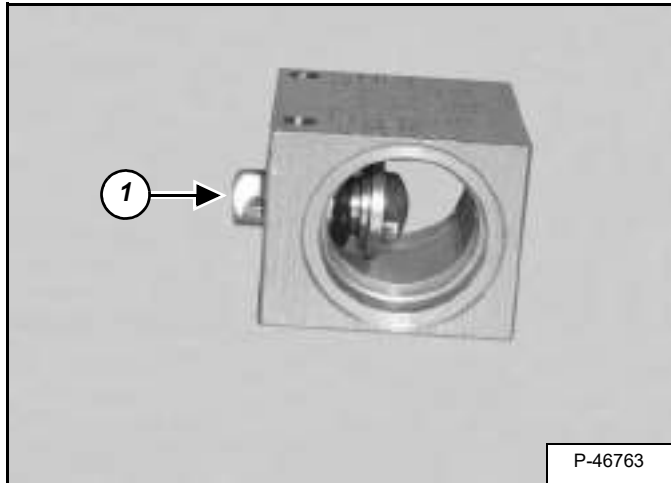


Assembly: Align the slot (Item 1) [Figure 20-200-13] with the notch (Item 1) [Figure 20-200-14] in the shaft.

**FRONT AUXILIARY HYDRAULIC PRESSURE
RELEASE VALVE (CONT'D)**

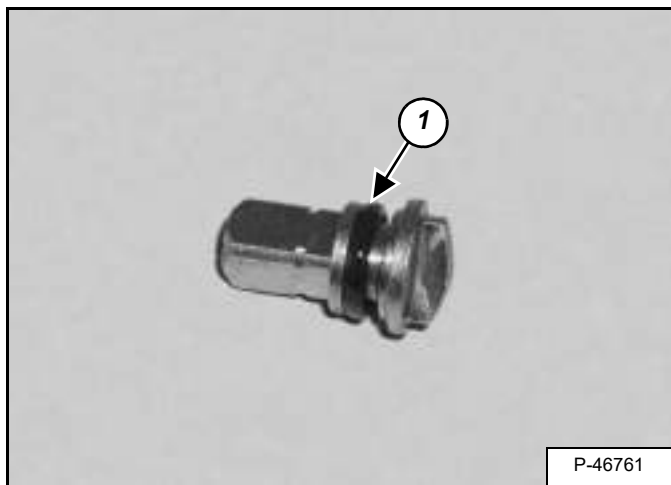
Disassembly And Assembly (Cont'd)

Figure 20-200-15



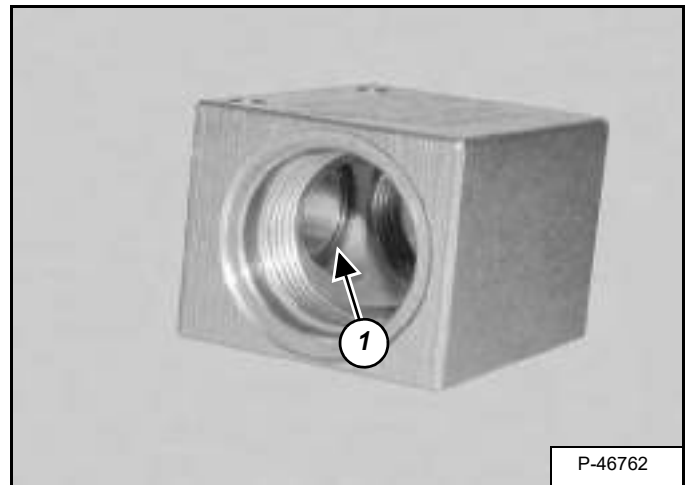
Remove the shaft (Item 1) [Figure 20-200-15] by pressing the shaft into the housing.

Figure 20-200-16



Remove the O-ring (Item 1) [Figure 20-200-16] from the shaft.

Figure 20-200-17



Remove the seal (Item 1) [Figure 20-200-17] from the housing.

Wash the components in clean solvent and dry with compressed air.

Check the components for wear or damage. Replace any worn or damaged components. Always use new O-rings and seals.

Apply clean hydraulic fluid to the O-rings and seals during assembly.

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

MANIFOLD (FOR S/N AC1911001 - 11251)

Removal And Installation

The manifold is located below the hydraulic control valve.

Relieve hydraulic pressure. (Refer to the Operation & Maintenance Manual for the correct procedure.)

! WARNING

Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a physician familiar with this injury is not received immediately.

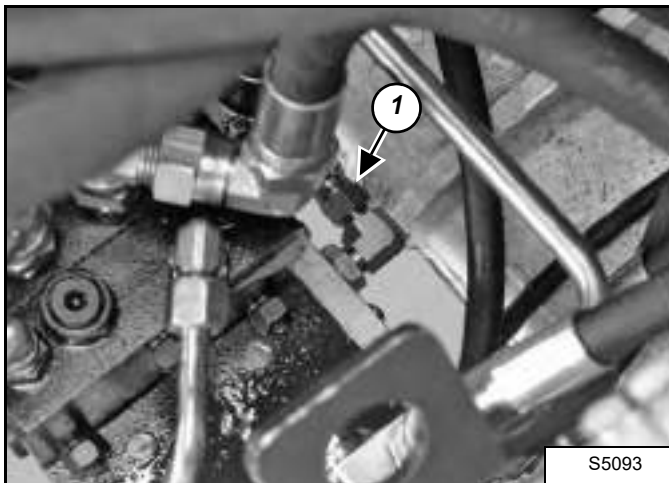
W-2145-0290

IMPORTANT

When making repairs on hydraulic system, clean the work area before disassemble and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

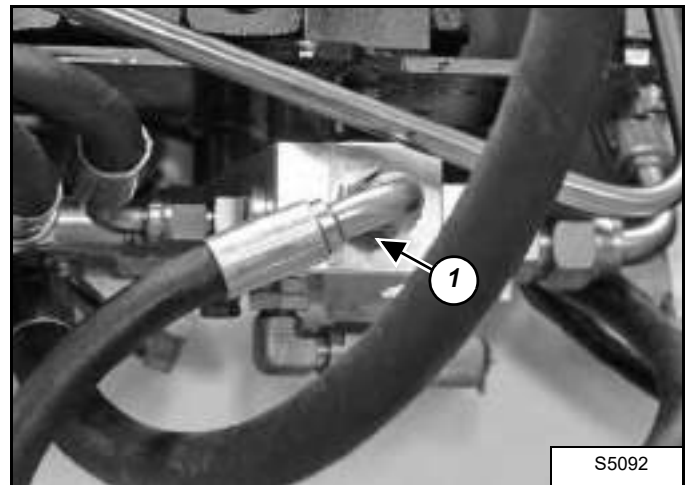
I-2056-0793

Figure 20-210-1



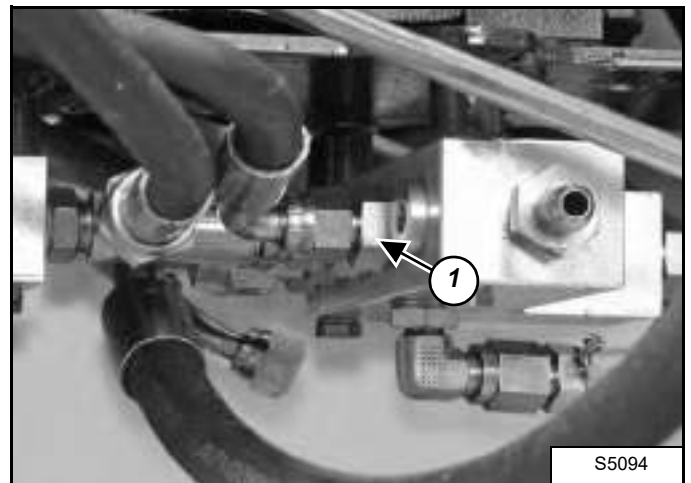
Remove the hose (Item 1) [Figure 20-210-1] on the manifold located towards the front of the machine.

Figure 20-210-2



Remove the hose (Item 1) [Figure 20-210-2] on the manifold located towards the backside of the machine.

Figure 20-210-3



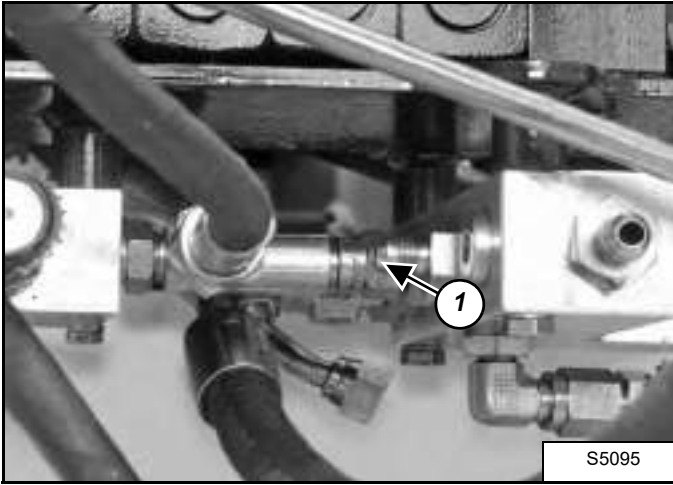
Remove, mark and cap the hoses on the left of the manifold, starting from the back of the machine to the front, beginning with the first (Item 1) [Figure 20-210-3].

Dealer Copy -- Not for Resale

MANIFOLD (FOR S/N AC1911001 - 11251) (CONT'D)

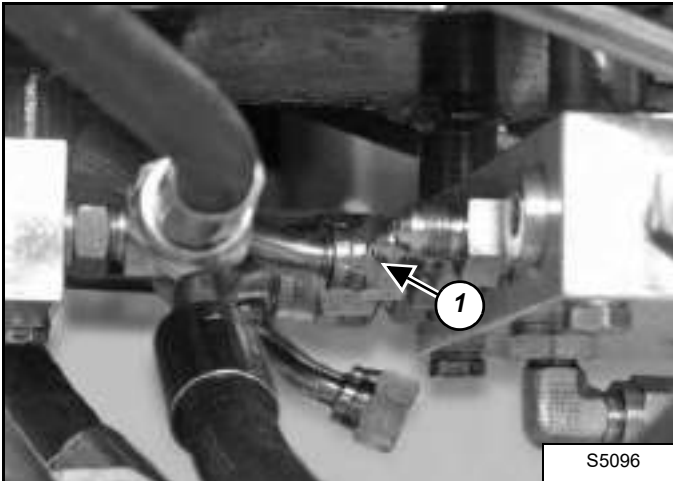
Removal And Installation (Cont'd)

Figure 20-210-4



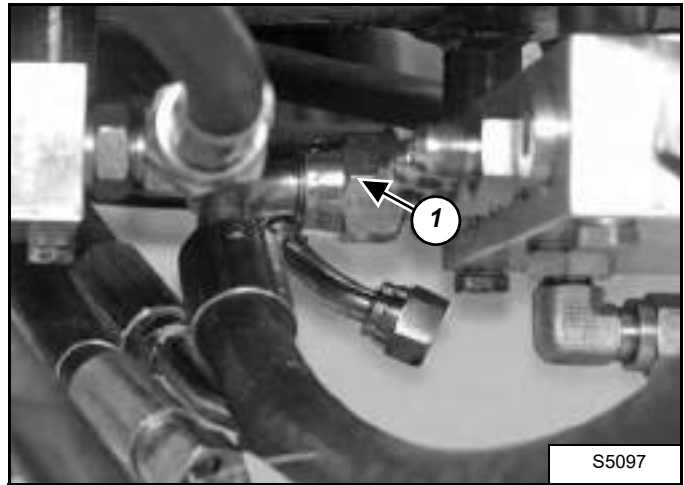
Remove the next hose (Item 1) [Figure 20-210-4].

Figure 20-210-5



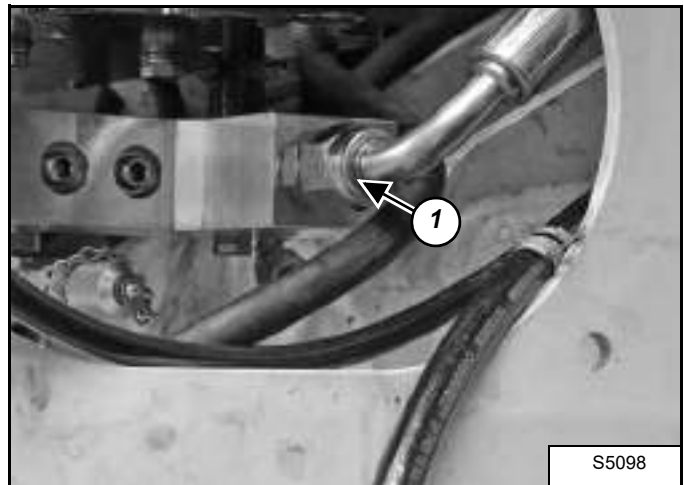
Remove the third hose (Item 1) [Figure 20-210-5].

Figure 20-210-6



Remove the last hose (Item 1) [Figure 20-210-6].

Figure 20-210-7



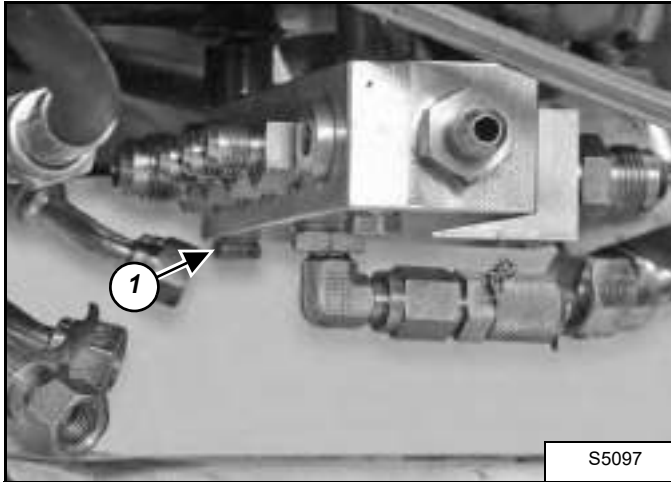
Remove the hose (Item 1) [Figure 20-210-7] on the right side of the manifold.

Dealer Copy -- Not for Resale

MANIFOLD (FOR S/N AC1911001 - 11251) (CONT'D)

Removal And Installation (Cont'd)

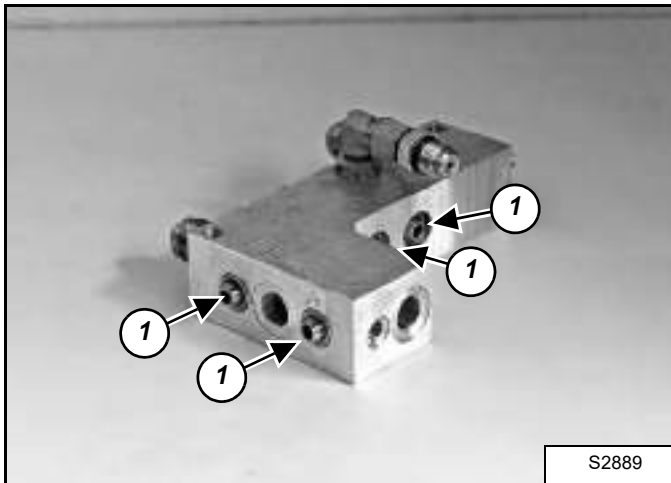
Figure 20-210-8



Remove the two bolts (Item 1) [Figure 20-210-8] and remove the manifold from the machine.

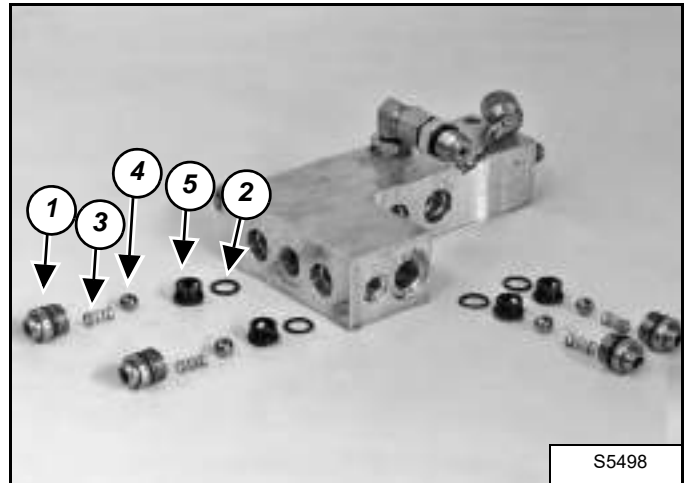
Disassembly

Figure 20-210-9



Remove all check valves (Item 1) [Figure 20-210-9].

Figure 20-210-10



Each check valve consists of a plug (Item 1), seal (Item 2), spring (Item 3), ball (Item 4) and ball seat (Item 5) [Figure 20-210-10]. Check for wear and replace if necessary.



Bobcat®

Dealer Copy -- Not for Resale

MANIFOLD (FOR S/N AC1911252 & ABOVE)

Removal And Installation

The manifold is located below the hydraulic control valve.

Relieve hydraulic pressure. (Refer to the Operation & Maintenance Manual for the correct procedure.)

WARNING

Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a physician familiar with this injury is not received immediately.

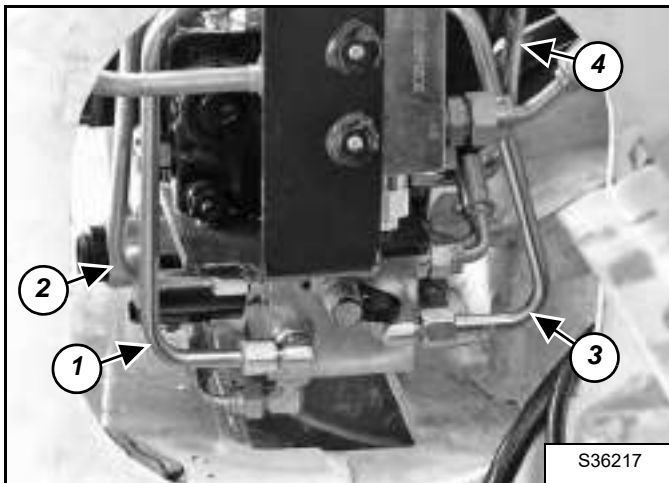
W-2145-0290

IMPORTANT

When making repairs on hydraulic system, clean the work area before disassemble and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

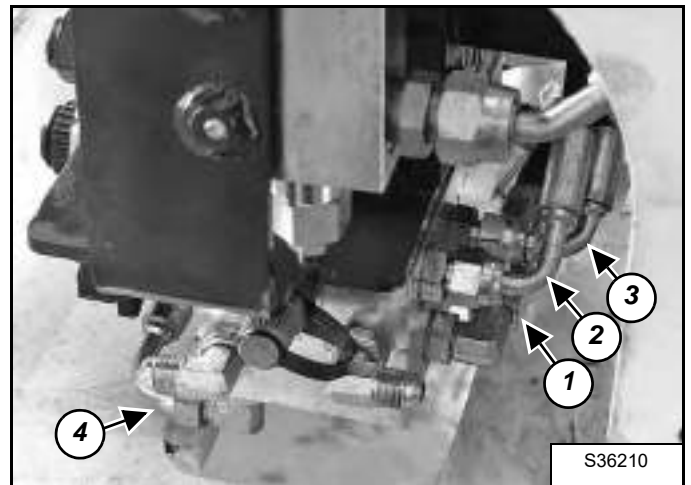
I-2056-0793

Figure 20-211-1



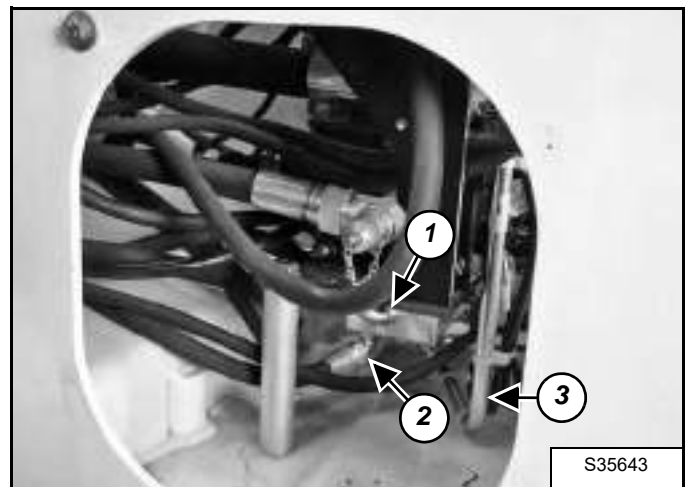
Remove the tubelines (Items 1 to 4) [Figure 20-211-2].

Figure 20-211-2



Remove the hoses (Items 1 to 4) [Figure 20-211-2].

Figure 20-211-3



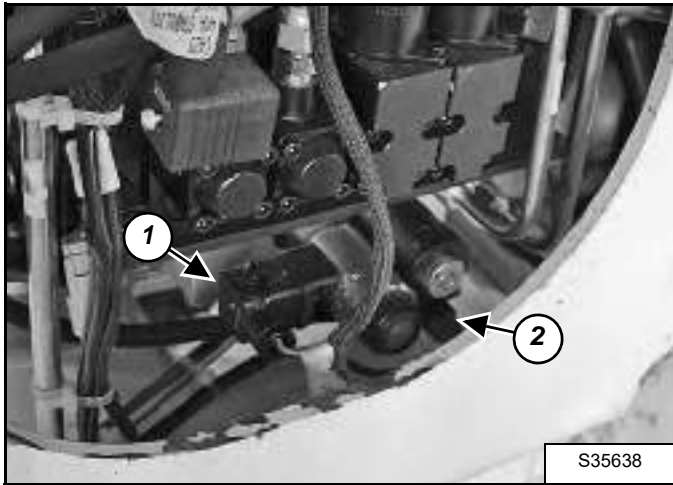
Remove the hoses (Items 1 & 2) and tubeline (Item 3) [Figure 20-211-3].

Dealer Copy -- Not for Resale

**MANIFOLD (FOR S/N AC1911252 & ABOVE)
(CONT'D)**

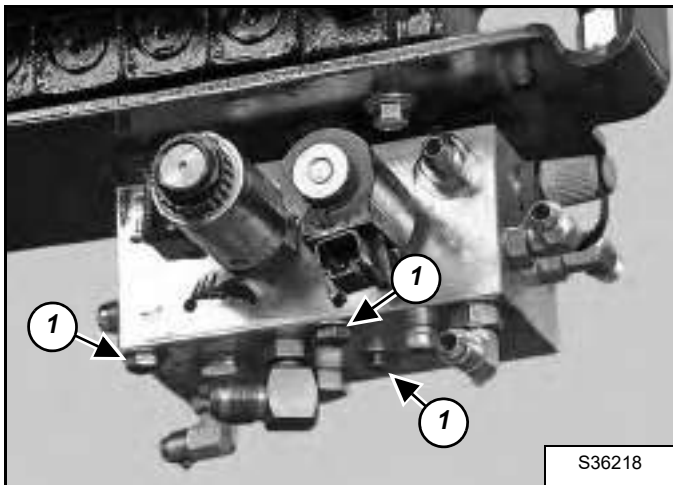
Removal And Installation (Cont'd)

Figure 20-211-4



Disconnect electric connectors from the boom float solenoid (Item 1) and workgroup lockout solenoid (Item 2) [Figure 20-211-4].

Figure 20-211-5



Remove bolts (Item 1) [Figure 20-211-5] from the manifold.

Remove the manifold.

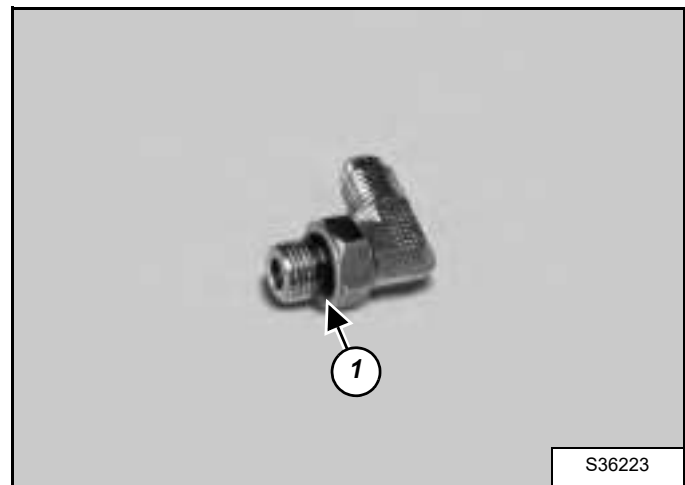
Disassembly

Figure 20-211-6



Remove all hydraulic fittings from the manifold [Figure 20-211-6].

Figure 20-211-7

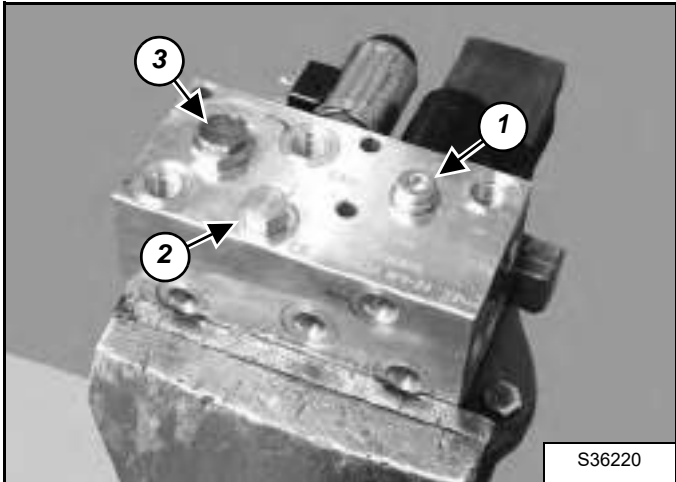


Replace the O-ring (Item 1) [Figure 20-211-6] on each hydraulic fitting.

Dealer Copy -- Not for Resale

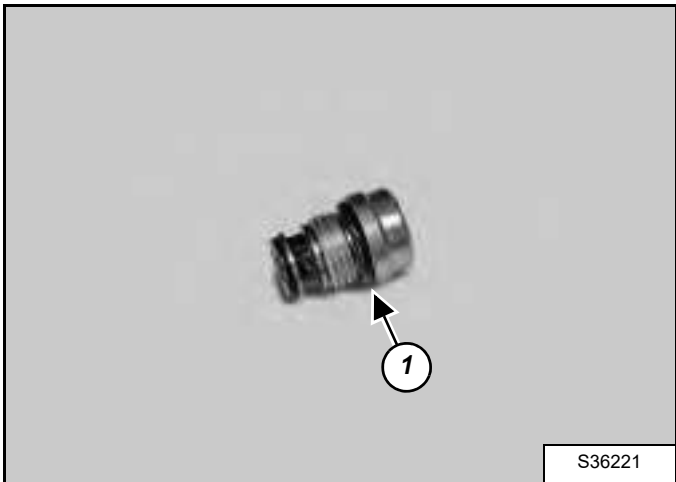
**MANIFOLD (FOR S/N AC1911252 & ABOVE)
(CONT'D)**

Figure 20-211-8



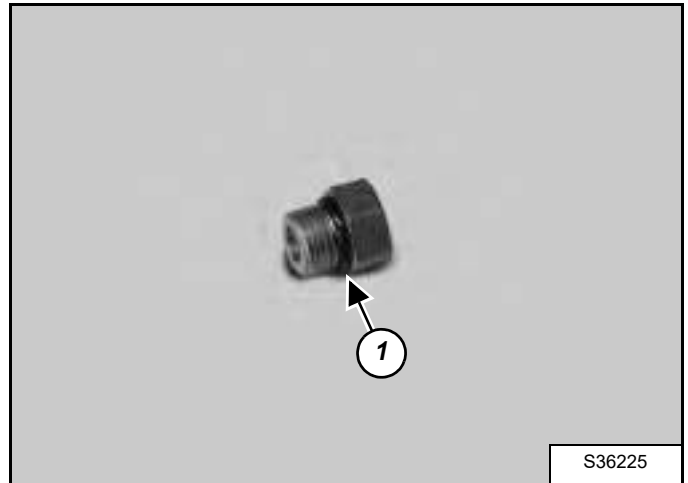
Remove the check valve (Item 1), plug (Item 2) and multifunction valve (Item 3) [Figure 20-211-8]. Check for wear and replace if necessary.

Figure 20-211-9



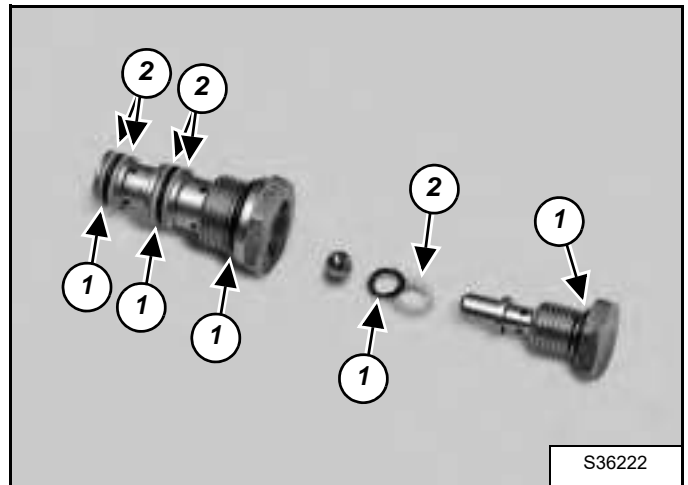
Replace the O-ring (Item 1) [Figure 20-211-9].

Figure 20-211-10



Replace the O-ring (Item 1) [Figure 20-211-10].

Figure 20-211-11



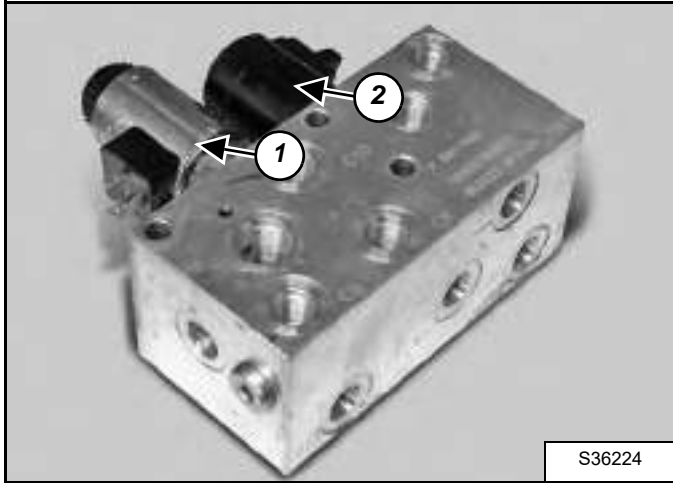
Replace the O-rings (Item 1) and backup rings (Item 2) [Figure 20-211-11].

Dealer Copy -- Not for Resale

**MANIFOLD (FOR S/N AC1911252 & ABOVE)
(CONT'D)**

Disassembly (Cont'd)

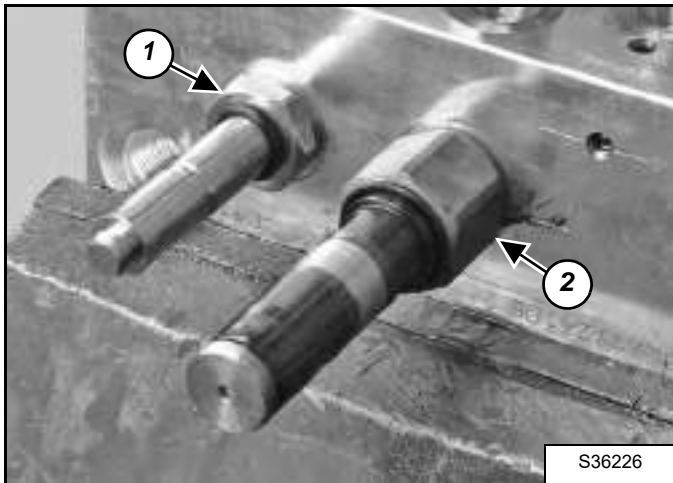
Figure 20-211-12



Remove the boom float solenoid (Item 1) and workgroup lockout solenoid (Item 2) **[Figure 20-211-12]**.

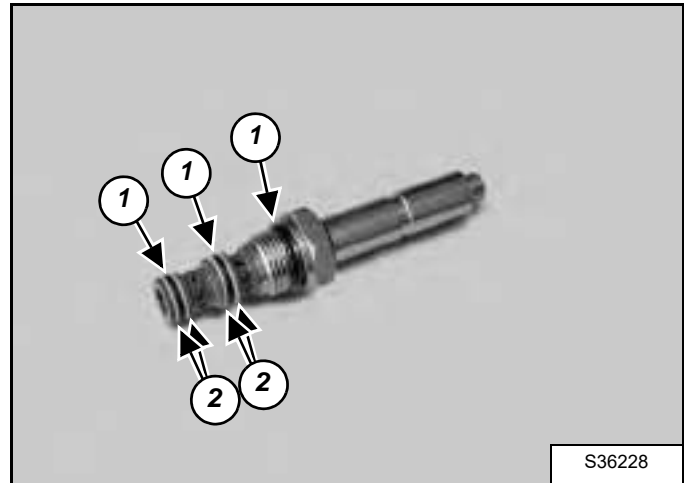
Installation: Each solenoid must be sealed with O-rings on both sides. Replace O-rings if damaged.

Figure 20-211-13



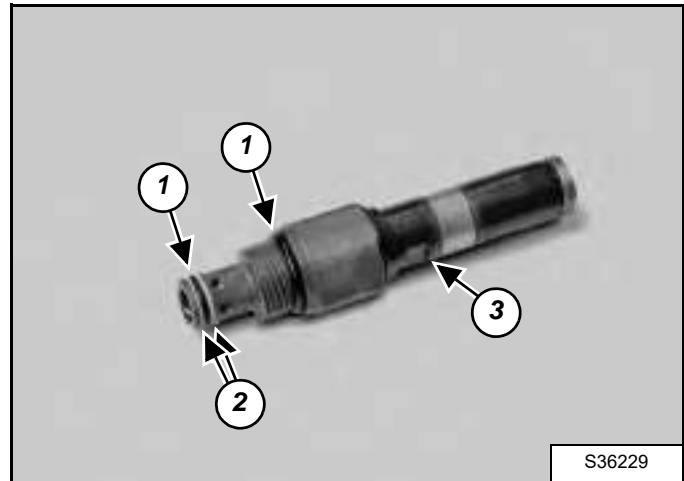
Remove the solenoid valve assemblies (Item 1) **[Figure 20-211-13]**.

Figure 20-211-14



Replace the O-rings (Item 1) and backup rings (Item 2) **[Figure 20-211-14]**.

Figure 20-211-15



Replace the O-rings (Item 1) and backup rings (Item 2) (Item 1) **[Figure 20-211-15]**.

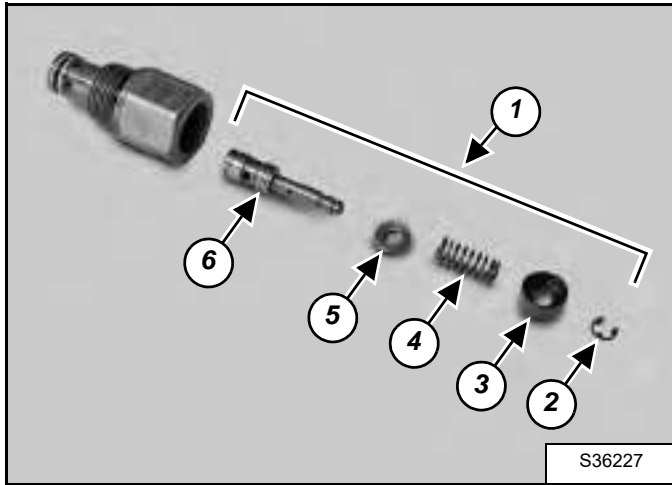
Remove the shaft (Item 3) **[Figure 20-211-15]**.

Dealer Copy -- Not for Resale

**MANIFOLD (FOR S/N AC1911252 & ABOVE)
(CONT'D)**

Disassembly (Cont'd)

Figure 20-211-16



Remove the spool assembly (Item 1) **[Figure 20-211-16]**.

Disassemble the spool assembly: snap ring (Item 2), spring retainer (Item 3), spring (Item 4), spring retainer (Item 5) and spool (Item 6).



Bobcat®

Dealer Copy -- Not for Resale

HYDROSTATIC SYSTEM

HYDROSTATIC SYSTEM INFORMATION	30-10-1
Troubleshooting Chart	30-10-1
Replenishing Valve Function	30-10-2
OIL COOLER	30-20-1
Removal And Installation	30-20-1
HYDROSTATIC DRIVE MOTOR	30-30-1
Removal And Installation	30-30-1
Parts Identification	30-30-2
Disassembly	30-30-5
Inspection	30-30-16
Assembly	30-30-18
HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)	30-40-1
Removal And Installation	30-40-1
Parts Identification	30-40-3
Disassembly	30-40-8
Inspection	30-40-20
Assembly	30-40-24
HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE)	30-41-1
Removal And Installation	30-41-1
Parts Identification	30-41-3
Shaft Disassembly	30-41-8
Relief Valves Disassembly And Assembly	30-41-10
Charge Pump Disassembly	30-41-11
Piston Pump Disassembly	30-41-13
Solenoid Block Disassembly	30-41-17
Inspection	30-41-19
Piston Pump Assembly	30-41-22
Charge Pump Assembly	30-41-26
Solenoid Block Assembly	30-41-28
Shaft Assembly	30-41-30
DRIVE BELT	30-50-1
Description	30-50-1
Shield Removal And Installation	30-50-1
Belt Adjustment	30-50-2
Belt Removal And Installation	30-50-3
Tensioner Pulley Removal And Installation	30-50-4
Tensioner Pulley Parts Identification	30-50-6
Tensioner Pulley Disassembly And Assembly	30-50-7

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

HYDROSTATIC SYSTEM INFORMATION

Troubleshooting Chart

The following troubleshooting chart is provided for assistance in locating and correcting problems which are most common. Many of the recommended procedures must be done by authorized Bobcat Service Personnel only.



WARNING

Check for correct function after adjustments, repairs or service. Failure to make correct repairs or adjustments can cause injury or death.

W-2004-1285

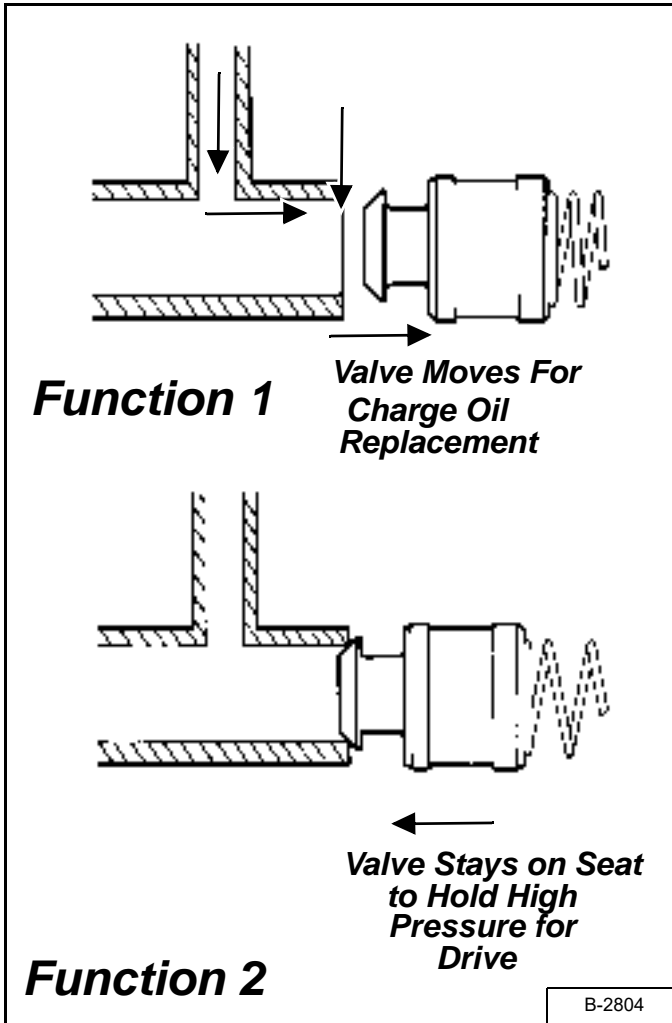
PROBLEM	CAUSE
The Telescopic Handler does not move	1, 2
The Telescopic Handler does not move in a straight line.	3, 4
The hydrostatic system is overheating.	5, 6, 7, 8
Warning light comes ON.	5, 8, 9, 10, 11

KEY TO CORRECT THE CAUSE
1. The hydrostatic pump has damage.
2. The hydrostatic motor has damage.
3. The tires do not have the correct tire pressure.
4. The tires are not the same size.
5. The hydrostatic fluid is not at the correct level.
6. The oil cooler has a restriction.
7. The temperature sending switch is not operating correctly.
8. The Telescopic Handler is not being operated at the correct RPM.
9. The sender is defective.
10. Pump is defective or worn hydrostatics
11. Hydraulic filter is plugged.

Dealer Copy -- Not for Resale

Replenishing Valve Function

Figure 30-10-1



IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

The functions of the replenishing valves are:

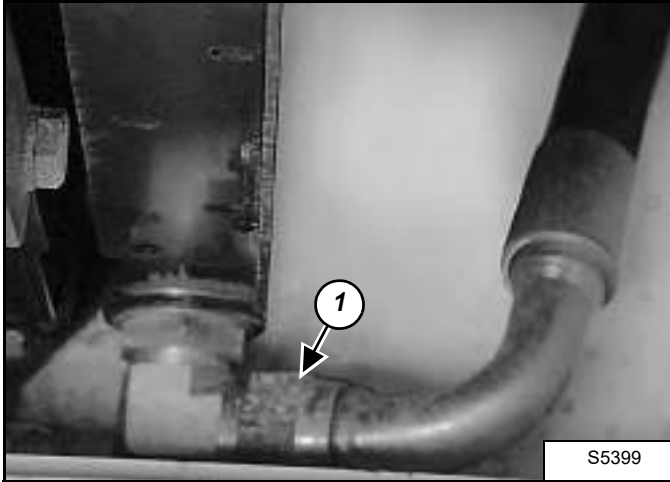
1. To give replacement fluid to the low pressure side of the hydrostatic circuit. Replacement fluid is needed because of normal internal leakage and the controlled flow to the oil cooler for cooling; Function 1 [Figure 30-10-1].
2. To keep high pressure fluid out of the low pressure side of the hydrostatic circuitry; Function 2 [Figure 30-10-1].

OIL COOLER

Removal And Installation

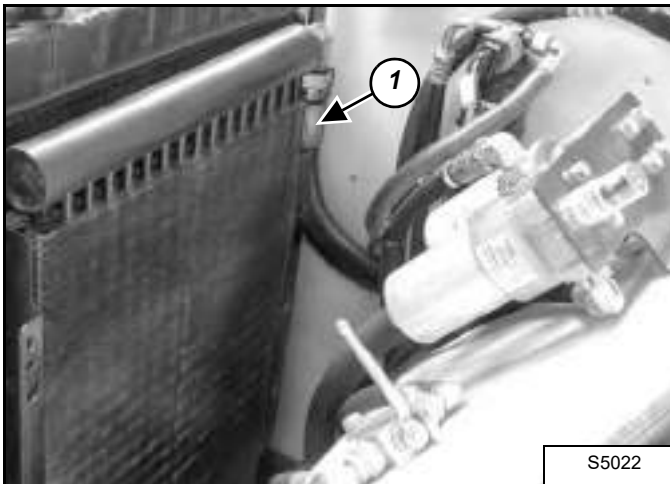
Remove the condenser if equipped. (See "Removal And Installation" on page 180-120-1.)

Figure 30-20-1



Remove the hydraulic hose (Item 1) [Figure 30-20-1] at the bottom of the oil cooler.

Figure 30-20-2



Remove the hydraulic hose (Item 1) [Figure 30-20-2] at the top of the oil cooler.

Figure 30-20-3



Remove the two screws (Item 1) [Figure 30-20-3] and remove the oil cooler.

Installation: Tighten the bolts to 25 N•m (18 ft-lb) torque.



Bobcat®

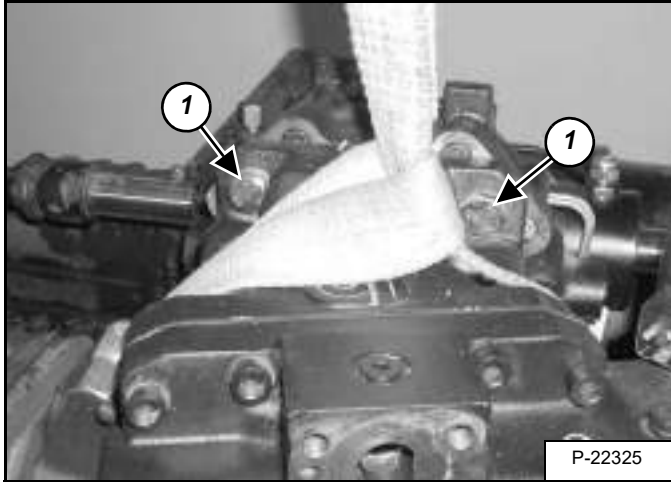
Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR

Removal And Installation

Remove the front axle (See Installation on Page 40-30-5.)

Figure 30-30-1



Install a chain hoist and lifting strap to lift and support the drive motor **[Figure 30-30-1]**.

Remove the four mounting bolts (Item 1) **[Figure 30-30-1]** from the drive motor.

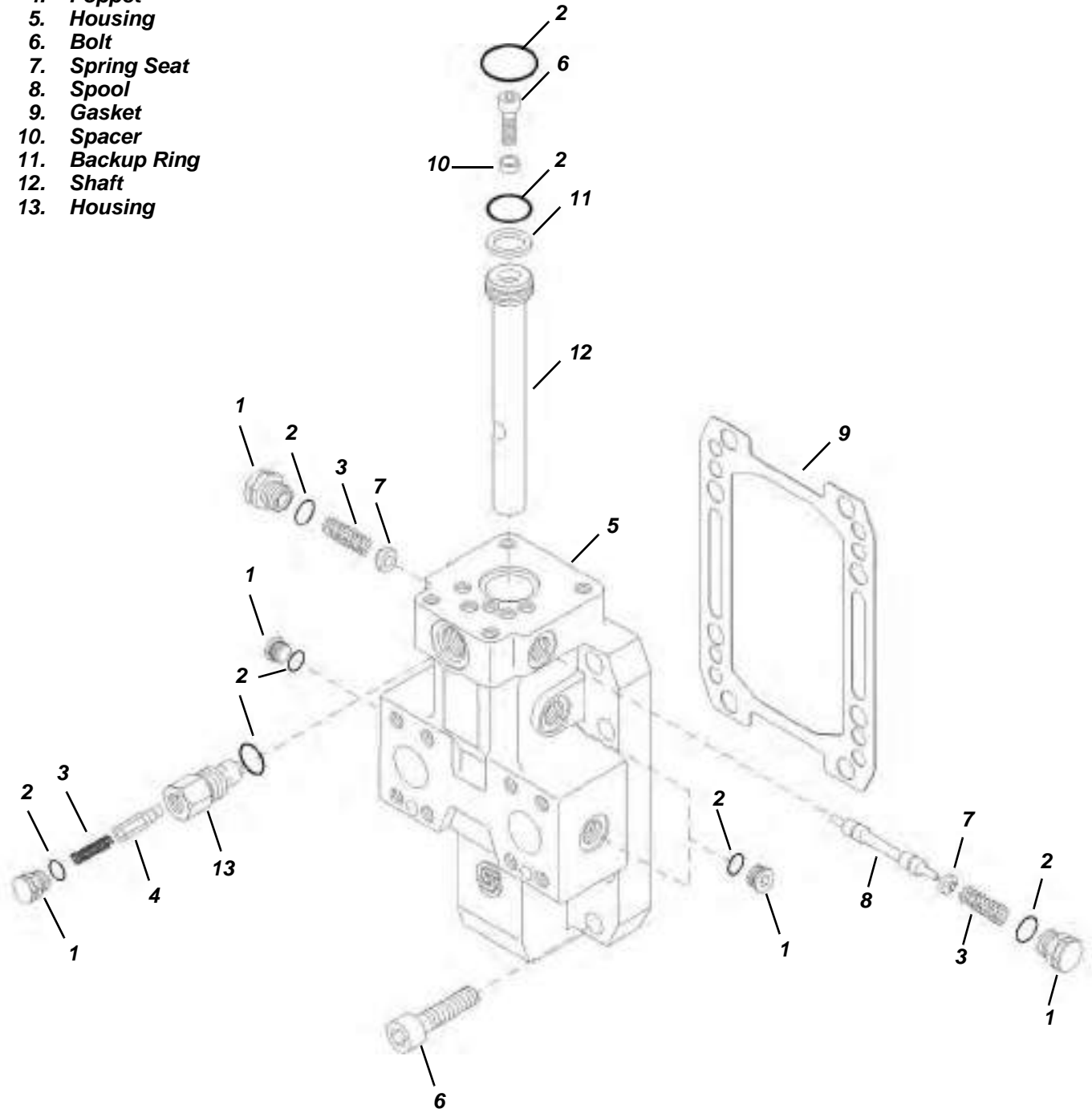
Assembly: Tighten the mounting bolts to 190-210 N•m (140-155 ft-lb) torque.

Remove the hydrostatic drive motor from the axle housing.

HYDROSTATIC DRIVE MOTOR (CONT'D)

Parts Identification

- 1. Plug
- 2. O-ring
- 3. Spring
- 4. Poppet
- 5. Housing
- 6. Bolt
- 7. Spring Seat
- 8. Spool
- 9. Gasket
- 10. Spacer
- 11. Backup Ring
- 12. Shaft
- 13. Housing



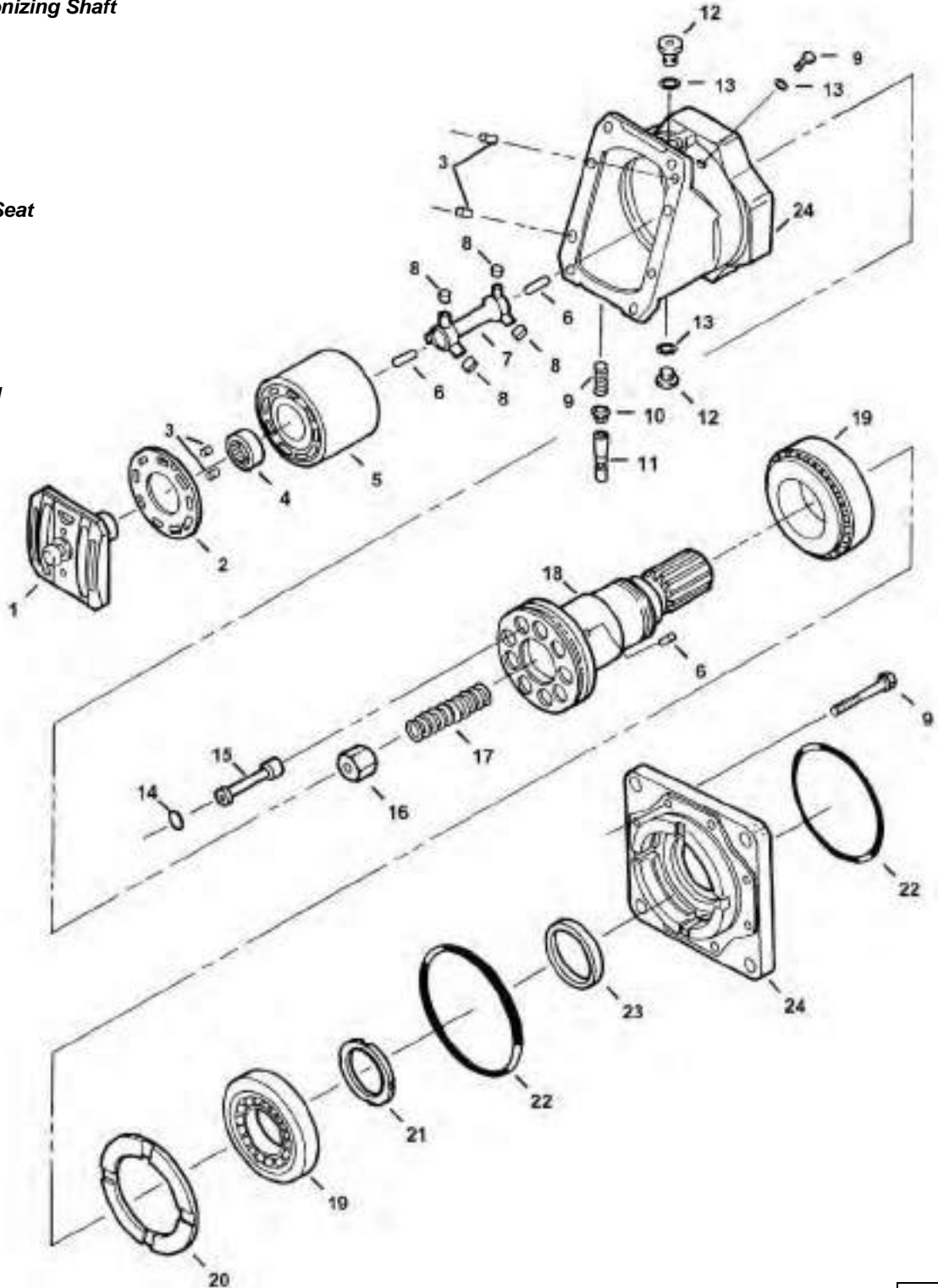
B-15938

Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR (CONT'D)

Parts Identification (Cont'd)

- 1. Valve Segment
- 2. Plate
- 3. Pins
- 4. Bearing
- 5. Cylinder
- 6. Pin
- 7. Synchronizing Shaft
- 8. Rollers
- 9. Bolt
- 10. Nut
- 11. Cap
- 12. Plug
- 13. O-Ring
- 14. Ring
- 15. Piston
- 16. Spring Seat
- 17. Spring
- 18. Shaft
- 19. Bearing
- 20. Spacer
- 21. Nut
- 22. O-Ring
- 23. Seal
- 24. Housing

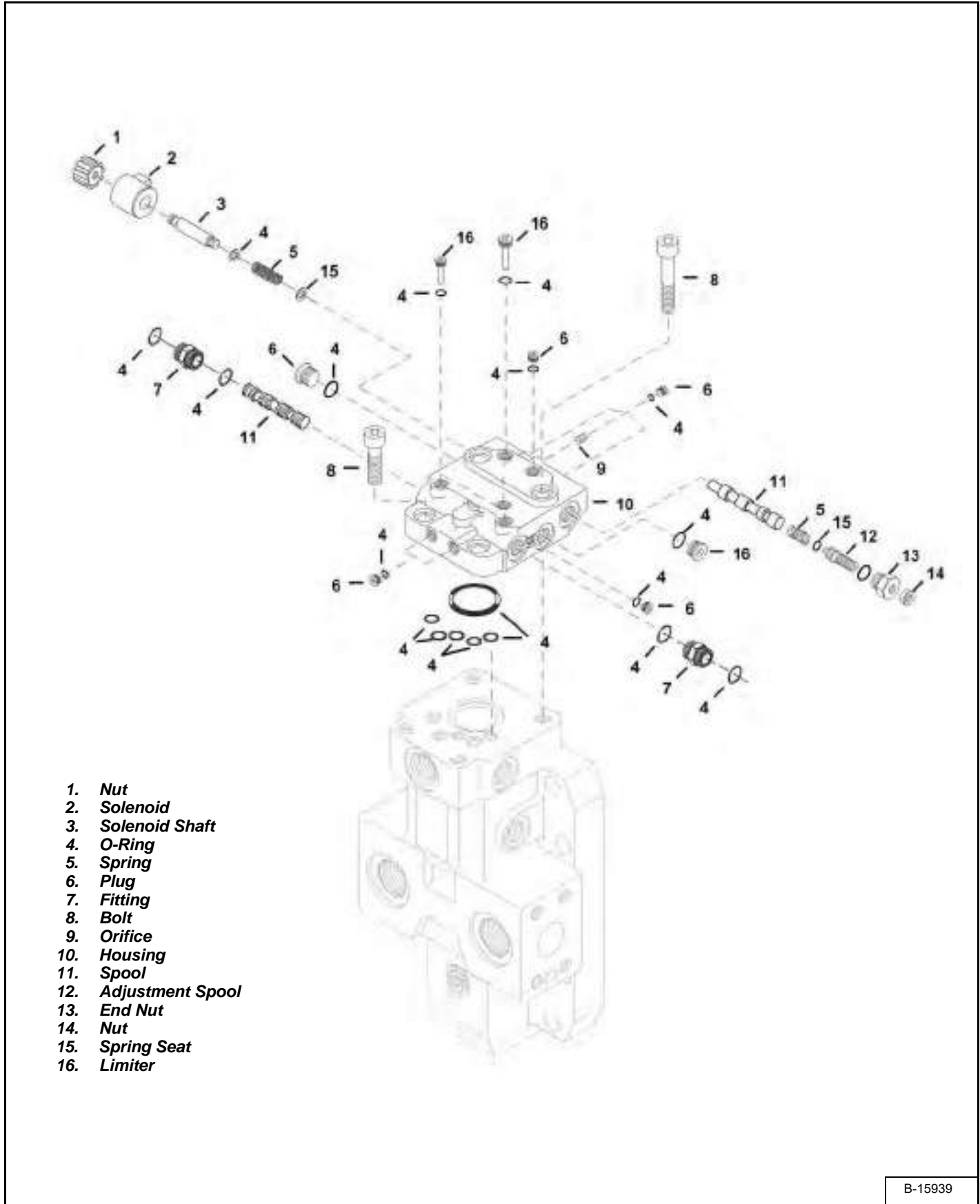


B-15937

Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR (CONT'D)

Parts Identification (Cont'd)



Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR (CONT'D)

Disassembly

Clean the outside of the drive motor before disassembly.

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

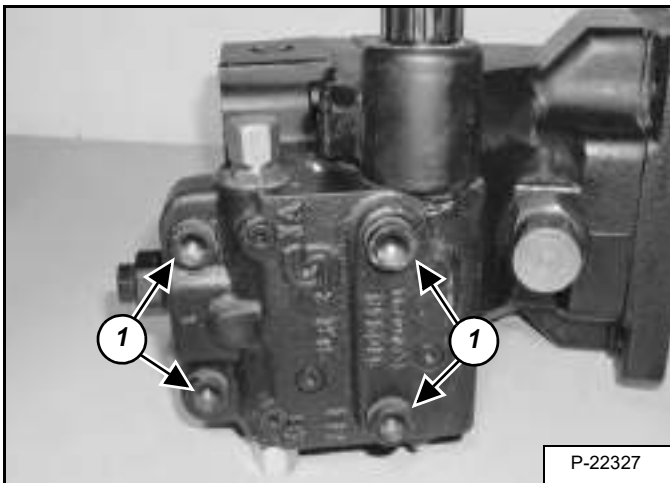
I-2003-0888

Figure 30-30-2



Place the hydrostatic drive motor on a work surface, mark the sections for correct assembly [Figure 30-30-2].

Figure 30-30-3



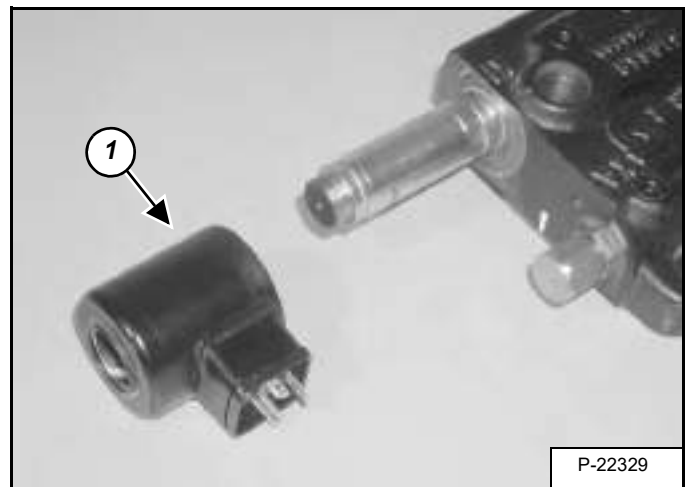
Remove the four bolts (Item 1) [Figure 30-30-3] and remove the solenoid housing.

Figure 30-30-4



Remove the solenoid nut (Item 1) [Figure 30-30-4].

Figure 30-30-5



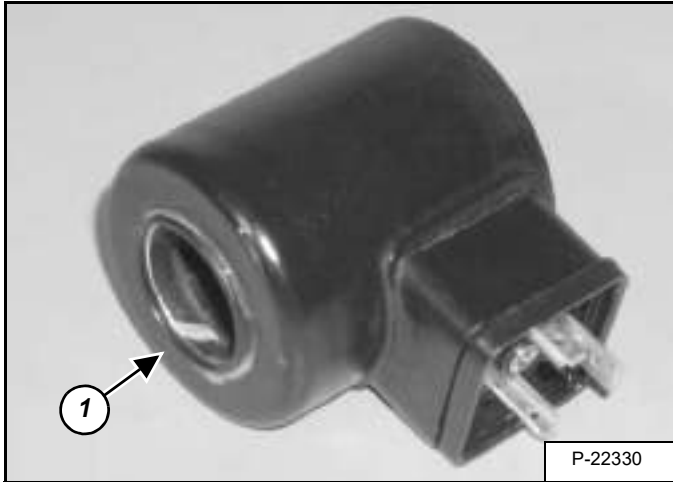
Remove the solenoid (Item 1) [Figure 30-30-5] from the shaft.

Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR (CONT'D)

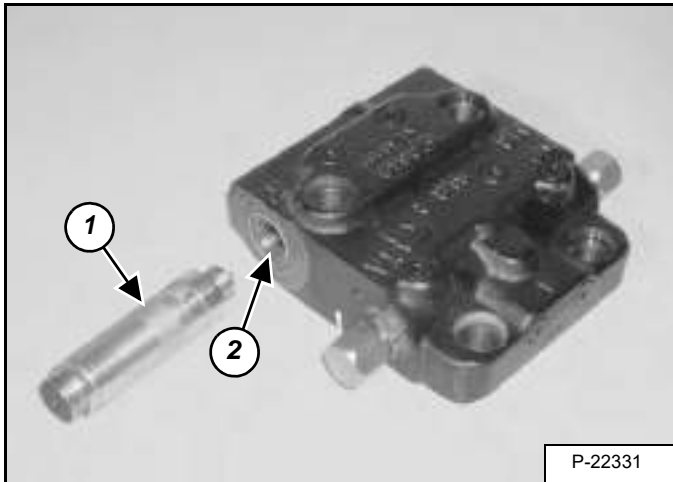
Disassembly (Cont'd)

Figure 30-30-6



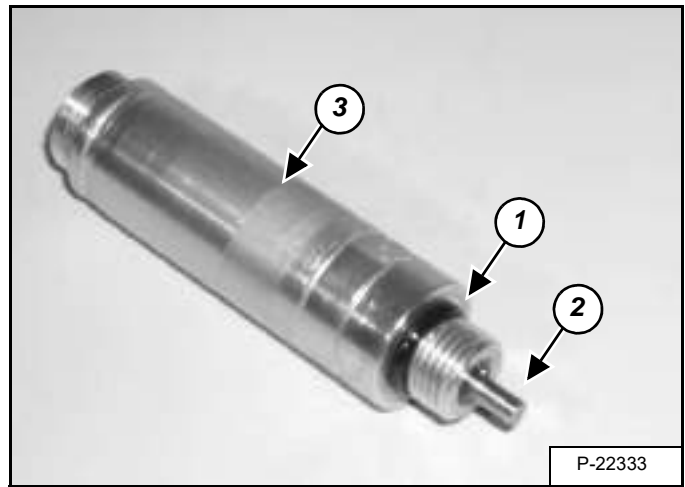
Remove and discard the O-ring (Item 1) [Figure 30-30-6] from the solenoid.

Figure 30-30-7



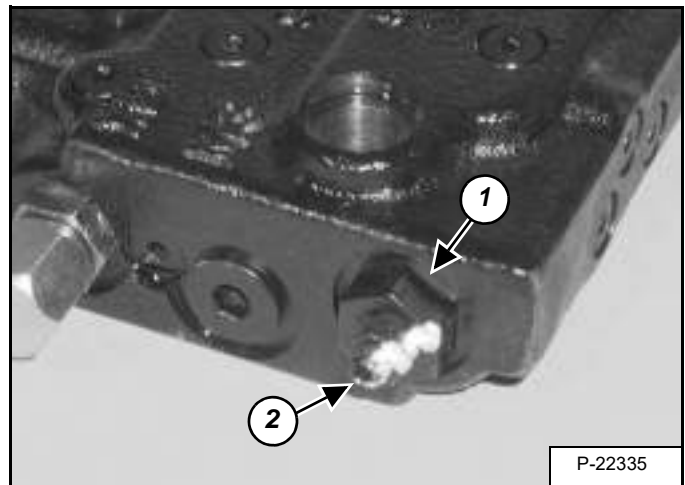
Remove the solenoid shaft (Item 1) and O-ring (Item 2) [Figure 30-30-7] from the housing.

Figure 30-30-8



Remove the O-ring (Item 1) and pin (Item 2) from the solenoid shaft (Item 3) [Figure 30-30-8].

Figure 30-30-9



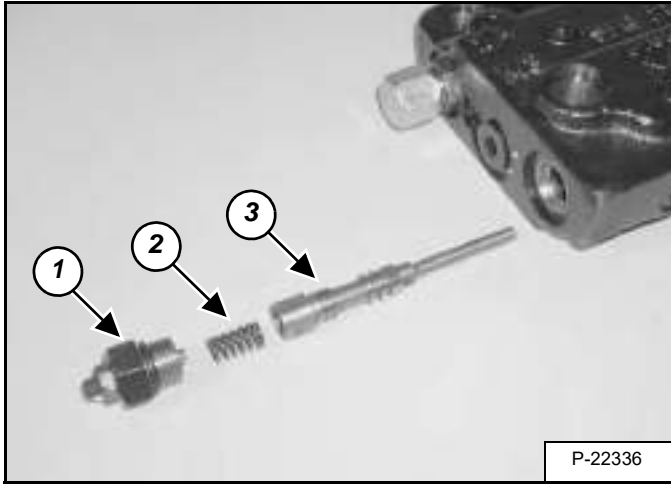
Loosen the large nut (Item 1) [Figure 30-30-9] on the compensator valve.

Do not loosen the small nut (Item 2) [Figure 30-30-9].

HYDROSTATIC DRIVE MOTOR (CONT'D)

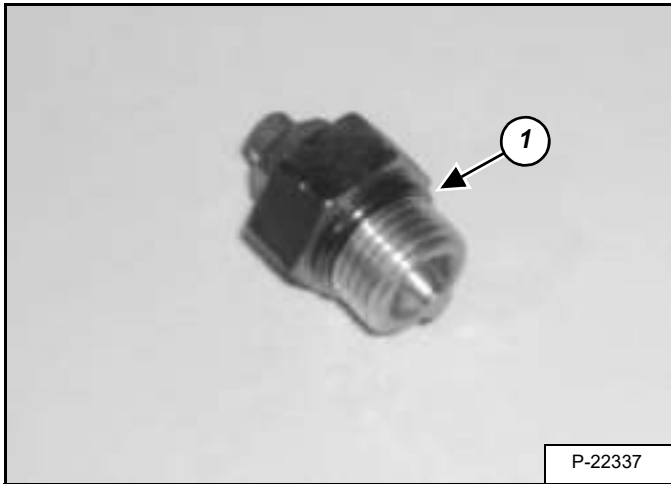
Disassembly (Cont'd)

Figure 30-30-10



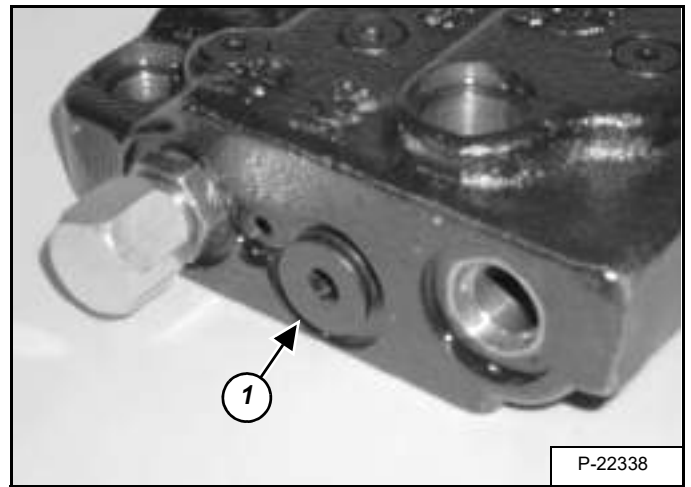
Remove the adjusting screw (Item 1), valve spring (Item 2) and spool assembly (Item 3) [Figure 30-30-10] from the housing.

Figure 30-30-11



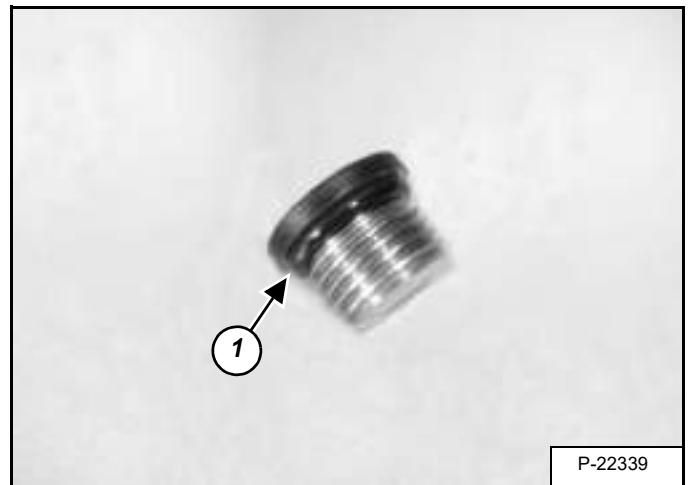
Remove and discard the O-ring (Item 1) [Figure 30-30-11] from the adjustment screw.

Figure 30-30-12



Remove the plug (Item 1) [Figure 30-30-12] from the housing.

Figure 30-30-13



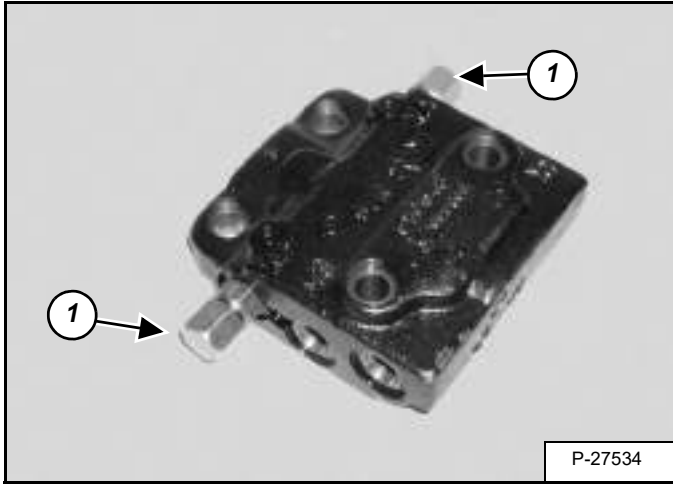
Remove and discard the O-ring (Item 1) [Figure 30-30-13] from the plug.

Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR (CONT'D)

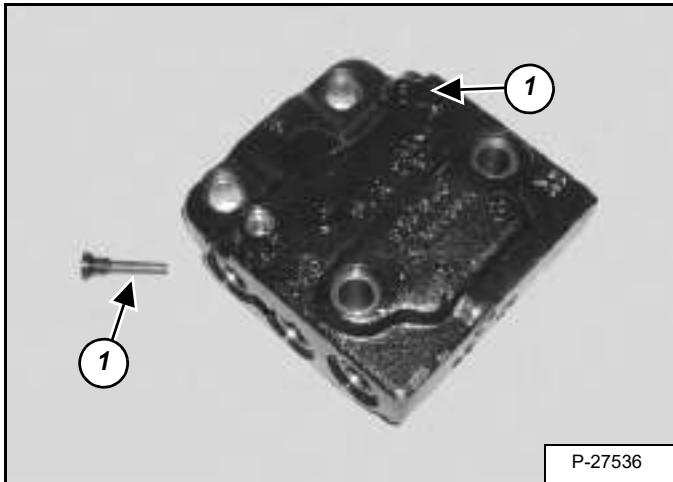
Disassembly (Cont'd)

Figure 30-30-14



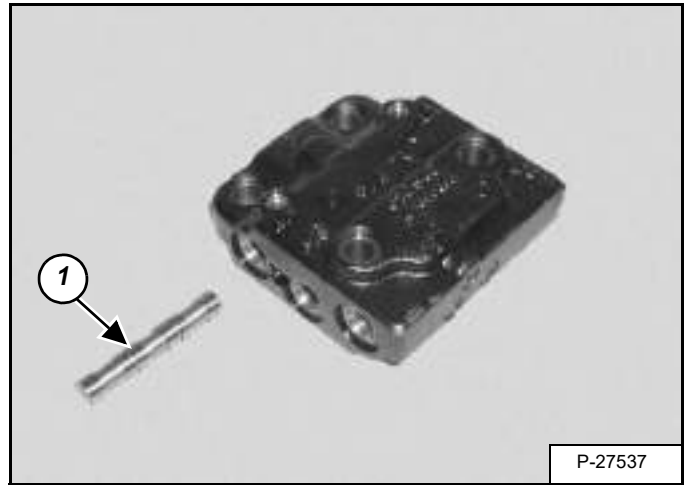
Remove the two fittings (Item 1) [Figure 30-30-14] from the housing.

Figure 30-30-15



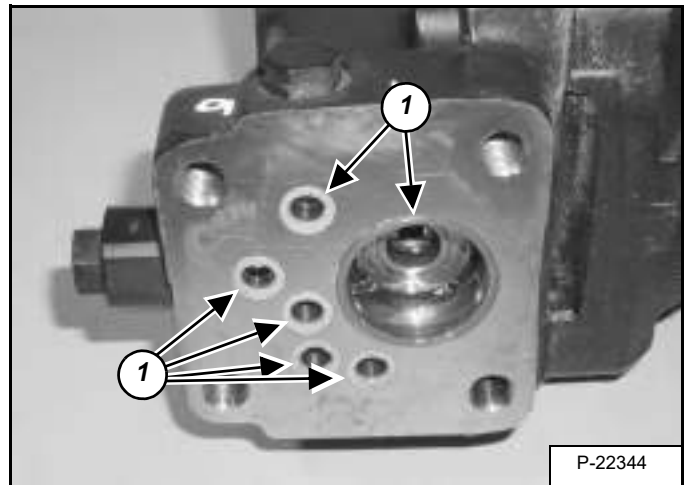
Remove the two spool limiters (Item 1) [Figure 30-30-15].

Figure 30-30-16



Remove the spool (Item 1) [Figure 30-30-16].

Figure 30-30-17



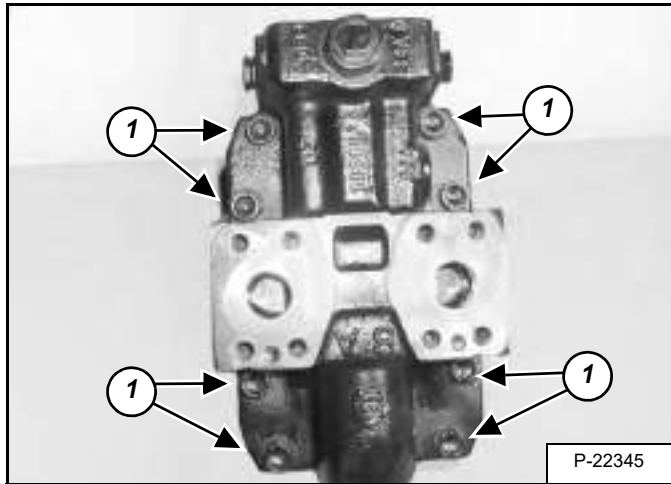
Remove and discard the six O-rings (Item 1) [Figure 30-30-17] from the housing.

Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR (CONT'D)

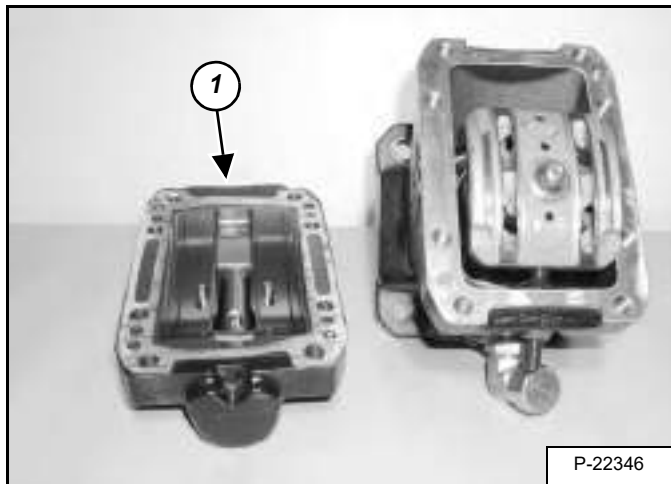
Disassembly (Cont'd)

Figure 30-30-18



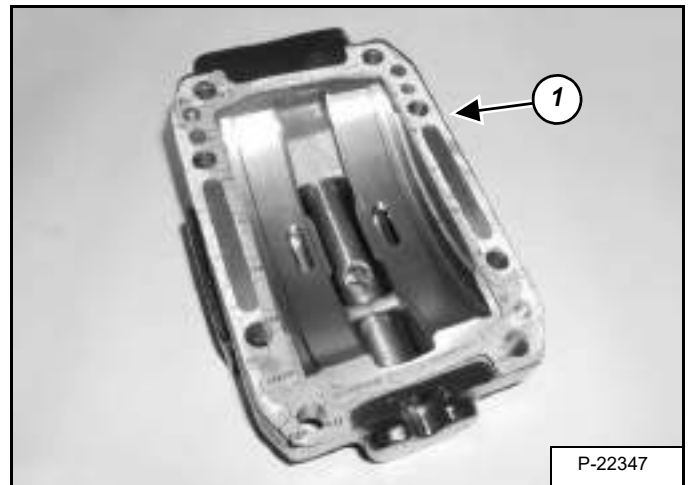
Remove the eight bolts (Item 1) [Figure 30-30-18] from the end cap.

Figure 30-30-19



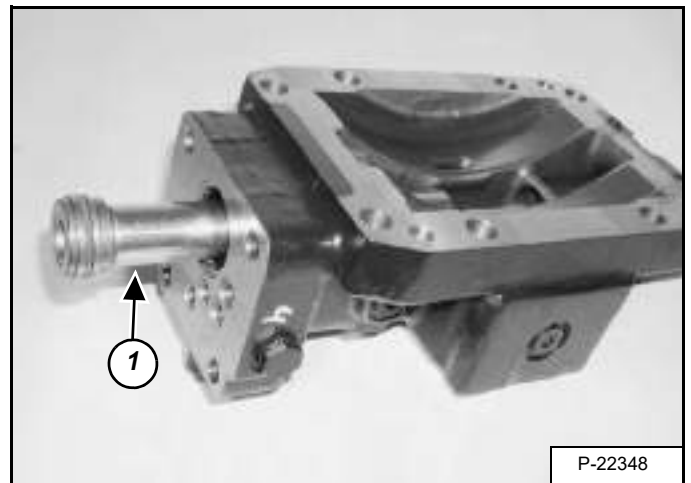
Lift and remove the end cap (Item 1) [Figure 30-30-19] from the housing.

Figure 30-30-20



Remove the gasket (Item 1) [Figure 30-30-20] from the end cap.

Figure 30-30-21



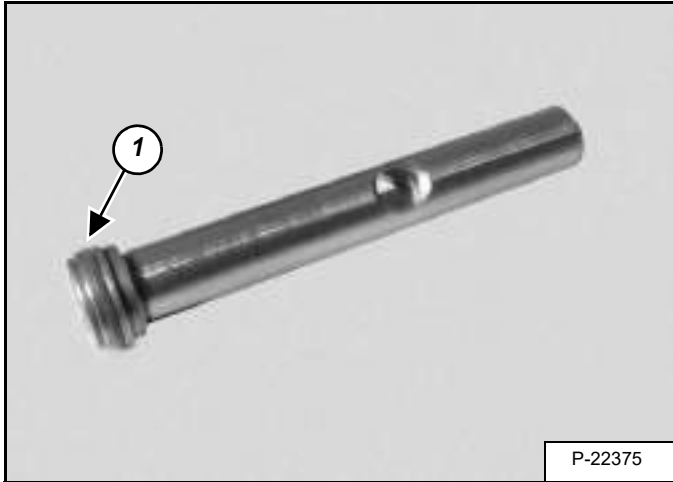
Remove the piston (Item 1) [Figure 30-30-21] from the end cap.

Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR (CONT'D)

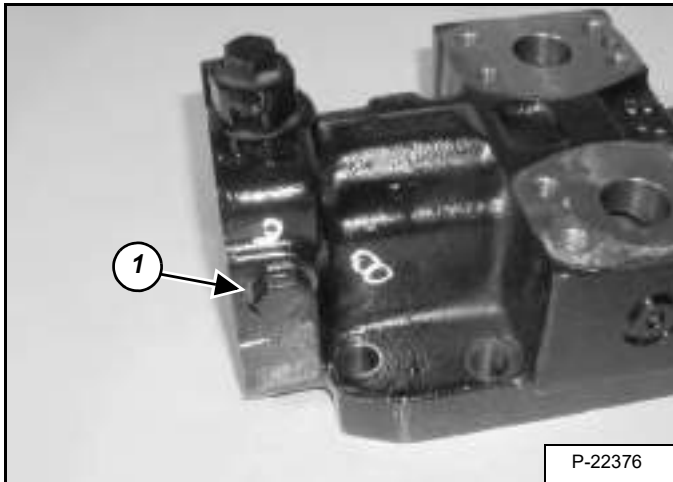
Disassembly (Cont'd)

Figure 30-30-22



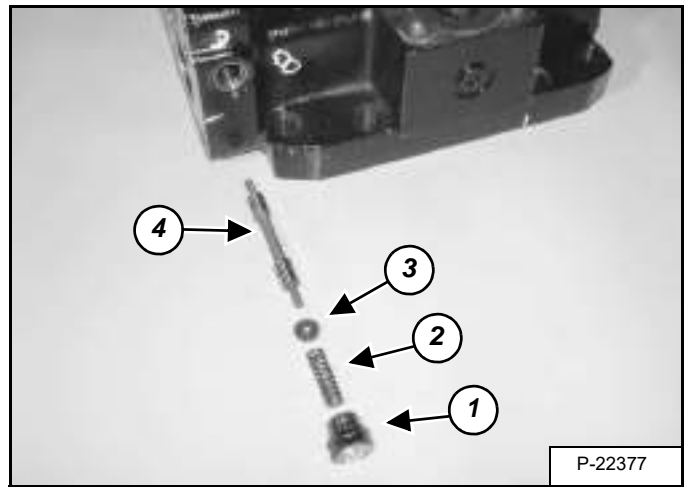
Remove the seal (Item 1) [Figure 30-30-22] from the piston.

Figure 30-30-23



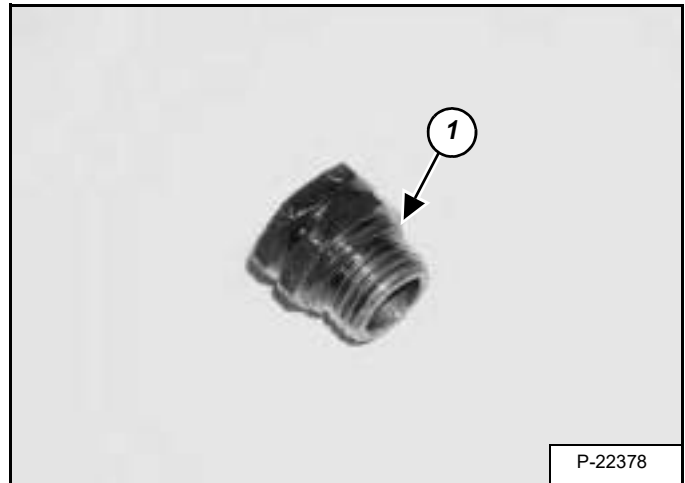
Loosen the plug (Item 1) [Figure 30-30-23].

Figure 30-30-24



Remove the plug (Item 1), spring (Item 2), spring seat (Item 3) and spool (Item 4) [Figure 30-30-24] from the housing.

Figure 30-30-25



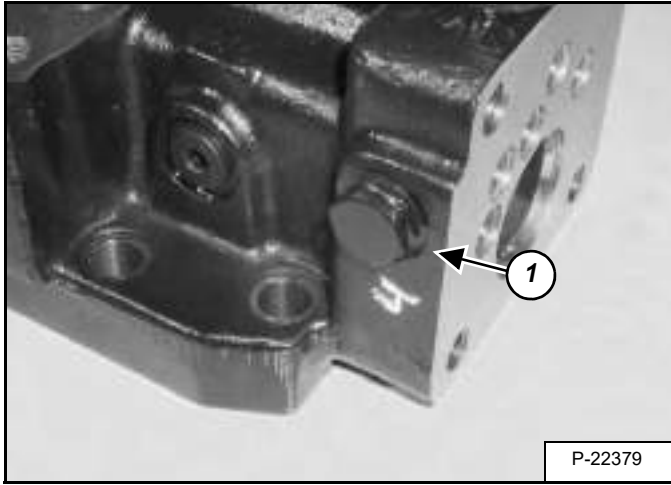
Remove and discard the O-ring (Item 1) [Figure 30-30-25] from the plug.

Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR (CONT'D)

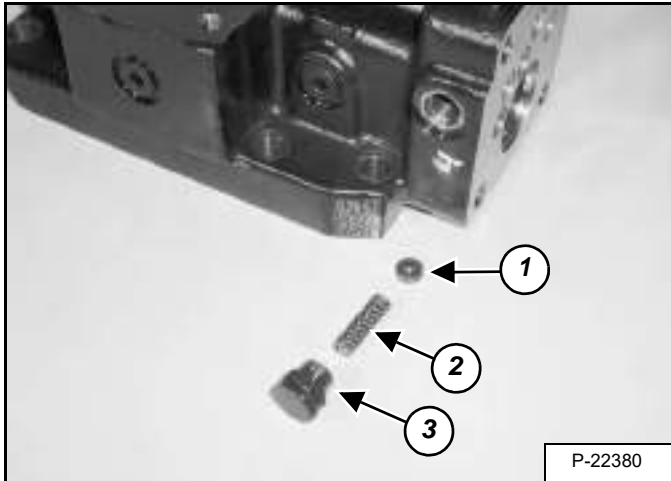
Disassembly (Cont'd)

Figure 30-30-26



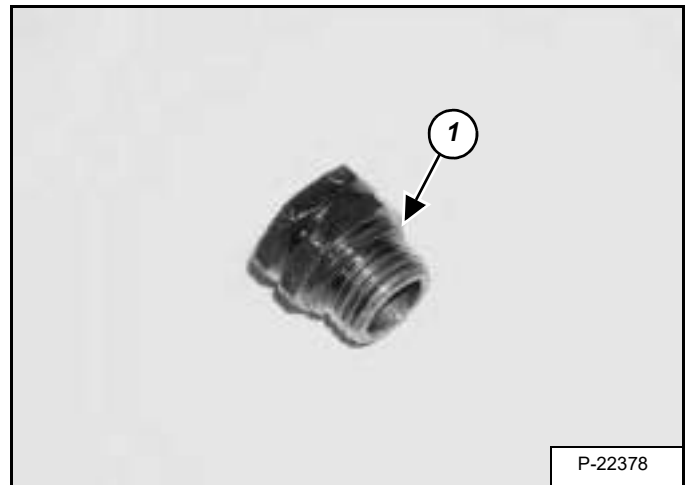
Loosen the plug (Item 1) [Figure 30-30-26].

Figure 30-30-27



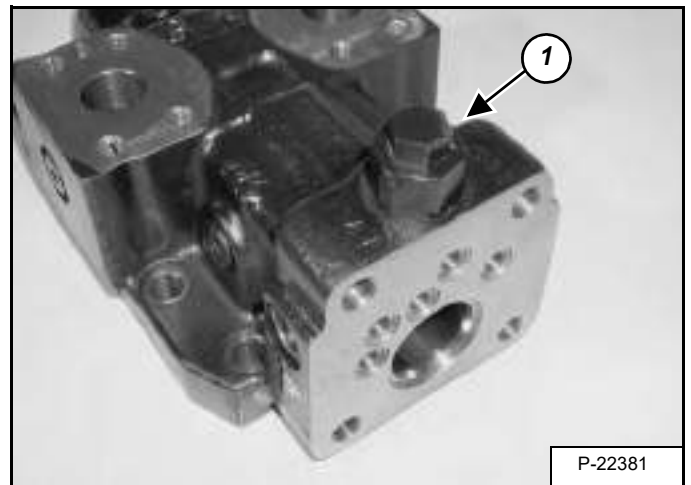
Remove the plug (Item 1), spring (Item 2) and spring seat (Item 3) [Figure 30-30-27] from the housing.

Figure 30-30-28



Remove and discard the O-ring (Item 1) [Figure 30-30-28] from the plug.

Figure 30-30-29



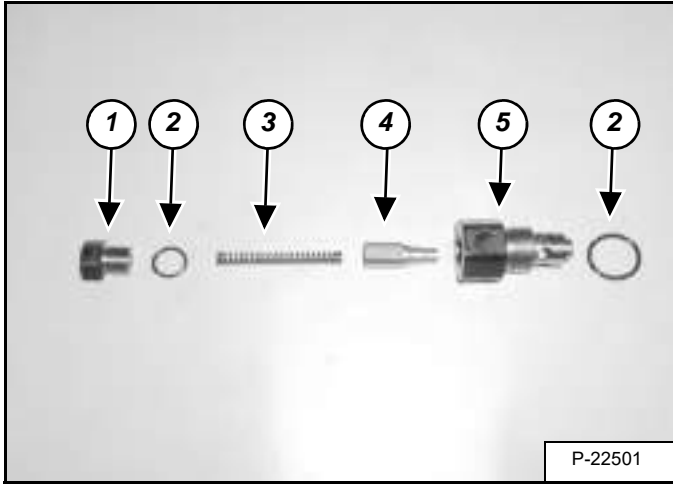
Loosen and remove the relief valve (Item 1) [Figure 30-30-29] from the housing.

Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR (CONT'D)

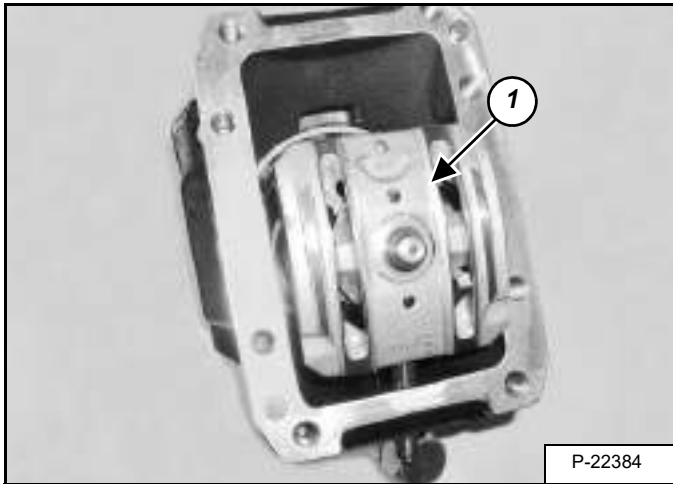
Disassembly (Cont'd)

Figure 30-30-30



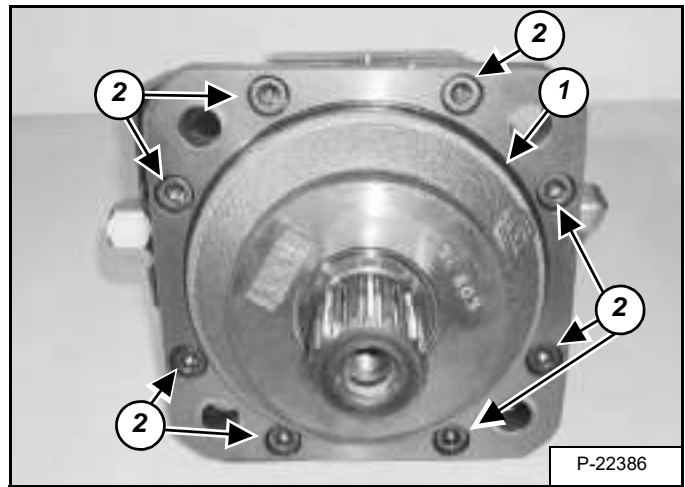
Remove the plug (Item 1), O-rings (Item 2), spring (Item 3) and poppet (Item 4) from the relief valve housing (Item 5) [Figure 30-30-30].

Figure 30-30-31



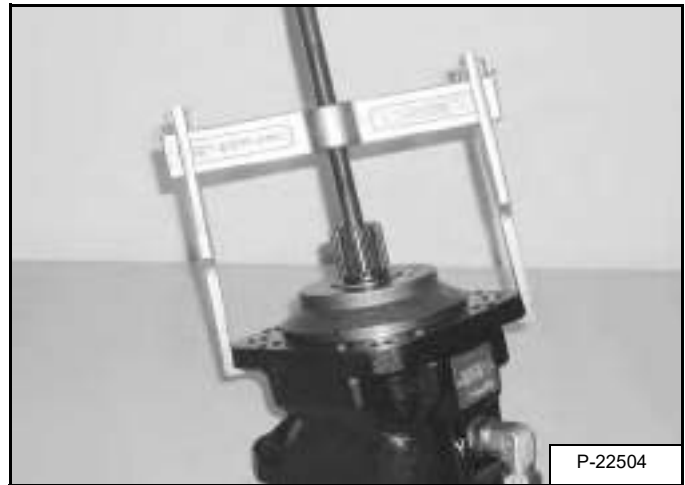
Remove the valve segment (Item 1) [Figure 30-30-31] from the cylinder.

Figure 30-30-32



Remove and discard the O-ring (Item 1). Remove eight mounting bolts (Item 2) [Figure 30-30-32] from the mounting plate.

Figure 30-30-33

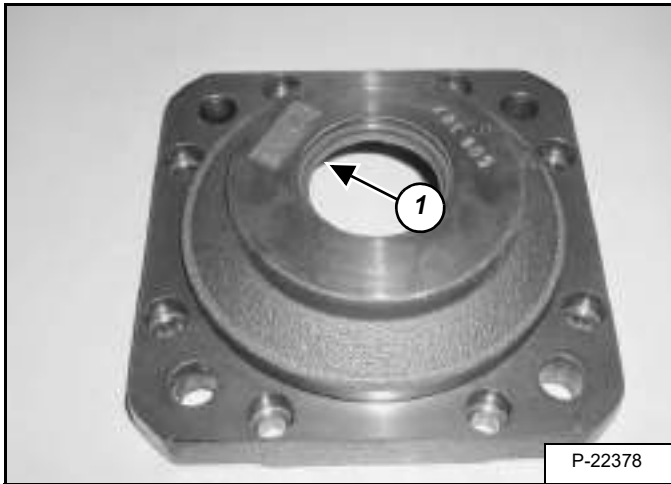


Remove the mounting plate (Item 1) [Figure 30-30-33] using a suitable puller.

HYDROSTATIC DRIVE MOTOR (CONT'D)

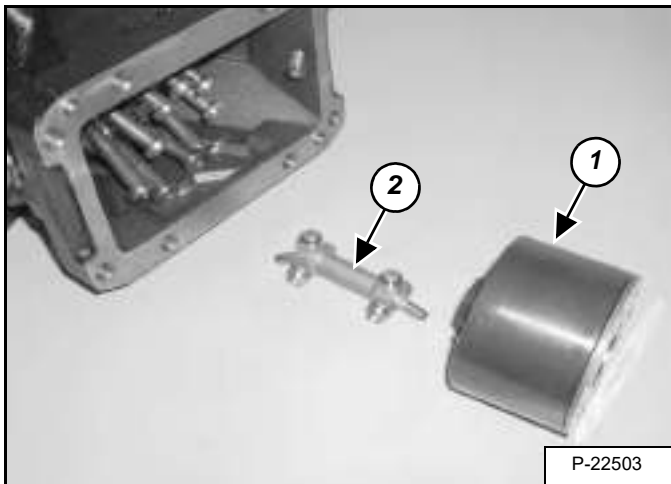
Disassembly (Cont'd)

Figure 30-30-34



Remove and discard the seal (Item 1) [Figure 30-30-34] from the mounting plate.

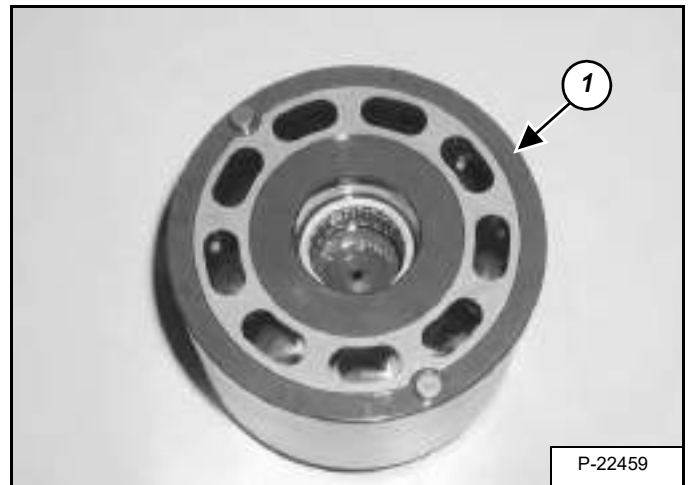
Figure 30-30-35



Remove the cylinder block (Item 1) and synchronizing shaft assembly (Item 2) [Figure 30-30-35] from the housing.

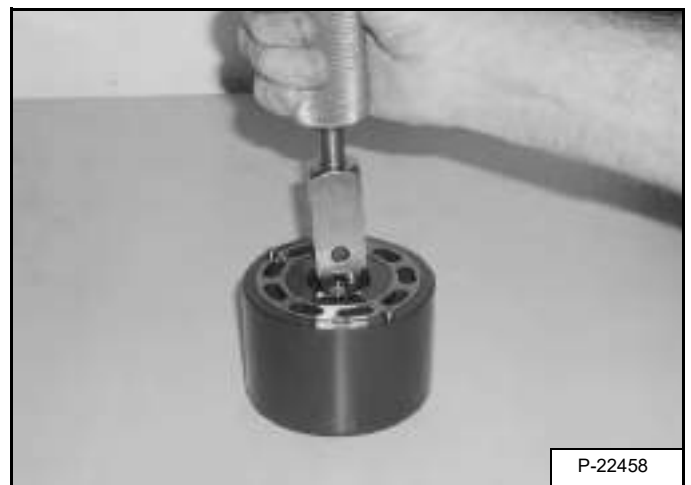
NOTE: It is not important that the pistons are installed in their original position.

Figure 30-30-36



Remove the bearing plate (Item 1) [Figure 30-30-36] from the cylinder block.

Figure 30-30-37



Remove the bearing from the cylinder block [Figure 30-30-37].

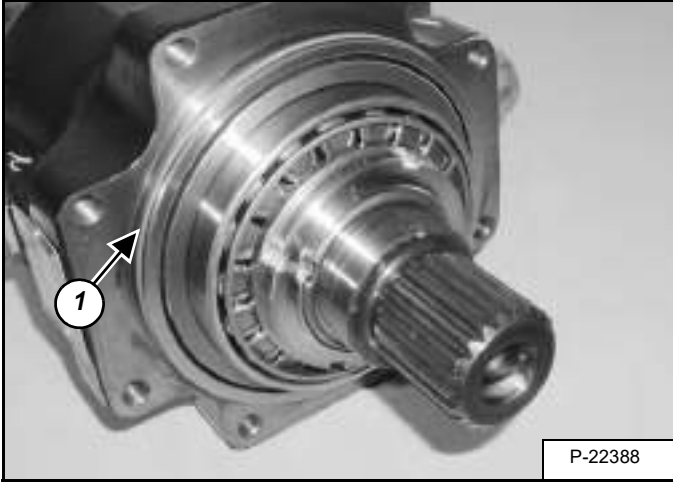
DO NOT damage the bearing plate surface of the cylinder block.

Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR (CONT'D)

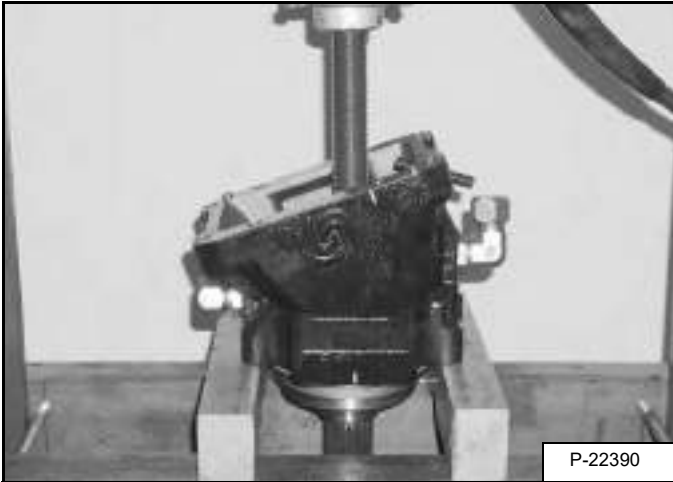
Disassembly (Cont'd)

Figure 30-30-38



Remove the O-ring (Item 1) [Figure 30-30-38] from the housing.

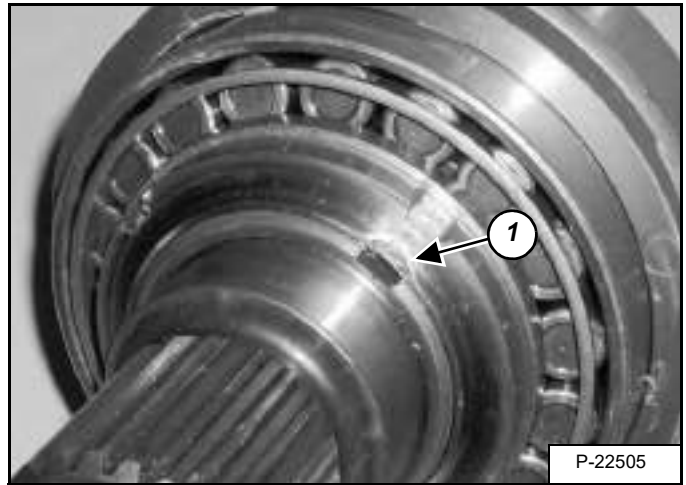
Figure 30-30-39



Press the piston/shaft assembly from the housing [Figure 30-30-39].

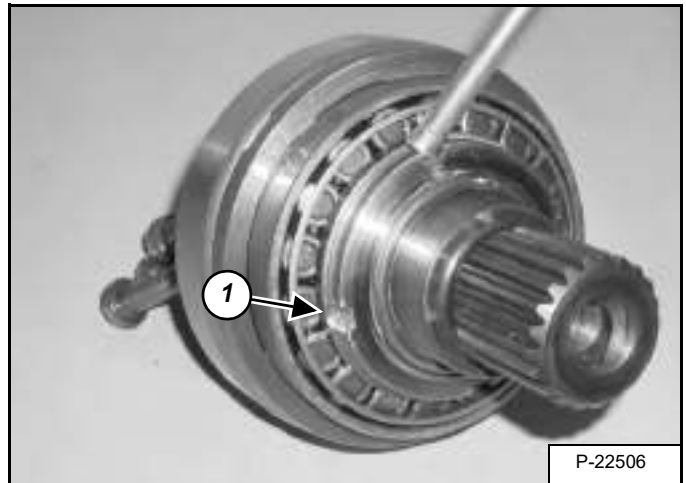
DO NOT damage the pistons.

Figure 30-30-40



Pry up the peened notch (Item 1) [Figure 30-30-40] in the ring nut.

Figure 30-30-41

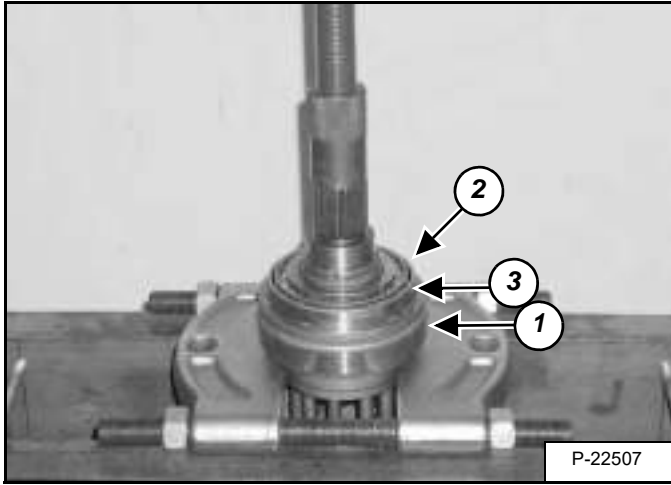


Remove the ring nut (Item 1) [Figure 30-30-41] from the shaft.

HYDROSTATIC DRIVE MOTOR (CONT'D)

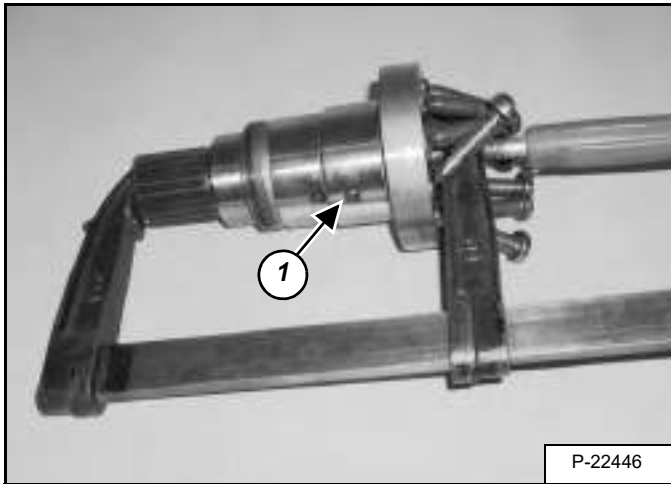
Disassembly (Cont'd)

Figure 30-30-42



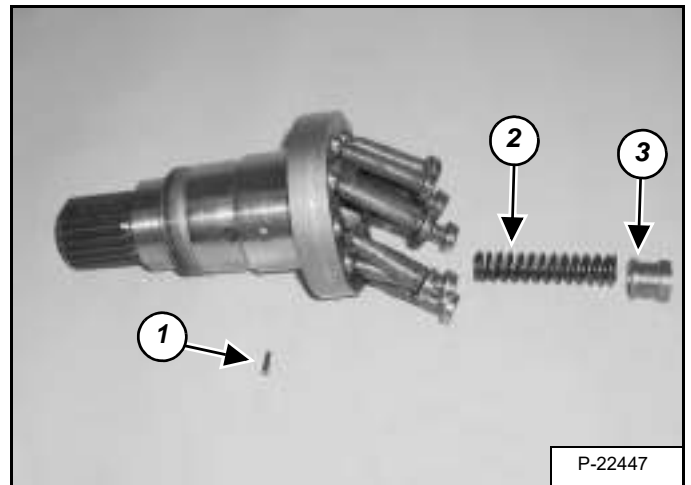
Remove the large bearing and race (Item 1), small bearing and race (Item 2) and spacer (Item 3) [Figure 30-30-42] from the shaft.

Figure 30-30-43



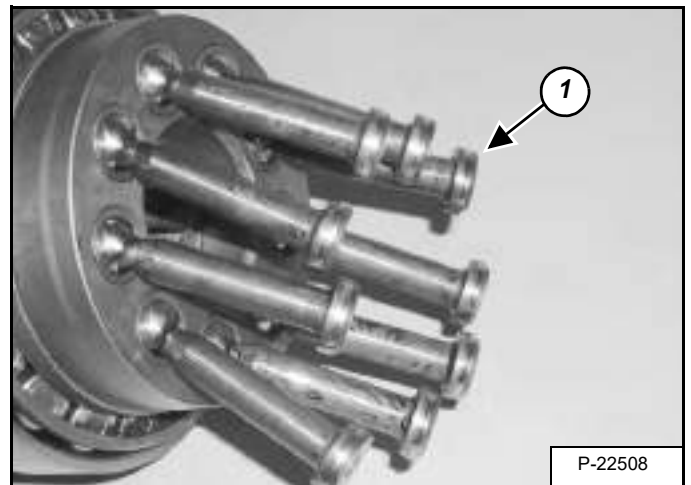
Using a clamp, compress the spring seat and spring, and drive the pin (Item 1) [Figure 30-30-43] inwards. Release the clamp.

Figure 30-30-44



Remove the pin (Item 1), spring (Item 2) and spring seat (Item 3) [Figure 30-30-44] from the shaft assembly.

Figure 30-30-45



Remove the piston rings (Item 1) [Figure 30-30-45] from the pistons.

NOTE: If any portion of the shaft assembly, bearings or races must be replaced, the complete shaft/bearing assembly must be replaced. The only serviceable part is the piston rings (Item 1) [Figure 30-30-45].

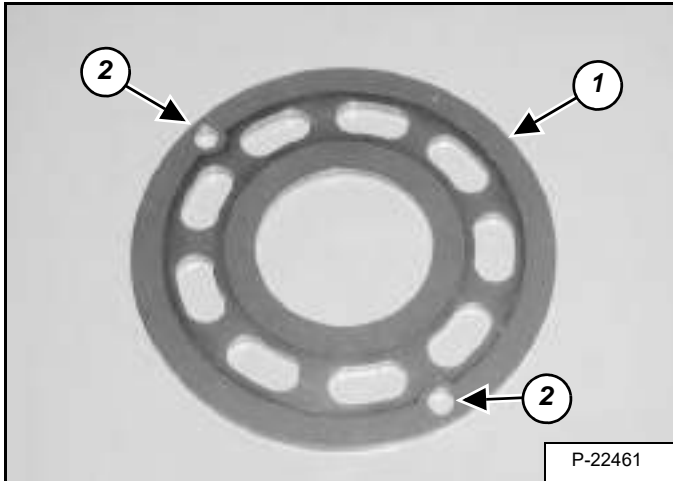
Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR (CONT'D)

Inspection

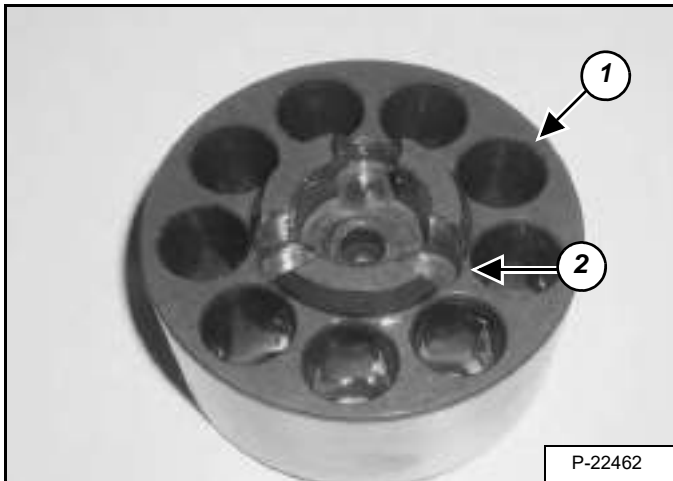
Clean all parts in solvent and use air pressure to dry them. DO NOT use cloth or paper as small pieces of material can get into the system and cause damage.

Figure 30-30-46



Inspect the running (bronze) surface of the bearing plate (Item 1) and locating pin holes (Item 2) [Figure 30-30-46] for wear. Replace if damaged or worn.

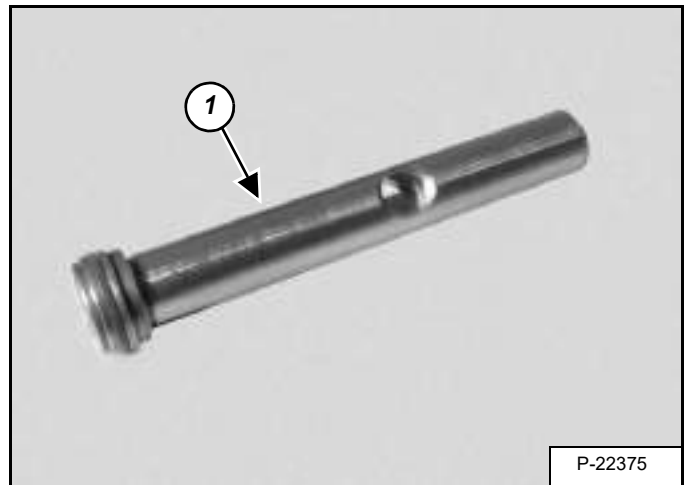
Figure 30-30-47



Inspect the cylinder block assembly for wear or damage. The piston bores (Item 1) must be smooth. The races for the synchronizing shaft rollers (Item 2) [Figure 30-30-47] must not be worn.

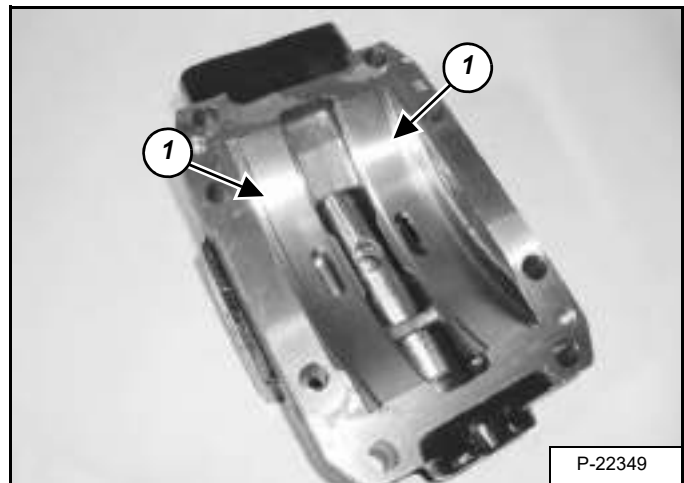
If there is any defect in the cylinder block or pistons, the complete rotating group must be replaced.

Figure 30-30-48



Inspect the piston (Item 1) [Figure 30-30-48] for wear or damage.

Figure 30-30-49

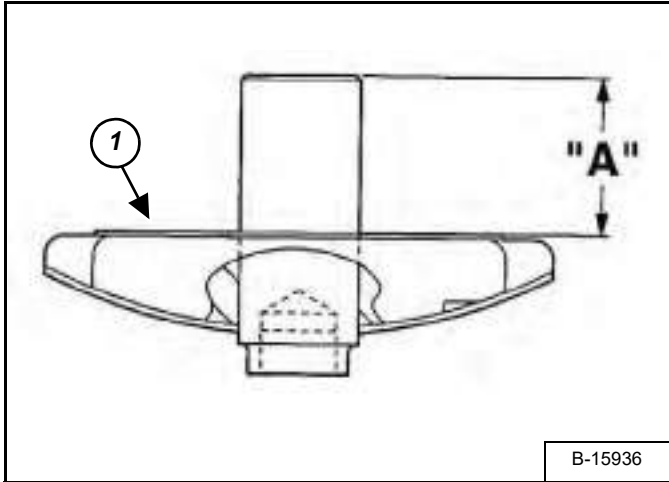


Inspect the wash plate running surface (Item 1) [Figure 30-30-49] in the end cap for wear or damage.

HYDROSTATIC DRIVE MOTOR (CONT'D)

Inspection (Cont'd)

Figure 30-30-50



Inspect the valve segment for damage or wear on the sealing surface (Item 1) **[Figure 30-30-50]**.

Check that the spindle is located correctly in the valve segment by measuring distance "A" **[Figure 30-30-50]**. If this dimension is not within 34,5 to 34,7 mm (1.36 to 1.37 in) the assembly must be replaced.

HYDROSTATIC DRIVE MOTOR (CONT'D)

Assembly

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

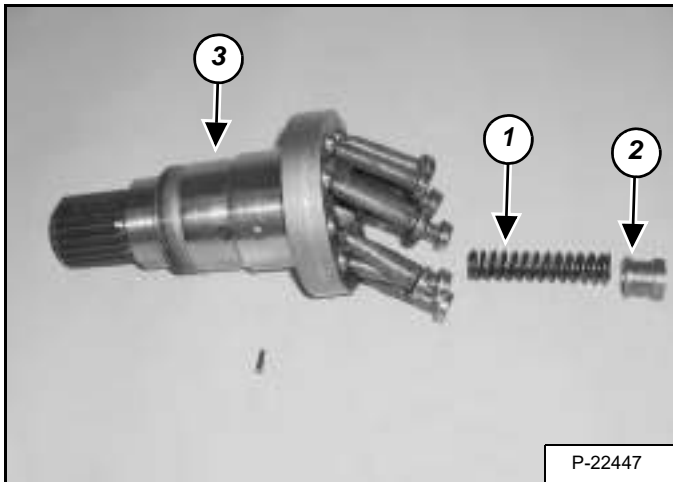
I-2003-0888

Clean all parts in solvent and dry with compressed air.

Inspect all parts for wear or damage. Replace any worn or damaged parts.

Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 30-30-51



P-22447

Install the spring (Item 1) and spring seat (Item 2) into the shaft assembly (Item 3) [Figure 30-30-51].

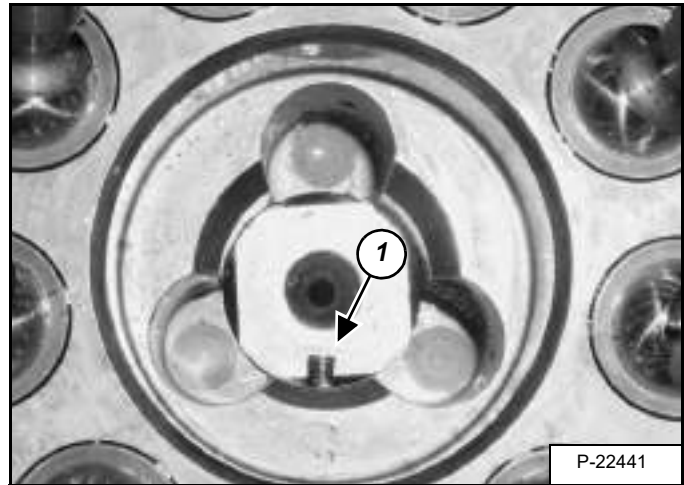
Figure 30-30-52



P-22446

Using a clamp, compress the spring and spring seat [Figure 30-30-52].

Figure 30-30-53



P-22441

Install the pin (Item 1) [Figure 30-30-53] as shown.

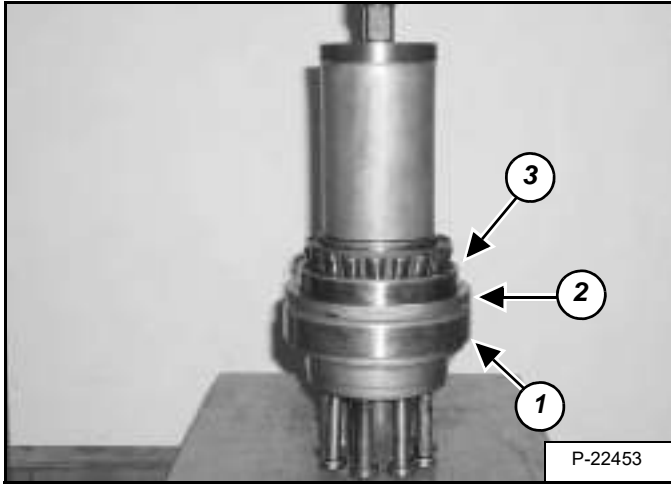
NOTE: Clamp is removed for photo clarity.

Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR (CONT'D)

Assembly (Cont'd)

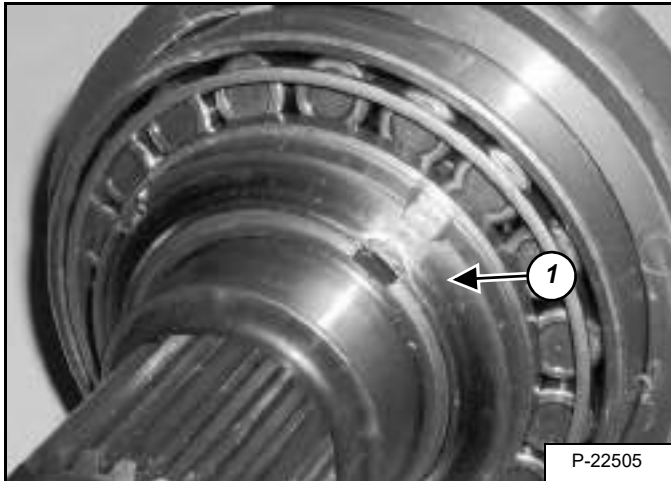
Figure 30-30-54



Support the shaft assembly in a press without causing damage to the pistons, install the large bearing and race (Item 1), spacer (Item 2) and small bearing and race (Item 3) [Figure 30-30-54] into the shaft assembly.

NOTE: Be sure not to over press the bearings, they should be able to roll freely.

Figure 30-30-55



Install the ring nut (Item 1) [Figure 30-30-55] onto the shaft.

NOTE: Do not over tighten the ring nut and that there is no noticeable looseness in the bearing.

Figure 30-30-56



Using a punch seat the ring nut into the groove in the shaft. [Figure 30-30-56].

Figure 30-30-57



Press the piston/shaft assembly into the housing [Figure 30-30-57].

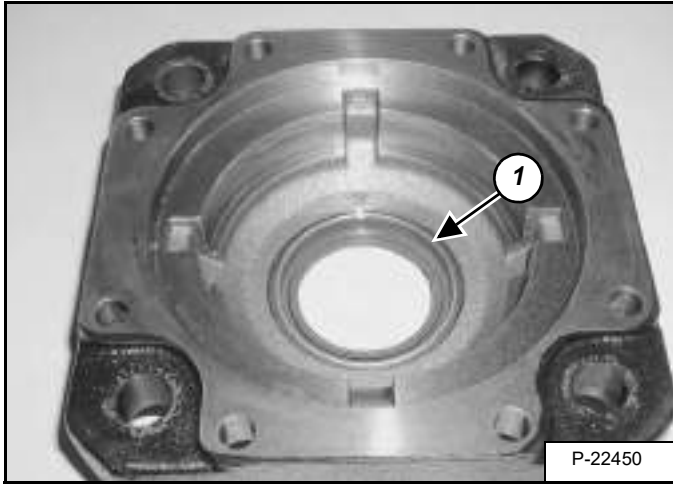
DO NOT DAMAGE THE PISTONS.

Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR (CONT'D)

Assembly (Cont'd)

Figure 30-30-58



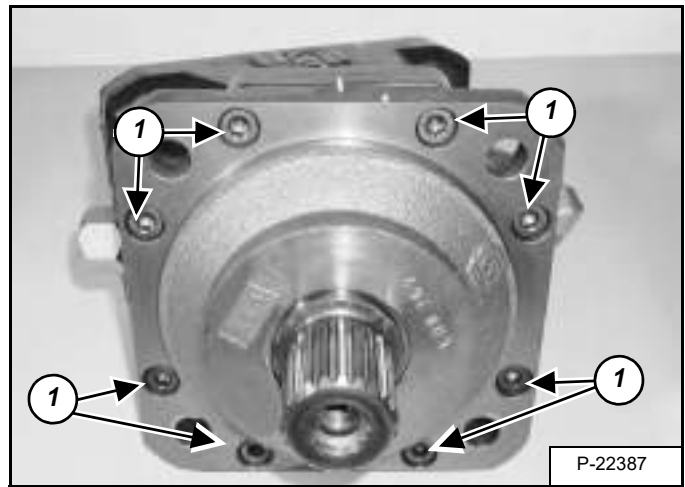
Install a new seal (Item 1) [Figure 30-30-58] into the mounting plate until it is fully seated.

Figure 30-30-59



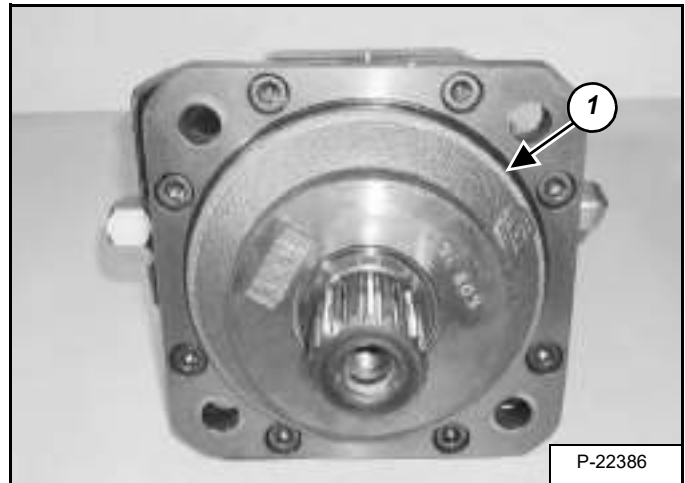
Install a new O-ring (Item 1) [Figure 30-30-59] onto the housing.

Figure 30-30-60



Install the mounting plate onto the housing, install the eight mounting bolts (Item 1) [Figure 30-30-60] and tighten to 63 N•m (46 ft-lb) torque.

Figure 30-30-61



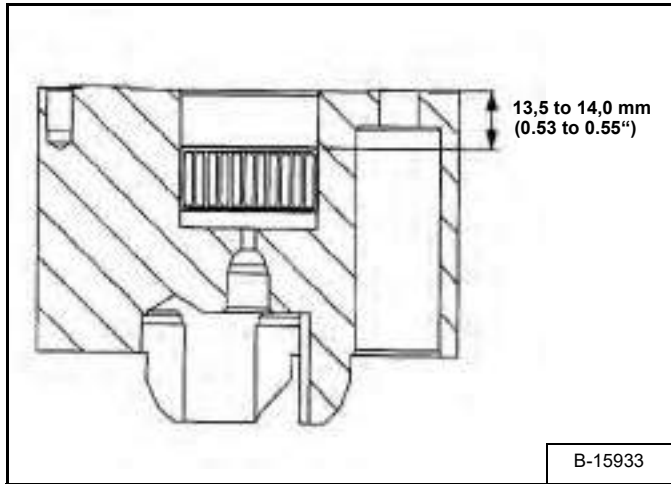
Install a new O-ring (Item 1) [Figure 30-30-61] onto the mounting plate.

Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR (CONT'D)

Assembly (Cont'd)

Figure 30-30-62



Press a new bearing into the cylinder block until it is located 13.5 to 14.0 mm (0.53 to 0.55 in) below the bearing plate surface [Figure 30-30-62].

Figure 30-30-63

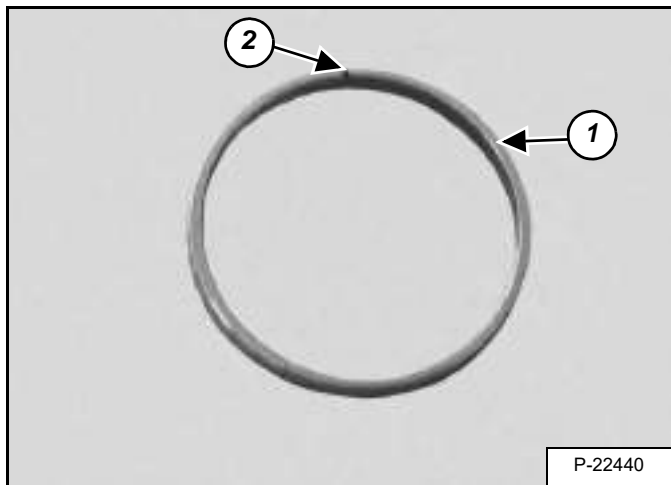
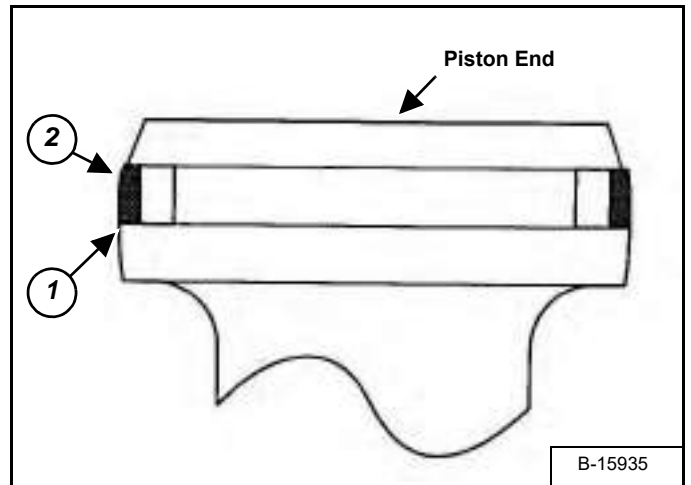


Figure 30-30-64



Install new piston rings (Item 1) [Figure 30-30-63] onto the pistons, make sure the spherical surface (Item 1) [Figure 30-30-64] conforms to the shape of the piston.

An identification mark (Item 2) [Figure 30-30-63] & [Figure 30-30-64] is on the "outer" side of the piston ring.

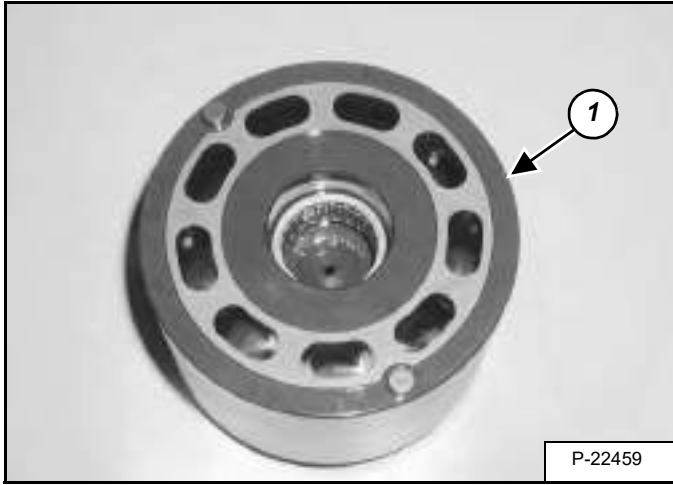
The ends of the piston rings must NOT overlap each other.

Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR (CONT'D)

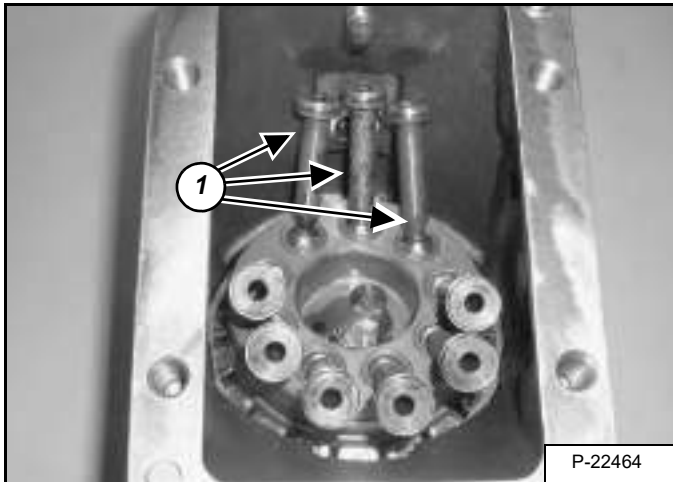
Assembly (Cont'd)

Figure 30-30-65



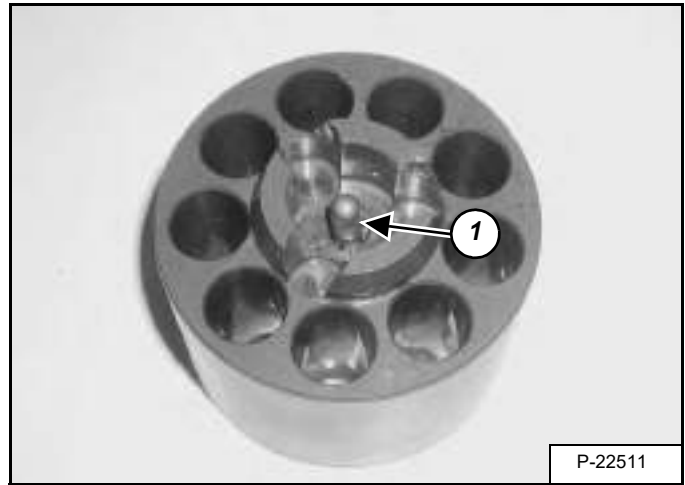
Install the bearing plate (Item 1) [Figure 30-30-65] with the bronze surface facing up onto the cylinder block.

Figure 30-30-66



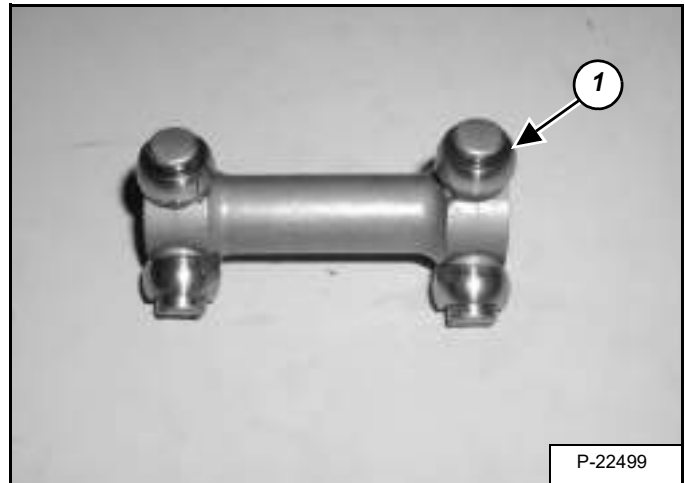
Position the housing on end, tip the three pistons (Item 1) [Figure 30-30-66] closest to the minimum angle stop out toward the housing.

Figure 30-30-67



Install the synchronizing shaft support pin (Item 1) [Figure 30-30-67] into the cylinder block and retain with grease.

Figure 30-30-68

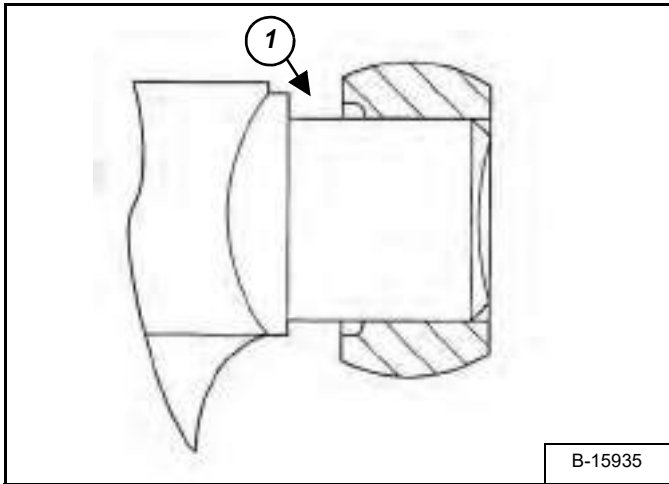


Install the six synchronizing shaft rollers (Item 1) [Figure 30-30-68] onto the synchronizing shaft and retain with grease.

HYDROSTATIC DRIVE MOTOR (CONT'D)

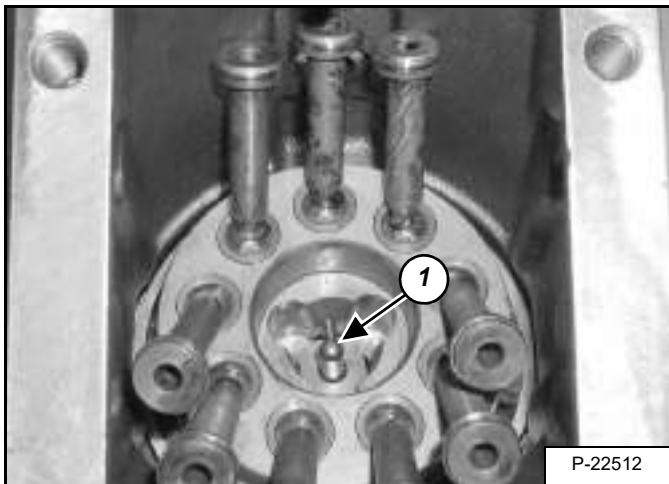
Assembly (Cont'd)

Figure 30-30-69



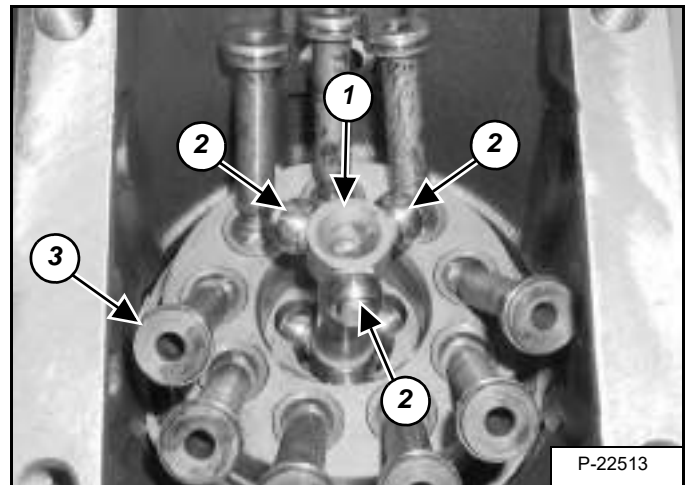
NOTE: The recess (Item 1) [Figure 30-30-69] on each roller **MUST** face the synchronizing shaft.

Figure 30-30-70



Install the synchronizing shaft support pin (Item 1) [Figure 30-30-70] into the motor shaft assembly and retain with grease.

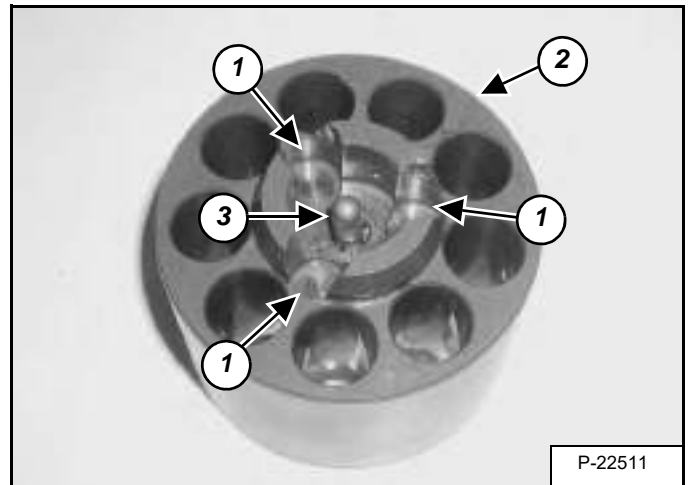
Figure 30-30-71



Install the synchronizing shaft and rollers (Item 1) [Figure 30-30-71] into the motor shaft races. When properly installed the synchronizing shaft should move freely in all directions.

NOTE: The motor shaft end of the synchronizing shaft is smaller than the cylinder end.

Figure 30-30-72



When installing the cylinder block, the races (Item 1) [Figure 30-30-72] in the cylinder block must be positioned so the synchronizing shaft rollers (Item 2) [Figure 30-30-72] and pistons (Item 3) [Figure 30-30-71] and their bores (Item 2) [Figure 30-30-72] are aligned.

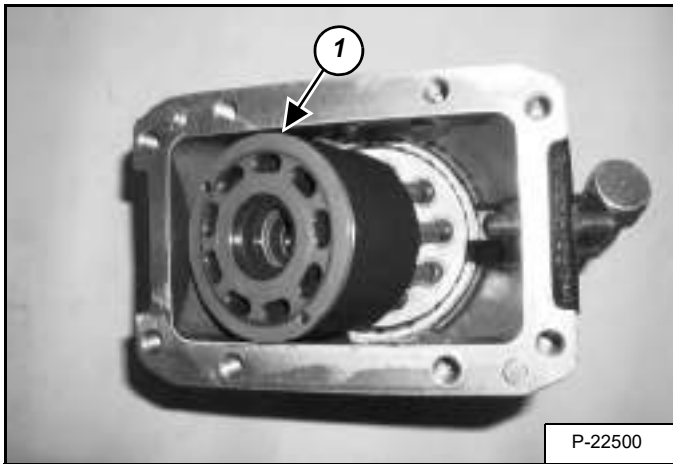
Install the six pistons (Item 3) [Figure 30-30-71] into the cylinder bores, tilt the block so the synchronizing shaft rollers enter their races in the block and the support pin (Item 3) [Figure 30-30-72] enter the recess.

Lift the cylinder block slightly and guide the three remaining pistons in position.

HYDROSTATIC DRIVE MOTOR (CONT'D)

Assembly (Cont'd)

Figure 30-30-73

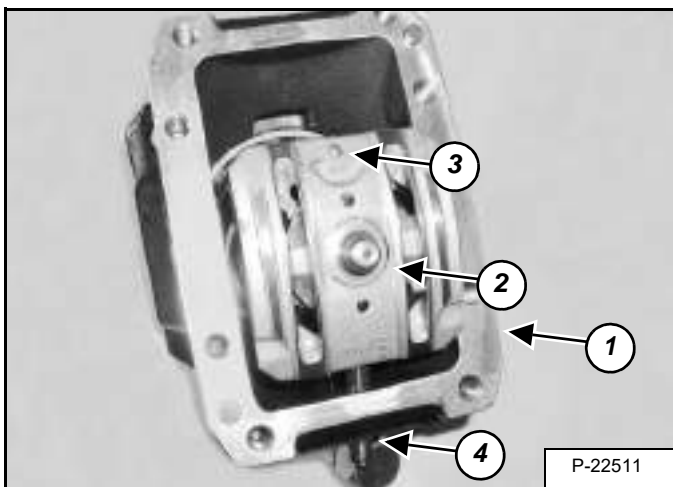


If the cylinder block (Item 1) [Figure 30-30-73] is properly installed, there should be very little rotational free-play between the block and the motor shaft.

NOTE: A brass rod may be used to guide the pistons into their bores.

Lubricate the pistons and cylinder block bores with hydraulic fluid.

Figure 30-30-74

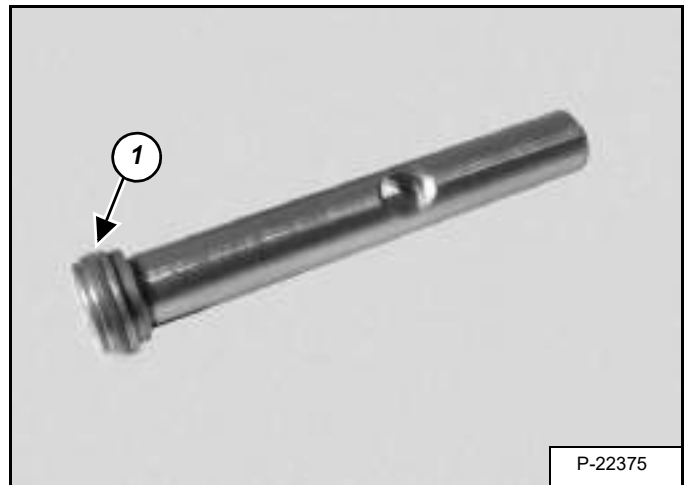


Install a new gasket (Item 1) [Figure 30-30-74] onto the housing.

Install the valve segment (Item 2) [Figure 30-30-74] onto the cylinder block and retain with heavy grease.

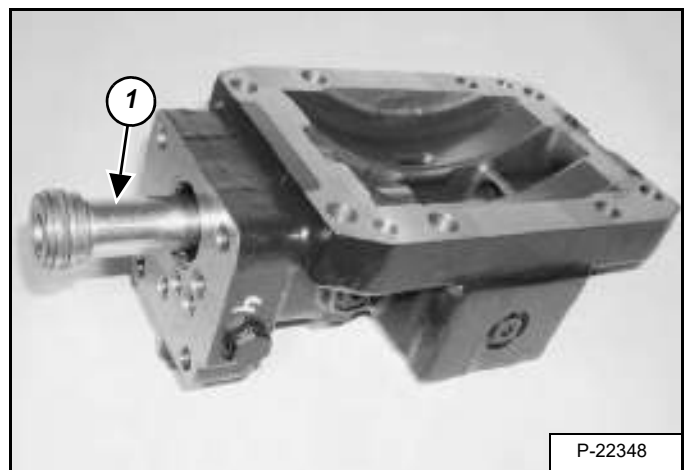
NOTE: The hole (Item 3) in the valve segment should be opposite the minimum displacement adjustment screw (Item 4) [Figure 30-30-74].

Figure 30-30-75



Install a new seal (Item 1) [Figure 30-30-75] onto the piston.

Figure 30-30-76



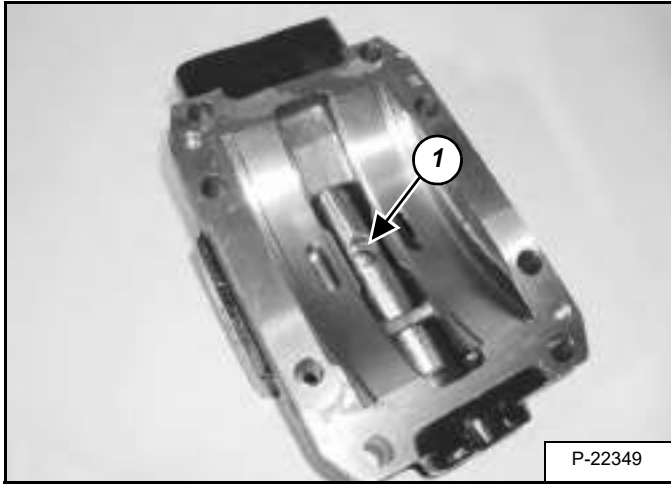
Lubricate and install the piston (Item 1) [Figure 30-30-76] into the end cap.

Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR (CONT'D)

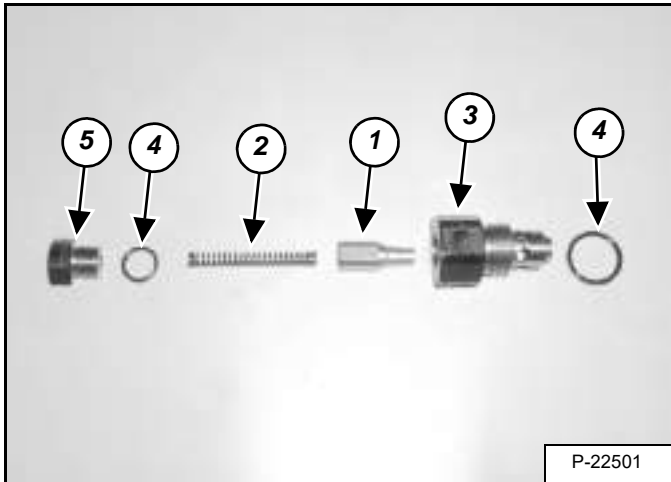
Assembly (Cont'd)

Figure 30-30-77



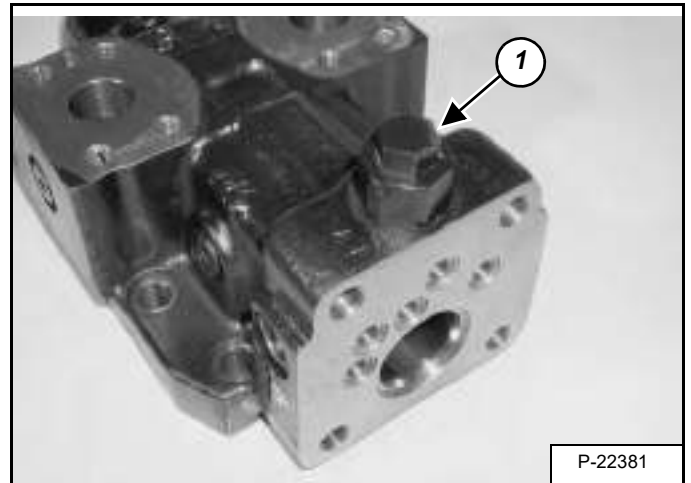
NOTE: Note the position of the hole (Item 1) [Figure 30-30-77] in the end cap.

Figure 30-30-78



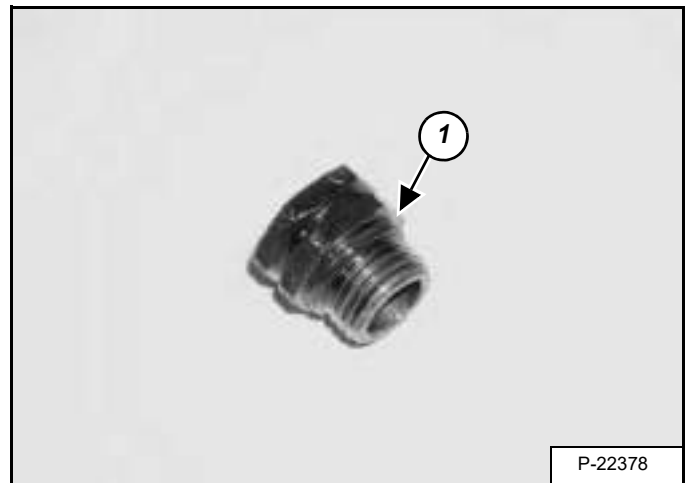
Assemble the poppet (Item 1) and spring (Item 2) into the relief valve housing (Item 3) install O-rings (Item 4) and plug (Item 5) [Figure 30-30-78].

Figure 30-30-79



Install the relief valve (Item 1) [Figure 30-30-79] into the housing and tighten to 52 N•m (38 ft-lb) torque.

Figure 30-30-80



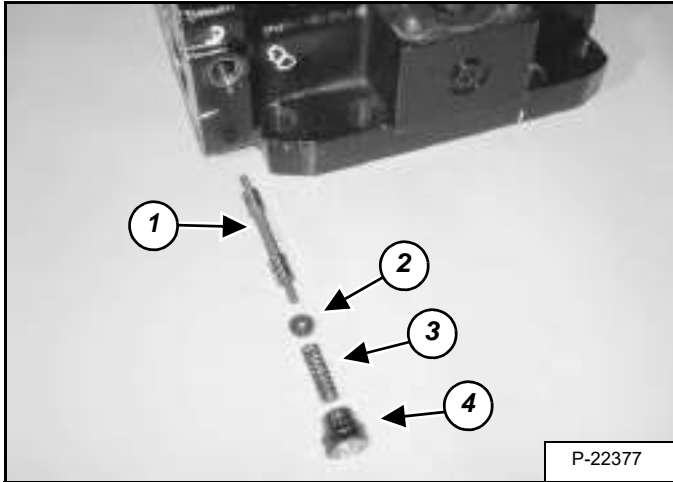
Install a new O-ring (Item 1) [Figure 30-30-80] onto the plug.

Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR (CONT'D)

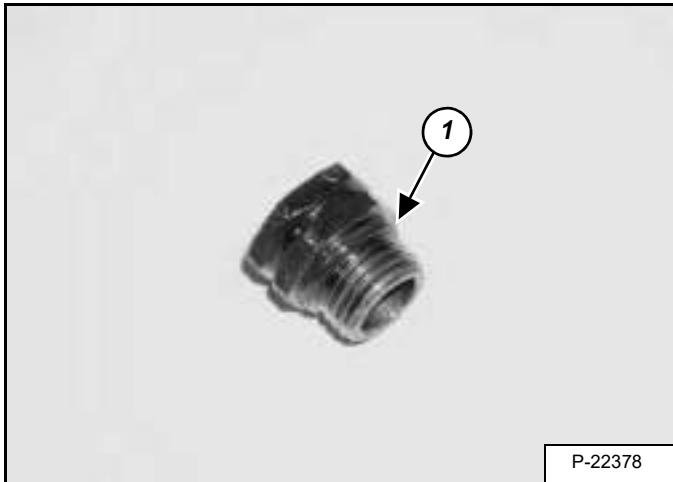
Assembly (Cont'd)

Figure 30-30-81



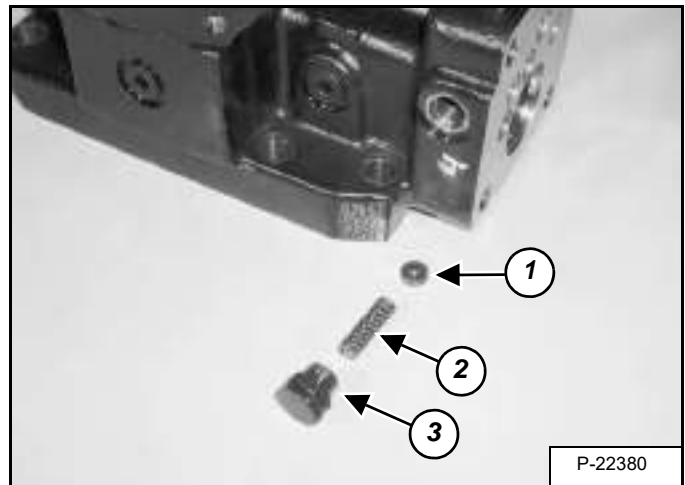
Install the spool (Item 1), spring seat (Item 2), spring (Item 3) and plug (Item 4) **[Figure 30-30-81]** into the housing and tighten to 41 N•m (30 ft-lb) torque.

Figure 30-30-82



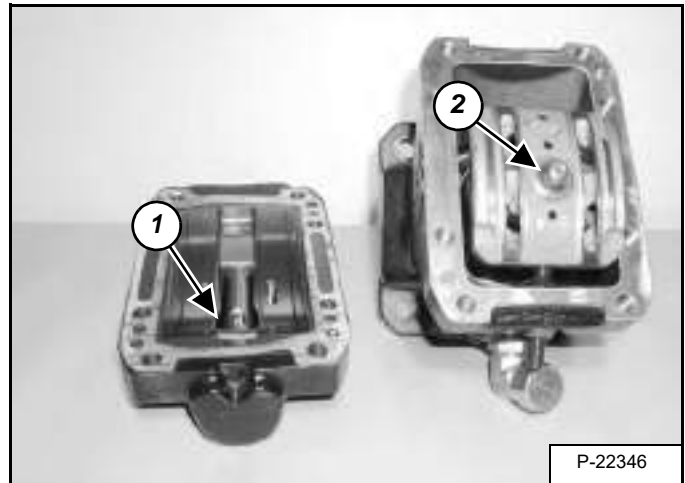
Install a new O-ring (Item 1) **[Figure 30-30-82]** onto the plug.

Figure 30-30-83



Install the spring seat (Item 1), spring (Item 2) and plug (Item 3) **[Figure 30-30-83]** into the housing and tighten to 41 N•m (30 ft-lb) torque.

Figure 30-30-84

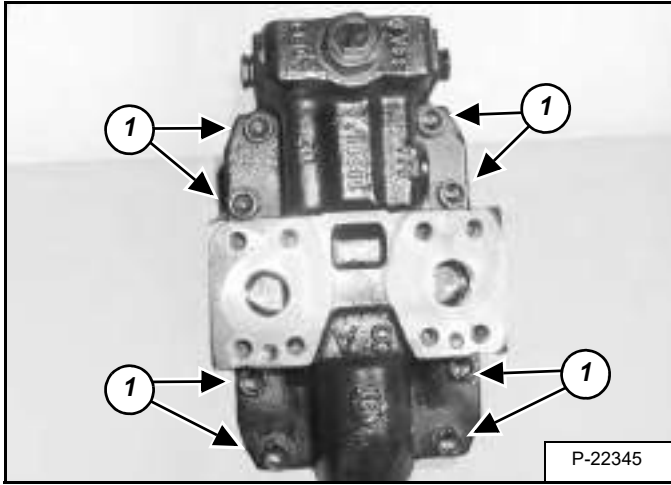


Align the hole in the piston (Item 1) and the valve segment (Item 2) **[Figure 30-30-84]**.

HYDROSTATIC DRIVE MOTOR (CONT'D)

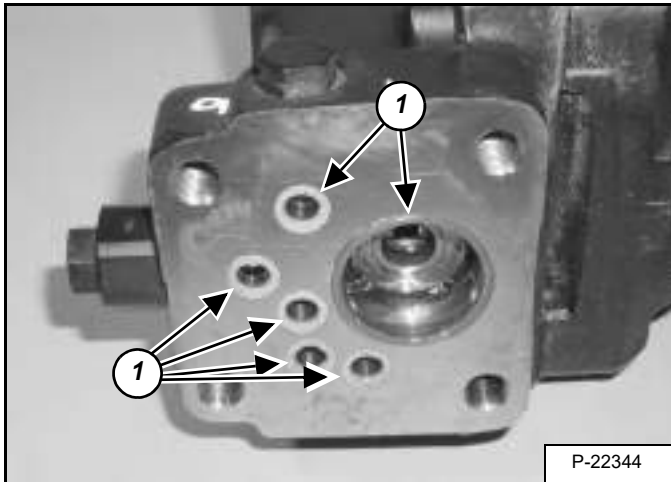
Assembly (Cont'd)

Figure 30-30-85



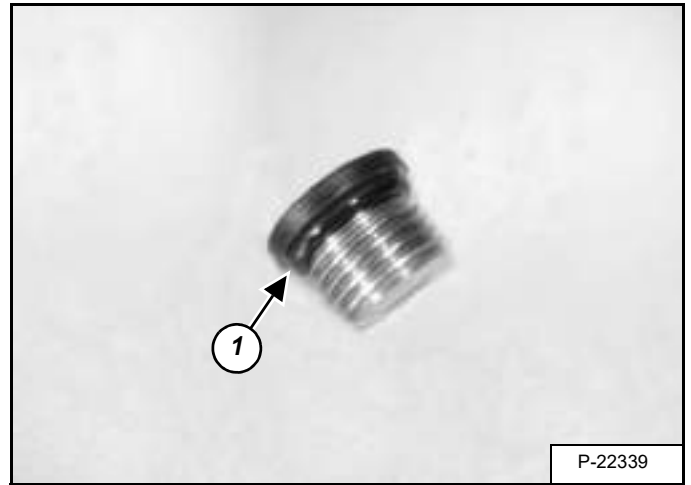
Install the end cap housing and tighten the eight bolts (Item 1) [Figure 30-30-85] to 115 N•m (85 ft-lb) torque.

Figure 30-30-86



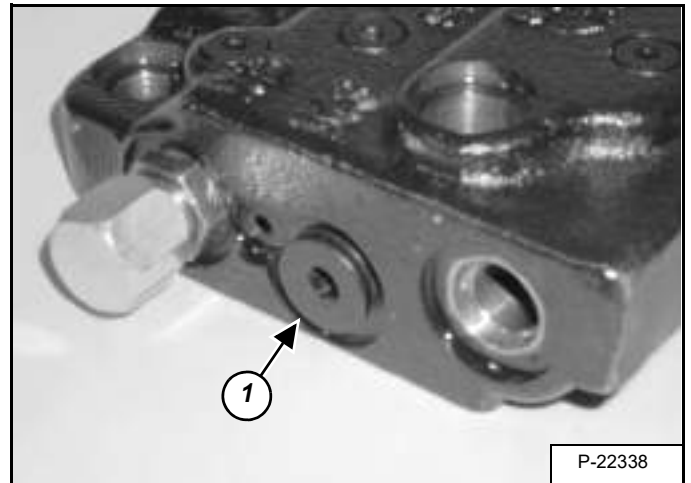
Install six new O-rings (Item 1) [Figure 30-30-86] onto the housing.

Figure 30-30-87



Install a new O-ring (Item 1) [Figure 30-30-87] onto the plug.

Figure 30-30-88



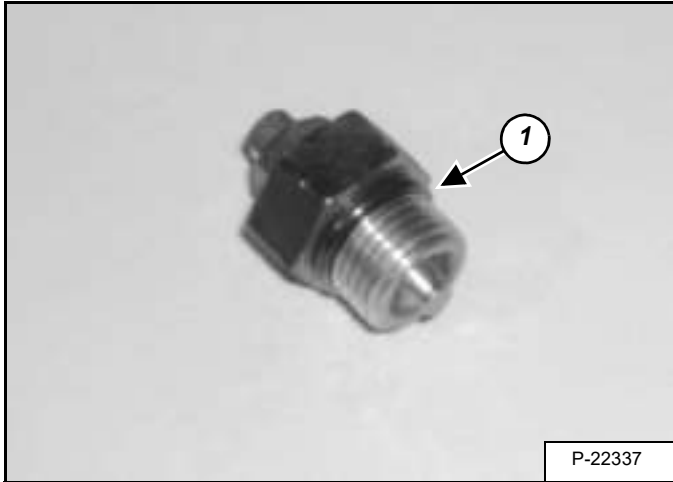
Install the plug (Item 1) [Figure 30-30-88] into the housing.

Dealer Copy -- Not for Resale

HYDROSTATIC DRIVE MOTOR (CONT'D)

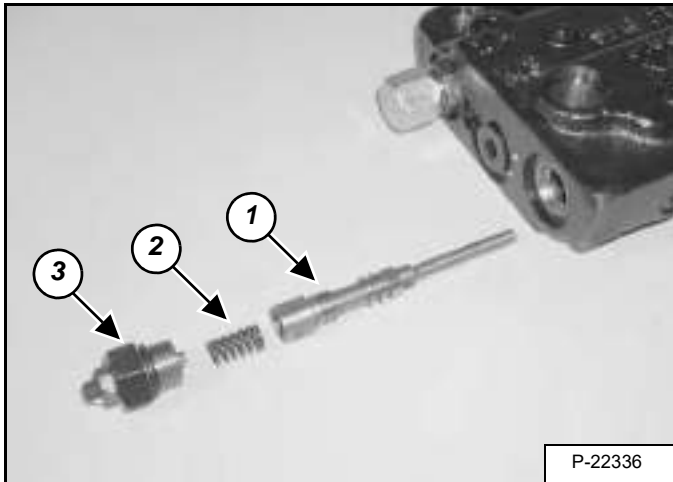
Assembly (Cont'd)

Figure 30-30-89



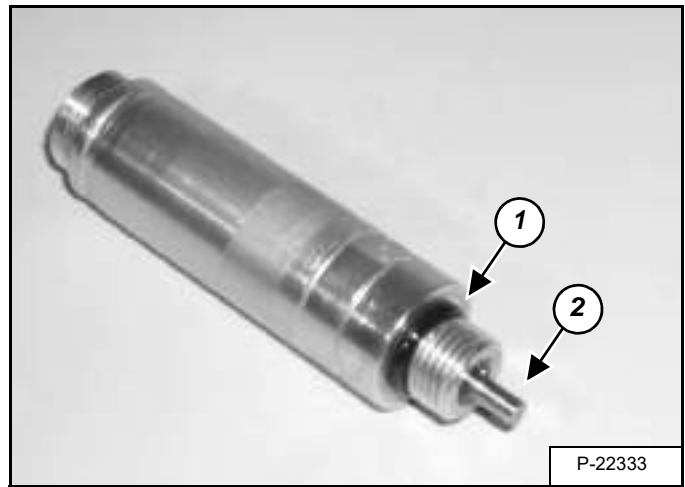
Install a new O-ring (Item 1) [Figure 30-30-89] onto the adjustment screw.

Figure 30-30-90



Install the spool (Item 1), spring (Item 2) and adjusting screw (Item 3) [Figure 30-30-90] into the housing and tighten to 9 N•m (79 in-lb) torque.

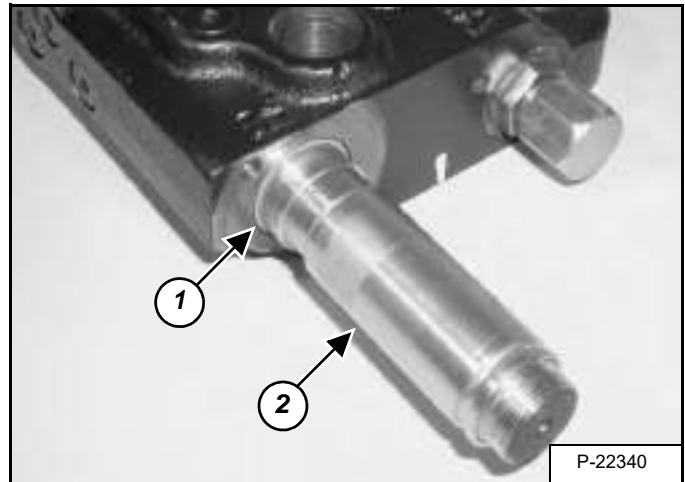
Figure 30-30-91



Install a new O-ring (Item 1) [Figure 30-30-91] onto the solenoid shaft.

Lightly lubricate the pin (Item 2) [Figure 30-30-91] and install into the solenoid shaft.

Figure 30-30-92

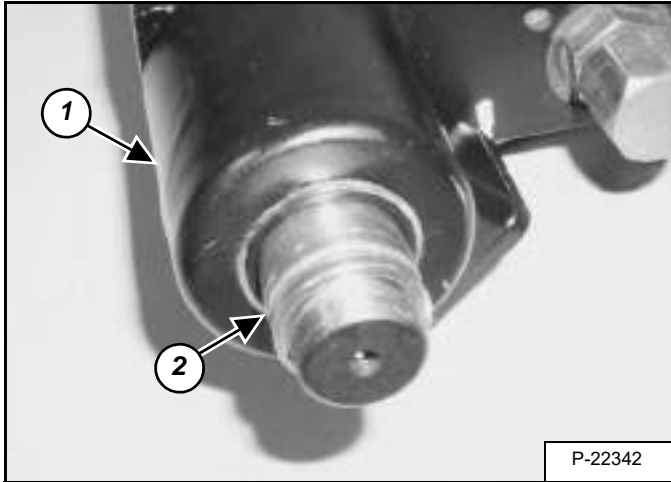


Install a new O-ring (Item 1) and solenoid shaft assembly (Item 2) [Figure 30-30-92] into the housing.

HYDROSTATIC DRIVE MOTOR (CONT'D)

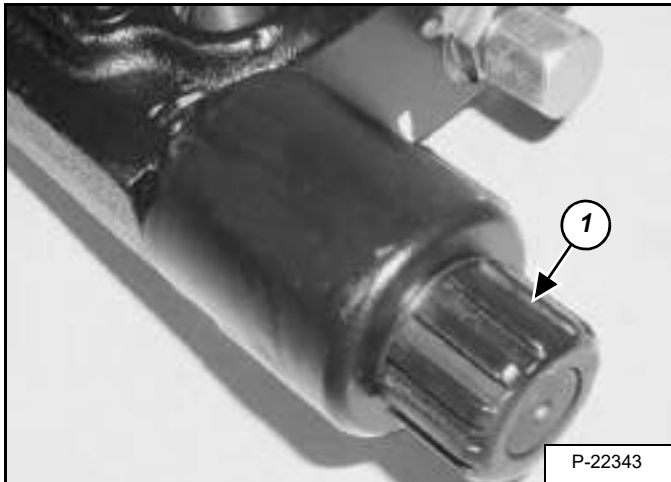
Assembly (Cont'd)

Figure 30-30-93



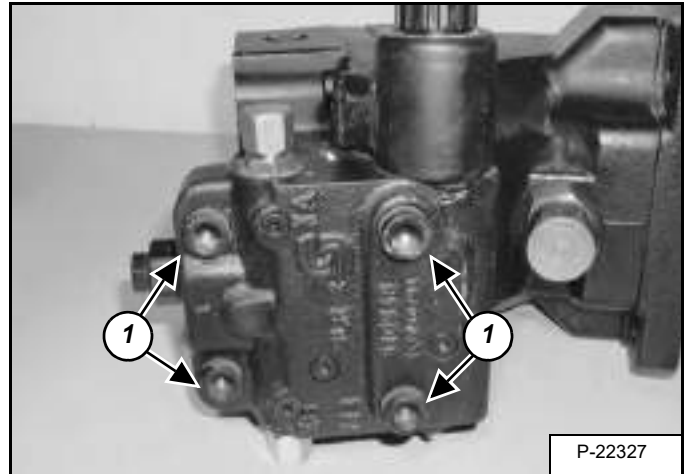
Install the solenoid housing (Item 1) onto the shaft and install a new O-ring (Item 2) **[Figure 30-30-93]**.

Figure 30-30-94



Install the solenoid nut (Item 1) **[Figure 30-30-94]** and hand tighten.

Figure 30-30-95



Install the solenoid housing assembly (Item 1) with four bolts (Item 2) **[Figure 30-30-95]**. Tighten the bolts to 78 N•m (58 ft-lb) torque.



Bobcat®

Dealer Copy -- Not for Resale

HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)

Removal And Installation

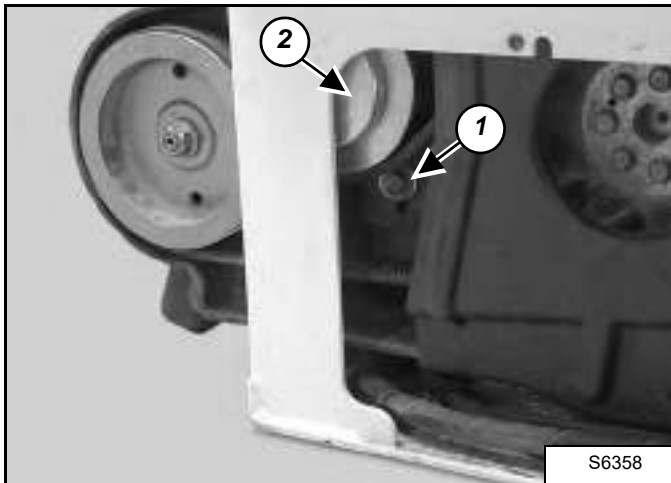
Remove the engine / hydrostat assembly. ((See Removal And Installation on Page 70-30-1.))

Figure 30-40-1



Loosen the bolt and nut (Item 1) [Figure 30-40-1].

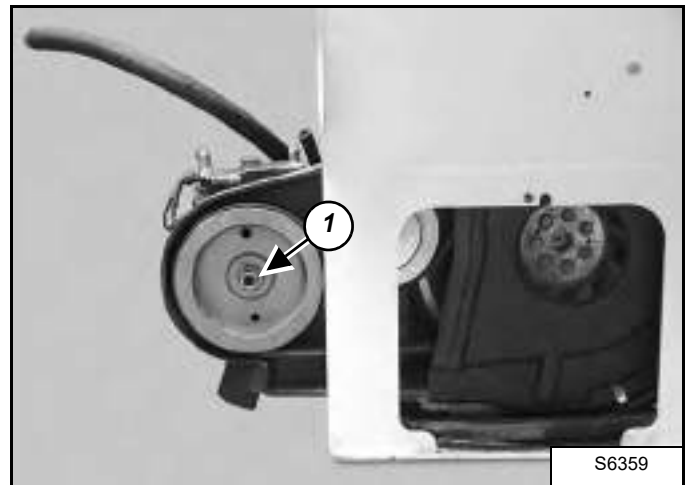
Figure 30-40-2



Loosen the bolt (Item 1) and move the tensioner pulley (Item 2) [Figure 30-40-2] up to loosen tension on the the drive belt.

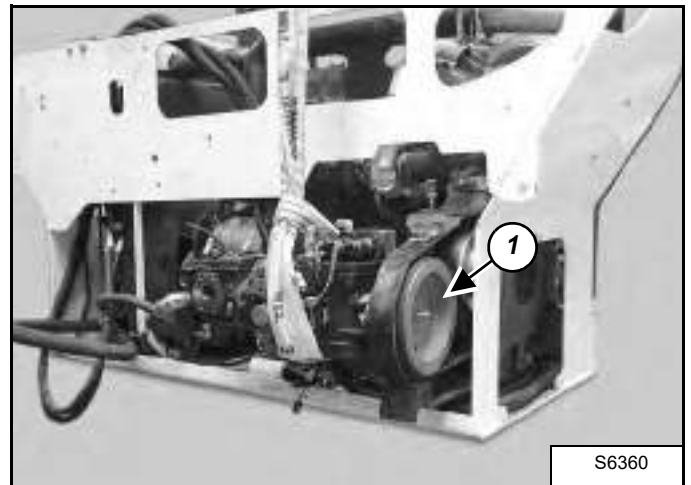
Remove the drive belt.

Figure 30-40-3



Remove the nut (Item 1) [Figure 30-40-3] from the pulley.

Figure 30-40-4



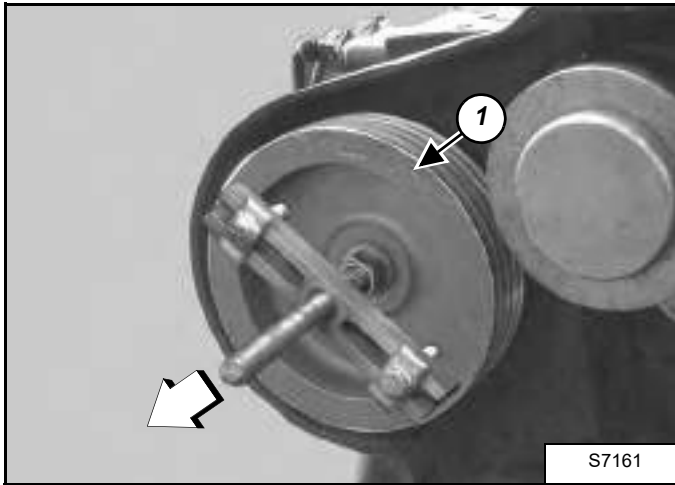
Install a chain hoist and lifting strap to lift and support the pump assembly.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

Removal And Installation (Cont'd)

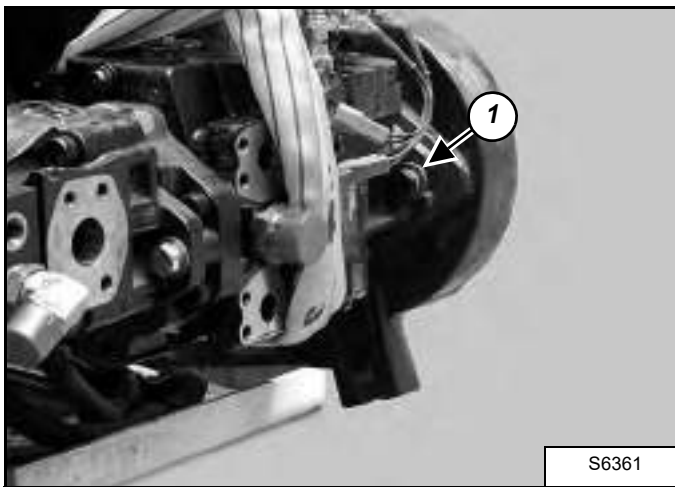
Figure 30-40-5



Remove the pulley (Item 1) [Figure 30-40-5] from the pump assembly.

Installation: Tighten the bolt to 300-330 N•m (220-245 ft-lb) torque.

Figure 30-40-6



Remove the two pump assembly mounting bolts (Item 1) [Figure 30-40-6].

Installation: Tighten the mounting bolts to 94-106 N•m (69-78 ft-lb) torque.

Remove the pump assembly.

Figure 30-40-7

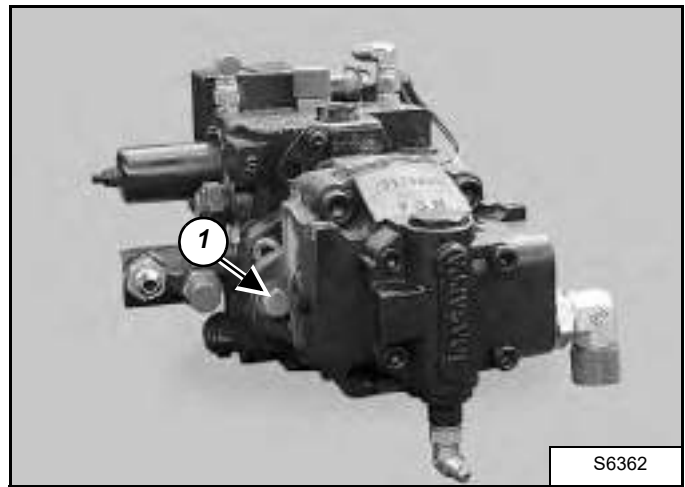
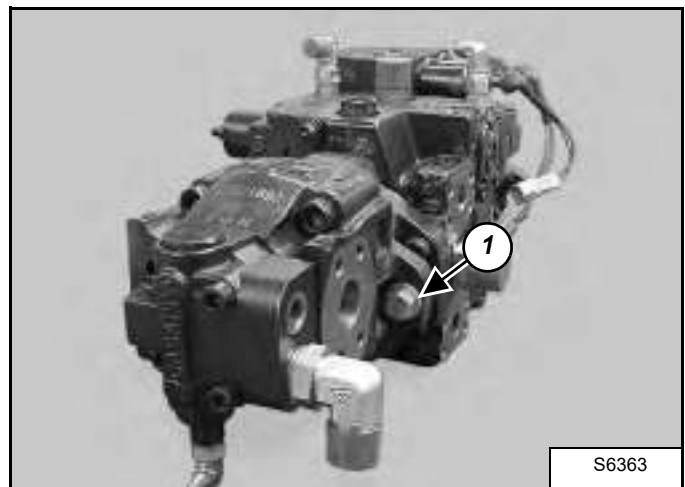


Figure 30-40-8



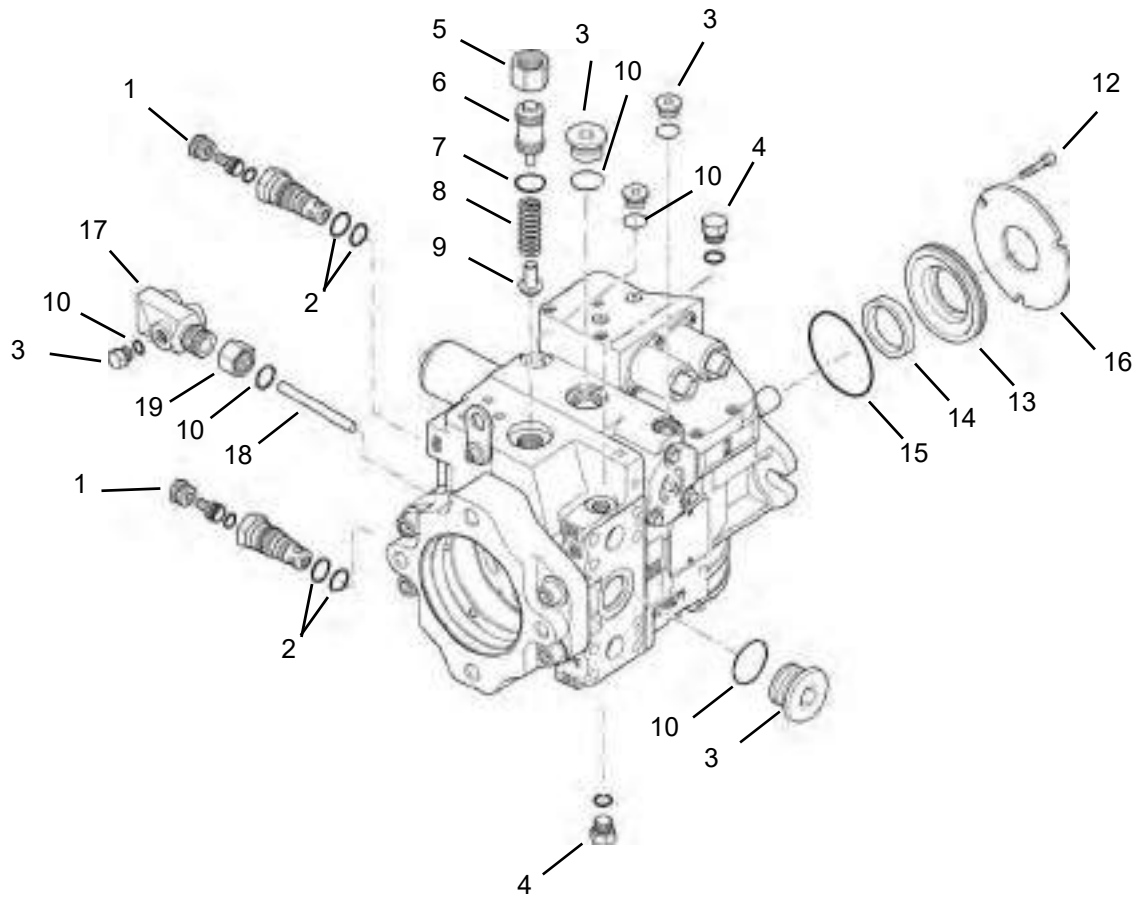
Remove the bolts (Item 1) [Figure 30-40-7] and [Figure 30-40-8] to separate the hydrostatic pump from the hydraulic pump.

Installation: Tighten the bolts to 70,8-80 N•m (52-59 ft-lb) torque.

HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999) (CONT'D)

Parts Identification

- 1. Multi-Function Valve Assembly
- 2. O-Ring
- 3. Plug
- 4. Plug
- 5. Nut
- 6. Charge Relief
- 7. O-Ring
- 8. Spring
- 9. Poppet
- 10. O-Ring
- 11. Control Filter Screen
- 12. Bolt
- 13. Lip Seal
- 14. Cover
- 15. O-Ring
- 16. Retainer Plate
- 17. Manifold (connections to/from filter)
- 18. Tube
- 19. Nut



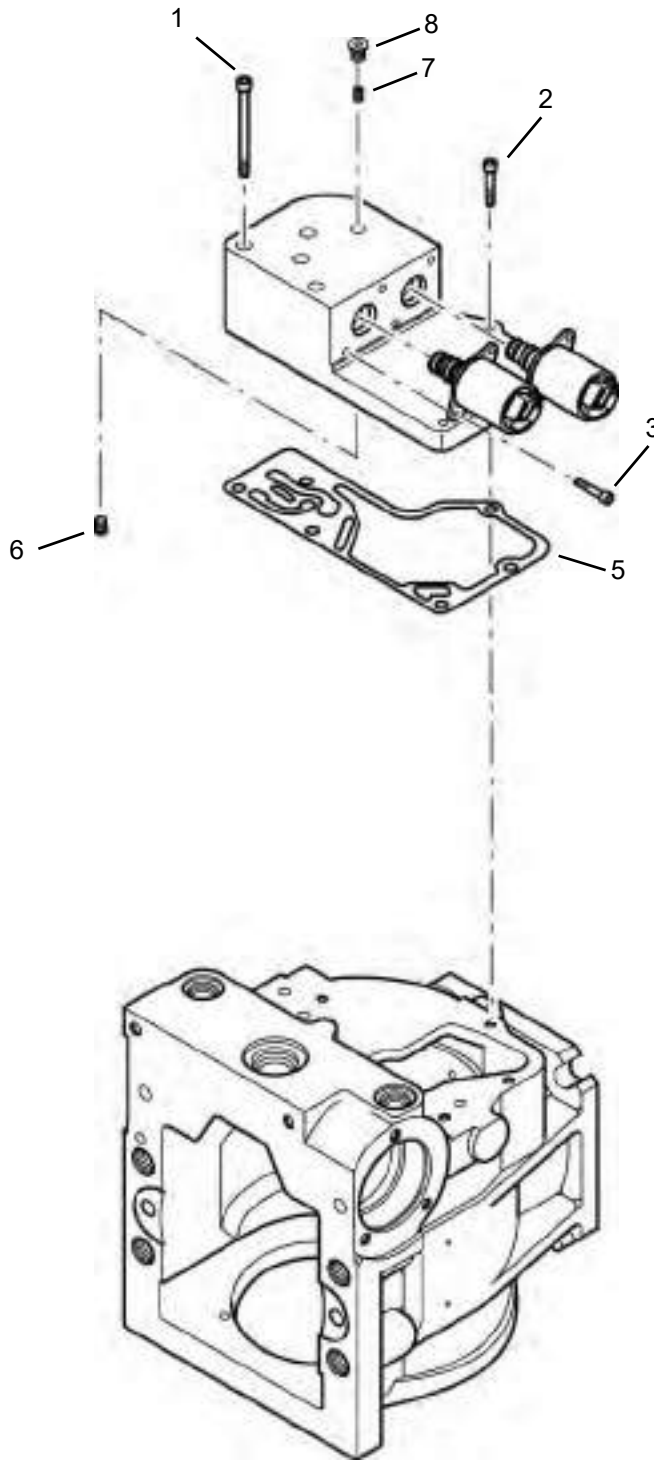
S2940

Dealer Copy -- Not for Resale

HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999) (CONT'D)

Parts Identification (Cont'd)

- 1. Bolt
- 2. Bolt
- 3. Bolt
- 4. Solenoid
- 5. Gasket
- 6. Orifice Plug
- 7. Orifice Plug
- 8. Plug



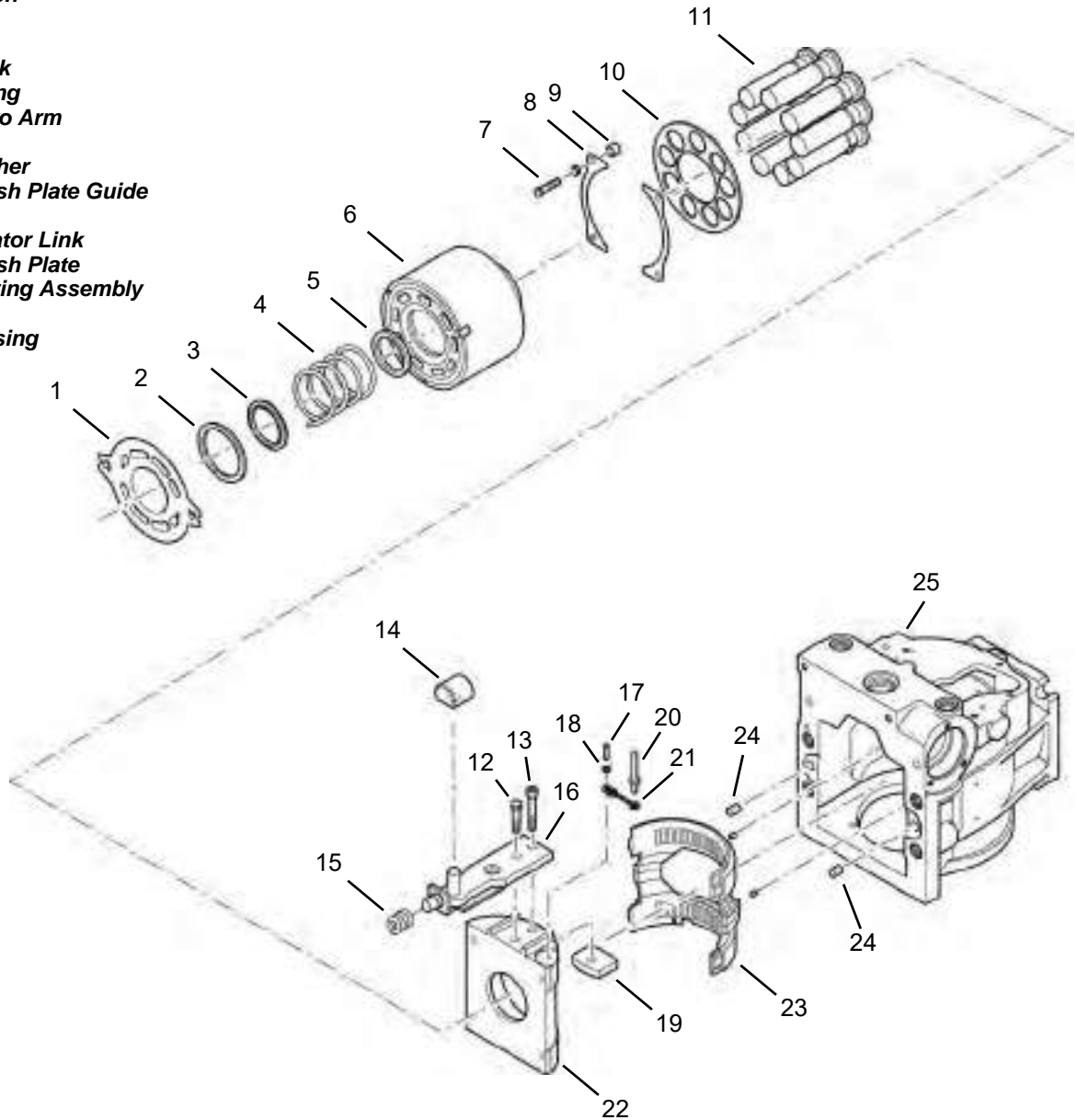
Dealer Copy -- Not for Resale

S2939

HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999) (CONT'D)

Parts Identification (Cont'd)

- 1. Valve Plate
- 2. Retainer Ring
- 3. Spring Retainer
- 4. Spring
- 5. Spring Seat
- 6. Cylinder
- 7. Bolt
- 8. Slipper Guide Bearing
- 9. Spacer
- 10. Slipper Guide
- 11. Piston
- 12. Bolt
- 13. Bolt
- 14. Block
- 15. Spring
- 16. Servo Arm
- 17. Pin
- 18. Washer
- 19. Swash Plate Guide
- 20. Pin
- 21. Locator Link
- 22. Swash Plate
- 23. Bearing Assembly
- 24. Pin
- 25. Housing



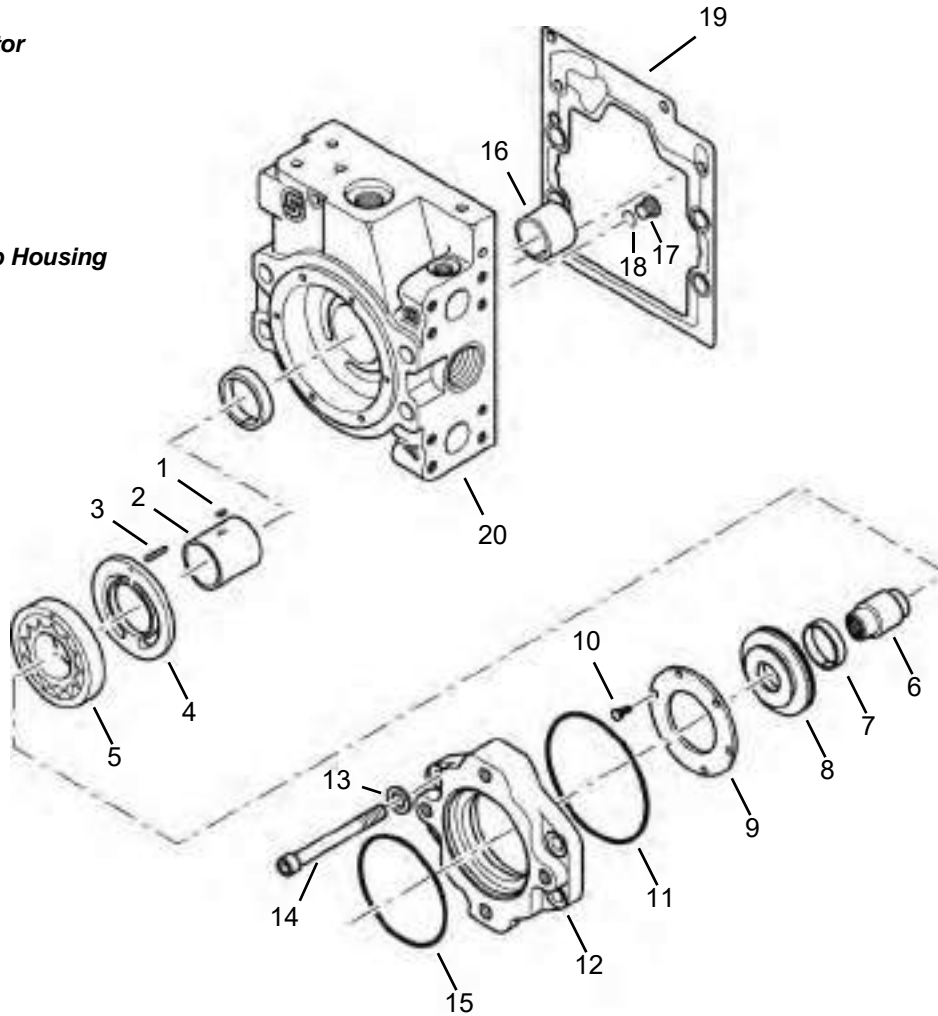
Dealer Copy -- Not for Resale

S2936

HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999) (CONT'D)

Parts Identification (Cont'd)

- 1. Key
- 2. Charge Pump Shaft
- 3. Pin
- 4. Wear Plate
- 5. Gears
- 6. Coupling
- 7. Seal
- 8. Charge Pump Cover
- 9. Retaining Plate
- 10. Bolt
- 11. O-Ring
- 12. Flange Adaptor
- 13. Washer
- 14. Bolt
- 15. O-Ring
- 16. Bushing
- 17. Plug
- 18. O-Ring
- 19. Gasket
- 20. Charge Pump Housing

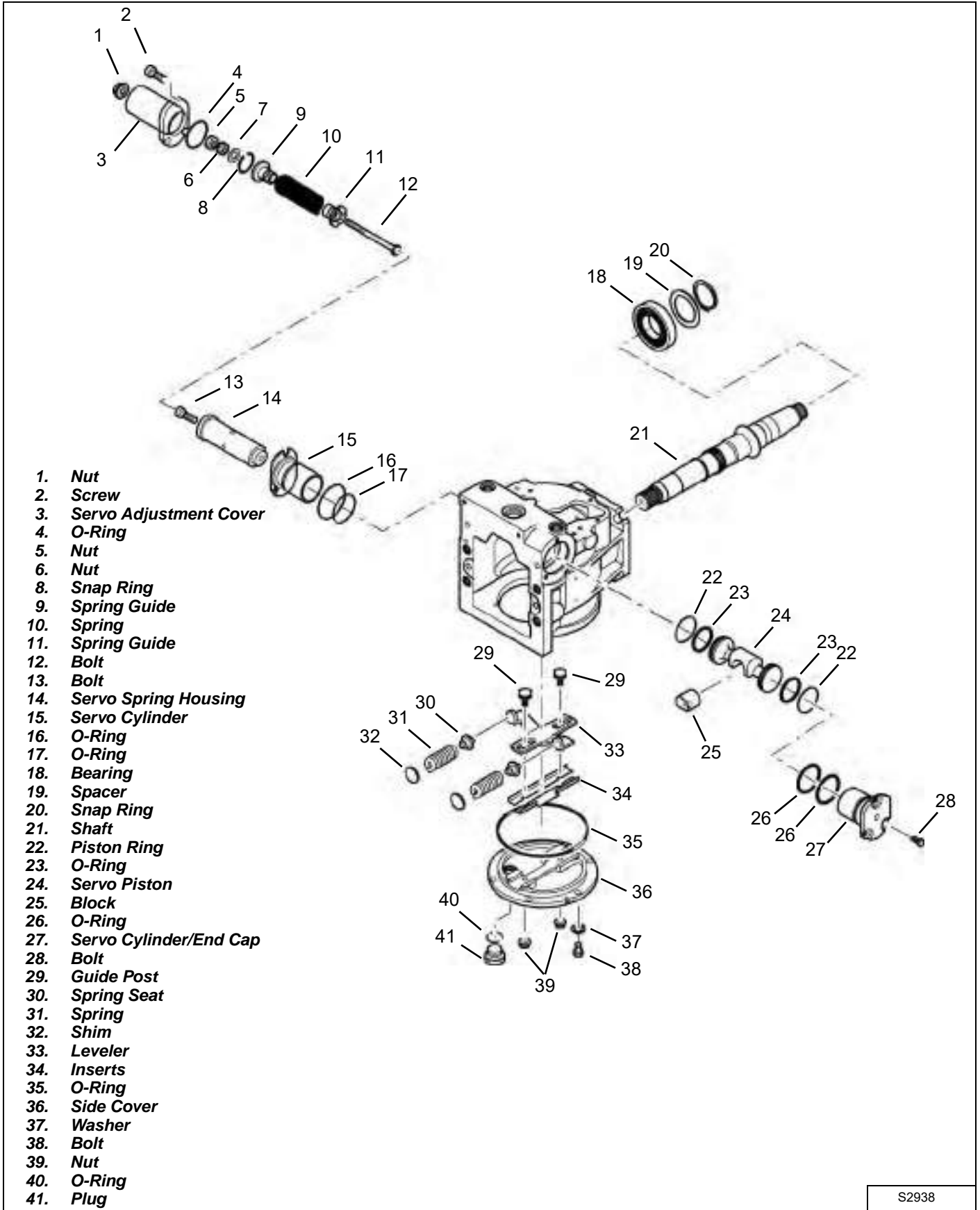


S2937

Dealer Copy -- Not for Resale

HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999) (CONT'D)

Parts Identification (Cont'd)



Dealer Copy -- Not for Resale

S2938

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

Disassembly

Clean the outside of the pump before disassembly.

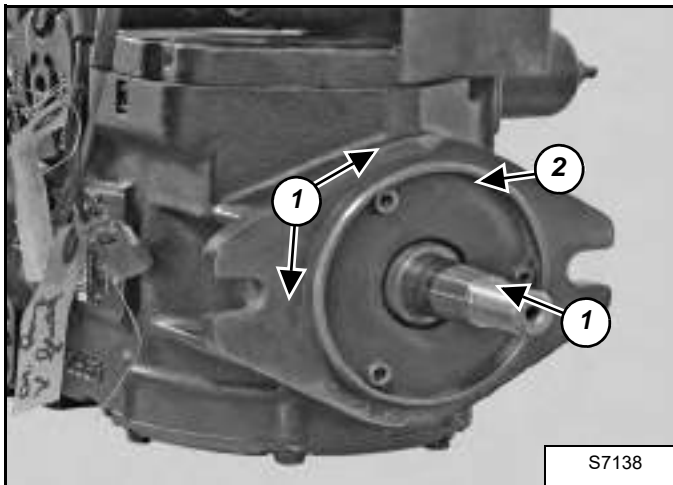
Mark the outside of the pump for ease of assembly.

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

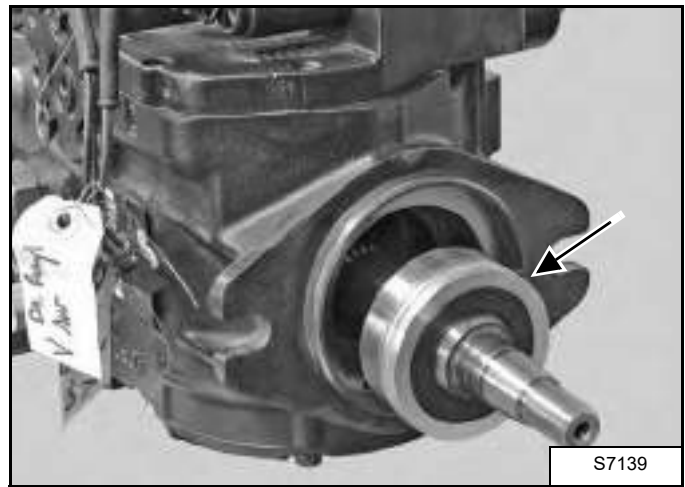
Figure 30-40-9



Remove the three bolts (Item 1) [Figure 30-40-9].

Remove the retainer plate (Item 2) [Figure 30-40-9] from the pump housing.

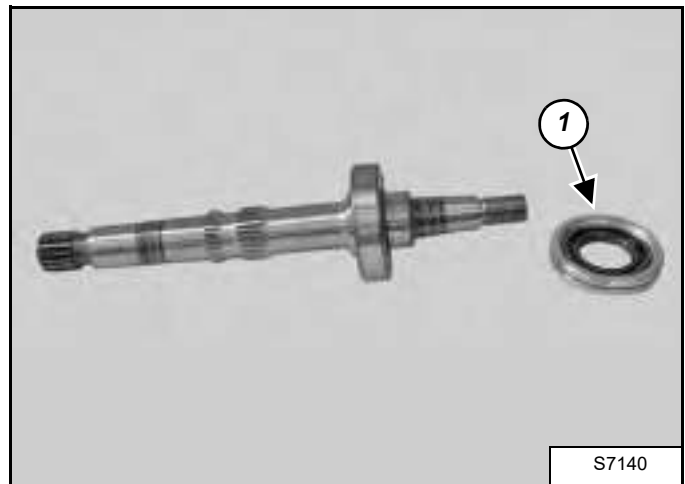
Figure 30-40-10



Remove the shaft and bearing assembly from the housing [Figure 30-40-10].

NOTE: If the shaft or bearing assembly become stuck in the housing, lightly tap on the shaft.

Figure 30-40-11



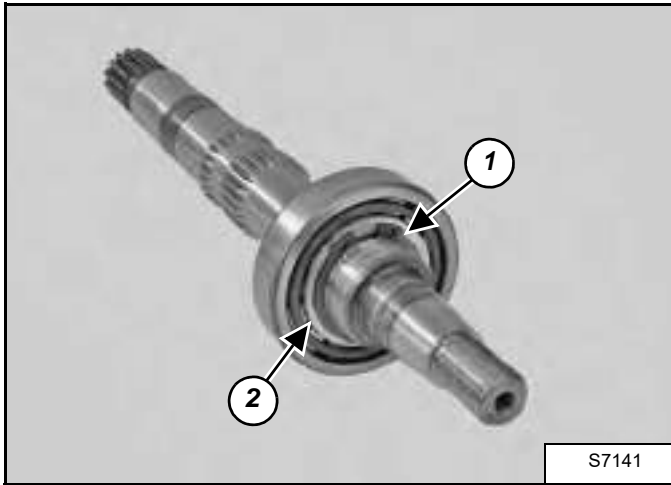
Remove the shaft seal (Item 1) [Figure 30-40-11] from the shaft.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

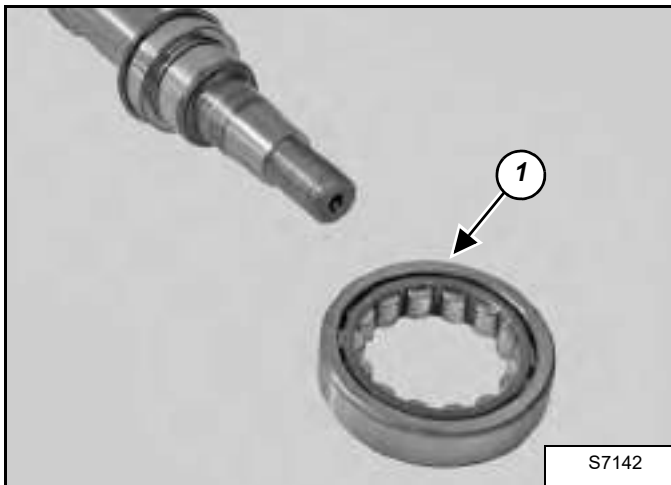
Disassembly (Cont'd)

Figure 30-40-12



Remove the snap ring (Item 1) and spacer washer (Item 2) [Figure 30-40-12] from the shaft.

Figure 30-40-13



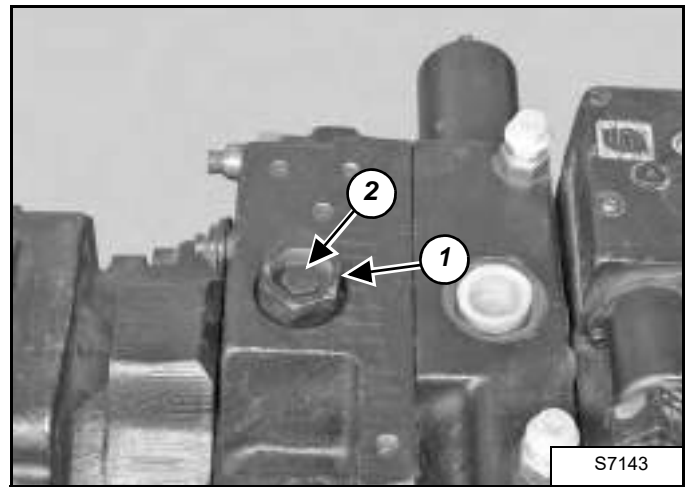
Remove the bearing (Item 1) [Figure 30-40-13] from the shaft.

Place the pump on the work surface with the charge pump up.

Mark the pump housings for correct assembly.

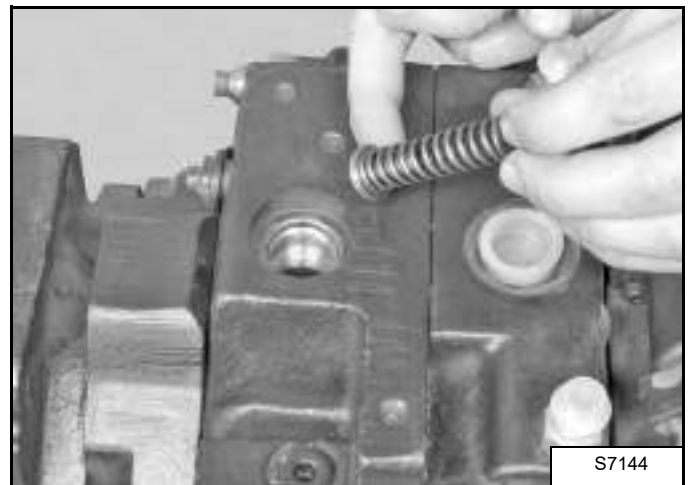
Before removing the relief valve mark the plug, lock nut and housing for approximate assembly adjustment.

Figure 30-40-14



Remove the relief valve lock nut (Item 1) and the plug (Item 2) [Figure 30-40-14].

Figure 30-40-15



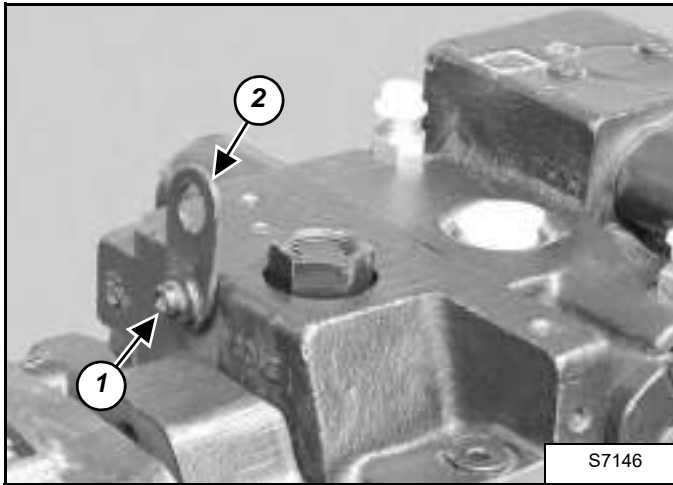
Remove the spring and relief poppet from the charge pump housing [Figure 30-40-15].

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

Disassembly (Cont'd)

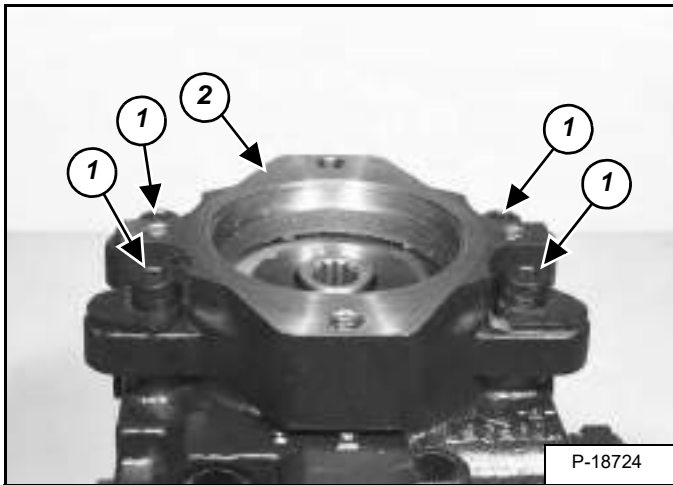
Figure 30-40-16



Remove the mounting bolt (Item 1) [Figure 30-40-16].

NOTE: Remove the lifting bracket (Item 2) [Figure 30-40-16] from the pump.

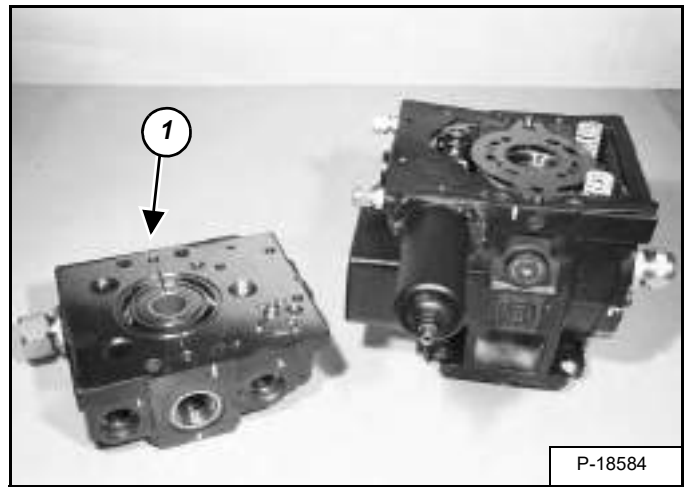
Figure 30-40-17



Remove the four mounting bolts (Item 1) [Figure 30-40-17] from the flange adapter.

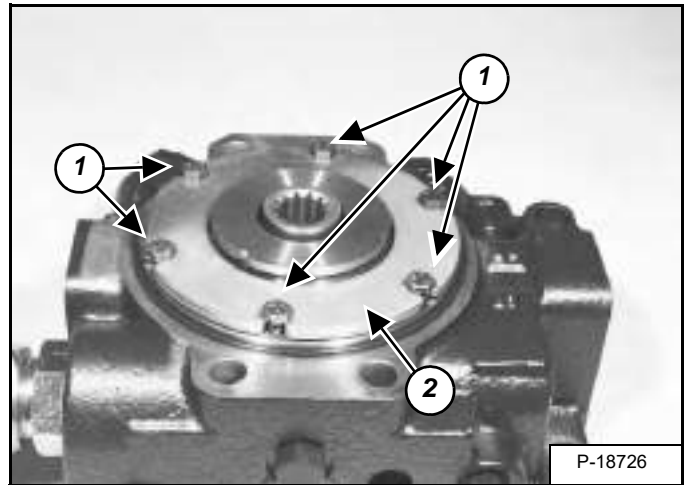
Remove the flange adapter (Item 2) [Figure 30-40-17].

Figure 30-40-18



Lift and remove the charge pump housing (incl. charge pump) (Item 1) [Figure 30-40-18] from the pump housing.

Figure 30-40-19

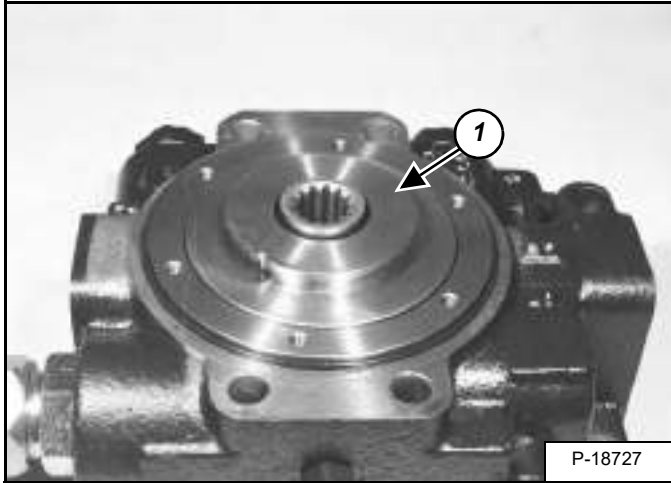


Remove the six bolts (Item 1) and remove the retaining plate (Item 2) [Figure 30-40-19] from the charge pump housing.

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

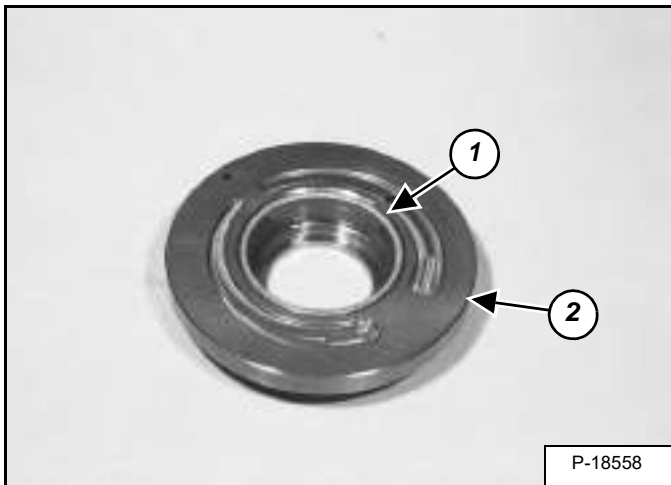
Disassembly (Cont'd)

Figure 30-40-20



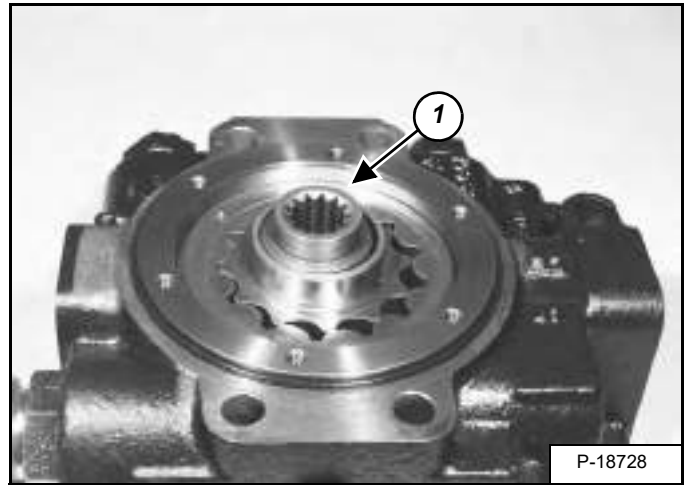
Remove the charge pump cover (Item 1) [Figure 30-40-20].

Figure 30-40-21



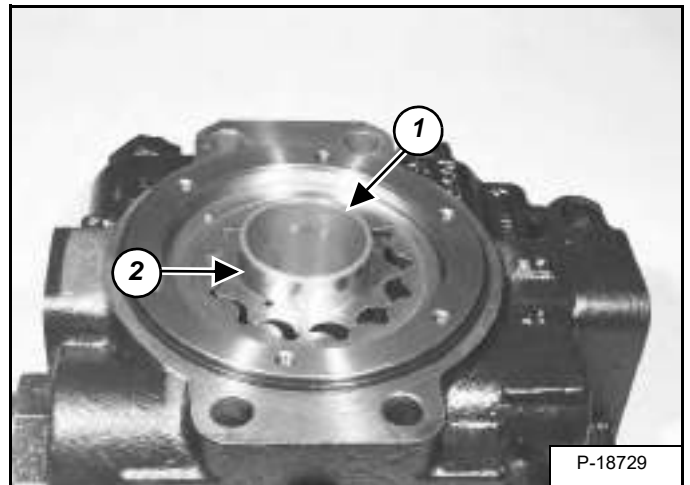
Only if wear marks are present, remove the bushing (Item 1) from the charge pump cover (Item 2) [Figure 30-40-21].

Figure 30-40-22



Remove the coupler (Item 1) [Figure 30-40-22].

Figure 30-40-23



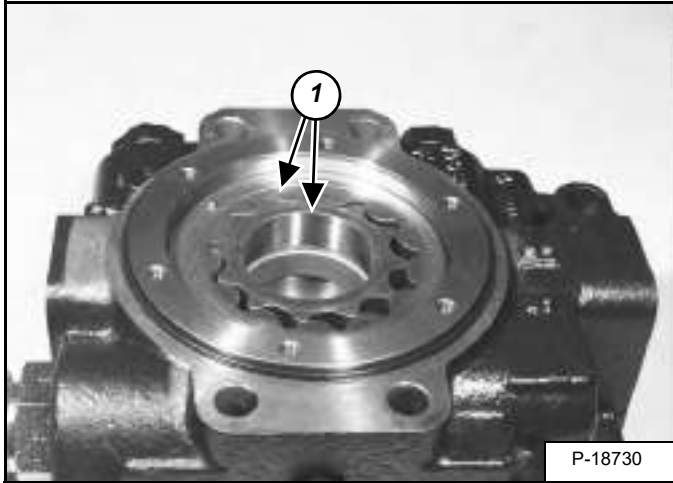
Remove the charge pump shaft (Item 1) and key (Item 2) [Figure 30-40-23] from the pump.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

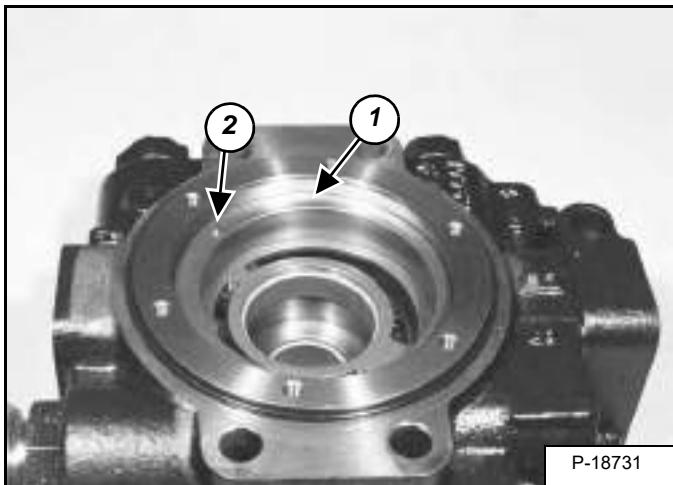
Disassembly (Cont'd)

Figure 30-40-24



Remove the charge pump gears (Item 1) [Figure 30-40-24].

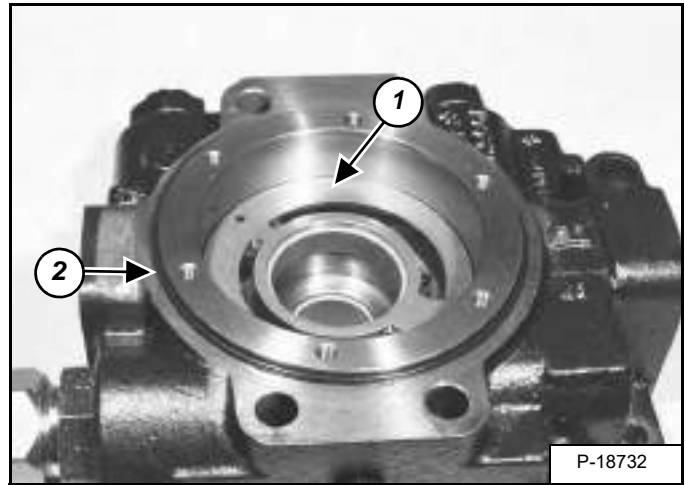
Figure 30-40-25



Remove the eccentric ring (Item 1) and alignment pin (Item 2) [Figure 30-40-25] from the pump.

Note the position of the alignment pin.

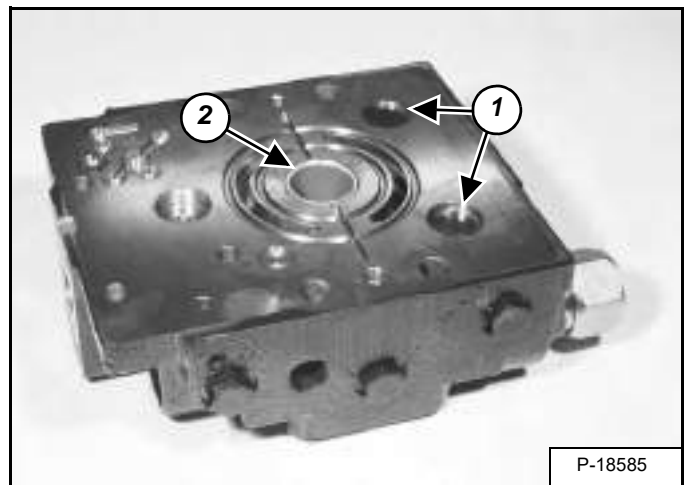
Figure 30-40-26



Remove the charge pump wear plate (Item 1) [Figure 30-40-26].

Remove the O-ring (Item 2) [Figure 30-40-26].

Figure 30-40-27



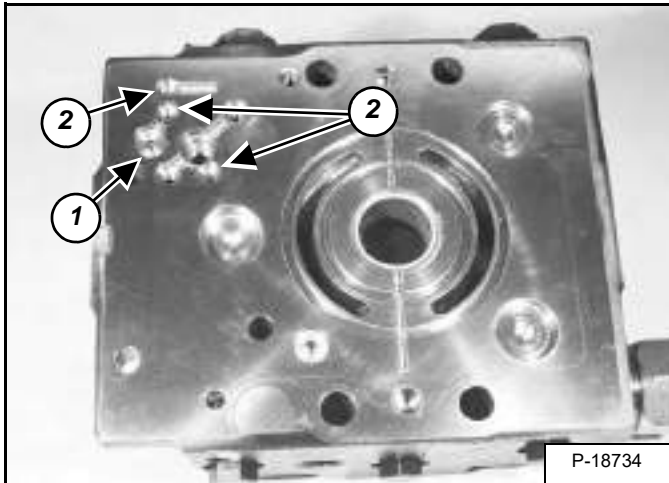
Remove the swash plate leveler spring shims (Item 1) [Figure 30-40-27] from the spring pockets.

Inspect the journal bearing (Item 2) [Figure 30-40-27]. Replace as needed.

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

Disassembly (Cont'd)

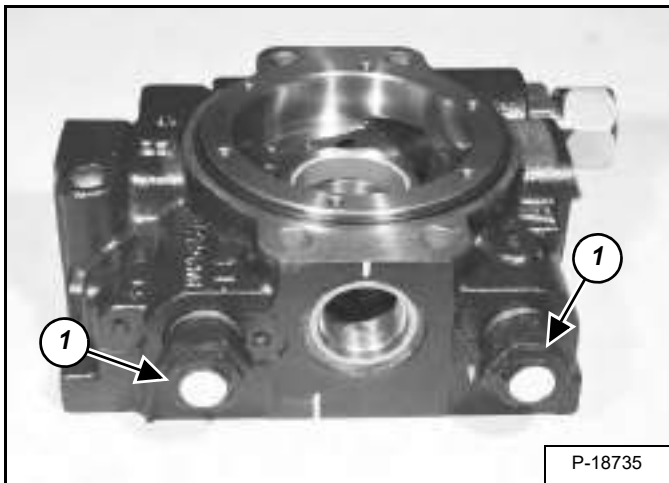
Figure 30-40-28



For proper operation, if the plugs are removed from the housing they must be returned to their original position [Figure 30-40-28].

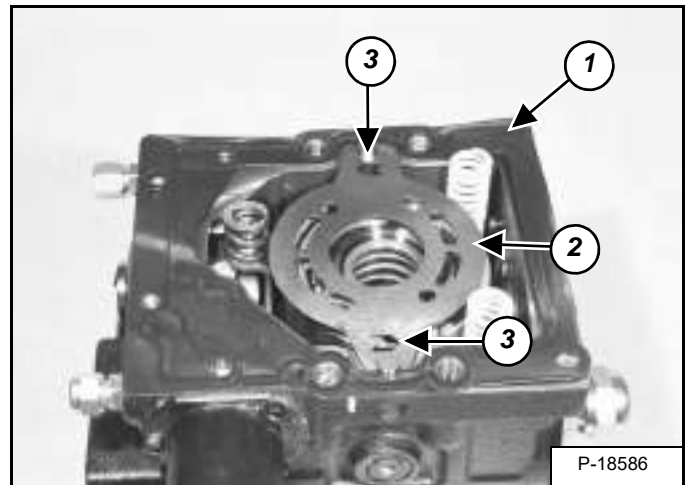
Installation: Tighten the servo relief valve plug (Item 1) to 12 N•m (106 in-lb) torque. Tighten the rotation pipe plugs (Item 2) [Figure 30-40-28] to 5.4 N•m (47.8 in-lb) torque.

Figure 30-40-29



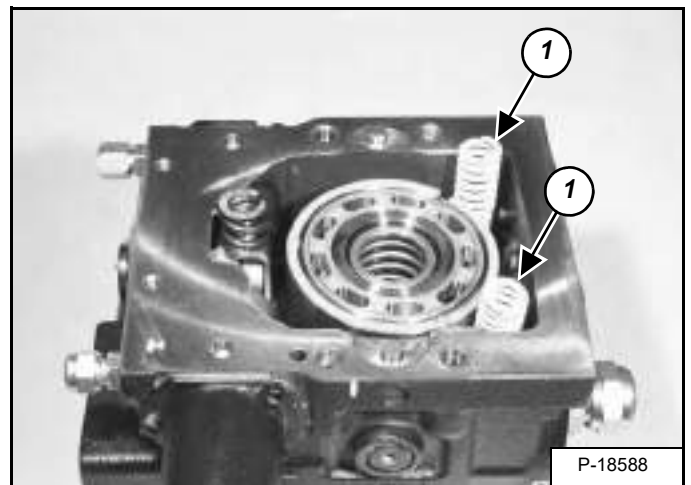
Remove the multi-function valve assemblies (Item 1) [Figure 30-40-29] from the housing.

Figure 30-40-30



Remove the gasket (Item 1) and the valve plate (Item 2) from the housing. Note the direction of the arrows (Item 3) [Figure 30-40-30] on the valve plate for proper assembly.

Figure 30-40-31



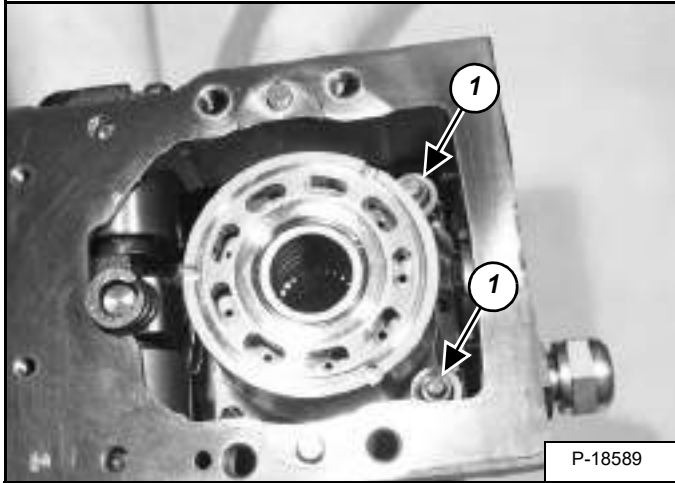
Remove the two leveler springs (Item 1) [Figure 30-40-31].

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

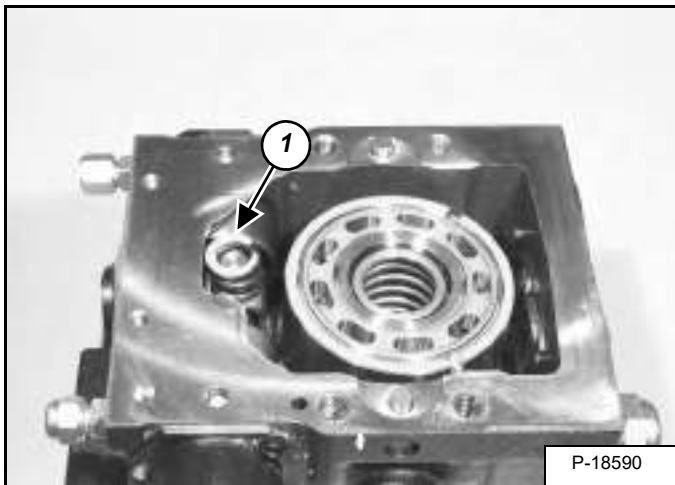
Disassembly (Cont'd)

Figure 30-40-32



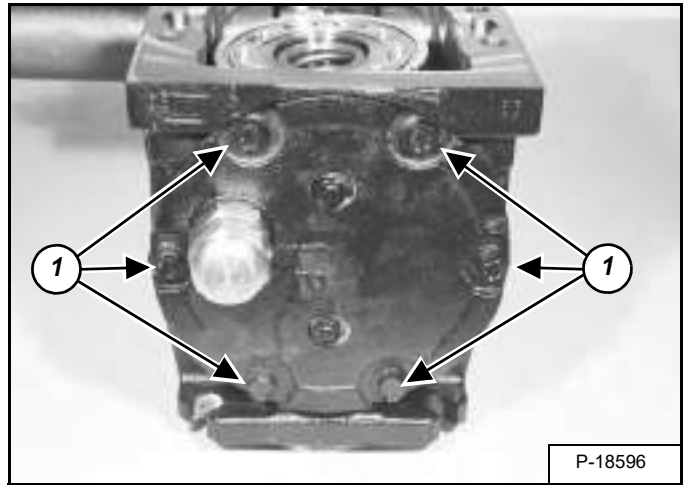
Remove both spring seats (Item 1) [Figure 30-40-32] from the swash plate leveler.

Figure 30-40-33



Remove the swash plate hold down spring (Item 1) [Figure 30-40-33].

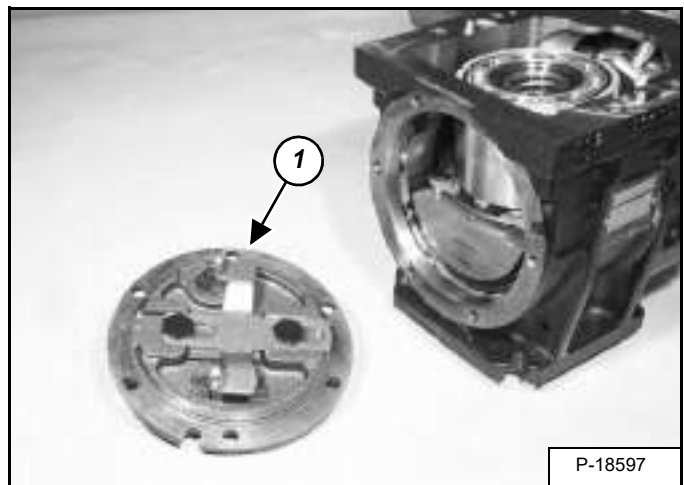
Figure 30-40-34



Mark the position of the side cover.

Remove the six bolts (Item 1) [Figure 30-40-34] from the side cover.

Figure 30-40-35



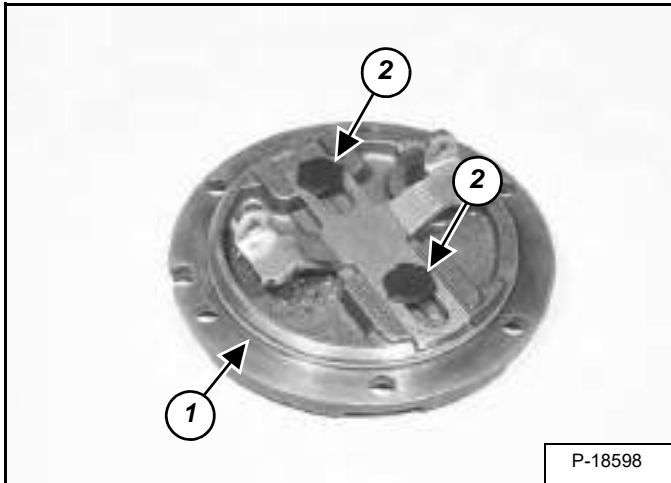
Remove the side cover/swash plate leveler assembly from the housing [Figure 30-40-35].

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

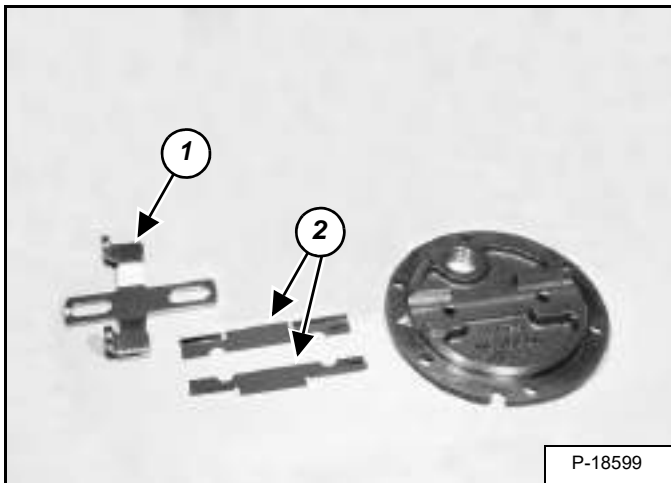
Disassembly (Cont'd)

Figure 30-40-36



Remove and discard the O-ring (Item 1). Loosen and remove both guide posts (Item 2) **[Figure 30-40-36]**.

Figure 30-40-37

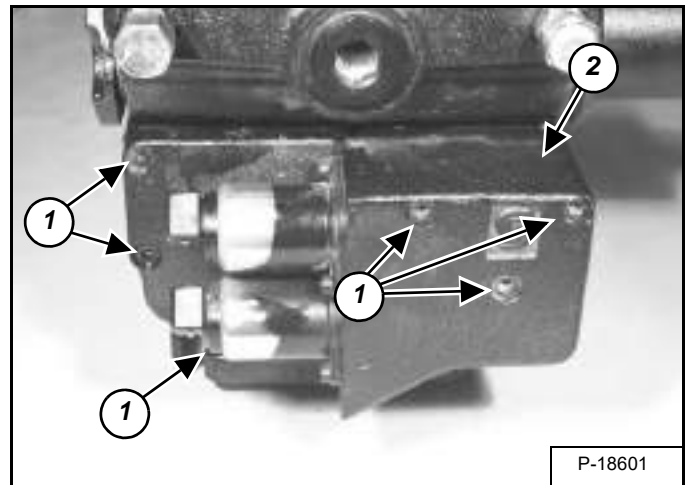


Remove the leveler (Item 1) and slide inserts (Item 2) **[Figure 30-40-37]** from the side cover.

Inspect the slide inserts for wear or damage.

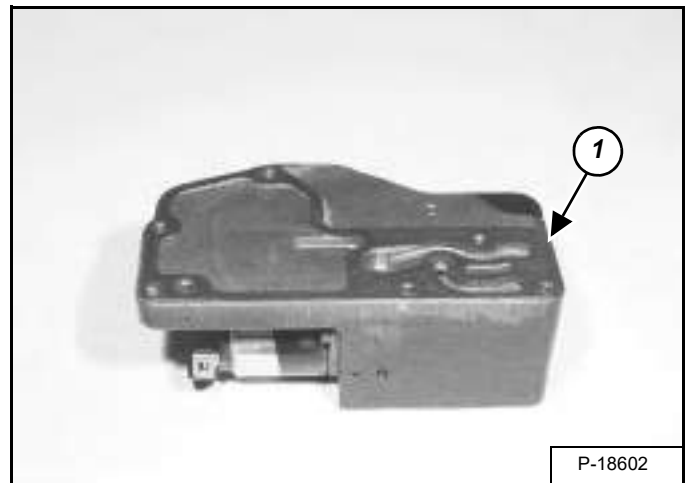
Replace if needed.

Figure 30-40-38



Remove the six solenoid manifold mounting bolts (Item 1). Remove the manifold (Item 2) **[Figure 30-40-38]**.

Figure 30-40-39



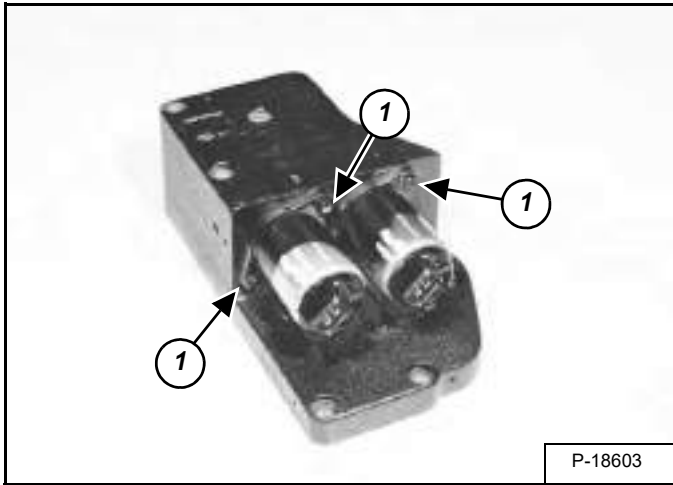
Remove the gasket (Item 1) **[Figure 30-40-39]** from the manifold.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

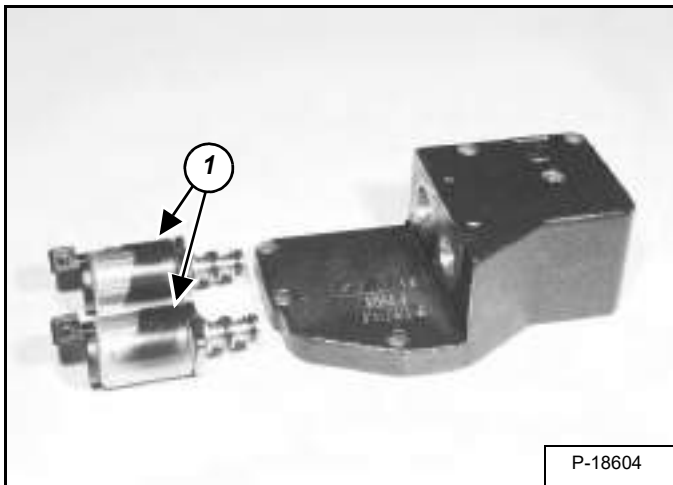
Disassembly (Cont'd)

Figure 30-40-40



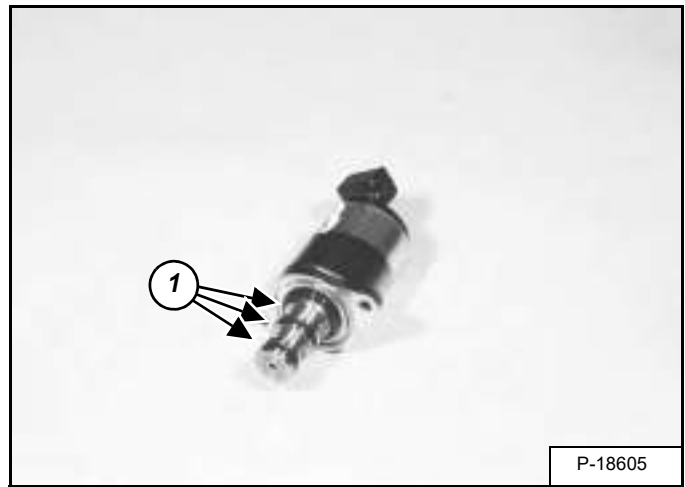
Remove the four solenoid mounting bolts (Item 1) [Figure 30-40-40].

Figure 30-40-41



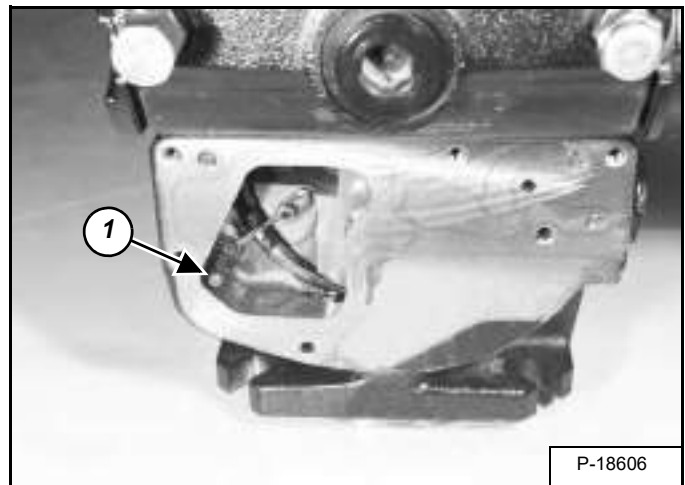
Remove the solenoids (Item 1) [Figure 30-40-41] from the manifold.

Figure 30-40-42



Remove and discard the three O-rings (Item 1) [Figure 30-40-42] from the solenoid.

Figure 30-40-43



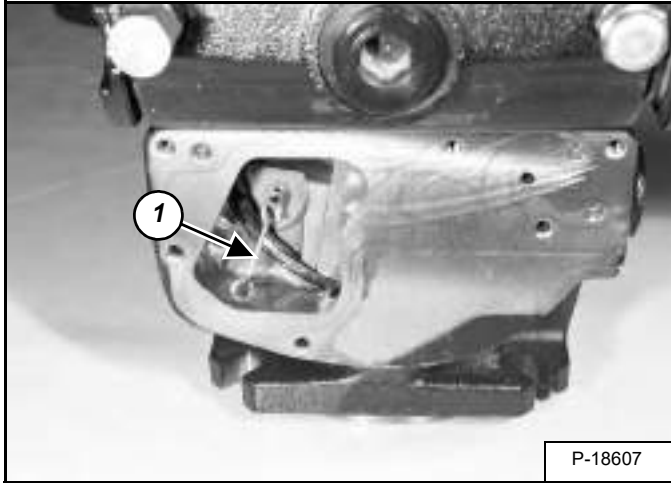
Remove the anchor pin (Item 1) [Figure 30-40-43].

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

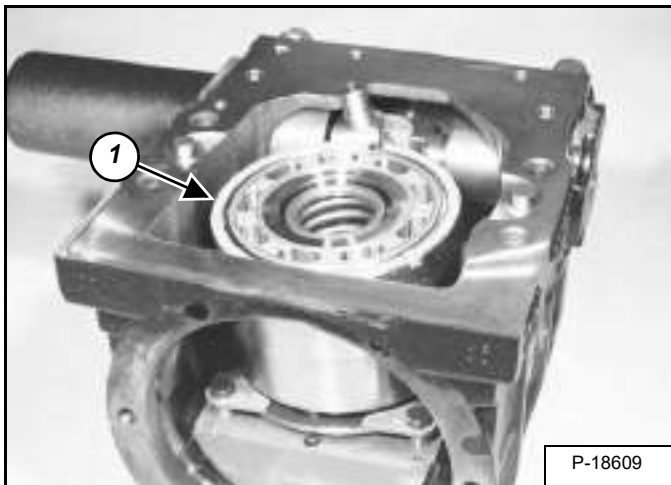
Disassembly (Cont'd)

Figure 30-40-44



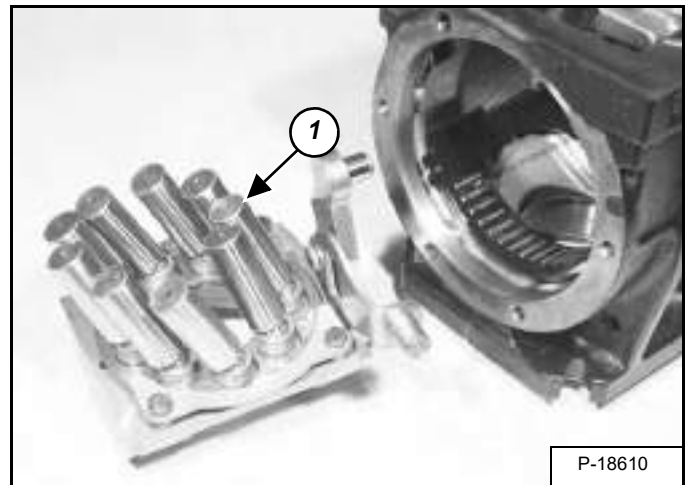
Remove the cage locator link (Item 1) [Figure 30-40-44] from the swash plate.

Figure 30-40-45



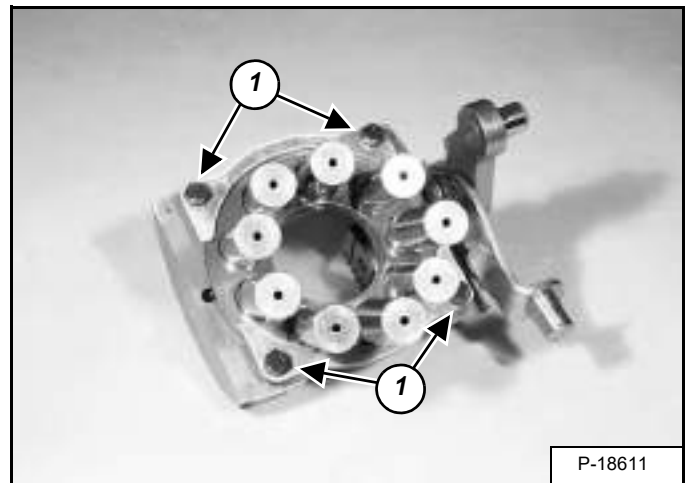
Remove the cylinder block (Item 1) [Figure 30-40-45] through the housing end opening. The swash plate and piston assembly will remain in the housing.

Figure 30-40-46



Remove the swash plate/piston assembly (Item 1) [Figure 30-40-46] from the pump housing.

Figure 30-40-47



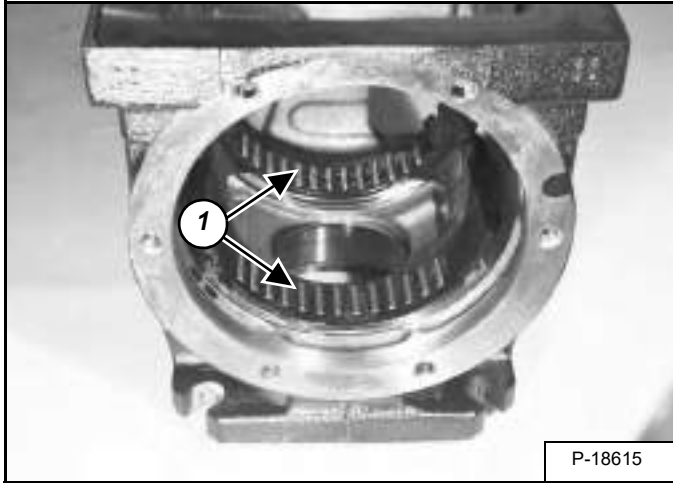
Remove the four slipper guide bearing retainer bolts (Item 1) [Figure 30-40-47].

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

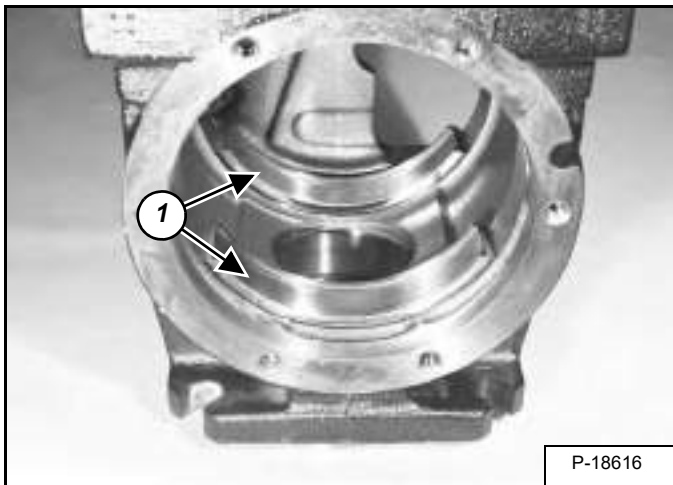
Disassembly (Cont'd)

Figure 30-40-48



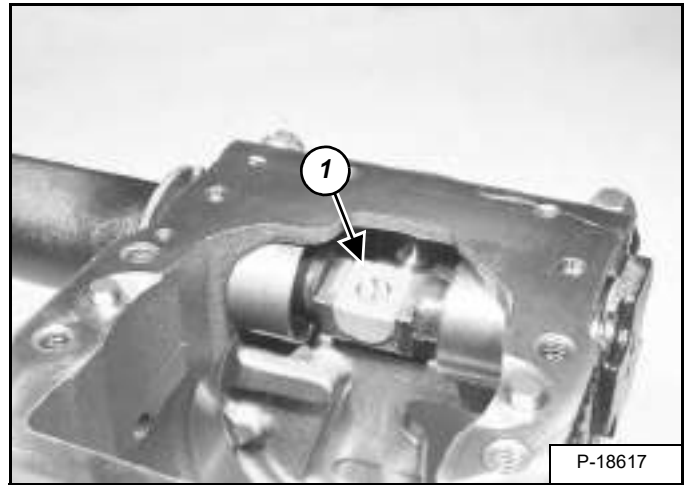
Remove the wash plate bearings (Item 1) [Figure 30-40-48] from the housing.

Figure 30-40-49



Remove the wash plate bearing races (Item 1) [Figure 30-40-49] from the housing.

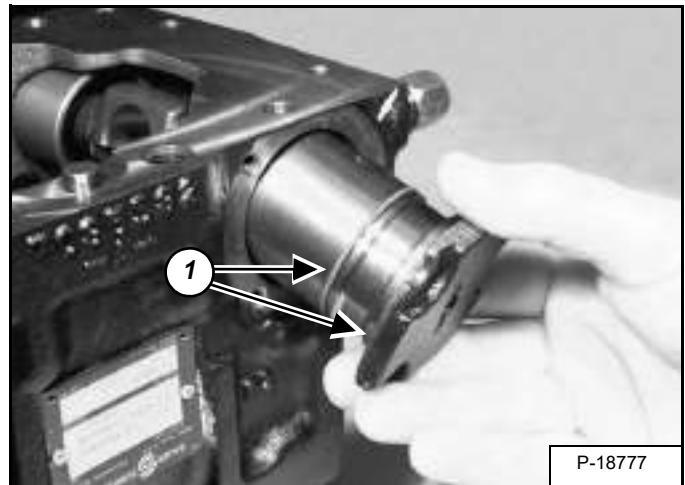
Figure 30-40-50



Remove the bronze slider block (Item 1) [Figure 30-40-50] from the servo piston.

Mark the position of the servo end covers.

Figure 30-40-51

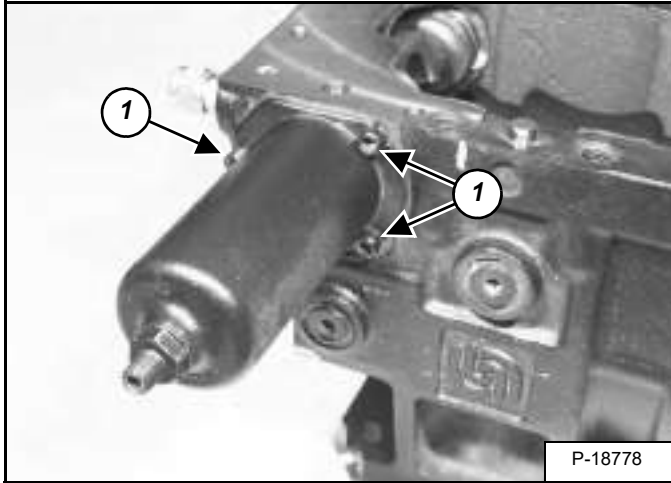


Remove the three bolts and remove the servo end cover. Remove and discard both O-rings (Item 1) [Figure 30-40-51].

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

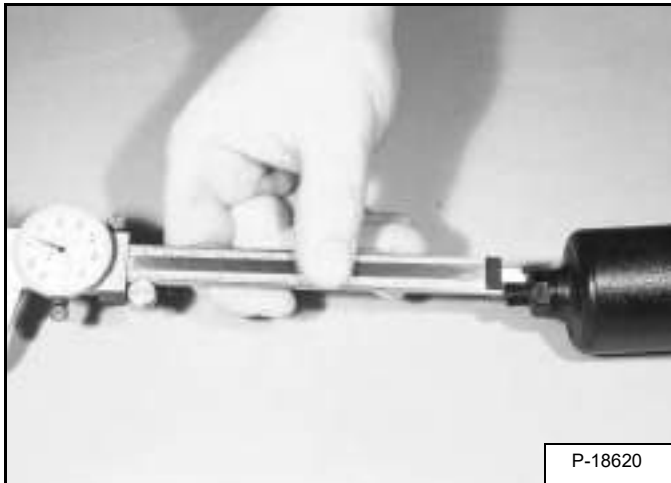
Disassembly (Cont'd)

Figure 30-40-52



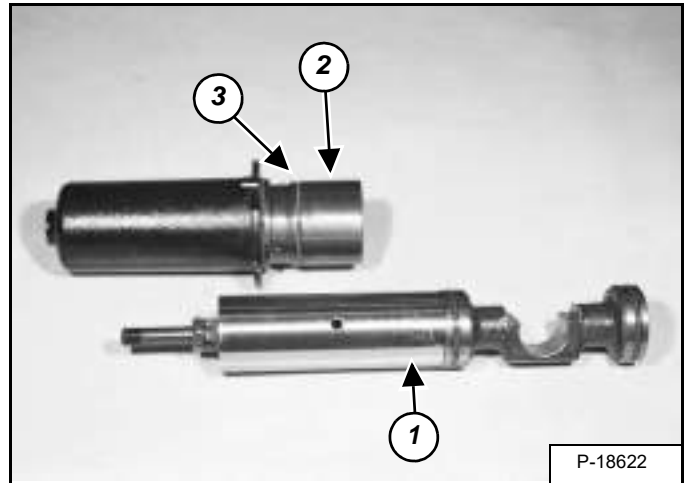
Remove the three bolts (Item 1) [Figure 30-40-52] and remove the servo adjustment cover.

Figure 30-40-53



Measure and record the adjustment setting for approximate installation adjustment [Figure 30-40-53].

Figure 30-40-54



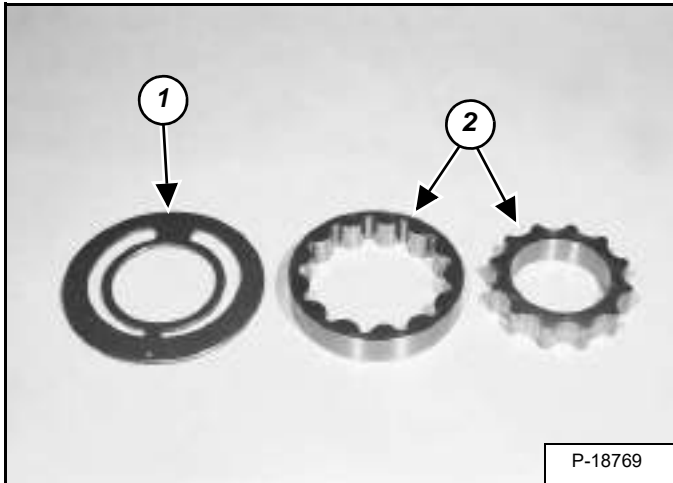
Remove the servo piston (Item 1) from the housing (Item 2) [Figure 30-40-54].

Remove and discard the O-ring (Item 3) [Figure 30-40-54].

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

Inspection

Figure 30-40-55



Clean all parts in solvent and use air pressure to dry them. DO NOT use cloth or paper as small pieces of material can get into the system and cause damage.

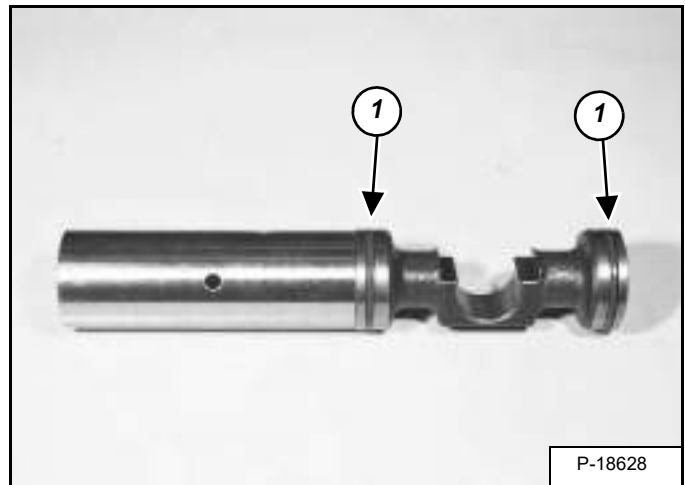
Check the wear plate (Item 1) and charge pump gears (Item 2) [Figure 30-40-55] for damage or wear.

Figure 30-40-56



Check the valve plate [Figure 30-40-56], the surface must be smooth and free of scratches. If scratches can be felt with a finger nail, replace the part.

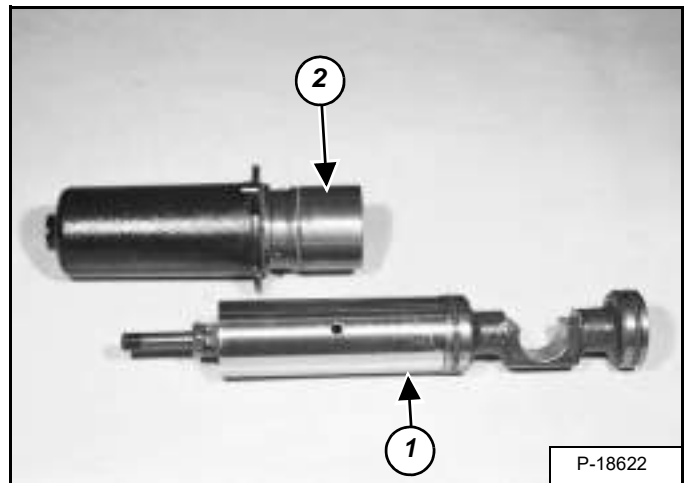
Figure 30-40-57



Inspect the servo piston and seal rings (Item 1) [Figure 30-40-57] for wear. If worn, remove the seal rings and expander O-rings from the piston.

Install new expander O-rings into the grooves in the servo piston. Carefully install the piston seal rings over the expander rings. Do not overstretch the piston seal rings.

Figure 30-40-58

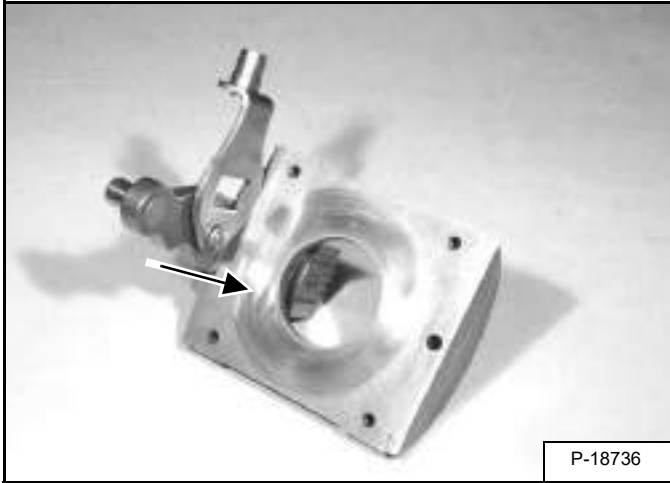


Lubricate the seal rings and carefully slide the servo piston (Item 1) into the cylinder (Item 2) [Figure 30-40-58]. Allow the assembly to set for 5 minutes to allow the seal rings to return to their original size.

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

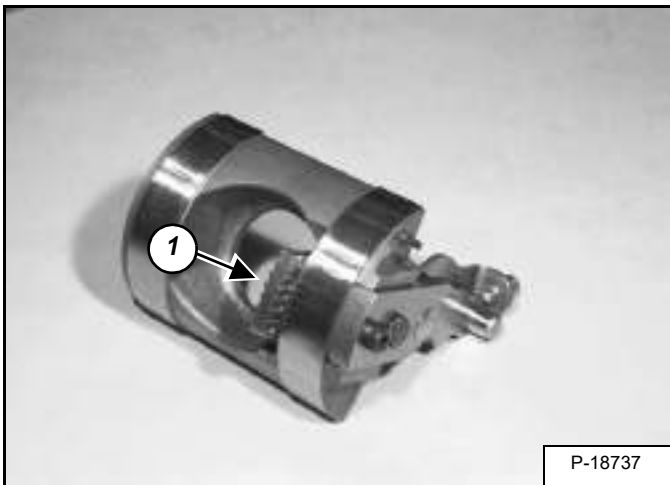
Inspection (Cont'd)

Figure 30-40-59



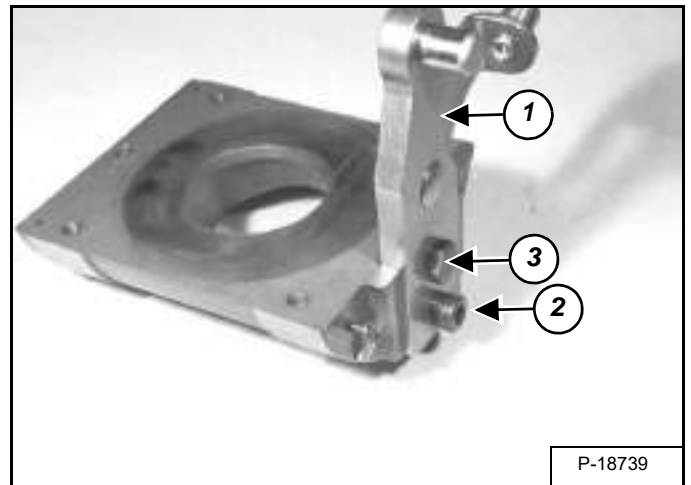
Check the swash plate assembly surface, it must be smooth and free of scratches [Figure 30-40-59].

Figure 30-40-60



Inspect the swash plate guide (Item 1) [Figure 30-40-60] for wear. Replace as needed.

Figure 30-40-61



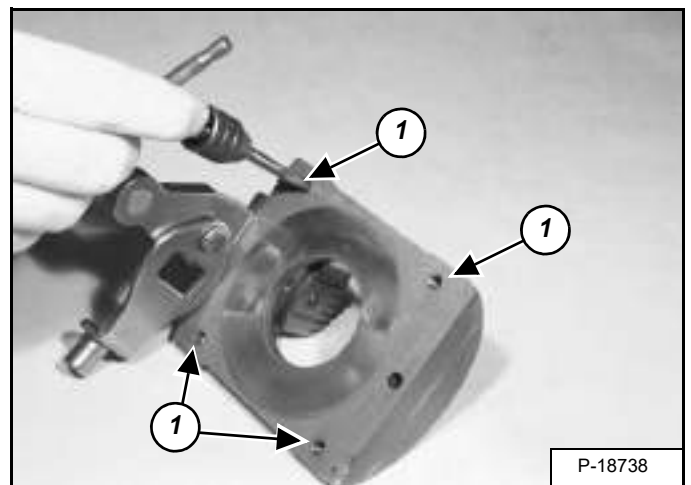
Servo arm (Item 1) [Figure 30-40-61] alignment is critical for proper pump operation. For this reason, removal of the servo arm from the swash plate is not recommended.

If the servo arm must be removed from the swash plate. Remove the swash plate guide bolt (Item 2) and the servo arm mounting bolt (Item 3) [Figure 30-40-61].

Installation: The servo arm (Item 1) [Figure 30-40-61] must be carefully aligned with the slot and threaded holes in the swash plate while installing, and must be pressed completely into the swash plate slot.

Tighten the swash plate guide bolt and servo arm bolt to 32 N•m (24 ft-lb) torque.

Figure 30-40-62



The threaded holes (Item 1) [Figure 30-40-62] in the swash plate must be cleaned prior to assembly.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

Inspection (Cont'd)

Figure 30-40-63

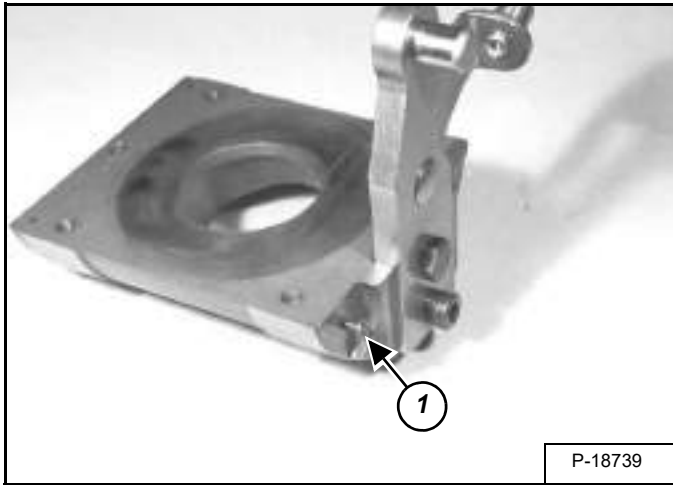
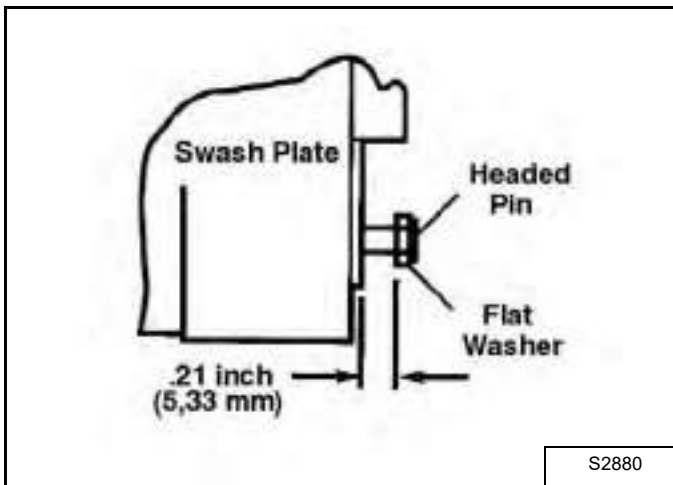


Figure 30-40-64



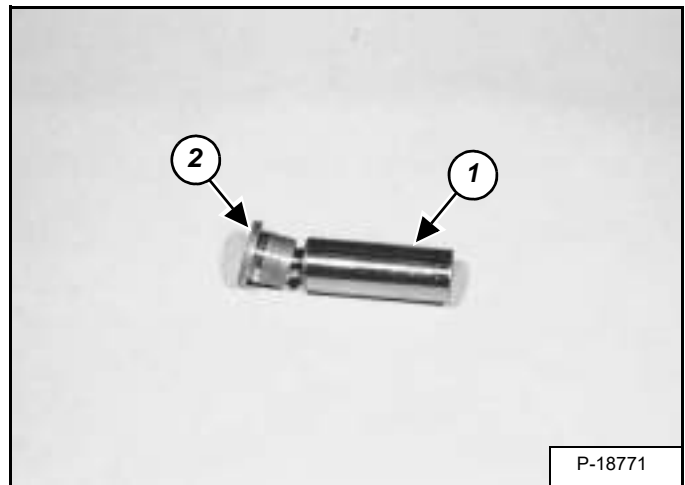
If the headed roll pin and flat washer (Item 1) [Figure 30-40-63] must be installed in the swash plate, the distance between the washer and the side of the swash plate must be 5,33 mm (0.21 in) [Figure 30-40-64].

Figure 30-40-65



Check the swash plate bearings (Item 1) [Figure 30-40-65] for wear and damage. Replace as needed.

Figure 30-40-66



Check each piston (Item 1) and piston shoe (Item 2) [Figure 30-40-66] for wear or scratches.

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

Inspection (Cont'd)

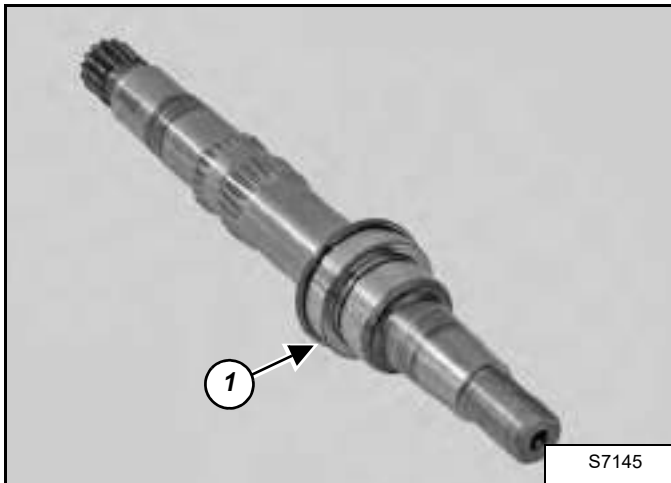
Figure 30-40-67



Check the cylinder block bores for wear or scratches **[Figure 30-40-67]**.

If there is any defect in the cylinder block or pistons, the complete rotating group must be replaced.

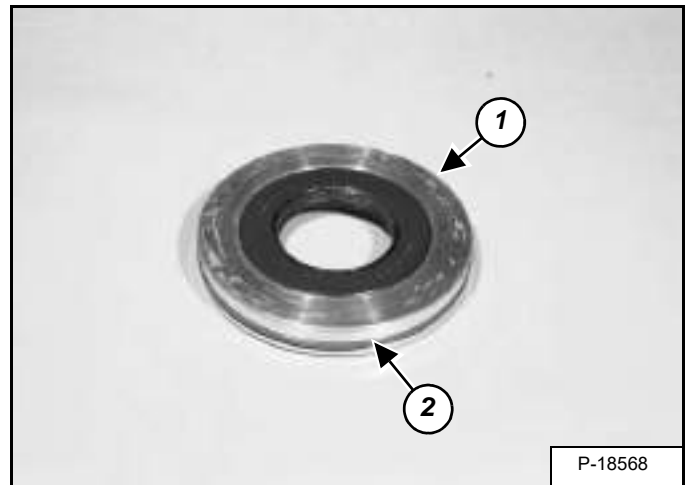
Figure 30-40-68



Check the shaft for wear or damage in the spline and bearing areas **[Figure 30-40-68]**.

Check the bearing for correct operation. Remove the race (Item 1) **[Figure 30-40-68]** from the shaft only if it is necessary to replace the bearing.

Figure 30-40-69



Inspect the shaft seal (Item 1) **[Figure 30-40-69]**. Replace if needed.

Remove and discard the O-ring (Item 2) **[Figure 30-40-69]**.

Inspect the multi-function valve cartridge for damage to parts or O-rings.

Figure 30-40-70



Replace O-rings as needed **[Figure 30-40-70]**.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

Assembly

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Clean all parts in solvent and dry with compressed air.

Inspect all parts for wear or damage. Replace any worn or damaged parts.

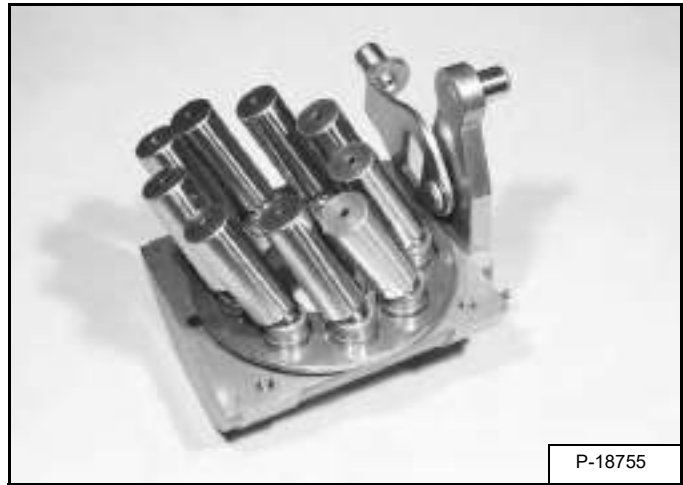
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 30-40-71



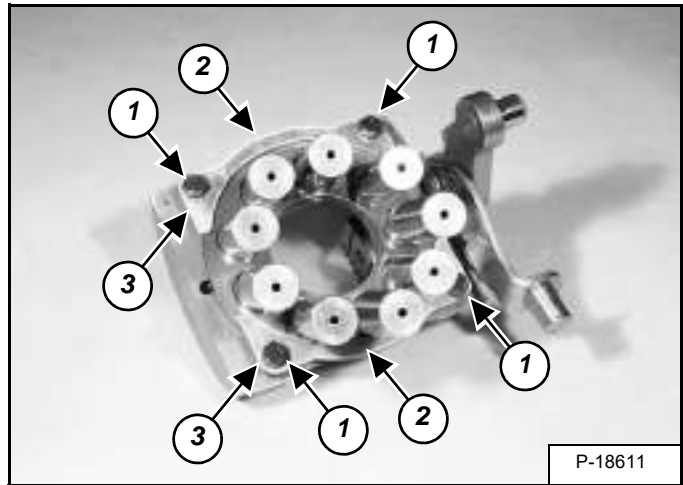
Put the piston assemblies into the slipper guide [Figure 30-40-71].

Figure 30-40-72



Lubricate the slipper running surface on the swash plate, center the piston and guide on the swash plate [Figure 30-40-72].

Figure 30-40-73



Apply LOCTITE #242 to four NEW retainer bolts (Item 1). Install the slipper guide bearings (Item 2) and spacers (Item 3) [Figure 30-40-73].

Tighten the four bolts to 13,5 N•m (10 ft-lb) torque.

NOTE: Always use NEW retainer bolts with proper locking compound.

NOTE: The slipper guides and piston slippers must slide freely on the swash plate.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

Assembly (Cont'd)

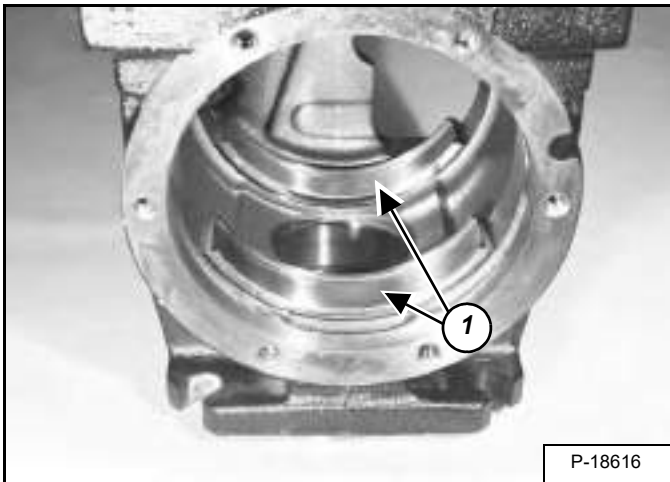
Figure 30-40-74



Lubricate the pistons and cylinder block bores. Install the assembled swash plate and pistons into the cylinder block [Figure 30-40-74].

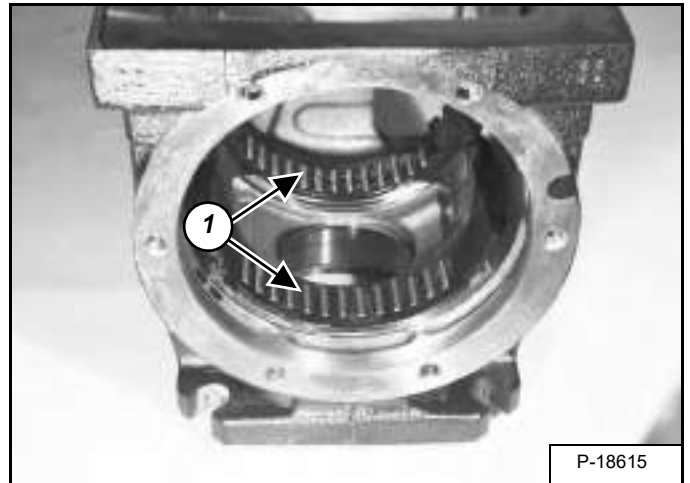
NOTE: The pistons and bores are not selectively fitted.

Figure 30-40-75



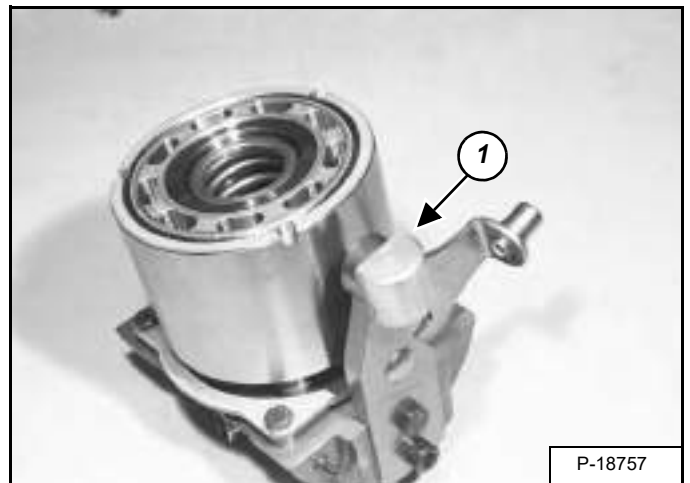
Install the swash plate bearing races (Item 1) [Figure 30-40-75] into the housing. Note the locating pins are offset in the housing to assure proper assembly.

Figure 30-40-76



Assemble and lubricate the bearing cage (Item 1) [Figure 30-40-76], and install it on the bearing races.

Figure 30-40-77



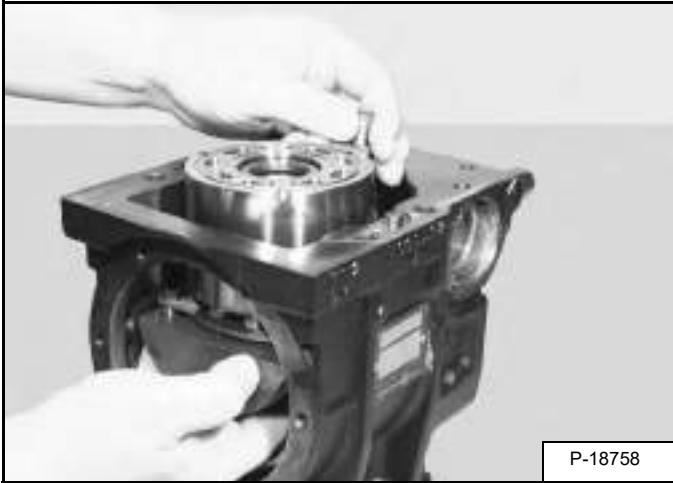
Install the bronze slider block (Item 1) [Figure 30-40-77] on the swash plate servo arm.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

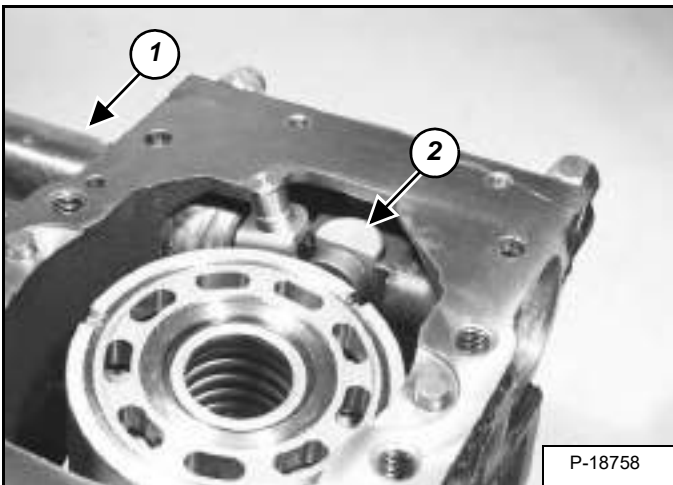
Assembly (Cont'd)

Figure 30-40-78



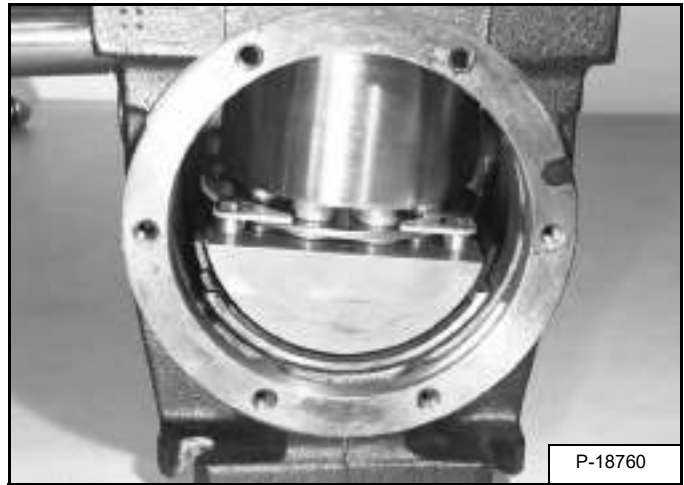
Carefully lower the cylinder block and swash plate assembly into the housing [Figure 30-40-78].

Figure 30-40-79



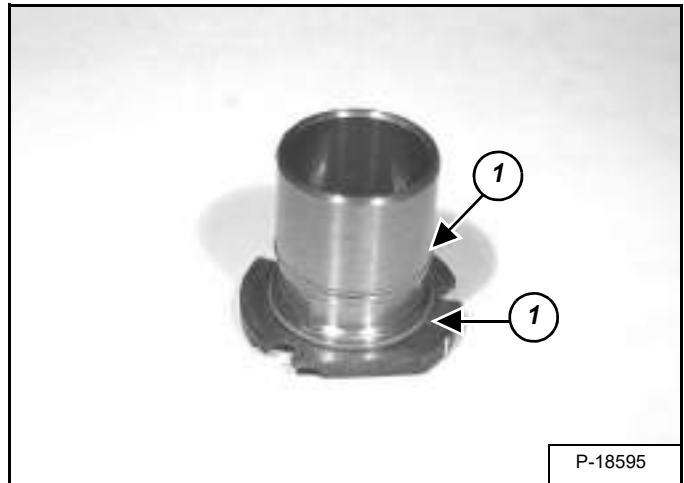
Holding the cylinder block and swash plate assembly approximately 12 mm (1/2") above the bearings. Position the servo piston (Item 1) on the bronze slider block (Item 2) [Figure 30-40-79]. Take care not to wedge the block, the parts should slide freely.

Figure 30-40-80



Lower the cylinder block and swash plate assembly until the swash plate is properly located on the bearings [Figure 30-40-80].

Figure 30-40-81



Install new O-rings (Item 1) [Figure 30-40-81] on the servo end cap.

Lightly lubricate the O-rings and the inner surface of the end cap.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

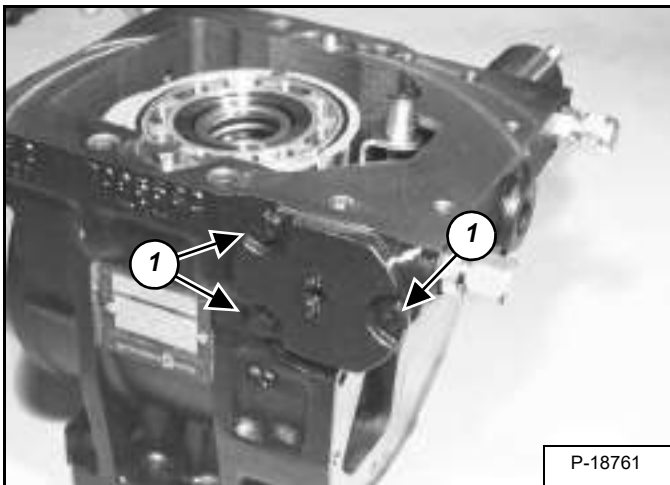
Assembly (Cont'd)

Figure 30-40-82



Hold the servo piston in position and install the servo end cap [Figure 30-40-82].

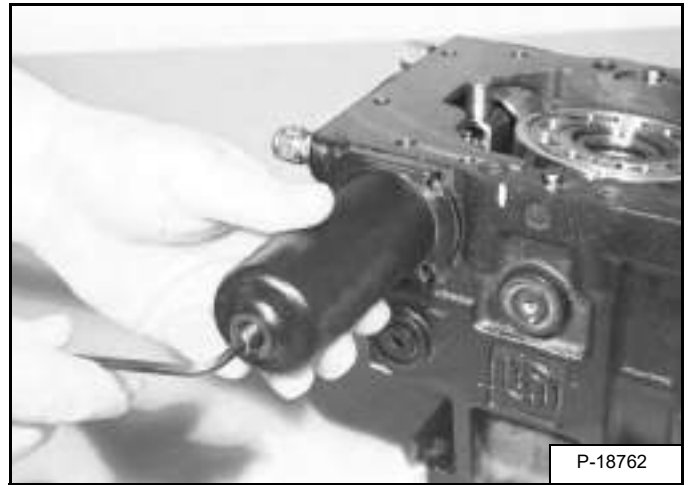
Figure 30-40-83



Install the three end cap mounting bolts (Item 1) [Figure 30-40-83]. Tighten to 13,5 N•m (10 ft-lb) torque.

Lightly lubricate the O-rings and inner surface of the adjustment cover.

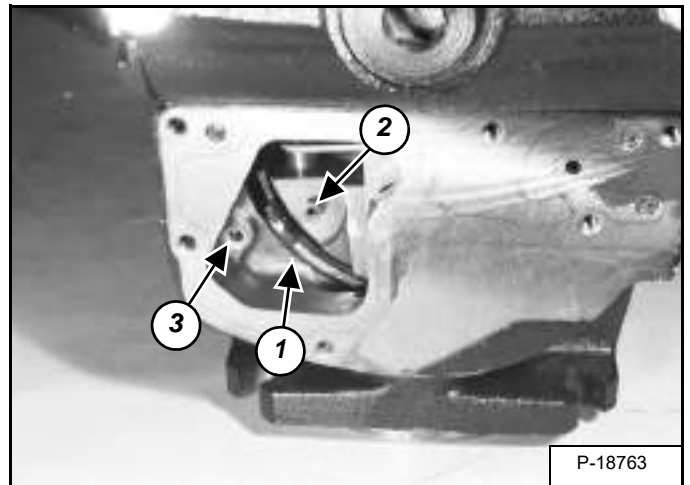
Figure 30-40-84



Install the servo adjustment cover over the servo piston until the piston adjustment screw touches the cover. Using a hex wrench, turn the adjustment screw counterclockwise while holding the cover until it is in position [Figure 30-40-84].

NOTE: Do not install the bolts at this time.

Figure 30-40-85



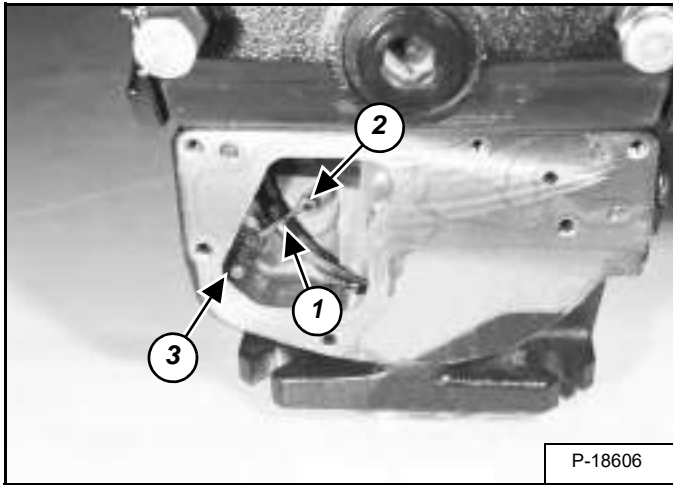
Align the slot in the swash plate bearing cage (Item 1) with the pin (Item 2) in the swash plate and the pin hole (Item 3) [Figure 30-40-85] in the housing.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

Assembly (Cont'd)

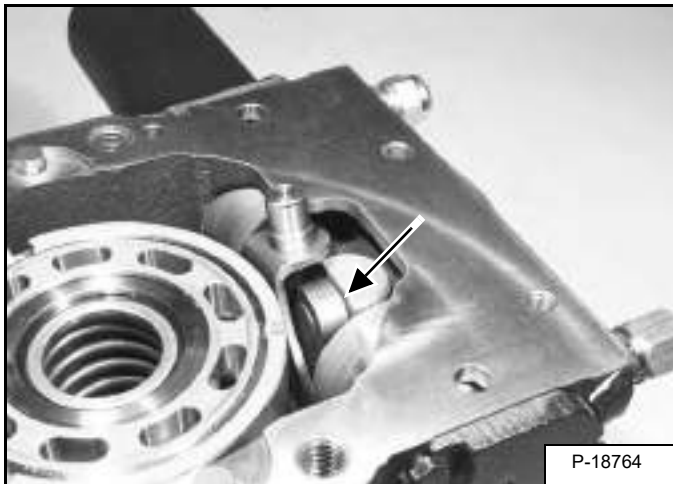
Figure 30-40-86



Hook the cage locator link (Item 1) over the pin (Item 2) [Figure 30-40-86] between the swash plate and washer. Rotate the link into the slot in the bearing cage.

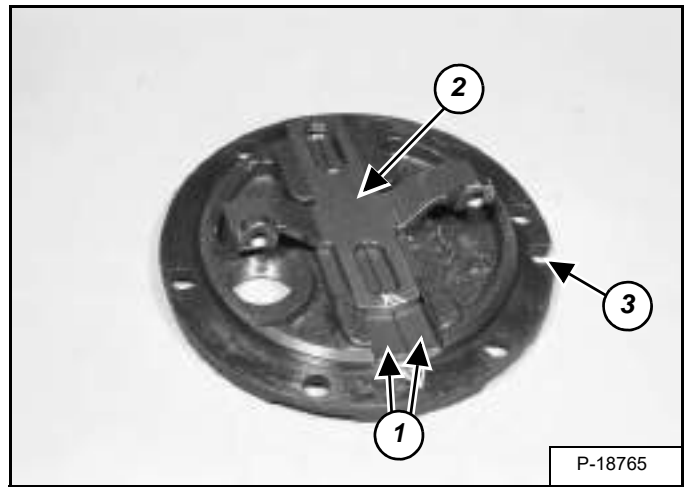
Install the anchor pin (Item 3) [Figure 30-40-86] through the locator link and into the housing.

Figure 30-40-87



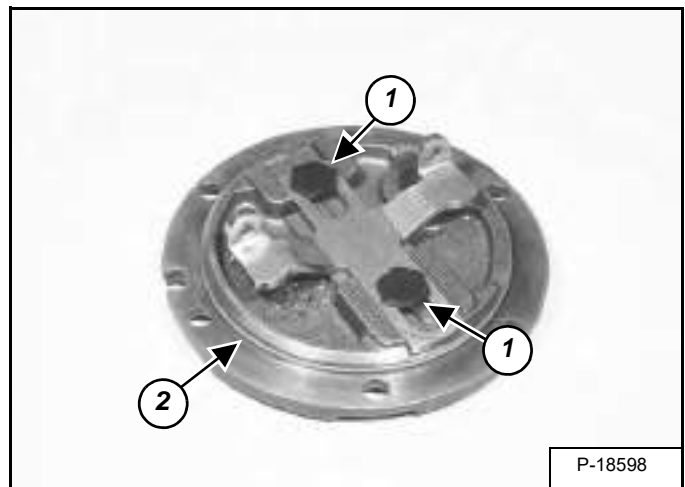
Push the swashplate assembly toward the servo piston until the swash plate guide contacts the bearing races. Check for clearance between the servo arm and the slider block [Figure 30-40-87]. If no clearance is present, recheck the assembly of the bearing cage and races.

Figure 30-40-88



Position the two side cover inserts (Item 1) and swashplate leveler (Item 2) on the side cover. Note the orientation of the leveler and the notch (Item 3) [Figure 30-40-88] in the cover.

Figure 30-40-89



Install the two guide post bolts (Item 1) [Figure 30-40-89] through the leveler and inserts. Install the sealing nuts and tighten to 23 N•m (17 ft-lb) torque.

Install a new O-ring (Item 2) [Figure 30-40-89] on the cover.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

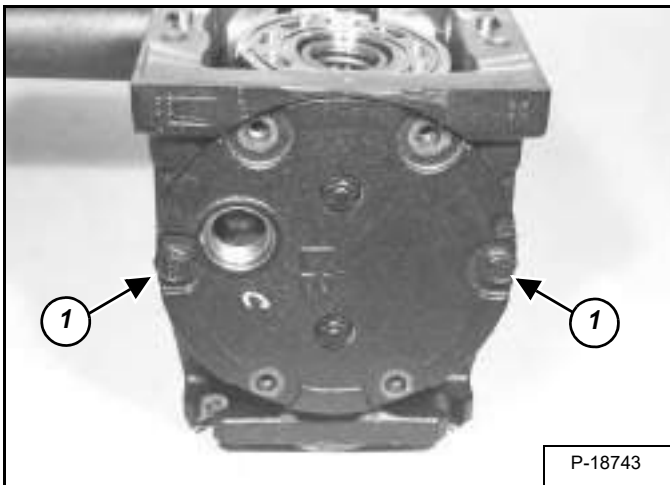
Assembly (Cont'd)

Figure 30-40-90



Lift the swash plate leveler and install the side cover [Figure 30-40-90].

Figure 30-40-91

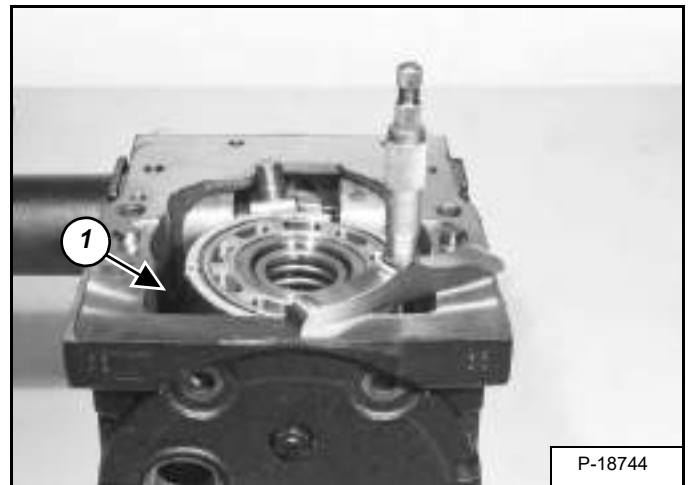


Install the two side cover bolts (Item 1) [Figure 30-40-91] finger tight.

Apply a force of 22 - 44 N (5 - 10 lb) to the swash plate leveler to make sure both leveler arms contact the swash plate.

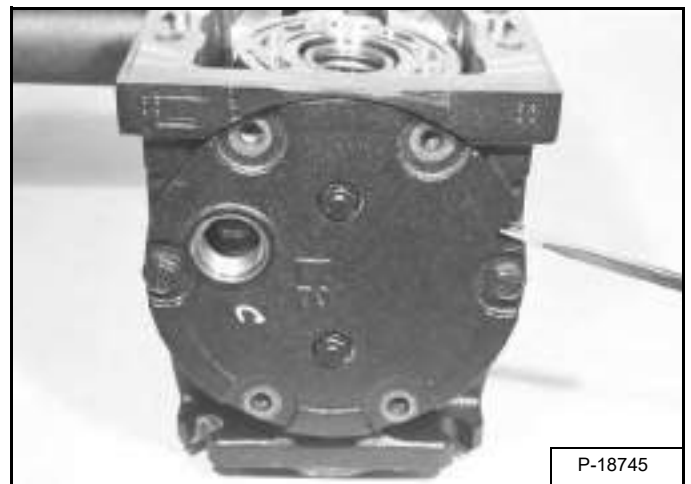
Make sure the swash plate assembly is seated correctly on the bearings.

Figure 30-40-92



Use a depth micrometer to measure the distance from the end cap to the swash plate surface. Take a second measurement at a point 90° (Item 1) [Figure 30-40-92] from the first point of measurement. These measurements must not vary more than 0,025 mm (0.001 in).

Figure 30-40-93



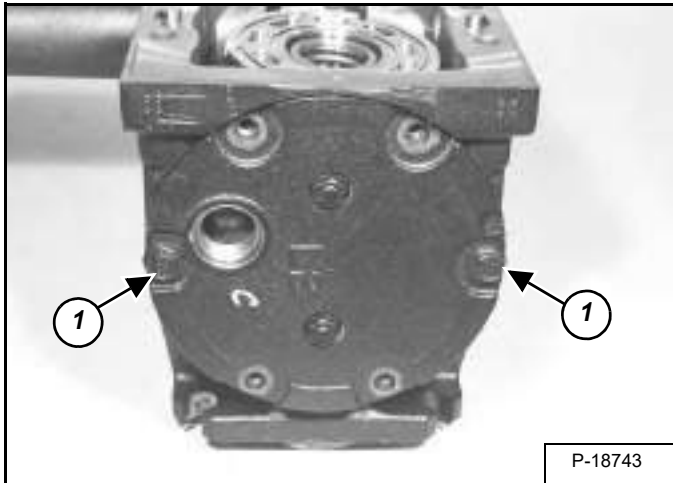
Rotate the side cover [Figure 30-40-93] (which will also rotate the leveler and swash plate) until the zero angle position is established, as determined by a second depth measurement.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

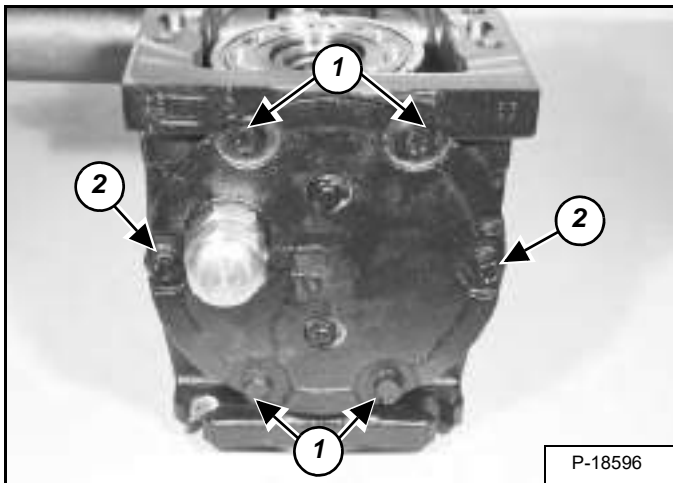
Assembly (Cont'd)

Figure 30-40-94



After the zero angle position has been established, tighten the two side cover bolts (Item 1) [Figure 30-40-94].

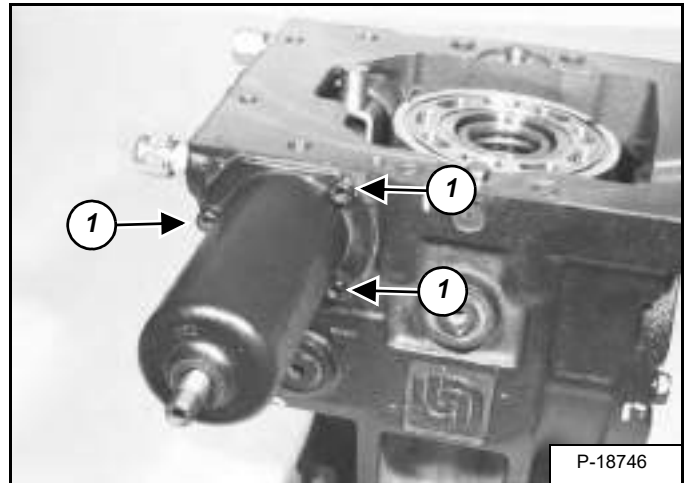
Figure 30-40-95



Install the four remaining side cover bolts, apply LOCTITE #242 to the threads of the "thru" bolts (Item 1) [Figure 30-40-95].

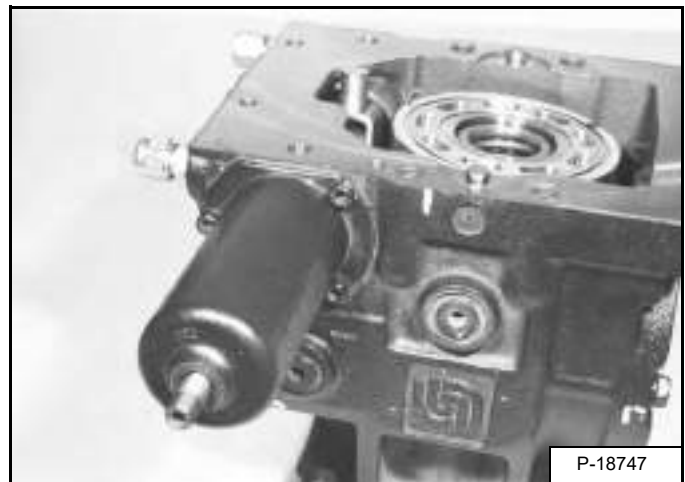
First tighten the four side cover bolts (Item 2) to 32,5 N•m (24 ft-lb) torque. Tighten the two remaining side cover bolts (Item 1) [Figure 30-40-95] to 25 N•m (18.5 ft-lb) torque.

Figure 30-40-96



Install the three servo adjustment cover mounting bolts (Item 1) [Figure 30-40-96]. Tighten to 13,5 N•m (10 ft-lb) torque.

Figure 30-40-97



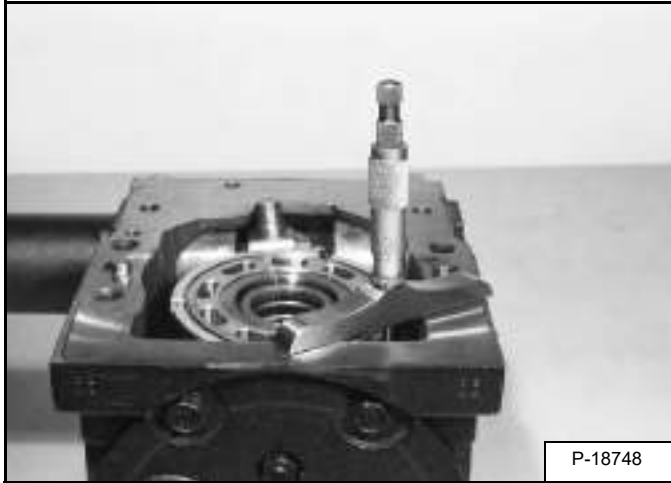
Turn the adjustment screw on the servo, which will rotate the swash plate assembly until a zero angle position is established [Figure 30-40-97].

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

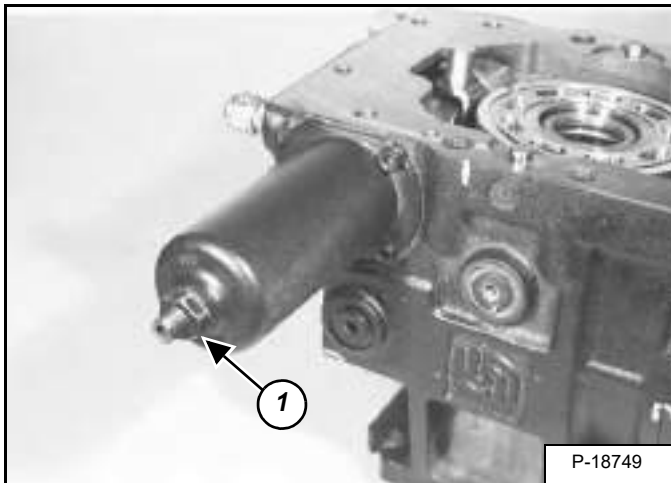
Assembly (Cont'd)

Figure 30-40-98



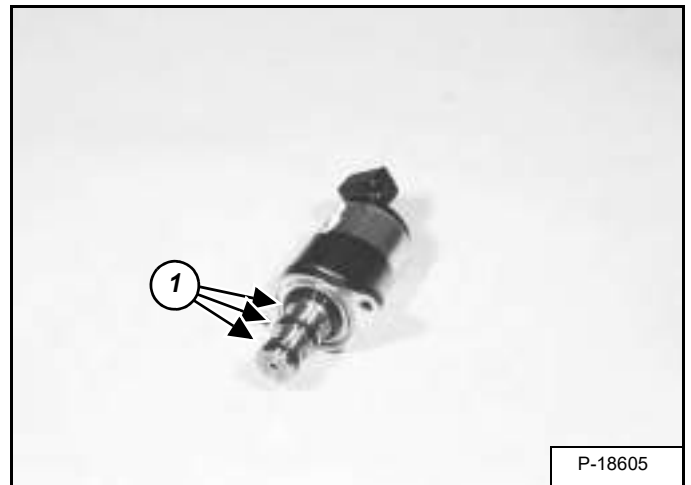
Use a depth micrometer to measure the distance from the end cap to the swash plate surface **[Figure 30-40-98]**. Take a second measurement at a point 180° from the first point of measurement. These measurements must not vary more than 0,025 mm (0.001 in).

Figure 30-40-99



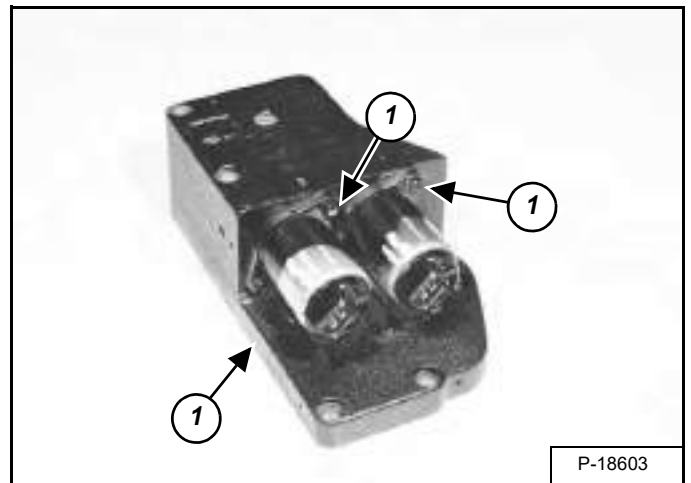
Without turning the servo adjustment screw, install the sealed nut (Item 1) **[Figure 30-40-99]** and tighten.

Figure 30-40-100



Install new O-rings (Item 1) **[Figure 30-40-100]** on the solenoid spool.

Figure 30-40-101



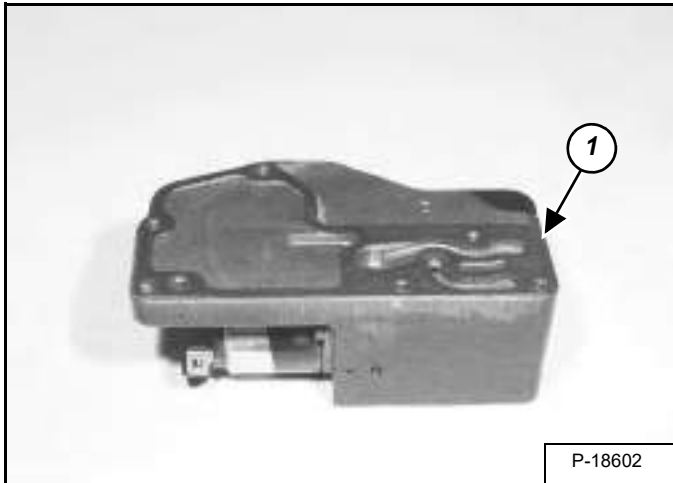
Lightly lubricate both solenoid spools and install into the manifold housing and retain with the four screws (Item 1) **[Figure 30-40-101]**.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

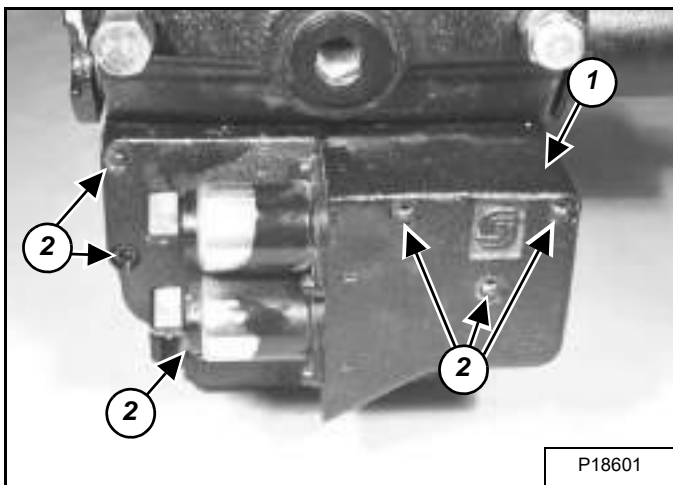
Assembly (Cont'd)

Figure 30-40-102



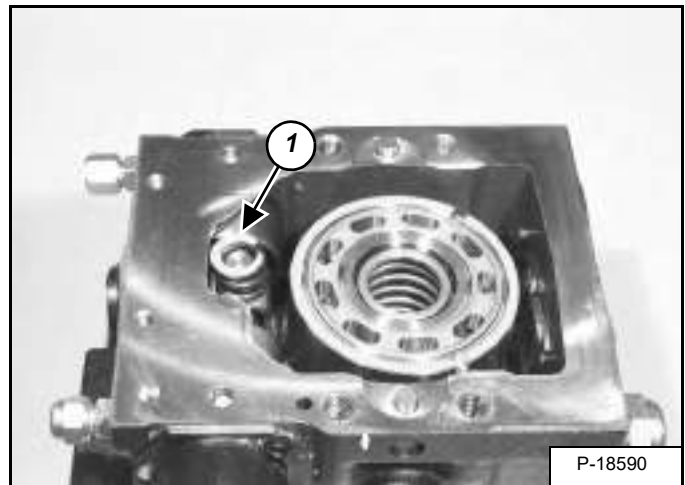
Apply assembly lube on the gasket (Item 1) [Figure 30-40-102] and install on the manifold housing.

Figure 30-40-103



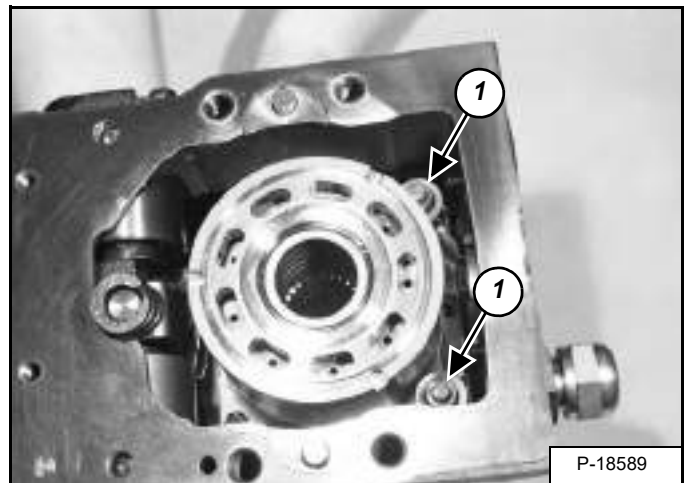
Install the manifold assembly (Item 1) on the pump with the six screws (Item 2) [Figure 30-40-103].

Figure 30-40-104



Install the spring (Item 1) [Figure 30-40-104] on the servo arm link.

Figure 30-40-105



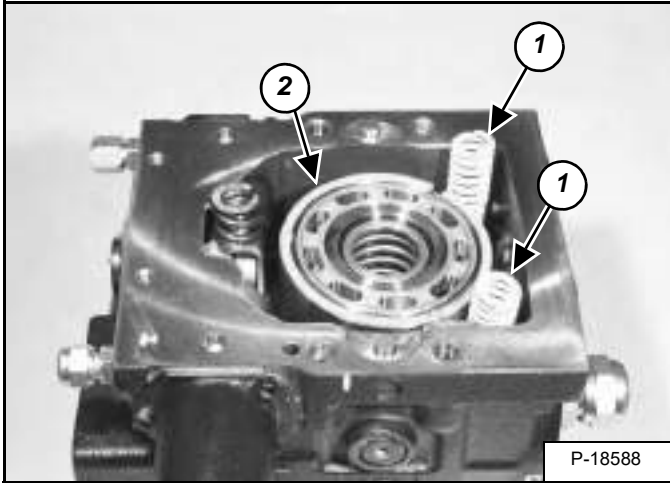
Install the spring seats (Item 1) [Figure 30-40-105] on the leveler arms.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

Assembly (Cont'd)

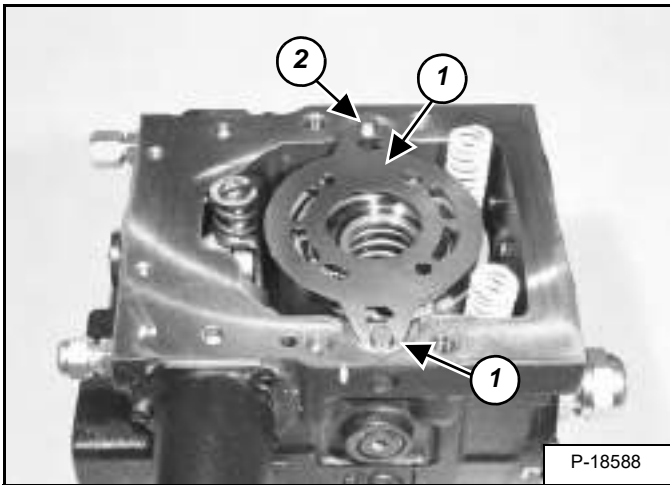
Figure 30-40-106



Install both springs (Item 1) [Figure 30-40-106] on the leveler spring seats.

Lubricate the running surface of the cylinder (Item 2) [Figure 30-40-106].

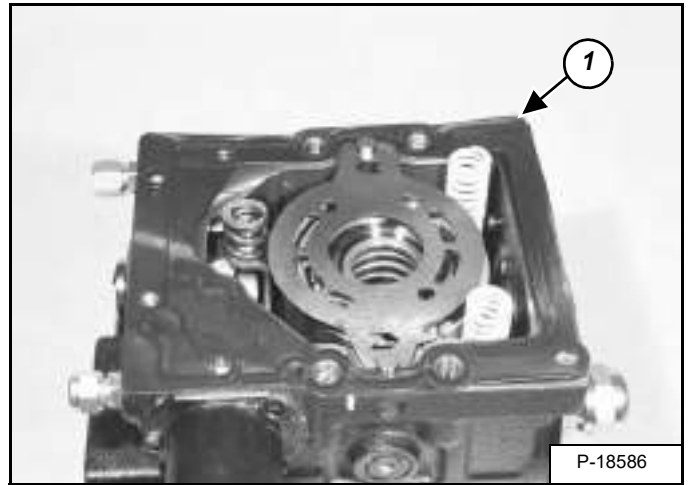
Figure 30-40-107



Install the valve plate (Item 1) [Figure 30-40-107] on the alignment pins.

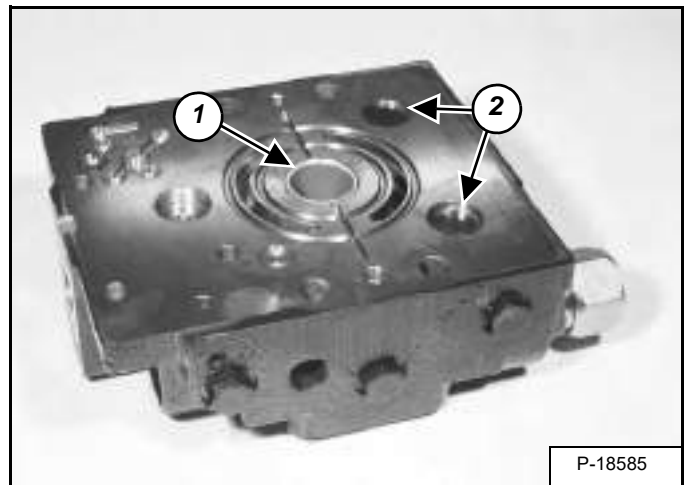
NOTE: The direction of the arrow cut outs (Item 2) [Figure 30-40-107] in the valve plate.

Figure 30-40-108



Install a new gasket (Item 1) [Figure 30-40-108] on the housing.

Figure 30-40-109



Lubricate the charge pump journal bearing (Item 1). Install the hardened shims (Item 2) [Figure 30-40-109] in the charge pump pockets for the swash plate leveler springs. Retain the shims with assembly lube.

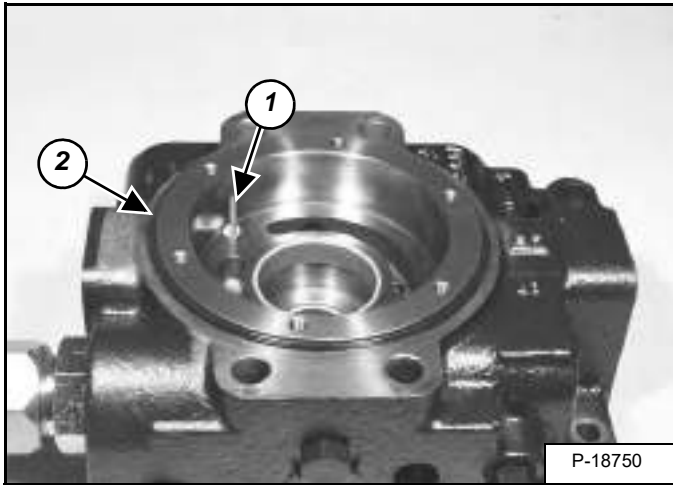
Turn the charge pump housing over.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

Assembly (Cont'd)

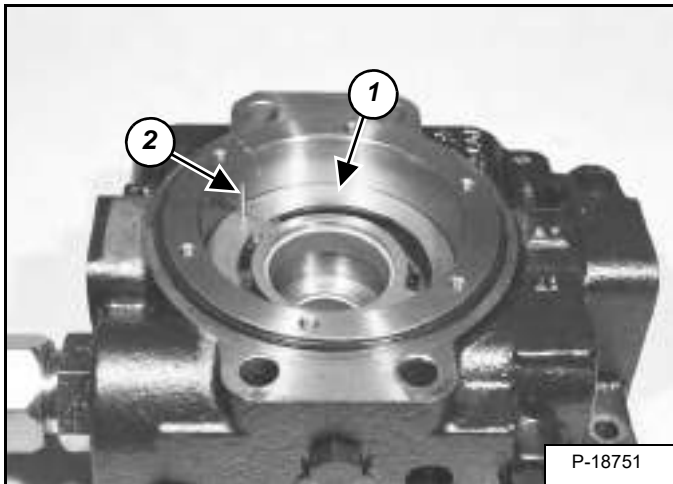
Figure 30-40-110



Lightly lubricate the alignment pin (Item 1) [Figure 30-40-110] and install into the charge pump housing, in the position marked at time of disassembly. This will properly align the wear plate and eccentric ring.

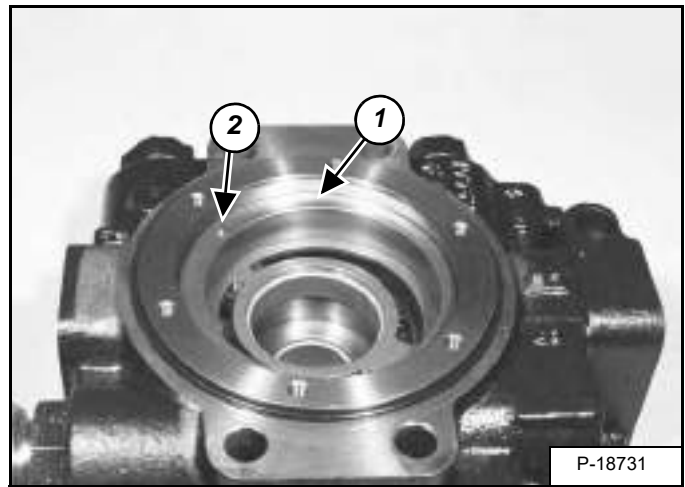
Install a new O-ring (Item 2) [Figure 30-40-110].

Figure 30-40-111



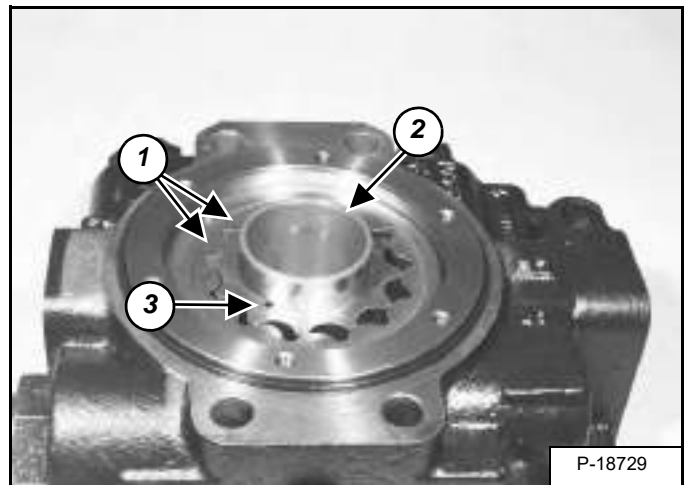
Lubricate both sides of the wear plate (Item 1) and install in the charge pump. Align the wear plate with the alignment pin (Item 2) [Figure 30-40-111].

Figure 30-40-112



Install the eccentric ring (Item 1) in the charge pump and align with the alignment pin (Item 2) [Figure 30-40-112].

Figure 30-40-113



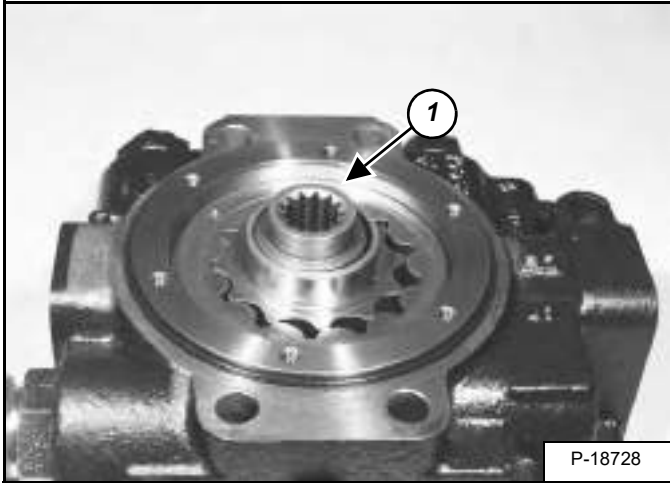
Apply assembly lube and install the charge pump gears (Item 1), charge pump shaft (Item 2) and key (Item 3) [Figure 30-40-113] into the pump.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

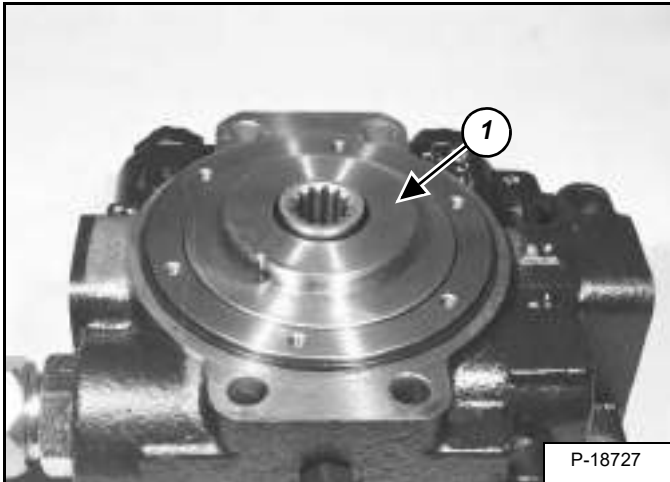
Assembly (Cont'd)

Figure 30-40-114



Install the coupler (Item 1) [Figure 30-40-114].

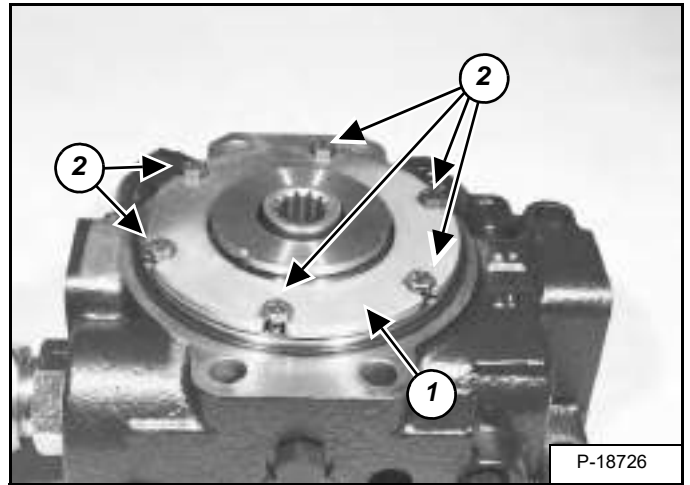
Figure 30-40-115



Install the charge pump cover (Item 1) [Figure 30-40-115].

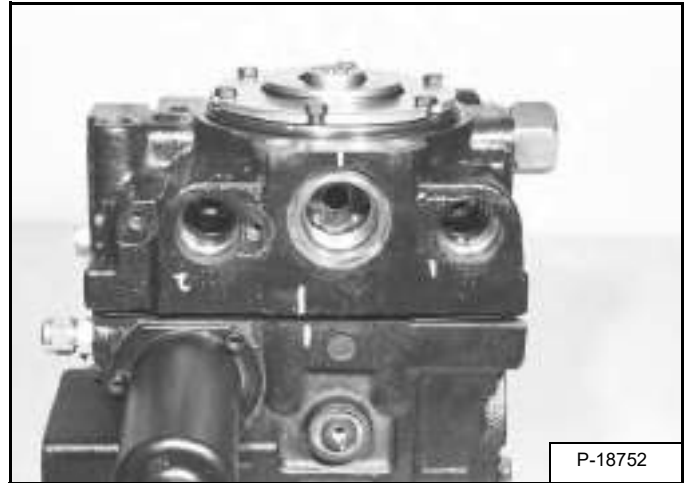
Rotate until the pin hole in the cover aligns with the pin.

Figure 30-40-116



Install the retaining plate cover (Item 1) and six bolts (Item 2) [Figure 30-40-116]. Tighten the bolts to 13,5 N•m (10 ft-lb) torque.

Figure 30-40-117



Lower the charge pump onto the pump housing while positioning the three springs in their pockets [Figure 30-40-117].

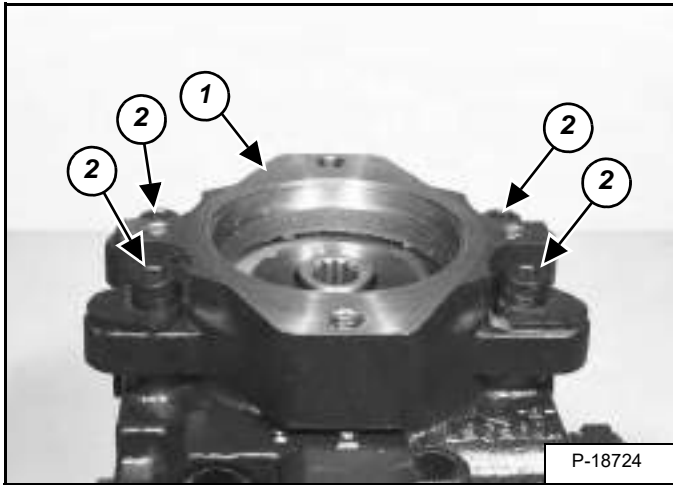
When properly installed, the charge pump will engage the alignment pins, but the springs will hold the charge pump housing 3 to 8 mm (1/8 to 1/4 in) away from the pump housing.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

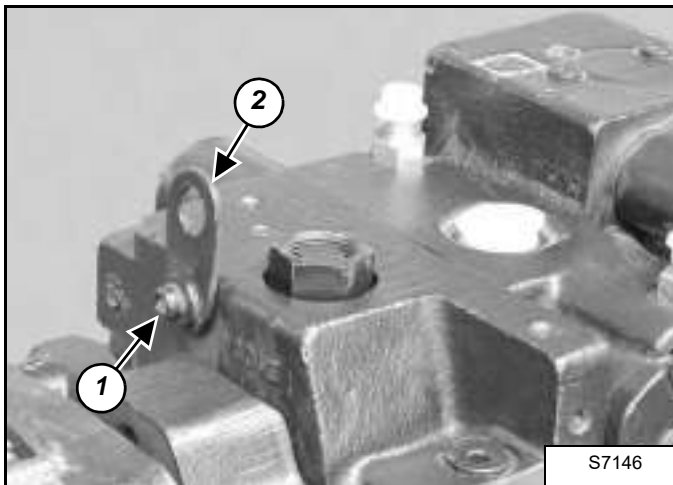
Assembly (Cont'd)

Figure 30-40-118



Install the flange adapter (Item 1) and four bolts (Item 2) [Figure 30-40-118]. Tighten the bolts to 122 N•m (90 ft-lb) torque.

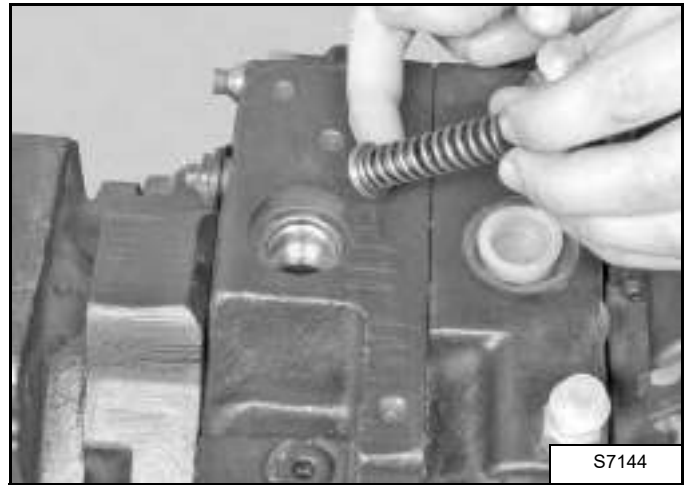
Figure 30-40-119



Install the mounting bolt (Item 1) [Figure 30-40-119] and tighten to 38 N•m (28 ft-lb) torque.

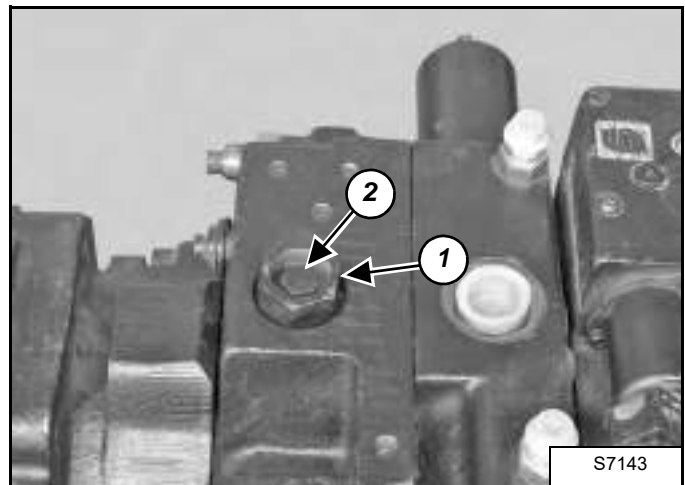
NOTE: Install the lifting bracket (Item 2) [Figure 30-40-119].

Figure 30-40-120



Install the spring and relief poppet into the charge pump [Figure 30-40-120].

Figure 30-40-121



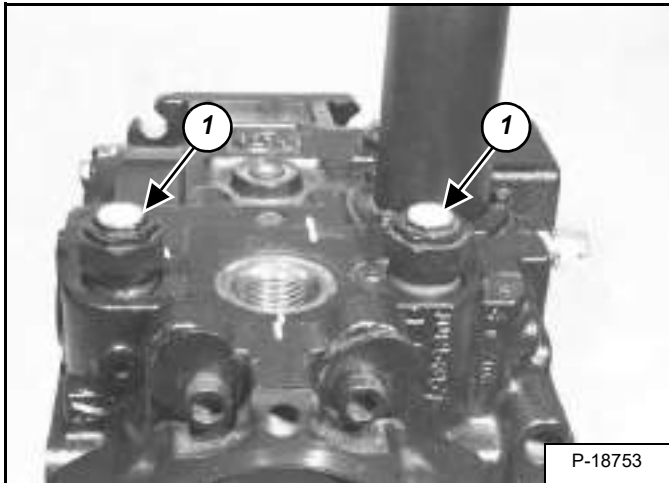
Install the plug with lock nut (Item 1) [Figure 30-40-121], align the marks made at disassembly. Tighten the lock nut to 52 N•m (38 ft-lb) torque.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

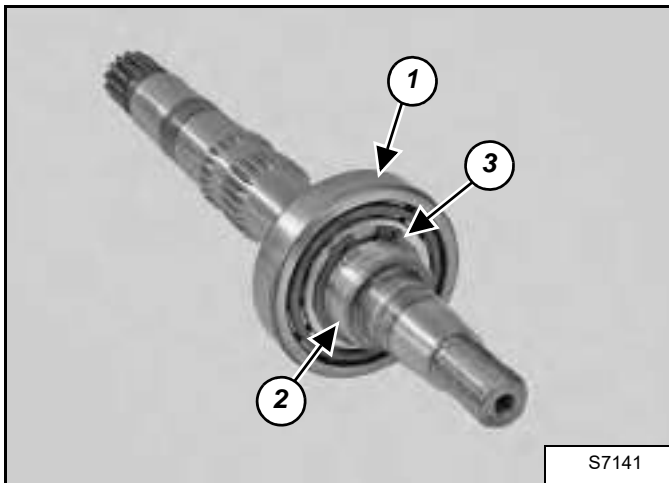
Assembly (Cont'd)

Figure 30-40-122



Lightly lubricate and install both multi-function valve assemblies (Item 1) [Figure 30-40-122] in the charge pump. Tighten to 89 N•m (66 ft-lb) torque.

Figure 30-40-123



Install the bearing (Item 1), the spacer washer (Item 2) and the snap ring (Item 3) [Figure 30-40-123] on the drive shaft.

Position the pump on the charge pump end.

Figure 30-40-124



Install the shaft and bearing assembly, aligning the shaft spline with the cylinder block spline. Continue to lower the shaft and align with the charge pump journal bearing and charge pump coupler [Figure 30-40-124].

Figure 30-40-125



Install a new O-ring (Item 1) [Figure 30-40-125].

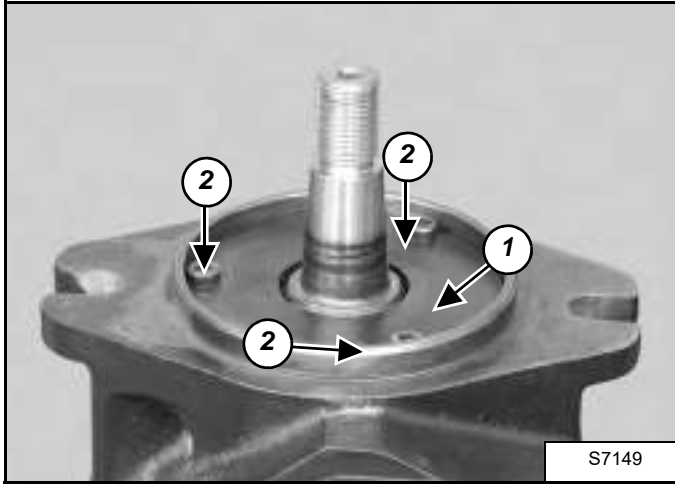
Lubricate the seal with assembly lube and install the seal assembly on the drive shaft and in the housing.

Dealer Copy -- Not for Resale

**HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)
(CONT'D)**

Assembly (Cont'd)

Figure 30-40-126



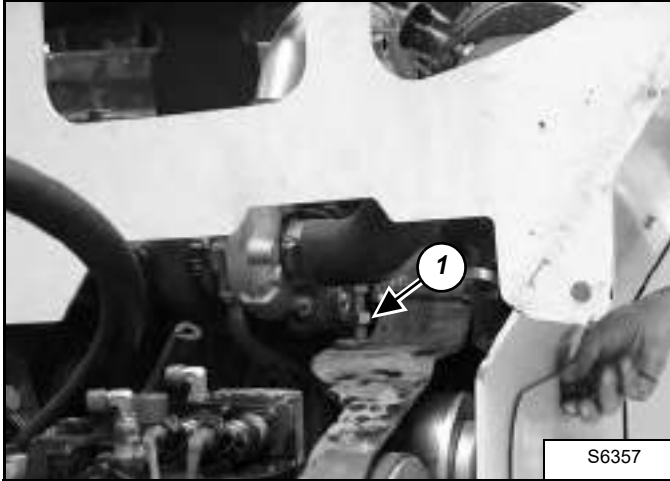
Install the retainer plate (Item 1) and three bolts (Item 2) **[Figure 30-40-126]**. Tighten the bolts in a sequenced pattern to 16 N•m (12 ft-lb) torque.

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE)

Removal And Installation

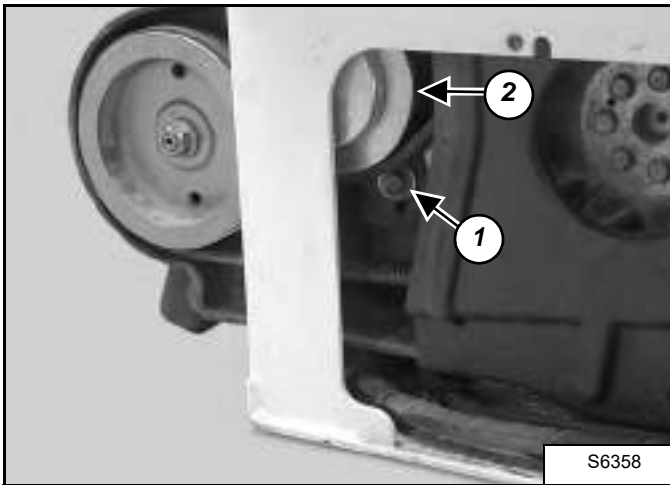
Remove the engine / hydrostat assembly. ((See Removal And Installation on Page 70-50-1.))

Figure 30-41-1



Loosen the bolt and nut (Item 1) [Figure 30-41-1].

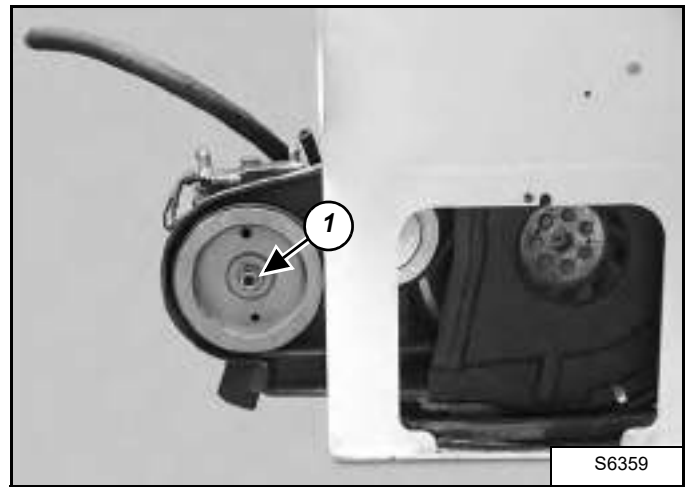
Figure 30-41-2



Loosen the bolt (Item 1) and move the tensioner pulley (Item 2) [Figure 30-41-2] up to loosen tension on the the drive belt.

Remove the drive belt.

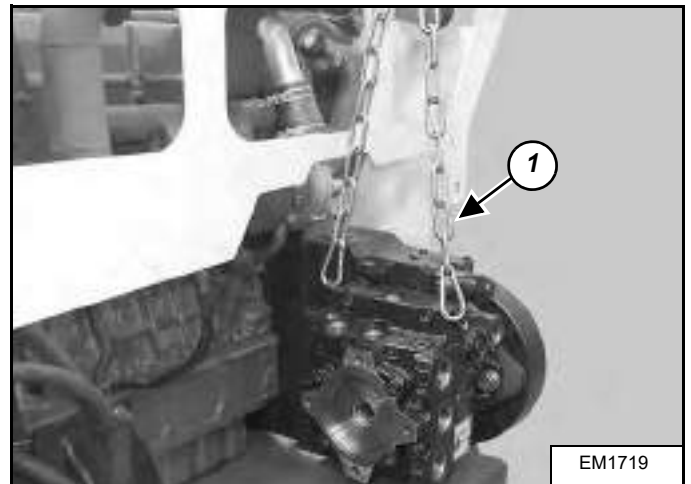
Figure 30-41-3



Loosen the nut (Item 1) [Figure 30-41-3] for about 8 mm (1/3 in). This will prevent the pulley from falling or damaging thread during removal.

Installation: Tighten the nut to 497 N•m (4400 ft-lb) torque.

Figure 30-41-4



Install a chain hoist to the pump eyelets to lift and support the pump assembly.

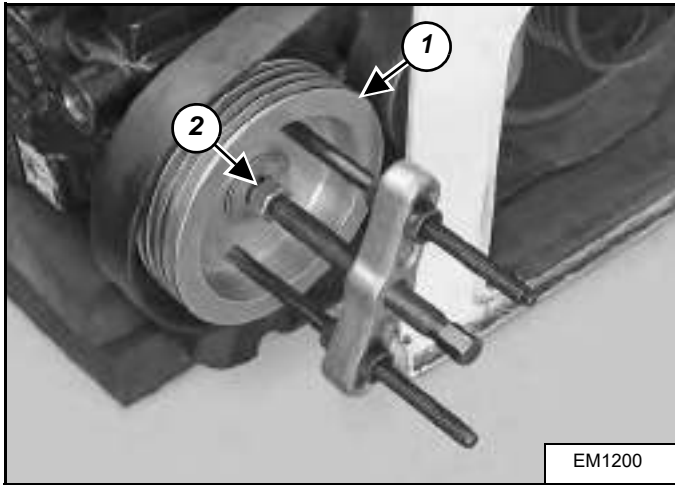
NOTE: Be careful when handling the hydrostatic motor. Its weight is more than 40 kg (88 lbs).

Dealer Copy -- Not for Resale

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

Removal And Installation (Cont'd)

Figure 30-41-5

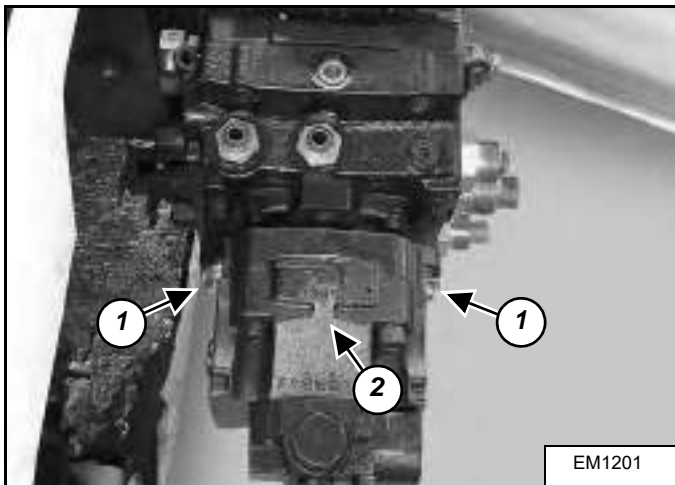


Remove the pulley (Item 1) [Figure 30-41-5] from the pump shaft.

Installation: Tighten the bolt to 300-330 N•m (220-245 ft-lb) torque.

Remove the nut (Item 2) and pulley (Item 1) [Figure 30-41-5] from the pump shaft.

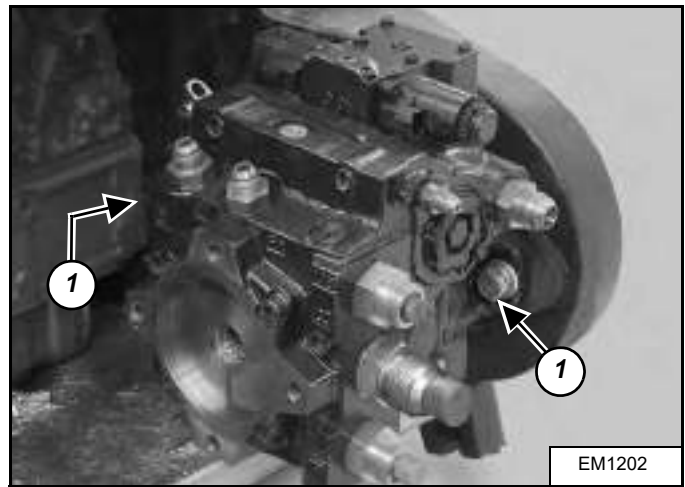
Figure 30-41-6



Remove the two bolts (Item 1) and remove the hydraulic pump (Item 2) [Figure 30-41-6] from the hydrostatic pump.

Assembly: Tighten the bolts to 70,8-80 N•m (52-59 ft-lb) torque.

Figure 30-41-7



Remove the two hydrostatic pump mounting bolts (Item 1) [Figure 30-41-7].

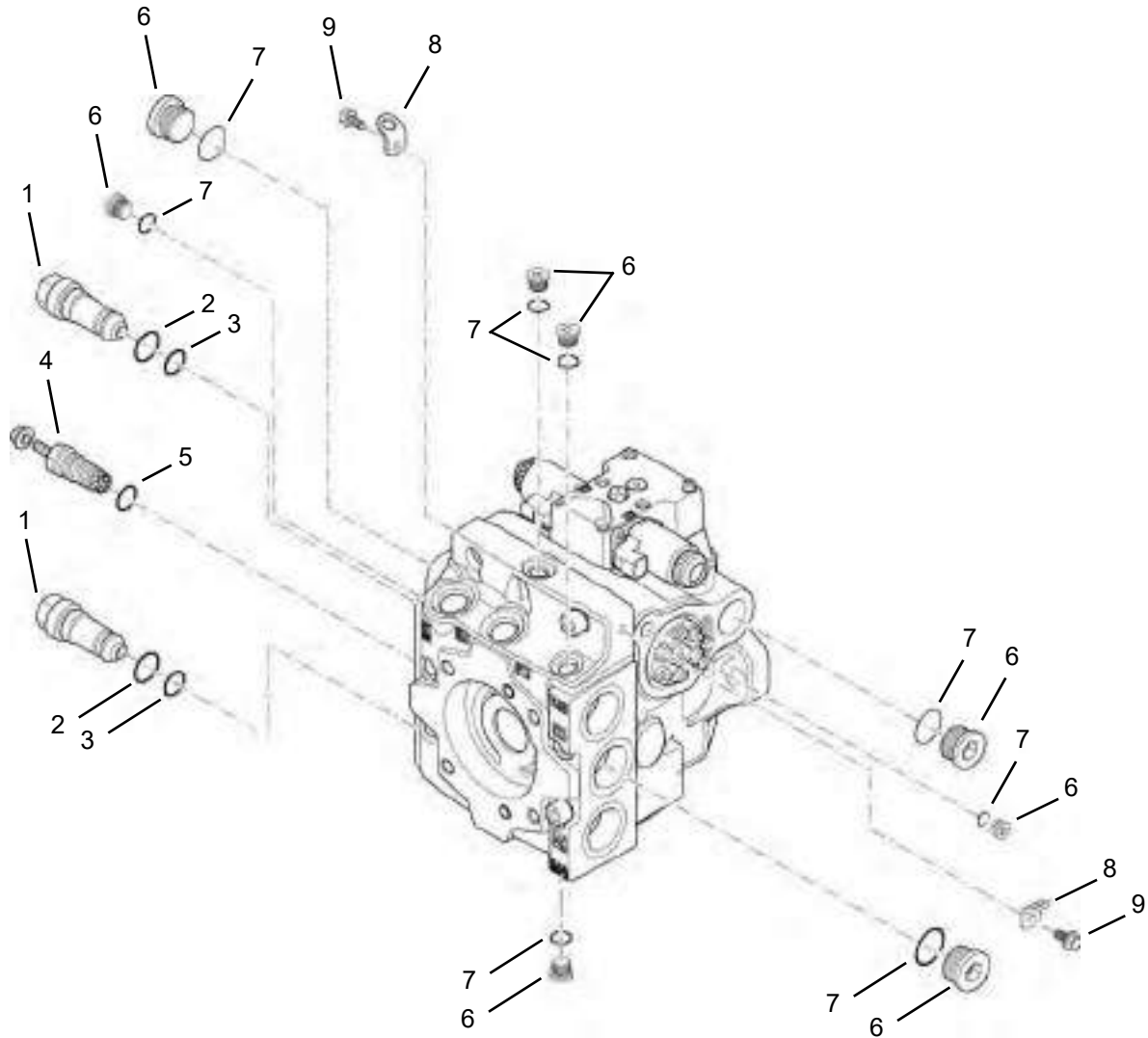
Assembly: Tighten the mounting bolts to 94-106 N•m (69-78 ft-lb) torque.

Remove the hydrostatic pump.

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

Parts Identification

- 1. **Multi-Function Valve Assembly**
- 2. **O-Ring**
- 3. **O-Ring**
- 4. **Charge Relief Valve**
- 5. **O-ring**
- 6. **Plug**
- 7. **O-Ring**
- 8. **Lifting Bracket**
- 9. **Bolt**



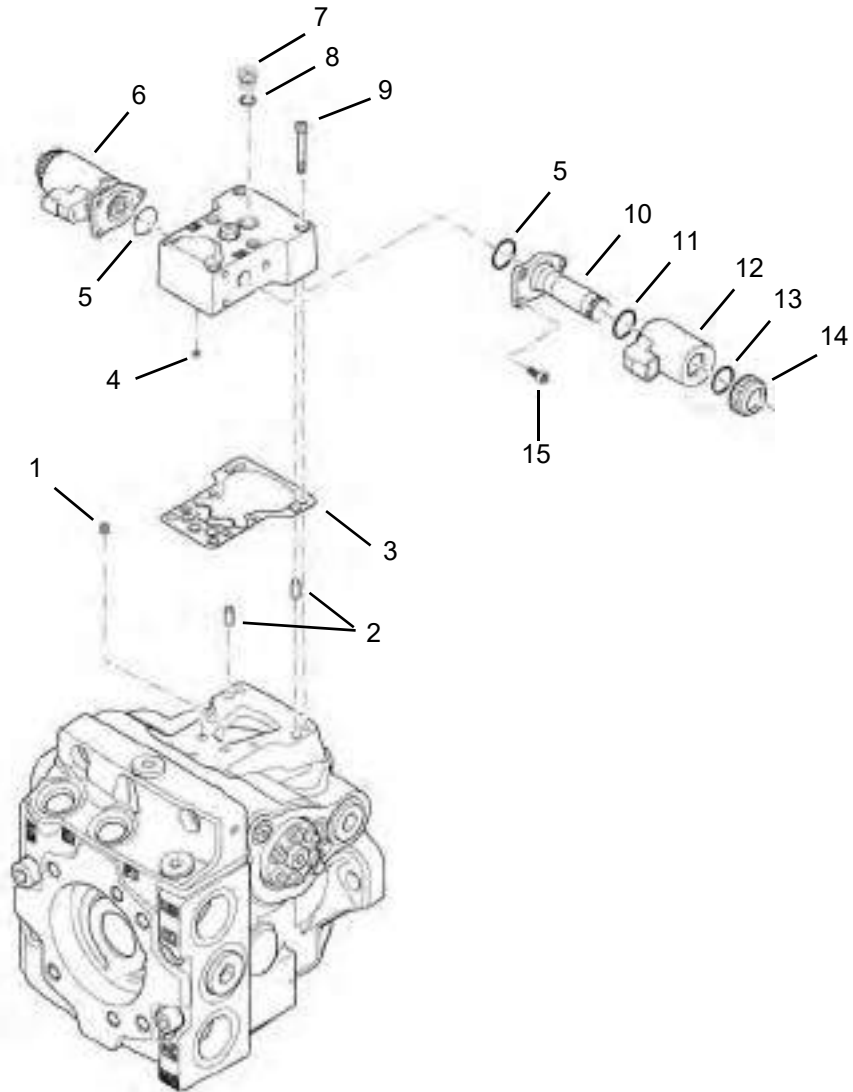
Dealer Copy -- Not for Resale

EM1203

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

Parts Identification (Cont'd)

- 1. Orifice
- 2. Pin
- 3. Gasket
- 4. Filter Screen
- 5. O-Ring
- 6. Solenoid
- 7. Plug
- 8. O-Ring
- 9. Bolt
- 10. Actuator
- 11. O-Ring
- 12. Coil
- 13. O-Ring
- 14. Nut
- 15. Screw



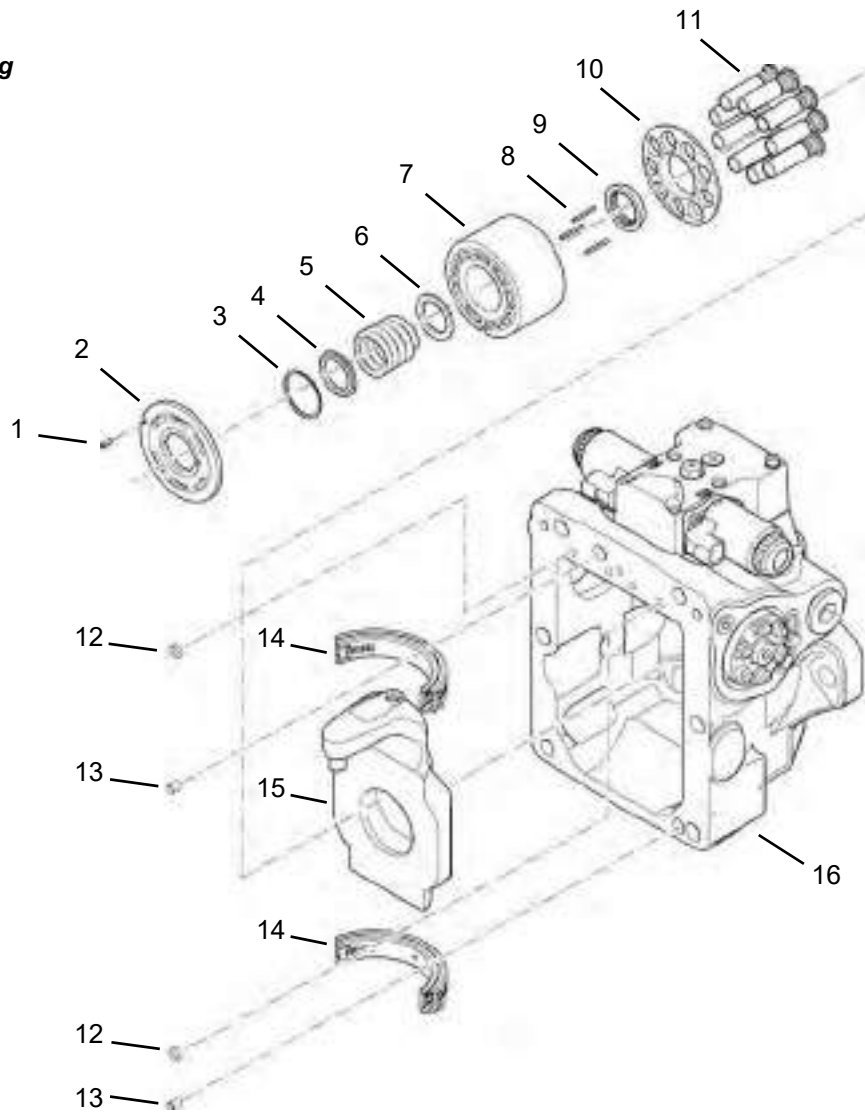
Dealer Copy -- Not for Resale

EM1204

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

Parts Identification (Cont'd)

- 1. Roll Pin
- 2. Valve Plate
- 3. Retainer
- 4. Spring Seat
- 5. Spring
- 6. Washer
- 7. Cylinder Block
- 8. Pin
- 9. Ball Guide Retainer
- 10. Slipper Guide
- 11. Piston
- 12. Filter Screen
- 13. Pin
- 14. Bearing Assembly
- 15. Swash Plate
- 16. Piston Pump Housing



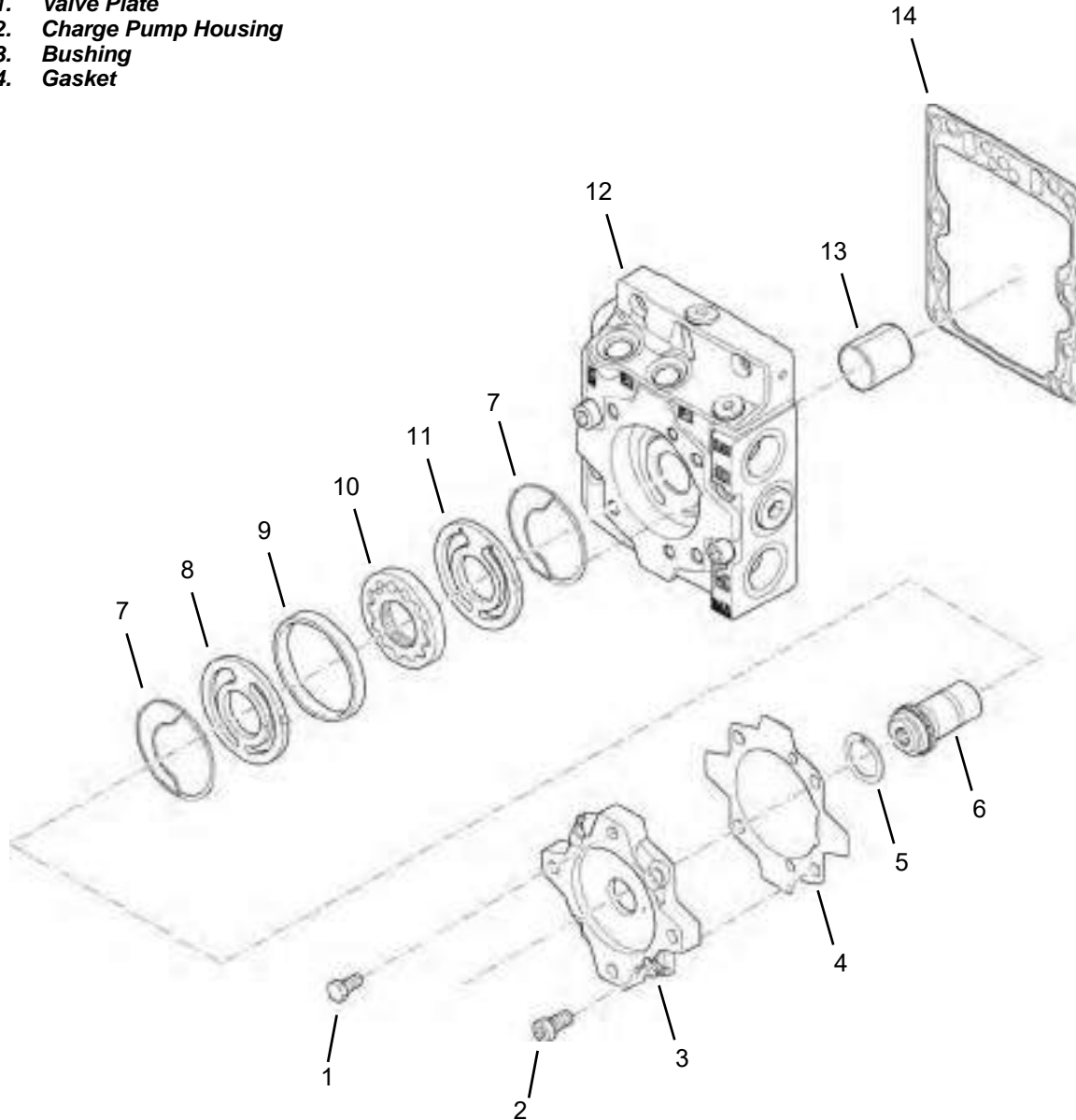
Dealer Copy -- Not for Resale

EM1205

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

Parts Identification (Cont'd)

- 1. Bolt
- 2. Bolt
- 3. Flange Adaptor
- 4. Gasket
- 5. Thrust bearing
- 6. Coupling
- 7. Seal
- 8. Pressure Balance Plate
- 9. Ring
- 10. Charge Pump Gears
- 11. Valve Plate
- 12. Charge Pump Housing
- 13. Bushing
- 14. Gasket



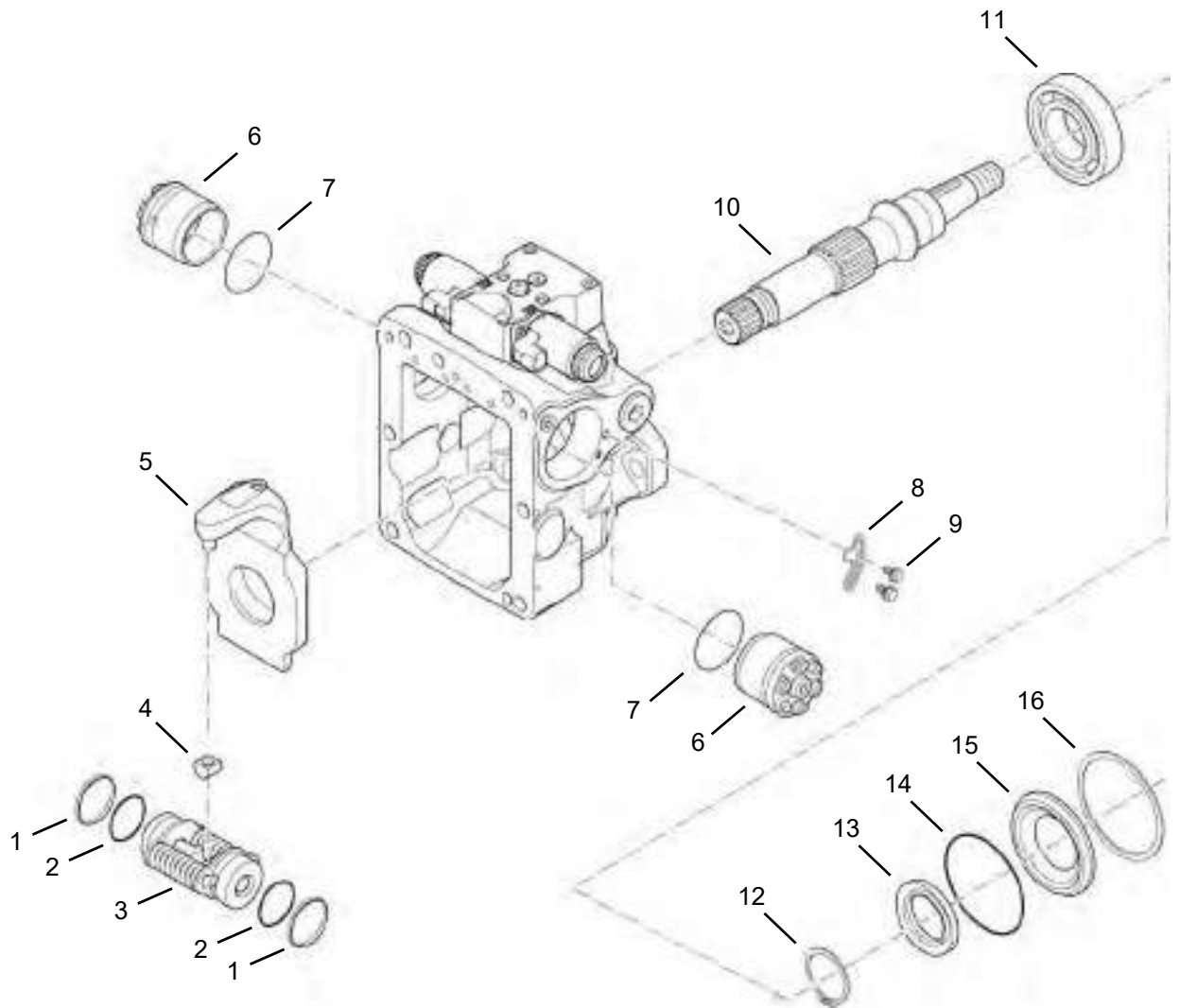
EM1206

Dealer Copy -- Not for Resale

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

Parts Identification (Cont'd)

- 1. *Piston Ring*
- 2. *O-Ring*
- 3. *Servo Piston*
- 4. *Block*
- 5. *Swash Plate*
- 6. *Cylinder*
- 7. *O-Ring*
- 8. *Lock Plate*
- 9. *Bolt*
- 10. *Shaft*
- 11. *Bearing*
- 12. *Snap Ring*
- 13. *Seal*
- 14. *O-Ring*
- 15. *Seal Carrier*
- 16. *Retainer*



Dealer Copy -- Not for Resale

EM1731

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

Shaft Disassembly

Clean the outside of the pump before disassembly.

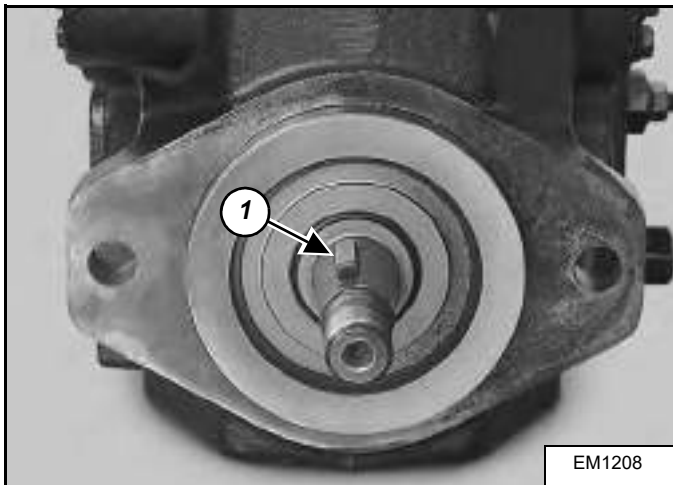
Mark the outside of the pump for ease of assembly.

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

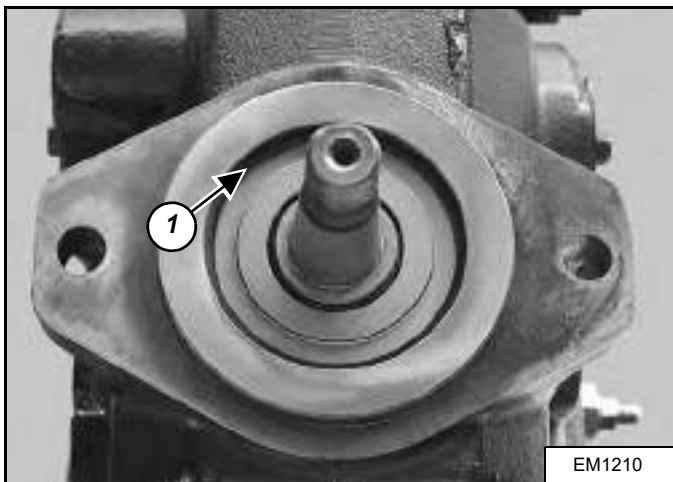
I-2003-0888

Figure 30-41-8



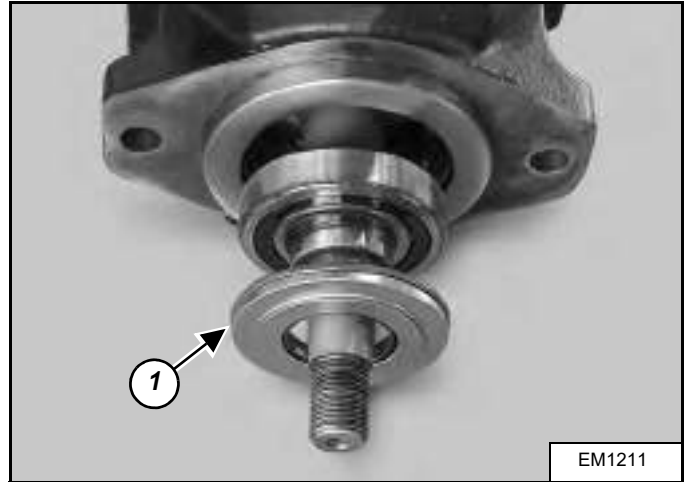
Remove the key (Item 1) [Figure 30-41-9].

Figure 30-41-9



Remove the retainer (Item 1) [Figure 30-41-9].

Figure 30-41-10

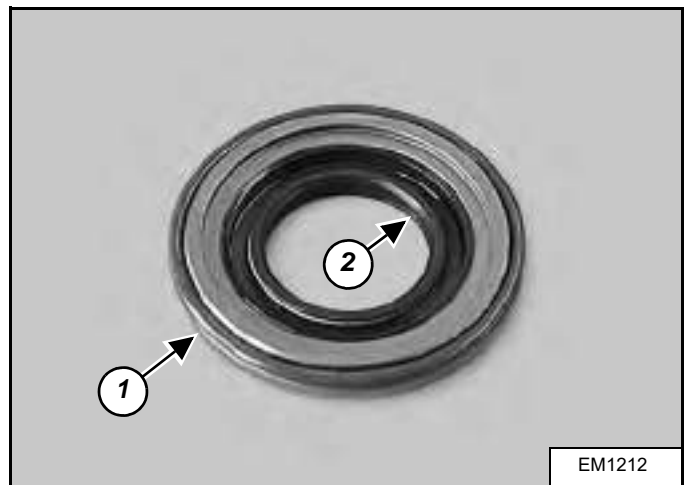


Remove the shaft and bearing assembly from the housing [Figure 30-41-10].

Remove the seal carrier (Item 1) [Figure 30-41-10] from the shaft.

NOTE: For easier removal, use a hammer and drift to tap lightly on the rear side of the shaft.

Figure 30-41-11



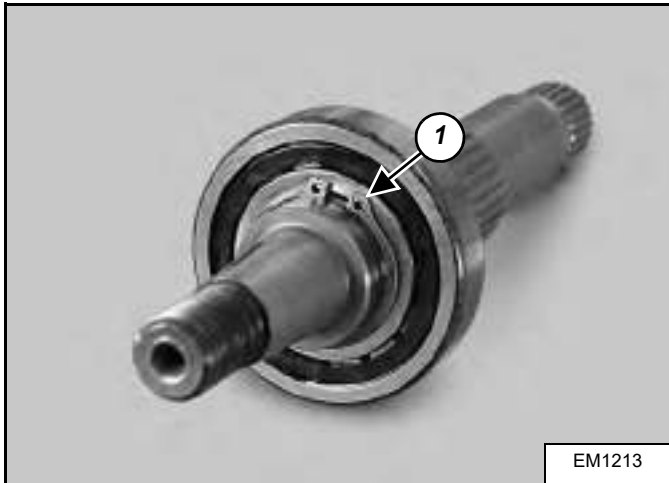
Remove the O-ring (Item 1) and shaft seal (Item 2) [Figure 30-41-11] from the seal carrier.

Dealer Copy -- Not for Resale

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

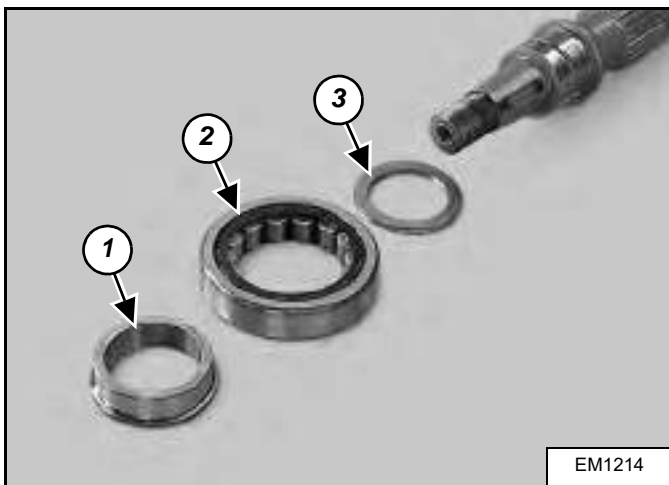
Shaft Disassembly (Cont'd)

Figure 30-41-12



Remove the snap ring (Item 1) [Figure 30-41-12] from the shaft.

Figure 30-41-13

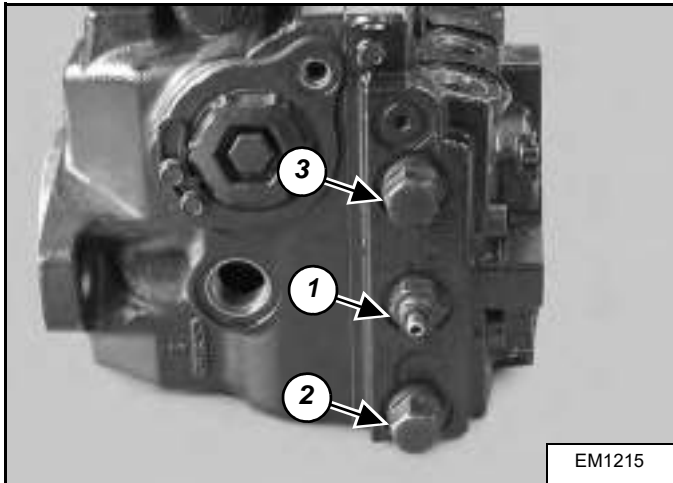


Press the bearing off the shaft. The bearing exists of three parts (Items 1, 2 & 3) [Figure 30-41-13].

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

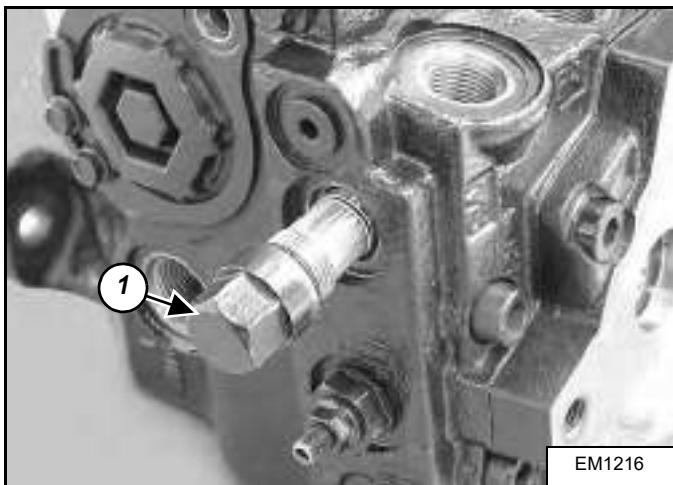
Relief Valves Disassembly And Assembly

Figure 30-41-14



- Charge pressure relief valve (gearset pump pressure relief) (Item 1) [Figure 30-41-14].
- High pressure relief valves (piston pump pressure relief):
`A' port side (Item 2) [Figure 30-41-14].
`B' port side (Item 3) [Figure 30-41-14].

Figure 30-41-15

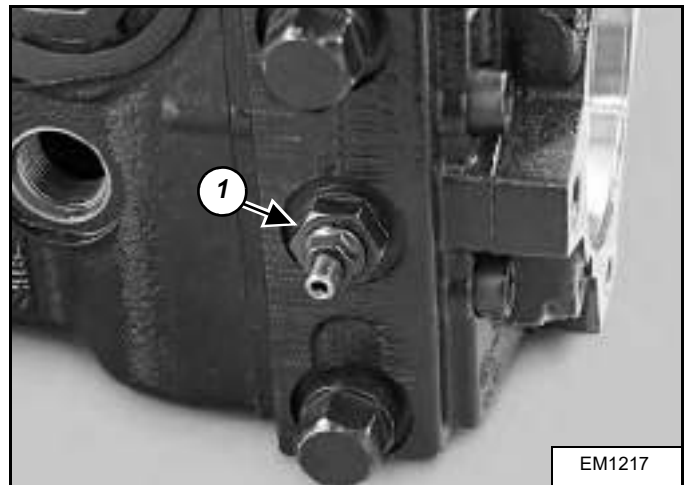


Remove the B port side relief valve (Item 1) [Figure 30-41-15].

Repeat for the A port side relief valve.

Installation: Tighten the valves to 110 N•m (81 ft-lb) torque.

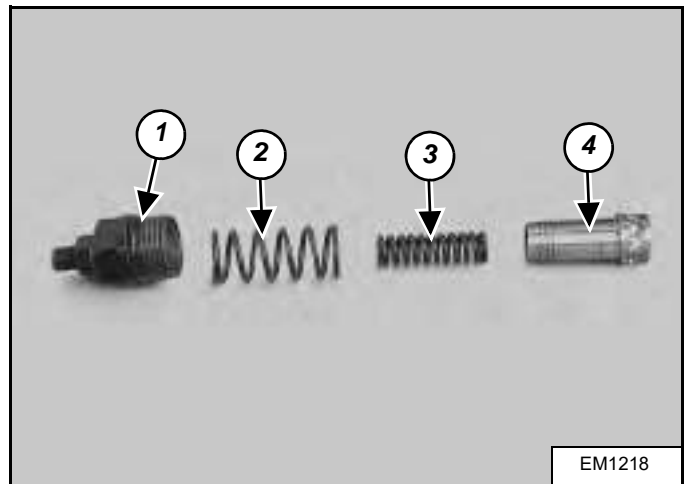
Figure 30-41-16



Remove the charge pressure relief valve (Item 1) [Figure 30-41-16].

Installation: Tighten the valve to 52 N•m (38 ft-lb) torque.

Figure 30-41-17



The valve exists of the following components: adjustable valve housing (Item 1), spring (Item 2), spring (Item 3) and spool (Item 4) [Figure 30-41-17].

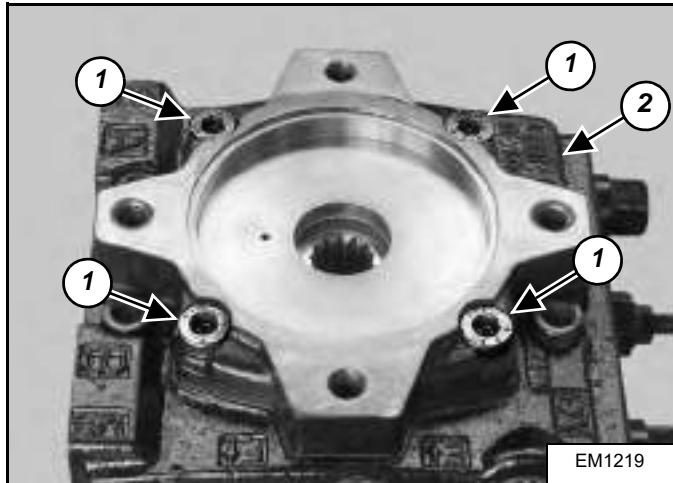
HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

Charge Pump Disassembly

Place the pump on the work surface with the charge pump up.

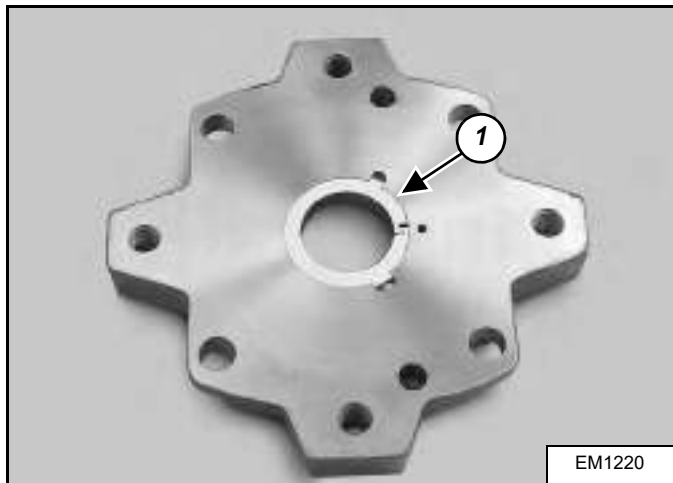
Mark the pump housings for correct assembly.

Figure 30-41-18



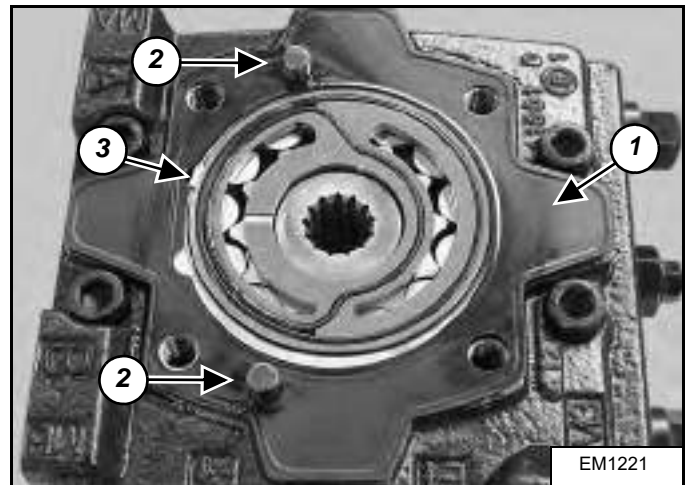
Remove the four bolts (Item 1) and remove the cover (Item 2) [Figure 30-41-18] from the charge pump housing.

Figure 30-41-19



Remove the thrust washer (Item 1) [Figure 30-41-19] from the cover.

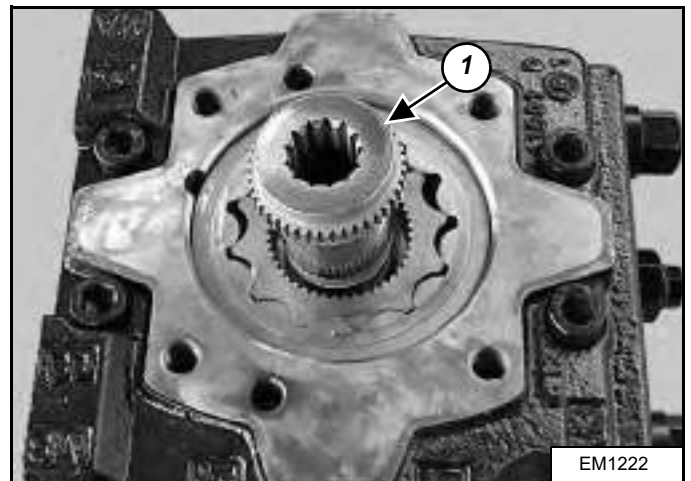
Figure 30-41-20



Remove the gasket (Item 1) and two pins (Item 2) [Figure 30-41-20] from the charge pump.

Lift the pressure balance plate (Item 3) [Figure 30-41-20] from the charge pump.

Figure 30-41-21



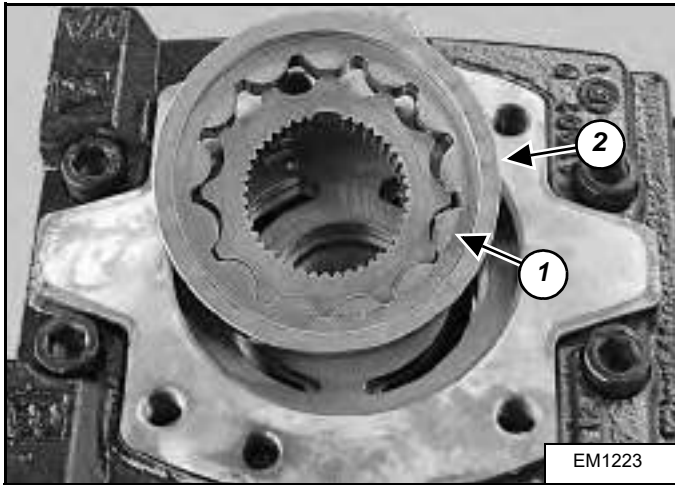
Remove the coupler shaft (Item 1) [Figure 30-41-21].

Dealer Copy -- Not for Resale

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

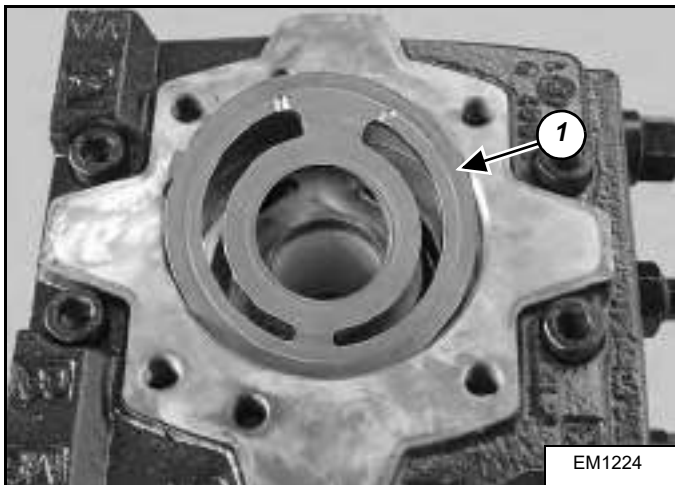
Charge Pump Disassembly (Cont'd)

Figure 30-41-22



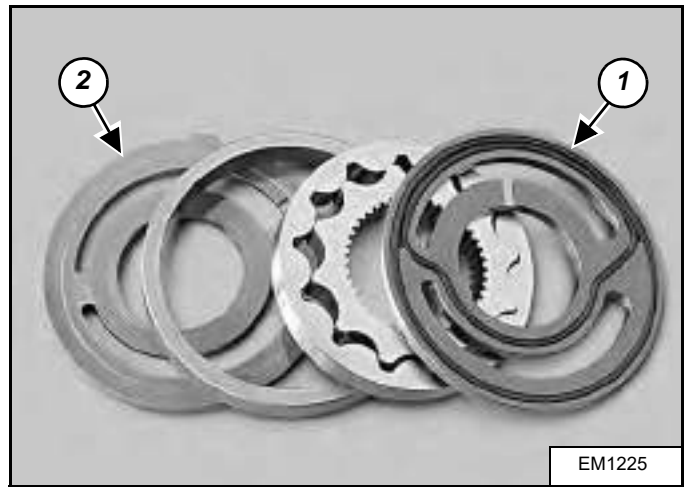
Remove the gearset (Item 1) and ring (Item 2) [Figure 30-41-22] from the pump.

Figure 30-41-23



Remove the valve plate (Item 1) [Figure 30-41-23].

Figure 30-41-24

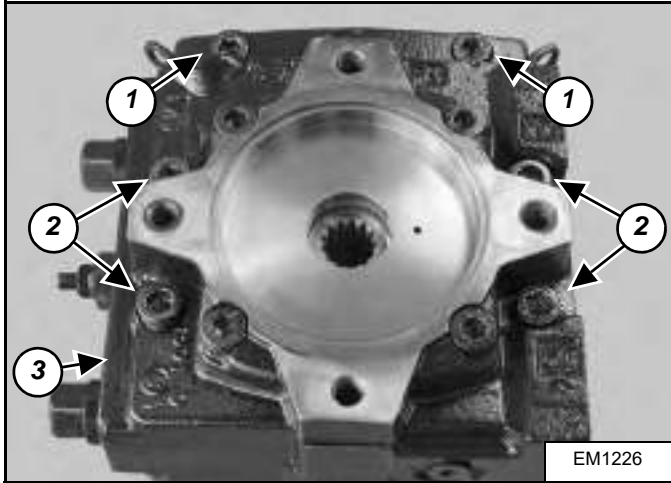


Remove the seal from the pressure balance plate (Item 1) and the valve plate (Item 2) [Figure 30-41-24].

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

Piston Pump Disassembly

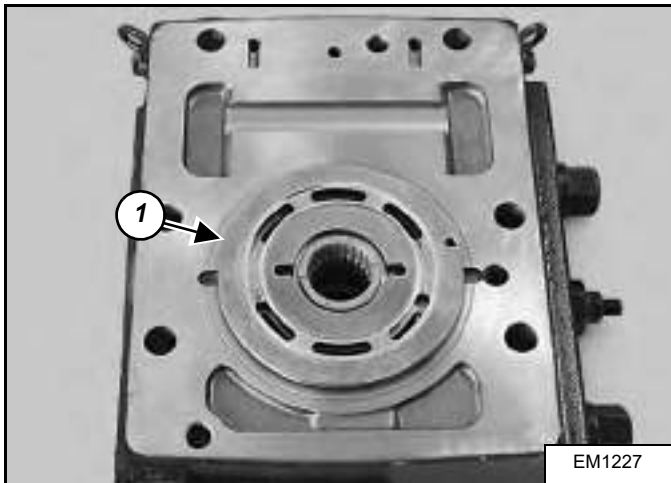
Figure 30-41-25



Remove the two bolts (Item 1) first. Then remove the four bolts (Item 2) [Figure 30-41-25] from the housing.

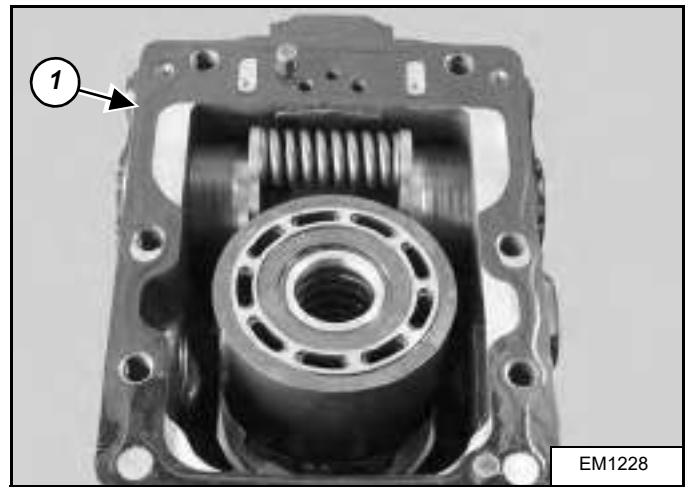
Remove the charge pump housing (incl. charge pump) (Item 3) [Figure 30-41-25] from the pump housing.

Figure 30-41-26



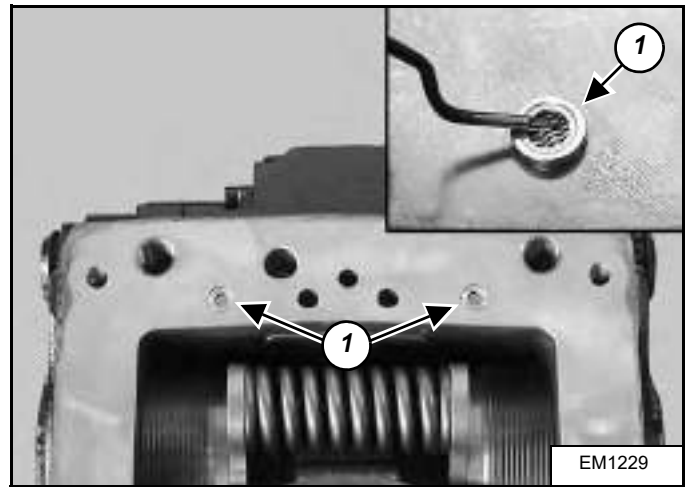
Remove the valve plate (Item 1) [Figure 30-41-26].

Figure 30-41-27



Remove the gasket (Item 1) [Figure 30-41-27].

Figure 30-41-28



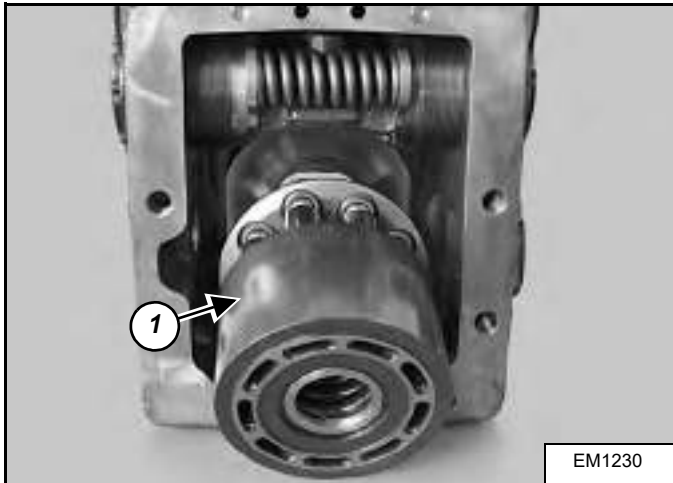
Remove the filter screen (Item 1) [Figure 30-41-28] from the pump housing.

Dealer Copy -- Not for Resale

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

Piston Pump Disassembly (Cont'd)

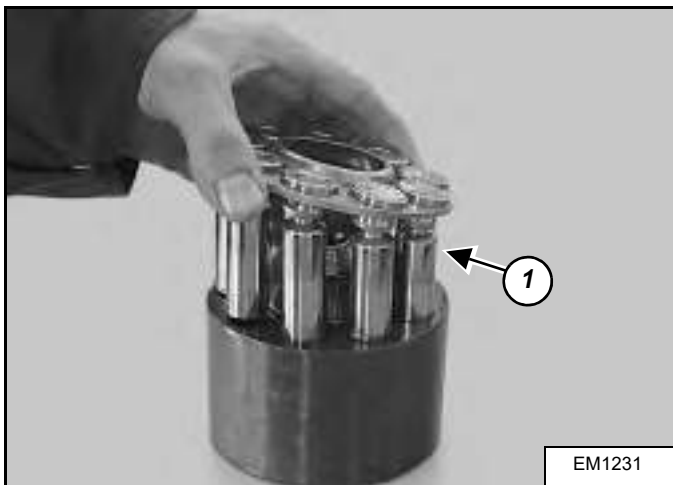
Figure 30-41-29



Tilt the pump housing on its side as shown **[Figure 30-41-29]**.

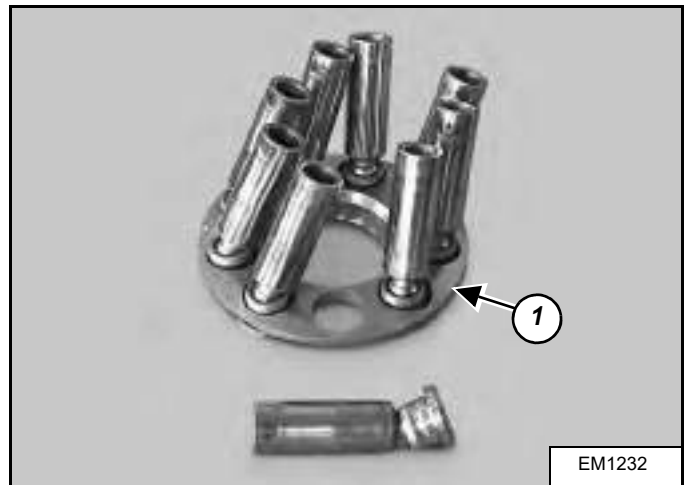
Remove the cylinder block/piston assembly (Item 1) **[Figure 30-41-29]**.

Figure 30-41-30



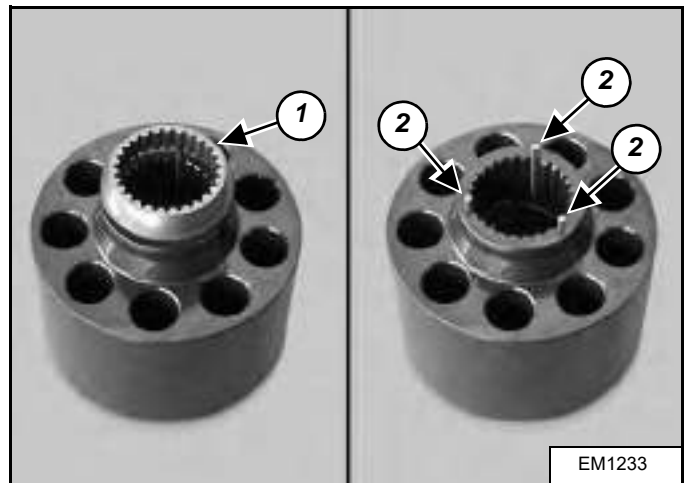
Remove the piston assembly (Item 1) **[Figure 30-41-30]** from the cylinder block.

Figure 30-41-31



Remove the pistons from the slipper guide (Item 1) **[Figure 30-41-31]**.

Figure 30-41-32



Remove the ball guide retainer (Item 1) **[Figure 30-41-32]** from the cylinder block.

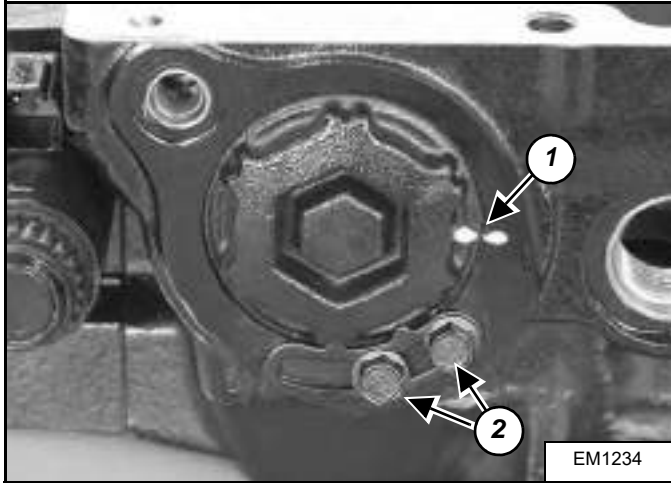
Remove the three pins (Item 2) **[Figure 30-41-32]** from the cylinder block.

Dealer Copy -- Not for Resale

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

Piston Pump Disassembly (Cont'd)

Figure 30-41-33

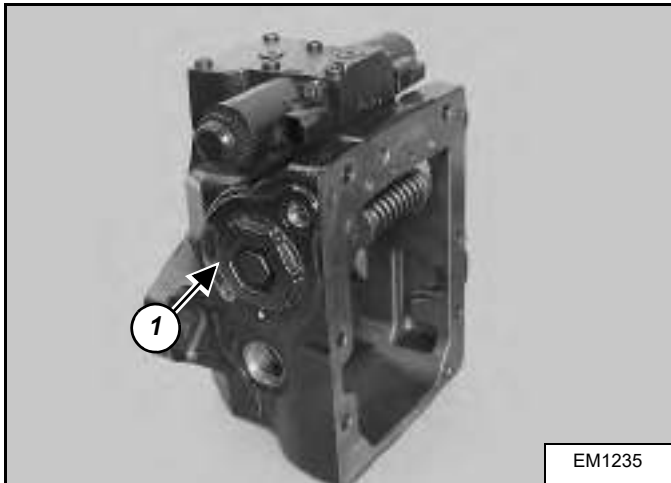


Mark the servo cylinder position (Item 1) [Figure 30-41-33]. Repeat for the other side.

NOTE: Also apply marks to distinguish the left cylinder from the right.

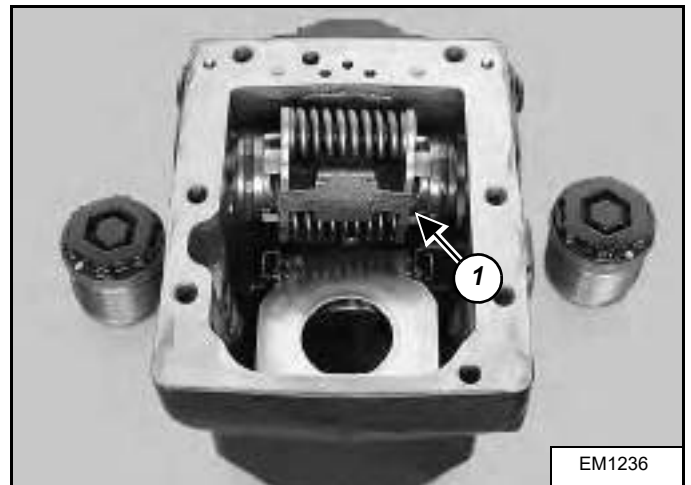
Remove both screws (Item 2) [Figure 30-41-33] from the servo cylinder locking plate. Repeat for the other side.

Figure 30-41-34



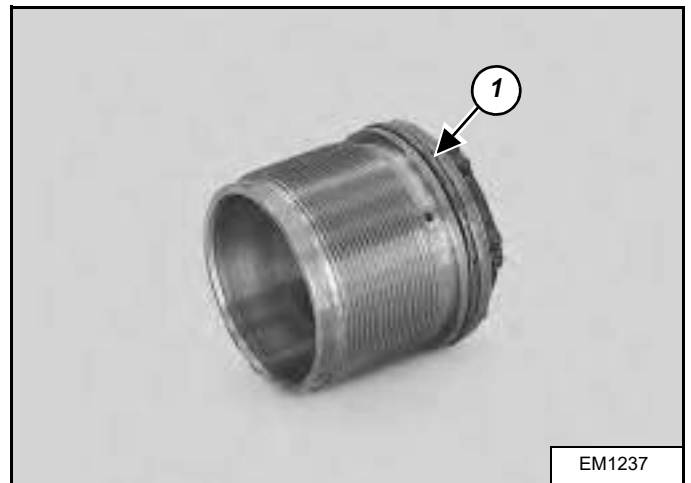
Remove the servo cylinder (Item 1) [Figure 30-41-34] from the housing. Repeat for the other side.

Figure 30-41-35



Remove the servo piston assembly (Item 1) [Figure 30-41-35] from the housing.

Figure 30-41-36



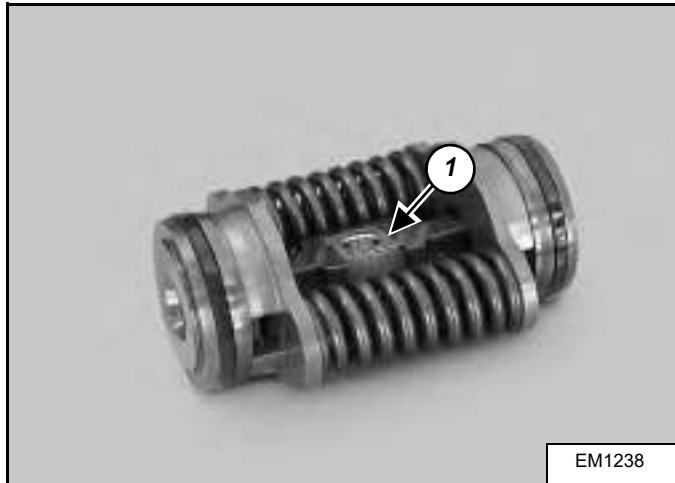
Remove the O-ring (Item 1) [Figure 30-41-36] from the servo cylinder.

Dealer Copy -- Not for Resale

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

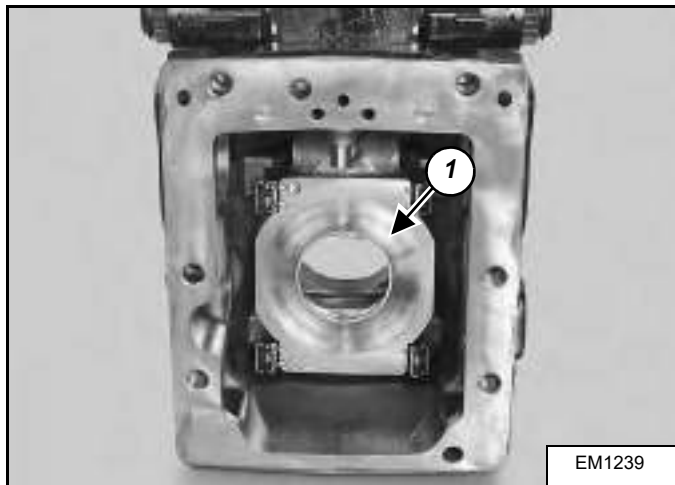
Piston Pump Disassembly (Cont'd)

Figure 30-41-37



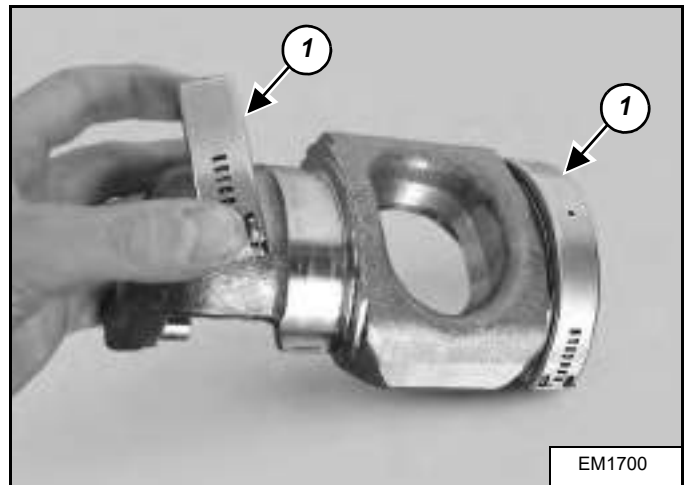
Remove the bronze slider block (Item 1) [Figure 30-41-37] from the servo piston.

Figure 30-41-38



Remove the swash plate (Item 1) [Figure 30-41-38] from the pump housing.

Figure 30-41-39

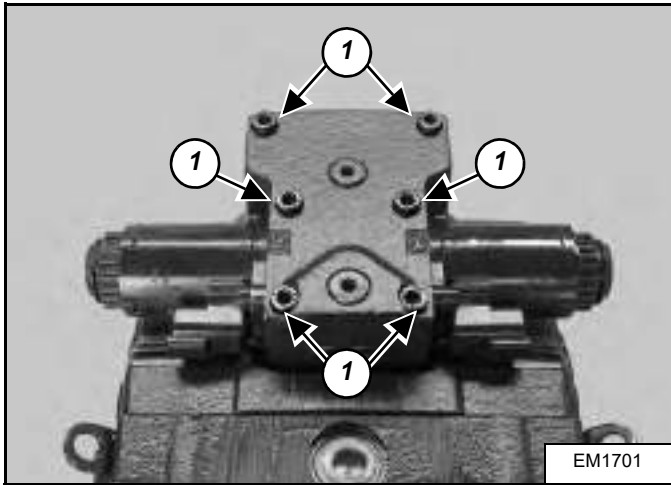


Remove the two swash plate bearings (Item 1) [Figure 30-41-39] from the swash plate.

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

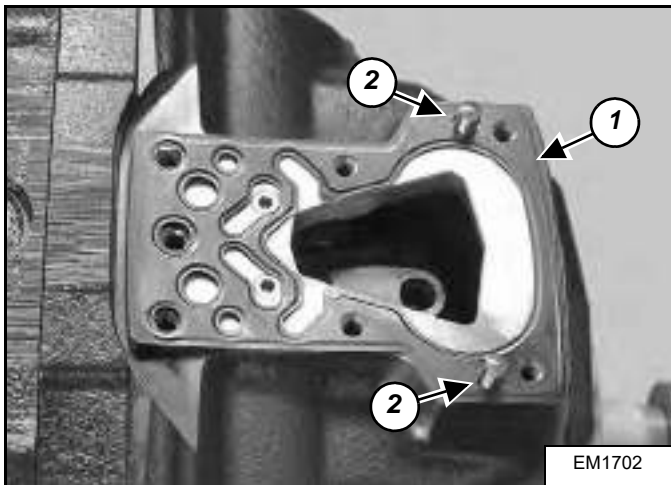
Solenoid Block Disassembly

Figure 30-41-40



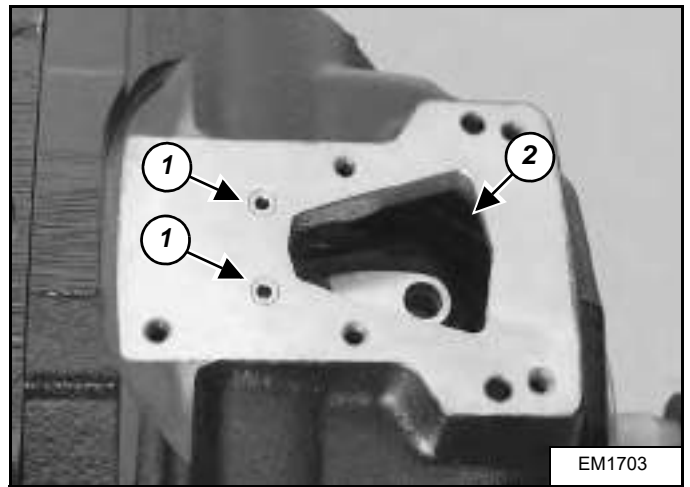
Remove the six screws (Item 1) [Figure 30-41-40] from the solenoid block.

Figure 30-41-41



Remove the gasket (Item 1) and two position pins (Item 2) [Figure 30-41-41] from the pump housing.

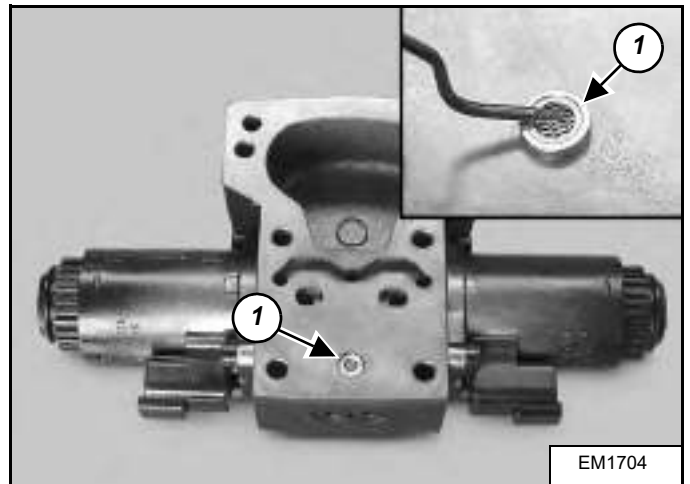
Figure 30-41-42



Remove the two orifices (Item 1) [Figure 30-41-42] from the pump housing.

NOTE: Cover the opening (Item 2) [Figure 30-41-42] in the pump housing to prevent the orifices or other parts from dropping into the housing.

Figure 30-41-43



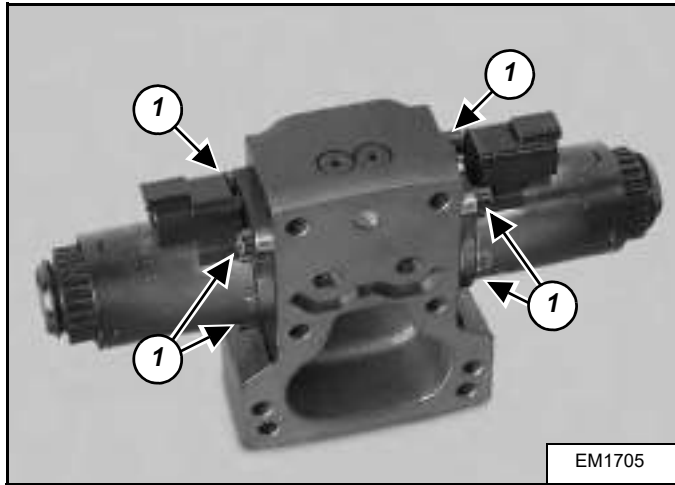
Remove the filter screen (Item 1) [Figure 30-41-43] from the solenoid block.

Dealer Copy -- Not for Resale

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

Solenoid Block Disassembly (Cont'd)

Figure 30-41-44



Remove the three screws (Item 1) [Figure 30-41-44] from each solenoid.

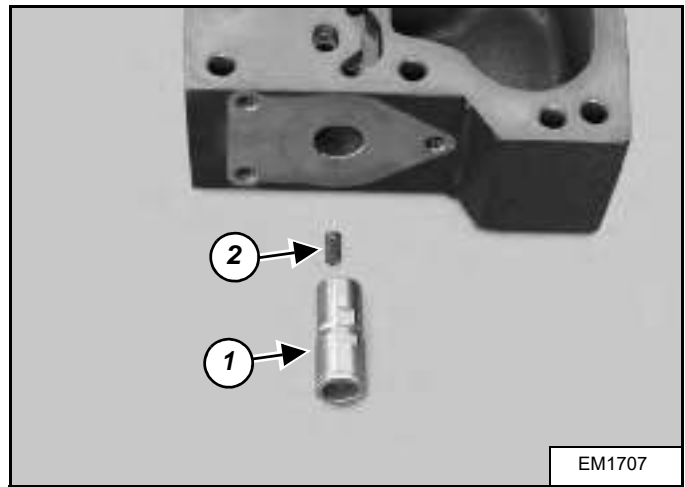
Remove both solenoids.

Figure 30-41-45



Remove the O-ring (Item 1) [Figure 30-41-45] from each solenoid.

Figure 30-41-46

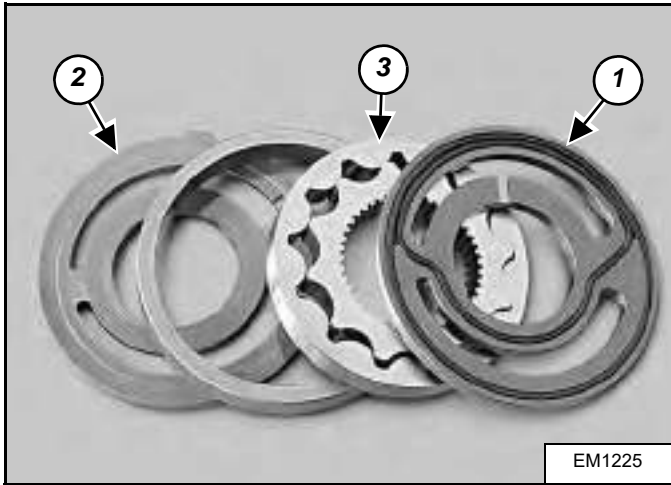


Remove the spool (Item 1) and spring (Item 2) [Figure 30-41-46] from the solenoid block.

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

Inspection

Figure 30-41-47



Clean all parts in solvent and use air pressure to dry them. DO NOT use cloth or paper as small pieces of material can get into the system and cause damage.

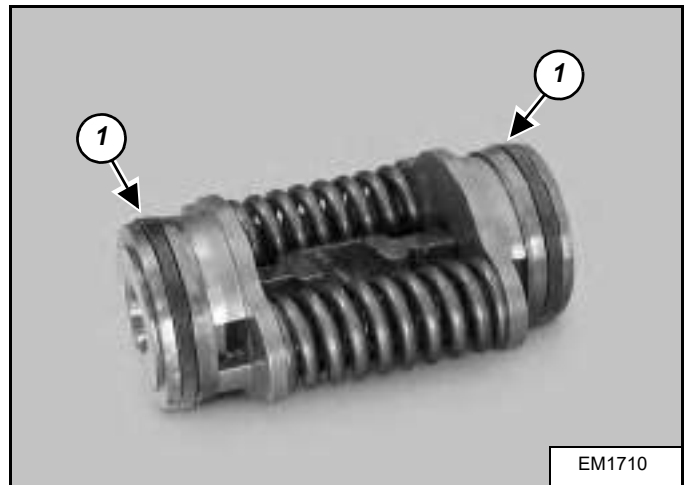
Check the pressure balance plate (Item 1) and the valve plate (Item 2) and charge pump gears (Item 3) [Figure 30-41-47] for damage or wear.

Figure 30-41-48



Check the valve plate [Figure 30-41-48], the surface must be smooth and free of scratches. If scratches can be felt with a finger nail, replace the part.

Figure 30-41-49

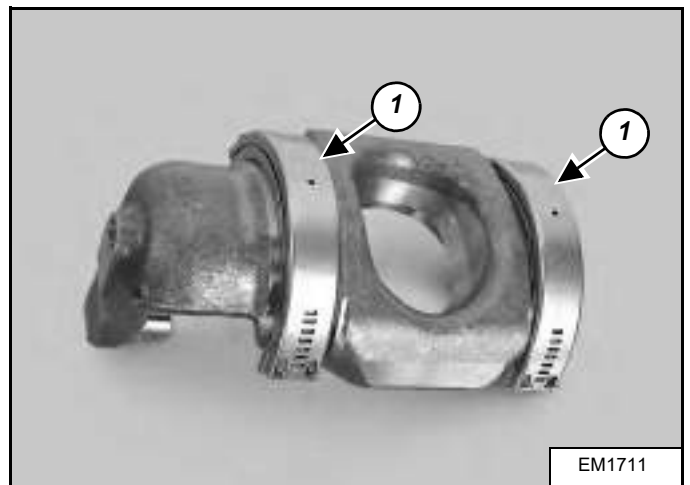


Inspect the servo piston and seal rings (Item 1) [Figure 30-41-49] for wear. If worn, remove the seal rings and expander O-rings from the piston.

Install new expander O-rings into the grooves in the servo piston. Carefully install the piston seal rings over the expander rings. Do not overstretch the piston seal rings.

Lubricate the seal rings and install them into the two (disassembled) servo cylinders to allow the assembly to set for 5 minutes for the seal rings to return to their original size. Remove the servo cylinders afterwards.

Figure 30-41-50



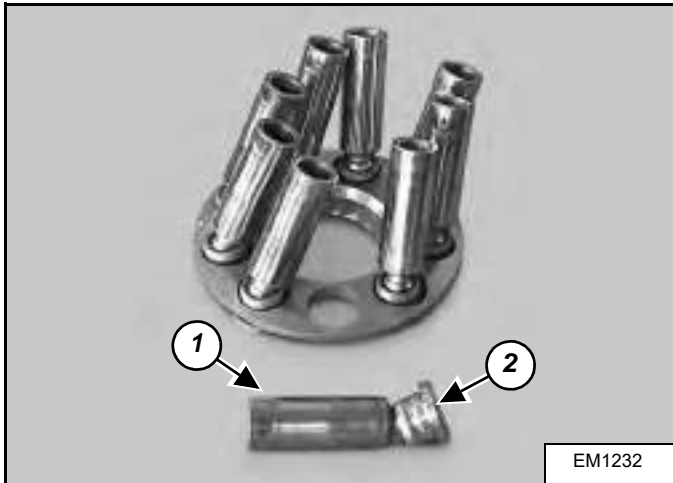
Check the swash plate bearings (Item 1) [Figure 30-41-50] for wear and damage. Replace as needed.

Dealer Copy -- Not for Resale

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

Inspection (Cont'd)

Figure 30-41-51



Check each piston (Item 1) and piston shoe (Item 2) [Figure 30-41-51] for wear or scratches.

Figure 30-41-52



Check the cylinder block bores for wear or scratches [Figure 30-41-52].

If there is any defect in the cylinder block or pistons, the complete rotating group must be replaced.

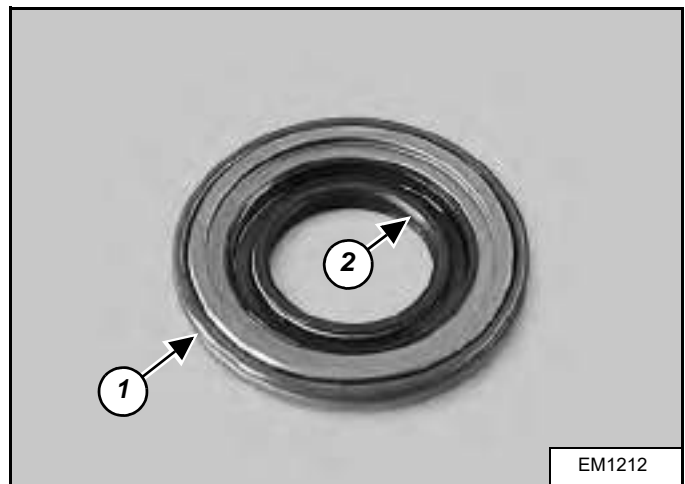
Figure 30-41-53



Check the shaft for wear or damage in the spline and bearing areas [Figure 30-41-53].

Check the bearing for correct operation. Remove the race (Item 1) [Figure 30-41-53] from the shaft only if it is necessary to replace the bearing.

Figure 30-41-54



Inspect the shaft seal (Item 1) [Figure 30-41-54]. Replace if needed.

Remove and discard the O-ring (Item 2) [Figure 30-41-54].

Inspect the multi-function valve cartridge for damage to parts or O-rings.

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

Inspection (Cont'd)

Figure 30-41-55



Replace O-rings as needed **[Figure 30-41-55]**.

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

Piston Pump Assembly

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

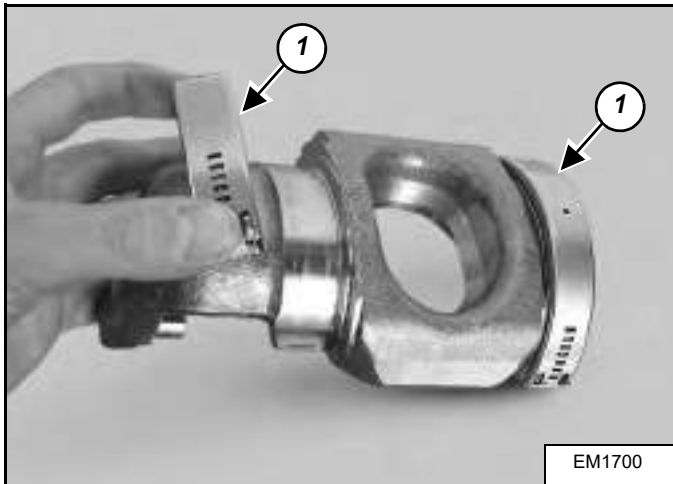
I-2003-0888

Clean all parts in solvent and dry with compressed air.

Inspect all parts for wear or damage. Replace any worn or damaged parts.

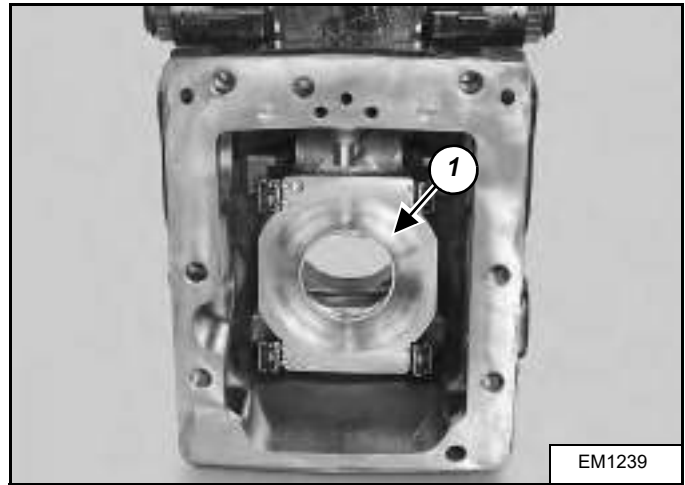
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 30-41-56



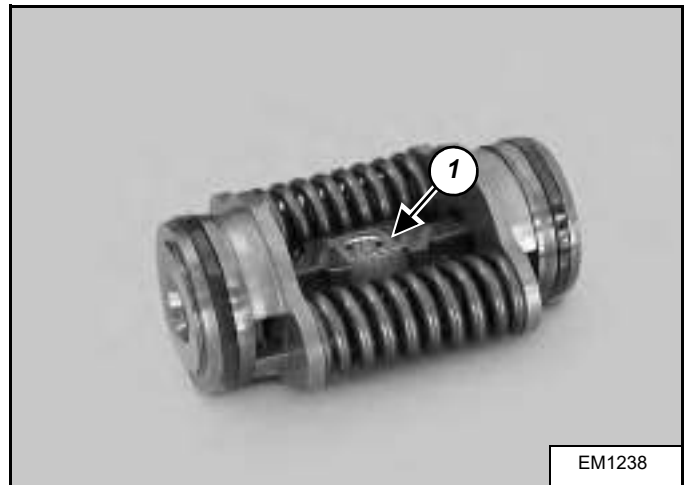
Install the two swash plate bearings (Item 1) [Figure 30-41-56] onto the swash plate.

Figure 30-41-57



Install the swash plate (Item 1) [Figure 30-41-57].

Figure 30-41-58



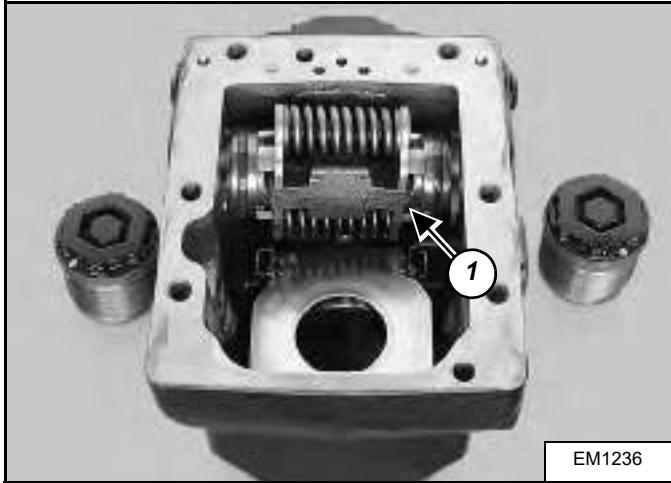
Install the bronze slider block (Item 1) [Figure 30-41-58] onto the servo piston.

Dealer Copy -- Not for Resale

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

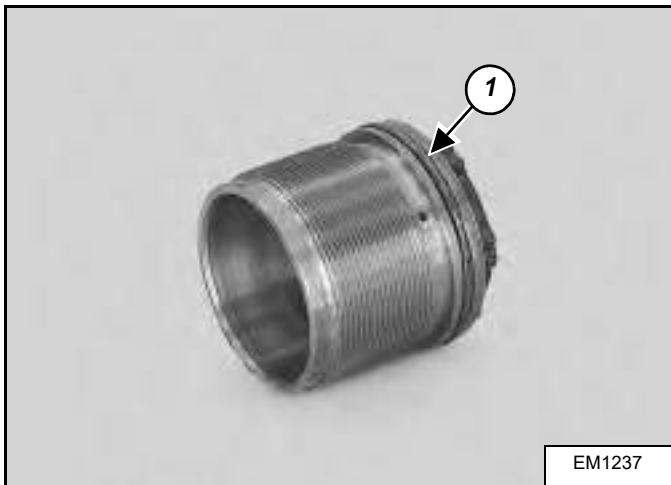
Piston Pump Assembly (Cont'd)

Figure 30-41-59



Install the servo piston assembly (Item 1) [Figure 30-41-59] into the housing.

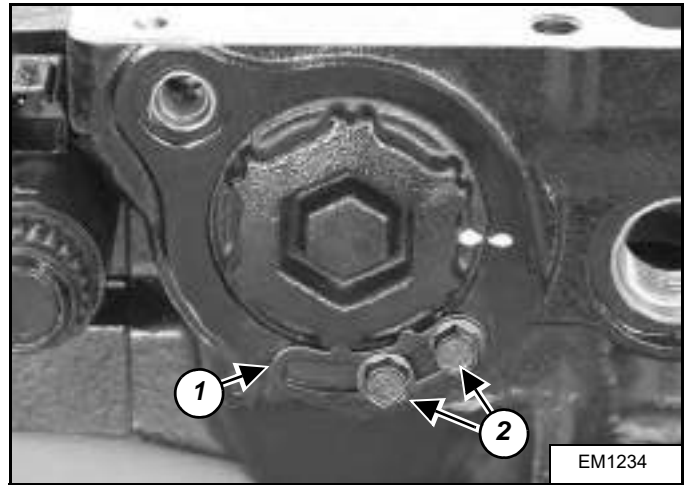
Figure 30-41-60



Install a new O-ring (Item 1) [Figure 30-41-60] on both servo cylinders.

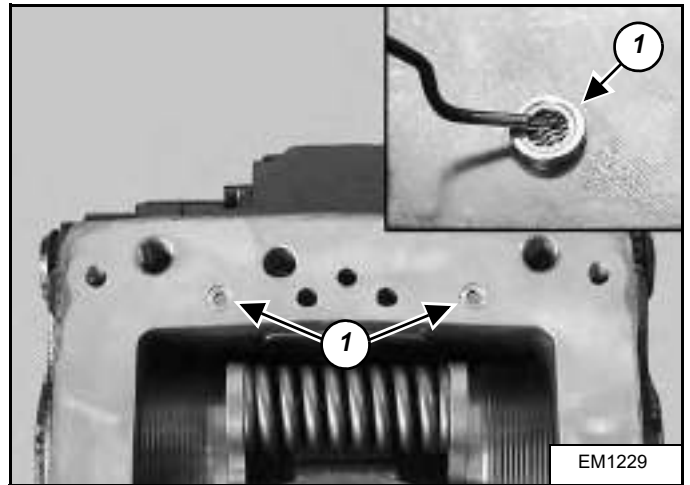
Install both servo cylinders until the marks are aligned.

Figure 30-41-61



Install the servo cylinder locking plate (Item 1) and both screws (Item 2) [Figure 30-41-61]. Repeat for the other side.

Figure 30-41-62



Clean and reinstall the two filter screens (Item 1) [Figure 30-41-62] into the pump housing.

NOTE: Respect right and left side servo cylinders.

Dealer Copy -- Not for Resale

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

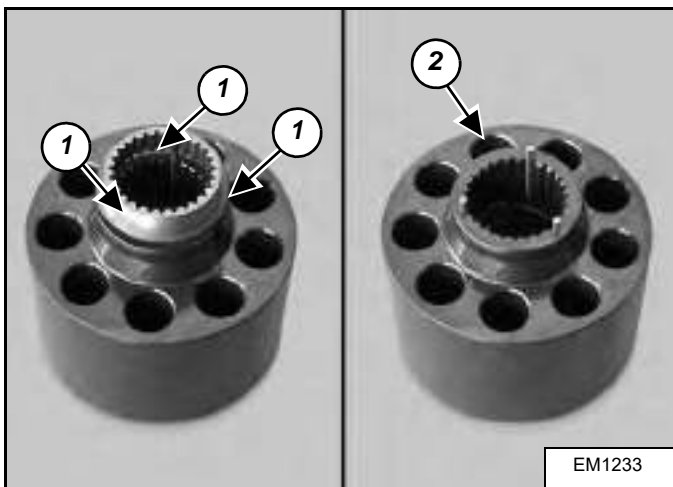
Piston Pump Assembly (Cont'd)

Figure 30-41-63



Put the piston assemblies into the slipper guide [Figure 30-41-63].

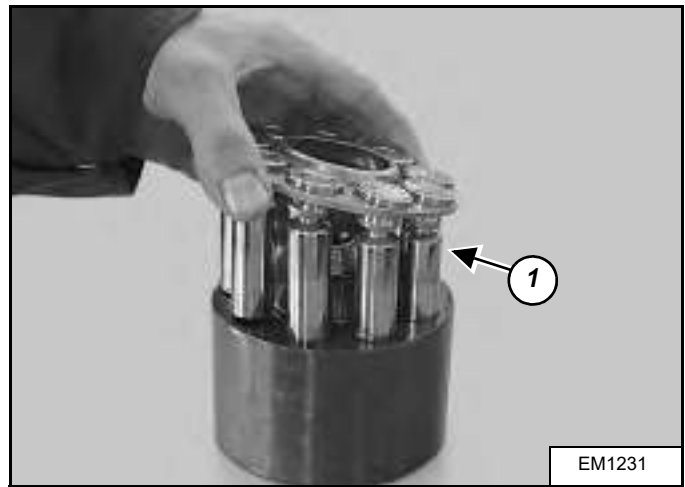
Figure 30-41-64



Install the three pins (Item 1) [Figure 30-41-64] onto the cylinder block.

Place the ball guide retainer (Item 2) [Figure 30-41-64] onto the cylinder block.

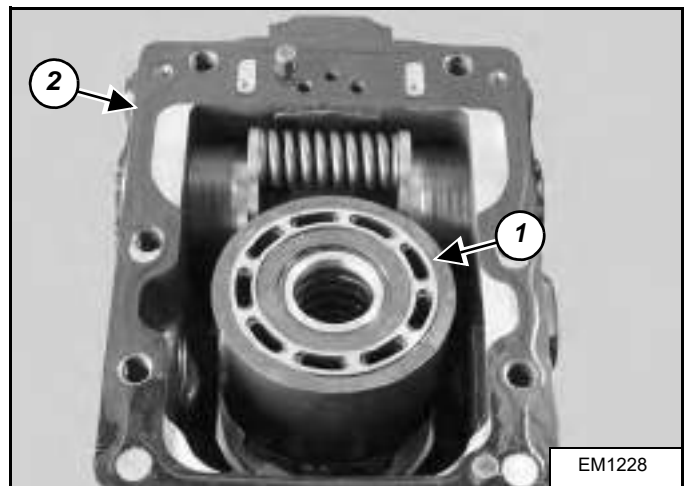
Figure 30-41-65



Install the piston assembly (Item 1) [Figure 30-41-65] into the cylinder block.

NOTE: Keep the ball guide retainer (Item 2) [Figure 30-41-64] in the correct position onto the cylinder block pins.

Figure 30-41-66



Install the cylinder block/piston assembly (Item 1) [Figure 30-41-66] into the pump housing.

NOTE: When installing, make sure the ball guide retainer (Item 2) [Figure 30-41-64] is kept in the correct position.

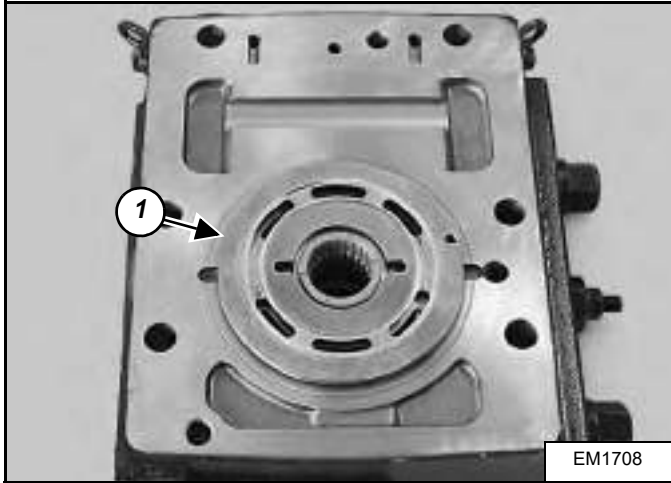
Install the gasket (Item 2) [Figure 30-41-66].

Dealer Copy -- Not for Resale

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

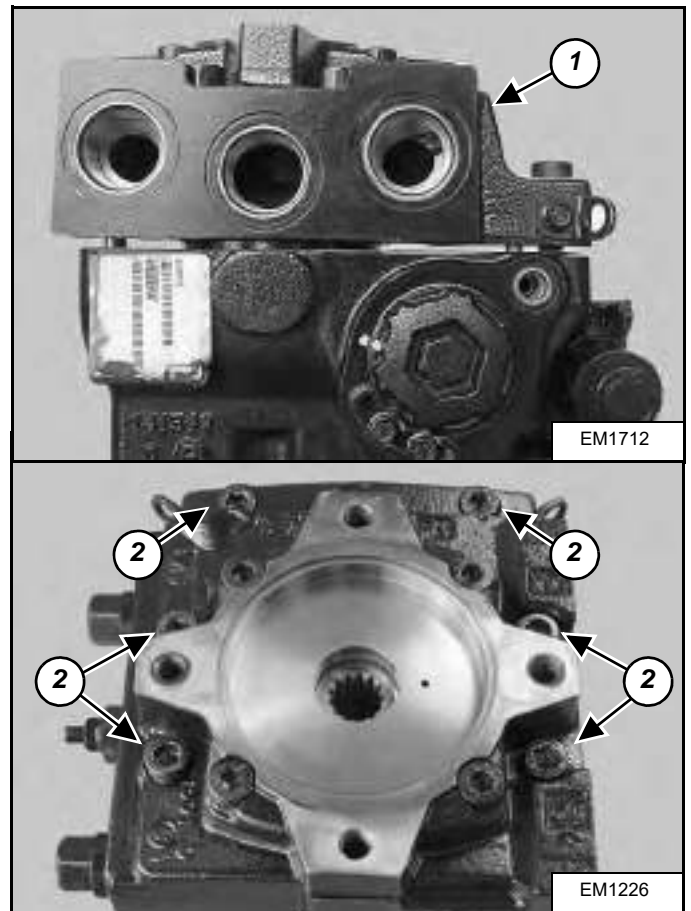
Piston Pump Assembly (Cont'd)

Figure 30-41-67



Install the valve plate (Item 1) [Figure 30-41-67].

Figure 30-41-68



Lower the charge pump (Item 1) [Figure 30-41-68] onto the pump housing.

When properly installed, the charge pump will engage the alignment pins, but the cylinder block spring pressure will hold the charge pump housing 3 to 8 mm (1/8 to 1/4 in) away from the pump housing.

Install and gradually tighten the six bolts (Item 2) [Figure 30-41-68] such that the gap evenly decreases. Tighten the bolts to 122 N•m (90 ft-lb) torque.

Dealer Copy -- Not for Resale

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

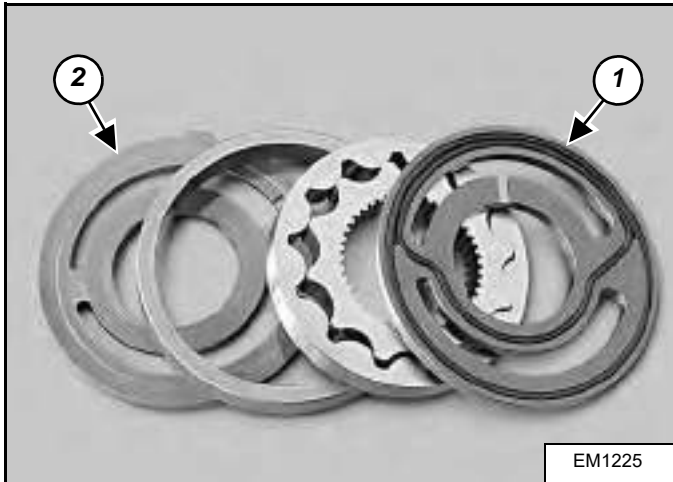
Charge Pump Assembly

Place the pump on the work surface with the charge pump up.

Mark the pump housings for correct assembly.

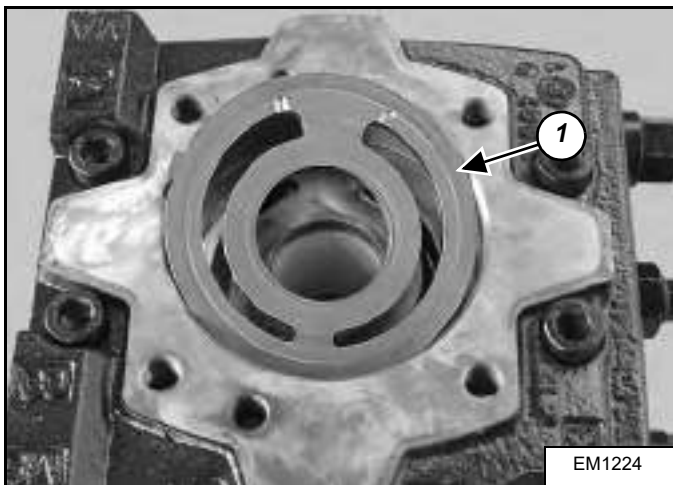
Before removing the relief valve mark the plug, lock nut and housing for approximate assembly adjustment.

Figure 30-41-69



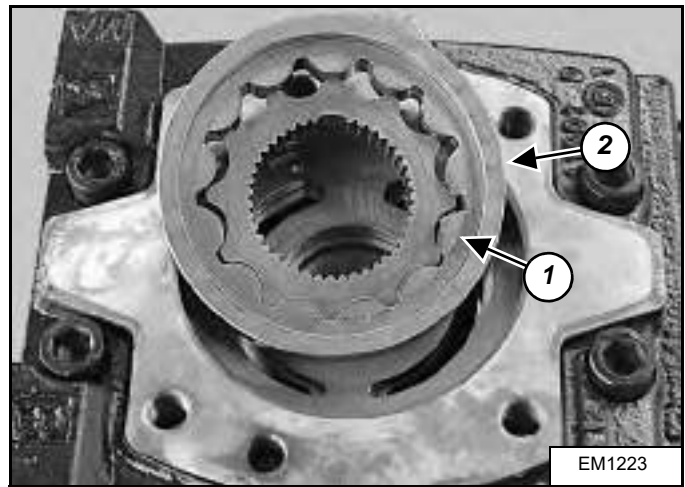
Install the seals onto the pressure balance plate (Item 1) and the valve plate (Item 2) [Figure 30-41-69].

Figure 30-41-70



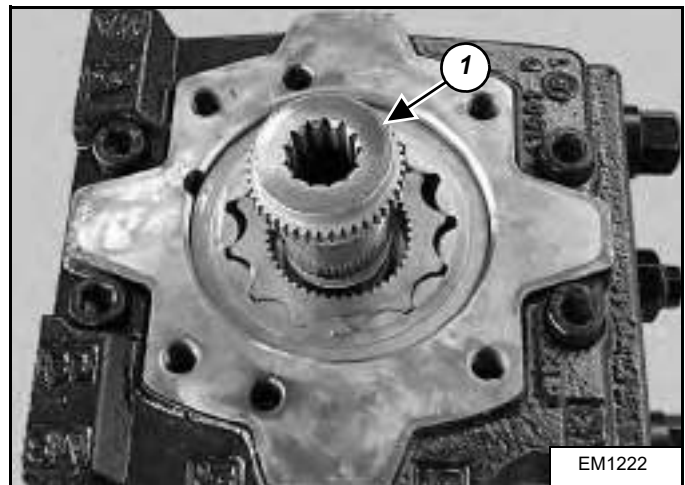
Install the valve plate (Item 1) [Figure 30-41-70].

Figure 30-41-71



Lubricate and install the gearset (Item 1) and ring (Item 2) [Figure 30-41-71].

Figure 30-41-72

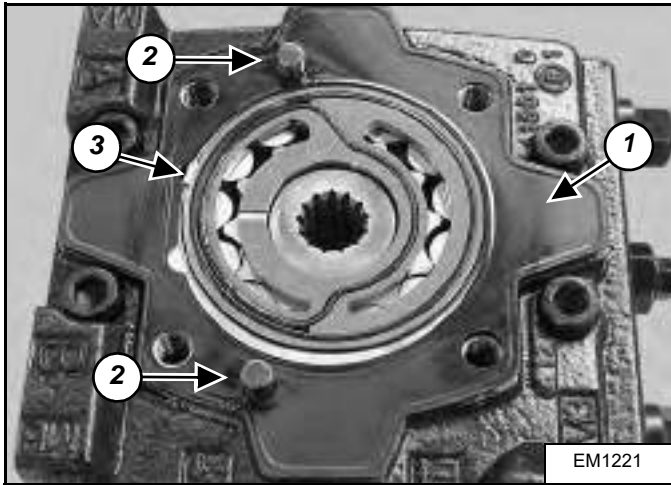


Install the coupler shaft (Item 1) [Figure 30-41-72].

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

Charge Pump Assembly (Cont'd)

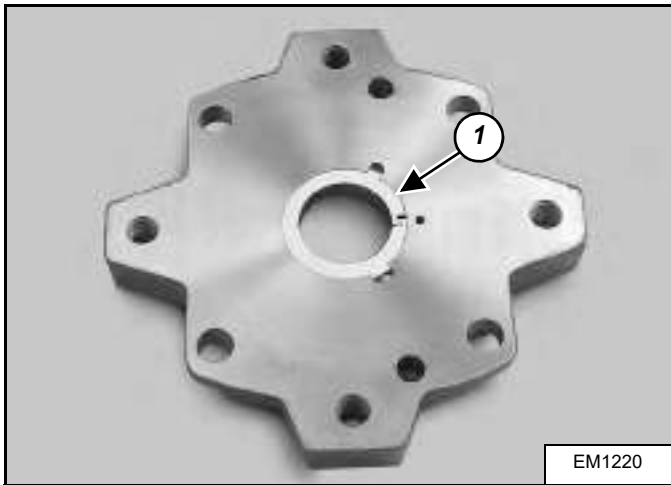
Figure 30-41-73



Install the pressure balance plate (Item 3) **[Figure 30-41-73]**.

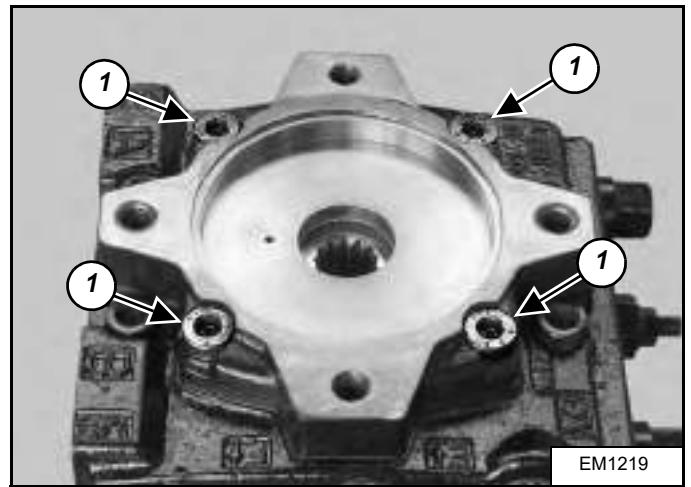
Install the gasket (Item 1) and two pins (Item 2) **[Figure 30-41-73]** onto the charge pump housing.

Figure 30-41-74



Install the thrust washer (Item 1) **[Figure 30-41-74]** onto the charge pump cover. The coated side goes toward charge pump coupling

Figure 30-41-75

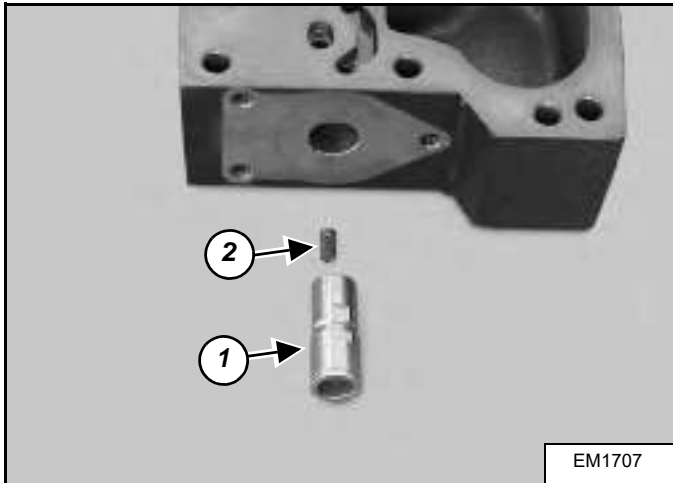


Install the cover and the four bolts (Item 1) **[Figure 30-41-75]**. Tighten the bolts to 92 N•m (68 ft-lb) torque.

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

Solenoid Block Assembly

Figure 30-41-76



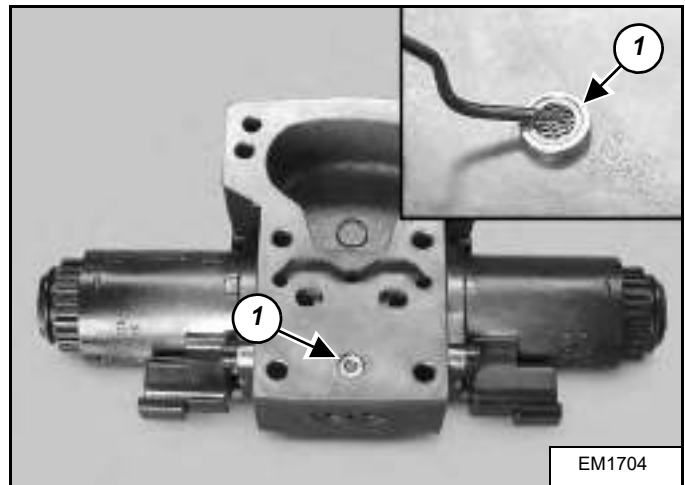
Install the spring (Item 1) and spool (Item 2) [Figure 30-41-46] into the solenoid block.

Figure 30-41-77



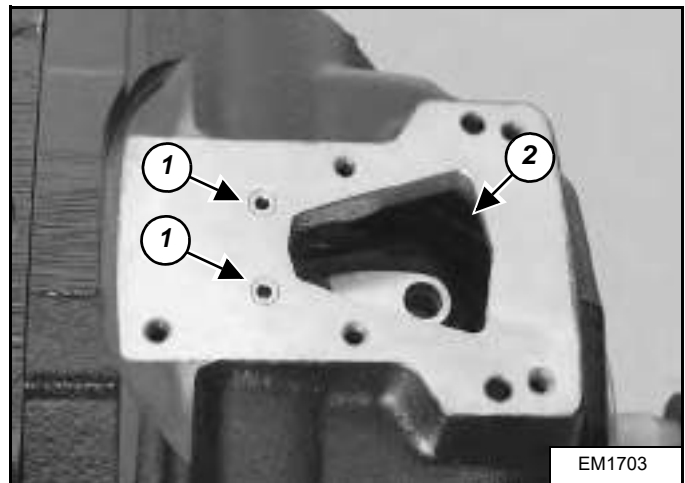
Install a new O-ring (Item 1) [Figure 30-41-45] onto each solenoid.

Figure 30-41-78



After cleaning, install the filter screen (Item 1) [Figure 30-41-43] into the solenoid block.

Figure 30-41-79



Install the two orifices (Item 1) [Figure 30-41-42] into the pump housing. Tighten to 2.5 N•m (22 ft-in) torque.

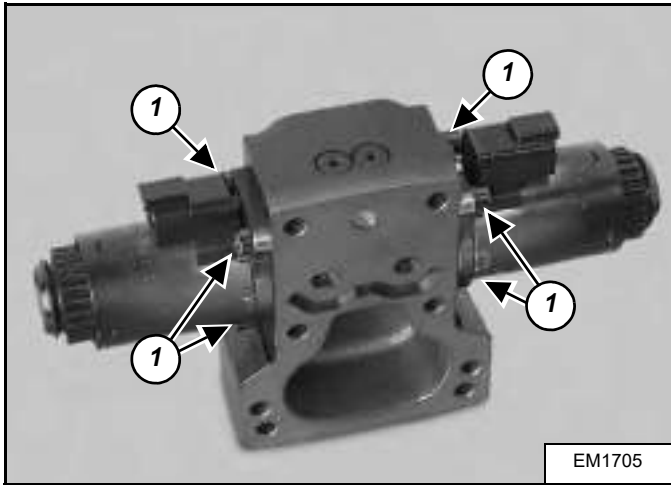
NOTE: Cover the opening (Item 2) [Figure 30-41-42] in the pump housing to prevent the orifices or other parts from dropping into the housing.

Dealer Copy -- Not for Resale

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

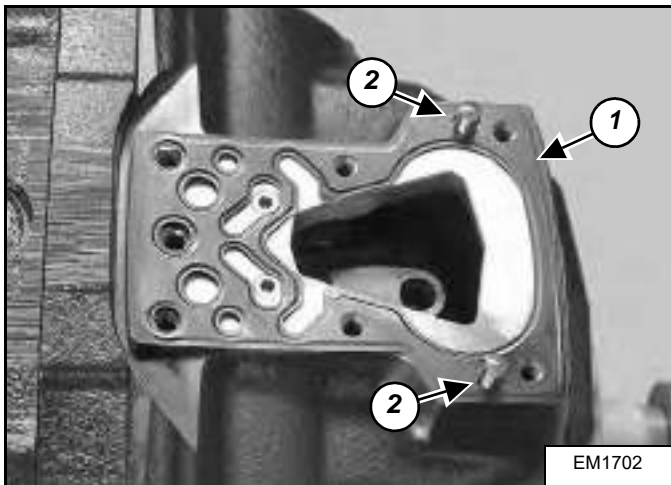
Solenoid Block Assembly (Cont'd)

Figure 30-41-80



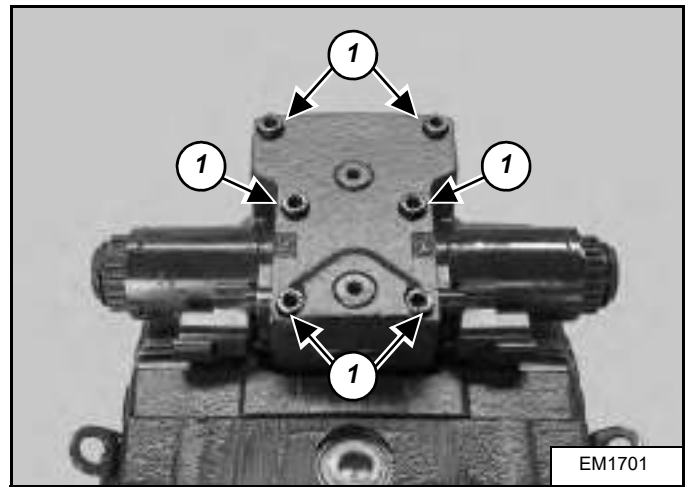
Install the three screws (Item 1) [Figure 30-41-44] for each solenoid. Tighten to 5 N•m (44 ft-in) torque.

Figure 30-41-81



Install the gasket (Item 1) and two position pins (Item 2) [Figure 30-41-41] onto the pump housing.

Figure 30-41-82



Install the six screws (Item 1) [Figure 30-41-40]. Tighten to 13.5 N•m (9.9 ft-lb) torque.

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

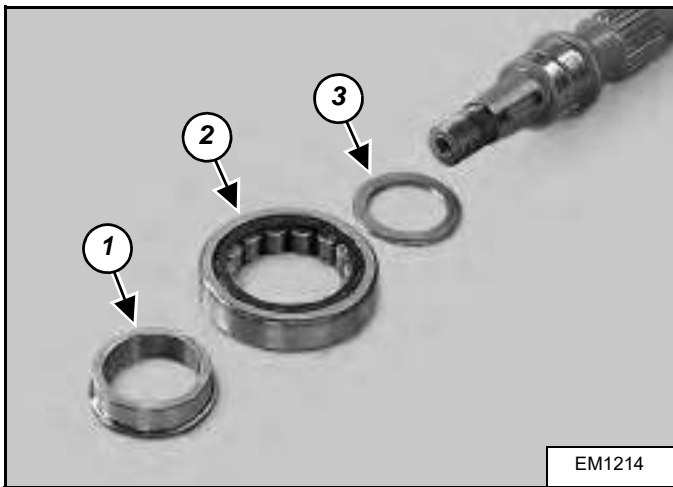
Shaft Assembly

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

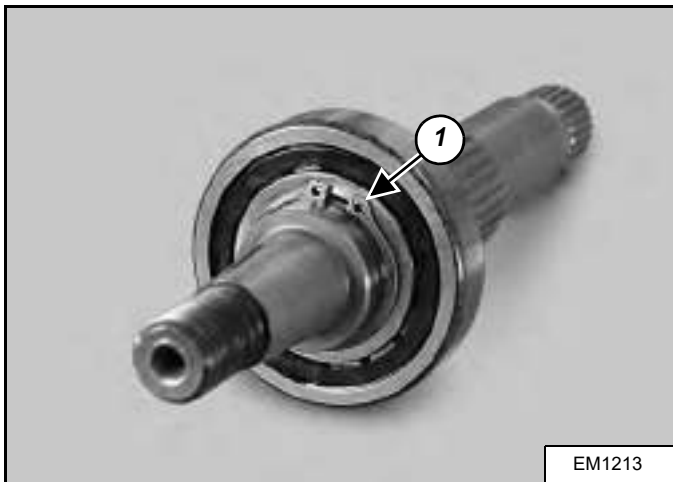
I-2003-0888

Figure 30-41-83



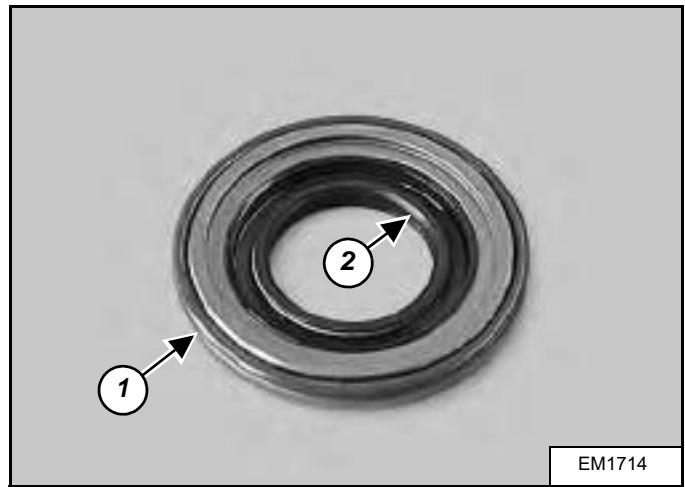
Install the bearing onto the shaft in the order as shown (Items 1, 2 & 3) [Figure 30-41-13].

Figure 30-41-84



Install the snap ring (Item 1) [Figure 30-41-12].

Figure 30-41-85



Install a new O-ring (Item 1) and shaft seal (Item 2) [Figure 30-41-11] onto the seal carrier.

Figure 30-41-86



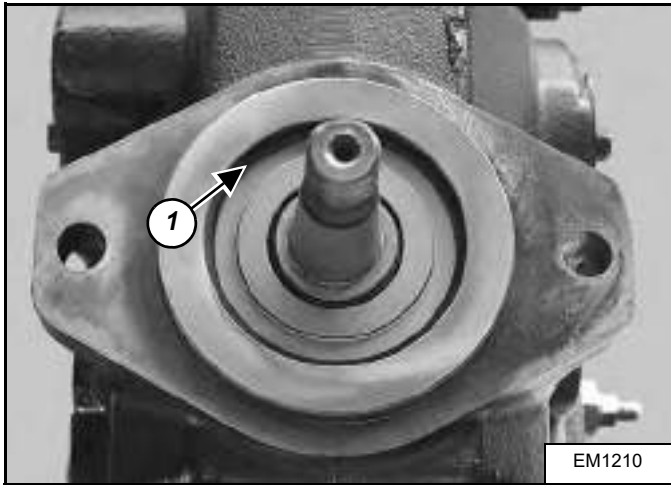
Install the shaft and bearing assembly into the housing as shown in [Figure 30-41-10].

Dealer Copy -- Not for Resale

HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE) (CONT'D)

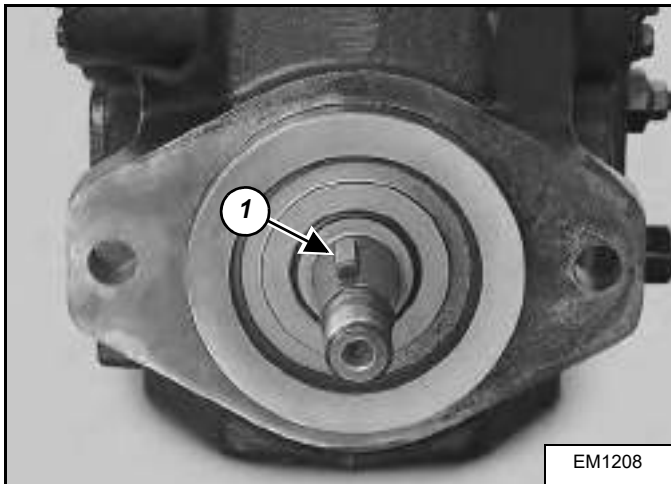
Shaft Assembly (Cont'd)

Figure 30-41-87



Remove the retainer (Item 1) **[Figure 30-41-9]**.

Figure 30-41-88



Install the key (Item 1) **[Figure 30-41-9]**.



Bobcat®

Dealer Copy -- Not for Resale

DRIVE BELT

Description

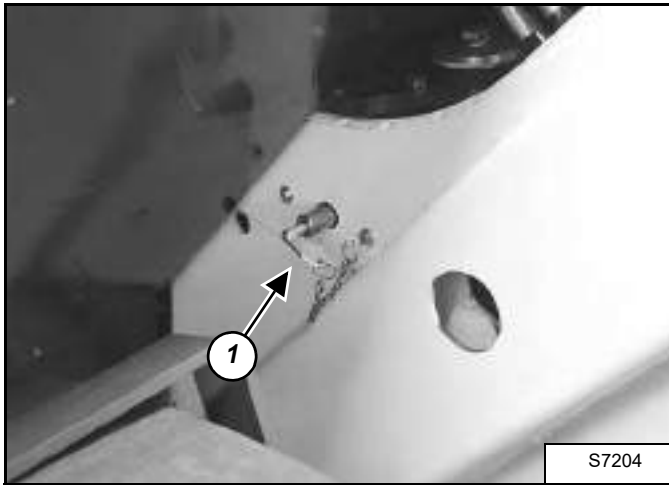
The drive belt connects the engine to the hydrostatic pumps. The drive belt is tightened by a spring tensioner and is covered by a shield to protect operator.

The drive belt is located on the flywheel side of the engine.

Shield Removal And Installation

Stop the engine.

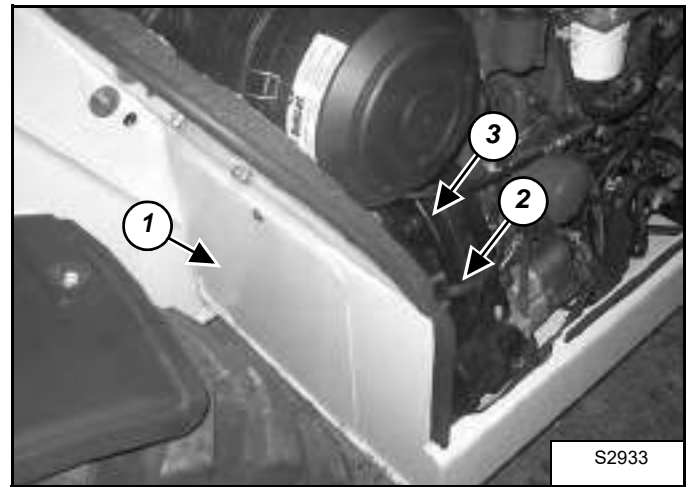
Figure 30-50-1



Rotate the battery disconnect switch (Item 1) **[Figure 30-50-1]** to the right, to disconnect the power supply from the battery.

Open the engine cover. (See "Opening And Closing The Engine Cover" on page 10-160-1)

Figure 30-50-2



Remove the cover (Item 1) **[Figure 30-50-2]** at the rear of the engine compartment.

Remove the three belt shield hold-down clips (Item 2) **[Figure 30-50-2]**.

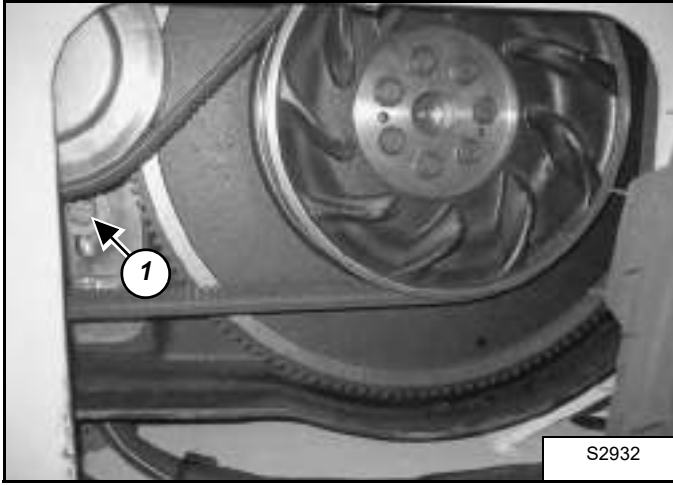
Remove the belt shield (Item 3) **[Figure 30-50-2]** from the drive belt housing.

Dealer Copy -- Not for Resale

DRIVE BELT (CONT'D)

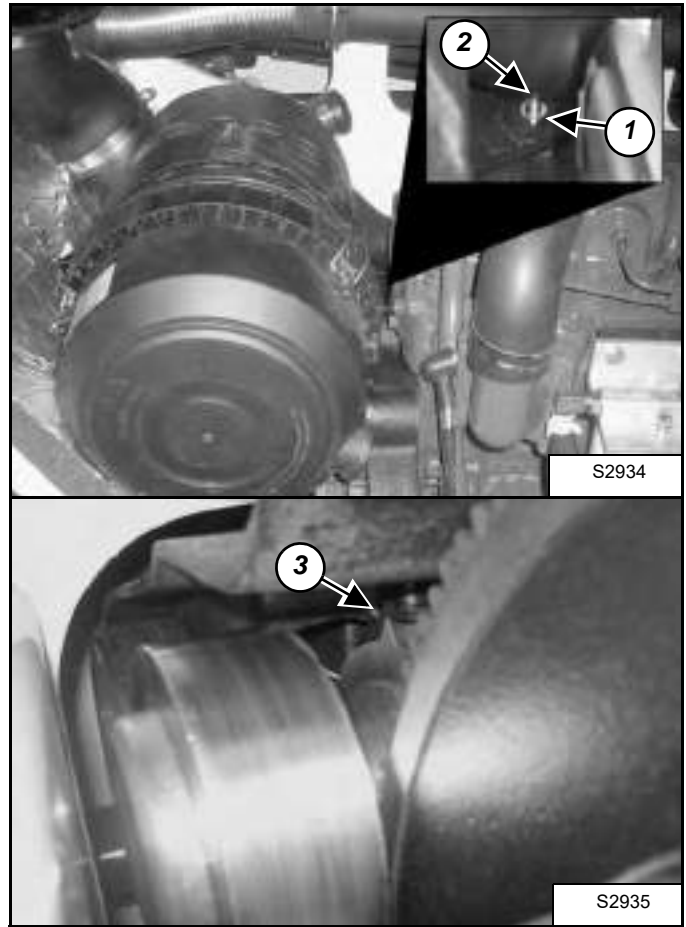
Belt Adjustment

Figure 30-50-3



Loosen the bolt (Item 1) [Figure 30-50-3] on the spring loaded tensioner.

Figure 30-50-4



Loosen the lock nut (Item 1) [Figure 30-50-4].

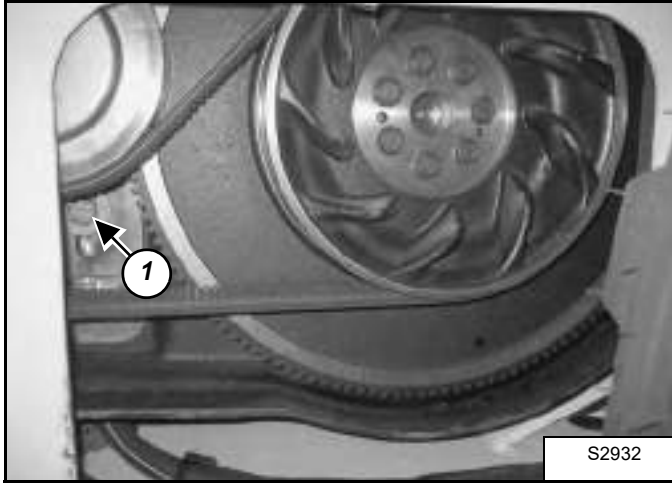
Adjust drive belt tension by tightening the bolt (Item 2) until the idler indicator (pointer) (Item 3) [Figure 30-50-4] is at twelve o'clock position.

When belt tension is correct, tighten the lock nut (Item 1) [Figure 30-50-4].

DRIVE BELT (CONT'D)

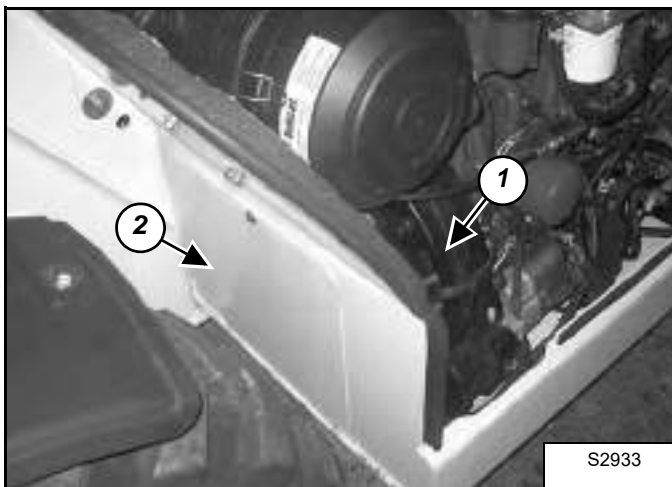
Belt Adjustment (Cont'd)

Figure 30-50-5



Tighten the mounting bolt (Item 1) [Figure 30-50-5] to 110 N•m (81 ft-lb) torque.

Figure 30-50-6



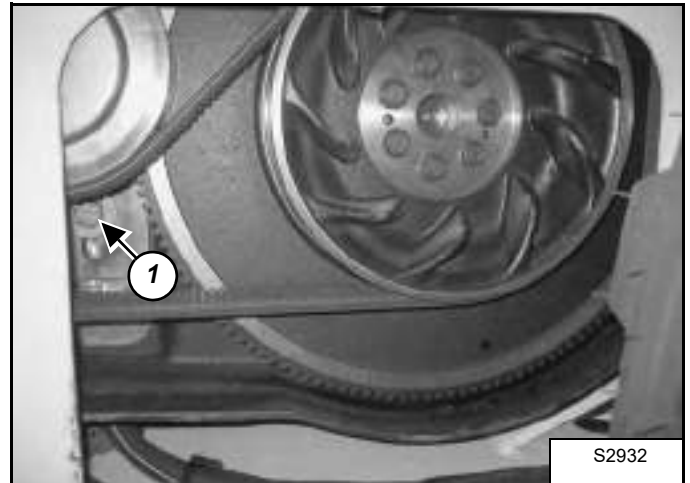
Reinstall the drive belt cover (Item 1) and the cover (Item 2) [Figure 30-50-6] at the rear of the engine compartment

Turn battery disconnect switch to the ON position.

Belt Removal And Installation

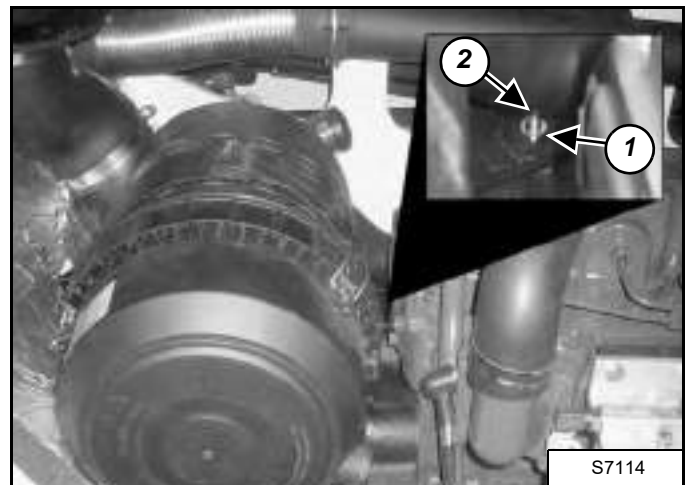
Remove the belt shield (See Shield Removal And Installation on Page 30-50-1.)

Figure 30-50-7



Loosen the bolt (Item 1) [Figure 30-50-7] on the spring loaded tensioner.

Figure 30-50-8



Loosen the lock nut (Item 1) [Figure 30-50-8].

Release belt tension by fully loosening the bolt (Item 2) [Figure 30-50-8].

Remove the drive belt from the pump pulley and flywheel.

Remove the drive belt.

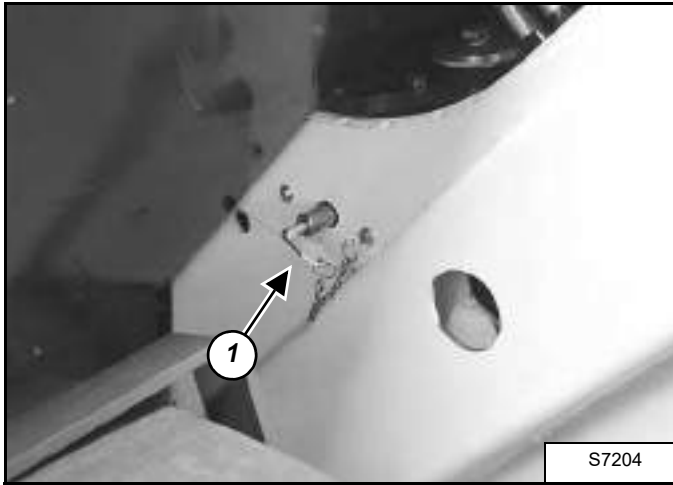
Dealer Copy -- Not for Resale

DRIVE BELT (CONT'D)

Tensioner Pulley Removal And Installation

Stop the engine.

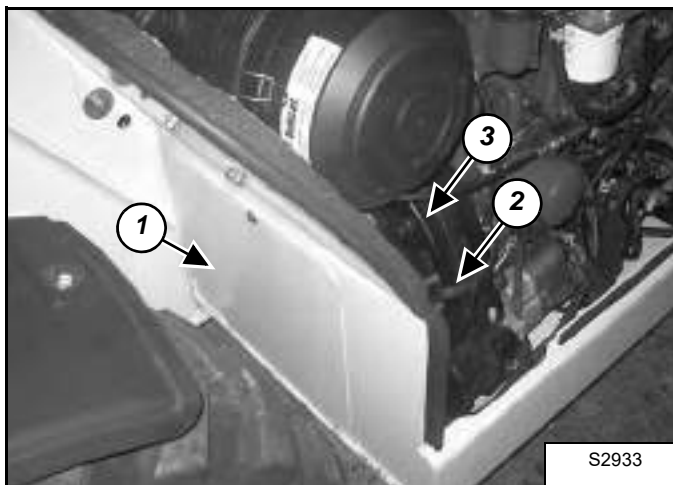
Figure 30-50-9



Rotate the battery disconnect switch (Item 1) **[Figure 30-50-9]** to the right, to disconnect the power supply from the battery.

Open the engine cover. (See "Opening And Closing The Engine Cover" on page 10-160-1)

Figure 30-50-10

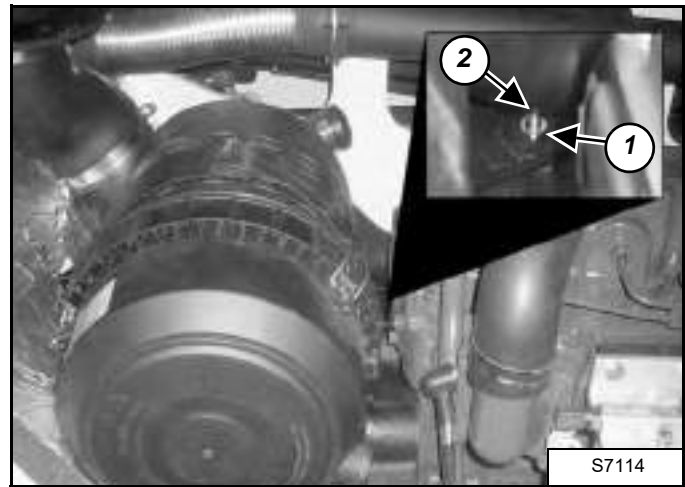


Remove the cover (Item 1) **[Figure 30-50-10]** at the rear of the engine compartment.

Remove the three belt shield holddown clips (Item 2) **[Figure 30-50-10]**.

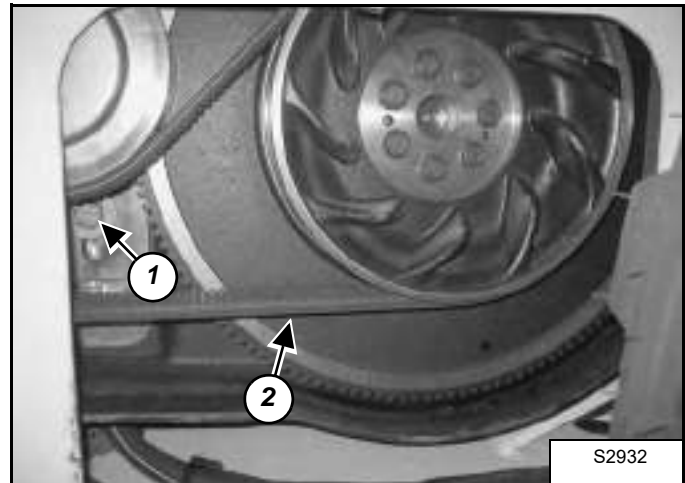
Remove the belt shield (Item 3) **[Figure 30-50-10]** from the drive belt housing.

Figure 30-50-11



Loosen the lock nut (Item 1) and fully loosen the bolt (Item 2) **[Figure 30-50-11]**

Figure 30-50-12



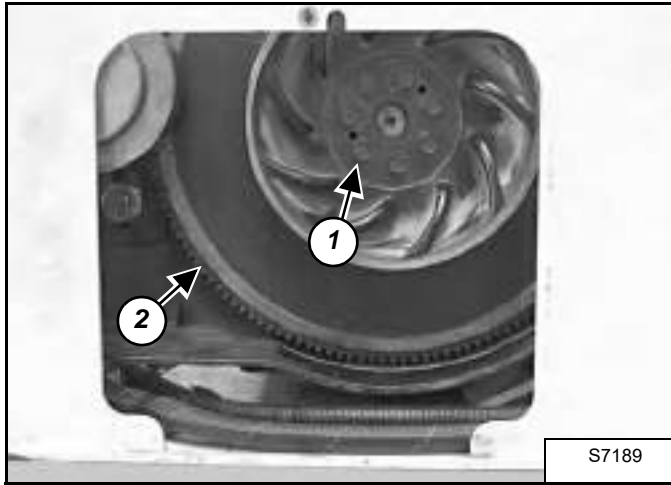
Loosen the bolt (Item 1) **[Figure 30-50-12]** on the spring loaded tensioner.

Remove the drive belt (Item 2) **[Figure 30-50-12]**.

DRIVE BELT (CONT'D)

Tensioner Pulley Removal And Installation (Cont'd)

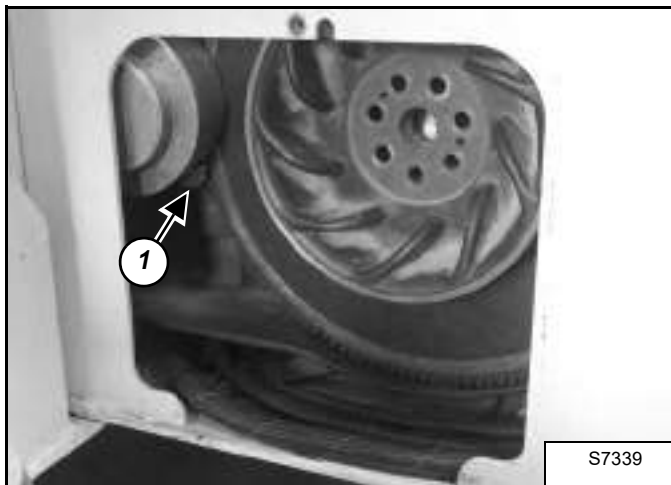
Figure 30-50-13



Remove the seven bolts (Item 1) from the flywheel (Item 2) [Figure 30-50-13].

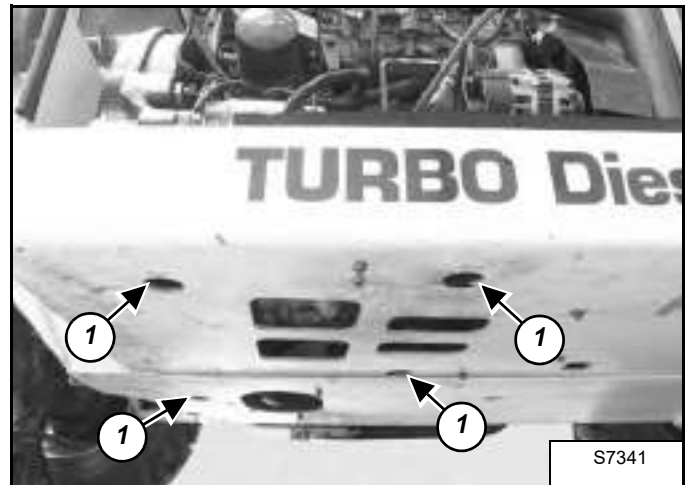
Remove the flywheel from its flange, but leave it in the engine compartment.

Figure 30-50-14



Remove the bolt and washer (Item 1) [Figure 30-50-14] from the tensioner pulley assembly.

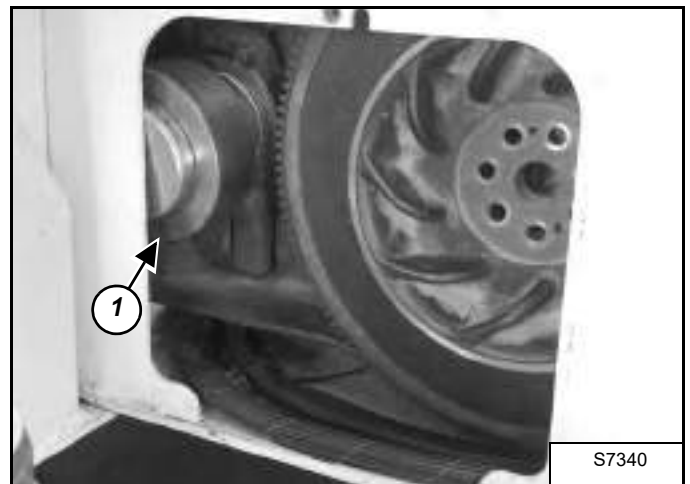
Figure 30-50-15



Remove the four engine mount bolts through the four openings (Item 1) [Figure 30-50-15] in the bottom side of the engine/hydrostat assembly.

The engine can now be slightly shifted to create the extra space which is needed to remove the tensioner pulley.

Figure 30-50-16



Remove the tensioner pulley assembly (Item 1) [Figure 30-50-16].

Installation: After re-installation of the tensioner pulley, flywheel and belt, perform the belt tension adjusting procedure. (See Belt Adjustment on Page 30-50-2.)

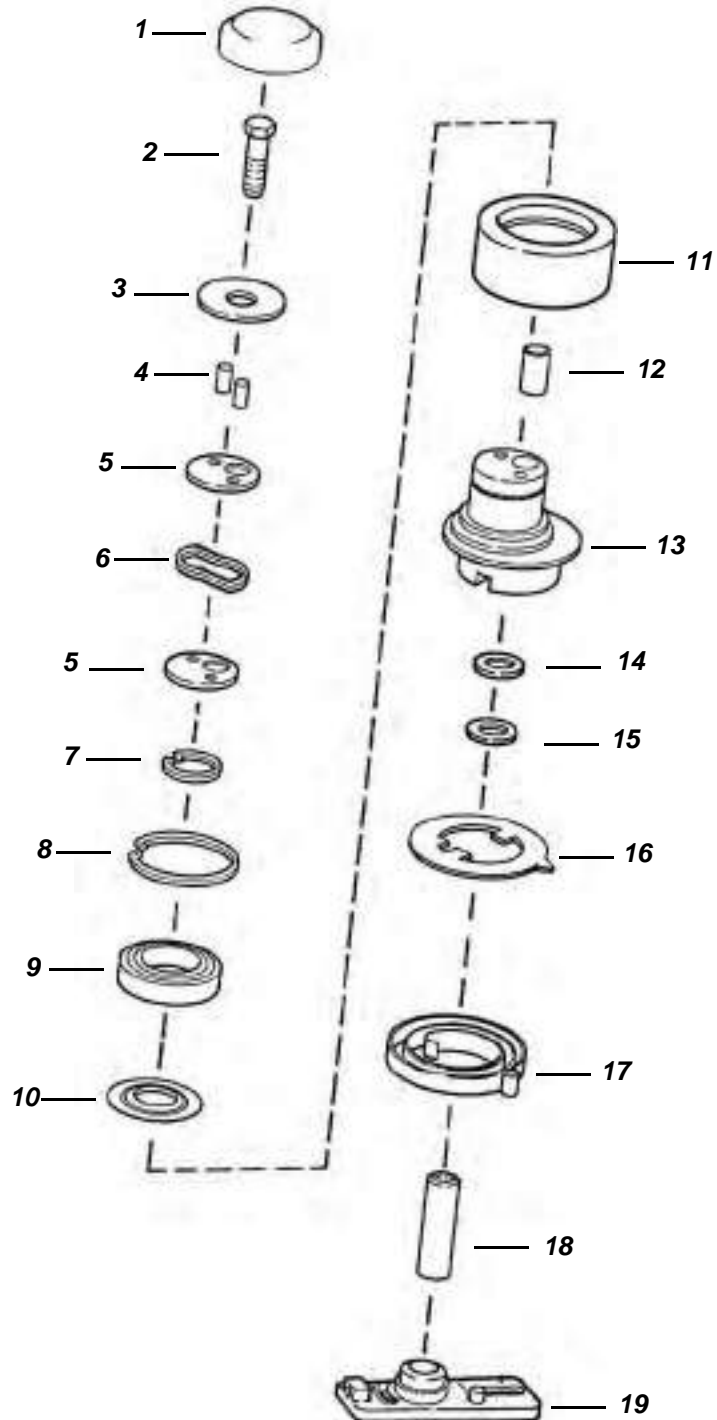
Dealer Copy -- Not for Resale

DRIVE BELT (CONT'D)

Tensioner Pulley Parts Identification

1. Cover
2. Bolt
3. Washer
4. Pins
5. Washer
6. Spring
7. Snap Ring
8. Snap Ring
9. Bearing
10. Dust Shield
11. Pulley
12. Bushing
13. Hub
14. Washer
15. Seal
16. Arrow Indicator Plate
17. Spring
18. Shaft
19. Bracket

NOTE: Belt tensioner parts are not all available individually. Consult parts catalog for available sub-assemblies.



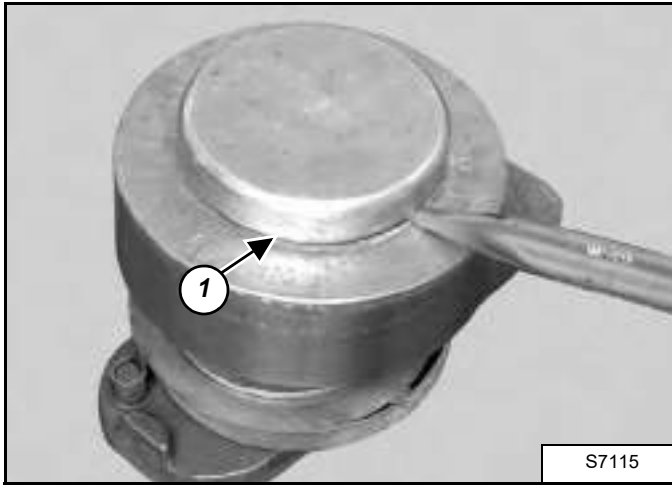
S7151

Dealer Copy -- Not for Resale

DRIVE BELT (CONT'D)

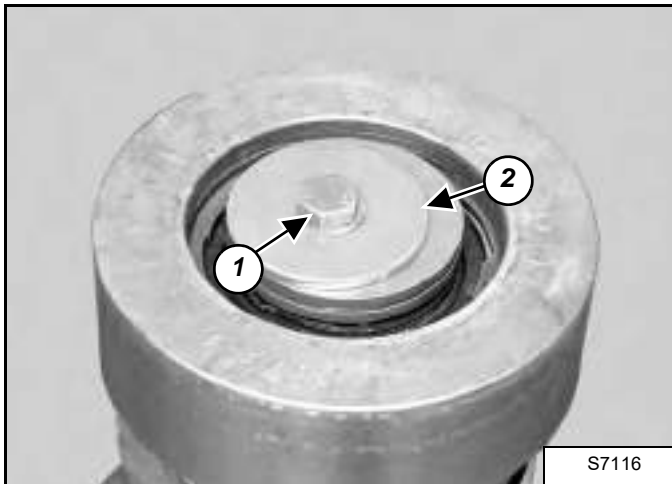
Tensioner Pulley Disassembly And Assembly

Figure 30-50-17



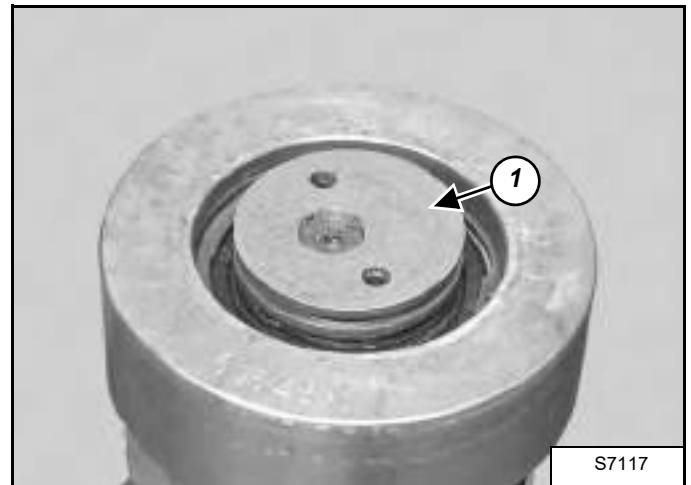
Remove the dust cap (Item 1) [Figure 30-50-17] from the pulley.

Figure 30-50-18



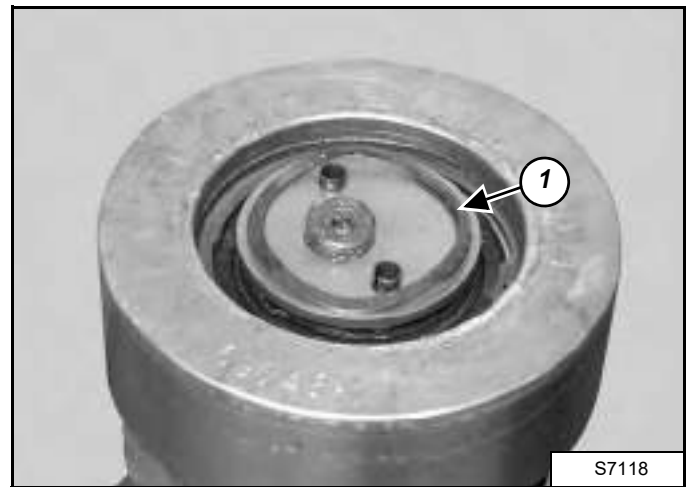
Remove the bolt (Item 1) and washer (Item 2) [Figure 30-50-18].

Figure 30-50-19



Remove the retainer washer (Item 1) [Figure 30-50-19].

Figure 30-50-20



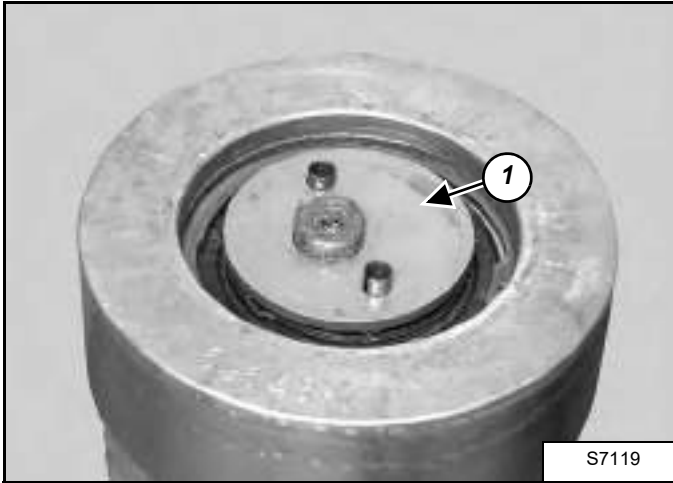
Remove the spring washer (Item 1) [Figure 30-50-20].

Dealer Copy -- Not for Resale

DRIVE BELT (CONT'D)

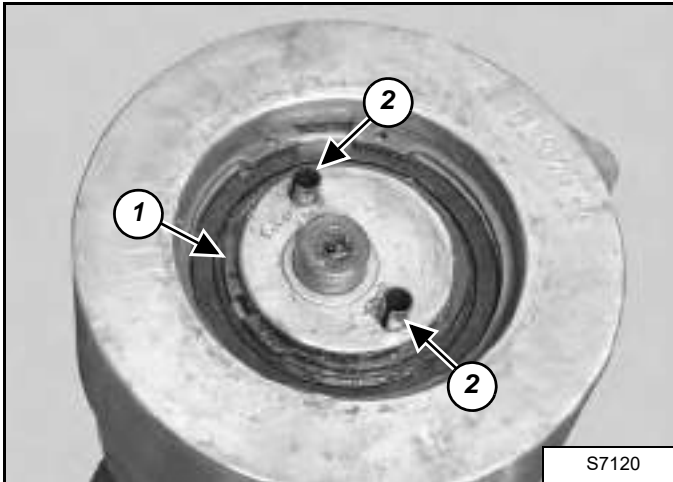
Tensioner Pulley Disassembly And Assembly (Cont'd)

Figure 30-50-21



Remove the retainer washer (Item 1) [Figure 30-50-21].

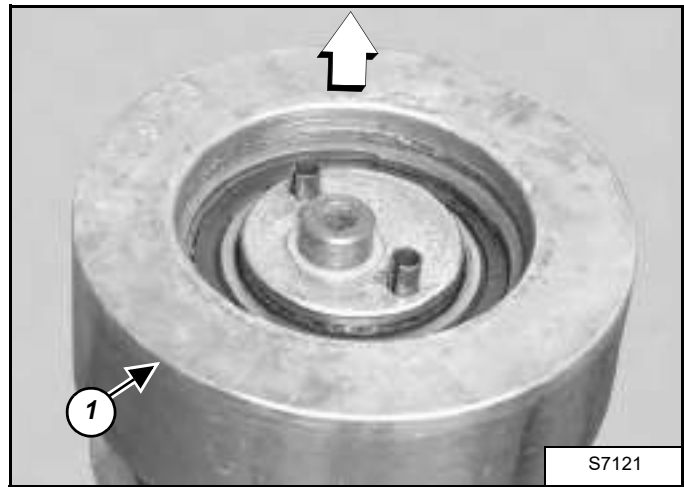
Figure 30-50-22



Remove the snap ring (Item 1) [Figure 30-50-22].

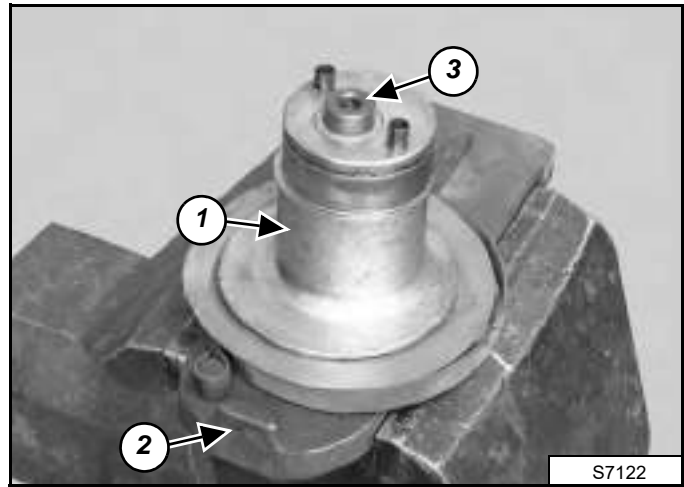
NOTE: Remove the two pins (Item 2) [Figure 30-50-22] from the hub assembly only if they have been damaged.

Figure 30-50-23



Lift the pulley from the hub (Item 1) [Figure 30-50-23].

Figure 30-50-24



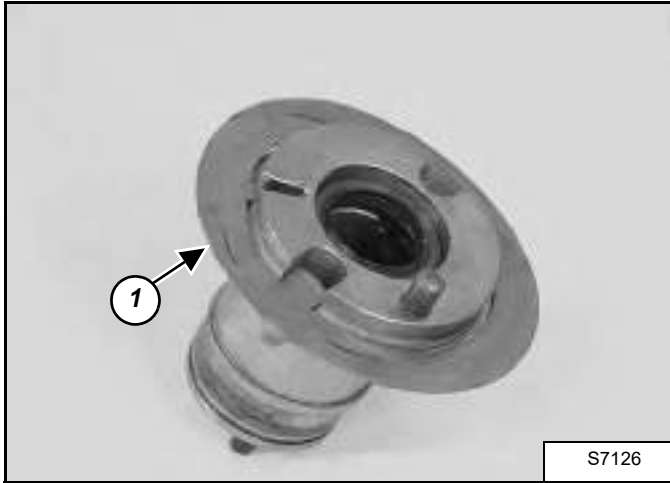
Lift and remove the hub (Item 1) from the bracket (Item 2) while tapping on the shaft (Item 3) [Figure 30-50-24] with a plastic hammer.

Dealer Copy -- Not for Resale

DRIVE BELT (CONT'D)

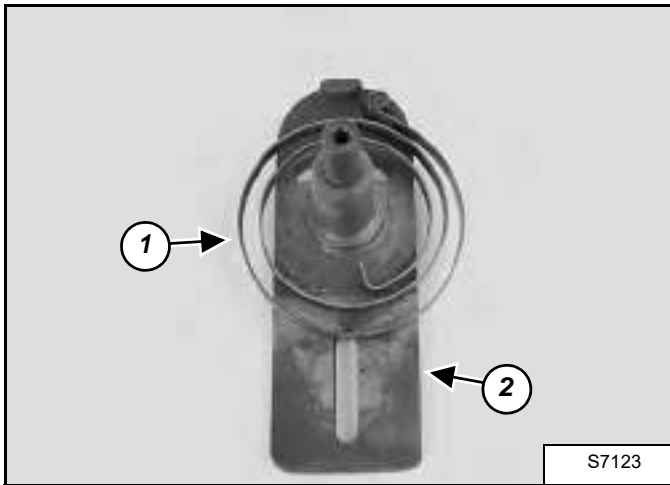
Tensioner Pulley Disassembly And Assembly (Cont'd)

Figure 30-50-25



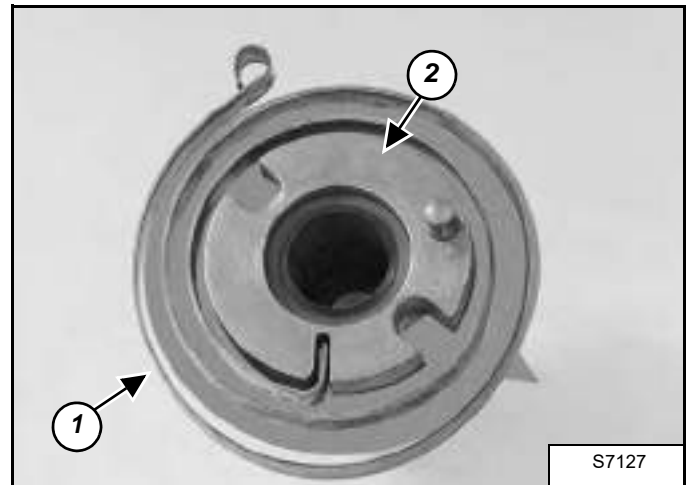
Remove the arrow indicator plate (Item 1) [Figure 30-50-25].

Figure 30-50-26



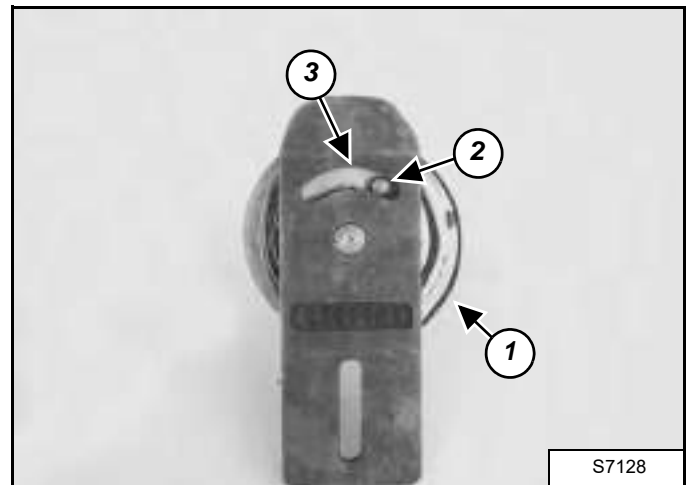
Remove the spring (Item 1) from the bracket (Item 2) [Figure 30-50-26].

Figure 30-50-27



Assembly: Install the spring (Item 1) on the hub (Item 2) [Figure 30-50-27] as shown.

Figure 30-50-28



Assembly: Install the hub and spring on the bracket and align the spring (Item 1) [Figure 30-50-28] over the alignment pin on the bracket.

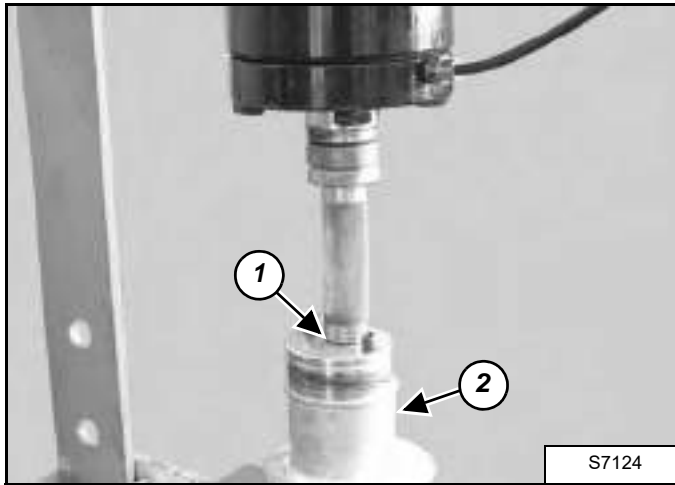
Assembly: Rotate the hub until it snaps into place. The pin (Item 2) must be positioned in the bracket cutaway (Item 3) [Figure 30-50-28] as shown.

Dealer Copy -- Not for Resale

DRIVE BELT (CONT'D)

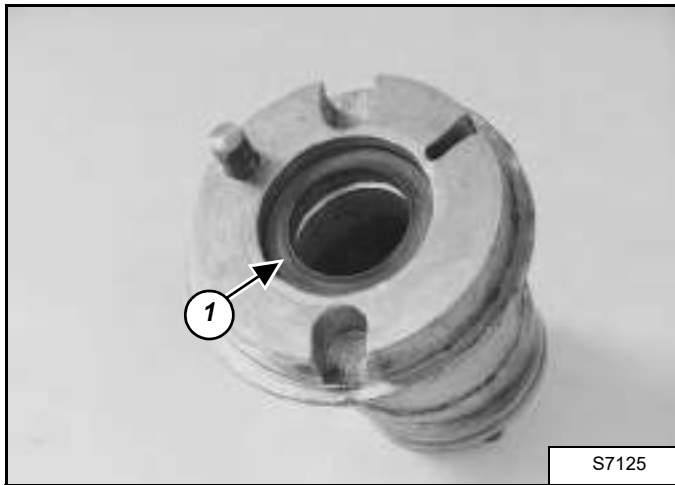
**Tensioner Pulley Disassembly And Assembly
(Cont'd)**

Figure 30-50-29



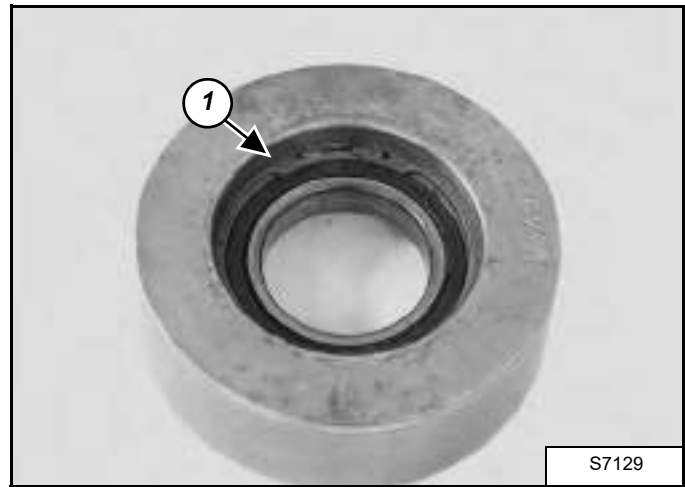
If needed, replace the copper bushing (Item 1) from the hub (Item 2) [Figure 30-50-29].

Figure 30-50-30



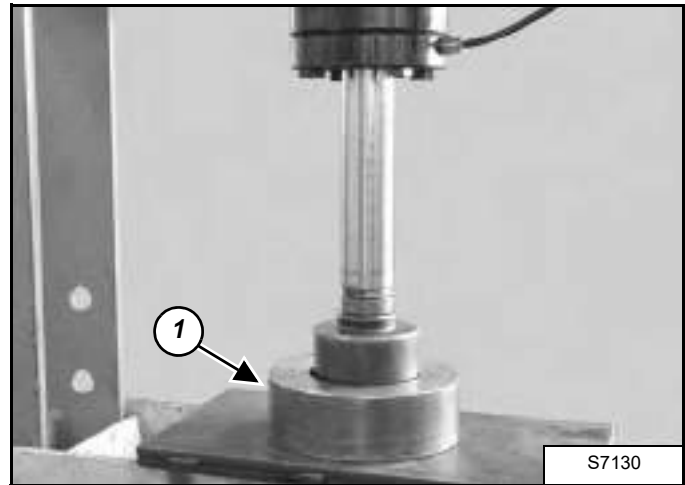
Remove the seal (Item 1) [Figure 30-50-30] from the hub.

Figure 30-50-31



Remove the snap ring (Item 1) [Figure 30-50-31] from the pulley.

Figure 30-50-32



Turn the pulley upside down and replace the bearing (Item 1) [Figure 30-50-32] from the pulley.

Dealer Copy -- Not for Resale

DRIVE SYSTEM

TROUBLESHOOTING	40-10-1
Chart	40-10-1
AXLE AND DIFFERENTIAL (FRONT)	40-20-1
Description	40-20-1
Planetary Carrier And Wheel Hub Parts Identification	40-20-1
Planetary Carrier Disassembly	40-20-2
Wheel Hub Disassembly	40-20-4
Steering Knuckle And Drive Shaft Parts Identification	40-20-7
Steering Knuckle Disassembly	40-20-8
Axle Housing / Drive Shaft Disassembly	40-20-12
Brake Group Parts Identification	40-20-15
Brake Group Disassembly	40-20-16
Differential Parts Identification	40-20-20
Differential Disassembly	40-20-21
Pinion Group Parts Identification	40-20-24
Pinion Group Disassembly	40-20-25
Pinion Group Assembly	40-20-27
Differential Assembly	40-20-33
Brake Group Assembly	40-20-36
Axle Housing / Drive Shaft Assembly	40-20-40
Steering Knuckle Assembly	40-20-43
Wheel Hub Assembly	40-20-49
Planetary Carrier Assembly	40-20-50
Special Tools	40-20-53
AXLE AND DIFFERENTIAL (REAR)	40-21-1
Description	40-21-1
Planetary Carrier And Wheel Hub Parts Identification	40-21-1
Planetary Carrier Disassembly	40-21-2
Wheel Hub Disassembly	40-21-4
Steering Knuckle and Drive Shaft Parts Identification	40-21-7
Steering Knuckle Disassembly	40-21-8
Axle Housing / Drive Shaft Disassembly	40-21-12
Differential Parts Identification	40-21-15
Pinion Group Parts Identification	40-21-20
Pinion Group Disassembly	40-21-21
Pinion Group Assembly	40-21-25
Differential Assembly	40-21-33
Steering Knuckle Assembly	40-21-37
Planetary Carrier Assembly	40-21-43
Special Tools	40-21-48
FRONT AXLE	40-30-1
Removal	40-30-1
Installation	40-30-5

AXLE TOE-IN	40-40-1
Adjustment	40-40-1
PARKING BRAKE	40-50-1
Releasing The Brake Discs	40-50-1
Engaging The Brake Discs	40-50-2
STEERING ANGLE ADJUSTMENT	40-60-1
Adjustment	40-60-1
DRIVE SHAFT	40-70-1
Removal And Installation	40-70-1
SERVICE BRAKE	40-80-1
Description	40-80-1
Bleeding The Brake Circuit	40-80-1
REAR AXLE	40-90-1
Removal	40-90-1
Installation	40-90-4

TROUBLESHOOTING

Chart

The following Troubleshooting Chart is provided for assistance in locating and correcting problems which are most common. Many of the recommended procedures must be done by authorized Bobcat Service Personnel only.

PROBLEM	CAUSE
Pinion or Ring gear tooth broken	1, 2, 3, 4, 5, 6
Pinion teeth pitted	5, 11
Axle housing bent	12, 13
Worn or pitted bearings	3, 5, 6, 11, 14
Oil leakage	6, 9, 14
Excessive wear on input shaft splines	3, 16, 17, 19
Pinion teeth fatigue	7, 12, 17, 19
Side gear spline worn	17, 19
Thrust washer surface worn	5, 6, 7
Inner diameter of tapered roller bearing worn	5, 6, 18, 19
Bent or broken half shaft	19
Half shaft broken at wheel side	20, 21

KEY TO CORRECT THE CAUSE
1. Excessive gear load
2. Incorrect gear adjustment (excessive play)
3. Pinion nut loose
4. Incorrect gear adjustment (insufficient play)
5. Insufficient lubrication
6. Contaminated oil
7. Incorrect lubrication
8. Worn bearings
9. Operation at high temperature
10. Low oil level
11. Excessive use
12. Overloaded
13. Accident
14. Normal Wear
15. Lip seal damaged
16. Pinion axle play
17. Continuous overload
18. Excessive pinion axle play
19. Vehicle intensively operated or overloaded
20. Wheel loose
21. Beam housing bent

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT)

Description

For photo clarity, the following axle procedures are done with the complete axle assembly removed from the machine, although the planetary carrier, wheel hub, steering knuckle and drive shaft procedures may be done with the axle assembly installed in the machine. For complete axle repair, the following must be done:

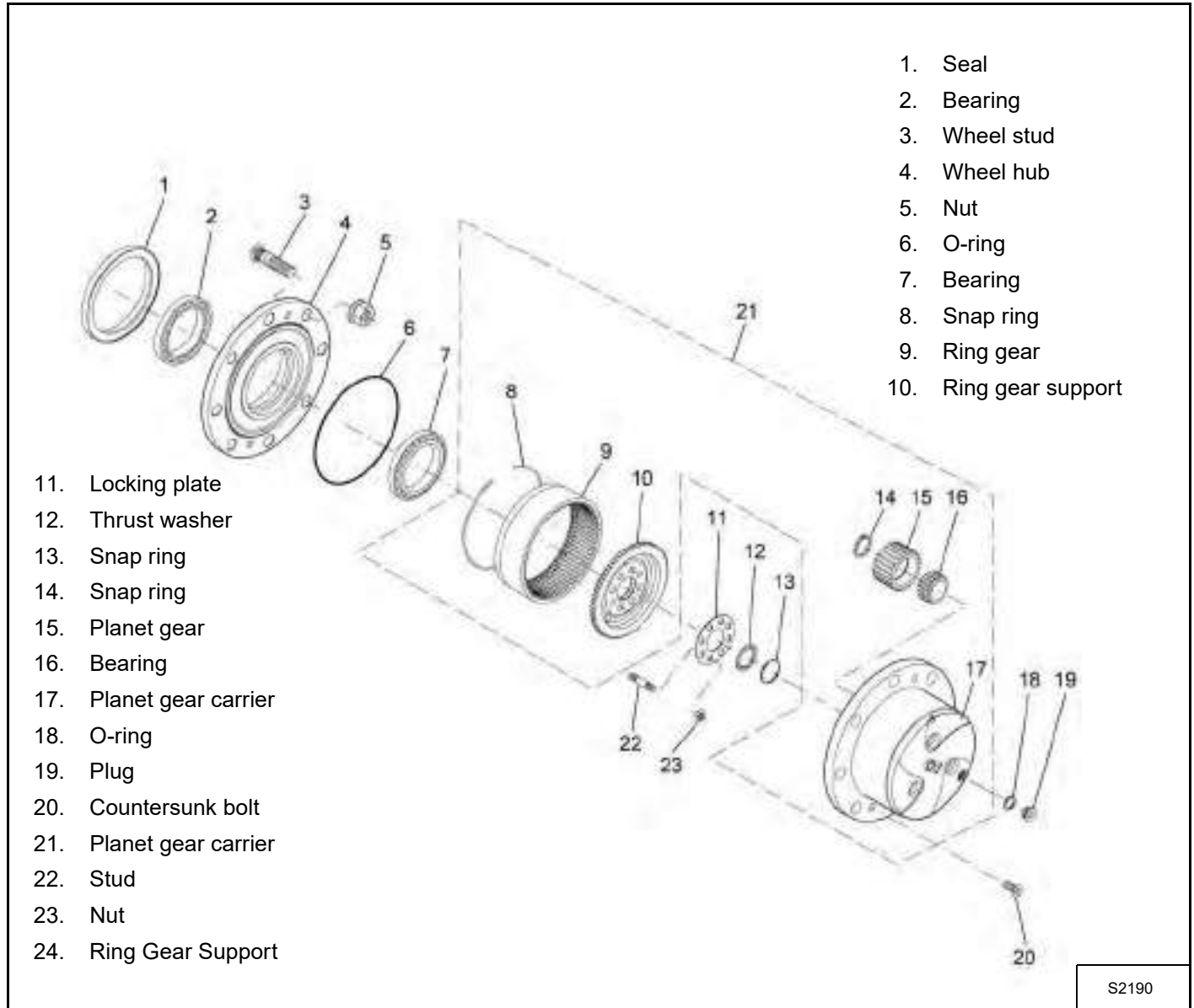
Front axle removal. (See Removal on Page 40-30-1.)

Drive motor removal. (See Removal And Installation on Page 30-30-1.)

Drive box removal. (See Disassembly on Page 20-70-2.)

Steering cylinder removal. (See Removing the Steering Cylinder on Page 20-60-1.)

Planetary Carrier And Wheel Hub Parts Identification



Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Planetary Carrier Disassembly

Clean the outside of the planetary carrier before disassembly.

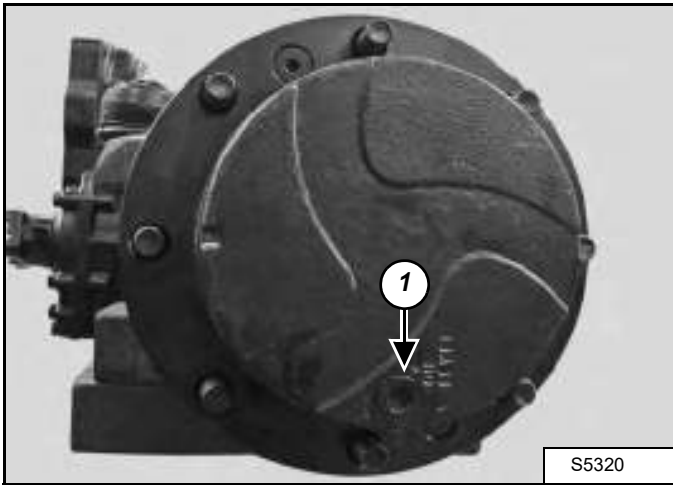
Mark the outside of the planetary carrier for ease of assembly.

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

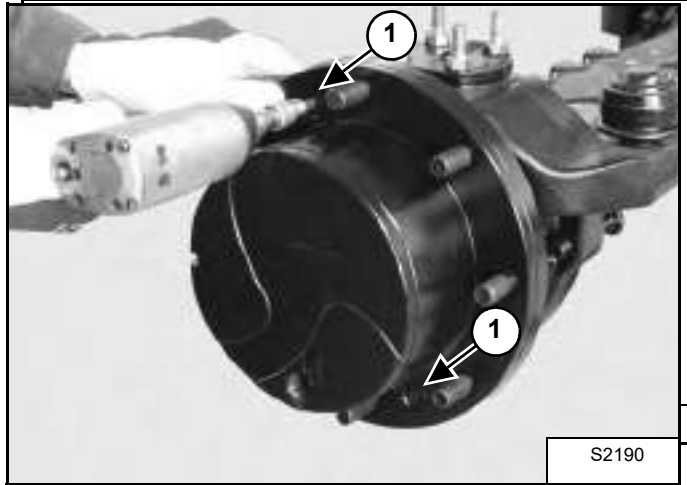
I-2003-0888

Figure 40-20-1



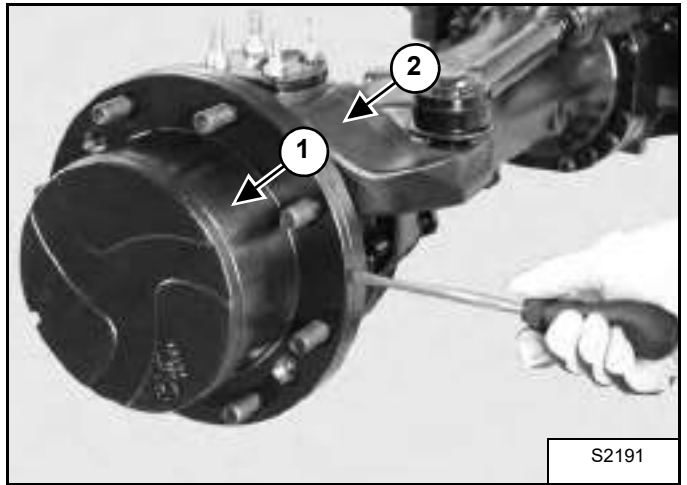
With the drain plug (Item 1) [Figure 40-20-1] in the position shown, place a drain pan under the hub and remove the plug.

Figure 40-20-2



Remove the two screws (Item 1) [Figure 40-20-2] from the planetary carrier.

Figure 40-20-3



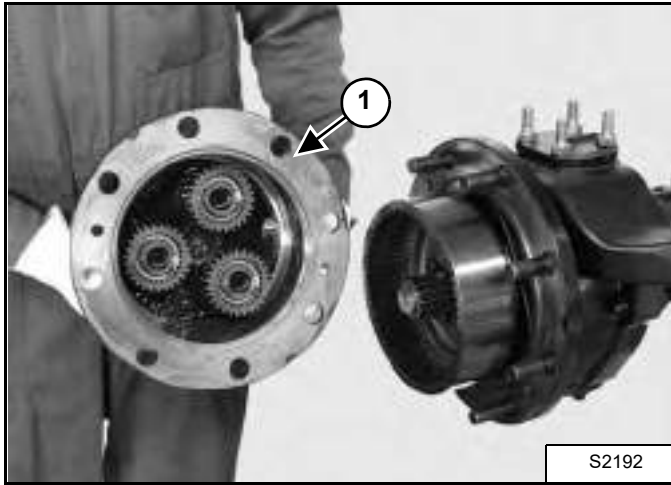
Remove the planetary gear carrier (Item 1) from the wheel hub (Item 2) [Figure 40-20-3] by alternately forcing a screwdriver into the appropriate slots.

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

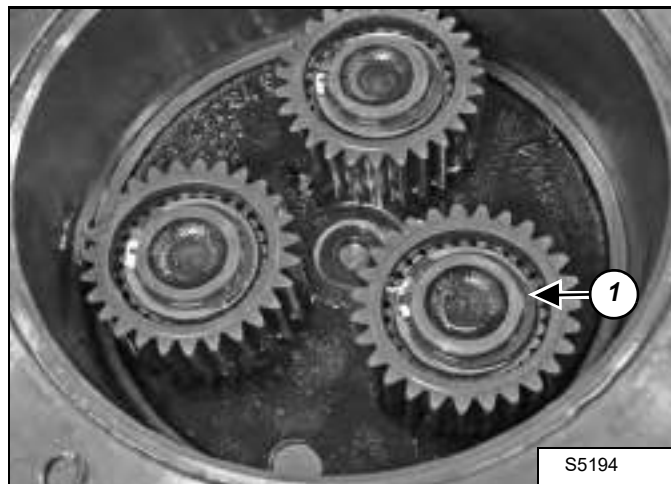
Planetary Carrier Disassembly (Cont'd)

Figure 40-20-4



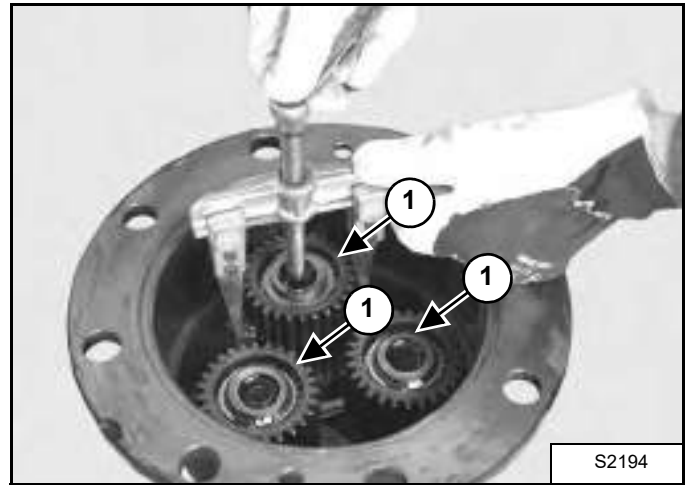
Remove the securing bolts and the complete planet gear carrier (Item 1) [Figure 40-20-4].

Figure 40-20-5



Remove the snap ring (Item 1) [Figure 40-20-5] from the planetary carrier.

Figure 40-20-6



With the help of a puller, remove the planet wheel gears (Item 1) [Figure 40-20-6].

NOTE: Note the assembly side of the planetary gears.

Figure 40-20-7



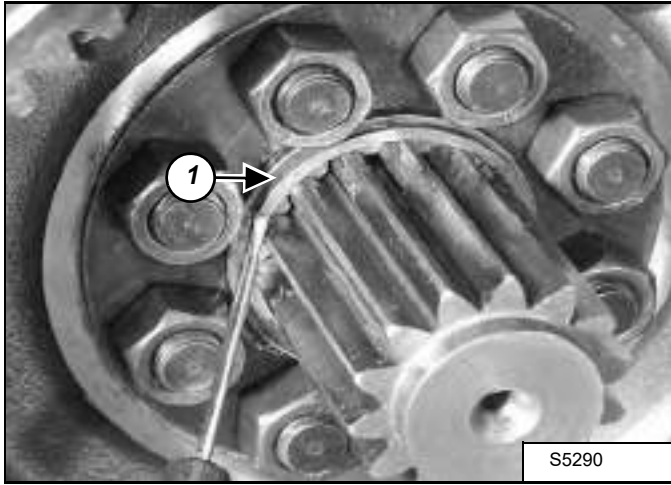
NOTE: Note down the direction of assembly of planet wheel gears [Figure 40-20-7].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

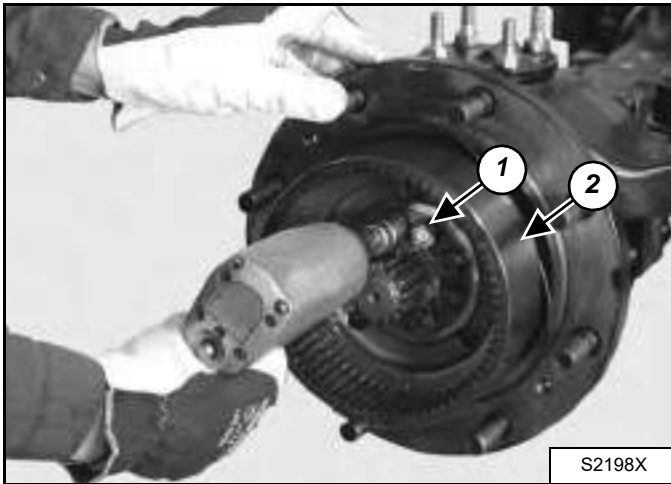
Wheel Hub Disassembly

Figure 40-20-8



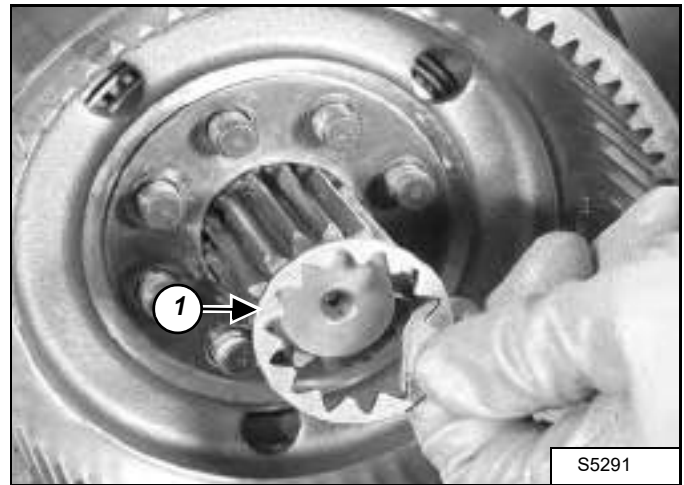
Remove the snap ring (Item 1) [Figure 40-20-8].

Figure 40-20-9



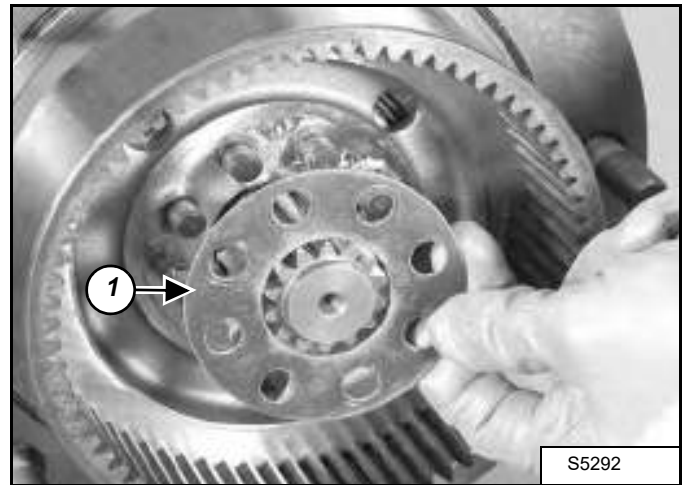
Remove the eight nuts (Item 1) from the ring gear (Item 2) [Figure 40-20-9].

Figure 40-20-10



Remove the thrust washer (Item 1) [Figure 40-20-10].

Figure 40-20-11

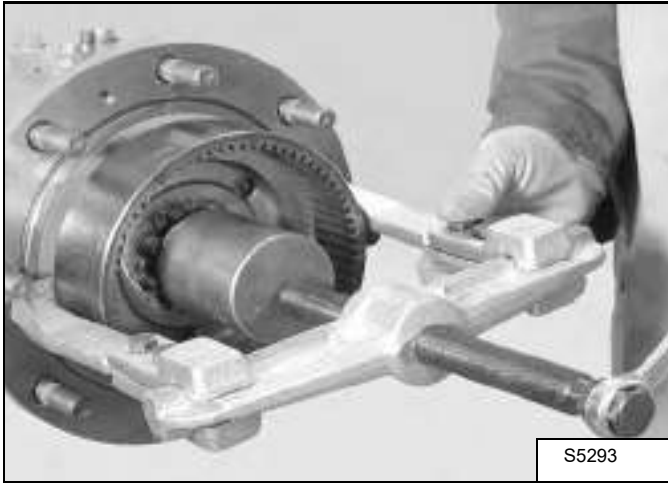


Remove the plate (Item 1) [Figure 40-20-11].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

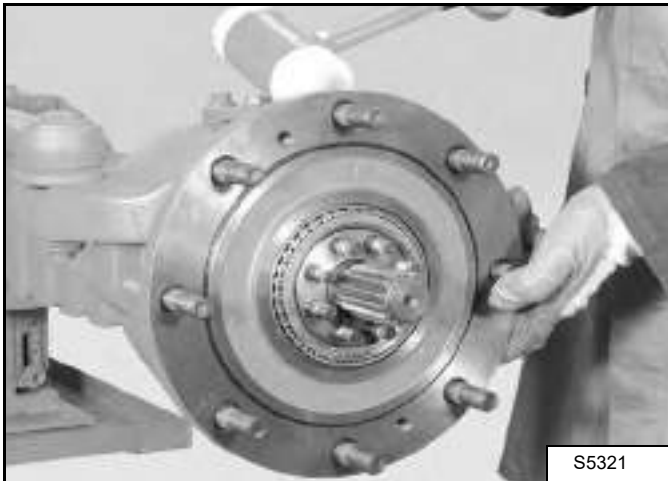
Wheel Hub Disassembly (Cont'd)

Figure 40-20-12



Remove the ring gear from the shaft [Figure 40-20-12].

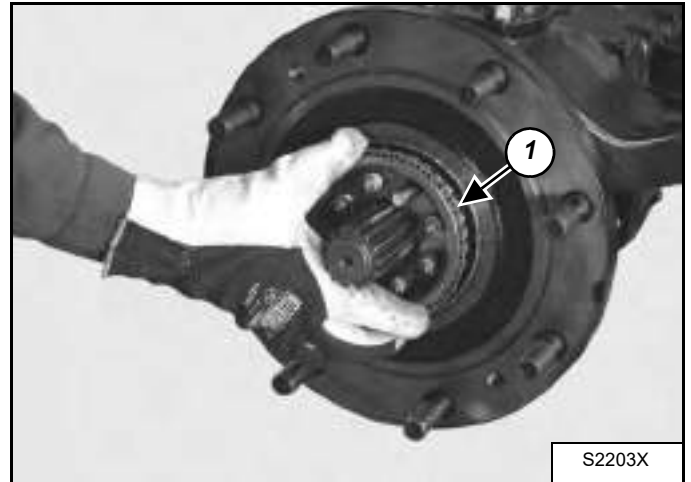
Figure 40-20-13



Loosen the hub with a plastic hammer [Figure 40-20-13].

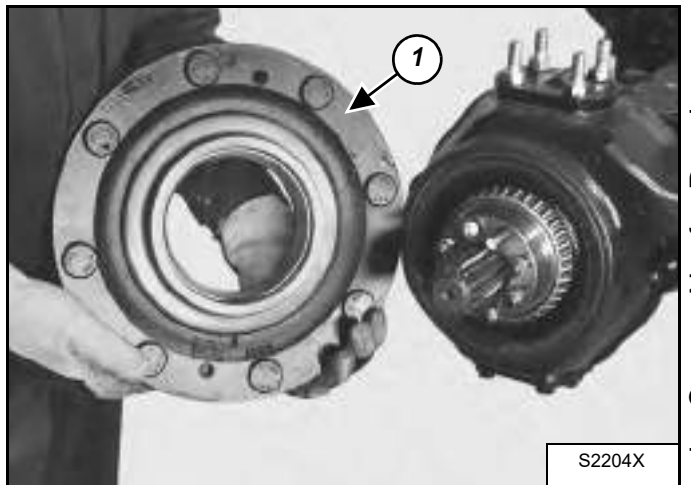
NOTE: Alternately hammer on several equidistant points.

Figure 40-20-14



Remove the bearing (Item 1) [Figure 40-20-14].

Figure 40-20-15



Remove the complete wheel hub (Item 1) [Figure 40-20-15] by hand.

NOTE: Use care while removing, as the assembly may come off easily.

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Wheel Hub Disassembly (Cont'd)

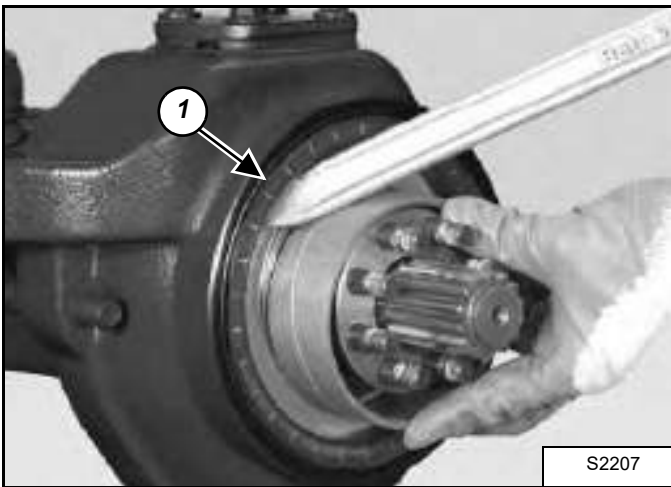
Figure 40-20-16



Remove the seals from the hub [Figure 40-20-16].

NOTE: Hammer in an alternate sequence to prevent crawling and deformation of the bearing races.

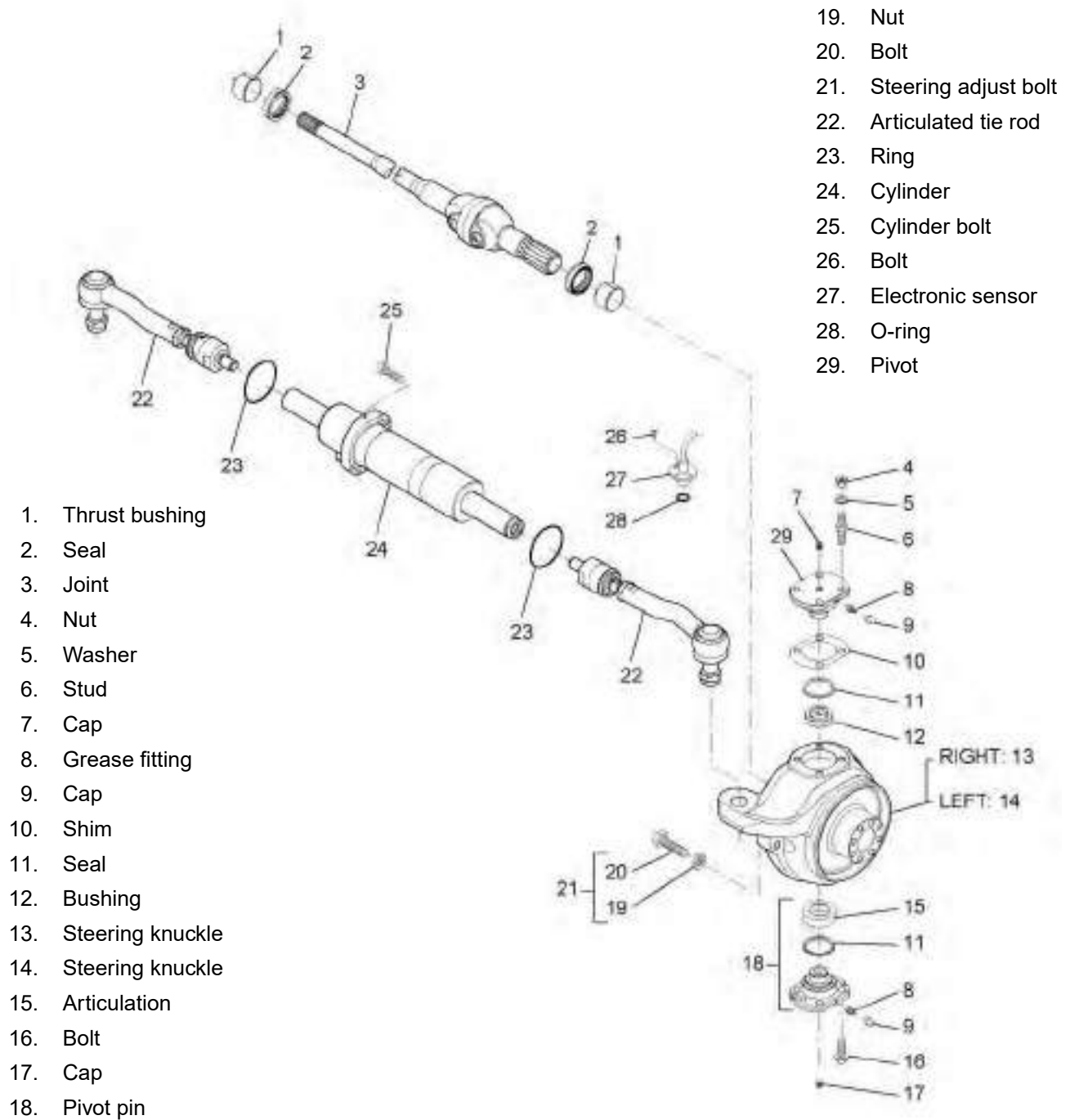
Figure 40-20-17



Remove the sealing ring from the steering knuckle (Item 1) [Figure 40-20-17] from the ring gear assembly.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Steering Knuckle And Drive Shaft Parts Identification



Dealer Copy -- Not for Resale

S1389

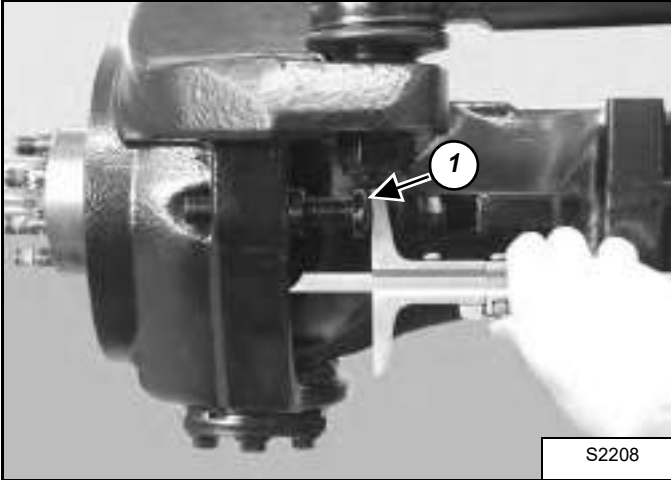
AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Steering Knuckle Disassembly

Clean the outside of the steering knuckle before disassembly.

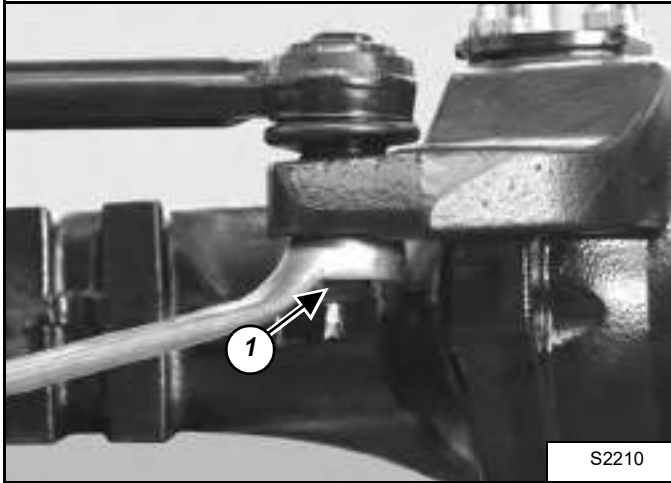
Mark the outside of the steering knuckle for ease of assembly.

Figure 40-20-18



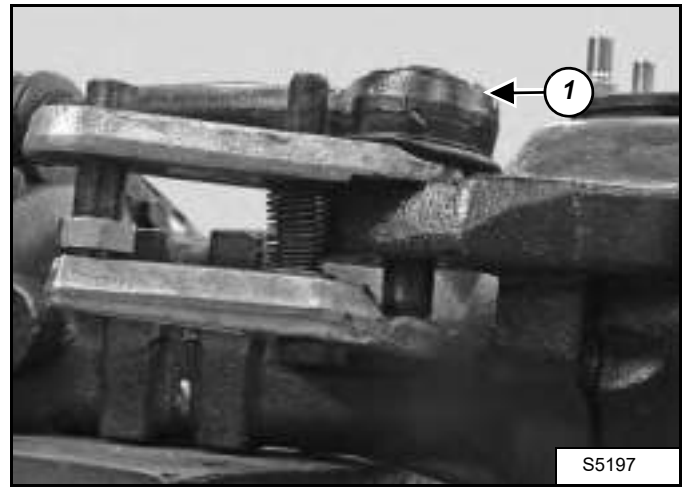
Measure and note the protrusion of the screw (Item 1) for reassembly [Figure 40-20-18] before removing the screw.

Figure 40-20-19



Remove the steering cylinder nut (Item 1) [Figure 40-20-19].

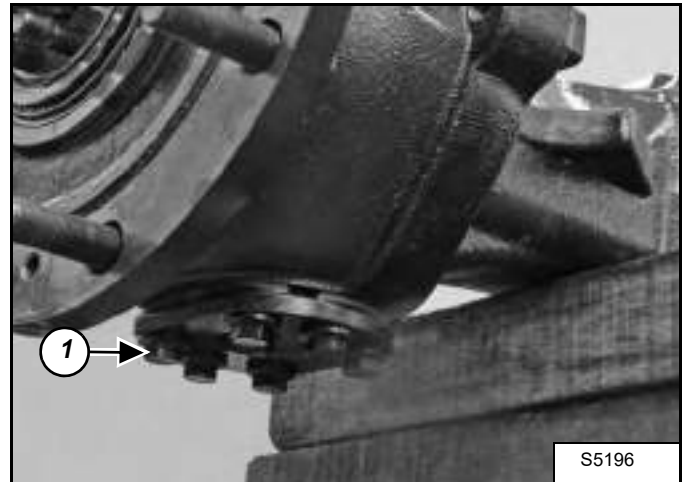
Figure 40-20-20



Remove the tapered end of the tie rod (Item 1) [Figure 40-20-20] from the steering knuckle.

NOTE: Be careful as the bolt may come out with great force.

Figure 40-20-21



Remove six screws from the bottom pivot (Item 1) [Figure 40-20-21].

Remove the pivot (Item 1) [Figure 40-20-21].

NOTE: Screws can not be re-used.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

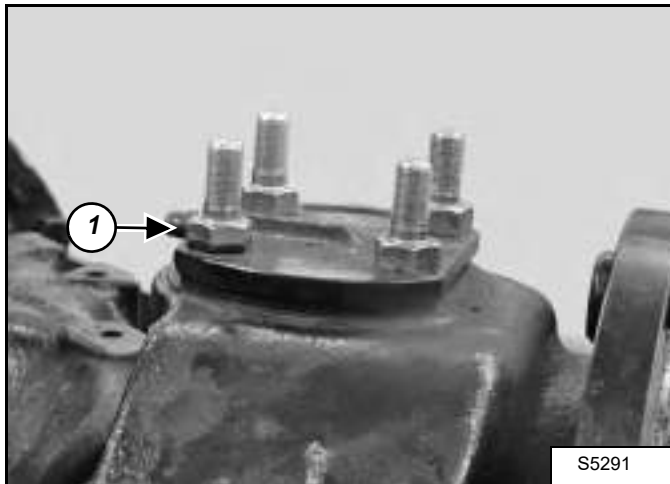
Steering Knuckle Disassembly (Cont'd)

Figure 40-20-22



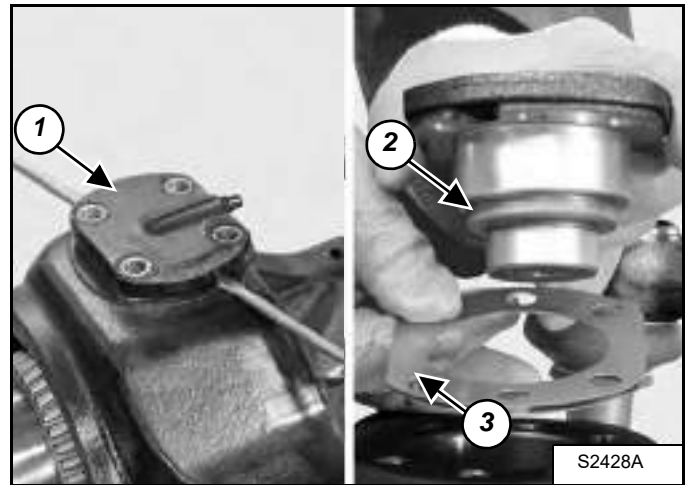
Remove the seal from the bottom pivot (Item 1) [Figure 40-20-22].

Figure 40-20-23



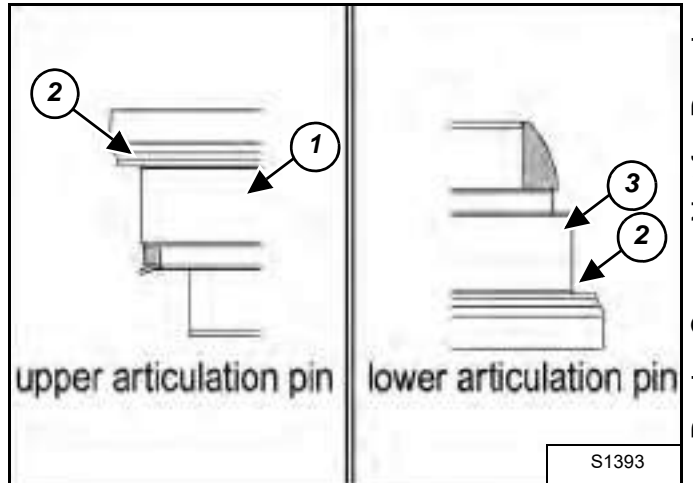
Remove the four screws (Item 1) [Figure 40-20-23] from the upper pivot.

Figure 40-20-24



Using two levers, remove the top pivot pin (Item 1) complete with front seal (Item 2) and shims (Item 3) [Figure 40-20-24].

Figure 40-20-25



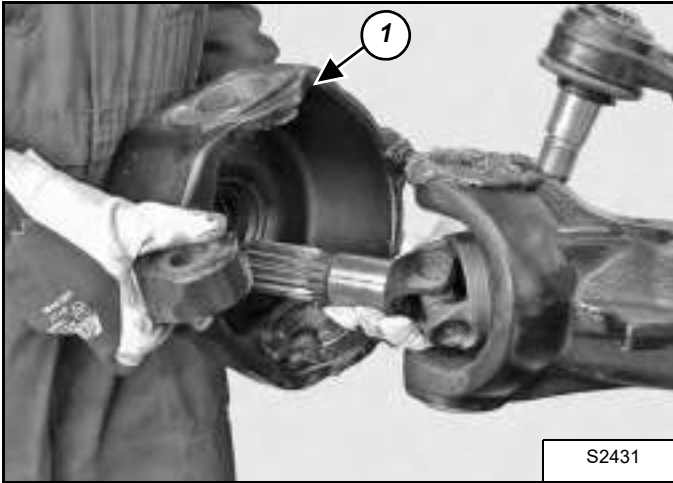
Configuration of the upper (Item 1) pivot pin with shims (Item 2) and the lower pivot pin (Item 3) [Figure 40-20-25].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

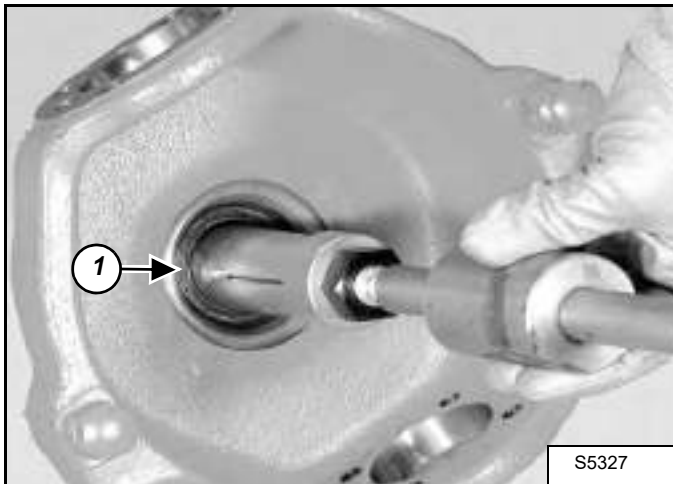
Steering Knuckle Disassembly (Cont'd)

Figure 40-20-26



Remove the steering knuckle (Item 1) [Figure 40-20-26] from the axle.

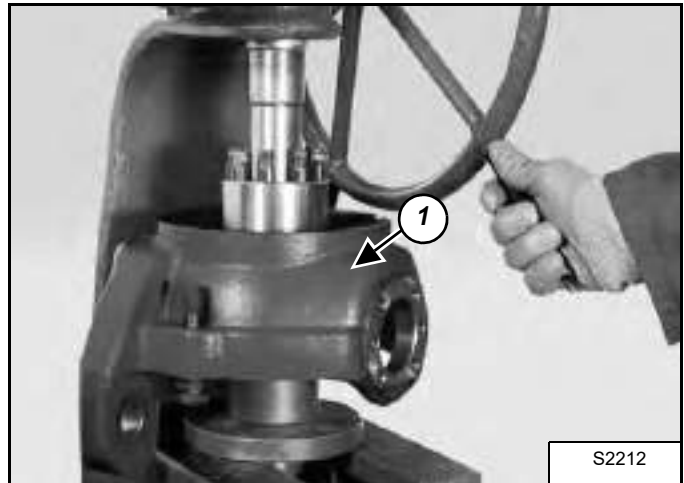
Figure 40-20-27



Use a puller to remove the seal from the steering knuckle (Item 1) [Figure 40-20-27].

Installation: Use special tool (Bobcat part number 6912178) to install the seal.

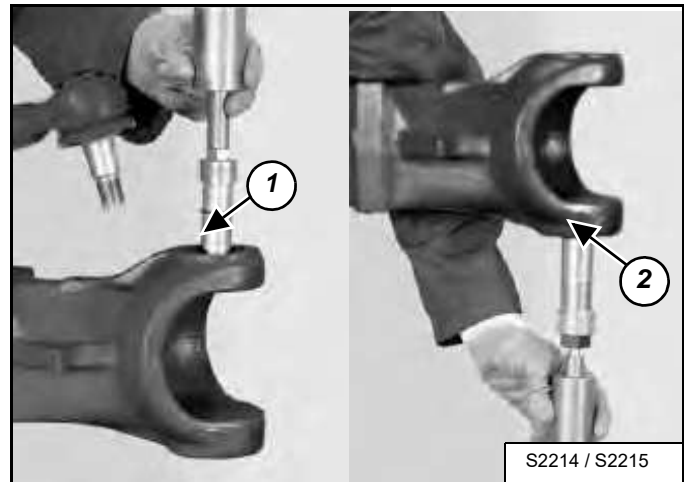
Figure 40-20-28



Remove the bushing from the steering knuckle (Item 1) [Figure 40-20-28].

NOTE: Note down the orientation of bushing.

Figure 40-20-29

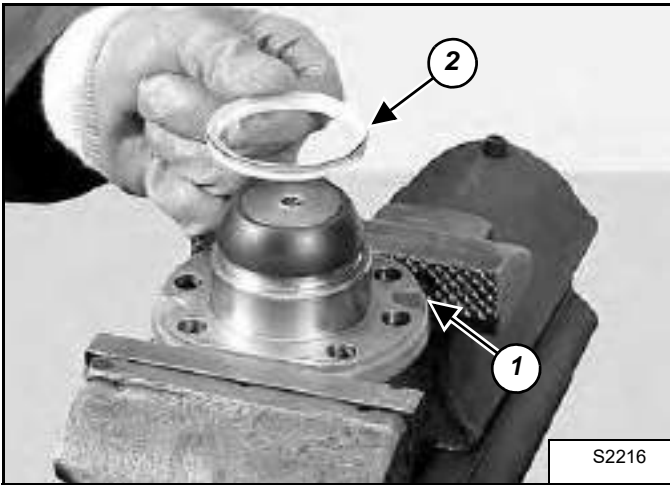


Using a puller for inner parts, remove the top bush (Item 1) and the bottom ball-bush (Item 2) [Figure 40-20-29].

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Steering Knuckle Disassembly (Cont'd)

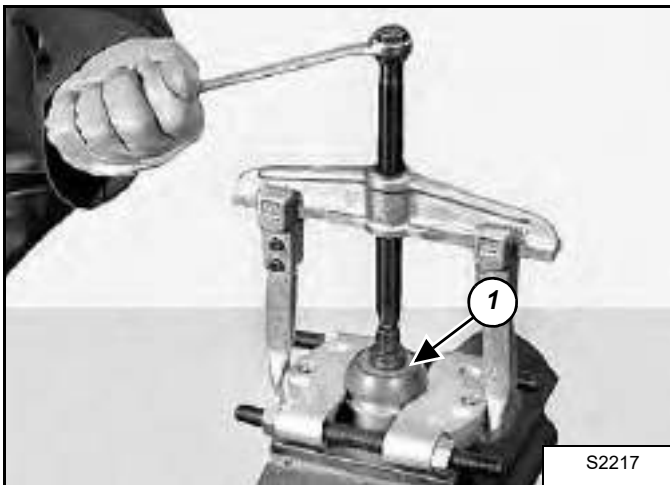
Figure 40-20-30



Remove the pivot pins (Item 1) and the front sealing rings (Item 2) [Figure 40-20-30].

NOTE: Note down the side for assembly

Figure 40-20-31



If the ball cover (Item 1) [Figure 40-20-31] needs replacing, remove it from the bottom pivot pin.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Axle Housing / Drive Shaft Disassembly

Clean the outside of the axle housing before disassembly.

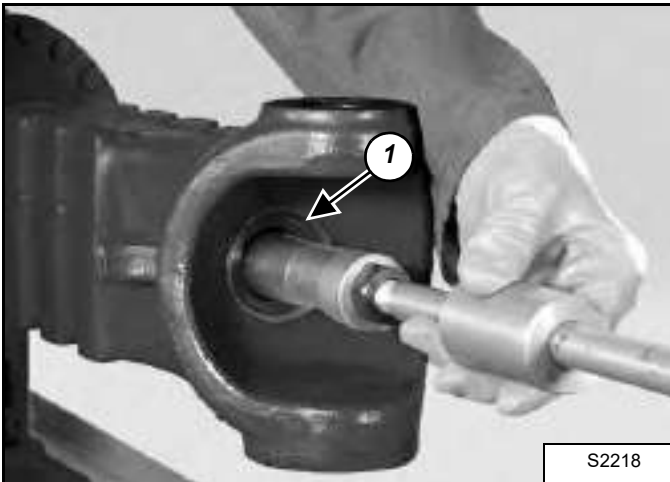
Mark the outside of the axle housing for ease of assembly.

Figure 40-20-32



Remove the drive shaft from the axle housing [Figure 40-20-32].

Figure 40-20-33

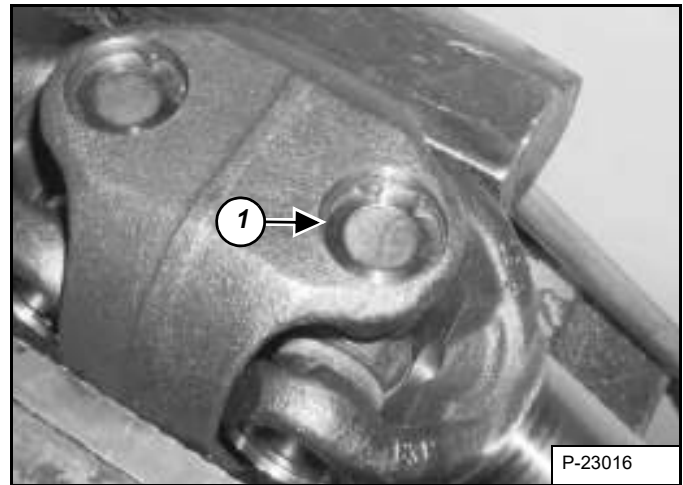


Remove seal ring (Item 1) [Figure 40-20-33] and the bushing from the arm.

NOTE: Note down the side for assembly

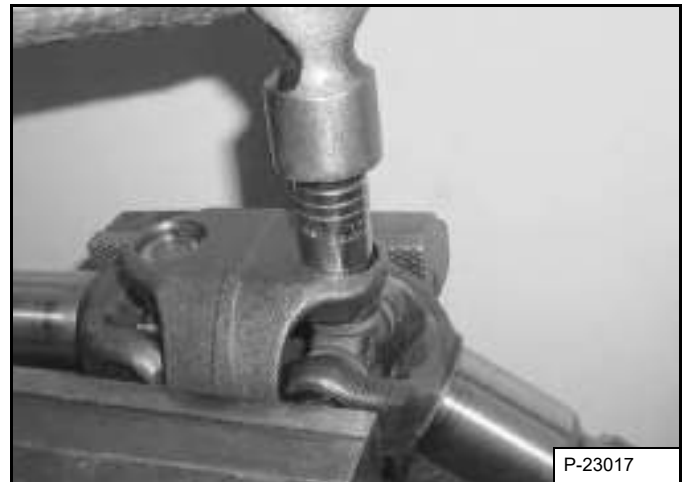
Check the position of the anti-extrusion and O-rings.

Figure 40-20-34



Remove the two snap rings (Item 1) [Figure 40-20-34] across from each other.

Figure 40-20-35



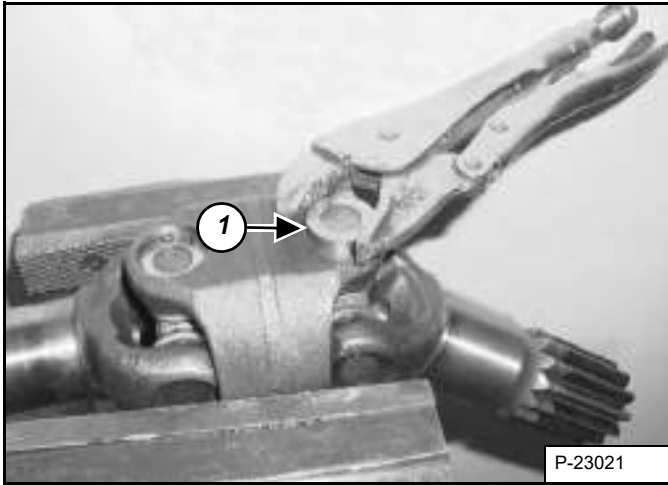
Drive the upper bearing cup down to push the opposite bearing cup partially through the yoke [Figure 40-20-35].

NOTE: The bottom bearing cup will not be completely removed.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

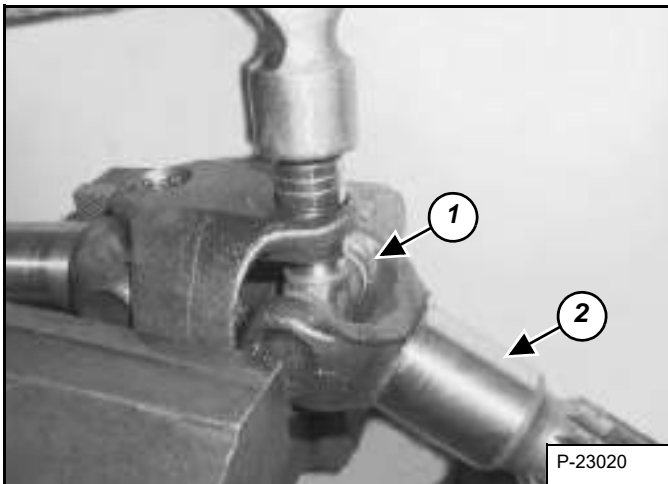
Axle Housing / Drive Shaft Disassembly (Cont'd)

Figure 40-20-36



Turn the shaft over and remove the bearing cup (Item 1) [Figure 40-20-36].

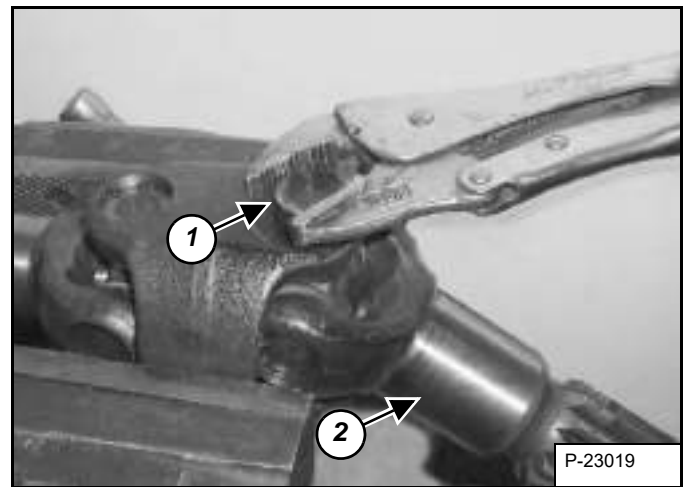
Figure 40-20-37



Drive the cross (Item 1) [Figure 40-20-37] down to push the opposite bearing cup through the yoke.

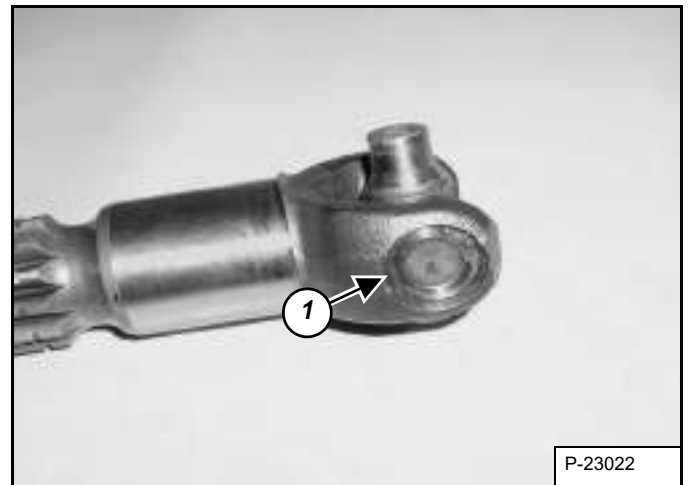
NOTE: The drive shaft end (Item 2) [Figure 40-20-37] may fall out of the yoke.

Figure 40-20-38



Turn the shaft over and remove the bearing cup (Item 1). Remove the drive shaft (Item 2) [Figure 40-20-38] from the yoke.

Figure 40-20-39



Remove the two snap rings (Item 1) [Figure 40-20-39] from the yoke.

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

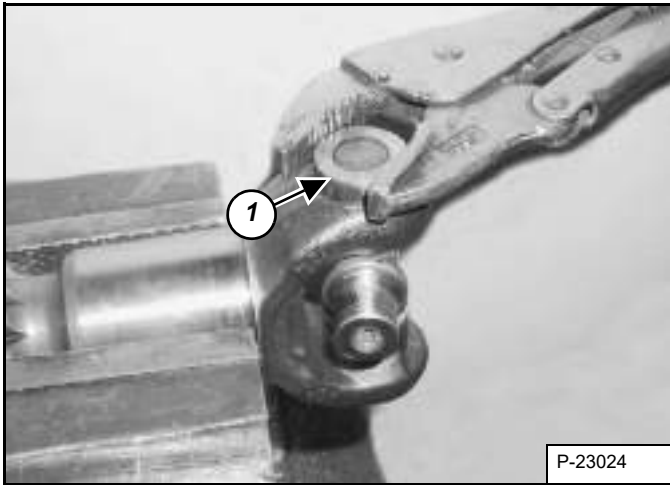
Axle Housing / Drive Shaft Disassembly (Cont'd)

Figure 40-20-40



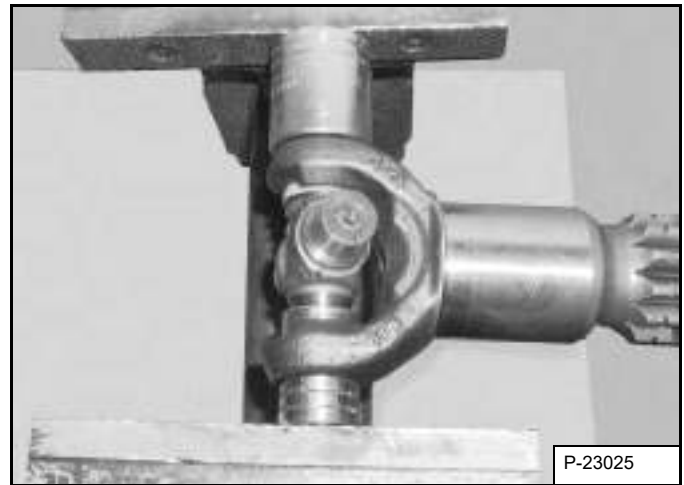
Using two different size sockets and a vice, and press one bearing cup into the yoke while pushing the opposite bearing cup through the yoke **[Figure 40-20-40]**.

Figure 40-20-41



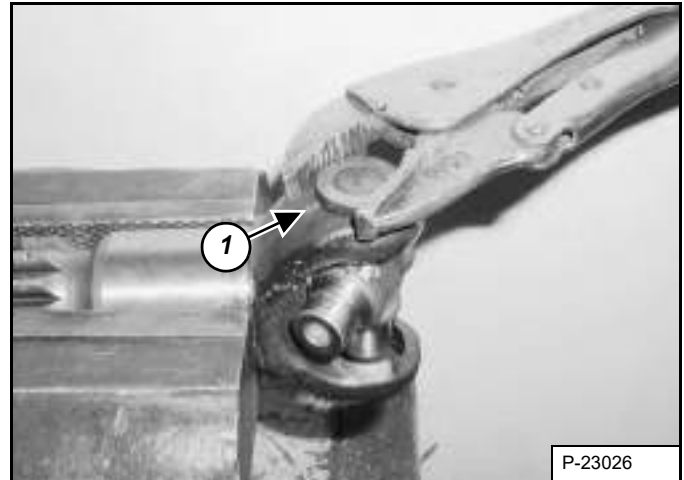
Remove the bearing cup (Item 1) **[Figure 40-20-41]**.

Figure 40-20-42



Press the second bearing cup through the yoke **[Figure 40-20-42]**.

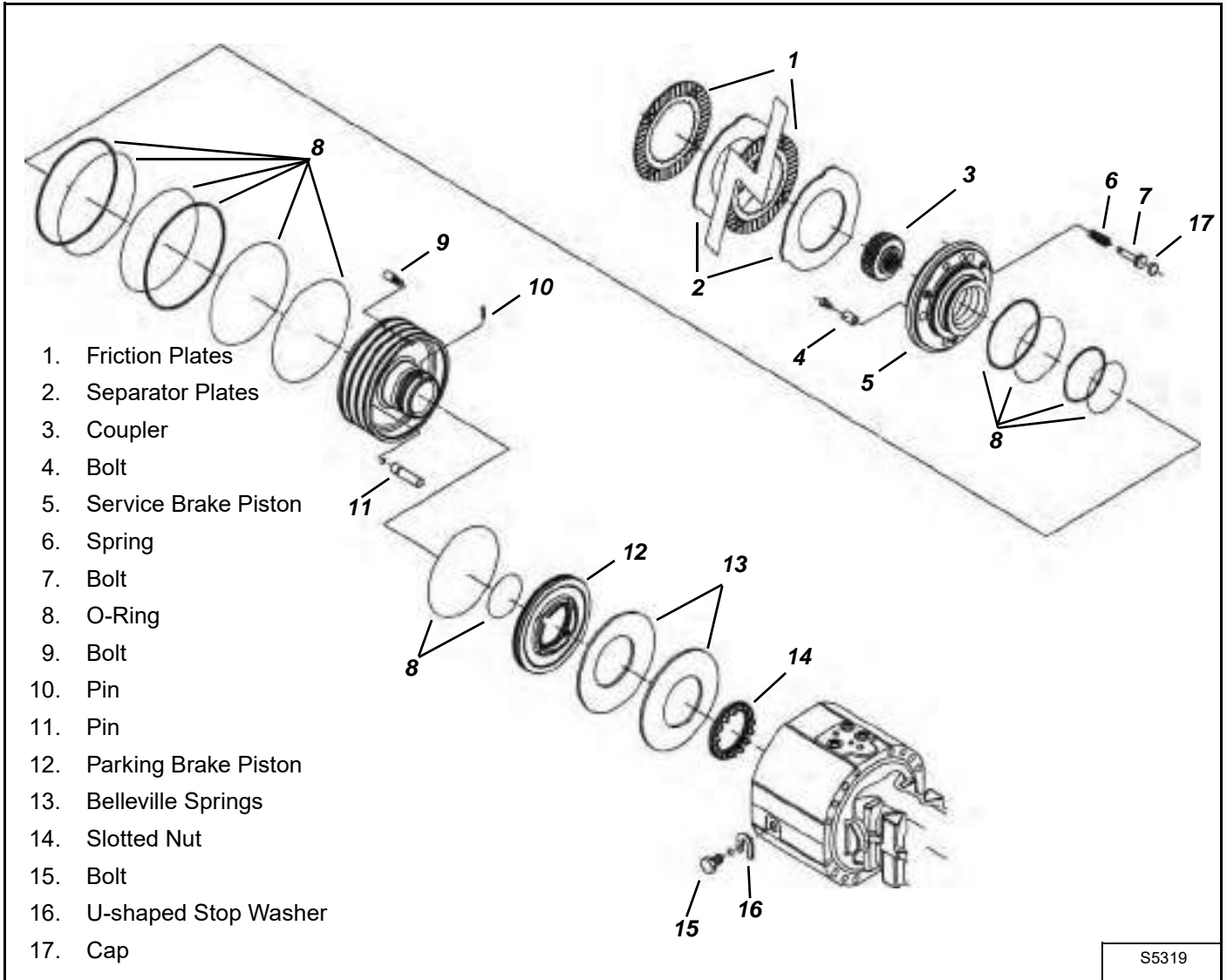
Figure 40-20-43



Remove the bearing cup (Item 1) and cross (Item 2) **[Figure 40-20-43]** from the yoke.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Brake Group Parts Identification



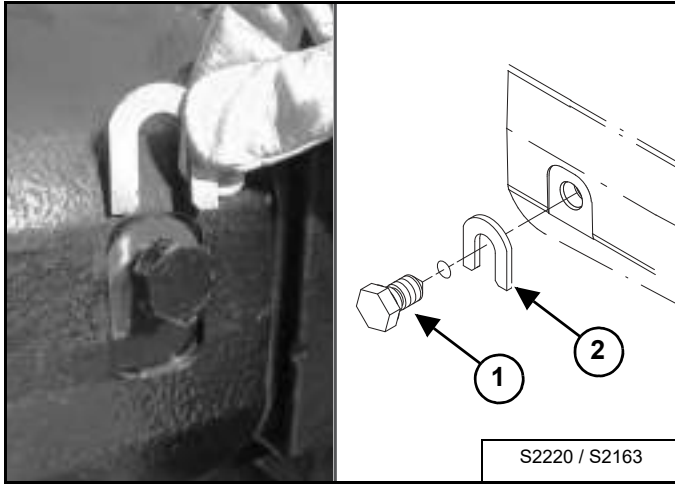
S5319

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

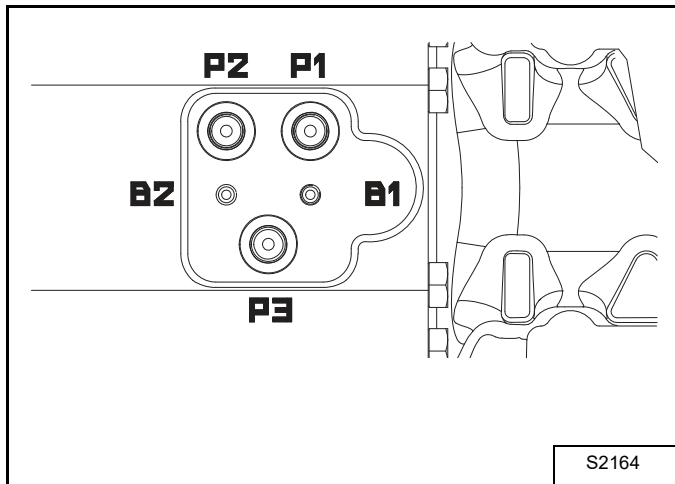
Brake Group Disassembly

Figure 40-20-44



Loosen the unlocking screws (Item 1) and remove the two U-shaped stop washers (Item 2) [Figure 40-20-44].

Figure 40-20-45



P1 = Park brake port. Release pressure 1,5-3 MPa (15-30 bar) (217-435 psi)

P2 = service brake port.

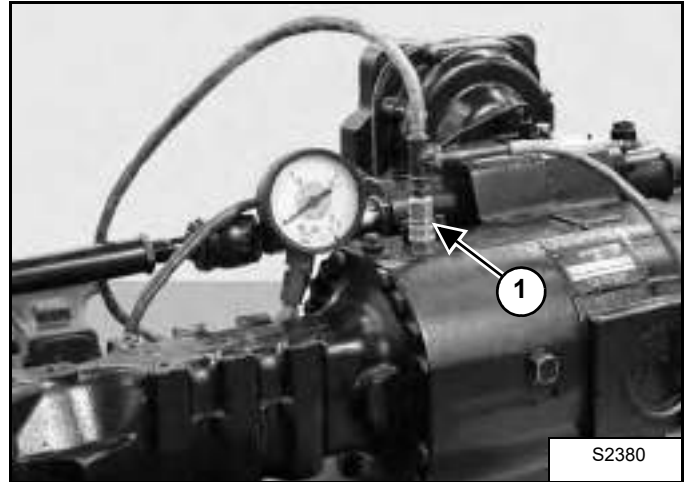
P3 = Hydraulic diff. lock port.

Working pressure 1,5-2,5 MPa (15-25 bar) (217-362 psi).

B1 = Park brake bleeding screw.

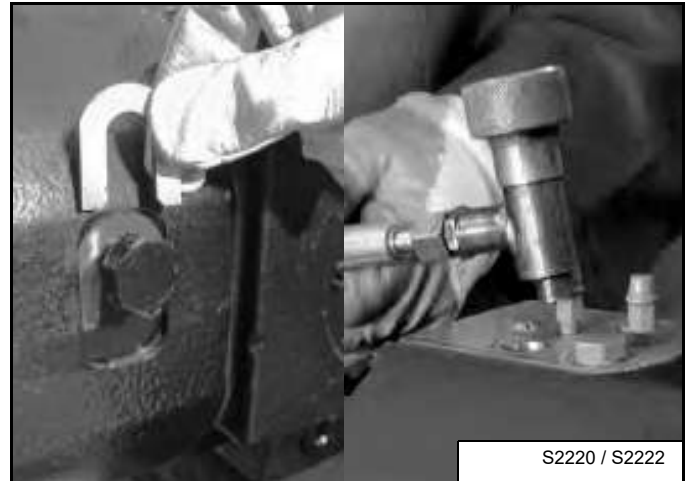
B2 = Service brake bleeding screw.

Figure 40-20-46



Connect an external pump to the park brake port (Item 1) [Figure 40-20-46] of the negative brake and introduce a pressure of 1,5-3 MPa (15-30 bar) (217-435 psi) in order to compress the Belleville springs.

Figure 40-20-47



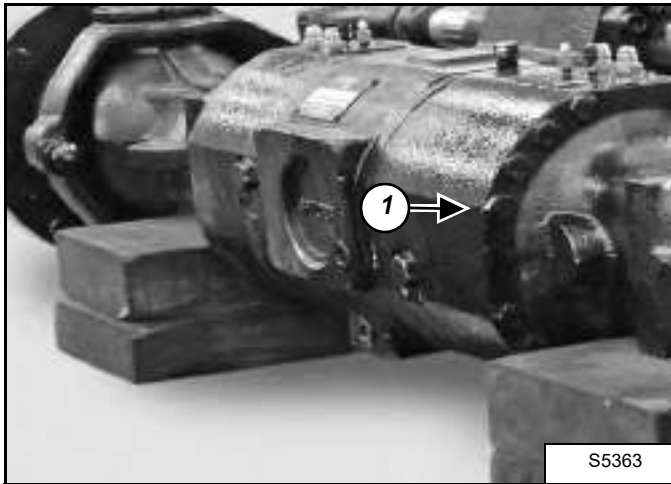
Insert block screws to end stroke and release pression.

If the screws are to be replaced, mark down the different colors for the different brake gaps.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Brake Group Disassembly (Cont'd)

Figure 40-20-48



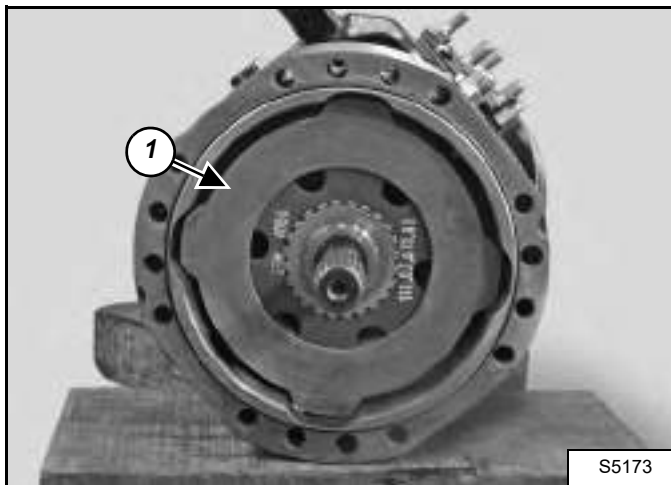
Remove the 16 axle housing mounting bolts (Item 1) [Figure 40-20-48].

Remove the axle housing.

Clean the outside of the brake group before disassembly.

Mark the outside of the brake group for ease of assembly.

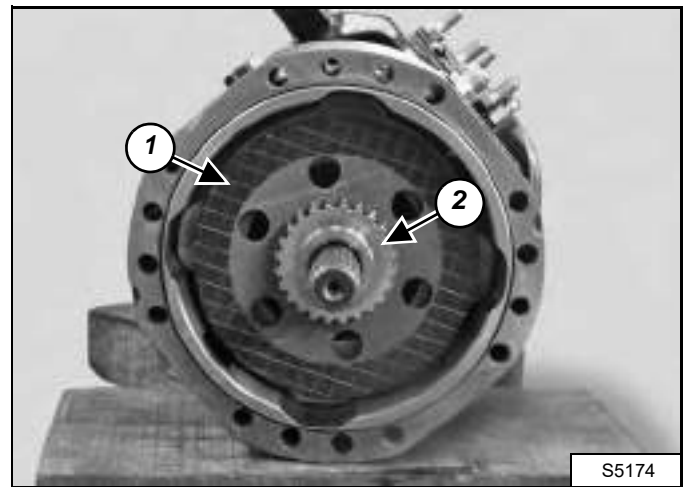
Figure 40-20-49



Remove the first brake separator plate (Item 1) [Figure 40-20-49] from the brake housing.

NOTE: For friction plate replacement only it is not necessary to remove the brake housing.

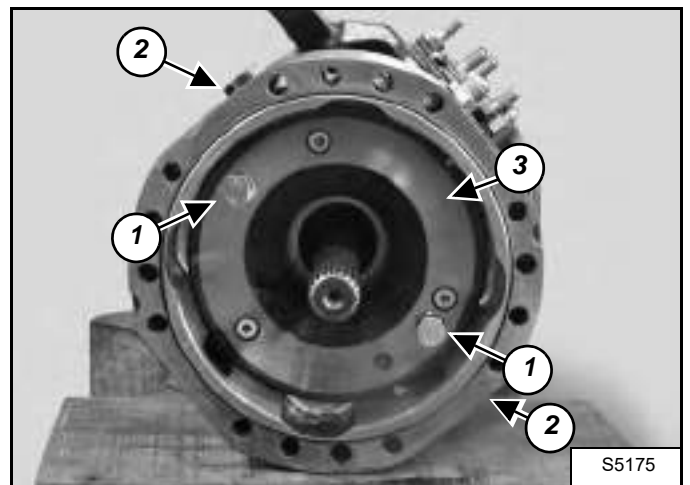
Figure 40-20-50



Remove the first friction plate (Item 1) [Figure 40-20-50].

Remove the remaining plates and the flange (Item 2) [Figure 40-20-50]. Do not mix up the sequence.

Figure 40-20-51



Install two screws (Item 1) [Figure 40-20-51] in order to compress the belleville springs of the negative brake preloaded.

Remove the 2 unlocking screws (Item 2) [Figure 40-20-51] from the brake housing.

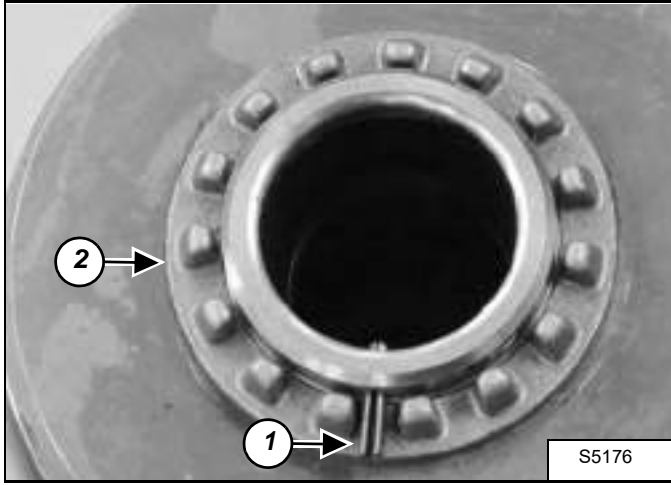
Remove the piston (Item 3) [Figure 40-20-51].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Brake Group Disassembly (Cont'd)

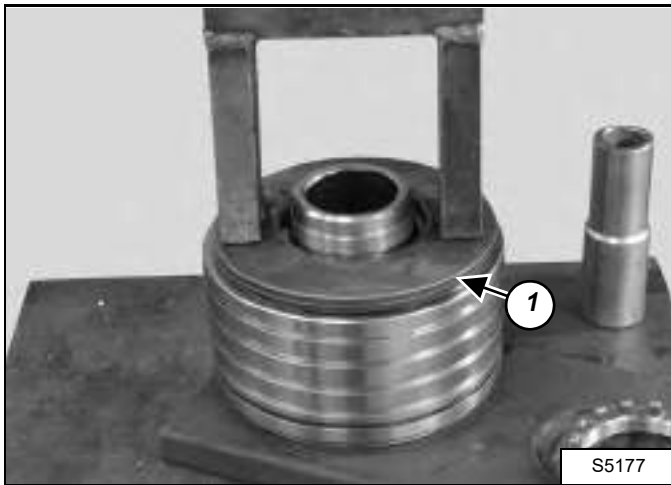
Figure 40-20-52



Turn the brake module upside down and use a pin driver to remove the locking pin (Item 1) from the slotted nut (Item 2) [Figure 40-20-52].

Mark the position of the slotted nut for reassembly.

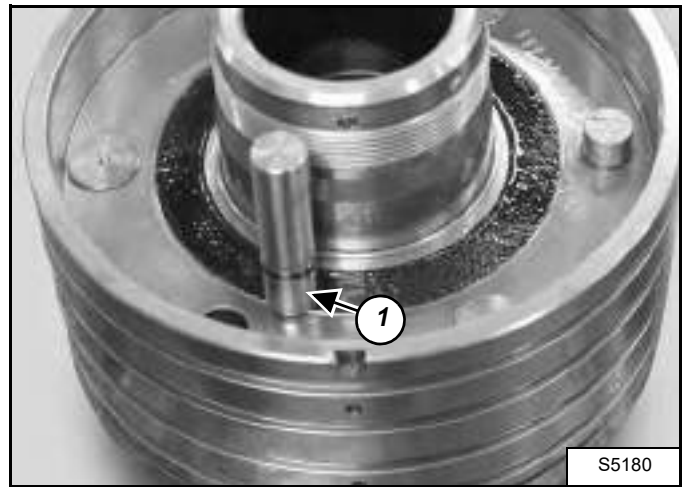
Figure 40-20-53



Put the brake module under a press to compress the belleville springs [Figure 40-20-53] and remove the slotted nut.

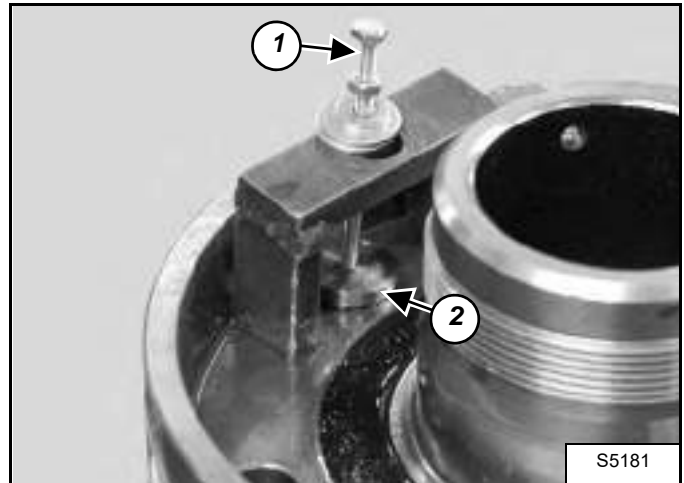
Carefully release the pressure and remove the brake housing from the press. Remove the belleville springs (Item 1) [Figure 40-20-53].

Figure 40-20-54



Turn the module upside down again and remove the three pins (Item 1) [Figure 40-20-54].

Figure 40-20-55

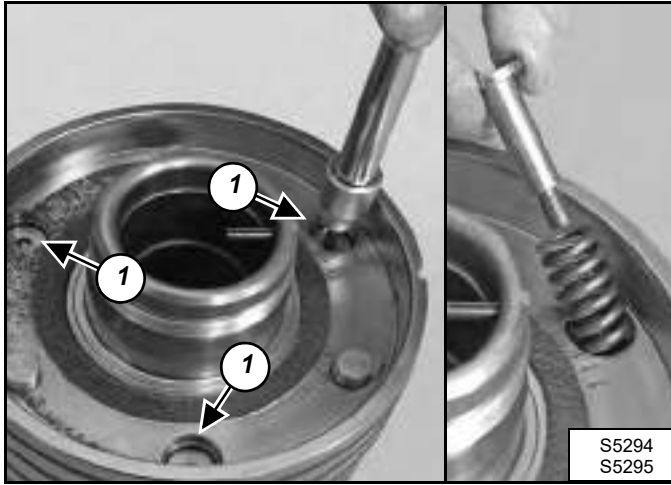


Use a new screw (Item 1) to remove the three caps (Item 2) [Figure 40-20-55].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Brake Group Disassembly (Cont'd)

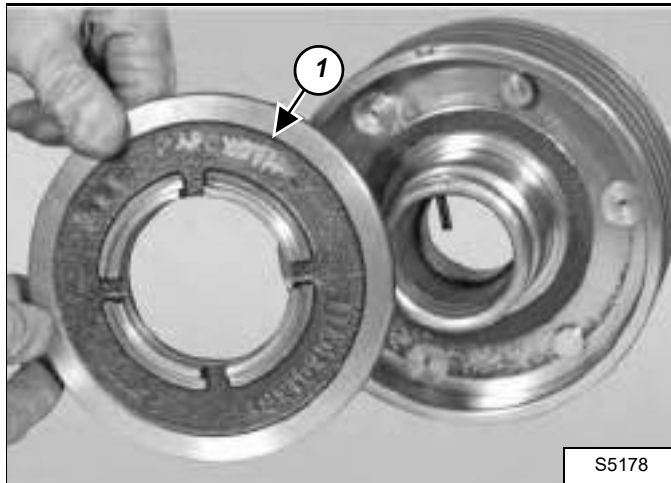
Figure 40-20-56



Remove the three spring mounted bolts (Item 1) [Figure 40-20-56].

Note: Be careful. The bolts are under spring pressure.

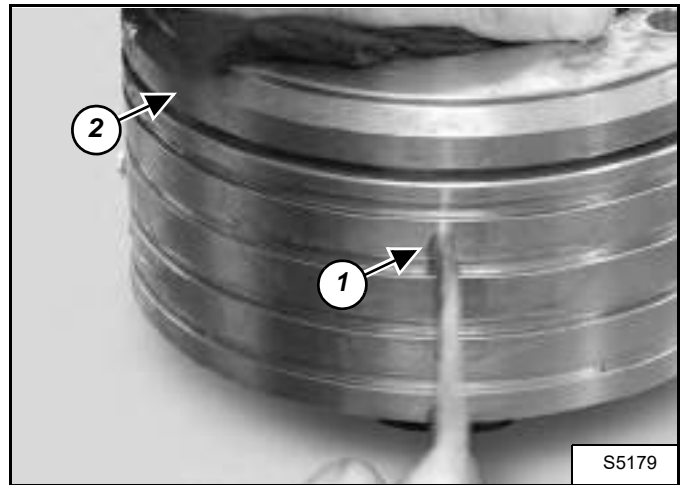
Figure 40-20-57



Remove the parking brake piston (Item 1) [Figure 40-20-57] from the brake module by carefully applying air pressure to the upper side hole.

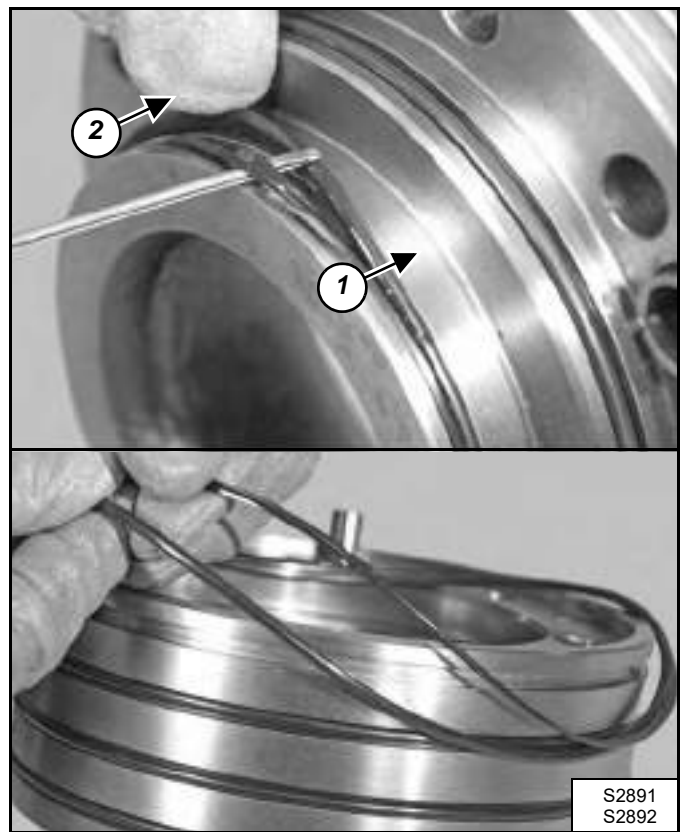
Put the oil into a container.

Figure 40-20-58



Turn the brake module upside down and carefully apply air pressure to the upper hole (Item 1) to remove the service brake piston (Item 2) [Figure 40-20-58].

Figure 40-20-59

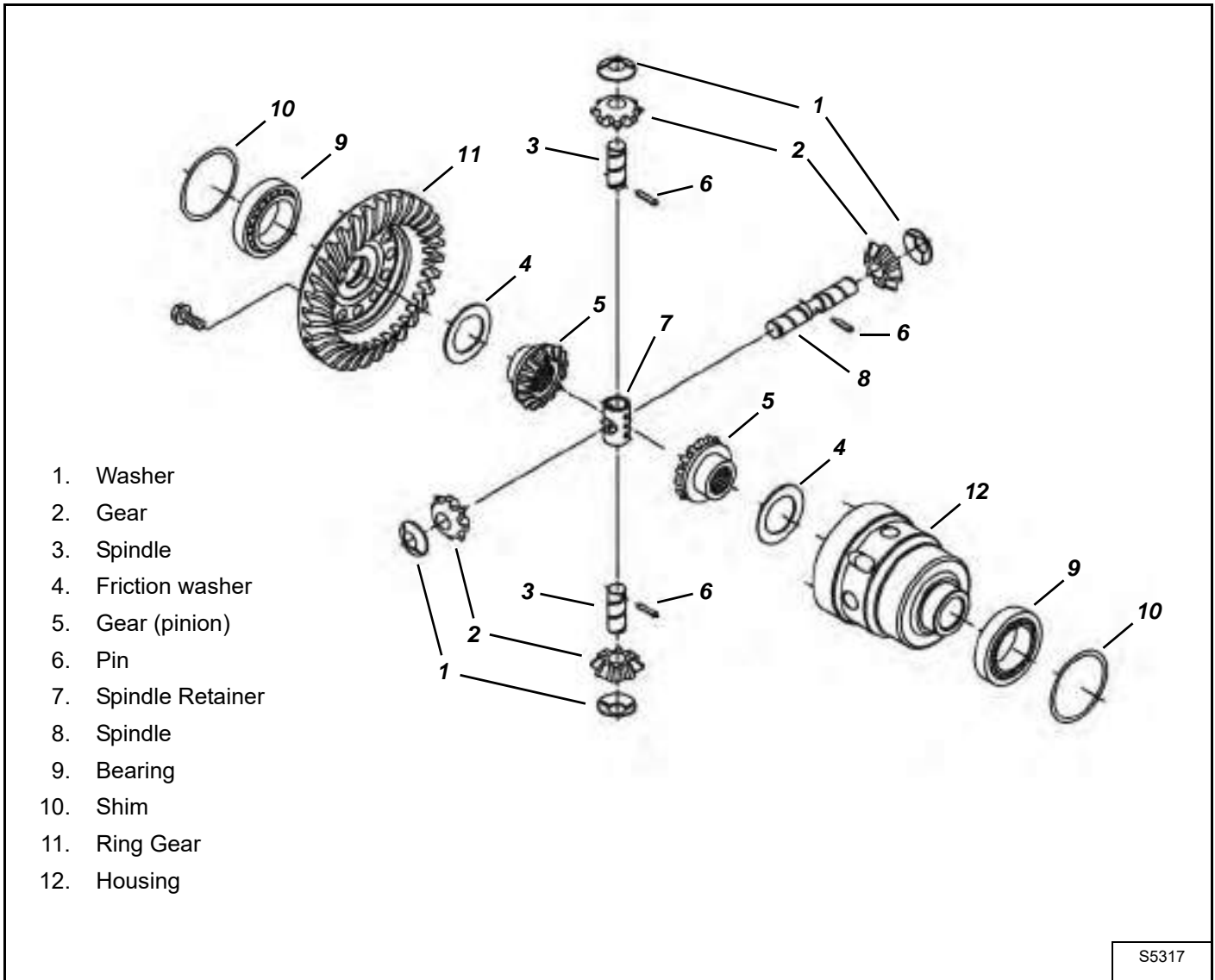


Remove the O-Rings and anti extrusion rings from the service brake, parking brake and piston housing [Figure 40-20-59].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Differential Parts Identification



Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

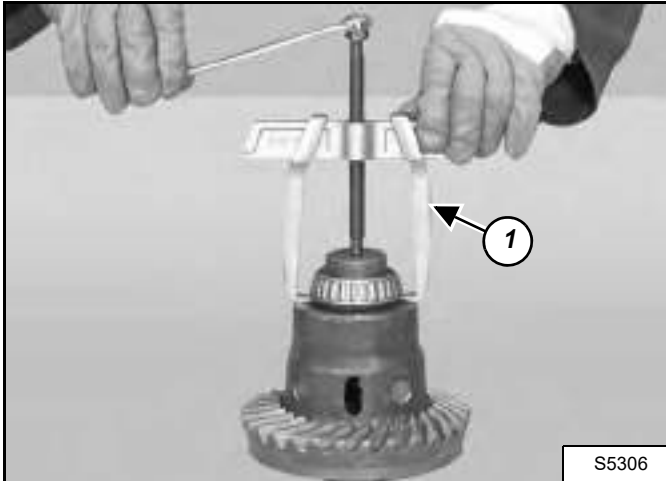
Differential Disassembly

Clean the outside of the differential before disassembly.

Mark the outside of the differential for ease of assembly.

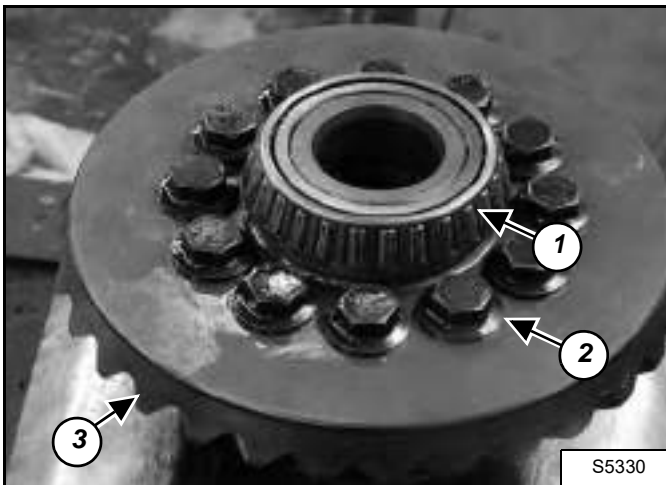
Remove the differential assembly from the axle housing.

Figure 40-20-60



If the bearing needs replacing, extract it with a puller (Item 1) [Figure 40-20-60].

Figure 40-20-61

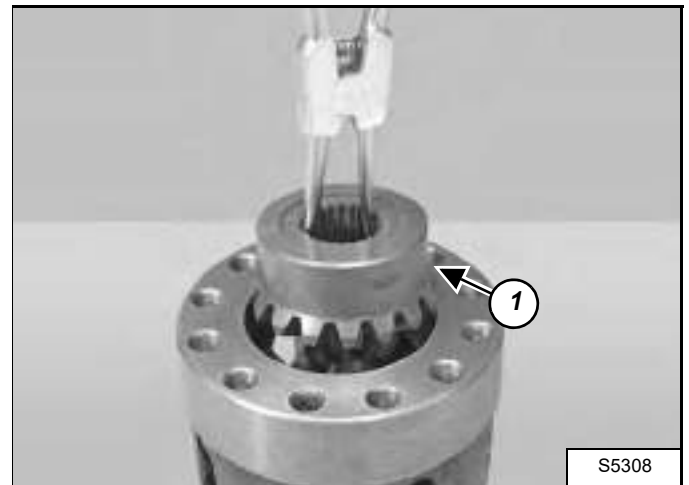


Remove the bearing (Item 1) [Figure 40-20-61].

Remove the 12 bolts (Item 2) [Figure 40-20-61].

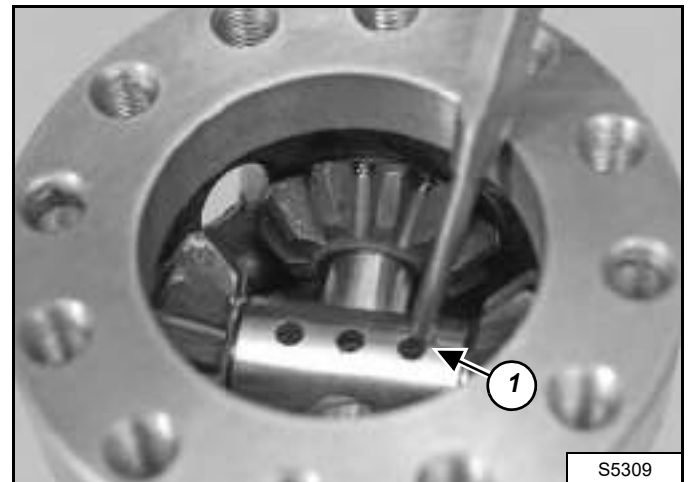
Remove the ring gear (Item 3) [Figure 40-20-61].

Figure 40-20-62



Turn the differential around and remove the top gear (Item 1) [Figure 40-20-63].

Figure 40-20-63



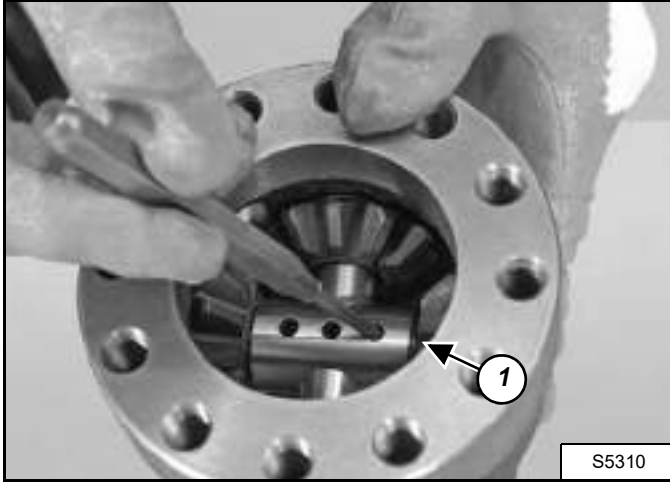
Use a pin driver to remove the three pins (Item 1) [Figure 40-20-63].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

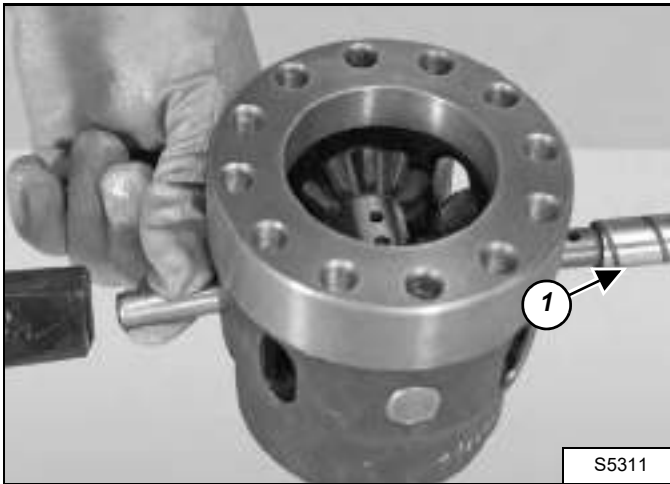
Differential Disassembly (Cont'd)

Figure 40-20-64



Push the two opposite mounted short pins to the outside (Item 1) [Figure 40-20-64].

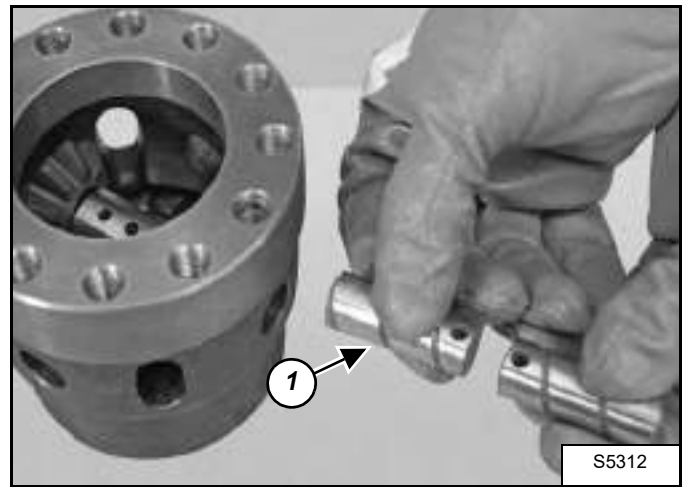
Figure 40-20-65



Remove the long spindle (Item 1) [Figure 40-20-65].

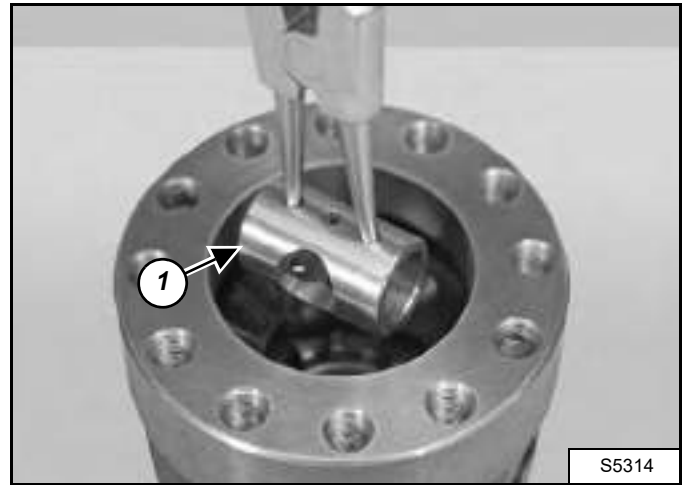
Remove the washers and satellite gears.

Figure 40-20-66



Remove the short spindles (Item 1) [Figure 40-20-66].

Figure 40-20-67

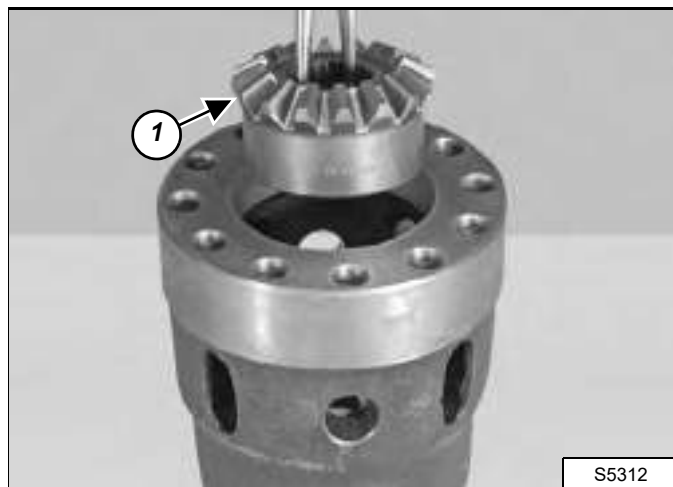


Lift the retainer (Item 1) [Figure 40-20-67]. Remove the washers and the gears.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Differential Disassembly (Cont'd)

Figure 40-20-68

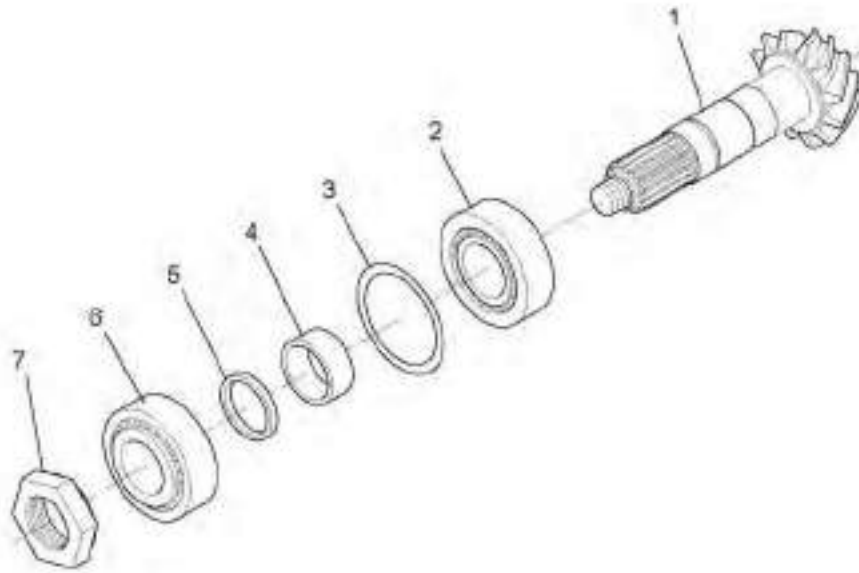


Lift the gear (Item 1) **[Figure 40-20-68]**. Remove the shim washer below.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Pinion Group Parts Identification

1. Bevel pinion
2. Bearing
3. Shim "S1"
4. Spacer
5. Shim "S2"
6. Bearing
7. Bolt



S2503

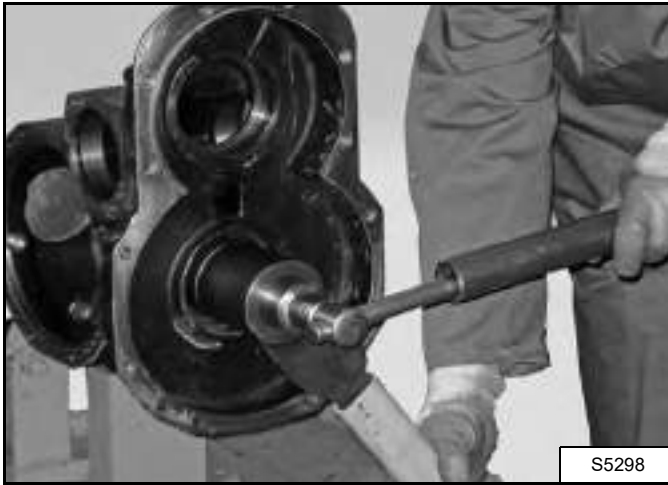
Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Pinion Group Disassembly

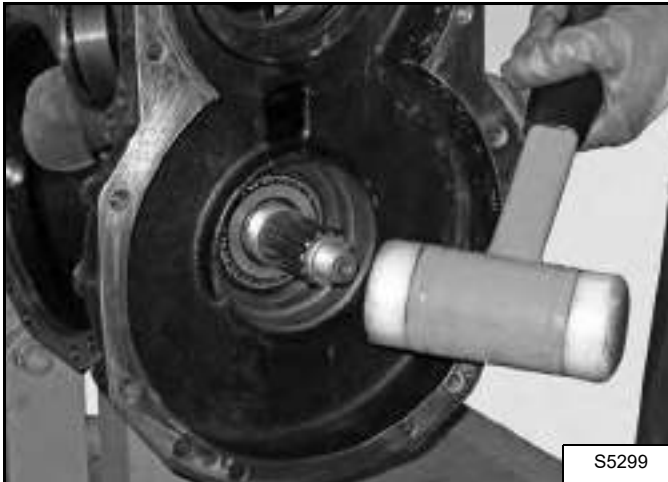
Clean the outside of the pinion group before disassembly.

Figure 40-20-69



Use the pinion ring nut (Bobcat part number 6912173) to remove the nut **[Figure 40-20-69]**.

Figure 40-20-70



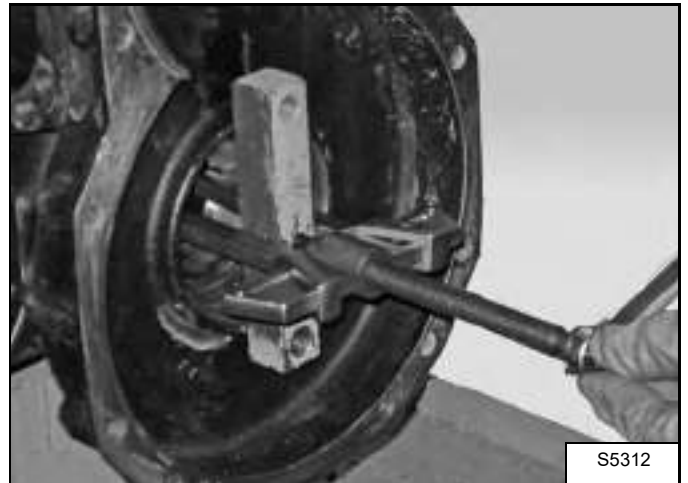
Remove the pinion, the shims and the spacer **[Figure 40-20-70]**.

Figure 40-20-71



Pull the internal bearing from the pinion if necessary **[Figure 40-20-71]**.

Figure 40-20-72



Remove the bearing race of the external bearing **[Figure 40-20-72]**.

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

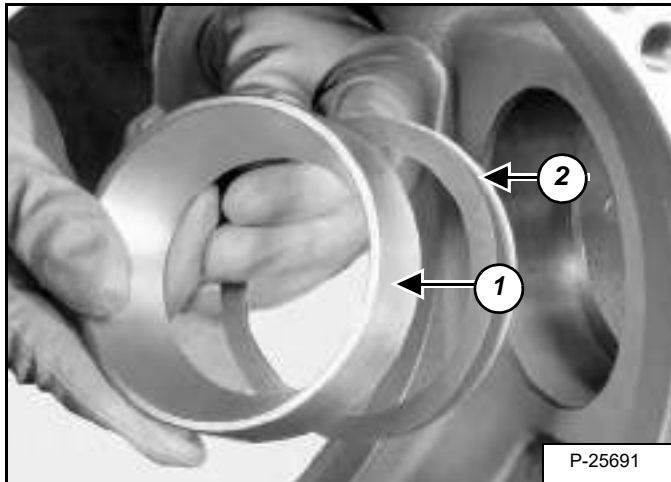
Pinion Group Disassembly (Cont'd)

Figure 40-20-73



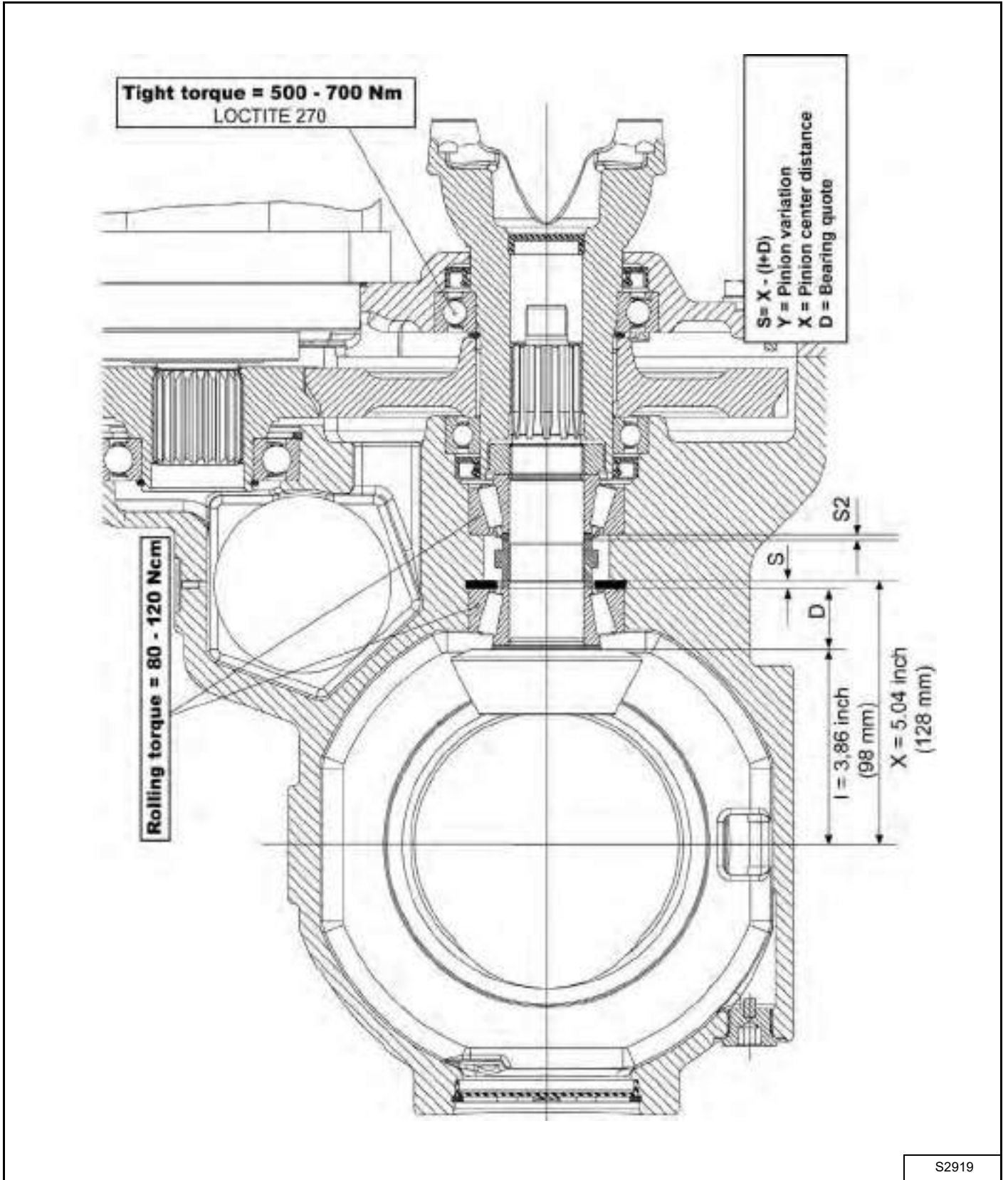
Insert a drift in the appropriate holes **[Figure 40-20-73]**.

Figure 40-20-74



Remove the bearing race (Item 1) of the internal bearing as well as the shim washer(s) (Item 2) **[Figure 40-20-74]**.

Pinion Group Assembly



Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Pinion Group Assembly (Cont'd)

Clean all parts in solvent and dry with compressed air.

Inspect all parts for wear or damage. Replace any worn or damaged parts if necessary.

Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

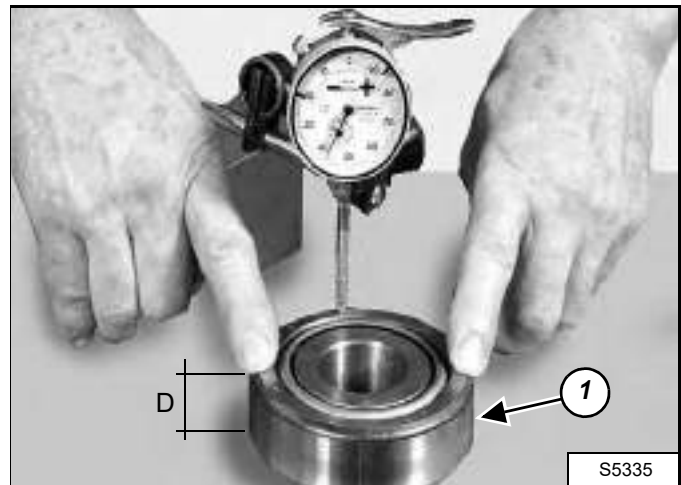
I-2003-0888

Figure 40-20-76



Using a faceplate, reset a centesimal comparator "DG" on a calibrated block (whose known thickness is 30 mm). Preload the comparator by about 3 mm [Figure 40-20-76].

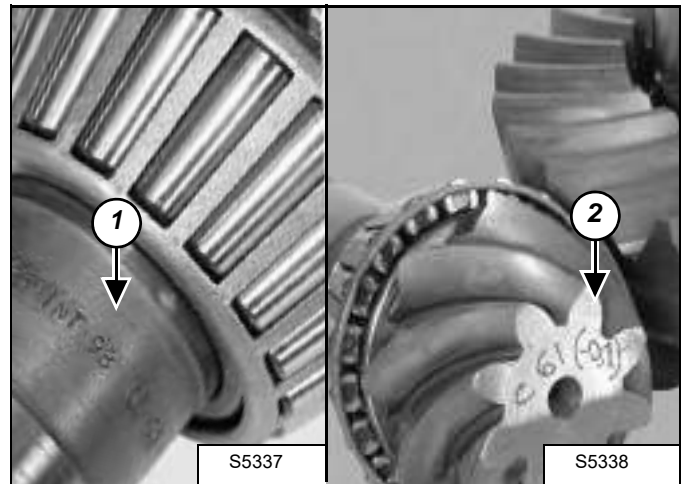
Figure 40-20-77



Measure the inner bearing (Item 1), complete with bearing race, under comparator "DG" [Figure 40-20-77]. Press the bearing race centrally and carry out several measurements by rotating the bearing race. The measurement is called D.

EXAMPLE: $30 - 0,55 = 29,45 = "D"$.

Figure 40-20-78



Check nominal dimension "INT" as marked on the pinion (Item 1) (eg 98). Add or subtract the variation indicated on the pinion (Item 2) [Figure 40-20-78] to "INT" to obtain the actual centre distance "I".

$I = INT \pm Y$.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Pinion Group Assembly (Cont'd)

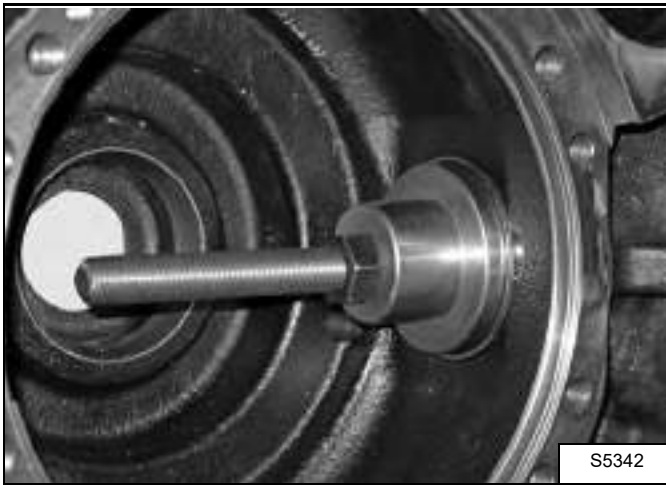
Figure 40-20-79



Calculate the shim "S1" [Figure 40-20-79] for insertion under the bearing race of the inner bearing using the following formula:

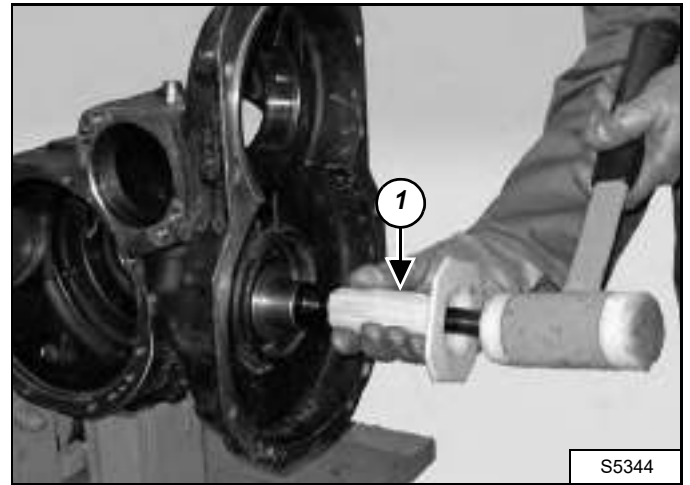
$S1 = X - (I + D)$ where $X = 128 \text{ mm (5.04")}$ (a fixed dimension, see [Figure 40-20-79]). I is the actual pinion center distance (as determined above). D is the total bearing thickness (as determined above).

Figure 40-20-80



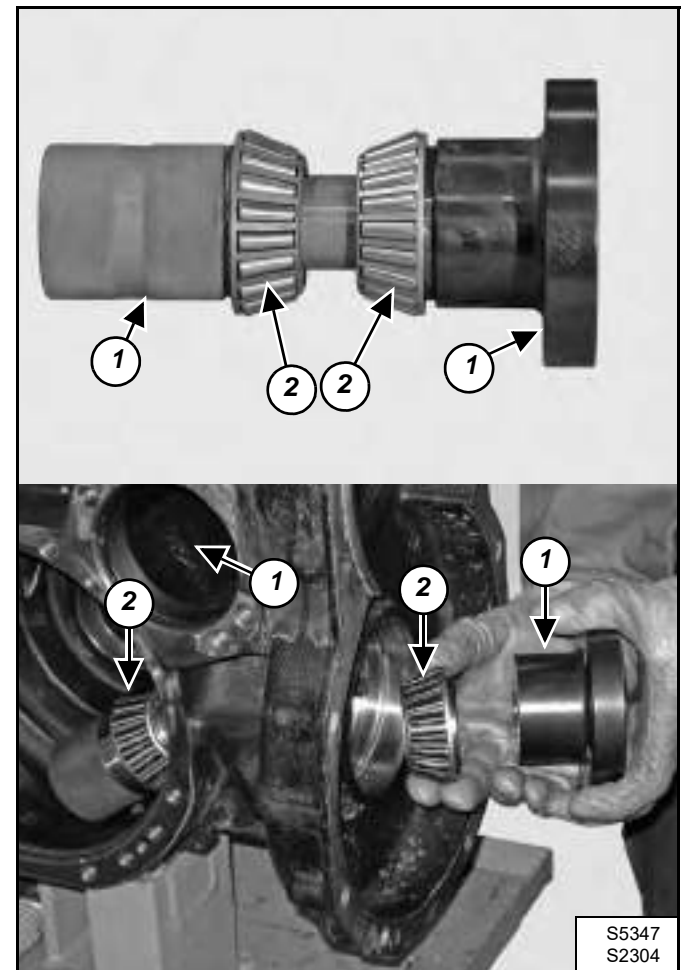
Make sure the bearing race has been completely inserted into its seat [Figure 40-20-80].

Figure 40-20-81



Insert the bearing race of the bearings and shims using a driver (Item 1) [Figure 40-20-81].

Figure 40-20-82



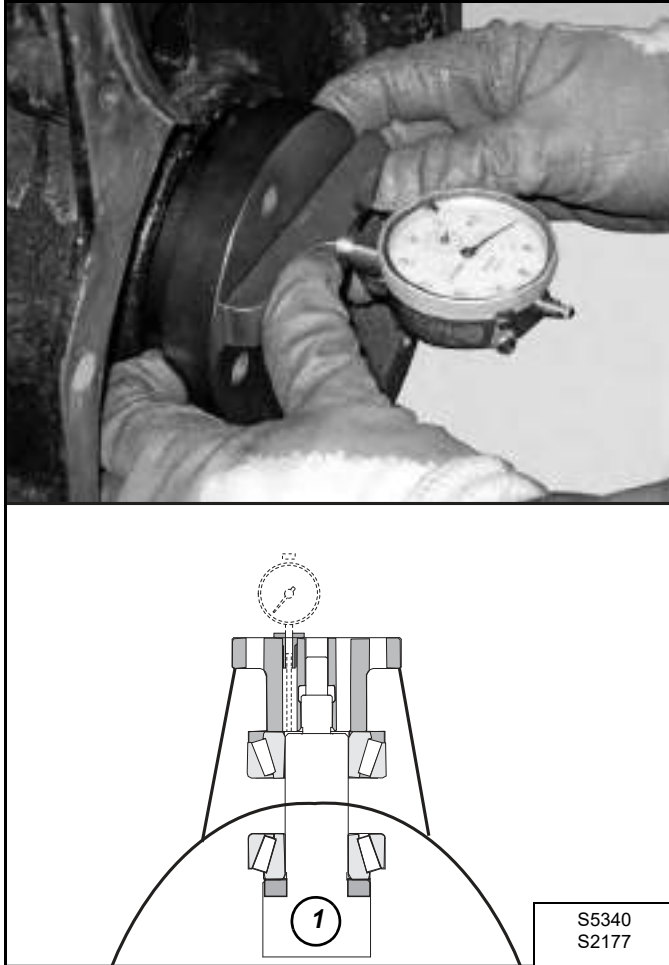
Insert tool the dummy pinion (Item 1) (Bobcat part number 6912176) complete with bearings (Item 2) [Figure 40-20-82].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Pinion Group Assembly (Cont'd)

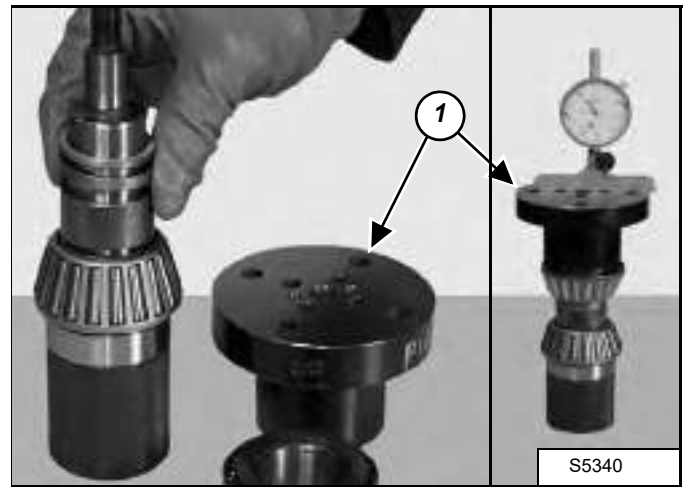
Figure 40-20-83



Use a depth comparator “DDG” into either side hole of the dummy pinion (Item 1) [Figure 40-20-83]. Reset the comparator with a preload of about 3 mm.

Measure value A.

Figure 40-20-84



Remove the dummy pinion (Item 1) [Figure 40-20-84], remove the bearings, and re-arrange the bearings, with the tool shim and the largest calibrated shim in between. Put the dummy pinion on top. Use the depth comparator to measure the depth “B” in either side hole of the dummy pinion.

Figure 40-20-85



Calculate the shim S2 to be inserted:

Calculate $H = A - B$. $S2 = H + Q$ where Q is fixed value to obtain = 0.07...0.08 mm [Figure 40-20-85].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

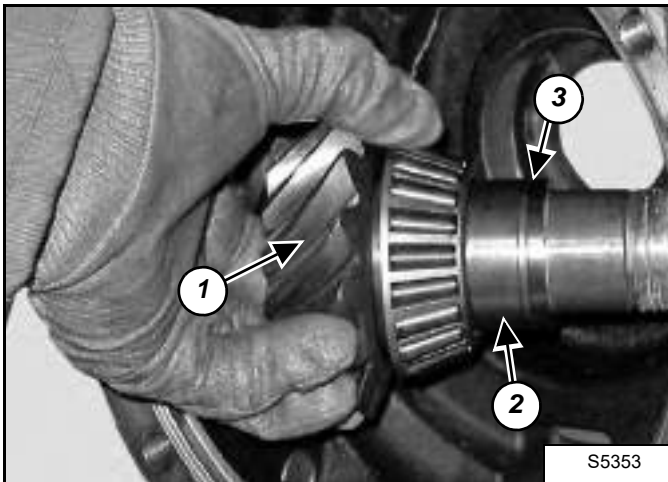
Pinion Group Assembly (Cont'd)

Figure 40-20-86



Heat the bearing to 100°C and assemble it to the pinion shaft [Figure 40-20-86].

Figure 40-20-87



Fit the pinion and bearing assembly (Item 1), the spacer (Item 2) and shim S2 (Item 3) [Figure 40-20-87].

Figure 40-20-88



Heat the external bearing to 100°C and fit it on the pinion [Figure 40-20-88].

Figure 40-20-89



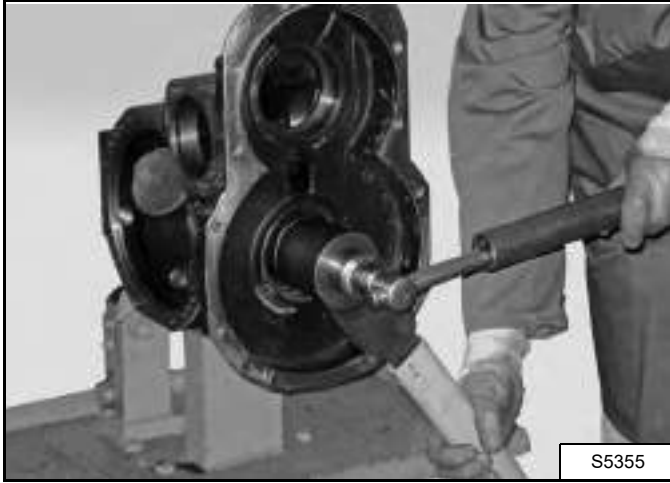
Apply Loctite 270 to the thread of the nut and screw the nut onto the pinion [Figure 40-20-89].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Pinion Group Assembly (Cont'd)

Figure 40-20-90



Use the pinion ring nut (Bobcat part number 6912173) to tighten the nut. Use a torque wrench set to 500 - 700 N•m [Figure 40-20-90].

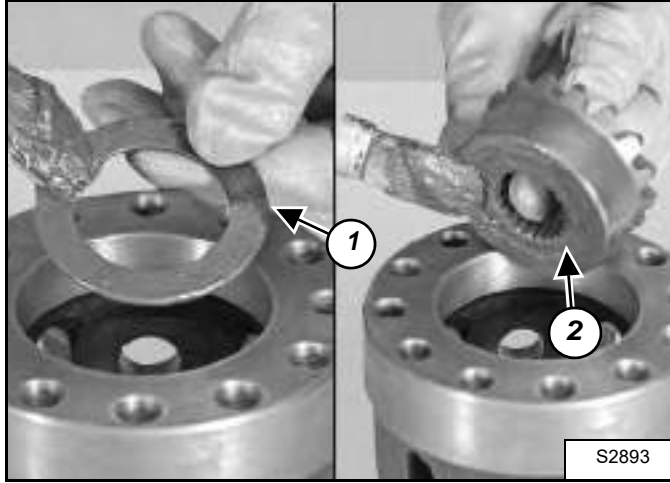
The rolling torque of the pinion shaft must be checked. Using a dial indicator torque wrench, measure the rolling torque .

The correct torque is 0,80 - 0,12 N•m (0.60-0.89 ft-lb).

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

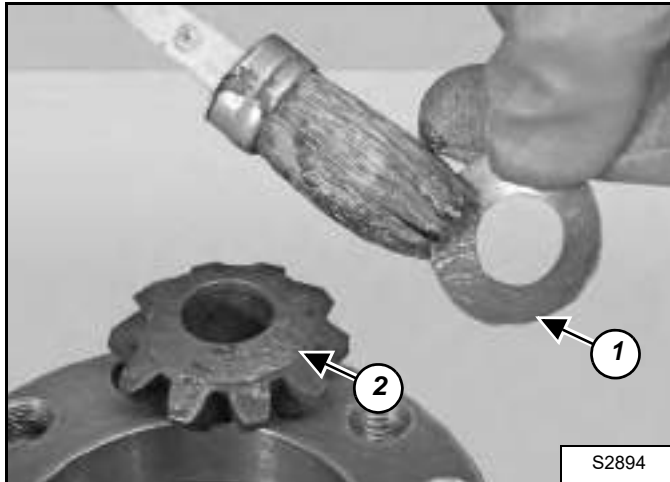
Differential Assembly

Figure 40-20-91



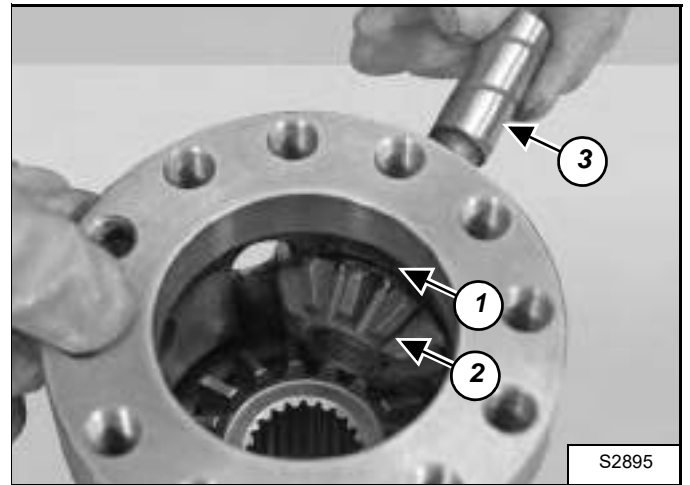
Lubricate and install the shim washer and pinion gear (Item 1) [Figure 40-20-91].

Figure 40-20-92



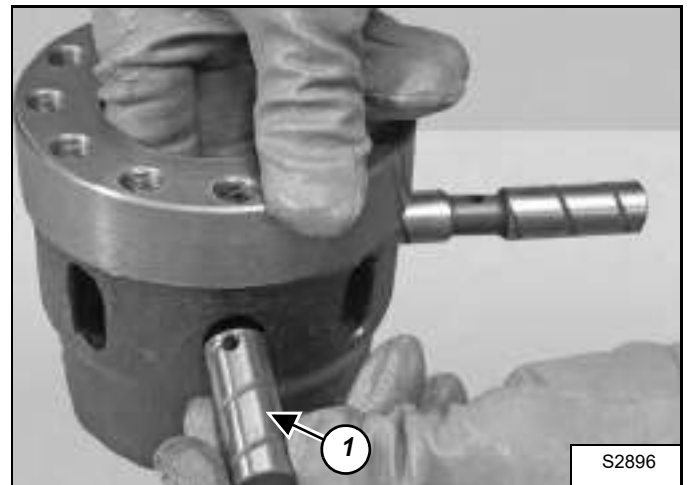
Lubricate the four washers and four gears (Item 1) [Figure 40-20-92].

Figure 40-20-93



Partially install a washer (Item 1), a gear (Item 2) and the long spindle (Item 3) [Figure 40-20-93] in the housing.

Figure 40-20-94



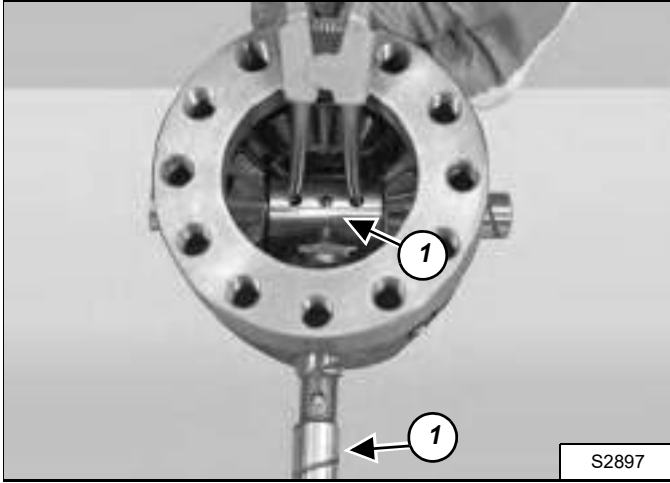
Insert the two short spindles (Item 1) [Figure 40-20-94], washers and gears.

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

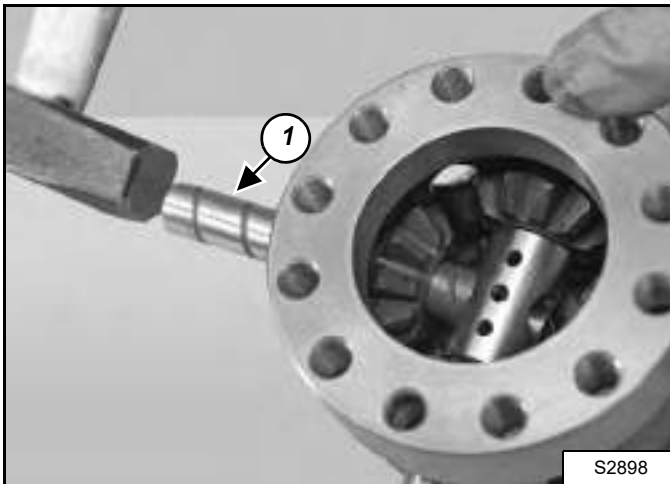
Differential Assembly (Cont'd)

Figure 40-20-95



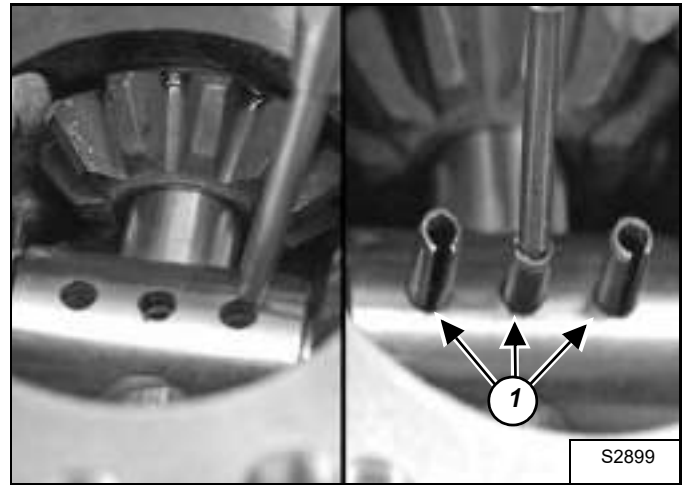
Insert the retainer (Item 1) [Figure 40-20-95] and completely insert the long spindle.

Figure 40-20-96



Fully insert the two short spindles (Item 1) [Figure 40-20-96].

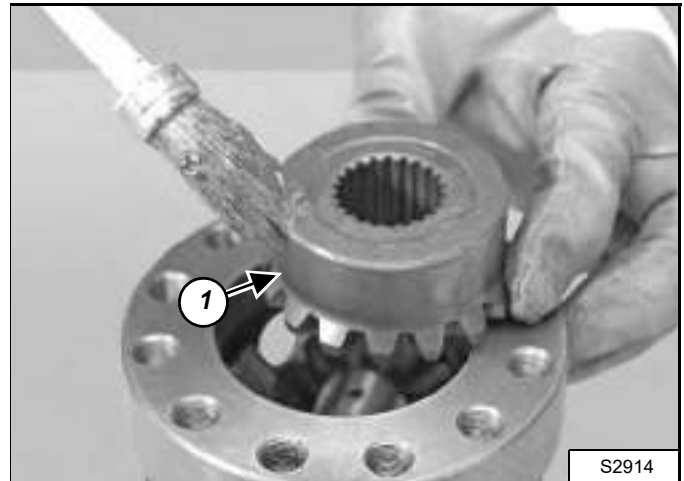
Figure 40-20-97



Center the pin holes and insert the three locking pins (Item 1) [Figure 40-20-97].

NOTE: Check the free rotation of the satellite wheels on the spindles.

Figure 40-20-98

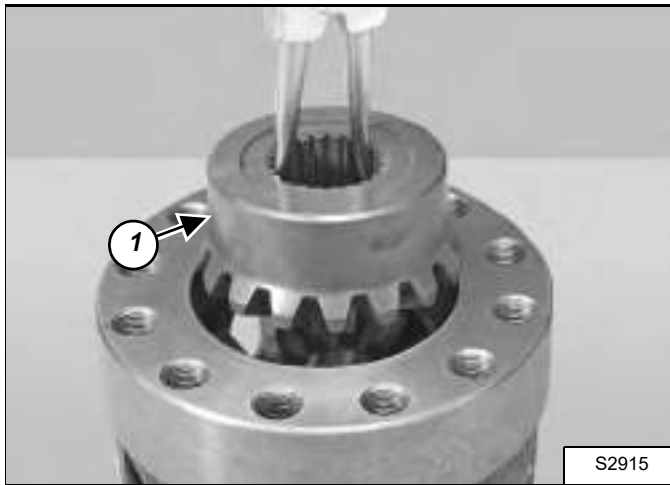


Lubricate the gear (Item 1) [Figure 40-20-98].

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

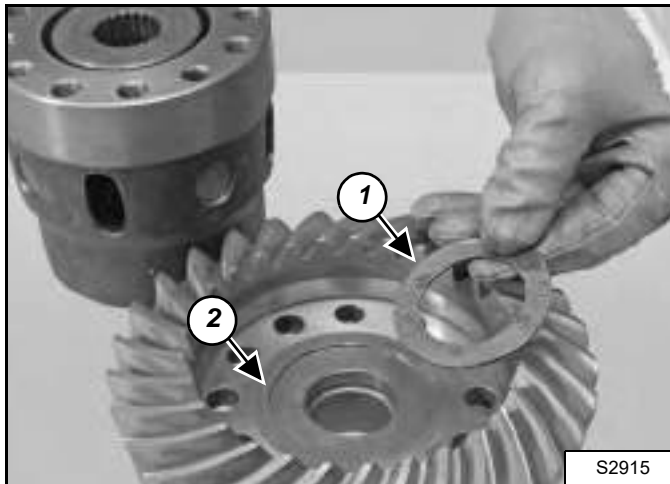
Differential Assembly (Cont'd)

Figure 40-20-99



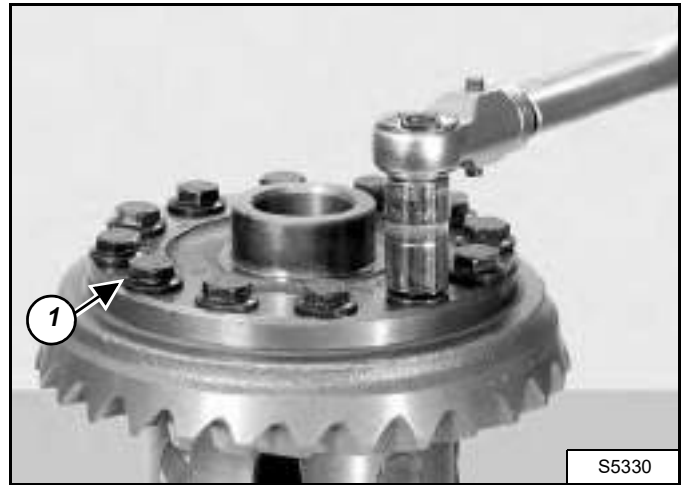
Install the gear (Item 1) [Figure 40-20-99].

Figure 40-20-100



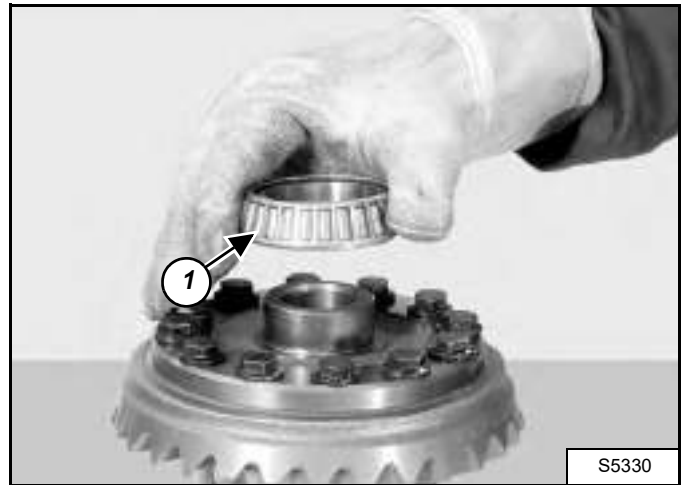
Position the shim washer (Item 1) on the gear (Item 2) [Figure 40-20-100].

Figure 40-20-101



Install the 12 bolts (Item 1) [Figure 40-20-101] and torque to 116-128 N•m (85.5- 94.5 ft-lb).

Figure 40-20-102

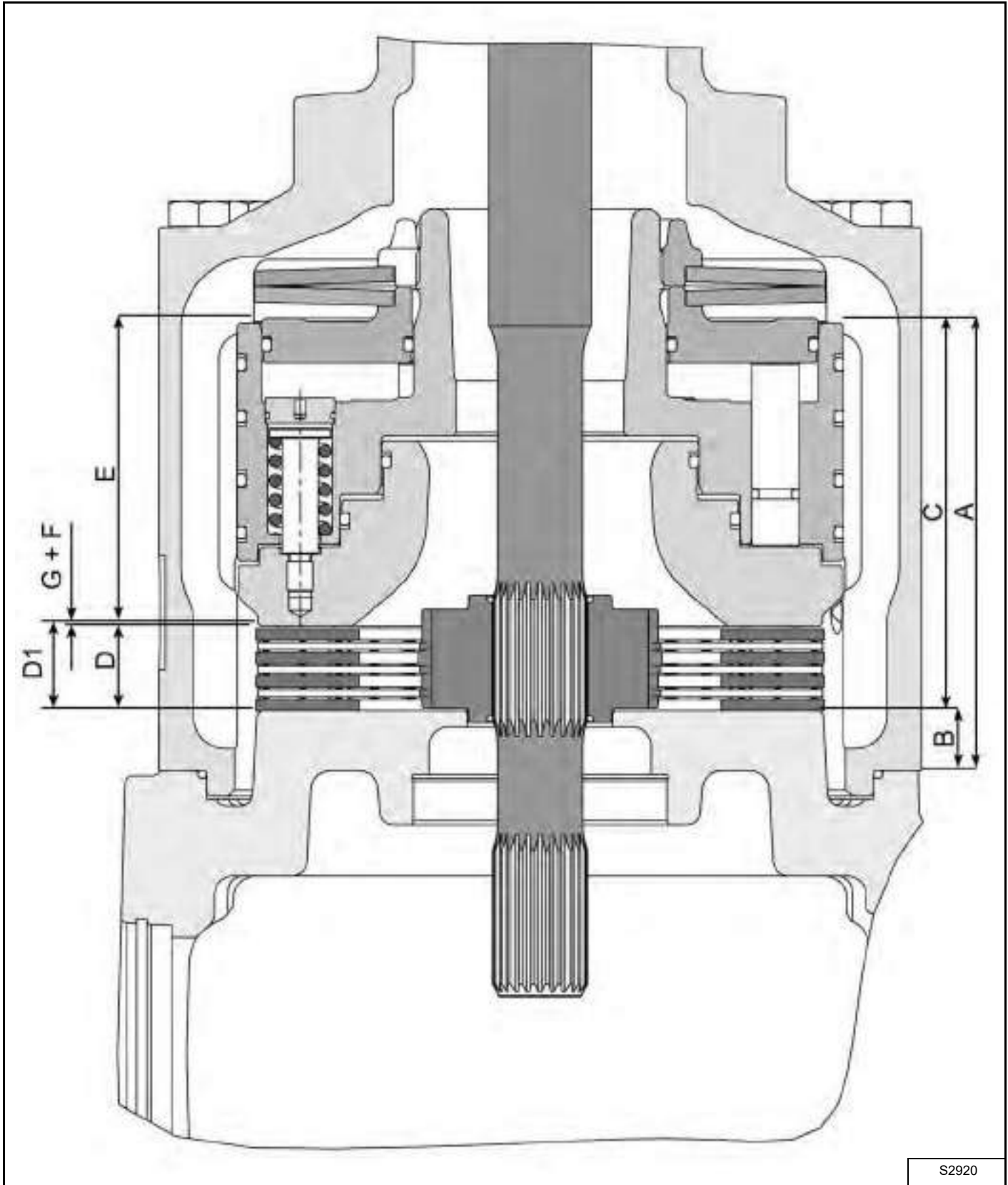


Install the bearing (Item 1) [Figure 40-20-102].

NOTE: Heat the bearing to 100°C (212°F) before assembling.

Dealer Copy -- Not for Resale

Brake Group Assembly



S2920

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

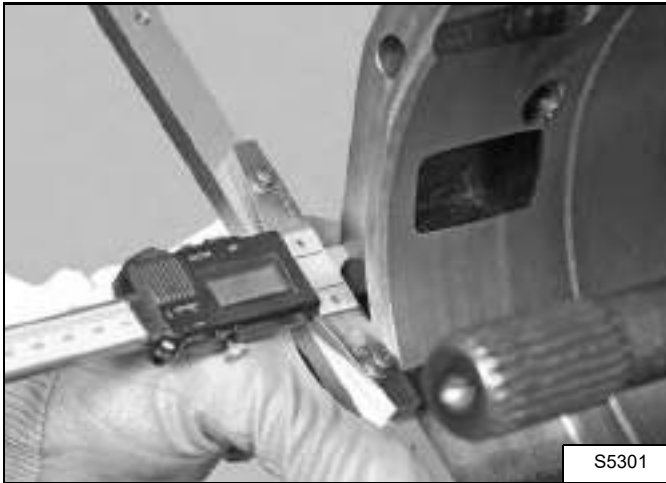
Brake Group Assembly (Cont'd)

Clean all parts in solvent and dry with compressed air.

Inspect all parts for wear or damage. Replace any worn or damaged parts.

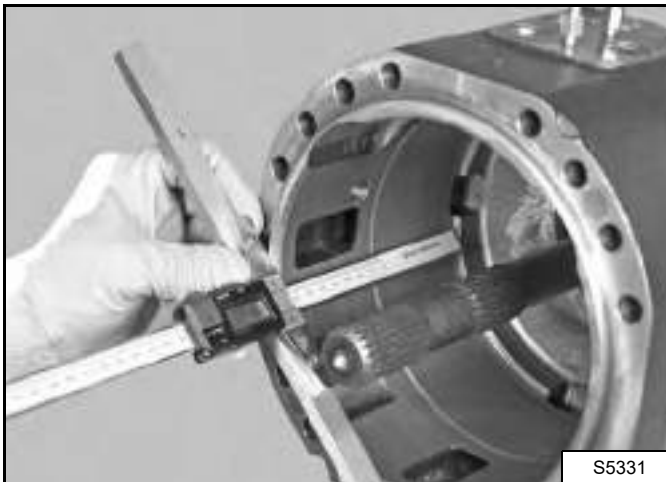
Always install new seals and O-rings. Lubricate all seals and O-rings with clean hydraulic fluid before installation.

Figure 40-20-104



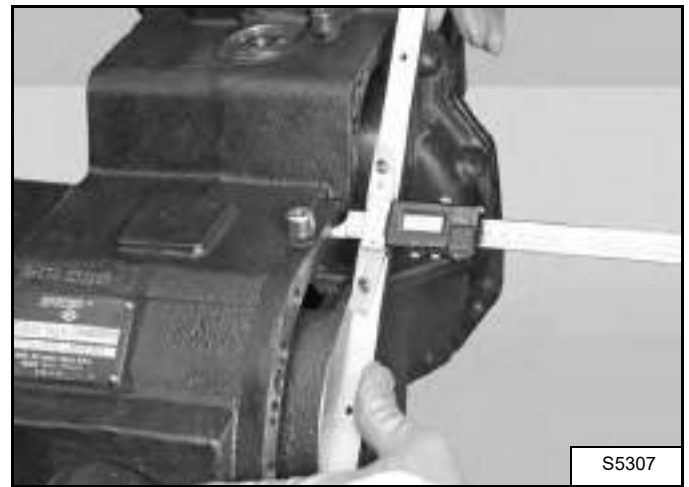
Measure the height U of the center ring to the support plane **[Figure 40-20-104]**.

Figure 40-20-105



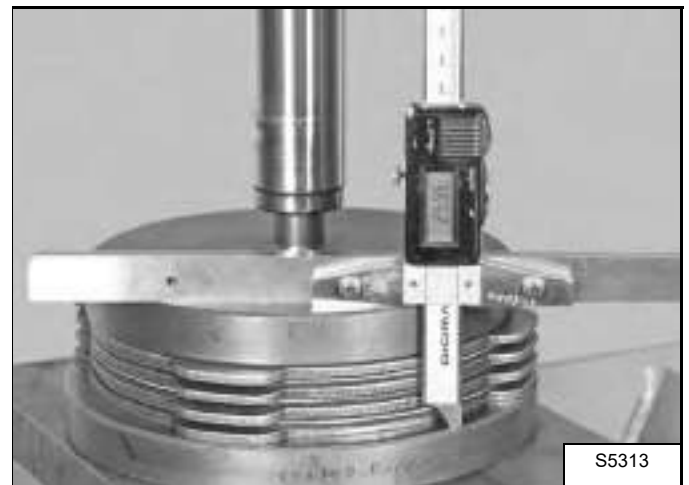
Measure distance V between the center ring and the piston pack stop **[Figure 40-20-105]**. Subtract U from V to obtain value A.

Figure 40-20-106



Measure the distance B between the disc support plane and the arm support plane **[Figure 40-20-106]**. Subtract B from A to obtain value C.

Figure 40-20-107



Bring the pack beneath a press, load with 1000 kg (2200 lb) and measure the distance D **[Figure 40-20-107]** between the top and bottom disc. Add G, the brake discs gap and F (fixed value of 0,2 mm) to obtain D1.

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Brake Group Assembly (Cont'd)

Subtract D1 from C to obtain E, the piston pack quote.

$$A = V - U$$

$$C = A - B$$

$$D1 = D + G + F$$

$$E = C - D1$$

Figure 40-20-108



Assemble the brake group in reverse order as described in the disassembly section, but without the Belleville springs. Tighten the cylinder until the measured value is equal to the calculated value E **[Figure 40-20-108]**.

Figure 40-20-109



Insert the slotted nut, and with respecting the value E, determine the distance H between the top of the brake group and the top of the slotted nut **[Figure 40-20-109]**.

Then install the Belleville springs and make sure the slotted nut is tighten to the same distance H as measured above.

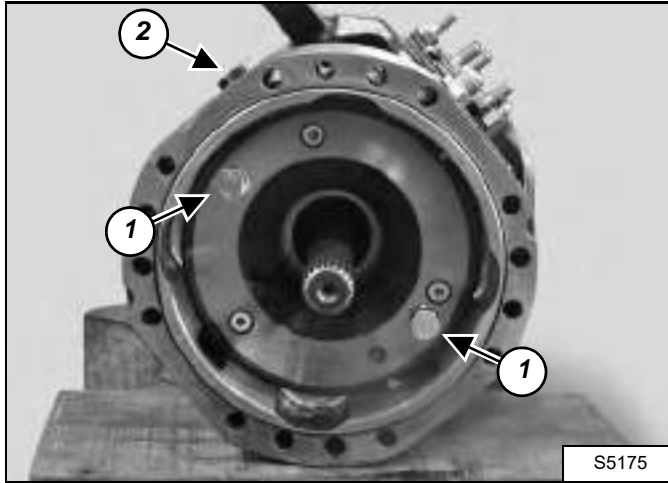
NOTE: Make sure the Belleville springs are centered in the housing.

Install the piston.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Brake Group Assembly (Cont'd)

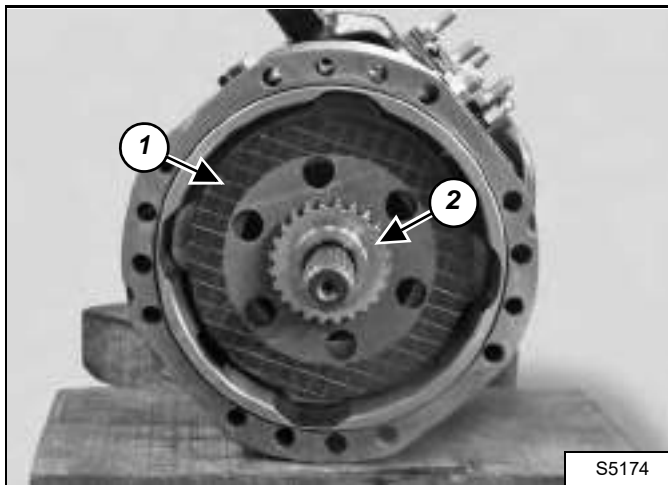
Figure 40-20-110



Install two screws (Item 1) [Figure 40-20-110] in order to keep the disc springs of the negative brake preloaded.

Install the two unlocking screws (Item 2) [Figure 40-20-110] on the brake housing.

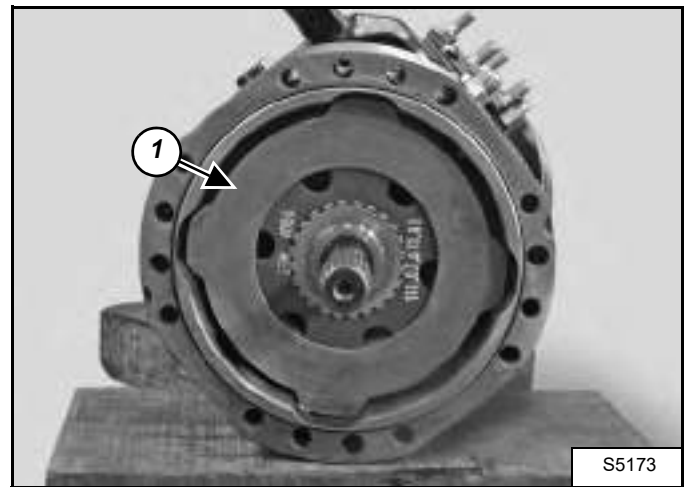
Figure 40-20-111



Install the first friction plate (Item 1) [Figure 40-20-111].

Install the remaining plates and the flange (Item 2) [Figure 40-20-111]. Do not mix up the sequence.

Figure 40-20-112

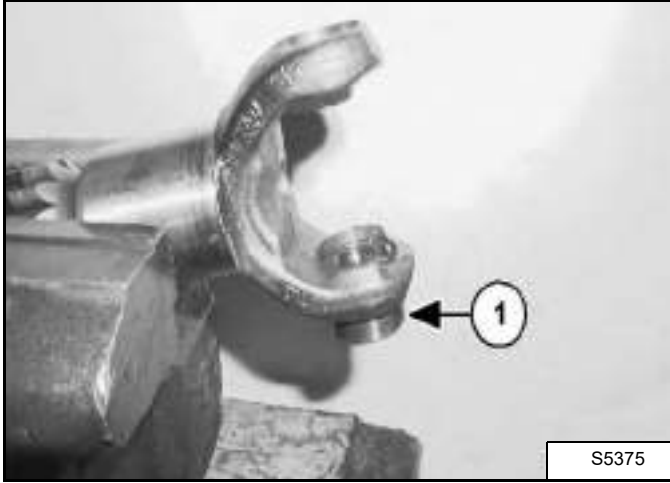


Install the first brake separator plate (Item 1) [Figure 40-20-112] on the brake housing.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

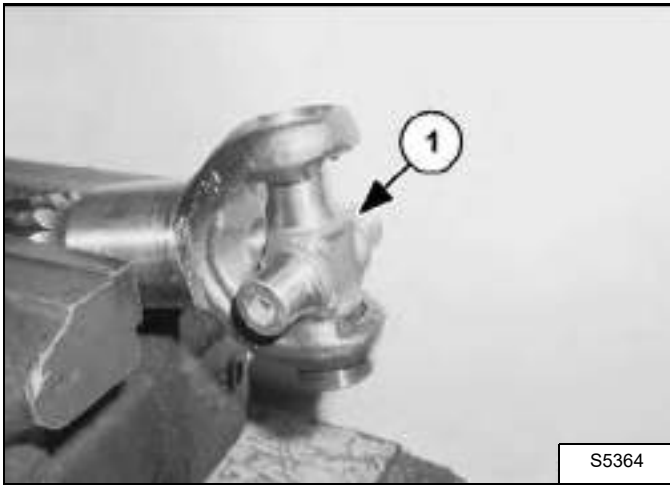
Axle Housing / Drive Shaft Assembly

Figure 40-20-113



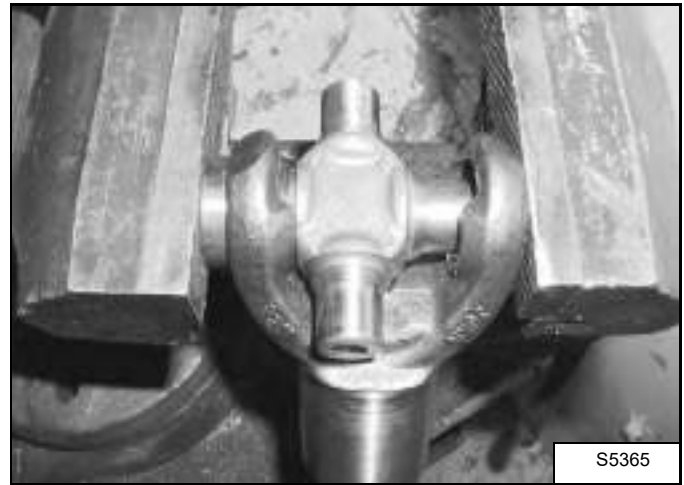
Partially install a new bearing cup (Item 1) [Figure 40-20-113] into the yoke.

Figure 40-20-114



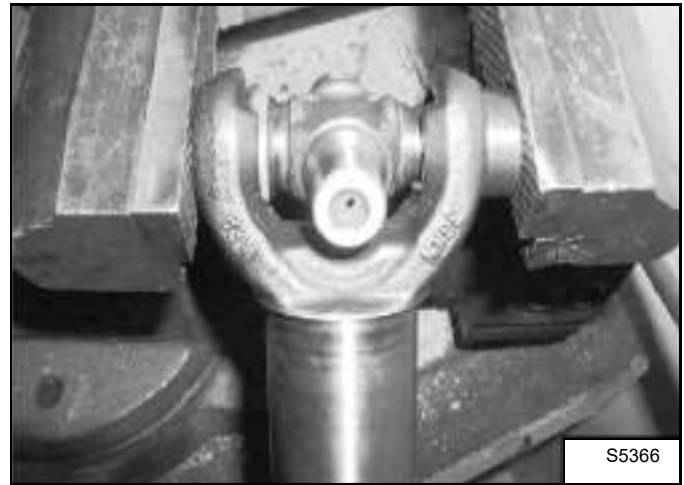
Install the cross (Item 1) [Figure 40-20-114] into the bearing cup.

Figure 40-20-115



Press the bearing cup into the yoke [Figure 40-20-115].

Figure 40-20-116



Install the second bearing cup into the yoke and press onto the cross [Figure 40-20-116].

NOTE: Use care not to lose or drop any needle bearings out of position.

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

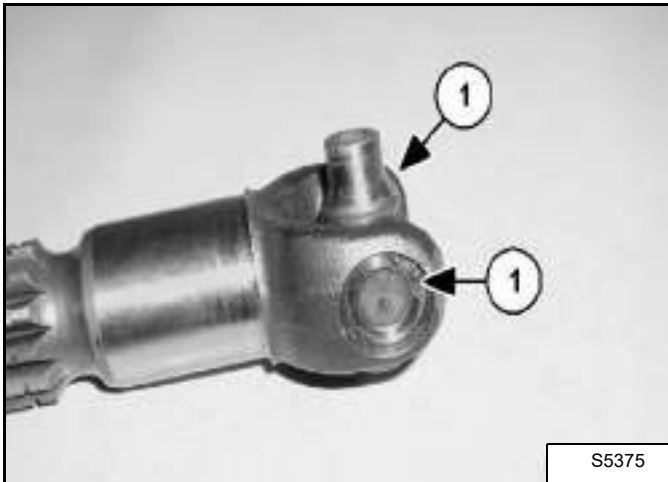
Axle Housing / Drive Shaft Assembly (Cont'd)

Figure 40-20-117



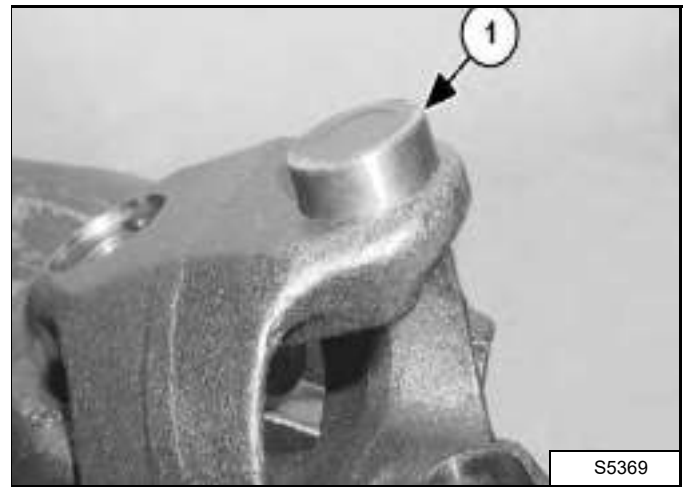
Fully press the two bearing cups into the drive shaft yoke [Figure 40-20-117].

Figure 40-20-118



Install the two snap rings (Item 1) [Figure 40-20-118].

Figure 40-20-119



Partially install a new bearing cup (Item 1) [Figure 40-20-119] into the yoke.

Figure 40-20-120



Install the cross / shaft assembly into the bearing cup [Figure 40-20-120].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Axle Housing / Drive Shaft Assembly (Cont'd)

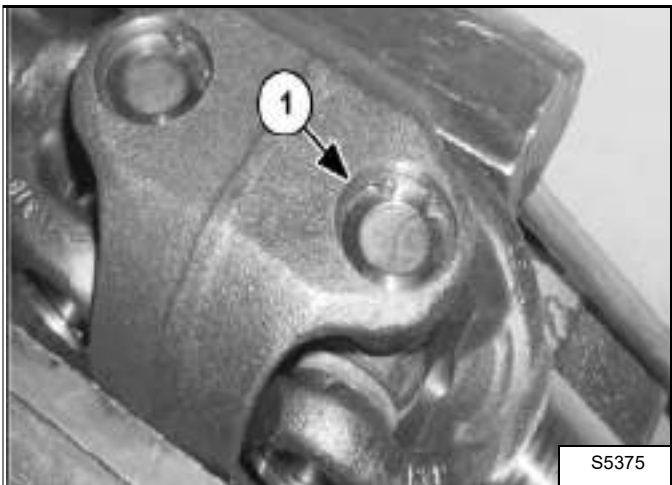
Figure 40-20-121



Install the second bearing cup into the yoke and press onto the cross **[Figure 40-20-121]**.

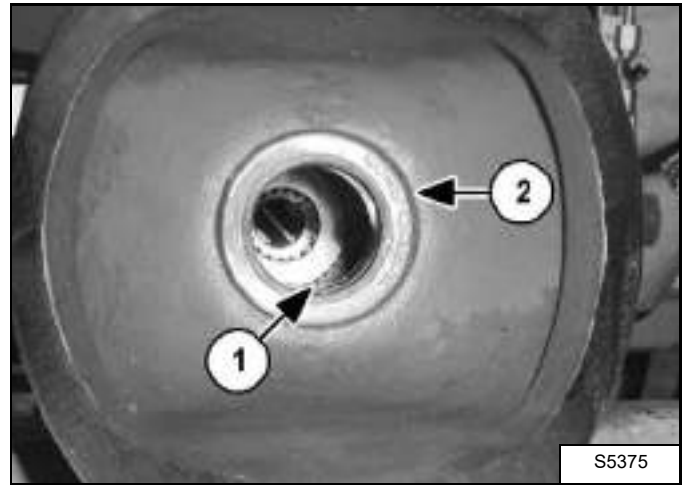
NOTE: Use care not to lose or drop any needle bearings out of position.

Figure 40-20-122



Make sure the bearing cups are fully seated and install the two snap rings **[Figure 40-20-122]**.

Figure 40-20-123



Install a new bushing (Item 1) and seal (Item 2) **[Figure 40-20-123]** into the axle housing.

Lightly lubricate the new seal and bushing.

Figure 40-20-124



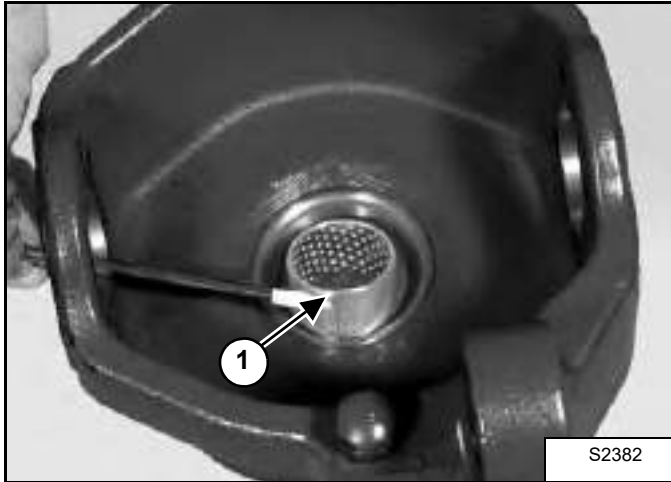
Install the drive shaft into the axle housing aligning the shaft with the splines.

NOTE: Use care not to damage the seal.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Steering Knuckle Assembly

Figure 40-20-125



Lubricate the bushing (Item 1) [Figure 40-20-125] and the seat of the steering knuckle. Install the bushing, using a special tool (Bobcat part number 6912180) .

Figure 40-20-126

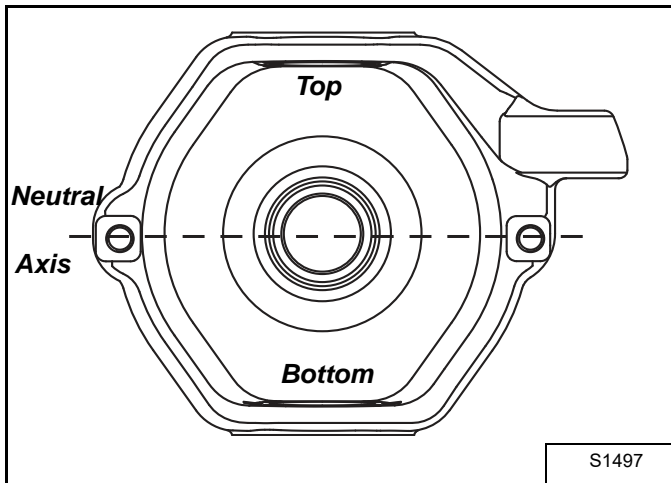
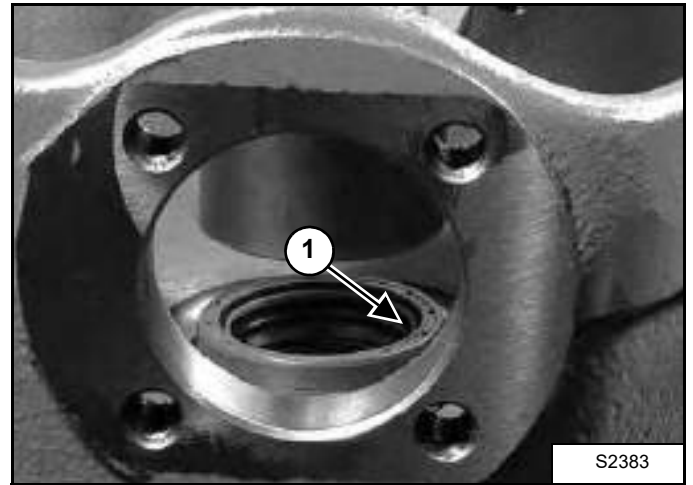


Figure 40-20-127



Lubricate the outer surface of the sealing ring (Item 1) [Figure 40-20-127]. Fit them into their seat using a special tool (Bobcat part number 6912181) [Figure 40-20-127].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Steering Knuckle Assembly (Cont'd)

Figure 40-20-128

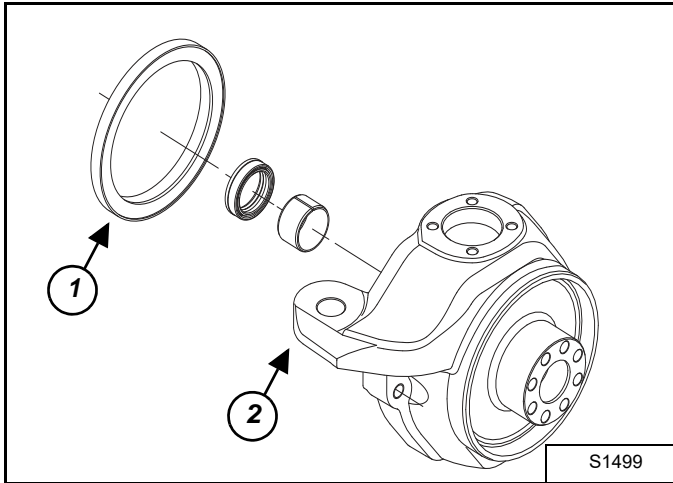
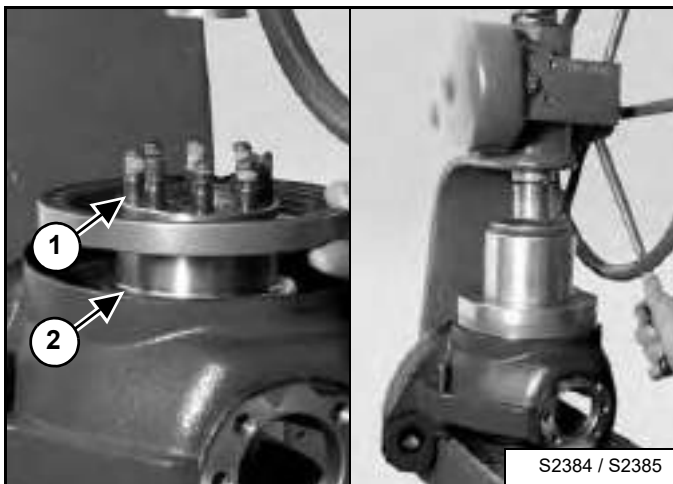


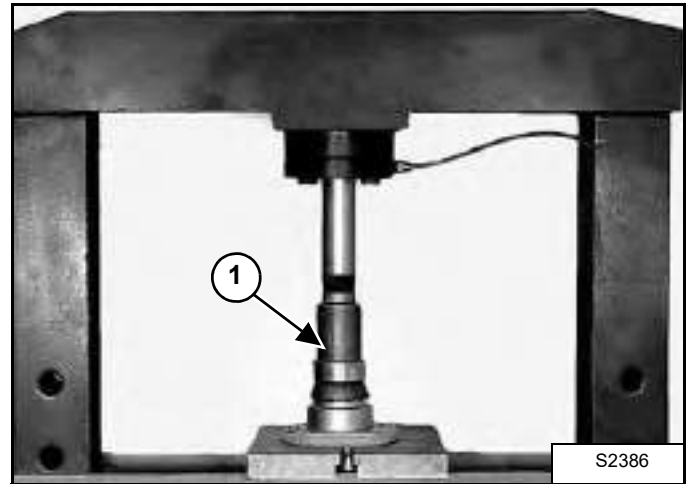
Figure 40-20-129



Using the wheel hub seal tool (Bobcat part number 6912182) apply a repositionable jointing compound for seals to the outer surface of the sealing ring (Item 1) [Figure 40-20-128] & [Figure 40-20-129]. Position the sealing ring in the steering knuckle (Item 2) [Figure 40-20-128] & [Figure 40-20-129].

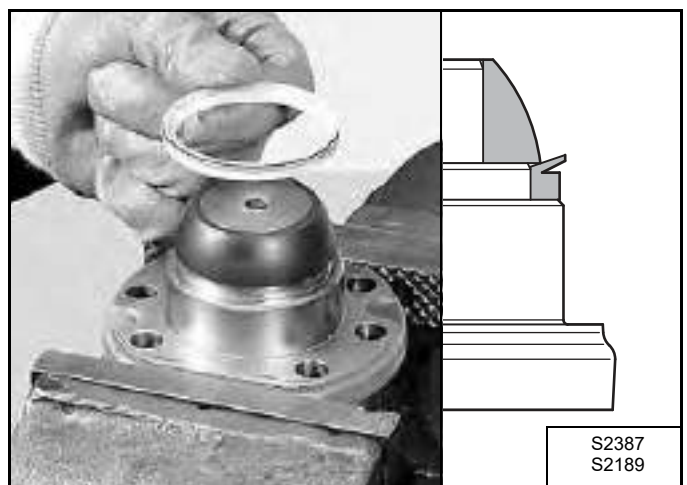
NOTE: Check that the ring (Item 1) [Figure 40-20-128] & [Figure 40-20-129] is correctly oriented.

Figure 40-20-130



If the bottom pivot pin has been extracted, position the pin under a press and fit the ball cover (Item 1) [Figure 40-20-130].

Figure 40-20-131



Fit the front sealing rings onto the pivot pins.

NOTE: Carefully check that the rings are properly oriented.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

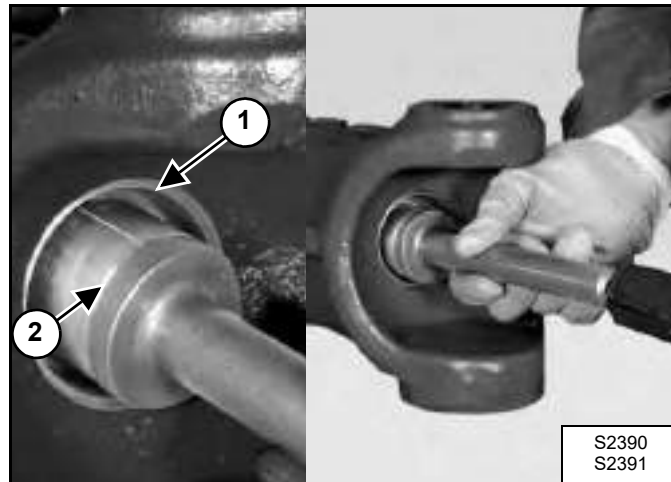
Steering Knuckle Assembly (Cont'd)

Figure 40-20-132



Lubricate the top bush or the bottom ball bush and fit them into the fulcrum holes of the arm.

Figure 40-20-133



Lubricate the bushing (Item 1) and the seat of the steering knuckle (Item 2). Install the bushing (Item 2) [Figure 40-20-133], using a special tool (Bobcat part number 6912180).

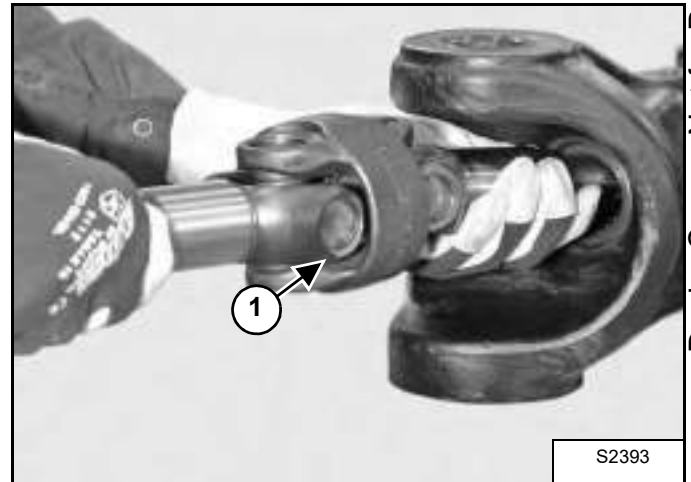
Figure 40-20-134



Lubricate and fit the sealing ring onto a special tool (Bobcat part number 6912181); install the rings into the arm.

NOTE: Pay particular attention to the direction of assembly of the rings (flat side facing out).

Figure 40-20-135



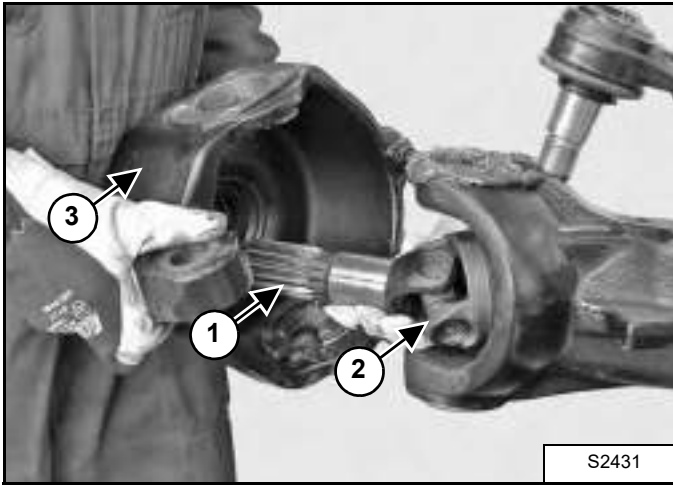
Insert the u-joint (Item 1) [Figure 40-20-135].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Steering Knuckle Assembly (Cont'd)

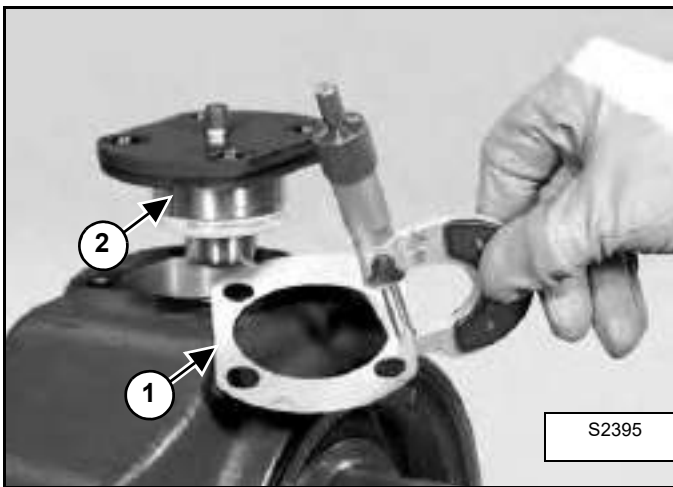
Figure 40-20-136



Lubricate the splined shaft (Item 1) of the u-joint (Item 2) and install the steering knuckle (Item 3) [Figure 40-20-136].

Pay due attention not to damage the dust cover rings and the sealing rings.

Figure 40-20-137



Prepare a series of shims (Item 1) [Figure 40-20-137] of 0,4 up to 0,7 mm.

To be assembled under the upper pin (Item 2) [Figure 40-20-137].

Figure 40-20-138



Lubricate with grease and install the unit in the steering knuckle.

Figure 40-20-139



Lubricate the steering knuckle.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

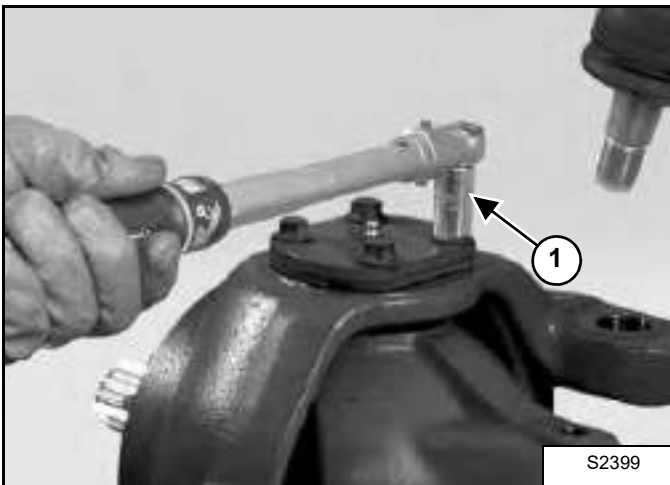
Steering Knuckle Assembly (Cont'd)

Figure 40-20-140



Fit the unit (Item 1) in the steering knuckle (Item 2) [Figure 40-20-140]. Position the screws and tightly tighten.

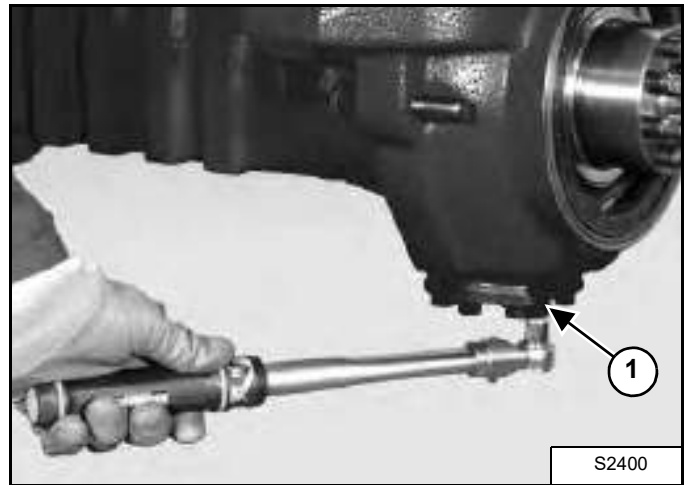
Figure 40-20-141



Tighten the new fitting screws (Item 1) [Figure 40-20-141] of top pivot pins in sequence using the cross tightening method.

Tighten the bolts to 90 - 100 N•m (66-74 ft-lb) torque.

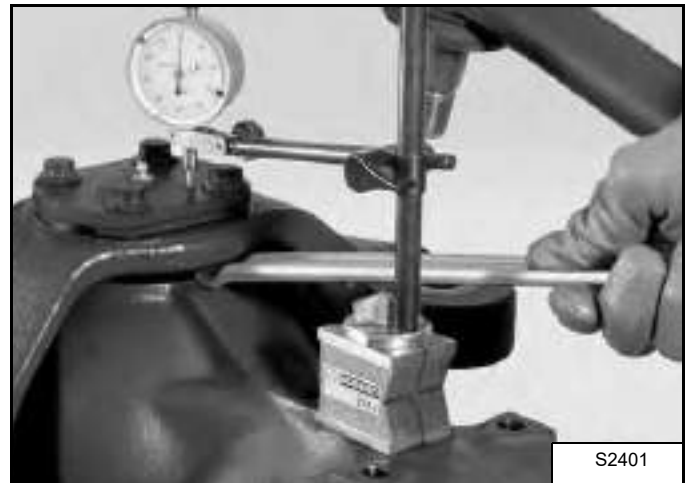
Figure 40-20-142



Tighten the new fitting screws (Item 1) [Figure 40-20-142] of bottom pivot pins in sequence using the cross tightening method.

Tighten the bolts to 90 - 100 N•m (66-74 ft-lb) torque.

Figure 40-20-143



Check by means of a lever that there is no vertical gap.

In case there is any gap, determine the width and reduce it by removing shims.

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Steering Knuckle Assembly (Cont'd)

Figure 40-20-144



Check the torque of the pins, which has to be 40 - 80 N•m (30 - 60 ft-lb). If the preliminary measured value is too high, the shims have to be increased.

Figure 40-20-145



Make certain that the notch is aligned with the cotter pin hole when the nut is finally locked down to max 300 N•m (222 ft-lb).

Figure 40-20-146

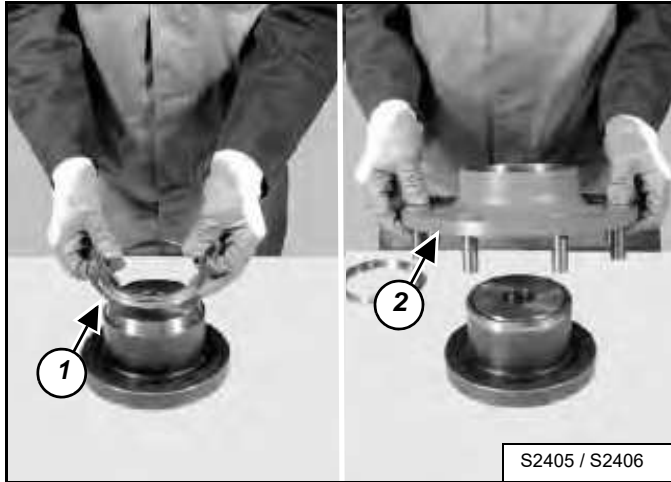


Set the screw to the length of protrusion previously noted during disassembly.

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Wheel Hub Assembly

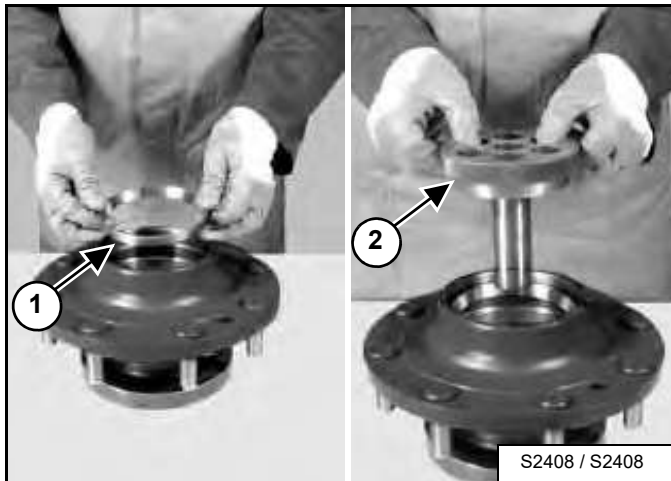
Figure 40-20-147



Position the bearing race (Item 1) [Figure 40-20-147] on the proper tool.

Lubricate the seats of the bearings and position the hub (Item 2) [Figure 40-20-147] on the tool with bearing race.

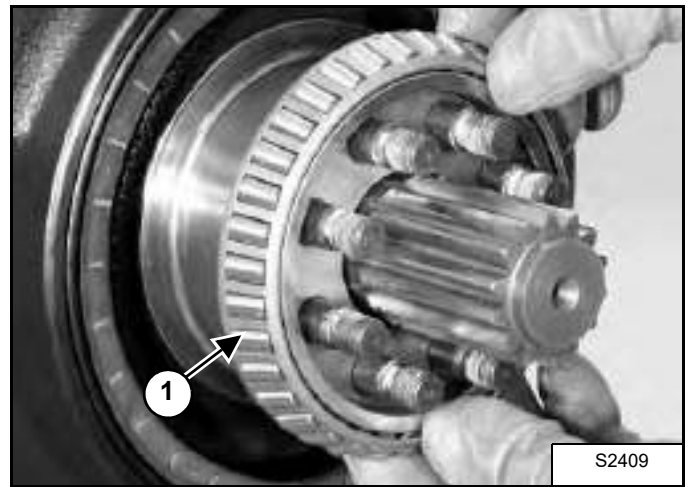
Figure 40-20-148



Position the bearing race (Item 1) of the internal bearing (Item 2) [Figure 40-20-148].

NOTE: Check that the bearing race is correctly oriented.

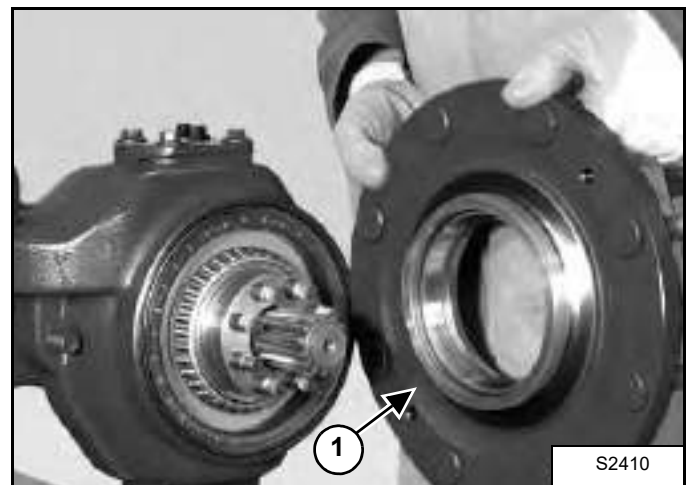
Figure 40-20-149



Install the external bearing (Item 1) [Figure 40-20-149].

NOTE: Move the bearing to the limit stop by hammering lightly all around the edge.

Figure 40-20-150



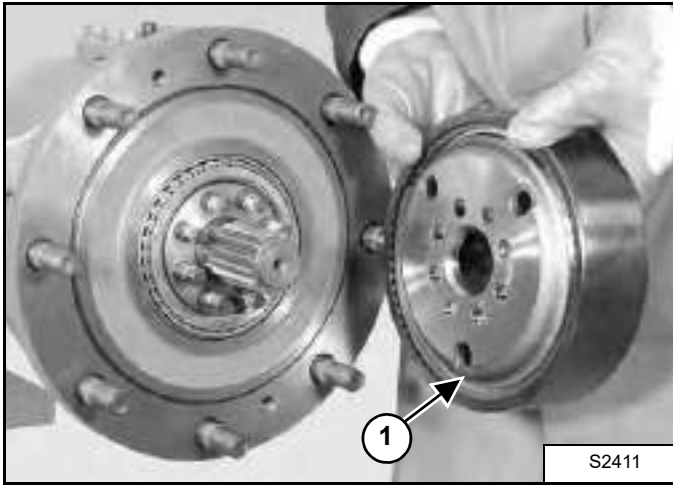
Install the wheel hub (Item 1) [Figure 40-20-150].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

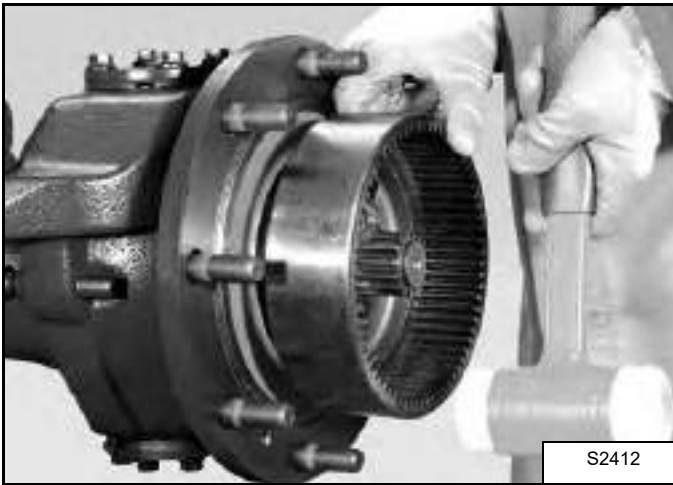
Planetary Carrier Assembly

Figure 40-20-151



Install the ring gear (Item 1) [Figure 40-20-151].

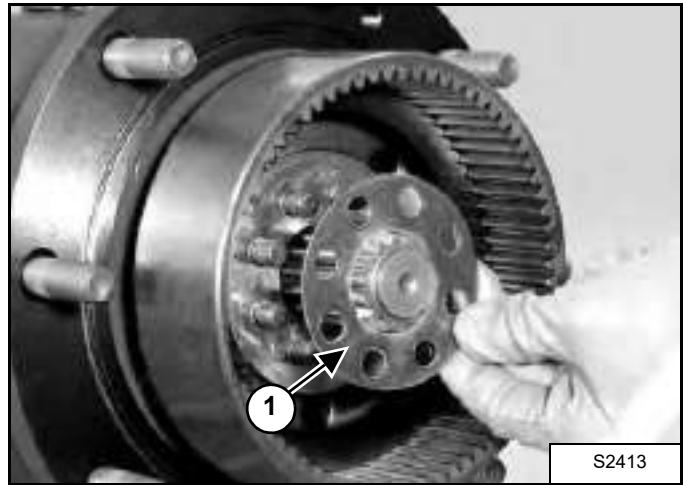
Figure 40-20-152



Fit the complete ring gear (Item 1) [Figure 40-20-152].

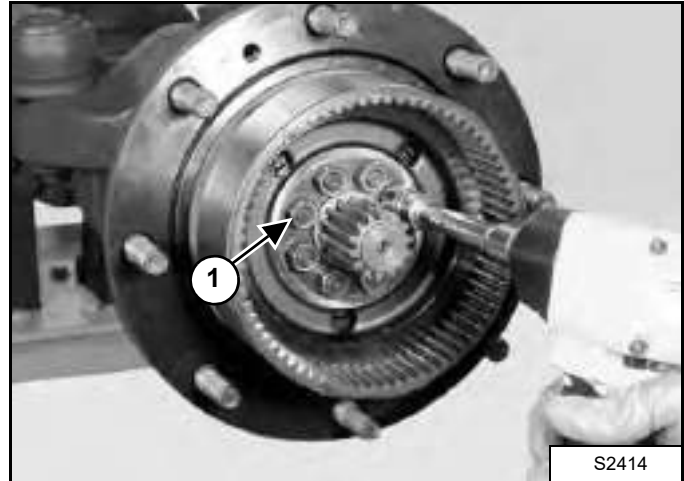
NOTE: In order to fasten the flange, use a plastic hammer and alternately hammer on several equidistant points.

Figure 40-20-153



Install the flange (Item 1) [Figure 40-20-153]. Using Tecno Lube /101, grease the surface of the flange that touches the ring gear.

Figure 40-20-154



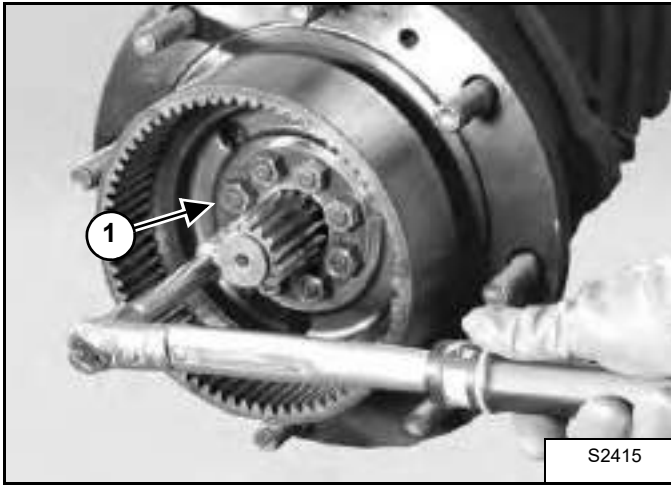
Coat the nuts (Item 1) [Figure 40-20-154] with Loctite 242 and screw them.

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Planetary Carrier Assembly (Cont'd)

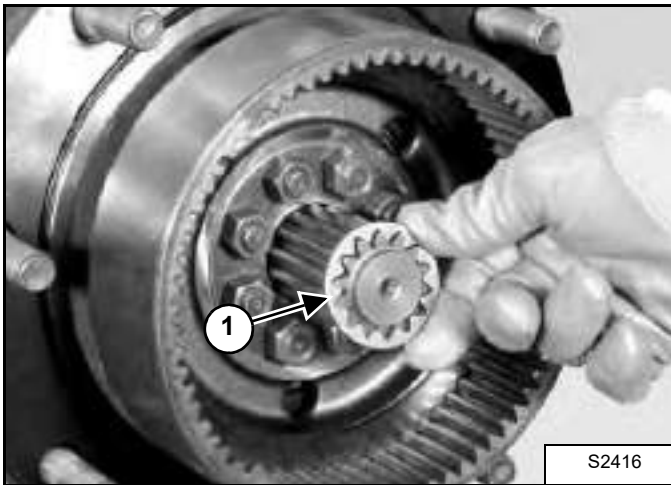
Figure 40-20-155



Tighten nuts (Item 1) [Figure 40-20-155] in two stages, using the criss-cross method.

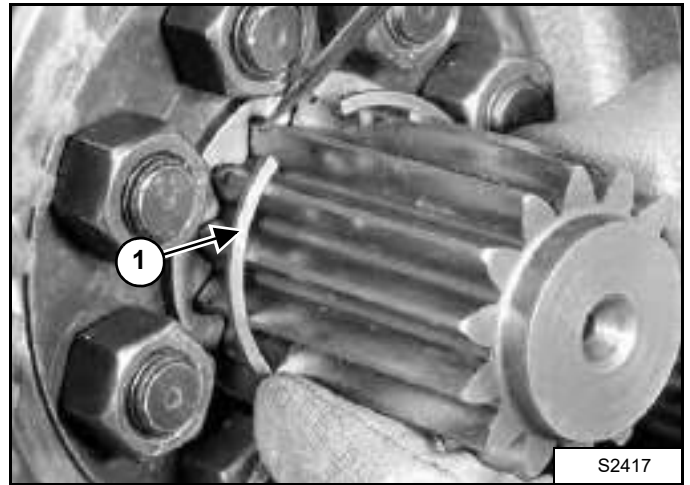
Initial torque wrench setting: 90 N•m (66 ft-lb).
Final torque wrench setting: 100 N•m (74 ft-lb).

Figure 40-20-156



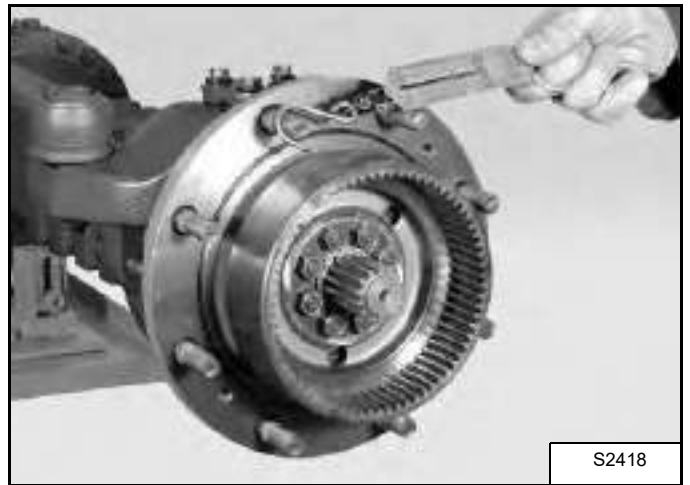
Install the distance piece (Item 1) [Figure 40-20-156].

Figure 40-20-157



Install the snap ring (Item 1) [Figure 40-20-157].

Figure 40-20-158



Check the continuous rolling torque on the hub (Item 1) [Figure 40-20-158]: torque 7 - 20 N•m (5-15 ft-lb).

If torque is too high, loosen the nuts (Item 1) [Figure 40-20-155], and re-tighten using a lower final torque setting.

If torque is too low, torque the nuts (Item 1) [Figure 40-20-155] using a higher final torque setting.

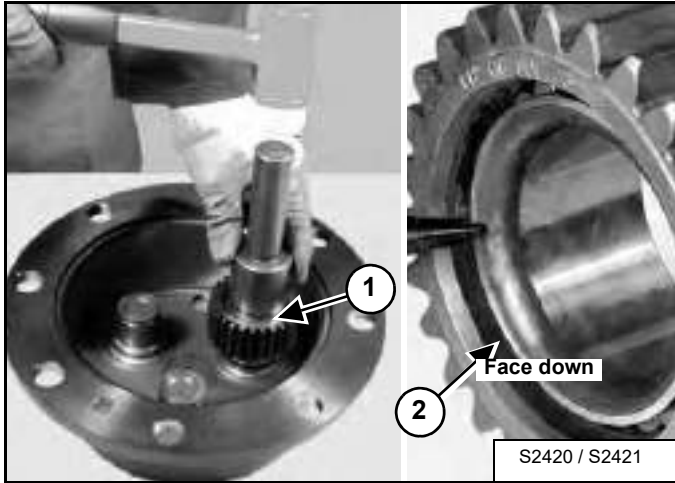
Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Planetary Carrier Assembly (Cont'd)

NOTE: Check the condition and position of the O-ring.

Figure 40-20-159



Fit the planetary gear (Item 1) [Figure 40-20-159] onto the planetary gear cover.

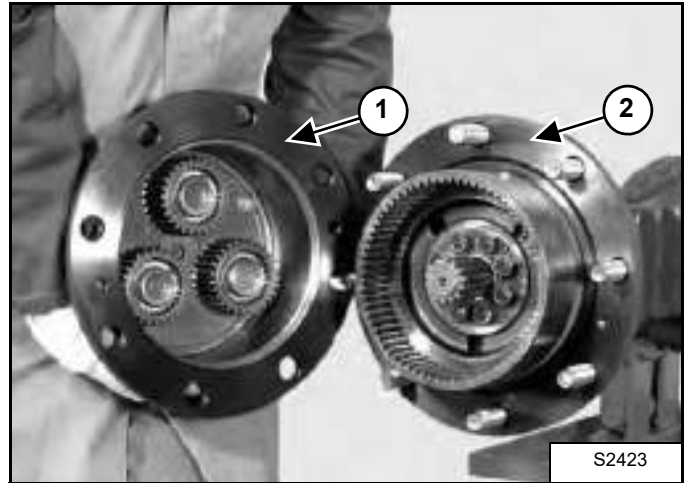
NOTE: The jointed portion (Item 2) [Figure 40-20-159] of the internal ring of the bearings must face the bottom of the pin.

Figure 40-20-160



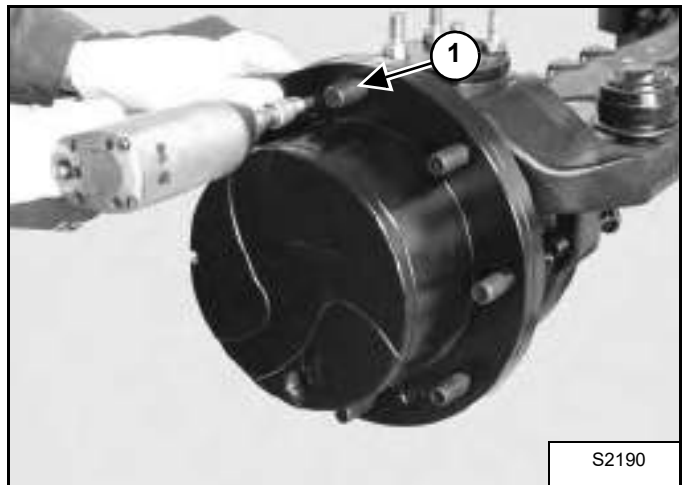
Lock into position the planetary gears with the snap rings [Figure 40-20-160].

Figure 40-20-161



Fit the planetary gear cover (Item 1) onto the wheel hub (Item 2) [Figure 40-20-161].

Figure 40-20-162





Fasten the bolts using a torque wrench setting of 40-50 N•m (29 - 37 ft-lbs).

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (FRONT) (CONT'D)

Special Tools

BOBCAT PN	IMAGE	DESCRIPTION
6912173	 A photograph showing a pinion ring nut assembly, including a large metal nut, a smaller component, and a long metal tool.	PINION RING NUT
6912176	 A photograph of a dummy pinion, which is a metal shaft with a large gear end and a smaller gear end.	DUMMY PINION
6912178	 A photograph of an input flange seal, showing two circular rings and a central component.	INPUT FLANGE SEAL
6912180	 A photograph of a U-joint arm and steering knuckle bushing, showing a metal arm and a bushing.	U-JOINT ARM & STEERING KNUCKLE BUSHING
6912181	 A photograph of a U-joint seal, arm side, showing a small metal component.	U-JOINT SEAL, ARM SIDE
6912182	 A photograph of a wheel hub seal, showing a circular metal component.	WHEEL HUB SEAL

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR)

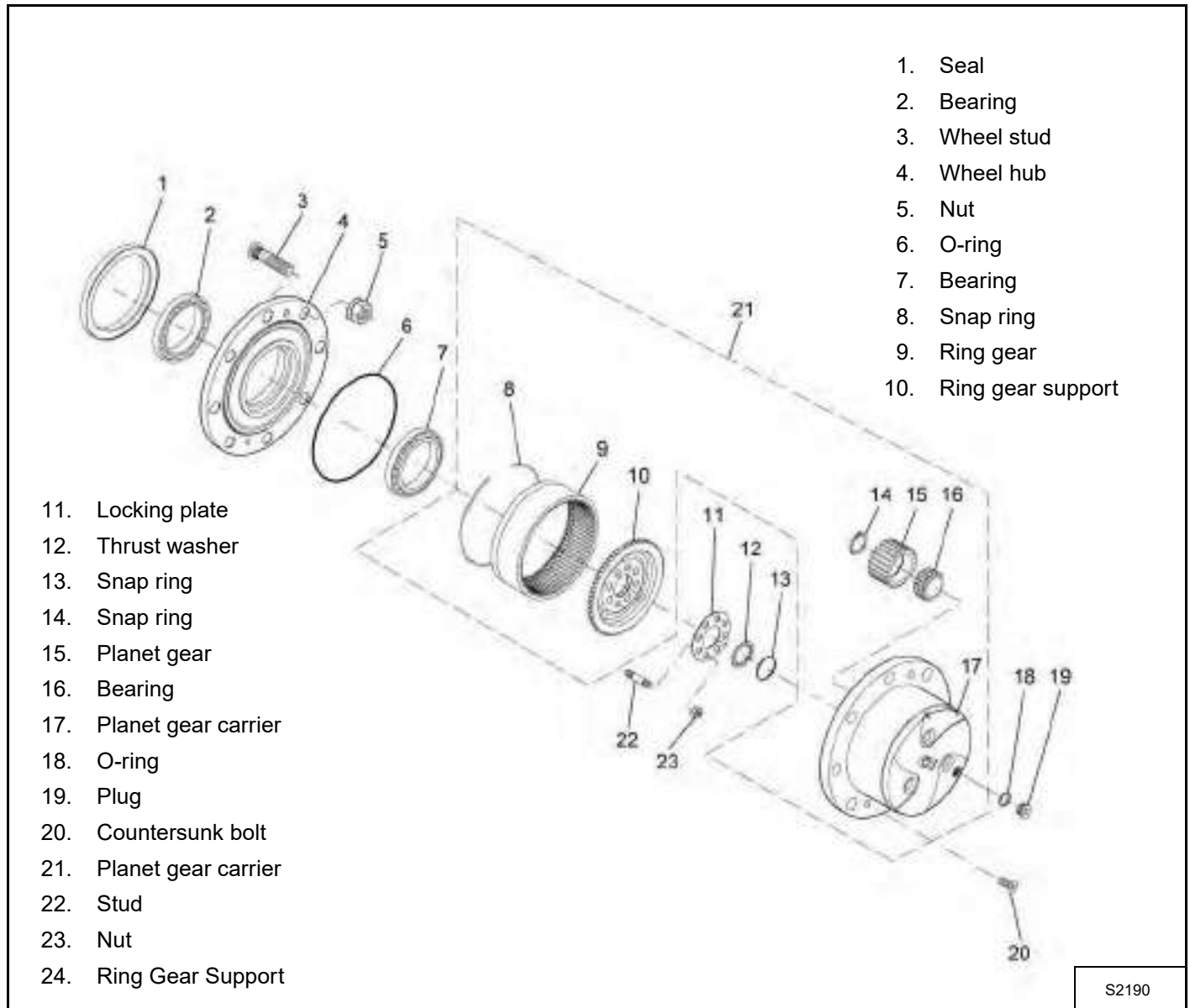
Description

For photo clarity, the following axle procedures are done with the complete axle assembly removed from the machine, although the planetary carrier, wheel hub, steering knuckle and drive shaft procedures may be done with the axle assembly installed in the machine. For complete axle repair, the following must be done.

Rear Axle removal. (See REAR AXLE on Page 40-90-1.)

Rear steering cylinder removal. (See Removing The Steering Cylinder on Page 20-61-1.)

Planetary Carrier And Wheel Hub Parts Identification



Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Planetary Carrier Disassembly

Clean the outside of the planetary carrier before disassembly.

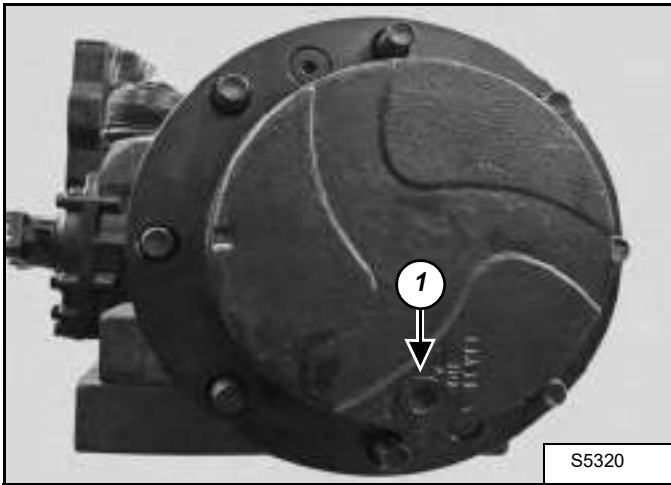
Mark the outside of the planetary carrier for ease of assembly.

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

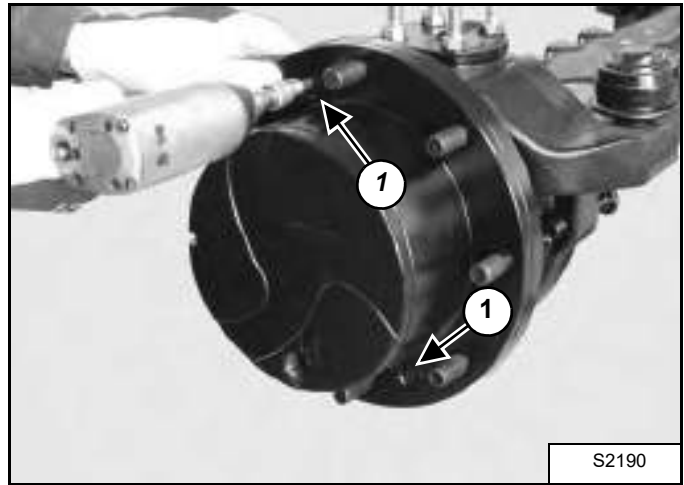
I-2003-0888

Figure 40-21-1



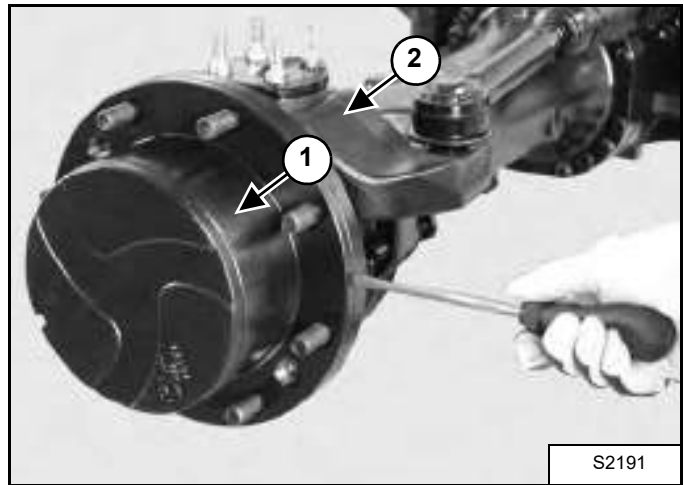
With the drain plug (Item 1) [Figure 40-21-1] in the position shown, place a drain pan under the hub and remove the plug.

Figure 40-21-2



Remove the two screws (Item 1) [Figure 40-21-2] from the planetary carrier.

Figure 40-21-3



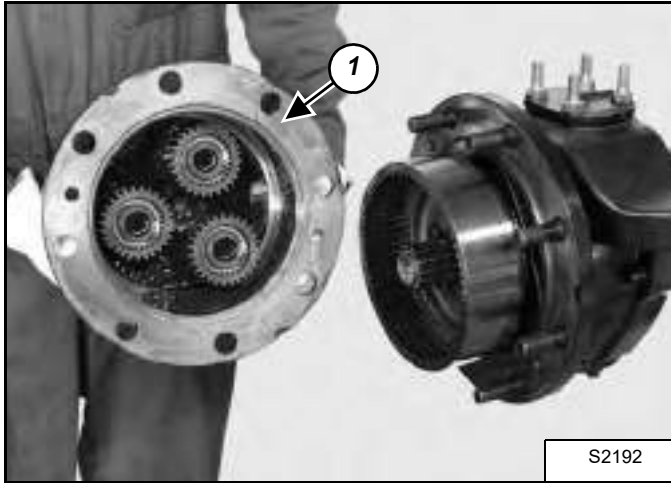
Remove the planetary gear carrier (Item 1) from the wheel hub (Item 2) [Figure 40-21-3] by alternately forcing a screwdriver into the appropriate slots.

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

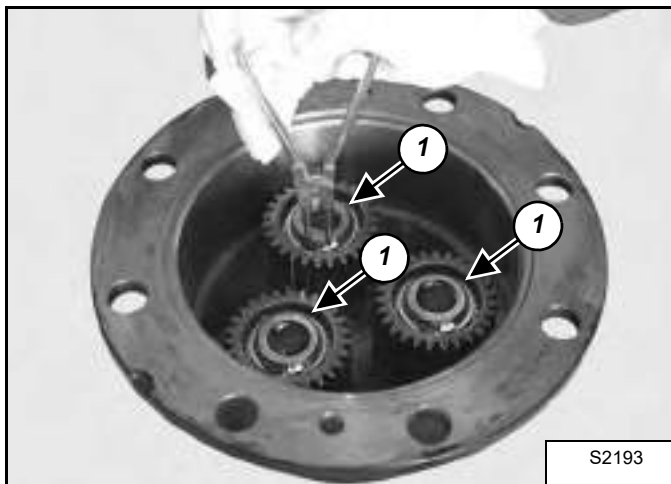
Planetary Carrier Disassembly (Cont'd)

Figure 40-21-4



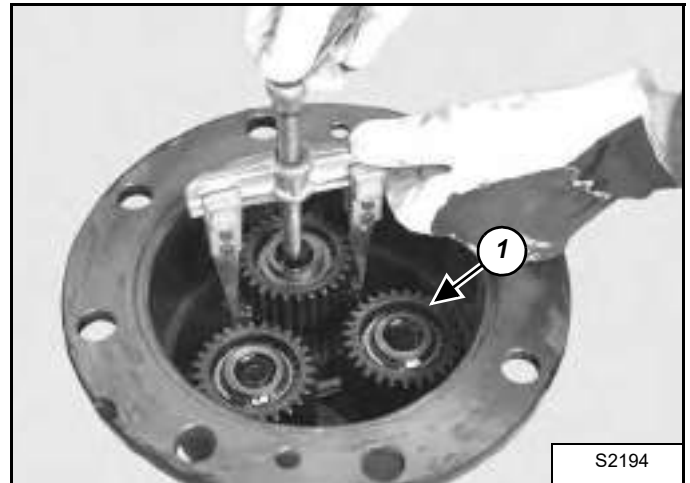
Remove the securing bolts and the complete planetary gear carrier (Item 1) [Figure 40-21-4].

Figure 40-21-5



Remove the snap rings (Item 1) [Figure 40-21-5] from the planetary carrier.

Figure 40-21-6



With the help of a puller, remove the planetary wheel gears (Item 1) [Figure 40-21-6].

NOTE: Note the assembly side of the planetary gears.

Figure 40-21-7



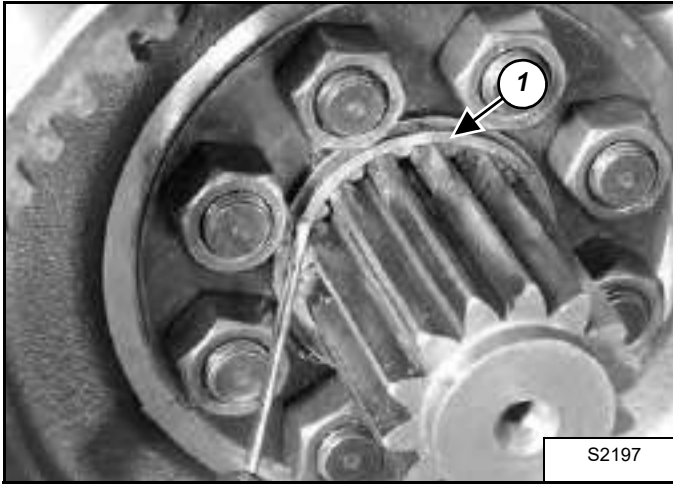
NOTE: Note down the direction of assembly of planetary gears.

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

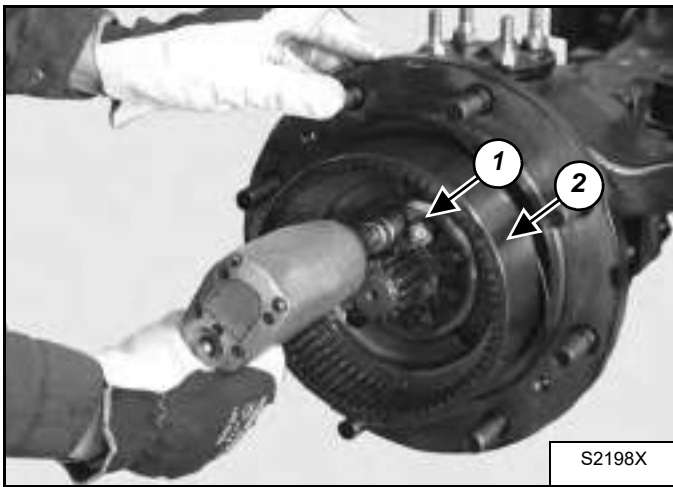
Wheel Hub Disassembly

Figure 40-21-8



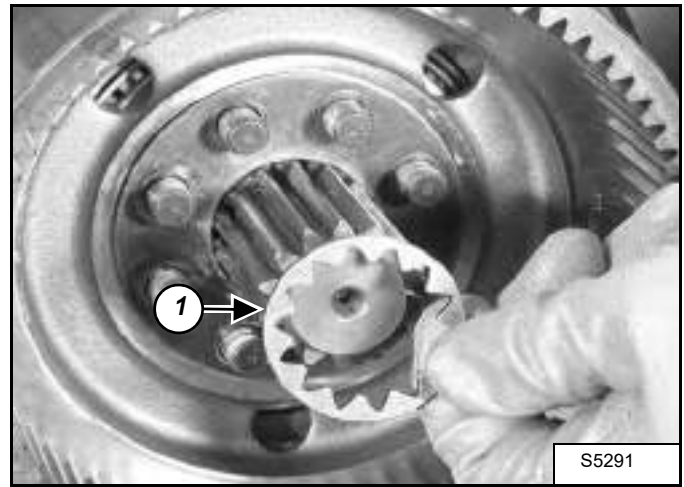
Remove the snap ring (Item 1) [Figure 40-21-8].

Figure 40-21-9



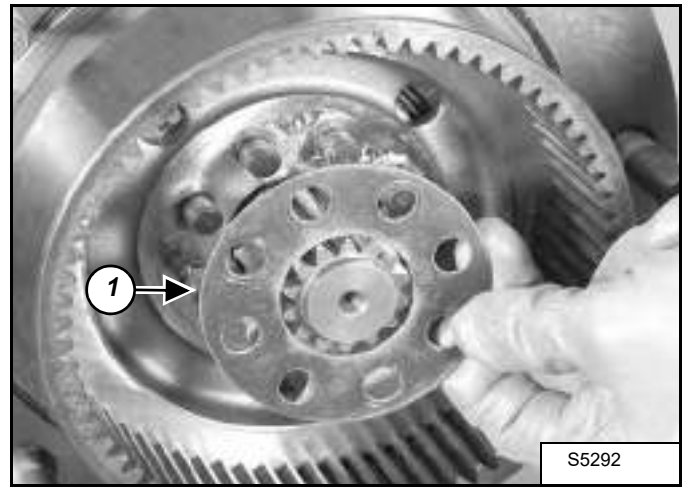
Remove the eight nuts (Item 1) from the ring gear (Item 2) [Figure 40-21-9].

Figure 40-21-10



Remove the thrust washer (Item 1) [Figure 40-21-10].

Figure 40-21-11

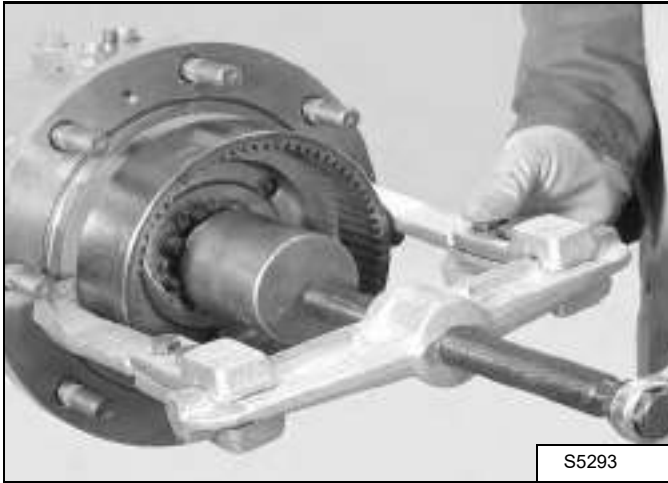


Remove the plate (Item 1) [Figure 40-21-11].

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

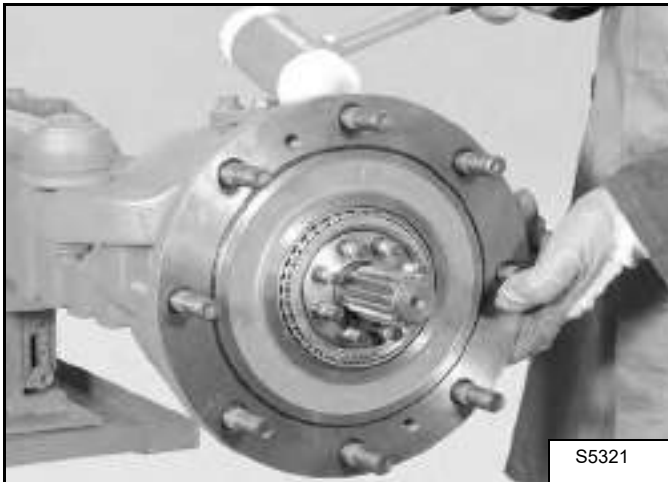
Wheel Hub Disassembly (Cont'd)

Figure 40-21-12



Remove the ring gear from the shaft [Figure 40-21-12].

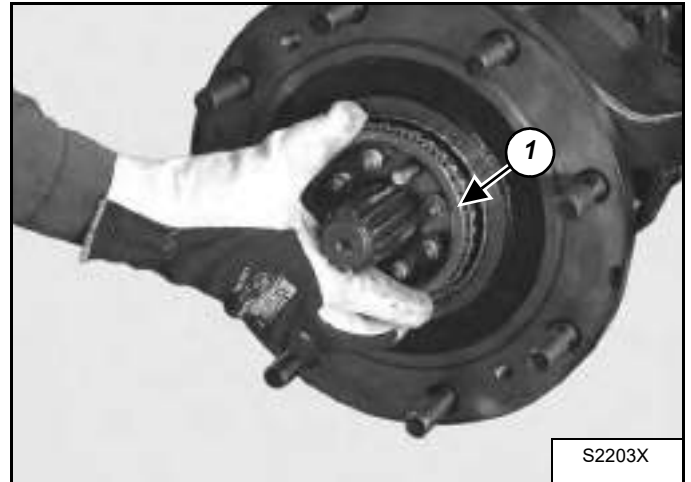
Figure 40-21-13



Loosen the hub with a plastic hammer [Figure 40-21-13].

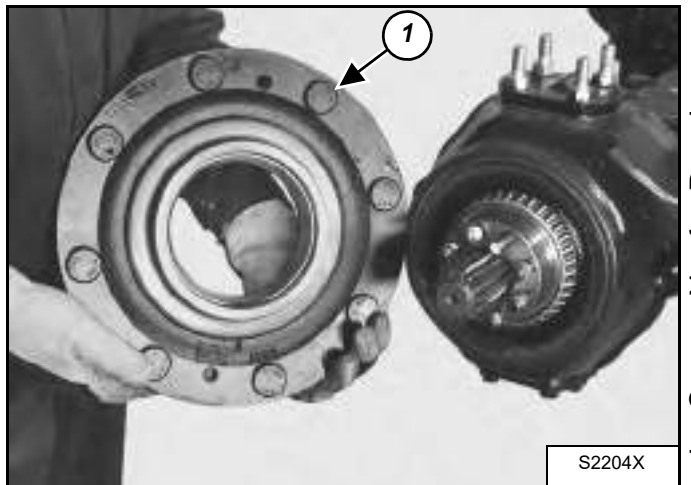
NOTE: Alternately hammer on several equidistant points.

Figure 40-21-14



Remove the bearing (Item 1) [Figure 40-21-14].

Figure 40-21-15



Remove the complete wheel hub (Item 1) [Figure 40-21-15] by hand.

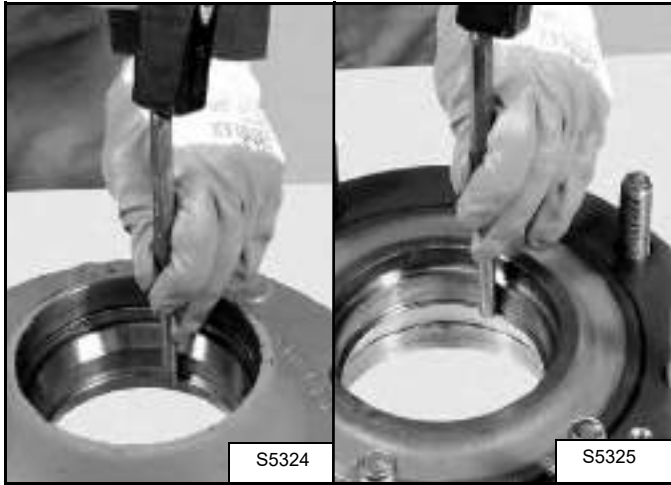
NOTE: Use care while removing, as the assembly may come off easily.

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Wheel Hub Disassembly (Cont'd)

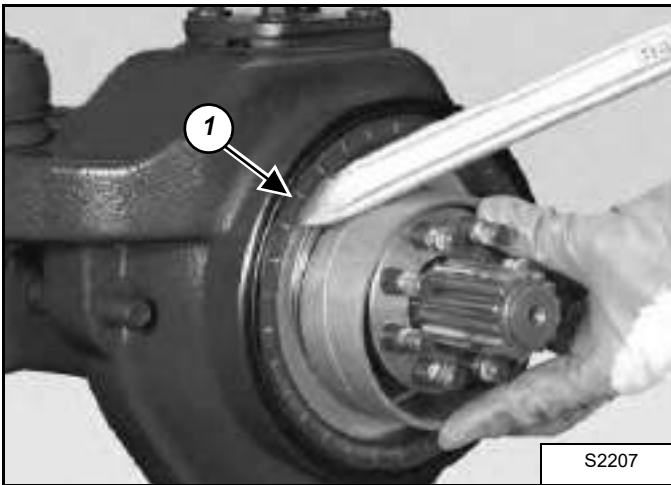
Figure 40-21-16



Remove the seals from the hub [Figure 40-21-16].

NOTE: Hammer in an alternate sequence to prevent crawling and deformation of the bearing races.

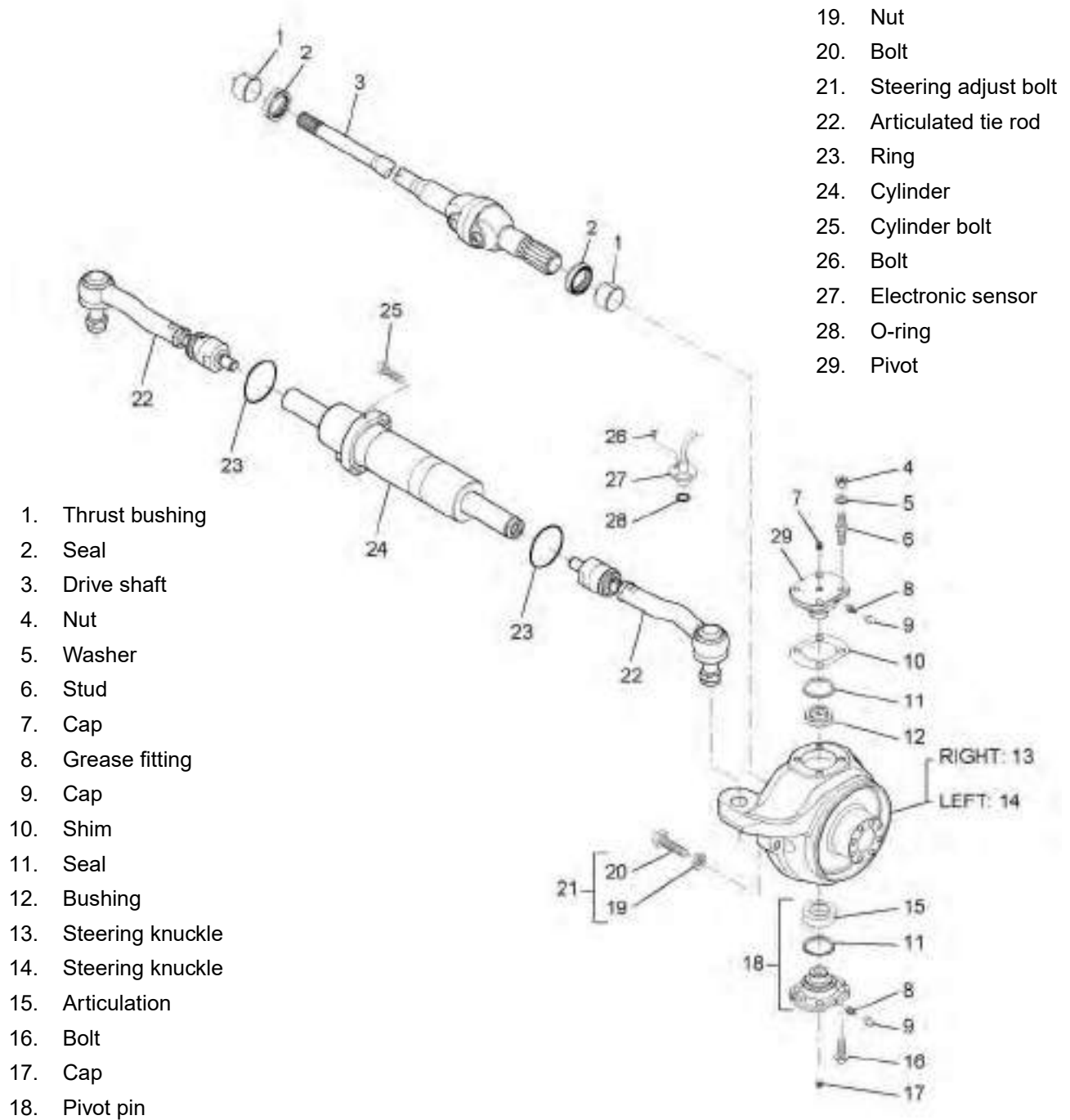
Figure 40-21-17



Remove the sealing ring from the steering knuckle (Item 1) [Figure 40-21-17]. Pay due attention not to damage the seat of bearing.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Steering Knuckle and Drive Shaft Parts Identification



Dealer Copy -- Not for Resale

S1389

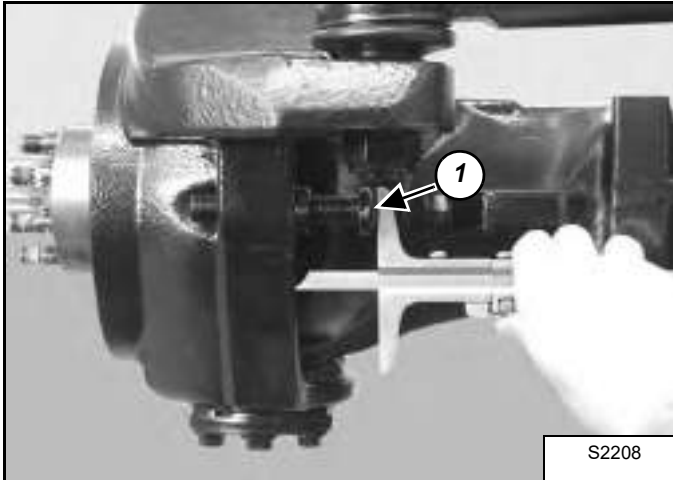
AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Steering Knuckle Disassembly

Clean the outside of the steering knuckle before disassembly.

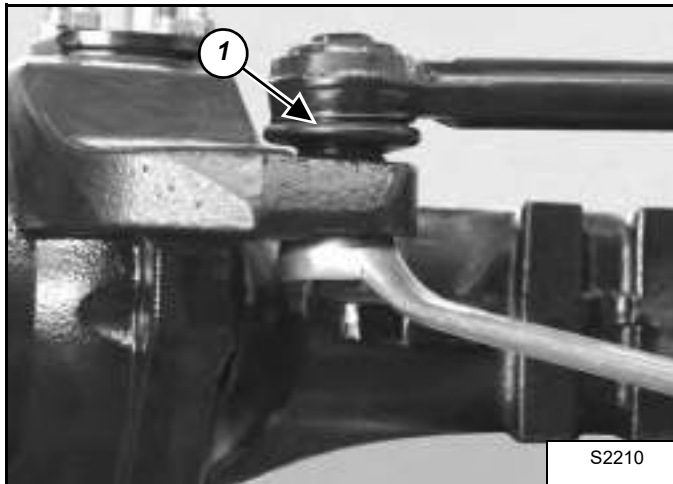
Mark the outside of the steering knuckle for ease of assembly.

Figure 40-21-18



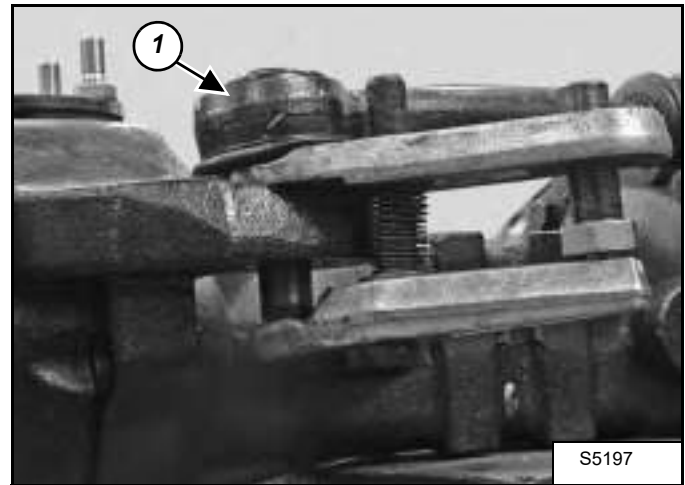
Measure and note the protrusion of the screw (Item 1) [Figure 40-21-18] and remove the screw.

Figure 40-21-19



Remove the steering cylinder nut (Item 1) [Figure 40-21-19].

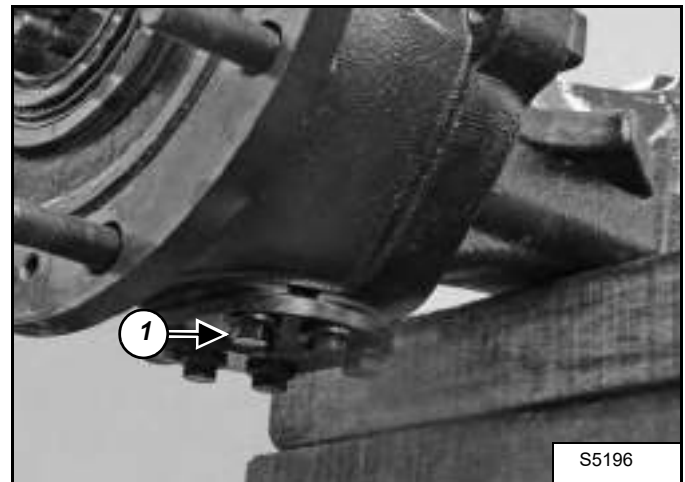
Figure 40-21-20



Remove the tapered end of the tie rod (Item 1) [Figure 40-21-20] from the steering knuckle.

NOTE: Be careful as the bolt may come out with great force.

Figure 40-21-21



Remove six screws from the bottom cap of the knuckle assembly [Figure 40-21-21].

Remove the pivot (Item 1) [Figure 40-21-21].

NOTE: Screws can not be re-used.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

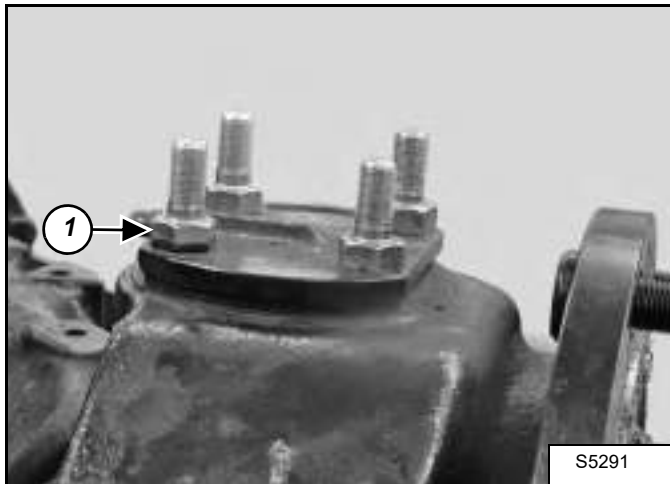
Steering Knuckle Disassembly (Cont'd)

Figure 40-21-22



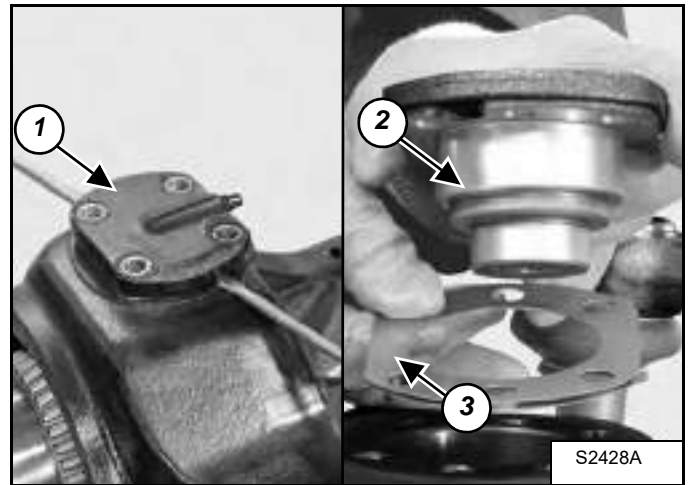
Remove the seal from the bottom pivot (Item 1) [Figure 40-21-22].

Figure 40-21-23



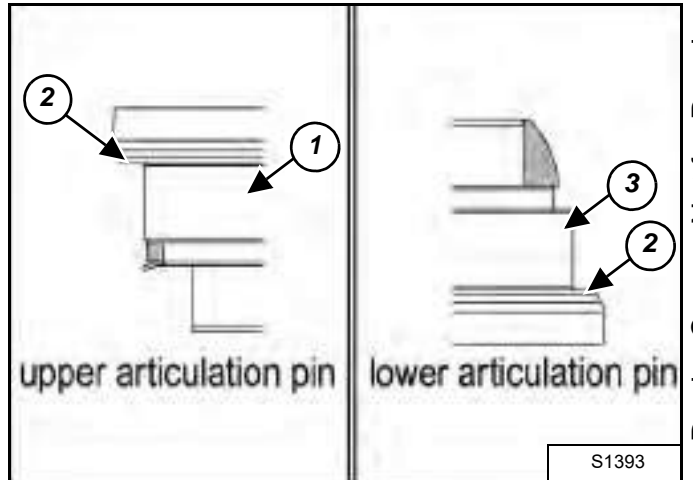
Remove the four screws (Item 1) [Figure 40-21-23] from the upper pivot.

Figure 40-21-24



Using two levers, remove the top pivot pin (Item 1) complete with front seal (Item 2) and shims (Item 3) [Figure 40-21-24].

Figure 40-21-25



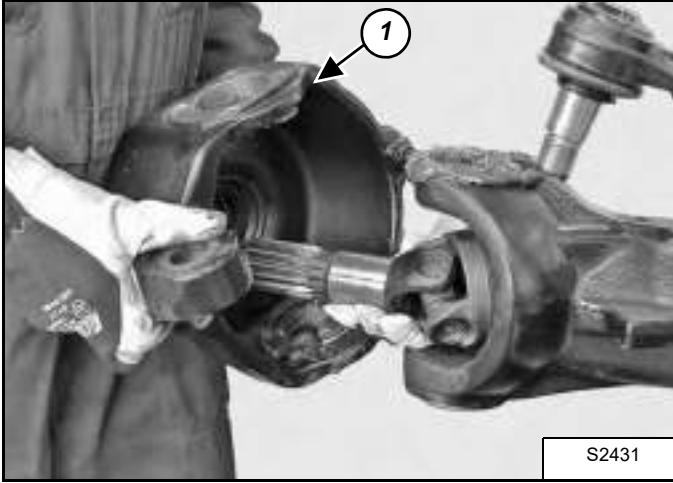
Configuration of the upper (Item 1) pivot pin with shims (Item 2) and the lower pivot pin (Item 3) [Figure 40-21-25].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

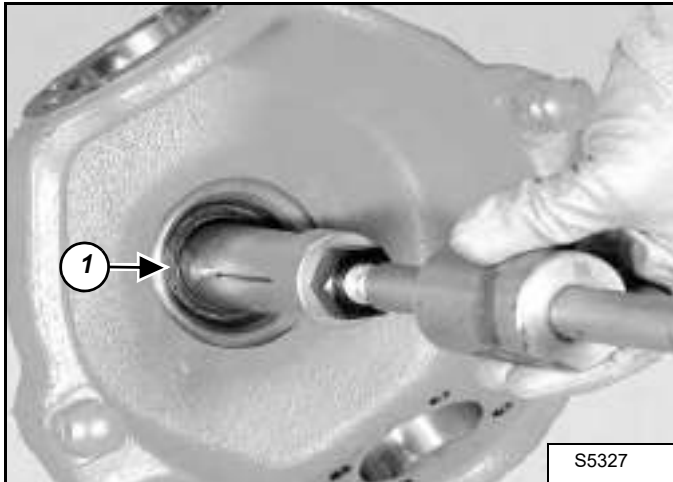
Steering Knuckle Disassembly (Cont'd)

Figure 40-21-26



Remove the steering knuckle (Item 1) [Figure 40-21-26] from the axle.

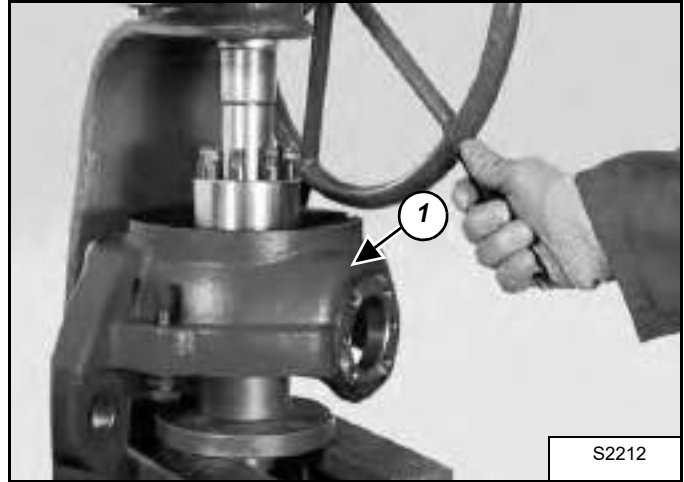
Figure 40-21-27



Use a puller to remove the seal from the steering knuckle (Item 1) [Figure 40-21-27].

Installation: Use special tool (Bobcat part number 6912178) to install the seal.

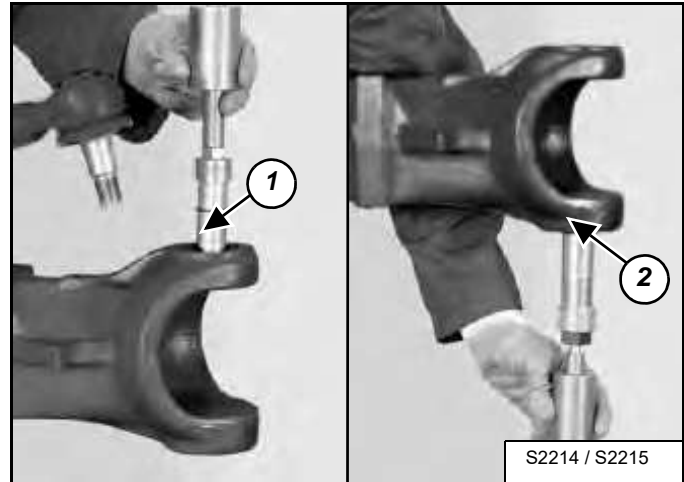
Figure 40-21-28



Remove the bushing from the steering knuckle (Item 1) [Figure 40-21-28].

NOTE: Note down the orientation of bushing.

Figure 40-21-29

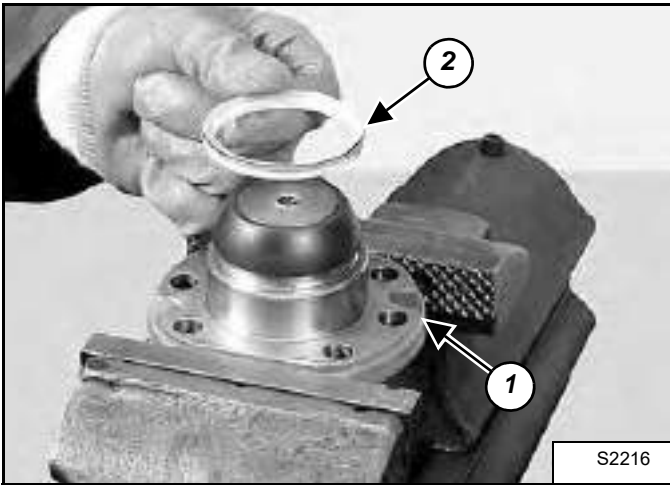


Using a puller for inner parts, remove the top bush (Item 1) and the bottom ball-bush (Item 2) [Figure 40-21-29].

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Steering Knuckle Disassembly (Cont'd)

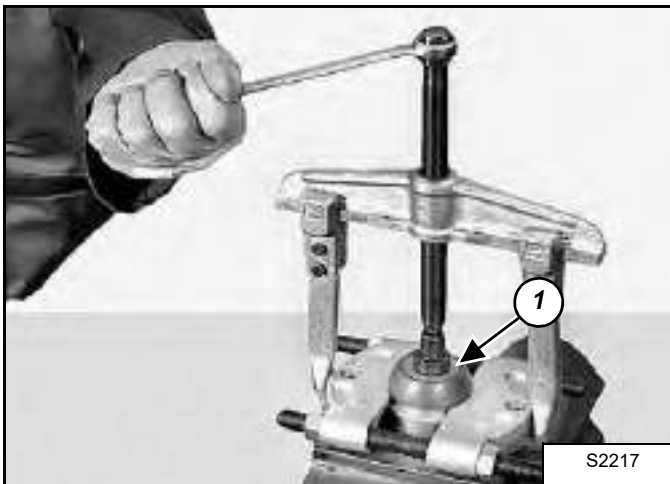
Figure 40-21-30



Remove the pivot pins (Item 1) and the front sealing rings (Item 2) [Figure 40-21-30].

NOTE: Note down the side for assembly

Figure 40-21-31



If the ball cover (Item 1) [Figure 40-21-31] need replacing, remove it from the bottom pivot pin.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Axle Housing / Drive Shaft Disassembly

Clean the outside of the axle housing before disassembly.

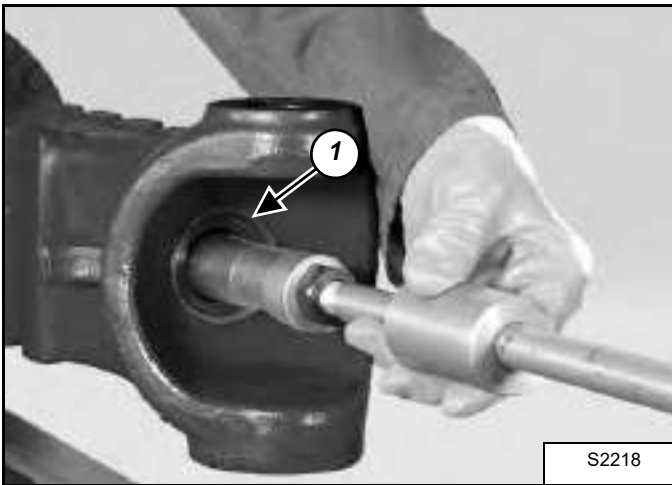
Mark the outside of the axle housing for ease of assembly.

Figure 40-21-32



Remove the drive shaft from the axle housing [Figure 40-21-32].

Figure 40-21-33

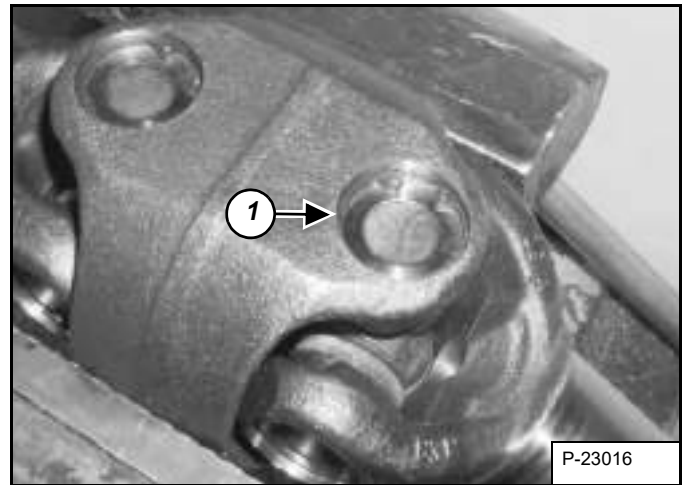


Remove sealing ring (Item 1) [Figure 40-21-33] and the bushing from the arm.

NOTE: Note down the side for assembly

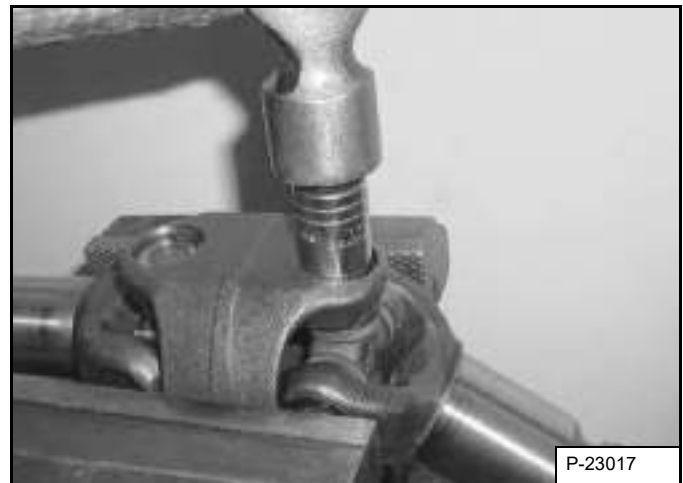
Check the position of the anti-extrusion and O-rings.

Figure 40-21-34



Remove the two snap rings (Item 1) [Figure 40-21-34] across from each other.

Figure 40-21-35



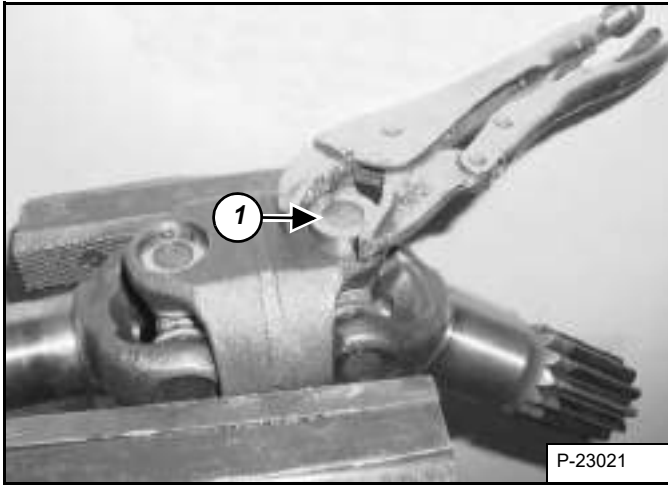
Drive the upper bearing cup down to push the opposite bearing cup partially through the yoke [Figure 40-21-35].

NOTE: The bottom bearing cup will not be completely removed.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

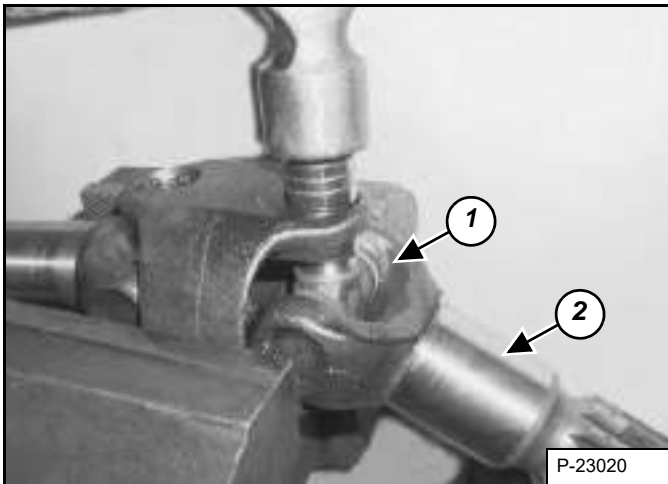
Axle Housing / Drive Shaft Disassembly (Cont'd)

Figure 40-21-36



Turn the shaft over and remove the bearing cup (Item 1) [Figure 40-21-36].

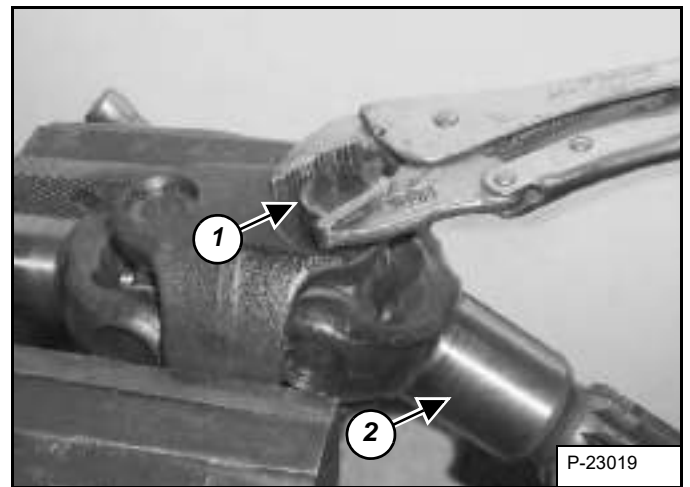
Figure 40-21-37



Drive the cross (Item 1) [Figure 40-21-37] down to push the opposite bearing cup through the yoke.

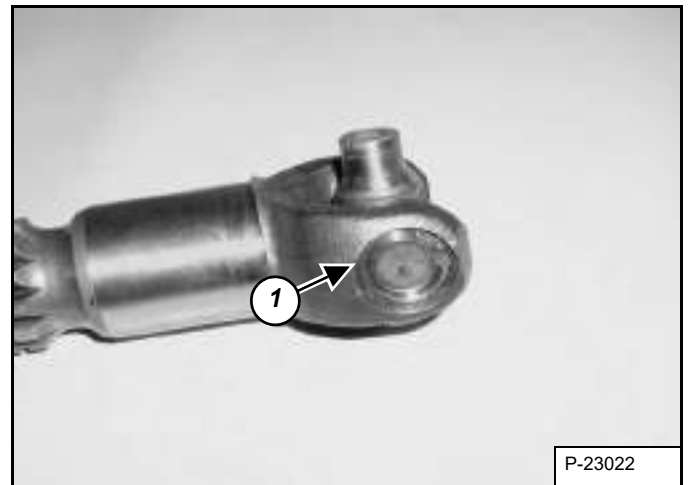
NOTE: The drive shaft end (Item 2) [Figure 40-21-37] may fall out of the yoke.

Figure 40-21-38



Turn the shaft over and remove the bearing cup (Item 1). Remove the drive shaft (Item 2) [Figure 40-21-38] from the yoke.

Figure 40-21-39



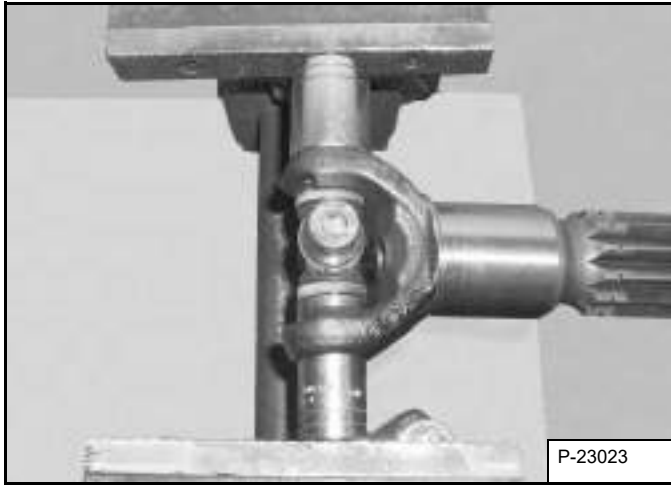
Remove the two snap rings (Item 1) [Figure 40-21-39] from the yoke.

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

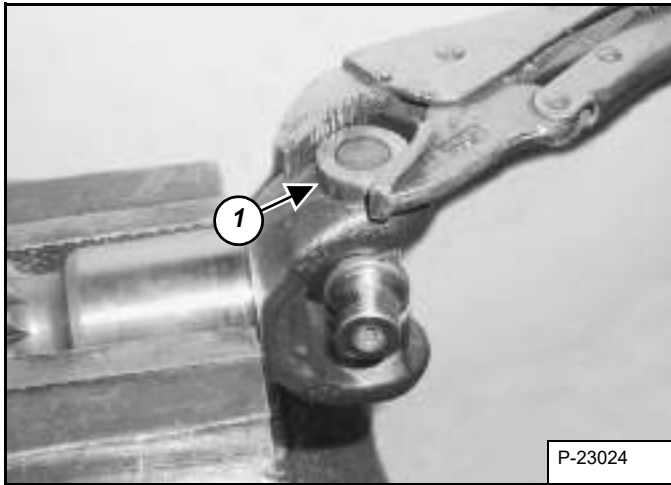
Axle Housing / Drive Shaft Disassembly (Cont'd)

Figure 40-21-40



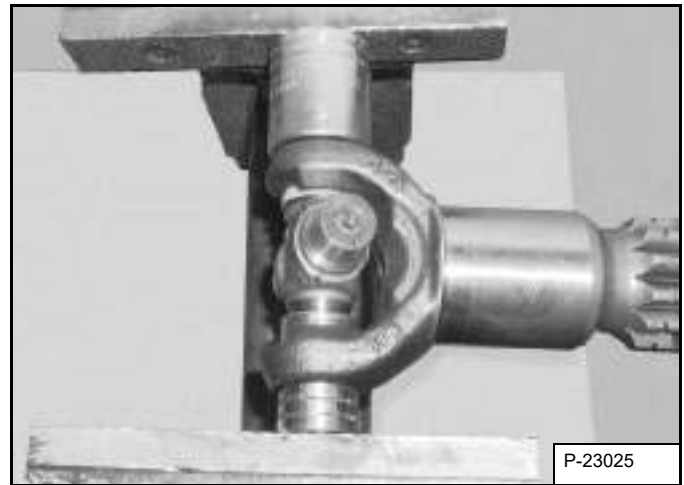
Using two different size sockets and a vice, and press one bearing cup into the yoke while pushing the opposite bearing cup through the yoke **[Figure 40-21-40]**.

Figure 40-21-41



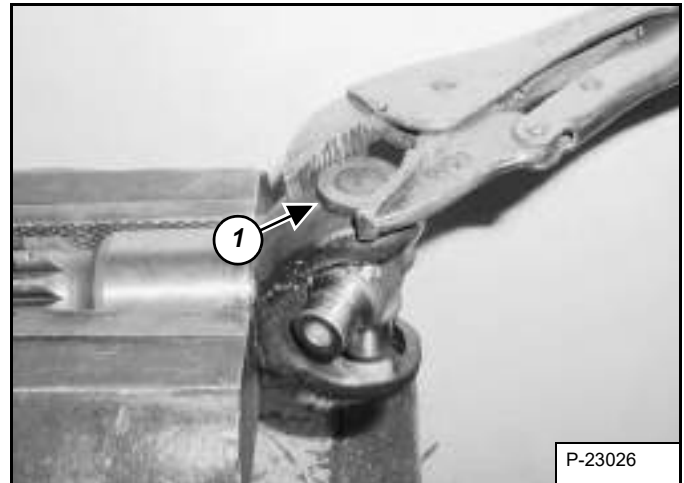
Remove the bearing cup (Item 1) **[Figure 40-21-41]**.

Figure 40-21-42



Press the second bearing cup through the yoke **[Figure 40-21-42]**.

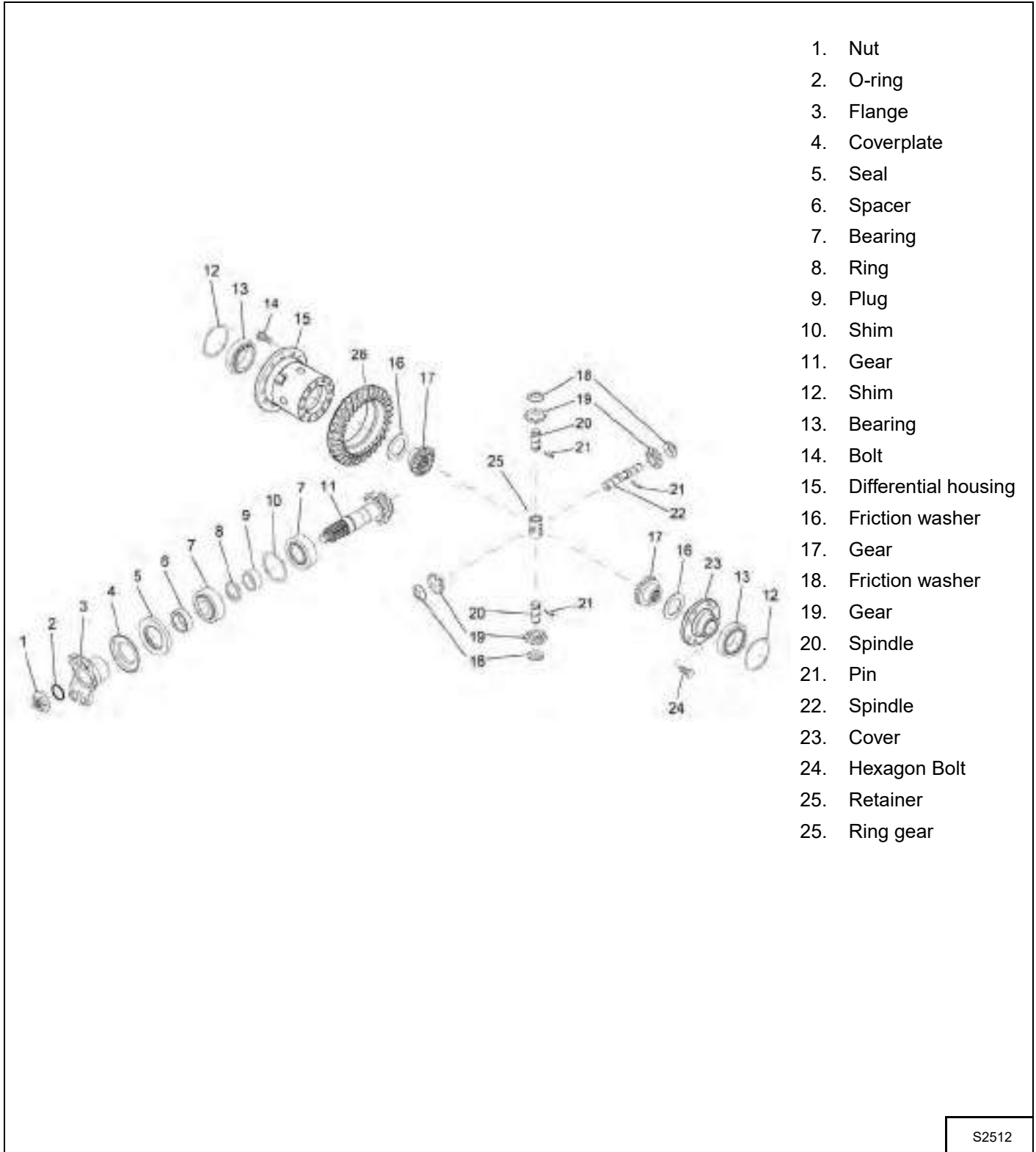
Figure 40-21-43



Remove the bearing cup (Item 1) and cross (Item 2) **[Figure 40-21-43]** from the yoke.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Differential Parts Identification



- 1. Nut
- 2. O-ring
- 3. Flange
- 4. Coverplate
- 5. Seal
- 6. Spacer
- 7. Bearing
- 8. Ring
- 9. Plug
- 10. Shim
- 11. Gear
- 12. Shim
- 13. Bearing
- 14. Bolt
- 15. Differential housing
- 16. Friction washer
- 17. Gear
- 18. Friction washer
- 19. Gear
- 20. Spindle
- 21. Pin
- 22. Spindle
- 23. Cover
- 24. Hexagon Bolt
- 25. Retainer
- 25. Ring gear

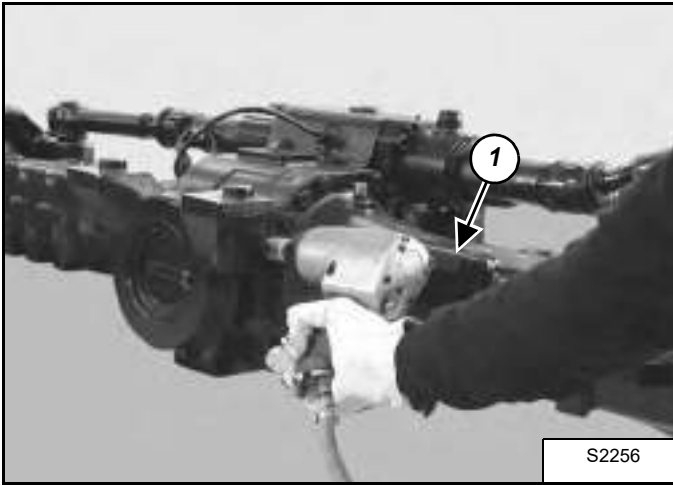
Dealer Copy -- Not for Resale

S2512

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

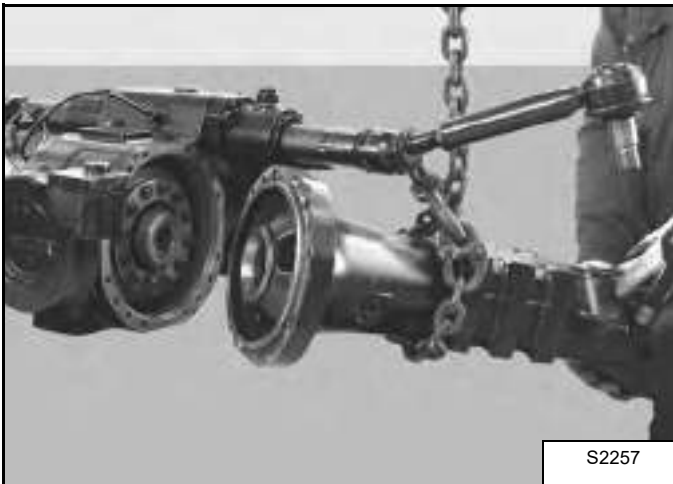
Differential Disassembly (Cont'd)

Figure 40-21-44



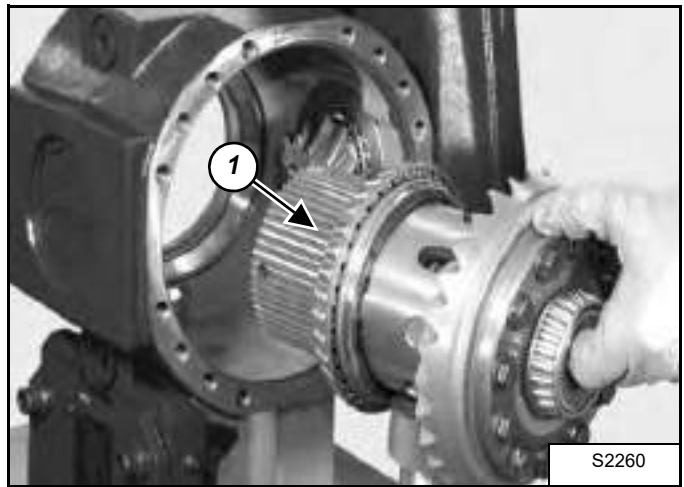
Remove the brake side arm (Item 1) [Figure 40-21-44].

Figure 40-21-45



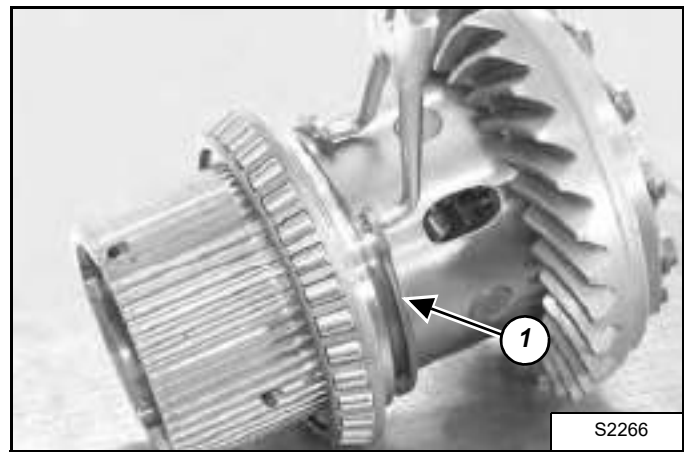
Sling the arm to be removed and connect it to a hoist, remove screws of the ring gear side arm [Figure 40-21-45].

Figure 40-21-46



Pull out the differential assembly (Item 1) [Figure 40-21-46].

Figure 40-21-47

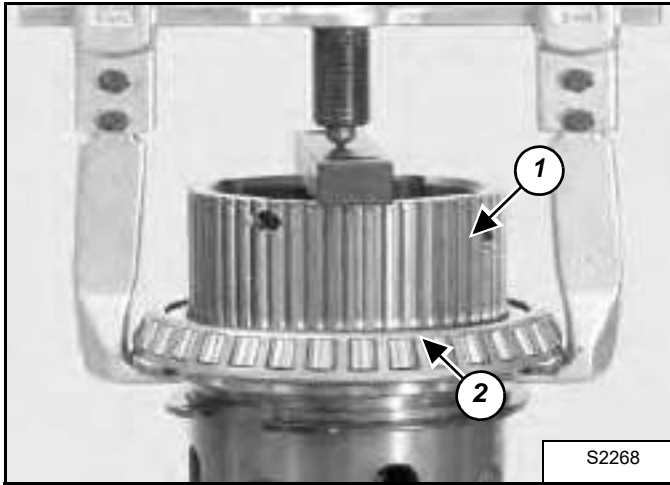


Open the snap ring (Item 1) [Figure 40-21-47] and place a bit further for later removal from the differential housing.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

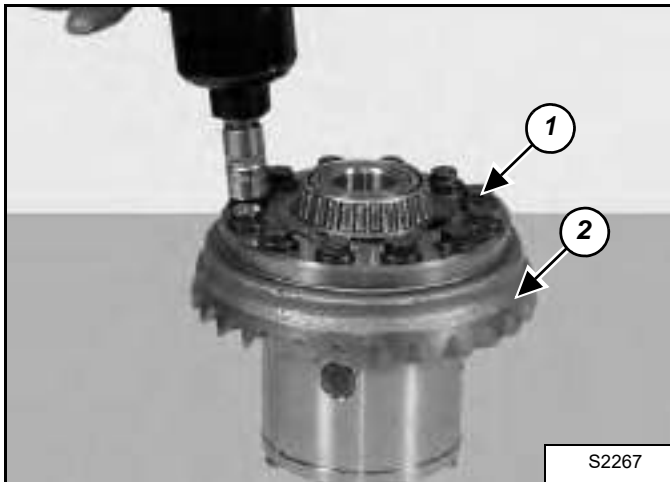
Differential Disassembly (Cont'd)

Figure 40-21-48



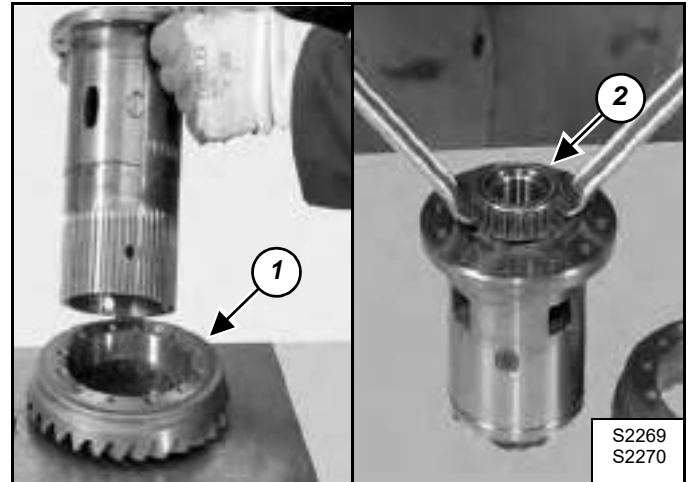
Remove the bearing (Item 2) from the differential housing (Item 1) [Figure 40-21-48].

Figure 40-21-49



Remove fixing screws (Item 1) of the ring gear (Item 2) [Figure 40-21-49]; exchange each time when removed.

Figure 40-21-50



Remove the ring gear (Item 1) [Figure 40-21-50] from the differential unit.

Using a puller, remove the bearing (Item 2) [Figure 40-21-50] of the ring gear side.

Figure 40-21-51



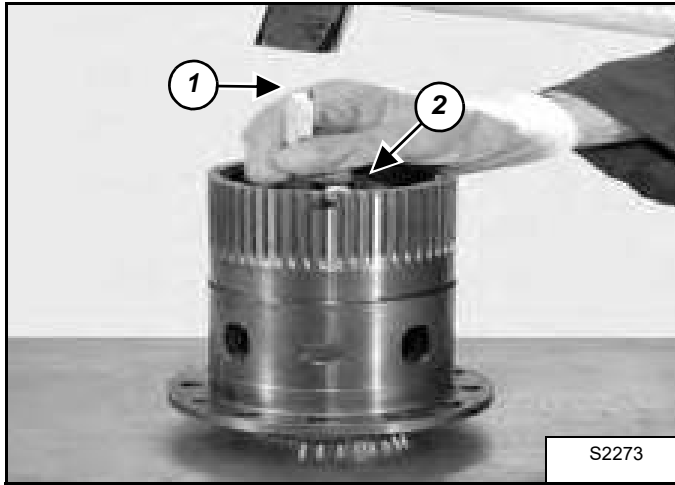
Remove the cover (Item 1) [Figure 40-21-51] from the blocking side of the differential unit.

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

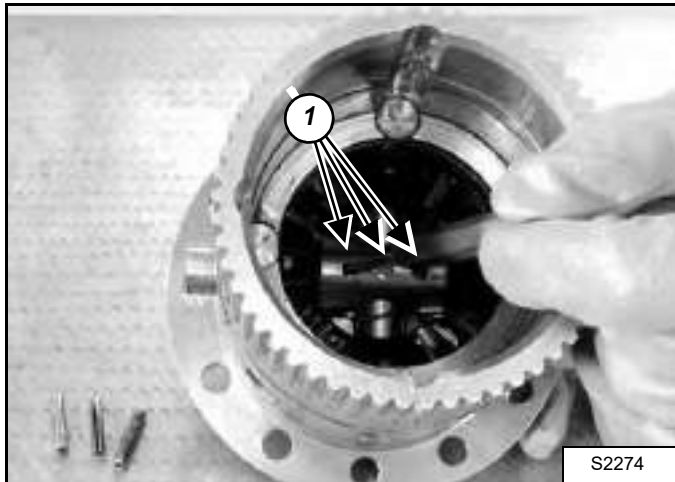
Differential Disassembly (Cont'd)

Figure 40-21-52



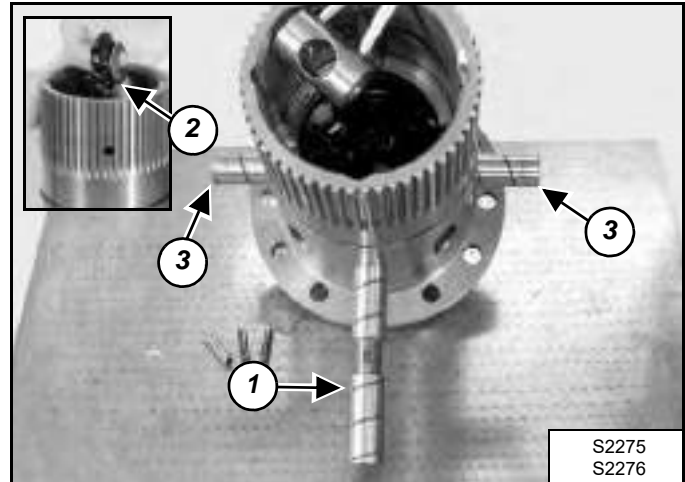
Remove the shim washer (Item 1) and the planetary gear (Item 2) [Figure 40-21-52].

Figure 40-21-53



Remove the pins (Item 1) [Figure 40-21-53] of the differential cross spindles.

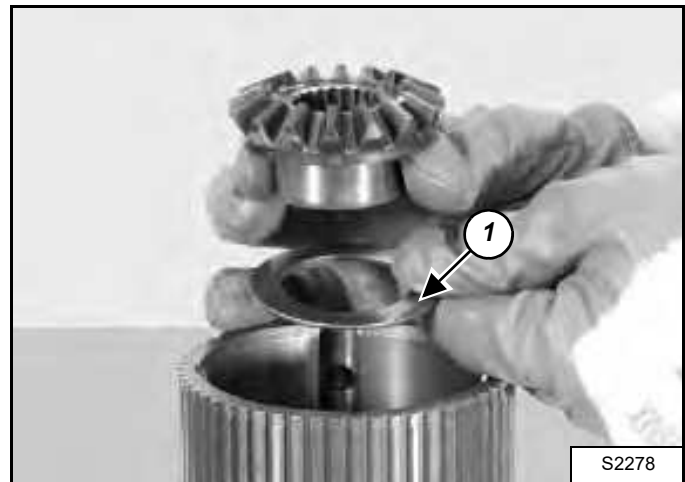
Figure 40-21-54



With a pin-driver, remove the long spindle (Item 1) and then the gears and washers (Item 2) [Figure 40-21-54].

Remove the short spindles (Item 3), gears and washers (Item 2) [Figure 40-21-54].

Figure 40-21-55



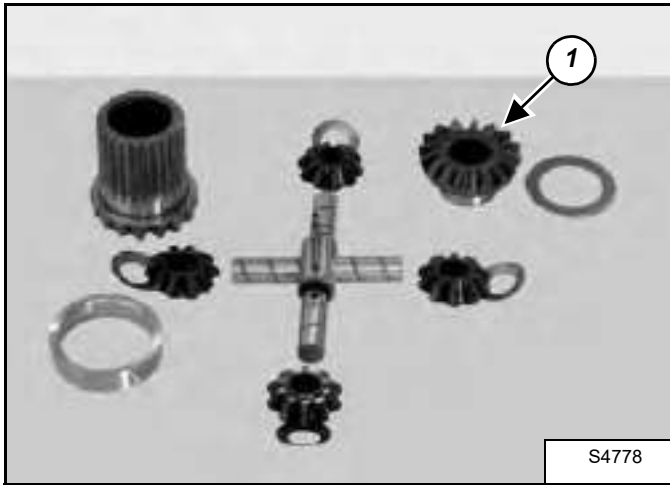
Remove the shim washer (Item 1) [Figure 40-21-55].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

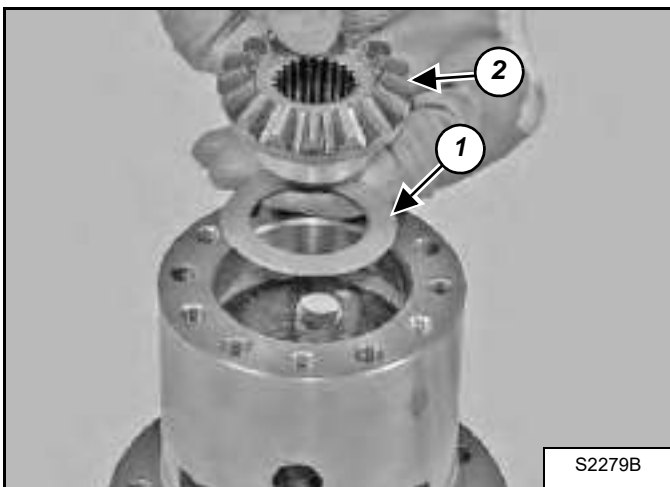
Differential Disassembly (Cont'd)

Figure 40-21-56



Remove the planetary gear (Item 1) [Figure 40-21-56].

Figure 40-21-57

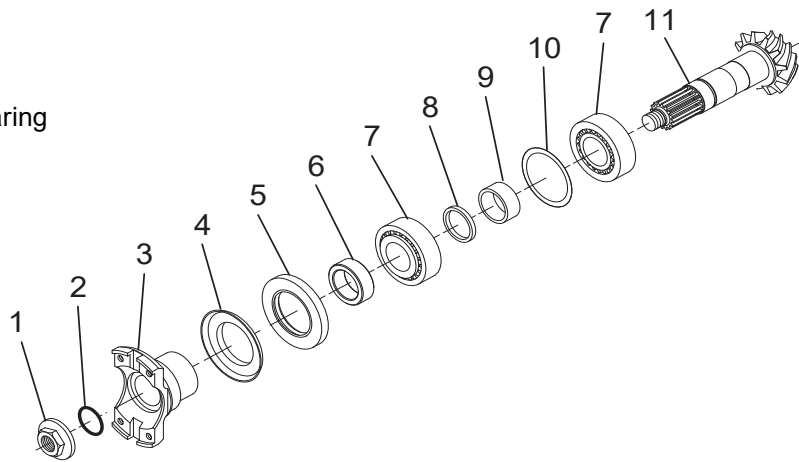


Remove the shim washer (Item 1) and the planetary gear (Item 2) [Figure 40-21-57].

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Pinion Group Parts Identification

1. Nut
2. O-ring
3. Flange
4. Coverplate
5. Seal
6. Spacer
7. Bearing
8. Shim "S2"
9. Plug
10. Shim "S1"
11. Taper roller Bearing



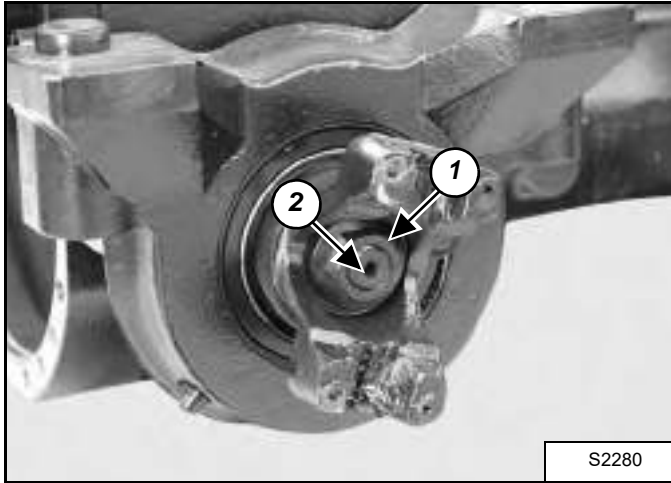
S2174

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Pinion Group Disassembly

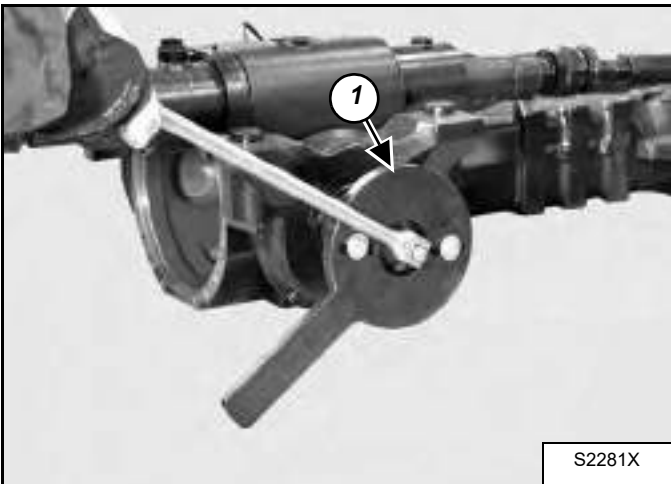
Figure 40-21-58



Make positional marks across nut (Item 1) and pinion (Item 2) tang; If disassembly is awkward, heat the check nut (Item 1) [Figure 40-21-58] of the flange at 80C°.

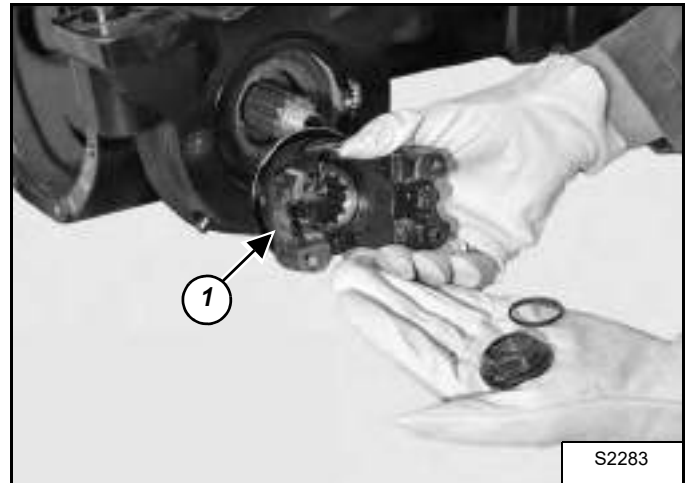
NOTE: Heating is meant to loosen the setting of Loctite on the nut (Item 1) [Figure 40-21-58].

Figure 40-21-59



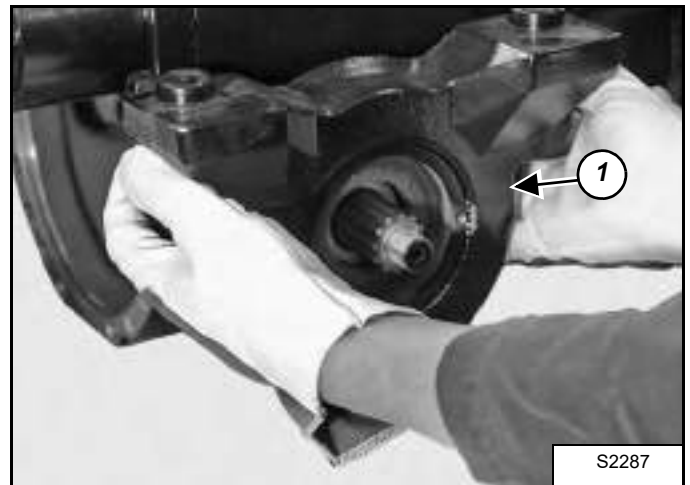
Lock the pinion with a wrench (Item 1) [Figure 40-21-59] to avoid rotation. Unloose and remove the nut; also remove the O-ring [Figure 40-21-59].

Figure 40-21-60



Remove the flange (Item 1) [Figure 40-21-60] by means of a puller.

Figure 40-21-61



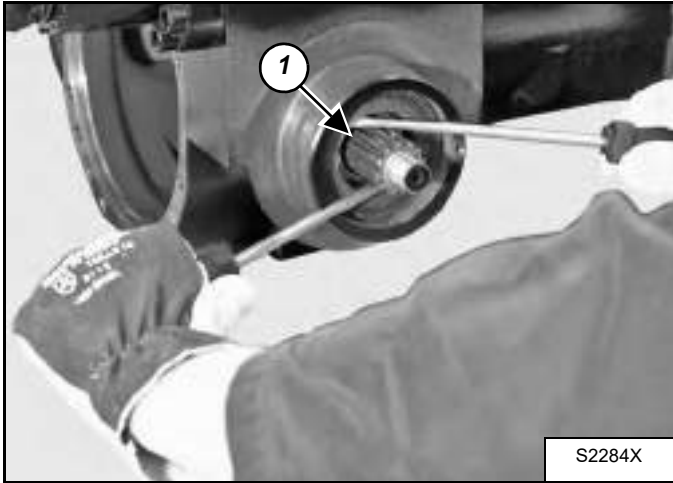
Remove the mount (Item 1) [Figure 40-21-61].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

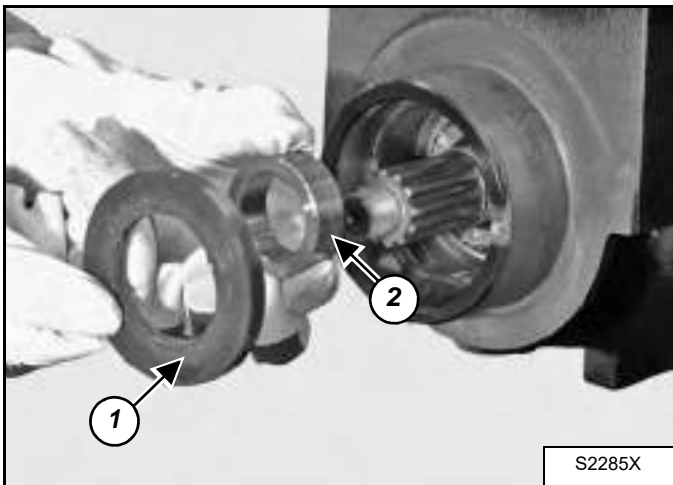
Pinion Group Disassembly (Cont'd)

Figure 40-21-62



Remove the sealing ring (Item 1) [Figure 40-21-62].

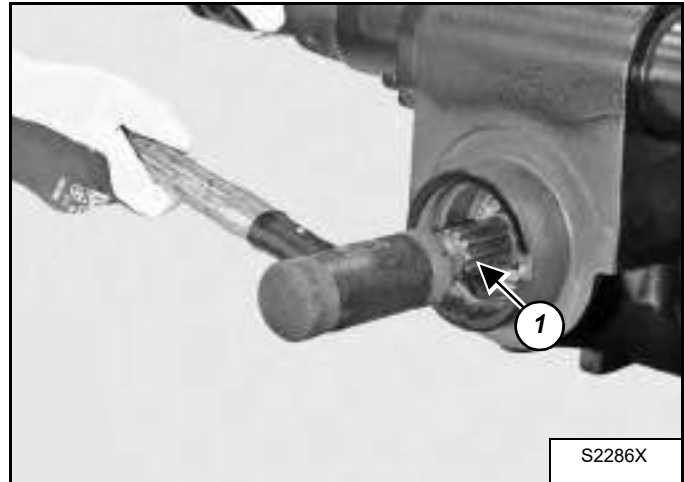
Figure 40-21-63



Remove the sealing ring (Item 1) and spacer (Item 2) [Figure 40-21-63].

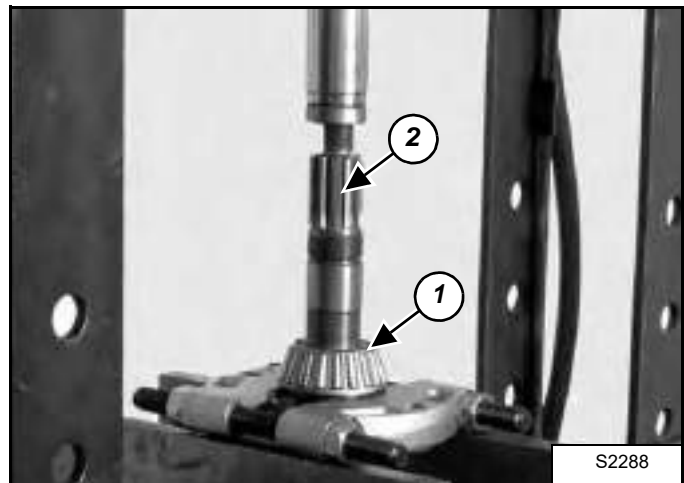
NOTE: Sealing rings must be replaced each time the unit is disassembled.

Figure 40-21-64



Remove the pinion (Item 1) [Figure 40-21-64], shims and distance piece. Refer and keep to the positions marked during disassembly.

Figure 40-21-65

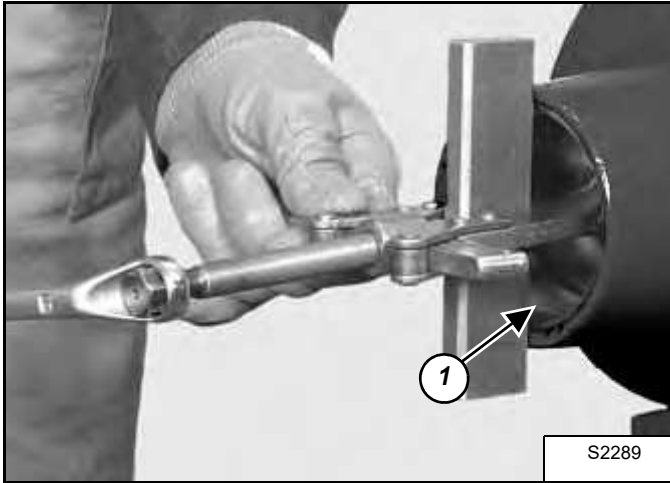


Using a puller and a press, remove the inner bearing (Item 1) from the pinion (Item 2) [Figure 40-21-65].

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

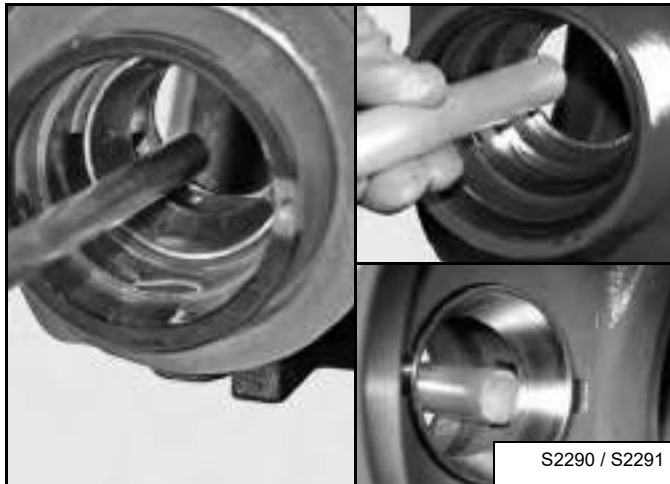
Pinion Group Disassembly (Cont'd)

Figure 40-21-66



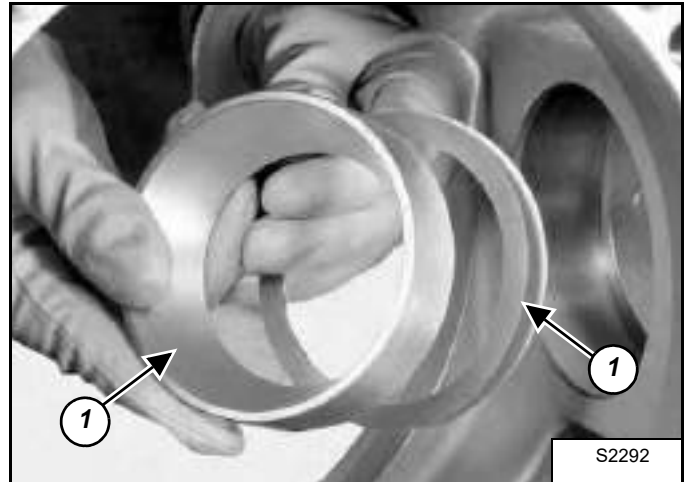
Remove the bearing race of the external bearing (Item 1) [Figure 40-21-66].

Figure 40-21-67



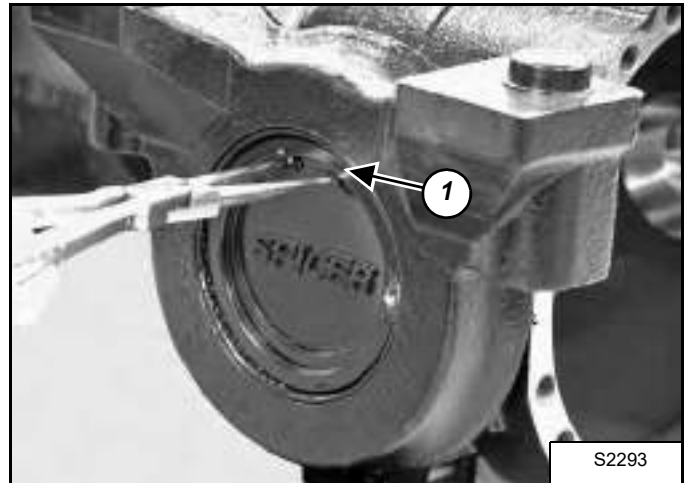
Insert a drift in the appropriate holes.

Figure 40-21-68



Remove the bearing race of the internal bearing (Item 1) as well as the shim washer(s) (Item 2) [Figure 40-21-68].

Figure 40-21-69



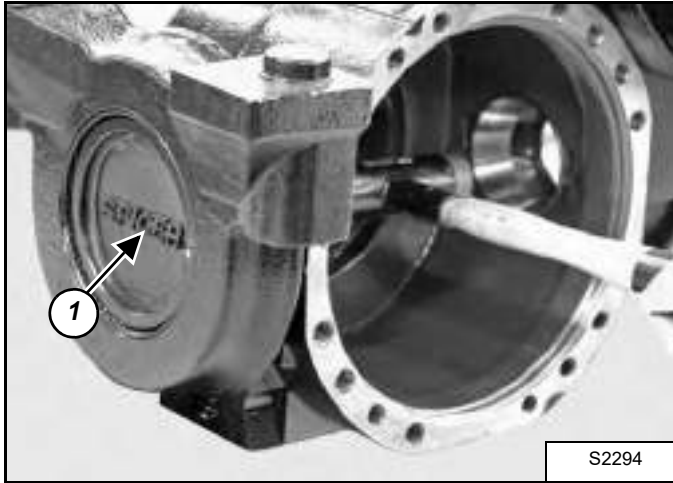
Remove the snap ring (Item 1) [Figure 40-21-69].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

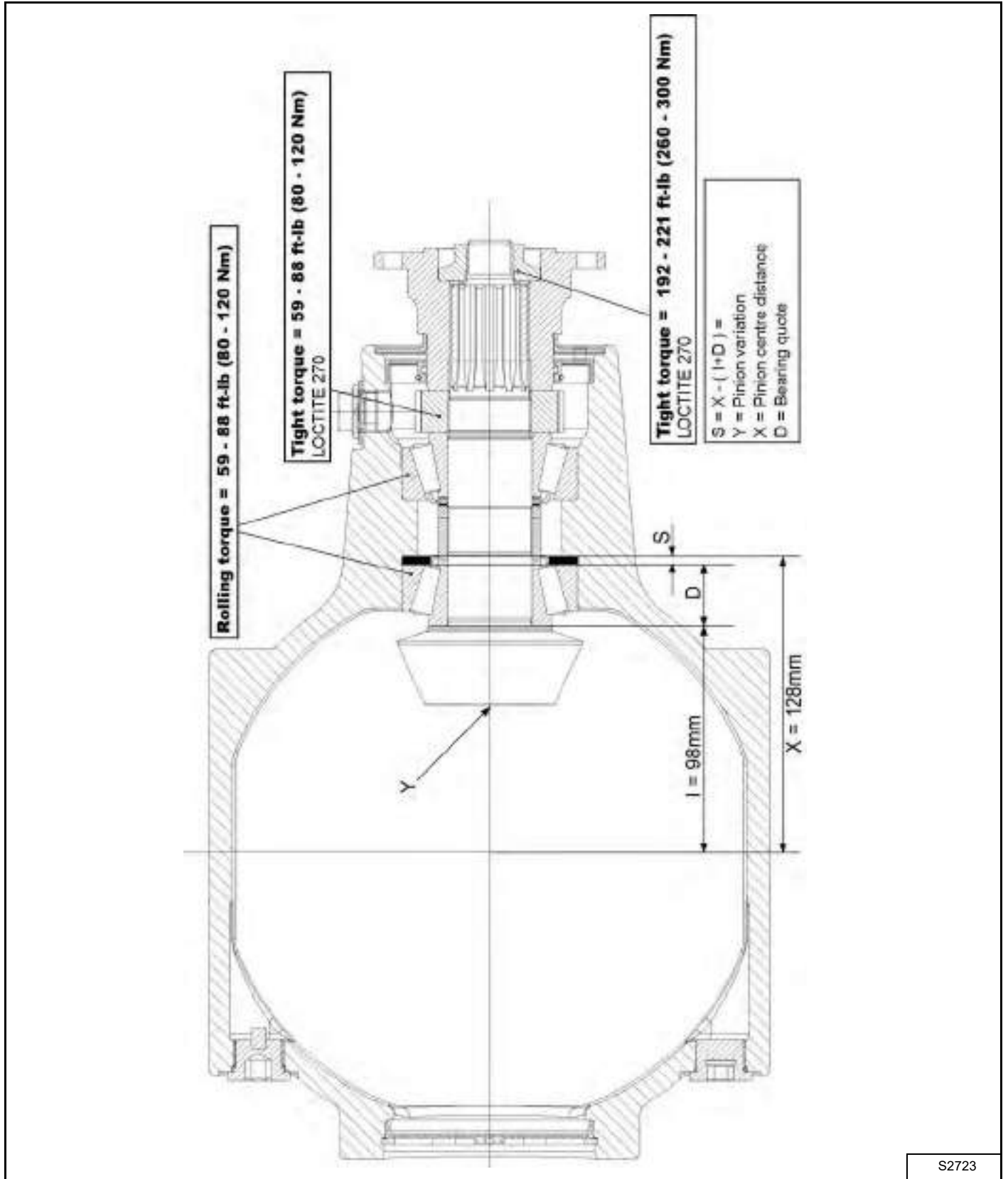
Pinion Group Disassembly (Cont'd)

Figure 40-21-70



Remove the cap (Item 1) [Figure 40-21-70].

Pinion Group Assembly

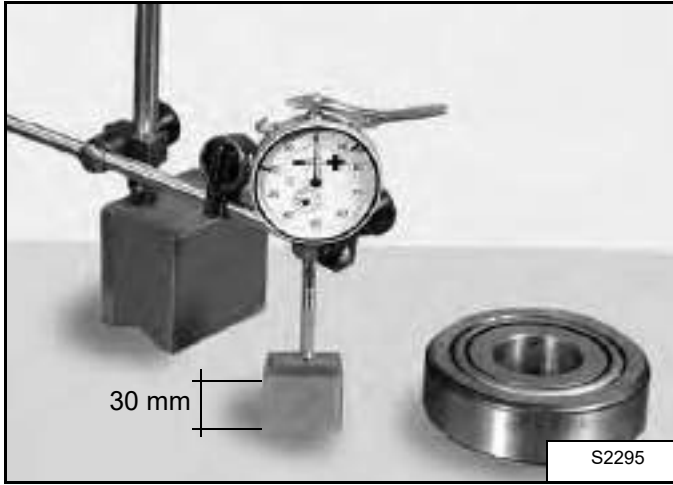


Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Pinion Group Assembly (Cont'd)

Figure 40-21-72

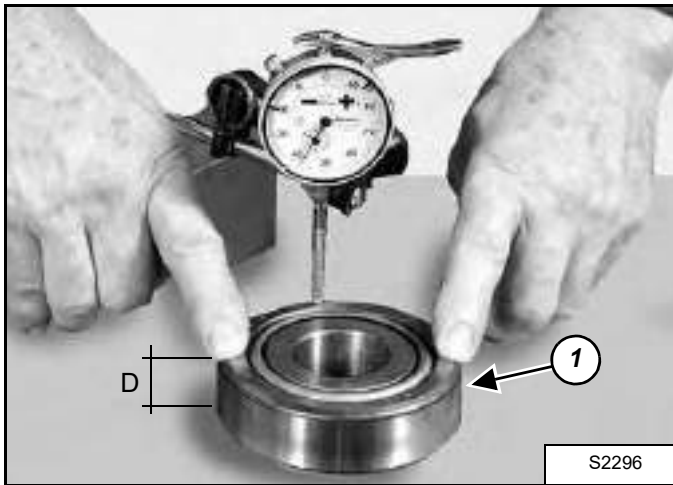


CALCULATING PINION CENTRE DISTANCE

Using a faceplate, reset a centesimal comparator "DG" on a calibrated block (whose known thickness is 30 mm).

Preload the comparator by about 3 mm.

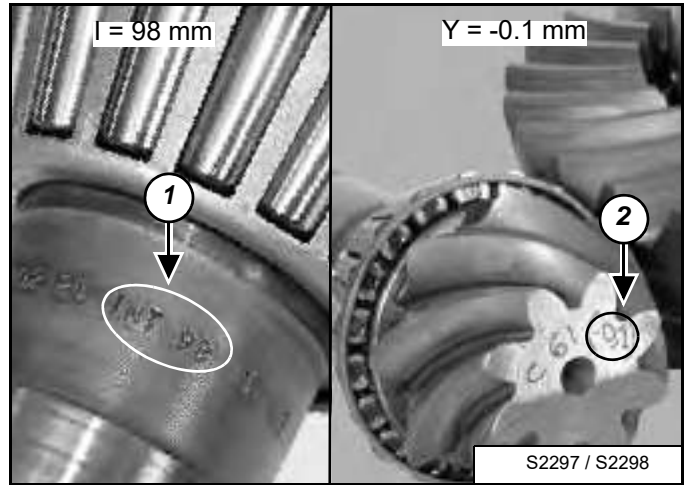
Figure 40-21-73



Bring inner bearing (Item 1) [Figure 40-21-73], complete with bearing race, under comparator "DG". Press the bearing race centrally and carry out several measurements by rotating the bearing race. The measurement is called D.

EXAMPLE: $30 - 0,55 = 29,45 = "D"$.

Figure 40-21-74



Check nominal dimension "INT" as marked on the pinion (Item 1) (eg 98). Add or subtract the variation indicated on the pinion (Item 2) [Figure 40-21-74] to "INT" to obtain the actual centre distance "I".

EXAMPLE: $I = INT \pm Y = 98 - 0,1 = 97,9\text{mm}$

NOTE: C61 = Match part number

Figure 40-21-75



C61 = bevel gear set matching number

(-0,1) = Y variation from the theoretical $I = 98$

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Pinion Group Assembly (Cont'd)

Figure 40-21-76



Calculate shims "S1" for insertion under the bearing race of the inner bearing using the following formula:

$S1 = X - (I + D)$ where: $X = 128$ (this is a fixed dimension, see figure [Figure 40-21-71])

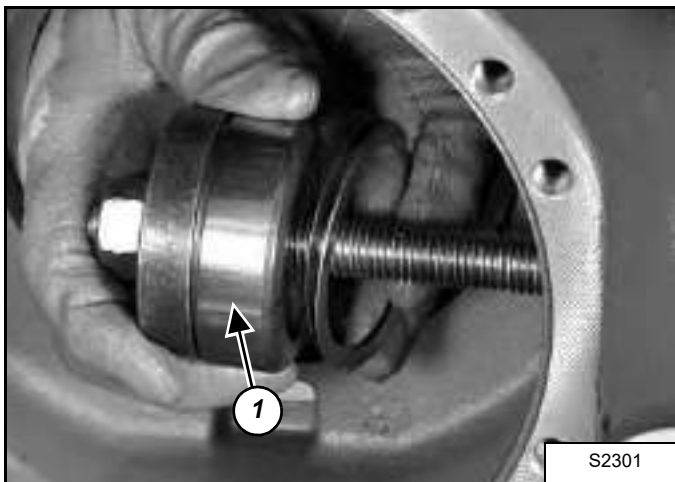
I = actual pinion centre distance

D = Total bearing thickness;

EXAMPLE: $S1 = 128 - (97,9 + 29,45) = 0,65$ mm

NOTE: If needed, more shims can be used to obtain the required thickness.

Figure 40-21-77



Using a proper tool, partially insert the bearing race (Item 1) and the selected shim(s) (Item 2) [Figure 40-21-77], together with the other bearing race.

The figure below [Figure 40-21-78] gives an idea of the internal setup.

Figure 40-21-78



Figure 40-21-79



Connect the tension rod to the press and move the bearing race of bearings into the seats.

Disconnect the press and remove the tension rod.

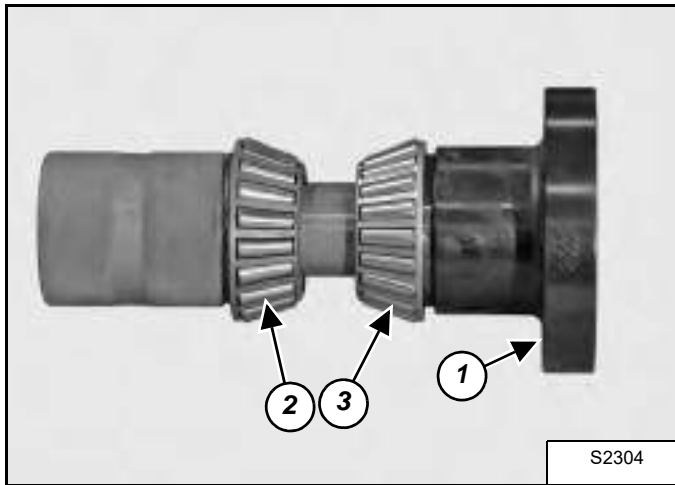
NOTE: Before starting the next stage, make sure that the bearing race has been completely inserted into its seat.

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Pinion Group Assembly (Cont'd)

Figure 40-21-80



CALCULATING PINION BEARINGS ROLLING TORQUE

Introduce a dummy pinion (Item 1) (Bobcat part number 6912176) complete with bearings (Item 2 and 3) **[Figure 40-21-80]** into the main body; tighten by hand until a rolling torque is definitely obtained.

Figure 40-21-81

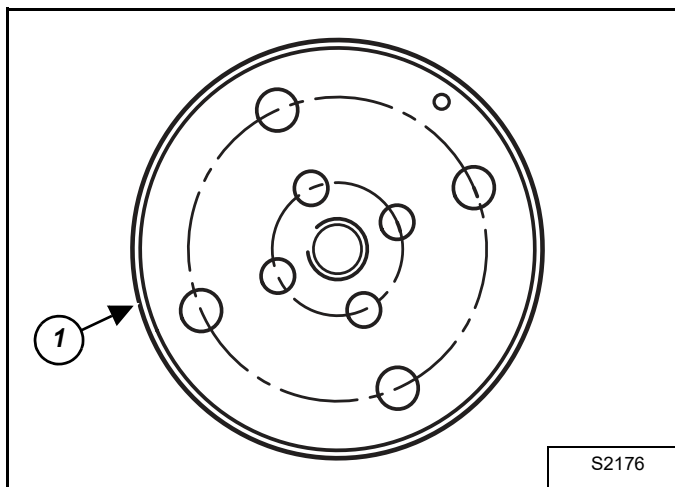
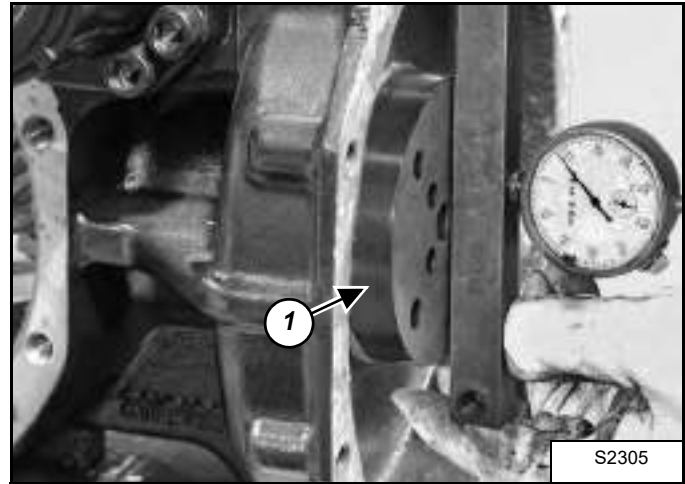


Figure 40-21-82



Introduce the tracer of a depth comparator "DDG" into either side hole of the dummy pinion (Item 1) **[Figure 40-21-81]** & **[Figure 40-21-82]**.

Reset the comparator with a preload of about 3 mm.

Measure value A.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Pinion Group Assembly (Cont'd)

Figure 40-21-83

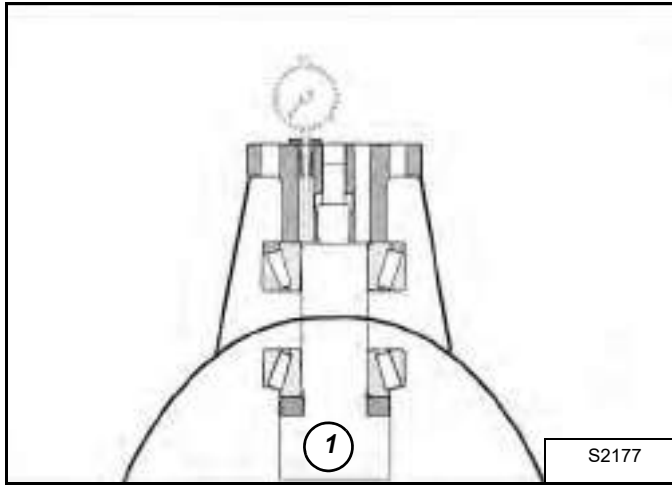
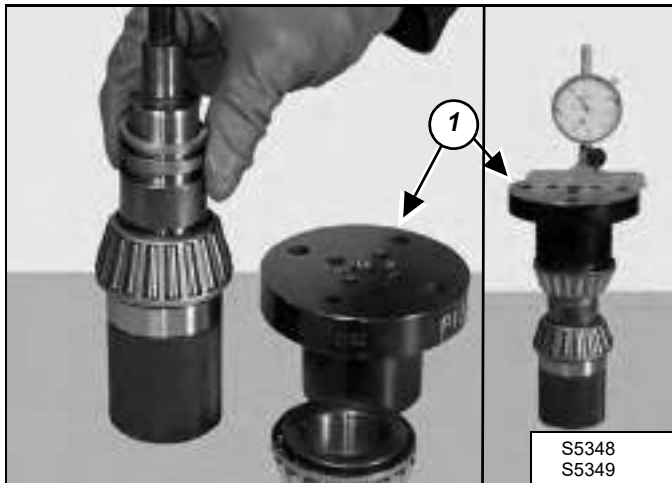


Figure 40-21-84



Remove the dummy pinion (Item 1), remove the bearings, and re-arrange the bearings, with the tool shim and the largest calibrated shim in between. Put the dummy pinion (Item 1) on top. Use the depth comparator to measure the depth "B" in either side hole of the dummy pinion (Item 1) [Figure 40-21-83] & [Figure 40-21-84].

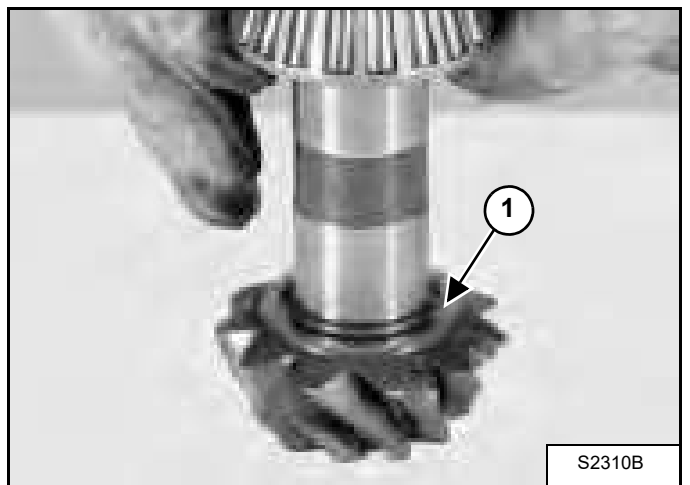
Figure 40-21-85



Calculate the shim S2 to be inserted:

Calculate $H = A - B$. $S2 = H + Q$ where Q is fixed value to obtain = 0.07...0.08 mm [Figure 40-21-85].

Figure 40-21-86



Measure the difference H using a dial gauge DDG

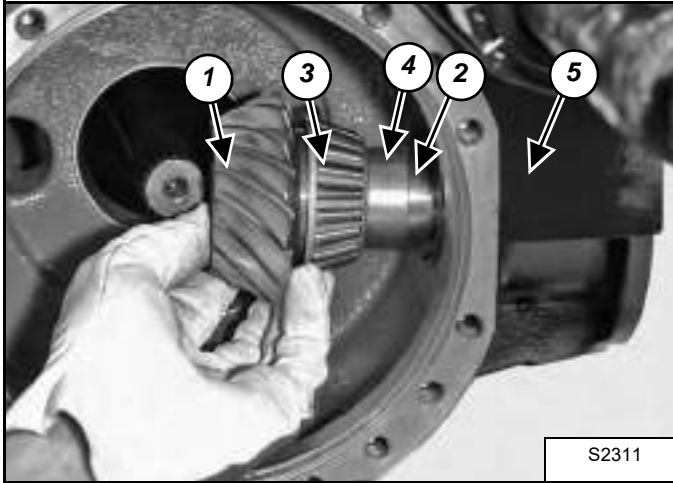
E.g. $H = A - B = 2.93 \text{ mm}$

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Pinion Group Assembly (Cont'd)

Figure 40-21-87



Fit the pinion (Item 1), shim "S1" (Item 2) and distance piece (Item 3 and 4) in the main body (Item 3) [Figure 40-21-87].

NOTE: The finer shims must be placed in-between the thicker ones.

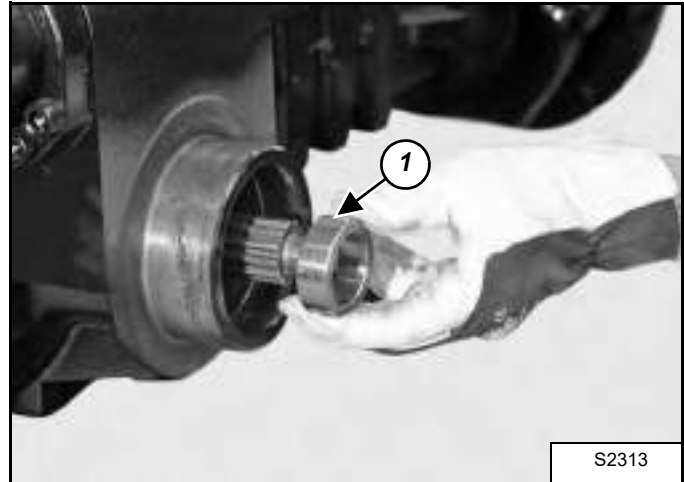
Figure 40-21-88



Heat the external bearing (Item 1) [Figure 40-21-88] to a temperature of about 100 C°.

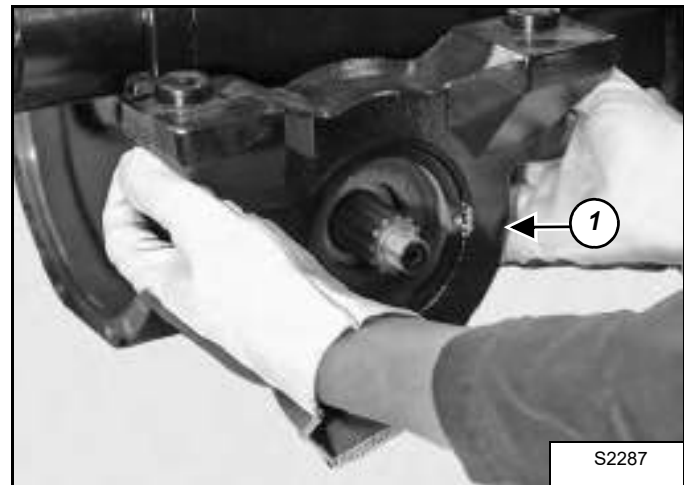
NOTE: Lightly lubricate bearing with SAE85W90 oil.

Figure 40-21-89



Insert the spacer (Item 1) [Figure 40-21-89].

Figure 40-21-90

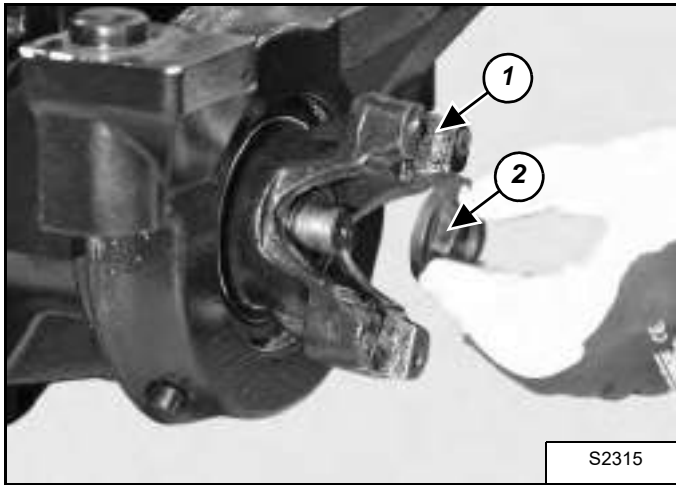


Install the mount bracket (Item 1) [Figure 40-21-90]

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

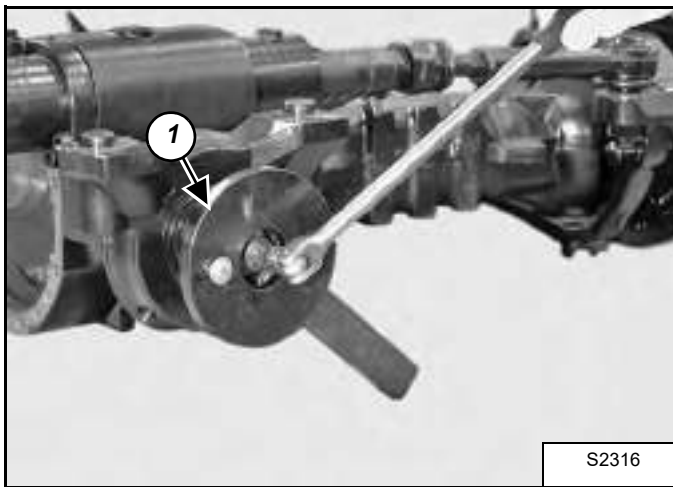
Pinion Group Assembly (Cont'd)

Figure 40-21-91



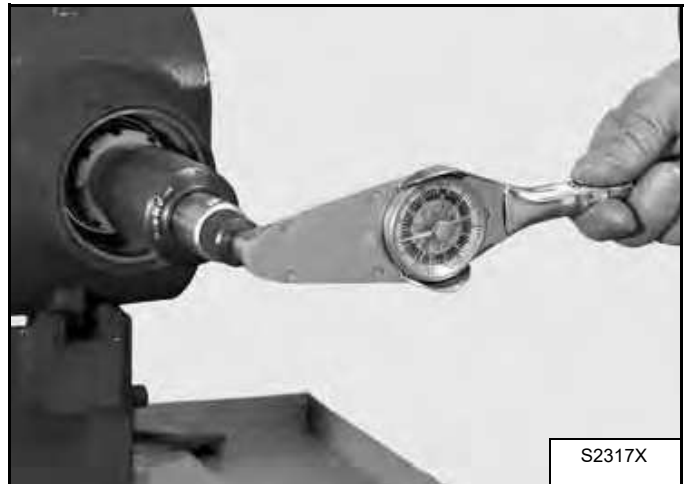
Install the flange (Item 1) onto the pinion without sealing ring and install the nut (Item 2) [Figure 40-21-91] without LOCTITE 270.

Figure 40-21-92



Lock the wrench (Item 1) [Figure 40-21-92], rotate the pinion using a dynamometric wrench, up to a minimum required torque setting of 260 - 300 N•m (192-222 ft-lb).

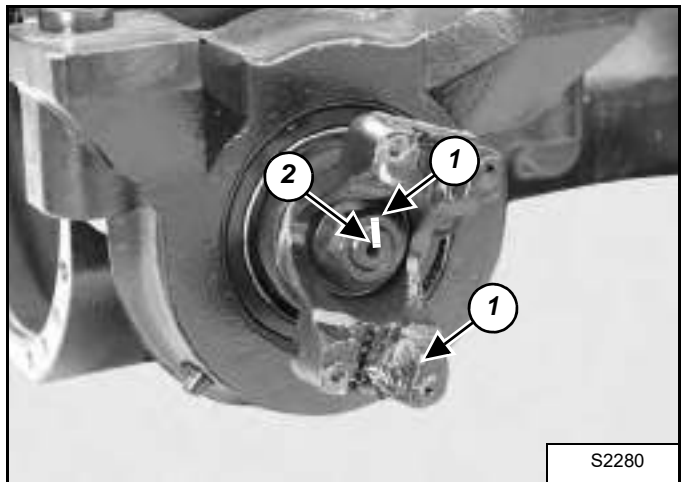
Figure 40-21-93



The rolling torque of the pinion shaft must be checked. Using a dial indicator torque wrench, measure the rolling torque [Figure 40-21-93].

The correct torque is 0,80 - 0,12 N•m (0.60-0.89 ft-lb).

Figure 40-21-94



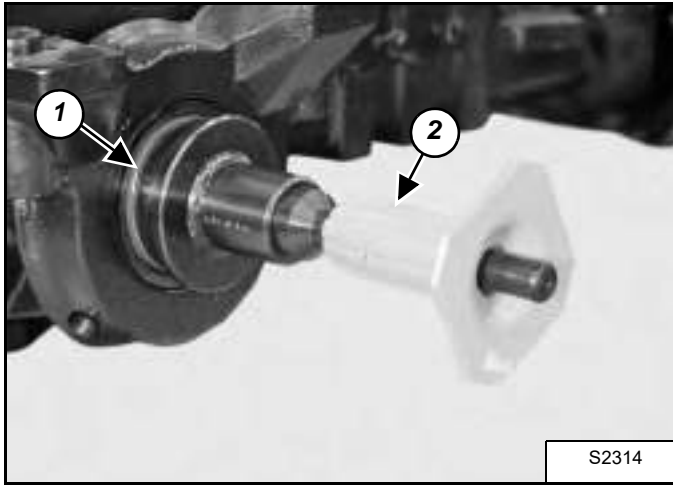
Make positional marks across nut (Item 1) and pinion (Item 2) tang; then remove nut and flange (Item 3) [Figure 40-21-94].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

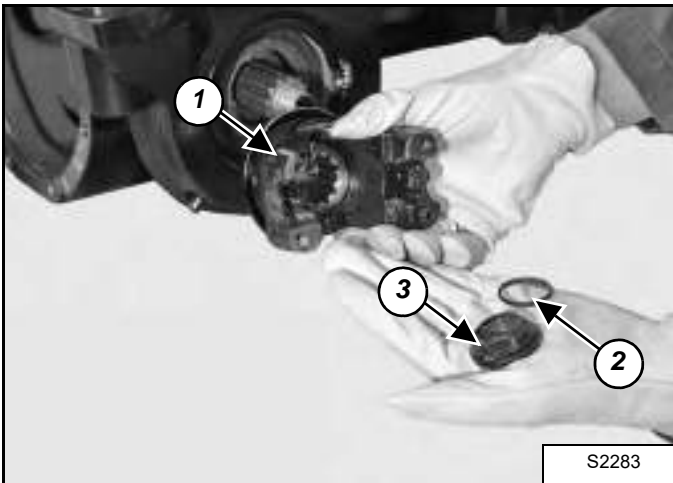
Pinion Group Assembly (Cont'd)

Figure 40-21-95



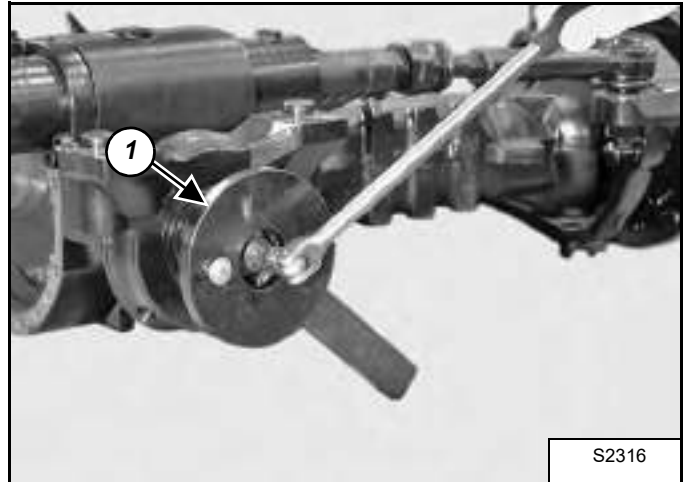
Fit ring (Item 1) in the main body using driver (Item 2) [Figure 40-21-95].

Figure 40-21-96



Oil seal ring lips and install flange (Item 1). Mount O-ring (Item 2) and apply Loctite 270 to pinion tang; tighten nut (Item 3) [Figure 40-21-96].

Figure 40-21-97

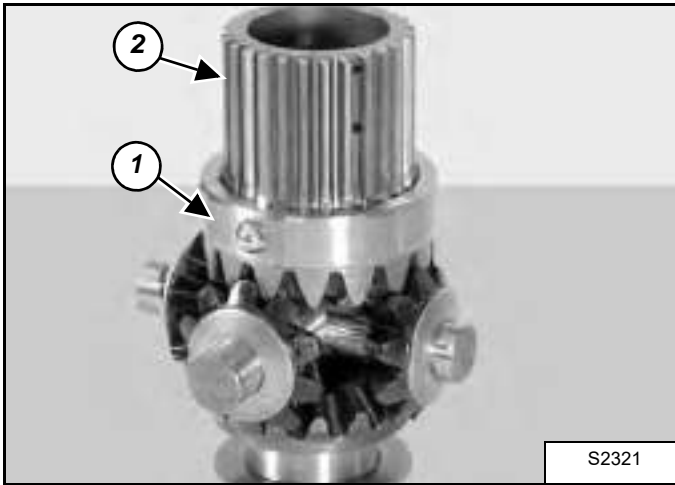


Lock the wrench (Item 1) [Figure 40-21-97], rotate the pinion using adynamometric wrench, up to a minimum required torque setting of 260-300 N•m (192-222 ft-lb).

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

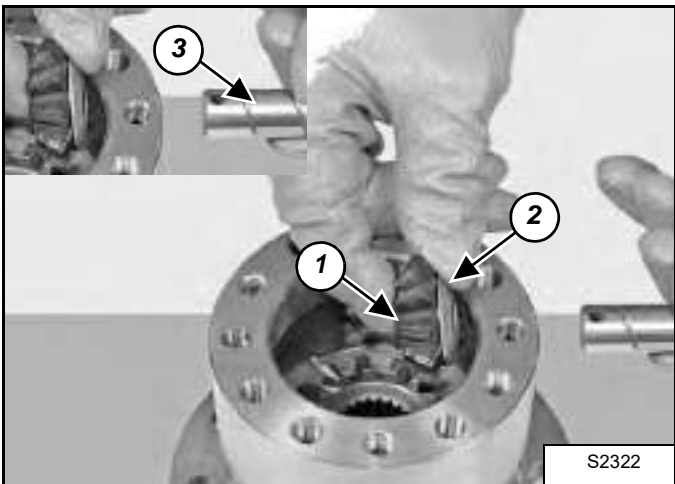
Differential Assembly

Figure 40-21-98



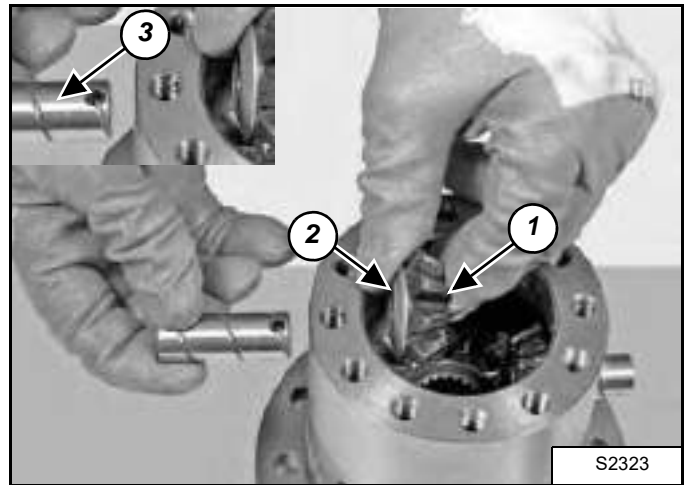
Insert the washer (Item 1) and the gear wheel (Item 2) [Figure 40-21-98] on the ring gear side.

Figure 40-21-99



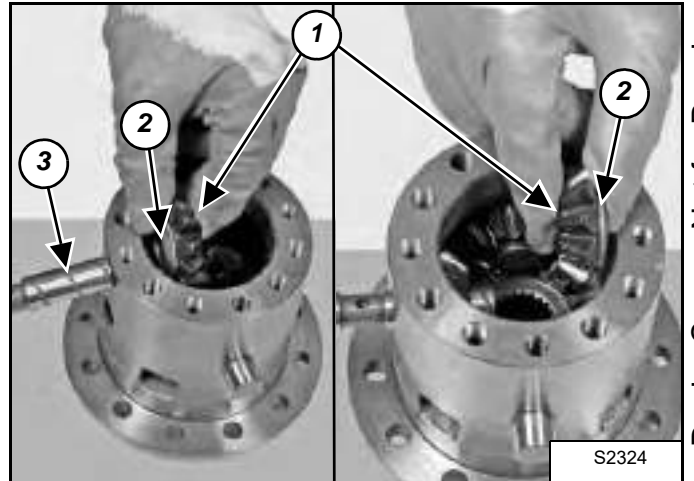
Insert the gear wheel (Item 1) with the spherical washer (Item 2) and the bolt (Item 3) [Figure 40-21-99] to keep them in position.

Figure 40-21-100



Insert the gear wheel (Item 1) with the spherical washer (Item 2) and the bolt (Item 3) [Figure 40-21-100] to keep them in position.

Figure 40-21-101



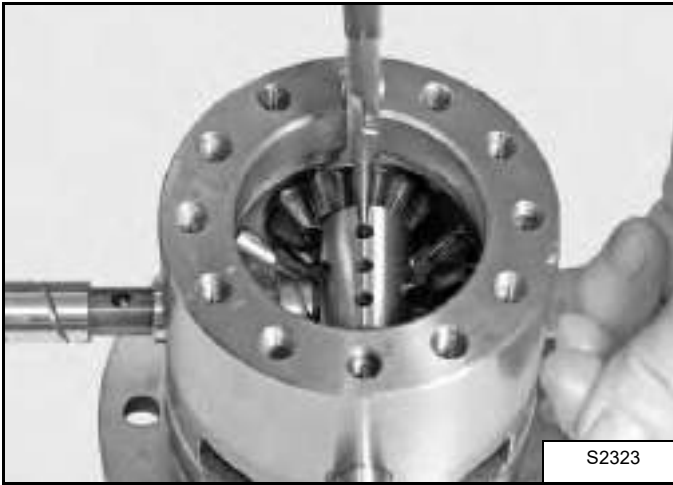
Insert the gear wheels (Item 1) with the spherical washers (Item 2) and the bolt (Item 3) [Figure 40-21-101].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

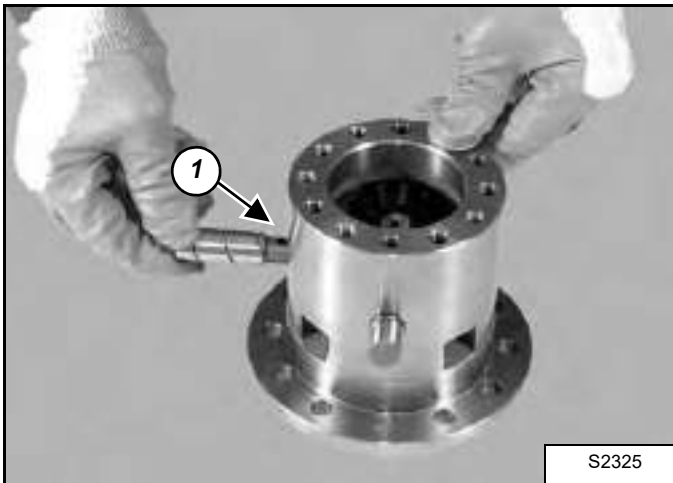
Differential Assembly (Cont'd)

Figure 40-21-102



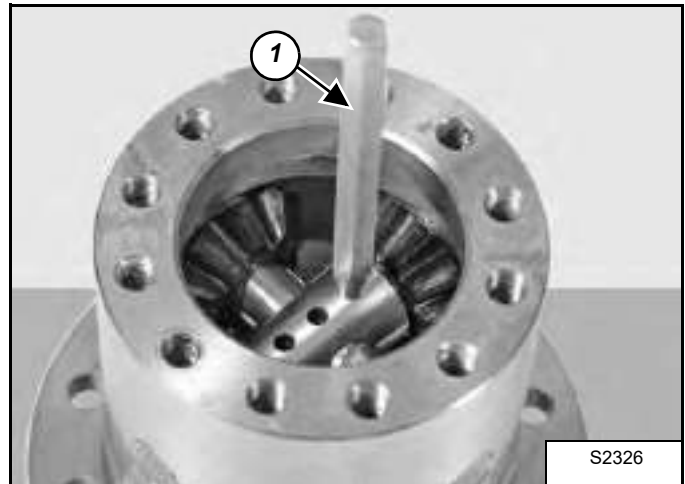
Insert the crossbolt (Item 1) [Figure 40-21-102] in the correct position.

Figure 40-21-103



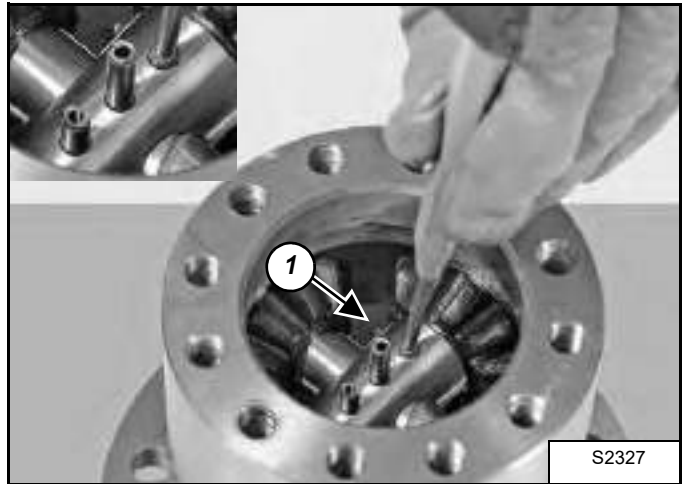
Insert the bolts in their position (Item 1) [Figure 40-21-103].

Figure 40-21-104



Bring the pin holes in line with the help of a pin-driver (Item 1) [Figure 40-21-104].

Figure 40-21-105

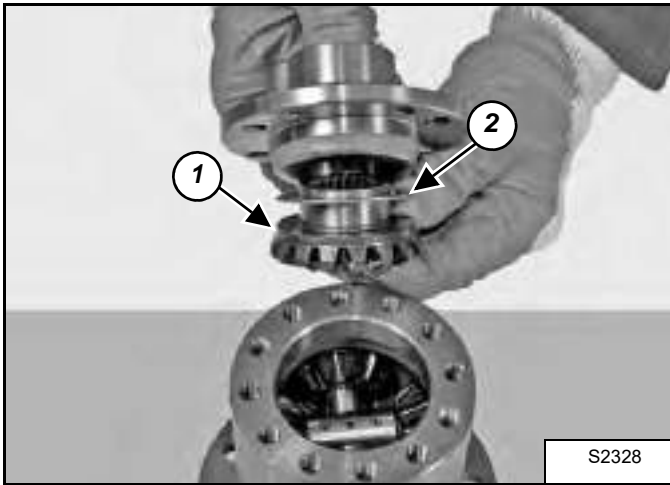


Insert pins (Item 1) [Figure 40-21-105] to end of stroke.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Differential Disassembly (Cont'd)

Figure 40-21-106



Insert planetary gear (Item 1) together with washer (Item 2) [Figure 40-21-106].

Figure 40-21-107



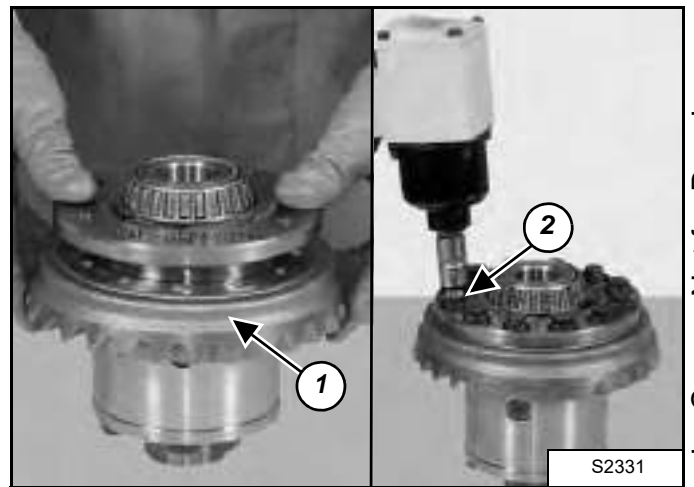
Coat the nuts (Item 1) [Figure 40-21-107] with Loctite 270 and screw them.

Figure 40-21-108



Tighten the bolts to 58 N•m (43 ft-lb) torque.

Figure 40-21-109



Install the ring gear (Item 1). Fix the screws (Item 2) [Figure 40-21-109] of the ring gear.

NOTE: Use LOCTITE 270 on screws not treated with DRILLOC.

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Differential Disassembly (Cont'd)

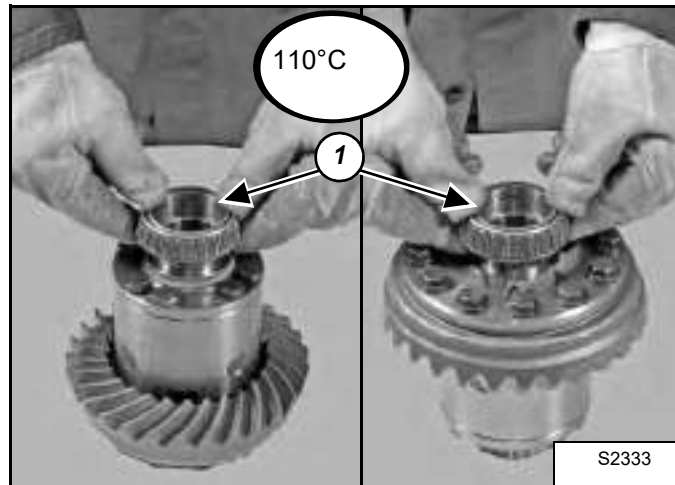
Figure 40-21-110



Tighten the screws of the ring gear using the criss cross method.

Tighten the bolts to 128-142 N•m (95-105 ft-lb) torque.

Figure 40-21-111

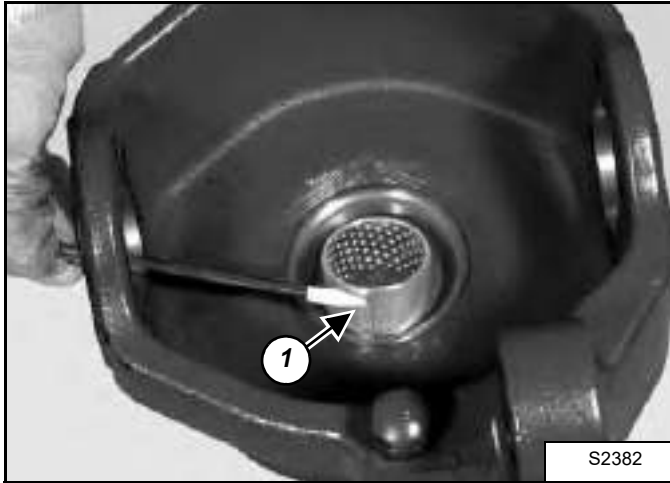


Heat up the roll bearings (Item 1) [Figure 40-21-111] to 110°C and insert it onto the differential.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Steering Knuckle Assembly

Figure 40-21-112



Lubricate the bushing (Item 1) [Figure 40-21-112] and the seat of the steering knuckle. Install the bushing, using a special tool (Bobcat part number 6912180).

Figure 40-21-113

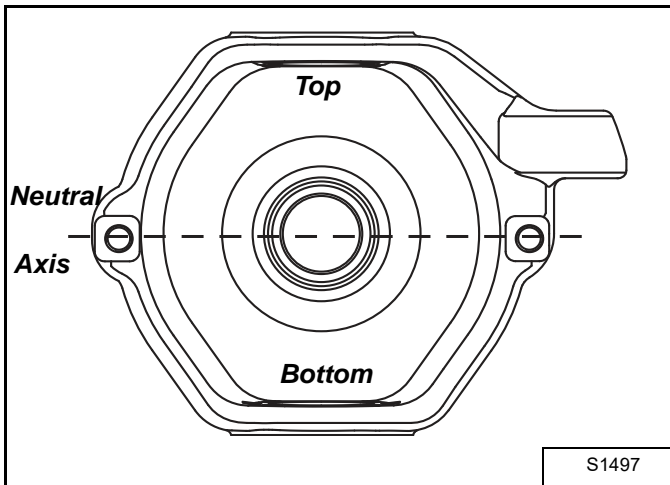
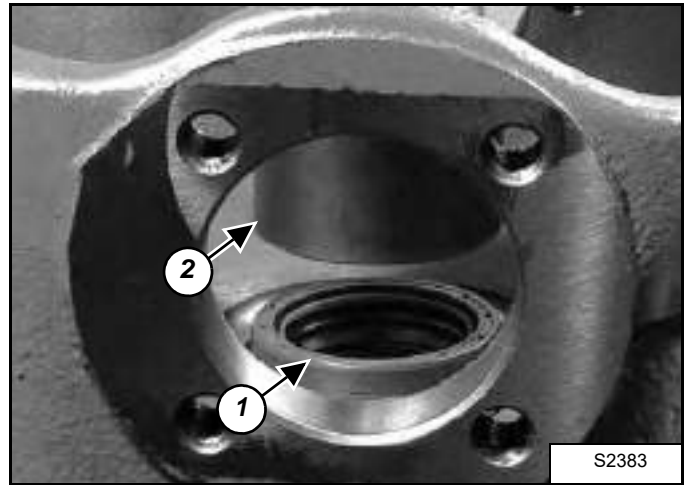


Figure 40-21-114



Lubricate the outer surface of the sealing ring (Item 1) [Figure 40-21-114]. Fit them into their seat using a special tool (Bobcat part number 6912181) (Item 2) [Figure 40-21-114].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Steering Knuckle Assembly (Cont'd)

Figure 40-21-115

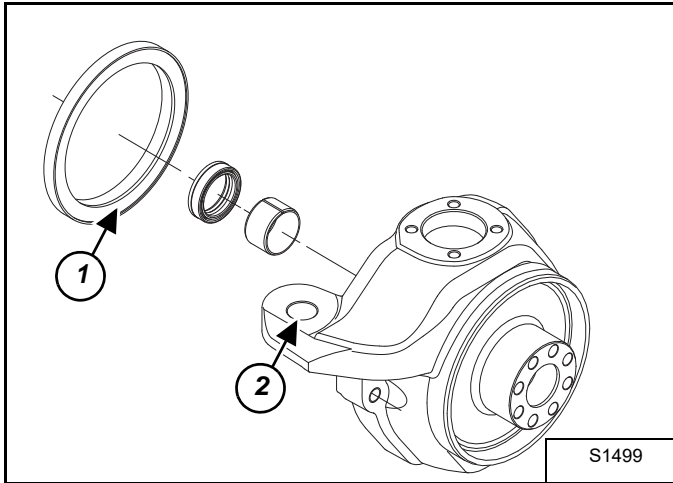
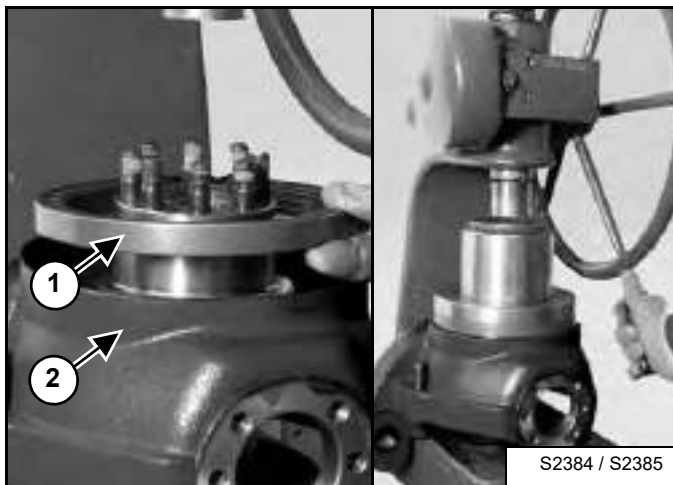


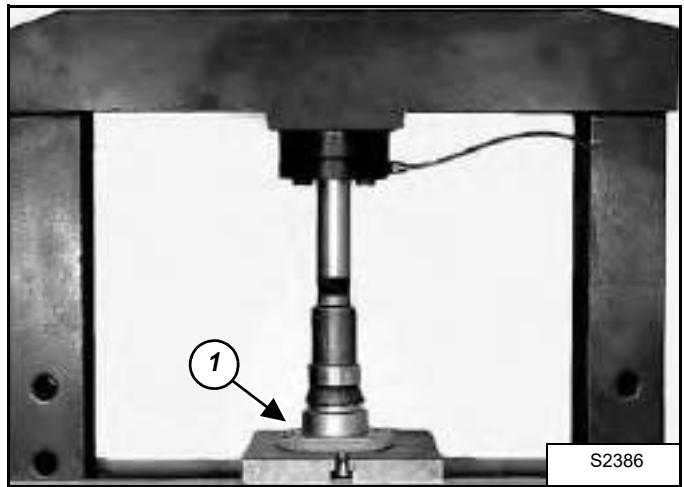
Figure 40-21-116



Using the wheel hub seal tool (Bobcat part number 6912182) apply a repositionable jointing compound for seals to the outer surface of the sealing ring (Item 1) [Figure 40-21-115] & [Figure 40-21-116]. Position the sealing ring in the steering knuckle (Item 2) [Figure 40-21-115] & [Figure 40-21-116].

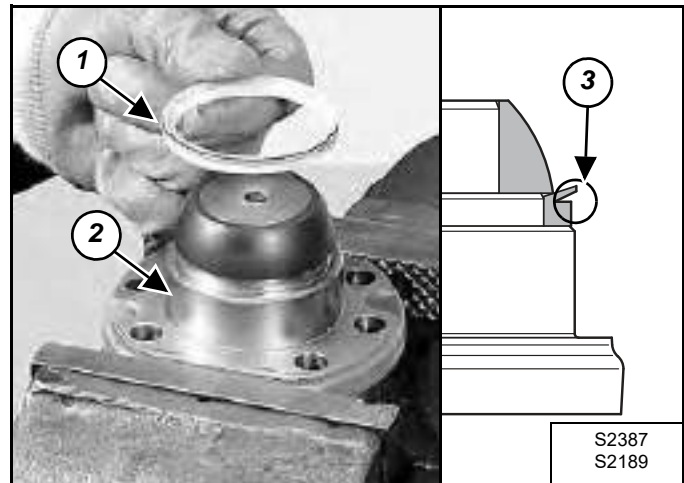
NOTE: Check that the ring (Item 1) [Figure 40-21-115] & [Figure 40-21-116] is correctly oriented.

Figure 40-21-117



If the bottom pivot pin (Item 1) [Figure 40-21-117] has been extracted, position the pin under a press and fit the ball cover.

Figure 40-21-118



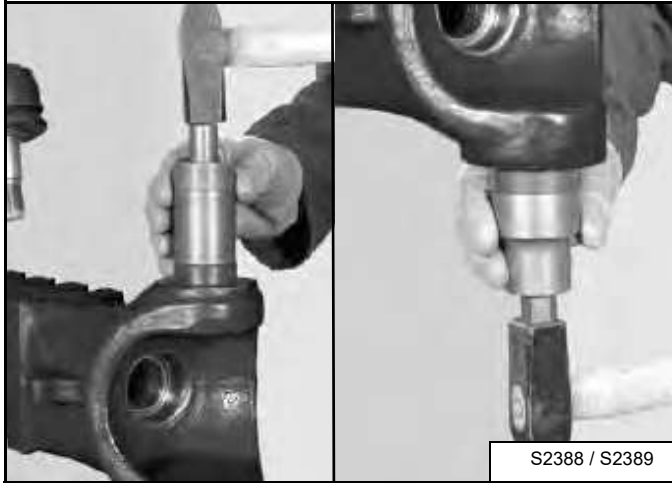
Fit the front sealing rings (Item 1) onto the pivot pins (Item 2) [Figure 40-21-118].

NOTE: Carefully check that the rings are properly oriented (Item 3) [Figure 40-21-118].

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

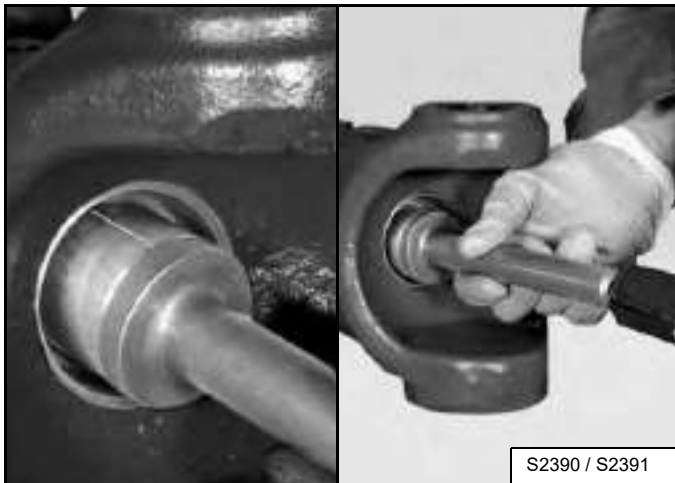
Steering Knuckle Assembly (Cont'd)

Figure 40-21-119



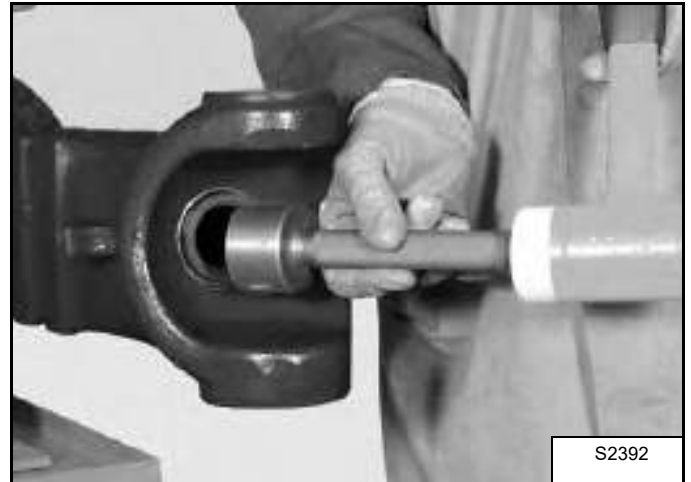
Lubricate the top bush or the bottom ball bush and fit them into the fulcrum holes of the arm.

Figure 40-21-120



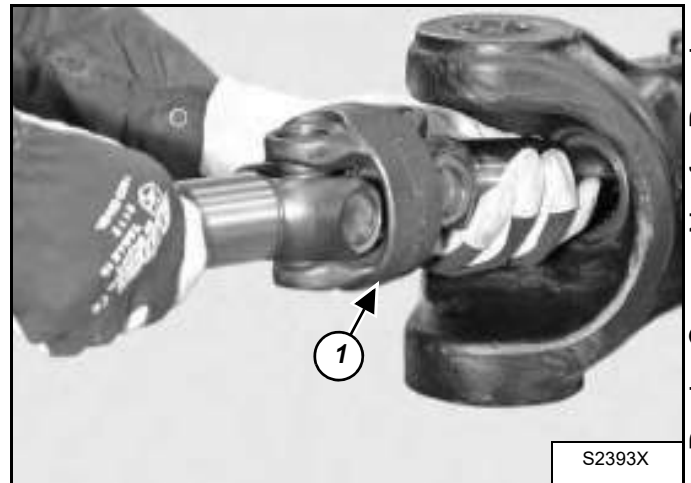
Lubricate the bushing and the seat of the steering knuckle. Install the bushing, using a special tool (Bobcat part number 6912180).

Figure 40-21-121



Lubricate and fit the sealing ring onto the special tool (Bobcat part number 6912181); install the rings into the arm.

Figure 40-21-122



Insert the u-joint (Item 1) [Figure 40-21-122].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Steering Knuckle Assembly (Cont'd)

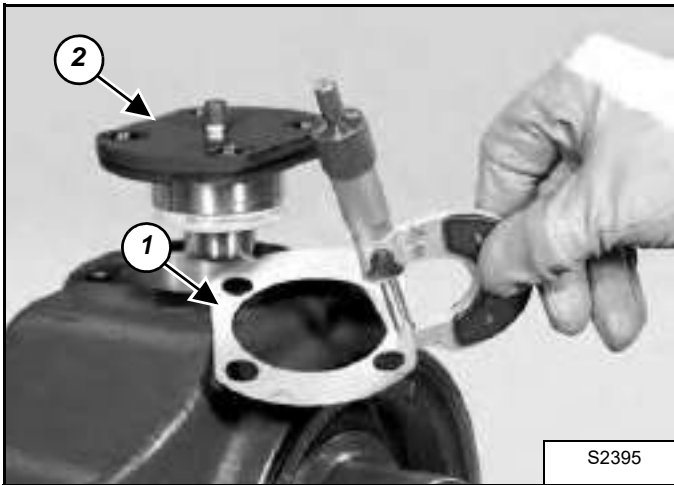
Figure 40-21-123



Lubricate the terminal of the u-joint and install the steering knuckle.

Pay due attention not to damage the dust cover rings and the sealing rings.

Figure 40-21-124



Prepare a series of shims (Item 1) [Figure 40-21-124] of 0,4 up to 0,7 mm.

To be assembled under the upper pin (Item 2) [Figure 40-21-124].

Figure 40-21-125



Lubricate and install the unit in the steering knuckle.

Figure 40-21-126

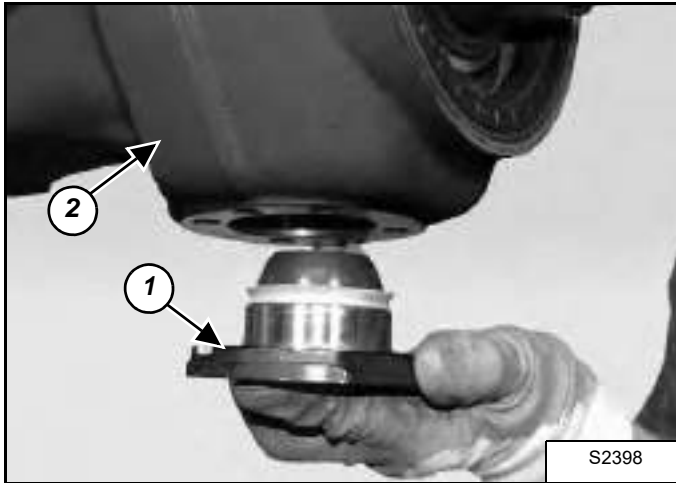


Lubricate the steering knuckle.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

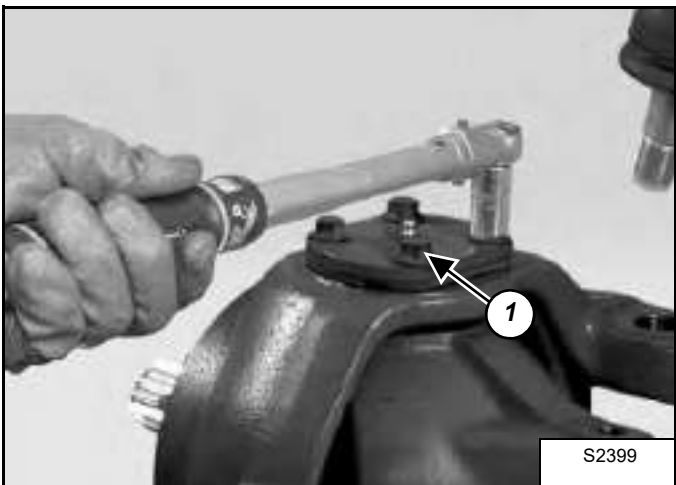
Steering Knuckle Assembly (Cont'd)

Figure 40-21-127



Fit the unit (Item 1) in the steering knuckle (Item 2) [Figure 40-21-127]. Position the screws and tightly tighten.

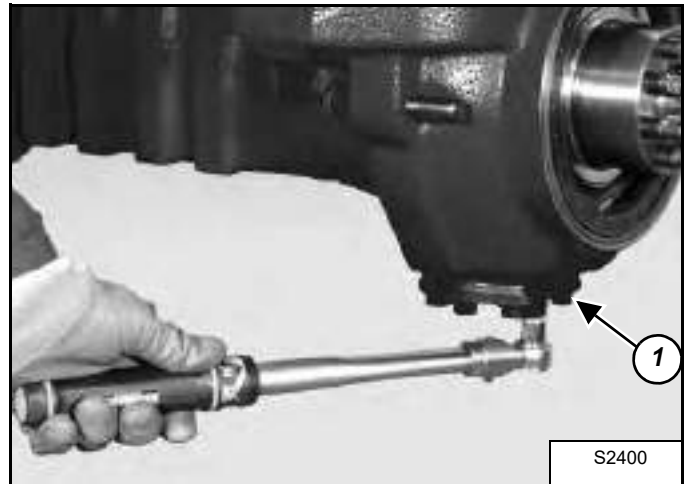
Figure 40-21-128



Tighten the new fitting screws (Item 1) [Figure 40-21-128] of top pivot pins in sequence using the cross tightening method.

Tighten the screws to 90 - 100 N•m (66-74 ft-lb) torque.

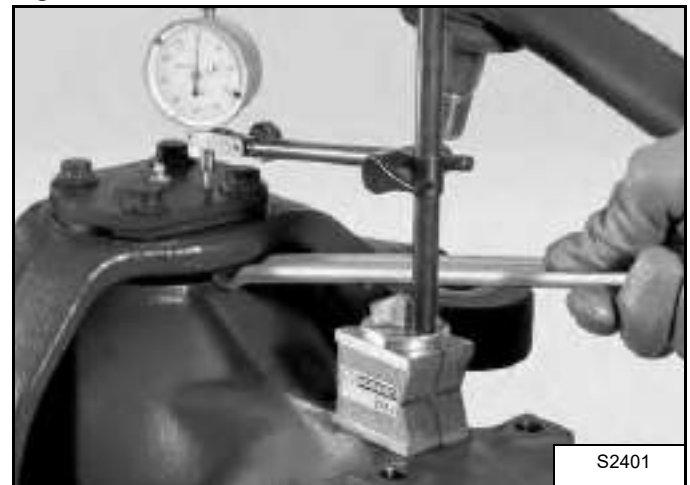
Figure 40-21-129



Tighten the new fitting screws (Item 1) [Figure 40-21-129] of bottom pivot pins in sequence using the cross tightening method.

Tighten the bolts to 90 - 100 N•m (66-74 ft-lb) torque.

Figure 40-21-130



Check by means of a lever that there is no vertical gap.

In case there is any gap, determine the width and reduce it by removing shims.

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Steering Knuckle Assembly (Cont'd)

Figure 40-21-131



Check the torque of the pins, which has to be between 40 N•m (30 ft-lb) and 80 N•m (60 ft-lb). If the preliminary measured value is too high, the shims have to be increased.

Figure 40-21-132



Make certain that the notch is aligned with the cotter pin hole when the nut is finally locked down to max 300 N•m (222 ft-lb).

Figure 40-21-133

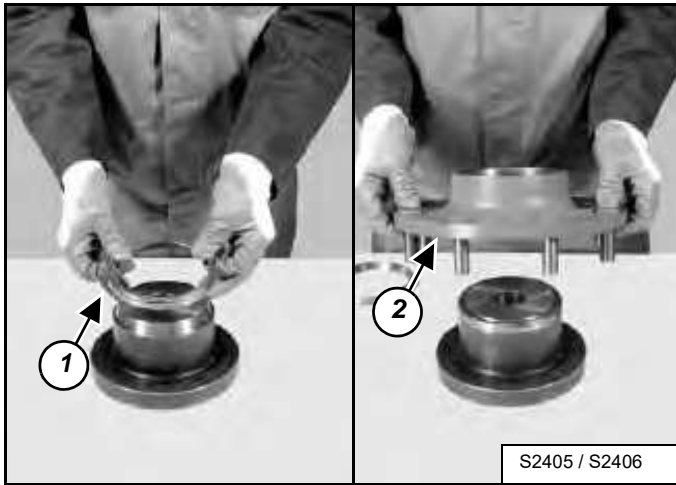


Set the screw to the length of protrusion previously noted during disassembly.

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Planetary Carrier Assembly

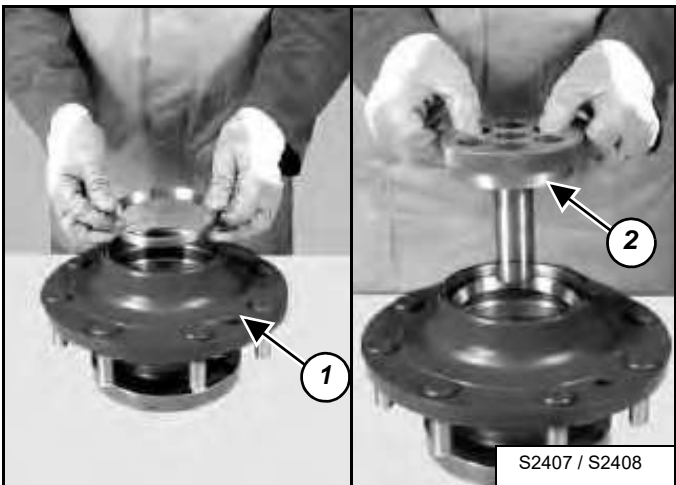
Figure 40-21-134



Position the bearing race (Item 1) [Figure 40-21-134] on the proper tool.

Lubricate the seats of the bearings and position the hub (Item 2) [Figure 40-21-134] on the tool with bearing race.

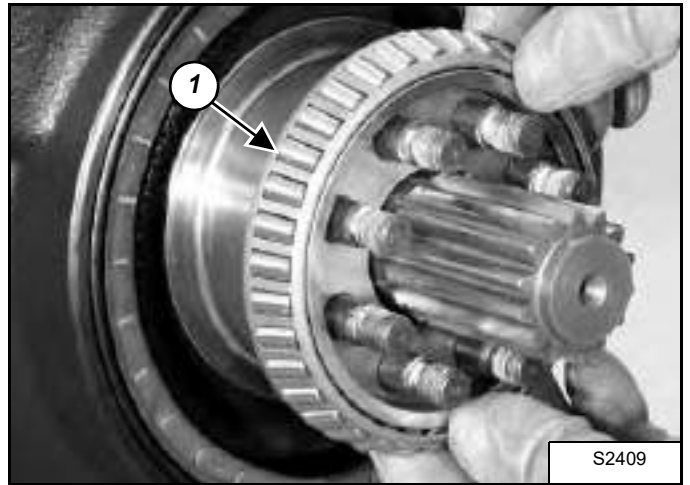
Figure 40-21-135



Position the bearing race (Item 1) of the internal bearing (Item 2) [Figure 40-21-135].

NOTE: Check that the bearing race is correctly oriented.

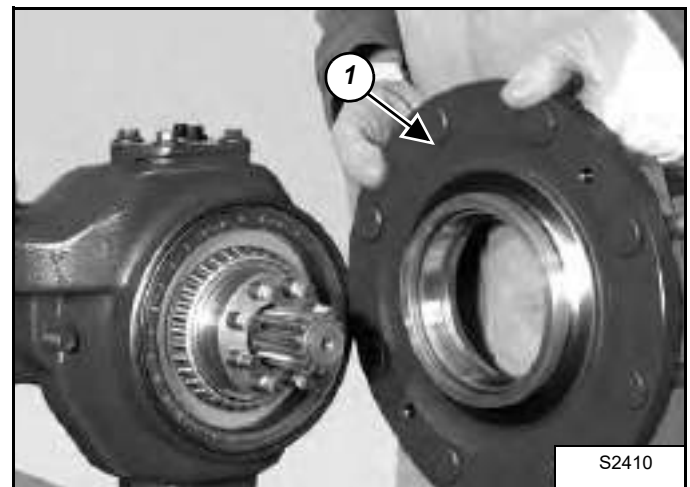
Figure 40-21-136



Install the external bearing (Item 1) [Figure 40-21-136].

NOTE: Move the bearing to the limit stop by hammering lightly all around the edge.

Figure 40-21-137



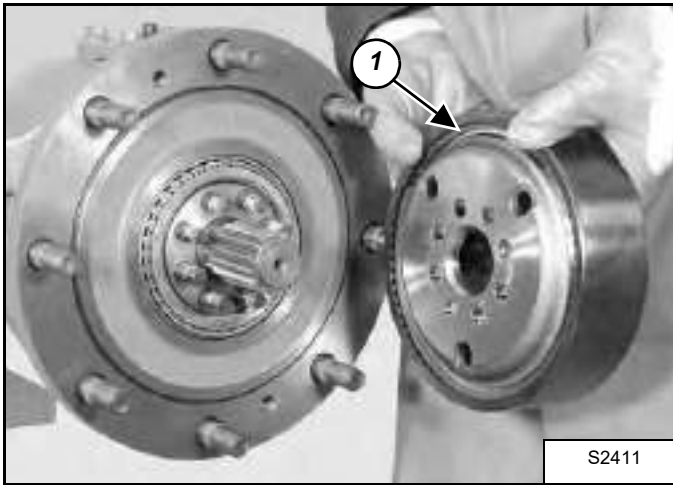
Install the wheel hub (Item 1) [Figure 40-21-137].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

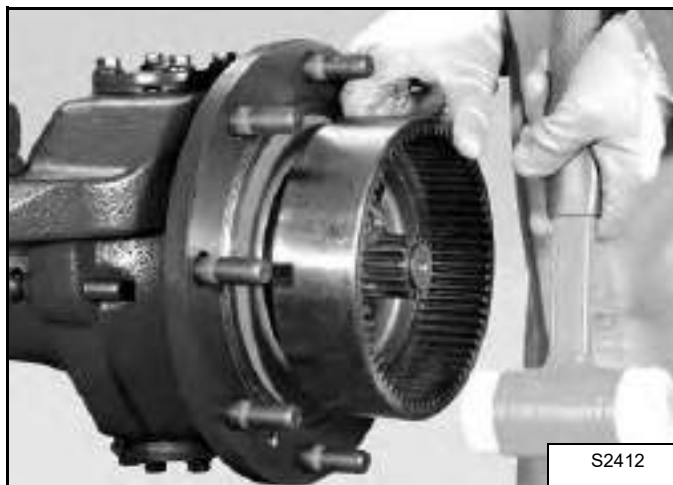
Planetary Carrier Assembly (Cont'd)

Figure 40-21-138



Install the ring gear (Item 1) [Figure 40-21-138].

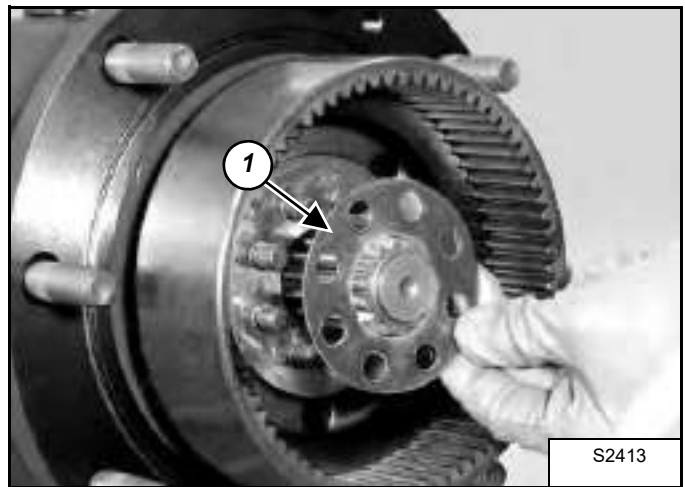
Figure 40-21-139



Fit the complete crown flange (Item 1) [Figure 40-21-139].

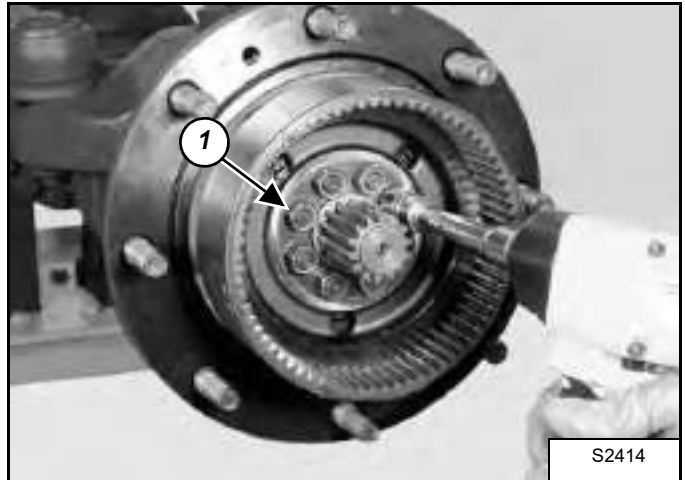
NOTE: In order to fasten the flange, use a plastic hammer and alternately hammer on several equidistant points.

Figure 40-21-140



Install the security flange (Item 1) [Figure 40-21-140]. Using Tecno Lube /101, grease the surface of the flange that touches the ring gear.

Figure 40-21-141

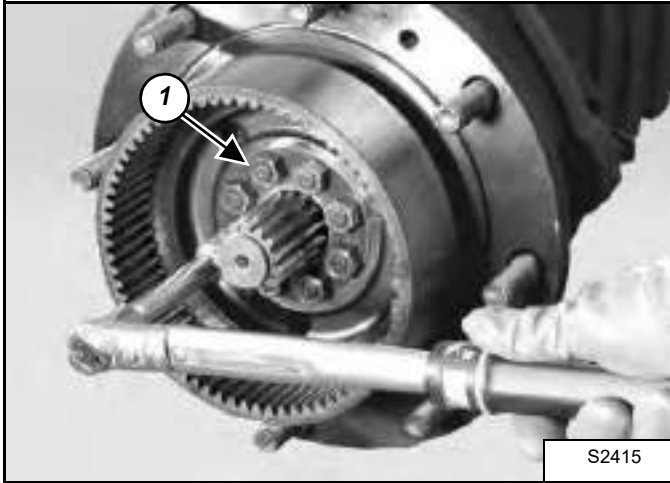


Coat the nuts (Item 1) [Figure 40-21-141] with Loctite 242 and screw them.

.AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Planetary Carrier Assembly (Cont'd)

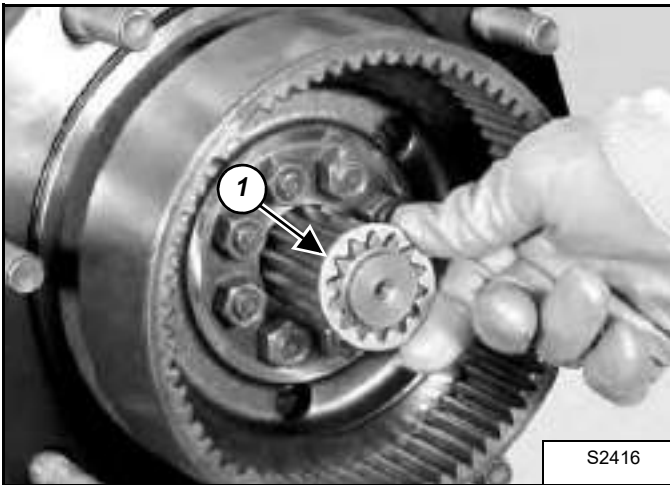
Figure 40-21-142



Tighten nuts (Item 1) [Figure 40-21-142] in two stages, using the criss-cross method.

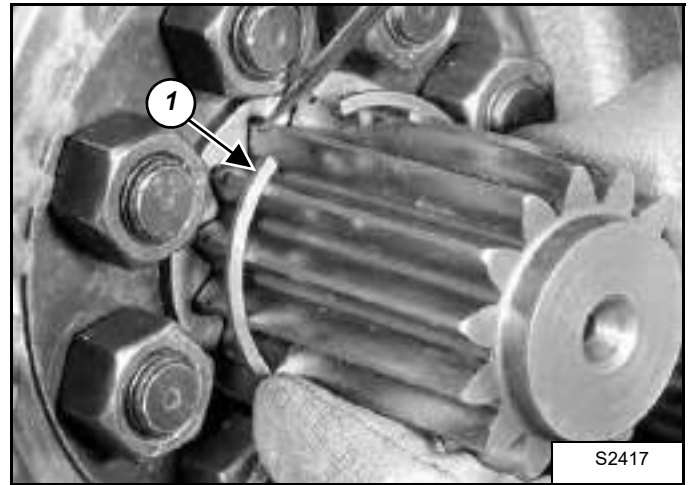
Initial torque wrench setting: 90 N•m (66 ft-lb).
Final torque wrench setting: 100 N•m (74 ft-lb).

Figure 40-21-143



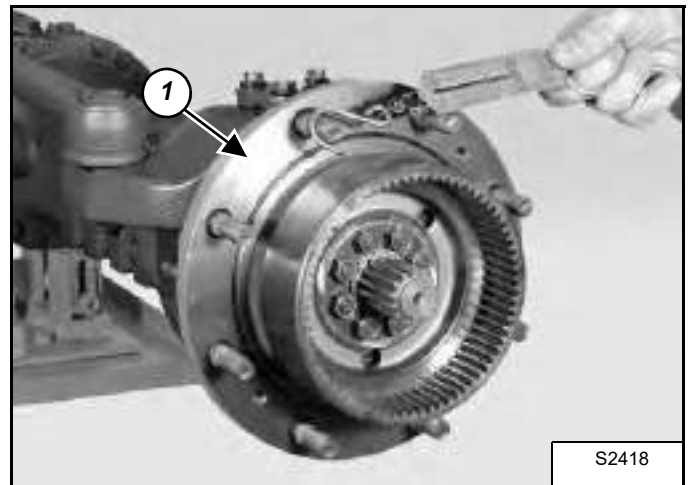
Install the distance piece (Item 1) [Figure 40-21-143].

Figure 40-21-144



Install the snap ring (Item 1) [Figure 40-21-144].

Figure 40-21-145



Check the continuous rolling torque on the hub (Item 1) [Figure 40-21-145]: torque 7 - 20 N•m (5-15 ft-lb).

If torque is too high, loosen the nuts (Item 1) [Figure 40-21-142], and re-tighten using a lower final torque setting.

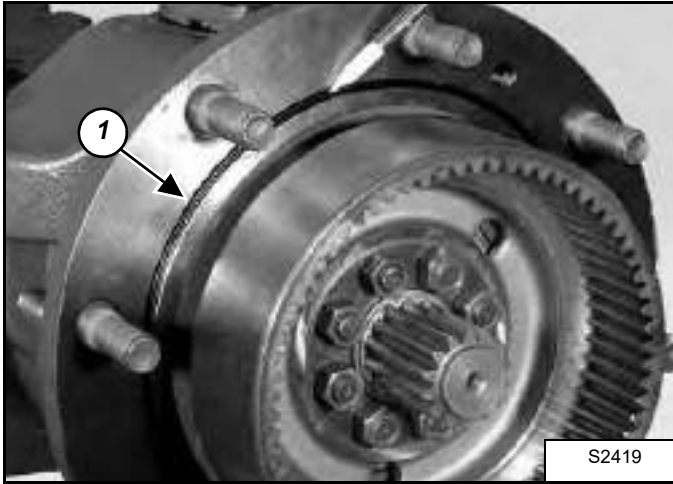
If torque is too low, torque the nuts (Item 1) [Figure 40-21-142] using a higher final torque setting.

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

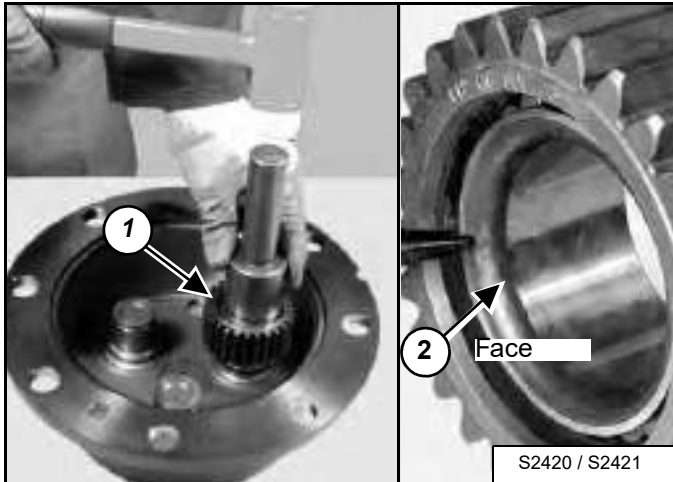
Planetary Carrier Assembly (Cont'd)

Figure 40-21-146



Make sure the O-ring (Item 1) [Figure 40-21-146] is fully seated in the groove.

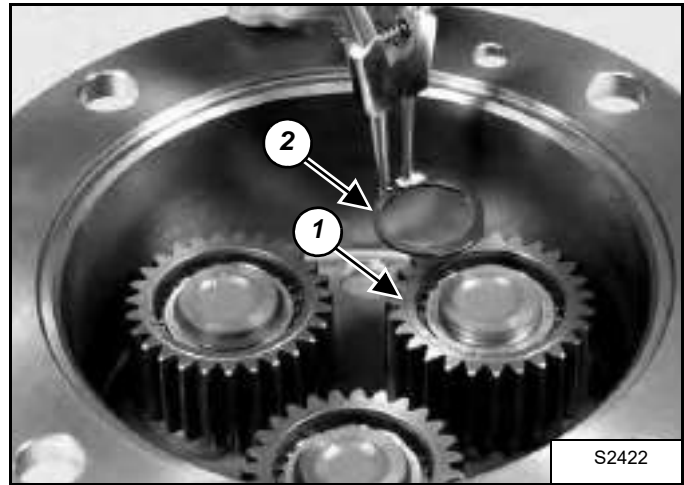
Figure 40-21-147



Fit the planetary gear (Item 1) onto the planetary gear cover (Item 2) [Figure 40-21-147].

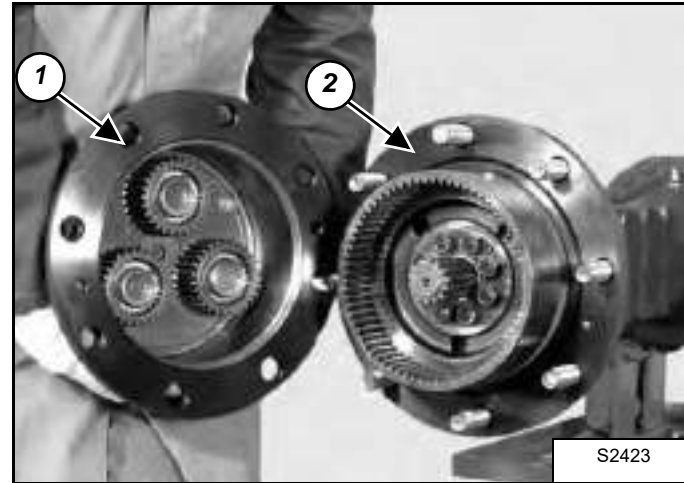
NOTE: The jointed portion (Item 2) [Figure 40-21-147] of the internal ring of the bearings must face the bottom of the pin.

Figure 40-21-148



Lock into position the planetary gears (Item 1) with the snap rings (Item 2) [Figure 40-21-148].

Figure 40-21-149



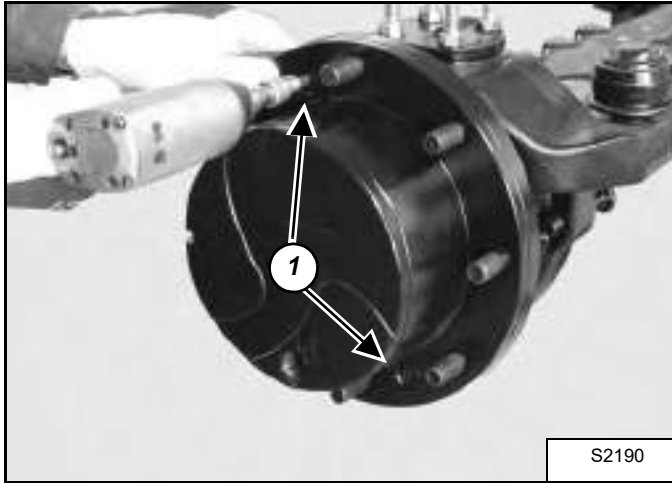
Fit the planetary gear cover (Item 1) onto the wheel hub (Item 2) [Figure 40-21-149].

Dealer Copy -- Not for Resale

AXLE AND DIFFERENTIAL (REAR) (CONT'D)

Planetary Carrier Assembly (Cont'd)

Figure 40-21-150



Install the two bolts (Item 1) **[Figure 40-21-150]**. Torque wrench 40-50 N•m (30-37 ft-lb).

AXLE AND DIFFERENTIAL (REAR) (CONT'D)**Special Tools**

BOBCAT PN	IMAGE	DESCRIPTION
6912173	 A photograph showing a pinion ring nut assembly, including a large metal nut, a smaller metal component, and a metal tool.	PINION RING NUT
6912176	 A photograph of a dummy pinion, which is a metal shaft with a hexagonal end and a smaller diameter section.	DUMMY PINION
6912178	 A photograph of an input flange seal, showing a metal flange and two O-rings.	INPUT FLANGE SEAL
6912180	 A photograph of a U-joint arm and steering knuckle bushing, showing a metal arm and a bushing.	U-JOINT ARM & STEERING KNUCKLE BUSHING
6912181	 A photograph of a U-joint seal, arm side, which is a small metal component.	U-JOINT SEAL, ARM SIDE
6912182	 A photograph of a wheel hub seal, showing a metal seal with a central opening.	WHEEL HUB SEAL

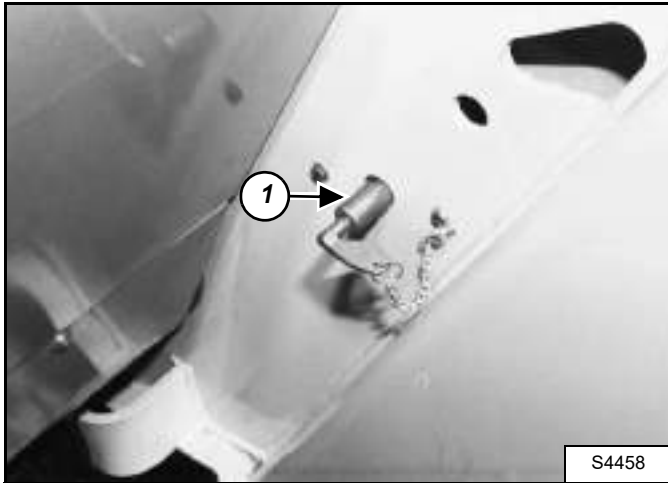
Dealer Copy -- Not for Resale

FRONT AXLE

Removal

Fully retract the telescoping boom and install a boomstop (See Installing The Approved Boom Stop on Page 10-160-1.) to allow the front axle to be removed from under the frame.

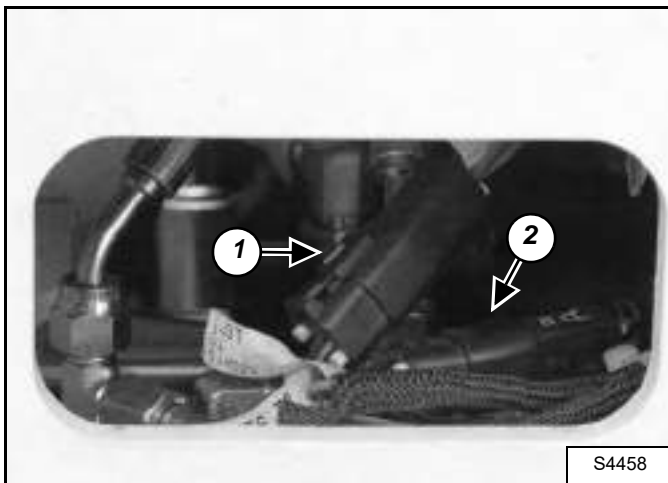
Figure 40-30-1



Rotate the battery disconnect switch (Item 1) [Figure 40-30-1] to the right, to disconnect the power supply from the battery.

Drain the hydraulic reservoir ((See Replacing Hydraulic Fluid on Page 10-100-2.)).

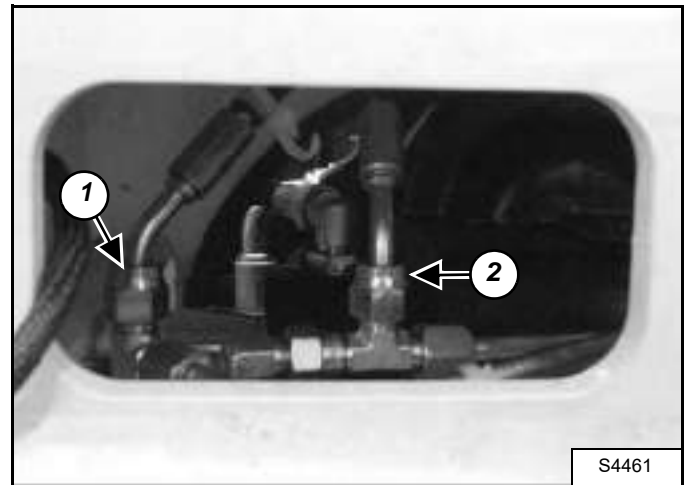
Figure 40-30-2



Disconnect the two harness connectors (Item 1 & 2) [Figure 40-30-2] at the front of the Telescopic Handler from the main harness.

NOTE: Mark all connectors for correct assembly.

Figure 40-30-3



Remove the two hydraulic hoses (Item 1 & 2) [Figure 40-30-3] at the front left of the Telescopic Handler.

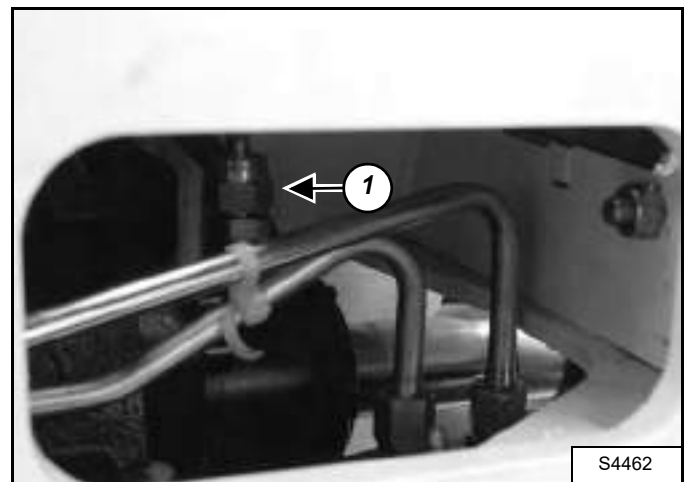
NOTE: Mark all hoses for correct installation.

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Figure 40-30-4



Remove the hydraulic hose (Item 1) [Figure 40-30-4] at the front right of the Telescopic Handler.

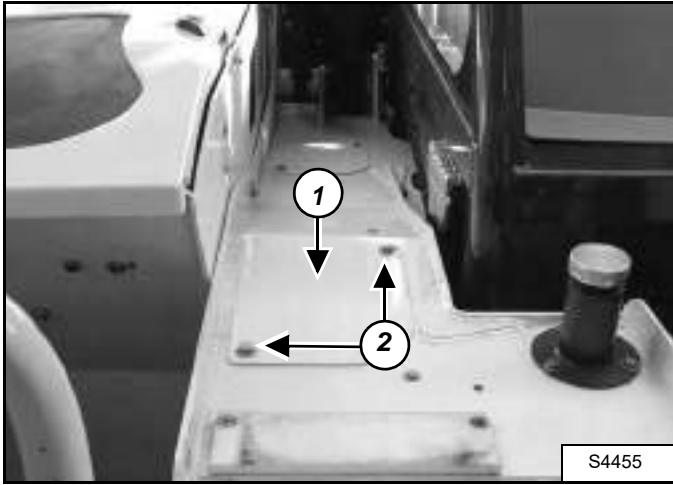
NOTE: Mark all hoses for correct installation.

Dealer Copy -- Not for Resale

FRONT AXLE (CONT'D)

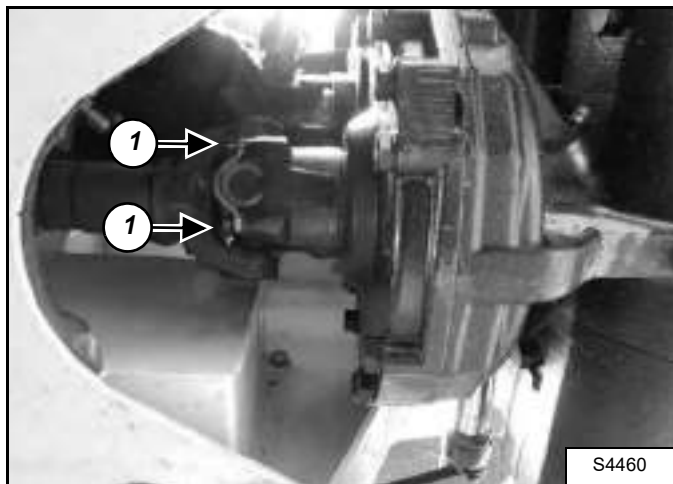
Removal (Cont'd)

Figure 40-30-5



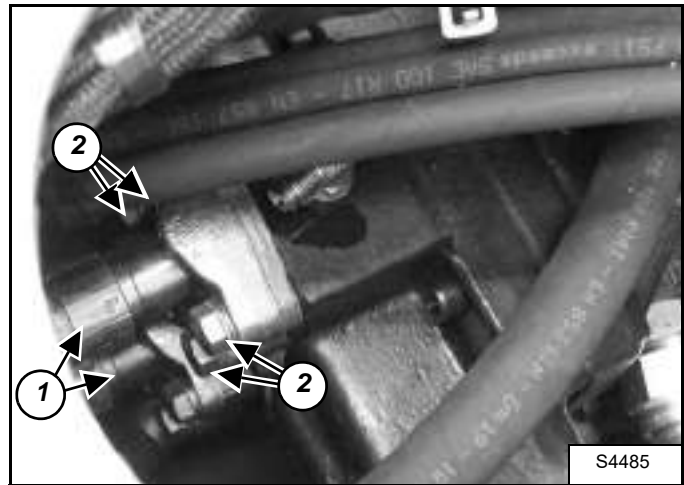
Remove the cover (Item 1) [Figure 40-30-5] by removing the two screws (Item 2).

Figure 40-30-6



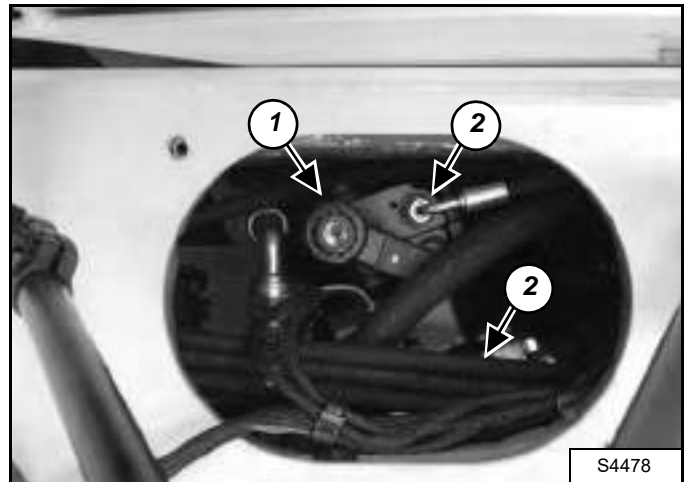
Remove the four driveshaft mounting bolts and nuts (Item 1) [Figure 40-30-6]. Lower the driveshaft.

Figure 40-30-7



Remove the two flange hoses (Item 1) [Figure 40-30-7] by removing the four bolts (Item 2) of each flange hose.

Figure 40-30-8



Remove the solenoid (Item 1) [Figure 40-30-8].

Remove the four hydraulic hoses (Item 2) [Figure 40-30-8] from the top and bottom of the drive motor.

FRONT AXLE (CONT'D)

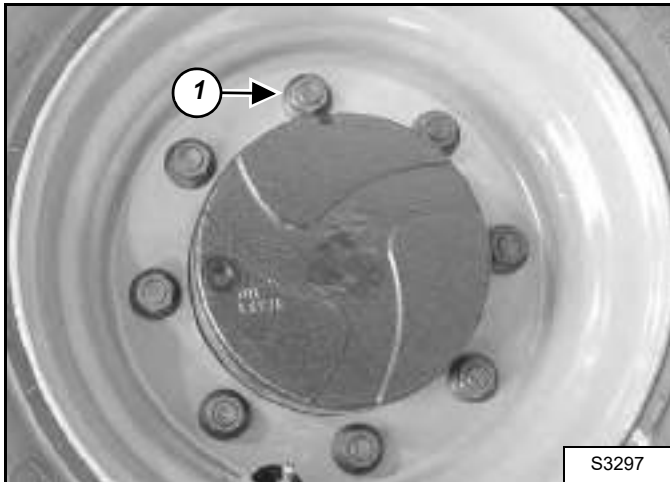
Removal (Cont'd)

Figure 40-30-9



Lift the front of the machine and place jack stands under the frame as shown [Figure 40-30-9].

Figure 40-30-10



Loosen the eight wheel nuts (Item 1) [Figure 40-30-10] of the two wheels.

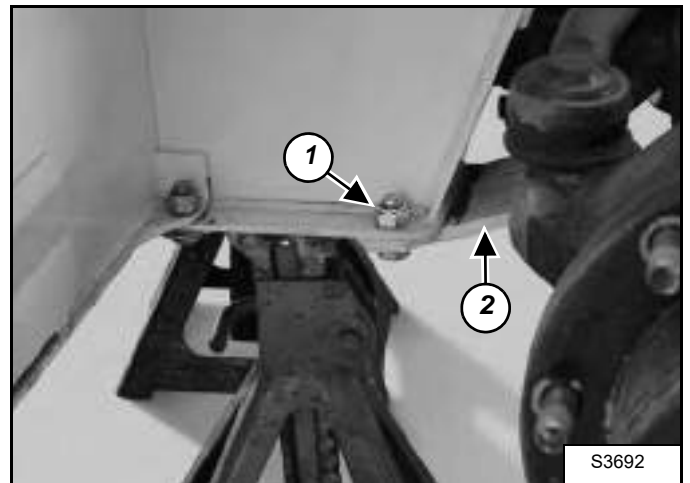
Remove both front wheels.

Figure 40-30-11



Using a floor jack, apply upward pressure to lift and support the front axle [Figure 40-30-11].

Figure 40-30-12



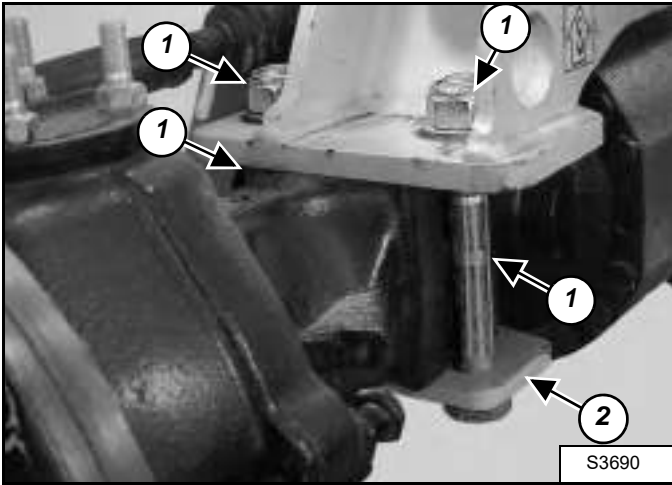
Remove the two remaining mounting plate bolts and nuts (Item 1) [Figure 40-30-12] on both sides.

Dealer Copy -- Not for Resale

FRONT AXLE (CONT'D)

Removal (Cont'd)

Figure 40-30-13



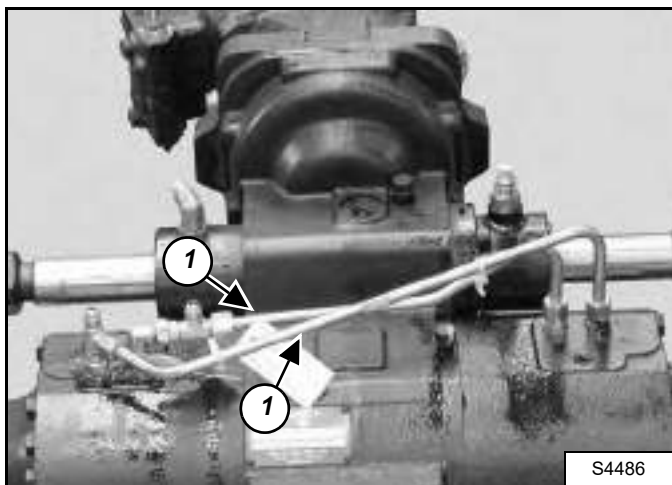
Remove the two mounting bolts and nuts (Item 1) [Figure 40-30-13] on each side.

Remove the mounting plate (Item 2) [Figure 40-30-13].

Have an assistant balance the axle on the floor jack and lower the floor jack slowly. Roll out the axle from under the frame.

Use a hoist and strap to put the axle well-supported in an appropriate place.

Figure 40-30-14



Remove the two hydraulic tubelines (Item 1 & 2) [Figure 40-30-14].

NOTE: Mark all hoses for correct installation.

IMPORTANT

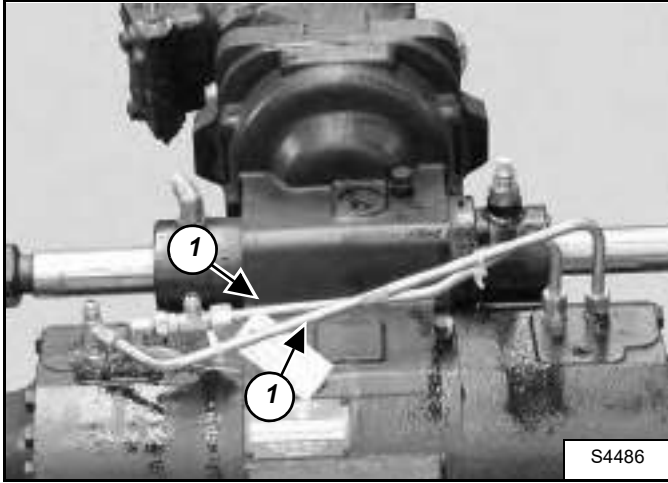
When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

FRONT AXLE (CONT'D)

Installation

Figure 40-30-15



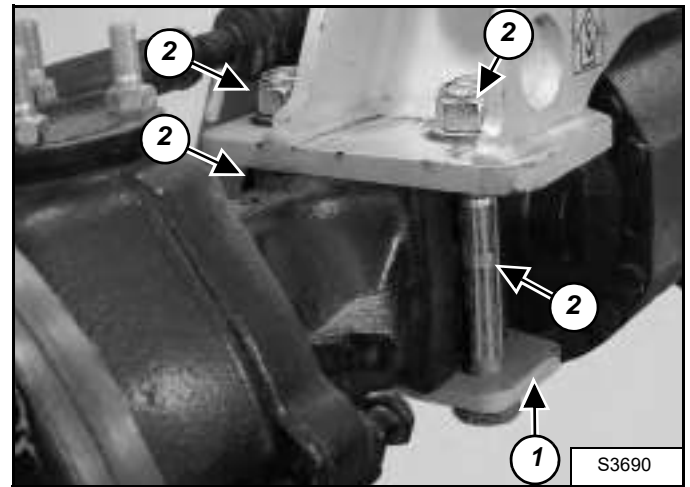
Install the two hydraulic tubelines (Item 1) [Figure 40-30-15].

Figure 40-30-16



Using a floor jack, position the axle and apply upward pressure to lift and support the front axle [Figure 40-30-16].

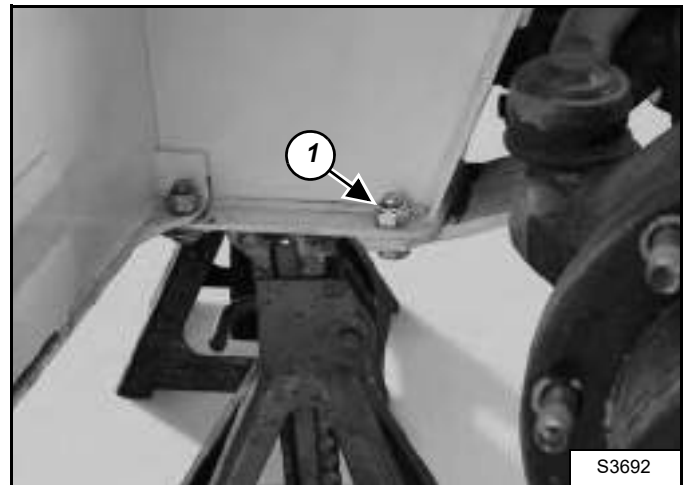
Figure 40-30-17



Install the mounting plate (Item 1) and two mounting bolts and nuts (Item 2) [Figure 40-30-17] on each side.

Tighten the nuts to 370-410 N•m (275-300 ft-lb) torque.

Figure 40-30-18



Install the two mounting plate bolts and nuts (Item 1) [Figure 40-30-18] on each side.

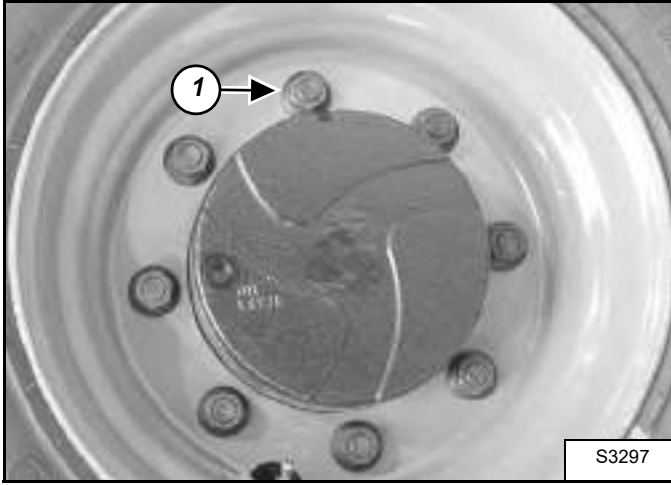
Tighten the nuts to 370-410 N•m (275-300 ft-lb) torque.

Dealer Copy -- Not for Resale

FRONT AXLE (CONT'D)

Installation (Cont'd)

Figure 40-30-19

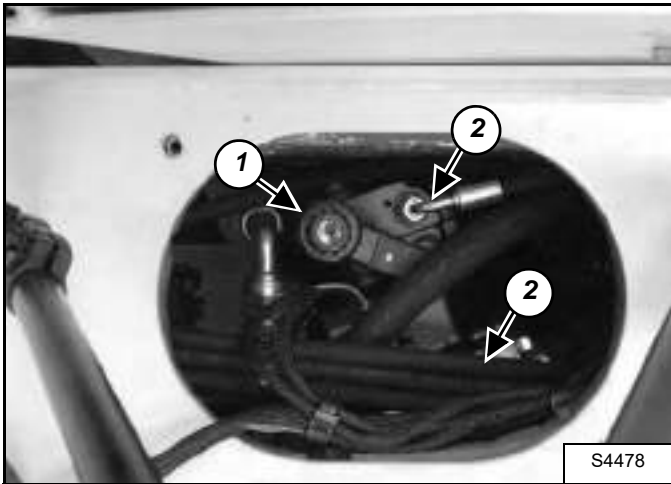


Install the two front wheels.

Install the eight wheel nuts (Item 1) [Figure 40-30-19] of both wheels. Tighten to 360 N•m (265 ft-lb) torque.

Fill the hydraulic reservoir. ((See Replacing Hydraulic Fluid on Page 10-100-2.)).

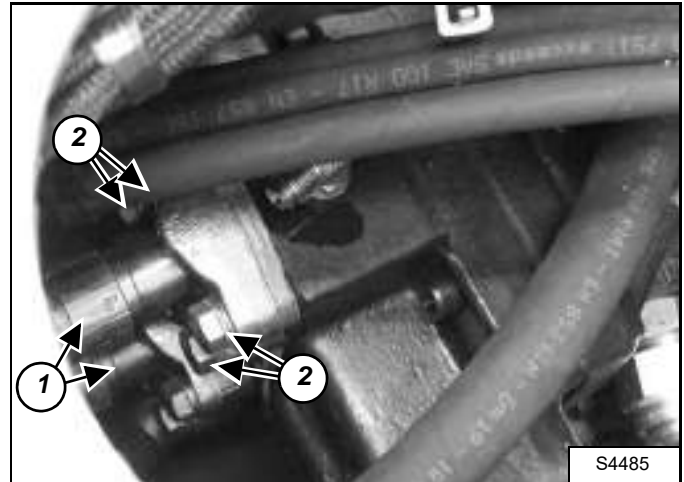
Figure 40-30-20



Install the solenoid (Item 1) [Figure 40-30-20].

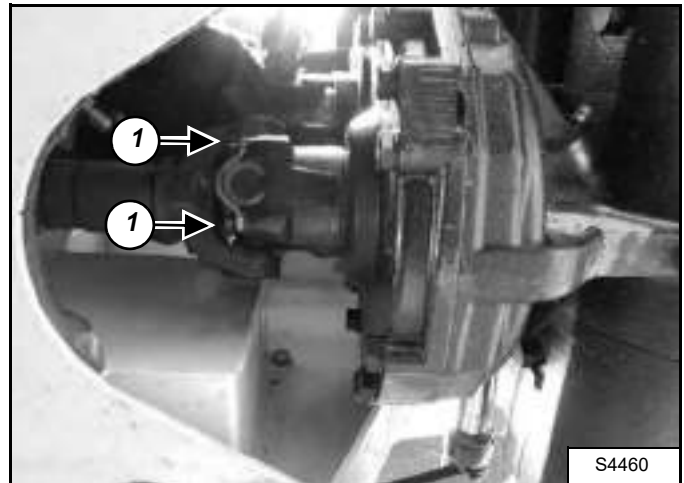
Install the hydraulic hoses (Item 2 & 3) [Figure 40-30-20].

Figure 40-30-21



Install the two flange hoses (Item 1) by removing the four bolts (Item 2) [Figure 40-30-21] of each flange hose.

Figure 40-30-22

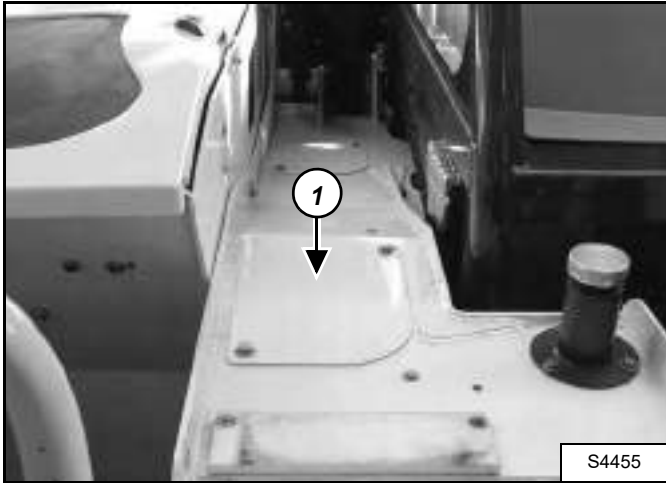


Install the four driveshaft mounting bolts and nuts (Item 1) [Figure 40-30-22].

FRONT AXLE (CONT'D)

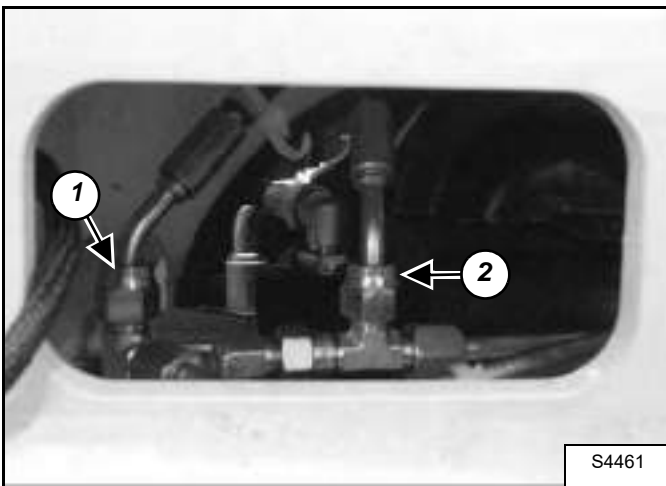
Installation (Cont'd)

Figure 40-30-23



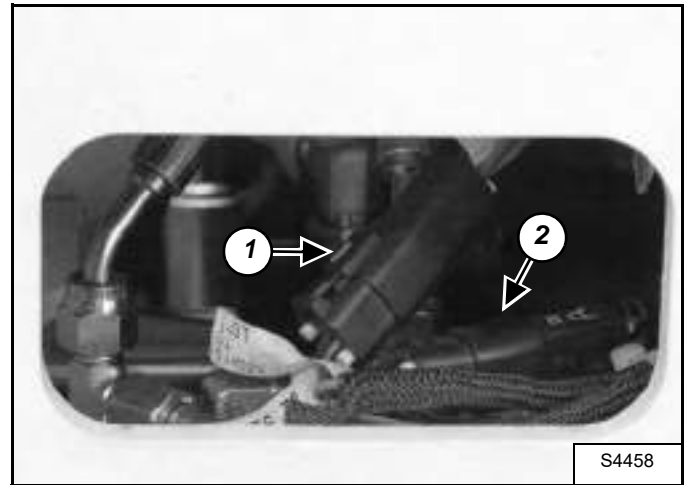
Install the cover (Item 1) [Figure 40-30-23].

Figure 40-30-24



Install the two hydraulic hoses (Item 1 & 2) [Figure 40-30-24] at the front left of the Telescopic Handler.

Figure 40-30-25



Connect the two harness connectors (Item 1 & 2) [Figure 40-30-25] at the front of the Telescopic Handler.

Secure the electrical harness (Item 1) [Figure 40-30-25] to the steering hoses with tie straps.

Remove the jackstands from the machine.

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

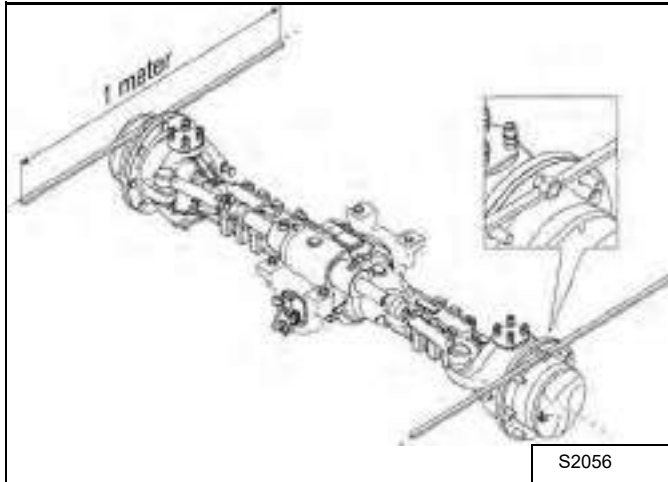
AXLE TOE-IN

Adjustment

The axle is removed from the machine for photo clarity, but this procedure may be completed with the axle installed in the machine.

Turn the steering wheel until the steering cylinder rod is positioned in the center. Measure the exposed part of the cylinder rod on each side of the cylinder housing making sure they are the same length.

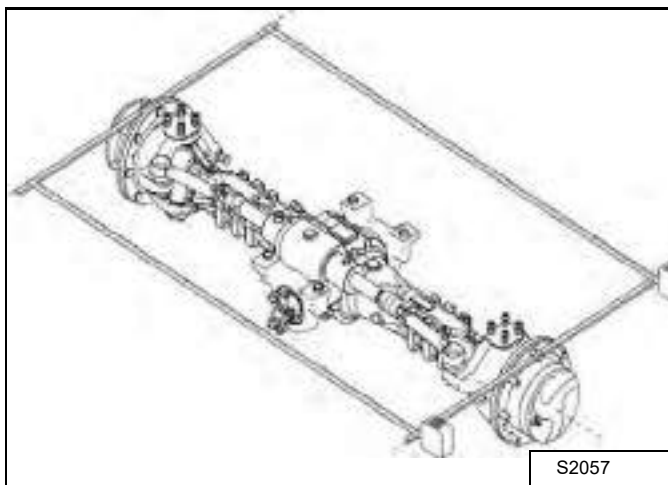
Figure 40-40-1



Install two identical, straight bars [Figure 40-40-1] onto the wheel hub and secure them using lug nuts.

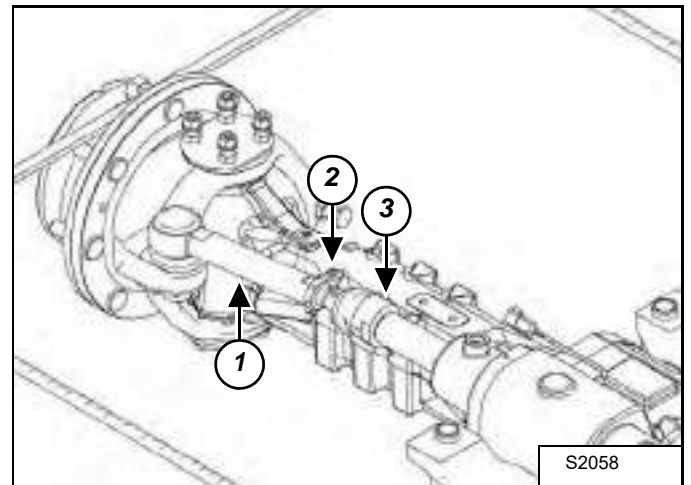
NOTE: The two bars must be perpendicular to the ground.

Figure 40-40-2



Measure the distance between the ends of the two bars [Figure 40-40-2]. The measurement must be equal.

Figure 40-40-3



If measurement is not the same, adjust the two tie rod ends (Item 1) by loosening or tightening the track rods (Item 2) [Figure 40-40-3] of the two tie rods until the measurement is the same.

Tighten the nut (Item 3) [Figure 40-40-3] to 300 N•m (221 ft-lb) torque.



Bobcat®

Dealer Copy -- Not for Resale

PARKING BRAKE

The Telescopic Handler can be towed a short distance such as removing it from mud or loading it onto a transport vehicle.



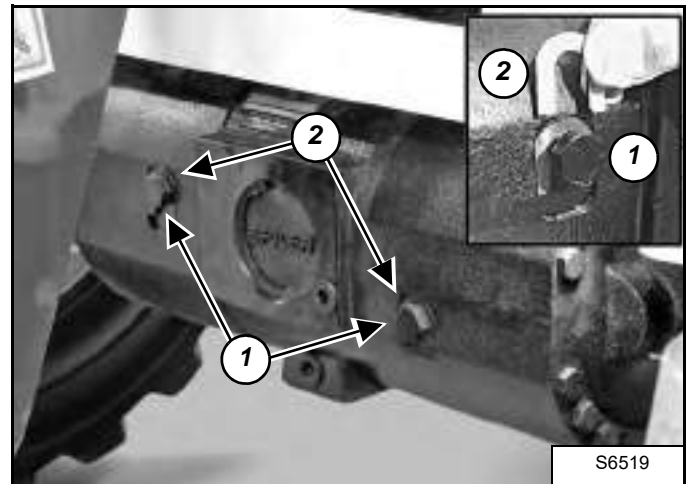
Block the wheels to prevent the machine from rolling.

Releasing The Brake Discs

The brakes are engaged by spring pressure and released by hydraulic pressure. The parking brake must be released manually before towing (if the engine can not be started to release the brakes or there is no hydraulic pressure). Only the front axle has brakes.

The following procedure describes how to release the brakes:

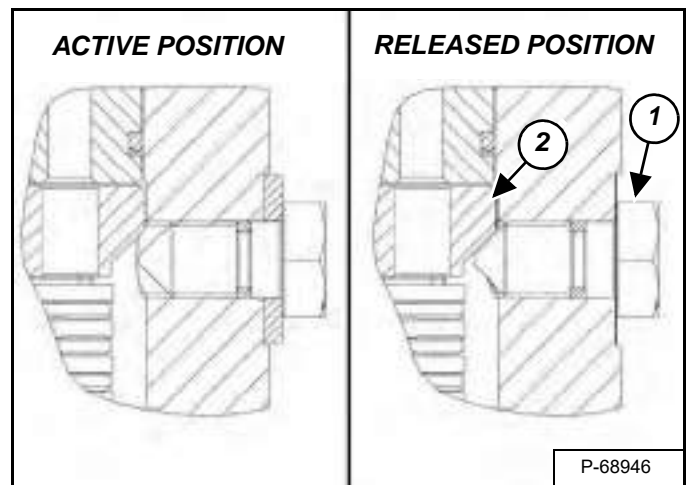
Figure 40-50-1



Loosen the four bolts (Item 1) until the slotted spacers (Item 2) [Figure 40-50-1] can be removed from under the bolt heads (the bolts and spacers are located on both the front and rear side of the front axle).

Remove the spacers (Item 2) [Figure 40-50-1] and save for reuse.

Figure 40-50-2



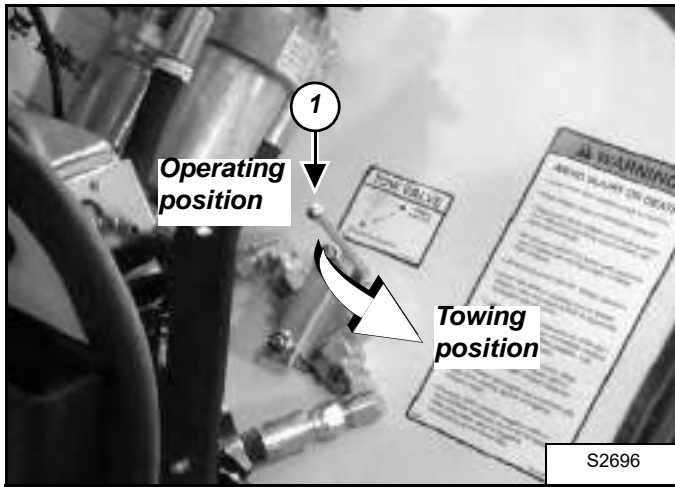
After removing the spacers, evenly tighten the front and rear bolts (Item 1) to hold the parking brake piston (Item 2) [Figure 40-50-2] in the released position.

Dealer Copy -- Not for Resale

PARKING BRAKE (CONT'D)

Releasing The Brake Discs (Cont'd)

Figure 40-50-3

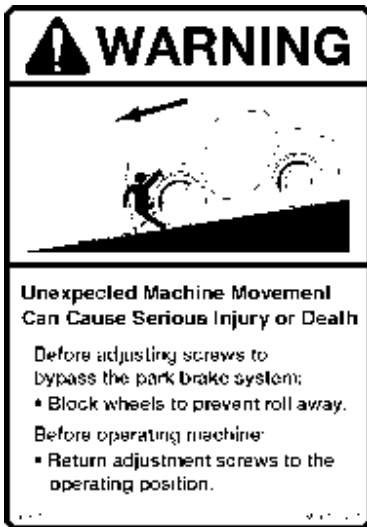


Raise the engine cover.

Turn the tow valve counterclockwise 90° (Item 1) [Figure 40-50-3] to TOWING POSITION.

Tow the Telescopic Handler at a slow speed.

NOTE: The vehicle will not be able to brake until the four bolts (Item 1) [Figure 40-50-4] & [Figure 40-50-5] are returned to their original position.



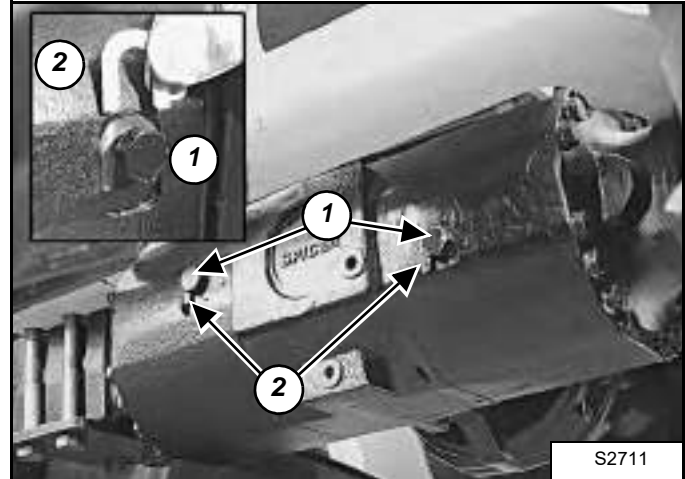
Block the wheels to prevent the machine from rolling.

After towing is completed, turn the tow valve (Item 1) [Figure 40-50-3] clockwise 90° to the OPERATING POSITION.

NOTE: If the tow valve is not returned to the operating position, the machine will not be able to be driven forward or backward.

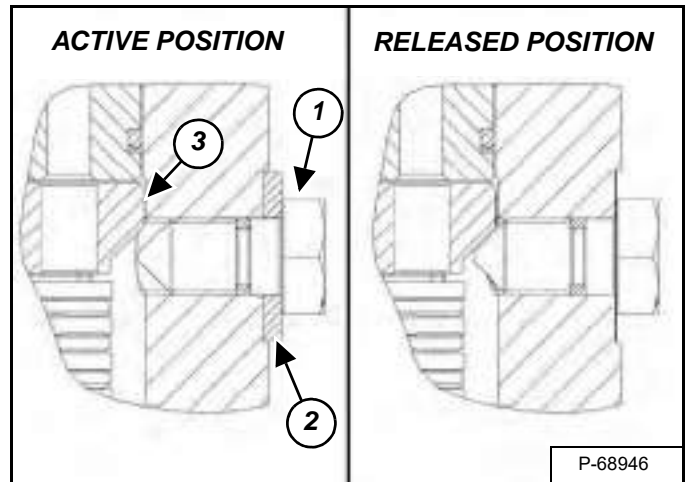
Engaging The Brake Discs

Figure 40-50-4



Loosen the four bolts (Item 1) until the spacers (Item 2) [Figure 40-50-4] can be installed under the bolt heads (the bolts and washers are located on both the front and rear side of front axle).

Figure 40-50-5



Evenly tighten the front and rear bolts (Item 1) to hold the spacers (Item 2) [Figure 40-50-4] & [Figure 40-50-5].

Tighten the bolts to 95-115 N•m (70-85 ft-lb) torque.

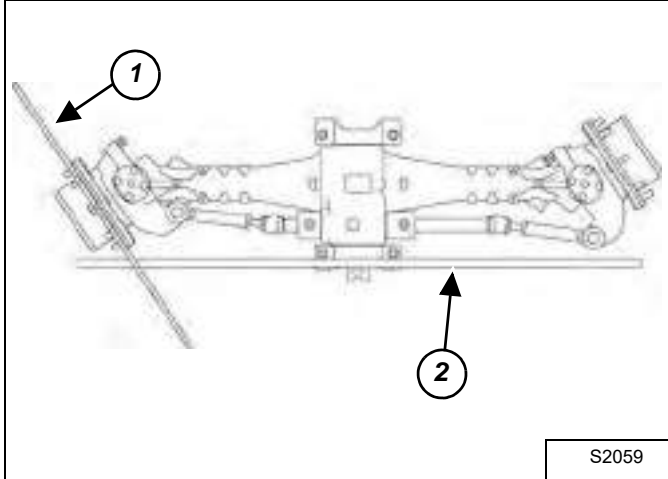
This will allow the parking brake piston (Item 3) [Figure 40-50-5] to be active again.

STEERING ANGLE ADJUSTMENT

Adjustment

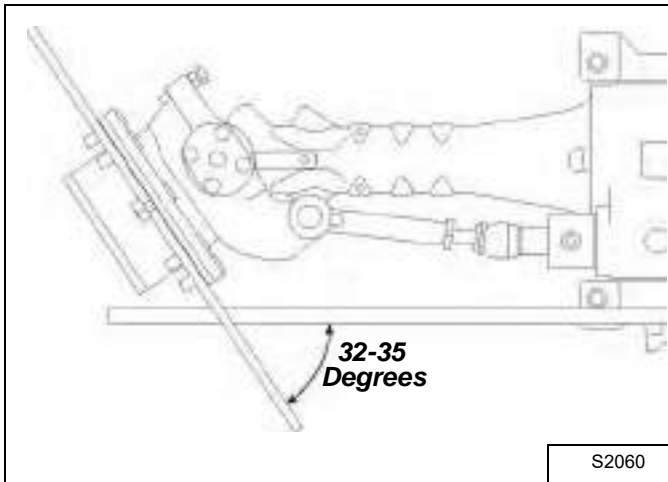
The axle is removed from the machine for photo clarity, but this procedure may be completed with the axle installed in the machine.

Figure 40-60-1



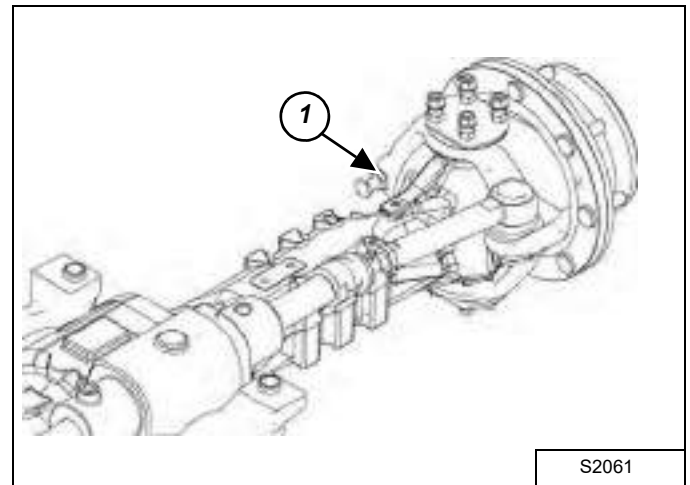
Install a straight bar (Item 1) onto the wheel hub and secure using lug nuts. Turn the steering wheel completely to one side. Place a straight bar (Item 2) [Figure 40-60-1] on the pinion shaft.

Figure 40-60-2



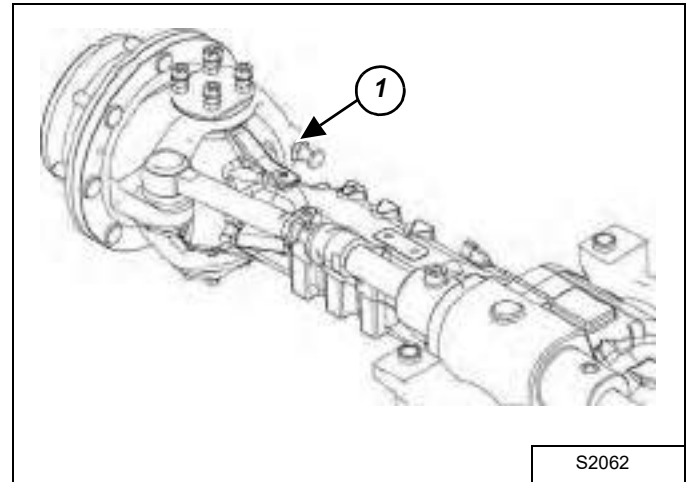
Use an angle gauge, to obtain a reading of 32-35 degrees [Figure 40-60-2].

Figure 40-60-3



Adjust the stop (Item 1) [Figure 40-60-3] as needed. Tighten the lock nut to 150 N•m (110 ft-lb) torque.

Figure 40-60-4



Turn the steering wheel completely to the other side [Figure 40-60-4] and repeat above procedure.

Dealer Copy -- Not for Resale



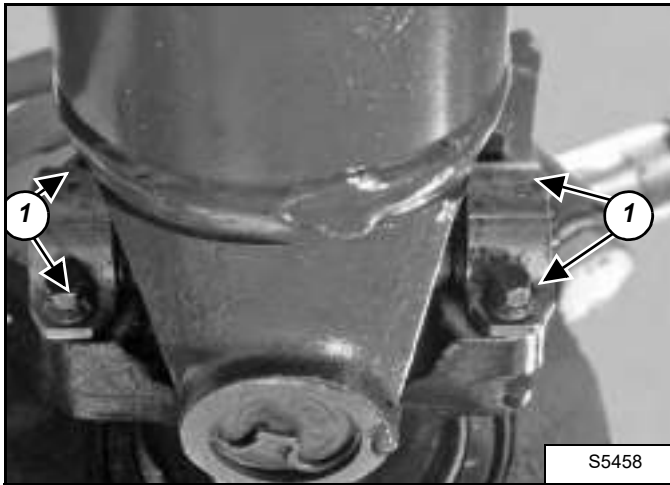
Bobcat®

Dealer Copy -- Not for Resale

DRIVE SHAFT

Removal And Installation

Figure 40-70-1



Remove the four drive shaft mounting bolts (Item 1) [Figure 40-70-1] from both ends of the drive shaft.

Installation: Tighten the mounting bolts to 33-41 N•m (24-30 ft-lb) torque.

Slide the drive shaft out of the machine.



Bobcat®

Dealer Copy -- Not for Resale

SERVICE BRAKE

Description

There are two bleed screws located on each side of the front axle differential housing.

Air trapped in the brake lines may cause a spongy feel and/or delayed activation of the service brake.

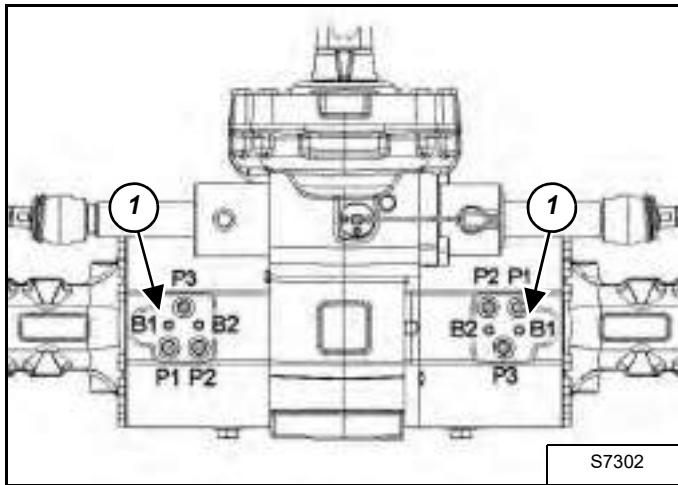
Use the following procedure to remove air from the brake circuit.

Bleeding The Brake Circuit

The machine will need to be operational so that the engine and the hydraulic system functions properly.

Block the wheels to prevent the machine from moving.

Figure 40-80-1

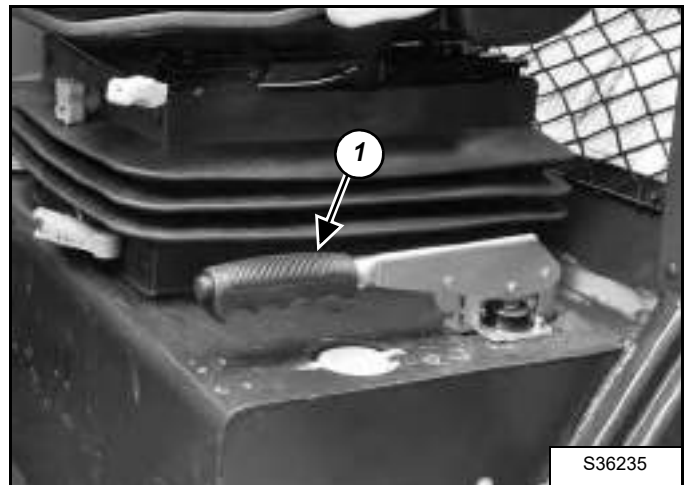


The parking brake will be bled using the bleed screws (Items 1) [Figure 40-80-1] at the top of the front axle (B1 port). Install a hose on the bleed screw and route the opposite end of the hose to a drain pan.

2 people will be needed to perform this procedure.

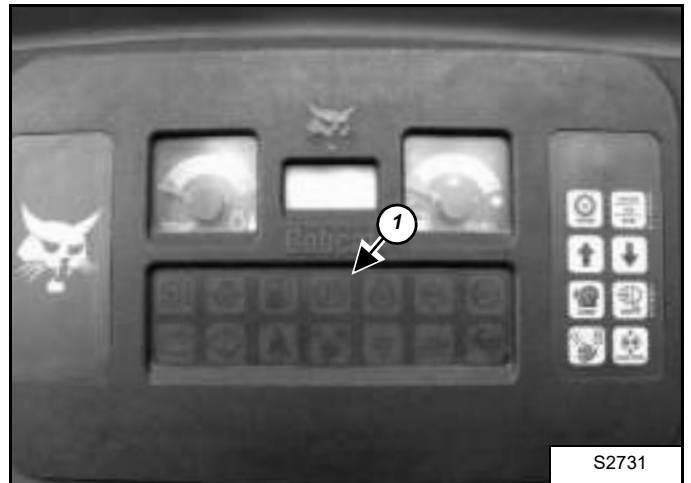
Enter the Telescopic Handler, put the Travel Direction Control in the neutral position, fasten the seat belt and start the engine.

Figure 40-80-2



Pull the parking brake lever (Item 1) [Figure 40-80-2] all the way up until locked to engage the brake.

Figure 40-80-3



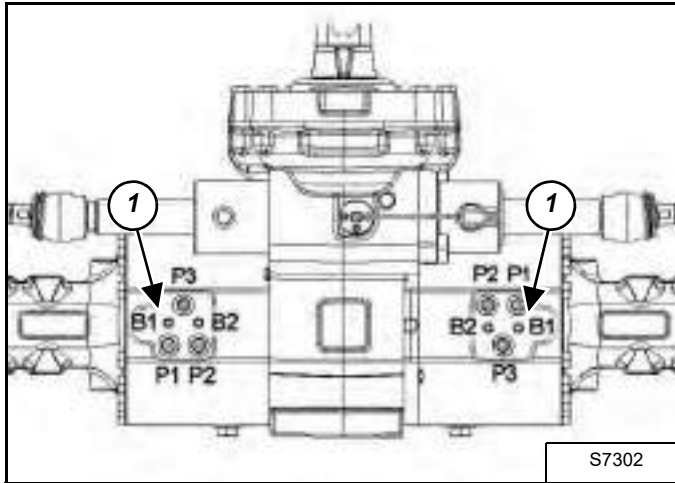
The red light (Item 1) [Figure 40-80-3] will turn on when the parking brake switch is engaged.

Dealer Copy -- Not for Resale

SERVICE BRAKE (CONT'D)

Bleeding The Brake Circuit (Cont'd)

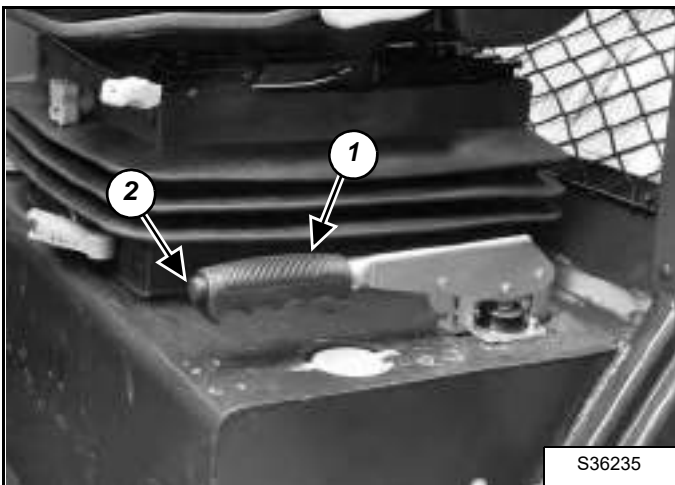
Figure 40-80-4



Have the second person open the parking brake bleed screw (Item 1) [Figure 40-80-4] and bleed the system until hydraulic fluid, with no air bubbles, flows from the end of the bleed hose at the drain pan. Close the brake bleed screw. Remove the hose from the bleed screw that was used in the bleeding procedure.

Have the second person move away from the machine.

Figure 40-80-5



Pull the lever (Item 1) up, press button (Item 2) [Figure 40-80-5] to release lock. Move the lever to the down position to release the brake.

The red light (Item 1) [Figure 40-80-3] will turn off when the parking brake switch is moved to the disengaged position.

Slowly move the machine to an open and clear area to test the parking brake. Keep all by-standers away while testing.

Pull the parking brake lever (Item 1) [Figure 40-80-2] all the way up until locked to engage the brake. The red light (Item 1) [Figure 40-80-3] will turn on when the parking brake switch is engaged.

Move the Travel Direction Control to the forward position. Increase RPM to 1500. The parking brake must not allow the Telescopic Handler to move.

Decrease RPM to low idle.

Move the Travel Direction Control in the reverse position. Increase RPM to 1500. The parking brake must not allow the Telescopic Handler to move.

Decrease RPM to low idle.

Move the Travel Direction Control in the neutral position.

If the brakes allowed the machine to move, repeat the park brake bleed procedure and then retest the park brake.

REAR AXLE

Removal

Position the machine on the work surface.

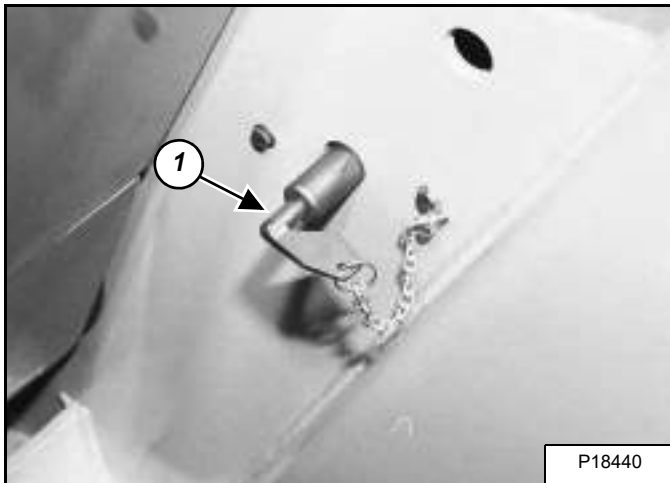
Relieve hydraulic pressure.



Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a physician familiar with this injury is not received immediately.

W-2145-0290

Figure 40-90-1



Rotate the battery disconnect switch (Item 1) [Figure 40-90-1] to the right, to disconnect the power supply from the battery.

Drain the hydraulic reservoir. ((See Replacing Hydraulic Fluid on Page 10-100-2.))

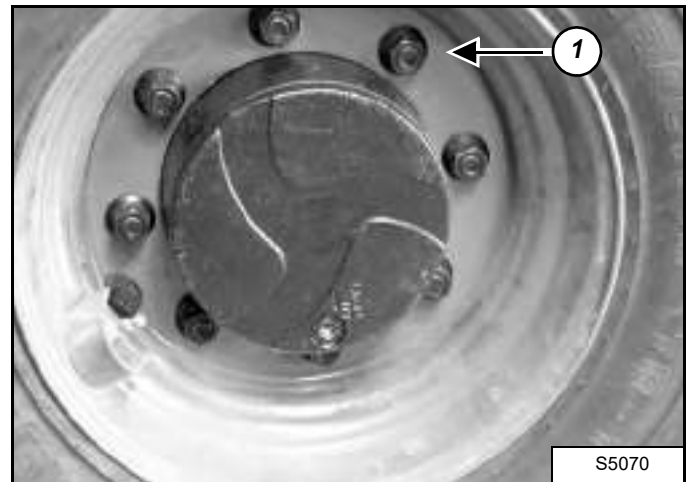
Figure 40-90-2



Lift the rear of the machine and place jackstands under the frame as shown.

Place a block in front and behind the front wheel [Figure 40-90-2].

Figure 40-90-3



Remove the eight lug nuts and washers (Item 1) [Figure 40-90-3] from each rear wheel.

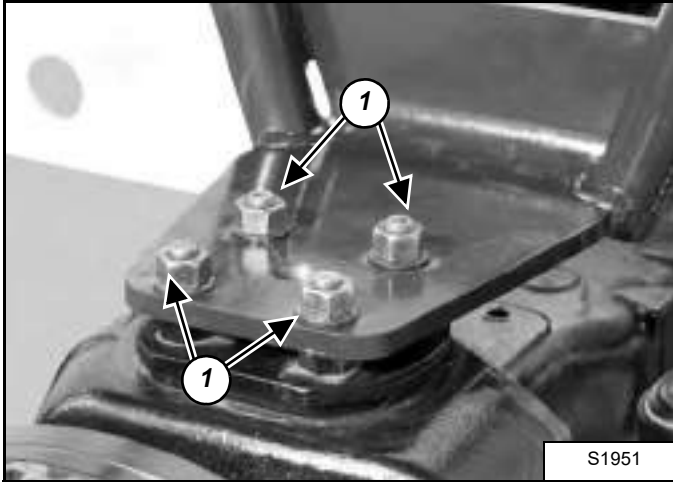
Remove both rear wheels.

Dealer Copy -- Not for Resale

REAR AXLE (CONT'D)

Removal (Cont'd)

Figure 40-90-4



Remove the four bolts (Item 1) [Figure 40-90-4] and remove the rear fenders.

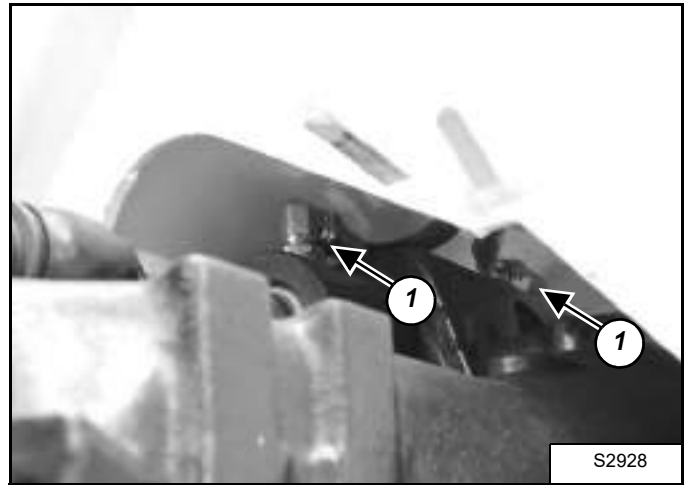
Remove the driveshaft. ((See DRIVE SHAFT on Page 40-70-1.))

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

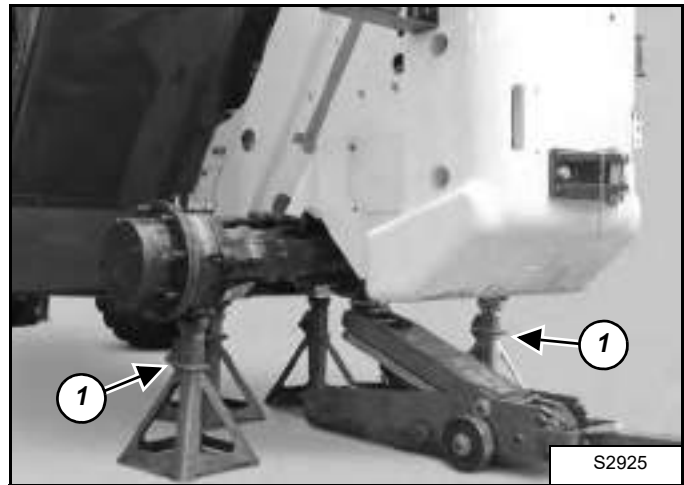
Figure 40-90-5



Remove the hoses (Item 1) [Figure 40-90-5] from the steering cylinder.

NOTE: Mark all hoses for correct installation.

Figure 40-90-6



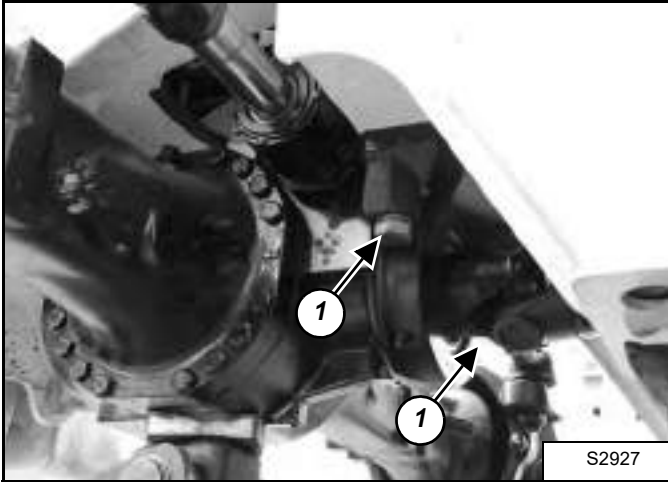
Install two jackstands (Item 1) [Figure 40-90-6] under the axle.

Dealer Copy -- Not for Resale

REAR AXLE (CONT'D)

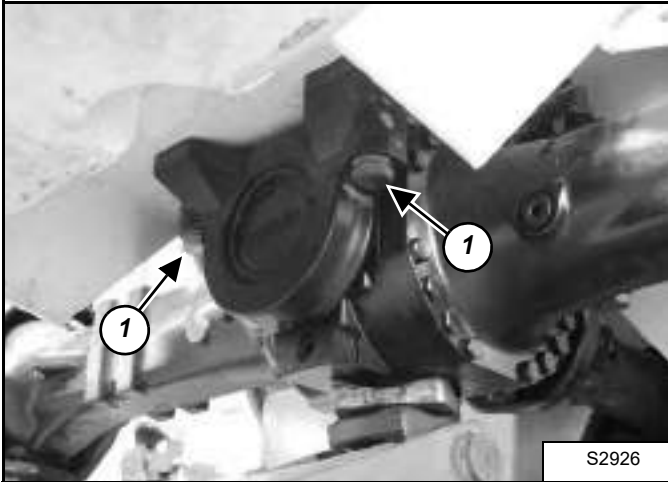
Removal (Cont'd)

Figure 40-90-7



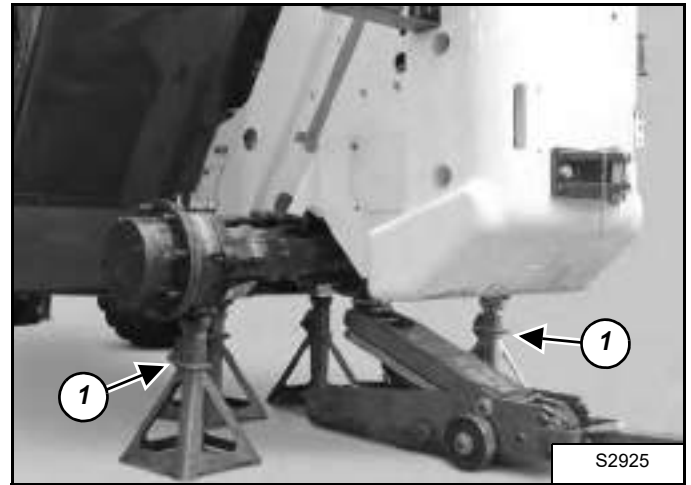
Remove the two bolts (Item 1) [Figure 40-90-7] from the front mount bracket.

Figure 40-90-8



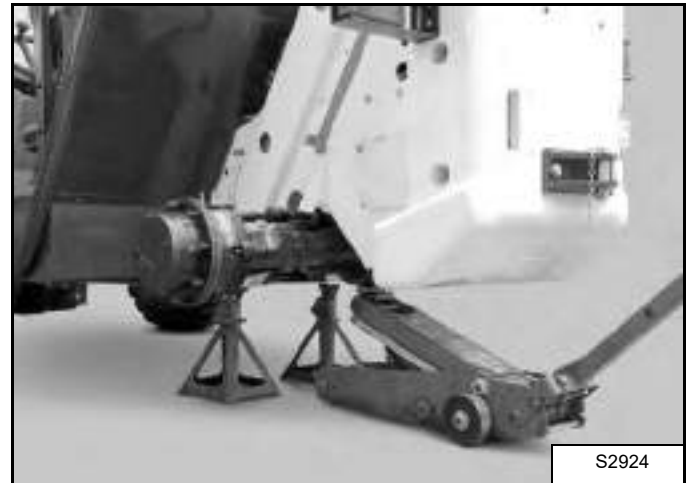
Remove the two bolts (Item 1) [Figure 40-90-8] from the rear mount bracket.

Figure 40-90-9



Remove the jackstands (Item 1) [Figure 40-90-9] from the axle.

Figure 40-90-10



Have an assistant balance the axle on the floor jack and lower the floor jack slowly. Roll the axle out from under the frame [Figure 40-90-10].

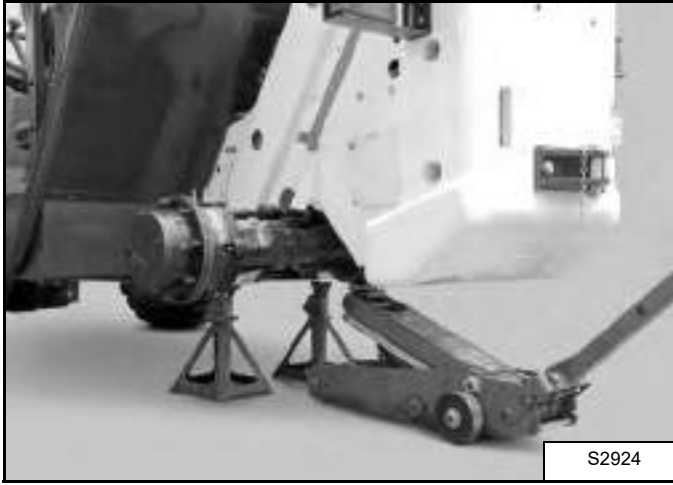
Dealer Copy -- Not for Resale

REAR AXLE (CONT'D)

Installation

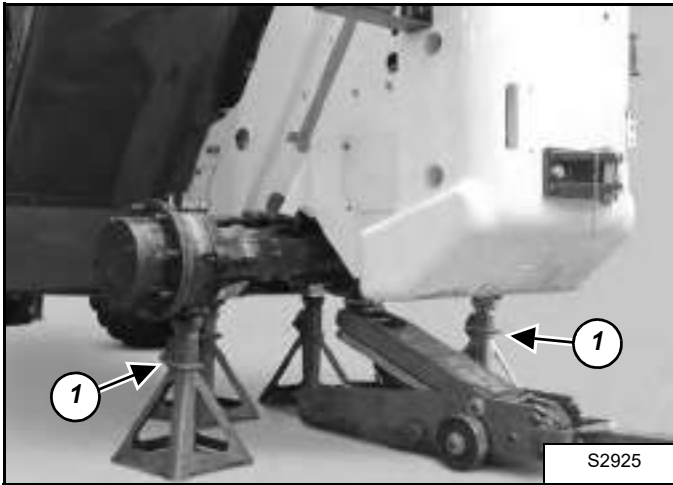
Have an assistant balance the axle on the floor jack and roll the axle under the frame .

Figure 40-90-11



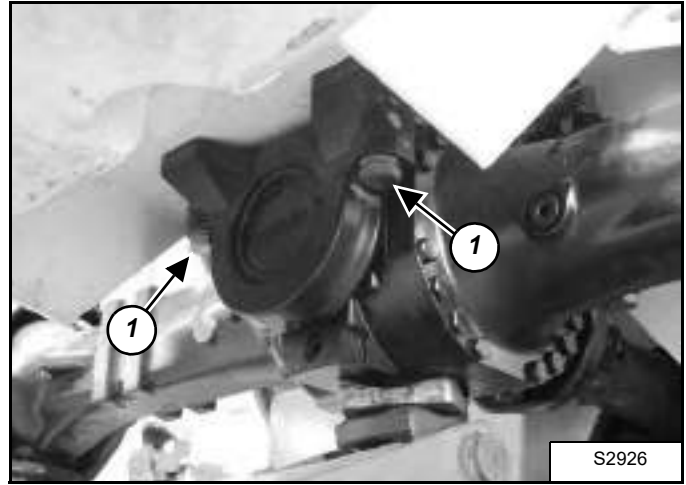
Raise the floor jack, lifting the axle upward and into position **[Figure 40-90-11]**.

Figure 40-90-12



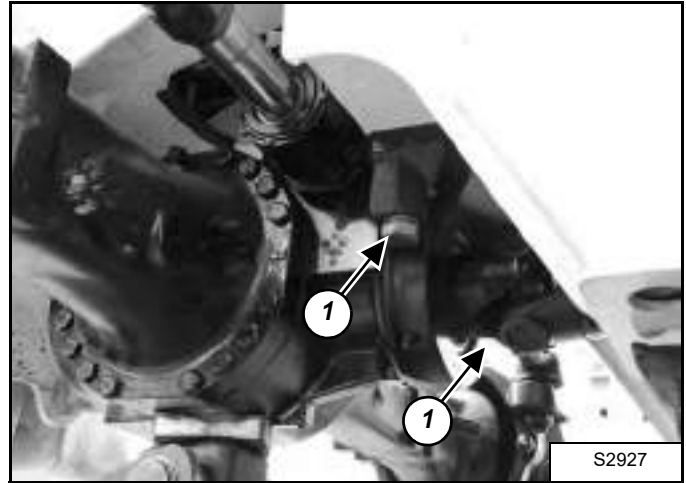
Install jackstands (Item 1) **[Figure 40-90-12]** under the axle.

Figure 40-90-13



Install the two bolts (Item 1) **[Figure 40-90-13]** in the rear mount bracket.

Figure 40-90-14



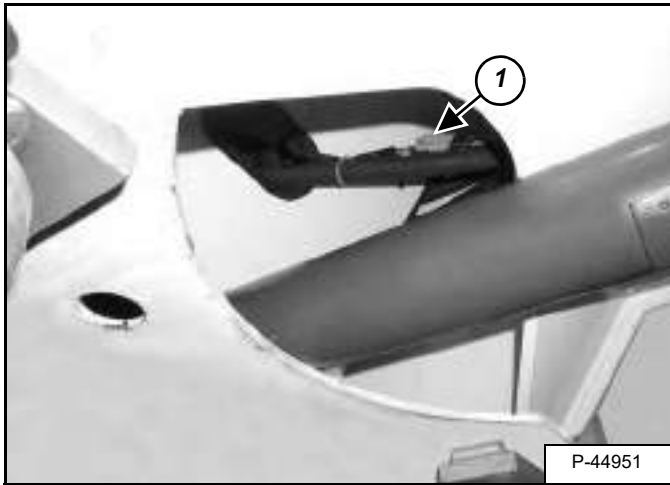
Install the two bolts (Item 1) **[Figure 40-90-14]** in the front mounting bracket.

Dealer Copy -- Not for Resale

REAR AXLE (CONT'D)

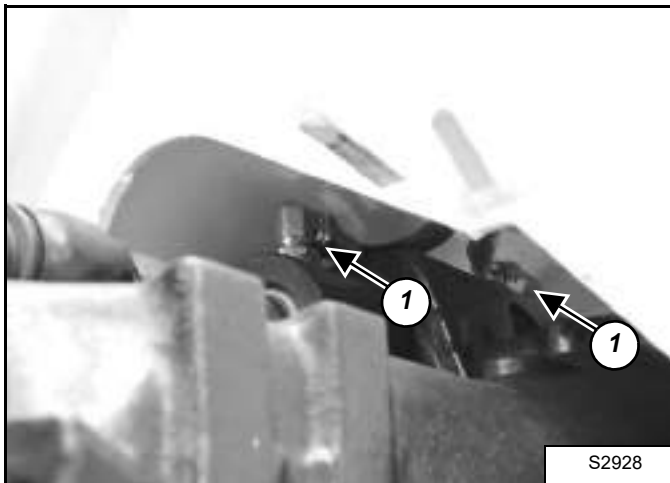
Installation (Cont'd)

Figure 40-90-15



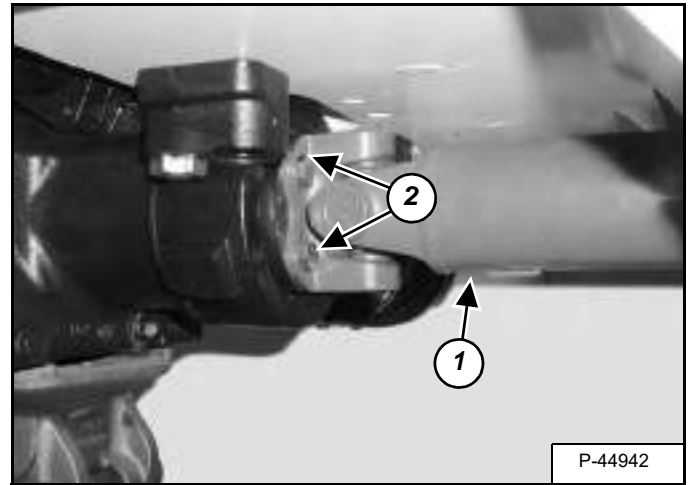
Plug the wire connector (Item 1) [Figure 40-90-15] into the wire harness.

Figure 40-90-16



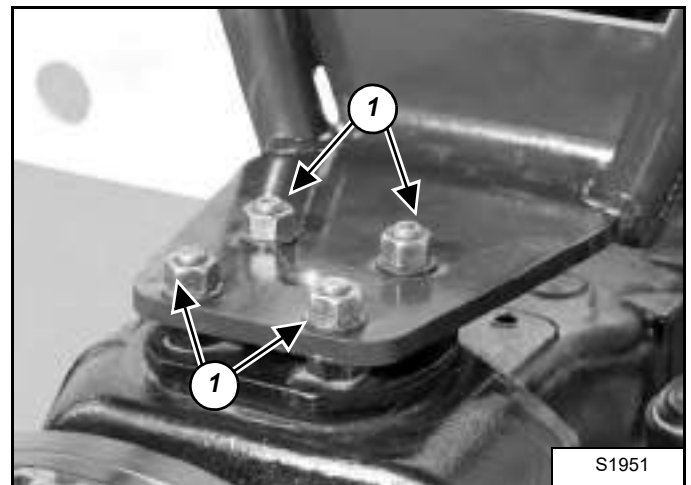
Install the hoses (Item 1) [Figure 40-90-16] on the steering cylinder.

Figure 40-90-17



Install the driveshaft (Item 1) with four bolts (Item 2) [Figure 40-90-17]. Tighten the bolts to 118 N•m (87 ft-lb) torque.

Figure 40-90-18



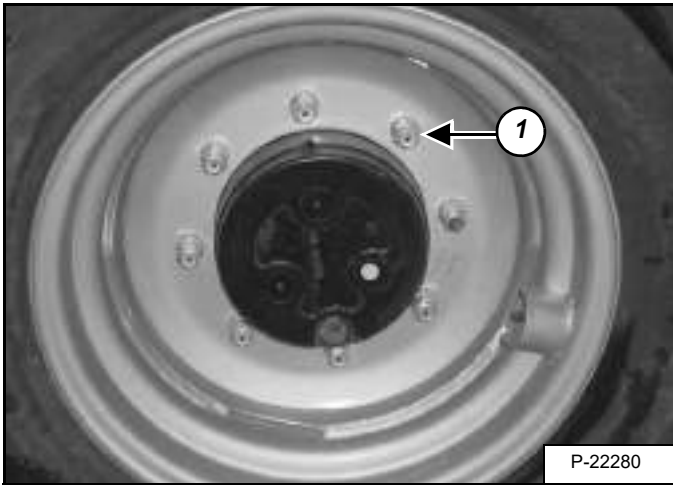
Install the rear fenders (Item 1) with two bolts (Item 2) [Figure 40-90-18].

Dealer Copy -- Not for Resale

REAR AXLE (CONT'D)

Installation (Cont'd)

Figure 40-90-19

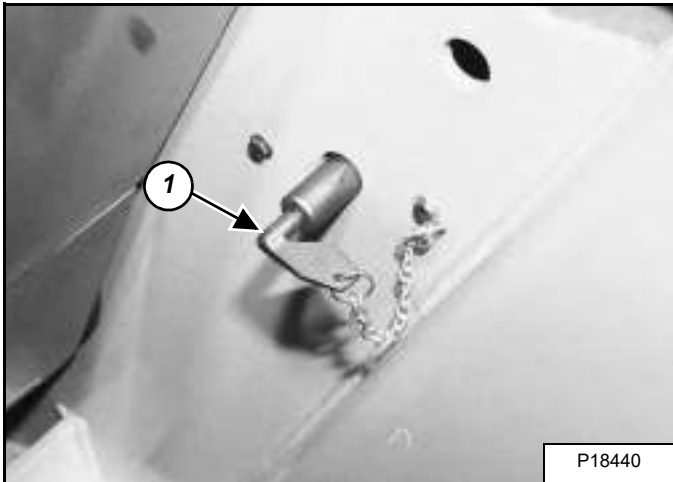


Install the rear tires with eight nuts (Item 1) **[Figure 40-90-19]** and washers.

Tighten the nuts to 300 N•m (221 ft-lb) torque.

Raise the machine and remove the jackstands. Lower the machine and remove the blocks from the front tire .

Figure 40-90-20



Rotate the battery disconnect switch (Item 1) **[Figure 40-90-20]** to the left, to restore the power supply from the battery.

Fill the hydraulic reservoir. (See Replacing Hydraulic Fluid on Page 10-100-2.)

MAIN FRAME

OPERATOR CAB (S/N AC1913000 & ABOVE)	50-11-1
Removal And Installation	50-11-1
OPERATOR CAB (S/N AC1912999 & BELOW)	50-10-1
Removal And Installation	50-10-1
OPERATOR SEAT	50-20-1
Removal And Installation	50-20-1
Assembly And Disassembly	50-20-1
BOOM ASSEMBLY	50-30-1
Removal And Installation	50-30-1
INNER BOOM	50-40-1
Removal	50-40-1
Installation	50-40-3
WEAR PADS (FRONT)	50-50-1
Removal And Installation	50-50-1
WEAR PADS (REAR)	50-51-1
Removal	50-51-1
Installation	50-51-1
ENGINE COVER	50-60-1
Locking Mechanism Removal And Installation	50-60-1
Removal And Installation	50-60-1
Lock	50-60-2
FUEL TANK	50-70-1
Removal And Installation	50-70-1
BOB-TACH	50-80-1
Removal And Installation	50-80-1
COUNTERWEIGHT	50-90-1
Removal And Installation	50-90-1
FENDER	50-100-1
Removal And Installation	50-100-1
JOYSTICK PANEL (S/N AC1912999 & BELOW)	50-110-1
Joystick Panel Cover Removal and Installation	50-110-1
JOYSTICK PANEL (S/N AC1913000 & ABOVE)	50-111-1
Joystick Panel Cover Removal and Installation	50-111-1

Dealer Copy -- Not for Resale

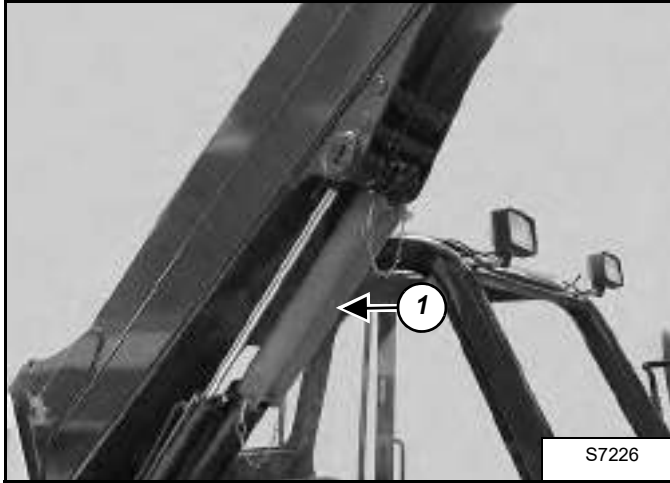
DASH COVER/STEERING COLUMN COVER (S/N AC1912999 & BELOW)	50-120-1
Steering Column Cover Removal And Installation	50-120-1
Dash Cover Removal And Installation	50-120-2
DASH COVER/STEERING COLUMN COVER (S/N AC1913000 & ABOVE)	50-121-1
Removal And Installation	50-121-1

Dealer Copy -- Not for Resale

OPERATOR CAB (S/N AC1912999 & BELOW)

Removal And Installation

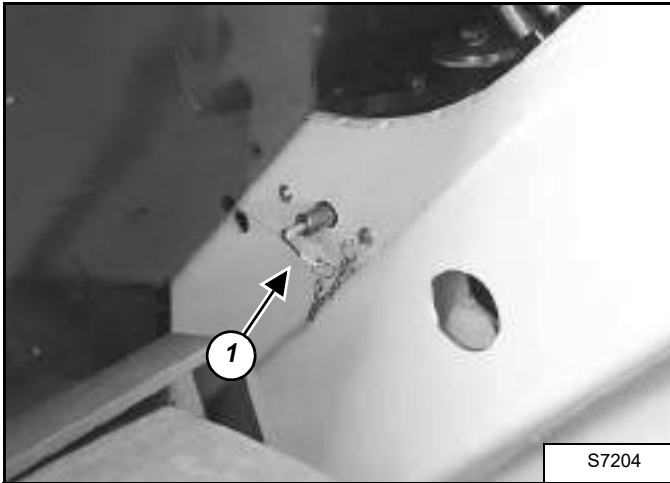
Figure 50-10-1



Raise the boom and install the boom stop (Item 1) [Figure 50-10-1].

Relieve hydraulic pressure.

Figure 50-10-2

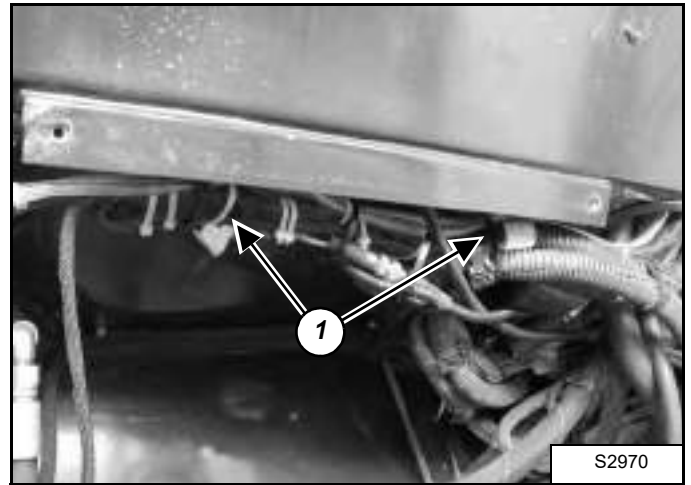


Rotate the battery disconnect switch (Item 1) [Figure 50-10-2] to the right, to disconnect the power supply from the battery.

Remove the battery access cover and battery (See Removal And Installation on Page 60-20-1.).

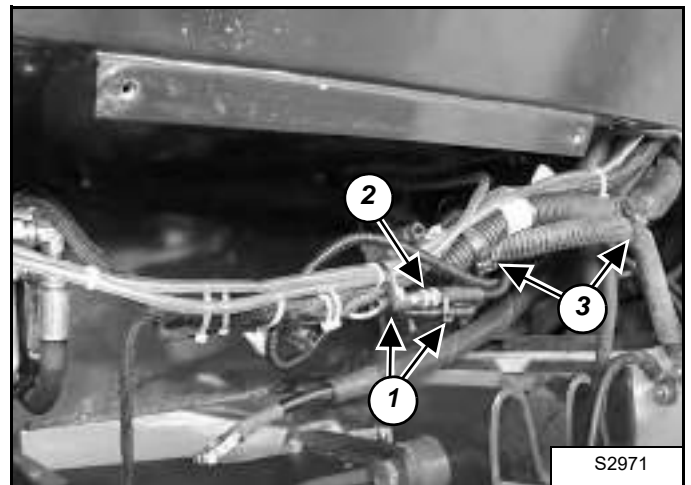
NOTE: Mark all hoses and electrical connectors for correct installation.

Figure 50-10-3



Remove the tie straps (Item 1) [Figure 50-10-3] that attach the harness to the cab frame.

Figure 50-10-4



Remove the tie straps (Item 1) from the connector. Disconnect the connector (Item 2) [Figure 50-10-4].

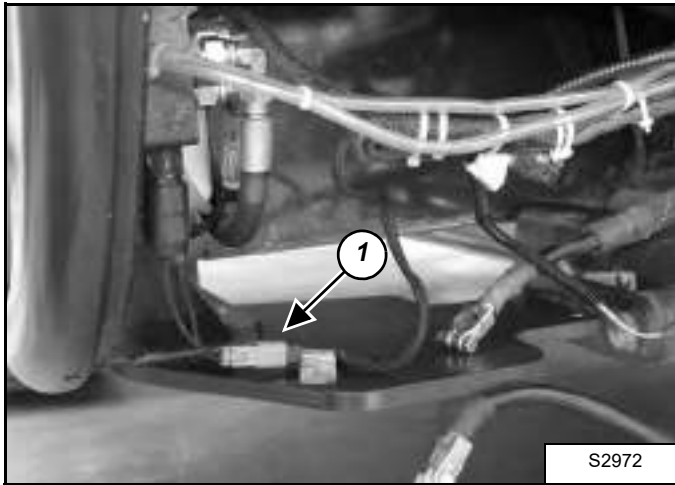
Remove the tie straps (Item 3) [Figure 50-10-4] from the harnesses.

Dealer Copy -- Not for Resale

**OPERATOR CAB (S/N AC1912999 & BELOW)
(CONT'D)**

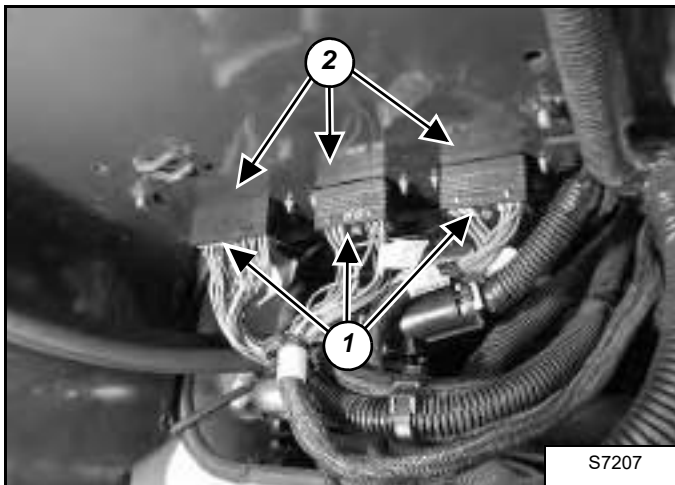
Removal And Installation (Cont'd)

Figure 50-10-5



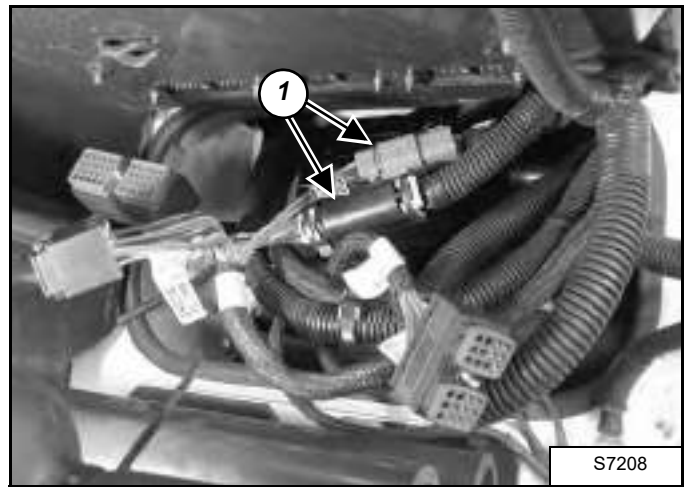
Disconnect the parking brake connector (Item 1) **[Figure 50-10-5]**.

Figure 50-10-6



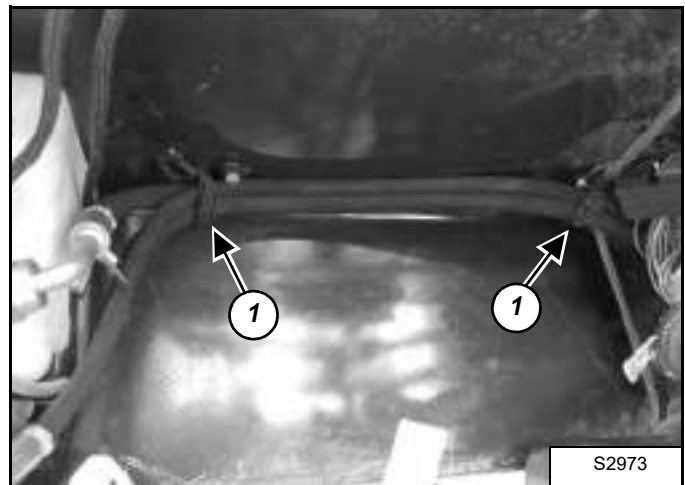
Loosen the screws (Item 1) and disconnect the three electrical connectors (Item 2) **[Figure 50-10-6]**.

Figure 50-10-7



Unplug the two electrical connectors (Item 1) **[Figure 50-10-7]**.

Figure 50-10-8



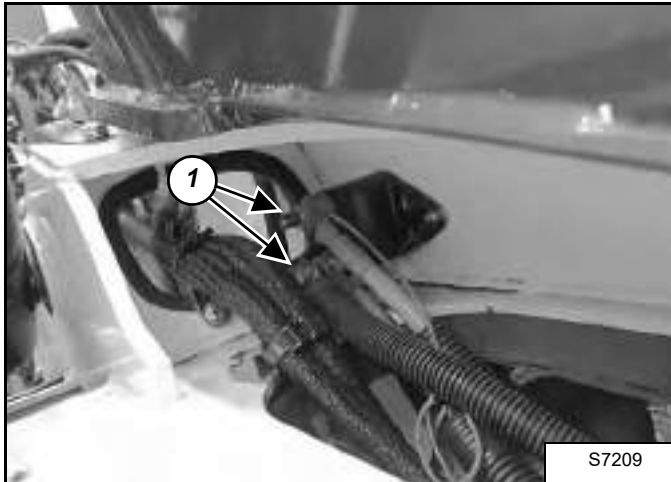
Remove the tie straps (Item 1) **[Figure 50-10-8]** from the parking brake hydraulic hoses.

Dealer Copy -- Not for Resale

**OPERATOR CAB (S/N AC1912999 & BELOW)
(CONT'D)**

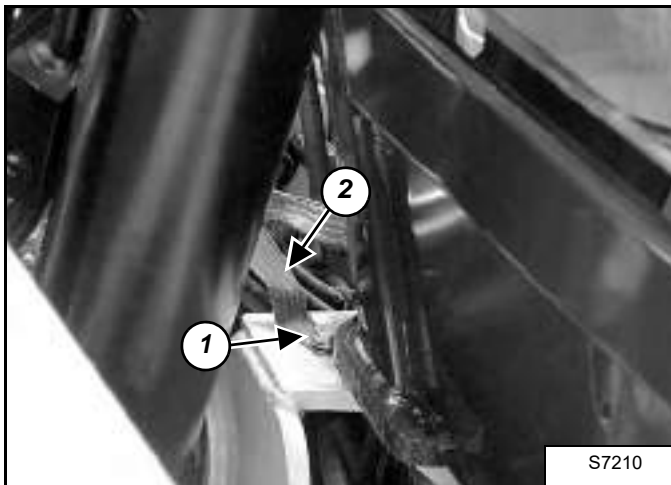
Removal And Installation (Cont'd)

Figure 50-10-9



Mark the wires and remove the two nuts (Item 1) [Figure 50-10-9] and wirings from the battery disconnect switch.

Figure 50-10-10



Remove the nut (Item 1), and bolt. Remove the grounding strap (Item 2) [Figure 50-10-10].

! WARNING

Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a physician familiar with this injury is not received immediately.

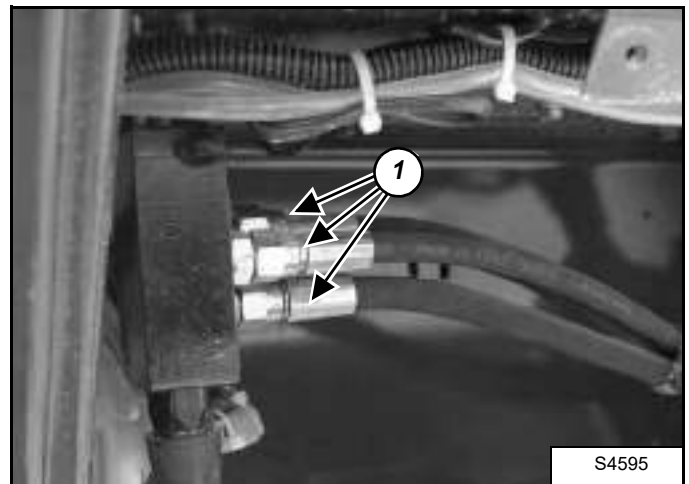
W-2145-0290

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Figure 50-10-11



Remove the three hydraulic hoses (Item 1) [Figure 50-10-11].

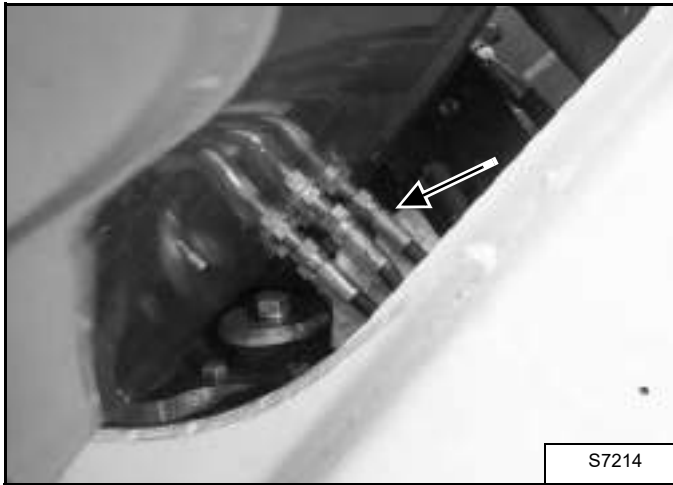
Remove any necessary nylon ties.

Dealer Copy -- Not for Resale

**OPERATOR CAB (S/N AC1912999 & BELOW)
(CONT'D)**

Removal And Installation (Cont'd)

Figure 50-10-12



Mark and remove the five hydraulic hoses [Figure 50-10-12].

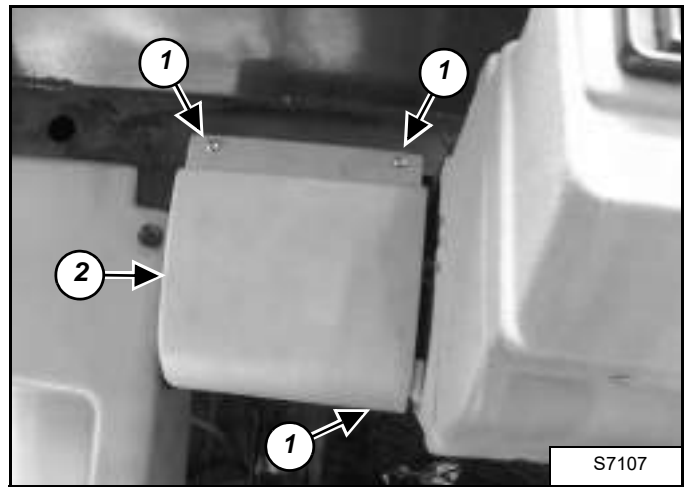
Figure 50-10-13



Remove, mark and cap the seven hoses on the right side of the cab [Figure 50-10-13].

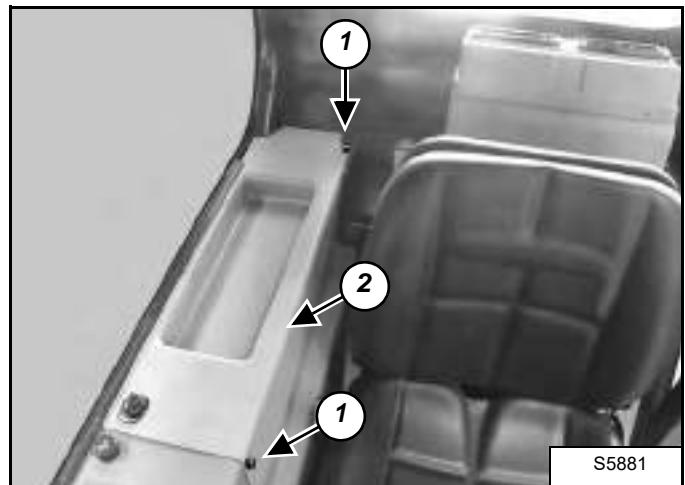
If machine is equipped with air conditioning, remove the refrigerant from the A/C system. (See "Reclamation Procedure" on page 80-100-1.)

Figure 50-10-14



Remove the three screws (Item 1) and remove the cover (Item 2) [Figure 50-10-14].

Figure 50-10-15



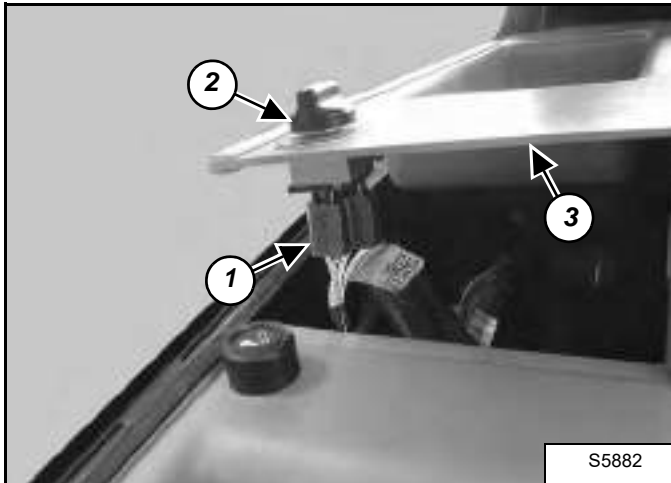
Remove the knobs (Item 1) and raise the fuse box cover (Item 2) [Figure 50-10-15] gently.

Dealer Copy -- Not for Resale

**OPERATOR CAB (S/N AC1912999 & BELOW)
(CONT'D)**

Removal And Installation (Cont'd)

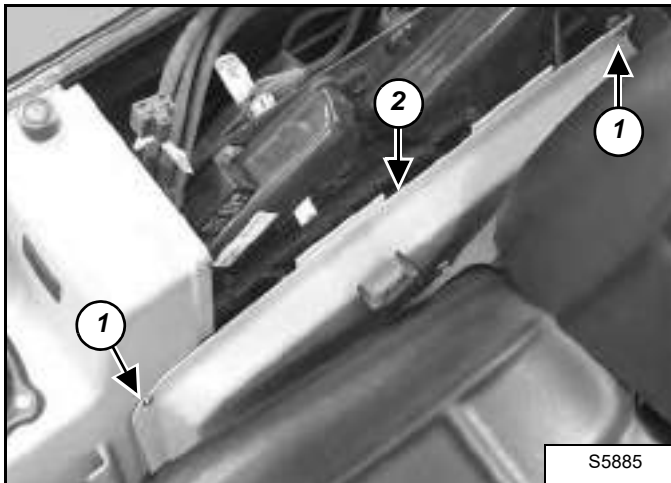
Figure 50-10-16



Remove the main wire harness connector (Item 1) from the A/C fan switch (Item 2) [Figure 50-10-16].

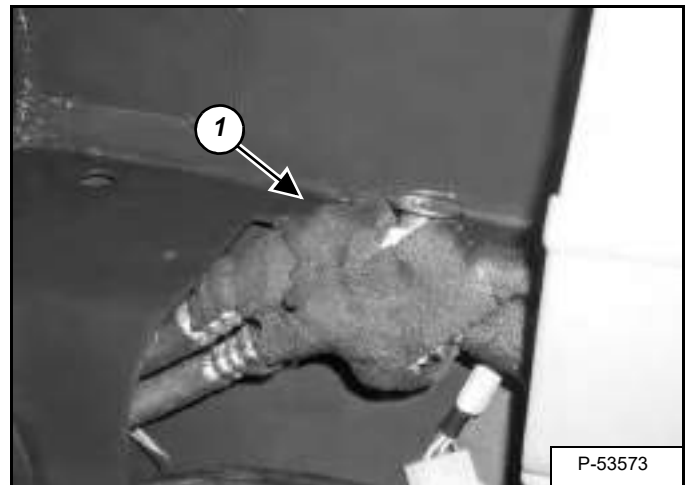
Remove the fuse box cover (Item 3) [Figure 50-10-16].

Figure 50-10-17



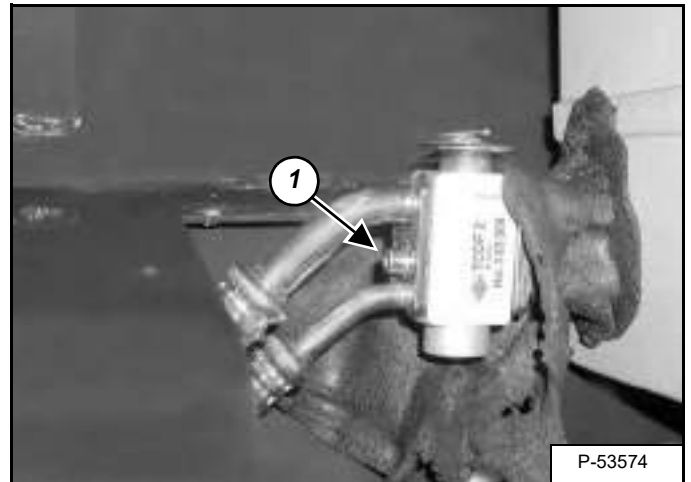
Remove two screws (Item 1) to remove the side cover (Item 2) [Figure 50-10-17].

Figure 50-10-18



Temporarily remove the protective covering (Item 1) [Figure 50-10-18] from the A/C hoses and expansion valve.

Figure 50-10-19



Remove the bolt (Item 1) and plate (Item 2) [Figure 50-10-19]. Remove the A/C hoses from the valve.

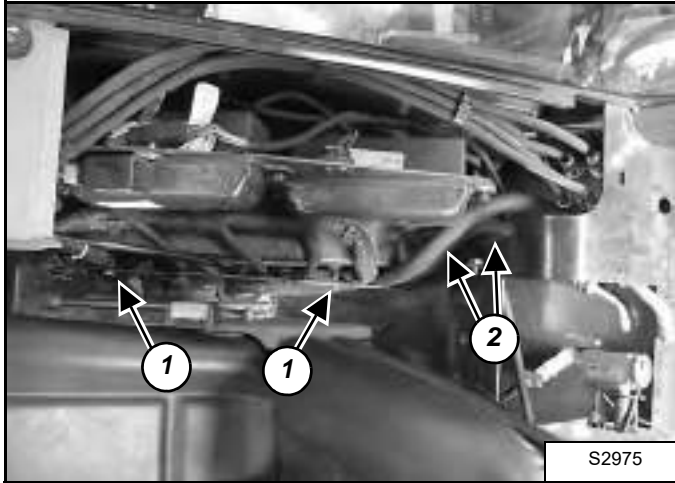
NOTE: Plug the A/C hoses to prevent contamination.

Dealer Copy -- Not for Resale

**OPERATOR CAB (S/N AC1912999 & BELOW)
(CONT'D)**

Removal And Installation (Cont'd)

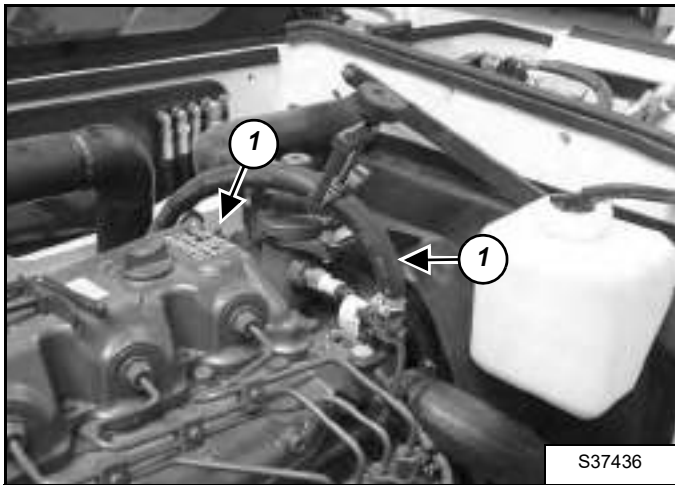
Figure 50-10-20



Loosen the bolts (Item 1) and remove the A/C hoses (Item 2) [Figure 50-10-20] from the cab by pulling them into the battery compartment.

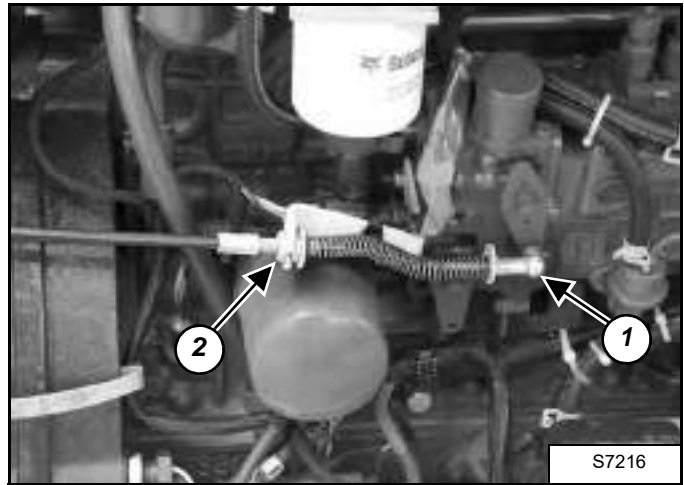
Open the engine cover.

Figure 50-10-21



Remove and plug the cab heater hoses (Item 1) [Figure 50-10-21].

Figure 50-10-22



Remove the engine speed control cable (Item 1) [Figure 50-10-22] from the linkage.

Remove the engine speed control cable from the mounting bracket (Item 2) [Figure 50-10-22].

Remove any necessary nylon ties, carefully remove the speed control cable from the engine compartment.

NOTE: Adjust the engine speed control cable during installation. (See Removal And Installation on Page 70-40-1.)

Close the engine cover.

Figure 50-10-23



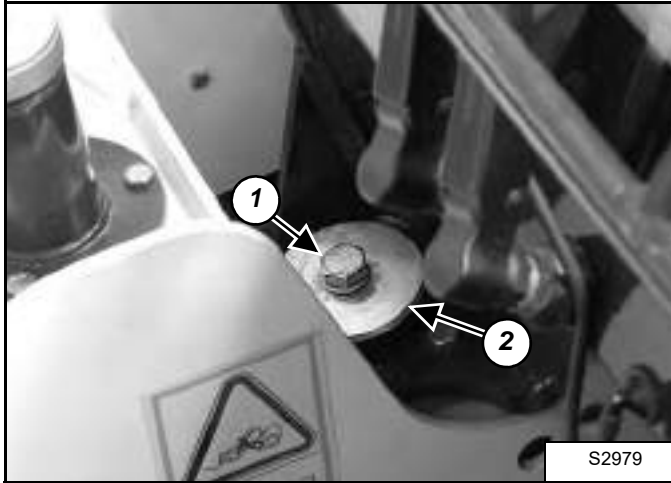
Install a hoist to lift and support the cab [Figure 50-10-23].

Apply light lifting pressure to the hoist to support the cab while the mounting hardware is being removed.

**OPERATOR CAB (S/N AC1912999 & BELOW)
(CONT'D)**

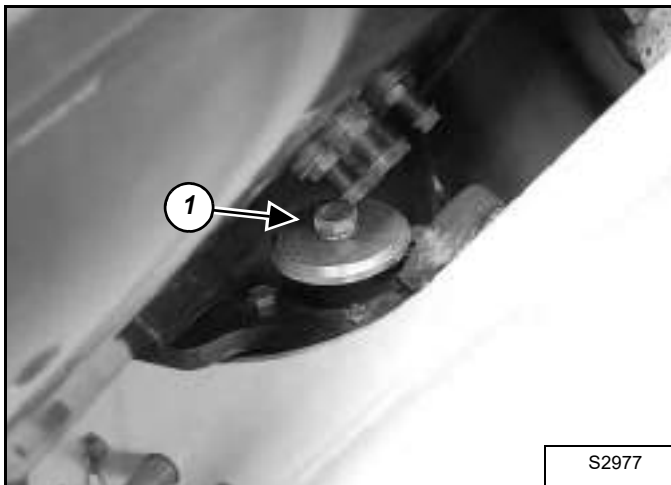
Removal And Installation (Cont'd)

Figure 50-10-24



Remove the cab mount bolt (Item 1) and washer (Item 2) [Figure 50-10-24] from the front of the cab.

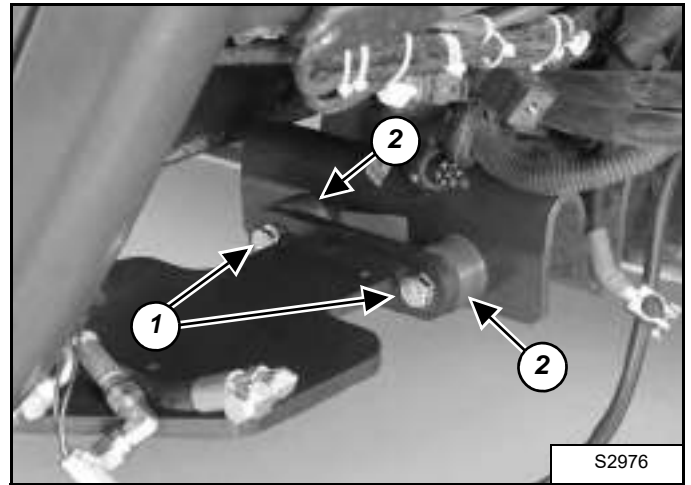
Figure 50-10-25



Loosen the rear mounting bolt (Item 1) [Figure 50-10-25] remove the nut.

NOTE: The bolt cannot be removed from the mount.

Figure 50-10-26



Remove the two bolts (Item 1) and plastic cushions (Item 2) [Figure 50-10-26].

Figure 50-10-27



Lift and remove the cab [Figure 50-10-27].

Dealer Copy -- Not for Resale



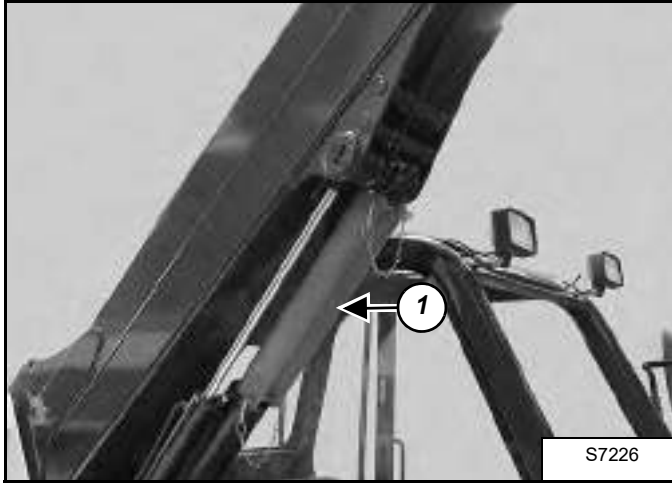
Bobcat®

Dealer Copy -- Not for Resale

OPERATOR CAB (S/N AC1913000 & ABOVE)

Removal And Installation

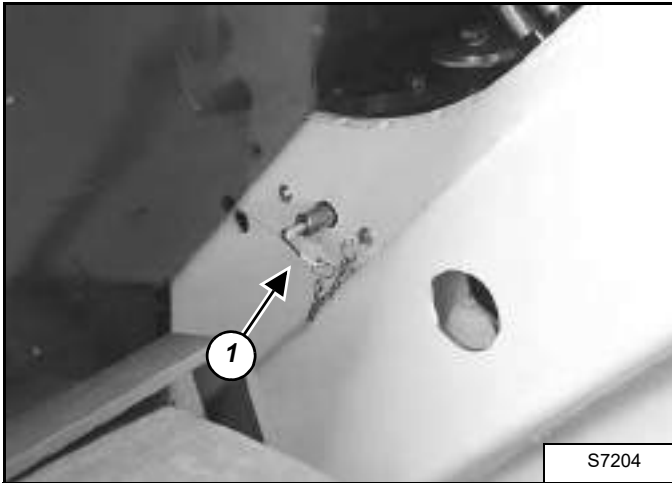
Figure 50-11-1



Raise the boom and install the boom stop (Item 1) [Figure 50-11-1].

Relieve hydraulic pressure.

Figure 50-11-2

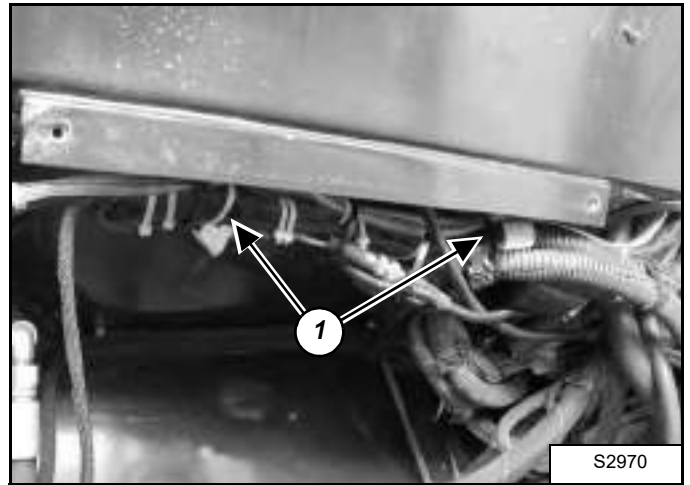


Rotate the battery disconnect switch (Item 1) [Figure 50-11-2] to the right, to disconnect the power supply from the battery.

Remove the battery access cover and battery (See Removal And Installation on Page 60-20-1.).

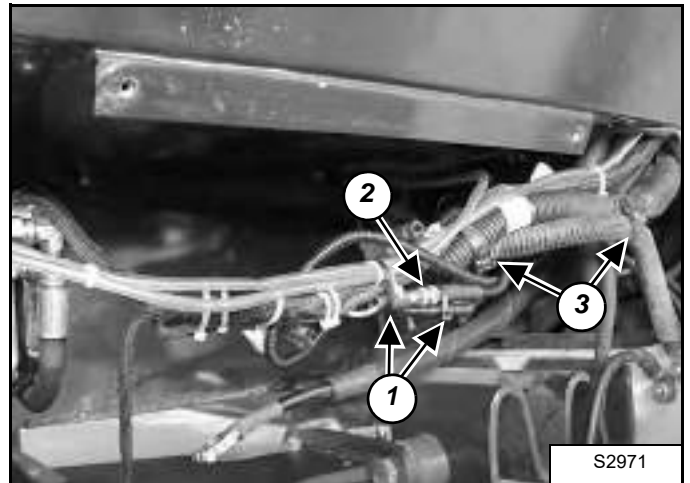
NOTE: Mark all hoses and electrical connectors for correct installation.

Figure 50-11-3



Remove the tie straps (Item 1) [Figure 50-11-3] that attach the harness to the cab frame.

Figure 50-11-4



Remove the tie straps (Item 1) from the connector. Disconnect the connector (Item 2) [Figure 50-11-4].

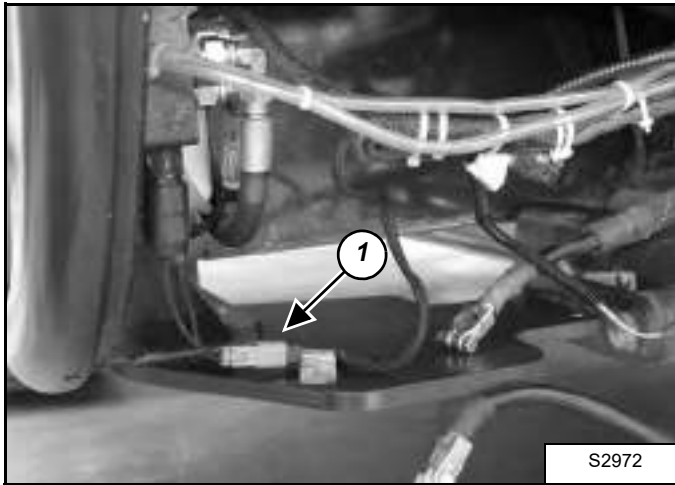
Remove the tie straps (Item 3) [Figure 50-11-4] from the harnesses.

Dealer Copy -- Not for Resale

**OPERATOR CAB (S/N AC1913000 & ABOVE)
(CONT'D)**

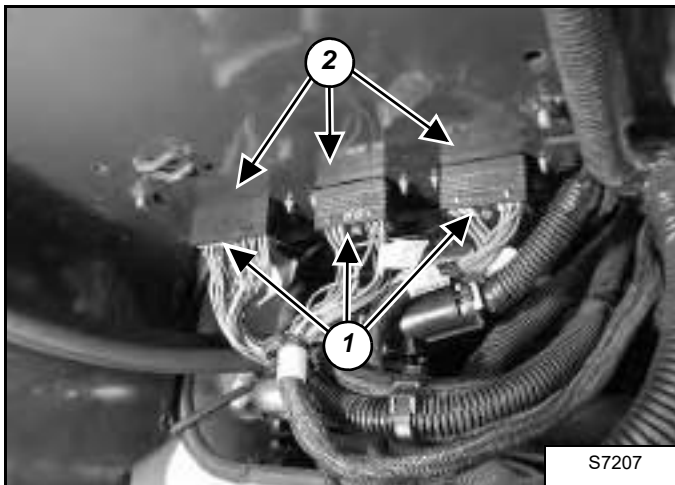
Removal And Installation (Cont'd)

Figure 50-11-5



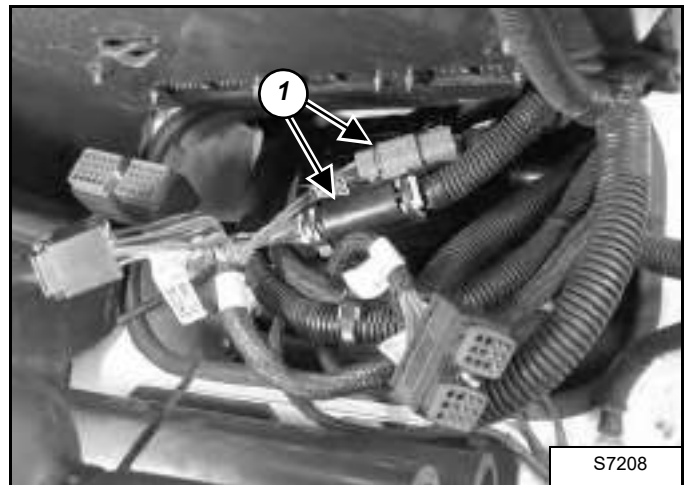
Disconnect the parking brake connector (Item 1) [Figure 50-11-5].

Figure 50-11-6



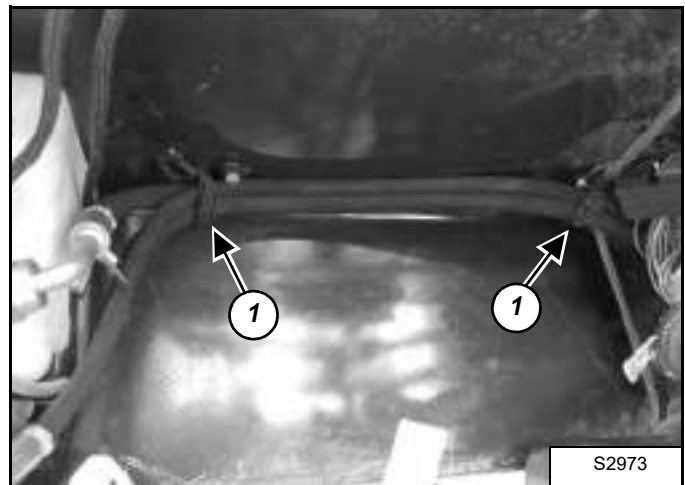
Loosen the screws (Item 1) and disconnect the three electrical connectors (Item 2) [Figure 50-11-6].

Figure 50-11-7



Unplug the two electrical connectors (Item 1) [Figure 50-11-7].

Figure 50-11-8



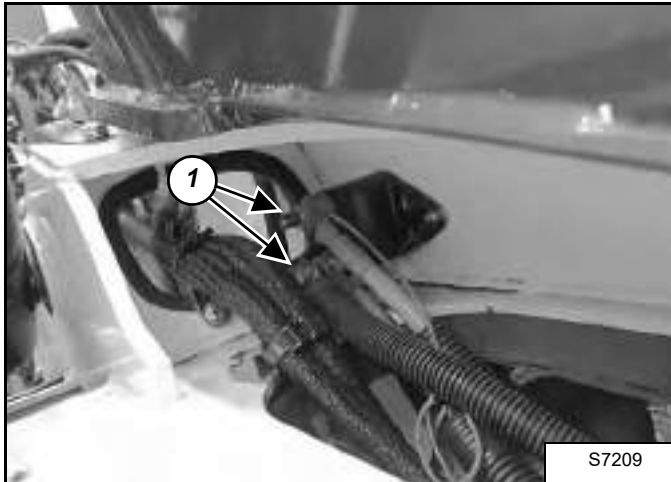
Remove the tie straps (Item 1) [Figure 50-11-8] from the parking brake hydraulic hoses.

Dealer Copy -- Not for Resale

**OPERATOR CAB (S/N AC1913000 & ABOVE)
(CONT'D)**

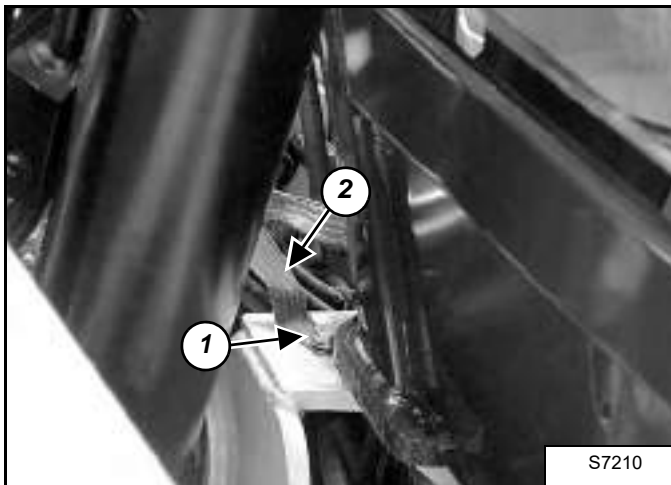
Removal And Installation (Cont'd)

Figure 50-11-9



Mark the wires and remove the two nuts (Item 1) [Figure 50-11-9] and wirings from the battery disconnect switch.

Figure 50-11-10



Remove the nut (Item 1), and bolt. Remove the grounding strap (Item 2) [Figure 50-11-10].

⚠ WARNING

Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin. This can cause serious injury and possible death if proper medical treatment by a physician familiar with this injury is not received immediately.

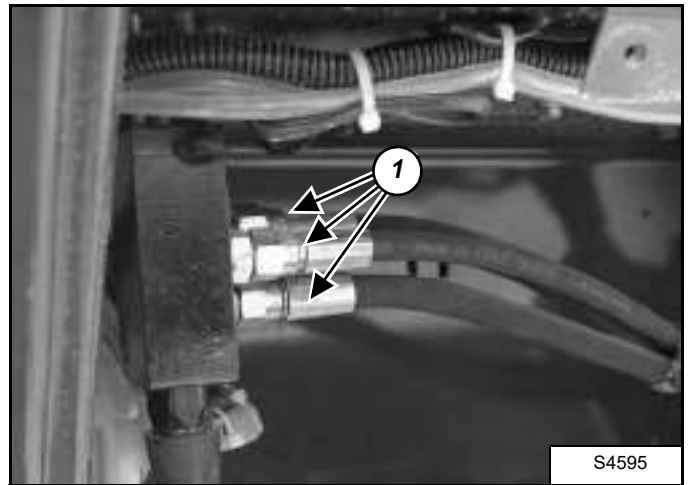
W-2145-0290

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

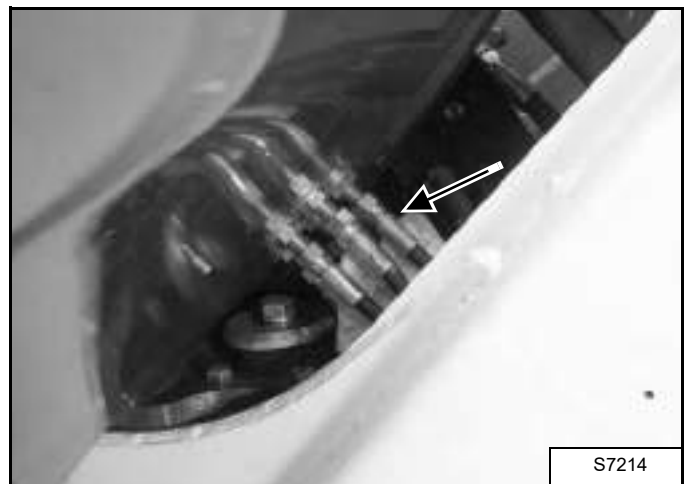
Figure 50-11-11



Remove the three hydraulic hoses (Item 1) [Figure 50-11-11].

Remove any necessary nylon ties.

Figure 50-11-12



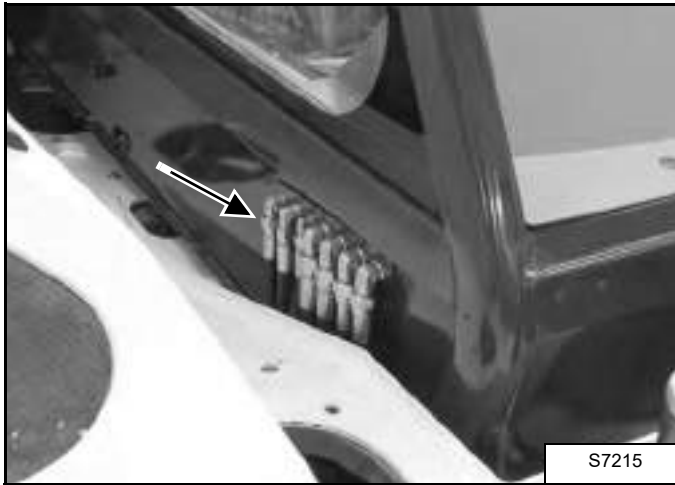
Mark and remove the five hydraulic hoses [Figure 50-11-12].

Dealer Copy -- Not for Resale

**OPERATOR CAB (S/N AC1913000 & ABOVE)
(CONT'D)**

Removal And Installation (Cont'd)

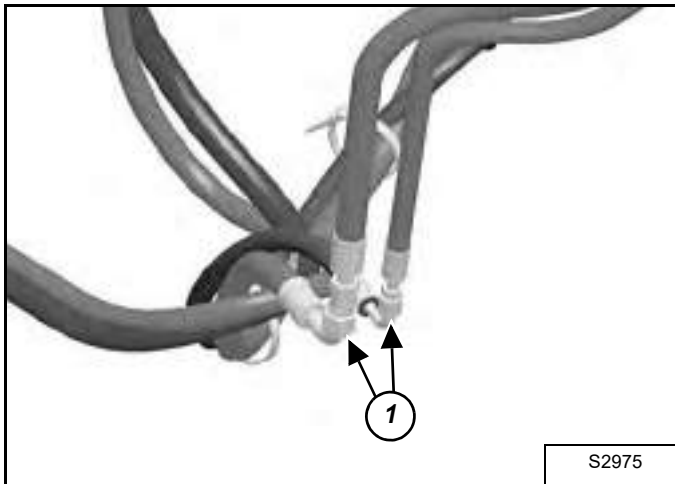
Figure 50-11-13



Remove, mark and cap the seven hoses on the right side of the cab [Figure 50-11-13].

If machine is equipped with air conditioning, remove the refrigerant from the A/C system. (See "Reclamation Procedure" on page 80-100-1.)

Figure 50-11-14

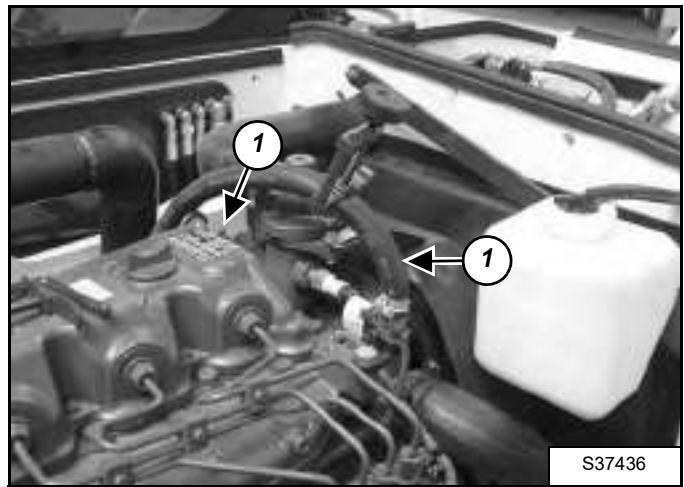


In the battery compartment, mark and disconnect the A/C compressor hoses (if equipped) (Item 1) [Figure 50-11-14] from the cab A/C hoses.

NOTE: Plug the A/C hoses (Item 1) [Figure 50-11-14] to prevent contamination.

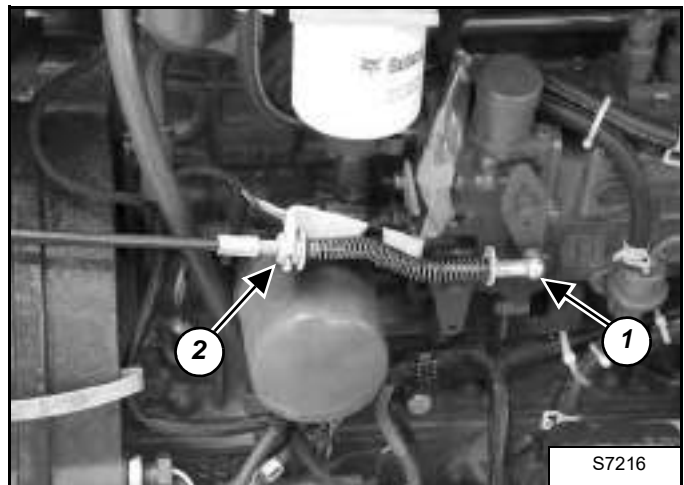
Open the engine cover.

Figure 50-11-15



Remove and plug the cab heater hoses (Item 1) [Figure 50-11-15].

Figure 50-11-16



Remove the engine speed control cable (Item 1) [Figure 50-11-16] from the linkage.

Remove the engine speed control cable from the mounting bracket (Item 2) [Figure 50-11-16].

Remove any necessary nylon ties, carefully remove the speed control cable from the engine compartment.

NOTE: Adjust the engine speed control cable during installation. (See Removal And Installation on Page 70-40-1.)

Close the engine cover.

Dealer Copy -- Not for Resale

**OPERATOR CAB (S/N AC1913000 & ABOVE)
(CONT'D)**

Removal And Installation (Cont'd)

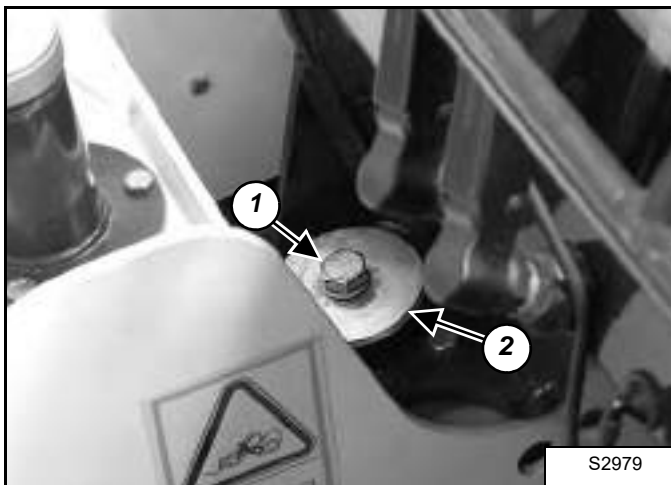
Figure 50-11-17



Install a hoist to lift and support the cab [Figure 50-11-17].

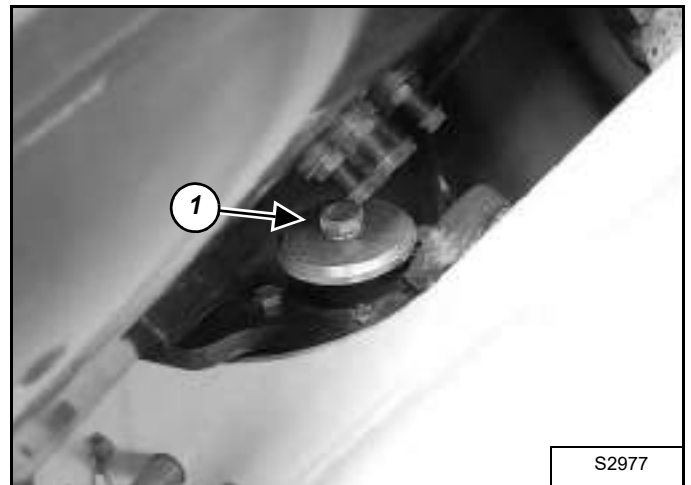
Apply light lifting pressure to the hoist to support the cab while the mounting hardware is being removed.

Figure 50-11-18



Remove the cab mount bolt (Item 1) and washer (Item 2) [Figure 50-11-18] from the front of the cab.

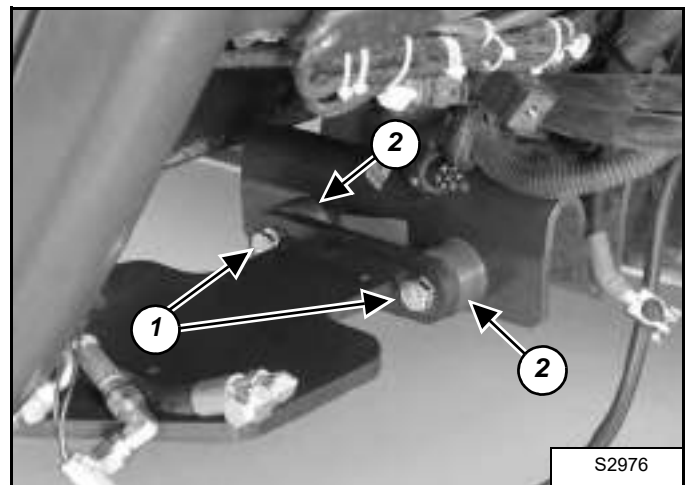
Figure 50-11-19



Loosen the rear mounting bolt (Item 1) [Figure 50-11-19] remove the nut.

NOTE: The bolt cannot be removed from the mount.

Figure 50-11-20



Remove the two bolts (Item 1) and plastic cushions (Item 2) [Figure 50-11-20].

Dealer Copy -- Not for Resale

**OPERATOR CAB (S/N AC1913000 & ABOVE)
(CONT'D)**

Removal And Installation (Cont'd)

Figure 50-11-21

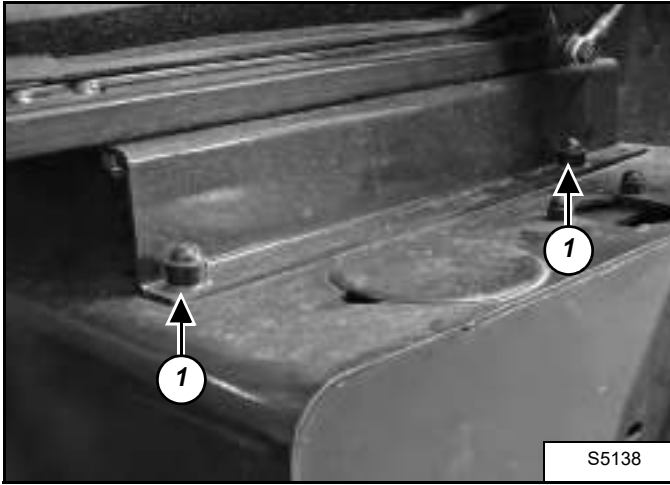


Lift and remove the cab **[Figure 50-11-21]**.

OPERATOR SEAT

Removal And Installation

Figure 50-20-1



Remove the bolt covers and the bolts beneath (Item 1) [Figure 50-20-1] on both sides of the seat.

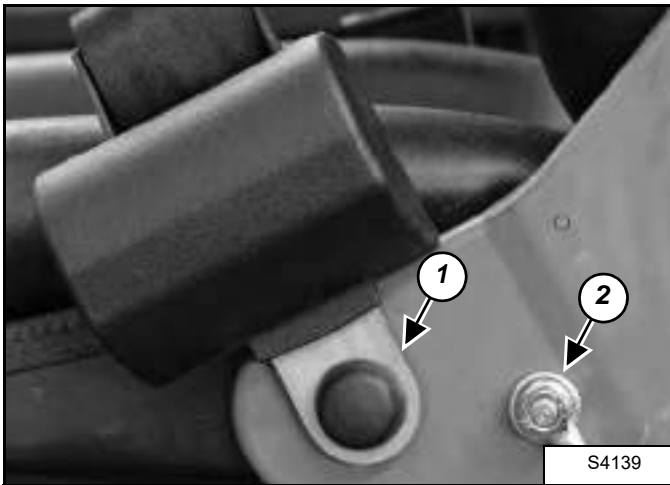
Installation: Tighten to 25 N•m (18 ft-lb) torque.

Remove the seat.

Assembly And Disassembly

Back Cushion removal

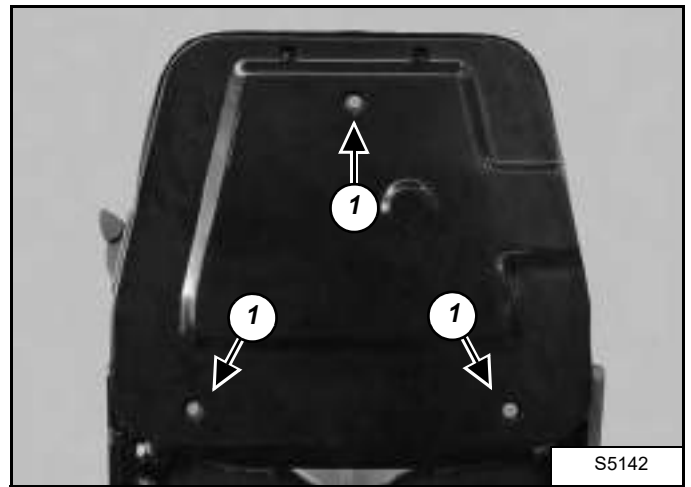
Figure 50-20-2



Remove the seat belt mounting bolt cover and the bolt beneath (Item 1) on both sides. Remove the retainers by removing the bolt (Item 1) [Figure 50-20-2].

Installation: Tighten to 25 N•m (18 ft-lb) torque.

Figure 50-20-3



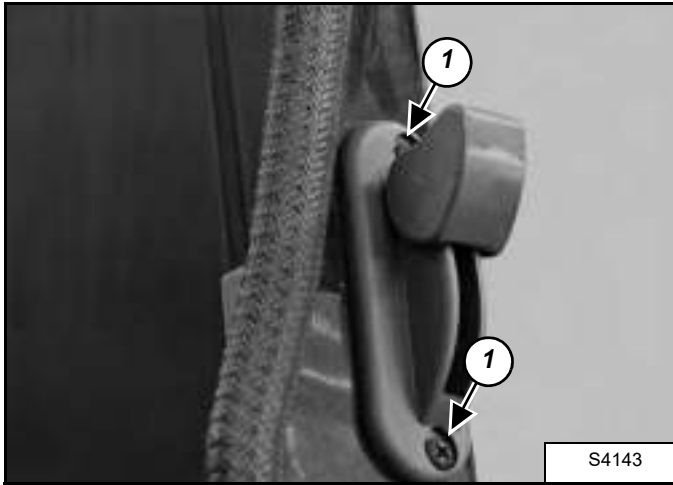
Remove the three cushion mount bolts (Item 1) [Figure 50-20-3] from the back of the seat to remove the back cushion.

OPERATOR SEAT (CONT'D)

Assembly And Disassembly (Cont'd)

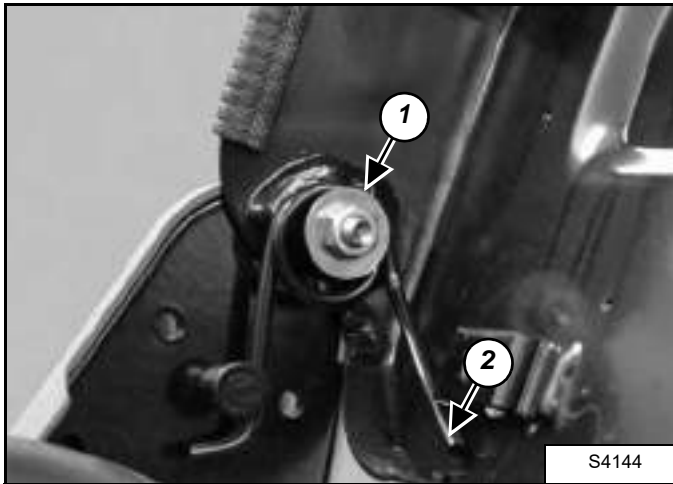
Back cushion pivoting mechanism removal

Figure 50-20-4



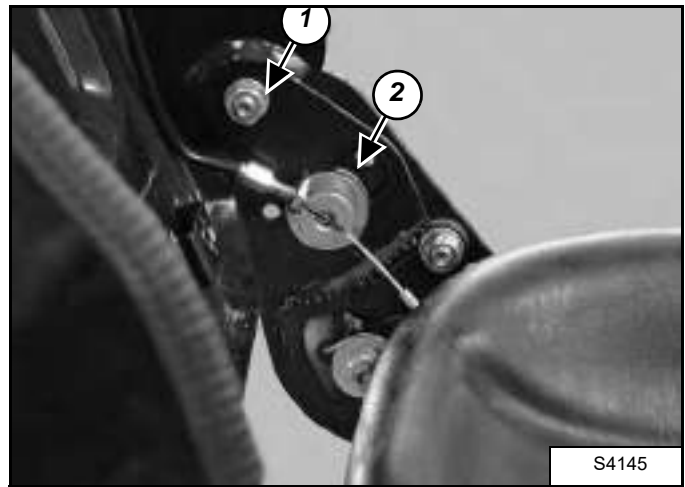
Remove the two screws (Item 1) [Figure 50-20-4].

Figure 50-20-5



Carefully remove the bolt (Item 1) . Make sure you guard the spring (Item 2) [Figure 50-20-5] to avoid it causing damage when released.

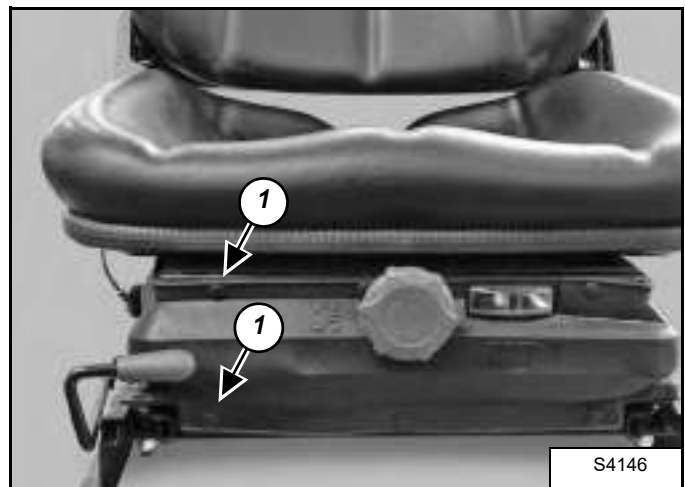
Figure 50-20-6



Remove the bolt (Item 1). Remove the back cushion pivot mechanism (Item 2) [Figure 50-20-6].

Operator Seat Frame removal

Figure 50-20-7

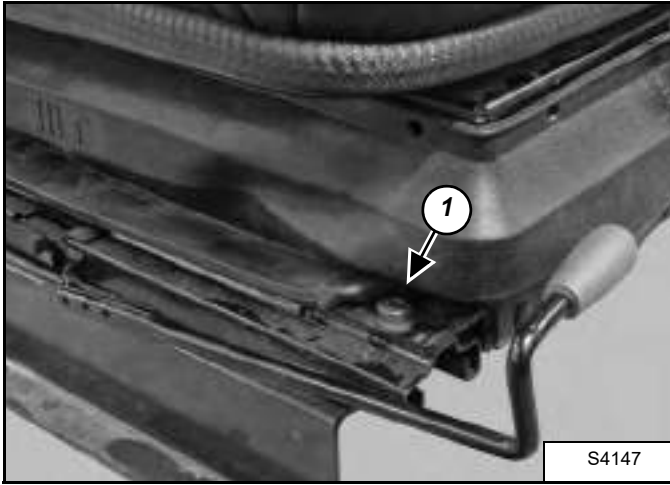


Remove the plastic pins that secure the Frame cover (Item 1) [Figure 50-20-7].

OPERATOR SEAT (CONT'D)

Assembly And Disassembly (Cont'd)

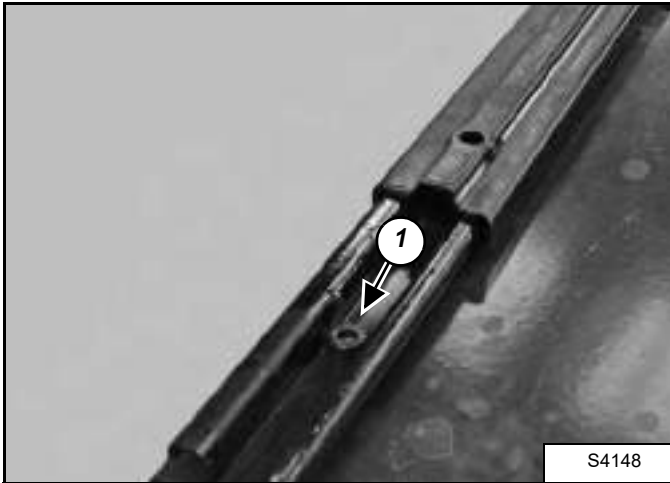
Figure 50-20-8



Remove the bolt (Item 1) [Figure 50-20-8] to remove the slide rail from the seat frame (Two bolts per rail).

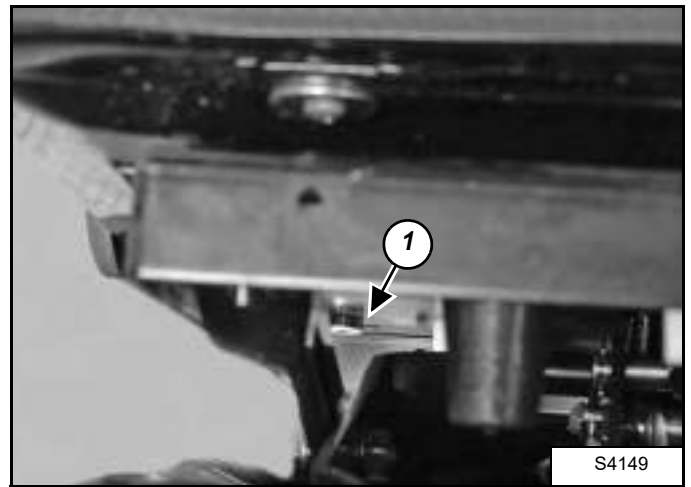
Remove the Frame Cover.

Figure 50-20-9



Remove the bolt (Item 1) [Figure 50-20-9] to remove the slide rail from the seat mounting frame (Two bolts per rail).

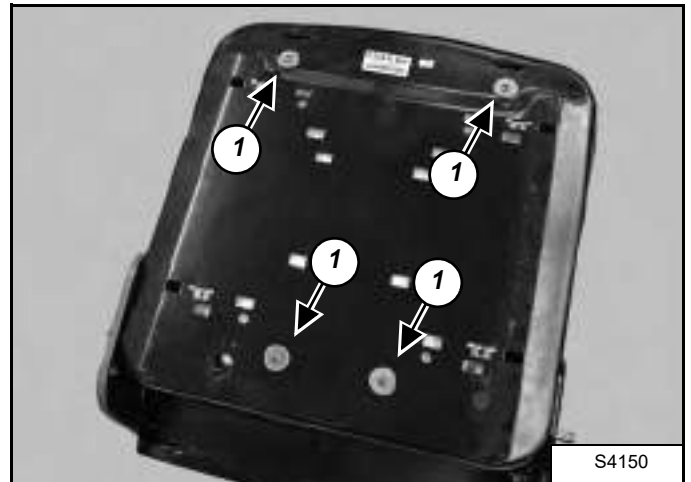
Figure 50-20-10



Remove the bolt (Item 1) [Figure 50-20-10] to remove the cushion seat from the seat frame (Four bolts require loosening).

Installation: Tighten to 25 N•m (18 ft-lb) torque.

Figure 50-20-11



Remove the screws (Item 1) [Figure 50-20-11] to remove the cushion seat from the seat frame.

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

BOOM ASSEMBLY

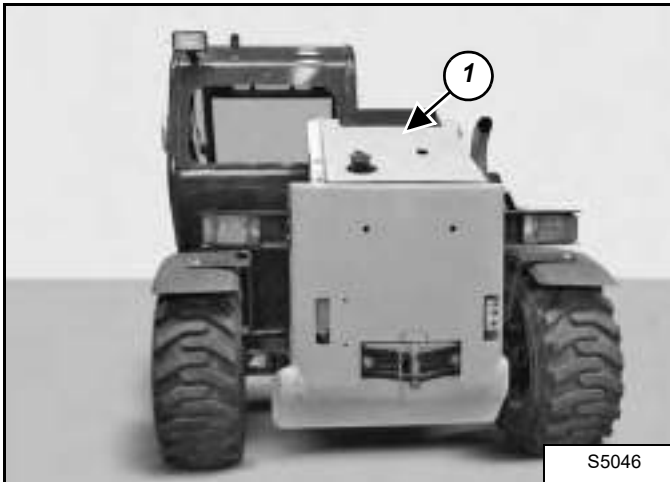
Removal And Installation

Figure 50-30-1



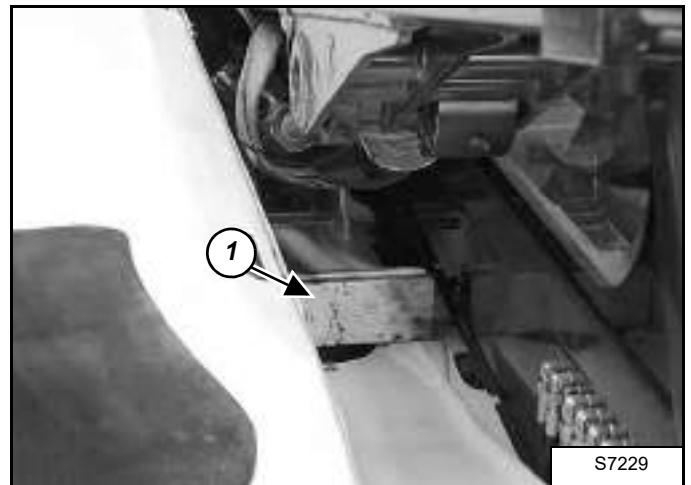
Lower the boom onto adequate stands or blocks as shown [Figure 50-30-1].

Figure 50-30-2



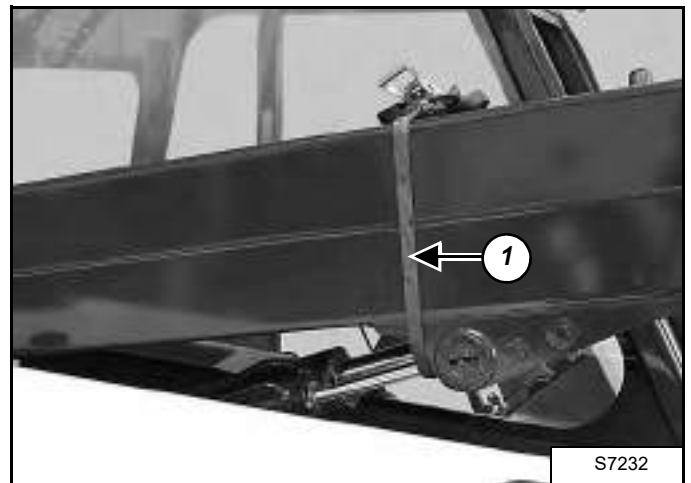
Remove the rear cover (Item 1) [Figure 50-30-2] from the machine.

Figure 50-30-3



Place a wood block (Item 1) [Figure 50-30-3] under the lift cylinder / bucket positioning cylinder.

Figure 50-30-4



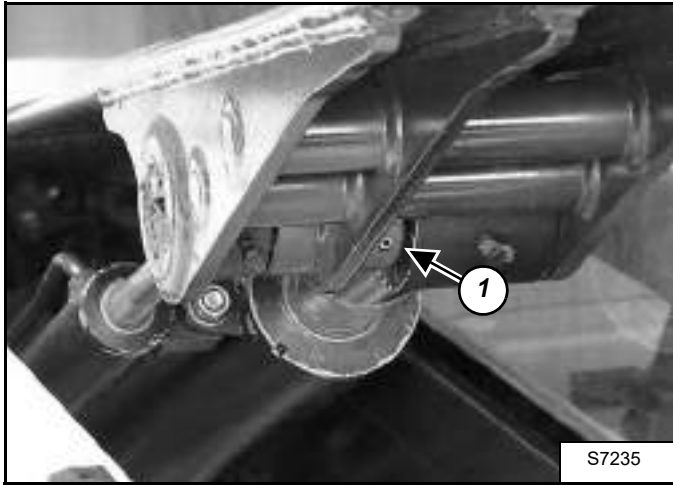
Support the two cylinders using a cinch strap (Item 1) [Figure 50-30-4].

Dealer Copy -- Not for Resale

BOOM ASSEMBLY (CONT'D)

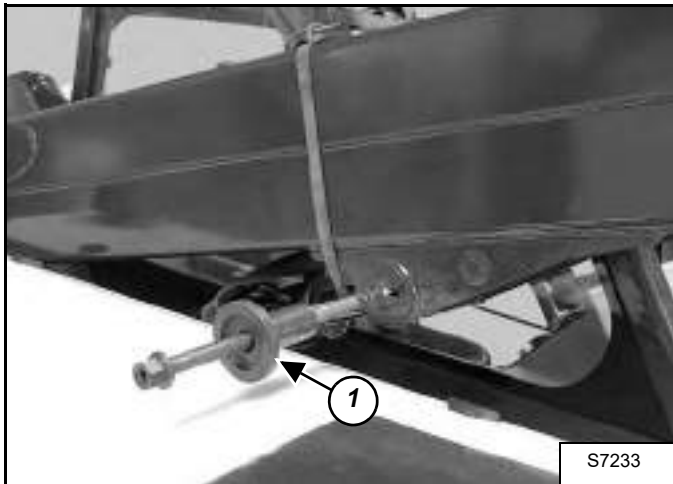
Removal And Installation (Cont'd)

Figure 50-30-5



Remove the pivot pin retainer bolt (Item 1) [Figure 50-30-5] from the lift cylinder/bucket positioning cylinder.

Figure 50-30-6



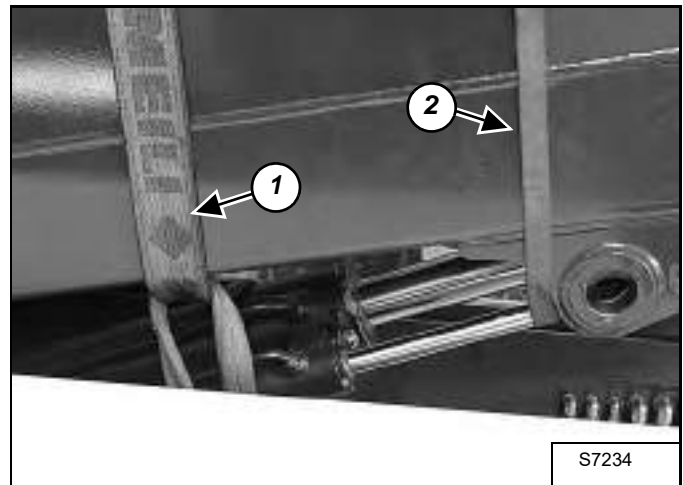
Remove the upper pivot pin using a pin removal tool (Item 1) [Figure 50-30-6].

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

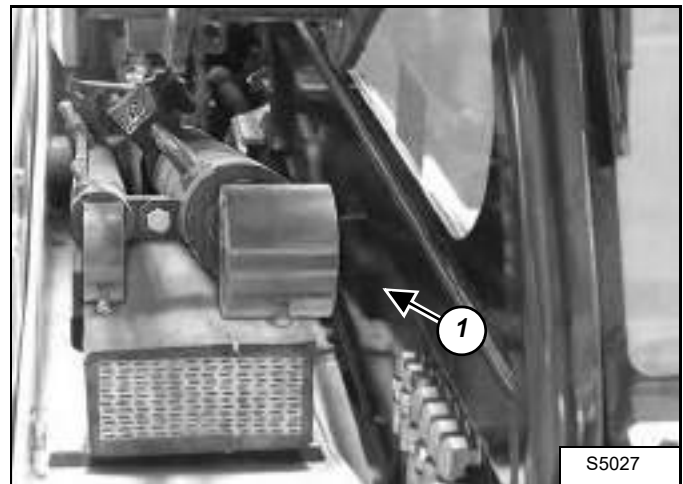
I-2003-0888

Figure 50-30-7



Lift and support the cylinders using a hoist and lifting strap (Item 1). Remove the cinch strap (Item 2) [Figure 50-30-7].

Figure 50-30-8



Lower the two cylinders onto a wood block (Item 1) [Figure 50-30-8].

BOOM ASSEMBLY (CONT'D)

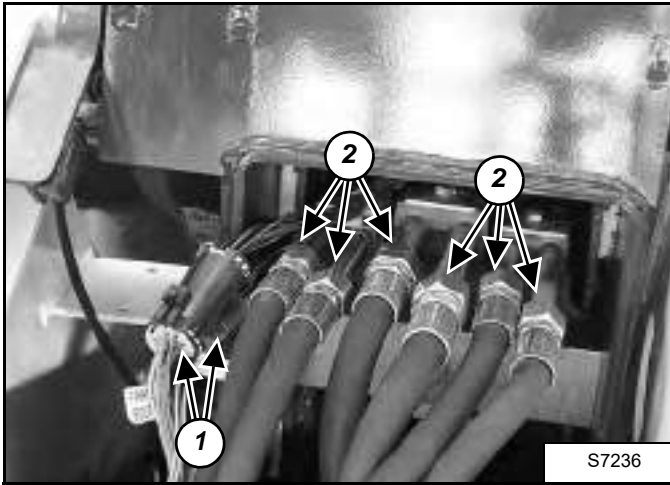
Removal And Installation (Cont'd)

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

Figure 50-30-9

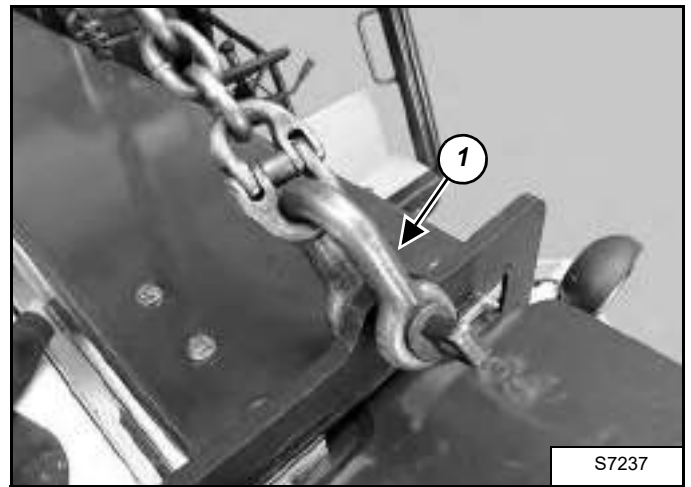


Disconnect the electrical connector(s) (Item 1) [Figure 50-30-9] (if equipped).

Disconnect the six hydraulic hoses (Item 2) [Figure 50-30-9] from the tubelines.

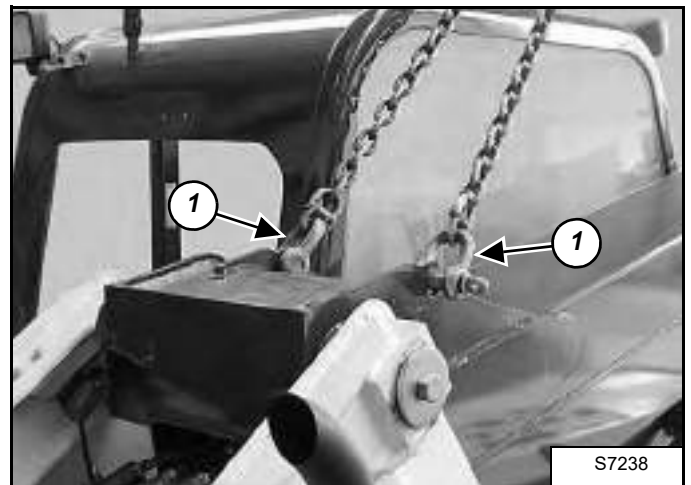
NOTE: Mark the hoses for correct installation. Cap and plug the hoses and tubelines.

Figure 50-30-10



Install a lifting chain (Item 1) [Figure 50-30-10] on the front of the boom.

Figure 50-30-11



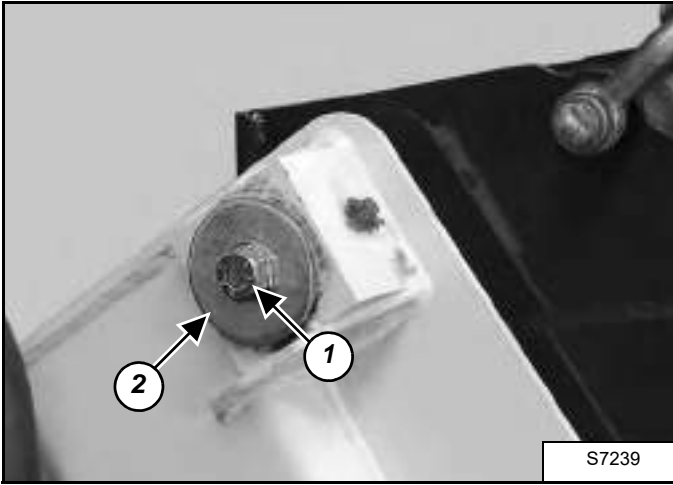
Install a lifting chain (Item 1) [Figure 50-30-11] at the rear of the boom.

Dealer Copy -- Not for Resale

BOOM ASSEMBLY (CONT'D)

Removal And Installation (Cont'd)

Figure 50-30-12



Remove the bolt (Item 1) and washer (Item 2) **[Figure 50-30-12]** from the boom pin.

Installation: Tighten the bolts to 321 N•m (225 ft-lb) torque.

Figure 50-30-13



Remove the boom pin **[Figure 50-30-13]**.

Figure 50-30-14

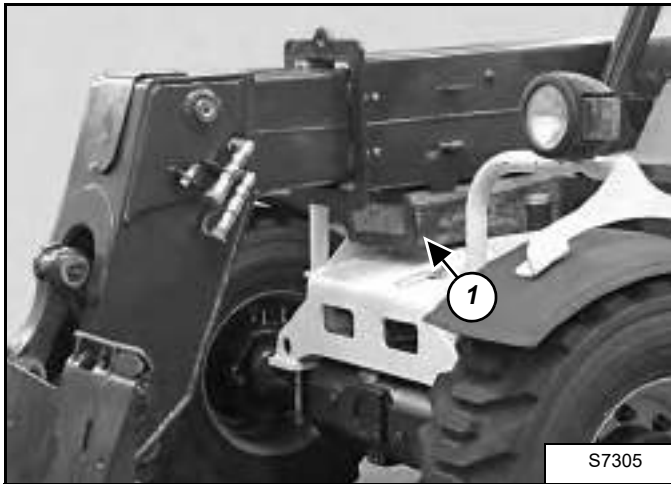


Lift and remove the boom assembly **[Figure 50-30-14]**.

INNER BOOM

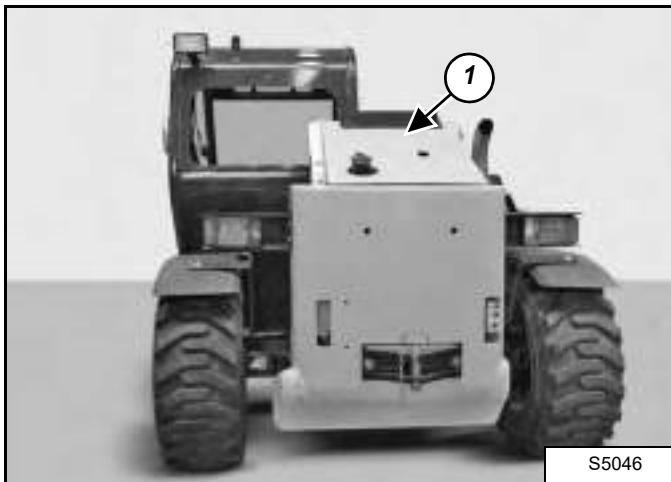
Removal

Figure 50-40-1



Install a wood block (Item 1) [Figure 50-40-1] under the boom, such that it is in a more horizontal position.

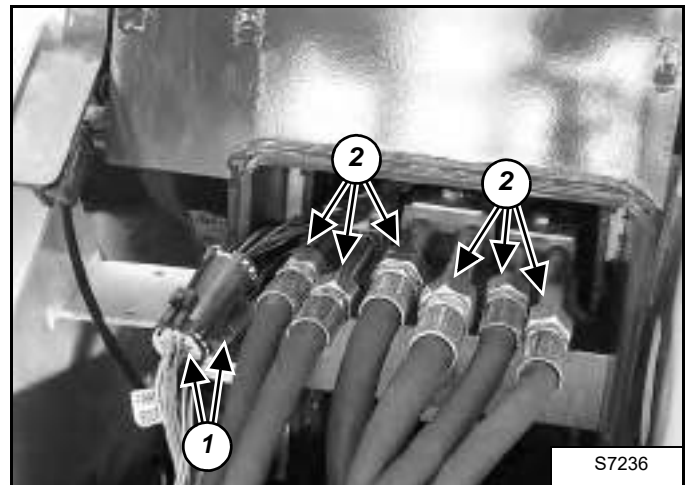
Figure 50-40-2



Remove the rear cover (Item 1) [Figure 50-40-2].

Remove the front wear pads. (See Removal And Installation on Page 50-50-1.)

Figure 50-40-3



Disconnect the electrical connector(s) (Item 1) [Figure 50-40-3] (if equipped).

Disconnect the six hydraulic hoses (Item 2) [Figure 50-40-3] from the tubelines.

NOTE: Mark the hoses for correct installation.

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

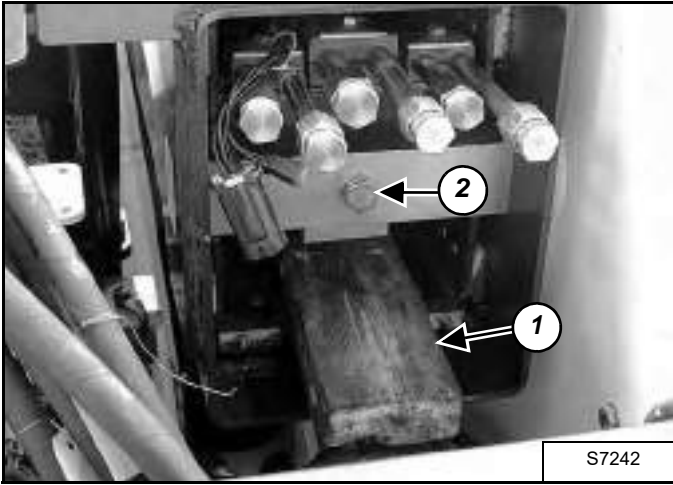
I-2003-0888

Dealer Copy -- Not for Resale

INNER BOOM (CONT'D)

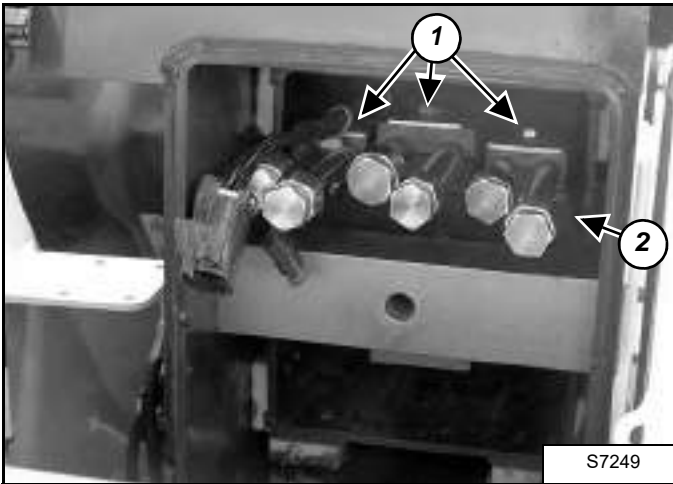
Removal (Cont'd)

Figure 50-40-4



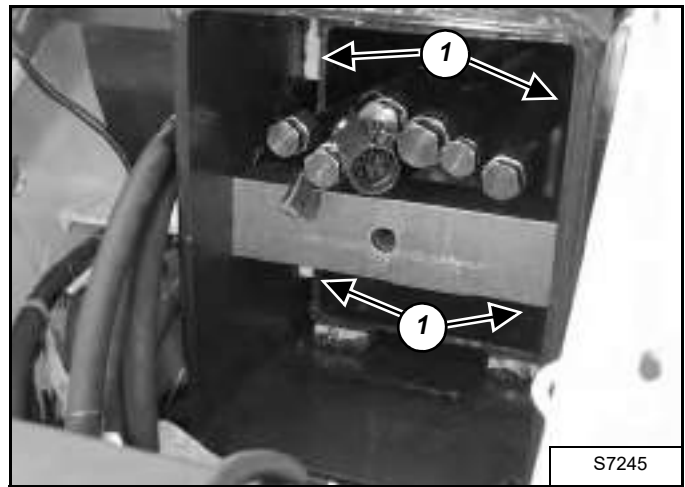
Place a wood block (Item 1) under the cylinder for support. Remove the bolt (Item 2) [Figure 50-40-4] from the cylinder.

Figure 50-40-5



Remove the three tubeline clamps (Item 1) and remove the tubeline bracket (Item 2) [Figure 50-40-5].

Figure 50-40-6



Remove the four side wear pads [Figure 50-40-6] at the rear of the boom.

Figure 50-40-7

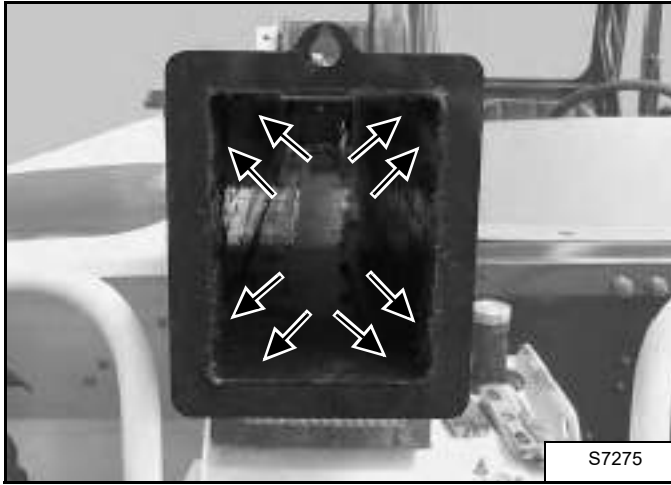


Begin sliding the inner boom from the main boom. Before the inner boom is completely removed, position a hoist and lifting strap on the inner boom. Carefully continue to remove the inner boom completely [Figure 50-40-7].

INNER BOOM (CONT'D)

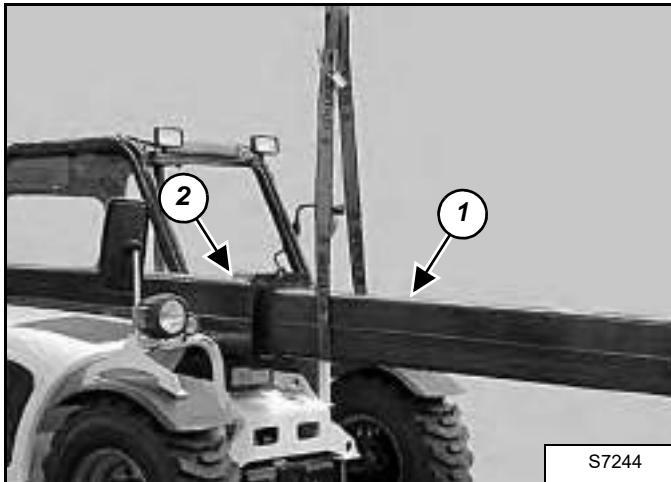
Installation

Figure 50-40-8



Apply grease to the inside top and bottom corners of the main boom [Figure 50-40-8].

Figure 50-40-9

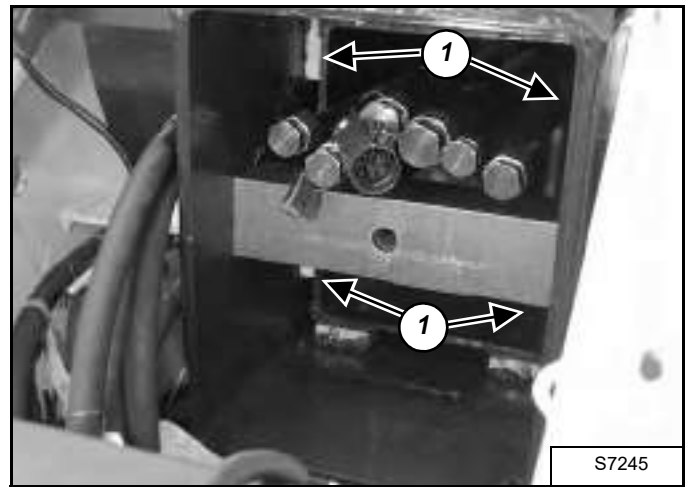


Install the end of the inner boom (Item 1) into the main boom (Item 2) [Figure 50-40-9] approximately 610 mm (2 ft).

Install the front wear pads. (See Removal And Installation on Page 50-50-1.)

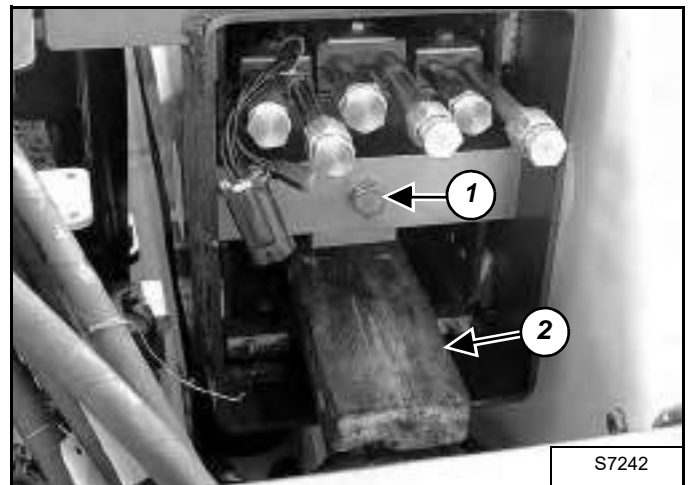
Remove the lifting strap and slide the inner boom fully into the main boom.

Figure 50-40-10



Install the four side wear pads [Figure 50-40-10] at the rear of the boom.

Figure 50-40-11



Install the bolt (Item 1) [Figure 50-40-11] through the support pin and into the cylinder. Tighten the bolt to 300 N•m (221 ft-lb) torque.

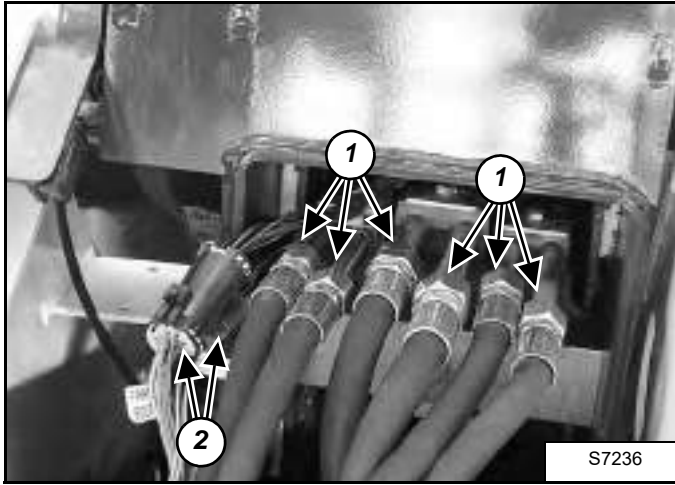
Remove the wood block (Item 2) [Figure 50-40-11].

Dealer Copy -- Not for Resale

INNER BOOM (CONT'D)

Installation (Cont'd)

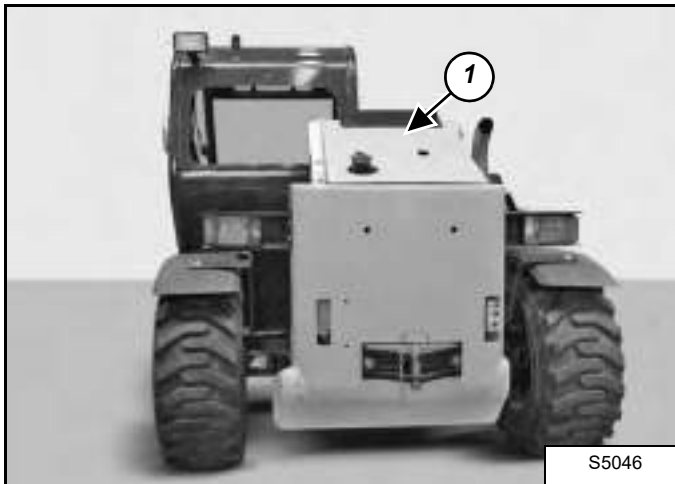
Figure 50-40-12



Install the six hoses (Item 1) [Figure 50-40-12] on the tubelines.

Install the electrical connector(s) (Item 1) [Figure 50-40-12] (if equipped).

Figure 50-40-13

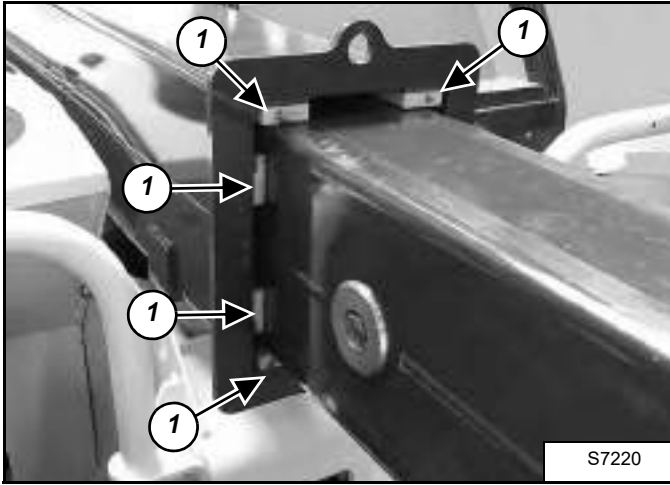


Install the rear cover (Item 1) [Figure 50-40-13].

WEAR PADS (FRONT)

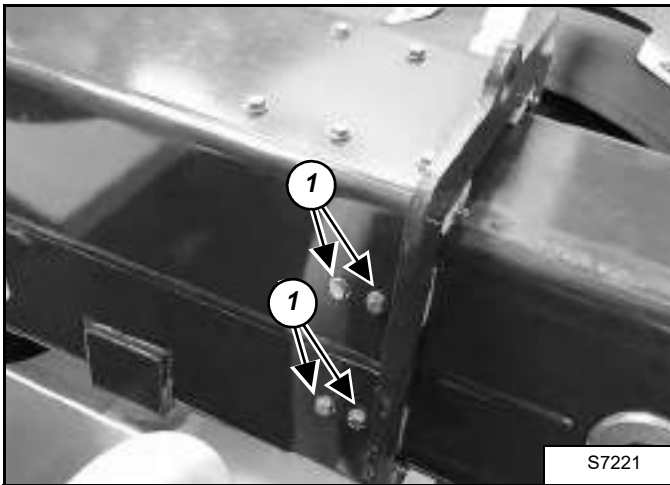
Removal And Installation

Figure 50-50-1



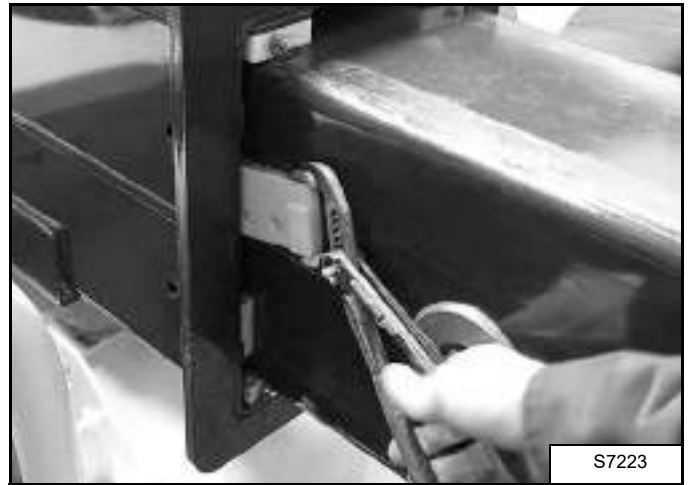
Extend the inner boom approximately 610 mm (2 ft) and mark the location of the eight wear pads (Item 1) [Figure 50-50-1].

Figure 50-50-2



Remove the four bolts (Item 1) [Figure 50-50-2] from the boom.

Figure 50-50-3

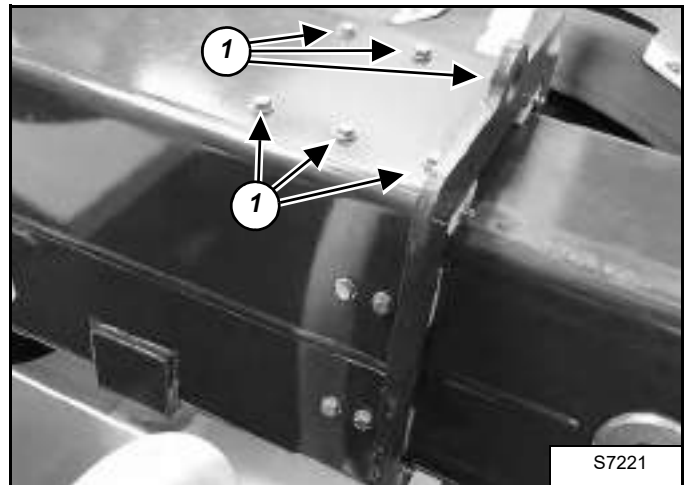


Remove the side wear pads [Figure 50-50-3].

Repeat the side wear pad removal steps for the other side.

Installation: Use Loctite 243 or equivalent. Tighten the bolts first by hand, then tighten an extra 1/8th turn.

Figure 50-50-4



Remove the six bolts (Item 1) [Figure 50-50-4] from the boom.

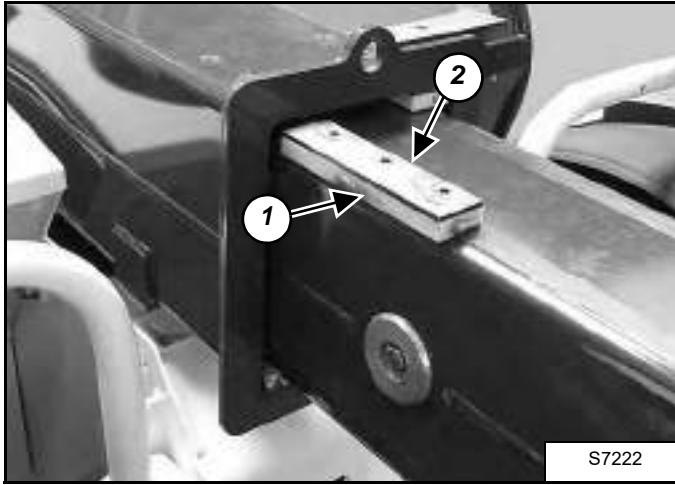
Installation: Use Loctite 243 or equivalent. Tighten the bolts to 20 N•m (15 ft-lb).

Dealer Copy -- Not for Resale

WEAR PADS (FRONT) (CONT'D)

Removal And Installation (Cont'd)

Figure 50-50-5



Remove the wear pad (Item 1) and spacer plate(s) (Item 2) **[Figure 50-50-5]**.

With the two upper wear pads removed, use a hoist and lifting strap at the end of the boom, apply upwards pressure, lifting the inner boom off the bottom wear pads.

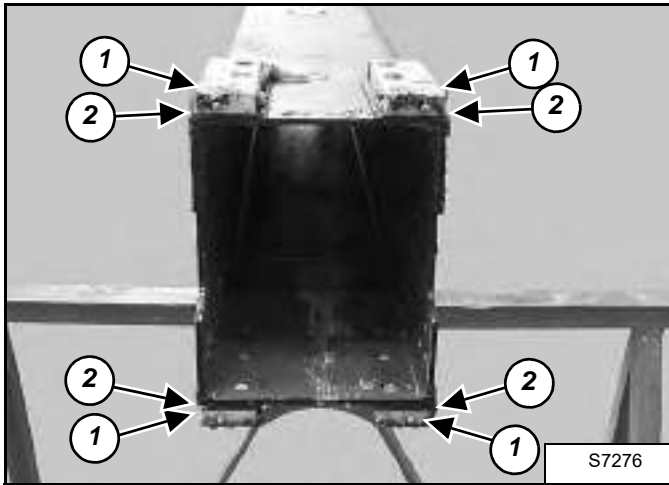
Remove the bottom wear pads.

WEAR PADS (REAR)

Removal

Remove the inner boom. (See Removal on Page 50-40-1.)

Figure 50-51-1

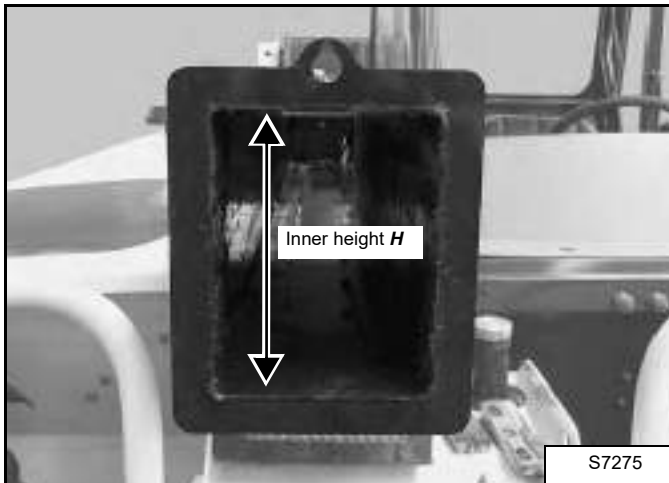


With the inner boom supported, remove the wear pads (Item 1) and spacer plates (Item 2) [Figure 50-51-1].

During inner boom removal, the side wear pads were removed.

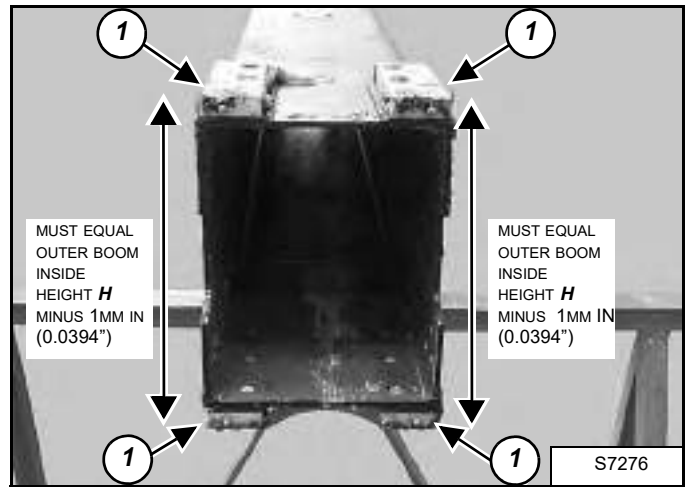
Installation

Figure 50-51-2



Measure and note down the inner height (H) of the outer boom [Figure 50-51-2].

Figure 50-51-3



Using the appropriate spacer plates to come to height H minus 1 mm (0.0394 in) of clearance, install the new wear pads (Item 1) [Figure 50-51-3].

Tighten the bolts to 20 N•m (15 ft-lb). Use Loctite 243 or equivalent.

NOTE: Spacer plates can be ordered in 1 mm (0.0394 in), 2 mm (0.0787 in) and 3 mm (0.1181 in) of thickness.

NOTE: Left and right side height should be exactly the same.

Apply grease to the wear pads.

Install the inner boom. (See Installation on Page 50-40-3.)

Dealer Copy -- Not for Resale



Bobcat®

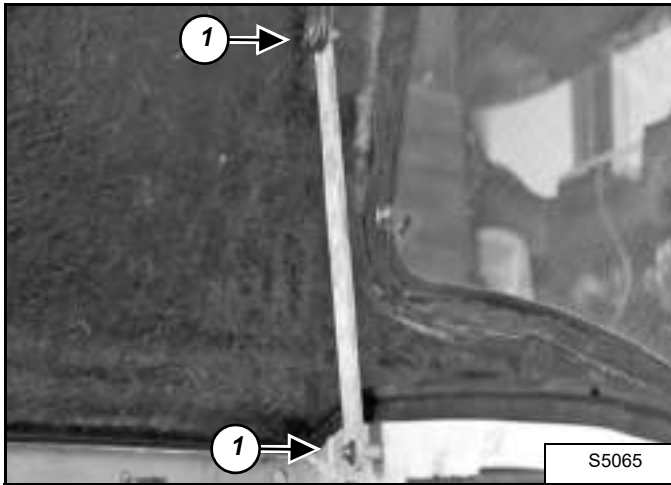
Dealer Copy -- Not for Resale

ENGINE COVER

Locking Mechanism Removal And Installation

Lift the engine cover. Add a support to prevent the cover from closing when the locking mechanism is removed.

Figure 50-60-1



Remove the retainer clips (Item 1) [Figure 50-60-1] at both of the ball joints ends. Remove the ball joints from the ends.

Removal And Installation

Figure 50-60-2

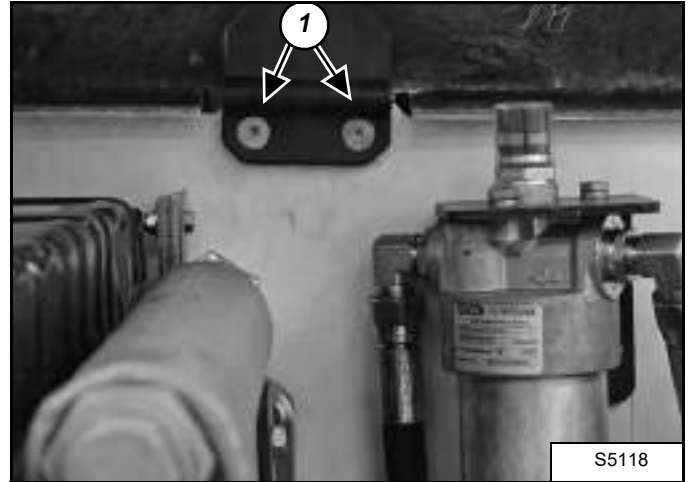
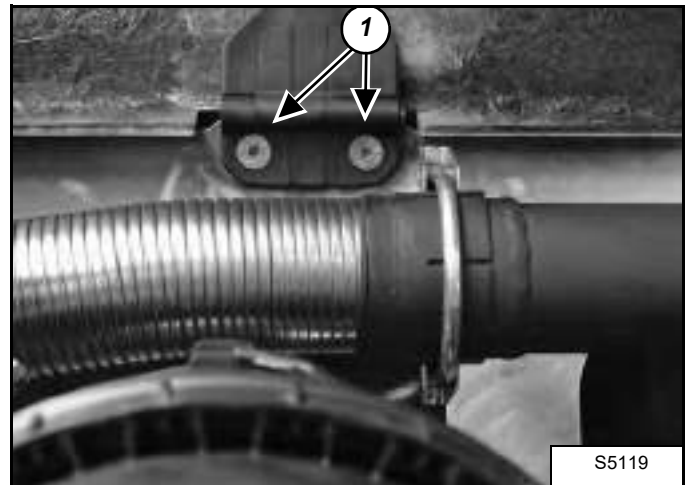


Figure 50-60-3



Remove the four hinge mounting bolts (Item 1) [Figure 50-60-2] and [Figure 50-60-3].

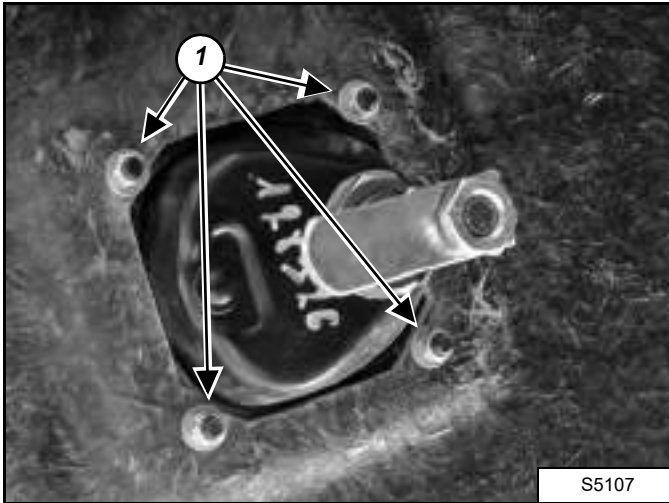
Remove the engine cover.

Dealer Copy -- Not for Resale

ENGINE COVER (CONT'D)

Lock

Figure 50-60-4

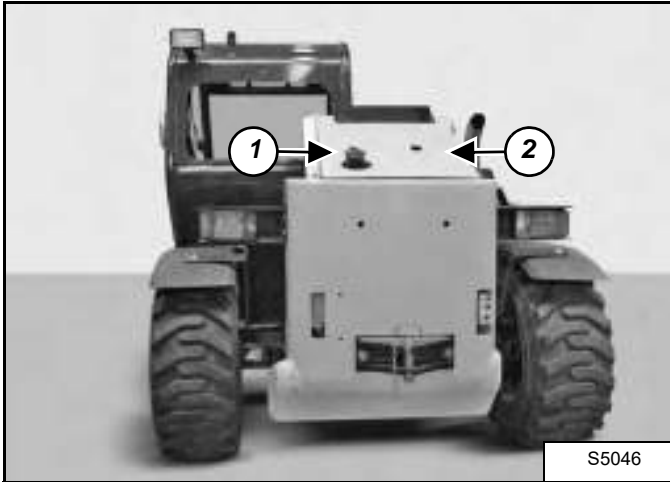


Loosen the four bolts (Item 1) **[Figure 50-60-4]**.

FUEL TANK

Removal And Installation

Figure 50-70-1

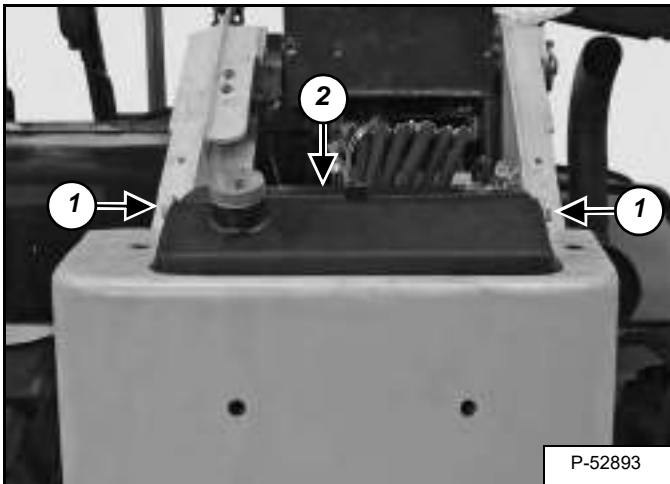


Remove the fuel cap (Item 1) [Figure 50-70-1].

Drain all fuel from the tank. Reinstall the fuel cap.

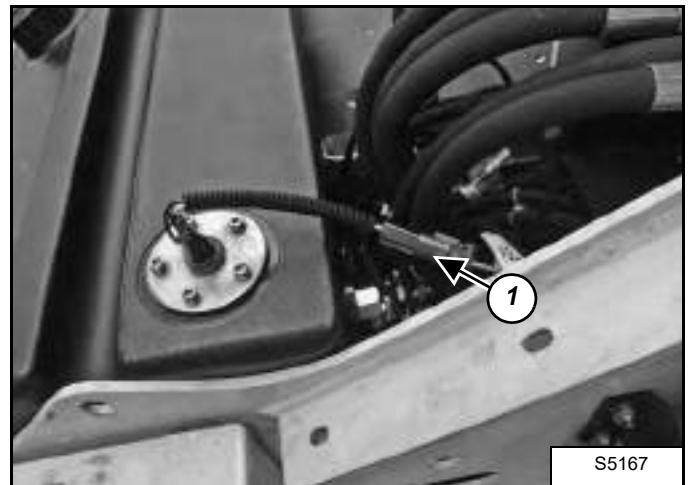
Remove the rear cover (Item 2) [Figure 50-70-1].

Figure 50-70-2



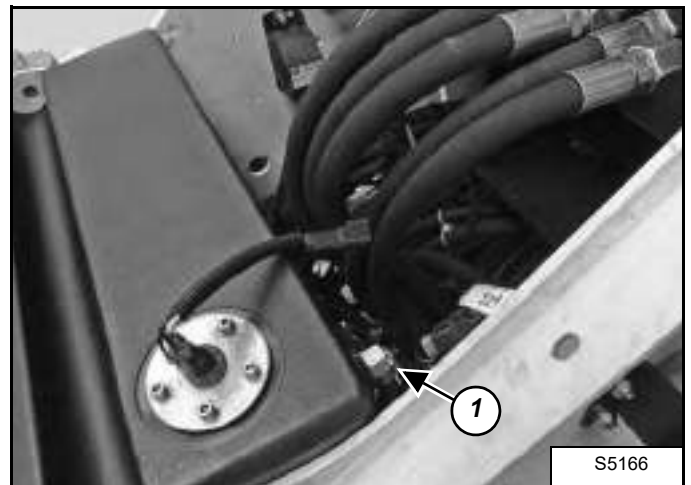
Remove the bolts (Item 1) and bar (Item 2) [Figure 50-70-2].

Figure 50-70-3



Disconnect the electrical connector (Item 1) [Figure 50-70-3].

Figure 50-70-4



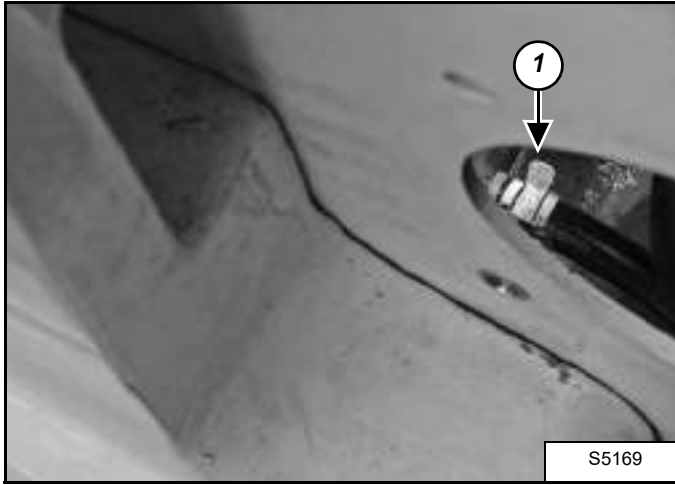
Remove the fitting (Item 1) [Figure 50-70-4].

Dealer Copy -- Not for Resale

FUEL TANK (CONT'D)

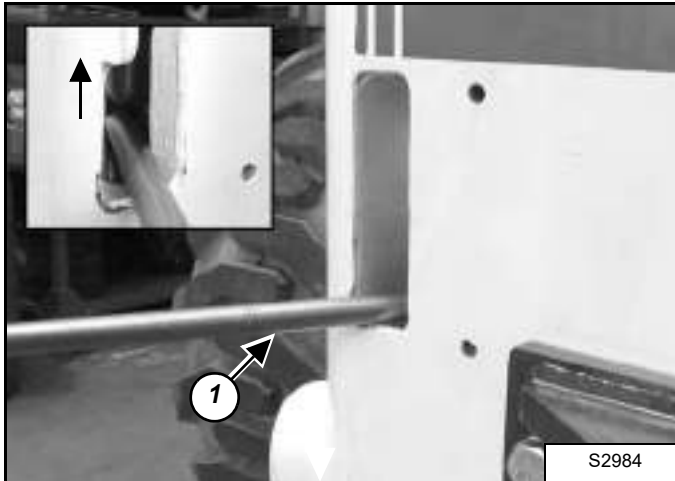
Removal And Installation (Cont'd)

Figure 50-70-5



Remove the fuel line (Item 1) **[Figure 50-70-5]**.

Figure 50-70-6



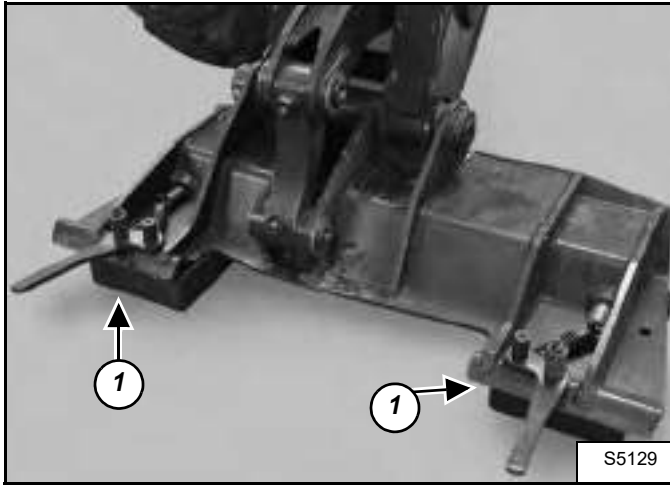
Lift the fuel tank out.

If necessary, a bar can be used to help lifting the tank (Item 1) **[Figure 50-70-6]**.

BOB-TACH

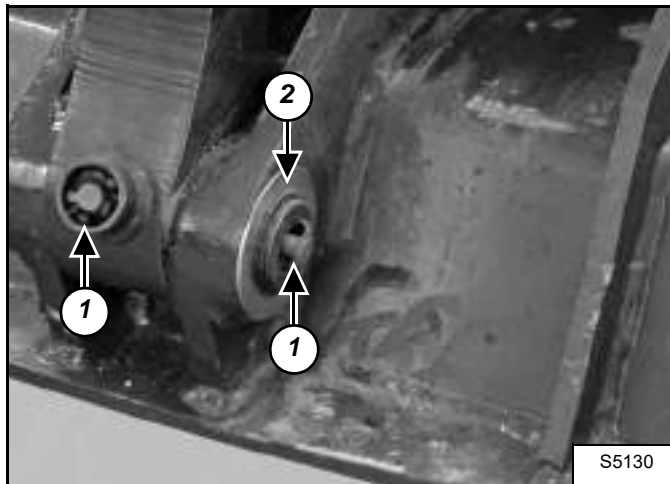
Removal And Installation

Figure 50-80-1



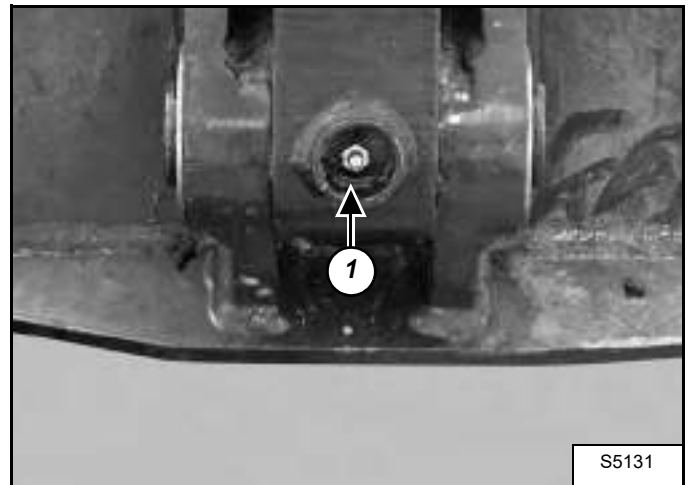
Lower the boom onto a wood block (Item 1) [Figure 50-80-1].

Figure 50-80-2



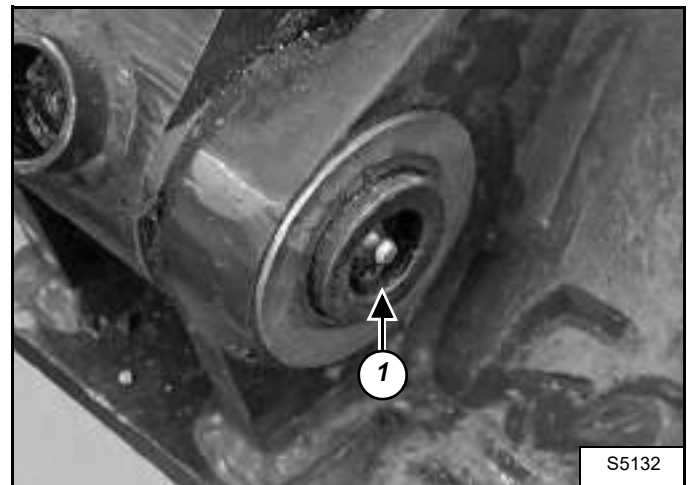
Remove the grease fitting caps (Item 1). Remove the snap ring on both sides (Item 2) [Figure 50-80-2].

Figure 50-80-3



Remove grease fitting from the top (Item 1) [Figure 50-80-3].

Figure 50-80-4



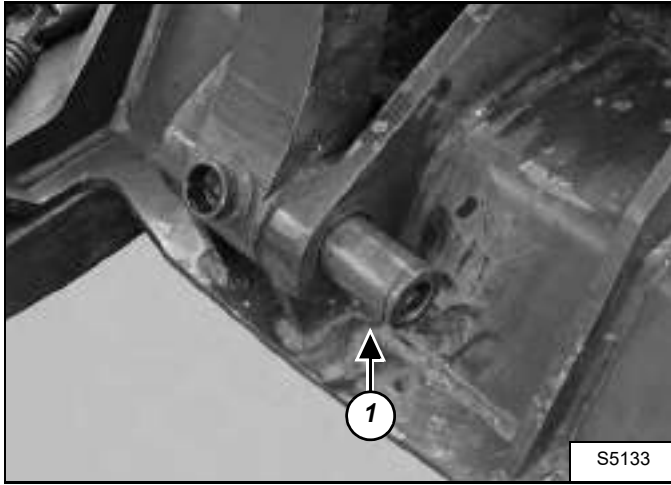
Remove the grease fittings on both sides (Item 1) [Figure 50-80-4].

Dealer Copy -- Not for Resale

BOB-TACH (CONT'D)

Removal And Installation (Cont'd)

Figure 50-80-5

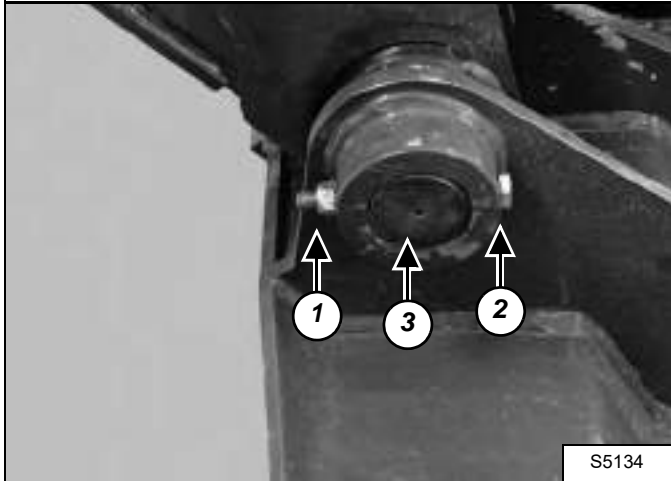


Drive the pivot pin out (Item 1) [Figure 50-80-5].

Start the engine, lower the restraint bar and retract the tilt cylinder by moving the joystick to the right.

Stop the engine.

Figure 50-80-6



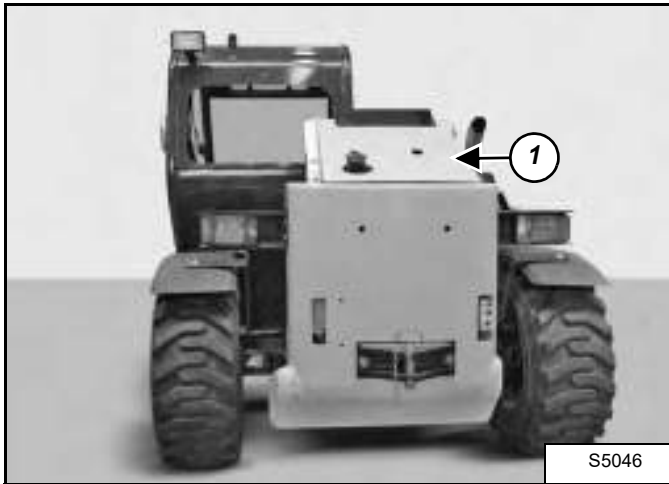
Remove the nut (Item 1) and bolt (Item 2) from the Bob-Tach base pin, on both sides. Drive the pin (Item 3) through [Figure 50-80-6].

Start the engine, lower the restraint bar, raise the boom and remove the Bob-Tach.

COUNTERWEIGHT

Removal And Installation

Figure 50-90-1

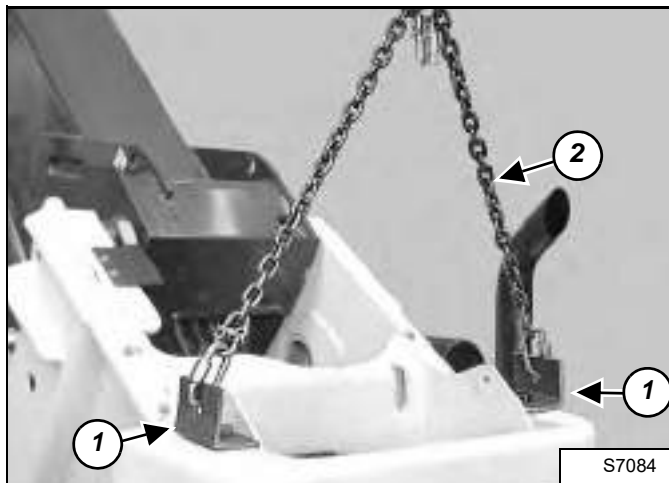


Remove the rear cover (Item 1) [Figure 50-90-1].

Remove the tail lights (See Rear Light Removal And Installation on Page 60-60-1.).

Remove the fuel tank (See Removal And Installation on Page 50-80-1.).

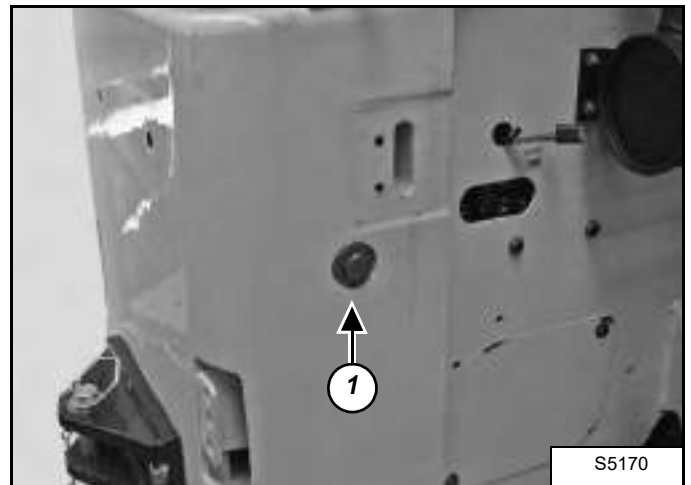
Figure 50-90-2



Install brackets (Item 1) [Figure 50-90-2] in the threaded holes on both sides to lift the weight.

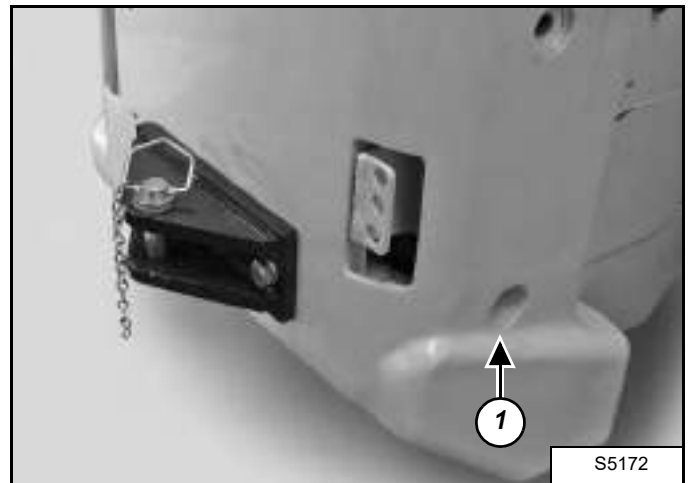
Install a hoist (Item 2) [Figure 50-90-2] to lift and support the weight (approx. 1000 kg (2204 lb)).

Figure 50-90-3



Loosen the top bolts (Item 1) [Figure 50-90-3] on both sides.

Figure 50-90-4



Remove the two mounting bolts (Item 1) [Figure 50-90-4].

Lift and remove the weight.

Dealer Copy -- Not for Resale



Bobcat®

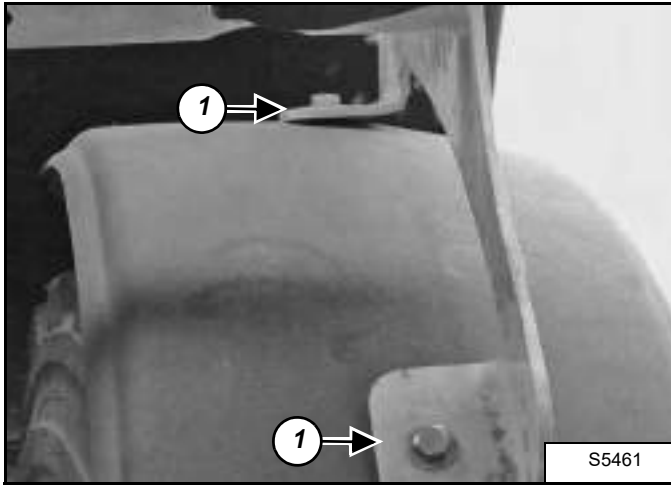
Dealer Copy -- Not for Resale

FENDER

Removal And Installation

Front Fender

Figure 50-100-1

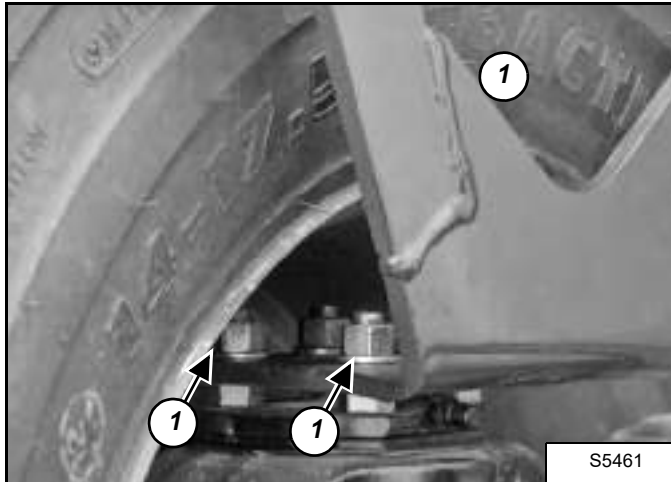


Remove the two fender mount bolts (Item 1) [Figure 50-100-1]. Remove the fender.

Installation: Tighten the bolts to 125-140 N•m (90-100 ft-lb) torque.

Rear Fender

Figure 50-100-2



Remove the four nuts and washers (Item 1) [Figure 50-100-2] from the tire. Remove the tire.



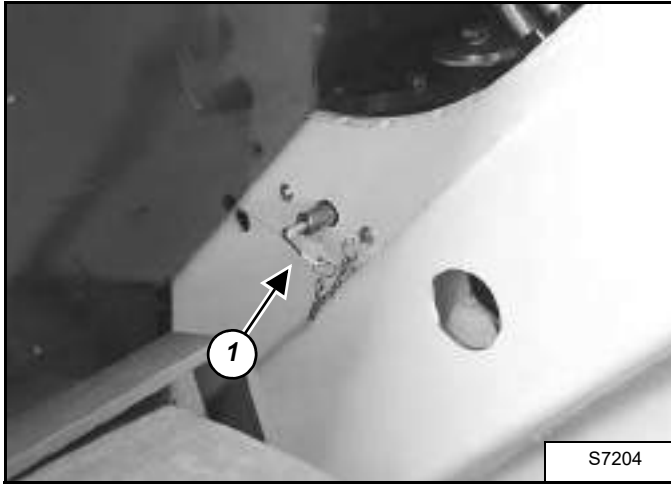
Bobcat®

Dealer Copy -- Not for Resale

JOYSTICK PANEL (S/N AC1912999 & BELOW)

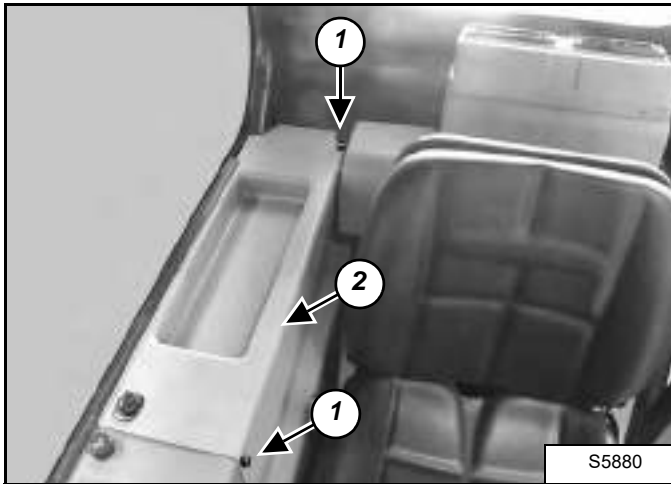
Joystick Panel Cover Removal and Installation

Figure 50-110-1



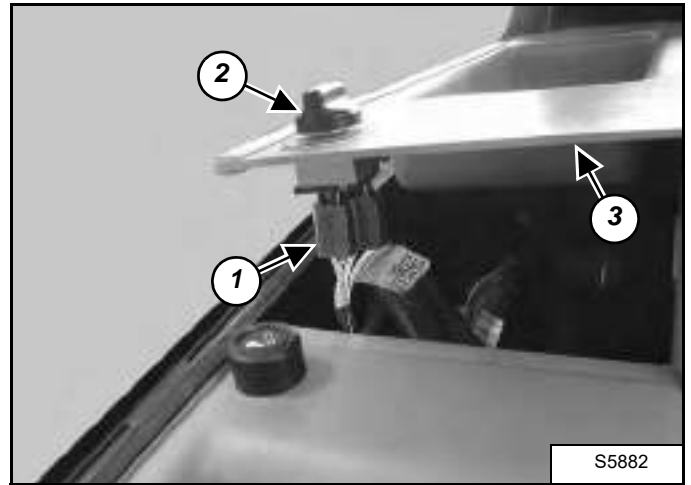
Rotate the battery disconnect switch (Item 1) **[Figure 50-110-1]** to the right, to disconnect the power supply from the battery.

Figure 50-110-2



Remove the knobs (Item 1) and raise the fuse box cover (Item 2) **[Figure 50-110-2]** gently.

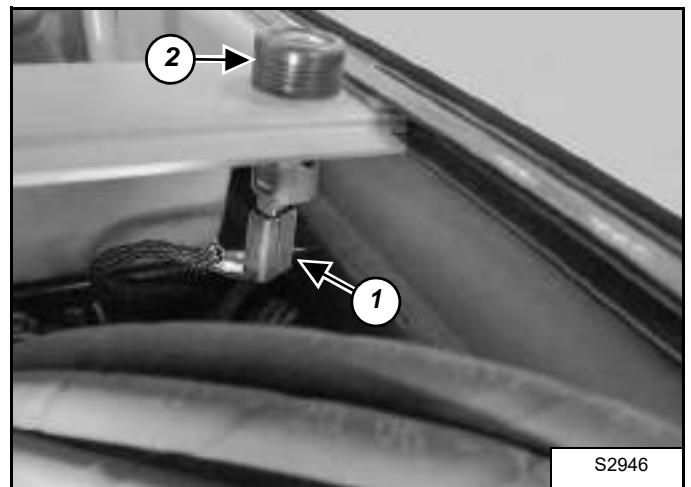
Figure 50-110-3



Remove the main wire harness connector (Item 1) from the A/C fan switch (Item 2) **[Figure 50-110-3]**.

Remove the fuse box cover (Item 3) **[Figure 50-110-3]**.

Figure 50-110-4



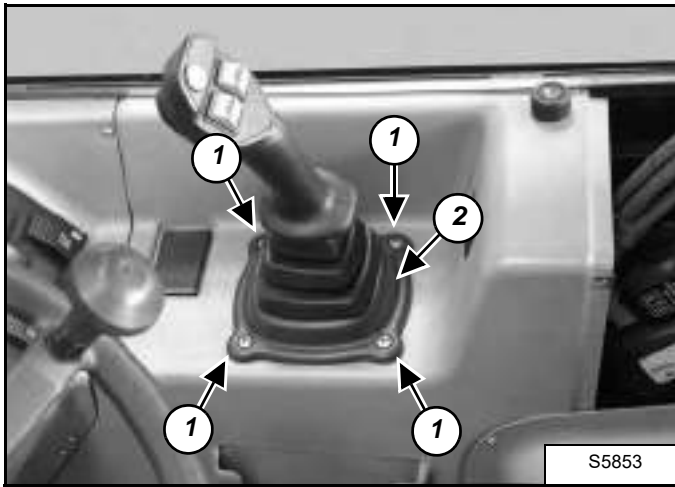
Remove the connector (Item 1) from the cigarette lighter (Item 2) **[Figure 50-110-4]**.

Dealer Copy -- Not for Resale

**JOYSTICK PANEL (S/N AC1912999 & BELOW)
(CONT'D)**

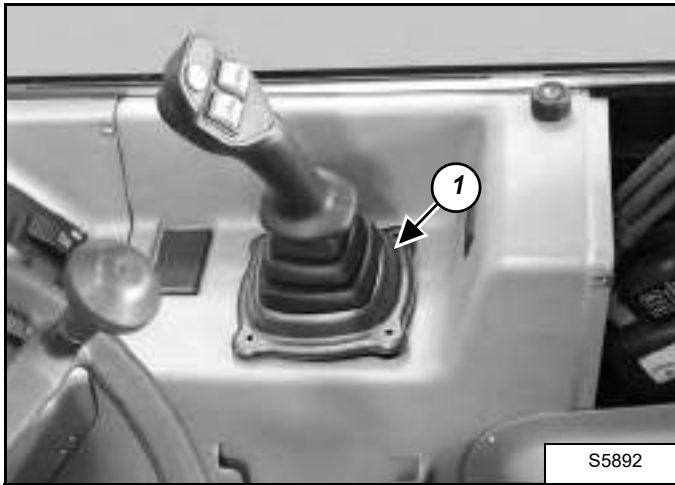
**Joystick Panel Cover Removal and Installation
(Cont'd)**

Figure 50-110-5



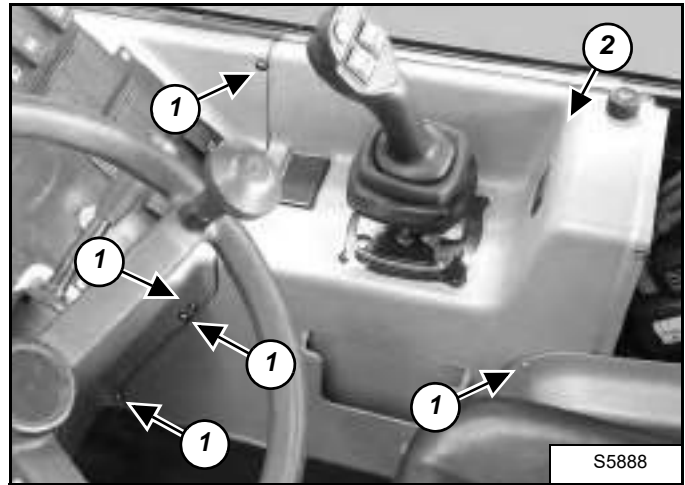
Remove the four screws (Item 1) from the joystick base plate (Item 2) **[Figure 50-110-5]**.

Figure 50-110-6



Remove the joystick base plate (Item 1) **[Figure 50-110-6]** by pulling it over the joystick.

Figure 50-110-7

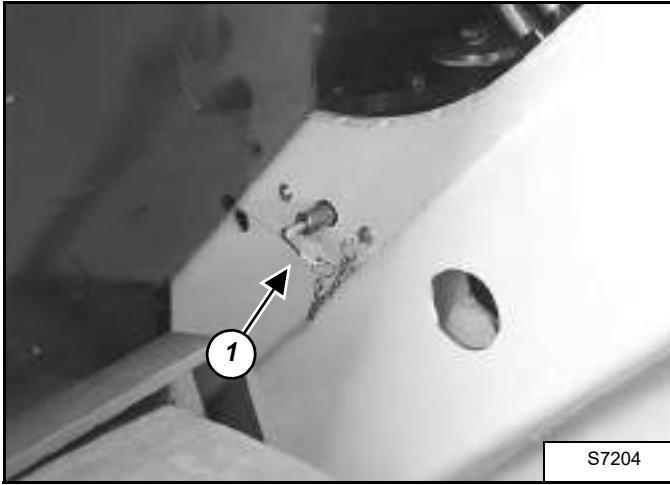


Remove the five screws (Item 1) and remove the joystick panel cover (Item 2) **[Figure 50-110-7]**.

JOYSTICK PANEL (S/N AC1913000 & ABOVE)

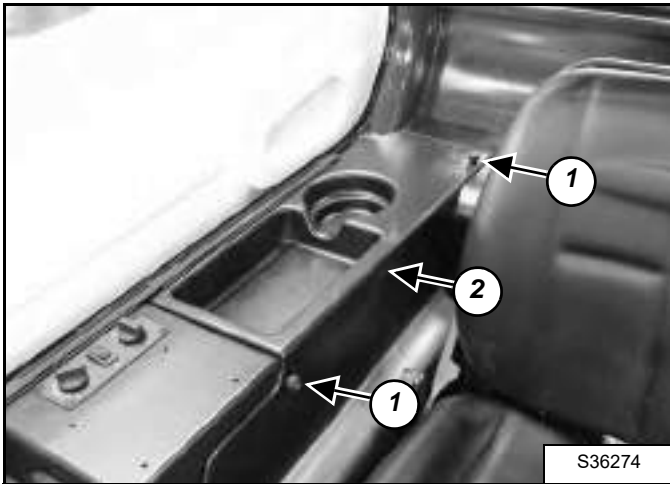
Joystick Panel Cover Removal and Installation

Figure 50-111-1



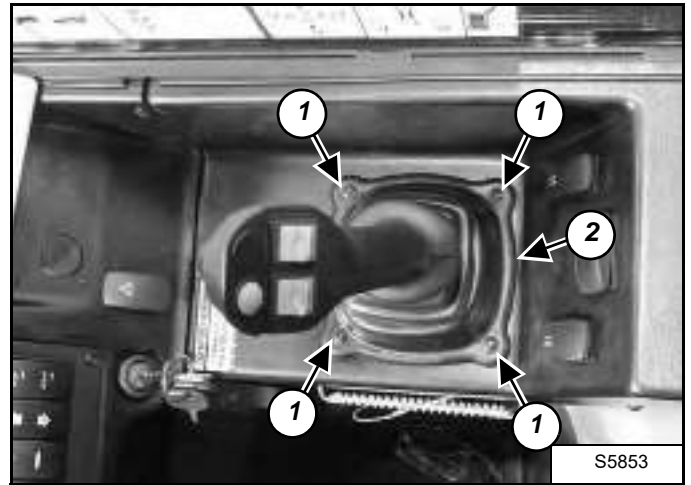
Rotate the battery disconnect switch (Item 1) [Figure 50-111-1] to the right, to disconnect the power supply from the battery.

Figure 50-111-2



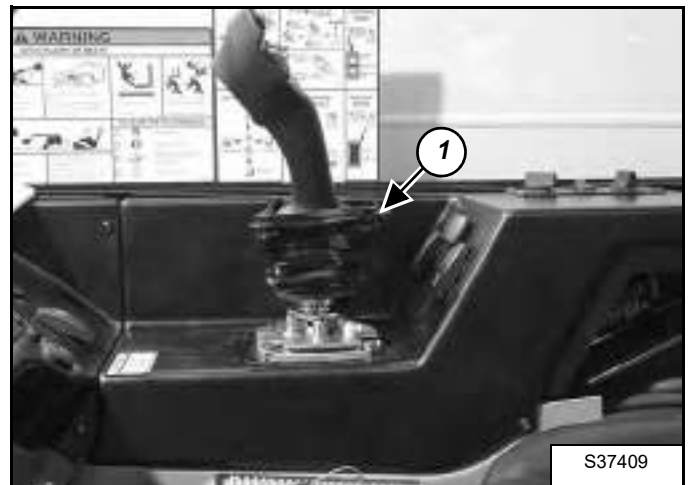
Remove the knobs (Item 1) and remove the fuse box cover (Item 2) [Figure 50-111-2].

Figure 50-111-3



Remove the four screws (Item 1) from the joystick base plate (Item 2) [Figure 50-111-3].

Figure 50-111-4



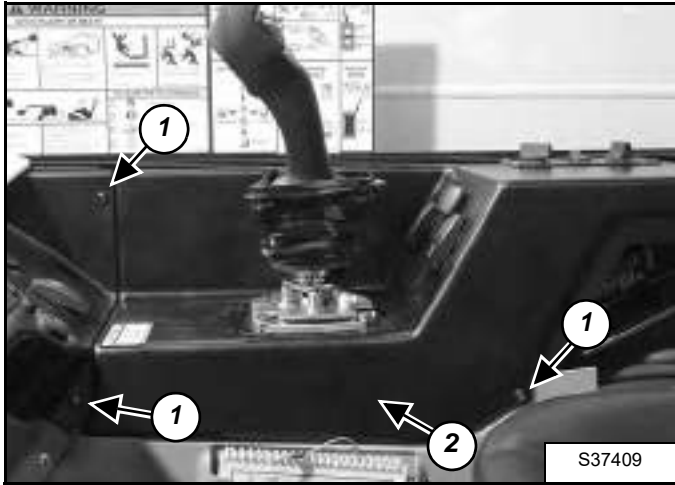
Remove the joystick base plate (Item 1) [Figure 50-111-4] by pulling it over the joystick.

Dealer Copy -- Not for Resale

**JOYSTICK PANEL (S/N AC1913000 & ABOVE)
(CONT'D)**

**Joystick Panel Cover Removal and Installation
(Cont'd)**

Figure 50-111-5

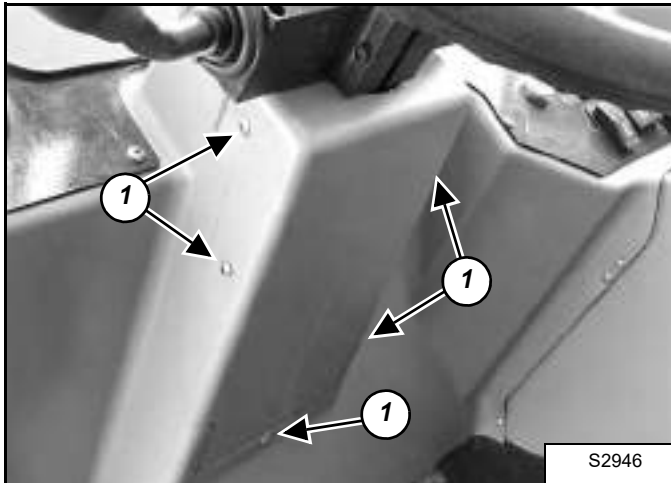


Remove the three screws (Item 1) and remove the joystick panel (Item 2) [Figure 50-111-5].

**DASH COVER/STEERING COLUMN COVER (S/N
AC1912999 & BELOW)**

Steering Column Cover Removal And Installation

Figure 50-120-1



Remove the five screws (Item 1) and remove the steering column cover **[Figure 50-120-1]**.

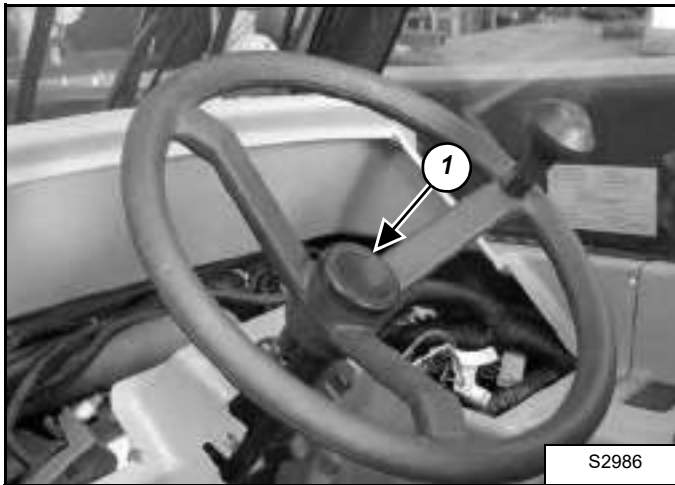
DASH COVER/STEERING COLUMN COVER (S/N AC1912999 & BELOW) (CONT'D)

Dash Cover Removal And Installation

Remove the Steering Column Cover. (See Steering Column Cover Removal And Installation on Page 50-120-1.)

Remove the Instrument Panel. (See Removal And Installation on Page 60-70-1.)

Figure 50-120-2



Remove the cap (Item 1) [Figure 50-120-2] from the steering wheel.

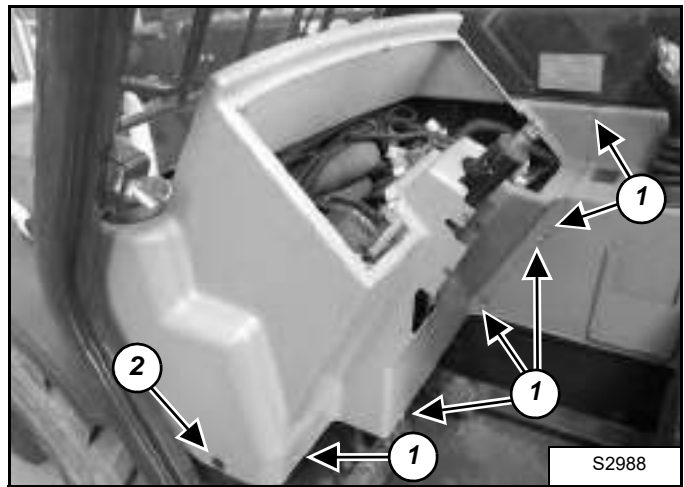
Figure 50-120-3



Remove the nut (Item 1) [Figure 50-120-3] from the steering wheel.

Remove the steering wheel.

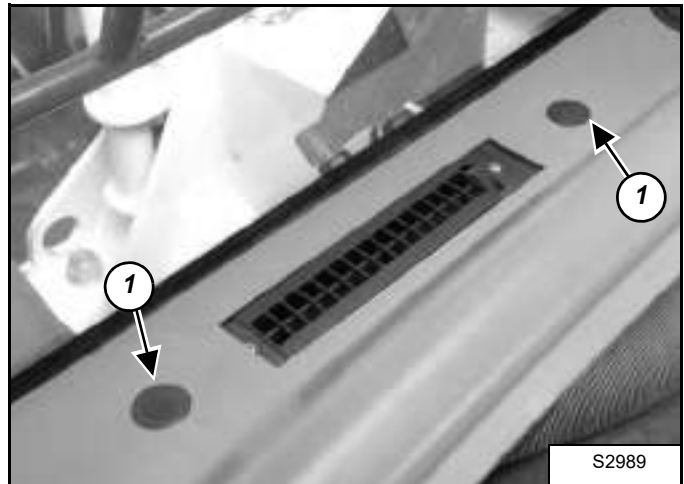
Figure 50-120-4



Remove the six screws (Item 1) [Figure 50-120-4] from the dash cover.

Remove the plastic plug (Item 2) [Figure 50-120-4] from the dash cover.

Figure 50-120-5



Remove the two plastic plugs (Item 1) [Figure 50-120-5] from the front top of the dash cover.

Remove the dash cover.

DASH COVER/STEERING COLUMN COVER (S/N AC1913000 & ABOVE)

Removal And Installation

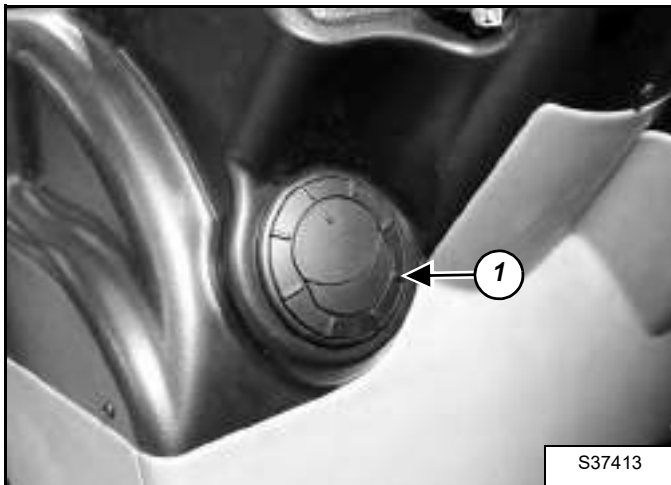
Remove the instrument panel. (See Removal And Installation on Page 60-70-1.)

Remove the switch panel. (See Removal And Installation on Page 60-80-1.)

Remove the steering wheel.

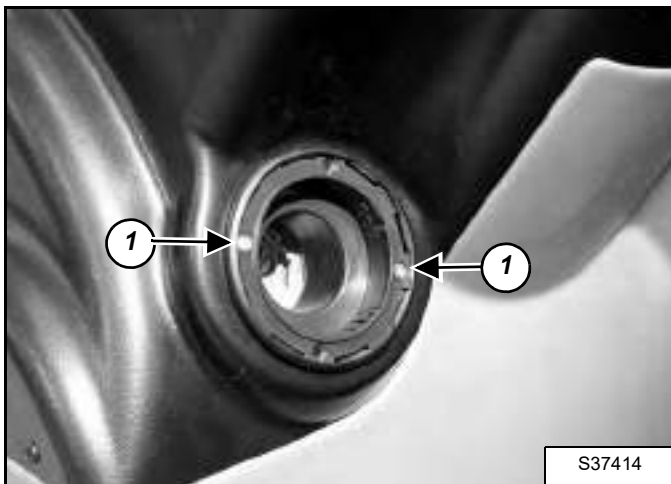
Remove the signal / travel levers. (See Removal And Installation on Page 60-61-1.)

Figure 50-121-1



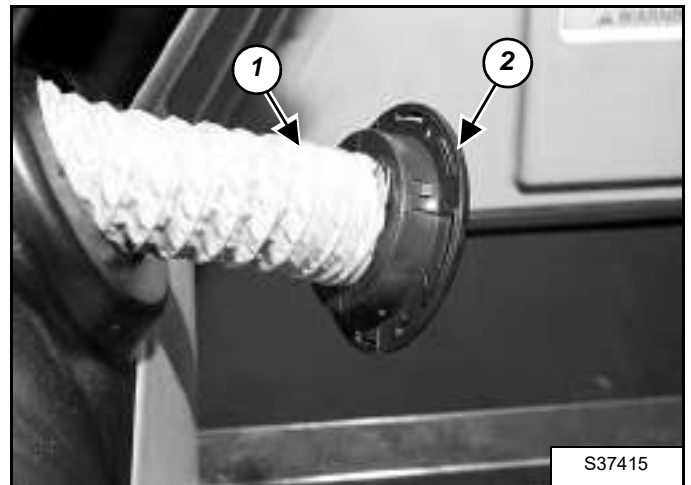
Remove the louver cap (Item 1) [Figure 50-121-1].

Figure 50-121-2



Remove the two screws (Item 1) [Figure 50-121-2].

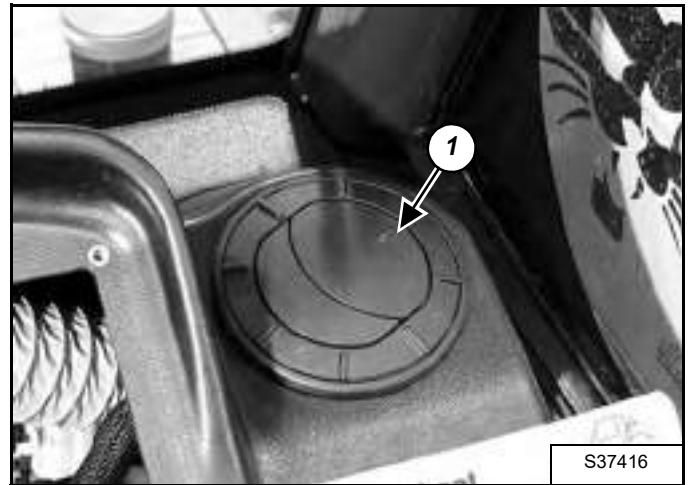
Figure 50-121-3



Pull out the blower hose (Item 1) [Figure 50-121-3].

Remove the cap (Item 2) [Figure 50-121-3].

Figure 50-121-4



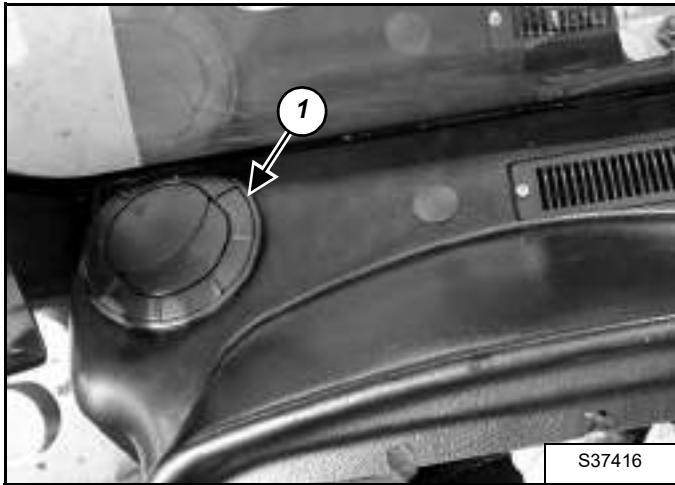
Repeat the above steps to remove the front right louver cap (Item 1) [Figure 50-121-4].

Dealer Copy -- Not for Resale

DASH COVER / STEERING COLUMN COVER (S/N AC1913000 & ABOVE) (CONT'D)

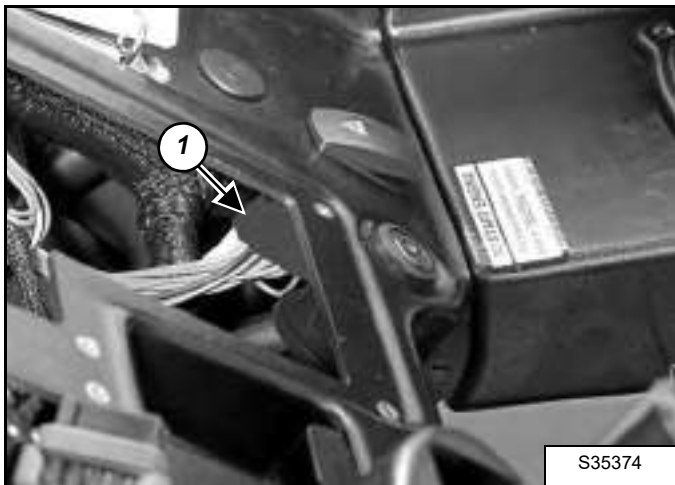
Removal And Installation (Cont'd)

Figure 50-121-5



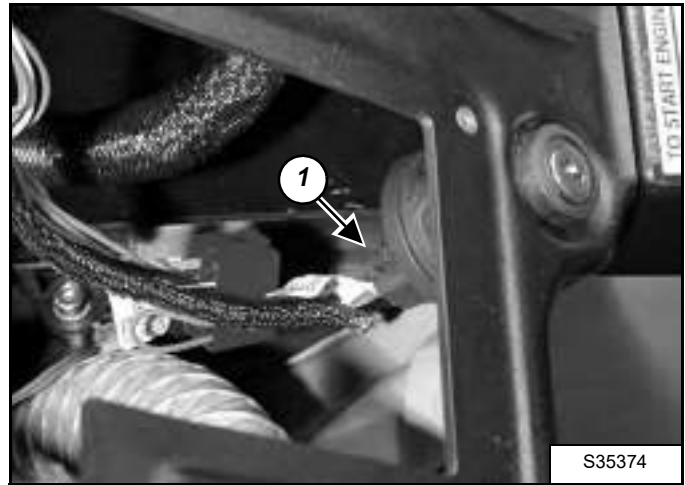
Repeat the above steps to remove the front left louver cap (Item 1) [Figure 50-121-4].

Figure 50-121-6



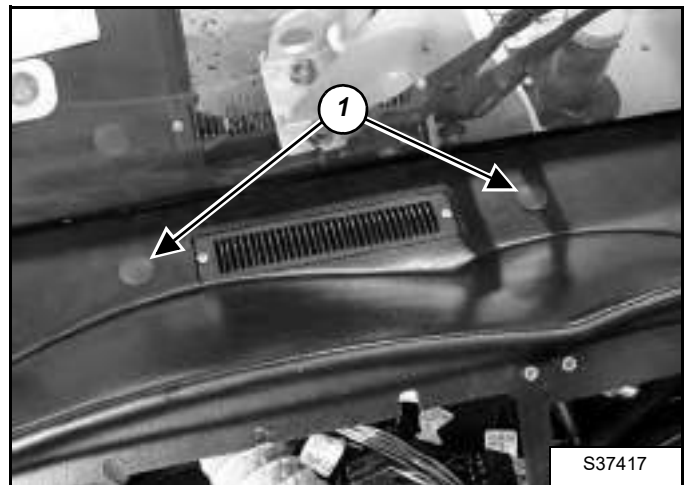
Unplug the connector (Item 1) [Figure 50-121-6] from the hazard lights switch.

Figure 50-121-7



Unplug the connector (Item 1) [Figure 50-121-6] from the starter key switch.

Figure 50-121-8



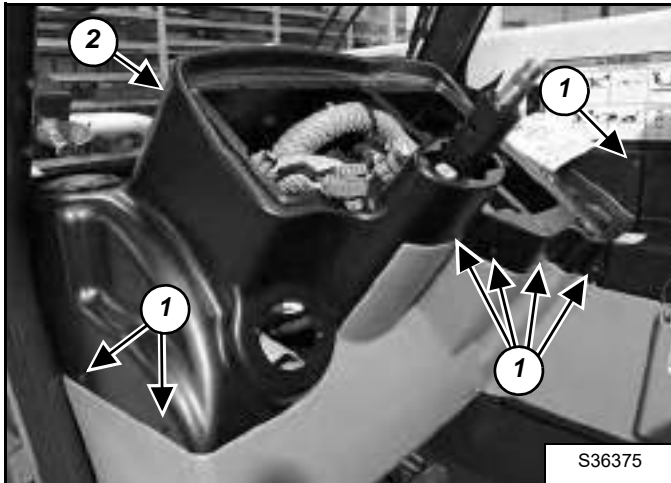
Remove the two dash cover mounting plugs (Item 1) [Figure 50-121-8].

Dealer Copy -- Not for Resale

DASH COVER / STEERING COLUMN COVER (S/N AC1913000 & ABOVE) (CONT'D)

Removal And Installation (Cont'd)

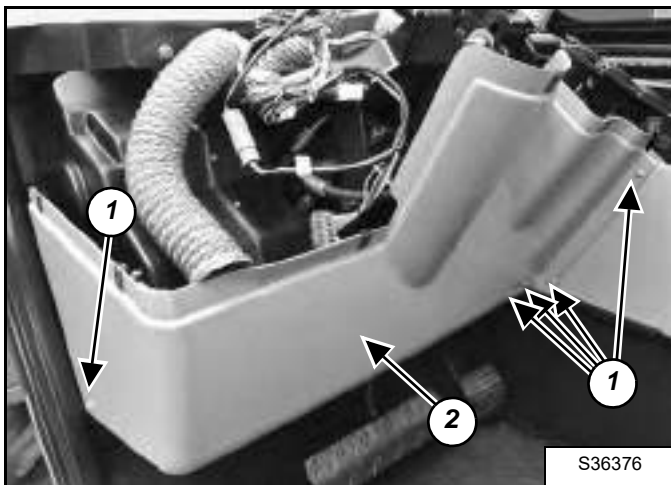
Figure 50-121-9



Remove the seven screws (Item 1) from the dash cover (Item 2) **[Figure 50-121-9]**.

Remove the dash cover.

Figure 50-121-10



Remove the five screws (Item 1) **[Figure 50-121-10]** from the steering column cover.

Remove the steering column cover (Item 2) **[Figure 50-121-10]**.



Bobcat®

Dealer Copy -- Not for Resale

ELECTRICAL SYSTEM AND ANALYSIS

ELECTRICAL SYSTEM INFORMATION (S/N AC1912999 & BELOW)	60-10-1
Troubleshooting Chart	60-10-1
Description	60-10-2
Fuses, Diodes And Relays	60-10-2
 ELECTRICAL SYSTEM INFORMATION (S/N AC1913000 & ABOVE)	 60-11-1
Troubleshooting Chart	60-11-1
Description	60-11-2
Fuses, Diodes And Relays	60-11-2
 BATTERY	 60-20-1
Removal And Installation	60-20-1
Servicing	60-20-2
Using A Booster Battery (Jump Starting)	60-20-3
 ALTERNATOR	 60-30-1
Removal And Installation	60-30-1
Belt Adjustment	60-30-2
Belt Replacement	60-30-2
 STARTER	 60-40-1
Testing	60-40-1
Removal And Installation	60-40-2
 LIGHTS	 60-60-1
Rear Light Removal And Installation	60-60-1
Front Light Removal And Installation	60-60-3
 TRAVEL LEVER (S/N AC1912999 & BELOW)	 60-60-1
Removal And Installation	60-60-1
 TRAVEL LEVER (S/N AC1913000 & ABOVE)	 60-61-1
Removal And Installation	60-61-1
 INSTRUMENT PANEL (S/N AC1912999 & BELOW)	 60-70-1
Removal And Installation	60-70-1
 INSTRUMENT PANEL (S/N AC1913000 & ABOVE)	 60-71-1
Removal And Installation	60-71-1
 SWITCH PANEL (S/N AC1913000 & ABOVE)	 60-80-1
Removal And Installation	60-80-1
 FRONT WIPER MOTOR	 60-90-1
Removal And Installation	60-90-1

Dealer Copy -- Not for Resale

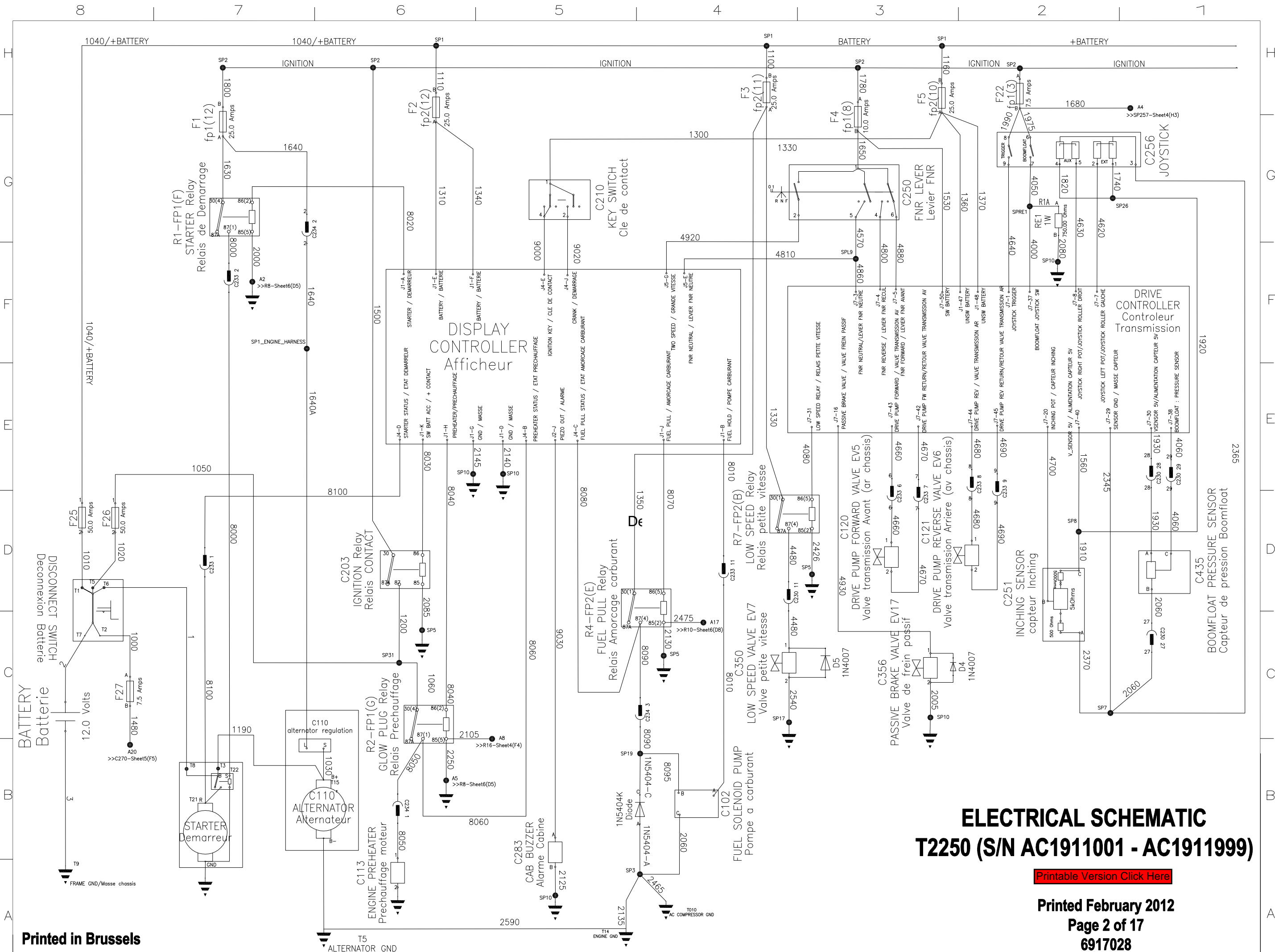
TOP WIPER MOTOR	60-100-1
Removal And Installation	60-100-1
REAR WIPER MOTOR	60-110-1
Removal And Installation	60-110-1
PEDAL ASSEMBLY	60-120-1
Removal And Installation	60-120-1
Disassembly And Assembly	60-120-2
INCHING SWITCH	60-130-1
Removal And Installation	60-130-1
Adjustment	60-130-1
Inching Control Calibration (Display Controller)	60-130-2
SERVICE SOFTWARE	60-140-1
Connecting Remote Start Tool to Laptop Computer	60-140-1
Connecting Remote Start Tool (Service Tool)	60-140-1
Connecting Remote Start Tool to Telescopic Handler	60-140-2
Entering The Service Software	60-140-3
Calibrate Inch Pedal	60-140-4
MAIN CONTROLLER	60-150-1
Removal And Installation	60-150-1
Connector Identification	60-150-2
DIAGNOSTIC SERVICE CODES	60-160-1
Viewing Service Codes	60-160-1
Service Codes List	60-160-2
LONGITUDINAL STABILITY INDICATOR CALIBRATION (S/N AC1911001-14999)	60-170-1
Fitting The Sensor	60-170-1
Calibration Procedure	60-170-1
LLMI / LLMC SYSTEM (S/N AC1915000 & ABOVE)	60-180-1
System Calibration	60-180-1
Calibration Test	60-180-3
System Failure Reports	60-180-4
System Components Identification	60-180-8
LLMS Removal	60-180-10
LLMS Installation	60-180-12
LLMC Controller Removal	60-180-15
LLMC Controller Installation	60-180-18

	DESIGNATION		SHEET	LOCATION		DESIGNATION		SHEET	LOCATION	
CAB / CABINE	JOYSTICK	JOYSTICK	3	G2	ENGINE / MOTEUR	STARTER	DEMARREUR	3	B7	
	KEY SWITCH	CLE DE CONTACT	3	G5		ALTERNATOR	ALTERNATEUR	3	B6	
	FNR LEVER	LEVIER FNR	3	G3		FUEL SOLENOID PUMP	POMPE A CARBURANT	3	B4	
	STARTER RELAY	RELAIS DEMARRAGE	3	G7		ENGINE PREHEATER	PRECHAUFFAGE MOTEUR	3	A6	
	IGNITION RELAY	RELAIS CONTACT	3	D6		AC COMPRESSOR	COMPRESSEUR DE CLIMATISATION	4	D3	
	GLOW PLUG RELAY	RELAIS PRECHAUFFAGE	3	C6		TRINARY SWITCH	FILTRE DESHYDRATEUR	4	B4	
	FUEL PULL RELAY	RELAIS AMORCAGE CARBURANT	3	C4		ENGINE COOLANT TEMP	TEMPERATURE EAU MOTEUR	4	D3	
	LOW SPEED RELAY	RELAIS PETITE VITESSE	3	D4		ENGINE OIL PRESSURE SWITCH	MANO CONTACT PRESSION HUILE MOTEUR	4	C2	
	INCHING SENSOR	CAPTEUR INCHING	3	D2		HYDRAULIC FILTER RESTRICTION	COLMATAGE FILTRE HYDRAULIQUE	4	C1	
	CAB BUZZER	ALARME CABINE	3	B5		ENGINE SPEED SENSOR	CAPTEUR DE VITESSE MOTEUR	7	F3	
	ISL (LONGITUDINAL STABILITY INDICATOR)	ISL (INDICATEUR STABILITE LONGITUDINALE)	4	F8		FRAME / CHASSIS	BATTERY	BATTERIE	3	C8
	AMA KEY SHUNT	CLE DE SHUNT AMA	4	D8			DISCONNECT SWITCH	DECONNEXION BATTERIE	3	D8
	STEER MODE TELLTALE	VOYANT MODE DIRECTIONNEL	4	E6			LOW SPEED VALVE	VALVE PETITE VITESSE	3	C4
	STEER MODE SWITCH	INTER. MODE DIRECTIONNEL	4	G6			DRIVE PUMP FORWARD VALVE	VALVE TRANSMISSION AVANT	3	D3
	6/2 VALVE SWITCH	INTER. ELECTRO 6/2	4	G7			DRIVE PUMP REVERSE VALVE	VALVE TRANSMISSION ARRIERE	3	D2
	HEATER 3 SPEED SWITCH	INTER. VENTILATION 3 VITESSES	4	D5	BOOMFLOAT PRESSURE SENSOR		CAPTEUR DE PRESSION BOOMFLOAT	3	D1	
	CAB HEATER BOWER	MOTEUR VENTILATION	4	B5	PASSIVE BRAKE VALVE		VALVE FREIN PASSIF	3	C3	
	AC FAN RELAY	RELAIS EVAPORATEUR CLIMATISATION	4	F4	BUZZER SHUNT AMA		ALARME SHUNT AMA	4	C8	
	BLOWER SPEED SWITCH	INTER. CLIMATISATION	4	E4	CRAB STEER VALVE		VALVE DIRECTIONNELLE CRABE	4	D6	
	AC EVAPORATOR/BLOWER	EVAPORATEUR CLIMATISATION	4	D4	4 WHEEL STEER VALVE		VALVE DIRECTIONNELLE 4 ROUES	4	D5	
	AC COMPRESSOR RELAY	RELAIS COMPRESSEUR CLIMATISATION	4	E3	HANDBRAKE STATUS PRESSURE SWITCH		MANO CONTACT ETAT FREIN DE PARK	4	C1	
	ACD LH SKI SWITCH	INTER. ACD SKI GAUCHE	4	G3	HYDRAULIC OIL TEMPERATURE		TEMPERATURE HUILE HYDRAULIQUE	4	C2	
	ACD ATTACH SKI SWITCH	INTER. ACD SKI HORIZONTAL	4	G2	HORN		KLAXON	5	E8	
	ACD RH SKI SWITCH	INTER. ACD SKI DROIT	4	G1	BOOMFLOAT VALVE		VALVE BOOMFLOAT	5	D2	
	CEILING LIGHT	PLAFONNIER	5	F8	REVERSE HORN		ALARME DE REcul	5	C1	
	HORN RELAY	RELAIS KLAXON	5	F8	FRONT LEFT LIGHT		FEUX AVANT GAUCHE	5	B8	
	HORN SWITCH (NA)	INTER. KLAXON (NA)	5	G7	REAR LEFT LIGHT		FEUX ARRIERE GAUCHE	5	B7	
	TURN SIGNAL SWITCH (ESA)	COMODO CLIGNOTANT (ESA)	5	G7	LICENSE PLACE LIGHT		FEU PLAQUE MINERALOGIQUE	5	A6	
	WIPER SWITCH	INTER. ESSUIE GLACE AVANT	5	E7	TRAILER PLUG		PRISE REMORQUE	5	A6	
	FRONT WASHER MOTOR	MOTEUR LAVE GLACE AVANT	5	D7	RIGHT REAR LIGHT		FEUX ARRIERE DROIT	5	B5	
	FRONT WIPER MOTOR	MOTEUR ESSUIE GLACE AVANT	5	D7	RIGHT FRONT LIGHT		FEUX AVANT DROIT	5	B4	
	TURN SIGNAL SWITCH (NA)	INTER. CLIGNOTANT (NA)	5	E6	RIGHT BLUE WORK LIGHT		PHARE DE TRAVAIL BLEU DROIT	6	C8	
	HAZARD WARNING SWITCH	INTER FEUX DE DETRESSE	5	F5	LEFT BLUE WORK LIGHT		PHARE DE TRAVAIL BLEU GAUCHE	6	C8	
	FLASHER RELAY	CENTRALE CLIGNOTANTE	5	E5	FRONT RIGHT WORK LIGHT		PHARE DE TRAVAIL AVANT DROIT	6	B7	
	HAZARD TELLTALE	VOYANT CLIGNOTANT	5	D5	FRONT LEFT WORK LIGHT		PHARE DE TRAVAIL AVANT GAUCHE	6	B7	
TRAILER TURN SIGNAL TELLTALE	VOYANT CLIGNOTANT REMORQUE	5	C5	REAR LEFT WORK LIGHT	PHARE DE TRAVAIL ARRIERE GAUCHE		6	B7		
FOG LIGHT SWITCH	INTER. FEU ANTI BROUILLARD	5	G5	BOOM WORK LIGHT	PHARE DE TRAVAIL DE BRAS		6	B6		
HEADLIGHT SWITCH	INTER. FEUX ROUTE	5	G4	REAR AUXILIARY HYDRAULIC CATCH - VALVE	VALVE AUXILIAIRE ARRIERE PRISE BAS		6	D4		
ROADLIGHT TELLTALE	VOYANT FEUX ROUTE	5	C4	REAR AUXILIARY HYDRAULIC CATCH + VALVE	VALVE AUXILIAIRE ARRIERE PRISE HAUT		6	D4		
LOW BEAM RELAY	RELAIS FEUX ROUTE	5	E3	REAR AUXILIARY DIVERTER VALVE	VALVE AUXILIAIRE ARRIERE ARBITRAGE		6	D4		
POWER BOBTACH SWITCH	INTER. POWER BOBTACH	5	G2	REAR AUXILIARY HOOK LOWER VALVE	VALVE AUXILIAIRE ARRIERE CROCHET BAS		6	D3		
BOOMFLOAT RELAY	RELAIS BOOMFLOAT	5	E2	REAR AUXILIARY HOOK RAISE VALVE	VALVE AUXILIAIRE ARRIERE CROCHET HAUT		6	D3		
POWER BOBTACH TELLTALE	VOYANT POWER BOBTACH	5	F3	AUXILIARY VALVE	VALVE AUXILIAIRE		7	E8		
PARK BRAKE SWITCH (NA)	INTER. FREIN DE PARK (NA)	5	G1	AUXILIARY VALVE	VALVE AUXILIAIRE		7	E7		
BACKUP ALARM RELAY	RELAIS ALARME DE REcul	5	E1	BOOM RETRACT VALVE	VALVE RETRACTATION BRAS		7	E7		
BLUE WORK LIGHT RELAY	RELAIS PHARE DE TRAVAIL BLEUS	6	D8	BOOM EXTEND VALVE	VALVE EXTENSION BRAS	7	E6			
FRONT WORK LIGHT RELAY	RELAIS PHARE DE TRAVAIL AVANT	6	D7	POWER BOBTACH 4/2 VALVE	VALVE POWER BOBTACH 4/2	7	D6			
REAR AND BOOM WORK LIGHT RELAY	RELAIS PHARE DE TRAVAIL ARRIERE ET BRAS	6	D7	AMA STABILITY VALVE	NIVEAU STABILITE AMA	7	E5			
BEACON SWITCH	INTER. GYROPHARE	6	G6	FUEL LEVEL	NIVEAU CARBURANT	7	F4			
BEACON	GYROPHARE	6	E6	WORK GROUP VALVE	VALVE MOUVEMENT BRAS	7	D3			
CIGAR LIGHT	ALLUME CIGARE	6	F6	BOOM ANGLE SWITCH	CONTACTEUR ANGLE BRAS	4	G8			
STOP LIGHT RELAY	RELAIS FEUX STOP	6	D5	ACD ATTACHMENT	EQUIPEMENT ACD	7	C5			
HYDRAULIC CATCH SWITCH	INTER. AUX ARRIERE PRISE	6	F4	POWER BOBTACH 6/2 VALVE	VALVE POWER BOBTACH 6/2	7	C3			
HYDRAULIC HOOK SWITCH	INTER. AUX ARRIERE CROCHET	6	F3							
BRAKE FAIL PRESSURE SWITCH (germany)	MANO CONTACT FREIN DE SERVICE (allemagne)	6	F2							
REAR WASHER SWITCH	INTER. LAVE GLACE ARRIERE	6	G2							
REAR WASHER MOTOR	MOTEUR LAVE GLACE ARRIERE	6	E2							
REAR WIPER	ESSUIE GLACE ARRIERE	6	C1							
TOP WIPER	ESSUIE GLACE DE TOIT	6	C1							
LORS BAR SENSOR	CAPTEUR DE PRESENCE BARRE CANOPY	7	G5							
CAR RADIO	AUTO RADIO	7	E2							
RIGHT SPEAKER HP	ENCEINTES AUTO RADIO DROIT	7	C1							
LEFT SPEAKER HP	ENCEINTES AUTO RADIO GAUCHE	7	C1							

ELECTRICAL SCHEMATIC
T2250 (S/N AC1911001 - AC1911999)

[Printable Version Click Here](#)

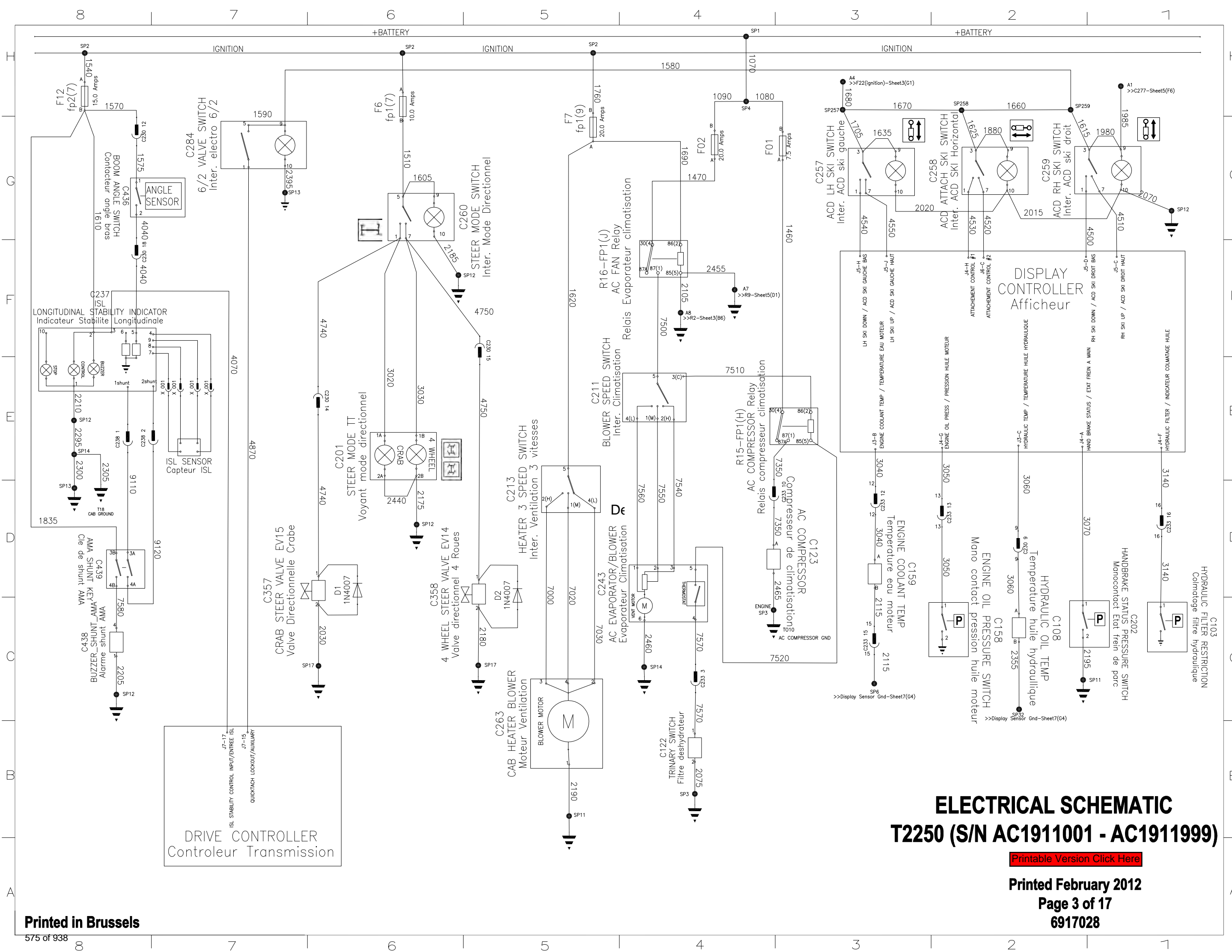
Printed February 2012
Page 1 of 17
6917028



ELECTRICAL SCHEMATIC T2250 (S/N AC1911001 - AC1911999)

[Printable Version Click Here](#)

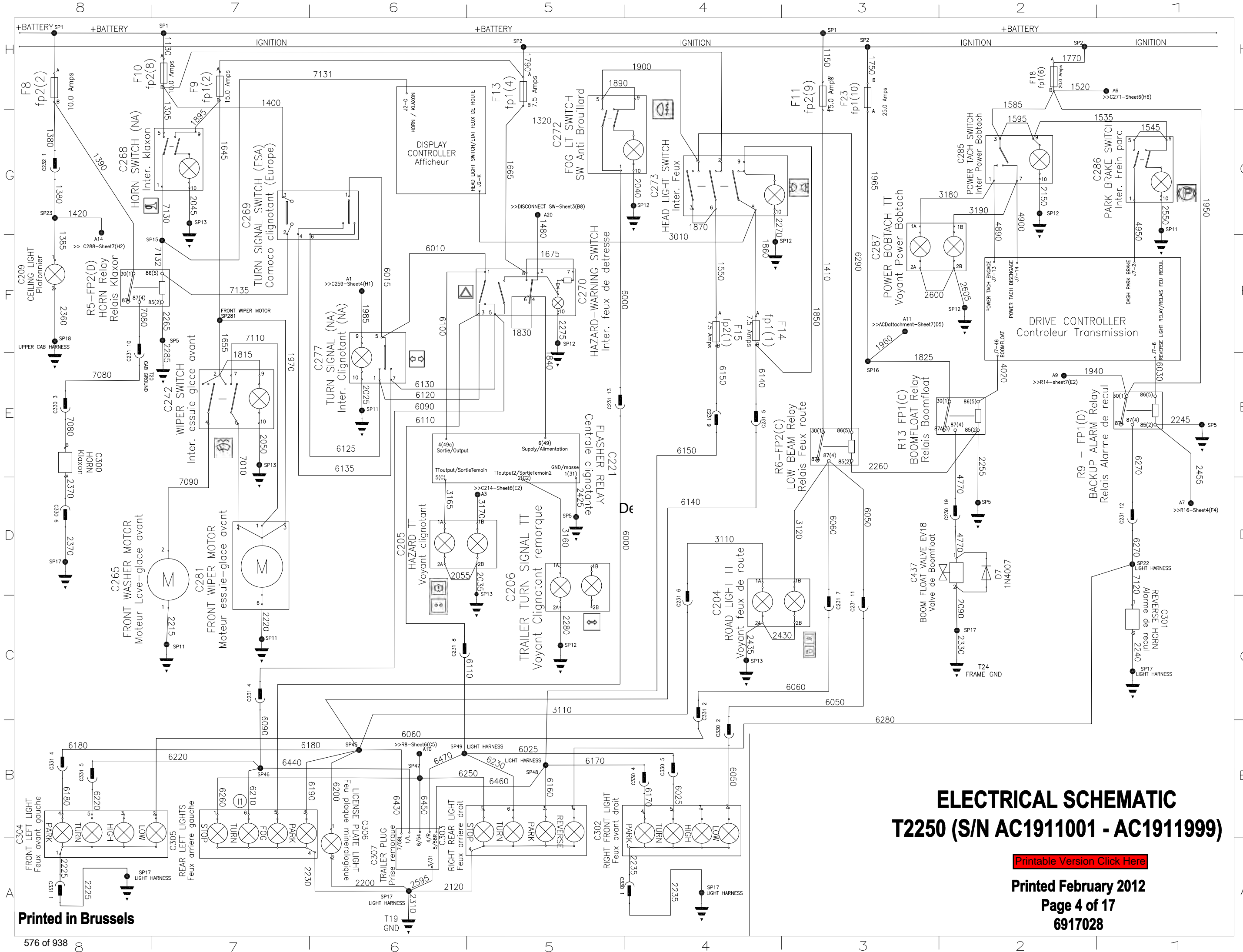
Printed February 2012
Page 2 of 17
6917028



ELECTRICAL SCHEMATIC T2250 (S/N AC1911001 - AC1911999)

[Printable Version Click Here](#)

Printed February 2012
Page 3 of 17
6917028



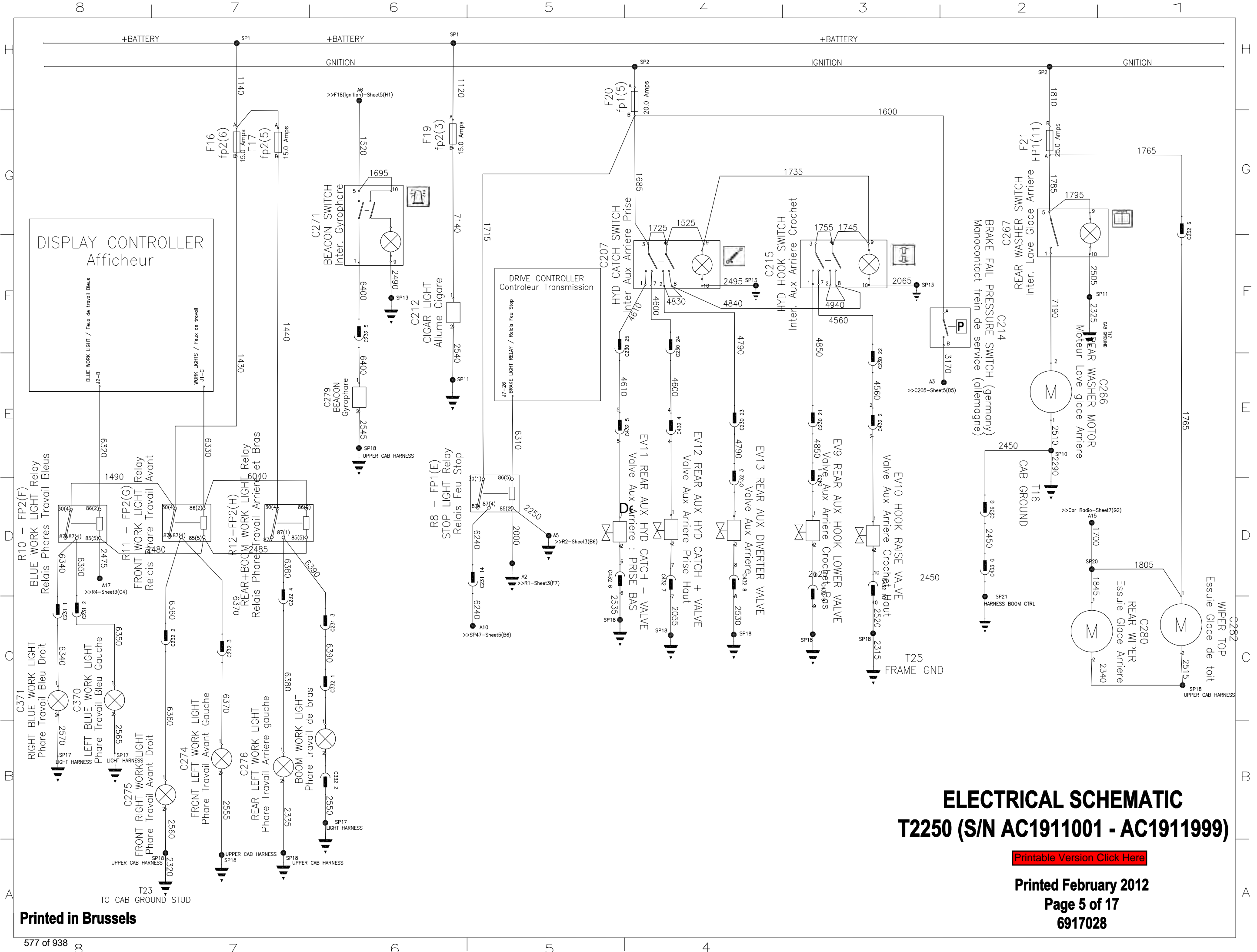
ELECTRICAL SCHEMATIC

T2250 (S/N AC1911001 - AC1911999)

[Printable Version Click Here](#)

Printed February 2012
Page 4 of 17
6917028

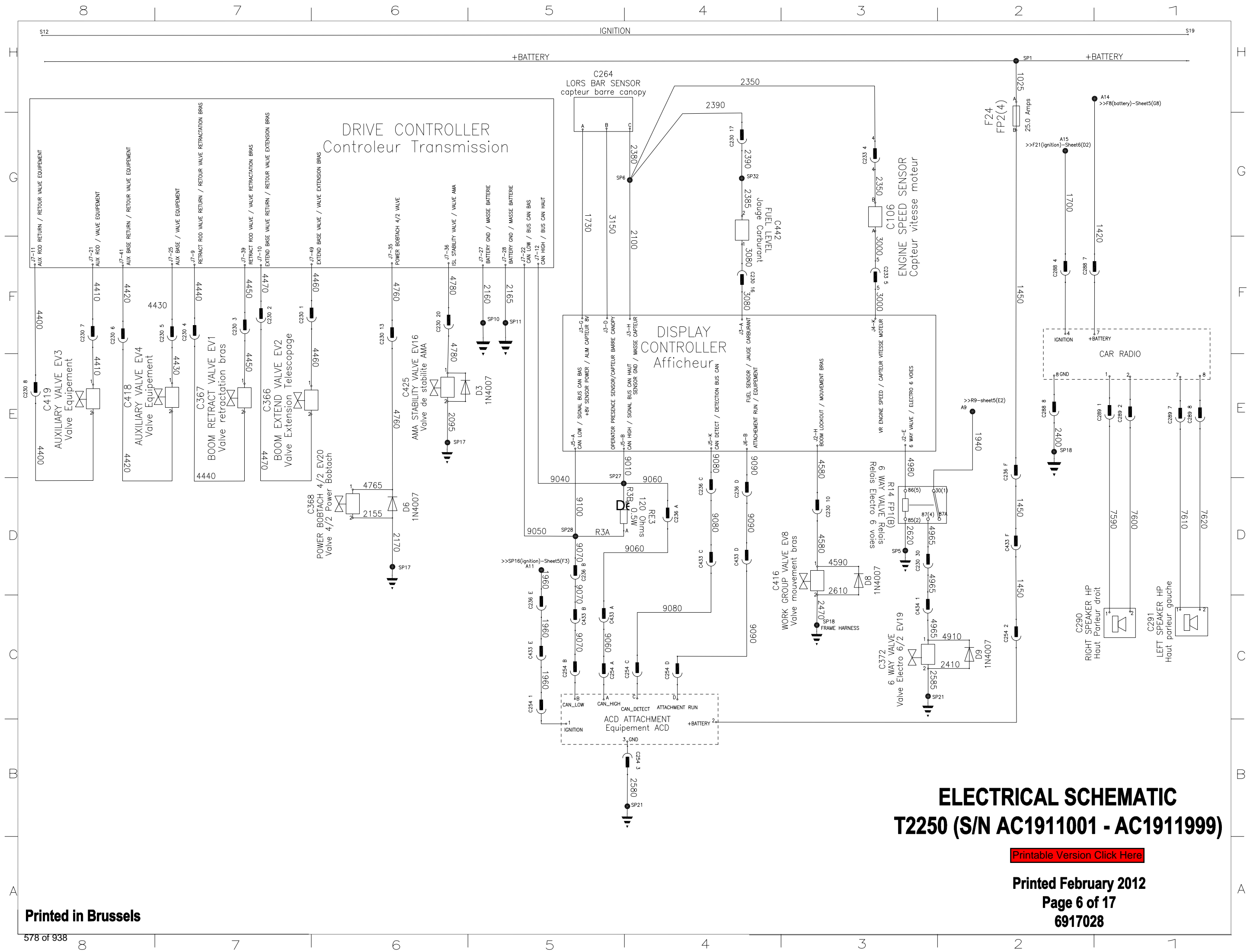
Printed in Brussels



ELECTRICAL SCHEMATIC T2250 (S/N AC1911001 - AC1911999)

[Printable Version Click Here](#)

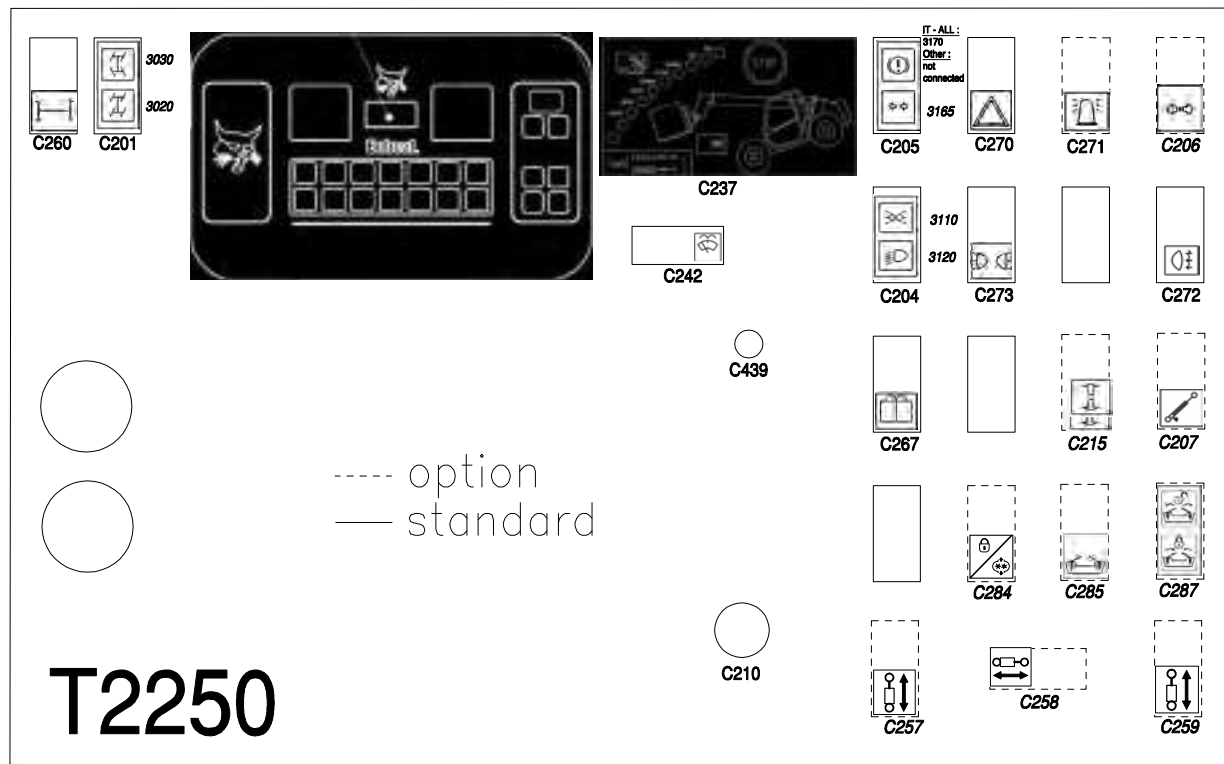
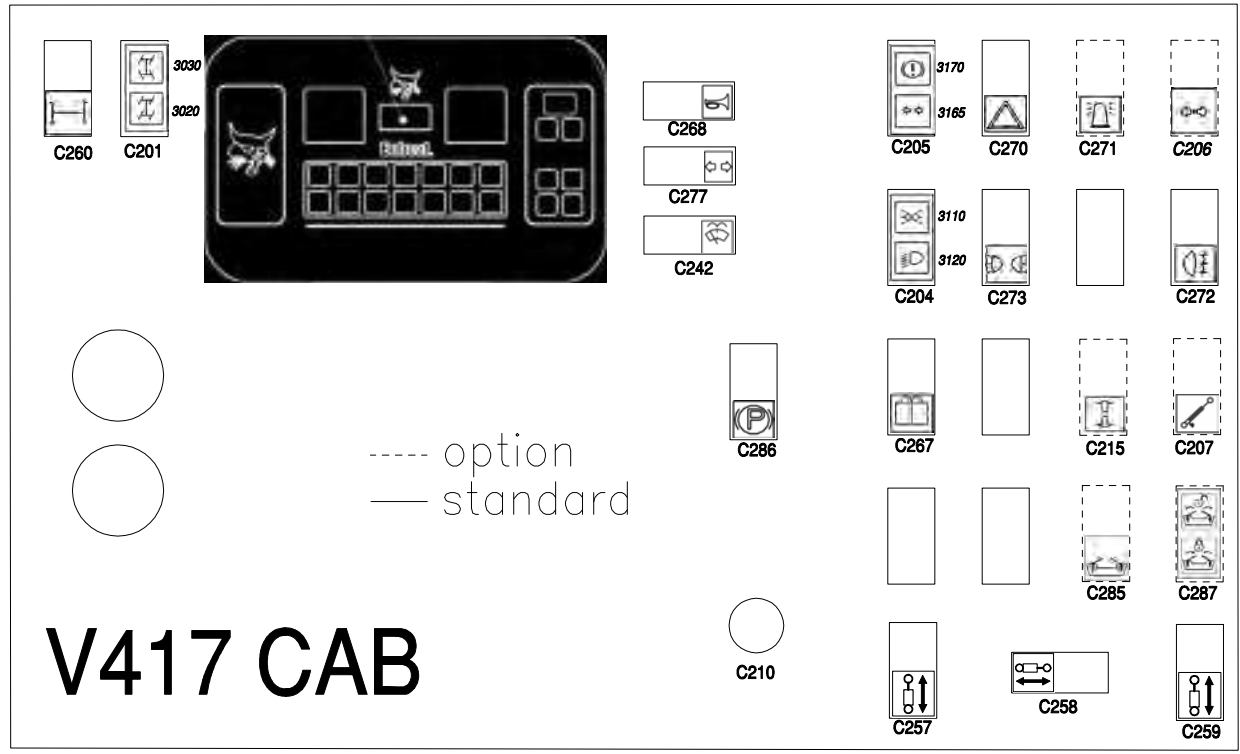
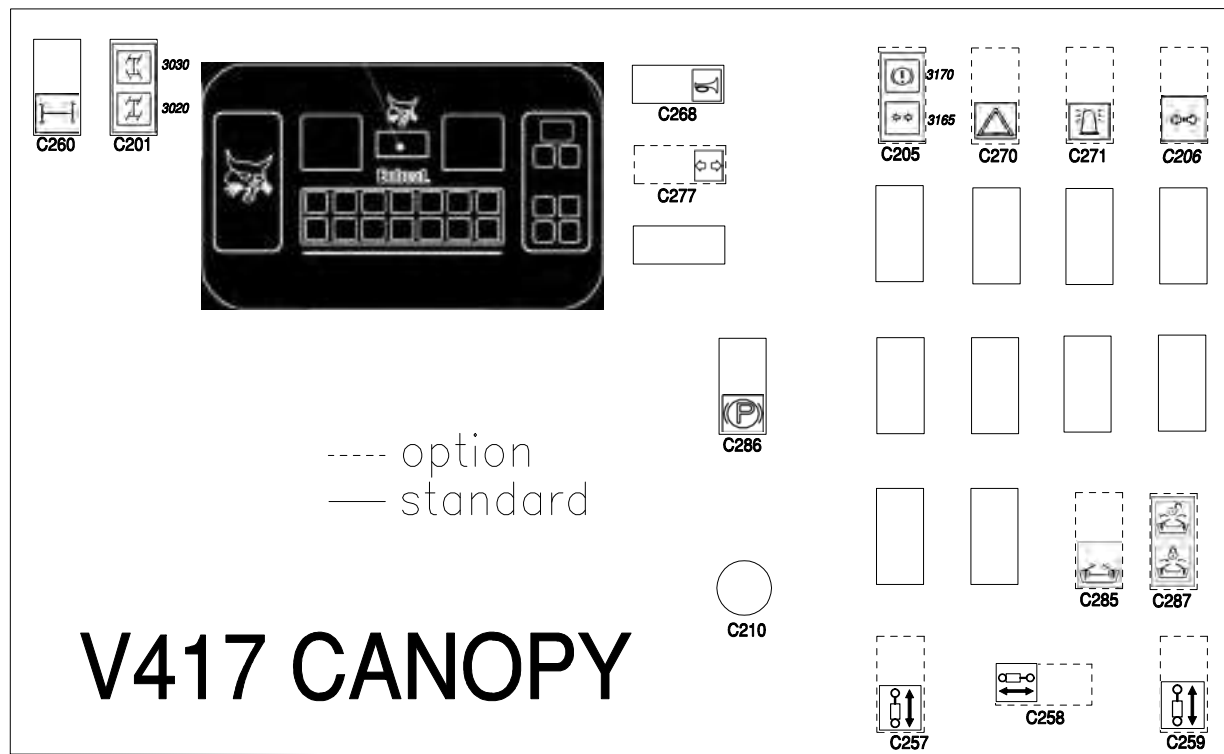
Printed February 2012
Page 5 of 17
6917028



ELECTRICAL SCHEMATIC T2250 (S/N AC1911001 - AC1911999)

[Printable Version Click Here](#)

Printed February 2012
Page 6 of 17
6917028

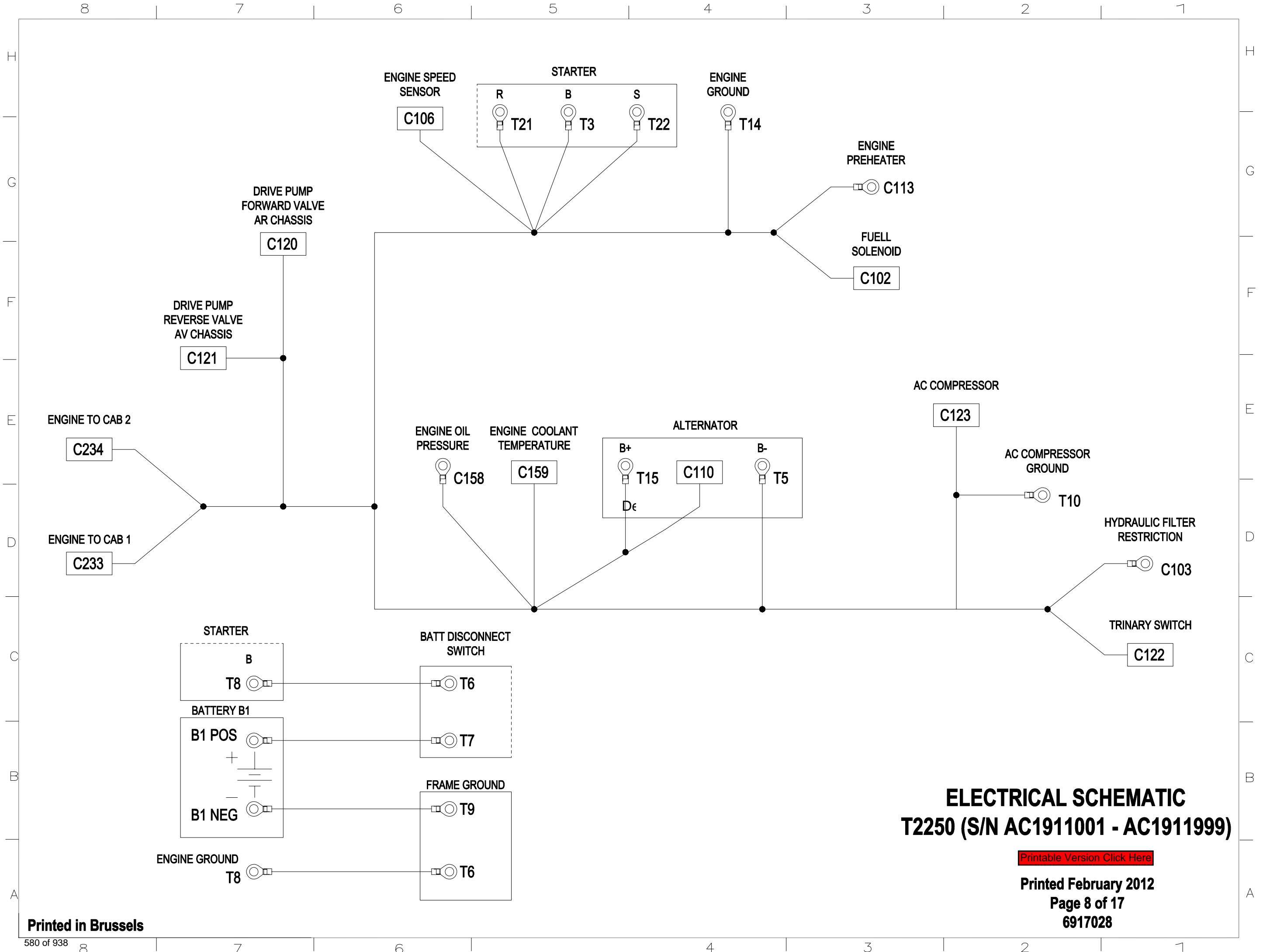


- | | | |
|--|--|---|
| C260 STEER MODE SWITCH.
INTER. MODE DIRECTIONNEL | C273 HEAD LIGHT SWITCH
INTER. FEUX | C439 SHUNT KEY AMA
CLE DE SHUNT AMA |
| C201 STEER MODE TT
VOYANT MODE DIRECTIONNEL | C272 FOG LIGHT SWITCH
INTER. ANTI BROUILLARD | C237 ISL |
| C268 HORN SWITCH
KLAXON | C267 WASHER SWITCH
INTER LAVE GLACE ARRIERE | C210 KEY SWITCH |
| C277 TURN SIGNAL SWITCH
INTER. CLIGNOTANT | C215 HYD. HOOK SWITCH
INTER. CROCHET HYD ARRIERE | |
| C242 WIPER SWITCH
INTER. ESSUIE GLACE AVANT | C207 HYD. CATCH SWITCH
INTER. ATTACH HYD ARRIERE | |
| C286 PARK BRAKE SWITCH
INTER. FREIN PARC | C284 6 / 2 VALVE SWITCH
INTER. ELECTRO 6 VOIES / QUICKTACH | |
| C270 HAZARD - WARNING | C285 POWER BOBTACH SWITCH
INTER POWER BOBTACH | |
| C205 HAZARD TT
VOYANT DEF. FREIN + CLIGNOTANT | C287 POWER TACH TT
VOYANT POWER BOBTACH | |
| C271 BEACON SWITCH
GYROPHARE | C257 LH SKI SWITCH
INTER. ACD SKI GAUCHE | |
| C206 TRAILER BLINKER
VOYANT CLIGNOTANT REMORQUE | C258 ATTACH SKI SWITCH
INTER. ACD ATTACH | |
| C204 ROAD LIGHTS TT
VOYANT FEUX | C259 RH SKI SWITCH
INTER. ACD SKI DROIT | |

ELECTRICAL SCHEMATIC T2250 (S/N AC1911001 - AC1911999)

[Printable Version Click Here](#)

Printed February 2012
Page 7 of 17
6917028

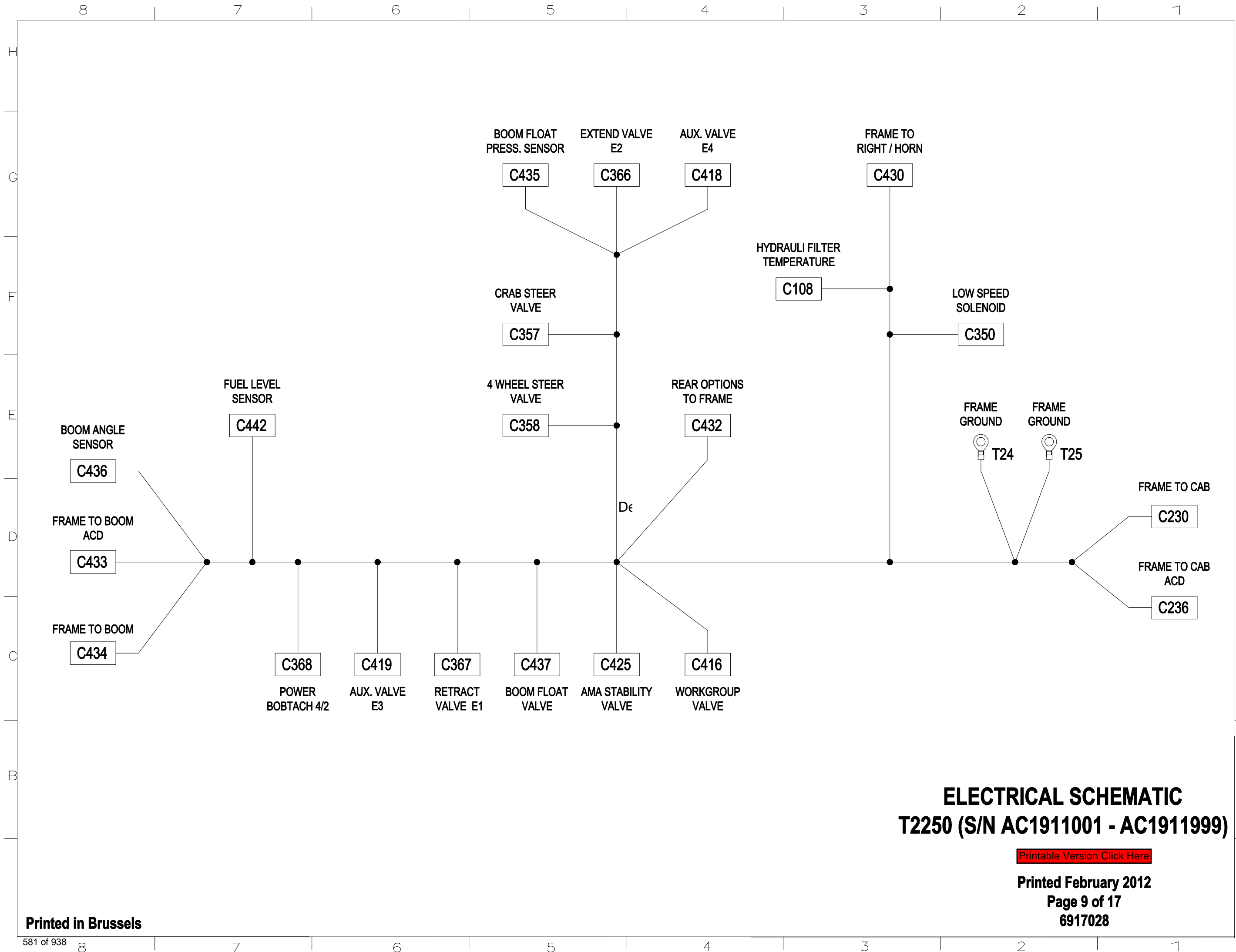


ELECTRICAL SCHEMATIC

T2250 (S/N AC1911001 - AC1911999)

[Printable Version Click Here](#)

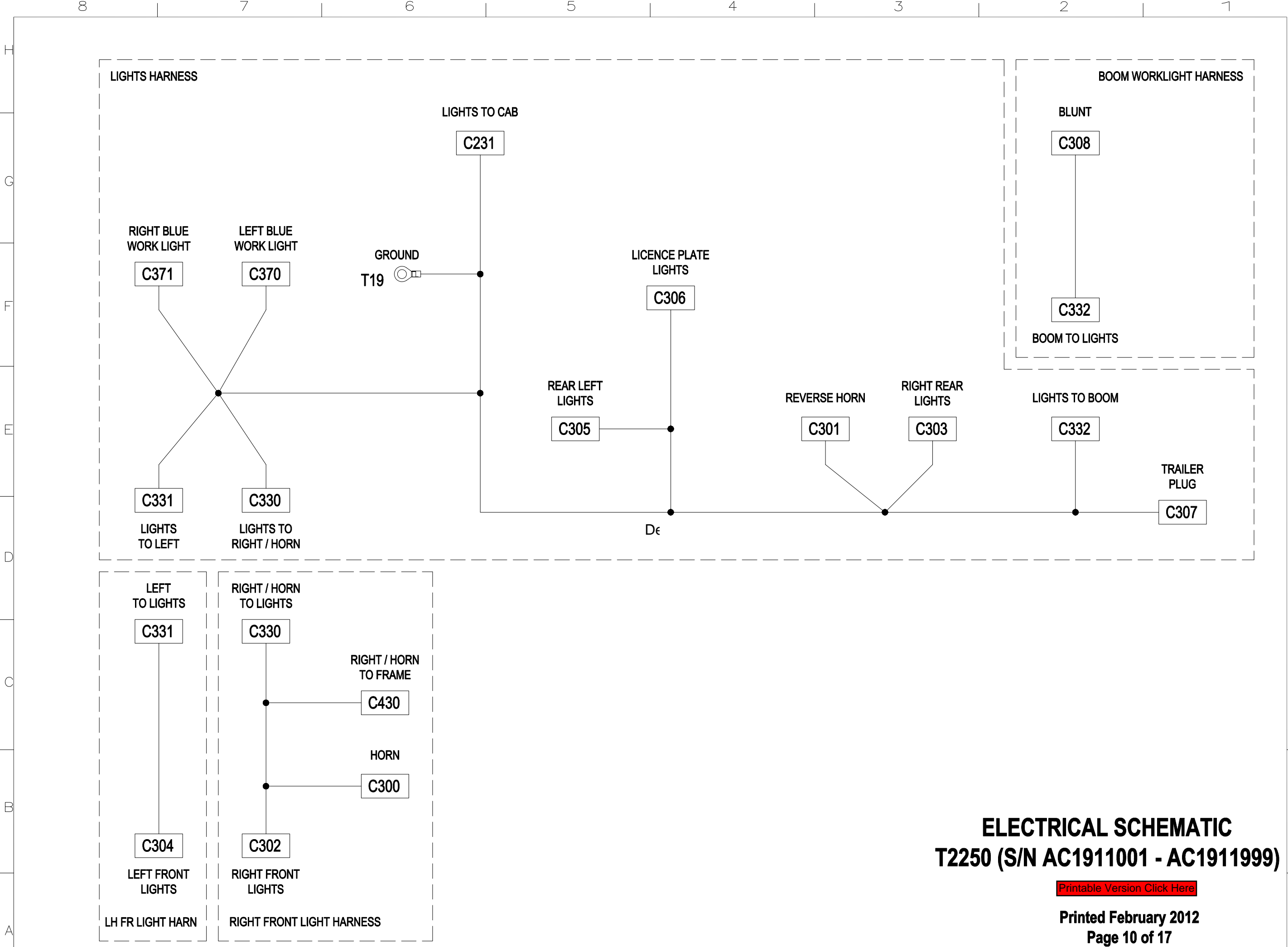
Printed February 2012
Page 8 of 17
6917028



**ELECTRICAL SCHEMATIC
T2250 (S/N AC1911001 - AC1911999)**

[Printable Version Click Here](#)

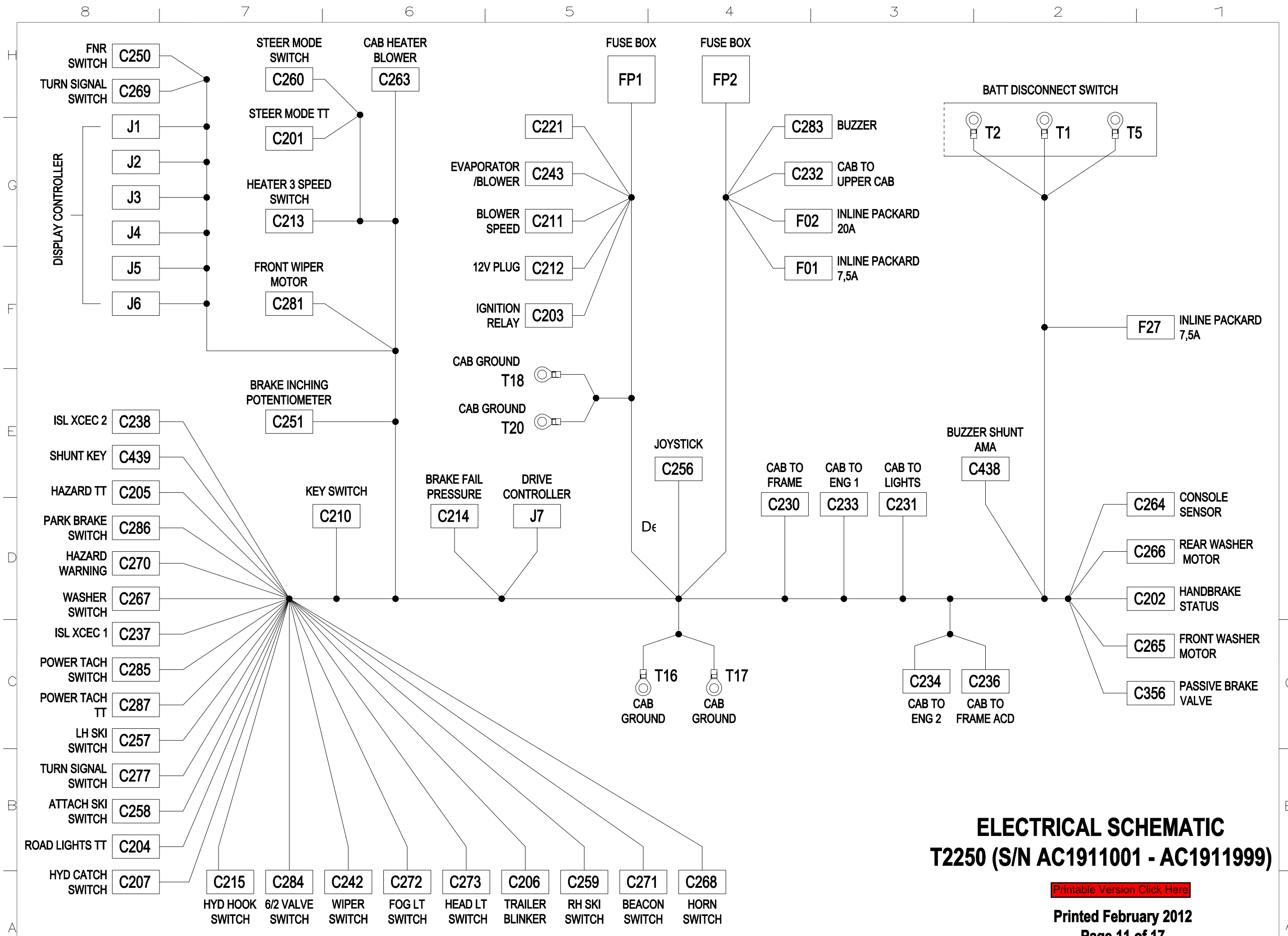
Printed February 2012
Page 9 of 17
6917028



**ELECTRICAL SCHEMATIC
T2250 (S/N AC1911001 - AC1911999)**

[Printable Version Click Here](#)

Printed February 2012
Page 10 of 17
6917028

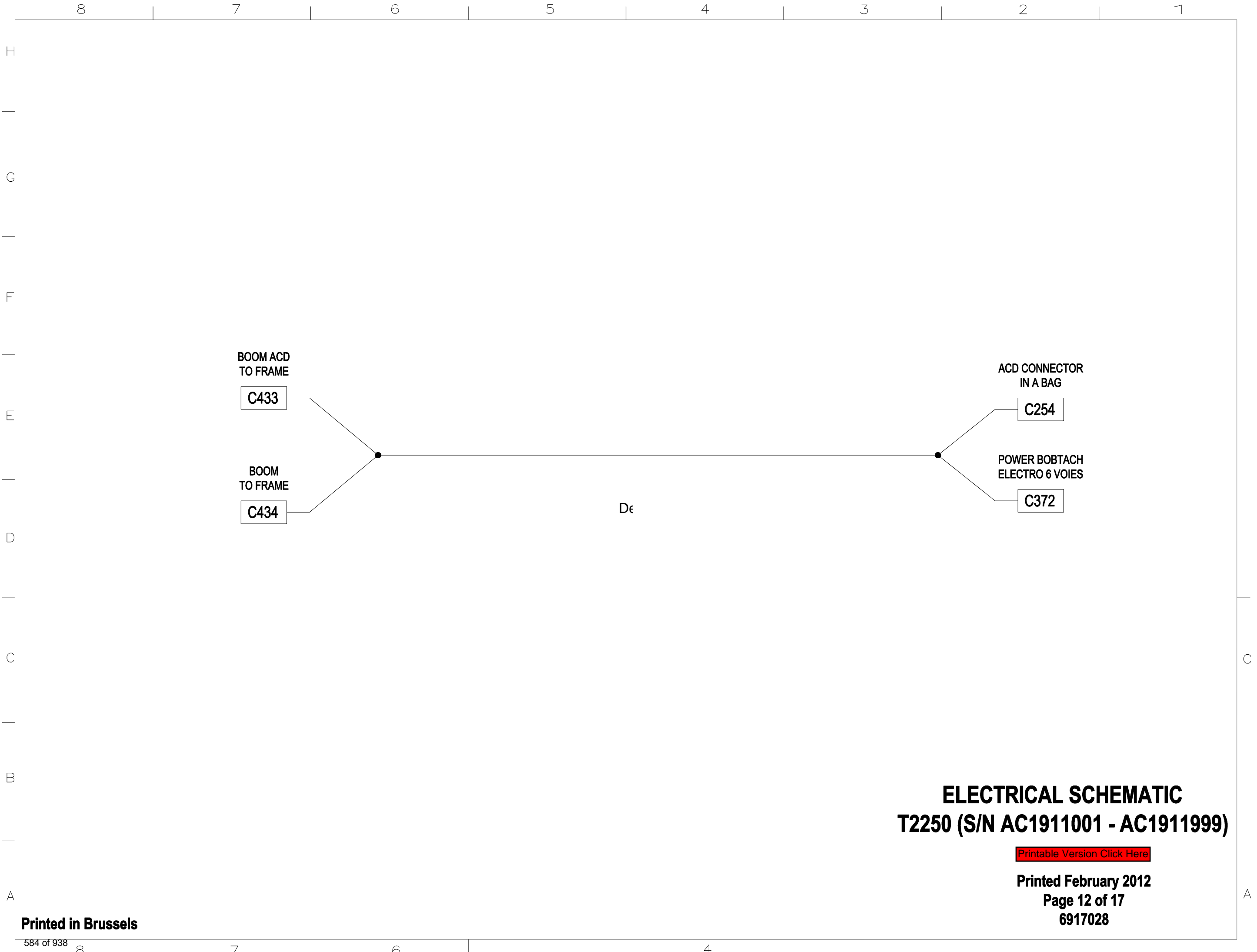


ELECTRICAL SCHEMATIC

T2250 (S/N AC1911001 - AC1911999)

[Printable Version Click Here](#)

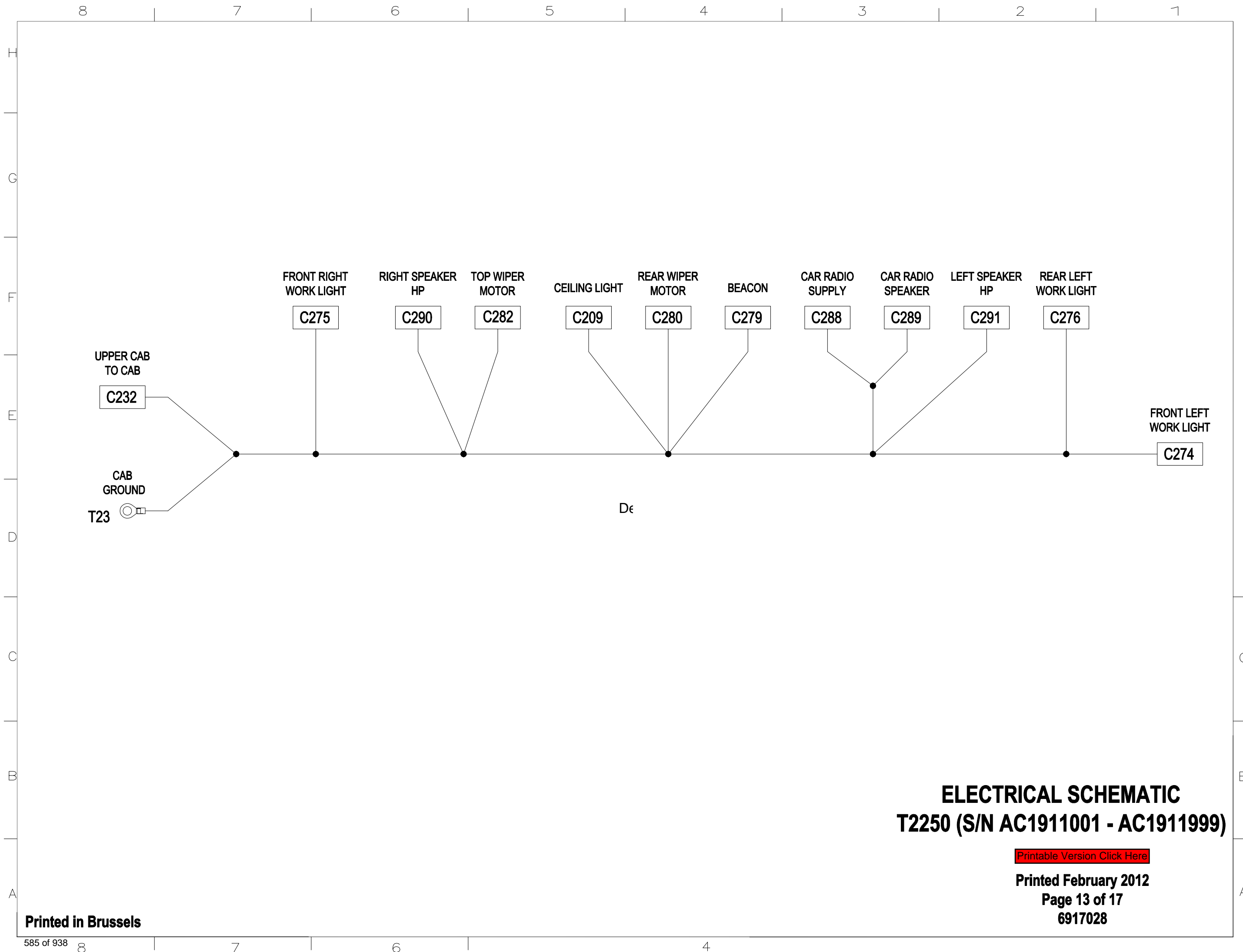
Printed February 2012
Page 11 of 17
6917028



**ELECTRICAL SCHEMATIC
T2250 (S/N AC1911001 - AC1911999)**

[Printable Version Click Here](#)

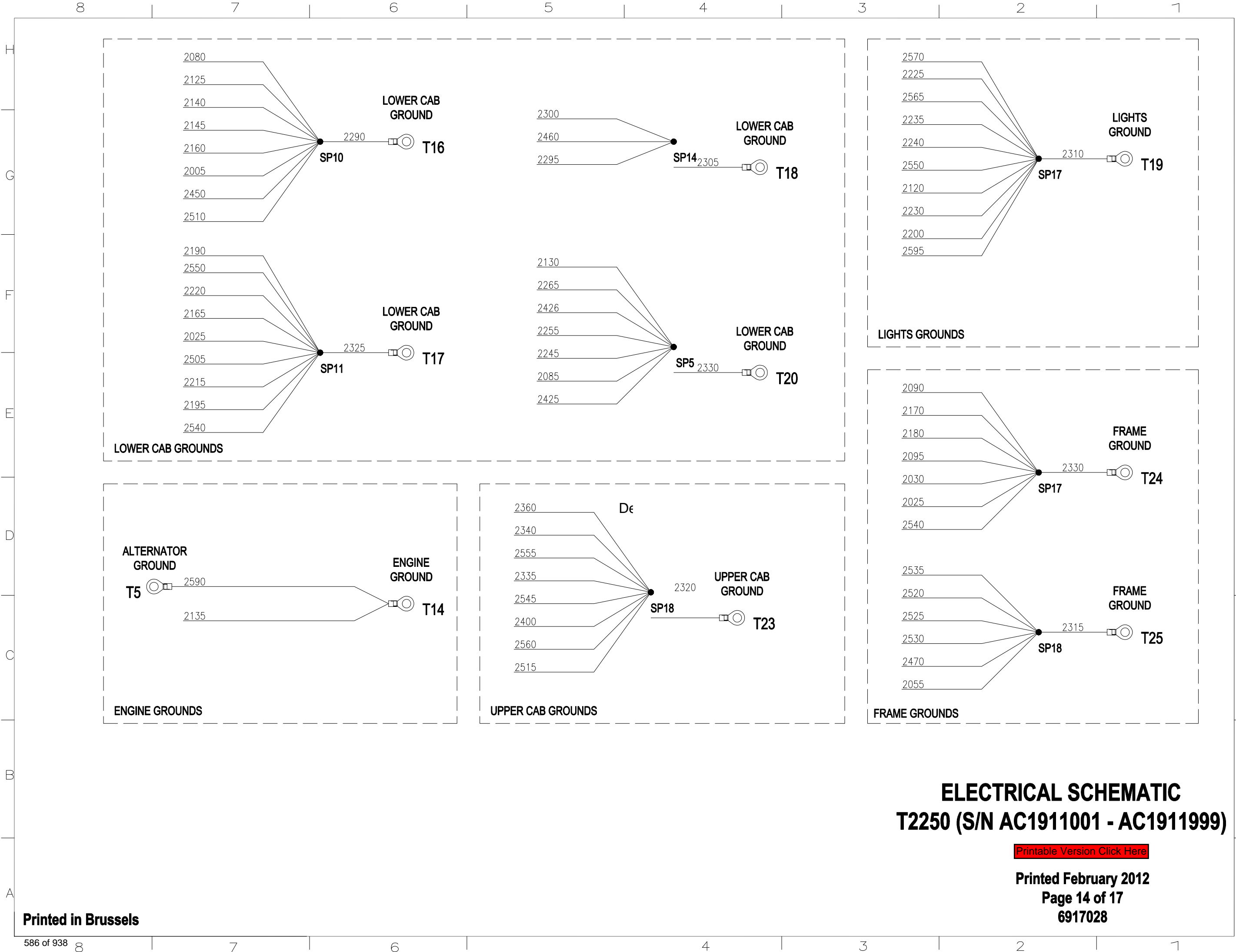
**Printed February 2012
Page 12 of 17
6917028**



**ELECTRICAL SCHEMATIC
T2250 (S/N AC1911001 - AC1911999)**

[Printable Version Click Here](#)

Printed February 2012
Page 13 of 17
6917028

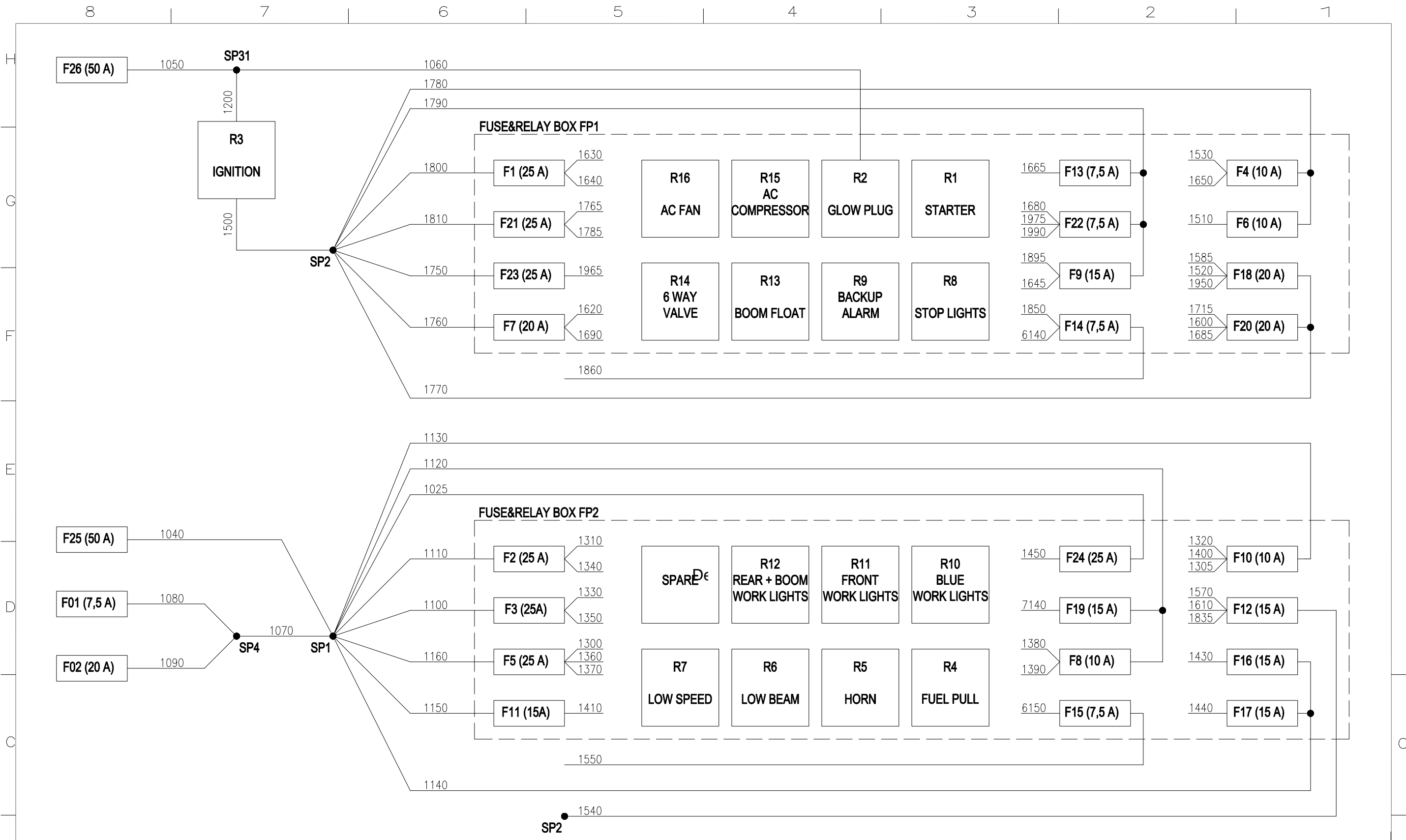


ELECTRICAL SCHEMATIC

T2250 (S/N AC1911001 - AC1911999)

[Printable Version Click Here](#)

Printed February 2012
 Page 14 of 17
 6917028

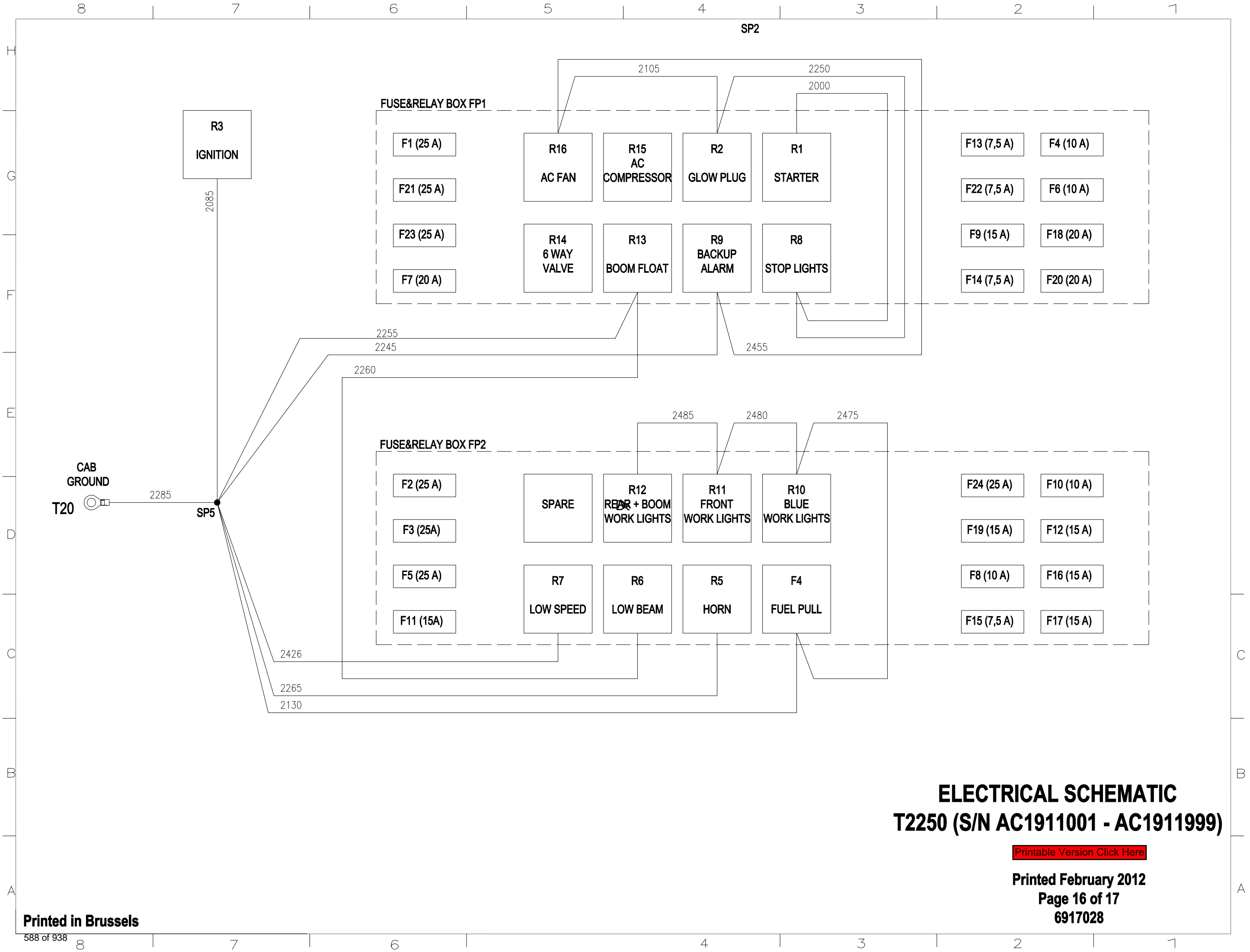


ELECTRICAL SCHEMATIC

T2250 (S/N AC1911001 - AC1911999)

[Printable Version Click Here](#)

Printed February 2012
 Page 15 of 17
 6917028



**ELECTRICAL SCHEMATIC
T2250 (S/N AC1911001 - AC1911999)**

[Printable Version Click Here](#)

Printed February 2012
Page 16 of 17
6917028

N°	BOITIERS FUSES BOX	CALIBR EVALUE	FONCTIONS FUNCTION	LIAISON LINK	
F1	FP1	25A	Relais de demarrage ; Alternateur	Starter Relay ; Alternator	Contact / Ignition
F2	FP2	25A	Controleur Display	Display Controller	+ Battery
F3	FP2	25A	Relais arrivée carburant ; Relais petite vitesse	Fuel pull relay ; Low speed relay	+ Battery
F4	FP1	10A	Levier FNR ; Controleur Drive	FNR lever ; Drive controller	Contact / Ignition
F5	FP2	25A	Controleur Drive ; Interrupteur clé contact	Drive controller ; Key switch	+ Battery
F6	FP1	10A	Mode directionnel	Steering mode	Contact / Ignition
F7	FP1	20A	Chauffage ; Climatisation	Heater blower ; AC Fan relay	Contact / Ignition
F8	FP2	10A	Plafonnier ; Relais Klaxon ; Auto-radio	Ceiling light ; Horn relay ; Car radio	+ Battery
F9	FP1	15A	Essuie-glace / Lave-glace avant ; Interrupteur Klaxon	Front wiper / Front washer ; Horn switch	Contact / Ignition
F10	FP2	10A	Interrupteur Feux ; Clignotant, Klaxon	Head light SW ; turn signal ; Horn	+ Battery
F11	FP2	15A	Feux de croisement	Low beam	+ Battery
F12	FP2	15A	ISL ; clé shunt ; capteur angle bras	ISL ; Shunt key ; Boom angle sensor	Contact / Ignition
F13	FP1	7,5A	Warning	Hazard	Contact / Ignition
F14	FP1	7,5A	Feux de position gauche ; feu plaque	Left park lights ; license plate light	+ Battery
F15	FP2	7,5A	Feux de position droit	Right park lights	+ Battery
F16	FP2	15A	Feux de travail avant	Front work lights	+ Battery
F17	FP2	15A	Feu de travail arrière + feu de travail bras	Rear and boom work lights	+ Battery
F18	FP1	20A	Interrupteur Power bobtach ; Interrupteur frein de parc ; Gyrophare ; Relais Alarme recul ; Relais Electro 6 voies.	Power bobtach switch ; Park brake switch ; Beacon ; Backup alarm relay ; 6/2 way valve relay	Contact / Ignition
F19	FP2	15A	Allume-cigare	Cigar light	+ Battery
F20	FP1	20A	Feux stop ; Auxiliaires arrière ; Mano contact défaillance frein de service	Stop Lights ; Rear auxiliaries ; Brake fail pressure switch	Contact / Ignition
F21	FP1	25A	essuie-glace arrière et toit ; lave-glace arrière ; auto-radio	Rear washer motor ; Top and Rear wiper motors ; Car radio	Contact / Ignition
F22	FP1	7,5A	Joystick ; interrupteur ACD ; inter electro 6 voies	Joystick ; ACD switches ; 6/2 way valve switch	Contact / Ignition
F23	FP1	25A	Boomfloat ; alimentation ACD	Boomfloat ; ACD supply	Contact / Ignition
F24	FP2	25A	Equipement ACD	ACD attachment	+ Battery
F25	lower cab	50A	+ BATTERIE	+ BATTERY	+ Battery
F26	lower cab	50A	Préchauffage ; relais de contact	Ignition relay ; Glow plug relay	+ Battery
F27	lower cab	7.5 A	Warning	Hazard	+ Battery
F01	lower cab	7,5A	Climatisation (compresseur)	AC compressor	+ Battery
F02	lower cab	20A	Climatisation	AC	+ Battery

**ELECTRICAL SCHEMATIC
T2250 (S/N AC1911001 - AC1911999)**

[Printable Version Click Here](#)

**Printed February 2012
Page 17 of 17
6917028**

	DESIGNATION	SHEET	LOCATION
	JOYSTICK	3	G2
	KEY SWITCH	3	G5
	FNR LEVER	3	G3
	STARTER RELAY	3	G7
	IGNITION RELAY	3	D6
	GLOW PLUG RELAY	3	C6
	FUEL PULL RELAY	3	C4
	LOW SPEED RELAY	3	D4
	INCHING SENSOR	3	D2
	CAB BUZZER	3	B5
	ISL (LONGITUDINAL STABILITY INDICATOR)	4	F8
	AMA KEY SHUNT	4	D8
	STEER MODE TELLTALE	4	E6
	STEER MODE SWITCH	4	G6
	6/2 VALVE SWITCH	4	G7
	HEATER 3 SPEED SWITCH	4	D5
	CAB HEATER BLOWER	4	B5
	AC FAN RELAY	4	F4
	BLOWER SPEED SWITCH	4	E4
	AC EVAPORATOR/BLOWER	4	D4
	AC COMPRESSOR RELAY	4	E3
	ACD LH SKI SWITCH	4	G3
	ACD ATTACH SKI SWITCH	4	G2
	ACD RH SKI SWITCH	4	G1
	CEILING LIGHT	5	F8
	HORN RELAY	5	F8
	HORN SWITCH (NA)	5	G7
	TURN SIGNAL SWITCH (ESA)	5	G7
	WIPER SWITCH	5	E7
	FRONT WASHER MOTOR	5	D7
	FRONT WIPER MOTOR	5	D7
	TURN SIGNAL SWITCH (NA)	5	E6
	HAZARD WARNING SWITCH	5	F5
	FLASHER RELAY	5	E5
	HAZARD TELLTALE	5	D5
	TRAILER TURN SIGNAL TELLTALE	5	C5
	FOG LIGHT SWITCH	5	G5
	HEADLIGHT SWITCH	5	G4
	ROADLIGHT TELLTALE	5	C4
	LOW BEAM RELAY	5	E3
	POWER BOBTACH SWITCH	5	G2
	BOOMFLOAT RELAY	5	E2
	POWER BOBTACH TELLTALE	5	F3
	PARK BRAKE SWITCH (NA)	5	G1
	BACKUP ALARM RELAY	5	E1
	BLUE WORK LIGHT RELAY	6	D8
	FRONT WORK LIGHT RELAY	6	D7
	REAR AND BOOM WORK LIGHT RELAY	6	D7
	BEACON SWITCH	6	G6
	BEACON	6	E6
	CIGAR LIGHT	6	F6
	STOP LIGHT RELAY	6	D5
	HYDRAULIC CATCH SWITCH	6	F4
	HYDRAULIC HOOK SWITCH	6	F3
	BRAKE FAIL PRESSURE SWITCH (germany)	6	F2
	REAR WASHER SWITCH	6	G2
	REAR WASHER MOTOR	6	E2
	REAR WIPER	6	C1
	TOP WIPER	6	C1
	LORS BAR SENSOR	7	G5
	CAR RADIO	7	E2
	RIGHT SPEAKER HP	7	C1
	LEFT SPEAKER HP	7	C1

CAB / CABINE

	DESIGNATION	SHEET	LOCATION
	STARTER	3	B7
	ALTERNATOR	3	B6
	FUEL SOLENOID PUMP	3	B4
	ENGINE PREHEATER	3	A6
	AC COMPRESSOR	4	D3
	TRINARY SWITCH	4	B4
	ENGINE COOLANT TEMP	4	D3
	ENGINE OIL PRESSURE SWITCH	4	C2
	HYDRAULIC FILTER RESTRICTION	4	C1
	ENGINE SPEED SENSOR	7	F3
	BATTERY	3	C8
	DISCONNECT SWITCH	3	D8
	LOW SPEED VALVE	3	C4
	DRIVE PUMP FORWARD VALVE	3	D3
	DRIVE PUMP REVERSE VALVE	3	D2
	BOOM FLOAT PRESSURE SENSOR	3	D1
	PASSIVE BRAKE VALVE	3	C3
	BUZZER SHUNT AMA	4	C8
	CRAB STEER VALVE	4	D6
	4 WHEEL STEER VALVE	4	D5
	HANDBRAKE STATUS PRESSURE SWITCH	4	C1
	HYDRAULIC OIL TEMPERATURE	4	C2
	HORN	5	E8
	BOOM FLOAT VALVE	5	D2
	REVERSE HORN	5	C1
	FRONT LEFT LIGHT	5	B8
	REAR LEFT LIGHT	5	B7
	LICENSE PLACE LIGHT	5	A6
	TRAILER PLUG	5	A6
	RIGHT REAR LIGHT	5	B5
	RIGHT FRONT LIGHT	5	B4
	RIGHT BLUE WORK LIGHT	6	C8
	LEFT BLUE WORK LIGHT	6	C8
	FRONT RIGHT WORK LIGHT	6	B7
	FRONT LEFT WORK LIGHT	6	B7
	REAR LEFT WORK LIGHT	6	B7
	BOOM WORK LIGHT	6	B6
	REAR AUXILIARY HYDRAULIC CATCH - VALVE	6	D4
	REAR AUXILIARY HYDRAULIC CATCH + VALVE	6	D4
	REAR AUXILIARY DIVERTER VALVE	6	D4
	REAR AUXILIARY HOOK LOWER VALVE	6	D3
	REAR AUXILIARY HOOK RAISE VALVE	6	D3
	AUXILIARY VALVE	7	E8
	AUXILIARY VALVE	7	E7
	BOOM RETRACT VALVE	7	E7
	BOOM EXTEND VALVE	7	E6
	POWER BOBTACH 4/2 VALVE	7	D6
	AMA STABILITY VALVE	7	E5
	FUEL LEVEL	7	F4
	WORK GROUP VALVE	7	D3
	BOOM ANGLE SWITCH	4	G8
	ACD ATTACHMENT	7	C5
	POWER BOBTACH 6/2 VALVE	7	C3

FRAME / CHASSIS

BOOM / BRAS

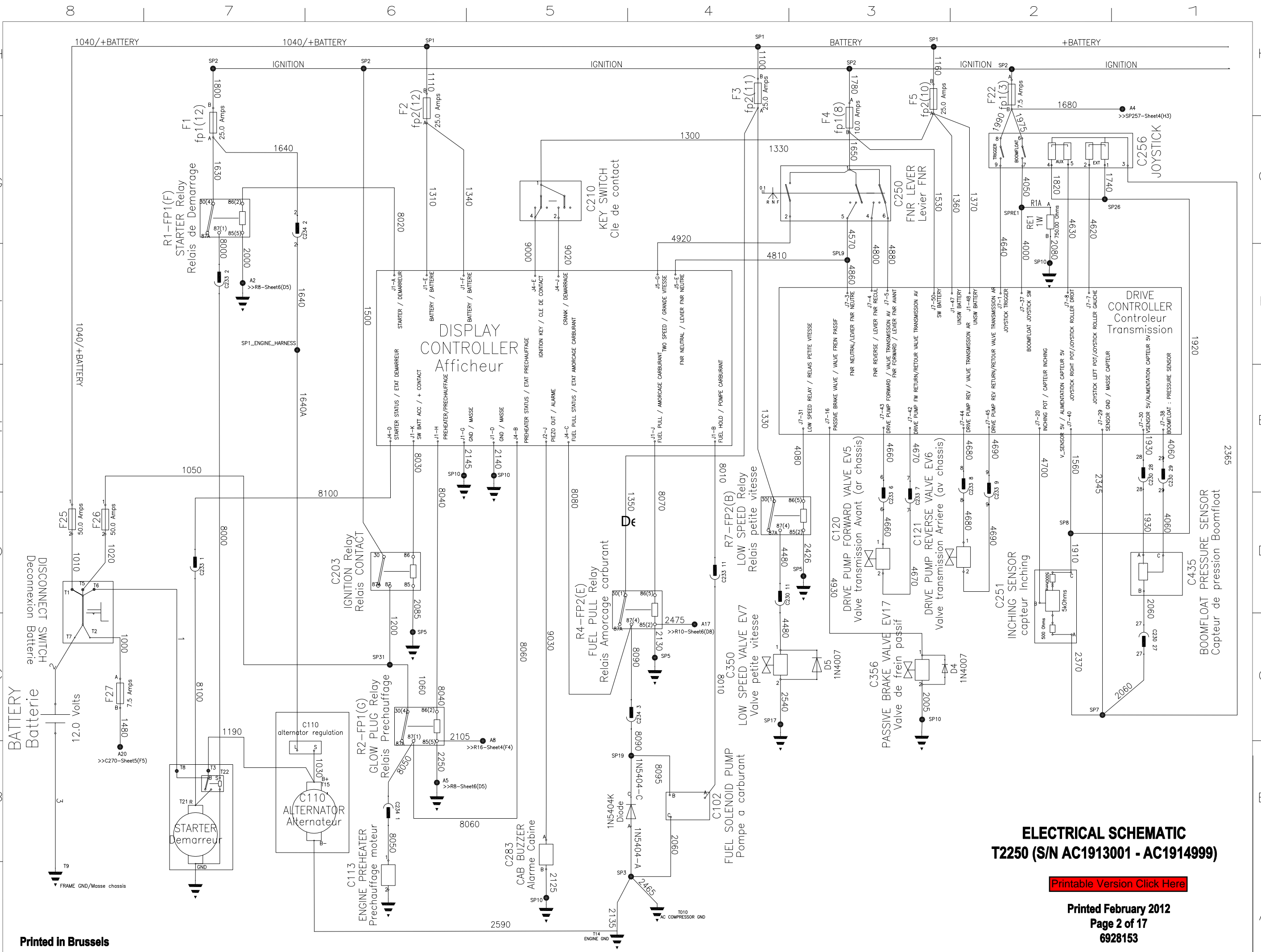
ELECTRICAL SCHEMATIC
T2250 (S/N AC1913001 - AC1914999)

[Printable Version Click Here](#)

Printed February 2012

Page 1 of 17

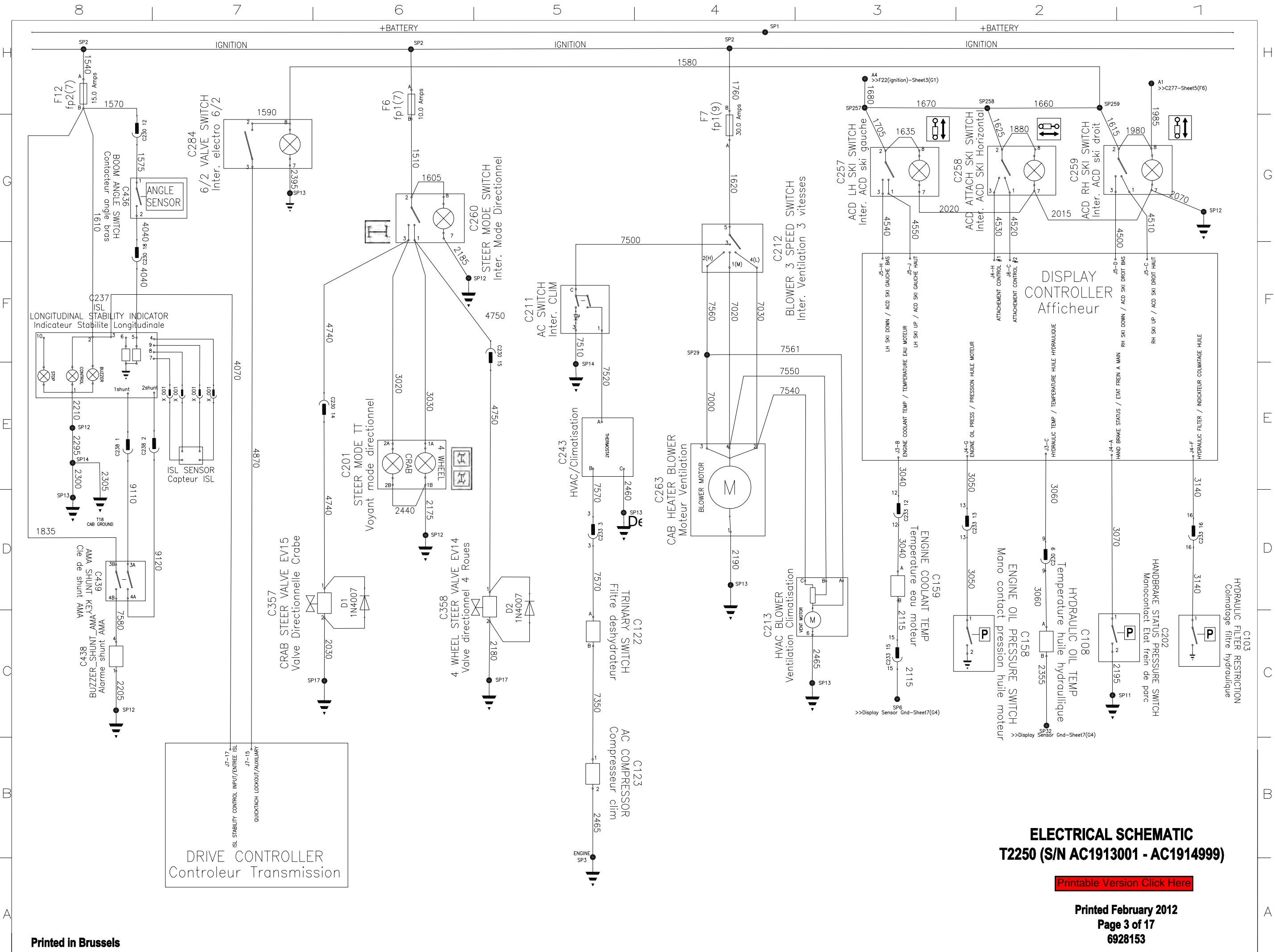
6928153



**ELECTRICAL SCHEMATIC
T2250 (S/N AC1913001 - AC1914999)**

[Printable Version Click Here](#)

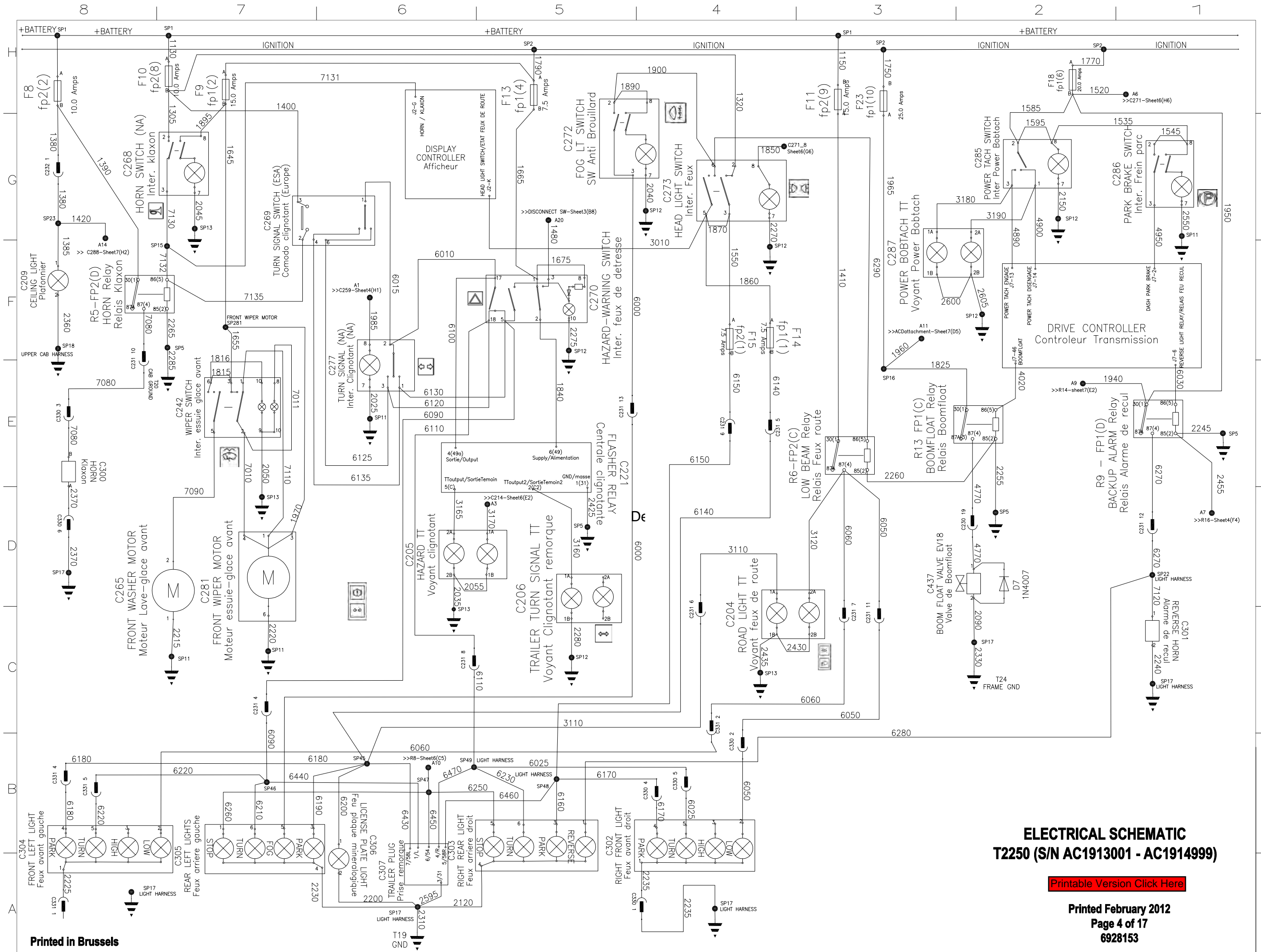
Printed February 2012
Page 2 of 17
6928153



**ELECTRICAL SCHEMATIC
T2250 (S/N AC1913001 - AC1914999)**

[Printable Version Click Here](#)

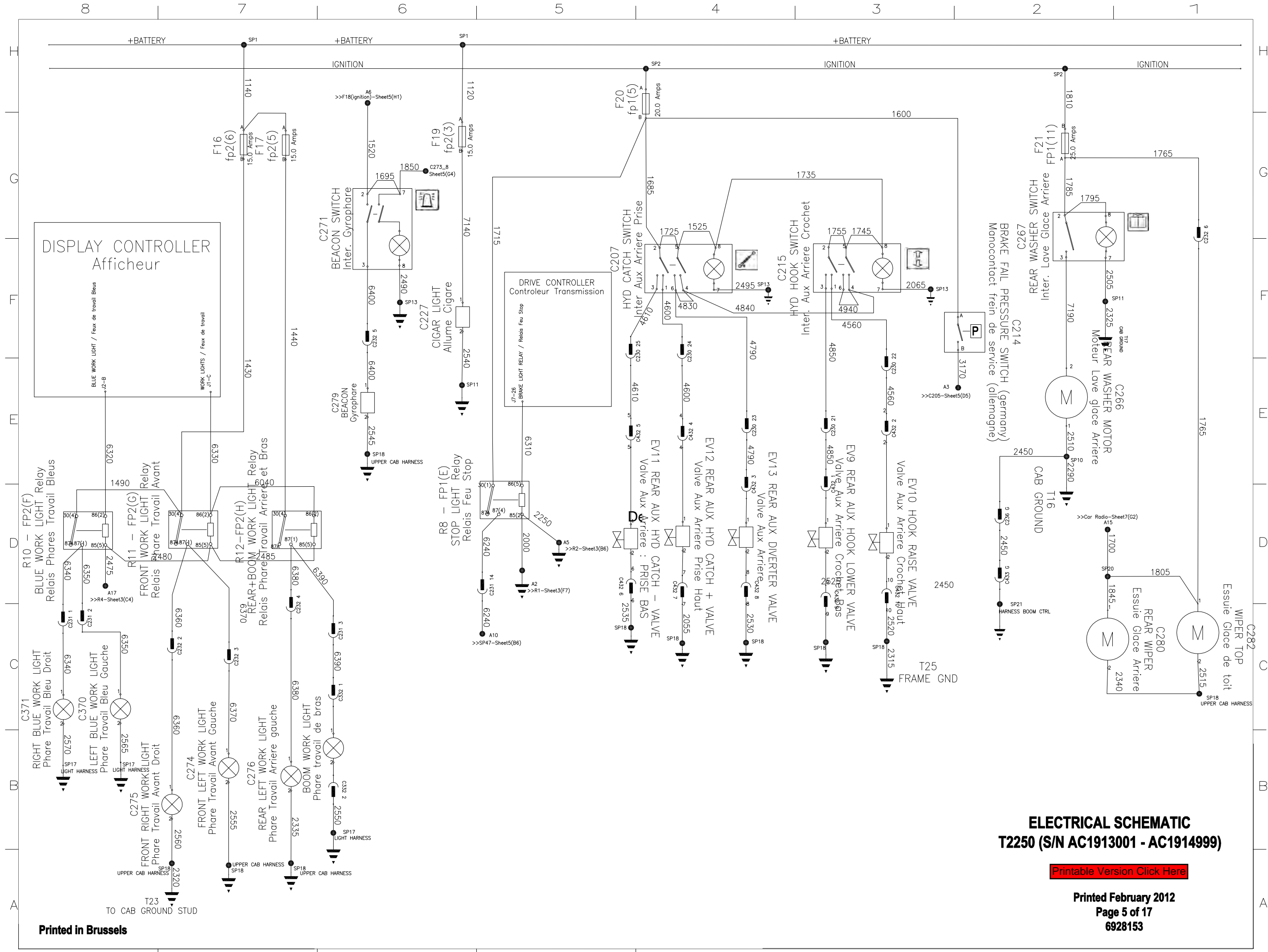
Printed February 2012
Page 3 of 17
6928153



ELECTRICAL SCHEMATIC
T2250 (S/N AC1913001 - AC1914999)

[Printable Version Click Here](#)

Printed February 2012
 Page 4 of 17
 6928153

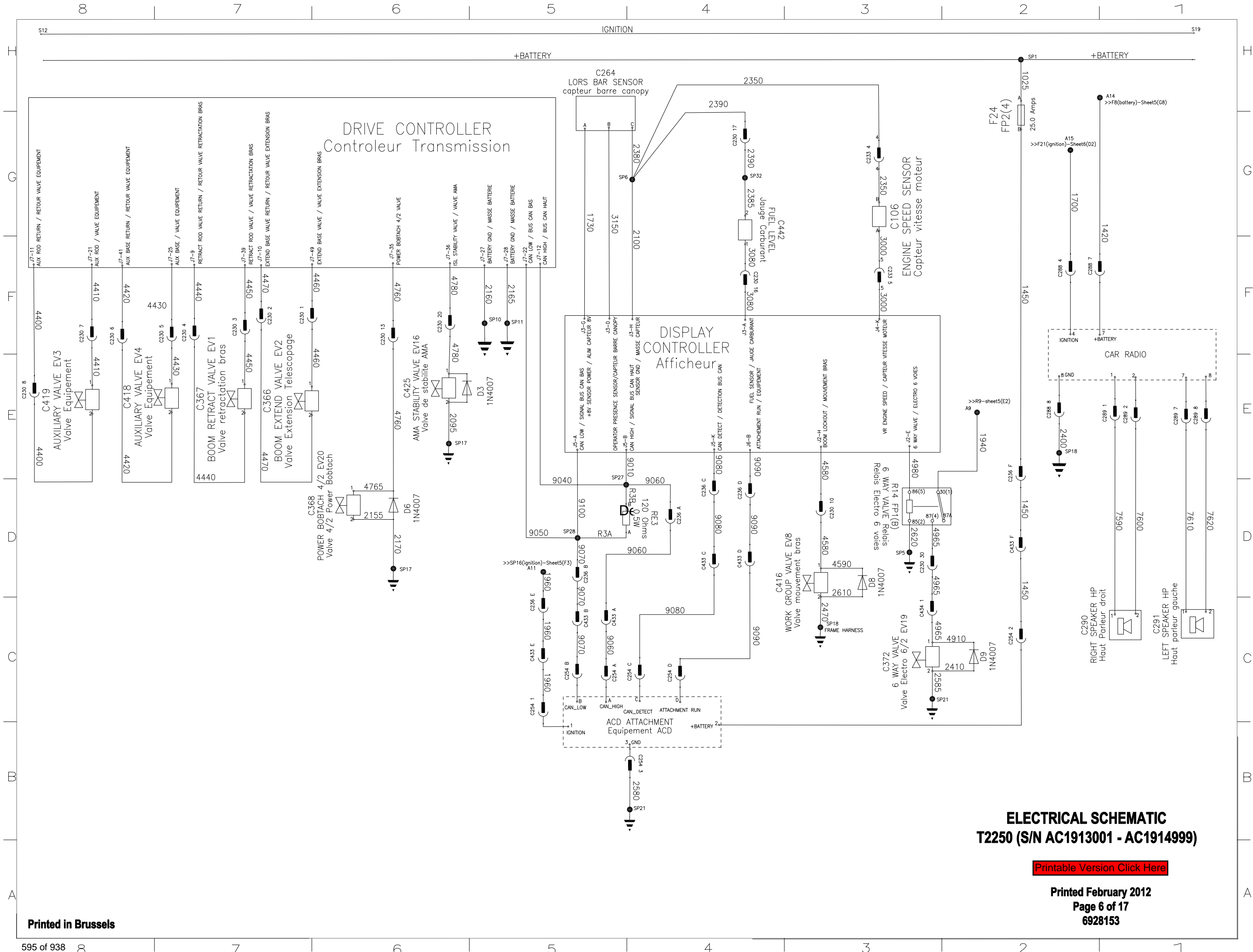


**ELECTRICAL SCHEMATIC
T2250 (S/N AC1913001 - AC1914999)**

[Printable Version Click Here](#)

Printed February 2012
Page 5 of 17
6928153

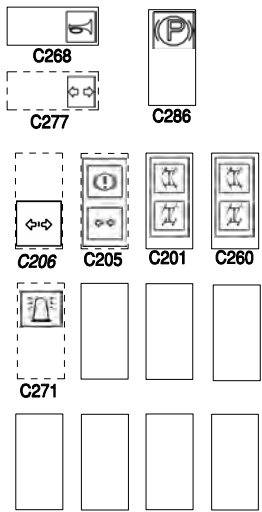
Printed in Brussels



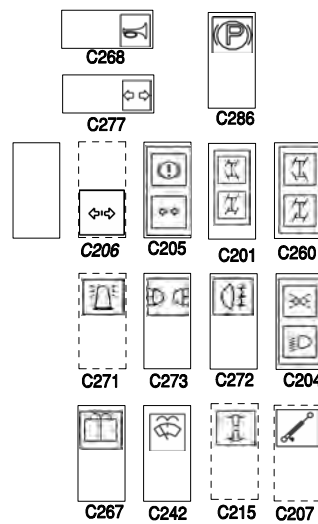
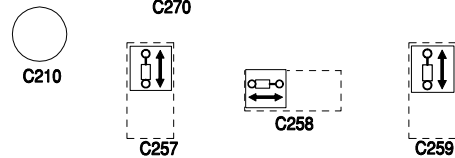
**ELECTRICAL SCHEMATIC
T2250 (S/N AC1913001 - AC1914999)**

[Printable Version Click Here](#)

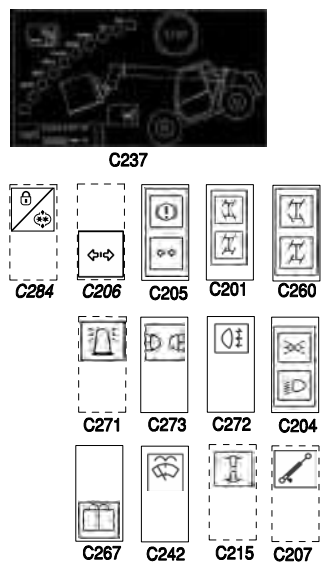
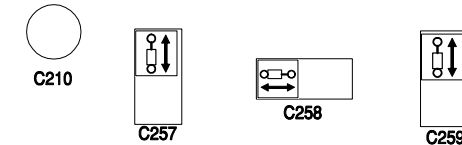
Printed February 2012
Page 6 of 17
6928153



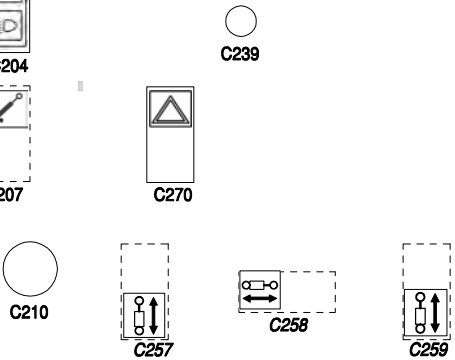
V417 CANOPY



V417 CABINE



T2250

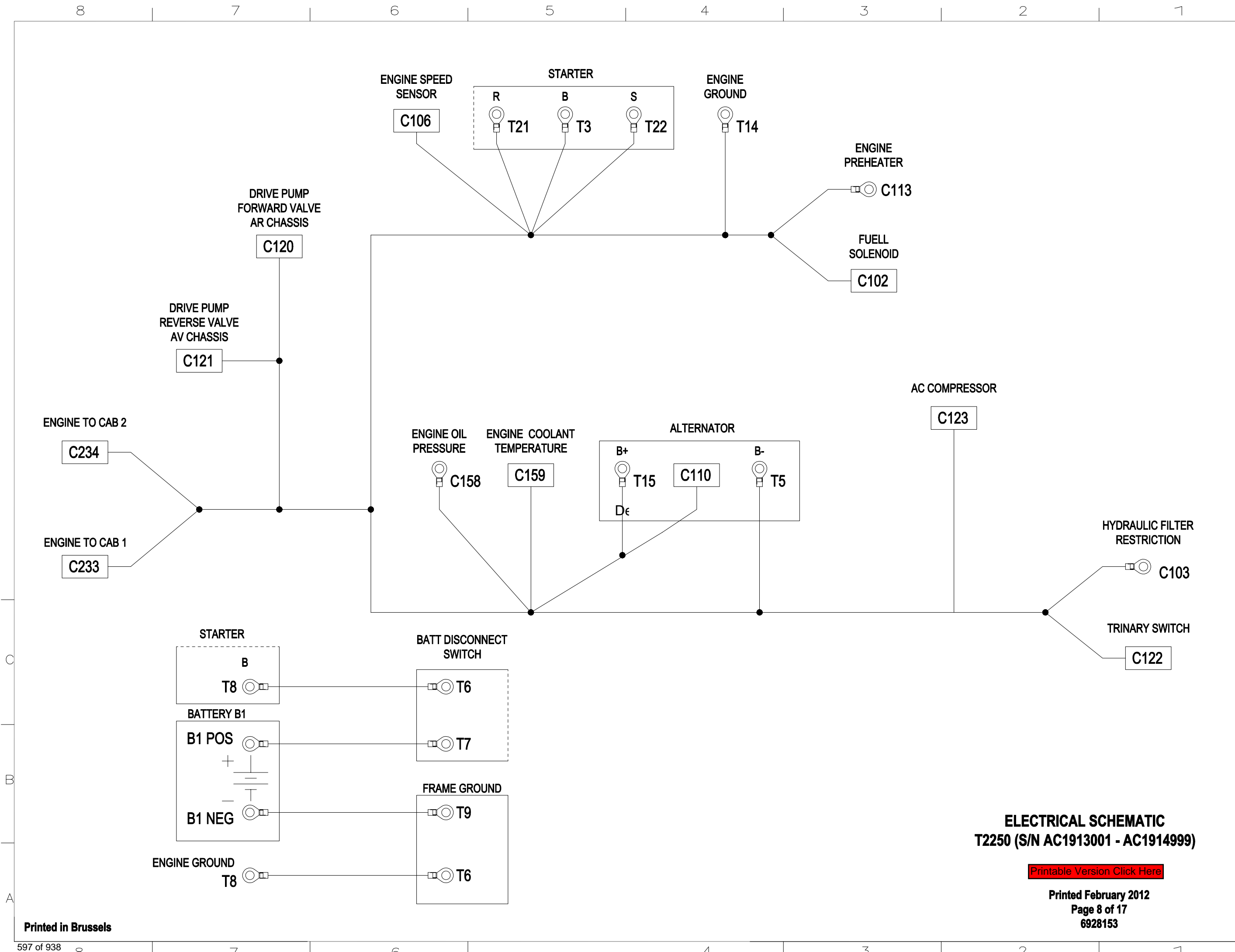


- | | | | | | |
|------|--|------|--|------|-----------------------------------|
| C260 | STEER MODE SWITCH.
INTER. MODE DIRECTIONNEL | C273 | HEAD LIGHT SWITCH
INTER. FEUX | C239 | SHUNT KEY AMA
CLE DE SHUNT AMA |
| C201 | STEER MODE TT
VOYANT MODE DIRECTIONNEL | C272 | FOG LIGHT SWITCH
INTER. ANTI BROUILLARD | C237 | ISL |
| C268 | HORN SWITCH
KLAXON | C267 | WASHER SWITCH
INTER LAVE GLACE ARRIERE | C210 | KEY SWITCH |
| C277 | TURN SIGNAL SWITCH
INTER. CLIGNOTANT | C215 | HYD. HOOK SWITCH
INTER. CROCHET HYD ARRIERE | | |
| C242 | WIPER SWITCH
INTER. ESSUIE GLACE AVANT | C207 | HYD. CATCH SWITCH
INTER. ATTACH HYD ARRIERE | | |
| C286 | PARK BRAKE SWITCH
INTER. FREIN PARC | C284 | 6 / 2 VALVE SWITCH
INTER. ELECTRO 6 VOIES / QUICKTACH | | |
| C270 | HAZARD - WARNING | C285 | POWER BOBTACH SWITCH
INTER POWER BOBTACH | | |
| C205 | HAZARD TT
VOYANT DEF. FREIN + CLIGNOTANT | C287 | POWER TACH TT
VOYANT POWER BOBTACH | | |
| C271 | BEACON SWITCH
GYROPHARE | C257 | LH SKI SWITCH
INTER. ACD SKI GAUCHE | | |
| C206 | TRAILER BLINKER
VOYANT CLIGNOTANT REMORQUE | C258 | ATTACH SKI SWITCH
INTER. ACD ATTACH | | |
| C204 | ROAD LIGHTS TT
VOYANT FEUX | C259 | RH SKI SWITCH
INTER. ACD SKI DROIT | | |

**ELECTRICAL SCHEMATIC
T2250 (S/N AC1913001 - AC1914999)**

[Printable Version Click Here](#)

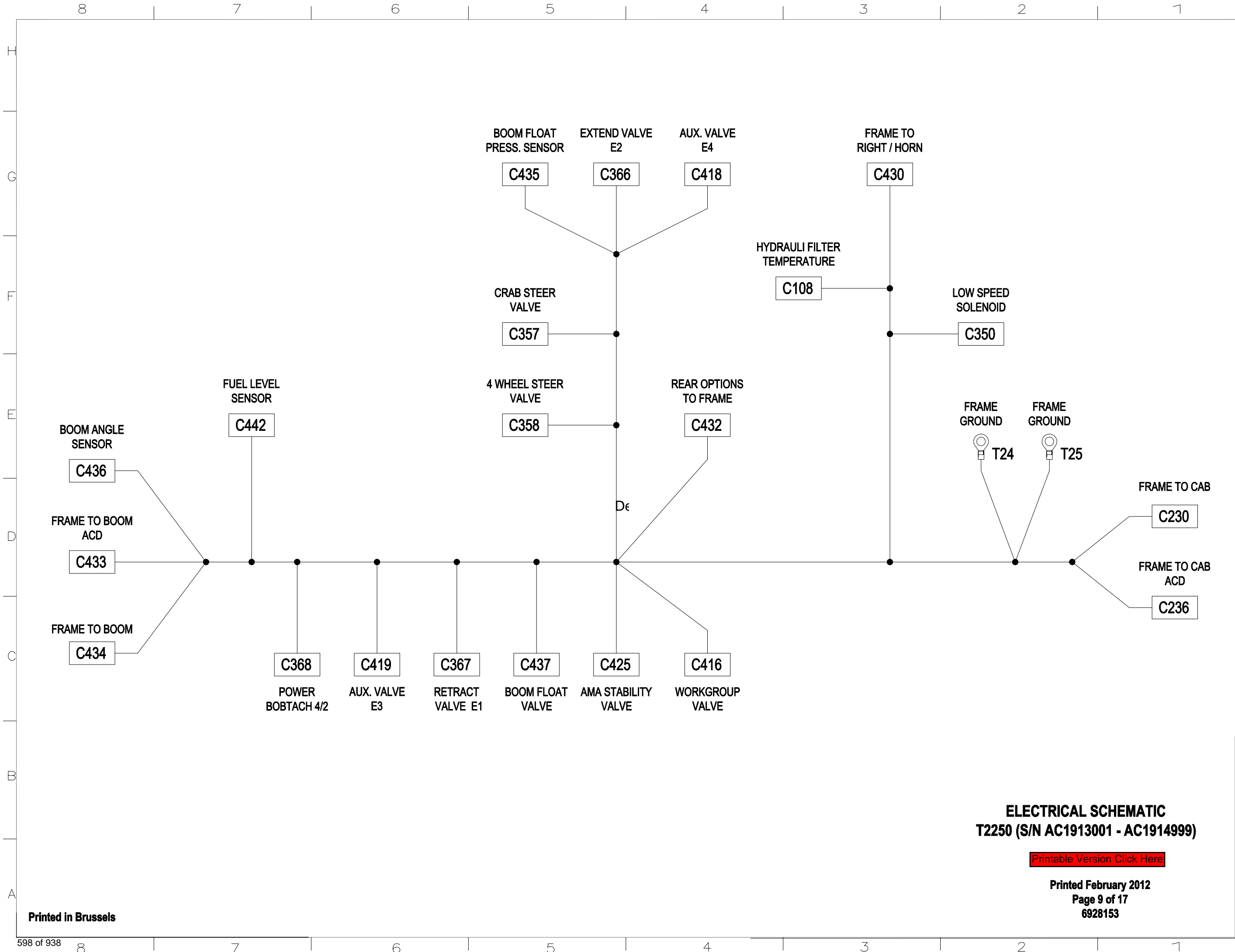
Printed February 2012
Page 7 of 17
6928153



**ELECTRICAL SCHEMATIC
T2250 (S/N AC1913001 - AC1914999)**

[Printable Version Click Here](#)

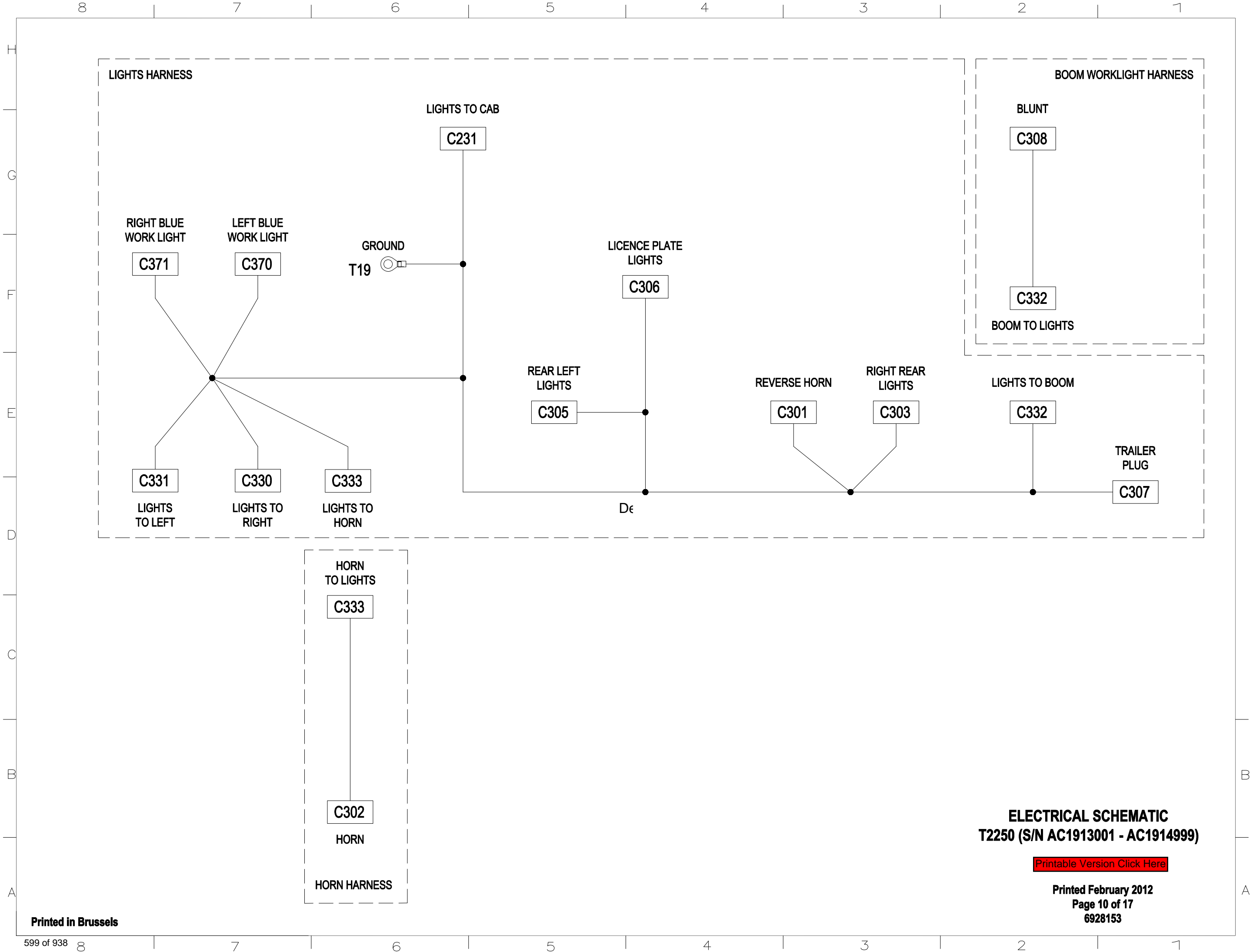
Printed February 2012
Page 8 of 17
6928153



**ELECTRICAL SCHEMATIC
T2250 (S/N AC1913001 - AC1914999)**

[Printable Version Click Here](#)

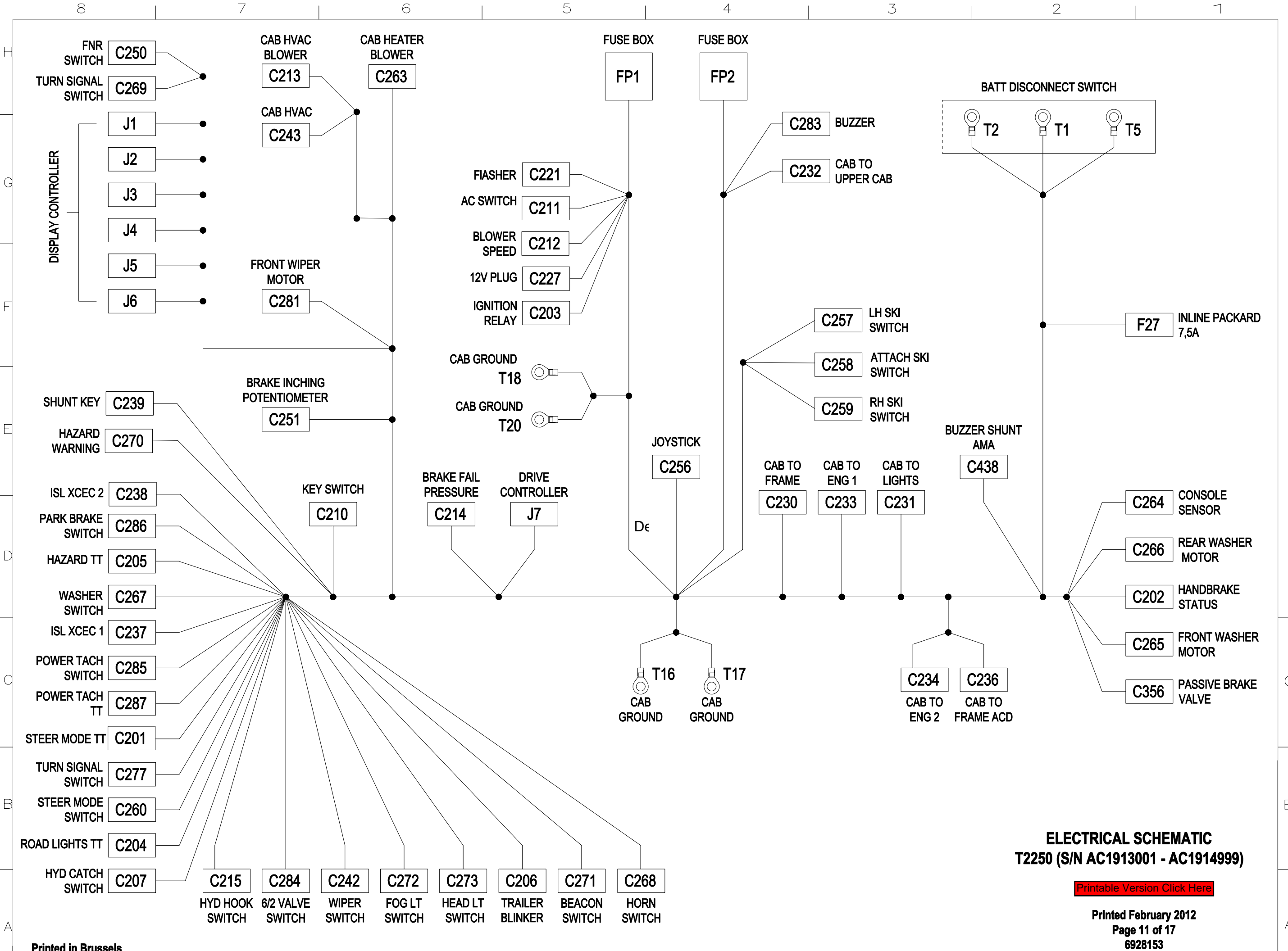
Printed February 2012
Page 9 of 17
6928153



**ELECTRICAL SCHEMATIC
T2250 (S/N AC1913001 - AC1914999)**

[Printable Version Click Here](#)

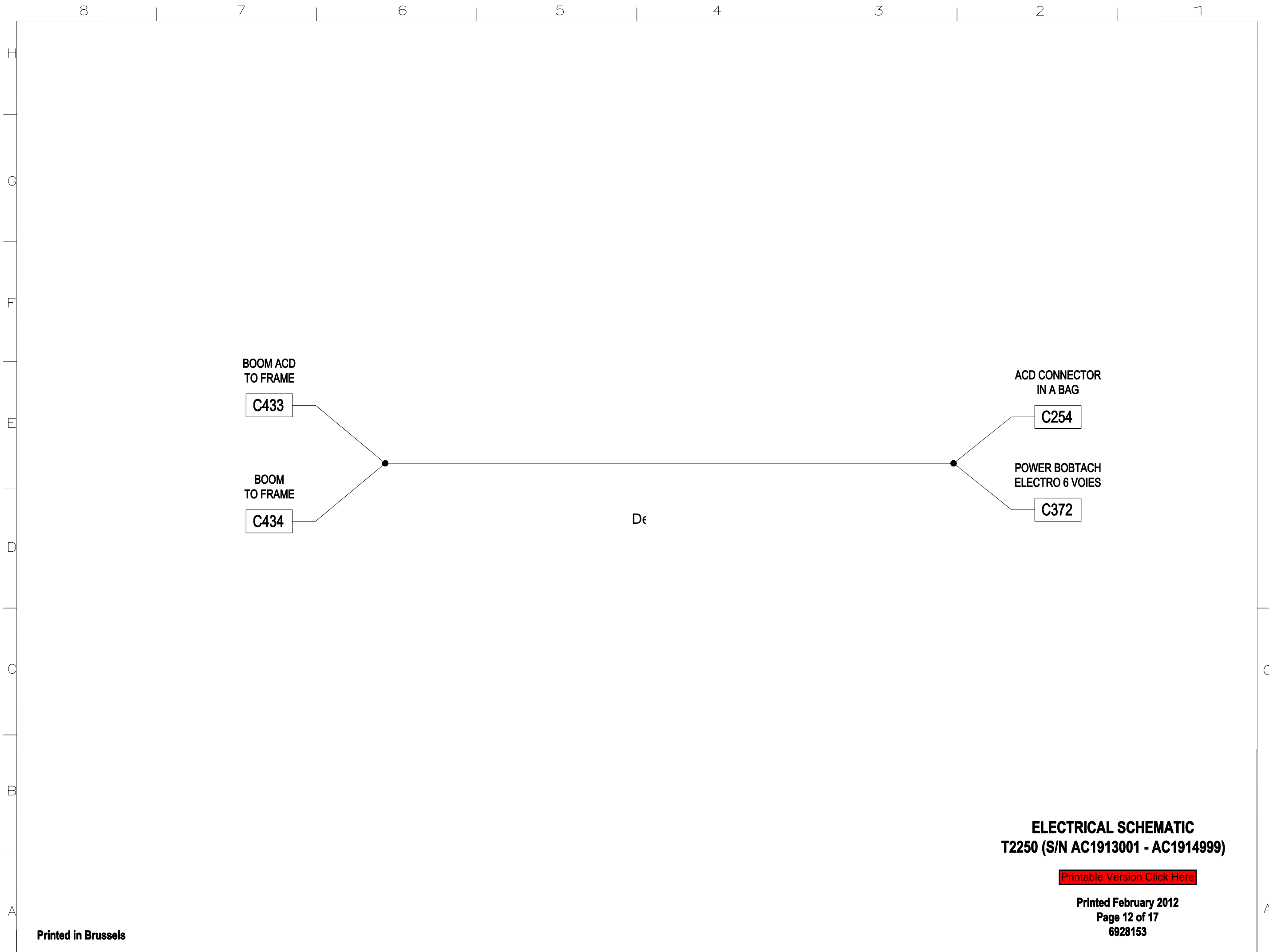
Printed February 2012
Page 10 of 17
6928153



ELECTRICAL SCHEMATIC
T2250 (S/N AC1913001 - AC1914999)

[Printable Version Click Here](#)

Printed February 2012
 Page 11 of 17
 6928153



BOOM ACD
TO FRAME

C433

BOOM
TO FRAME

C434

Dε

ACD CONNECTOR
IN A BAG

C254

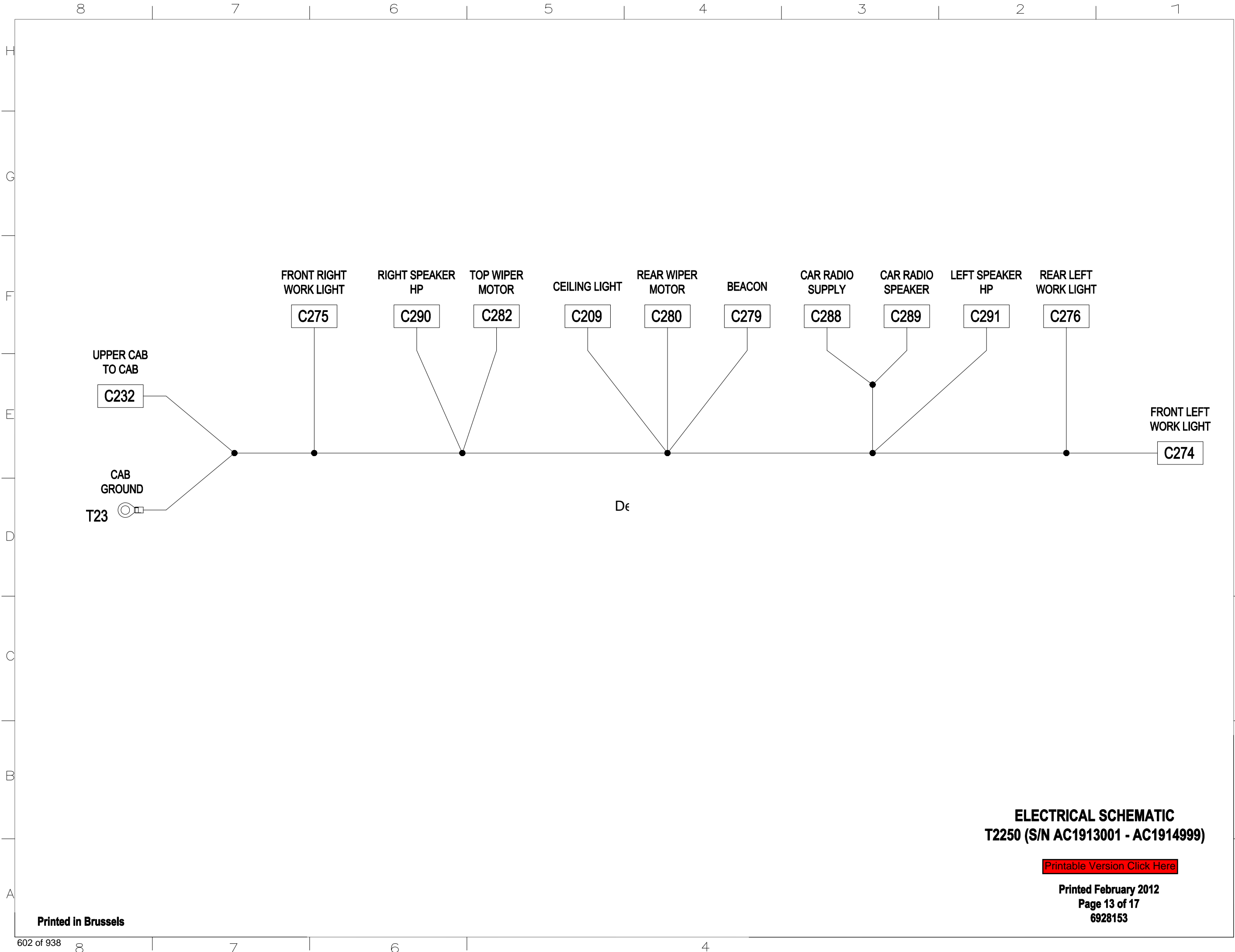
POWER BOBTACH
ELECTRO 6 VOIES

C372

**ELECTRICAL SCHEMATIC
T2250 (S/N AC1913001 - AC1914999)**

[Printable Version Click Here](#)

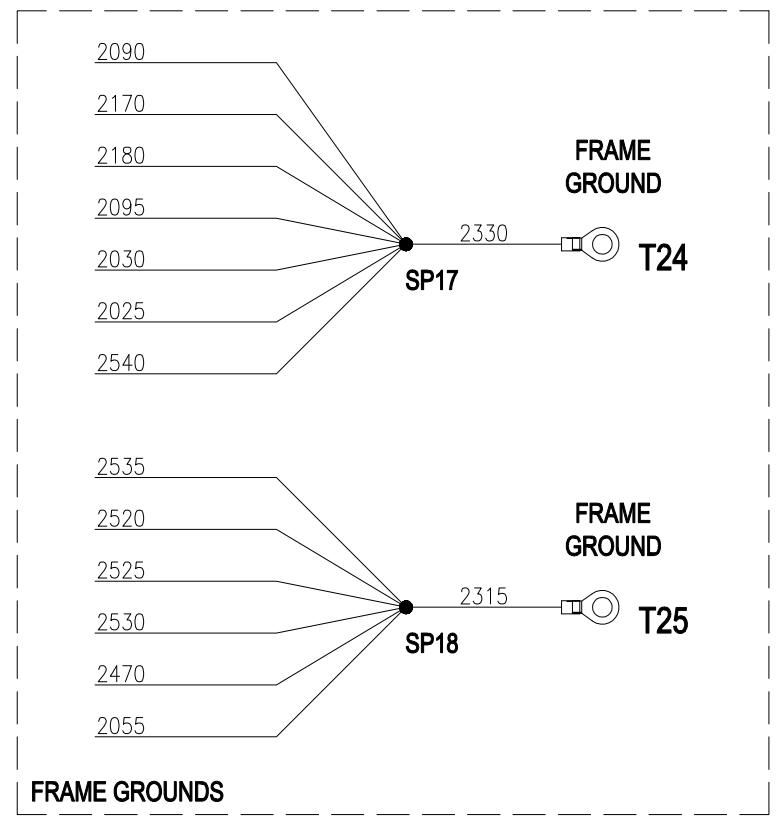
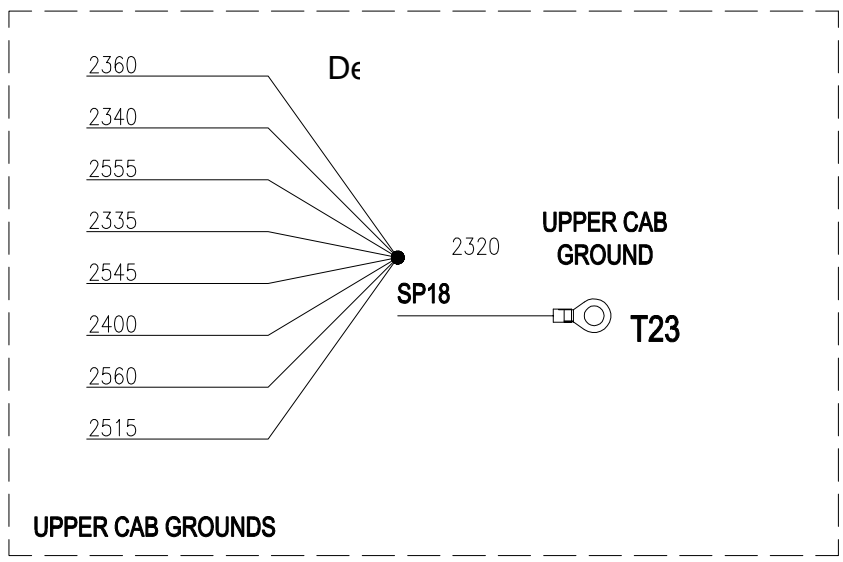
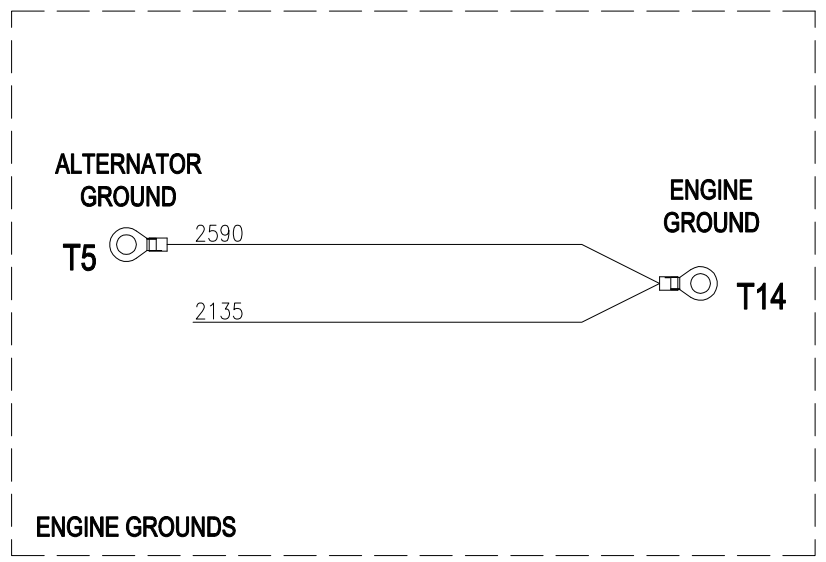
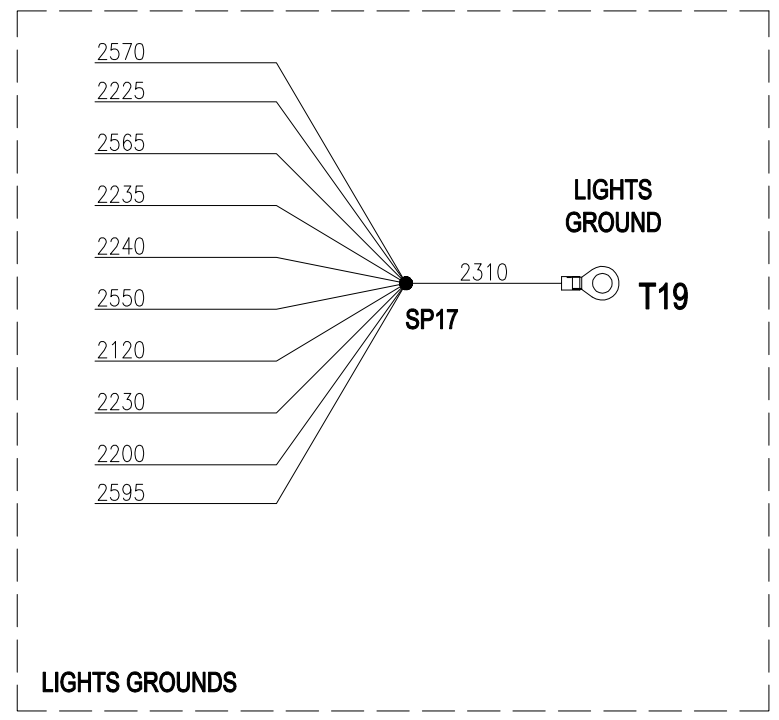
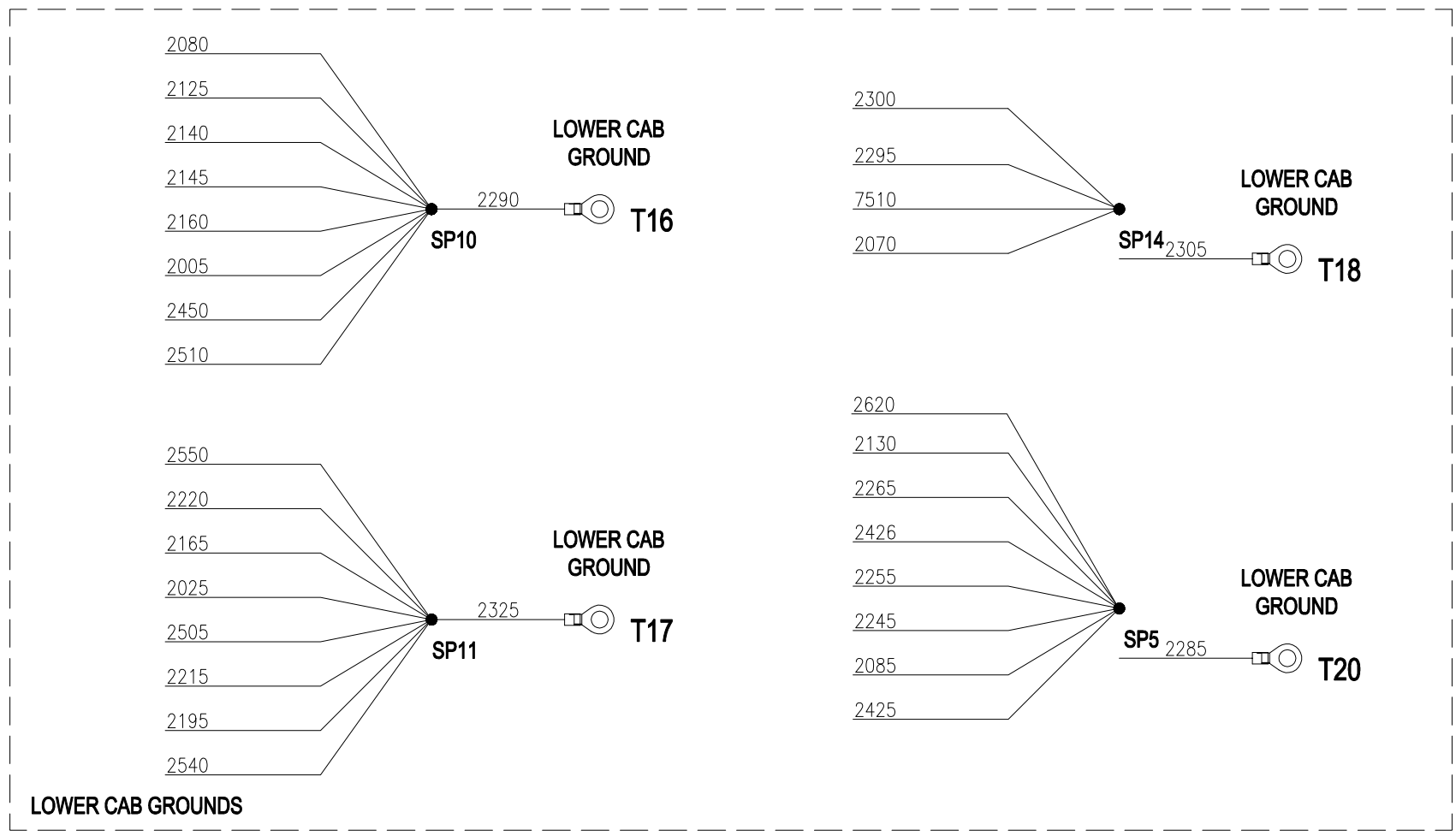
Printed February 2012
Page 12 of 17
6928153



**ELECTRICAL SCHEMATIC
T2250 (S/N AC1913001 - AC1914999)**

[Printable Version Click Here](#)

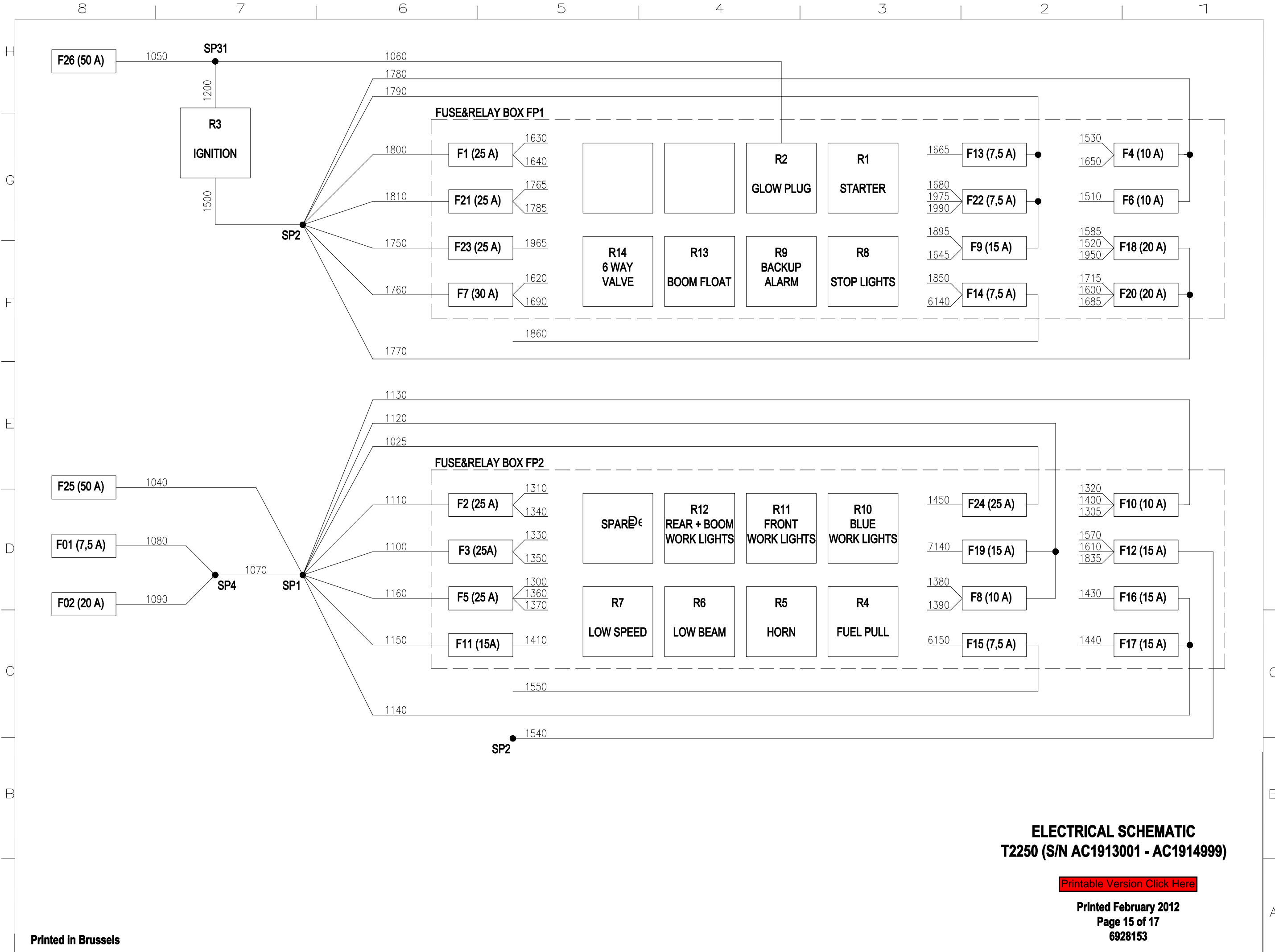
Printed February 2012
Page 13 of 17
6928153



**ELECTRICAL SCHEMATIC
T2250 (S/N AC1913001 - AC1914999)**

[Printable Version Click Here](#)

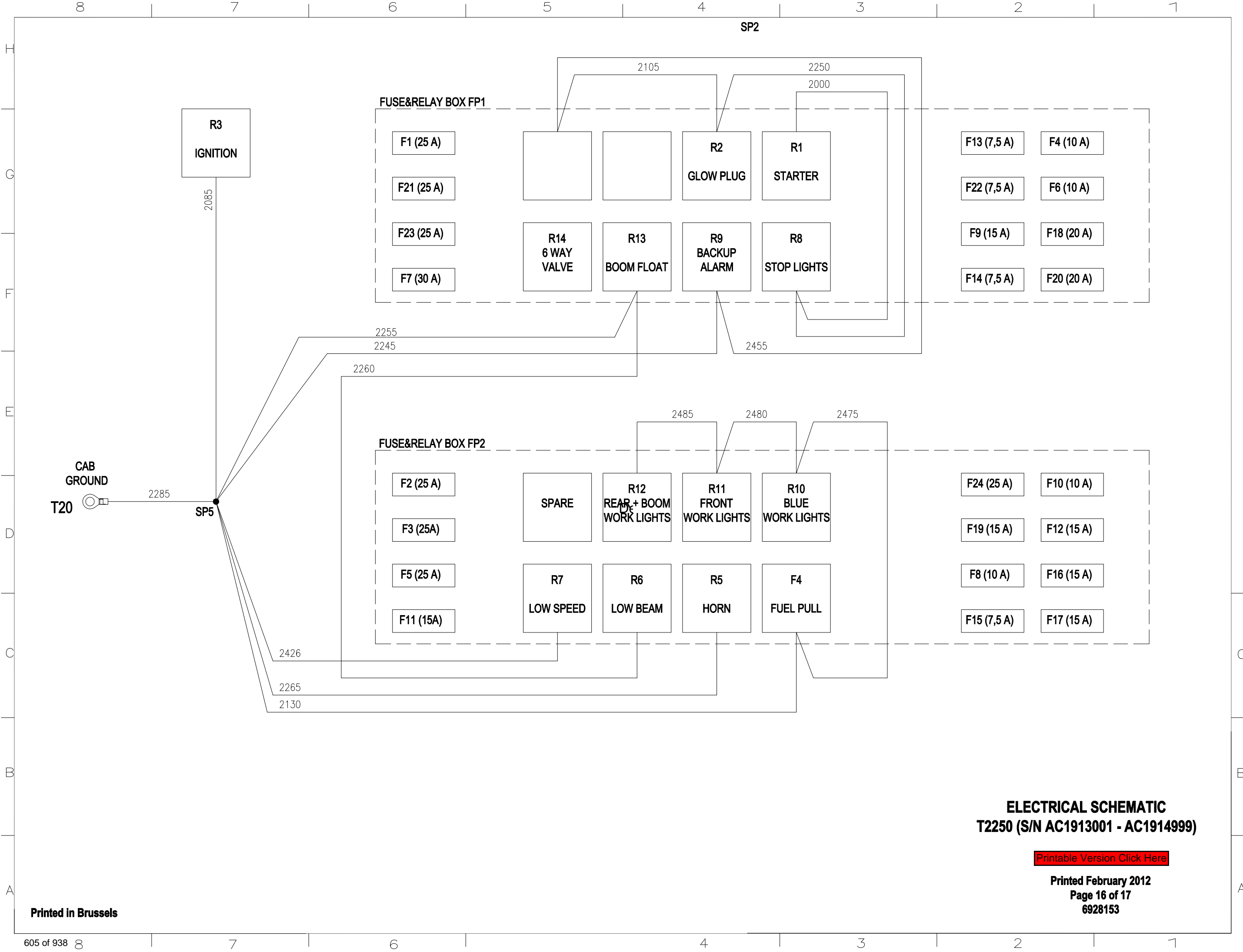
Printed February 2012
Page 14 of 17
6928153



**ELECTRICAL SCHEMATIC
T2250 (S/N AC1913001 - AC1914999)**

[Printable Version Click Here](#)

Printed February 2012
Page 15 of 17
6928153



**ELECTRICAL SCHEMATIC
T2250 (S/N AC1913001 - AC1914999)**

[Printable Version Click Here](#)

Printed February 2012
Page 16 of 17
6928153

N°	BOITIERS FUSES BOX	CALIBR EVALUE	FONCTIONS FUNCTION	LIAISON LINK	
F1	FP1	25A	Relais de demarrage ; Alternateur	Starter Relay ; Alternator	Contact / Ignition
F2	FP2	25A	Controleur Display	Display Controller	+ Battery
F3	FP2	25A	Relais arrivée carburant ; Relais petite vitesse	Fuel pull relay ; Low speed relay	+ Battery
F4	FP1	10A	Levier FNR ; Controleur Drive	FNR lever ; Drive controller	Contact / Ignition
F5	FP2	25A	Controleur Drive ; Interrupteur clé contact	Drive controller ; Key switch	+ Battery
F6	FP1	10A	Mode directionnel	Steering mode	Contact / Ignition
F7	FP1	20A	Chauffage ; Climatisation	Heater blower ; AC Fan relay	Contact / Ignition
F8	FP2	10A	Plafonnier ; Relais Klaxon ; Auto-radio	Ceiling light ; Horn relay ; Car radio	+ Battery
F9	FP1	15A	Essuie-glace / Lave-glace avant ; Interrupteur Klaxon	Front wiper / Front washer ; Horn switch	Contact / Ignition
F10	FP2	10A	Interrupteur Feux ; Clignotant, Klaxon	Head light SW ; turn signal ; Horn	+ Battery
F11	FP2	15A	Feux de croisement	Low beam	+ Battery
F12	FP2	15A	ISL ; clé shunt ; capteur angle bras	ISL ; Shunt key ; Boom angle sensor	Contact / Ignition
F13	FP1	7,5A	Warning	Hazard	Contact / Ignition
F14	FP1	7,5A	Feux de position gauche ; feu plaque	Left park lights ; license plate light	+ Battery
F15	FP2	7,5A	Feux de position droit	Right park lights	+ Battery
F16	FP2	15A	Feux de travail avant	Front work lights	+ Battery
F17	FP2	15A	Feu de travail arrière + feu de travail bras	Rear and boom work lights	+ Battery
F18	FP1	20A	Interrupteur Power bobtach ; Interrupteur frein de parc ; Gyrophare ; Relais Alarme recul ; Relais Electro 6 voies.	Power bobtach switch ; Park brake switch ; Beacon ; Backup alarm relay ; 6/2 way valve relay	Contact / Ignition
F19	FP2	15A	Allume-cigare	Cigar light	+ Battery
F20	FP1	20A	Feux stop ; Auxiliaires arrière ; Mano contact défaillance frein de service	Stop Lights ; Rear auxiliaries ; Brake fail pressure switch	Contact / Ignition
F21	FP1	25A	essuie-glace arrière et toit ; lave-glace arrière ; auto-radio	Rear washer motor ; Top and Rear wiper motors ; Car radio	Contact / Ignition
F22	FP1	7,5A	Joystick ; interrupteur ACD ; inter electro 6 voies	Joystick ; ACD switches ; 6/2 way valve switch	Contact / Ignition
F23	FP1	25A	Boomfloat ; alimentation ACD	Boomfloat ; ACD supply	Contact / Ignition
F24	FP2	25A	Equipement ACD	ACD attachment	+ Battery
F25	lower cab	50A	+ BATTERIE	+ BATTERY	+ Battery
F26	lower cab	50A	Préchauffage ; relais de contact	Ignition relay ; Glow plug relay	+ Battery
F27	lower cab	7.5 A	Warning	Hazard	+ Battery
F01	lower cab	7,5A	Climatisation (compresseur)	AC compressor	+ Battery
F02	lower cab	20A	Climatisation	AC	+ Battery

**ELECTRICAL SCHEMATIC
T2250 (S/N AC1913001 - AC1914999)**

[Printable Version Click Here](#)

Printed February 2012
Page 17 of 17
6928153

	DESIGNATION	SHEET	LOCATION
	JOYSTICK	3	G2
	KEY SWITCH	3	G5
	FNR LEVER	3	G3
	STARTER RELAY	3	G7
	IGNITION RELAY	3	D6
	GLOW PLUG RELAY	3	C6
	FUEL PULL RELAY	3	C4
	LOW SPEED RELAY	3	D4
	INCHING SENSOR	3	D2
	CAB BUZZER	3	B5
	LLMI (LONGITUDINAL LOAD MOMENT INDICATOR)	8	E4
	AMA KEY SHUNT	8	F5
	STEER MODE TELLTALE	4	E6
	STEER MODE SWITCH	4	G6
	6/2 VALVE SWITCH	4	G7
	HEATER 3 SPEED SWITCH	4	D5
	CAB HEATER BLOWER	4	B5
	AC FAN RELAY	4	F4
	BLOWER SPEED SWITCH	4	E4
	AC EVAPORATOR/BLOWER	4	D4
	AC COMPRESSOR RELAY	4	E3
	ACD LH SKI SWITCH	4	G3
	ACD ATTACH SKI SWITCH	4	G2
	ACD RH SKI SWITCH	4	G1
	CEILING LIGHT	5	F8
	HORN RELAY	5	F8
	HORN SWITCH (NA)	5	G7
	TURN SIGNAL SWITCH (ESA)	5	G7
	WIPER SWITCH	5	E7
	FRONT WASHER MOTOR	5	D7
	FRONT WIPER MOTOR	5	D7
CAB / CABINE	TURN SIGNAL SWITCH (NA)	5	E6
	HAZARD WARNING SWITCH	5	F5
	FLASHER RELAY	5	E5
	HAZARD TELLTALE	5	D5
	TRAILER TURN SIGNAL TELLTALE	5	C5
	FOG LIGHT SWITCH	5	G5
	HEADLIGHT SWITCH	5	G4
	ROADLIGHT TELLTALE	5	C4
	LOW BEAM RELAY	5	E3
	POWER BOBTACH SWITCH	5	G2
	BOOMFLOAT RELAY	5	E2
	POWER BOBTACH TELLTALE	5	F3
	PARK BRAKE SWITCH (NA)	5	G1
	BACKUP ALARM RELAY	5	E1
	BLUE WORK LIGHT RELAY	6	D8
	FRONT WORK LIGHT RELAY	6	D7
	REAR AND BOOM WORK LIGHT RELAY	6	D7
	BEACON SWITCH	6	G6
	BEACON	6	E6
	CIGAR LIGHT	6	F6
	STOP LIGHT RELAY	6	D5
	HYDRAULIC CATCH SWITCH	6	F4
	HYDRAULIC HOOK SWITCH	6	F3
	BRAKE FAIL PRESSURE SWITCH (germany)	6	F2
	REAR WASHER SWITCH	6	G2
	REAR WASHER MOTOR	6	E2
	REAR WIPER	6	C1
	TOP WIPER	6	C1
	LORS BAR SENSOR	7	G5
	CAR RADIO	7	E2
	RIGHT SPEAKER HP	7	C1
	LEFT SPEAKER HP	7	C1

	DESIGNATION	SHEET	LOCATION
	STARTER	3	B7
	ALTERNATOR	3	B6
	FUEL SOLENOID PUMP	3	B4
	ENGINE PREHEATER	3	A6
	AC COMPRESSOR	4	D3
	TRINARY SWITCH	4	B4
	ENGINE COOLANT TEMP	4	D3
	ENGINE OIL PRESSURE SWITCH	4	C2
	HYDRAULIC FILTER RESTRICTION	4	C1
	ENGINE SPEED SENSOR	7	F3
ENGINE / MOTEUR	BATTERY	3	C8
	DISCONNECT SWITCH	3	D8
	LOW SPEED VALVE	3	C4
	DRIVE PUMP FORWARD VALVE	3	D3
	DRIVE PUMP REVERSE VALVE	3	D2
	BOOMFLOAT PRESSURE SENSOR	3	D1
	PASSIVE BRAKE VALVE	3	C3
	BUZZER SHUNT AMA	4	C8
	CRAB STEER VALVE	4	D6
	4 WHEEL STEER VALVE	4	D5
	HANDBRAKE STATUS PRESSURE SWITCH	4	C1
	HYDRAULIC OIL TEMPERATURE	4	C2
	HORN	5	F8
	BOOMFLOAT VALVE	5	D2
	REVERSE HORN	5	C1
	FRONT LEFT LIGHT	5	B8
	REAR LEFT LIGHT	5	B7
	LICENSE PLACE LIGHT	5	A6
	TRAILER PLUG	5	A6
	RIGHT REAR LIGHT	5	B5
	RIGHT FRONT LIGHT	5	B4
	RIGHT BLUE WORK LIGHT	6	C8
	LEFT BLUE WORK LIGHT	6	C8
	FRONT RIGHT WORK LIGHT	6	B7
	FRONT LEFT WORK LIGHT	6	B7
	REAR LEFT WORK LIGHT	6	B7
	BOOM WORK LIGHT	6	B6
	REAR AUXILIARY HYDRAULIC CATCH - VALVE	6	D4
	REAR AUXILIARY HYDRAULIC CATCH + VALVE	6	D4
	REAR AUXILIARY DIVERTER VALVE	6	D4
	REAR AUXILIARY HOOK LOWER VALVE	6	D3
	REAR AUXILIARY HOOK RAISE VALVE	6	D3
	AUXILIARY VALVE	7	E8
	AUXILIARY VALVE	7	E7
	BOOM RETRACT VALVE	7	E7
	BOOM EXTEND VALVE	7	E6
	POWER BOBTACH 4/2 VALVE	7	D6
	AMA STABILITY VALVE	7	E5
	FUEL LEVEL	7	F4
	WORK GROUP VALVE	7	D3
BOOM / BRAS	BOOM ANGLE SWITCH	8	F6
	ACD ATTACHMENT	7	C5
	POWER BOBTACH 6/2 VALVE	7	C3

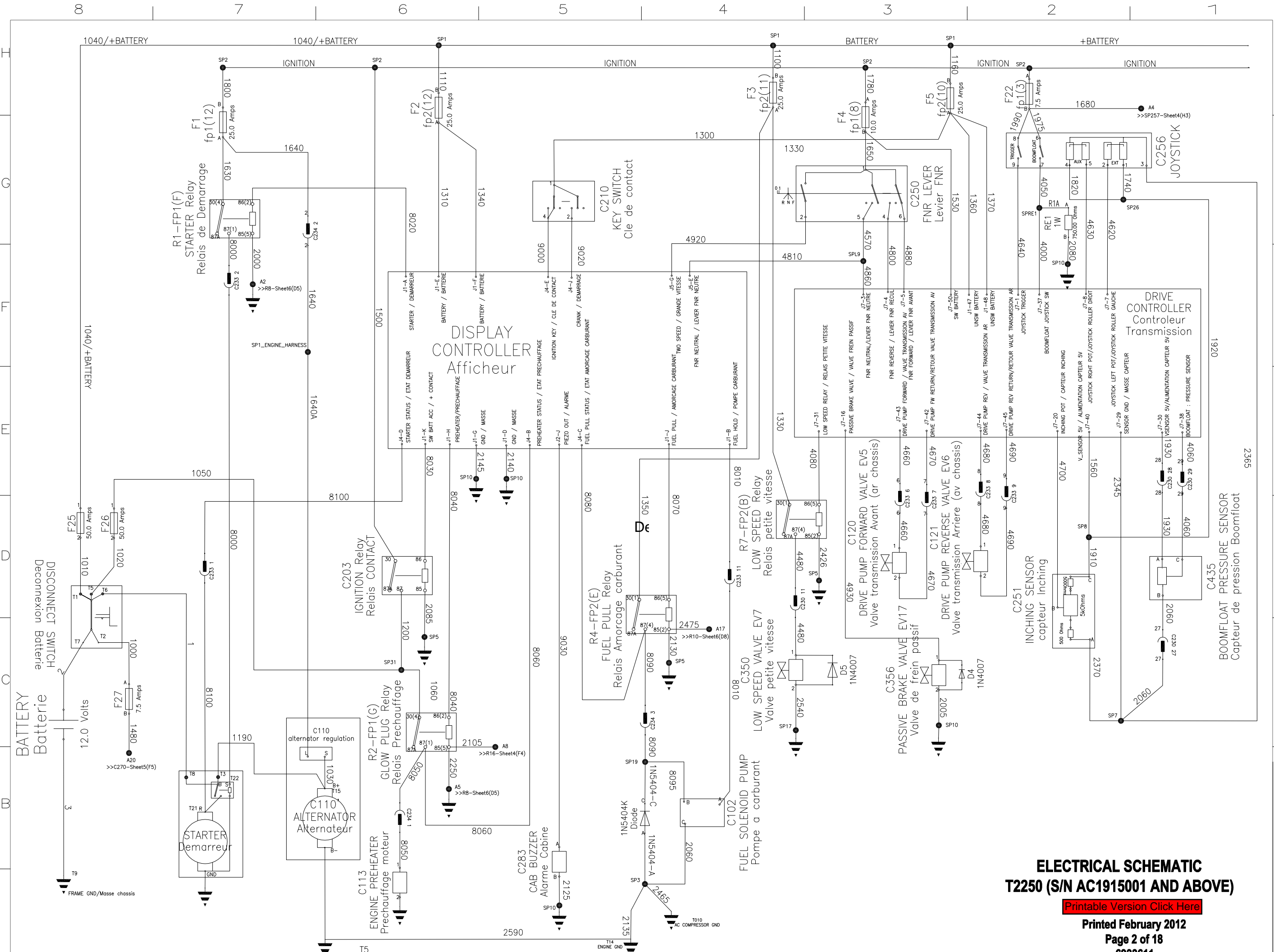
**ELECTRICAL SCHEMATIC
T2250 (S/N AC1915001 AND ABOVE)**

[Printable Version Click Here](#)

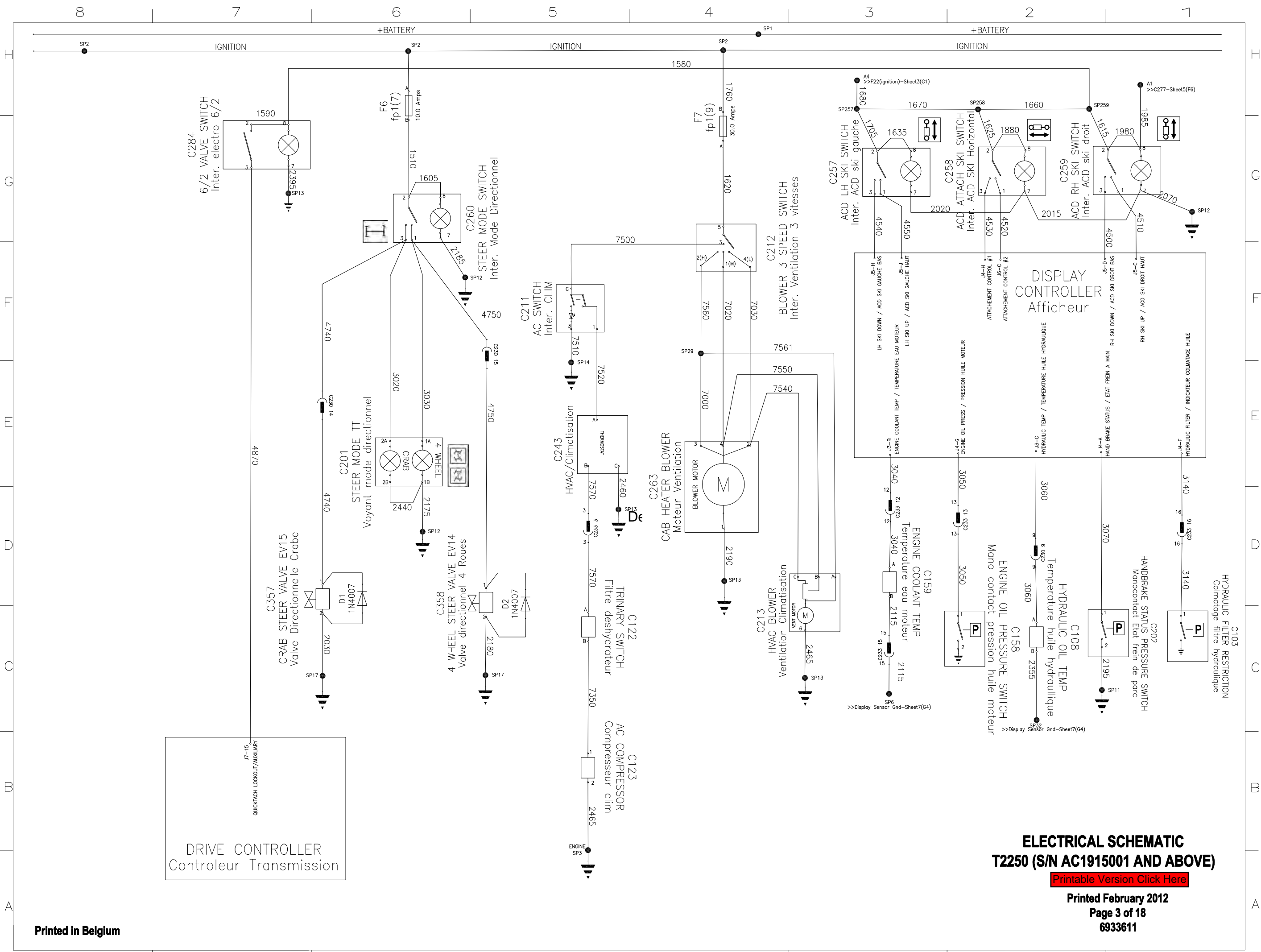
Printed February 2012

Page 1 of 18

6933611



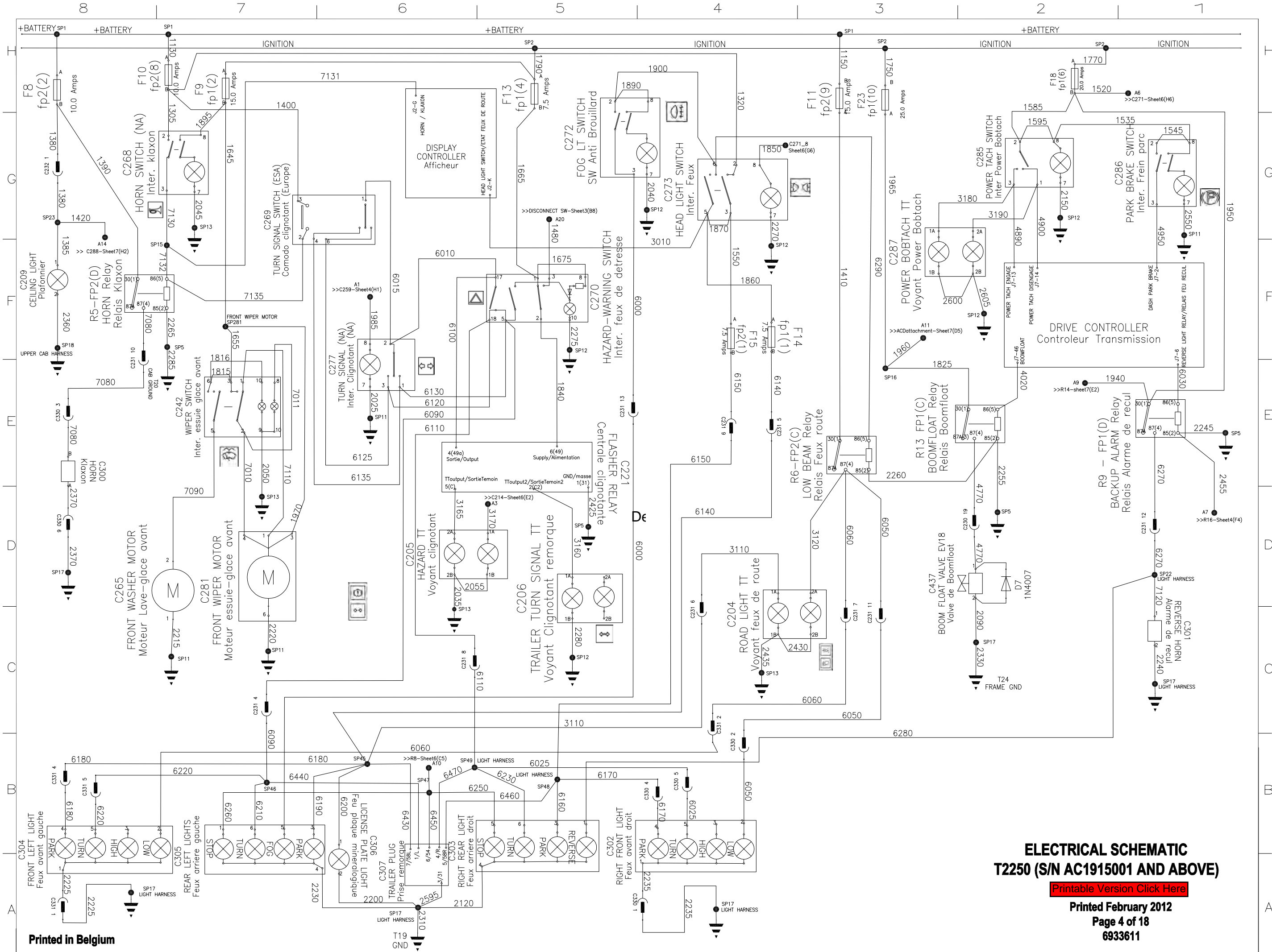
ELECTRICAL SCHEMATIC
T2250 (S/N AC1915001 AND ABOVE)
[Printable Version Click Here](#)
 Printed February 2012
 Page 2 of 18
 6933611



**ELECTRICAL SCHEMATIC
T2250 (S/N AC1915001 AND ABOVE)**

[Printable Version Click Here](#)

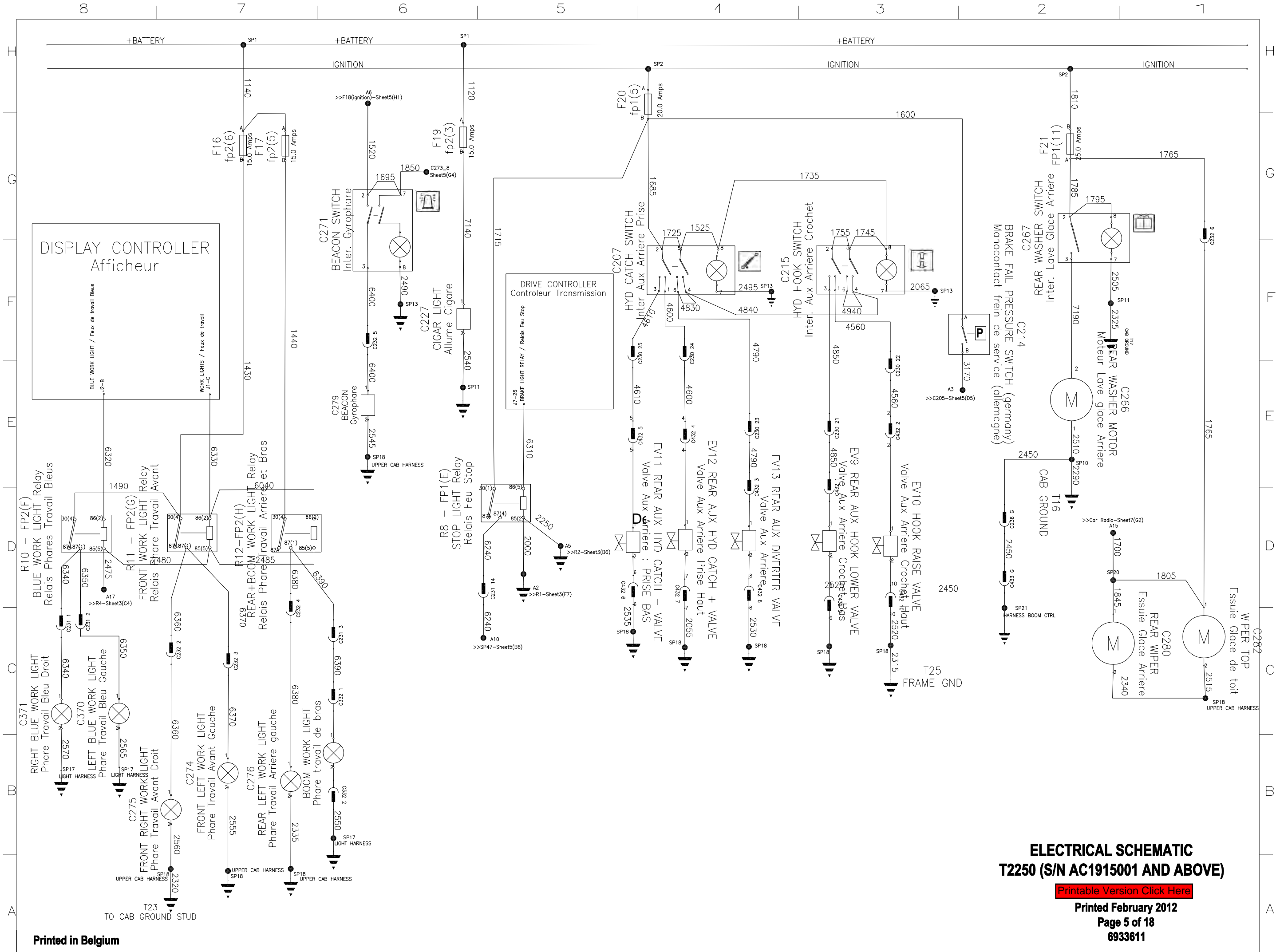
Printed February 2012
Page 3 of 18
6933611



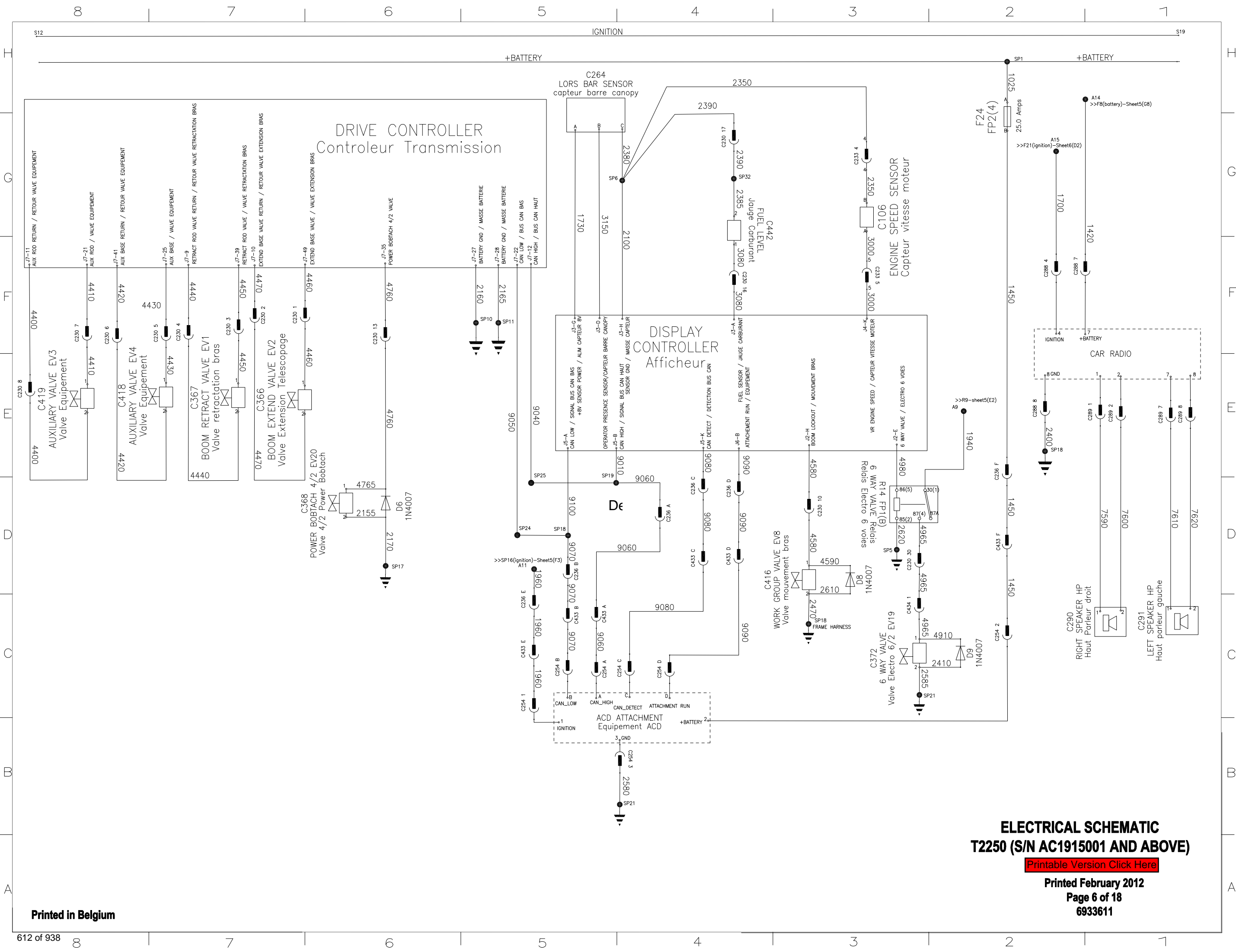
**ELECTRICAL SCHEMATIC
T2250 (S/N AC1915001 AND ABOVE)**

[Printable Version Click Here](#)

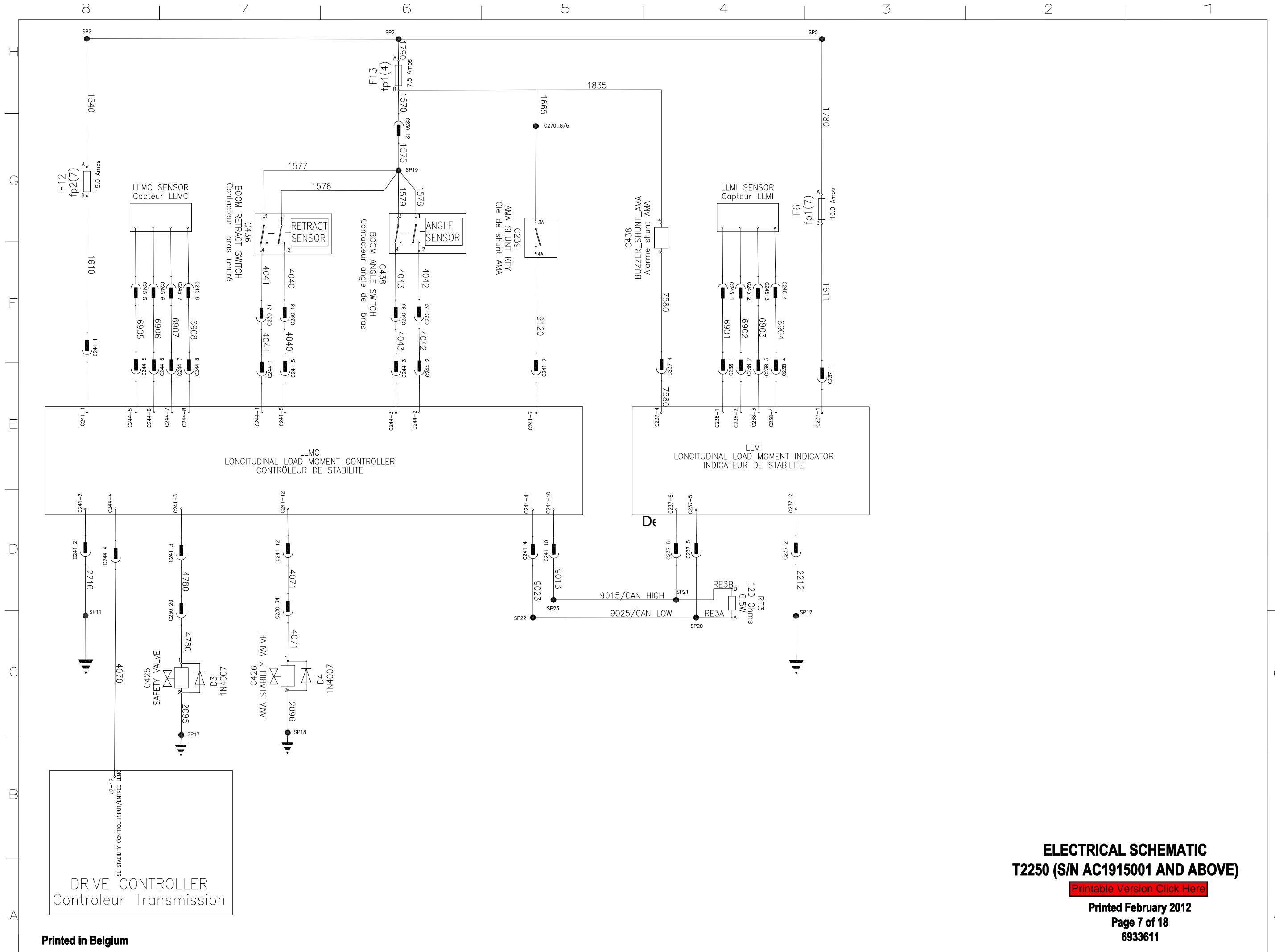
Printed February 2012
Page 4 of 18
6933611



ELECTRICAL SCHEMATIC
T2250 (S/N AC1915001 AND ABOVE)
[Printable Version Click Here](#)
 Printed February 2012
 Page 5 of 18
 6933611



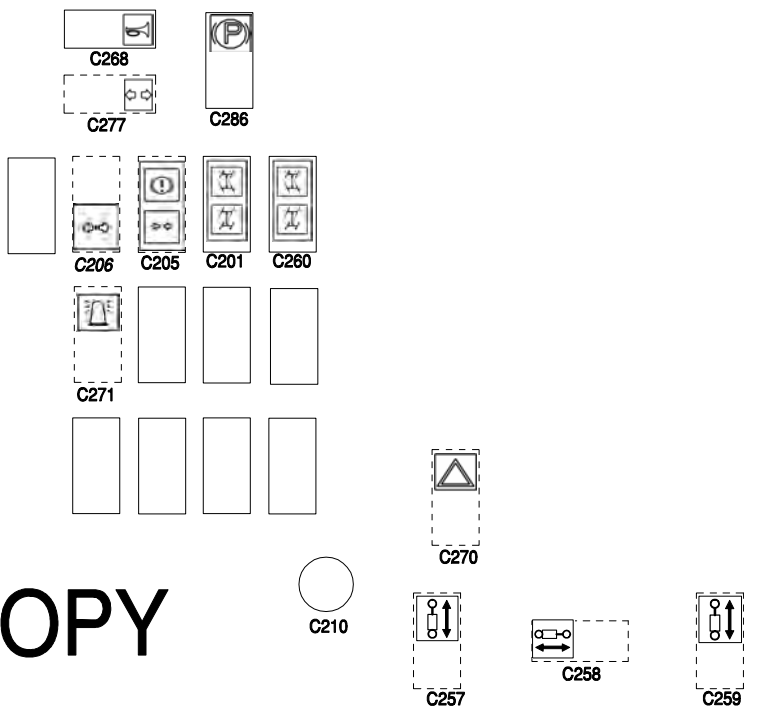
ELECTRICAL SCHEMATIC
T2250 (S/N AC1915001 AND ABOVE)
[Printable Version Click Here](#)
 Printed February 2012
 Page 6 of 18
 6933611



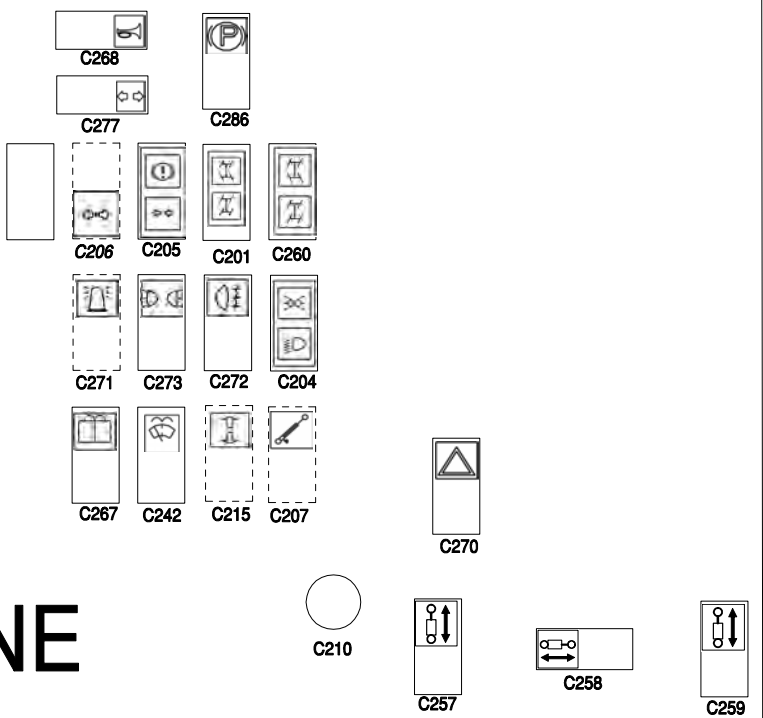
**ELECTRICAL SCHEMATIC
T2250 (S/N AC1915001 AND ABOVE)**

[Printable Version Click Here](#)

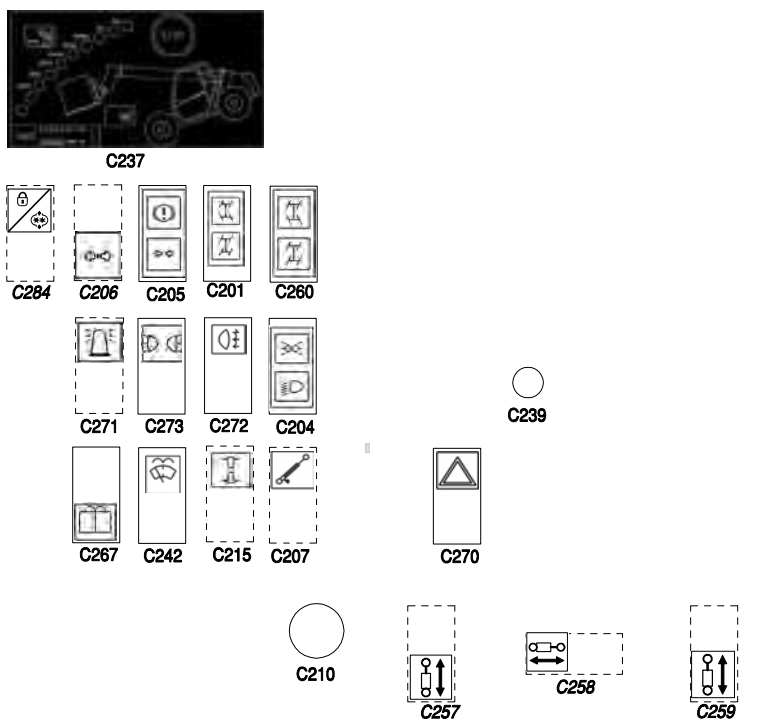
Printed February 2012
Page 7 of 18
6933611



V417 CANOPY



V417 CABINE



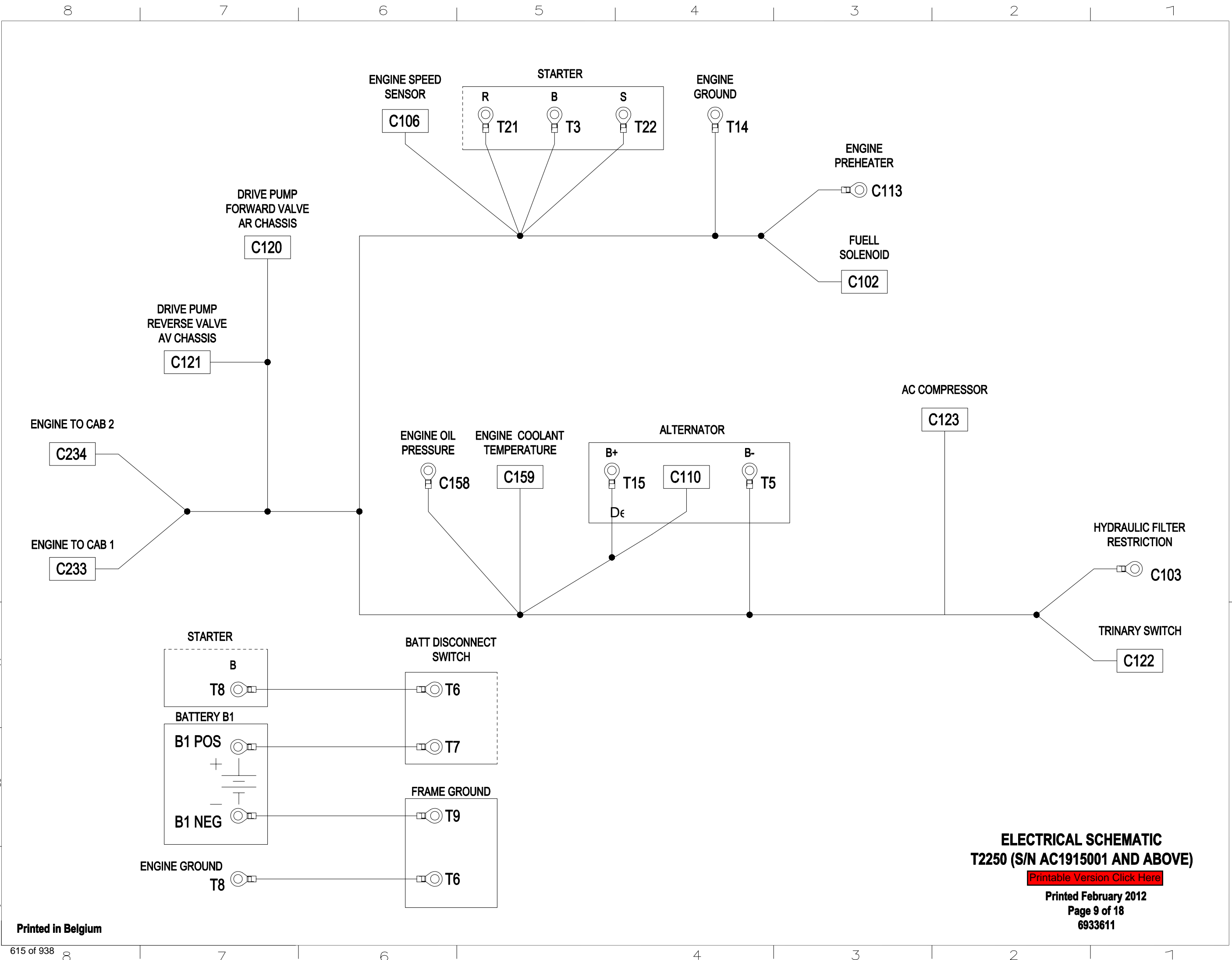
T2250

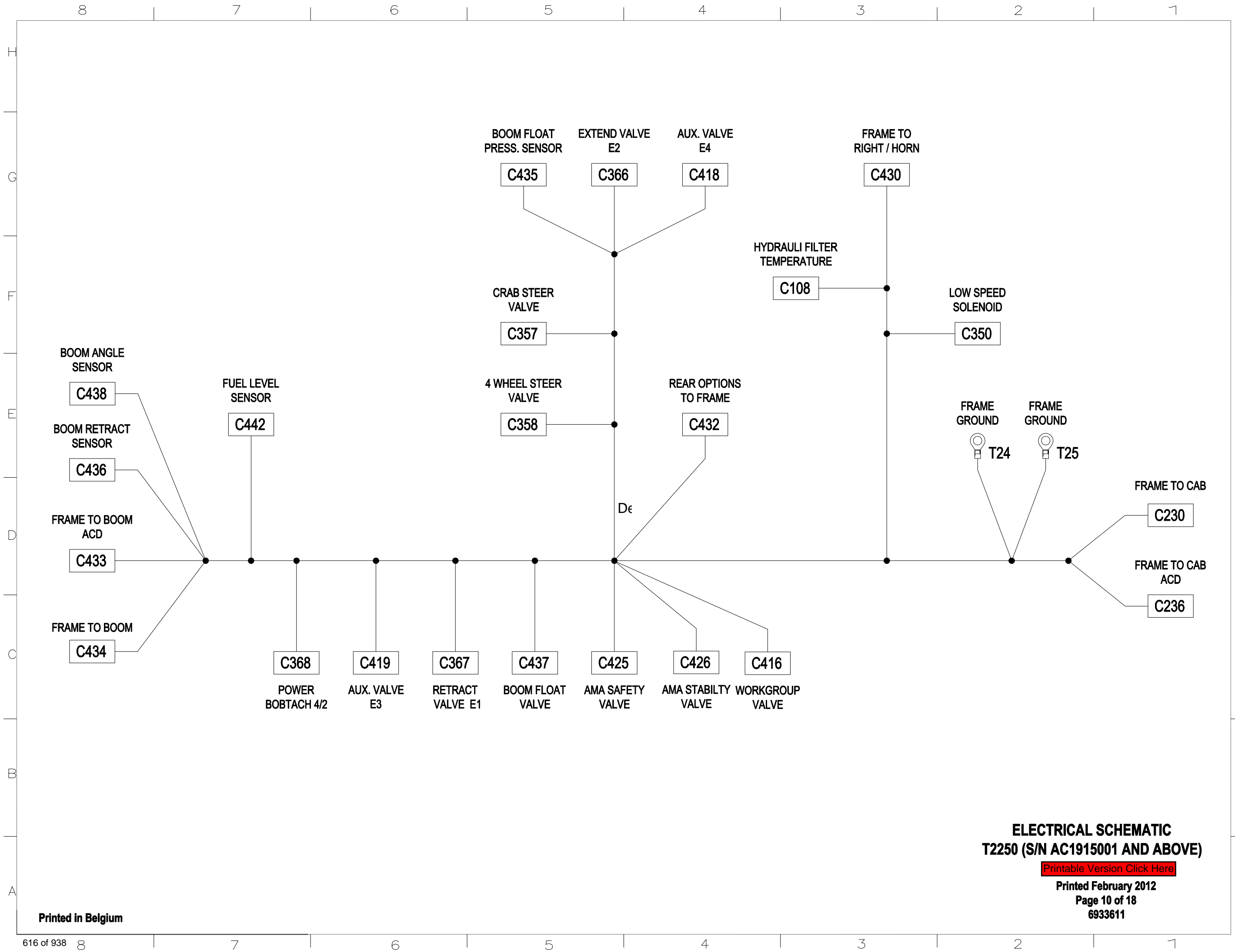
- | | | | | | |
|------|--|------|--|------|-----------------------------------|
| C260 | STEER MODE SWITCH.
INTER. MODE DIRECTIONNEL | C273 | HEAD LIGHT SWITCH
INTER. FEUX | C239 | SHUNT KEY AMA
CLE DE SHUNT AMA |
| C201 | STEER MODE TT
VOYANT MODE DIRECTIONNEL | C272 | FOG LIGHT SWITCH
INTER. ANTI BROUILLARD | C237 | ISL |
| C268 | HORN SWITCH
KLAXON | C267 | WASHER SWITCH
INTER LAVE GLACE ARRIERE | C210 | KEY SWITCH |
| C277 | TURN SIGNAL SWITCH
INTER. CLIGNOTANT | C215 | HYD. HOOK SWITCH
INTER. CROCHET HYD ARRIERE | | |
| C242 | WIPER SWITCH
INTER. ESSUIE GLACE AVANT | C207 | HYD. CATCH SWITCH
INTER. ATTACH HYD ARRIERE | | |
| C286 | PARK BRAKE SWITCH
INTER. FREIN PARC | C284 | 6 / 2 VALVE SWITCH
INTER. ELECTRO 6 VOIES / QUICKTACH | | |
| C270 | HAZARD - WARNING | C285 | POWER BOBTACH SWITCH
INTER POWER BOBTACH | | |
| C205 | HAZARD TT
VOYANT DEF. FREIN + CLIGNOTANT | C287 | POWER TACH TT
VOYANT POWER BOBTACH | | |
| C271 | BEACON SWITCH
GYROPHARE | C257 | LH SKI SWITCH
INTER. ACD SKI GAUCHE | | |
| C206 | TRAILER BLINKER
VOYANT CLIGNOTANT REMORQUE | C258 | ATTACH SKI SWITCH
INTER. ACD ATTACH | | |
| C204 | ROAD LIGHTS TT
VOYANT FEUX | C259 | RH SKI SWITCH
INTER. ACD SKI DROIT | | |

ELECTRICAL SCHEMATIC T2250 (S/N AC1915001 AND ABOVE)

[Printable Version Click Here](#)

Printed February 2012
Page 8 of 18
6933611

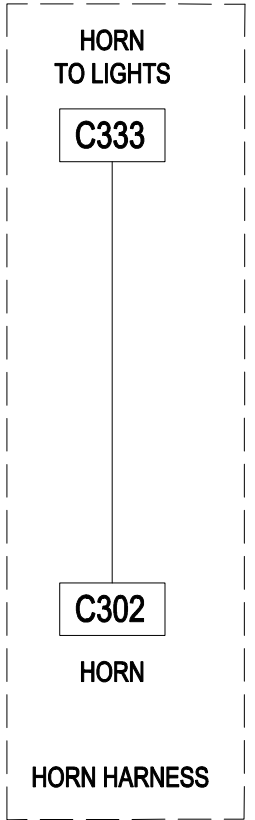
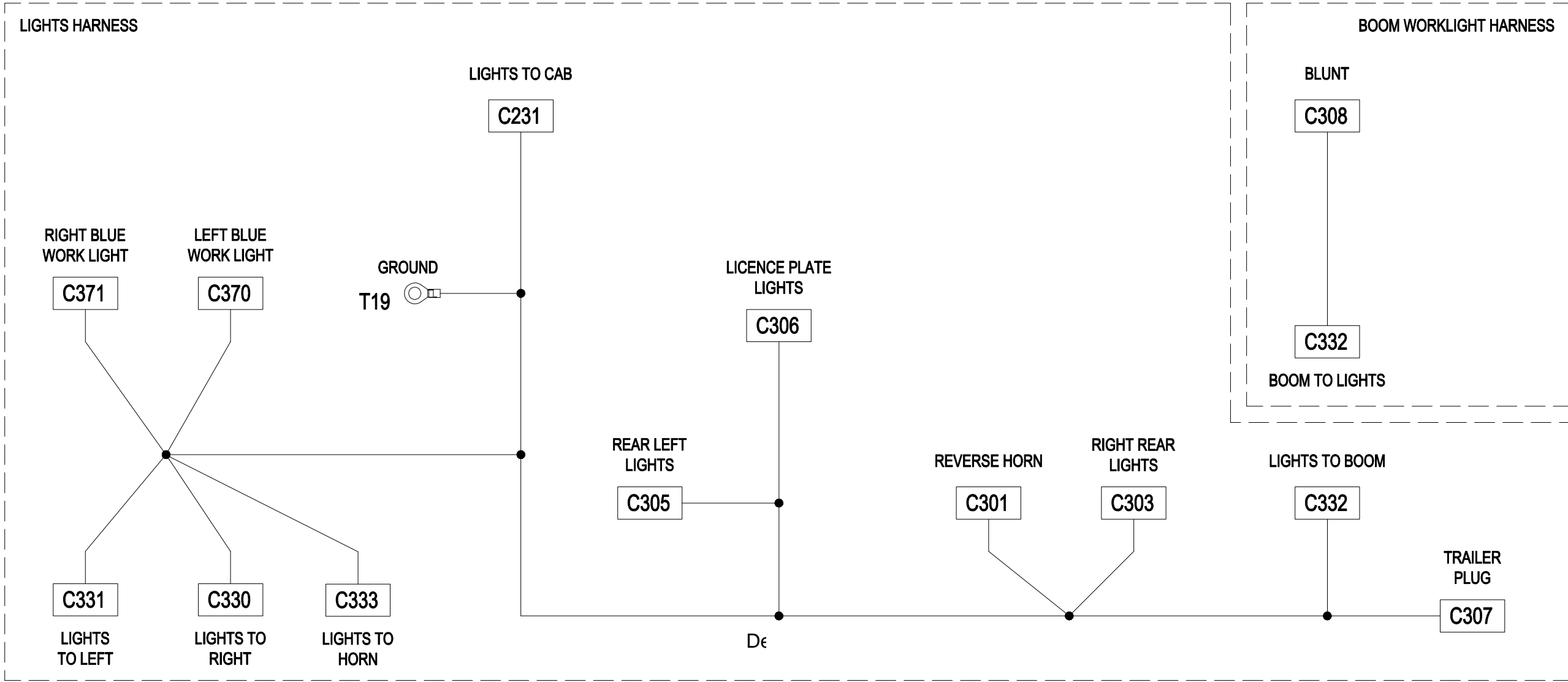




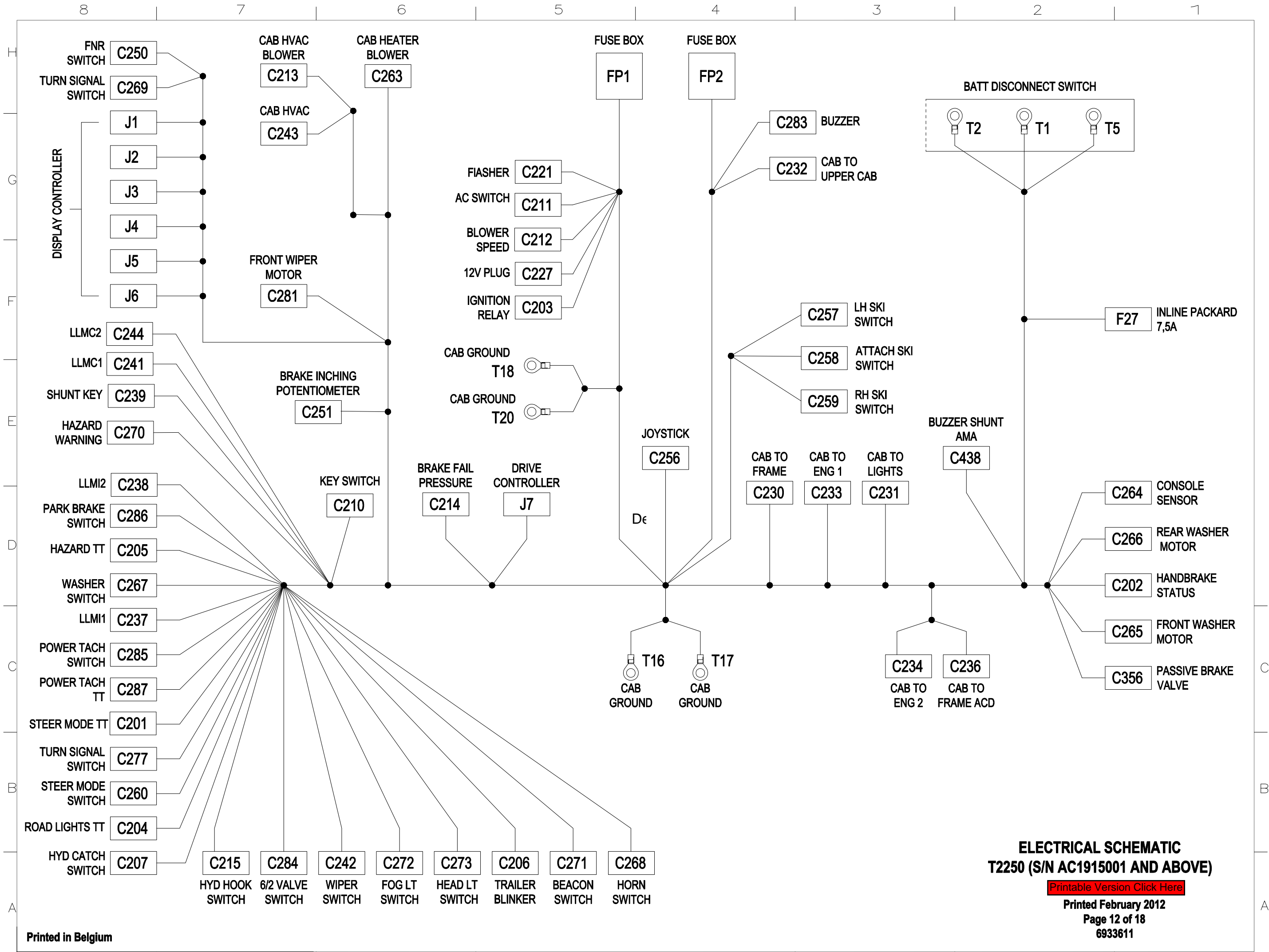
**ELECTRICAL SCHEMATIC
T2250 (S/N AC1915001 AND ABOVE)**

[Printable Version Click Here](#)

Printed February 2012
Page 10 of 18
6933611



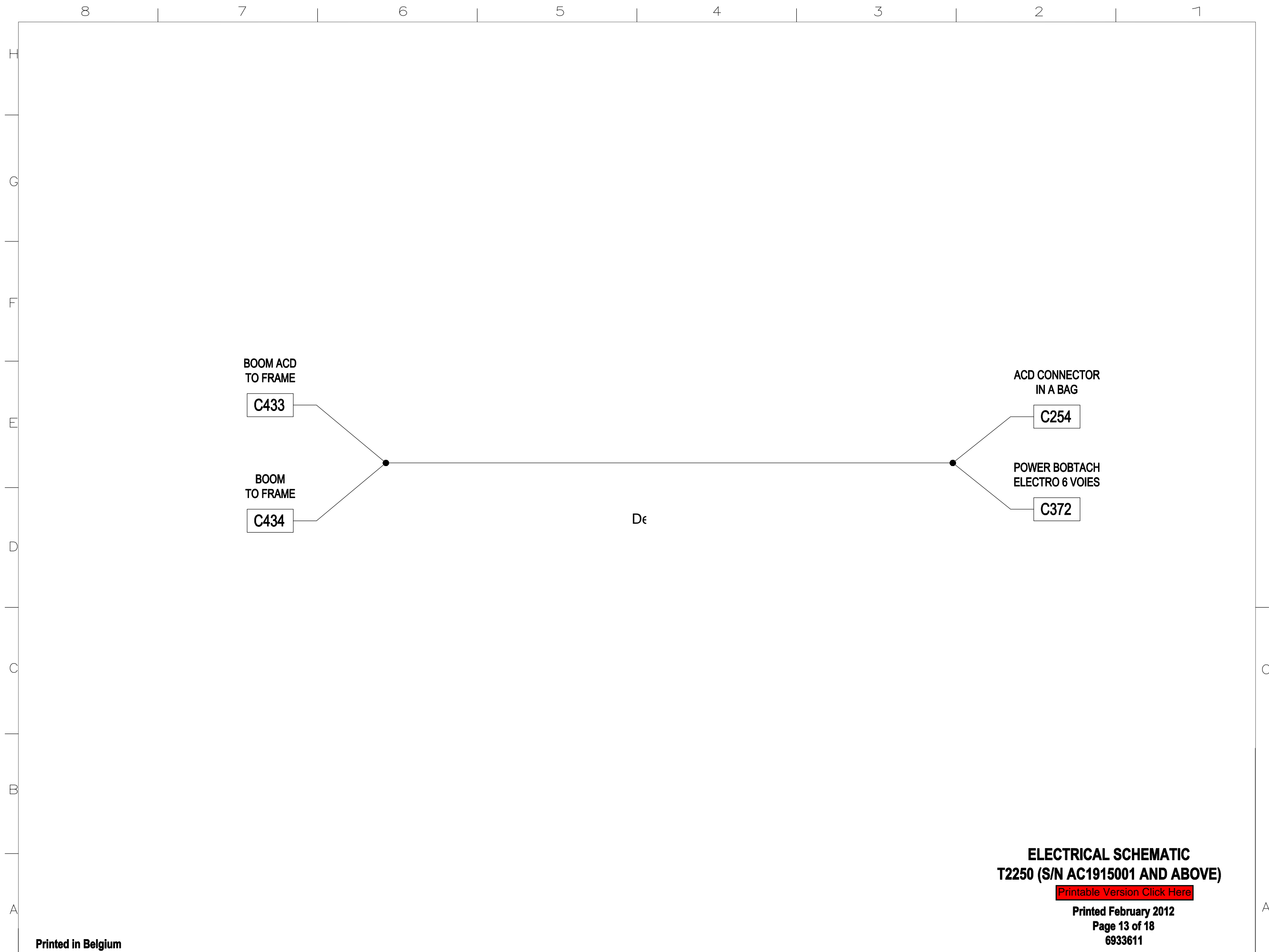
ELECTRICAL SCHEMATIC
T2250 (S/N AC1915001 AND ABOVE)
[Printable Version Click Here](#)
 Printed February 2012
 Page 11 of 18
 6933611

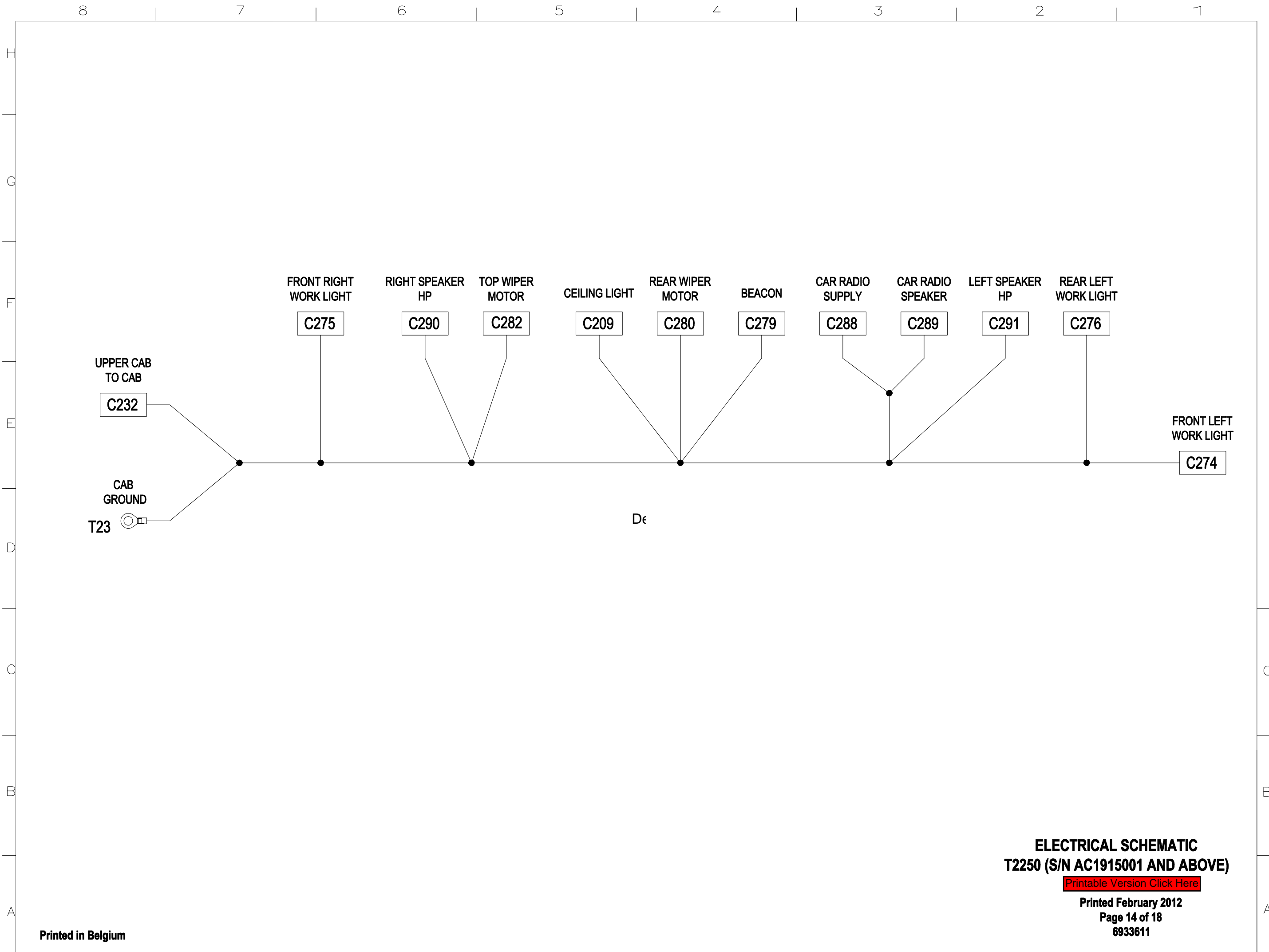


**ELECTRICAL SCHEMATIC
T2250 (S/N AC1915001 AND ABOVE)**

[Printable Version Click Here](#)

Printed February 2012
Page 12 of 18
6933611

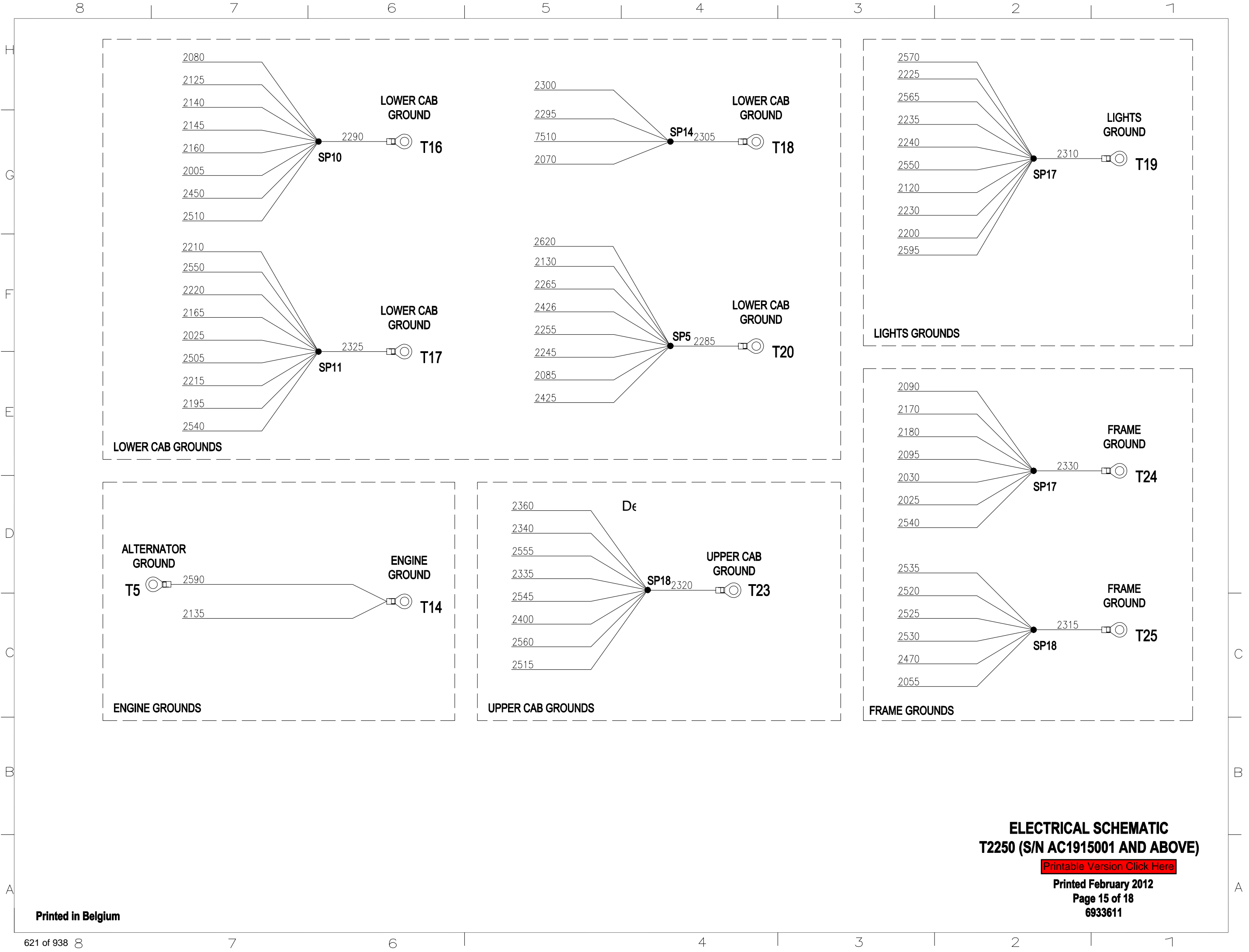




**ELECTRICAL SCHEMATIC
T2250 (S/N AC1915001 AND ABOVE)**

[Printable Version Click Here](#)

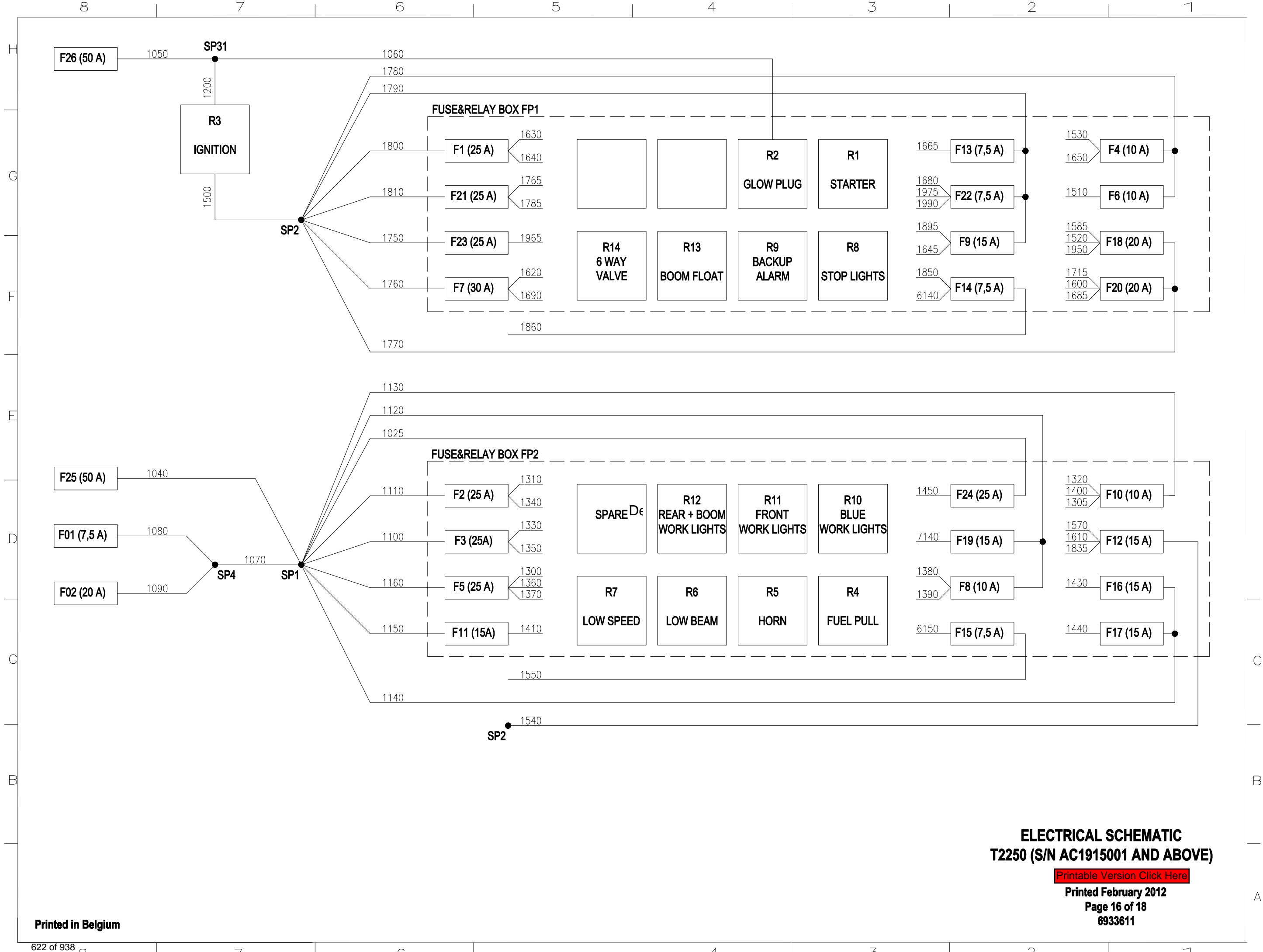
Printed February 2012
Page 14 of 18
6933611



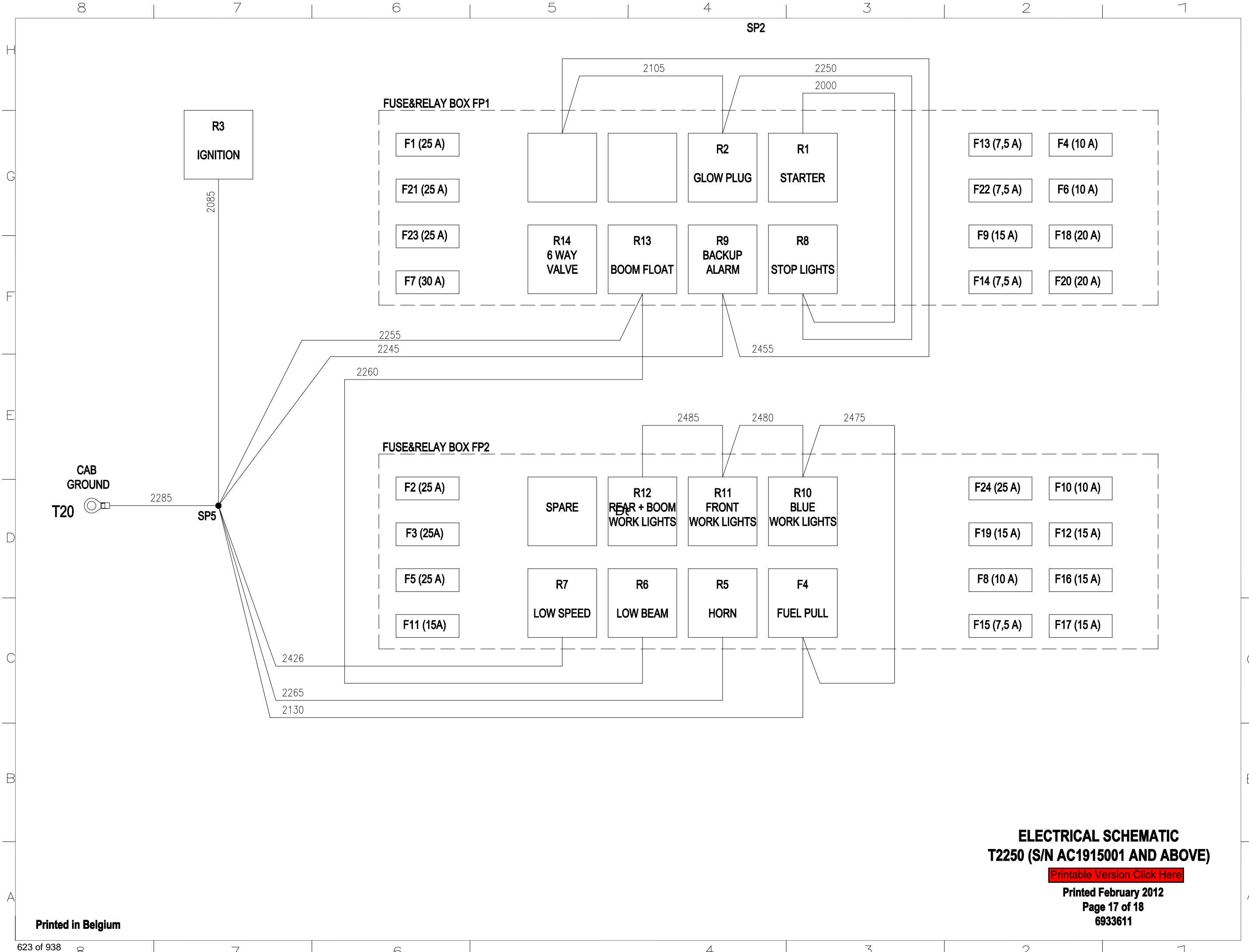
**ELECTRICAL SCHEMATIC
T2250 (S/N AC1915001 AND ABOVE)**

[Printable Version Click Here](#)

Printed February 2012
Page 15 of 18
6933611



**ELECTRICAL SCHEMATIC
T2250 (S/N AC1915001 AND ABOVE)**
[Printable Version Click Here](#)
 Printed February 2012
 Page 16 of 18
 6933611



N°	BOITIERS FUSES BOX	CALIBR EVALUE	FONCTIONS FUNCTION	LIAISON LINK	
F1	FP1	25A	Relais de demarrage ; Alternateur	Starter Relay ; Alternator	Contact / Ignition
F2	FP2	25A	Controleur Display	Display Controller	+ Battery
F3	FP2	25A	Relais arrivée carburant ; Relais petite vitesse	Fuel pull relay ; Low speed relay	+ Battery
F4	FP1	10A	Levier FNR ; Controleur Drive	FNR lever ; Drive controller	Contact / Ignition
F5	FP2	25A	Controleur Drive ; Interrupteur clé contact	Drive controller ; Key switch	+ Battery
F6	FP1	10A	LLMI, Mode directionnel	Steering mode	Contact / Ignition
F7	FP1	20A	Chauffage ; Climatisation	Heater blower ; AC Fan relay	Contact / Ignition
F8	FP2	10A	Plafonnier ; Relais Klaxon ; Auto-radio	Ceiling light ; Horn relay ; Car radio	+ Battery
F9	FP1	15A	Essuie-glace / Lave-glace avant ; Interrupteur Klaxon	Front wiper / Front washer ; Horn switch	Contact / Ignition
F10	FP2	10A	Interrupteur Feux ; Clignotant, Klaxon	Head light SW ; turn signal ; Horn	+ Battery
F11	FP2	15A	Feux de croisement	Low beam	+ Battery
F12	FP2	15A	LLMC	ISL ; Shunt key ; Boom angle sensor	Contact / Ignition
F13	FP1	7,5A	Warning, clé shunt ; capteur angle bras et retract	Hazard	Contact / Ignition
F14	FP1	7,5A	Feux de position gauche ; feu plaque	Left park lights ; license plate light	+ Battery
F15	FP2	7,5A	Feux de position droit	Right park lights	+ Battery
F16	FP2	15A	Feux de travail avant	Front work lights	+ Battery
F17	FP2	15A	Feu de travail arrière + feu de travail bras	Rear and boom work lights	+ Battery
F18	FP1	20A	Interrupteur Power bobtach ; Interrupteur frein de parc ; Gyrophare ; Relais Alarme recul ; Relais Electro 6 voies.	Power bobtach switch ; Park brake switch ; Beacon ; Backup alarm relay ; 6/2 way valve relay	Contact / Ignition
F19	FP2	15A	Allume-cigare	Cigar light	+ Battery
F20	FP1	20A	Feux stop ; Auxiliaires arrière ; Mano contact défaillance frein de service	Stop Lights ; Rear auxiliaries ; Brake fail pressure switch	Contact / Ignition
F21	FP1	25A	essuie-glace arrière et toit ; lave-glace arrière ; auto- radio	Rear washer motor ; Top and Rear wiper motors ; Car radio	Contact / Ignition
F22	FP1	7,5A	Joystick ; interrupteur ACD ; inter electro 6 voies	Joystick ; ACD switches ; 6/2 way valve switch	Contact / Ignition
F23	FP1	25A	Boomfloat ; alimentation ACD	Boomfloat ; ACD supply	Contact / Ignition
F24	FP2	25A	Equipement ACD	ACD attachment	+ Battery
F25	lower cab	50A	+ BATTERIE	+ BATTERY	+ Battery
F26	lower cab	50A	Préchauffage ; relais de contact	Ignition relay ; Glow plug relay	+ Battery
F27	lower cab	7.5 A	Warning	Hazard	+ Battery
F01	lower cab	7,5A	Climatisation (compresseur)	AC compressor	+ Battery
F02	lower cab	20A	Climatisation	AC	+ Battery

**ELECTRICAL SCHEMATIC
T2250 (S/N AC1915001 AND ABOVE)**

[Printable Version Click Here](#)

Printed February 2012
Page 18 of 18
6933611

ELECTRICAL SYSTEM INFORMATION (S/N AC1912999 & BELOW)

Troubleshooting Chart

The following troubleshooting chart is provided for assistance in locating and correcting problems which are most common. Many of the recommended procedures must be done by authorized Bobcat Service Personnel only.



Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death.

W-2003-0199

PROBLEM	CAUSE
Battery will not take charge.	1, 2, 3, 4, 5
Alternator will not charge.	1, 2, 5
Starter will not turn the engine.	2, 3, 4, 6, 7, 8, 9
Warning light comes ON.	5, 8, 9, 10, 11

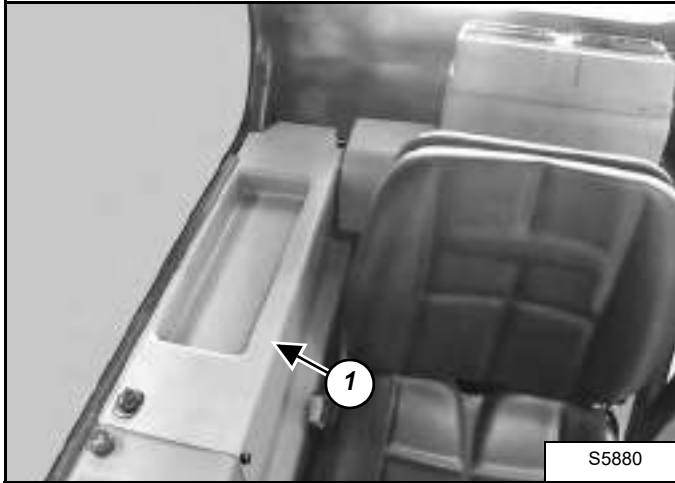
KEY TO CORRECT THE CAUSE
1. Alternator belt is loose or damaged.
2. Battery connections are dirty or loose.
3. Battery is damaged.
4. The ground connection is not making a good contact.
5. The alternator is damaged
6. The engine is locked.
7. The starter is damaged.
8. The wiring or the solenoid is damaged.
9. Check the fuses.

Dealer Copy -- Not for Resale

**ELECTRICAL SYSTEM INFORMATION (S/N
AC1912999 & BELOW) (CONT'D)**

Description

Figure 60-10-1

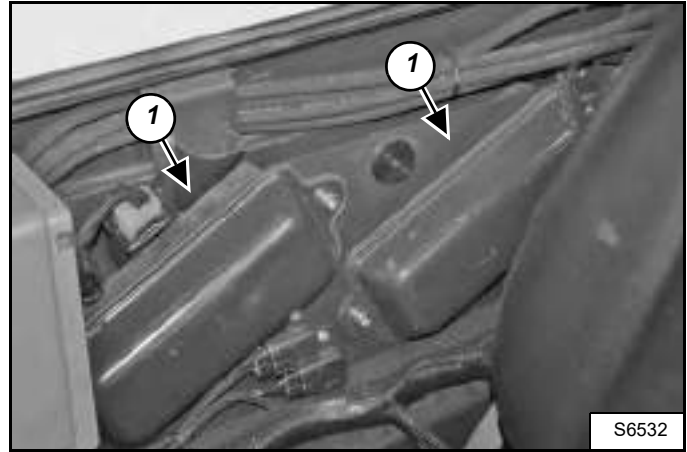


The Telescopic Handler has a 12 volt, negative ground alternator charging system. The electrical system is protected by fuses located in the cab in the right console (Item 1) **[Figure 60-10-1]**.

The fuses will protect the electrical system when there is an electrical overload. The reason of the overload must be found before starting the engine again.

Fuses, Diodes And Relays

Figure 60-10-2

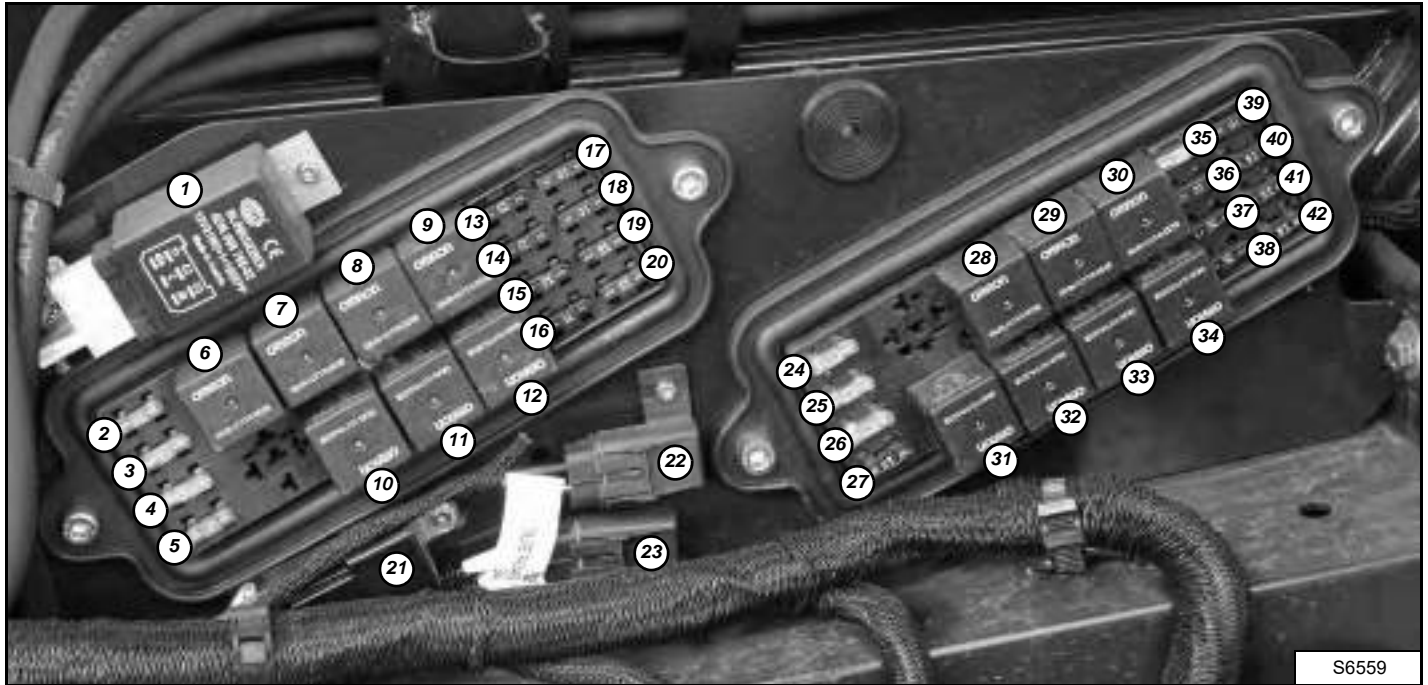


Remove the covers from the rows of fuses/relays/diodes (Item 1) **[Figure 60-10-2]** to check or replace fuses, diodes or relays.

ELECTRICAL SYSTEM INFORMATION (S/N AC1912999 & BELOW) (CONT'D)

Fuses, Diodes & Relays (Cont'd)

Figure 60-10-3



The locations and descriptions are shown below and in **[Figure 60-10-3]**.

FUSES

Ref.	Description.	Amps
2	Starter Relay & Alternator	25 A
3	◆ Rear Washer & Top Wiper & Rear Wiper & Radio	25 A
4	Boom Float & ACD Supply	25 A
5	◆ Heater Blower & AC Fan Relay	20 A
13	Hazard Lights	7.5 A
14	Joystick & ACD Switches & 6/2 Way Valve Switch	7.5 A
15	◆ Front Wiper/ Washer & Horn Switch	15 A
16	Left Park Lights & License Plate Light	7.5 A
17	FNR Lever & Drive Controller	10 A
18	Steering Mode	10 A
19	Power Bob-Tach Switch & Parking Brake Switch & Beacon	15 A
20	Stop Lights & Rear Auxiliaries & Brake Fail Pressure Switch	15 A
22	◆ Air Conditioner Fan	20 A
23	◆ Air Condition Compressor	7.5 A
24	Display Controller	25 A
25	Fuel Pull Relay & Low Speed Relay	25 A

RELAYS

Ref.	Description	Amps
26	Drive Controller & Key Switch	25 A
27	Low Beam Headlights	15 A
35	ACD Attachment	25 A
36	Cigar Lighter	10 A
37	Ceiling Light & Horn Relay & Radio	7.5 A
38	Right Park Lights	
39	Head Light SW & Turn Signal & Horn	10 A
40	ISL & Shunt Key & Boom Angle Sensor	15 A
41	Front Work Lights	15 A
42	Rear & Boom Work Lights	15 A
*	+ Battery	50 A
*	Ignition Relay & Glow Plug Relay	50 A
*	Hazard Lights	7.5 A

Ref.	Description
1	Flasher Relay Unit
6	AC Fan
7	AC Compressor
8	Glow Plugs
9	Starter
10	Boom Float
11	Back Up Alarm
12	Stop Lights
21	Ignition
28	Rear & Boom Work Lights
29	Front Work Lights
30	Blue Work Lights
31	Low Speed
32	Low Beam Headlights
33	Horn
34	Fuel Pull

* Located under the cab, close to the battery.

◆ Not used on Canopy models.



Bobcat®

ELECTRICAL SYSTEM INFORMATION (S/N AC1913000 & ABOVE)

Troubleshooting Chart

The following troubleshooting chart is provided for assistance in locating and correcting problems which are most common. Many of the recommended procedures must be done by authorized Bobcat Service Personnel only.



Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual, Handbook and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can cause injury or death.

W-2003-0199

PROBLEM	CAUSE
Battery will not take charge.	1, 2, 3, 4, 5
Alternator will not charge.	1, 2, 5
Starter will not turn the engine.	2, 3, 4, 6, 7, 8, 9
Warning light comes ON.	5, 8, 9, 10, 11

KEY TO CORRECT THE CAUSE
1. Alternator belt is loose or damaged.
2. Battery connections are dirty or loose.
3. Battery is damaged.
4. The ground connection is not making a good contact.
5. The alternator is damaged
6. The engine is locked.
7. The starter is damaged.
8. The wiring or the solenoid is damaged.
9. Check the fuses.

Dealer Copy -- Not for Resale

**ELECTRICAL SYSTEM INFORMATION (S/N
AC1913000 & ABOVE) (CONT'D)**

Description

Figure 60-11-1

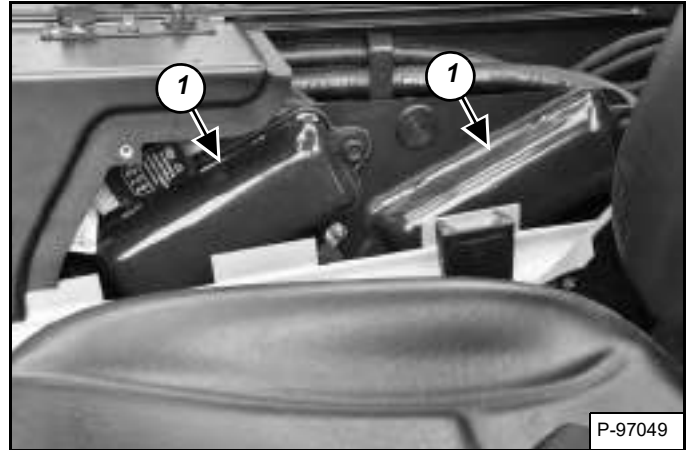


The Telescopic Handler has a 12 volt, negative ground alternator charging system. The electrical system is protected by fuses located in the cab in the right console (Item 1) **[Figure 60-11-1]**.

The fuses will protect the electrical system when there is an electrical overload. The reason of the overload must be found before starting the engine again.

Fuses, Diodes And Relays

Figure 60-11-2

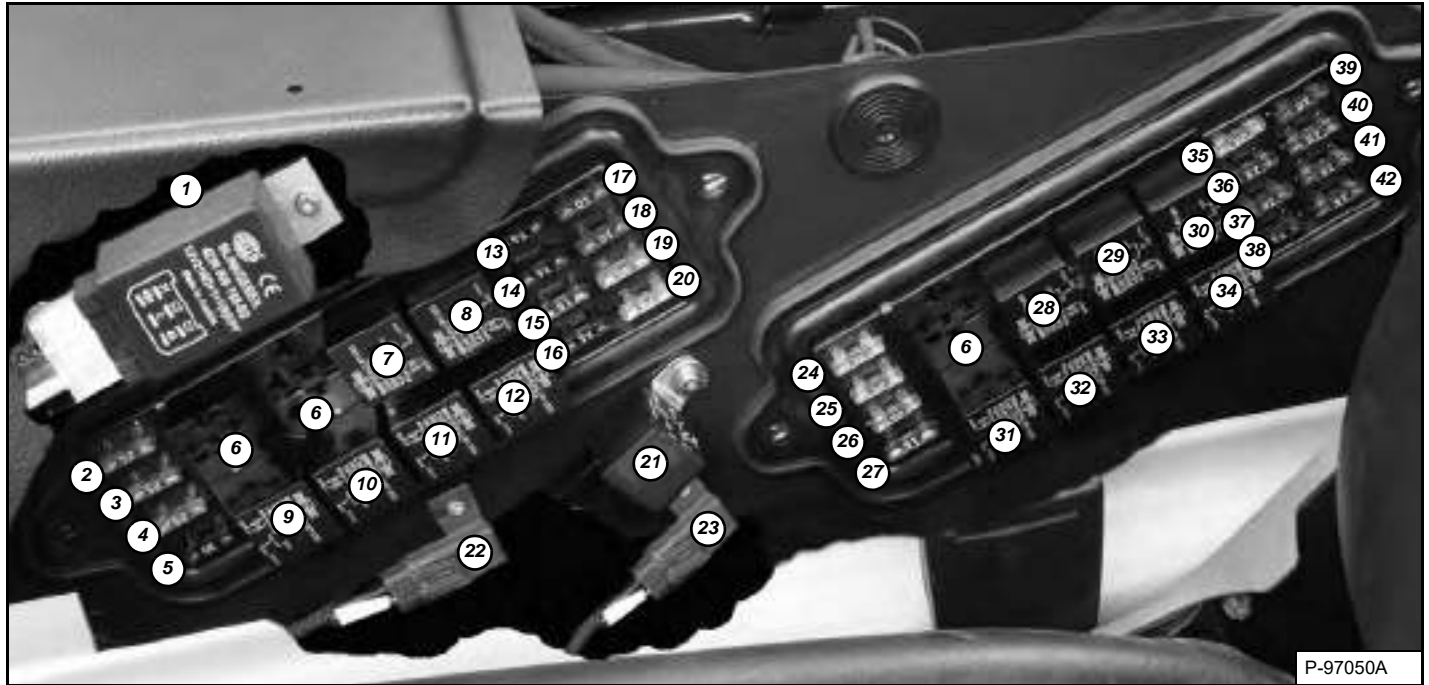


Remove the covers from the rows of fuses/relays/diodes (Item 1) **[Figure 60-11-2]** to check or replace fuses, diodes or relays.

ELECTRICAL SYSTEM INFORMATION (S/N AC1913000 & ABOVE) (CONT'D)

Fuses, Diodes & Relays (Cont'd)

Figure 60-11-3



The locations and descriptions are shown below and in **[Figure 60-11-3]**.

FUSES

Ref	Description.	Amps
2	Starter Relay & Alternator	25 A
3	Rear Washer, Top & Rear Wiper Motors, Radio	25 A
4	Boom Float (If Equipped), ACD Supply	25 A
5	HVAC Blower Relay	20 A
13	Hazard Lights	7.5 A
14	Joystick, ACD Switches, 6/2 Way Valve Switch	7.5 A
15	Front Wiper/ Washer & Horn Switch	15 A
16	Left Park Lights, License Plate Light	7.5 A
17	FNR Lever, Drive Controller	10 A
18	Steering Mode	10 A
19	Beacon, Backup Alarm, 6/2 Way Valve Switch	20 A
20	Stop Lights, Rear Auxiliaries, Brake Fail Pressure Switch (If Equipped) (Germany)	20 A
22	Not used	-
23	Not used	-
24	Display Controller	25 A
25	Fuel Pull Relay, Low Speed Relay	25 A

RELAYS

Ref	Description	Amps
26	Drive Controller, Key Switch	25 A
27	Low Beam Headlights	15 A
35	ACD Attachment	25 A
36	Power Plug	15 A
37	Dome Light, Horn Relay, Radio	10 A
38	Right Park Lights	7.5 A
39	Head Light Switch, Turn Signal, Horn	10 A
40	ISL, Shunt Key, Boom Angle Sensor	15 A
41	Front Work Lights	15 A
42	Rear Work Lights, Boom Work Lights	15 A
*	+ Battery	50 A
*	Ignition Relay, Glow Plug Relay	50 A
*	Hazard	7.5 A
*	AC Compressor	7.5 A
*	AC	20 A

Ref	Description
1	Flasher Relay Unit (Direction and Warning Lights)
6	Not used
7	Glow Plugs
8	Starter
9	6 Way Valve
10	Boom Float (If Equipped)
11	Back Up Alarm (If Equipped)
12	Stop Lights
21	Ignition
28	Rear & Boom Work Lights
29	Front Work Lights
30	Blue Work Lights (If Equipped)
31	Low Speed
32	Low Beam Headlights
33	Horn
34	Fuel Pull

* **Located under the cab, close to the battery.**

Dealer Copy -- Not for Resale



Bobcat®

BATTERY

Removal And Installation

WARNING

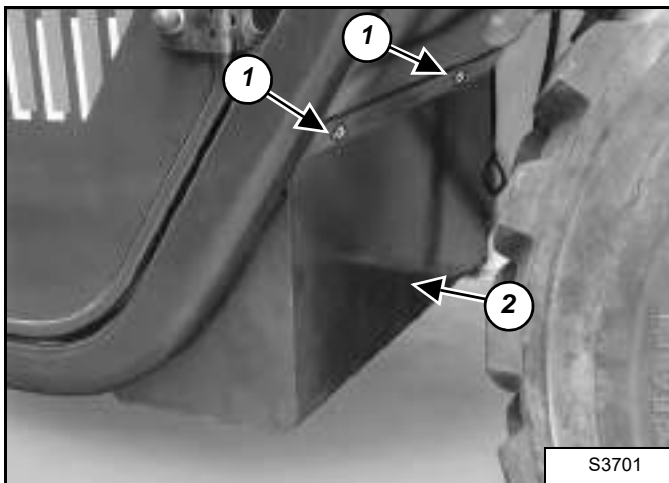
Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body. In case of acid contact, wash immediately with water.

In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.

If electrolyte is taken internally drink large quantities of water or milk! DO NOT induce vomiting. Get prompt medical attention.

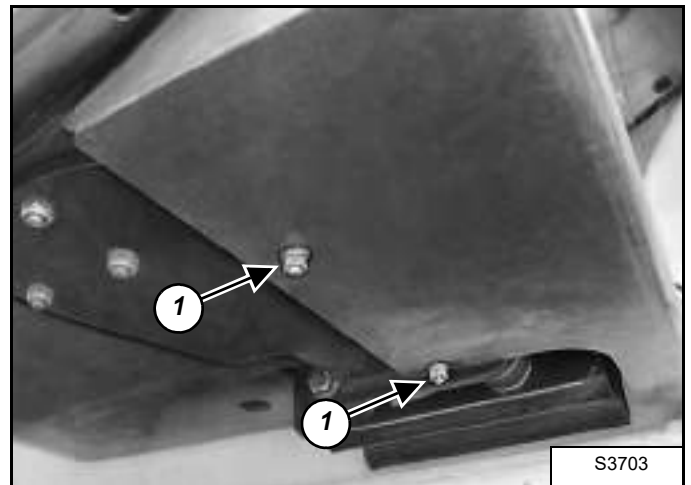
W-2065-1296

Figure 60-20-1



Remove the two screws (Item 1) from the battery access cover (Item 2) [Figure 60-20-1] located on the back of the cab.

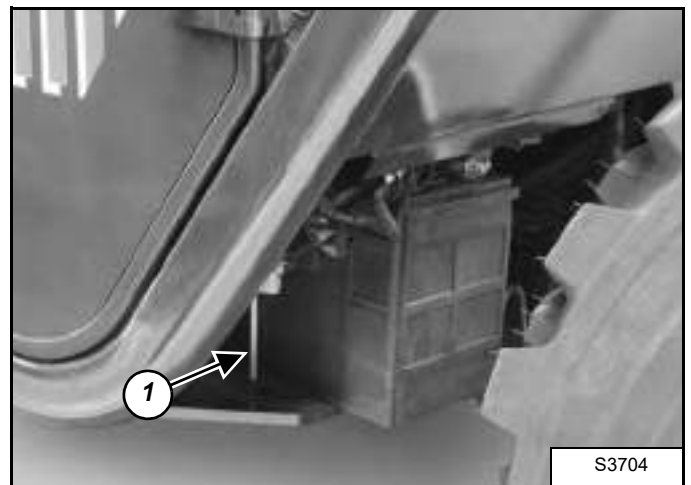
Figure 60-20-2



Remove the two nuts (Item 1) [Figure 60-20-2] from the bottom of the battery access cover.

Remove the battery access cover.

Figure 60-20-3



Remove the bolts (Item 1) [Figure 60-20-3] on both sides of the battery. The nuts have already been removed for battery cover removal.

Always disconnect the negative cable first to prevent sparks.

Remove the positive battery cable.

Remove the battery.

Dealer Copy -- Not for Resale

BATTERY (CONT'D)

Servicing

WARNING

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body. In case of acid contact, wash immediately with water.

In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.

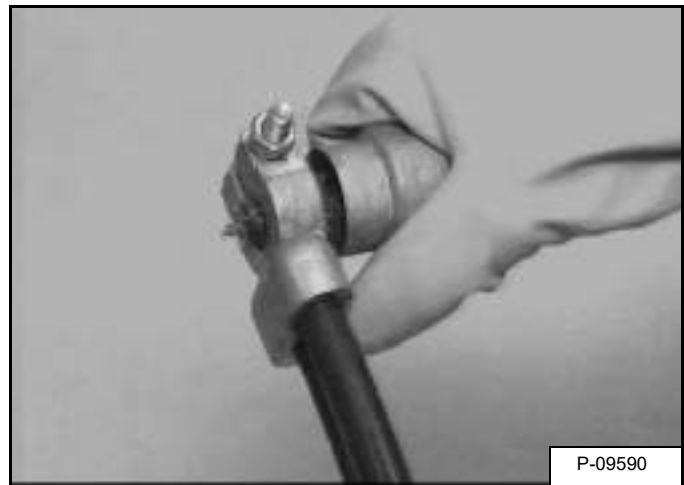
If electrolyte is taken internally drink large quantities of water or milk! DO NOT induce vomiting. Get prompt medical attention.

W-2065-1296

Figure 60-20-4



Figure 60-20-5



Always clean the terminals and cable ends when installing a new battery [Figure 60-20-4] and [Figure 60-20-5].

When installing the battery in the Telescopic Handler, do not touch any metal parts with the battery terminal posts.

Connect and tighten the battery cables. Connect the negative (-) cable last to prevent sparks.

Figure 60-20-6



The battery cables must be clean and the connections tight. Remove acid or corrosion from the battery and cables with a sodium bicarbonate (baking soda) and water solution [Figure 60-20-6].

Check the electrolyte level in the battery. Add distilled water as needed.

Put Battery Saver (P/N 6664458) or grease on the battery terminals and cable ends to prevent corrosion.

BATTERY (CONT'D)

Using A Booster Battery (Jump Starting)

If it is necessary to use a booster battery to start the engine, BE CAREFUL! There must be one person in the operator's seat and one person to connect and disconnect the battery cables.

The key switch must be OFF. The booster battery must be 12 volt.

IMPORTANT

Damage to the alternator can occur if:

- **Engine is operated with battery cables disconnected.**
- **Battery cables are connected when using a fast charger or when welding on the Telescopic Handler. (Remove both cables from the battery.)**
- **Extra battery cables (booster cables) are connected wrong.**

I-2345-0311

WARNING

AVOID INJURY OR DEATH

Batteries contain acid which burns eyes and skin on contact. Wear goggles, protective clothing and rubber gloves to keep acid off body.

In case of acid contact, wash immediately with water. In case of eye contact get prompt medical attention and wash eye with clean, cool water for at least 15 minutes.

If electrolyte is taken internally drink large quantities of water or milk! DO NOT induce vomiting. Get prompt medical attention.

W-2065-0807

WARNING

BATTERY GAS CAN EXPLODE AND CAUSE SERIOUS INJURY OR DEATH

Keep arcs, sparks, flames and lighted tobacco away from batteries. When jumping from booster battery make final connection (negative) at machine frame.

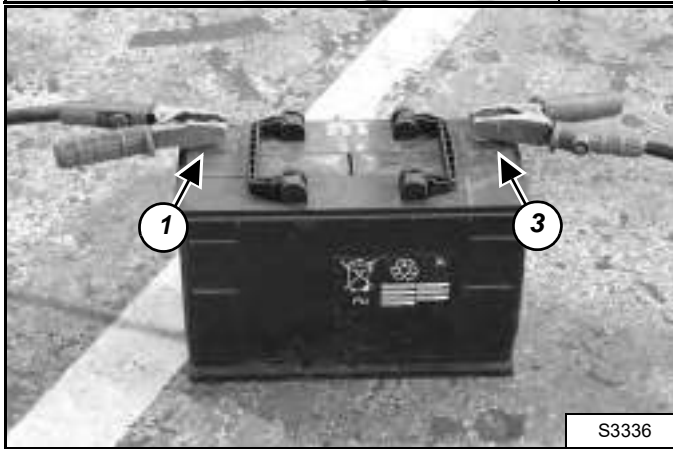
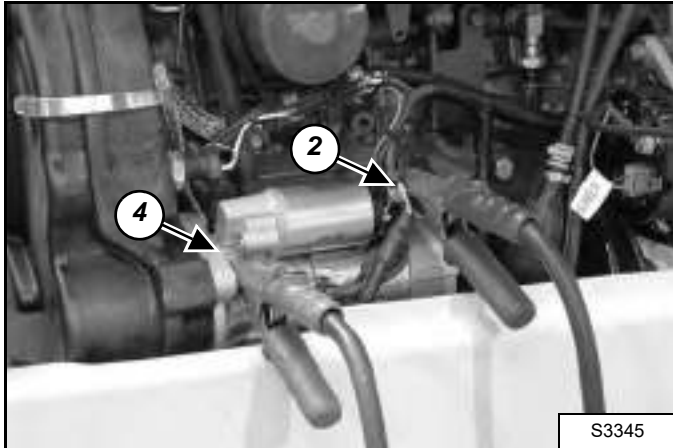
Do not jump start or charge a frozen or damaged battery. Warm battery to 16°C (60°F) before connecting to a charger. Unplug charger before connecting or disconnecting cables to battery. Never lean over battery while boosting, testing or charging.

W-2066-0910

BATTERY (CONT'D)

Using A Booster Battery (Jump Starting) (Cont'd)

Figure 60-20-7



Connect the end of the first cable to the positive (+) terminal of the booster battery (Item 1) **[Figure 60-20-7]**. Connect the other end of the same cable to the positive terminal (Item 2) **[Figure 60-20-7]** on the Telescopic Handler starter.

Connect the end of the second cable to the negative (-) terminal of the booster battery (Item 3) **[Figure 60-20-7]**. Connect the other end of the same cable to one of the bolts that connect the engine to the belt shield (Item 4) **[Figure 60-20-7]** or to the ground cables of the engine (beneath the alternator).

Keep cables away from moving parts. Start the engine.

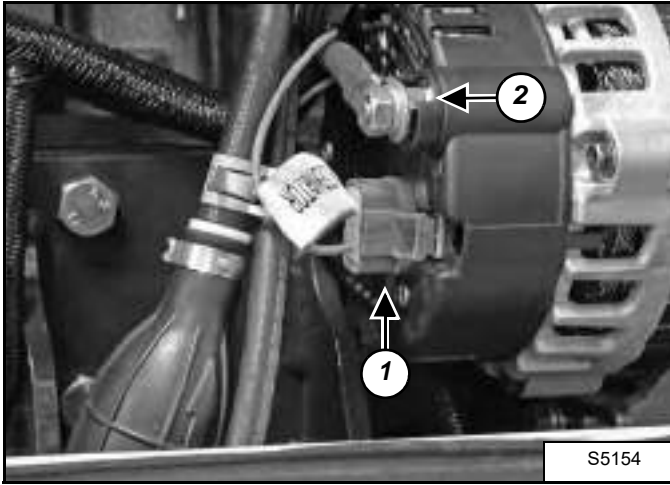
After the engine has started, remove the ground (-) cable (Item 4) **[Figure 60-20-7]** first.

Remove the cable from the positive terminal (Item 2) **[Figure 60-20-7]**.

ALTERNATOR

Removal And Installation

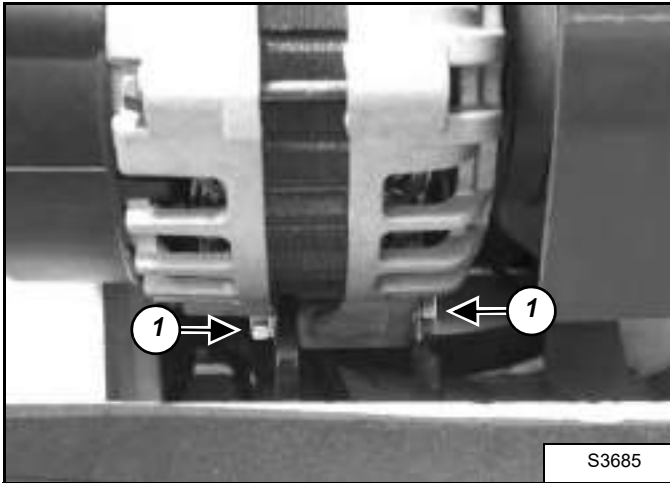
Figure 60-30-1



Open the engine cover.

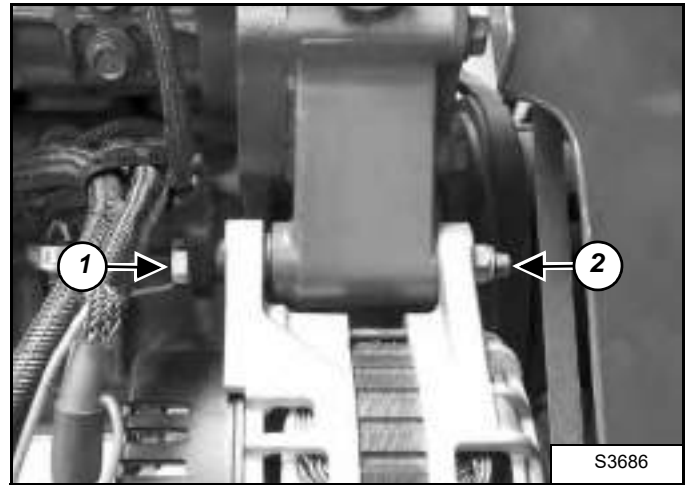
Remove the connector (Item 1) and the bolt (Item 2) [Figure 60-30-1].

Figure 60-30-2



Loosen the two bolts (Item 1) [Figure 60-30-2] from the bottom of the alternator.

Figure 60-30-3



Remove the bolt (Item 1) and the nut (Item 2) [Figure 60-30-3].

Remove the alternator.

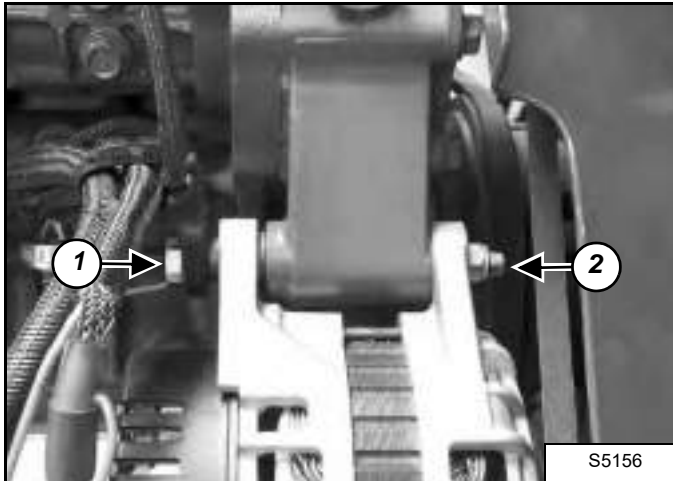
ALTERNATOR (CONT'D)

Belt Adjustment

Stop the engine and open the engine cover.

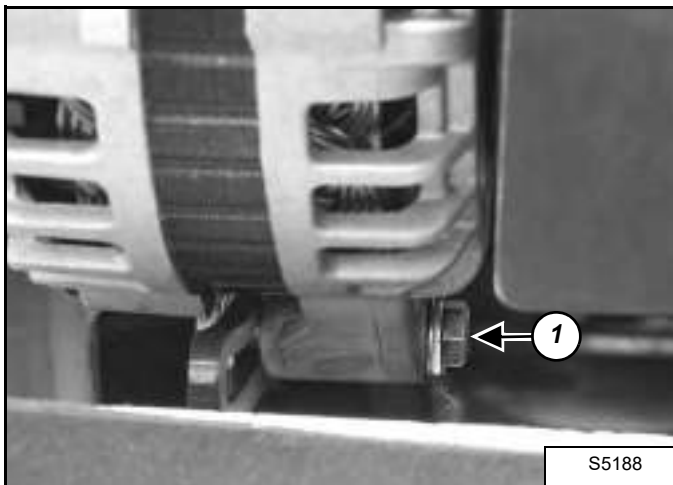
NOTE: The following photos show the machine without air conditioning, the procedure is the same for belt adjustment with or without air conditioning. Only belt length is different.

Figure 60-30-4



Loosen the bolt (Item 1) and nut (Item 2) [Figure 60-30-4] at the top of the alternator.

Figure 60-30-5



Loosen the alternator mounting bolt (Item 1) [Figure 60-30-5] at the bottom of the alternator.

Move the alternator until the belt has 8,0 mm (5/16 in) movement at the middle of the belt span with 20 N (15 lbs) of force.

Tighten the adjustment and mounting bolts.

Belt Replacement

Loosen the alternator mounting and adjustment bolts (Items 1 & 2) [Figure 60-30-4] and (Item 1) [Figure 60-30-5] and loosen the belt all the way.

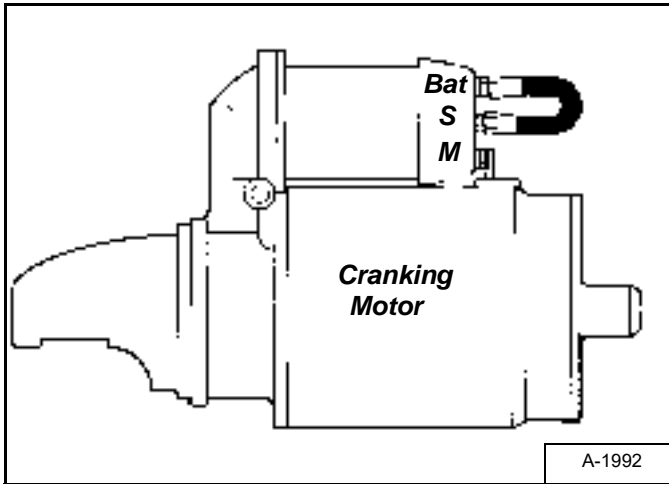
Remove the belt and install a new belt.

Adjust the belt as shown above.

STARTER

Testing

Figure 60-40-1



The key switch must be in the OFF position.

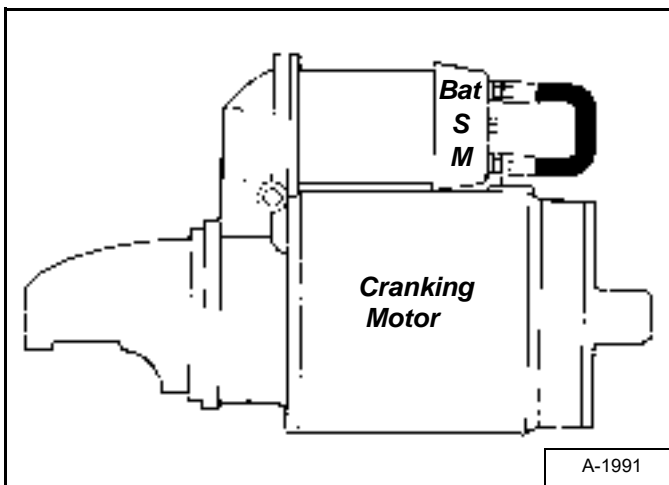
The battery must be at full charge.

The cable connections on the battery must be clean and tight.

Connect a jumper wire between S terminal and BAT terminal [Figure 60-40-1].

If the starter turns but does not turn the engine, the starter drive has a defect.

Figure 60-40-2

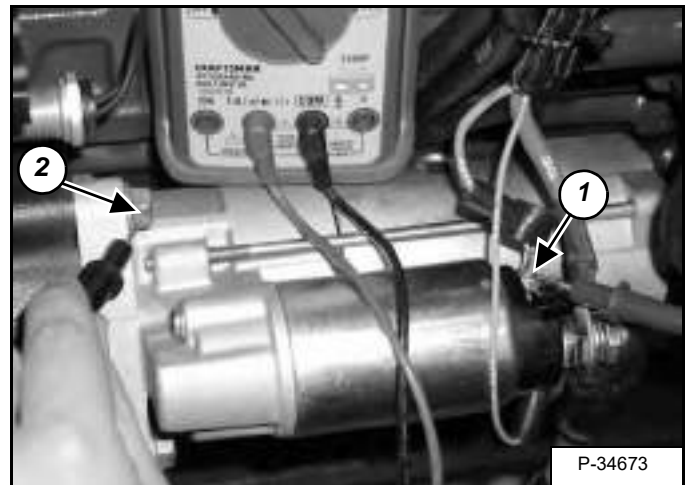


Connect a jumper wire (of at least 4 gauge in size) between the M terminal and the BAT terminal [Figure 60-40-2].

If the starter turns, the defect is in the solenoid.

If the starter does not turn, the starter is defective.

Figure 60-40-3

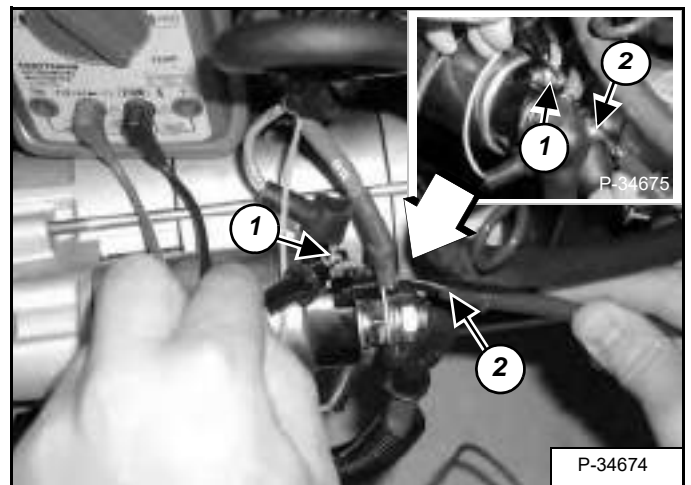


Disconnect the negative cable from the battery. (See Removal And Installation on Page 60-20-1.)

Disconnect the S terminal on the starter (Item 1) [Figure 60-40-3].

Hold-In Test: Use circuit tester, touch one probe to the S terminal (Item 1) and one probe to the mounting bolt (Item 2) [Figure 60-40-3] on the magnetic switch (solenoid). If there is no continuity replace the magnetic switch (solenoid).

Figure 60-40-4



Disconnect the negative cable from the battery. (See Removal And Installation on Page 60-20-1.)

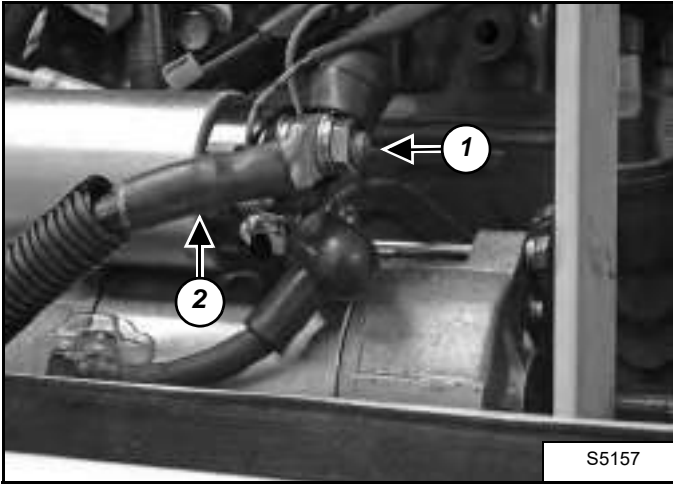
Disconnect the S terminal on the starter (Item 1) [Figure 60-40-4].

Pull-In Test: Use circuit tester, touch one probe to the S terminal (Item 1) and one probe to the starter motor terminal (Item 2) [Figure 60-40-4]. If there is no continuity replace the magnetic switch (solenoid).

STARTER (CONT'D)

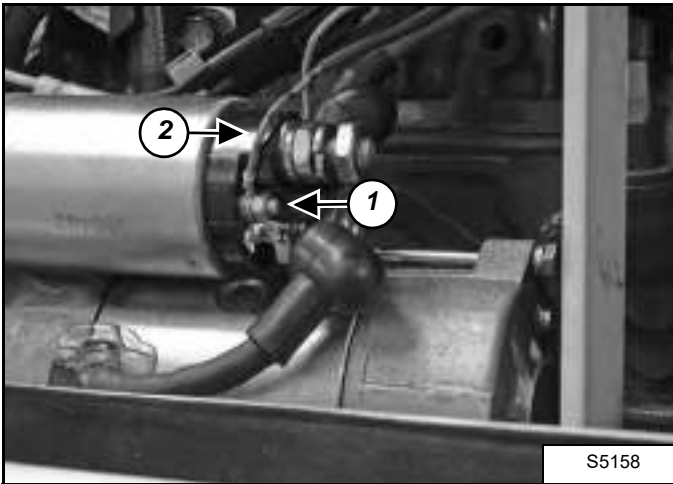
Removal And Installation

Figure 60-40-1



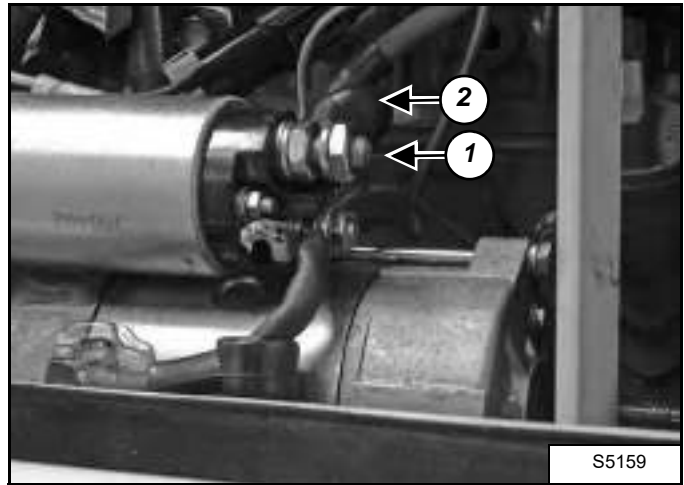
Loosen the bolt (Item 1) to remove the electrical wire (Item 2) [Figure 60-40-1].

Figure 60-40-2



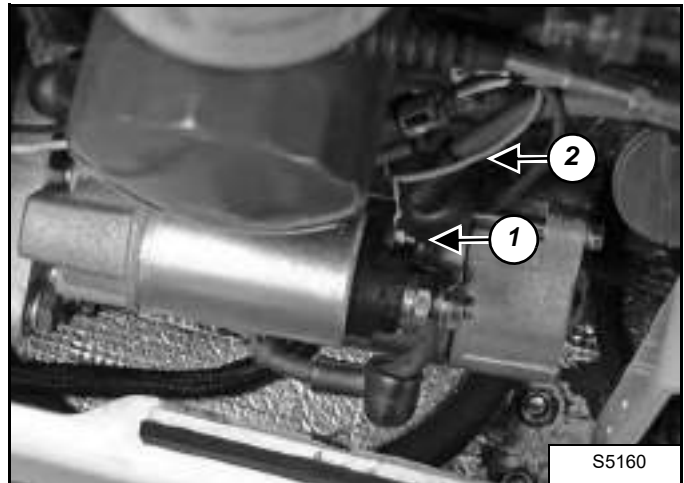
Remove the small bolt (Item 1) and remove the electrical wire (Item 2) [Figure 60-40-2].

Figure 60-40-3



Loosen the bolt (Item 1) to remove the electrical wire (Item 2) [Figure 60-40-3] from the starter.

Figure 60-40-4

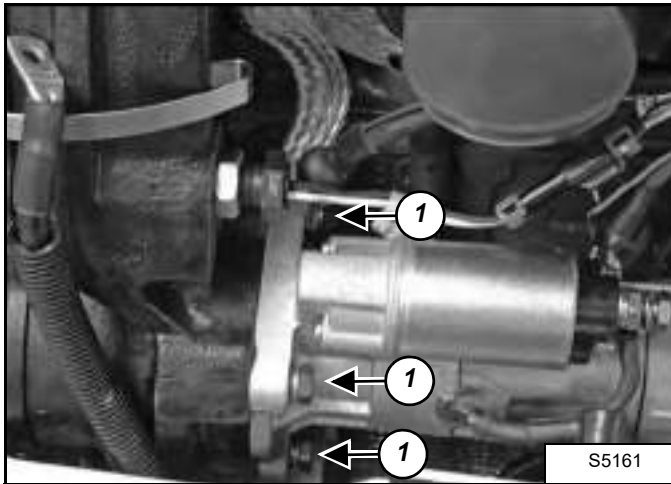


Remove the bolt (Item 1) and the electrical wire (Item 2) [Figure 60-40-4] from the starter.

STARTER (CONT'D)

Removal And Installation (Cont'd)

Figure 60-40-5



Remove the three bolts (Item 1) [Figure 60-40-5] from the magnetic switch.

Remove the starter from the engine.

Installation: Tighten to 54-61 N•m (40-45 ft-lb) torque

NOTE: *The starter is not serviceable. If starter is damaged the entire assembly must be replaced.*

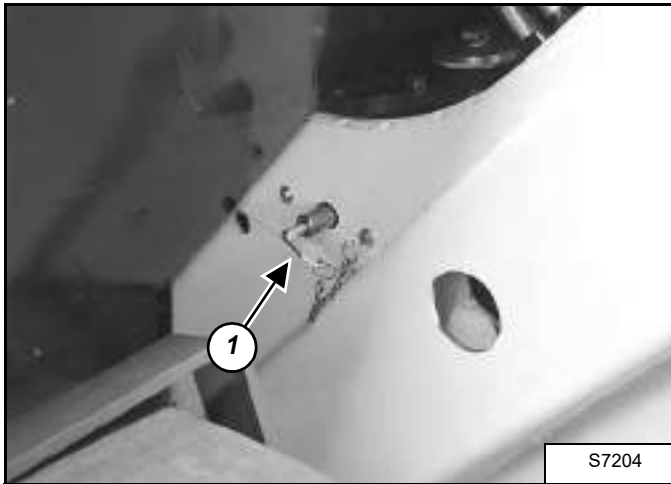


Bobcat®

LIGHTS

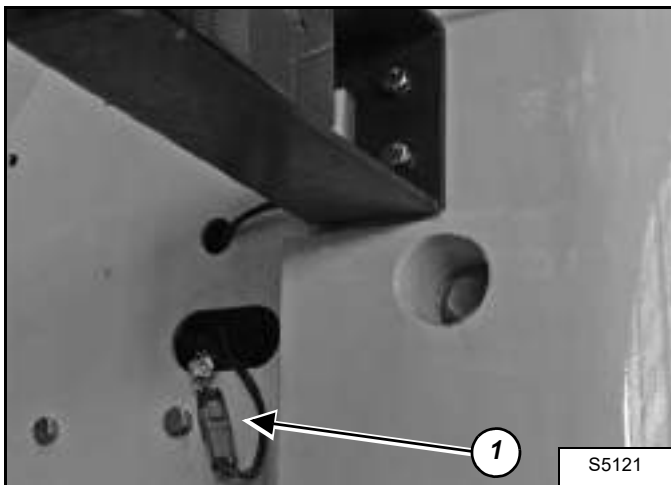
Rear Light Removal And Installation

Figure 60-60-1



Rotate the battery disconnect switch (Item 1) [Figure 60-60-1] to the right, to disconnect the power supply from the battery.

Figure 60-60-2

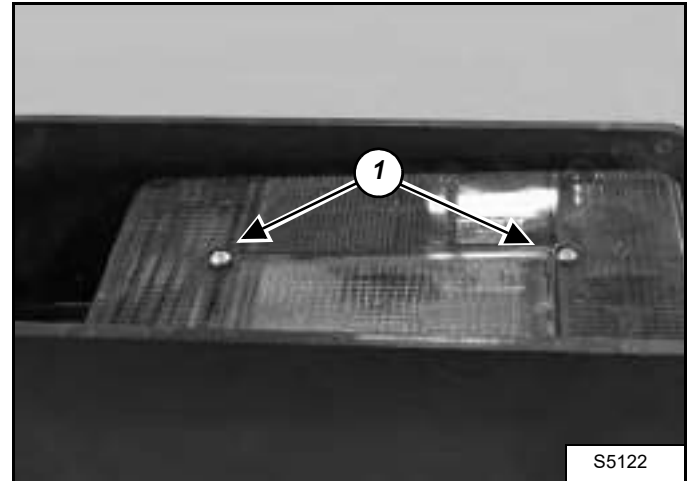


Disconnect the light harness connector (Item 1) [Figure 60-60-2] from the main harness.

Remove the harness from the main frame.

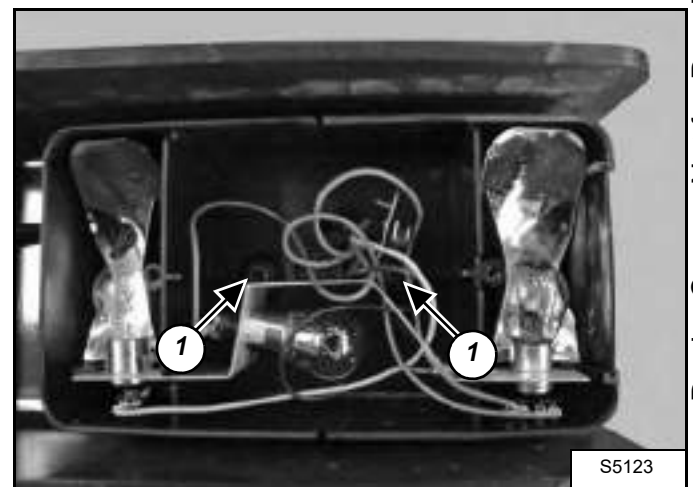
For T2250 models with S/N AC1912999 & Below:

Figure 60-60-3



Remove the two lens retainer screws (Item 1) [Figure 60-60-3].

Figure 60-60-4



Remove the two light mounting bolts (Item 1) [Figure 60-60-4].

Remove the light assembly.

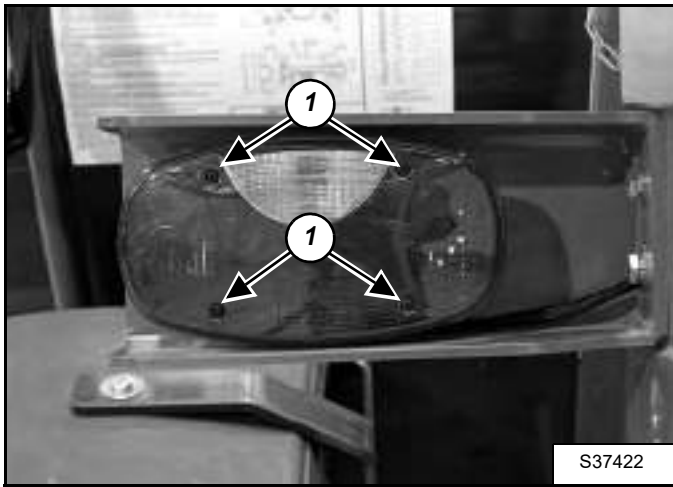
Dealer Copy -- Not for Resale

LIGHTS (CONT'D)

Rear Light Removal And Installation (Cont'd)

For T2250 models with S/N AC1913000 & Above:

Figure 60-60-5



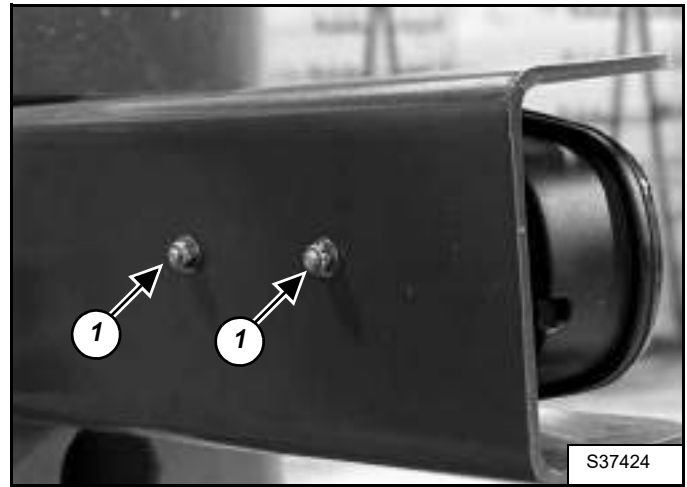
Remove the four lens retainer screws (Item 1) [Figure 60-60-5].

Figure 60-60-6



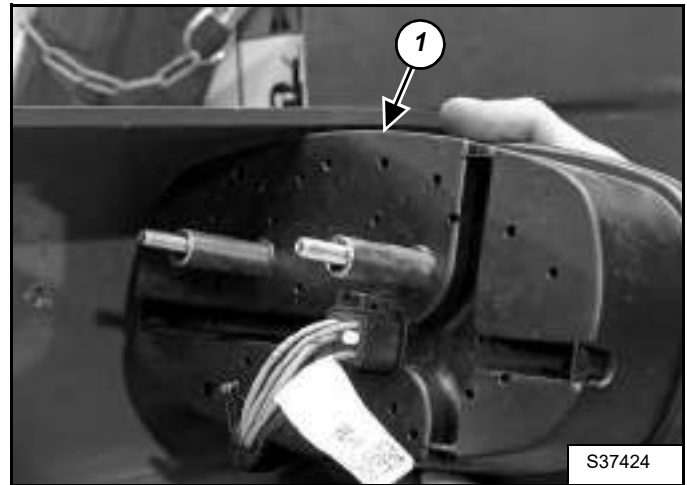
Replace the lightbulbs that need replacement [Figure 60-60-6].

Figure 60-60-7



Remove the two light mounting bolts (Item 1) [Figure 60-60-7].

Figure 60-60-8



Remove the light assembly (Item 1) [Figure 60-60-8].

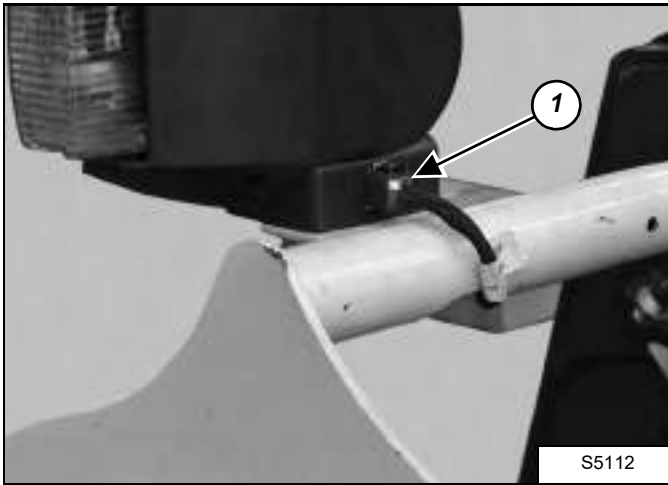
Dealer Copy -- Not for Resale

LIGHTS (CONT'D)

Front Light Removal And Installation

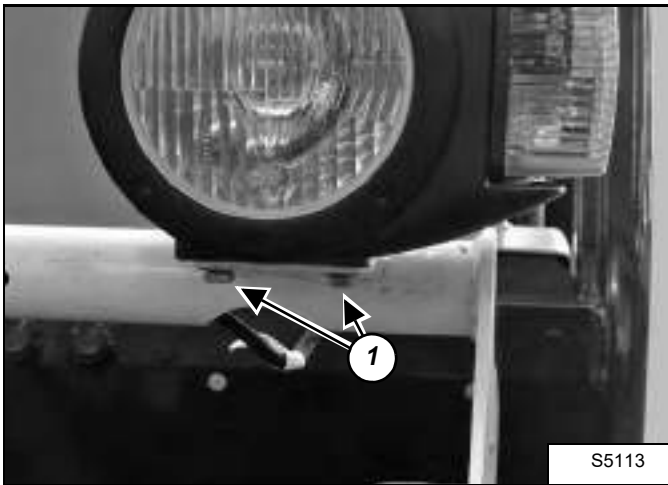
For T2250 models with S/N AC1912999 & Below:

Figure 60-60-9



Disconnect the light harness connector (Item 1) [Figure 60-60-9] from the light.

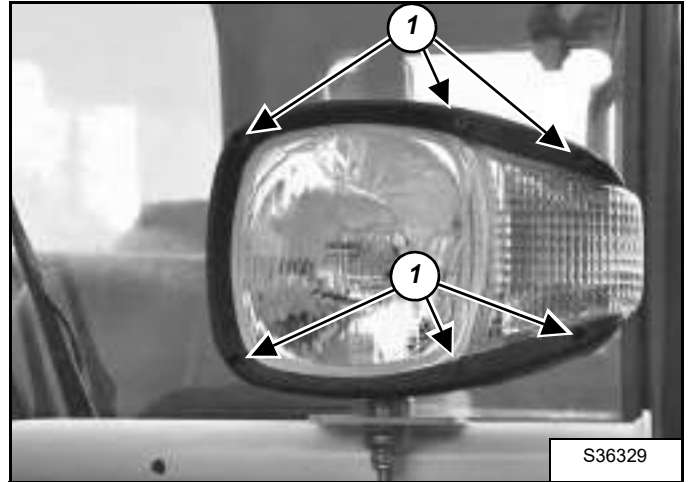
Figure 60-60-10



Remove the two bolts (Item 1) [Figure 60-60-10] and remove the light.

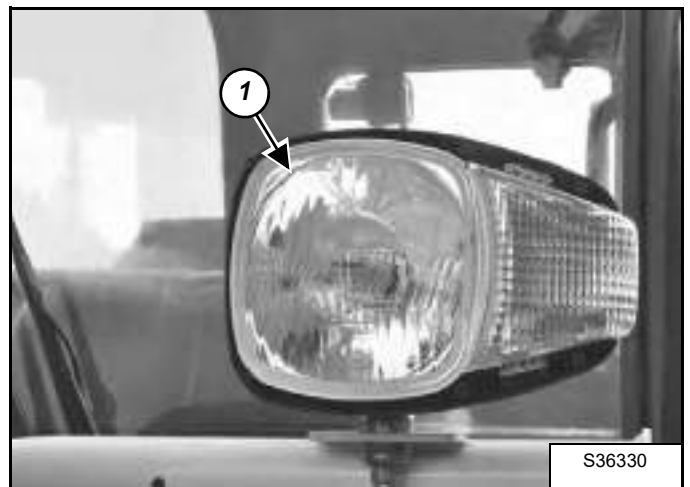
For T2250 models with S/N AC1913000 & Above:

Figure 60-60-11



Remove six screws (Item 1) [Figure 60-60-11] from the light.

Figure 60-60-12



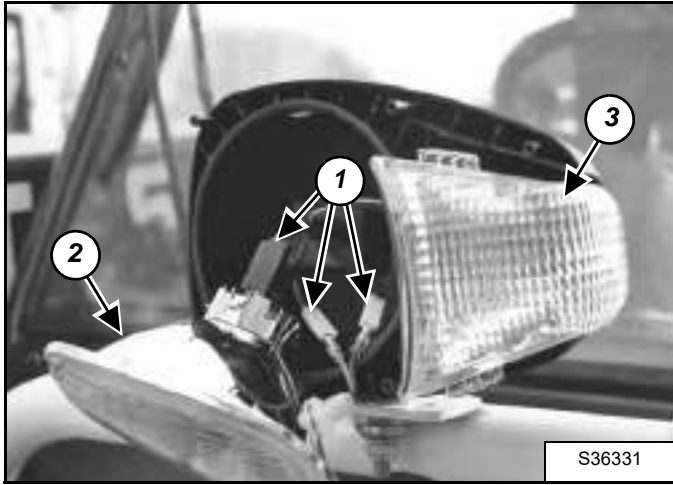
Loosen the front light (Item 1) [Figure 60-60-12].

Dealer Copy -- Not for Resale

LIGHTS (CONT'D)

Front Light Removal And Installation (Cont'd)

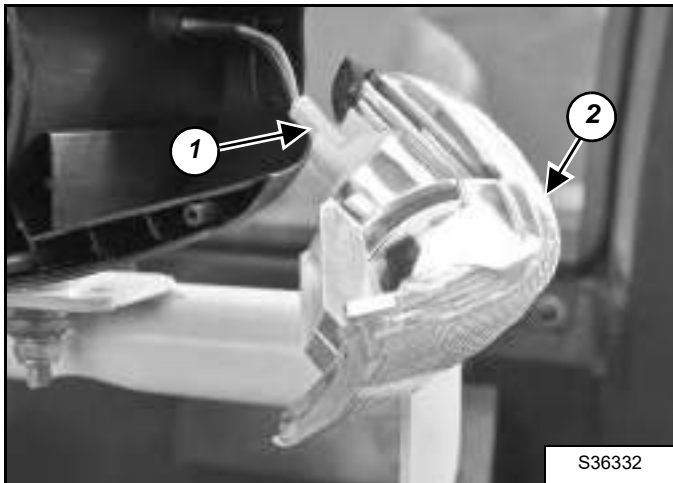
Figure 60-60-13



Unplug the connectors (Item 1) and remove the light (Item 2) **[Figure 60-60-13]**.

Loosen the indicator light (Item 3) **[Figure 60-60-13]**.

Figure 60-60-14

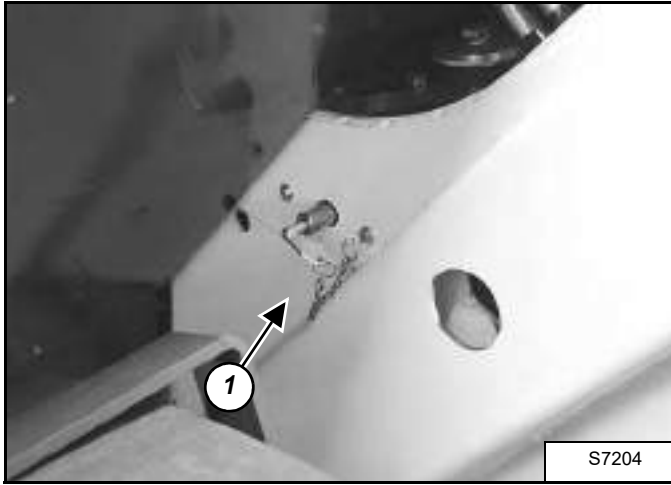


Unplug the connector (Item 1) and remove the indicator light (Item 2) **[Figure 60-60-14]**.

TRAVEL LEVER (S/N AC1912999 & BELOW)

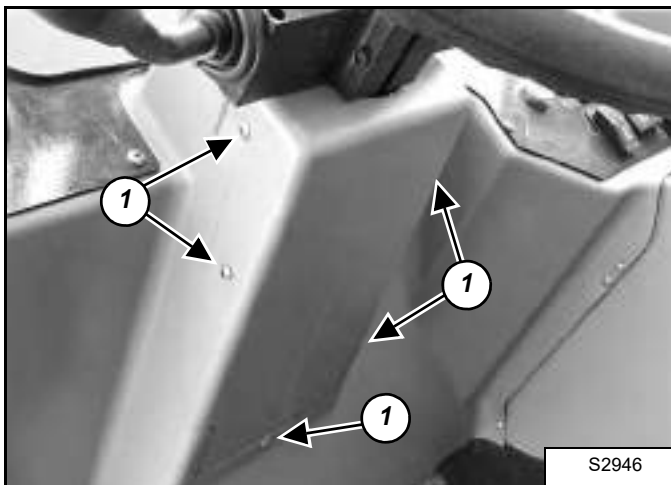
Removal And Installation

Figure 60-60-1



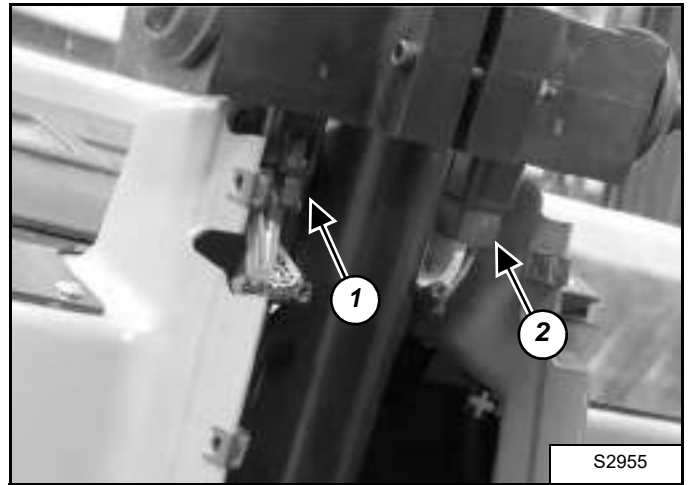
Rotate the battery disconnect switch (Item 1) [Figure 60-60-1] to the right, to disconnect the power supply from the battery.

Figure 60-60-2



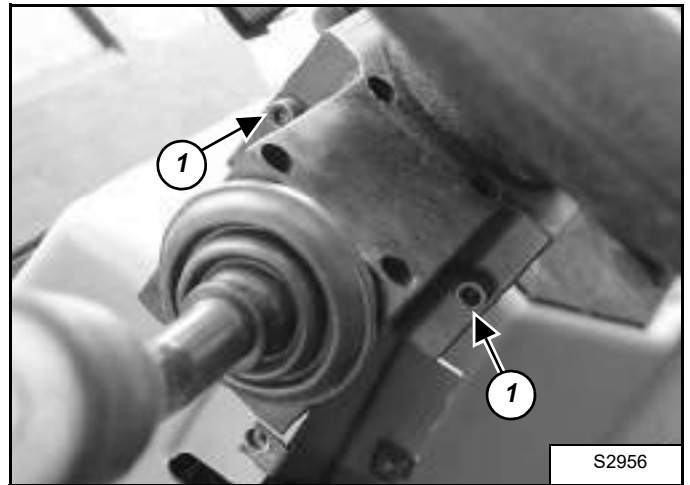
Remove the five screws (Item 1) and remove the steering column cover [Figure 60-60-2].

Figure 60-60-3



Disconnect the travel control wire harness connector (Item 1) and signal control wire connector (Item 2) [Figure 60-60-3].

Figure 60-60-4



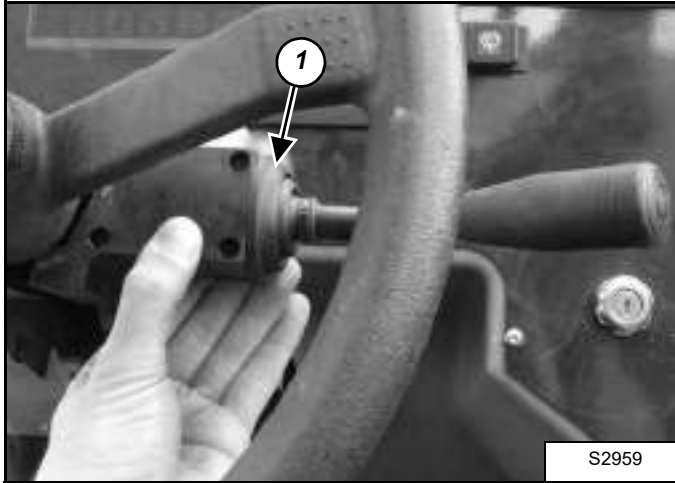
Remove the two screws (Item 1) [Figure 60-60-4] from the travel lever.

Dealer Copy -- Not for Resale

**TRAVEL LEVER (S/N AC1912999 & BELOW)
(CONT'D)**

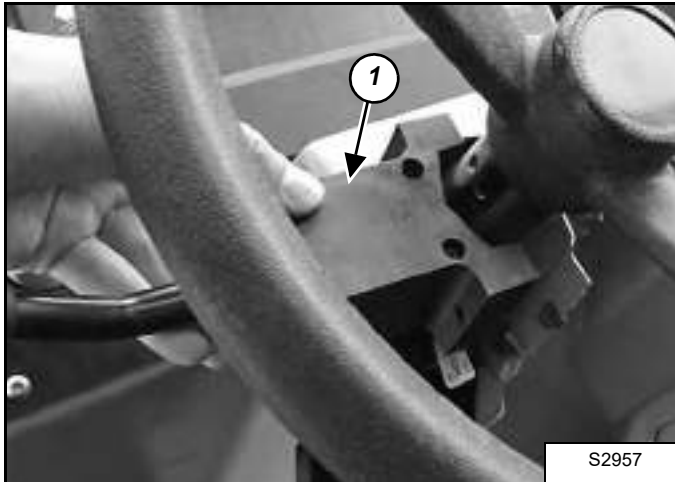
Removal And Installation (Cont'd)

Figure 60-60-5



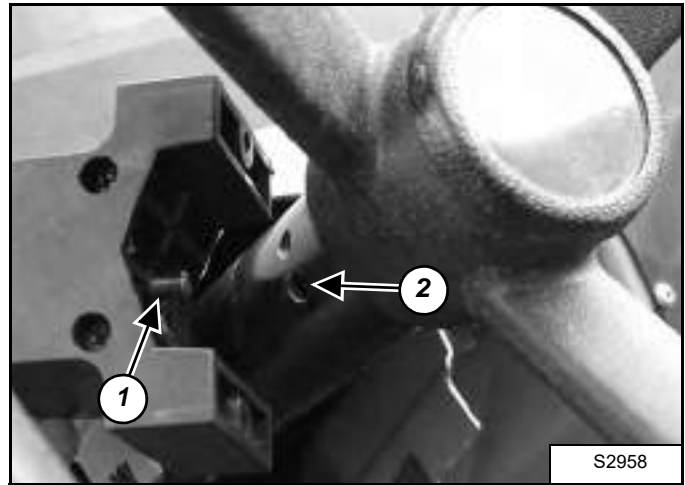
Remove the signal lever (Item 1) [Figure 60-60-5].

Figure 60-60-6



Remove the travel lever (Item 1) [Figure 60-60-6].

Figure 60-60-7

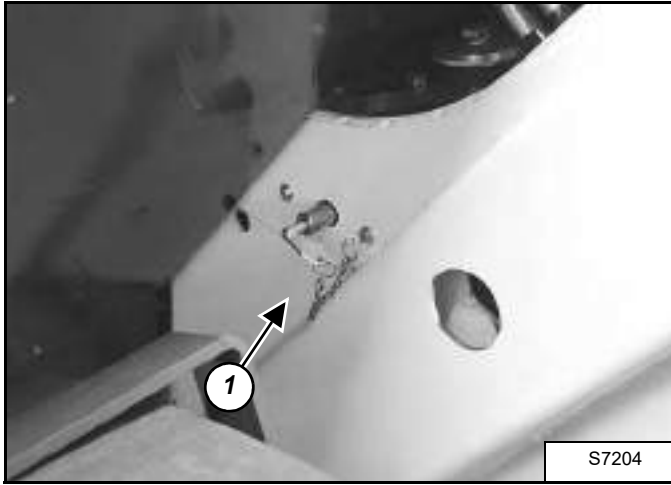


Installation: Align the pin (Item 1) in the travel lever with the hole (Item 2) [Figure 60-60-7] in the steering column.

TRAVEL LEVER (S/N AC1913000 & ABOVE)

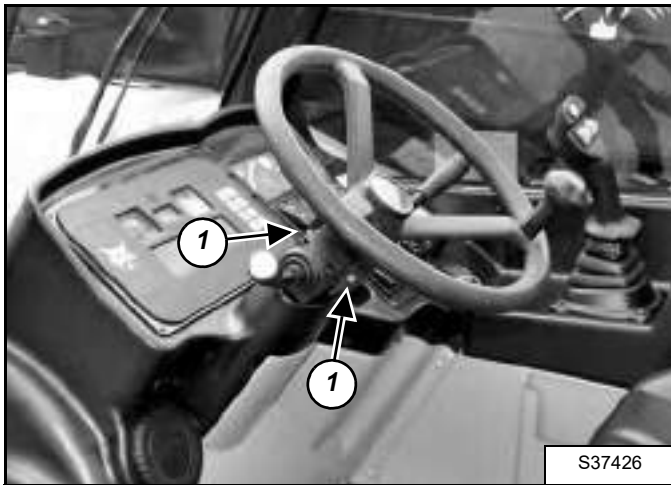
Removal And Installation

Figure 60-61-1



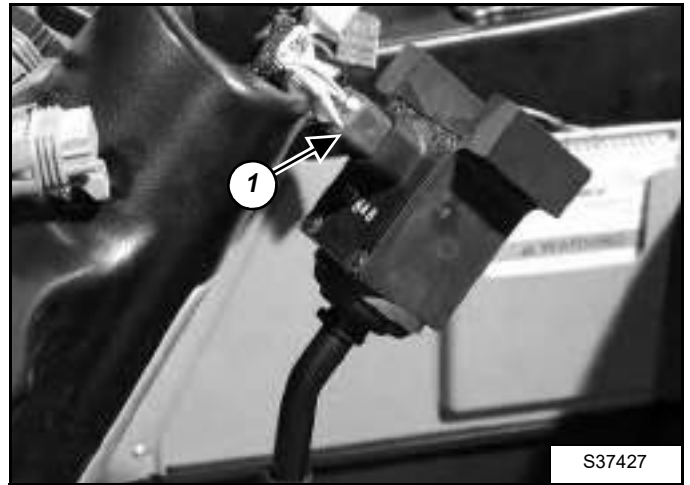
Rotate the battery disconnect switch (Item 1) [Figure 60-61-1] to the right, to disconnect the power supply from the battery.

Figure 60-61-2



Remove the two screws (Item 1) [Figure 60-61-2] from the travel lever.

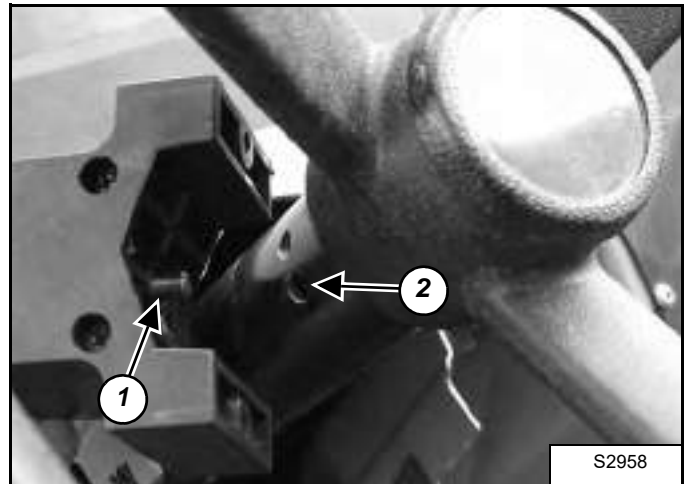
Figure 60-61-3



Disconnect the travel control wire harness connector (Item 1) [Figure 60-61-3]. Remove the travel control lever.

Repeat for the signal control wire connector.

Figure 60-61-4



Installation: Align the pin (Item 1) in the travel lever with the hole (Item 2) [Figure 60-61-4] in the steering column.

Dealer Copy -- Not for Resale



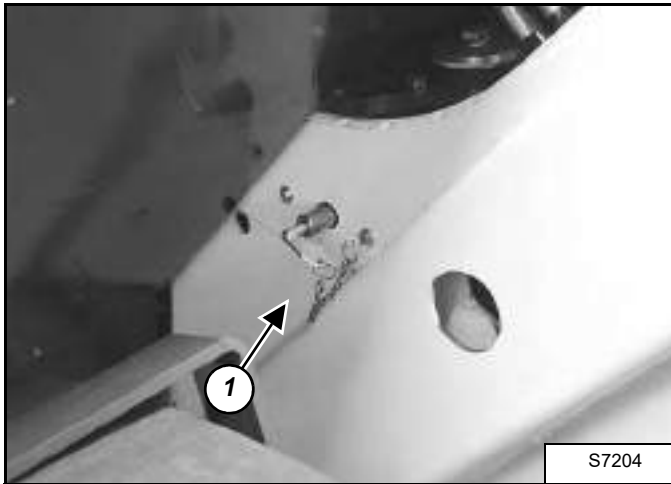
Bobcat®

Dealer Copy -- Not for Resale

INSTRUMENT PANEL (S/N AC1912999 & BELOW)

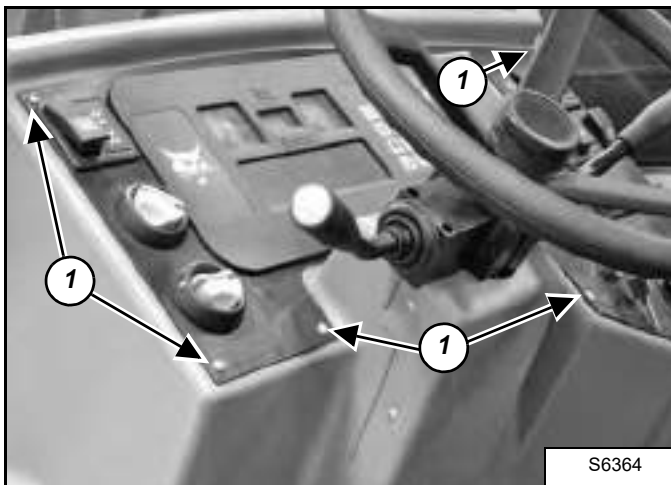
Removal And Installation

Figure 60-70-1



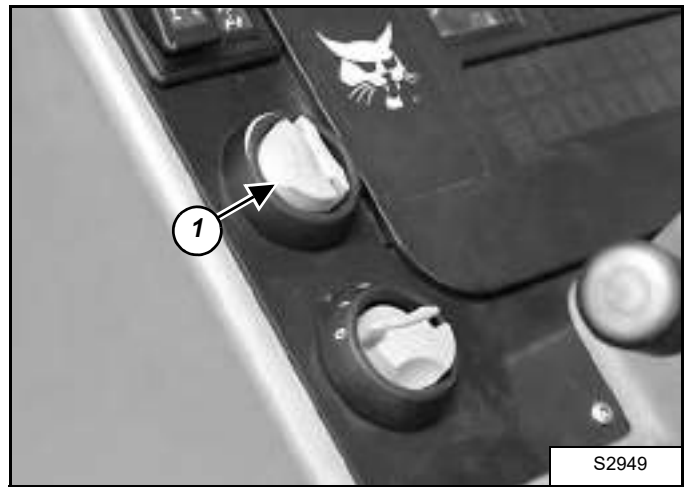
Rotate the battery disconnect switch (Item 1) [Figure 60-70-1] to the right, to disconnect the power supply from the battery.

Figure 60-70-2



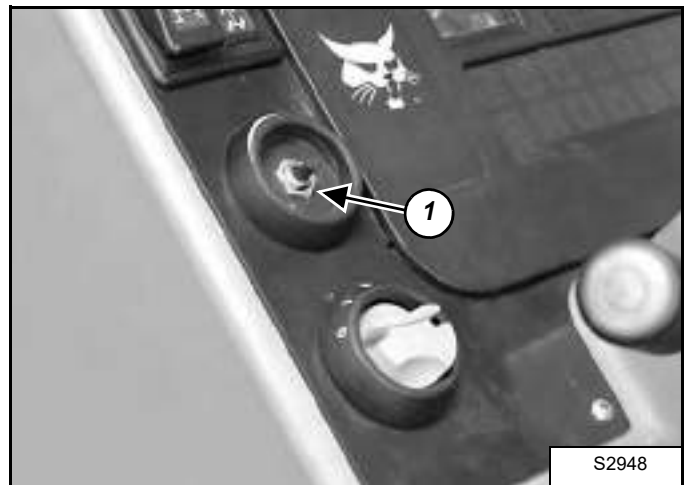
Remove the nine instrument panel mounting bolts (Item 1) [Figure 60-70-2].

Figure 60-70-3



Remove the temperature control knob (Item 1) [Figure 60-70-3] (If Equipped).

Figure 60-70-4



Remove the nut (Item 1) [Figure 60-70-4] and let the temperature controller fall inward.

Dealer Copy -- Not for Resale

**INSTRUMENT PANEL (S/N AC1912999 & BELOW)
(CONT'D)**

Removal And Installation (Cont'd)

Figure 60-70-5

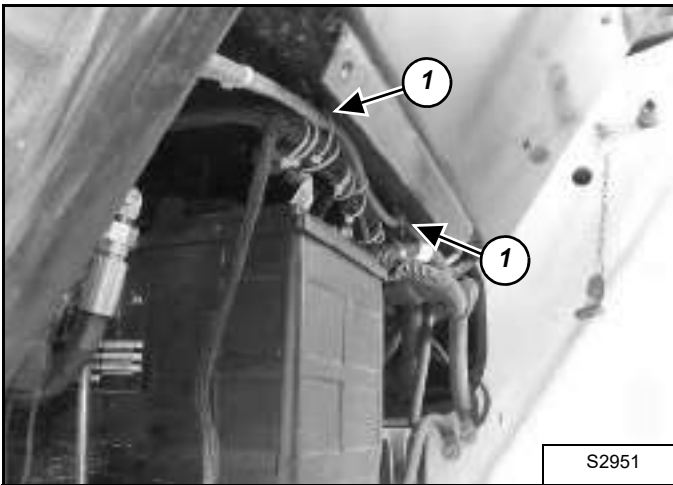


Tilt the instrument panel forward and unplug all connectors [Figure 60-70-5].

NOTE: Mark the connectors for correct installation.

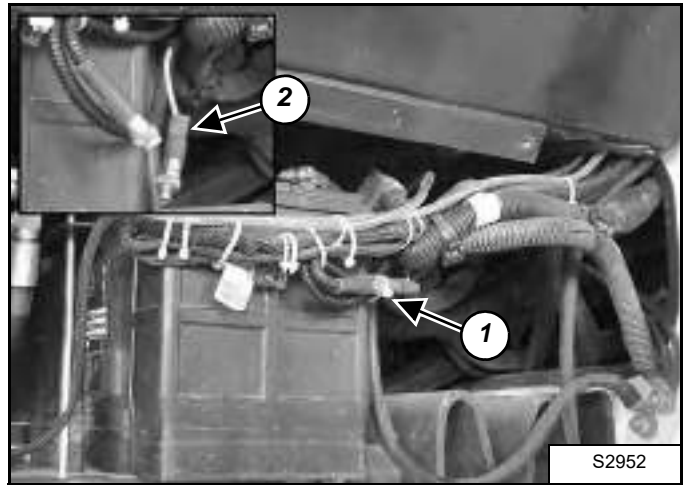
Remove the battery cover. (See "Removal And Installation" on page 60-20-1.)

Figure 60-70-6



Remove the tie straps (Item 1) [Figure 60-70-6] that connect the harness to the frame.

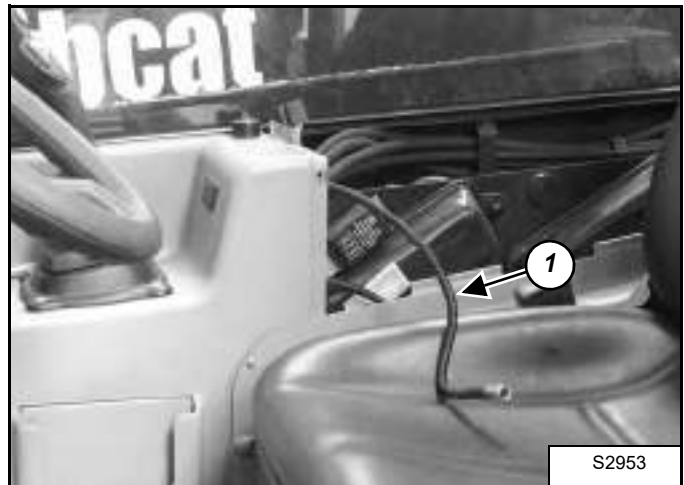
Figure 60-70-7



Remove the tie straps (Item 1) and unplug the connector (Item 2) [Figure 60-70-7].

Remove the fuse box cover.

Figure 60-70-8



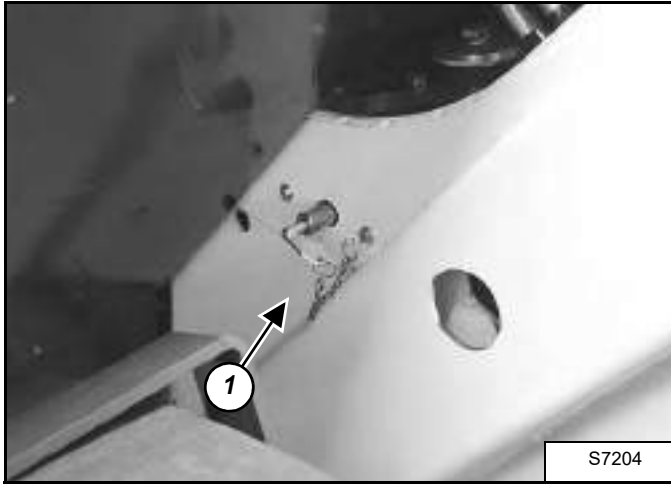
Pull the harness and connector (Item 1) [Figure 60-70-8] into the cab. Then continue pulling the harness and connector to the instrument panel.

Remove the instrument panel.

INSTRUMENT PANEL (S/N AC1913000 & ABOVE)

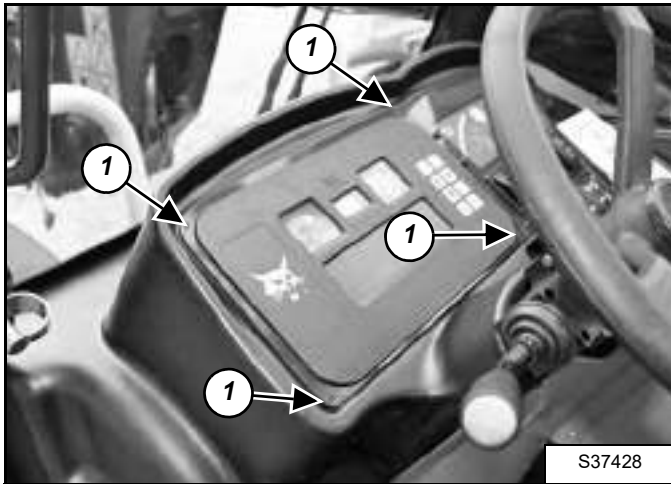
Removal And Installation

Figure 60-71-1



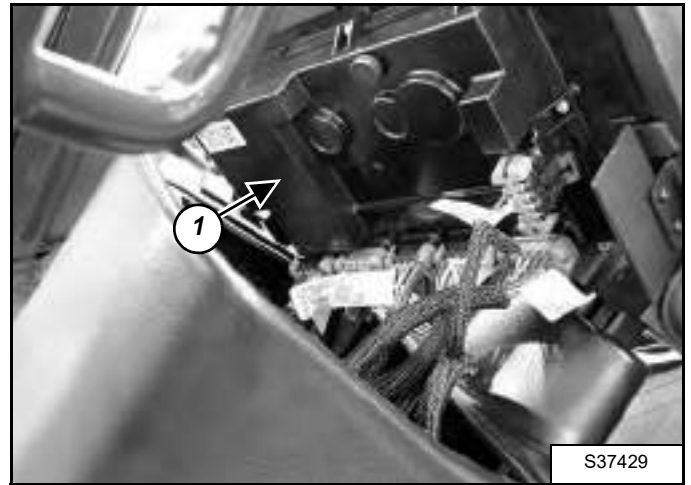
Rotate the battery disconnect switch (Item 1) **[Figure 60-71-1]** to the right, to disconnect the power supply from the battery.

Figure 60-71-2



Remove the four instrument panel mounting bolts (Item 1) **[Figure 60-71-2]**.

Figure 60-71-3



Tilt the instrument panel forward and unplug all connectors **[Figure 60-71-3]**.



Bobcat®

SWITCH PANEL (S/N AC1913000 & ABOVE)

Removal And Installation

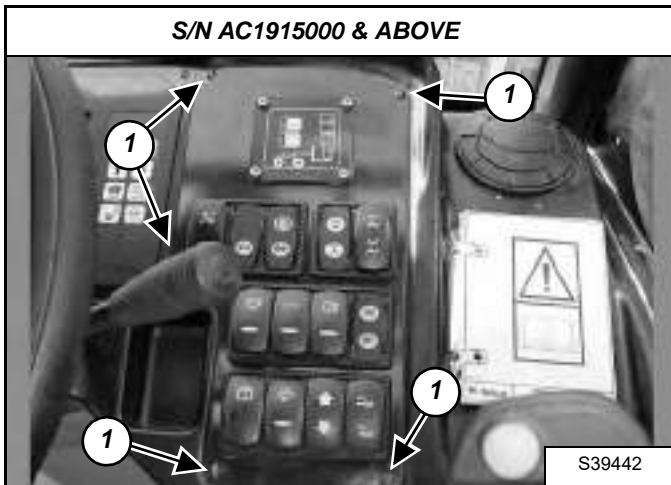
For machines with S/N AC1912999 & below, the switch panel is integrated in the instrument panel. (See INSTRUMENT PANEL (S/N AC1912999 & BELOW) on Page 60-70-1.)

Figure 60-80-1



Remove the five screws (Item 1) [Figure 60-80-1].

Figure 60-80-2



Remove the five screws (Item 1) [Figure 60-80-2].

Figure 60-80-3



Unplug the harness connectors from the back of the switch panel [Figure 60-80-3].

NOTE: Mark all connectors for ease of installation.

Remove the switch panel.

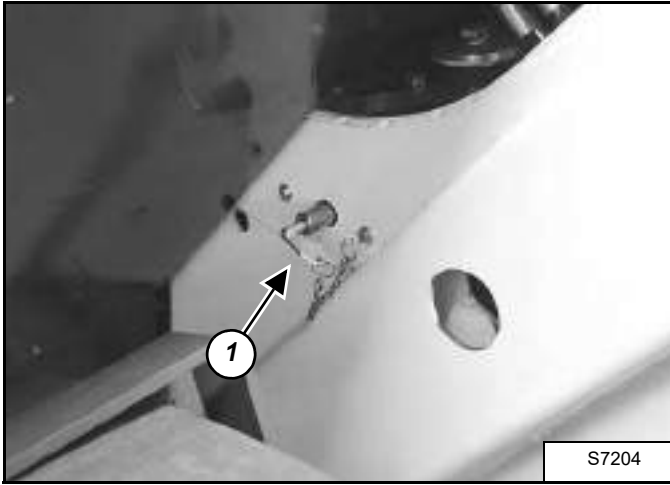


Bobcat®

FRONT WIPER MOTOR

Removal And Installation

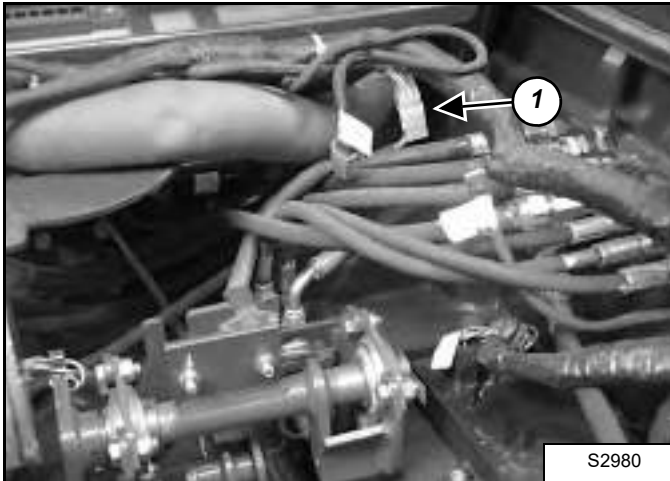
Figure 60-90-1



Rotate the battery disconnect switch (Item 1) [Figure 60-90-1] to the right, to disconnect the power supply from the battery.

Remove the dash cover/steering column cover. (See DASH COVER/STEERING COLUMN COVER (S/N AC1912999 & BELOW) on Page 50-120-1.)

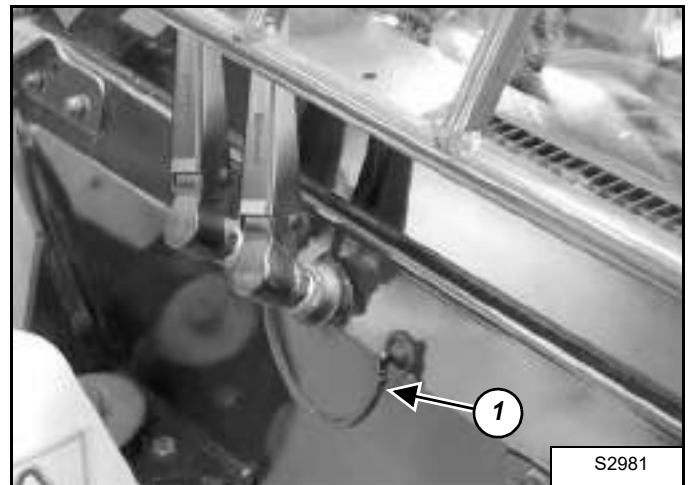
Figure 60-90-2



Disconnect the front wiper connector (Item 1) [Figure 60-90-2] from the main harness.

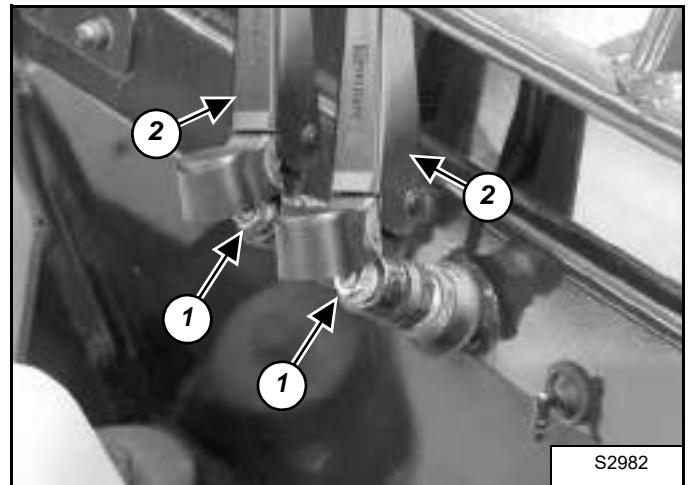
Reposition the main wire harness to the right side of the cab.

Figure 60-90-3



Remove the spray tube (Item 1) [Figure 60-90-3].

Figure 60-90-4



Flip open the wiper covers and remove the two nuts (Item 1) [Figure 60-90-4].

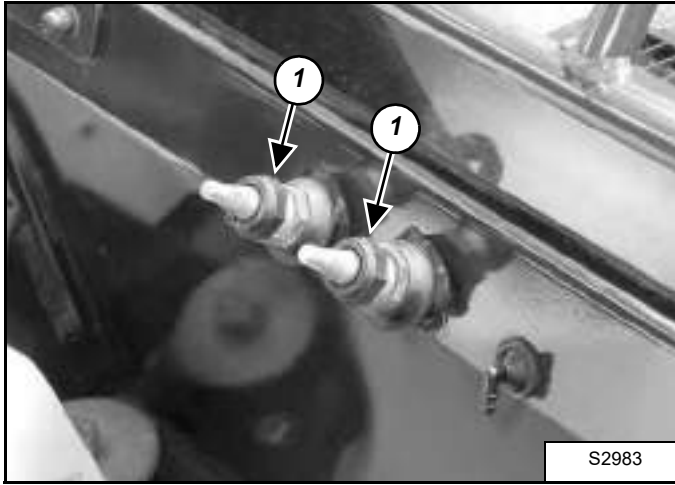
Remove the wiper arms (Item 2) [Figure 60-90-4] from the wiper motor shafts.

Dealer Copy -- Not for Resale

FRONT WIPER MOTOR (CONT'D)

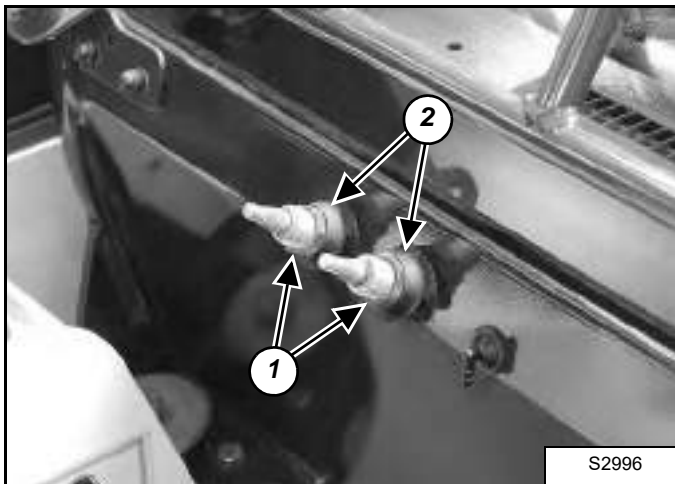
Removal And Installation (Cont'd)

Figure 60-90-5



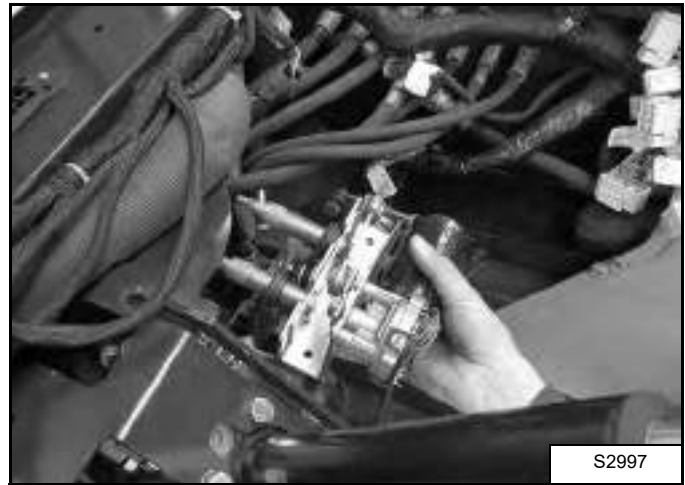
Remove both outer nuts (Item 1) [Figure 60-90-5].

Figure 60-90-6



Remove both inner nuts (Item 1) and washers (Item 2) [Figure 60-90-6].

Figure 60-90-7

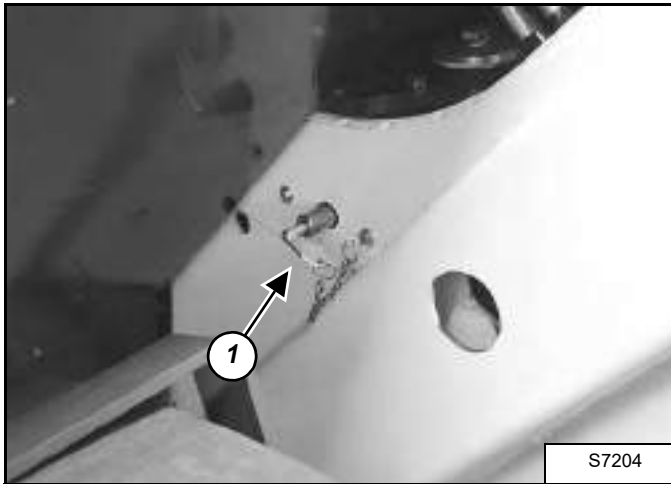


Remove the wiper motor from inside the cab [Figure 60-90-7].

TOP WIPER MOTOR

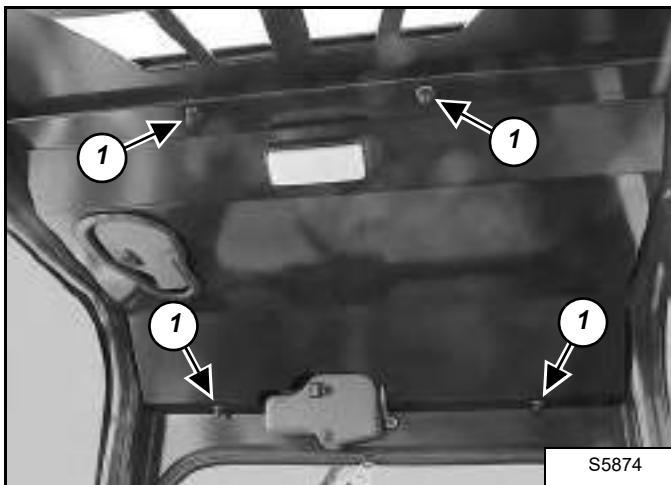
Removal And Installation

Figure 60-100-1



Rotate the battery disconnect switch (Item 1) [Figure 60-100-1] to the right, to disconnect the power supply from the battery.

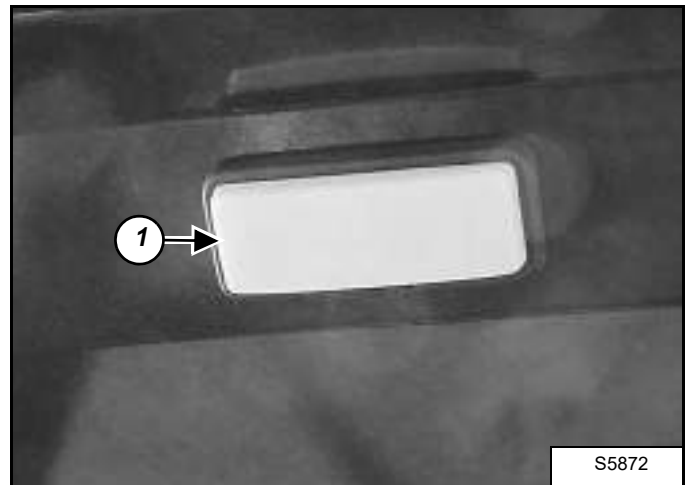
Figure 60-100-2



Remove the four bolts (Item 1) [Figure 60-100-2].

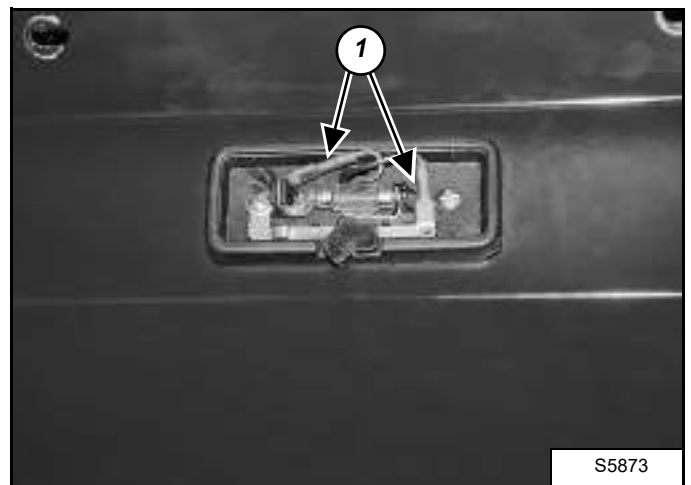
Gently lower the roof cowling.

Figure 60-100-3



Remove the cover (Item 1) [Figure 60-100-3] from the interior light.

Figure 60-100-4



Mark and disconnect electrical connectors (Item 1) [Figure 60-100-4] from the interior light.

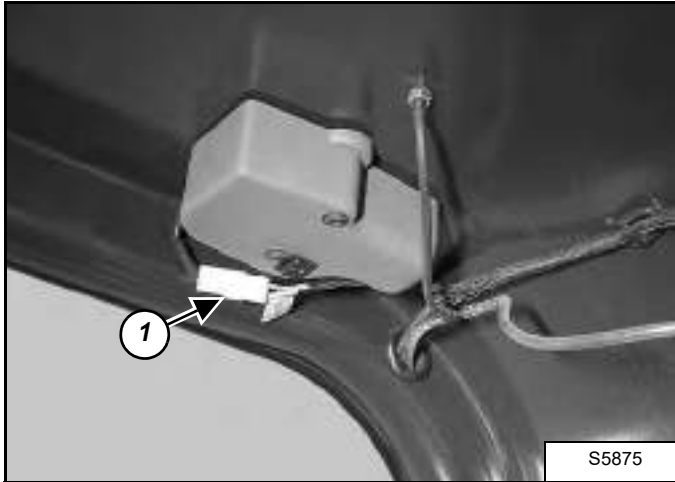
Remove the roof cowling.

Dealer Copy -- Not for Resale

TOP WIPER MOTOR (CONT'D)

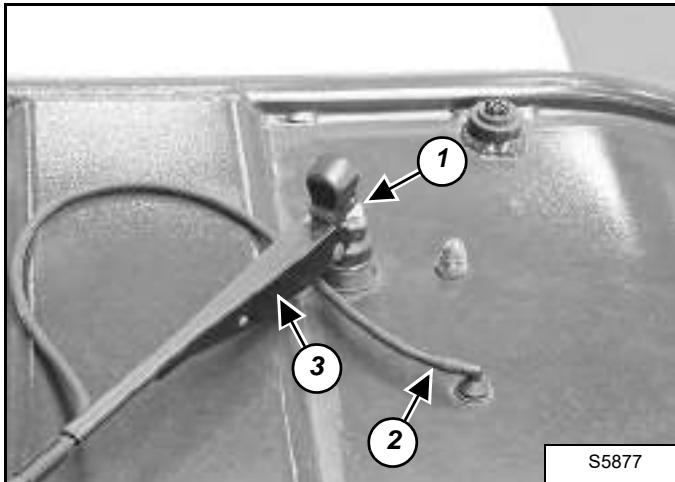
Removal And Installation (Cont'd)

Figure 60-100-5



Disconnect the top wiper connector (Item 1) [Figure 60-100-5] from the main harness.

Figure 60-100-6



Flip open the wiper cover and remove the nut (Item 1) [Figure 60-100-6].

Disconnect the spray tube (Item 2) [Figure 60-100-6].

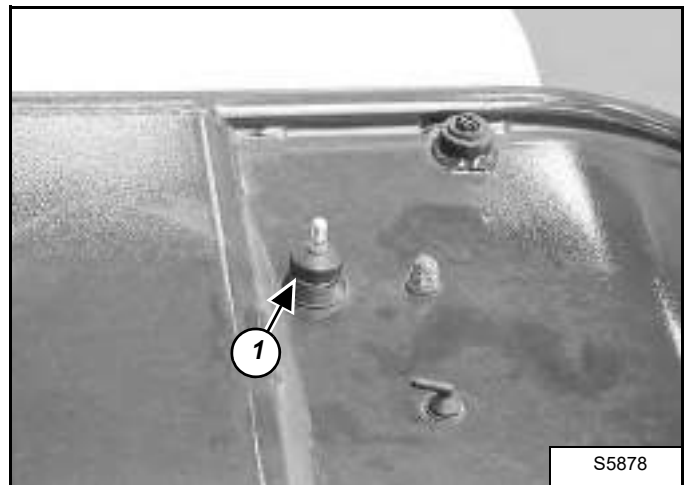
Remove the wiper arm (Item 3) [Figure 60-100-6] from the wiper motor shaft.

Figure 60-100-7



Have an assistant support the wiper motor [Figure 60-100-7].

Figure 60-100-8

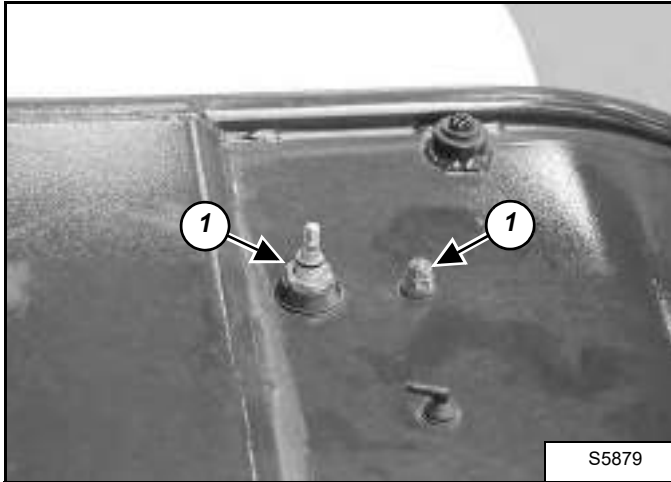


Remove the plastic cover (Item 1) [Figure 60-100-8].

TOP WIPER MOTOR (CONT'D)

Removal And Installation (Cont'd)

Figure 60-100-9



Remove the two nuts (Item 1) [Figure 60-100-9].

Remove the wiper motor.

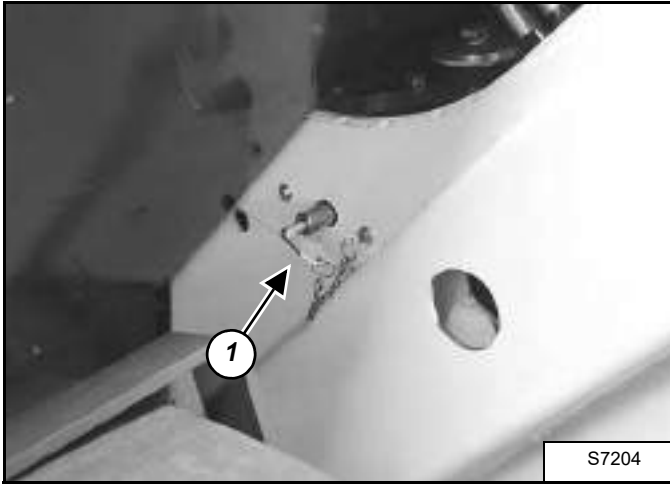


Bobcat®

REAR WIPER MOTOR

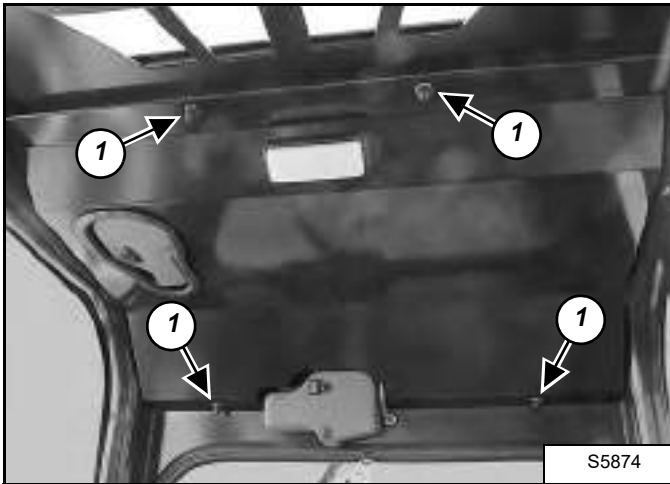
Removal And Installation

Figure 60-110-1



Rotate the battery disconnect switch (Item 1) [Figure 60-110-1] to the right, to disconnect the power supply from the battery.

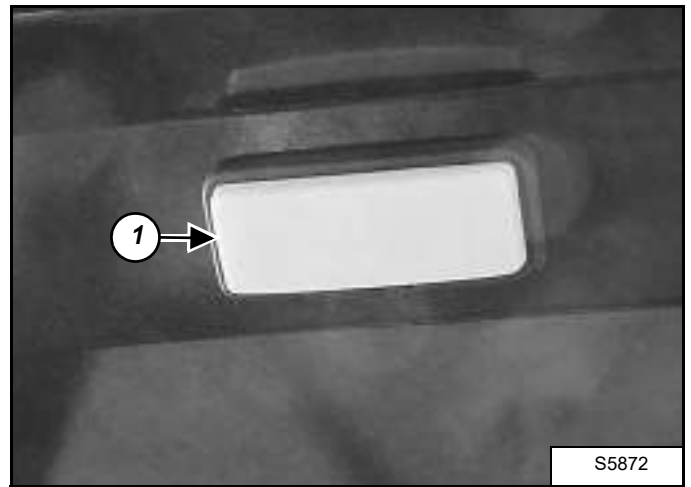
Figure 60-110-2



Remove the four bolts (Item 1) [Figure 60-110-2].

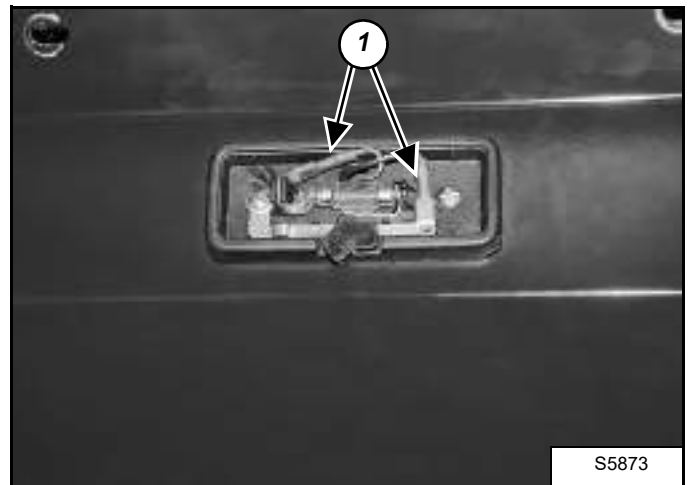
Gently lower the roof cowling.

Figure 60-110-3



Remove the cover (Item 1) [Figure 60-110-3] from the interior light.

Figure 60-110-4



Mark and disconnect electrical connectors (Item 1) [Figure 60-110-4] from the interior light.

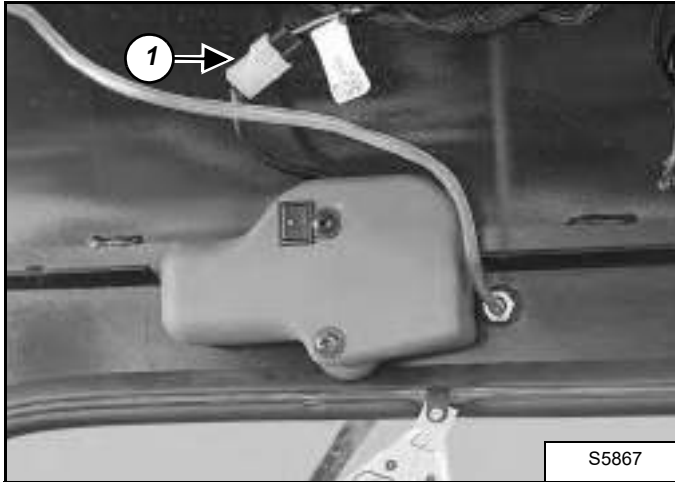
Remove the roof cowling.

Dealer Copy -- Not for Resale

REAR WIPER MOTOR (CONT'D)

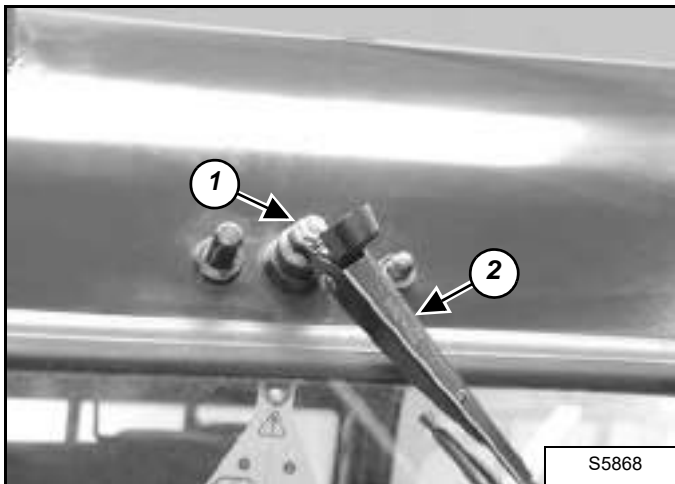
Removal And Installation (Cont'd)

Figure 60-110-5



Disconnect the rear wiper connector (Item 1) **[Figure 60-110-5]** from the main harness.

Figure 60-110-6



Flip open the wiper cover and remove the nut (Item 1) **[Figure 60-110-6]**.

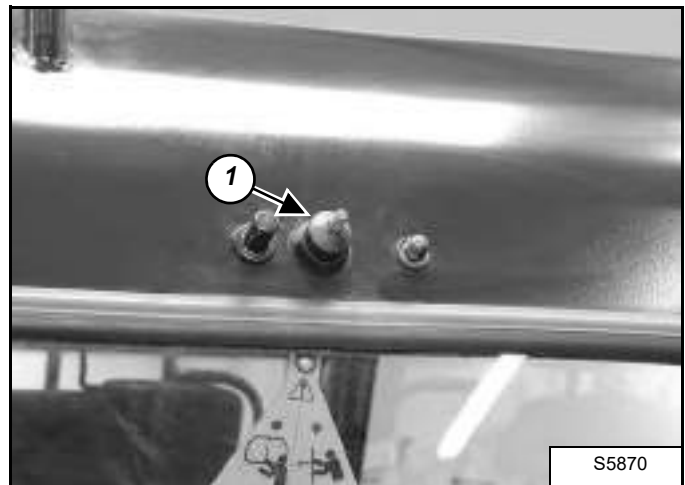
Remove the wiper arm (Item 2) **[Figure 60-110-6]**.

Figure 60-110-7



Have an assistant support the wiper motor **[Figure 60-110-7]**.

Figure 60-110-8

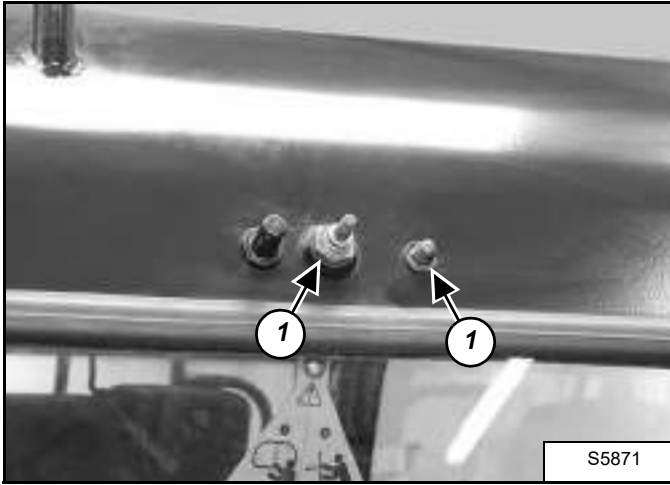


Remove the plastic cover (Item 1) **[Figure 60-110-8]**.

REAR WIPER MOTOR (CONT'D)

Removal And Installation (Cont'd)

Figure 60-110-9



Remove the two nuts (Item 1) [Figure 60-110-9].

Remove the wiper motor.



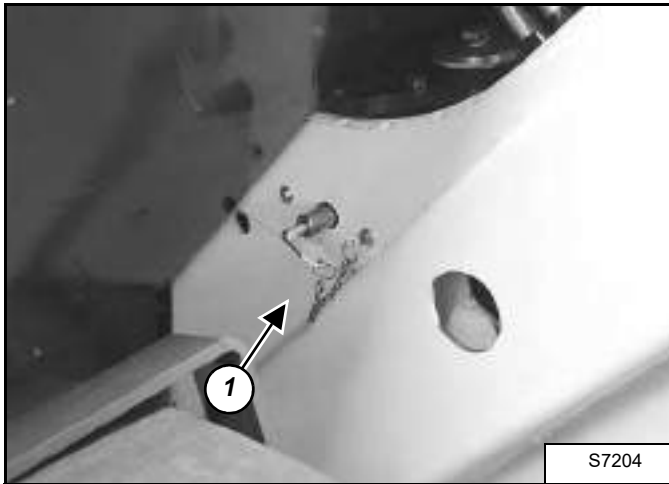
Bobcat®

Dealer Copy -- Not for Resale

PEDAL ASSEMBLY

Removal And Installation

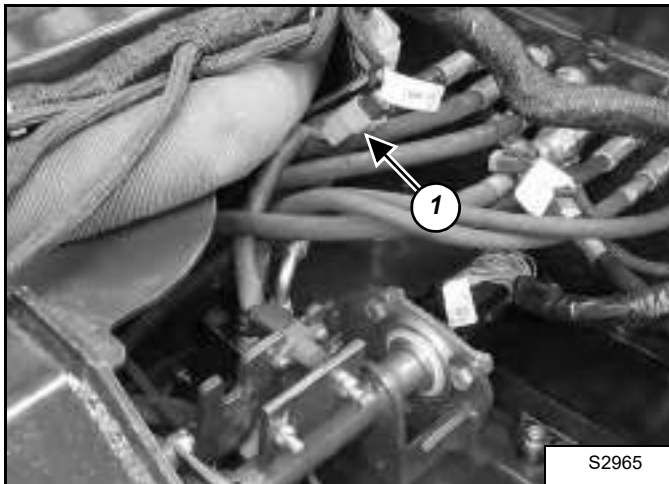
Figure 60-120-1



Rotate the battery disconnect switch (Item 1) [Figure 60-120-1] to the right, to disconnect the power supply from the battery.

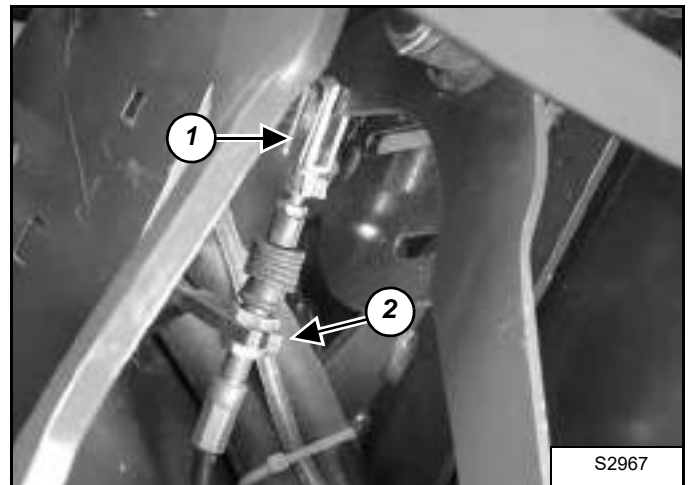
Remove the dash cover/column cover. ((See DASH COVER/STEERING COLUMN COVER (S/N AC1912999 & BELOW) on Page 50-120-1.))

Figure 60-120-2



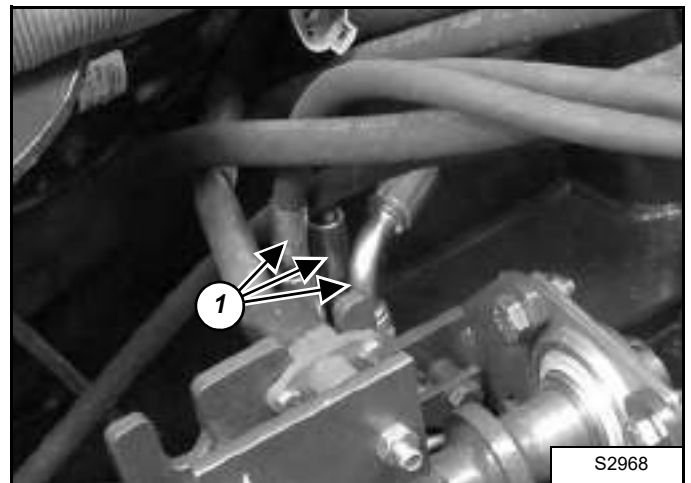
Disconnect the connector (Item 1) [Figure 60-120-2] from the inching switch.

Figure 60-120-3



Remove the accelerator cable (Item 1) from the pedal and mounting bracket (Item 2) [Figure 60-120-3].

Figure 60-120-4



Remove the three hoses (Item 1) [Figure 60-120-4] from the brake valve.

NOTE: Mark hoses for correct installation.

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

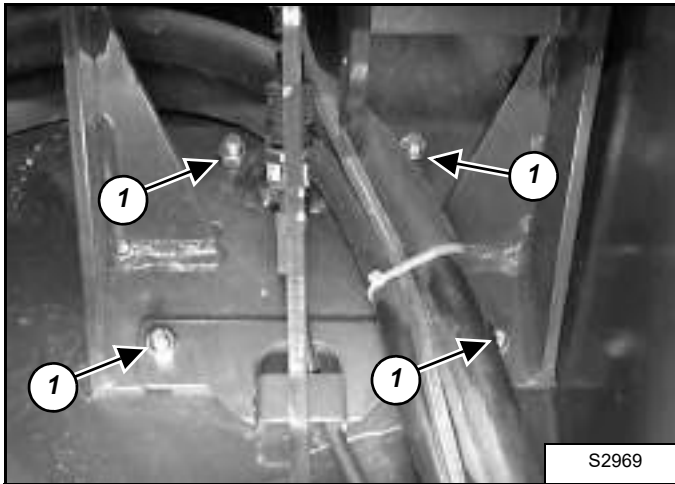
I-2003-0888

Dealer Copy -- Not for Resale

PEDAL ASSEMBLY (CONT'D)

Removal And Installation (Cont'd)

Figure 60-120-5



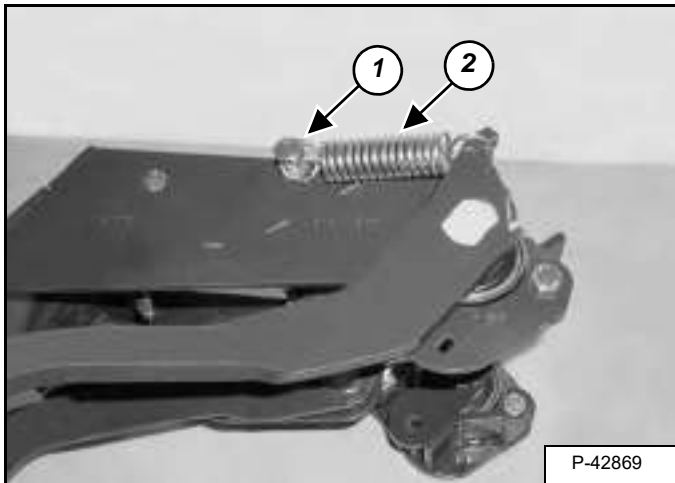
Remove the mounting nuts (Item 1) [Figure 60-120-5].

Remove the pedal assembly.

Installation: Tighten the nuts to 25 N•m (18 ft-lb) torque.

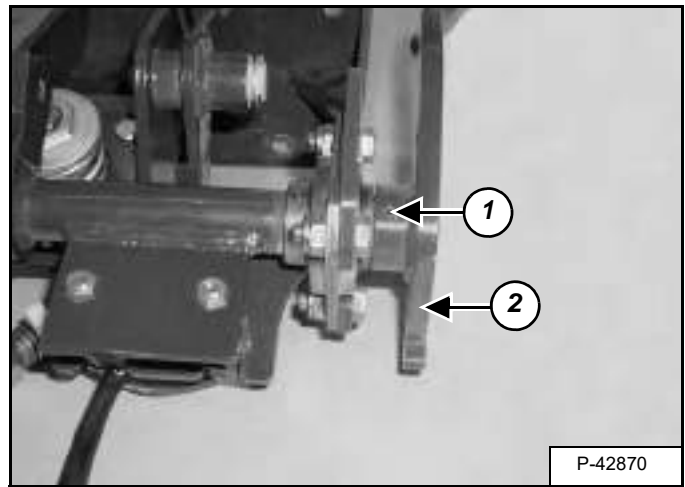
Disassembly And Assembly

Figure 60-120-6



Remove the bolt (Item 1) and spring (Item 2) [Figure 60-120-6].

Figure 60-120-7

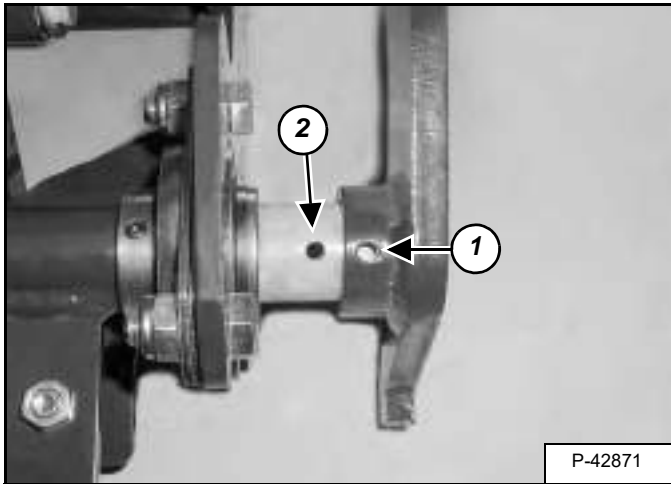


Remove the roll pin (Item 1) and pedal (Item 2) [Figure 60-120-7].

PEDAL ASSEMBLY (CONT'D)

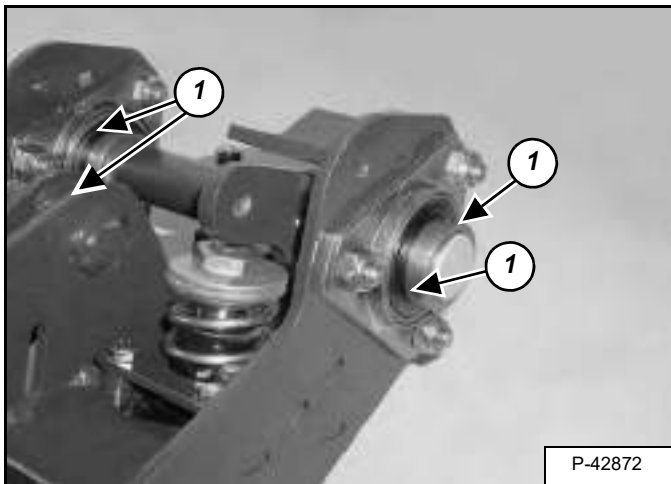
Disassembly And Assembly (Cont'd)

Figure 60-120-8



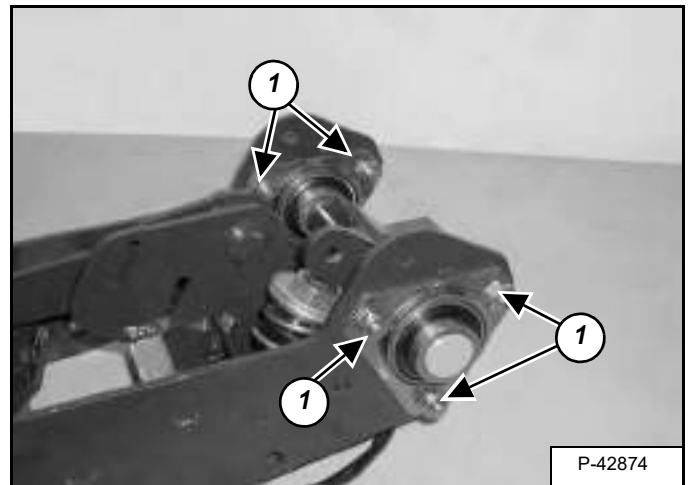
Installation: Align the hole (Item 1) in the pedal with the hole (Item 2) [Figure 60-120-8] in the shaft.

Figure 60-120-9



Loosen the two set screws (Item 1) [Figure 60-120-9] on the two bearings.

Figure 60-120-10



Remove the three bolts (Item 1) [Figure 60-120-10] from the two bearing flanges.

Figure 60-120-11



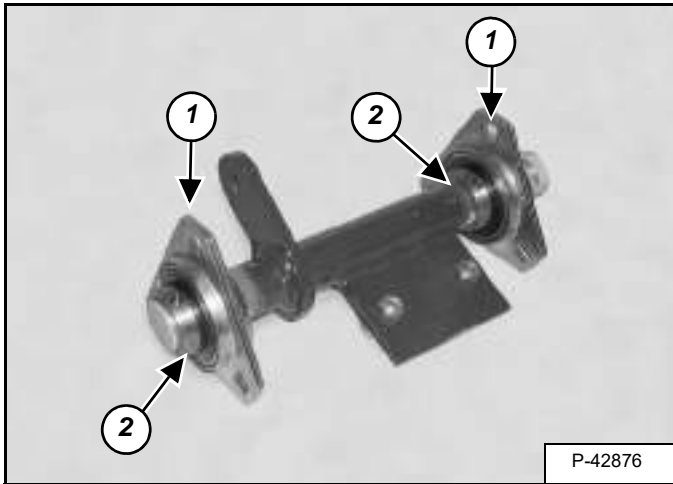
Remove the shaft and bearing assembly [Figure 60-120-11].

Dealer Copy -- Not for Resale

PEDAL ASSEMBLY (CONT'D)

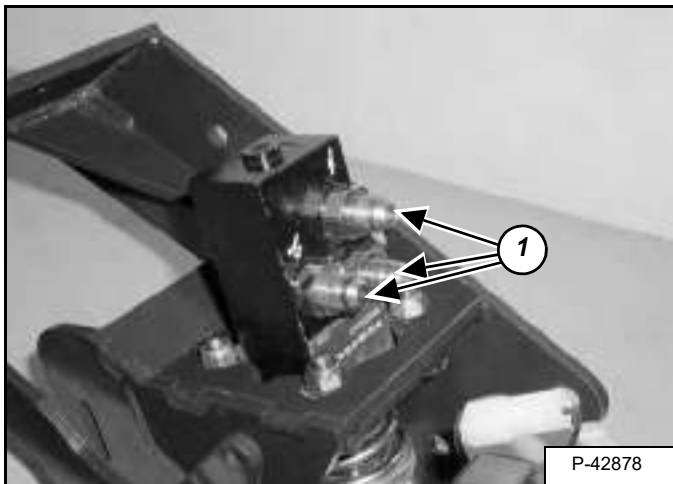
Disassembly And Assembly (Cont'd)

Figure 60-120-12



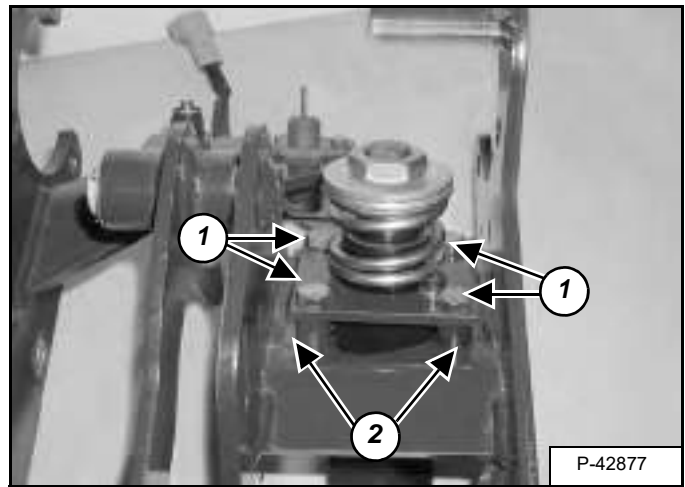
Remove the flanges (Item 1) and bearings (Item 2) [Figure 60-120-12].

Figure 60-120-13



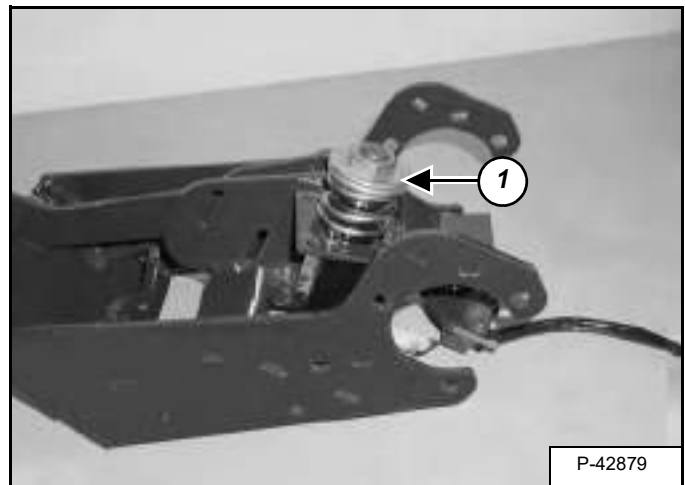
Remove the three fittings (Item 1) [Figure 60-120-13] from the brake valve.

Figure 60-120-14



Remove the four bolts (Item 1) spacers (Item 2) [Figure 60-120-14] and nuts from the brake valve.

Figure 60-120-15



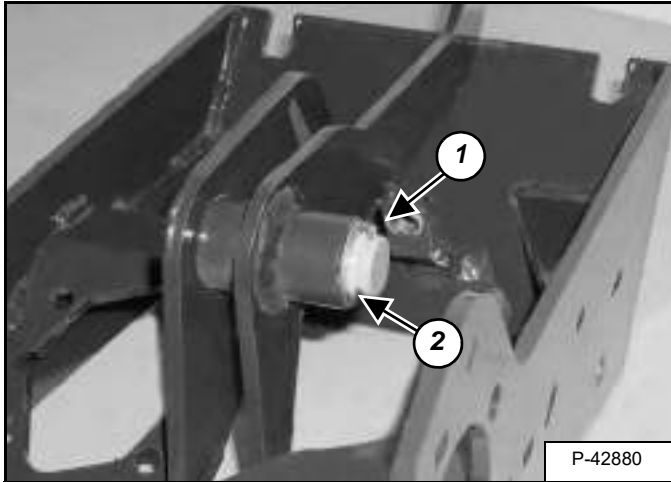
Remove the brake valve (Item 1) [Figure 60-120-15].

Dealer Copy -- Not for Resale

PEDAL ASSEMBLY (CONT'D)

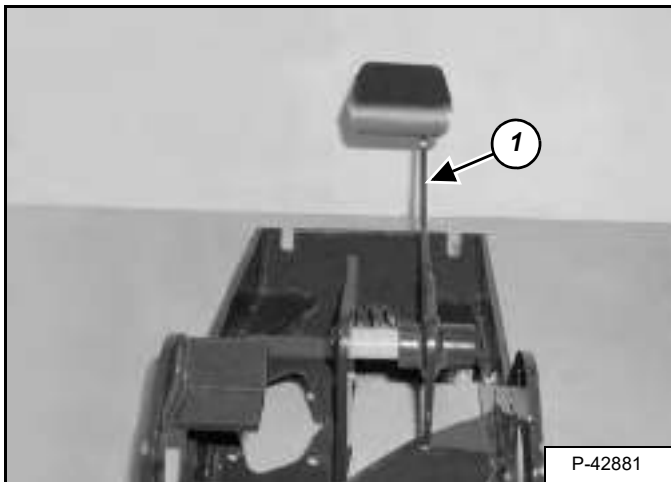
Disassembly And Assembly (Cont'd)

Figure 60-120-16



Remove the retainer pin (Item 1) and washer (Item 2) **[Figure 60-120-16]**.

Figure 60-120-17



Remove the pedal (Item 1) **[Figure 60-120-17]**.



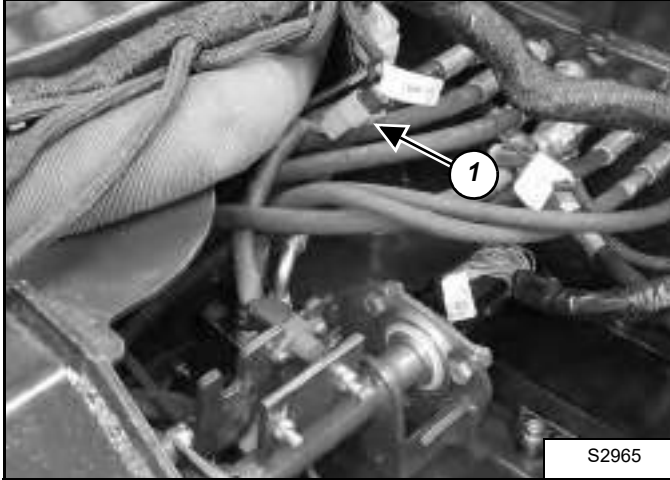
Bobcat®

INCHING SWITCH

Removal And Installation

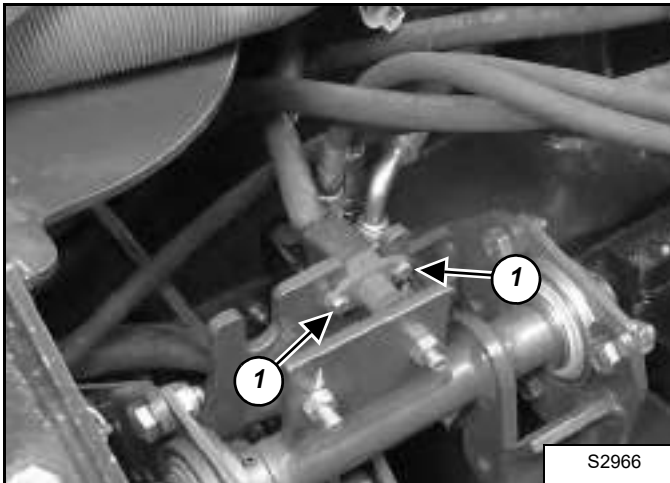
Remove the dash cover/column cover. (See "DASH COVER/STEERING COLUMN COVER (S/N AC1912999 & BELOW)" on page 50-120--1.)

Figure 60-130-1



Remove the tie strap and unplug the switch connector (Item 1) [Figure 60-130-1] from the harness.

Figure 60-130-2



Remove the two mounting bolts and nuts (Item 1) [Figure 60-130-2].

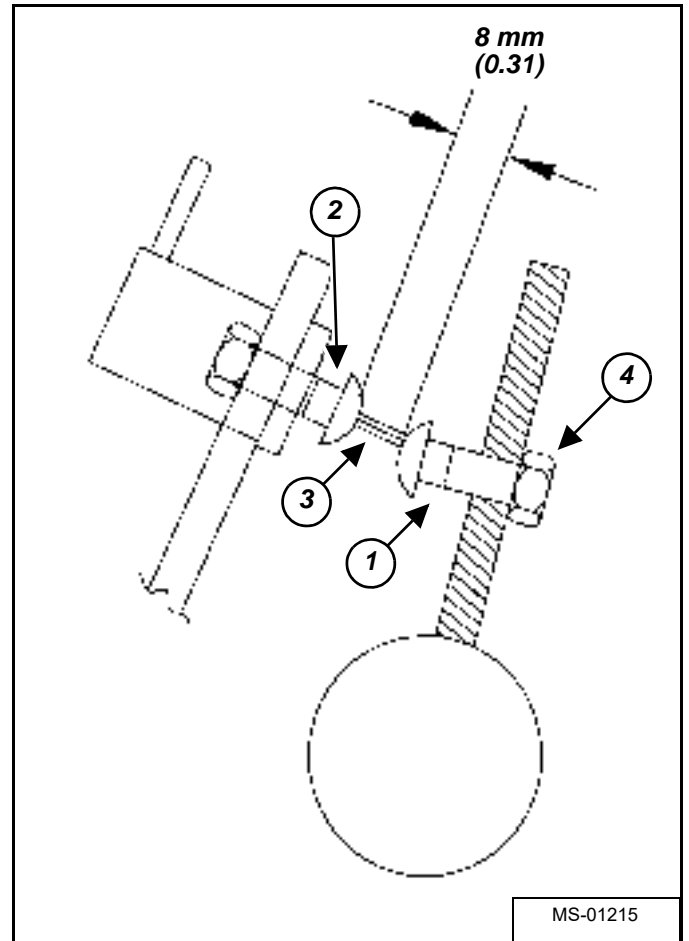
Installation: Be sure the switch is on the front side of the mounting bracket.

Remove the switch.

Adjustment

Remove the dash cover/column cover. (See "DASH COVER/STEERING COLUMN COVER (S/N AC1912999 & BELOW)" on page 50-120--1.)

Figure 60-130-3



With the brake pedal in the rest position, turn the adjustment bolt (Item 1) so that it is 8 mm (0.31 in) away from the switch body (Item 2) [Figure 60-130-3].

Check that the potentiometer rod (Item 3) [Figure 60-130-3] is in contact with the center of the adjusting bolt.

When adjustment is complete, tighten the nut (Item 4) [Figure 60-130-3] without turning the adjusting bolt.

Dealer Copy -- Not for Resale

INCHING SWITCH (CONT'D)

Inching Control Calibration (Display Controller)

Description

The Inching Control is used to slow the Telescopic Handler while maintaining high engine RPM.

The Inching Control will have to be recalibrated if an Inching Control fault occurs, or if the Drive Controller is replaced.

The Inching Control Calibration Display Controller procedure shows how to calibrate the Inching Control through the display panel.

Procedure

Connect the remote start tool to the Telescopic Handler. (See "REMOTE START" on page 10-180--1.)

Figure 60-130-4



Figure 60-130-5



To enter Inching Control calibration from the Display Controller, press the Hours/Job/RPM button (Item 1) [Figure 60-130-4] until HRS is displayed (Item 1) [Figure 60-130-5].

Figure 60-130-6



Once the total machine hours are displayed, press and hold the Hours/jobs/RPM button (Item 1) [Figure 60-130-4] for approximately 5 seconds until CAL is displayed (Item 1) [Figure 60-130-6].

Figure 60-130-7



After approximately 3 seconds the display will change to inch (Item 1) [Figure 60-130-7].

INCHING SWITCH (CONT'D)

**Inching Control Calibration (Display Controller)
(Cont'd)**

Figure 60-130-8



Press the up arrow (Item 1) [Figure 60-130-8] to enter Inching Control Calibration.

Figure 60-130-9



PdLUP [Figure 60-130-9] will be displayed indicating that the brake pedal needs to be released.

Figure 60-130-10



PdLdn [Figure 60-130-10] will be displayed indicating that the brake pedal needs to be depressed.

INCHING SWITCH (CONT'D)

Inching Control Calibration (Display Controller) (Cont'd)

Figure 60-130-11



Figure 60-130-13



If the Inching Control calibration passed, then press and hold the Hours/Job/RPM button (Item 1) [Figure 60-130-13] until the display powers down. The calibration procedure is now complete.

Figure 60-130-12



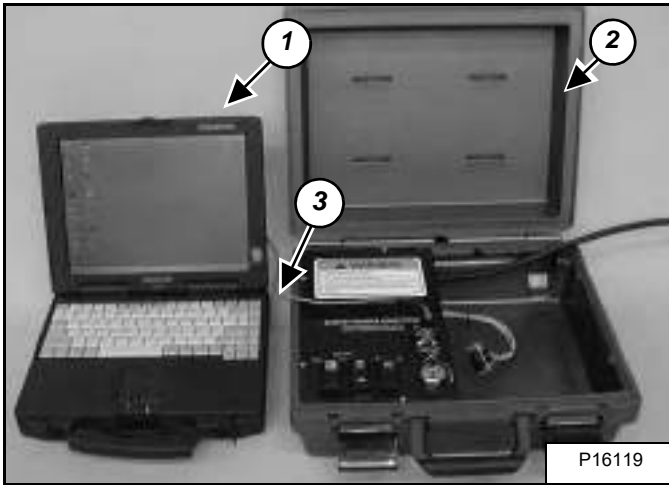
After approximately 3 pedal cycles of depressing and releasing the brake pedal, the LCD display will display either a Pass (Item 1) [Figure 60-130-11] or a fail (Item 1) [Figure 60-130-12], indicating whether the Inching Control has been successfully calibrated.

If the Inching Control calibration failed, then the power will need to be cycled, and this process will need to be restarted from the beginning.

SERVICE SOFTWARE

Connecting Remote Start Tool to Laptop Computer

Figure 60-140-1



Tools that will be needed to complete the following steps are:

MEL1563 - Remote Start Tool
MEL1565 - Service Tool Harness Control
MEL1566 - Service Tool Harness Communicator (Computer Interface)

NOTE: Make all connections with the key in the OFF position.

The Service PC (Item 1) with the remote start tool (Item 2) [Figure 60-140-1]. When connected to the Telescopic Handler, the Service PC is used to monitor, conduct diagnostic and load software.

Connect the Service Tool Harness Communicator (MEL1566) (Item 3) [Figure 60-140-1] to the designated serial port on the Service PC.

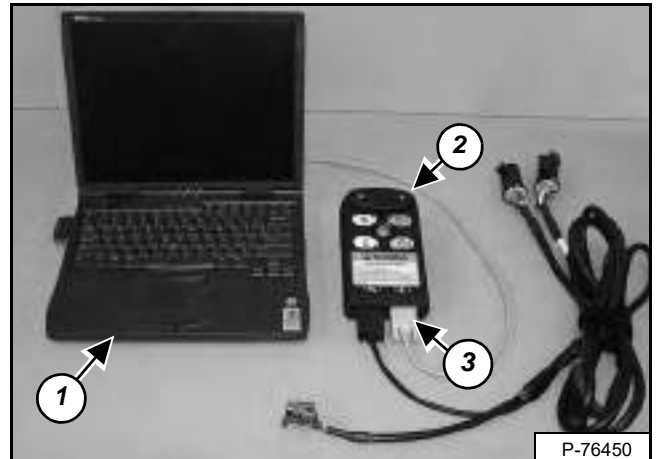
NOTE: The recommended serial cable length should not exceed 15 feet. A serial cable longer than 15 feet will create a degraded signal causing communication errors.

Connect the other end to the connector on the remote start tool.

Connect the remote start tool to the Telescopic Handler. (See Connecting Remote Start Tool to Telescopic Handler on Page 60-140-2.)

Connecting Remote Start Tool (Service Tool)

Figure 60-120-1



The tools listed will be needed to do the following procedure:

Order from Bobcat Parts P/N: 6689779 - Remote Start Tool (Service Tool) Kit

Kit Includes:
6689778 - Remote Start Tool (Service Tool)
6689747 - Service Tool Harness
6689746 - Computer Service Tool Harness
6689745 - BOSS® Service Tool Harness

NOTE: Make all connections with the key in the OFF position.

The Service PC (Item 1) with the Remote Start Tool (Service Tool) (Item 2) [Figure 60-120-1]. When connected to the telescopic handler, the Service PC is used to monitor, conduct diagnostics, and upgrade software.

Connect the Remote Start Tool (Service Tool) Computer Service Tool Harness (Item 3) [Figure 60-120-1] to the designated serial port on the Service PC.

NOTE: The recommended serial cable length should not exceed 15 feet. A serial cable longer than 15 feet will create a degraded signal causing communication errors.

Connect the other end to the connector on the Remote Start Tool (Service Tool).

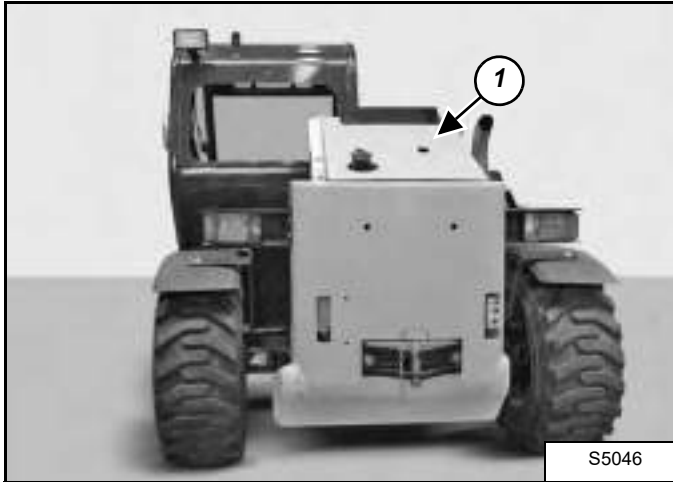
Connect the Remote Start Tool (Service Tool) to the telescopic handler. (See Connecting Remote Start Tool to Telescopic Handler on Page 60-140-2.)

Dealer Copy -- Not for Resale

SERVICE SOFTWARE (CONT'D)

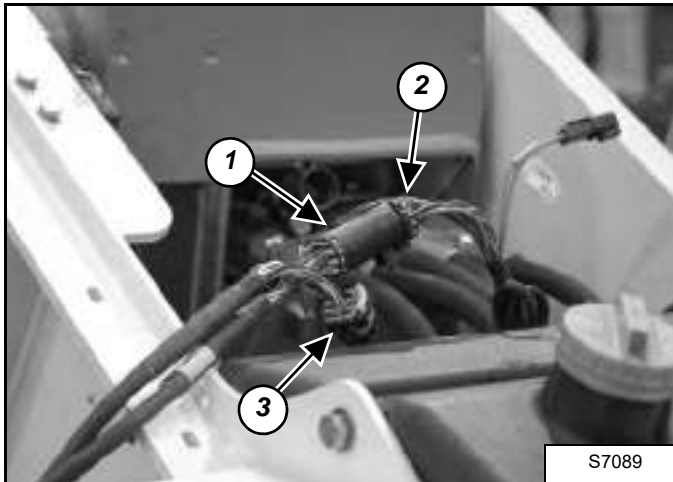
Connecting Remote Start Tool to Telescopic Handler

Figure 60-140-1



Remove the rear cover (Item 1) [Figure 60-140-1] from the Telescopic Handler.

Figure 60-140-2



Connect the MEL1565 main connector (Item 1) to the machine frame harness connector (Item 2) [Figure 60-140-2], located in the rear of the machine.

For machines with an attachment control harness, the attachment harness must first be disconnected from the Telescopic Handler harness.

NOTE: The remote start tool connection harness has two connectors (Item 1) and (Item 3). The main connector (Item 1) is always used for connection to the engine harness [Figure 60-140-2].

The second connector (Item 3) [Figure 60-140-2] is used for attachment ACD upgrades or attachment operational diagnostics only. This connector has a cap attached to it to prevent damage or corrosion when not in use.

NOTE: The key switch on the machine operator panel must be in the off position or the Remote Start Kit will not operate.

SERVICE SOFTWARE (CONT'D)

Entering The Service Software

Position the laptop such that its screen can be read from the operator seat.

Start the program by clicking the “Factory Analyzer” icon on the desktop.

Figure 60-140-3



The “select port” screen will appear when entering the Telescopic Handler service analyzer **[Figure 60-140-3]**. The com port can be changed, if com port 1 is already being used.

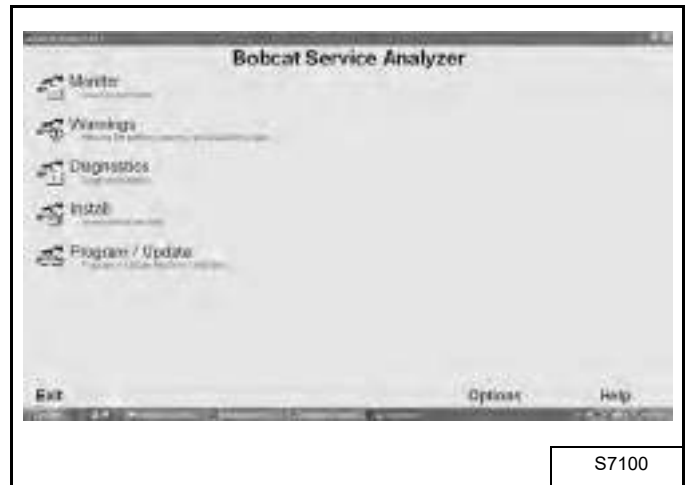
Figure 60-140-4



The above screen **[Figure 60-140-4]** will appear if:

- The remote start tool is not connected to the machine.
- The service tool ignition key is not in ON position.

Figure 60-140-5

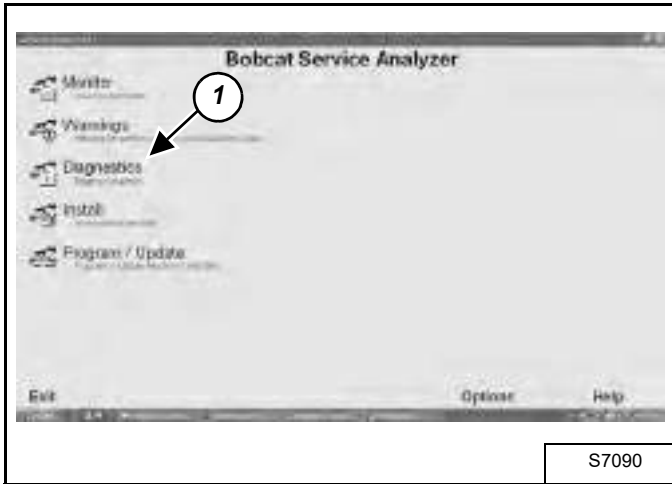


This is the Main Screen of the Telescopic Handler analyzer program **[Figure 60-140-5]**.

SERVICE SOFTWARE (CONT'D)

Calibrate Inch Pedal

Figure 60-140-6



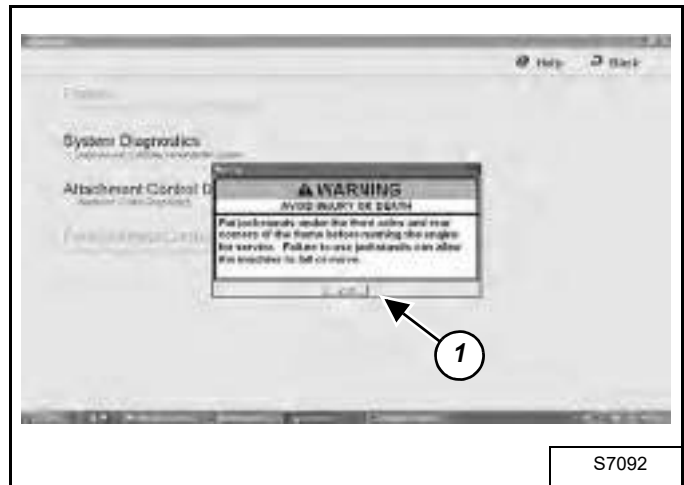
Select the Diagnostics icon (Item 1) [Figure 60-140-6].

Figure 60-140-7



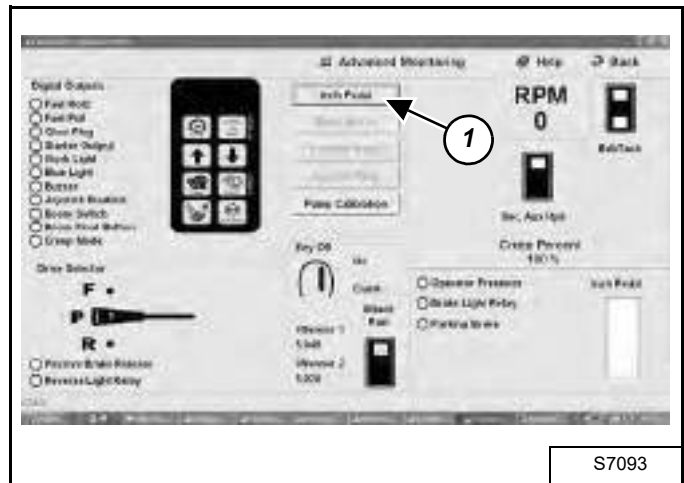
Select System Diagnostics (Item 1) [Figure 60-140-7].

Figure 60-140-8



Read the warning and make sure the situation is conform with its content. Click OK (Item 1) [Figure 60-140-8].

Figure 60-140-9

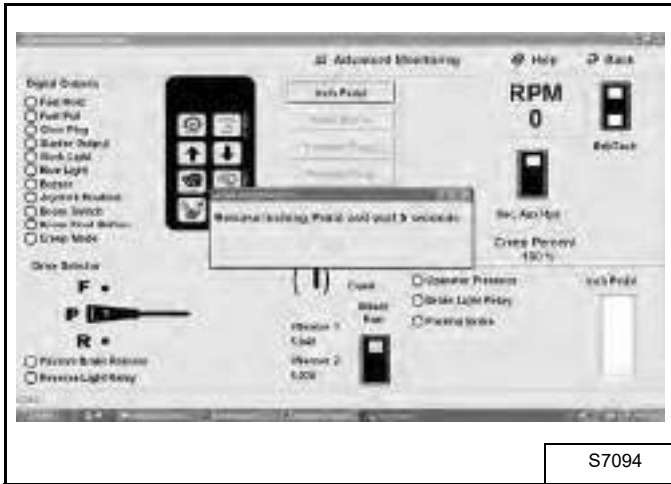


In the Diagnostic Screen, click on the Inch Pedal Button (Item 1) [Figure 60-140-9].

SERVICE SOFTWARE (CONT'D)

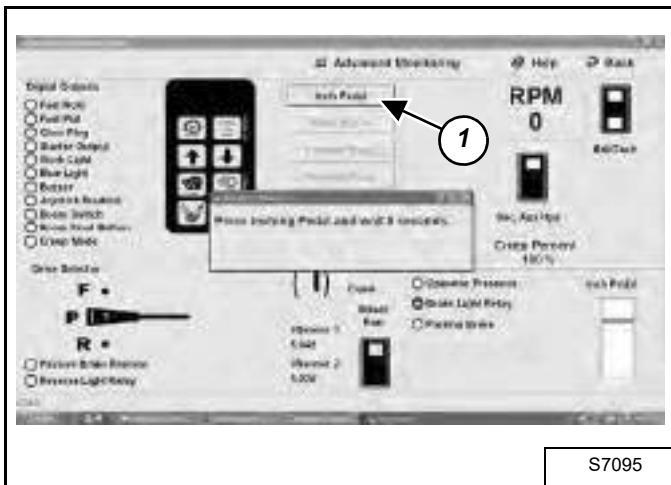
Calibrate Inch Pedal (Cont'd)

Figure 60-140-10



Enter the cab, and keep the inching pedal released for at least 5 seconds, as instructed on the screen [Figure 60-140-10].

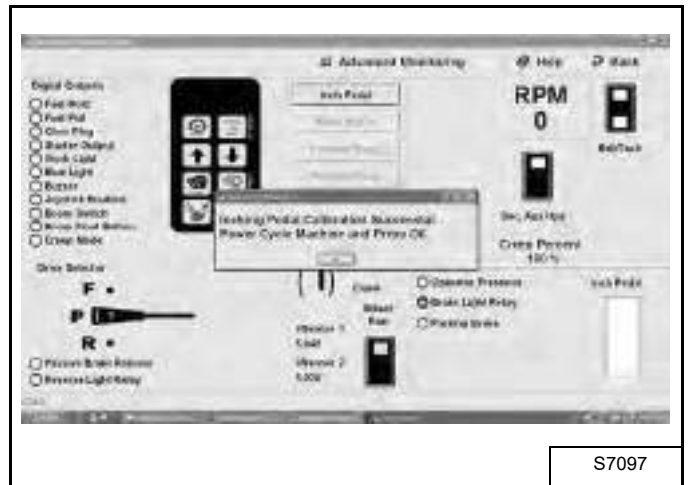
Figure 60-140-11



Follow the new instruction on the screen and keep the inching pedal pressed for at least 5 seconds [Figure 60-140-11].

Follow further instructions on the screen. The above steps will recur several times.

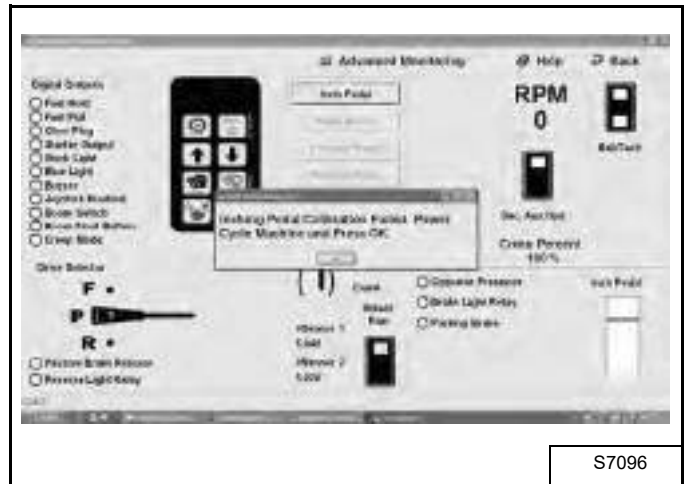
Figure 60-140-12



If the procedure was successful, the above screen will appear [Figure 60-140-12].

Before pressing OK, power cycle the machine by turning the machine contact key to ON and then again to OFF. Then press OK to return to the Diagnostic Screen.

Figure 60-140-13



If the procedure was not successful, the above screen will appear [Figure 60-140-13].

Before pressing OK, power cycle the machine by turning the machine contact key to ON and then again to OFF. Then press OK to return to the Diagnostic Screen.

Repeat the Calibrate Inch Pedal procedure until successful.

Dealer Copy -- Not for Resale

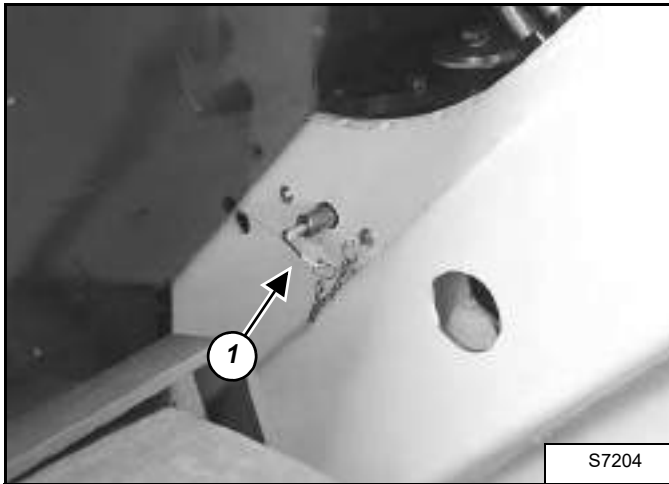


Bobcat®

MAIN CONTROLLER

Removal And Installation

Figure 60-150-1

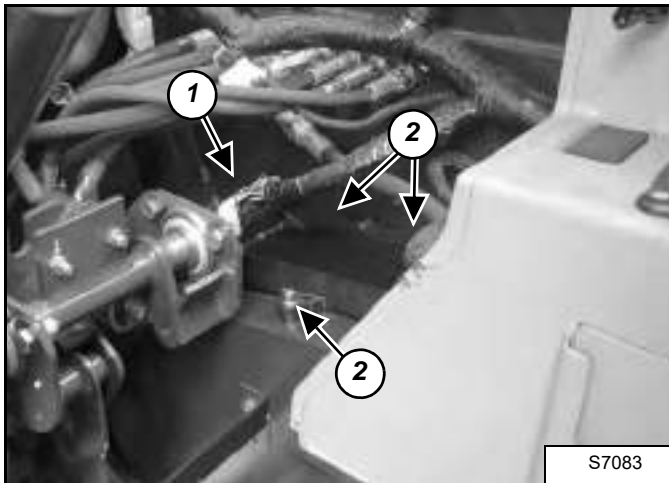


Rotate the battery disconnect switch (Item 1) **[Figure 60-150-1]** to the right, to disconnect the power supply from the battery.

Remove the dash cover / column cover. See "DASH COVER/STEERING COLUMN COVER (S/N AC1912999 & BELOW)" on page 50-120--1.

The main controller (drive controller) is located under the dash cover, on the right hand side in front of the joystick.

Figure 60-150-2



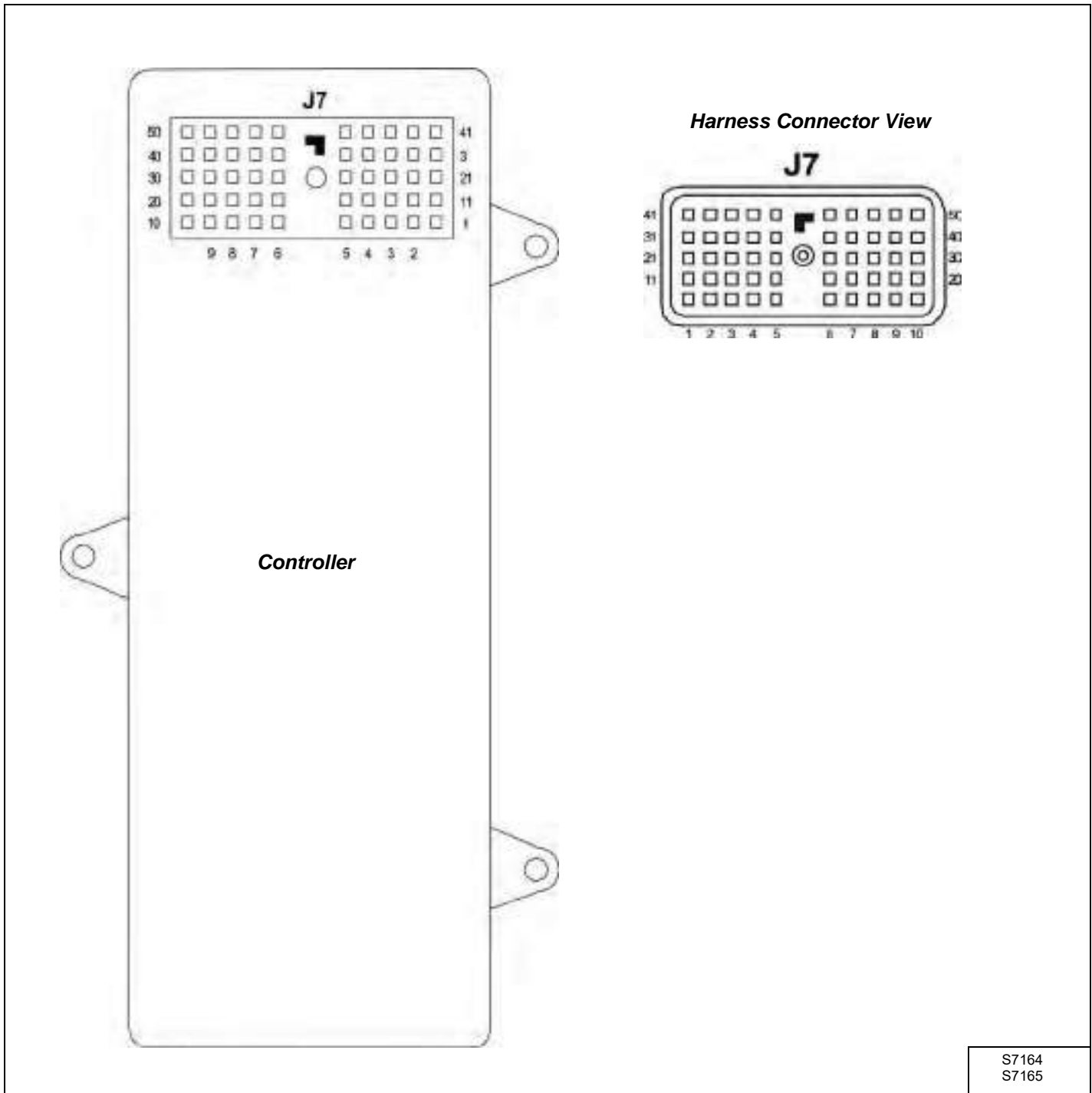
Disconnect the electrical connector (Item 1) **[Figure 60-150-2]**.

Remove the three bolts (Item 2) **[Figure 60-150-2]** from the main controller.

Remove the main controller.

MAIN CONTROLLER (CONT'D)

Connector Identification



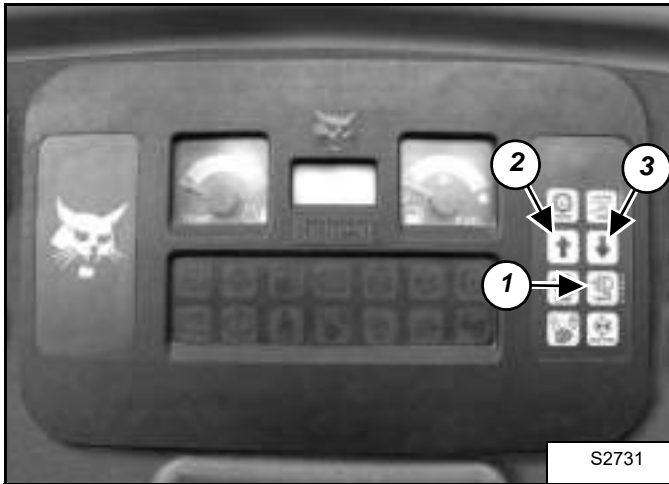
S7164
S7165

Dealer Copy -- Not for Resale

DIAGNOSTIC SERVICE CODES

Viewing Service Codes

Figure 60-160-1



Press and hold the Work Lights button (Item 1) for three seconds to consult the service codes on the display screen (Item 2). Use the Up and Down buttons (Items 2 & 3) [Figure 60-160-1] to scroll if there are multiple service codes.

NOTE: Corroded or loose grounds can cause multiple service codes and/or abnormal symptoms. All instrument panel lights flashing, alarm sounding, headlights and taillights flashing, could indicate a bad ground. The same symptoms could apply if the voltage is low, such as loose or corroded battery cables. If you observe these symptoms, check grounds and positive leads first.

DIAGNOSTIC SERVICE CODES (CONT'D)**Service Codes List**

CODE	FUNCTION	FAILURES	ICON	BUZZER	COMMENT
03-09	Battery Voltage	Low	solid battery icon	triple beep	display will power down if in limited function mode - lights operate normally
03-10	Battery Voltage	High	solid battery icon	triple beep	machine able to start - if engine is running it will not shut off
03-11	Battery Voltage	Extremely High	flashing battery icon - all other icons disabled	solid beep	display backlight is off - machine able to start - lights operate normally
03-14	Battery Voltage	Extremely Low	solid battery icon	solid beep	error code is created
03-15	Battery Voltage	In Shutdown	solid battery icon	no beep	engine is shut down
03-22	Battery Voltage	Out Of Range Low	flashing battery icon	triple beep	
04-14	Engine Oil Pressure	Extremely Low	flashing engine oil pressure icon	no beep	
04-15	Engine Oil Pressure	In Shutdown	flashing engine oil pressure icon	no beep	engine is shut down
06-10	Engine Speed	High	solid general warning icon	triple beep	
06-11	Engine Speed	Extremely High	flashing general warning icon	solid beep	
06-13	Engine Speed	No Signal	flashing general warning icon	solid beep	
06-15	Engine Speed	In Shutdown	flashing general warning icon	solid beep	
06-18	Engine Speed	Out Of Range	solid general warning icon	triple beep	
07-10	Hydraulic Fluid Temperature	High	solid hydraulic fluid temperature icon	triple beep	
07-11	Hydraulic Fluid Temperature	Extremely High	flashing hydraulic fluid temperature icon	solid beep	
07-15	Hydraulic Fluid Temperature	In Shutdown	flashing hydraulic fluid temperature icon	no beep	
07-21	Hydraulic Fluid Temperature	Out Of Range High	solid hydraulic fluid temperature icon	triple beep	
07-22	Hydraulic Fluid Temperature	Out Of Range Low	solid hydraulic fluid temperature icon	triple beep	
08-10	Engine Coolant Temperature	High	solid engine coolant temperature icon	triple beep	
08-11	Engine Coolant Temperature	Extremely High	flashing engine coolant temperature icon	solid beep	
08-15	Engine Coolant Temperature	In Shutdown	flashing engine coolant temperature icon	no beep	
08-21	Engine Coolant Temperature	Out Of Range High	solid engine coolant temperature icon	triple beep	
08-22	Engine Coolant Temperature	Out Of Range Low	solid engine coolant temperature icon	triple beep	

Dealer Copy -- Not for Resale

CODE	FUNCTION	FAILURES	ICON	BUZZER	COMMENT
09-21	Fuel Level	Out Of Range High	solid general warning icon	triple beep	
09-22	Fuel Level	Out Of Range Low	flashing general warning icon	triple beep	
13-05	Fuel Hold	Short To Battery	solid general warning icon	triple beep	
13-06	Fuel Hold	Short To Ground	solid general warning icon	triple beep	
13-07	Fuel Hold	Open Circuit	solid general warning icon	triple beep	
14-02	Fuel Pull	Error On	solid general warning icon	triple beep	
14-03	Fuel Pull	Error Off	solid general warning icon	triple beep	
21-02	Preheater	Error On	flashing preheater icon	triple beep	
21-03	Preheater	Error Off	flashing preheater icon	triple beep	
22-02	Starter Output	Error On	solid general warning icon	triple beep	
22-03	Starter Output	Error Off	solid general warning icon	triple beep	
30-28	Watchdog	Failure			
31-28	Recovery Mode	Failure			
33-23	Constant Data	Not Calibrated	solid general warning icon	triple beep	
36-48	ACD (Attachment Control Device)	Multiple Controllers Present	solid general warning icon	triple beep	
50-02	Extend / Retract Control	Out Of Range High	flashing joystick lockout icon	triple beep	
50-03	Extend / Retract Control	Out Of Range Low	flashing joystick lockout icon	triple beep	
50-04	Extend / Retract Control	Not Calibrated	flashing joystick lockout icon	triple beep	
50-05	Auxiliary Control	Out Of Range High	flashing auxiliary hydraulic icon	triple beep	
50-06	Auxiliary Control	Out Of Range Low	flashing auxiliary hydraulic icon	triple beep	
50-07	Auxiliary Control	Not Calibrated	flashing auxiliary hydraulic icon	triple beep	
50-14	Inching Control	Out Of Range High	solid general warning icon	triple beep	
50-15	Inching Control	Out Of Range Low	solid general warning icon	triple beep	
50-16	Inching Control	Not Calibrated	solid general warning icon	triple beep	still present after calibration
50-20	Boom Pressure	Out Of Range High	solid general warning icon	triple beep	
50-21	Boom Pressure	Out Of Range Low	solid general warning icon	triple beep	

Dealer Copy -- Not for Resale

CODE	FUNCTION	FAILURES	ICON	BUZZER	COMMENT
50-23	Constant Data	Not Calibrated	solid general warning icon	triple beep	
50-24	Stability Valve	Error On	solid general warning icon	triple beep	
50-25	Stability Valve	Error Off	solid general warning icon	triple beep	
50-26	Recovery Mode	Failure			only visible with the service analyzer
50-28	FPR	No Inputs Active	solid general warning icon	triple beep	
50-29	FPR	More Than One Input Active	solid general warning icon	triple beep	
50-30	Rear Light Relay	Error On	solid general warning icon	triple beep	
50-31	Rear Light Relay	Error Off	solid general warning icon	triple beep	
50-33	Brake Control System Valve	Error On	solid general warning icon	triple beep	
50-34	Brake Control System Valve	Error Off	solid general warning icon	triple beep	
50-36	Brake Light Relay	Error On	solid general warning icon	triple beep	
50-37	Brake Light Relay	Error Off	solid general warning icon	triple beep	
50-42	Secondary Auxiliary Hydraulic Valve	Error On	solid general warning icon	triple beep	
50-43	Secondary Auxiliary Hydraulic Valve	Error Off	solid general warning icon	triple beep	
50-45	Extend / Retract Base	Error On	solid general warning icon	triple beep	
50-46	Extend / Retract Base	Error Off	solid general warning icon	triple beep	
50-48	V Sensor 1	Out Of Range Low	solid general warning icon	triple beep	
50-49	V Sensor 1	Out Of Range High	solid general warning icon	triple beep	
50-50	V Sensor 2	Out Of Range Low	solid general warning icon	triple beep	
50-51	V Sensor 2	Out Of Range High	solid general warning icon	triple beep	
50-54	Switched Battery	Over Voltage	solid general warning icon	triple beep	
50-55	Switched Battery	Under Voltage	solid general warning icon	triple beep	
50-56	CAN	Communication Fault	solid general warning icon	triple beep	
50-57	Drive Controller	Not Calibrated	solid general warning icon	triple beep	
50-58	CAN	RPM Message Stale	solid general warning icon	triple beep	

Dealer Copy -- Not for Resale

CODE	FUNCTION	FAILURES	ICON	BUZZER	COMMENT
50-60	Drive Pump Forward	Error On	solid general warning icon	triple beep	
50-61	Drive Pump Forward	Error Off	solid general warning icon	triple beep	
50-63	Drive Pump Reverse	Error On	solid general warning icon	triple beep	
50-64	Drive Pump Reverse	Error Off	solid general warning icon	triple beep	
50-66	Extend / Retract Rod	Error On	solid general warning icon	triple beep	
50-67	Extend / Retract Rod	Error Off	solid general warning icon	triple beep	
50-69	Auxiliary Hydraulics Base	Error On	solid general warning icon	triple beep	
50-70	Auxiliary Hydraulics Base	Error Off	solid general warning icon	triple beep	
50-72	Auxiliary Hydraulics Rod	Error On	solid general warning icon	triple beep	
50-73	Auxiliary Hydraulics Rod	Error Off	solid general warning icon	triple beep	
50-78	Float Valve	Error On	flashing boom float icon	triple beep	
50-79	Float Valve	Error Off	flashing boom float icon	triple beep	
50-80	Two Speed Relay	Error On	flashing two speed icon	triple beep	
50-81	Two Speed Relay	Error Off	flashing two speed icon	triple beep	
50-82	EEPROM	Error	solid general warning icon	triple beep	
63-05	Operator Presence Switch	Short To Battery		triple beep	
63-06	Operator Presence Switch	Short To Ground		triple beep	
64-05	Accessory Relay	Short To Battery	solid general warning icon	triple beep	
64-06	Accessory Relay	Short To Ground	solid general warning icon	triple beep	
64-07	Accessory Relay	Open Circuit	solid general warning icon	triple beep	
65-05	Joystick Lockout	Short To Battery	flashing joystick lockout icon	triple beep	
65-06	Joystick Lockout	Short To Ground	flashing joystick lockout icon	triple beep	
65-07	Joystick Lockout	Open Circuit	flashing joystick lockout icon	triple beep	
70-28	Brake Pressure	Failure	flashing parking brake icon	triple beep	
77-48	Multiple Key	Alarm			machine will shut down

Dealer Copy -- Not for Resale



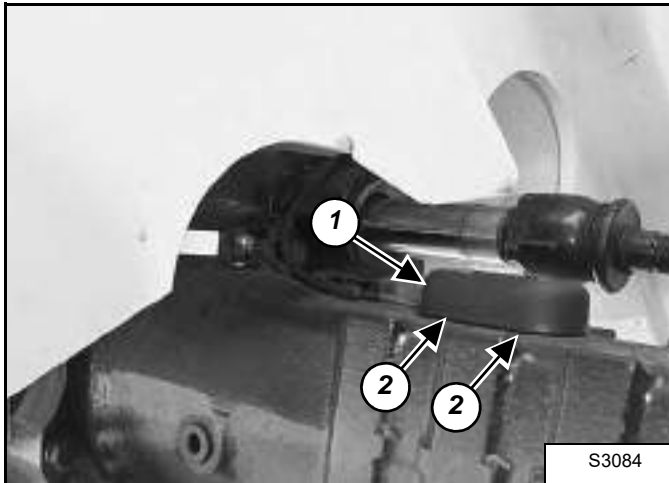
Bobcat®

Dealer Copy -- Not for Resale

LONGITUDINAL STABILITY INDICATOR CALIBRATION (S/N AC1911001-14999)

Fitting The Sensor

Figure 60-170-1



Remove the paint around the 2 M10-threaded holes on the rear axle and verify flatness of the surface. The surface must be perfectly flat.

Degrease the surface.

Apply Loctite® to the threads of both screws.

Fit the sensor (P/N 6910655) (Item 1) [Figure 60-170-1] by alternately fastening both screws until a torque value of 60 N•m is reached.

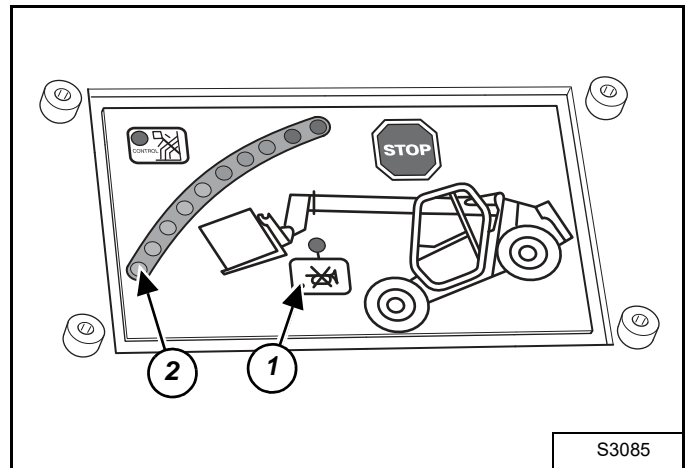
Calibration Procedure

IMPORTANT

The following adjustments must be done on a flat surface, without braking and conform to the telescopic handler safety prescriptions.

Lower the boom completely and turn off the engine.

Figure 60-170-2



1. Turn off the ignition. Push buzzer button (Item 1) [Figure 60-170-2] and hold it.
2. While holding the buzzer button (Item 1) [Figure 60-170-2] pressed, start the machine. Hold the button for another five seconds and release it when the green LED's light up.
3. With the machine unloaded and the boom retracted, raise the boom until the maximum angle.
4. Wait until the machine stabilizes.
5. Push the buzzer button (Item 1) [Figure 60-170-2] for five seconds and wait until the "STOP" light turns red.
6. Lower the boom.
7. Take a load that can make the machine tip (do not exceed the maximum authorised load) over and lift it 30 centimeters above the ground.
8. Extend the boom till the rear wheels do no longer touch the ground. Use, if needed, the shunt key (located above the contact key).

Dealer Copy -- Not for Resale

**LONGITUDINAL STABILITY INDICATOR
CALIBRATION (S/N AC1911001-14999) (CONT'D)**

Calibration Procedure (Cont'd)



WARNING

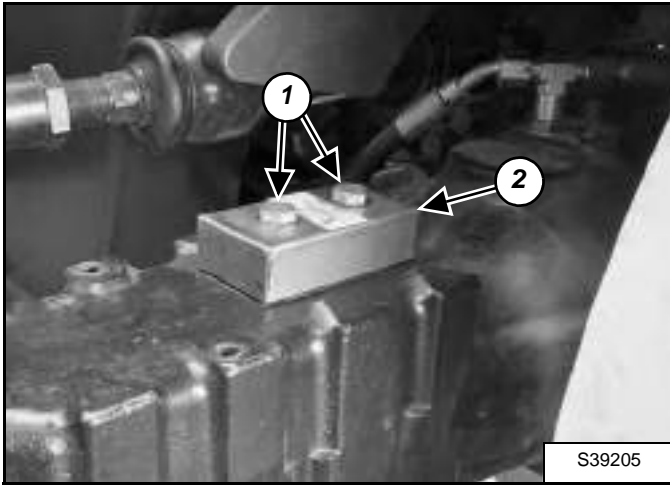
Chain up the rear of the machine to the floor, to prevent tipping over too far.

9. Push the buzzer button (Item 1) **[Figure 60-170-2]** for five seconds and wait until all lights of the indicator turn on.
10. If the shunt key has been activated, turn it off now.
11. Retract the boom and then extend again to check if the LEDs (Item 2) **[Figure 60-170-2]** light up in the right order and the buzzer works and if the system works correctly.
The order is: green, orange, buzzer, red and "STOP".
Aggravating movements (such as extending the boom) will be stopped when the "STOP" light turns on.
12. Remove the load.

LLMI / LLMC SYSTEM (S/N AC1915000 & ABOVE)

System Calibration

Figure 60-180-1

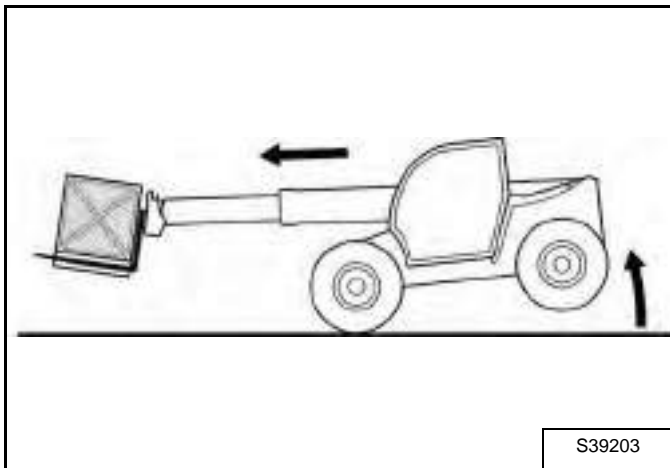


Before calibration, drive the machine for a while in order to warm the axles, then check tightening torque of the two bolts (Item 1) of the LLMS (Longitudinal Load Moment Sensor) (Item 2) [Figure 60-180-1]. Torque value should be 65 N•m (48 ft-lb).

Park the machine on flat level ground and align the front and rear wheels straight ahead.

NOTE: A load will be needed to topple the machine.

Figure 60-180-2



Using the LLMC override switch, decrease the rear axle load pressure by picking up a load and extending the boom until the machine topples over (rear wheels off the ground) [Figure 60-180-2].

NOTE: Do not move or reposition the machine after decreasing the rear axle load pressure.

Retract the boom for 3 m (10 ft) and place the load on the ground. Then retract the boom and turn off the engine.

Follow the procedure below to calibrate the LLMC system:

NOTE: Calibration must be performed within a time span of 5 minutes. If longer, the LLMC will return to its original settings.

NOTE: During the procedure below, the buzzer will be activated whenever the TEST button is pushed.

Figure 60-180-3

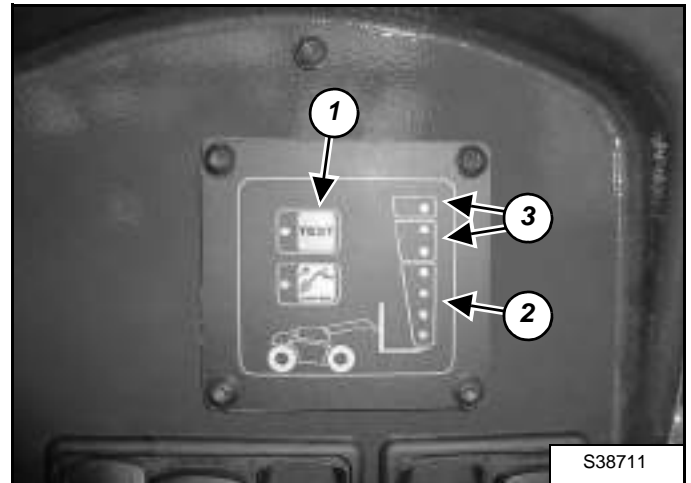
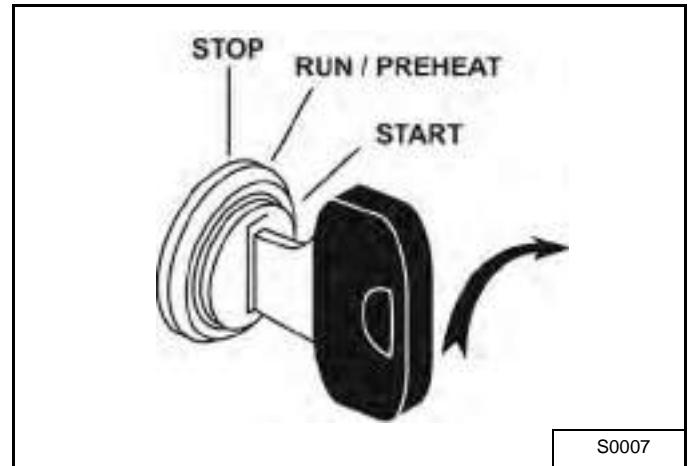


Figure 60-180-4



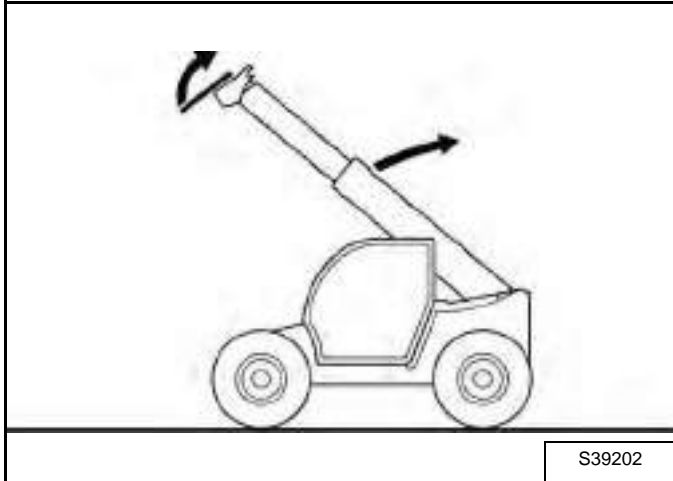
1. Push and hold the TEST button (Item 1) [Figure 60-180-3] while starting the machine (START) [Figure 60-180-4] then quickly press the TEST button (Item 1) [Figure 60-180-3] for 3 times within the first 4 seconds after power on.

NOTE: To indicate that the system enters calibration mode, the LED bar (Items 2 and 3) [Figure 60-180-3] will be blinking and the buzzer sounds intermittent for 3 seconds.

2. The green LED's (Item 2) [Figure 60-180-3] light up to indicate the system is ready to record the first calibration point.

System Calibration (Cont'd)

Figure 60-180-5



3. Without attachment and with the attachment carrier fully tilted up, fully retract and raise the boom [Figure 60-180-5].
4. Press and release the TEST button (Item 1) [Figure 60-180-3] to record the first calibration point.
5. The orange and red LED's (Item 3) [Figure 60-180-3] light up to indicate the system is ready to record the second calibration point.

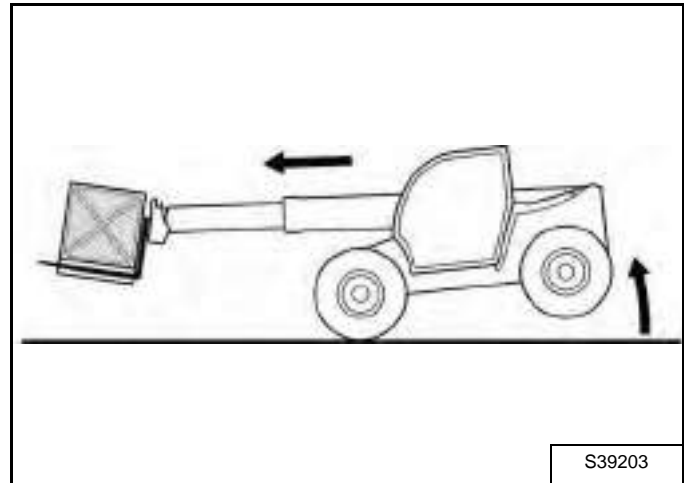
! WARNING

TIPPING CAN CAUSE SERIOUS INJURY OR DEATH

Keep the boom low, only raise the load 500 mm (20 in) when calibrating the LLMI / LLMC system.

W-2929-1111

Figure 60-180-6



6. Pick up the load and extend the boom until the machine topples over (rear wheels off the ground) [Figure 60-180-6].
7. Press and release the TEST button (Item 1) [Figure 60-180-3] to record the second calibration point.
8. To indicate the calibration has been validated, the LED bar (Items 2 and 3) [Figure 60-180-3] lights up for 3 seconds and the buzzer sounds two times.

NOTE: If the buzzer sounds and LED's light up in a particular configuration, a calibration failure has occurred. (See System Failure Reports on Page 60-180-4.)

Calibration is finished. The LLMC system automatically returns to normal mode.

Always perform the LLMI / LLMC calibration test after system calibration. (See Calibration Test on Page 60-180-3.)

**LLMI / LLMC SYSTEM (S/N AC1915000 & ABOVE)
(CONT'D)**

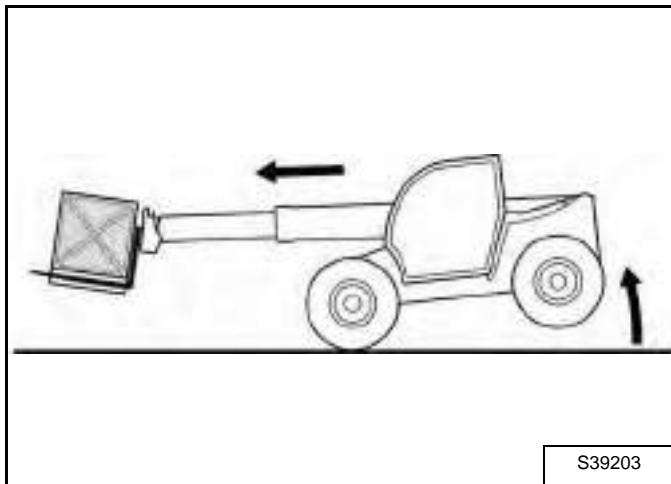
Calibration Test

The Longitudinal Load Moment Control (LLMC) system calibration can be tested by performing the following procedure:

Park the machine on flat level ground and align the front and rear wheels straight ahead.

NOTE: A load will be needed to topple the machine.

Figure 60-180-7

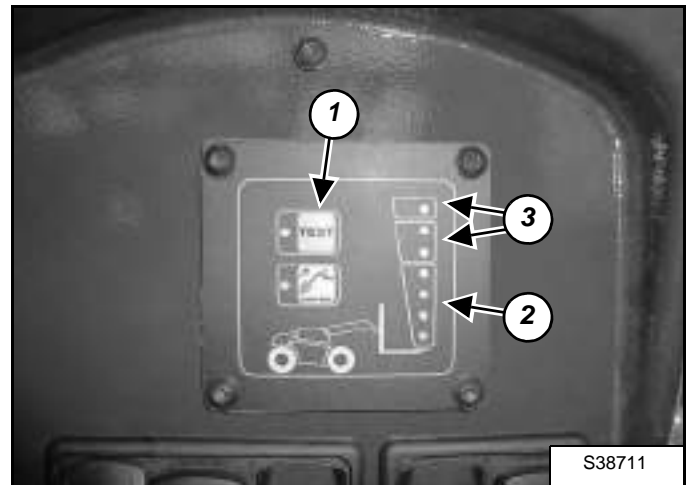


Using the LLMC override switch, decrease the rear axle load pressure by picking up a load and extending the boom until the machine topples over (rear wheels off the ground) [Figure 60-180-7].

NOTE: Do not move or reposition the machine after decreasing the rear axle load pressure.

Retract the boom for 3 m (10 ft) and place the load on the ground.

Figure 60-180-8



1. Raise the boom, fully retracted and without attachment.
2. Tilt the attachment carrier fully up.
3. Push and hold the TEST button (Item 1) [Figure 60-180-8].
4. After five seconds, all LED's will shortly light up and the buzzer sounds discontinuously.
5. The calibration test starts now. Two results are possible:

- the four green LED's (Item 2) [Figure 60-180-8] light up, calibration is OK.
- the orange and red LED's (Item 3) [Figure 60-180-8] light up, calibration is out of range. Please redo calibration of the LLMC system. (See System Calibration on Page 60-180-1.)

6. Release the TEST button (Item 1) [Figure 60-180-8].

NOTE: After pressing the TEST button (Item 1) [Figure 60-180-8] longer than 60 seconds, the procedure will automatically end and the system will return to normal mode.







NOTE: The system always returns to normal mode when the TEST button (Item 1) [Figure 60-180-8] is released during the procedure.

Dealer Copy -- Not for Resale

LLMI / LLMC SYSTEM (S/N AC1915000 & ABOVE) (CONT'D)

System Failure Reports







During the occurrence of one or more of the failures below, the buzzer will sound discontinuous.

LOCATION	FUNCTION	DISPLAY	MACHINE BEHAVIOR	CAUSE	SOLUTION
Power Supply	LLMI Voltage Low		Normal	Battery voltage low.	
	LLMI Voltage Out Of Range		Normal		
	LLMC Voltage Low		No aggravating movements possible. Shunt is allowed.	Battery voltage low.	
	LLMC Voltage Out Of Range		No aggravating movements possible. Shunt is allowed.		
Internal	CRC Error - Program Flash			LLMI, LLMC or BCC not programmed correctly.	Identify the faulty controller and re-program.
	Test Button			<ul style="list-style-type: none"> - The Test button is pressed for more than 10 seconds when the LLMI / LLMC system is started. - The Test button is pressed for more than 60 seconds in the calibration test procedure. 	Release the Test button. After 10 seconds, system startup can be repeated. If not successful, replace the LLMI.

Dealer Copy -- Not for Resale

LLMI / LLMC SYSTEM (S/N AC1915000 & ABOVE) (CONT'D)







System Failure Reports (Cont'd)

LOCATION	FUNCTION	DISPLAY	MACHINE BEHAVIOR	CAUSE	SOLUTION
LLMS	Sensor Scale Too Tight		No aggravating movements possible. Shunt is allowed.	Calibration points too close.	Do system calibration again within a time span of less than 5 minutes.
	Calibration Values Reversed		No aggravating movements possible. Shunt is allowed.	Calibration not successful. (Recordings of first and second calibration point have been swapped.)	Do system calibration again within a time span of less than 5 minutes.
	Calibration Values Out of Range		No aggravating movements possible. Shunt is allowed.		Do system calibration again within a time span of less than 5 minutes.
	Calibration Time-out		No aggravating movements possible. Shunt is allowed.	The calibration took more than 5 minutes.	Do system calibration again within a time span of less than 5 minutes.
	LLMI Linked Sensor (LLMS)		The speed of the aggravating movements is decreased (50%).	- The LLMI linked sensor input is disconnected. - The sensor linked to the LLMI has stopped sending CAN frame.	- Check the harness between the sensor and the LLMI. - Replace the sensor on the rear axle and do system calibration again.
	LLMC Linked Sensor (LLMS)		The speed of the aggravating movements is decreased (50%).	- The LLMC linked sensor input is disconnected. - The sensor linked to the LLMC has stopped sending CAN frame.	- Check the harness between the sensor and the LLMC. - Replace the sensor on the rear axle and do system calibration again.

Dealer Copy -- Not for Resale

LLMI / LLMC SYSTEM (S/N AC1915000 & ABOVE) (CONT'D)



System Failure Reports (Cont'd)

LOCATION	FUNCTION	DISPLAY	MACHINE BEHAVIOR	CAUSE	SOLUTION
LLMS	LLMI / LLMC Sensor Signature		No movement allowed.	- The LLMS inputs have been swapped between the LLMI and the LLMC. - The LLMI and/or the LLMC was reprogrammed.	- Check the harness between the LLMS and the LLMI/LLMC. - Do system calibration again within a time span of less than 5 minutes.
	LLMS Value Shift (toward stability)	After 30 seconds: 	No aggravating movements possible. Shunt is allowed.		Do system calibration again within a time span of less than 5 minutes.
	LLMS Value Shift (toward instability)		No aggravating movements possible. Shunt is allowed		Do system calibration again within a time span of less than 5 minutes.
	Sensor Redundancy 1		Normal	The difference between the dual LLMS values has drifted over the first level.	- Do system calibration again within a time span of less than 5 minutes. - Replace the LLMS if needed.
	Sensor Redundancy 2		No movement allowed.	The difference between the dual LLMS values has drifted over the second level.	- Do system calibration again within a time span of less than 5 minutes. - Replace the LLMS if needed.
	Sensor Frame Default		No aggravating movements possible. Shunt is allowed	Faulty LLMS.	Replace the LLMS and do system calibration again within a time span of less than 5 minutes.

Dealer Copy -- Not for Resale

LLMI / LLMC SYSTEM (S/N AC1915000 & ABOVE) (CONT'D)

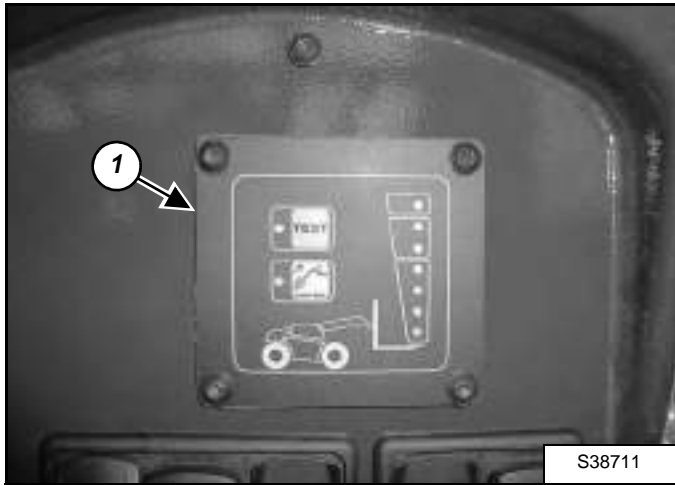
System Failure Reports (Cont'd)

LOCATION	FUNCTION	DISPLAY	MACHINE BEHAVIOR	CAUSE	SOLUTION
Switches	Retract Switch		Boom considered not retracted while this failure is on.	<ul style="list-style-type: none"> - The retract switch is disconnected - There is a short-circuit in the switch or in the harness. 	<ul style="list-style-type: none"> - Check the harness between the "boom retracted" switch and the LLMC. - Check the function of the switch.
	5° Switch		Boom angle considered over 5° while this failure is on.	<ul style="list-style-type: none"> - The 5° switch is disconnected. - There is a short-circuit in the 5° switch or in the harness. 	<ul style="list-style-type: none"> - Check the harness between the 5° switch and the LLMC. - Check the function of the switch.

Dealer Copy -- Not for Resale

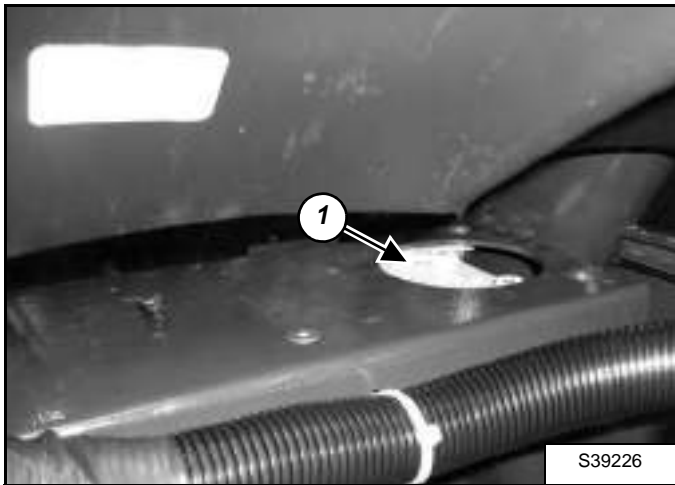
System Components Identification

Figure 60-180-9



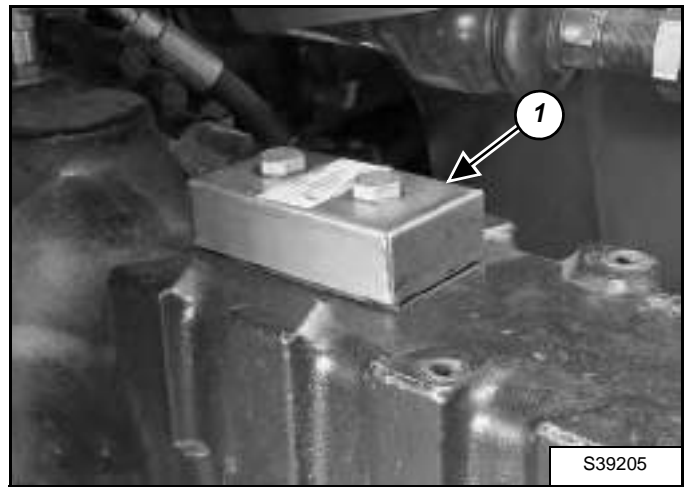
The LLMI (Longitudinal Load Moment Indicator) (Item 1) [Figure 60-180-9] which is located on the dashboard, indicates the stability level of the machine, using a LED bargraph and a buzzer.

Figure 60-180-10



The LLMC (Longitudinal Load Moment Controller) (Item 1) [Figure 60-180-10] which is located under the dashboard, reduces and stops the boom movements in relation to the machine stability. This controller combines with other controllers in the machine.

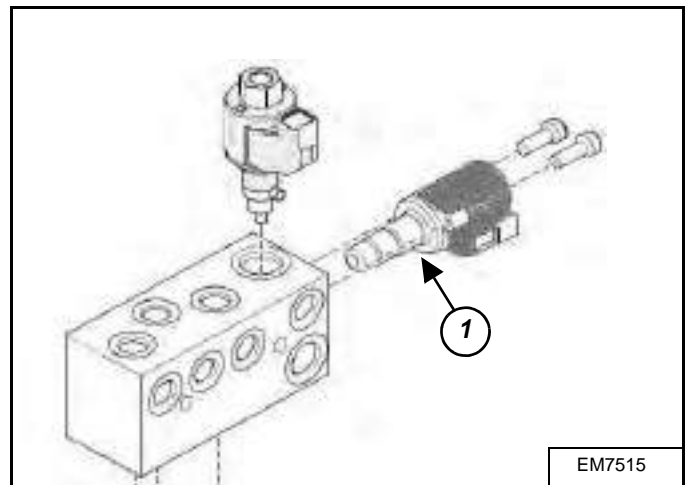
Figure 60-180-11



The LLMS (Longitudinal Load Moment Sensor) (Item 1) [Figure 60-180-11] measures the actual load on the rear axle.

The LLMS is equipped with dual electronics, which independently measure the same load. The first measurement is used by the LLMI, while the second measurement is used by the LLMC. The most critical measurement of both will have priority.

Figure 60-180-12

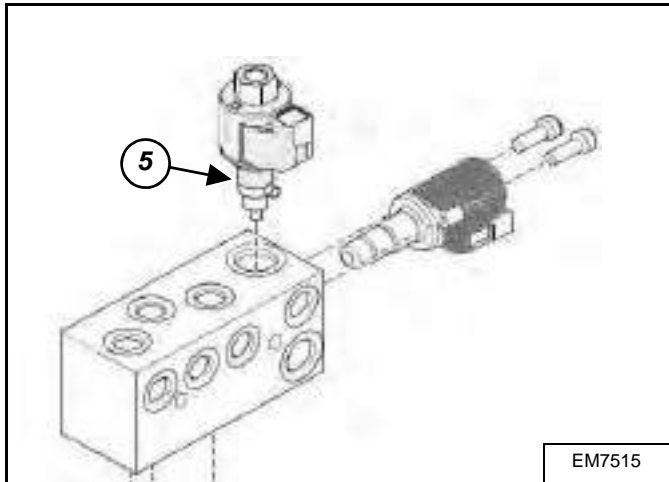


The proportional valve (Item 1) [Figure 60-180-12] is used to reduce boom, auxiliary and tilt movement speed as commanded by the LLMC.

**LLMI / LLMC SYSTEM (S/N AC1915000 & ABOVE)
(CONT'D)**

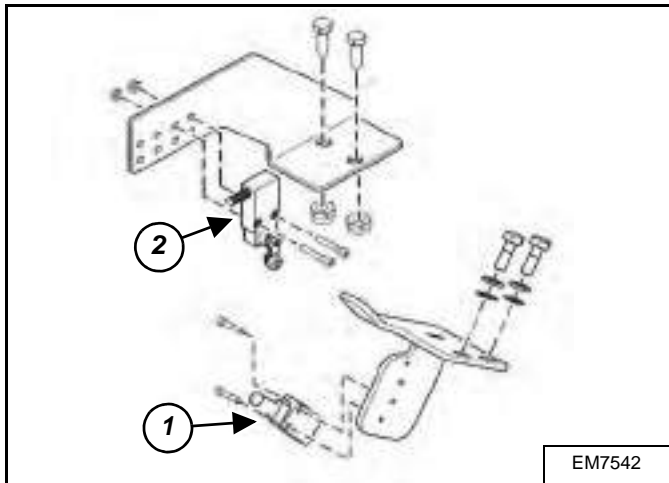
System Components Identification (Cont'd)

Figure 60-180-13



The safety valve (Item 1) [Figure 60-180-13] is used as a safety backup. If machine instability keeps increasing due to a certain failure, the safety valve will stop all boom movements.

Figure 60-180-14



The boom angle sensor (5°) (Item 1) [Figure 60-180-14] measures the boom angle. If the boom angle is lower than five degrees and the machine is in unstable condition, boom movement speed is reduced.

The boom retracted sensor (Item 2) [Figure 60-180-14] detects if the boom is fully retracted. When the boom is retracted all boom movements will be fully operational at any angle. The buzzer is deactivated with retracted boom.

Figure 60-180-15



The LLMC system override switch key ("shunt key") (Item 1) [Figure 60-180-15] can be used to override the LLMC system.

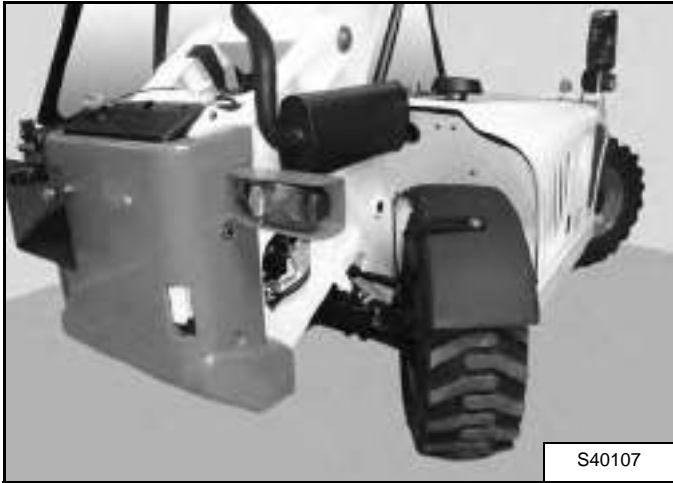
Turned anticlockwise (unstable position), the switch (Item 1) [Figure 60-180-15] overrides the LLMC system. As soon as the key is released the LLMC system will be active again.

Dealer Copy -- Not for Resale

**LLMI / LLMC SYSTEM (S/N AC1915000 & ABOVE)
(CONT'D)**

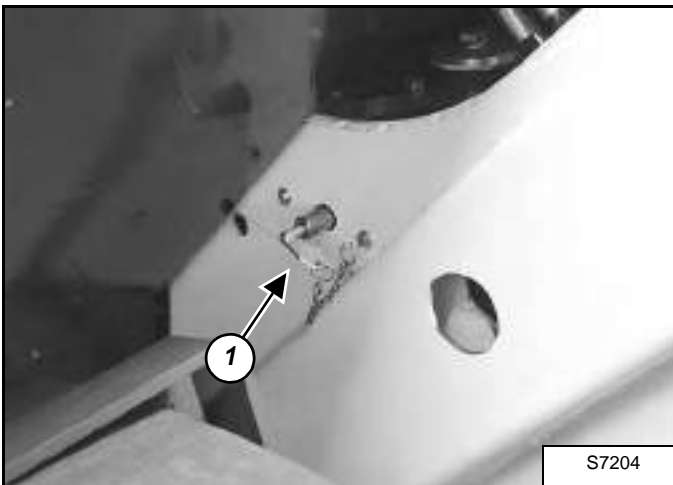
LLMS Removal

Figure 60-180-16



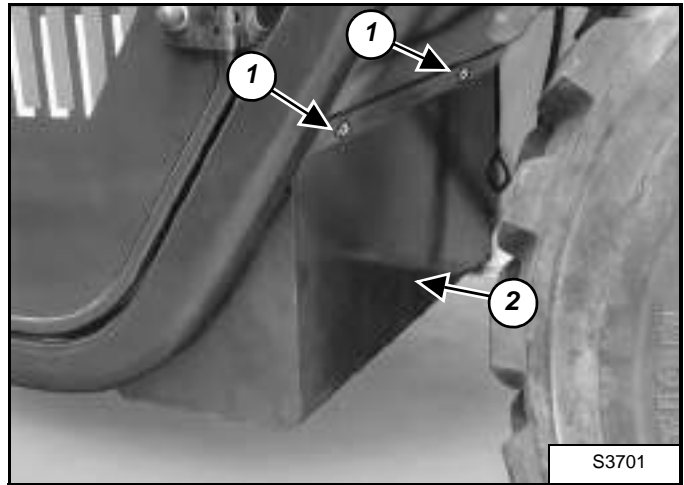
For better access to the LLMS, turn the rear wheels fully to the left **[Figure 60-180-23]**.

Figure 60-180-17



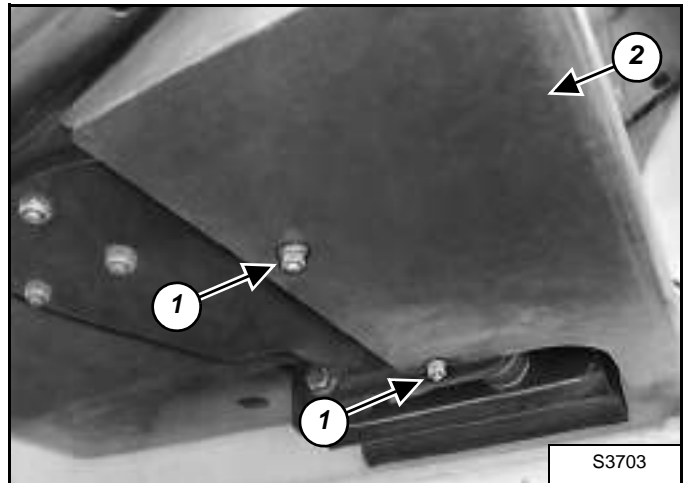
Rotate the battery disconnect switch (Item 1) **[Figure 60-180-17]** to the right, to disconnect the power supply from the battery.

Figure 60-180-18



Remove the two screws (Item 1) from the battery access cover (Item 2) **[Figure 60-180-18]** located on the back of the cab.

Figure 60-180-19



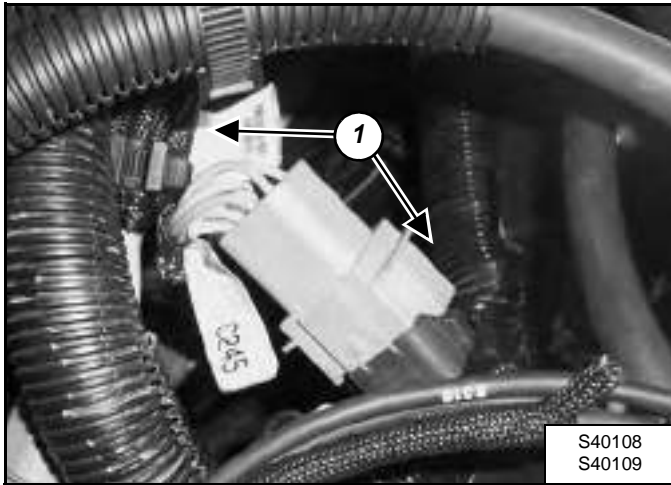
Remove the two nuts (Item 1) **[Figure 60-180-19]** from the bottom of the battery access cover.

Remove the battery access cover (Item 2) **[Figure 60-180-19]**.

**LLMI / LLMC SYSTEM (S/N AC1915000 & ABOVE)
(CONT'D)**

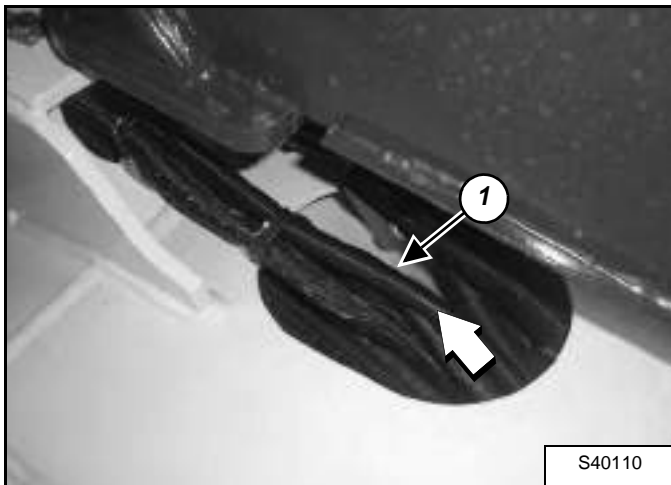
LLMS Removal (Cont'd)

Figure 60-180-20



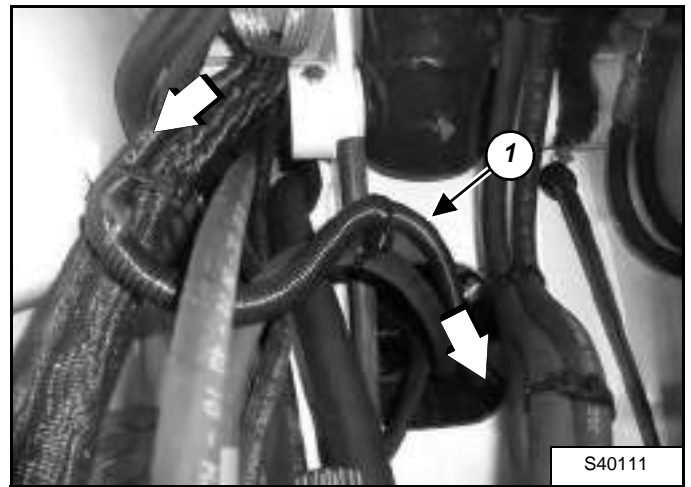
Unplug the electrical connector (Item 1) [Figure 60-180-20] (labeled as "C245").

Figure 60-180-21



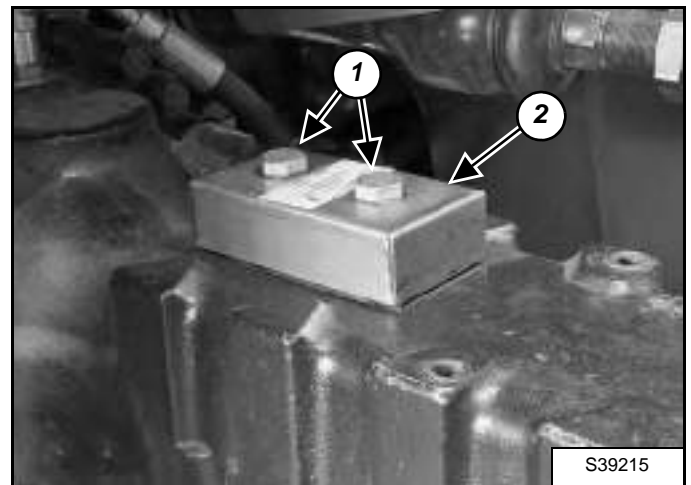
Cut any tie straps that hold the cable (Item 1) [Figure 60-180-21] and pull the cable out of the hole below the boom at the right back side of the cab.

Figure 60-180-22



Cut any tie straps that hold the cable (Item 1) [Figure 60-180-22] and pull the cable out of the machine.

Figure 60-180-23



Remove the two bolts (Item 1) and remove the LLMS (Item 2) [Figure 60-180-23].

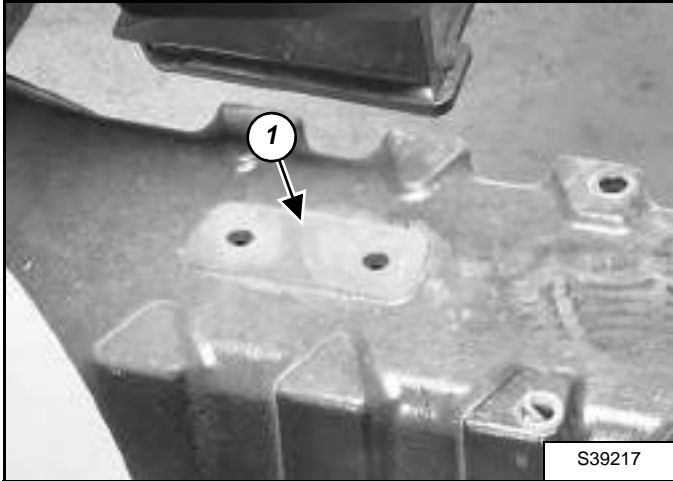
Dealer Copy -- Not for Resale

**LLMI / LLMC SYSTEM (S/N AC1915000 & ABOVE)
(CONT'D)**

LLMS Installation

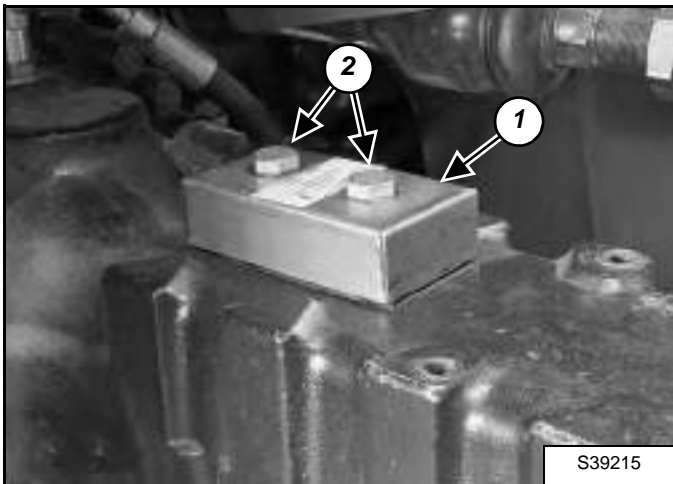
Raise the boom and install the approved boom stop. (See the Operation And Maintenance Manual for more information.)

Figure 60-180-24



Clean the axle sensor area (Item 1) [Figure 60-180-24] to remove rust and/or dirt.

Figure 60-180-25



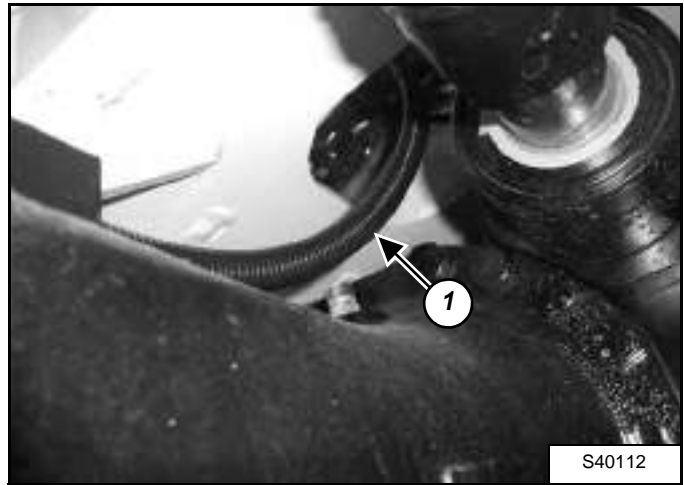
Position the LLMS (Item 1) and install the two bolts (Item 2) [Figure 60-180-25].

NOTE: Apply Loctite® 243 to the bolts.

Tighten the two bolts (Item 2) [Figure 60-180-25] in three progressive steps:

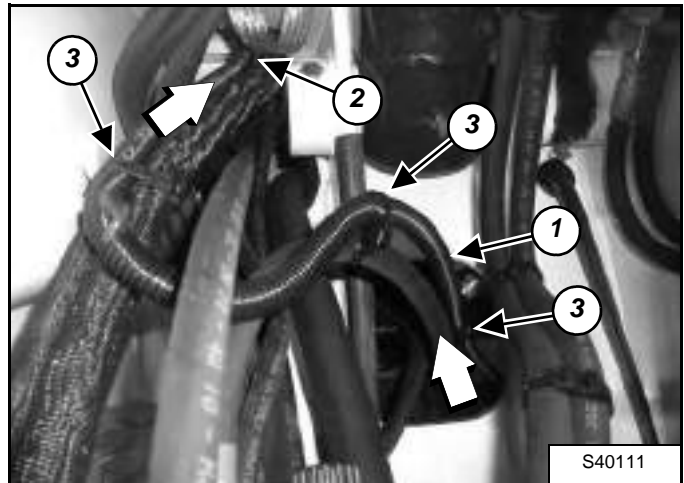
- 25 N•m (18.4 ft-lb)
- 45 N•m (33.2 ft-lb)
- 65 N•m (47.9 ft-lb).

Figure 60-180-26



Route the LLMS cable (Item 1) [Figure 60-180-26] through the opening inside the chassis to the area under the boom.

Figure 60-180-27



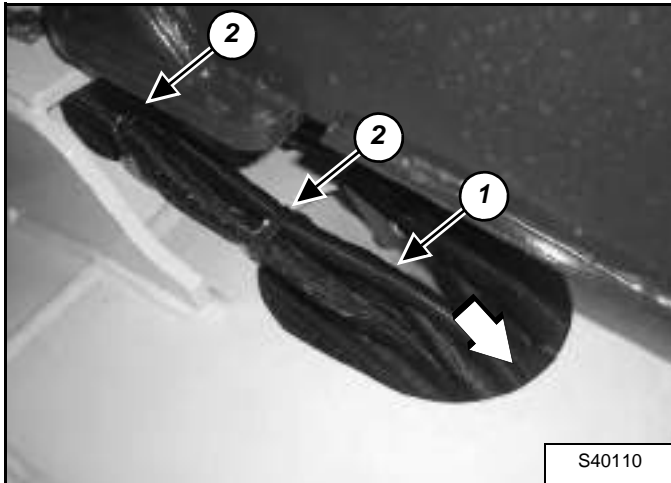
Under the boom cylinder base, route the LLMS cable (Item 1) further to the cab side and then up through the opening (Item 2) [Figure 60-180-27] in the frame.

Install three tie straps (Item 3) [Figure 60-180-27] to secure the cable to the nearby hoses.

**LLMI / LLMC SYSTEM (S/N AC1915000 & ABOVE)
(CONT'D)**

LLMS Installation (Cont'd)

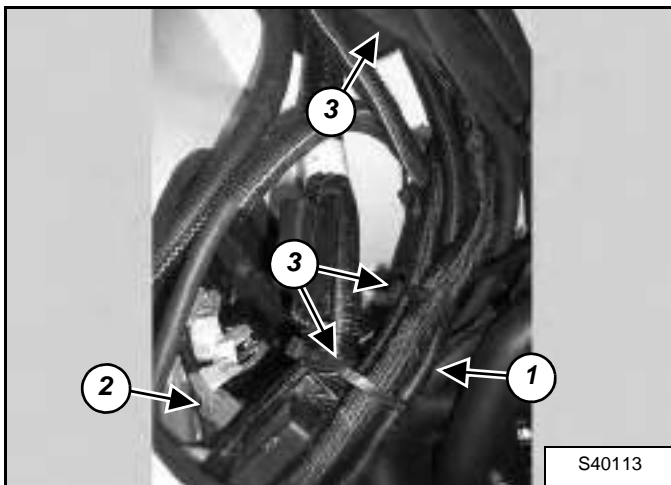
Figure 60-180-28



Route the cable (Item 1) [Figure 60-180-28] through the hole below the right back side of the cab.

Install two tie straps (Item 2) [Figure 60-180-28] to secure the cable to the nearby harness.

Figure 60-180-29

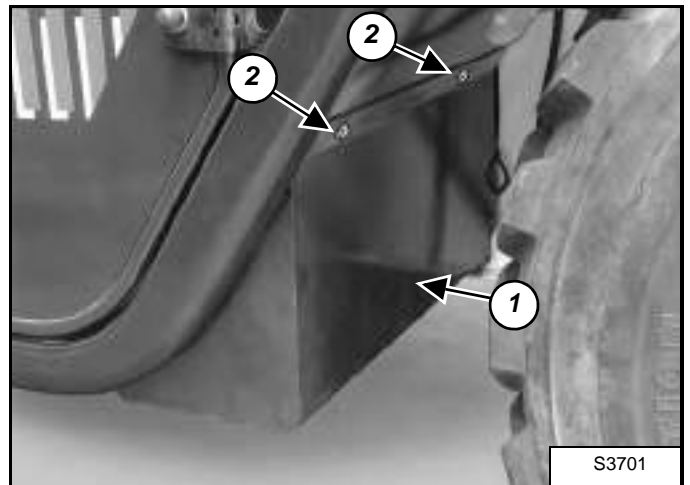


Route the cable (Item 1) [Figure 60-180-29] to the connector labeled as "C245" and connect.

NOTE: The connector (Item 2) [Figure 60-180-29] is located next to the opening in the frame, which leads to the back of the cab.

Install three tie straps (Item 3) [Figure 60-180-29] to secure the cable to the nearby harness.

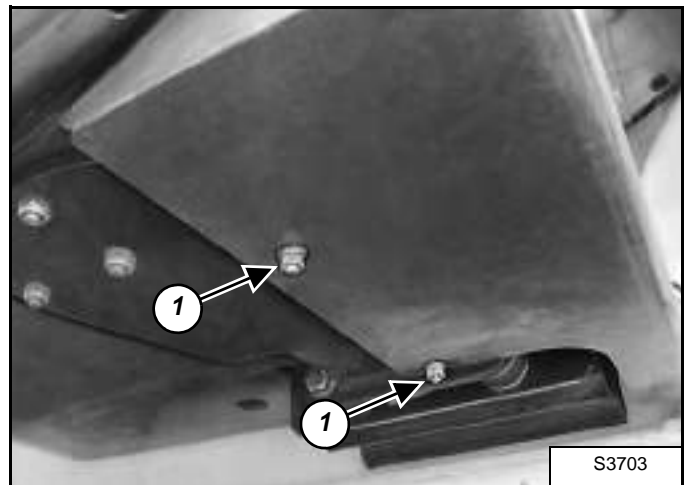
Figure 60-180-30



Install the access cover (Item 1) [Figure 60-180-30].

Install the two screws (Item 2) [Figure 60-180-30].

Figure 60-180-31



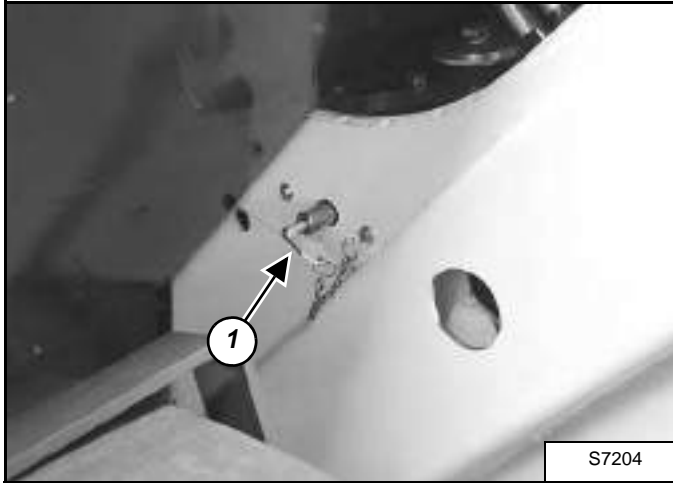
Install the two nuts (Item 1) [Figure 60-180-31] at the bottom of the battery access cover.

Dealer Copy -- Not for Resale

**LLMI / LLMC SYSTEM (S/N AC1915000 & ABOVE)
(CONT'D)**

LLMS Installation (Cont'd)

Figure 60-180-32



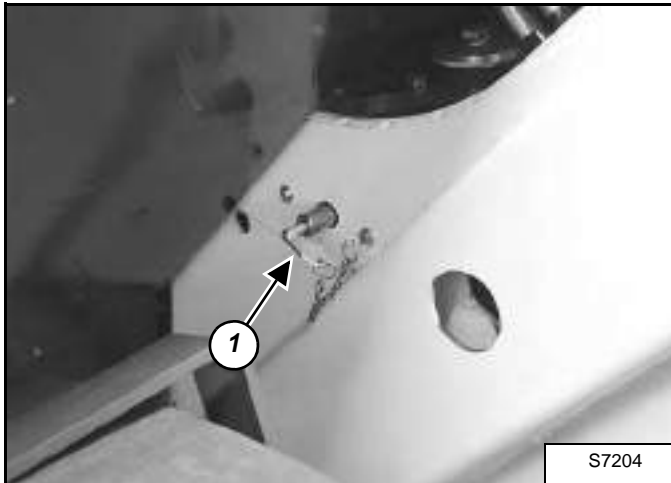
Rotate the battery disconnect switch (Item 1) **[Figure 60-180-32]** to the left, to connect the power supply from the battery.

Remove the approved boom stop and lower the boom.

**LLMI / LLMC SYSTEM (S/N AC1915000 & ABOVE)
(CONT'D)**

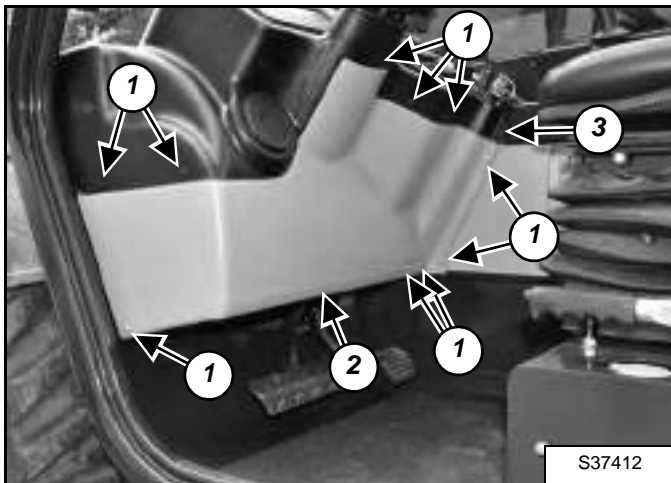
LLMC Controller Removal

Figure 60-180-33



Rotate the battery disconnect switch (Item 1) [Figure 60-180-33] to the right, to disconnect the power supply from the battery.

Figure 60-180-34

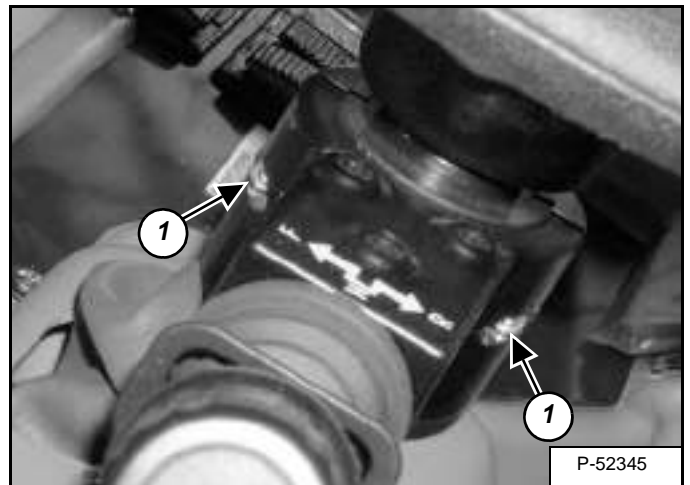


Remove the eleven screws (Item 1) [Figure 60-180-34] from the column cover.

Remove the column cover (Item 2) [Figure 60-180-34].

Remove the screw (Item 3) [Figure 60-180-34] of the dash cover.

Figure 60-180-35



Remove the two screws (Item 1) [Figure 60-180-35] from the travel / signal levers.

Figure 60-180-36



Remove the travel / signal levers from the steering column, such that the dash cover can be partly lifted [Figure 60-180-36].

Dealer Copy -- Not for Resale

LLMI / LLMC SYSTEM (S/N AC1915000 & ABOVE)
(CONT'D)

LLMC Controller Removal (Cont'd)

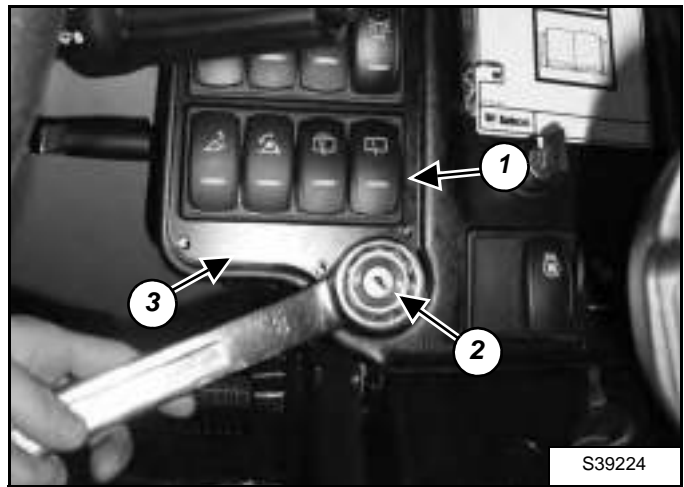
Figure 60-180-37



Remove the ignition key and nut cover (Item 1) [Figure 60-180-37] from the switch panel.

Remove the screws (Item 2) [Figure 60-180-37] from the switch panel.

Figure 60-180-38

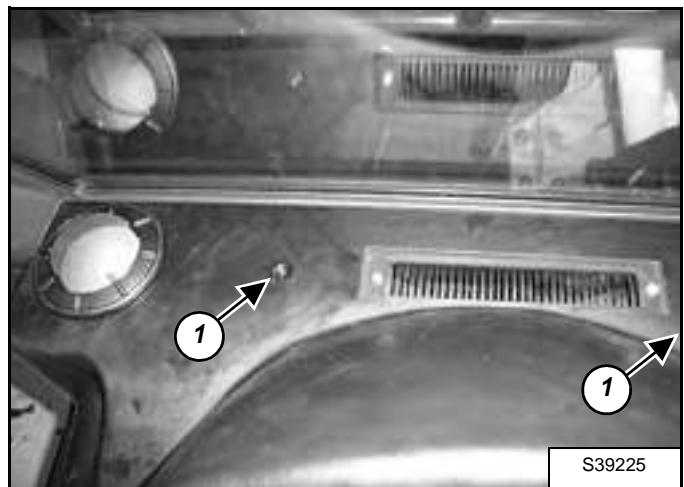


Take out the switch row (Item 1) from the switch panel in order to have a grip on the ignition key switch and remove the nut from the ignition key switch (Item 2) [Figure 60-180-38].

Press the ignition key switch (Item 2) [Figure 60-180-38] into the switch panel.

Partly remove the switch panel (Item 3) [Figure 60-180-38], in order to access to the LLMC controller.

Figure 60-180-39



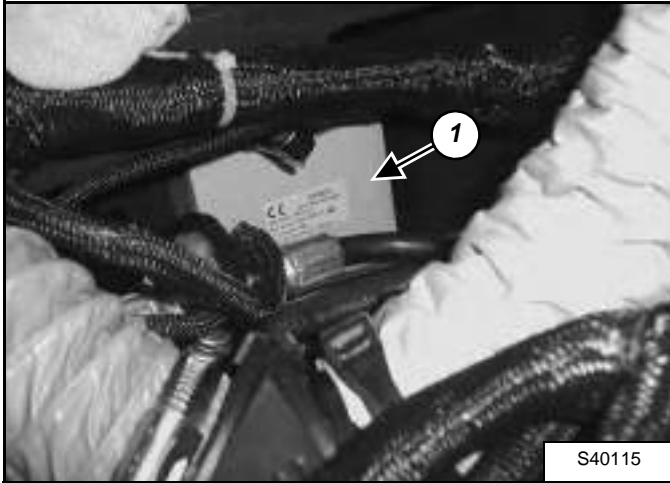
Remove and discard both plugs (Item 1) [Figure 60-180-39] from the dash cover.

Lift the dash cover approximately 15 cm (6 in).

**LLMI / LLMC SYSTEM (S/N AC1915000 & ABOVE)
(CONT'D)**

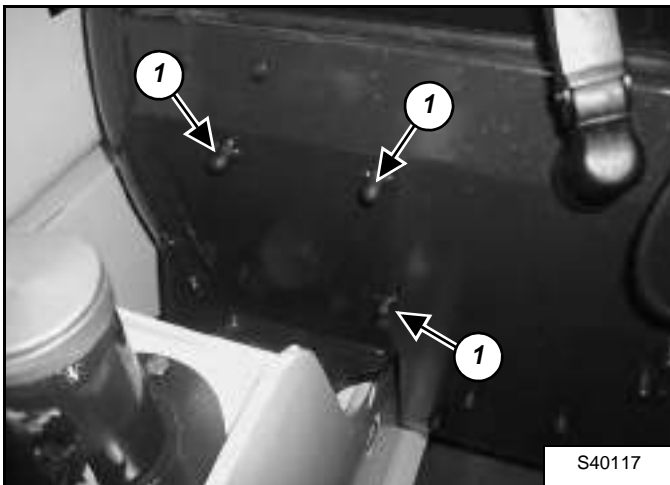
LLMC Controller Removal (Cont'd)

Figure 60-180-40



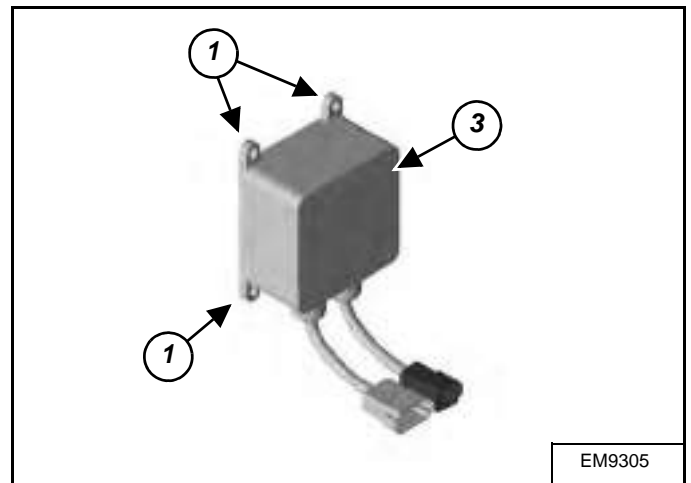
The LLMC (Item 1) [Figure 60-180-40] is located under the front side of the dashboard.

Figure 60-180-41



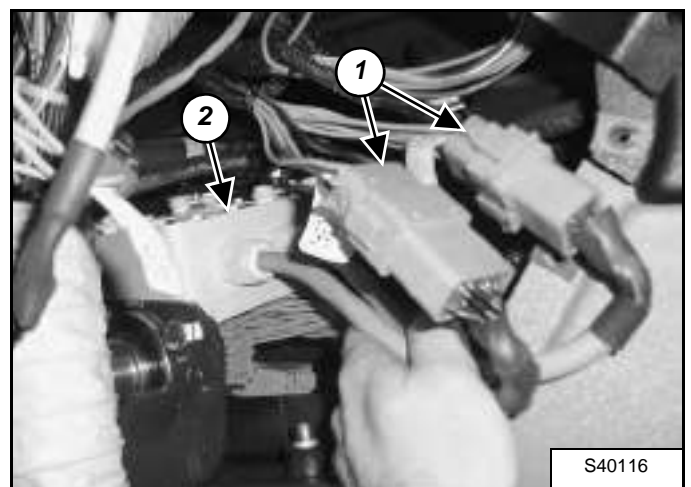
Remove the three caps (Item 1) [Figure 60-180-41].

Figure 60-180-42



Remove the three mounting bolts (Item 1) and nuts (Item 2) of the LLMC (Item 3) [Figure 60-180-42].

Figure 60-180-43



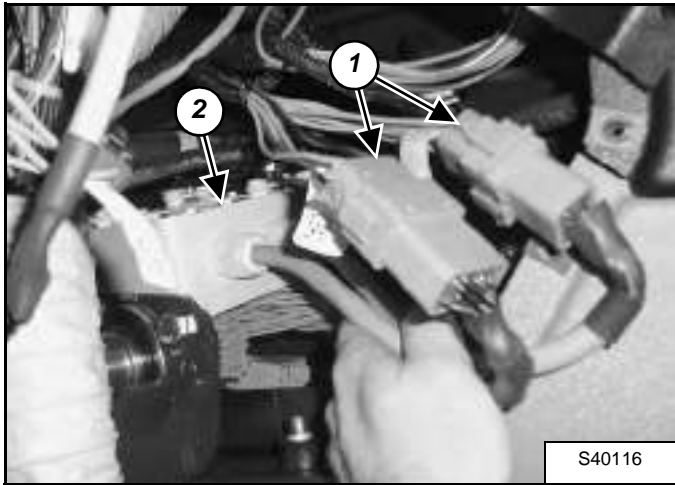
Unplug both connectors (Item 1) [Figure 60-180-43] labeled as "C241" and "C244".

Remove the LLMC (Item 2) [Figure 60-180-43].

Dealer Copy -- Not for Resale

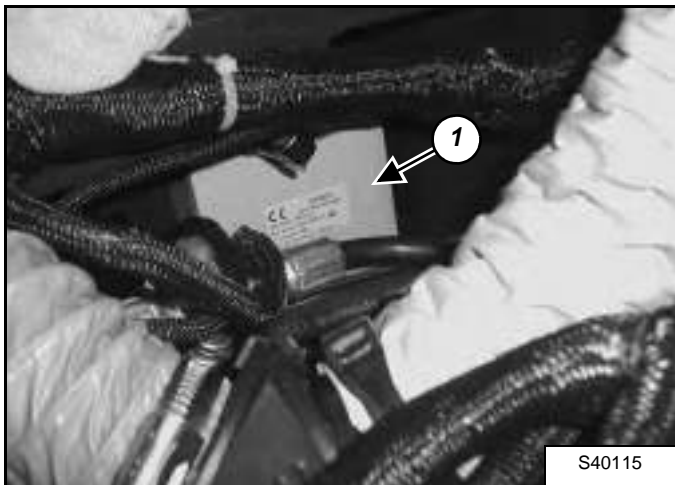
LLMC Controller Installation

Figure 60-180-44



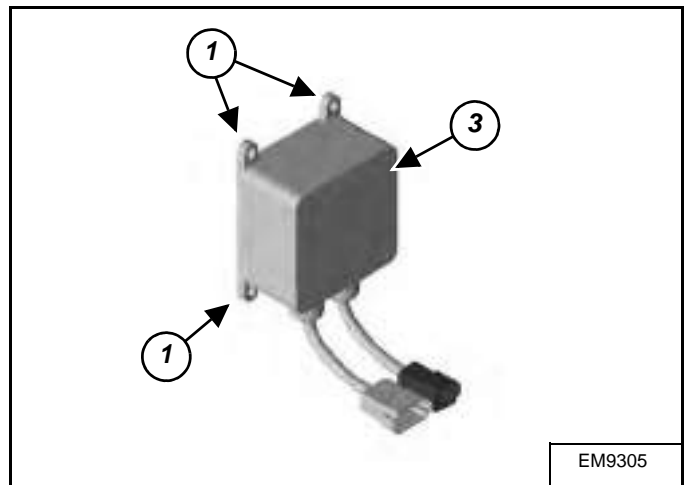
Plug the LLMC connectors to the machine connectors (Item 1) [Figure 60-180-44] labeled as "C241" and "C244".

Figure 60-180-45



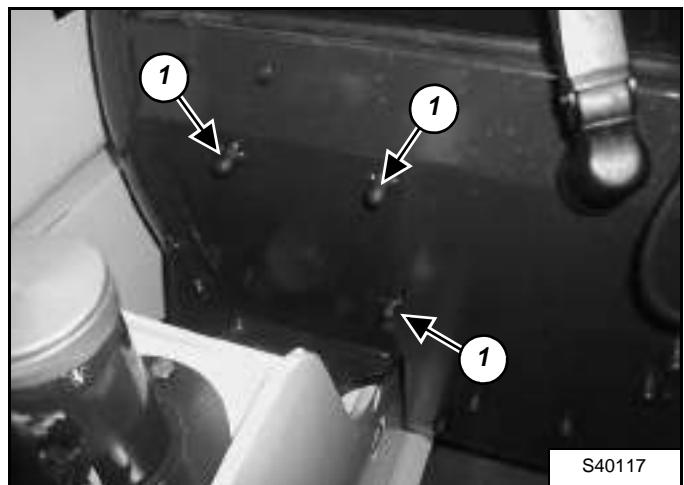
Position the LLMC (Item 1) [Figure 60-180-45] at the the front side of the cab, under the dashboard.

Figure 60-180-46



Remove the three mounting bolts (Item 1) and nuts (Item 2) of the LLMC (Item 3) [Figure 60-180-46].

Figure 60-180-47



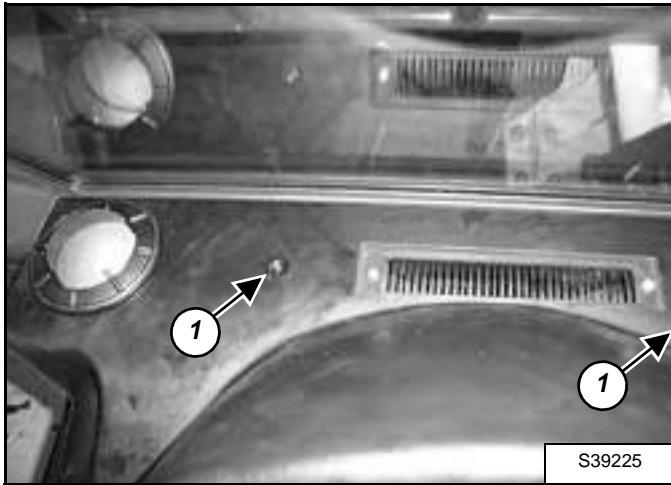
Install the three caps (Item 1) [Figure 60-180-47].

Lower the dash cover to its original position.

**LLMI / LLMC SYSTEM (S/N AC1915000 & ABOVE)
(CONT'D)**

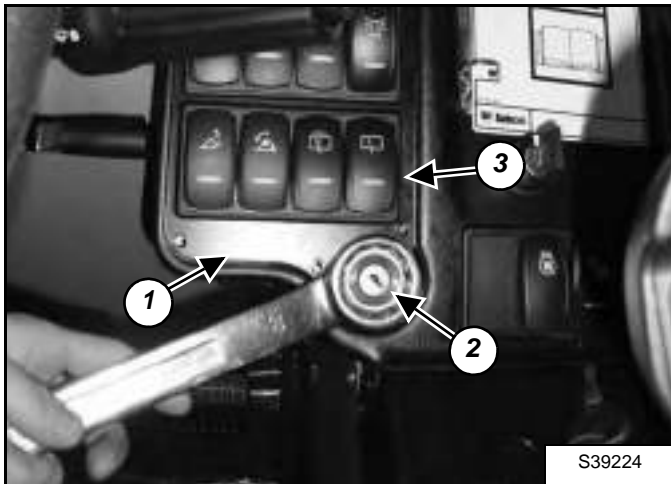
LLMC Controller Installation (Cont'd)

Figure 60-180-48



Install two new plugs (Item 1) [Figure 60-180-48].

Figure 60-180-49

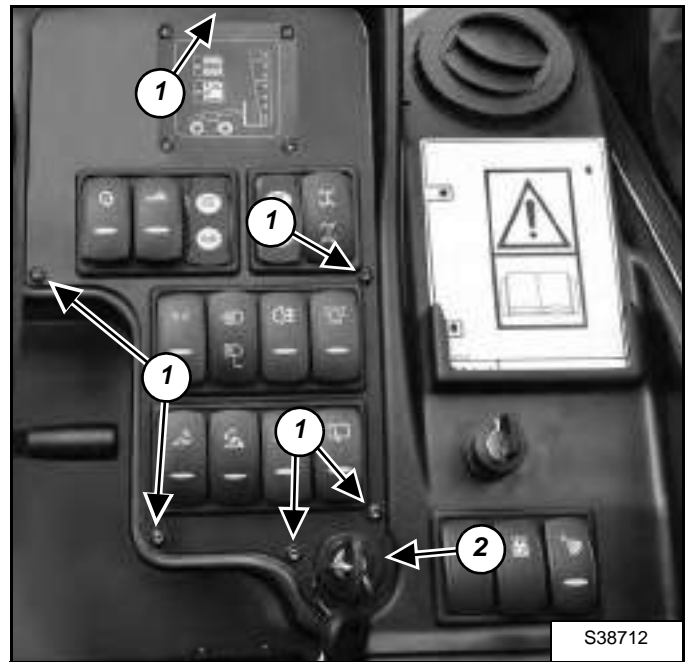


Put the switch panel (Item 1) [Figure 60-180-49] back in place.

Install the ignition key switch (Item 2) into the switch panel and install the nut that holds the ignition key switch (Item 2) [Figure 60-180-49].

Install the switch row (Item 3) [Figure 60-180-49].

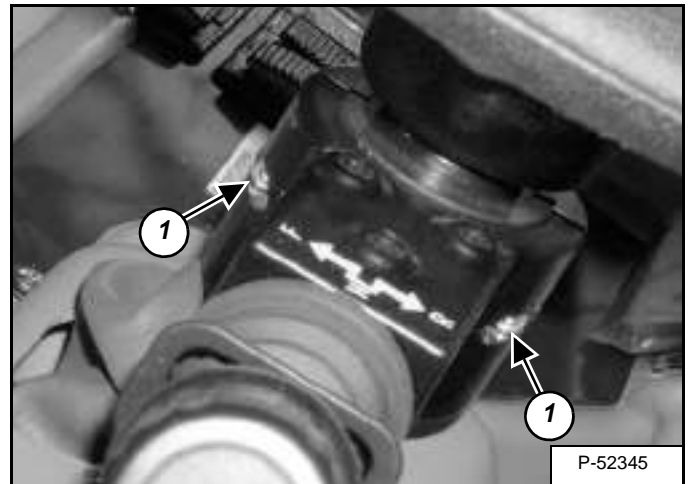
Figure 60-180-50



Install the screws (Item 1) [Figure 60-180-50] of the switch panel.

Install the nut cover (Item 2) [Figure 60-180-50] of the ignition key switch.

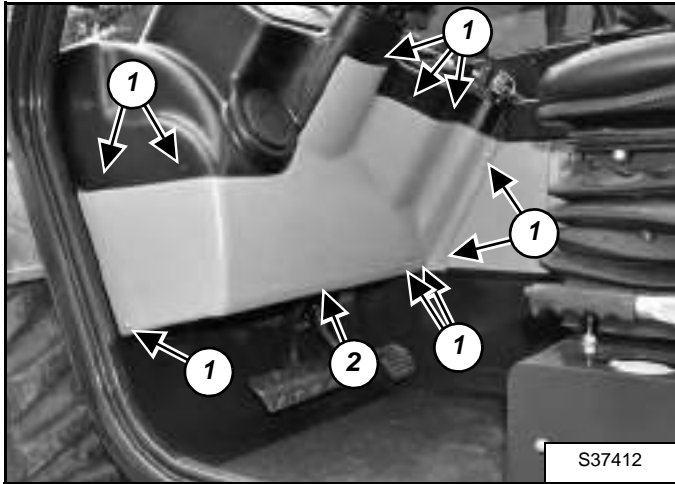
Figure 60-180-51



Put the travel / signal levers back in place and install the two screws (Item 1) [Figure 60-180-51].

Dealer Copy -- Not for Resale

Figure 60-180-52

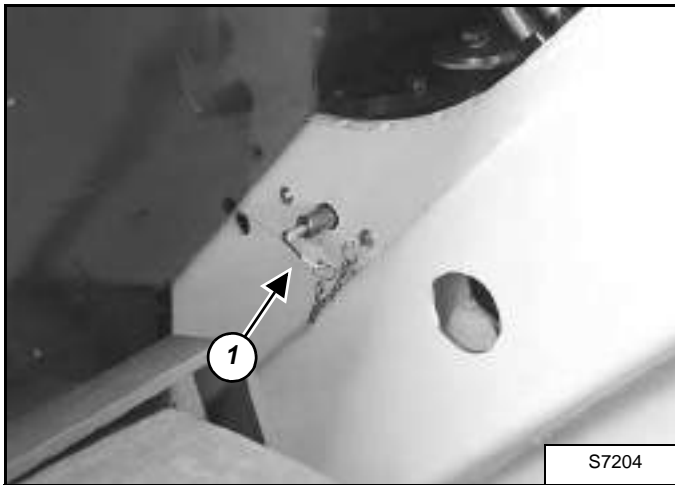


Install the eleven screws (Item 1) [Figure 60-180-52] from the column cover.

Install the column cover (Item 2) [Figure 60-180-52].

Install the screw (Item 3) [Figure 60-180-52] of the dash cover.

Figure 60-180-53



Rotate the battery disconnect switch (Item 1) [Figure 60-180-53] to the left, to connect the power supply from the battery.

ENGINE SERVICE

ENGINE INFORMATION	70-10-1
Description	70-10-1
Specifications	70-10-2
Troubleshooting	70-10-10
Compression - Checking	70-10-12
ENGINE AND ENGINE MOUNTS	70-20-1
Removal And Installation	70-20-1
ENGINE AND HYDROSTAT ASSEMBLY	70-30-1
Removal And Installation	70-30-1
ENGINE SPEED CONTROL	70-40-1
Removal And Installation	70-40-1
MUFFLER	70-50-1
Removal And Installation	70-50-1
AIR CLEANER	70-60-1
Removal And Installation	70-60-1
Air Intake Cowling Removal And Installation	70-60-1
ENGINE COOLING SYSTEM	70-70-1
Radiator Removal And Installation	70-70-1
Fan Removal And Installation	70-70-3
Water Pump Removal And Installation	70-70-3
Water Pump Disassembly And Assembly	70-70-4
Thermostat Housing Removal And Installation	70-70-4
LUBRICATION SYSTEM	70-80-1
Oil Pan Removal And Installation	70-80-1
Oil Pump Removal And Installation	70-80-2
Oil Pump Inspection	70-80-2
Oil Filter Cooler Removal And Installation	70-80-4
Engine Oil Pressure - Testing	70-80-5
FUEL SYSTEM	70-90-1
Fuel Camshaft Removal And Installation	70-90-1
Injection Pump Governor Housing Removal And Installation	70-90-3
Injection Pump Governor Housing Disassembly And Assembly	70-90-5
Fuel Shutoff Solenoid - Checking	70-90-7
Fuel Shutoff Solenoid - Removal And Installation	70-90-7
Fuel Injection Pump Removal And Installation	70-90-8
Fuel Injection Pump Housing Removal	70-90-16
Fuel Injection Pump Housing Installation	70-90-20
Injection Pump Timing	70-90-23
Fuel Injector Removal and Installation	70-90-26
Fuel Injector Nozzle Pressure - Checking	70-90-28

Nozzle Spraying Condition	70-90-28
Valve Seat Tightness	70-90-29
CYLINDER HEAD	70-100-1
Intake Air Heater - Testing	70-100-1
Intake Air Heater Removal And Installation	70-100-1
Valve Clearance Adjustment	70-100-2
Valve Timing - Checking	70-100-3
Cylinder Head Removal And Installation	70-100-4
Cylinder Head Disassembly And Assembly	70-100-7
Cylinder Head - Servicing	70-100-7
Cylinder Head Top Clearance	70-100-8
Valve Guide - Checking	70-100-9
Reconditioning The Valve And Valve Seat	70-100-11
Valve Spring	70-100-13
Valve Tappets	70-100-14
Rocker Arm And Shaft - Checking	70-100-15
CRANKSHAFT AND PISTONS	70-110-1
Piston And Connecting Rod Removal And Installation	70-110-1
Piston And Connecting Rod - Servicing	70-110-3
Cylinder Bore Checking	70-110-8
Connecting Rod Alignment	70-110-9
Crankshaft Gear Removal And Installation	70-110-9
Crankshaft And Bearings Removal and Installation	70-110-10
Crankshaft And Bearings - Servicing	70-110-14
CAMSHAFT AND TIMING GEARS	70-120-1
Timing Gearcase Cover Removal And Installation	70-120-1
Timing Gears Backlash - Checking	70-120-2
Camshaft - Servicing	70-120-3
Idle Gear And Shaft Removal And Installation	70-120-5
Idler Gear And Shaft - Servicing	70-120-6
Balancer Shaft Servicing	70-120-9
TURBOCHARGER	70-130-1
Description	70-130-1
Testing	70-130-1
Removal And Installation	70-130-2
FLYWHEEL AND HOUSING	70-140-1
Flywheel Removal And Installation	70-140-1
Ring Gear Removal And Installation	70-140-1
Housing Removal And Installation	70-140-2
EXHAUST GAS RECIRCULATION (EGR) SYSTEM	70-150-1
Checking The Function Of EGR System	70-150-1
Disassembly And Assembly	70-150-4

ENGINE INFORMATION

Description

The T2250 has the Kubota direct injected V3800 Turbo diesel engine with a displacement of 3,8 L (230 cu.in).

The engine has 4 cylinders and the rotation is counter-clockwise (viewed from the flywheel side). It is also equipped with an air intake heater for assisting in cold starts. Engine block heaters are also available from Bobcat Parts.

The engine serial number is stamped on the engine and is located near the injection pump. The model number is located on the valve cover. Use these numbers to obtain the correct service parts.

The engine is liquid cooled with a ethylene glycol/water mixture. The cooling fan is driven by a hydraulic motor. The speed of the fan is determined by the engine coolant temperature sensor and the hydraulic/hydrostatic fluid temperature sensor.

ENGINE INFORMATION (CONT'D)

Specifications

All dimensions are given in millimeters. Respective imperial dimensions are given in inches enclosed by parentheses.

General

Number Of Cylinders	4
Cylinder Arrangement	In-line
Cycle	4 Stroke
Direction Of Rotation	Counterclockwise Viewed on Flywheel
Intake System	Turbocharged
Combustion System	Reentrant Type, Center Direct Injection Type
Nominal Bore	100 (3.937)
Stroke	120 (4.724)
Compression Ratio	19.0:1
Displacement	3,8 L (4 qt) (230.0 C.I.)
Firing Order	1-3-4-2

Fuel System

Injection Timing	5.25°-6.75° before T.D.C. 0.0917 to 0.117 rad.
Fuel Injection Pressure - 1st Stage	18,63-19,61 MPa (186- 196 bar) (2702-2845 psi)
Fuel Injection Pressure - 2nd Stage	23,54-24,52 MPa (235-245bar) (3414-3556 psi)
Fuel Tightness of Nozzle Valve Seat	When the pressure is 16,67 MPa (166.7 bar) (2418 psi), the valve seat must be fuel tight.
Fuel Tightness of Pump Element - Allowable Limit	18,63 MPa (186 bar) (2702 psi)
Fuel Tightness of Delivery Valve	10 seconds 18,63 --> 17,65 MPa 186 --> 176 bar 2702 --> 2560 psi
Allowable Limit	5 seconds 18,63 --> 17,65 MPa 186 --> 176 bar 2702 --> 2560 psi

Cylinder Head

Cylinder Head Surface Flatness - Allowable Limit	0,05 (0.002)
Top Clearance	0,701 - 0,930 (0,0276 - 0,0366)
Compression Pressure	504 psi / 250 RPM 3.47 MPa / 250 RPM
Allowable Limit	371 psi/ 250 RPM 2.56 MPa / 250 RPM
Variance Among Cylinder - Allowable Limit	10% or less

Dealer Copy -- Not for Resale

ENGINE INFORMATION (CONT'D)

All dimensions are given in millimeters. Respective imperial dimensions are given in inches enclosed by parentheses.

Valve Guides

Inside Diameter	8,250-8,350 (0.3248-0.3287)
Outside Diameter	13,034-13,047 (0.5131-0.5137)
Valve Guide Bore	13,000-13,027 (0.5118-0.5129)
Valve Guide Clearance In The Cylinder Head (Interference)	0,007-0,047 (0.0003-0.00019)
Overall Length:	
Intake	128,92-129,37 (5.076-5.093)
Exhaust	128,92-129,37 (5.075-5.093)
Protrusion From Bottom	12,35-12,65 (0.486-0.498)

Valve Tappets

Push Rod Alignment - Allowable Limit	0,25 (0.0098)
Clearance Between Tappet And Guide	0,020 - 0,062 (0.00079 - 0.0024)
Allowable Limit	0,07 (0.0028)
Tappet Guide Bore I.D.	24,000 - 24,021 (0.94489 - 0.94570)
Tappet O.D.	23,959 - 23,980 (0.94327 - 0.94409)

Exhaust Valves

Valve Stem Outside Diameter	6,960 - 6,975 (0.2741- 0.2746)
Clearance Between Valve Stem and Valve Guide	0,055 - 0,085 (0.0022 - 0.0033)
Allowable Limit	0,1 (0.0039)
Valve Guide Inside Diameter	7,030 - 7,045 (0.2768 - 0.2773)
Maximum	0,10 (0.004)
Valve Recessing	0,850 - 1,05 (0.0335 - 0.0413)
Allowable Limit	1,2 (0.047)
Valve Face Angle	45°
Seal Type	Stem seal with integral seating washer
Valve Seat Angle	45°
Valve Seat Width	2,3 - 2,6 (0.091 - 0.10)
Valve Clearance (Cold)	0,23 - 0,27 (0.0091-0.010)

Dealer Copy -- Not for Resale

ENGINE INFORMATION (CONT'D)

All dimensions are given in millimeters. Respective imperial dimensions are given in inches enclosed by parentheses.

Intake Valves

Valve Stem Outside Diameter	6,960 - 6,975 (0.2741 - 0.2746)
Valve Guide Clearance	0,055 - 0,085 (0.0022 - 0.0033)
Valve Guide Inside Diameter	7,030 - 7,045 (0.2768 - 0.2773)
Maximum	0,10 (0.004)
Valve Recessing	0,60 - 0,80 mm (0.024 - 0.031)
Allowable Limit	1,2 (0.047)
Valve Face Angle	60°
Seal Type	Stem seal with integral seating washer
Valve Seat Angle	60°
Valve Seat Width	1,6 - 2,0 (0.063 - 0.078)
Valve Clearance (Cold)	0,23 - 0,27 (0.0091 - 0.010)

Valve Springs

Valve Spring (Intake)	35,1 - 35,6 (1.3819 - 1.4016)
Allowable Limit	34,6 (1.3622)
Valve Spring (Exhaust)	35,1 - 35,6 (1.3819 - 1.4016)
Allowable Limit	34,6 (1.3622)
Free Length (Intake/Exhaust)	35,1 - 35,6 (1.39 - 1.40)
Allowable Limit	34,6 (1.36)
Setting Load/Setting Length (Intake)	63,547 N / 31,5 mm (14.256 lbs / 1.2401 in)
Allowable Limit	45,864 N / 31,5 mm (10.296 lbs / 1.2401 in)
Setting Load/Setting Length (Exhaust)	63,547 N / 31,5 mm (14.256 lbs / 1.2401 in)
Allowable Limit	45,864 N / 31,5 mm (10.296 lbs / 1.2401 in)
Tilt - Allowable Limit	1,0 (0.039)

Valve Timing

Intake Valve - Open	14° before T.D.C. 0.24 rad.
Closed	36° after B.D.C. 0.63 rad.
Exhaust Valve - Open	45° before B.D.C. 0.79 rad.
Closed	17° after T.D.C. 0.30 rad.

Rocker Arm

Clearance Between Valve Arm Bridge And Valve Arm Bridge Shaft	0,018 - 0,042 (0.00071 - 0.0016)
Allowable Limit	0,15 (0.0059)
Valve Arm Bridge I.D.	9,050 - 9,065 (0.3563 - 0.3568)
Valve Arm Bridge Shaft O.D.	9,023 - 9,032 (0.3552 - 0.3555)
Clearance Between Rocker Arm Shaft And Rocker Arm	0,016 - 0,045 (0.00063 - 0.0017)
Allowable Limit	0,15 (0.0059)
Rocker Arm Shaft O.D.	15,973 - 15,984 (0.62886 - 0.62929)
Rocker Arm I.D. For Shaft	16,000 - 16,018 (0.62993 - 0.63062)

ENGINE INFORMATION (CONT'D)

All dimensions are given in millimeters. Respective imperial dimensions are given in inches enclosed by parentheses.

Camshaft

Camshaft Side Clearance	0,070 - 0,22 (0.0028 - 0.0086)
Allowable Limit	0,30 (0.012)
Camshaft Alignment - Allowable Limit	0,01 (0.0004)
Cam Height of Intake	37,63 (1.481)
Allowable Limit	37,13 (1.462)
Cam Height of Exhaust	38,96 (1.534)
Allowable Limit	38,46 (1.514)
Oil Clearance of Camshaft	0,050 - 0,091 (0.0020 - 0.0035)
Allowable Limit	0,15 (0.0059)
Camshaft Journal O.D.	45,934 - 45,950 (1.8085 - 1.8090)
Camshaft Bearing I.D.	46,000 - 46,025 (1.8111 - 1.8120)

Timing Gear

Timing Gear Backlash	
Crank Gear - Idler Gear 1	0,0490 - 0,193 (0.00193 - 0.00759)
Allowable Limit	0,22 (0.0087)
Idler Gear 1 - Cam Gear	0,0490 - 0,189 (0.00193 - 0.00744)
Allowable Limit	0,22 (0.0087)
Idler Gear 1 - Idler Gear 2	0,0440 - 0,185 (0.00174 - 0.00728)
Allowable Limit	0,22 (0.0087)
Idle Gear 2 - Injection Pump Gear	0,0440 - 0,177 (0.00174 - 0.00696)
Allowable Limit	0,22 (0.0087)
Cam Gear to Balancer Gear 1	0,0470 - 0,182 (0.00185 - 0.00716)
Allowable Limit	0,22 (0.0087)
Idle Gear 1 to Balancer Gear 2	0,0440 - 0,183 (0.00172 - 0.00720)
Allowable Limit	0,22 (0.0087)
Oil Clearance Between Idle Gear Shaft 1,2 And Idle Gear Bushing 1,2	0,05 - 0,091 (0.0020 - 0.0035)
Allowable Limit	0,10 (0.0039)
Idle Gear 1,2 Bushing I.D.	45,025 - 45,050 (1.7727 - 1.7736)
Idle Gear 1,2 Shaft O.D.	44,959 - 44,975 (1.7701 - 1.7706)
Idle Gear Side Clearance	0,15 - 0,30 (0.0059 - 0.011)
Allowable Limit	0,9 (0.04)
Balancer Shaft Side Clearance	0,070 - 0,22 (0.0028 - 0.0086)
Allowable Limit	0,3 (0.01)
Balancer Shaft Alignment	-
Allowable Limit	0,02 (0.008)
Balancer Shaft Oil Clearance	0,0700 - 0,159 (0.00276 - 0.00625)
Allowable Limit	0,2 (0.008)
Balancer Shaft Journal O.D.	50,920 - 50,940 (2.0048 - 2.0055)
Balancer Shaft Bearing I.D.	51,01 - 51,08 (2.008 - 2.011)

Dealer Copy -- Not for Resale

ENGINE INFORMATION (CONT'D)

All dimensions are given in millimeters. Respective imperial dimensions are given in inches enclosed by parentheses.

Piston And Piston Ring

Piston Pin Bore I.D.	30,000 - 30,013 (1.1811 - 1.1816)
Allowable Limit	30,05 (1.183)
Clearance Between Top Ring and Ring Groove	0,05 - 0,09 (0.002 - 0.003)
Allowable Limit	0,15 (0.0059)
Clearance Between Second Ring and Ring Groove	0,0930 - 0,120 (0.00367 - 0.00472)
Allowable Limit	0,20 (0.0079)
Clearance Between Oil Ring And Ring Groove	0,020 - 0,060 (0.00079 - 0.0023)
Allowable Limit	0,15 (0.0059)
Piston Ring Gap	
Top Ring	0,30 - 0,45 (0.012 - 0.017)
Allowable Limit	1,25 (0.0492)
Second Ring	0,30 - 0,45 (0.012 - 0.017)
Allowable Limit	1,25 (0.0492)
Oil Ring	0,25 - 0,45 (0.0099 - 0.017)
Allowable Limit	1,25 (0.0492)

Connecting Rod

Connecting Rod Alignment - Allowable Limit	0,05 (0.0020)
Clearance Between Piston Pin And Small End Bushing	0,02 - 0,040 (0.00079 - 0.0015)
Allowable Limit	0,15 (0.0059)
Piston Pin O.D.	30,006 - 30,011 (1.1814 - 1.1815)
Small End Busing I.D.	30,031 - 30,046 (1.1824 - 1.1829)

Cylinder Bore

Cylinder Bore I.D.	100,000 - 100,022 (3.93701 - 3.93787)
Allowable Limit	100,15 (3.9429)
Oversized Cylinder Liner I.D.	100,500 - 100,522 (3.95670 - 3.95755)
Allowable Limit	100,65 (3.96260)

Crankshaft

Crankshaft Alignment - Allowable Limit	0,02 (0.0008)
Crankpin O.D.	52,977 - 52,990 (2.0857 - 2.0862)
Crankshaft Journal O.D.	74,977 - 74,990 (2.9519 - 2.9523)
Oil Clearance Between Crankshaft Journal And Crankshaft Bearing	0,018 - 0,062 (0.00071 - 0.0024)
Allowable Limit	0,20 (0.0079)
Oil Clearance Between Crank Pin And Pin Bearing	0,018 - 0,051 (0.00071 - 0.0020)
Allowable Limit	0,20 (0.0079)
Crankshaft Side Clearance	0,15 - 0,31 (0.0059 - 0.0122)
Allowable Limit	0,50 (0.020)

Dealer Copy -- Not for Resale

ENGINE INFORMATION (CONT'D)

All dimensions are given in millimeters. Respective imperial dimensions are given in inches enclosed by parentheses.

Oil Pump

Engine Oil Pressure - At Idle Speed	-
Allowable Limit	50 kPa (0,5 bar) (7 psi)
Engine Oil Pressure - At Rated Speed	200 - 390 kPa (2-3,9 bar) (29 - 56 psi)
Allowable Limit	150 kPa (1.5 bar) (21 psi)
Engine Oil Pressure Switch Working Pressure	40 - 50 kPa (0,4 - 0,5 bar) (6 - 8 psi)
Clearance Between Inner Rotor And Outer Rotor	0,040 - 0,16 (0.0016 - 0.0062)
Allowable Limit	0,3 (0.01)
Clearance Between Outer Rotor And Pump Body	0,100 - 0,184 (0.00394 - 0.00724)
Allowable Limit	0,3 (0.01)
Clearance Between Inner Rotor And Cover	0,025 - 0,075 (0.00099 - 0.0029)
Allowable Limit	0,225 (0.00886)
Relief Valve Working Pressure	887 kPa (8.87 bar)(129 psi)

Cooling System

Thermostat Valve Opening Temperature	74,5 - 78,5°C (166.1 - 173.3°F)
Temperature At Which Thermostat Completely Opens	90°C (194°F)
Radiator Water Tightness	No leak at specified pressure
Radiator Cap Air Leakage	10 seconds or more 90 --> 60 kPa 0,9 --> 0,6 bar 10 --> 9 psi
Fan Belt Tension	10 - 12 mm / 98 N (0.40 - 0.47 in / 98 N) (22 lbs)

Intake Air Heater

Intake Air Heater Resistance (at cold occasion)	Approximately 0.3W
---	--------------------

Dealer Copy -- Not for Resale

ENGINE INFORMATION (CONT'D)

Torque Values

Kubota Metric Engine Bolts

Thread Size (Dia. x Pitch)	Material		
	Head Mark 4	Head Mark 7	Head Mark 10
M5 x 0.8		4-5 N•m (3-4 ft-lb)	
M6 x 1.0		8-9 N•m (6-7 ft-lb)	8-12 N•m (6-9 ft-lb)
M8 x 1.25	8-12 N•m (6-9 ft-lb)	15-22 N•m (11-16 ft-lb)	24-34 N•m (18-25 ft-lb)
M10 x 1.25	18-24 N•m (13-18 ft-lb)	30-41 N•m (22-30 ft-lb)	49-68 N•m (36-50 ft-lb)
M12 x 1.25	30-41 N•m (22-30 ft-lb)	54-73 N•m (40-54 ft-lb)	94-118 N•m (69-87 ft-lb)
M14 x 1.5	49-68 N•m (36-50 ft-lb)	79-108 N•m (58-80 ft-lb)	157-186 N•m (116-137 ft-lb)

Tightening Torques For General Use Screws, Bolts And Nuts

Grade Nominal Unit Diameter	Standard Screw and Bolt (4)			Special Screw and Bolt (7)		
	N•m	kg•fm	ft-lbs	N•m	kg•fm	ft-lbs
M6	7.9 to 9.3	0.80 to 0.95	5.8 to 6.9	9.8 to 11.3	1.00 to 1.15	7.23 to 8.32
M8	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
M10	39.2 to 45.1	4.0 to 4.6	28.9 to 33.3	49.0 to 55.9	5.0 to 5.7	36.2 to 41.2
M12	62.8 to 72.6	6.4 to 7.4	46.3 to 53.5	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5

Screw and bolt material grades are shown by numbers punched on the screw and bolt heads. Prior to tightening, be sure to check out the numbers as shown below.

Punched number	Screw and bolt material grade
None or 4	Standard screw and bolt SS400, S20C
7	Special screw and bolt S43C, S48C (Refined)

ENGINE INFORMATION (CONT'D)

Engine Torque Component

NOTE:

- For “*” marked screws, bolts and nuts on the table, apply engine oil to their threads and seats before tightening.
- The letter “M” in Size x Pitch means that the screw, bolt or nut dimension stands for metric. The size is the nominal outside diameter in mm of the threads. The pitch is the nominal distance in mm between two threads.

ITEM	SIZE X PITCH	N•M	KGf•M	FT-LB
Cylinder head cover screw	-	6,9 - 11,2	0,70 - 1,15	5.1 - 8.31
*Cylinder head screw	M12 x 1.25	98,1 - 107	10,0 - 11,0	72,4 - 79,5
*Connecting rod screw	M10 x 1.25	79 - 83	8,0 - 8,5	58 - 61
*Flywheel screw	M12 x 1.25	98,1 - 107	10,0 - 11,0	72,4 - 79,5
*Crankshaft screw	M16 x 1.5	255 - 274	26,0 - 28,0	188 - 202
*Main bearing case screw	M14 x 1.5	138 - 147	14,0 - 15,0	102 - 108
Rocket arm bracket screw	M10 x 1.25	49 - 55	5,0 - 5,7	37 - 41
Nozzle holder clamp nut	M8 x 1.25	18 - 20	1,8 - 2,1	13 - 15
Injection pipe retaining nut	M12 x 1.5	23 - 36	2,3 - 3,7	17 - 26
Overflow pipe assembly retaining screw	M6 x 1.0	9,8 - 11,2	1,0 - 1,15	7.24 - 8.31
Oil switch taper screw	R 1/8	15 - 19	1,5 - 2,0	11 - 14
Oil cooler joint screw	-	40 - 44	4,0 - 4,5	29 - 32
Oil pump cover screw	-	7,9 - 9,3	0,80 - 0,95	5.8 - 6.8
Intake air heater terminal nut	M6 x 1.0	3,5 - 5,3	0,35 - 0,55	2.6 - 3.9
Starter's terminal B mounting nut	M8 x 1.25	9,8 - 11	1,0 - 1,2	7.3 - 8.6
Timer gear mounting nut	-	74 - 83	7,5 - 8,5	55 - 61
Injection pump unit mounting nut	M8 x 1.25	18 - 20	1,8 - 2,1	13 - 15
Gear case cover	M8 x 1.25 (7T)	24 - 27	2,4 - 2,8	18 - 20
	M8 x 1.25 (10T)	33 - 36	3,3 - 3,7	24 - 26
Relief valve retaining screw	-	69 - 78	7,0 - 8,0	51 - 57
Idle gear mounting screw	M8 x 1.25	24 - 27	2,4 - 2,8	18 - 20
Plate mounting screw	M8 x 1.25	24 - 27	2,4 - 2,8	18 - 20
Camshaft set screw	M8 x 1.25	24 - 27	2,4 - 2,8	18 - 20
Flywheel housing mounting screw	M12 x 1.25	78 - 90	7,9 - 9,2	58 - 66
Crankcase 2 mounting screw	M10 x 1.25	49 - 55	5,0 - 5,7	37 - 41
Injection pump mounting screw	M8 x 1.25	24 - 27	2,4 - 2,8	18 - 20
Injection pump mounting nut	M8 x 1.25	18 - 20	1,8 - 2,1	13 - 15
Boost actuator (Boost compensator model only)	-	40 - 45	4,0 - 4,6	29 - 33
Governor weight mounting nut	M12 x 1.25	63 - 72	6,4 - 7,4	47 - 53
Fuel camshaft stopper mounting screw	-	7,9 - 9,3	0,80 - 0,95	5.8 - 6.8
Governor housing mounting screw	M6 x 1.0	9,8 - 11,2	1,0 - 1,15	7.24 - 8.31
Anti-rotation nut	M5 x 0.8	2,8 - 4,0	0,29 - 0,41	2.1 - 2.9
Balancer shaft set screw	M8 x 1.25	24 - 27	2,4 - 2,8	18 - 20
Bearing case cover mounting screw	M8 x 1.25	24 - 27	2,4 - 2,8	18 - 20
Alternator pulley nut	-	58,4 - 78,9	5,95 - 8,05	43.1 - 58.2
Thermo valve	R 3/8	30 - 39	3,0 - 4,0	22 - 28

Dealer Copy -- Not for Resale

ENGINE INFORMATION (CONT'D)

Troubleshooting

The following troubleshooting chart is provided for assistance in locating and correcting problems which are most common. Many of the recommended procedures must be done by authorized Bobcat Service Personnel only.

PROBLEM	CAUSE
Slow cranking speed.	1, 2, 3
Engine will not start.	2, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 19, 27, 28, 29
Difficult to start.	1, 2, 5, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 25, 27, 28, 29, 54
No power for engine.	8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 20, 21, 22, 23, 27, 28, 29
Engine is mis-firing.	8, 9, 11, 12, 13, 15, 16, 17, 21, 22, 24, 25, 26, 28
Too much fuel consumption.	10, 12, 13, 15, 16, 17, 19, 20, 21, 23, 24, 25, 27, 28, 29
Black exhaust.	10, 12, 13, 15, 16, 17, 19, 20, 21, 23, 24, 25, 27, 28, 29
Blue/white exhaust.	4, 10, 15, 16, 17, 21, 23, 27, 29, 30, 50
Low oil pressure.	4, 31, 32, 33, 34, 35, 37, 38, 39, 52
Engine knocking.	13, 15, 16, 19, 22, 24, 25, 27, 29, 31, 40, 41, 53
Engine running rough.	7, 8, 9, 10, 11, 12, 13, 17, 18, 22, 24, 25, 26, 29, 40, 53
Vibration.	12, 13, 17, 21, 22, 25, 26, 29, 40, 42, 43
High oil pressure warning.	4, 33, 36
Overheating.	10, 12, 13, 15, 16, 20, 21, 40, 44, 45, 46, 47, 48, 51
Too much crankcase pressure.	22, 27, 29, 30, 40, 49
Poor compression.	10, 16, 21, 24, 25, 27, 28, 29, 30, 41, 53
Start and stop.	9, 10, 11

Dealer Copy -- Not for Resale

ENGINE INFORMATION (CONT'D)

Troubleshooting (Cont'd)

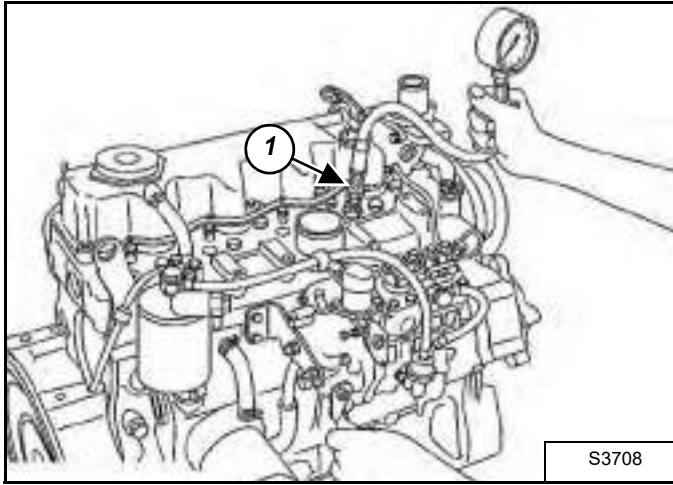
KEY TO CORRECT THE CAUSE	
1. Alternator belt is loose or damaged.	28. Worn valve and seats.
2. Bad electrical connections.	29. Broken or worn piston rings.
3. Faulty starter motor.	30. Worn valve stems or guides.
4. Incorrect grade of oil.	31. Worn or damaged bearings.
5. Low cranking speed.	32. Not enough oil in the crankcase.
6. Fuel tank empty.	33. Switch/sensor is defective.
7. Faulty stop control operation.	34. Oil pump worn.
8. Plugged fuel line.	35. Relief valve is sticking open.
9. Plugged fuel filter.	36. Relief valve is sticking closed.
10. Restriction in the air cleaner.	37. Broken relief valve spring.
11. Air in the fuel system.	38. Faulty suction pipe.
12. Faulty fuel injection pump.	39. Plugged oil filter.
13. Faulty fuel injectors.	40. Piston seizure.
14. Broken injection pump drive.	41. Incorrect piston height.
15. Incorrect injection pump timing.	42. Faulty engine mounting.
16. Incorrect valve timing.	43. Incorrect flywheel alignment.
17. Poor compression.	44. Faulty thermostat.
18. Plugged fuel tank vent.	45. Restriction in water jacket.
19. Incorrect grade of fuel.	46. Loose alternator belt.
20. Exhaust pipe restriction.	47. Plugged radiator.
21. Cylinder head gasket leaking.	48. Faulty water pump.
22. Overheating.	49. Plugged breather pipe.
23. Cold running.	50. Damaged valve stem deflectors.
24. Incorrect tappet adjustment.	51. Coolant level to low.
25. Sticking valves.	52. Plugged oil pump pipe strainer.
26. Incorrect fuel lines.	53. Broken valve spring.
27. Worn cylinder bores.	54. Damaged Battery

Dealer Copy -- Not for Resale

ENGINE INFORMATION (CONT'D)

Compression - Checking

Figure 70-10-1



After warming up the engine, stop it and remove the air cleaner, the muffler, high pressure pipes, cylinder head cover, overflow pipe, all nozzle holders and all nozzle gaskets.

Install a compression tester and nozzle adaptor MEL1614 for diesel engines to nozzle holder hole (Item 1) [Figure 70-10-1].

After making sure that the stop lever is set at the stop position (Non-injection), run the engine at 200 to 300 RPM with the starter.

Read the maximum pressure. Measure the pressure more than twice.

If the measurement is below the allowable limit, apply a small amount of oil to the cylinder wall through the nozzle hole and measure the compression pressure again.

If the compression pressure increase after applying oil. check the cylinder wall and piston rings.

If the compression pressure is still less than the allowable limit, check the top clearance, valve and cylinder head.

NOTE: Check the compression pressure with the specified valve clearance.

Always use a fully charged battery for performing this test.

Variations in cylinder compression values should be under 10%.

Compression pressure	Factory spec.	3,47 MPa /250 RPM 504 psi /250 RPM
	Allowable limit	2,56 MPa / 250 RPM 371 psi / 250 RPM

Tightening Torque	Nozzle holder clamp nut	18 to 20 N•m 13 to 15 ft-lb
	Overflow pipe assembly retaining screw	9,8 to 11,2 N•m 7.24 to 8.31 ft-lb
	Cylinder head cover screw	6,9 to 11,2 N•m 5.1 to 8.31 ft-lb
	Injection pipe retaining nut	23 to 36 N•m 17 to 26 ft-lb

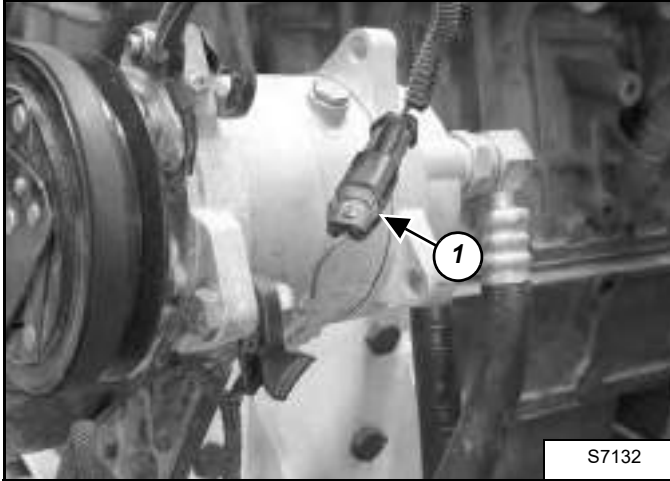
ENGINE AND ENGINE MOUNTS

Removal And Installation

Remove the engine / hydrostat assembly. (See Removal And Installation on Page 70-30-1.)

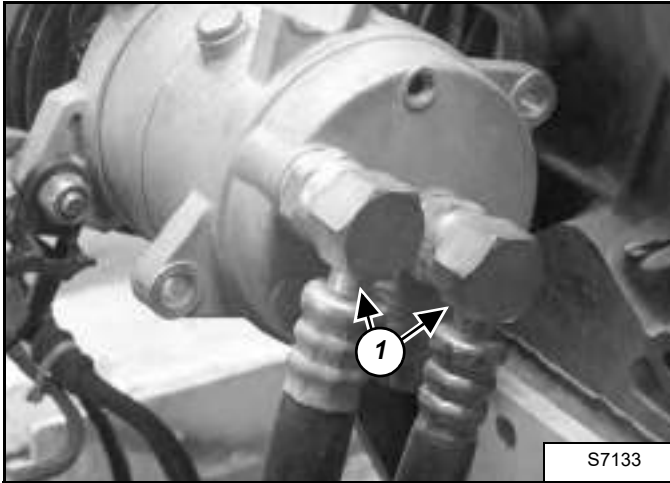
Remove the radiator. (See Radiator Removal And Installation on Page 70-70-1.)

Figure 70-20-1



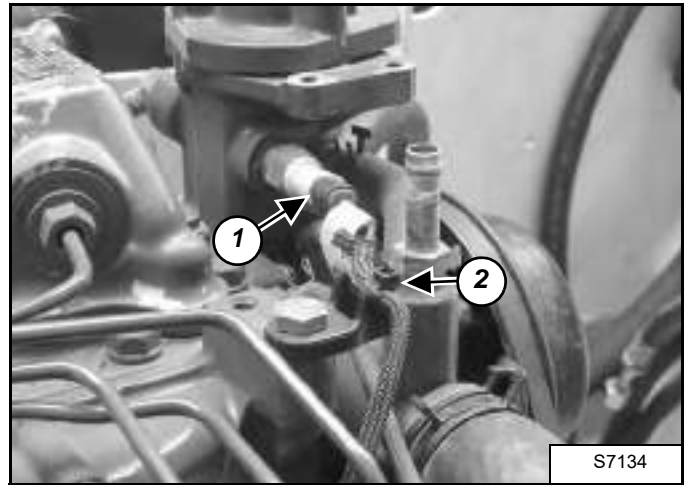
Disconnect the electrical connector (Item 1) [Figure 70-20-1] from the A/C compressor (if machine is equipped with air conditioning).

Figure 70-20-2



Remove the two hoses (Item 1) [Figure 70-20-2] from the A/C compressor (if machine is equipped with air conditioning).

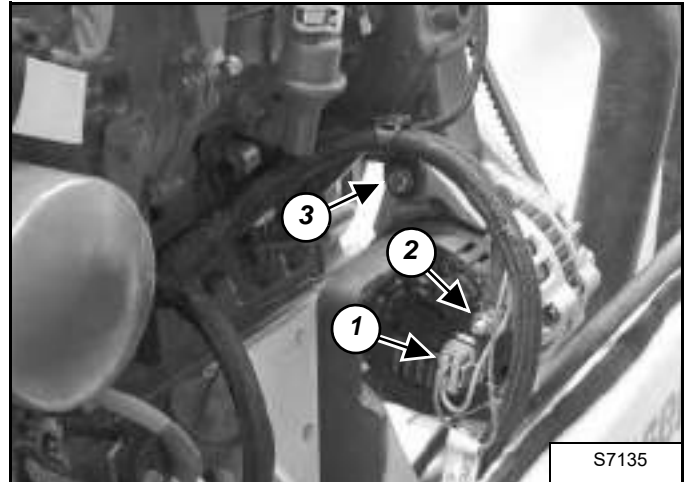
Figure 70-20-3



Disconnect the water temperature sender connector (Item 1) [Figure 70-20-3].

Remove the tie strap (Item 2) [Figure 70-20-3] from the wiring harness clamp.

Figure 70-20-4



Remove the L & S terminal (Item 1) and B+ terminal (Item 2) [Figure 70-20-4] from the alternator.

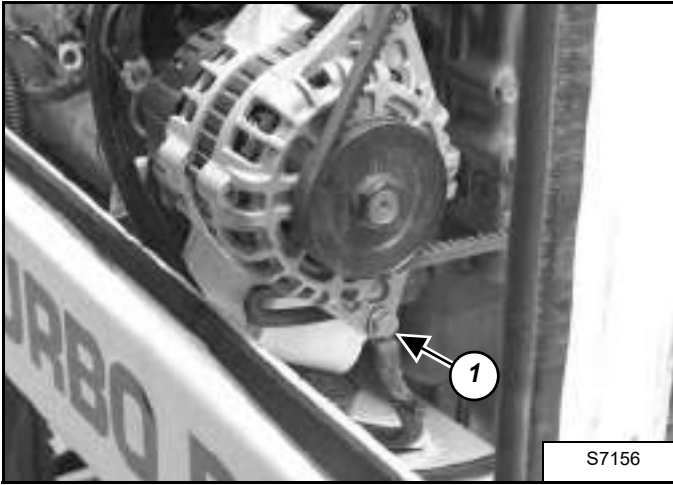
Remove the wire harness clamp (Item 2) [Figure 70-20-4].

Dealer Copy -- Not for Resale

ENGINE AND ENGINE MOUNTS (CONT'D)

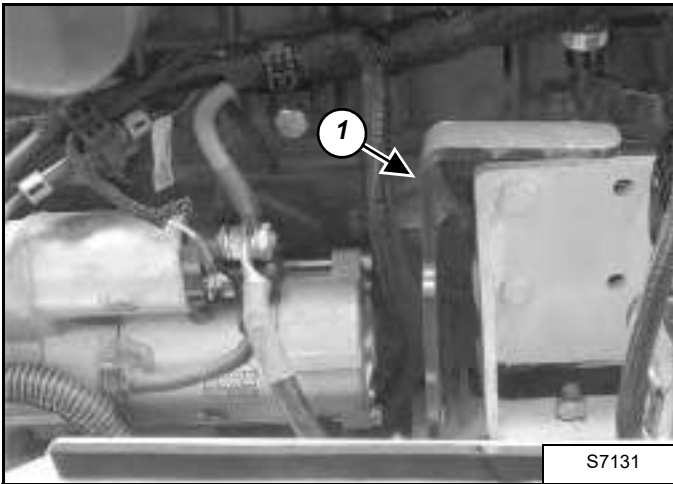
Removal And Installation (Cont'd)

Figure 70-20-5



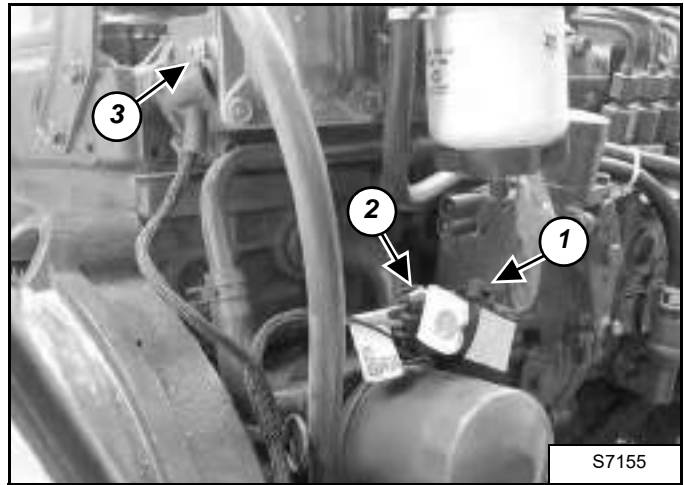
Remove the ground cable (Item 1) [Figure 70-20-5] from the alternator.

Figure 70-20-6



Remove the bracket (Item 1) [Figure 70-20-6].

Figure 70-20-7

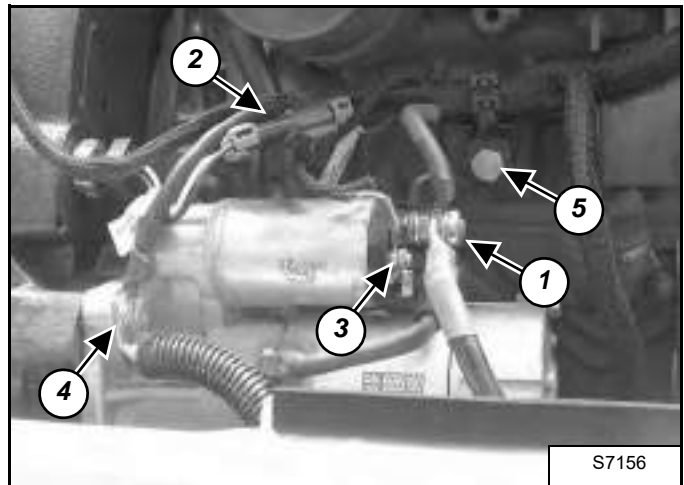


Remove the tie strap (Item 1) [Figure 70-20-7].

Disconnect the fuel shutoff solenoid connector (Item 2) [Figure 70-20-7].

Disconnect the wiring harness (Item 3) [Figure 70-20-7] from the air intake heater.

Figure 70-20-8



Disconnect the positive (+) wires (Item 1) [Figure 70-20-8] from the starter.

Disconnect the wire connector (Item 2) [Figure 70-20-8] from the engine speed sensor

Disconnect the wire (Item 3) [Figure 70-20-8] from the starter solenoid.

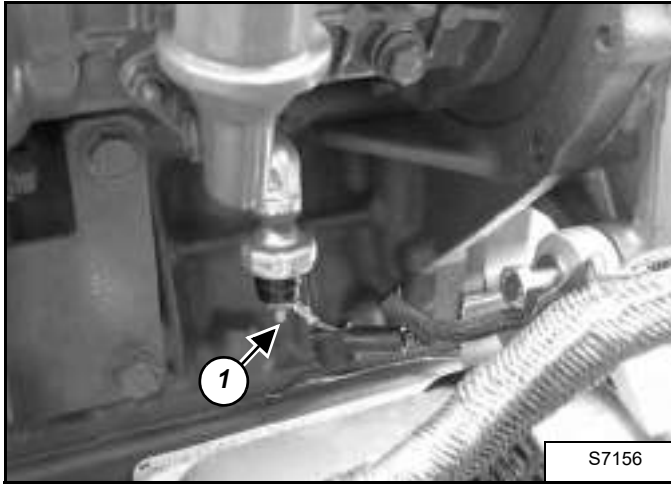
Remove the ground cable (Item 4) [Figure 70-20-8].

Remove the wire harness clamp (Item 5) [Figure 70-20-8].

ENGINE AND ENGINE MOUNTS (CONT'D)

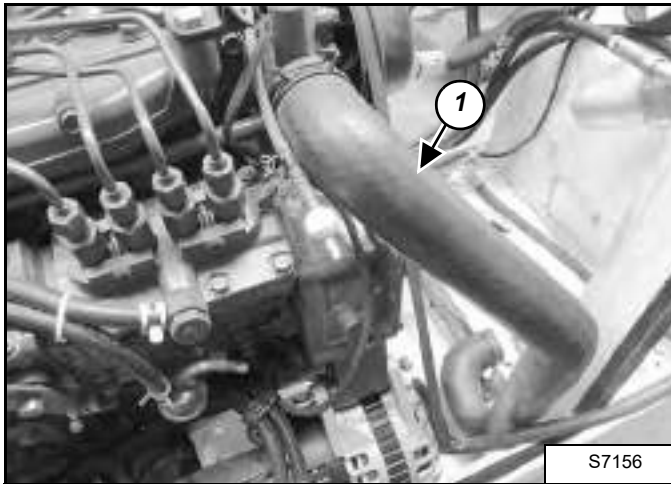
Removal And Installation (Cont'd)

Figure 70-20-9



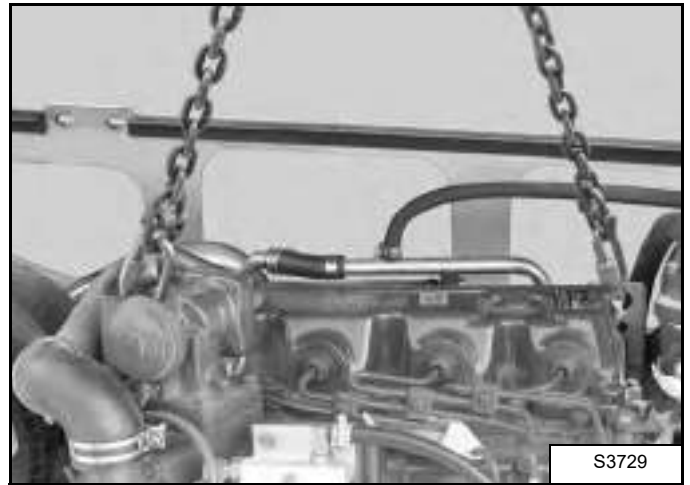
Disconnect the wire connector (Item 1) [Figure 70-20-9] from the oil pressure sender.

Figure 70-20-10



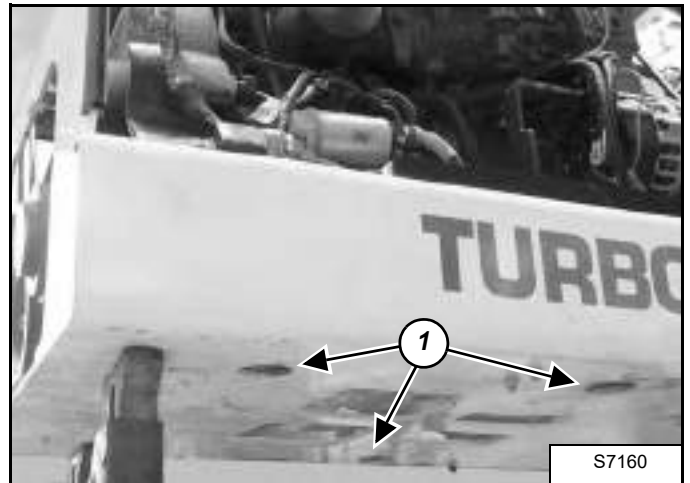
Remove the radiator hose (Item 1) [Figure 70-20-10] from the engine.

Figure 70-20-11



Install a hoist and chain to the lifting brackets [Figure 70-20-11] as shown.

Figure 70-20-12



Remove the three engine mount bolts (Item 1) [Figure 70-20-12] through the three openings in the bottom side of the engine / hydrostat assembly.

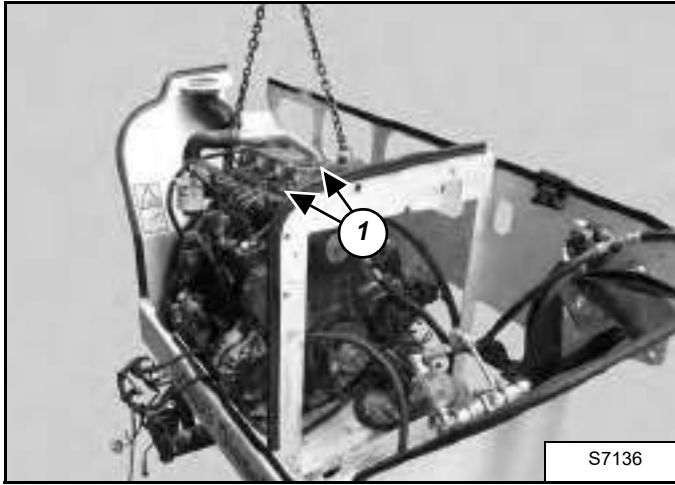
Installation: Tighten the engine mount bolts to 83-94 N•m (61-69 ft-lb) torque.

Dealer Copy -- Not for Resale

ENGINE AND ENGINE MOUNTS (CONT'D)

Removal And Installation (Cont'd)

Figure 70-20-13



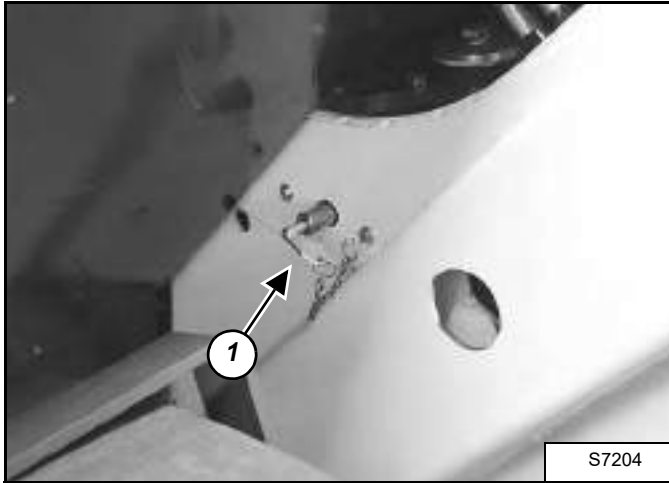
Lift the engine [Figure 70-20-13].

ENGINE AND HYDROSTAT ASSEMBLY

Removal And Installation

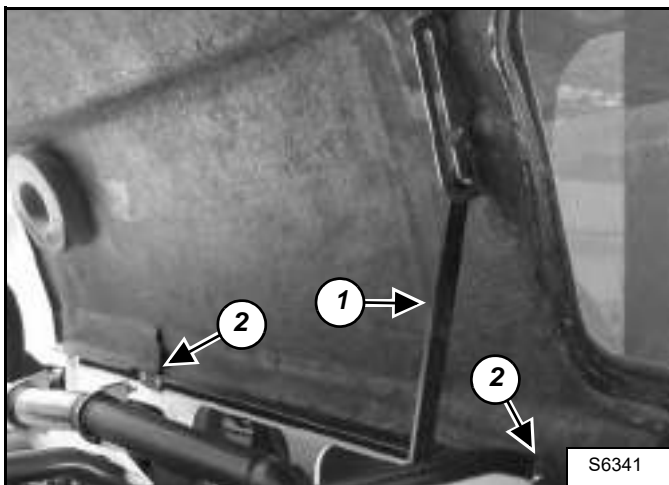
Raise the boom and install the boom stop. (See Installing The Approved Boom Stop on Page 10-160-1.)

Figure 70-30-1



Rotate the battery disconnect switch (Item 1) **[Figure 70-30-1]** to the right, to disconnect the power supply from the battery.

Figure 70-30-2



Remove the support (Item 1) **[Figure 70-30-2]** from the bracket on the engine cover.

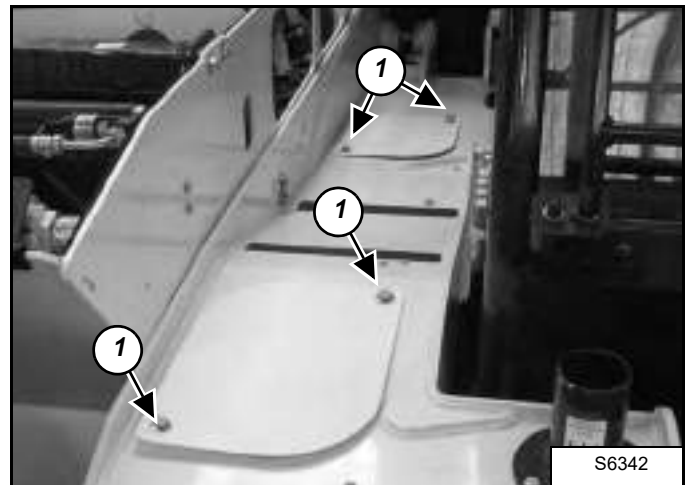
Remove the engine cover by disconnecting it from the hinges (Item 2) **[Figure 70-30-2]**.

Remove the muffler (See "Removal And Installation" on page 70-30-1).

Drain the hydraulic reservoir ((See Replacing Hydraulic Fluid on Page 10-100-2.)).

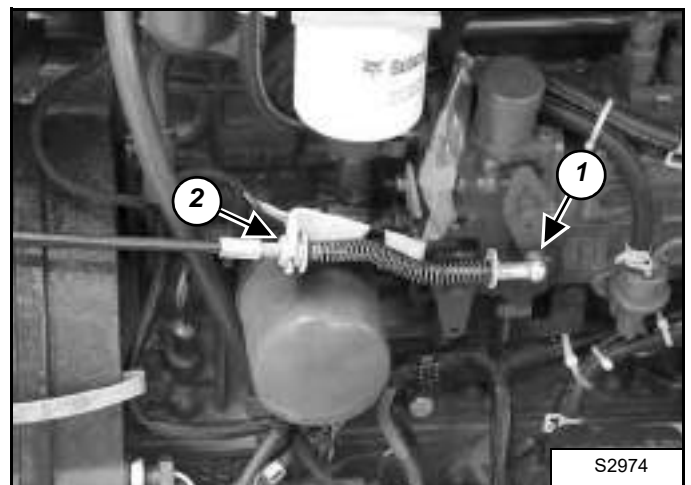
Drain the radiator (See Removing And Replacing The Coolant on Page 10-70-2.).

Figure 70-30-3



Remove the two covers by removing the bolts (Item 1) **[Figure 70-30-3]**.

Figure 70-30-4



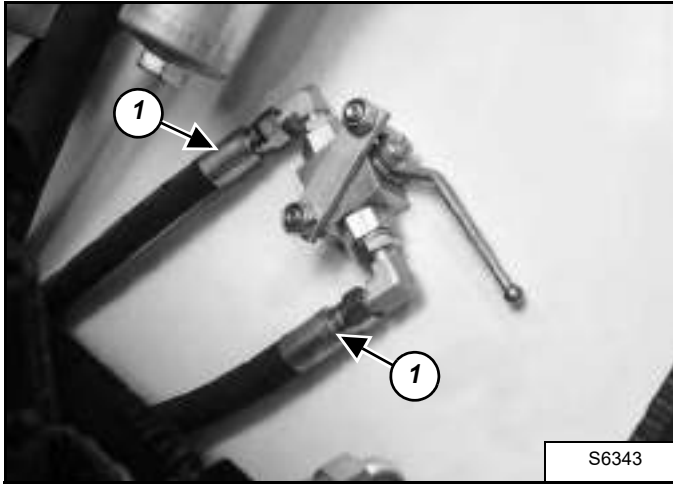
Remove the engine speed cable (Items 1 and 2) **[Figure 70-30-4]**.

Dealer Copy -- Not for Resale

ENGINE AND HYDROSTAT ASSEMBLY (CONT'D)

Removal And Installation (Cont'd)

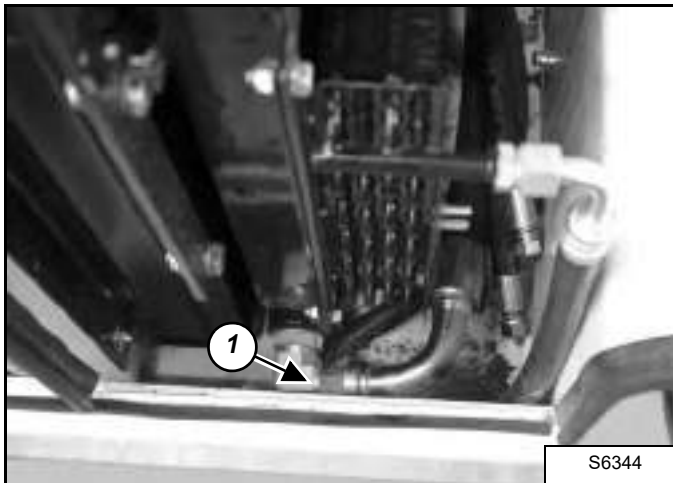
Figure 70-30-5



Disconnect the two hoses (Item 1) [Figure 70-30-5] of the towing valve.

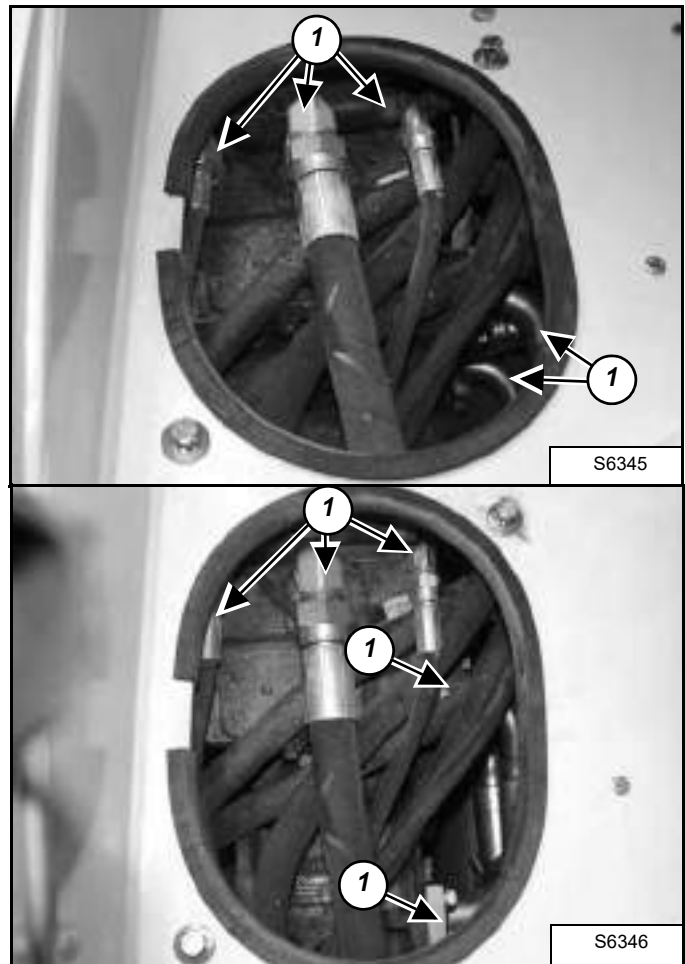
NOTE: Mark hoses for ease of installation.

Figure 70-30-6



Disconnect the hose (Item 1) [Figure 70-30-6] from the radiator.

Figure 70-30-7

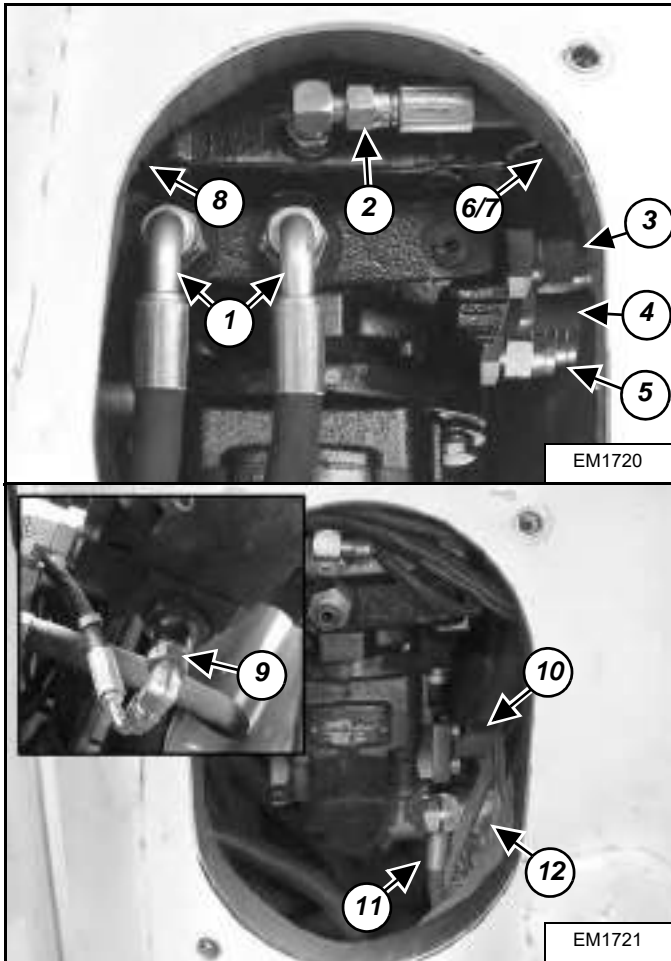


For S/N AC1911001 to 11999: Disconnect the twelve hydraulic hoses and tubelines (Item 1) [Figure 70-30-7]. Do this through the hole under the boom and through the hole in the bottom side of the machine.

ENGINE AND HYDROSTAT ASSEMBLY (CONT'D)

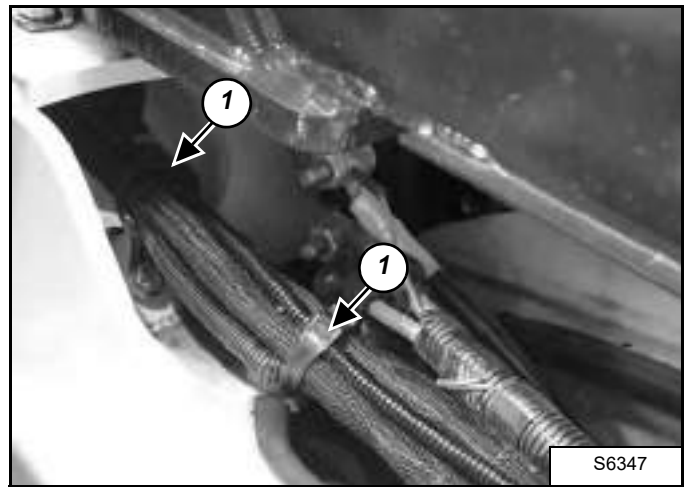
Removal And Installation (Cont'd)

Figure 70-30-8



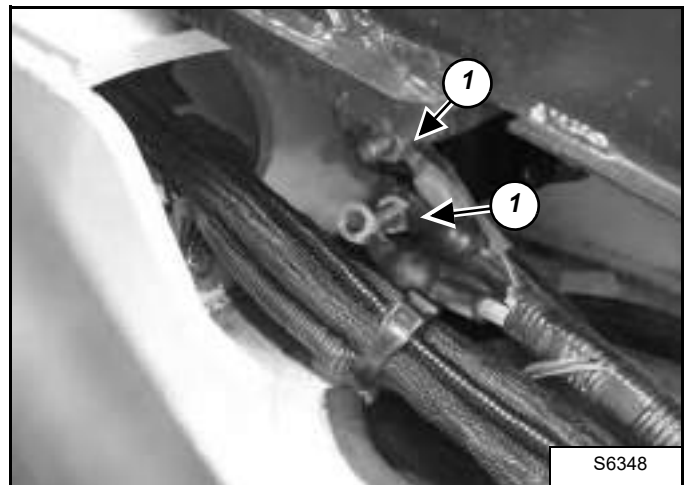
For S/N AC1912000 & Above: Disconnect all twelve hydraulic hoses (Items 1 to 12) [Figure 70-30-8]. Do this through the hole under the boom and through the hole in the bottom side of the machine.

Figure 70-30-9



Remove the tie straps (Item 1) [Figure 70-30-9] from the cables.

Figure 70-30-10



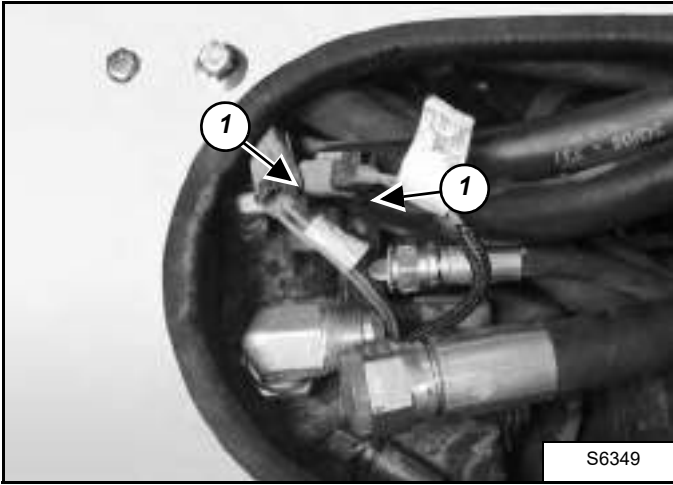
Remove the cables (Item 1) [Figure 70-30-10] from the main switch.

Dealer Copy -- Not for Resale

ENGINE AND HYDROSTAT ASSEMBLY (CONT'D)

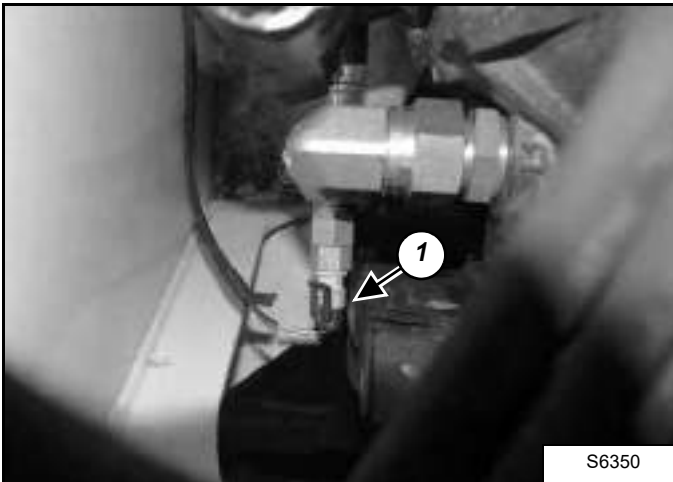
Removal And Installation (Cont'd)

Figure 70-30-11



Disconnect the two wire harness connectors (Item 1) [Figure 70-30-11] from the pump assembly.

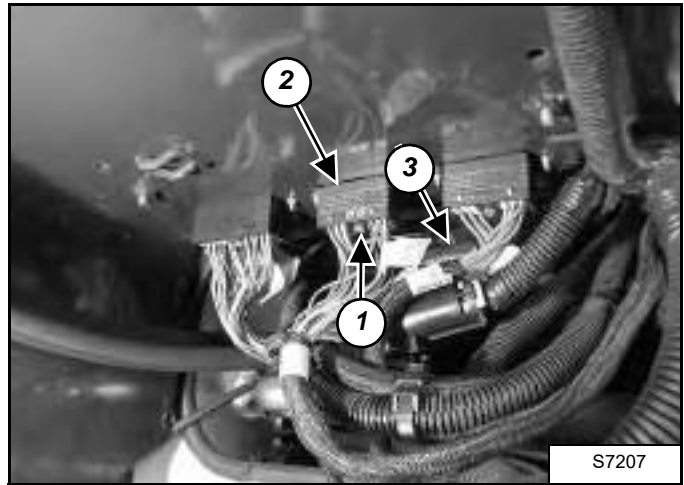
Figure 70-30-12



Disconnect the electrical connector (Item 1) [Figure 70-30-12] through the front hole under the boom.

Remove the battery access cover and battery (See Removal And Installation on Page 60-20-1.).

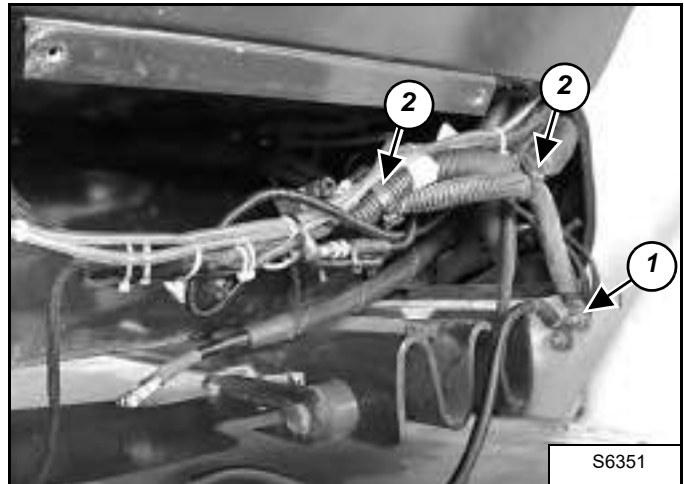
Figure 70-30-13



Loosen the screw (Item 1) and disconnect the electrical connector (Item 2) [Figure 70-30-13].

Disconnect the grey electrical connector (Item 3) [Figure 70-30-13].

Figure 70-30-14



Remove the ground cable (Item 1) [Figure 70-30-14] from the frame.

Remove the tie straps (Item 2) [Figure 70-30-14] from the harness.

ENGINE AND HYDROSTAT ASSEMBLY (CONT'D)

Removal And Installation (Cont'd)

If equipped with air conditioning, perform the following steps:

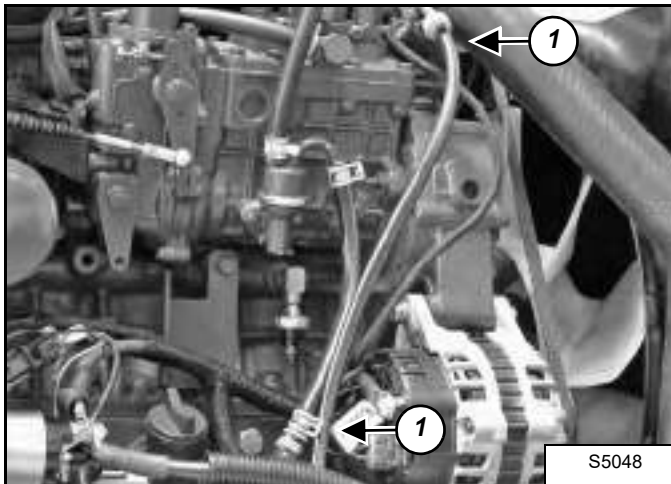
Remove the refrigerant from the A/C system. (See SYSTEM CHARGING AND RECLAMATION on Page 80-40-1.)

Remove the condenser from the A/C system:

S/N AC1C12999 & below: (See Removal And Installation on Page 80-60-1.)

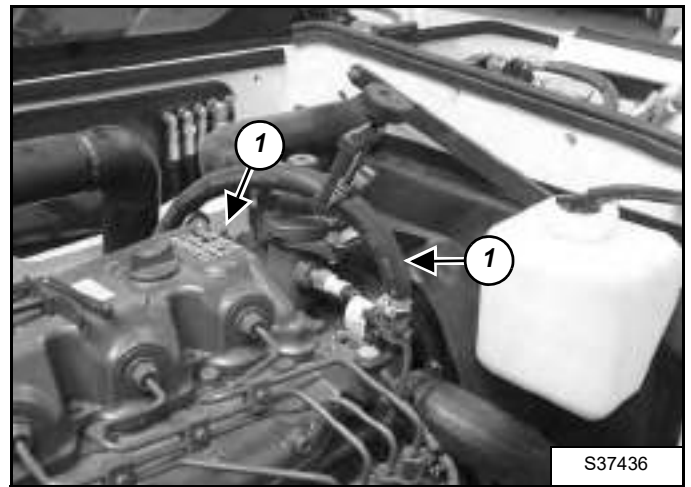
S/N AC1C13000 & above: (See Removal And Installation on Page 80-61-1.)

Figure 70-30-15



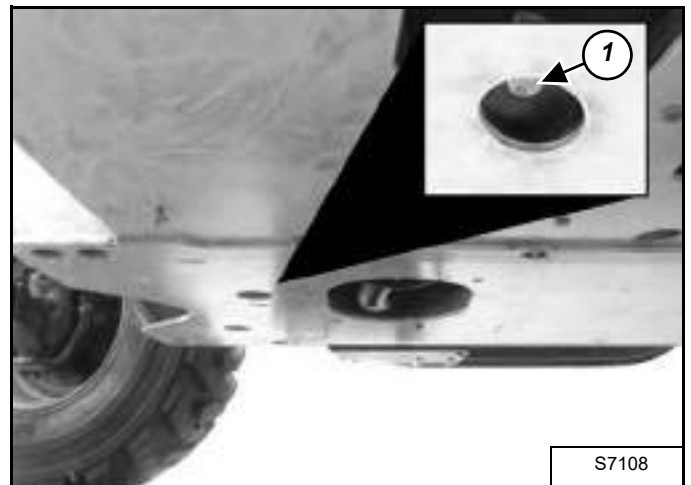
Disconnect and plug the fuel lines (Item 1) [Figure 70-30-15].

Figure 70-30-16



Remove and plug the cab heater hoses (Item 1) [Figure 70-30-15] (cab version only).

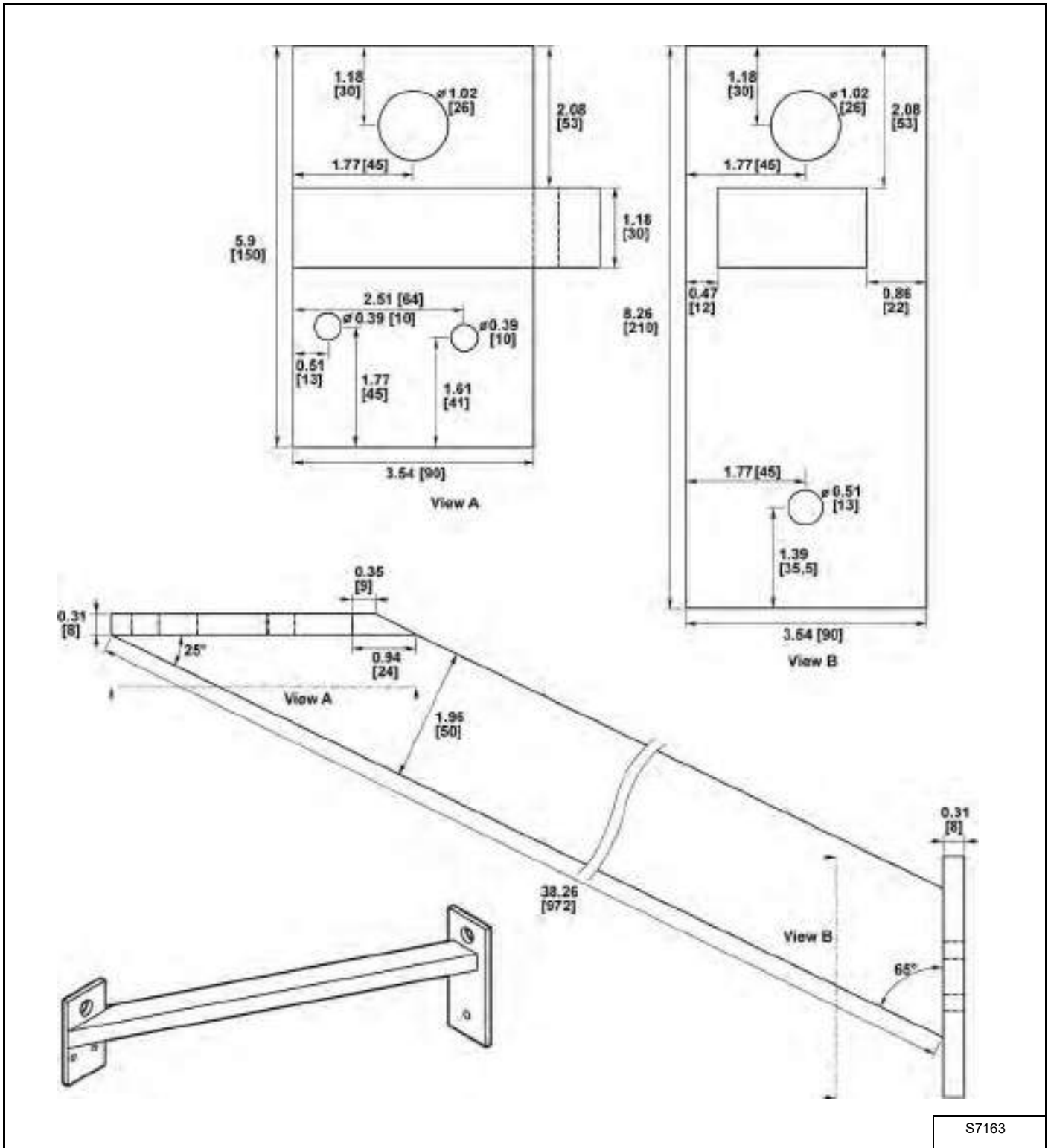
Figure 70-30-17



Remove the engine mounting bolt (Item 1) [Figure 70-30-17] on the bottom of the frame, below the drive belt cast housing.

Dealer Copy -- Not for Resale

Removal And Installation (Cont'd)



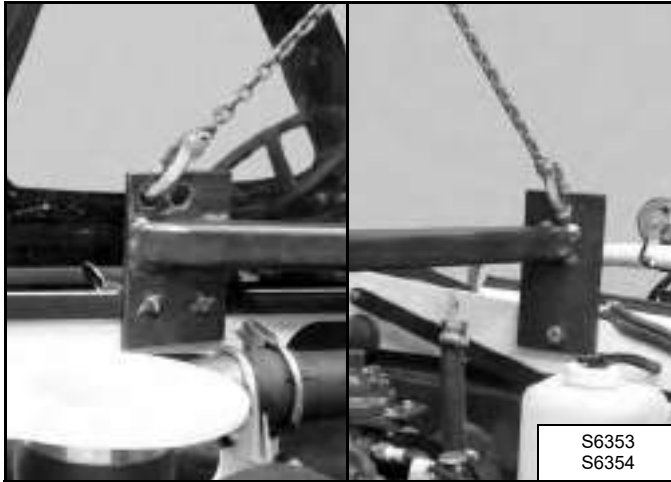
Dealer Copy -- Not for Resale

A tool needs to be fabricated to use in the removal procedure. This tool allows the engine/hydrostatic pump assembly to be lifted evenly for easier removal. Use the dimensions shown in **[Figure 70-30-18]** to make the engine removal tool.

ENGINE AND HYDROSTAT ASSEMBLY (CONT'D)

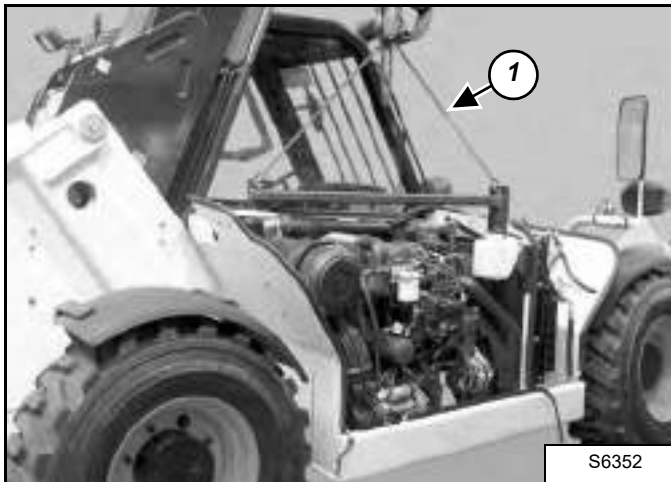
Removal And Installation (Cont'd)

Figure 70-30-19



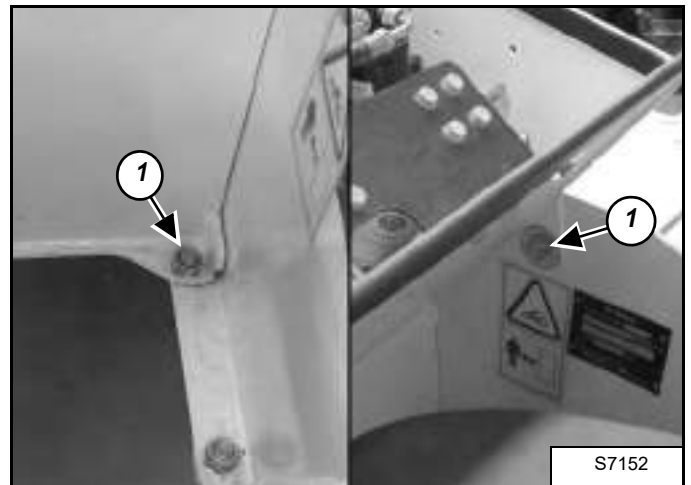
Attach chains to the lifting tool and attach to the frame [Figure 70-30-19].

Figure 70-30-20



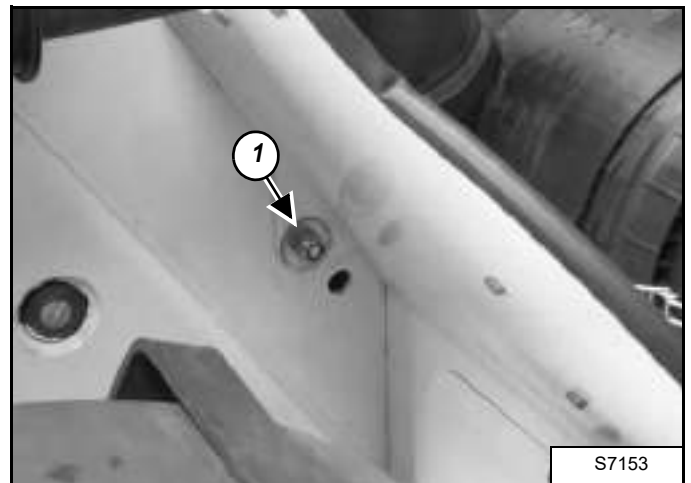
Properly attach the chains (Item 1) [Figure 70-30-20] to a lifting device.

Figure 70-30-21



Remove the two mounting bolts (Item 1) [Figure 70-30-21] on the front side of the engine / hydrostat assembly.

Figure 70-30-22



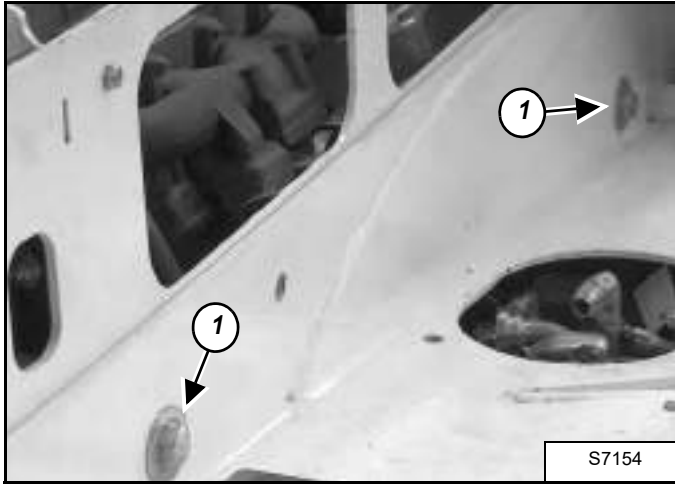
Remove the mounting bolt (Item 1) [Figure 70-30-22] on the rear side of the engine / hydrostat assembly.

Dealer Copy -- Not for Resale

ENGINE AND HYDROSTAT ASSEMBLY (CONT'D)

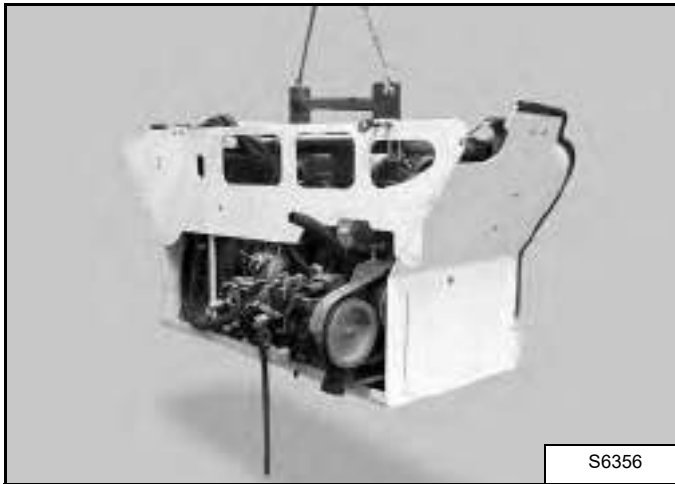
Removal And Installation (Cont'd)

Figure 70-30-23



Remove the two mounting bolts (Item 1) **[Figure 70-30-23]** on the boom side of the engine / hydrostat assembly.

Figure 70-30-24



Lift the engine / hydrostat assembly away from the machine **[Figure 70-30-24]**.



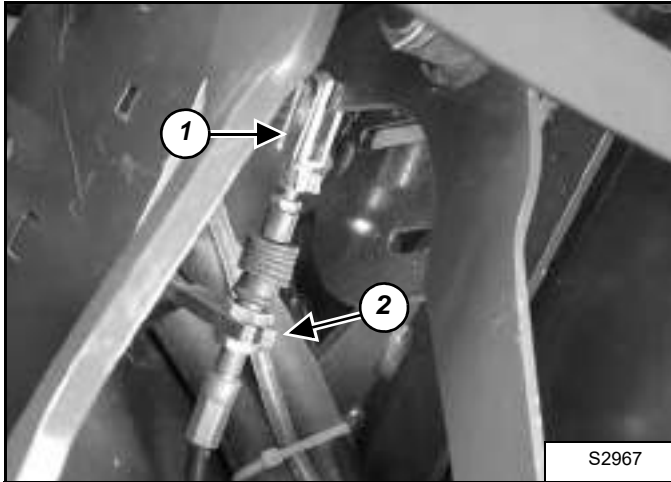
Bobcat®

Dealer Copy -- Not for Resale

ENGINE SPEED CONTROL

Removal And Installation

Figure 70-40-1



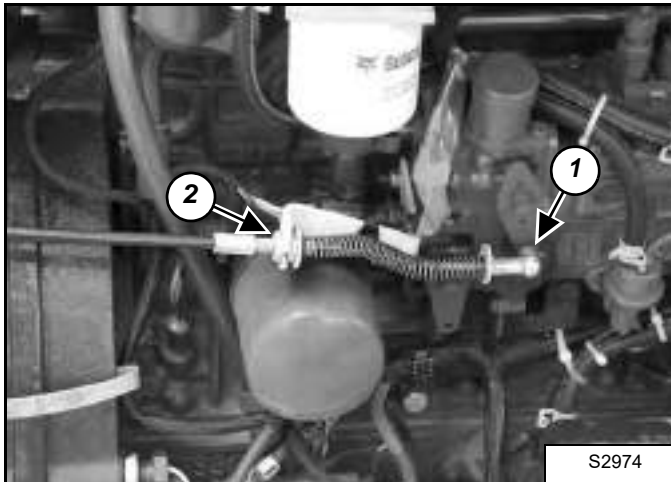
Remove the accelerator cable (Item 1) from the pedal and mounting bracket (Item 2) [Figure 70-40-1].

Remove the battery box cover.

Carefully pull the speed control cable through the cab and into the battery box.

Open the engine cover.

Figure 70-40-2



Remove small clip to remove ball joint (Item 1) [Figure 70-40-2].

Loosen the nut (Item 2) [Figure 70-40-2] to remove the speed control cable from the mounting bracket.

Remove any necessary tie straps and carefully remove the speed control cable.



Bobcat®

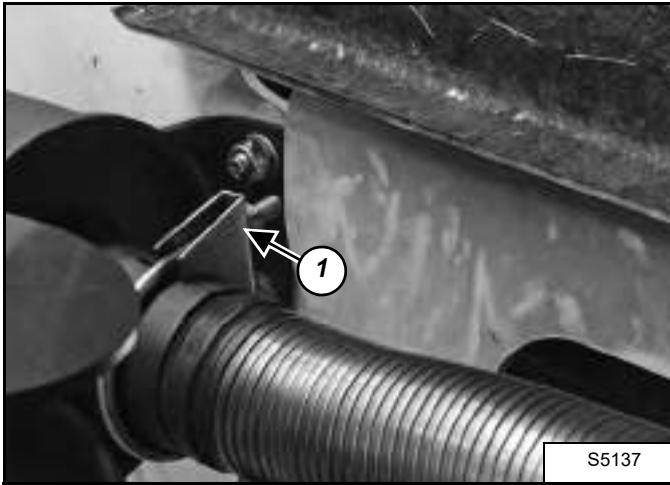
Dealer Copy -- Not for Resale

MUFFLER

Removal And Installation

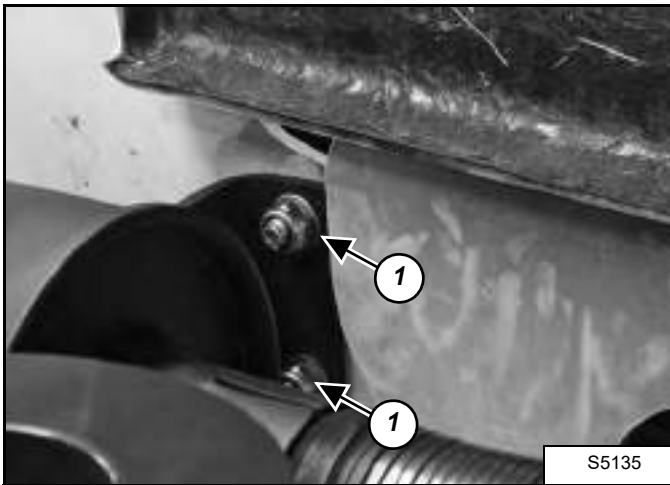
Open the Engine Cover.

Figure 70-50-1



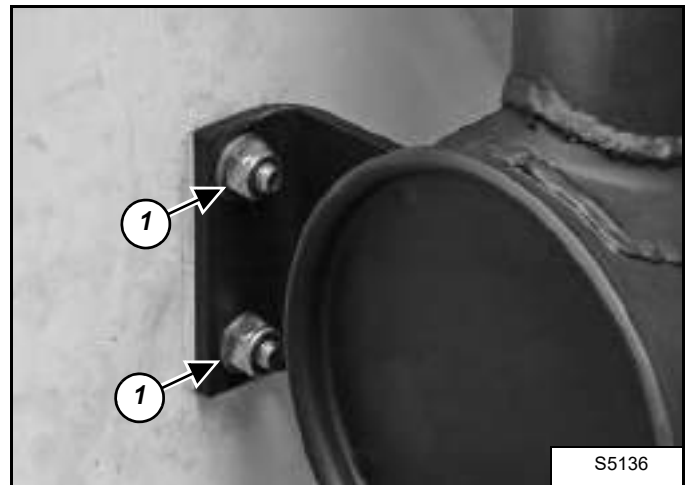
Remove the tightening bracket (Item 1) **[Figure 70-50-1]**.

Figure 70-50-2



Remove the two bolts (Item 1) **[Figure 70-50-2]** securing the muffler to the frame.

Figure 70-50-3



Remove the two bolts (Item 1) **[Figure 70-50-3]**.



Bobcat®

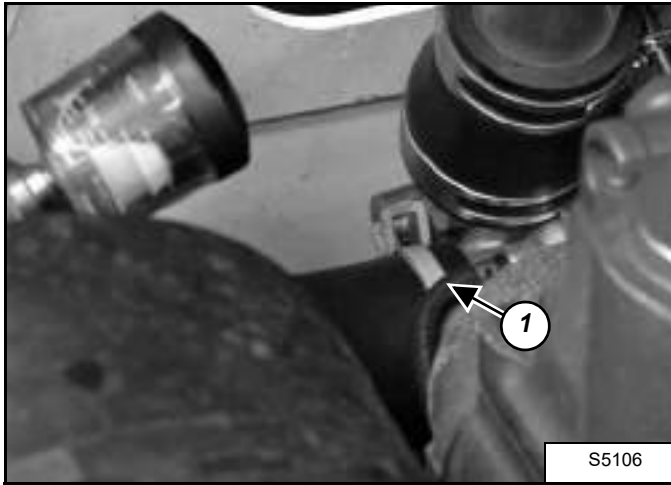
Dealer Copy -- Not for Resale

AIR CLEANER

Removal And Installation

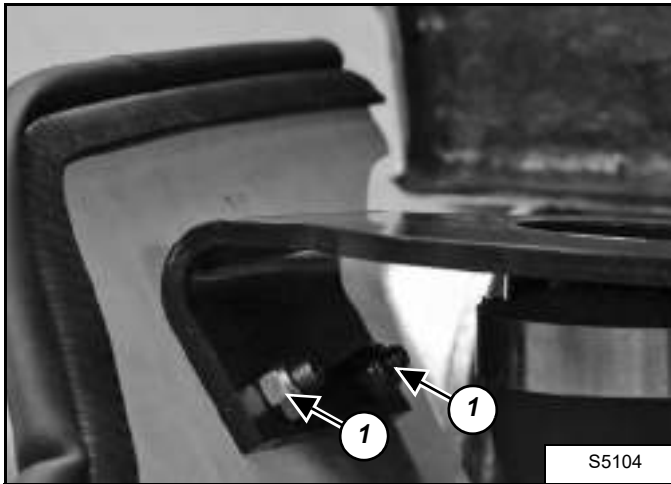
Open the Engine Cover.

Figure 70-60-1



Remove the hose clamp (Item 1) [Figure 70-60-1].

Figure 70-60-2



Remove the two nuts and bolts (Item 1) [Figure 70-60-2] securing the air cleaner frame to engine cover frame.

Figure 70-60-3

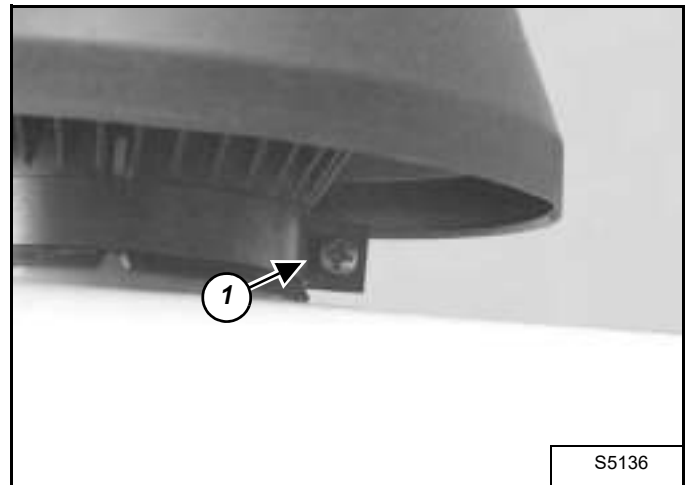


Remove the bolts (Item 1) [Figure 70-60-3] and remove the air cleaner.

Installation: perform the actions for removal in reverse order.

Air Intake Cowling Removal And Installation

Figure 70-60-4



Loosen the bolt (Item 1) [Figure 70-60-4] and remove the air intake cowling.

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

ENGINE COOLING SYSTEM

Radiator Removal And Installation

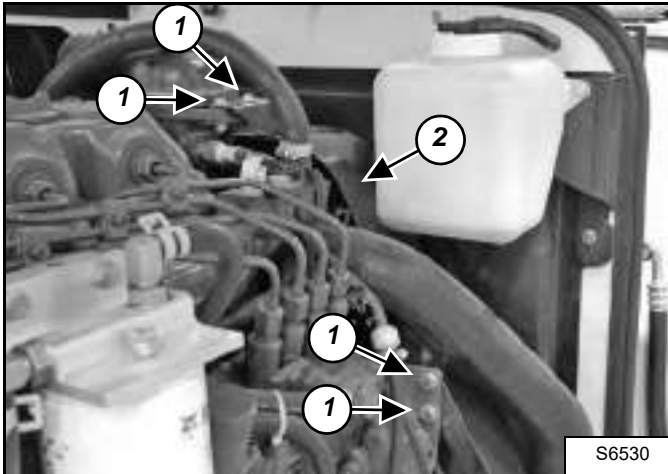
Drain the fluid from the radiator. (See Removing And Replacing The Coolant on Page 10-70-2.)

Remove the condenser (if equipped). (See Removal And Installation on Page 80-120-1.)

Remove the hydraulic fluid cooler. (See Removal And Installation on Page 80-60-1.)

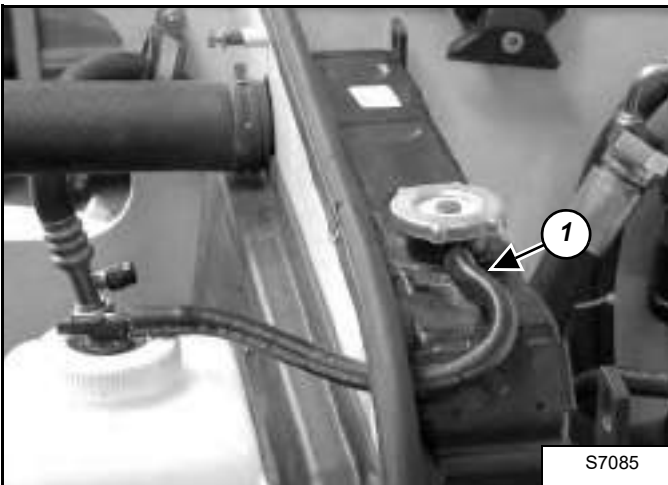
NOTE: The procedure is described with the cradle removed from the engine, for clarity.

Figure 70-70-1



Remove the four bolts (Item 1) and the belt shield (Item 2) [Figure 70-70-1] for easier access.

Figure 70-70-2



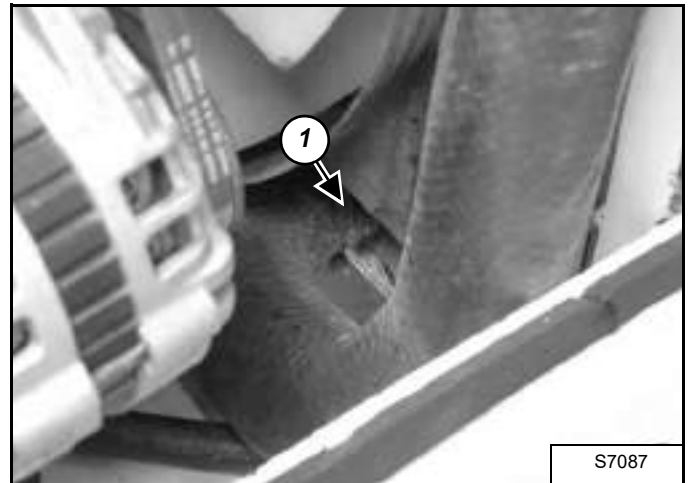
Remove the cooling fluid hose (Item 1) [Figure 70-70-2] from the radiator.

Figure 70-70-3



Remove the bolts (Item 1) [Figure 70-70-3] and remove the hydraulic fluid reservoir.

Figure 70-70-4



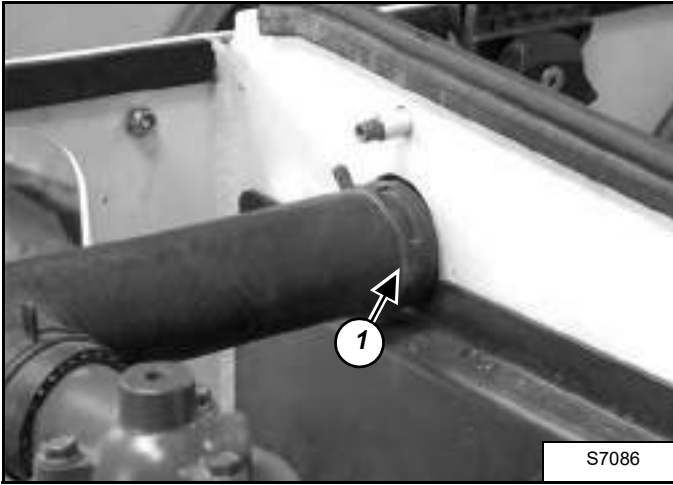
Remove the hose (Item 1) [Figure 70-70-4] from the radiator hose mounting bracket.

Dealer Copy -- Not for Resale

ENGINE COOLING SYSTEM (CONT'D)

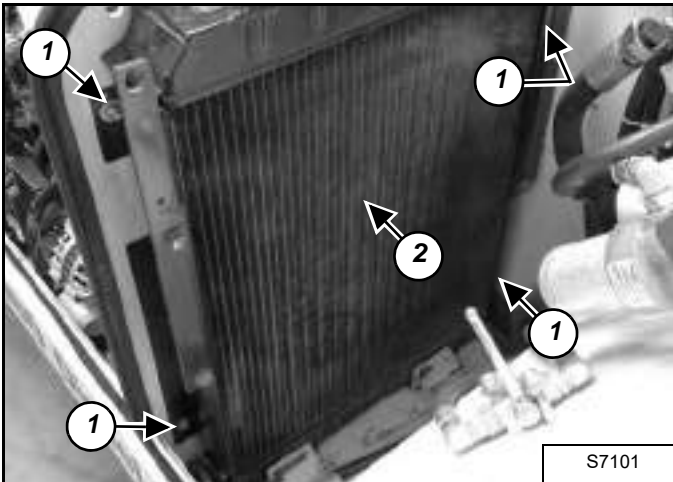
Radiator Removal And Installation (Cont'd)

Figure 70-70-5



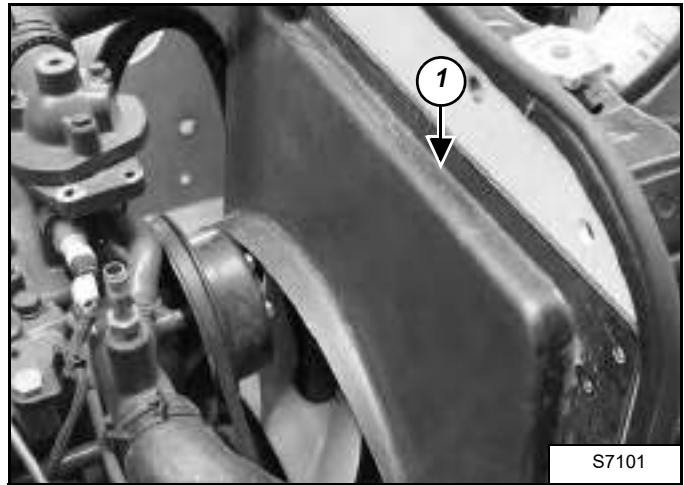
Remove the hose clamp (Item 1) [Figure 70-70-5] from the radiator hose mounting bracket.

Figure 70-70-6



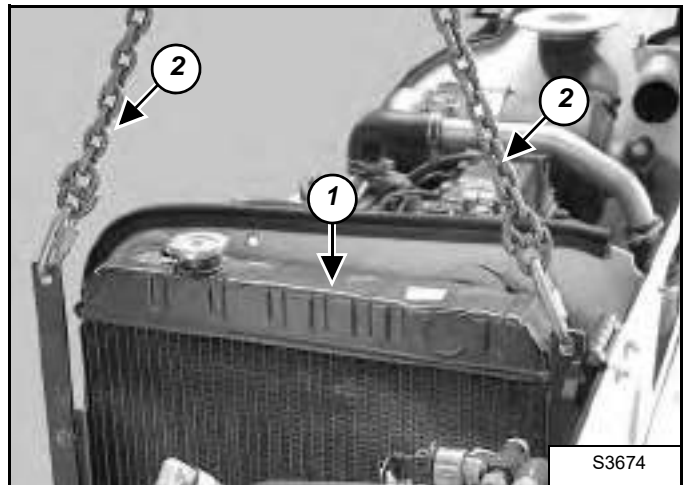
Remove the four bolts (Item 1) [Figure 70-70-6].

Figure 70-70-7



Loosen the fan cover (Item 1) [Figure 70-70-7].

Figure 70-70-8



Remove the radiator (Item 1) [Figure 70-70-8].

Use proper support (Item 2) [Figure 70-70-8].

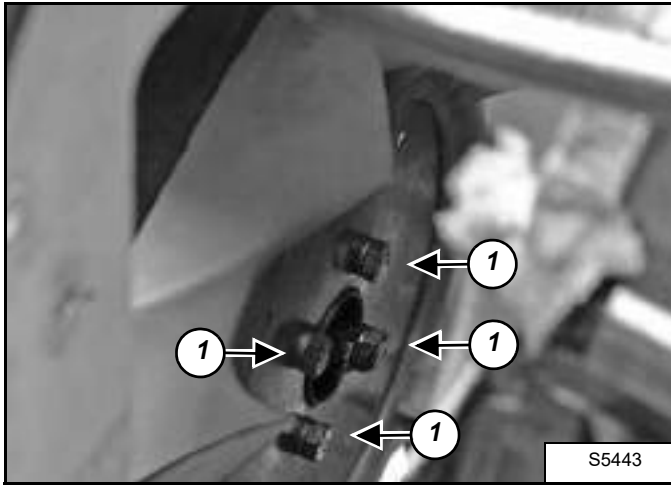
NOTE: Take care not to damage the drain valve underneath the radiator upon removal.

ENGINE COOLING SYSTEM (CONT'D)

Fan Removal And Installation

Remove the radiator.

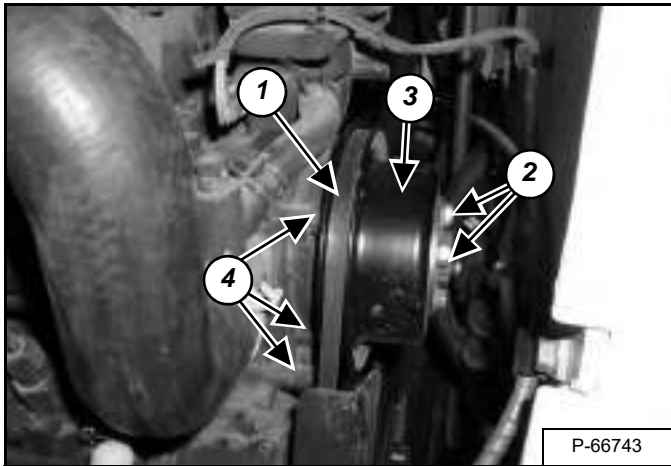
Figure 70-70-9



Remove the four bolts (Item 1) [Figure 70-70-9] and remove the fan.

Water Pump Removal And Installation

Figure 70-70-10



Drain the fluid from the radiator. (See Removing And Replacing The Coolant on Page 10-70-2.)

Loosen the four bolts (Item 2) from the water pump pulley (Item 3) [Figure 70-70-10].

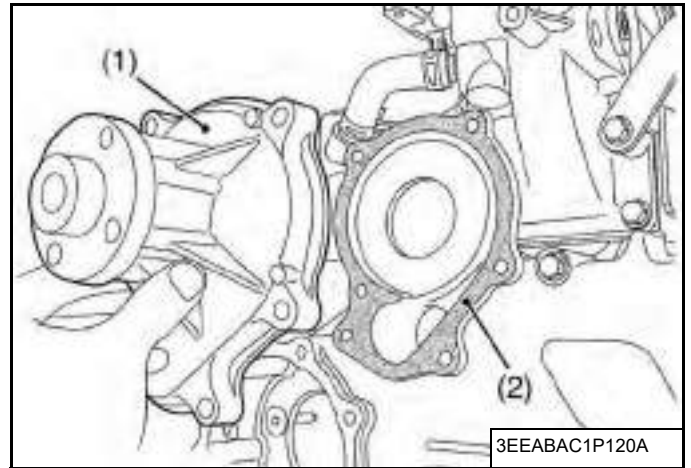
Remove the alternator belt (Item 1) [Figure 70-70-10]. (See Removal And Installation on Page 60-30-1.)

Remove the four bolts (Item 2) from the water pump pulley (Item 3) [Figure 70-70-10].

Remove the water pump pulley (Item 3) [Figure 70-70-10].

Remove the six water pump bolts (Item 4) [Figure 70-70-10].

Figure 70-70-11



Remove the water pump (Item 1) [Figure 70-70-11] from the gearcase.

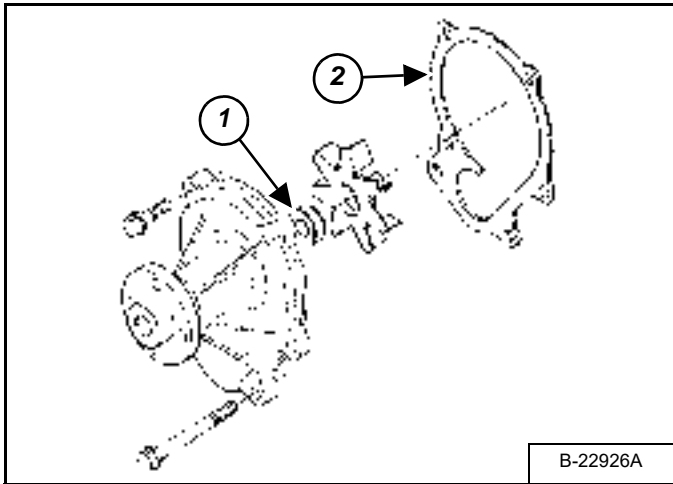
When mounting the water pump, use the new gasket (Item 2) [Figure 70-70-11].

Dealer Copy -- Not for Resale

ENGINE COOLING SYSTEM (CONT'D)

Water Pump Disassembly And Assembly

Figure 70-70-12



Remove the water pump assembly.

NOTE: The seal (Item 1) and the gasket (Item 2) [Figure 70-70-12] are available for replacement parts .

Thermostat Housing Removal And Installation

Figure 70-70-13

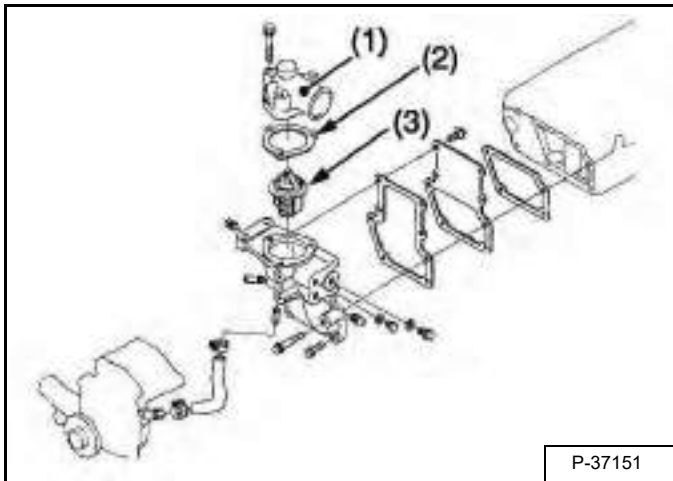
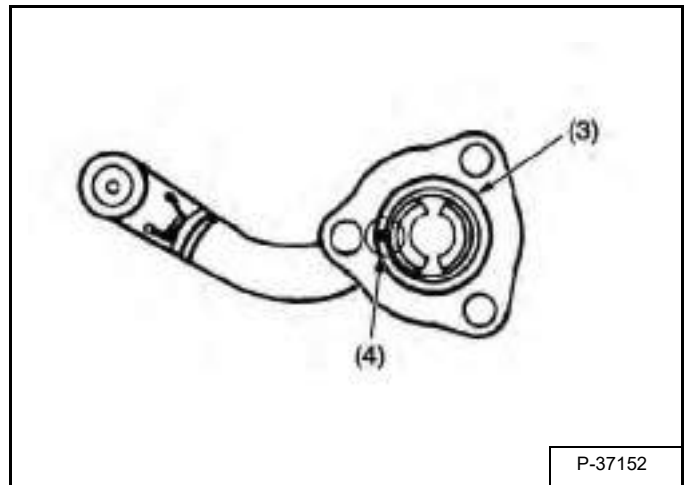


Figure 70-70-14



Remove the thermostat cover mounting screws, and remove the thermostat cover (Item 1) [Figure 70-70-13].

Remove the thermostat assembly (Item 3) [Figure 70-70-13].

Apply a liquid gasket (Three Bond 1215 or equivalent) only at the thermostat cover side of the gasket (Item 2) [Figure 70-70-13].

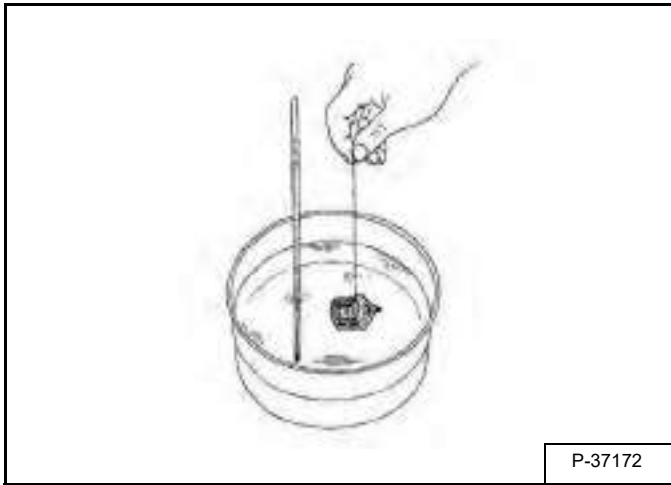
Attach the thermostat (Item 3) with its hole (Item 4) facing toward the air suction side [Figure 70-70-14].

ENGINE COOLING SYSTEM (CONT'D)

Thermostat Housing Removal And Installation (Cont'd)

Thermostat Checking

Figure 70-70-15



Push down the thermostat valve and insert a string between the valve and the valve seat.

Place the thermostat and a thermometer in a container with water and gradually heat the water **[Figure 70-70-15]**.

Hold the string to suspend the thermostat in the water. When the water temperature rises, the thermostat valve will open, allowing it to fall down from the string.

Continue heating the water and read the temperature when the valve has risen by about 8 mm (0.315 in).

If the measurement is not acceptable, replace the thermostat.

Thermostat's valve opening temperature	Factory spec.	74.5 to 78.5°C (166.1 to 173.3°F)
Temperature at which thermostat completely opens	Factory spec.	90°C (194°F)



Bobcat®

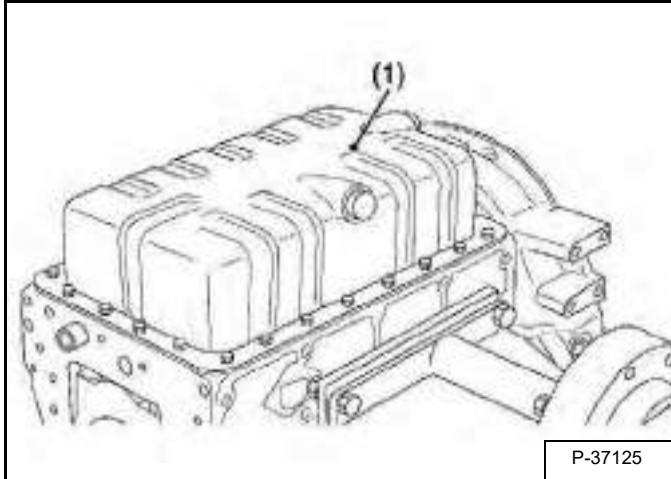
Dealer Copy -- Not for Resale

LUBRICATION SYSTEM

Oil Pan Removal And Installation

Remove the engine/hydrostatic pump package from the Telescopic Handler. (See Removal And Installation on Page 70-20-1.)

Figure 70-80-1



Unscrew the oil pan mounting screws and remove the oil pan (Item 1) **[Figure 70-80-1]**.

Figure 70-80-2

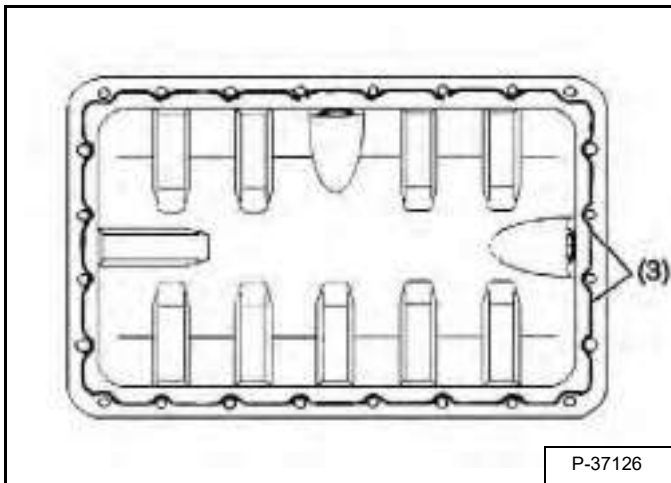
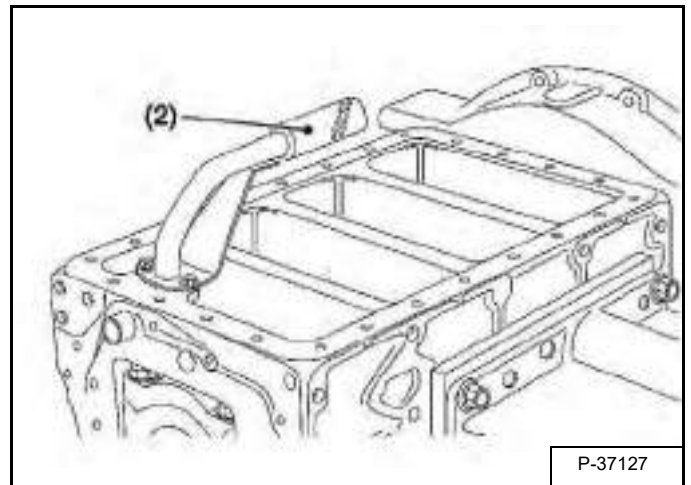


Figure 70-80-3



Unscrew the oil strainer mounting screw, and remove the oil strainer (Item 2) **[Figure 70-80-3]**.

Install the oil strainer, using care not to damage the O-ring.

Apply liquid gasket to the oil pan (Item 3) **[Figure 70-80-2]**.

Confirm that the liquid gasket coating surface is free of water, dust and oil in order to maintain sealing effect.

Carefully apply the adhesive evenly.

NOTE: When mounting the adhesive-applied parts, take care to fit them to the mating parts.

Assemble the adhesive-applied parts within 10 minutes.

To avoid uneven tightening, tighten mounting screws in diagonal order from the center.

After cleaning the oil strainer, install it.

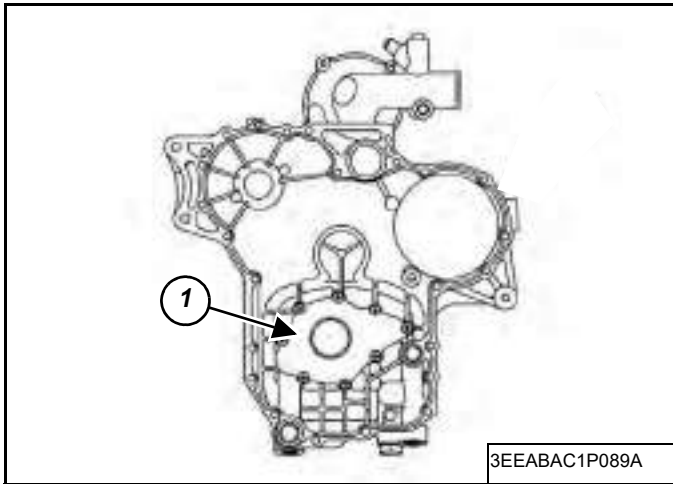
Attach the oil pan with its central drain plug facing toward the air suction side.

Dealer Copy -- Not for Resale

LUBRICATION SYSTEM (CONT'D)

Oil Pump Removal And Installation

Figure 70-80-4

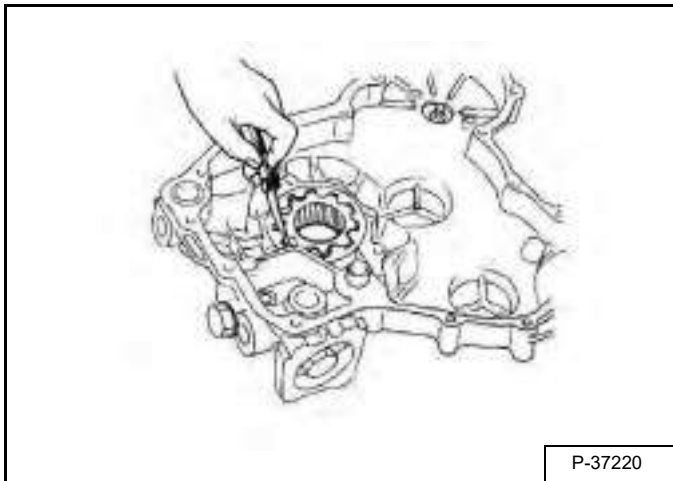


Remove the timing gearcase cover. (See Timing Gearcase Cover Removal And Installation on Page 70-120-1.)

Remove the oil pump cover (Item 1) [Figure 70-80-4].

Oil Pump Inspection

Figure 70-80-5

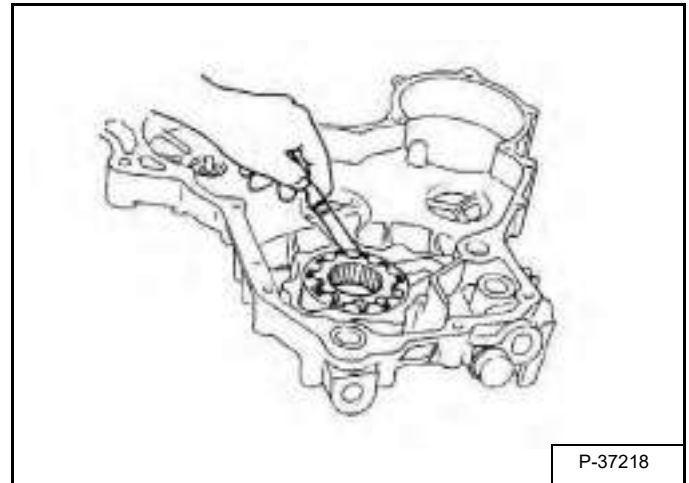


Measure the clearance between lobes of the inner rotor and the outer rotor with a feeler gauge [Figure 70-80-5].

If the clearance exceeds the factory specifications, replace the oil pump rotor assembly.

Clearance between inner rotor and outer rotor	Factory spec.	0.04 to 0.16 mm 0.0016 to 0.0062 in
	Allowable Limit	0.3 mm 0.01 in

Figure 70-80-6



Measure the clearance between the outer rotor and the pump body with a feeler gauge [Figure 70-80-6].

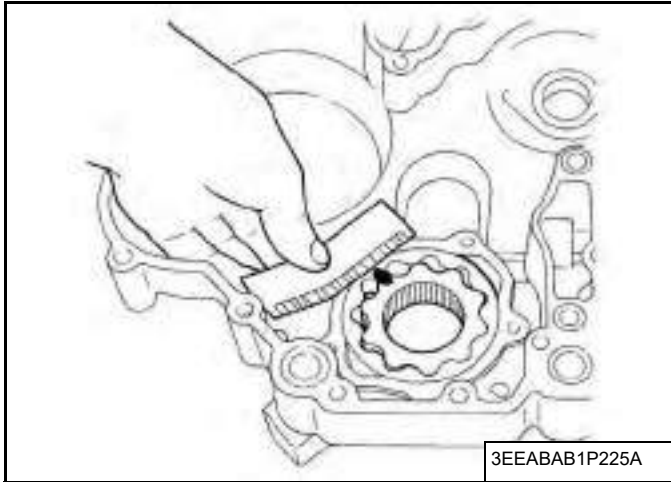
If the clearance exceeds the factory specifications, replace the oil pump rotor assembly.

Clearance between outer rotor and pump body	Factory spec.	0.100 to 0.184 mm 0.00394 to 0.00724 in
	Allowable limit	0.3 mm 0.01 in

LUBRICATION SYSTEM (CONT'D)

Oil Pump Inspection (Cont'd)

Figure 70-80-7



Put a strip of plastigage (Code No. 07909-30241) onto the rotor face with grease [Figure 70-80-7].

Install the cover and tighten the screws with the specified torque.

Remove the cover carefully, and measure the amount of the flattening with the scale and get the clearance.

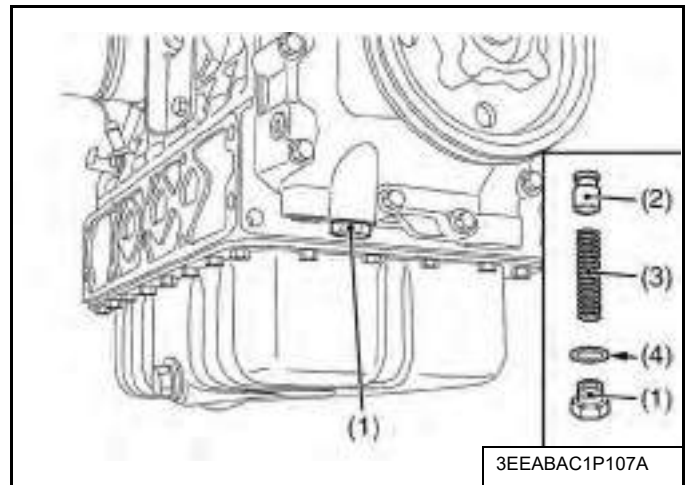
If the clearance exceeds the allowable limit, replace oil pump rotor assembly and the cover.

Clearance between inner rotor and cover	Factory spec.	0,025 to 0,075 mm (0.00099 to 0.0029 in)
	Allowable limit	0,225 mm (0.00886 in)

Tightening torque	Oil pump cover screw	7,9 to 9,3 N•m (5.8 to 6.8 ft-lb)
-------------------	----------------------	--------------------------------------

Relief Valve

Figure 70-80-8



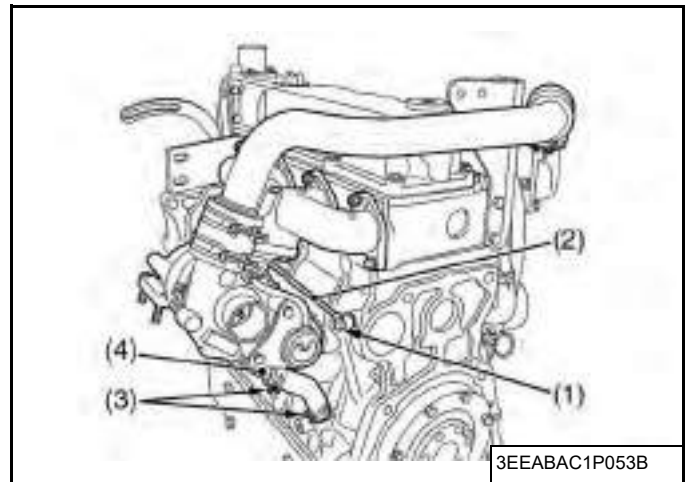
Remove the bolt (Item 1) [Figure 70-80-8].

Remove the relief valve (Item 2), the spring (Item 3) and the packing (Item 4) [Figure 70-80-8].

Tightening torque	Relief valve retaining screw	69 to 78 N•m 51 to 57 ft-lb
-------------------	------------------------------	--------------------------------

Oil Pipe

Figure 70-80-9



Remove the joint bolt (Item 1) and take off the pipe (Item 2) [Figure 70-80-9].

Remove the bolts (Item 3) and release the clamp (Item 4) [Figure 70-80-9].

Remove the oil pipe 2 (Item 5) [Figure 70-80-9].

Before installation pour fresh engine oil through the oil supply port of the turbocharger.

Dealer Copy -- Not for Resale

LUBRICATION SYSTEM (CONT'D)

Oil Filter Cooler Removal And Installation (Cont'd)

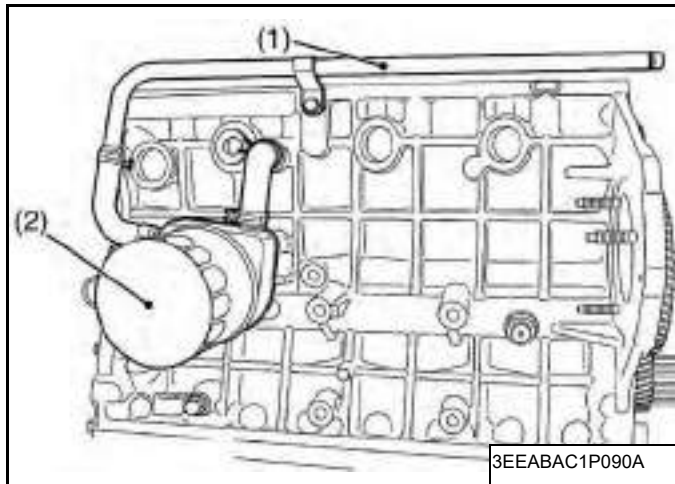
Replace the gasket with new one.

Be careful not to allow dust, dirt and other foreign matters in the oil pipes.

NOTE: *Tape or plug all openings to prevent foreign matters from damaging the oil cavities in the turbocharger.*

Oil Filter Cooler Removal And Installation

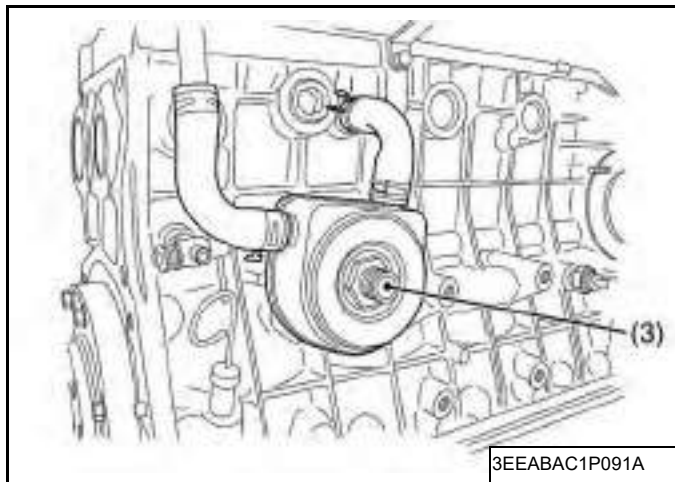
Figure 70-80-10



Remove the water pipe (Item 1) [Figure 70-80-10].

Remove the oil filter cartridge (Item 2) [Figure 70-80-10].

Figure 70-80-11



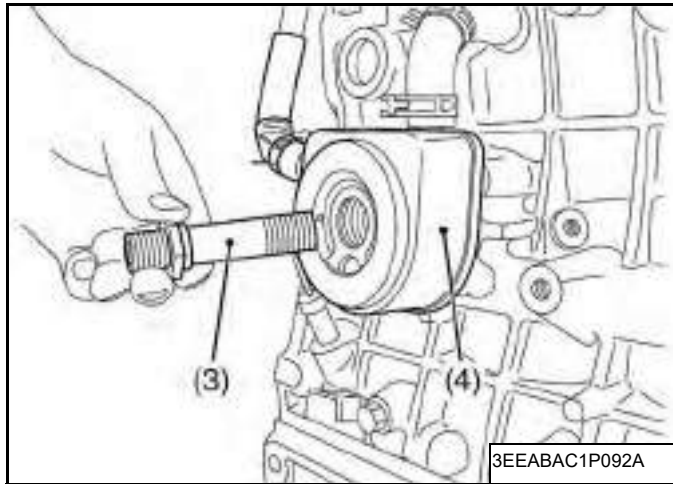
Remove the oil cooler joint screw (Item 3) [Figure 70-80-11] & [Figure 70-80-12].

Installation: Tighten the oil cooler joint screw to 40 - 44 N•m (29 - 32 ft-lb).

LUBRICATION SYSTEM (CONT'D)

Oil Filter Cooler Removal And Installation (Cont'd)

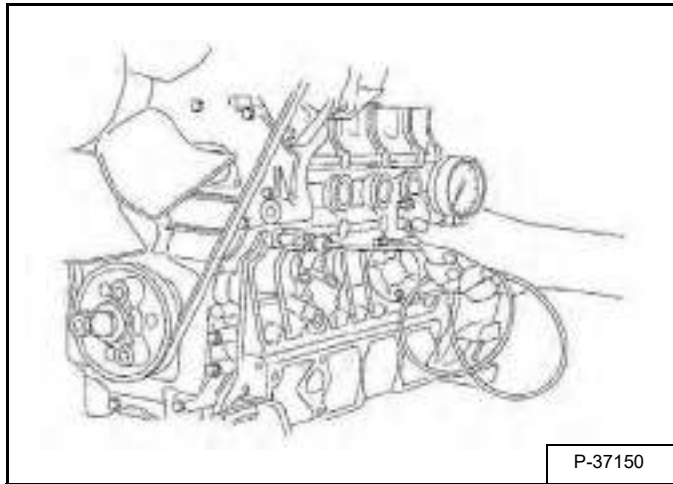
Figure 70-80-12



Remove the oil cooler (Item 4) [Figure 70-80-12].

Engine Oil Pressure - Testing

Figure 70-80-13



Remove the oil switch and set a pressure tester (Code No. 07916-32031) [Figure 70-80-13].

Start the engine. After warming up, measure the oil pressure of both idling and rated speeds.

If the oil pressure is less than the allowable limit, check the following:

- Engine oil insufficient
- Oil pump defective
- Oil strainer clogged
- Oil filter cartridge
- Oil gallery clogged
- Excessive oil clearance of bearing

Foreign matter in the relief valve

After checking the engine oil pressure, tighten the engine oil pressure switch to the specified torque.

At idle speed	Allowable limit	50 kPa 0,5 bar 7 psi
---------------	-----------------	----------------------------

At rated speed	Factory spec.	200 to 390 kPa 2 to 3,9 bar 29 to 56 psi
	Allowable limit	150 kPa 1.5 bar 21 psi

Dealer Copy -- Not for Resale



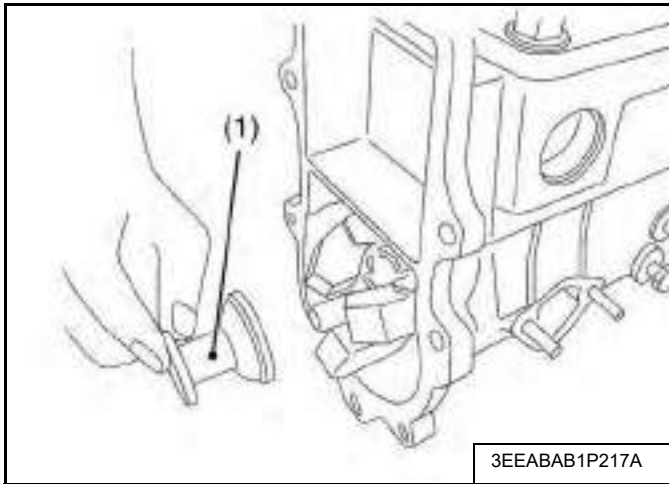
Bobcat®

Dealer Copy -- Not for Resale

FUEL SYSTEM

Fuel Camshaft Removal And Installation

Figure 70-90-1

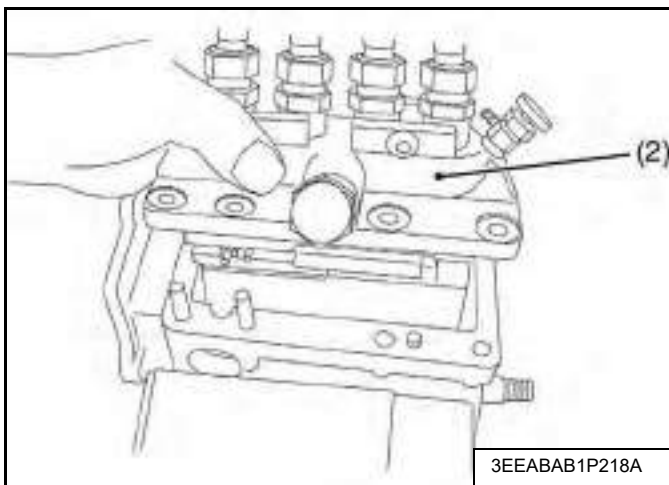


Separate the governor housing assembly from the injection pump unit.

Remove the fuel feed pump from the injection pump unit.

Remove the governor sleeve (Item 1) [Figure 70-90-1].

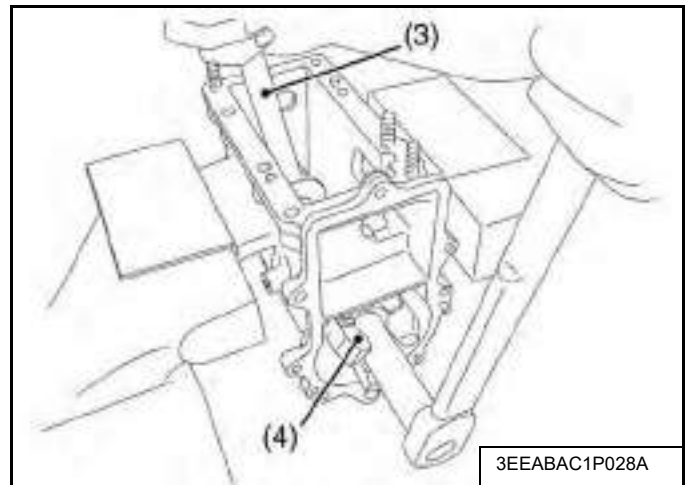
Figure 70-90-2



Remove the injection pump assembly (Item 2) [Figure 70-90-2].

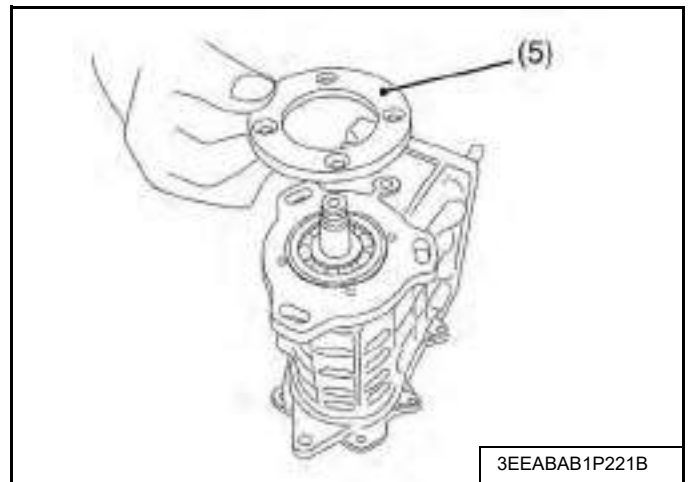
Remove the fuel camshaft lock bolts.

Figure 70-90-3



Secure the fuel camshaft with open end wrench (Item 3), and remove the governor weight mounting nut and the governor weight (Item 4) [Figure 70-90-3].

Figure 70-90-4



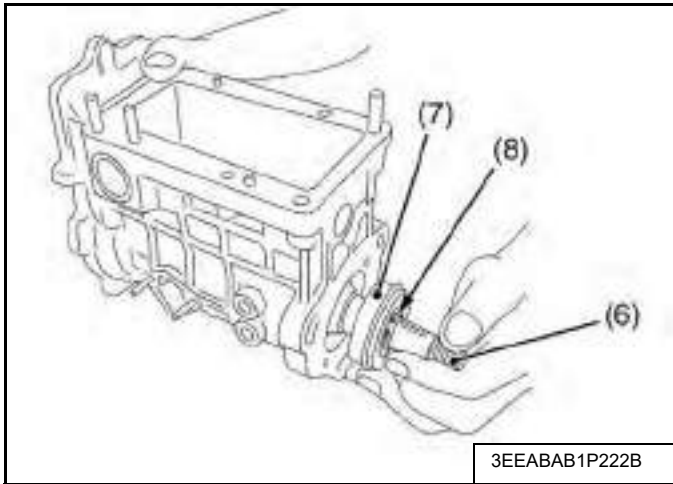
Loosen the fuel camshaft stopper mounting screws and remove the fuel camshaft stopper (Item 5) [Figure 70-90-4].

Dealer Copy -- Not for Resale

FUEL SYSTEM (CONT'D)

Fuel Camshaft Removal And Installation (Cont'd)

Figure 70-90-5



Pull out the fuel camshaft (Item 6) and bearings (Item 7) [Figure 70-90-5] together.

After removing the bearing's cir-clip (Item 8) [Figure 70-90-5], press out the bearings.

NOTE: Do not use the fuel camshaft lock bolts, when remove the governor weight mounting nut. Otherwise, the lock bolts or injection pump housing might get damaged.

Press the bearings into the fuel camshaft.

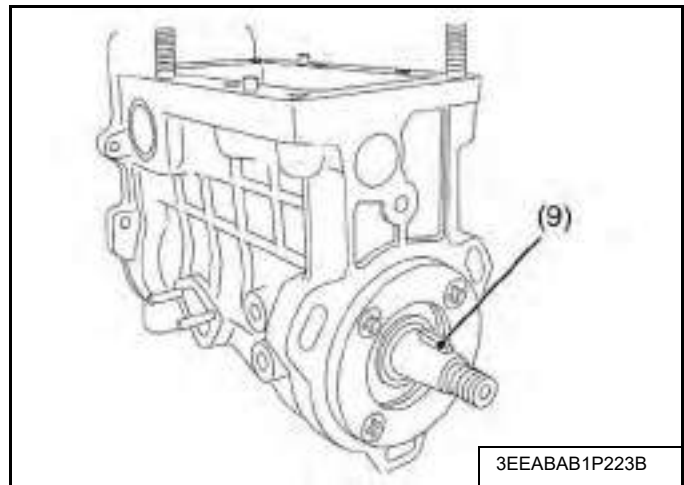
Set the cir-clip at the gear side's bearing.

Install the fuel camshaft and bearings to the injection pump housing.

Attach the fuel camshaft stopper and tighten the fuel camshaft stopper mounting screws with the specified torque.

Attach the governor weight to the fuel camshaft and tighten the governor weight mounting nut with specified torque.

Figure 70-90-6



Secure the fuel camshaft with lock bolts as the key way to fuel camshaft (Item 9) [Figure 70-90-6] is right-downward.

Install the injection pump assembly to the injection pump housing.

Attach the O-ring and the cover and tighten the cover mounting bolts.

Install the governor sleeve to the fuel camshaft.

Check the movement of the governor sleeve.

NOTE: Be careful not to damage the O-ring.

NOTE: Be careful the direction of the governor sleeve.

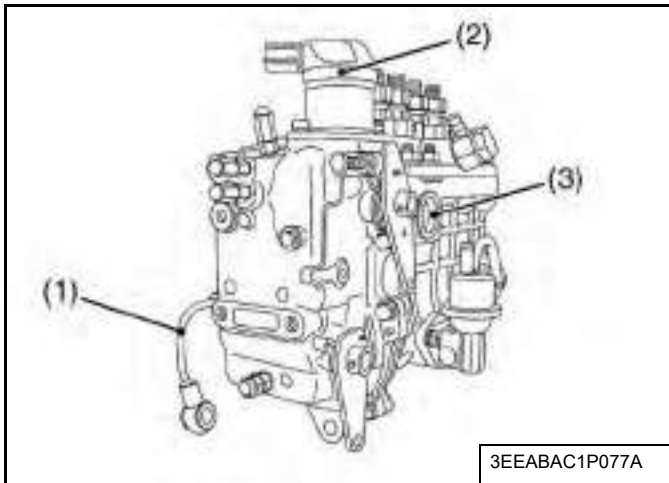
NOTE: When reassembling the inside parts, slightly lubricate each inside part with oil.

Tightening torque	Fuel camshaft stopper mounting screw	7.9 to 9.3 N•m 5.8 to 6.8 ft-lb
	Governor weight mounting screw	63 to 72 N•m 47 to 53 ft-lb

FUEL SYSTEM (CONT'D)

Injection Pump Governor Housing Removal And Installation

Figure 70-90-7



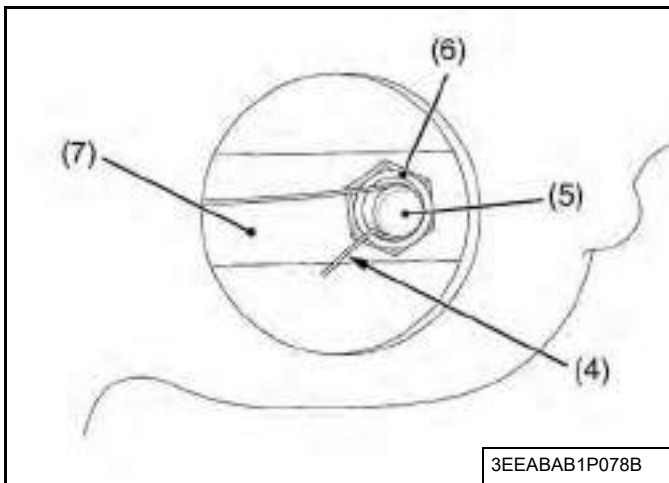
Remove the injection pump unit from the engine.

Remove the governor lubricating pipe (Item 1) [Figure 70-90-7].

Remove the stop solenoid (Item 2) [Figure 70-90-7].

Detach the sight cover (Item 3) [Figure 70-90-7] from the injection pump unit.

Figure 70-90-8



Unhook the start spring (Item 4) from the rack pin (Item 5) [Figure 70-90-8] of the injection pump assembly.

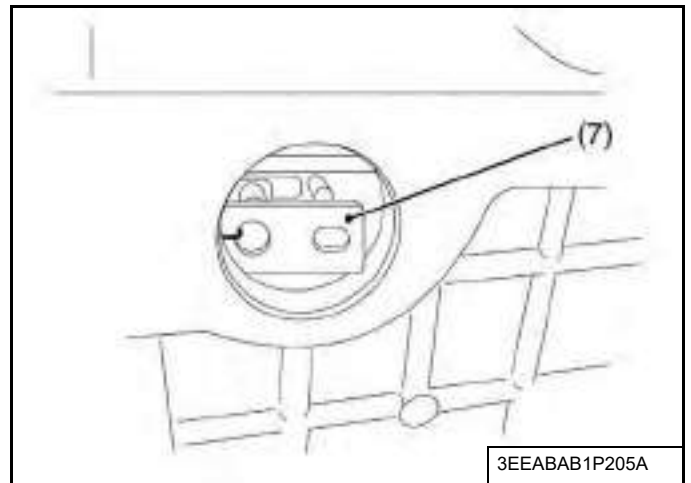
Remove the nut (Item 6) [Figure 70-90-8].

NOTE: Be careful not to drop the nut inside.

NOTE: (See Fuel Injection Pump Removal And

Installation on Page 70-90-8.) for proper alignment of the governor connection rod procedure. The procedure will require a special tool part number MEL1637.

Figure 70-90-9



Slide off the governor connecting rod (Item 7) [Figure 70-90-9] from the rack pin of the injection pump assembly.

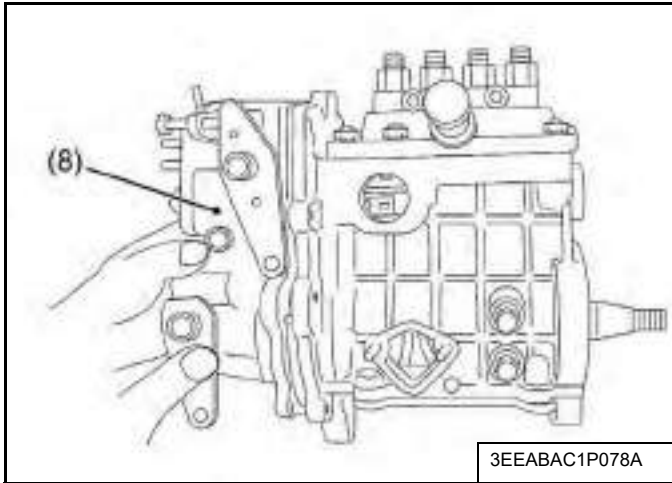
For convenience, temporarily hook the start spring on the rack pin hole of the governor connecting rod.

Remove the governor housing mounting bolts.

FUEL SYSTEM (CONT'D)

Injection Pump Governor Housing Removal And Installation (Cont'd)

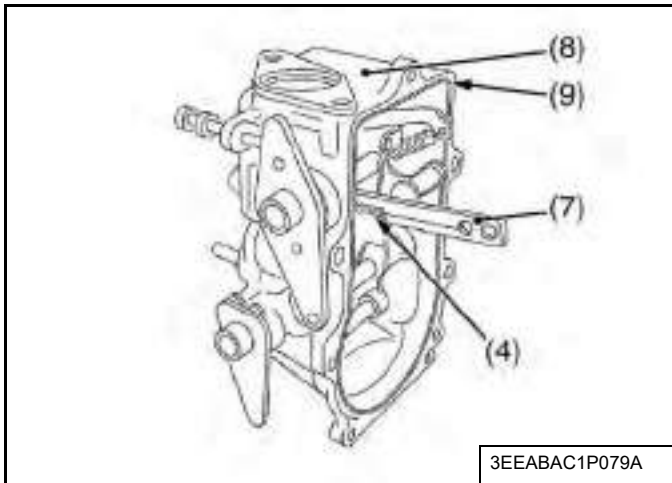
Figure 70-90-10



Detach the governor housing assembly (Item 8) [Figure 70-90-10] from the injection pump unit.

NOTE: The injection pump unit is lubricated with engine oil. Oil will leak when the governor housing is removed from the injection pump.

Figure 70-90-11



When reassembling the inside parts, lightly lubricate each inside part with oil.

After sliding on the governor connecting rod to the rack pin, tighten the nut with the specified torque with using the jig for keeping the control rod horizontal.

After tightening the nut, hook the start spring on the rack pin.

Check the movement of control rack of injection pump assembly by the stop lever.

NOTE: When installing the governor housing assembly to the injection pump unit, be careful not to damage O-ring (Item 9) [Figure 70-90-11].

NOTE: When linking the control rod to the rack pin of injection pump, use the tool for keeping the control rod horizontal. Otherwise the control rack may be stuck, and causes to be difficult to start the engine or hunting of governor.

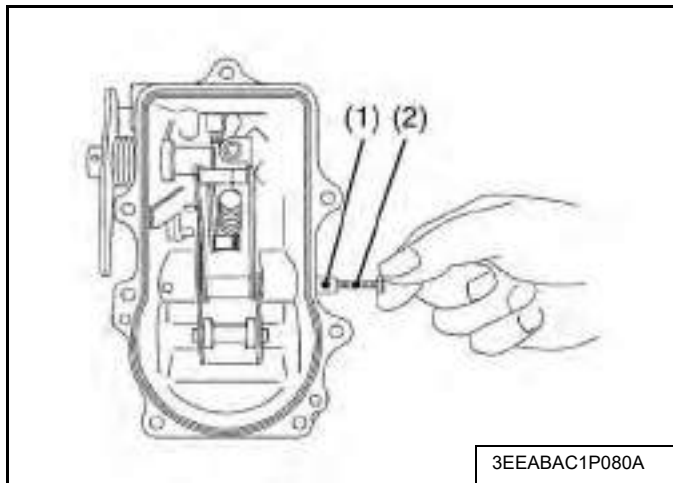
Tightening torque	Governor housing mounting bolt	9.8 to 11.2 N•m 7.24 to 8.31 ft-lb
	Anti-rotation nut	2.8 to 4.0 N•m 2.1 to 2.9 ft-lb

FUEL SYSTEM (CONT'D)

Injection Pump Governor Housing Disassembly And Assembly

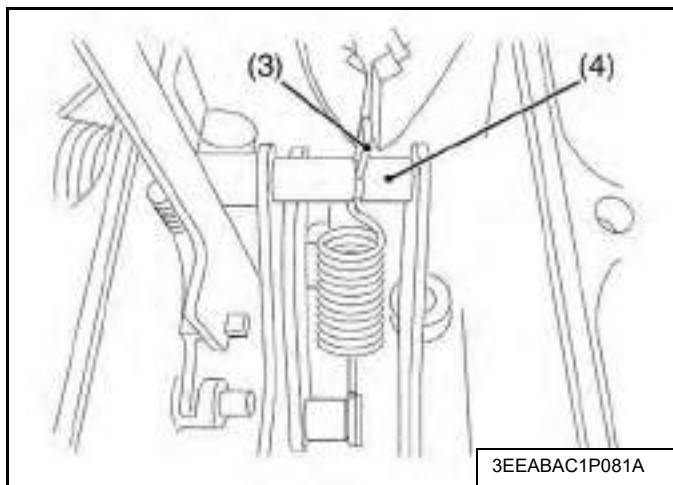
Fork Lever

Figure 70-90-12



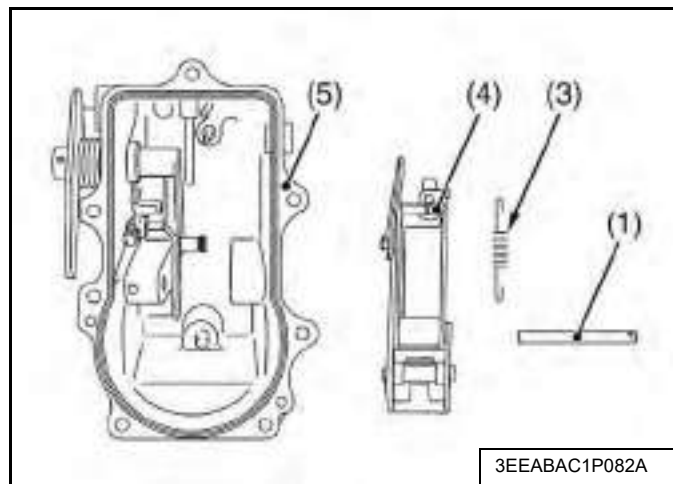
Pull off the governor for lever shaft (Item 1) with the extra bolt (Dia.: 4 mm, Pitch: 0,7 mm, Length: more than 25 mm) (Item 2) [Figure 70-90-12].

Figure 70-90-13



Unhook the governor spring (Item 3) at the governor fork lever (Item 4) [Figure 70-90-13] side.

Figure 70-90-14



Remove the governor fork lever assembly from the governor housing (Item 5) [Figure 70-90-14].

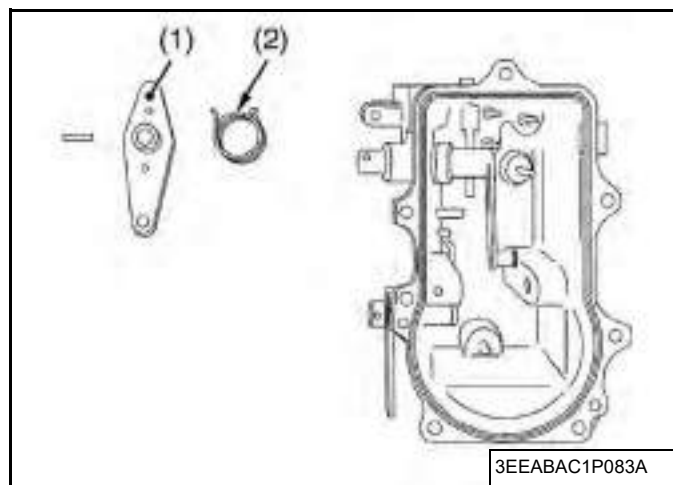
After reassembling the governor housing assembly, check the movement of the governor fork lever assembly, the speed control lever and the stop lever.

NOTE: When assembling the inside parts, lightly lubricate each inside part with oil.

NOTE: Be careful not to deform the start spring.

Speed Lever

Figure 70-90-15



Remove the speed control lever (Item 1) and the return spring (Item 2) [Figure 70-90-15].

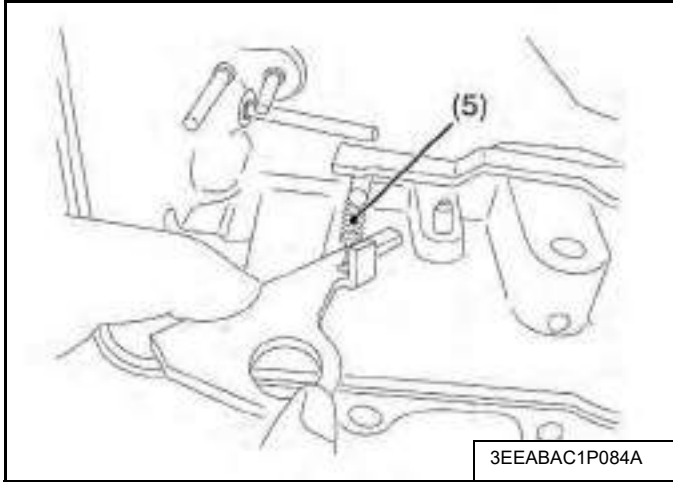
Dealer Copy -- Not for Resale

FUEL SYSTEM (CONT'D)

Injection Pump Governor Housing Disassembly And Assembly (Cont'd)

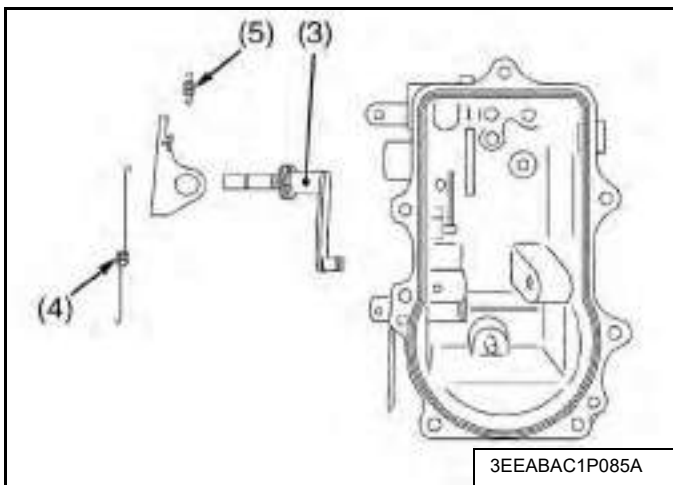
Governor Fork

Figure 70-90-16



Remove the governor lever assembly (Item 3) **[Figure 70-90-16]** from the governor housing.

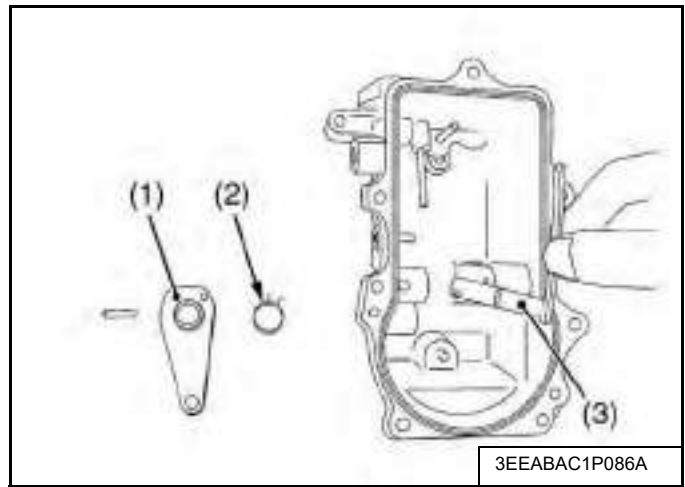
Figure 70-90-17



Remove the start spring (Item 4) and the stop spring (Item 5) **[Figure 70-90-17]**

Stop Lever

Figure 70-90-18



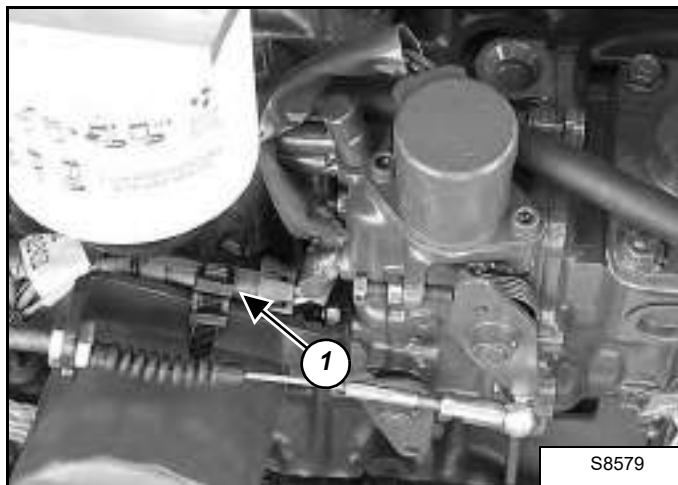
Remove the stop lever (Item 1) and the return spring (Item 2) **[Figure 70-90-18]**.

Remove the stop lever shaft (Item 3) **[Figure 70-90-18]**.

FUEL SYSTEM (CONT'D)

Fuel Shutoff Solenoid - Checking

Figure 70-90-19



Stop the engine. The fuel shutoff solenoid connector is located between the fuel filter and the oil filter.

Remove the tie strap and disconnect the fuel shutoff solenoid connector (Item 1) [Figure 70-90-19].

Use an ohmmeter to check the fuel shutoff solenoid.

Figure 70-90-20

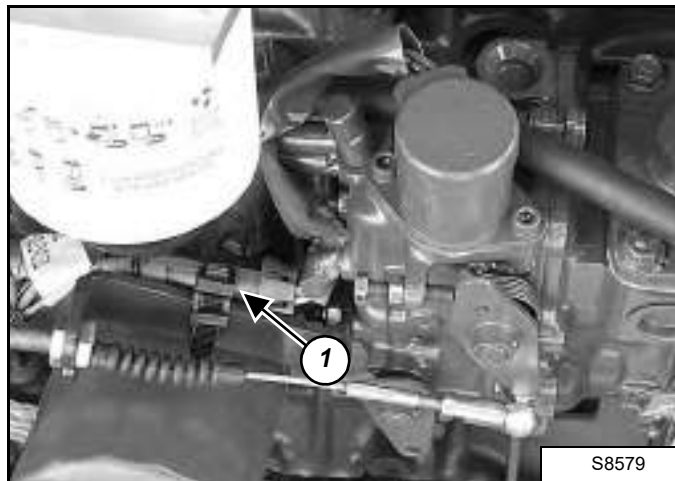


The reading between electrical connector terminal C and terminal A must be approximately 15.6 ohms [Figure 70-90-20].

The reading between electrical connector terminal C and terminal B must be approximately 0.35 to 0.40 ohms.

Fuel Shutoff Solenoid - Removal And Installation

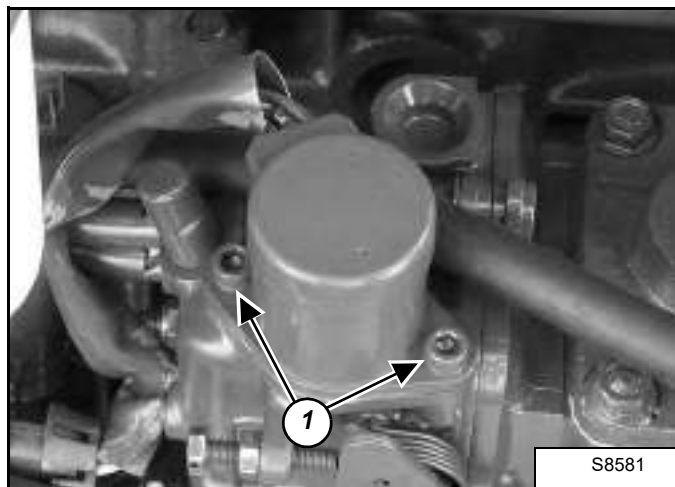
Figure 70-90-21



Stop the engine. The fuel shutoff solenoid connector is located between the fuel filter and the oil filter.

Remove the tie strap and disconnect the fuel shutoff solenoid connector (Item 1) [Figure 70-90-21].

Figure 70-90-22



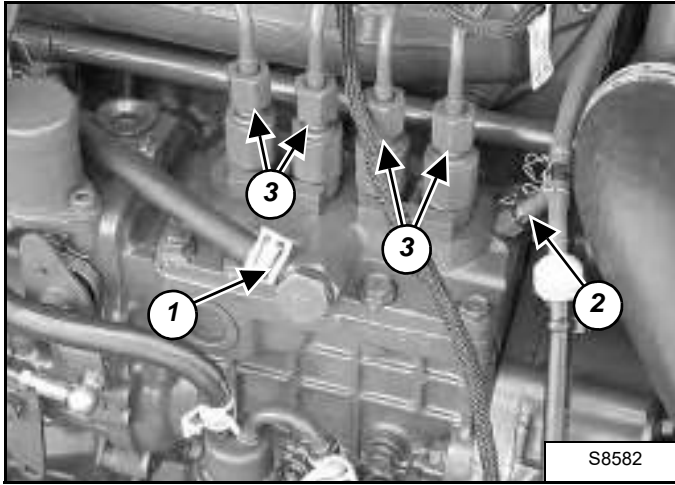
Remove the two mounting bolts (Item 1) [Figure 70-90-22] from the fuel stop solenoid. Remove the solenoid from the injection pump.

Dealer Copy -- Not for Resale

FUEL SYSTEM (CONT'D)

Fuel Injection Pump Removal And Installation

Figure 70-90-23



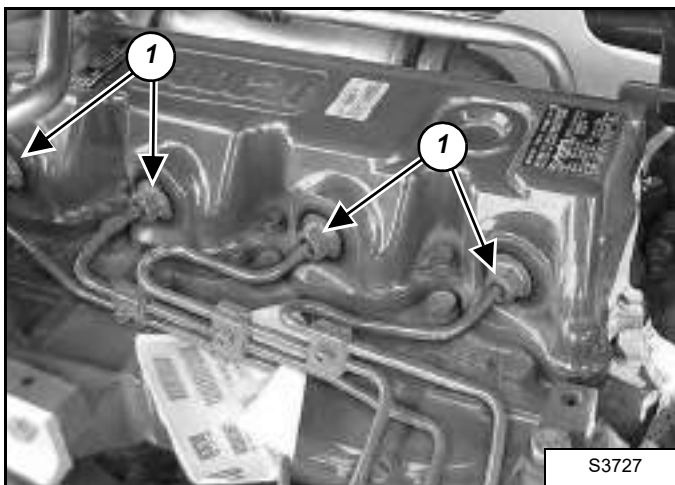
NOTE: The injection pump must be removed as a complete unit. Do Not remove individual pump barrels. If individual pump barrels are removed, the pump must be recalibrated in a certified injection shop.

NOTE: The injection pump can be replaced with the engine crankshaft in any position.

Disconnect and plug the fuel hose (Item 1) and fuel overflow hose (Item 2) [Figure 70-90-23].

Disconnect the four injection lines (Item 3) [Figure 70-90-23] at the injection pump.

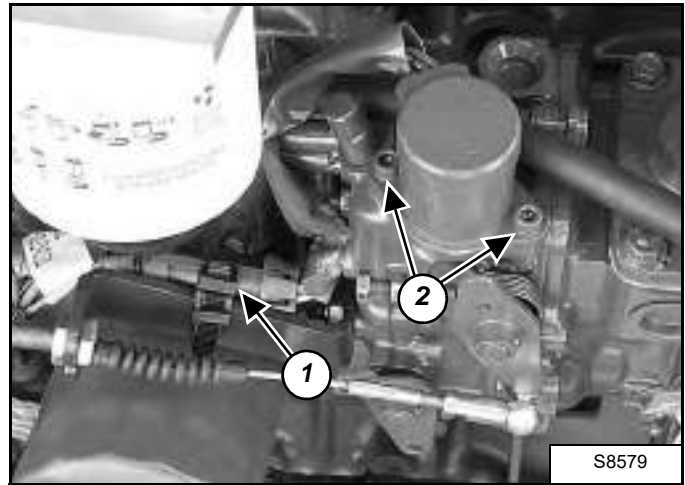
Figure 70-90-24



Disconnect the four injection lines (Item 1) [Figure 70-90-24] at the injectors.

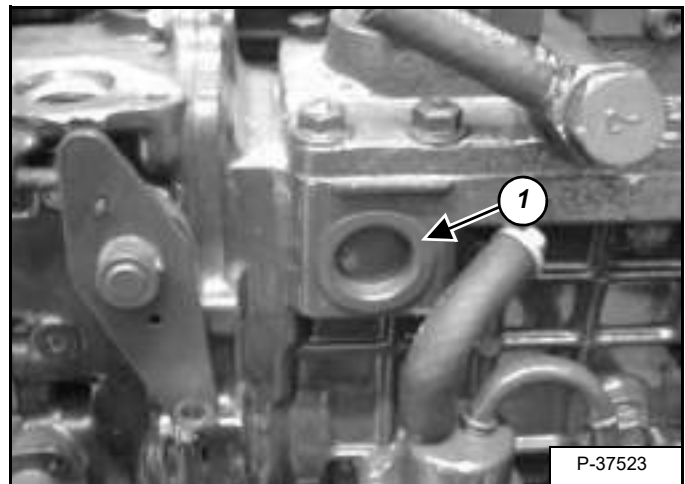
Remove the injection lines from the engine.

Figure 70-90-25



Remove the tie strap and disconnect the electrical connector (Item 1) from the fuel stop solenoid. Then remove the two mounting bolts (Item 2) [Figure 70-90-25] from the fuel stop solenoid. Remove the solenoid from the injection pump.

Figure 70-90-26

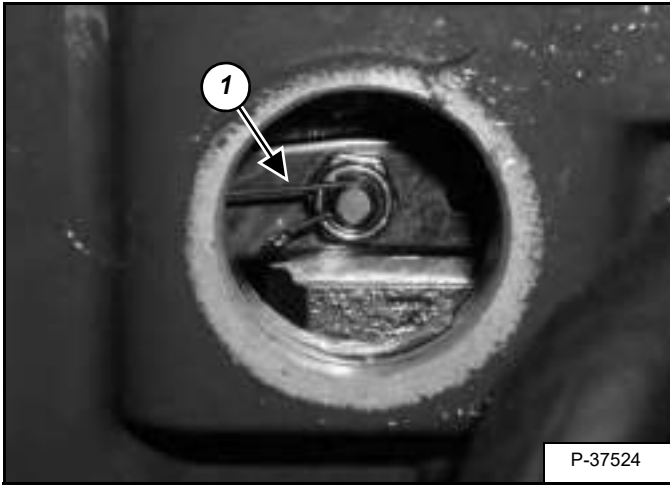


Remove the sight cover (Item 1) [Figure 70-90-26] from the injection pump unit.

FUEL SYSTEM (CONT'D)

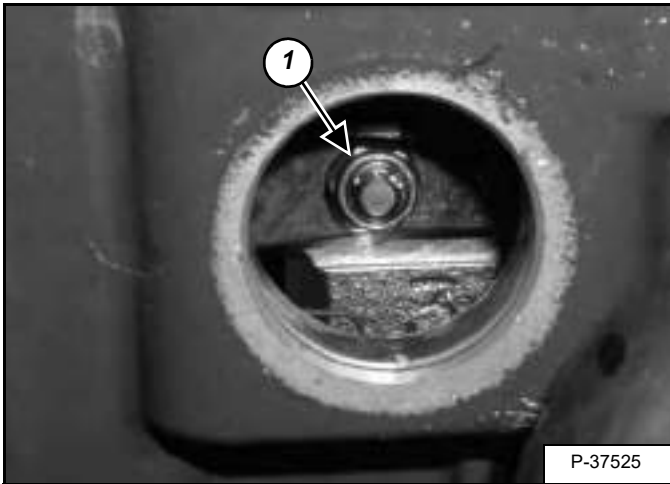
Fuel Injection Pump Removal And Installation (Cont'd)

Figure 70-90-27



Disconnect the starter spring hook (Item 1) [Figure 70-90-27]. (Be careful to not deform the starter spring.)

Figure 70-90-28

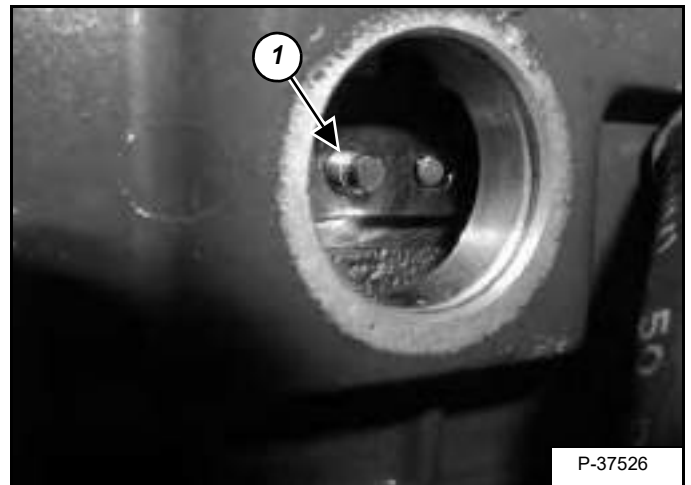


Remove the anti-rotation nut (Item 1) [Figure 70-90-28].

Installation: Tighten the anti-rotation nut to 2,8 - 4,0 N•m (2.1 - 2.9 ft-lb) torque.

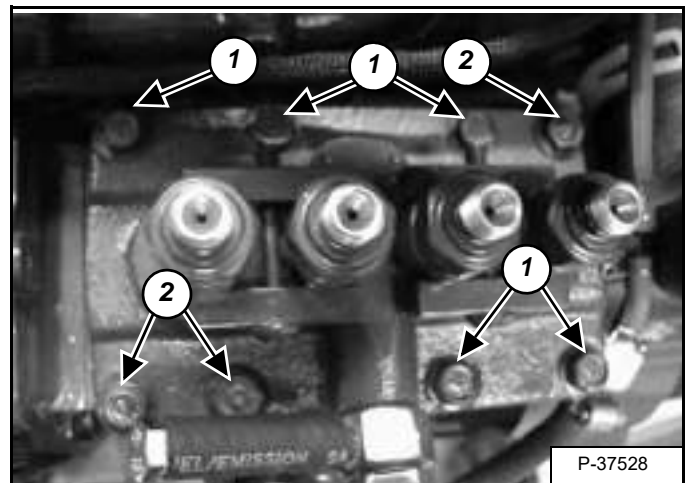
NOTE: Be careful not to drop the anti-rotation nut inside.

Figure 70-90-29



Disconnect the governor connecting rod (Item 1) [Figure 70-90-29] from the injection pump.

Figure 70-90-30



Remove the five injection pump mounting screws (Item 1) [Figure 70-90-30].

Remove the three injection pump mounting nuts (Item 2) [Figure 70-90-30].

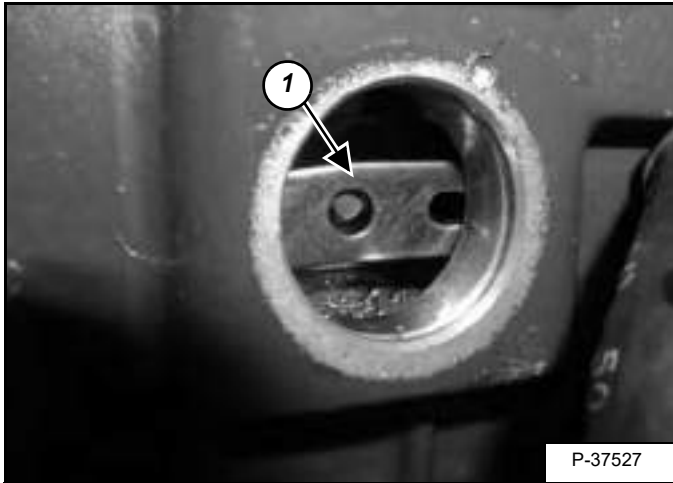
Installation: Tighten the injection pump mounting screws to 24-27 N•m (18-20 ft-lb) torque. Tighten the injection pump mounting nuts to 18-20 N•m (13-15 ft-lb) torque.

Dealer Copy -- Not for Resale

FUEL SYSTEM (CONT'D)

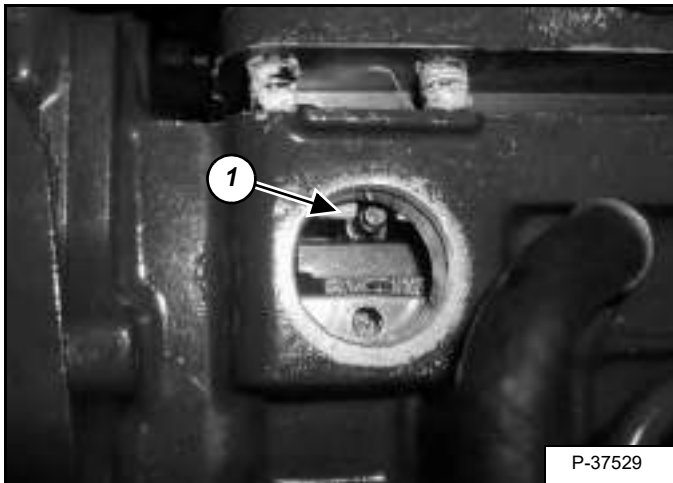
Fuel Injection Pump Removal And Installation (Cont'd)

Figure 70-90-31



With the injection pump mounting bolts and nuts loose, be sure the governor connecting rod (Item 1) **[Figure 70-90-31]** clears the rack pin on the injection pump.

Figure 70-90-32



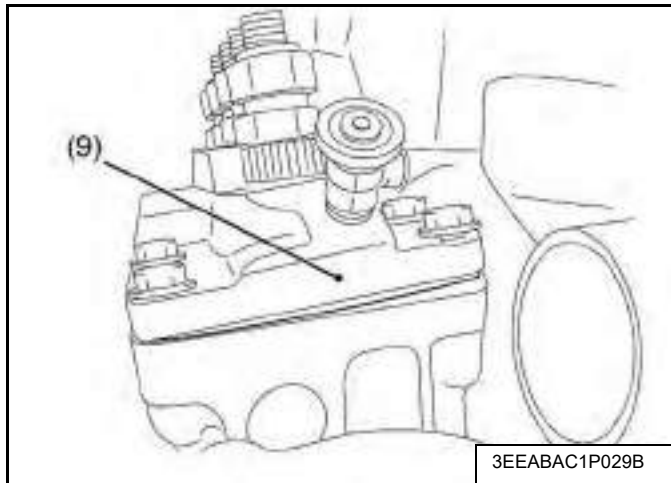
Align the pin on the injection pump (Item 1) **[Figure 70-90-32]** with the notch in the housing.

Remove the injection pump from the injection pump housing.

FUEL SYSTEM (CONT'D)

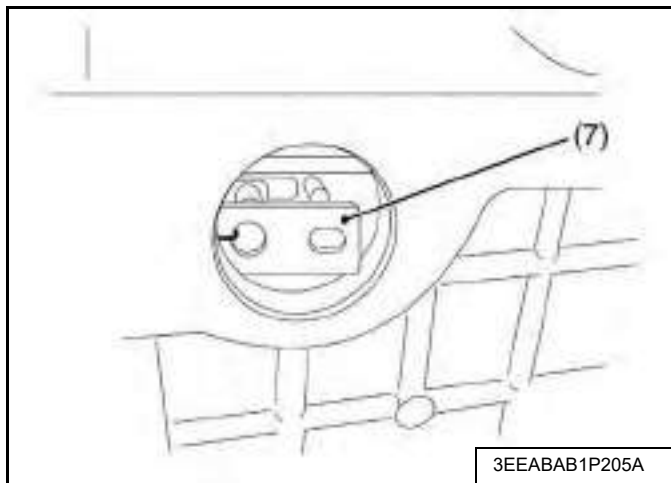
Fuel Injection Pump Removal And Installation (Cont'd)

Figure 70-90-33



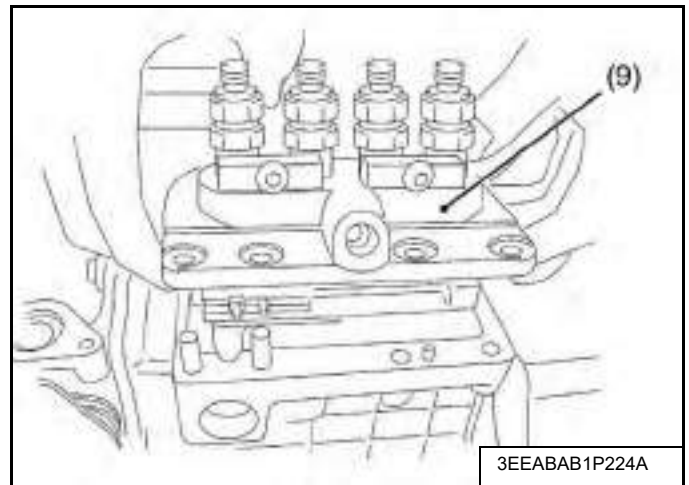
Slightly loosen the injection pump assembly mounting bolts and nuts so that they tilt the injection pump assembly (Item 9) [Figure 70-90-33].

Figure 70-90-34



Slide off the governor connecting rod (Item 7) [Figure 70-90-34] from the rack pin of the injection pump assembly.

Figure 70-90-35

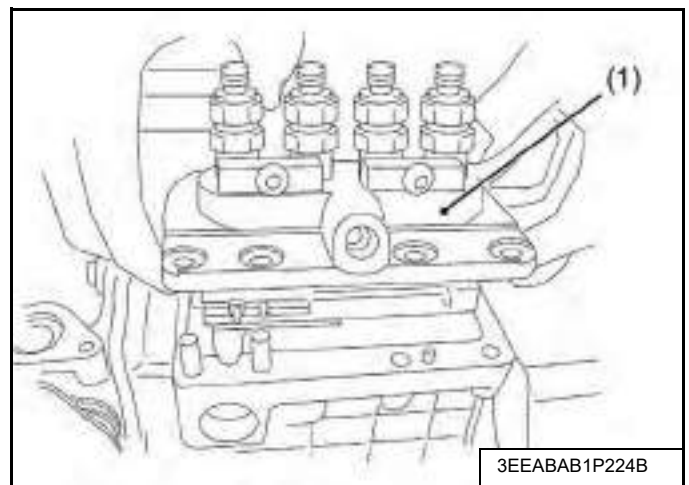


Remove the injection pump mounting bolts and nuts completely and take out the injection pump assembly (Item 9) [Figure 70-90-35].

NOTE: Be careful not to deform the start spring.

NOTE: When taking out the injection pump assembly, be careful not to hit it against the governor connecting rod.

Figure 70-90-36



Install the injection pump assembly (Item 1) in the unit, and tighten the mounting bolts and nuts that keep the injection pump assembly (Item 1) [Figure 70-90-36] tilted.

Dealer Copy -- Not for Resale

FUEL SYSTEM (CONT'D)

Fuel Injection Pump Removal And Installation (Cont'd)

Figure 70-90-37

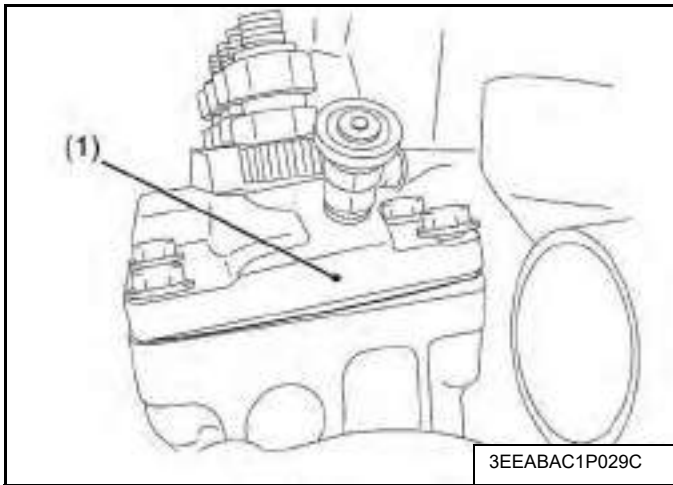
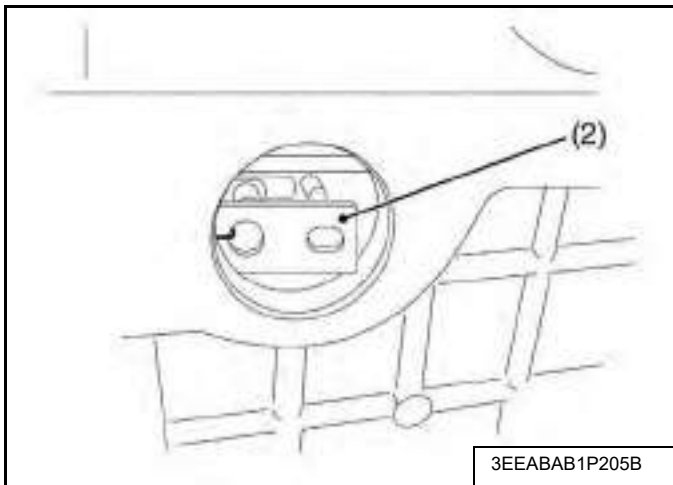


Figure 70-90-38



Hook the governor connecting rod (Item 2) [Figure 70-90-38] to the rack pin of the injection pump assembly (Item 1) [Figure 70-90-37].

Tighten the mounting bolts and nuts with the specified torque, not to slide off the governor connecting rod (Item 2) [Figure 70-90-38] from the rack pin.

Figure 70-90-39

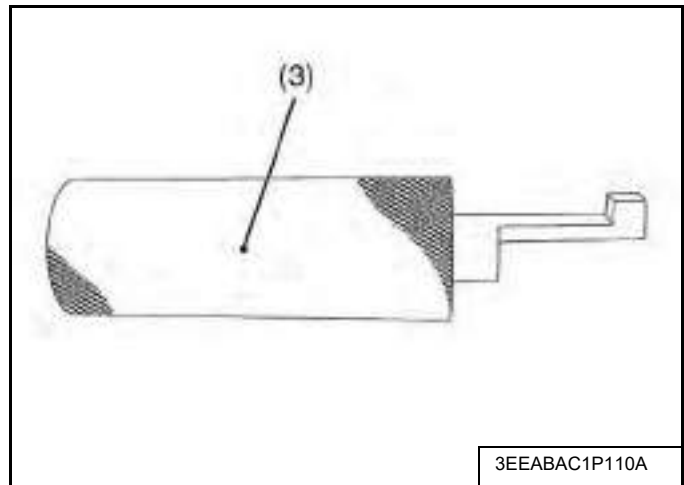
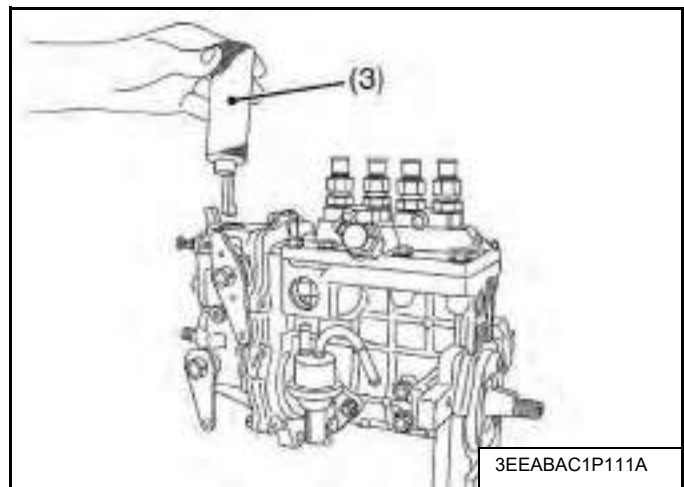


Figure 70-90-40



Place the tool (Item 3) [Figure 70-90-39] & [Figure 70-90-40] in the stop solenoid mounting hole of the injection pump unit.

NOTE: The Bobcat tool part number is MEL1637 for the governor connection rod alignment tool (Item 3) [Figure 70-90-39].

FUEL SYSTEM (CONT'D)

**Fuel Injection Pump Removal And Installation
(Cont'd)**

Figure 70-90-41

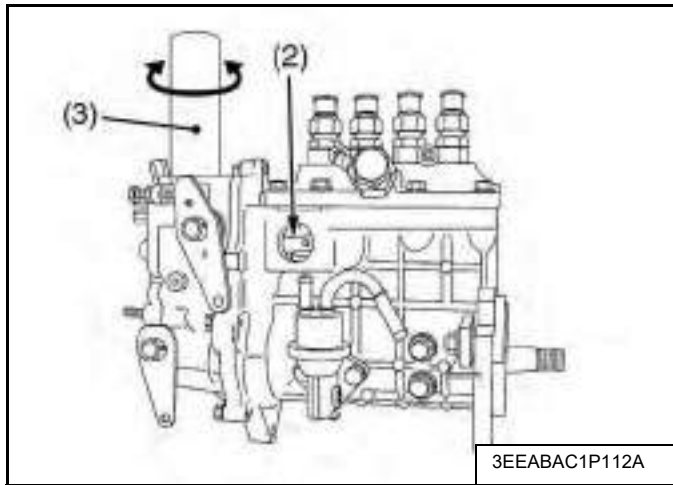


Figure 70-90-42

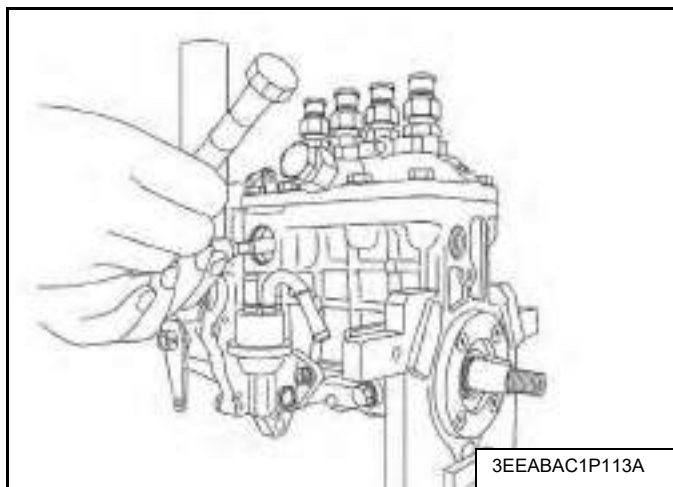
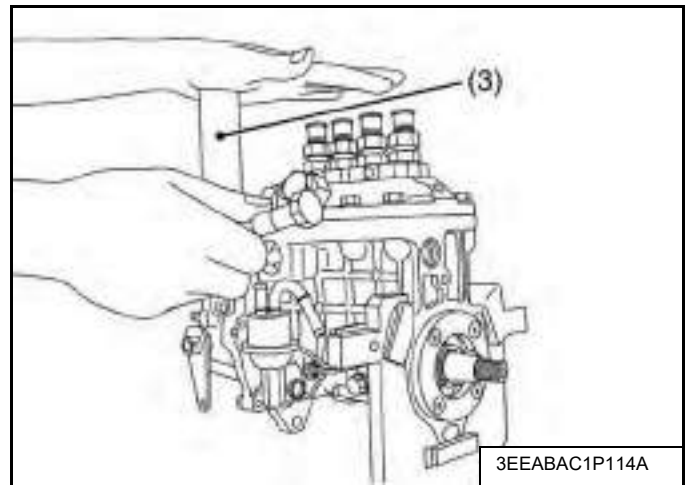


Figure 70-90-43



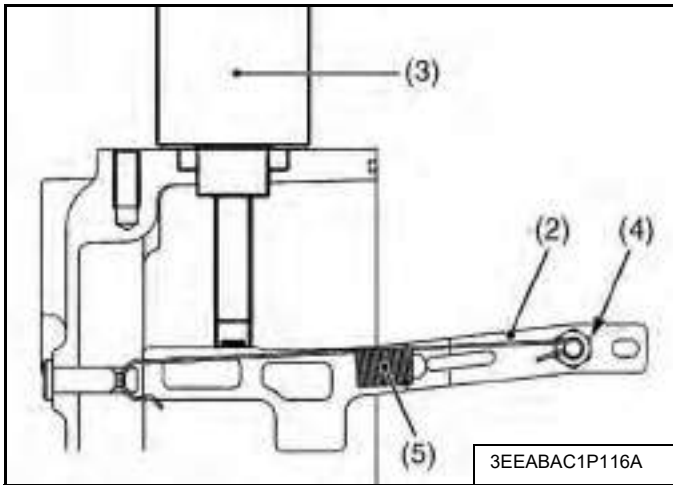
Make sure the permanent magnet at the top of the tool (Item 3) is attracted to the governor connecting rod (Item 2). To do this, turn the tool a little clockwise and counterclockwise and look into the sight cover hole to see if the governor connecting rod (Item 2) [Figure 70-90-41] moves right and left accordingly [Figure 70-90-42] & [Figure 70-90-43].

Dealer Copy -- Not for Resale

FUEL SYSTEM (CONT'D)

Fuel Injection Pump Removal And Installation (Cont'd)

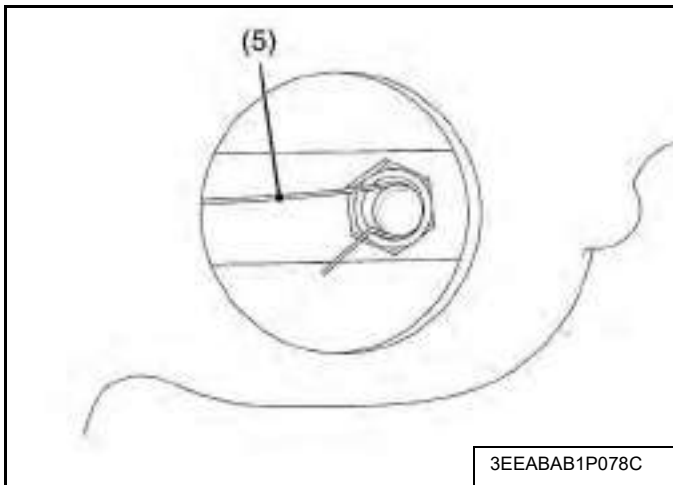
Figure 70-90-44



Slightly tighten the anti-rotation nut (Item 4) [Figure 70-90-44] of the governor connecting rod.

Holding down the tool by hand, tighten up the anti-rotation nut to the specified torque.

Figure 70-90-45



Hook the start spring (Item 5) [Figure 70-90-45] to the rack pin.

Figure 70-90-46

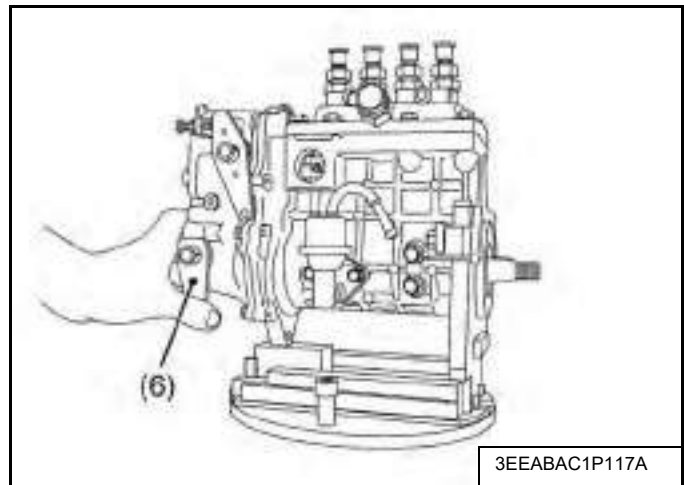
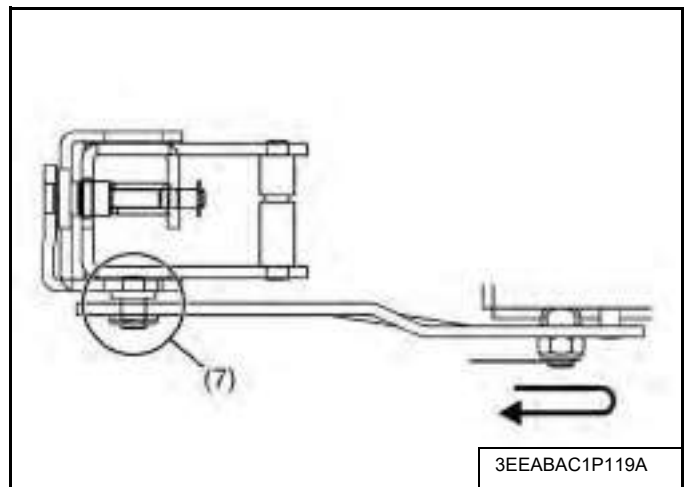


Figure 70-90-47



Move the stop lever (Item 6) [Figure 70-90-46] and visually check to see if the fuel injection pump control rack comes smoothly back to the start position by the counter force of the start spring. At the same time, visually check to see if there is no twist in the sliding point (Item 7) [Figure 70-90-47] between the governor fork lever and the governor connecting rod from the stop solenoid mounting hole.

If the control rack fails to move back smoothly, remove the start spring and the anti-rotation nut, and go through the procedure above starting with [Figure 70-90-39].

FUEL SYSTEM (CONT'D)

**Fuel Injection Pump Removal And Installation
(Cont'd)**

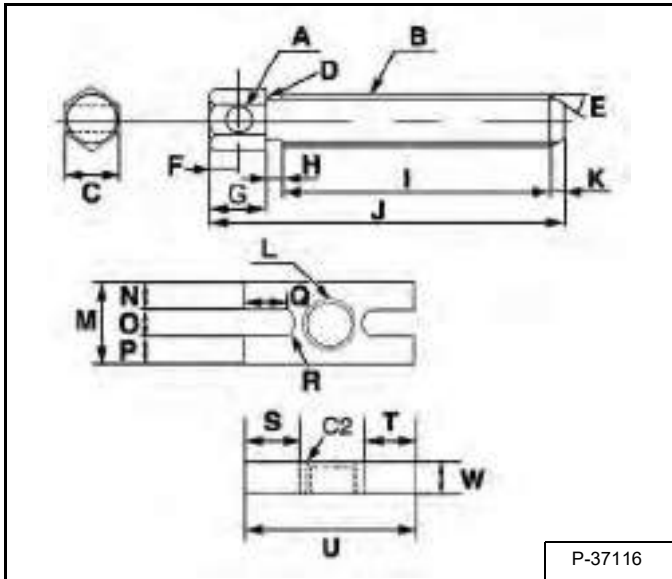
Finally fit the sight cover and the stop solenoid back into place.

Tightening torque	Injection pump mounting screw and nut	Screw	24 to 27 N•m 18 to 20 ft-lb
		Nut	18 to 20 N•m 13 to 15 ft-lb
	Anti-rotation nut	2.8 to 4.0 N•m 2.1 to 2.9 ft-lb	

FUEL SYSTEM (CONT'D)

Fuel Injection Pump Housing Removal

Figure 70-90-48

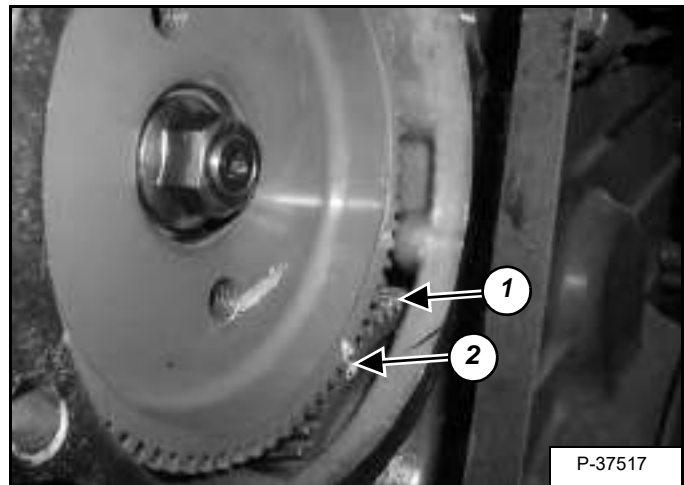


Injection Pump Gear Puller

Application: Use this puller for removing the injection pump gear from the governor shaft.

A	10 mm (0.39 in dia.)
B	M16 x Pitch 1.5
C	19 mm (0.75 in)
D	0,5 mm radius (0.02 in radius)
E	0.89 rad. (50°)
F	10 mm dia. (0.39 in)
G	20 mm (0.79 in)
H	5 mm (0.20 in)
I	95 mm (3.74 in)
J	125 mm (4.93 in)
K	5 mm (0.20 in)
L	M16 x Pitch 1.5
M	30 mm (1.18 in)
N	9,5 mm (0.3740 in)
O	11 mm (0.4331 in)
P	9,5 mm (0.3740 in)
Q	15,5 mm (0.6102 in)
R	4,5 mm radius (0.18 in radius)
S	20 mm (0.79 in)
T	20 mm (0.79 in)
U	80 mm (3.1496 in)
W	12 mm (0.47 in)
C2	Chamfer 2,0 mm (0.079 in)

Figure 70-90-49

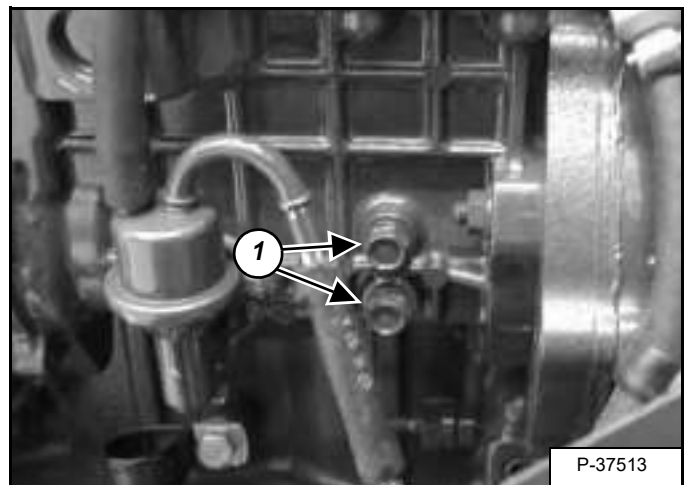


Place the piston of the 4th cylinder at the top dead center in the compression stroke. Fix the flywheel with the flywheel stopper bolt.

Look for a timing mark on the idler gear (Item 1), if one is not present, mark the engaged tooth (Item 2) [Figure 70-90-49] with a white marking pin to aid in reassembly.

If the timing marks are present and aligned the gears do not need to be marked.

Figure 70-90-50

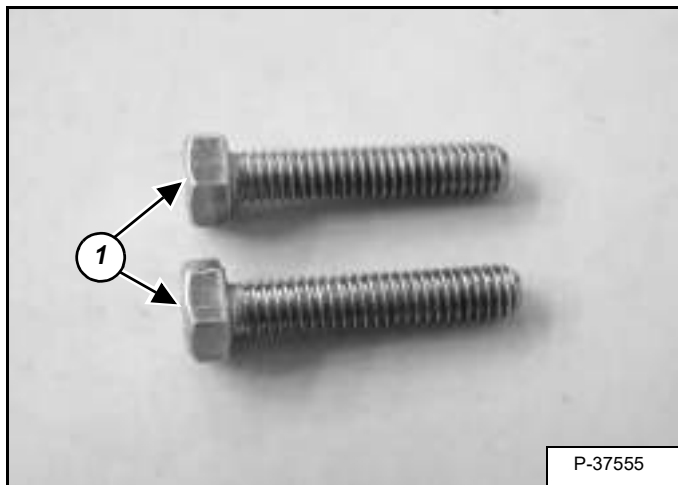


Unscrew the two flange bolts (Item 1) [Figure 70-90-50] from the injection pump unit. Have the fuel cam shaft lock bolts at hand.

FUEL SYSTEM (CONT'D)

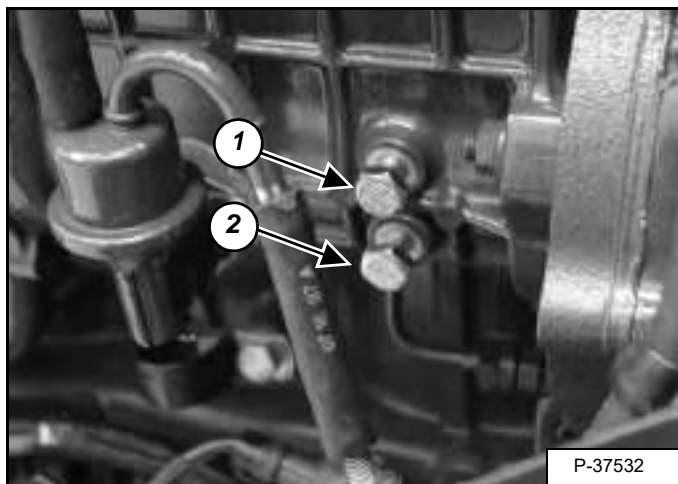
Fuel Injection Pump Housing Removal (Cont'd)

Figure 70-90-51



The fuel cam shaft lock bolts (Item 1) [Figure 70-90-51] are M8 X 1.25 X 30 mm.

Figure 70-90-52

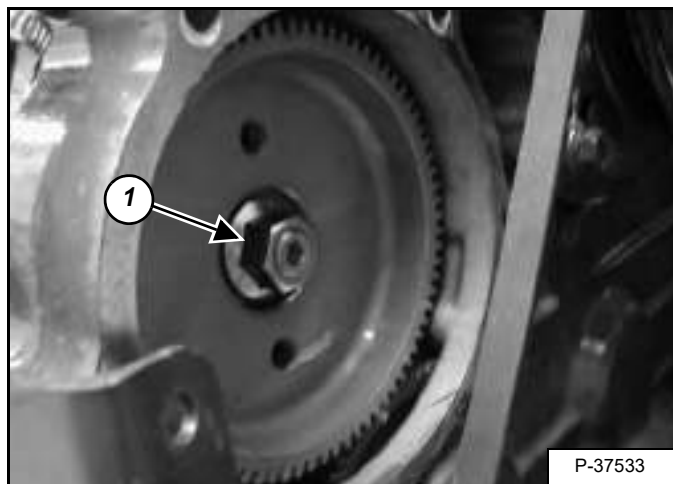


Tighten the upper fuel cam shaft lock bolt (Item 1) [Figure 70-90-52] until it comes into contact with the fuel cam shaft. Make sure the cam shaft does not move.

Tighten the lower fuel cam shaft lock bolt (Item 2) [Figure 70-90-52] until it comes into contact with the fuel camshaft.

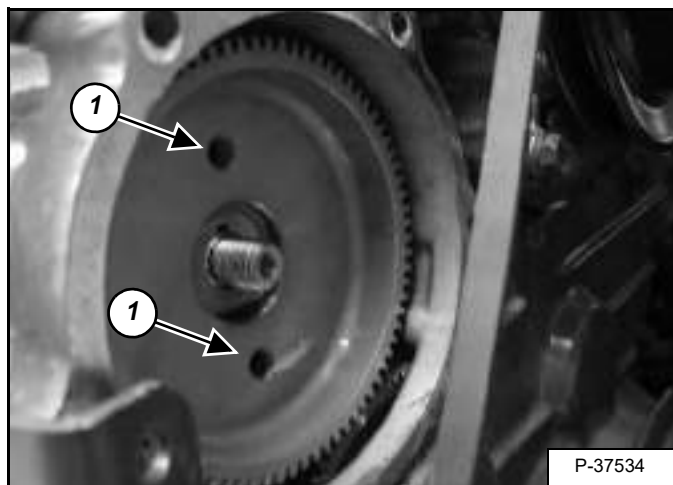
Do not over tighten the lock bolts when they have come in contact with the cam shaft.

Figure 70-90-53



Loosen the injection pump gear mounting nut (Item 1) [Figure 70-90-53].

Figure 70-90-54



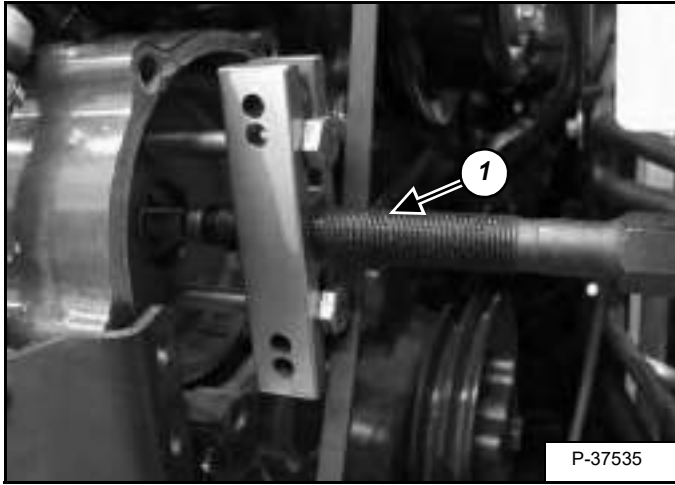
Install two bolts (M10 X 1,25 X 80 mm) into the two threaded holes (Item 1) [Figure 70-90-54] in the injection pump cam gear.

Dealer Copy -- Not for Resale

FUEL SYSTEM (CONT'D)

Fuel Injection Pump Housing Removal (Cont'd)

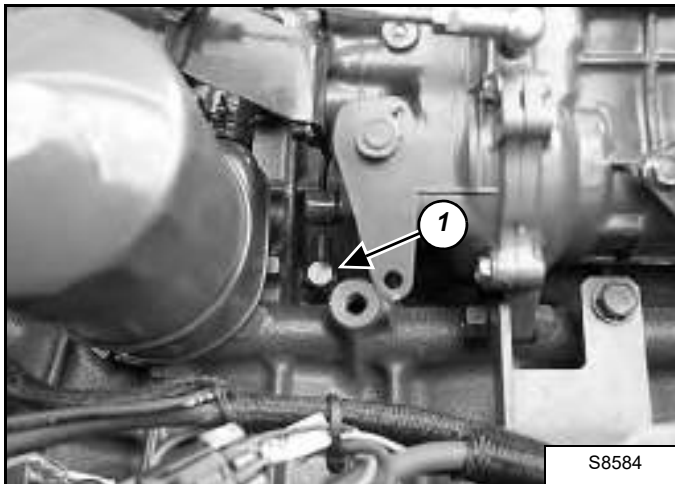
Figure 70-90-55



Install a gear puller (Item 1) [Figure 70-90-55] and remove the gear.

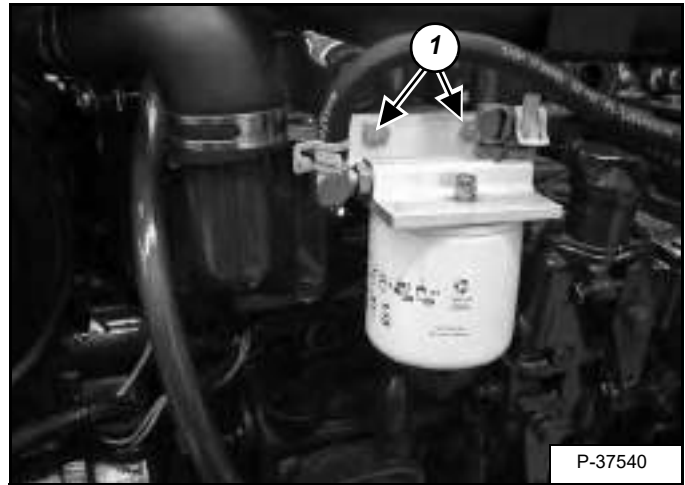
Remove the key from the key way on the injection pump shaft.

Figure 70-90-56



Disconnect the lubricating oil pipe (Item 1) [Figure 70-90-56].

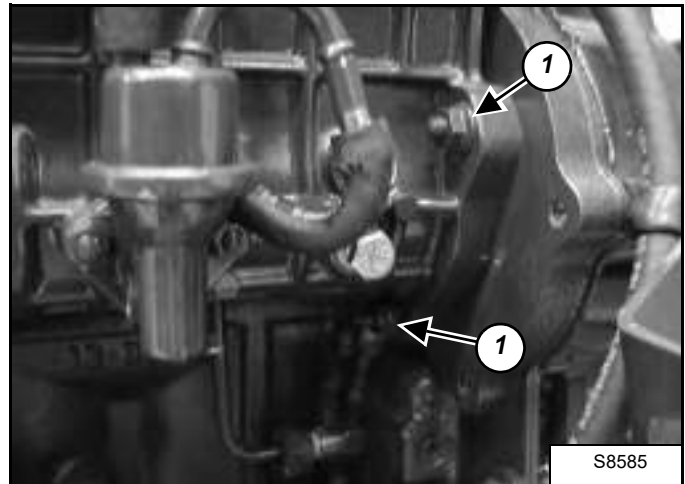
Figure 70-90-57



Remove the two mounting bolts (Item 1) [Figure 70-90-57] and move the fuel filter to allow clearance for the injection pump assembly to be removed.

Disconnect the throttle linkage from the injection pump.

Figure 70-90-58

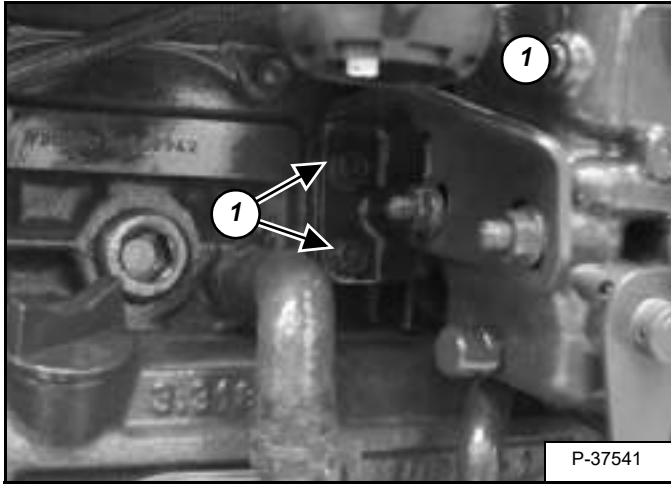


Remove the three injection pump unit mounting flange nuts (Item 1) [Figure 70-90-58]. (Two on the front side and one on the back side of the injection pump.)

FUEL SYSTEM (CONT'D)

Fuel Injection Pump Housing Removal (Cont'd)

Figure 70-90-59



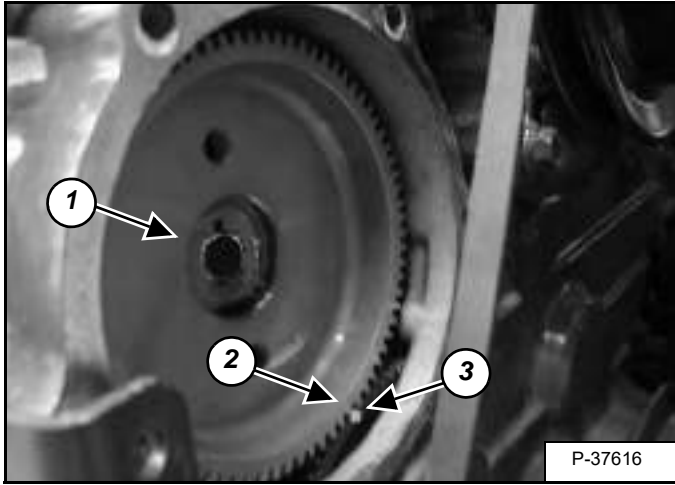
Remove the two injection pump unit support bolts (Item 1) [Figure 70-90-59].

Remove the injection pump unit from the engine.

FUEL SYSTEM (CONT'D)

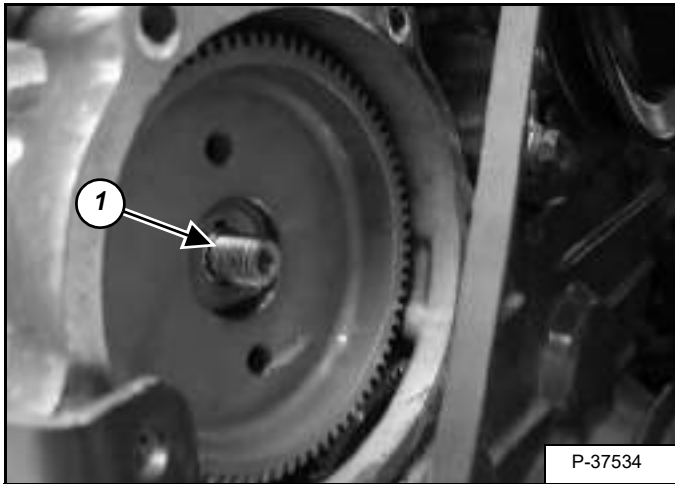
Fuel Injection Pump Housing Installation

Figure 70-90-60



Place the injection pump gear (Item 1) back into the gear case. Align the marks of the injection pump gear (Item 2) and the idle gear (Item 3) [Figure 70-90-60].

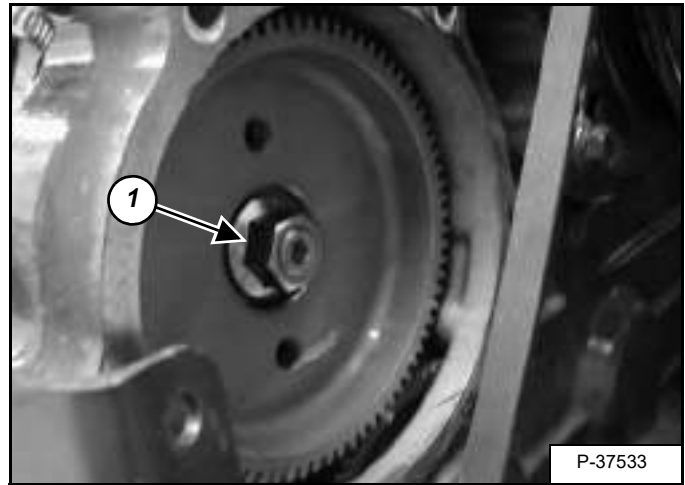
Figure 70-90-61



Install the injection pump unit into the injection pump gear (Item 1) [Figure 70-90-61].

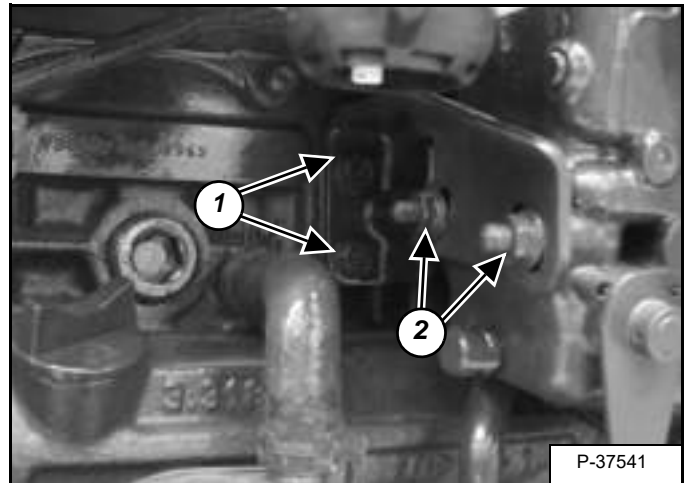
NOTE: When installing the injection pump unit to the injection pump gear, make sure that the key is fit in the keyway of injection pump gear.

Figure 70-90-62



Hand tighten the injection pump gear mounting nut (Item 1) [Figure 70-90-62].

Figure 70-90-63



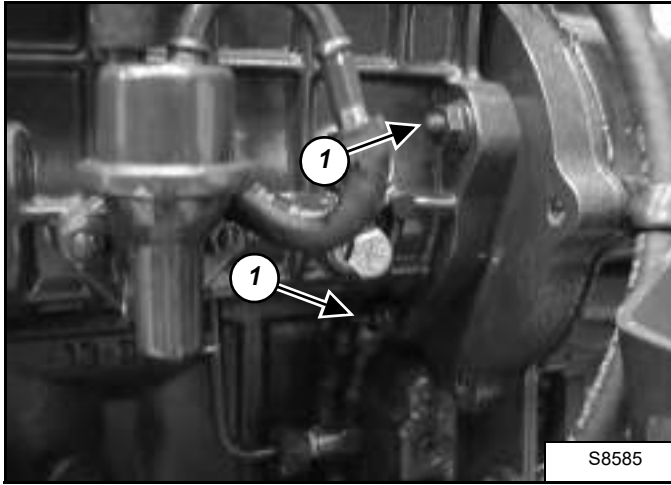
Install the two rear mount bolts (Item 1) [Figure 70-90-63] and tighten.

Loosen the two injection pump adjustment bolts (Item 2) [Figure 70-90-63].

FUEL SYSTEM (CONT'D)

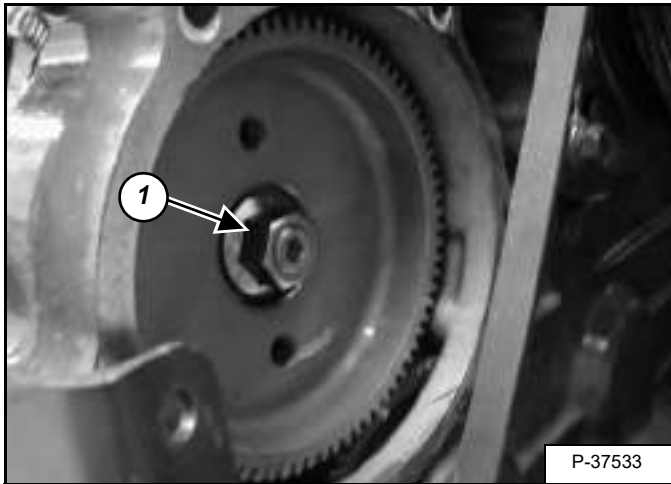
Fuel Injection Pump Housing Installation (Cont'd)

Figure 70-90-64



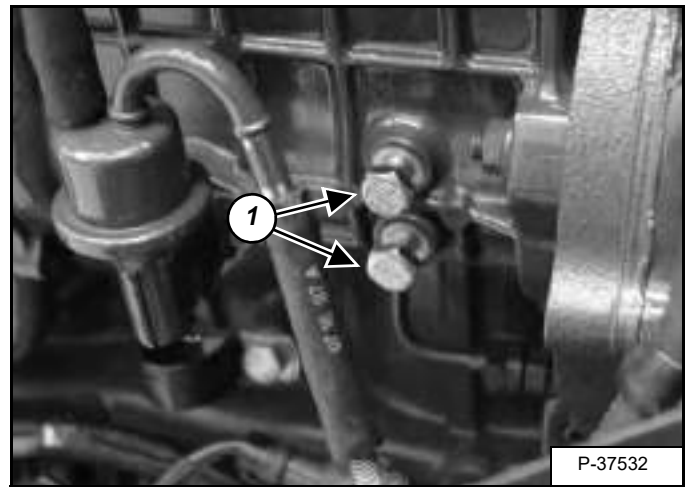
Install the three mounting flange nuts (Item 1) [Figure 70-90-64] and hand tighten. (Two on the front side and one on the back side of the injection pump.)

Figure 70-90-65



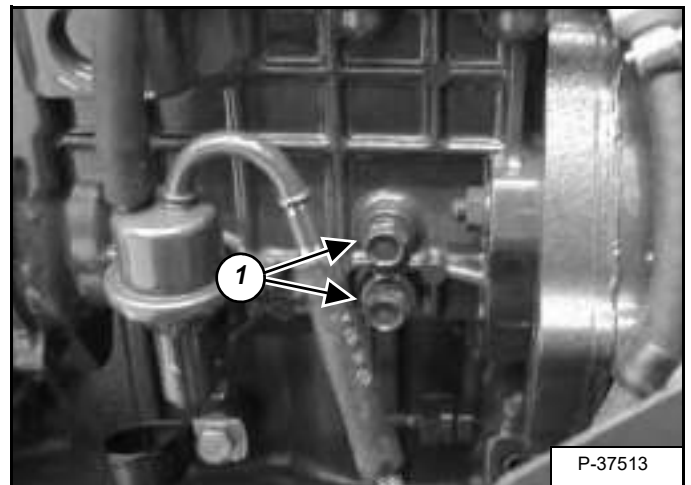
Tighten the injection pump gear mounting nut (Item 1) [Figure 70-90-65] to 74 - 83 N•m (55 - 61 ft-lb) torque.

Figure 70-90-66



Remove the two fuel camshaft lock bolts (Item 1) [Figure 70-90-66].

Figure 70-90-67



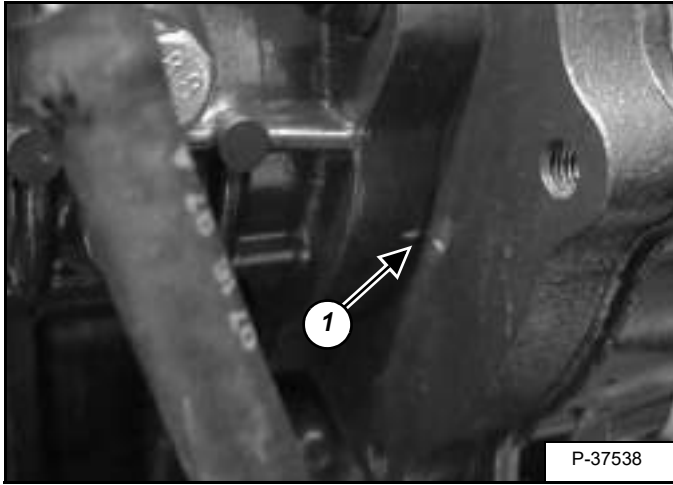
Install the two flange bolts (Item 1) [Figure 70-90-67] and tighten to 24-27 N•m (18-20 ft-lb) torque.

Dealer Copy -- Not for Resale

FUEL SYSTEM (CONT'D)

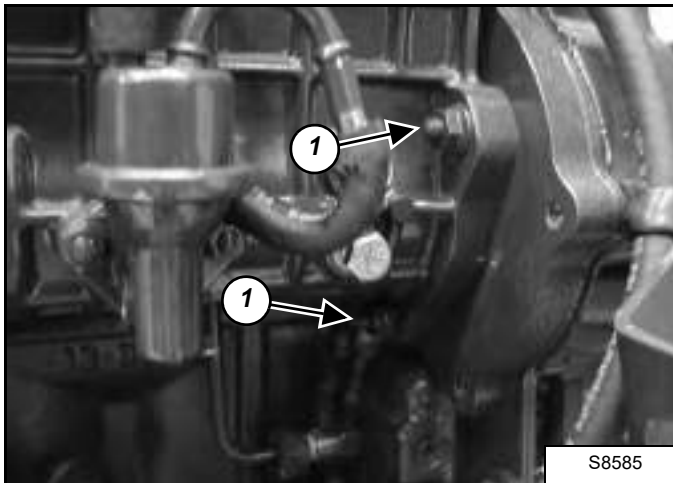
Fuel Injection Pump Housing Installation (Cont'd)

Figure 70-90-68



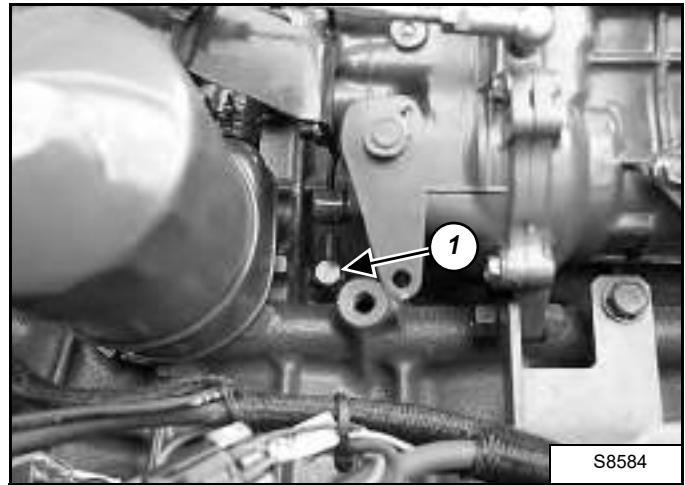
Move the injection pump unit clockwise (viewed from gearcase side), align the injection timing marks (Item 1) [Figure 70-90-68] on the injection pump unit and on the engine gearcase.

Figure 70-90-69



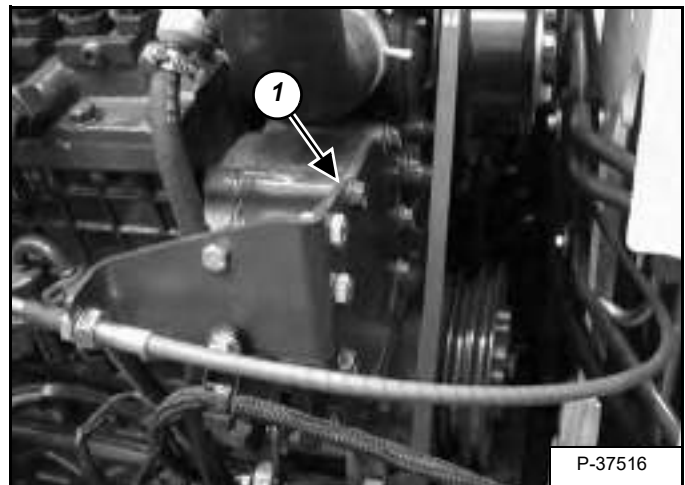
Tighten the three injection pump unit mounting flange nuts (Item 1) [Figure 70-90-69] to 18-20 N•m (13-15 ft-lb) torque. (Two on the front side and one on the back side of the injection pump.)

Figure 70-90-70



Reconnect the lubricating oil pipe (Item 1) [Figure 70-90-70].

Figure 70-90-71

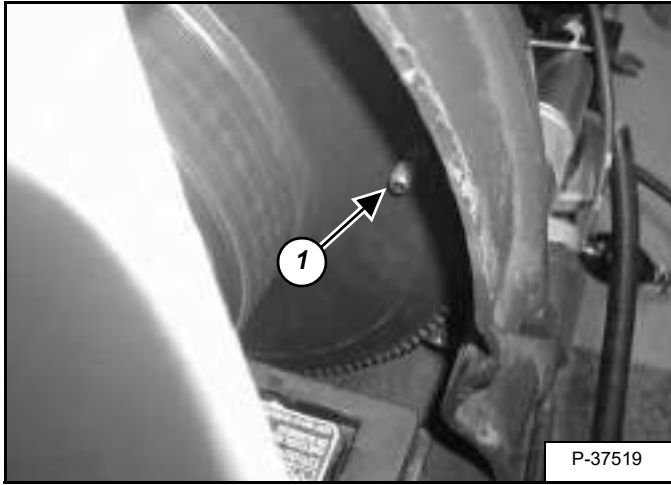


Install the injection pump gear cover and throttle cable mount bracket, and tighten the eight screws (Item 1) [Figure 70-90-71] to 24-27 N•m (18- 20 ft-lb) torque.

FUEL SYSTEM (CONT'D)

Fuel Injection Pump Housing Installation (Cont'd)

Figure 70-90-72



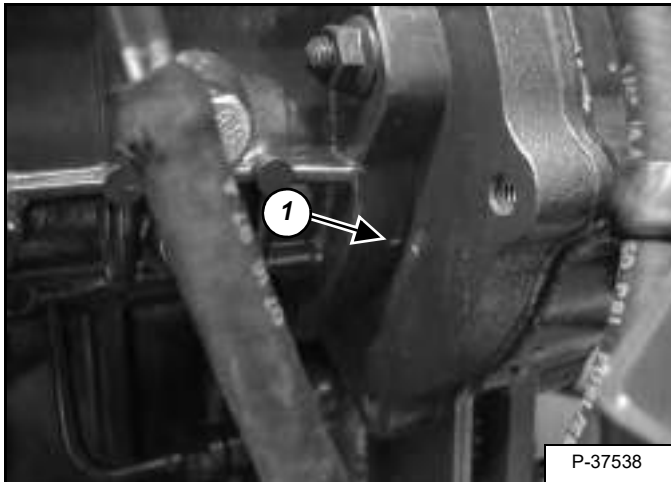
Remove the flywheel pin (Item 1) [Figure 70-90-72] from the engine flywheel and flywheel casting.

Check the injection timing. (See Injection Pump Timing on Page 70-90-23.)

Install the flywheel cover on the flywheel casting.

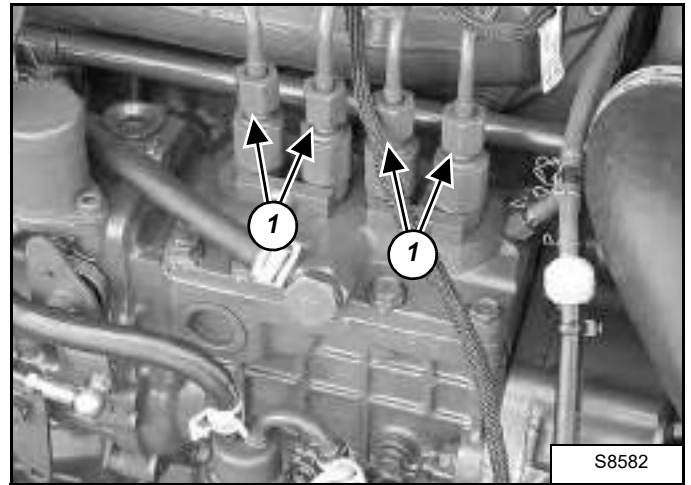
Injection Pump Timing

Figure 70-90-73



Align the timing mark on the injection pump (Item 1) [Figure 70-90-73] with the timing mark on the gearcase housing.

Figure 70-90-74

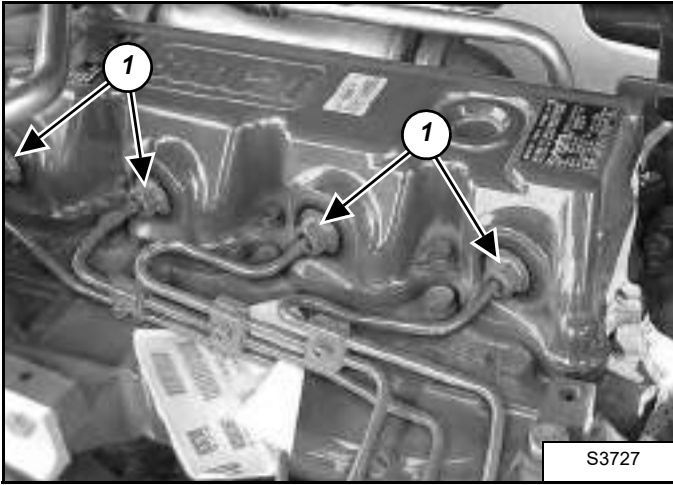


Disconnect the four injection lines (Item 1) [Figure 70-90-74] from the injection pump.

FUEL SYSTEM (CONT'D)

Injection Pump Timing (Cont'd)

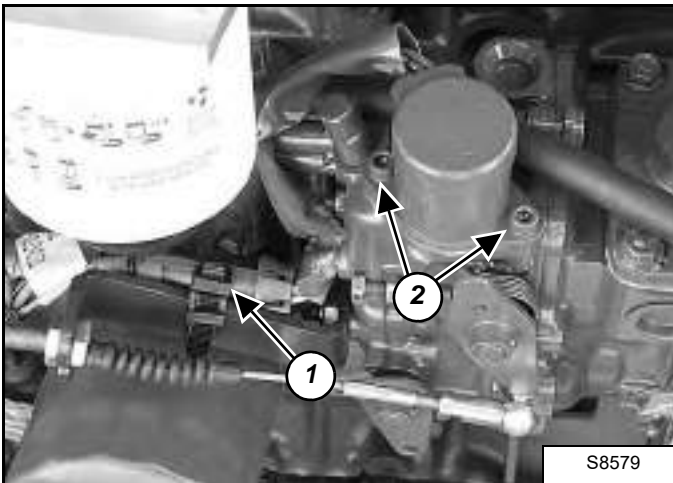
Figure 70-90-75



Disconnect the four injection lines (Item 1) [Figure 70-90-75] from the injector.

Remove the injector lines from the engine.

Figure 70-90-76

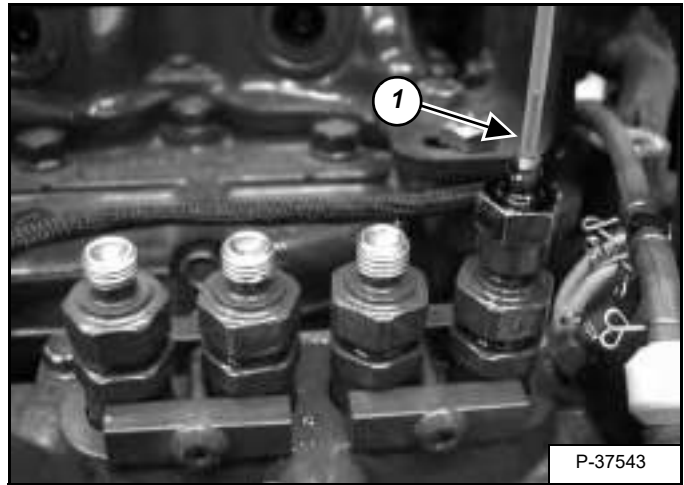


Remove the tie strap and disconnect the electrical connector (Item 1) [Figure 70-90-76] from the fuel shutoff solenoid.

Remove the two mount bolts (Item 2) [Figure 70-90-76] from the fuel shutoff solenoid.

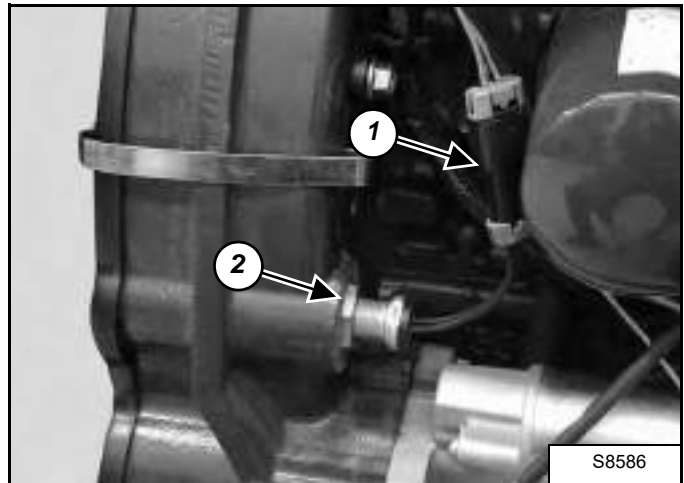
Remove the fuel shutoff solenoid from the engine.

Figure 70-90-77



Install a short plastic tube (Item 1) [Figure 70-90-77] in the number one cylinder port of the injection pump. The tube should fit securely and point upward.

Figure 70-90-78



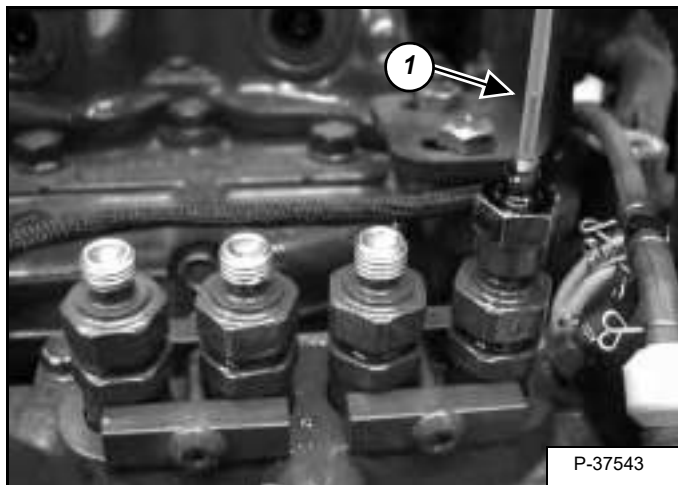
Disconnect the wiring connector (Item 1) [Figure 70-90-78] from the engine speed control sensor.

Remove the speed sensor (Item 2) [Figure 70-90-78] from the engine.

FUEL SYSTEM (CONT'D)

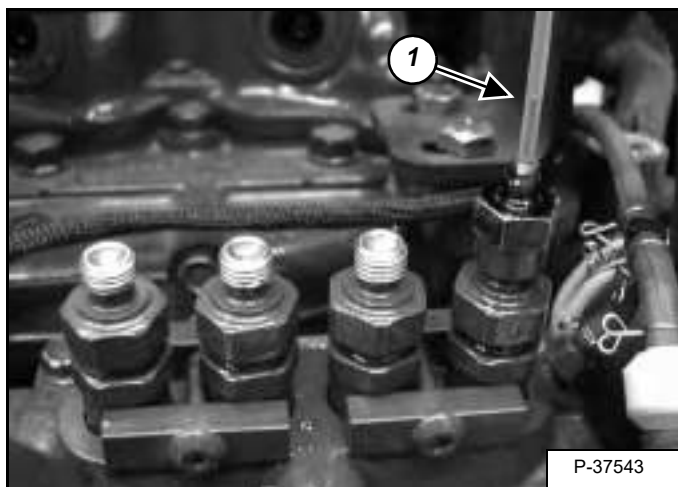
Injection Pump Timing (Cont'd)

Figure 70-90-79



Turn the engine counterclockwise (viewed from flywheel end) until the fuel partially fills the plastic tube (Item 1) [Figure 70-90-79].

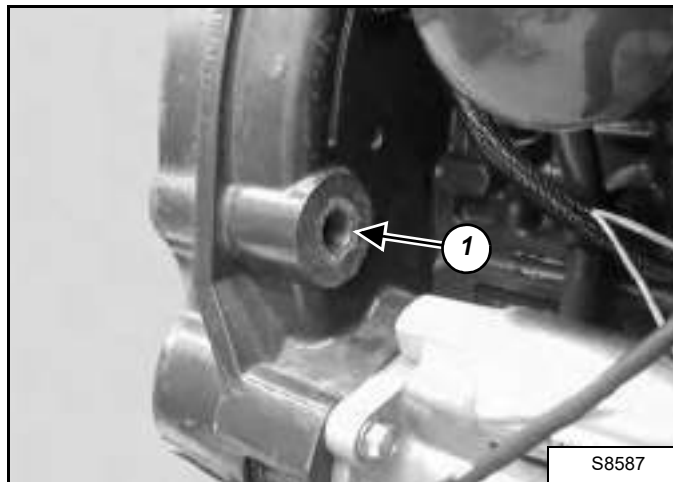
Figure 70-90-80



After there is fuel rise seen in the plastic tube, rotate the engine back (clockwise) at least 90 degrees.

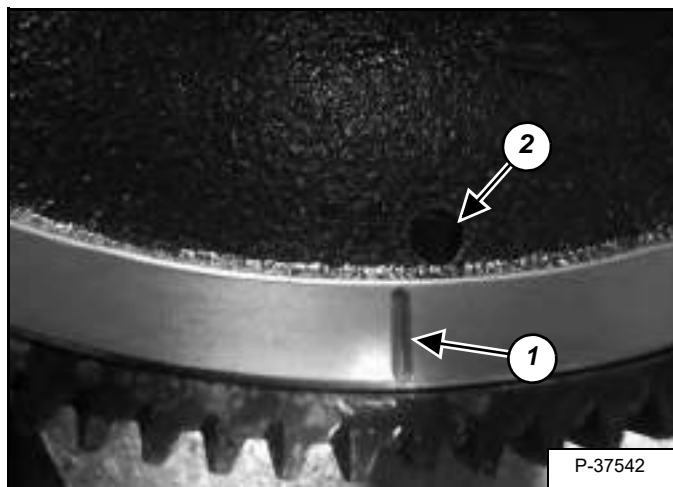
Slowly rotate the engine counterclockwise (viewed from flywheel end) and stop turning when the fuel begins to rise in the plastic tube (Item 1) [Figure 70-90-80].

Figure 70-90-81



Check the location of the engine timing mark, by looking in the engine speed sensor hole on the engine flywheel casting (Item 1) [Figure 70-90-81].

Figure 70-90-82



The timing mark (Item 1) [Figure 70-90-82] should be located in the center of the engine speed sensor hole.

NOTE: The T.D.C. hole (Item 2) [Figure 70-90-82] in the flywheel will not be visible by looking in the speed sensor hole.

If the timing mark is not located in the center of the hole, rotate the injection pump unit until the injection timing is adjusted.

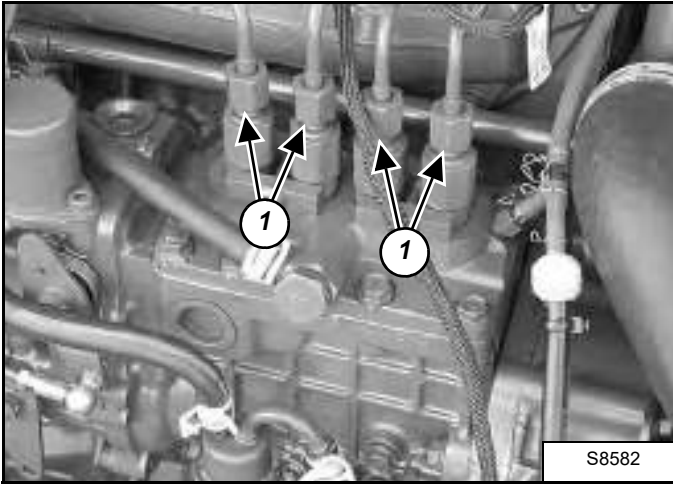
The injection timing is 5.25 to 6.75 degrees before T.D.C. (0.0917 to 0.117 rad.).

Dealer Copy -- Not for Resale

FUEL SYSTEM (CONT'D)

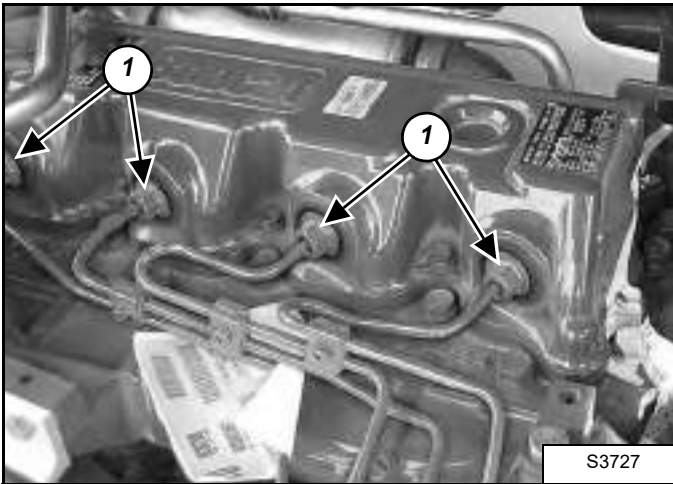
Fuel Injector Removal and Installation

Figure 70-90-83



Disconnect the four injection lines (Item 1) [Figure 70-90-83] from the injection pump.

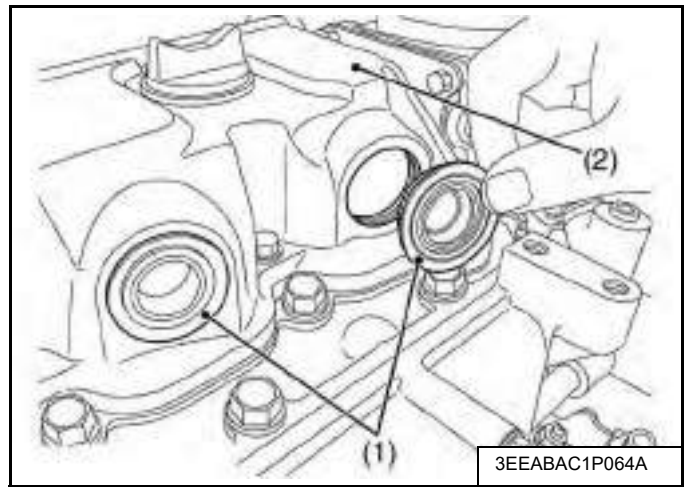
Figure 70-90-84



Disconnect the four injection lines (Item 1) [Figure 70-90-84] from the injector.

Remove the injector lines from the engine.

Figure 70-90-85



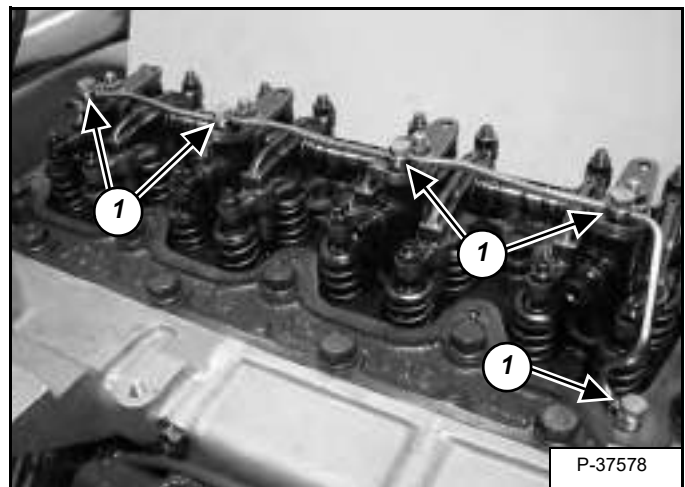
Remove the injection nozzle oil seal (Item 1) from the cylinder head cover (Item 2) [Figure 70-90-85].

Installation: Install new injection nozzle oil seals.

Remove the cylinder head cover (Item 2) [Figure 70-90-85].

Installation: Tighten the cylinder head cover screws to 6.9 to 11.2 N•m (5.1-8.31 ft-lb) torque.

Figure 70-90-86



Remove the five overflow pipe retaining screws (Item 1) [Figure 70-90-86].

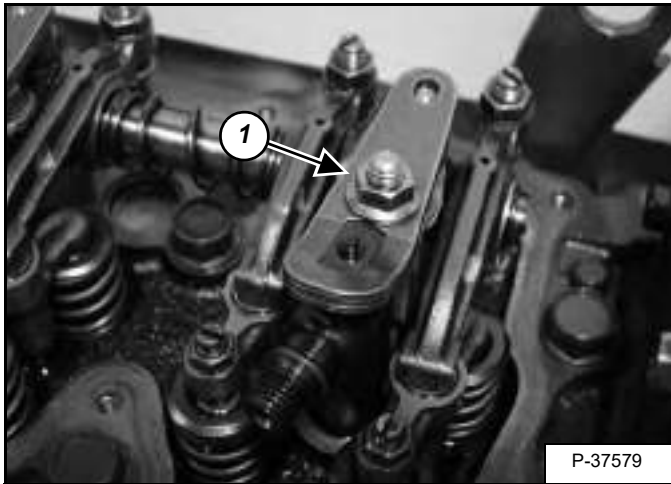
Installation: Tighten the retaining screws to 9.8-11.2 N•m (7.24-8.31 ft-lb) torque.

Remove the nozzle holder clamps (Item 1) [Figure 70-90-88] from the injector nozzle.

FUEL SYSTEM (CONT'D)

Fuel Injector Removal and Installation (Cont'd)

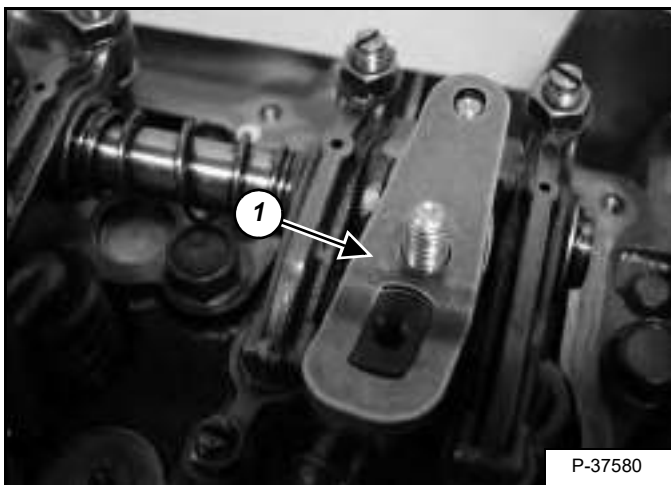
Figure 70-90-87



Remove the nut (Item 1) [Figure 70-90-87] from the injector nozzle holder clamp.

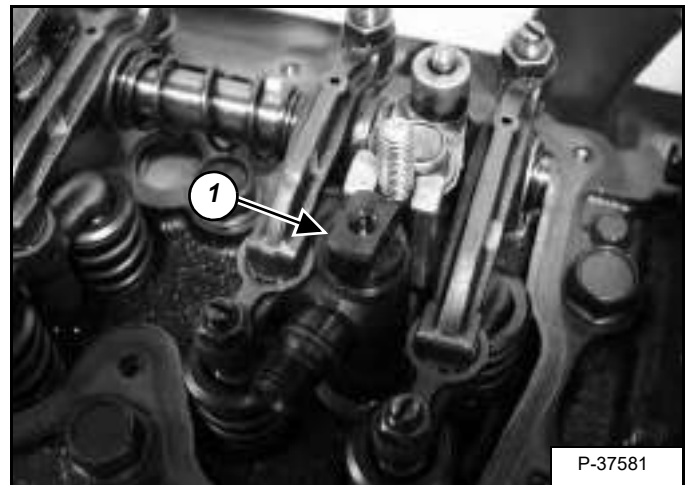
Installation: Tighten the injector nozzle holder clamp nut to 18-20 N•m (13-15 ft-lb) torque.

Figure 70-90-88



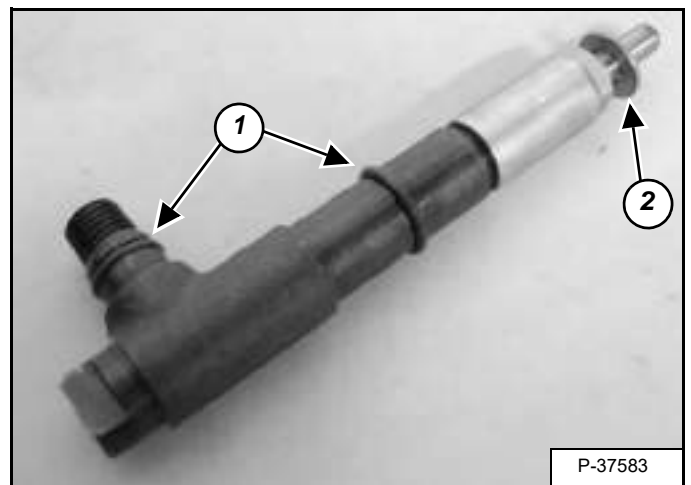
Remove the injector nozzle holder clamp (Item 1) [Figure 70-90-88].

Figure 70-90-89



Remove the injector nozzle (Item 1) [Figure 70-90-89] from the engine.

Figure 70-90-90



Check the injector nozzle O-rings (Item 1) and nozzle washer (Item 2) [Figure 70-90-90].

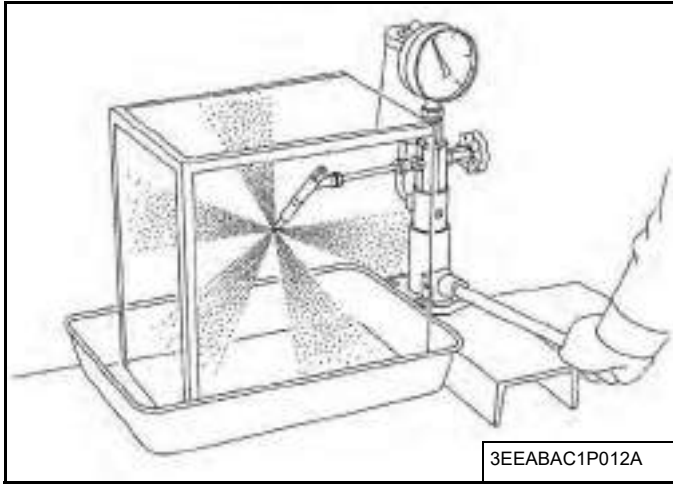
Always replace the injector O-rings and washer before installation.

Dealer Copy -- Not for Resale

FUEL SYSTEM (CONT'D)

Fuel Injector Nozzle Pressure - Checking

Figure 70-90-91



Set the injection nozzle to the nozzle tester (Code No.: 07909-31361).

Slowly move the tester handle to measure the pressure at which fuel begins jetting out from the nozzle.

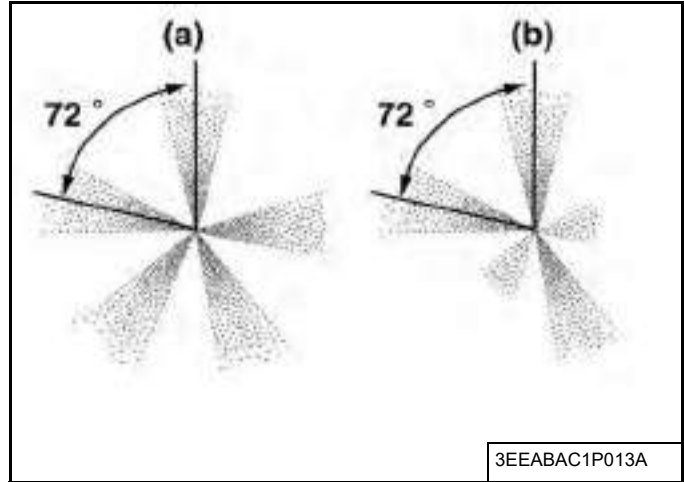
If the measurement is not within the factory specifications, replace the injection nozzle assembly or repair at Denso service shop.

NOTE: Injection nozzle gasket must be replaced when the injection nozzle is removed for checking.

Injection pressure	Factory spec.	1st stage	18.63 to 19.61 MPa (186.3 to 196.1 bar) (2702 to 2845 psi)
--------------------	---------------	-----------	--

Nozzle Spraying Condition

Figure 70-90-92



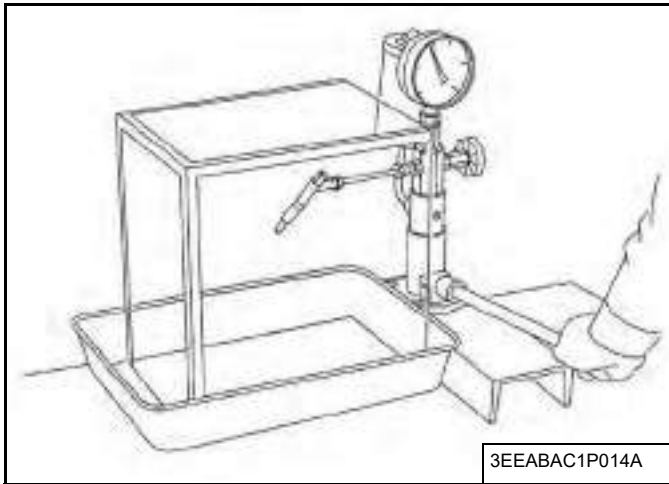
Set the injection nozzle to a nozzle tester (Code No. 07909-31361), and check the nozzle spraying condition.

If the spraying condition is defective, replace the injection nozzle assembly or repair at Denso service shop.

FUEL SYSTEM (CONT'D)

Valve Seat Tightness

Figure 70-90-93



Set the injection nozzle to a nozzle tester (Code No. 07909-31361).

Raise the fuel pressure, and keep at 16,67 MPa (168 bar) (2418 psi) for 10 seconds.

If any fuel leak is found, replace the injection nozzle assembly or repair at Denso service shop.

Valve seat tightness	Factory spec.	No fuel leak at 16.67 MPa (168 bar) (2418 psi)
----------------------	---------------	--



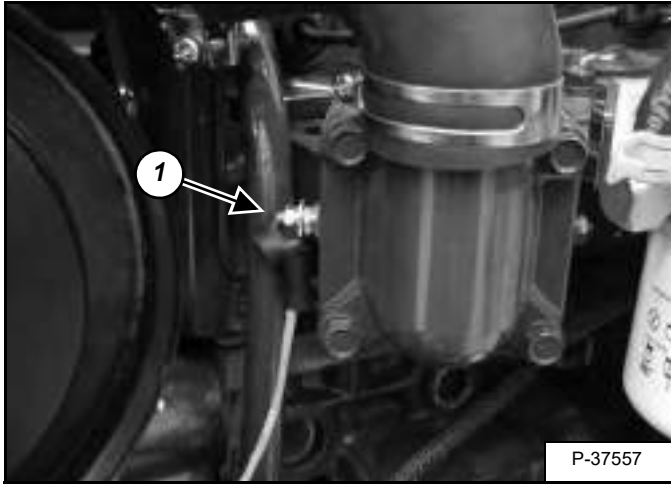
Bobcat®

Dealer Copy -- Not for Resale

CYLINDER HEAD

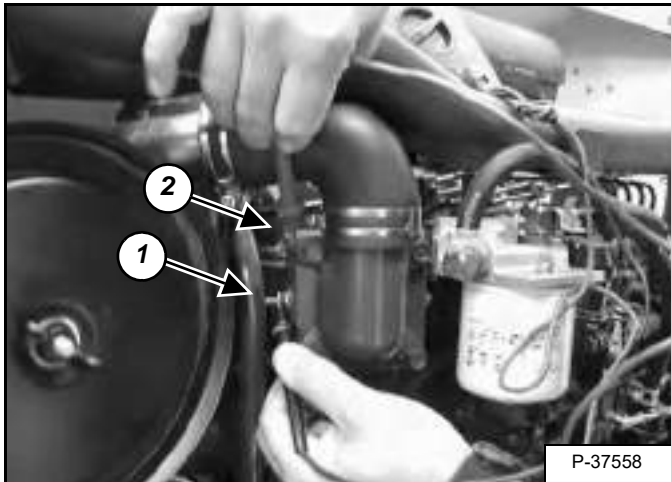
Intake Air Heater - Testing

Figure 70-100-1



Disconnect the electrical wire (Item 1) [Figure 70-100-1] from the air intake heater.

Figure 70-100-2



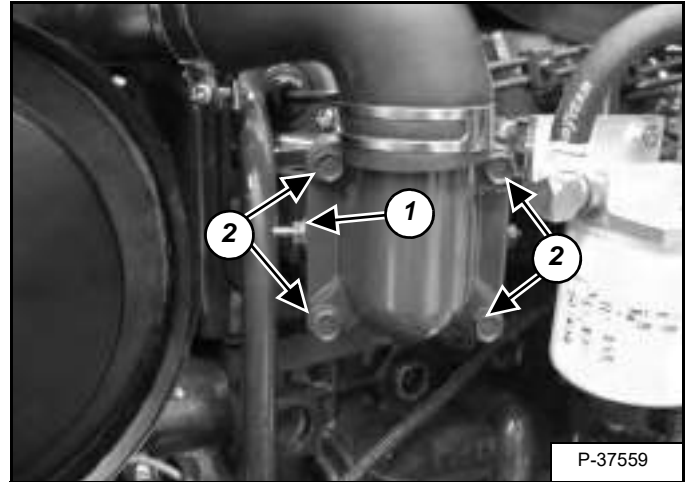
Measure the resistance between + terminal (Item 1) and intake air heater body (Item 2) [Figure 70-100-2].

If the resistance is open, the intake air heater is faulty.

Intake air heater resistance	Factory spec.	Approx. 0.3 Ohms (At cold occasion)
------------------------------	---------------	-------------------------------------

Intake Air Heater Removal And Installation

Figure 70-100-3

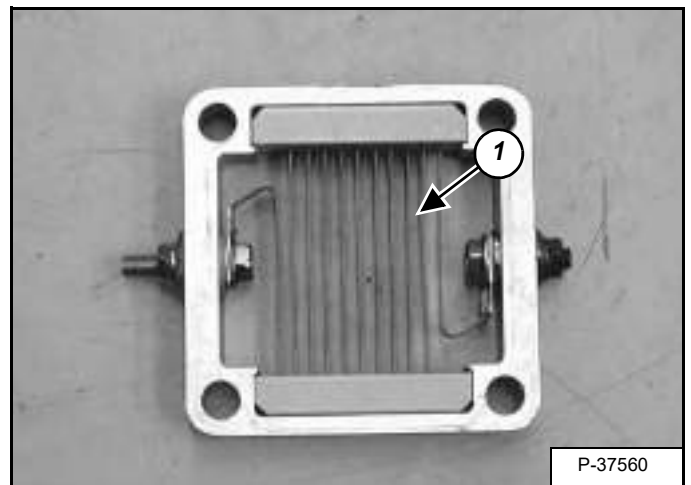


Disconnect the electrical wire from the intake heater lead (Item 1) [Figure 70-100-3]

Remove the four mount bolts (Item 2) [Figure 70-100-3] from the intake air heater housing.

Installation: Tighten the bolts to 24-27 N•m (18-20 ft-lb) torque.

Figure 70-100-4



NOTE: When installing the intake air heater in the housing, install the intake air heater so the heater lines (Item 1) [Figure 70-100-4] are vertical, to prevent a short-circuit in the system.

Dealer Copy -- Not for Resale

CYLINDER HEAD (CONT'D)

Valve Clearance Adjustment

NOTE: Valve clearance must be checked and adjusted when engine is cold.

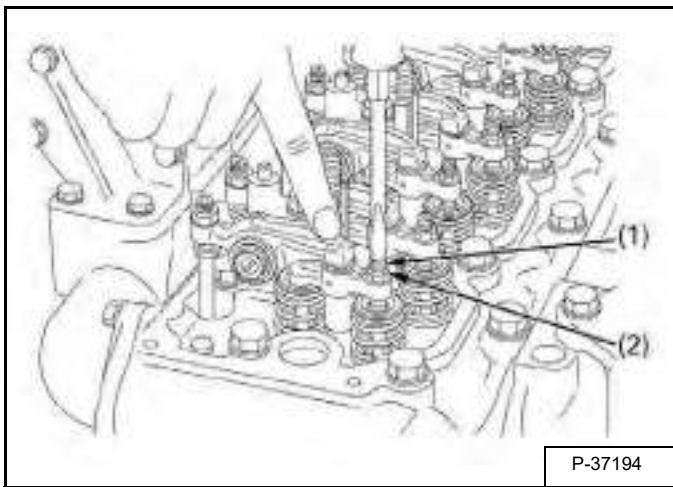
Remove the injection pipes.

Remove the head cover.

Set the No.1 piston at the compression Top Dead Center. (See Valve Timing - Checking on Page 70-100-3.)

Before adjusting the valve clearance, adjust the bridge to set the height of valves.

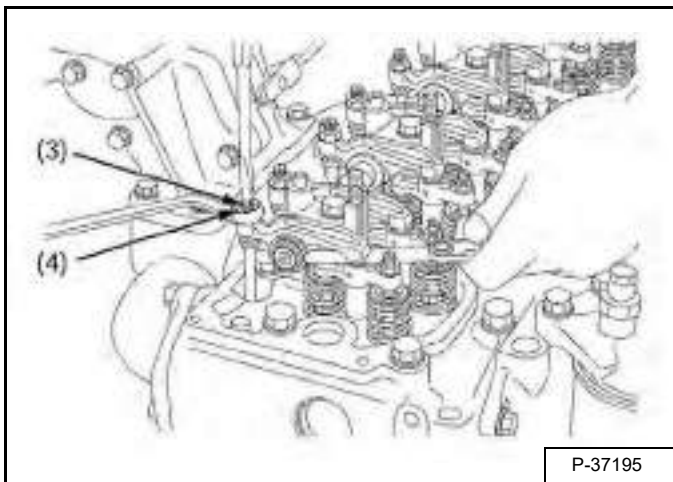
Figure 70-100-5



Loosen the lock nut (Item 2) and return the adjusting screw (Item 1) [Figure 70-100-5].

Push the rocker arm by your fingers and screw in the adjusting screw slowly until you feel the screw touch the top of valve stem, then tighten the lock nut.

Figure 70-100-6



Loosen the lock nut (Item 4) of adjusting screw (Item 3) [Figure 70-100-6] (push rod side) and insert the thickness gauge between the rocker arm and the bridge head. Set the adjusting screw to the specified value, then tighten the lock nut.

Valve clearance (cold)	Factory spec.	0,23 to 0,27 mm (0.0091 to 0.010 in)
------------------------	---------------	---

NOTE: After adjusting, tighten the lock nut (Item 4) [Figure 70-100-6] securely.

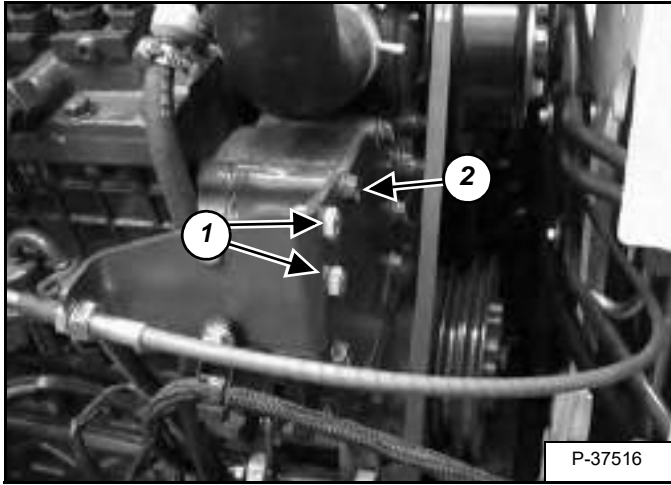
Valve arrangement Adjustment cylinder Location of piston		IN.	EX.
When No. 1 piston is compression top dead center	1st	*	*
	2nd	*	
	3rd		*
	4th		
When No. 1 piston is overlap position	1st		
	2nd		*
	3rd	*	
	4th	*	*

Tightening torque	Cylinder head cover screw	6.9 to 11.2 N•m 5.1 to 8.31 ft-lb
	Injection pipe retaining nut	23 to 36 N•m 17 to 26 ft-lb

CYLINDER HEAD (CONT'D)

Valve Timing - Checking

Figure 70-100-7

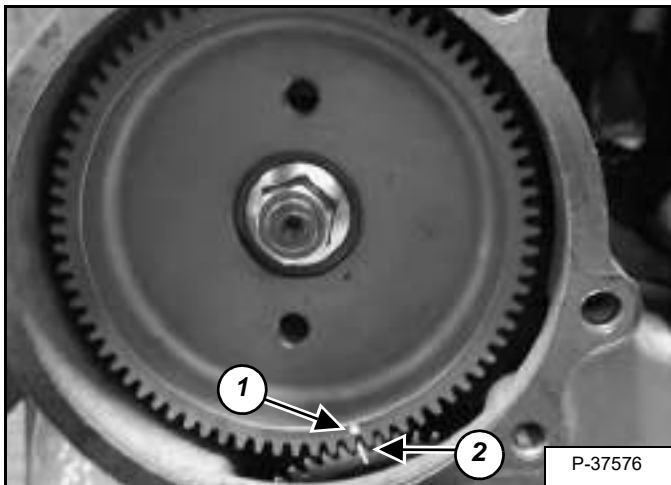


Remove the two bolts (Item 1) [Figure 70-100-7] from the throttle linkage mount and the injection pump gear cover.

Remove the six remaining mount bolts (Item 2) [Figure 70-100-7] from the injection pump gear cover.

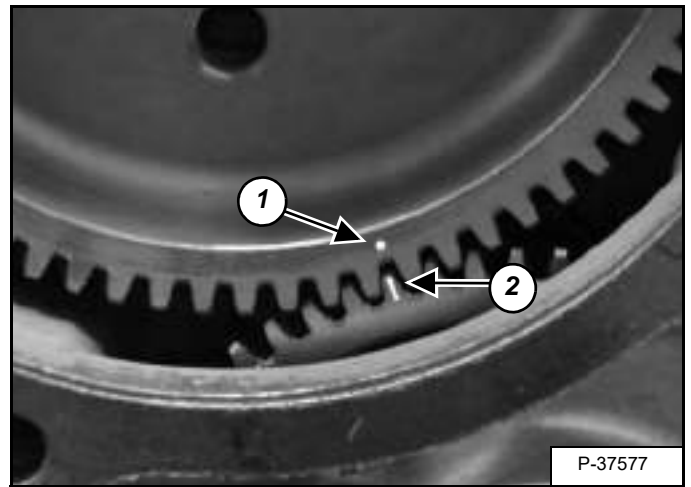
Remove the injection pump gear cover from the engine.

Figure 70-100-8



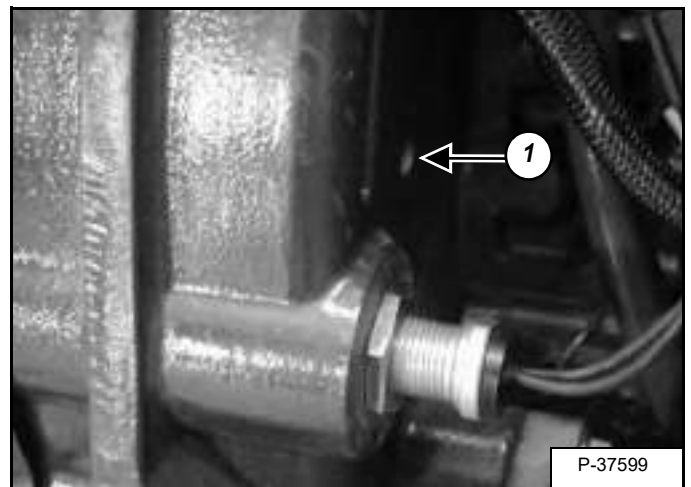
Rotate the engine, until the timing mark on the injection pump fuel cam gear (Item 1) is meshed with the idler gear (Item 2) [Figure 70-100-8].

Figure 70-100-9



Any time the timing mark (Item 1) on the fuel cam gear is meshed with the idler gear (Item 2) [Figure 70-100-9] the engine is on top dead center of the compression stroke on number four cylinder.

Figure 70-100-10



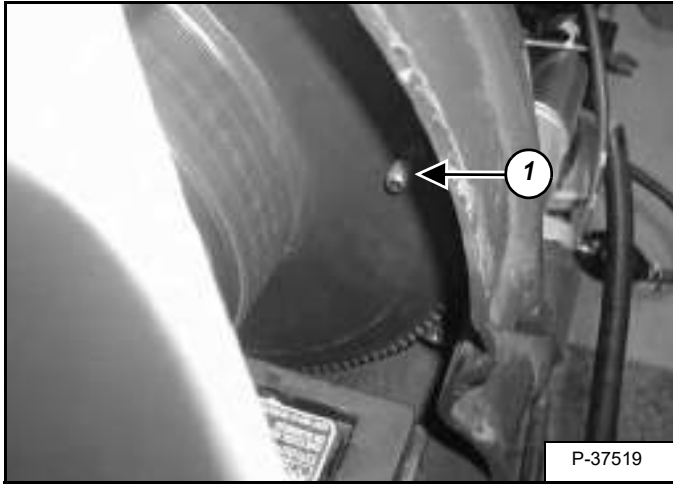
Install a 9,525 mm (0.375 in) bolt through the hole in the flywheel casting (Item 1) [Figure 70-100-10].

Dealer Copy -- Not for Resale

CYLINDER HEAD (CONT'D)

Valve Timing - Checking (Cont'd)

Figure 70-100-11



Remove the flywheel cover from the engine flywheel housing.

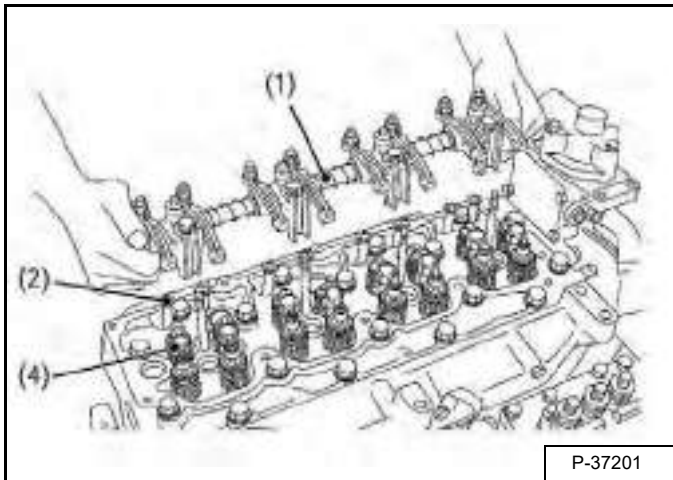
Check to see that the bolt (Item 1) [Figure 70-100-11] is completely through the flywheel.

The engine is now pinned on Top Dead Center.

Cylinder Head Removal And Installation

Remove the fuel injectors. (See Fuel Injector Removal and Installation on Page 70-90-26.)

Figure 70-100-12

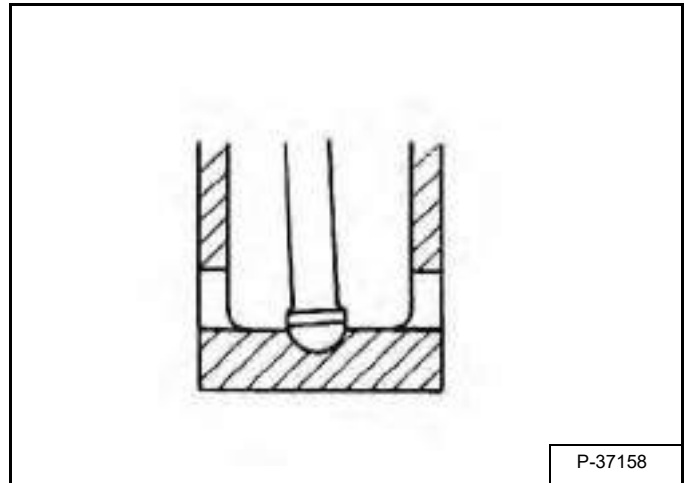


Remove the rocker arm assembly (Item 1) [Figure 70-100-12].

Remove the push rods (Item 2) [Figure 70-100-12].

Remove the bridge arm (Item 4) [Figure 70-100-12].

Figure 70-100-13



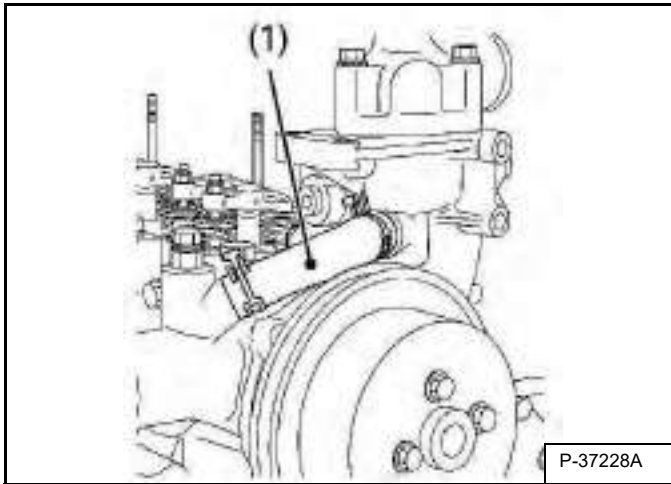
Putting the push rods onto the tappets (Item 3) [Figure 70-100-13], check to see if their ends are properly engaged with the grooves.

NOTE: After reassembling the rocker arm, be sure to adjust the valve clearance.

CYLINDER HEAD (CONT'D)

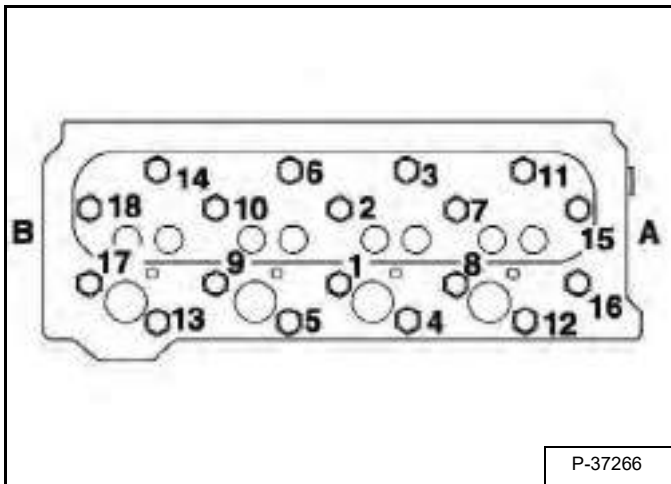
Cylinder Head Removal And Installation (Cont'd)

Figure 70-100-14



Loosen the hose clamps and remove the water return hose (Item 1) [Figure 70-100-14].

Figure 70-100-15



Remove the cylinder head screw in the order of (18) to (1) [Figure 70-100-15], and remove the cylinder head.

Remove the cylinder head gasket. (O-ring is not attached to because of metal type cylinder head gasket.)

The cylinder head should be free of scratches and dust.

Take care for handling the gasket not to damage it.

Install the cylinder head.

Tightening torque	Cylinder head screw	98.1 to 107 N•m 72.4 to 79.5 ft-lb
-------------------	---------------------	---------------------------------------

Tighten the cylinder head screw gradually in the order of (1) to (18) after applying engine oil.

Be sure to adjust the valve clearance. (See Valve Clearance Adjustment on Page 70-100-2.)

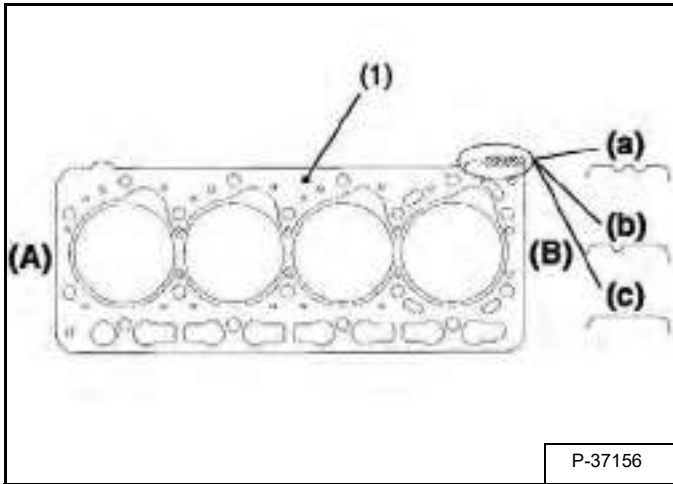
It is not necessary to retighten the cylinder head screw after running the engine for 30 minutes.

NOTE: When replacing the piston, piston pin bushing, connecting rod or crank pin bearing, select the cylinder head gasket thickness to meet with the top clearance.

CYLINDER HEAD (CONT'D)

Cylinder Head Removal And Installation (Cont'd)

Figure 70-100-16



Make sure to not the notch (a), (b) or (c) of cylinder head gasket (Item 1) [Figure 70-100-16] in advance.

Replace the same notch (a), (b) or (c) as the original cylinder head gasket (Item 1) [Figure 70-100-16].

Select the cylinder head gasket (Item 1) [Figure 70-100-16] thickness to meet with the top clearance when replacing the piston, piston pin bushing, connecting rod or crank pin bearing.

Figure 70-100-17

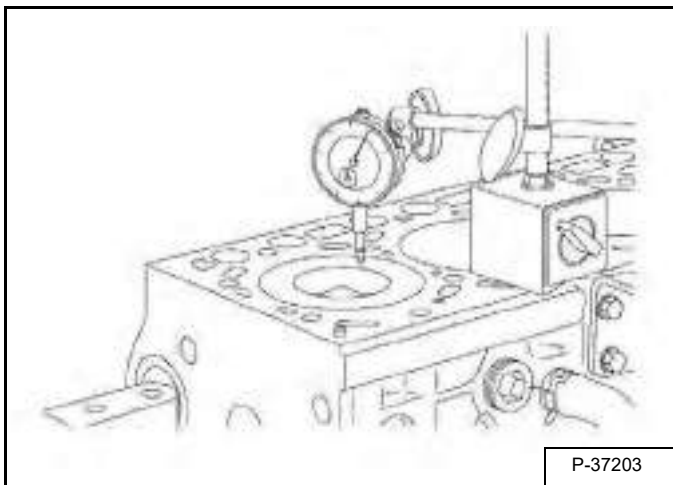
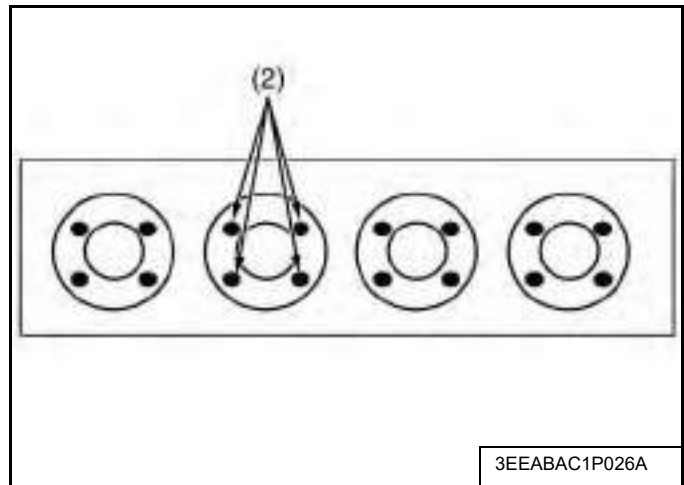


Figure 70-100-18



Measure the piston head's recessing or protrusion from the crankcase cylinder face 4 spots per each piston [Figure 70-100-18] and (average of four pistons) using the dial gauge as shown in [Figure 70-100-17].

Select the suitable cylinder head gasket refer to the table below.

Notch of Cylinder Head Gasket	Thickness of cylinder head gasket		Part Code	Piston Head's recessing or protrusion from the level of crankcase cylinder face. (average of 4 pistons)
	Before tightening	After tightening		
2 notches (a)	0.90 mm 0.0354 in	0.80 mm 0.0315 in	1C02 0- 03310	-0.07 to +0.0490 mm -0.0028 to +0.0019 in
1 notch (b)	1.00 mm 0.0394 in	0.90 mm 0.0354 in	1C02 0- 03600	+0.050 to +0.149 mm +0.0020 to +0.0058 in
Without notch (c)	1.05 mm 0.0413 in	0.95 mm 0.0374 in	1C02 0- 03610	+0.150 to +0.20 mm +0.0059 to +0.0078 in

CYLINDER HEAD (CONT'D)

Cylinder Head Disassembly And Assembly

Figure 70-100-19

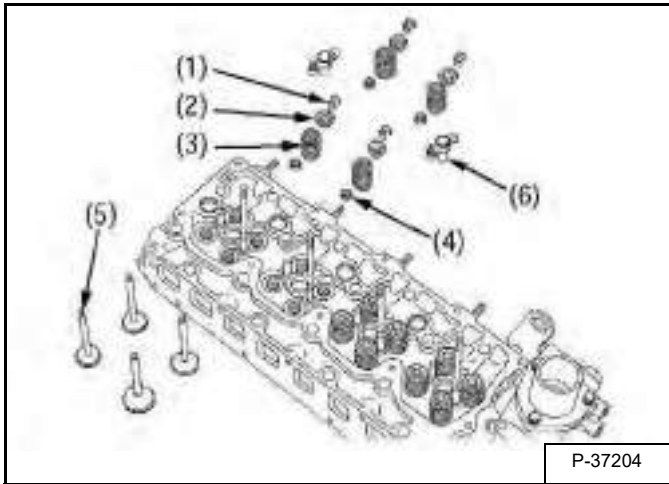
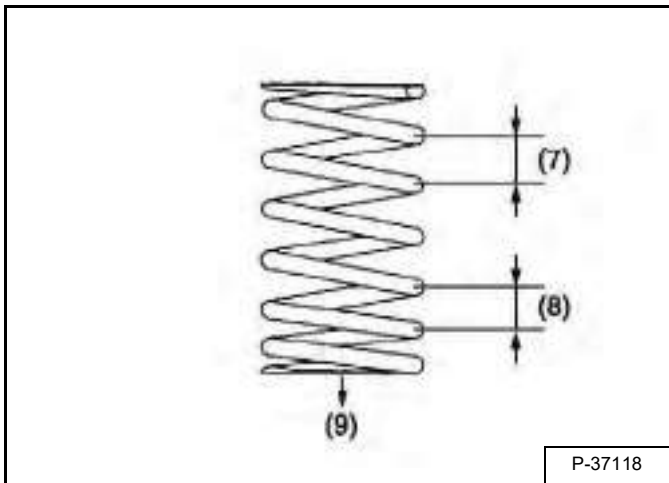


Figure 70-100-20



Remove the valve spring collets (Item 1) after compressing the valve spring (Item 3) with the valve spring retainer (Item 2) [Figure 70-100-19].

Install the valve spring [Figure 70-100-20] with its small-pitch end downward (at the head side).

Wash the valve stem and valve guide hole, and apply engine oil sufficiently.

After installing the valve spring collets, lightly tap the stem to assure proper fit with a plastic hammer.

Cylinder Head - Servicing

Figure 70-100-21

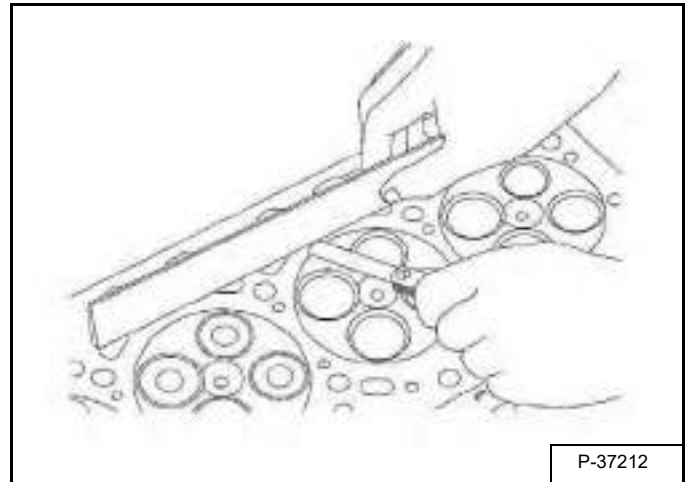
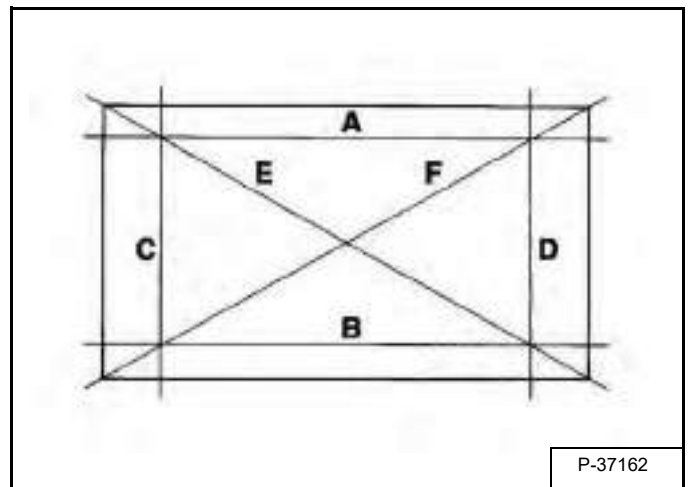


Figure 70-100-22



Thoroughly clean the cylinder head surface.

Place a straightedge on the cylinder head's four sides and two diagonal [Figure 70-100-22]. Measure the clearance with a feeler gauge [Figure 70-100-21].

If the measurement exceeds the allowable limit, correct it with a surface grinder. (See Specifications on Page 70-10-2.)

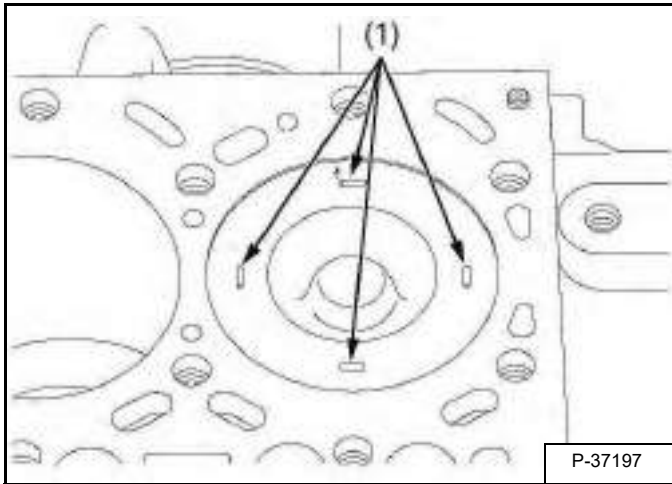
NOTE: Be sure to check the valve recessing after correcting.

Dealer Copy -- Not for Resale

CYLINDER HEAD (CONT'D)

Cylinder Head Top Clearance

Figure 70-100-23



Remove the cylinder head (remove the cylinder head gasket completely).

Bring the piston to its top dead center fasten 1.5 mm dia. 5 to 7 mm long fuse wires to 3 to 4 spots (Item 1) **[Figure 70-100-23]** on the piston top with grease so as to avoid the intake and exhaust valves.

Bring the piston to its middle position, install the cylinder head, and tighten the cylinder head screws to specification. (Head gasket must be changed to new one).

Turn the crankshaft until the piston exceeds its top dead center.

Remove the cylinder head, and measure squeezed fuse wires for thickness.

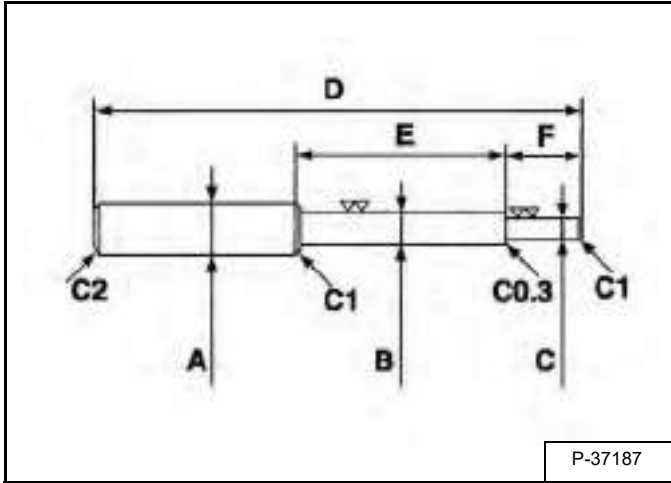
If the measurement is not within the specified value, check the oil clearance of the crank pin journal and the piston pin.

Top clearance	Factory spec.	0.701 to 0.930 mm 0.0276 to 0.0366 in
Tightening torque	Cylinder head screw	98,1 to 107 N•m 72.4 to 79.5 ft-lb

Valve Guide - Checking

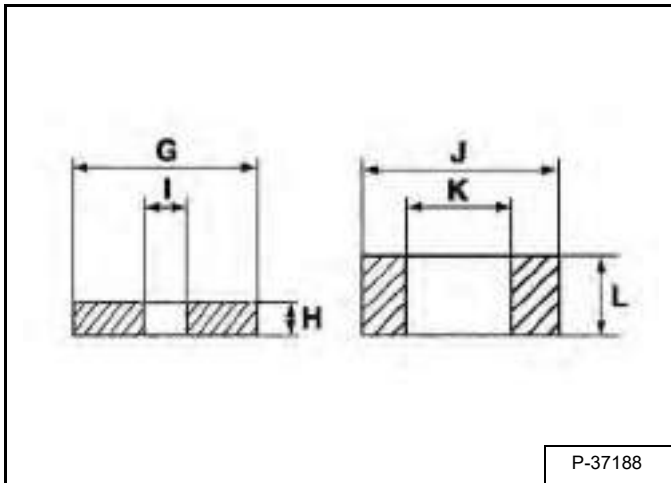
The tool described below is not provided. The tool is used for inserting and removing the valve guides. Use the dimensions below [Figure 70-100-24] and [Figure 70-100-25] to make this tool.

Figure 70-100-24



P-37187

Figure 70-100-25



P-37188

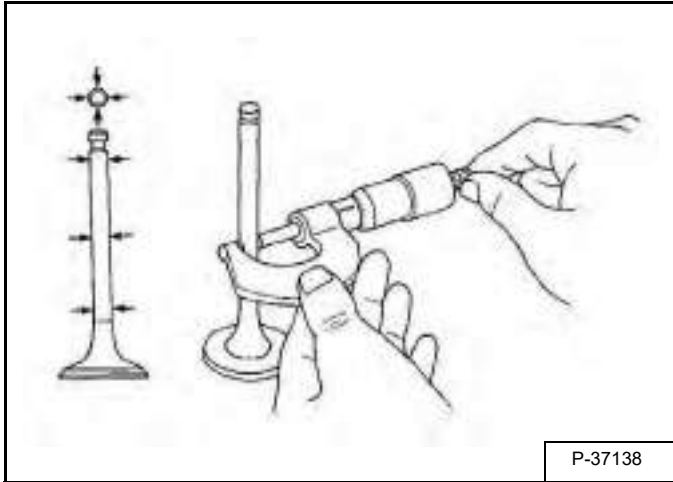
A	20 mm dia. (0.79 in dia.)
B	11.7 to 11.9 mm dia. (0.460 to 0.468 in dia.)
C	6.5 to 6.6 mm dia. (0.256 to 0.259 in dia.)
D	225 mm (8.86 in)
E	70 mm (2.76 in)
F	45 mm (1.77 in)
G	25 mm (0.98 in)
H	5 mm (0.197 in)
I	6.7 to 7.0 mm dia. (0.263 to 0.275 in dia.)
J	20 mm dia. (0.787 in dia.)
K	12.5 to 12.8 mm dia. (0.492 to 0.504 in dia.)
L	8.9 to 9.1 mm (0.350 to 0.3578 in dia.)
C1	Chamfer 1.0 mm (0.039 in)
C2	Chamfer 2.0 mm (0.079 in)

Dealer Copy -- Not for Resale

CYLINDER HEAD (CONT'D)

Valve Guide - Checking (Cont'd)

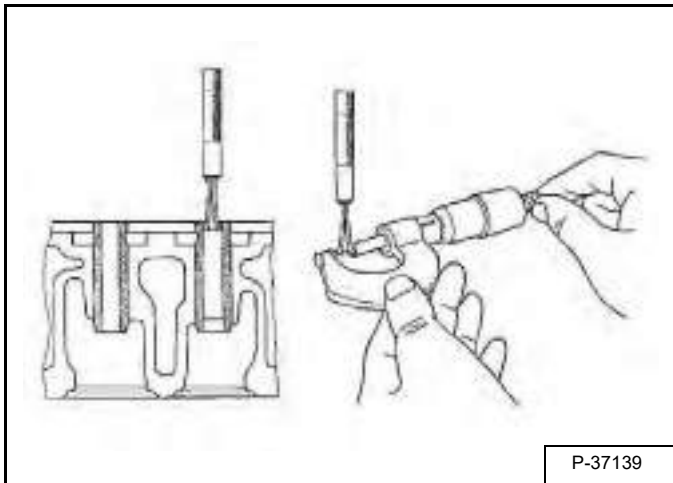
Figure 70-100-26



Remove carbon from the valve guide section.

Measure the valve stem O.D. with an outside micrometer **[Figure 70-100-26]**.

Figure 70-100-27



Measure the valve guide I.D. of the cylinder head at the most wear part as shown in **[Figure 70-100-27]** with a small hole gauge and calculate the clearance.

If the clearance exceeds the allowable limit, replace the valves. If it still exceeds the allowable limit, replace the valve guide.

Clearance between valve stem and guide	Factory spec.	Intake valve	0,055 to 0,085 mm 0.0022 to 0.0033 in
		Exhaust valve	0,055 to 0,085 mm 0.0022 to 0.0033 in
Allowable limit		0,1 mm 0.004 in	

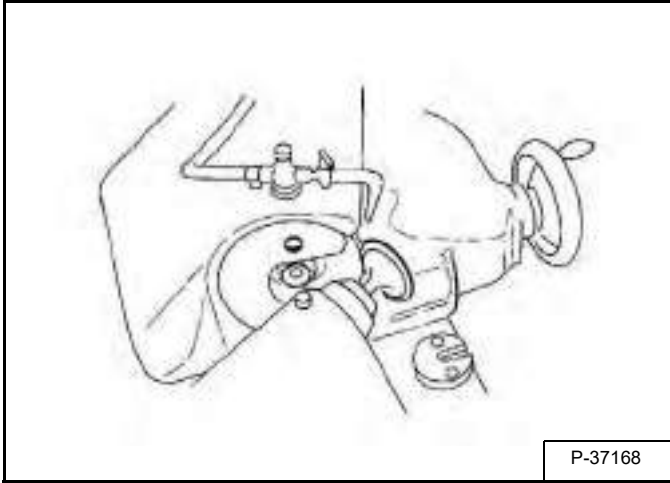
Valve stem O.D.	Factory spec.	Intake valve	6,960 to 6,975 mm 0.2741 to 0.2746 in
		Exhaust valve	6,960 to 6,975 mm 0.2741 to 0.2746 in

Valve guide I.D.	Factory spec.	Intake valve	7,030 to 7,045 mm 0.2768 to 0.2773 in
		Exhaust valve	7,030 to 7,045 mm 0.2768 to 0.2773 in

CYLINDER HEAD (CONT'D)

Reconditioning The Valve And Valve Seat

Figure 70-100-28



NOTE: Before correcting the valve and seat, check the valve stem and the I.D. of valve guide section, and repair them if necessary.

After correcting the valve seat, be sure to check the valve recessing [Figure 70-100-28].

Correct the valve with a valve refacer.

Figure 70-100-29

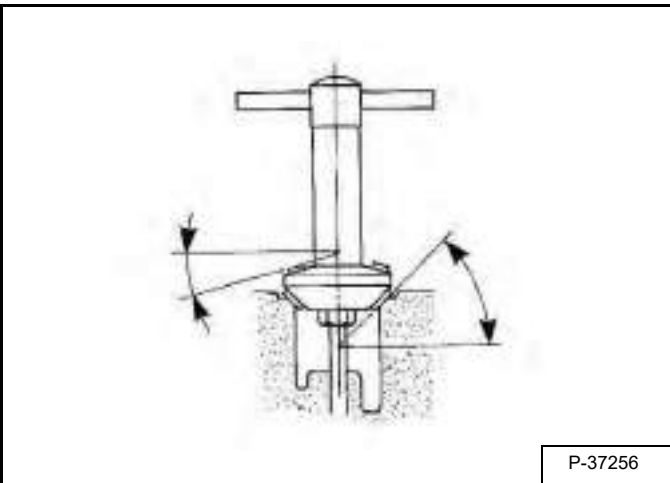
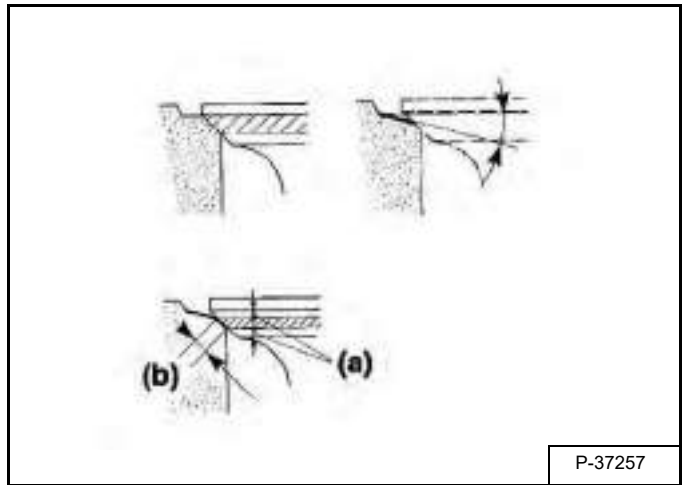


Figure 70-100-30



Slightly correct the seat surface with a 1.047 rad. (60°) (intake valve) or 0.785 rad. (45°) (exhaust valve) seat cutter (Code No. 07909-33102) [Figure 70-100-29].

Resurface the seat surface with a 0.523 rad. (30°) valve seat cutter to intake valve seat and with a 0.262 rad. (15°) valve seat cutter to exhaust valve seat so that the width is close to specified valve seat width (for intake valve: 1.6-2.0 mm, 0.063-0.078 in; for exhaust valve: 2.3-2.6 mm, 0.091-0.10 in) [Figure 70-100-30].

After resurfacing the seat, inspect for even valve seating, apply a thin film of compound between the valve face and valve seat, and fit them with valve lapping tool.

Check the valve seating with prussian blue. The valve seating surface should show good contact all the way around.

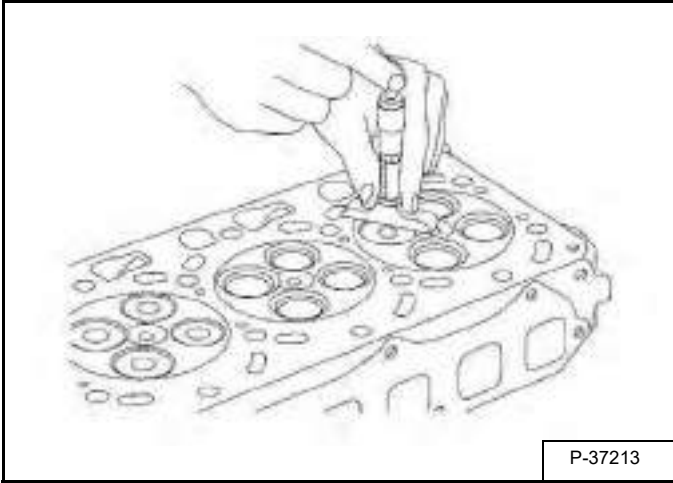
Dealer Copy -- Not for Resale

CYLINDER HEAD (CONT'D)

Reconditioning The Valve And Valve Seat (Cont'd)

Valve Recessing

Figure 70-100-31



Clean the cylinder head, the valve face and seat.

Insert the valve into the valve guide.

Measure the valve recessing with a depth gauge **[Figure 70-100-31]**.

If the measurement exceeds the allowable limit, replace the valve.

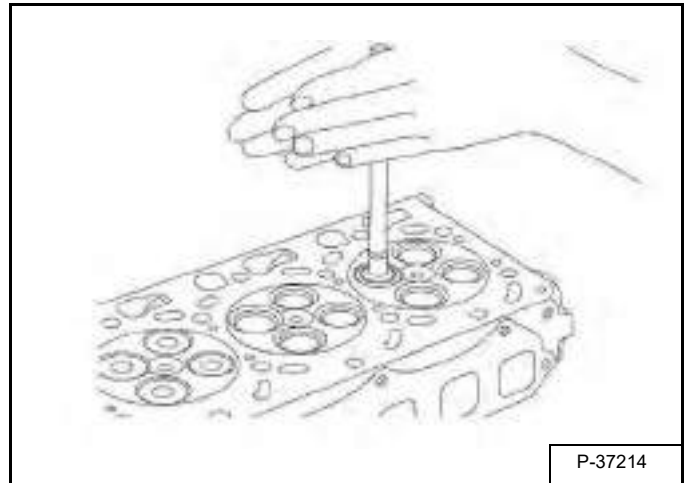
If it still exceeds the allowable limit after replacing the valve, correct the valve seat face of the cylinder head with a valve seat cutter or valve seat grinder.

Then, correct the cylinder head surface with a surface grinder, or replace the cylinder head.

Valve recessing	Factory spec.	Intake valve	(recessing) 0,6 to 0,8 mm (0.024 to 0.031 in)
		Exhaust valve	(recessing) 0.850 to 1.05 mm (0.0335 to 0.0413 in)
	Allow-able limit	(recessing) 1,2 mm (0.047 in)	

Valve Lapping

Figure 70-100-32



Apply compound evenly to the valve lapping surface.

Insert the valve into the valve guide. Lap the valve onto its seat with a valve flapper or screwdriver **[Figure 70-100-32]**.

After lapping the valve, wash the compound away and apply oil, then repeat valve lapping with oil.

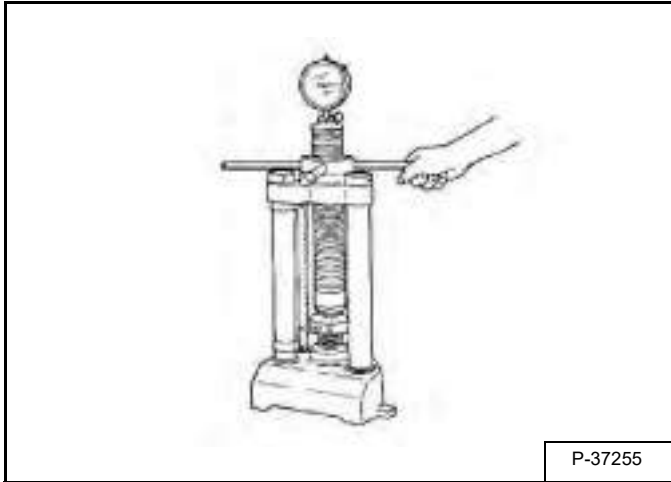
Apply prussian blue to the contact surface to check the seated rate. If it is less than 70%, repeat valve lapping again.

NOTE: When valve lapping is performed, be sure to check the valve recessing and adjust the valve clearance after assembling the valve.

CYLINDER HEAD (CONT'D)

Valve Spring

Figure 70-100-33



P-37255

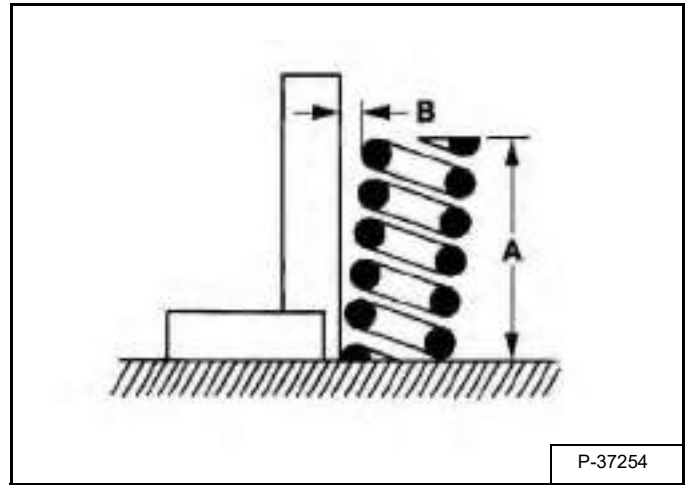
Place the valve spring on a tester and compress it to the same length it is actually compressed in the engine **[Figure 70-100-33]**.

Read the compression load on the gauge.

If the measurement is less than the allowable limit, replace it.

Setting load/ setting length	Factory spec.	Intake valve	63.5 N / 31,5 mm 14.3 lbs / 1.24 in
		Exhaust valve	63.5 N / 31,5 mm 14.3 lbs / 1.24 in
	Allow-able limit	Intake valve	45.9 N / 31,5 mm 10.3 lbs / 1.24 in
		Exhaust valve	45.9 N / 31.5 mm 10.3 lbs / 1.24 in

Figure 70-100-34



P-37254

Measure the free length **(A)** with vernier calipers **[Figure 70-100-34]**. If the measurement is less than the allowable limit, replace it.

Put the spring on a surface plate, place a square on the side of the spring, and check to see if the entire side is contact with the square. Rotate the spring and measure the maximum **(B)** **[Figure 70-100-34]**. If the measurement exceeds the allowable limit, replace.

Check the entire surface of the spring for scratches. Replace it, if any.

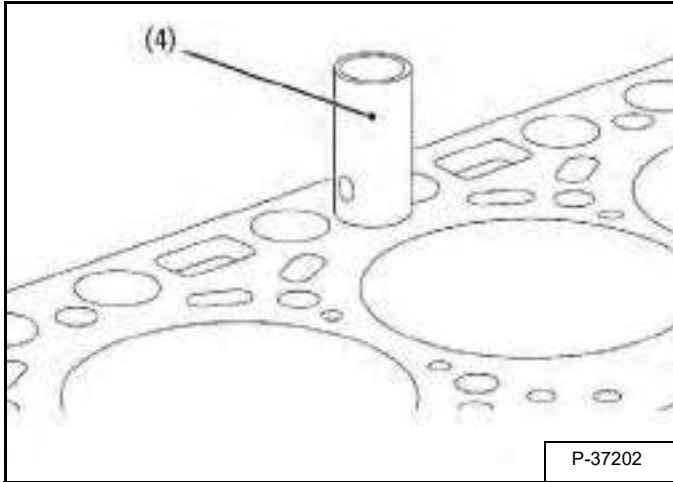
Free length (A)	Factory spec.	Intake valve	35,1 to 35,6 mm 1.39 to 1.40 in
		Exhaust valve	35,1 to 35,6 mm 1.39 to 1.40 in
	Allow-able limit	Intake valve	34,6 mm 1.36 in
		Exhaust valve	34,6 mm 1.36 in
Tilt (B)	Allow-able limit	1.0 mm 0.039 in	

Dealer Copy -- Not for Resale

CYLINDER HEAD (CONT'D)

Valve Tappets

Figure 70-100-35



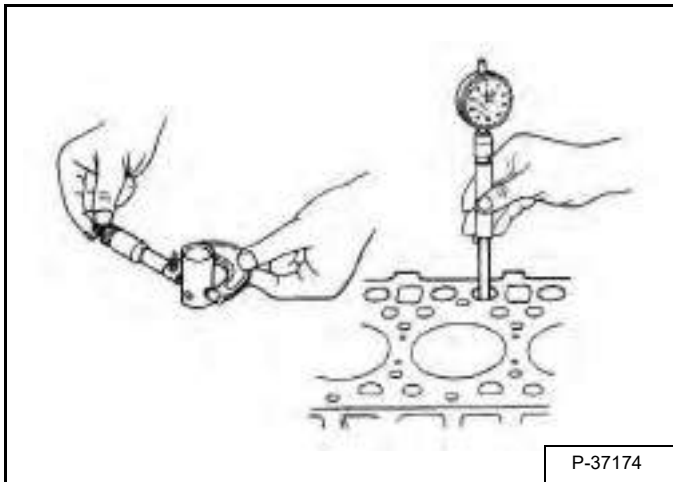
Remove the tappets (Item 4) **[Figure 70-100-35]** from the crankcase.

When reassembling replace the head gasket with a new one.

Before installing the tappets (Item 4) **[Figure 70-100-35]**, apply engine oil thinly around them.

NOTE: Mark the cylinder number to the tappets to prevent interchanging.

Figure 70-100-36



Measure the tappet O.D. with an outside micrometer **[Figure 70-100-36]**.

Measure the I.D. of the tappet guide bore with a cylinder gauge, and calculate the oil clearance **[Figure 70-100-36]**.

If the oil clearance exceeds the allowable limit or the tappet is damaged, replace the tappet.

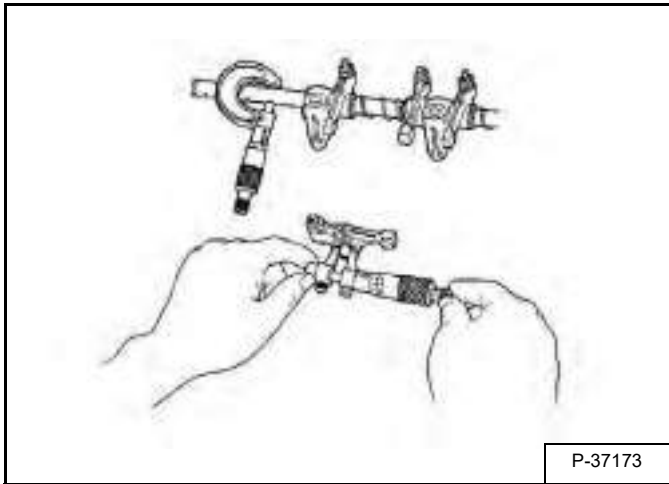
Oil clearance between tappet and guide	Factory spec.	0.020 to 0.062 mm 0.00079 to 0.0024 in
	Allowable limit	0.07 mm 0.003 in

Tappet O.D.	Factory spec.	23.959 to 23.980 mm 0.94327 to 0.94409 in
Tappet guide bore I.D.	Factory spec.	24.000 to 24.021 mm 0.94489 to 0.94570 in

CYLINDER HEAD (CONT'D)

Rocker Arm And Shaft - Checking

Figure 70-100-37



Measure the rocker arm bearing I.D. with an inside micrometer **[Figure 70-100-37]**.

Measure the rocker arm shaft O.D. with an outside micrometer, and then calculate the oil clearance **[Figure 70-100-37]**.

If the clearance exceeds the allowable limit, replace the rocker arm and measure the oil clearance again. If it still exceeds the allowable limit, replace also the rocker arm shaft.

Oil clearance or rocker arm shaft and bearing	Factory spec.	0.016 to 0.045 mm 0.00063 to 0.0017 in
	Allowable limit	0.15 mm 0.0059 in

Rocker arm shaft O.D.	Factory spec.	15.973 to 15.984 mm 0.62886 to 0.62929 in
Rocker arm I.D. for shaft	Factory spec.	16.000 to 16.018 mm 0.62993 to 0.63062 in



Bobcat®

Dealer Copy -- Not for Resale

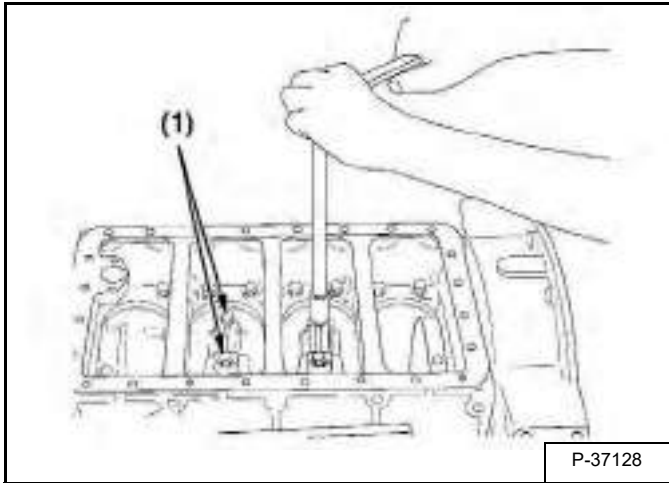
CRANKSHAFT AND PISTONS

Piston And Connecting Rod Removal And Installation

Remove the oil pan. (See Oil Pan Removal And Installation on Page 70-80-1.)

Remove the cylinder head. (See Cylinder Head Removal And Installation on Page 70-100-4.)

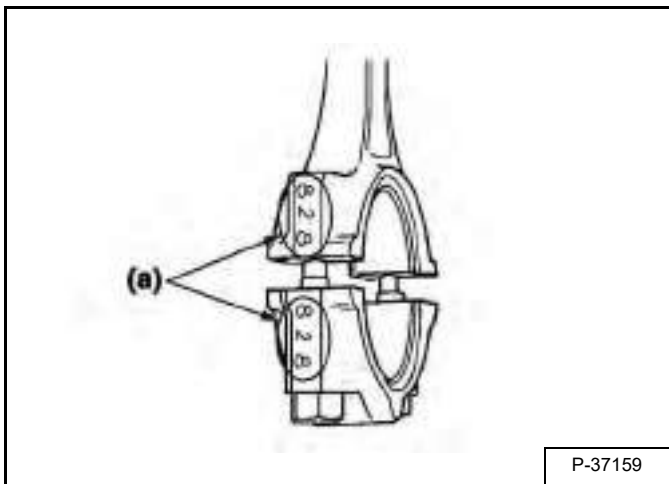
Figure 70-110-1



Remove the connecting rod screws (Item 1) [Figure 70-110-1] from connecting rod cap.

Remove the connecting rod caps.

Figure 70-110-2



Align the marks (a) [Figure 70-110-2] with each other. (Face the marks toward the injection pump.)

Apply engine oil to the connecting rod screws and lightly screw it in by hand, then tighten it to the specified torque. If the connecting rod screw won't be screwed in smoothly,

clean the threads. If the connecting rod screw is still hard to screw in, replace it.

When using the existing crank pin metal again, put tally marks on the crank pin metal and the connecting rod in order to keep their positioning.

Fit the crank pin metal in place.

Tightening torque	Connecting rod screw	79 to 83 N•m 58 to 61 ft-lb
-------------------	----------------------	--------------------------------

CRANKSHAFT AND PISTONS (CONT'D)

Piston And Connecting Rod Removal And Installation (Cont'd)

Figure 70-110-3

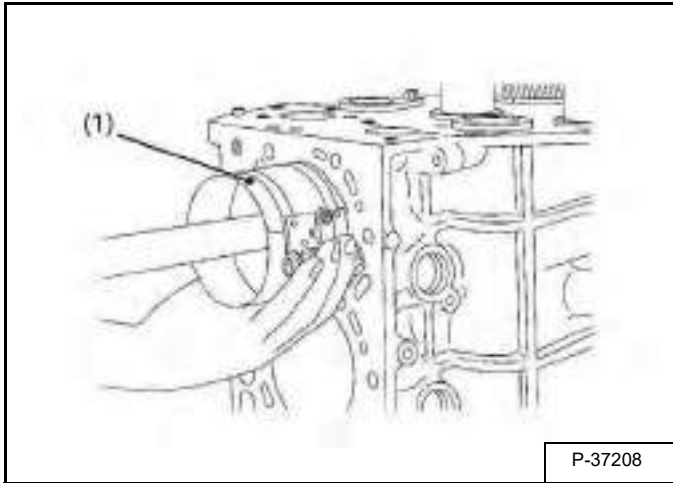


Figure 70-110-4

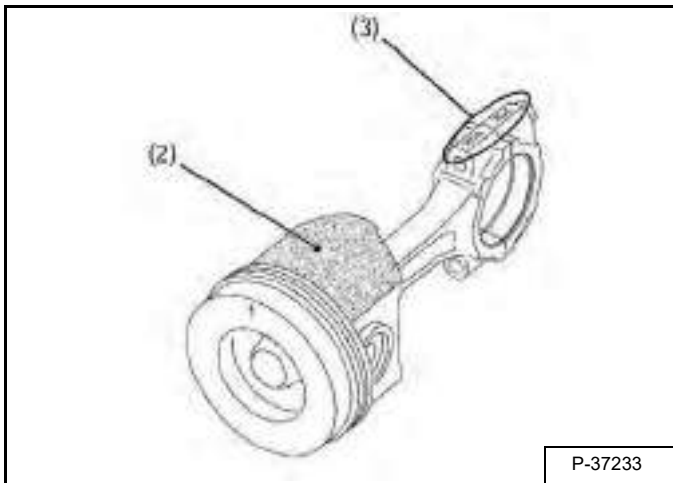
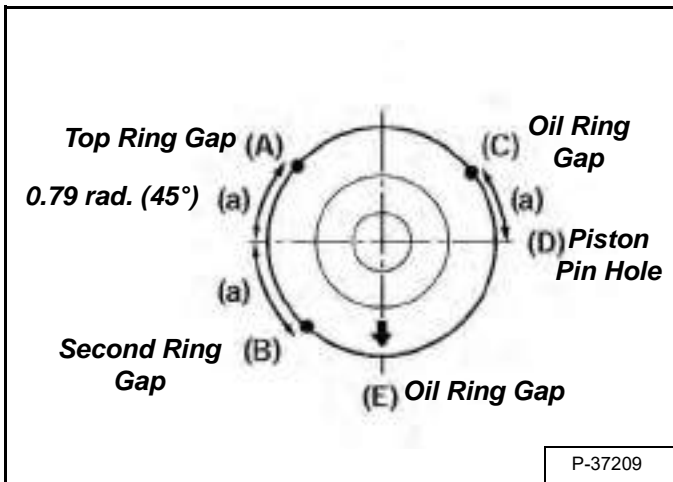


Figure 70-110-5



Completely clean carbon in the cylinders.

Turn the flywheel and set a piston to the top dead center.

Pull out the piston upward by lightly tapping it from the bottom of the crankcase with the grip of a hammer.

Before inserting the piston into the cylinder, apply enough engine oil to the cylinder.

When inserting the piston into the cylinder, face the mark (Item 3) [Figure 70-110-4] on the connecting rod to the injection pump.

NOTE: Do not change the combination of cylinder and piston.

Make sure of the position of each piston by marking. For example, mark "1" on the No. 1 position.

When inserting the piston into the cylinder, place the gap of the compression ring 1 on the opposite side of the combustion chamber and stagger the gaps of the compression ring 2 and oil ring marking a right angle from the gap of the compression ring 1.

Carefully insert the pistons using a piston ring compressor (Item 1) [Figure 70-110-3]. Otherwise, their chrome-plated section of piston rings may be scratched, causing trouble inside the liner.

When inserting the piston in place, be careful not to get the molybdenum disulfide coating (Item 2) [Figure 70-110-4] torn off its skirt. This coating is useful in minimizing the clearance with the cylinder liner. Just after the piston pin has been press-fitted, in particular, the piston is still hot and the coating is easy to peel off. Wait until the piston cools down.

CRANKSHAFT AND PISTONS (CONT'D)

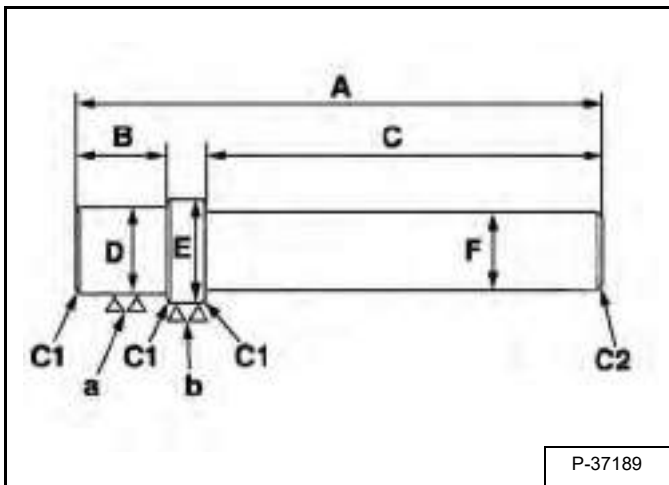
Piston And Connecting Rod - Servicing

The Connecting Rod Alignment Tool is not provided. Order this tool using the code below.

Code No:	07909-31661
Application:	Use for checking the connecting rod alignment.
Application Range:	Connecting rod big end I.D. 30 to 75 mm (1.18 to 2.95 in dia.) Connecting rod length 65 to 330 mm (2.56 to 12.99 in)

The Small End Bushing Replacing Tool can be made using the dimensions below. One set of dimensions is for the press out tool and one for press fit.

Figure 70-110-6



Small End Bushing Replacing Tool

Application: Use to press out and to press fit the small end bushing in the connection rod.

(Press out)

A	157 mm dia. (6.181 in)
B	14.5 mm (0.571 in)
C	120 mm (4.7244 in)
D	30.101 to 30.156 mm dia. (1.1851 to 1.187 in dia.)
E	33.075 to 33.100 mm dia. (1.3021 to 1.3031 in dia.)
F	20 mm (0.7874 in)
a	0.0000063 mm (0.00025 in)
b	0.0000063 mm (0.00025 in)
C1	Chamfer 1,0 mm (0.039 in)
C2	Chamfer 2,0 mm (0.079 in)

(Press fit)

A	157 mm dia. (6.181 in)
B	14,5 mm (0.571 in)
C	120 mm (4.7244 in)
D	30,101 to 30,156 mm dia. (1.1851 to 1.187 in dia.)
E	42.000 mm dia. (1.6535 in dia.)
F	20 mm (0.7874 in)
a	0.0000063 mm (0.00025 in)
b	0.0000063 mm (0.00025 in)
C1	Chamfer 1,0 mm (0.039 in)
C2	Chamfer 2,0 mm (0.079 in)

CRANKSHAFT AND PISTONS (CONT'D)

Piston And Connecting Rod - Servicing (Cont'd)

Figure 70-110-7

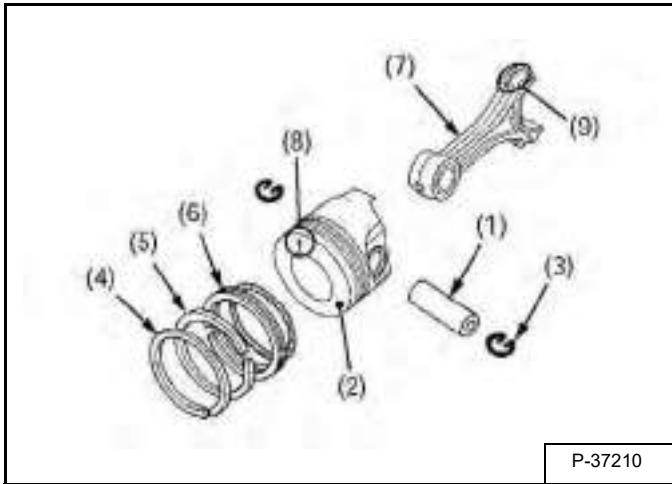
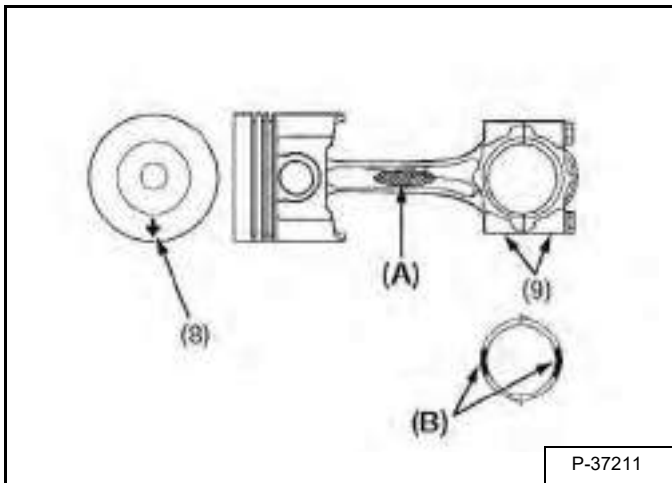


Figure 70-110-8



Remove the piston rings using a piston ring tool.

Remove the piston pin (Item 1), and separate the connecting rod (Item 7) from the piston (Item 2) [Figure 70-110-7].

Be sure to fix the crank pin bearing and the connecting rod are same I.D. colors.

When installing the piston pin, immerse the piston in 80°C (176°F) oil for 10 to 15 minutes and insert the piston pin to the piston.

Figure 70-110-9

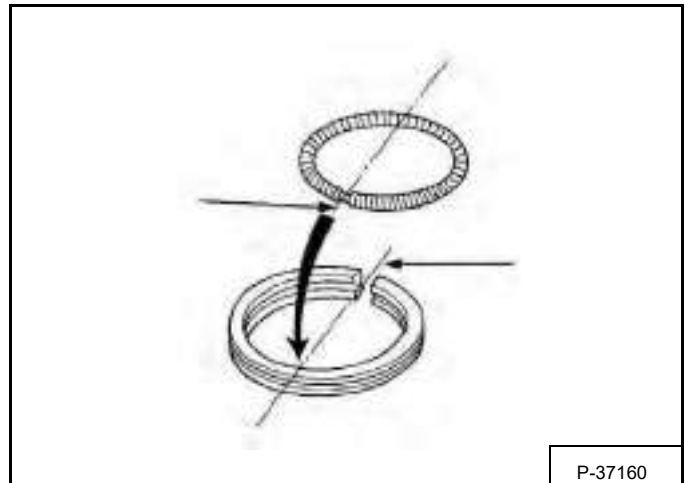
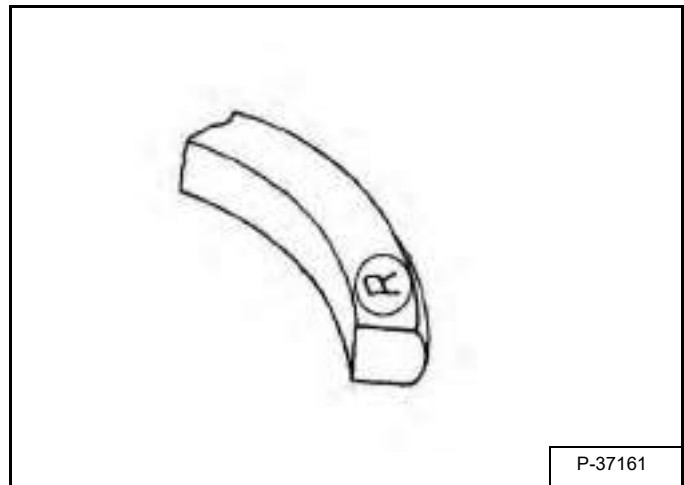


Figure 70-110-10



When installing the ring, assemble the rings so that the manufacturer's mark (Item 12) [Figure 70-110-10] near the gap faces the top of the piston.

When installing the oil ring onto the piston, place the expander joint (Item 10) on the opposite side of the oil ring gap (Item 11) [Figure 70-110-9].

Apply engine oil to the piston pin (Item 1) [Figure 70-110-7].

Assemble the piston to the connecting rod with the ↑ mark (Item 8) and the connecting rod numbering mark (Item 9) [Figure 70-110-8] facing same side.

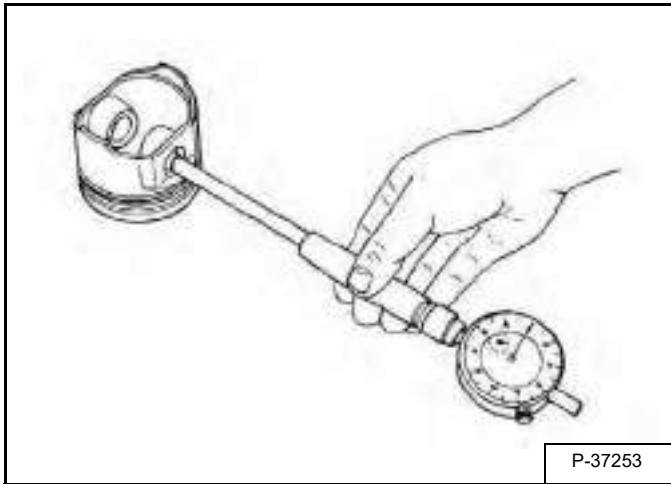
The end faces of the oil ring are plated with hard chrome. In putting the piston into the cylinder, be careful not to get the oil ring scratched by the cylinder. Use the piston ring fitter to tighten up the oil ring. If the ring's planted is scratched, it may get stuck on the cylinder wall, causing a serious trouble.

NOTE: Mark the same number on the connecting rod and the piston so as not to change the combination.

CRANKSHAFT AND PISTONS (CONT'D)

Piston And Connecting Rod - Servicing (Cont'd)

Figure 70-110-11

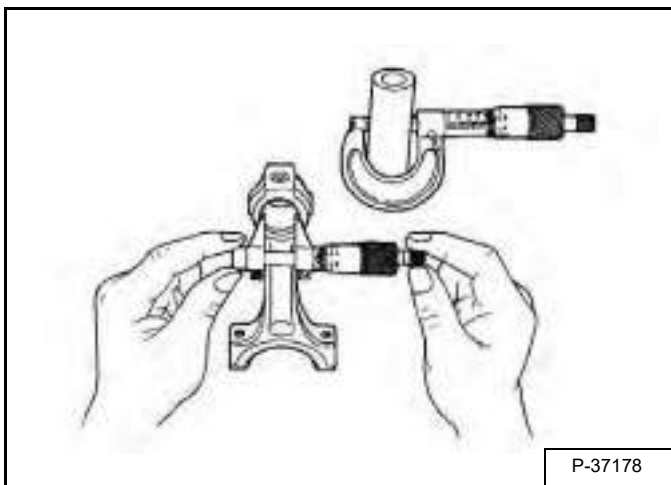


Measure the piston pin bore I.D. in both the horizontal and vertical directions with a cylinder gauge **[Figure 70-110-11]**.

If the measurement exceeds the allowable limit, replace the piston.

Piston pin bore I.D.	Factory spec.	30,000 to 30,013 mm 1.1811 to 1.1816 in
	Allowable limit	30,05 mm 1.183 in

Figure 70-110-12



Measure the O.D. of the piston pin where it contacts the bushing with an outside micrometer **[Figure 70-110-12]**.

Measure the I.D. of the piston pin bushing at the connecting rod small end with a cylinder gauge **[Figure 70-110-12]**.

If the clearance exceeds the allowable limit, replace the bushing. If it still exceeds the allowable limit, replace the piston pin.

Oil clearance between piston pin and small end bushing	Factory spec.	0,020 to 0,040 mm 0.00079 to 0.0015 in
	Allowable limit	0,15 mm 0.0059 in

Piston pin O.D.	Factory spec.	30,006 to 30,011 mm 1.1814 to 1.1815 in
Small end bushing I.D.	Factory spec.	30,031 to 30,046 mm 1.1824 to 1.1829 in

CRANKSHAFT AND PISTONS (CONT'D)

Piston And Connecting Rod - Servicing (Cont'd)

Figure 70-110-13

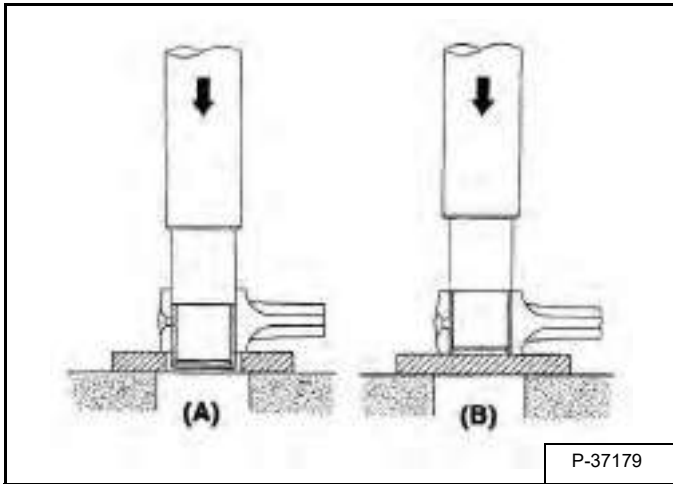
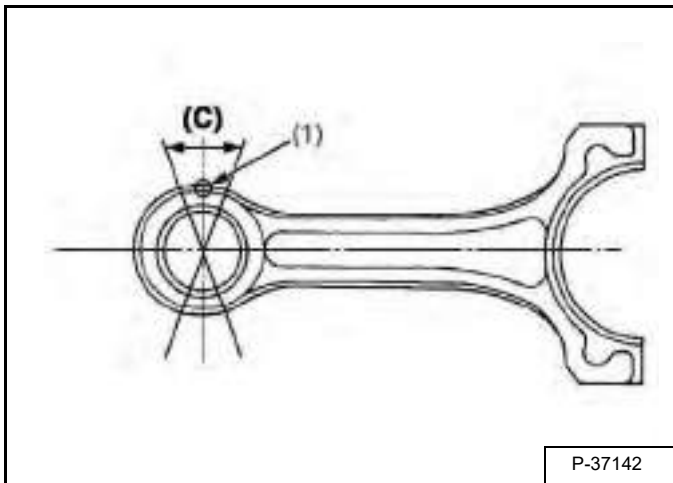


Figure 70-110-14



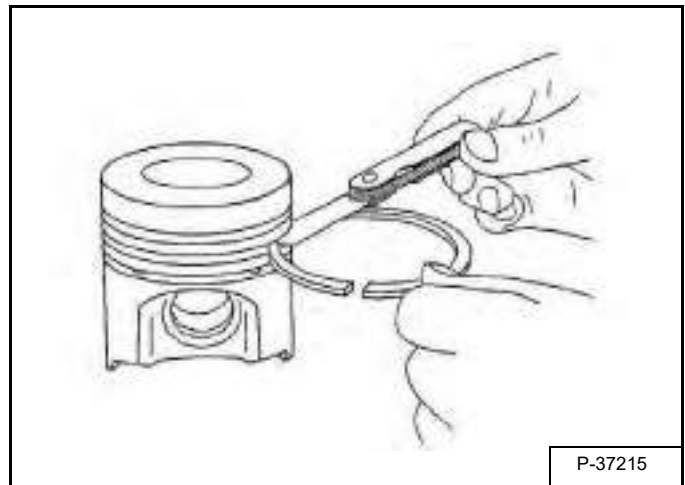
Press out the used bushing using a small end bushing replacing tool **[Figure 70-110-13]**.

Clean a new small end bushing and bore, and apply engine oil to them.

Insert a new bushing onto the tool and press-fit it with a press so that the seam (Item 1) **[Figure 70-110-14]** of the bushing is flush with the connecting rod.

Piston Ring Groove

Figure 70-110-15



Remove carbon from the ring grooves.

Measure the clearance between the ring and the groove with a feeler gauge **[Figure 70-110-15]**.

If the clearance exceeds allowable limit, check the new rings on an old piston and if it is out of spec, replace the piston.

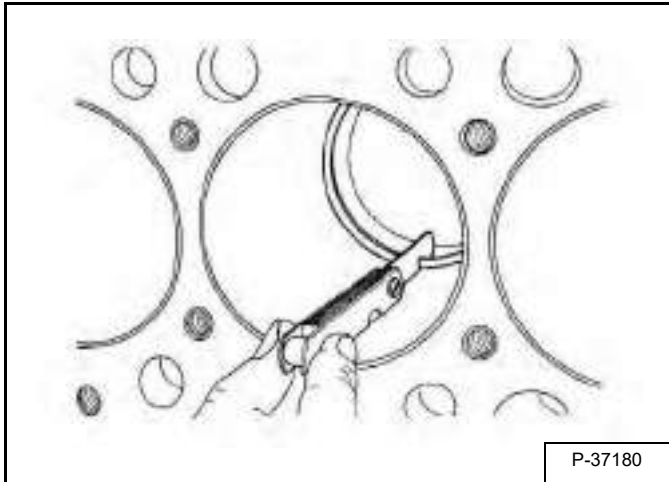
Factory spec.	Top Ring	0.05 to 0.09 mm 0.002 to 0.003 in.
	Second Ring	0.0930 to 0.120 mm 0.00367 to 0.00472 in.
	Oil Ring	0.020 to 0.060 mm 0.00079 to 0.0023 in.
Allowable limit	Top Ring	0.15 mm 0.0059 in.
	Second Ring	0.20 mm 0.0079 in.
	Oil ring	0.15 mm 0.0059 in.

CRANKSHAFT AND PISTONS (CONT'D)

Piston And Connecting Rod - Servicing (Cont'd)

Piston Ring Gap

Figure 70-110-16



Insert the piston ring into the lower part of the liner (the least worn out part) with the piston.

Measure the ring gap with a feeler gauge **[Figure 70-110-16]**.

If the gap exceeds the allowable limit, replace the piston ring.

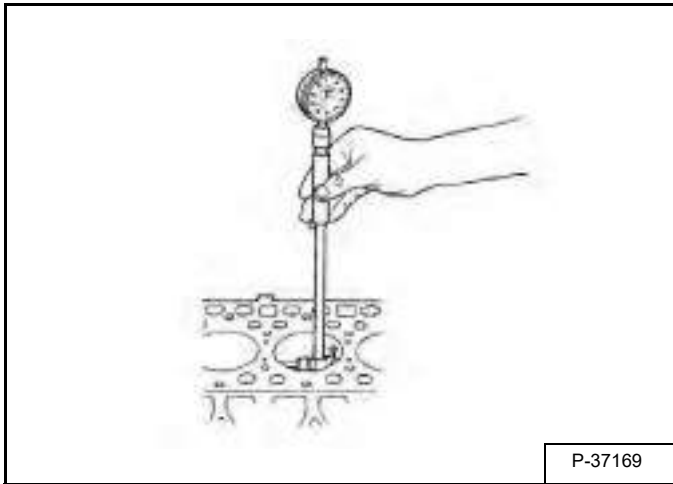
Top and Second Ring	Factory spec.	0.30 to 0.45 mm 0.012 to 0.017 in.
	Allowable limit	1.25 mm 0.0492 in.

Oil Ring	Factory spec.	0.25 to 0.45 mm 0.0099 to 0.017 in.
	Allowable limit	1.25 mm 0.0492 in.

CRANKSHAFT AND PISTONS (CONT'D)

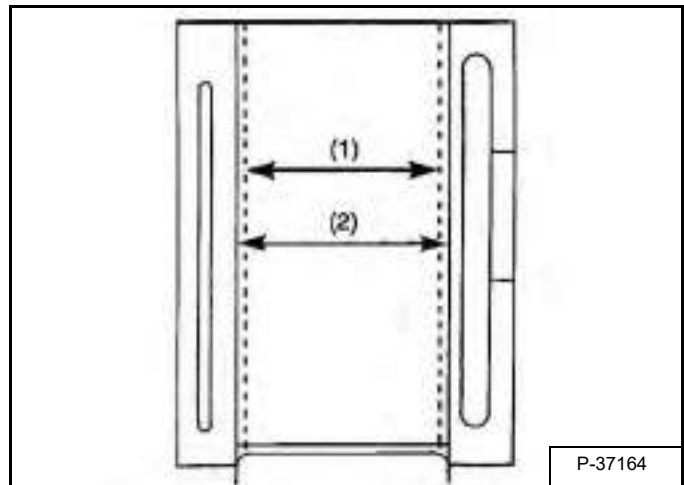
Cylinder Bore Checking

Figure 70-110-17



P-37169

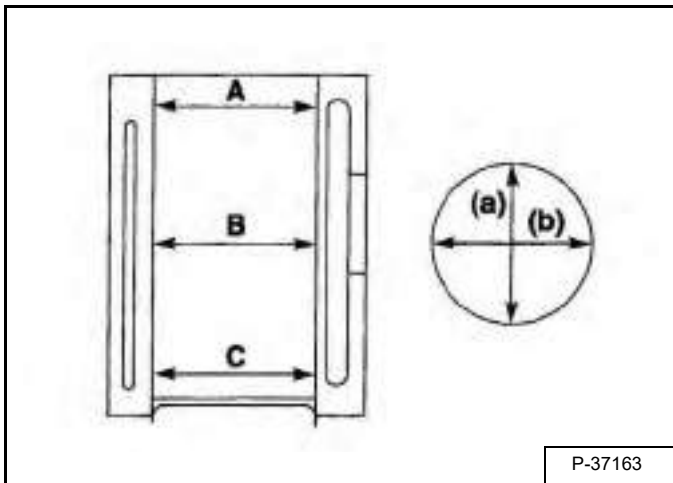
Figure 70-110-19



P-37164

When the cylinder is worn beyond the allowable limit, bore and hone it to the specified dimension [Figure 70-110-19].

Figure 70-110-18



P-37163

Measure the six points with a cylinder gauge to find out the maximum wear [Figure 70-110-17]. Generally, position (1) in the (a, b) direction (at about 20 mm (0.79 in) from the top) shows the maximum wear [Figure 70-110-18]. Since position (3) at the lower part of the bore will show the minimum wear, find these difference.

Cylinder bore I.D.	Factory spec.	100,000 to 100,022 mm (3.93701 to 3.93787 in)
	Allowable limit	100,150 mm (3.9429 in)

Cylinder I.D. (2)	Oversize (+ 0,5 mm) Spec.	100,500 to 100,522 mm (3.95670 to 3.95755 in)
Maximum wear	Allowable limit	100,650 mm (3.96260 in)
Finishing	Hone to 1.2 to 2.0 μ R max. _____ (0.000047 to 0.0079 in.R max.)	

Replace the piston and piston rings with oversize (0,5 mm) ones.

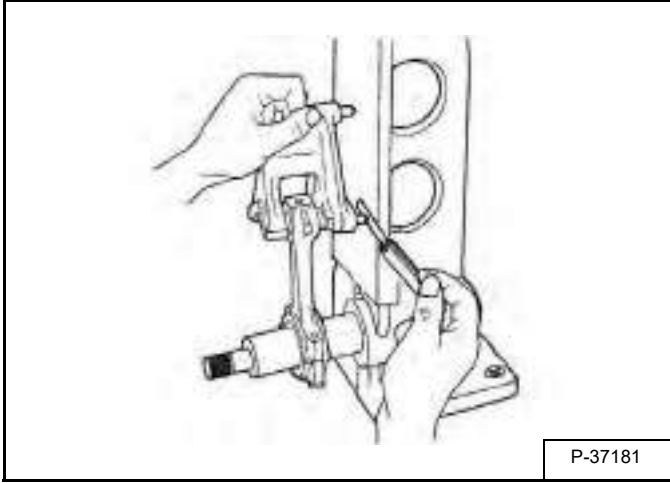
Part Name	Part Code	Marking
Piston	1C050-21910	05 OS
Piston Ring Assembly	1C020-21090	05 OS

NOTE: When the oversize cylinder is worn beyond the allowable limit, replace the cylinder block with a new one.

CRANKSHAFT AND PISTONS (CONT'D)

Connecting Rod Alignment

Figure 70-110-20



(See Piston And Connecting Rod - Servicing on Page 70-110-3.) for the code to order this tool [Figure 70-110-20] from the engine manufacturer.

NOTE: *Since the I.D. of the connecting rod small end bushing is the basis of this check, check the bushing for wear beforehand.*

Remove the piston pin in the connecting rod.

Install the piston pin in the connecting rod.

Install the connecting rod on the connecting rod alignment tool.

Put a gauge over the piston pin, and move it against the face plate [Figure 70-110-20].

If the gauge does not fit squarely against the face plate, measure the space between the pin of the gauge and the face plate.

If the measurement exceeds the allowable limit, replace the connecting rod.

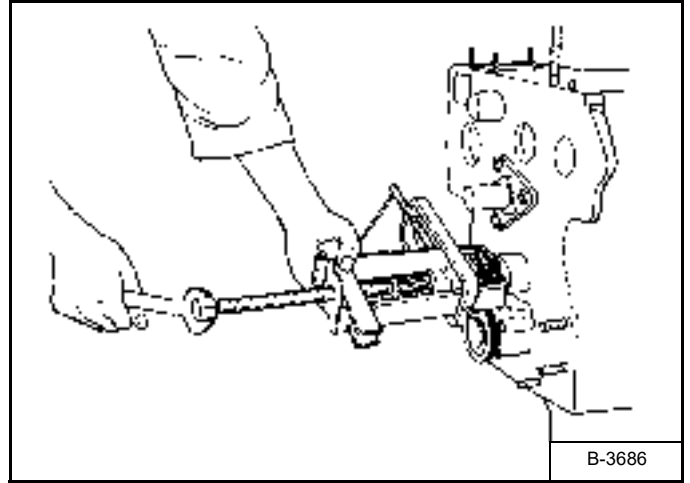
Connecting rod alignment	Allowable limit	0.05 mm 0.002 in.
--------------------------	-----------------	----------------------

Crankshaft Gear Removal And Installation

Remove the timing gearcase cover. (See Timing Gearcase Cover Removal And Installation on Page 70-120-1.)

Remove the idler gear. (See Idle Gear And Shaft Removal And Installation on Page 70-120-5.)

Figure 70-110-21



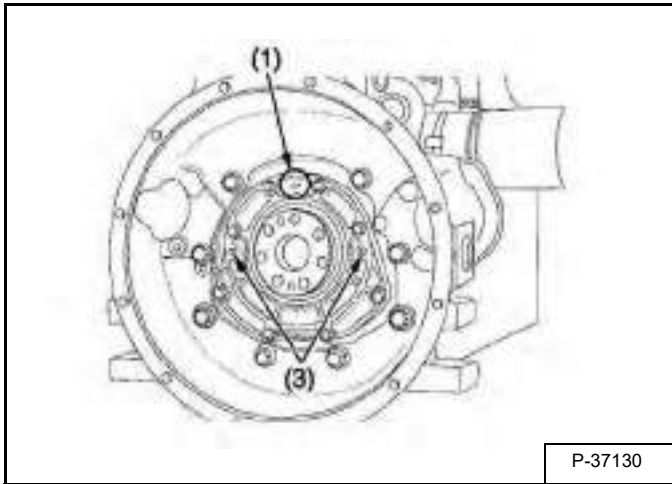
Remove the crankshaft gear with a puller [Figure 70-110-21].

Remove the crankshaft key.

CRANKSHAFT AND PISTONS (CONT'D)

Crankshaft And Bearings Removal and Installation

Figure 70-110-22

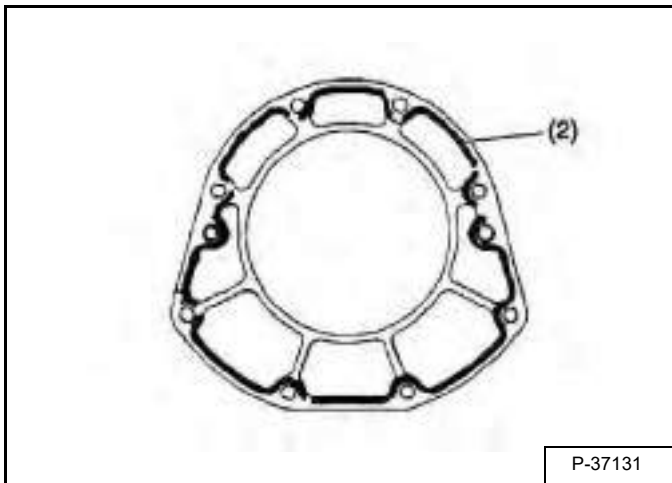


NOTE: Before disassembling, check the side clearance of crankshaft. Also check it during reassembly.

Remove the bearing case cover mounting screws.

Screw two removed screws into the screw hole (Item 3) [Figure 70-110-22] of bearing case cover to remove it.

Figure 70-110-23



NOTE: In case of replacing the oil seal, use caution when installing the seal in the bearing case cover as not to install it tilted. The seal should be flush with the cover.

Confirm that the liquid gasket coating surface is free of water, dust and oil in order to maintain sealing effect.

Apply liquid gasket (Item 2) [Figure 70-110-23]

to the bearing case cover evenly.

Before installing the bearing case cover / oil seal assembly, lube the seal and be careful not to damage the seal while installing the assembly.

Install the bearing case cover / oil seal assembly to the position the casting mark "UP" on it upward (Item 1) [Figure 70-110-23].

Tighten the bearing case cover mounting screws with even force on the diagonal line.

When mounting the adhesive-applied parts, take care to fit them to the mating parts.

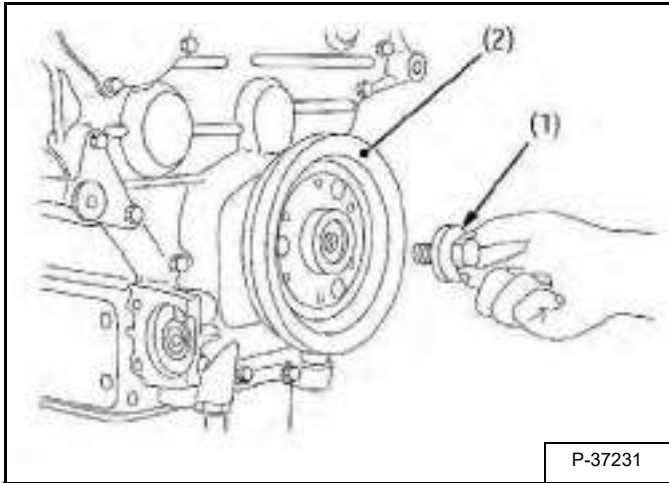
Assemble the adhesive-applied parts within 10 minutes.

Tightening torque	Bearing Case Cover mounting screw	24 to 27 N•m 18 to 20 ft-lb
-------------------	-----------------------------------	--------------------------------

CRANKSHAFT AND PISTONS (CONT'D)

Crankshaft And Bearings Removal and Installation (Cont'd)

Figure 70-110-24



Install the engine flywheel pin.

Remove the crankshaft screw (Item 1) [Figure 70-110-24].

Remove the fan drive pulley (Item 2) [Figure 70-110-24].

NOTE: Clean the crankshaft screw and the alternator drive pulley sleeve surface thoroughly and tighten the screw securely to specified torque.

Tightening torque	Crankshaft screw	255 to 274 N•m 188 to 202 ft-lb
-------------------	------------------	------------------------------------

Figure 70-110-25

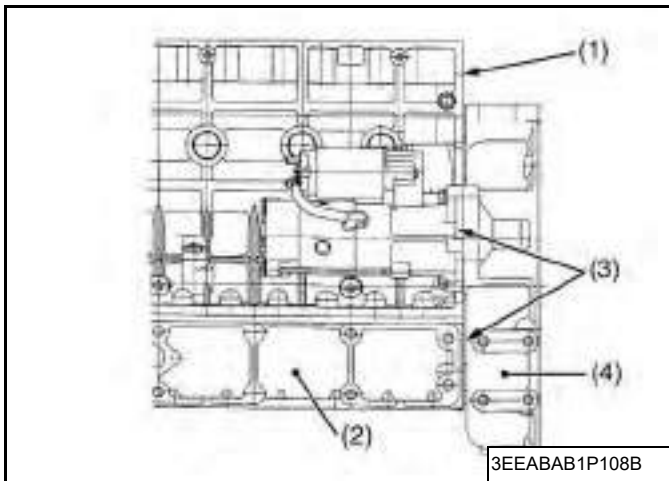
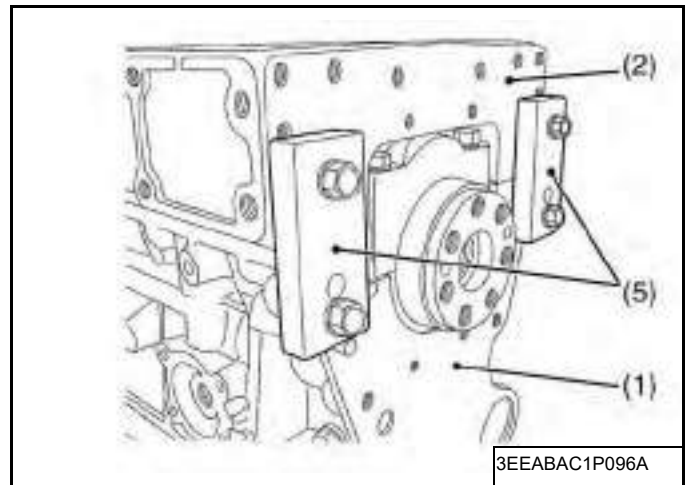


Figure 70-110-26



Match the crankcase 1 (Item 1) and crankcase 2 (Item 2), [Figure 70-110-25] referring to the flywheel's contoured face.

Tighten the crankcase 2 mounting bolts loosely.

Tighten up the tool (Item 5) [Figure 70-110-26] to the specified torque same as the flywheel housing screw (Item 4) [Figure 70-110-25]. This helps to minimize the level difference between the crankcase 1 and the crankcase 2 (at the flywheel side). Possible gap must be 0.05 mm or smaller (Item 3) [Figure 70-110-25].

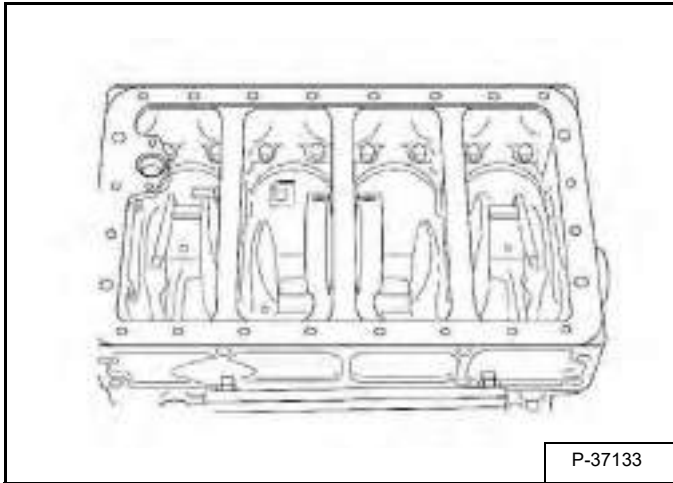
Tightening torque	Crankcase 2 mounting screw	49 to 55 N•m 37 to 41 ft-lb
	Flywheel housing screw	78 to 90 N•m 58 to 66 ft-lb

Dealer Copy -- Not for Resale

CRANKSHAFT AND PISTONS (CONT'D)

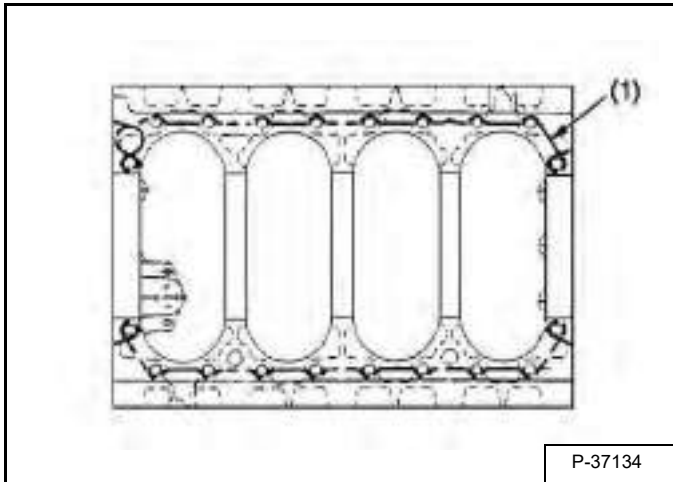
Crankshaft And Bearings Removal and Installation (Cont'd)

Figure 70-110-27



Remove the crankcase 2 [Figure 70-110-27].

Figure 70-110-28



NOTE: Make sure the crankcase 1 and 2 are clean.

Apply liquid gasket (Item 1) [Figure 70-110-28] to the crankcase 2 as shown in the figure.

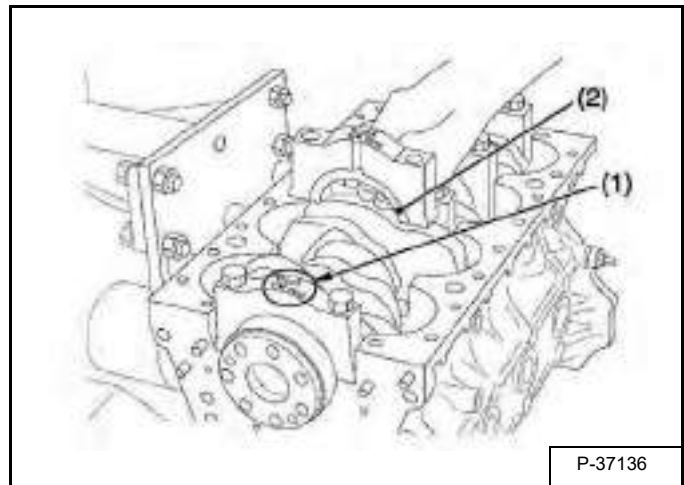
Tighten the crankcase 2 mounting screws with even force on the diagonal line.

Confirm that the liquid gasket coating surface is free of water, dust and oil in order to maintain sealing effect.

Carefully apply the adhesive evenly.

Tightening torque	Crankcase 2 mounting screw	49 to 55 N•m 37 to 41 ft-lb
-------------------	----------------------------	--------------------------------

Figure 70-110-29



Remove the main bearing case.

Remove the crankshaft.

Reassemble the main bearing case having the same number as the one engraved on the crankcase, and set the casting mark "F / W SIDE" (Item 1) [Figure 70-110-29] on the main bearing case facing towards the flywheel side.

CRANKSHAFT AND PISTONS (CONT'D)

Crankshaft And Bearings Removal and Installation (Cont'd)

Figure 70-110-30

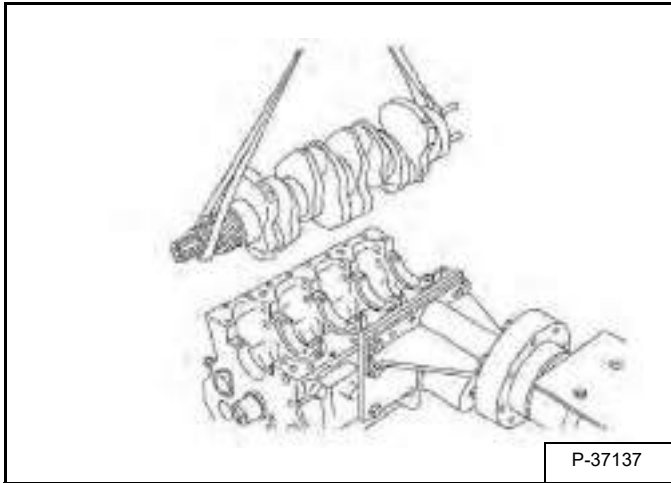


Figure 70-110-31

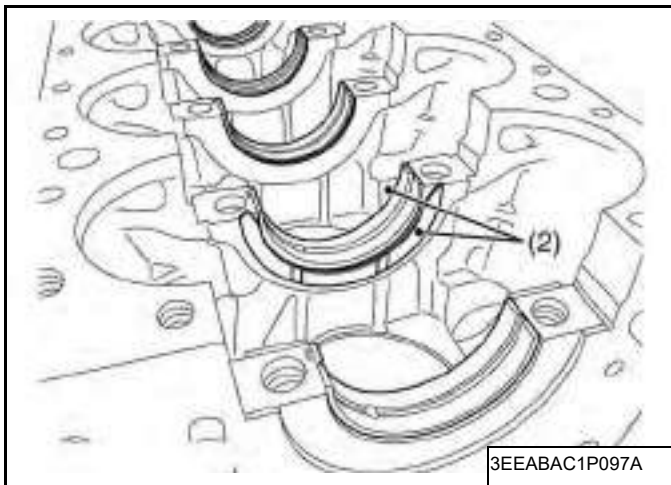


Figure 70-110-32

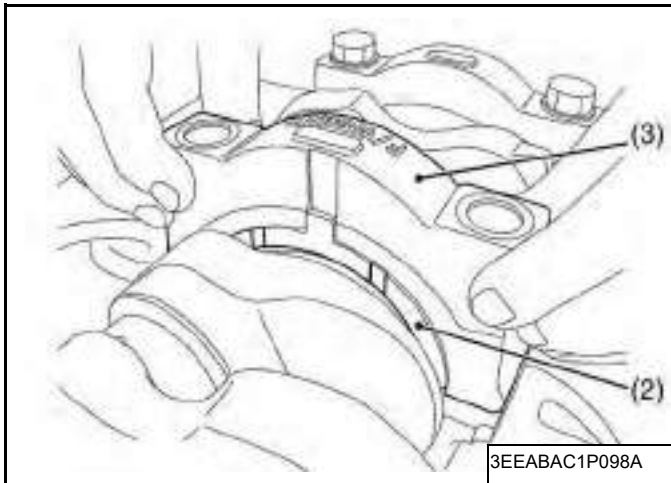
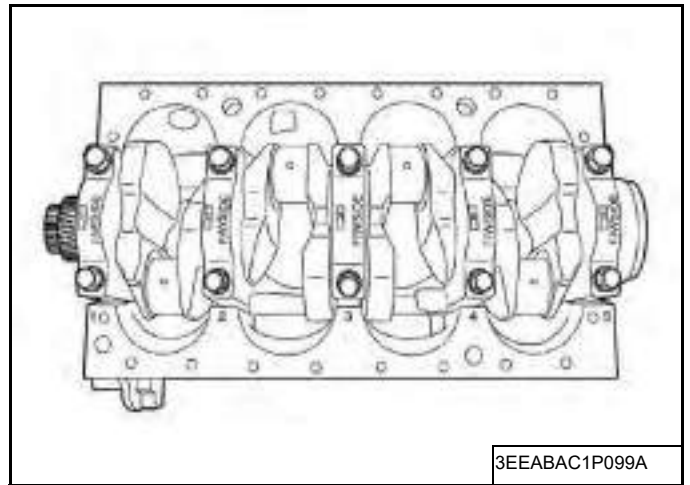


Figure 70-110-33



Reassemble the thrust bearing (Item 2) **[Figure 70-110-31]**, with the oil groove facing outside, into both side of the fourth main bearing case.

Apply oil to the bearing case screws and tighten them to the specified torque.

Tightening torque	Main bearing case screw	138 to 147 N•m 102 to 108 ft-lb
-------------------	-------------------------	------------------------------------

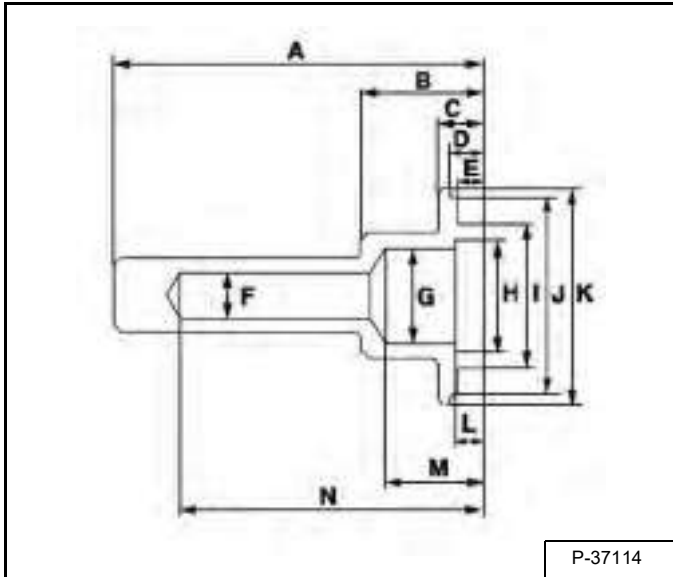
Dealer Copy -- Not for Resale

CRANKSHAFT AND PISTONS (CONT'D)

Crankshaft And Bearings - Servicing

The following special tools are not provided, so make them referring to [Figure 70-110-34], [Figure 70-110-35] & [Figure 70-110-36].

Figure 70-110-34



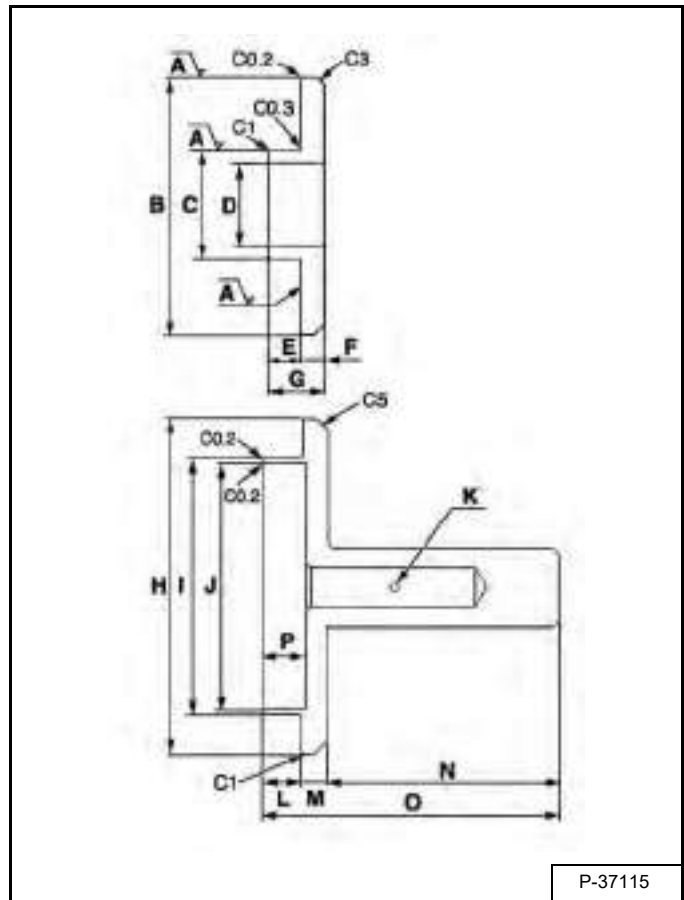
P-37114

Gearcase Oil Seal Replacing Tool

Application: Use to press fit the oil seal.

A	148.8 mm (5.8582 in)
B	50 mm (1.9685 in)
C	18.8 mm (0.7401 in)
D	13.7 to 13.9 mm (0.5394 to 0.5472 in)
E	11 mm (0.433 in)
F	18 mm dia. (0.7087 in dia.)
G	38 mm dia. (1.4961 in dia.)
H	45 mm dia. (1.7716 in dia.)
I	57.9 to 58.1 mm (2.2795 to 2.2874 in)
J	79.5 mm dia. (3.1299 in dia.)
K	87 mm (3.452 in)
L	12 mm (0.4724 in)
M	40 mm (1.5748 in)
N	120 mm (4.7244 in)

Figure 70-110-35



P-37115

Auxiliary Socket For Fixing Crankshaft Sleeve

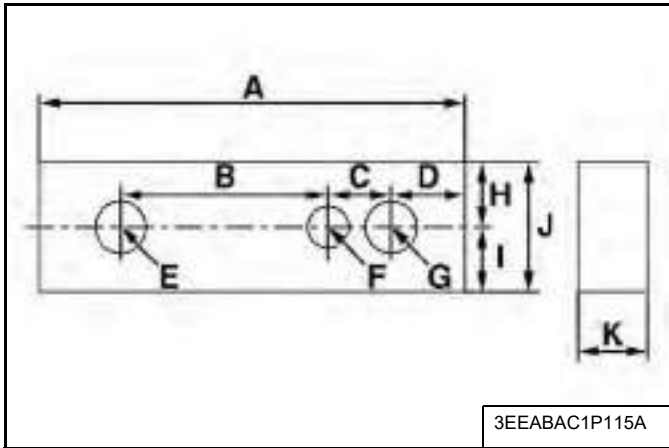
Application: Use to fix the crankshaft sleeve of the diesel engine.

A	Rmax = 12.5 S
B	94.5 to 95.0 mm (3.7205 to 3.7402 in)
C	40 mm (1.5748 in)
D	30 mm (1.1811 in)
E	12 mm (0.4724 in)
F	7.9 to 8.1 mm (0.3110 to 0.3189 in)
G	20 mm (0.0787 in)
H	130 mm (5.1181 in)
I	99.4 to 99.6 mm (3.9134 to 3.9213 in)
J	95.05 to 95.20 mm (3.7421 to 3.7480 in)
K	3 mm dia. (0.1181 in dia.)
L	15 mm (0.5905 in)
M	10 mm (0.3937 in)
N	90 mm (3.5433 in)
O	115 mm (4.5275 in)
P	16.9 to 17.1 mm (0.6654 to 0.6732 in)
C1	Chamfer 1.0 mm (0.039 in)
C3	Chamfer 3.0 mm (0.1181 in)
C5	Chamfer 5.0 mm (0.1969 in)
C0.2	Chamfer 0.2 mm (0.0079 in)
C0.3	Chamfer 0.3 mm (0.0118 in)

CRANKSHAFT AND PISTONS (CONT'D)

Crankshaft And Bearings - Servicing (Cont'd)

Figure 70-110-36



3EEABAC1P115A

Application: Use for aligning the crankcase 1 and 2.

A	115 mm (4.5276 in)
B	56 mm (2.2047 in)
C	17 mm (0.6693 in)
D	20 mm (0.7874 in)
E	f14 mm (0.5512 in dia.)
F	f11 mm (0.4331 in dia.)
G	f14 mm (0.5512 in dia.)
H	17.5 mm (0.6890 in)
I	17.5 mm (0.6890 in)
J	35 mm (1.3780 in)
K	19mm (0.7480 in)

Dealer Copy -- Not for Resale

CRANKSHAFT AND PISTONS (CONT'D)

Crankshaft And Bearings - Servicing (Cont'd)

Crankshaft Side Clearance

Figure 70-110-37

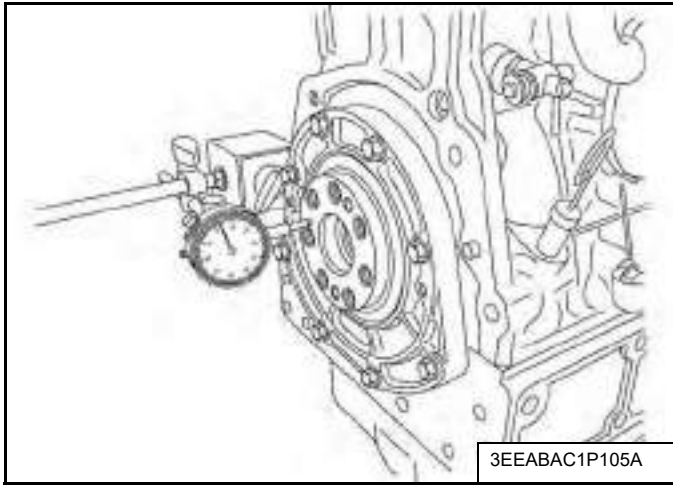
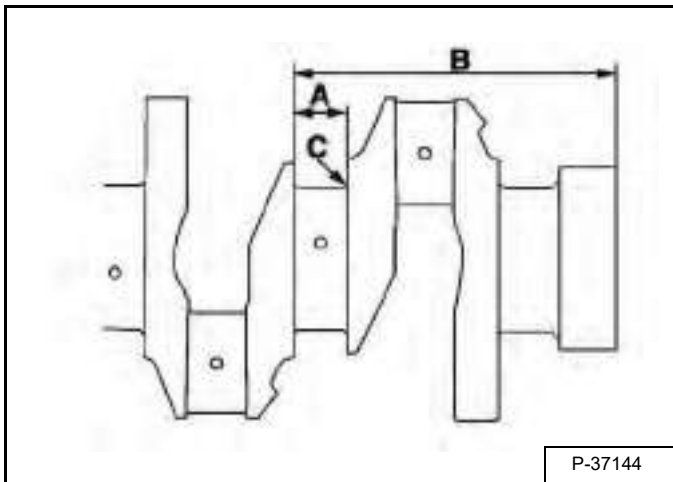


Figure 70-110-38



Set a dial indicator with its tip on the end of the crankshaft **[Figure 70-110-37]**.

Measure the side clearance by moving the crankshaft to the front and rear.

If the measurement exceeds the allowable limit, replace the thrust bearings.

If the same size bearing is useless because of the crankshaft journal wear, replace it with an oversize one referring to the table and **[Figure 70-110-38]**.

Crankshaft side clearance	Factory spec.	0.15 to 0.31 mm 0.0059 to 0.0122 in.
	Allowable limit	0.50 mm 0.020 in.

Oversize thrust bearing

Oversize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Thrust bearing 1 02	1C010-23951	020 OS
	Thrust bearing 2 02	1C010-23971	020 OS
0.4 mm 0.016 in.	Thrust bearing 1 04	1C010-23961	040 OS
	Thrust bearing 1 04	1C010-23981	040 OS

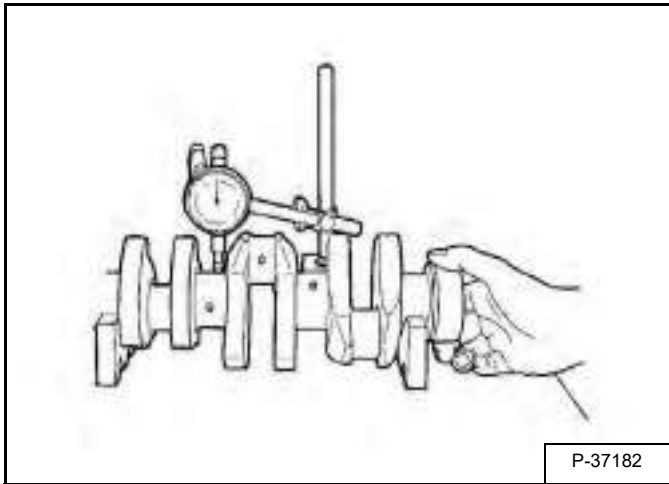
Oversize dimensions of crankshaft journal.

Oversize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension A	29.20 to 29.25 mm 1.1496 to 1.1515 in.	29.40 to 29.45 mm 1.1574 to 1.1594 in.
Dimension B	169.1 to 169.15 mm 6.6575 to 6.6594 in.	169.2 to 169.25 mm 6.6614 to 6.6634 in.
Dimension C	2.8 to 3.2 mm radius 0.1102 to 0.1260 in radius	2.8 to 3.2 mm radius 0.1102 to 0.1260 in radius
(0.8-S)		
The crankshaft journal must be fine-finished to higher than _____		

CRANKSHAFT AND PISTONS (CONT'D)

Crankshaft And Bearings - Servicing (Cont'd)

Figure 70-110-39



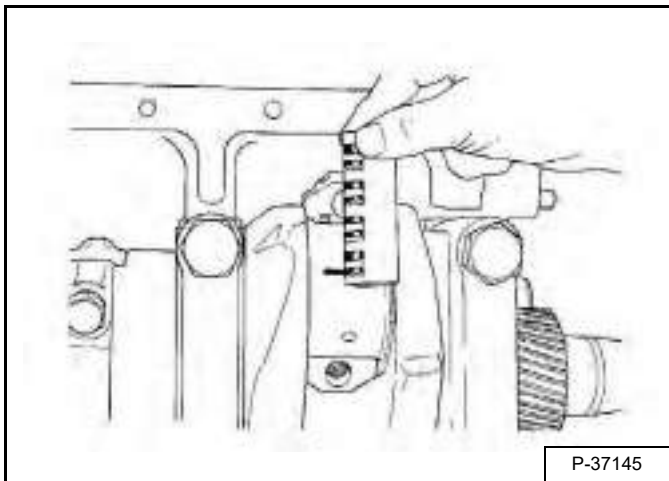
Support the crankshaft with V block on the surface plate and set a dial indicator with its tip on the intermediate journal at right angle [Figure 70-110-39].

Rotate the crankshaft on the V block and get the misalignment (half of the measurement).

If the misalignment exceeds the allowable limit, replace the crankshaft.

Crankshaft alignment	Allowable limit	0.02 mm 0.0008 in.
----------------------	-----------------	-----------------------

Figure 70-110-40



Clean the crank pin and crank pin bearing.

Put a strip of plastigage (Code No. 07909-30241) [Figure 70-110-40] on the center of the crank pin.

Install the connecting rod cap and tighten the connecting rod screws to the specified torque, and remove the cap again.

Measure the amount of the flattening with the scale, and get the oil clearance.

If the oil clearance exceeds the allowable limit, replace the crank pin bearing.

If the same size bearing is useless because of the crank pin wear, replace it with an undersize one referring to the table and figure.

NOTE: Never insert the plastigage into the crank pin oil hole. Be sure not to move the crankshaft while the connecting rod screws are tightened.

Crank pin O.D.	Factory spec.	52.977 to 52.990 mm 2.0857 to 2.0862 in.
----------------	---------------	---

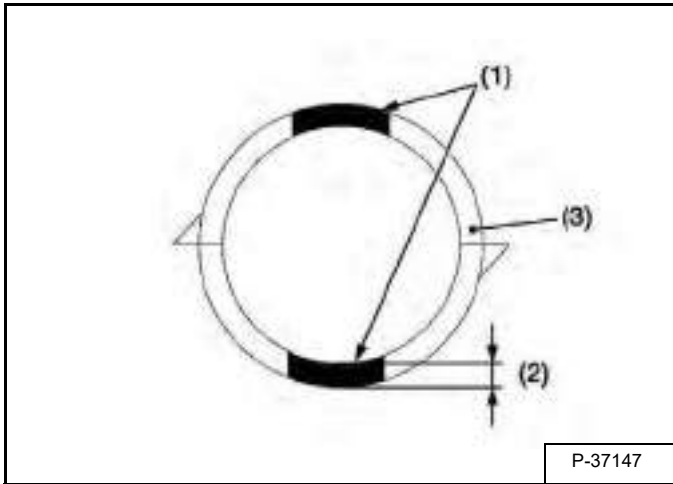
Oil clearance between crank pin and crank pin bearing	Factory spec.	0.018 to 0.051 mm 0.0007 to 0.0020 in.
	Allowable limit	0.20 mm 0.0079 in.

Dealer Copy -- Not for Resale

CRANKSHAFT AND PISTONS (CONT'D)

Crankshaft And Bearings - Servicing (Cont'd)

Figure 70-110-41



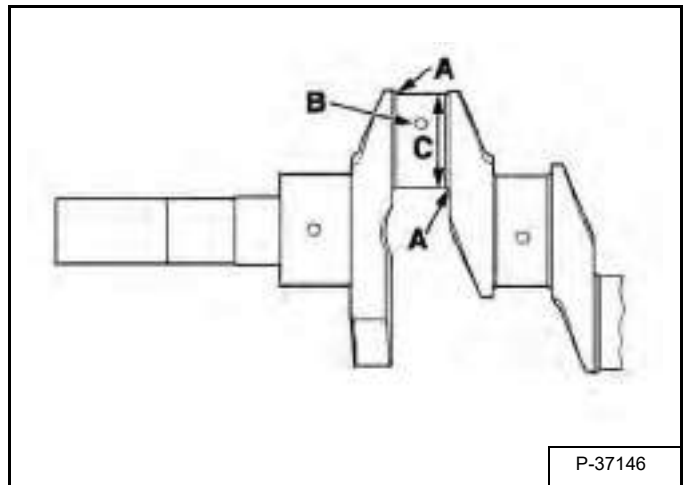
NOTE: STD size crank pin bearing for V3300. To replace it with a specific STD service part, make sure the crank pin bearing has the same ID color as the connecting rod [Figure 70-110-41].

ID Color	Connecting rod	Crank pin bearing		
	Large-end in dia.	Class	Part code	Center wall thick
Blue	56.01 to 56.02 mm 2.2051 to 2.2055 in.	L	1C020-22311	1.496 to 1.501 mm 0.0589 to 0.0591 in.
Yellow or No Color	56.00 to 56.01 mm 2.2047 to 2.2051 in.	S	1C020-22331	1.491 to 1.496 mm 0.0587 to 0.0589 in.

Undersize crank pin bearing.

Undersize	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crank pin bearing 02	1C020-22960	020 US
0.4 mm 0.016 in.	Crank pin bearing 04	1C020-22970	040 US

Figure 70-110-42



Undersize dimensions of crank pin.

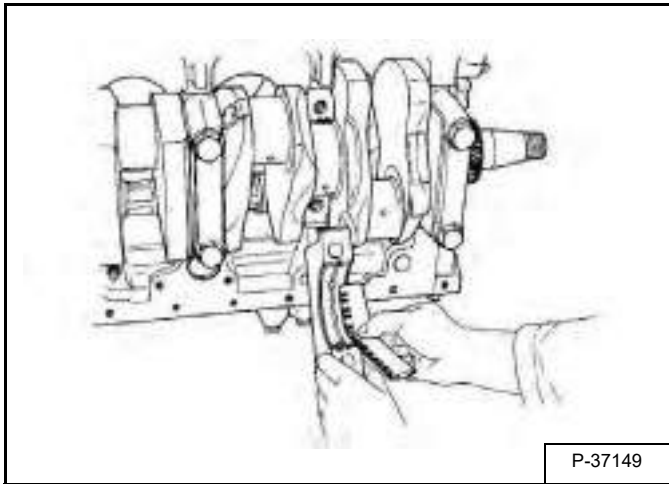
Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension A	2.8 to 3.2 mm radius 0.1102 to 0.1260 in radius	2.8 to 3.2 mm radius 0.1102 to 0.1260 in radius
Dimension B	1.0 to 1.5 mm radius 0.0394 to 0.0591 in radius	1.0 to 1.5 mm radius 0.0394 to 0.0591 in radius
Dimension C	52.777 to 52.790 mm 2.0778 to 2.0783 in.	52.577 to 52.590 mm 2.0700 to 2.0705 in.
(0.8-S)		
The crank pin must be fine-finished to higher than —		

Dealer Copy -- Not for Resale

CRANKSHAFT AND PISTONS (CONT'D)

Crankshaft And Bearings - Servicing (Cont'd)

Figure 70-110-43



Clean the crankshaft journal and crankshaft bearing.

Put a strip of press gauge (Code No.: 07909-30241) on the center of the journal [Figure 70-110-43].

NOTE: Never insert the press gauge into the oil hole of the journal.

Install the main bearing case and tighten the screws to the specified torque, and remove the cases again.

Measure the amount of the flattening with the scale and get the oil clearance.

If the clearance exceeds the allowable limit, replace the crankshaft bearing.

Crankshaft journal O.D.	Factory spec.	74.977 to 74.990 mm 2.9519 to 2.9523 in.
-------------------------	---------------	---

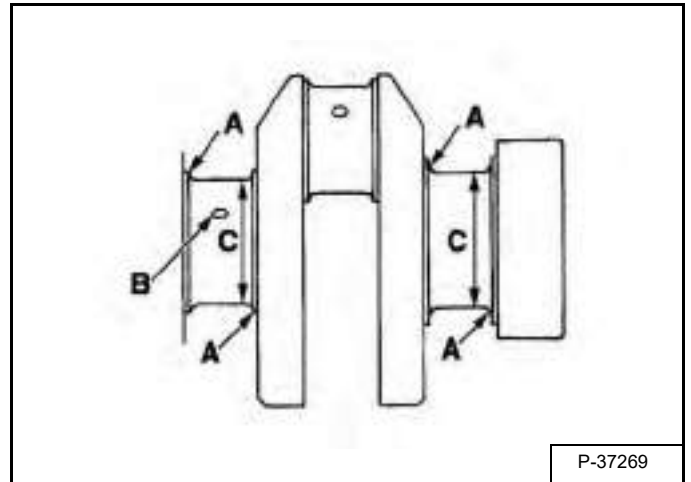
Oil clearance between crankshaft journal and crankshaft bearing	Factory spec.	0.018 to 0.062 mm 0.00071 to 0.0024 in.
	Allowable limit	0.20 mm 0.0079 in.

Undersize crank pin bearing.

Under-size	Bearing	Code Number	Marking
0.2 mm 0.008 in.	Crankshaft bearing 02	1C020-23910	020 US

0.4 mm 0.016 in.	Crankshaft bearing 04	1C020-22920	040 US
---------------------	-----------------------	-------------	--------

Figure 70-110-44



Undersize dimensions of crank pin [Figure 70-110-44].

Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension A	2.8 to 3.2 mm radius 0.1102 to 0.1260 in radius	2.8 to 3.2 mm radius 0.1102 to 0.1260 in radius
Dimension B	1.0 to 1.5 mm radius 0.0394 to 0.0591 in radius	1.0 to 1.5 mm radius 0.0394 to 0.0591 in radius
Dimension C	74.777 to 74.790 mm 2.9440 to 2.9445 in.	74.577 to 74.590 mm 2.9361 to 2.9366 in.
(0.8-S)		
The crank pin must be fine-finished to higher than —		

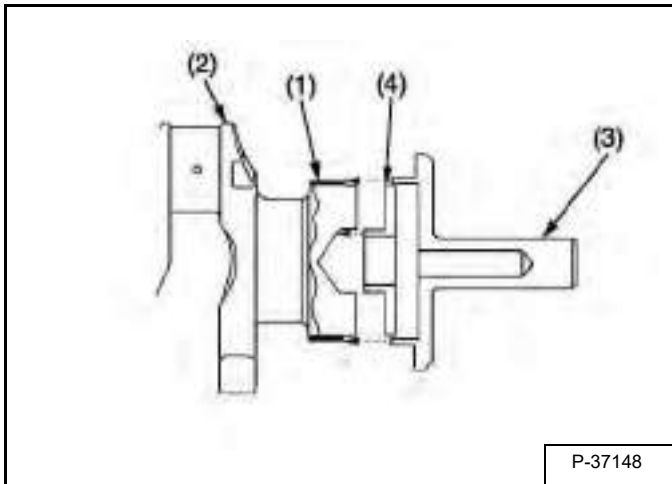
Dealer Copy -- Not for Resale

CRANKSHAFT AND PISTONS (CONT'D)

Crankshaft And Bearings - Servicing (Cont'd)

Crankshaft Sleeve

Figure 70-110-45



Remove the used crankshaft sleeve (Item 1) **[Figure 70-110-45]** using a special-use puller set (Code No.: 07916-09032).

Set the sleeve guide (Item 4) to the crankshaft (Item 2) **[Figure 70-110-45]**.

Heat a new sleeve to a temperature between 150 and 200°C (302 and 392°F), and fix the sleeve to the crankshaft.

Press fit the sleeve using the auxiliary socket for pushing (Item 3) **[Figure 70-110-45]**.

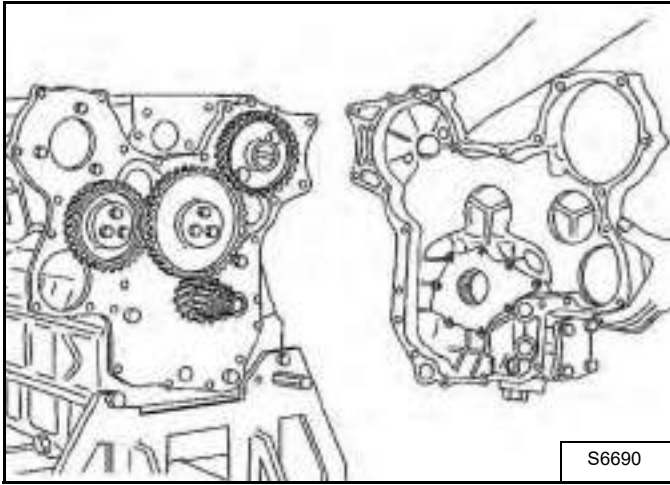
NOTE: Mount the sleeve with its largely chamfered surface facing outward.

Dealer Copy -- Not for Resale

CAMSHAFT AND TIMING GEARS

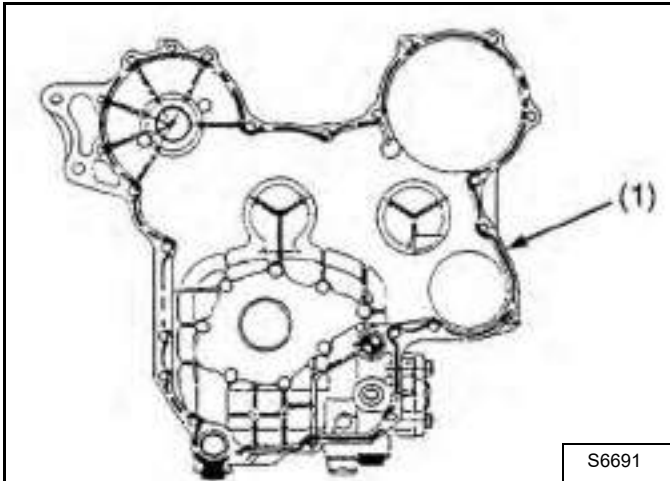
Timing Gearcase Cover Removal And Installation

Figure 70-120-1



Remove the gearcase cover (Item 1) [Figure 70-120-1].

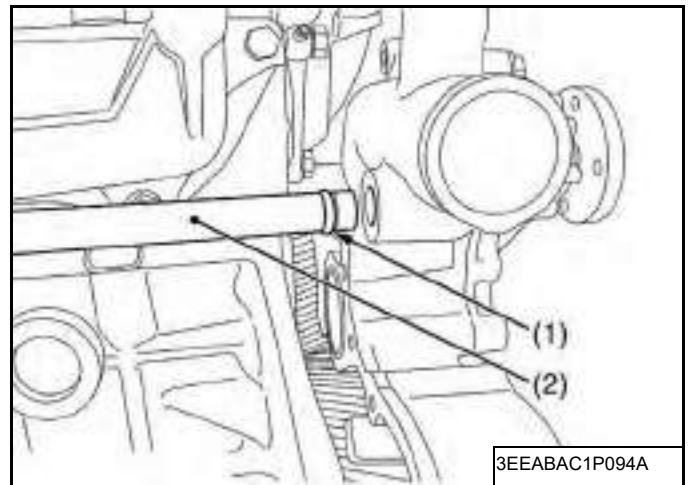
Figure 70-120-2



Confirm that the liquid gasket coating surface is free of water, dust and oil in order to maintain sealing effect.

Carefully apply the adhesive evenly [Figure 70-120-2].

Figure 70-120-3



Be careful not to damage the water pipe (Item 2) [Figure 70-120-3].

NOTE: When mounting the adhesive-applied parts, take care to fit them to the mating parts.

NOTE: Assemble the adhesive-applied parts within 10 minutes.

NOTE: Apply a liquid gasket to the gearcase cover.

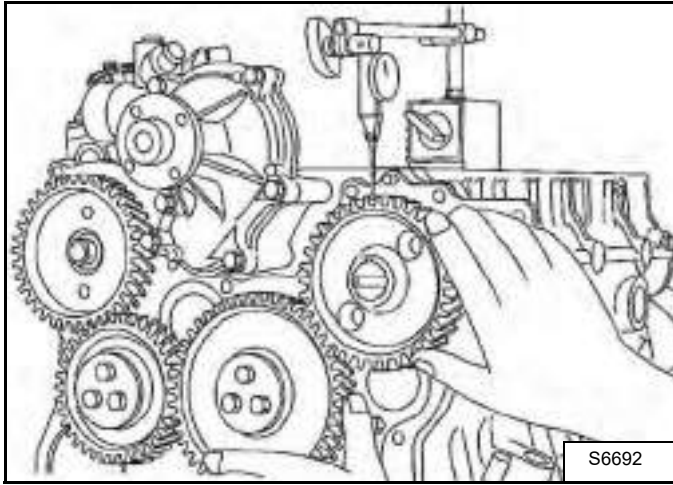
NOTE: Use the new O-rings when attaching gearcase cover.

Dealer Copy -- Not for Resale

CAMSHAFT AND TIMING GEARS (CONT'D)

Timing Gears Backlash - Checking

Figure 70-120-4



Set a dial indicator (lever type) with its tip on the gear tooth [Figure 70-120-4].

Move the gear to measure the backlash, holding its mating gear.

If the backlash exceeds the allowable limit, check the oil clearance of the shafts and the gear.

If the oil clearance is proper, replace the gear.

Cam gear Balancer gear 1	Factory spec.	0.0470 to 0.182 mm 0.00185 to 0.00716 in.
	Allowable limit	0.22 mm 0.0087 in.
Idle gear 1 Balancer gear 2	Factory spec.	0.0440 to 0.183 mm 0.00172 to 0.00720 in.
	Allowable limit	0.22 mm 0.0087 in.

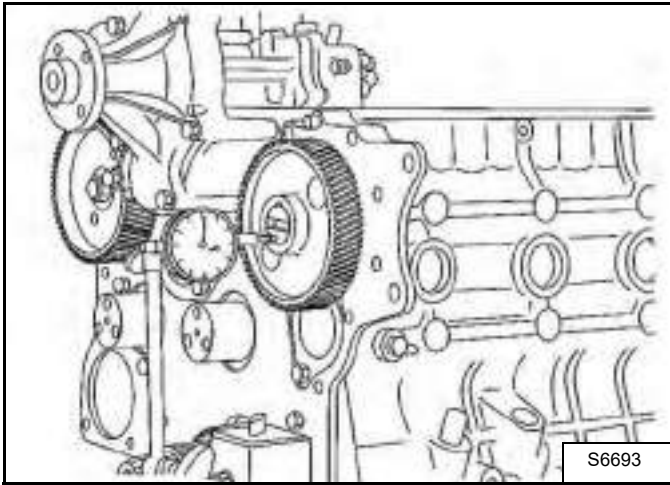
Crank gear Idle gear 1	Factory spec.	0.0490 to 0.193 mm 0.00193 to 0.00759 in.
	Allowable limit	0.22 mm 0.0087 in.
Idle gear 1 Cam gear	Factory spec.	0.0490 to 0.189 mm 0.00193 to 0.00744 in.
	Allowable limit	0.22 mm 0.0087 in.
Idle gear 1 Idle gear 2	Factory spec.	0.0440 to 0.185 mm 0.00174 to 0.00728 in.
	Allowable limit	0.22 mm 0.0087 in.
Idle gear 2 Injection pump gear	Factory spec.	0.0440 to 0.177 mm 0.00174 to 0.00728 in.
	Allowable limit	0.22 mm 0.0087 in.

CAMSHAFT AND TIMING GEARS (CONT'D)

Camshaft - Servicing

Side Clearance

Figure 70-120-5



Set a dial indicator with its tip on the camshaft **[Figure 70-120-5]**.

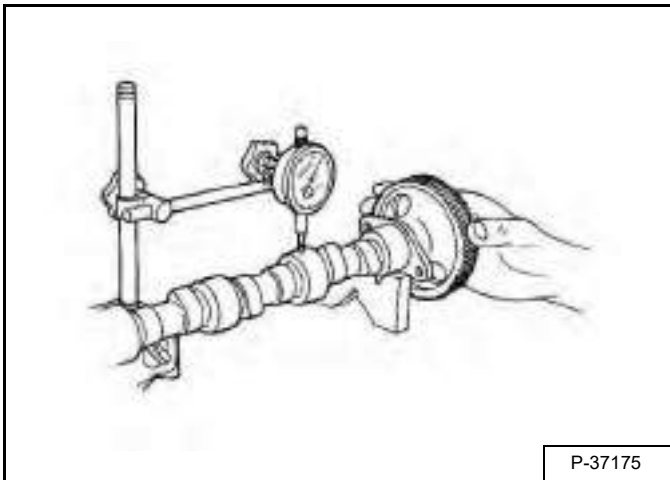
Measure the side clearance by moving the cam gear to the front and rear.

If the measurement exceeds the allowable limit, replace the camshaft stopper.

Side clearance	Factory spec.	0.070 to 0.22 mm 0.0028 to 0.0086 in.
	Allowable limit	0.30 mm 0.012 in.

Alignment

Figure 70-120-6



Support the camshaft with V block on the surface plate and set a dial indicator with its tip on the intermediate journal at right angle **[Figure 70-120-6]**.

Rotate the camshaft on the V blocks and get the misalignment (half of the measurement).

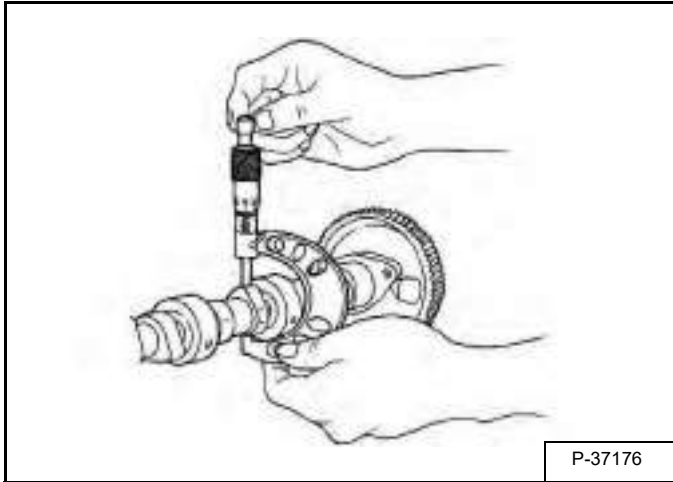
If the misalignment exceeds the allowable limit, replace the camshaft.

Camshaft alignment	Allowable limit	0.01 mm 0.0004 in.
--------------------	-----------------	-----------------------

CAMSHAFT AND TIMING GEARS (CONT'D)

Camshaft - Servicing (Cont'd)

Figure 70-120-7



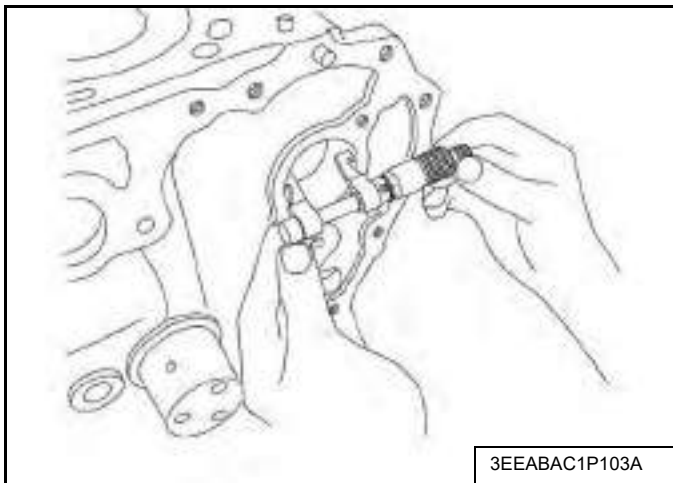
P-37176

Measure the height of the cam at its highest point with an outside micrometer **[Figure 70-120-7]**.

If the measurement is less than the allowable limit, replace the camshaft.

Intake and exhaust cam height	Factory spec.	Intake valve	37.63 mm 1.481 in.
		Exhaust valve	38.96 mm 1.534 in.
	Allowable limit	Intake valve	37.13 mm 1.462 in.
		Exhaust valve	38.46 mm 1.514 in.

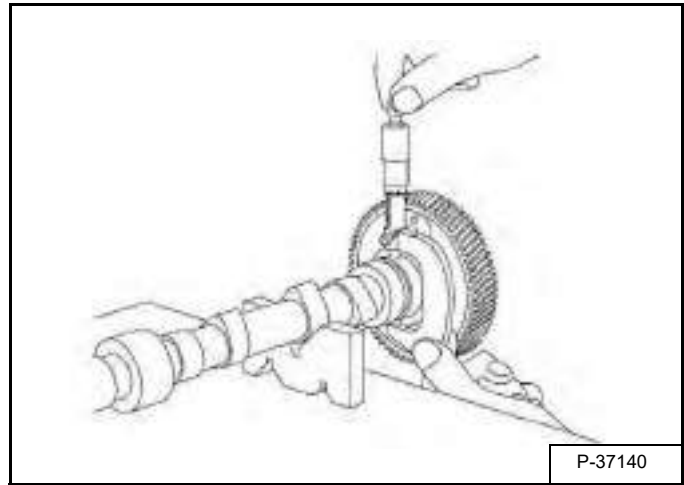
Figure 70-120-8



3EEABAC1P103A

Measure the cylinder block bore I.D. for camshaft with an inside micrometer **[Figure 70-120-8]**.

Figure 70-120-9



P-37140

Measure the camshaft journal O.D. with an outside micrometer **[Figure 70-120-9]**.

If the clearance exceeds the allowable limit, replace the camshaft.

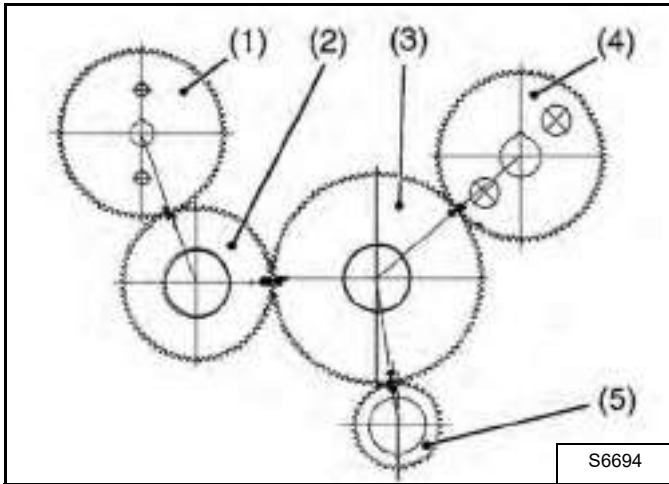
Oil clearance of camshaft journal	Factory spec.	0.050 to 0.091 mm 0.0020 to 0.0035 in.
	Allowable limit	0.15 mm 0.0059 in.

Camshaft journal O.D.	Factory spec.	45.934 to 45.950 mm 1.8085 to 1.8090 in.
Camshaft journal I.D.	Factory spec.	46.000 to 46.025 mm 1.8111 to 1.8120 in.

CAMSHAFT AND TIMING GEARS (CONT'D)

Idle Gear And Shaft Removal And Installation

Figure 70-120-10



Remove three set screws of the idle gear and draw out the idle gear 1, 2 [Figure 70-120-10].

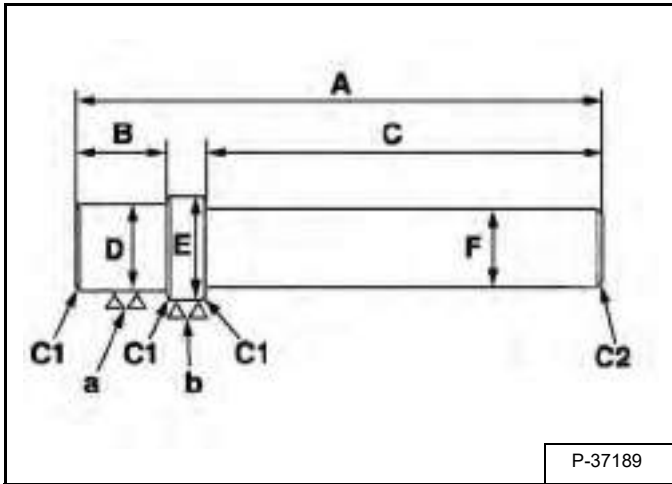
Remove two set screws of the camshaft stopper and draw out the camshaft.

Set the crankshaft at the top dead center of No. 1 and 4 cylinder and the camshaft key to the top position and align the marks of idle gear and cam gear and crank gear to assemble them [Figure 70-120-10].

CAMSHAFT AND TIMING GEARS (CONT'D)

Idler Gear And Shaft - Servicing

Figure 70-120-11



P-37189

Bushing Replacing Tool

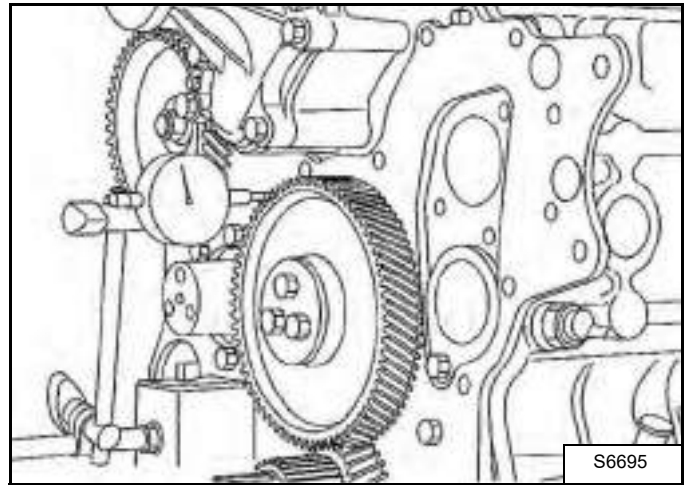
Application: Use to press out and press fit the bushing.

1. For idle gear bushing.

A	196 mm (7.7165 in)
B	37.5 mm (1.476 in)
C	150 mm (5.9055 in)
D	46.325 to 46.500 mm dia. (1.8238 to 1.8307 in dia.)
E	48.100 to 48.075 mm dia. (1.8937 to 1.8927 in dia.)
F	20 mm (0.7874 in)
a	0.0000063 mm (0.00025 in)
b	0.0000063 mm (0.00025 in)
C1	Chamfer 1.0 mm (0.039 in)
C2	Chamfer 2.0 mm (0.079 in)

Side Clearance

Figure 70-120-12



Set a dial indicator with its tip on the idle gear [Figure 70-120-12].

Measure the side clearance by moving the idle gear to the front and rear.

If the measurement exceeds the allowable limit, replace the idle gear collar.

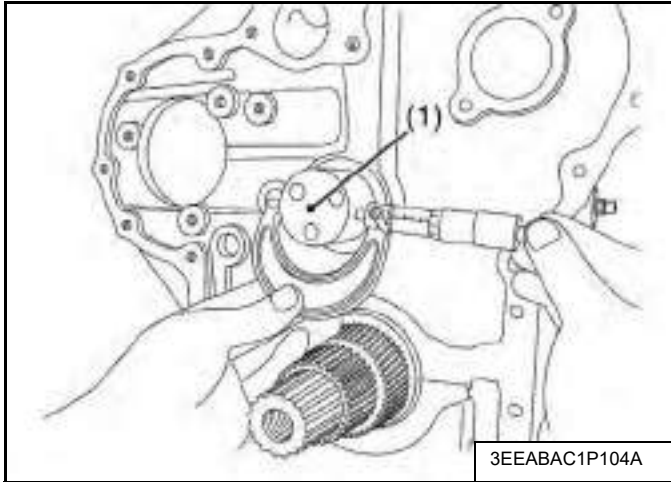
Side clearance	Factory spec.	0.15 to 0.30 mm 0.0059 to 0.011 in.
	Allowable limit	0.9 mm 0.04 in.

CAMSHAFT AND TIMING GEARS (CONT'D)

Idler Gear And Shaft Servicing (Cont'd)

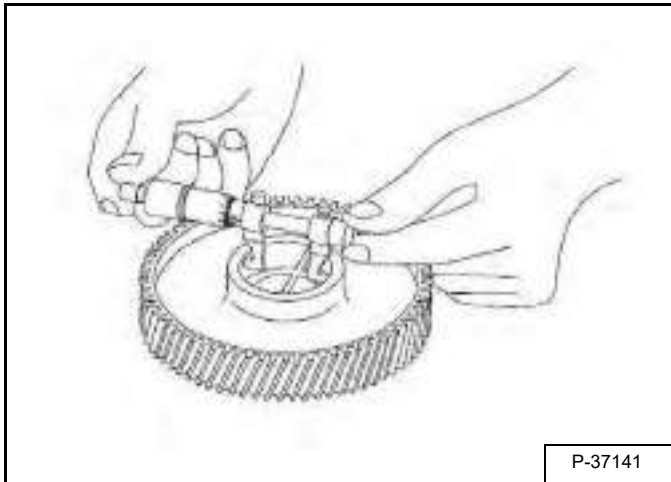
Idle gear shaft O.D.	Factory spec.	44.959 to 44.975 mm 1.7701 to 1.7706 in.
----------------------	---------------	---

Figure 70-120-13



Measure the idle gear shaft O.D. with an outside micrometer **[Figure 70-120-13]**.

Figure 70-120-14



Measure the idle gear bushings I.D. with an inside micrometer, and calculate the oil clearance **[Figure 70-120-14]**.

If the oil clearance exceeds the allowable limit, replace the bushing.

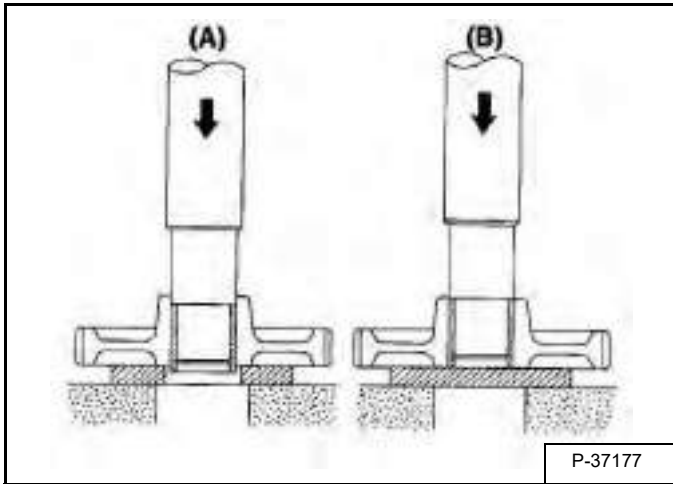
Clearance between idle gear shaft and idle gear bushing	Factory spec.	0.05 to 0.091 mm 0.0020 to 0.0035 in.
	Allowable limit	0.10 mm 0.0039 in.

Idle gear bushing I.D.	Factory spec.	45.025 to 45.050 mm 1.7727 to 1.7736 in.
------------------------	---------------	---

CAMSHAFT AND TIMING GEARS (CONT'D)

Idler Gear And Shaft Servicing (Cont'd)

Figure 70-120-15



Using an idler gear bushing replacing tool, press out the used bushing. (See Idler Gear And Shaft - Servicing on Page 70-120-6.)

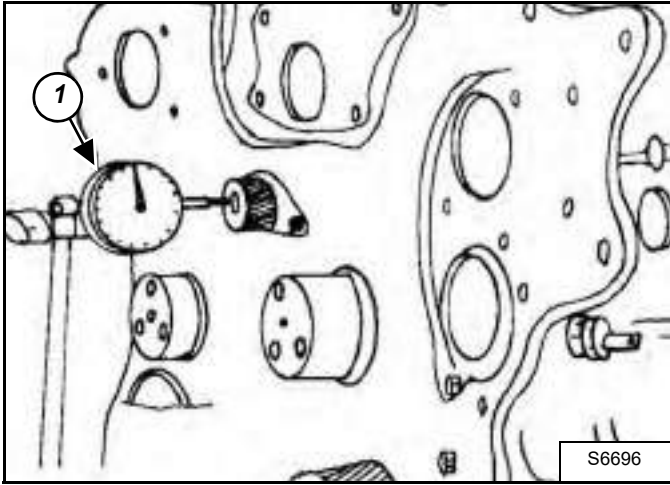
Clean a new idler gear bushing and idler gear bore, and apply engine oil to them.

Using an idler gear bushing replacing tool, press in a new bushing (service parts) to the specified dimension **[Figure 70-120-15]**.

CAMSHAFT AND TIMING GEARS (CONT'D)

Balancer Shaft Servicing

Figure 70-120-16



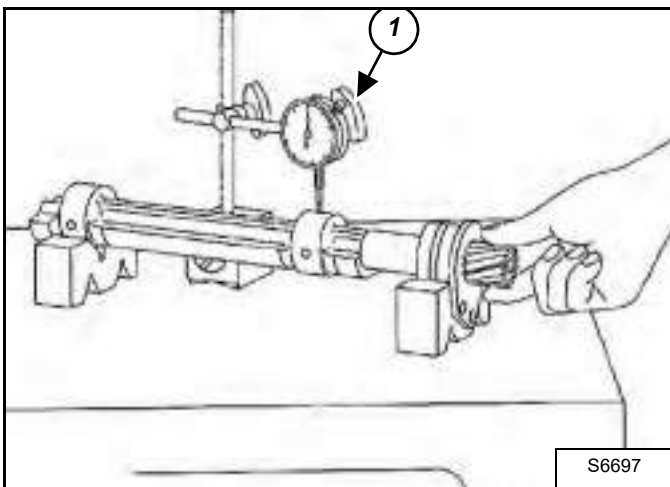
Set a dial indicator (Item 1) [Figure 70-120-16] with tip on the balancer shaft.

Measure the side clearance by moving the balancer shaft to the front and rear.

If the measurement exceeds the allowable limit, replace the balancer shaft.

Side Clearance	Factory spec.	0,070 to 0,22 mm (0.0028 to 0.0086 in)
	Allowable limit	0,3 mm (0.01 in)

Figure 70-120-17



Support the balancer shaft with V blocks on the surface plate and set a dial indicator (Item 1) [Figure 70-120-17] with its tip on the intermediate journal at high angle.

Rotate the balancer shaft on the V block and get the misalignment (half of the measurement).

If the misalignment exceeds the allowable limit, replace the balancer shaft.

Balancer shaft alignment	Allowable limit	0,02 mm (0.0008 in)
--------------------------	-----------------	------------------------

CAMSHAFT AND TIMING GEARS (CONT'D)

Balancer Shaft Servicing (Cont'd)

Figure 70-120-18

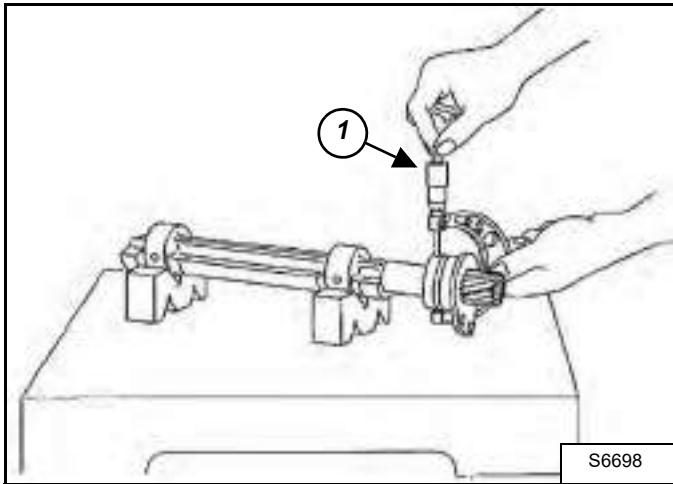
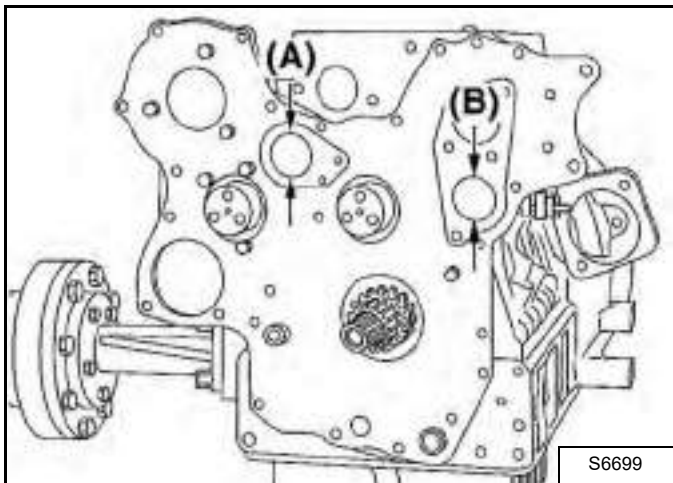


Figure 70-120-19



Measure the balancer shaft journal O.D. with an outside micrometer (Item 1) **[Figure 70-120-18]**.

Measure the cylinder block bore I.D. (A), (B) **[Figure 70-120-19]** for balancer shaft with an inside micrometer.

If the clearance exceeds the allowable limit, replace the balancer shaft.

Balancer-shaft bearing I.D. (A), (B)	Factory spec.	51.01 to 51.08 mm 2.008 to 2.011 in
--------------------------------------	---------------	--

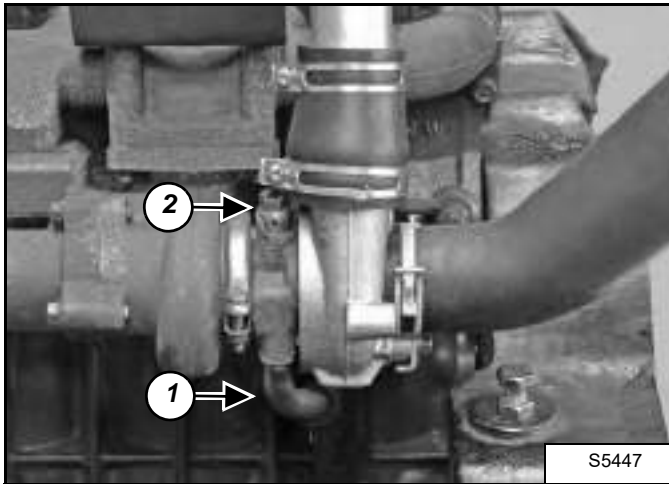
Oil clearance of balancer-shaft journal	Factory spec.	0.0700 to 0.159 mm 0.00276 to 0.00625 in
	Allowable limit	0.2 mm 0.008 in.
Balancer-shaft journal O.D.	Factory spec.	50.920 to 50.940 mm 2.0048 to 2.0055 in

Dealer Copy -- Not for Resale

TURBOCHARGER

Description

Figure 70-130-1



The turbocharger is placed between the exhaust and intake manifolds. It is driven by hot exhaust gases and supplies air at more than atmospheric pressure to the intake. It is lubricated by oil from the main galley. The location of the turbo is between the engine and the blower housing.

The oil flows to the turbo by a tubeline (Item 1) and returns to the engine block through another tubeline (Item 2) [Figure 70-130-1].

The turbocharger internal components are not serviceable.

Testing

Inspect the turbine fins and the turbo housing for damage.

Spin turbine by hand. Turbine should spin freely.

If the turbine is damaged replace the turbocharger.

Check the oil tubelines for leaks.

TURBOCHARGER (CONT'D)

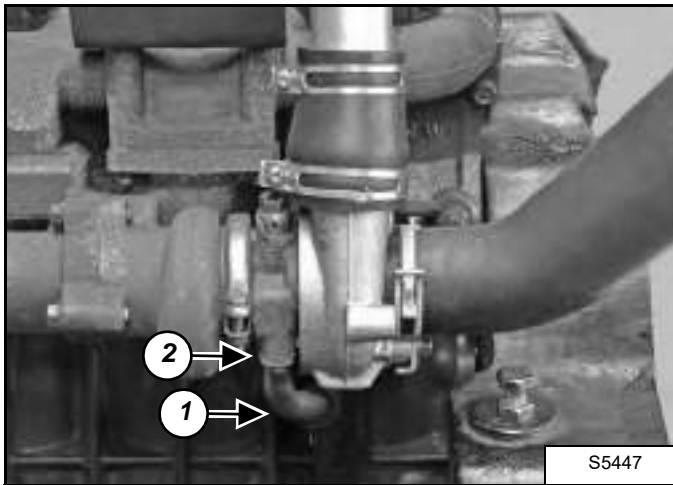
Removal And Installation

! WARNING

Turbochargers, operate at high speed and high temperatures. Keep fingers, tools and other objects away from the inlet and outlet ports. Avoid contact with hot surfaces.

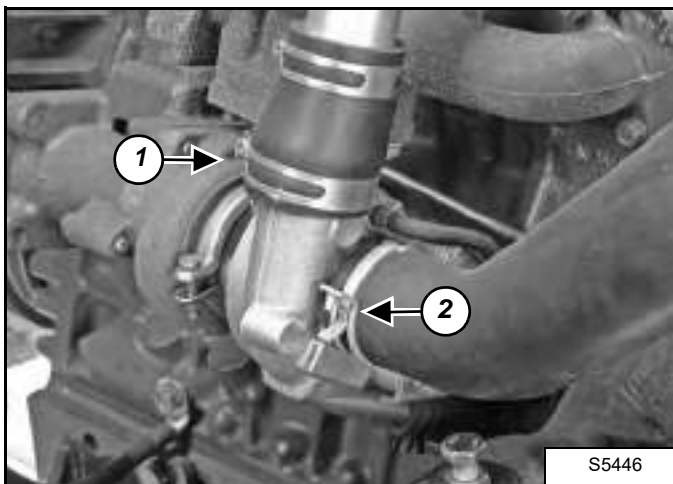
W-2257-1196

Figure 70-130-2



Remove the bolts (Item 1) and tubeline [Figure 70-130-2].

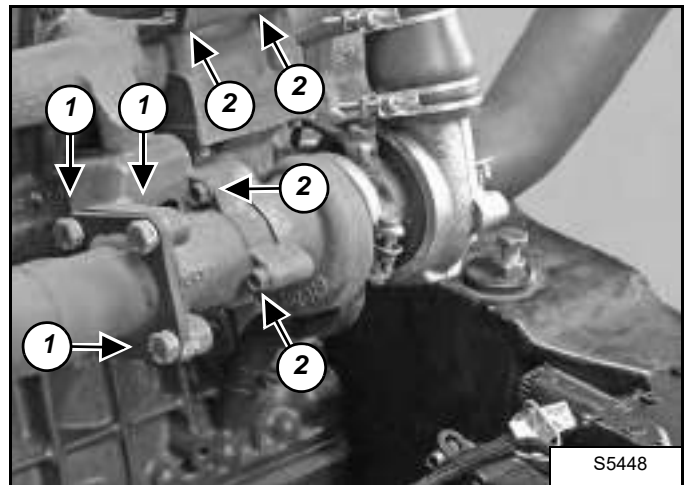
Figure 70-130-3



Loosen the intake hose clamps (Item 1) [Figure 70-130-3] and remove the intake hose.

Loosen the air cleaner hose clamps (Item 2) [Figure 70-130-3] and remove the air cleaner hose.

Figure 70-130-4



Remove the exhaust four tube bolts (Item 1) [Figure 70-130-4].

Remove the seven turbocharger mounting bolts (Item 2) [Figure 70-130-4].

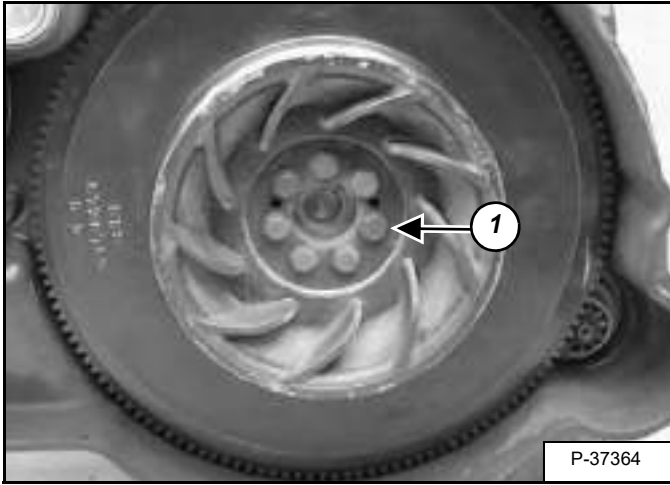
Take off the turbocharger assembly.

Installation: During installation replace all gaskets with new ones.

FLYWHEEL AND HOUSING

Flywheel Removal And Installation

Figure 70-140-1



NOTE: To avoid damage to the RPM sensor, remove the RPM sensor before removing the flywheel.

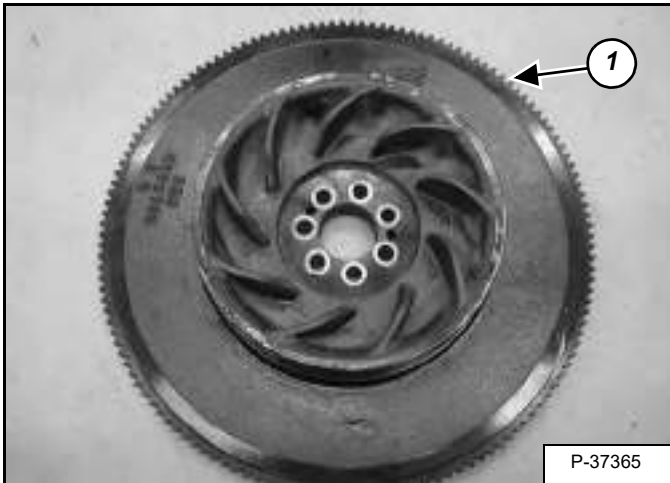
Remove the drive belt. (See Belt Removal And Installation on Page 30-50-3.)

Remove the bolts (Item 1) [Figure 70-140-1] from the flywheel.

Installation: Tighten the flywheel screws to 98,1-107 N•m (72.4-79.5 ft-lb) torque.

Installation: There are two alignment pins on the crankshaft that are used to install the flywheel in the proper position for timing purposes.

Figure 70-140-2



Remove the flywheel from the engine crankshaft [Figure 70-140-2].

Ring Gear Removal And Installation

NOTE: The lead chamfer on ring gear tooth must face the starter.

The ring gear (Item 1) [Figure 70-140-2] on the flywheel is an interference fit. Heat the ring gear enough to expand it and hit it with a hammer to remove it evenly.

Clean the outer surface of the flywheel to give it a smooth fit.

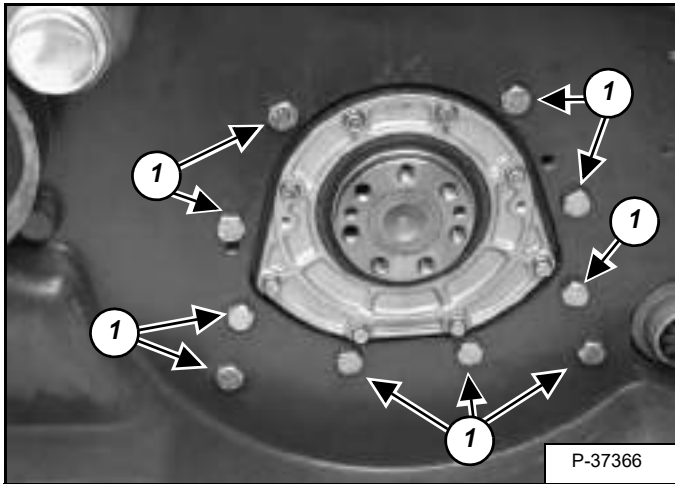
Clean the new ring gear and heat it to a maximum temperature of 220°C (428°F).

Fit the ring gear over the flywheel. Make sure the gear is on the seat correctly.

FLYWHEEL AND HOUSING (CONT'D)

Housing Removal And Installation

Figure 70-140-3



Remove the drive belt. (See Belt Removal And Installation on Page 30-50-3.)

Remove the hydrostatic pump. (See Removal And Installation on Page 30-40-1.)

Remove the belt tension pulley assembly. (See Tensioner Pulley Removal And Installation on Page 30-50-4.)

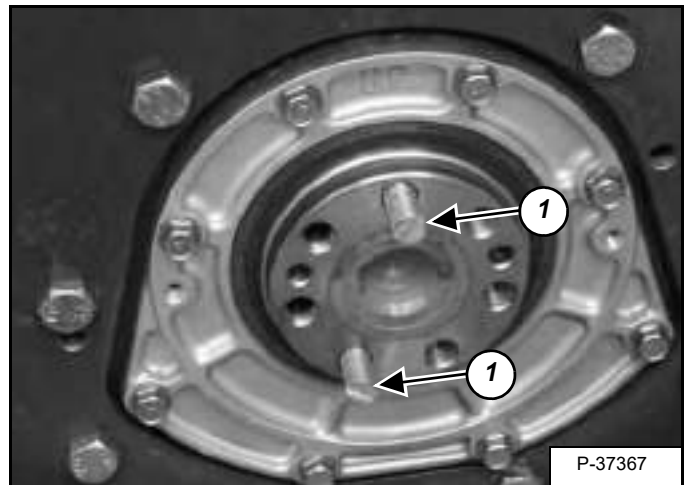
Remove the starter. (See Removal And Installation on Page 60-40-2.)

Remove the ten flywheel housing mounting screws (Item 1) [Figure 70-140-3].

Installation: Tighten the mounting screws to 78-90 N•m (58-66 ft-lb) torque.

Remove the flywheel housing from the engine.

Figure 70-140-4



Installation: Install the flywheel housing on the engine.

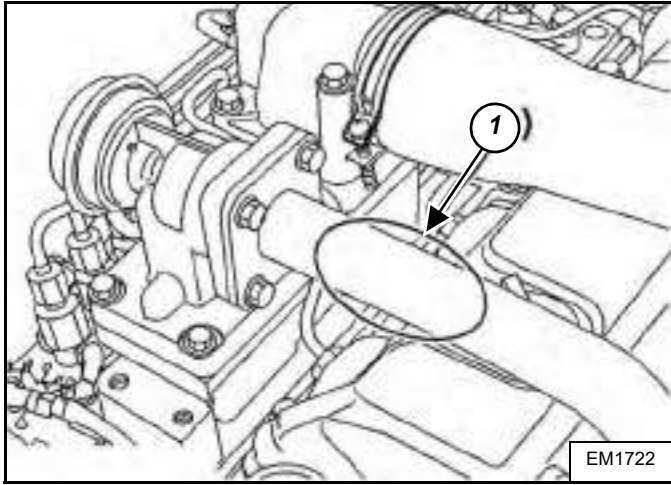
Install two alignment studs (Item 1) [Figure 70-140-4] into the engine crankshaft to help align the flywheel.

The two studs are M12 x 1.25 x 76 mm (3 in) long.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

Checking The Function Of EGR System

Figure 70-150-1



Measure the EGR Pipe Surface Temperature in this area (Item 1) [Figure 70-150-1].

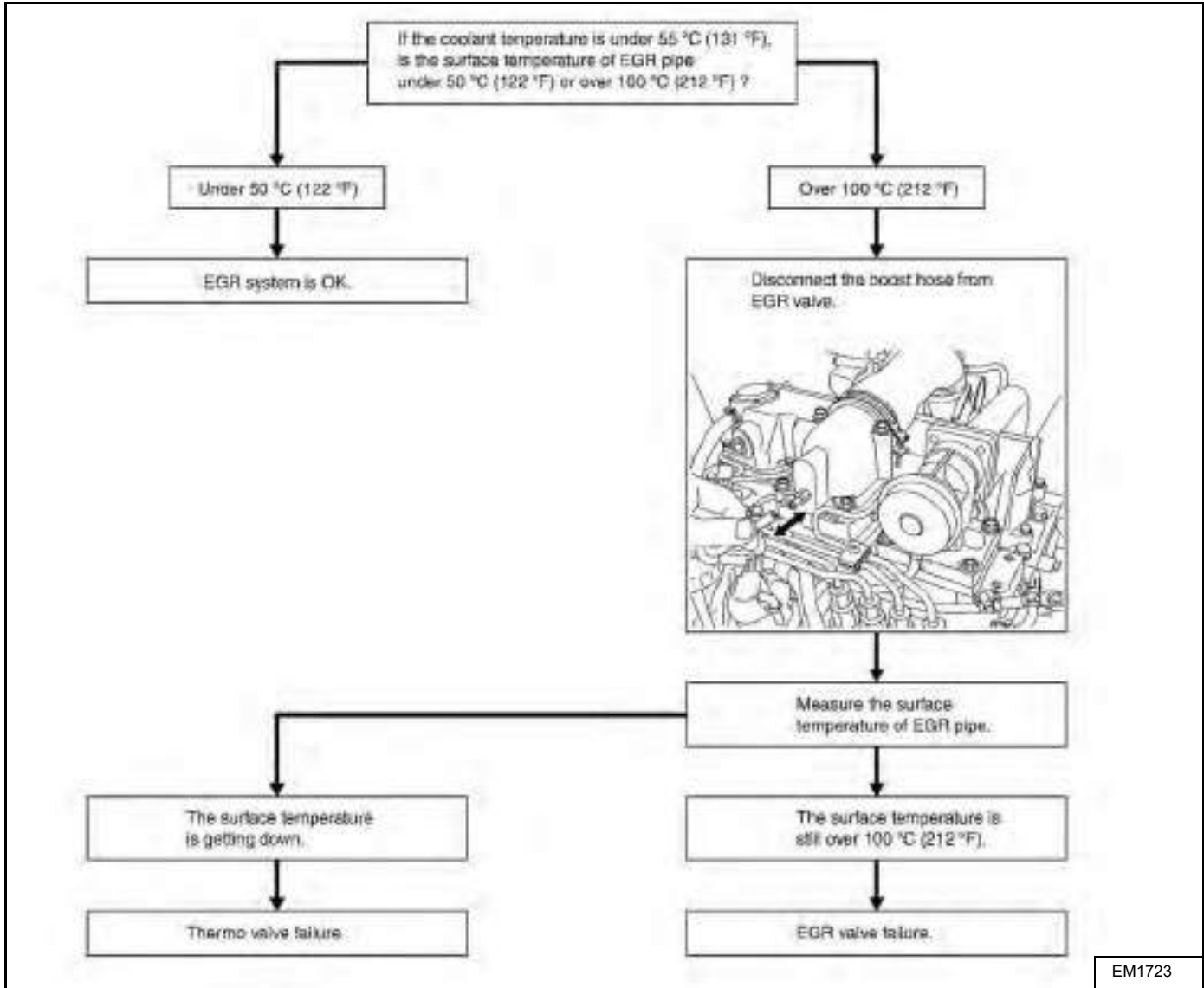
1. Check the coolant temperature and monitor the coolant temperature while following the checking procedures.
2. If the coolant temperature is already 55°C (131°F), cool down the engine.
3. Start the engine and go to check Procedure 1 immediately.
4. After completing Procedure 1, arrange the coolant temperature is getting over 70°C (158°F).
5. If the coolant temperature is over 70°C (158°F), go to check Procedure 2.

**EXHAUST GAS RECIRCULATION (EGR) SYSTEM
(CONT'D)**

Checking The Function Of EGR System (Cont'd)

Procedure 1: If the coolant temperature is under 55°C (131°F), the surface temperature of EGR pipe must be under 50°C (122°F).

Figure 70-150-2



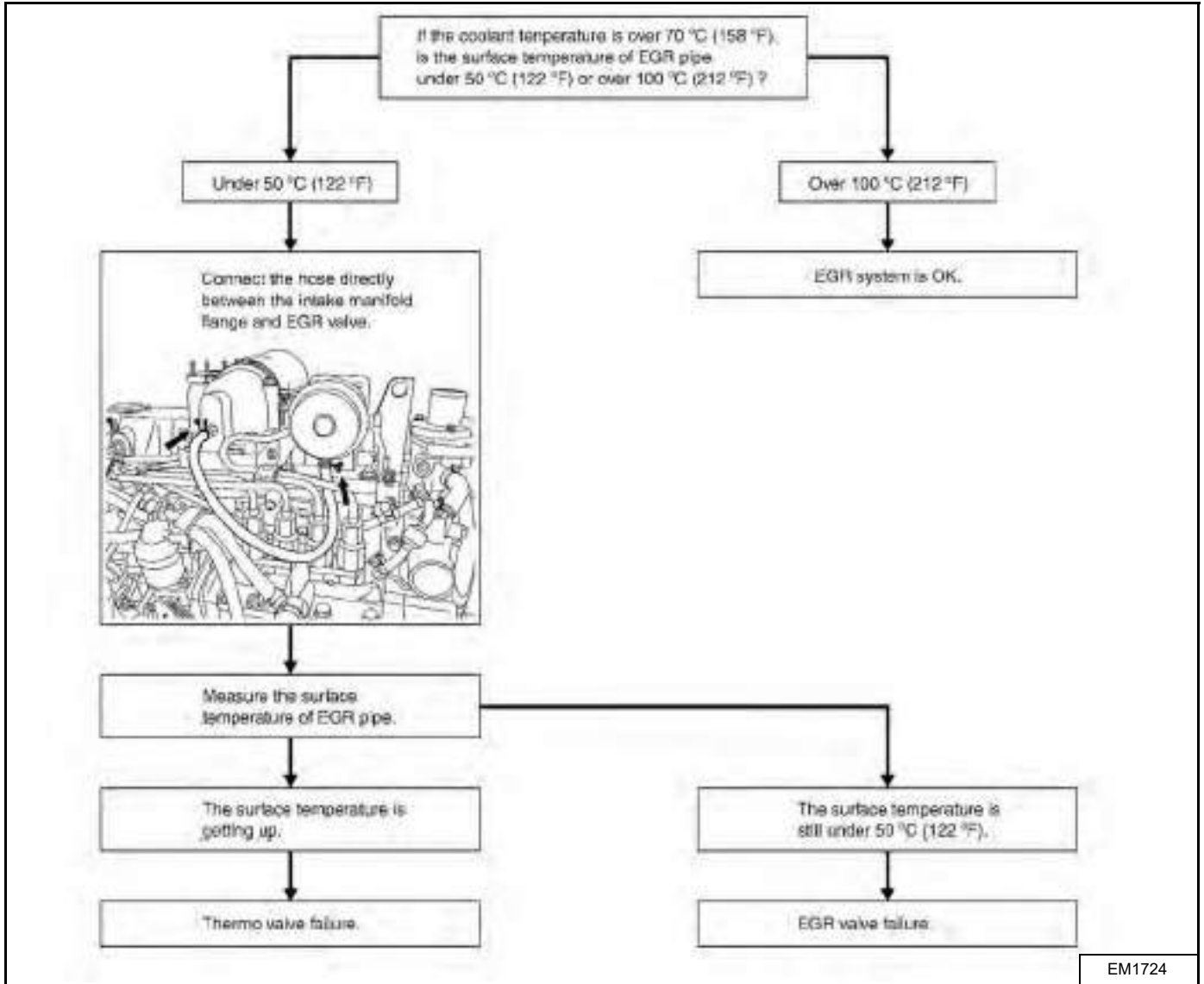
Dealer Copy -- Not for Resale

**EXHAUST GAS RECIRCULATION (EGR) SYSTEM
(CONT'D)**

Checking The Function Of EGR System (Cont'd)

Procedure 2: If the coolant temperature is over 70°C (158°F), the surface temperature of EGR pipe must be over 100°C (212°F).

Figure 70-150-3



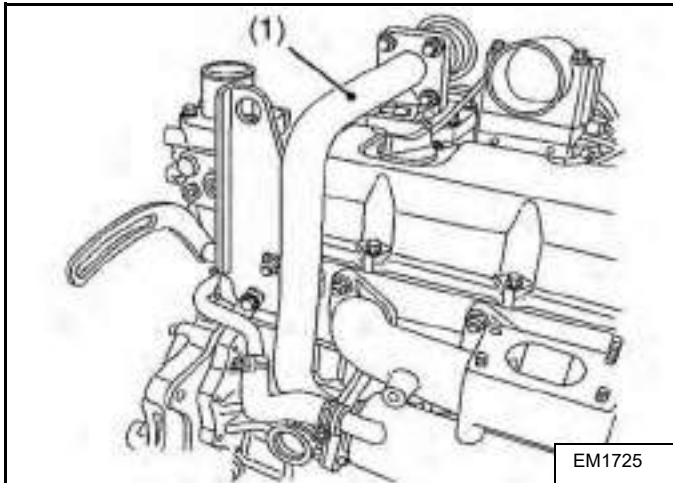
EM1724

Dealer Copy -- Not for Resale

**EXHAUST GAS RECIRCULATION (EGR) SYSTEM
(CONT'D)**

Disassembly And Assembly

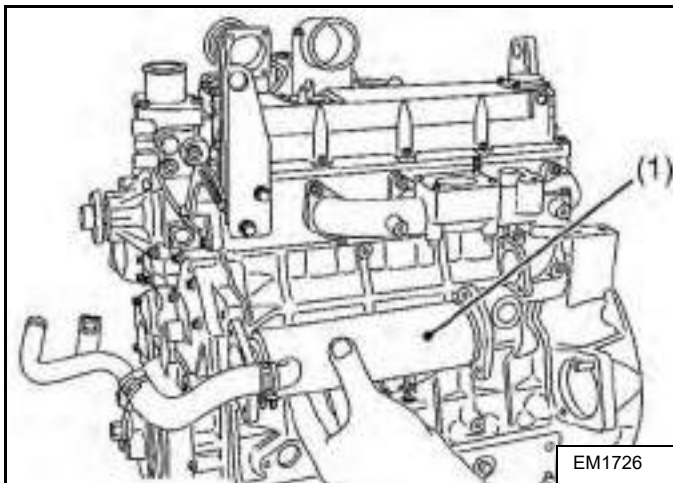
Figure 70-150-4



Remove the EGR pipe (Item 1) [Figure 70-150-4].

Replace the gaskets upon reassembly.

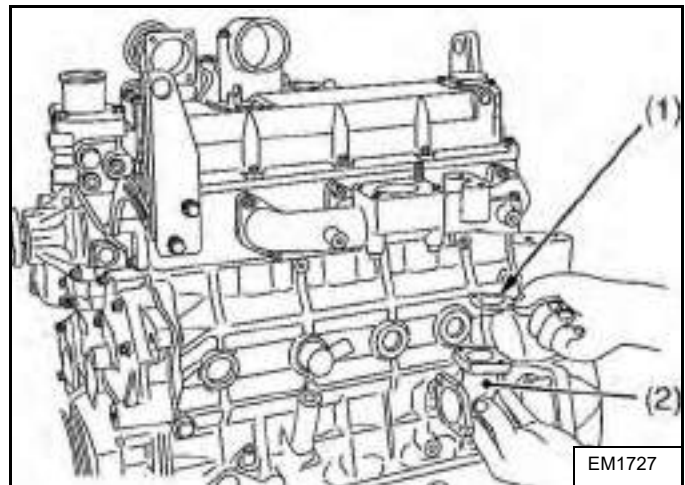
Figure 70-150-5



Remove the EGR cooler (Item 1) [Figure 70-150-5].

Replace the gaskets upon reassembly.

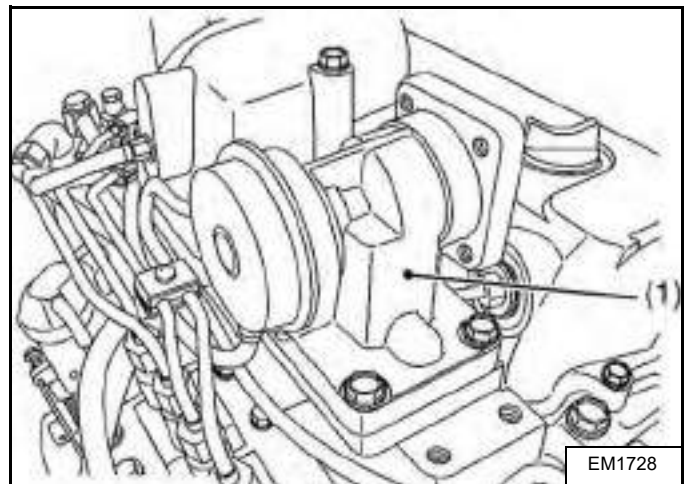
Figure 70-150-6



Remove the EGR cooler flange (Item 2) [Figure 70-150-6].

Replace the gaskets (Item 1) [Figure 70-150-6] upon reassembly.

Figure 70-150-7



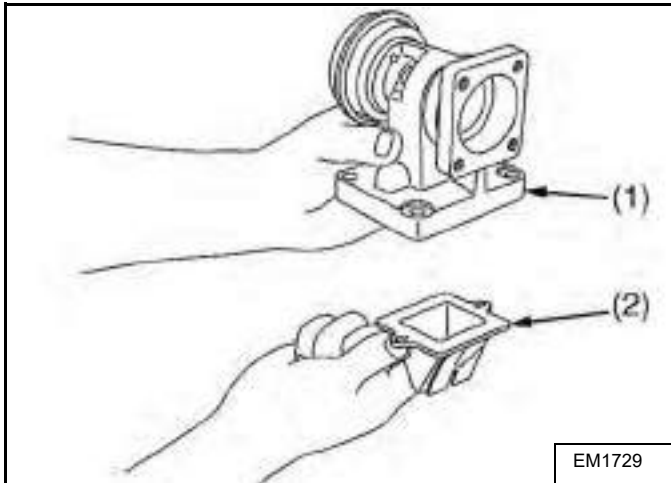
Remove the EGR valve (Item 1) [Figure 70-150-7].

Replace the gaskets upon reassembly.

**EXHAUST GAS RECIRCULATION (EGR) SYSTEM
(CONT'D)**

Disassembly And Assembly (Cont'd)

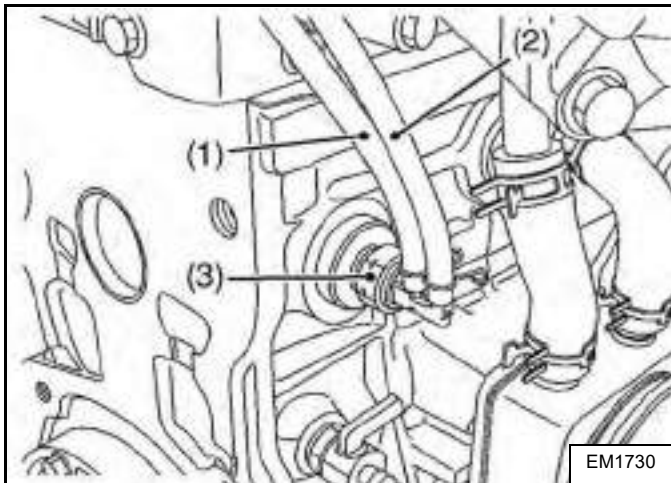
Figure 70-150-8



Remove the reed valve (Item 2) from the EGR valve (Item 1) [Figure 70-150-8].

Replace the gaskets upon reassembly.

Figure 70-150-9



Disconnect hose to EGR Valve (Item 1) and hose from Intake Manifold Flange (Item 2) [Figure 70-150-9].

Remove the thermo valve (Item 3) [Figure 70-150-9].

NOTE: If you drop the thermo valve, replace the thermo valve (Item 3) [Figure 70-150-9] with new one.

Assembly: Securely connect the hoses (Item 1 & 2) [Figure 70-150-9].

Thermo valve	Tightening torque	30 to 39 N-m 22 to 28 ft-lb
--------------	-------------------	--------------------------------



Bobcat®

Dealer Copy -- Not for Resale

HEATING, VENTILATION, AIR CONDITIONING

AIR CONDITIONING SYSTEM FLOW	80-10-1
Description	80-10-1
Chart	80-10-2
Components	80-10-3
Safety Equipment	80-10-7
REGULAR MAINTENANCE	80-20-1
Filters	80-20-1
Compressor And Alternator Drive Belt Inspection	80-20-2
Cleaning The Condenser	80-20-3
Air Conditioning Lubrication	80-20-3
Air Conditioning Service Chart	80-20-4
TROUBLESHOOTING	80-30-1
Gauge Pressure Related Troubleshooting	80-30-2
Troubleshooting Tree	80-30-4
Temperature / Pressure Chart	80-30-8
Poor A/C Performance	80-30-9
HVAC Repair And Leaks	80-30-10
Checking The Electrical System	80-30-11
SYSTEM CHARGING AND RECLAMATION	80-40-1
Reclamation Procedure	80-40-1
Charging Procedure With A Manifold Gauge Set	80-40-5
COMPRESSOR	80-50-1
Removal And Installation	80-50-1
Compressor Oil	80-50-3
Compressor Oil Check	80-50-3
Compressor Clutch Disassembly And Assembly	80-50-5
CONDENSER (S/N AC1912999 & BELOW)	80-60-1
Removal And Installation	80-60-1
CONDENSER (S/N AC1913000 & ABOVE)	80-61-1
Removal And Installation	80-61-1
RECEIVER / DRIER	80-70-1
Removal And Installation	80-70-1
PRESSURE SWITCH	80-80-1
Removal And Installation	80-80-1
EVAPORATOR/BLOWER UNIT (S/N AC1912999 & BELOW)	80-90-1
Removal And Installation	80-90-1
EVAPORATOR/BLOWER UNIT (S/N AC1913000 & ABOVE)	80-91-1
Removal And Installation	80-91-1

Dealer Copy -- Not for Resale

EXPANSION VALVE (S/N AC1912999 & BELOW)	80-100-1
Removal And Installation	80-100-1
EXPANSION VALVE (S/N AC1913000 & ABOVE)	80-101-1
Removal And Installation	80-101-1
HEATER ASSEMBLY	80-110-1
Removal And Installation	80-110-1
Fan Removal And Installation	80-110-2
Core Removal And Installation	80-110-3

AIR CONDITIONING SYSTEM FLOW

Description

In an air conditioning system the refrigerant is circulated under pressure through five major components in a closed circuit. At these five points in the system the refrigerant goes through pressure and temperature changes.

The compressor (Item 1) (See Chart on Page 80-10-2.) takes in heated, low pressure refrigerant gas through the suction valve (low pressure side) and as the name indicates, pressurizes the heated refrigerant and forces it through the discharge valve (high pressure side) on the condenser (Item 2) (See Chart on Page 80-10-2.).

Ambient air passing through the condenser removes the heat from refrigerant resulting in physical state change in the refrigerant from a gas to a liquid.

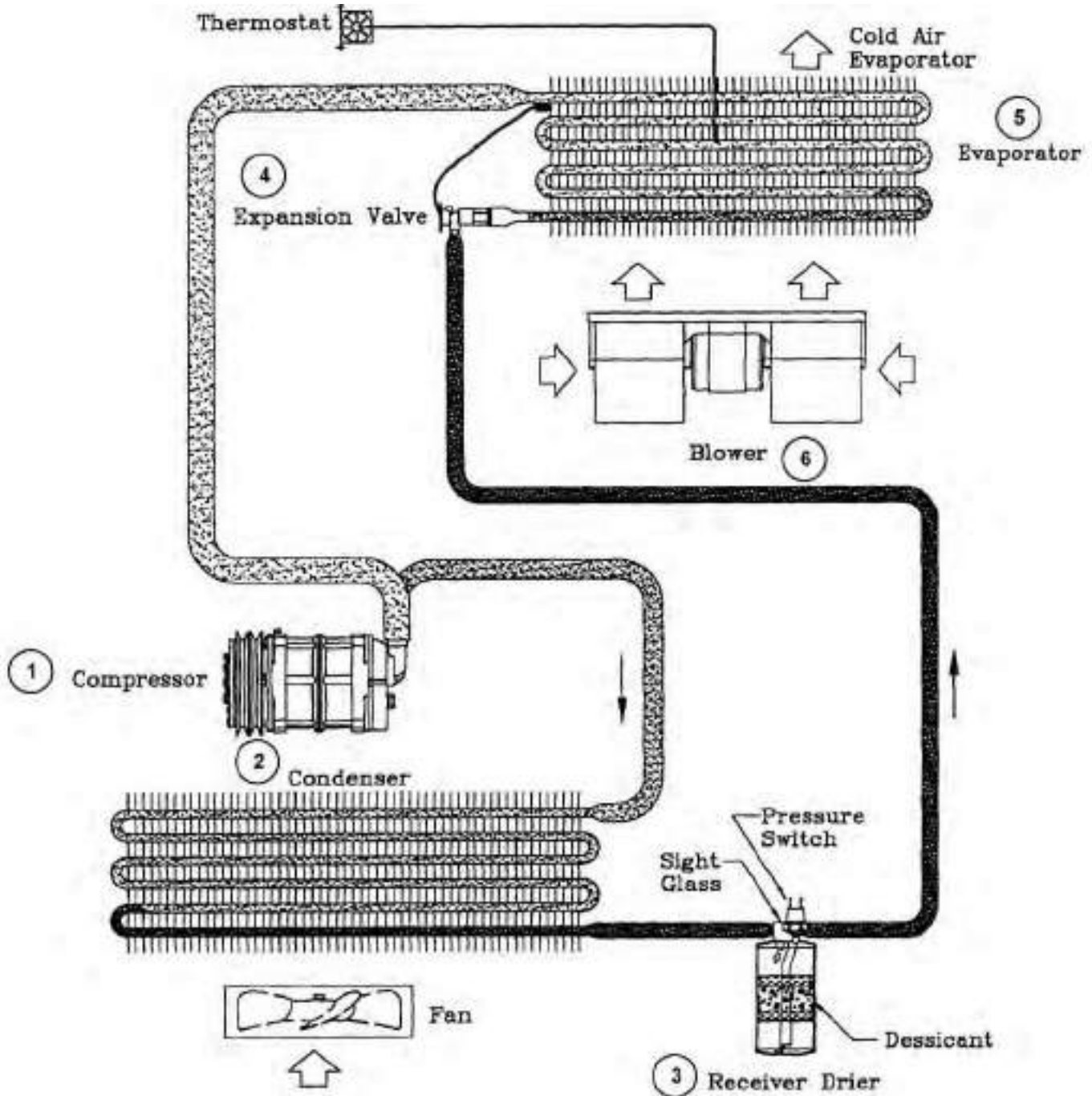
The liquid refrigerant moves on to the receiver/drier (Item 3) (See Chart on Page 80-10-2.) where impurities such as moisture and dirt are filtered out. The receiver/drier also serves as the storage tank for the liquid refrigerant. The liquid refrigerant (still under high pressure) flows to the expansion valve (Item 4) (See Chart on Page 80-10-2.).

The expansion valve meters the amount of refrigerant into the evaporator coil (Item 5) (See Chart on Page 80-10-2.). As the refrigerant passes through the expansion valve, it again changes its physical state. It becomes a low temperature, low-pressure liquid and saturated vapor. The low pressure liquid immediately starts to boil and vaporize as it enters the evaporator. The hot humid air of the machine's cab is drawn through or blown into the evaporator by the evaporator fan (blower) (Item 6) (See Chart on Page 80-10-2.). Since the refrigerant is colder than the air, it absorbs the heat from the air and produces cooled air, which is pushed into the cab by the fan. The moisture in the air condenses on the evaporator coil and drips into the drain pan, which directs the water out of the cab.

The refrigerant cycle is completed when the heated low pressure gas is again drawn into the compressor.

AIR CONDITIONING SYSTEM FLOW (CONT'D)

Chart



Status Of R134a

 High Pressure Gas	 Low Pressure Liquid
 High Pressure Liquid	 Low Pressure Gas

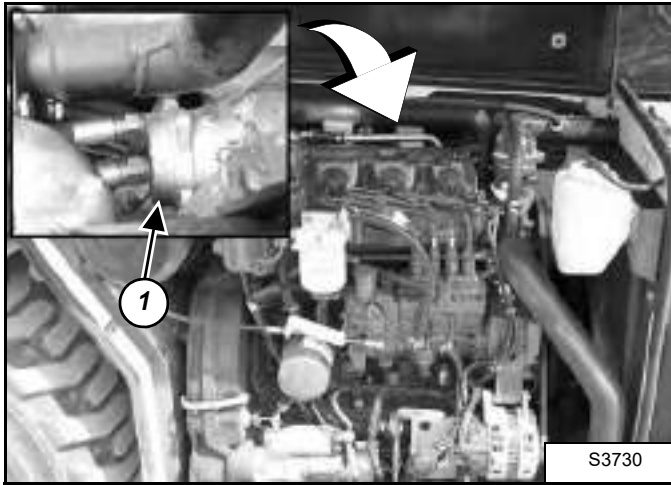
Dealer Copy -- Not for Resale

AIR CONDITIONING SYSTEM FLOW (CONT'D)

Components

S/N AC1912999 & Below

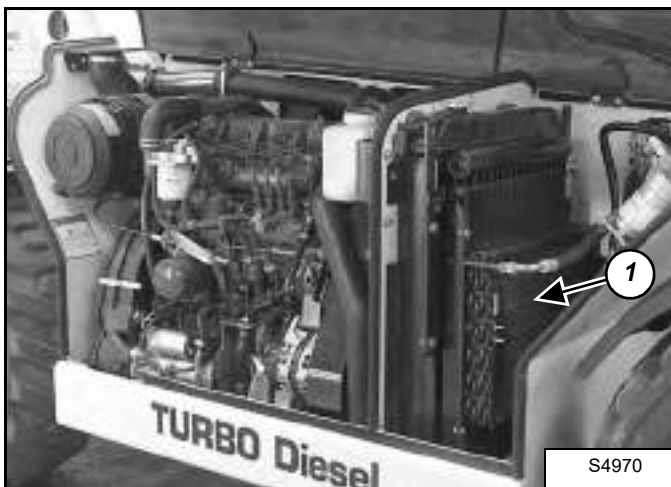
Figure 80-10-1



Compressor: The compressor (Item 1) [Figure 80-10-1] is the pump that circulates the refrigerant throughout the system. It raises the pressure of the refrigerant for heat transfer through the condenser and evaporator.

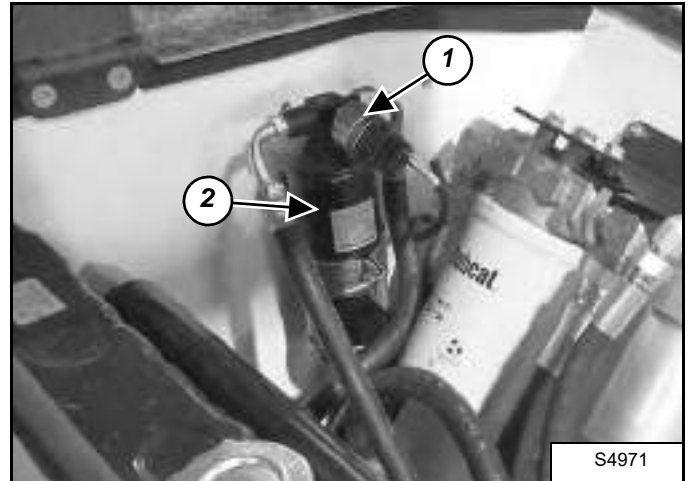
NOTE: The A/C System (compressor) is recommended to be turned on for at least 5 minutes weekly throughout the year to lubricate the internal components.

Figure 80-10-2



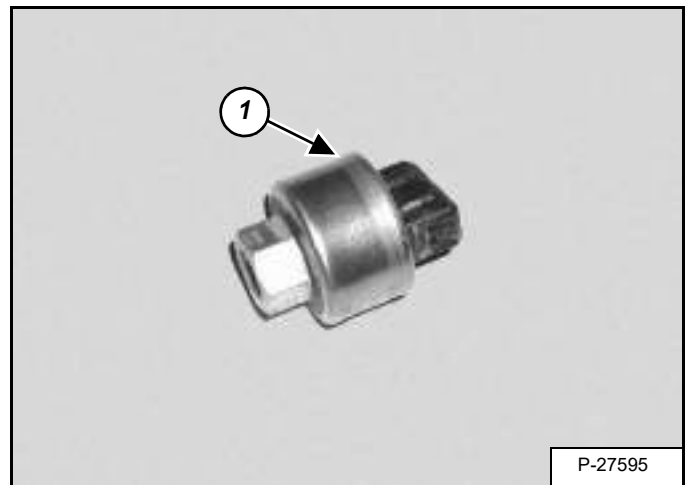
Condenser: The condenser (Item 1) [Figure 80-10-2] is the unit that receives the high pressure, high temperature refrigerant vapor from the compressor and condenses it into a high temperature liquid.

Figure 80-10-3



Receiver / Drier: The receiver / drier (Item 1) [Figure 80-10-3] is the unit that receives the liquid refrigerant from the condenser and removes moisture and foreign matter from the system. It also serves as a storage tank for the extra liquid refrigerant until it is needed by the evaporator.

Figure 80-10-4



Pressure Switch: The pressure switch (Item 1) [Figure 80-10-4] is located on the receiver / drier assembly (Item 2) [Figure 80-10-3]. It will disengage the compressor clutch if the pressure readings are too low or too high, which indicates loss of refrigerant.

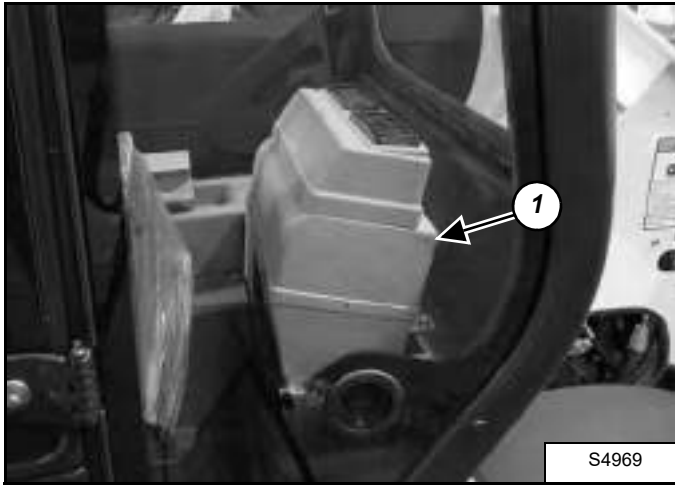
Dealer Copy -- Not for Resale

AIR CONDITIONING SYSTEM FLOW (CONT'D)

Components (Cont'd)

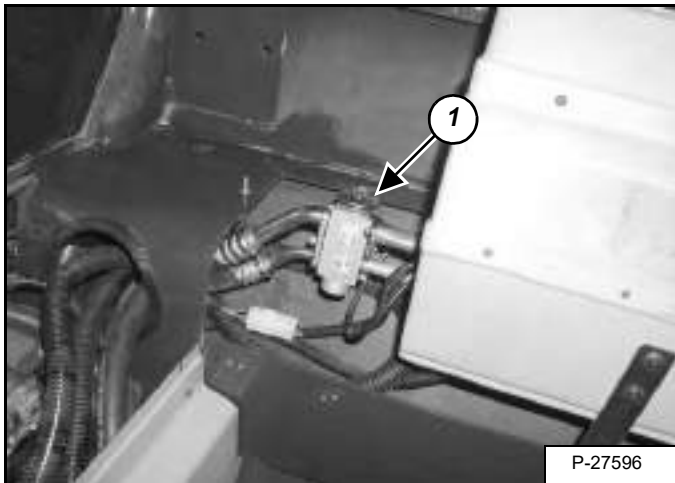
S/N AC1912999 & Below (Cont'd)

Figure 80-10-5



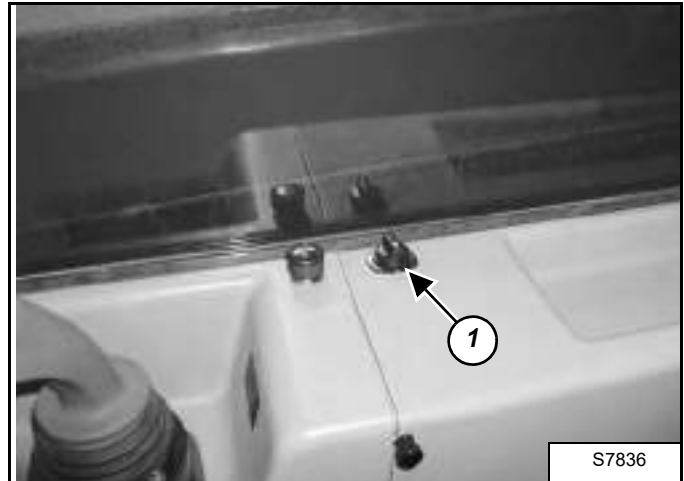
Evaporator Unit: The evaporator unit (Item 1) [Figure 80-10-5] is located behind the operator seat inside the cab. The unit delivers the cold air for the A/C into the cab. The unit also contains the blower fan, evaporator coil and thermostat which are not serviceable.

Figure 80-10-6



Expansion Valve: The expansion valve (Item 1) [Figure 80-10-6] controls the amount of refrigerant entering the evaporator coil.

Figure 80-10-7



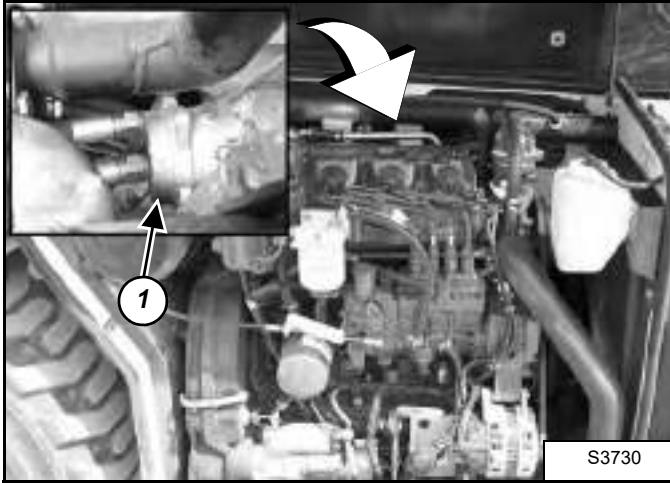
Blower Fan Switch: This is a three position switch (Item 1) [Figure 80-10-7]. When the blower fan switch is in the OFF position the A/C will not engage.

AIR CONDITIONING SYSTEM FLOW (CONT'D)

Components (Cont'd)

S/N AC1913000 & Above

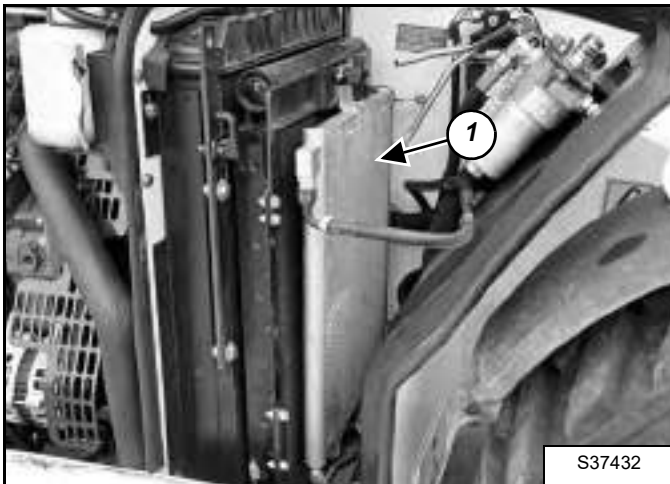
Figure 80-10-1



Compressor: The compressor (Item 1) [Figure 80-10-1] is the pump that circulates the refrigerant throughout the system. It raises the pressure of the refrigerant for heat transfer through the condenser and evaporator.

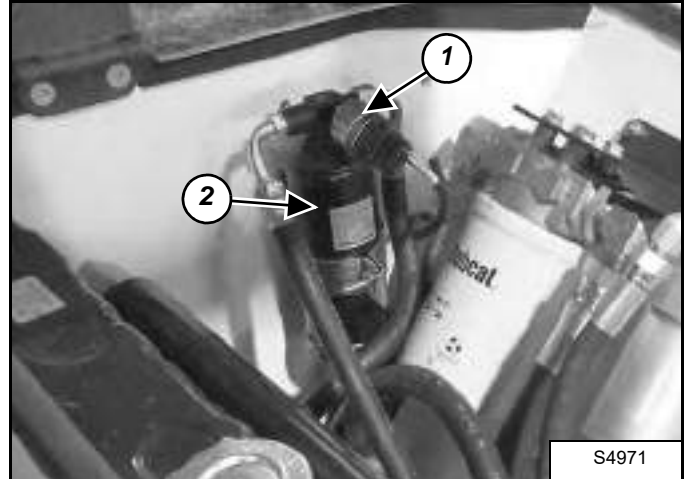
NOTE: The A/C System (compressor) is recommended to be turned on for at least 5 minutes weekly throughout the year to lubricate the internal components.

Figure 80-10-2



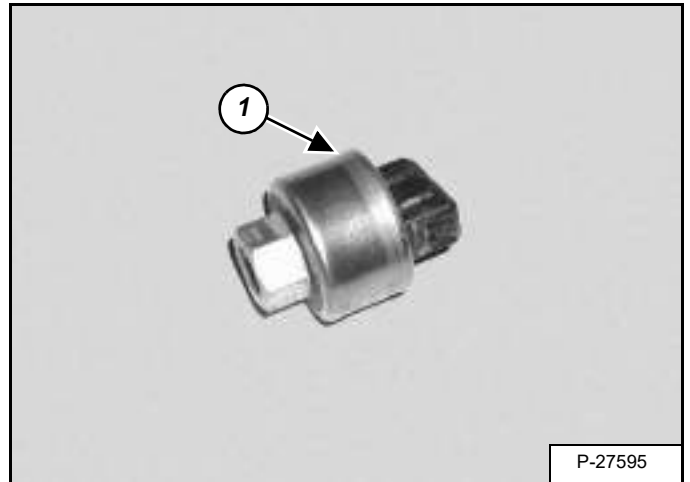
Condenser: The condenser (Item 1) [Figure 80-10-2] is the unit that receives the high pressure, high temperature refrigerant vapor from the compressor and condenses it into a high temperature liquid.

Figure 80-10-3



Receiver / Drier: The receiver / drier (Item 1) [Figure 80-10-3] is the unit that receives the liquid refrigerant from the condenser and removes moisture and foreign matter from the system. It also serves as a storage tank for the extra liquid refrigerant until it is needed by the evaporator.

Figure 80-10-4



Pressure Switch: The pressure switch (Item 1) [Figure 80-10-4] is located on the receiver / drier assembly (Item 2) [Figure 80-10-3]. It will disengage the compressor clutch if the pressure readings are too low or too high, which indicates loss of refrigerant.

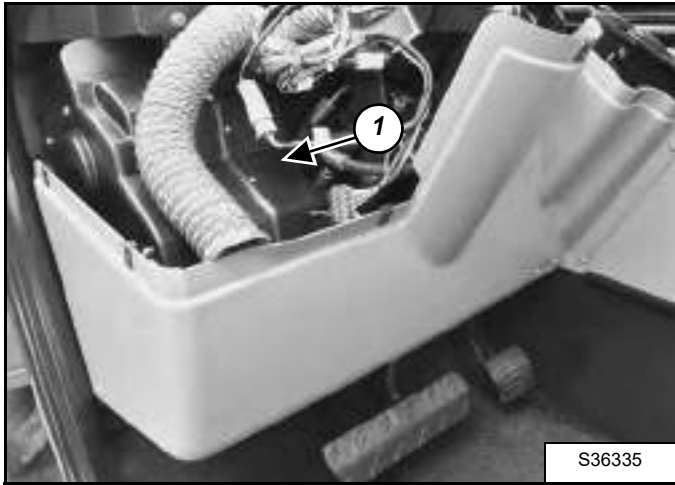
Dealer Copy -- Not for Resale

AIR CONDITIONING SYSTEM FLOW (CONT'D)

Components (Cont'd)

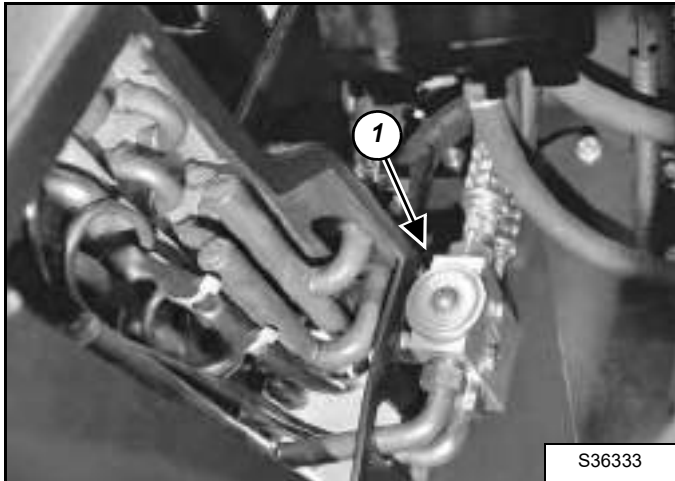
S/N AC1913000 & Above (Cont'd)

Figure 80-10-5



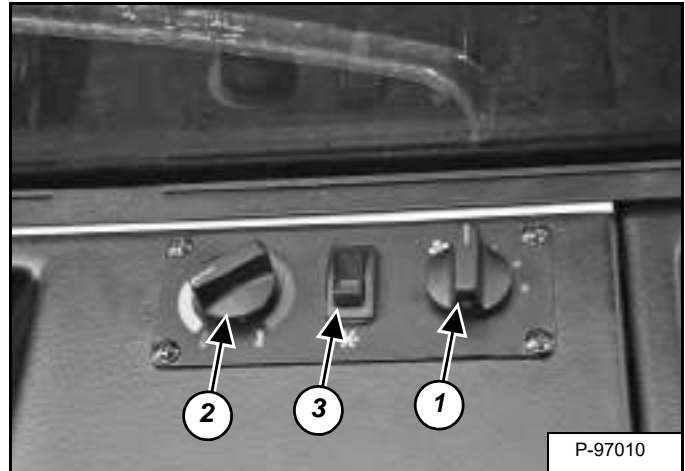
Evaporator Unit: The evaporator unit (Item 1) [Figure 80-10-5] is located under the dashboard inside the cab. The unit delivers the cold air for the A/C into the cab. The unit also contains the blower fan, evaporator coil and thermostat which are not serviceable.

Figure 80-10-6



Expansion Valve: The expansion valve (Item 1) [Figure 80-10-6] controls the amount of refrigerant entering the evaporator coil.

Figure 80-10-7



1. **Blower Fan Switch** - This is a three position switch (Item 1) [Figure 80-10-7]. When the blower fan switch is in the OFF position the A/C will not engage.
2. **Temperature Control** - Turn clockwise to increase cab temperature; counterclockwise to decrease.
3. **Air Conditioning Switch (If Equipped)** - Press the top of the switch (Item 3) [Figure 80-10-7] to turn the Air Conditioning ON - Press the bottom of the switch to turn the Air Conditioning OFF.

AIR CONDITIONING SYSTEM FLOW (CONT'D)

Safety Equipment



In the event of a leakage, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

W-2371-0500



HFC 134A refrigerant can be dangerous if not properly handled. Liquid 134A may cause blindness if it contacts the eyes and may cause serious frostbite if it contacts the skin.

- *Gaseous 134A becomes lethal (phosgene) gas when it contacts open flame or very hot substances.*
- *NEVER SMOKE when there is the possibility of even small amounts of 134A in the air.*

Any servicing work that involves release or addition of 134A to the system must be done by a competent refrigeration dealer who has the proper equipment, knowledge, and experience to service refrigeration equipment.

W-2373-0500

Figure 80-10-1



In servicing A/C and heater systems you will be exposed to high pressures, temperatures and several chemical hazards. Moving belts and pulleys are normal shop hazards.

In addition to exercising caution in your work, DO WEAR SAFETY GLASSES OR A FACE SHIELD [Figure 80-10-1] when you are using R-134a or a leak detector, adjusting service valves or the manifold gage set connectors. Safety glasses or a transparent face shield are practical safety items and one or the other is absolutely required.

Figure 80-10-2



R-134a inside a canister or in an A/C system is a liquid under pressure. When it escapes or releases into the air, **ITS TEMPERATURE DROPS TO 21.6 F DEGREES "INSTANTLY"**. If it spills on your skin or in your eyes you should flood the area with cool water and **SEEK MEDICAL ATTENTION FAST!** It is a good idea to wear gloves [Figure 80-10-2] to prevent frost bite if you should get refrigerant on your hands.

Dealer Copy -- Not for Resale



Bobcat®

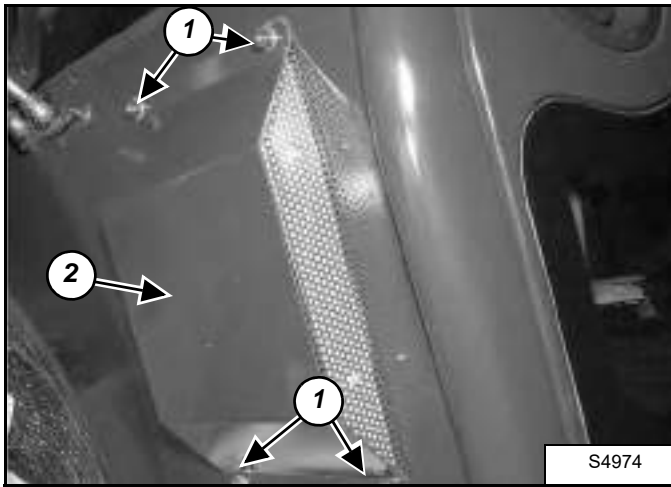
Dealer Copy -- Not for Resale

REGULAR MAINTENANCE

Filters

Fresh Air Filters

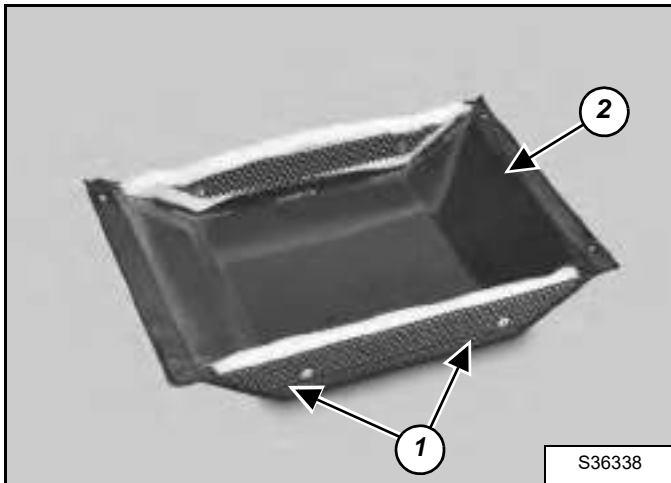
Figure 80-20-1



Remove the four mount bolts (Item 1) [Figure 80-20-1] from the fresh air filter cover at the front of the cab.

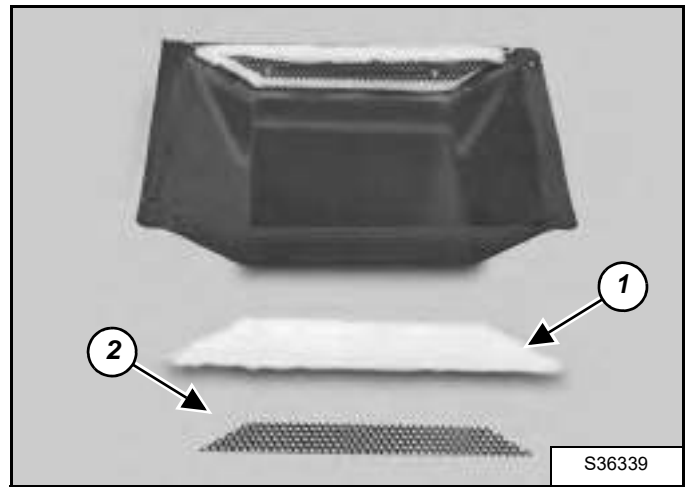
Remove the fresh air filter cover (Item 2) [Figure 80-20-1].

Figure 80-20-2



Remove the two filter mount bolts and nuts (Item 1) from the filter cover (Item 2) [Figure 80-20-2].

Figure 80-20-3



Remove the filter (Item 1) and backup screen (Item 2) [Figure 80-20-3].

The fresh air filter (Item 1) [Figure 80-20-3] is made of open cell foam and should be cleaned with water. A mild detergent can also be used.

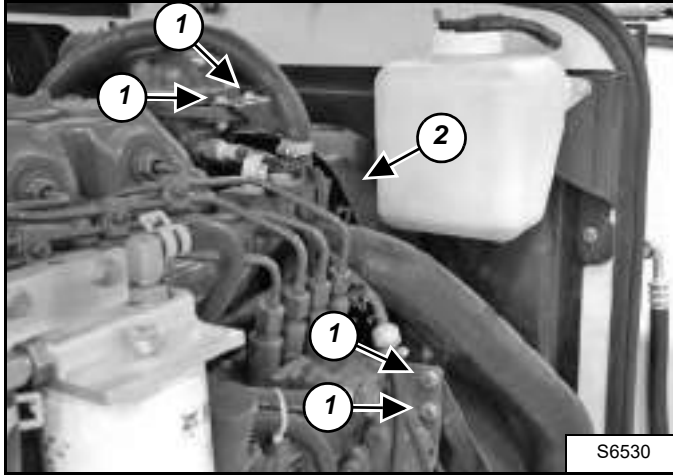
REGULAR MAINTENANCE (CONT'D)

Compressor And Alternator Drive Belt Inspection

It is a good rule to regularly inspect (weekly) the compressor / alternator drive belt for tension and wear.

Open the engine cover.

Figure 80-20-4



Remove the four bolts (Item 1) and the belt shield (Item 2) [**Figure 80-20-4**].

Check the tension on the compressor / alternator belt.

Adjust if necessary. (See Belt Adjustment on Page 60-30-2.)

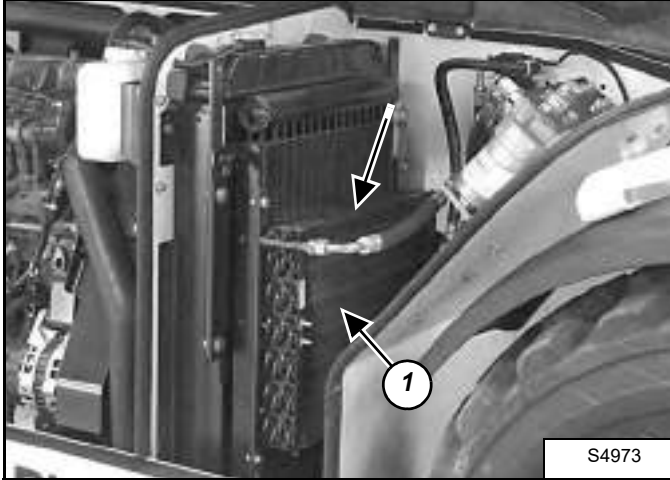
REGULAR MAINTENANCE (CONT'D)

Cleaning The Condenser

Open the engine cover.

S/N AC1912999 & Below:

Figure 80-20-5

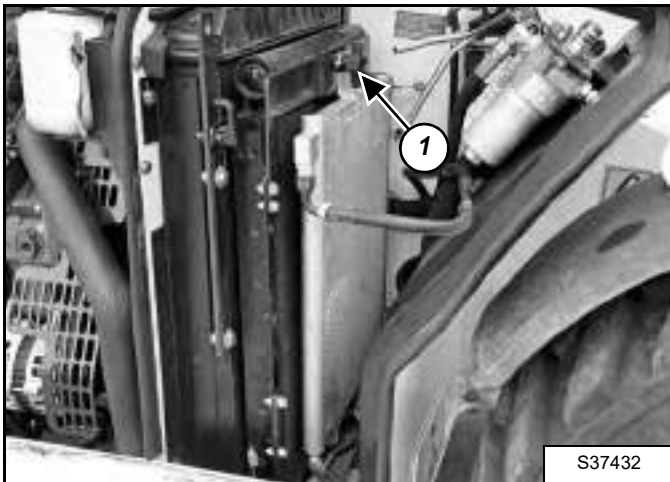


Clean the condenser (Item 1) [Figure 80-20-5] using water or air pressure.

NOTE: Also clean area between the oil cooler and condenser.

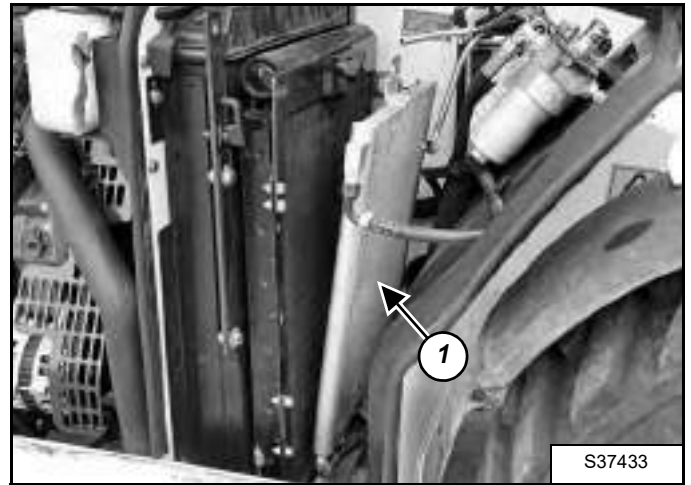
S/N AC1913000 & Above:

Figure 80-20-6



Loosen the screw (Item 1) [Figure 80-20-5] and tilt the condenser forward.

Figure 80-20-7



Clean the condenser (Item 1) [Figure 80-20-5] using water or air pressure.

NOTE: Also clean area between the oil cooler and condenser.

Air Conditioning Lubrication

Run the air conditioning for about five minutes every week to lubricate the internal components.

Dealer Copy -- Not for Resale

REGULAR MAINTENANCE (CONT'D)

Air Conditioning Service Chart

Service Company/Phone Number: Date: Machine Model: Machine Serial Number: Machine Hours:		Machine Dealer: Customer:	
Pre Service Conditions	15 Minutes	30 Minutes	Notes
Ambient Temperature:			
Louver Temperature:			
Cab Temperature at Head Position:			
Temperature into Condenser:			
High Side Pressure			
Low Side Pressure			
Ambient Humidity			
Observations:			
Explain services required:			
Post Service Conditions	15 Minutes	30 Minutes	Notes
Ambient Temperature:			
Louver Temperature:			
Cab Temperature at Head Position:			
Temperature into Condenser:			
High Side Pressure			
Low Side Pressure			
Ambient Humidity			
Observations:			

Dealer Copy -- Not for Resale

TROUBLESHOOTING

Blower motor does not operate

POSSIBLE CAUSE	INSPECTION	SOLUTION
1. Blown Fuse.	Inspect the fuse/wiring.	Replace fuse/repair wiring.
2. Broken wiring or bad connection.	Check the fan motor ground and connectors.	Repair the wiring or connector.
3. Fan motor malfunction.	Check the lead wires from the motor with a circuit tester.	Replace Evaporator/Blower Unit.
4. Fan motor switch malfunction.	Check power into and out of the fan switch.	Replace Fan Switch.

Blower motor operates normally, but air flow is insufficient

Possible Cause	Inspection	Solution
1. Evaporator inlet obstruction	Check evaporator for plugging.	Remove obstruction and clean evaporator fins with air or water.
2. Defective thermo. switch (frozen evaporator).	Check thermostat using a circuit tester.	Replace Evaporator/Blower unit.

Insufficient cooling although air flow and compressor operation are normal

POSSIBLE CAUSE	INSPECTION	SOLUTION
1. System low on refrigerant.	The high side pressure will be low and bubbles may be present in sight glass on receive drier.	Repair any leaks and recharge the refrigerant to the correct level.
2. Excessive refrigerant.	The high pressure side pressure will be high.	Use refrigerant recovery equipment to capture excess refrigerant. Charge to the correct refrigerant level.

The compressor does not operate at all, or operates improperly

POSSIBLE CAUSE	INSPECTION	SOLUTION
1. Loose drive belt.	The belt is vibrating or oscillating.	Adjust tension.
2. Internal compressor malfunction.	The compressor is locked up and the belt slips.	Replace compressor.
	Magnetic clutch related	
3. Low battery voltage.	Clutch slips.	Recharge the battery.
4. Faulty coil.	Clutch slips.	Replace the magnetic clutch.
5. Oil on the clutch surface.	Clutch slips.	Replace or clean the clutch surface.
6. Open coil.	Clutch does not engage and there is not reading when a circuit tester is connected between the coil and terminals.	Replace clutch.
7. Broken wiring or poor ground.	Clutch will not engage. Inspect the ground and connections.	Repair.
8. Wiring harness components.	Test the conductance of the pressure switch, thermostat, Relay, etc.	Check operation.

TROUBLESHOOTING (CONT'D)

Gauge Pressure Related Troubleshooting

Normal compressor suction (low side) and discharge (high side) pressure at ambient temperatures of 86-96 degrees F (30-38 degrees C) and compressor speed of approximately 2000 RPM are:

High pressure side pressure: 210-265 psi

Low pressure side pressure: 15-33 psi

As a rule of thumb the high side pressure will be around eight times greater than the low side pressure.

POSSIBLE CAUSE	INSPECTION	SOLUTION
Low pressure side Too high.	The low pressure side pressure normally becomes too high when the high pressure side pressure is too high. As this is explained below, the following inspection is only used when the low pressure side is too high.	
1. Expansion valve opens too far.	Frost is present on the suction hose.	Replace expansion valve
2. Defective compressor	The high and low pressure side gauge pressures equalize when the magnetic clutch is disengaged.	Replace compressor.
Low pressure side Too low.		
1. Low refrigerant charge	The high side pressure will be low and bubbles may be present in sight glass on receiver drier.	Repair any leaks and recharge the refrigerant to the correct level.
2. Clogged or closed expansion valve.	The expansion valve's inlet side is frosted. Moisture or other Contaminants can be the cause.	Clean or replace the expansion Valve.
3. Restriction between drier and expansion valve.	Frost on the line between drier and expansion valve. A Negative low pressure reading may be shown.	Flush system or replace hose.
4. Thermostat malfunction.	The evaporator is frozen.	Replace Evaporator/Blower unit.
High pressure side Too high.		
1. Poor condenser performance.	Dirty or clogged condenser fins. Condenser fans not Operating.	Clean fins, and/or repair the fan.
2. Excessive refrigerant.	The high pressure side pressure will be high.	Use refrigerant recovery equipment to capture excess refrigerant. Charge to the correct refrigerant level.
3. Excessive oil charge	The high pressure side will be high.	Evacuate system. Remove oil from condenser and compressor. Measure oil from compressor and add correct oil charge back into compressor. Flush system with nitrogen. Replace drier.
4. Air in system.	Pressure is high on both high and low sides.	Evacuate and recharge with Refrigerant.
5. Restriction in drier, condenser or high pressure line.	High pressure side will be high, and low pressure side will be low.	Evacuate and flush system replacing defective parts.

Dealer Copy -- Not for Resale

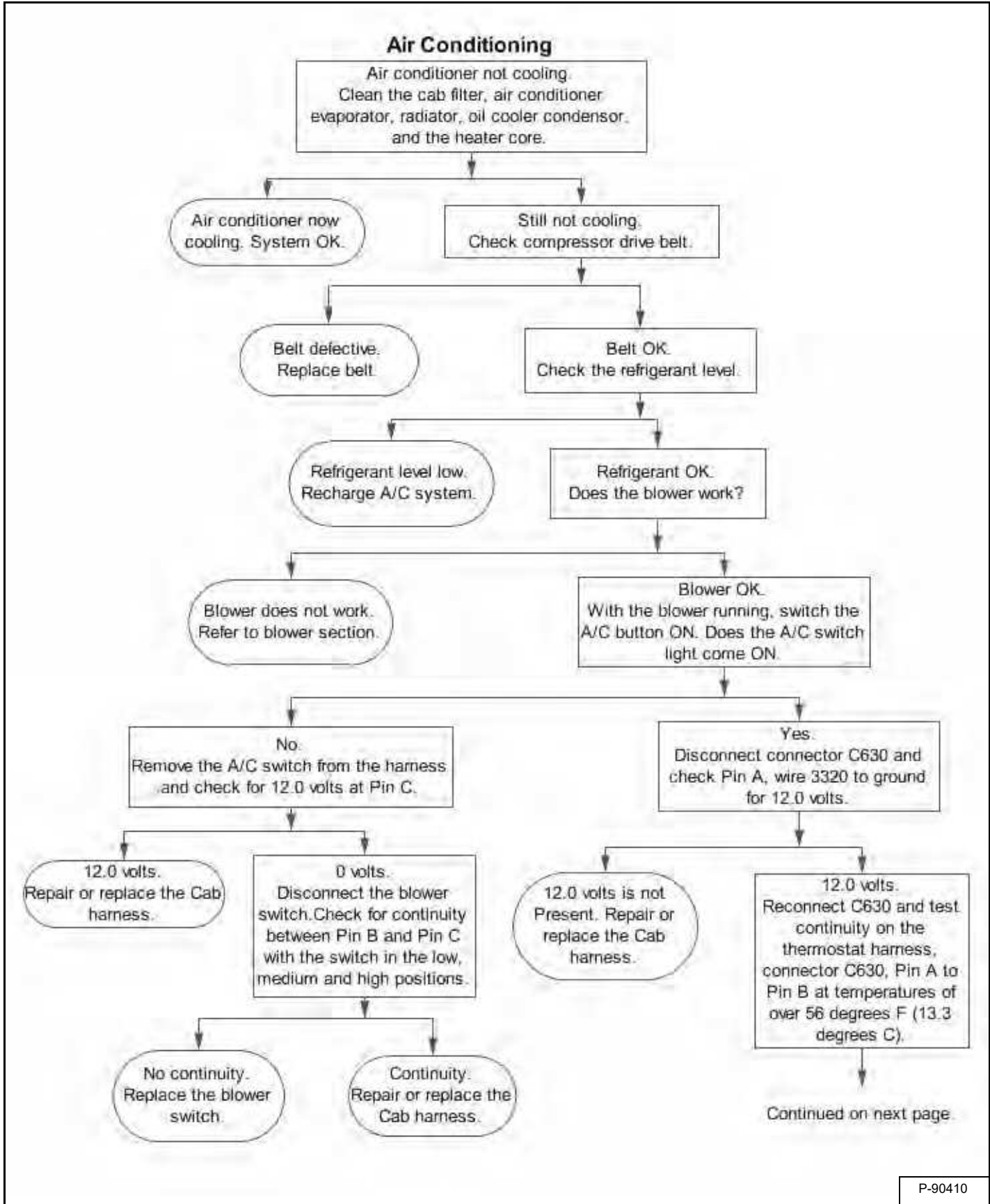
TROUBLESHOOTING (CONT'D)

Gauge Pressure Related Troubleshooting (Cont'd)

POSSIBLE CAUSE	INSPECTION	SOLUTION
High pressure side too low		
1. Low refrigerant charge	The high side pressure will be low and bubbles may be present in sight glass on receiver drier.	Repair any leaks and recharge the refrigerant to the correct level.
System pressures Equal		
1. Clutch not operating	See magnetic clutch related topics above.	
2. Compressor not pumping.	Equal high and low pressures.	Replace compressor.

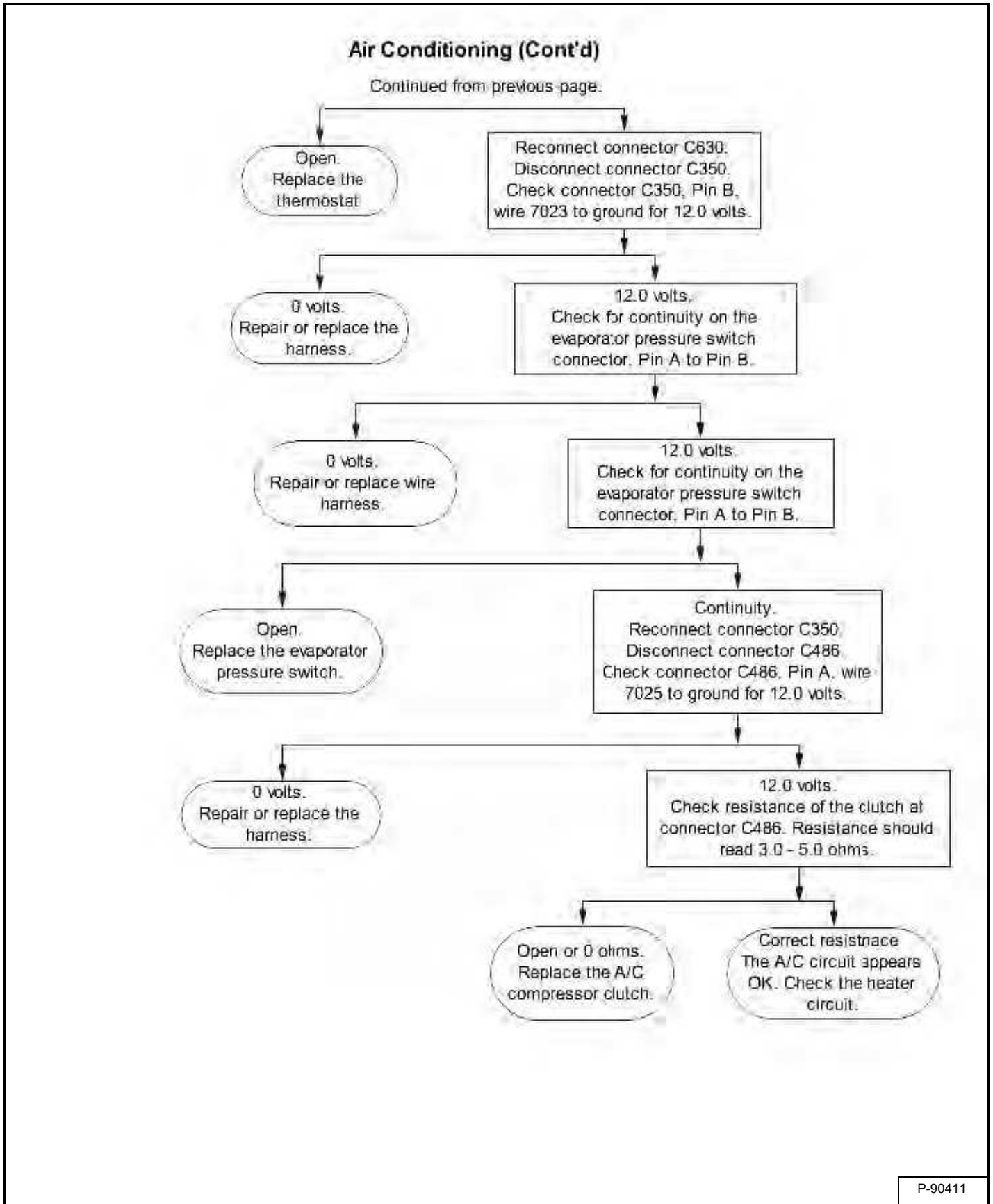
TROUBLESHOOTING (CONT'D)

Troubleshooting Tree



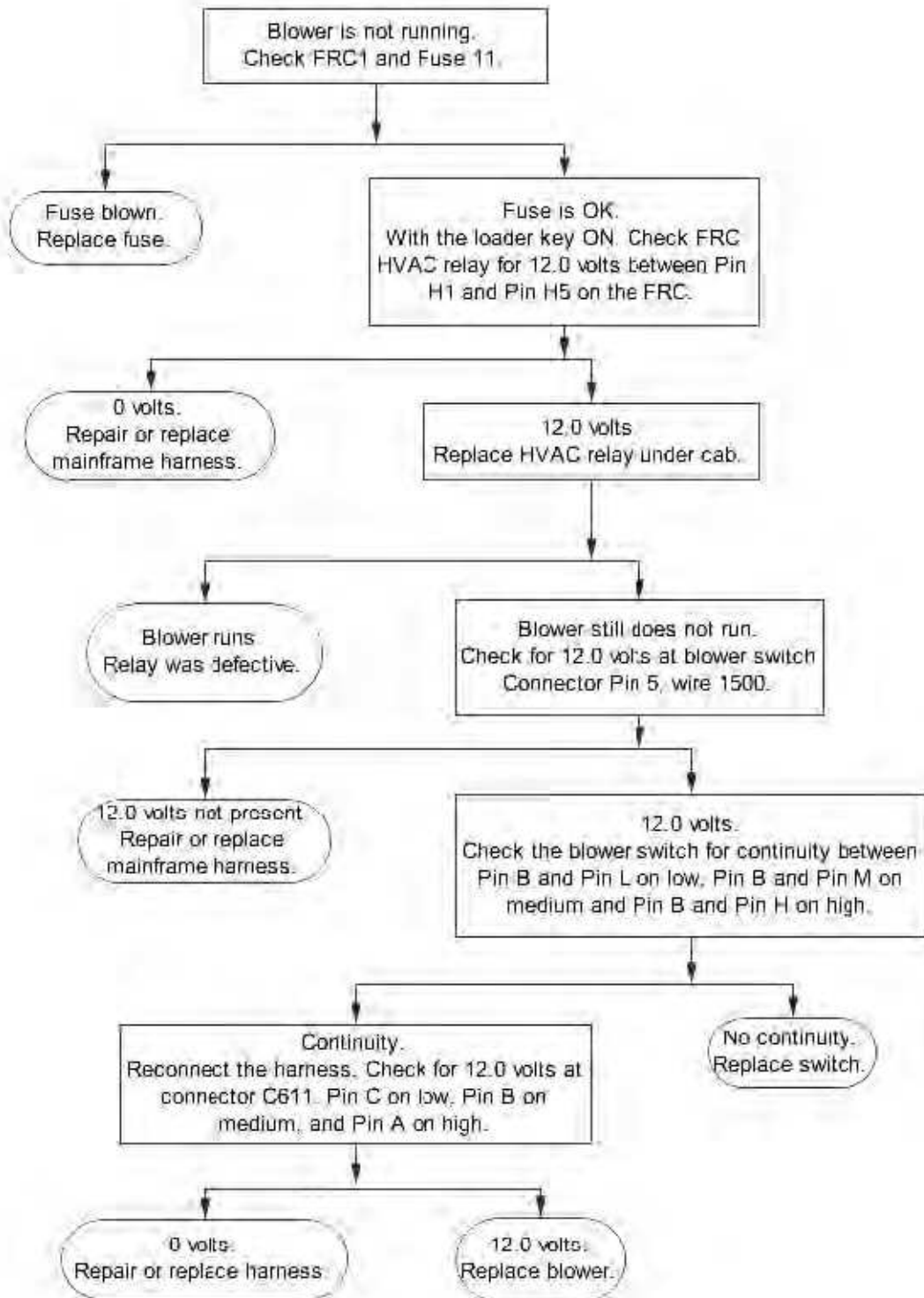
Dealer Copy -- Not for Resale

Troubleshooting Tree (Cont'd)



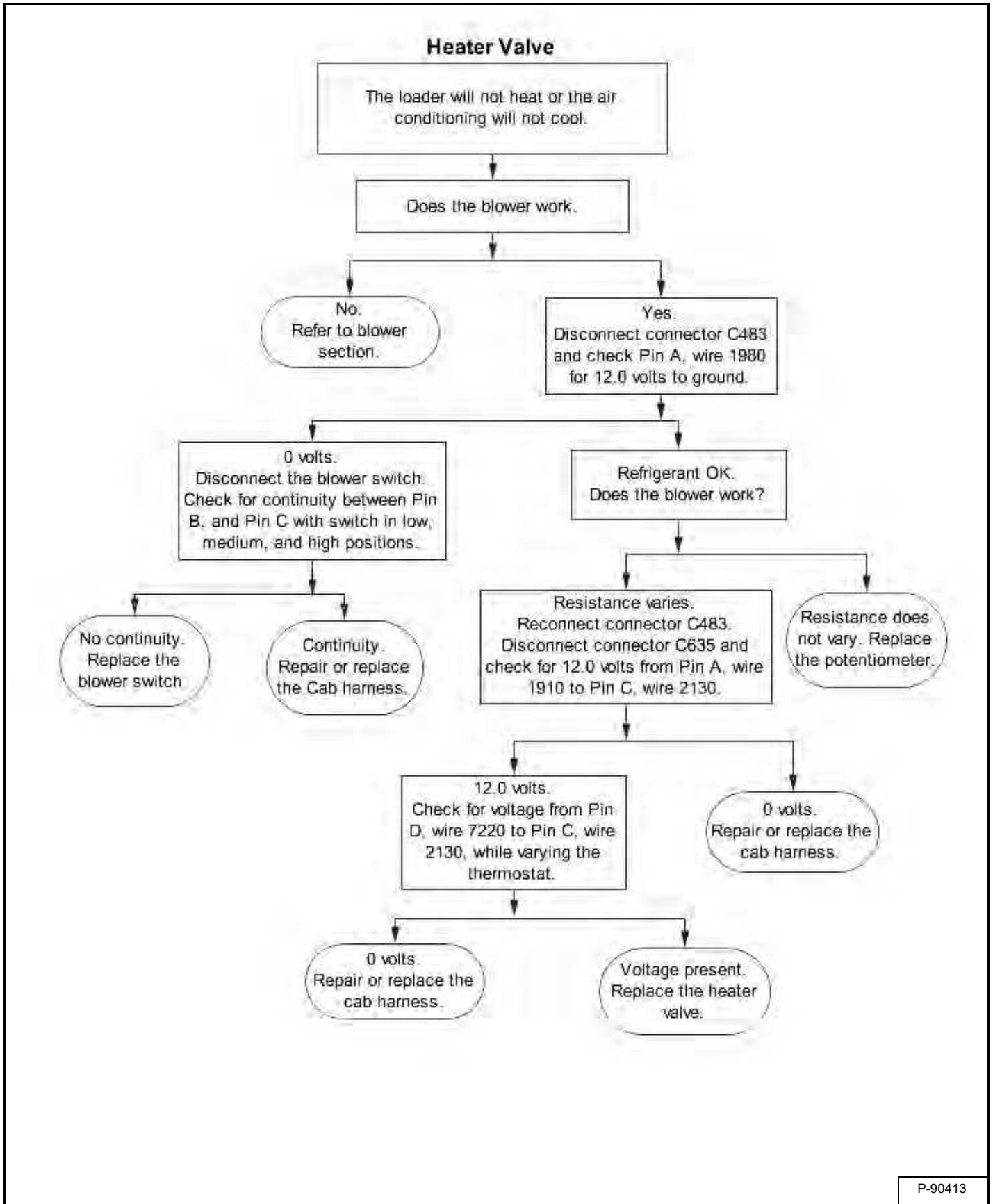
Dealer Copy -- Not for Resale

Blower



P-90412

Troubleshooting Tree (Cont'd)



Dealer Copy -- Not for Resale

TROUBLESHOOTING (CONT'D)

Temperature / Pressure Chart

NORMAL EVAPORATOR RANGE	
TEMP F.	PSIG
16	15.69
18	17.04
20	18.43
22	19.87
24	21.35
26	22.88
28	24.47
30	26.10
32	27.79
34	29.52
36	31.32
38	33.17
40	35.07
42	37.03
44	39.05
45	40.09
50	45.48
55	51.27
60	57.47
65	64.10
70	71.19
75	78.75
80	86.80
85	95.40
90	104.40
91	106.30
92	108.20

NORMAL CONDENSER RANGE	
TEMP F.	PSIG
93	110.20
94	112.10
95	114.10
100	124.30
102	128.50
104	132.90
106	137.30
108	141.90
110	146.50
112	151.30
114	156.10
116	161.10
118	166.10
120	171.30
122	176.60
124	182.00
126	187.50
128	193.10
130	198.90
135	213.70
140	229.40
145	245.80
150	263.00
155	281.10
160	300.10
165	320.10
170	340.80

Evaporator

Pressures represent gas temperatures inside the coil, not the coil surface. For an estimate of the temperature of the air coming off the coil add 8-10 degrees F. to the temperature on the chart.

Condenser

Temperatures are not ambient temperatures but condensing temperatures. Add 40 degrees F. to the ambient temperature to get the condensing temperature and then refer to the pressure chart to see appropriate pressure for ambient temperature.

Example: Ambient Temperature=90 degrees F.
 90 degrees F.
 +40 degrees F.
 130 degrees F. condenser temperature=200 psig

Conditions and pressures will vary from system to system.

If any of the above resistance tests fail, replace the blower fan switch.

Dealer Copy -- Not for Resale

TROUBLESHOOTING (CONT'D)

Poor A/C Performance

Start the Telescopic Handler, engage the parking brake. Engage the A/C system with the blower fan on high. Run the Telescopic Handler at full RPM for approximately 15 minutes, with the cab door closed.

Figure 80-30-1

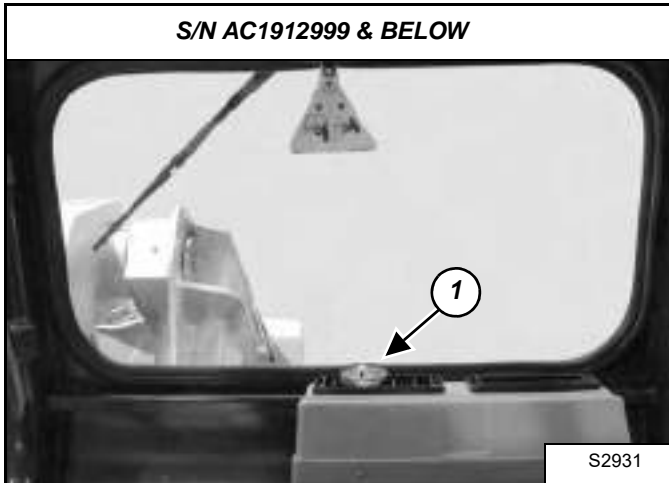


Figure 80-30-2

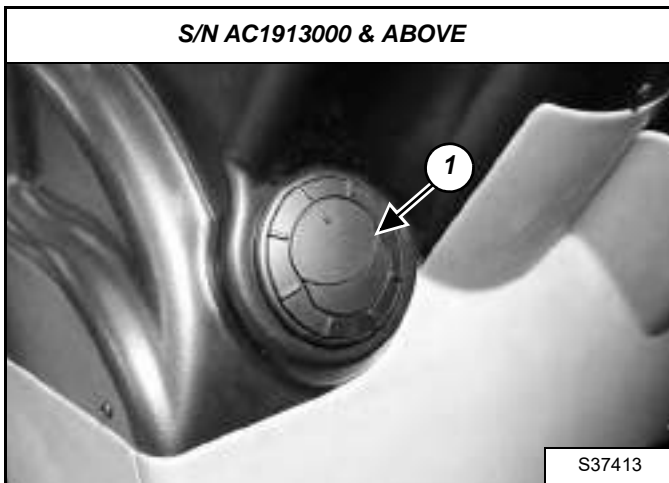
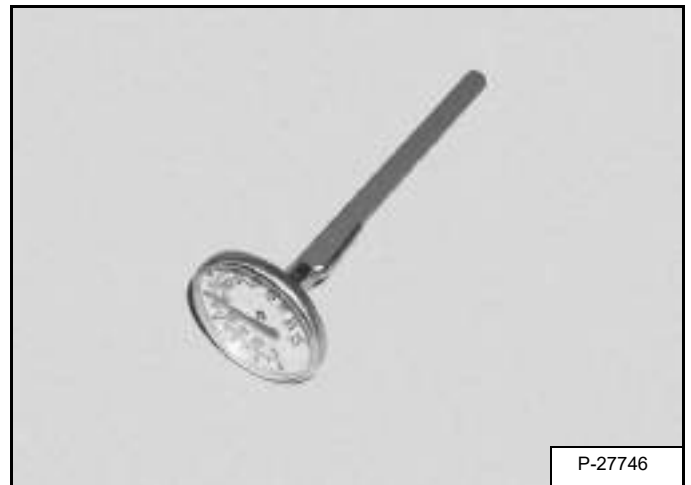


Figure 80-30-3



Check the temperature at (one of) the louvers (Item 1) [Figure 80-30-1] and [Figure 80-30-3] with a thermometer [Figure 80-30-3].

The louver temperature should be between 2.2-11,6°C (36-53°F) depending on the amount of humidity in the air.

If the louver temperature is too high. (See SYSTEM TROUBLESHOOTING CHART on Page 80-70-1.)

Check the blower fan for proper operation or noise, and replace if necessary. (See EVAPORATOR/BLOWER UNIT (S/N AC1912999 & BELOW) on Page 80-90-1.)

Check the belt tension on the A/C compressor. (See Compressor And Alternator Drive Belt Inspection on Page 80-20-2.)

Check the A/C condenser for dirt or mud, and clean if necessary. (See Cleaning The Condenser on Page 80-20-3.)

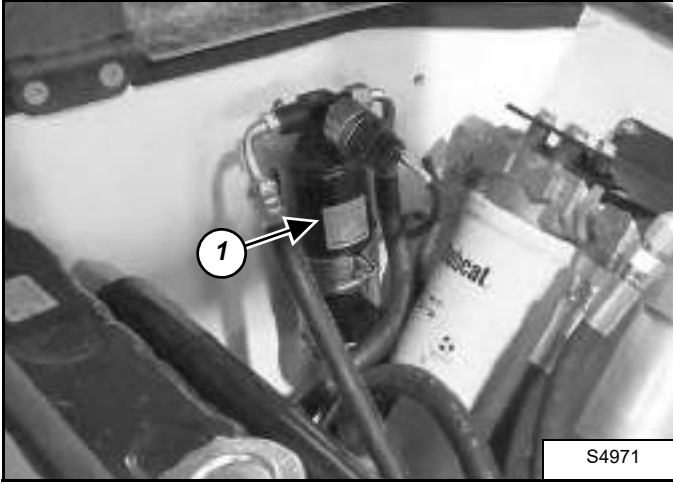
Inspect the sight glass located on the receiver/drier for air bubbles. (See REGULAR MAINTENANCE on Page 80-20-1.)

Dealer Copy -- Not for Resale

TROUBLESHOOTING (CONT'D)

HVAC Repair And Leaks

Figure 80-30-4



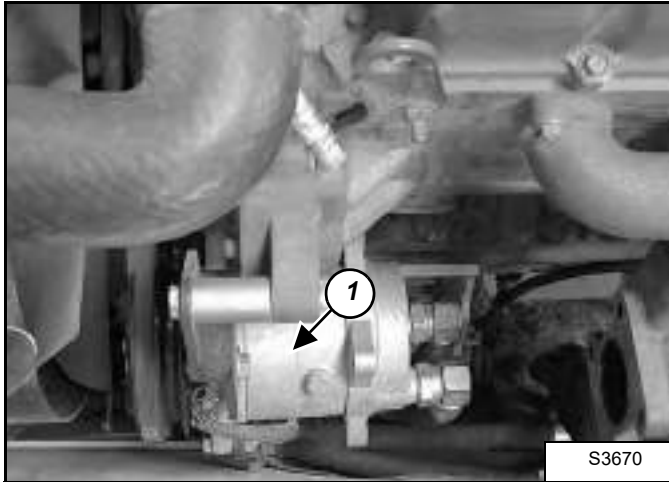
Whenever the A/C system is opened to the atmosphere or there has been a leak in the system, the receiver / drier (Item 1) **[Figure 80-30-4]** must be changed.

Never leave hose fittings, compressor fittings or components uncapped while working on the A/C system.

TROUBLESHOOTING (CONT'D)

Checking The Electrical System

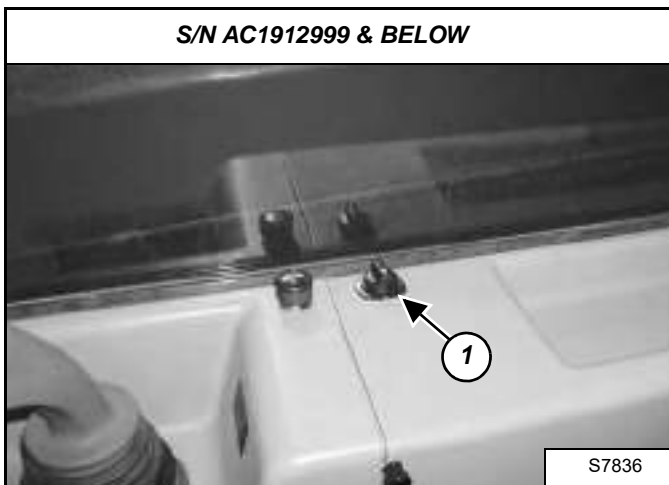
Figure 80-30-5



Check to see if the compressor clutch (Item 1) [Figure 80-30-5] is engaging.

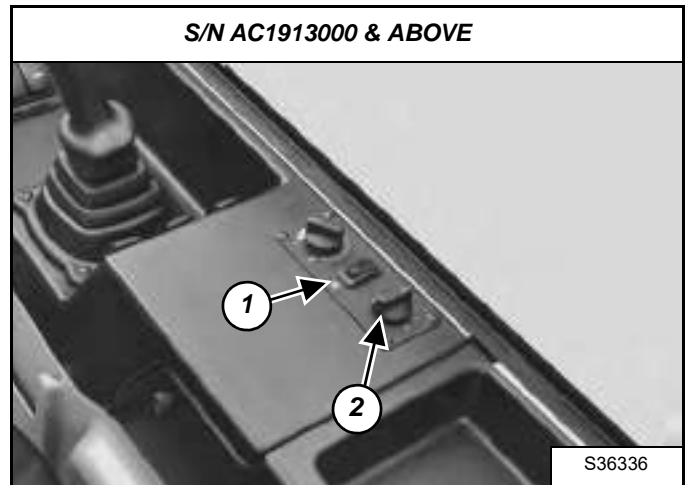
Turn the ignition key switch to the RUN position without starting the machine.

Figure 80-30-6



Turn the blower fan switch (Item 1) [Figure 80-30-6] to the first on position, the compressor clutch should make a click sound, which indicates the clutch is engaging.

Figure 80-30-7



Press the A/C switch (Item 1) and turn the blower fan switch on (Item 2) [Figure 80-30-7] (position 1). The compressor clutch should make a click sound, which indicates the clutch is engaging.

If the compressor clutch does not engage, check the air condition compressor fuse:

S/N AC1912999 & Below: (See Fuses, Diodes And Relays on Page 60-10-2.)

S/N AC1913000 & Above: (See Fuses, Diodes And Relays on Page 60-11-2.)

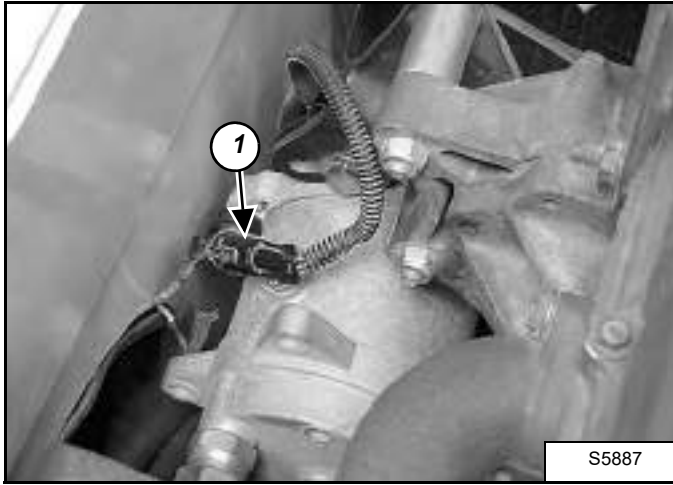
Replace the fuse if needed.

Dealer Copy -- Not for Resale

TROUBLESHOOTING (CONT'D)

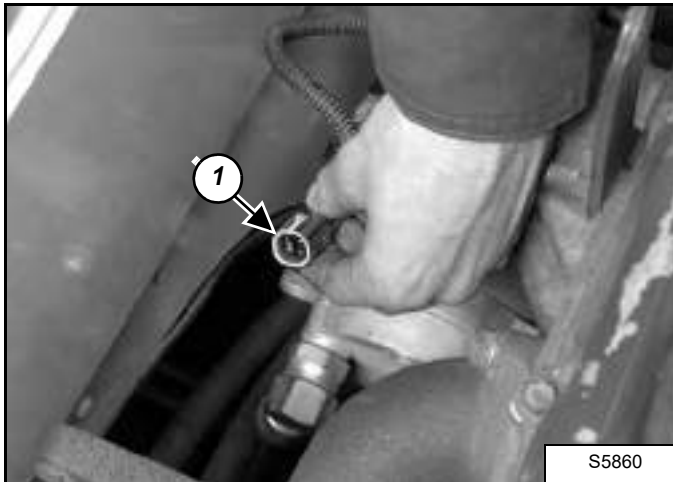
Checking The Electrical System (Cont'd)

Figure 80-30-8



Unplug the connector (Item 1) [Figure 80-30-8] from the compressor.

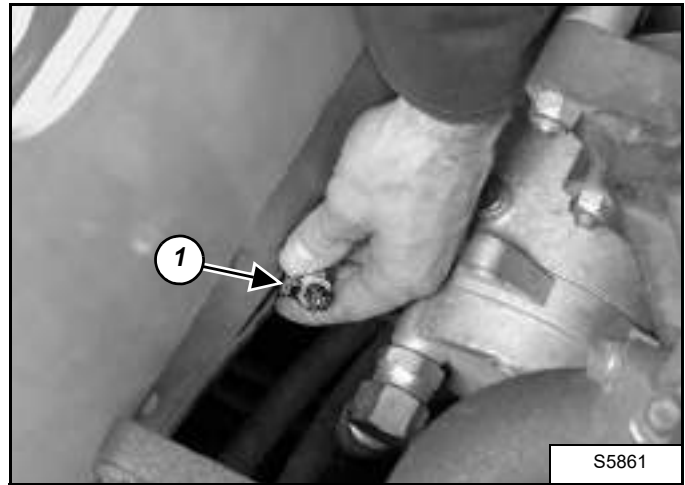
Figure 80-30-9



With a multimeter check the resistance to the compressor clutch connector (Item 1) [Figure 80-30-9].

If there is no resistance value replace the compressor clutch. (See COMPRESSOR on Page 80-50-1.)

Figure 80-30-10

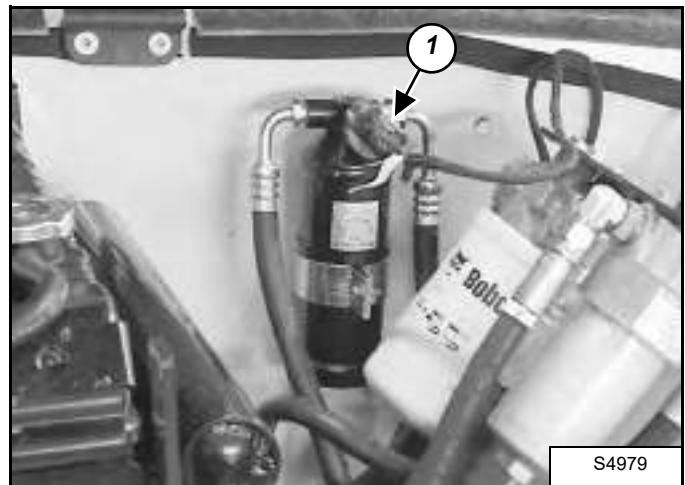


With a multimeter, check the voltage to the compressor clutch at the main harness (Item 1) [Figure 80-30-10].

If there is no power at the clutch, check the wiring harness for broken wires.

If there is no power at the clutch, reconnect the wiring harness to the compressor clutch.

Figure 80-30-11

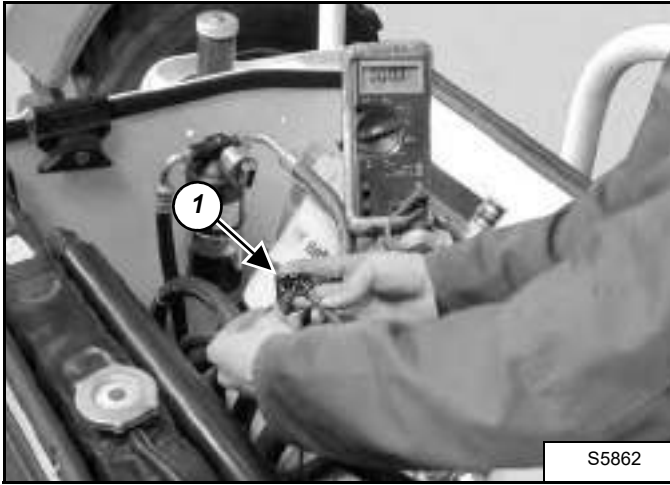


Disconnect the machine harness (Item 1) [Figure 80-30-11] from the pressure switch.

TROUBLESHOOTING (CONT'D)

Checking The Electrical System (Cont'd)

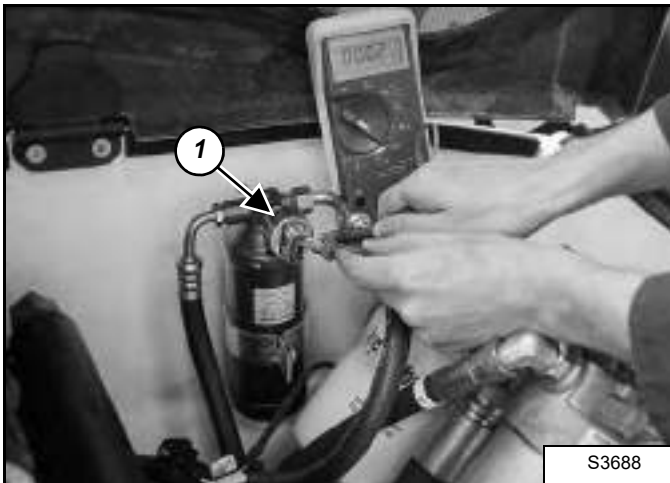
Figure 80-30-12



With the key switch to the run position (engine off) and the blower fan switch on the first position. Use a multimeter to check the main harness (Item 1) [Figure 80-30-12] for voltage.

There should be 12 volts. If there is no voltage, check the harness for broken wires.

Figure 80-30-13



If there is voltage at the harness, check the resistance at the pressure switch (Item 1) [Figure 80-30-13].

If there is no resistance value, check for a low refrigerant level. (See SYSTEM CHARGING AND RECLAMATION on Page 80-40-1.)

If good resistance value is observed, the pressure switch is good.

Reconnect the main harness to the pressure switch.

Figure 80-30-14

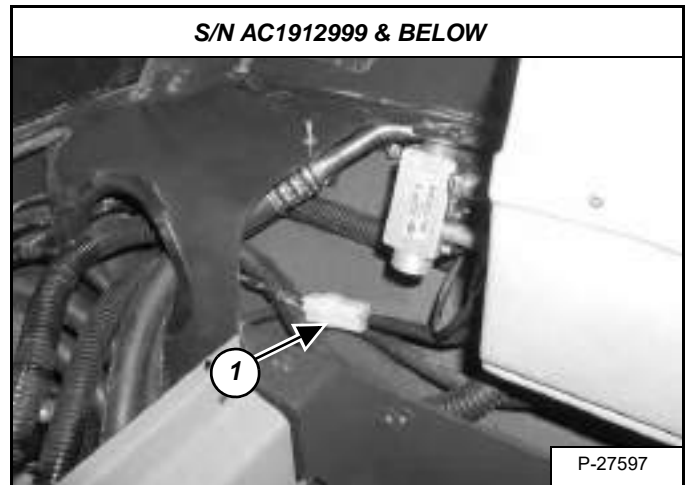
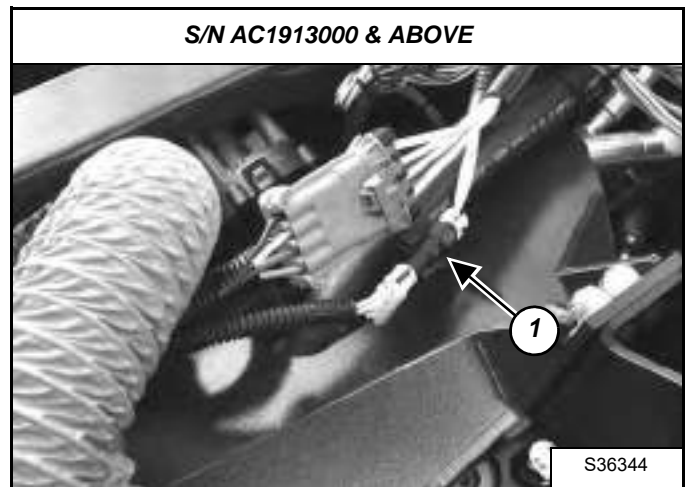


Figure 80-30-15



Disconnect the thermostat wiring connector (Item 1) [Figure 80-30-14] and [Figure 80-30-15] from the main harness.

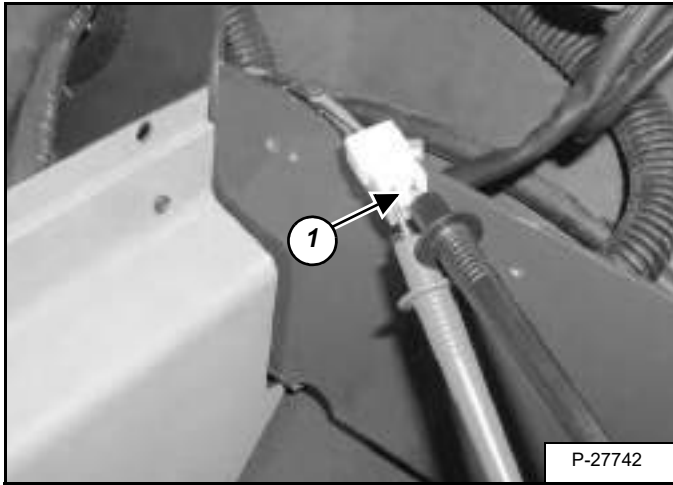
Dealer Copy -- Not for Resale

TROUBLESHOOTING (CONT'D)

Checking The Electrical System (Cont'd)

S/N AC1912999 & Below:

Figure 80-30-16



Check the main harness (Item 1) [Figure 80-30-16] for voltage. The voltage should be 12 volts. If there is no voltage, check the harness for broken wires.

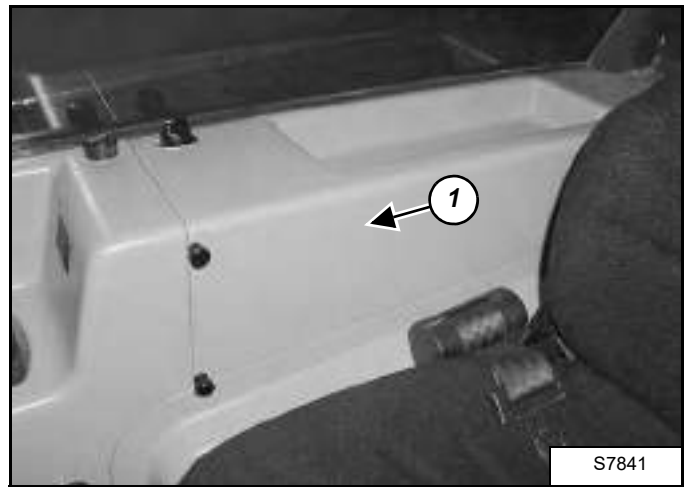
Figure 80-30-17



If there is voltage at the wiring harness, check the thermostat wire (green) for resistance. The resistance value should be 10 ohms at 20°C (68°F) [Figure 80-30-17].

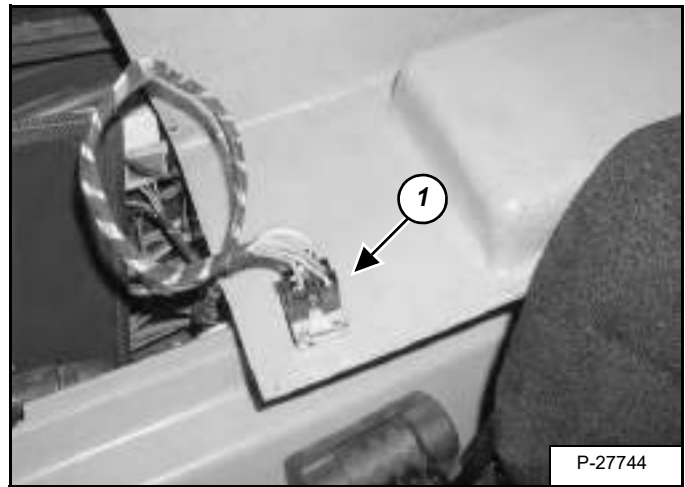
If there is no resistance, replace the entire blower fan unit.

Figure 80-30-18



Remove the fuse box cover (Item 1) [Figure 80-30-18].

Figure 80-30-19



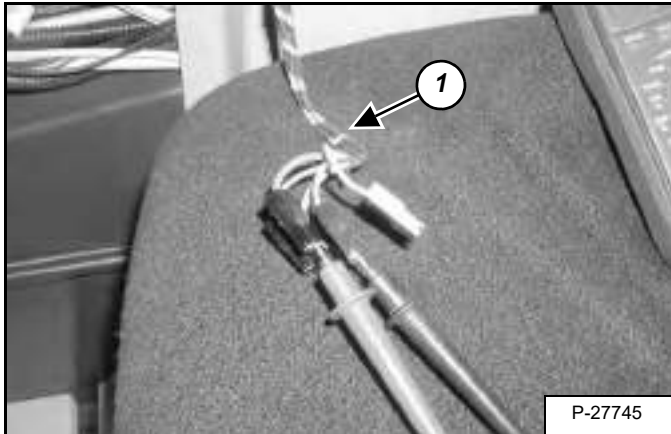
Disconnect the main wire harness connectors (Item 1) [Figure 80-30-19] from the switch.

NOTE: Mark the wires for correct assembly.

TROUBLESHOOTING (CONT'D)

Checking The Electrical System (Cont'd)

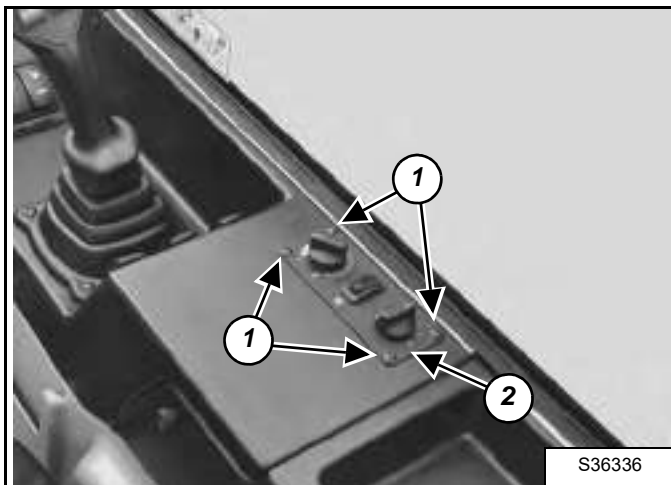
Figure 80-30-20



Check the main harness (Item 1) [Figure 80-30-20] for voltage. The voltage should be 12 volts if there is no voltage check the harness for broken wires.

S/N AC1913000 & Above:

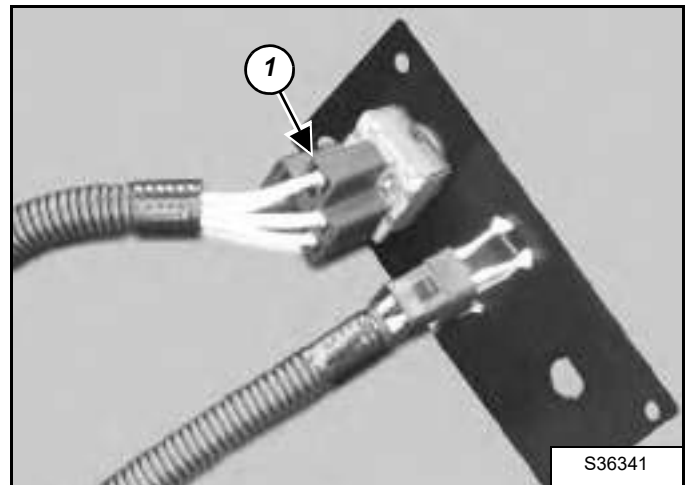
Figure 80-30-21



Remove the four screws (Item 1) [Figure 80-30-21].

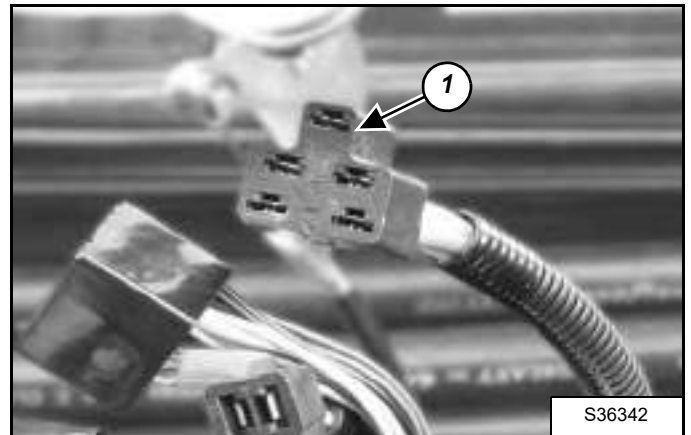
Remove the panel (Item 2) [Figure 80-30-21].

Figure 80-30-22



Disconnect the main wire harness connector (Item 1) [Figure 80-30-22] from the switch.

Figure 80-50-1



Check the main harness (Item 1) [Figure 80-50-1] for voltage. The voltage should be 12 volts if there is no voltage check the harness for broken wires.

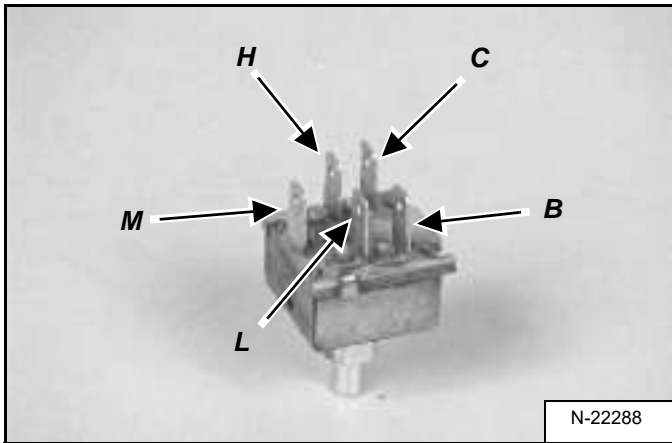
Dealer Copy -- Not for Resale

TROUBLESHOOTING (CONT'D)

Checking The Electrical System (Cont'd)

For all models:

Figure 80-30-1



If there is voltage at the main harness check the blower fan switch **[Figure 80-30-1]** for resistance.

With the switch in the **OFF** position, there should be zero resistance between all terminals.

With the switch in the **1** position, there should be resistance between **C** terminal and the **B** terminal. And also between the **C** terminal and the **L** terminal frame **[Figure 80-30-1]**.

With the switch in the **2** position, there should be resistance between **C** terminal and the **B** terminal. And also between the **C** terminal and the **M** terminal frame **[Figure 80-30-1]**.

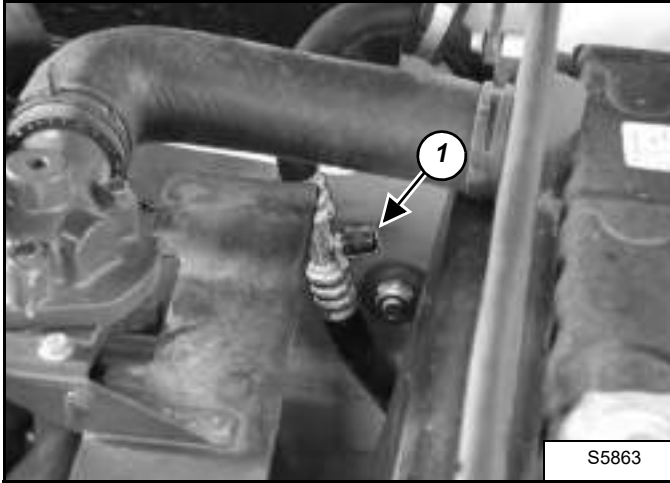
With the switch in the **3** position, there should be resistance between **C** terminal and the **B** terminal. And also between the **C** terminal and the **H** terminal frame **[Figure 80-30-1]**.

SYSTEM CHARGING AND RECLAMATION

Reclamation Procedure

Open the engine cover.

Figure 80-40-1



Locate the low pressure port (Item 1) [Figure 80-40-1] of the A/C circuit.

Figure 80-40-2

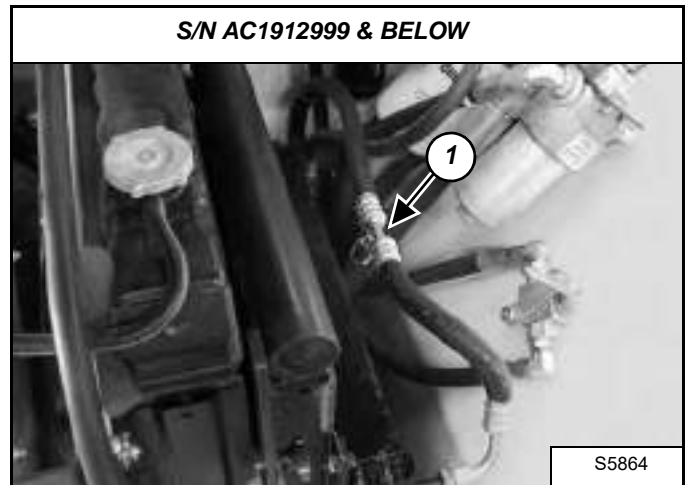
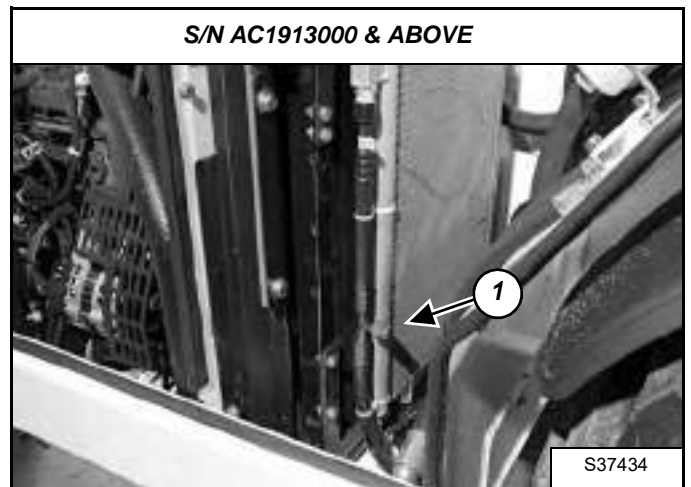


Figure 80-40-3



Locate the high pressure port (Item 1) [Figure 80-40-2] and [Figure 80-40-3] of the A/C circuit.

Dealer Copy -- Not for Resale

WARNING

In the event of a leakage, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

W-2371-0500

SYSTEM CHARGING AND RECLAMATION (CONT'D)

Reclamation Procedure (Cont'd)

NOTE: This test is run with the engine OFF, and the A/C switch in the OFF position.

Figure 80-40-4



NOTE: Before reclaiming a refrigeration system, it is recommended to identify the type of refrigerant that is in the A/C system and if it is pure enough to use. The tool MEL1592, Refrigerant Identifier (Item 1) [Figure 80-40-4], will determine the kind of refrigerant and any possible harmful or dangerous substances that may be present in the system. Thus preventing mixing of dangerous material with your reclaimed R-134a in your reclaimer, and further contamination to other A/C systems that are reclaimed and charged from your MEL 1581 Recovery/Recycling/Recharging Machine.

Remove the protective cap and connect the refrigerant identifier to the low pressure hose (Item 1) [Figure 80-40-1].

Connect the refrigerant identifier to its power source.

Figure 80-40-5



Follow the steps displayed on the refrigerant identifier screen [Figure 80-40-5].

Allow 2 minutes for the refrigerant identifier to display the type of refrigerant and air content. An alarm will sound if potentially flammable hydrocarbons are present and will also indicate on the visual display.

Disconnect the refrigerant identifier from the A/C.

If the refrigerant is dangerous or flammable, it must be evacuated from the A/C system into a separate container and properly and safely disposed of.

If R134a is found, evacuate the system.

SYSTEM CHARGING AND RECLAMATION (CONT'D)

Reclamation Procedure (Cont'd)

WARNING

In the event of a leak, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R-134a refrigerant gives a toxic gas.

W-2371-0611

WARNING

HFC 134A refrigerant can be dangerous if not properly handled. Liquid 134A may cause blindness if it contacts the eyes and may cause serious frostbite if it contacts the skin.

- Gaseous 134A becomes lethal (phosgene) gas when it contacts open flame or very hot substances.
- NEVER SMOKE when there is the possibility of even small amounts of 134A in the air.

Any servicing work that involves release or addition of 134A to the system must be done by a competent refrigeration dealer who has the proper equipment, knowledge, and experience to service refrigeration equipment.

W-2373-0500

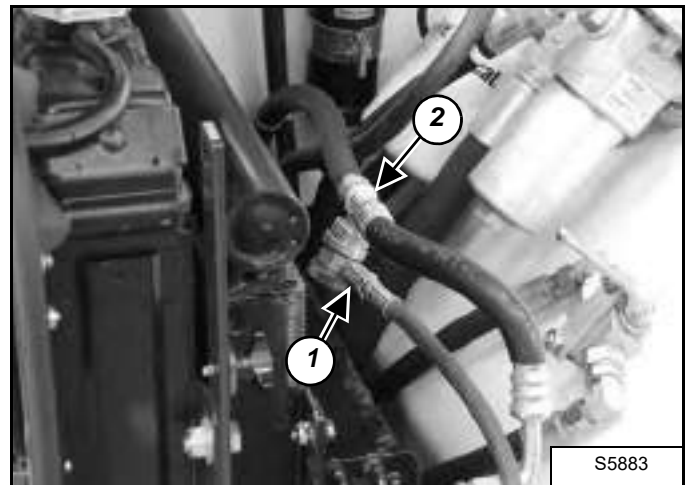
Figure 80-40-6



Use an approved recovery/charging unit [Figure 80-40-6] to evacuate the system.

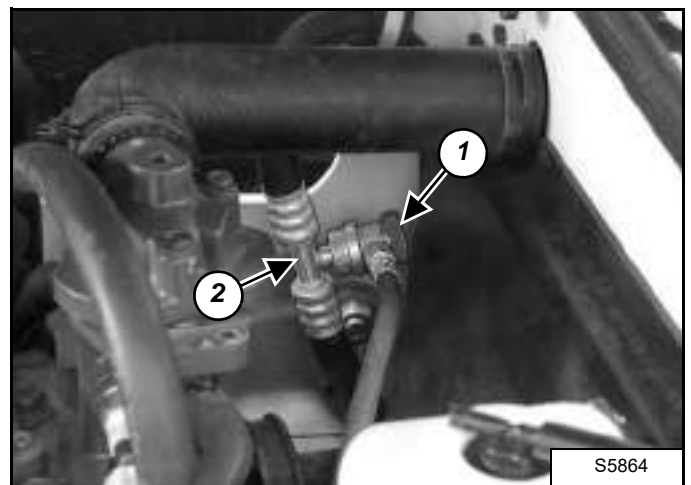
Connect the reclaimer to the A/C charge ports.

Figure 80-40-7



Connect the Red hose (Item 1) to the high pressure port (Item 2) [Figure 80-40-7] and open the valve.

Figure 80-40-8



Connect the Blue hose (Item 1) to the low pressure port (Item 2) [Figure 80-40-8] and open the valve.

Dealer Copy -- Not for Resale

SYSTEM CHARGING AND RECLAMATION (CONT'D)

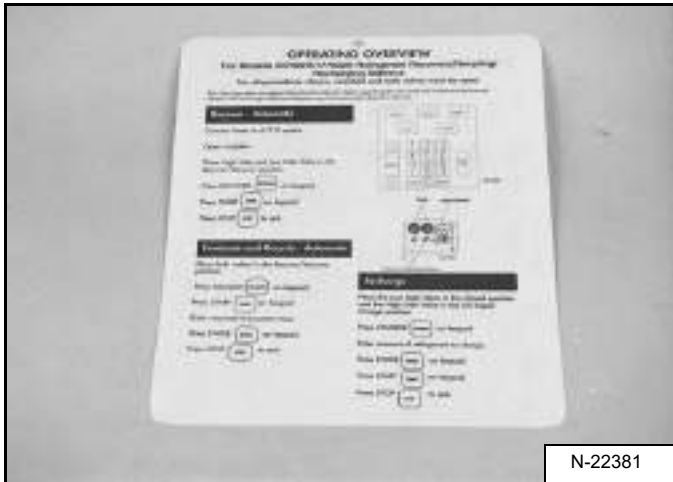
Reclamation Procedure (Cont'd)

Figure 80-40-9



Turn the reclaimer unit [Figure 80-40-9] to the ON position and follow the on screen instructions.

Figure 80-40-10



NOTE: The reclaimer unit, has a complete step by step set of instructions [Figure 80-40-10] to follow for reclamation and recharging of the A/C system. A trained technician should follow these instructions as they may vary slightly depending on the model and brand of reclaimer used.

SYSTEM CHARGING AND RECLAMATION (CONT'D)

Charging Procedure With A Manifold Gauge Set

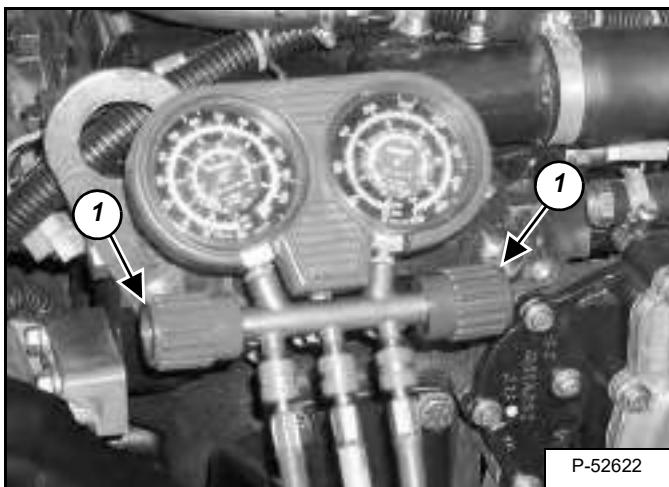
Open the hood.



In the event of a leakage, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

W-2371-0500

Figure 80-40-11

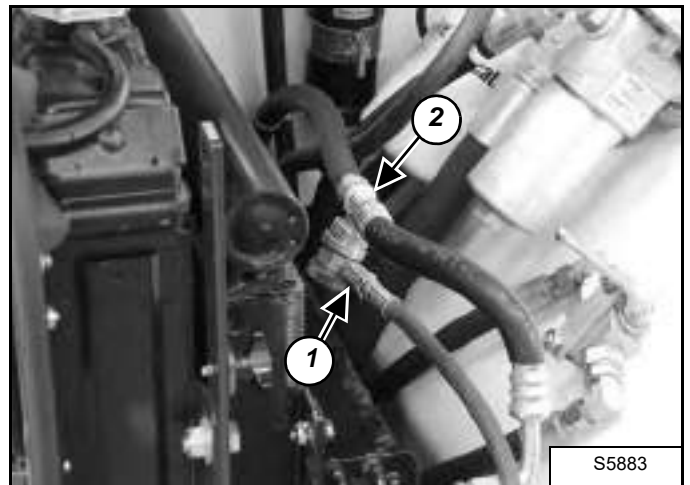


Check to see that the hand valves (Item 1) [Figure 80-40-11] are closed on the manifold gauge set.

If there is any refrigerant in the A/C system, it must be recovered by an approved A/C reclamation procedure. (See Reclamation Procedure on Page 80-40-1.)

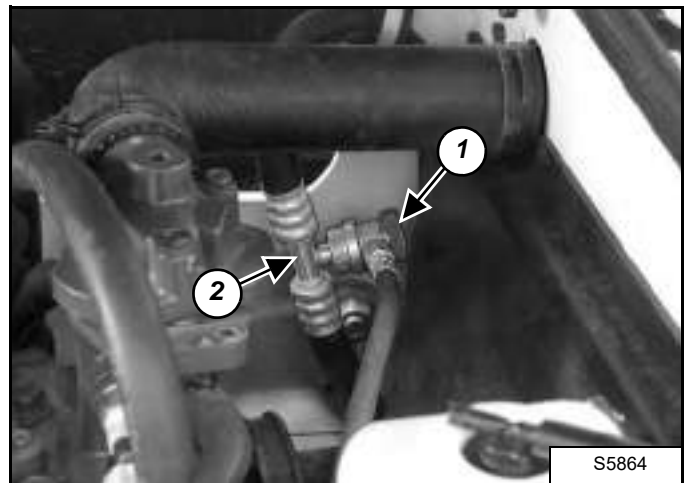
Connect the gauges to the A/C charge ports.

Figure 80-40-12



Connect the Red hose (Item 1) to the high pressure port (Item 2) [Figure 80-40-12] and open the valve.

Figure 80-40-13



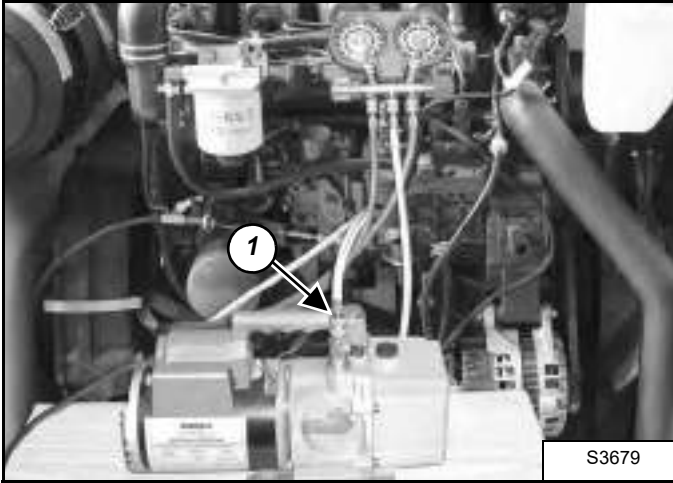
Connect the Blue hose (Item 1) to the low pressure port (Item 2) [Figure 80-40-13] and open the valve.

Dealer Copy -- Not for Resale

SYSTEM CHARGING AND RECLAMATION (CONT'D)

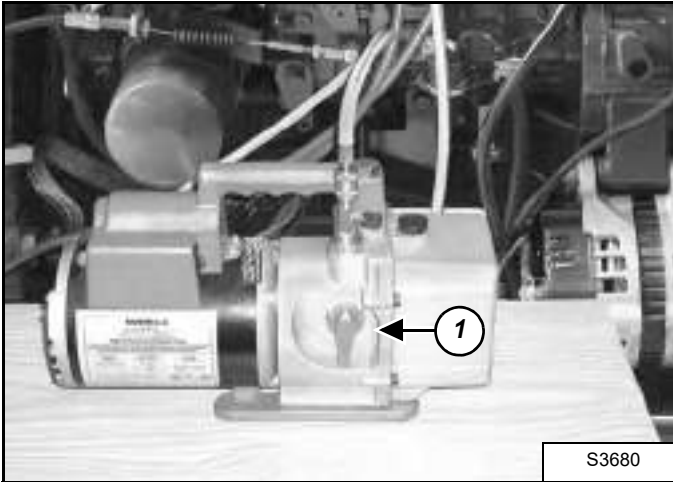
Charging Procedure With A Manifold Gauge Set (Cont'd)

Figure 80-40-14



Connect the Yellow hose (Item 1) [Figure 80-40-14] to the vacuum pump.

Figure 80-40-15

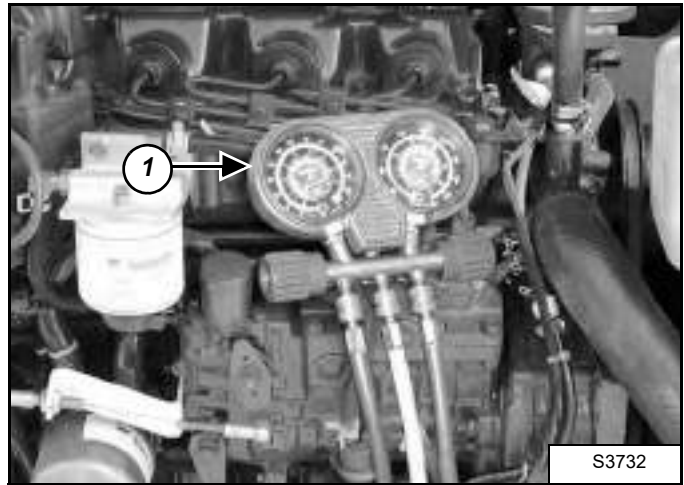


Start the vacuum pump and open ISO-valve (Item 1) [Figure 80-40-15] on the vacuum pump.

Run the vacuum pump for at least 5-10 minutes to insure that a vacuum has been pulled on the system.

Close the ISO-valve (Item 1) [Figure 80-40-15] (which isolates the vacuum pump from the A/C system) and turn OFF the vacuum pump.

Figure 80-40-16

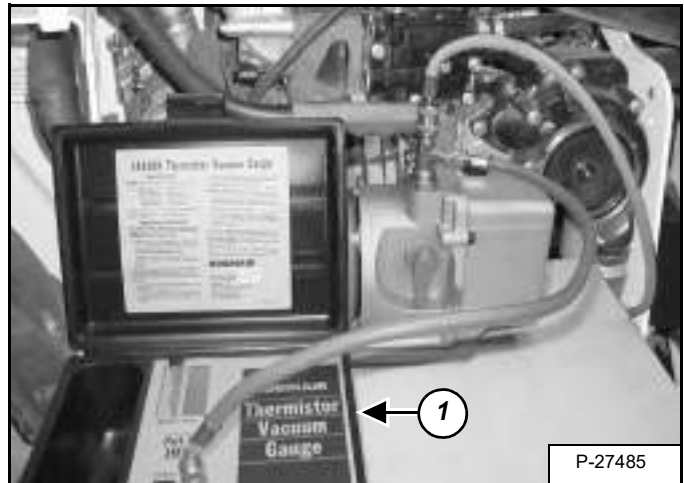


Note vacuum pressure indicated on the low pressure (Blue) gauge (Item 1) [Figure 80-40-16]. Let stand for 5-10 minutes and recheck the pressure for changes.

If the pressure drops, this may be an indication of a leak in the A/C system.

Determine the problem with the A/C system and repair it.

Figure 80-40-17



A thermistor vacuum gauge (Item 1) [Figure 80-40-17] can be used to determine the critical vacuum level during evacuation. It is a solid state instrument that constantly monitors and visually indicates the vacuum level.

The thermistor vacuum gauge is used with the vacuum pump [Figure 80-40-17].

Start the vacuum pump and open ISO-valve on the vacuum pump.

SYSTEM CHARGING AND RECLAMATION (CONT'D)

Charging Procedure With A Manifold Gauge Set (Cont'd)

Be sure that both hand valves, and both charge port valves are open.

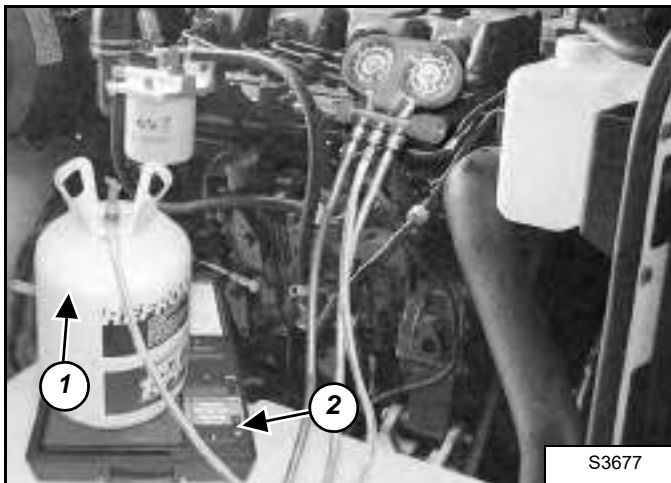
Run the vacuum pump for at least 45 minutes to insure that all the moisture is boiled out of the system.

Stop the vacuum pump and close the ISO-valve on the vacuum pump.

Close both hand valves on the manifold gauge set and remove the yellow hose from the vacuum pump that goes to the manifold gauge set.

Remove the vacuum pump and thermistor vacuum gauge.

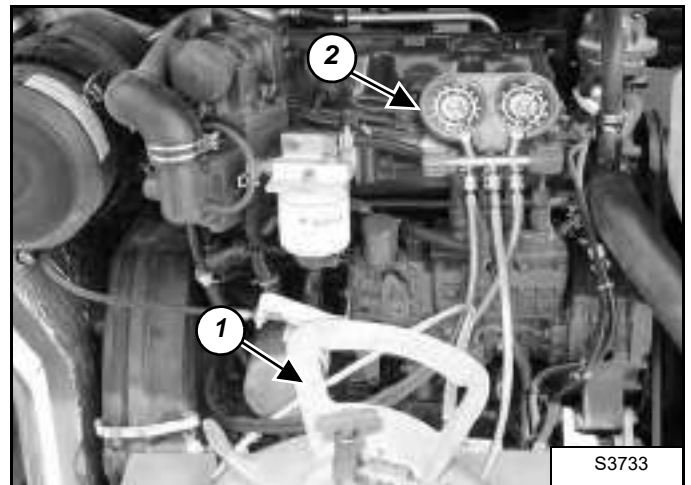
Figure 80-40-18



Place a refrigerant container with R134a (Item 1) on a charging scale (Item 2) [Figure 80-40-18] and zero out the scale.

Connect the yellow hose (Item 3) [Figure 80-40-18] from the manifold gauge set to the valve on the refrigerant tank.

Figure 80-40-19



Open the valve on the refrigerant container (Item 1) and open the low pressure hand valve (Blue) (Item 2) [Figure 80-40-19] on the manifold gauge set. Allow the vacuum to pull in the refrigerant until the pressure stabilizes.

Dealer Copy -- Not for Resale

SYSTEM CHARGING AND RECLAMATION (CONT'D)

Close the engine cover.

Charging Procedure With A Manifold Gauge Set (Cont'd)

Figure 80-40-20

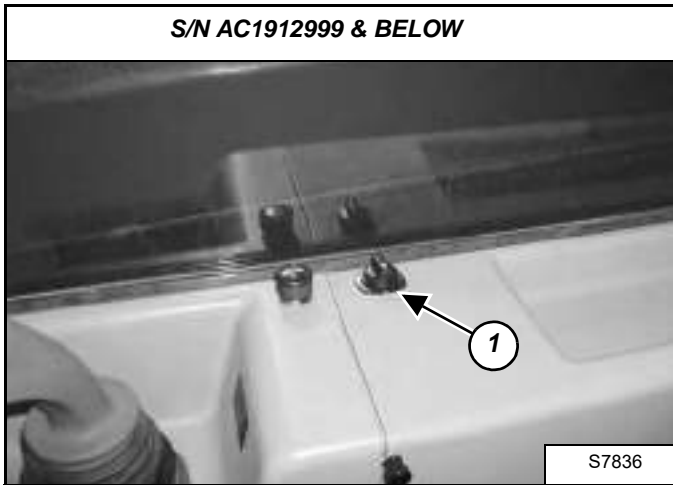
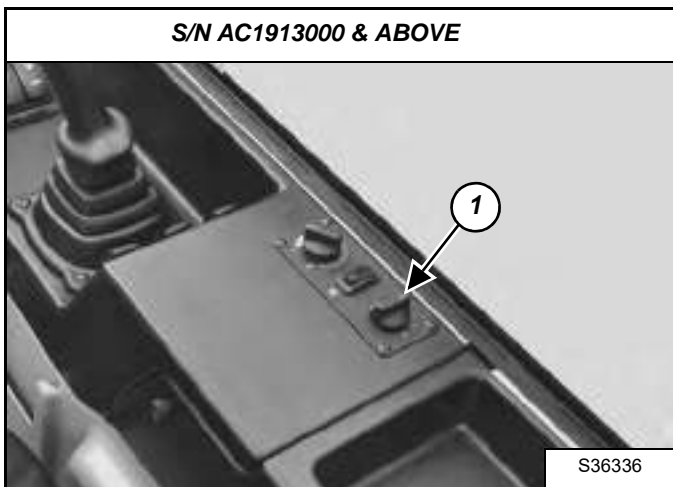


Figure 80-40-21



Turn the A/C fan switch (Item 1) [Figure 80-40-20] and [Figure 80-40-21] to HIGH position. The A/C switch must be ON (Item 2) [Figure 80-40-21] (only for S/N AC1913000 & Above)

Start the machine and run at medium speed.

Watch the scale and run system until the predetermined amount of refrigerant is added to the A/C system.

The A/C system holds 0,800 Kg (1.76 lb) of refrigerant.

Turn off the valve on the refrigerant container, and hand valves on the manifold gauge set.

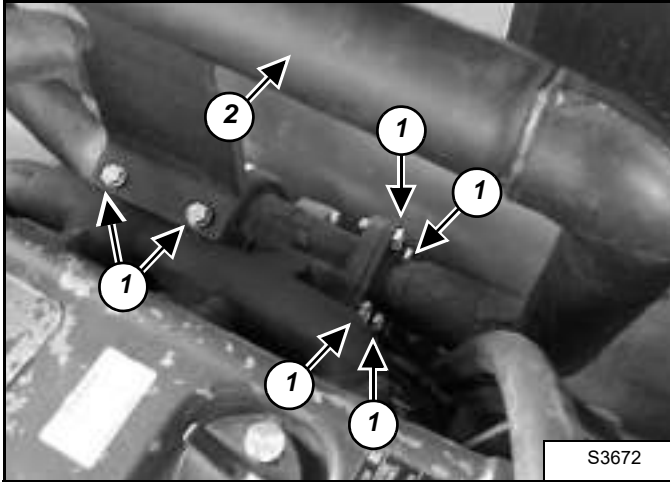
Turn off the engine and remove the A/C charging equipment from the machine.

COMPRESSOR

Removal And Installation

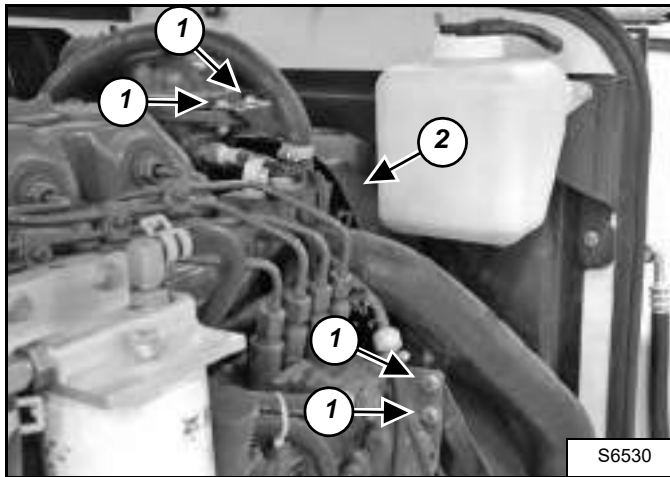
Evacuate the A/C system. (See SYSTEM CHARGING AND RECLAMATION on Page 80-40-1.)

Figure 80-50-1



Remove the six bolts (Item 1) and remove the exhaust pipe (Item 2) [Figure 80-50-1] for easier access to the compressor.

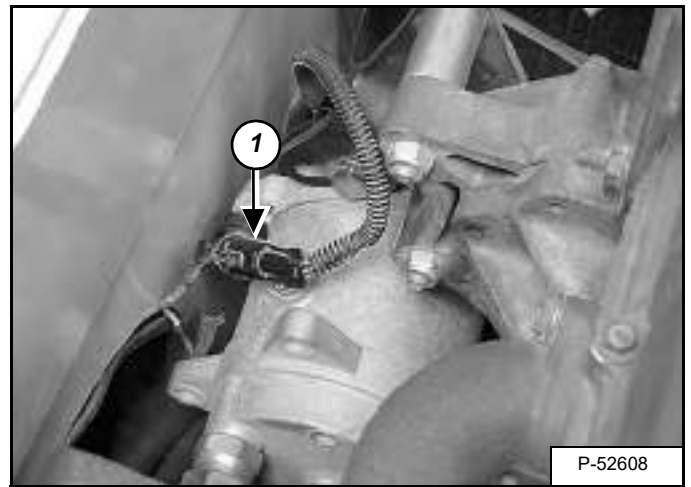
Figure 80-50-2



Remove the four bolts (Item 1) and the belt shield (Item 2) [Figure 80-50-2] for easier access to the compressor.

Remove the compressor belt.

Figure 80-50-3



Unplug the connector (Item 1) [Figure 80-50-3] from the compressor.

Mark the compressor hoses for correct installation.

WARNING

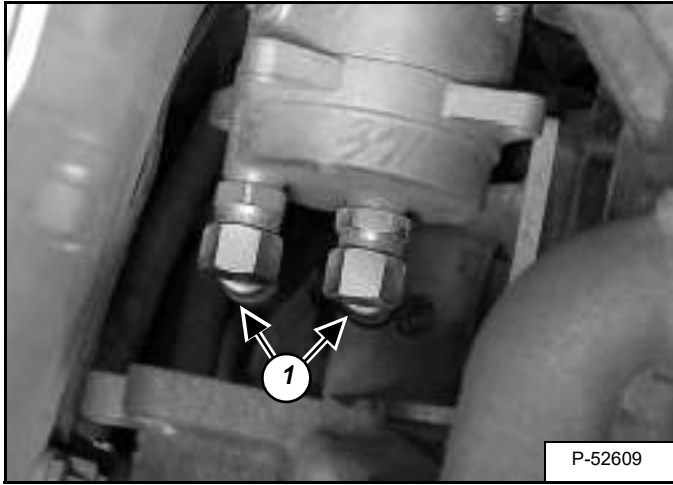
In the event of a leakage, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

W-2371-0500

COMPRESSOR (CONT'D)

Removal And Installation (Cont'd)

Figure 80-50-4

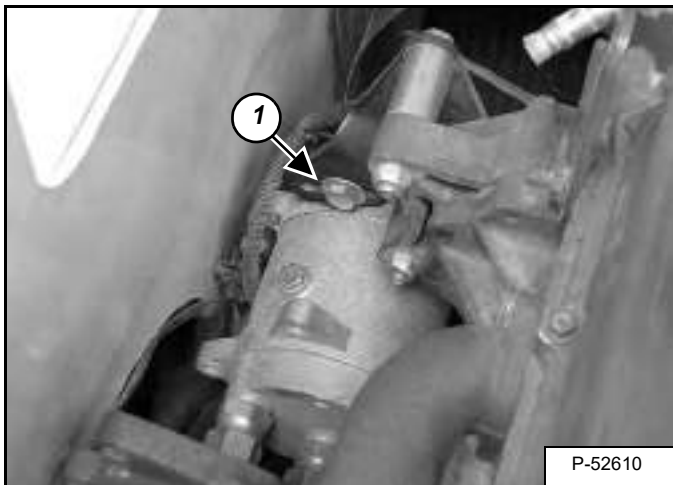


Remove the compressor hoses (Item 1) [Figure 80-50-4].

Installation: Tighten the hoses to 29,8 N•m (22 ft-lb) torque.

Cap and plug the hoses and fittings with the proper A/C caps and plugs.

Figure 80-50-5



Remove the mount bolts (Item 1) [Figure 80-50-5].

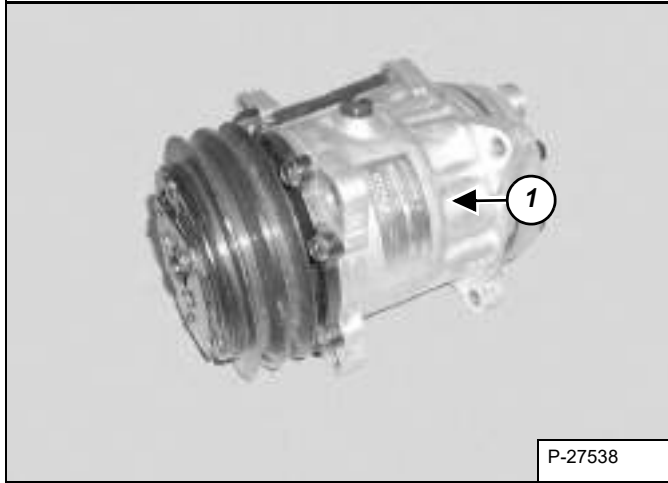
NOTE: One mount bolt is hidden in the picture.

Remove the compressor.

COMPRESSOR (CONT'D)

Compressor Oil

Figure 80-50-1



The compressor (Item 1) [Figure 80-50-1] is factory filled with 150-170 cc's of PAG oil (Poly Alkelene Glycol).

Unlike engine oil, it is not necessary to frequently check or change the compressor oil.

It is necessary to check, replenish or replace the compressor oil in the following cases:

1. When the evaporator, condenser or receiver-drier is replaced.
2. When refrigerant has leaked from the system.
3. When refrigerant is suddenly released from the cooling cycle.
4. When any related problems occur in the cooling cycle.

When one of the components (the evaporator, condenser or receiver-drier) is replaced, **one ounce** (30 cc) of PAG oil should be added for each component replaced.

If the A/C compressor is changed, no oil should be added to the system, because the compressor comes factory filled with oil.

NOTE: Only PAG oil should be used. Never mix R-12 and R-134a Oils.

Compressor Oil Check

The compressor oil should be checked as follows when oil is being added to a machine in service.

There is a close affinity between oil and refrigerant. During normal operation, part of the oil circulates with the refrigerant in the system. Therefore, when checking the amount of oil in the system or replacing any system component, the compressor must be run in to insure return of oil to the compressor.

If the amount of refrigerant in the system has decreased, charge the system. (See SYSTEM CHARGING AND RECLAMATION on Page 80-40-1.)

Open the cab door and windows.

Run the blower fan at maximum speed.

Run the compressor for at least 20 minutes at 800-1200 RPM.

Remove the compressor from the machine. (See Removal And Installation on Page 80-50-1.)

COMPRESSOR (CONT'D)

Compressor Oil Check (Cont'd)

Figure 80-50-2

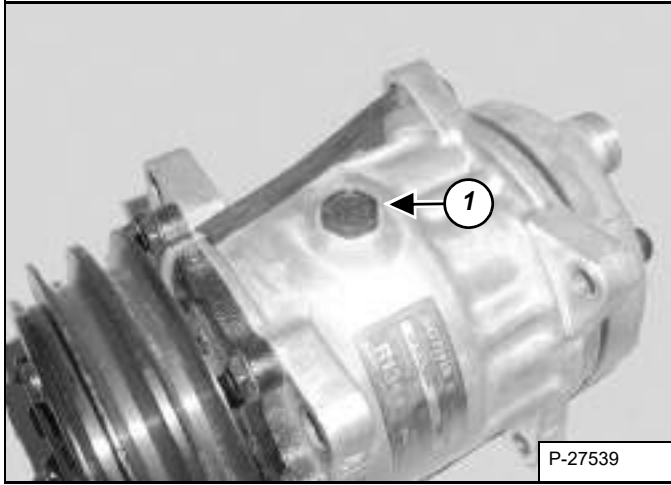
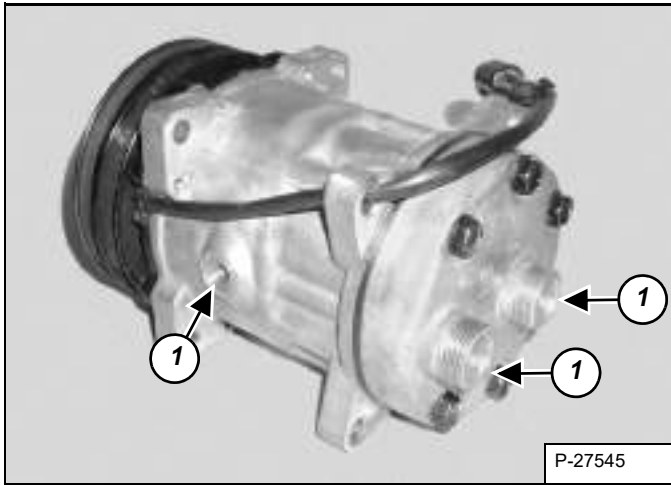


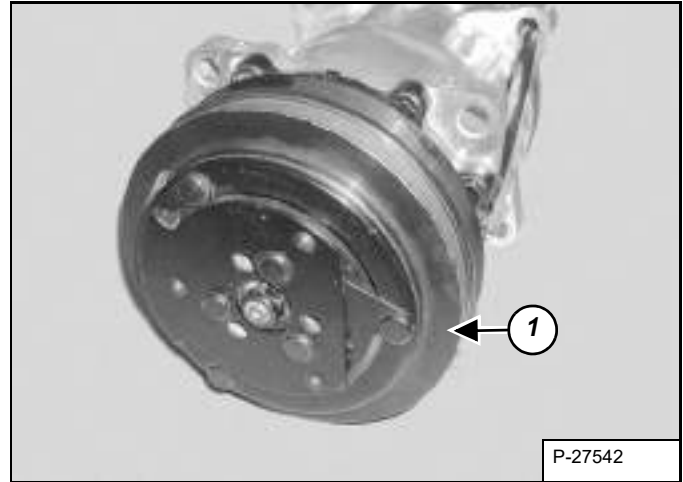
Figure 80-50-3



Remove the oil drain plug (Item 1) [Figure 80-50-2] and drain the oil through the connectors and the oil drain hole (Item 1) [Figure 80-50-3].

Installation: Tighten the oil drain plug to 13-15 N•m (9.4 -10.8 ft-lb) torque.

Figure 80-50-4



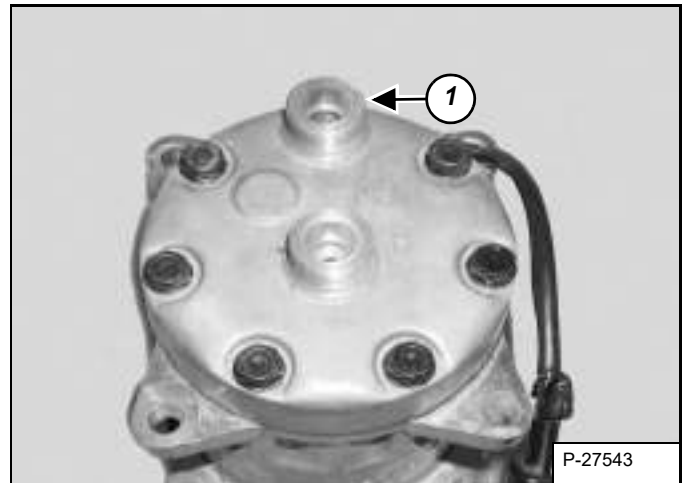
NOTE: After draining the oil through the drain hole and the connectors, extract the remaining oil through the discharge-side connector by rotating the drive pulley (Item 1) [Figure 80-50-4] several times by hand.

Measure the drained oil in a measuring cylinder.

Check the oil for contamination, dirt, metal shavings, or varnish color, discard the oil if contaminated.

NOTE: If metal shavings are found in the compressor oil, replace the complete compressor assembly.

Figure 80-50-5



Add new compressor oil through the suction side connector (Item 1) [Figure 80-50-5].

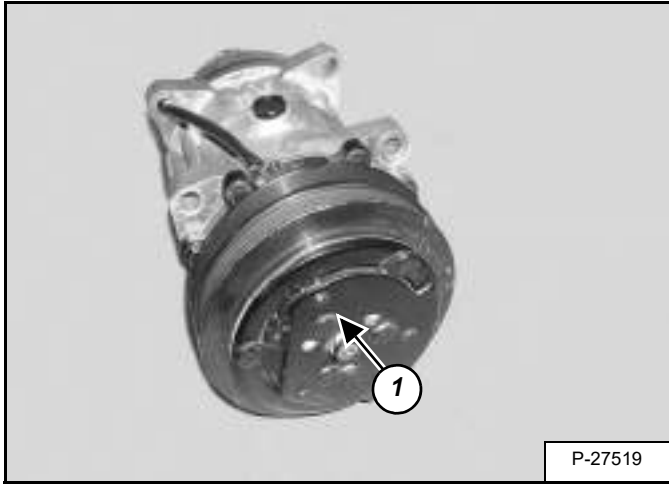
Installation: Add 150-170 cc's of PAG oil.

NOTE: The suction port on the compressor is marked with an S and is the large port on the compressor.

COMPRESSOR (CONT'D)

Compressor Clutch Disassembly And Assembly

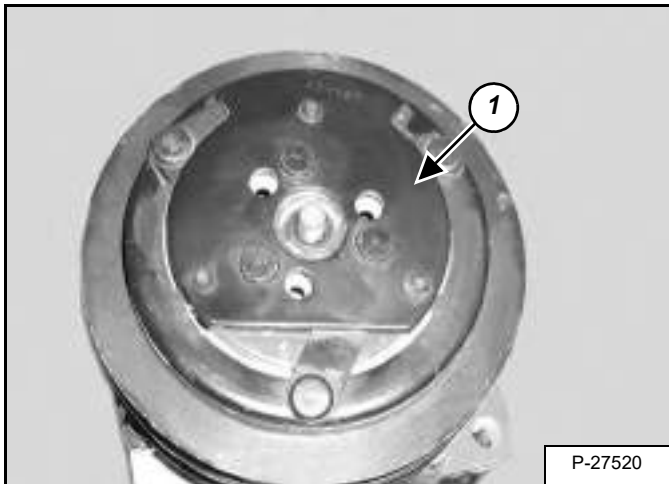
Figure 80-50-6



Remove the center armature nut (Item 1) [Figure 80-50-6].

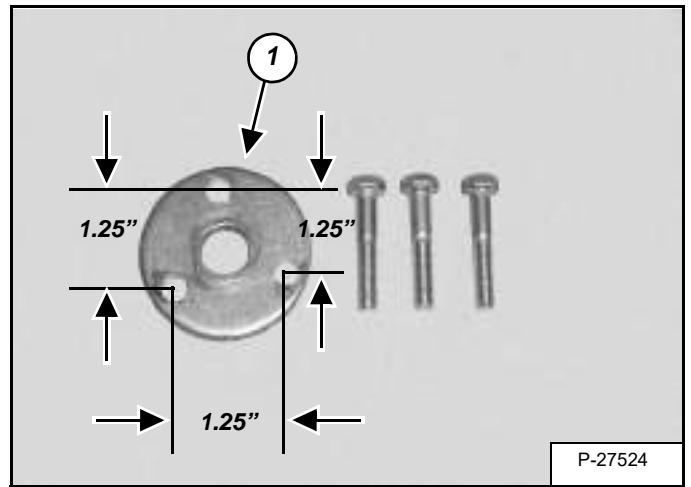
Assembly: Tighten the armature nut to 12 N•m (106 in-lb).

Figure 80-50-7



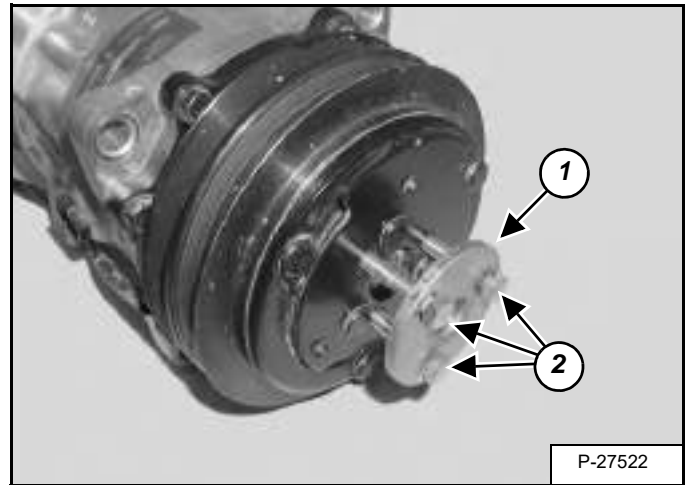
To remove the armature plate (Item 1) [Figure 80-50-7] from the clutch face you must make an armature plate puller.

Figure 80-50-8



The armature plate puller (Item 1) [Figure 80-50-8] can be constructed by drilling three 8 mm (0.315 in) holes in a flat circular plate, located 31,75 mm (1.25 in) apart.

Figure 80-50-9



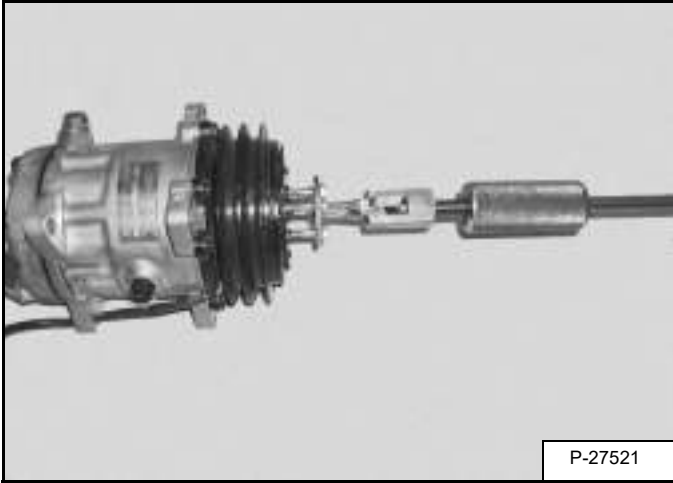
Attach the armature puller plate (Item 1) to the armature plate using the three bolts (Item 2) [Figure 80-50-9].

Dealer Copy -- Not for Resale

COMPRESSOR (CONT'D)

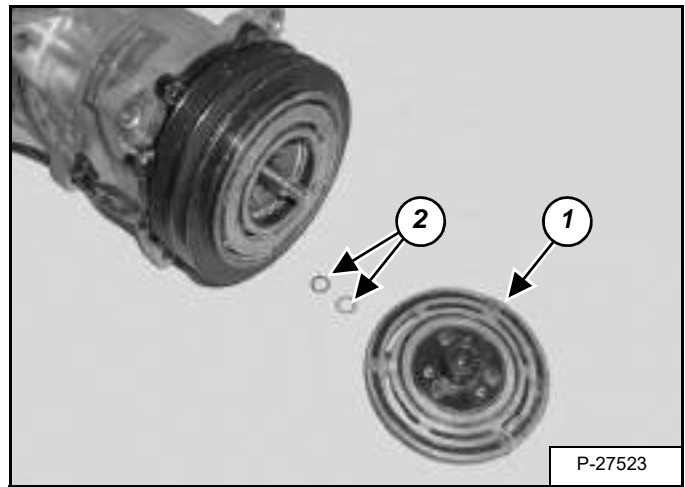
Compressor Clutch Disassembly And Assembly (Cont'd)

Figure 80-50-10



Attach a slide hammer puller to the armature puller tool [Figure 80-50-10].

Figure 80-50-11



Remove the armature plate (Item 1) [Figure 80-50-11] from the compressor clutch.

Remove the shims (Item 2) [Figure 80-50-11] from the armature shaft or armature plate.

Assembly: Insure that the clutch has the correct clearance by adding the shims (Item 2) [Figure 80-50-11].

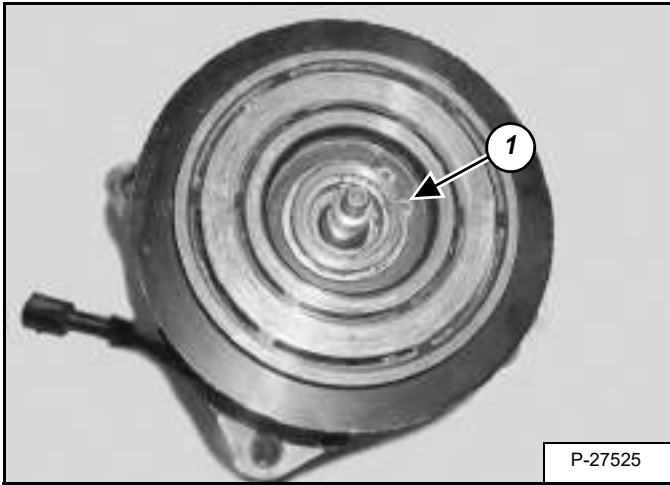
The specified clearance for the clutch is 0.3-0.6 mm (0.01-0.02 in) adjusting shims are available in the following thicknesses.

- 0.1 mm (0.0039 in)
- 0.3 mm (0.0118 in)
- 0.5 mm (0.0197 in)

COMPRESSOR (CONT'D)

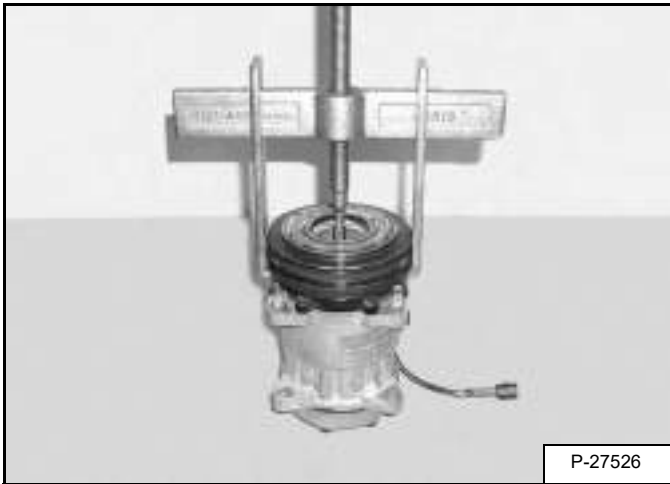
Compressor Clutch Disassembly And Assembly (Cont'd)

Figure 80-50-12



Remove the snap ring (Item 1) [Figure 80-50-12] from the pulley assembly.

Figure 80-50-13



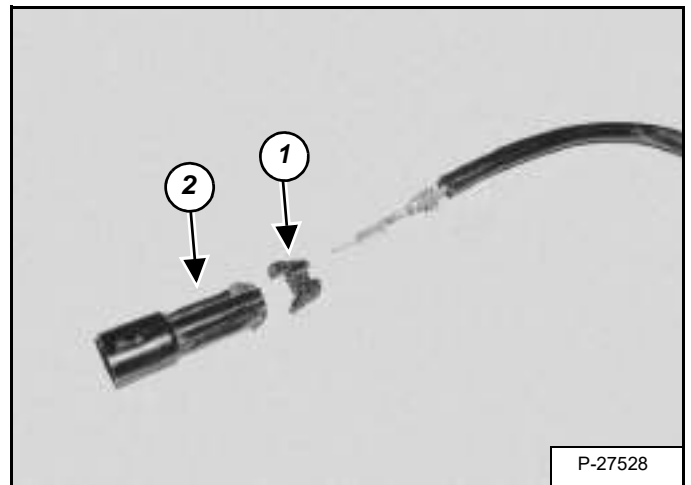
Remove the pulley from the compressor [Figure 80-50-13].

Figure 80-50-14



The pulley assembly and bearing [Figure 80-50-14] must be replaced as a complete unit.

Figure 80-50-15



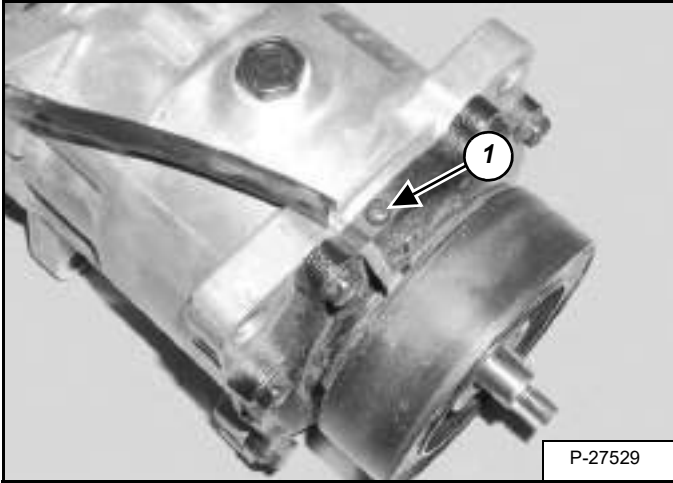
Remove the lock (Item 1) and connector (Item 2) [Figure 80-50-15] from the compressor harness.

Dealer Copy -- Not for Resale

COMPRESSOR (CONT'D)

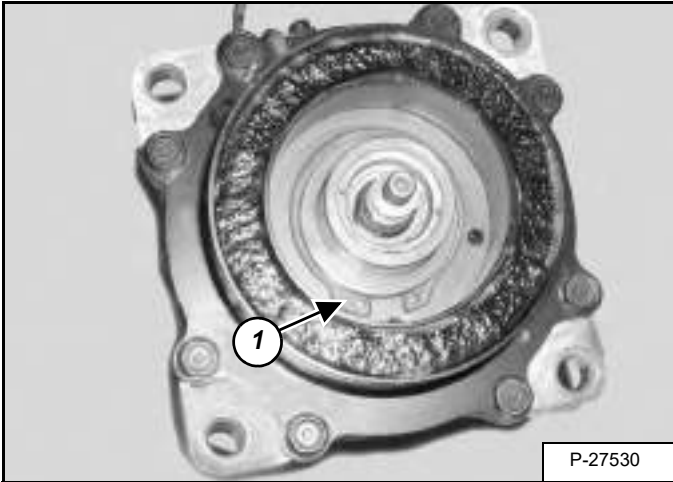
Compressor Clutch Disassembly And Assembly (Cont'd)

Figure 80-50-16



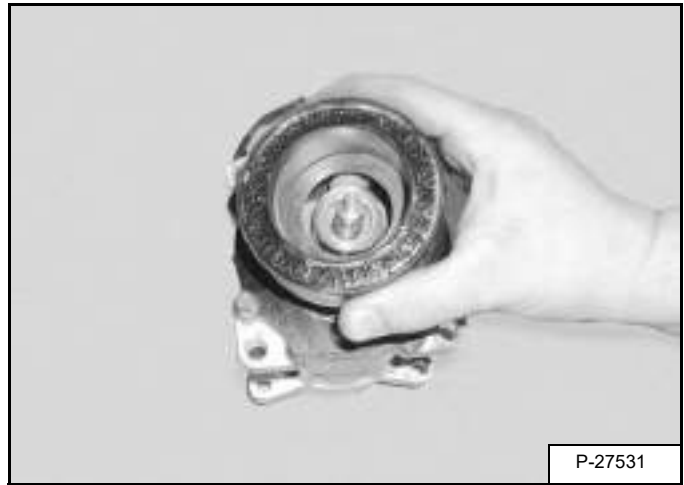
Remove the harness retainer screw assembly (Item 1) [Figure 80-50-16].

Figure 80-50-17



Remove the snap ring (Item 1) [Figure 80-50-17] from the coil.

Figure 80-50-18



Remove the coil from the compressor [Figure 80-50-18].

Figure 80-50-19



The compressor [Figure 80-50-19] must be replaced as a complete unit.

CONDENSER (S/N AC1912999 & BELOW)

Removal And Installation

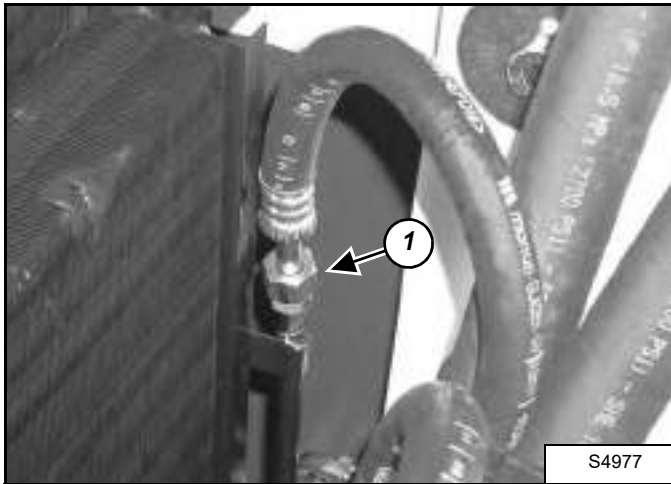
Remove the refrigerant from the A/C system. (See SYSTEM CHARGING AND RECLAMATION on Page 80-40-1.)



In the event of a leakage, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

W-2371-0500

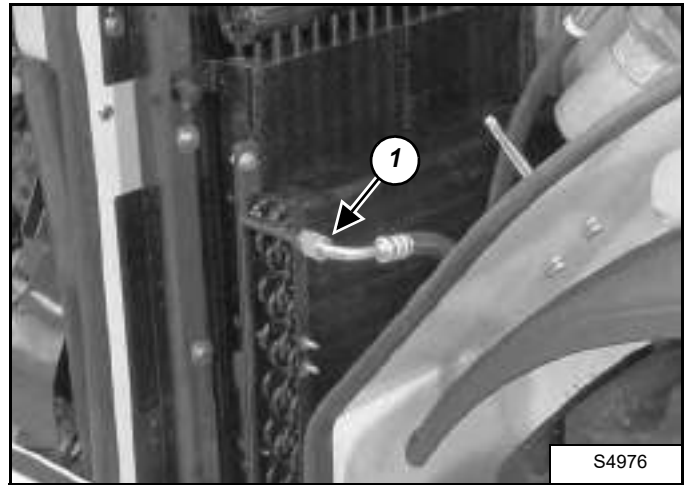
Figure 80-60-1



Remove the hose (Item 1) [Figure 80-60-1] from the condenser.

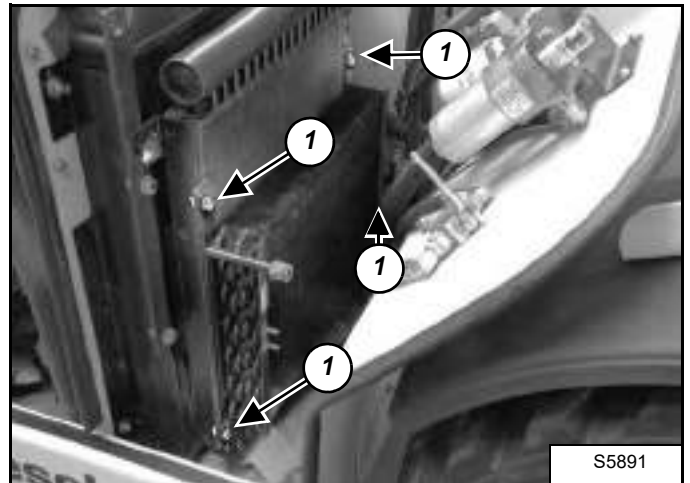
NOTE: Install caps and plugs on all fittings.

Figure 80-60-2



Remove the A/C hose (Item 1) [Figure 80-60-2] from the condenser.

Figure 80-60-3



Remove the two bolts and nuts (Item 1) [Figure 80-60-3] from each side of the condenser.

Tilt the condenser forward and remove.

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

CONDENSER (S/N AC1913000 & ABOVE)

Removal And Installation

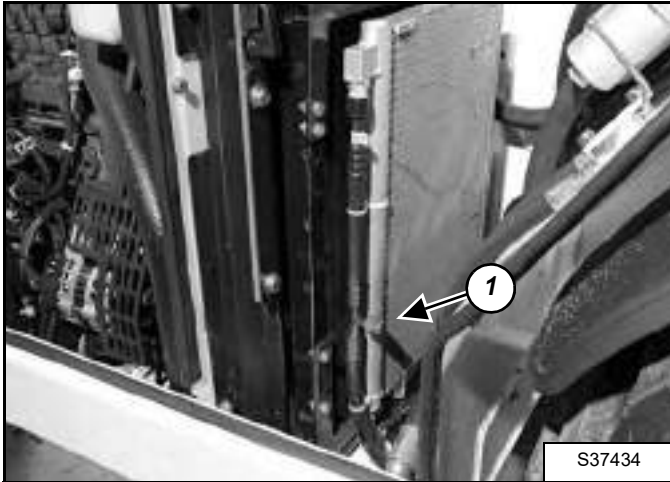
Remove the refrigerant from the A/C system. (See SYSTEM CHARGING AND RECLAMATION on Page 80-40-1.)

WARNING

In the event of a leakage, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

W-2371-0500

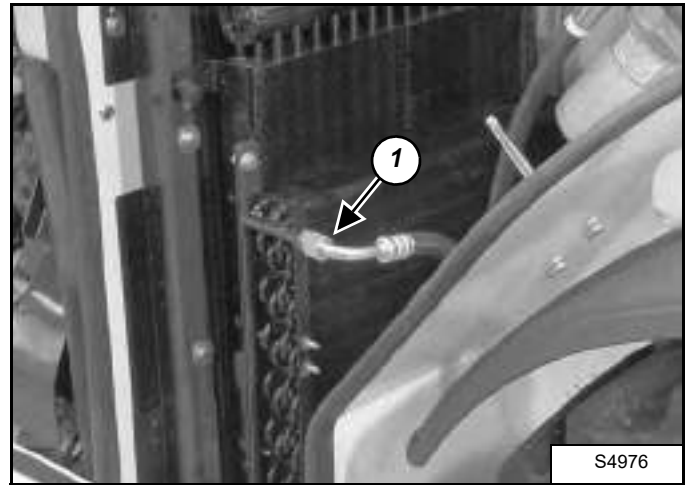
Figure 80-61-1



Remove the hose (Item 1) [Figure 80-61-1] from the condenser.

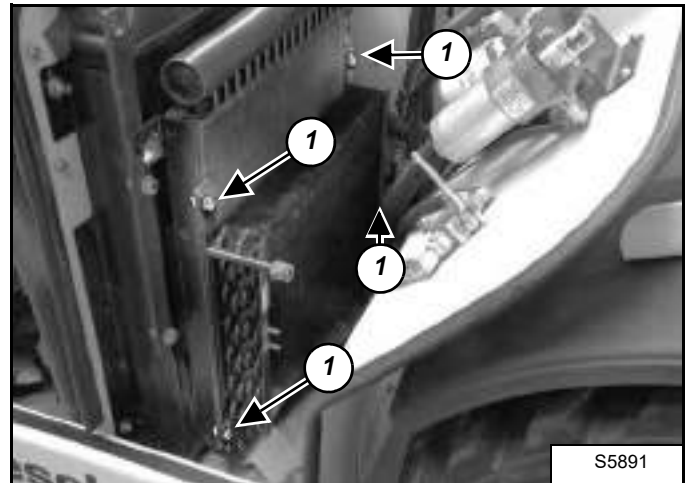
NOTE: Install caps and plugs on all fittings.

Figure 80-61-2



Remove the A/C hose (Item 1) [Figure 80-61-2] from the condenser.

Figure 80-61-3



Remove the two bolts and nuts (Item 1) [Figure 80-61-3] from each side of the condenser.

Tilt the condenser forward and remove.

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

RECEIVER / DRIER

Removal And Installation

Open the engine cover.

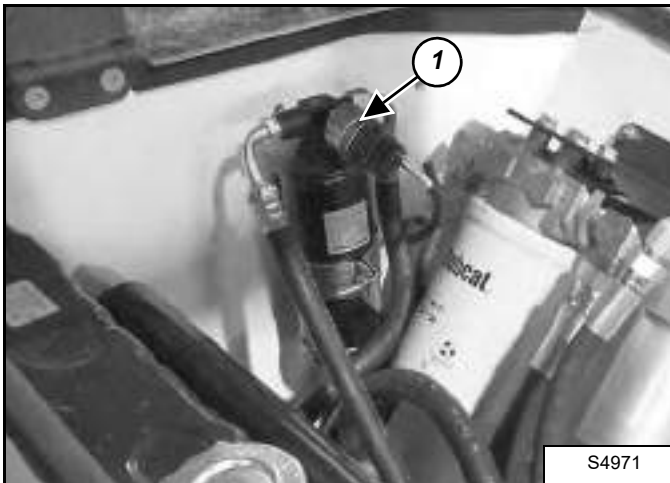
Remove the refrigerant from the A/C system. (See SYSTEM CHARGING AND RECLAMATION on Page 80-40-1.)

WARNING

In the event of a leakage, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

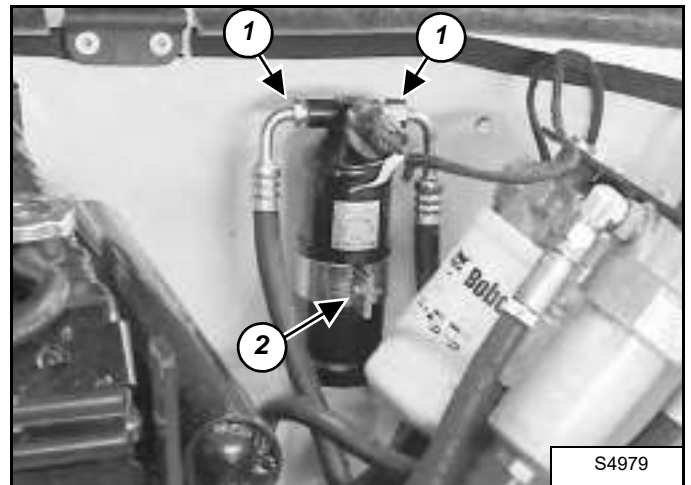
W-2371-0500

Figure 80-70-1



Unplug the connector (Item 1) [Figure 80-70-1] from the pressure switch.

Figure 80-70-2



Remove the two hoses (Item 1) [Figure 80-70-2] from the Receiver / Drier.

NOTE: Mark the hoses for correct installation.

NOTE: Install caps and plugs on all fittings.

Loosen the bolt (Item 2) [Figure 80-70-2] on the mounting bracket.

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

PRESSURE SWITCH

Removal And Installation

Open the engine cover.

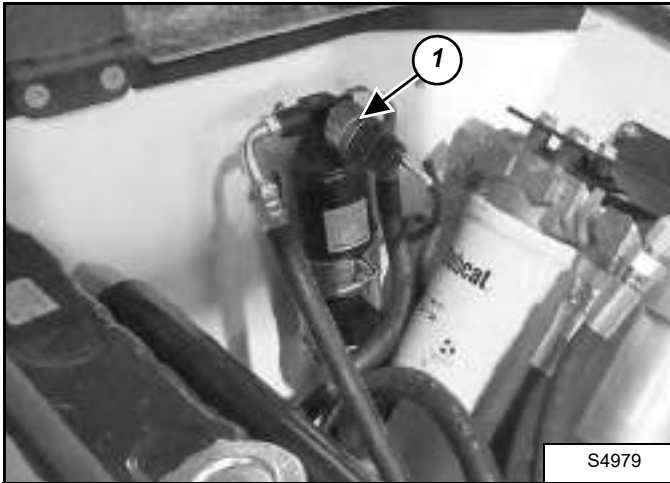
Remove the refrigerant from the A/C system. (See SYSTEM CHARGING AND RECLAMATION on Page 80-40-1.)

WARNING

In the event of a leakage, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

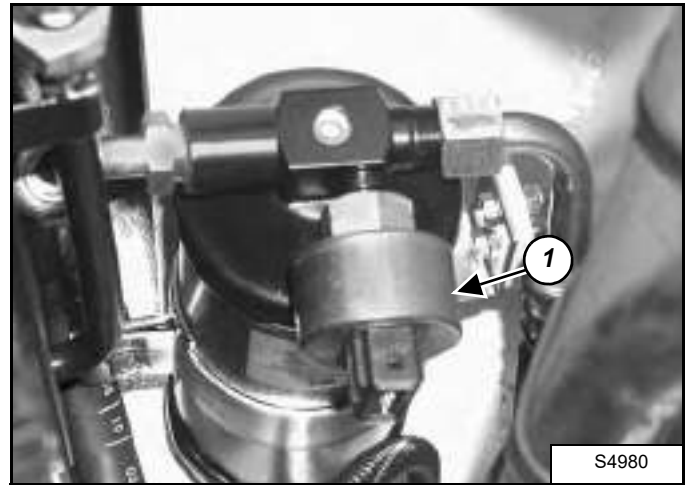
W-2371-0500

Figure 80-80-1



Unplug the connector (Item 1) from the pressure switch (Item 2) **[Figure 80-80-1]**.

Figure 80-80-2



Remove the pressure switch (Item 1) **[Figure 80-80-2]** from the Receiver / Drier assembly.



Bobcat®

Dealer Copy -- Not for Resale

EVAPORATOR/BLOWER UNIT (S/N AC1912999 & BELOW)

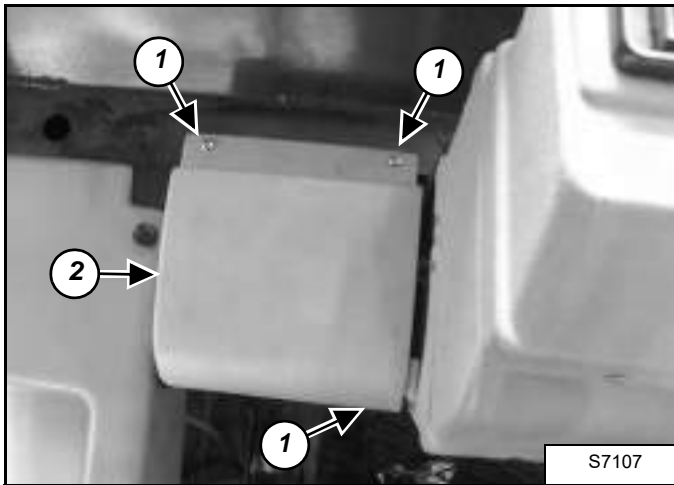
Removal And Installation



In the event of a leakage, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

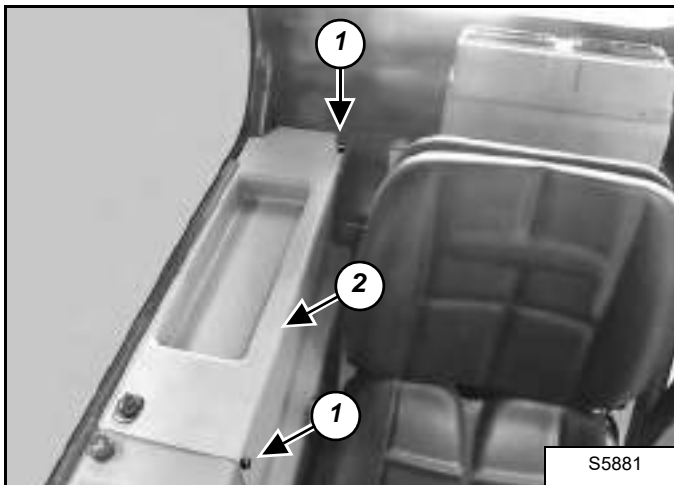
W-2371-0500

Figure 80-90-1



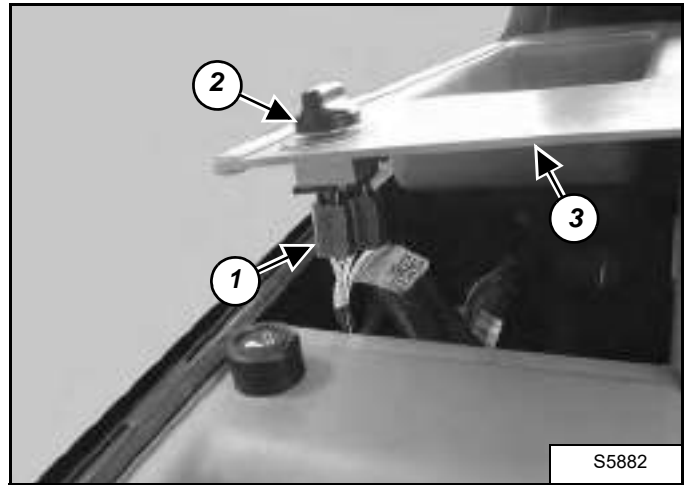
Remove the three screws (Item 1) and remove the cover (Item 2) [Figure 80-90-1].

Figure 80-90-2



Remove the knobs (Item 1) and raise the fuse box cover (Item 2) [Figure 80-90-2] gently.

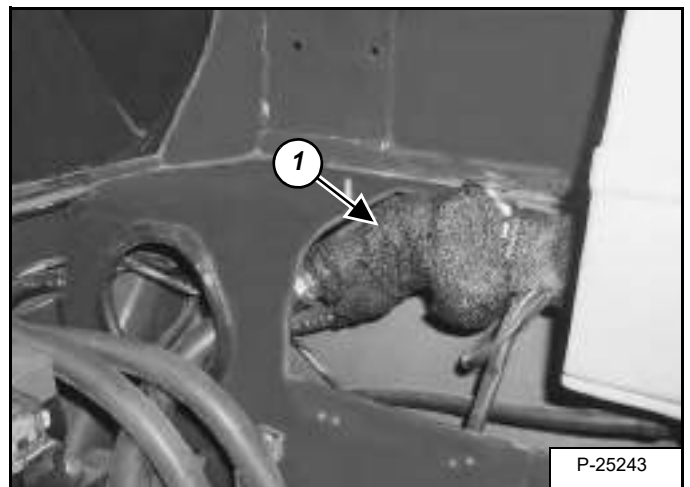
Figure 80-90-3



Remove the main wire harness connector (Item 1) from the blower fan switch (Item 2) [Figure 80-90-3].

Remove the fuse box cover (Item 3) [Figure 80-90-3].

Figure 80-90-4



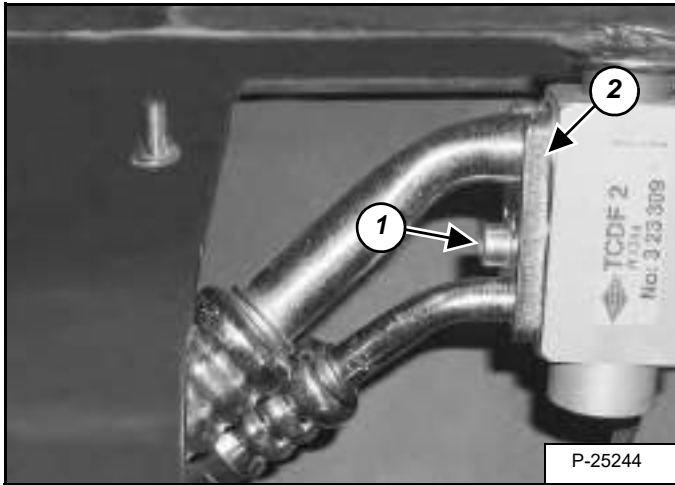
Temporarily remove the covering (Item 1) [Figure 80-90-4] from the A/C hoses and expansion valve.

Dealer Copy -- Not for Resale

EVAPORATOR/BLOWER UNIT (S/N AC1912999 & BELOW) (CONT'D)

Removal And Installation (Cont'd)

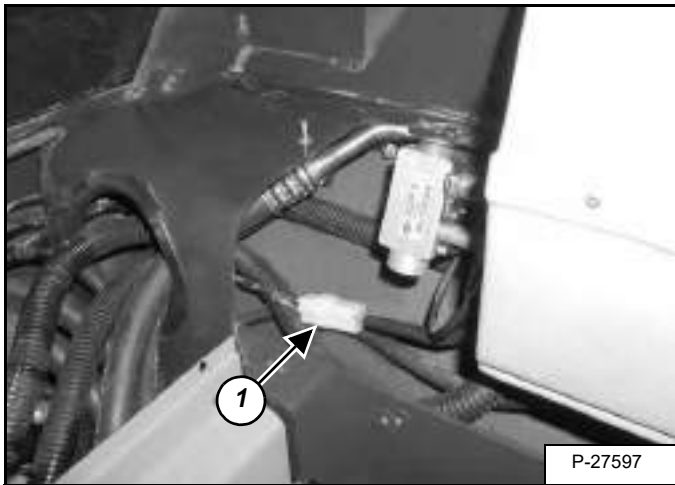
Figure 80-90-5



Remove the bolt (Item 1) and plate (Item 2) [Figure 80-90-5]. Remove the two A/C hoses.

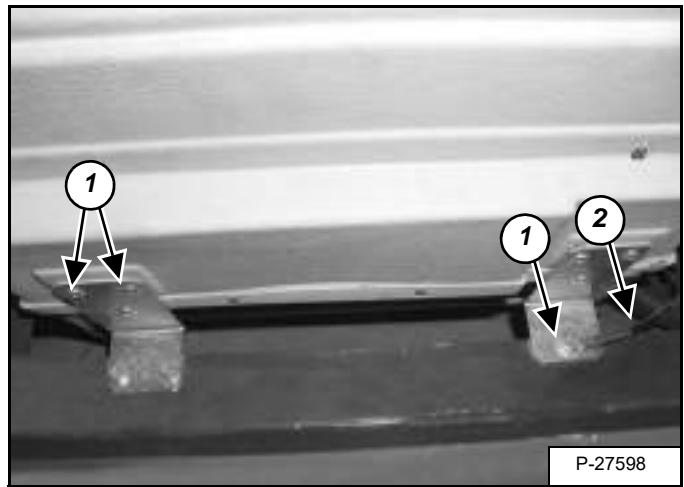
NOTE: Plug the A/C hoses to avoid contamination.

Figure 80-90-6



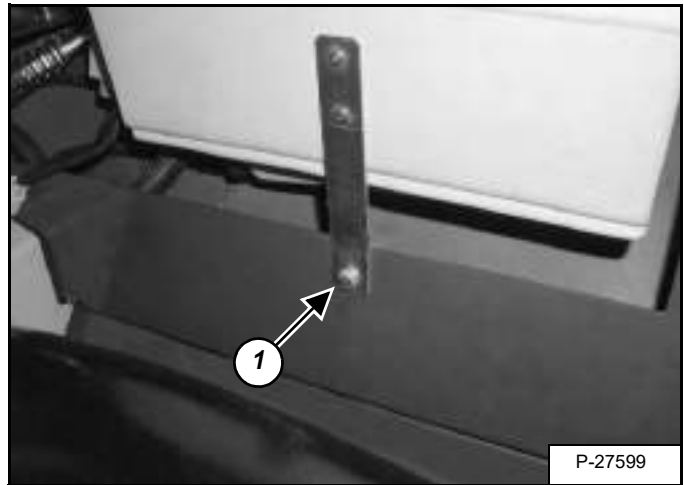
Disconnect the thermostat wiring connector (Item 1) [Figure 80-90-6].

Figure 80-90-7



Remove the three mount bolts (Item 1) and ground wire (Item 2) [Figure 80-90-7] from the back of the evaporator unit.

Figure 80-90-8



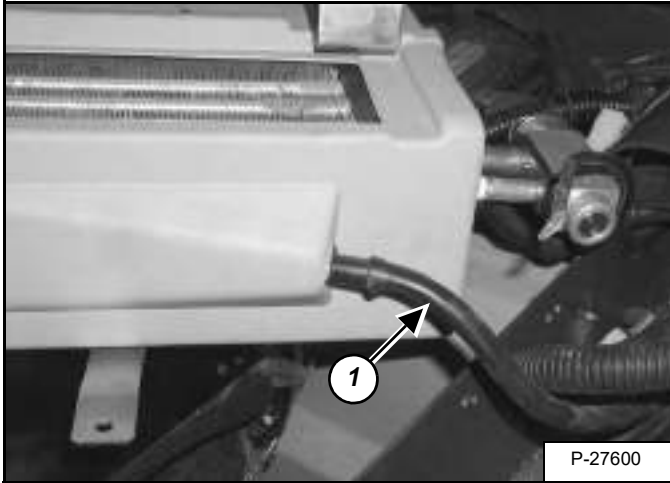
Remove the front mounting bolt (Item 1) [Figure 80-90-8].

Lay the evaporator/blower unit on the seat.

EVAPORATOR/BLOWER UNIT (S/N AC1912999 & BELOW) (CONT'D)

Removal And Installation (Cont'd)

Figure 80-90-9



Remove the drain hose (Item 1) **[Figure 80-90-9]**.

Remove the evaporator/blower unit from the machine.



Bobcat®

Dealer Copy -- Not for Resale

EVAPORATOR/BLOWER UNIT (S/N AC1913000 & ABOVE)

Removal And Installation

Remove the refrigerant from the A/C system. (See Reclamation Procedure on Page 80-40-1.)

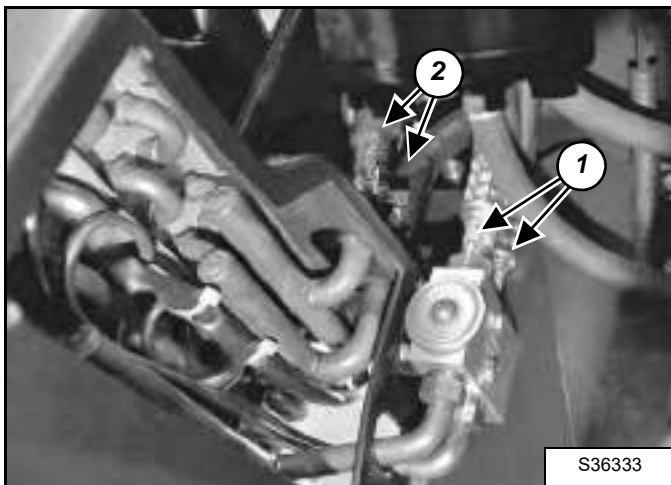


In the event of a leak, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R-134a refrigerant gives a toxic gas.

W-2371-0611

Remove the dash cover / steering column cover. (See Removal And Installation on Page 50-121-1.)

Figure 80-91-1

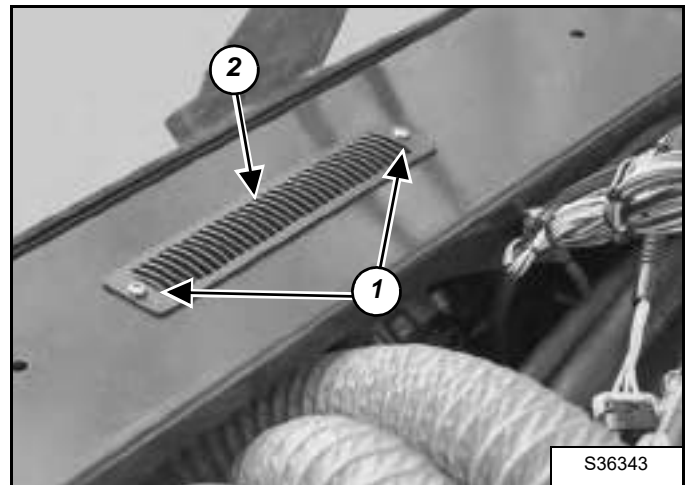


Mark and remove both A/C hoses (Item 1) [Figure 80-91-1].

NOTE: Plug the A/C hoses (Item 1) [Figure 80-91-1] to avoid contamination.

Remove the two heater hoses (Item 2) [Figure 80-91-1].

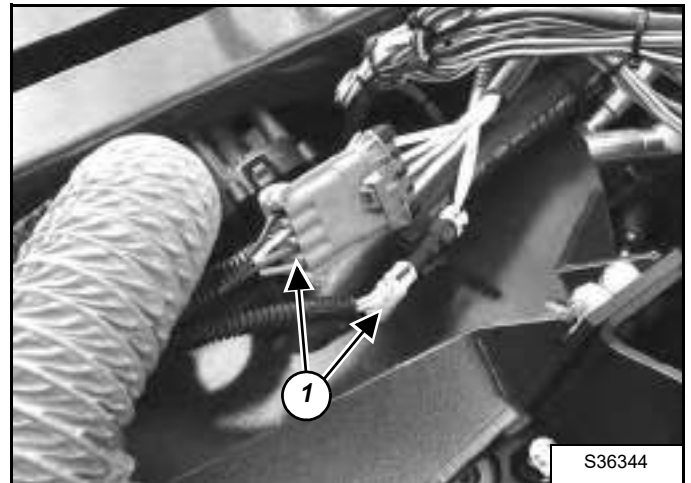
Figure 80-91-2



Remove the two screws (Item 1) [Figure 80-91-2].

Remove the vent (Item 2) [Figure 80-91-2].

Figure 80-91-3



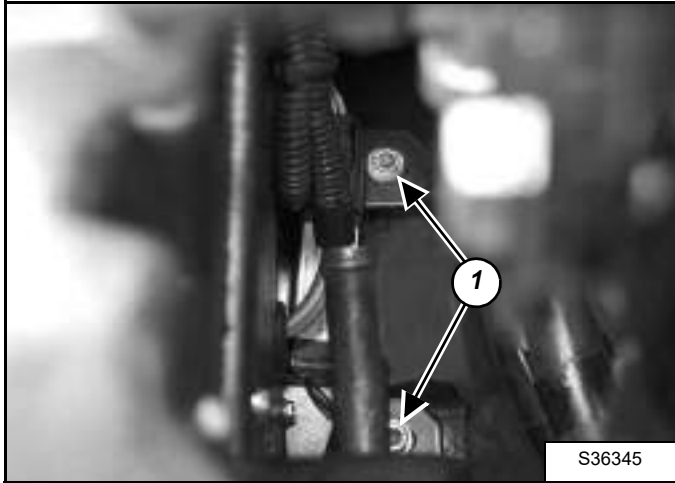
Unplug the connectors (Item 1) [Figure 80-91-3] located under the dashboard.

Dealer Copy -- Not for Resale

EVAPORATOR / BLOWER / HEATER UNIT (S/N AC1913000 & ABOVE) (CONT'D)

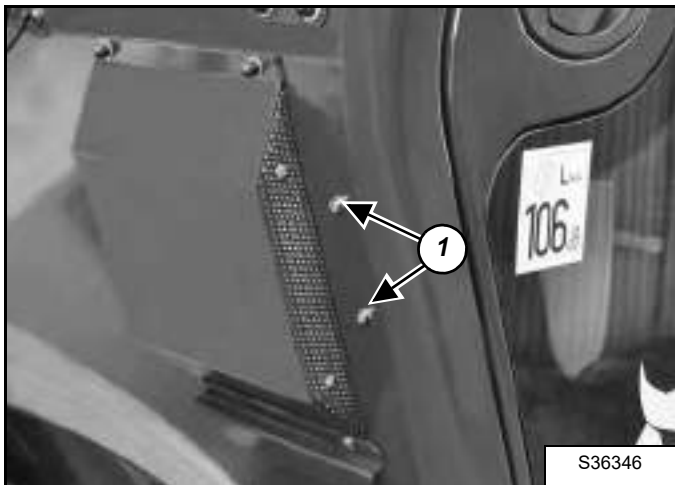
Removal And Installation (Cont'd)

Figure 80-91-4



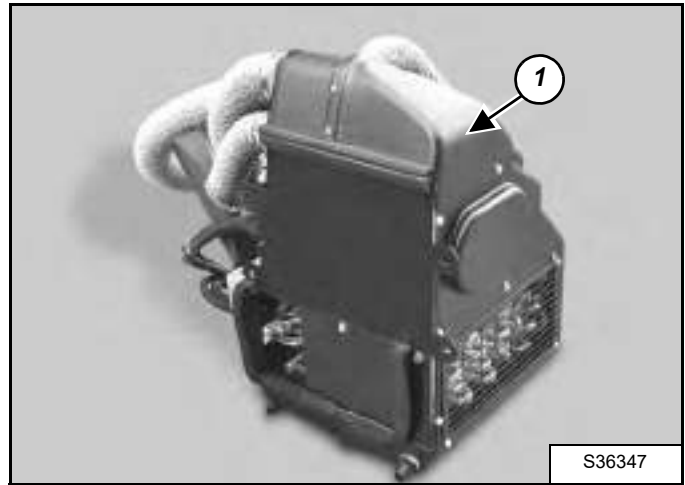
Remove the two bolts (Item 1) [Figure 80-91-4] on the right side of the evaporator / blower unit.

Figure 80-91-5



Remove the two bolts (Item 1) [Figure 80-91-5] on the left side of the evaporator / blower unit outside the cab.

Figure 80-91-6



Remove the evaporator / blower unit (Item 1) [Figure 80-91-6].

EXPANSION VALVE (S/N AC1912999 & BELOW)

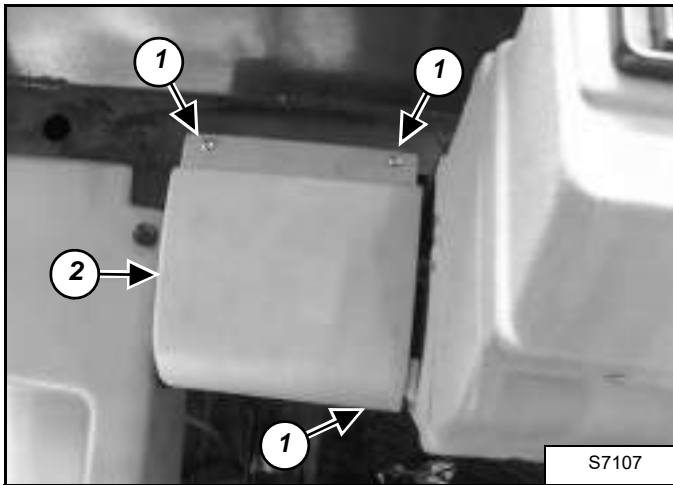
Removal And Installation



In the event of a leakage, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R134a refrigerant gives a toxic gas.

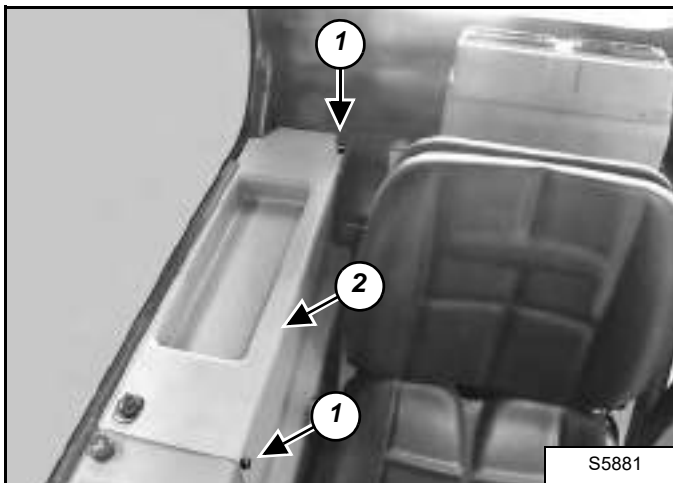
W-2371-0500

Figure 80-100-1



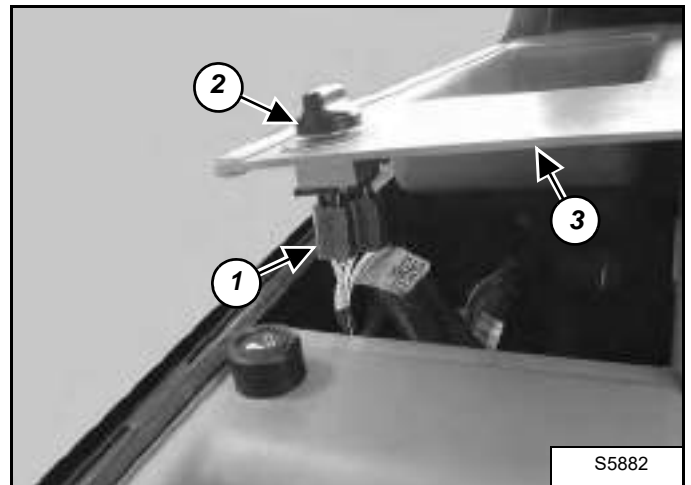
Remove the three screws (Item 1) and remove the cover (Item 2) [Figure 80-100-1].

Figure 80-100-2



Remove the knobs (Item 1) and raise the fuse box cover (Item 2) [Figure 80-100-2] gently.

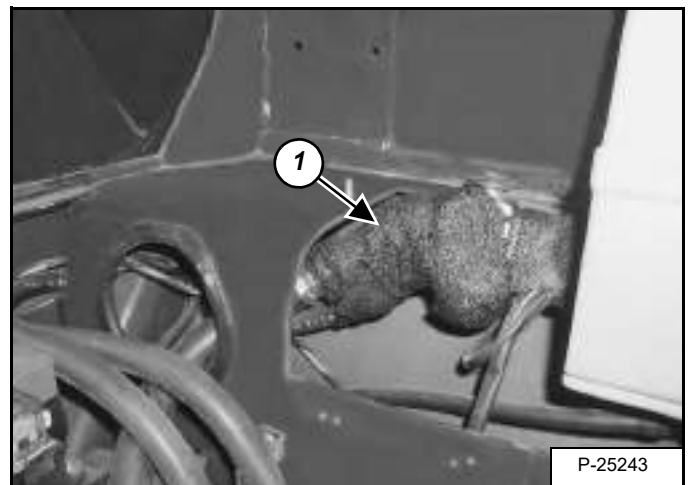
Figure 80-100-3



Remove the main wire harness connector (Item 1) from the blower fan switch (Item 2) [Figure 80-100-3].

Remove the fuse box cover (Item 3) [Figure 80-100-3].

Figure 80-100-4



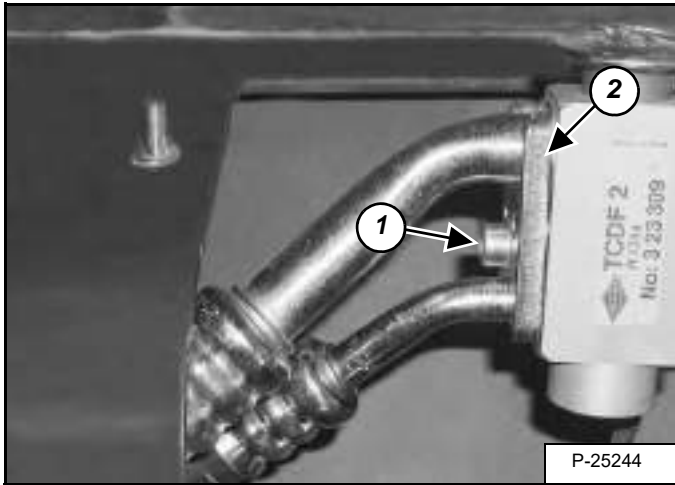
Temporarily remove the covering (Item 1) [Figure 80-100-4] from the A/C hoses and expansion valve.

Dealer Copy -- Not for Resale

**EXPANSION VALVE (S/N AC1912999 & BELOW)
(CONT'D)**

Removal And Installation (Cont'd)

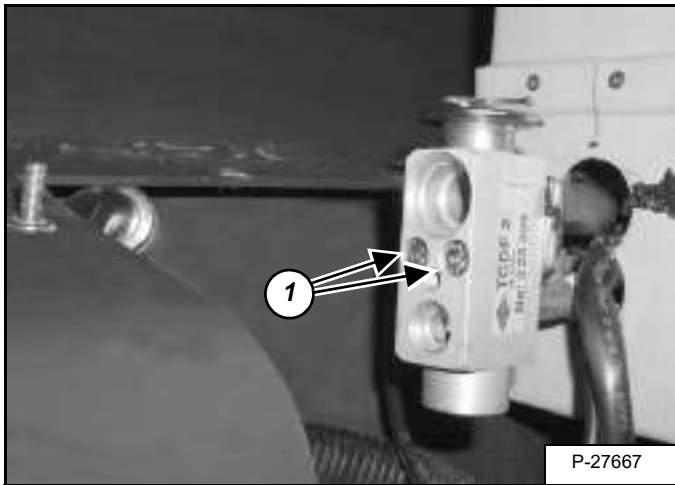
Figure 80-100-5



Remove the bolt (Item 1) and plate (Item 2) [Figure 80-100-5]. Remove the two A/C hoses.

NOTE: Plug the A/C hoses to avoid contamination.

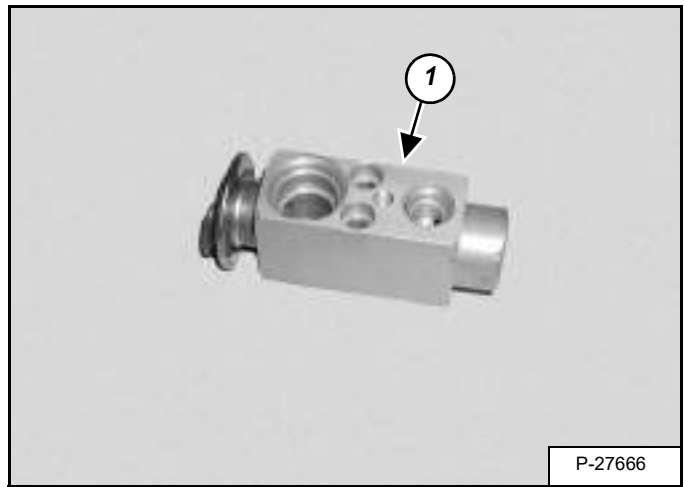
Figure 80-100-6



Remove the two mount bolts (Item 1) [Figure 80-100-6].

Remove the expansion valve.

Figure 80-100-7



The expansion valve (Item 1) [Figure 80-100-7] is replaced as a complete unit.

EXPANSION VALVE (S/N AC1913000 & ABOVE)

Removal And Installation

Remove the refrigerant from the A/C system. (See Reclamation Procedure on Page 80-40-1.)

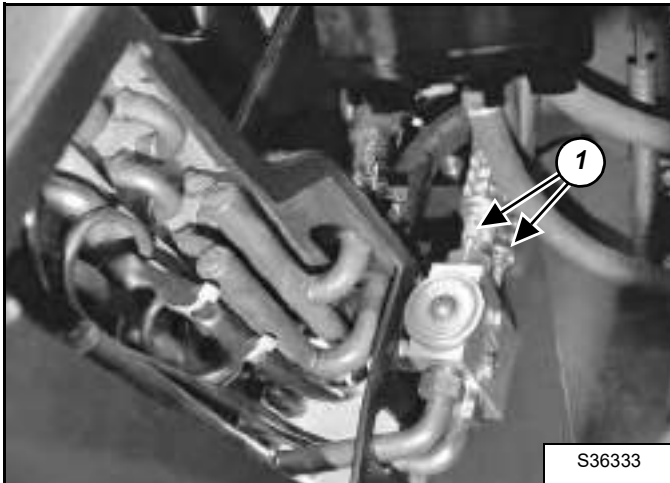
WARNING

In the event of a leak, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R-134a refrigerant gives a toxic gas.

W-2371-0611

Remove the dash cover / steering column cover. (See Removal And Installation on Page 50-121-1.)

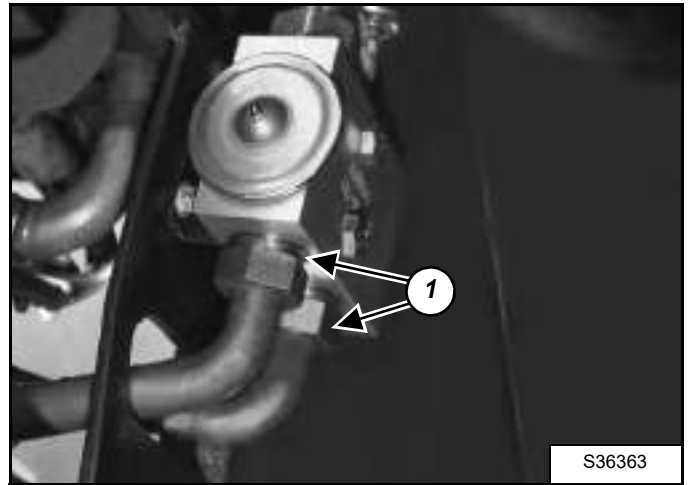
Figure 80-101-1



Mark and remove both A/C hoses (Item 1) [Figure 80-101-1].

NOTE: Plug the A/C hoses (Item 1) [Figure 80-101-1] to prevent contamination.

Figure 80-101-2

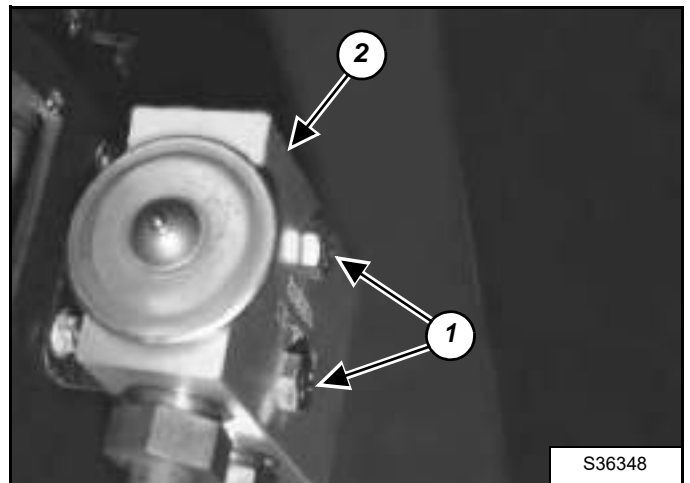


Remove the two evaporator fittings (Item 1) [Figure 80-101-2] from the expansion valve.

Installation: Tighten the two evaporator fittings to 29,8 N•m (22 ft-lb) torque.

NOTE: Plug the evaporator tubelines to prevent contamination.

Figure 80-101-3



Remove the two mount bolts (Item 1) [Figure 80-101-3].

Remove the expansion valve (Item 2) [Figure 80-101-3].

NOTE: The expansion valve (Item 2) [Figure 80-101-3] is replaced as a complete unit.

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

HEATER ASSEMBLY

S/N AC1913000 & Above:

(See Removal And Installation on Page 80-91-1.)

S/N AC1912999 & Below:

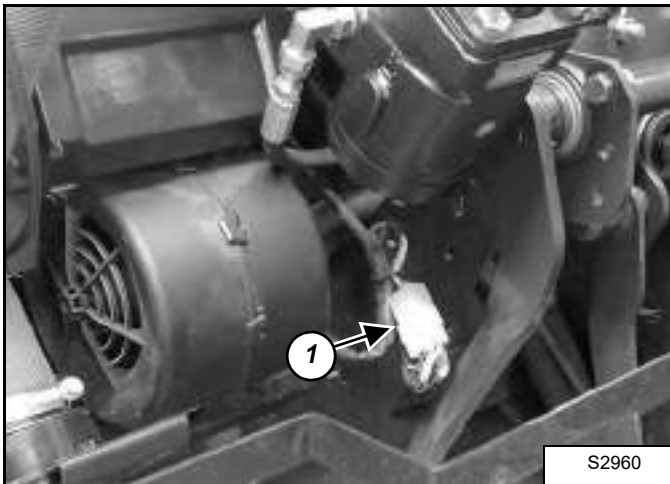
Removal And Installation

Remove the travel/signal levers. (See TRAVEL LEVER (S/N AC1912999 & BELOW) on Page 60-60-1.)

Remove the instrument panel. (See INSTRUMENT PANEL (S/N AC1912999 & BELOW) on Page 60-70-1.)

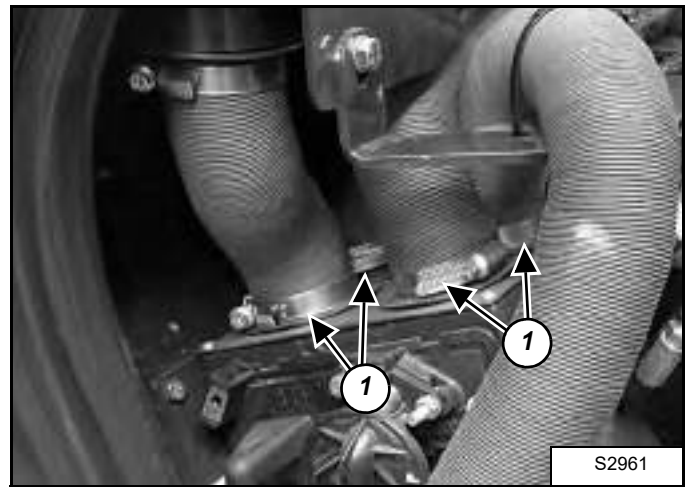
Remove the dash cover/steering column cover. (See DASH COVER/STEERING COLUMN COVER (S/N AC1912999 & BELOW) on Page 50-120-1.)

Figure 80-110-1



Disconnect the harness connector (Item 1) [Figure 80-110-1].

Figure 80-110-2



Remove the vent hoses (Item 1) [Figure 80-110-2] from the top of the assembly.

Figure 80-110-3



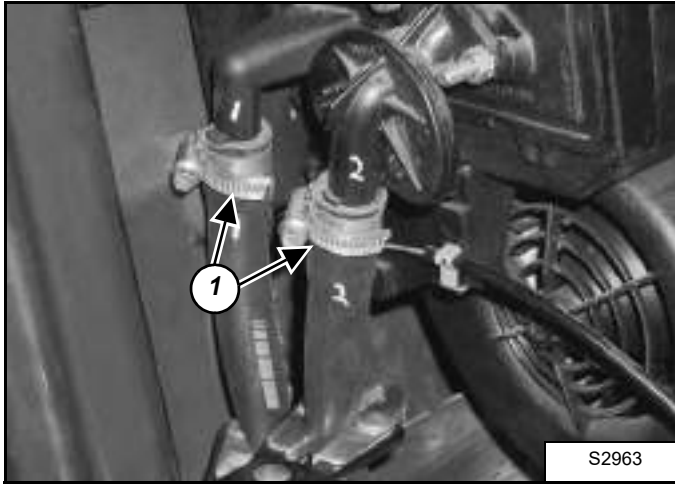
Clamp the heater hoses [Figure 80-110-3].

Dealer Copy -- Not for Resale

HEATER ASSEMBLY (CONT'D)

Removal And Installation (Cont'd)

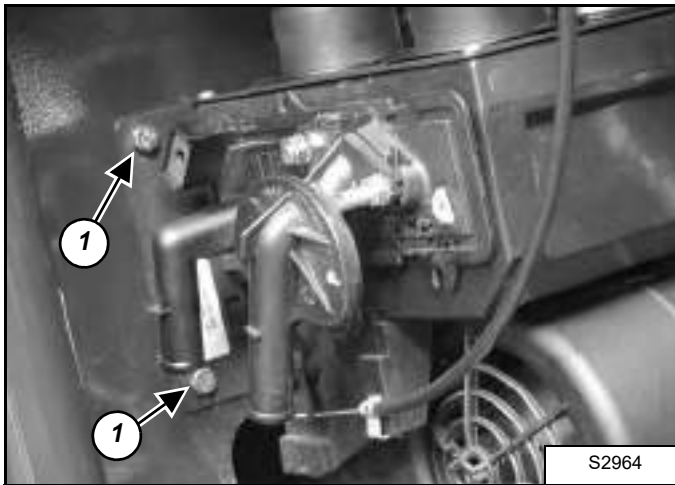
Figure 80-110-4



Remove the heater hoses (Item 1) [Figure 80-110-4] from the heater assembly.

NOTE: Mark the hoses for correct installation.

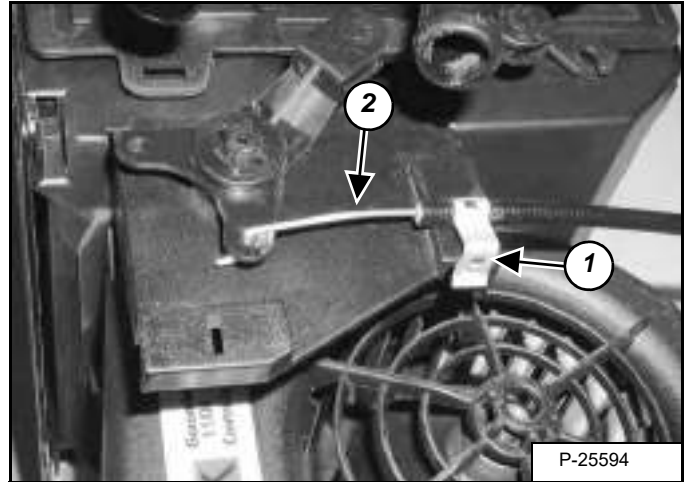
Figure 80-110-5



Remove the mounting bolts (Item 1) [Figure 80-110-5] and remove the heater assembly.

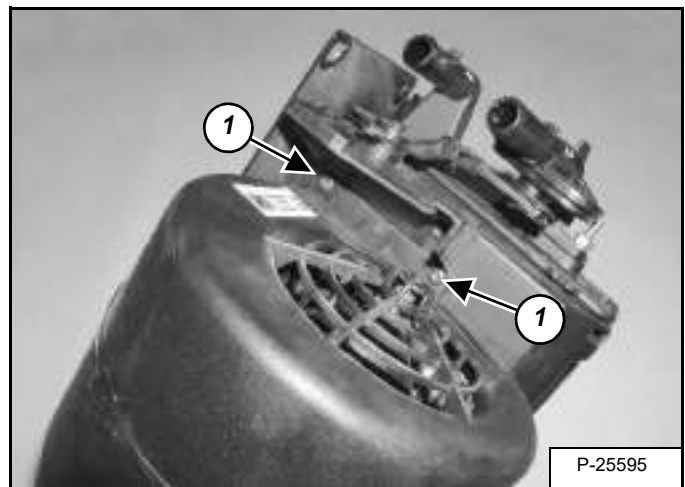
Fan Removal And Installation

Figure 80-110-6



Carefully remove the clip (Item 1) and cable (Item 2) [Figure 80-110-6].

Figure 80-110-7



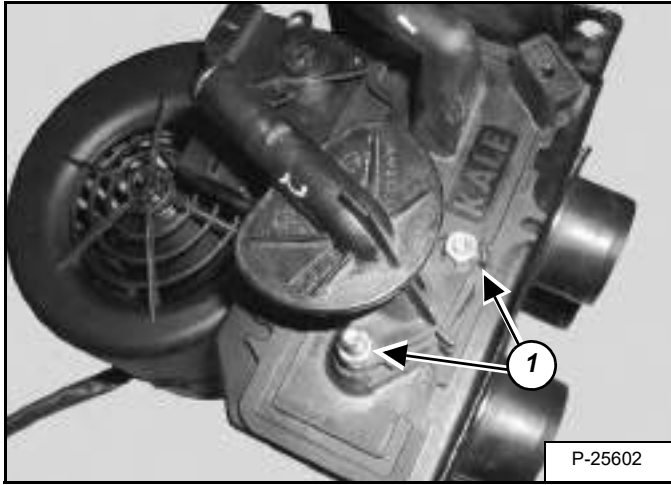
Remove the blower fan mounting bolts (Item 1) [Figure 80-110-7] and remove the blower fan.

Dealer Copy -- Not for Resale

HEATER ASSEMBLY (CONT'D)

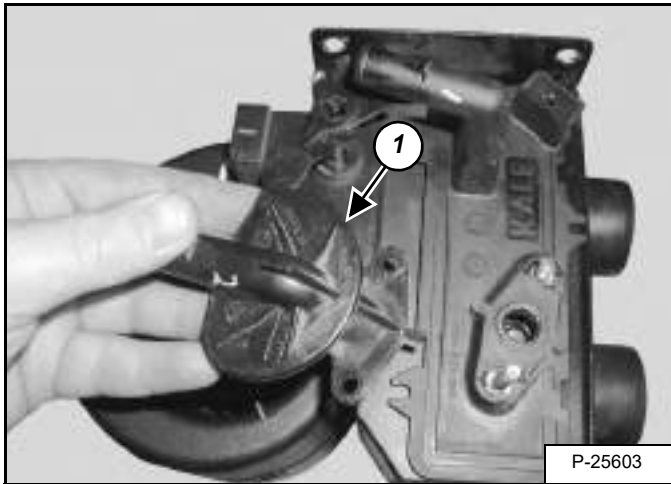
Core Removal And Installation

Figure 80-110-8



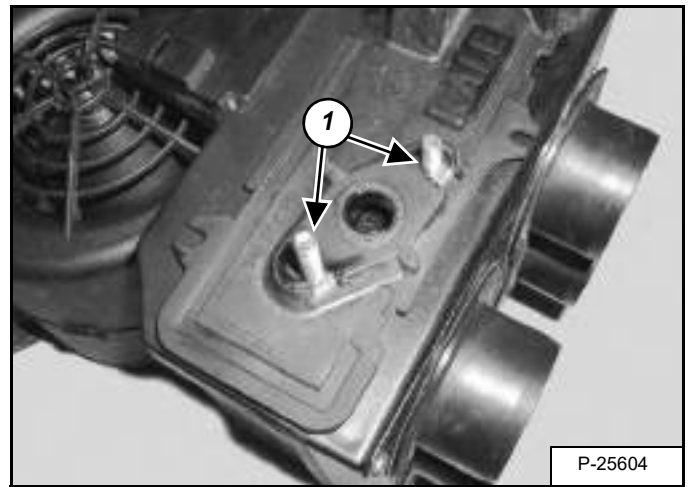
Remove the two flange mounting nuts (Item 1) [Figure 80-110-8].

Figure 80-110-9



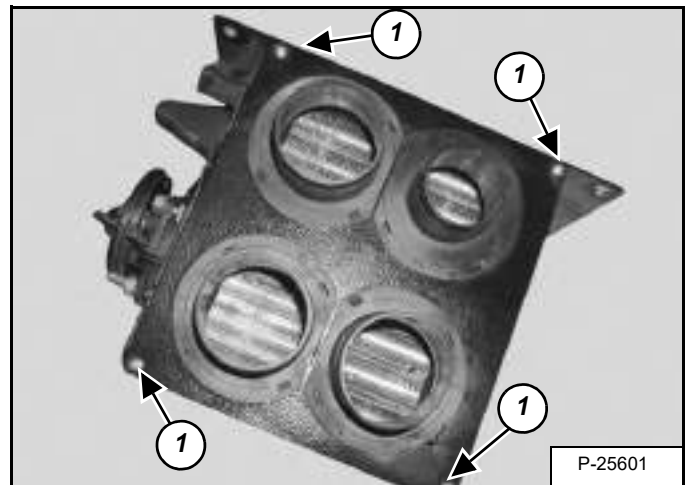
Remove the flange / linkage assembly (Item 1) [Figure 80-110-9] from assembly.

Figure 80-110-10



Remove the two bolts (Item 1) [Figure 80-110-10] and save for later use.

Figure 80-110-11



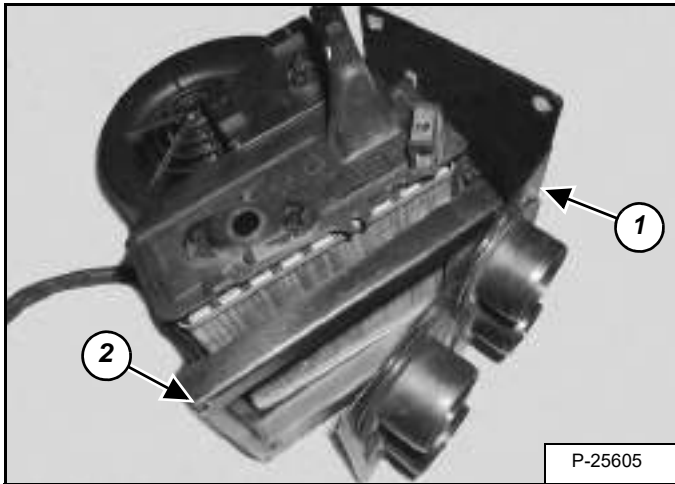
Remove the four screws (Item 1) [Figure 80-110-11] from the vent bracket.

Dealer Copy -- Not for Resale

HEATER ASSEMBLY (CONT'D)

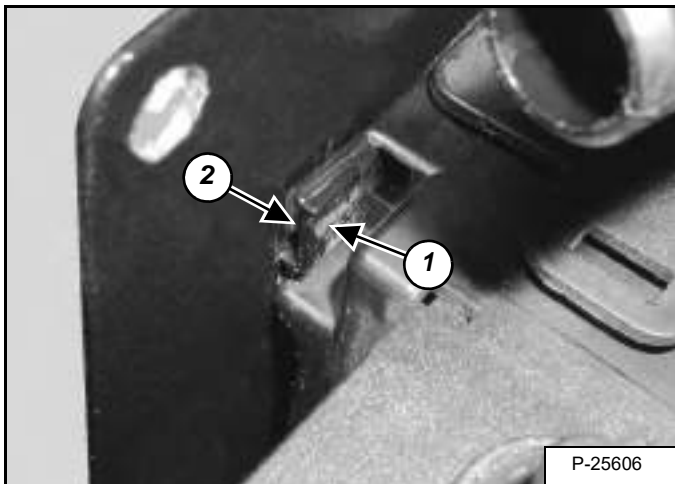
Core Removal And Installation (Cont'd)

Figure 80-110-12



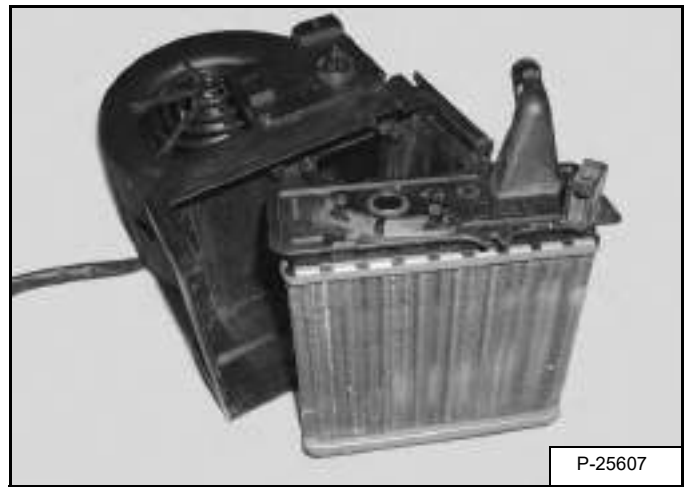
Remove the end bracket (Item 1) and spacer (Item 2) [Figure 80-110-12] from the assembly.

Figure 80-110-13



Be sure to separate the bracket (Item 1) and tab (Item 2) [Figure 80-110-13].

Figure 80-110-14



Slide the core from the housing [Figure 80-110-14].

SPECIFICATIONS

(T2250) TELESCOPIC HANDLER SPECIFICATIONS	SPEC-10-1
Machine Dimensions	SPEC-10-1
Performance	SPEC-10-2
Weights	SPEC-10-2
Engine	SPEC-10-2
Controls	SPEC-10-3
Drive System	SPEC-10-3
Traction	SPEC-10-3
Steering	SPEC-10-3
Brakes	SPEC-10-3
Fluid Capacities	SPEC-10-4
Hydraulic System	SPEC-10-4
Electrical System	SPEC-10-4
Instrument Panel	SPEC-10-5
Environmental	SPEC-10-5
Temperature Range	SPEC-10-5
MACHINE TORQUE SPECIFICATIONS	SPEC-20-1
Specifications	SPEC-20-1
TORQUE SPECIFICATIONS FOR BOLTS	SPEC-30-1
Torque for General SAE Bolts	SPEC-30-1
Torque For General Metric Bolts	SPEC-30-2
HYDRAULIC CONNECTION SPECIFICATIONS	SPEC-40-1
O-ring Face Seal Connection	SPEC-40-1
Straight Thread O-ring Fitting	SPEC-40-1
Tubelines And Hoses	SPEC-40-1
Flare Fitting	SPEC-40-2
O-ring Flare Fitting	SPEC-40-3
Port Seal Fitting	SPEC-40-5
HYDRAULIC/HYDROSTATIC FLUID SPECIFICATIONS	SPEC-50-1
Specifications	SPEC-50-1
CONVERSIONS	SPEC-60-1
Decimal And Millimeter Equivalents	SPEC-60-1
U.S. To Metric Conversion	SPEC-60-2

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

(T2250) TELESCOPIC HANDLER SPECIFICATIONS



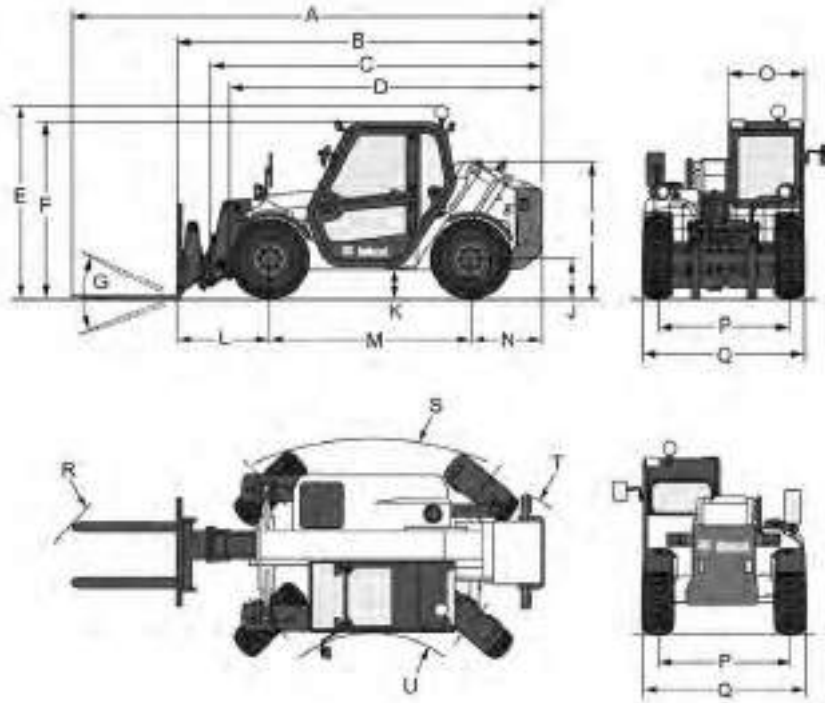
WARNING

Each attachment and each Telescopic Handler have different Load Capacity Charts. For example: An 84 in bucket used on a T2250 will have its own chart; that same 84 in bucket when used on a T3571 will have a different chart. Be sure you use the correct chart for your attachment and Telescopic Handler combination.

Dimensions are given for machine equipped with standard tyres and can vary with other tyre types.

Where applicable, specifications conform to SAE, ASME or ISO standards and are subject to change without notice.

Machine Dimensions



(A) Overall length (with forks)	5330 mm (209.8 in)
(B) Overall length (with carriage)	4145 mm (163.2 in)
(C) Overall length (Bob-Tach™ without attachment)	3984 mm (156.8 in)
(C) Overall length (Quick Tach without attachment)	4000 mm (157.5 in)
(D) Overall length (to front tyres)	3585 mm (141.1 in)
(E) Overall height (with rotating beacon)	2185 mm (86.0 in)
(F) Overall height	1985 mm (78.1 in)
(G) Carriage rotation angle	148°
(I) Height to back of the machine	1553 mm (61.1 in)
(J) Axle centre height	430 mm (16.9 in)
(K) Ground clearance (from step)	294 mm (11.6 in)
(M) Wheelbase	2300 mm (90.6 in)
(O) Operator cab outside width	860 mm (33.9 in)
(P) Track width (front & rear)	1485 mm (58.5 in)
(Q) Width over standard tyres	1840 mm (72.4 in)
(R) External turning radius (with forks 1200 mm apart)	4280 mm (168.5 in)
(S) External turning radius (at tyres)	3170 mm (124.8 in)
(T) External turning radius (at counterweight)	-
(U) Internal turning radius	1500 mm (59.1 in)
Height to steering wheel	1175 mm (46.3 in)
Operator cab inside width	845 mm (33.3 in)

Dealer Copy -- Not for Resale

(T2556) TELESCOPIC HANDLER SPECIFICATIONS (CONT'D)

Performance

Crowding force	2100 daN (4721 lbf)
Drawbar pull	3100 daN (6969 lbf)
Ground pressure on tyres	600 kPa (87 psi)
Rated operation capacity*	2200 kg (4850 lb)
Capacity at max. height	2200 kg (4850 lb)
Capacity at max. reach (Bob-Tach™)	1000 kg (2205 lb)
Capacity at max. reach (Quick-Tach)	950 kg (2095 lb)
Push force	3100 daN (6969 lbf)
Tipping load	1235 kg (2723 lb)
Lifting height (Bob-Tach™)	5230 mm (206 in)
Lifting height (Quick-Tach)	5210 mm (205 in)
Max. reach (Bob-Tach™)	3010 mm (118.5 in)
Max. reach (Quick-Tach)	3030 mm (119 in)

* Static and dynamic tests have been carried out and passed according to EN1459.

Weights

Weight (unladen)	4695 kg (10351 lb)
Front axle weight unladen	1775 kg (3913 lb)
Rear axle weight unladen	2920 kg (6437.5 lb)
Total weight with pallet frame and forks	5040 kg (11111.5 lb)
Front axle weight with pallet frame and forks	2215 kg (4883 lb)
Rear axle weight with pallet frame and forks	2835 kg (6250 lb)
Total weight with bucket	4995 kg (11012 lb)
Front axle weight with bucket	2235 kg (4927.5 lb)
Rear axle weight with bucket	2760 kg (6085 lb)

Engine

Make / Model	KUBOTA / V3800-DI Turbo
Fuel	Diesel
Cooling	Liquid
Rated power (DIN 6271) at 2400 RPM	55,9 kW (75 hp)
Rated speed	2400 RPM
Maximum torque at 1600 RPM	274 Nm
Number of cylinders	4
Displacement	3,8 L (4 qt) (1 Gal.)
Bore	100 mm (3.94 in)
Stroke	120 mm (4.72 in)
Ignition	Diesel-compression

(T2556) TELESCOPIC HANDLER SPECIFICATIONS (CONT'D)

Controls

Engine	Foot accelerator pedal
Starting	Key-type starter switch and shutdown. Key activated air intake heater
Front auxiliary	Electro hydraulic proportional on joystick
Hydraulics lift and tilt	Hydraulic proportional joystick
Hydraulics telescope in and telescope out	Electro hydraulic proportional on joystick
Service brake	Pedal-activated wet multi-disk on front axle
Secondary brake	Hydrostatic transmission
Parking brake	Hand lever activates spring-applied pressure release multi-disk brake
Steering	LS hydraulic steering via a conventional steering wheel
Speed range and reverse selection	Left-hand multi-function lever
4WD/2WD/parallel drive selection	Three-position switch
Auxiliary pressure release	Manual valve on front of machine

Drive System

Transmission	Hydrostatic with electronic regulation
Main drive	2-speed hydrostatic motor
Filtration	Remote filter with replaceable cartridge

Traction

Standard tyres	Mitas 14x17.5 (425 kPa) (4.25 bar) (61 psi)
Optional tyres	Not yet available
Low speed (forward/reverse)	0-7 km/h (0-4 mph)
High speed (forward/reverse)	0-25 km/h (0-15 mph)
Driving modes	Direct drive / soft drive

Steering

Steering pump	26.7 cc Gear pump with LS valve
Steering modes	2WS / 4WS / CRAB
(R) External turning radius (with forks 1200 mm apart)	4280 mm

Brakes

Engine braking	Hydrostatic
Parking and emergency brake	Negative brake with hydraulic command
Service brake	Oil-immersed disk

Dealer Copy -- Not for Resale

(T2556) TELESCOPIC HANDLER SPECIFICATIONS (CONT'D)

Fluid Capacities

Axle and reduction gears front / rear	8,9 / 5,6 L (9 / 7 qt)(2.35 / 1.48 Gal.)
Cooling system	11 L (11.6 qt) (2.9 Gal.)
Engine oil	12 L (12.6 qt)(3.2 Gal.)
Engine lubrication plus oil filter	-
Fuel tank	91 L (96 qt) (24 Gal.)
Hydraulic reservoir (hydraulic / overall)	29 / 44 L (30.6 / 46 qt) (7.7 / 11.6 Gal.)
Hydraulic system plus reservoir	70 L (73 qt) (18.5 Gal.)

Hydraulic System

Pump type	Gear pump with LS valve
Pump capacity	85 L/min (22.5 U.S. gpm)
Relief valve pressure setting	25 MPa (250 bar, 3626 psi)
Auxiliary flow	85 L/min (22.5 U.S. gpm)

Electrical System

Alternator	90 A
Battery	12 V - 105 Ah - 950 A cold cranking at -18°C (0°F)
Starter	12 V - 2,7 kW (3.6 hp) gear reduction type

Dealer Copy -- Not for Resale

(T2556) TELESCOPIC HANDLER SPECIFICATIONS (CONT'D)

Instrument Panel

The following functions are monitored by a combination of gauges and warning lights in the operator's line of sight. The system alerts the operator of monitored malfunctions by way of audible and visual indicators.

Gauges

- Total operating hours / job clock / engine speed
- Fuel gauge
- Engine coolant temperature gauge

Indicators

- Left and right turn
- Parking brake
- Longitudinal stability indicator alarm active
- Windscreen wipers
- Work lights
- Flashing warning lights
- Hazard warning lights
- Transmission mode
- Rear fog lights
- Boom-head hydraulic function locked
- Steering mode
- Joystick locked
- Travel speed mode
- Boom float actuation

Warning lights

- Hydraulic fluid temperature over 104°C (219°F) in the transmission loop
- Engine coolant over 110°C (230°F)
- Low oil pressure
- Low fuel level
- Battery not charging
- General warning icon
- Longitudinal stability alarm
 - Green - less than 61% of load
 - Amber - 63 to 68% of load
 - Red - over 71% of load

Dealer Copy -- Not for Resale

Environmental

Noise level LpA (EU Directive 2000/14/EC)	82 dB(A)	Noise level LWA (EU Directive 2000/14/EC)	106 dB(A)
Operator position noise level (EU Directive 2006/42/EC)	104 dB(A)	Uncertainties	YY dB(A)
Whole body vibration (ISO 2631-1) (limit 0.5 m/s ²)	1,2 m/s ²	Uncertainties	0,4 m/s ²
Hand-arm vibration (ISO 5349-1) (limit 2.5 m/s ²)	N/A	Uncertainties	N/A

Temperature Range

Operation and storage	-20°C / + 40°C (-4 / 104°F)
-----------------------	-----------------------------



Bobcat®

Dealer Copy -- Not for Resale

MACHINE TORQUE SPECIFICATIONS

Specifications

Axle

	N•M	FT-LB
Axle To Frame Mounting Bolts	370-410	275-300
Brake Housing Hex Bolt	80	59
Brake Housing Spring Bolts	10	7
Brake Housing Stud	120	88
Differential Lock Retainer Bolt	13	10
Fender Mount Bolt	125-140	90-100
Housing Bolt	320	236
Housing Nut	190	140
King Pin Mount Bolts	190	140
Pinion Ring Gear Bolts	13	10
Planetary Cover Bolts	25	18
Planetary Gear Mount Bolts	120	88
Steering Cylinder Bolts	120	88
Tie Rod Jam Nut	250	185
Tie Rod Nut	220	160
Tie Rod Swivel End	406	300
Turn Stop Adjust Jam Nut	150	110
Wheel Nuts	300	221

Boom

	N•M	FT-LB
Extension Cylinder Base End	180	133
Extension Cylinder Rod End	255-285	188-210
Wear Pads Front	58	43
Wear Pads Rear	39	29

Drive Box

	N•M	FT-LB
Cover Bolts	60	44
Inner Housing Bolts	120	88
Mounting Flange Bolts	60	44

Drive Motor

	N•M	FT-LB
End Cap Bolts	115	85
Mounting Bolts	210	155
Mounting Plate Bolts	63	46

Dealer Copy -- Not for Resale

MACHINE TORQUE SPECIFICATIONS (CONT'D)

Specifications (Cont'd)

Engine

	<i>N•M</i>	<i>FT-LB</i>
A/C Compressor Mount Bolts	120	88
Alternator Mount Bolts	54	45
Starter Mount Bolts	54	45

Hydraulic Pump

	<i>N•M</i>	<i>FT-LB</i>
Filter Head	122	90
Flange Adapter	122	90
Guide Post Bolts	23	17
Mounting Bolts	106	78
Retaining Plate	13	10
Servo End Cap	13	10
Side Cover Bolts	32	24

Dealer Copy -- Not for Resale

TORQUE SPECIFICATIONS FOR BOLTS

Torque for General SAE Bolts

The following table shows standard torque specifications for bolts with zinc phosphate coating. Bolts purchased from Melroe that have zinc phosphate coating are specified by the letter H following the part number.

THREAD SIZE		SAE GRADE 5	SAE GRADE 8
IN LBS (N•m)	0.250	80-90 (9,0-10,2)	110-120 (12,4-13,6)
	0.3125	180-200 (20,3-22,6)	215-240 (24,2-27,1)
FOOT LBS (N•m)	0.375	25-28 (34-38)	35-40 (47-54)
	0.4375	40-45 (54-61)	60-65 (81-88)
	0.500	65-70 (88-95)	90-100 (122-136)
	0.5625	90-100 (122-136)	125-140 (170-190)
	0.625	125-140 (170-190)	175-190 (240-260)
	0.750	220-245 (300-330)	300-330 (410-450)
	0.875	330-360 (450-490)	475-525 (645-710)
	1.000	475-525 (645-710)	725-800 (985-1085)
	1.125	650-720 (880-975)	1050-1175 (1425-1600)
	1.250	900-1000 (1200-1360)	1475-1625 (2000-2200)
	1.375	1200-1350 (1630-1830)	2000-2200 (2720-2980)
	1.500	1500-1650 (2040-2240)	2600-2850 (3530-3870)
	1.625	2000-2800 (2720-2980)	3450-3800 (4680-5150)
	1.750	2500-2750 (3390-3730)	4300-4800 (5830-6500)
	1.875	3150-3500 (4270-4750)	5500-6100 (5830-6500)
	2.000	3800-4200 (5150-5700)	6500-7200 (8800-9800)

Dealer Copy -- Not for Resale

TORQUE SPECIFICATIONS FOR BOLTS (CONT'D)**Torque For General Metric Bolts**

Thread Size (Dia. x Pitch)	Material		
	Head Mark 4	Head Mark 7	Head Mark 10
M 5 x 0.8		4 - 5 N•m (3 - 4 ft-lb)	
M 6 x 1.0		8 - 9 N•m (6 - 7 ft-lb)	8 - 12 N•m (6 - 9 ft-lb)
M 8 x 1.25	8 - 12 N•m (6 - 9 ft-lb)	15 - 22 N•m (11-16 ft-lb)	24 - 34 N•m (18 - 25 ft-lb)
M 10 x 1.25	8 - 14 N•m (13 - 18 ft-lb)	30 - 41 N•m (22 - 30 ft-lb)	49 - 68 N•m (36 - 50 ft-lb)
M 12 x 1.25	30 - 41 N•m (22 - 30 ft-lb)	54 - 73 N•m (40 - 54 ft-lb)	94 - 118 N•m (69 - 87 ft-lb)
M 14 x 1.5	49 - 68 N•m (36 - 50 ft-lb)	79 - 108 N•m (58 - 80 ft-lb)	157 - 186 N•m (116 - 137 ft-lb)

HYDRAULIC CONNECTION SPECIFICATIONS

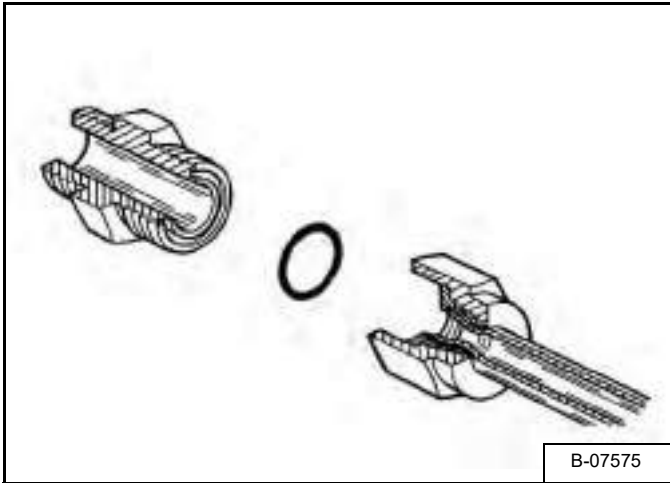
O-ring Face Seal Connection

IMPORTANT

When repairing hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0888

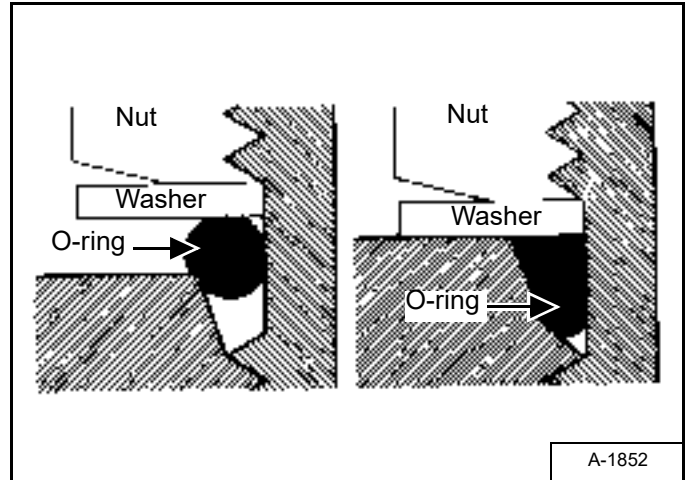
Figure SPEC-40-1



When the fitting is tightened, you can feel when the fitting is tight to eliminate leakage caused by under or over torqued fittings. Use vaseline petroleum jelly to hold the O-ring in position until the fittings are assembled [Figure SPEC-40-1].

Straight Thread O-ring Fitting

Figure SPEC-40-2



Lubricate the O-ring before installing the fitting. Loosen the jam nut and install the fitting. Tighten the jam nut until the washer is tight against the surface [Figure SPEC-40-2].

Tubelines And Hoses

Replace any tubelines that are bent or flattened. They will restrict flow, which will slow hydraulic action and cause heat.

Replace hoses which show signs of wear, damage or weather cracked rubber.

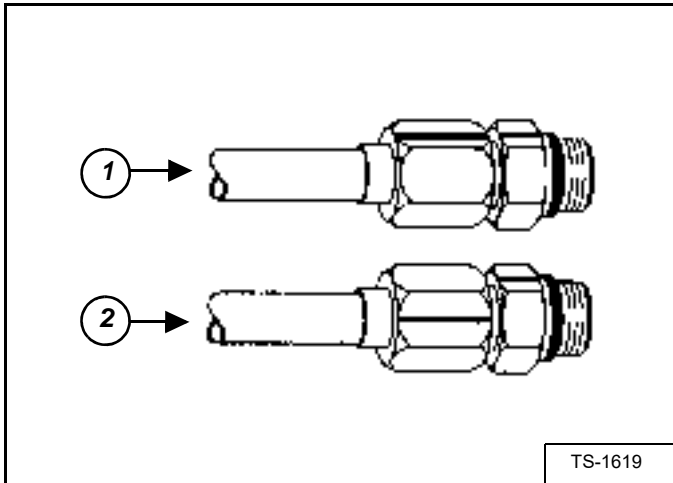
Always use two wrenches when loosening and tightening hose or tubeline fittings.

Dealer Copy -- Not for Resale

**HYDRAULIC CONNECTION SPECIFICATIONS
(CONT'D)**

Flare Fitting

Figure SPEC-40-3



Use the following procedure to tighten the flare fitting:

Tighten the nut until it makes contact with the seat. Make a mark across the *flats* of both the male and female parts of the connection (Item 1) [Figure SPEC-40-3].

Use the chart below to find the correct tightness needed (Item 2) [Figure SPEC-40-3]. If the fitting leaks after tightening, disconnect it and inspect the seat area for damage.

FLARE FITTING TIGHTENING TORQUE

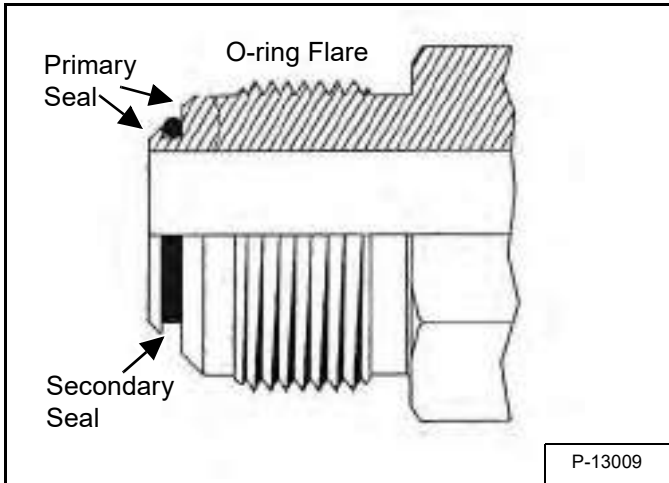
WRENCH SIZE	TUBELINE OUTSIDE DIAMETER	THREAD SIZE	TORQUE FT-LB (N•M)	NEW ROTATE NO. OF HEX FLATS	RE-ASSEMBLY ROTATE NO. OF HEX FLATS
5/8"	5/16"	1/2" - 20	17 (23)	2-1/2	1
11/16"	3/8"	9/16" - 18	22 (30)	2	1
7/8"	1/2"	3/4" - 16	40 (54)	2	1
1"	5/8"	7/8" - 14	60 (81)	1-1/2	1
1-1/4"	3/4"	1-1/16" - 12	84 (114)	1	3/4
1-3/8"	1"	1-5/16" - 12	118 (160)	3/4	3/4

Dealer Copy -- Not for Resale

**HYDRAULIC CONNECTION SPECIFICATIONS
(CONT'D)**

O-ring Flare Fitting

Figure SPEC-40-4

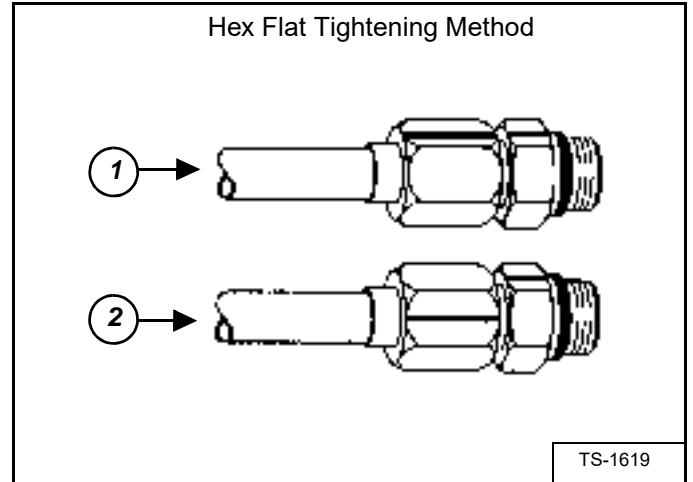


The flare is the primary seal, the O-ring is the secondary seal and helps absorb vibration and pressure pulses at the connection [Figure SPEC-40-4].

If necessary, the O-ring-flare fitting can be used without an O-ring.

Use the following procedure to tighten the O-ring flare fitting.

Figure SPEC-40-5



Tighten the nut until it contacts with the seat. Make a mark across the flats of both the male and female parts of the connection (Item 1) [Figure SPEC-40-5].

Use the chart below to find the correct tightness needed (Item 2) [Figure SPEC-40-5]. If the fitting leaks after tightening, disconnect it and inspect the seat area for damage.

FLARE FITTING TIGHTENING TORQUE					
WRENCH SIZE	TUBELINE OUTSIDE DIAMETER	THREAD SIZE	* TORQUE FT-LB (N•M)	** NEW ROTATE NO. OF HEX FLATS	*** RE-ASSEMBLY ROTATE NO. OF HEX FLATS
5/8"	5/16"	1/2" - 20	17 (23)	2-1/2	1
11/16"	3/8"	9/16" - 18	22 (30)	2	1
7/8"	1/2"	3/4" - 16	40 (54)	2	1
1"	5/8"	7/8" - 14	60 (81)	1-1/2	1
1-1/4"	3/4"	1-1/16" - 12	84 (114)	1	3/4
1-3/8"	1"	1-5/16" - 12	118 (160)	3/4	3/4

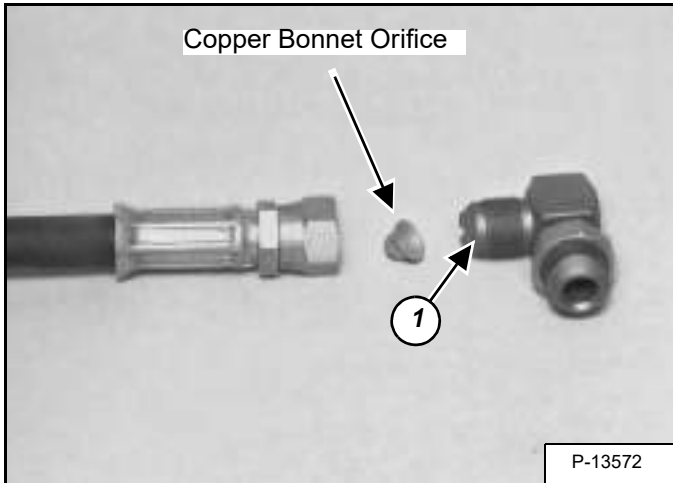
*	If a torque wrench is used to tighten a new fitting to a used hose/tubeline.
*	If a torque wrench is used to tighten a used fitting to a new hose/tubeline.
*	If a torque wrench is used to tighten a new fitting to a new hose/tubeline.
**	If using the hex flat tightening method to tighten a new fitting to a new hose/tubeline.
**	If using the hex flat tightening method to tighten a new fitting to a used hose/tubeline.
***	If using the hex flat tightening method to tighten a used fitting to a new hose/tubeline.

Dealer Copy -- Not for Resale

**HYDRAULIC CONNECTION SPECIFICATIONS
(CONT'D)**

O-ring Flare Fitting (Cont'd)

Figure SPEC-40-6



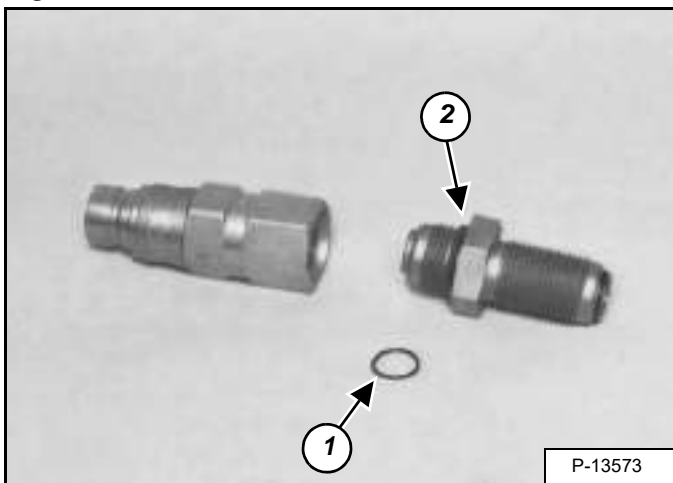
NOTE: O-ring flare fittings are not recommended in all applications. Use the standard flare fittings in these applications.

Do not use a O-ring flare fitting when a copper bonnet orifice is used. When tightened the connection at the bonnet may distort the flare face and prevent it from sealing.

Use a standard flare fitting (Item 1) [Figure SPEC-40-6] as shown.

When a O-ring flare fitting is used as a straight thread port adapter the O-ring flare face is not used to seal. The O-ring may come off the fitting and enter the system.

Figure SPEC-40-7



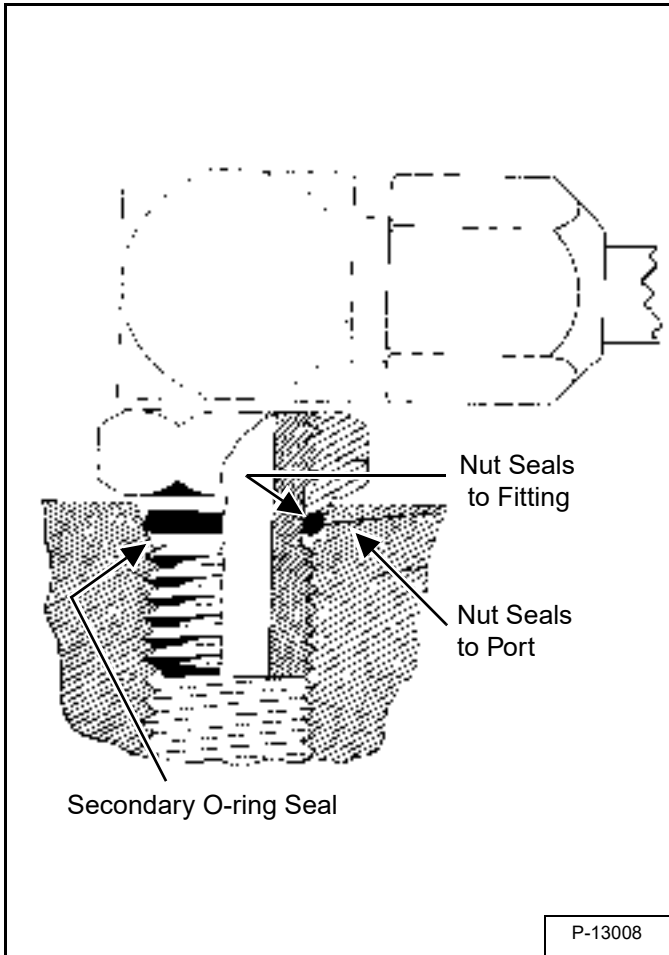
Always remove the O-ring (Item 1) [Figure SPEC-40-7] from the flare face as shown.

An O-ring (Item 2) [Figure SPEC-40-7] is added to the flat boss of the fitting to seal the connection in this application.

**HYDRAULIC CONNECTION SPECIFICATIONS
(CONT'D)**

Port Seal Fitting

Figure SPEC-40-8



The nut is the primary seal, the O-ring is the secondary seal and helps absorb vibration and pressure pulses at the connection [Figure SPEC-40-8].

The hex portion of the nut does not contact the surface of the component when the nut is tight.

Use the following procedure to tighten the port seal fitting:

Port seal and nut, washer and O-ring (O-ring Boss) fittings use the same tightening torque valve chart.

If a torque wrench cannot be used, use the following method.

Tighten the nut until it just makes metal to metal contact, you can feel the resistance.

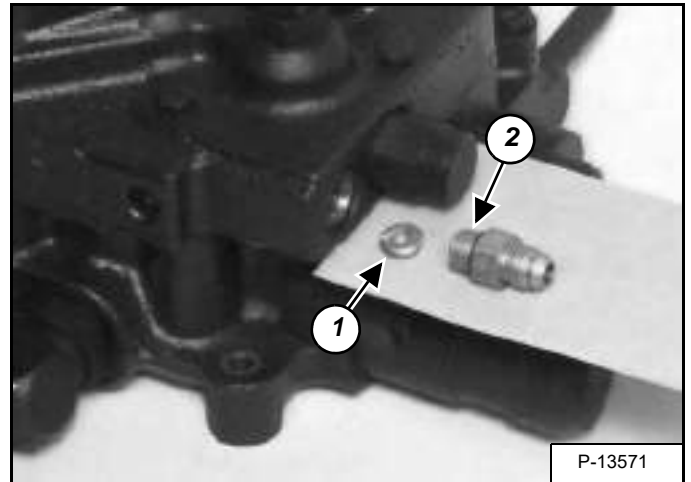
Tighten the nut with a wrench no more than one hex flat maximum.

Do not over tighten the port seal fitting.

NOTE: If a torque wrench cannot be used, use the hex flat tightening method as an approximate guideline.

NOTE: Port seal fittings are not recommended in all applications. Use O-ring boss fittings in these applications.

Figure SPEC-40-9



Do not use port seal fittings when a thread in orifice (Item 1) [Figure SPEC-40-9] is used in the port. The orifice may interfere with the fitting and prevent it from sealing.

Use an O-ring boss fitting (Item 1) [Figure SPEC-40-9] as shown.

PORT SEAL AND O-RING BOSS TIGHTENING TORQUE		
FITTING NUT WRENCH SIZE	THREAD SIZE	TORQUE FT.LBS (N•M)
11/16"	9/16" - 18	22 (30)
15/16"	3/4" - 16	40 (54)
1 - 1/8"	7/8" - 14	60 (81)
1 - 1/4"	1 - 1/16" - 12	84 (114)
1 - 1/2"	1 - 5/16" - 12	118 (160)

Dealer Copy -- Not for Resale



Bobcat®

Dealer Copy -- Not for Resale

HYDRAULIC/HYDROSTATIC FLUID SPECIFICATIONS

Specifications

Use Bobcat axle fluid (P/N 100032-06A), for the drive box, planetarys and axle housing.

Use Bobcat hydraulic/hydrostatic transmission fluid (P/N 6903117). If this fluid is not available, use 10W-30 or 10W-40 SAE Motor Oil (5W-30 for -18°C (0°F) and Below).

DO NOT use automatic transmission fluids in the Telescopic Handler or permanent damage to the transmission will result.

WARNING

Diesel fuel or hydraulic fluid under pressure can penetrate skin or eyes, causing serious injury or death. Fluid leaks under pressure may not be visible. Use a piece of cardboard or wood to find leaks. Do not use your bare hand. Wear safety goggles. If fluid enters skin or eyes, get immediate medical attention from a physician familiar with this injury.

W-2072-0496

When temperatures below zero degree -18°C (0°F) are common, the machine must be kept in a warm building. Extra warm-up time must be used each time the machine is started during cold temperature conditions. Cold fluid will not flow easily and it makes action on the hydraulic function slower. Loss of fluid flow to the hydrostatic pump can cause hydraulic / hydrostatic system damage in less than 60 seconds.

WARNING

During cold weather (0°C (32°F) and below), do not operate machine until the engine has run for at least 5 minutes at less than half throttle. This warm-up period is necessary for foot pedal operation and safe stopping. Do not operate controls during warm-up period.

When temperatures are below -30°C (-20°F), the hydrostatic oil must be heated or kept warm. The hydrostatic system will not get enough oil at low temperatures. Park the machine in an area where the temperature will be above -18°C (0°F) if possible.

W-2027-1285



Bobcat®

Dealer Copy -- Not for Resale

CONVERSIONS

Decimal And Millimeter Equivalents

FRACTIONS	DECIMALS	MM	FRACTIONS	DECIMALS	MM
1/64	0.015625	0.397	33/64	0.515625	13.097
1/32	0.03125	0.794	17/32	0.53125	13.494
3/64	0.046875	1.191	35/64	0.546875	13.891
1/16	0.0625	1.588	9/16	0.5625	14.288
5/64	0.078125	1.984	37/64	0.578125	14.684
3/32	0.09375	2.381	19/32	0.59375	15.081
7/64	0.109375	2.778	39/64	0.609375	15.478
1/8	0.1250	3.175	5/8	0.6250	15.875
9/64	0.140625	3.572	41/64	0.640625	16.272
5/32	0.15625	3.969	21/32	0.65625	16.669
11/64	0.171875	4.366	43/64	0.671875	17.066
3/16	0.1876	4.762	11/16	0.6875	17.462
13/64	0.203125	5.159	45/64	0.703125	17.859
7/32	0.21875	5.556	23/32	0.71875	18.256
15/64	0.234375	5.953	47/64	0.734375	18.653
1/4	0.2500	6.350	3/4	0.7500	19.050
17/64	0.265625	6.747	49/64	0.765625	19.447
9/32	0.28125	7.144	25/32	0.78125	19.844
19/64	0.296875	7.541	51/64	0.796875	20.241
5/16	0.3125	7.938	13/16	0.8125	20.638
21/64	0.328125	8.334	53/64	0.828125	21.034
11/32	0.34375	8.731	27/32	0.84375	21.431
23/64	0.359375	9.128	55/64	0.859375	21.828
3/8	0.3750	9.525	7/8	0.8750	22.225
25/64	0.390625	9.922	57/64	0.890625	22.622
13/32	0.40625	10.319	29/32	0.90625	23.019
27/64	0.421875	10.716	59/64	0.921875	23.416
7/16	0.4375	11.112	15/16	0.9375	23.812
29/64	0.453125	11.509	61/64	0.953125	24.209
15/32	0.46875	11.906	31/32	0.96875	24.606
31/64	0.484375	12.303	63/64	0.984375	25.003
1/2	0.5000	12.700	1	1.000	25.400
1 mm = 0.03937"	0.001" = 0.0254 mm				

Dealer Copy -- Not for Resale

CONVERSION (CONT'D)**U.S. To Metric Conversion**

	TO CONVERT	INTO	MULTIPLY BY
LINEAR MEASUREMENT	Miles	Kilometers	1.609
	Yards	Meters	0.9144
	Feet	Meters	0.3048
	Feet	Centimeters	30.48
	Inches	Meters	0.0254
	Inches	Centimeters	2.54
	Inches	Millimeters	25.4
AREA	Square Miles	Square Kilometers	2.59
	Square Feet	Square Meters	0.0929
	Square Inches	Square Centimeters	6.452
	Acre	Hectare	0.4047
VOLUME	Cubic Yards	Cubic Meters	0.7646
	Cubic Feet	Cubic Meters	0.02832
	Cubic Inches	Cubic Centimeters	16.39
WEIGHT	Tons (Short)	Metric Tons	0.9078
	Pounds	Kilograms	0.4536
	Ounces (Avdp.)	Grams	28.3495
PRESSURE	Bar	Pounds/Square Inch	14,5
WORK	Foot-Pounds	Newton-Metre	1.356
LIQUID VOLUME	Quarts	Liters	0.9463
	Gallons	Liters	3.785
LIQUID FLOW	Gallons/Minute	Liters/Minute	3.785
TEMPERATURE	Fahrenheit	Celsius	1. Subtract 32° 2. Multiply by 5/9

Dealer Copy -- Not for Resale

ALPHABETICAL INDEX

(T2250) TELESCOPIC HANDLER SPECIFICATIONS	SPEC-10-1	ELECTRICAL SYSTEM INFORMATION (S/N AC1913000 & ABOVE)	60-11-1
AIR CLEANER SERVICE	10-60-1	EMERGENCY EXIT	10-210-1
AIR CLEANER	70-60-1	ENGINE AND ENGINE MOUNTS	70-20-1
AIR CONDITIONING SYSTEM FLOW	80-10-1	ENGINE COOLING SYSTEM	10-70-1
ALTERNATOR	60-30-1	ENGINE COOLING SYSTEM	70-70-1
APPROVED BOOM STOP (IF EQUIPPED)	10-160-1	ENGINE COVER	10-170-1
ATTACHMENT CARRIER	10-110-1	ENGINE COVER	50-60-1
AXLE AND DIFFERENTIAL (FRONT)	40-20-1	ENGINE INFORMATION	70-10-1
AXLE AND DIFFERENTIAL (REAR)	40-21-1	ENGINE LUBRICATION SYSTEM	10-90-1
AXLE TOE-IN	40-40-1	ENGINE SPEED CONTROL	70-40-1
AXLES (FRONT AND REAR)	10-130-1	ENGINE AND HYDROSTAT ASSEMBLY	70-30-1
BATTERY	60-20-1	EVAPORATOR/BLOWER UNIT (S/N AC1912999 & BELOW)	80-90-1
BOBCAT TELESCOPIC HANDLER IDENTIFICATION	1-13	EVAPORATOR/BLOWER UNIT (S/N AC1913000 & ABOVE)	80-91-1
BOB-TACH (HAND LEVER) (IF EQUIPPED)	10-110-1	EXHAUST GAS RECIRCULATION (EGR) SYSTEM	70-150-1
BOB-TACH	50-80-1	EXPANSION VALVE (S/N AC1912999 & BELOW)	80-100-1
BOOM ASSEMBLY	50-30-1	EXPANSION VALVE (S/N AC1913000 & ABOVE)	80-101-1
BRAKE VALVE	20-110-1	EXTENSION CYLINDER	20-40-1
BUCKET POSITIONING CYLINDER	20-30-1	FENDER	50-100-1
CAMSHAFT AND TIMING GEARS	70-120-1	FIRE PREVENTION	1-10
COMPRESSOR	80-50-1	FLYWHEEL AND HOUSING	70-140-1
CONDENSER (S/N AC1912999 & BELOW)	80-60-1	FOREWORD	1-7
CONDENSER (S/N AC1913000 & ABOVE)	80-61-1	FRONT AUXILIARY HYDRAULIC PRESSURE RELEASE VALVE	20-200-1
CONVERSIONS	SPEC-60-1	FRONT AXLE	40-30-1
COUNTERWEIGHT	50-90-1	FRONT WIPER MOTOR	60-90-1
CRANKSHAFT AND PISTONS	70-110-1	FUEL SYSTEM	10-80-1
CYLINDER HEAD	70-100-1	FUEL SYSTEM	70-90-1
DASH COVER/STEERING COLUMN COVER (S/N AC1912999 & BELOW)	50-120-1	FUEL TANK	50-70-1
DASH COVER/STEERING COLUMN COVER (S/N AC1913000 & ABOVE)	50-121-1	GEAR PUMP	20-120-1
DELIVERY REPORT	1-12	HEATER ASSEMBLY	80-110-1
DIAGNOSTIC SERVICE CODES	60-160-1	HYDRAULIC / HYDROSTATIC SYSTEM	10-100-1
DRIVE BELT	30-50-1	HYDRAULIC CONNECTION SPECIFICATIONS	SPEC-40-1
DRIVE BOX	20-70-1	HYDRAULIC CONTROL VALVE (FOR S/N AC1911001 - 11251)	20-150-1
DRIVE SHAFT	40-70-1	HYDRAULIC CONTROL VALVE (FOR S/N AC1911252 & ABOVE)	20-151-1
ELECTRICAL SYSTEM INFORMATION (S/N AC1912999 & BELOW)	60-10-1	HYDRAULIC FLUID RESERVOIR	20-130-1

Dealer Copy -- Not for Resale

HYDRAULIC SYSTEM INFORMATION . . .	20-10-1	OPERATOR SEAT	50-20-1
HYDRAULIC/HYDROSTATIC FLUID SPECIFICATIONS	SPEC-50-1	PARKING BRAKE	20-170-1
HYDROSTATIC DRIVE MOTOR	30-30-1	PARKING BRAKE	40-50-1
HYDROSTATIC PUMP (FOR S/N AC1911001 - 11999)	30-40-1	PEDAL ASSEMBLY	60-120-1
HYDROSTATIC PUMP (FOR S/N AC1912000 & ABOVE)	30-41-1	PORT RELIEF VALVES	20-90-1
HYDROSTATIC SYSTEM INFORMATION .	30-10-1	PRESSURE SWITCH	80-80-1
INCHING SWITCH	60-130-1	REAR AXLE	40-90-1
INNER BOOM	50-40-1	REAR WIPER MOTOR	60-110-1
INSTRUMENT PANEL (S/N AC1912999 & BELOW)	60-70-1	RECEIVER / DRIER	80-70-1
INSTRUMENT PANEL (S/N AC1913000 & ABOVE)	60-71-1	REGULAR MAINTENANCE	80-20-1
JOYSTICK PANEL (S/N AC1912999 & BELOW) .	50-110-1	REMOTE START	10-180-1
JOYSTICK PANEL (S/N AC1913000 & ABOVE) .	50-111-1	SAFETY INSTRUCTIONS	1-9
JOYSTICK	20-160-1	SERIAL NUMBER LOCATION	1-12
LIFT CYLINDER	20-20-1	SERVICE BRAKE	40-80-1
LIFTING AND BLOCKING THE TELESCOPIC HANDLER	10-10-1	SERVICE SCHEDULE	10-50-1
LIGHTS	60-60-1	SERVICE SOFTWARE	60-140-1
LLMI / LLMC SYSTEM (S/N AC1915000 & ABOVE)	60-180-1	STARTER	60-40-1
LONGITUDINAL STABILITY INDICATOR CALIBRATION (S/N AC1911001-14999)	60-170-1	STEERING ANGLE ADJUSTMENT	40-60-1
LUBRICATING THE TELESCOPING HANDLER	10-140-1	STEERING CYLINDER (FRONT)	20-60-1
LUBRICATION SYSTEM	70-80-1	STEERING CYLINDER (REAR)	20-61-1
MACHINE TORQUE SPECIFICATIONS	SPEC-20-1	STEERING MODE VALVE BLOCK	20-100-1
MAIN CONTROLLER	60-150-1	STEERING VALVE	20-140-1
MAIN RELIEF VALVE	20-80-1	STOPPING THE ENGINE AND LEAVING THE TELESCOPIC HANDLER	10-200-1
MAINTENANCE SAFETY	1-1	SWITCH PANEL (S/N AC1913000 & ABOVE)	60-80-1
MANIFOLD (FOR S/N AC1911001 - 11251) .	20-210-1	SYSTEM CHARGING AND RECLAMATION .	80-40-1
MANIFOLD (FOR S/N AC1911252 & ABOVE)	20-211-1	TELESCOPIC HANDLER STORAGE AND RETURN TO SERVICE	10-190-1
MUFFLER	70-50-1	TILT CYLINDER	20-50-1
OIL COOLER	30-20-1	TIRE MAINTENANCE	10-150-1
OPERATOR CAB (ROPS / FOPS)	10-20-1	TOP WIPER MOTOR	60-100-1
OPERATOR CAB (S/N AC1912999 & BELOW) .	50-10-1	TORQUE SPECIFICATIONS FOR BOLTS	SPEC-30-1
OPERATOR CAB (S/N AC1913000 & ABOVE) . .	50-11-1	TOW VALVE	20-190-1
		TOWING THE TELESCOPIC HANDLER	10-40-1
		TRANSPORTING THE TELESCOPIC HANDLER ON A TRAILER	10-30-1
		TRAVEL LEVER (S/N AC1912999 & BELOW)	60-60-1
		TRAVEL LEVER (S/N AC1913000 & ABOVE)	60-61-1
		TROUBLESHOOTING	40-10-1
		TROUBLESHOOTING	80-30-1
		TURBOCHARGER	70-130-1

WEAR PADS (FRONT) 50-50-1
WEAR PADS (REAR) 50-51-1
WORKGROUP LOCKOUT VALVE 20-180-1



Bobcat®