RR 5200 DC

Service & Parts Manual

Crown PF13000-00M

New Bremen, Ohio 45869 USA
Phone 419/629-2311
crown.com

HOW TO ORDER SERVICE PARTS

To obtain fast, efficient service when ordering repair parts for your Crown Material Handling Equipment, please follow this simple procedure:

1. Address all orders to your local Crown dealer.
2. Specify model and serial number of truck, which is shown on the serial number plate.
3. List the quantity needed.
4. List the part number and description, as shown in this Service Manual.
5. Show billing and shipping address.
6. Suggest fastest routing.

Your authorized Crown dealer stocks a large number of standard service parts. In addition, he has a factory-trained Service Department to serve you.

Our Local Crown Dealer Is

NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

TELEPHONE _____

The information in this manual is the latest available at the time of printing for the unit with which it was shipped. Should there be any variation due to vendor changes or special options on your unit, contact your Crown Dealer or Crown at the above address.

Crown 1986 PF7609 Rev. 4/01

Printed in U.S.A.

RR	RD	Revision No. - Date	Title	Serial No. of Units Used For From: March 28, 2001 To: Standard	Special	Date	Page Number

This page available for **NOTES.**

General Maintenance Instructions

WARNING

TO PREVENT SERIOUS RISK OF INJURY TO YOURSELF AND OTHERS OBSERVE THE FOLLOWING SAFETY INSTRUCTIONS

Power industrial trucks may become hazardous if adequate maintenance is neglected. Therefore, adequate maintenance facilities, trained personnel and procedures should be provided.

Maintenance and inspection shall be performed in conformance with the following practices:

1. A scheduled planned maintenance, lubrication, and inspection system should be followed.
2. Only qualified and authorized personnel shall be permitted to maintain, repair, adjust and inspect truck.
3. Before leaving the truck—
   - Stop truck.
   - Fully lower the load engaging means.
   - Place directional controls in neutral.
   - Apply the parking brake.
   - Turn off power (power disconnect).
   - Remove key.
   - Block the wheels if truck is on an incline.
4. Before working on truck—
   - Raise drive wheel free of floor or disconnect power sources.
   - Use chocks or other positive positioning devices.
   - Block load engaging means, inter masts, or chassis before working under them.
   - Operation to check performance of truck or attachments shall be conducted in an authorized safe clearance area.
5. Before starting to operate truck—
   - Be in operating position.
   - Apply brake.
   - Place directional control in neutral.
   - Before operating truck, check functions of lift systems, directional control, speed control, steering, warning devices, brakes and any attachments if any used.
6. Avoid fire hazards and have fire protection equipment present. Do not use an open flame to check level, or for leakage of electrolyte and fluids or oil. Do not use open pans of fuel or flammable cleaning fluids for cleaning parts.
7. Keep shop well ventilated, clean and dry.
8. Brakes, steering mechanisms, control mechanisms, lift overload devices, guards, and safety devices shall be inspected regularly and maintained in a safe operating condition.
   - All guards must be installed to factory configuration and condition before operating truck. Do not operate truck if any guards or fasteners are damaged, improperly installed or missing.
9. Capacity, operation and maintenance instruction plates or decals shall be maintained in legible condition.
10. All parts of lift mechanisms shall be inspected to maintain them in safe operating condition.
11. All hydraulic systems shall be regularly inspected and maintained in conformance with good practice. Cylinders, valves, and other similar parts shall be checked to assure that “drift” has not developed to the extent that it would create a hazard.
12. Batteries, motors, controllers, limit switches, protective devices, electrical conductors, and connections shall be maintained in conformance with good practice. Special attention shall be paid to the condition of electrical insulation.
13. Trucks shall be kept in a clean condition to minimize fire hazards and facilitate detection of loose or defective parts.

14. Modifications and additions which affect capacity and safe truck operation shall not be performed by the customer or user without manufacturers prior written approval. Capacity, operation and maintenance plates or decals shall be changed accordingly.

    – Adding electrical devices (radio, terminal, lights, etc.) or changing existing components or wiring can affect truck operation and could cause an accident. Contact authorized Crown personnel before adding to or changing the electrical system in any way.

    – For EE rated trucks, adding electrical devices could cause a fire or explosion, as well as void the EE rating. Written approval must be obtained from Crown prior to adding electrical device(s). Prior to use, inspection of installed device(s) must be performed by an appropriate nationally recognized testing laboratory (i.e. Underwriters Laboratories Inc) or the Authority Having Jurisdiction (see NFPA 505).

15. Care shall be taken to assure that all replacement parts are interchangeable with the original parts and of equal quality to that provided in the original equipment.

16. Be sure that any equipment added to the truck (terminal, fan, clipboard, etc.) is positioned so that it does not block your vision or interfere with safe and efficient operation of the truck.

For further information pertaining to operating and maintenance procedures:

- All trucks except Series B and Tow Tractors, refer to current ASME B56.1.
- Series B trucks, refer to current ASME B56.10.
- Tow Tractors, refer to current ASME B56.9.

Cleaning of Material Handling Equipment

Cleaning Methods

The preferred method of cleaning built up dirt and dust from electric material handling equipment is dry pressured air. For localized degreasing, use of an appropriate solvent is recommended.

If these methods are not effective and power washing is the only alternative, extreme care must be exercised. Electrical components including connectors, terminal boards and wiring can be permanently damaged from water and/or cleaning solvents. Mineral and chemical residue left on or in components (i.e., circuit boards, contactors, encoders, switches, potentiometers, etc.) after washing is a proponent of oxidation and corrosion.

Functional integrity of contaminated components may be questionable. Nuisance fault logging, intermittent operation or immediate failure could be the resultant of power washing. For these reasons all electronic components including motors must be protected. Component removal is the best method to eliminate the risk of damage.

Power washing will also remove and/or destroy lubricants in or on the surface of shafts, unsealed bearings, hinges, exposed gears, bushings, chains, linkages, etc. These Items must also be protected or properly lubricated after cleaning.

Consideration must also be given to metal surfaces. The cleaning process can strip away paint and protective coatings applied to components (i.e., hydraulic lines, terminal strips, linkages) for freezer/corrosion environment. Paint and/or protective coating must be reapplied to these areas to reduce the chance of oxidation and corrosion.

Before installing removed components, lubricating or returning the equipment to service it must be free of solvent residue and thoroughly dry.

Crown Cleaning Products Chart

Cleaner Type	Part Number	Package Quanity
Degreaser & Cleaner	363105-001 363105-012	20 oz. Can (12) 20 oz. Cans
All Purpose Cleaner	363114-001 363114-012	20 oz. Can (12) 20 oz. Cans
Glass Cleaner	363101-001 363101-012	20 oz. Can (12) 20 oz. Cans
Waterless Hand Cleaner	363111-001 363111-012	15 oz. Tube (12) 15 oz. Tubes
Pumiced & Smooth Hand Cleaner	363112-001 363112-004	1 Gallon Jug (4) 1 Gallon Jugs
Wall Mounted Deluxe Soap Dispenser	363122	Used with 363112-001
Tough On Grease	063009-005	1 Gallon Jug

RR/RD 5200/5200S
RR/RD 5200(AC)/5200S(AC)

In the interest of safety and to ensure compliance with the OSHA Regulations, (Standards - 29 CFR), The control of hazardous energy (lockout/tagout) - 1910.147, Crown has developed guidelines for proper energy control when performing service and maintenance on the RR/RD 5200/5200S or RR/RD 5200(AC)/5200S(AC). Before performing any service or maintenance on the RR/RD 5200/5200S or RR/RD 5200(AC)/5200S(AC), review the appropriate sections in this service manual for additional procedures to be followed.

In addition, Crown recommends that all mechanics wear appropriate protective items, such as safety glasses, work gloves, and steel toed shoes, whenever performing service or maintenance work on Crown equipment.

BATTERY

SAFETY RULES

- Wear protective clothing, such as, rubber apron, gloves, boots and full-face shield when performing any maintenance on batteries. Do not allow electrolyte to come in contact with eyes, skin, clothing or floor. If electrolyte comes in contact with eyes, flush immediately and thoroughly with clean water. Obtain medical attention immediately. Should electrolyte be spilled on skin, rinse promptly with clean water and wash with soap. A baking soda solution (.454 kg [1 lb.] to 4.55 Litre [1 gal.] of water) will neutralize acid spilled on clothing, floor or any other surface. Apply solution until bubbling stops and rinse with clean water.
- Keep vent plugs firmly in place at all times except when adding water or taking hydrometer readings.
- Do not bring any type of flame, spark, etc., near the battery. Gas formed while the battery is charging, is highly explosive. This gas remains in the cells long after charging has stopped.
- Do not lay metallic or conductive objects on battery. Arcing will result.
- Do not allow dirt, cleaning solution or other foreign material to enter cells. Impurities in electrolyte has a neutralizing effect reducing available charge.
- If battery repair is planned, follow the battery manufacturer's instructions concerning repair practices and procedures.

BATTERY CARE

CAUTION

Only qualified and experienced personnel should perform maintenance and repair on batteries.

- Make certain the charger being used matches the voltage and amperage of the truck battery. This voltage is listed on the truck serial plate.
- Before disconnecting or connecting batteries to a charger, make sure the charger is "OFF". If an attempt is made to do this while the charger is "ON", serious injury to you, the battery and charger could result.
- Never use a match or lighter. Battery fumes are explosive.
- Make certain battery used meets weight, size and voltage requirements of truck (refer to serial plate). NEVER operate truck with an undersized battery.

CHARGING

CAUTION

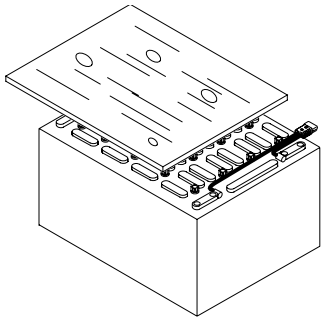
Never smoke or bring flame near the battery. Gas formed during charging is highly explosive and can cause serious injury.

Consult the charger manufacturer’s manual covering your charger for hints on operation and maintenance.

BATTERY REMOVAL

CAUTION

When removing the battery, move truck to area intended for battery care. Floor must be level. Turn keyswitch or toggle switch to "off" position and remove key. Disconnect battery and lockout or tagout truck as described in Battery - Lockout/ Tagout in this section. Never move battery partially from truck without roller stand in place. Lower load engaging means completely. If battery is removed with load engaging means raised, use hoist attached to mast to provide tip over protection. Don't allow any metallic object to come in contact with the top of the battery cells. This may cause a short circuit when removing, transporting the battery. Use an insulator (such as plywood) to cover the top of the battery before and during removal.



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BATTERY INSTALLATION

CAUTION

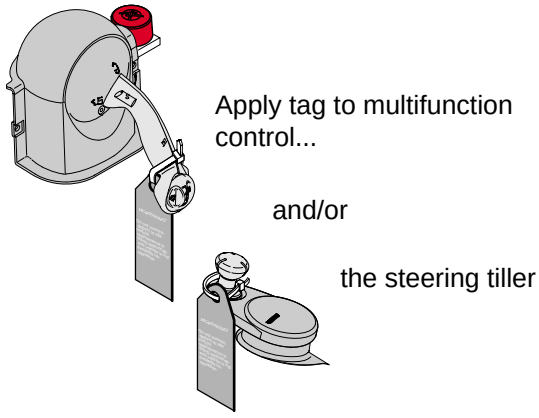
When installing the battery, move truck to area intended for battery care. Floor must be level. Turn keyswitch or toggle switch to "off" position and remove key. Lockout or tagout truck as described in Battery - Lockout/Tagout in this section. If battery was removed with load engaging means raised, use hoist attached to mast to provide tip over protection. Don't allow any metallic object to come in contact with the top of the battery cells. This may cause a short circuit when transporting or installing the battery. Use an insulator (such as plywood) to cover the top of the battery before and during installation.

CAUTION

Make certain battery used meets weight, size and voltage requirements of truck (refer to serial plate). NEVER operate truck with an undersized battery.

LOCKOUT - TAGOUT

Always turn key switch to "off", remove key and apply tag to multifunction control and/or steering tiller with cable tie warning others truck is being serviced.



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When maintenance is to be performed and the battery will be left in the truck, disconnect battery, remove the main power fuses and install a commercially available lockout device on the battery connector.

When maintenance is performed and the battery is removed from the truck, remove the main power fuses, install a lockout device on the trucks battery connector if possible, or if possible install a tag with a cable tie on the trucks battery connector so it cannot be removed easily warning that the truck is not available for operation.

CAPACITANCE

Due to capacitance voltage present in the Access 2 and Access 3 modules, whenever performing maintenance which may permit contact with the bus bars and associated power cables, discharge the capacitors.

1. Move truck to a secure non traffic maintenance area with a level floor.
2. Chock wheels of truck. Refer to Lifting and Blocking in this section.
3. Disconnect battery. Lockout or tagout truck as described in Battery - Lockout/Tagout in this section.
4. Turn and hold the keyswitch to the "start" position until the indicators on the Access 1 face first go dim - then out.
5. Turn key switch to "off", remove key.

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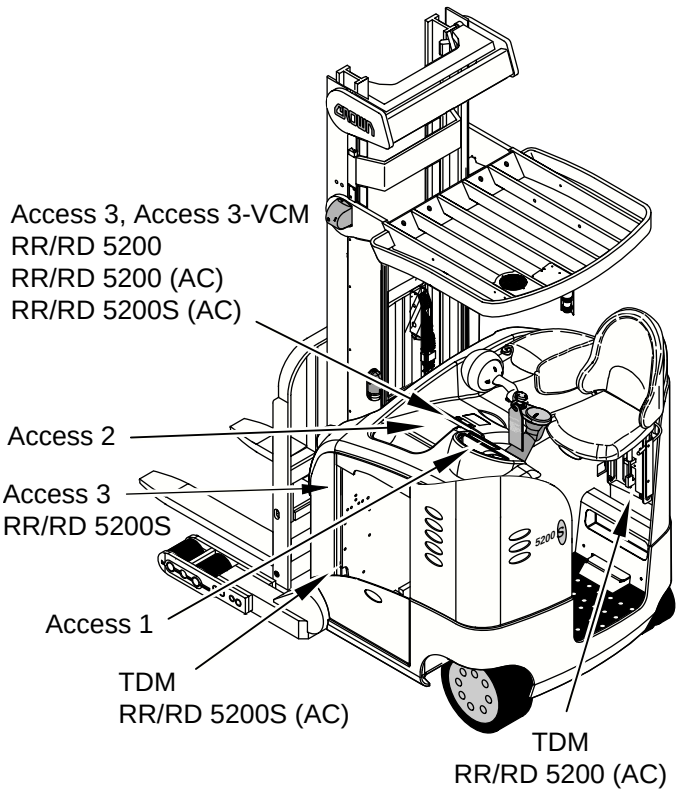

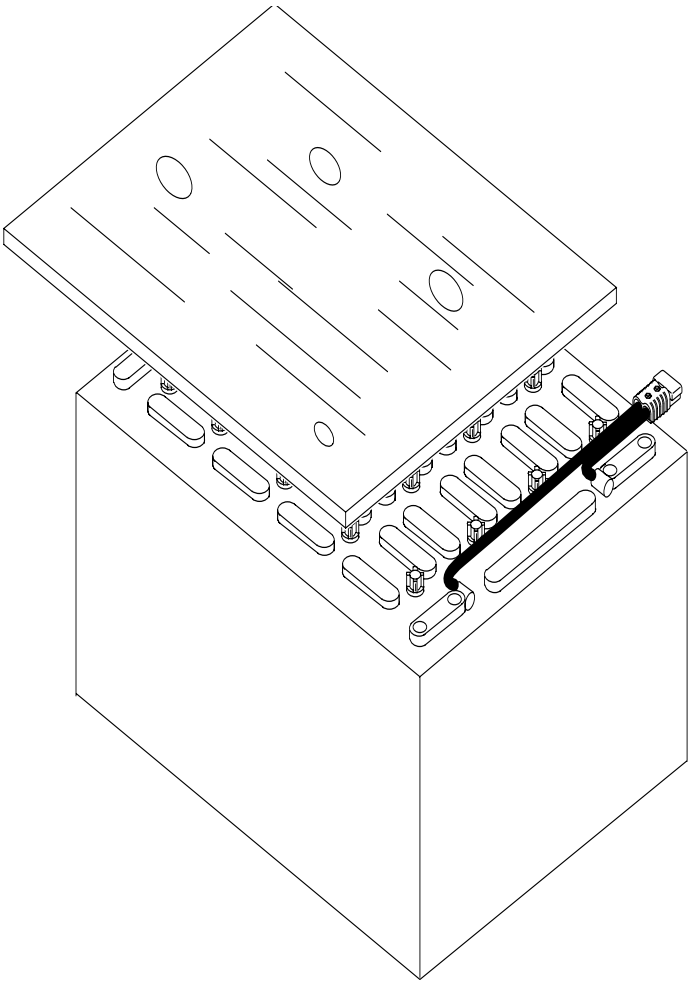

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BRAKE

The brakes can be released through the use of the Brake Release Service Tool (127373) during a maintenance situation. When using this method to release the brakes, the truck will not have brakes available for stopping from the operator compartment pedal. The truck will not have traction and power steering will not work.

An adapter harness, 129694, can be used to connect the Brake Release Service Tool to a four pin 062702-003 (Deutsch style) connector, if required.

WARNING

Extreme care must be taken when using the Brake Release Service Tool to release the brakes. The truck will be free-wheeling and the brake pedal in the operator compartment will have no effect on braking.

CONNECTING BRAKE RELEASE SERVICE TOOL

1. Lower load engaging means completely.
2. Lockout or Tagout truck as described in Battery - Lockout/Tagout in this section.
3. Chock wheels or make sure truck is secured by some means to keep it from rolling away.
4. Disconnect CA609 at the traction motor brake and connect the Brake Release Service Tool to the brake connector.
5. Plug the battery connector of the Brake Release Service Tool to the battery.
6. Move the power switch on the Brake Release Service Tool to "on".
7. Toggle the brake release switch to release the brakes.
8. Remove wheel chocks and move truck to area intended for maintenance. When towing the truck make sure all operators are informed of the trucks lack of braking.

APPLYING THE BRAKES

To apply the brakes, move the power switch on the Brake Release Service Tool to "off".

DISCONNECTING BRAKE RELEASE SERVICE TOOL

1. Move the service tool power switch to "off".
2. Disconnect the battery connector.
3. Unplug service tool from the brake connector.
4. Connect the harness connector to the brake connector.

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HYDRAULIC

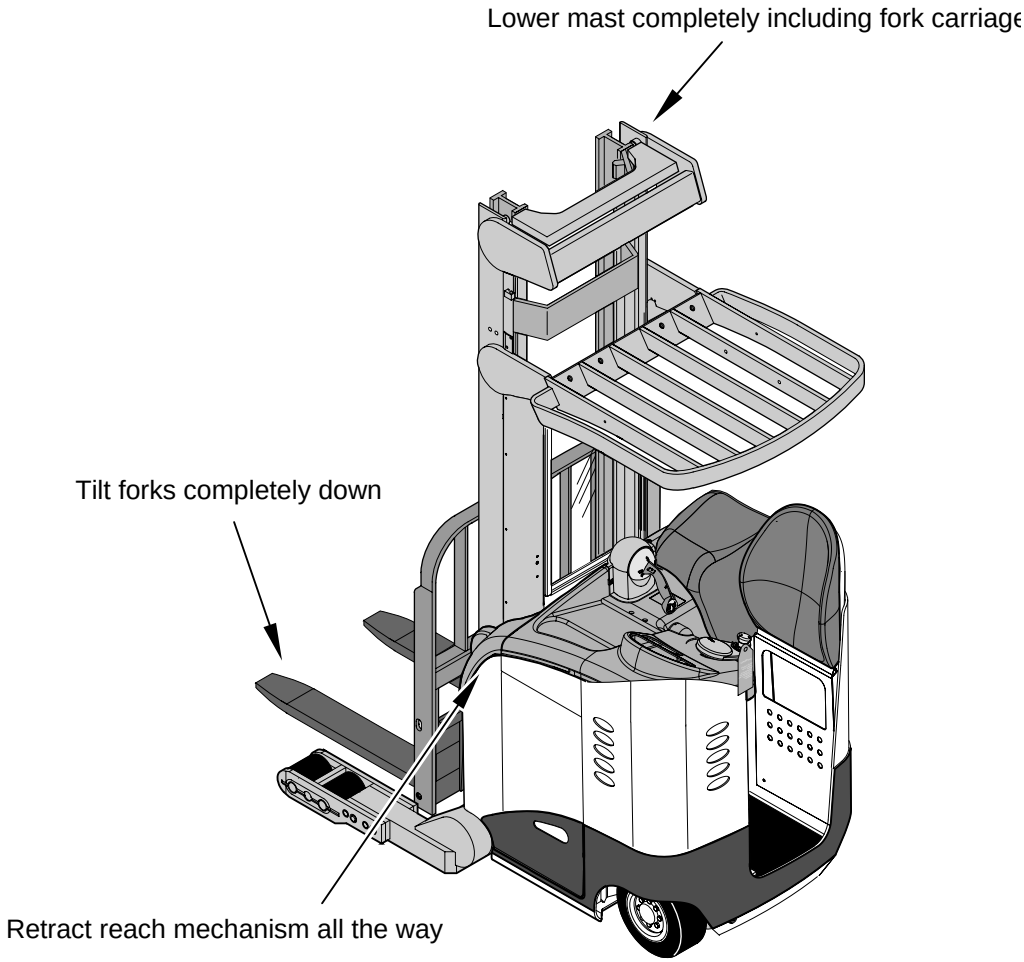
WARNING

AVOID HIGH PRESSURE FLUIDS—Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic lines. Tighten all connections before applying pressure. Keep hands and body away from pin holes which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.

Any fluid injected into the skin under high pressure should be considered as a serious medical emergency despite an initial normal appearance of the skin. There is a delayed onset of pain, and serious tissue damage may occur. Medical attention should be sought immediately by a specialist who has had experience with this type of injury.

When maintenance is to be performed on the hydraulic system, to make sure the hydraulic system is not under pressure:

1. Move truck to a secure non traffic maintenance area with a level floor.
2. Retract reach mechanism all the way or, if required for maintenance, block when extended as described in Reach Mechanism of this section.
3. Completely lower load engaging means (mast and fork carriage) or, if required for maintenance, block mast sections at appropriate height as described in Mast of this section.
4. Tilt forks tips all the way down. Do not continue to tilt after fork tips are down to keep pressure from building up at the tilt cylinder.
5. Turn key switch to "off", remove key.
6. Disconnect battery. Lockout or tagout truck as described in Battery - Lockout/Tagout in this section.
7. Open manual lower valve to relieve hydraulic pressure.



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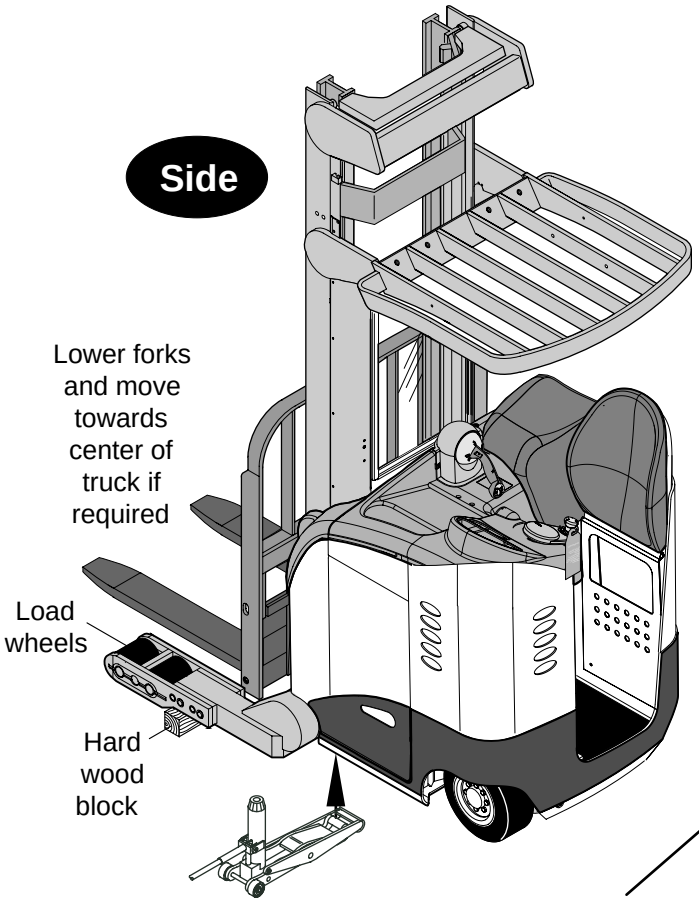
LIFTING AND BLOCKING



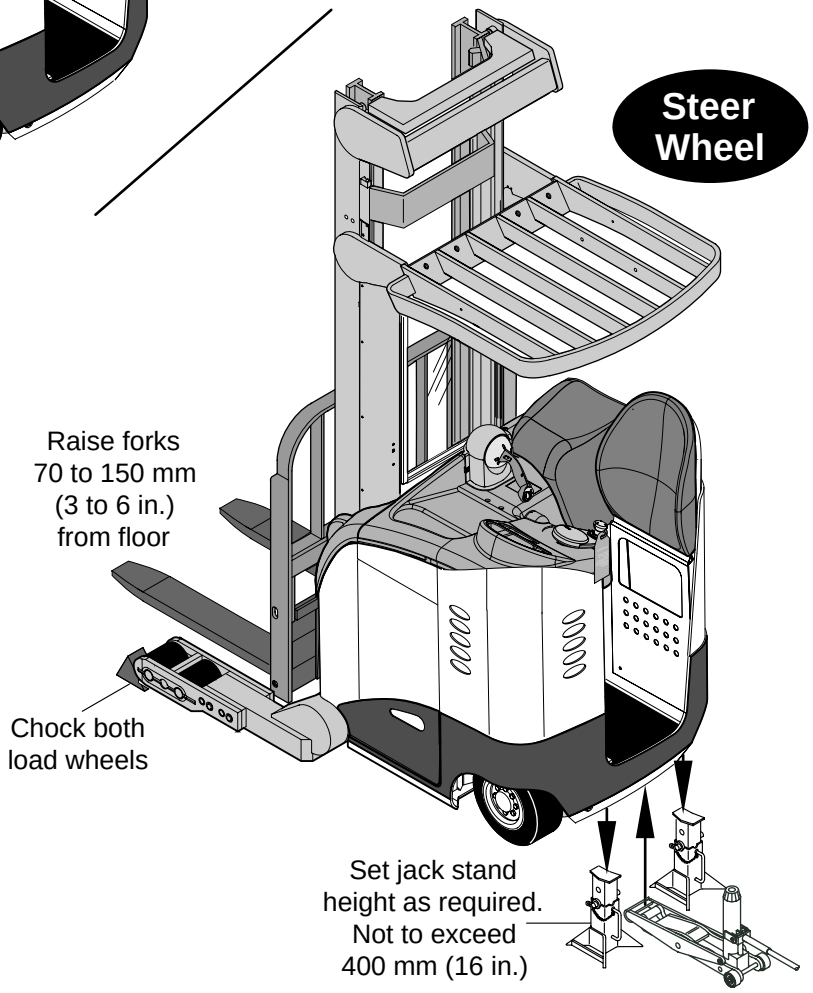
1. RR 5200 truck shown. Information applies to RR/RD 5200/5200S and RR/RD 5200(AC)/5200S(AC) trucks.
2. Move truck to a secure non traffic maintenance area with a level floor.
3. No load on forks.
4. Lockout or tagout truck as described in Battery - Lockout/Tagout in this section.

NOTES :

- Hydraulic Jack - Capacity 3620 kg. (8000 lbs.)
- Crown part number: 122599
- Collapsed height minimum: 60 mm (2.25 in.)
- Raised height maximum: 400 mm (16 in.)
- Jack Stand - capacity 4500 kg. (10,000 lbs.) Commercially available.

WARNING

Truck stability decreases dramatically if load wheels are raised more than 13 mm (0.5 inch). Attach sling and overhead lifting device to all cross members of the mast to prevent truck from tipping over when raising the side of the truck.



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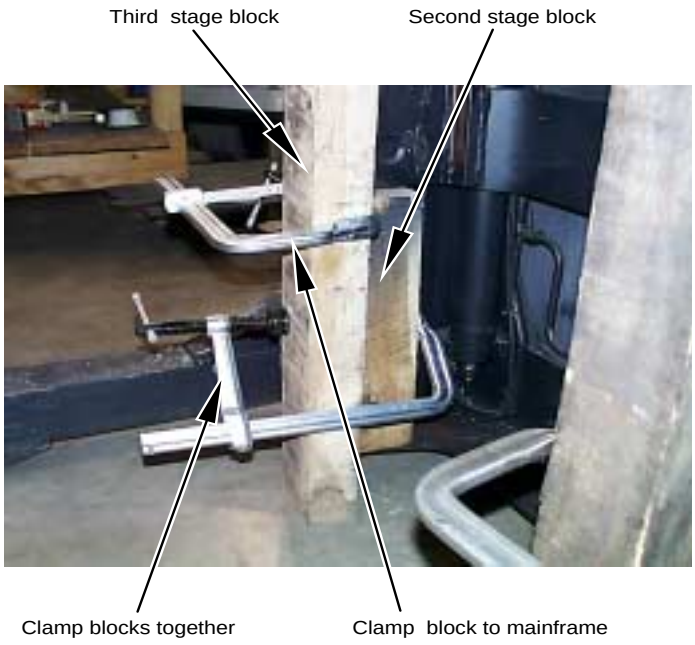
MAST AND FORK CARRIAGE

Blocking Masts

Use 100 mm (4 in.) by 100 mm (4 in.) or bigger hardwood blocks of the appropriate length for supporting mast channels. Block both mast rails of each stage to maintain truck stability.

Remove any carriage mounted accessory (e.g. carton clamp, slip sheet, roll loader [SP only], etc.) except sideshifters before blocking masts. These accessories add significant weight to the mast.

1. Move truck to a secure non traffic maintenance area with a level floor.
2. Chock wheels of truck. Refer to Lifting and Blocking in this section.
3. Connect battery.
4. Raise forks and position block under second stage mast.
5. Using a clamp, secure block to mast channel.
6. Lower mast and position appropriate length block under third stage mast.
7. Using a clamp, secure block to mast channel or second stage block.
8. Lower fork carriage until carriage rests on stops or place block under carriage and lower until weight rests on block.
9. Lockout or tagout truck as described in Battery - Lockout/Tagout in this section.



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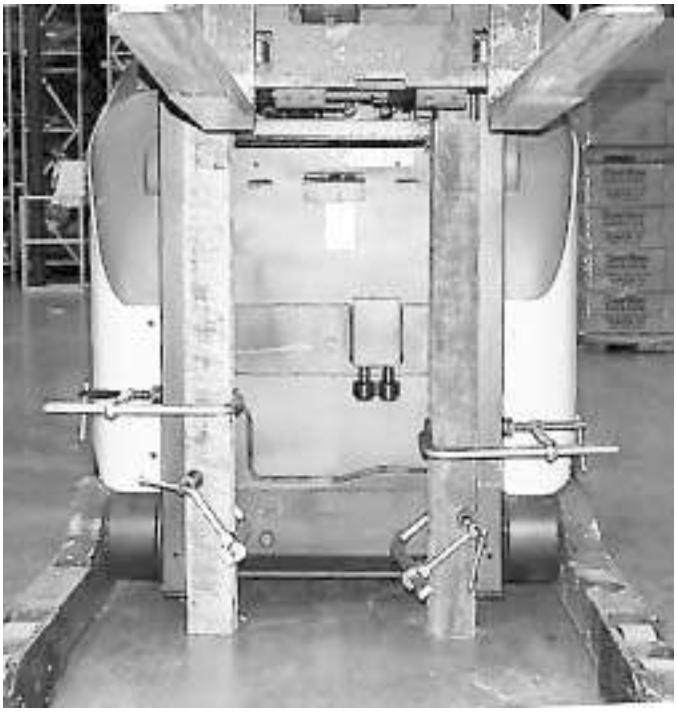

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REACH MECHANISM

1. Move truck to a secure non traffic maintenance area with a level floor.

2. Chock wheels of truck. Refer to Lifting and Blocking in this section.

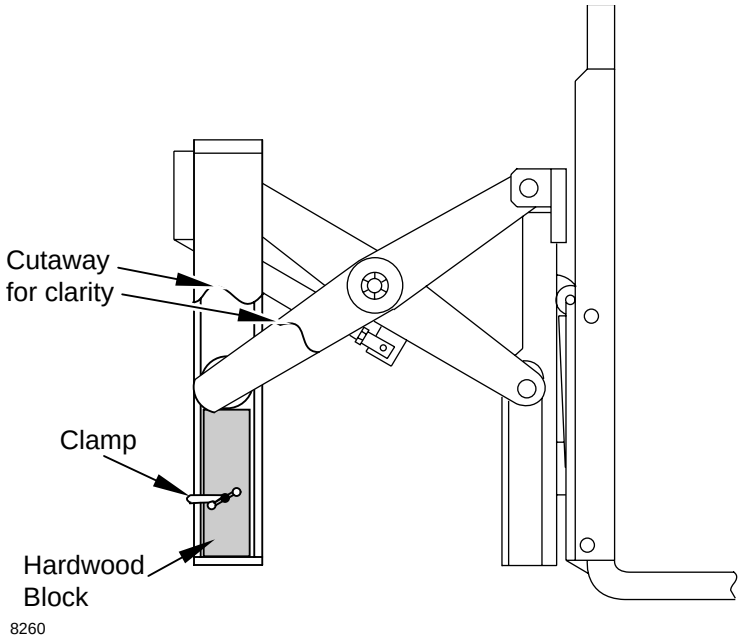
3. Extend reach assembly.

4. Clamp a 50 mm x 100 mm (2 in. x 4 in.) hardwood block in either left or right channel of reach support assembly below the roller.

5. Relieve hydraulic pressure from reach circuit by retracting carriage until roller rests on block.

6. If mast is staged refer to Mast in this section for blocking instructions.

7. Lockout or tagout truck as described in Battery - Lockout/Tagout in this section.



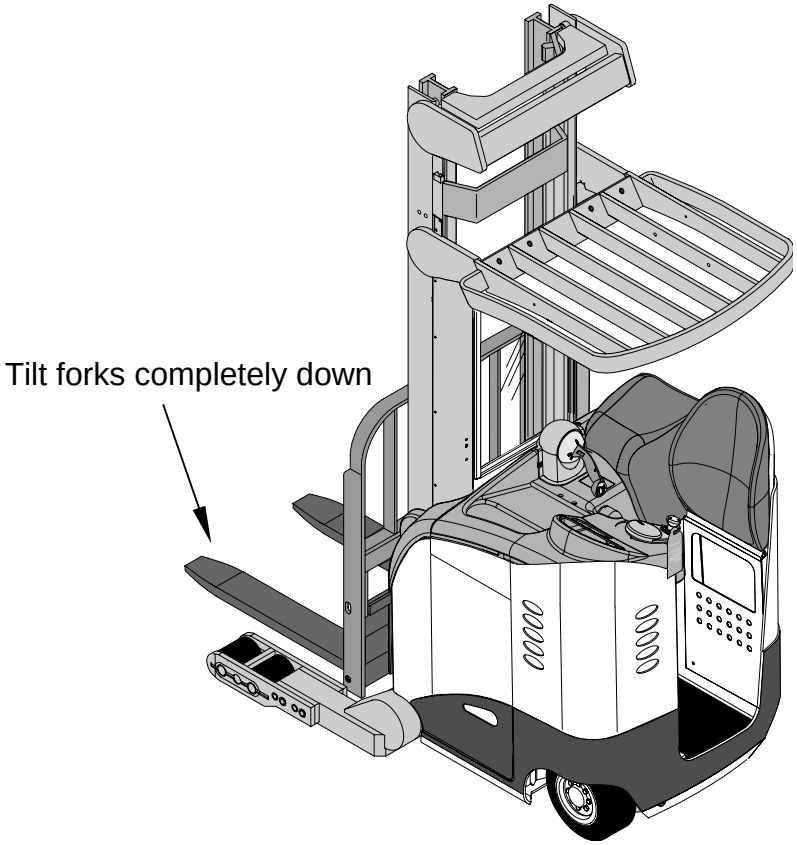
TILT

1. Move truck to a secure non traffic maintenance area with a level floor.

2. Chock wheels of truck. Refer to Lifting and Blocking in this section.

3. Tilt forks down so weight of carriage is not on the tilt cylinder.

4. Lockout or tagout truck as described in Battery - Lockout/Tagout in this section.



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Control of Hazardous Energy

Lockout/Tagout

In the interest of safety and to ensure compliance with OSHA Regulations, (Standards - 29 CFR), control of hazardous energy (lockout/tagout) - 1910.147, Crown has developed guidelines for proper energy control when performing service and maintenance on the truck. Before performing any service or maintenance, review the appropriate sections in this service manual for any additional procedures to be followed.

In addition, Crown recommends that all mechanics wear appropriate protective items, such as safety glasses, work gloves, and steel-toed shoes, whenever performing service or maintenance work on Crown equipment.

Battery

Safety Rules

- Wear protective clothing, such as, rubber apron, gloves, boots and full-face shield when performing any maintenance on batteries. Do not allow electrolyte to come in contact with eyes, skin, clothing or floor. If electrolyte comes in contact with eyes, flush immediately and thoroughly with clean water. Obtain medical attention immediately. Should electrolyte be spilled on skin, rinse promptly with clean water and wash with soap. A baking soda solution (0.454 kg (1 lb) to 4.55 Litre (1 gal) of water) will neutralize acid spilled on clothing, floor or any other surface. Apply solution until bubbling stops and rinse with clean water.
- Keep vent plugs firmly in place at all times except when adding water or taking hydrometer readings.
- Do not bring any type of flame, spark, etc., near the battery. Gas formed while the battery is charging, is highly explosive. This gas remains in the cells long after charging has stopped.
- Do not lay metallic or conductive objects on battery. Arcing will result.
- Do not allow dirt, cleaning solution or other foreign material to enter cells. Impurities in electrolyte has a neutralizing effect reducing available charge.
- If battery repair is planned, follow the battery manufacturer's instructions concerning repair practices and procedures.

Battery Care

CAUTION

Only qualified and experienced personnel should perform maintenance and repair on batteries.

- Make certain the charger being used matches the voltage and amperage of the truck battery. This voltage is listed on the truck serial plate.
- Before disconnecting or connecting batteries to a charger, make sure charger is "OFF". If an attempt is made to do this while charger is "ON", serious injury to you, the battery and charger could result.
- Never use a match or lighter. Battery fumes are explosive.
- Make certain battery used meets weight, size and voltage requirements of truck (refer to serial plate). NEVER operate truck with an undersized battery.

Charging

CAUTION

Never smoke or bring flame near the battery. Gas formed during charging is highly explosive and can cause serious injury.

Consult the charger manufacturer’s manual covering your charger for hints on operation and maintenance.

Battery Removal

CAUTION

When removing the battery, move truck to area intended for battery care. Floor must be level. Turn key switch or toggle switch to "OFF" position and remove key. Disconnect battery and lockout or tagout truck as described in Lockout - Tagout in this section. Never move battery partially from truck without roller stand in place. Lower load engaging means completely. If battery is removed with load engaging means raised, use hoist attached to mast to provide tip over protection. Do not allow any metallic object to come in contact with the top of the battery cells. This may cause a short circuit when removing, transporting the battery. Use an insulator (such as plywood) to cover the top of the battery before and during removal.

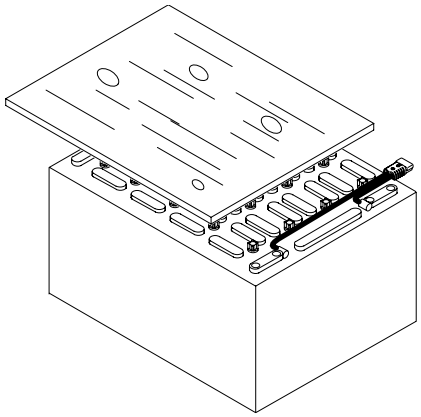


Figure 8251

Battery Installation

CAUTION

When installing the battery, move truck to area intended for battery care. Floor must be level. Turn key switch or toggle switch to "OFF" position and remove key. Lockout or tagout truck as described in Lockout - Tagout in this section. If battery was removed with load engaging means raised, use hoist attached to mast to provide tip over protection. Do not allow any metallic object to come in contact with the top of the battery cells. This may cause a short circuit when transporting or installing the battery. Use an insulator (such as plywood) to cover the top of the battery before and during installation.

CAUTION

Make certain battery used meets weight, size and voltage requirements of truck (refer to serial plate). NEVER operate truck with an undersized battery.

Lockout - Tagout

Always turn key switch to "OFF", remove key and apply tag to multifunction control and/or steering tiller with cable tie warning others truck is being serviced.

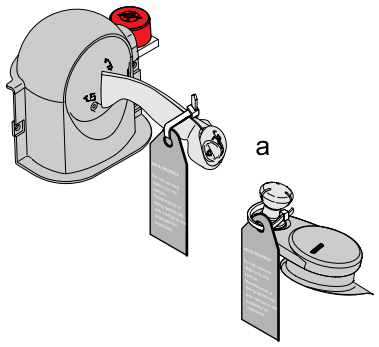


Figure 15985-01

a Apply Tag to Multi-task Handle and/or the Steering Tiller

When maintenance is to be performed and the battery will be left in the truck, disconnect battery, remove the main power fuses and install a commercially available lockout device on the battery connector.

When maintenance is performed and the battery is removed from the truck, remove main power fuses, install a lockout device on the trucks battery connector if possible, or if possible install a tag with a cable tie on the trucks battery connector so it cannot be removed easily warning that the truck is not available for operation.

Capacitance

Due to capacitance voltage present in the Access 2 and Access 3 modules, whenever performing maintenance which may permit contact with the bus bars and associated power cables, discharge the capacitors.

- Move truck to a secure non-traffic maintenance area with a level floor.
- Chock wheels of truck (refer to Lifting and Blocking in this section).
- Disconnect battery. Lockout or tagout truck as described in Lockout - Tagout in this section.
- Turn and hold the key switch to the "start" position until the indicators on the Access 1 face first go dim - then out.
- Turn key switch to "OFF" and remove key.

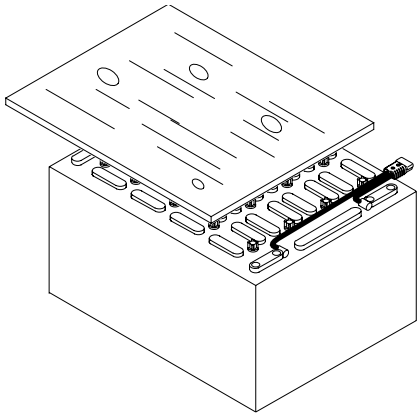


Figure 8251

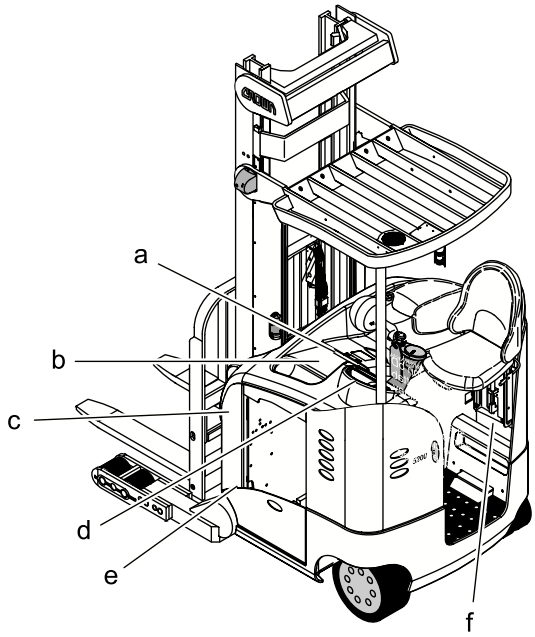


Figure 15986-01

a Access 3 RR/RD 5200, RR/RD 5200 (AC), RR/RD 5200S (AC)

b Access 2

c Access 3 RR/RD 5200S

d Access 1

e TDM RR/RD 5200S (AC)

f TDM RR/RD 5200 (AC)

Brake

The brakes can be released through the use of the Brake Release Service Tool (127373) during a maintenance situation. When using this method to release the brakes, the truck will not have brakes available for stopping from the operator compartment pedal. The truck will not have traction and power steering will not work.

An adapter harness, 129694, can be used to connect the Brake Release Service Tool to a four pin 062702-003 (Deutsch style) connector, if required.

WARNING

Extreme care must be taken when using the Brake Release Service Tool to release the brakes. The truck will be free-wheeling and the brake pedal in the operator compartment will have no effect on braking.

Connecting Brake Release Service Tool

1. Lower load engaging means completely.
2. Lockout or Tagout truck as described in Lockout - Tagout in this section.
3. Chock wheels or make sure truck is secured by some means to keep it from rolling away.
4. Disconnect CA609 at the traction motor brake and connect the Brake Release Service Tool to the brake connector.
5. Plug the battery connector of the Brake Release Service Tool to the battery.
6. Move the power switch on the Brake Release Service Tool to "ON".
7. Toggle the brake release switch to release the brakes.
8. Remove wheel chocks and move truck to area intended for maintenance. When towing the truck make sure all operators are informed of the trucks lack of braking.

Applying the Brakes

To apply the brakes, move the power switch on the Brake Release Service Tool to "OFF".

Disconnecting Brake Release Service Tool

1. Move the service tool power switch to "OFF".
2. Disconnect the battery connector.
3. Unplug service tool from the brake connector.
4. Connect harness connector to brake connector.

Figure 8255

Hydraulic

WARNING

AVOID HIGH PRESSURE FLUIDS – Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic lines. Tighten all connections before applying pressure. Keep hands and body away from pin holes which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.
Any fluid injected into the skin under high pressure should be considered as a serious medical emergency despite an initial normal appearance of the skin. There is a delayed onset of pain, and serious tissue damage may occur. Medical attention should be sought immediately by a specialist who has had experience with this type of injury.

When maintenance is to be performed on the hydraulic system, to make sure the hydraulic system is not under pressure:

- Move truck to a secure non-traffic maintenance area with a level floor.
- Retract reach mechanism all the way or, if required for maintenance, block when extended as described in Reach Mechanism of this section.
- Completely lower load engaging means (mast and fork carriage) or, if required for maintenance, block mast sections at appropriate height as described in Mast of this section.
- Tilt forks tips all the way down. Do not continue to tilt after fork tips are down to keep pressure from building up at the tilt cylinder.
- Turn key switch to "OFF" and remove key.
- Disconnect battery. Lockout or tagout truck as described in Lockout - Tagout in this section.
- Open the manual lower valve to relieve hydraulic pressure.

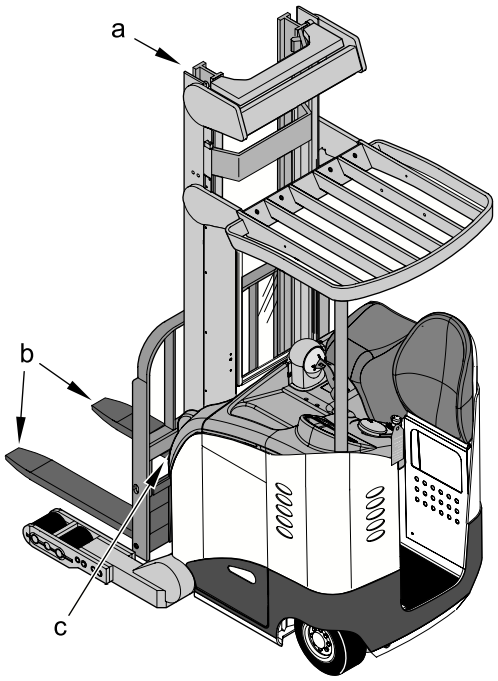


Figure 15987-01

a Lower Mast Completely Including Fork Carriage
b Tilt Forks Completely Down
c Retract Reach Mechanism All the Way

Towing Truck

Refer to the following guidelines when towing the truck:

Towing by Pulling in Power Unit First Direction

WARNING

- *Towed truck must always maintain three contact points with floor and/or towing device.*
- *Maximum travel speed while towing truck is 3.2 kph (2 mph).*
- *Do not make sharp turns when lifting/towing truck.*
- *Towed vehicle forks should be empty and no more than 305 mm (12.0 in) off floor. If possible, tilt forks back and center sideshifter.*
- *Extreme care must be taken when using this method to release the brakes. With brakes released on uneven surfaces, vehicle will roll.*
- *Provide a safe distance for truck to coast to stop.*
- *Excessive acceleration by towing vehicle, or drag caused by towed vehicle (i.e., brake drag, drive unit drag, wheel drag, etc.) will greatly increase requirements to pull or push a vehicle.*

Preparing Truck For Towing:

- Power must be applied to the brake circuit to release brakes for towing. Refer to Brake Release Instructions in this section.
- Turn power OFF.

WARNING

Truck will be difficult to steer. Use extreme caution.

- Driver will be required to steer truck, as there is no power assist from hydraulics. For applying brakes, refer to Applying the Brakes in this section.

Towing Device Requirements:

- Towing device/vehicle must have pulling/braking capacity greater than 3900 kg (8600 lb).
- When attaching towing device to lift truck to be towed, firmly attach tow device to rear, lower portion of power unit skirt, within +/- 51 mm (2.0 in) of truck center. Fasten so as not to loosen or disengage during towing.

Towing Guidelines:

- Maximum travel speed while towing truck is 3.2 kph (2 mph).

WARNING

Truck will be difficult to steer. Use extreme caution.

- Driver will be required to steer truck, as there is no power assist from hydraulics. For applying brakes, refer to Applying the Brakes in this section.
- Truck will coast to stop.
- Operator actions: see WARNINGS above.

Towing by Pulling in the Forks First Direction

WARNING

Towing by pulling in the forks first direction is not recommended.

Towing by Lifting Truck and Pulling in Power Unit First Direction

WARNING

- *Do not lift towed truck higher than 51 mm (2.0 in) off floor.*
- *Towed truck must always maintain three contact points with floor and/or towing device.*
- *Maximum travel speed while towing truck is 3.2 kph (2 mph).*
- *Do not make sharp turns when lifting/towing truck.*
- *Towed vehicle forks should be empty and no more than 305 mm (12.0 in) off floor. If possible, tilt forks back and center sideshifter.*

Preparing Truck For Towing:

- Power must be applied to the brake circuit to release brakes for towing. Refer to Brake Release Instructions in this section.
- Turn power OFF.

Towing Device Requirements:

- Towing device/vehicle must have lifting capacity of 2722 kg (6000 lb) at lift position at rear of skirt.
- Towing device/vehicle must have pulling/pushing/braking capacity greater than 3900 kg (8600 lb).
- Ensure that a stem or ball capable of stated pulling/pushing/braking capacity, and of such a design as to prevent disengagement during towing operation, is used.
- When attaching towing device to lift truck being towed, engage to rear, lower portion of power unit skirt, within +/- 51 mm (2.0 in) of truck center.

Towing Guidelines:

- Maximum travel speed while towing truck is 3.2 kph (2 mph).

WARNING

Truck will be difficult to steer. Use extreme caution.

- No operator should be on lifted and towed truck.
- Operator actions: see WARNINGS above.

Towing by Lifting Truck and Pulling in the Forks First Direction

WARNING

Towing by lifting truck and pulling in the forks first direction is not recommended.

Lifting and Blocking

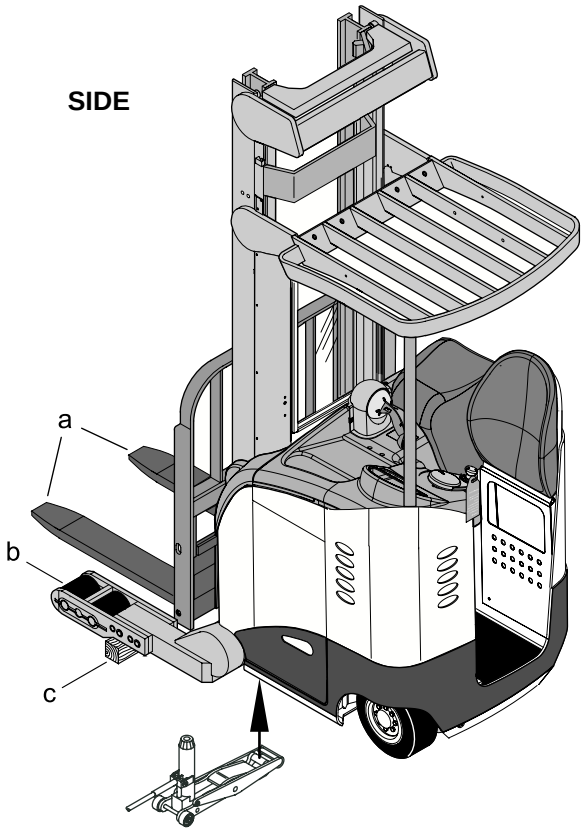


Figure 16022-01

a Lower Forks and Move Towards Center of Truck if Required

b Load Wheels

c Hardwood Block

- RR 5200 truck shown. Information applies to RR/RD 5200/5200S/5200(AC)/5200S(AC) trucks.
- Move truck to a secure non-traffic maintenance area with a level floor.
- No load on forks.
- Lockout or tagout truck as described in Lockout - Tagout in this section.

NOTES:

- Hydraulic Jack Capacity: 3620 kg (8000 lb)
  - Crown Part Number: 122599
  - Collapsed Height Minimum: 60 mm (2.25 in)
  - Raised Height Maximum: 400 mm (16 in)
- Jack Stand Capacity: 4500 kg (10000 lb)
  - Commercially Available.

WARNING

Truck stability decreases dramatically if load wheels are raised more than 13 mm (0.5 in). Attach sling and overhead lifting device to all cross members of the mast to prevent truck from tipping over when raising the side of the truck.

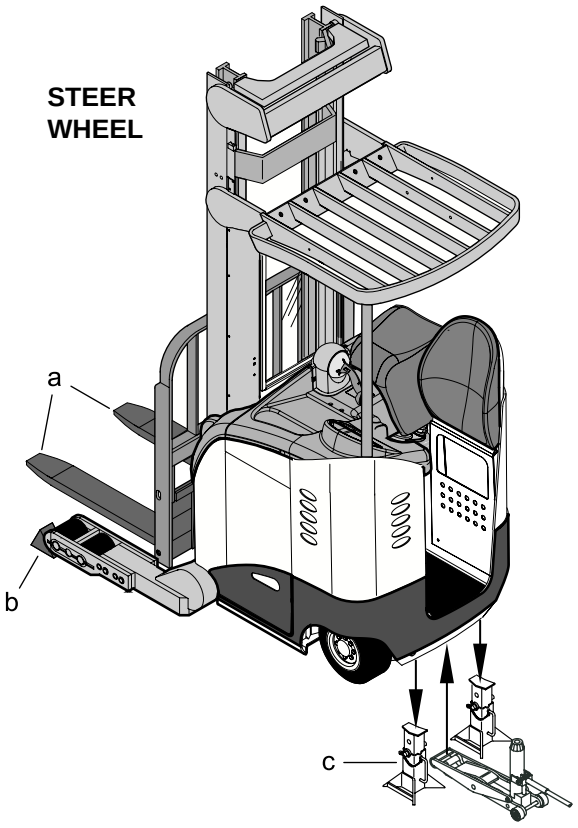


Figure 15988-01

a Raise Forks 70 to 150 mm (3.0 to 6.0 in) from Floor

b Chock Both Load Wheels

c Set Jack Stand as Required – Not to Exceed 400 mm (16.0 in)

Mast and Fork Carriage

Blocking Masts

Use 100 x 100 mm (4 x 4 in) or bigger hardwood blocks of the appropriate length for supporting mast channels. Block both mast rails of each stage to maintain stability.

Remove any carriage mounted accessory (i.e., carton clamp, slip sheet, roll loader, etc.) except sideshifters before blocking masts. These accessories add significant weight to the mast.

- Move truck to a secure non-traffic maintenance area with a level floor.
- Chock wheels of truck (refer to Lifting and Blocking in this section).
- Connect battery.
- Raise forks and position block under second stage mast.
- Using a clamp, secure block to mast channel.
- Lower mast and position appropriate length block under third stage mast.
- Using a clamp, secure block to mast channel or second stage block.
- Lower fork carriage until carriage rests on stops or place block under carriage and lower until weight rests on block.
- Lockout or tagout truck as described in Lockout - Tagout in this section.

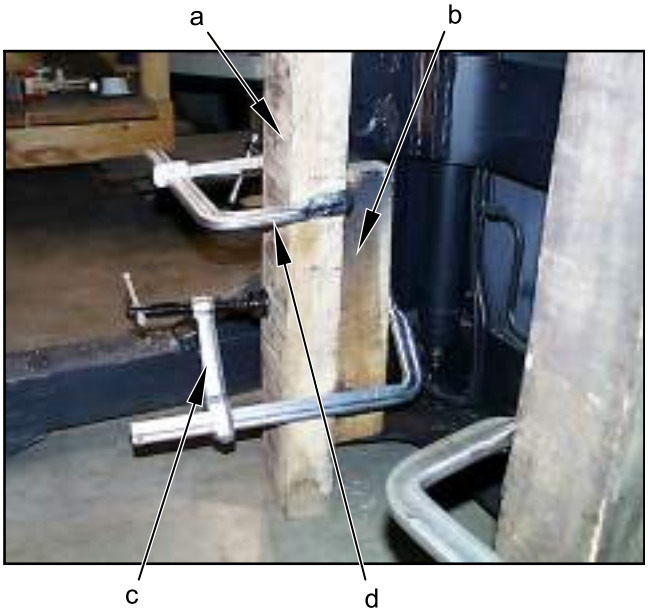


Figure 15989-01

a Third Stage Block
b Second Stage Block
c Clamp Blocks Together
d Clamp Block to Main Frame

Figure 15990

Reach Mechanism

- Move truck to a secure non-traffic maintenance area with a level floor.
- Chock wheels of truck (refer to Lifting and Blocking in this section).
- Extend reach assembly.
- Clamp a 50 x 100 mm (2 x 4 in) hardwood block in either left or right channel of reach support assembly below the roller.
- Relieve hydraulic pressure from reach circuit by retracting carriage until roller rests on block.
- If mast is staged refer to Mast in this section for blocking instructions.
- Lockout or tagout truck as described in Lockout - Tagout in this section.

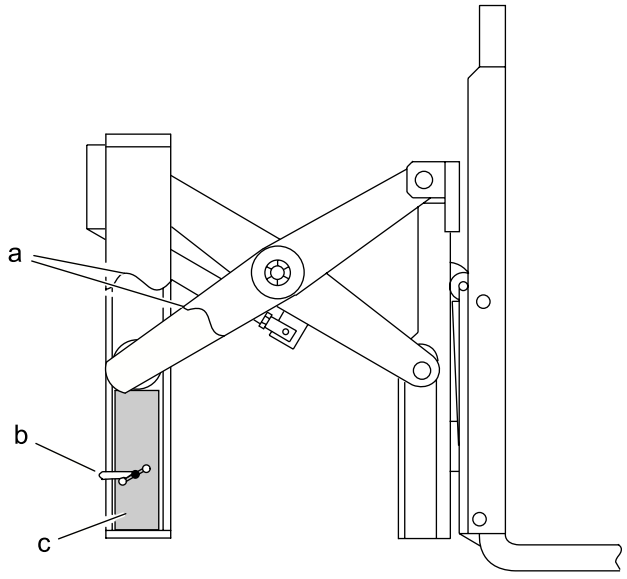


Figure 15991-01

a Cut Away for Clarity
b Clamp
c Hardwood Block

Tilt

- Move truck to a secure non-traffic maintenance area with a level floor.
- Chock wheels of truck (refer to Lifting and Blocking in this section).
- Tilt forks down so weight of carriage is not on the tilt cylinder.
- Lockout or tagout truck as described in Lockout - Tagout in this section.

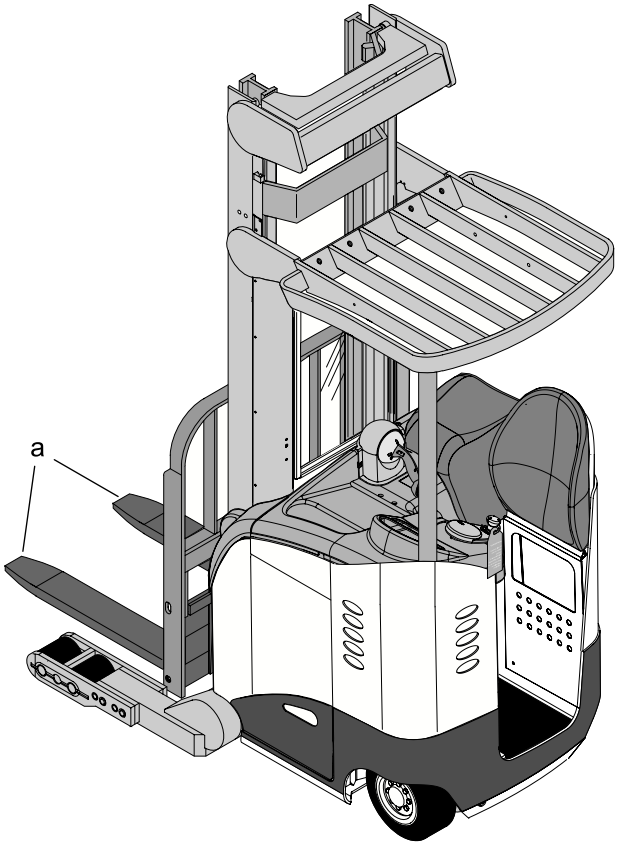


Figure 15992-01

a Tilt Forks Completely Down

Introduction

This manual is intended for the service mechanic who is seeking information about maintenance and service replacement parts. It contains a section on troubleshooting which will enable a qualified mechanic to locate and solve problems which may occur.

Operator Instructions

This manual does not contain operator instructions. Operator instructions in tag or booklet form are sent with each truck. Additional copies can be ordered if required. These booklets are for you and your personnel to insure years of safe, trouble free operation of your Crown Lift Truck. For operator instructions, refer to Crown publications, "Operator Manual RR/RD 5200 Series", "Operator Manual RR/RD 5200S Series".

Operator Training

Crown produces a complete series of operator training programs available through your local Crown dealer. A complete listing of these and other available programs can also be found under "Training" on www.crown.com.

Service Training

Complete Service Training is available for the lift truck technician covering all Crown Lift Trucks, module systems, wire guidance, hydraulic and electrical systems. To obtain more information concerning service training, contact your Crown Dealer or under "Training" on www.crown.com.

Replacement Parts

When ordering replacement parts from this manual, always specify, along with the part number, the model and serial number of the truck. This information will further enable us to give correct, fast and efficient service.

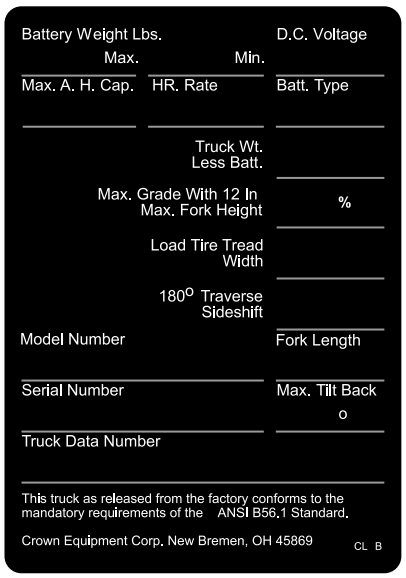
For current part number of service manuals, operator manuals, operator training programs, truck capacities and technical specifications, contact your local Crown dealer or at www.crown.com.

This manual is arranged according to major sections which covers maintenance and replacement parts. The sectional descriptions are as follows:

Maintenance		Replacement Parts	
Section	Description	Section	Description
M1	Lubrication and Adjustment	1	Basic Chassis Power Unit
M2	Hydraulic	2	Hydraulic System & Components
M3	Drive Unit	3	Drive Unit & Components
M4	Electrical	4	Electrical Components
M5	Brake	5	Brake Assemblies & Brake Systems
M6	Steering	6	Steering System & Components
M7	Mast and Main Frame	7	Main Frame and Mast Assemblies
M8	Cylinder	8	Cylinders
M9	Reach Assembly	9	Reach Assembly
M10	Glossary	10	Accessories
		11	Specifications

The data plate for the RR/RD 5200 series truck is located on the cover below the operator back rest/seat and includes a model number and truck data number. From these two numbers, you can identify the truck model, series and series updates, determine relative size or performance, capacity and specific truck data. The following pages explain the model & truck data numbering system.

RR/RD 5200

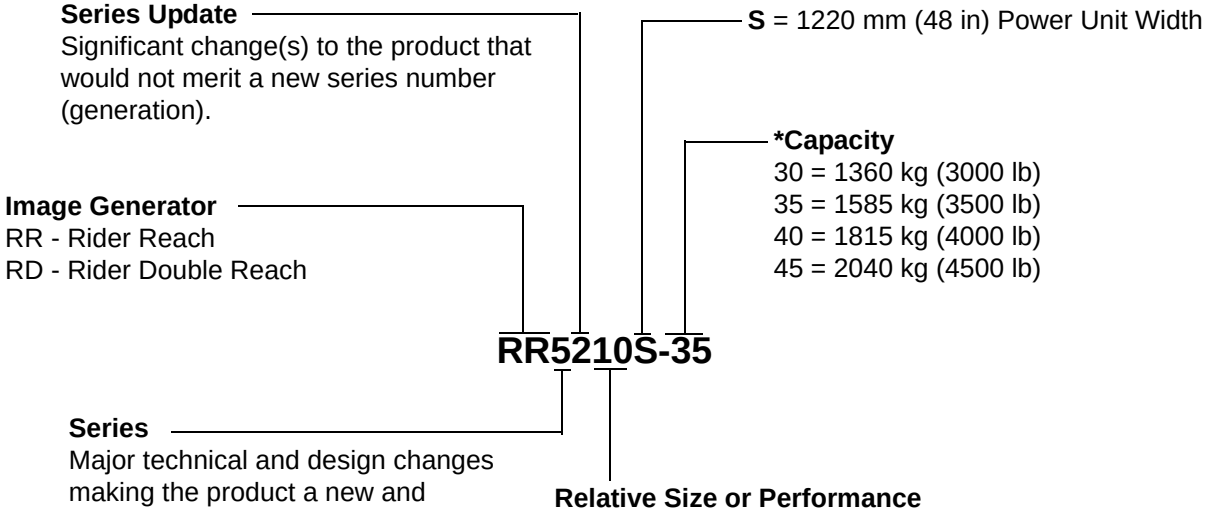


Truck Data Plate

RR/RD 5200S

Figure 17934

MODEL NUMBER EXAMPLE



The example of the model number shown above (RR5210-35) is a RR 5200 series. It has a 24 volt electrical system and 1585 kg (3500 lb) capacity.

*Actual rated capacity may vary, depending on special equipment or modifications. Consult capacity plate located on the power unit console.

The example of the truck data number shown on the following page is a DC traction drive truck with telescopic triple stage mast, 6095 mm (240 in) lift height, "C" size battery compartment, inside straddle dimension of 865 mm (34 in), without freezer condition, 100 mm x 105 mm (4 in x 4.12 in) load wheels, poly drive tire, sideshift, forward steering, without lights and travel alarm, bolt on outriggers, standard display, no productivity package, standard lift pump and without brush wear/over temperature indicator.

The truck data number provides you and your Crown dealer with a wealth of information to ensure the selection of proper parts for your Crown truck. You may simply provide this number to your Crown dealer, or use the following breakdown if selecting your own part numbers or service information from this manual.

Cold Conditioning/EE Rating
- = No Cold Conditioning/No EE
C = Corrosion Conditioning/No EE
F = Freezer Conditioning/No EE
E = No Cold Conditioning/EE Rating
D = Corrosion Conditioning/EE Rating
T = Thermo Assist/No EE

Battery Compartment Size
A = A Battery Compartment
B = B Battery Compartment
C = C Battery Compartment
D = D Battery Compartment
E = E Battery Compartment
* = Special

Mast Type
TT = Telescopic Triple Stage
DT = TT Drive Thru Mast

Drive Tire/Traction Control
P = Poly with DC Traction
S = Special with DC Traction
A = Poly with AC Traction
C = Special with AC Traction

Steering
F = Forward
R = Reverse

Outriggers
- = Standard
B = Bolt On
T = Tapered
O = Bolt On Tapered

Productivity Package
- = No Productivity Package
P = Productivity Package

Brush Wear/Over Temp Indicator & EE Rating
- = No Indicator
B = Indicator/No EE Rating
E = Indicator EE Rating

- TT 240 C 34 - 2 P S F - B S - Q - -

Standard/Custom/Special
- = Standard
C = Custom
S = Special

Lift Height
Displays Lift Height Dimension i.e.
240 = 240 in
270 = 270 in

Inside Straddle Dimension
i.e.
34 = 34 in
42 = 42 in
** = Special

Load Wheel Size
1 = 4 in x 2.9 in
2 = 4 in x 4.1 in
3 = 5 in x 2.9 in
4 = 5 in x 4.1 in
5 = 10.5 in x 4 in
6 = 10.5 in x 4.5 in
7 = 6 in x 2.9 in
8 = 6 in x 4.1 in
* = Special

Sideshifter
- = No Sideshifter
S = Sideshifter
* = Special

Travel Alarm & Light Package Option
- = No Travel Alarm & Lights
1 = Strobe Light
2 = Travel Alarm
3 = Worklights
4 = Travel Alarm & Strobe Light
5 = Worklights & Strobe Light
6 = Travel Alarm, Worklights, & Strobe Light
7 = Travel Alarm & Worklights

Display
S = Standard
E = Enhanced
C = Enhanced with CDM

Lift Pump
Q = Standard
S = High Speed

Third Post
- = No Third Post
T = Third Post
D = Drive in Rack Third Post

Lubrication and Adjustment

To obtain maximum life of any industrial equipment, a well planned maintenance program (PM), performed by qualified technical personnel should be followed. In conjunction with, and an integral part of, any planned maintenance program should be daily operator input. Operator involvement can greatly reduce truck down time, assist in determining planned maintenance (PM) schedules and ultimately save money. For these reasons, Crown recommends a checklist similar to the Operators Daily Checklist shown below.

Before performing maintenance to any unit, it should be taken to an area set aside for maintenance or a section where there is adequate space to perform required work. This is a must to insure the safety of others and to insure that proper maintenance is performed to the unit.

If desired, padded packs of this checklist (OF-3772) are available through your Crown dealer.

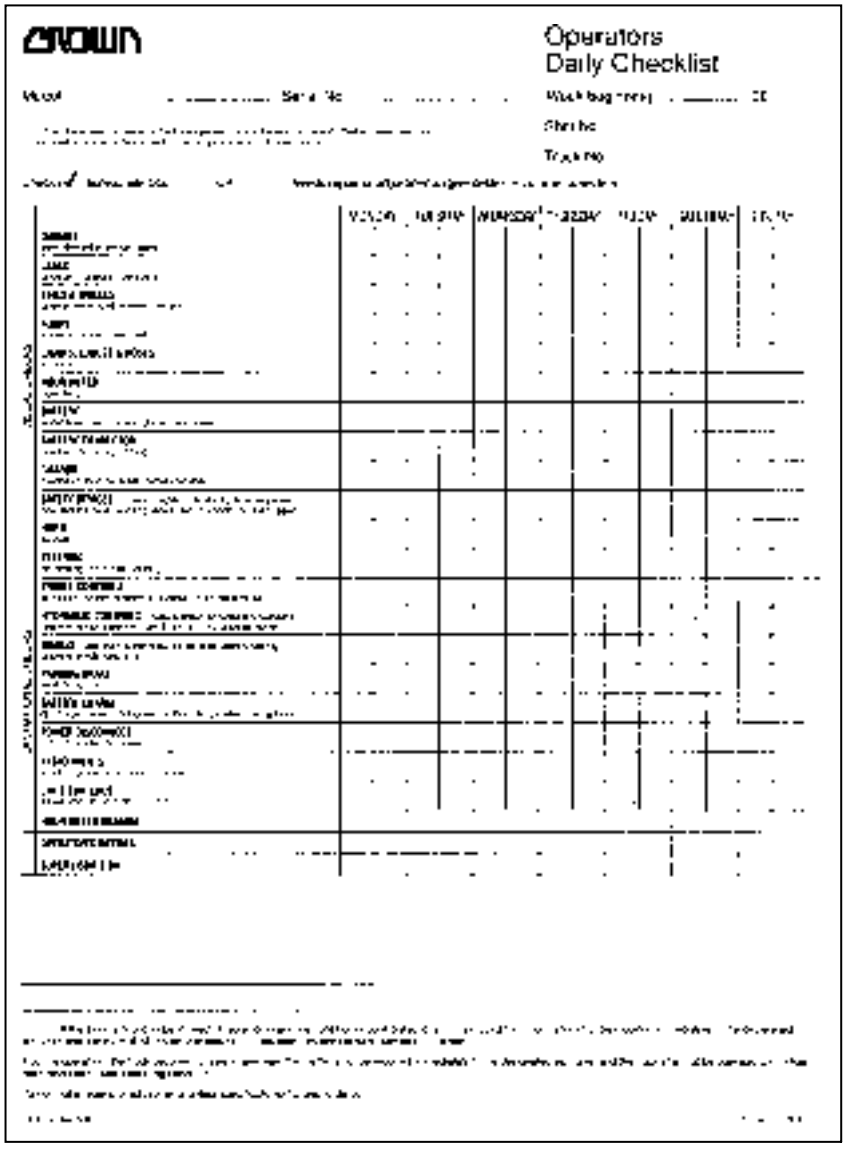

Operators
Daily Checklist

Figure 14990

The following is a list of lubricants and maintenance products recommended when doing Planned Maintenance on Crown Lift Trucks.

Lubrication Identification Chart

Type of Lubricant		Part Number	Package Quantity
A	Gear Lube 80W-90 (Typical)	363506-001 363506-012	1 Quart (12) 1 Quart Cans
AA	Automatic Transmission Fluid (Multi-Purpose)	363503-001 363503-012	1 Quart (12) 1 Quart
AAA	Universal Hydraulic & Transmission Fluid	363513-001 363513-012	1 Quart (12) 1 Quart
B	Grease (Multi-Purpose)	063002-034 063002-045	14.5 oz Cartridge (40) 14.5 oz Cartridges
BB(1)	Grease (Low Temperature)	063002-017 063002-046	14.5 oz Cartridge (40) 14.5 oz Cartridges
BBB	Food Grade Grease (Multi-Purpose)	363002-001 363002-030	14 oz Cartridge (30) 14 oz Cartridges
C	Oil (SAE 40)		
CC	Engine Oil (10W30)	363500-001 363500-012	1 Quart (12) 1 Quart
D	Hydraulic Oil	363504-101 363504-106	1 Gallon (6) 1 Gallon
DD(1)	Hydraulic Oil (Low Temp)	363505-101 363505-106	1 Gallon (6) 1 Gallon
DDD	Hydraulic Oil - DTE24	063001-021	1 Gallon
E	Channel Grease	063002-024 063002-022	14.5 oz Cartridge 35 lb Pail
F	Gear Grease	063002-024 063002-022	14.5 oz Cartridge 35 lb Pail
G	Chain & Cable Lube	363107-001 363107-012	15 oz Can (12) 15 oz Cans
	Premium Chain & Cable Lube	363115-001 363115-012	12 oz Can (12) 12 oz Cans
H	Final Finish - Rubber & Vinyl Dressing	363129-001 363129-012	11 oz Can (12) 11 oz Cans
I	Grease (Lift Pump Coupling)	063002-039 127801S	1 lb 1 oz
J	Brake Fluid - Dot 5	063004-002 063004-003	12 oz 1 Gallon

(1) Trucks operated in below freezing temperatures must use Low Temp Hydraulic Oil & Grease.

Lubrication Identification Chart			
Type of Lubricant		Part Number	Package Quantity
K	Grease (Wheel Bearing)	063002-034 063002-045	14.5 oz Cartridge (40) 14.5 oz Cartridges
L	Metal Assembly Spray	063002-021	11 oz Spray
M	Silicone Grease (Clear)	063002-020	5.3 oz Tube
N	Brake & Parts Cleaner	363102-001 363102-012	14 oz Can (12) 14 oz Cans
	Low VOC Brake & Parts Cleaner	363103-001 363103-012	14 oz Can (12) 14 oz Cans
	Non-Flammable Brake & Parts Cleaner	363116-001 363116-012	19 oz Can (12) 19 oz Cans
O	Penetrating Lubricant	363104-001 363104-012	20 oz Can (12) 20 oz Cans
P	Premium Formula Multi-Purpose Grease	363108-001 363108-012	11 oz Can (12) 11 oz Cans
Q	White Lithium Grease	363110-001 363110-012	11 oz Can (12) 11 oz Cans
R	Choke & Carburetor Cleaner	363109-001 363109-012	15 oz Can (12) 16 oz Cans
S	Contact Cleaner - Non-Flammable	363106-001 363106-012	10 oz Can (12) 10 oz Cans
	Contact Cleaner	363128-001 363128-012	11 oz Can (12) 11 oz Cans
T	Electrical Connector Oxidation & Corrosion Inhibitor	127189-001	30 cc
U	Battery Cleaner	363124-001 363124-012	18 oz Can (12) 18 oz Cans
V	Battery Protector	363125-001 363125-012	15 oz Can (12) 15 oz Cans
W	Food Grade Machine Lubricant	363127-001 363127-012	12 oz Can (12) 12 oz Cans
X	Food Grade Silicone Spray	363126-001 363126-012	11 oz Can (12) 11 oz Cans
Y	Coolant	363509-101 363509-106	1 Gallon (6) 1 Gallon
	Extended Life Coolant	363511-101 363511-106	1 Gallon (6) 1 Gallon

Alternate Lubricants & Fluids Chart			
Type of Lubricant		Product Name	Manufacturer / Distributor
A	Gear Lube 80W-90 (Typical)	Crown	Crown
AA	Automatic Transmission Fluid (Multi-Purpose)	Crown	Crown
B	Grease (Multi-Purpose)	Mobilgrease XHP 222 Special Union Unoba EP No 2 Retinax A(1) LM Grease Unirex EP-2	Mobil Union 76 Co. Shell Burmah Castrol Exxon
BB	Grease (Low Temp) (2)	Lubriplate Alvania RA(1) Helveum O(1)	Fiske Bros Refining Co. Shell Burmah Castrol
BBB	Food Grade Grease (Multi-Purpose)	Petro Canada Purity FG	Petro Canada
C	Oil (SAE 40)		
D	Hydraulic Oil	Crown	Crown
DD	Hydraulic Oil (Low Temp) (2)	Crown	Crown
DDD	Hydraulic Oil - DTE24 (3)	Mobil DTE 24	Mobil
E	Channel Grease	Factran #2	Standard Oil Co.
F	Gear, Channel & Shaft Grease	Molykote BR-2 Plus	Dow Corning
G	Chain & Cable Lube	Crown	Crown
	Premium Chain & Cable Lube	Crown	Crown
H	Final Finish - Rubber & Vinyl Dressing	Crown	Crown
I	Grease (Lift Pump Coupling)	Nyogel 774F-MS	NYE Lubricants
J	Brake Fluid - Dot 5	Q2-1141 Silicon Brake Fluid	Dow Corning
K	Grease (Wheel Bearing)	Mobilgrease XHP 222 Special Unirex EP-2 Lubriplate No. 1242(1)	Mobil Exxon Fiske Bros. Refining Co.
L	Metal Assembly Spray	Dow Corning	Dow Corning
M	Silicon Grease (Clear)	Dow Corning 111 Compound	Dow Corning
N	Brake & Parts Cleaner	Crown	Crown
	Low VOC Brake & Parts Cleaner	Crown	Crown
	Non-Flammable Brake & Parts Cleaner	Crown	Crown

(1) Denotes allowable substitutes, contact factory if unavailable.
(2) Trucks operated in below freezing temperatures must use Low Temp Hydraulic Oil & Grease.
(3) Premium antiwear hydraulic oil used in blending with low temp oil.

Alternate Lubricants & Fluids Chart			
Type of Lubricant		Product Name	Manufacturer / Distributor
O	Penetrating Lubricant	Crown	Crown
P	Premium Formula Multi-Purpose Grease	Crown	Crown
Q	White Lithium Grease	Crown	Crown
R	Choke & Carburetor Cleaner	Crown	Crown
S	Contact Cleaner	Crown	Crown
T	Electrical Connector Oxidation & Corrosion Inhibitor	Nye Grease	NYE Lubricants
U	Battery Cleaner	Crown	Crown
V	Battery Protector	Crown	Crown
W	Food Grade Machinery Lubricant	Crown	Crown
X	Food Grade Silicone Spray	Crown	Crown
Y	Extended Life Coolant		

This page available for **NOTES.**

Lubrication and Adjustment

Component Accessibility

For regular maintenance, access to various truck components is accomplished by removing covers, panels or opening the power unit door. The following is a general explanation of which cover, panel, etc. that must be removed to allow for the most efficient access when performing service and/or maintenance to components. Refer to the figures in this section as an aid in locating parts that require attention.

NOTE

Be sure battery connectors are disconnected.

The power unit console is secured to the top of power unit with five clip springs. Lift and remove console to perform maintenance to Access 3, Access 2, multi-task handle assembly, distribution panel (ALM1), key switch, hydraulic manifold block, Access 1 and key switch suppressor (SB20).

Remove four screws securing the contactor panel cover and remove cover to perform maintenance to the contactors, fuse panel and battery connector(s).

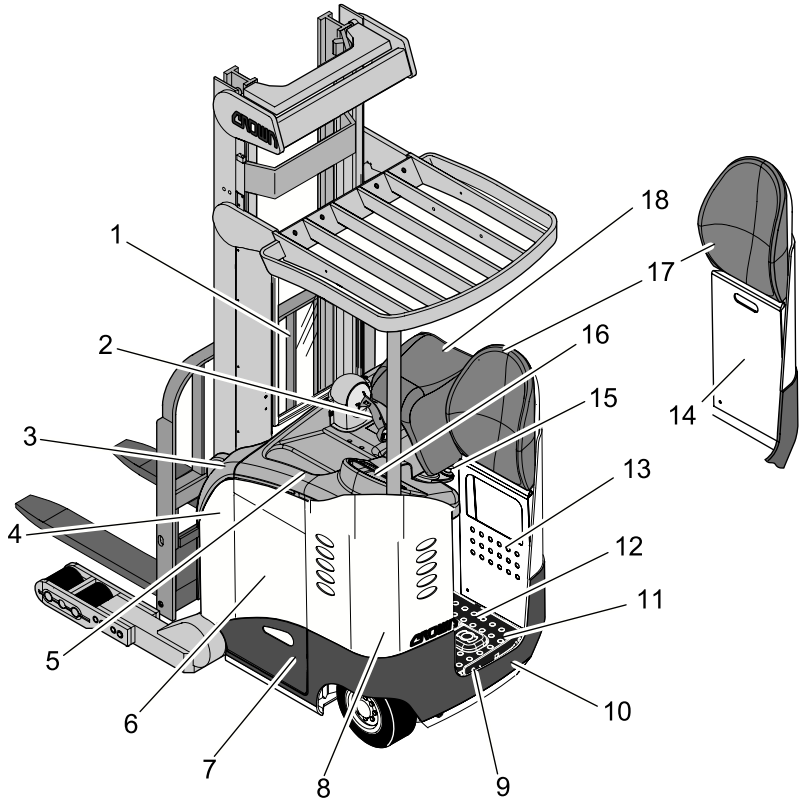
Remove contactor compartment cover and floorboard cover to access top of caster.

Remove floorboard to service pedals, switches ENS, BRS1 and DMS1 and connector JC607.

Unlatching and swinging open the power unit door allows access to the steering control unit (SCU), traction motor (M1), traction encoder (ECR1), electric brake (BRK1), lift pump motors (M2 & M3), lift pumps (P1 & P2), hydraulic steer motor linkage, horn (HN) and travel alarm (ALM2).

Remove left hand reservoir cover(s) to gain access to the left reservoir and breather element.

Remove right hand reservoir cover(s) to gain access to the right reservoir and filter element.



1 Safety Shield
2 Multi-Task Handle
3 Reservoir Cover
4 Reservoir Cover
5 Power Unit Cover
6 Battery Compartment
7 Battery Retainer
8 Power Unit Door
9 Floorboard Assembly
10 Entry Bar
11 Brake Pedal
12 Power ON Pedal
13 Contactor Panel Cover DC Drive
14 Traction Drive Module AC Drive
15 Steering Tiller
16 Access1 Display
17 Back Pad
18 Arm Pad

Figure 16772

Lubrication

The following information is intended to provide guidelines for proper lubrication intervals as called out in the lubrication chart. However, some operating conditions will require more frequent checks and lubrication than listed. For example, applications with much dust or moisture will require modification of the schedule to fit that particular application.

The use of high grade lubricants and fluids should be used. Sources of these lubricants may be from almost any of the oil companies; those listed in chapter M1 are typical and any lubricant with equal specifications may be used.

For truck applications operating continually in temperatures at or above 4° C (40° F) use 100% standard hydraulic oil (063001-001). Refer to Figure 16773.

For truck applications primarily operating in a cooler environment with intermittent freezer entry, use a 50/50 blend of low temperature (063001-006) and standard (063001-021) hydraulic oils. Refer to Figure 16773.

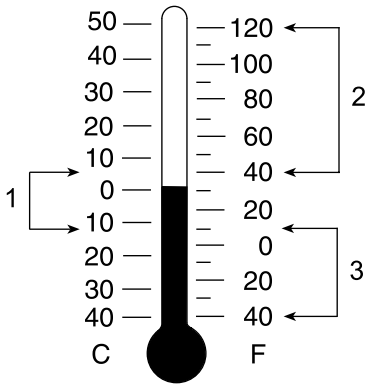
For trucks running continuously at temperatures of 12° C (10° F) or below, use an 80% low temperature (063001-006) and 20% standard (063001-021) hydraulic oils. Refer to Figure 16773.

Blending hydraulic oil as described above will ensure the best and most efficient operation of your Crown equipment.

All screws, washers, nuts, roll pins, retaining rings, etc. need to be coated with a rust preventive (078882) to protect against corrosion. Lubrication intervals must be changed to a frequency that will minimize corrosion and wear on moving shafts and parts.

NOTE

Use Planned Maintenance Inspection Reports (PF13025) for RR/RD 5200 trucks as required to record and assure maintenance checks.

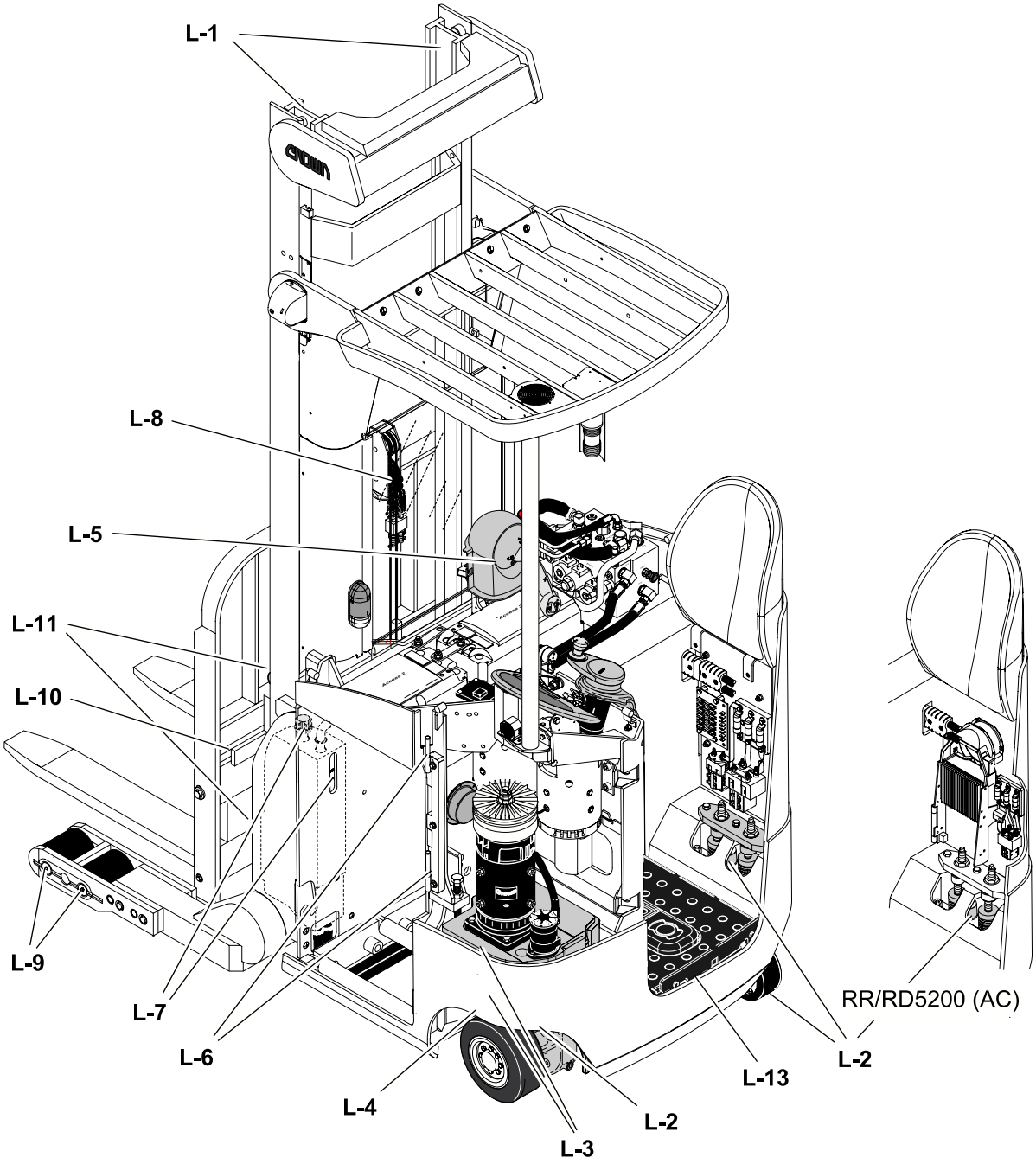


1 50/50 Blend of Low-Temp (063001-006 [50%]) & Hydraulic Oil (063001-021 [50%])

2 Hydraulic Oil (063001-001 [100%])

3 80/20 Blend of Low-Temp (063001-006 [80%]) & Hydraulic Oil (063001-021 [20%])

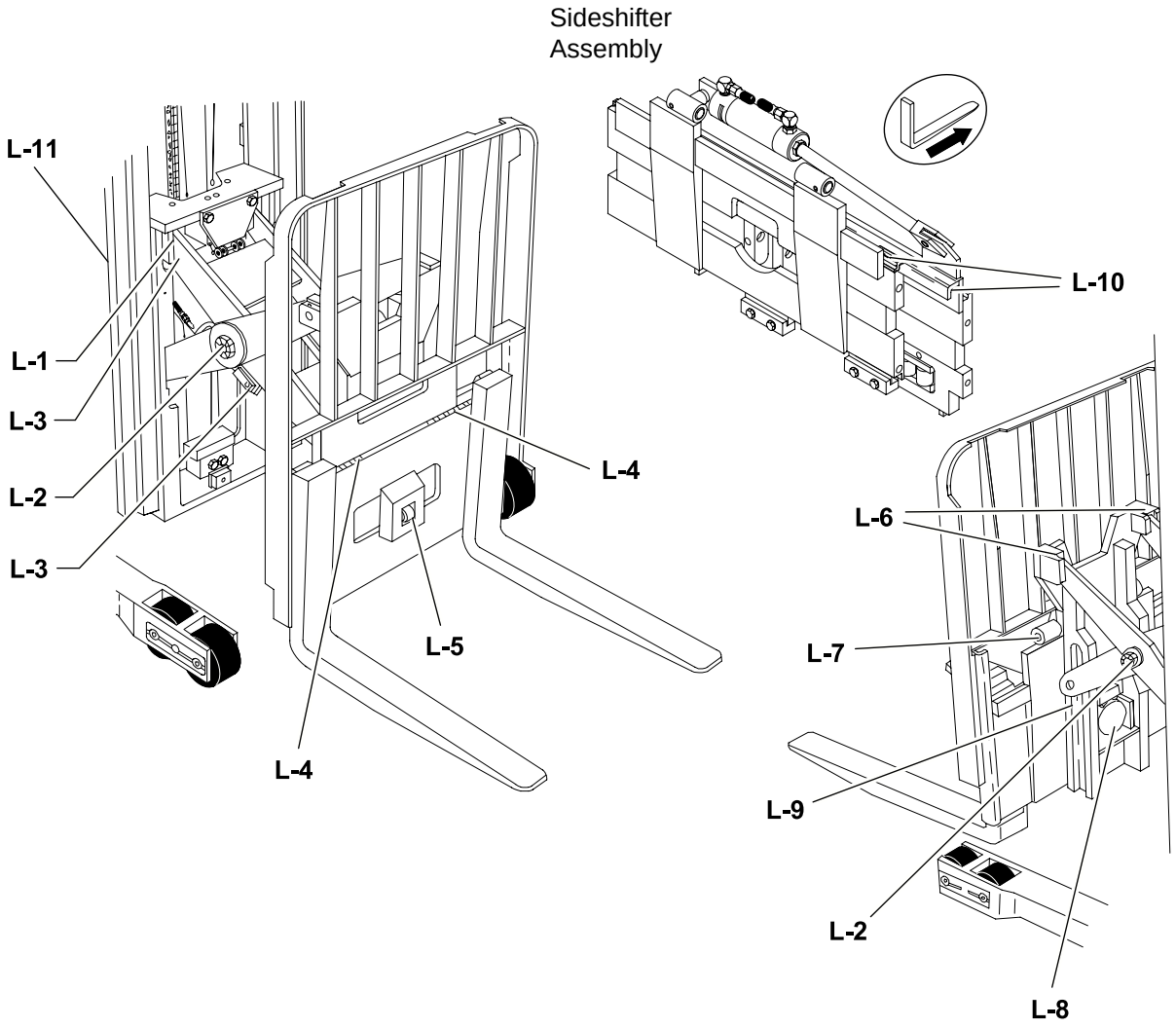
Figure 16773



See Lubrication Chart 1

Figure 16774

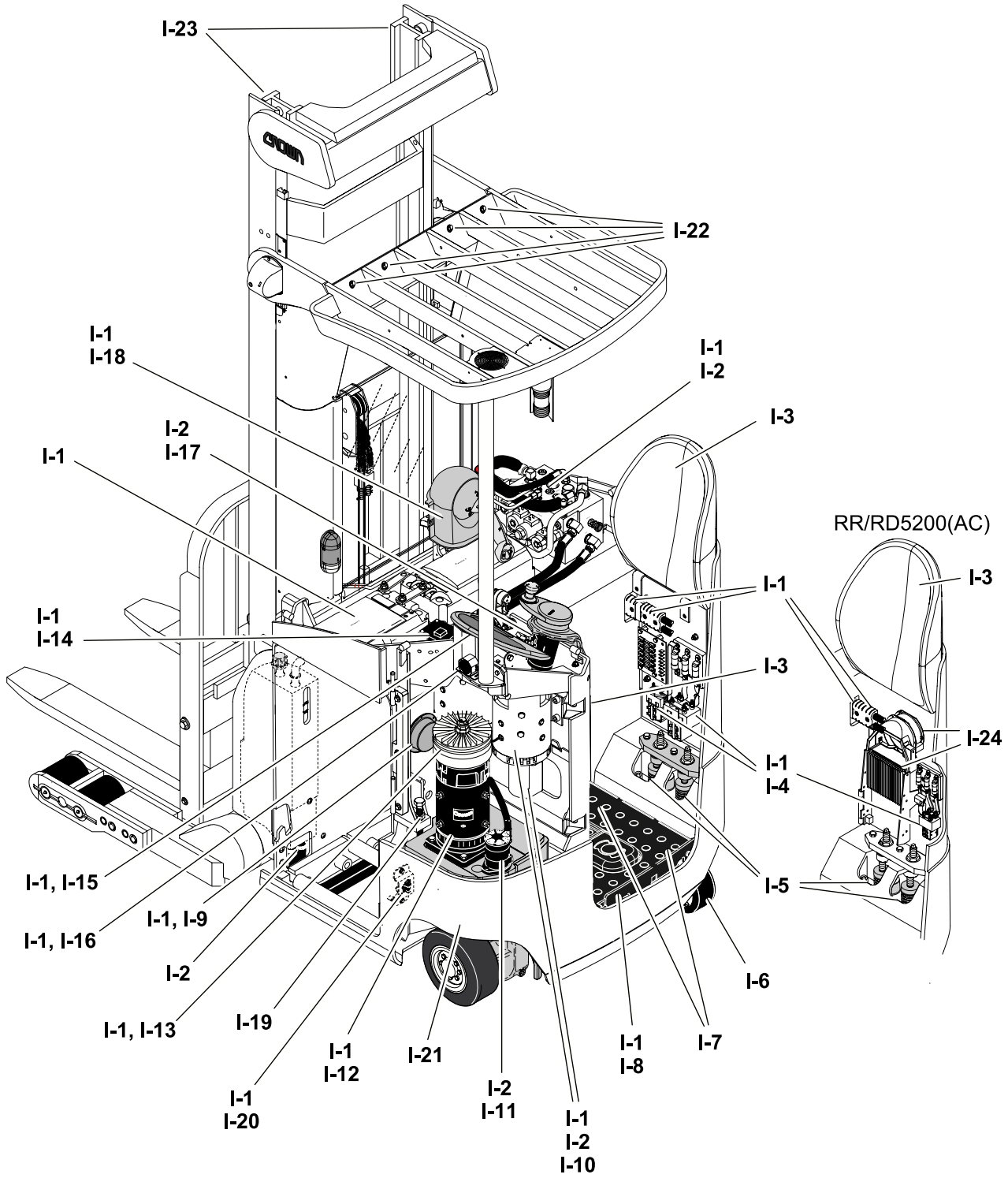
Lubrication Chart 1					
Index	Component	Lube Type	Quantity	60 Days 250 Hrs	12 Months 2000 Hrs
L-1	Mast Channels	E	As Req.	Check	
L-2	Castor Axle & Pivot	B**	As Req.	Lubricate	
L-3	Drive Unit Pivot	B	As Req.	Lubricate	
L-4	Drive Unit Level	A*	0.7 Litre (1.5 pint)	Check 1st Change	Change
L-5	Multi-Task Handle (Ramps & Plunger)	M	As Req.	Lubricate	
L-6	Door Hinge Pin(s)	C	As Req.	Check	
L-7	Hydraulic Reservoir - Left (shown)				
	Oil	D	12.3 Litre (3.25 Gallon)		Change
	Breather	D	1		Change
	Hydraulic Reservoir - Right				
	Oil	D	12.3 Litre (3.25 Gallon)		Change
	10 Micron Filter Element	D	1		Change
	Cap Breather Element	D	1		Change
L-8	All Lift Chains	C	As Req.	Check	
L-9	Load Wheel Axles (Left & Right Side)	B	As Req.	Check	
L-10	Fork Slides	B	As Req.	Check	
L-11	Mast Staging Bumpers (Bottom 2nd Stage Mast)	B	As Req.	Check	
L-12	Steering Gears	B	As Req.	Lubricate	
L-13	Lower Floorboard & Entry Bar Pivot Points	C	As Req.	Lubricate	
See “Lubrication Identification Chart” and “Alternate Lubricants & Fluids Chart” for Lube Type designation explanation chapter M1. Lubrication intervals must be changed to a frequency that will minimize wear on moving shafts and parts on vehicles used in less desirable operating conditions.					
Lubrication intervals for Freezer/Corrosion trucks must be changed to a frequency that will minimize corrosion and wear on moving parts.					
* In below freezing temperatures use Dextron II, Crown part number 063001-010.					
** In below freezing temperatures use low temperature, multipurpose grease, Crown part number 063002-017.					



See Lubrication Chart 2

Figure 16775

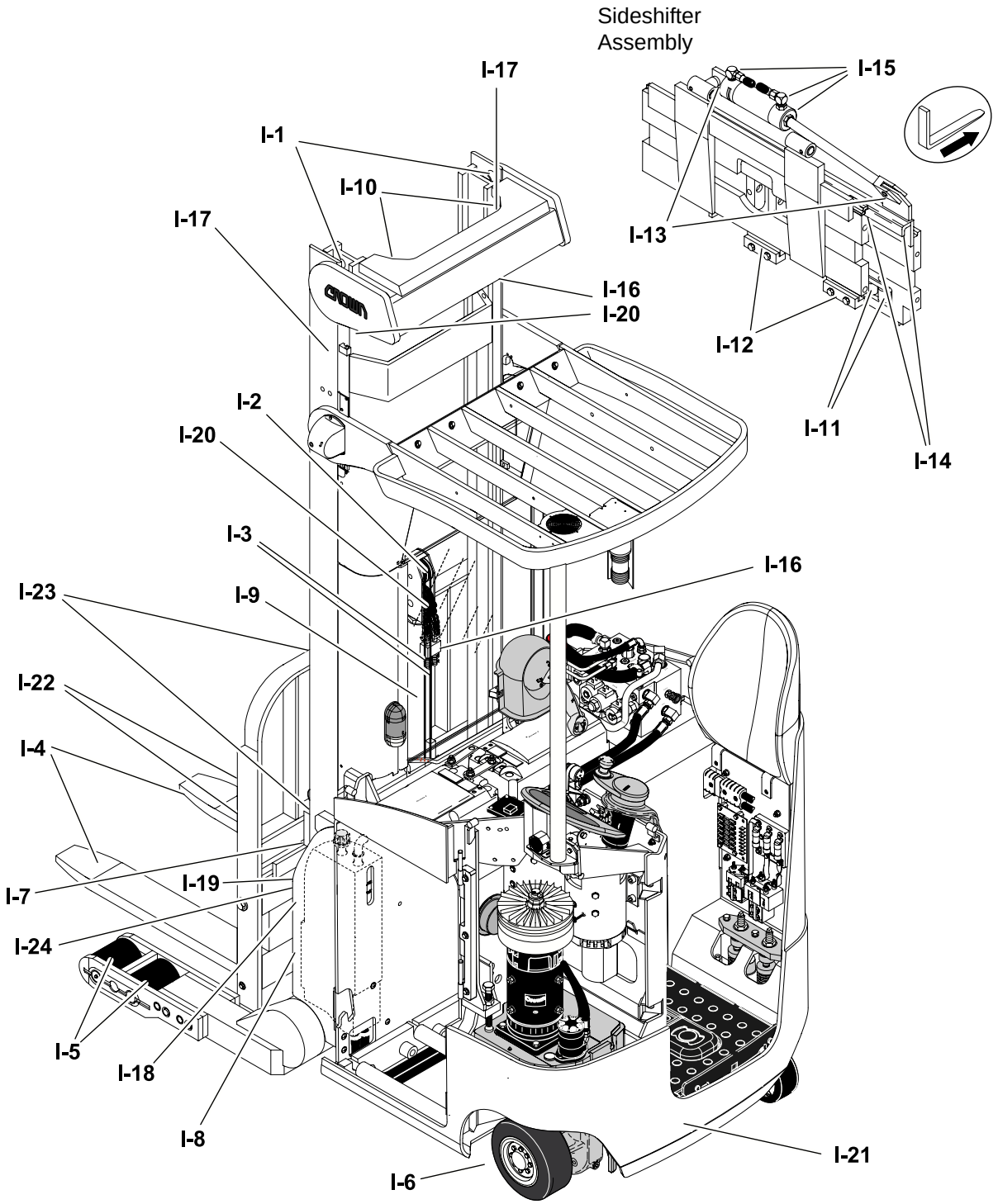
Lubrication Chart 2					
Index	Component	Lube Type	Quantity	60 Days 250 Hrs	12 Months 2000 Hrs
L-1	Upper Inner Arms	B	As Req.	Check	
L-2	Reach Pivot(s)	B	As Req.	Check	
L-3	Reach Cylinder Pivot(s)	L	As Req.	Check	
L-4	Fork Slides	B	As Req.	Check	
L-5	Tilt Cylinder Rod End	L	As Req.	Check	
L-6	Upper Outer Arm(s)	B	As Req.	Check	
L-7	Fork Carriage Pivot(s)	L	As Req.	Check	
L-8	Tilt Cylinder Pivot Bearings	L	As Req.	Check	
L-9	Carriage Channel	E	As Req.	Check	
L-10	Sideshifter Slide Rail	B	As Req.	Check	
L-11	Reach Carriage Staging Bumpers	B	As Req.	Check	
See “Lubrication Identification Chart” and “Alternate Lubricants & Fluids Chart” for Lube Type designation explanation chapter M1. Lubrication intervals must be changed to a frequency that will minimize wear on moving shafts and parts on vehicles used in less desirable operating conditions.					
Lubrication intervals for Freezer/Corrosion trucks must be changed to a frequency that will minimize corrosion and wear on moving parts.					



See Inspection Chart 1

Figure 16776

Inspection Chart 1			
Index	Component	60 Days 250 Hrs	12 Months 2000 Hrs
I-1	Electrical: Connections, Cables & Wiring	Check	
I-2	Hydraulic: Hoses & Fittings	Check	
I-3	Padding	Check	
I-4	Contactor Tips (ED & P2)	Check	
I-5	Undercarriage Articulation	Check	
I-6	Caster Wheel	Check	
I-7	Floorboard Springs	Check	
I-8	Floorboard Assembly (ENS, BRS1, DMS1)	Check	
I-9	Horn	Check	
I-10	Pump Motors (M2 & M3), Motor Brushes	Check	
	Pumps (P1 & P2)	Check	
I-11	Steer Motor	Check	
I-12	DC Traction Motor (M1): Motor Brushes	Check	
I-13	Electrical Brake (BRK1 & ECR1)	Check	
I-14	Distribution Panel (K1, K2, FU10 & FU11)	Check	
I-15	Access 1, Display Panel	Check	
I-16	Travel Alarm (Optional)	Check	
I-17	Steering Control Unit (SCU)	Check	
I-18	Multi-Task Control (POT1, 2, 3, FS, RS & EDS)	Check	
I-19	Articulation Adjustment	Check	
I-20	Battery Retainer (BRES1, Right & BRES2, Left Shown)	Check	
I-21	Drive Unit Oil Pump Operation	Check	
I-22	Overhead Guard: Secure To Truck & No Cracks	Check	
I-23	Mast Dampening Screws (2nd & 3rd Masts Top & Bottom)	Check	
I-24	Electrical: Connections, Wiring & Blow Dust Off Fan & TDM Heat Sink)	Check	
Refer to appropriate section of service manual for additional information concerning inspection and/ or adjustment.			



See Inspection Chart 2

Figure 16777

Inspection Chart 2			
Index	Component	60 Days 250 Hrs	12 Months 2000 Hrs
I-1	Column Rollers	Check	
I-2	Yoke	Check	
I-3	Control Cables	Check	
I-4	Forks	Check	
I-5	Load Wheels	Check	
I-6	Drive Tire & Lug Bolts	Check	
I-7	Reach Cylinders	Check	
I-8	Tilt Cylinders	Check	
I-9	Free Lift Cylinder	Check	
I-10	Lift Cylinders	Check	
I-11	Rollers & Bearings	Check	
I-12	Lower Hangers	Check	
I-13	Sideshift Cylinder Mounting	Check	
I-14	Slides	Check	
I-15	Sideshift Cylinder & Hydraulic Connections	Check	
I-16	Lift Chain Anchors	Check	
I-17	Height Sensor (ECR2) - See Note 1 & Height Encoder	Check	
I-18	Free Lift Switch (FLS)	Check	
I-19	Fork Switch (FKS) - Optional	Check	
I-20	All Lift Chains	Check	
I-21	Undercarriage Pivot Points	Check	
I-22	Mast & Reach Carriage Staging Bumpers	Check	
I-23	Mast Mounting Screws (6) for Tightness	Check	
I-24	Tilt Position Assist (TPA)	Check	
Refer to appropriate section of service manual for additional information concerning inspection and/ or adjustment.			
Note 1: ECR2 is optional on trucks with 6860 mm (270 in) or less lift height and standard on trucks with greater than 6860 mm (270 in) lift height.			

Componentry

ALM1

Status Alarm

Location: distribution panel.

Purpose: draws operator attention to changing truck status.

Data: controlled by Access 3.

Adjustment: none required.

ALM2

Travel Alarm

Location: above motors in motor compartment.

Purpose: audible warning when traveling forward and/or reverse direction.

Data: controlled by Access 2.

Adjustment: none required.

BRES1, BRES2

Battery Retainer Switches

Location: battery compartment wall toward operator compartment.

Purpose: monitor switch for control system. Informs control system when battery restraints are in place.

Data: wired normally open.

Adjustment: Slight adjustment through elongated mounting holes in mounting bracket.

BRK1

Drive Brake

Location: traction motor (M1).

Purpose: provide braking force to drive motor to stop truck and prevent movement of parked vehicle.

Data: Access 3 release via operator or control system request, spring applied.

Adjustment: Service menu level P6.

BRS1

Brake Pedal Switch

Location: under floorboard left foot pedal.

Purpose: allows operator to control brakes operation through control system.

Data: momentary contact wired normally closed. Switch actuated when operator not on pedal.

Adjustment: none required.

BWS1, BWS2, BWS3

Motor Brush Wear Switches

Location: BWS1 - traction motor, BWS2 - pump motor P1, BWS3 - pump motor P2.

Purpose: informs control system when brushes are worn to replacement length.

Data: wired normally closed. Brushes worn to replacement length open contact.

Adjustment: none required.

CBV

Counter Balance Valve

Location: reach carriage.

Purpose: provide smooth motion control for reach, tilt, sideshift, control reach & tilt drift.

Data: pressure setting pre-set by vendor.

Adjustment: none required.

CV1

Check Valve

Location: hydraulic manifold.

Purpose: allow one direction flow of hydraulic fluid from PCA to PVH and prevent back flow to PCBy and PCA during lowering.

Data: not applicable.

Adjustment: none required.

CV2

Check Valve

Location: hydraulic manifold.

Purpose: prevent back flow into pump P2.

Data: not applicable.

Adjustment: none required.

CV3

Check Valve

Location: hydraulic manifold.

Purpose: prevent lift cylinder from bypassing PVH during lower.

Data: not applicable.

Adjustment: none required.

CV4

Check Valve

Location: hydraulic manifold.

Purpose: prevent lift flow from P1 bypassing PVH during raise.

Data: not applicable.

Adjustment: none required.

CV6

Check Valve

Location: hydraulic manifold (36V trucks).

Purpose: permit P2 pressure to be limited by RV1 during high speed lift. Blocks flow from P1 into P2 circuit during low speed lift.

Data: not applicable.

Adjustment: none required.

DMS1

Interlock Switch

Location: under floorboard right pedal.

Purpose: limits truck operation when operator's foot is not in proper position.

Data: wired normally closed. Switch actuated when operator's foot not on pedal.

Adjustment: none required.

DPS1, DPS2, DPS3, DPS4, DPS5, DPS6

Display Function Switches

Location: Access 1 (display panel). DPS1 - up arrow, DPS2 - down arrow, DPS3 - enter, DPS4 - performance, DPS5 - truck hours, DPS6 - service codes.

Purpose: operator interface with control system for various truck information.

Data: printed circuit board mounted push button switch wired normally open.

Adjustment: none required.

ECR1

Traction Feedback Encoder

Location: on traction motor (M1).

Purpose: provide ground speed and direction information for control system based on motor speed.

Data: 5 volts DC, 128 counts per revolution resolution.

Adjustment: none required.

ECR2

Height Sensor

Location: side of mast.

Purpose: provide measured height of forks beyond free lift.

Data: 32 counts per revolution resolution.

Adjustment: see Calibration.

ED

Emergency Disconnect Contactor

Location: contactor panel.

Purpose: provide means for operator or control system to remove power from control and/or power circuits.

Data: Access 3 provides battery positive to contactor and Access 2 provides battery negative. Coil voltage 24 volts DC, coil resistance 44 ohms.

Adjustment: none required.

EDS

Emergency Disconnect Switch

Location: operator compartment.

Purpose: resets emergency disconnect contactor, removing battery power from control and power circuits.

Data: wired normally closed. Pressing switch button actuates switch.

Adjustment: none required.

ENS

Operator Compartment Entry Switch

Location: under floorboard.

Purpose: signals Access 3 to remove power from traction circuit when operator's foot is resting on power unit skirt area along operator compartment.

Data: wired normally closed. Operator standing on skirt actuates switch.

Adjustment: none required.

FN

Operator Compartment Fan

Location: overhead guard.

Purpose: operator comfort.

Data: 24 volt DC high speed, 12 volt DC low speed, 1 amp current draw.

Adjustment: none required.

FN1, FN2

Motor Compartment Fans

Location: compartment door.

Purpose: enhance thermal capacity.

Data: 24 to 56 volt DC, 420 mA running current, 3500 rpm, 235 cfm.

Adjustment: none required.

FKS

Forks Tilted Switch

Location: reach carriage.

Purpose: monitor switch for control system. Informs control system when forks are tilted fully up or down.

Data: wired normally open. Switch contacts open when forks tilted to maximum limits.

Adjustment: none required.

FLS

Free Lift Switch

Location: reach carriage.

Purpose: monitor switch for control system. Informs control system when mast is within free lift range.

Data: wired normally open. Switch is actuated when mast is in free lift range.

Adjustment: none required.

FNS

Fan Switch

Location: operator compartment panel.

Purpose: permit operator to control operator comfort fan with OFF, LOW and HIGH selections.

Data: three position selector switch.

Adjustment: none required.

FS

Forward Switch

Location: pivot point of multi-task control handle.

Purpose: informs control system forward travel direction is being requested by operator.

Data: optic switch output is 0 volts when forward travel direction selected. Output is 5 volts when in neutral or when reverse travel is selected.

Adjustment: none required.

FU1

Main Control Fuse

Location: contactor panel.

Purpose: protect control circuitry from over current.

Data: see Electrical Parts.

Adjustment: none required.

FU2

Fan/Work Lights Fuse

Location: contactor panel.

Purpose: protect lights and associated wiring from over current.

Data: see Electrical Parts.

Adjustment: none required.

FU3

Options Fuse

Location: contactor panel.

Purpose: protect optional components and associated wiring from over current.

Data: see Electrical Parts.

Adjustment: none required.

FU4

Hydraulics Fuse

Location: contactor panel.

Purpose: protect componentry controlled by Access 2 and associated wiring from over current.

Data: see Electrical Parts.

Adjustment: none required.

FU5

Brake Outer Coil Fuse (BRK1)

Location: contactor panel.

Purpose: protect outer coil and associated wiring from over current.

Data: see Electrical Parts.

Adjustment: none required.

FU6

Brake Inner Coil Fuse (BRK1)

Location: contactor panel.

Purpose: protect BRK1 inner coil and associated wiring from over current.

Data: see Electrical Parts.

Adjustment: none required.

FU7

M3 Motor Fuse (P2)

Location: contactor panel.

Purpose: protect motor and associated wiring from over current.

Data: see Electrical Parts.

Adjustment: none required.

FU8

M2 Lift Motor Fuse (P1)

Location: contactor panel.

Purpose: protect lift motor and associated circuitry from over current.

Data: see Electrical Parts.

Adjustment: none required.

FU9

Traction Motor Fuse (M1)

Location: contactor panel.

Purpose: protect traction motor and associated circuitry from over current.

Data: see Electrical Parts.

Adjustment: none required.

FU10

Access 3 Switch Common (T-COMM)

Location: distribution panel.

Purpose: protect Access 3 input circuitry from over current.

Data: see Electrical Parts.

Adjustment: none required.

FU11

Access 2 Switch Common (H-COMM)

Location: distribution panel.

Purpose: protect Access 2 input circuitry from over current.

Data: see Electrical Parts.

Adjustment: none required.

FU12

Freezer Condition Fuse

Location: freezer condition distribution panel.

Purpose: protect freezer condition components and wiring from over current.

Data: see Electrical Parts.

Adjustment: none required.

FU13

Freezer Condition Fuse

Location: freezer condition distribution panel.

Purpose: protect freezer condition components and wiring from over current.

Data: see Electrical Parts.

Adjustment: none required.

HGTRS

Height Reset Switch

Location: side of mast.

Purpose: resets counter in electronic system when forks are lowered.

Data: wired normally open. When mast is within free lift range switch is held closed.

Adjustment: none required.

HGTS12

Height Switch 305 mm (12 in)

Location: top of main frame.

Purpose: monitor switch for control system. Switch resets when forks are within 305 mm (12 in) of full lift height to allow Access 2 to limit lift speed.

Data: wired normally open. Actuated when forks are more than 305 mm (12 in) from full lift height.

Adjustment: Adjust switch arm to reset switch when forks are within 305 mm (12 in) of full lift height.

HN

Horn

Location: motor compartment.

Purpose: provide operator controlled audible warning to operating area.

Data: 24 to 48 volt DC, 0.4 amp.

Adjustment: none required.

HNS

Horn Switch

Location: multi-task control handle.

Purpose: allows operator to sound horn.

Data: wired normally open. When pressed, actuates Mosfet Driver which energizes K2 that supplies battery voltage to horn.

Adjustment: none required.

HSS

High Speed Switch

Location: tilt cylinder.

Purpose: monitor switch for control system. Informs if forks are carrying a load. Limits high speed traction and lower.

Data: wired normally closed. Load on forks actuates switch by monitoring pressure in tilt cylinders.

Adjustment: none required.

K1

Power Up Relay

Location: distribution panel.

Purpose: provides power up, power down sequence interlock.

Data: 24 or 36 volt DC coil energized upon key switch test position closure.

Adjustment: none required.

K2

Horn Relay

Location: distribution panel.

Purpose: provides battery voltage path to horn.

Data: 24 or 36 volt DC coil energized upon horn switch closure by operator.

Adjustment: none required.

K3

Options Relay

Location: display mounting bracket.

Purpose: provides electrical power for optional electrical equipment e.g. lights, fan, etc.

Data: 24 or 36 volt DC coil energized upon key switch test position closure.

Adjustment: none required.

KYS

Key Switch

Location: operator compartment.

Purpose: allows operator to power up and power down truck.

Data: key operated selector switch. Energizes K1 with start position and maintains K1 with ignition position.

Adjustment: none required.

LGS1

Light Switch Number 1 (dome)

Location: operator compartment (display).

Purpose: allows operator to turn dome light on and off.

Data: toggle switch wired normally open.

Adjustment: none required.

LGS2

Light Switch Number 2 (work)

Location: operator compartment (display).

Purpose: allows operator to turn work lights on and off.

Data: toggle switch wired normally open.

Adjustment: none required.

LGT1

Dome Light

Location: on LH mast guard.

Purpose: provide light for operator compartment.

Data: 12.8 volt DC, 1.44 amp, use 10 ohm resistor in series for 24 volt trucks and 20 ohm resistor in series for 36 volt trucks.

Adjustment: none required.

LGT2, LGT3

Work Lights

Location: side of mast at over head guard. Optional mounting in center of mast at overhead guard.

Purpose: provide work area light outside operator compartment.

Data: 2 amp, 24 volt DC for 24 volt trucks and 36 volt DC for 36 volt trucks.

Adjustment: minimal manual directional adjustment.

LGT4

Strobe Light

Location: overhead guard.

Purpose: high intensity visual warning of lift truck presence.

Data: 0.5 amp, 24 volt DC for 24 volt trucks, 36 volt DC for 36 volt trucks.

Adjustment: none required.

LS

Load Sense

Location: base of tilt cylinder.

Purpose: provide approximate weight measurement information on forks for data capacity monitor.

Data: bi-directional differential pressure transducer.

Adjustment: refer to Calibration.

M1

Traction Motor

Location: in motor compartment.

Purpose: provide driving force for traction.

Data: Access 3 provides speed control via operator input (POT1).

Adjustment: none required.

M2

Lift Motor #1

Location: in motor compartment.

Purpose: provide driving force for hydraulic pump supplying hydraulic pressure for lift, steering and accessory functions.

Data: speed control provided by Access 2 via operator input (POT2).

Adjustment: none required.

M3

Lift Motor P2

Location: in motor compartment.

Purpose: provide driving force for hydraulic pump supplying hydraulic pressure for high speed lift.

Data: on/off control provided by P2 contactor which is controlled by Access 2 via operator input (POT2).

Adjustment: none required.

MRC1

Access 3

Location: top of power unit below console.

Purpose: controls traction motor speed via operator input (POT1).

Data: transistor control circuitry.

Adjustment: refer to AC Traction Drive.

MRC2

Access 2

Location: top of power unit below console.

Purpose: controls motor M2 speed and motor M3 on/off via operator input (POT2).

Data: transistor control circuitry.

Adjustment: refer to AC Traction Drive.

MVL

Manual Lowering Valve

Location: hydraulic manifold.

Purpose: provide emergency manual lower for lift cylinders in event of power failure.

Data: fine metering needle valve (eight turns for full open adjustment). Normally closed.

Adjustment: none required.

ORF1

Orifice #1

Location: hydraulic manifold.

Purpose: vent output for PCA when not used.

Data: nominal 0.4 mm (0.016 in) orifice.

Adjustment: none required.

ORF2

Orifice #2

Location: hydraulic manifold.

Purpose: vent pilot signal for PCBy when not raising.

Data: nominal 0.25 mm (0.010 in) orifice diameter.

Adjustment: none required.

ORF3

Orifice #3

Location: hydraulic manifold.

Purpose: dampen pressure signal to PCH.

Data: nominal 0.38 mm (0.015 in) diameter orifice.

Adjustment: none required.

ORF4

Orifice #4

Location: hydraulic manifold.

Purpose: dampen pressure pilot signal to PCBy.

Data: nominal 0.79 mm (0.031 in) diameter orifice.

Adjustment: none required.

ORS

Lift Cutout Override Switch

Location: operator compartment (display).

Purpose: allows operator to override a lift cutout.

Data: momentary contact toggle switch wired normally open.

Adjustment: none required.

P1

Lift, Steering and Accessory Hydraulic Pump

Location: in motor compartment.

Purpose: provide hydraulic flow to operate steering, lift and accessory functions of truck.

Data: not applicable.

Adjustment: none required.

P2

High Speed Lift Hydraulic Pump

Location: in motor compartment.

Purpose: provide hydraulic pressure for high speed lift function.

Data: see parts page for displacement.

Adjustment: none required.

P2

Pump Contactor

Location: contactor panel.

Purpose: switch power to motor M3. On/off controlled by Access 2 via operator input (POT2).

Data: 24 volt DC.

Adjustment: none required.

PCA

Pressure Compensator

Location: hydraulic manifold.

Purpose: provide compensated flow control for accessory functions & bypass excess flow to lift.

Data: not applicable.

Adjustment: none required.

PCBy

Pressure Compensator Bypass

Location: hydraulic manifold.

Purpose: bypass excess lift and accessory flow to tank.

Data: 695 kPa (100 psi) bias at crack; nominal 10 gpm flow.

Adjustment: none required.

PCH

Pressure Compensator

Location: hydraulic manifold.

Purpose: provide meter-out pressure compensation for PVH flow.

Data: not applicable.

Adjustment: none required.

POT1

Traction Request Potentiometer

Location: pivot point of multi-task control handle.

Purpose: provide traction input to controller.

Data: 1.7 K ohm.

Adjustment: refer to Calibration.

POT2

Lift Request Potentiometer

Location: pivot point of multi-task control handle.

Purpose: provide lift request input to controller.

Data: 1.7 K ohm.

Adjustment: refer to Calibration.

POT3

Accessory Request Potentiometer

Location: multi-task control handle.

Purpose: provide accessory functions request input to controller.

Data: 1.7 K ohms.

Adjustment: refer to Calibration.

POT4

Tilt Position Assist Potentiometer

Location: reach carriage.

Purpose: provide tilt position input to TPA module.

Data: 5 K ohms.

Adjustment: refer to Calibration.

PVA

Accessory Function Electrical Proportional Valve

Location: hydraulic manifold.

Purpose: provide proportional flow control of accessory functions.

Data: coil controlled by Access 2 when accessory function is selected via POT3 and SSS.

Adjustment: refer to Calibration.

PVH

Raise/Lower Electrical Proportional Valve

Location: hydraulic manifold.

Purpose: provide proportional flow control of raise and lower functions.

Data: coil controlled by Access 2 when raise/lower function is selected via POT2.

Adjustment: refer to Calibration.

RDB1

Horn Relay Driver Block

Location: top of motor compartment.

Purpose: provides ground path to horn relay K2.

Data: 24 or 36 volt MOSFET driver actuated upon switch closure.

Adjustment: none required.

RS

Reverse Switch

Location: pivot point of multi-task control handle.

Purpose: informs control system reverse travel direction being requested by operator.

Data: optic switch output 0 volt when reverse travel direction selected. Output 5 volt when in neutral or forward travel selected.

Adjustment: none required.

RV1

Relief Valve #1

Location: hydraulic manifold.

Purpose: limit maximum lift pressure for raise.

Data: not applicable.

Adjustment: adjusted to 21,375 kPa (3100 psi) & sealed at inspection.

RV2

Relief Valve #2

Location: hydraulic manifold.

Purpose: limit maximum accessory pressure (independent of lift).

Data: preset to 10,340 kPa (1500 psi).

Adjustment: none required.

RV3

Relief Valve #3

Location: steering control unit.

Purpose: limit maximum inlet steering pressure.

Data: preset to 8275 kPa (1200 psi).

Adjustment: none recommended.

SB20

Suppressor Block

Location: display, mounting bracket.

Purpose: key switch inrush current protection.

Data: not applicable.

Adjustment: none required.

SB21

Suppressor Block

Location: near Access 2.

Purpose: suppress electrical noise from operation of horn.

Data: not applicable.

Adjustment: none required.

SB42

Suppressor Block

Location: fan wire harness.

Purpose: suppress electrical noise from operation of compartment fans.

Data: not applicable.

Adjustment: none required.

SB80

Suppressor Block

Location: inside fan assembly (OHG).

Purpose: suppress electrical noise from operation of operator compartment fan (FN).

Data: not applicable.

Adjustment: none required.

SB81

Suppressor Block

Location: inside strobe light assembly (OHG).

Purpose: suppress electrical noise from operation of strobe light (LGT4).

Data: not applicable.

Adjustment: none required.

SCU

Steering Control Unit

Location: at base of steering tiller.

Purpose: provide steer direction & flow to steer motor.

Data: not applicable.

Adjustment: none required.

SCV6

Solenoid Check Valve

Location: hydraulic manifold.

Purpose: 24V - to maximize efficiency by bypassing all other valving when maximum lift is requested.
36V - uses CV6 check valve.

Data: not applicable.

Adjustment: none required.

SSS

Side Shift Select Switch

Location: switch in multi-task handle.

Purpose: allows operator to select between reach and side shift functions.

Data: printed circuit board mounted push button.

Adjustment: none required.

SVA

Accessory Direction

Location: hydraulic manifold.

Purpose: select direction of hydraulic fluid flow for accessory function.

Data: coil energized by Access 2 when accessory function selected via POT3, SSS, or TDS. Coil resistance 28.8 ohms. Coil voltage 24 volts DC regardless of battery voltage.

Adjustment: none required.

SVL

Lower Solenoid

Location: hydraulic manifold.

Purpose: provide hydraulic flow path for lower function.

Data: coil energized by Access 2 when lower function selected via POT2. Coil resistance 28.8 ohms. Coil voltage 24 volts DC regardless of battery voltage.

Adjustment: none required.

SVP

Solenoid Venting Pilot

Location: hydraulic manifold.

Purpose: open load sense pilot to PCBy while raise function is selected.

Data: coil energized by Access 2 when raise function is selected via POT2. Coil resistance 39.3 ohms. Coil voltage 24 volts DC regardless of battery voltage.

Adjustment: none required.

SVR

Reach Solenoid

Location: manifold block on reach support.

Purpose: provide hydraulic flow path for reach function.

Data: coil energized by Access 2 when reach function is selected via POT3. Coil resistance 39.3 ohms. Coil voltage 24 volts D.C. regardless of battery voltage.

Adjustment: none required.

SVS

Side Shift Solenoid

Location: manifold block on reach carriage.

Purpose: provide hydraulic flow path for side shift function.

Data: coil energized when side shift function selected via POT3 and SSS. Coil resistance 39.3 ohms. Coil voltage 24 volts D.C. regardless of battery voltage.

Adjustment: none required.

SVT

Tilt Solenoid

Location: manifold block on reach carriage.

Purpose: provide hydraulic flow path for tilt function.

Data: coil energized by Access 2 when tilt function is selected via TBS or TDS. Coil resistance 39.3 ohms. Coil voltage 24 volts D.C. regardless of battery voltage.

Adjustment: none required.

TBS

Tilt Back Switch

Location: multi-task control handle.

Purpose: allows operator to select tilt back function of hydraulic system.

Data: printed circuit board mounted push button switch wired normally open.

Adjustment: none required.

TDS

Tilt Down Switch

Location: multi-task control handle.

Purpose: allows operator to select tilt down function of hydraulic system.

Data: printed circuit board mounted push button switch wired normally open.

Adjustment: none required.

THS1, THS2, THS3

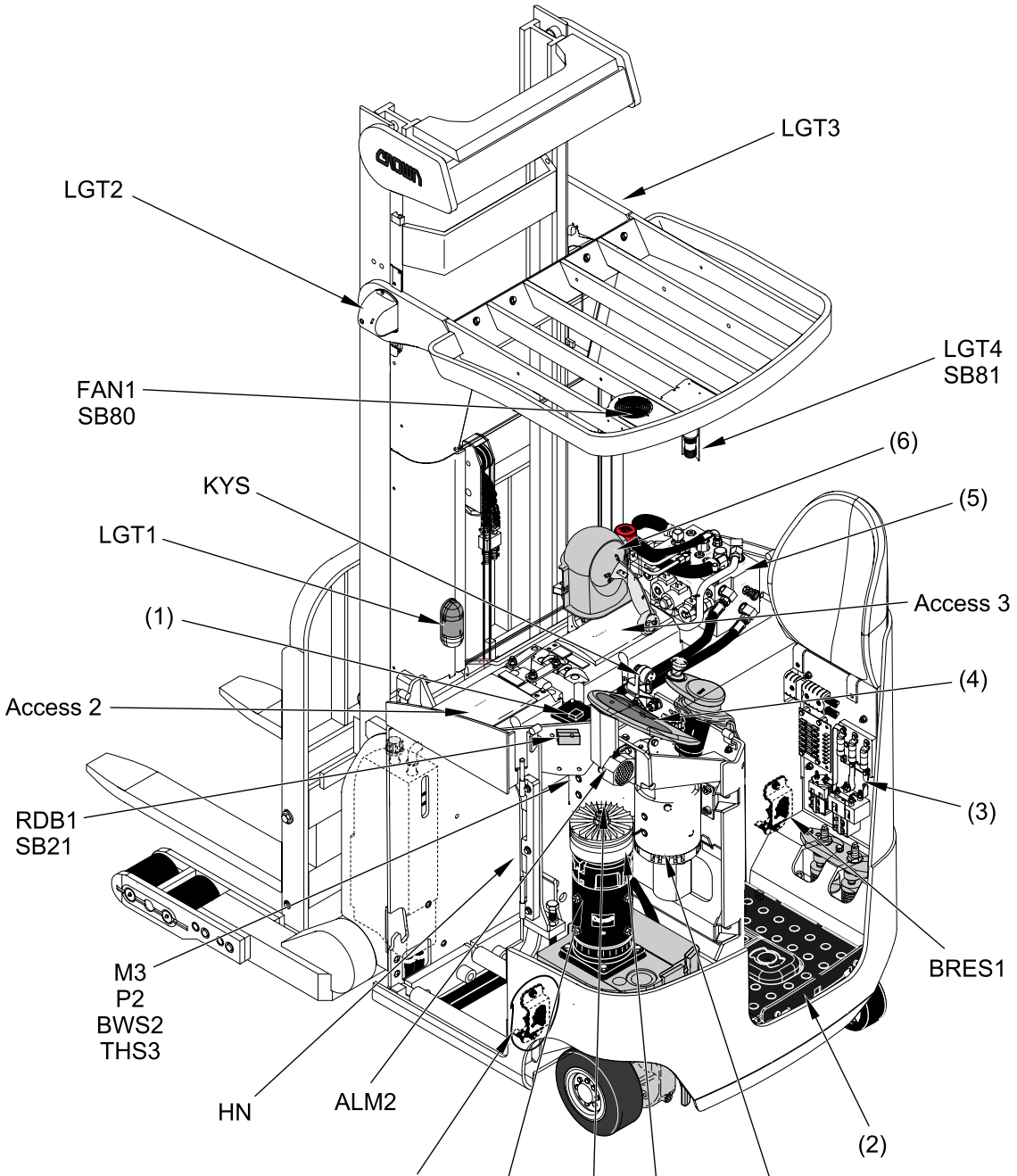
Motor Thermal Switches

Location: THS1 - traction motor, THS2 - lift motor P1, THS3 - lift motor P2.

Purpose: motor over temperature monitors.

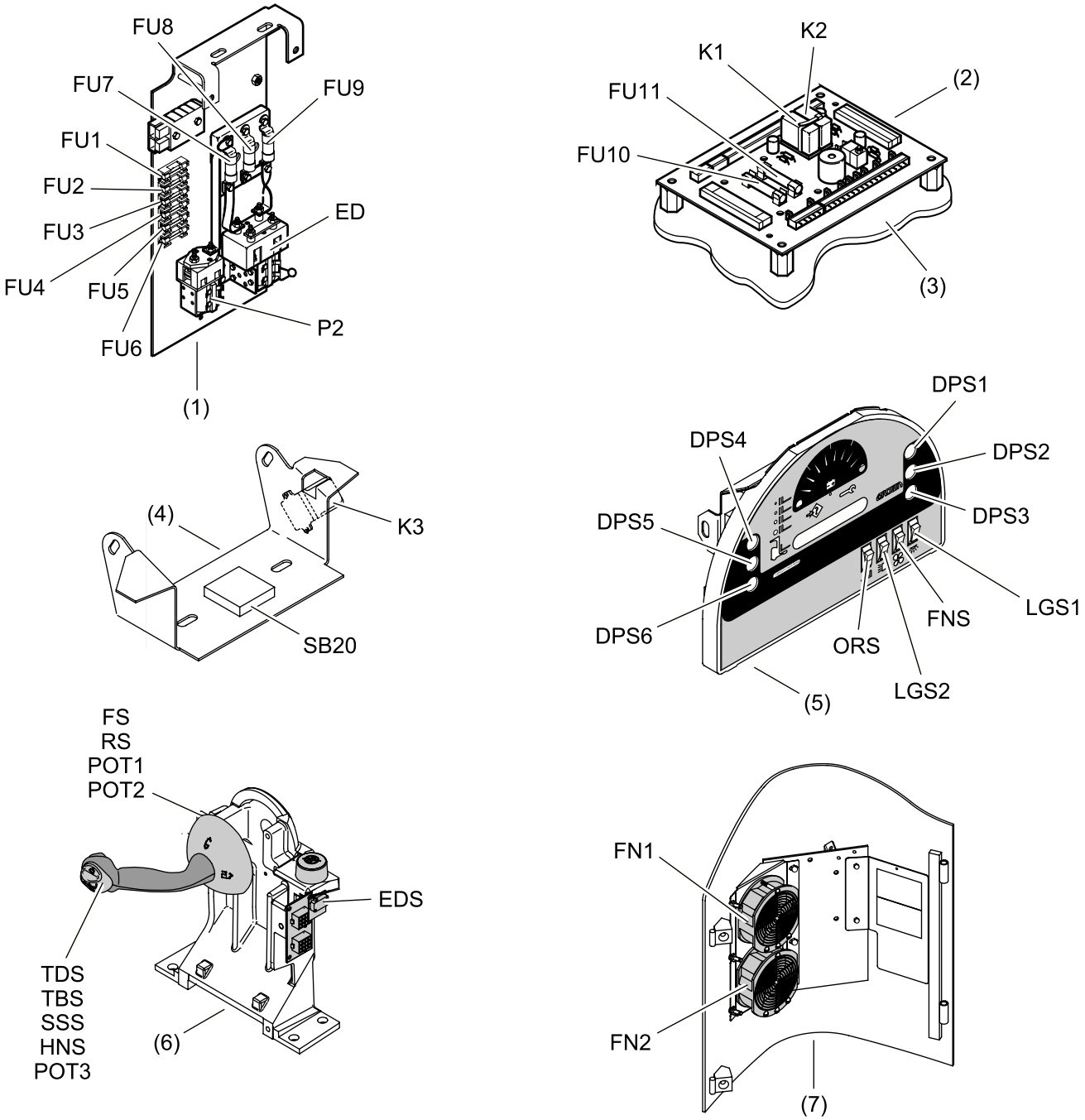
Data: momentary contact thermal switch wired normally open. Over temperature condition actuates switch.

Adjustment: none required.



(1) Distribution Panel
(2) Floorboard
(3) Contactor Panel
(4) Display/Access 1
(5) Hydraulic Manifold
(6) Multi-Task Control

Figure 17203



(1) Contactor Panel
(2) Distribution Board
(3) Power Unit Top
(4) Display Mounting Bracket
(5) Display/Access 1
(6) Multi-Task Control
(7) Compartment Door

Figure 17204

(1) Location of Switches Determined by Lift Height
(2) Reach Support
(3) Floorboard (Bottom View)
(4) Reach Carriage
(5) Freezer Condition Circuit Board
(6) Hydraulic Manifold (Three Views)

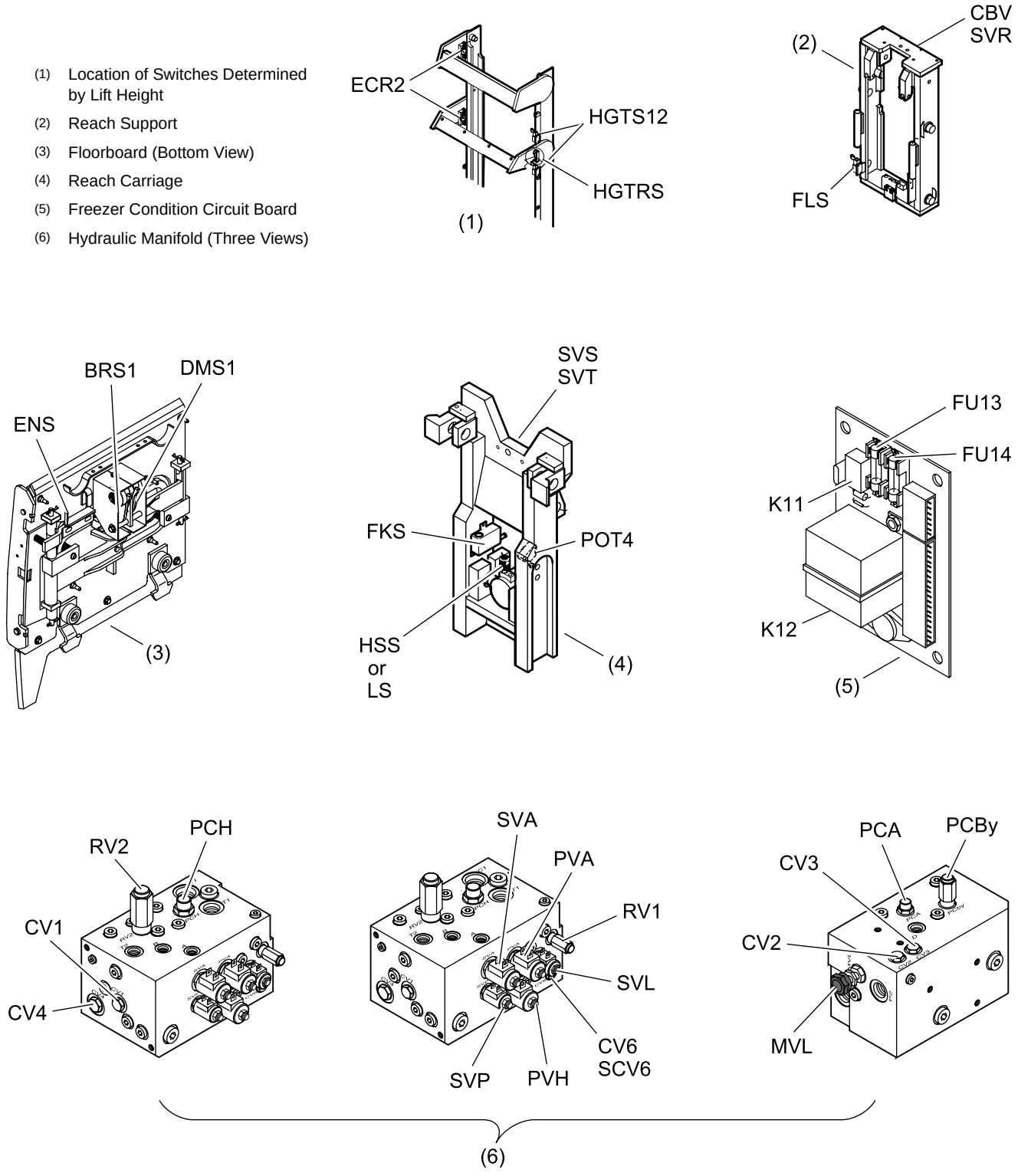


Figure 17205

Torque Values

All Crown Trucks are manufactured with Grade 5 or better screws and bolts. The information contained in this section will aid you when replacing any screws and bolts that are necessary when performing maintenance on your lift truck.

Grade

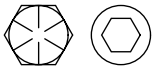
Grade Marking (on Head)	Specification	Material	Bolt and Screw Size (Inches)
	SAE - Grade 2	Low Carbon Steel	1/4 thru 1-1/2
	SAE - Grade 5	Medium Carbon Steel, Quenched and Tempered	1/4 thru 1-1/2
	SAE - Grade 8	Medium Carbon Alloy Steel, Quenched and Tempered	1/4 thru 1-1/2
NOTE: Even though a bolt head is unmarked, Crown uses nothing less than Grade 5 in all of its bolted assemblies. Instances do occur when Grade 5 bolts are manufactured unmarked. When a fastener is replaced that is unmarked, replace the fastener with a Grade 5.			

Figure 14916

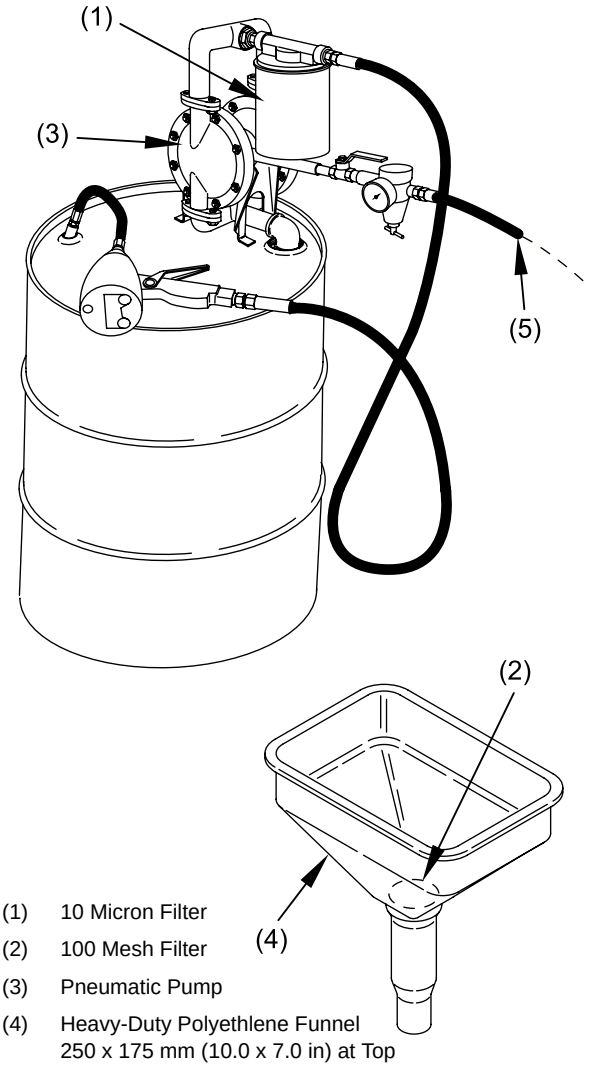
Torque Chart						
Bolt Diameter	Grade 5			Grade 8		
	Dry Torque Requirement			Dry Torque Requirement		
in	ft lb	kgm	Nm	ft lb	kgm	Nm
1/4	9 ± 3	1.2 ± .4	12 ± 4	13 ± 4	1.8 ± .5	17.5 ± 5.5
5/16	18 ± 5	2.5 ± .7	24.5 ± 7	25 ± 5	3.5 ± .7	34 ± 7
3/8	32 ± 5	4.4 ± .7	43.5 ± 7	48 ± 10	6.6 ± 1.3	65 ± 13.5
7/16	50 ± 10	6.9 ± 1.4	67.5 ± 13.5	75 ± 10	10.4 ± 1.4	102 ± 13.5
1/2	75 ± 10	10.4 ± 1.4	101.5 ± 13.5	112 ± 15	15.5 ± 2.0	152 ± 20.5
9/16	110 ± 15	15.2 ± 2.0	149 ± 20.5	163 ± 20	22.5 ± 3.0	221 ± 27
5/8	150 ± 20	20.7 ± 2.8	203.5 ± 27	225 ± 30	31.1 ± 4.1	305 ± 41
3/4	265 ± 35	36.6 ± 4.8	359 ± 47.5	400 ± 50	55.2 ± 6.9	542 ± 68
7/8	420 ± 60	58.1 ± 8.3	569 ± 81	640 ± 80	88.3 ± 11.0	868 ± 108
1	640 ± 80	88.5 ± 11.1	868 ± 109	960 ± 115	132.5 ± 15.9	1300 ± 156
1 1/8	800 ± 100	110.6 ± 13.8	1085 ± 136			
1 1/4	1000 ± 120	138 ± 16.6	1356 ± 163			
1 3/8	1200 ± 150	166 ± 20.7	1630 ± 203			
1 1/2	1500 ± 200	207 ± 27.7	2034 ± 271			
Mounting bolt torque requirements involving hydraulic valves.						
5/16	13 ± 2	1.8 ± .3	17.5 ± 2.5			
3/8	24 ± 2	3.3 ± .3	32.5 ± 2.5			
7/16	39 ± 2	5.4 ± .3	53 ± 2.5			
NOTE: Torque values called out in the maintenance section of this manual will take precedence over torque values found on this page.						

Hydraulic System

Adding Hydraulic Oil

The hydraulic system is very susceptible to dirt and contamination that could, over time, create hydraulic malfunctions. Therefore, before adding oil to truck, filter oil with a 10 micron filter or with a 100 mesh strainer. This is especially important when the oil source is a 55 gallon drum. An example of a pneumatic pump with a 10 micron in-line filter and funnel with a 100 mesh strainer is shown below.

To select appropriate hydraulic oil, refer to Lubrication and Adjustment.



(1) 10 Micron Filter
(2) 100 Mesh Filter
(3) Pneumatic Pump
(4) Heavy-Duty Polyethlene Funnel 250 x 175 mm (10.0 x 7.0 in) at Top
(5) To Air Source

Figure 16837

WARNING

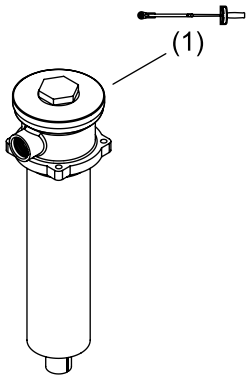
AVOID HIGH PRESSURE FLUIDS-Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic lines. Tighten all connections before applying pressure. Keep hands and body away from pin holes which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.
Any fluid injected into the skin under high pressure should be considered as a serious medical emergency despite an initial normal appearance of the skin. There is a delayed onset of pain, and serious tissue damage may occur. Medical attention should be sought immediately by a specialist who has had experience with this type of injury.

Hydraulic Lines and Fittings

1. Blow air through all hose and lines to remove loose particles before installing. Any rubber hose with wire braid inner construction, thermoplastic hose and any steel tube lines which have been collapsed or kinked are permanently damaged and must be replaced even if the damage is not externally visible.
2. Flexible hose shall be replaced if it collapses in its normal operating position.
3. All hoses and lines are to be clear of any surface or edge which will cause damaging wear and cuts, or on which they can become caught.
4. All connections are to be leak free.
5. Beaded elbows in suction ports of all pumps must be positioned such that the suction hose retains its full volume flow, and does not collapse.

Filter

The internal filter is contained within the reservoir filter/ fill assembly.



(1) 22 - 27 Nm
(16 - 20 ft lb)

Figure 16838

To access filter, rotate filter cap CCW and remove. Grasp inner support tube and remove the filter element. The filter element can be removed from the support tube and replaced. Insert filter element and support tube and replace filter cap. Torque cap to 22-27 Nm (16-20 ft lb) Dispose of filter and used oil in accordance laws and regulations concerning the disposal of hazardous waste.

Reservoir

Check reservoir fluid level when oil is warm, if not, operate lift for fifteen minutes first before checking fluid level.

With all cylinders in the retracted position and after all air has been bled from the hydraulic system, fill reservoir so that the oil level is at the "add" marks. Excess oil above the "add" mark should be removed. The total capacity of the hydraulic system at this level should be approximately:

- Trucks with dual reservoirs:24.6 liters (6.5 gal)
- Trucks with single reservoirs:27.4 liters (7.25 gal)

CAUTION

Never stand or work under a suspended load.

Drift Test

All drift tests should be conducted with a capacity load (refer to capacity plate for the rated capacity of your truck). The material used for the test load must be evenly stacked within the limits of a four foot square pallet and must be secured to the fork carriage with the forks spread to their maximum width.

Tilt Drift Test

Cycle tilt forward and back several times before testing drift. Elevate test load 600 mm (24.0 in) off floor. Measure drift at the load center with forks tilted up. Forks may not drift more than 15 mm (0.50 in) over a five minute period.

Lift Drift Test

Elevate the test load above staging height and tilt carriage to the full back position. After five minutes, measure the distance the carriage has drifted. Drifting in excess of 50 mm (2.0 in) over a five minute period is considered unacceptable.

NOTE

The lift measurement is to be taken from the tip of the fork to the floor.

Occasionally, a slight creep of the fork assembly may occur due to internal leakage in the piston pak, but it can also be caused by leakage in a check or control valve. To seat these valves properly when this occurs, raise and lower the forks to flush out any foreign material from the valve seat.

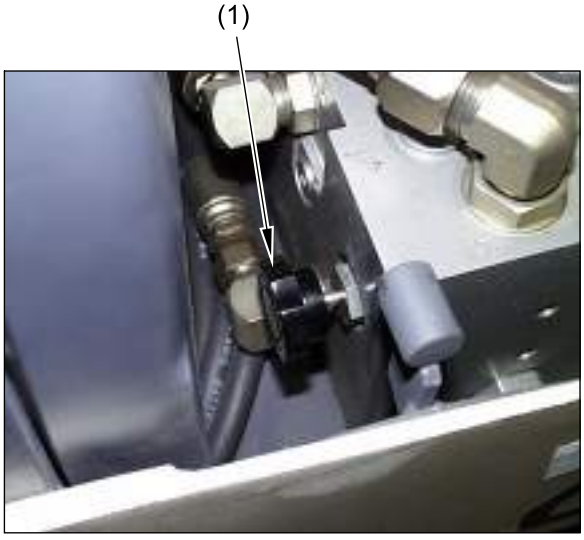
A thorough check for leaks in the system should be conducted if abnormal oil losses occur. The hydraulic system is designed to eliminate mechanical damage even if fittings become loose.

Hydraulic System Contamination

Contamination in the hydraulic system can cause severe damage to the system. Any maintenance done to the hydraulic system should be done in a clean work area and the component parts should be kept as clean as possible during assembly. Any hydraulic oil put into the system should be clean and strained as described in "Adding Hydraulic Oil" in this section.

Main Lift Cylinder and Carriage Cylinder Contamination

1. Move truck to service area, preferably under a hoist, and chock wheels.
2. Raise mast and block 2nd stage mast 915 mm (36.0 in) from floor. Turn key switch OFF and disconnect battery.
3. Open manual lowering valve, MVL, and slowly lower carriage.



(1) MVL - Manual Valve Lowering

Figure 16839

4. Refer to Figure 16840. Loosen fitting on cross over hydraulic tube leading from main supply line on left lift cylinder, as viewed facing front of truck. Loosen fitting and remove hydraulic tube from bottom of right hand lift cylinder.

(1) Loosen fitting; do not remove
(2) Left Hand Lift Cylinder
(3) Right Hand Lift Cylinder
(4) Loosen and remove fitting from bottom of cylinder

Figure 16840

5. Remove hydraulic lines from both lift cylinders, from bottom of carriage cylinder and from hydraulic hose to truck power unit. Blow air through hoses and lines to remove loose particles or contamination. Catch any hydraulic oil that may be spilled, do not reuse.

6. Remove rams from both main lift cylinders. Flush both cylinders with water based degreaser such as part number 065009-005. Thoroughly blow all degreaser and moisture from cylinder tubes making sure they are clean and totally dry. Inspect rams and cylinder tubes for damage.
7. Remove ram from carriage cylinder. Flush carriage cylinder tube with water based degreaser, part number 065009-005, and blow all degreaser and moisture from cylinder tube making sure it is clean and dry. Inspect ram and cylinder tube for damage.
8. Remove hydraulic line from port "C" on manifold block going to lift cylinder and blow air through line to remove any foreign particles. Connect hydraulic lines to cylinders but do not connect hydraulic line to manifold block. Plug line with plastic plug to prevent dirt or contamination from getting into line.

Hydraulic Tank Contamination

9. Check condition of hydraulic filter element, breather element and change as required per the chart in Lubrication and Adjustment. Crown recommends replacement of the following every 2000 hours of operation:

- Hydraulic Oil
- Filter Element 127741
- Breather Element 127742

10. If contamination has reached the hydraulic reservoir(s) Crown recommends draining the hydraulic reservoir(s). Remove hydraulic lines or tubes and flush tank(s) with water based degreaser, such as part number 065009-005. Blow all degreaser and moisture from hydraulic reservoir(s), and reconnect all lines and tubes to reservoir(s).
11. Clean outside of manifold block with same water based degreaser to remove surface dirt. A decision needs to be made at this point whether to clean and flush the manifold block or replace it with a rebuilt or new assembly. A rebuilt manifold block assembly is now available from Crown, part number 123192-00R for RR/RD5000 series trucks and 128348-00R for all RR/RD5200 series trucks. If contamination inside the manifold block is extensive, replacement should be seriously considered.

Hydraulic Manifold Block Removal and Flushing

CAUTION

Do Not put hydraulic manifold or components into degreaser tank to clean.

12. Remove hydraulic lines from block, plug ports and hoses with plastic plugs to avoid oil leakage or contamination of lines or hoses.
13. Loosen accessible cartridge valves and SAE plugs while the manifold is still in the truck, do not remove any of the components at this time.
14. Remove manifold block from truck and put on a clean piece of cardboard for disassembly as shown in Figure 7829P.

Figure 7829P

15. Remove all solenoid coils from valves and mark coils for re-assembly.
16. Remove all cartridge valves from manifold block and place into a clean tub. During the entire disassembly, flushing and re-assembly it is extremely important to keep all work surfaces, equipment and parts as clean as possible to prevent contamination after assembly. Check to make sure ORF4 is removed from SVP cavity; this is the only orifice that is not screwed into the block. Do not remove any of the other orifices from the block.

Figure 7933P

17. Make a visual inspection of valves and valve cavities for any signs of contamination. Check operation of valve mechanisms for sticking or rough operation as seen in Figure 16841. If any valves are contaminated or do not function properly, discard valve and replace with new valve.

(1) Note visible contamination on valve screen

Figure 16841

18. Thoroughly clean the valves using a siphon sprayer, such as Crown part number 065174-001, and same water based degreaser as used in step 6. Do not clean valves or manifold block in degreaser tank. Do not exceed 275 kPa (40 psi) of air pressure to the sprayer to avoid doing any damage to the valves. Refer to Figure 16842.

(1) Sprayer and water based degreaser

(2) Air pressure not more than 275 kPa (40 psi)

Figure 16842

19. After cleaning, blow all liquid from valves with air nozzle, not to exceed 275 kPa (40 psi) air pressure, check valve operation again and place valves in a clean lint free location.

20. Remove SAE plugs from manifold block. It sometimes helps to tap the top of the plugs using a small hammer and a large diameter (6.5 mm (0.25 in)) flat punch prior to loosening with a wrench. Be careful not to damage the hex hole or the plug by using excessive force. Refer to Figure 7936P.

Figure 7936P

21. Inspect all ports for contamination and then place manifold block in a clean container for flushing. With same sprayer and water based degreaser thoroughly flush each port on manifold block, not to exceed 275 kPa (40 psi) air pressure into sprayer. Do not clean manifold block in degreaser tank. Refer to Figure 7937P.

Figure 7937P

22. Remove manifold block from container and place into clean container on top of clean block. Use compressed air nozzle to blow air over and through manifold block to completely remove any moisture, air pressure not to exceed 275 kPa (40 psi) air pressure. It is very important the inside and outside of the block be totally dry and clean. Refer to Figure 7938P.

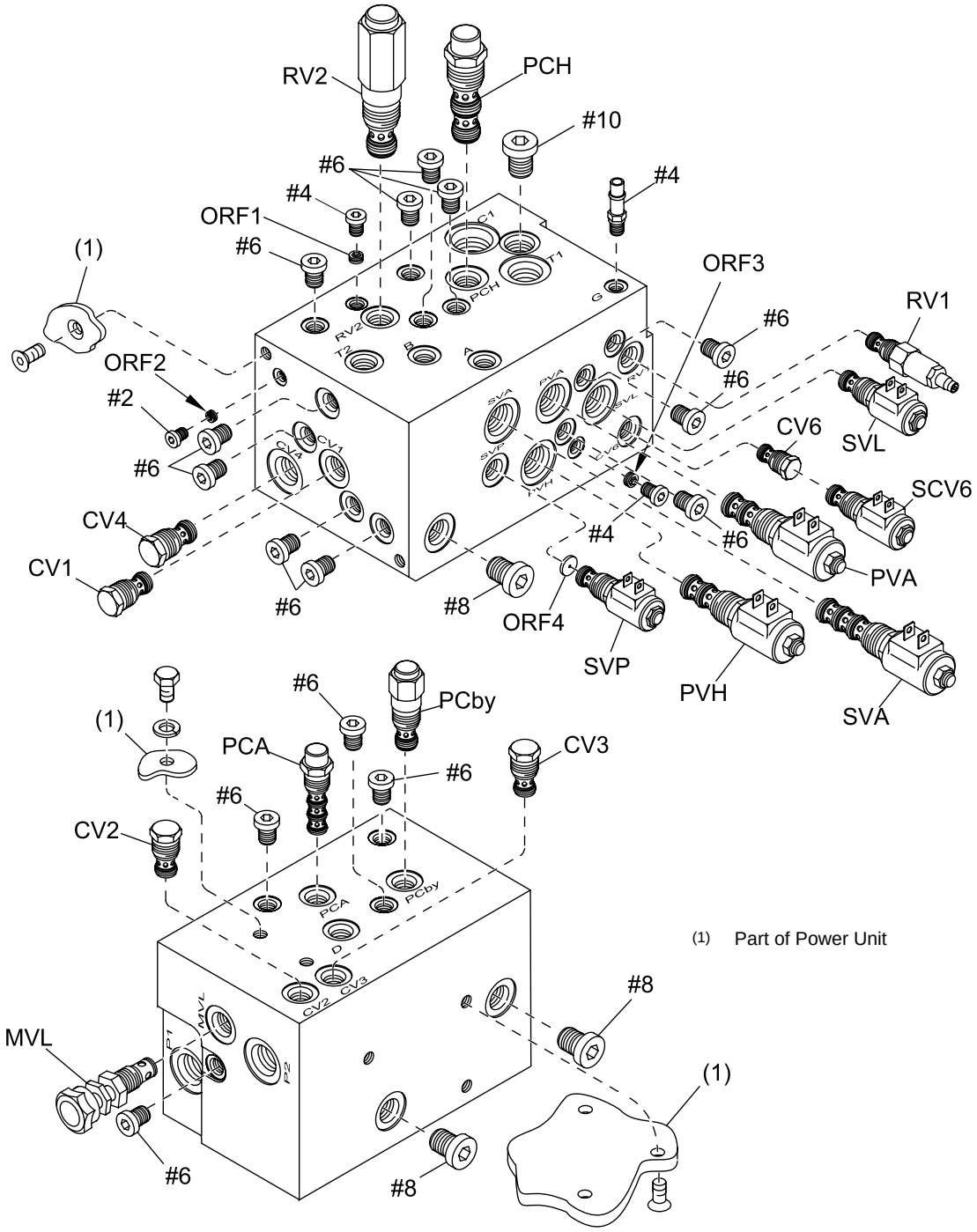
Figure 7938P

23. Refer to Figure 7939P and look into each port with a flashlight and check for contamination that may not have been completely flushed out. If any is found flush block a second time as described in steps 21 and 22.

Figure 7939P

24. Remove top o-ring seal from each valve, cover threads on valve with sleeve or tape to prevent damage to new seal, and carefully replace top o-ring seal supplied in kit. The top o-ring seal will be the one closest to the outside surface of the manifold block after the valve is installed in the manifold block. Visually inspect all other o-ring seals and back up rings, replace as required. These o-rings are not supplied in kit, but are listed in Manifold, and are available through Crown.
25. Apply a light film of hydraulic oil to the o-ring and threads of all the valves and plugs before installing back into manifold block. When installing ORF4 and SVP in cavity, spread clean light grease on FLAT side of ORF4 and stick on nose of SVP, then carefully insert into cavity. This will properly orient ORF4 and prevent it from changing position during installation.
26. Screw each valve and plug into manifold block by hand until snug.

27. Refer to Figure 16843 for valve placement. See charts for torque values of valves and plugs, and torque accordingly.



(1) Part of Power Unit

Figure 16843

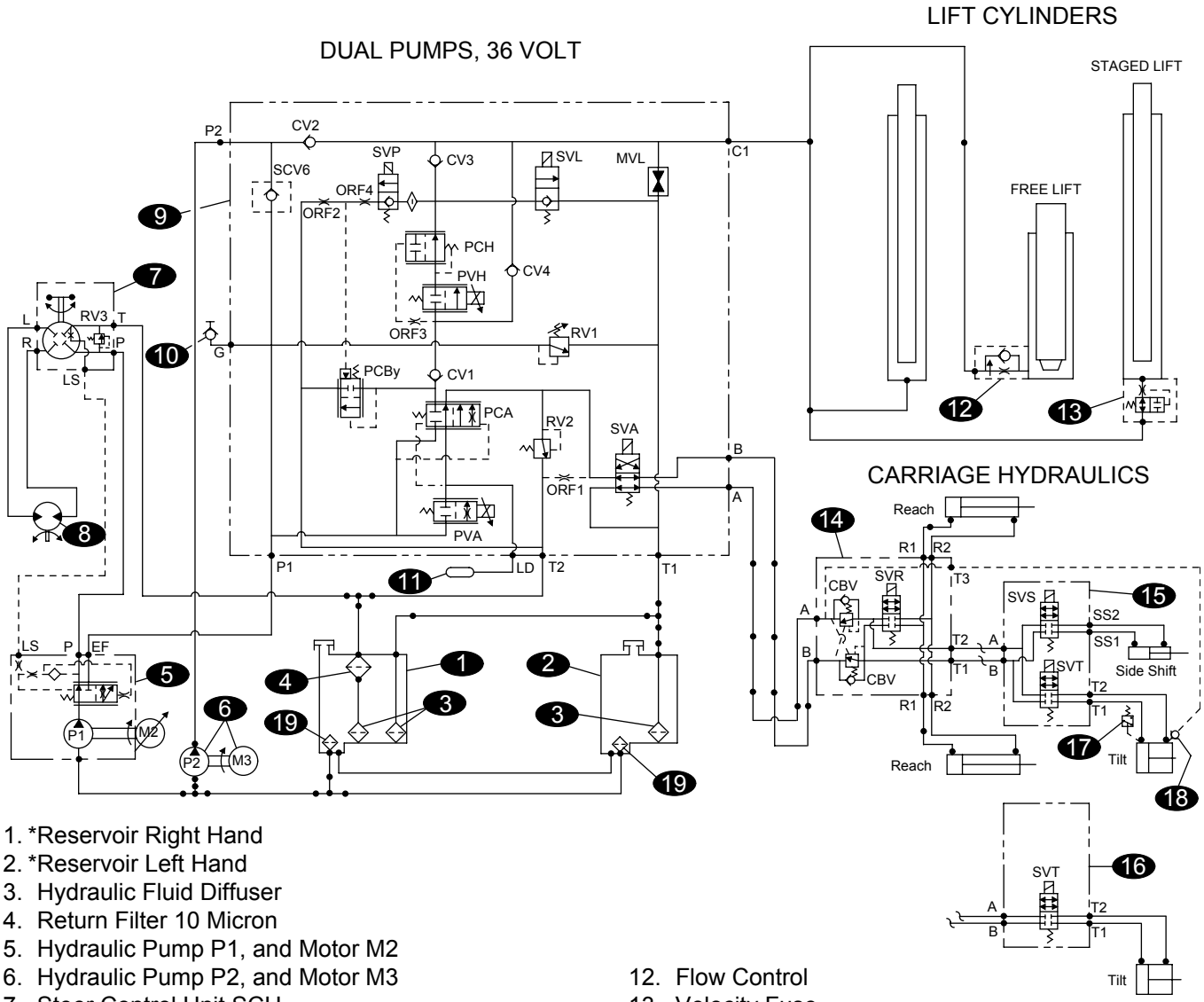
Recommended Torque Values for Valves					
Crown Valve Identification	Vendor Identification Number	Cavity Size	Torque Valve Cartridge Nm (ft lb)	Torque Coil Nut Nm (ft lb)	Top O-Ring Replacement Part Number
CV1	CV12-20	C12-2	102-109 (75-80)		064019-075
CV2	CV12-20	C12-2	102-109 (75-80)		064019-075
CV3	CV12-20	C12-2	102-109 (75-80)		064019-075
CV4	CV16-20	C16-2	129-135 (95-100)		064019-076
CV6	CV10-20	C10-2	54-61 (40-45)		064019-045
SCV6	SV10-20	C10-2	47-60 (35-40)		064019-045
RV1	RV10-22	C10-2	54-61 (40-45)		064019-045
RV2	RV10-22	C10-2	54-61 (40-45)		064019-045
MVL	NV08-21E	C08-2	41-47 (30-35)		064019-030
PVA	PV70-33B	C10-3	47-60 (35-40)	14-16 (10-12)	064019-045
PCA	EC12-4001	C12-4	68-75 (50-55)		064019-075
PVH	PV72-33A	C12-3	68-75 (50-55)	14-16 (10-12)	064019-075
PCH	EC12-3002	C12-3	68-75 (50-55)		064019-075
PCby	EC12-S3503	C12-3	68-75 (50-55)		064019-075
SVA	SV10-40	C10-4	47-60 (35-40)	8 (6)	064019-045
SVL	SV16-2202	C16-2	102-108.5 (75-80)	8 (6)	064019-076
SVP	SV08-2012	C08-2	34-41 (25-30)	8 (6)	064019-030

Plug Size	Thread Size	Torque Plugs Nm (ft lb)	Replacement O-Rings
#2	5/16-24	7-8 (5-6)	064019-074
#4	7/16-20	14-15 (10-11)	064019-031
#6	9/16-18	23-24 (17-18)	064019-029
#8	¾-16	41-43 (30-32)	064019-030
#10	7/8-14	43-49 (32-36)	064019-045

28. Mount manifold block into power unit, remove all plastic plugs, and connect all hydraulic lines and hoses previously removed from manifold block, cylinders, and power unit.
29. Fill reservoir(s) with hydraulic oil using 100 micro strainer, use hydraulic oil specified in Lubrication and Adjustment.
30. Connect battery and turn truck ON, allow truck to run for a minute or two. Slowly elevate carriage through free lift to re-stage mast. Continue to slowly lift mast until mast block can be removed from under second stage mast. After carefully removing mast block turn truck OFF and disconnect battery, leave mast in elevated position.
31. Slowly open bleed screw on carriage (free lift) cylinder, and bleed air from cylinder until a solid stream of hydraulic fluid flows out around bleed screw.
32. Tighten bleed screw and wipe off excess oil.
33. Slowly open bleed screw on right hand or left hand lift cylinder and bleed air from cylinder until a solid stream of hydraulic oil flows out around screw.
34. Tighten bleed screw and wipe off excess oil.
35. Bleed second lift cylinder as described above.
36. After bleeding cylinders, connect battery and turn truck ON and use multi-task control to raise carriage through free lift and into stage, stop and hold position.
37. With carriage raised, examine cylinders for any leaks.
38. Lower carriage through free lift to examine operation and staging.
39. Raise and lower carriage rapidly through complete lift/lower cycle a minimum of 10 cycles to flush system.
40. Turn truck OFF and check hydraulic oil level. Add specified hydraulic oil as required.
41. Check truck operation.

RR/RD 5200/5200S
RR/RD 5200 (AC)/5200S (AC)
HYDRAULIC CIRCUITS
AS A FUNCTION OF THE MULTI-TASK HANDLE

The following information contains brief descriptions of the hydraulic circuits for the various hydraulic functions. Illustration 1 is a reference schematic for these descriptions and may vary for that which is applicable to your truck. Refer to the hydraulic schematic in the HYD section of this manual for the schematic of your unit.



1. *Reservoir Right Hand
2. *Reservoir Left Hand
3. Hydraulic Fluid Diffuser
4. Return Filter 10 Micron
5. Hydraulic Pump P1, and Motor M2
6. Hydraulic Pump P2, and Motor M3
7. Steer Control Unit SCU
8. Steering Hydraulic Motor
9. Manifold Assembly Contains - CV1, CV2, CV3, CV4, MVL, PCA, PCby, PCH, PVA, PVH, RV1, RV2, SCV6, SVA, SVL, & SVP
10. Quick Disconnect Test Point
11. Hydraulic Expansion Chamber
12. Flow Control
13. Velocity Fuse
14. Reach Manifold - Contains CBV & SVR
15. Tilt/Sideshift Manifold - Contains SVS & SVT
16. Tilt Manifold - Contains SVT
17. Pressure Switch HSS/Pressure Transducer LS
18. Check Valve CV
19. Strainer

*Only one (1) Reservoir on RR/RD 5200S trucks

6198-04

ILLUSTRATION 1

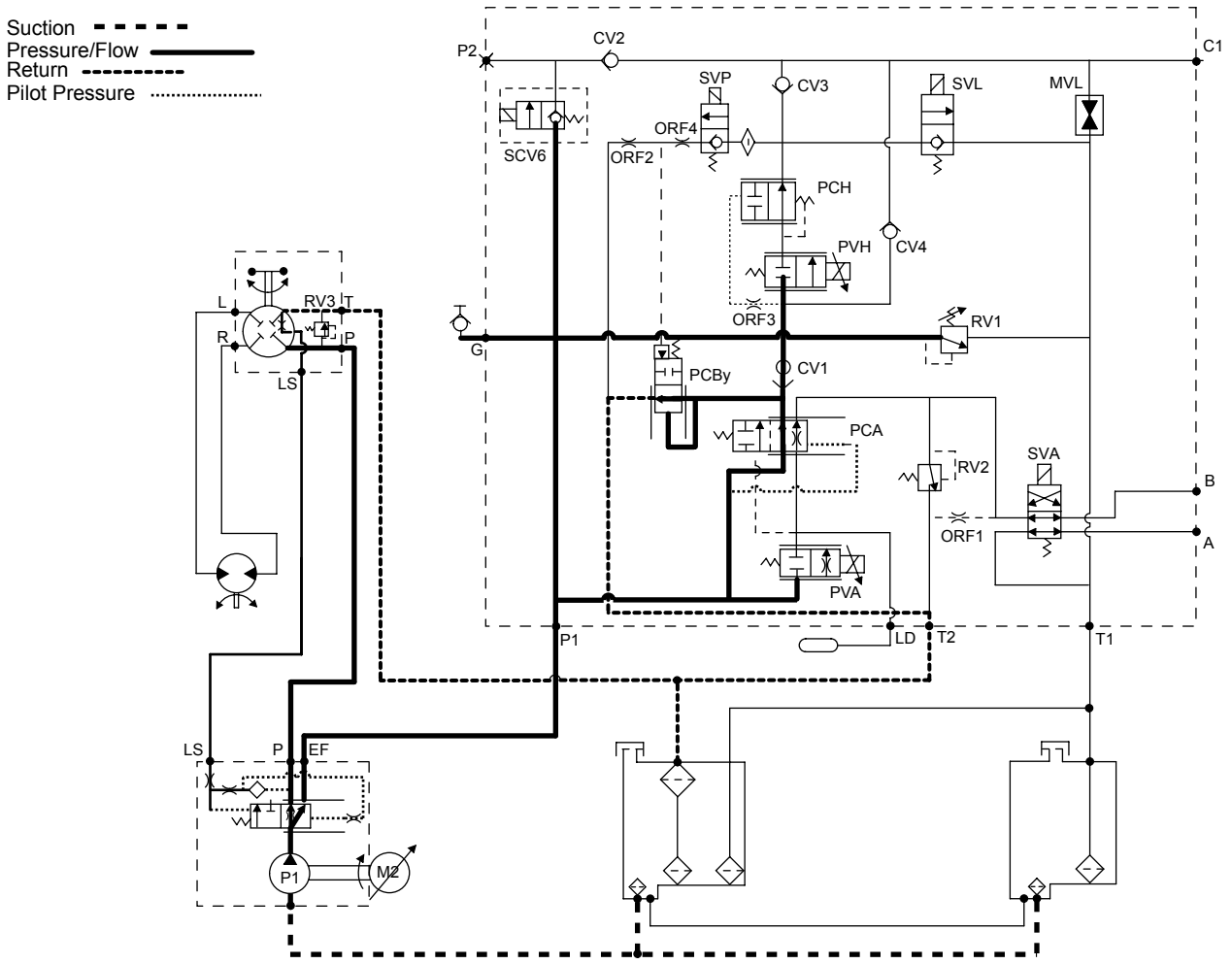
010328

4225

No Demand For Steering

With no demand on the steering circuit, pump P1 will draw oil from the reservoir, through the pump and internal load sense with flow divider assembly and provide standby flow out port P to the steering control unit (SCU), any excess flow will go out port EF. Static pressure at port P, with no steering requested, is between 7 and 8.3 bar/100 and 120 psi.

A small amount of oil will flow from port LS of the pump flow divider to port LS on the SCU. The line that connects the two LS ports is the load sensing line. Within the pump flow divider a small amount of oil flow will pass across the internal filter. Just past the filter pilot flow splits, with a portion of the oil routed to the right side of flow divider spool and a portion of the oil passing across a small orifice. Oil that has passed across the orifice continues to the load sense line to pass through the SCU and return to tank through port T of the SCU. As oil passes across this control orifice a pressure differential is created that is sensed at both sides of flow divider spool. When sufficient pressure differential exists, as when no steering flow is demanded, pressure on the right side of flow divider spool is sufficient to overcome the bias spring force on left side of spool and spool will shift left, opening the bypass flow path for the main pump flow to port EF. This action provides a standby flow to the SCU and provides nearly full flow out port EF to port P1 of the hydraulics manifold assembly for accessory or lift functions.



8700-02

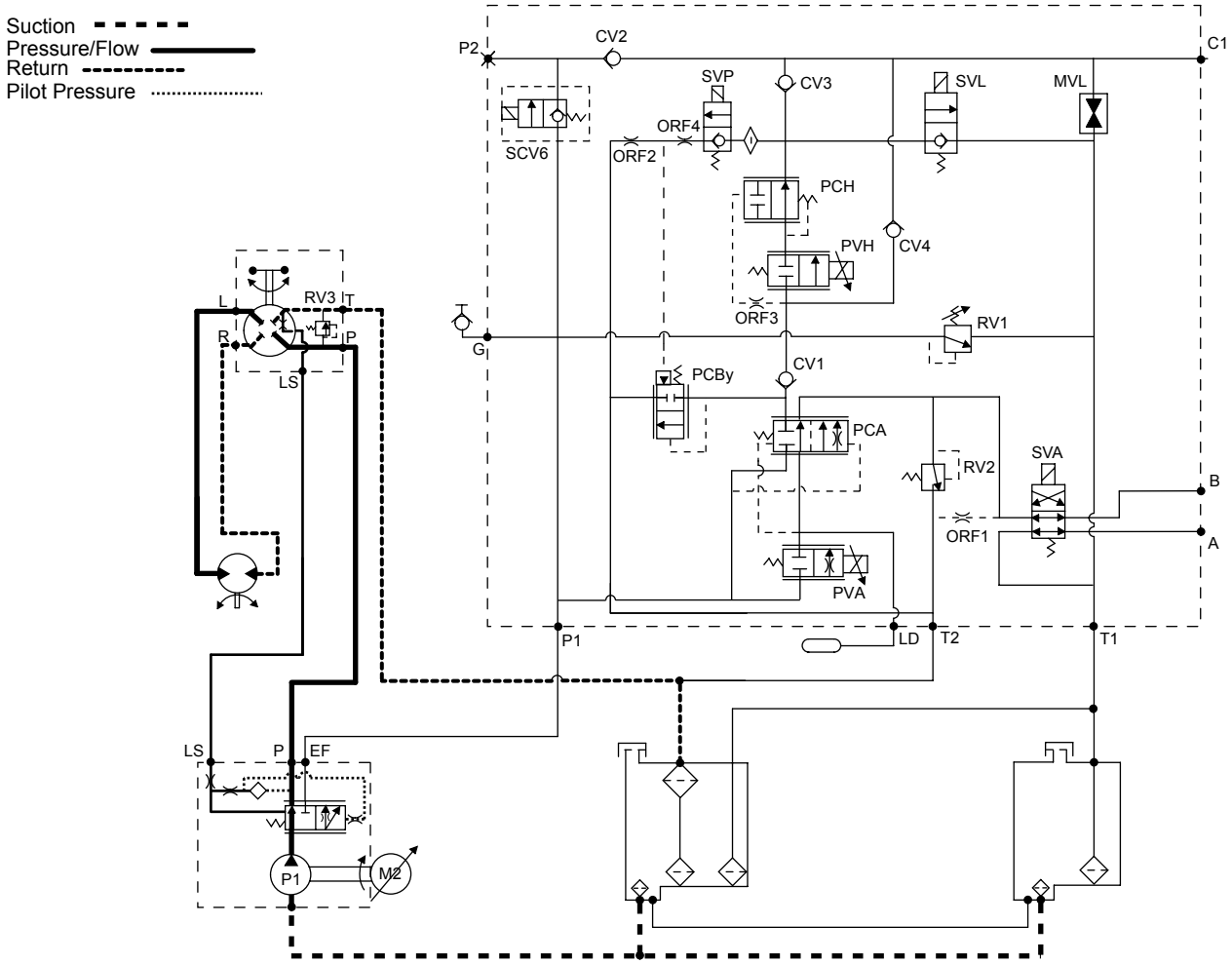
ILLUSTRATION 2

Full Demand For Steering

With the steering tiller turned, oil flow is routed through the SCU from port P to either port L or R, depending on which direction steering tiller is turned, through the steering motor, back to port L or R of the SCU, out port T of SCU and back to reservoir.

At the same time, load sense port is also connected to the pressurized port, L or R, in the SCU, causing load sense line to become pressurized at load pressure. This pressure is transmitted back to pump flow divider section through port LS and is sensed at left side of the flow divider spool. This pressure assists the bias spring to overcome the pressure on right side of flow divider spool and causes the spool to shift right. This ensures that steering receives priority flow to satisfy steer demand regardless of accessory or lift operation.

With oil flowing through P1/load sensing priority flow divider assembly due to operator turning the tiller, P1 becomes loaded. When P1 is loaded (due to increased pressure) current to M2 also increases proportionally. Current flow through M2 armature is monitored by Access 2. When Access 2 senses armature current increase, it will increase voltage to M2 in order to maintain P1 preloaded speed and maintain P1 pump speed to provide enough oil flow in system to meet steering demand. RV3 protects the steering circuit at a fixed relief pressure of 83 to 90 bar/1200 to 1300 psi.



8701-02

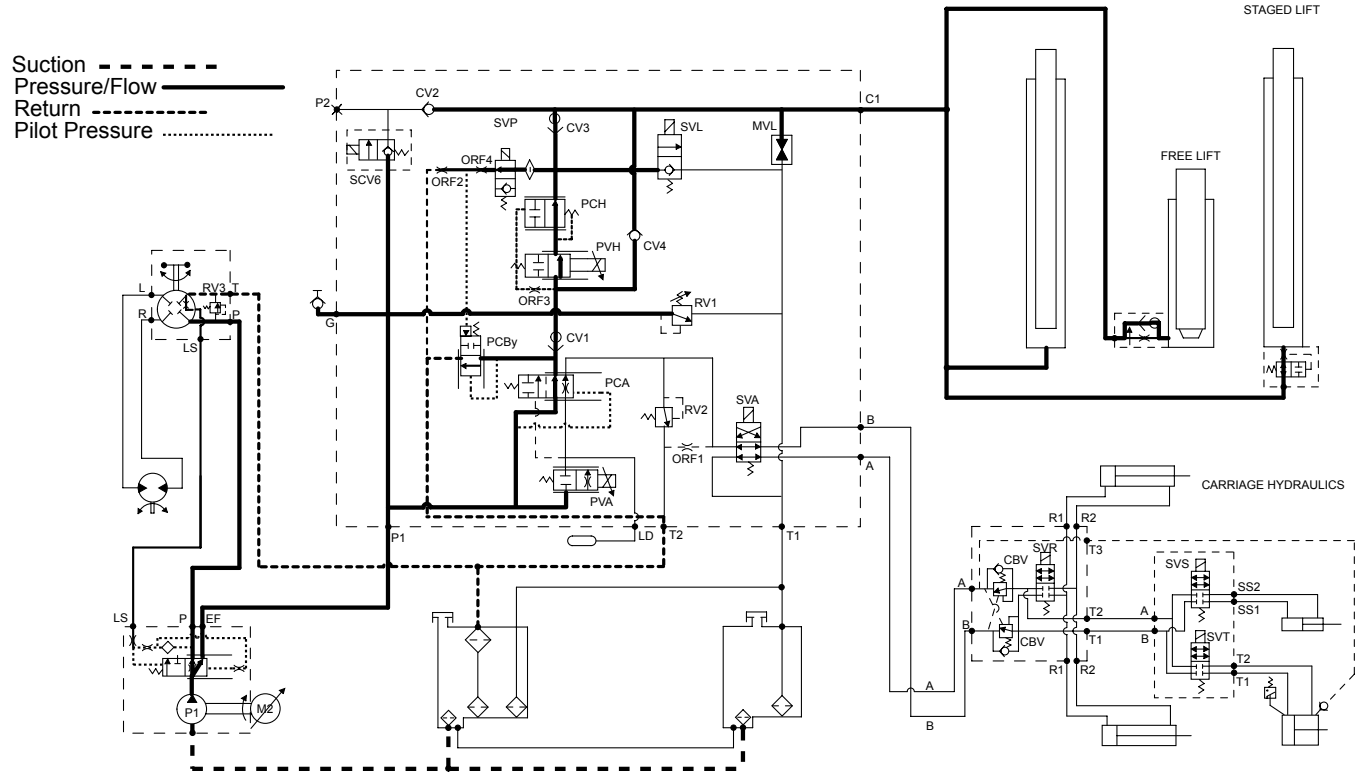
ILLUSTRATION 3

24 Volt Low Speed (RR Model 5210)

PVH is the raise/lower electrical proportional valve which provides proportional control of raise/lower functions. Access 2 controls PVH through pulse width modulation. This means that the wider the pulse from access two, the more PVH will open. SVP is a solenoid controlled pilot valve that is used to control PCBy. Access 2 will energize SVP simultaneously with PVH during lift. Oil will flow from port EF of P1/ flow divider assembly into port P1 of the hydraulics manifold. Oil flow will exit manifold at port C1 and travel to the base of the mast cylinders via steel tubing and to the base of the free lift cylinder via hose that is connected to the same tubing and routed through the mast.

During lift, oil flows from pump port EF through manifold port P1 to valve PCA. With accessory functions not used, a pilot line delivers oil pressure to the right side of PCA and causes PCA to shift left when that pressure overcomes the bias spring force. With PCA shifted left, oil is permitted to flow through it. Immediately after PCA the oil flow is split; oil will flow to PCBy and also through CV1 to PVH. With PVH closed, pilot passage at PCBy pressurizes the bottom of PCBy and overcomes the bias spring force, allowing oil to be bypassed to tank at a low pressure.

When lift is commanded, PVH is opened proportionally in response to operator command. Simultaneously, SVP is actuated. Oil from PCA passes through PVH, PCH, CV3 and exits out manifold port C1 and is routed to lift cylinders. With SVP opened, a pilot pressure equal to lift pressure at C1 is delivered to the pilot side of PCBy. Therefore, a pressure differential is created across PVH and PCH which acts in conjunction with spring bias in PCBy to control how much oil is bypassed at PCBy and how much oil is sent to the lift cylinders. This permits full pressure compensation of the lift flow. With the same operator command to PVH, the same flow will be delivered out port C1 regardless of system load or pressure. If PVH is just “cracked” open, the pressure differential across PVH and PCH will act against the PCBy bias spring and cause PCBy to be partially shifted open, allowing excess flow to be bypassed to tank through manifold port T2. In this scenario, the demanded flow delivered to port C1 is for a slow, metered lift.



8702-02

ILLUSTRATION 4

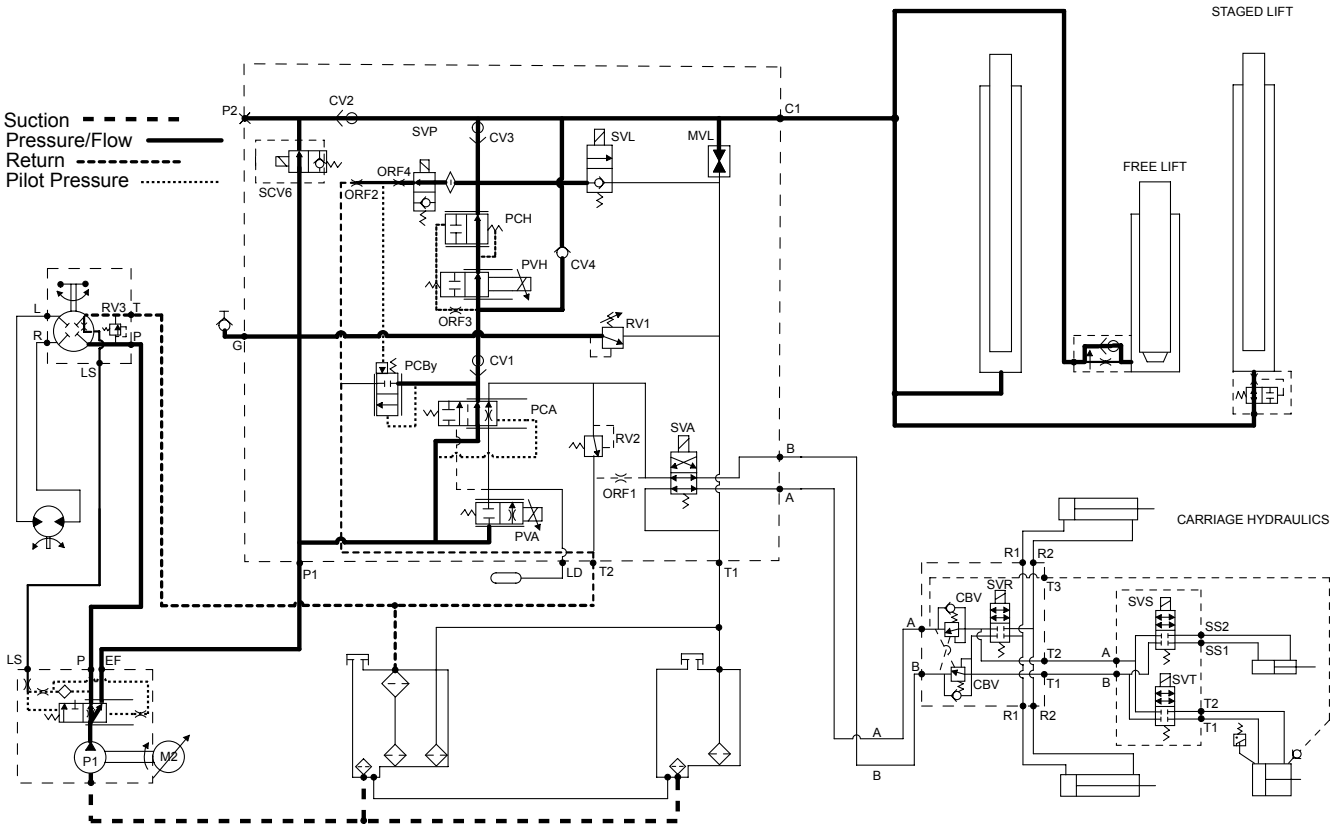
24 Volt High Speed (RR Model 5210)

When PVH is fully opened for full speed lift, minimal pressure differential will exist across PVH and PCH causing PCBy to fully close due to spring bias overcoming the pressure differential. This allows full flow to be delivered to port C1 for maximum speed lift. During lift operation ORF4, which is a 1.3 mm/0.051 in. orifice, dampers the pilot pressure signal to PCBy to prevent any flutter during low speed metered lift.

When lift is stopped and multi-task handle is centered, PVH and SVP are de-energized. ORF2 is a 0.25 mm/0.010 in. orifice that permits pilot pressure signal to PCBy to be bled off to reservoir through port T2. This permits PCBy to bypass oil flow out port T2 to reservoir when truck is at idle.

On trucks equipped with 24 volt, one lift pump system, SCV6 is a solenoid check valve that is energized by Access 2 when the operator raises multi-task handle all the way up. Its purpose is to maximize efficiency of 24 volt, one lift pump truck by bypassing all other valving when maximum lift is requested.

RV1 is an adjustable relief valve that protects the lift circuit at a relief pressure of 214 - 220 bar/3100 - 3200 psi. This is system working pressure, not system capacity.



8703-02

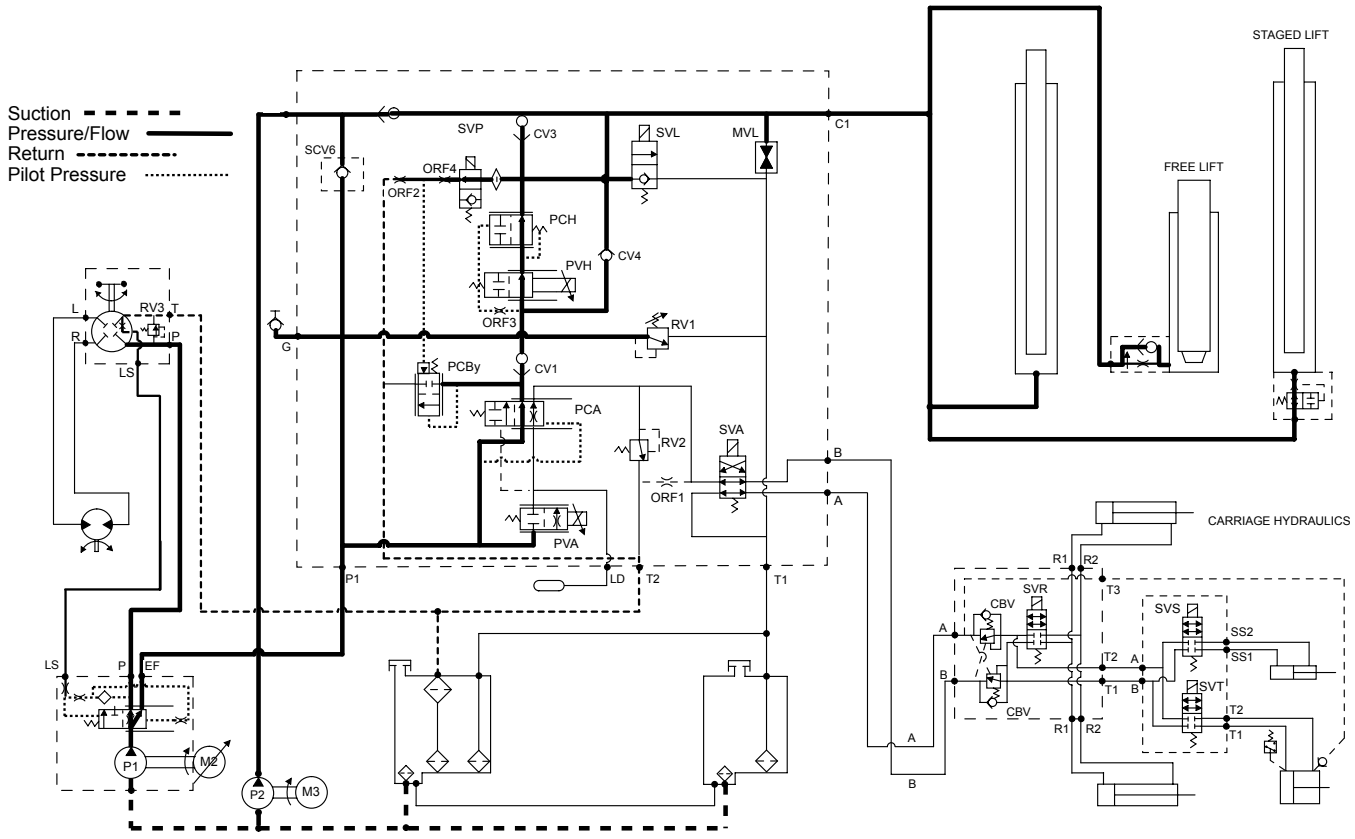
ILLUSTRATION 5

36 Volt Two Pumps

The 36 volt RR/RD 5200 and RR/RD 5200S will both have two lift pumps. The theory of operation for both trucks hydraulic circuit is the same with the exception the 5200 has a dual reservoir system and the 5200S does not.

Oil will flow in P1 circuit in the same manner as 24 volt trucks. When the multi-task handle is lifted all the way up, voltage across lift potentiometer will signal Access 2 to energize P2 contactor, energizing Motor 3. M3 is a fixed speed motor that powers Pump 2. When P2 is being driven it will pull oil out of the reservoir and push it into port P2 of the hydraulics manifold. Oil flow will pass through CV2 and join oil flow from P1 circuit at the output of CV3, increasing the amount of oil that flows out of port C1 and into the lift cylinders.

On two lift pump trucks, SCV6 is simply a check valve. First, it allows relief valve RV1 to limit system pressure to 214 bar/ 3100 psi with both P1 and P2 lift pumps operating. Second, during slow speed lift, with only P1 operating, SCV6 prevents oil in P1 circuit from flowing back into P2.



8704-02

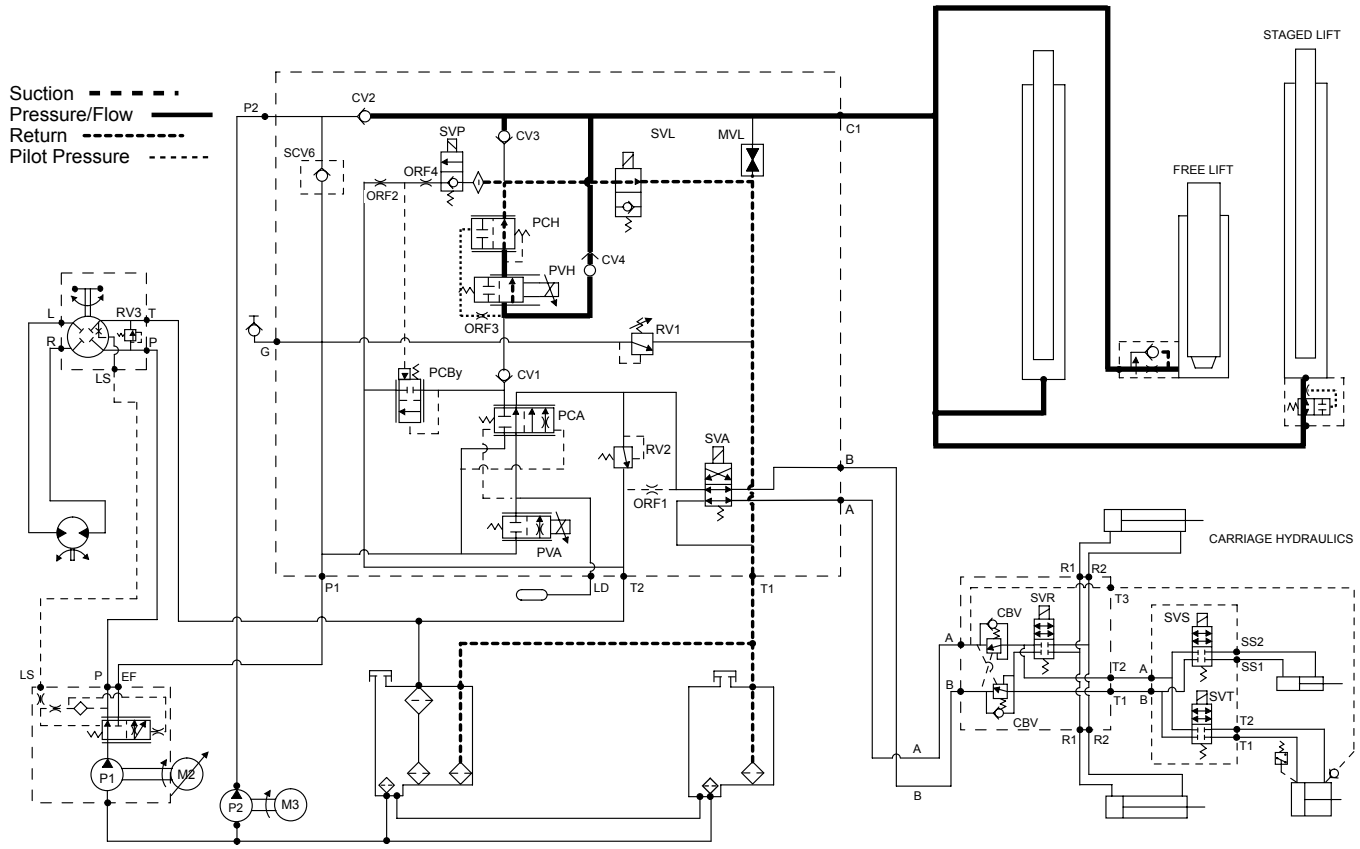
ILLUSTRATION 6

Lower circuits will be the same for all versions of the 5200 and 5200S series reach trucks. The only difference is that the return oil flow will split into two paths for return to trucks with a dual reservoir system.

Lower is requested by the operator pushing down on multi-task handle. This action changes the voltage across the raise/lower potentiometer which signals Access 2 that lower has been requested. Access 2 will energize SVL and pulse PVH, with PVH opening in proportion to the operator command to control lower speed.

During lower, oil flows from lift cylinders to port C1 of the manifold assembly, through CV4, PVH, PCH, SVL, and out port T1 of the manifold assembly. From there it returns to reservoir(s).

PCH is the pressure compensator for the lower circuit. Pressure compensated lower control is accomplished in the following manner. As SVL is opened, any pressure in the circuit after PCH is dropped to tank pressure. With PVH still closed, a pilot pressure is delivered through ORF3, a 0.4 mm/0.015 in. orifice, to left side of PCH. ORF3's purpose is to slow PCH's response. When PVH is opened, the bias spring in PCH holds PCH open to allow lower. If flow across PVH increases to the point that the pressure differential is greater than PCH spring bias force, PCH will be gradually closed in response. To control lower flow, the maximum pressure drop across PVH is the only pressure needed to overcome 11 bar/160 psi bias spring in PCH. Because of this, the flow across PVH and PCH will remain constant for a given command regardless of load or pressure at port C1 of the manifold assembly, providing pressure compensated lower control. Maximum lower speed is controlled by the maximum opening of PVH. PVH's position is electronically controlled by Access 2, giving Access 2 electronic control of lower speed. Lower speed, as controlled by Access 2, can be modified in the Performance menu.



8705-02

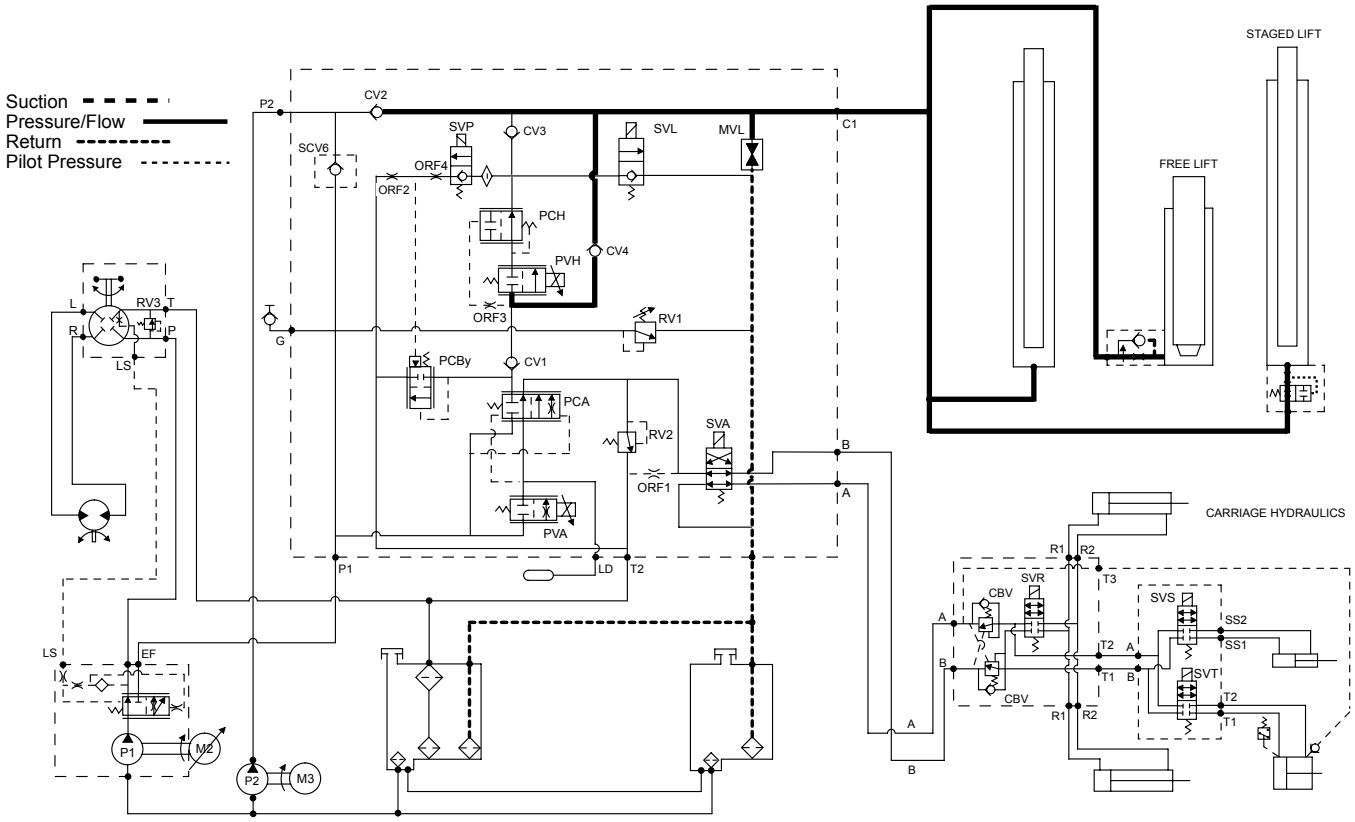
ILLUSTRATION 7

The mast and carriage can be manually lowered. It is important to ensure that the reach carriage, forks, mast channels and lift chains are not obstructed in any way before lowering. The valve is turned counterclockwise to open and clockwise to close.

CAUTION

Keep hands, feet etc. from all moving parts. DO NOT stand under forks while lowering.

When MVL is opened a path for oil flow is created from the lift cylinders into port C1 of the hydraulics manifold, through MVL, out port T1 and to reservoir(s).

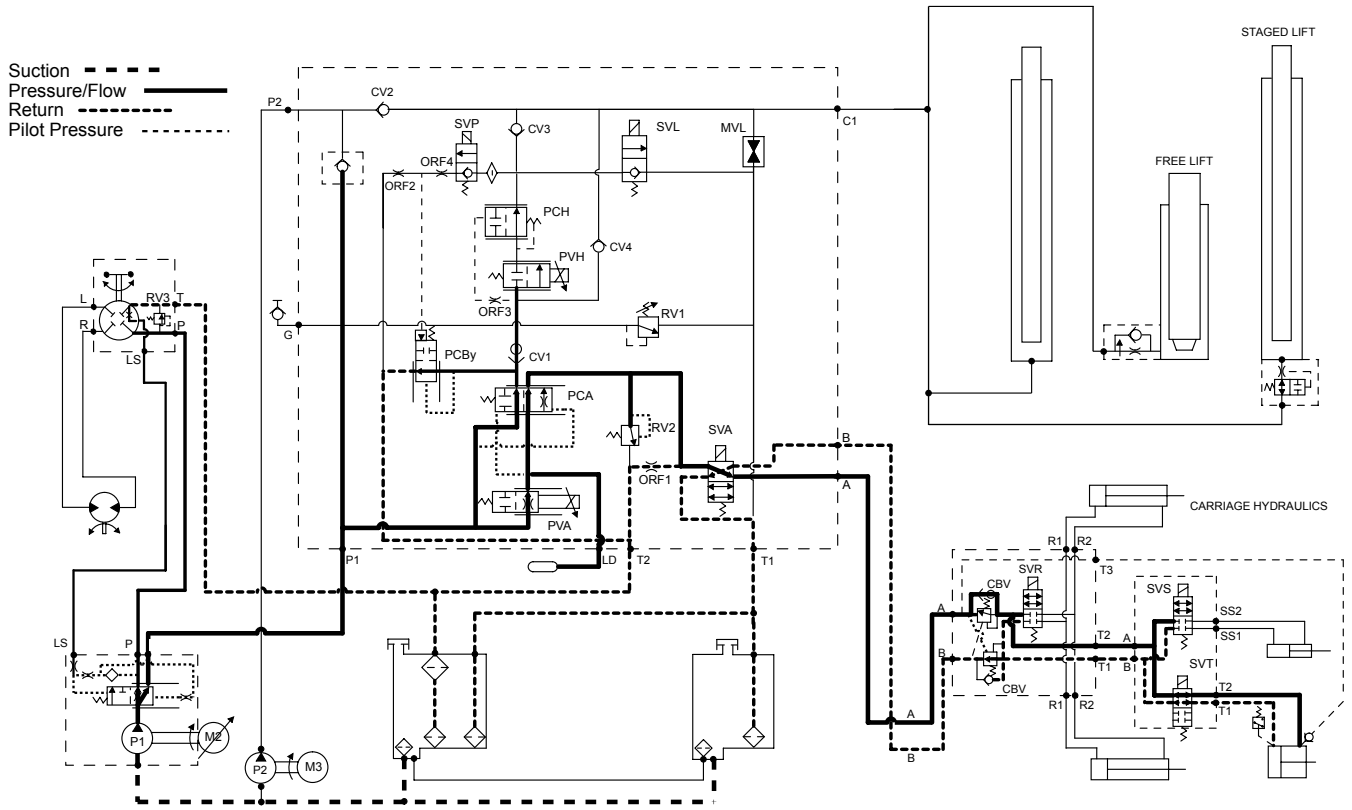


8706-02

ILLUSTRATION 8

Pressing the lower portion of the thumb control, in multi-task handle, will close TDS, signaling Access 2 to energize PVA, SVA and SVT. Oil will flow from port EF of P1, into port P1 of the hydraulics manifold, through PVA, PCA and upper envelope of SVA. SVA is energized for tilt down. Oil flow will then exit hydraulics manifold at port A, enter reach manifold at port A, pass through upper portion of the dual counterbalance valve, exit reach manifold at port T2, enter tilt/side shift manifold at port A, pass through the upper envelope of SVT, exit tilt/side shift manifold at port T2 and enter at front of tilt cylinder.

Return oil will exit rear of the tilt cylinder, enter tilt/side shift manifold at port T1, pass through the upper envelope of SVT, exit tilt/side shift manifold at port B, enter reach manifold at port T1, pass through lower portion of the dual counterbalance valve, exit reach manifold at port B, enter hydraulics manifold at port B, pass through the upper envelope of SVA, exit hydraulics manifold at port T1 and return to reservoir(s). When accessories are de-energized, ORF1 bleeds off pressure trapped in accessory hose B. Accessory hose A is bled to T1.



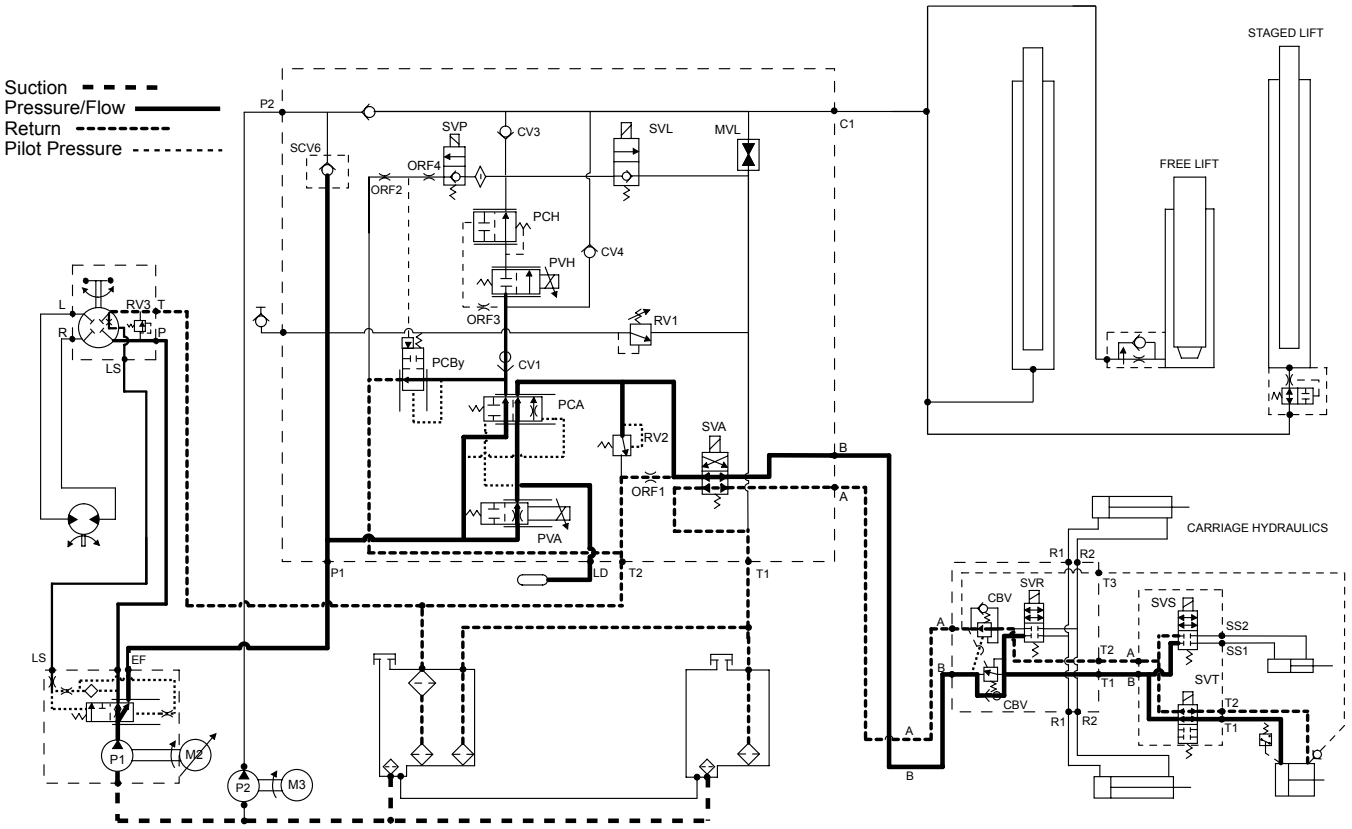
Maximum Tilt Pressure is Limited to 103.4 bar / 1500 psi by Manifold Relief Valve RV2.

8707-02

ILLUSTRATION 9

Pressing the upper portion of the thumb control, in multi-task handle, will close TBS, signaling Access 2 to energize PVA and SVT. SVA will not be energized for tilt back. Oil will flow from port EF of P1, into port P1 of the hydraulics manifold, through PVA, PCA and the lower envelope of SVA. Oil flow will then exit hydraulics manifold at port B, enter reach manifold at port B, pass through lower portion of the dual counterbalance valve, exit reach manifold at port T1, enter tilt/side shift manifold at port B, pass through the upper envelope of SVT, exit tilt/side shift manifold at port T1 and enter at rear of tilt cylinder.

Return oil will exit at front of tilt cylinder, enter tilt/side shift manifold at port T2, pass through the upper envelope of SVT, exit tilt/side shift manifold at port A, enter reach manifold at port T2, pass through upper portion of the dual counterbalance valve, exit reach manifold at port A, enter hydraulics manifold at port A, pass through the lower envelope of SVA, exit hydraulics manifold at port T1 and return to reservoir(s). When tilt is stopped, PVA and SVT are de-energized, oil in carriage circuit is trapped by counterbalance valves and SVT in carriage manifold block to prevent carriage drifting. Pressurized oil in the mast hose, connected between hydraulic manifold port B and carriage manifold port B, is depressurized through ORF1.



8708-02

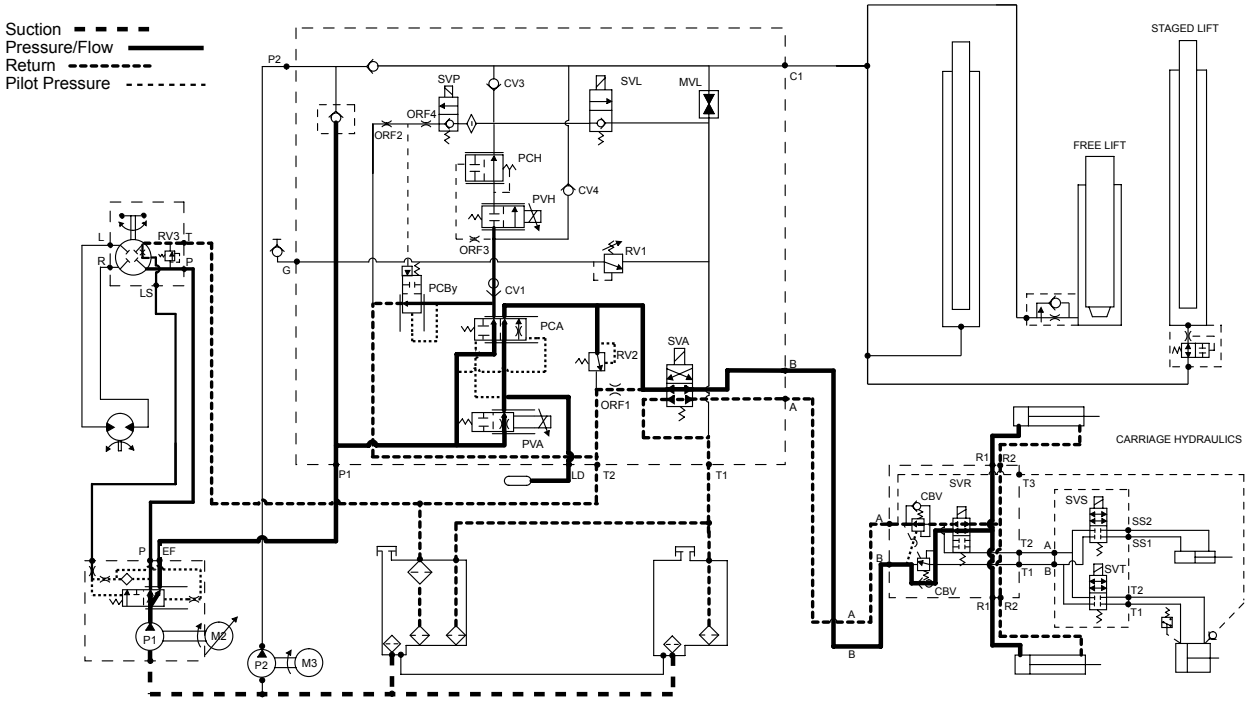
ILLUSTRATION 10

Oil will flow from Pump1's EF port into port P1 of the hydraulics manifold. Flow then passes to PVA and also to bypass port of PCA. PVA is the proportional valve that determines the amount of oil flow delivered to accessory circuits. How far PVA will shift open is in direct proportion to how far the operator moves POT 3. During accessory idle, when PVA is closed, a pilot line delivers oil pressure to right side of PCA causing PCA to shift left when pressure overcomes the bias spring force. With PCA shifted left, oil is permitted to flow through PCA. After PCA the flow is split between PCBy and CV1/PVH. With PVH closed, pilot passage at PCBy pressurizes the bottom of PCBy and overcomes the bias spring, allowing all oil to be bypassed to tank port T2 at a low pressure. When PVA is shifted open, oil flows through PVA to priority port into PCA. A pilot line directs pressure to the left side of PCA and acts with the bias spring to spool PCA right. A pressure differential is now sensed by PCA, with inlet pressure to PVA sensed by a pilot line to the right of the spool, and downstream pressure, after PCA, acting with the bias spring to provide pressure compensation of accessory flow. If PVA is shifted open with a high inlet pressure, PCA is shifted more to the left, decreasing accessory circuit flow, allowing more inlet flow to be bypassed to tank port T2. If PVA is shifted open with a low inlet pressure, PCA is shifted more to the right, allowing more inlet flow to be passed to accessory circuit, and less inlet flow to be bypassed to tank port T2.

Reach is requested by the operator through movement of POT 3 in multi-task handle. PVA is energized, opening to deliver the desired flow out of the priority port of PCA, with excess flow being bypassed over PCA to CV1 and PCBy. From PCA's priority port, oil flows to solenoid selector valve SVA. SVA is not energized for reach and oil passes through lower portion of SVA, out port B of hydraulics manifold, and into port B of reach manifold. With reach selected, solenoid selector valve SVR will be energized. Oil will flow through lower counterbalance valve of double counterbalance valve assembly, through SVR, and exit reach manifold at ports R1, it is routed into rear of reach cylinders causing them to extend.

Oil in front of reach cylinders will be pushed out of the cylinders and into ports R2 on the manifold, through SVR, the other side of dual counterbalance valve, out port A of reach manifold block, into port A of hydraulics manifold block, through SVA, exit hydraulics manifold block at port T1 and return to reservoir(s).

When reach is stopped, PVA and SVR are de-energized, oil in carriage circuit is trapped by counterbalance valves and SVR in carriage manifold block to prevent carriage drifting. Pressurized oil in the mast hose, connected between hydraulic manifold port B and carriage manifold port B, is depressurized through ORF1.



Maximum Reach Extend Pressure is Limited to 103.4 bar / 1500 psi by Manifold Relief Valve RV2.

8709-02

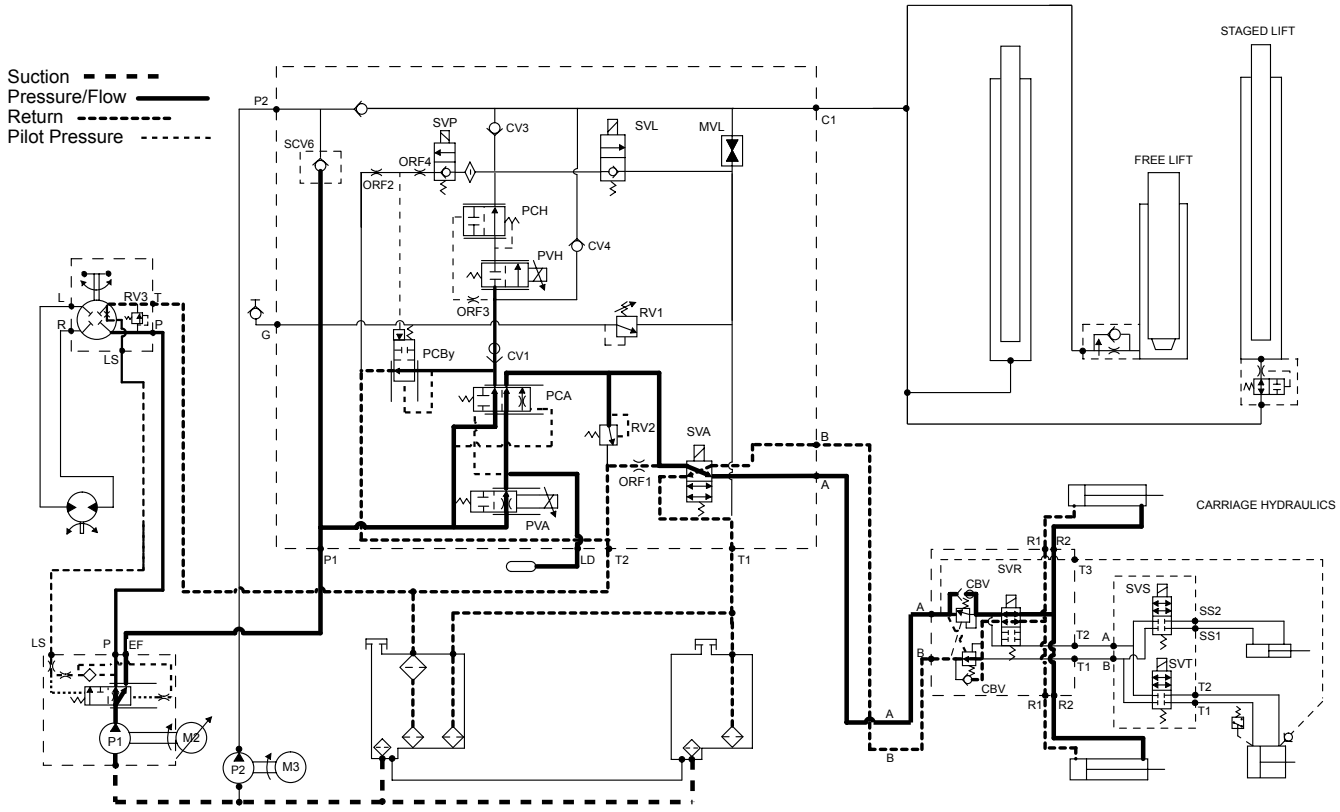
ILLUSTRATION 11

To retract the carriage, the operator “rocks” the thumb control on the multi-task handle in the direction opposite from the one used for reach. This action will move POT 3, causing a voltage change across it, signaling Access 2 to energize PVA, SVA and SVR.

Oil will flow from P1’s EF port to port P1 of hydraulics manifold, through PVA, PCA, and SVA. For retract, SVA will be energized. SVA will shift and supply oil will flow out of hydraulics manifold at port A, into reach manifold at port A, through the upper portions of the dual counterbalance valve and SVR, out ports R2 of manifold and into the front of the cylinders, causing the rods to retract.

Return oil will flow from rear of cylinders, into ports R1 of reach manifold, through SVR and dual counterbalance valve, out port B of reach manifold, into port B of hydraulics manifold, through SVA, out port T1 of hydraulics manifold and back to reservoir(s).

When retract is stopped and PVA and SVR is de-energized, oil in carriage circuit is trapped by the counterbalance valve and SVR in reach manifold block to prevent reach carriage from drifting. Pressurized oil in the mast hose, between hydraulics manifold port A and reach manifold port A, is gradually depressurized by passing through SVA and back to reservoir(s) through hydraulics manifold port T1.



Maximum Retract Pressure is Limited to 103.4 bar / 1500 psi by Manifold Relief Valve RV2.

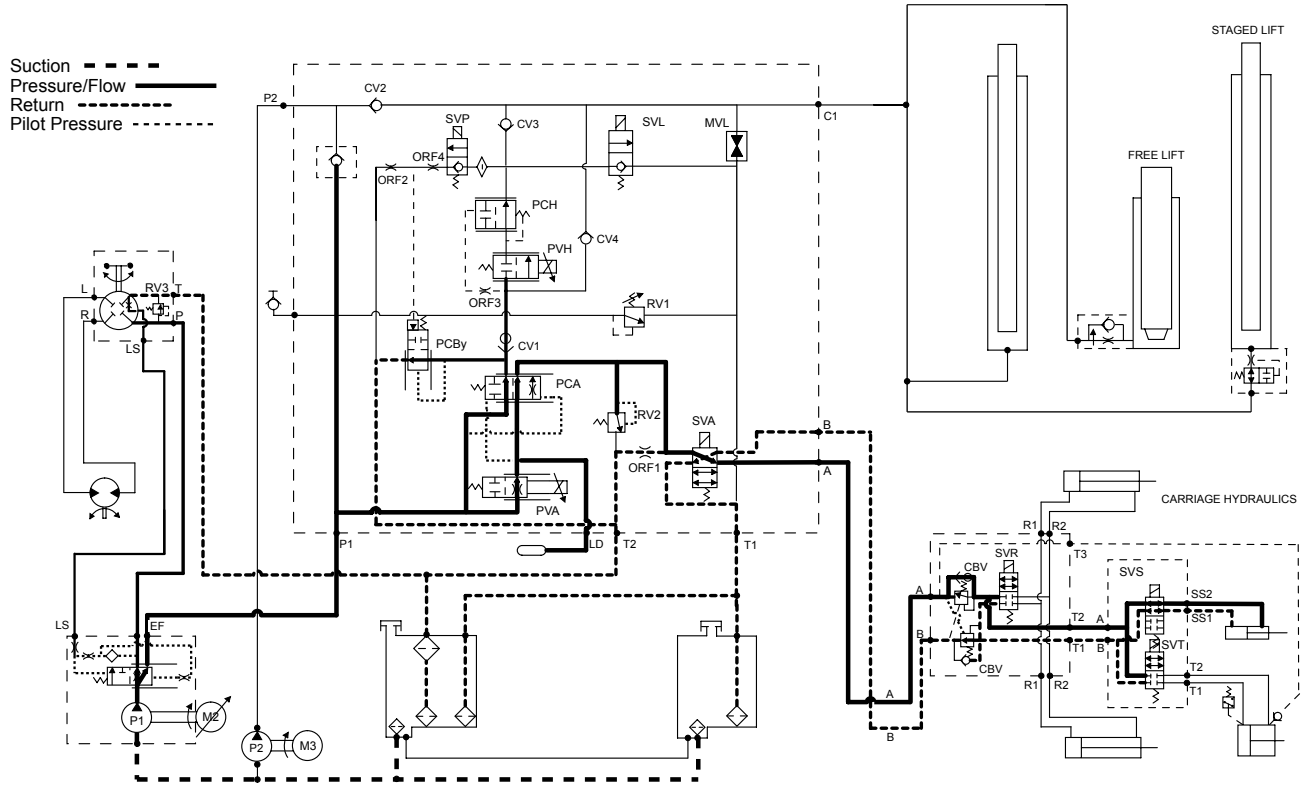
8710-02

ILLUSTRATION 12

Sideshift switch and POT 3 inputs to Access 2 will control sideshift function. For sideshift left, the sideshift switch must be depressed and held while “rocking” the thumb control to the left. Moving the thumb control moves POT 3 which controls PVA’s position.

Pressing and holding SS switch while “rocking” the thumb controlled knob to the left will provide a path for oil to flow from P1’s EF port into port P1 of the hydraulics manifold and through PVA, PCA and SVA. For sideshift left, SVA will be energized by Access 2 and its’ valve will shift positions. Supply oil will flow out port A of hydraulics manifold, into port A of reach manifold, through the upper portion of dual counterbalance valve, out port T2 of reach manifold, into port A of tilt/sideshift manifold, through the upper envelope of SVS, out port SS2 of tilt/side shift manifold and into right side of the SS cylinder.

Return oil will flow from left side of SS cylinder, into port SS1 of tilt/side shift manifold, through the upper envelope of SVS, out port B of tilt/side shift manifold, into port T1 of reach manifold, through the lower portion of dual counterbalance valve, out port B of reach manifold, into port B of hydraulics manifold, through the upper envelope of SVA, out port T1 of hydraulics manifold and return to reservoir(s).



Maximum Side Shift Pressure is Limited to 103.4 bar / 1500 psi by Manifold Relief Valve RV2.

8711-02

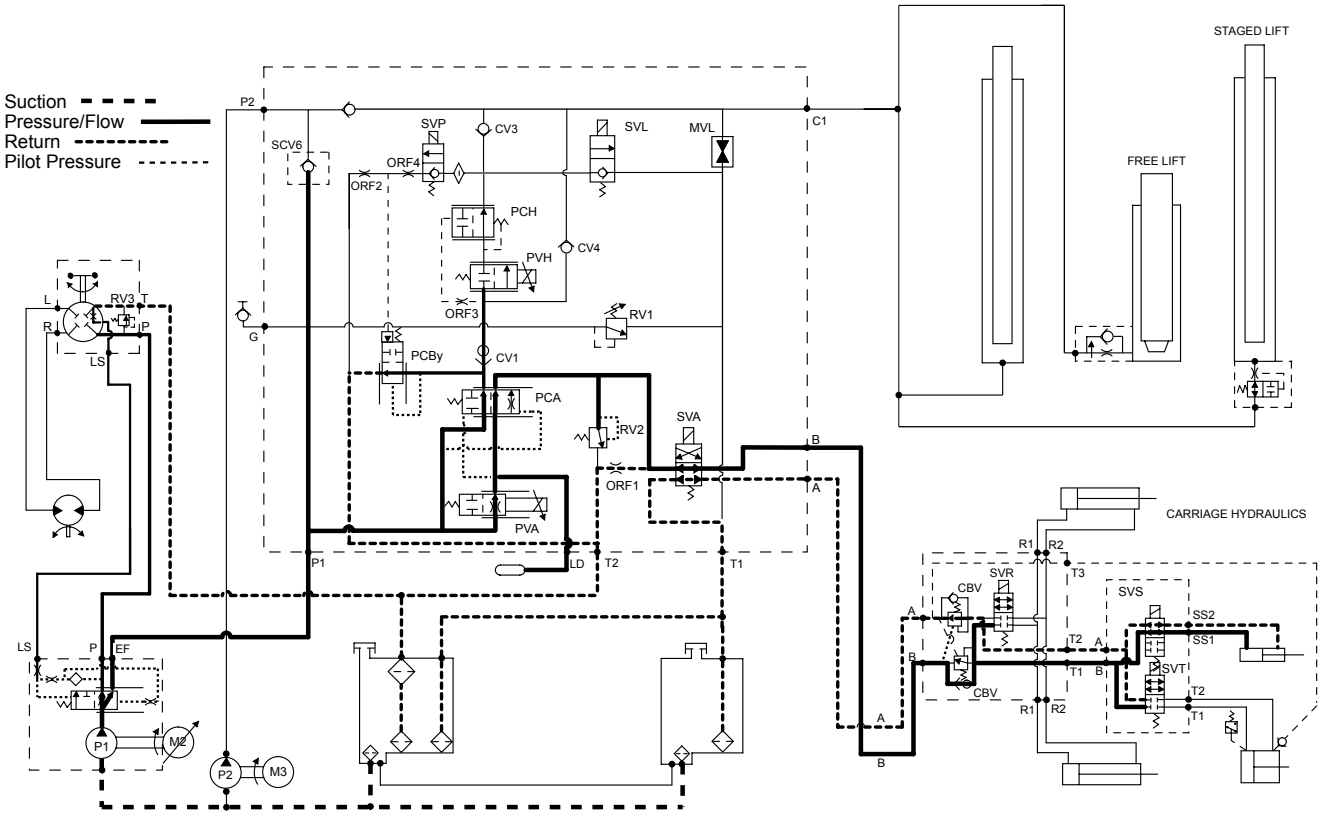
ILLUSTRATION 13

Sideshift switch and POT 3 inputs to Access 2 will control sideshift function. For sideshift right, the sideshift switch must be depressed and held while “rocking” the thumb control to the right. Moving the thumb control moves POT 3 which controls PVA’s position.

When the SS switch is pressed and held and thumb control is “rocked” to the right, oil will flow from P1’s EF port into port P1 of hydraulics manifold, and through PVA and PCA as before. SVA will not be energized and oil will flow through its’ lower envelope, out port B of hydraulics manifold, into port B of reach manifold, through the lower portion of the dual counterbalance valve, out port T1 of reach manifold, into port B of tilt/side shift manifold, through the upper envelope of SVS, out port SS1 of SS manifold and into the SS cylinder.

Return oil from SS cylinder will enter port SS2 of tilt/side shift manifold, flow through the upper envelope of SVS, out port A of SS manifold, into port T2 of reach manifold, through the upper portion of the dual counterbalance valve, out port A of reach manifold, into port A of hydraulics manifold, through the lower envelope of SVA and out port T1 of hydraulics manifold where it will return to reservoir(s).

When side shift is stopped, PVA and SVS are de-energized, oil in carriage circuit is trapped by counterbalance valves and SVS in carriage manifold block to prevent carriage drifting. Pressurized oil in the mast hose, connected between hydraulic manifold port B and carriage manifold port B, is depressurized through ORF1.

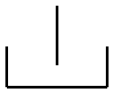


8712-02

ILLUSTRATION 14

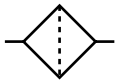
This page available for **NOTES.**

Hydraulic Schematic Symbols



VENTED RESERVOIR
with lines above fluid level

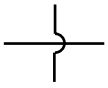
VENTED RESERVOIR
with lines below fluid level



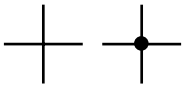
FILTER or STRAINER

HYDRAULIC LINE
with full flow (plumbing - may be tubing, hose, or flow passage in manifold

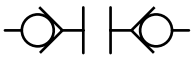
PILOT or DRAIN LINE
limited flow



LINES CROSSING

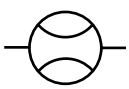


LINES CONNECTED

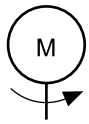


QUICK DISCONNECT
(disconnected)

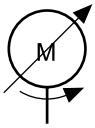
PLUGGED PORT
(test port)



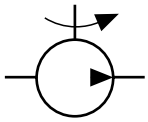
FLOW METER



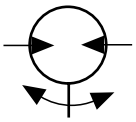
ELECTRIC MOTOR
unidirectional single speed



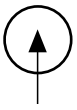
ELECTRIC MOTOR
unidirectional variable speed



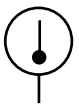
HYDRAULIC PUMP
fixed displacement unidirectional



HYDRAULIC MOTOR
bi-directional



GAUGE
pressure

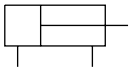


GAUGE
temperature

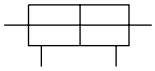
ACCUMULATOR
gas charged diaphragm type

Figure 3559-03

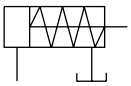
PRESSURE SWITCH



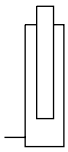
CYLINDER
double acting unequal area



CYLINDER
double acting equal area
(steer) (double end)



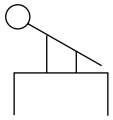
CYLINDER
single acting spring returned
(rod end vented)



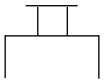
CYLINDER
single acting ram type

CYLINDER
single acting with cushion

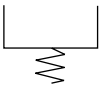
COMPONENT ENCLOSURE
manifold block



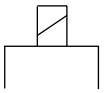
ACTUATOR MANUAL LEVER



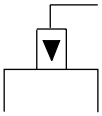
ACTUATOR MANUAL



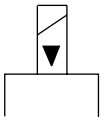
SPRING
(bias to normal
de-energized position)



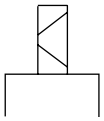
SOLENOID
single coil or winding



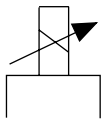
HYDRAULIC PILOT
OPERATED



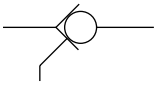
SOLENOID
pilot operated



SOLENOID DUAL



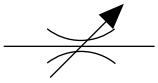
SOLENOID PROPORTIONAL



VALVE PILOT CHECK
(pilot to open)

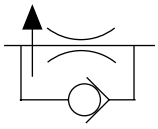
Figure 3560-03

ORIFICE THROTTLE
fixed

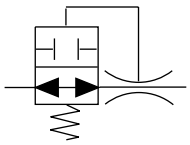


ORIFICE THROTTLE
adjustable

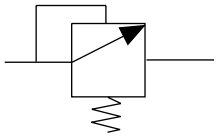
FLOW CONTROL
PRESSURE COMPENSATED
fixed



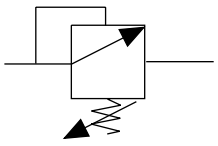
FLOW CONTROL
PRESSURE COMPENSATED
fixed with reverse flow bypass



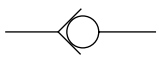
FUSE VELOCITY



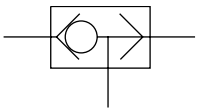
VALVE RELIEF
fixed setting



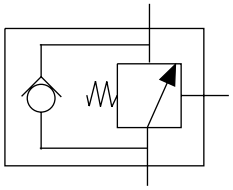
VALVE RELIEF
adjustable



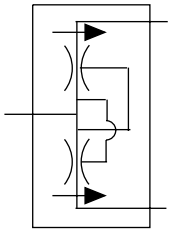
VALVE CHECK



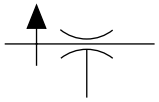
VALVE SHUTTLE



VALVE
SINGLE COUNTERBALANCE
in manifold

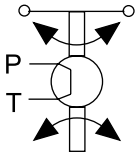


FLOW DIVIDER/COMBINER

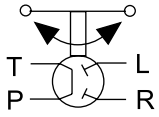


BYPASS FLOW CONTROL
regulated flow
pressure compensated

VALVE MANUAL SHUTOFF

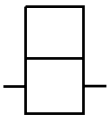


TORQUE GENERATOR

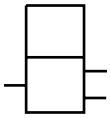


STEER UNIT
hydrostatic

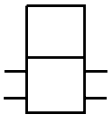
Figure 3561-03



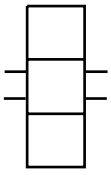
VALVE
2 way 2 position



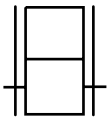
VALVE
3 way 2 position



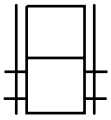
VALVE
4 way 2 position



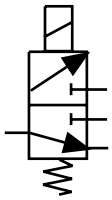
VALVE
4 way 3 position



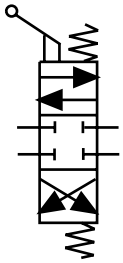
VALVE
2 way infinite positions



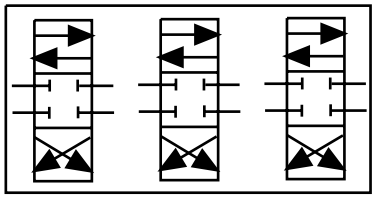
VALVE
4 way infinite positions



VALVE
3 way 2 position
spring bias, solenoid control



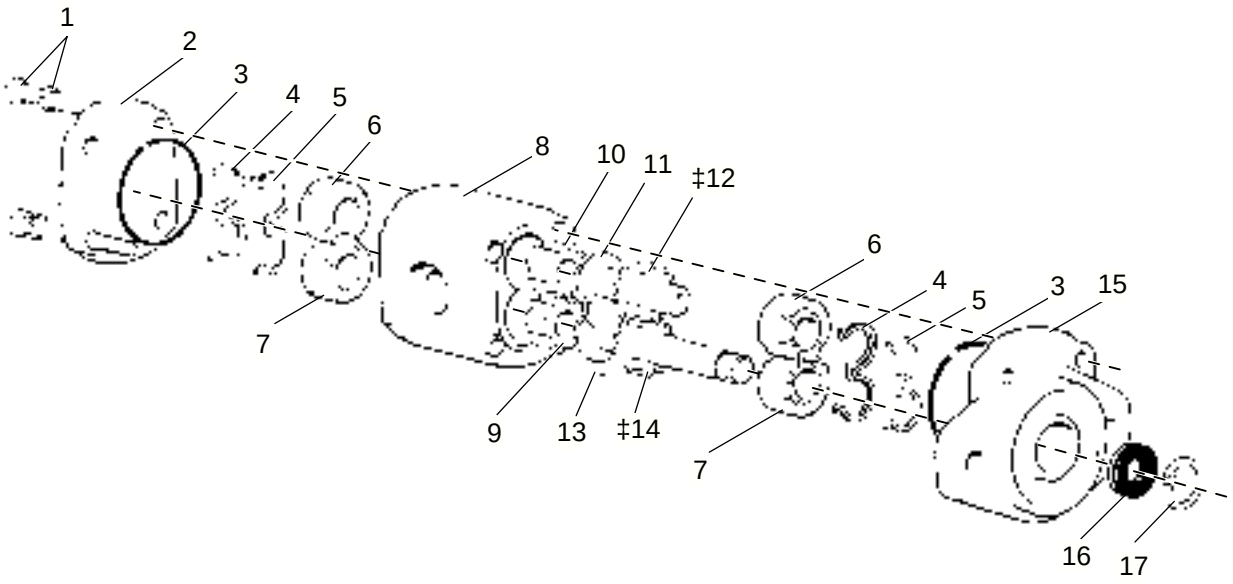
VALVE
4 way 3 position
dual spring centered,
manual lever control



NOTE: The type of valve depends on the number of spools found in the component enclosure (Triple spool valve shown)

Figure 3562-03

RR/RD 5200/5200S



6243S

ILLUSTRATION 1

General

Pumps are comprised of an end cover, body housing a dual element gear set, bushes and a mounting flange bolted together with through bolts. The gear set comprises of a dual element arrangement with phased teeth to give low pressure ripple and hence overall low system noise. The gear sets are separated by a balance plate and the gear journals are supported in plain bearings within pressure balanced bushes to give high volumetric and mechanical efficiencies.

Routine maintenance consists of periodic checks for tightness of the mounting bolts and port fittings plus visual examination for oil leaks. The unit should be kept externally clean, especially in the area of the shaft seal as dirt can accelerate seal wear and cause leakage.

The direction of rotation is indicated by the word "rotate" and an arrow etched on the body adjacent to the driveshaft. Rotation is always specified as viewed on the driveshaft.

Pump Disassembly

Overhaul the pump in a clean, dust free location, using clean tools and equipment. Dirt or grit will damage the highly polished machined surfaces and will result in leakage or premature pump failure.

Before beginning disassembly, scribe matched marks on the body assembly, the end cover and mounting flange to insure that the pump will be reassembled properly. This pump can be assembled for either clockwise or counterclockwise rotation as viewed from driveshaft end. Note which direction the arrow is pointing next to the word "rotation" prior to disassembly.

- Remove bolts and spring washers (1).
- Remove end cover (2), body O-ring (3), bush seal (5) and backup seal (4).
- Turn unit over and lightly tap mounting flange (15), to disengage it from the locating dowels and slide the flange off the shaft.
- Remove retaining ring (17) and push the shaft seal (16) out of the mounting flange taking care not to damage any sealing surfaces.
- Remove body O-ring (3), bush seal (5) and backup seal (4).
- Before removing internal components mark the bushes to denote location in the body.
- With unit lying on its side, hold the driveshaft and pull it squarely out of the body bringing with it bushes 6 and 7 and complete gear pack 10, 11, 12, 14 and 18.

- Remove gears, key and plate (9, 10, 11 and 13) from the driveshaft and driven gear journals, note the position of plate (11) to ensure reassembly in the same position.

- Remove the two remaining bushes from the body bores.

Parts Inspection

Each component should be thoroughly cleaned. Inspected in the order disassembled, for wear and damage and assessed for suitability of reuse.

Inspect the body bore cutin where gears wipe into the body.

The body can only be reused if the cutin is bright and polished in appearance and the depth does not exceed 0.08mm (0.003 in.).

The body is unserviceable if the surface is scored, has a matte appearance or shows signs that the tip of the gears have dug in and torn away the surface metal.

The body should be inspected to ensure that there is no superficial damage which may adversely effect performance or sealing. Pay particular attention to the port threads and body O-ring seal recesses.

Mounting Flange And End Cover

The inner surfaces should be inspected to ensure that there is no unusual wear or scoring in the regions where the body O-rings and bush seals contact, which could result in external leakage.

Check shaft seal recesses for scoring or damage that could result in oil leakage around the outer diameter of the shaft seal. Replacement shaft seal can be refitted with hydraulic sealant (061004-023) to overcome slight damage in this area.

Bushes and Balance Plate

The side faces which abut the gears should be perfectly flat showing no sign of scoring. Characteristically there are bright polished areas on this surface caused by loading against the gear faces, which is often more pronounced on the low pressure side. These should not be used if there is any general scoring or fine scoring with a matte appearance or tearing of the surface material. There must be no noticeable wear step as it is critical that the bush side face and balance plate are completely flat to the gear side face.

Bush bearing liners are acceptable providing that they are not scored or show other damage. The general outside area of the bush should not show any prominent signs of wear.

Gears

Gear side faces should be examined for bruising or scoring. Often operation on contaminated fluid shows scoring between the root of the gear and the journal which leaves a wear step. If a wear step can be felt, coincidental with the root diameter, by drawing a sharp pointed tool across the surface from the journal outwards towards the tip of the gear, then the gear is unserviceable.

Gear teeth should be carefully examined to ensure that there are no signs of bruising or pitting.

Journal bearing surfaces should be completely free from scoring or bruising. The surface should appear highly polished and smooth to touch.

Examine the area where the shaft seal lips run on the driveshaft, this shows up as a polished ring or rings. If a noticeable groove can be felt or there is scoring the shaft is unserviceable.

Examine drive keyway in driveshaft journal extension to ensure it is not damaged or chipped.

If the driveshaft and gears are not damaged then they can be reused. If, however, the gears are damaged they are unserviceable.

Pump Assembly

All parts should be perfectly clean and lubricate bushes and gears with clean hydraulic oil. Make sure O-ring recess and end faces of body remain dry. This will assist assembly of components into body bores.

- Install end cover (2) bushes (6 & 7) into undoweled end of the body from where they were removed. The "C" shape cutout in the bushes must be to the side of the body with the cusp removal flat. Refer to Illustration 2.

- Place end cover (2) against the undowelled end of the body (8) and stand assembly on the cover so the dowels are uppermost and to the lefthand side.

- Hold driveshaft and driven gear (12 & 14) together and install plate (11) in its original position. The two grooves in the plate must be to the low pressure side of the pump (the side where body bores meet in a point) with the driveshaft nearest to you these grooves will be the lefthand side as shown in Illustration 1 for counter clockwise rotation.

- Install key (13) to keyway in drive shaft and carefully install gear (9) to locate on key, install the second gear (10) to the extended plain journal of the driven gear.

- Keeping the gear pack together carefully install assembly into the body bores with the driveshaft positioned to suit the required direction of rotation. For clockwise rotation driveshaft in the top bore and for counterclockwise rotation in the bottom bore. Refer Illustration 2.

- Install mounting flange end (15) bushes (6 & 7) into their original bores remembering the "C" cutout must be to the side of the body with the cusp removal flat and match the cover end bushes.

- Install replacement body O-ring (3), bush seal and backup seal (4 & 5) ensuring the seals locate correctly on the seal grooves.

- Install replacement shaft seal into recess in the mounting flange with the garter spring facing the pump. Remember that if the seal recess was scored then hydraulic sealant (061004-023) must be applied to the outer diameter of the seal. Apply a coat of high melting point grease to the shaft seal lips. Install retaining ring (17) in its groove.

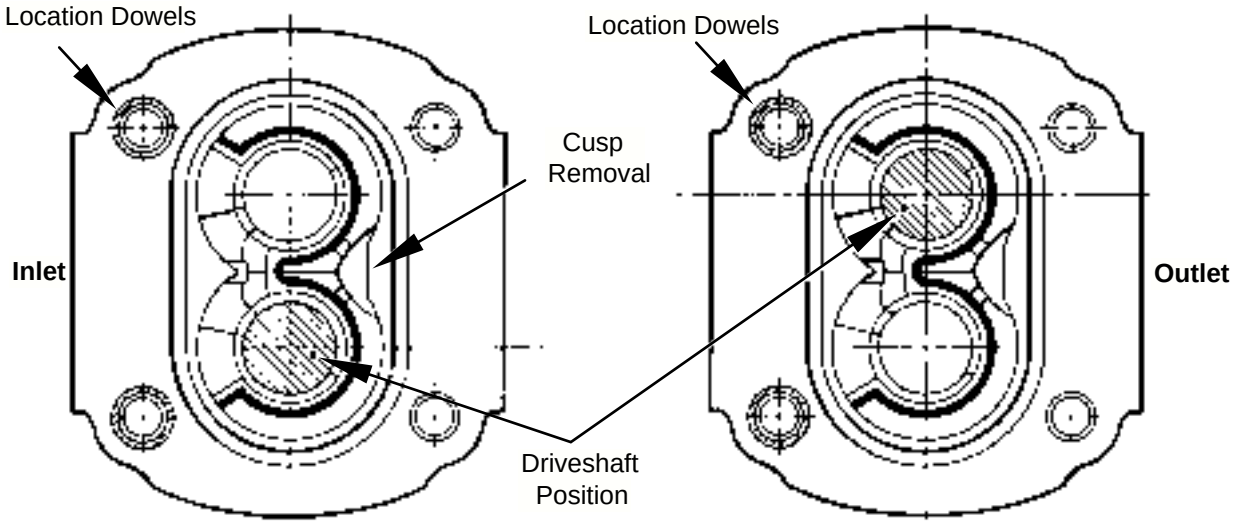
- Install shaft seal assembly sleeve over driveshaft and carefully install mounting flange (15) ensuring that it locates squarely onto the dowels in the body, remove assembly sleeve.

- Holding the whole unit together carefully turn it over and support it on the mounting flange, not the driveshaft.

- Remove end cover (2) and install replacement O-ring (3), bush seals (6 & 7) and backup seals (4 & 5).

- Install end cover (2) and bolts and lockwashers (1). Tighten bolts to 45 - 50 Nm (34 - 38 ft. lbs.).

- Pour a small amount of clean hydraulic oil into a port and check that the shaft can be rotated without undo force.



6326S

ILLUSTRATION 2

LOAD SENSING FLOW VALVE

General

The load sensing flow control valve mounts directly onto the end of the pump and its function is to split the output flow into two independently usable flows. The output from a fixed displacement gear pump will vary if the drive speed is altered.

With the load sensing flow control valve will supply sufficient flow to power steering rather than a constant flow. This means that more flow is available to the secondary circuit.

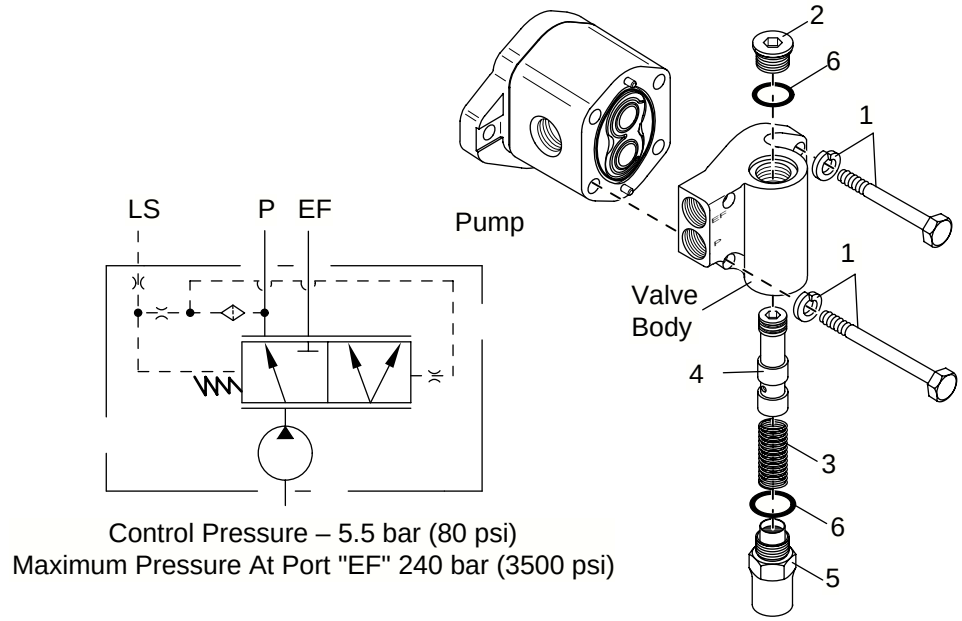
Load Sensing Valve Disassembly

Clean all accumulations from the outside of valve. Remove valve from pump and place in a clean dirt free location.

- Remove spool plug (2) and spring seat (5) allowing spring (3) and spool (4) to be removed. Examine spool and bore for signs of damage. Refer to Illustration 3.
- Remove O-rings (6) and install replacement O-rings.
- Spring seat (5) has a 0.7 mm (0.0275 in.) orifice in the base of the spring seat. It is important that this orifice is clear and free of contaminants.

Load Sensing Valve Assembly

- Replace spool (4), spring (3) and spool plugs (2 & 5) and tighten item 5 to 100 - 105 Nm (74 - 78 ft. lbs.) and item 2 to 75 - 80 Nm (55 - 59 ft. lbs.).
- Install valve to pump ensuring inlet to valve in rear face is over high pressure side of pump (semicircular cutout in bushes).
- Tighten bolts (1) 46 - 51 Nm (34 - 38 ft. lbs.).



Control Pressure – 5.5 bar (80 psi)
Maximum Pressure At Port "EF" 240 bar (3500 psi)

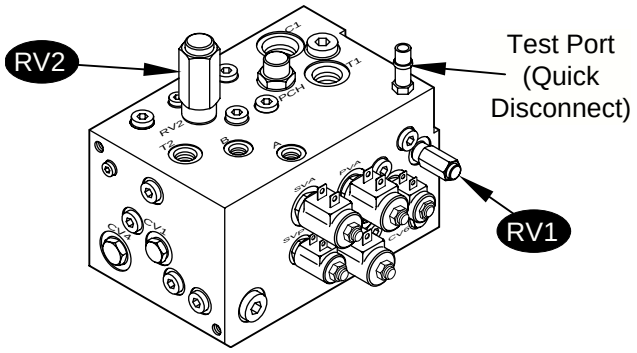
8812

ILLUSTRATION 3

RR/RD 5200/5200S
RR/RD 5200(AC)/5200S(AC)

RELIEF VALVE #1 & #2 (RV1 & RV2)
Operation

The lift circuit is protected from excessive oil pressure by RV1 and the accessory (reach, tilt, etc.) circuit is protected by RV2. If pressure within the circuit exceeds the relief valve preset level, the valve will open and relieve pressure by directing oil to the reservoir thus maintaining a maximum pressure limit for the circuit.



6479-02 ILLUSTRATION 1

Adjustment

A fully charged battery should be installed in the truck and all truck calibration and feature configuration should be completed before attempting any measurements or adjustments.

RV1

To adjust RV1:

1. Connect a 0 to 35 mPa/0 to 5000 psi. pressure gauge to the test port of the manifold. Insert thermometer in hydraulic oil.

2. Place a 2750 kg/6000 lb. load on forks. Hold control lever in the full raise position while reading gauge. Pressure reading must be taken while passing full flow over relief valve with all pumps operating. Pressure range is:

Oil Temperature		Pressure	
C°	F°	mPa	PSI
20 to 32	70 to 90	22.40 to 22.75	3250 to 3300
38 to 60	100 to 140	21.70 to 22.05	3150 to 3200

3. If relief valve setting is not within required range, loosen jam nut on RV1 and adjust valve.

4. Tighten jam nut when adjustment is correct and re-check pressure setting. Readjust if necessary.

RV2

RV2 is not adjustable. To check for proper operation:

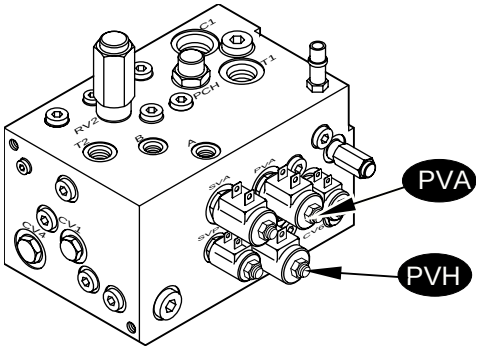
1. Connect a 0 to 35 mPa/0 to 5000 psi. pressure gauge to the test port of the manifold. Insert thermometer in hydraulic oil.

2. Place a 2750 kg/6000 lb. load on forks. Depress and hold tilt back switch on multi task handle. Keep mast in full tilt back position while reading gauge. Pressure reading must be taken while passing full flow over relief valve. Pressure range is:

Oil Temperature		Pressure	
C°	F°	mPa	PSI
20 to 32	70 to 90	11.65 to 12.35	1690 to 1790
38 to 60	100 to 140	11.40 to 12.05	1650 to 1750

PROPORTIONAL VALVES PVA & PVH

If PVA and PVH are replaced, valves must be calibrated. To calibrate, refer to section M4.3.



6481-02 ILLUSTRATION 2

Manifold Block O-Ring Replacement

1. Remove console on 5200 series trucks or open side panel covering manifold block on 5200S series trucks.

2. Open Manual Lowering Valve (MVL) on manifold block to relieve system pressure. See Illustration 3.

WARNING

AVOID HIGH PRESSURE FLUIDS – Escaping fluid under high pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic lines. Tighten all connections before applying pressure. Keep hands and body away from pin holes which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.

Any fluid injected into the skin under high pressure should be considered as a serious medical emergency despite an initial normal appearance of the skin. There is a delayed onset of pain and serious damage may occur. Medical attention should be sought immediately by a specialist who has had experience with this type of injury.

7815P ILLUSTRATION 3

3. Remove all hydraulic hoses and lines from manifold block, cap lines and hoses with plastic plugs to avoid oil leakage and contamination. Catch any oil that may be spilled.

4. Loosen accessible cartridge valves while the manifold block is still in the truck, do not remove any of the valves at this time.

5. Remove manifold block from truck and place on a clean piece of cardboard in a clean area to avoid contamination while disassembling, as shown in Illustration 4.

7. Remove all valves from manifold block and place on a clean piece of cardboard. During the entire disassembly, replacement of o-rings, putting valves back into manifold, and proper torque of valves, it is extremely important to keep work surfaces and parts as clean as possible to avoid contamination. Check to make sure ORF4 is removed from SVP cavity, refer to Illustration 5, this is the only orifice that is not screwed into the block. Do not remove any of the other orifices or SAE plugs from the block.

8. Make a visual inspection of valves and valve cavities for any signs of contamination. Check operation of valve mechanisms for sticking or rough operation as seen in Illustration 6. If any valves are contaminated or do not function properly, discard valve and replace with new valve.

9. Remove top (cap) o-ring from each valve, cover threads on valve with sleeve or tape to prevent damage to replacement o-ring, and carefully replace top o-ring. The top o-ring (cap) will be the one closest to the outside surface of the manifold block after the valve is installed in the manifold block. Visually inspect all other o-ring and back-up rings, replace as required. Refer to Chart 1 for o-ring usage.

10. Apply a light film of hydraulic oil to threads of all the valves before installing into the manifold block. When installing ORF4 and SVP in cavity, spread a clean light grease on **FLAT** side of ORF4 and stick on nose of SVP, then carefully insert into cavity. This will properly orient ORF4 and prevent it from changing position during installation.

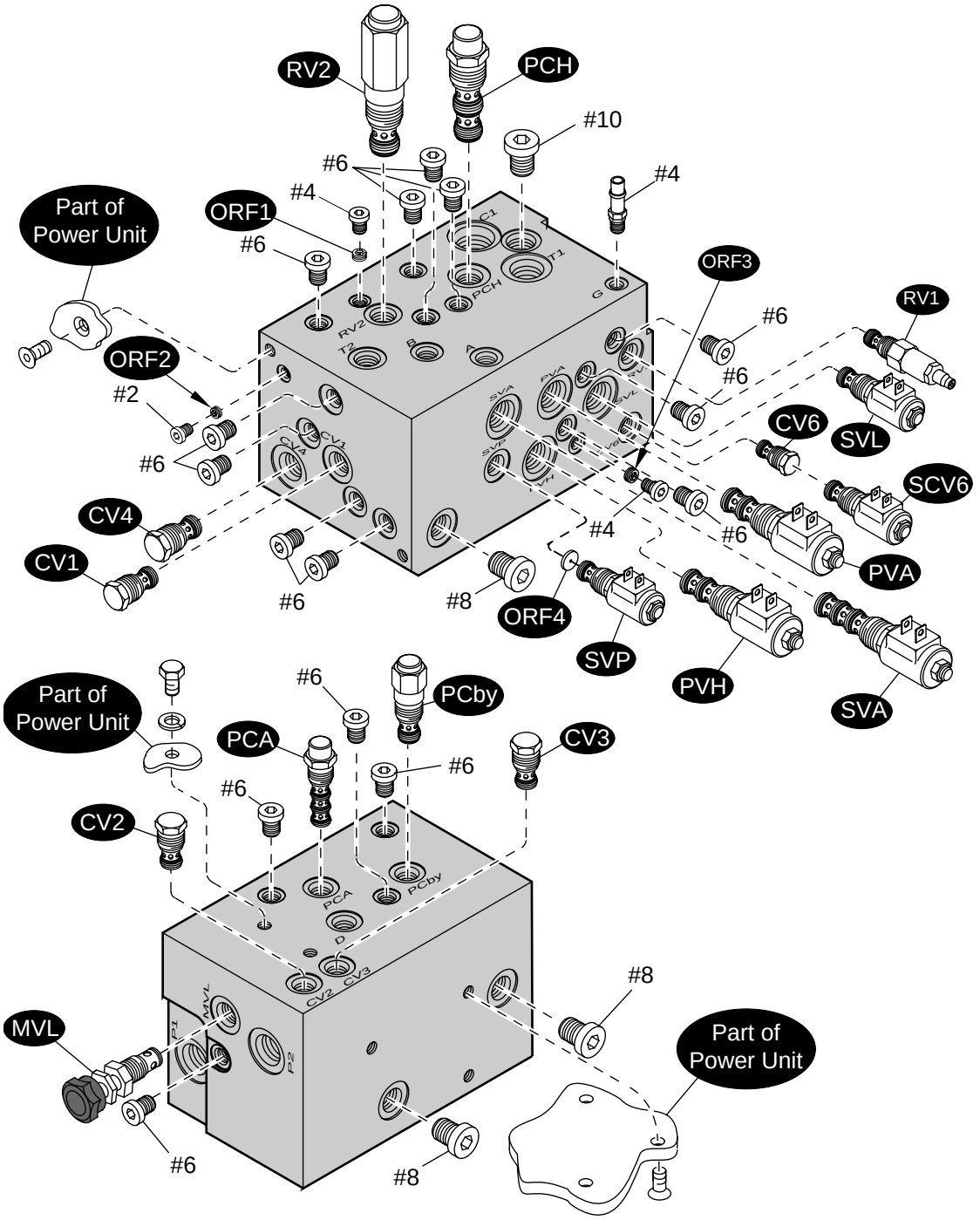
11. Install each valve into manifold block by hand until snug.

12. Refer to Illustration 7 for valve and plug placement and Chart 2 for torque values of valves and plugs. Torque each valve to the value given. If using a crows foot or other extension, position it at 90° to torque wrench handle to keep torque value same as torque wrench setting.

7932P ILLUSTRATION 4

7934P ILLUSTRATION 6

7933P ILLUSTRATION 5



7947-02

ILLUSTRATION 7

Chart 1 lists the top o-ring part number for valves and plugs installed in the lift/accessory and reach carriage manifold blocks. Refer to this chart whenever installing a top replacement o-ring. Seal kits are available to replace all o-rings on each cartridge type valve. Refer to parts section 2.0 and 2.4 for seal kit part numbers.

Reference Designation	Valve/Plug Part No.	Location	O-Ring Part No.	O-Ring Dim. (mm) W.	I.D.	O.D.	O-Ring Dim. (in.) W.	I.D.	O.D.
CV1, CV2, CV3	123255-001	Lift/Acc. Manifold	**064019-075**	0.62	59.50	55.65	0.103	1.987	2.19
CV4	123255-002		**064019-076**	2.95	29.75	–	0.116	1.171	–
CV6	125379		**064019-045**	2.45	19.20	–	0.097	0.755	–
SCV6	117304-003		**064019-045**	2.45	19.20	–	0.097	0.755	–
RV1	117913-002		**064019-045**	2.45	19.20	–	0.097	0.755	–
CBV	121819	Carriage Manifold	**064019-045**	2.45	19.20	–	0.097	0.755	–
SVR/SVS SVT	122167-001		**064019-030**	2.20	16.35	–	0.087	0.644	–
RV2	123334-002	Lift/Acc. Manifold	**064019-045**	2.45	19.20	–	0.097	0.755	–
MVL	177739		**064019-030**	2.20	16.35	–	0.087	0.644	–
PVA	123257-002		**064019-045**	2.45	19.20	–	0.097	0.755	–
PCA	123259		**064019-075**	0.62	59.50	55.65	0.103	1.987	2.19
PVH	123257-001		**064019-075**	0.62	59.50	55.65	0.103	1.987	2.19
PCH	123261		**064019-075**	0.62	59.50	55.65	0.103	1.987	2.19
PCby	123260		**064019-075**	0.62	59.50	55.65	0.103	1.987	2.19
SVL	117305-003		**064019-076**	2.95	29.75	–	0.116	1.171	–
SVP	123258		**064019-030**	2.20	16.35	–	0.087	0.644	–
SVA	117385-003		**064019-045**	2.45	19.20	–	0.097	0.755	–
#2 Plug	064091-004		**064019-074**	1.65	6.10	–	0.064	0.239	–
#4 Plug	064091-006		**064019-031**	1.85	8.90	–	0.072	0.351	–
#6 Plug	064091-002		**064019-029**	1.98	11.89	15.85	0.078	0.468	0.624
#8 Plug	064091-001		**064019-030**	2.20	16.35	–	0.087	0.644	–
#10 Plug	064091-007		**064019-045**	2.45	19.20	–	0.097	0.755	–

Chart 2 lists torque values for all cartridge type valves installed in the lift/accessory manifold block and reach carriage manifold block(s) and plugs. Refer to this chart whenever installing a replacement cartridge valve(s) and/or plugs.

Part No.	Reference Designation	Location	Cartridge Torque Nm	Cartridge Torque (Ft. Lbs.)	Coil Nut Torque Nm	Coil Nut Torque (Ft. Lbs.)
117304-003	SCV6 (1 Lift Pump)	Lift/Acc. Manifold	48 - 54	(35 - 40)	N/A	
117305-003	SVL		102 - 108	(75 - 80)	8.0	(6.0)
117385-003	SVA		48 - 54	(35 - 40)	8.0	(6.0)
117739	MVL		41 - 48	(30 - 35)	N/A	
117913-002	RV1		54 - 61	(40 - 45)	N/A	
121819	CBV	Carriage Manifold	34	(25)	N/A	
122167-001	SVR/SVS SVT		27	(20)	10	(7.0)
123255-001	CV1/CV2 CV3	Lift/Acc. Manifold	102 - 108	(75 - 80)	N/A	
123255-002	CV4		129 - 135	(95 - 100)	N/A	
123257-001	PVH		68 - 75	(50 - 55)	14 - 16	(10 - 12)
123257-002	PVA		48 - 54	(35 - 40)	14 - 16	(10 - 12)
123258	SVP		34 - 41	(25 - 30)	8.0	(6.0)
123259	PCA		68 - 75	(50 - 55)	N/A	
123260	PCby		68 - 75	(50 - 55))	N/A	
123261	PCH		68 - 75	(50 - 55)	N/A	
123334-002	RV2		54 - 61	(40 - 45)	N/A	
125379	CV6 (2 Lift Pumps)		54 - 61	(40 - 45)	N/A	
064091-001	#8 Plug		41 - 44	(30 - 32)	N/A	
064091-002	#6 Plug		23 - 24	(17 - 18)	N/A	
064091-004	#2 Plug		7 - 8	(5 - 6)	N/A	
064091-006	#4 Plug		14 - 15	(10 - 11)	N/A	
064091-007	#10 Plug		44 - 49	(32 - 36)	N/A	

The following Troubleshooting Chart contains general information necessary to effectively solve the more common hydraulic problems. Know the system to the best of your ability. Understand the components and their function within the system. Develop a systematic pattern to locate and solve the various hydraulic problems that occur. The ability to identify problems and proceed in solving the problem grows with experience. The following chart contains problems, probable cause and remedy. The information is general in nature and a remedy may simply refer you to a maintenance section that has more complete troubleshooting. Use the chart(s) carefully and completely. Do not make the system more complicated than necessary. Do not overlook the simplest reason(s) for a hydraulic problem.

NOTE

Many hydraulic components are monitored by the truck's electrical system. If failures occur in the monitored components, a fault or status code will be displayed on Access 1. Truck status codes can be referenced in section M4.3 of this manual.

Troubleshooting

Problem	Probable Cause	Remedy
Hydraulic oil foaming	Introduction of air into pump	Check reservoir oil level. Check for proper oil viscosity. Check plumbing.
	Water in oil	Check reservoir.
Hydraulic oil overheating *	Oil too thin * Oil contaminated Introduction of air into pump Oil level low	Change to proper viscosity oil. Change filters and fill with clean oil. Check plumbing. Fill reservoir to proper level.
Loss of lift function	Mast assembly binding Lift motor or pump not operating PCBY stuck in open position CV1 stuck in closed position Binding or jammed spool in PVH Binding or jammed spool in SVP Restriction in ORF4	Inspect mast for damage. See section M2.1. Check PCBY. Check CV1. Check PVH. Check SVP. Inspect and clean manifold orifice.
Reduced lift function	Broken spring in PCBY Enlarged ORF2 Contaminated CV3 (partially closed) Broken spring/dirty CV2 (stuck open) Incorrect calibration of PVH	Check PCBY. Inspect and clean manifold orifice. Check CV3. Check CV2. Check and reset.
Loss of lowering function	Velocity fuse actuated Mast assembly binding Binding or jammed spool in PVH Binding or jammed spool in SVL	Check for severe oil leak. Inspect mast for damage. Check PVH. Check SVL.
Reduced lowering function	Debris in flow control valve Line restriction Binding in mast assembly Binding or jammed spool in PVH Spring failure in PCH (partially closed) Spring failure in CV4 (partially closed)	Cycle through lift/lower to free possible debris. Check hydraulic plumbing. Inspect mast for damage, misalignment, shimming, etc. Check PVH. Check PCH. Check CV4.

Troubleshooting

Problem	Probable Cause	Remedy
Excessive lowering function (Lowers too fast)	Debris in flow control valve	Cycle through lift/lower to free possible debris.
	SVL sticking	Test SVL using analzer A3.5 menu. Replace SVL.
	External oil leak	Check hydraulic plumbing for leak(s).
	Contamination of PCH (stuck open)	Check PCH.
	Blockage of ORF3	Inspect and clean manifold orfice.
	Incorrect calibration of PVH	Check and reset.
Sudden movement or jerking	Broken spring/dirty CV4 (stuck open)	Check CV4.
	PCBY stuck in closed position	Check PCBY.
Lift pump & motor overheating *	Relief valve malfunction	Reset or replace relief valve.
	Exceeding capacity load	Check load weight.
	Low fluid level	Inspect fluid level and fill.
	Worn or damaged pump	Inspect pump & motor for damage repair or replace as needed.
	Oil too thin *	Change to proper viscosity oil.
Abnormal hydraulic oil usage	External leak	Inspect hydraulic plumbing.
Carriage drifts down (in excess of drift test)	Worn lift cylinder packings	See section M8.0 for replacement.
	Broken spring/dirty CV1 (stuck open)	Check CV1.
	Broken spring/dirty CV2 (stuck open)	Check CV2.
	Broken spring or dirt in SVP	Check SVP.
	Broken spring/dirty SVL (stuck open)	Check SVL.
	MVL open or damaged	Check MVL.
Carriage drifts up slightly	PCBY stuck in closed position	Check PCBY.
	Restriction in ORF2	Check ORF2.
Forks drift down (in excess of drift test)	Worn tilt cylinder packings	See section M8.0 for replacement.
	Broken spring/dirty CBV (stuck open)	Check CBV.
Loss of accessory functions (no functions when requested)	Binding or jammed spool in PVA	Check PVA.
	Binding or jammed spool in SVR	Check SVR.
	Binding or jammed spool in SVS	Check SVS.
	Binding or jammed spool in SVT	Check SVT.
Reduced accessory functions (low flow rate)	Contaminated/dirty PCA	Check PCA.
	Dirt or broken spring in RV2	Inspect RV2.
	RV1 set incorrectly	Reset relief valve.
	Broken spring/dirty SCV6 (stuck open)	Check SCV6.
	Oil too thick *	Change to proper viscosity oil.
	Incorrect calibration of PVH	Check and reset
Accessories function with no command or input	Broken spring/dirty SVR (stuck open)	Check SVR.
	Broken spring/dirty SVS (stuck open)	Check SVS.
	Broken spring/dirty SVT (stuck open)	Check SVT.

Troubleshooting

Problem	Probable Cause	Remedy
Accessories function in reverse (ask for tilt up get tilt down)	Broken wire, spring or coil at SVA Incorrect calibration of POT3	Check SVA. Check POT3.
Excessive accessory operation (accessories operate too fast)	Contaminated/dirty PCA Dirt or broken spring in RV2 RV2 set incorrectly Broken spring PCBY (partially closed) Incorrect calibration of PVA	Check PCA. Inspect RV2. Reset relief valve. Check PCBY. Check and reset.
Slow or sluggish steering	Dirty/worn Priority Flow Divider (PFD) Worn/dirty SCU Worn or dirty steering hydraulic motor Binding of steer gears Load sense line is blocked RV3 set incorrectly	Inspect lift pump PFD. See section M6.3. Check for binding or damaged gears. Check for kinked or broken line. Inspect RV3.
Steering jerks abruptly	Dirty/worn Priority Flow Divider (PFD) Worn or dirty steering hydraulic motor Binding of steer gears Air in system	Inspect lift pump PFD. Check for binding or damaged gears. Check fittings and inspect for leaks.
Unable to maintain steered position (steering will not track straight)	Worn/dirty SCU Worn or dirty steering hydraulic motor Binding of steer gears	See section M6.3. Check for binding or damaged gears.

*Be sure the truck has been performing its normal duty cycle at this time. Trucks equipped to operate in freezer require a thinner weight oil.

This page available for **NOTES.**

Disassembly and Assembly

CAUTION

Disconnect battery and chock load wheels before performing any maintenance procedure.

Drive Tire Replacement

When replacing the drive tire, make sure the composition and size are such that maneuverability and braking requirements are maintained. The drive tire is a "press-on" type; press the old tire off the hub and press new tire on.

1. Disconnect battery and chock wheels.
2. Raise and block the power unit so drive tire is off of the floor. Loosen and remove the 8 lug bolts and remove wheel and hub from drive unit.
3. Locate existing tire assembly on hydraulic press directly below ram.

CAUTION

Extreme pressure is used to press tires, always exercise caution and assure that only trained personnel are allowed to operate a hydraulic press.

4. Use suitable press tooling for press to contact hub circumference and remove existing tire from hub.
5. Discard existing tire.
6. Place new tire on press, centered below ram.
7. Lightly lubricate inside top 75 mm (3 in) of tire band with light oil.
8. Place hub directly over tire with leading edge chamfer inserted into tire band. See Figure 16864.
9. Place press tool, 134169, over top of hub with alignment pins in lug bolt countered bored holes.
10. Center press tool, hub, and tire below ram plate, which should be a minimum 240 mm (9.5 in) diameter.
11. Press hub into tire band until flush, monitor alignment during press operation.

CAUTION

Replacement of original equipment tires with other than those recommended by Crown may result in decreased operating performance, traction and stability. Consult appropriate truck Service & Parts manual.

Several checks should be made during the press operation:

- Check the OD leading edge chamfer of the hub to verify it is free of burrs or gouges.
- Check the circumference of the hub for heavy galling, replace if necessary.
- Verify the base band of the tire has not been previously pressed.
- Monitor hub tire alignment closely during first 75 mm (3 in) of insertion, misalignment can damage tire band.
- Monitor press force during process, low force may indicate a worn out hub.
- Always press the hub into the tire for proper installation.
- DO NOT press directly on center of the convex hub.
- Press until hub face is flush with tire band.

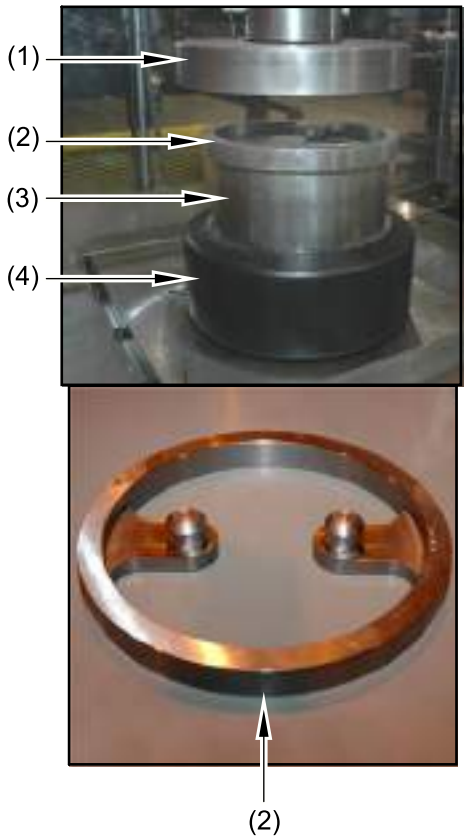


Figure 16864

(1) Minimum 240 mm (9.5 in) Diameter
(2) Tire Press Tool
(3) Hub
(4) Tire

12. Inspect hub and remove any paint that may be present on tapered lug seats or on inner hub face that contacts truck axle. See Figure 16865.

13. Finger tighten lug bolts, then tighten to 135/ 150 Nm (100/111 ft lb) making sure that they are tightened in the sequence shown in Figure 16865.

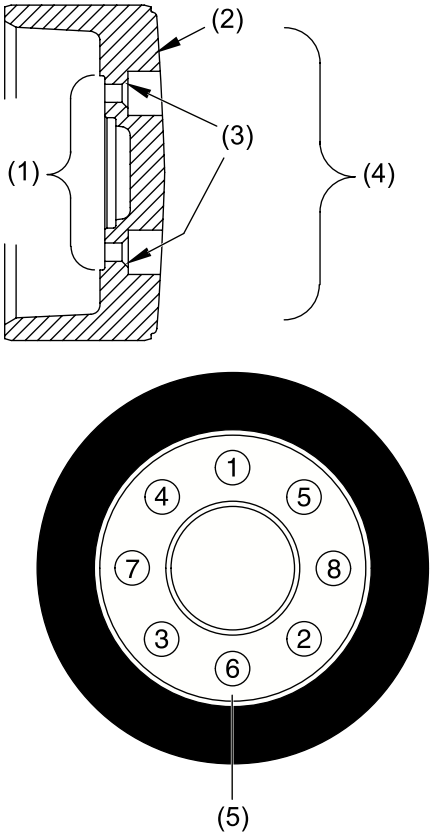


Figure 16865

(1) Inner Hub Face
(2) Hub
(3) Tapered Lug Seats
(4) If Present, Remove Paint on Tapered Lug Seats and on Inner Hub Face that Contacts Truck Axle
(5) Tighten Lug Nuts in Sequence Shown

14. Remove blocks, lower power unit, connect battery and remove wheel chocks.

15. Adjust the articulation as described later in this section.

Drive Unit Lubrication

The drive unit has a capacity of approximately 710 ml (1.5 pints) of 80/90W gear oil Crown no. 063002-003 (063001-010, ATF for trucks operating in below freezing applications). Remove drain plug to completely drain unit. To fill, remove fill plug. Add gear oil until present at oil level check plug. Refer to Figure 16866.

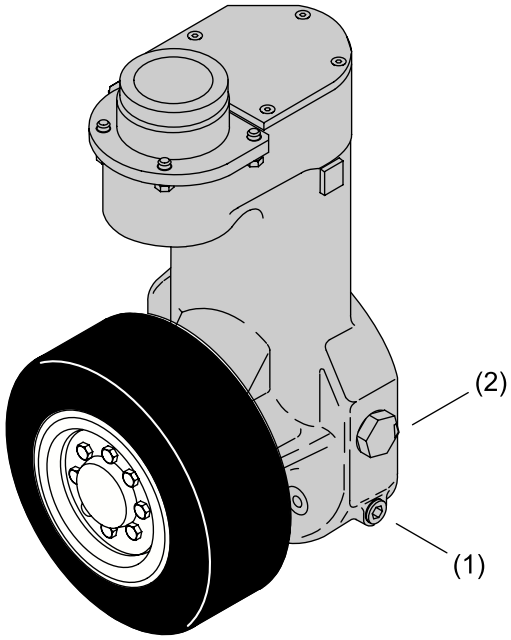


Figure 16866

(1) Drain Plug

(2) Fill and Oil Level Check Plug

Drive unit oil should be changed at the first 500 hours and then every 2000 hours thereafter.

- Normal application 0° C (32° F) and above

  – Use 90 wt. gear lube (Part Number 063002-003)

- Freezer application 0° C (32° F) and below

  – Use Automatic Transmission Fluid (Part Number 063001-010)

Oil Pump Disassembly (Refer to Figures 16867 & 16868)

1. Disconnect battery and chock wheels.

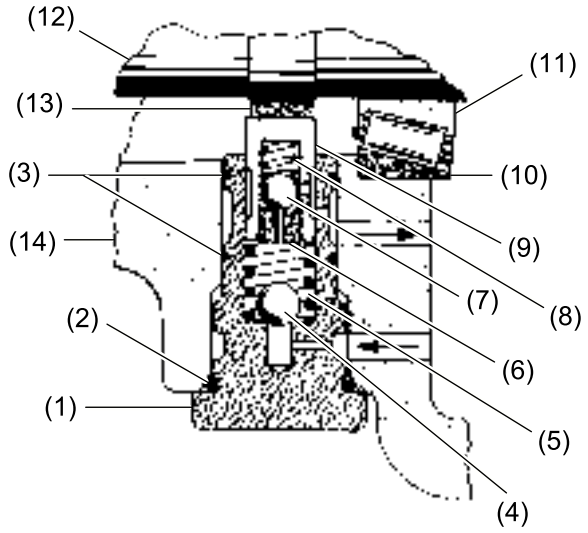


Figure 16867

(1)	Oil Pump Housing	(8)	Spring
(2)	O-Ring	(9)	Piston
(3)	O-Ring	(10)	Bearing Cup
(4)	Ball	(11)	Bearing Cone
(5)	Spring	(12)	Axle
(6)	Special Plug	(13)	Cam
(7)	Ball	(14)	Drive Unit Housing

2. Remove drain plug (13); drain oil from drive unit.

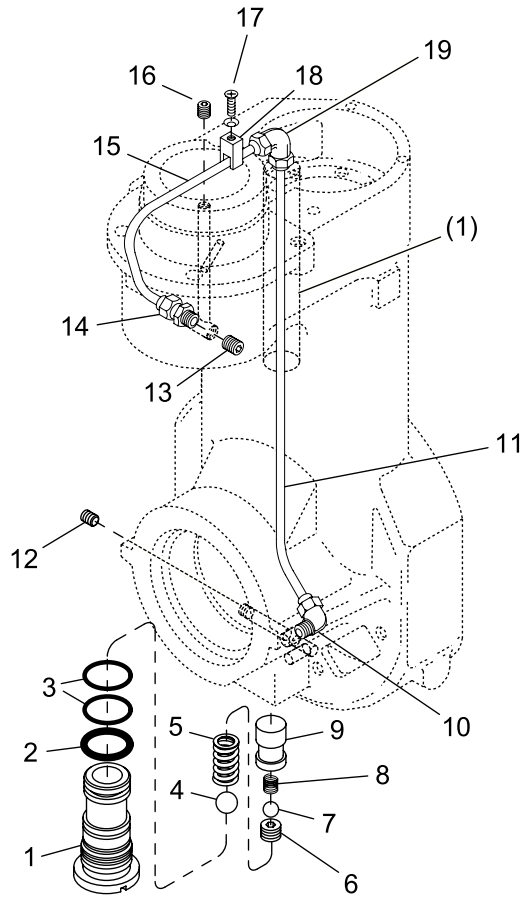


Figure 16868

(1) Tubing is Installed Through Cored Hole in Casting

3. Remove oil pump housing (1) from drive unit and move to a clean work area for further disassembly.
4. Check O-rings (2) and (3) for damage and replace if necessary.
5. Remove piston (9), spring (8) and ball (7) from oil pump housing.
6. Remove special pipe plug (6), spring (5) and ball (4) from oil pump housing.
7. Thoroughly clean housing and all parts.

Oil Pump Assembly (Refer to Figures 16867 & 16868)

Inspect all component parts and drive unit casting for dirt and burrs before assembly.

1. Place ball (4) and spring (5) into oil pump housing (1).
2. Place ball (7), spring (8) and special pipe plug into piston (9). Lubricate piston with oil to aid in smooth action and install piston into oil pump housing installed in drive unit housing.
3. Install O-rings (2) and (3) onto pump body.
4. Oil pump body and port thoroughly and screw pump assembly into casting until seated.
5. Apply hydraulic sealer (061004-023) to drain plug and replace drain plug. Fill drive unit with 710 ml (1.5 pints) of gear oil, 063002-003 (063001-010, ATF for trucks operating in below freezing applications).
6. To check oil pump output remove pipe plug (13) and observe oil flow from port.

Under Carriage Inspections and Adjustments (Refer to Figure 16869 & 16870)

1. Disconnect battery and remove from compartment; lift up and remove power unit door.
2. Disconnect all wiring to drive motor and electrical brake.
3. Disconnect hydraulic hoses to hydraulic steering motor and cap hose ends.
4. When removing undercarriage note the number and position of washers and replace in same position at assembly.
5. The four 0.75 in diameter bolts that clamp pivot shaft to the power unit must be tightened to 305 - 340 Nm (225 - 251 ft lb) at assembly.

NOTE

Under normal maintenance operations it is recommended the undercarriage not be removed completely from the power unit.

6. Inspect springs and mounting hardware.
7. Inspect caster and wheel assembly.
8. Inspect caster assembly bearings. The locknut that secures the caster to the undercarriage must be tightened to 30 - 43 Nm (22 - 32 ft lb). Rotate caster assembly while tightening to insure centering of bearings.

Articulation Adjustment

Correct articulation adjustment will help maintain proper traction, truck stability and increase drive tire life.

1. When making articulation adjustments it is very important to have the truck on a level floor surface. To achieve this a 4 ft level can be placed across the outriggers and behind the power unit as shown in Figure 16869. Move the truck until you find a floor area that is level in both locations. After finding a level floor section, mark the area with tape or paint so that it can be used for future articulation adjustments. The trailing edge of the caster wheel must be pointing towards the drive tire as shown.

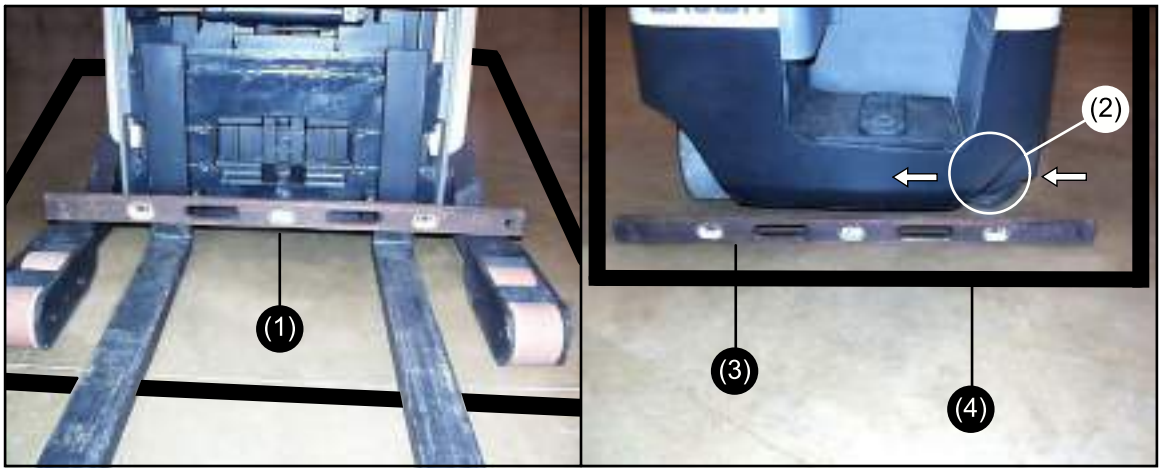


Figure 16869

(1) Check Level Across Outriggers
(2) Caster Wheel to be Turned Sideways
(3) Check Level of Floor
(4) Tape Off Flat, Level Area of Floor;
Use Same Area of Floor for Future Articulation Adjustments

DC Traction Shown

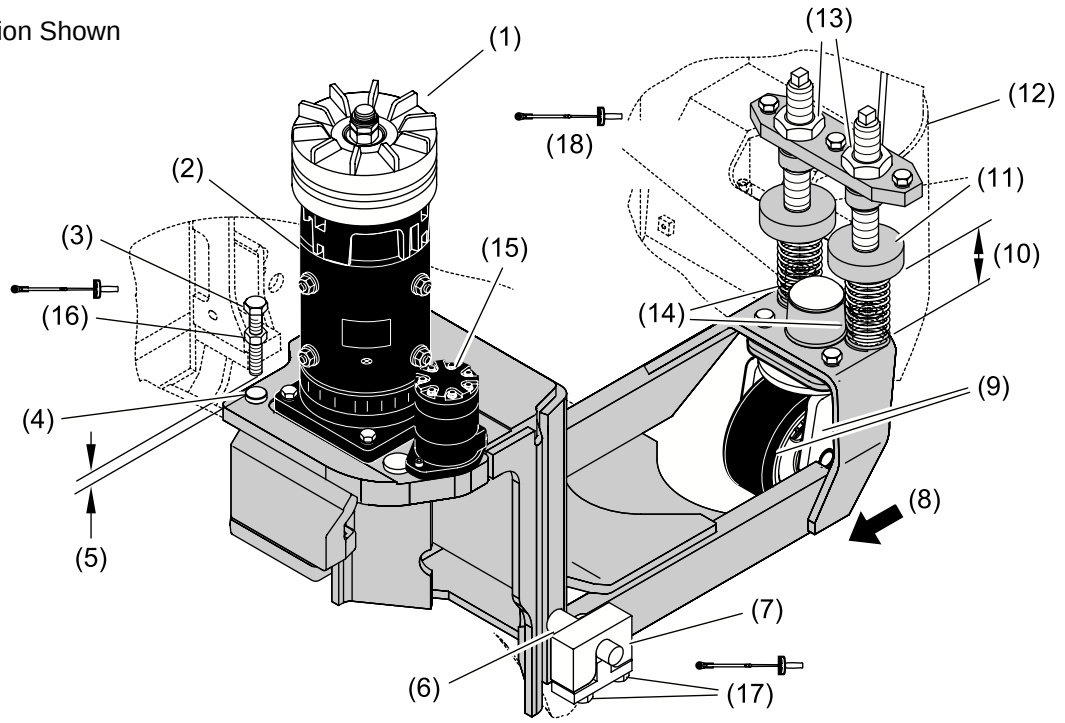


Figure 16870-01

(1)	Brake	(10)	Adjust Height of Both Stops to 89 mm (3.50 in)
(2)	Drive Motor	(11)	Articulation Stops
(3)	Articulation Adjusting Screw	(12)	Right Rear Corner of Power Unit
(4)	Wear Plug	(13)	Articulation Adjustment
(5)	Adjust Articulation to 1.5 mm + 0.0/-0.5 mm (0.06 in + 0.0/-0.02 in)	(14)	Inspect Spacers and Springs
(6)	Note Number and Location of Flatwashers	(15)	Hydraulic Steering Motor
(7)	Part of Power Unit	(16)	375 - 405 Nm (277 - 299 ft lb)
(8)	Trailing Edge of Caster Must be in Direction of Arrow for Articulation Adjustment	(17)	305 - 340 Nm (225 - 251 ft lb)
(9)	Inspect Caster and Wheel	(18)	30 - 43 Nm (22 - 32 ft lb)

2. Inspect wear plug on drive side of undercarriage and replace as necessary. Refer to Figure 16870.
3. Adjust the amount of undercarriage articulation on the left side (drive tire) to 1.5 mm +0.0/-0.5 mm (0.06 in +0.0/-0.02 in) between top of the wear plug and bottom of the articulation adjustment screw, tighten jam nut to 375 to 405 Nm (277 to 299 ft lb).
4. On the right side adjustment distance top surface of undercarriage and bottom of articulation stops to 89 mm +0.0/-1.0 mm (3.5 in +0.0/-0.04 in) as shown in Figure 16870. After adjustment, springs should be able to rotate, but should not be able to move up and down. Using incorrect stops/spacers and/or springs can effect truck stability. The proper gap and spring rate is now directly related to lift height and sideshift specifications of the truck. Reference Chart 1 and Figure 16871. The stop/spacer can be identified by the number of grooves machined into it, and the spring by its color.

CHART 1		
Articulation STOP/SPACER Selection Lift Height mm/in	Stop/Spacer Part Number	No. Req.
All Trucks Without Sideshift	126780-001	2
Trucks With Sideshift		
5030 mm/198 in thru 5335 mm/210 in	126780-002	2
5360 mm/211 in thru 10160 mm/400 in	126780-004	2
Articulation SPRING Selection Lift Height mm/in	Spring Part Number	No. Req.
5030 mm/198 in thru 6860 mm/270 in	122457 RED	2
6885 mm/271 in thru 10160 mm/400 in	122456 BLUE	2

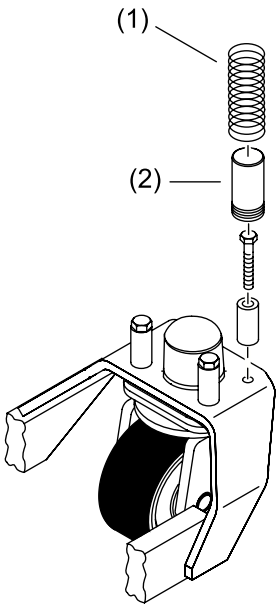


Figure 16871

(1) Spring

(2) Stop/Spacer

RR/RD 5200S/5200S(AC)

1. When making articulation adjustments it is very important to have the truck on a level floor surface. To achieve this a 4 ft. level can be placed across the outriggers and behind the power unit as shown in Figure 16869. Move the truck until you find a floor area that is level in both locations. After finding a level floor section, mark the area with tape or paint so that it can be used for future articulation adjustments. The trailing edge of the caster wheel must be pointing towards the drive tire as shown.
2. Inspect wear plugs on both ends of undercarriage and replace as necessary. Refer to Figure 16872.
3. Adjust right side (caster) to 6.4 mm +0.0 -1.0 mm (0.25 in +0.00 -0.04 in) from top of wear plug to bottom of adjusting bolt, and tighten jam nut. Refer to Figure 16872.
4. Adjust left side (drive tire) to 6.4 mm +0.0 -1.0 mm (0.25 in +0.00 -0.04 in) for mast heights to 8155 mm (321 in) and below. For truck heights 8180 mm (322 in) and above adjust to 3.0 mm +0.0 -1.0 mm (0.12 in +0.00 -0.04 in). Refer to Figure 16872.

DC Traction Shown

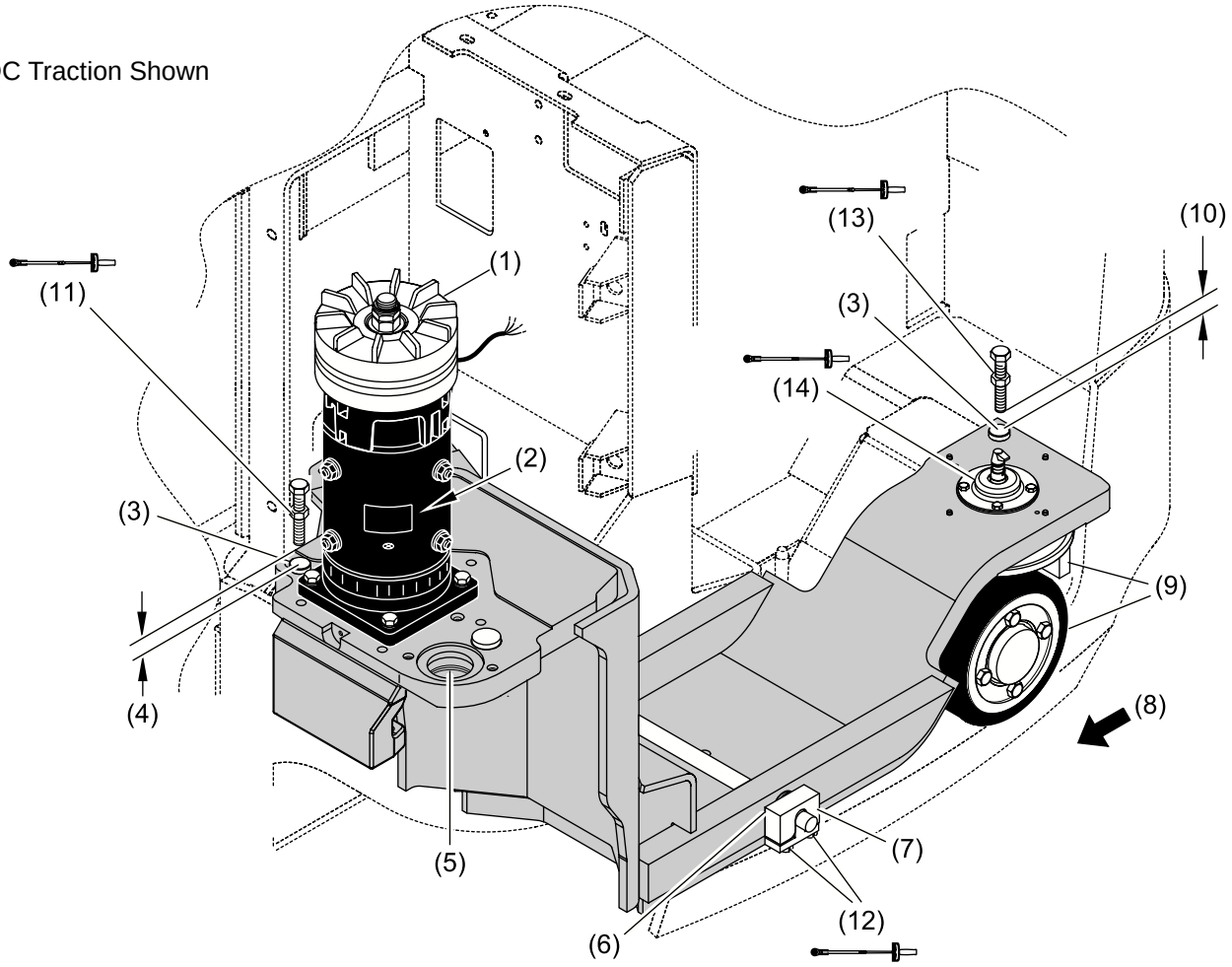


Figure 16872-01

(1) Brake

(2) Drive Motor

(3) Inspect Wear Plug

(4) Adjust Articulation to 6.4 mm +0.0/-1.0 mm (0.25 in +0.0/-0.04 in) for Mast Heights 8155 mm (321 in) and Below. For Mast Heights 8180 mm (322 in) and Above, Adjust to 3.0 mm +0.0/-1.0 mm (0.12 in +0.0/-0.04 in)

(5) Hydraulic Steering Motor

(6) Note Number and Location of Flatwashers

(7) Part of Power Unit

(8) Trailing Edge of Caster Must be in Direction of Arrow for Articulation Adjustment

(9) Inspect Caster and Wheel

(10) Adjust Articulation to 6.4 mm +0.0/-1.0 mm (0.25 in +0.0/-0.04 in)

(11) 375 - 405 Nm (277 - 299 ft lb)

(12) 305 - 340 Nm (225 - 251 ft lb)

(13) 375 - 405 Nm (277 - 299 ft lb)

(14) 30 - 43 Nm (22 - 32 ft lb)

Drive Unit Removal

(Refer to Figure 16873)

1. Chock load wheels, disconnect battery.
2. Using a floor jack, raise and block rear of truck high enough to allow for drive unit removal, but not higher than 400 mm (16 in).
3. Remove the eight lug bolts and drive tire assembly.
4. Support and stabilize the drive unit with a floor jack or transmission jack.
5. Remove the five 0.625 in screws and two dowel pins that secure the drive unit stud assembly to the articulation carriage.

CAUTION

Make sure truck is properly blocked and jack stands securely under the power unit before removing drive unit.

6. Carefully lower drive unit using jack, refer to step 4. When drive unit is clear of power unit, remove it to a clean work area for further disassembly and repair.

CAUTION

Drive unit may tip over when lowering it. Keep hands and feet away from pinch points

.

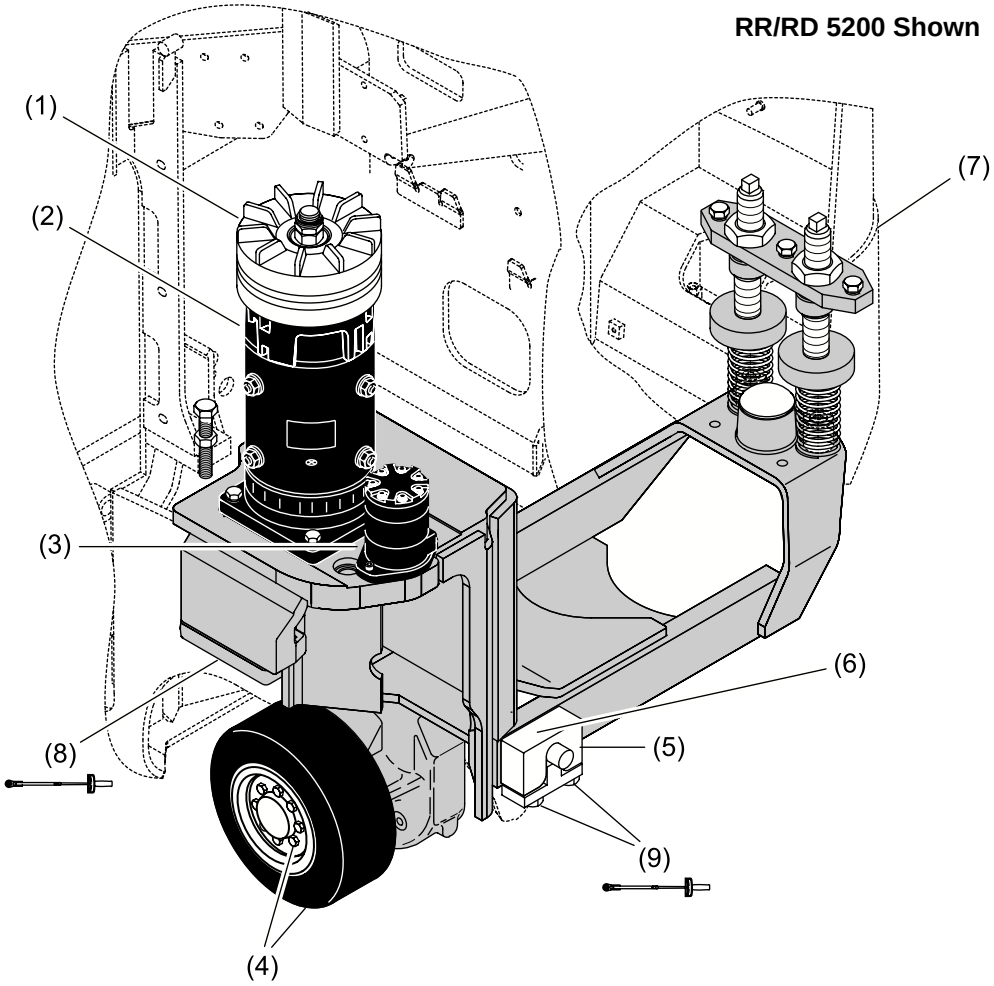


Figure 16873-01

(1) Brake

(2) Drive Motor

(3) Hydraulic Steering Motor

(4) Remove Eight Lug Bolts and Drive Tire

(5) Part of power Unit

(6) Note Number and Location of Flatwashers

(7) Right Rear Corner of Power Unit

(8) Remove Five 0.62 in Bolts and Two Dowel Pins. Torque to 285 - 312 Nm (210 - 230 ft lb). When Removing Bearing Cup Holder, Use Two 3/4-10 Screws in Tapped Holes to Drive Cup Holder Off of Dowel Pins.

(9) 305 - 340 Nm (225 - 251 ft lb)

(6) Note Number and Location of Flatwashers

Drive Unit Replacement

1. Make sure load wheels are chocked and rear of truck is securely blocked high enough to allow drive unit replacement, but not higher than 400 mm (16 in).
2. Refer to Figure 16874. Clean all mounting surfaces on undercarriage and drive unit and check for damage.
3. Install seal (16), bearing cup (15), bearing cone (14) and seal (13) into undercarriage.
4. Install ring gear (12) to drive unit. Apply blue thread lock adhesive, 061004-026, to screws (11) and torque to 34 to 41 Nm (25 - 30 ft lb).
5. Install dowel pin (10) and bearing stud (9) into drive unit. Use red thread lock adhesive, 061004-019, on screw (5) and torque to 47 Nm (35 ft lb).
6. Install metallic seal (8), bearing cone (7) and bearing cup (6).
7. Raise drive unit into position using floor jack.

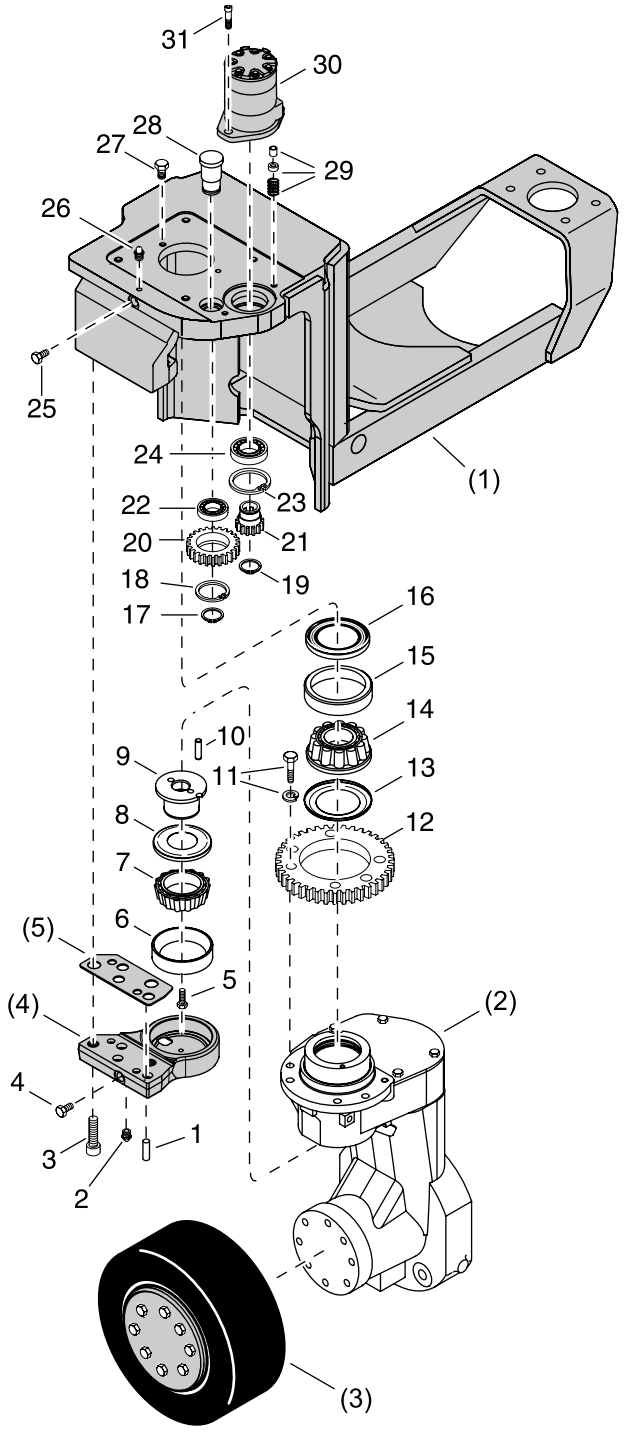


Figure 16874

(1) Undercarriage
(2) Drive Unit
(3) Drive Tire
(4) Bearing Cup Holder
(5) Shim(s)

8. If same drive unit is being re-installed back into truck, use same shims that were removed at disassembly. If a replacement drive unit is being put into the truck the amount of shims will need to be determined.
   The replacement drive unit will be shipped with one thick shim that will bring it to an established standard measurement determined by the factory. Five 0.002 shims will also be included in the kit. To determine the proper number of shims required:

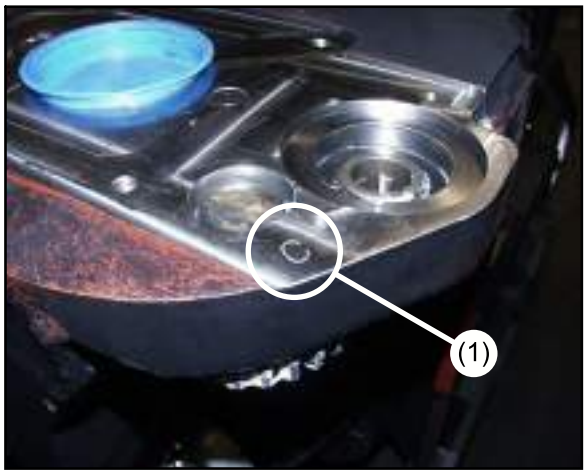


Figure 16875

(1) Location 1

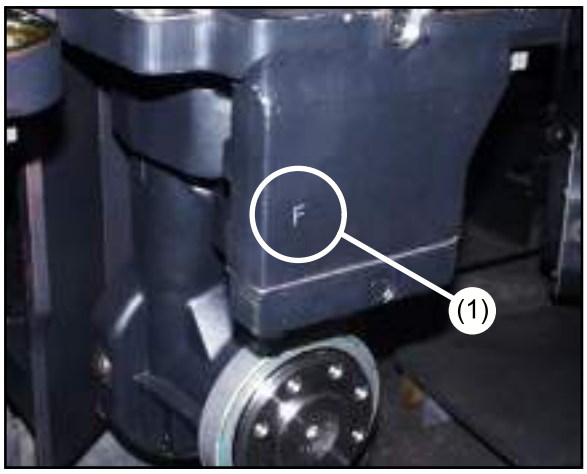


Figure 16876

(1) Location 2

Trucks with Factory Stamp

Locate the undercarriage factory stamp, letters A - K. Two possible locations have been used to stamp your drive unit. The first is located on the machined surface near the steering unit towards the left side of the undercarriage, see Figure 16875. The second is located on the lower left side near the bearing cup mounting surface, see Figure 16876. For all trucks with undercarriage stamps refer to Chart 2 for correct amount of shims.

Trucks without Factory Stamp

Some trucks in service do not have an undercarriage stamp. These trucks will require use of a special tool, Crown part number 126383, to determine the correct number of shims required. Always use the thick shim provided with the drive unit kit. Note: If old drive unit is being returned for core value or warranty, include the old Bearing Cup Holder, 125362, and shims when returning.

9. Thoroughly clean the mounting surface on the undercarriage. Remove Steer Bearing Cup from undercarriage, punch access holes are provided on motor mount surface to aid in removal. Mount Crown tool 126383 to the undercarriage using motor mounting screws, see Figure 16877. Determine the gap measurement with a feeler gauge. Use Chart 2 to determine both letter stamp and correct number of shims to be used. Stamp appropriate letter on undercarriage in either location, noted in Figure 16875 or 16876, for future reference.

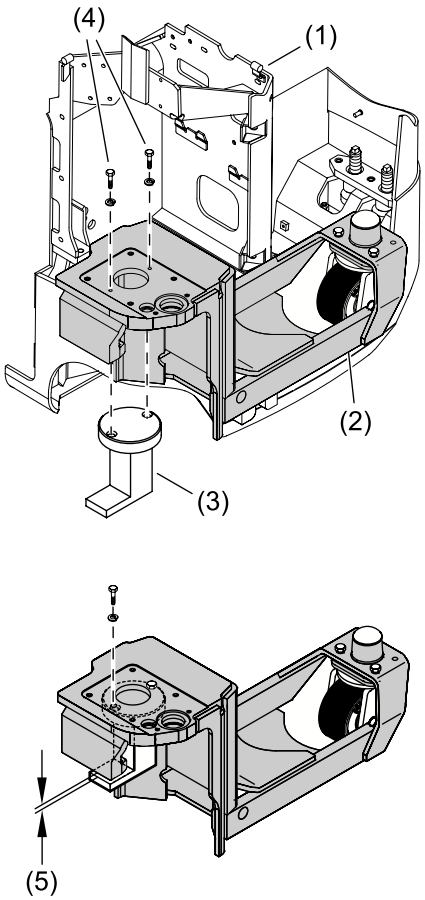


Figure 16877

(1) Part of Power Unit
(2) Undercarriage
(3) Crown Tool 126383
(4) 5/16-18 Bolts
(5) This Gap to be Measured with Feeler Gauge

CHART 2			
Gap Measurement		Steel Stamps	Thin Shims
mm	in		
0.00 - 0.25	0.000 - 0.010	K	0
0.25 - 0.28	0.010 - 0.011	J	0
0.28 - 0.30	0.011 - 0.012	I	1
0.30 - 0.33	0.012 - 0.013	H	1
0.33 - 0.36	0.013 - 0.014	G	2
0.36 - 0.38	0.014 - 0.015	F	2
0.38 - 0.41	0.015 - 0.016	E	3
0.41 - 0.43	0.016 - 0.017	D	3
0.43 - 0.46	0.017 - 0.018	C	4
0.46 - 0.48	0.018 - 0.019	B	4
0.48 - 0.51	0.019 - 0.020	A	5

10. Install two dowel pins (1) and align bearing cup holder. Apply red thread lock adhesive, 061004-019, to screws (3) and secure bearing cup holder and drive unit to undercarriage. Torque five screws 285 to 312 Nm (210 to 230 ft lb).
11. Install drive tire as described in "Drive Tire Replacement" in this section.
12. Apply hydraulic seal, 061004-023, to drain plug and install. Fill drive unit with 710 ml (1.5 pints) of gear oil. See "Drive Unit Lubrication" in this section for recommended gear oil. Apply hydraulic seal to fill plug and install.
13. Lower truck, remove chocks and test for proper operation.

Drive Unit Dowel Pins

(Refer to Figure 16878)

Refer to the following repair procedure for dowel pins that are missing and/or protruding out of their respective holes.

1. Raise and securely block truck so drive tire is off floor.
2. Loosen the four hex socket head screws securing cup holder (contains lower drive unit bearing).
3. Insert the two dowel pins and tighten the four socket head screws. (This ensures alignment of the dowel pin holes since they may have previously shifted.)
4. Remove dowel pins.
5. Tap dowel pin holes with special 1/2" 13 NC BH7 roll tap, Crown Part number 126105.
6. Insert dowel pins.
7. Torque hex socket head screws 285 to 312 Nm (210 to 230 ft lb).

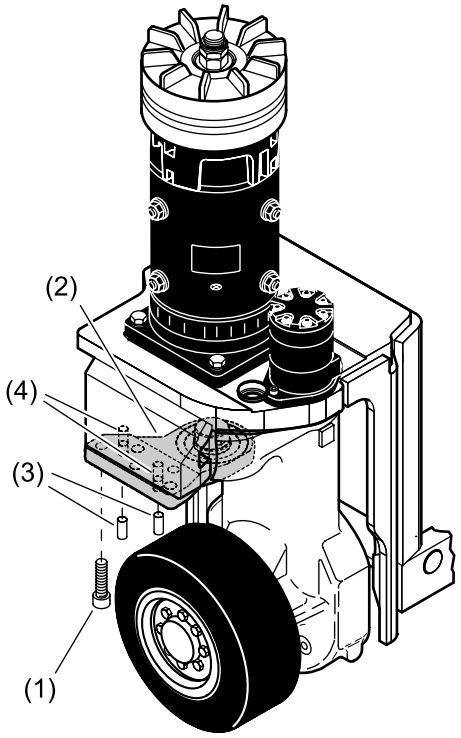


Figure 16878

(1) Hex Socket Head Screw
(2) Cup Holder
(3) Dowel Pins
(4) Tap Dowel Pin Holes

WIRING COLOR CODES

The following information is an explanation of terms and symbols which are being standardized on Crown wiring diagrams.

The leads used are limited to the following colors. The color of the wire is based on the function of the circuit in which it is used. Each wire is assigned a three or four digit number. The first one or two numbers identify the color of the lead. The last two numerals number the lead from one thru ninety-nine. (See chart below) Exceptions to this can be leads supplied by vendors with components. The color of each function shall be shown on the schematic. Each wire shall be identified by a number on the wiring pictorial.

ABBR.	COLOR	NUMBER	FUNCTION	FUNCTION
BLK	Black	0 **	†Reverse	‡Traction Inputs/Outputs
BRN	Brown	1 **	†Potentiometer or 2nd Speed	‡Analog Inputs
RED	Red	2 **	†Positive	‡Battery Positive
ORG	Orange	3 **	†Hydraulic Solenoid Valves	‡Non-Battery Positive
YEL	Yellow	4 **	†Forward	‡Status Inputs/Outputs
GRE	Green	5 **	†Negative	‡Battery Negative
BLU	Blue	6 **	†Bypass or 3rd Speed	‡Isolated Negative
VIO	Violet	7 **	†Hydraulic Pump Motor	‡Load Position Inputs/Outputs
GRAY	Gray	8 **	†Horn	‡Indicators and Warning Devices
WHT	White	9 **	†Miscellaneous	‡Miscellaneous
R/W	Red Stripe/White	29 **	†Positive that has gone thru a switch	‡Positive that has gone thru a switch
G/W	Green Stripe/White	59 **	†Negative that has gone thru a switch	‡Negative that has gone thru a switch or resistor

** - 01 thru 99
†Trucks Prior to 1988
‡Trucks 1988 to Present

WIRING HARNESS

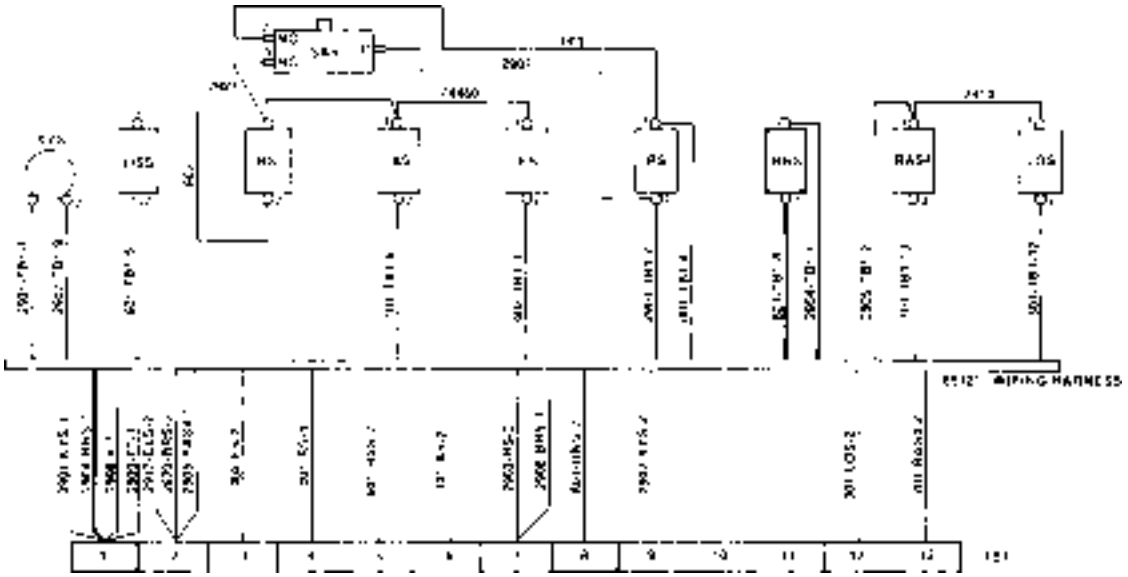
Shown here is a section of a pictorial wiring diagram showing a wiring harness. The wires shown coming from the wiring harness are all labeled on the diagram in such a way as to be able to tell where the other end of a particular wire is connected. Following is an example taken from this wiring diagram.

There are two wires coming from the harness which lead to HNS (Horn Switch) terminal 1 and terminal 2, labeled 2904-TB1-1 and 801-TB1-8 respectively. 2904-TB1-1 is a red stripe wire marked 2904 (see “Wiring Color Codes”), which goes through the wiring harness to Terminal Board 1 (TB1), terminal 1.

801-TB1-8 is a gray wire marked 801 which goes through the wiring harness to connect to Terminal Board 1, terminal 8.

The wires are labeled similarly at Terminal Board 1. The wire shown coming from terminal 1 of TB1 which leads to the Horn Switch is labeled on the diagram 2904-HNS-1 (Red stripe wire marked 2904 which leads to horn switch, terminal 1).

The wire leading to the horn switch, terminal 2 is labeled 801-HNS-2 on the diagram.



6011SI

POWER CABLES

Power cables are designated using one of the following abbreviations, followed by a dash number.

Abbreviation	Part No.
PC # 1	084571
PC # 2	084570
PC # 4	084569
PC # 6	084568
PC#10	090963
PC # 1/0	084572
PC # 2/0	084573
PC # 3/0	086749

An example of such a cable is PC # 1/0 - 10. The part number for this cable is 084572-010.

SYMBOL NOMENCLATURE

Abbreviation	Component
F#	Forward Contactor
R#	Reverse Contactor
A	Speed Contactor
B	Speed Contactor
C	Speed Contactor
P*	Pump Contactor
S	Power Steering Contactor
K*	Relay Contactor
1A	SCR Bypass Contactor
ACS	Accelerator Switch
AS	Switch for A
AXA	Auxiliary Switch A
AXB	Auxiliary Switch B
AXC	Auxiliary Switch C
AXF	Auxiliary Forward Switch
AXR	Auxiliary Reverse Switch
AXS*	Auxiliary Switch
BRS*	Brake Switch
BS	Switch for B
CA*	Connector Assembly
CAP*	Capacitor
CHS*	Chain Switch
CLS	Clamp Switch
CS	Switch for C
DB*	Diode Block
DIS	Directional Switch
DMS*	Safety Switch
DRS	Door Switch
ECR*	
EDS	Emergency Disconnect Switch
EMS*	Emergency Switch
FS	Forward Switch
FU*	Fuse
GUS	Guidance Switch
HF*	Hash Filter
HN	Horn
HNS	Horn Switch
HSC	High Speed Card
HSS	High Speed Switch
JC*	Jack (Receptacle) Part of CA
KYS	Key Switch

Abbreviation	Component
LGS*	Light Switch
LMS*	Limit Switch
LOS	Lower Switch
MFS*	Multi-Function Switch
ORS	Override Switch
PC*	Plug Part of CA
PLS	Pivot Left Switch
POT*	Potentiometer
PRS	Pivot Right Switch
PTS	Pivot Switch
PUS	Pump Switch
RAS*	Raise Switch
RES*	Resistor
RIS	Reach In Switch
RLS	Rotate Left Switch
ROS	Reach Out Switch
RRS	Rotate Right Switch
RS	Reverse Switch
RTS	Rotate Switch
SAS	Safety Switch
SB*	Suppressor Block
SES*	Seat Switch
SLS	Side Shift Left Switch
SQS*	Sequence Switch
SRS	Side shift Right Switch
SSC	Safety Switch Card
SSS	Side Shift Switch
STS	Power Steering Switch
SV*	Solenoid Valve (Hydraulic)
TB*	Terminal Board
TD*	Time Delay
TDS	Tilt Down Switch
TES	Test Switch
TLS	Traverse Left Switch
TRS	Traverse Right Switch
TT	Hour Meter (Travel Time)
TBS	Tilt Back Switch
TVS	Traverse Switch
V	Discharge Meter (Volt Meter)
XC*	Card Edge Connector

* If more than one, use suffix 1, 2, 3...

If more than one, use suffix A, B, C....Z

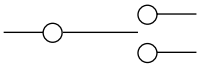
NOTE

The abbreviations listed above are examples of abbreviations found on wiring diagrams. It's not a complete list of all abbreviations on wiring diagrams in this manual. For a complete list, refer to the glossary located in section M10.

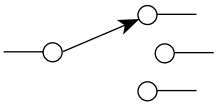
Maintained Contact Switches Operator Actuated

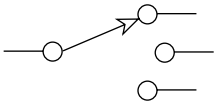

Normally Open

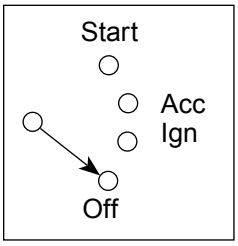

Normally Closed


Center Off


Double Throw


Multiple Pole
Break Before Make


Multiple Pole
Make Before Break



Key
Switch

Momentary Contact Switches Mechanically Operator Actuated

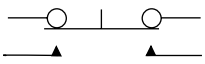

Normally Open


Held Closed


Held Open


Normally Closed

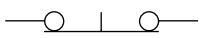

Double Throw

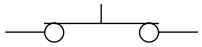

2 Circuit

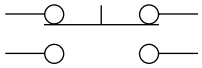
Momentary Contact Switches Operator Actuated

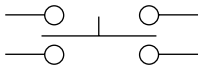

Normally Open

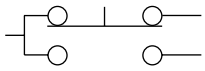

Held Open


Normally Closed


Held Closed


2 Circuit


Center Off


Double Throw

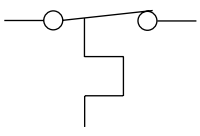
Momentary Contact Switches Mechanically Actuated

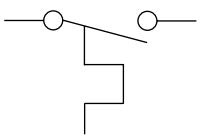

Normally Open

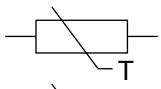

Normally Open
Held Closed

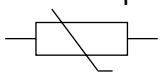

Normally Closed
Held Open

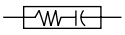

Normally Closed

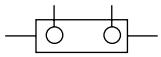

Open On Rise


Close On Rise

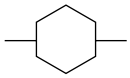

Thermistor


Mov or Transzorb


Suppressor


Current Shunt

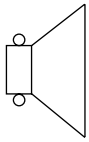

Connection Point

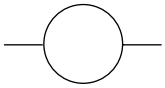

Power Termination

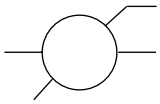

Mast Cable

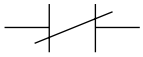

Common Isolated

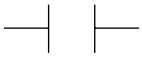

Battery Negative


Horn

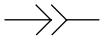

Coil


Solenoid Valve or Relay
With Suppression


Normally Closed

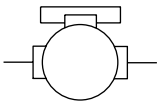

Normally Open

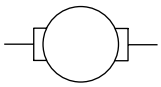

Plug PC


Connector CA

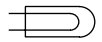

Jack JC

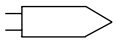

Test Point

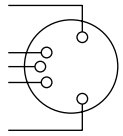

PM Motor

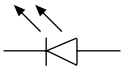

Wound Motor
Armature

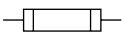
Motor Field

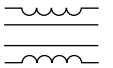

Lamp


Tach Sensor


Encoder


LED

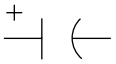

Fuse

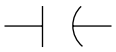

Transformer


SIP Resistor


Battery

Inductor


Polarized Capacitor

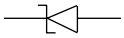

Non-Polarized Capacitor


LVDT

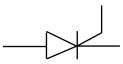

Resistor


Potentiometer


Rheostat


Zener Diode


Diode


SCR

This page available for **NOTES.**

Electrical System

The following is an explanation of terms and symbols which are standard on Crown wiring diagrams.

Wiring Color Codes

Wires are limited to the colors shown in the chart below. The color of the wire is based on the function of the circuit in which it is used. Each wire is assigned a three or four digit number. The first one or two numbers identify the color of the lead. The last two numerals number the lead from one thru ninety-nine. Exceptions to this can be component leads supplied by vendors. Each wire is identified by a number on a wiring pictorial (refer to section DIA).

Wiring Color Codes Chart

Number	Color	Function
0**	Black	Traction Inputs/Outputs
1**	Brown	Analog Inputs
2**	Red	Battery Positive
3**	Orange	Non-Battery Positive
4**	Yellow	Status Inputs/Outputs
5**	Green	Battery Negative
6**	Blue	Isolated Negative
7**	Violet	Load Position Inputs/Outputs
8**	Gray	Indicators and Warning Devices
9**	White	Miscellaneous
29**	Red Stripe/White	Positive that has gone thru a switch
59**	Green Stripe/White	Negative that has gone thru a switch or resistor

Power Cables

Except WP trucks, power cables are designated using one of the following abbreviations, followed by a dash number.

Power Cables Abbreviations Chart

Abbreviation	Part Numbers
PC#1	084571
PC#2	084570
PC#4	084569
PC#6	084568
PC#10	090963
PC#1/0	084572
PC#2/0	084573
PC#3/0	086749

An example of such a cable is PC # 1/0 - 10. The part number for this cable is 084572-010.

Component Abbreviations and Designators	
Components	
1AD	1A Bypass Driver
ALM	Alarm
ATD	Anti Tie Down Module
BATT	Battery
BDI	Battery Disch. Interrupt
BRK	Brake
CA	Connector Assembly
CAP	Capacitor
DB	Diode Block
DFR	Defrost
DMC	Dual Motor Card
DR	Driver Module
ECN	Encoder
FAN	Fan
FIL	Filter
FLS	Flasher
FU	Fuse
HF	Hash Filter
HN	Horn
HR	Heater
HSC	High Speed Card
JC	Fixed Part of Ca
LGT	Light
M	Motor
MCR	Motor Control
PC	Movable Part of Ca
PCVA	"Pressure Compensated Valve, Acc."
PCVH	"Pressure Compensated Valve, Hoist"
PMTD	Pulse Monitor Trip Driver
POT	Potentiometer
PS	Power Supply
PS	Pressure Switch

Component Abbreviations and Designators	
REC	Rectifier
RES	Resistor
SB	Suppressor Block
SSC	Safety Switch Card
SV	Hydraulic Solenoid
SVA	Solenoid Valve - Accessory
SVL	Solenoid Valve - Lower
SVP	Solenoid Valve - Pilot
SVR	Solenoid Valve - Reach
SVS	Solenoid Valve - Sideshift
SVT	Solenoid Valve - Tilt
TB	Terminal Board
TD	Time Delay
TDR	Time Delay Relay
TMM	Truck Management Module
TP	Test Point
TT	Hour Meter (Truck Time)
V	Discharge or Volt Meter
XC	Socket for PC Board
Contactor and Relays	
A	Speed Contactor
B	Speed Contactor
C	Speed Contactor
D	Dual Contactor
ED	Emerg. Disc. Contactor
F	Forward Contactor
FA	Forward Contactor A
FB	Forward Contactor B
FW	Field Weakening
K	Relay
P	Pump Contactor
R	Reverse Contactor
RA	Reverse Contactor A
RB	Reverse Contactor B

Component Abbreviations and Designators	
RGB	Regen. Braking Contactor
S	Power Steering Contactor
1A	Bypass Contactor
Switches	
1AS	Traction Bypass Switch
ACC	Accessory Switch
ACS	Accelerator Switch
AHS	Aux. Height Switch
AS	Switch For A Contactor
AxA	Aux. Sw. on A Contactor
AxB	Aux. Sw. on B Contactor
AxC	Aux. Sw. on C Contactor
AxF	Aux. Sw. on Fwd. Contactor
AxR	Aux. Sw. on Rev. Contactor
AXS	Aux. Function Switch
BFS	Brake Fluid Switch
BLS	Battery Latched Switch
BMS	Brake Monitor Switch
BPS	Brake Pressure Switch
BRES	Battery Restraint Switch
BRS	Brake Switch
BS	Switch For B Contactor
CHS	Chain Switch
CHSL	Chain Switch Left
CHSR	Chain Switch Right
CLS	Clamp Switch
CS	Switch For C Contactor
CTS	Cable Tension Switch
DIS	Direction Switch
DMS	Dead Man Switch
DMSL	Dead Man Switch Left
DMSR	Dead Man Switch Right
DPS	Display Switch
DRS	Door Switch

Component Abbreviations and Designators	
DTS	Drive Tow Switch
ECS	Elevation Control Switch
EDS	Emergency Disconnect Switch
EIS	Extend In Switch
EMS	Emergency Switch
ENS	Entry Switch
EOS	Extend Out Switch
ERLS	Emergency Raise/Lower Switch
ERS	Erase Switch
EXS	Extend Switch
FHS	Fork Home Switch
FKS	Fork Switch
FLMCS	Forward Left Motor Cover Sw
FLS	Fork Left Switch/Free Lift Switch
FNS	Fan Switch
FRMCS	Forward Right Motor Cover Sw
FRS	Fork Right Switch
FS	Forward Switch
FTS	Foot Guard Switch
GCSL	Gate Closed Switch Left
GCSR	Gate Closed Switch Right
GOSL	Gate Open Switch Left
GOSR	Gate Open Switch Right
GTS	Gate Switch
GUS	Guidance Switch
HCS	Height Cable Switch
HGTS	Height Switch
HNS	Horn Switch
HSS	High Speed Switch
HTS	Heater Switch
HTSXX	Height Switch (XX Inches)
KORS	Key Override Switch
KYS	Key Switch
LCS	Lower Cutout Switch

Component Abbreviations and Designators	
LGS	Light Switch
LMS	Limit Switch
LOS	Lower Switch
LTS	Loadtray Switch
MFS	Multi-funciton Switch
MVS	Multi-voltage Switch
NUS	Null Switch
ORS	Override Switch
PLS	Pivot Left Switch
PORS	Presence Overide Switch
PRS	Pivot Right Switch
PS	Pressure Switch
PTS	Pivot Switch
PUS	Pump Switch
QPS	Quick Pick Switch
RAS	Raise Switch
RES	Reach Extended Switch
RGS	Rail Guide Switch
RGSL	Rail Guidance Switch Left
RGSR	Rail Guidance Switch Right
RIS	Reach In Switch
RLMCS	Rear Left Motor Cover Switch
ROS	Reach Out Switch
RRMCS	Rear Right Motor Cover Switch
RS	Reverse Switch
RSS	Sheet Retainer Switch
SAS	Safety Switch
SCS	Sideshift Center Switch
SES	Seat Switch
SLS	Sideshift Left Switch
SQS	Sequence Switch
SRS	Sideshift Right Switch
SSS	Sideshift Switch
STS	Power Steer Switch

Component Abbreviations and Designators	
SWH	Operator Activated Switch
TBS	Tilt Back Switch
TDS	Tilt Down Switch
TES	Test Switch
THS	Thermal Switch
TLS	Traverse Left Switch
TLT	Tilt Switch
TRS	Traverse Right Switch
TUS	Tilt Up Switch
TVS	Traverse Switch
ZSS	Zone Select Switch
Terms	
ASM	Assembly
CTRL	Control
CTRLR	Controller
DESIG LIST	Designation List
DIST PNL	Distribution Panel
DSPL	Display
F / C	Freezer Conditioning
HCM	Hydraulic Control Module
HDL	Handle
HYD	Hydraulic
OHG	Overhead Guard
PCB	Printed Circuit Board
PICT	Pictorial
PKT	Packet
PL	Platform
PWR	Power
PWR SPLY	Power Supply
SCHEM	Schematic
TCM	Traction Control Module
TMM	Truck Management Module
TRAC	Traction

SWITCHES

Switch symbols convey:

1. Type of switch.
2. Number of terminals.
3. Momentary or maintained contact.
4. How the switch is held and wired.
5. How the switch is activated.
6. Application.

Type of Switch

- With common

Figure 8115-01

or

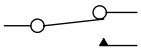


Figure 8116-01

- Without common

Figure 8117-01

or

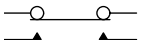


Figure 8118-01

Number of Terminals

- All terminals are shown even if not wired.

Momentary or Maintained Contact

- Momentary contact is a shaded triangle.

Figure 8119-01

or

Figure 8120-01

- Maintained is an open circle (an open circle also denotes the common terminal).

Figure 8115-01

or

Figure 8117-01

How the Switch is Held and Wired

To determine how the switch is held and wired, look closely at the contact symbols. An open circle denotes a maintained contact so therefore it is the normally closed terminal. A shaded triangle denotes a momentary contact, therefore it is the normally open terminal.

Switches having more than one maintained contact do not have a normally open or normally closed terminal, although they may have a common. Symbols for these switches include the markings present on the actual switch.

Example:

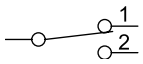
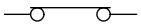


Figure 8121-01

Examples (All Momentary)		
	With Common (Transfer)	Without Common (Double Break)
Wired normally open, held open	 Figure 8119-01	 Figure 8120-01
Wired normally open, held closed	 Figure 8122	Figure 8123
Wired normally closed, held open	 Figure 8115-01	 Figure 8117-01
Wired normally closed, held closed	 Figure 8124	 Figure 8125

How the Switch is Activated

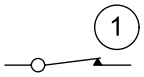
If it is necesary to include how the switch is mechanically actuated, a note will be added to the drawing (example: operator, lever or truck actuated, etc.)

Application

Switch application is conveyed through the abbreviation (example: HTS = Height Switch 120 in., DTS = Drive/Tow Switch).

Notes:

- In a schematic, the condition of a circuit is defined using a note (example: vehicle shown fully lowered with no operator on vehicle).
- Positive action switches are marked with the following symbol:



8126-02

Switch Symbols (Mechanically activated switches)

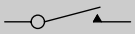
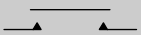
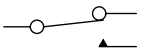
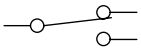
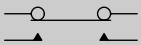
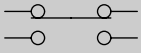
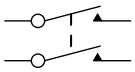
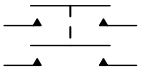
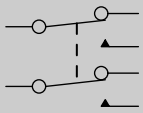
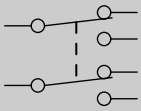
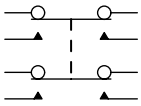
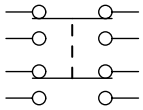
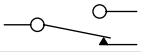
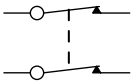
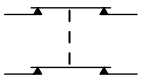
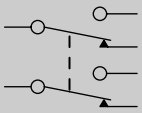
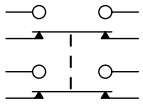
Actuation	Description	No. of Terminals	Momentary		Fully Maintained	
			w/common	w/o common	w/common	w/o common
NO	SPST	2				
	SPDT	3				
	SPDT	4				
	DPDT	4				
	DPDT	6				
	DPDT	8				
NOHC	SPST	2				
	SPDT	3				
	SPDT	4				
	DPDT	4				
	DPDT	6				
	DPDT	8				

Figure 8100-01

Switch Symbols (Mechanically activated switches) **Continued**

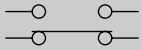
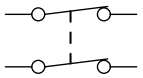
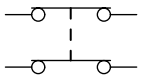
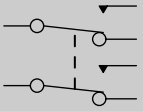
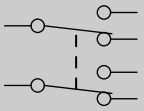
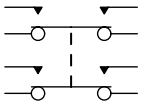
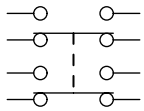
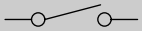
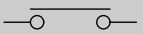
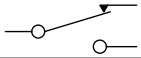
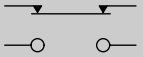
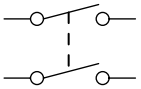
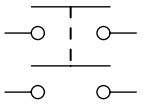
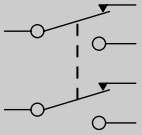
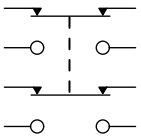
Actuation	Description	No. of Terminals	Momentary		Fully Maintained	
			w/common	w/o common	w/common	w/o common
NC	SPST	2				
	SPDT	3				
	SPDT	4				
	DPST	4				
	DPDT	6				
	DPDT	8				
NCHO	SPST	2				
	SPDT	3				
	SPDT	4				
	DPST	4				
	DPDT	6				
	DPDT	8				

Figure 8101-02

Specialty Switches

Pressure Switch

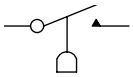


Figure 8127

Reed Switch

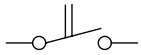


Figure 8128

Temperature Switch

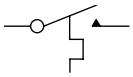


Figure 8129

Brake Fluid Switch

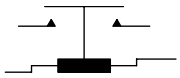


Figure 8130

Three Position Key Switch

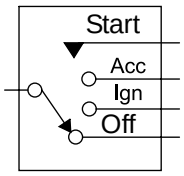


Figure 8131-01

Other Electrical Symbols

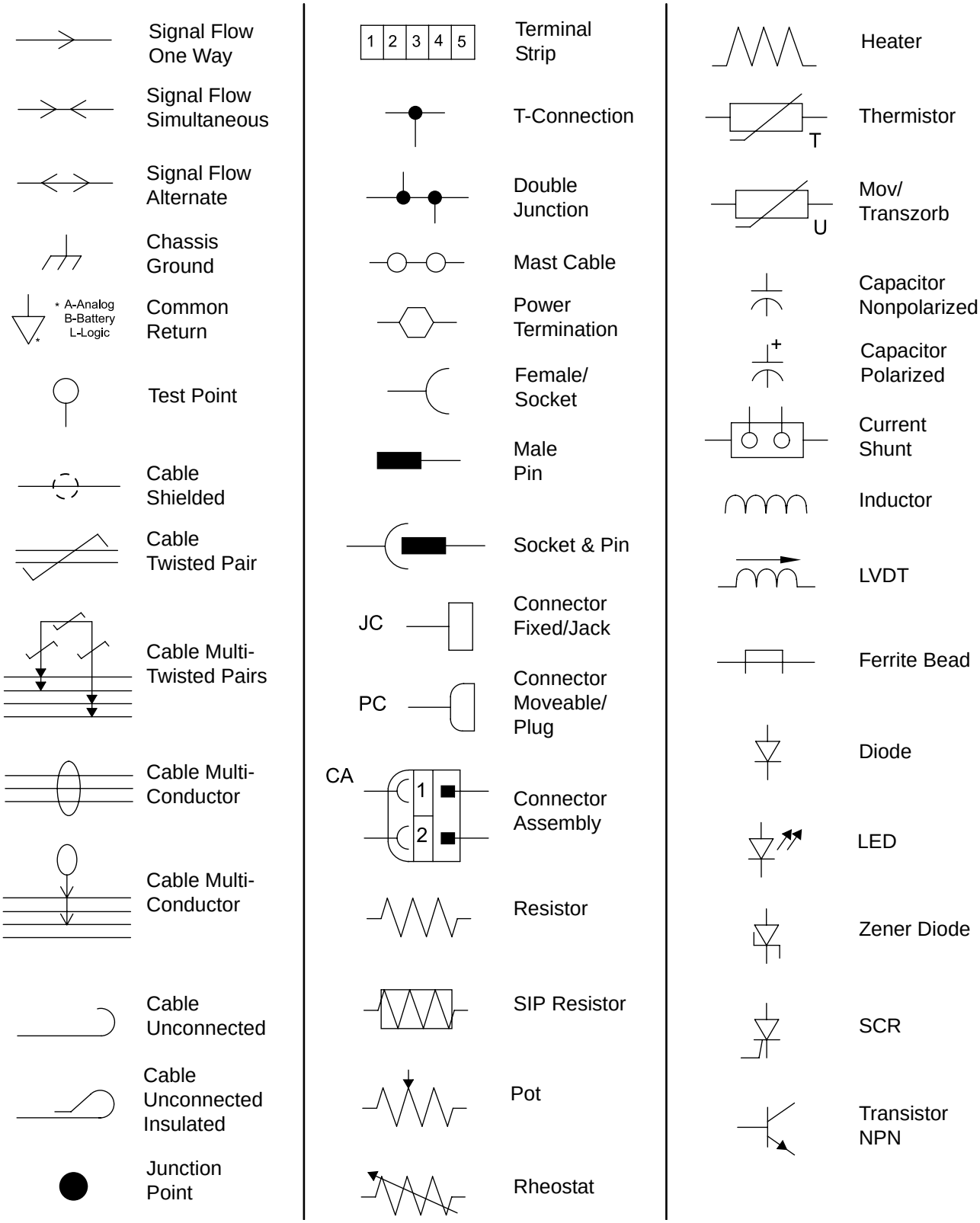


Figure 8132-02

Other Electrical Symbols

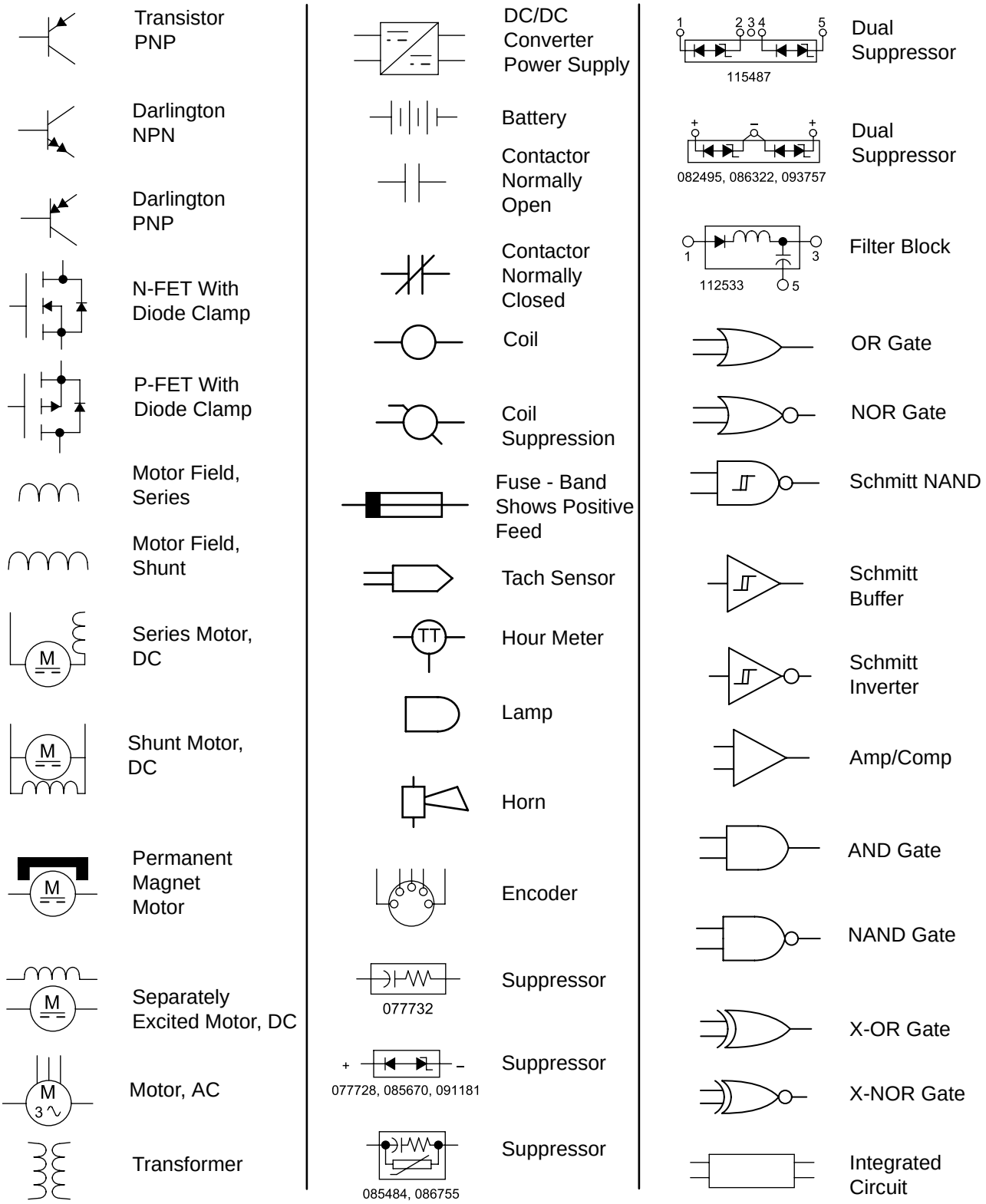


Figure 8133-02

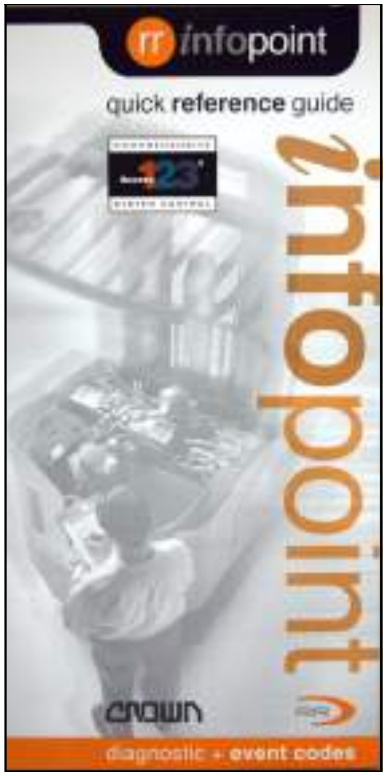
Software Version 17
To confirm actual software part number go to utilities menu U1.4

RR/RD 5200/5200S

The Access 1 module, commonly referred to as the display, is the interface between the operator or service technician and the truck electronic system. This section will cover the control components of the Access 1 module for monitoring and testing truck operation.

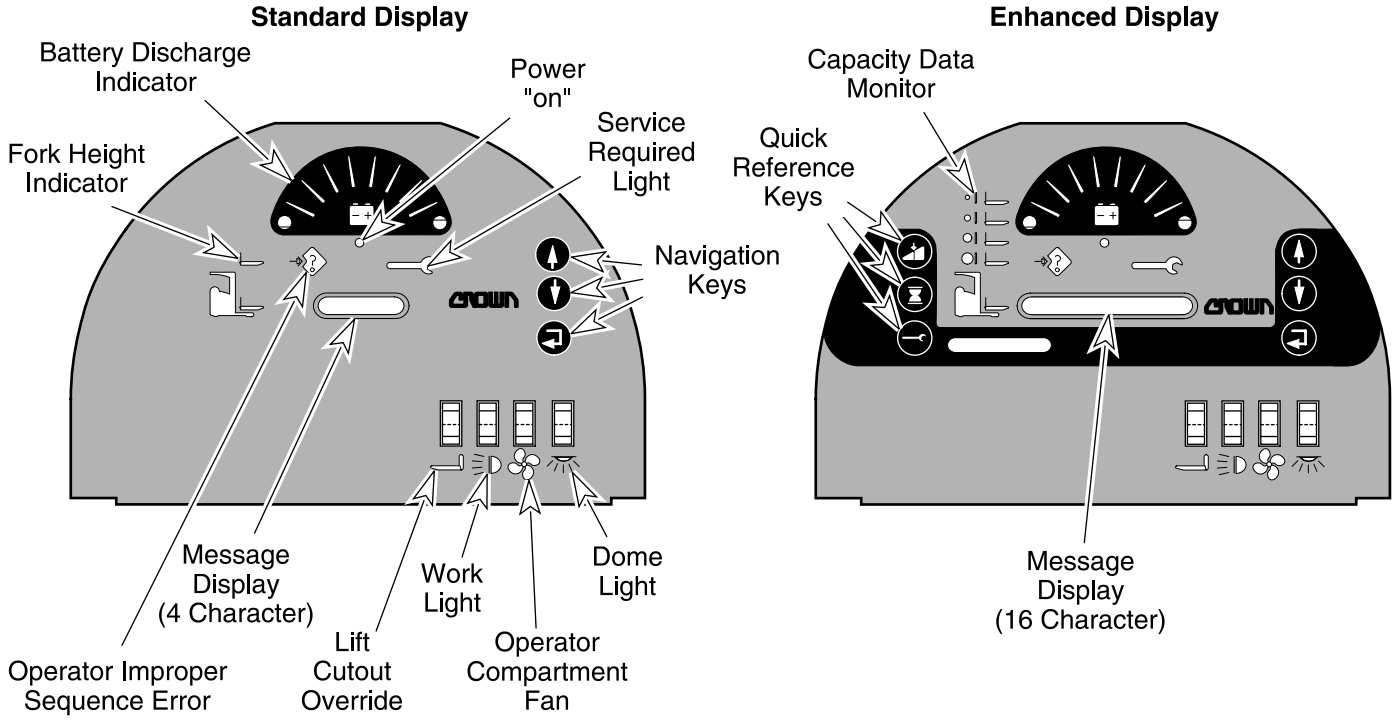
Quick Reference Guide

A troubleshooting guide for field service technicians is available and is a supplement to this manual section (M4.3). The 115 x 215 mm/4.5 x 8.5 in. Quick Reference Guide, PF13368, includes display messages, menus, list of components, and status codes.



12677

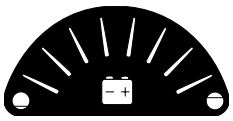
Controls and Indicators



8881

010328 10955

These indicators on all displays:


6219

Battery Discharge Indicator
- resembles fuel gauge for indication of battery state of charge.
- display represents approximate battery charge.
- the indicators in the corners represent a fully charged battery to the right and battery in need of charge to the left and will flash when this level is reached.


6215

Power "on"
- illuminates when power is present to display.


6216

Operator Improper Sequence Error
- illuminates when operator uses incorrect sequence of truck operation.
- on trucks equipped with CDM, illuminates when load that is over capacity (based on 600 mm/24 inch load center) has been picked up with forks.


12684

Service Required
- illuminates when a status has been detected that requires attention. Accompanied by status code.


6222

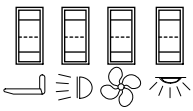
Navigation Keys
- arrow up and arrow down keys scroll display up and down through menus. Used also to enter the service modes at power up.
- return or enter key moves display into and out of selected menus and allows system to accept inputs.


6224

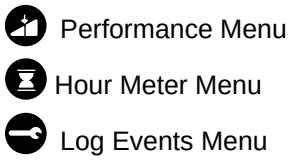
Fork Height Indicator
- illuminates when forks are above free lift.
- flashes and alarm sounded when forks above free lift and travel speed greater than 2.4 kph/ 1.5 mph.


6250

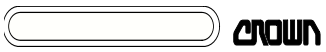
Message Display (standard display only, requires reference material)
- 4 character limited alphabet capabilities and full numeric capability display.
- presents information to operator as necessary.
- visual interface with truck electronic system.


6251

Options Control Switches
- control switches for trucks equipped with dome light, operator comfort fan, work lights and/ or lift cutout override.



6221


6225

These indicators on enhanced displays only:

Quick Reference Keys
- during truck operation, keys can be used to go directly to indicated operator menu.
- pressing key while in menu returns display to normal operation.

Extended Message Display (in place of 4 character display on standard)
- 16 character alpha numeric display.
- presents more comprehensive information to operator as necessary.
- visual interface with truck electronic system.

This indicator on enhanced display with CDM


6223

Capacity Data Monitor
- fork icon indicates approximate lift height of forks.
- bar left of fork icon indicates maximum recommended lift height for load on forks.
- circle to the left of the bar corresponds to data plate circles.
- for more information on the capacity data monitor, refer to the M4.3 Capacity Data Monitor section of the service manual.

TRUCK SOFTWARE TOOLS RR/RD5000/5000S, RR/RD5200/5200S, RR/RD5200(AC)/5200S(AC)

PF12937-PRO is a CD-ROM based software utility program created to assist the service technician in configuring truck setups. A PC, with requirements specified below, Down Load Cable (126456), and Isolator Connector (062785-001) are also required. With this software utility the technician can:
- Configure, save or print truck setups.
- View or modify service password.
- View or erase fault code history.
- View or modify hour meters.
- Save or print hour meter and log history (via Data Dump).

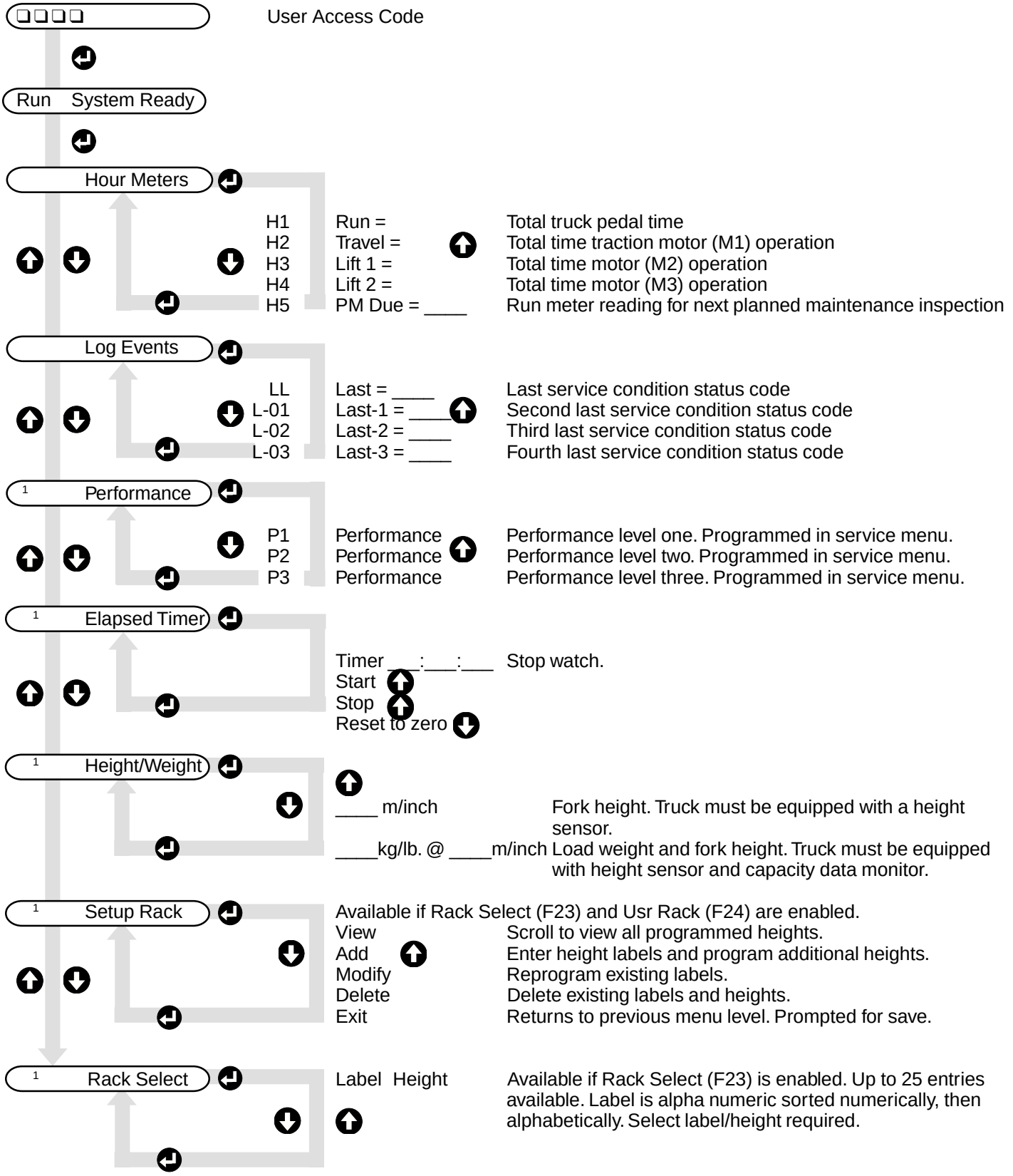
Truck System Requirements:
- DC traction models with version 12 through 14 Software.
- AC traction models with version 01 through 04 Software (Data Dump feature not available on version 01 and 02 Software).

Computer System Requirements:
Before using the Crown Programming Tool, PF12937-PRO, the following minimum requirements for the personal computer being used are needed:
- Minimum 1.5 mb of available hard drive disk space.
- Operating system Windows 95, 98, 2000, ME, XP or NT.
- An available COM (communications) port.
- CD-ROM drive

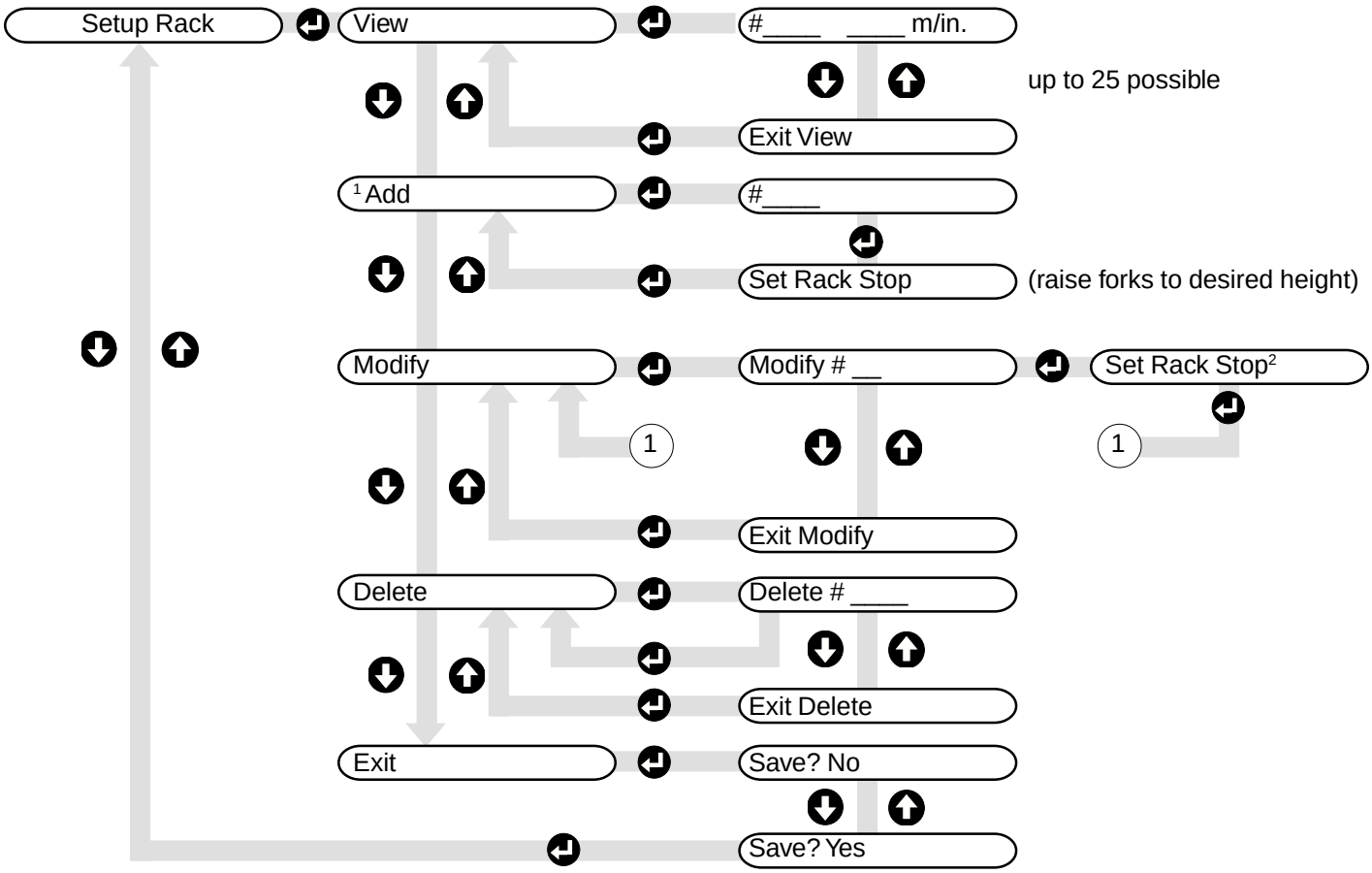
11183-01

USER MAIN MENU LEVEL

The truck operator has access to the following menu after inputting the required user code.



[1] = not available on trucks with standard display.



[1] The minimum programmable height for the rack select feature is approximately 635 mm/25 inches above staging.
[2] Raise forks to desired height.

RACK SELECT SETUP

View

Press ↵ at the Setup Rack menu of the User Main Menu to access this menu. Press ↵ again to enter this menu. All (up to 25 maximum) pre-programmed height selections can be viewed by using ↑ and ↓ on the display. Preceding the height measurement in inches is a label that can be numeric or alpha in either digit location. The list is sorted and displayed by the label (left digit first, numerically then alphabetically then the right digit, numerically then alphabetically). Press ↓ to access the Add menu.

Add

Press ↵ to access this menu level. The display will show "#_ _". First, enter a label for the height to be set. Entering a label already existing will return the message "invalid #". Pressing ↵ will return the message "Exit Add" and pressing ↵ again will return the display to the Add menu level. The height is obtained by raising the forks to the desired height and pressing ↵. The minimum programmable height for the rack height select feature is approximately 635 mm/25 inches above staging. The display will return to the Add menu level. To add more heights press ↵ and repeat procedure. To access the Modify menu, press ↓.

Modify

Press ↵. The message "Modify #__" will appear. Use the ↑ and ↓ keys to locate the label that needs to be modified. Raise the forks to the height desired for the selected label. Press ↵. The display will return to the Modify menu. To access the Delete menu, press ↓.

Delete

Enter the delete menu by pressing ↵. Scroll up and down the list using ↑ and ↓ to locate the label. With the desired label displayed, press ↵ to delete. The display will return to the Delete menu. If additional deletions are required, press ↵. When complete, press ↓ from the Delete menu to access the Exit menu.

Exit

If more work is to be done at this menu level, press the ↑ and ↓ keys to access the desired menu. At this menu level press ↵ to exit rack select setup. The display will return to the User Main Menu Level.

If it is desired not to allow users to change, delete or add rack heights, disable the User Rack feature (F24) in the Service one button mode menu.

RACK SELECT OPERATION

CAUTION

The Rack Height Select feature is primarily intended to relieve operator strain by assisting in positioning the forks near a selected rack position. It is always the responsibility of the operator, whether or not Rack Height Select is used, to assure that the forks are at the required height before inserting them into a load or before depositing a load in a rack. Variations in pallet or skid openings, load packaging, rack heights, etc. throughout a given site need to be considered at all times.

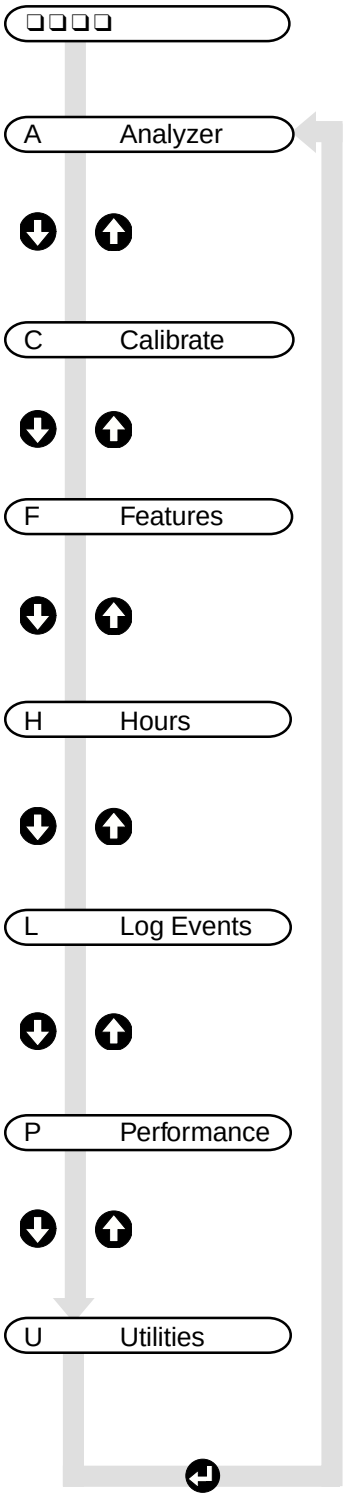
Before operating the hydraulics, operators must also assure that a clear path exists for the forks and assure that sufficient overhead clearance is available in the load handling area. The same level of operator attention must be given to all aspects of driving and maneuvering whether Rack Height Select is used or not.

If a specific rack height is not selected in the display (No Rack), Rack Height Select will not interfere with normal manual operation of the truck's hydraulic system. There is no automated function for retrieval or deposit of the load as part of the Rack Height Select feature.

When the truck is powered up, navigate to the Rack Select menu using the ↑ and ↓ keys on the display. Press ↵ or press SSS (the accessory switch on the multi task control) momentarily. Use ↑ and ↓ or press SSS momentarily to navigate to the desired rack height. The displayed height is the height the forks will stop at when raising or lowering. When the forks come to a stop at the desired height, an audible tone will sound to indicate the selected height has been reached. Return the multi task control to the neutral position and the display will show the message No Rack. Repeat the above procedure when a rack height is again desired.

The service technician has access to various portions of the following menu depending on the access level selected.

- Level two service menu is accessed by pressing the "up" arrow key during power up of the truck. This level allows truck operation.
- Level three menu is accessed by pressing the "up" and "down" arrow keys simultaneously during truck power up.This level does not permit truck operation.



- Level two (except the A4 menu level) and level three menu.
- In A1 menu the truck status can be checked which will match the truck status listed with each status code. A2 menu permits checking inputs to the Access 2 and 3 modules as seen by the modules. A3 menu permits checking the outputs of the Access 2 and 3 modules as seen by the modules. A4 is the test output menu which allows the system to power the output components, without truck operation, for troubleshooting.

- Level two menu only.
- Truck components requiring calibration to the Access 1 2 3® system are contained in this menu.

- Level two and level three menu.
- In the features menu, programming is performed to set truck operation and performance to customer specifications and truck configuration.

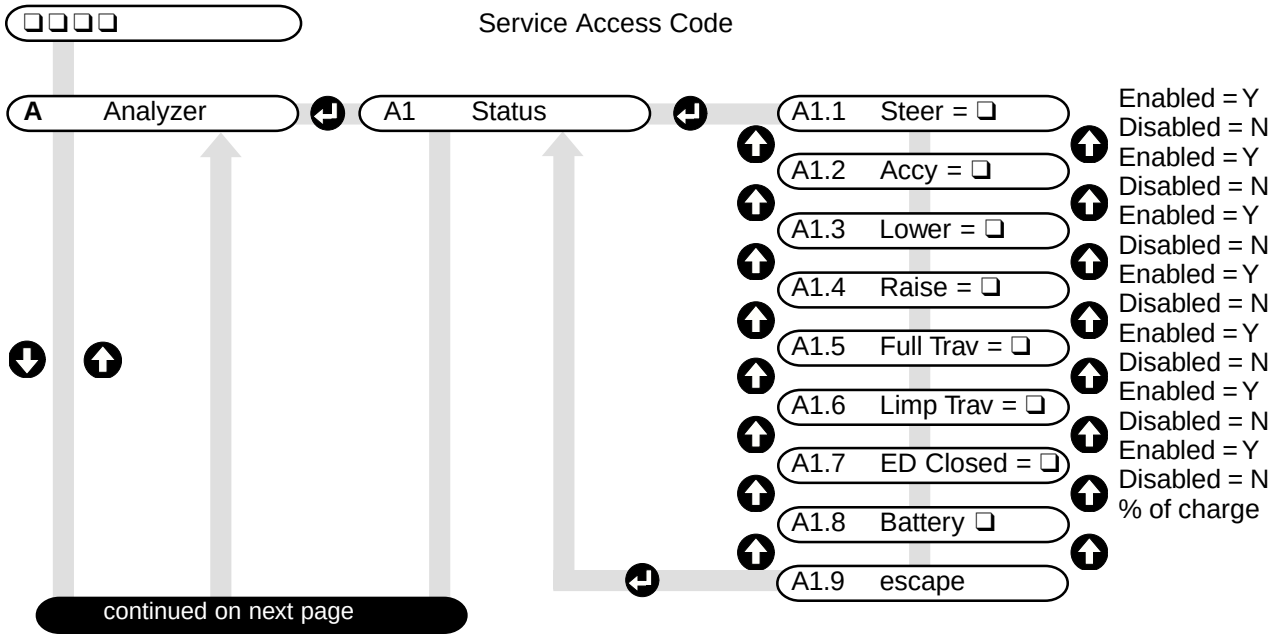
- Level two menu only.
- Ability to check hour meters available in this menu.

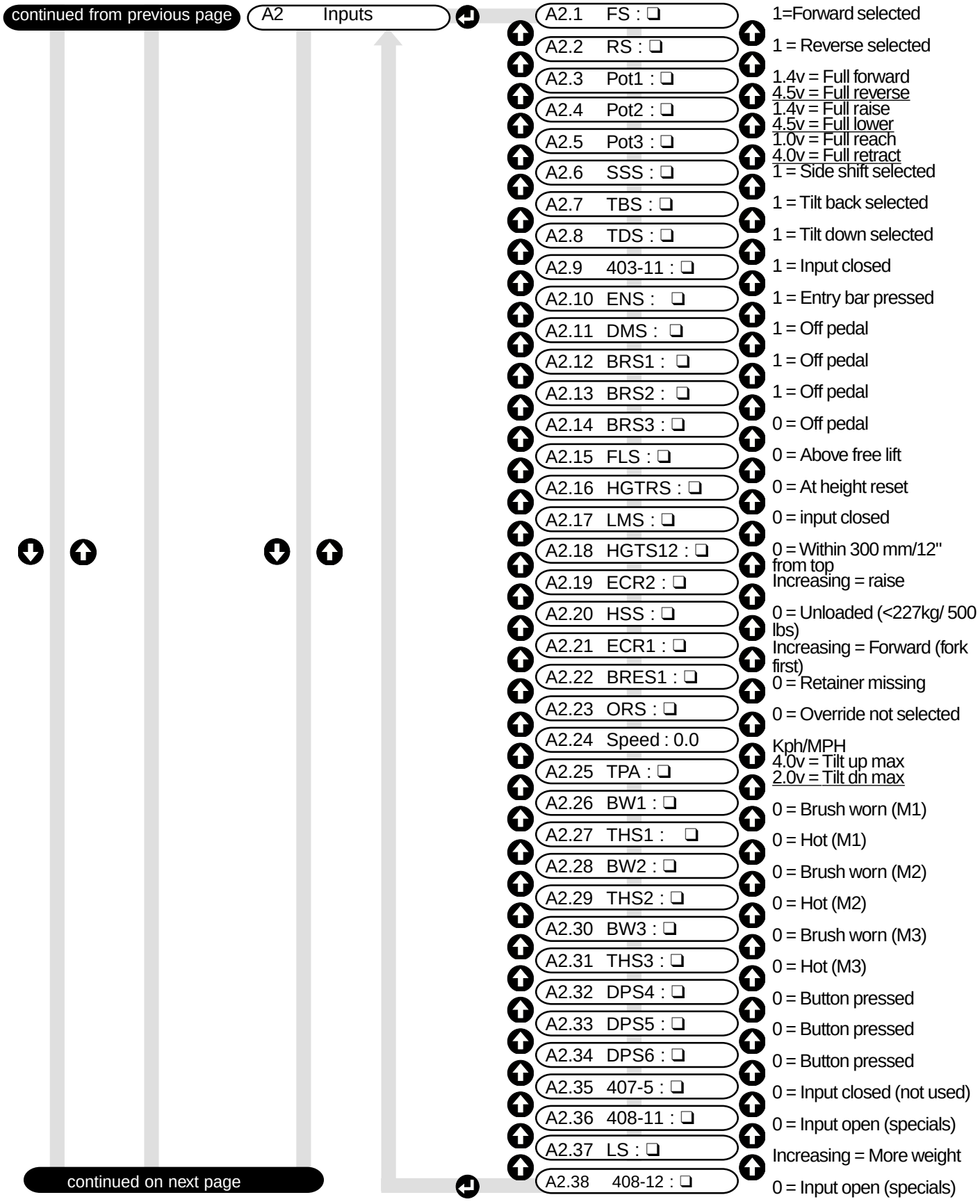
- Level two and level three menu.
- The last 16 codes in order of occurance and the accumulative count for each code can be viewed in this menu. Resetting log event counts available.

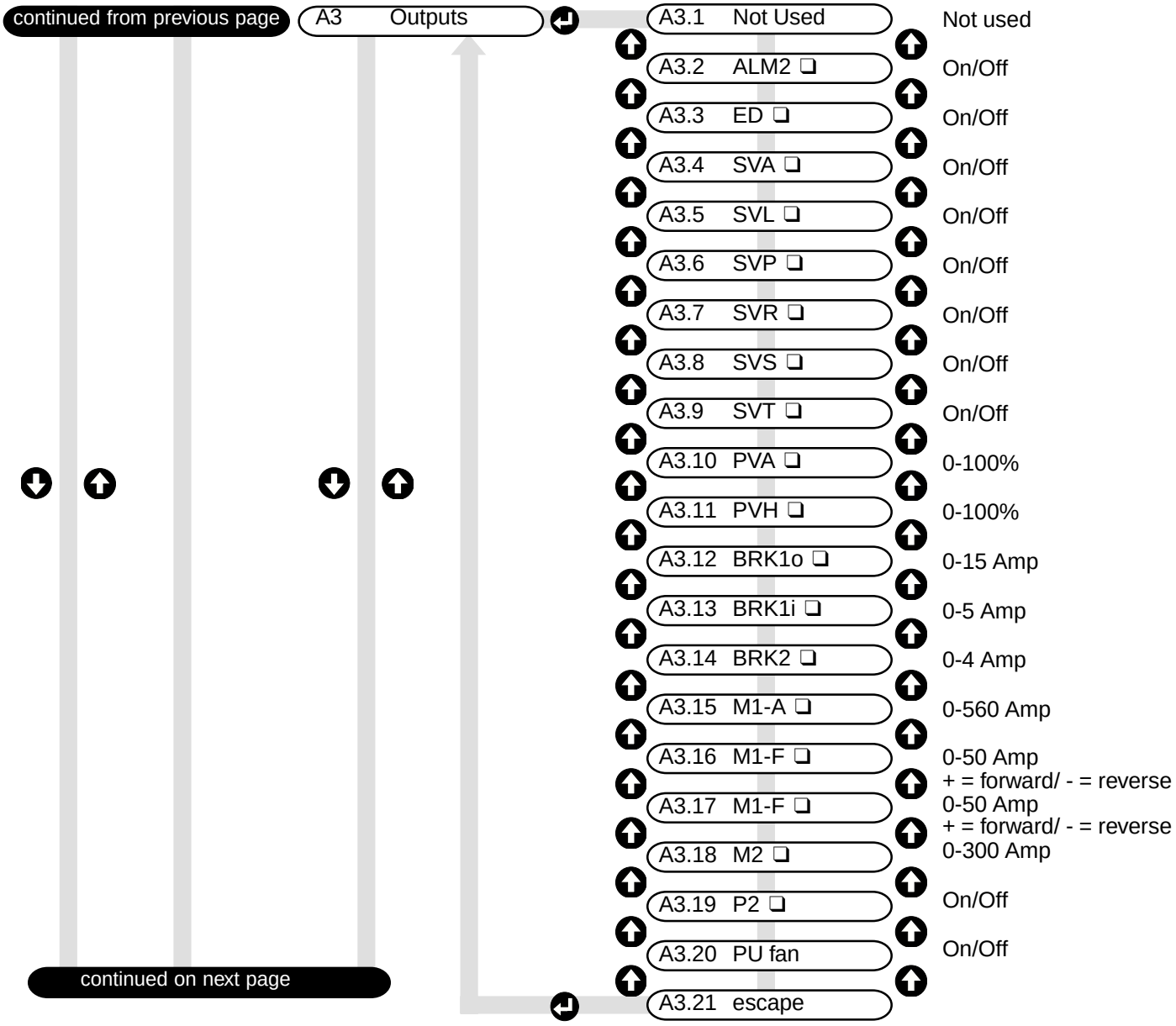
- Level two menu only.
- Truck performance for operator code is set in this menu with additional overall performance adjustments available.

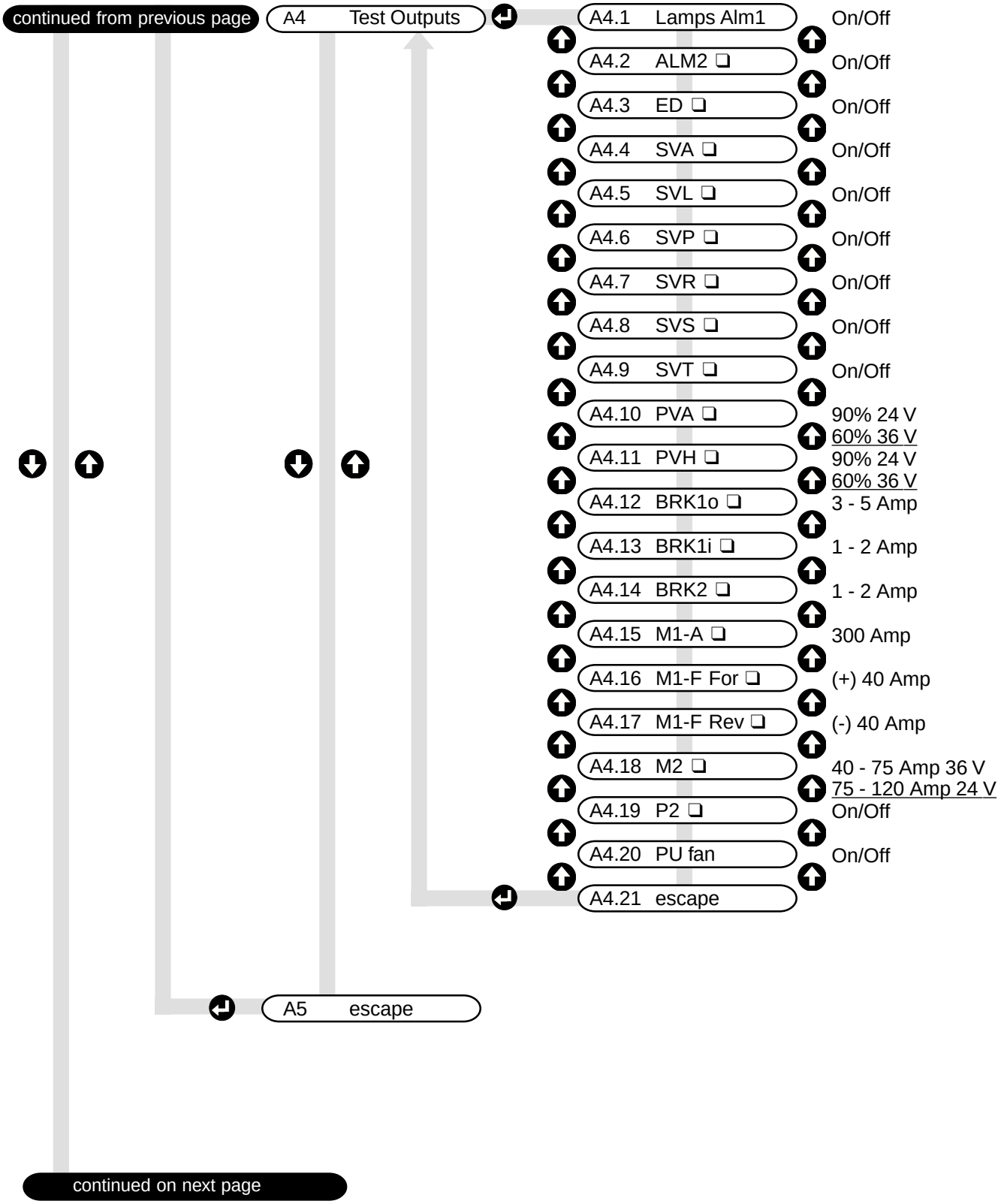
- Level two and level three menu.
- Part numbers of the Access 1, Access 2 and Access 3 modules and software version number accessable in U1 menu. The U2 menu provides the tool for copying setup values from one module to the other. The U3 menu provides the capability to enter hour meter readings when Access 3 is replaced and to reset the travel, lift 1 or lift 2 hour meter after corresponding motor replacement.

Press the ↵ key to move right and left in the menu and allow system to perform function requested. Press the ↑ and ↓ to move up and down.

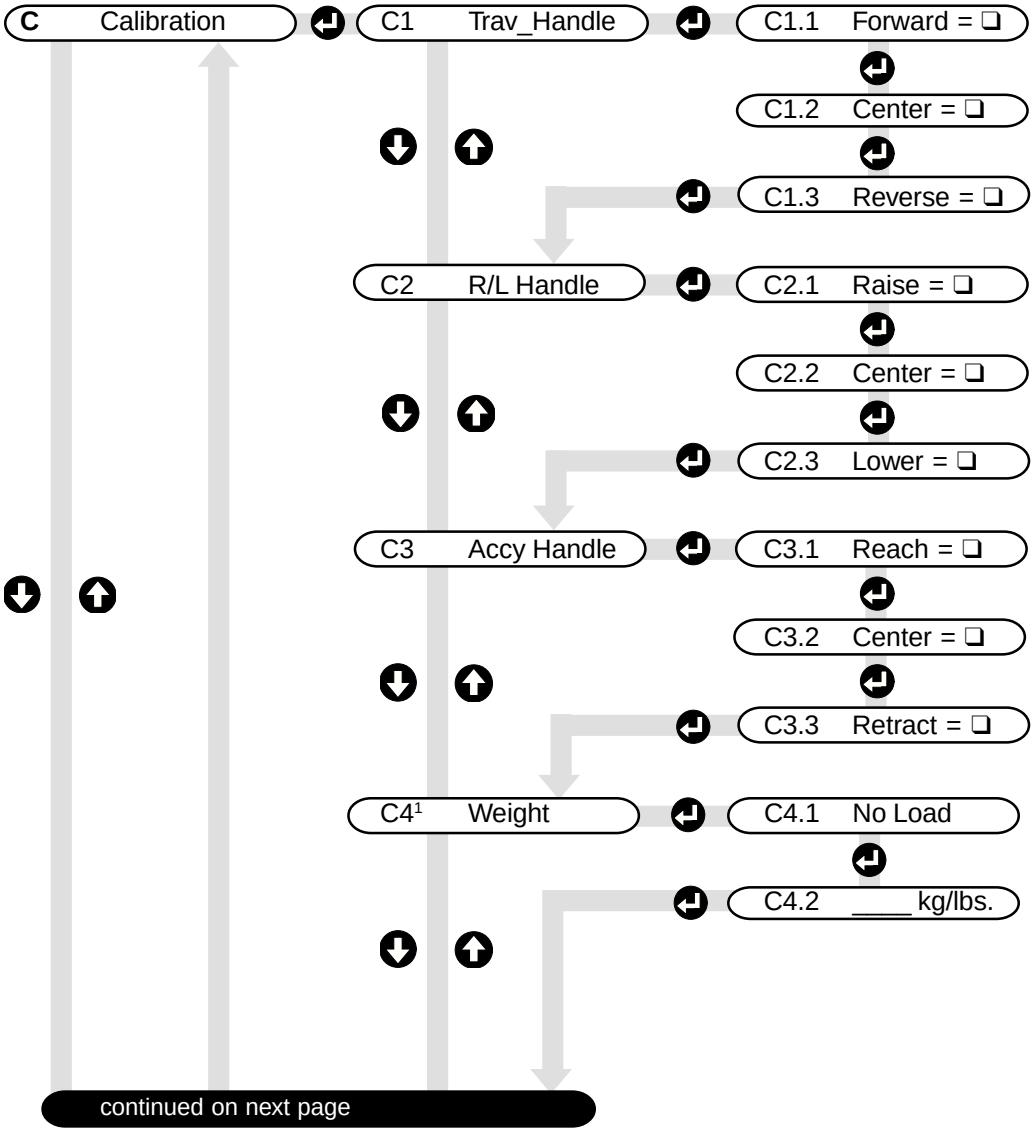




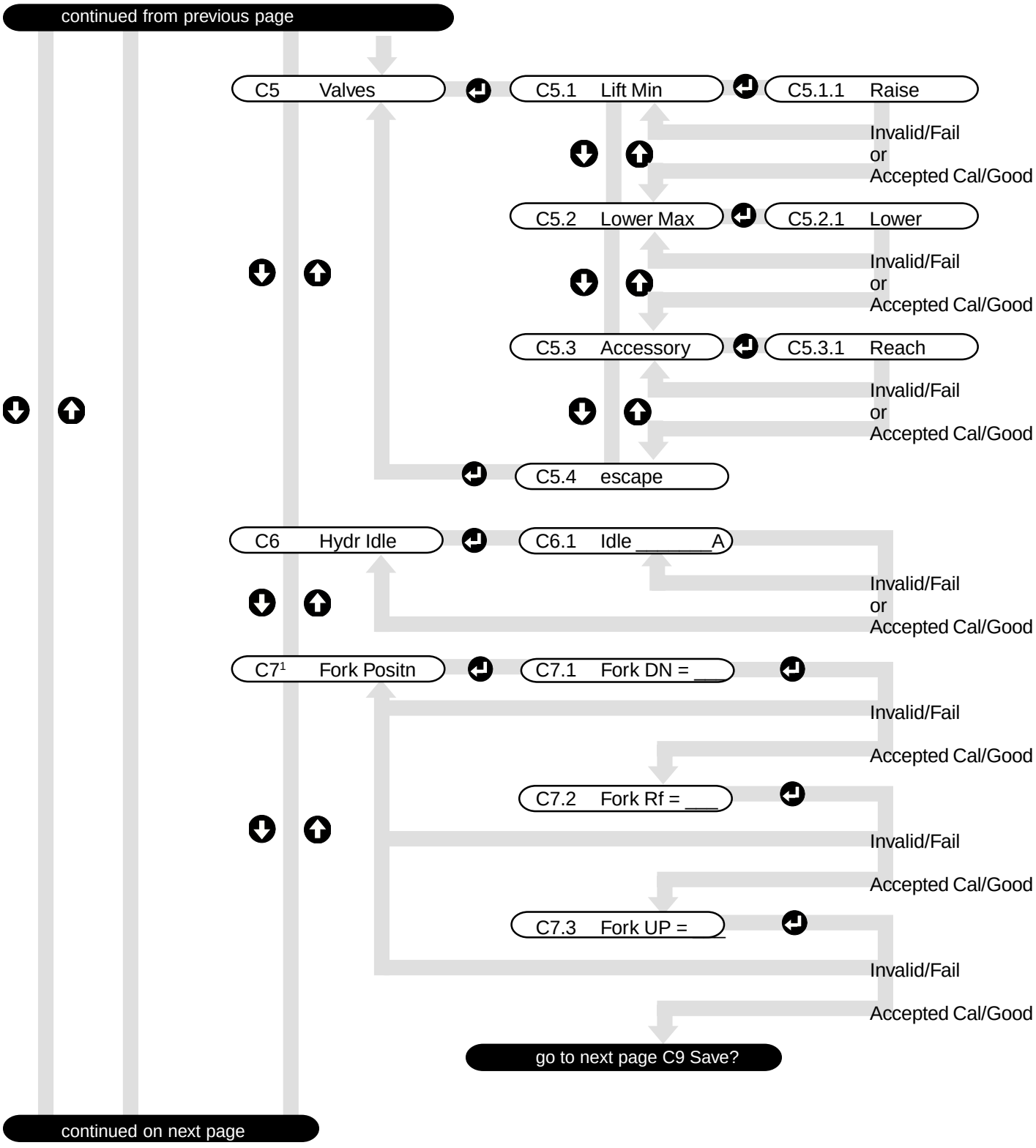




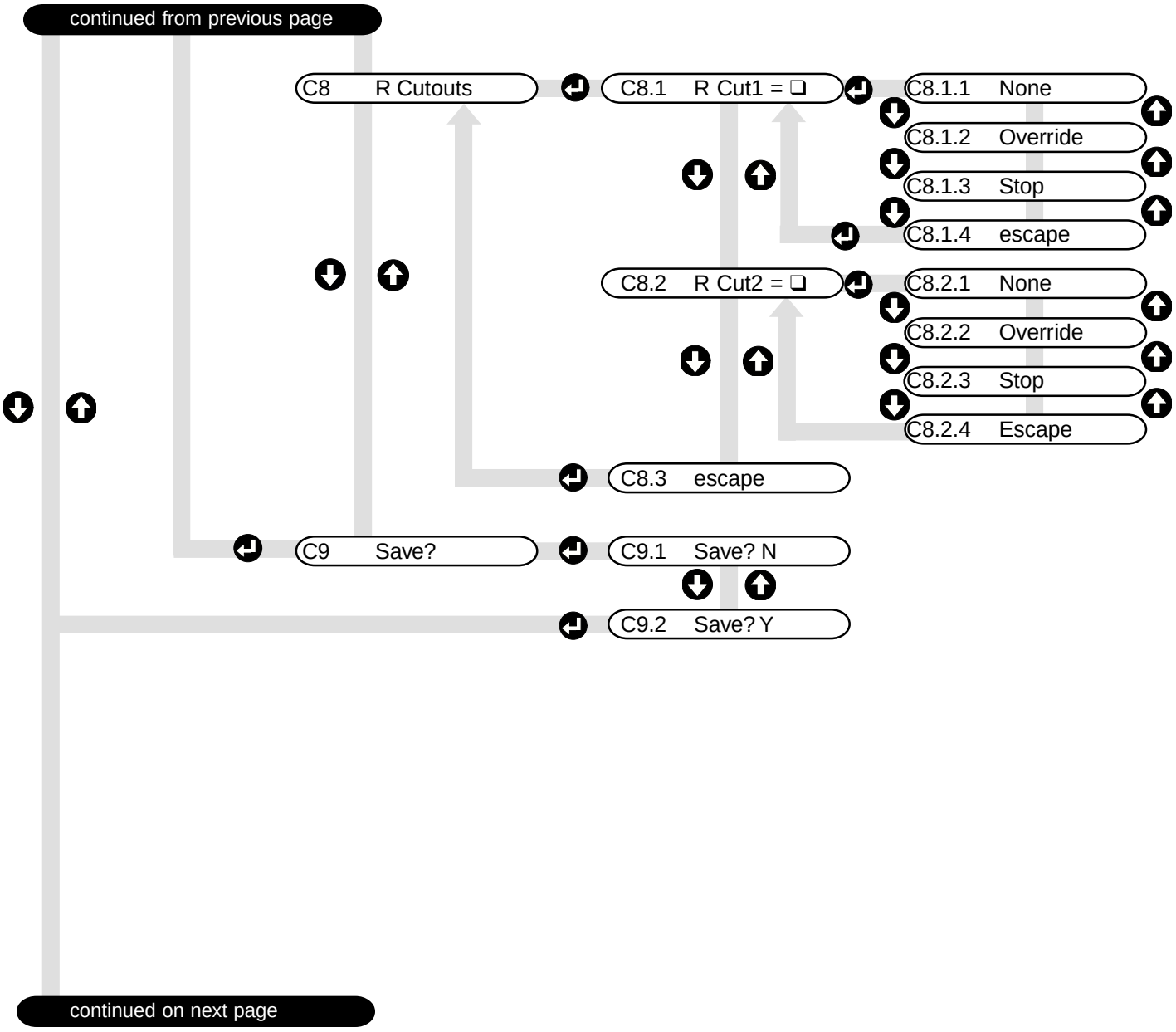
Press the ↵ key to move right and left in the menu and allow system to accept calibration values. Press the ↑ and ↓ to move up and down.



[1] = available on trucks equipped with capacity data monitor (CDM) only.



[1] = TPA (Tilt Position Assist)



The calibration menu is shown on the preceding and following pages. The first level of the menu shows the different areas of calibration for this truck. If calibration procedures are not performed correctly and/or features settings not entered correctly, unsatisfactory truck performance may result.

- C1 Trav Handle — traction potentiometer (Pot1) in the multi task control.
- C2 R/L Handle — raise/lower potentiometer (Pot2) in the multi task control.
- C3 Accy Handle — accessory potentiometer (Pot3) in the multi task control.
- C4 Weight — capacity data monitor (CDM). Truck must be equipped with enhanced display, height sensor and load sense transducer. F9 in the features menu must be enabled.
- C5 Valves — raise/lower (PVH), accessory (PVA) electrical proportional valves and height sensor. Correct performance from this procedure depends on correct settings in F26, F27 and F28.
- C6 Hydr Idle — learning current draw of pump motor at 2 speeds. Correct performance from this procedure depends on correct settings in F11.
- C7 Fork Position — Tilt Position Assist module potentiometer on the tilt cylinder.
- C8 Raise Cutout — truck must be equipped with height sensor. Correct performance from this procedure depends on the proper calibration of C5.

When to calibrate:

- Access 3 was replaced and the truck previously contained less than Version 12 software, a complete truck calibration is required.
- Access 1 replaced will require the load sense transducer (LS) to be calibrated.
- Access 2 or Access 3 replaced will require the potentiometers in the multi task control to be calibrated.
- any of the potentiometers or components used to mount or position potentiometers in the multi task control replaced.
- the hydraulic manifold has been replaced without keeping the existing electrical proportional valves (PVH, PVA).
- PVH replaced.
- PVA replaced.
- load sense transducer (LS) replaced.
- status code instructions recommends recalibration of a specific component.
- height sensor replaced (C5.2)
- TPA (Tilt Position Assist) potentiometer is replaced.
- TPA (Tilt Position Assist) CAN module is replaced.
- Software replaced, recommend calibration of:
  POT1 traction potentiometer (C1)
  POT2 raise/lower potentiometer (C2)
  POT3 accessory potentiometer (C3)
  TPA fork position potentiometer (C7), if equipped.
  Raise/lower cutouts (C8), if equipped.

Calibration Access

When powering up the truck, press and maintain the arrow up key on the display. This enters level two of Access 1 operation. Navigate to the C - Calibrate menu and press the enter key. The message display now displays the message: C1 Trav Handle (as shown in the menu on the preceding pages).

Calibration Procedures

A full explanation of calibration procedures for each menu level follows.

Calibration Complete

When calibration procedures are complete, scroll down to the Save? (C9) menu and press the enter key. If the calibration completed is necessary to save into memory for future truck operation, select the "Save? Y" (C9.2) menu and press the enter key. This process will require less than a minute to complete. To keep calibration values from becoming unusable, do not operate any truck controls or display keys during this process.

C1 Trav Handle (traction request potentiometer - POT1)

C1.1 (forward) - move the multi task handle to the full speed forward traction position and press ↵. The menu will then move to the next menu level.

C1.2 (center) - with the multi task handle in the neutral position, press ↵. The menu will then move to the next menu level.

C1.3 (reverse) - move the multi task handle to the full speed reverse traction position and press ↵. The menu will go to the C2 menu level. Whenever a step fails the menu will return to the level that will allow recalibration of the present step.

If no additional calibration procedures are to be performed, scroll to the C9 menu level, press ↵ and select the C9.2 menu. Calibration is complete and truck can be returned to operation. If additional calibration procedures are to be performed, scroll to the appropriate menu level and continue.

C2 R/L Handle (raise/lower request potentiometer - POT2)

C2.1 (raise) - move the multi task handle to the full speed raise position and press ↵. The menu will then move to the next menu level.

C2.2 (center) - with the multi task handle in the neutral position, press ↵. The menu will then move to the next menu level.

C2.3 (lower) - move the multi task handle to the full speed lower position and press ↵. The menu will go to the C3 menu level. Whenever a step fails the menu will return to the level that will allow recalibration of the present step.

If no additional calibration procedures are to be performed, scroll to the C9 menu level, press ↵ and select the C9.2 menu. Calibration is complete and truck can be returned to operation. If additional calibration procedures are to be performed, scroll to the appropriate menu level and continue.

C3 Accy Handle (multi task accessory function control thumbwheel)

C3.1 (reach) - move the multi task thumbwheel to the full speed reach position and press ↵. The menu will then move to the next menu level.

C3.2 (center) - with the thumbwheel in the neutral position, press ↵. The menu will then move to the next menu level.

C3.3 (retract) - move the multi task thumbwheel to the full speed retract position and press ↵. The menu will go to the C4 menu level. Whenever a step fails the menu will return to the level that will allow recalibration of the present step.

If no additional calibration procedures are to be performed, scroll to the C9 menu level, press ↵ and select C9.2. Calibration is complete and truck can be returned to operation. If additional calibration procedures are to be performed, scroll to the appropriate menu level and continue.

C4 Weight (calibration of load sense transducer [LS])

When calibrating LS, the forks must be level with an accurate load weight and 600 mm/24 inches load center for the truck. Make sure load is 300 mm/12 inches above the floor. To make sure load is sufficient for this step, navigate to the A2.37 menu (LS). With no load on the forks, note the reading obtained on the display. Lift the recommended load and again note the reading. A difference in the two readings of less than 200 will result in an invalid calibration. Although a minimum load is required, a load near the rated capacity of the truck will improve the accuracy of the CDM feature.

C4.1 (no load) - No load on forks. Press ↵. Menu will advance to next level.

C4.2 (____ lbs) - With a load greater than 1240 kg/2750 pounds and of the correct load center and 300 mm/12 inches above floor, enter the load weight to the nearest kg/pound, press ↵. Menu will advance to next level. Whenever a step fails the menu will return to the level that will allow recalibration of the present step.

If no additional calibration procedures are to be performed, scroll to the C9 menu level, press ↵ and select C9.2. Calibration is complete and truck can be returned to operation. If additional calibration procedures are to be performed, scroll to the appropriate menu level and continue.

C5 Valves (calibrates PVH and PVA) – perform procedures with forks empty unless noted otherwise. Do not move steering tiller during calibration process to avoid corrupting data. Display messages in the following procedure are shown as “Accepted Cal/Good” and “Invalid/Fail” with the enhanced display message shown first followed by the standard display message. Whenever a step fails, the menu will return to the level that will allow recalibration of the present step.

Prior to calibrating the valves, the following features must be set correctly and saved:

F1 – 24 volt or 36 volt.
F2 – 2 pedal or 5 pedal.
F11 – 168 mm/6.6 inch or 190 mm/7.5 inch diameter pump motor.
F26 – Maximum lift height taken from truck nameplate or maximum allowable lift height permitted at installation site.
F27 – Collapsed height of truck measured from the floor to the top of mast when forks are completely lowered.
F28 – Load backrest height measured from the top of forks to top of load backrest.

Before beginning with the valve and hydraulic calibration procedure in C5 and C6, operate the lift/lower function until the hydraulic oil reaches normal operating temperature of 38° C/100° F. This typically requires 10 to 15 minutes of operation.

NOTE

Use following procedures when installation site overhead clearance does not limit using the truck to its maximum lift height. When overhead clearance limits the lift height, use the Alternate Valve Calibration following C5.2.1.

Press ↵.

C5.1 (lift minimum) – programs the minimum valve (PVH) current to achieve lift. Press ↵ to enter calibration menu.

C5.1.1 (RAISE) – move multi task handle to full raise position. When the display exhibits the message "Accepted Cal/Good" (will take 5 to 10 seconds), return multi task handle to neutral.

C5.2 (lower maximum) – programs the current to achieve maximum lowering speed and calibrates the height sensor. Truck must have 680 kg/1500 pound or greater load on forks. If truck has raise cutouts programmed, it will be necessary to recalibrate the cutouts (C8) since calibration of lower maximum will reset all cutouts to staging plus 300 mm /12 inches. Before pressing ↵ forks must be at full lift position. Press ↵ to access C5.2.1.

C5.2.1 (LOWER) – move multi task handle to full lower position. When the display exhibits the message "Accepted Cal/Good", return multi task handle to neutral. Raise cutouts can now be calibrated or must be re-calibrated if cutouts exist.

Alternate Valve Calibration

- For trucks equipped with height encoder and lift height of truck greater than clearance in installation site.

First measure maximum allowable height of forks and enter this measurement in the features menu F26 Max Hgt. If the max height measurement is a non standard lift height, enter the correct collapsed height in menu F27 Clsp Ht.

Return to valve calibration menu C5 and navigate to C5.2 lower maximum. With the forks at the full maximum allowable raised position and a load of 680 kg/1500 pounds or greater, press ↵ and lower forks at full speed until message "Accepted Cal/Good" is displayed. Continue with the calibration procedures described in C5.3 Accessory.

When C5 calibration procedures are complete, go to menu C8 Rcutouts and install raise cutout for the maximum allowable lift height.

CAUTION

Without installing the raise cutout, lift will operate past the programmed max height, at slower speed, to maximum truck lift height.

When calibration is complete, navigate to C9 Save?.

- For trucks not equipped with height encoder and lift height of truck greater than clearance in installation site.

Submit an Equipment Modification Request for limiting maximum lift height of the subject truck. After approval received and modification completed, the truck is calibrated through normal procedures.

C5.3 (accessory) – programs the valve (PVA) current to achieve maximum accessory speed. With no load on forks, press ↵ to enter the calibration menu.

C5.3.1 (REACH or TILT or SIDESHIFT) – move thumbwheel to full command position for active accessory. The reach mechanism will remain idle for approximately 20 seconds then move out slowly, return slowly, reach out fast then return slowly (total time will be approximately 1 minute). When the display exhibits the message "Accepted Cal/Good", return thumbwheel to neutral. Press ↵.

If no additional calibration procedures are to be performed, scroll to the C9 menu level, press ↵ and select the C9.2 menu. Calibration is complete and truck can be returned to operation. If additional calibration procedures are to be performed, scroll to the appropriate menu level and continue.

C6 Hydr Idle (calibrates the minimum speed of the hydraulic pump and motor) – Do not move steering tiller during calibration process to avoid corrupting data. Position empty forks at approximately 300 mm/12 inches of lift. Display messages in the following procedure are shown as "Accepted Cal/Good" and "Invalid/Fail" with the enhanced display message shown first followed by the standard display message. Press ↵.

C6.1 (IDLE) – wait for pump to cycle on and off, and the display to exhibit the message "Accepted Cal/Good" (approximately 30 seconds).

If no additional calibration procedures are to be performed, scroll to the C9 menu level, press ↵ and select the C9.2 menu. Calibration is complete and truck can be returned to operation. If additional calibration procedures are to be performed, scroll to the appropriate menu level and continue.

C5 and C6 Calibration Checks

The following checks are intended to verify correct calibration values were obtained. If any of the following checks are out of range, a faulty component or mechanical binding is present inhibiting the proper values.

Motor Idle Check

Attach hydraulic system test gauge to port G1 on the hydraulic manifold. Raise forks to 300 mm/12 inches of lift, fully extend carriage, and then retract to near halfway. Read hydraulic pressure on gauge with motor at idle speed. Pressure on gauge should be greater than 690 kPa/100 psi and less than 965 kPa/140 psi. Possible causes of a reading out of range include: F11 (motor size) set incorrectly, oil temperature out of normal operating range (4 to 82 C/40 to 180 F standard [ISO 32], -23 to 49 C/-10 to 120 F with 50/50 blend, -40 to 27 C/-40 to 80 F with 80/20 blend), steer motor not at idle during performance check or motor idle calibration, plugged filter or return line restriction.

Accessory Speed Check

Measure reach speeds using a stopwatch or similar timing device. Time to be measured from when the thumbwheel is first moved until the carriage reaches the maximum travel. Raise forks to 300 mm/12 inches of lift with carriage retracted completely. Request maximum reach with thumbwheel control and time fork movement. Time should be between 2.0 seconds and 2.5 seconds for the RR. RD time should be between 4.0 seconds and 5.0 seconds. Possible causes of a reading out of range include: Performance level 15 (P15) not set to 7, steering tiller not idle during calibration procedure, reach mechanism not reaching full extension during calibration, RV2 set too low, defective PVA, defective PCA, defective pump (P1).

Lower Speed Check

Performance Level 1 (P1) must be selected and Performance Level 1.5 (P1.5) set to 90. Measure lower speeds with forks tilted completely up. The lower speed setting should allow the fork carriage to pass through a 3 m/10 foot distance within 6.3 to 7.0 seconds. To measure this, either mark an adjacent rack or the mast for 3 m/10 feet of fork carriage movement. (Note: On a TT mast, each channel moves at a rate of approximately 2:1, or 1/2 speed of carriage movement.) With a minimum 680 kg/1500 lb. weight, raise the mast to the full raised position without contacting the mast stops. Select maximum speed lower and time the rate of descent through the previously marked 3 m/10 foot distance. The target time is 6.7 seconds with the acceptable range between 6.3 and 7.0 seconds. Possible causes of a reading out of range include: F26 maximum height not set correctly, F27 collapsed height not set correctly, F28 load backrest height not set correctly, P1 setup not selected and P1.5 lowering performance not set to 90 during calibration, defective PVH, defective PCH.

C7 Fork Position (calibrates the tilt position assist feature) – Press ↵.
C7.1 (fork dn) – tilt forks tips all the way down and press ↵. Display should show approximately 2.0 volts.
C7.2 (fork rf) – tilt forks to position required and press ↵.
C7.3 (fork up) – tilt fork tips all the way up and press ↵. Display should show approximately 4.0 volts.

If the voltages at the tilt limits are too close together, the message "Invalid/Fail" will appear. Verify condition and operation of the tilt potentiometer and condition of associated wiring prior to calibrating again.

When calibration is accepted, display will go to C9 menu level, press ↵ and select the C9.2 menu. Calibration is complete and truck can be returned to operation. If additional calibration procedures are to be performed, scroll to the appropriate menu level and continue.

C8 Raise Cutout

Fork height must be below free lift before entering this menu.

C8.1 (R cut1) - this menu level permits programming a lift cutout. If more than one cutout is to be programmed, this level must be the lower lift height and must be performed at the "override" level (C8.1.2).

C8.1.1 (none) select this level by pressing ↵, if no cutouts are required. The menu will return to the C8.1 level.

C8.1.2 (override) programs a lift cutout with override. Press ↵. The message "Lift to Limit" is displayed. Position the forks at the desired lift cutout height. Press ↵. Programming is complete and menu will return to C8.1.

C8.1.3 (stop) programs a lift cutout without override. Press ↵. The message "Lift to Limit" is displayed. Position the forks at the desired lift cutout height. Press ↵. Programming is complete and menu will return to C8.1.

C8.1.4 (escape) select this menu level by pressing ↵ if no changes are to be made.

C8.2 (R cut2) - this menu level permits programming a second lift cutout. This cutout must be at a higher lift height than C8.1.

C8.2.1 (none) select this level by pressing ↵, if this cutout is not required. The menu will return to the C8.1 level.

C8.2.2 (override) programs a lift cutout with override. Press ↵. The message "Lift to Limit" is displayed. Position the forks at the desired lift cutout height. Press ↵. Programming is complete and menu will return to C8.2.

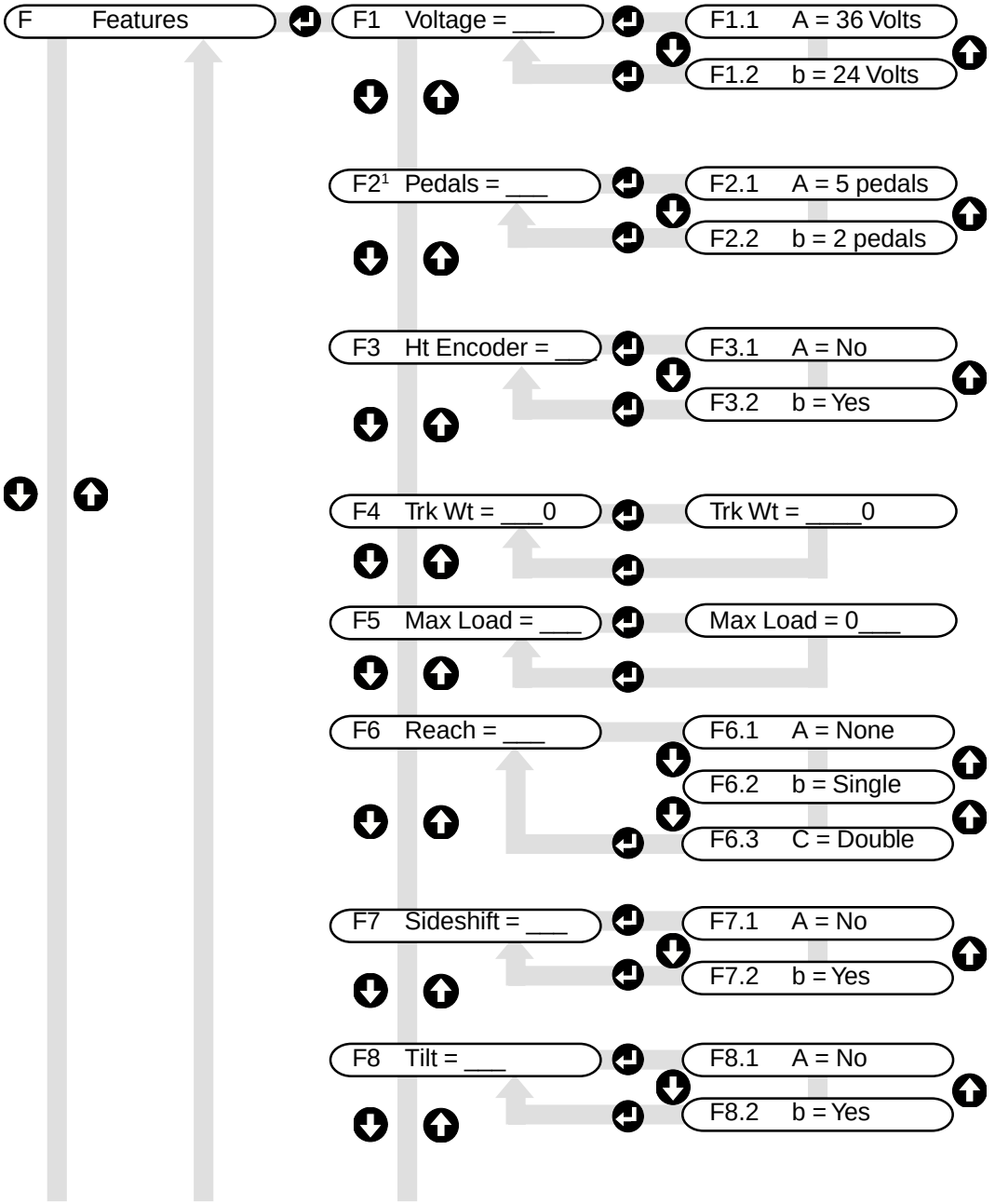
C8.2.3 (stop) programs a lift cutout without override. Press ↵. The message "Lift to Limit" is displayed. Position the forks at the desired lift cutout height. Press ↵. Programming is complete and menu will return to C8.2.

C8.2.4 (escape) select this menu level by pressing ↵ if no changes are to be made.

C8.3 (escape) select this menu level by pressing ↵ to return to the C8 menu level.

If no additional calibration procedures are to be performed, scroll to the C9 menu level, press ↵ and select C9.2. Calibration is complete and truck can be returned to operation. If additional calibration procedures are to be performed, scroll to the appropriate menu level and continue.

Press the ↵ key to move right and left in the menu and allow system to accept changes to the features. Press the ↑ and ↓ to move up and down.



Listed on truck data plate.

RR/RD 5200S

RR/RD 5200

Trucks equipped with height encoder

(With battery - From data plate)

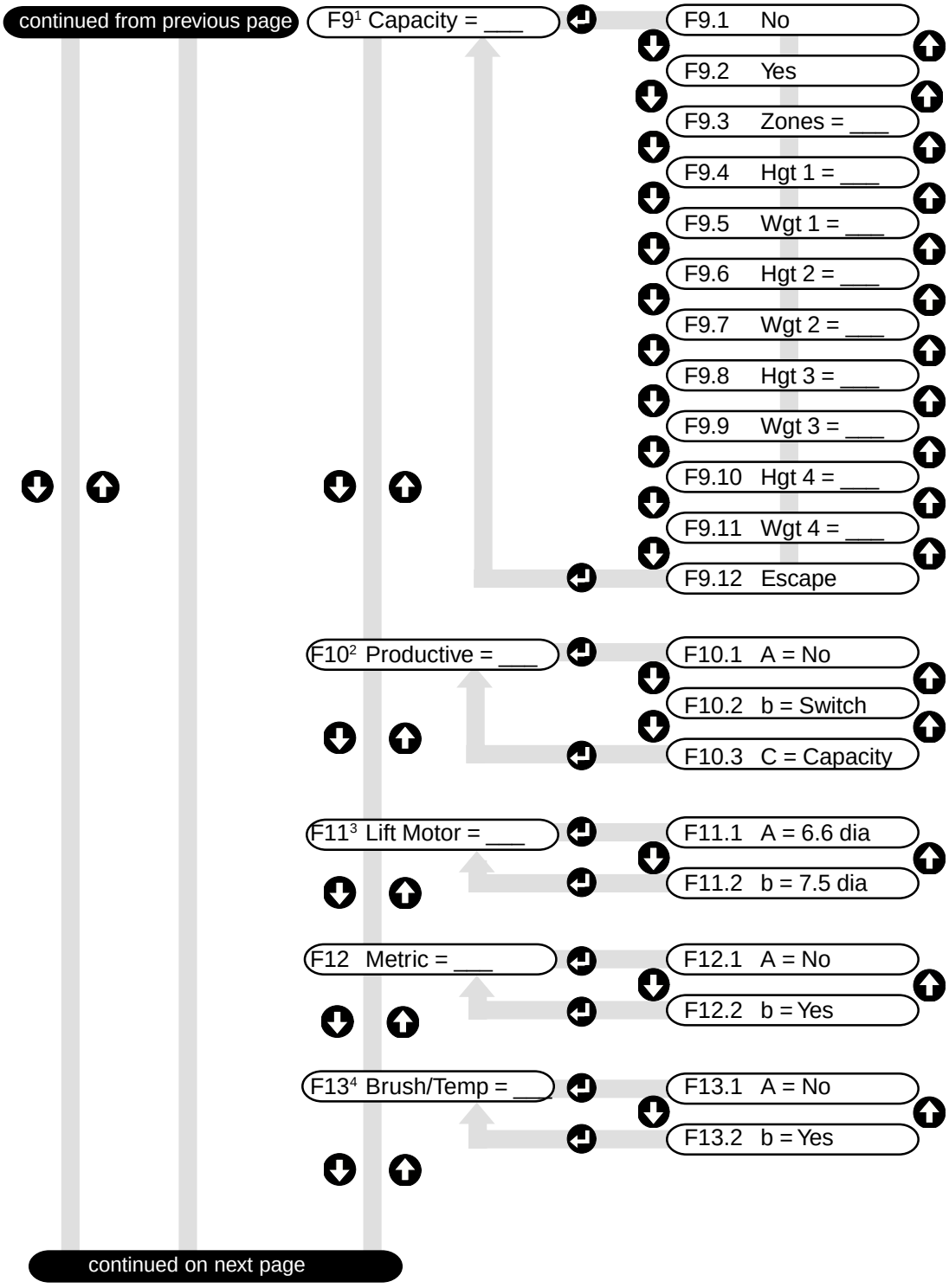
(From data plate)

RR

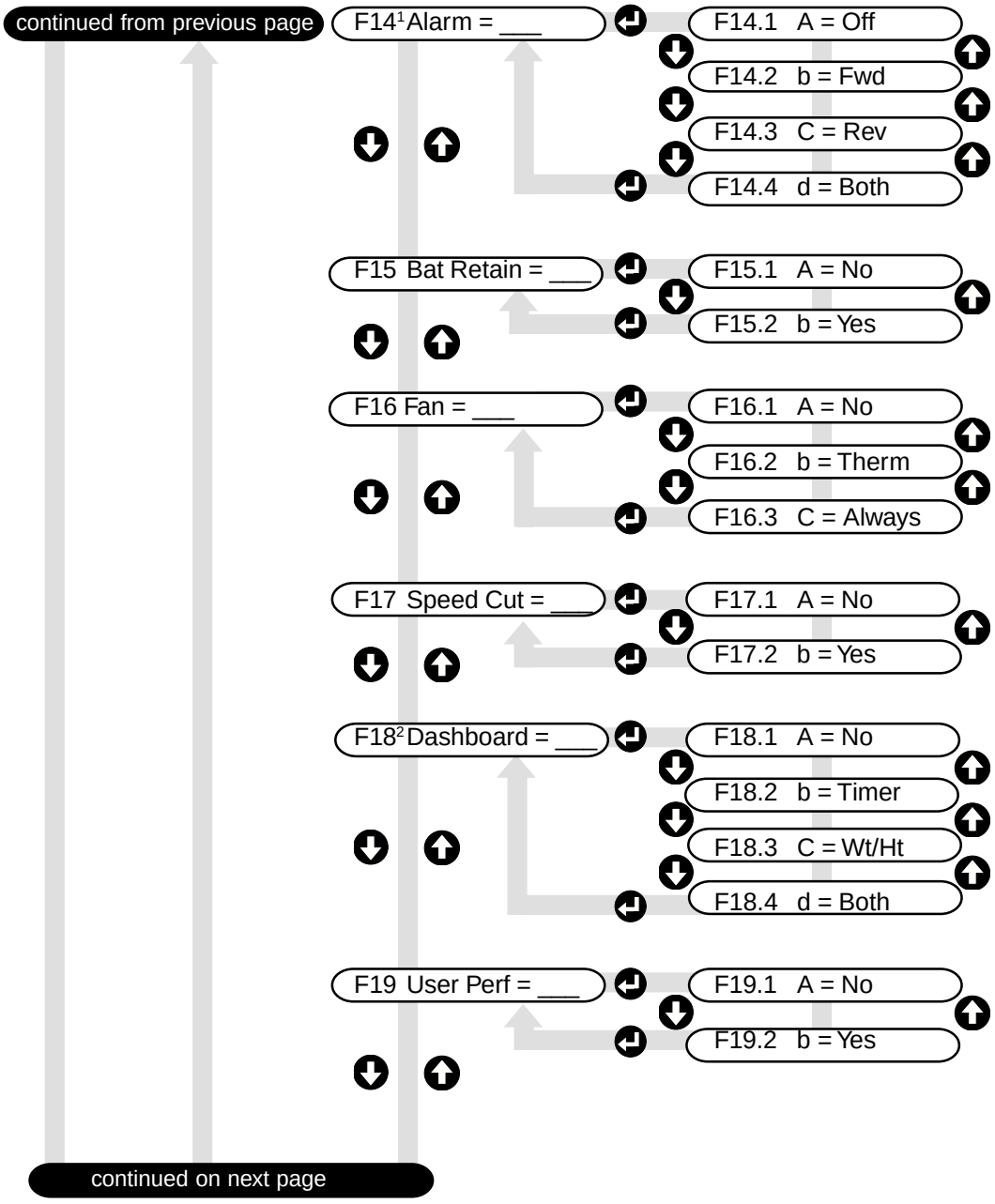
RD

continued on next page

[1] = Menu available on 36 volt trucks.

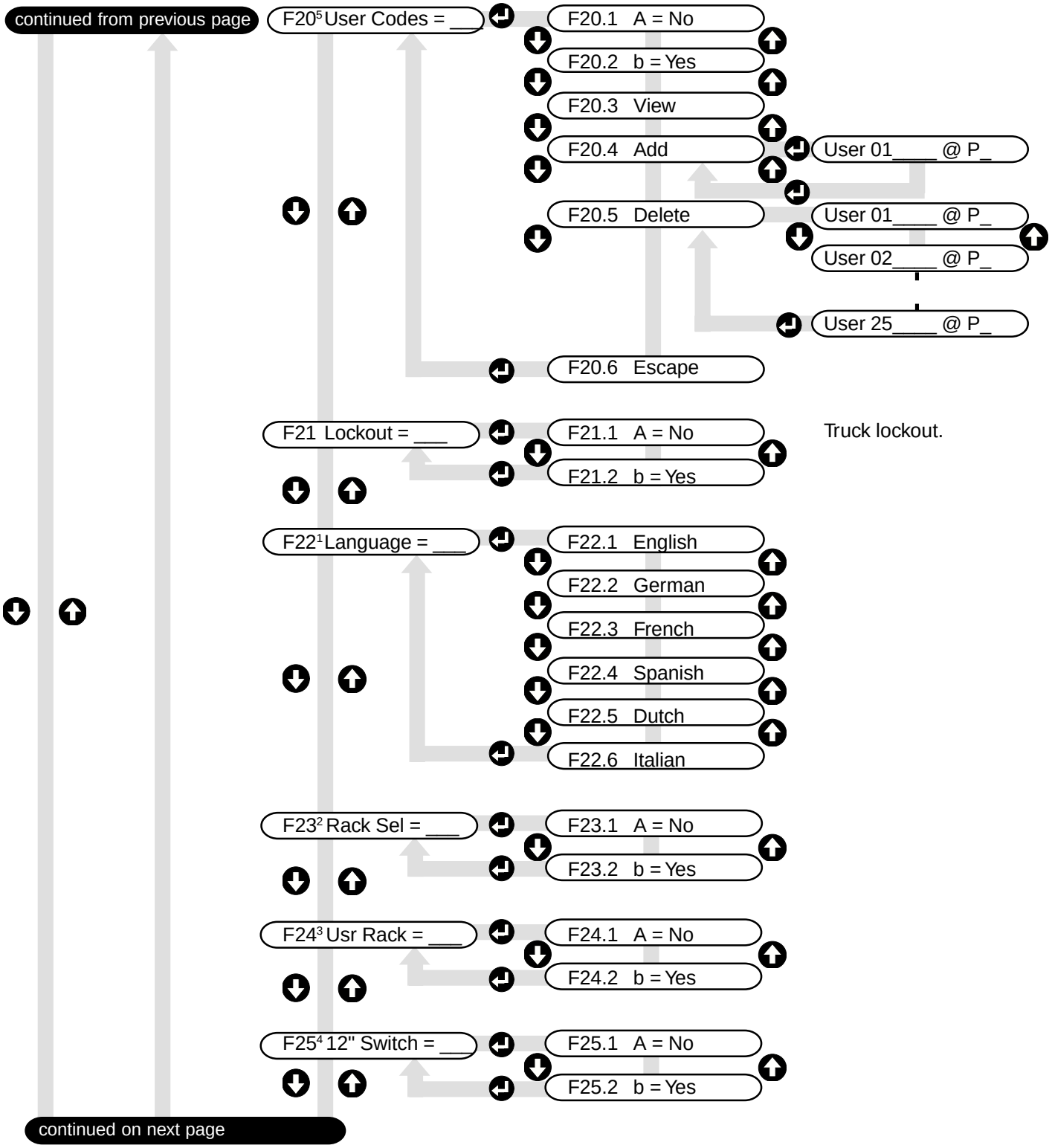


[1] = menu available on trucks with enhanced display and height sensor.
[2] = 36 volt trucks with productivity package/CDM.
[3] = available on 5200S only.
[4] = menu available on trucks with enhanced display.

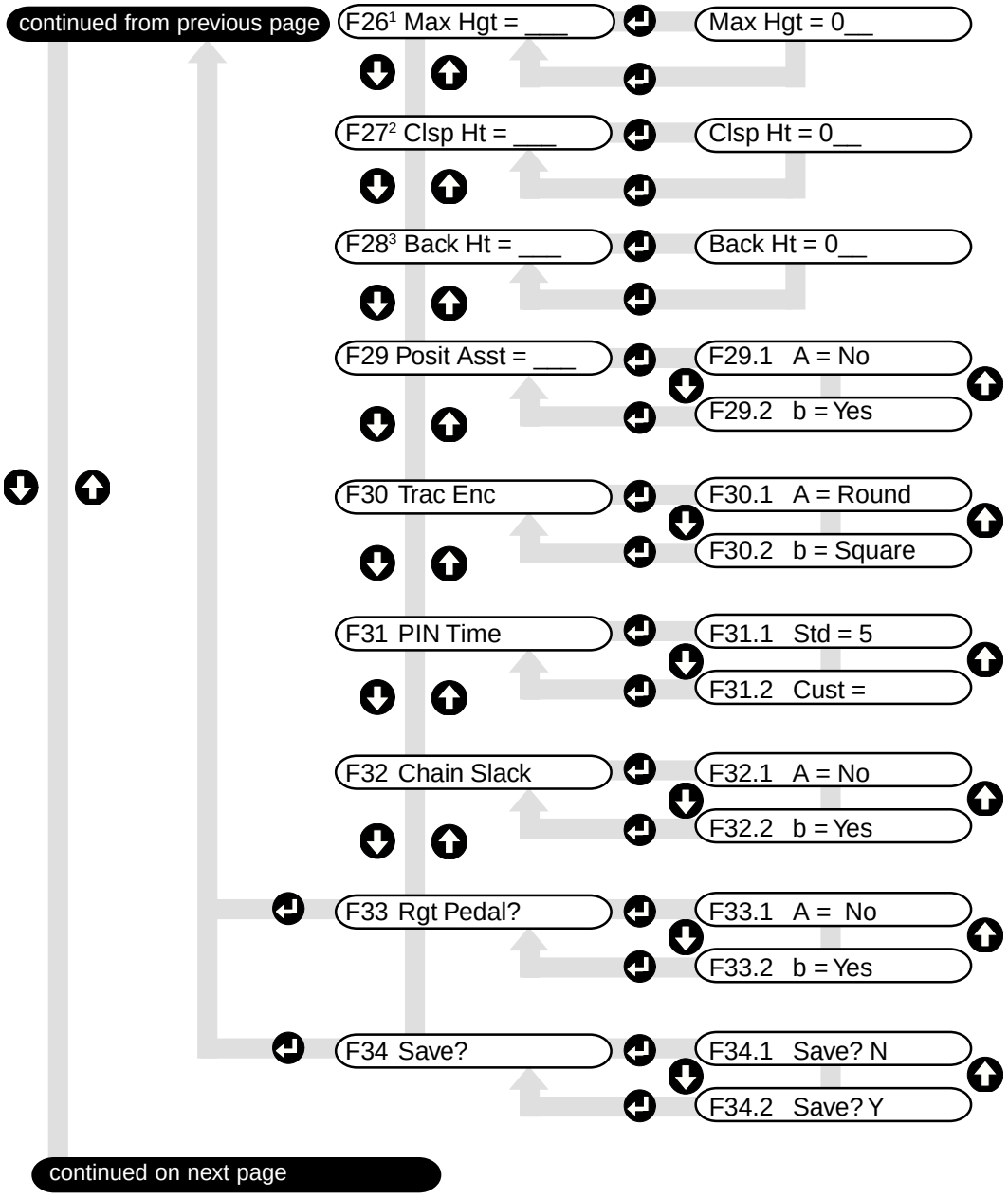


[1] = travel alarm.

[2] = menu available on trucks with enhanced display.



[1] = Menu available with enhanced display only.
[2] = Menu available with height encoder and enhanced display only. F9 CDM must be Yes.
[3] = F23 must be Yes.
[4] = Menu available only if F3 is No.
[5] = If F20 is "yes", then at least one Personal Identification Number (PIN) is required. If F19 is "yes", any user can select any performance level. The vehicle PIN timeout feature is adjustable from 2 to 20 minutes, in 1 minute increments, through F31 menu.



Note: Do not operate vehicle during the "save" operation or values may get corrupted.

[1] Enter lift height as shown on truck nameplate or if the overhead height at the installation site is less than that on the nameplate, enter the maximum allowable lift height in inches.

[2] If the lift height entered in F26 is a "standard" lift height, this will auto fill with the correct collapsed height. If lift height is a "special", this will default to the Max Hgt, measure collapsed height and enter here.

[3] Defaults to 1.2 m/48 inches. Measure backrest height from top of forks to top of backrest and enter here.

The feature menu is shown on the following pages. The first level of the menu shows the different areas of setup for the truck.

Features Access

When powering up the truck, press and maintain ↑ on the display, then enter the service code. This enters service level two of Access 1 operation. Navigate to the F - Features menu and press ↵. The message display now displays the message shown in the following menu.

The "**•**" marks the highest levels of the features (F) menu.

- **F1** **Voltage = __**
  The current selected truck voltage is displayed. If voltage is correct, press ↓ to access F2. If voltage displayed is incorrect, press ↵ to access F1.1.
  - **F1.1** **A = 36 volts**
    Press ↵ if truck has a 36 volt electrical system. The menu will return to F1. If truck has a 24 volt electrical system, press ↓ to access F1.2.
  - **F1.2** **b = 24 volts**
    Press ↵ if truck has a 24 volt electrical system. The menu will return to F1.

- **F2** **Pedals = __**
  The current selection is displayed. "B" for 5200 truck and "A" for 5200S truck. If selection is correct press ↓ to access F3. If selection is incorrect, press ↵ to access F2.1.
  - **F2.1** **A = 5 pedals**
    On 5200S trucks press ↵ at this menu level. The menu will return to F2. If truck is a 5200, press ↓ to access F2.2.
  - **F2.2** **b = 2 pedals**
    On 5200 trucks, press ↵ at this menu level. The menu will return to F2.

- **F3** **Ht Encoder = __**
  The current selection is displayed. If the correct message is displayed, "B" for trucks equipped with height encoder and "A" for trucks not equipped with height encoder, press ↓ to access F4. If the setting must be changed, press ↵ to access F3.1.
  - **F3.1** **A = No**
    Press ↵ if truck is not equipped with height encoder. The display will return to the F3 menu. If truck is equipped with height encoder, press ↵ to access F3.2.
  - **F3.2** **b = yes**
    Press ↵ if truck is equipped with height encoder. The display will return to the F3 menu.

- **F4** **Trk Wt = __**
  The current truck weight is displayed. If displayed weight is incorrect, press ↵. Enter truck weight with battery and without load from data plate. Press ↵ to change/modify truck weight. Then use ↓ and ↑ to select the remaining digits.
  Note: The fifth digit (zero) is permanent and unchangable on the enhanced display. On the standard display the fifth digit (zero) is hidden from view. For example:

Standard Display	Enhanced Display
0650	06500

  To enter a Trk Wt 13640 lbs, you would enter 1364.

Standard Display	Enhanced Display
1250	12500

  Press ↵ to accept input and return to F4.
  Press ↓ to access F5.

- **F5** **Max Load = __**
  Enter maximum capacity load from data plate. Press ↵ to change/modify Max Load. Then use the ↓ and ↑ to select the first digit. Press ↵ to move to the second digit. Use these steps to set the remaining digits. Press ↵ to accept input and return to F5. Press ↓ to access F6.

- **F6** **Reach = __**
  If the correct configuration is displayed for your truck, "B" for RR and "C" for RD, press ↓ to access F7. If necessary to change, press ↵ to access F6.1.
  - **F6.1** **A = None**
    If truck is not equipped with a reach mechanism, press ↵. Display will return to F6. If this is not the correct selection, press ↓ to access F6.2.
  - **F6.2** **b = Single**
    On RR trucks, press ↵. The display will return to the F6 menu. If truck is not an RR, press ↓ to access F6.3.
  - **F6.3** **c = Double**
    On RD trucks, press ↵. The display will return to the F6 menu.

- **F7 Sideshift = __**
  The current selection is displayed ("B" for trucks equipped with sideshifter, "A" for trucks not equipped with sideshifter). If selection is correct for truck, press ↓ to access F8. If selection is not correct, press ↵ to access F7.1.

  F7.1 A = No
  On trucks not equipped with sideshifter, press ↵. The display will return to the F7 menu. If truck is equipped with sideshifter, press ↓ to access F7.2.

  F7.2 b = Yes
  Trucks equipped with sideshifter, press ↵. The display will return to F7.

- **F8 Tilt = __**
  The current selection is displayed ("B" for trucks equipped with tilt, "A" for trucks not equipped with tilt). If selection is correct for truck, press ↓ to access F9. If selection is not correct, press ↵ to access F8.1.

  F8.1 A = No
  On trucks not equipped with tilt, press ↵. The display will return to the F8 menu. If truck is equipped with tilt, press ↓ to access F8.2.

  F8.2 b = Yes
  Trucks equipped with tilt, press ↵. The display will return to F8.

- **F9 Capacity = __**
  If truck is equipped with a capacity data monitor the display should show "B". Trucks not equipped with capacity data monitor should be "A". If message is correct, press ↓ to access F10. If message needs to be changed, press ↵.

  F9.1 A = No
  If truck is not equipped with capacity data monitor, press ↵. Display will return to F9. If this is not the correct choice press ↓ to access F9.2.

  F9.2 B = Yes
  On trucks equipped with capacity data monitor, press ↵. Display will return to F9.

  F9.3 Zones = __
  Enter the number of zones. This number is the number of spaces filled in on the capacity data plate. When entered press ↓.

  F9.4 Height 1 = __
  If the value displayed is not the first (highest) height listed on the capacity data plate, enter the correct value. Press ↓.

  F9.5 Weight 1 = __
  If the value displayed is not the first (lowest) weight listed on the capacity data plate, enter the correct value. Press ↓.

  F9.6 Height 2 = __
  If the value displayed is not the second height listed on the capacity data plate, enter the correct value. Press ↓.

  F9.7 Weight 2 = __
  If the value displayed is not the second weight listed on the capacity data plate, enter the correct value. Press ↓.

  F9.8 Height 3 = __
  If the value displayed is not the third height listed on the capacity data plate, enter the correct value. Press ↓.

  F9.9 Weight 3 = __
  If the value displayed is not the third weight listed on the capacity data plate, enter the correct value. Press ↓.

  F9.10 Height 4 = __
  If the value displayed is not the fourth (lowest) height listed on the capacity data plate, enter the correct value. Press ↓.

  F9.11 Weight 4 = __
  If the value displayed is not the fourth (greatest) weight listed on the capacity data plate, enter the correct value. Press ↓.

  F9.12 Escape
  When all values have been entered, press ↵. The display will return to F9.

- **F10 Productive = __**
  The current selection will be displayed. Message "A" is displayed if truck is not equipped with the productivity package/capacity data monitor. Message "B" is displayed if truck is equipped with productivity package and pressure switch on the tilt cylinder. Message "C" is displayed on trucks equipped with Capacity Data Monitor and pressure transducer on the tilt cylinder. If the incorrect selection is present, press ↵ to access F10.1

  F10.1 A = No
  If truck is not equipped with the optional Productivity Package or Capacity Data Monitor, press ↵ to select "no" and return to menu F10. If truck is equipped with one of these options press ↓ to access F10.2.

  F10.2 b = Switch
  Press ↵ at this level if truck is equipped with the Productivity Package. Display will return to menu F10. If this is not the option on the truck, press ↓ to access F10.3.

  F10.3 C = Capacity
  Press ↵ if truck is equipped with the Capacity Data Monitor. Display will return to menu F10.

- **F11 Lift Motor = __**
  This menu is available only on 5200S trucks. The current selection is displayed. If selection is incorrect, press ↵ to access F11.1.

  F11.1 A = 168 mm/6.6 inch diameter
  Press ↵ if truck is not equipped with the high performance lift motors. If truck is equipped with this option, press ↓.

  F11.2 b = 190 mm/7.5 inch diameter
  Press ↵ if truck is equipped with the high performance lift motors. The display will return to menu F11.

- **F12 Metric = __**
  If message is "B", a conversion of weight, height and speed measurements to metric units will be present in messages on the display. The message "A" will display measurements in U.S. units. If selection needs to be changed, press ↵ to access F12.1.

  F12.1 A = No
  When units of measurement are to be U.S., press ↵ at this menu level. The display will return to F12. To change units of measurement, press ↓ to access F12.2.

  F12.2 b = Yes
  Press ↵ if units of measurements displayed are to be in metric units. Display will return to F12.

- **F13 Brush/Temp = __**
  This menu is available only on trucks equipped with an enhanced display. If message is "B" truck must be equipped with brush wear and temperature sensors in the traction and lift motors. Without sensors, message is "A". To change message, press ↵ to access F13.1.

  F13.1 A = No
  If truck is not equipped with brush wear and temperature sensors in the traction and lift motors, press ↵. Display will return to menu F13. If this selection is not wanted, press ↓ to access F13.2.

  F13.2 b = Yes
  Press ↵ if truck is equipped with brush wear and temperature sensors in the traction and lift motors. The display will return to menu F13.

- **F14 Alarm = __**
  The current alarm configuration will be displayed. A travel alarm selection is required if truck is equipped with alarm 2. "A" is displayed if alarm is disabled. "B" is displayed when alarm in forward direction of travel (forks first) is enabled. "C" is displayed when alarm in reverse direction of travel (power unit first) is enabled. "Both" is displayed when both forward and reverse alarms are enabled. To change selection, press ↵ to access F14.1.

  F14.1 A = Off
  Press ↵ if truck is not equipped with alarm2. Display will return to F14. To change selection, press ↓ to access F14.2.

  F14.2 b = Fwd
  Pressing ↵ at this menu level will activate the travel alarm when traveling in the forward (forks first) direction. The display will return to F14. To make different selection, press ↓ to access menu F14.3.

  F14.3 C = Rev
  Pressing ↵ at this menu level will activate the travel alarm when traveling in the reverse (power unit first) direction. The display will return to F14. To make different selection, press ↓ to access menu F14.4.

  F14.4 d = Both
  Pressing ↵ at this menu level will activate the travel alarm when traveling in both the forward (forks first) and reverse (power unit first) direction. The display will return to F14.

- **F15 Bat Retain = __**
  The current selection is displayed. Trucks without battery retainer switches should have the message "A" and trucks with battery retainer switches should display the message "B". To change the setup, press ↵.

  F15.1 A = No
  Press ↵ to make selection for trucks without battery retainer switches. The display will return to F15. Press ↓ to access F15.2.

  F15.2 b = Yes
  Press ↵ at this menu level when truck is equipped with battery retainer switches. The display will return to F15.

- **F16 Fan = __**
  Used to control drive motor compartment fan. Trucks without motor compartment fan should display message "A" and trucks with motor compartment fan should display message "b" or "C". Select "b" to enable the thermally controlled drive motor compartment fan feature. When enabled, the fan will only operate when motor compartment reaches predetermined temperature. Select "C" to enable the always on drive motor compartment fan feature. To change the setup, press ↵.

  F16.1 A = No (no fan)
  Press ↵ to make this feature disbled. Display will return to F16. If desired to enable feature, press ↓ to access F16.2.

  F16.2 b = Therm (thermally controlled)
  Press ↵ to enable the thermally controlled drive motor compartment fan feature. Display will return to F16. If desired not to select this feature, press ↓ to access F16.3.

  F16.3 C = Always (fan always on)
  Press ↵ to enable the always on drive motor compartment fan feature. The fan will operate at all times when the truck is powered up. Display will return to F16.

- **F17 Speed Cut = __ (reduction input [special])**
  When current status is "B" a switch input at CA403-16 is required. Adjustment range between 0.0 to 2.6 Kph (0.0 to 1.6 MPH). To change setting, press ↵ to access F17.1.

  F17.1 A = No
  Press ↵ to make this feature disabled. Display will return to F17. If desired to enable feature, press ↓ to access F17.2.

  F17.2 b = Yes
  Press ↵ to enable the speed cut out feature. Display will return to F17.

- **F18 Dashboard = __**
  This menu level is available on trucks with an enhanced display. The current selection is displayed. Activating makes selected items available on operator menu. Message "A" will have none of the options available. "B" makes a stopwatch type timer available to the operator. "C" requires a height encoder for height and the Capacity Data Monitor for weight. To change selection, press ↵ to access F18.1.

  F18.1 A = No
  To make none of the enhancements available to the operator, press ↵. The display will return to F18. To enable either or both enhancements, press ↓ to access F18.2.

  F18.2 b = Timer
  Press ↵ to make a stopwatch style timer only available in the operator menu. For a different selection, press ↓.

  F18.3 C = Wt/Ht
  To view the fork height in the operator menu, the height sensor must be installed on the truck. To view the load weight in the operator menu, the capacity data monitor must be installed. To make this enhancement active, press ↵. The display will return to F18. To make all enhancements active, press ↓ to access F18.4.

  F18.4 d = Both
  Pressing ↵ will make all enhancements in F18 active. The display will return to F18.

- **F19 User Perf = __**
  The current selection is displayed. If "b" is message displayed, any user can select any performance level (P1, P2, P3) regardless of F20 settings. If message displayed is "A", operator user code will enable only the performance level assigned to the code. To change the current setting, press ↵ to access F19.1.

  F19.1 A = No
  Press ↵ to make the performance levels accessible only through use of a user code. To make all performance levels available to all operators, press ↓ to access F19.2.

  F19.2 b = yes
  Press ↵ to make performance levels available to all operators. Display will return to F19.

- **F20 User Codes = __**
  Use this menu level to enter up to 25 user codes which can be applied to various performance levels. If F19 is **b**, any user can select any performance level. If it is desired to enable this feature and enter user codes, press ↵ to access F20.1. The vehicle PIN timeout feature is adjustable with times ranging from 2 to 20 minutes, in 1 minute increments, through the F31 menu.

  F20.1 A = No
  Pressing ↵ at this menu level will disable the user code option and return the display to F20. To continue, press ↓ to access F20.2

  F20.2 b = Yes
  To enable this feature, press ↵. Dislpay will return to F20. Press ↓ to advance to the F20.3 menu.

  F20.3 C = View
  To view all codes entered in the system, press ↵. To move forward and backward through the codes, press ↑ and ↓. To advance to F20.4, press ↵ to return to F20.3 and then use ↓.

F20.4 Add

To add user codes, press ↵. A prompt (User _ _ _ _ @ P _) for entering a four digit number and the assigned performance level will appear. Enter the desired code and performance level and press ↵. The display will return to F20.4. If additional codes are to be added, repeat process described. Press ↓ to access F20.5.

F20.5 Delete

To delete any of the user codes, press ↵. The available codes can be scrolled through with ↑ and ↓ until the desired code is displayed. To delete, press ↵. The display will return to F20.5. To delete additional codes repeat process described. Press ↓ to access F20.6.

F20.6 escape

When done in the user code sub menu, press ↵ to return to F20.

- **F21 Lockout = __**

Current status of truck operation lockout displayed. Message "A" indicates truck is not disabled. Message "B" indicates truck operation is disabled. To change status of this feature press ↵ to access F21.1.

F21.1 A = No

If truck is disabled and it is desired to enable operation, press ↵. The display will return to menu F21. If it is desired to disable truck operation, press ↓ to access F21.2.

F21.2 b = Yes

To disable truck operation, press ↵. Display will return to menu F21.

- **F22 Language = __**

Not available on standard display. This menu level enables selection of desired language for Level 1 display messages. If language change is desired, press ↵ to access F22.1.

F22.1 English

To select, press ↵. Display will return to F22. For different language, press ↓ to access F22.2.

F22.2 German

To select, press ↵. Display will return to F22. For different language, press ↓ to access F22.3.

F22.3 French

To select, press ↵. Display will return to F22. For different language, press ↓ to access F22.4.

F22.4 Spanish

To select, press ↵. Display will return to F22. For different language, press ↓ to access F22.5.

F22.5 Dutch

To select, press ↵. Display will return to F22. For different language, press ↓ to access F22.6.

F22.6 Italian

To select, press ↵. Display will return to F22.

- **F23 Rack Sel = ___**

Menu available only if truck is equipped with a height sensor and enhanced display. F9 CDM must be set to "Yes". Current status of rack select option displayed. Message "B" indicates that the rack select option is enabled. Message "A" indicates that the rack select option is disabled. To change status of this feature press ↵ to access F23.1.

F23.1 A = No

To disable this feature, press ↵. Display will return to menu F23. To enable this feature press ↓ to access 23.2.

F23.2 b = Yes

If this feature is disabled and it is desired to enable, press ↵. The display will return to menu F23. If this feature is enabled and it is desired to disable, press ↓ to access F23.1.

- **F24 Usr Rack = ___**

F23 must be Yes for this menu to be available. Current status of user rack option displayed. Message "B" indicates that the user rack option is enabled. Message "A" indicates that the user rack option is disabled. To change status of this feature press ↵ to access F24.1.

NOTE: To program the label and height selections for the F23 Rack Select feature, F24 Usr Rack must be enabled. When programming is complete, the system can be protected from unauthorized changes by now disabling F24 Usr Rack. The Rack Select feature will still be enabled and usable.

F24.1 A = No

To disable this feature, press ↵. Display will return to menu F24. To enable this feature press ↓ to access 24.2.

F24.2 b = Yes

If this feature is disabled and it is desired to enable, press ↵. The display will return to menu F24. If this feature is enabled and it is desired to disable, press ↓ to access F24.1.

- **F25 12" Switch = ___**
  Menu available only if F3 height encoder is "No". Current status of 12 inch switch feature displayed. Message "B" indicates that the truck is equipped with a switch that indicates forks are 300 mm/12 inches from maximum lift height. Message "A" indicates that the truck is not equipped with a 12 inch switch that indicates forks are 300 mm/12 inches from maximum lift height. To change status of this feature press ↵ to access F25.1.

  F25.1 A = No
  To disable this feature, press ↵. Display will return to menu F25.

  F25.2 b = Yes
  If truck is equipped with a 12 inch switch, press ↵. The display will return to menu F25. If the truck is not equipped with a 12 inch switch, press ↓ to access F25.2.

- **F26 Max Hgt = ___**
  Note: If feature F12 Metric is yes (b), enter height in centimeters.
  The current lift height programmed is displayed. If the displayed height is incorrect when compared to lift height marked on truck nameplate, press ↵ to modify/change setting. Use ↑ and ↓ to select the digit indicated. After each digit, press ↵ to advance to next digit. When correct height is entered, press ↵ to return to menu F27.

- **F27 Clsp Ht = ___**
  Note: If feature F12 Metric is yes (b), enter height in centimeters.
  The current collapsed height programmed is displayed. If the lift height entered in menu F26 is a standard lift height, this will auto-fill with the correct collapsed height. When a non-standard lift height is entered in F26, this will default to the maximum lift height value available. If necessary, measure the collapsed height of the truck and enter in cm/inches. Use the ↵ key to advance to next digit and use the ↑ and ↓ keys to scroll to the correct digit in the indicated position. When data is entered, press ↵ to return to menu F28.

- **F28 Back Ht = ___**
  The current load backrest height programmed is displayed. Load backrest height is measured from the top of the forks to the top of the load backrest. Enter this measurement in cm/inches. Use the ↵ key to advance to next digit and use the ↑ and ↓ keys to scroll to the correct digit in the indicated position. When data is entered, press ↵ to access menu F29.

- **F29 Posit Asst = ___ (TPA [Tilt Position Assist])**
  The current status of this feature is displayed. Truck must be equipped with a tilt position assist module to use this feature. If it is desired to change the status of this feature, press ↵ to access F29.1.

  F29.1 A = No
  To disable this feature, press ↵. Display will return to menu F29.

  F29.2 b = Yes
  If truck is equipped with a tilt position assist module, press ↵. The display will return to menu F29. If the truck is not equipped with a tilt position assist module, press ↑ to access menu F29.1.

- **F30 Trac Enc = ___** (ECR1)
  Traction encoder type, round or square can be chosen from the menu. This menu is set to automatically default to the round style encoder. Press ↵ to access menu F30.1.

  F30.1 A = Round
  If truck is equipped with the round style, sensor bearing, encoder press ↵ to return to menu F30. Press ↓ to access F30.2 menu.

  F30.2 b = Square
  If truck is equipped with square encoder, press ↵ to return to menu F30.

- **F31 Oper PIN Timeout**
  Entering this menu will allow the operator to accept the standard PIN timeout of 5 minutes, or to select from 2 to 20 minute timeout, in 1 minute increments.

  F31.1 Std = 5
  The standard PIN timeout is 5 minutes, if this is acceptable press ↵ to return to menu F31, or press ↓ to set custom time.

  F31.2 Cust = __
  If a custom time is desired, from 2 to 20 minutes in 1 minute increments, set time and press ↵ to return to menu F31.

- **F32 Chn Slack = Chain Slack Feature**
  Entering this menu allows you to turn on and off the Chain Slack Feature. The Chain Slack Feature is designed to detect lift chain slack while lowering. Chain slack switch and hardware is required for this feature to work. If chain slack is detected, lower function is stopped, which will limit the amount of chain slack. At the same time, statue alarm (ALM1) will be sounded and the message "chain slack" will be displayed along with the operator error icon. Travel and Raise are not effected, lowering will not be allowed until the chain slack situation is corrected. The Current Status of this Feature is displayed, if it is desired to change the status of this feature, press ↵ to access F32.1.

  F32.1 A=No
  To disable this feature, press ↵. Display will return to F32. Press ↓ to access F32.2.

  F32.2 B=Yes
  After feature is enabled, as desired, press ↵ to return to menu F32.

- **F33 Rgt. Pedal?**
  When software is enabled, allows operator to reposition right foot on pedal without travel interruption.

  F33.1 A=No
  Enables right pedal feature. Press ↵ to return to F33, or ↓ to access F33.2 menu.

  F33.2 b=yes
  Disables right pedal feature. Press ↵ to return to F33 menu.

NOTE

The right pedal feature can be enabled or disabled on any RR/RD 5000 or 5200 series truck regardless of floorboard style.

- **F34 Save?**
  Entering this menu level permits saving the changes made or discarding changes and returning to the previously saved feature parameters. Press ↵ to access F33.1.

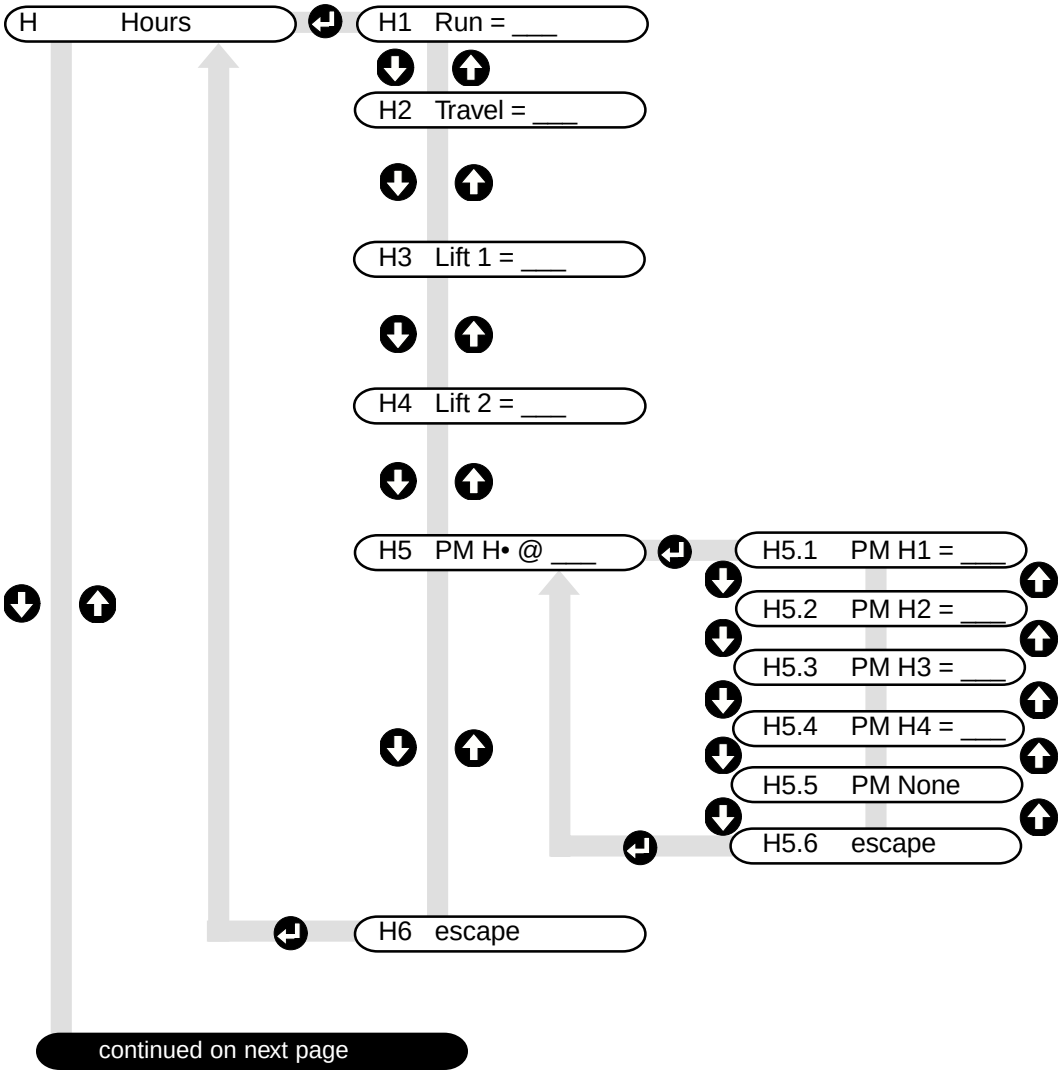
  F34.1 Save? N
  Press ↵ at this menu level to discard any changes made and return to previously saved feature parameters. Press ↓ to access the F33.2 menu.

  F34.2 Save? Y
  Press ↵ at this menu level to save changes made. During the save process, do not operate any truck controls to avoid corrupting data being saved. When data is saved, the system will return to the F menu.

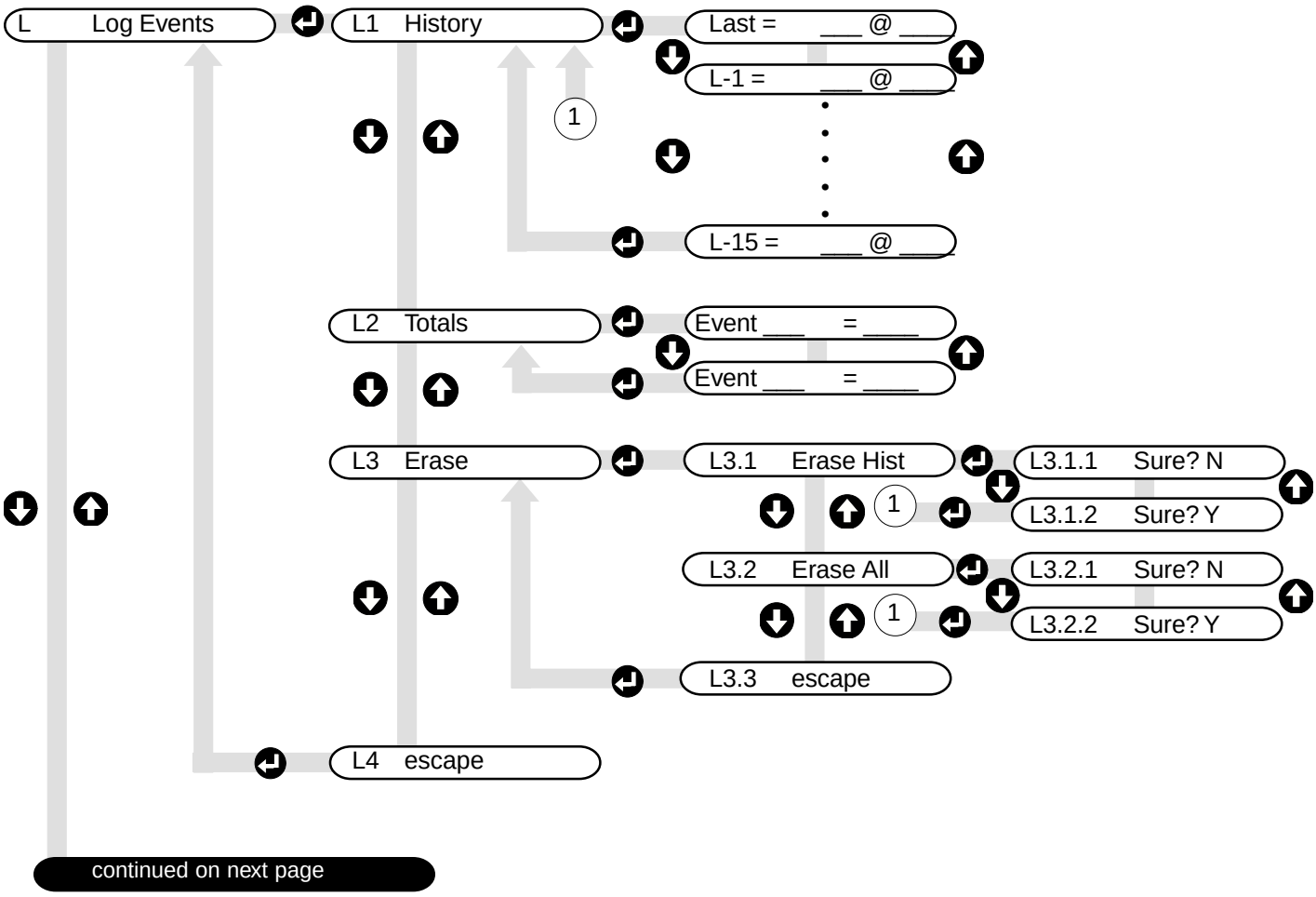
Features Complete

When setup procedures are complete, scroll down to the Save? (F33) menu and press ↵. If the setup completed is necessary to save into memory for future truck operation, select the Save? Y (F33.2) menu and press ↵. This process will require less than a minute to complete. Do not operate any truck controls or display keys during this process.

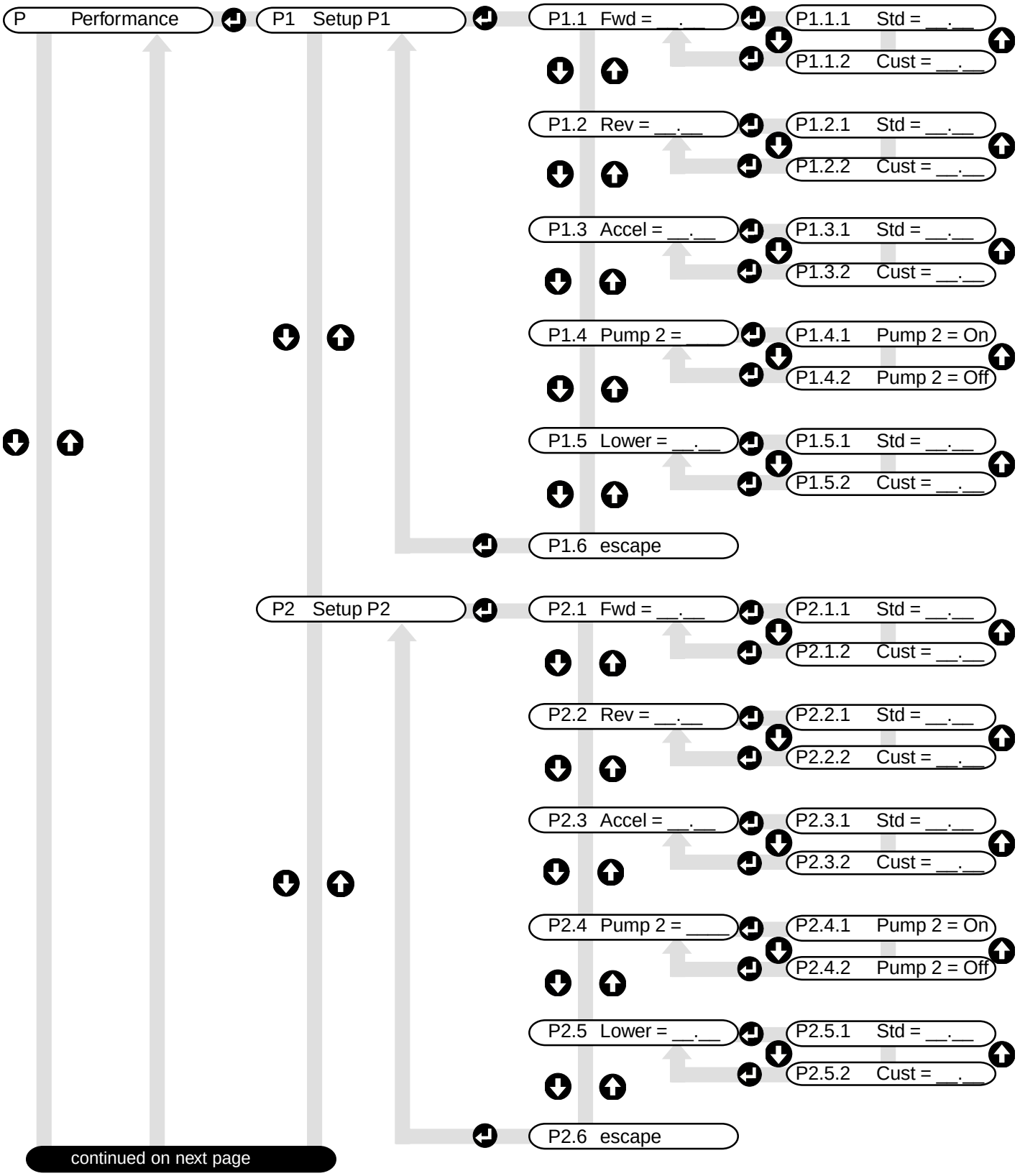
Press the ↵ key to move right and left in the menu and allow system to accept changes to the hour reset menu. Press the ↑ and ↓ to move up and down.



Press the ↵ key to move right and left in the menu and allow system to accept changes to the log events menu. Press the ↑ and ↓ to move up and down.



Press the ↵ key to move right and left in the menu and allow system to accept changes to the performance menu. Press the ↑ and ↓ to move up and down.



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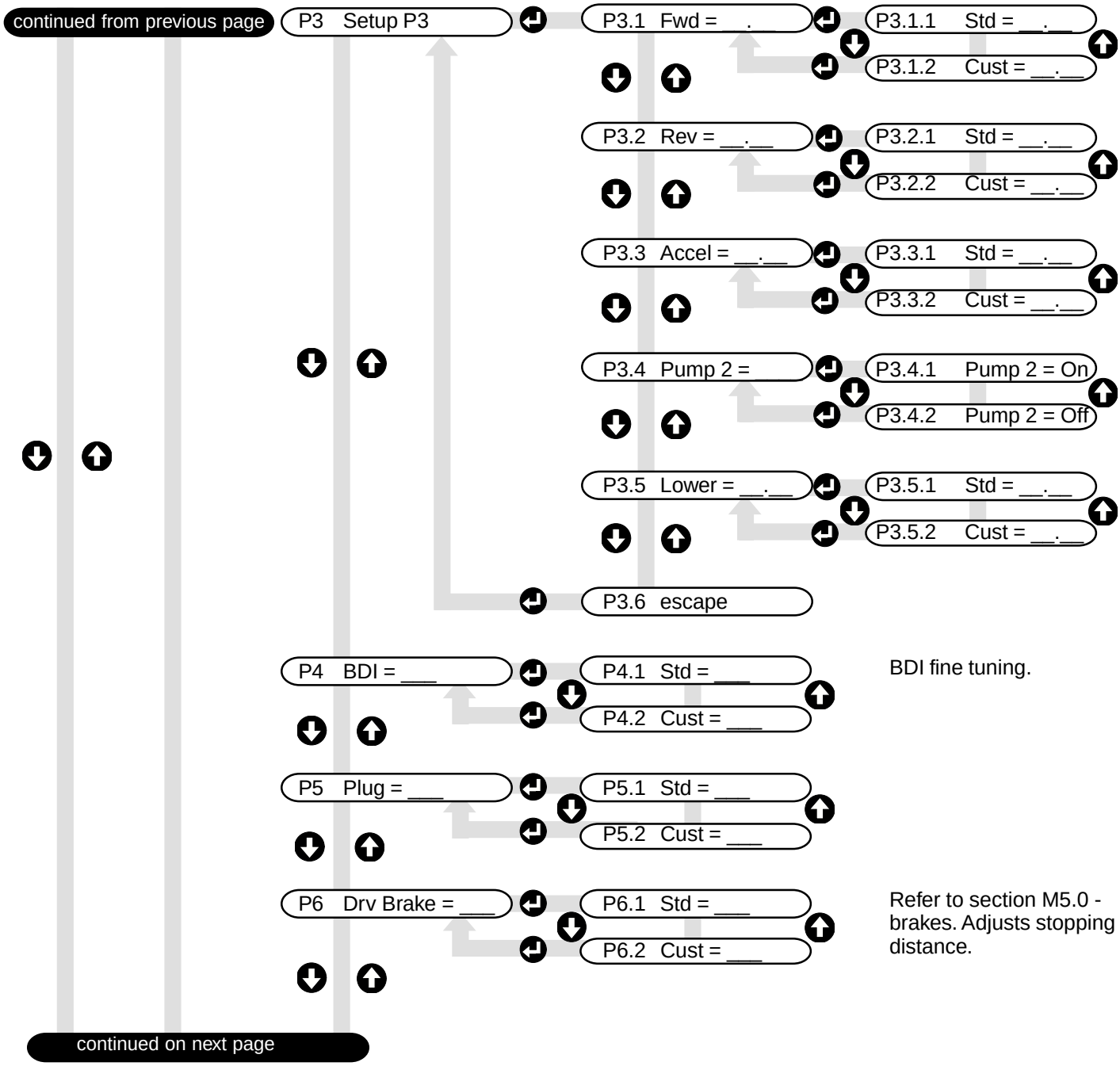
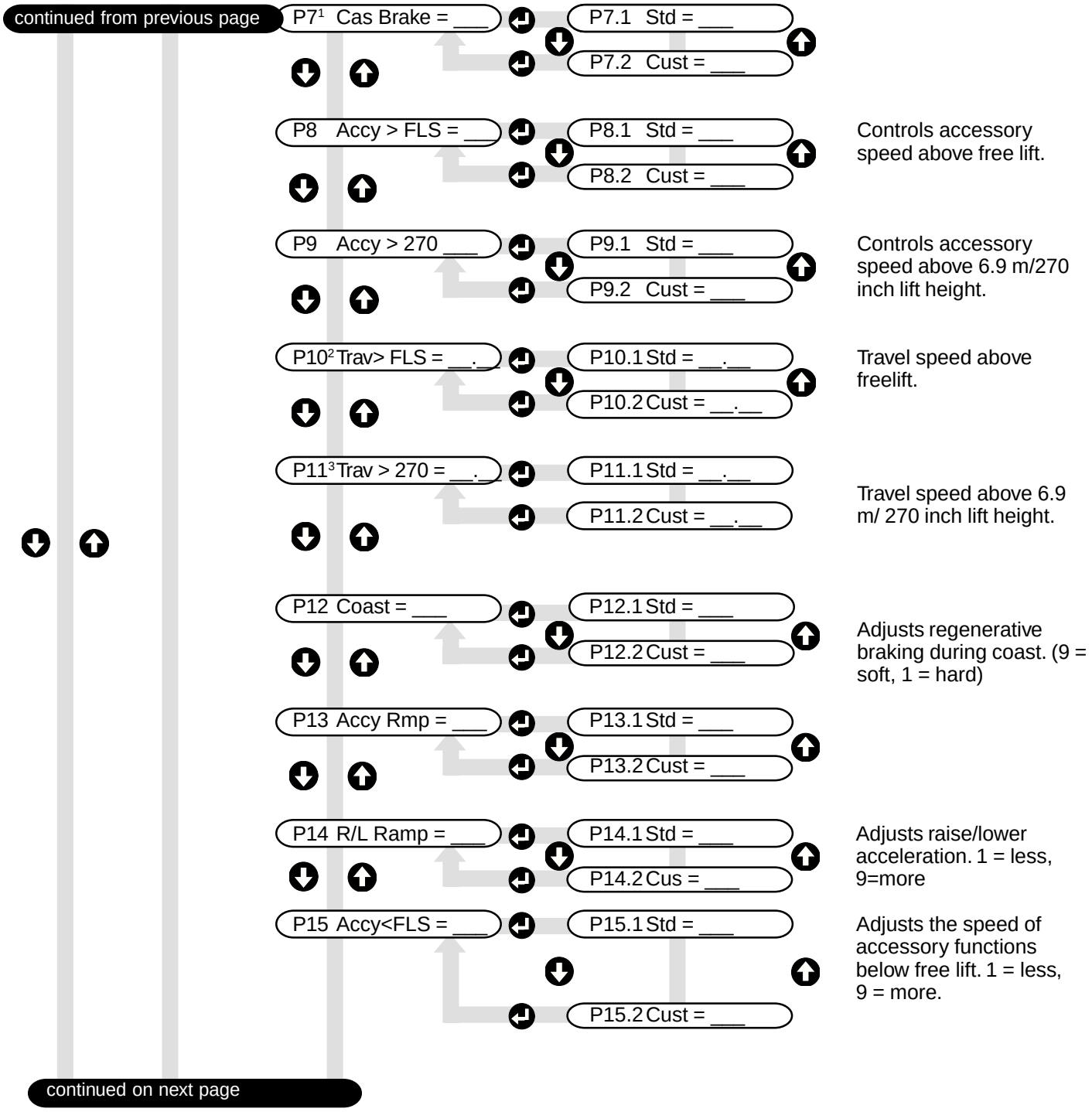
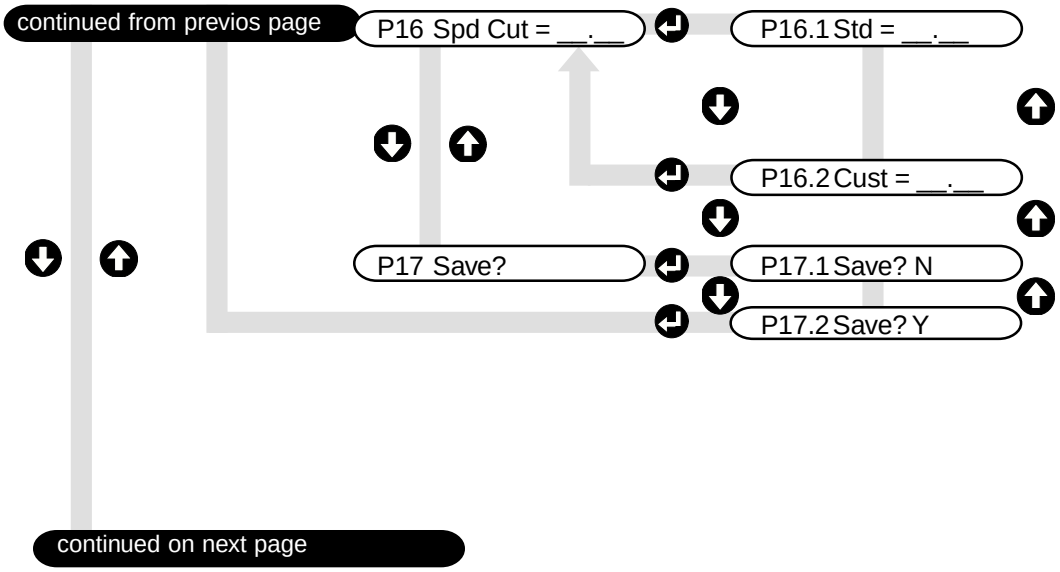




[1] = available on 5200S.

[2] = requires P1, P2 and P3 setups. Cannot be set higher than the lowest forward and reverse speed setting in P1, P2, P3 setups.

[3] = menu available on trucks equipped with height sensor only. Requires P1, P2 and P3 setups. Cannot be set higher than the lowest forward and reverse speed setting in P1, P2, P3 setups.



Adjustable from 0 kph/mph to maximum forward speed based on (p1.1) in the performance menu. Requires switch input at CA403-16 of Access 3.

The first level of the menu shows the different areas of performance for this truck. The Features must be set prior to setting Performance since Features turns on and off certain Performance levels.

Performance Access

When powering up the truck, press and maintain ↑ on the display, then enter the service code. This enters service level two of Access 1 operation. Navigate to the P - Performance menu and press ↵.

The "•" marks the highest levels of the Performance (P) menu.

- **P1, P2, P3 performance:** These represent three performance levels that may be selected when in the operator mode. When a PIN code is used (Personal Identification Number) any one of the three performance levels can be assigned to 25 different PIN codes. Performance settings affect truck performance. Refer to F19 and F20 in the features menu to activate.

  Any adjustment under each performance level can be higher, lower or the same as the adjustment under any other performance level e.g. traction speeds forward and reverse can be the same for all performance levels and the lower speed can be different for all performance levels. The factory set performance levels of P1, P2 and P3 are as follows:

  NOTE: Travel speed displayed does not account for the boosted speed when equipped with the productivity or CDM option. Therefore maximum travel speed for all speed settings can be up to 1.1 kph/ 0.7 mph faster than displayed if the truck is equipped with these options and the right conditions exist.

  P1: set for the maximum achievable performance level.
  P2: reduced performance from the maximum level and is similar to the performance of the Model RR3500.
  P3: lowest performance setting of the three levels.

- **P1 Setup P1**
  Enter the parameters for the P1 performance level in this sub menu. Press ↵ to view/change the current P1 settings. Press ↓ to go to P2 setups.

P1.1 Fwd. = _____
The set traction speed in the forks first direction of travel in effect will be displayed. To change/ modify this speed press ↵. Press ↓ to go to P1.2 Reverse. Note: Trucks with productivity package or capacity data monitor option, this setting represents the travel speed with a capacity load. The unloaded travel speed will be faster.

P1.1.1 Std = _____
The P1 Standard traction speed in the forks first direction of travel is displayed. If this is the desired setting and is the setting displayed in P1.1, press ↵ to return to P1.1. If a setting other than that displayed is desired, press ↓ to access P1.1.2.

P1.1.2 Cust = _____
If a traction speed in the forks first direction of travel less than the standard is desired, press ↵. Then use ↑ and ↓ to display the speed required. Once the desired speed is displayed, press ↵ to return to P1.1.

P1.2 Rev. = _____
The set traction speed in the power unit first direction of travel in effect will be displayed. To change/modify this speed press ↵ to go to P1.2.1. Note: Trucks with productivity package or capacity data monitor option, this setting represents the travel speed with a capacity load. The unloaded travel speed will be faster.

P1.2.1 Std = _____
The P1 Standard traction speed in the power unit first direction of travel is displayed. If this is the desired setting and is the setting displayed in P1.2, press ↵ to return to P1.2. If a setting other than that displayed is desired, press ↓ to access P1.2.2.

P1.2.2 Cust = _____
If a traction speed in the power unit first direction of travel less than the standard is desired, press ↵. Then use ↑ and ↓ to display the speed required. Once the desired speed is displayed, press ↵ to return to P1.2.

P1.3 Accel = _____
The setting of the acceleration rate (time for truck to go from stop the top speed) is displayed here. The adjustment range is 1 for the longest acceleration time to 9 for the shortest acceleration time. If this setting is okay, press ↓ to go to P1.4. To change/modify the acceleration rate press ↵ to go to P1.3.1.

P1.3.1 Std = _____
The P1 Standard acceleration setting is displayed. If this is the desired setting and is the setting displayed in P1.3, press ↵ to return to P1.3. If a setting other than that displayed is desired, press ↓ to access P1.3.2.

P1.3.2 Cust = _____
If an acceleration rate other than the standard is desired, press ↵. Then use ↑ and ↓ to obtain the desired setting. When set, press ↵ to return to P1.3.

P1.4 Pump 2 = _____
If pump 2 is enabled for high speed lift, "on" will be displayed. If pump 2 is disabled, "off" will be displayed. To change/modify the status of pump 2 press ↵. Press ↓ to go to P1.5 Lower.

P1.4.1 Pump 2 = On
If it is necessary to have pump 2 enabled, press ↵ in this screen to select "on" and return to P1.4. If pump is to be disabled, press ↓ to access P1.4.2.

P1.4.2 Pump 2 = Off
If it is necessary to have pump 2 disabled, press ↵ in this screen to select "off" and return to P1.4.

P1.5 Lower = _____
The set lower speed of the forks in meter/feet per minute will be displayed in this screen. The adjustment range is 0.36 to 0.46 meter/70 to 90 feet per second. Note: Trucks with productivity package or capacity data monitor option, this setting represents the lowering speed with a capacity load. The fork empty lowering speed will be faster. To change/modify the lowering speed press ↵. Press ↓ to go to P1.6 Escape.

P1.5.1 Std = _____
The P1 Standard lower speed is displayed. If this is the desired setting and is the setting displayed in P1.5, press ↵ to return to P1.5. If a setting other than that displayed is desired, press ↓ to access P1.5.2.

P1.5.2 Cust = _____
If a lower speed other than the standard is desired, press ↵. Then use ↑ and ↓ to obtain the desired setting. When set, press ↵ to return to P1.5. Then press ↓ to go to the P1.6 Escape menu.

P1.6 Escape
In this menu press ↵ to exit the P1 performance sub menus and return to P1.

- **P2 Setup P2**
Enter the parameters for the P2 performance level in this sub menu. Press ↵ to change the current P2 performance settings. Press ↓ to go to P3 setups.

P2.1 Fwd. = _____
The set traction speed in the forks first direction of travel in effect will be displayed. To change/modify this speed press ↵. Press ↓ to go to P2.2 Reverse.

P2.1.1 Std = _____
The P2 Standard traction speed in the forks first direction of travel is displayed. If this is the desired setting and is the setting displayed in P2.1, press ↵ to return to P2.1. If a setting other than that displayed is desired, press ↓ to access P2.1.2.

P2.1.2 Cust = _____
If a traction speed in the forks first direction of travel different than the standard is desired, press ↵. Then use ↑ and ↓ to display the speed required. Once the desired speed is displayed, press ↵ to return to P2.1.

P2.2 Rev. = _____
The set traction speed in the power unit first direction of travel in effect will be displayed. To change/modify this speed press ↵. Press ↓ to go to P2.3 Accel.

P2.2.1 Std = _____
The P2 Standard traction speed in the power unit first direction of travel is displayed. If this is the desired setting and is the setting displayed in P2.2, press ↵ to return to P2.2. If a setting other than that displayed is desired, press ↓ to access P2.2.2.

P2.2.2 Cust = _____
If a traction speed in the power unit first direction of travel different than the standard is desired, press ↵. Then use ↑ and ↓ to display the speed required. Once the desired speed is displayed, press ↵ to return to P2.2.

P2.3 Accel = _____
The setting of the acceleration rate (time for truck to go from stop the top speed) is displayed here. The adjustment range is 1 for the longest acceleration time to 9 for the shortest acceleration time. To change/modify the status of acceleration rate press ↵. Press ↓ to go to P2.4 Pump 2.

P2.3.1 Std = _____
The P2 Standard acceleration setting is displayed. If this is the desired setting and is the setting displayed in P2.3, press ↵ to return to P2.3. If a setting other than that displayed is desired, press ↓ to access P2.3.2.

P2.3.2 Cust = _____
If an acceleration rate other than the current is desired, press ↵. Then use ↑ and ↓ to obtain the desired setting. When set, press ↵ to return to P2.3.

P2.4 Pump 2 = _____
If pump 2 is enabled for high speed lift, "on" will be displayed. If pump 2 is disabled, "off" will be displayed. To change/modify the status of pump 2 press ↵. Press ↓ to go to P2.5 Lower.

P2.4.1 Pump 2 = On
If it is necessary to have pump 2 enabled, press ↵ in this screen to select "on" and return to P2.4. If pump is to be disabled, press ↓ to access P2.4.2.

P2.4.2 Pump 2 = Off
If it is necessary to have pump 2 disabled, press ↵ in this screen to select "off" and return to P2.4.

P2.5 Lower = _____
The set lower speed of the forks in meter/feet per minute will be displayed in this screen. The adjustment range is 0.36 to 0.46 meter/70 to 90 feet per second. Note: Trucks with productivity package or capacity data monitor option, this setting represents the lowering speed with a capacity load. The fork empty lowering speed will be faster.

P2.5.1 Std = _____
The P2 Standard lower speed is displayed. If this is the desired setting and is the setting displayed in P2.5, press ↵ to return to P2.5. If a setting other than that displayed is desired, press ↓ to access P2.5.2.

P2.5.2 Cust = _____
If a lower speed other than the standard is desired, Press ↵. Then use ↑ and ↓ to obtain the desired setting. When set, press ↵ to return to P2.5. Then Press ↓ to go to the P2.6 escape menu.

P2.6 Escape
In this menu Press ↵ to exit the P2 performance sub menus and return to P2.

- **P3 Setup P3**
Enter the parameters for the P3 performance level in this sub menu. Press ↵ to view/change the current P3 performance settings. Press ↓ to go to P4 BDI.

P3.1 Fwd. = _____
The set traction speed in the forks first direction of travel in effect will be displayed. Note: Trucks with productivity package or capacity data monitor option, this setting represents the travel speed with a capacity load. The unloaded travel speed will be faster.

P3.1.1 Std = _____
The P3 Standard traction speed in the forks first direction of travel is displayed. If this is the desired setting and is the setting displayed in P3.1, press ↵ to return to P3. If a setting other than that displayed is desired, press ↓ to access P3.1.2.

P3.1.2 Cust = _____
If a traction speed in the forks first direction of travel different than the standard is desired, press ↵. Then use ↑ and ↓ to display the speed required. Once the desired speed is displayed, press ↵ to return to P3.1.

P3.2 Rev. = _____
The set traction speed in the power unit first direction of travel in effect will be displayed. To change/modify this speed press ↵. Press ↓ to go to P3.3 Accel. Note: Trucks with productivity package or capacity data monitor option, this setting represents the travel speed with a capacity load. The unloaded travel speed will be faster.

P3.2.1 Std = _____
The P3 Standard traction speed in the power unit first direction of travel is displayed. If this is the desired setting and is the setting displayed in P3.2, press ↵ to return to P3.2. If a setting other than that displayed is desired, press ↓ to access P3.2.2.

P3.2.2 Cust = _____
If a traction speed in the power unit first direction of travel different than the standard is desired, press ↵. Then use ↑ and ↓ to display the speed required. Once the desired speed is displayed, press ↵ to return to P3.2.

P3.3 Accel = _____
The setting of the acceleration rate (time for truck to go from stop to top speed) is displayed here. The adjustment range is 1 for the longest acceleration time to 9 for the shortest acceleration time. To change/modify the acceleration rate press ↵, Press ↓ to go to P3.4 Pump 2.

P3.3.1 Std = _____
The P3 Standard acceleration setting is displayed. If this is the desired setting and is the setting displayed in P3.3, press ↵ to return to P3.3. If a setting other than that displayed is desired, press ↓ to access P3.3.2.

P3.3.2 Cust = _____
If an acceleration rate other than the standard is desired, Press ↵. Then use ↑ and ↓ to obtain the desired setting. When set, press ↵ to return to P3.3.

P3.4 Pump 2 = _____

If pump 2 is enabled for high speed lift, "on" will be displayed. If pump 2 is disabled, "off" will be displayed. To change/modify the status of Pump 2 press ↵. Press ↓ to go to P3.5 Lower.

P3.4.1 Pump 2 = On

If it is necessary to have pump 2 enabled, press ↵ in this screen to select "on" and return to P3.4. If pump is to be disabled, press ↓ to access P3.4.2.

P3.4.2 Pump 2 = Off

If it is necessary to have pump 2 disabled, press ↵ in this screen to select "off" and return to P3.4.

P3.5 Lower = _____

The set lower speed of the forks in meter/feet per minute will be displayed in this screen. The adjustment range is 0.36 to 0.46 meter/70 to 90 feet per second. Note: Trucks with productivity package or capacity data monitor option, this setting represents the lowering speed with a capacity load. The fork empty lowering speed will be faster. To change/modify the lowering speed press ↵. Press ↓ to go to P3.6 Escape.

P3.5.1 Std = _____

The P3 Standard lower speed is displayed. If this is the desired setting and is the setting displayed in P3.5, press ↵ to return to P3.5. If a setting other than that displayed is desired, press ↓ to access P3.5.2.

P3.5.2 Cust = _____

If a lower speed other than the standard is desired, Press ↵. Then use ↑ and ↓ to obtain the desired setting. When set, press ↵ to return to P3.5. Then Press ↓ to go to the P3.6 escape menu.

P3.6 Escape

In this menu Press ↵ to exit the P3 performance sub menus and return to P3.

- **P4 BDI = _____**

This adjusts the electronic system incorporated in Access 1 2 3® that monitors the battery's state of charge. Changing this setting will effect the battery discharge lift lockout level, which disables the lift circuit when the battery is discharged.

Decreasing the P4 setting will reduce the volts per cell monitor level allowing the battery to go into deeper discharge prior to lift lockout. If the P4 setting is adjusted to a level that will permit battery discharge that is too deep, fault code 832 will be registered. (See fault code 832 description.) Increasing the P4 setting will increase the volts per cell monitor level disabling the lift function earlier in the discharge cycle.

The current settings will be displayed. Adjustment range for the BDI is 1-9. A setting of 1 will take the battery to its deepest discharge. A setting of 9 will decrease the level of discharge. To change/modify press ↵. Press ↓ to go to P5 Plug.

NOTE: If this adjustment is set incorrectly, a fault code 832, indicating low battery voltage may result.

P4.1 Std = _____

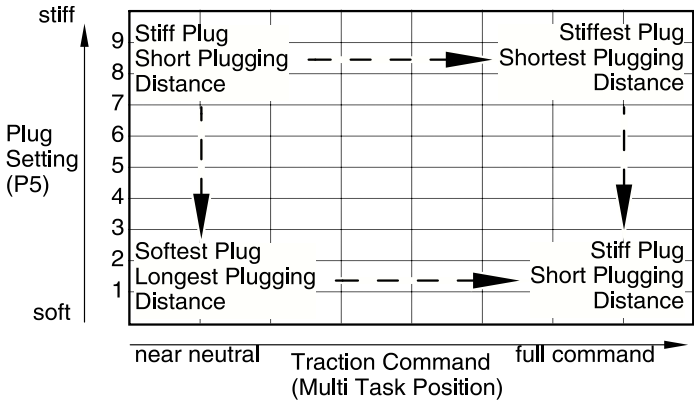
This setting is the factory recommended setting. If this is the desired setting and the setting displayed in P4, press ↵ to return to P4. If a setting other than the displayed is desired, press ↓ to access P4.2.

P4.2 Cust = _____

Press ↵. Then use ↑ and ↓ to obtain the desired setting. When set, press ↵ to return to P4.

- **P5 Plug = _____**

The current setting will be displayed. Adjustment range for Plug is 1 to 9.



At neutral the distance truck coasts is controlled by performance setting P12.

9016

This feature allows the operator to control the amount of plugging distance with the multi-task handle position. The longest plugging distance will occur with the multi-task handle near neutral position and P5 setting of 1. The shortest plugging distance is achieved when the multi-task handle is at full command position and P5 setting of 9. To change/modify Plugging press ↵. Press ↓ to go to P6 Drive brake.

P5.1 Std = _____

The value displayed is a setting that is acceptable for optimum truck and installation conditions. If this setting is the desired setting and is the value displayed in P5, press ↵ to return to P5. If a value different than this is desired, press ↓ to access P5.2.

P5.2 Cust = _____

Press ↵. Then use ↑ and ↓ to obtain the desired setting. When set, press ↵ to return to P5.

- **P6 Drv Brake = _____**

This affects the drive motor brake's braking effort. The current setting will be displayed. Adjustment range is 1 to 9. 9 will provide the most braking power and 1 the least. To change/modify the braking effort press ↵. Press ↓ to go to P7 (RR/RD 5200 "S" trucks only) or P8 (RR/RD 5200).

P6.1 Std = _____

The value displayed is a setting that is acceptable for optimum truck and installation conditions. If this setting is the desired setting and is the value displayed in P6, press ↵ to return to P6. If a value different than this is desired, press ↓ to access P6.2.

P6.2 Cust =

Refer to section M5 in this manual for adjustment procedures. Press ↵. Then use ↑ and ↓ to obtain the desired setting. When set, press ↵ to return to P6.

- **P7 Cas Brake = _____**

(RR/RD 5200S trucks only) This affects the caster brake's braking effort. The current setting will be displayed. Adjustment range is 1 to 9. 9 will provide the most braking power and 1 the least. To change/modify the braking effort press ↵. Press ↓ to go to P8 Accy > FLS.

P7.1 Std = _____

The value displayed is a setting that is acceptable for optimum truck and installation conditions. If this setting is the desired setting and is the value displayed in P7, press ↵ to return to P7. If a value different than this is desired, press ↓ to access P7.2.

P7.2 Cust = _____

Refer to section M5 in this manual for adjustment procedures. Press ↵. Then use ↑ and ↓ to obtain the desired setting. When set, press ↵ to return to P7.

- **P8 Accy>FLS = _____**

This affects the hydraulic accessory speed when the forks are above free lift. The current setting will be displayed. Adjustment range is 1 to 9. 9 will provide the greatest speed and 1 the least. To change/modify the accessory speed above free lift press ↵. Press ↓ to go to P9 Accy > 270.

P8.1 Std = _____

The value displayed is a setting that is acceptable for optimum truck and installation conditions. If this setting is the desired setting and is the value displayed in P8, press ↵ to return to P8. If a value different than this is desired, press ↓ to access P8.2.

P8.2 Cust = _____

Press ↵. Then use ↑ and ↓ to obtain the desired setting. When set, press ↵ to return to P8.

- **P9 Accy>270 = _____**

This affects the hydraulic accessory speed when the forks are above 6.9 m/270 inches. The current setting will be displayed. Adjustment range is 1 to 9. 9 will provide the greatest speed and 1 the least. To change/modify the accessory speed above 6.9 m/270 inches press ↵. Press ↓ to go to P10 Travel > FLS.

P9.1 Std = _____

The value displayed is a setting that is acceptable for optimum truck and installation conditions. If this setting is the desired setting and is the value displayed in P9, press ↵ to return to P9. If a value different than this is desired, press ↓ to access P9.2.

P9.2 Cust = _____

Press ↵. Then use ↑ and ↓ to obtain the desired setting. When set, press ↵ to return to P9.

- **P10 Trav>FLS = _____**

This affects the traction speed when the forks are above free lift. The current setting will be displayed. Adjustment range is between 0.1 to 4.8 Kph (0.1 to 3 MPH). To change/modify travel speed above free lift press ↵. Press ↓ to go to P11 Travel > 270.

P10.1 Std = _____

The value displayed is a setting that is acceptable for optimum truck and installation conditions. If this setting is the desired setting and is the value displayed in P10, press ↵ to return to P10. If a value different than this is desired, press ↓ to access P10.2.

P10.2 Cust = _____

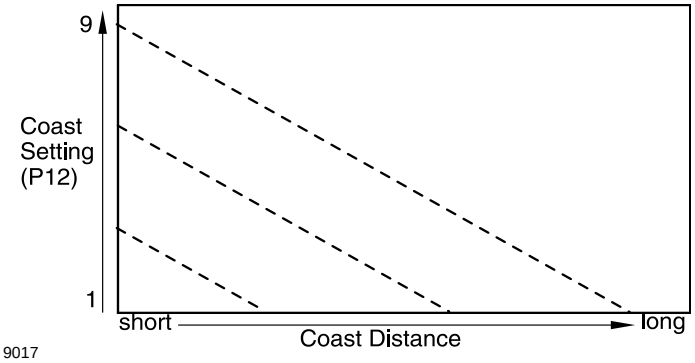
Press ↵. Then use ↑ and ↓ to obtain the desired setting. When set, press ↵ to return to P10.

- **P11 Trav>270 = _____**
  This affects traction speed when the forks are above 6.9 m/270 inches. The current setting will be displayed. Adjustment range is between 0.1 to 2.4 Kph (0.1 to 1.5 MPH). To change/modify travel speed above 6.9 m/270 inches press ↵. Press ↓ to go to P12 Coast.

  P11.1 Std = _____
  The value displayed is a setting that is acceptable for optimum truck and installation conditions. If this setting is the desired setting and is the value displayed in P11, press ↵ to return to P11. If a value different than this is desired, press ↓ to access P11.2.

  P11.2 Cust = _____
  Press ↵. Then use ↑ and ↓ to obtain the desired setting. When set, press ↵ to return to P11.

- **P12 Coast = _____**
  The current setting will be displayed. Adjustment range is 1 to 9.



9017

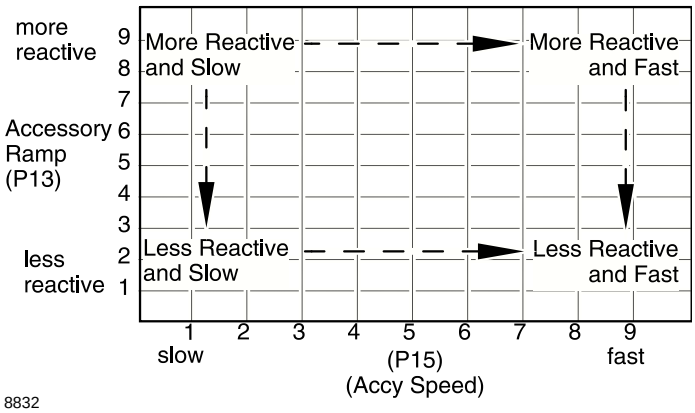
This feature controls the amount of regenerative braking current applied to the drive motor when the operator returns the multi-task handle to neutral while the truck is in motion. The higher the setting, the lower the amount of regenerative braking current applied to the drive motor, resulting in the longest coasting distance. The lower the setting, the higher the amount of regenerative braking current applied to the drive motor, the shorter the coasting distance. To change/modify coasting effort press ↵. Press ↓ to go to P13 Accy Rmp.

P12.1 Std = _____
The value displayed is a setting that is acceptable for optimum truck and installation conditions. If this setting is the desired setting and is the value displayed in P12, press ↵ to return to P12. If a value different than this is desired, press ↓ to access P12.2.

P12.2 Cust = _____
Press ↵. Then use ↑ and ↓ to obtain the desired setting. When set, press ↓ to return to P12.

- **P13 Accy Rmp**
  This adjustment affects the ramp time of the accessory valve. Increasing this setting numerically makes the accessory hydraulic functions more reactive. A setting of 1 will provide smoother reaction, while a setting of 9 will be more reactive.

Accessory (Reach & Sideshift) Response



8832

To change/modify Accy Rmp, press ↵ to access menu P13.1

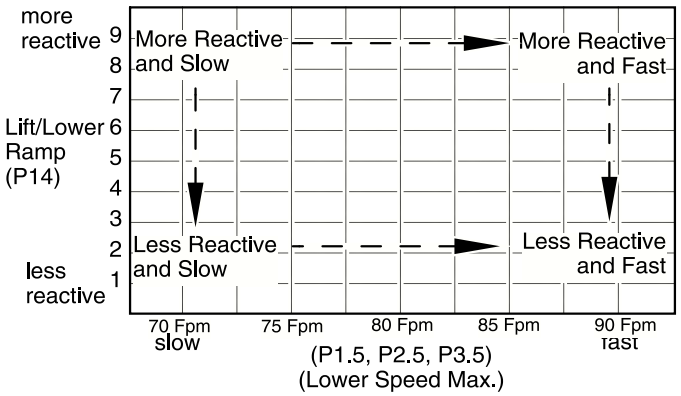
P13.1 Std = ___
The value displayed is a setting that is acceptable for optimum truck and installation conditions. If this setting is the desired setting and is the value displayed in P13, press ↵ to return to P13. If a value different than this is desired, press ↓ to access P13.2.

P13.2 Cust = ___
Press ↵. Use the ↑ and ↓ keys to obtain the desired setting. When set, press ↵ to return to P13.

NOTE: Unsatisfactory accessory hydraulic performance could be the result of air trapped in the accessory circuit. Refer to section M2 for more information.

- **P14 R/L Ramp = ___**
  Affects the acceleration rate of the raise and lower functions. The current setting of this performance level is displayed. Adjustment range is between 1 (less) and 9 (more).
  To change/modify the acceleration rate press ↵ to access menu P14.1.

Lift/Lower Response



8831

P14.1 Std = ___
The value displayed is a setting that is acceptable for optimum truck and installation conditions. If this setting is the desired setting and is the value displayed in P14, press ↵ to return to P14. If a value different than this is desired, press ↓ to access P14.2.

P14.2 Cust = ___
Press ↵. Use the ↑ and ↓ keys to obtain the desired setting. When set, press ↵ to return to P14.

- **P15 Accy<FLS = ___**
  This menu level displays the setting of the accessory function at a lift height less than free lift. Adjustment range is between 1 (less) and 9 (more). To change/modify the accessory speed, press ↵ to access menu level P15.1.

P15.1 Std = ___
The value displayed is a setting that is acceptable for optimum truck and installation conditions. If this setting is the desired setting and is the value displayed in P15, press ↵ to return to P15. If a value different than this is desired, press ↓ to access P15.2.

P15.2 Cust = ___
Press ↵. Use the ↑ and ↓ keys to obtain the desired setting. When set, press ↵ to return to P15.

- **P16 Spd Cut = ___**
  The speed range is adjustable from 0 kph/mph to the maximum forward speed based on (P1.1) in the performance menu. Speed cutback feature F17 must be enabled for this to be active and a switch input at CA403-16 must be present to make this performance level functional. The current speed setting is displayed. If it is desired to change this menu level, press ↵ to access menu P16.1.

P16.1 Std. = ___
The value displayed is a setting that is acceptable for optimum truck and installation conditions. If this setting is the desired setting and is the value displayed in P16, press ↵ to return to P16. If a value different than this is desired, press ↓ to access P16.2.

P16.2 Cust = ___
Press ↵. Use the ↑ and ↓ keys to obtain the desired setting. When set, press ↵ to return to P16.

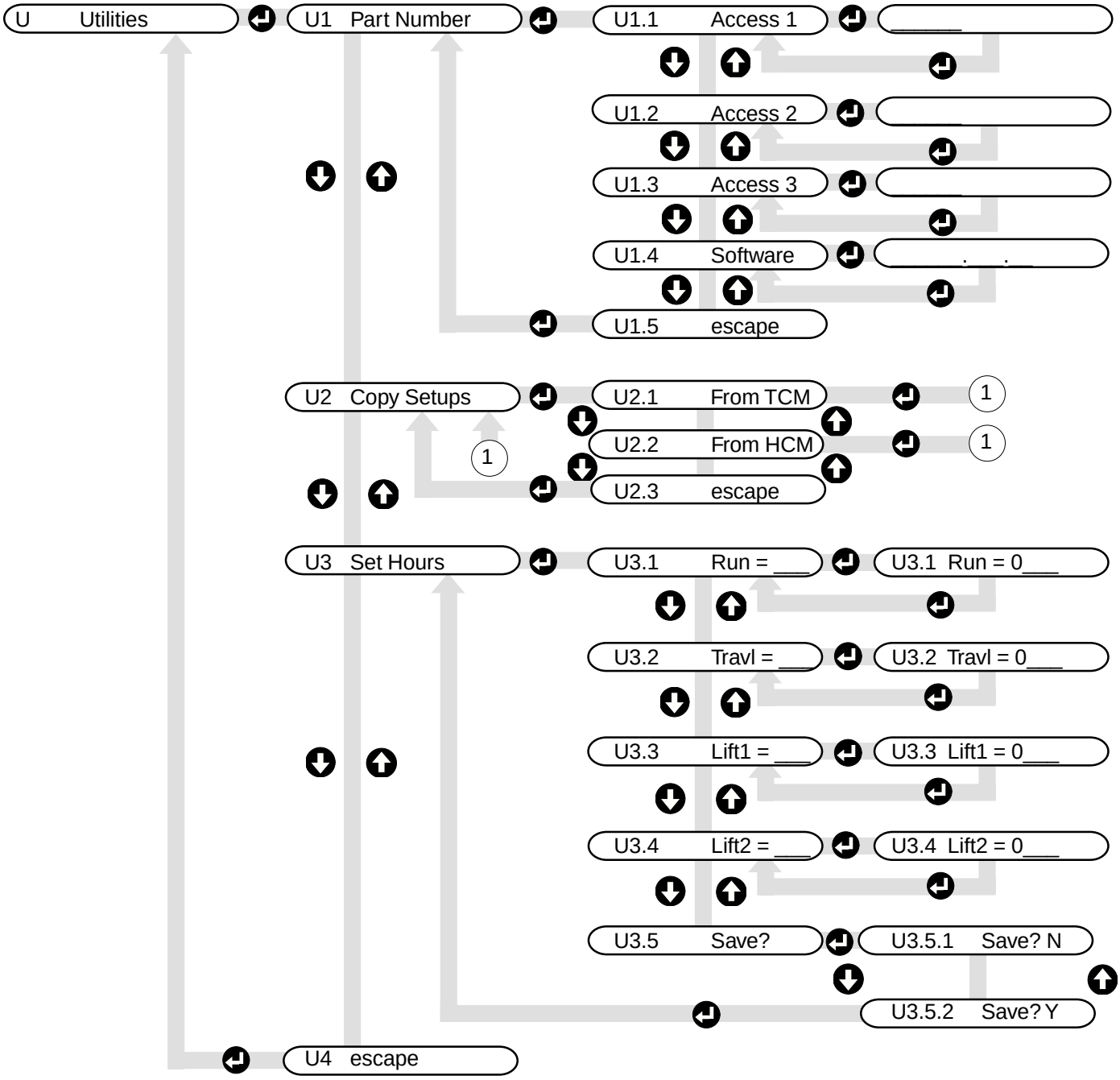
- **P17 Save?**
  Entering this menu level permits saving the changes made or discarding changes and returning to the previously saved performance parameters. Press ↵ to access P17.1.

P17.1 Save? N
Press ↵ at this menu level to discard any changes made and return to previously saved performance parameters. Press ↓ to access the P17.2 menu.

P17.2 Save? Y
Press ↵ at this menu level to save changes made. During the save process, do not operate any truck controls to avoid corrupting data being saved. When data is saved, the system will return to the P Performance menu.

Setup Complete

When setup procedures are complete, scroll down to the Save? (P17) menu and press ↵. If the setup completed is necessary to save into memory for future truck operation, select the Save? Y (P17.2) menu and press ↵. This process will require less than a minute to complete. Do not operate any truck controls or display keys during this process.



The Utilities menu has one adjustable level which are the hour meters under the U3 Hour Set menu.

Utilities Access

When powering up the truck, press and maintain ↑ on the display., then enter the service code. This enters service level two of Access 1 operation. Navigate to the U – Utilities menu and press ↵.

At the U1 menu level, press ↵ to access the U1 Part Number menu or use ↑ and ↓ to access other levels under the Utilities menu.

- **U1 Part Number**
  This menu retrieves part numbers for the Access 1, Access 2 and Access 3 modules and the software part number present on the truck. Press ↵ to access menu U1.1 Access 1.

  U1.1 Access 1
  Press ↵ to view the part number of the Access 1 Module. Press ↵ to return to the U1.1 menu. Press ↓ to access the U1.2 Access 2 menu.

  U1.2 Access 2
  Press ↵ to view the part number of the Access 2 Module. Press ↵ to return to the U1.2 menu. Press ↓ to access the U1.3 Access 3 menu.

  U1.3 Access 3
  Press ↵ to view the part number of the Access 3 Module. Press ↵ to return to the U1.3 menu. Press ↓ to access the U1.4 Software menu.

  U1.4 Software
  Press ↵ to view the software part number. Press ↵ to return to the U1.4 menu. Press ↓ to access the U1.5 Escape menu.

  U1.5 Escape
  At this menu level press ↵ to return to the U1 menu level. From the U1 menu, the ↑ and ↓ keys can be used to access other menus in the Utility level.

- **U2 Copy Setups**
  This menu will normally be used when a Status Code 834 is displayed. Code 834 occurs at power up after either Access 2 or Access 3 is replaced. In the Copy Setups menu, information stored in the Traction Control Module (Access 3) can be copied to the Hydraulic Control Module (Access 2) or vice versa. The Features, Performance, Height, Weight, Valve Calibration, Raise Cutouts and Steer Idle setups are copied. Multi Task Potentiometer and Fork Position setups are not copied and must be calibrated. Press ↵ to access U2.1 From TCM. Press ↓ to access the U3 Set Hours menu.

  U2.1 From TCM
  To copy setup values stored in Access 3 to Access 2, press ↵. When the copy process is complete the display will advance to the U2.3 Escape menu.

  U2.2 From HCM
  To copy setup values stored in Access 2 to Access 3, press ↵. When the copy process is complete the display will advance to the U2.3 Escape menu.

  U2.3 Escape
  When the desired transfer of setups is complete and this menu is displayed, press ↵ to return to the U2 Copy Setups menu.

- **U3 Set Hours**
  Under this menu the Run, Travel, Lift 1 and Lift 2 hour meters can be set. Press ↵ to access the U3.1 menu.

  U3.1 Run = ___
  The current reading of the total key on hours is displayed. This hour meter can be set forward, but never backwards. If a number less than the current reading is entered, the message “Invalid” will be displayed. To change the setting press ↵. After each digit is set to the required number by using the ↑ and ↓ keys, press ↵ to proceed to the next digit. When the required hours is entered, press ↵ to access the U3.2 menu.

  U3.2 Travel = ___
  The current number of drive motor hours is displayed. To change the setting press ↵. After each digit is set to the required number by using the ↑ and ↓ keys, press ↵ to proceed to the next digit. When the required hours is entered, press ↵ to access the U3.3 menu.

U3.3 Lift1 = ___

The M2 motor hours are displayed. To change the setting press ↵. After each digit is set to the required number by using the ↑ and ↓ keys, press ↵ to proceed to the next digit. When the required hours is entered, press ↵ to access the U3.4 menu.

U3.4 Lift2 = ___

Motor M3 hours are displayed. To change the setting press ↵. After each digit is set to the required number by using the ↑ and ↓ keys, press ↵ to proceed to the next digit. When the required hours is entered, press ↵ to access the U3.5 menu.

U3.5 Save

When ↵ is pressed at this level the option to save changes or exit without saving changes is offered. Press ↵. The message “Save?N” is displayed. If the changes made are not to be saved, press ↵ to return to menu level U3. If changes made are to be saved, press ↓ and the message “Save?Y” will be displayed. To save the changes press ↵. After the save process is complete, the display will return to the U3 menu.

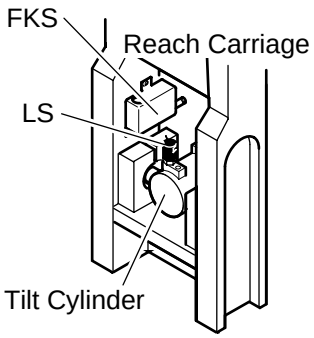
- **U4 Escape**

When viewing and changes are complete in the utilities menu, press ↵ to return to the U Utilities menu.

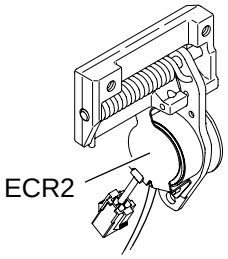
RR/RD 5200/5200S

The capacity data monitor (CDM) requires the enhanced display with CDM, a hydraulic pressure transducer at the base of the tilt cylinder, tilt switch, height sensor and capacity plate information entered in the capacity (F9) portion of the features (F) menu (refer to the M4.3 section for menus).

- CDM provides the visual indicators required.
- hydraulic pressure transducer (LS) provides the signal to the system electronics for determining load weight.
- tilt switch (FKS) arrangement is used for blocking transducer signals at full tilt down and full tilt back.
- height sensor (ECR2) provides information to the system electronics used for displaying actual lift height.
- capacity plate information provides the data for determining the indicators required for truck status.



6234



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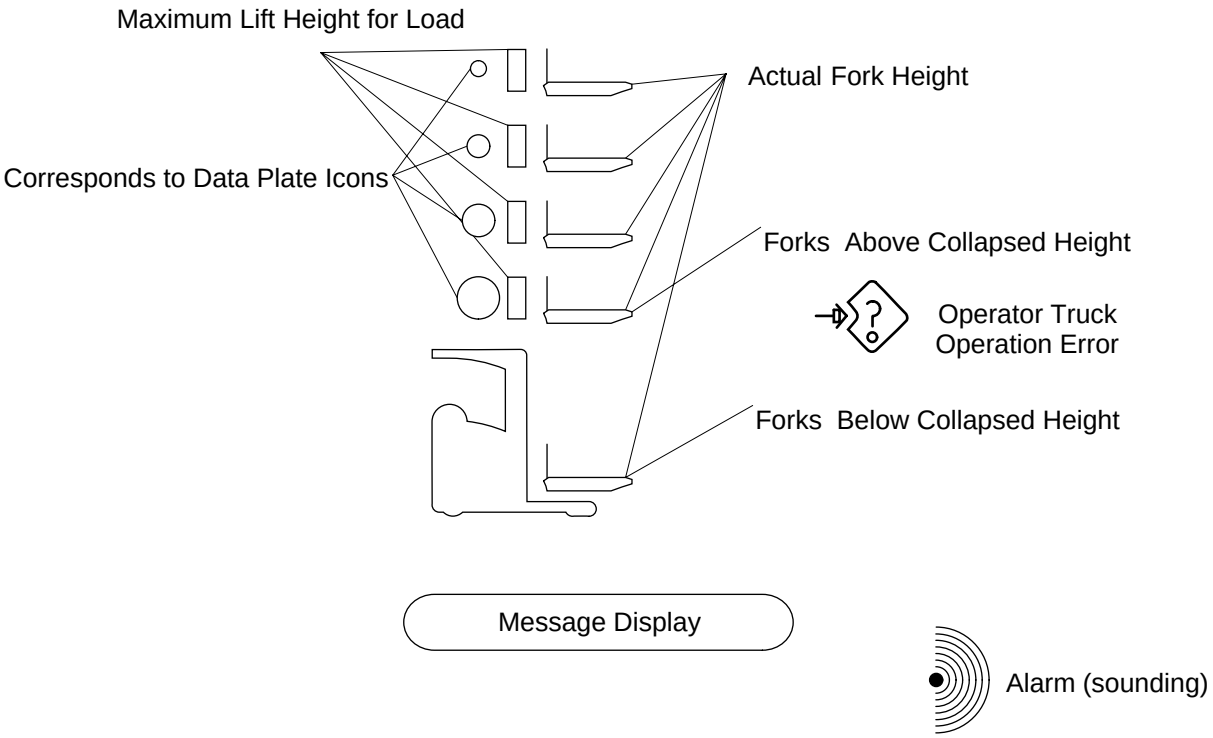
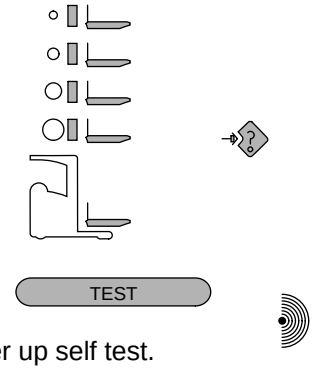
Capacity Data Monitor (CDM)
(located on display panel)



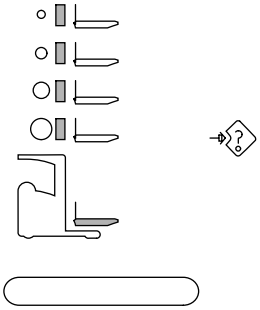
6236

Information input from the monitoring devices is processed by the system electronics and the results displayed.

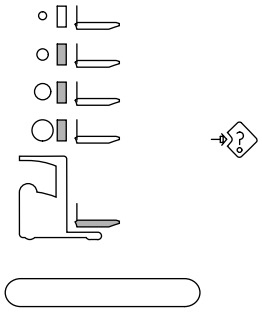
Following are displays observed for various speed, load and height conditions.



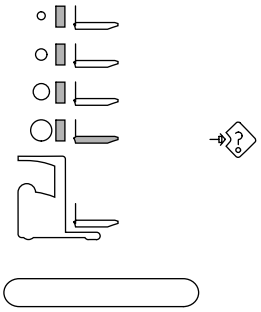
- power up self test.
- audible alarm continuous. (self test = approx. 2 seconds)



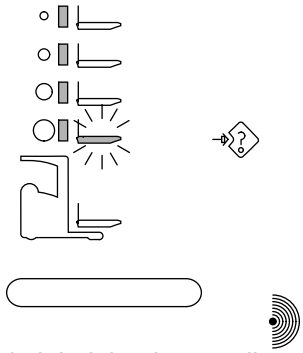
- fork height below collapsed height.
- load weight and load center allows lift to full height.



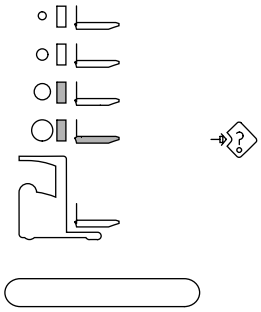
- fork height below collapsed height.
- load weight and load center limits recommended lift height.



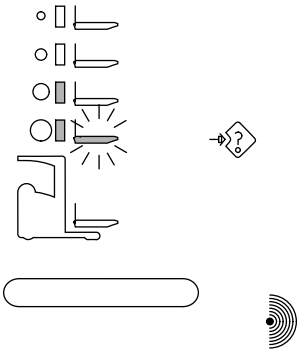
- fork height above collapsed height.
- load weight and load center allows lift to full height.
- traction speed less than creep speed (0.9 km/h - 1.5 m.p.h.)



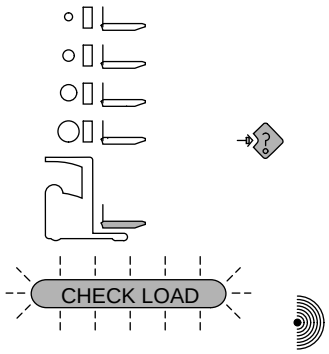
- fork height above collapsed height.
- load weight and load center allows lift to full height.
- traction speed equal to or greater than creep speed.



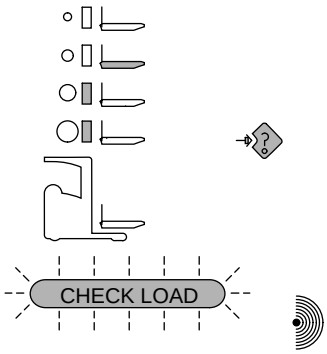
- fork height above collapsed height.
- load weight and load center limits recommended lift height.
- traction speed less than creep speed.



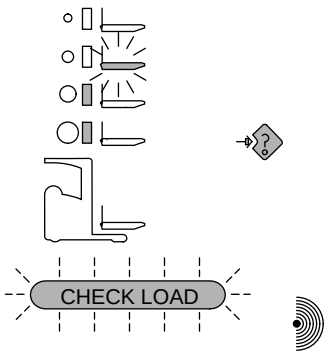
- fork height above collapsed height.
- load weight and load center limits recommended lift height.
- traction speed equal to or greater than creep speed.



- fork height below collapsed height.
- over capacity load (based on 610 mm /24 in. load center) for truck.

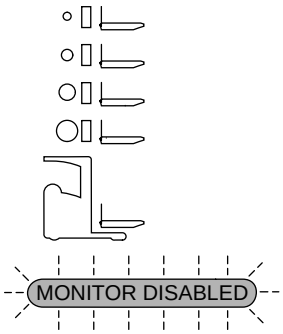


- fork height above collapsed height.
- over capacity load (based on 610 mm 24 in. load center) for lift height.
- traction speed less than creep speed.



- fork height above collapsed height.
- over capacity load (based on 610 mm/24 in. load center) for lift height.
- traction speed equal to or greater than creep speed.

6237-01



- fork tilt opens switch FKS.
- green capacity bars turned off.
- fork height indication normal.
- message "monitor disabled" on display.
- no audible alarm.

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General Information and Troubleshooting

Inputs from the monitoring components can be monitored with the Access 1 module.

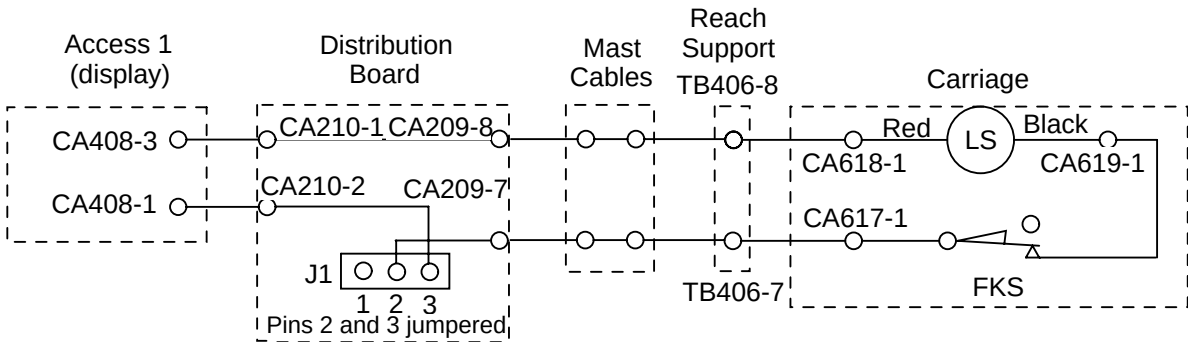
- ECR2. access the A2 inputs menu and scroll down to A2.19. Display count should increase when forks are being raised and decrease during lower.
- LS and FRK. both components in series as shown by illustration. access the A2 inputs menu and scroll down to A2.35. Display count should increase when weight is added to forks and decrease when weight is removed.

No ECR2 height encoder reading indicated on display.

- Check wiring between the Access 3 module and the height sensor including connector and contact condition.
- Replace ECR2.

No LS/FRK signal indicated on display.

- Power for circuit originates at CA408-3 of the Access 1 module. 12 volts D.C. Voltage missing, replace Access 1.
- Check wiring of the LS/FKS circuit using schematic in illustration including connector and contact condition.
- FKS is open. Occurs when forks are tilted full down or full up.
- Check for presence and proper placement of jumper on J1 of the distribution board.



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Load Sense Circuit

CDM (Load Sense Troubleshooting Calibration)

Using the analyzer 2.37 menu, view and record counts in following manner.

1. With forks unloaded and level, record reading.

2. Add a weight of 1250 kg. (2750 lbs.) to the level forks and record reading.

3. Subtract unloaded count reading from loaded count reading and record.

If difference in counts is more than 200:
Check to see if features menu F3, F10 and F18 are set correctly.
Calibrate Load Sense per section M4.3 Calibration (C4 menu) in appropriate Service and Parts Manual.

If difference in counts is 200 or less:
Check FKS, TB406-7, TB406-8, CA209, CA210, CA408-1 and CA408-3 connections.
Verify that mast cable does not have broken or shorted wires.
Verify J1 jumper, on distribution panel, is positioned over pins 2 and 3.

The following information is provided as reference only. Forks are level and at 610 mm (24 in.) load center.
Note: Voltages may very with fork position and weight on forks.

Reference CA407-6 on Access 1 (T-Comm), forks empty and operator off pedals:

(+) CA408-3 FKS open = (+) 11.96 volts FKS closed = 11.54 volts

(+) CA408-1 FKS open = (+) 0.017 volts FKS closed = 0.633 volts

Reference CA407-6 on Access 1 (T-Comm), forks empty and operator on pedals:

(+) CA408-3 FKS open = (+) 13.9 volts

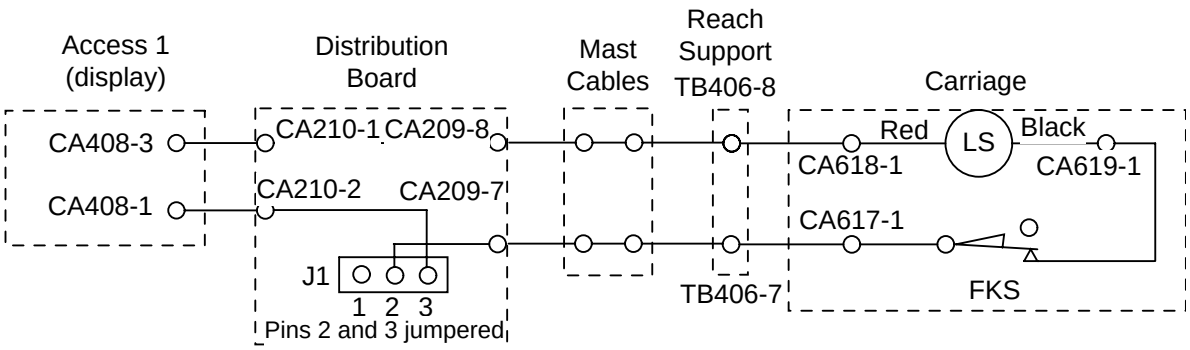
680 kg. (1500 lb.) load on forks:

(+) CA408-1 to (-) CA407-6 = 0.769 volts Analyzer menu A2.37 reading = 620

1360 kg. (3000 lb.) load on forks:

(+) CA408-1 to (-) CA407-6 = 0.893 volts Analyzer menu A2.37 reading = 730

Resistance between CA408-1 and CA407-6 on Access 1, harness disconnected, should be 150 OHMS.
If reading is infinity, replace Access 1.



6238 LOAD SENSE CIRCUIT

Height Sensor

The friction height sensor is mounted near the top of the main frame in one of the two positions shown, depending on mast collapsed height.

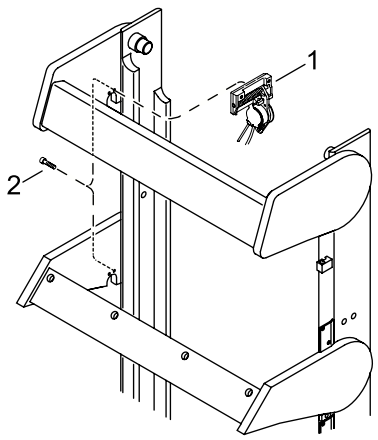


Figure 21845

Removal and Disassembly

CAUTION

The encoder is ESD sensitive. Personnel must be grounded to mast member, with a wrist strap, when handling the height sensor to protect from static charge damage. The wrist strap must remain on until the height sensor is fully assembled to the mast.

1. Move truck to a secure maintenance area.
2. Lower mast completely, turn key switch OFF.
3. Chock wheels and disconnect the battery. Refer to Control of Hazardous Energy.
4. Lockout/Tagout truck as described in Control of Hazardous Energy.
5. Remove the console.
6. Disconnect the height sensor harness. Note the number and position of cable ties that hold it in position and remove the cable ties.
7. If freezer condition truck, disconnect the two heater assembly connectors close to the height sensor.
8. Refer to Figure 21845. Remove height sensor assembly (1) from the top of the main frame by removing the two screws (2) that hold it in place.
9. Refer to Figure 21846. Remove the arm (3) from bracket (1) by sliding it to the side away from the spring (4).

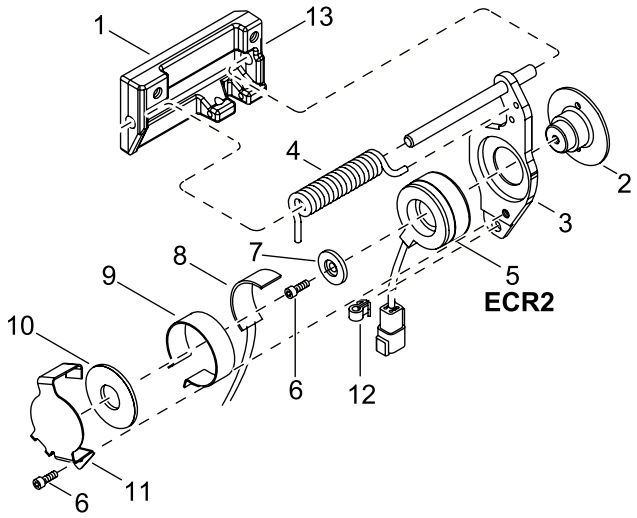


Figure 21846

10. Remove spring (4) from arm (3) shaft.
11. Remove the sensor retainer (11).
12. If freezer condition truck, remove the heater retainer (9). If ECR2 is to be replaced then remove the heater assembly (8).
13. Remove screw (6) and washer (7) from the wheel (2).
14. To remove wheel (2) from ECR2 (5), place the arm (3), ECR2 and wheel assembly in a vise with the jaws spread far enough apart to allow the wheel to face down between the jaws, but be free to move. Use a flat nose punch and hammer to tap the wheel out of ECR2. Then remove ECR2 from the arm.

Assembly and Installation

CAUTION

The encoder is ESD sensitive. Personnel must be grounded to mast member, with a wrist strap, when handling the height sensor to protect from static charge damage. The wrist strap must remain on until the height sensor is fully assembled to the mast.

1. Place ECR2 (5), into the arm (3) counterbore as shown in Figure 21846.
2. Place the wheel (2) on the opposite side of the arm (3) and tap it into position in the encoder (5) using a cylindrical bar, approximately 19 mm (0.75 in) diameter, and a small hammer.
3. Install washer (7) and screw (6), into back of wheel (2) and torque the screw to 2.8 ± 0.6 Nm (25 ± 5 in lb).
4. If freezer condition truck, install the heater assembly (8), on the outer race on the bottom side of the encoder (5) with the leads exiting at the same location as the encoder leads. Install the heater retainer (9), over the heater to keep it in position.
5. If replacing the gasket (10), place the adhesive side against the sensor retainer (11).
6. Clip the sensor retainer (11), over arm (3) and ECR2 (5) and secure in position using screw (6).
7. Use clip (12) to secure the wire to the arm (3).
8. Apply a light film of grease, 063002-017, to both ends of the arm (3) shaft.
9. Position the spring (4) as shown in Figure 21846. Slide the spring over the end of the arm (3) shaft and insert the spring end into the arm.
10. Slide the arm (3) shaft into the slotted hole (13) in the bracket (1).
11. Insert the long end of the arm (3) shaft into the hole at the other end of the bracket (1).
12. Rotate the arm (3) down into the groove in the bracket and secure with cotter pin, 060038-003.
13. Using the existing mounting screws, install the height sensor to the top section of the main frame. Ensure the assembly is in the same position and orientation as removed.
14. Apply blue thread locking adhesive to mounting screws and torque screws to 4.1 ± 0.6 Nm (36 ± 5 in lb). Remove cotter pin, 060038-003.
15. If freezer condition truck, connect heater wires into the heater assembly.
16. Route the height sensor harness down the mast in the same manner as previously removed and secure with cable ties as noted during removal.
17. Connect the height sensor harness into the harness below console.
18. Re-calibrate the height sensor as described in ACCESS 123® - Calibration section of this manual.
19. Install console back on the truck and remove wheel chocks.
20. Connect battery and check truck operation.

RR/RD 5200/5200S SERVICE EVENT CODES

ACCESS 1 2 3®

Access 1 2 3® is Crown's Integrated Control System, which electronically monitors operating functions. This maintenance section helps identify the problem when a code is encountered and provides corrective actions to help resolve the cause of the code.

EVENT CODES

Each event code is presented on following pages with code number, code cause, analytical and corrective steps.

- **Code Cause** is an abbreviated explanation of code cause.
- **Analytical and Corrective Steps** for correcting malfunction causing displayed code.

WHEN AN EVENT CODE OCCURS

Some Troubleshooting Basics. Statistically the majority of malfunctions occur in or at output components such as solenoid valves, contactors and motors. The next most error prone components are connectors, wiring and input devices such as switches, potentiometers or encoders. The last likely to fail are electronic Access 2 and Access 3 control modules. In all cases, begin troubleshooting at output device, proceed to input devices, then, and only then, move on to electronic module to which these devices attach.

WHEN TRUCK DOES NOT OPERATE AND THERE IS NOT A CODE

Event codes are the result of tests performed on outputs of the Access 2 and Access 3 modules. Malfunctions that can occur without providing a event code can fall into one of four catagories.

1. **POWER UP CIRCUIT HAS MALFUNCTIONED.**

   Truck does not power up. Malfunctions in "power up" circuit can keep truck and Access 1 2 3® modules from powering up. Refer to "power up" circuit on following page to troubleshoot this condition.

2. **MALFUNCTION IS NOT ELECTRICAL.**

   Truck powers up but a code is not present, indicates fault is a mechanical or hydraulic malfunction rather than an electrical malfunction. Information regarding mechanical and hydraulic troubleshooting is located in appropriate section of Service and Parts Manual.

3. **The Access 1 2 3® system detects a condition requiring system shutdown. (Truck does not function)**

   Truck down. There are circumstances which cause the Access 1 2 3® system to go into system shut down. In this condition, truck will not "power up". Shutdown is required to protect Access 1 2 3® electronic system when it detects conditions which could be destructive to its internal electronic system. These types of faults could be a direct result of shorted or open circuits which are primary to the systems power source.

   During the shutdown sequence, observe amber lights on Access 2 and 3 modules. Access 2 will flash a 14 while Access 3 flashes a 1 followed by code 328.

   To extract fault code, enter two button level of Access 1 service and select log events. The code causing shutdown will be displayed as the last log entry and can be resolved by following corrective actions associated with this code.

4. **Truck powers up but malfunctions.** One of a small group of unmonitored inputs has malfunctioned.

Following is a list of inputs that are not monitored by the Access 1 2 3® system.

SSS	Side Shift Switch
TBS	Tilt Back Switch
TDS	Tilt Down Switch
ORS	Lift Cutout Over Ride Switch
HNS	Horn Switch
HGTS12	12 inch from maximum lift height switch

Optional Feature Switches

FKS	Fork Tilt Switch
HSS	High Speed Switch (hydraulic pressure switch)

DISPLAY MESSAGES

During truck and Access 1 operation, messages may occur which are intended to provide visual assistance to the operator of the truck and/or display. Following is a list of these messages as viewed on standard and enhanced displays with a description of message intent.

Messages During Display Operation and After Power Up

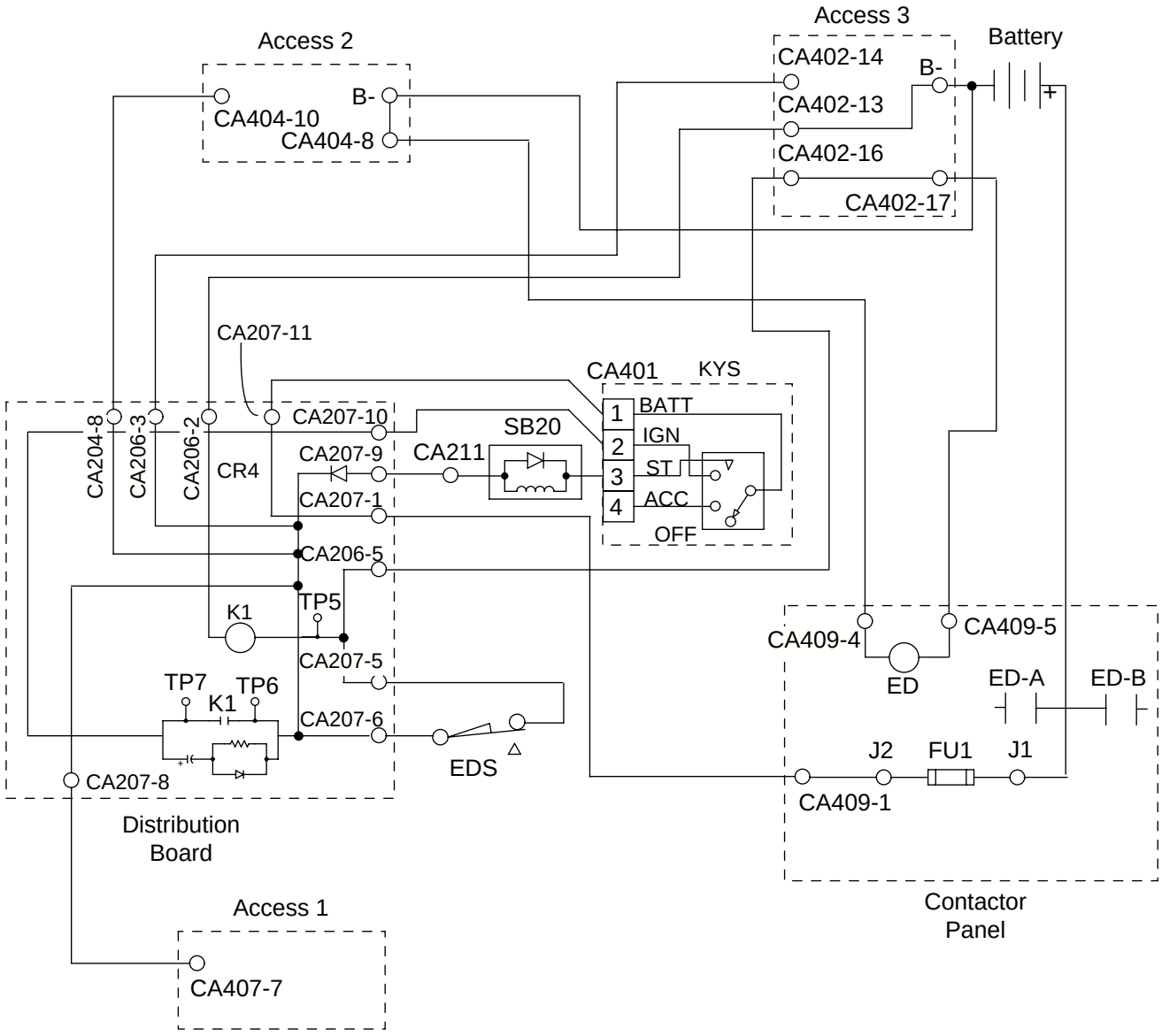
Std. Display	Enh. Display	Description
Test	Lamp Test	Self test during truck power up
Off	Off	Need to re-enter user code, time out after 5 minutes
Ser <-> due	Service Due	Planned maintenance due on truck
Off	User Code Error	Flashes when wrong user code is entered
_ _ _ _	User Code	Prompting for user code input
Stby	Please Stand By	System waiting on Access 1 2 3 precharge or brake pedal was toggled 5 times in 5 seconds. If message does not clear in 30 seconds follow procedure for code 321.
Lo <-> Batt	Low Battery	Battery charge low. If battery is not low on charge follow procedures for code 832
Loc	Lockout Active	Indicates that truck lockout has been selected, disabling truck operation

<-> = display toggles between message on either side.

Messages During Truck Operation

Std. Display	Enh. Display	Description
ACC2 <-> hot	Access 2 Overtemp	Follow procedure for code 269
ACC2 <-> cold	Access 2 Cold temp	Follow procedure for code 268
ACC3 <-> hot	Access 3 Overtemp	Follow procedure for code 369
ACC3 <-> cold	Access 3 Cold temp	Follow procedure for code 368
Door	Battery Door	Battery retainer not in place
Br1i <-> hot	Brk1i Overtemp	Follow procedure for code 345
Br1o <-> hot	Brk1o Overtemp	Follow procedure for code 347
Br2 <-> hot	Brk2 Overtemp	Follow procedure for code 349
Hand	Center Handle	Need to place multi task handle in neutral. If handle is in the neutral position mechanically, a problem with one of the handle potentiometers may exist. Refer to fault codes 243-248 and 333-343 for additional information.
Ctr	Center Pedal	Need to toggle the center brake pedal. (RR5000S)
N/A	Check Load	Above operating limits based on capacity plate data
Ent	Entry Bar	Entry bar actuated
Foot	Left Foot	Need to step on left pedal for action requested
Foot	Right Foot	Need to step on right pedal for action requested
(N/A)	Lift1 Motor	Follow procedure for code 828
(N/A)	Lift 2 Motor	Follow procedure for code 827
(N/A)	Lift Overtemp	Follow procedure for code 824 and 825
(N/A)	Monitor Disabled	Forks are tilted to limits, disabling the Capacity Data Monitor.
Rcut	Raise Cutout	Raise cutout zone has been reached. Over ride switch must be used to continue raise function
(N/A)	Travel Motor	Follow procedure for code 829
(N/A)	Travel Overtemp	Follow procedure for code 826

<-> = display toggles between message on either side.



6480-03

TRUCK POWER UP CIRCUIT

WHEN PERFORMING MAINTENANCE:

CAUTION

Due to capacitance voltage present in Access 2 and Access 3 modules, whenever performing maintenance which may permit contact with bus bars and associated power cables, discharge capacitors. Discharge by disconnecting battery, turning and holding keyswitch to start position until indicators on the Access 1 face first go dim - then out.

CAUTION

Raise drive wheel clear of floor and place hard-wood blocks under truck frame.

SVA (ACCESSORY SOLENOID) Open external circuit. EVENT CODE 211

Step 1: Attach meter across coil terminals.

Leave wires connected.

Step 2: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select SVA (A4.4) on display menu.

Press and hold ↵. (drives component)

Step 3: Check meter reading

If : Battery volts coil open circuit.

Then replace solenoid coil.

If: 0 volts positive or negative missing.

Then "power up" truck, move one test lead to B- on Access 2.

0 volts after standing on the operator pedals. Then positive missing. Use missing positive test**.**

Battery volts negative missing, Use missing negative test.

If : 20 volts correct functional reading.

Then problem likely an intermittent loose connection.

Check wiring. Wiring checks okay, replace Access 2**.** See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Note: *Fault codes 211, 226 or 228 may occur if the horn suppressor block is faulty or if it has not been installed on the truck. See TSB428.*

Missing Positive and Negative Test

Missing Positive Test

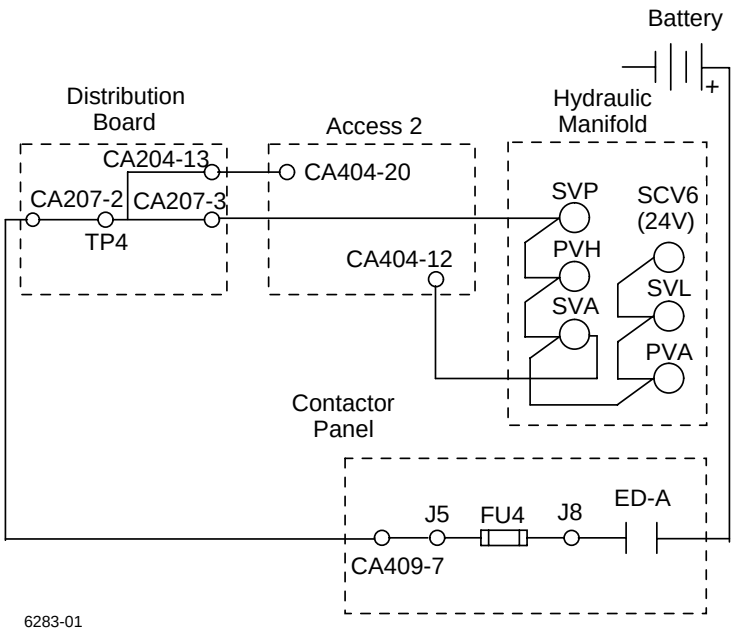
1. Check FU4.
2. FU4 is okay, power up truck without Access 1 service mode. Measuring from CA404-20 to B- on Access 2, reading should be battery volts when standing on operator pedals.
3. If not, check wiring from CA404-20 back to battery positive. Refer to illustration.

Missing Negative Test

1. Attach meter leads to SVA and CA404-12 of Access 2.
2. Turn key "ON" while pressing the ▲ and ▼ buttons.
3. Select SVA (A4.4) on display menu.
4. Press and hold ↵. (drives component)

   Battery volts, wiring open circuit between Access 2 and SVA.

   0 volts, replace Access 2. See note.



SVL (LOWER SOLENOID) Open external circuit. EVENT CODE 212

Step 1: Attach meter across coil terminals.

Leave wires connected.

Step 2: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select SVL (A4.5) on display menu.

Press and hold ↵. (drives component)

If: **Battery volts** coil open circuit.

Then replace solenoid coil.

If: **0 volts** positive or negative missing.

Then "power up" truck, move one test lead to B- on Access 2.

0 volts after standing on the operator pedals, Then positive missing. Use positive missing test.

Battery volts. Then negative missing. Use negative missing test.

If: **20 volts** correct functional reading.

Then problem likely an intermittent loose connection.

Check wiring. Wiring checks okay, replace Access 2**.** See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Missing Positive and Negative Test

Missing Positive Test

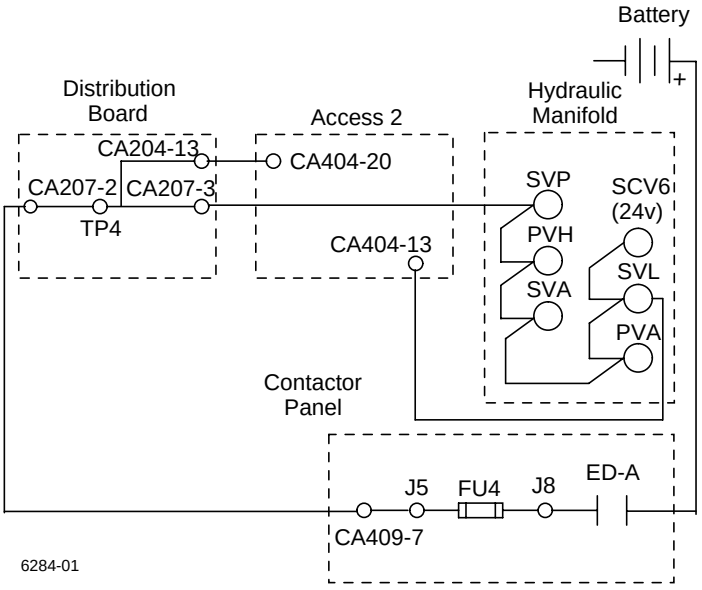
1. Check positive wire connected from SVL to PVA.

Missing Negative Test

1. Check negative output of Access 2 by attaching meter leads to SVL and CA404-13 of Access 2.
2. Turn key "ON" while pressing the ▲ and ▼ buttons.
3. Select SVL (A4.5) on display menu.
4. Press and hold ↵. (drives component)

   Battery volts, wiring open circuit between Access 2 and SVL.

   0 volts, replace Access 2. See note.



SVP (PILOT SOLENOID) Open external circuit. EVENT CODE 213

Step 1: Attach meter across coil terminals.

Leave wires connected.

Step 2: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select SVP (A4.6) on display menu.

Press and hold ↵. (drives component)

Check meter reading.

If: **Battery volts** coil open circuit.

Replace solenoid coil.

If: **0 volts** positive or negative missing.

Then "power up" truck, move one test lead to B- on Access 2.

0 volts after standing on the operator pedals, positive missing. Use missing positive test.

Battery volts, negative missing. Use missing negative test.

If: **20 volts** correct functional reading.

Then problem likely an intermittent loose connection.

Check wiring. Wiring checks okay, replace Access 2**.** See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Missing Positive and Negative Test

Missing Positive Test

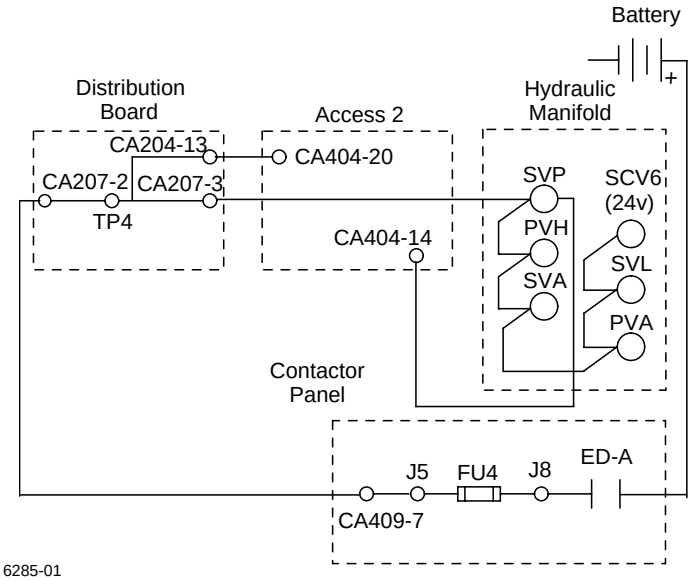
1. Check positive wire connected from SVP to PVA.

Missing Negative Test

1. Check negative output of Access 2 by attaching meter leads to SVP and CA404-14 of Access 2.
2. Turn key "ON" while pressing the ▲ and ▼ buttons.
3. Select SVP (A4.6) on display menu.
4. Press ↵ and hold. (drives component)

   Battery volts, wiring open circuit between Access 2 and SVP.

   0 volts, replace Access 2. See note.



SVR (REACH SOLENOID) Open external circuit. EVENT CODE 214

Step 1: Attach meter across coil terminals, leave wires connected.

Step 2: Turn key "ON" while pressing the ▲ and ▼ buttons.

Check meter reading.

Select SVR (A4.7) on display menu.

Press and hold ↵. (drives component)

If: **Battery volts** coil open circuit.

Then replace solenoid coil.

If: **0 volts** positive or negative missing.

Then "power up" truck, move one test lead to B- on Access 2.

0 volts after standing on operator pedals, battery positive missing. Use missing positive test.

Battery volts, negative missing. Use missing negative test.

If: **20 volts** correct functional reading.

Then problem likely an intermittent loose connection.

Check wiring. Wiring checks okay, replace Access 2**.** See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Missing Positive and Negative Test

Missing Positive Test

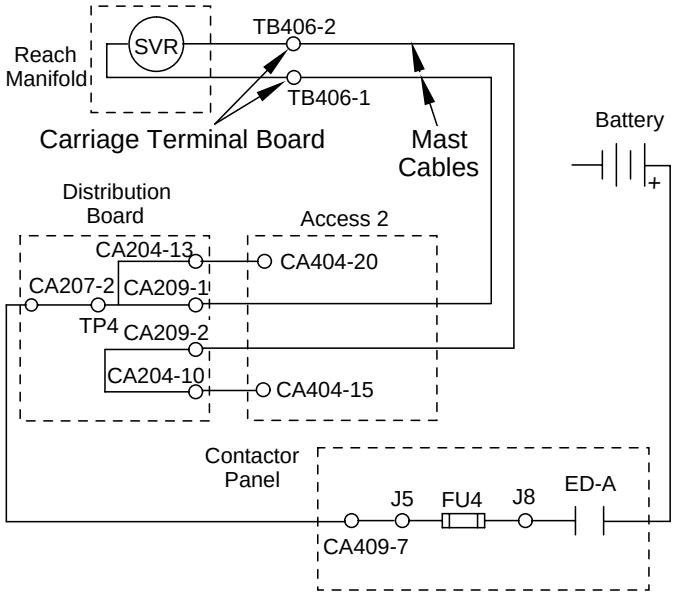
1. Trace the positive wiring by referring to illustration.

Missing Negative Test

1. Check negative output of Access 2 by attaching meter leads to SVR and CA404-15 of Access 2.
2. Turn key "ON" while pressing the ▲ and ▼ buttons.
3. Select SVR (A4.7) on display menu.
4. Press and hold ↵. (drives component)

   Battery volts, wiring open circuit between Access 2 and SVR.

   0 volts, replace Access 2. See note.



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SVS (SIDESHIFT SOLENOID) Open external circuit. EVENT CODE 215

Step 1: Attach meter across coil terminals.

Leave wires connected.

Step 2: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select SVS (A4.8) on display menu.

Press and hold ↵. (drives component)

If: **Battery volts** coil open circuit.

Then replace solenoid coil.

If: **0 volts** positive or negative missing.

Then "power up" truck, move one test lead to B- on Access 2.

0 volts after standing on operator pedals, positive missing. Use missing positive test.

Battery volts, negative missing. Use missing negative test.

If: **20 volts,** correct functional reading.

Then problem likely an intermittent loose connection.

Check wiring. Wiring checks okay, replace Access 2**.** See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Missing Positive and Negative Test

Missing Positive Test

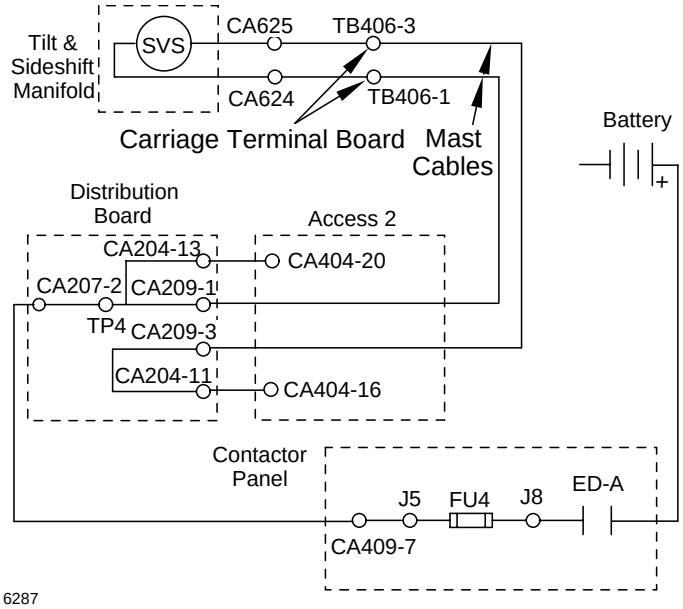
1. Trace positive wiring by referring to illustration.

Missing Negative Test

1. Check negative output of Access 2 by attaching meter leads to SVS and CA404-16 of Access 2.
2. Turn key "ON" while pressing the ▲ and ▼ buttons.
3. Select SVS (A4.8) on display menu.
4. Press and hold ↵. (drives component)

Battery volts, wiring open circuit between Access 2 and SVS.

0 volts, replace Access 2. See note.



SVT (TILT SOLENOID) Open external circuit. EVENT CODE 216

Step 1: Attach meter across coil terminals.

Leave wires connected.

Step 2: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select SVT (A4.9) on display menu.

Press and hold ↵. (drives component)

If: **Battery volts** coil open circuit.

Then replace solenoid coil.

If: **0 volts** positive or negative missing.

Then "power up" truck, move one test lead to B- on Access 2.

0 volts after standing on operator pedals, positive missing. Use missing positive test.

Battery volts, negative missing. Use missing negative test.

If: **20 volts** correct functional reading.

Then problem likely an intermittent loose connection.

Check wiring. Wiring checks okay, replace Access 2**.** See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Missing Positive and Negative Test

Missing Positive Test

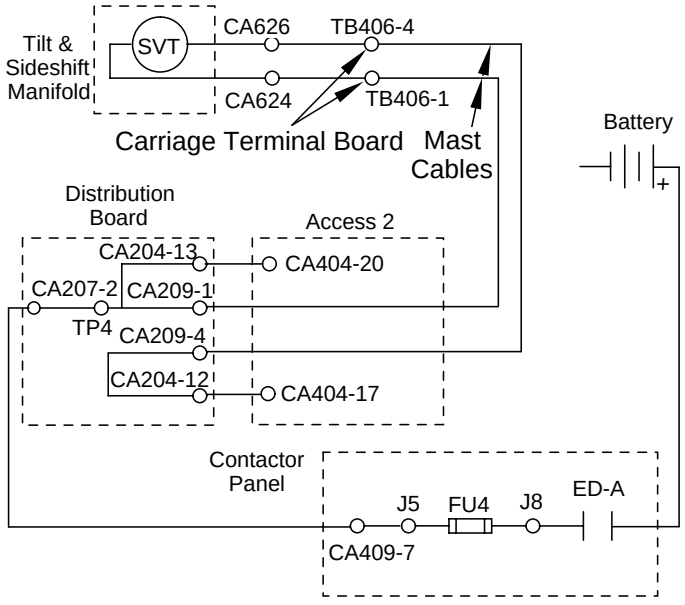
1. Trace the positive wiring by referring to illustration.

Missing Negative Test

1. Check negative output of Access 2 by attaching meter leads to SVT and CA404-17 of Access 2.
2. Turn key "ON" while pressing the ▲ and ▼ buttons.
3. Select SVT (A4.9) on display menu.
4. Press and hold ↵. (drives component)

   Battery volts , wiring open circuit between Access 2 and SVT.

   0 volts, replace Access 2. See note.



ALM2 (TRAVEL ALARM) Open external circuit. EVENT CODE 217

Step 1: Attach meter across ALM2 terminals.

Leave wires connected.

Step 2: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select ALM2 (A4.2) on display menu.

Press and hold ↵. (drives component)

Check meter reading.

If: **Battery volts** ALM2 open circuit.

Then replace ALM2.

If: **0 volts** positive or negative missing.

Then "power up" truck, move one test lead to B- on Access 2.

0 volts after standing on operator pedals, positive missing. Use missing positive test.

Battery volts, negative missing. Use missing negative test.

If: **20 volts** correct functional reading.

Then problem likely an intermittent loose connection.

Check wiring. Wiring checks okay, replace Access 2**.** See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Missing Positive and Negative Test

Missing Positive Test

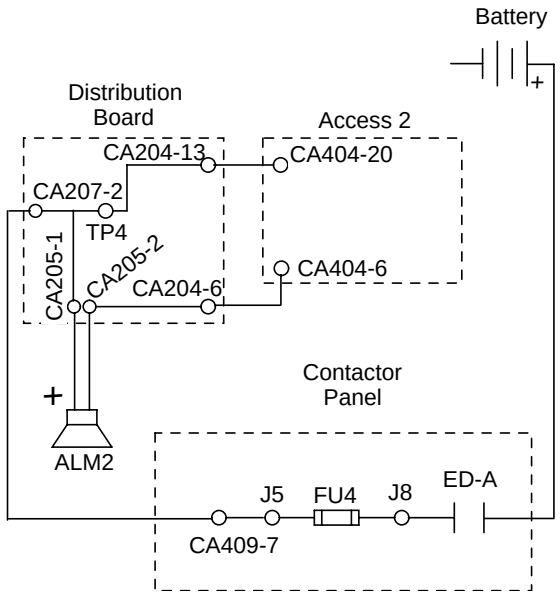
1. Trace positive wiring by referring to illustration.

Missing Negative Test

1. Check negative output of Access 2 by attaching meter leads to ALM2 and CA404-6 of Access 2.
2. Turn key "ON" while pressing the ▲ and ▼ buttons.
3. Select ALM2 (A4.2) on display menu.
4. Press and hold ↵. (drives component)

   Battery volts, open wiring between Access 2 and ALM2.

   0 volts, replace Access 2. See note.



6289

P2 (PUMP CONTACTOR) Open external circuit. EVENT CODE 218

Step 1: Attach meter across coil terminals.

Leave wires connected.

Step 2: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select P2 (A4.19) on display menu.

Press and hold ↵. (drives component)

Check meter reading.

If: **Battery volts** coil open circuit.

Then replace coil.

If: **0 volts** positive or negative missing.

Then "power up" truck, move one meter lead to B- terminal on Access 2.

0 volts after standing on operator pedals, positive missing. Use missing positive test.

Battery volts, negative missing. Use missing negative test.

If: **20 volts** correct functional reading.

Then problem likely an intermittent loose connection.

Check wiring. Wiring checks okay, replace Access 2**.** See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Missing Positive and Negative Test

Missing Positive Test

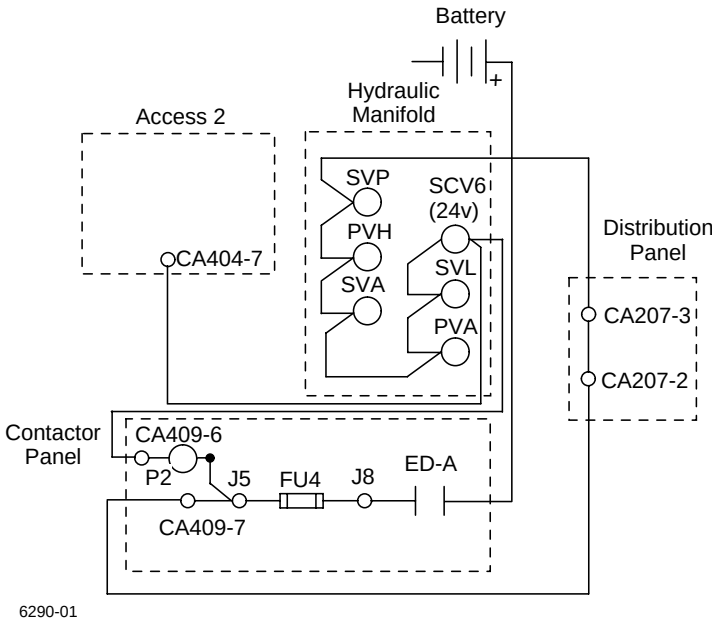
1. Trace positive wiring by referring to illustration

Missing Negative Test

1. Check negative output of Access 2 by attaching meter leads to P2 and CA404-7 of Access 2.
2. Turn key "ON" while pressing the ▲ and ▼ buttons.
3. Select P2 (A4.19) on display menu.
4. Press and hold ↵. (drives component)

   Battery volts, open wiring between Access 2 and P2.

   0 volts, replace Access 2. See note.



PVH (PROPORTIONAL VALVE RAISE/LOWER) Open external circuit. EVENT CODE 219

Step 1: Attach meter across coil terminals.

Leave wires connected.

Step 2: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select PVH (A4.11) on display menu.

Press and hold ↵. (drives component)

Check meter reading.

If: **Battery volts** coil open circuit.

Then replace solenoid coil.

If: **0 volts** positive or negative missing.

Then "power up" truck and move one test lead to B- terminal on Access 2.

0 volts after standing on operator pedals, positive missing. Use missing positive test.

Battery volts, negative missing. Use missing negative test.

If: **20 volts,** correct functional reading.

Then problem likely an intermittent loose connection.

Check wiring. Wiring checks okay, replace Access 2**.** See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Missing Positive and Negative Test

Missing Positive Test

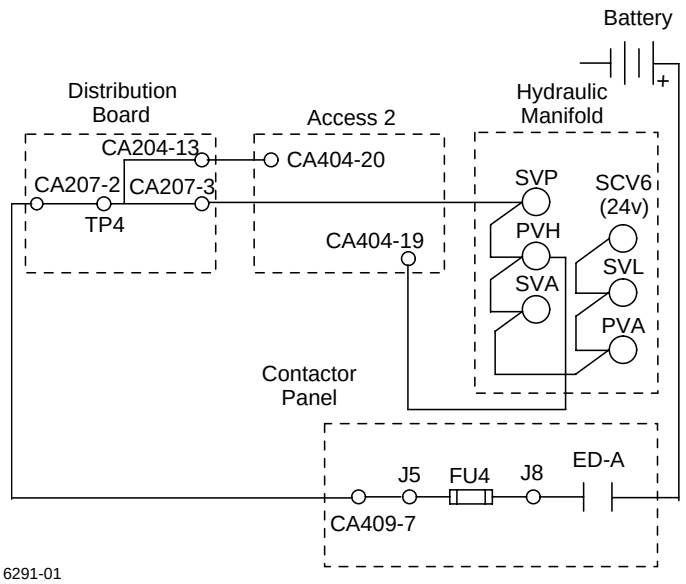
1. Trace positive wiring by referring to illustration.

Missing Negative Test

1. Check negative output of Access 2 by attaching leads to PVH and CA404-19 of Access 2.
2. Turn key "ON" while pressing the ▲ and ▼ buttons.
3. Select PVH (A4.11) on display menu.
4. Press and hold ↵. (drives component)

   Battery volts , open wiring between Access 2 and PVH.

   0 volts, replace Access 2. See note.



PUMP M2 MOTOR Open circuit. EVENT CODE 222

Step 1: Attach meter across M2 motor terminals. (Refer to capacitor discharge Caution in Control of Hazardous Energy section in Service and Parts Manual)

Step 2: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select M2 (A4.18) on display menu.

Press and hold ↵. (drives component)

Check meter reading.

If: **25 volts** on meter and less than 20 amps on display.

Then open pump motor M2. Check power cables, ED tips and motor terminals. Repair/Replace.

If: **0 volts**, repeat test at A1 and B+ terminals at Access 2.

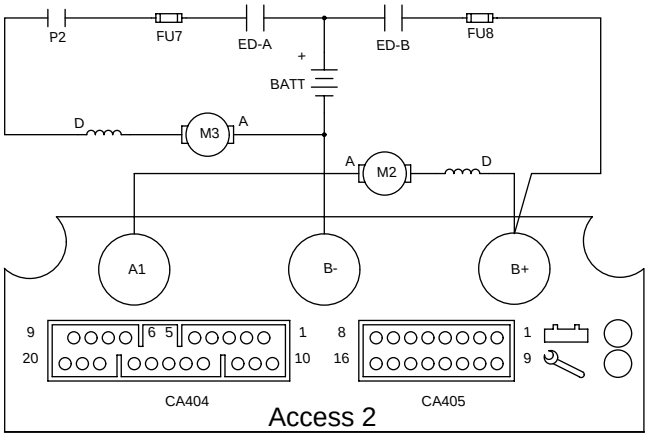
0 volts, replace Access 2.

25 volts on meter and less than 20 amps on display.

Then open pump motor M2. Repair/Replace.

If: **36 volts** replace Access 2. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2. Also see PIB03-04-01, Radio Frequency Compliance.*



6292-02

HYDRAULIC MOTOR (M2) Short circuited. EVENT CODE 223

Step 1: (Refer to capacitor Caution earlier in this guide) Disconnect and isolate one power cable at pump motor M2. "Power up" truck and observe last log event.

If: **Code 222** is last log event then there may be a short circuit in motor. See code 222.

If: **Code 223** is last log event then reconnect power cable to pump motor and go to step 2.

Step 2: Disconnect cable A1 at Access 2 and "power up" the truck.

If: **Code 222** registered, check for a shorted power cable.

If: **Code 223** still remains.

Then check ED contactor tips

If OK, check wiring to ED contactor.

If OK, check cabling to ED contactor and M2 motor.

If OK, replace ED contactor.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

SVA, SVL, SVP, SVR, SVS OR SVT Short circuit. EVENT CODE 224

Step 1: "Power up" truck. Begin selecting and operating one hydraulic function at a time. Note which function is interrupted by a wrench light.

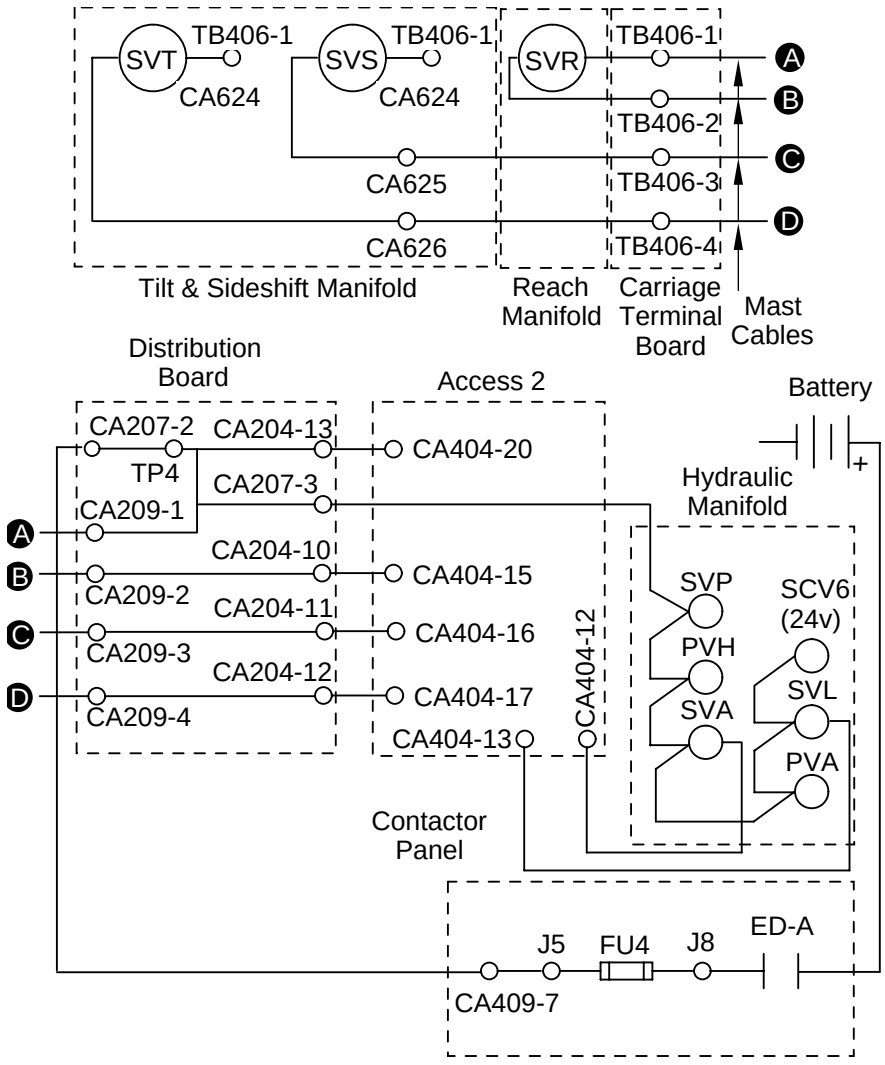
Step 2: Once faulted circuit is found, disconnect and isolate component leads. "Power up" truck and observe fault code.

If: **Code 224** remains, check wiring and/or repeat component disconnections at CA404.

Code remains, replace Access 2. See note.

If: **If code changes,** short circuit has been found. Replace component or wiring that was isolated prior to test.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*



6293-01

PVA, PVH, ALM2, P2 Short circuit. EVENT CODE 225

Step 1: Remove one wire from PVA, PVH, ALM2, P2, SCV6 one component at a time, "powering up" truck and checking last log entry after each component.

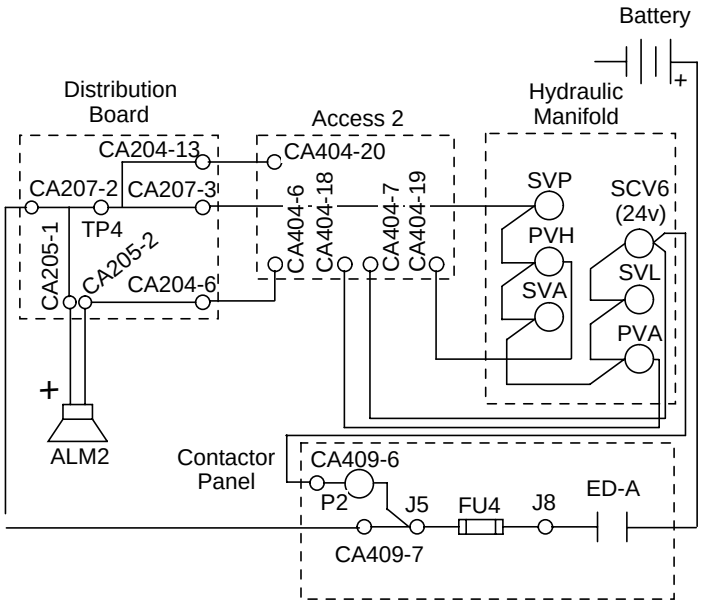
Step 2: Once faulted circuit is found, disconnect and isolate component leads. "Power up" truck and observe fault code.

If: **Code 225** remains, check wiring and/or repeat component disconnections at CA404.

Code remains, replace Access 2. See note.

If: **If code changes,** short circuit has been found. Replace component or wiring that was isolated prior to test.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*



6294-01

PVA (PROPORTIONAL VALVE ACCESSORY) Open external circuit. EVENT CODE 226

Step 1: Attach meter across coil terminals.

Leave wires connected.

Step 2: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select PVA (A4.10) on display menu.

Press and hold ↵. (drives component)

Check meter reading.

If: **Battery volts** coil open circuit.

Then replace solenoid coil.

If: **0 volts** positive or negative missing.

Then "power up" truck, move one test lead to B- on Access 2.

0 volts after standing on operator pedals, positive missing. Use missing positive test.

Battery volts, negative missing. Use missing negative test.

If: **20 volts** correct functional reading.

Then problem likely an intermittent loose connection.

Check wiring. Wiring checks okay, replace Access 2**.** See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Note: *Fault codes 211, 226 or 228 may occur if the horn suppressor block is faulty or if it has not been installed on the truck. See TSB428.*

Missing Positive and Negative Test

Missing Positive Test

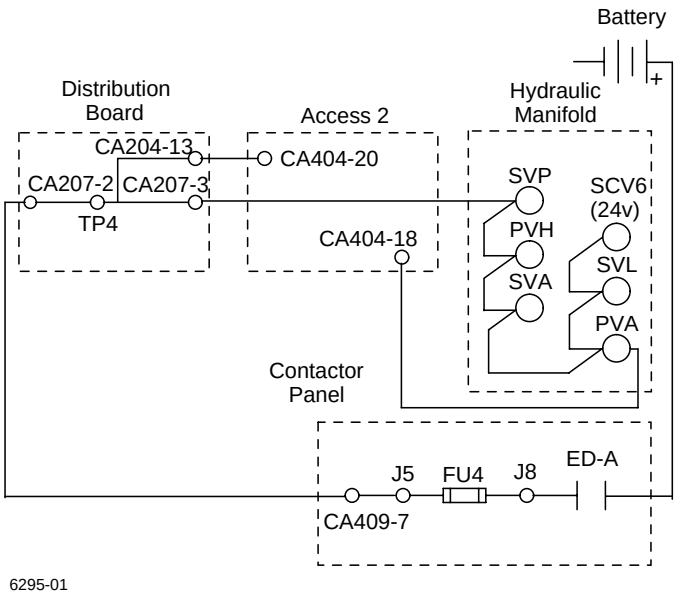
1. Trace positive wiring by referring to illustration.

Missing Negative Test

1. Check negative signal of Access 2 by attaching leads to PVA and CA404-18 of Access 2.
2. Turn key "ON" while pressing the ▲ and ▼ buttons.
3. Select PVA (A4.10) on display menu.
4. Press and hold ↵. (drives component)

   Battery volts, open wiring between Access 2 and PVA.

   0 volts, replace Access 2. See note.



ACCESS 2 Miswired or power bridge bad. EVENT CODE 227

Step 1: Attach meter across Access 2 A1 and B- terminals.

Leave wires connected to terminals.

Step 2: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select M2 (A4.18) on display menu.

Press and hold ↵. (drives component)

Step 3: Check meter reading.

If: **Battery volts** replace Access 2. See note.

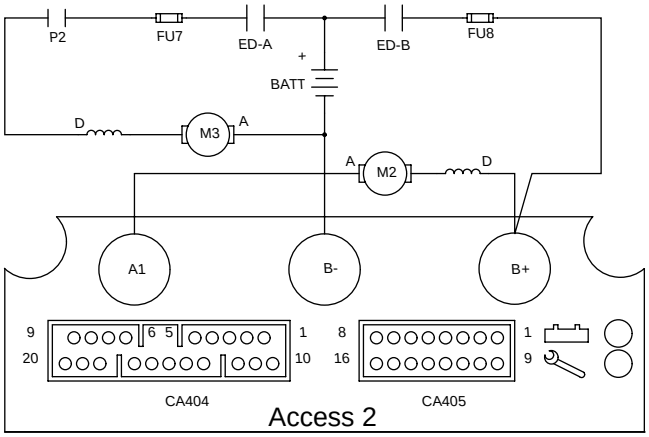
If: **0 volts** disconnect cable from A1 terminal. Re-select M2 (A4.18) on display menu.

Then press and hold ↵ and watch response on meter.

If: 0 volts, replace Access 2. See note.

If: Battery volts check cables for poor connections or corrosion.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*



6292-02

FU8 (PUMP MOTOR FUSE) Open circuit. EVENT CODE 228

Step 1: Replace FU8. Note: due to the capacitance build up within module a conclusive in circuit test of fuse may not be possible.

Step 2: Attach meter leads across Access 2 B+ and B- terminals.

Leave wires connected to these terminals.

Step 3: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select M2 (A4.18) on display menu.

Press and hold ↵. (drives component)

Step 4: Check meter reading.

If: **Near 0 volts:** Open power circuit between Access 2 and the battery.

Then check all connections including power cables, ED tips, FU8 and battery connection. Refer to illustration.

If: **Battery volts** power circuit is good.

Step 5: Upon "power up".

If: **Code 228** occurs then "power up" truck with operator pedals "Actuated".

If: **Code 294** occurs then check key switch and ED switch wiring for incorrect connections.

If: **Wiring OK** then replace Access 2. See Note.

***Note**: If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 2.*

***Note:** Fault codes 211, 226, or 228 may occur if the horn suppressor block is faulty or if it has not been installed on the truck. See TSB428.*

POT3 (ACCESSORY) Above electrical limit. EVENT CODE 243

Step 1: Turn key "ON" while pressing the ▲ button.

Select POT3 (A2.5) on display menu.

Move accessory thumb knob to confirm following readings.

If: **Approximately 5 volts**. Open between potentiometer and Access 2.

Then check connections to CA405-7 and CA405-6.

Okay, replace potentiometer

If: **Approximately 2.5 volts** thumb wheel in center position. Correct reading

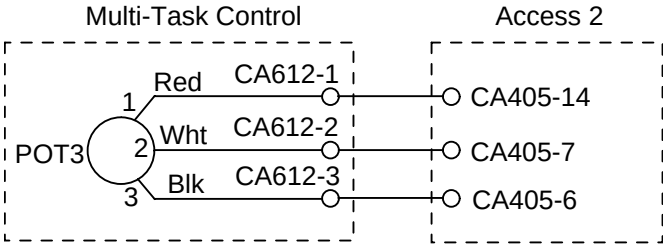
If: **Approximately 1.2 volts** thumb wheel at full left position. Correct reading

If: **Approximately 3.8 volts** thumb wheel in full right position. Correct reading

Correct readings are confirmed, intermittent connection likely in potentiometer circuit.

Check connections and potentiometer.

Note: *(calibrate potentiometer after repair)*



6296

POT3 (ACCESSORY) Below electrical limit. EVENT CODE 244

Step 1: Turn key "ON" while pressing the ▲ button.

Select POT3 (A2.5) on display menu.

Move accessory thumb knob to confirm following readings.

If: **Approximately 0 volts**. Open between potentiometer circuit and Access 2.

Then check connection at CA405-14. Refer to above illustration.

Okay, replace potentiometer

If: **Approximately 2.5 volts** thumb wheel in center position. Correct reading

If: **Approximately 1.2 volts** thumb wheel at full left position. Correct reading

If: **Approximately 3.8 volts** thumb wheel in full right position. Correct reading

Correct readings confirmed, intermittent connection likely in potentiometer circuit.

Check connections and potentiometer.

Note: *(calibrate potentiometer after repair)*

POT2 (RAISE/LOWER) Above electrical limit. EVENT CODE 245

Step 1: Turn key "ON" while pressing the ▲ button.

Select POT2 (A2.4) on display menu.

Move control handle to confirm following readings.

If: **Approximately 5 volts.** Open in circut between potentiometer and CA405-16 or CA405- 8 of Access 2.

Okay, replace potentiometer.

If: **Approximately 2.5 volts** raise/lower handle in center position. Correct reading

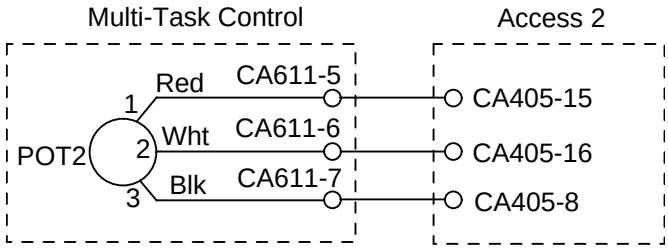
If: **Approximately 1.2 volts** raise/lower handle in full up position. Correct reading

If: **Approximately 3.8 volts** raise/lower handle in full lower position. Correct reading

Correct readings confirmed, intermittent connection likely in potentiometer circuit.

Then check connections and potentiometer.

Note: *(calibrate potentiometer after repair)*



6297

POT2 (RAISE/LOWER) Below electrical limit . EVENT CODE 246

Step 1: Turn key "ON" while pressing the ▲ button.

Select POT2 (A2.4) on display menu.

Move control handle to confirm following readings.

If: **Approximately 0 volts.** Open in circut between potentiometer and CA405-16 or CA405- 8 of Access 2.

Okay, replace potentiometer. Refer to above illustration.

If: **Approximately 2.5 volts** raise/lower handle in center position. Correct reading

If: **Approximately 1.2 volts** raise/lower handle in full raise position. Correct reading

If: **Approximately 3.8 volts** raise/lower handle in full lower position. Correct reading

Correct readings confirmed, intermittent connection likely in potentiometer circuit.

Then check connections and potentiometer.

Note: *(calibrate potentiometer after repair)*

POT3 (ACCESSORY) Handle calibration limits too narrow. EVENT CODE 247

Step 1: Turn key "ON" while pressing the ▲ button.

Select POT3 (A2.5) on display menu.

Move accessory thumb knob to confirm following readings.

If: Approximately 1.2 volts thumb knob at full forward position.

If: Approximately 2.5 volts thumb knob in center position.

If: Approximately 3.8 volts thumb knob in full back position.

Note: Voltage should vary at least .7 volts.

Voltage varies more, check handle linkage. Okay, potentiometer faulty.

Voltage varies less, check handle linkage. Okay, potentiometer faulty.

POT2 (RAISE/LOWER) Handle calibration limits too narrow. EVENT CODE 248

Step 1: Turn key "ON" while pressing the ▲ button.

Select POT2 (A2.4) on display menu.

Move control handle to confirm following readings.

If: Approximately 1.2 volts raise/lower handle in full raise position.

If: Approximately 2.5 volts raise/lower handle in center position.

If: Approximately 3.8 volts raise/lower handle in full lower position.

Note: Voltage should vary at least .5 volts.

Voltage varies more, check handle linkage. Okay, potentiometer faulty.

Voltage varies less, check handle linkage. Okay, potentiometer faulty.

ACCESSORY CALIBRATION TIMED OUT. EVENT CODE 254

***Note**: This code will only occur during calibration.*

Step 1: Verify correct truck voltage is set in Features menu F1.

If: Voltage set correctly, proceed to step 2.

If: Incorrect voltage selected, change to correct voltage.

Step 2: Verify correct pump motor size is selected in Features menu F11.

If: Pump motor size set correctly, proceed to step 3.

If: Incorrect pump motor size selected, change to correct size.

Step 3: Accessory mechanism not advancing, stop to stop, quick enough. Inspect accessory mechanism for obstructions and mechanical binding.

If: Obstructions or binding present, correct problem.

If: Carriage moves freely, bleed air from accessory lines, as described in Service and Parts Manual section M9.0, and re-calibrate. If problem still exists proceed to step 4.

Step 4: With pressure gauge attached to test port G1, operate accessory function to relief. Pressure gauge should indicate 1750 p.s.i.

If: Pressure is less than 1700 p.s.i., replace accessory function relief valve RV2.

If: Pressure is 1750 p.s.i., proceed to step 5.

Step 5: Check if steering control unit (SCU) is allowing substantial flow to reservoir without steering command. Load sense operation will allow 0.25 gpm from SCU to reservoir. The flow check in this step is for significantly more flow.

If: Substantial flow to reservoir is present, replace SCU.

If: Normal flow present, proceed to step 6.

Step 6: Set Performance menu P1.4 to OFF by selecting P1.4.2. Mark mast to indicate 3 m (10 ft.) of fork movement. Raise forks through 3 m (10 ft.) distance at maximum speed. Forks should pass through 3 m (10 ft.) distance in 14.7 to 15.3 seconds.

If: Forks pass through distance in greater time, pump performance is below nominal. Replace pump.

If: Forks pass through distance in recommended time, proceed to step 7.

Step 7: Make sure previous steps have not indicated reason for event code prior to performing this step.

No procedure exists to test PCA or PVA valves. To verify valve operation, replace PCA valve and calibrate. If code is again logged, install original PCA valve, then replace PVA valve and calibrate.

Step 8: Look for obstructions in reach cylinder lines and fittings.

ACCESS 2 Temperature outside of normal range. EVENT CODE 261

Step 1: Verify duty cycle of truck.

Step 2: If truck duty cycle does not seem to be excessive, clean Access 2 module. Make certain adequate air flow is possible and that module is clean.

Check Access 2 mounting. Make sure sufficient heat transfer grease is between module and mounting surface and that module is tight against mounting surface. Check mounting screw tightness.

Make sure ambient temperature is within operating range of control -40° to +85° C (-40° to +185° F).

Check all termination's and make sure they are secure. Check pump motor for overheating. Make sure correct fuse size is used for FU8. See note.

***Note**: If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 2.*

ACCESS 2 Temperature too cold. EVENT CODE 268

Step 1: Make sure ambient temperature is within operating range of control -40° to + 85° C (-40° to 185° F).

Make certain adequate air flow is possible and that module is clean.

If: Ambient temperature is correct and module is clean, go to step 2.

Step 2: Refer to PIB03-04-01, Radio Frequency Compliance. If that does not apply, and truck application is correct, replace Access 2. See note.

***Note:** If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 2.*

ACCESS 2 Temperature too hot. EVENT CODE 269

Step 1: Verify duty cycle of truck.

Truck duty cycle okay.

Step 2: Clean the Access 2 module. Make certain adequate air flow is possible and that module is clean.

Check mounting. Make sure sufficient heat transfer grease is between module and mounting surface and that module is tight against mounting surface. Check mounting screw tightness. Make sure correct fuse size is used for FU8.

Check all termination's and make sure they are secure. Replace module. See note.

***Note:** If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 2.*

ACCESS 2 Cannot Communicate With Access 3 — EVENT CODE 291

Step 1: Check condition of fuse FU10 and FU11.

Fuse open circuit. Replace.

Step 2: Ensure green LED on Access 2 is “on”.

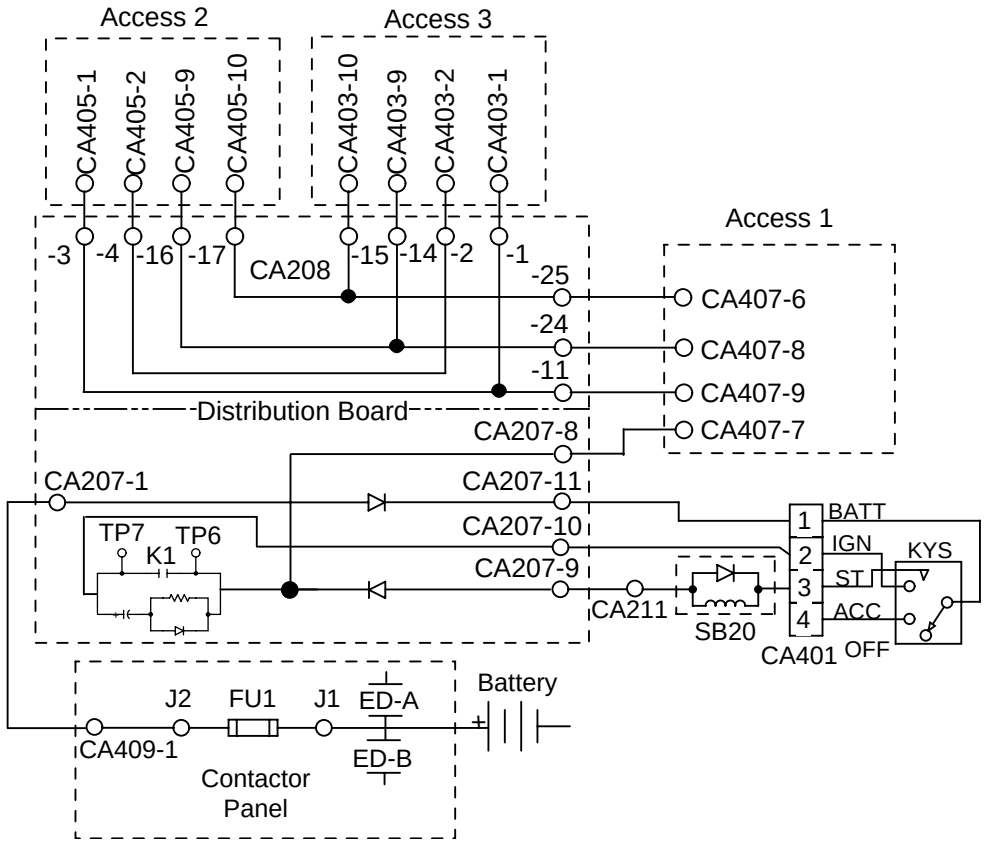
If: Light is not “ON”, check input power source.

Step 3: View amber light on Access 2.

If: LED is solid “ON”, replace Access 2.

If: Flashing a code 14 or amber LED “OFF”, the communications wiring harness or connectors for the CAN network is open or has a bad connection.

Repair/Replace.



6298-02

ACCESS 2 Module or software not compatible with Access 3. EVENT CODE 292

Step 1: Replace Access 2. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 2.*

ACCESS 2 Trademark not valid. EVENT CODE 293

Step 1: Replace Access 2. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 2.*

ED (EMERGENCY DISCONNECT CONTACTOR) Power tips failed to close. EVENT CODE 294

Step 1: Attach meter across coil terminals. Leave wires connected.

Step 2: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select ED (A4.3) on display menu.

Press and hold ↵. (drives component)

Step 3: Check meter reading.

If: **36 volts** coil open circuit. Then replace coil.

If: **20 volts** correct functional reading.

Then "power up" truck.

Code not registered, check connections and possible mechanical obstruction in contactor.

Code again registered. Access 2 faulty, replace. See note.

If: **0 volts** positive or negative to contactor missing. See positive and negative test.

Step 4: "Power up" truck with operator pedals "Not Actuated".

If: **Code 228** occurs, then "power up" truck with operator pedals "Actuated".

If: **Code 294** occurs, then check key switch and ED switch wiring for incorrect connections.

If: **Wiring OK** see note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 2.*

Missing Positive and Negative Test

Missing Positive Test

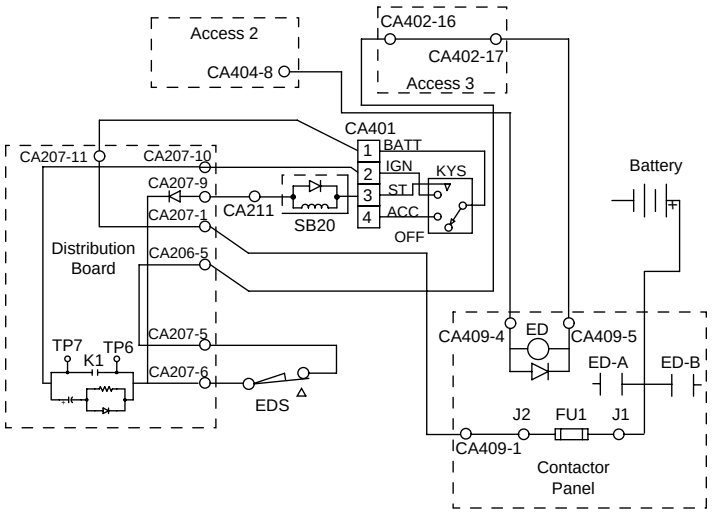
1. Check power path from battery (reference illustration). Power for ED goes through Access 3 (input - CA402-16, output - CA402-17), if power is present at the input and not at the output, replace Access 3.

Missing Negative Test

1. Check negative output between terminal B+ and CA404-8 using test output (A4.3).

   Signal present, open wiring.

   Signal missing, replace Access 2. See note.



ACCESS 2 Data lost. EVENT CODE 295

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 2.*

ACCESS 3 Controller 15 volts out of range. EVENT CODE 311

Step 1: Connect meter to B- terminal of Access 3 and with positive lead check CA402-2 then CA402-3.

If: **Either measures battery voltage** check wiring to Access 2 and 3. Also see if FU10 is blown. FU10 is located on distribution panel.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 3.*

ACCESS 3 Powerbase 15 volts out of range. EVENT CODE 312

Step: 1 Connect meter to B- terminal of Access 3 and with positive lead check CA402-2 then CA402-3.

If: **Either measures battery voltage,** check wiring to Access 2 and 3.

*N**ote:** If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

ACCESS 3 Negative12 volt power supply out of range. EVENT CODE 313

Step: 1 Connect meter to B- terminal of Access 3 and with positive lead check CA402-2 then CA402-3.

If: **Either measures battery voltage** check wiring to Access 2 and 3.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

ACCESS 3 Can communication 5 volts out of range. EVENT CODE 314

Step 1: Connect meter to B- terminal of Access 3 and with positive lead check CA402-2 then CA402-3.

If: **Either measures battery voltage** check wiring to Access 2 and 3.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

ACCESS 3 Encoder 5 volt supply out of range. EVENT CODE 315

Step 1: Connect meter to B- terminal of Access 3 and with positive lead check CA402-2 then CA402-3.

If: Either measures battery voltage check wiring to Access 2 and 3. Also see if FU10 is blown.

Step 2: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

WARNING

Never *key "ON" truck with any Access 1, 2 or 3 connections disconnected. In addition,* ***never*** *remove or connect any Access 1, 2 or 3 connections while the truck is keyed "ON".*

Step 3: Disconnect traction encoder at CA602. "Power up" truck and attempt travel. Check last log event.

If: Code changes, fault in encoder circuit.

Repair/replace.

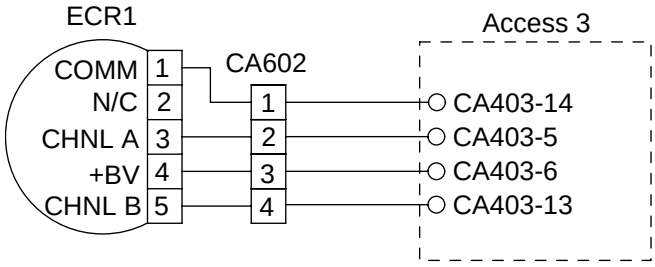
If: Code remains 315, check for shorted wire harness by disconnecting CA403-6 and "powering up" truck. Attempt to travel.

Check last log event.

If: Code changes, short circuit exists in wire harness. On 5200 Series trucks with height encoder, check encoder harness on mast for damage. See PIB03-02-01, Height Sensor Wire Harness.

If code remains 315, internal module fault. Replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

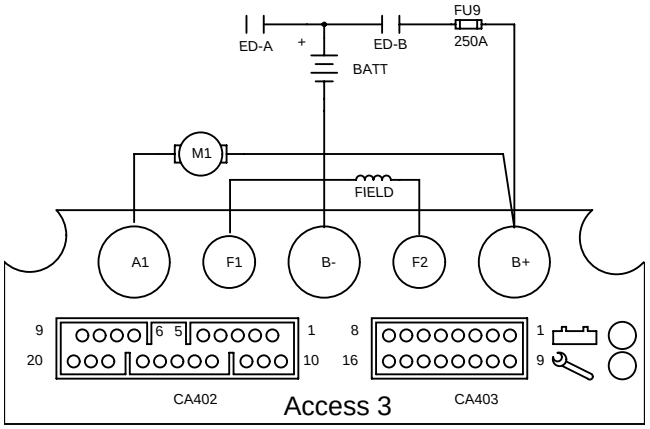


6300-01

OVER VOLTAGE OCCURRED IN TRACTION MOTOR CIRCUIT DURING REGENERATIVE BRAKING. EVENT CODE 316

Step 1: This is caused by an open circuit in the traction motor circuit. Components to check include: ED contactor tips, FU9, cables and connections in path of battery to traction motor.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*



6301

OVER CURRENT CONDITION OCCURRED IN TRACTION MOTOR ARMATURE CIRCUIT. EVENT CODE 317

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Check traction motor A1 power cable wiring to A1 terminal on Access 3. Refer to above illustration.

Step 3: Disconnect and isolate A1 terminal at drive motor and "power up" truck. Depress operator pedals. "Power down" truck and turn key "ON" while pressing the ▲ and ▼ buttons. Check last log event (L1).

If: **Code changes to 374.** Check wiring between M1 motor and Access 3.

If wiring is correct, check or replace drive motor armature or drive motor.

If: **Code 317 remains:** Disconnect cable on A1 terminal of Access 3 and "power up" truck. Depress operator pedals. "Power down" truck and turn key "ON" while pressing the ▲ and ▼ buttons. Check last log event (L1).

If the symptom and code 317 remains, replace Access 3.

VOLTAGE ON BRAKE LOW WHEN ED IS CLOSED. EVENT CODE 318

This condition is present when low voltage is sensed on both CA402-18 and CA402-19 simultaneously. The probable cause is ED contact tips or a mechanical bind in ED contactor.

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Attach meter leads to battery negative and first CA402-18 then CA402-19.

Step 3: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select ED (A4.3) on display menu.

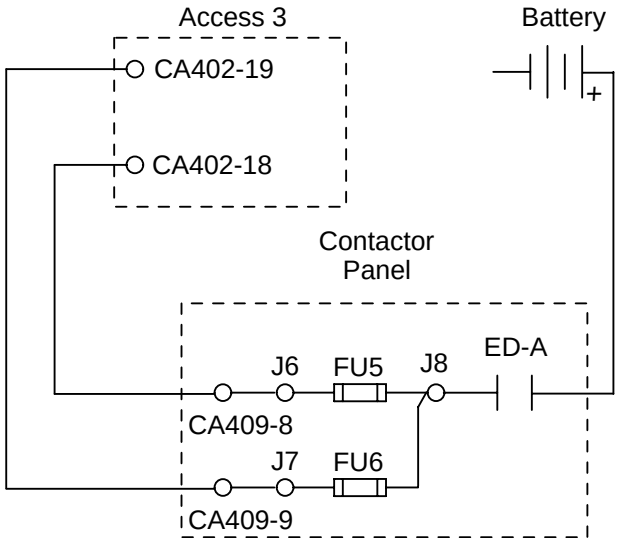
Press and hold ↵. (drives component)

Check meter reading. Battery volts should be present at CA402-18 and CA402-19 when ED is energized.

If low voltage, then check for a high resistance connection between CA402-18, CA402-19 on Access 3, and ED tips.

Check for high resistance connection between Access 3 CA402-18, CA402-19 and battery positive. See note.

***Note**: If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*



6302

OVER CURRENT CONDITION OCCURRED IN TRACTION MOTOR FIELD CIRCUIT. EVENT CODE 319

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Check traction motor F1 and F2 power cable connections and cable condition between motor and Access 3 module (refer to illustration).

Check that F1 and F2 motor connections are not wired to B-, B+ terminals of Access 3.

Step 3: (refer to capacitor discharge Caution on first page of section) Disconnect and isolate drive motor F1, F2 terminals one at a time and "power up" truck. Depress operator compartment pedals. "Power down" truck and turn key "ON" while pressing the ▲ and ▼ buttons. Check last log event (L1).

If: Code changes to 324: Check or replace drive motor field or drive motor.

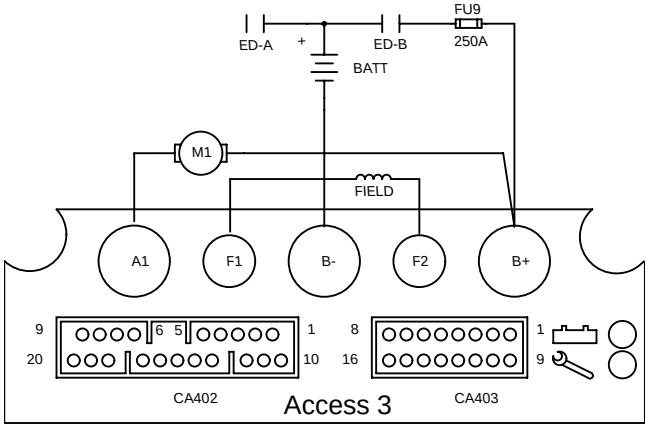
If: Code 319 remains: Disconnect and isolate Access 3 F1, F2 terminals one at a time and "power up" truck. Depress operator pedals.

"Power down" truck and turn key "ON" while pressing the ▲ and ▼ buttons.

Check last log event (L1).

If symptom and fault remain, replace Access 3. See note.

***Note**: If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*



6301

INCORRECT VOLTAGE AT B+ TERMINAL OF ACCESS 2 AND ACCESS 3 BEFORE ED CLOSURE. EVENT CODE 321

Step 1: Check for battery voltage between Access 3 B- terminal and CA402-15, CA404-11 with battery plugged in. Should be battery volts.

Step 2: Make sure power cables are connected to Access 2, M2 pump motor, Access 3, and traction motor correctly.

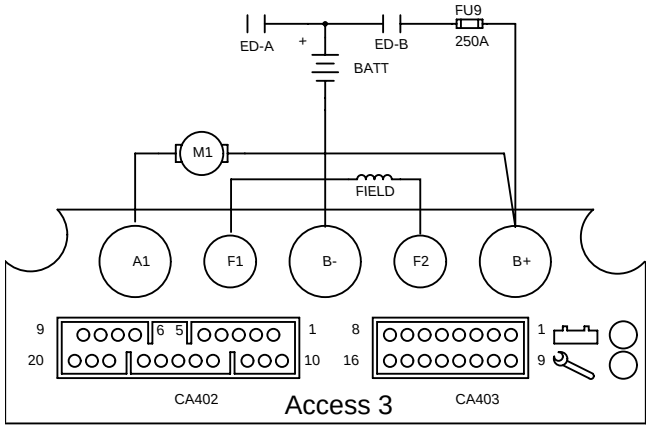
Step 3: (refer to capacitor discharge Caution on first page of section) Unplug truck and disconnect all connections from B+ of Access 3. With key "OFF" and battery plugged in, verify battery voltage at B+ terminal of Access 3.

If: 0 volts, replace Access 3.

If: Battery volts, verify battery volts at B+ terminal of Access 2.

If: 0 volts, replace Access 2. See note

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*



6301

CHECKS THAT CA402-17 NOT AT BATTERY POSITIVE BEFORE ED CONTACTS CLOSE. EVENT CODE 322

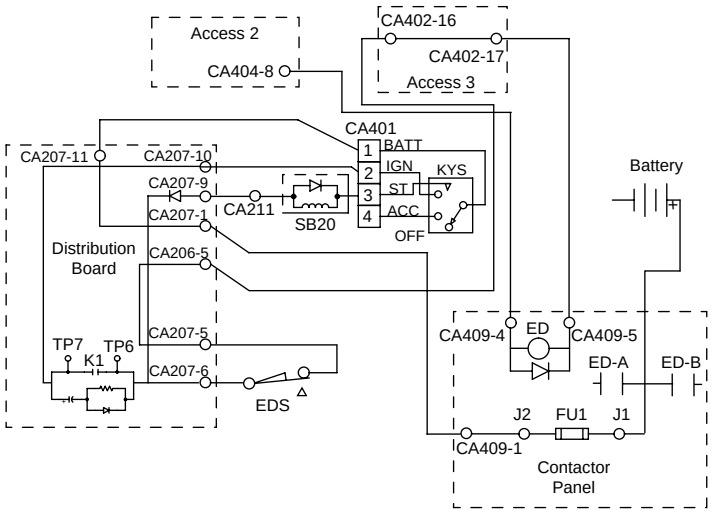
Step 1: Short circuit exists between battery positive and CA402-17. Battery voltage should only be present at CA402-17 after depressing operator pedals when truck is "powered up".

No short circuit. Go to Step 2.

Step 2: Verify ED coil is not open circuit between CA402-17 and CA404-8.

Wiring okay, replace Access 3. See note

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*



6299-04

ACCESS 3 COMMAND TO MOTOR ARMATURE NOT SENSED WITHIN LIMITS. EVENT CODE 323

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Check power cable connections between motor and Access 3.

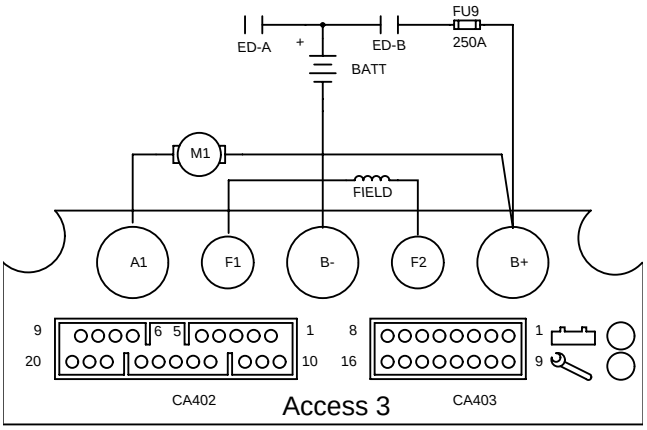
Step 3: (refer to capacitor discharge Caution on first page of section) Remove power cable from Access 3 A1 terminal.

"Power up" truck and attempt to travel.

If code does not change.

Then replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*



6301

ACCESS 3 COMMAND TO MOTOR FIELD PRESENT BUT NOT SENSED WITHIN LIMITS. EVENT CODE 324

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Attach meter across motor field terminals F1 and F2.

Step 3: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select M1-F (A4.16) for forward direction or M1-R (A4.17) for reverse direction on display menu.

Press and hold ↵. (drives motor field)

Observe meter voltage reading and display amperage reading.

If: Battery volts on meter, less than 10 amps on display: Then open exists in drive motor field circuit. Repair/replace.

If: 0 volts on meter, less than 10 amps on display: Then attach meter leads to F1 and F2 terminals on Access 3.

Turn key "ON" while pressing the ▲ and ▼ buttons.

Select M1-F (A4.16) M1-R (A4.17) on display menu.

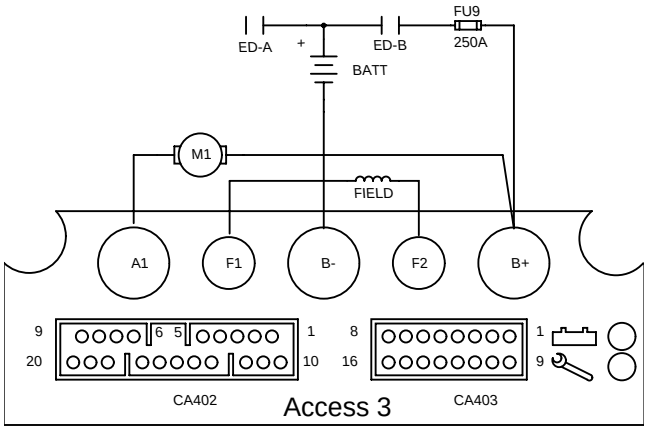
Press and hold ↵. (drives motor field)

Observe meter voltage reading and display amperage reading.

Battery volts, open circuit in power cable circuit.

O volts on meter and less than 10 amps on display, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*



6301

ALM1 (ALARM) Driver open (CA402-6) or alarm shorted. EVENT CODE 325

Step 1: "Power down" truck, disconnect wire from CA206-1. "Power up" truck and view code.

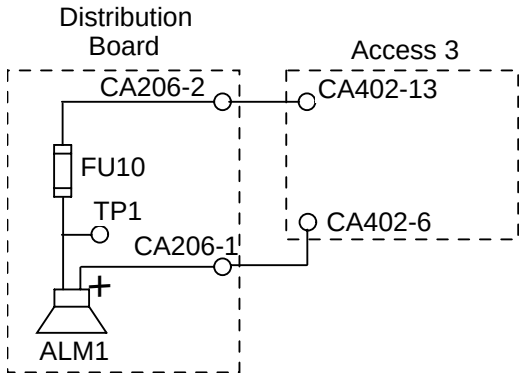
If: **Code changes or no code displayed**, then short circuit exists between CA206-1 to battery negative. Check wiring or replace distribution board.

If: **Code 325 is displayed**, disconnect CA402-6, "power up" truck.

Code changes, short circuit exists in wiring between distribution panel and Access 3.

Code 325 remains, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*



6303

INTERNAL MODULE FAULT. EVENT CODE 326

Step 1: If truck does not operate check all wiring from module.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

CA402-18 AND/OR CA402-19 HAS VOLTAGE PRESENT WHEN ED CONTACTOR IS NOT ENERGIZED. EVENT CODE 327

Step 1: Check for positive voltage at CA402-18 and CA402-19 without depressing operator pedals.

If: **Voltage (should be 0 volts before ED closes),** short circuit exists between CA402-18 or CA402-19 and battery positive.

Then clean all terminals of ED contactor, check for welded tips and possible missed wiring. Also verify power cable and control wiring is not grounded to truck frame. Repair/replace

If: **0 volts,** this is correct voltage reading.

Then check both ED contactor tips for excessive pitting or mechanical binding. Repair/replace.

Step 2: Check voltage at CA402-18 and CA402-19. With ED contactor closed, should be battery volts.

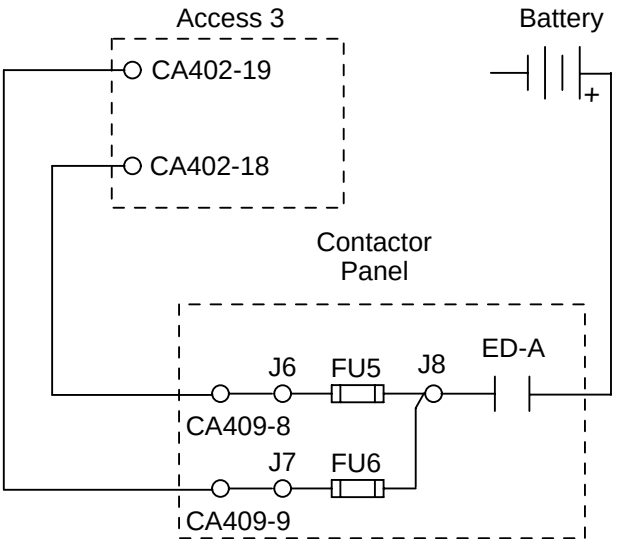
If: **0 volts,** check wiring, FU5 and FU6. On DC Traction models trace A1 power cable on Access 3 and B+ power cable on Access 2 per Power Cable Diagram, they may be reversed.

Step 3: Check for battery positive at CA402-15.

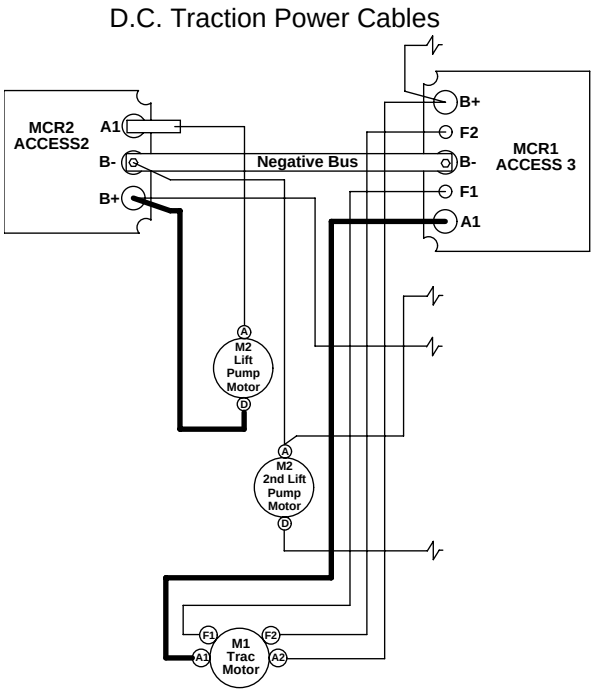
If: **0 volts**, check wiring.

If: **Battery volts**, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*



6302



11031

ED (EMERGENCY DISCONNECT CONTACTOR) COIL SHORT. EVENT CODE 328

Note: Follow this log event procedule only when code 328 is displayed on Access 1. If Access 3 amber light is flashing a code 328 and Access 1 is inoperable, refer to “When truck does not operate and there is no code” at beginning of this book.

Step 1: Disconnect leads at ED coil. Use continuity check to test for short circuit in ED coil. Coil resistance is 40 - 47 ohms.

If: Shorted, then repair/replace.

When corrected, "power up" truck and verify code is cleared.

If code still present, check wiring from ED coil through connector 409, wires may be reversed.

If: No short circuit, proceed with step 2.

Step 2: "Power down" truck and check the suppressor across the ED coil. This suppressor is polarity sensitive. Make sure it is installed correctly.

If: Installed correctly, remove the suppressor and using a digital voltmeter with a diode check scale, check voltage across suppressor in conducting (approximately 0.5 volts) and non-conducting (no voltage) direction.

If: Suppressor checks okay, reinstall suppressor making sure polarity is correct. Proceed to step 3.

Step 3: "Power down" truck. Disconnect green striped-white lead to ED coil. "Power up" truck and measure voltage between disconnected wire and battery negative.

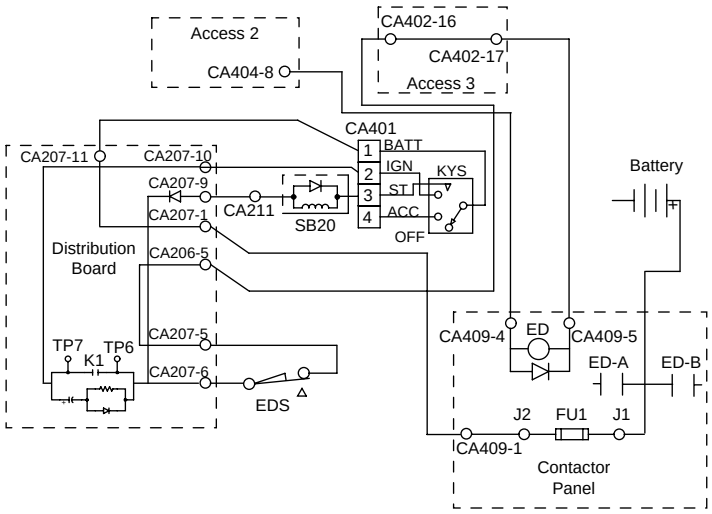
If: Voltage present, proceed with step 4.

If: 0 volts, short circuit exists. Check wiring.

Step 4: If no faults are found in above checks, verify wiring condition.

Wiring okay. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*



6299-04

POSITIVE VOLTAGE AT CA402-6 WHEN NOT REQUIRED. EVENT CODE 329

Step 1: Disconnect CA206-1.

If: Alarm remains on, replace distribution board.

If: Alarm turns off, check output from CA402-6.

If 12 or battery volts, proceed with step 2.

Step 2: Disconnect wire at CA402-6 on Access 3.

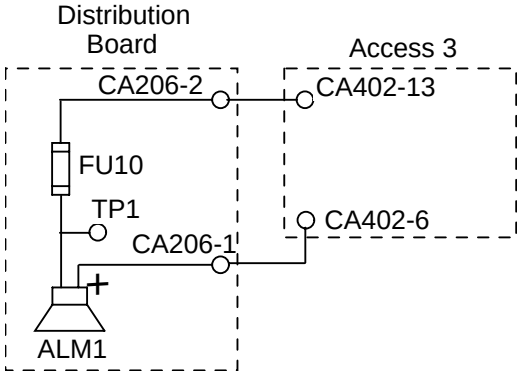
Check voltage at output pin (CA402-6) on Access 3.

If: 12 volts or battery voltage remains, replace Access 3.

If: 0 volts, check for 12 or battery volts on disconnected wire (CA402-6).

If voltage present, then short circuit exists between CA402-6, CA206-1, and ALM1.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*



6303

ECR1 (TRACTION FEEDBACK ENCODER) COUNTS NOT AS EXPECTED. EVENT CODE 331

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Turn key "ON" while pressing the ▲ button.

Select ECR1 (A2.21) on display menu.

Step 3: Move multi task lever slightly to provide traction command and observe encoder counts on display when drive wheel is moving.

If: Count not present, then check for +5 volts between CA602- 5 and CA602-2.

If: 5 volts is present, check encoder pulsing with digital meter measuring between Access 3 B- terminal and first CA403-5 (Channel A) then CA403-13 (Channel B).

If not pulsing, check wiring and mechanical coupling.

If wiring and coupling okay, replace ECR1.

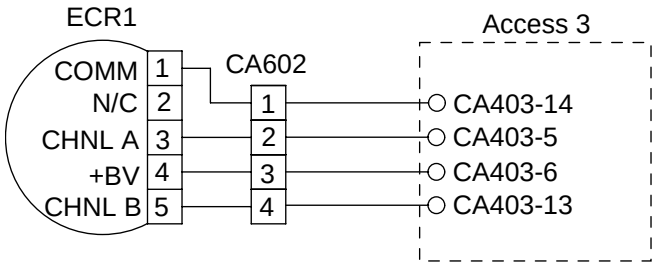
If: 0 volts, check for +5 volts between CA403-6 and CA403-14.

If voltage present, repair/replace wiring.

If 0 volts, disconnect wires at CA403-6 and CA403-14 and retest.

If 0 volts, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*



6300-01

ECR1 (TRACTION FEEDBACK ENCODER) Feedback opposite traction command. EVENT CODE 332

Step 1: Verify wiring of channels A and B between ECR1 and Access 3. Refer to above illustration.

Miswired, correct.

Step 2: Verify wiring of traction motor field and armature cables.

If: Reversed, correct.

If: Correct, replace ECR1.

If: All checks above are okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

DC TRACTION POT1 (TRACTION COMMAND POTENTIOMETER) Above electrical limit. EVENT CODE 333

Step 1: Turn key "ON" while pressing the ▲ button.

Select POT1 (A2.3) on display menu.

View reading on display.

If: Approximately 5 volts, open between potentiometer and CA403-7 orCA403-8 on Access 3. Then repair/replace.

If wiring okay, replace potentiometer. (Refer to illustration for connections).

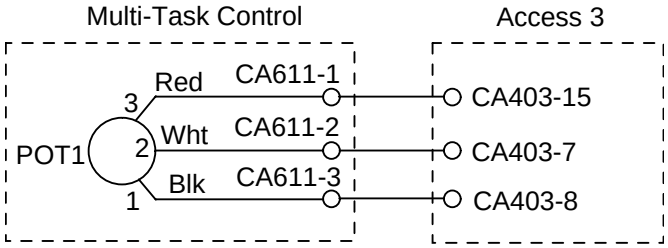
If: Between 2.1 to 2.9 volts, Control handle in center position

If: Between 0.7 to 1.5 volts, control handle in full forward travel position.

If: Between 3.5 to 4.3 volts, control handle in full reverse position.

Correct readings confirmed, intermittent connection in potentiometer circuit. Check connections and potentiometer harness routing and condition.

Note: *Calibrate handle after repair/replacement.*



6304

DC TRACTION POT1 (TRACTION COMMAND POTENTIOMETER) Below electrical limit. EVENT CODE 334

Step 1: Turn key "ON" while pressing the ▲ button.

Select POT1 (A2.3) on display menu.

View reading on display.

If: Approximately 0 volts, open circuit between potentiometer and Access 3. Refer to illustration.

Then check connection between potentiometer and CA403-15 or CA403-7 on Access 3.

Connection okay, replace potentiometer. (Refer to illustration for connections).

If: Between 2.1 to 2.9 volts, control handle in center position.

If: Between 0.7 to 1.5 volts, control handle in full forward travel position.

If: Between 3.5 to 4.3 volts, control handle in full reverse position.

Correct readings confirmed, intermittent connection in potentiometer circuit. Check connections and potentiometer harness and condition.

Note: *Calibrate handle after repair/replacement.*

DURING CALIBRATION, INSUFFICIENT VOLTAGE VARIATION IS OBTAINED FROM POT1. EVENT CODE 337

Note: *This code will display after POT1 calibration procedure is performed incorrectly (multi task handle moved to forward travel direction when reverse movement required and vice versa). Recalibrate POT1.*

Step 1: Turn key "ON" while pressing the ▲ button.

Select POT1 (A2.3) on display menu.

View reading on display while moving multi task handle from full reverse to full forward.

Step 2: Voltage should be approximately 4.0 volts at full reverse, 2.5 volts at neutral and 1.2 volts at full forward.

If: Voltages higher or lower than listed then adjust potentiometer or linkage.

If: Voltage span less than listed, recalibrate POT1.

TRACTION COMMAND (POT1) Not matching forward switch (FS) signal. EVENT CODE 341

Step 1: Turn key "ON" while pressing the ▲ button.

Select POT1 (A2.3), FS (A 2.1) on display menu.

View reading on display to verify correct operation.

Note: *If these components have been worked on, verify that wiring is not reversed.*

Forward Switch (yellow sleeving) mounted nearest handle grip. "F" stamped on actuator that passes between optic sensors.

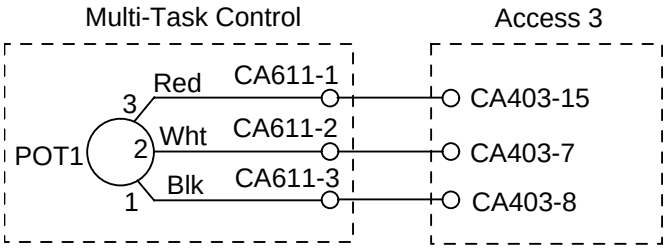
Reverse Switch (black sleeving) mounted nearest support casting. "R" stamped on actuator that passes between optic sensors.

Step 2: **FS/POT1 operation:** input statue of switch with multi task handle in neutral should be "open" indicated by "0" on the display (A2.1). The POT1 reading on display (A2.3) should be between 2.1 to 2.9 volts. Moving multi task handle to full forward position should toggle switch input status to "closed", display to "1" (A2.1). Reading for POT1 (A2.1) should go between 0.7 to 1.5 volts.

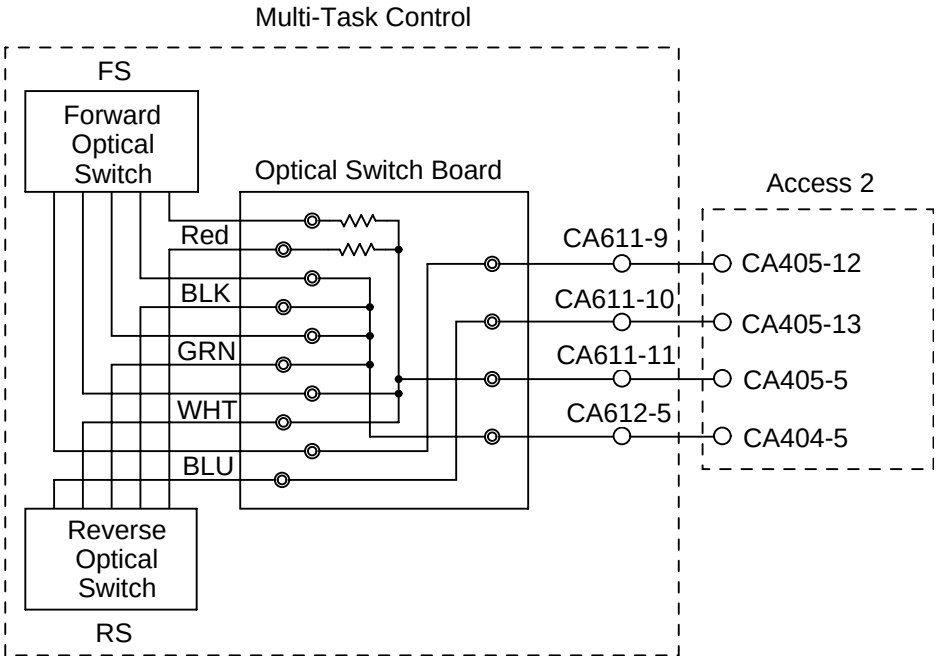
If: Readings are not as listed, check switch for physical damage and/or damage to wiring.

If: Damaged, replace optical switch assembly. Harnesses must be routed properly so spherical handle cover does not contact harness as handle is moved from one extreme to the other. Verify harnesses routed properly after installation. Calibrate handle.

If: POT1 not within limits, replace. Calibrate handle.



6304



6305

TRACTION COMMAND (POT1) Not matching reverse switch (RS) signal. EVENT CODE 342

Step 1: Turn key "ON" while pressing the ▲ button.

Select POT1 (A2.3), RS (A2.2) on display menu.

View reading on display to verify correct operation.

Note: *If these components have been worked on, verify that wiring is not reversed.*

Forward Switch (yellow sleeving) mounted nearest handle grip. "F" stamped on actuator that passes between optic sensors.

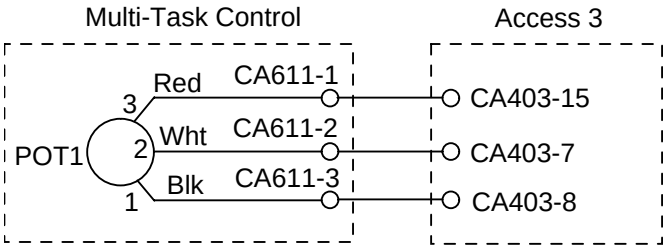
Reverse Switch (black sleeving) mounted nearest support casting. "R" stamped on actuator that passes between optic sensors.

Step 2: **RS/POT1 operation:** Input status of switch with multi task handle in neutral should be "open" indicated by "0" on display (A2.2). The POT1 reading on display (A2.3) should be between 2.1 to 2.9 volts. Moving multi task handle to full reverse position should toggle switch input status to "closed", display to "1" (A2.2). Reading for POT1 (A2.1) should go between 3.5 to 4.3 volts.

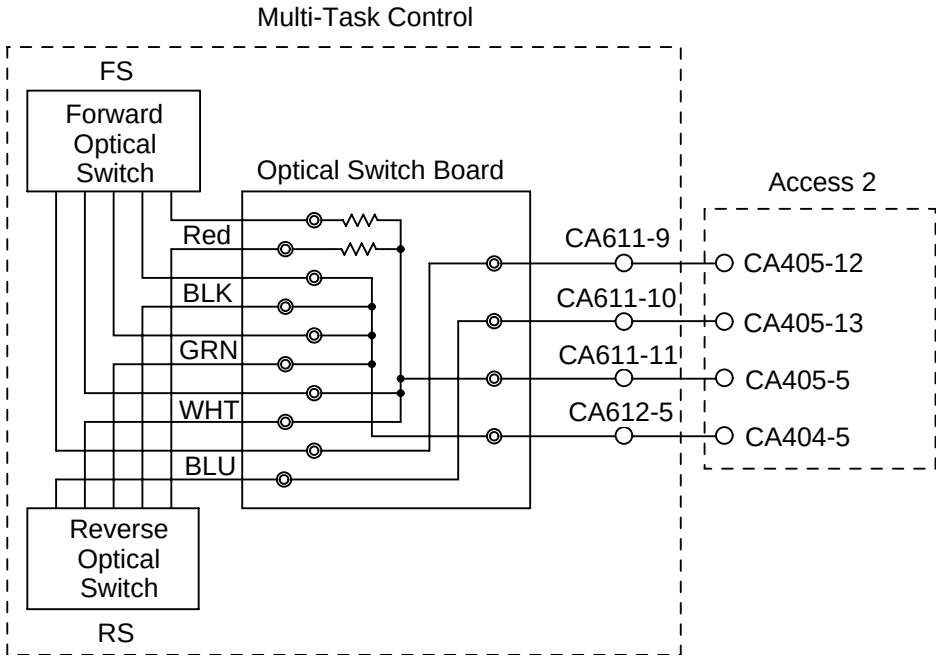
If: Readings are not as listed, then check switch for damaged wiring or physical damage.

If: Damaged, replace optical switch assembly. Harnesses must be routed properly so spherical handle cover does not contact harness as handle is moved from one extreme to the other. Verify harnesses routed properly after installation. Calibrate handle.

If: POT1 not within limits, replace. Calibrate handle.



6304



6305

FS AND RS (START SWITCHES) Indicating both closed at same time. EVENT CODE 343

Step 1: Check FS and RS for physical damage to wiring or switch and mounting.

If: Damaged, replace optical switch assembly. **See note 1.** Calibrate handle.

If: Appearance OK, proceed to step 2.

Step 2: Turn key "ON" while pressing the ⏏ button. Use display menu for FS (A2.1) and RS (A2.2). Check status of FS and RS with multi task handle in neutral position.

If: Either FS or RS is "1", select that switch to use in step 3.

If: Both FS and RS are "1", choose either switch and proceed to step 3.

Step 3: Check optical switch function by disconnecting output (WHT CA611-9 for FS, or WHT CA611-10 for RS) of previously selected switch.

If: Selected switch display changes to "0" when switch wire is disconnected, replace optical switch assembly. **See Note 1.** Calibrate handle.

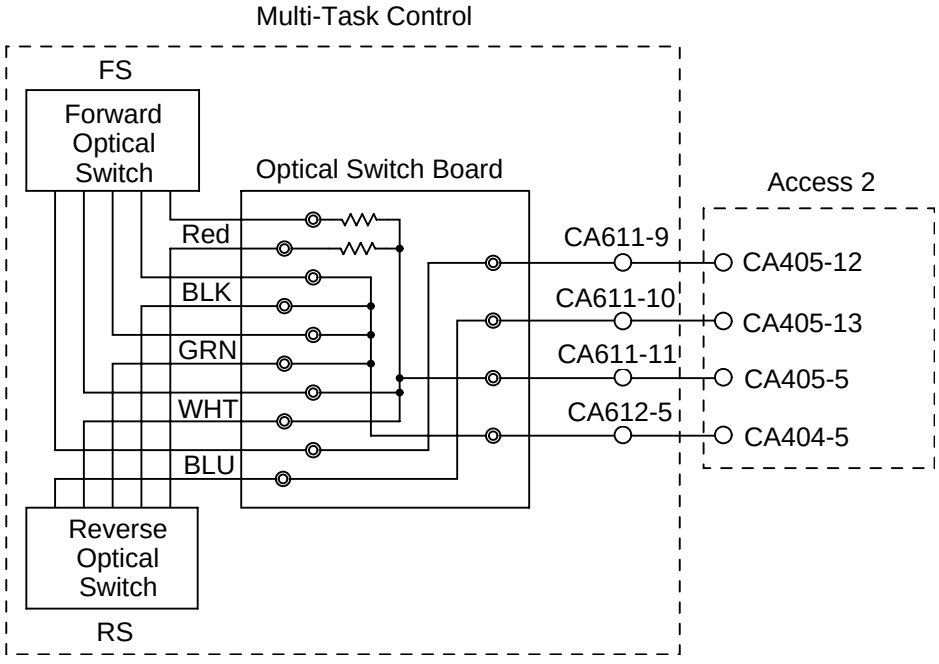
If: Selected switch display is "1", proceed to step 4.

Step 4: Disconnect wire (WHT CA405-12 for FS, or WHT CA405-13 for RS) of selected switch at Access 2.

If: Selected switch display changes to "0" when wire is disconnected, repair/replace wiring of selected switch between Access 2 and multi task handle (CA405-12 and CA611-9 for FS, CA405-13 and CA611-10 for RS)

If: Selected switch is "1" with multi task handle in neutral, replace Access 2. **See Note 2.**

Note 1: *Harness must be routed properly so spherical handle cover does not contact harness as handle is moved from one extreme to the other. Verify harness is routed properly after installation.*
Note 2: *If truck operates, this could be a random nuisance code. Monitor code frequency. If frequency increases for no apparent reason, replace Access 2.*



6305

INNER BRAKE CURRENT TOO HIGH — EVENT CODE 344

Step 1: Check for short circuit in brake coil or wiring between Access 3 and brake coil.

Step 2: Check brake coil resistance. Resistance range is 2.49 to 5.52 ohms. Normal reading at 20° C (68° F), is 3.56 ohms.

If: **Outside these ranges**, following should be considered:

Cold temperatures greatly decreases resistance of coil, increasing current draw by the coil.

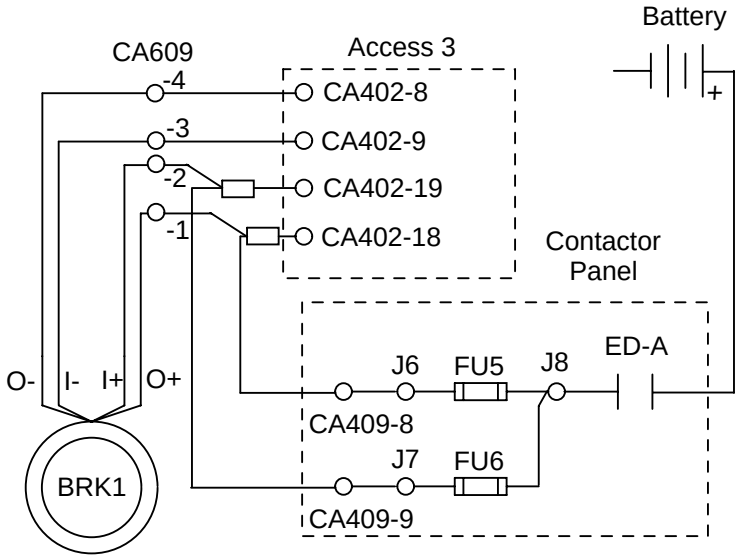
If in a cold environment, warm coil and recheck resistance readings.

If resistance is still outside range after coil is warmed, replace brake coil.

If: **Coil resistance checks okay**, disconnect wires at CA402-19 and CA402-9. Recheck resistance readings at Access 3, CA402-19 and CA402-9.

Should be within specified range above. If not, check wiring between Access 3 and brake coil for short circuit.

If: **Problem can not be found** and truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.



6306

INNER BRAKE RESISTANCE TOO HIGH — EVENT CODE 345

Step 1: Check FU6 for open circuit.

Step 2: Attach meter leads across CA609-2 and CA609-3 near brake coil.

Step 3: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select BRK1i (A4.13) on display menu.

Press and hold ↵. (drives component)

View reading on display and meter.

If: Battery volts on meter/ 0 amps on display: Open circuit in brake coil. Repair/replace.

If: 0 volts on meter and 0 amps on display: Re-select BRK1i (A4.13) on display. Check for battery positive at CA402-19 while pressing and holding ↵.

If: 0 volts, double check FU6 and associated wiring.

If: Battery positive, Re-select BRK1i (A4.13) on display and measure voltage between CA402-19 and CA402-9 while pressing and holding ↵.

Battery volts, open circuit in wiring between Access 3 and brake coil. Repair/replace.

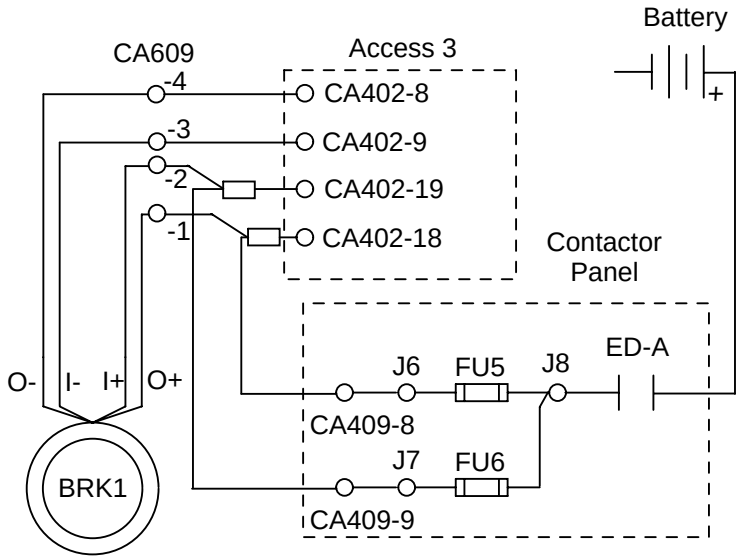
0 volts, replace Access 3.

If: Less than 10 volts on meter and 3 to 6 amps on display. This could be an indication that brake assembly is getting too hot during operation. Check for dragging brakes or improper adjustment.

If: Okay, check resistance of brake coil. Correct reading is between 2.49 and 5.52 ohms at 20° C (68° F).

If: Neither of these two conditions exists, verify that condition is not intermittent or occurs during extended use.

Note: *If problem can not be found and truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*



6306

OUTER BRAKE RESISTANCE TOO LOW. EVENT CODE 346

Step 1: Check for short circuit in brake coil or wiring between Access 3 and brake coil.

Step 2: Check brake coil resistance. Resistance range is between 0.95 to 2.1 ohms. At 20° C (68° F), it will measure 1.4 ohms.

If: **Outside these ranges** the following should be considered.

Cold temperatures greatly decreases resistance of coil.

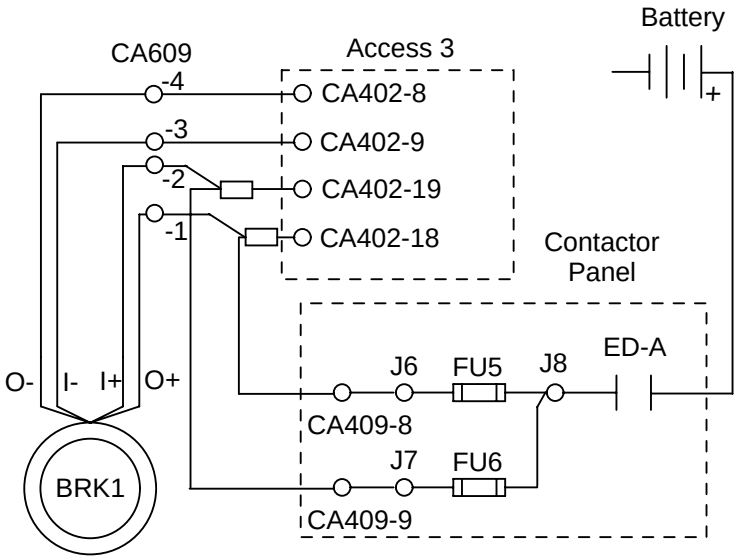
If in a cold environment, warm coil and recheck resistance readings.

If resistance is still outside range listed, replace brake coil.

If: **Coil checks okay** or truck is not used in a cold environment, recheck resistance readings at Access 3, CA402-18 and CA402-8.

Resistance out of range, check wiring between Access 3 and brake coil for short circuit.

If: **Problem can not be found** and truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.



6306

OUTER BRAKE RESISTANCE TOO HIGH. EVENT CODE 347

Step 1: Check FU 5 for open circuit.

Step 2: Attach meter leads across CA609-1 and CA609-4 near brake coil.

Step 3: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select BRK1o (A4.12) on display menu.

Press and hold ↵. (drives component)

View reading on display and meter.

If: Battery volts on meter/ 0 amps on display: Open circuit in brake coil. Repair/replace.

If: 0 volts on meter and 0 amps on display: Re-select BRK1o on display. Check for battery positive at CA402-18 while pressing and holding ↵.

If: 0 volts, double check FU5 and associated wiring.

If: Battery positive, Re-select BRK1o on display and measure voltage between CA402-18 and CA402-8 while pressing and holding ↵.

Battery volts, open circuit in wiring between Access 3 and brake coil. Repair/replace.

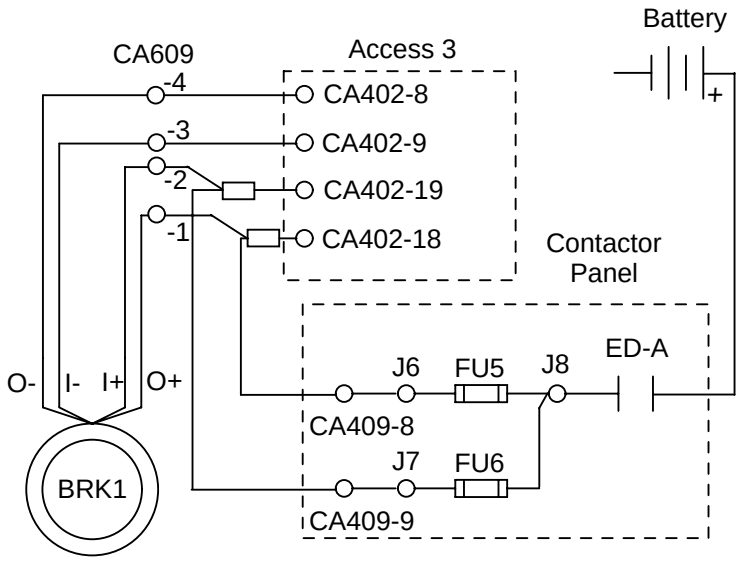
0 volts, replace Access 3.

If: Less than 10 volts on meter and 3 to 6 amps on display. This could be an indication that brake assembly is getting too hot during operation. Check for dragging brakes or improper adjustment.

If: Okay, check resistance of brake coil. Correct reading should be between 0.95 and 2.1 ohms at 20° C (68° F).

If: Neither of these two conditions exists, verify that condition is not intermittent or occurs during extended use.

Note: *If problem can not be found and truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*



6306

CASTER BRAKE RESISTANCE TOO LOW. EVENT CODE 348

Step 1: Raise truck so drive tire and caster are clear of floor and place hardwood blocks under truck frame.

Step 2: Disconnect CA610. Check brake coil resistance with caster in static condition and while rotating caster slowly for one full rotation to check for open spots in slip ring. Resistance for acceptable temperature range is between 3.35 and 7.43 ohms. At 20° C (68° F), resistance should measure approximately 4.79 ohms.

Cold temperatures decrease resistance of coil.

If in a cold environment, warm coil and recheck resistance.

If: Resistance is outside range listed, go to step 3.

If: Coil checks okay or truck is not used in a cold environment, reconnect CA610, recheck resistance at Access 3 CA409-19 and CA402-20.

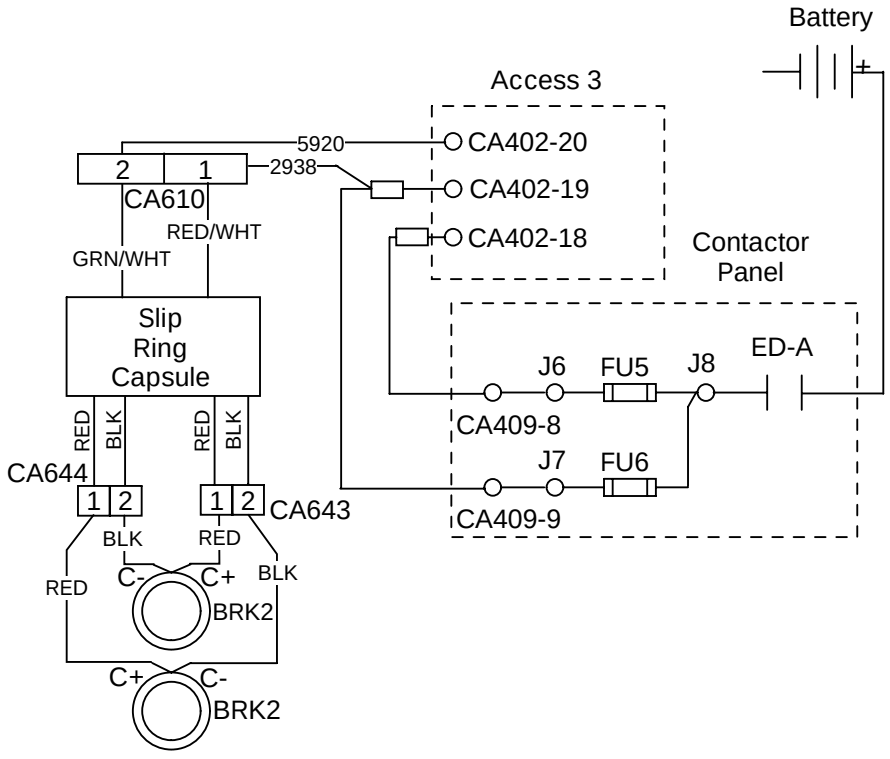
Resistance out of range, check wiring between Access 3 and connectors CA610.

Step 3: Disconnect CA643 and CA644, leave both brake wires of brake side of connector attached. Check brake coil resistance between CA643 and CA644.

If: Resistance is still outside range listed, replace caster brakes.

If: Coil checks okay, replace slip ring capsule.

Note: *If problem can not be found and truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*



10535

CASTER BRAKE RESISTANCE TOO HIGH. EVENT CODE 349

Step 1: Check FU6 for open circuit.

Step 2: Raise truck so drive tire and caster are clear of floor and place hardwood blocks under truck frame.

Step 3: Attach meter leads across CA643 and CA644 near brake coil.

Step 4: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select BRK2 (A4.14) on display menu.

Press and hold ↵. (drives component)

View reading on display and meter.

If: Battery volts on meter/ 0 amps on display: Open circuit in brake coil. Proceed with step 6.

If: 0 volts on meter and 0 amps on display: Check for battery positive at CA402-19.

If: 0 volts, double check FU6 and associated wiring.

If: Battery positive, select BRK2 (A4.14) on display, press and hold ↵ and measure voltage between CA402-19 and CA402-20.

Battery volts, open circuit in wiring between Access 3 and brake coil. Proceed with step 5.

0 volts, replace Access 3.

If: Less than 10 volts on meter and 3 to 6 amps on display. This could be an indication that brake assembly is getting too hot during operation. Check for dragging brakes or improper adjustment.

If: Okay, check resistance of brake coil. Correct reading is between 3.35 to 7.43 ohms at 20° C (68° F).

If: Neither of these two conditions exists, verify that condition is not intermittent or occurs during extended use.

Step 5: Disconnect CA610. Check brake coil resistance between connectors with caster in static condition and while rotating caster slowly for one full rotation to check for open spots in slip ring.

Resistance for acceptable temperature range is between 3.35 and 7.43 ohms. At 20° C (68° F), resistance should measure approximately 4.79 ohms.

Cold temperatures decrease resistance of coil.

If in a cold environment, warm coil and recheck resistance.

If: Resistance is outside range listed, go to step 6.

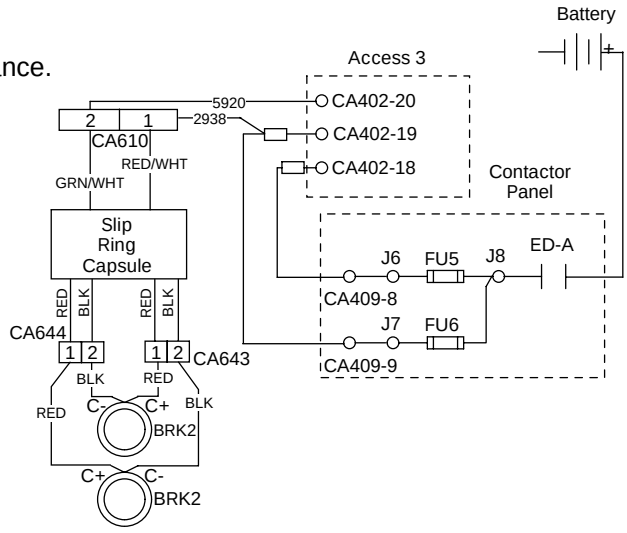
If: Coil checks okay or truck is not used in a cold environment, reconnect CA610, recheck resistance at Access 3 CA402-19 and CA402-20.

Resistance out of range, check wiring between Access 3 and connectors CA610.

Step 6: Disconnect CA643 and CA644, leave both brake wires of brake side of connector attached. Check brake coil resistance between CA643 and CA644.

If: Resistance is still outside range listed, replace caster brakes.

If: Coil checks okay, replace slip ring capsule.



Note: *If problem can not be found and truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

INNER BRAKE COIL SHORT CIRCUIT. EVENT CODE 351

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Check voltage at CA402-18 and CA402-19. Should read battery volts when "power-up" and attempt to travel.

If: 0 volts, check fuses and wiring.

If: Battery volts, continue with step 3.

Step 3: Remove coil leads from connector CA609-2 and CA609-3. "Power up" truck and attempt to travel.

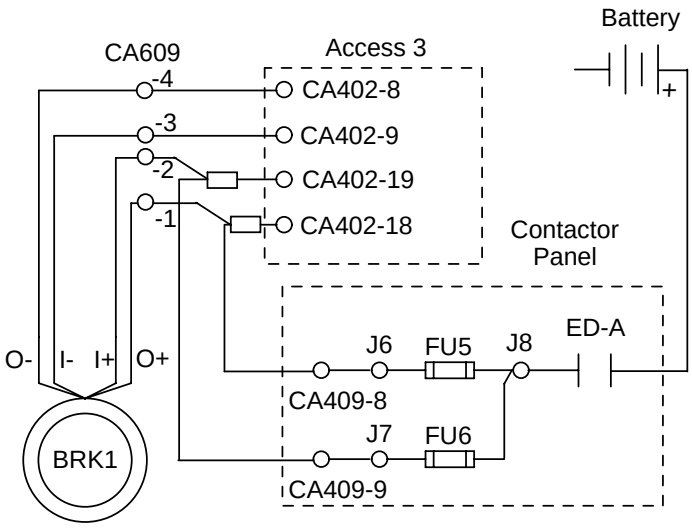
If: Different code displayed, short circuit exists in brake coil.

If: Code 351, disconnect CA402-19 and CA402-9. "Power up" truck and attempt to travel.

Code changes, short circuit in wiring between brake coil and Access 3.

Code 351, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*



6306

OUTER BRAKE COIL SHORT CIRCUIT OR ACCESS 3 OPEN CIRCUIT. EVENT CODE 352

Step 1: Check voltage at CA402-18 and CA402-19. Should read battery volts when "power-up" and attempt to travel.

If: 0 volts, check fuses FU5, FU6 and wiring.

If: Battery volts, continue with step 2.

Step 2: Remove coil leads from connector CA609-1 and CA609-4. "Power up" truck and attempt to travel.

If: Different code displayed, short circuit exists in brake coil.

If: Code 352, disconnect CA402-18 and CA402-8. "Power up" truck and attempt to travel.

Code changes, short circuit in wiring between brake coil and Access 3.

Code 352, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

ACCESS 3 UNABLE TO READ FROM ACCESS 1 OR ACCESS 2. EVENT CODE 353

This indicates a problem with communications between Access 1 2 3®. Access 1 may be locked up in this condition. Code 328 preceded by a single flash will be blinked on LED of Access 3 and Code 14 will be blinked on LED of Access 2.

Step 1: Check condition of communications link between Access 1 2 3® (connectors, connector pins, wiring).

Step 2 Check for +5 volts at Access 3 between CA403-2 and CA403-10.

WARNING

Never *key "ON" truck with any Access 1, 2 or 3 connections disconnected. In addition,* ***never*** *remove or connect any Access 1, 2 or 3 connections while truck is keyed "ON".*

If: 5 volts, then continue with step 3.

If: 0 volts then disconnect CA405-2. Re-measure voltage between CA403-2 and CA403-10.

If: Voltage is present, then short circuit exists in Access 2. Repair/ replace.

If: Voltage is not present, disconnect CA403-2 and CA403-10 at Access 3 and measure voltage on Access 3 pins.

If voltage is present, short exists in wiring. Repair/replace.

If voltage not present, replace Access 3.

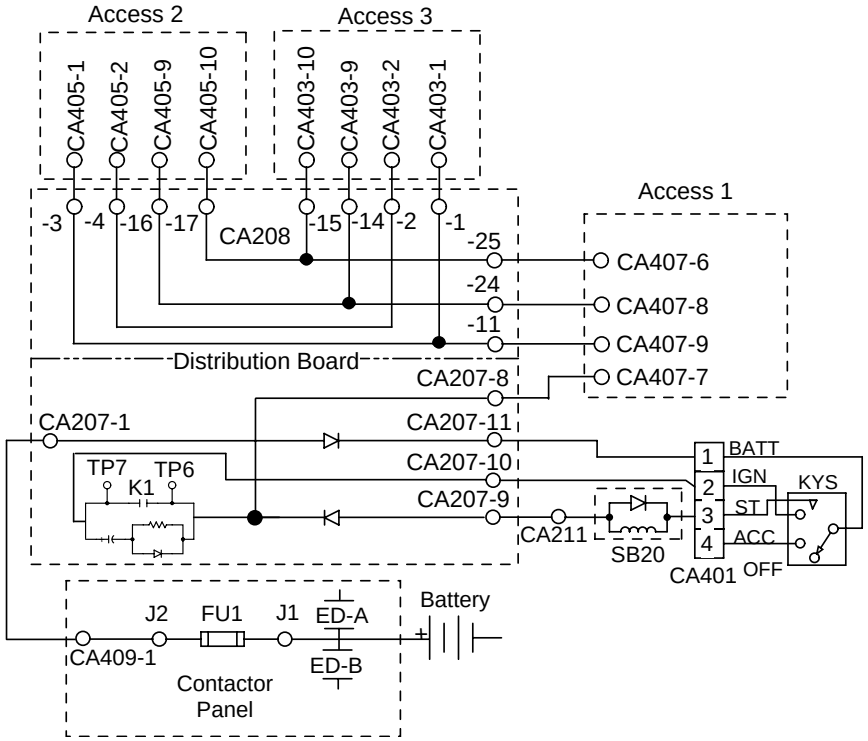
Step 3: Check for +5 volts at Access 2 between CA405-2 and CA405-10.

If: 5 volts then continue with step 4.

If: 0 volts then open circuit in communication link exists between modules. Locate open and repair.

Step 4: Check communication lines voltage level. 2.5 volts should be present at CA208-3 and CA208-16.

If: Less than 2.2 volts or greater than 2.8 volts, disconnect CA208, recheck all communication line voltage. Should be 2.5 volts between battery negative and CA403-1, CA403-9, CA405-1, CA405-9, CA407-9 and CA407-8.



6298-02

CAN WRITE TIME OUT. EVENT CODE 354

This indicates a problem with communications between Access 1 2 3®. Access 1 may be locked up in this condition. Code 328 preceded by a single flash will be blinked on LED of Access 3 and Code 14 will be blinked on LED of Access 2.

Step 1: Check condition of communications link between Access 1 2 3® (connectors, connector pins, wiring).

Step 2 Check for 5 volts at Access 3 between CA403-2 and CA403-10.

WARNING

Never *key "ON" truck with any Access 1, 2 or 3 connections disconnected. In addition,* ***never*** *remove or connect any Access 1, 2 or 3 connections while truck is keyed "ON".*

If: 5 volts then continue with step 3.

If: 0 volts then disconnect CA405-2. Re-measure voltage between CA403-2 and CA403-10.

If: Voltage is present, then short circuit exists in Access 2. Repair/ replace.

If: Voltage is not present, disconnect CA403-2 and CA403-10 at Access 3 and measure voltage on Access 3 pins.

If voltage is present, short exists in wiring. Repair/replace.

If voltage not present, replace Access 3.

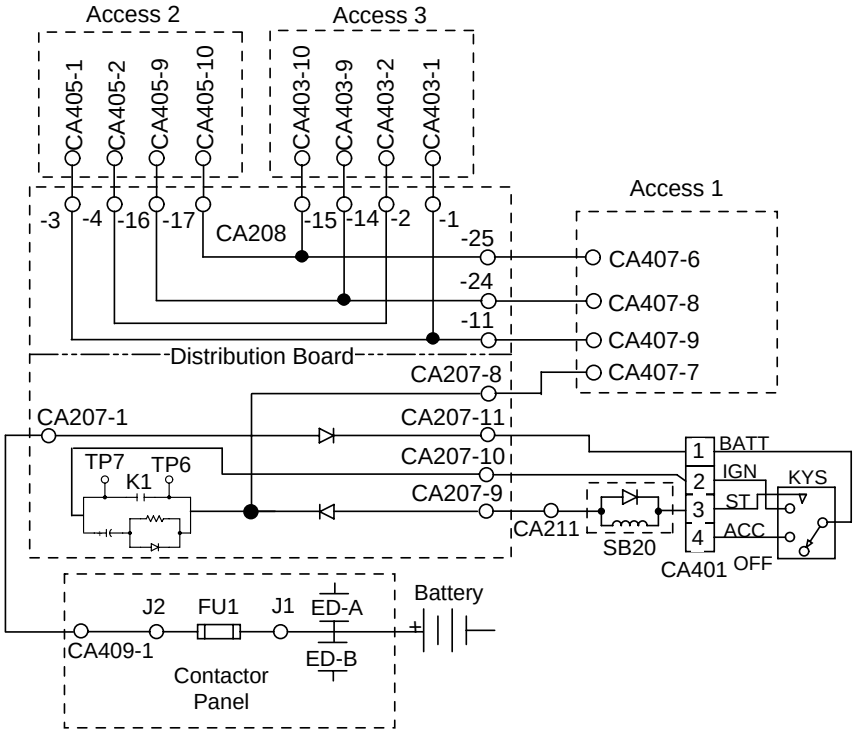
Step 3: Check for +5 volts at Access 2 between CA405-2 and CA405-10.

If: 5 volts then continue with step 4.

If: 0 volts then open circuit in communication link between modules. Locate open and repair.

Step 4: Check communication lines voltage level. 2.5 volts should be present at CA208-3 and CA208-16.

If: Less than 2.2 volts or greater then 2.8 volts, disconnect CA208, recheck all communication line voltage. Should be 2.5 volts between battery negative and CA403-1, CA403-9, CA405-1, CA405-9, CA407-9 and CA407-8.



6298-02

ACCESS 1 internal fault. EVENT CODE 355

Step 1: If truck does not operate, check wiring.

Wiring okay, go to step 2.

Step 2: Check TPA wiring per code 841.

If: Wiring OK, go to step 3.

Step 3: Replace Access 1, see note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 1.*

ACCESS 2 internal fault. EVENT CODE 356

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 2. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 2.*

ACCESS 3 Internal fault EVENT CODE 357

Step 1: If truck does not operate, check wiring. Check for shorts to frame on wiring connected to T-Comm on FU10.

If: Wiring OK, replace Access 3, see note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

ACCESS 3 Internal fault EVENT CODE 358

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

ACCESS 3 Internal fault EVENT CODE 359

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

ACCESS 3 internal fault — EVENT CODE 361

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

CASTER BRAKE COIL SHORT CIRCUIT OR ACCESS 3 OPEN CIRCUIT. — EVENT CODE 362

Step 1: Check voltage at CA402-18 and CA402-19. Should read battery volts with operator pedals depressed.

If: 0 volts, check FU5, FU6 and associated wiring.

If: Battery volts, then continue with step 2.

Step 2: Remove coil leads from connector CA610. "Power up" truck and attempt to travel.

If: Different code displayed, short circuit in brake coil or slip ring capsule.

Reconnect CA610, disconnect CA643 and CA644. "Power up" truck and attempt to travel.

If different code displayed, short circuit in brake coil. Replace.

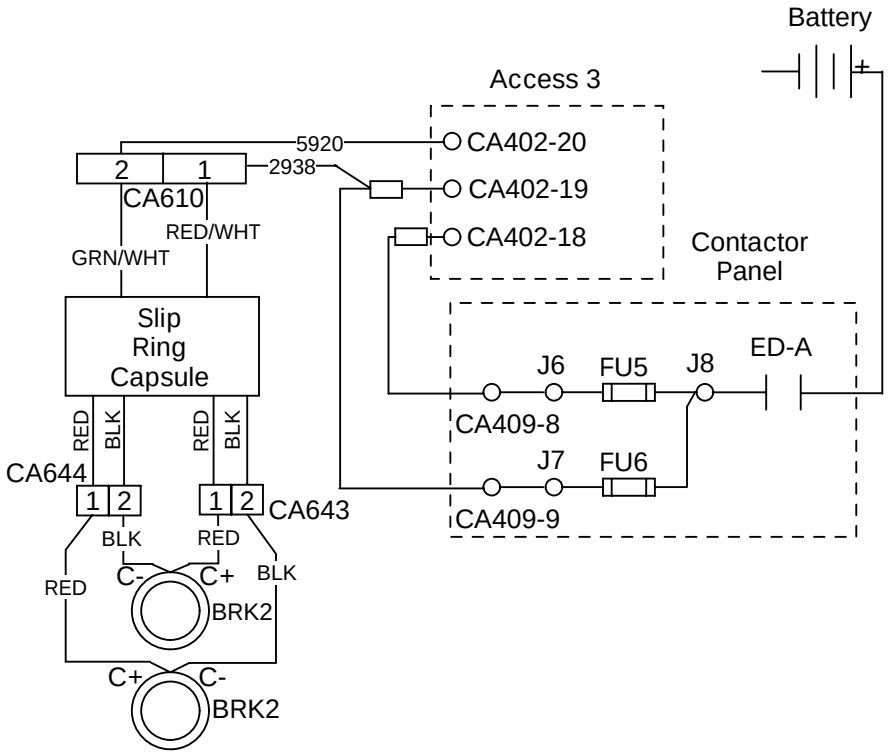
If code 362 displayed, short circuit in slip ring module. Replace.

If: Code 362 displayed, disconnect CA610 and CA402-20. "Power up" truck and attempt to travel.

If code 362, replace Access 3. See note.

Code changes, short circuit in wiring between brake coil and Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*



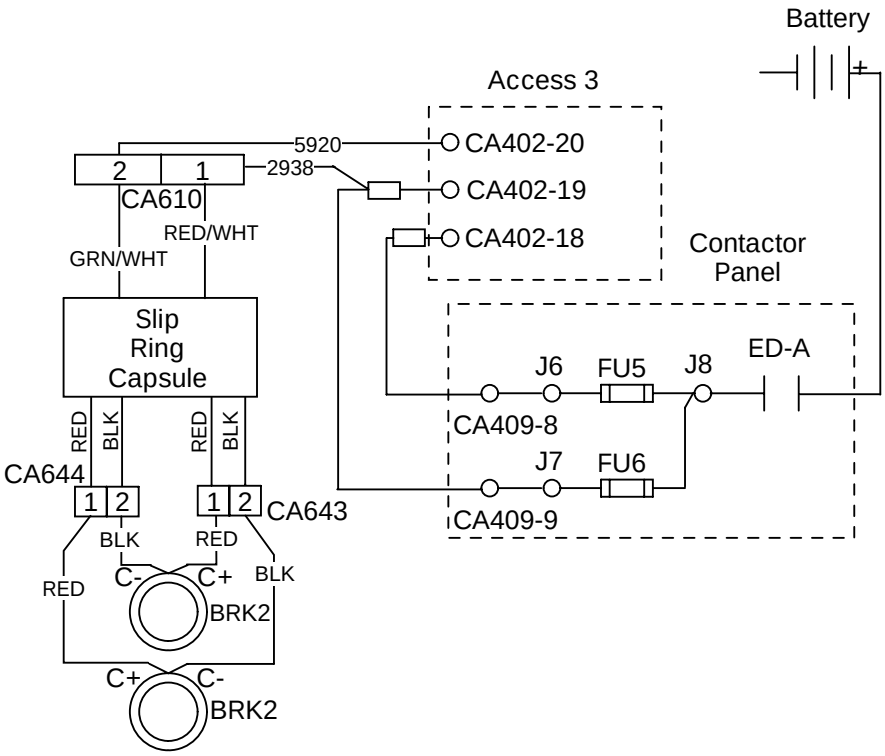
10535

CASTER BRAKE DRIVER SHORT CIRCUIT WITHIN ACCESS 3. EVENT CODE 363

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*



10535

M1 (TRACTION MOTOR) ARMATURE SHORT. EVENT CODE 364

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Check drive motor armature connections for looseness or incorrect wiring.

Check B+ on Access 2 and Access 3 to see if wiring is reversed.

Step 3: Disconnect cable from motor A1 terminal. "Power up" truck and attempt to travel.

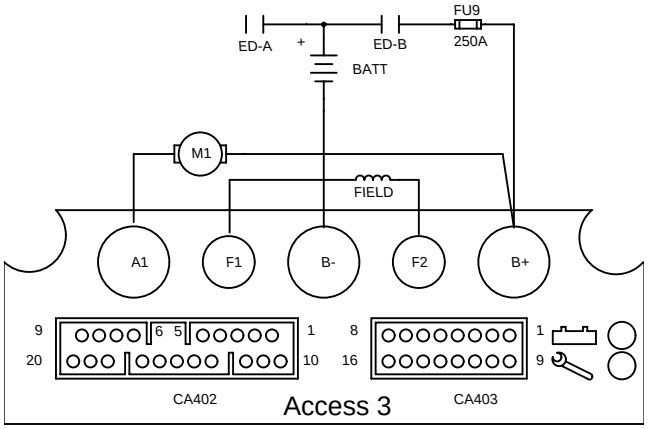
If: Code changes, problem in drive motor circuit.

If: Code 364, disconnect cable from Access 3 A1 terminal, "power up" truck and attempt to travel.

If code changes, short circuit in power cables between Access 3 and drive motor.

If code 364, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*



6301

ACCESS 3 INTERNAL FAULT. EVENT CODE 365

Step 1: If truck does not operate, check wiring and check for proper software (AC or DC traction).

If: Wiring and software OK, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

ACCESS 3 INTERNAL FAULT. EVENT CODE 366

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

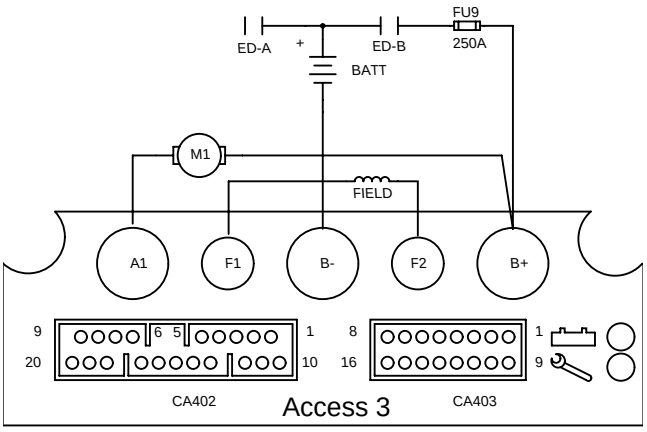
Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

FU9 OPEN CIRCUIT OR M1 (TRACTION MOTOR) CIRCUIT OPEN. EVENT CODE 367

Step 1: Check condition of fuse FU9 and ED contactor tips. Repair/replace.

Step 2: Check for open circuit between battery positive, ED tips, FU9 and Access 3.

Note: *Due to stored capacitance voltage in Access 3, a voltage check of FU9 may be misleading. Replace with known good fuse and retest.*



6301

ACCESS 3 TEMPERATURE BELOW LIMIT FOR PROPER OPERATION. EVENT CODE 368

Step 1: If truck has been left in the blast freezer in the "OFF" condition for an extended period of time this code may register.

If condition cannot be cleared after leaving the truck "powered up" for a period of time, move truck to warmer location.

Code 368, replace Access 3.

ACCESS 3 Temperature above limit for proper operation. EVENT CODE 369

Step 1: Make sure drive motor fuse FU9 size is correct (250 amps).

Step 2: Check for loose or corroded connections to power terminals on Access 3. Repair.

Step 3: Make sure full surface contact is being made between Access 3 and the mounting surface with a complete film of thermal transfer grease between mounting surfaces.

Check tightness of module mounting screws to ensure module is tightly secured to mounting surface.

Step 4: Has duty cycle been increased to include short distance runs with capacity loads?

If not, a component problem with either the drive motor or Access 3 exists.

Note:*If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

CASTER BRAKE DRIVER SHORT. Internal module short circuit, EVENT CODE 371

Step 1: Measure voltage at CA402-20 to battery negative.

If: Less than 5 volts, check for short circuit between CA402-20 and battery negative. Repair/replace.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

M1 ARMATURE CURRENT (TRACTION MOTOR) Too high or too low during regenerative braking. EVENT CODE 372

Step 1: Verify that the brakes are not dragging or misadjusted.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

M1 (TRACTION MOTOR) field current too high or too low. EVENT CODE 373

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Turn key "ON" while pressing the ▲ and ▼ buttons.

Select M1-F (A4.16) for forward direction or M1-R (A4.17) for reverse direction on display menu.

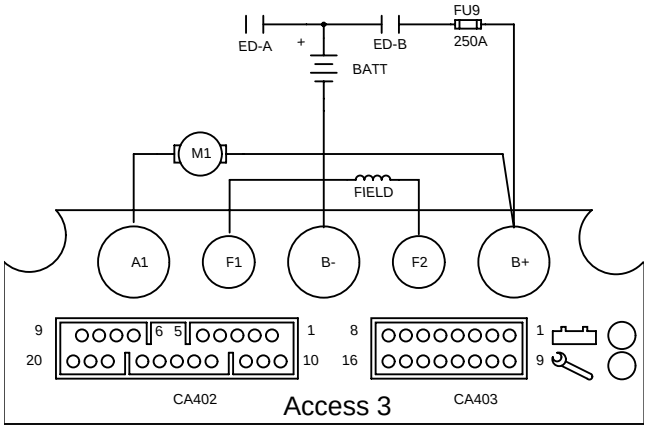
Press and hold ↵. (drives motor field)

Observe display current reading.

If: Field current above 50 amps, check for short circuit in motor field circuit. Repair/replace.

If: Field current below 30 amps, check for open circuit in motor field circuit. Repair/replace.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*



6301

M1 (TRACTION MOTOR) Armature open circuit. EVENT CODE 374

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Attach meter across A1 and A2 terminals.

Turn key "ON" while pressing the ▲ and ▼ buttons.

Select M1-A (A4.15) on display menu.

Press and hold ↵. (drives armature)

Observe meter voltage reading and display current reading.

If: Battery volts on meter and less than 50 amps on display: Open drive motor circuit.

Then check power cable connections, motor brushes and holder, and condition to M1. Repair/replace.

If: 0 volts on meter and less than 50 amps on display: Then check output of Access 3. Move meter leads to the A1 and A2 terminals of Access 3 and repeat test.

If battery volts, open circuit in power cables between drive motor and Access 3.

If 0 volts on meter and less than 50 amps on display, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

M1 (TRACTION MOTOR) Sensed field input exceeds limits for off condition. EVENT CODE 375

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

ACCESS 3 Internal fault. EVENT CODE 376

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

ACCESS 3 Internal fault. EVENT CODE 377

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

M1 (TRACTION MOTOR) Armature shorted. EVENT CODE 378

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Disconnect and isolate A1 power cable at drive motor. "Power up" truck and attempt to travel.

If: **Code changes** then short exists in drive motor. Repair/ replace.

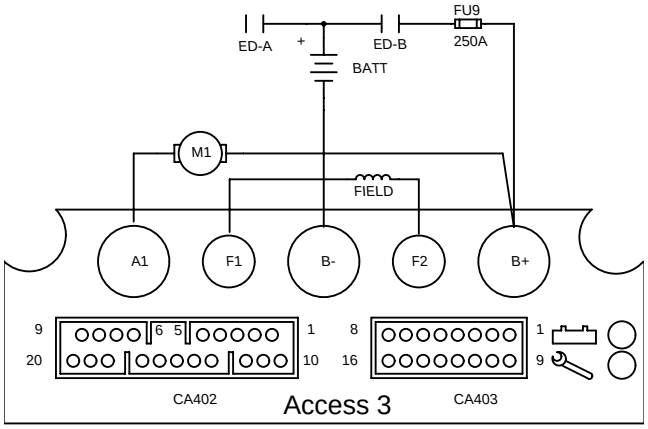
If: **Code 378 remains**, verify code in Access 1, 2 button mode.

If code 378 present, (refer to capacitor discharge Caution on first page of section) disconnect power cables at A1 and B+ terminals of Access 3. "Power up" truck and attempt traction.

Code changes, short in power cables between the drive motor armature and Access 3. Repair/ Replace.

Code remains, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*



6301

M1 (TRACTION MOTOR) Field shorted. EVENT CODE 379

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: (refer to capacitor discharge Caution on first page of section) Disconnect and isolate F1 or F2 power cables at drive motor. "Power up" truck and attempt to travel.

If: **Code changes**, short circuit in drive motor field or power cable wiring. Repair/replace.

If: **Code 379 remains**, (refer to capacitor discharge Caution on first page of section) disconnect F1 and F2 power cables at Access 3 and repeat test.

If code changes, short in power cables between drive motor field and Access 3. Repair/ Replace.

If code remains, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

ACCESS 3 Inner module short circuit. EVENT CODE 381

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

ACCESS 3 Inner module short circuit. EVENT CODE 382

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

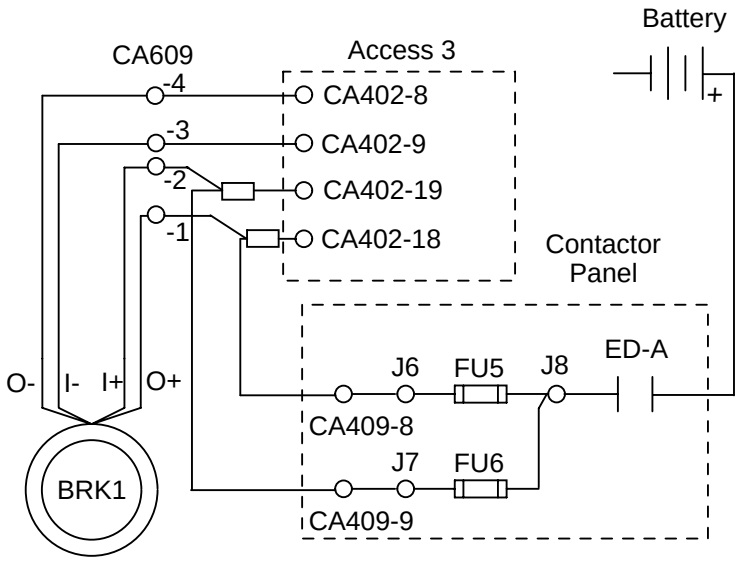
INNER BRAKE DRIVER Inner module short circuit. EVENT CODE 383

Step 1: Measure voltage between CA402-9 and battery negative.

If: Less than 5 volts, check for short circuit between CA402-9 and battery negative.

Step 2: Disconnect brake at CA609 and measure resistance of both brake coils. Outer coil resistance measured at CA402-8 and 402-18 should measure .95 to 2.1 ohms. Inner coil resistance measured at CA402-9 and CA402-19 should measure 2.49 to 5.52 ohms. If measurement is out of range, replace brake. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*



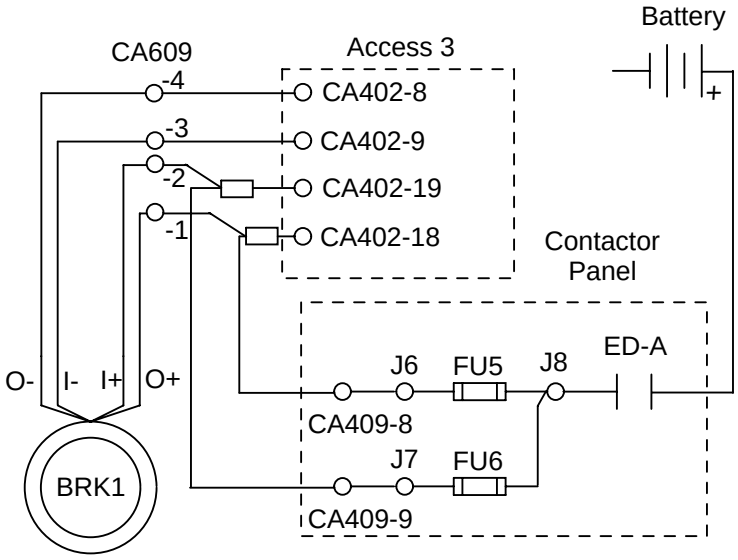
6306

OUTER BRAKE DRIVER Internal module short circuit. EVENT CODE 384

Step 1: Measure voltage between CA402-8 and battery negative.

If: Less than 5 volts, check for short circuit between CA402-8 and battery negative. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*



6306

ACCESS 3 Nearing over temperature condition. EVENT CODE 385

Step 1: Has duty cycle of truck changed? Traction used much more than lift and/or long runs with capacity loads. Access 3 may need to cool.

Step 2: Verify that drive motor fuse (FU9) is correct size. (250 amps)

Step 3: Check that Access 3 mounting surface is in full contact with mounting surface on truck and that an even layer of heat transfer grease is present.

Step 4: Check tightness of Access 3 mounting screws.

BATTERY VOLTAGE Not matching setup voltage. EVENT CODE 386

Step 1: Make sure battery installed in truck is correct voltage for truck.

Step 2: Turn key "ON" while pressing the ⏏ button.

Select voltage (F1) on display menu.

Make sure voltage setup matches truck and battery voltage.

If: Setting correct, check fuse FU1, if no change try different battery.

If: Code 386 remains, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

TILT POSITION ASSIST Sensor out of range. EVENT CODE 387

Step 1: Voltage input from TPA sensor can be viewed in analyzer mode under A2.25. Voltage viewed should vary between 4.5 volts with forks tilted full up, to .5 volt with forks tilted full down.

If: Voltages as described, proceed with step 2.

If: Voltages not as described, proceed with step 3.

Step 2: Calibrate the tilt position assist potentiometer (POT4).

If: Problem corrected, return truck to service.

If: Code 387 remains, proceed to step 3.

Step 3: Check wiring at the TPA sensor potentiometer (POT4). Also check wiring from POT4 to TPA CAN module.

If: Wiring damaged, repair/replace as needed.

If: Wiring OK, proceed to step 4.

Step 4: Check TPA POT4 voltage across TB406-9 and TB406-11. Voltage should be near 5 volts.

If: 5 volts present proceed to step 5.

If: 5 volts not present proceed to step 6.

Step 5: Measure voltage across TB406-9 and TB406-10. Forks tilted full up should be 4.5 volts. Forks tilted full down should be .5 volt.

If: Voltage within range check for wiring problem from Terminal Board TB406 to TPA CAN module.

If: Voltage is not present or within range check for wiring problem at TPA POT4 or between Terminal Board TB406 and POT4.

Step 6: Disconnect wires going to TPA POT4 on TB406. Check for 5 volts across Pins 9 and 11 again.

If: 5 volts present. Problem is in POT4 or wiring. Repair/replace.

If: 5 volts not present. Proceed to event code 841, but first see note below.

Note: *387 Event Code has been known to be caused by moisture in the TPA CAN Module. If moisture is found, dry out and re-seal lid. Put truck back in service. If problems continue proceed to Event Code 841.*

ACCESS 3 Internal fault. EVENT CODE 391

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

ACCESS 3 Internal fault. EVENT CODE 392

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

ACCESS 3 Internal fault. EVENT CODE 393

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

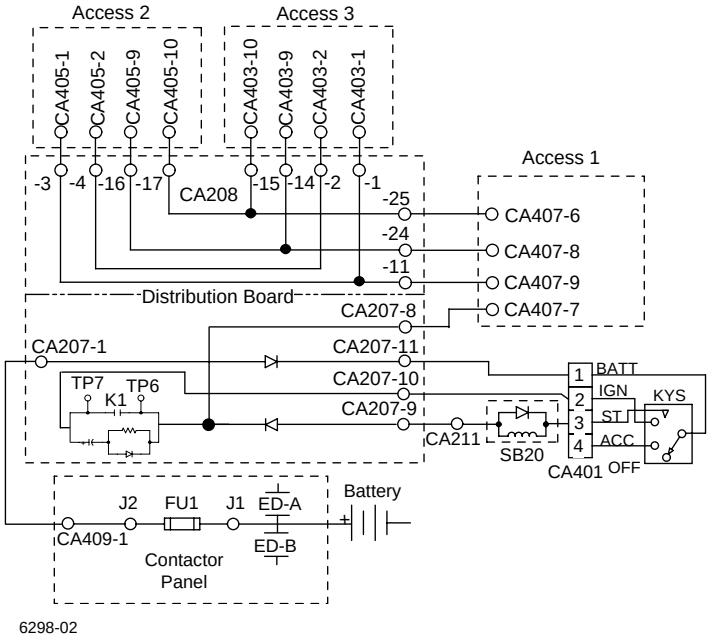
ACCESS 1 Cannot communicate with ACCESS 3. EVENT CODE 394

Step 1: Check the CAN communications wiring and connectors between Access 1, 2 & 3. Make sure corrosion isn't present on connector pins. If truck is equipped with TPA, Tilt Position Assist option, check CAN wiring per Event Code 841.

Step 2: Check power input to Access 1 at CA407-7.

If: **Battery volts** then replace Access 1. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*



ACCESS 1 not compatible with Access 3. EVENT CODE 395

Step 1: Use earlier version software or upgrade Access 1 2 3® modules.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

DISPLAY Invalid. EVENT CODE 396

Step 1: Non OEM Access 1 installed or Access 1 failure. Replace.

ACCESS 3 Internal fault. EVENT CODE 397

Step 1: Replace Access 3.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

ACCESS 2 Internal fault. EVENT CODE 398

Step 1: Replace Access 2.

ACCESS 3 Internal fault. EVENT CODE 399

Step 1: Replace Access 3.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

RAISE COMMAND GIVEN AND ENCODER COUNTS NOT DECREASING. EVENT CODE 814

Step 1: If HGTRS is open when forks are in free lift zone and raising forks, this code will be registered. Monitor HGTRS condition by following event code description for code 822.

Step 2: Turn key ON while pressing the ▲ button.

Select ECR2 (A2.19) on the display menu.

View reading on display while raising and lowering forks.

If: **No counts** then wiring open circuit between encoder and Access 3 or encoder faulty. Repair or replace.

Make sure height sensor is operating correctly. Reference M4.3 section of service manual.

ENCODER COUNTS Above maximum calibrated height. EVENT CODE 816

Step 1: Check condition of height sensor. Encoder wheel worn, replace.

Check for proper maximum height calibration.

LOWER COMMAND GIVEN AND ENCODER COUNTS NOT DECREASING. EVENT CODE 818

Step 1: If this is an intermittent condition, an operator induced error may be present (e.g. forks resting on rack). This code will also occur when velocity fuse activates due to excessive hydraulic fluid flow.

Step 2: If the HGTRS switch is open when mast is in freelift zone while lowering, this code will be registered. Monitor HGTRS condition, following the event code description for code 822.

Step 3: Turn key on while pressing the ▲ button.

Select ECR2 (A2.19) on display menu.

View reading on display while raising and lowering forks.

If: **No counts** then wiring open circuit between encoder and Access 3 or encoder faulty. Repair or replace.

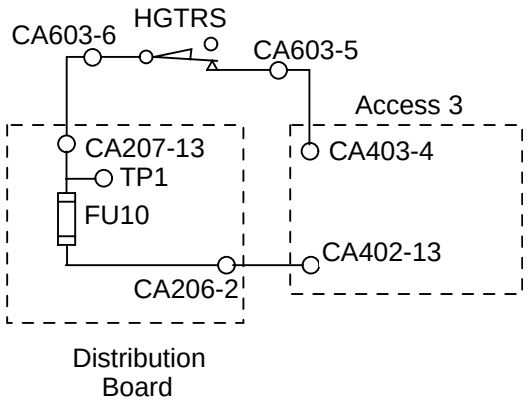
Make sure height sensor is operating correctly. Reference M4.3 section of service manual.

HGTRS (HEIGHT RESET SWITCH)
Did not change state when encoder counts indicate reset should occur.

EVENT CODE 819

Step 1: Check adjustment of HGTRS. Out of adjustment, correct.

Step 2: Check for open or short circuit in HGTRS circuit. Repair or replace.



6308

HGTRS (HEIGHT RESET SWITCH)
Did not change state when encoder counts indicate reset should occur.

EVENT CODE 822

Step 1: Check adjustment of HGTRS. Out of adjustment, correct.

Note: *If the adjustment isn't correct, the switch can reset when the mast shifts during travel or while raising or lowering. Ensure there's adequate engagement of the switch after adjustment.*

Step 2: Turn key ON while depressing the ▲ button to enter the service mode.

Select A2.16 on display menu to monitor the HGTRS switch.

If: Switch status shows open (1 on display) Switch is open when it should be closed. Adjust, repair, replace.

Note: *Switch may need to be temporarily bypassed to raise mast to access switch.*

If: Switch status shows closed (0 on display) Operate lift and monitor switch status. Switch should remain in closed state until mast staging occurs. If switch checks okay, then switch adjustment may need fine adjustment since problem is most likely intermittent due to mast movement while raising or traveling.

Step 3: Check mechanical link between encoder and the truck for tightness.

Step 4: Replace Access 3. See note.

Note: *If truck operates, then this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

M3 (HIGH PERFORMANCE RAISE PUMP MOTOR) Over temperature. EVENT CODE 824

Step 1: Verify duty cycle of M3 lift motor is not excessive or unusual.

Step 2: Check for loose connections, corroded terminals and brush condition. Correct.

Step 3: Make sure lift motor is clean.

Step 4: Check motor and pump assembly to ensure mechanical binding does not exist.

Step 5: Check lift circuit relief pressure.

M2 (PUMP MOTOR) Over temperature. EVENT CODE 825

Step 1: Verify duty cycle of M2 lift motor is not excessive or unusual.

Step 2: Check for loose connections, corroded terminals and brush condition. Correct.

Step 3: Make sure M2 motor is clean.

Step 4: Check motor and pump assembly to ensure mechanical binding does not exist.

Step 5: Check lift circuit relief pressure.

M1 (TRACTION MOTOR) Over temperature. EVENT CODE 826

This code is registered each time Access 1 displays the message “Travel Overtemp.”

> ***Note:*** *Verify duty cycle of M1 traction motor is not excessive or unusual. In many cases the display message (Traction overtemp) will disappear once the travel speed increases. An occasional registering of this code could be considered normal in some applications.*

A problem exists when the display message “Traction Overtemp” remains on for an extended period of time during the trucks current duty cycle.

Step 1: Check for loose connections, corroded terminals and brush condition. Correct.

Step 2: Make sure M1 motor is clean.

Step 3: Check brake, traction motor, drive unit condition to ensure mechanical binding does not exist.

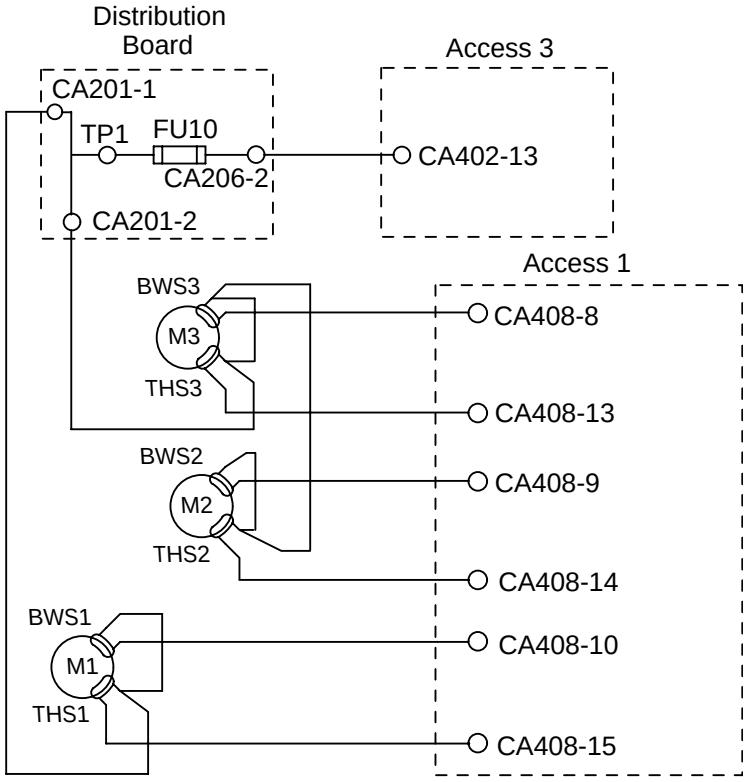
Step 4: Verify that the brake cover shroud is installed and properly mounted.

M3 (HIGH PERFORMANCE LIFT PUMP MOTOR) Brush wear indication. EVENT CODE 827

Step 1: Check wear on brushes, reference service manual.

Step 2: Wire between Access 1 CA408-8 and motor open circuit. Repair or replace.

Step 3: Located next to the brush holders are spring taps used to make the brush wear indication. Verify both the brush holder and indicator spring taps are clean, and a good electrical connection exists.



6309

M2 (PUMP MOTOR) Brush wear indication. EVENT CODE 828

Step 1: Check wear on brushes, reference service manual.

Step 2: Wire between Access 1 CA408-9 and motor open circuit. Repair or replace.

Step 3: Located next to the brush holders are spring taps used to make the brush wear indication. Verify both the brush holder and indicator spring taps are clean, and a good electrical connection exists.

M1 (TRACTION MOTOR) Brush wear indication. EVENT CODE 829

Step 1: Check wear on brushes, reference service manual.

Step 2: Wire between Access 1 CA408-10 and motor open circuit. Repair or replace.

Step 3: Located next to the brush holders are spring taps used to make the brush wear indication. Verify both the brush holder and indicator spring taps are clean, and a good electrical connection exists.

LOW BATTERY VOLTAGE LOCKOUT. EVENT CODE 832

Step 1: Battery completely discharged. Replace or recharge.

Step 2: Replace Access 3. See note.

Note: *If this occurs frequently and at low state of battery charge, it may be an indication that the BDI adjustment is set too low or the battery is in poor condition. See the P4 menu for more information. Consider adjusting the P4 BDI setting and having the battery tested.*

ACCESS 2 Internal fault. EVENT CODE 833

If truck operates, then this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 2.

SETUP MISMATCH BETWEEN ACCESS 2 AND ACCESS 3 EVENT CODE 834

Step 1: Turn key ON while pressing the ▲ button.

Copy setup values from the module which was not replaced. U2.1 to copy from Access 3, U2.2 to copy from Access 2.

ACCESS 2 AND ACCESS 3 Contain invalid setups. EVENT CODE 835

Step 1: Turn key ON while pressing the ▲ button.

Features (F), calibration (C) and performance (P) menu items must be programmed. See service manual.

ACCESS 3 Hardware and software not compatible. EVENT CODE 836

Step 1: Non OEM software or hardware introduced to system. Install OEM component.

Step 2: Use compatible components by installing previous version software or hardware or upgrade software or hardware to compatible levels.

ACCESS 3 INTERNAL FAULT. EVENT CODE 837

If truck operates, then this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.

TRUCK SETUPS SAVE FAILURE. EVENT CODE 838

Modifications made to the truck under one or two button mode failed to be saved. On next power up, code 834 will be registered.

Step 1: Power up truck in one button mode.

Step 2: Navigate to the Utilities, Copy Setups, From TCM at U2.1 menu level.

Step 3: Power up truck in one button mode of the display and verify settings that were changed. Return truck to service.

LOAD SENSE 2 (LS) CALIBRATION ERROR. EVENT CODE 839

The LS calibration information was corrupted or the sensor never calibrated.

Step 1: Power up truck in one button mode.

Step 2: Navigate to the C4 menu and perform calibration procedure.

If: **Code 839** is again logged, proceed with step 3.

Step 3: Replace LS and repeat step 2.

LOST COMMUNICATIONS WITH THE TILT POSITION ASSIST SENSOR MODULE. EVENT CODE 841

LED indication on the TPA module for a functional module with established communications link is a flash every other second. If there is any LED flash, power is supplied to the module.

Step 1: **LED off**, check for battery volts at the terminal strip internal to the module, V+ (red wire) and GND (black wire).

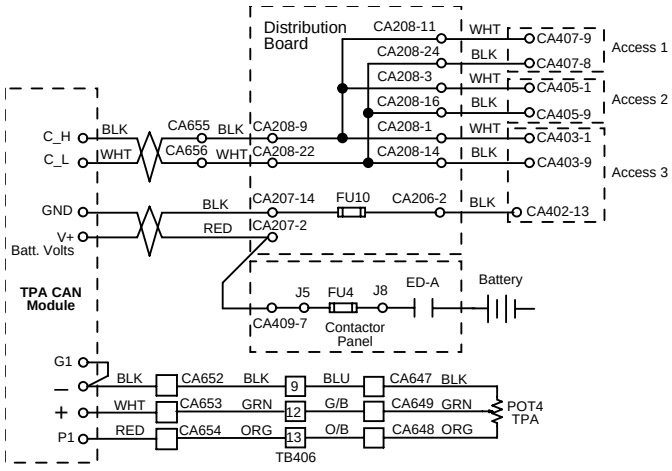
- **If: battery volts,** correct functional reading, replace TPA module.
- **If: 0 volts,** check for battery volts at distribution board CA207-2 positive and CA207-14 negative.
  - **If: Battery volts,** check wiring and connections between TPA CAN Module and distribution board. Repair or replace as necessary.
  - **If: 0 volts,** check condition of FU10 on distribution board and FU4 on control fuse panel. Replace fuse(s) if open circuit, replace distribution board if fuses are OK.

Step 2: **LED always on or flashing twice every second,** module has power supplied, but CAN communications not established. Make continuity check on wiring between distribution board CA208 and TPA CAN Module terminal CL (Can Low, white wire) and CH (Can High, black wire).

- **If: continuity present,** replace TPA module.
- **If: open circuit,** repair or replace wiring or connections.

Step 3: **LED flash once every second,** check signal at TPA module terminal board, + (white wire) and - (black wire). 1.5 volts to 4.5 volts depending on fork position.

- **If: 1.5 volts to 4.5 volts,** replace TPA module.
- **If: 0 volts,** check for 5 volts between - (white wire) and P1 (red wire).
  - **If: 0 volts,** replace TPA module.
  - **If: 5 volts,** check fault code history for a code 387 and perform the steps associated with that code.



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Event Codes

RR/RD 5200/5200S Service Event Codes Software Version 19

RR/RD 5200(AC)/5200S(AC) Service Event Codes Software Version 09

ACCESS 1 2 3®

Access 1 2 3® is Crown's Integrated Control System, which electronically monitors operating functions. This maintenance section helps identify the problem when a code is encountered and provides corrective actions to help resolve the cause of the code.

Event Codes

Each event code is presented on following pages with code number, code cause, analytical and corrective steps.

- Code Cause is an abbreviated explanation of code cause.
- Analytical and Corrective Steps for correcting malfunction causing displayed code.

When an event CODE occurs

Some Troubleshooting Basics. Statistically the majority of repair issues occur in or at output components such as solenoid valves, contactors and motors. The next components to test are connectors, wiring and input devices such as switches, potentiometers or encoders. The last component to test are electronic Access 2 and Access 3 control modules. In all cases, begin troubleshooting at output device, proceed to input devices, then, and only then, move on to electronic module to which these devices attach.

WARNING

Never key "ON" truck with any Access 1, 2 or 3 connectors disconnected. In addition, never remove or connect any Access 1, 2 or 3 connectors while the truck is keyed "ON".

When Truck Does Not Operate and There is Not a Code

Event codes are the result of tests performed on outputs of the Access 2 and Access 3 modules. Malfunctions that can occur without providing an event code can fall into one of four categories.

1. Power Up Circuit has Malfunctioned.
   Truck does not power up. Malfunctions in "power up" circuit can keep truck and Access 1 2 3® modules from powering up. Refer to "power up" circuit on following page to troubleshoot this condition.
2. Malfunction is Not Electrical.
   Truck powers up but a code is not present, indicates fault is a mechanical or hydraulic malfunction rather than an electrical malfunction. Information regarding mechanical and hydraulic troubleshooting is located in appropriate section of Service and Parts manual.
3. The Access 1 2 3® system detects a condition requiring system shutdown. (Truck does not function)
   Truck down. There are circumstances which cause the Access 1 2 3® system to go into system shut down. In this condition, truck will not "power up". Shutdown is required to protect Access 1 2 3® electronic system when it detects conditions which could be destructive to its internal electronic system. These types of faults could be a direct result of shorted or open circuits which are primary to the systems power source.
   During the shutdown sequence, observe amber lights on Access 2 and 3 modules. Access 2 will flash a 14 while Access 3 flashes a 1 followed by code 328.
   To extract fault code, enter two button level of Access 1 service and select log events. The code causing shutdown will be displayed as the last log entry and can be resolved by following corrective actions associated with this code.
4. **Truck powers up but malfunctions.** One of a small group of unmonitored inputs has malfunctioned.

Following is a list of inputs that are not monitored by the Access 1 2 3® system.

SSS	Side Shift Switch
TBS	Tilt Back Switch
TDS	Tilt Down Switch
ORS	Lift Cutout Over Ride Switch
HNS	Horn Switch
HGTS12	12 inch from maximum lift height switch

Optional Feature Switches

FKS	Fork Tilt Switch
HSS	High Speed Switch (hydraulic pressure switch)

Display Messages

During truck and Access 1 operation, messages may occur which are intended to provide visual assistance to the operator of the truck and/or display. Following is a list of these messages as viewed on standard and enhanced display with a description of message intent.

Messages During Display Operation and After Power Up		
Std. Display	Enh. Display	Description
Test	Lamp Test	Self test during truck power up
Off	Off	Need to re-enter user code, time out after 5 minutes
Ser <-> due	Service Due	Planned maintenance due on truck
Off	User Code Error	Flashes when wrong user code is entered
_ _ _ _	User Code	Prompting for user code input
Stby	Please Stand By	System waiting on Access 1 2 3 precharge or brake pedal was toggled 5 times in 5 seconds. If message does not clear in 30 seconds follow procedure for code 321.
Lo <-> Batt	Low Battery	Battery charge low. If battery is not low on charge follow procedures for code 832
Loc	Lockout Active	Indicates that truck lockout has been selected, disabling truck operation
<-> = display toggles between message on either side.		

Messages During Truck Operation		
Std. Display	Enh. Display	Description
ACC2 <-> hot	Access 2 Overtemp	Follow procedure for code 269
ACC2 <-> cold	Access 2 Cold temp	Follow procedure for code 268
ACC3 <-> hot	Access 3 Overtemp	Follow procedure for code 369
ACC3 <-> cold	Access 3 Cold temp	Follow procedure for code 368
Door	Battery Door	Battery retainer not in place
Br1i <-> hot	Brk1i Overtemp	Follow procedure for code 345
Br1o <-> hot	Brk1o Overtemp	Follow procedure for code 347
Br2 <-> hot	Brk2 Overtemp	Follow procedure for code 349
Hand	Center Handle	Need to place multi task handle in neutral. If handle is in the neutral position mechanically, a problem with one of the handle potentiometers may exist. Refer to event codes 243-248 and 333-343 for additional information.
Ctr	Center Pedal	Need to toggle the center brake pedal. (RR5000S)
N/A	Check Load	Above operating limits based on capacity plate data
Ent	Entry Bar	Entry bar actuated
Foot	Left Foot	Need to step on left pedal for action requested
Foot	Right Foot	Need to step on right pedal for action requested
(N/A)	Lift1 Motor	Follow procedure for code 828
(N/A)	Lift 2 Motor	Follow procedure for code 827
(N/A)	Lift Overtemp	Follow procedure for code 824 and 825
(N/A)	Monitor Disabled	Forks are tilted to limits, disabling the Capacity Data Monitor.
Rcut	Raise Cutout	Raise cutout zone has been reached. Over ride switch must be used to continue raise function
(N/A)	Travel Motor	Follow procedure for code 829
(N/A)	Travel Overtemp	Follow procedure for code 826
<-> = display toggles between message on either side.		

Truck Power Up Circuit

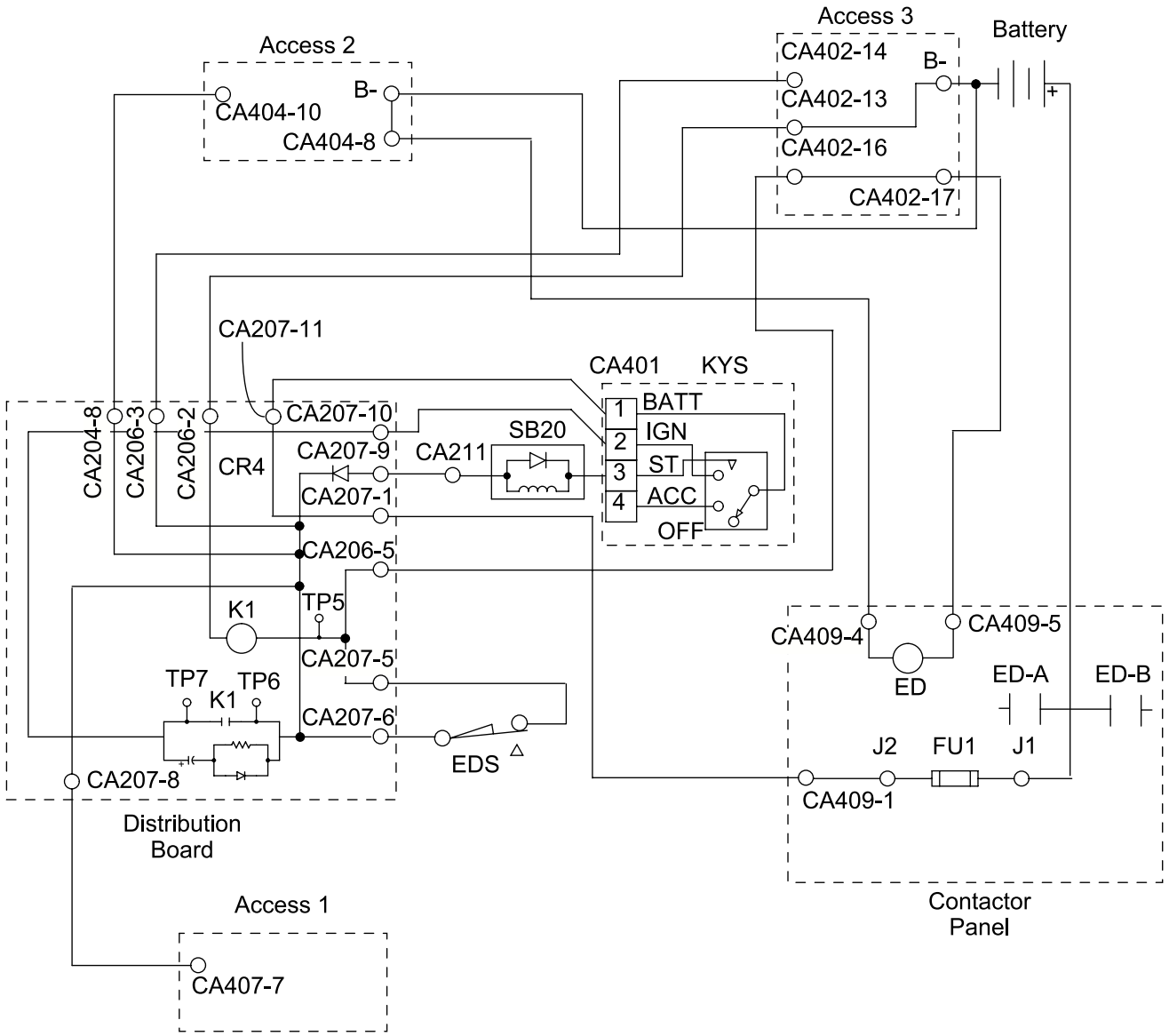

Figure 17946

When performing maintenance:

CAUTION

Due to capacitance voltage present in Access 2 and Access 3 modules, whenever performing maintenance which may permit contact with bus bars and associated power cables, discharge capacitors. Discharge by disconnecting battery, turning and holding keyswitch to start position until indicators on Access 1 face first go dim - then out.

CAUTION

Raise drive wheel clear of floor and place hardwood blocks under truck frame.

Event Code 211

SVA (Accessory Solenoid) Open external circuit.

Step 1: Attach meter across coil terminals.
Leave wires connected.

Step 2: Turn key ON while pressing the ↑ and ↓ buttons.
Select SVA (A4.4) on display menu.
Press and hold ↵ (drives component)

Step 3: Check meter reading

- If: Battery volts coil open circuit.
  - Then replace solenoid coil.
- If: 0 volts positive or negative missing.
  - Then "power up" truck, move one test lead to B- on Access 2.
    0 volts after standing on the operator pedals. Then positive missing. Use missing positive test.
    Battery volts negative missing, Use missing negative test.
- If: 20 volts correct functional reading.
  - Then problem is likely an intermittent loose connection.
    Check wiring. Wiring checks okay, replace Access 2. See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Note: *Fault codes 211, 226 or 228 may occur if horn suppressor block is faulty or if it has not been installed on truck. See TSB428.*

Missing Positive and Negative Test	
Missing Positive Test	
1.	Check FU4.
2.	FU4 is okay, “power up” truck without Access 1 service mode. Measuring from CA404-20 to B- on Access 2, reading should be battery volts when standing on operator pedals.
3.	If not, check wiring from CA404-20 back to battery positive. Refer to illustration.
Missing Negative Test	
1.	Attach meter leads to SVA and CA404-12 of Access 2
2.	Turn key ON while pressing the ↑ and ↓ buttons.
3.	Select SVA (A4.4) on display menu.
4.	Press and hold ↵ (drives component) **Battery volts**, wiring open circuit between Access 2 and SVA. **0 volts**, replace Access 2. See note.

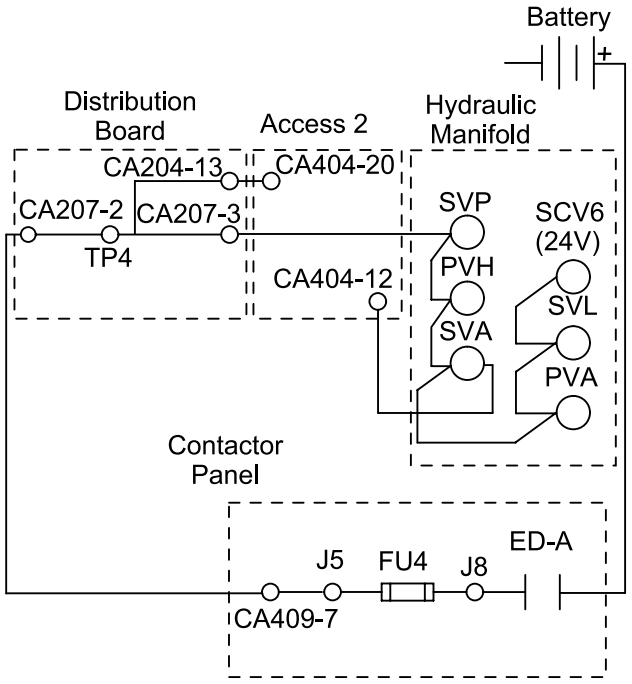

Figure 17947

Event Code 212

SVL (lower solenoid) open external circuit.

Step 1: Attach meter across coil terminals.
Leave wires connected.

Step 2: Turn key ON while pressing the ↑ and ↓ buttons.
Select SVL (A4.5) on display menu.
Press and hold ↵ (drives component)

- If: Battery volts coil open circuit.
  - Then replace solenoid coil.
- If: 0 volts positive or negative missing.
  - Then "power up" truck, move one test lead to B- on Access 2.
    0 volts after standing on the operator pedals, Then positive missing. Use positive missing test.
    Battery volts. Then negative missing. Use negative missing test.
- If: 20 volts correct functional reading.
  - Then problem is likely an intermittent loose connection.
    Check wiring. Wiring checks okay, replace Access 2. See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Missing Positive and Negative Test
Missing Positive Test
1. Check positive wire connected from SVL to PVA.
Missing Negative Test
1. Check negative output of Access 2 by attaching meter leads to SVL and CA404-13 of Access 2.
2. Turn key ON while pressing the ↑ and ↓ buttons.
3. Select SVL (A4.5) on display menu.
4. Press and hold ↵ (drives component) **Battery volts**, wiring open circuit between Access 2 and SVL. **0 volts**, replace Access 2. See note.

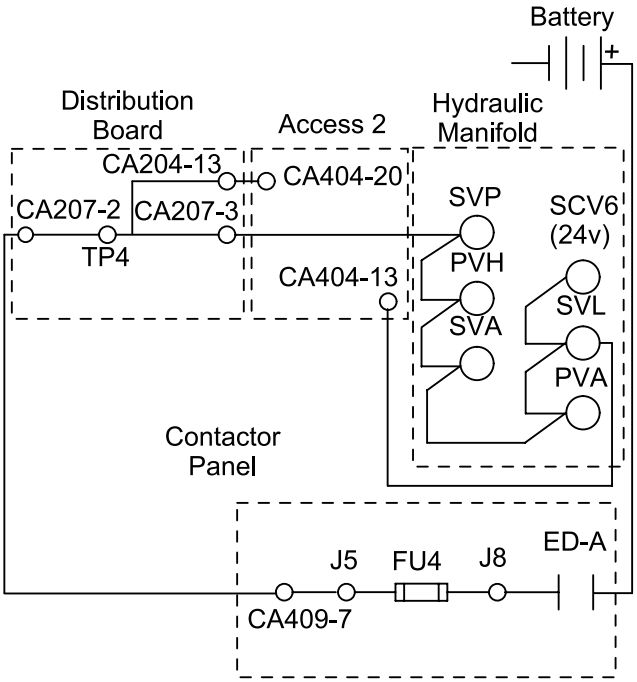

Figure 17948

Event Code 213

SVP (pilot solenoid) open external circuit.

Step 1: Attach meter across coil terminals.
Leave wires connected.

Step 2: Turn key ON while pressing the ↑ and ↓ buttons.
Select SVP (A4.6) on display menu.
Press and hold ↵ (drives component)
Check meter reading.

- If: Battery volts coil open circuit.
  - Replace solenoid coil.
- If: 0 volts positive or negative missing.
  - Then "power up" truck, move one test lead to B- on Access 2.
    0 volts after standing on the operator pedals, positive missing. Use missing positive test.
    Battery volts, negative missing. Use missing negative test.
- If: 20 volts correct functional reading.
  - Then problem is likely an intermittent loose connection.
    Check wiring. Wiring checks okay, replace Access 2. See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Missing Positive and Negative Test
Missing Positive Test
1. Check positive wire connected from SVP to PVA.
Missing Negative Test
1. Check negative output of Access 2 by attaching meter leads to SVP and CA404-14 of Access 2.
2. Turn key "ON" while pressing the ↑ and ↓ buttons.
3. Select SVP (A4.6) on display menu.
4. Press ↵ and hold. (drives component) **Battery volts**, wiring open circuit between Access 2 and SVP. **0 volts**, replace Access 2. See note.

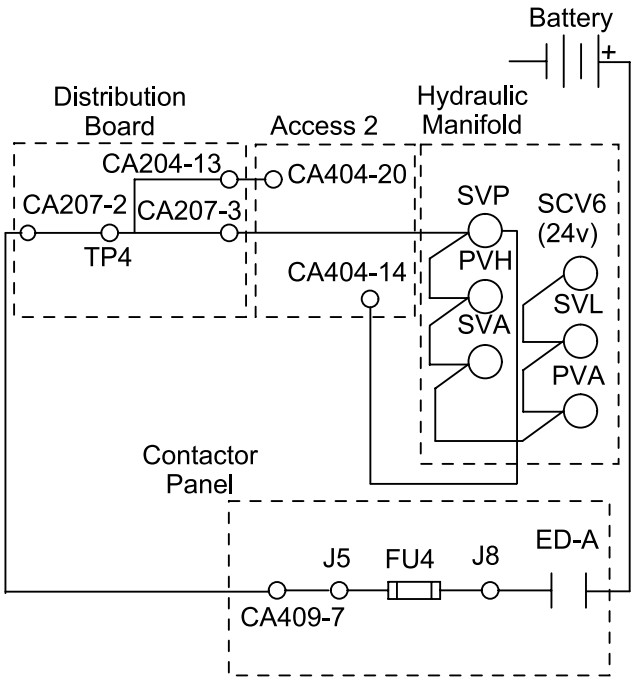

Figure 17949

Event Code 214

SVR (reach solenoid) open external circuit.

Step 1: Attach meter across coil terminals, leave wires connected.

Step 2: Turn key ON while pressing the ↑ and ↓ buttons.
Check meter reading.
Select SVR (A4.7) on display menu.
Press and hold ↵ (drives component)

- If: Battery volts coil open circuit.
  - Then replace solenoid coil.
- If: 0 volts positive or negative missing.
  - Then "power up" truck, move one test lead to B- on Access 2.
    0 volts after standing on operator pedals, battery positive missing. Use missing positive test.
    Battery volts, negative missing. Use missing negative test.
- If: 20 volts correct functional reading.
  - Then problem is likely an intermittent loose connection.
    Check wiring. Wiring checks okay, replace Access 2. See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Missing Positive and Negative Test
Missing Positive Test
1. Trace the positive wiring by referring to illustration.
Missing Negative Test
1. Check negative output of Access 2 by attaching meter leads to SVR and CA404-15 of Access 2.
2. Turn key ON while pressing the ↑ and ↓ buttons.
3. Select SVR (A4.7) on display menu.
4. Press and hold ↵ (drives component) **Battery volts**, wiring open circuit between Access 2 and SVR. **0 volts**, replace Access 2. See note.

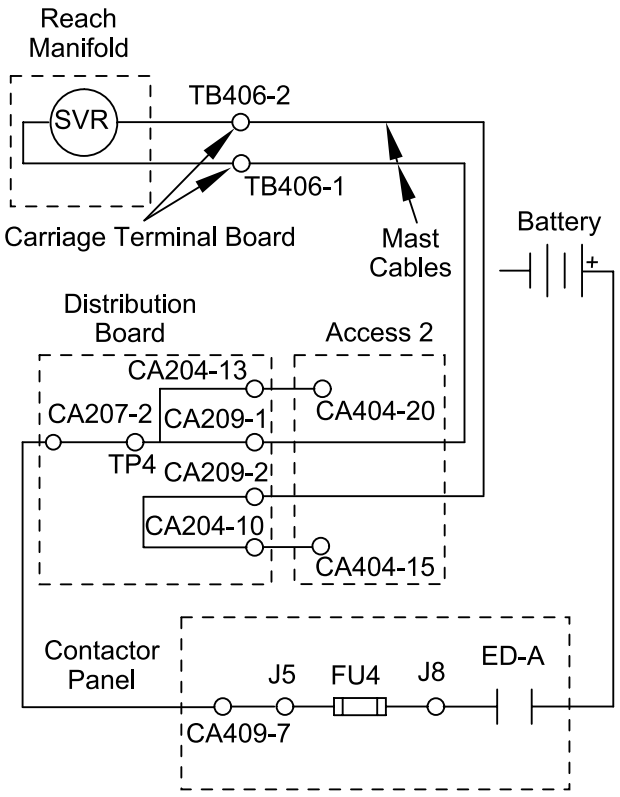

Figure 17950

Event Code 215

SVS (sideshift solenoid) open external circuit.

Step 1: Attach meter across coil terminals.

Leave wires connected.

Step 2: Turn key ON while pressing the ↑ and ↓ buttons.
Select SVS (A4.8) on display menu.
Press and hold ↵ (drives component)

- If: Battery volts coil open circuit.
  - Then replace solenoid coil.
- If: 0 volts positive or negative missing.
  - Then "power up" truck, move one test lead to B- on Access 2.
    0 volts after standing on the operator pedals, positive missing. Use missing positive test.
    Battery volts, negative missing. Use missing negative test.
- If: 20 volts, correct functional reading.
  - Then problem is likely an intermittent loose connection.
    Check wiring. Wiring checks okay, replace Access 2. See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Missing Positive and Negative Test
Missing Positive Test
1. Trace positive wiring by referring to illustration.
Missing Negative Test
1. Check negative output of Access 2 by attaching meter leads to SVS and CA404-16 of Access 2.
2. Turn key ON while pressing the ↑ and ↓ buttons.
3. Select SVS (A4.8) on display menu.
4. Press and hold ↵ (drives component) **Battery volts**, wiring open circuit between Access 2 and SVS. **0 volts**, replace Access 2. See note.

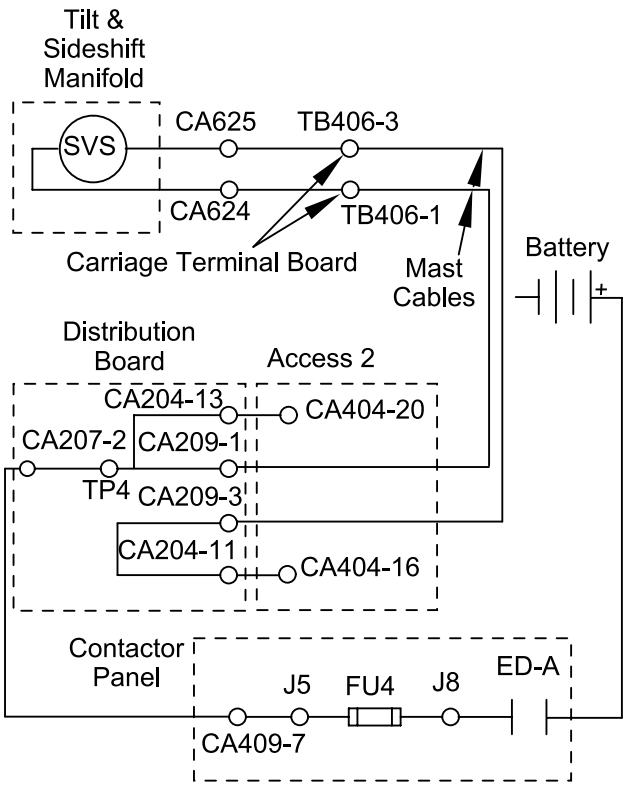

Figure 17951

Event Code 216

SVT (tilt solenoid) open external circuit.

Step 1: Attach meter across coil terminals.

Leave wires connected.

Step 2: Turn key ON while pressing the ↑ and ↓ buttons.
Select SVT (A4.9) on display menu.
Press and hold ↵ (drives component)

- If: Battery volts coil open circuit.
  - Then replace solenoid coil.
- If: 0 volts positive or negative missing.
  - Then "power up" truck, move one test lead to B- on Access 2.
    0 volts after standing on operator pedals, positive missing. Use missing positive test.
    Battery volts, negative missing. Use missing negative test.
- If: 20 volts correct functional reading.
  - Then problem is likely an intermittent loose connection.
    Check wiring. Wiring checks okay, replace Access 2. See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Missing Positive and Negative Test
Missing Positive Test
1. Trace the positive wiring by referring to illustration.
Missing Negative Test
1. Check negative output of Access 2 by attaching meter leads to SVT and CA404-17 of Access 2.
2. Turn key ON while pressing the ↑ and ↓ buttons.
3. Select SVT (A4.9) on display menu.
4. Press and hold ↵ (drives component) **Battery volts**, wiring open circuit between Access 2 and SVT. **0 volts**, replace Access 2. See note.

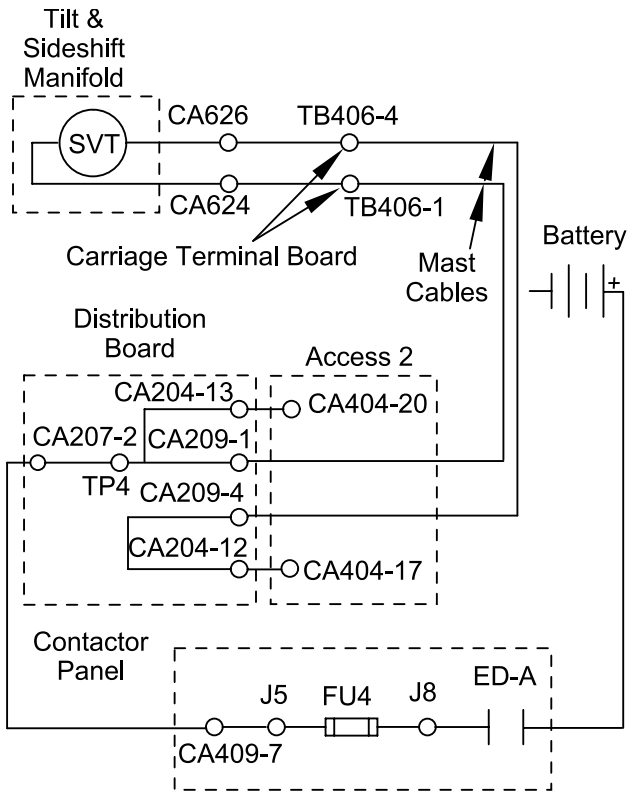

Figure 17952

Event Code 217

ALM2 (travel alarm) open external circuit.

Step 1: Attach meter across ALM2 terminals.

Leave wires connected.

Step 2: Turn key ON while pressing the ↑ and ↓ buttons.

Select ALM2 (A4.2) on display menu.
Press and hold ↵ (drives component)
Check meter reading.

- If: Battery volts ALM2 open circuit.
  - Then replace ALM2.
- If: 0 volts positive or negative missing.
  - Then "power up" truck, move one test lead to B- on Access 2.
    0 volts after standing on operator pedals, positive missing. Use missing positive test.
    Battery volts, negative missing. Use missing negative test.
- If: 20 volts correct functional reading.
  - Then problem is likely an intermittent loose connection.
    Check wiring. Wiring checks okay, replace Access 2. See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Missing Positive and Negative Test	
Missing Positive Test	
1.	Trace positive wiring by referring to illustration.
Missing Negative Test	
1.	Check negative output of Access 2 by attaching meter leads to ALM2 and CA404-6 of Access 2.
2.	Turn key ON while pressing the ↑ and ↓ buttons.
3.	Select ALM2 (A4.2) on display menu.
4.	Press and hold ↵ (drives component) **Battery volts**, open wiring between Access 2 and ALM2. **0 volts**, replace Access 2. See note.

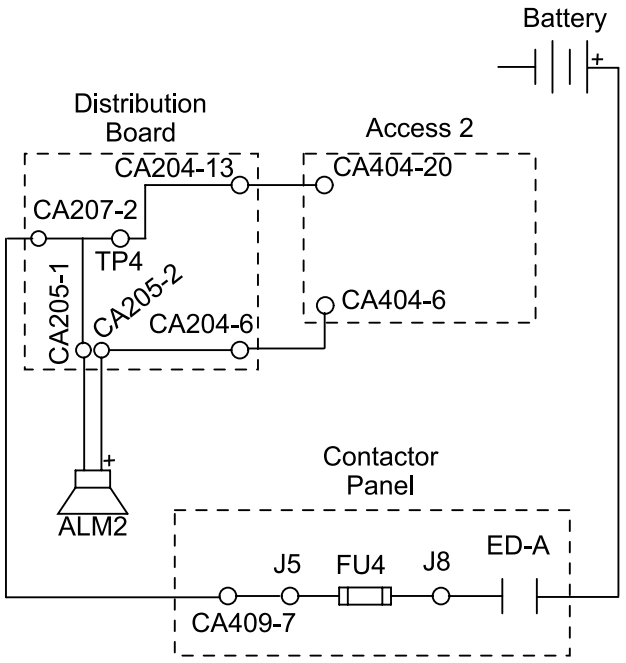

Figure 17953

Event Code 218

P2 (pump contactor) open external circuit.

Step 1: Attach meter across coil terminals.

Leave wires connected.

Step 2: Turn key ON while pressing the ↑ and ↓ buttons.

Select P2 (A4.19) on display menu.
Press and hold ↵ (drives component)
Check meter reading.

- If: Battery volts coil open circuit.
  - Then replace coil.
- If: 0 volts positive or negative missing.
  - Then "power up" truck, move one meter lead to B- terminal on Access 2.
    0 volts after standing on operator pedals, positive missing. Use missing positive test.
    Battery volts, negative missing. Use missing negative test.
- If: 20 volts correct functional reading.
  - Then problem is likely an intermittent loose connection.
    Check wiring. Wiring checks okay, replace Access 2. See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Missing Positive and Negative Test
Missing Positive Test
1. Trace positive wiring by referring to illustration.
Missing Negative Test
1. Check negative output of Access 2 by attaching meter leads to P2 and CA404-7 of Access 2.
2. Turn key ON while pressing the ↑ and ↓ buttons.
3. Select P2 (A4.19) on display menu.
4. Press and hold ↵ (drives component) **Battery volts**, open wiring between Access 2 and P2. **0 volts**, replace Access 2. See note.

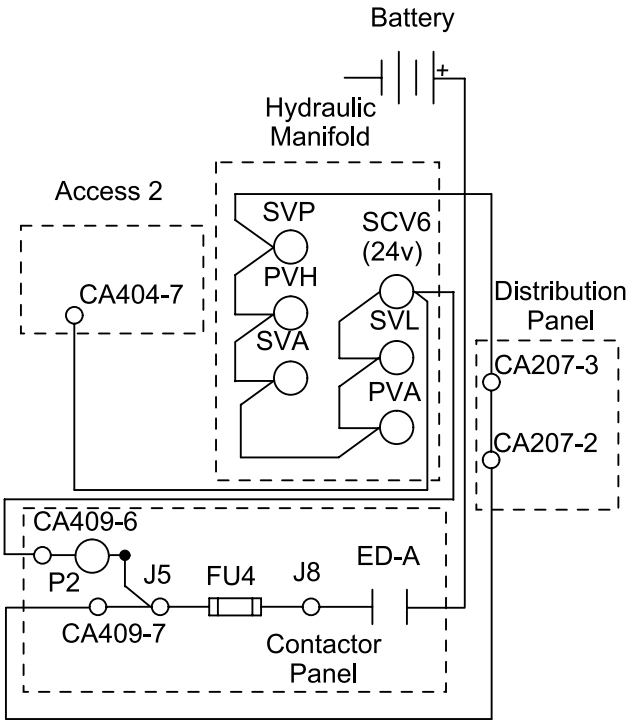

Figure 17954

Crown 2002 PF13324-12 Rev. 6/09

Event Code 219

PVH (proportional valve raise/lower) open external circuit.

Step 1: Attach meter across coil terminals.

Leave wires connected.

Step 2: Turn key ON while pressing the ↑ and ↓ buttons.

Select PVH (A4.11) on display menu.
Press and hold ↵ (drives component)
Check meter reading.

- If: Battery volts coil open circuit.
  - Then replace solenoid coil.
- If: 0 volts positive or negative missing.
  - Then "power up" truck and move one test lead to B- terminal on Access 2.
    0 volts after standing on operator pedals, positive missing. Use missing positive test.
    Battery volts, negative missing. Use missing negative test.
- If: 20 volts, correct functional reading.
  - Then problem is likely an intermittent loose connection.
    Check wiring. Wiring checks okay, replace Access 2. See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Missing Positive and Negative Test
Missing Positive Test
1. Trace positive wiring by referring to illustration.
Missing Negative Test
1. Check negative output of Access 2 by attaching leads to PVH and CA404-19 of Access 2.
2. Turn key ON while pressing the ↑ and ↓ buttons.
3. Select PVH (A4.11) on display menu.
4. Press and hold ↵ (drives component) **Battery volts**, open wiring between Access 2 and PVH. **0 volts**, replace Access 2. See note.

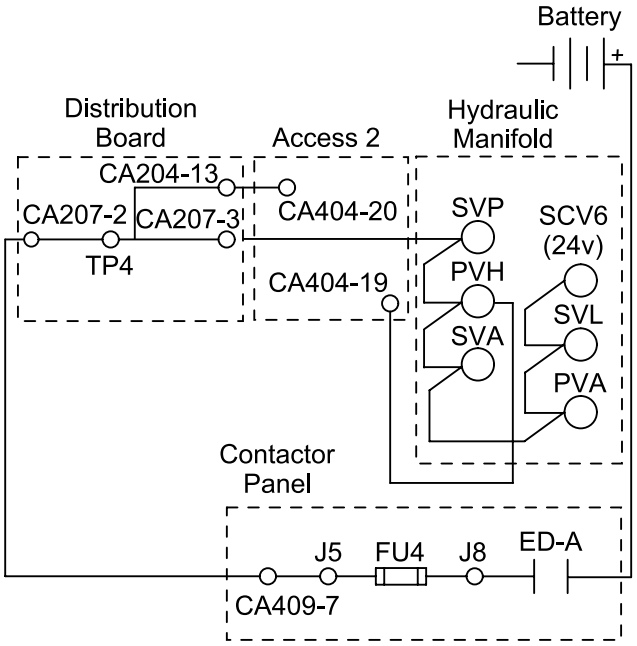

Figure 17955

Event Code 222

Pump M2 motor Open circuit.

Step 1: Attach meter across M2 motor terminals. (Refer to capacitor discharge Caution in Control of Hazardous Energy section in Service and Parts Manual.)

Step 2: Turn key ON while pressing the ↑ and ↓ buttons.

Select M2 (A4.18) on display menu.
Press and hold ↵ (drives component)
Check meter reading.

- If: 25 volts on meter and less than 20 amps on display.
  - Then open pump motor M2. Check power cables, ED tips and motor terminals. Repair/Replace.
- If: 0 volts, repeat test at A1 and B+ terminals at Access 2.
  - 0 volts, replace Access 2.
    25 volts on meter and less than 20 amps on display.
    Then open pump motor M2. Repair/Replace.
- If: 36 volts replace Access 2. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2. Also see PIB03-04-01, Radio Frequency Compliance.*

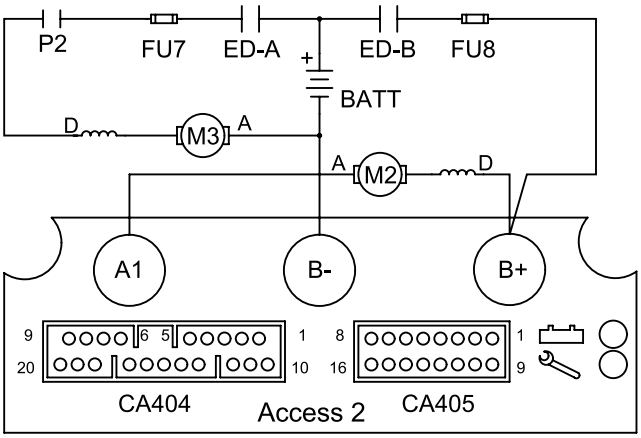

Figure 17956

Event Code 223

Hydraulic motor (M2) short circuited.

Step 1: (Refer to capacitor Caution earlier in this guide) Disconnect and isolate one power cable at pump motor M2. "Power up" truck and observe last log event.

- If: Code 222 is last log event then there may be a short circuit in motor. See code 222.
- If: Code 223 is last log event then reconnect power cable to pump motor and go to step 2.

Step 2: Disconnect cable A1 at Access 2 and "power up" truck.

- If: Code 222 registered, check for a shorted power cable.
- If: Code 223 still remains.
  - Then check ED contactor tips
    If OK, check wiring to ED contactor.
    If OK, check cabling to ED contactor and M2 motor.
    If OK, replace ED contactor.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

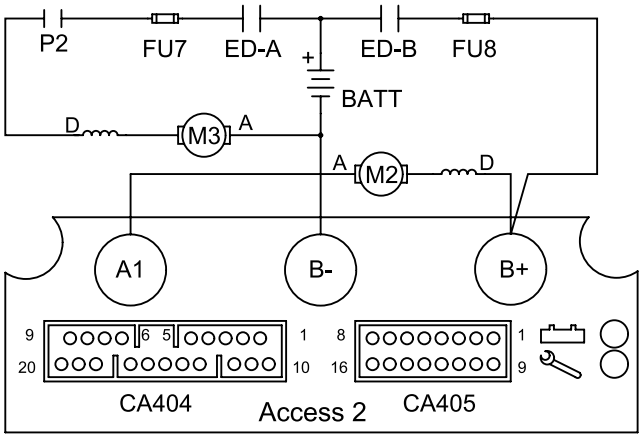

Figure 17956

Event Code 224

SVA, SVL, SVP, SVR, SVS or SVT short circuit.

Step 1: "Power up" truck. Begin selecting and operating one hydraulic function at a time. Note which function is interrupted by a wrench light.

Step 2: Once faulted circuit is found, disconnect and isolate component leads. "Power up" truck and observe code.

- If: Code 224 remains, check wiring and/or repeat component disconnections at CA404.
  Code remains, replace Access 2. See note.
- If: If code changes, short circuit has been found.
  Replace component or wiring that was isolated prior to test.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

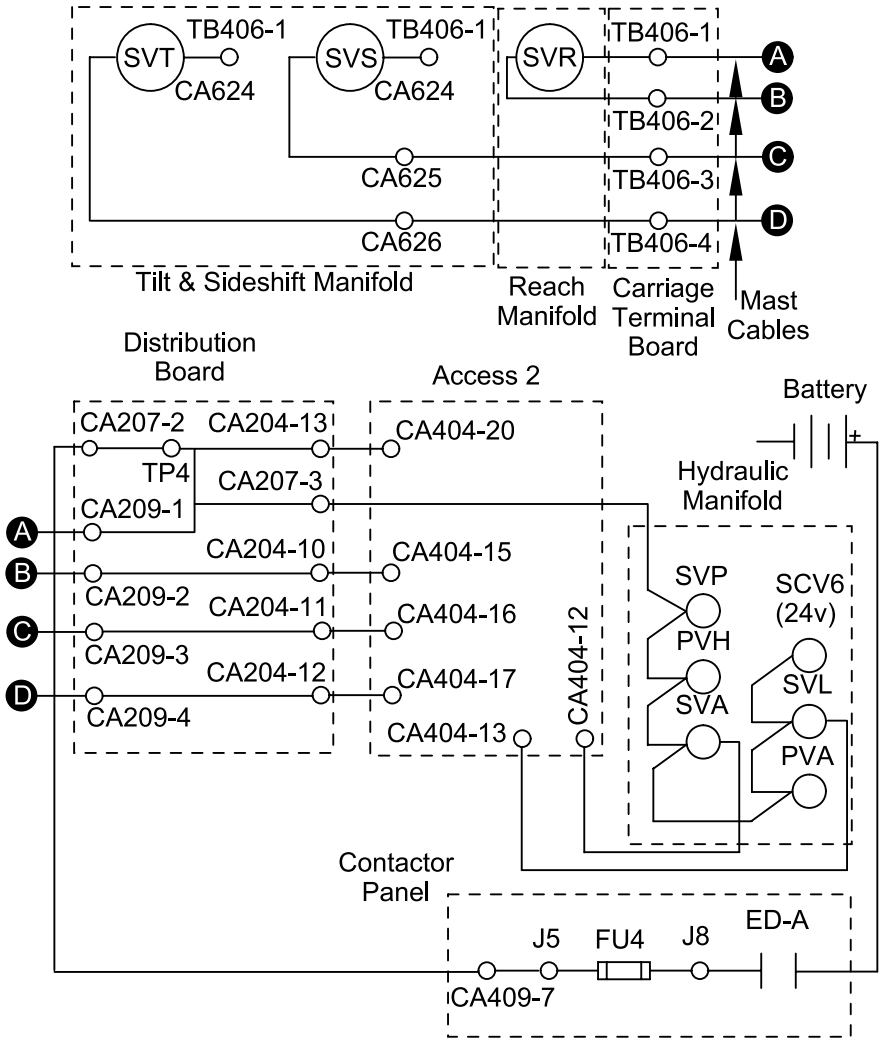

Figure 17957

Event Code 225

PVA, PVH, ALM2, P2 Short circuit.

Step 1: Remove one wire from PVA, PVH, ALM2, P2, SCV6 one component at a time, "powering up" truck and checking last log entry after each component.

Step 2: Once faulted circuit is found, disconnect and isolate component leads. "Power up" truck and observe code.

- If: Code 225 remains, check wiring and/or repeat component disconnections at CA404.
  Code remains, replace Access 2. See note.
- If: If code changes, short circuit has been found. Replace component or wiring that was isolated prior to test.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

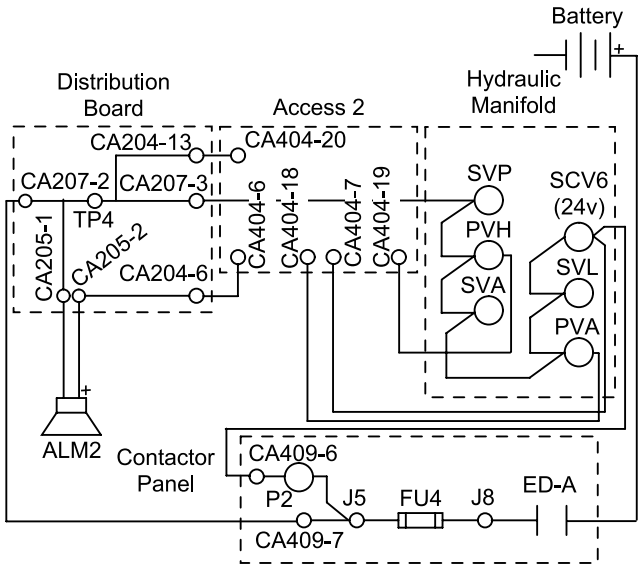

Figure 17958

Event Code 226

PVA (proportional valve accessory) Open external circuit.

Step 1: Attach meter across coil terminals.

Leave wires connected.

Step 2: Turn key ON while pressing the ↑ and ↓ buttons.

Select PVA (A4.10) on display menu.
Press and hold ↵ (drives component)
Check meter reading.

- If: Battery volts coil open circuit.
  - Then replace solenoid coil.
- If: 0 volts positive or negative missing.
  - Then "power up" truck, move one test lead to B- on Access 2.
    0 volts after standing on operator pedals, positive missing. Use missing positive test.
    Battery volts, negative missing. Use missing negative test.
- If: 20 volts correct functional reading.
  - Then problem likely an intermittent loose connection.
    Check wiring. Wiring checks okay, replace Access 2. See note.

Note: *If truck operates, check connectors at module for corrosion and verify good electrical connections are being made. If connectors are okay this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

Note: *Fault codes 211, 226 or 228 may occur if the horn suppressor block is faulty or if it has not been installed on the truck. See TSB428.*

Missing Positive and Negative Test
Missing Positive Test
1. Trace positive wiring by referring to illustration.
Missing Negative Test
1. Check negative signal of Access 2 by attaching leads to PVA and CA404-18 of Access 2.
2. Turn key ON while pressing the ↑ and ↓ buttons.
3. Select PVA (A4.10) on display menu.
4. Press and hold ↵ (drives component) **Battery volts**, open wiring between Access 2 and PVA. **0 volts**, replace Access 2. See note.

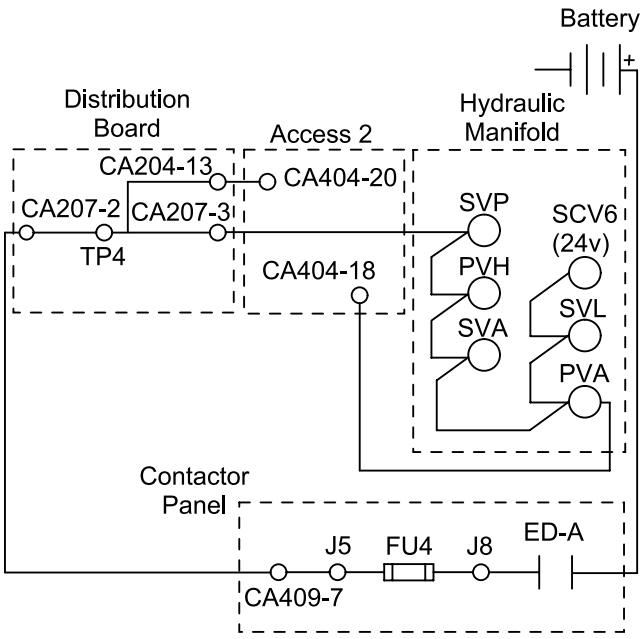

Figure 17959

Event Code 227

Access 2 Miswired or power bridge bad.

Step 1: Attach meter across Access 2 A1 and B- terminals.

Leave wires connected to terminals.

Step 2: Turn key ON while pressing the ↑ and ↓ buttons.

Select M2 (A4.18) on display menu.
Press and hold ↵ (drives component)

Step 3: Check meter reading.

- If: Battery volts replace Access 2. See note.
- If: 0 volts disconnect cable from A1 terminal. Reselect M2 (A4.18) on display menu.
  - Then press and hold ↵ and watch response on meter.
- If: 0 volts, replace Access 2. See note.
- If: Battery volts check cables for poor connections or corrosion.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 2.*

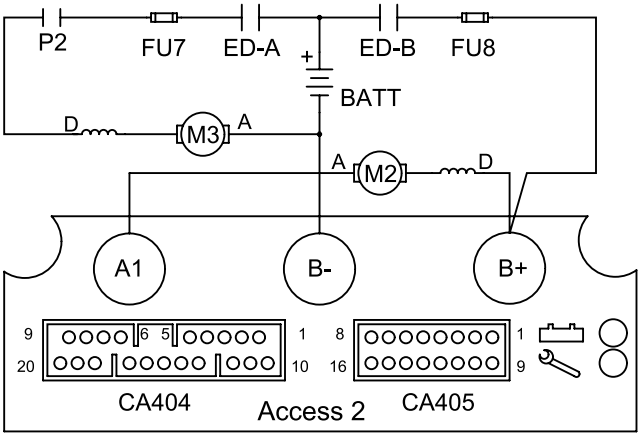

Figure 17956

Event Code 228

FU8 (pump motor fuse) Open circuit.

Step 1: Replace FU8. Note: due to the capacitance build up within module a conclusive in circuit test of fuse may not be possible.

Step 2: Attach meter leads across Access 2 B+ and B- terminals.

Leave wires connected to these terminals.

Step 3: Turn key ON while pressing the ↑ and ↓ buttons.

Select M2 (A4.18) on display menu.
Press and hold ↵ (drives component)

Step 4: Check meter reading.

- If: Near 0 volts: Open power circuit between Access 2 and the battery.
  - Then check all connections including power cables, ED tips, FU8 and battery connection. Refer to illustration.
- If: Battery volts power circuit is good.
  - Then replace Access 2. See note.

Step 5: Upon "power up".

- If: Code 228 occurs then "power up" truck with operator pedals "Actuated".
- If: Code 294 occurs then check key switch and ED switch wiring.
- If: Wiring OK then replace Access 2. See Note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 2.*

Note: *Fault codes 211, 226 or 228 may occur if the horn suppressor block is faulty or if it has not been installed on the truck. See TSB428.*

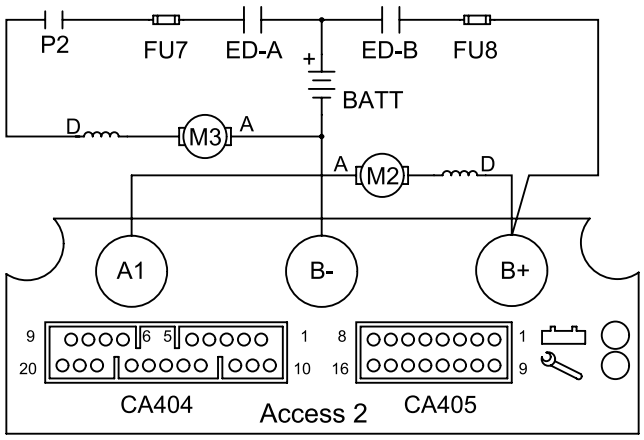

Figure 17956

Event Code 243

POT3 (accessory) Above electrical limit.

Step 1: Turn key ON while pressing the ↑ button.

Select POT3 (A2.5) on display menu.
Move accessory thumb knob to confirm following readings.

- If: Approximately 5 volts. Open in circuit between potentiometer and CA405-16 or CA405-8 on Access 2.
  - Then check connections to CA405-7 and CA405-6.
    Okay, replace potentiometer.
- If: Between 2.3 to 2.8 volts thumb wheel is in center position.
- If: Between 0.7 to 1.4 volts thumb wheel is at full left position.
- If: Between 3.7 to 4.3 volts thumb wheel is in full right position.
  Correct readings are confirmed, intermittent connection likely in potentiometer circuit.
  Check connections and potentiometer harness routing and condition.

Note: *Calibrate handle after repair.*

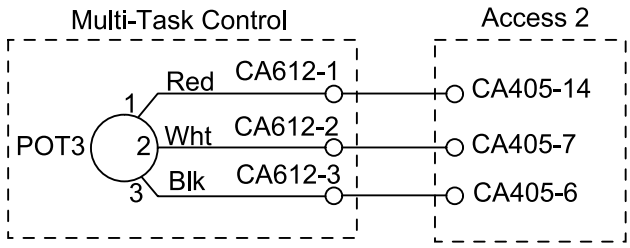

Figure 17960

Event Code 244

POT3 (accessory) Below electrical limit.

Step 1: Turn key ON while pressing the ↑ button.

Select POT3 (A2.5) on display menu.
Move accessory thumb knob to confirm following readings.

- If: Approximately 0 volts. Open between potentiometer circuit and Access 2.
  - Then check connection at CA405-14 or CA405-7. Refer to illustration.
    Okay, replace potentiometer.
- If: Between 2.3 to 2.8 volts thumb wheel is in center position.
- If: Between 0.7 to 1.4 volts thumb wheel is at full left position.
- If: Between 3.7 to 4.3 volts thumb wheel in full right position.
  Correct readings confirmed, intermittent connection likely in potentiometer circuit.
  Check connections and potentiometer harness routing and condition.

Note: *Calibrate handle after repair.*

Event Code 245

POT2 (raise/lower) Above electrical limit.

Step 1: Turn key ON while pressing the ↑ button.

Select POT2 (A2.4) on display menu.
Move control handle to confirm following readings.

- If: Approximately 5 volts. Open in circuit between potentiometer and CA405-16 or CA405-8 on Access 2.
  Okay, replace potentiometer.
- If: Between 2.2 to 2.7 volts raise/lower handle is in center position.
- If: Between 0.7 to 1.5 volts raise/lower handle is in full up position.
- If: Between 3.5 to 4.3 volts raise/lower handle is in full lower position.
  Correct readings confirmed, intermittent connection likely in potentiometer circuit.
  Then check connections and potentiometer harness routing and condition.

Note: *Calibrate handle after repair.*

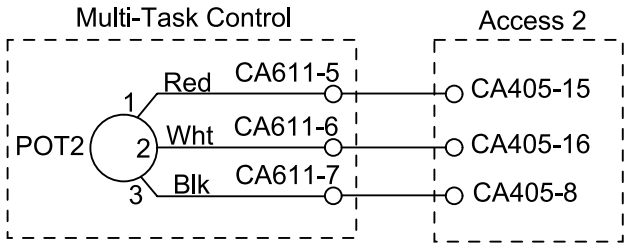

Figure 17961

Event Code 246

POT2 (raise/lower) Below electrical limit.

Step 1: Turn key ON while pressing ↑ button.

Select POT2 (A2.4) on display menu.
Move control handle to confirm following readings.

- If: Approximately 0 volts. Open in circuit between potentiometer and CA405-16 or CA405-15 on Access 2.
  Okay, replace potentiometer. Refer to illustration.
- If: Between 2.2 to 2.7 volts raise/lower handle is in center position.
- If: Between 0.7 to 1.5 volts raise/lower handle is in full raise position.
- If: Between 3.5 to 4.3 volts raise/lower handle is in full lower position.
  Correct readings confirmed, intermittent connection likely in potentiometer circuit.
  – Then check connections and potentiometer harness routing and condition.

Note: *Calibrate handle after repair.*

Event Code 247

POT3 (accessory) Handle calibration limits too narrow.

Step 1: Turn key ON while pressing the ↑ button.

Select POT3 (A2.5) on display menu.
Move accessory thumb knob to confirm following readings.

- If: Between 0.7 to 1.4 volts thumb knob is at full forward position.
- If: Between 2.3 to 2.8 volts thumb knob is in center position.
- If: Between 3.7 to 4.3 volts thumb knob is in full back position.

Note: *Voltage should vary at least 0.7 volts when moving handle to maximum position up and down from neutral position.*

Voltage varies less, check linkage to POT3. Okay, potentiometer faulty, replace POT3 and calibrate handle.

Event Code 248

POT2 (raise/lower) Handle calibration limits too narrow.

Step 1: Turn key ON while pressing the ↑ button.

Select POT2 (A2.4) on display menu.
Move control handle to confirm following readings.

- If: Between 0.7 to 1.5 volts raise/lower handle is in full raise position.
- If: Between 2.2 to 2.7 volts raise/lower handle is in center position.
- If: Between 3.5 to 4.3 volts raise/lower handle is in full lower position.

Note: *Voltage should vary at least 0.5 volts when moving handle to maximum position up and down from neutral position.*

Voltage varies less, check linkage to POT2. Okay, potentiometer faulty, replace POT2 and calibrate handle.

Event Code 254

Accessory Calibration Timed Out.

Note: *This code will only occur during calibration.*

Step 1: Verify correct truck voltage is set in Features menu F1.

- If: Voltage set correctly, proceed to step 2.
- If: Incorrect voltage selected, change to correct voltage.

Step 2: Verify correct pump motor size is selected in Features menu F11.

- If: Pump motor size set correctly, proceed to step 3.
- If: Incorrect pump motor size selected, change to correct size.

Step 3: Reach mechanism not advancing, stop to stop, quick enough. Inspect accessory mechanism for obstructions and mechanical binding.

- If: Obstructions or binding present, correct problem.
- If: Carriage moves freely, bleed air from accessory lines, as described in Service and Parts Manual section M9.0, and re-calibrate. If problem still exists proceed to step 4.

Step 4: With pressure gauge attached to test port G1, operate reach function to relief. Pressure gauge should indicate 1750 p.s.i.

- If: Pressure is less than 1700 p.s.i., replace reach function relief valve RV2.
- If: Pressure is 1750 p.s.i., proceed to step 5.

Step 5: Check if steering control unit (SCU) is allowing substantial flow to reservoir without steering command. Load sense operation will allow 0.25 gpm from SCU to reservoir. The flow check in this step is for significantly more flow.

- If: Substantial flow to reservoir is present, replace SCU.
- If: Normal flow present, proceed to step 6.

Step 6: Set Performance menu P1.4 to OFF by selecting P1.4.2. Mark mast to indicate 3 m (10 ft) of fork movement. Raise forks through the 3 m (10 ft) distance at maximum speed. Forks should pass through the 3 m (10 ft) distance in 14.7 to 15.3 seconds.

- If: Forks pass through distance in greater time, pump performance is below nominal. Replace pump.
- If: Forks pass through distance in recommended time, proceed to step 7.

Step 7: Make sure previous steps have not indicated reason for event code prior to performing this step.
No procedure exists to test the PCA or PVA valves. To verify valve operation, replace PCA valve and calibrate. If code is again logged, install original PCA valve then replace PVA valve and calibrate.

Step 8: Look for obstructions in reach cylinder lines and fittings.

Event Code 261

Access 2 Temperature outside of normal range.

Step 1: Verify duty cycle of truck.

Step 2: If truck duty cycle does not seem to be excessive, clean Access 2 module. Make certain adequate air flow is possible and that module is clean.
Check Access 2 mounting. Make sure sufficient heat transfer grease is between module and mounting surface and that module is tight against mounting surface. Check mounting screw tightness.
Make sure ambient temperature is within operating range of control -40 to +85° C (-40 to +185° F).
Check all termination's and make sure they are secure.
Check pump motor for overheating. Make sure correct fuse size is used for FU8 (250 amp). See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 2.*

Event Code 268

Access 2 Temperature too cold.

Step 1: Make sure ambient temperature is within operating range of control -40° to + 85° C (-40° to 185° F). Make certain adequate air flow is possible and that module is clean.

- If: Ambient temperature is correct and module is clean, go to step 2.

Step 2: Refer to PIB03-04-01, Radio Frequency Compliance. If that does not apply, and truck application is correct, replace Access 2. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 2.*

Event Code 269

Access 2 Temperature too hot.

Step 1: Verify duty cycle of truck.

Truck duty cycle okay.

Step 2: Clean Access 2 module and make certain adequate air flow is possible.
Check mounting. Make sure sufficient heat transfer grease is between module and mounting surface and that module is tight against mounting surface. Check mounting screw tightness. Make sure correct fuse size is used for FU8 (250 amp).
Check all termination's and make sure they are secure.
Replace module. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 2.*

Event Code 291

Access 2 Cannot Communicate With Access 3.

Step 1: Check condition of fuse FU10 and FU11.

Fuse open circuit. Replace.

Step 2: Ensure green LED on Access 2 is ON.

- If: Light is not ON, check input power source.

Step 3: View amber light on Access 2.

- If: LED is solid ON, replace Access 2.
- If: Flashing a code 14 or amber LED OFF, the communications wiring harness or connectors for CAN network is open or has a bad connection.
  - Repair/Replace.

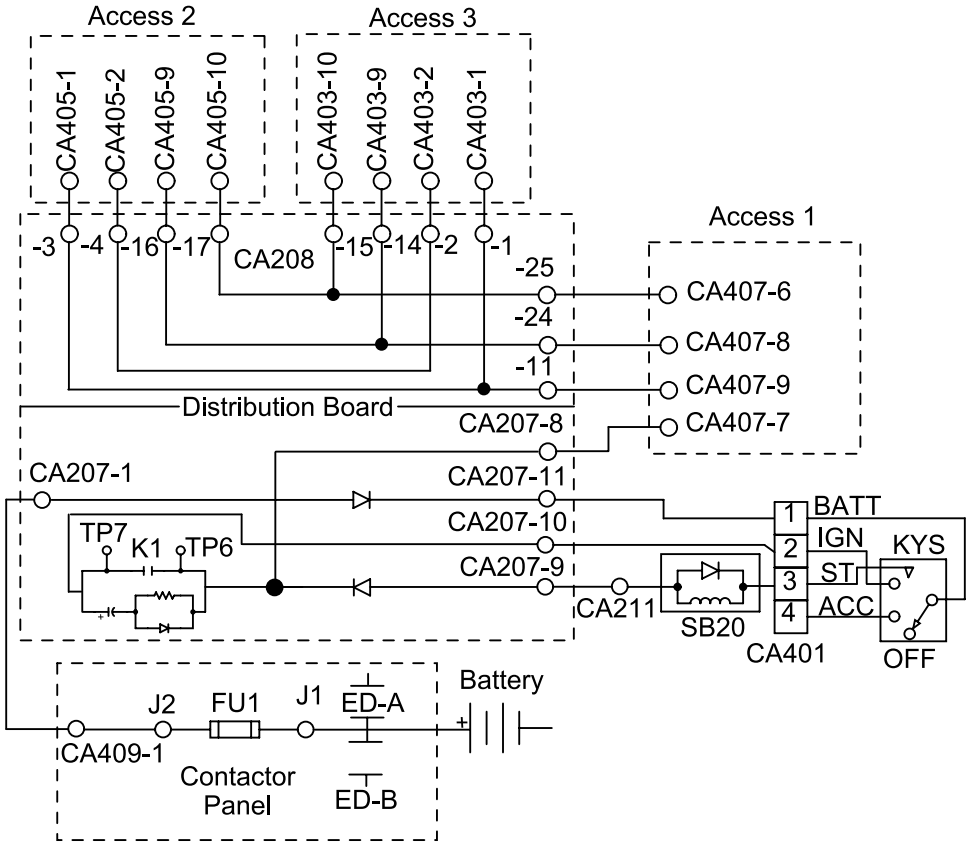

Figure 17962

Event Code 292

Access 2 Module or software not compatible with Access 3.

Step 1: Replace Access 2. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 2.*

Event Code 293

Access 2 Trademark not valid.

Step 1: Replace Access 2. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 2.*

Event Code 294

ED (emergency disconnect contactor) Power tips failed to close.

Step 1: Attach meter across coil terminals. Leave wires connected.

Step 2: Turn key ON while pressing the ↑ and ↓ buttons.

Select ED (A4.3) on display menu.
Press and hold ↵ (drives component)

Step 3: Check meter reading.

- If: 36 volts coil open circuit. Then replace coil.
- If: 20 volts correct functional reading.
  - Then "power up" truck.
    Code not registered, check connections and possible mechanical obstruction in contactor.
    Code again registered. Access 2 faulty, replace. See note.
- If: 0 volts positive or negative to contactor missing.
  See positive and negative test.

Step 4: "Power up" truck with operator pedals "Not Actuated".

- If: Code 228 occurs, then "power up" truck with operator pedals "Actuated".
- If: Code 294 occurs, then check key switch and ED switch wiring for incorrect connections.
- If: Wiring OK see note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 2.*

Missing Positive and Negative Test
Missing Positive Test
1. Check power path from battery (reference illustration). Power for ED goes through Access 3 (input - CA402-16, output - CA402-17), if power is present at input and not at output, replace Access 3.
Missing Negative Test
1. Check negative output between terminal B+ and CA404-8 using test output (A4.3). **Signal present**, open wiring. **Signal missing**, replace Access 2. See note.

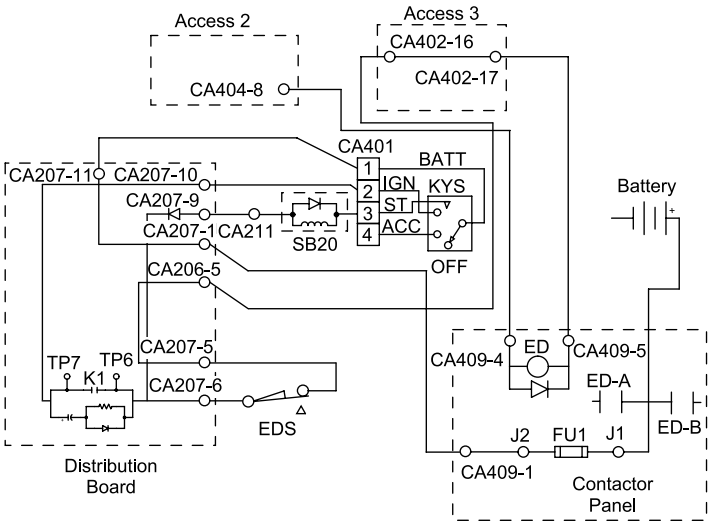

Figure 17963

Event Code 295

Access 2 Data lost.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 2.*

Event Code 311

Access 3 Controller 15 volts out of range.

Step 1: Connect meter to B- terminal of Access 3 and with positive lead check CA402-2 then CA402-3.

- If: Either measures battery voltage check wiring to Access 2 and 3. Also see if FU10 is blown. FU10 is located on distribution panel.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If frequency gradually increases for no apparent reason, replace Access 3.*

Event Code 312

Access 3 Powerbase 15 volts out of range.

Step 1: Connect meter to B- terminal of Access 3 and with positive lead check CA402-2 then CA402-3.

- If: Either measures battery voltage, check wiring to Access 2 and 3.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

Event Code 313

Access 3 Negative12 volt power supply out of range.

Step 1: Connect meter to B- terminal of Access 3 and with positive lead check CA402-2 then CA402-3.

- If: Either measures battery voltage check wiring to Access 2 and 3.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

Event Code 314

Access 3 Can communication 5 volts out of range.

Step 1: Connect meter to B- terminal of Access 3 and with positive lead check CA402-2 then CA402-3.

- If: Either measures battery voltage check wiring to Access 2 and 3.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

Event Code 315

Access 3 Encoder 5 volt supply out of range.

Step 1: Connect meter to B- terminal of Access 3 and with positive lead check CA402-2 then CA402-3.

- If: Either measures battery voltage check wiring to Access 2 and 3. Also see if FU10 is blown.

Step 2: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 3: Disconnect traction encoder at CA602. "Power up" truck and attempt travel. Check last log event.

- If: Code changes, fault in encoder circuit. Repair or replace.
- If: Code remains 315, check for shorted wire harness by disconnecting CA403-6 and "powering up" truck. Attempt to travel. Check last log event.
- If code changes, short circuit exists in wire harness. On 5200 Series trucks with height encoder, check encoder harness on mast for damage. See PIB03-02-01, Height Sensor Wire Harness.
- If code remains 315, internal module fault. Replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

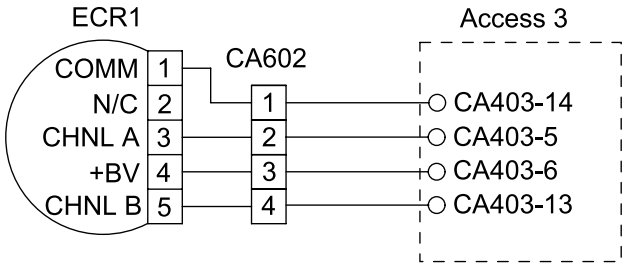

Figure 17964

WARNING

Never key ON truck with any Access 1, 2 or 3 connections disconnected. In addition, never remove or connect any Access 1, 2 or 3 connections while the truck is keyed ON.

Event Code 316

Over voltage occurred in traction motor circuit during regenerative braking.

Step 1: This is caused by an open circuit in the traction motor circuit. Components to check include: ED contactor tips, FU9, cables and connections in path of battery to traction motor.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

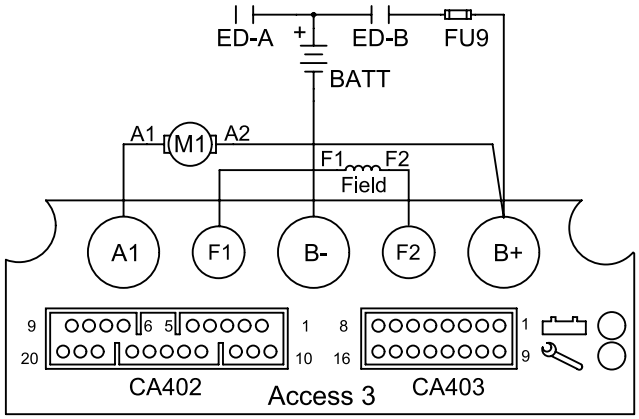

Figure 17965

Event Code 317

Over current condition occurred in traction motor armature circuit.

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Check traction motor A1 power cable wiring to A1 terminal on Access 3. Refer to illustration.

Step 3: Disconnect and isolate A1 terminal at drive motor and "power up" truck. Depress operator pedals. "Power down" truck and turn key ON while pressing the and buttons. Check last log event (L1).

- If: Code changes to 374. Check wiring between M1 motor and Access 3.
- If wiring is correct, check or replace drive motor armature or drive motor.
- If: Code 317 remains: Disconnect cable on A1 terminal of Access 3 and "power up" truck. Depress operator pedals. "Power down" truck and turn key ON while pressing the and buttons. Check last log event (L1).
- If the symptom and code 317 remains, replace Access 3.

Event Code 318

Voltage on brake low when ED is closed.

This condition is present when low voltage is sensed on both CA402-18 and CA402-19 simultaneously. The probable cause is ED contact tips or a mechanical bind in ED contactor.

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Attach meter leads to battery negative and first CA402-18 then CA402-19.

Step 3: Turn key ON while pressing the ↑ and ↓ buttons.

Select ED (A4.3) on display menu.
Press and hold ↵ (drives component)
Check meter reading. Battery volts should be present at CA402-18 and CA402-19 when ED is energized.

- If low voltage, then check for a high resistance connection between CA402-18, CA402-19 on Access 3, and ED tips.
  Check for high resistance connection between Access 3 CA402-18, CA402-19 and battery positive. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

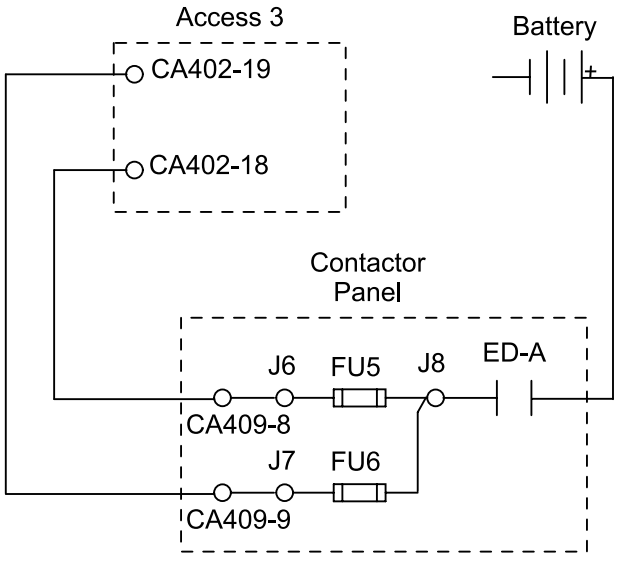

Figure 17966

Event Code 319

Over current condition occurred in traction motor field circuit.

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Check traction motor F1 and F2 power cable connections and cable condition between motor and Access 3 module (refer to illustration).
Check that F1 and F2 motor connections are not wired to B-, B+ terminals of Access 3.

Step 3: (refer to capacitor discharge Caution on first page of section) Disconnect and isolate drive motor F1, F2 terminals one at a time and "power up" truck. Depress operator compartment pedals. "Power down" truck and turn key ON while pressing the ↑ and ↓ buttons. Check last log event (L1).

- If: Code changes to 324: Check or replace drive motor field or drive motor.
- If: Code 319 remains: Disconnect and isolate Access 3 F1, F2 terminals one at a time and "power up" truck. Depress operator pedals. "Power down" truck and turn key ON while pressing the ↑ and ↓ buttons.
  Check last log event (L1).
- If symptom and code remain, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

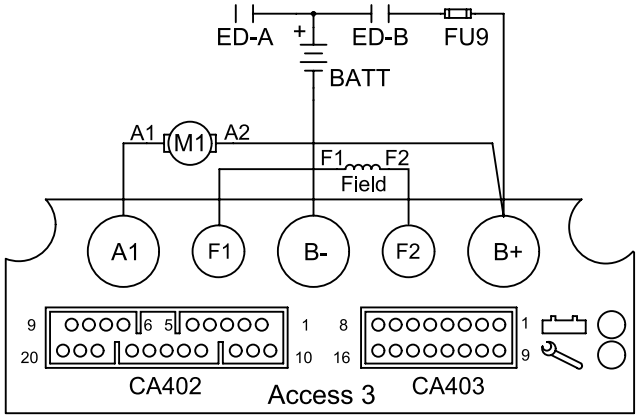

Figure 17965

Event Code 321

Incorrect Voltage at B+ terminal of access 2 and Access 3 before ED closure.

Step 1: Check for battery voltage between Access 3 B- terminal and CA402-15, CA404-11 with battery plugged in.

Should be battery volts.

Step 2: Make sure power cables are connected to Access 2, M2 pump motor, Access 3, and traction motor correctly.

Step 3: (refer to capacitor discharge Caution on first page of section) Unplug truck and disconnect all connections from B+ of Access 3. With key OFF and battery plugged in, verify battery voltage at B+ terminal of Access 3.

- If: 0 volts, replace Access 3.
- If: Battery volts, verify battery volts at B+ terminal of Access 2.
- If: 0 volts, replace Access 2. See note

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

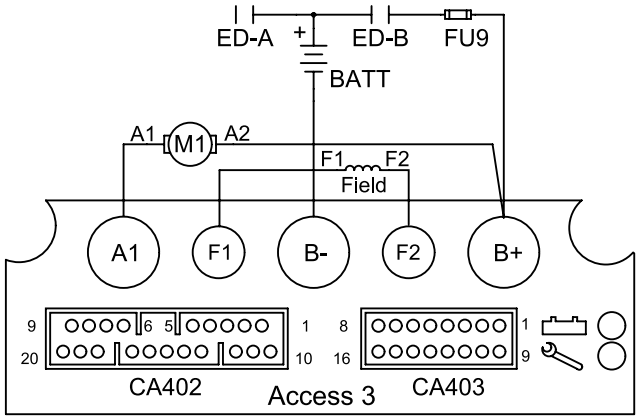

Figure 17965

Event Code 322

Checks that CA402-17 not at battery positive before ED contacts close.

Step 1: Short circuit exists between battery positive and CA402-17. Battery voltage should only be present at CA402-17 after depressing operator pedals when truck is "powered up".

No short circuit. Go to Step 2.

Step 2: Verify ED coil is not open circuit between CA402-17 and CA404-8.

Wiring okay, replace Access 3. See note

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

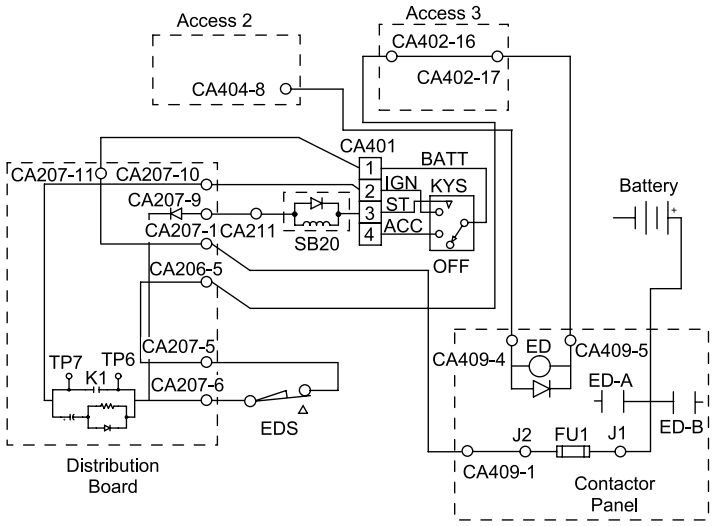

Figure 17963

Event Code 323

Access 3 command to motor armature not sensed within limits.

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Check power cable connections between motor and Access 3.

Step 3: (refer to capacitor discharge Caution on first page of section) Remove power cable from Access 3 A1 terminal.

"Power up" truck and attempt to travel.

- If code does not change.
  - – Then replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

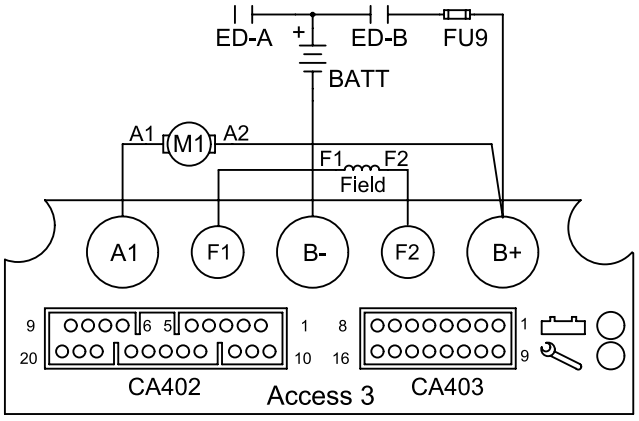

Figure 17965

Event Code 324

Access 3 command to motor field present but not sensed within limits.

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Attach meter across motor field terminals F1 and F2.

Step 3: Turn key ON while pressing the ↑ and ↓ buttons.

Select M1-F (A4.16) for forward direction or M1-R (A4.17) for reverse direction on display menu.

Press and hold ↵ (drives motor field)

Observe meter voltage reading and display amperage reading.

- If: Battery volts on meter, less than 10 amps on display: Then open exists in drive motor field circuit. Repair/replace.
- If: 0 volts on meter, less than 10 amps on display: Then attach meter leads to F1 and F2 terminals on Access 3.

  Turn key ON while pressing the ↑ and ↓ buttons.

  Select M1-F (A4.16) M1-R (A4.17) on display menu.

  Press and hold ↵ (drives motor field)

  Observe meter voltage reading and display amperage reading.

  Battery volts, open circuit in power cable circuit.

  O volts on meter and less than 10 amps on display, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

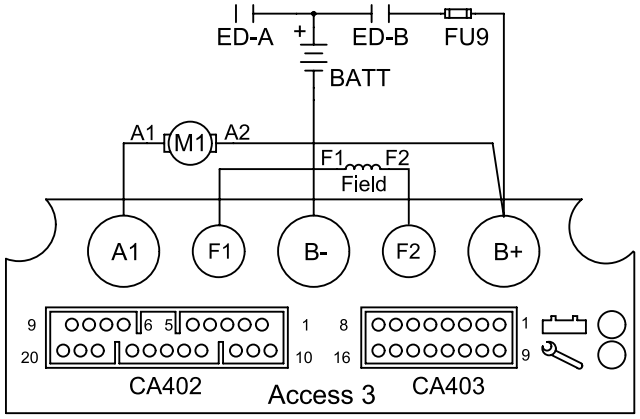

Figure 17965

Event Code 325

ALM1 (Alarm) Driver open (CA402-6) or alarm shorted.

Step 1: "Power down" truck, disconnect wire from CA206-1. "Power up" truck and view code.

- If: Code changes or no code displayed, then short circuit exists between CA206-1 to battery negative. Check wiring or replace distribution board.
- If: Code 325 is displayed, disconnect CA402-6, "power up" truck.
  Code changes, short circuit exists in wiring between distribution panel and Access 3.
  Code 325 remains, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

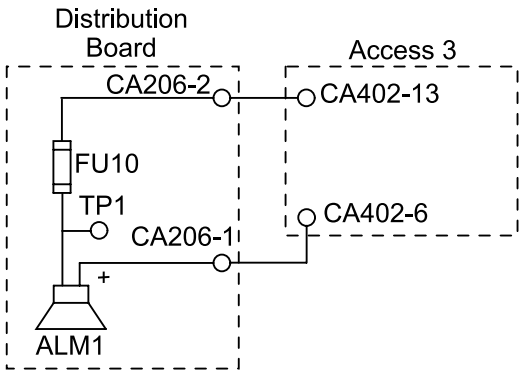

Figure 17967

Event Code 326

Internal module fault.

Step 1: If truck does not operate check all wiring from module.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

Event Code 327

CA402-18 and/or CA402-19 has voltage present when ED contactor is not energized.

Step 1: Check for positive voltage at CA402-18 and CA402-19 without depressing operator pedals.

- If: Voltage (should be 0 volts before ED closes), short circuit exists between CA402-18 or CA402-19 and battery positive.
  - Then clean all terminals of ED contactor, check for welded tips and possible missed wiring. Also verify power cable and control wiring is not grounded to truck frame. Repair/replace
- If: 0 volts, this is correct voltage reading.
  - Then check both ED contactor tips for excessive pitting or mechanical binding. Repair/replace.

Step 2: Check voltage at CA402-18 and CA402-19. With ED contactor closed, should be battery volts.

- If: 0 volts, check wiring, FU5 and FU6.
  On DC Traction models trace A1 power cable on Access 3 and B+ power cable on Access 2 per Power Cable Diagram, they may be reversed.

Step 3: Check for battery positive at CA402-15.

- If: 0 volts, check wiring.
- If: Battery volts, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

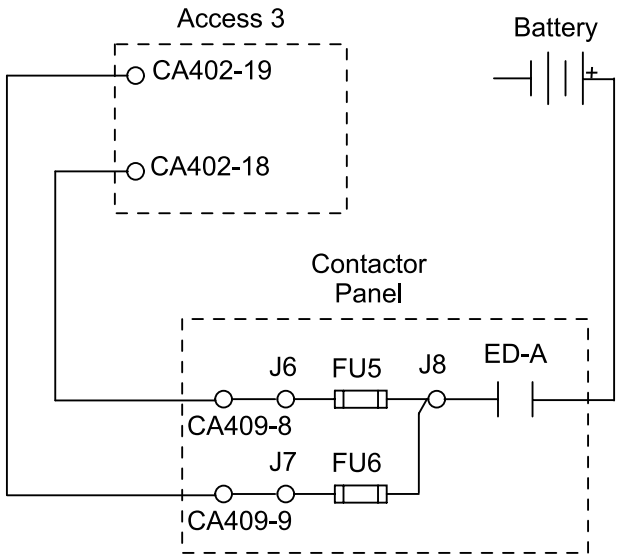

Figure 17966

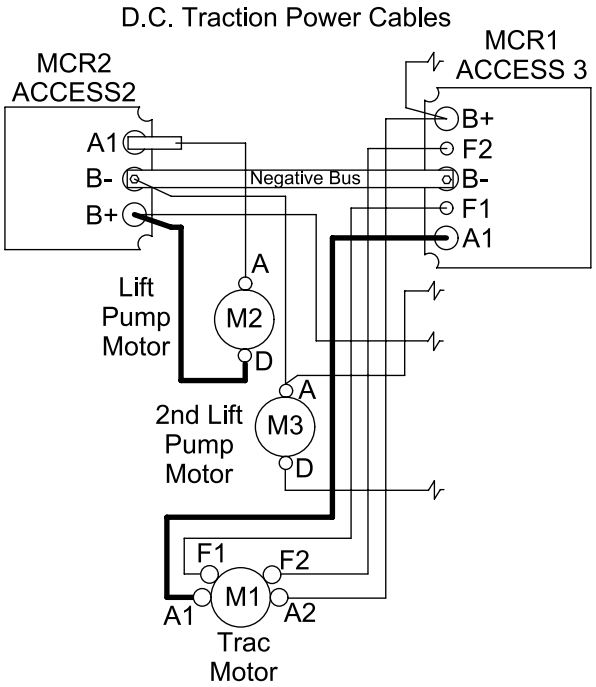

Figure 17968

Event Code 328

ED (emergency disconnect contactor) coil short.

Note: *Follow this log event procedure only when code 328 is displayed on Access 1. If Access 3 amber light is flashing a code 328 and Access 1 is inoperable, refer to "When truck does not operate and there is no code" at beginning of this section.*

Step 1: Disconnect leads at ED coil. Use continuity check to test for short circuit in ED coil. Coil resistance is 40 - 47 ohms.

- If: Shorted, then repair/replace.
  When corrected, "power up" truck and verify code is cleared.
- If code still present, check wiring from ED coil through connector 409, wires may be reversed.
- If: No short circuit, proceed with step 2.

Step 2: "Power down" truck and check suppressor across the ED coil. This suppressor is polarity sensitive. Make sure it is installed correctly.

- If: Installed correctly, remove suppressor and using a digital voltmeter with a diode check scale, check voltage across suppressor in conducting (approximately 0.5 volts) and non-conducting (no voltage) direction.
- If: Suppressor checks okay, reinstall suppressor making sure polarity is correct. Proceed to step 3.

Step 3: "Power down" truck. Disconnect green striped-white lead to ED coil. "Power up" truck and measure voltage between disconnected wire and battery negative.

- If: Voltage present, proceed with step 4.
- If: 0 volts, short circuit exists. Check wiring.

Step 4: If no faults are found in above checks, check wiring.

Wiring okay. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

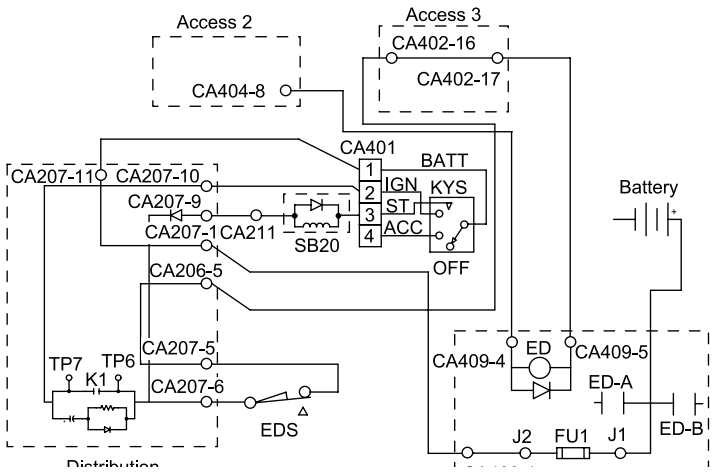

Figure 17963

Event Code 329

Positive voltage at CA402-6 when not required.

Step 1: Disconnect CA206-1.

- If: Alarm remains on, replace distribution board.
- If: Alarm turns off, check output from CA402-6.
- If: 12 or battery volts, proceed with step 2.

Step 2: Disconnect wire at CA402-6 on Access 3.

Check voltage at output pin (CA402-6) on Access 3.

- If: 12 volts or battery voltage remains, replace Access 3.
- If: 0 volts, check for 12 or battery volts on disconnected wire (CA402-6).
- If voltage present, then short circuit exists between CA402-6, CA206-1, and ALM1.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

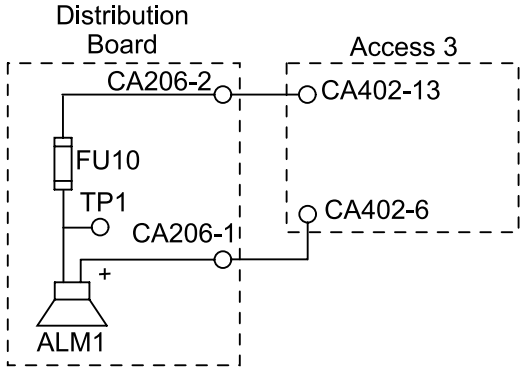

Figure 17967

Event Code 331

ECR1 (traction feedback encoder) counts not as expected.

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Turn key ON while pressing the ↑ button.

Select ECR1 (A2.21) on display menu.

Step 3: Move multi task lever slightly to provide traction command and observe encoder counts on display when drive wheel is moving.

- If: Count not present, then check for +5 volts between CA602- 5 and CA602-2.
- If: 5 volts is present, check encoder pulsing with digital meter measuring between Access 3 B- terminal and first CA403-5 (Channel A) then CA403-13 (Channel B).
- If not pulsing, check wiring and mechanical coupling.
- If wiring and coupling okay, replace ECR1.
- If: 0 volts, check for +5 volts between CA403-6 and CA403-14.
- If voltage present, repair/replace wiring.
- If 0 volts, disconnect wires at CA403-6 and CA403-14 and retest.
- If 0 volts, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

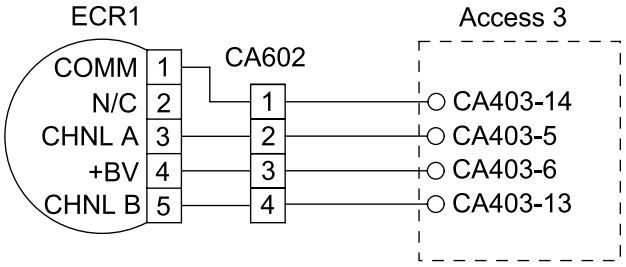

Figure 17964

Event Code 332

ECR1 (traction feedback encoder) Feedback opposite traction command.

Step 1: Check wiring of channels A and B between ECR1 and Access 3. Refer to illustration.

Miswired, correct.

Step 2: Check wiring of traction motor field and armature cables.

- If: Reversed, correct.
- If: Correct, replace ECR1.
- If: All checks above are okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.*

Event Code 333

DC Traction POT1 (traction command potentiometer) Above electrical limit.

Step 1: Turn key ON while pressing the ↑ button.

Select POT1 (A2.3) on display menu. View reading on display.

- If: Approximately 5 volts, open between potentiometer and CA403-7 or CA403-8 on Access 3. Then repair/replace.
- If wiring okay, replace potentiometer. (Refer to illustration for connections).
- If: Between 2.1 to 2.9 volts, control handle is in center position.
- If: Between 0.7 to 1.5 volts, control handle is in full forward position.
- If: Between 3.5 to 4.3 volts, control handle is in full reverse position.
  Correct readings confirmed, intermittent connection in potentiometer circuit. Check connections and potentiometer harness and condition.

Note: *Calibrate handle after repair/replacement.*

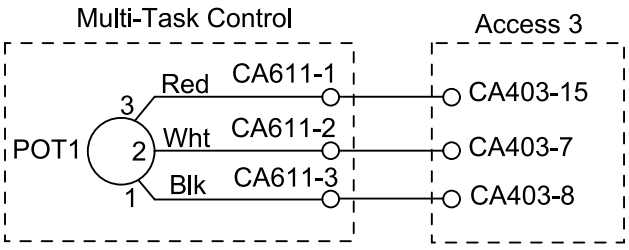

Figure 17969

Event Code 333

AC Traction POT1 (traction command potentiometer) Above electrical limit.

Step 1: Turn key ON while pressing the ↑ button.

Select POT1 (A2.3) on display menu. View reading on display.

- If: Approximately 5 volts, open between potentiometer and CA403-8 on Access 3. Then repair/replace.
- If wiring okay, replace potentiometer. (Refer to illustration for connections).
- If: Between 2.1 to 2.9 volts, control handle is in center position
- If: Between 0.7 to 1.5 volts, control handle is in full forward travel position.
- If: Between 3.5 to 4.3 volts, control handle is in full reverse position.
  Correct readings confirmed, intermittent connection in potentiometer circuit. Check connections and potentiometer harness routing and condition.

Note: *Calibrate handle after repair/replacement.*

Event Code 334

DC Traction System (traction command potentiometer) Below electrical limit.

Step 1: Turn key ON while pressing the ↑ button.

Select POT1 (A2.3) on display menu. View reading on display.

- If: Approximately 0 volts, open circuit between potentiometer and Access 3. (Refer to illustration).
  - Then check connection between potentiometer and CA403-15 or CA403-7 on Access 3. Connection okay, replace potentiometer. (Refer to illustration for connections).
- If: Between 2.1 to 2.9 volts, control handle is in center position.
- If: Between 0.7 to 1.5 volts, control handle is in full forward position.
- If: Between 3.5 to 4.3 volts, control handle is in full reverse position.
  Correct readings confirmed, intermittent connection in potentiometer circuit. Check connections and potentiometer harness routing and condition.

Note: *Calibrate handle after repair/replacement.*

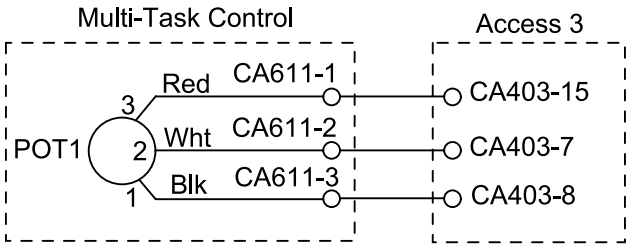

Figure 17969

Event Code 334

AC Traction POT1 (traction command potentiometer) Below electrical limit.

Step 1: Turn key ON while pressing the ↑ button.

Select POT1 (A2.3) on display menu. View reading on display.

- If: Approximately 0 volts, open circuit between potentiometer and CA403-7 or CA403-15 on Access 3. Refer to illustration. Then repair/replace.
- If wiring okay, replace potentiometer (Refer to illustration for connections).
- If: Between 2.1 to 2.9 volts, control handle is in center position.
- If: Between 0.7 to 1.5 volts, control handle is in full forward travel position.
- If: Between 3.5 to 4.3 volts, control handle is in full reverse position.
  Correct readings confirmed, intermittent connection in potentiometer circuit. Check connections and potentiometer harness routing and condition.

Note: *Calibrate handle after repair/replacement.*

Event Code 335

AC Traction System Battery Current Sensor Power Interruption.

Step 1: Disconnect CA412. Measure the voltage from Access 3 between pins C and A of CA412. (CA412 is located in wire harness between CA413 on Access 3 and BDI Current Sensor.) Should measure between 4.5 and 5.5 volts DC.

- If: Voltage okay.
  - Then power supply voltage is okay. Proceed to Step 2.
- If: Voltage is out of range or missing.
  Measure voltage between pins 10 and 11 of CA413. Should measure between 4.5 and 5.5 volts DC.
- If: Voltage okay.
  - Then power supply voltage is okay. Locate and repair broken wire(s) between CA413 pins 10 and 11 and CA412 pins C and A.
- If: Voltage is out of range or missing.
  Check condition of pins 10 and 11 in JC 413 (on Access 3)
- If: Pins are not bent, broken, or corroded;
  - Then replace Access 3 module.

Step 2: Check wiring between JC412 and the BDI Current Sensor. The BDI Current sensor is located beneath fuse panel just above the Traction Drive Module.

- If: Wiring checks okay.
  - Then replace the BDI current sensor.

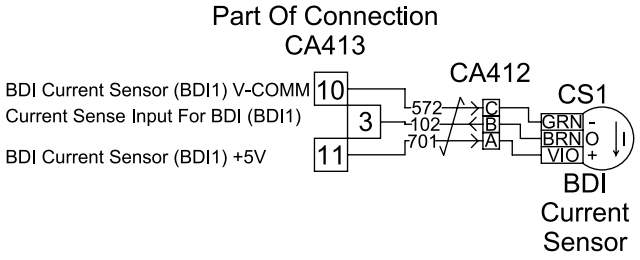

Figure 17970

Event Code 336

AC Traction System Auxiliary 1 Power Supply Interruption. Auxiliary 1 Power Supply is Located in the ACCESS 3 Module.

The auxiliary power supply voltage is monitored. If it is detected that voltage is out of range, code 336 is logged.

Note: *As of 12/14/01 this output is not used.*

Step 1: Measure voltage between CA413-12 and battery negative. Should measure between 4.5 to 5.5 volts DC.

- If: Voltage okay.
  - Then power supply is okay. This power supply interruption may be intermittent. See Note.
- If: Voltage out of range.
  - Then replace Access 3.

Note: *If truck operates, this could be a random nuisance code. Monitor the code frequency. If it gradually increases, replace the Access 3 module.*

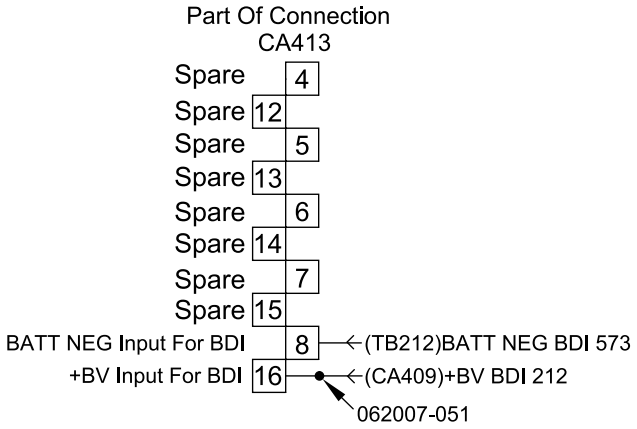

Figure 17971

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Event Code 337

During calibration, insufficient voltage variation is obtained from POT1.

Note: *This code will display after POT1 calibration procedure is performed incorrectly (multi task handle moved to forward travel direction when reverse movement required or conversely).*

Step 1: Turn key ON while pressing the ↑ button.

Select POT1 (A2.3) on display menu.
View reading on display while moving multi task handle from full reverse to full forward.

Step 2: Voltage should be between 3.5 to 4.3 volts at full reverse, 2.1 to 2.9 volts at neutral and 0.7 to 1.5 volts at full forward.

- If: Voltage higher or lower than listed, then replace potentiometer.
- If: Voltage span less than listed, recalibrate handle.

Event Code 341

Traction command (POT1) Not matching forward switch (FS) signal.

Step 1: Turn key ON while pressing the ↑ button.

Select POT1 (A2.3), FS (A 2.1) on display menu.
View reading on display to verify correct operation.

Note: *If these components have been worked on, verify that wiring is not reversed.*

Forward Switch (yellow sleeving) mounted nearest handle grip. "F" stamped on actuator that passes between optic sensors.

Reverse Switch (black sleeving) mounted nearest support casting. "R" stamped on actuator that passes between optic sensors.

Step 2: FS/POT1 operation: input statue of switch with multi task handle in neutral should be "open" indicated by "0" on the display (A2.1). The POT1 reading on display (A2.3) should be between 2.1 to 2.9 volts. Moving multi task handle to full forward position should toggle switch input status to "closed", display to "1" (A2.1). Reading for POT1 (A2.1) should go between 0.7 to 1.5 volts.

- If: Readings are not as listed, check switch for physical damage and/or damage to wiring.
- If: Damaged, replace optical switch assembly. Harnesses must be routed properly so spherical handle cover does not contact harness as handle is moved from one extreme to the other. Verify harnesses routed properly after installation. Calibrate handle.
- If: POT1 not within limits, replace. Calibrate handle.

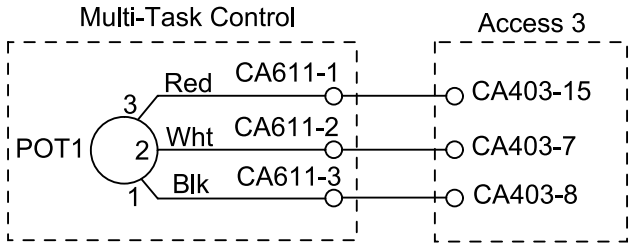

Figure 17969

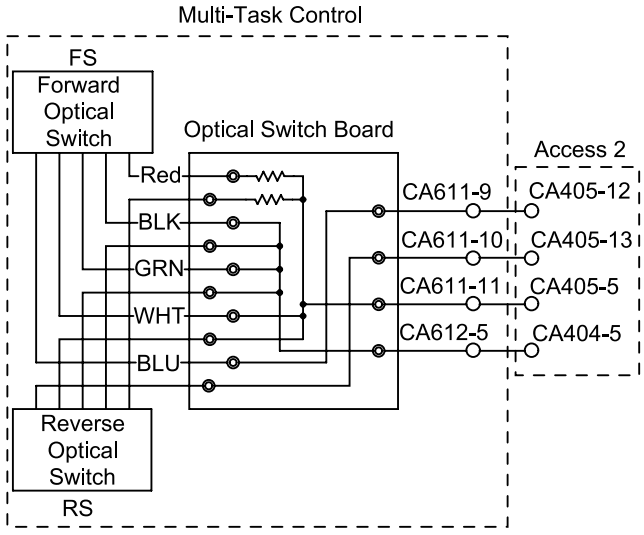

Figure 17972

Event Code 342

Traction command (POT1) Not matching reverse switch (RS) signal.

Step 1: Turn key "ON" while pressing the ↑ button.

Select POT1 (A2.3), RS (A2.2) on display menu. View reading on display to verify correct operation.

Note: *If these components have been worked on, verify that wiring is not reversed.*

Forward Switch (yellow sleeving) mounted nearest handle grip. "F" stamped on actuator that passes between optic sensors.

Reverse Switch (black sleeving) mounted nearest support casting. "R" stamped on actuator that passes between optic sensors.

Step 2: RS/POT1 operation: Input status of switch with multi task handle in neutral should be "open" indicated by "0" on the display (A2.2). POT1 reading on display (A2.3) should be between 2.1 to 2.9 volts. Moving multi task handle to full reverse position should toggle switch input status to "closed", display to "1" (A2.2). Reading for POT1 (A2.1) should go between 3.5 to 4.3 volts.

- If: Readings are not as listed, then check switch for damaged wiring or physical damage.
- If: Damaged, replace optical switch assembly. Harnesses must be routed properly so spherical handle cover does not contact harness as handle is moved from one extreme to the other. Verify harnesses routed properly after installation. Calibrate handle.
- If: POT1 not within limits, replace. Calibrate handle.

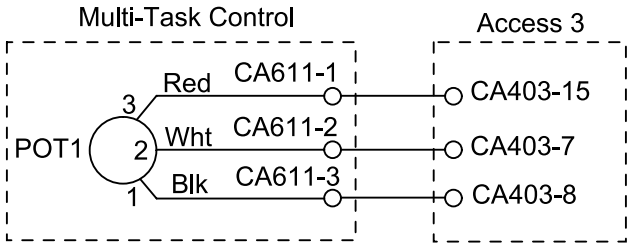

Figure 17969

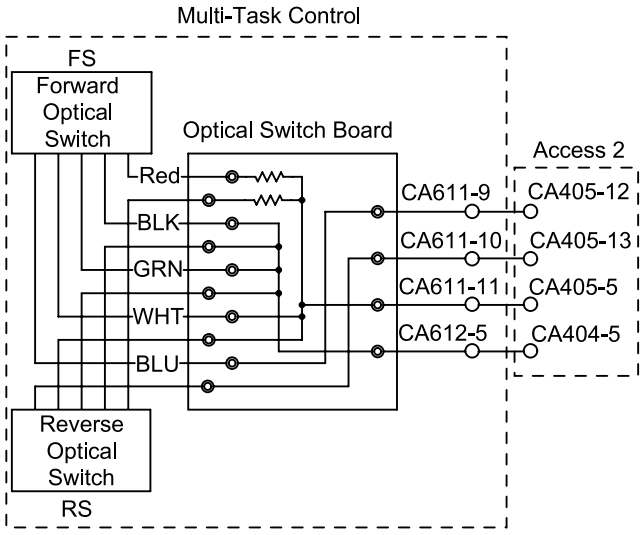

Figure 17972

Event Code 343

FS and RS (start switches) indicating both closed at same time.

Step 1: Check FS and RS for physical damage to wiring or switch and mounting.

- If: Damaged, replace optical switch assembly. See Note 1. Calibrate handle.
- If: Appearance OK, proceed to step 2.

Step 2: Turn key ON while pressing the ↑ button. Use display menu for FS (A2.1) and RS (A2.2). Check status of FS and RS with multi task handle in neutral position.

- If: Either FS or RS is "1", select that switch to use in step 3.
- If: Both FS and RS are "1", choose either switch and proceed to step 3.

Step 3: Check optical switch function by disconnecting output (WHT CA611-9 for FS, or WHT CA611-10 for RS) of previously selected switch.

- If: Selected switch display changes to "0" when switch wire is disconnected, replace optical switch assembly. See Note 1. Calibrate handle.
- If: Selected switch display is "1", proceed to step 4.

Step 4: Disconnect wire (WHT CA405-12 for FS, or WHT CA405-13 for RS) of selected switch at Access 2.

- If: Selected switch display changes to "0" when wire is disconnected, repair/replace wiring selected switch between Access 2 and multi task handle (CA405-12 and CA611-9 for FS, CA405-13 and CA611-10 for RS)
- If: Selected switch is "1" with multi task handle in neutral, replace Access 2. See Note 2.

Note 1: *Harness must be routed properly so spherical handle cover does not contact harness as handle is moved from one extreme to the other. Verify harness is routed properly after installation.*

Note 2: *If truck operates, this could be a random nuisance code. Monitor code frequency. If frequency increases for no apparent reason, replace Access 2.*

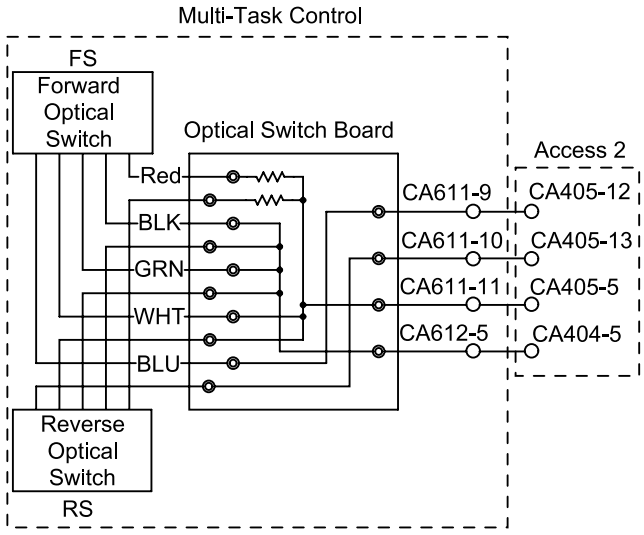

Figure 17972

Event Code 344

Inner brake current too high.

Step 1: Check for short circuit in brake coil or wiring between Access 3 and brake coil.

Step 2: Check brake coil resistance. The resistance range is 2.49 to 5.52 ohms. The normal reading at 20° C (68° F), is 3.56 ohms.

- If: Outside these ranges, the following should be considered:
  Cold temperatures greatly decreases resistance of coil, increasing current draw by coil.
- If in a cold environment, warm coil and recheck resistance readings.
- If resistance is still outside range after coil is warmed, replace brake coil.
- If: Coil resistance checks okay, disconnect wires at CA402-19 and CA402-9. Recheck resistance readings at Access 3, CA402-19 and CA402-9. Should be within specified range above. If not, check wiring between Access 3 and brake coil for short circuit.
- If: Problem can not be found and truck operates, then this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.

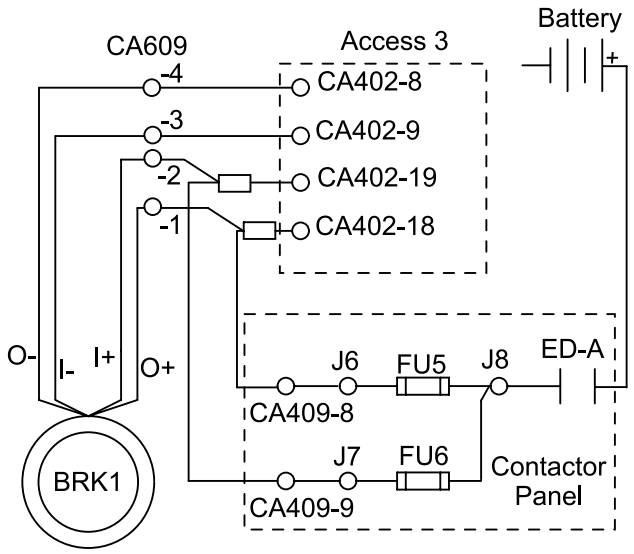

Figure 17973

Event Code 345

Inner brake resistance too high.

Step 1: Check FU6 for open circuit.

Step 2: Attach meter leads across CA609-2 and CA609-3 near brake coil.

Step 3: Turn key ON while pressing the ↑ and ↓ buttons.

Select BRK1i (A4.13) on display menu.

Press and hold ↵ (drives component)
View reading on display and meter.

- If: Battery volts on meter/ 0 amps on display: Open circuit in brake coil. Repair/replace.
- If: 0 volts on meter and 0 amps on display: Re-select BRK1i (A4.13) on display. Check for battery positive at CA402-19 while pressing and holding ↵.
- If: 0 volts, double check FU6 and associated wiring.
- If: Battery positive, Re-select BRK1i (A4.13) on display and measure voltage between CA402-19 and CA402-9 while pressing and holding ↵.
  Battery volts, open circuit in wiring between Access 3 and brake coil. Repair/replace.
  0 volts, replace Access 3.
- If: Less than 10 volts on meter and 3 to 6 amps on display. This could be an indication that brake assembly is getting too hot during operation. Check for dragging brakes or improper adjustment.
- If: Okay, check brake coil resistance, it should be between 2.49 and 5.52 ohms at 20° C (68° F).
- If: Neither of these two conditions exists, verify this condition is not intermittent or occurs during extended use.

Note: *If problem can not be found and truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

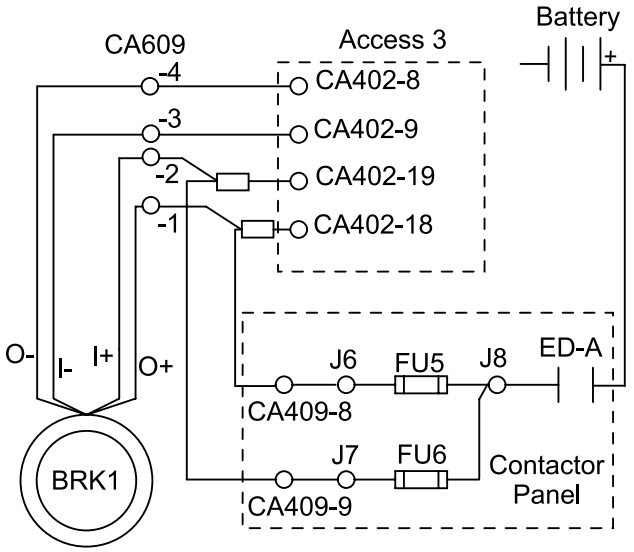

Figure 17973

Event Code 346

Outer brake resistance too low.

Step 1: Check for short circuit in brake coil or wiring between Access 3 and brake coil.

Step 2: Check brake coil resistance, it should be between 0.95 to 2.1 ohms. At 20° C (68° F) it will measure 1.4 ohms.

- If: Outside these ranges the following should be considered.
  Cold temperatures greatly decreases resistance of coil.
- If in a cold environment, warm coil and recheck resistance readings.
- If resistance is still outside range listed, replace brake coil.
- If: Coil checks okay or truck is not used in a cold environment, recheck resistance readings at Access 3, CA402-18 and CA402-8.
  Resistance out of range, check wiring between Access 3 and brake coil for short circuit.
- If: Problem can not be found and truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.

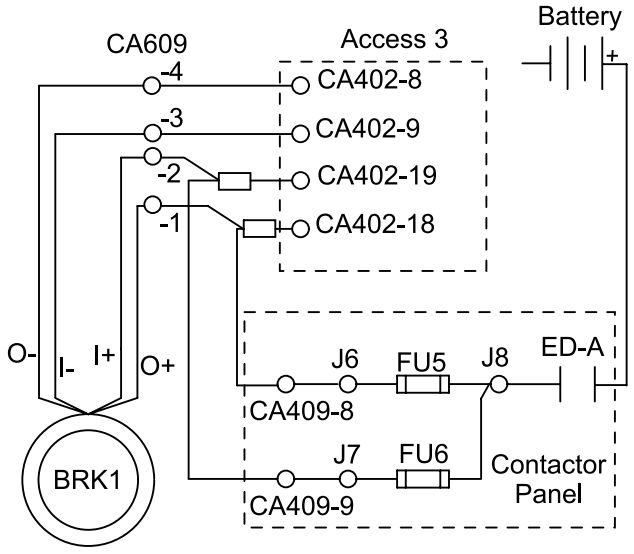

Figure 17973

Event Code 347

Outer brake resistance too high.

Step 1: Check FU 5 for open circuit.

Step 2: Attach meter leads across CA609-1 and CA609-4 near brake coil.

Step 3: Turn key ON while pressing the ↑ and ↓ buttons.

Select BRK1o (A4.12) on display menu.
Press and hold ↵ (drives component)
View reading on display and meter.

- If: Battery volts on meter/0 amps on display: Open circuit in brake coil. Repair/replace.
- If: 0 volts on meter and 0 amps on display: Re-select BRK1o on display. Check for battery positive at CA402-18 while pressing and holding ↵
- If: 0 volts, double check FU5 and associated wiring.
- If: Battery positive, Re-select BRK1o on display and measure voltage between CA402-18 and CA402-8 while pressing and holding ↵
  Battery volts, open circuit in wiring between Access 3 and brake coil. Repair/replace.
  0 volts, replace Access 3.
- If: Less than 10 volts on meter and 3 to 6 amps on display. This could be an indication the brake assembly is getting too hot during operation. Check for dragging brakes or improper adjustment.
- If: Okay, check brake coil resistance, it should be between 0.95 and 2.1 ohms at 20° C (68° F).
- If: Neither of these two conditions exists, verify this condition is not intermittent or occurs during extended use.

Note: *If problem can not be found and truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

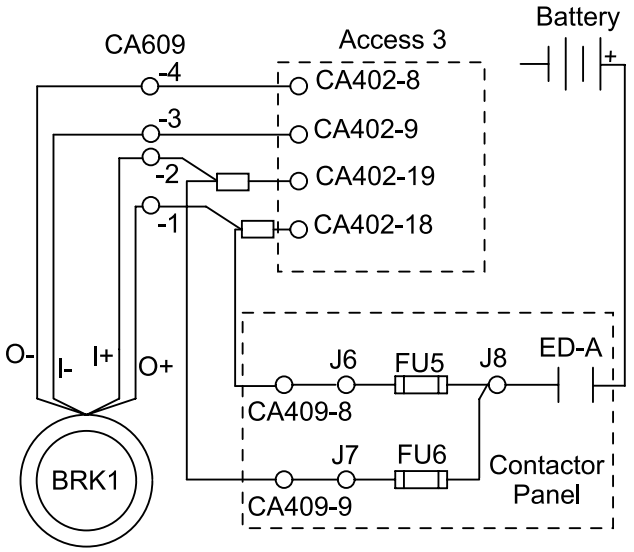

Figure 17973

Event Code 348

Caster brake resistance too low.

Step 1: Raise truck so drive tire and caster are clear of floor and place hardwood blocks under truck frame.

Step 2: Disconnect CA610. Check brake coil resistance with caster in static condition and while rotating caster slowly for one full rotation to check for open spots in slip ring. Resistance for acceptable temperature range is between 3.35 and 7.43 ohms. At 20° C (68° F) resistance should measure approximately 4.79 ohms.

Cold temperatures decrease resistance of coil.

- If in a cold environment, warm coil and recheck resistance.
- If: Resistance is outside range listed, go to step 3.
- If: Coil checks okay or truck is not used in a cold environment, reconnect CA610, recheck resistance at Access 3 CA409-19 and CA402-20. Resistance out of range, check wiring between Access 3 and connectors CA610.

Step 3: Disconnect CA643 and CA644, leave both brake wires of the brake side of the connector attached. Check brake coil resistance between CA643 and CA644.

- If: Resistance is still outside range listed, replace caster brakes.
- If: Coil checks okay, replace slip ring capsule.

Note: *If problem can not be found and truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

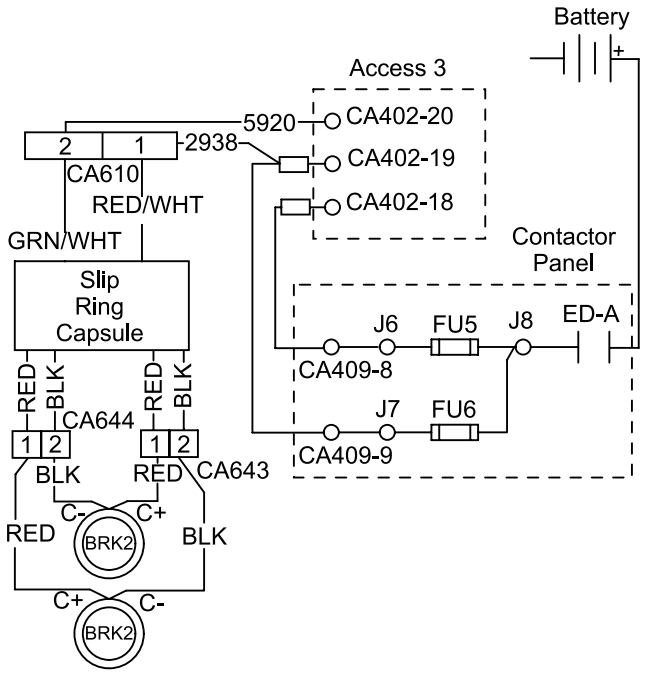

Figure 17974

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Event Code 349

Caster brake resistance too high.

Step 1: Check FU6 for open circuit.

Step 2: Raise truck so drive tire and caster are clear of floor and place hardwood blocks under truck frame.

Step 3: Attach meter leads across CA643 and CA644 near brake coil.

Step 4: Turn key ON while pressing the ↑ and ↓ buttons.

Select BRK2 (A4.14) on display menu.
Press and hold ↵ (drives component)
View reading on display and meter.

- If: Battery volts on meter/ 0 amps on display: Open circuit in brake coil. Proceed with step 6.
- If: 0 volts on meter and 0 amps on display: Check for battery positive at CA402-19.
- If: 0 volts, double check FU6 and associated wiring.
- If: Battery positive, select BRK2 (A4.14) on display, press and hold ↵and measure voltage between CA402-19 and CA402-20.
  Battery volts, open circuit in wiring between Access 3 and brake coil. Proceed with step 5.
  0 volts, replace Access 3.
- If: Less than 10 volts on meter and 3 to 6 amps on display. This could be an indication the brake assembly is getting too hot during operation. Check for dragging brakes or improper adjustment.
- If: Okay, check brake coil resistance, it should be between 3.35 and 7.43 ohms at 20° C (68° F).
- If: Neither of these two conditions exists, verify this condition is not intermittent or occurs during extended use.

Step 5: Disconnect CA610. Check brake coil resistance between connectors with caster in static condition and while rotating caster slowly for one full rotation to check for open spots in slip ring.

Resistance for acceptable temperature range is between 3.35 and 7.43 ohms. At 20° C (68° F) resistance should measure approximately 4.79 ohms.
Cold temperatures decrease resistance of coil.

- If in a cold environment, warm coil and recheck resistance.
- If: Resistance is outside range listed, go to step 6.
- If: Coil checks okay or truck is not used in a cold environment, reconnect CA610, recheck resistance at Access 3 CA402-19 and CA402-20. Resistance out of range, check wiring between Access 3 and connectors CA610.

Step 6: Disconnect CA643 and CA644, leave both brake wires of brake side connector attached. Check brake coil resistance between CA643 and CA644.

- If: Resistance is still outside range listed, replace caster brakes.
- If: Coil checks okay, replace slip ring capsule.

Note: *If problem can not be found and truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

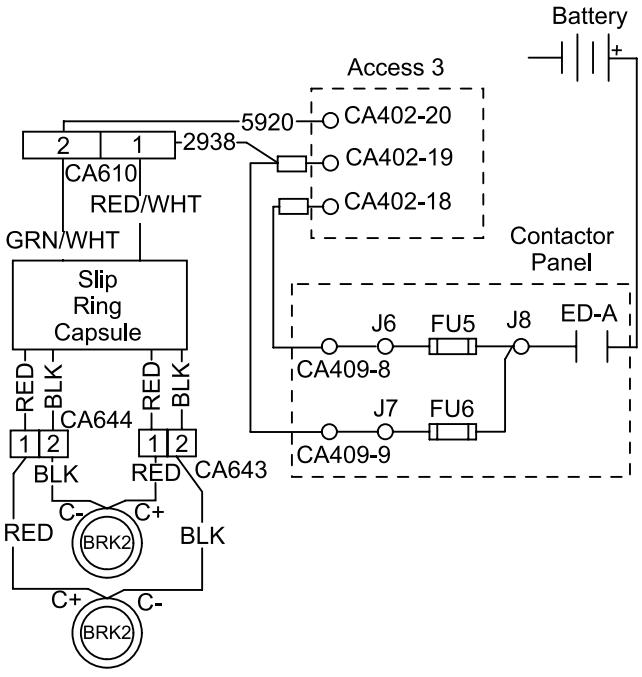

Figure 17974

Event Code 351

Inner brake coil short circuit.

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Check voltage at CA402-18 and CA402-19. Should read battery volts when "power up" and attempt to travel.

- If: 0 volts, check fuses and wiring.
- If: Battery volts, continue with step 3.

Step 3: Remove coil leads from connector CA609-2 and CA609-3. "Power up" truck and attempt to travel.

- If: Different code displayed, short circuit exists in brake coil.
- If: Code 351, disconnect CA402-19 and CA402-9. "Power up" truck and attempt to travel.
  Code changes, short circuit in wiring between brake coil and Access 3.
  Code 351, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

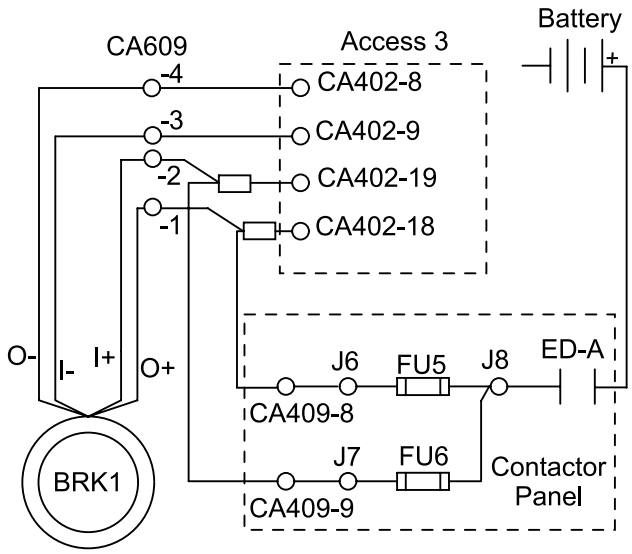

Figure 17973

Event Code 352

Outer brake coil short circuit or Access 3 open circuit.

Step 1: Check voltage at CA402-18 and CA402-19. Should read battery volts when "power up" and attempt to travel.

- If: 0 volts, check fuses FU5, FU6 and wiring.
- If: Battery volts, continue with step 2.

Step 2: Remove coil leads from connector CA609-1 and CA609-4. "Power up" truck and attempt to travel.

- If: Different code displayed, short circuit exists in brake coil.
- If: Code 352, disconnect CA402-18 and CA402-8. "Power up" truck and attempt to travel.
  Code changes, short circuit in wiring between brake coil and Access 3.
  Code 352, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 353

Access 3 unable to read from Access 1 or Access 2.

This indicates a problem with communications between Access 1, 2 & 3. Access 1 may be locked up in this condition. Code 328 preceded by a single flash will be blinked on LED of Access 3 and Code 14 will be blinked on LED of Access 2.

Step 1: Check condition of communications link between Access 1, 2 & 3 (connectors, connector pins, wiring).

Step 2: Check for +5 volts at Access 3 between CA403-2 and CA403-10.

WARNING

Never key ON truck with any Access 1, 2 or 3 connections disconnected. In addition, never remove or connect any Access 1, 2 or 3 connections while truck is keyed ON.

- If: 5 volts, then continue with step 3.

- If: 0 volts then disconnect CA405-2. Re-measure voltage between CA403-2 and CA403-10.
- If: Voltage is present, then short circuit exists in Access 2. Repair/ replace.
- If: Voltage is not present, disconnect CA403-2 and CA403-10 at Access 3 and measure voltage on Access 3 pins.
- If voltage is present, short exists in wiring. Repair/ replace.
- If voltage not present, replace Access 3.

Step 3: Check for +5 volts at Access 2 between CA405-2 and CA405-10.

- If: 5 volts then continue with step 4.
- If: 0 volts then open circuit in communication link exists between modules. Locate open and repair.

Step 4: Check communication lines voltage level. 2.5 volts should be present at CA208-3 and CA208-16.

- If: Less than 2.2 volts or greater than 2.8 volts, disconnect CA208, recheck all communication line voltage. Should be 2.5 volts between battery negative and CA403-1, CA403-9, CA405-1, CA405-9, CA407-9 and CA407-8.

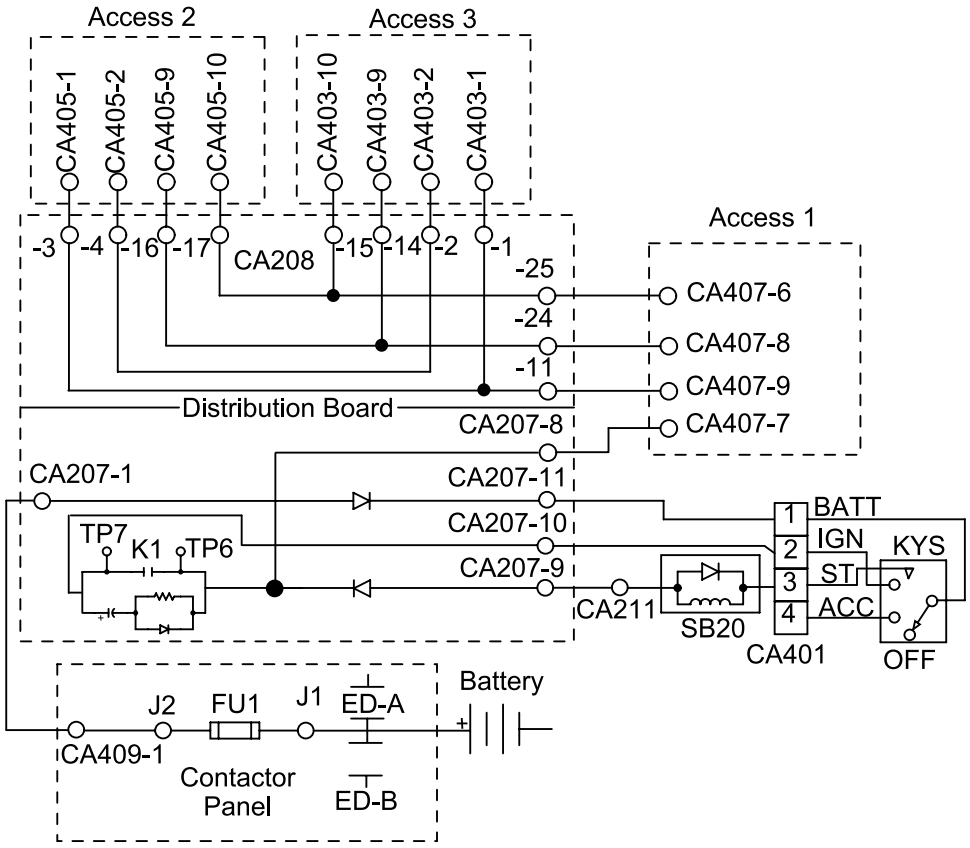

Figure 17962

Event Code 354

Can write time out.

This indicates a problem with the communications between Access 1, 2 & 3. Access 1 may be locked up in this condition. Code 328 preceded by a single flash will be blinked on LED of Access 3 and Code 14 will be blinked on LED of Access 2.

Step 1: Check condition of the communications link between Access 1, 2 & 3 (connectors, connector pins, wiring).

Step 2: Check for 5 volts at Access 3 between CA403-2 and CA403-10.

WARNING

Never key ON truck with any Access 1, 2 or 3 connections disconnected. In addition, never remove or connect any Access 1, 2 or 3 connections while the truck is keyed ON.

- If: 5 volts then continue with step 3.
- If: 0 volts then disconnect CA405-2. Re-measure voltage between CA403-2 and CA403-10.
- If: Voltage is present, then short circuit exists in Access 2. Repair/ replace.
- If: Voltage is not present, disconnect CA403-2 and CA403-10 at Access 3 and measure voltage on Access 3 pins.
- If voltage is present, short exists in wiring. Repair/ replace.
- If voltage not present, replace Access 3.

Step 3: Check for +5 volts at Access 2 between CA405-2 and CA405-10.

- If: 5 volts then continue with step 4.
- If: 0 volts then open circuit in communication link between modules. Locate open and repair.

Step 4: Check communication lines voltage level. 2.5 volts should be present at CA208-3 and CA208-16.

- If: Less than 2.2 volts or greater then 2.8 volts, disconnect CA208, recheck all communication line voltage. Should be 2.5 volts between battery negative and CA403-1, CA403-9, CA405-1, CA405-9, CA407-9 and CA407-8.

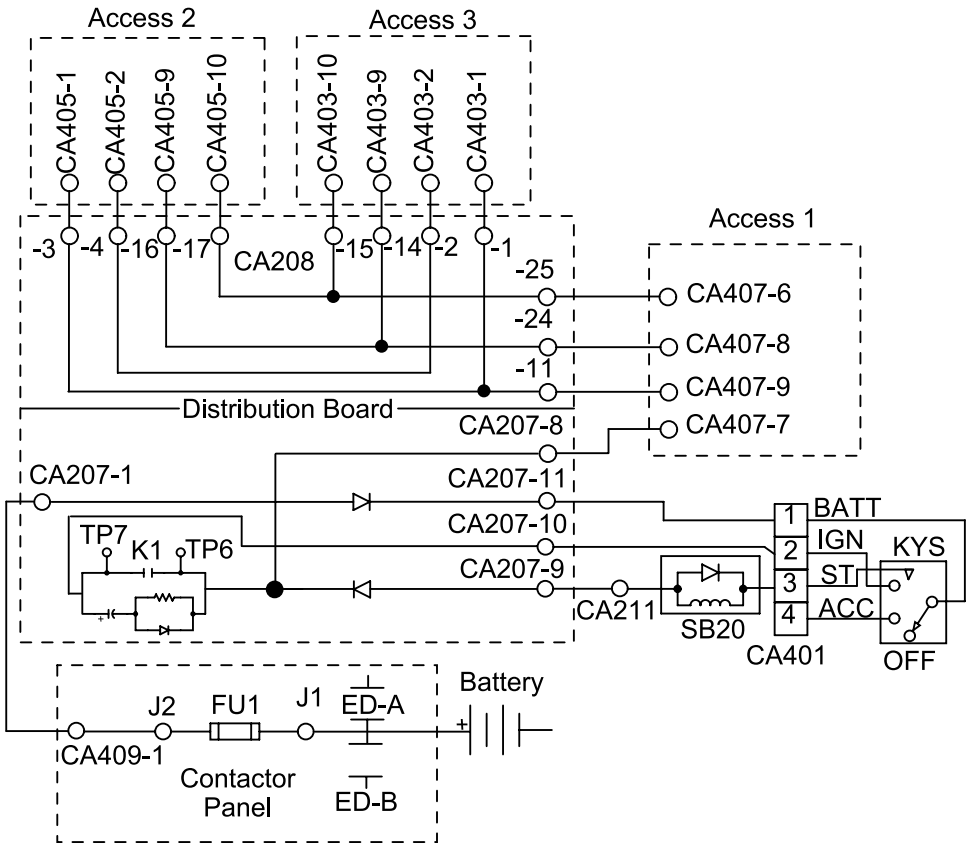

Figure 17962

Event Code 355

Access 1 internal fault.

Step 1: If truck does not operate, check wiring.

Wiring okay, go to step 2.

Step 2: Check TPA wiring per code 841.

- If: Wiring OK, go to step 3.

Step 3: Replace Access 1, see note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 1.*

Event Code 356

Access 2 internal fault.

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 2. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 2.*

Event Code 357

Access 3 Internal fault.

Step 1: If truck does not operate, check wiring. Check for shorts to frame on wiring connected to T-Comm on FU10.

- If: Wiring OK, replace Access 3, see note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 358

Access 3 Internal fault.

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 359

Access 3 Internal fault.

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 361

Access 3 internal fault.

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 362

Caster brake coil short circuit or Access 3 open circuit.

Step 1: Check voltage at CA402-18 and CA402-19. Should read battery volts with operator pedals depressed.

- If: 0 volts, check FU5, FU6 and associated wiring.
- If: Battery volts, then continue with step 2.

Step 2: Remove coil leads from connector CA610. "Power up" truck and attempt to travel.

- If: Different code displayed, short circuit in brake coil or slip ring capsule.
  Reconnect CA610, disconnect CA643 and CA644. "Power up" truck and attempt to travel.
- If different code displayed, short circuit in brake coil. Replace.
- If code 362 displayed, short circuit in slip ring module. Replace.
- If: Code 362 displayed, disconnect CA610 and CA402-20. "Power up" truck and attempt to travel.
- If code 362, replace Access 3. See note.
  Code changes, short circuit in wiring between brake coil and Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

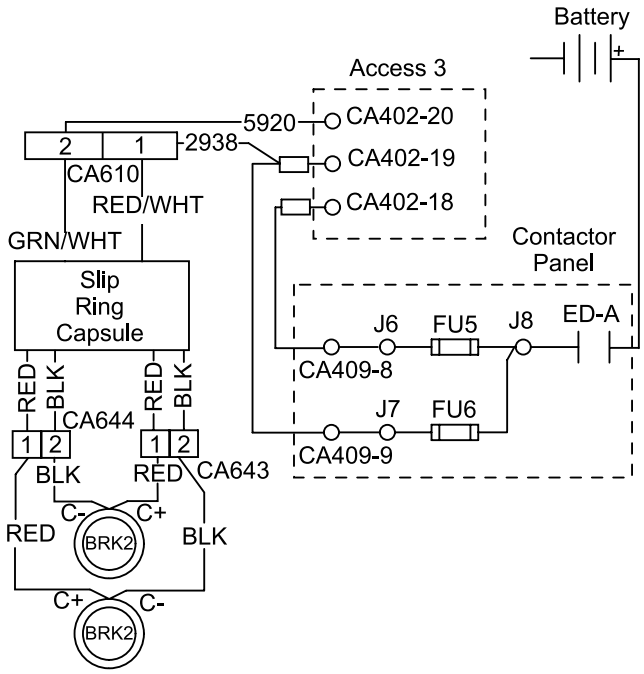

Figure 17974

Event Code 363

Caster brake driver short circuit within Access 3.

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

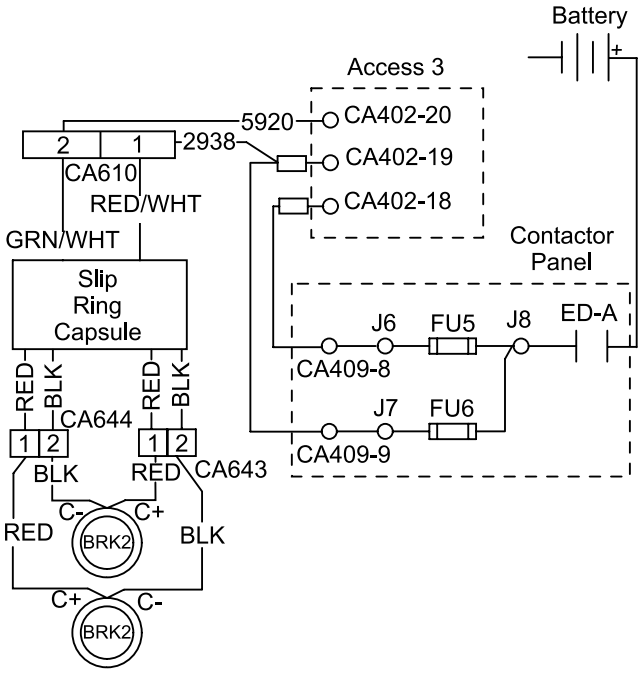

Figure 17974

Event Code 364

M1 (traction motor) armature short.

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Check drive motor armature connections for looseness or incorrect wiring.

Check B+ on Access 2 and Access 3 to see if wiring is reversed.

Step 3: Disconnect cable from motor A1 terminal. "Power up" truck and attempt to travel.

- If: Code changes, problem in drive motor circuit.
- If: Code 364, disconnect cable from Access 3 A1 terminal, "power up" truck and attempt to travel.
- If code changes, short circuit in power cables between Access 3 and drive motor.
- If code 364, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

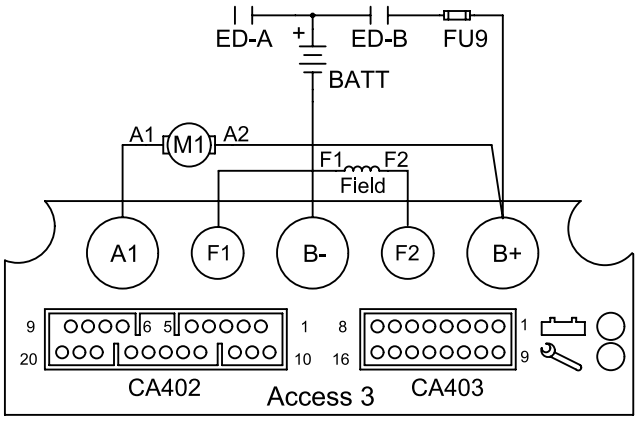

Figure 17965

Event Code 365

Access 3 internal fault.

Step 1: If truck does not operate, check wiring and check for proper software (AC or DC traction).

- If: Wiring and software OK, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 366

Access 3 internal fault.

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 367

FU9 open circuit or M1 (traction motor) circuit open.

Step 1: Check condition of fuse FU9 and ED contactor tips. Repair/replace.

Step 2: Check for open circuit between battery positive, ED tips, FU9 and Access 3.

Note: *Due to stored capacitance voltage in Access 3, a voltage check of FU9 may be misleading. Replace with known good fuse and retest.*

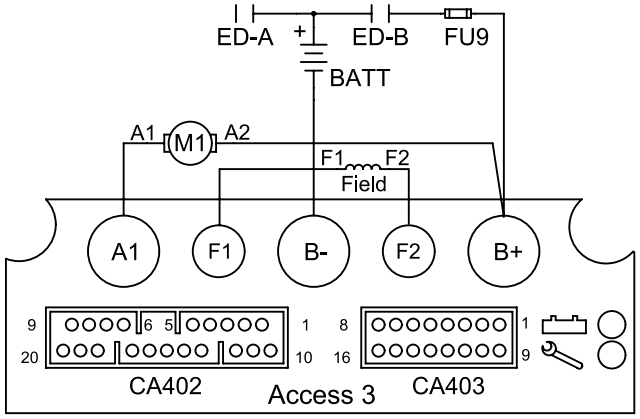

Figure 17965

Event Code 368

Access 3 temperature below limit for proper operation.

Step 1: If truck has been left in the blast freezer in the OFF condition for an extended period of time this code may register.

- If condition cannot be cleared after leaving the truck "powered up" for a period of time, move truck to warmer location.
  Code 368, replace Access 3.

Event Code 369

Access 3 Temperature above limit for proper operation.

Step 1: Make sure drive motor fuse FU9 size is correct (250 amps).

Step 2: Check for loose or corroded connections to power terminals on Access 3. Repair.

Step 3: Make sure full surface contact is being made between Access 3 and the mounting surface with a complete film of thermal transfer grease between mounting surfaces.

Check tightness of module mounting screws to ensure module is tightly secured to mounting surface.

Step 4: Has duty cycle been increased to include short distance runs with capacity loads?

- If not, a component problem with either drive motor or Access 3 exists.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 371

Caster Brake driver short. Internal module short circuit.

Step 1: Measure voltage at CA402-20 to battery negative.

- If: Less than 5 volts, check for short circuit between CA402-20 and battery negative. Repair/replace.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 372

M1 Armature current (traction motor) Too high or too low during regenerative braking.

Step 1: Verify that brakes are not dragging or misadjusted.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 373

M1 (traction motor) field current too high or too low.

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Turn key ON while pressing the ↑ and ↓ buttons.

Select M1-F (A4.16) for forward direction or M1-R (A4.17) for reverse direction on display menu.
Press and hold ↵ (drives motor field)
Observe display current reading.

- If: Field current above 50 amps, check for short circuit in motor field circuit. Repair/replace.
- If: Field current below 30 amps, check for open circuit in motor field circuit. Repair/replace.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

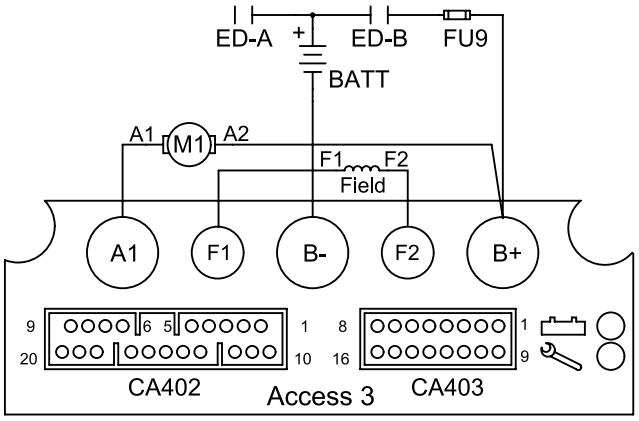

Figure 17965

Event Code 374

M1 (traction motor) Armature open circuit.

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Attach meter across A1 and A2 terminals.

Turn key ON while pressing the ↑ and ↓ buttons.
Select M1-A (A4.15) on display menu.
Press and hold ↵ (drives armature)
Observe meter voltage reading and display current reading.

- If: Battery volts on meter and less than 50 amps on display: Open drive motor circuit.
  - Then check power cable connections, motor brushes and holder, and condition to M1. Repair/replace.
- If: 0 volts on meter and less than 50 amps on display: Then check output of Access 3. Move meter leads to the A1 and A2 terminals of Access 3 and repeat test.
- If battery volts, open circuit in power cables between the drive motor and Access 3.
- If 0 volts on meter and less the 50 amps on display, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 375

M1 (traction motor) Sensed field input exceeds limits for off condition.

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 376

Access 3 Internal fault.

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 377

Access 3 Internal fault.

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 378

M1 (traction motor) Armature shorted.

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: Disconnect and isolate A1 power cable at drive motor. "Power up" truck and attempt to travel.

- If: Code changes then short exists in drive motor. Repair/replace.
- If: Code 378 remains, verify code in Access 1, 2 button mode.
- If code 378 present, (refer to capacitor discharge Caution on first page of section) disconnect power cables at A1 and B+ terminals of Access 3. "Power up" truck and attempt traction.
  Code changes, short in power cables between drive motor armature and Access 3. Repair/ Replace.
  Code remains, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

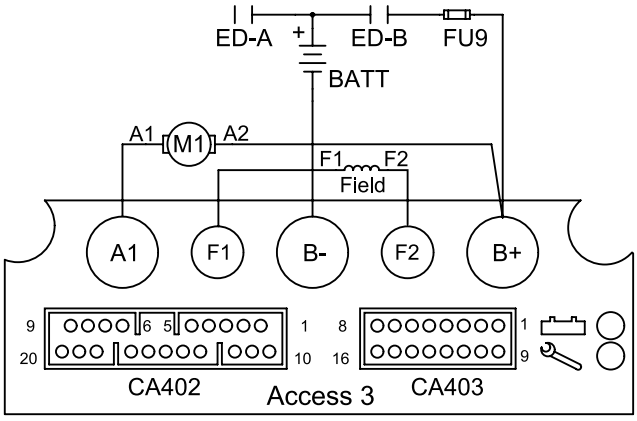

Figure 17965

Event Code 379

M1 (traction motor) Field shorted.

Step 1: Raise truck so drive tire is clear of floor and place hardwood blocks under truck frame.

Step 2: (refer to capacitor discharge Caution on first page of section) Disconnect and isolate F1 or F2 power cables at drive motor. "Power up" truck and attempt to travel.

- If: Code changes, short circuit in drive motor field or power cable wiring. Repair/replace.
- If: Code 379 remains, (refer to capacitor discharge Caution on first page of section) disconnect F1 and F2 power cables at Access 3 and repeat test.
- If code changes, short in power cables between drive motor field and Access 3. Repair/Replace.
- If code remains, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 381

Access 3 Inner module short circuit.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 382

Access 3 Inner module short circuit.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 383

Inner brake driver Inner module short circuit.

Step 1: Measure voltage between CA402-9 and battery negative.

- If: Less than 5 volts, check for short circuit between CA402-9 and battery negative.

Step 2: Disconnect brake at CA609 and measure resistance of both brake coils. Outer coil resistance measured at CA402-8 and 402-18 should measure 0.95 to 2.1 ohms. Inner coil resistance measured at CA402-9 and CA402-19 should measure 2.49 to 5.52 ohms. If measurement is out of range, replace brake. See Note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

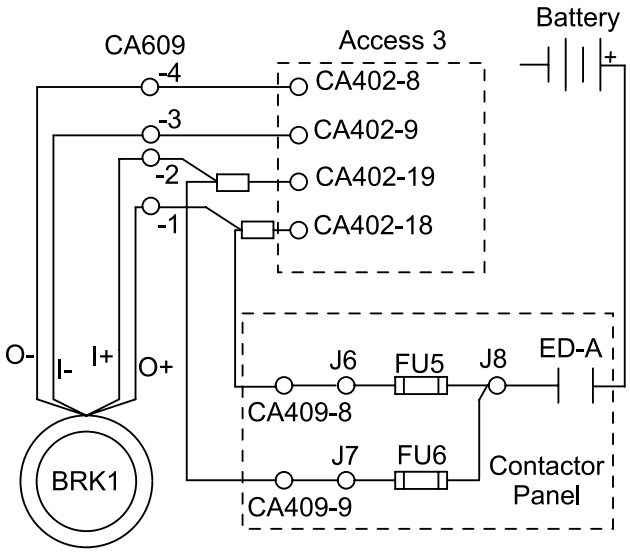

Figure 17973

Event Code 384

Outer brake driver Internal module short circuit.

Step 1: Measure voltage between CA402-8 and battery negative.

- If: Less than 5 volts, check for short circuit between CA402-8 and battery negative. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

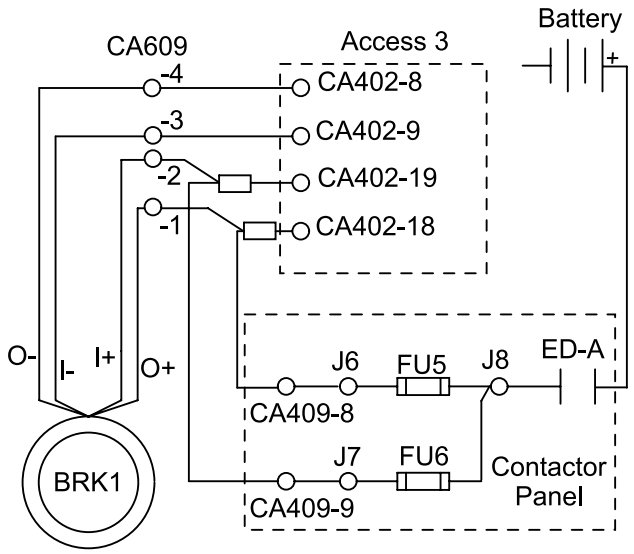

Figure 17973

Event Code 385

Access 3 Nearing over temperature condition.

Step 1: Has duty cycle of truck changed? Traction used much more than lift and/or long runs with capacity loads. Access 3 may need to cool.

Step 2: Verify drive motor fuse (FU9) is correct size. (250 amps)

Step 3: Check Access 3 mounting surface is in full contact with mounting surface on truck and that an even layer of heat transfer grease is present.

Step 4: Check tightness of Access 3 mounting screws.

Event Code 386

Battery voltage Not matching setup voltage.

Step 1: Make sure battery installed in truck is correct voltage for truck.

Step 2: Turn key ON while pressing the ↑ button.

Select voltage (F1) on display menu.
Make sure voltage setup matches truck and battery voltage.

- If: Setting correct, check fuse, FU1, if no change try different battery.
- If: Code 386 remains, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 387

Tilt Position Assist Sensor out of range.

Step 1: Voltage input from TPA sensor can be viewed in analyzer mode under A2.25. Voltage viewed should vary between 4.5 volts with forks tilted full up, to 0.5 volt with forks tilted full down.

- If: Voltages as described, proceed with step 2.
- If: Voltages not as described, proceed with step 3.

Step 2: Calibrate tilt position assist potentiometer (POT 4).

- If: Problem corrected, return truck to service.
- If: Code 387 remains, DC Traction Drive trucks proceed with steps 3 thru 6. AC Traction Drive trucks proceed with steps 7 thru 10. Note: AC Traction Drive trucks do not use TPA CAN modules, signal is generated by Access 3.

Step 3: DC Traction Trucks Only.

Check wiring at TPA sensor potentiometer (POT 4). Also check wiring from POT4 to TPA CAN module.

- If: Wiring damaged, repair/replace.
- If: Wiring OK, proceed to step 4.

Step 4: Check TPA POT4 voltage across TB406-9 and TB406-11. Voltage should be near 5 volts.

- If: 5 volts present proceed to step 5.
- If: 5 volts not present proceed to step 6.

Step 5: Measure voltage across TB406-9 and TB406-10. Forks tilted up should be 4.5 volts. Forks tilted full down should be 0.5 volt.

- If: Voltage within range check for wiring problem from Terminal Board TB406 to TPA CAN module.
- If: Voltage is not present or within range check for wiring problem at TPA POT4 or between Terminal Board TB406 and POT4.

Step 6: Disconnect wires going to TPA POT4 on TB406. Check for 5 volts across Pins 9 and 11 again.

- If: 5 volts present. Problem is in POT4 or wiring. Repair/replace.
- If: 5 volts not present. Proceed to Event Code 841, but first see note below.

Note: *387 Event Code has been known to be caused by moisture in TPA CAN Module. If moisture is found, dry out and re-seal lid. Put truck back in service. If problems continue proceed to Event Code 841.*

Event Code 388

Battery Current Sensor Failure.

Step 1: Disconnect CA412. Measure voltage from Access 3 between pins C and A of CA412. (CA412 is located in wire harness between CA413 on Access 3 and BDI Current Sensor.) Should measure between 4.5 and 5.5 volts DC.

- If: Voltage okay.
  - Then power supply voltage is okay. Proceed to Step 2.
- If: Voltage is out of range or missing.

Measure voltage between pins 10 and 11 of CA413. Should measure between 4.5 and 5.5 volts DC.

- If: Voltage okay.
  - Then power supply voltage is okay. Locate and repair broken wire(s) between CA413 pins 10 and 11 and CA412 pins C and A.
- If: Voltage is out of range or missing.

Check condition of pins 10 and 11 in JC 413 (on Access 3)

- If: Pins are not bent, broken, or corroded;
  - Then replace Access 3 module.
- If: Connection condition faulty.
  - Then repair/replace.

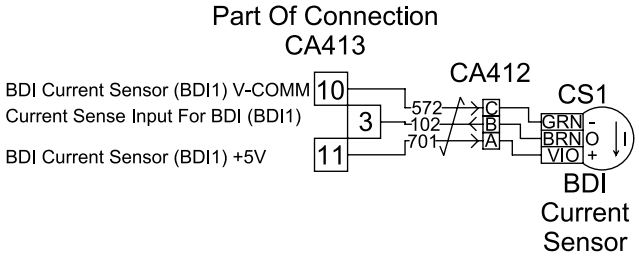

Figure 17970

Event Code 389

Battery Current Sensor Zero Offset Out of Range.

Note: *Tests battery current sensor for zero current while not operating and ED de-energized.*

Step 1: Measure DC voltage between CA413-3 and CA413-10. Should measure 2.5 volts (when operator compartment unattended and foot pedals not actuated).

- If: 2.5 volts.
  - Then check connection at CA413-3.
- If: Connection okay.
  - Then replace Access 3.
- If: Connection requires attention.
  - Then repair/replace.
- If: 0 volts present.
  - Then perform checks listed for Code 388.

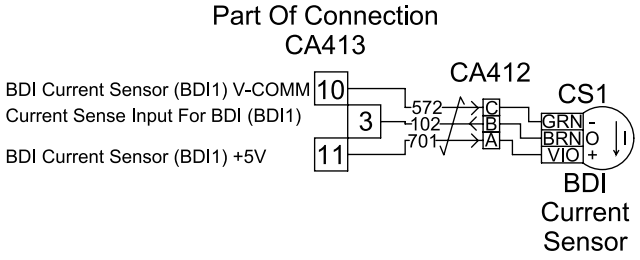

Figure 17970

Event Code 391

Access 3 Internal fault.

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 392

Access 3 Internal fault.

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 393

Access 3 Internal fault.

Step 1: If truck does not operate, check wiring.

Wiring okay, replace Access 3. See note.

Note: *If truck operates, then this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 394

Access 1 Cannot communicate with Access 3.

Step 1: Check the CAN communications wiring and connectors between Access 1, 2 & 3. Make sure corrosion isn't present on connector pins. If truck is equipped with TPA, Tilt Position Assist option, check CAN wiring per Event Code 841.

Step 2: Check power input to Access 1 at CA407-7.

- If: Battery volts then replace Access 1. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

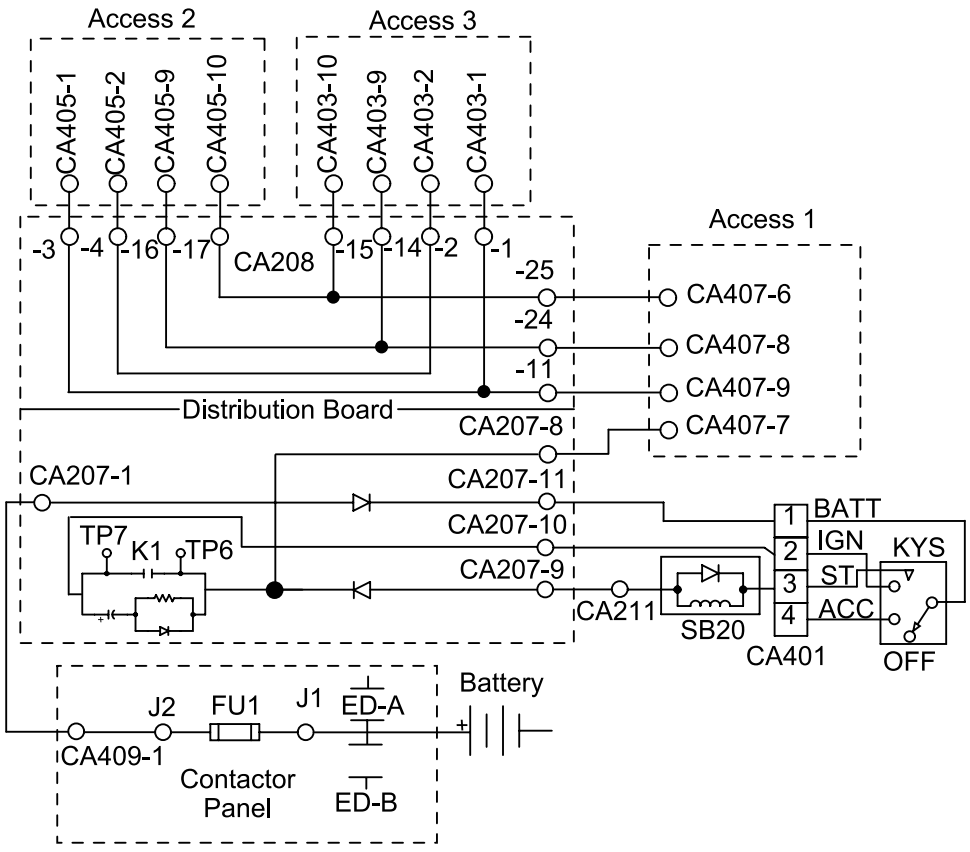

Figure 17962

Event Code 395

Access 1 not compatible with Access 3.

Step 1: Upgrade Access 1 module or install correct software.

Note: *If truck operates, then this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 396

Display Invalid.

Step 1: Non OEM Access 1 installed or Access 1 failure. Replace.

Event Code 397

Access 3 Internal fault.

Step 1: Replace Access 3.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 398

Access 2 Internal fault.

Step 1: Replace Access 2.

Event Code 399

Access 3 Internal fault.

Step 1: Replace Access 3.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 411

Traction Sensor Bearing.

Detects failure of Sensor Bearing in Traction Motor.

Step 1: Check for +12 volts DC between CA659, pins 3 (red lead) and CA659 pin 6 (black lead).

- If: Voltage present.
  - Then +12 volts from TDM is okay. Proceed to step 2.
- If: Voltage is out of range or missing.
  - Then check for +12 volts DC between CA414 pin 3 (red lead) and CA414 pin 4 (black lead).
- If: Voltage is present.
  - Then +12 volts from TDM is okay. Check wire harness between CA414 and CA659.
- If: Voltage is out of range or missing.
  - Then check condition of pins 3 and 4 of CA414. If pins do not appear to be bent, broken or corroded, replace TDM.

Step 2: Check for signal from Sensor Bearing Channel A between CA414 pin 6 (red lead) and CA414 pin 4 (black lead). Signal should be +8.5 volts DC when Channel A is high, and approximately +4 volts DC average. Check for signal from Sensor Bearing Channel B between CA414 pin 5 (red lead) and CA414 pin 4 (black lead). Signal should be +8.5 volts DC when Channel B is high and approximately +4 volts DC average.

- If: One or both channels are missing.
  Check for intermittent break in continuity of wire harness between CA414 and CA659.
- If: Wire harness continuity is good.
  Replace Traction Sensor Bearing (internal to motor).

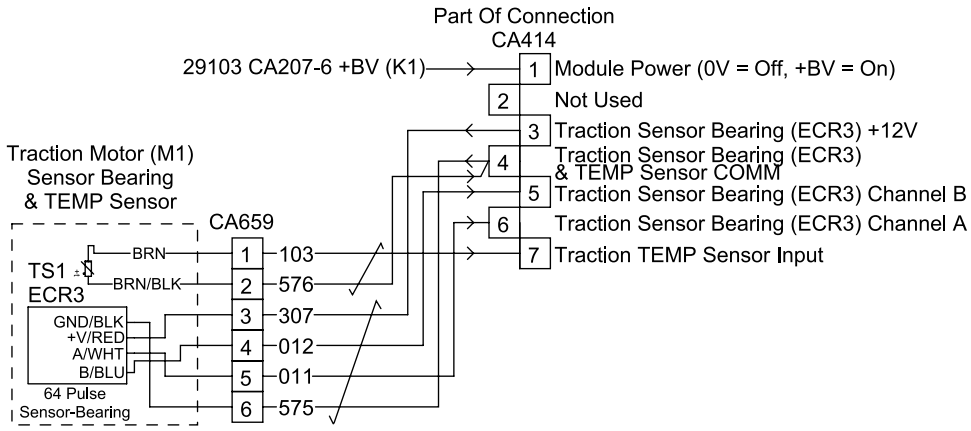

Figure 17975

Event Code 412

Traction Motor Over Temperature.

Monitors temperature of traction motor through thermal sensor (TS1) and disables traction to protect motor. Prior to logging this code, display will show message Over Temp, and an event code 433 will occur, which is an alert that motor temperature is nearing its limit. When event code 433 occurs, traction performance is decreased to 60%. If operation continues and temperature continues to rise, traction performance will continue to decrease to 0%, at which time event code 412 occurs and traction is disabled until truck is "powered down" and back up.

Step 1: Did event code 433 occur and traction performance decrease to 60% prior to this event?

- If: Yes.
  Follow procedure for event code 433.
- If: No.
  Proceed to Step 2.

Step 2: Allow traction system of truck to cool down, then "power up" truck.

- If: Traction operates at normal performance level;
  Return to service and monitor for re-occurrence of event codes 433 and 412.
- If: Code 412 re-occurs immediately;
  "Power down" truck and check continuity of wire harness between TDM and Traction Motor. (CA414 to CA659)
- If: Continuity is good.
  Replace Stator or Traction Motor, whichever is most economical.
- If: Continuity is missing/bad.
  Repair/replace wire harness.

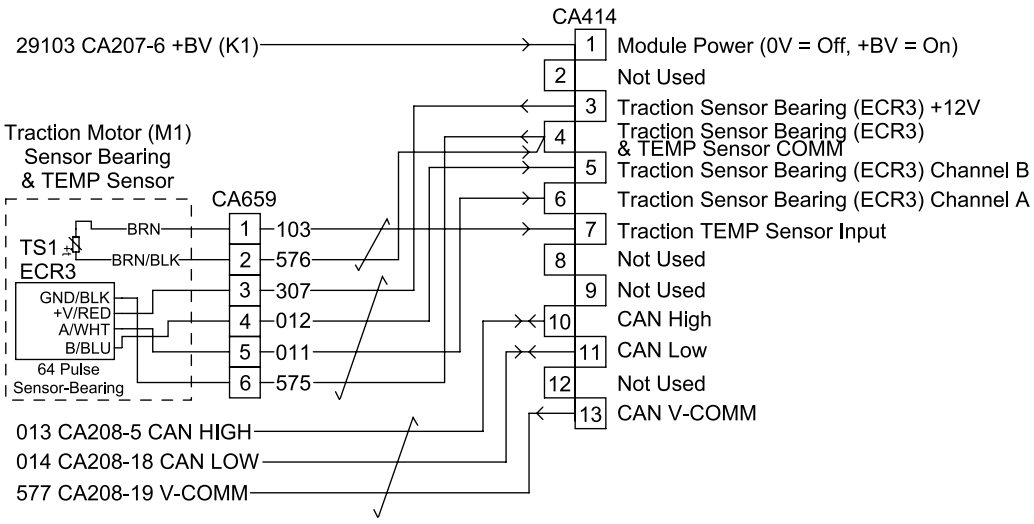

Figure 17976

Event Code 413

TDM Power Base Over Temperature.

Monitors temperature of traction drive power base and inhibits traction to protect drive. Prior to logging code, an event code 428 will occur which is an alert that traction drive power base temperature is nearing its limit. When event code 428 occurs, traction performance is decreased to 60%. If operation continues and temperature continues to rise, traction performance will continue to decrease to 0%, at which time code 413 occurs and traction is disabled until truck is "powered down" and back up.

Step 1: Did event code 428 occur and traction performance decrease to 60% prior to this event?

- If: Yes.
  Follow procedure for event code 428.
- If: No.
  Proceed to Step 2.

Step 2: Allow traction system of truck to cool down, then "power up" the truck.

- If: Traction operates at normal performance level.
  Return to service and monitor for re-occurrence of event codes 428 and 413.
- If: Code 413 re-occurs immediately.
  Replace TDM.

Event Code 414

Traction Over Current Detected.

Monitors TDM output current and verifies it is within a valid range.

Step 1: Check U, V and W phase output cables for shorts to truck frame.

- If: Power cable(s) shorted.
  Repair/replace.
- If: Power cables okay.
  Proceed to Step 2.

Step 2: Check Traction Motor Windings for shorts, phase to phase, or phase to truck frame.

- If: Traction Motor winding(s) shorted.
  Replace Traction Motor.
- If: Traction Motor windings okay.
  Replace TDM.

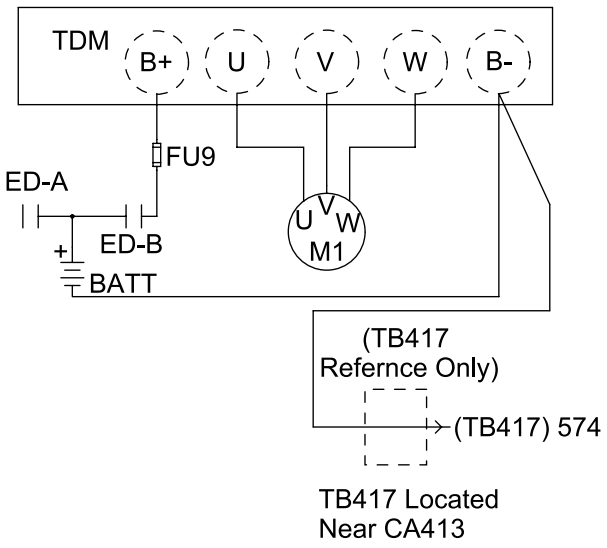

Figure 17977

Event Code 415

Pre-Charge Voltage Too High.

Monitors TDM pre-charge bus voltage and verifies voltage is not over limit. Note: event code 415 will occur at approximately 50 volts or higher.

Step 1: Check voltage across battery. A freshly charged “good” battery will read approximately 37 to 39 volts.

- If: Battery volts normal.
  Proceed to Step 2.
- If: Battery volts abnormal.
  Replace battery with a known good one and recheck for event code 415.

Step 2: Check for loose Battery positive and Battery negative connections at TDM. Check for loose U, V and W phase connections at TDM and Traction Motor.

- If: Connections are loose.
  Tighten and recheck for event code 415.
- If: Connections are tight.
  Replace TDM.

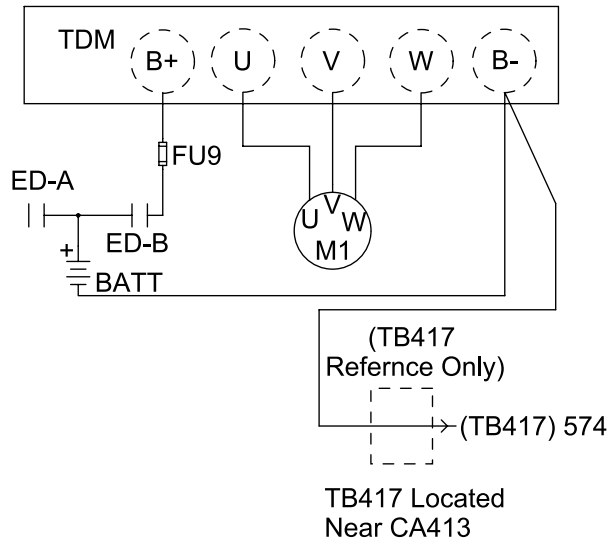

Figure 17977

Event Code 416

Pre-Charge Voltage Too Low.

Monitors TDM pre-charge bus voltage and verifies voltage is not under limit. Display will show message PLEASE STAND BY. Note: event code 416 will occur at less than 25 volts. (Approximately 18 volts.)

Step 1: Check voltage across battery (battery disconnected). A freshly charged "good" battery will read approximately 37 to 39 volts.

- If: Battery volts normal.
  Proceed to Step 2.
- If: Battery volts abnormal.
  Replace battery with a known good one and recheck for event code 416.

Step 2: Check for normal battery voltage between B+ and B- at TDM.

- If: Battery volts normal.
  Replace TDM.
- If: Battery volts missing or abnormal.
  Check, tighten, repair/replace FU9 and/or power cables between battery and TDM.

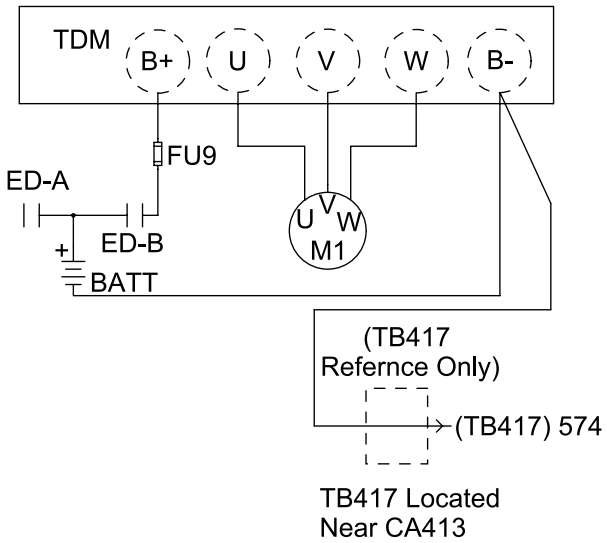

Figure 17977

Event Code 417

No Pre-Charge Voltage.

Monitors TDM pre-charge bus voltage and returns event code if voltage is not present. Follow steps listed under event code 416.

Event Code 418

TDM CAN Communication Failure.

During operation, if too many communication errors are detected, this event code is returned.

Step 1: Check for 60 ohms at each end of harness by measuring pin to pin (with harness connected).

- If: 60 ohms present.
  Check pins for corrosion or damage.
- If: 60 ohms not present.
  Proceed to step 2.

Step 2: Check continuity of CAN lines, plug to plug. (With harness disconnected.)

- If: Continuity missing.
  Replace/replace CAN line harness.
- If: Continuity present.
  Replace TDM.

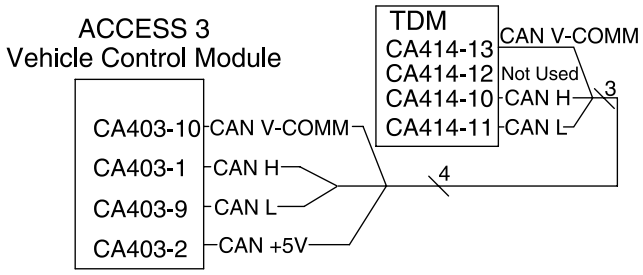

Figure 17978

Event Code 421

TDM Circuit Board Temperature Out of Range.

Monitors temperature of TDM printed circuit board and inhibits traction to protect TDM. Prior to logging this code, event code 429 will occur which is an alert that TDM printed circuit board temperature is nearing its limit. When event code 429 occurs, traction performance is decreased to 60%. If operation continues and temperature continues to rise, traction performance will continue to decrease to 0%, at which time code 421 occurs and traction is disabled until truck is "powered down" and back up.

Step 1: Did event code 429 occur and traction performance decrease to 60% prior to this event?

- If: Yes.
  Follow procedure for event code 429.
- If: No.
  Proceed to Step 2.

Step 2: Allow traction system of truck to cool down, then "power up" the truck.

- If: Traction operates at normal performance level.
  Return to service and monitor for re-occurrence of event codes 429 and 421.
- If: Code 421 re-occurs immediately.
  Replace TDM.

Event Code 422

Traction Sensor Bearing Failure.

Detects failure of Sensor Bearing in Traction Motor. Follow steps listed under event code 411.

Event Code 423

Traction Sensor Bearing Load Open.

Detects failure of Sensor Bearing in Traction Motor or an open wire. Follow steps listed under event code 411.

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Event Code 424

Traction Sensor Bearing Short Circuit.

Detects failure of Sensor Bearing in Traction Motor or a shorted wire.

Step 1: Disconnect CA659 and check for +12 volts DC (from TDM) between pins 3 and 6.

- If: Voltage present.
  - Then +12 volts from TDM, and wire harness to CA659 is okay. Proceed to step 2.
- If: Voltage out of range or missing.
  Disconnect CA414 from TDM and check for +12 volts DC between pin 3 and pin 4 (at TDM).
- If: Voltage present.
  - Then +12 volts from TDM is okay. Check wire harness between CA414 and CA659.
- If: Voltage out of range or missing.
  Check condition of pins 3 and 4 of CA414. If pins do not appear to be touching each other, replace TDM.

Step 2: Check for signal from Sensor Bearing Channel A between CA414 pin 6 (red lead) and CA414 pin 4 (black lead). Signal should be +8.5 volts DC when Channel A is high and approximately +4 volts DC average. Check for signal from Sensor Bearing Channel B between CA414 pin 5 (red lead) and CA414 pin 4 (black lead). Signal should be +8.5 volts DC when Channel B is high and approximately +4 volts DC average.

- If: One or both channels are missing.
  Key truck off, disconnect CA414, and check for continuity between either pin4, 5 or 6 and truck frame or Traction Motor case.
- If: Continuity exists on one or more pins.
  Inspect/repair wire harness between TDM and Traction Motor.
- If: Wire harness is good.
  Replace Traction Sensor Bearing (internal to motor).

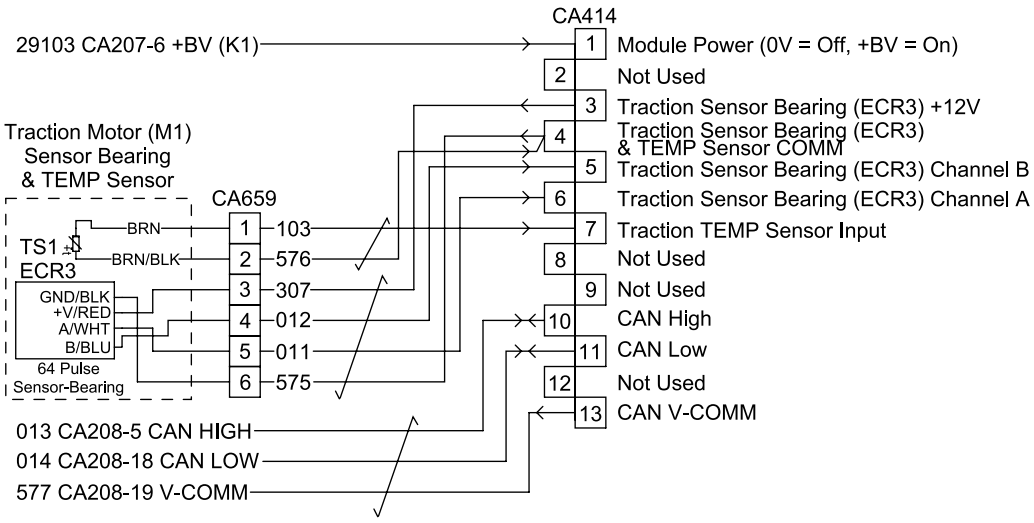


Figure 17976

Event Code 425

TDM Trip and No communications.

This event code is returned when Access 3 indicates an error condition, but CAN communications between TDM and Access 3 are not functioning, preventing error from being identified.

Step 1: Check CAN communication lines between Access 3 and TDM for an intermittent break.

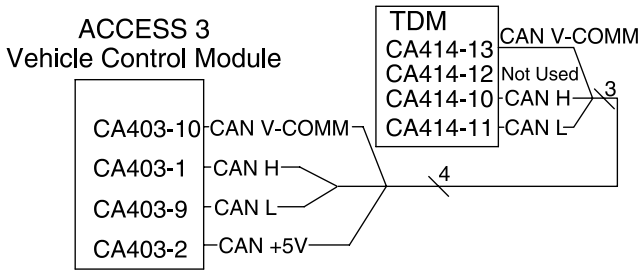


Figure 17978

Event Code 416

TDM Network Watchdog.

This event code is returned when a CAN communication failure is detected between TDM and other modules. Follow step listed for event code 425.

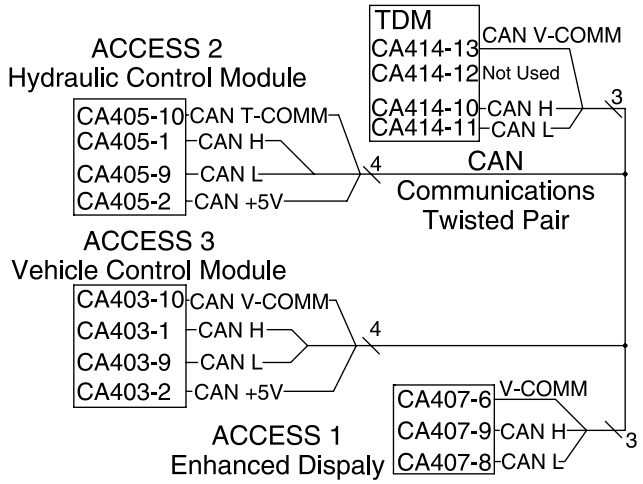


Figure 17980

Event Code 427

TDM Incompatible.

System identifies TDM at "power up". If an incompatible software version or hardware number is present, this event code is returned.

Replace TDM with OEM part.

Event Code 428

TDM Temperature Out of Range. (Alert)

Traction Driver Module (TDM) temperature is monitored and a 428 code occurs to alert operator that an over temperature condition has occurred internal to TDM. When code 428 occurs, traction performance is decreased to 60%. If operation continues and temperature continues to rise, traction performance will continue to decrease to 0%, at which time a code 413 occurs and traction is disabled until truck is "powered down" and back up.

Note: *Code 413 is logged when internal TDM temperature reaches 115° C (239° F). Code 428 occurs when internal TDM temperature reaches 80° C (176° F).*

Step 1: Check TDM Fan operation.

- If: Fan working.
  - Then remove service access plug on fan cowling and use low pressure compressed air to blow out fan and blow air across TDM heatsink fins.
- If: Code 428 is registered again.
  - Then proceed to step 4.
- If: Fan not working.
  - Then go to Analyzer Menu A4, Test Outputs. Select A4.21, DR Fan. Press enter and check operation of fan.
- If: Fan runs.
  - Then go to Step 4.
- If: Fan does not run.
  - Then proceed with step 2.

Step 2: Check for voltage at fan leads.

Note: *Voltage across fan leads while disconnected will measure battery volts. Voltage across fan leads while connected (fan not powered) will read approximately 3 to 4 volts.*

Connect volt meter leads across fan leads while connected to fan. Access Test Output menu, A4.21, and press enter button. Voltage should be battery volts.

- If: Battery volts present.
  - Then replace the fan.
- If: Battery volts not present.
  - Then measure voltage between CA207-8 on Distribution Board and CA402-15 on Access 3 while turning on Test Output A4.21.
- If: Battery volts present.
  - Then check wiring going to fan from CA207-8 and CA402-15.
- If: Battery volts not present.
  - Then proceed with step 3.

Step 3: Check TDM Fan Driver Output on Access 3 CA402-15. Measure voltage between battery positive (Access 2 B+) and CA402-15 while turning on Test Output A4.21. Voltage should measure battery volts.

- If: Battery volts present.
  - Then open circuit exists between Access 3 and fan. Find and repair open circuit.
- If: Battery volts not present.
  - Then fan driver is faulty. Replace Access 3.

Step 4: Truck operating as intended.

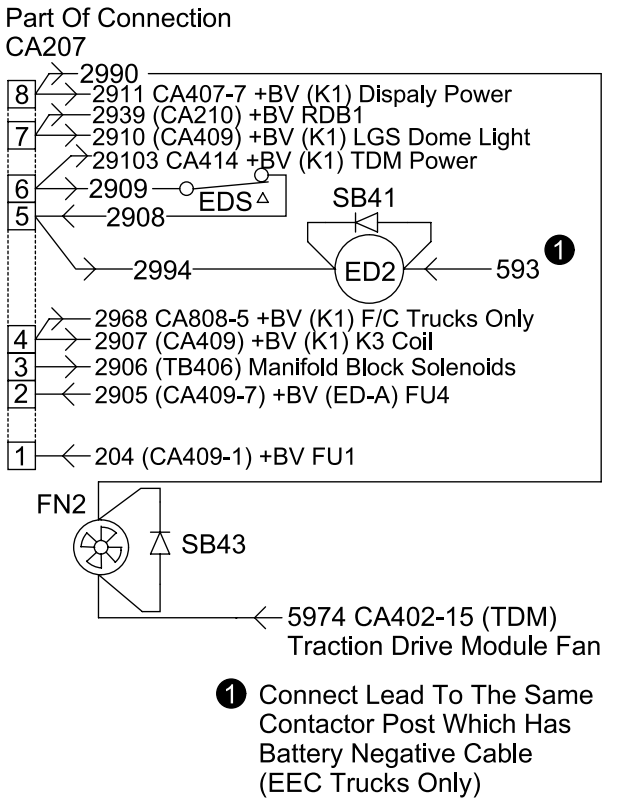


Figure 17981

Event Code 429

TDM Circuit Board Temperature Out of Range. (Alert)

Traction Driver Module (TDM) printed circuit board is monitored and a 429 code occurs to alert operator that an over temperature condition has occurred internal to TDM. When a 429 occurs, traction performance is decreased to 60%. If operation continues and temperature continues to rise traction performance will continue to decrease to 0%, at which time a code 421 occurs and traction is disabled until truck is "powered down" and back up.

Step 1: Check TDM Fan operation.

- If: Fan working.
  - Then remove service access plug on fan cowling and use low pressure compressed air to blow out fan and blow air across TDM heatsink fins.
- If: Code 429 is registered again.
  - Then proceed to step 4.
- If: Fan not working.
  - Then go to Analyzer Menu A4, Test Outputs. Select A4.21, DR Fan. Press enter and check operation of fan.
- If: Fan runs.
  - Then go to Step 4.
- If: Fan does not run.
  - Then proceed with step 2.

Step 2: Check for voltage at fan leads.

Note: *Voltage across fan leads while disconnected will measure battery volts. Voltage across fan leads while connected (fan not powered) will read approximately 3 to 4 volts.*

Connect meter leads across fan leads while connected to fan. Access Test Output menu, A4.21, and press enter button. Voltage should be battery volts.

- If: Battery volts present.
  - Then replace fan.
- If: Battery volts not present.
  - Then measure voltage between CA207-8 on Distribution Board and CA402-15 on Access 3 while turning on Test Output A4.21.
- If: Battery volts present.
  - Then check wiring going to fan from CA207-8 and CA402-15.
- If: Battery volts not present.
  - Then proceed with step 3.

Step 3: Check TDM Fan Driver Output on Access 3 CA402-15. Measure voltage between battery positive (Access 2 B+) and CA402-15 while turning on Test Output A4.21. Voltage should measure battery volts.

- If: Battery volts present.
  - Then open circuit exists between Access 3 and fan. Find and repair open circuit.
- If: Battery volts not present.
  - Then fan driver is faulty. Replace Access 3.

Step 4: Truck operating as intended.

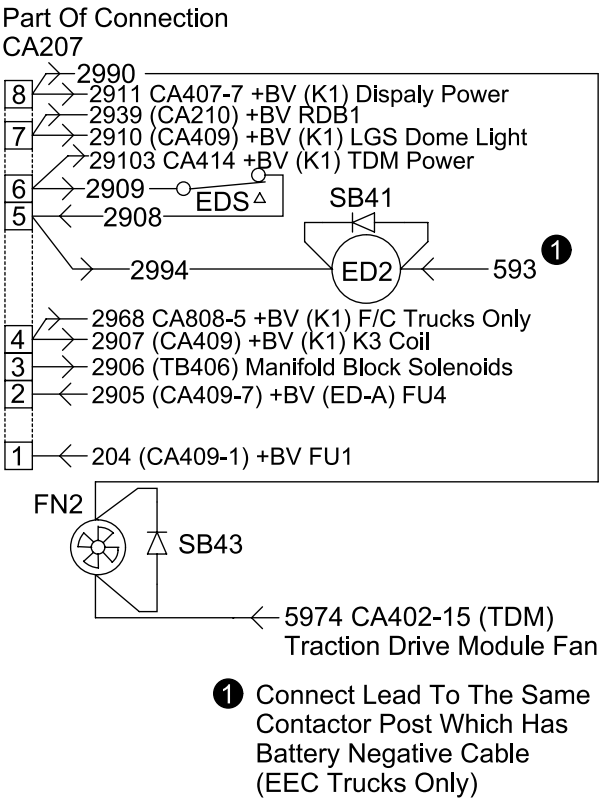


Figure 17981

Event Code 431

Traction Motor Thermal Sensor (TS1) Failure.

This event code is returned when Traction Motor temperature sensor (TS1) is not functioning properly. Truck traction performance is decreased to 60%.

Step 1: Check TS1. With CA659 connected to motor measure DC volts across CA659-1 (+) and CA659-2 (-). Should measure 1.45 VDC @ 25° C (77° F). The hotter the motor temperature the higher the reading will be. However, reading should not be higher than 3.75 VDC.

- If: Voltage within range could be an intermittent problem. Check wiring from motor to TDM Module.
- If: Voltage out of range proceed to step 2.

Step 2: Check TDM Inputs. With CA659 disconnected from motor measure voltage across CA659-1 (+) and CA659-2 (-) on TDM side of connector. Should measure approximately 3.75 VDC.

- If: Voltage within range proceed to step 3.
- If: Voltage out of range check wiring for shorts to frame. If no shorts to frame, replace Traction Drive Module (TDM).

Step 3: Check TS1 resistance. With CA659 disconnected measure resistance across CA659-1 (+) and CA659-2 (-) on motor side of connector. Should read between 600 K ohms @ 25° C (77° F) and 1130 K ohms @ 120° C (248° F).

- If: Reading within range, TS1 is OK.
- If: Reading out of range, check for wiring damage where it enters the motor. If no damage found replace stator or motor assembly.

Event Code 432

TDM Parameter Checksum Failure.

After "power up", Access 3 verifies calibration parameters. If verification fails, TDM restores calibration to default values and this event code is logged. If TDM cannot restore calibration to default values, event code 435 will be logged.

Step 1: Power truck down and back up.

- If: Code 432 returned immediately.
  - Then replace TDM.

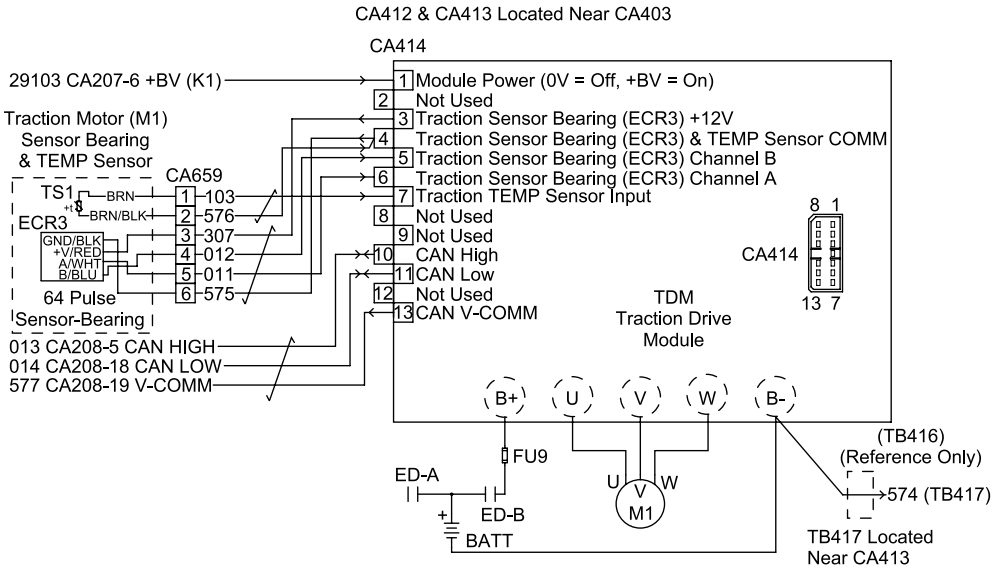


Figure 17982

Event Code 433

Traction Motor Temperature Out of Range. (Alert)

Traction motor temperature is monitored by thermal sensor TS1. If temperature exceeds preset limit, a code 433 occurs and display will show message Over Temp. When a 433 occurs, traction performance is decreased to 60%. If operation continues and temperature continues to rise, traction performance will continue to decrease to 0%, at which time a code 412 occurs and traction is disabled until truck is powered down and back up.

Step 1: Check Traction Compartment fan operation (FN1).

- If: Fan working.
  - Then remove service access plug on fan cowling and use low pressure compressed air to blow out fan and blow air across TDM heat sink fins.
- If: Code 433 is registered again.
  - Then proceed to step 4.
- If: Fan not working.
  - Then go to Analyzer Menu A4 Test Outputs. Select A4.20, PU Fan, press enter and check operation of fan.
- If: Fan runs.
  - Then go to Step 4.
- If: Fan does not run.
  - Then proceed with step 2.

Step 2: Check for voltage at fan leads.

Note: *Voltage across fan leads while disconnected will measure battery volts. Voltage across fan leads while connected (fan not powered) will read approximately 3 to 4 volts.*

Connect meter leads across fan leads while connected to fan. Access Test Output menu, A4.21, and press enter button. Voltage should be battery volts.

- If: Battery volts present.
  - Then replace the fan.
- If: Battery volts not present.
  - Then proceed with step 3.

Step 3: Measure voltage between CA207-8 on Distribution Board and CA402-15 on Access 3 while turning on Test Output A4.21.

- If: Battery volts present.
  - Then check wiring going to fan from CA207-8 and CA402-15.
- If: Battery volts not present.
  - Then check TDM Fan Driver Output on Access 3 CA402-15. Measure voltage between battery positive (Access 2 B+) and CA402-15 while turning on Test Output A4.21. Voltage should measure battery volts.
- If: Battery volts present.
  - Then open circuit exists between Access 3 and fan. Find and repair open circuit.
- If: Battery volts not present.
  - Then fan driver is faulty. Replace Access 3.

Step 4: Truck operating as intended.

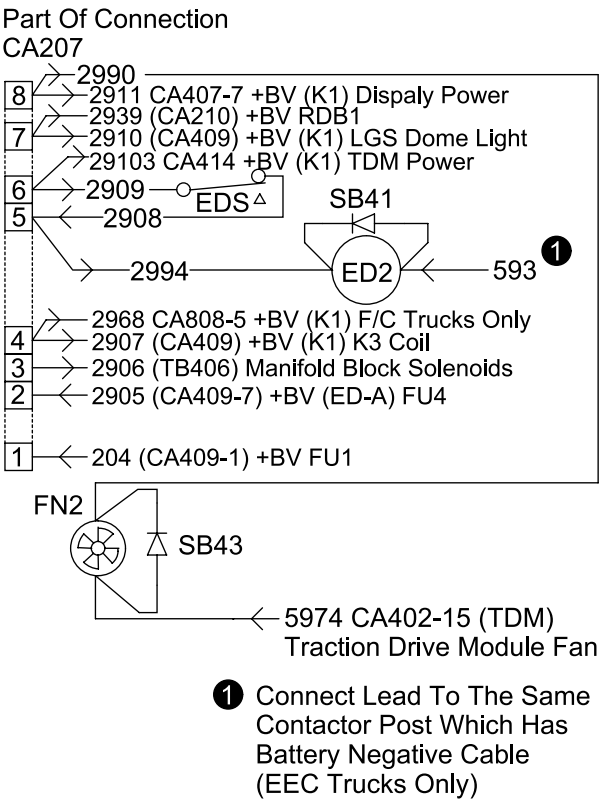


Figure 17981

Event Code 434

Power Cables Between Traction Motor and TDM Open Circuit.

TDM performs a current calibration self test upon "power up". If an error occurs, event code 434 will be logged.

Step 1: Check terminations of power cables at TDM and traction motor.

- If: Terminations loose or corroded.
  - Then tighten, clean or replace.
- If: Terminations tight and in good condition.
  Remove power from truck and check continuity of power cables.
- If: Continuity of power cables good.
  Replace TDM.

Event Code 435

TDM EEPROM Write Failure.

After "power up", Access 3 verifies calibration parameters. If verification fails, TDM restores calibration to default values and event code 432 is logged. If TDM cannot restore calibration to default values, event code 435 will be logged.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace TDM.*

Event Code 436

TDM Not Compatible with Truck Configuration.

Access 3 identifies TDM upon "power up". If Vendor ID is not recognized, (“blank” TDM, or TDM is not compatible with current truck configuration), this event code is logged.

Replace TDM with OEM part.

Event Code 814

Raise Command Given and Encoder Counts Not Decreasing.

Step 1: If HGTRS is open when forks are in free lift zone and raising forks, this code will be registered. Monitor HGTRS condition by following event code description for code 822.

Step 2: Turn key ON while pressing the ↑ button.

Select ECR2 (A2.19) on display menu.
View reading on display while raising and lowering forks.

- If: No counts wiring open circuit between encoder and Access 3 or encoder faulty. Repair/replace. Make sure height sensor is operating correctly. Reference M4.3 section of service manual.

Event Code 816

Encoder Counts Above Maximum Calibrated Height.

Step 1: Check condition of height sensor. Encoder wheel worn, replace.

Check for proper maximum height calibration.

Event Code 818

Lower Command Given and Encoder Counts Not Decreasing.

Step 1: If this is an intermittent condition, an operator induced error may be present (e.g. forks resting on rack). This code will also occur when velocity fuse activates due to excessive hydraulic fluid flow.

Step 2: If the HGTRS switch is open when mast is in freelift zone while lowering, this code will be registered. Monitor HGTRS condition, following event code description for code 822.

Step 3: Turn key ON while pressing the ↑ button.

Select ECR2 (A2.19) on display menu.
View reading on display while raising and lowering forks.

- If: No counts, wiring open circuit between encoder and Access 3 or encoder faulty. Repair/replace. Make sure height sensor is operating correctly. Reference M4.3 section of Service and Parts manual.

Event Code 819

HTRS (Height Reset Switch) Did not change state when encoder counts indicate reset should occur.

Step 1: Check adjustment of HGTRS. Out of adjustment, correct.

Step 2: Check for open or short circuit in HGTRS circuit. Repair/replace.

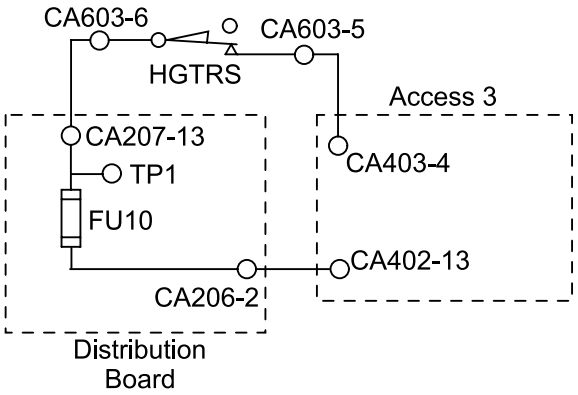


Figure 17983

Event Code 822

HTRS (Height Reset Switch) Did not change state when encoder counts indicate reset should occur.

Step 1: Check adjustment of HGTRS. Out of adjustment, correct.

Note: *If adjustment isn't correct, switch can reset when mast shifts during travel or while raising or lowering. Ensure there's adequate engagement of switch after adjustment.*

Step 2: Turn key ON while depressing the ↑ button to enter the service mode.

Select A2.16 on display menu to monitor the HGTRS switch.

- If: Switch status shows open (1 on display) Switch is open when it should be closed. Adjust, repair, replace.

Note: *Switch may need to be temporarily bypassed to raise mast to access switch.*

- If: Switch status shows closed (0 on display) Operate lift and monitor switch status. Switch should remain in closed state until mast staging occurs. If switch checks okay, then switch may need fine adjustment since problem is most likely intermittent due to mast movement while raising or traveling.

Step 3: Check mechanical link between encoder and truck for tightness.

Step 4: Replace Access 3. See note.

Note: *If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases for no apparent reason, replace Access 3.*

Event Code 824

M3 (High Performance Raise Pump Motor) Over Temperature.

Step 1: Verify duty cycle of M3 lift motor is not excessive or unusual.

Step 2: Check for loose connections, corroded terminals and brush condition. Correct.

Step 3: Make sure lift motor is clean.

Step 4: Check motor and pump assembly to ensure mechanical binding does not exist.

Step 5: Check lift circuit relief pressure.

Event Code 825

M2 (Pump Motor) Over Temperature.

Step 1: Verify duty cycle of M2 lift motor is not excessive or unusual.

Step 2: Check for loose connections, corroded terminals and brush condition. Correct.

Step 3: Make sure M2 motor is clean.

Step 4: Check motor and pump assembly to ensure mechanical binding does not exist.

Step 5: Check lift circuit relief pressure.

Event Code 826

M1 (Traction Motor) Over Temperature.

This code is registered each time Access 1 displays message "Travel Overtemp."

Note: *Verify duty cycle of M1 traction motor is not excessive or unusual. In many cases display message (Traction overtemp) will disappear once travel speed increases. An occasional registering of this code could be considered normal in some applications.*

A problem exists when display message "Traction Overtemp" remains on for an extended period of time during trucks current duty cycle.

Step 1: Check for loose connections, corroded terminals and brush condition. Correct.

Step 2: Make sure M1 motor is clean.

Step 3: Check brake, traction motor, drive unit condition to ensure mechanical binding does not exist.

Step 4: Verify that brake cover shroud is installed and properly mounted.

Event Code 827

M3 (High Performance Lift Pump Motor) Brush Wear Indication.

Step 1: Check wear on brushes, reference Service and Parts manual.

Step 2: Wire between Access 1 CA408-8 and motor open circuit. Repair or replace.

Step 3: Located next to brush holders are spring taps used to make brush wear indication. Verify both brush holder and indicator spring taps are clean, and a good electrical connection exists.

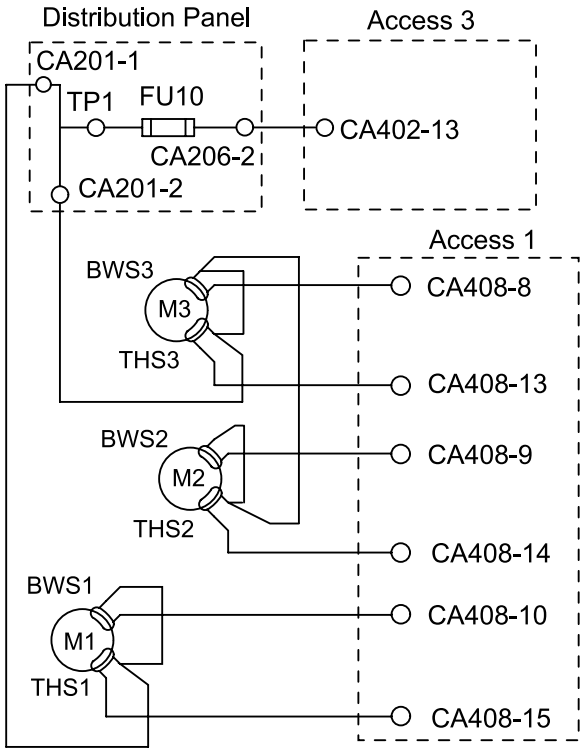


Figure 17984

Event Code 828

M2 (Pump Motor) Brush Wear Indication.

Step 1: Check wear on brushes, reference Service and Parts manual.

Step 2: Wire between Access 1 CA408-9 and motor open circuit. Repair/replace.

Step 3: Located next to brush holders are spring taps used to make brush wear indication. Verify both brush holder and indicator spring taps are clean, and a good electrical connection exists.

Event Code 829

M1 (Traction Motor) Brush Wear Indication.

Step 1: Check wear on brushes, reference Service and Parts manual.

Step 2: Wire between Access 1 CA408-10 and motor open circuit. Repair/replace.

Step 3: Located next to brush holders are spring taps used to make brush wear indication. Verify both brush holder and indicator spring taps are clean, and a good electrical connection exists.

Event Code 832

Low Battery Voltage Lockout.

Step 1: Battery completely discharged. Replace/recharge.

Step 2: Replace Access 3. See note.

Note: *If this occurs frequently and at low state of battery charge, it may be an indication that BDI adjustment is set too low or battery is in poor condition. See P4 menu for more information. Consider adjusting P4 BDI setting and having battery tested.*

Event Code 833

Access 2 Internal Fault.

If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 2.

Event Code 834

Setup Mismatch Between Access2 and Access3.

Step 1: Turn key ON while pressing the ↑ button.

Copy setup values from module which was not replaced. U2.1 to copy from Access 3, U2.2 to copy from Access 2.

Event Code 835

Access 2 and Access 3 Contain Invalid Setups.

Step 1: Turn key ON while pressing the ↑ button.

Features (F), calibration (C) and performance (P) menu items must be programmed. See Service and Parts manual.

Event Code 836

Access 3 Hardware and Software Not Compatible.

Step 1: Non OEM software or hardware introduced to system. Install OEM component.

Step 2: Use compatible components by installing previous version software or hardware or upgrade software or hardware to compatible levels.

Event Code 837

Access 3 Internal Fault.

If truck operates, this could be a random nuisance code. Monitor code frequency. If it gradually increases, replace Access 3.

Event Code 838

Truck Setups Save Failure.

Modifications made to truck under one or two button mode failed to be saved. On next "power up", code 834 will be registered.

Step 1: "Power up" truck in one button mode.

Step 2: Navigate to the Utilities, Copy Setups, From TCM at U2.1 menu level.

Step 3: "Power up" truck in one button mode of display and verify settings that were changed. Return truck to service.

Event Code 839

Load Sense 2 (LS) Calibration Error.

The LS calibration information was corrupted or sensor never calibrated.

Step 1: "Power up" truck in one button mode.

Step 2: Navigate to C4 menu and perform calibration procedure.

- If: Code 839 is again logged, proceed with step 3.

Step 3: Replace LS and repeat step 2.

Event Code 841

Lost Communications with the Tilt Position Assist Sensor Module.

LED indication on TPA module for a functional module with established communications link is a flash every other second. If there is any LED flash, power is supplied to module.

Step 1: LED off, check for battery volts at terminal strip internal to module, V+ (red wire) and GND (black wire).

- If: Battery volts, correct functional reading, replace TPA module.
- If: 0 volts, check for battery volts at distribution board CA207-2 positive and CA207-14 negative.
- If: Battery volts, check wiring and connections between TPA CAN Module and distribution board. Repair/replace.
- If: 0 volts, check condition of FU10 on distribution board and FU4 on control fuse panel. Replace fuse(s) if open circuit, replace distribution board if fuses are OK.

Step 2: LED always on or flashing twice every second, module has power supplied, but CAN communications not established. Make continuity check on wiring between distribution board CA208 and TPA CAN Module terminal CL (Can Low, white wire) and CH (Can High, black wire).

- If: Continuity present, replace TPA module.
- If: Open circuit, repair/replace wiring or connections.

Step 3: LED flash once every second, check signal at TPA module terminal board, + (white wire) and - (black wire). 1.5 volts to 4.5 volts depending on fork position.

- If: 1.5 volts to 4.5 volts, replace TPA module.
- If: 0 volts, check for 5 volts between - (white wire) and P1 (red wire).
- If: 0 volts, replace TPA module.
- If: 5 volts, check fault code history for a code 387 and perform steps associated with that code.

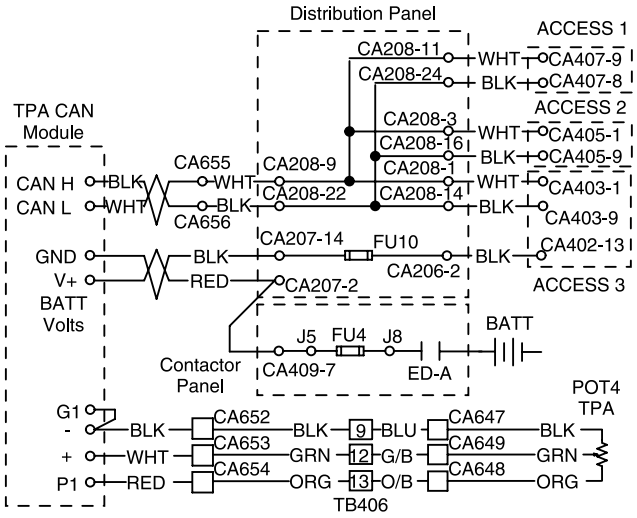


Figure 17985

Event Code 842

Internal Fault.

This event code is logged after power up self test if Access 3 detects an internal error.

Step 1: "Power down" truck then back up.

- If: Code 842 is returned immediately.
  - Then replace Access 3.

Event Code 843

AC Traction System BDI Voltage to Access 3 Not Present.

This event code is logged if Access 3 does not detect Battery Voltage at CA413 pins 8 and 16.

Step 1: Measure voltage between CA413-16 and CA413-8. Should be battery volts.

- If: Battery volts present.
  Check condition of pins 8 and 16 on PC413 (at Access 3).
- If: Pins are not bent, broken, or corroded.
  – Then replace Access 3.
- If: Voltage out of range or missing.
  Measure voltage across battery (battery disconnected)
- If: Battery voltage normal.
  Proceed to Step 2.
- If: Battery voltage low or 0.
  Replace battery with a known good one and retest.

Step 2: Check condition of FU3.

- If: FU3 open circuit.
  – Then replace.
- If: FU3 okay.
  Locate and repair open circuit between Access 3 (CA413-16) and B+, (Wire 210 to J1).
  Or, locate and repair open circuit between Access 3 (CA413-8) and B-, (Wire 573 to NB213).

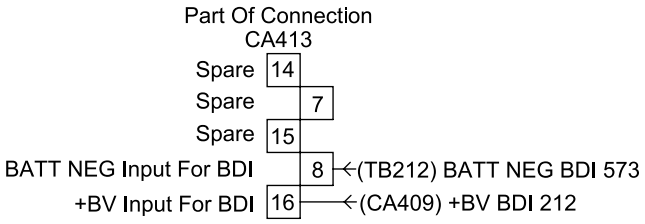


Figure 17986

Event Code 844

AC Traction System Excessive Battery Current Detected.

This event code is logged when current draw is detected under following conditions:

Truck is "powered up",
Operator compartment pedals are depressed,
NO hydraulic or traction commands are present.

Step 1: Check condition of contactor P2 tips.

- If: Welded or stuck shut.
  – Then repair/replace.
- If: Contacts in good condition and no short circuits exist around contacts.
  – Then replace Access 3.

Contactor

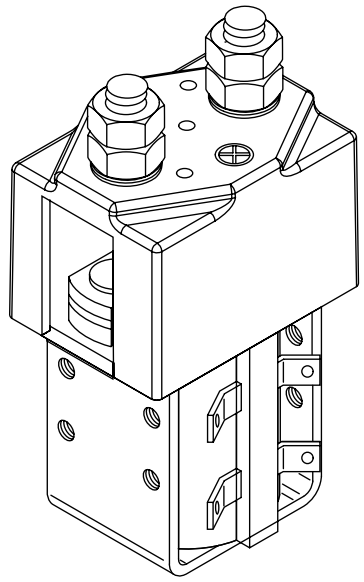


Figure 10554-01

The purpose of this information is to instruct the technician on proper care and maintenance to obtain satisfactory service from these devices. Crown has tested and applied these contactors according to the requirements of our vehicle. No modifications or changes should be made in the layout, physical arrangement or electrical connections without permission from Crown.

CAUTION

Before any inspection, adjustments, servicing, parts replacement or any other act is performed requiring physical contact with the electrical working components or wiring of these contactors, disconnect battery, raise drive wheels clear of floor and place blocks under truck frame.

Inspection

The following information is intended to assist during periods of normal maintenance and to provide checks for maintaining adjustments. As these devices are tested and adjusted at the factory, they should not normally require further adjustments. However, if factory adjustments are tampered with or otherwise changed, the checks contained in the following information may be made.

Contacts

- In normal operation, the contacts will become blackened, discolored, and roughened. This will not interfere with proper operation and cleaning is not necessary.
- The contacts should be replaced before the silver contact facing is completely eroded through to the backing material. The silver contact facing may transfer to either the moving or stationary contact and cause buildup on one contact. This can be expected under certain conditions and does not require contact dressing or filing.
- It is recommended that contacts always be replaced in mating pairs.

Coil

- Remove all electrical connections.
- Resistance reading of the coil should be between 15 - 19 ohms.
- If reading does not fall within the limits, replace coil.

Component Replacement

Refer to Figure 5674 and parts breakdown in Parts Section of manual when replacing components.

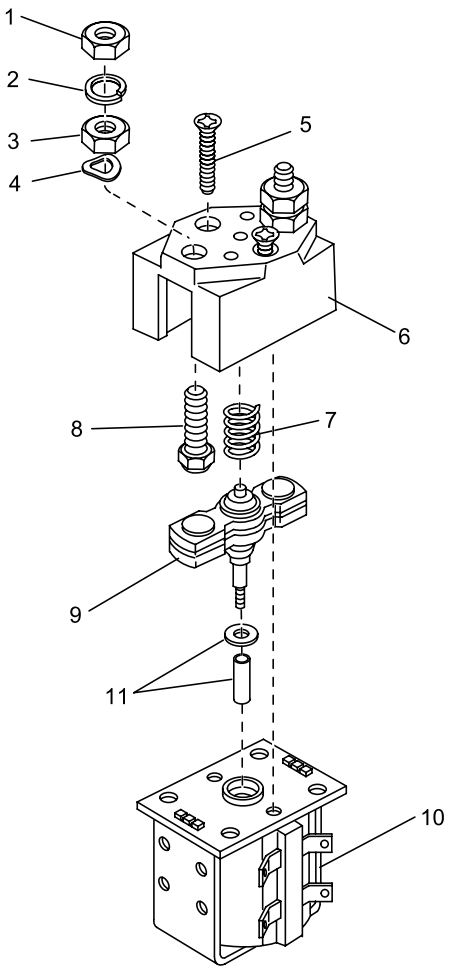


Figure 5674

Contact Replacement

1. Remove electrical connections to contacts (coils do not have to be disconnected for this procedure).
2. Remove two screws (5) from top of contact and remove contact top cover (6).
3. Remove and replace contacts (contacts always should be replaced in pairs).
4. Place contact assembly on coils and install top cover and secure with two screws removed in step 1.
5. Connect electrical wiring removed in step 1.

Coil Replacement

1. Disconnect all electrical wiring.
2. Remove four mounting screws that secure contactor to mounting bracket and remove contactor from truck.
3. Remove two screws (5) and separate contact assembly from coil assembly.
4. Select replacement coil and transfer plunger (9) from existing coil to replacement coil.
5. Reassemble contact assembly to coil and secure with two screws (5).
6. Mount contactor on truck and reconnect all electrical wiring removed in step 1.

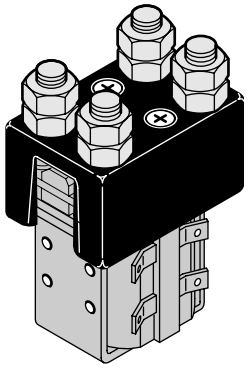
118396 CONTACTOR 24 Volt

Emergency Disconnect ED

The purpose of these instructions is to instruct the user on proper care and maintenance to obtain satisfactory service from these devices. Crown has tested and applied these contactors according to the requirements of our vehicle. No modifications or changes should be made in the layout, physical arrangement or electrical connections without permission from Crown.

DANGER

Before any inspection, adjustments, servicing, parts replacement or any other act is performed requiring physical contact with the electrical working components or wiring of these contactors; disconnect battery, raise drive wheels clear of floor and place blocks under truck frame.



6079 ILLUSTRATION 4.4-1

Inspection

The following information is intended to assist during periods of normal maintenance and to provide checks for maintaining adjustments. As these devices are tested and adjusted at the factory, they should not normally require further adjustments. However, if factory adjustments are tampered with or otherwise changed, the checks contained in the following information may be made.

CONTACTS

In normal operation, the contacts will become blackened, discolored, and roughened. This will not interfere with proper operation and cleaning is not necessary. The contacts should be replaced before the silver contact facing is completely eroded through to the backing material. The silver contact facing may transfer to either the moving or stationary contact and cause buildup on one contact. This can be expected under certain conditions and does not require contact dressing or filing. It is recommended that contacts always be replaced in mating pairs.

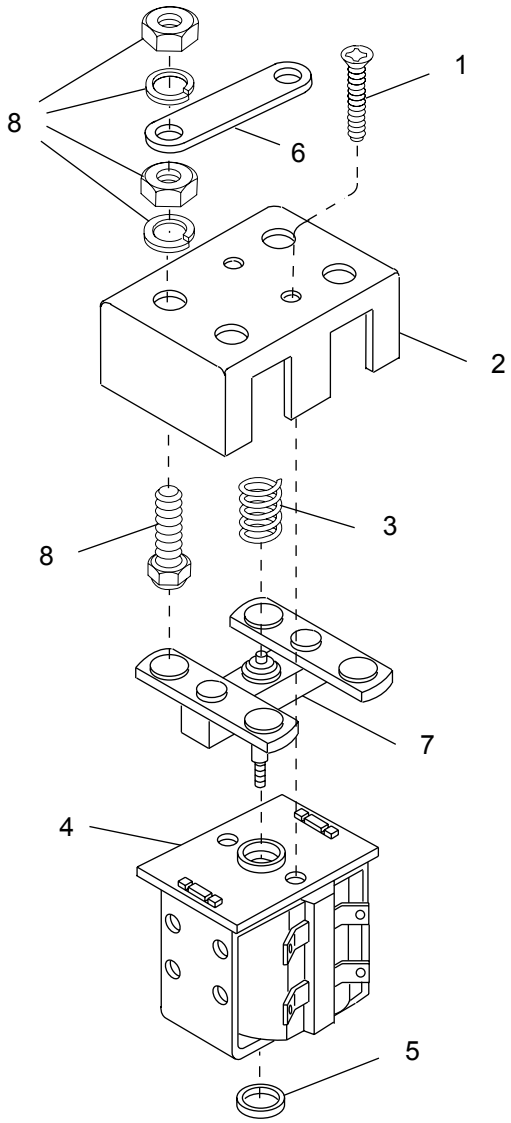
To inspect the normally closed (N.C.) contacts, manually push the contacts apart. Use an inspection mirror to inspect the contacts to the rear of the contactors.

COILS

Remove all electrical connections from coils. Resistance reading of the coils should be between 41.8 - 46.2 ohms. If reading does not fall within the limits, replace.

Component Replacement

Refer to parts breakdown in Illustration 4.4-2 when replacing components.



3041

ILLUSTRATION 4.4-2

Index	Part Name
1	Screw
2	Cover Top
3	Spring Return
4	Coil
5	Cap End
6	Link Terminal
7	Contact Moving
8	Contact Fixed

CONTACT REPLACEMENT

Disconnect all electrical wiring from contactor. Note order of hardware. Remove bolts from mounting bracket and lift contactor from truck. Remove two (2) screws (Index 1) from top cover of contactor. Lift off top cover (Index 2). Remove return spring (Index 3) and the four (4) fixed contacts (Index 8) from the contactor assembly.

Select a replacement moving contact (Index 7). Position on the coil assembly (Index 4). Locate the return spring (Index 3) on the moving contact.

Locate the fixed contacts (Index 8) into the top cover (Index 2). Holding carefully, turn top side up onto moving contact and coil assembly. Ensure correct location of return spring. Secure with screws (Index 1). Torque up to 1.8 ft. lbs. (2.4 Nm). Install contactor on mounting bracket of traction panel with mounting bolts. Connect electrical wiring.

COIL REPLACEMENT

Disconnect all electrical wiring from contactor. Note order of hardware. Remove bolts from mounting bracket and lift contactor from truck. Remove two (2) screws (Index 1) from top cover of contactor. Lift off top cover (Index 2). Remove return spring (Index 3) and the four (4) fixed contacts (Index 8) from the contactor assembly. Remove the moving contact (Index 7) from the coil assembly.

Select a replacement coil assembly (Index 4). Locate the return spring (Index 3) and the moving contact (Index 7) on the coil assembly.

Locate the fixed contacts (Index 8) into the top cover (Index 2). Holding carefully, turn top side up onto moving contact and coil assembly. Ensure correct location of return spring. Secure with screws (Index 1). Torque up to 1.8 ft. lbs. (2.4 Nm). Install contactor on mounting bracket of traction panel with mounting bolts. Connect electrical wiring.

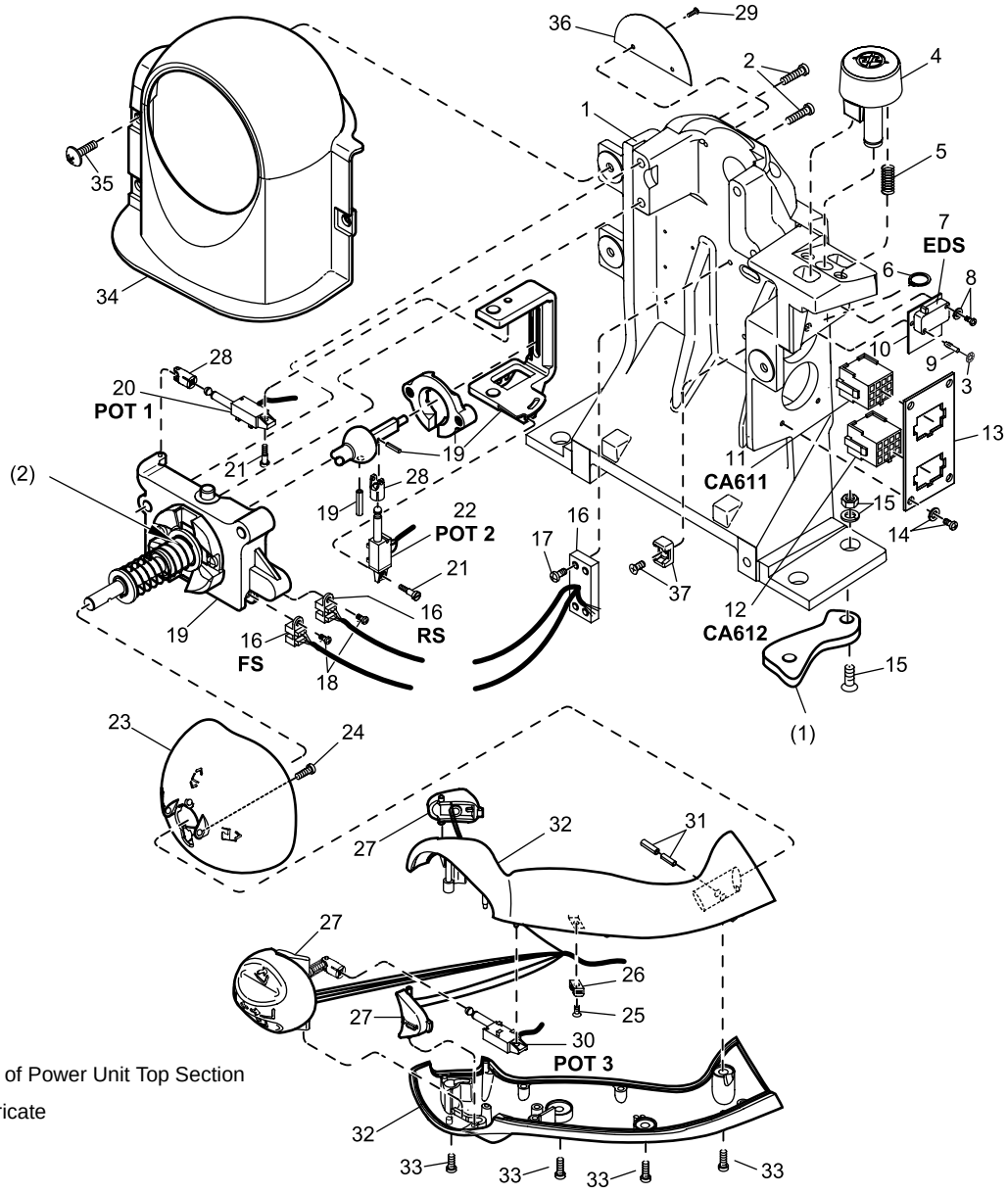
Multi-Task Control

Your truck utilizes a sequential multi-task control handle that eliminates multiple hydraulic levers. Multi-task control, for the right hand, gives operator complete control of travel speed, direction, lift, lower, reach, side shift, tilt and horn functions.

Multi-task control is located at top and in center of power unit; console must be removed to perform maintenance on multi-task control. Four micro switches, two optic sensors, and three potentiometers are used in multi-task control.

Lubrication

Refer to Figure 17062. Remove multi-task cover and console. Tilt multi-task handle down, and lubricate base as shown using silicon grease (Crown part number 063002-020). Multi-task handle should be lubricated every 500 hrs or 90 days, whichever comes first.



(1) Part of Power Unit Top Section

(2) Lubricate

Figure 17062

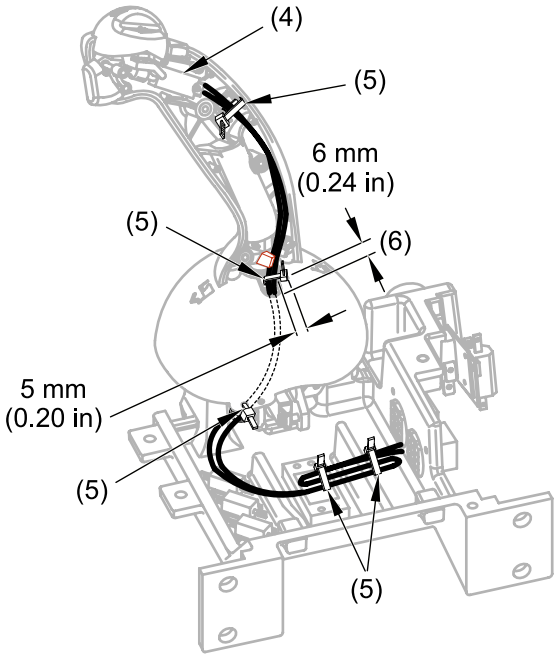
Replacement of Wire Harness in Handle

Containing SSS, TBS, TDS, & HNS, or POT 3

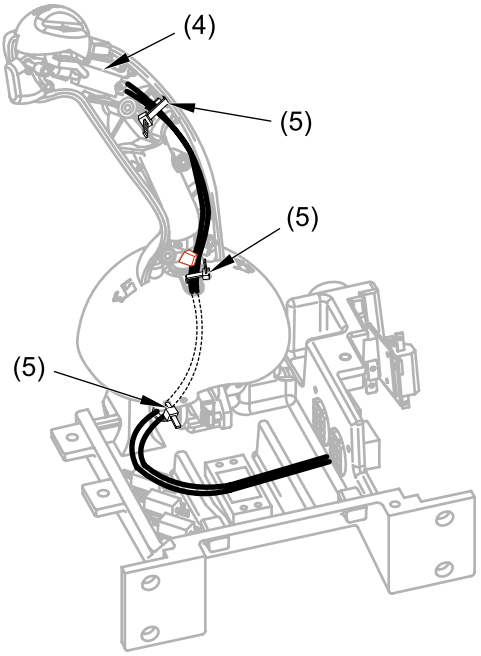
1. Lower forks completely, turn key switch off and disconnect battery.
2. Remove multi-task control cover and console.
3. Refer to Figure 17062. Remove four screws, index 33, and remove lower portion of handle, index 32.
4. Remove cable ties from dust cover as required if harnesses in handle are being replaced.
5. The wire harness containing HNS, SSS, TBS, & TDS, index 27, or POT 3 index 30, can now be removed from handle and dust cover, depending on part(s) requiring replacement.
6. Use extraction tool 118993 to remove wires from connectors CA611 or CA612, noting position of all wires removed.
7. Refer to Figure 17063. Route harness thru handle and dust cover as shown. Secure as indicated with cable ties part number 061003-002.
8. Insert wires into connectors in proper positions.
9. Assemble and secure bottom section of handle.
10. Connect battery and check operation of multi-task handle. If operating correctly, replace console and cover.

Replacement of POT 1 or POT 2

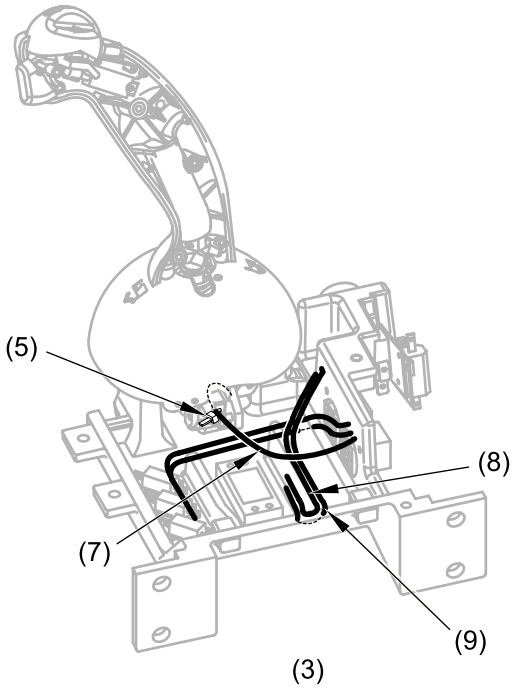
1. Lower forks completely, turn key switch off and disconnect battery.
2. Remove multi-task control cover and console.
3. Refer to Figure 17062. Remove four screws, index 2 and 3, noting their positions.
4. Remove cable ties as required, and use extraction tool 118993 to remove wires from connectors CA611 and CA612, noting their positions.
5. Replace POT 1 or POT 2 and route wiring as shown in Figure 17063.
6. Use cable tie 061003-002 to secure wires as shown.
7. Insert wires into connectors in proper positions.
8. Reassemble handle to support.
9. Connect battery and check multi-task handle operation. If operating correctly, replace console and cover.



(1)



(2)



(3)

(1) Routing Original Handle Harness

(2) Routing Shorter Handle Harness

(3) Routing Wiring for Resistors, POT1 and POT2, and Optic Sensors

(4) Position POT3 with Terminal Side in Toward Upper Hancle

(5) Cable Tie

(6) 3 mm (0.12 in) Diameter Hole

(7) Harness, POT1 and POT2

(8) Optic Sensor Black Wire (Note: Keep Between Board and Support)

(9) Optic Sensor Yellow Wire (Note: Keep Between Board and Support)

Figure 17063

This page available for **NOTES.**

Battery

The care and maintenance of the battery is very important to obtain efficient truck operation and maximum battery life.

CAUTION

Gases produced by a battery can be explosive. Do not smoke, use an open flame, create an arc or sparks in the vicinity of the battery. Ventilate an enclosed area well when charging.
Batteries contain sulfuric acid which may cause severe burns. Avoid contact with eyes, skin or clothing. In case of contact, flush immediately and thoroughly with clean water. Obtain medical attention when eyes are affected. A baking soda solution (one pound to one gallon of water) applied to spilled acid until bubbling stops, neutralizes the acid for safe handling and disposal.

Leakage voltage from battery terminals to battery case can cause misleading trouble symptoms with the truck electrical system. Since components of the truck electrical system are insulated from truck frame, leakage voltage will not normally affect truck operation unless a short circuit or breakdown of circuit wire insulation to truck frame occurs.

A voltage check from battery connector terminal to battery case should indicate near zero volts. Typically, however, the sum of the voltages at both terminals will equal battery volts. This leakage voltage will discharge the battery. As battery cleanliness deteriorates, the usable charge of the battery decreases due to this self discharge.

Although a leakage voltage reading of zero volts may not be possible, a cleaner battery will have more usable charge for truck operation and not affect operation of electronic devices on the unit.

Safety Rules

- Wear protective clothing, such as, rubber apron, gloves, boots and goggles when performing any maintenance on batteries. Do not allow electrolyte to come in contact with eyes, skin, clothing or floor. If electrolyte comes in contact with eyes, flush immediately and thoroughly with clean water. Obtain medical attention immediately. Should electrolyte be spilled on skin, rinse promptly with clean water and wash with soap. A baking soda solution (one pound to one gallon of water) will neutralize acid spilled on clothing, floor or any other surface. Apply solution until bubbling stops and rinse with clean water.
- Keep vent plugs firmly in place at all times except when adding water or taking hydrometer readings.
- Do not bring any type of flame, spark, etc., near the battery. Gas formed while the battery is charging, is highly explosive. This gas remains in the cells long after charging has stopped.
- Do not lay metallic or conductive objects on battery. Arcing will result.
- Do not allow dirt, cleaning solution or other foreign material to enter cells. Impurities in electrolyte has a neutralizing effect reducing available charge.
- If battery repair is planned, follow the battery manufacturer's instructions concerning repair practices and procedures.

Checking Battery

Battery electrolyte level should be checked before each charge of the battery. The level should be maintained at 13 mm (0.5 in) above plates or just below the lower lip of the filler hole at all times. If low, add distilled water or approved local supply (consult battery manufacturer) at the end of a charge cycle. Do not overfill.

For maximum battery life, specific gravity readings should be taken daily on a pilot cell and recorded. A different pilot cell should be selected on a monthly basis with readings taken on all cells at semi annual or annual intervals. Do not take specific gravity readings immediately after adding water. Water and electrolyte must be thoroughly mixed by charging before a reliable reading can be taken. Normal full charged specific gravity should be between 1.265 and 1.285.

Battery Care

Your Crown truck is powered by an electrical storage battery. Here are a few suggestions which will help you give the battery proper care.

The battery on your Narrow Aisle Stand-up Rider is located in front of the operator's compartment.

1. Charge the battery only in areas designated for that use.
2. Make certain the charger being used matches the voltage and amperage of the truck battery. This voltage is listed on the truck data plate.
3. Before disconnecting or connecting batteries to a charger, make sure the charger is OFF. If an attempt is made to do this while the charger is ON, serious injury to you, the battery and charger could result.
4. Before charging, make sure the battery cells contain the correct amount of water. Charging batteries with a low water level might result in damage to the cells. When checking water levels, never use any type of open flame. Battery fumes are explosive.
5. Before connecting the battery cable to the truck's receptacle, make sure the key switch is OFF and all controls are in the OFF position and the brakes are locked. The battery cable must be fully connected before the truck is used. If the plug is not making good contact, heat will weld the two parts of the battery connector together, making it difficult to remove and necessary to replace.
6. Battery terminals should be checked and cleaned of corrosion regularly. Good battery terminal contact is essential not only for operation, but also for proper charging of the battery.
7. The charging requirements will vary depending on the use of the truck. The battery should be given an equalizing charge on a weekly basis. This charge should normally be an additional three hours at the finish rate.
8. Refer to charger manufacturer's instruction for specific charging procedures.
9. Make certain battery used meets weight and size requirements of truck (refer to data plate). NEVER operate truck with an undersized battery.

Charging Battery

Charging requirements will vary depending on use of truck. A battery with a specific gravity of 1.160 or less should be recharged. In some applications more than one battery is required to provide ample power to the unit during the service period.

CAUTION

Never smoke or bring flame near the battery. Gas formed during charging is highly explosive and can cause serious injury.

Consult the charger manufacturer's manual covering your charger for hints on operation and maintenance. Some of the basic rules are as follows:

Placing battery on charge:

- Park truck at charging station with forks lowered and key removed.
- Make certain charger control is in the off position.
- Connect battery to charger and make certain connectors are mated completely.
- Set timer for specified time. Set for Normal (Daily Charge, except one night a week when the Equalize [Weekend] Charge should be used.)
- Check ammeter to make certain it shows charge.

Removing battery from charge:

- Make certain charger is turned off.
- Unplug the connector, using both hands with a straight pulling motion.
- Hang up the charger cable to prevent damage to the cable. (Broken connectors can cause poor connections and connector failures).
- Make daily battery checks, add water as needed.
- Connect battery to truck. Make certain connectors are mated completely.

Battery Removal & Installation (S Series Truck Shown)

Battery Removal

CAUTION

Do not allow any metallic object to come in contact with the top of the battery cells. This may cause a short circuit when removing, installing or transporting the battery. Use an insulator (such as plywood) to cover the top of the battery before and during removal and installation.

1. 1. Turn key switch OFF.
2. Disconnect the battery.

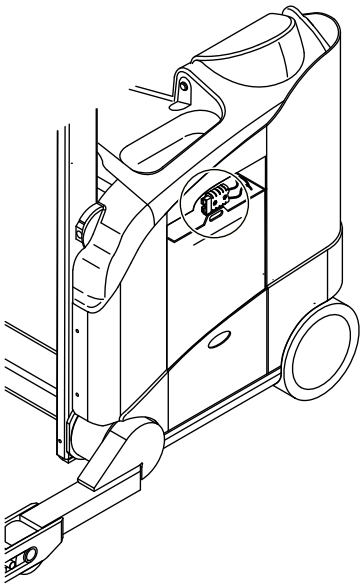


Figure 16817-01

3. Lift and remove the battery retainer (one side only).

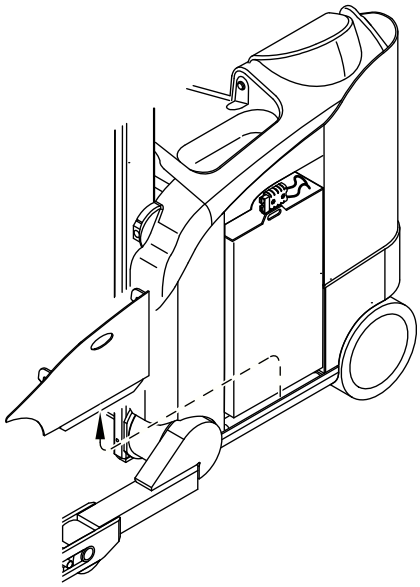


Figure 16818-01

4. Position the battery roller stand next to the truck. Align the stand with the battery. Battery roller stand should be the same height as the truck's battery compartment rollers and as long as or longer than the battery.

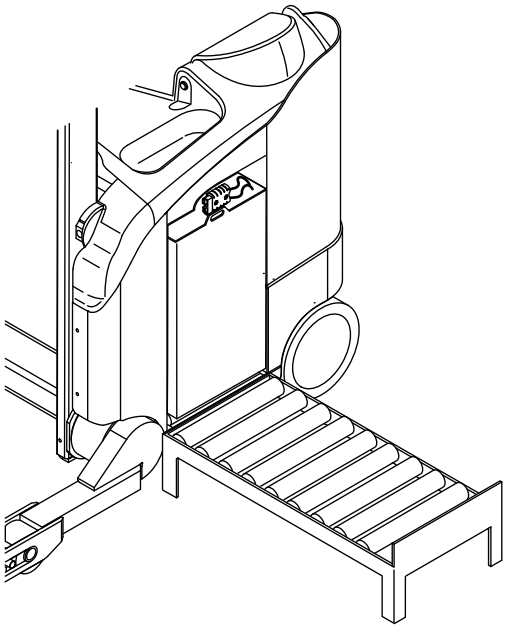


Figure 16819-01

5. Roll battery onto stand. Use approved spreader bar (1) to lift and move battery to charging area.

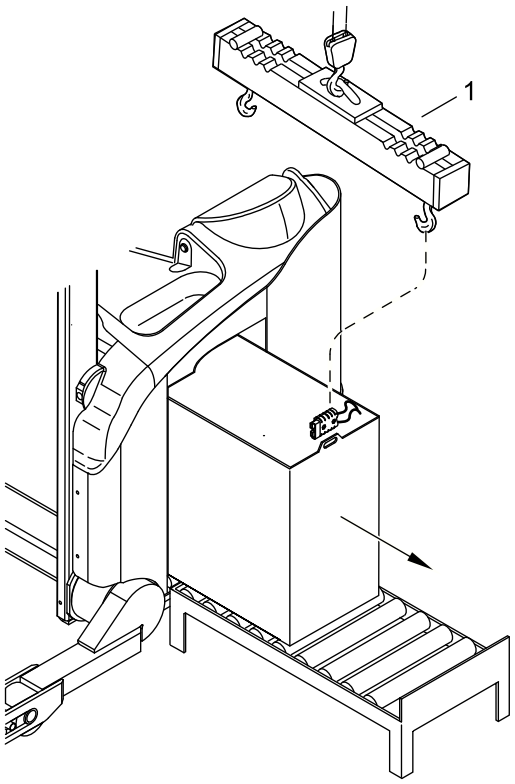


Figure 16820-01

Battery Installation

CAUTION

Do not allow any metallic object to come in contact with the top of the battery cells. This may cause a short circuit when removing, installing or transporting the battery. Use an insulator (such as plywood) to cover the top of the battery before and during removal and installation.

1. Be sure the key switch is turned OFF.
2. Remove the battery retainer (one side only).

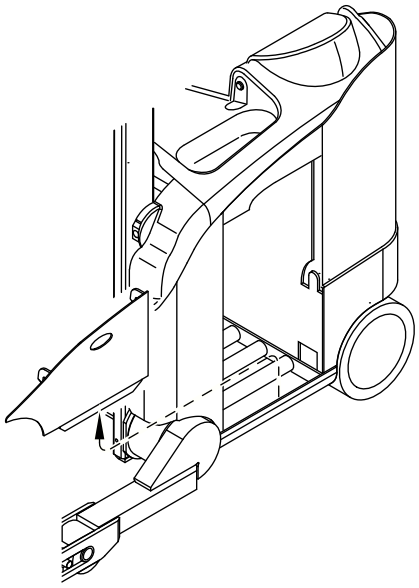


Figure 16821-01

3. Position the battery roller stand next to the truck. Align the stand with the battery compartment. The battery roller stand should be the same height as the truck's battery compartment rollers and as long as or longer than the battery.

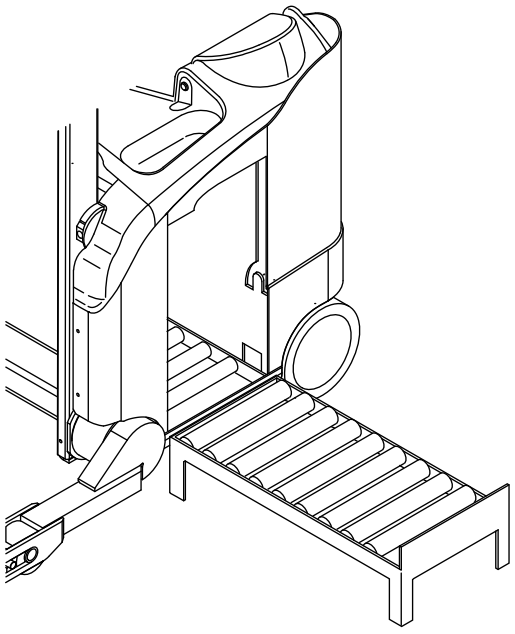


Figure 16822-01

4. Using an approved spreader bar (1), move the battery onto the roller stand and push the battery into the battery compartment.

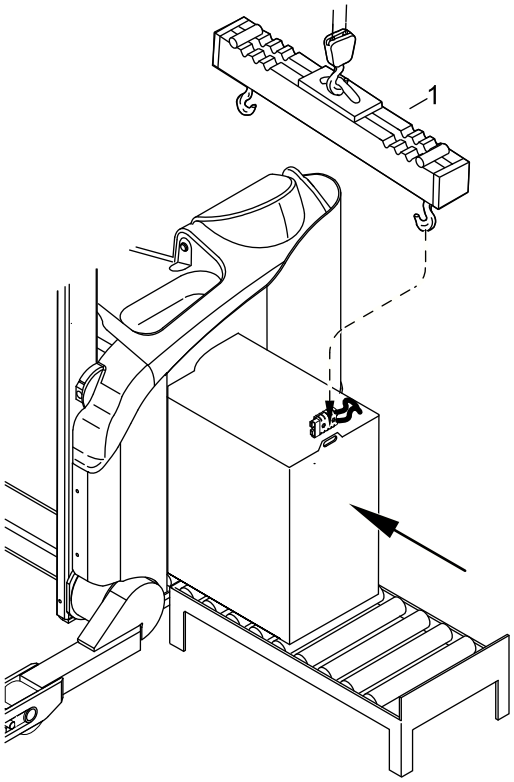


Figure 16823-01

5. Remove the roller stand and install the battery retainer.

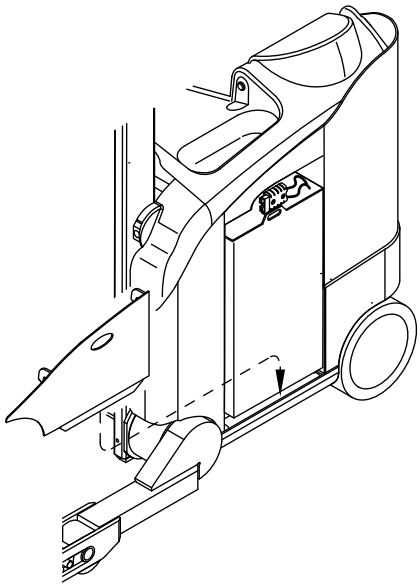


Figure 16824-01

6. Connect the battery.
7. Turn the key switch ON and check truck operation.

CAUTION

Make certain the same battery or battery of equal weight is loaded into the truck for truck stability. See truck's data plate for minimum battery weight.

Battery Cleaning

Always keep vent plugs tightly in place when cleaning the battery. When properly watered and charged, the battery will remain clean and dry. All that is necessary is to brush or blow off any dust or dirt which may accumulate on them. However, if electrolyte is spilled or overflows from a cell, it should be neutralized with a solution of baking soda and water (one pound soda to a gallon of water). To do this, remove the battery from the truck and clean with the solution of soda and water, brushing the soda solution beneath the connectors and removing the grime from the covers. Then rinse the battery with cool water from a low pressure supply to remove the soda and loosened dirt. If batteries stay wet consistently, they may be either overcharge or overfilled. This condition should be investigated and corrected.

Troubleshooting

Records of battery specific gravity readings, charger used, truck used, etc. can be the most effective trouble-shooting aid. Contact your dealer for charts designed specifically for this purpose.

Voltage readings of each cell taken at the normal charger finish rate also indicate battery condition. New batteries will have cell voltages ranging from 2.55 V to 2.65 V. Older batteries may however range from 2.45 V to 2.55 V. These readings still indicate a battery in good condition.

A variation of 0.20 V may be normal if certain cells are exposed to higher temperatures during discharge. Voltage differences that cannot be attributed to battery age or operating conditions indicate a weak cell(s) and maintenance is required.

CAUTION

Only qualified and experienced personnel should perform maintenance and repair on batteries.

RR/RD 5200/5200S

MOTOR INFORMATION CHART

	TRACTION 020615 (36 V.) 020615-002 (36 V.) without sensors	TRACTION 020512 (36 V.) 020512-002 (36 V.) with sensors	TRACTION EE 020627 (36 V.) with sensors
Brushes:	**8**	**8**	**8**
No. of Brush Holders	1	1	1
No. of Brush Assemblies	8	8	8
No. of Brush Springs	8	8	8
Brush Length - New	33.1 mm (1.30 inches)	33.1 mm (1.30 inches)	33.1 mm (1.30 inches)
Spring Tension on New Brushes	1360 grams (48 ounces)	1360 grams (48 ounces)	1360 grams (48 ounces)
Min. Brush Length - Replace	16 mm (0.62 inches)	16 mm (0.62 inches)	16 mm (0.62 inches)
Spring Tension Before Replacement	907 grams (32 ounces)	907 grams (32 ounces)	907 grams (32 ounces)
Commutator:			
Max. Diameter - New	85.3 mm (3.36 inches)	85.3 mm (3.36 inches)	85.3 mm (3.36 inches)
Min. Diameter - Reslotting	82.3 mm (3.24 inches)	82.3 mm (3.24 inches)	82.3 mm (3.24 inches)
Min. Diameter - Replace	81.0 mm (3.19 inches)	81.0 mm (3.19 inches)	81.0 mm (3.19 inches)
Bearings:			
Lubricant	Hi Temp 25-30% fill Chevron SRI-2 or equivalent	Hi Temp 25-30% fill Chevron SRI-2 or equivalent	Hi Temp 25-30% fill Chevron SRI-2 or equivalent
Cond. of Performance:			
(No Load)			
Volts	12	12	12
Max. Amperes	10	10	10
RPM	510	510	510
Field Resistance:			
(each at 75° F [24° C])			
Series Ohms	0.59	0.59	0.59
Armature Resistance:			
(each at 77° F [25° C])			
Ohms	0.0038	0.0038	0.0038
Measured Between Bars	1 and 12	1 and 12	1 and 12
Frame Diameter:	184 mm (7.25 inches)	184 mm (7.25 inches)	184 mm (7.25 inches)
Wound in:			
Direction of Rotation:	Reversible	Reversible	Reversible

	TRACTION 020616 (36 V.) 020616-002 (36 V.) without sensors	TRACTION 020513 (36 V.) 020513-002 (36 V.) with sensors
Brushes:	**8**	**8**
No. of Brush Holders	1	1
No. of Brush Assemblies	8	8
No. of Brush Springs	8	8
Brush Length - New	33.1 mm (1.30 inches)	33.1 mm (1.30 inches)
Spring Tension on New Brushes	1360 grams (48 ounces)	1360 grams (48 ounces)
Min. Brush Length - Replace	16 mm (0.62 inches)	16 mm (0.62 inches)
Spring Tension Before Replacement	907 grams (32 ounces)	907 grams (32 ounces)
Commutator:		
Max. Diameter - New	85.3 mm (3.36 inches)	85.3 mm (3.36 inches)
Min. Diameter - Reslotting	82.3 mm (3.24 inches)	82.3 mm (3.24 inches)
Min. Diameter - Replace	81.0 mm (3.19 inches)	81.0 mm (3.19 inches)
Bearings:		
Lubricant	Hi Temp 25-30% fill Chevron SRI-2 or equivalent	Hi Temp 25-30% fill Chevron SRI-2 or equivalent
Cond. of Performance:		
(No Load)		
Volts	12	12
Max. Amperes	10	10
RPM	510	510
Field Resistance:		
(each at 75° F [24° C])		
Series Ohms	0.59	0.59
Armature Resistance:		
(each at 77° F [25° C])		
Ohms	0.0038	0.0038
Measured Between Bars	1 and 12	1 and 12
Frame Diameter:	184 mm (7.25 inches)	184 mm (7.25 inches)
Wound in:		
Direction of Rotation:	Reversible	Reversible

	TRACTION 020600 (24 V.) 020600-001 (24 V.) without sensors	TRACTION EE 020600-002 (24 V.) without sensors
Brushes:	**8**	**8**
No. of Brush Holders	1	1
No. of Brush Assemblies	8	8
No. of Brush Springs	8	8
Brush Length - New	33.1 mm (1.30 inches)	33.1 mm (1.30 inches)
Spring Tension on New Brushes	1360 grams (48 ounces)	1360 grams (48 ounces)
Min. Brush Length - Replace	16 mm (0.62 inches)	16 mm (0.62 inches)
Spring Tension Before Replacement	907 grams (32 ounces)	907 grams (32 ounces)
Commutator:		
Max. Diameter - New	85.3 mm (3.36 inches)	85.3 mm (3.36 inches)
Min. Diameter - Reslotting	82.3 mm (3.24 inches)	82.3 mm (3.24 inches)
Min. Diameter - Replace	81.0 mm (3.19 inches)	81.0 mm (3.19 inches)
Bearings:		
Lubricant	Hi Temp 25-30% fill Chevron SRI-2 or equivalent	Hi Temp 25-30% fill Chevron SRI-2 or equivalent
Cond. of Performance:		
(No Load)		
Volts	12	12
Max. Amperes	12	12
RPM	650	650
Field Resistance:		
(each at 75° F [24° C])		
Series Ohms	0.37	0.37
Armature Resistance:		
(each at 77° F [25° C])		
Ohms	0.0038	0.0038
Measured Between Bars	1 and 12	1 and 12
Frame Diameter:	184 mm (7.25 inches)	184 mm (7.25 inches)
Wound in:		
Direction of Rotation:	Reversible	Reversible

	HYDRAULIC 020575-001 (36 V.) 020575-003 (36 V.) with sensors	HYDRAULIC 020614 (36 V.) 020614-002 (36 V.) without sensors
Brushes:	**4**	**4**
No. of Brush Holders	1	1
No. of Brush Assemblies	4	4
No. of Brush Springs	4	4
Brush Length - New	33.1 mm (1.30 inches)	33.1 mm (1.30 inches)
Spring Tension on New Brushes	1360 grams (48 ounces)	1360 grams (48 ounces)
Min. Brush Length - Replace	16 mm (0.62 inches)	16 mm (0.62 inches)
Spring Tension Before Replacement	907 grams (32 ounces)	907 grams (32 ounces)
Commutator:		
Max. Diameter - New	74 mm (2.92 inches)	74 mm (2.92 inches)
Min. Diameter - Reslotting	72 mm (2.85 inches)	72 mm (2.85 inches)
Min. Diameter - Replace	70 mm (2.75 inches)	70 mm (2.75 inches)
Bearings:		
Lubricant	Hi Temp 35% fill Chevron SRI-2 or equivalent	Hi Temp 35% fill Chevron SRI-2 or equivalent
Cond. of Performance: (No Load)		
Volts	12	12
Max. Amperes	30	30
RPM	3700	3700
Field Resistance: (each at 75° F [24° C])		
Series Ohms	0.0064	0.0064
Armature Resistance: (each at 77° F [25° C])		
Ohms	0.0044	0.0044
Measured Between Bars	1 and 10	1 and 10
Frame Diameter:	171 mm (6.75 inches)	171 mm (6.75 inches)
Wound in:		
Direction of Rotation:	CWDE	CWDE

	HYDRAULIC 020532-001 (36 V.) 020894 (36 V.) with sensors	HYDRAULIC EE 020532-002 (36 V.) with sensors
Brushes:	**8**	**8**
No. of Brush Holders	1	1
No. of Brush Assemblies	8	8
No. of Brush Springs	8	8
Brush Length - New	33.1 mm (1.30 inches)	33.1 mm (1.30 inches)
Spring Tension on New Brushes	1360 grams (48 ounces)	1360 grams (48 ounces)
Min. Brush Length - Replace	16 mm (0.62 inches)	16 mm (0.62 inches)
Spring Tension Before Replacement	907 grams (32 ounces)	907 grams (32 ounces)
Commutator:		
Max. Diameter - New	85.3 mm (3.36 inches)	85.3 mm (3.36 inches)
Min. Diameter - Reslotting	82.3 mm (3.24 inches)	82.3 mm (3.24 inches)
Min. Diameter - Replace	81 mm (3.19 inches)	81 mm (3.19 inches)
Bearings:		
Lubricant	Hi Temp 25-30% fill Chevron SRI-2 or equivalent	Hi Temp 25-30% fill Chevron SRI-2 or equivalent
Cond. of Performance:		
(No Load)		
Volts	12	12
Max. Amperes	42	42
RPM	2800	2800
Field Resistance:		
(each at 75° F [24° C])		
Series Ohms	0.0025	0.0025
Armature Resistance:		
(each at 77° F [25° C])		
Ohms	0.0035	0.0035
Measured Between Bars	1 and 9	1 and 9
Frame Diameter:	184 mm (7.25 inches)	184 mm (7.25 inches)
Wound in:		
Direction of Rotation:	CWDE	CWDE

HYDRAULIC
020603 (24 V.)
020893 (24 V.)
with sensors

Brushes:	**4**
No. of Brush Holders	1
No. of Brush Assemblies	4
No. of Brush Springs	4
Brush Length - New	33 mm (1.30 inches)
Spring Tension on New Brushes	1360 grams (48 ounces)
Min. Brush Length - Replace	16 mm (0.62 inches)
Spring Tension Before Replacement	907 grams (32 ounces)
Commutator:	
Max. Diameter - New	74 mm (2.92 inches)
Min. Diameter - Reslotting	72 mm (2.85 inches)
Min. Diameter - Replace	70 mm (2.75 inches)
Bearings:	
Lubricant	Hi Temp 25-30% fill Chevron SRI-2 or equivalent
Cond. of Performance:	
(No Load)	
Volts	12
Max. Amperes	52
RPM	4500
Field Resistance:	
(each at 75° F [24° C])	
Series Ohms	0.0016
Armature Resistance:	
(each at 77° F [25° C])	
Ohms	0.0044
Measured Between Bars	1 and 9
Frame Diameter:	171 mm (6.75 inches)
Wound in:	
Direction of Rotation:	CWDE

M4.7–1452–006

Brake System

There are two sources of drive wheel braking on the 5200 and 5200S series, a 3 step, spring applied, electromagnetically released, friction disc brake on the drive motor armature shaft and dynamic motor braking, typically called regenerative braking. The 5200S has additional braking in two, electromagnetically applied, friction disc brakes in the caster wheels.

When a brake request is made by the operator (by releasing either of the two "left pedals" or by applying the "center pedal"), the "Access 3" microprocessor determines the amount of braking effort to be applied based on the known truck weight (includes battery and maximum allowable fork load) and the maximum allowable speed for the particular travel direction and fork height. The total braking effort is shared between the drive tire and caster tire (5200S only) based on the known weight distribution. The drive tire portion is further split between the motor regenerative braking and the 3 step friction brake. The motor regenerative portion is made as large as practical in order to reduce wear on the 3 step friction brake. The drive tire and caster tire brake effort can be further electronically adjusted through the performance menu (P6 and P7) in order to address tire slide for the particular floor condition in the application.

Stopping Distance

Before making changes in stopping distance, verify the actual truck stop distance as listed in chart 1. If it is determined that the truck no longer meets the required stopping distance, complete the following adjustments prior to programing the P6 and P7 functions of Access 1:

- Articulation adjustment, refer to section M3.0.
- Truck weight & maximum load, refer to F4 and F5 in section M4.3. Compare to data tag.
- Drive brake torque gap adjustment, this section.

CAUTION

The customer shall verify that the stopping distance in any part of the application doesn't prevent the operator from performing a specific task safely, or result in braking characteristics that are significantly different from other similar vehicles being used in the facility. An alternative is for the customer to train the operator to reduce travel speed and/or allow for longer stopping distances.

To check stopping distance

1. Set the drive and caster brake performance values (Access 1), P6 and P7, to their default values of 6.
2. Travel with no load, on a level, smooth, dry, concrete surface, at maximum acceleration from zero to top speed in the forks first direction and apply brakes. Use Access 1 input menu, A2.24, to monitor truck speed in mph.
3. Verify the truck stops within the distance and from the maximum speed listed in the following chart with no caster tire slide and minimal drive tire slide.
4. To address tire slide for the floor condition in the application, Access 1 performance menu brake adjustments, P6 (drive brake) and P7 (caster brake) provide individual adjustment of the two brakes. These settings may be reduced if the standard setting results in tire slide in the application. If the floor conditions will accommodate a more aggressive braking force then these settings may be increased. These adjustments affect the brake force in both travel directions when the forks are below the free lift height.

Chart 1 Stopping Distance				
Model	Forks First Maximum Speed		Maximum Stopping Distance	
	kmh (+0.0/-0.1)	mph (+0.0/-0.1)	meters	feet
RR5210 & RR5220	9.2	5.7	2.1	7.0
RR5220 with productivity package	10.5	6.5	2.7	9.0
RR5260 & RR5280	10.8	6.7	2.7	9.0
RD5220	9.2	5.7	2.3	7.5
RD5220 with productivity package	10.5	6.5	2.9	9.5
RD5260 & RD5280	10.8	6.7	2.9	9.5

Drive Brake

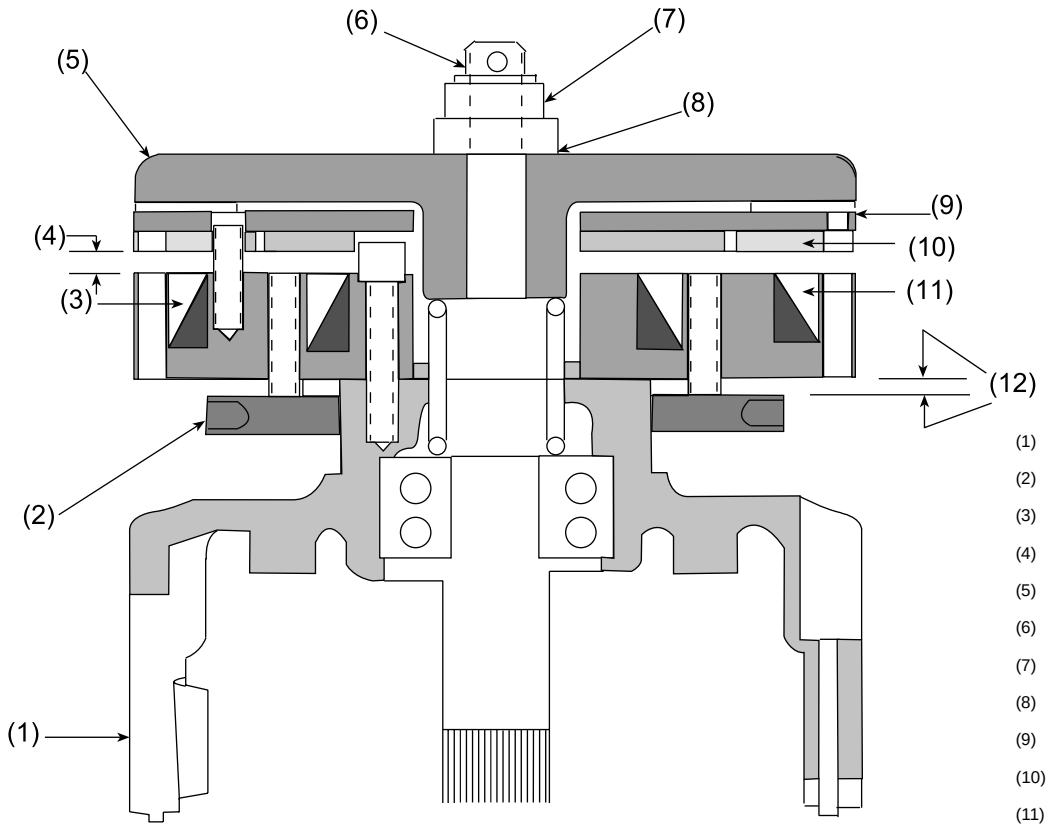
Air Gap Adjustment

The "air gap", referred to on this truck, is the distance between the brake armature and the electromagnet body with brakes applied (see Figure 16799). As the brake pads and rotor wear normally, the air gap will increase and should be readjusted, or parts checked and replaced, when it exceeds 1.0 mm (0.040 in).

NOTE

If the air gap measures more than 1.0 mm (0.040 in), the brake may not release properly. If the brake pad thickness is less than 2.8 mm (0.110 in), the brake pads and rotor should be replaced.

1. Chock load wheels. Open power unit doors to access brake assembly.
2. Using low pressure air, remove any dirt between armatures and magnet body.
3. To minimize the risk of possible damage to the encoder, remove encoder.
4. Loosen the 7/8 in locknut.
5. Turn the 1-1/8 in hex nut down until the air gap is 0.25 mm (0.010 in) at its tightest location. One complete turn of the nut will change the gap 1.4 mm (0.056 in) or a 1/6 (60 degree) turn will change the gap 0.235 mm (0.009 in).
6. Torque the 7/8 in locknut to 122 Nm (90 ft lb).
7. Install encoder. Apply blue thread locking adhesive (061004-026) to set screw.
8. After adjustment has been completed, remove chocks and check for proper operation.



(1) Drive Motor
(2) Torque Adjuster Plate
(3) Electromagnet
(4) Air Gap
(5) Rotor
(6) Motor Shaft
(7) 7/8 in Hex Nut
(8) 1 1/8 in Hex Nut
(9) Armature
(10) Brake Pads
(11) Electromagnet
(12) Torque Adjuster Gap

Figure 16799

Torque Gap Adjustment

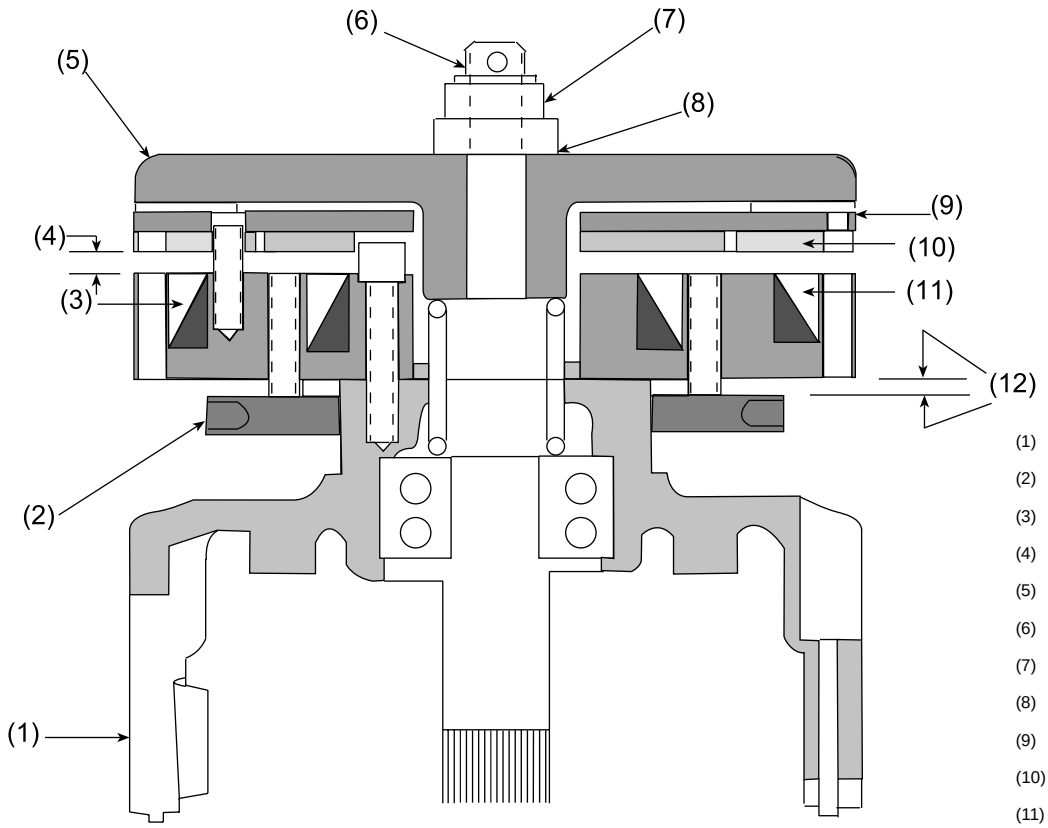
The "torque gap", referred to on this truck, is the distance between the torque adjuster plate and the electromagnet (see Figure 16799). The torque plate is factory preset and no adjustment is required, however, through routine maintenance it may be necessary to replace components and the gap may need to be reset to factory specifications. The torque gap will vary with each trucks GVW.

NOTE

Refer to the capacity plate for truck GVW as equipped with maximum battery and capacity load.

Chart 2 Torque Gap Adjustment

Torque Gap		GVW (capacity load and maximum battery	
mm	inch	kg	lb
0.00	0.00	greater than 6960	greater than 15350
0.50	0.02	6645 - 6960	14650 - 15349
1.00	0.04	6330 - 6644	13950 - 14649
1.50	0.06	5990 - 6329	13200 - 13949
2.00	0.08	5670 - 5989	12500 - 13199
2.50	0.10	5350 - 5669	11800 - 12499
3.00	0.12	5010 - 5349	11050 - 11799
3.50	0.14	4695 - 5009	10350 - 11049
4.00	0.16	4375 - 4694	9650 - 10349
4.50	0.18	4035 - 4374	9650 - 10349
5.00	0.20	less than 4035	less than 8900



(1) Drive Motor
(2) Torque Adjuster Plate
(3) Electromagnet
(4) Air Gap
(5) Rotor
(6) Motor Shaft
(7) 7/8 in Hex Nut
(8) 1 1/8 in Hex Nut
(9) Armature
(10) Brake Pads
(11) Electromagnet
(12) Torque Adjuster Gap

Figure 16799

Brake Assembly

Before assembling brake, inspect all components for wear, grooves, nicks or other damage. If any abnormal wear or damage appears that may affect brake operation, replace with new parts. Assemble brake as follows:

1. Turn torque adjuster plate down as far as possible to reduce spring force.
2. Apply a light coat of multipurpose grease (063002-024) to the motor end cap threads and on top of the torque adjuster plate.
3. Position the magnet body on the motor so the coil wires are positioned as shown in (Figure16800). Apply blue thread locking adhesive (061004-026) to the three screws and secure magnet to motor with screws.
4. Assemble springs, inner and outer armatures to magnet body. Apply a light coat of multipurpose grease (063002-024) to entire bottom of (119046) brake pad plate assembly. Be careful not to contaminate brake pads with grease.
5. Install compression spring over armature shaft.
6. Slip rotor on motor shaft, hub first. Thread hex nut onto motor shaft. Turn the nut down until the rotor moves down and almost touches the brake pads. Proper air gap adjustment will be made later.
7. Thread nut onto motor shaft. Add flatwasher(s) and place retaining ring on motor shaft.
8. Set torque adjuster gap to its original factory setting. See Torque Gap Adjustment procedures.
9. Connect wire harness to brake assembly.
10. Adjust air gap. See Air Gap Adjustment procedures.
11. Check brake operation and stopping distance. See adjustment procedures in truck settings section of this manual.

(1) Retaining Ring
(2) Flatwasher
(3) 7/8 in Locknut
(4) 1 1/8 in Hex Nut
(5) Brake Pad Plate Assembly
(6) Rotor
(7) Compression Ring
(8) Outer Armature
(9) Inner Armature
(10) 24 Volt Wire Position
(11) Springs
(12) 36 Volt Wire Position
(13) Magnet Body
(14) Torque Plate

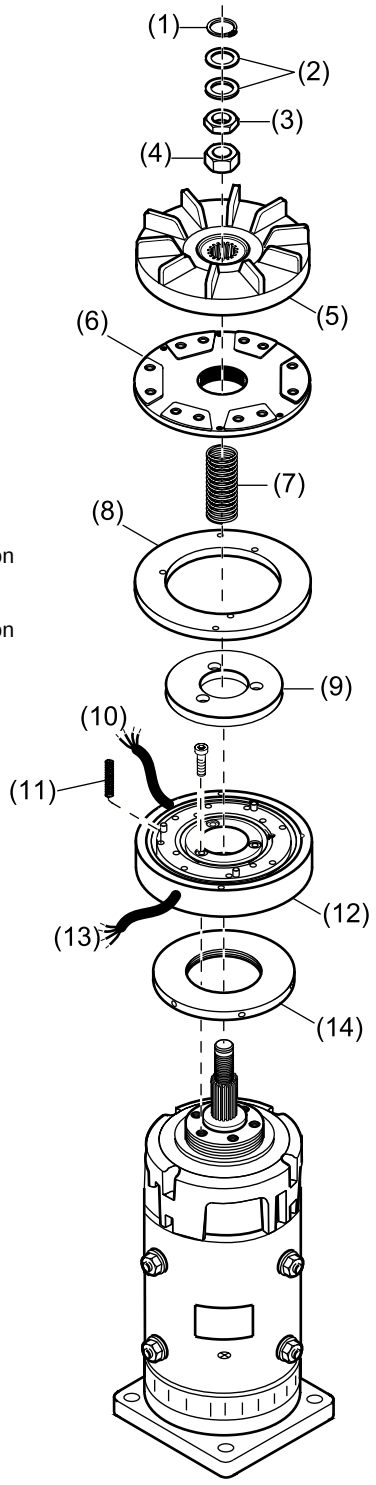
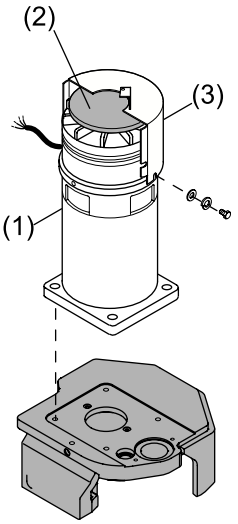


Figure 16800

Fan Shroud Installation ("EE" Trucks Only)

After completion of brake installation and adjustment, install fan shroud as follows:

1. Temporarily place a 3.3 to 3.5 mm (0.13 to 0.14 in) thick spacer plate on top of rotor fins to allow for proper clearance.
2. Mount back half of shroud with top inner face of shroud resting on spacer plate and make certain it rests evenly against spacer plate so shroud face is parallel with top of rotor fins. Refer to (Figure 16801).
3. Tighten the shroud-to-motor mounting screws.
4. Remove the spacer from between the shroud and rotor.



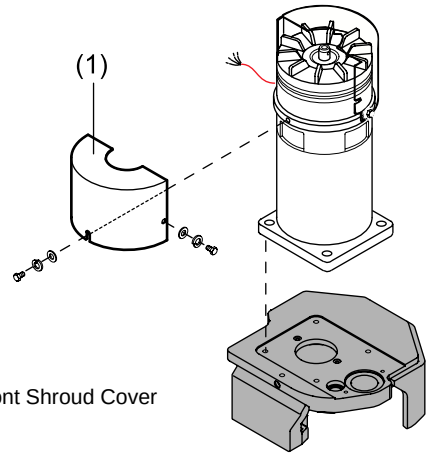
(1) Drive Motor
(2) Spacer Inserted to Mount Rear Shroud
(3) Rear Shroud

Figure 16801

CAUTION

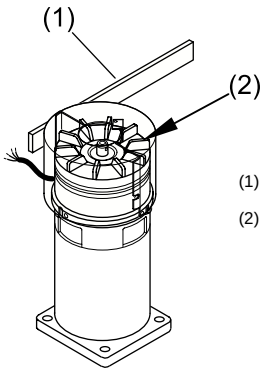
Failure to remove spacer can cause serious damage to the shroud and brake rotor assembly.

5. Place the outer half of the shroud on the motor, routing the brake wire harness through grommet in shroud. Refer to (Figure 16802).
6. Place a straight edge across top of both shroud halves and position outer shroud half so straight edge is flat across top of both halves when placed in any position. Refer to (Figure 168003).
7. Refer to (Figure 16803) and check for a 0.8 mm (1/32 in [0.032 in]) maximum gap on top of shroud (between the two halves).
8. Tighten the shroud to motor and shroud to shroud mounting screws and recheck top gap.



(1) Front Shroud Cover

Figure 16802



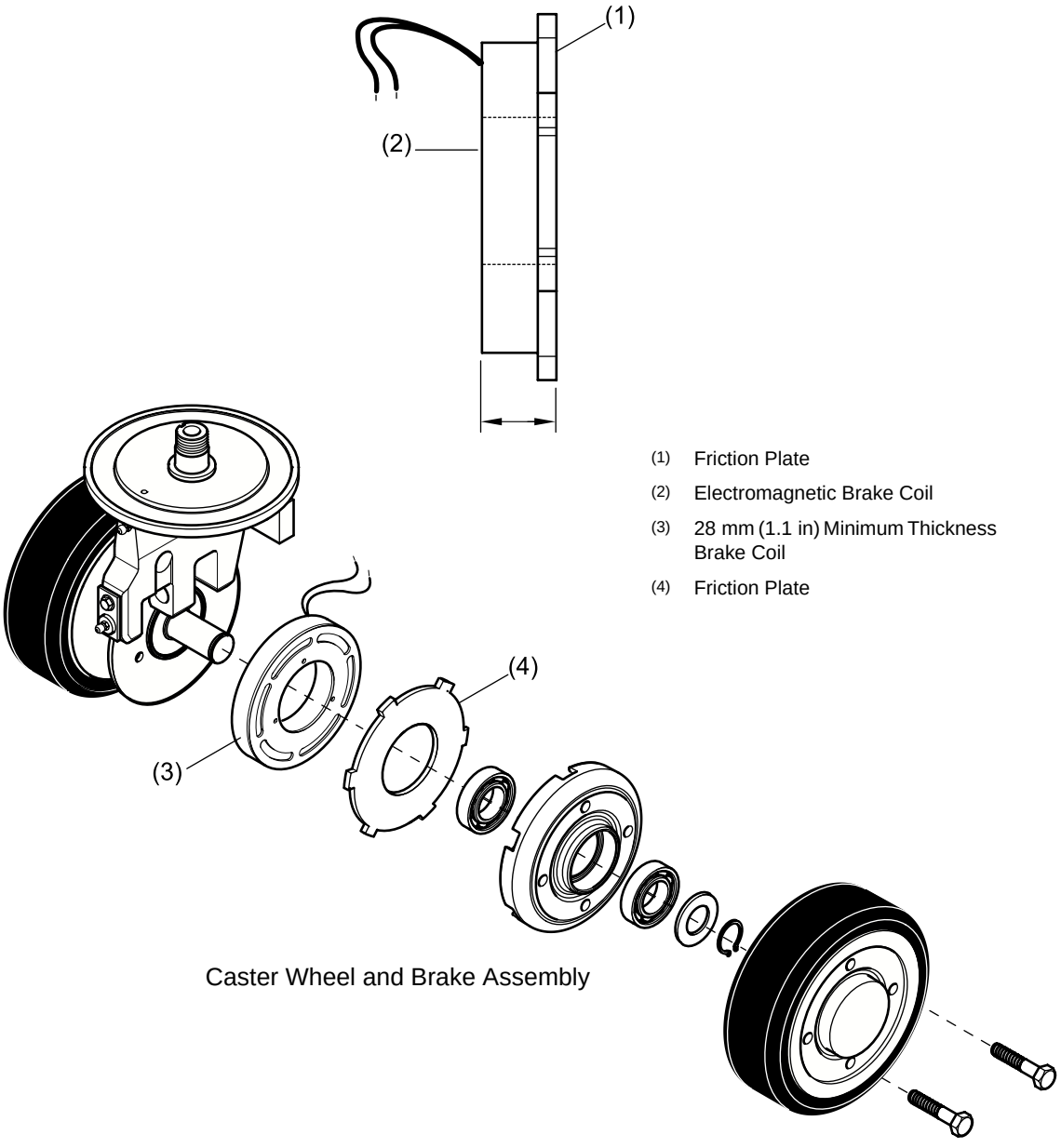
(1) Straight Edge
(2) 0-0.8 mm (0-0.032 in)

Figure 16803

Caster Brake

Two Electromagnetically applied friction brakes are located in the caster wheel assembly. Caster brakes on all RR/RD 5200S Models are factory preset and no adjustments to the components can be made. Refer to Stopping Distance in this section for detailed instructions on adjusting braking via Access 1.

Should a status code for the caster brake be shown, check for the minimum component thickness (Figure 16804). If the caster brake dimension falls below the minimum thickness of 28 mm (1.1 in), replacement of both the friction plate and electromagnetic coil is required.



(1) Friction Plate
(2) Electromagnetic Brake Coil
(3) 28 mm (1.1 in) Minimum Thickness Brake Coil
(4) Friction Plate

Caster Wheel and Brake Assembly

Figure 16804

Chart 3 Troubleshooting Brake System		
Problem	Probable Cause	Remedy
Brakes will not release	Air gap more than 1.0 mm (0.040 in)	Adjust
	Open circuit in brake circuitry or wiring	Check floorboard switches and all associated wiring
	Armatures movement restricted by dirt, foreign material	Clean with low pressure air
Brake drag	Air gap more than 0.25 mm (0.010 in)	Adjust
	Brake pad mounting plate or rotor distorted	Replace
	Armatures movement restricted by dirt, foreign material	Clean with low pressure air
Brakes grab	Incorrect stopping distance adjustment	Adjust (see P6/P7 Section M4.3)
	Brake pad mounting plates or rotor distorted	Replace
Stopping distance too long	Incorrect stopping distance adjustment	Adjust (see P6/P7 Section M4.3)
	Brake pad loose or soiled with grease	Replace
Abnormal noise and chatter when brakes applied	Brake pad mounting plates or rotor distorted	Replace
	Brake pads worn out, loose, soiled with grease, foreign material embedded	Replace
Abnormal braking force for lift height or brakes applied without request	Rotor thin, cracked or spline worn	Replace
	Open circuit in brake circuitry or wiring	Check all switches and associated wiring

RR/RD 5200 SERIES

Your truck is equipped with a hydraulic steering system. A hydrostatic steering control unit, located in the power unit, is coupled via hydraulic hoses to the steering motor, mounted on the drive carriage, used to actuate the steering.

HYDROSTATIC STEERING UNIT

The hydrostatic steering unit (open center non-reaction) mounts in the power unit below the steering tiller. The non-reaction unit maintains the steered position when the operator releases the steering tiller. The cylinder ports are blocked in the neutral valve position. The operator must steer the drive wheel back to the straight ahead position.

The steering unit meters a proportional amount of oil to the steering motor when the tiller is rotated. This pressurized oil is supplied by the P1 pump, and is supplied to the appropriate side of the steering motor by the direction of rotation of the steer control unit via the steering tiller. When the steering tiller rotation is stopped the steer motor ports are blocked to hold the steering in that position. In the event that pump flow is stopped, the steer unit can be manually rotated to "pump" flow to the appropriate motor port by turning the steering tiller in the desired direction, thus allowing emergency steering.

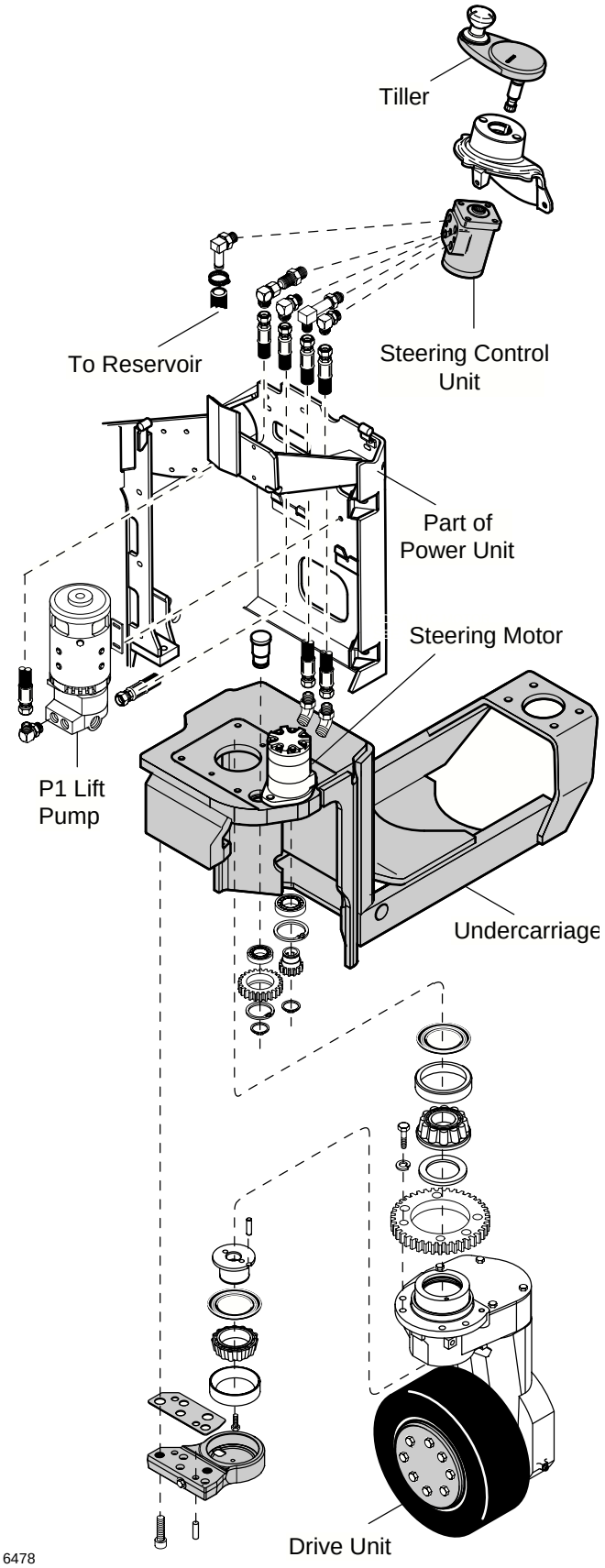
Steer circuit relief pressure is non-adjusting and pre-set to 59.850 kPa (1,250 psi). Normal steering pressures are 19.150 - 28.730 kPa (400-600 psi).

FORWARD AND REVERSE STEERING

The steering on your truck can be changed from forward steering to reverse steering by reversing the hydraulic lines at the steering motor. Care should be exercised when maintenance is performed on the steering system to return the truck to the proper steering mode upon completion.

NOTE

Prior to disassembly the service technician should determine the steer direction of the truck, upon completion of the maintenance, steer direction should be checked to insure that it is set for the desired direction and functioning properly.



6478

Hydraulic Steer Motor

Disassembly

Cleanliness is extremely important when repairing hydraulic motors. Work in a clean area. Before disconnecting hydraulic lines, clean port area of motor. Before disassembly, drain oil from motor. Then plug ports and thoroughly clean exterior of motor. Check output shaft, remove any burrs, nicks, or sharp edges.

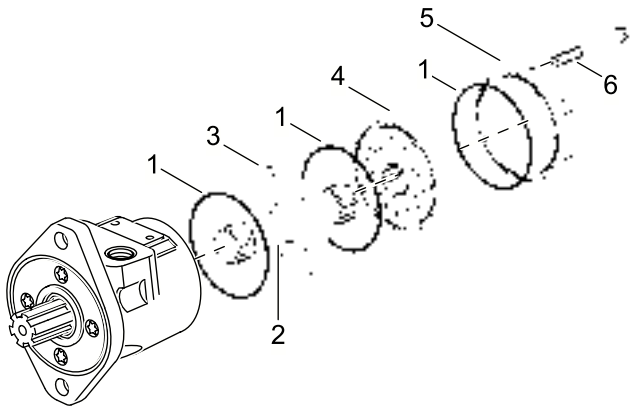


Figure 21925

1. Seal
2. Drive
3. Spacer Plate
4. Geroler
5. End Cap
6. Cap Screw

Tools Required:

- Torque wrench, 34 Nm (25 ft lb) capacity
- Ratchet wrench
- 5/16 in - 12 point heavy duty socket, 56 Nm (41.3 ft lb) capacity
- 5/16 in - 6 point/torx (E10) heavy duty socket, 56 Nm (41.3 ft lb) capacity
- Small flat blade screwdriver
- 3/16 in hex key
- Rubber hammer

1. Using protective material on vise jaws, clamp motor in a vise so shaft is vertical and end cap is on top. Clamp on mounting flange, using just enough clamping force to securely hold motor.
2. Remove screws (6) from end cap (5) and disassemble motor as shown in Figure 21925. Do not disassemble geroler (4).
3. Refer to Figure 21926. Unclamp motor and remove output shaft (3), thrust needle bearing (2) and thrust bearing race (1).

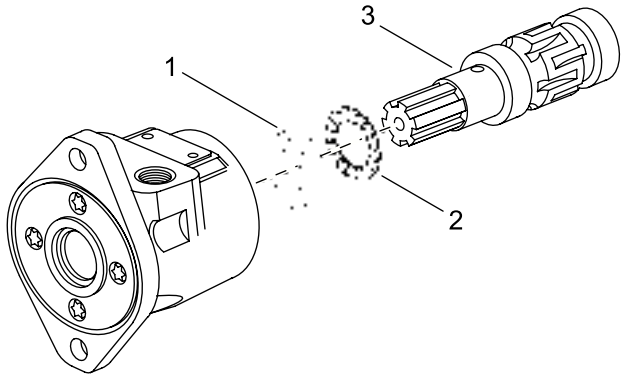


Figure 21926

1. Thrust Bearing Race
2. Thrust Needle Bearing
3. Output Shaft

4. Clamp motor in vise so mounting flange is on top. Clamp across port area. Do not clamp on motor housing. Use just enough clamping force to hold motor securely.
5. Remove screws securing mounting flange to motor housing.

CAUTION

Thread locking adhesive was applied to screws during assembly. Do not exceed 56 Nm (41.3 ft lb) of removal torque.

Refer to Figure 21927. Since thread locking adhesive was applied to screws, heat may have to be applied to motor housing to loosen screws. Use propane torch and apply just enough heat to remove screws (1). Do not overheat motor housing or mounting flange.

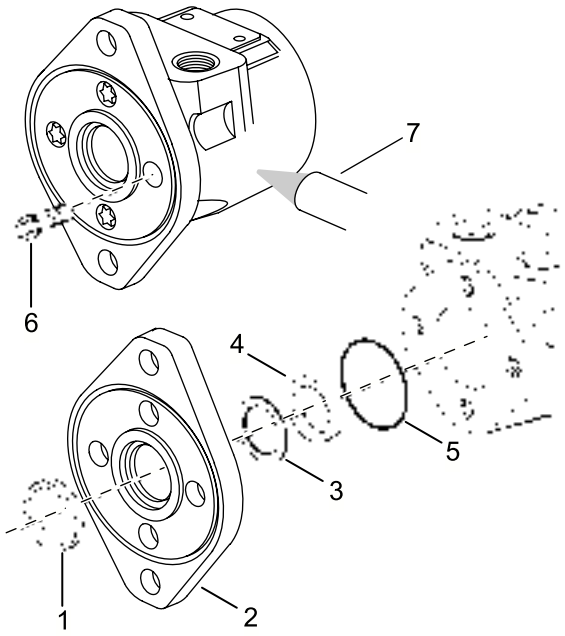


Figure 21927

1 Exclusion Seal
2 Mounting Flange
3 Back-Up Ring
4 Pressure Seal
5 Seal
6 Cap Screw
7 Heat with a propane torch

6. Remove mounting flange (2) from motor housing.
7. Carefully remove exclusion seal (1), pressure seal (4) and backup ring (3) from mounting flange (2). A seal removal tool may be fabricated by bending and rounding the end of a small flat blade screwdriver, refer to Figure 21928. Be careful to not damage the mounting flange shaft bore.

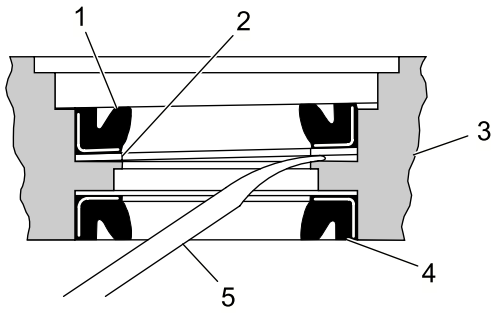


Figure 21928

1 Pressure Seal
2 Back-Up Ring
3 Mounting Flange
4 Exclusion Seal
5 Seal Removal Tool

Steer Motor Assembly

Check all mating surfaces. Replace any parts with scratches or burrs that could cause leakage. Wash all metal parts in clean solvent. Blow dry with low pressure air. Do not wipe parts dry with paper towels or cloth. Lint in a hydraulic system will cause damage. Check spline and chamfered area of output shaft; remove any nicks, burrs, or sharp edges that could damage shaft seals during assembly.

NOTE

Always use new seals when assembling hydraulic motors. Lubricate new seals with clean petroleum jelly. Also, lubricate machined surfaces and bearings with clean hydraulic fluid.

1. Remove all thread locking adhesive from mounting flange screws and their threaded holes. Threads must be clean and dry before applying new thread locking adhesive.
2. Refer to Figure 21926. Lubricate and install output shaft (3), thrust needle bearing (2) and bearing race (1) into housing. Do not allow oil to enter cap screw threaded holes.
3. Refer to Figure 21927 for correct seal orientation. Lubricate exclusion seal (1) and install in mounting flange (2).

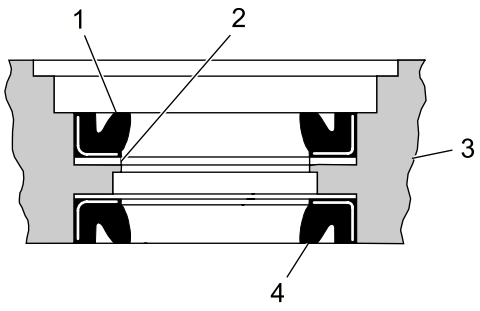


Figure 21929

1 Pressure Seal
2 Back-Up Ring
3 Mounting Flange
4 Exclusion Seal

4. Refer to Figure 21929. Lubricate and install backup ring (2) and pressure seal (1). Be sure exclusion seal (4) and pressure seal (1) are undamaged and properly seated.
5. Apply thread locking adhesive (061004-019) to mounting flange cap screw threaded holes in motor housing.

NOTE

Thread locking adhesive must cure completely before motor is put into service. Using primer reduces curing time. For curing time, refer to thread locking adhesive manufacturer instructions.

6. Install a protective sleeve over output shaft. Lubricate inner edges of exclusion and pressure seals. Lubricate and install the 49 mm (1 15/16 in) diameter o-ring seal on mounting flange. Slide mounting flange over shaft.
7. Remove protective sleeve and install the four cap screws. Torque cap screws, in a crisscross pattern, to 28 Nm (20.7 ft lb). Be sure output shaft remains in housing.
8. Securely clamp motor in vise so output shaft is vertical and down. Clamp on mounting flange.
9. Pour clean hydraulic fluid into motor to provide start-up lubrication.
10. Lubricate and install one of the three largest diameter seals in motor housing groove.
11. Install drive. If splined ends of drive are different lengths, install longer end into shaft.

Motor Timing

12. Refer to Figure 21930. Align shaft timing dot (3) with any bolt hole (5). Bolt hole will be used for timing reference.

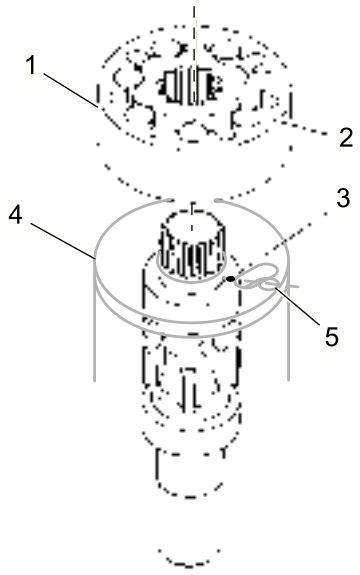


Figure 21930

1 Geroler
2 Star Point
3 Timing Dot
4 Spacer Plate
5 Threaded Hole for Timing Dot Reference

13. Install spacer plate (4), and note position of threaded hole in housing (aligned with timing dot on shaft). Be sure slots in spacer plate provide passage for hydraulic fluid as well as cap screws. If spacer plate is improperly installed (wrong-side-up), the motor will not operate.
14. Lightly stretch, lubricate and install the second of three large diameter seals in geroler (1).
15. Install geroler (1).
16. Align any star point (2) with threaded hole (noted for location of timing dot).
17. Rotate the geroler (1) to align the screw holes.
18. Lubricate and install the last of the three large diameter seals in end cap groove.
19. Install end cap and secure with cap screws. Torque cap screws, in a crisscross pattern, to 34 Nm (25 ft lb).

This page available for **NOTES.**

Mast

Torque Requirements

- The four, 20 mm (0.75 in) diameter bolts that fasten the lower portion of the power unit to the main frame base plate torque must be 305 - 340 Nm (225 - 250 ft lb).
- The two, 15.8 mm (0.625 in) diameter bolts that fasten the upper portion of the power unit to the main frame torque must be 225 - 250 Nm (165 - 185 ft lb).
- The four, 15.8 mm (0.625 in) diameter bolts that secure the removable load wheel assemblies to the main frame outriggers torque must be 225 - 250 Nm (165 - 185 ft lb).
- The four, 3/8-16 nuts that secure the free lift cylinder clamps (two for each clamp) and cylinder to the third stage mast torque must be 41 - 48 Nm (30 - 35 ft lb).

Fork Adjustments

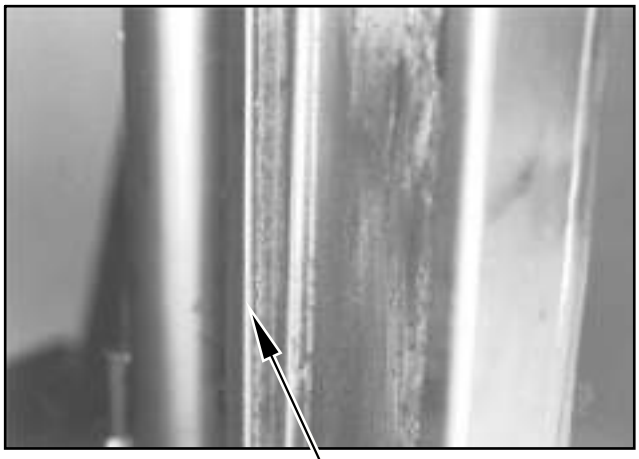
- With the forks completely lowered and level, adjust so that the top surface of the fork tip is a maximum of 65 mm (2.5 in) from the floor.
- Maximum fork height is to be within ± 25 mm (± 1.00 in) of the fork height specified on the truck data plate.

Mast Testing (Assembled)

WARNING

Wear appropriate items, such as safety glasses, whenever performing maintenance work. Do not place fingers, hands or arms through mast or position them at pinch points.
In this section you may be required to lift and block the truck and mast or raise and lower different components for removal and installation. Make sure lifting device and sling are sufficiently rated to withstand the weight being lifted. Never work under or around a truck that is not properly secured. Refer to truck Data Plate for truck weight information.
It will be necessary to disconnect and remove the battery from the truck, disconnect tilt cylinders from the mast, disconnect electrical connections and hydraulic lines. "Control of Hazardous Energy" section provides information for performing the above procedures along with some additional information on other procedures dealing with truck maintenance. This section should be read and reviewed prior to mast removal, installation and maintenance as outlined in this section.

1. Inspect each channel for the roller tracking path. The only area that should show wear is the back portion of the I-beam where the roller rides. Refer to Figure 17058. The I-beam should not show signs of any cutting or grooving. If grooving or cutting is evident, it will normally take place at the side of the roller; 10 mm (0.375 in) from the channel face. If this type of wear is evident, a shim will have to be removed.
2. Once an adjustment has been made by removing or adding shims, a recheck of the mast channel will be required. To see the new wear pattern, clean the channel with a solvent that will remove the lubricant and then wipe with a cloth. Spray the channel with a thin coat of paint. This will allow a visible indication of where the rollers are riding. Repeat as required.
3. Once the mast meets requirements, lubricate mast with grease, Crown No. 063002-024 for standard or 063002-017 for freezer/corrosion application. When the mast is raised near full extension, it should not lean right or left; instead it should appear even and straight. If a leaning condition exists, it is a sign that the shimming is to loose or unbalanced and will need to be adjusted.



Channel Should Only Show Wear Here

Figure 17058

Flaking

It is not uncommon for a new mast to appear as if it is flaking or peeling. This appearance is an indication the rollers are seating to the mast channel and is considered normal. Eventually, this condition will disappear. Grease applied to the channel will retain these particles.

Mast Staging Bumper Replacement

1. Refer to Figure 17059
2. Raise mast and replace bumper, item 56.
3. Lower mast and check that mast bumpers contact their stops at the same time. Adjust by adding or removing shims as required. Use shim 060030-277 (0.8 mm [0.031 in] thick).
4. Apply thread locking adhesive to bumper screws and tighten.

Mast Dampening Screws

The mast dampening screws are located at the bottom of the main frame, top and bottom of the second stage mast and at the top of the third stage mast.

ADJUSTMENT:

1. Refer to Figure 17059. Lower mast completely.
2. Adjust mast dampening screws, item 56 until they just touch the mast roller directly behind each screw. Apply thread lock adhesive to the screws.

NOTE

Height Encoder is standard on collapsed heights above 3025 mm (119 in) and optional on 3025 mm (119 in) and below. HGTS12 switch is not required if height encoder is present.
HGTS12 switch is standard on 3025 mm (119 in) and below collapsed heights.

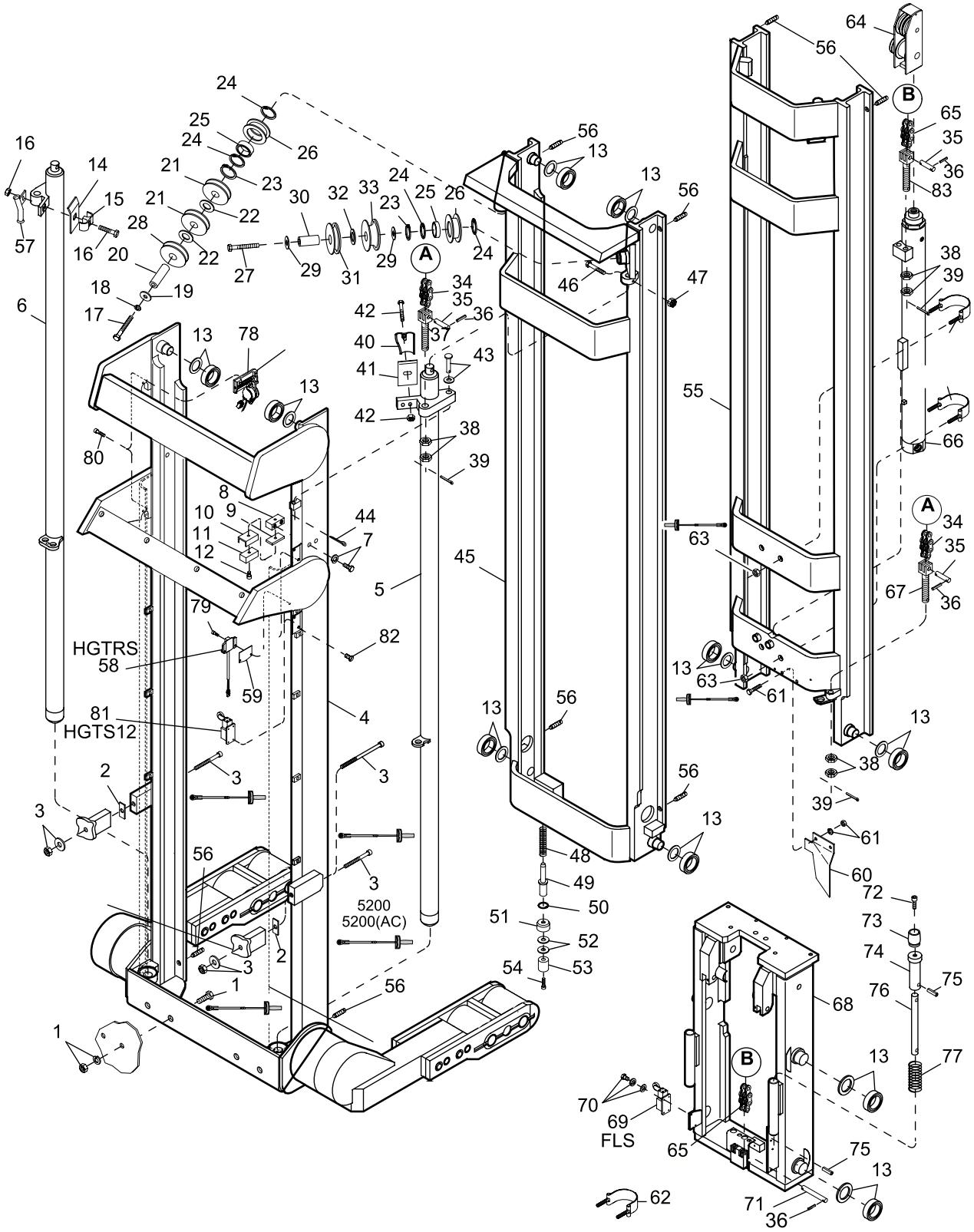


Figure 17059

Disassembly

WARNING

Wear appropriate items, such as safety glasses, whenever performing maintenance work. Do not place fingers, hands or arms through mast or position them at pinch points.
In this section you may be required to lift and block the truck and mast or raise and lower different components for removal and installation. Make sure lifting device and sling are sufficiently rated to withstand the weight being lifted. Never work under or around a truck that is not properly secured. Refer to truck Data Plate for truck weight information.
It will be necessary to disconnect and remove the battery from the truck, disconnect tilt cylinders from the mast, disconnect electrical connections and hydraulic lines. "Control of Hazardous Energy" section provides information for performing the above procedures along with some additional information on other procedures dealing with truck maintenance. This section should be read and reviewed prior to mast removal, installation and maintenance as outlined in this section.

1. Extend reach assembly, disconnect and remove battery.
2. Remove load backrest and forks from carriage.
3. Remove safety shield.
4. Refer to Figure 17059. Connect lifting device to carriage assembly and raise to get slack in chains. Remove yoke and chains, items 64 & 65, from free lift cylinder. The seals at the top of the free lift cylinder can be replaced if required.

NOTE

The reach assembly can be kept in an upright position much easier if it is extended. Block reach assembly to prevent premature retraction.

5. Unhook chains, control cables and hydraulic lines from carriage assembly and lower carriage to floor.
6. Connect hoist to top cross-brace of third stage mast and raise until reach assembly can be slid forward to clear mast. Lower mast to the collapsed position.
7. Removal of free lift cylinder.
   – Remove guard, item 60.
   – Remove hydraulic tube from free lift cylinder. Have container in position to catch oil from cylinder.
   – Use cylinder clamp or braided strap around cylinder just below chain anchor and connect to lifting device.
   – Remove clamps, item 62, holding free lift cylinder and remove cylinder.
8. Secure lifting device to third stage mast and raise to obtain slack in chains.
9. Remove guides, items 14, 15, 40, 41 & 57, from lift cylinders, right and left hand sides.
10. Remove control cables, hydraulic lines, chains and pulleys from top of second stage mast and bottom of third stage mast. Note position of all components, right and left hand sides are different.
11. Use lifting device to lift third stage mast out top of second stage mast. Lay third stage mast on floor.
12. Remove height sensor, cable, spring and bracket, items 59, 78, 79 & 83. Or remove height switch, item 81.
13. Connect lifting device to top cross brace of second stage mast. Raise slightly, remove screw and nut, items 46 & 47, that secure lift cylinder rams to second stage mast. The seals at the top of the lift cylinders can be replaced if required.
14. Raise second stage mast until stop block on main frame can be accessed thru hole at bottom of second stage mast. Remove stop block, items 7 thru 12, from main frame.
15. Raise and remove second stage mast from top of main frame. Lay second stage mast on floor.
16. Most repairs can be completed without removing the lift cylinders, however if their removal is required remove cross tube from left lift cylinder and from right hydraulic tube on right lift cylinder. Use container to catch oil.
17. Remove right hydraulic tube from right lift cylinder and from main frame. Use container to catch oil.
18. Use cylinder clamp or braided strap around left lift cylinder just below anchor block and connect to lifting device.
19. Remove cotter pin and clevis pin, items 43 & 44.

20. Remove left lift cylinder from main frame.
21. Repeat procedure, steps 20 thru 22, to remove right lift cylinder.

If the amount of overhead room will not allow the masts to be raised enough for removal, the mast assembly will need to be unbolted from the power unit and laid down. The following procedure should be followed if removal from the power unit is necessary.

WARNING

Wear appropriate items, such as safety glasses, whenever performing maintenance work. Do not place fingers, hands or arms through mast or position them at pinch points.
In this section you may be required to lift and block the truck and mast or raise and lower different components for removal and installation. Make sure lifting device and sling are sufficiently rated to withstand the weight being lifted. Never work under or around a truck that is not properly secured. Refer to truck Data Plate for truck weight information.
It will be necessary to disconnect and remove the battery from the truck, disconnect tilt cylinders from the mast, disconnect electrical connections and hydraulic lines. "Control of Hazardous Energy" section provides information for performing the above procedures along with some additional information on other procedures dealing with truck maintenance. This section should be read and reviewed prior to mast removal, installation and maintenance as outlined in this section.

1. Refer to Figure 17059, disconnect and remove battery.
2. Remove load backrest, forks and carriage assembly. Refer to previous disassembly procedure.
3. Remove safety shield and overhead guard.
4. Disconnect cables and hydraulic lines from power unit to mast assembly. Use container to catch hydraulic fluid.
5. Raise the rear of the truck enough to get a 100x100x900 mm (4x4x36 in) hardwood block under the base plate of the power unit and the base plate of the mast assembly. This block should carry the weight of the power unit and the mast assembly when the mounting bolts are removed. The block is positioned parallel with the base plates.
6. Loosen the four, 20 mm (0.75 in) bolts at the base plate.
7. Attach lifting device to the top of the main frame: raise just enough to take the weight off of the hardwood block.
8. Remove the two, 15.8 mm (0.625 in) bolts at the top of the power unit. The weight of the power unit and mast assembly should be on the hardwood block at this time.
9. Remove the four, 20 mm (0.75 in) bolts across the base of the power unit.
10. Roll the mast assembly away from the power unit.
11. Move the mast assembly to an area large enough to allow the mast to be laid down and disassembled.
12. Lower the mast assembly, with the outriggers up, very carefully. Keep the lifting device directly over the top of the main frame while lowering to prevent the base plate from sliding on the floor.
13. Refer to the disassembly procedures in this section at this time if further disassembly is required.

NOTE

With the mast assembly laid down, the cylinder and mast assemblies must be removed by making all hook ups with the lifting device as near the center of the assembly as possible to maintain balance.

Assembly

NOTE

Before assembly, refer to torque requirements, fork adjustment and mast staging procedures located in the first part of this section.

CAUTION

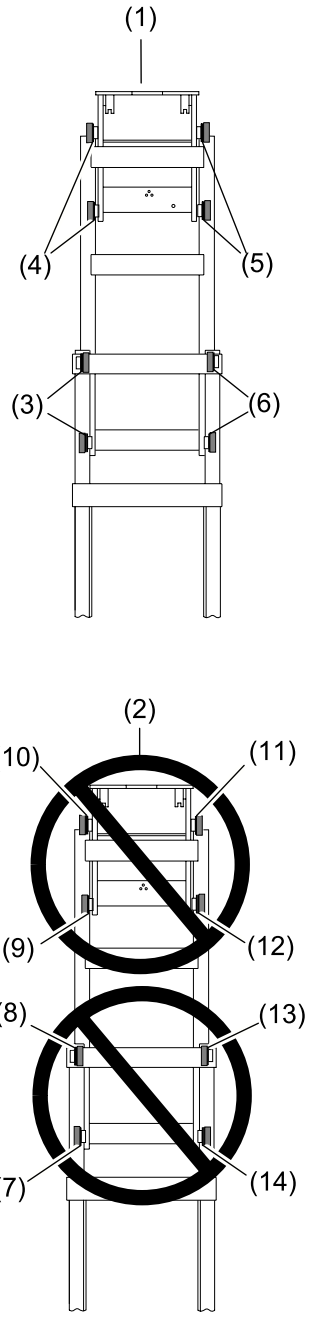
Always block masts when working on masts in an elevated position, even though connected to a hoist.

1. Refer to Figure 17059. Use cylinder clamp or braided strap around right lift cylinder just below anchor block and connect to lifting device.
2. Lift and position right lift cylinder in main frame. Secure to main frame with clevis pin and cotter pin, items 43 & 44.
3. Using lifting device, lift and position left lift cylinder in main frame. Secure to main frame with clevis pin and cotter pin, items 43 & 44.
4. Connect right hydraulic tube to right lift cylinder.
5. Install left cross tube to left lift cylinder and right tube.
6. Clean column roller studs at the top of the main frame and bottom of second stage mast. If any paint or rust is evident on the studs, remove with emery cloth and lubricate with grease, Crown No. 063002-024 for standard or 063002-017 for freezer/corrosion application.
7. Install two shims on each of the four studs, two at the top of the main frame and two at the bottom of the second stage mast. Use shim 060030-085 on RR 1585 kg (3500 lb) capacity mast, or shim 060030-130 on RR 2040 kg (4500 lb) and RD 1360 kg (3000 lb) capacity masts. Place one roller on each stud.
8. Attach lifting device to top cross member of second stage mast, lift and assemble second stage into main frame.
9. Once the mast has been reassembled, the column rollers ride and clearance should be checked.
10. Use lifting device to raise second stage mast so the rollers are about 150 to 200 mm (6 to 8 in) below the mounting holes for the stop block, item 8, in the main frame.
11. Use a pry bar to shift the mast channels to one side. Pry on the opposite side to shift it against the other side, then go back and pry on the original side to shift it back again. This will seat the rollers and force the opposite side tight against the mast channel. This is necessary to allow for accurate roller to channel clearance measurement. Once the mast has shifted, retain light pressure to hold the mast from slipping back.

WARNING

Wear appropriate items, such as safety glasses, whenever performing maintenance work. Do not place fingers, hands or arms through mast or position them at pinch points.
In this section you may be required to lift and block the truck and mast or raise and lower different components for removal and installation. Make sure lifting device and sling are sufficiently rated to withstand the weight being lifted. Never work under or around a truck that is not properly secured. Refer to truck Data Plate for truck weight information.
It will be necessary to disconnect and remove the battery from the truck, disconnect tilt cylinders from the mast, disconnect electrical connections and hydraulic lines. "Control of Hazardous Energy" section provides information for performing the above procedures along with some additional information on other procedures dealing with truck maintenance. This section should be read and reviewed prior to mast removal, installation and maintenance as outlined in this section.

12. Measure the distance between the channel and the roller, about 10 mm (0.375 in) from channel face. Always measure from the side the rollers are canted toward. If the dimension is greater than 0.79 mm (0.031 in) add another shim behind the roller. If the dimension is less than 0.76 mm (0.030 in) and it does not appear to be tight, proceed in checking the remaining channel rollers. Lower the second stage and check running clearance. If shims need to be added, remove second stage mast, add shims as required, and install second stage mast back into main frame.
13. Accurate measurements can only be checked from one side. Once the previously described dimensions are obtained, the mast channel rollers for the second stage to main frame will be within tolerance. When shims are installed it is always ideal to have an equal number of shims on each column roller stud. If an unequal number of shims are required, it is very important that an equal distribution of shims per side be followed. Refer to Figure 16950.



(1) Correct
(3) 2 Shims (Mast)
(4) 1 Shim (Carriage)
(5) 2 Shims (Carriage)
(6) 1 Shim (Mast)
(2) Incorrect
(7) 1 Shim (Mast)
(8) 2 Shims (Mast)
(9) 1 Shim (Carriage)
(10) 2 Shims (Carriage)
(11) 1 Shim (Carriage)
(12) 2 Shims (Carriage)
(13) 1 Shim (Mast)
(14) 2 Shims (Mast)

Figure 16950

14. Brush grease on main frame and second stage rails, use Crown No. 063002-024 for standard or 063002-017 for freezer/corrosion application.
15. Raise second stage mast until access hole in mast channel is aligned with stop block mounting holes.
16. Refer to Figure 17059. Assemble stop blocks, items 7 thru 12, to main frame, apply thread lock adhesive to screws.
17. Secure tops of the cylinders to the brackets on the second stage mast using the 6.3 mm (0.25 in) screw and nut, items 46 and 47.
18. Assemble height switch, item 81, or height sensor, cable, spring and bracket, items 59, 78, 79 & 83, to mast.
19. Install two shims on each of the four studs, two studs at the top of the second stage and two studs at the bottom of the third stage mast. Use appropriate shims as indicated in step 7 of Assembly. Place one roller on each stud.
20. Attach lifting device to top cross member of third stage mast, lift and assemble third stage mast into second stage mast.
21. Use a lifting device to raise third stage mast so that rollers are about 300 to 400 mm (12 to 16 in) below the rollers at the top of the second stage mast.
22. Use a pry bar to shift the third stage mast channels to one side, then pry on the opposite side to shift it against the other side, then go back and pry on the original side to shift it back one more time. This will seat the rollers and force the opposite side tight against the second stage mast channel. Once the mast has been shifted, retain light pressure to hold the mast from slipping back.
23. Measure the distance between the channel and the roller as described in step 12. If shims need to be added, remove third stage mast and install shims as required. Install third stage mast back into second stage mast and check running clearances.
24. Brush grease, Crown No. 063002-024 for standard or 063002-017 for freezer/corrosion application, on second and third stage rails.
25. Assemble lift chains and chain pulleys to the second stage mast.
26. Connect lift chains to third stage mast.
27. Refer to Figure 17060. Assemble hydraulic hoses and pulleys, items 6 & 7, to second stage mast.

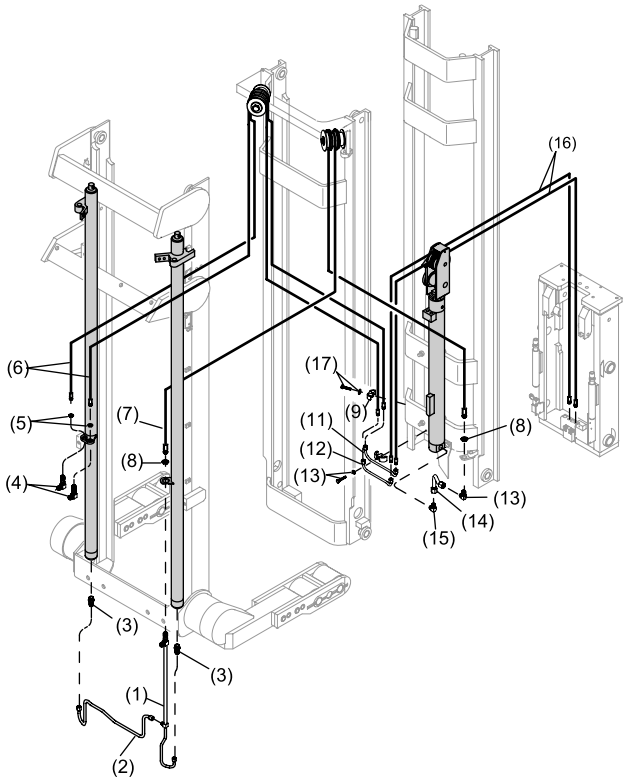


Figure 17060

28. Refer to Figure 17059. Assemble hose guides, items 14, 15, 40, 41 & 57, to lift cylinders, right and left hand sides.
29. Refer to Figure 17061. Install control cable(s) and pulley(s) on second stage mast.

NOTE

Items 8 - 13 used only when truck is equipped with load sensing and freezer condition options.

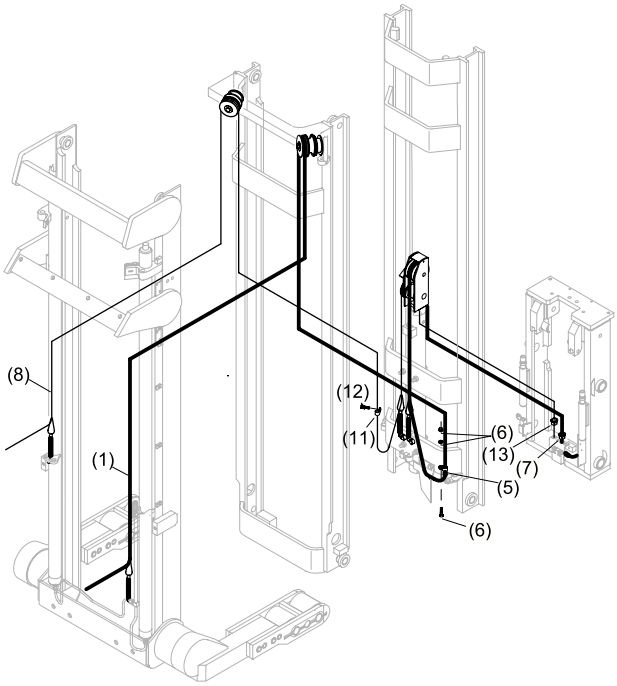


Figure 17061

30. Refer to 17059. Lower mast completely. Use cylinder clamp or braided strap and put just below chain anchor bracket on free lift cylinder, connect to lifting device.
31. Inspect free lift cylinder clamps, item 62, for fatigue cracks and replace as required. If the clamp is not the newest style clamp, part number 132466, or if clamps were installed with the cut edges of the clamp to the inside of the bend, replace clamps with new ones. Install both clamps with the cut edges of the clamp to the outside of the bend and torque nuts as specified in first part of this section.
32. Install two shims and one roller on each of the four studs on the reach assembly. Use appropriate shims as indicated in step 7 of Assembly.
33. Attach lifting device to top cross brace of third stage mast. Raise mast and position reach assembly under third stage mast and lower mast over reach assembly.
34. Attach lifting device to reach assembly and raise reach assembly up mast about 1525 mm (60 in). Check fit of reach assembly in third stage mast with pry bar to determine if it is tight. Continue to raise the reach assembly up the mast and check fit two or three more times as it is raised.

35. Raise until the top roller of the reach assembly is about 300 mm (12 in) below the top of the third stage mast. Use a pry bar to shift the reach assembly to one side and pry on the opposite side to shift it against the other side, then go back and pry on the original side to shift it one more time. This will seat the rollers and force the opposite side tight against the third stage mast channel. Once the reach assembly has been shifted, retain light pressure to hold the reach assembly from slipping back.
36. Measure the distance between the channel and the roller as described in step 12. Lower the reach assembly and remove from mast if shims need to be changed. Install reach assembly back into third stage mast and check clearances.
37. Brush grease, Crown No. 063002-024 for standard or 063002-017 for freezer/corrosion application, on third stage rails.
38. Attach free lift chains to reach assembly.
39. Install yoke on top of free lift cylinder, route free lift chain back to mast, connect to mast.
40. Refer to Figure 17060. Make connections of reach hoses to third stage mast, route thru yoke and make connections to reach assembly.
41. Refer to Figure 17061. Install control cable grip springs and harness clamps to third stage mast, route control cable(s) thru yoke and make connections to reach assembly.
42. Refer to Figure 17059. Assemble guard, item 60, over hydraulic tubes.
43. Install load backrest and forks to carriage.
44. Install safety shield.

CAUTION

Be sure all stops and safety devices are in place before cycling mast to check for proper operation.

45. Remove lifting device, install battery and check truck operation.

WARNING

AVOID HIGH PRESSURE FLUIDS - Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic lines. Tighten all connections before applying pressure. Keep hands and body away from pin holes which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.
Any fluid injected into the skin under high pressure should be considered as a serious medical emergency despite an initial normal appearance of the skin. There is a delayed onset of pain, and serious tissue damage may occur. Medical attention should be sought immediately by a specialist who has had experience with this type of injury.
Carriage hydraulic circuits need to be flushed after repair of reach cylinders and bled of all air. Before flushing and bleeding of system inspect all hydraulic connections and verify that all filters are installed and hydraulic fluid levels are adequate for test. Hydraulic system must be pressurized during the flushing and bleeding procedures.

Flushing

1. Remove hoses from side-shift cylinder and connect them together using a male connector.
2. Energize SVS side-shift solenoid selector valve, actuate manual valve at full speed in order to pump hydraulic oil through carriage hydraulics and then back through the filter.
3. Flush carriage hydraulics for at least 2 minutes, reversing flow frequently.
4. Reconnect hoses to side-shift cylinder.

Bleeding

WARNING

AVOID HIGH PRESSURE FLUIDS - Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic lines. Tighten all connections before applying pressure. Keep hands and body away from pin holes which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.

Any fluid injected into the skin under high pressure should be considered as a serious medical emergency despite an initial normal appearance of the skin. There is a delayed onset of pain, and serious tissue damage may occur. Medical attention should be sought immediately by a specialist who has had experience with this type of injury.

Carriage hydraulic circuits need to be flushed after repair of reach cylinders and bled of all air. Before flushing and bleeding of system inspect all hydraulic connections and verify that all filters are installed and hydraulic fluid levels are adequate for test. Hydraulic system must be pressurized during the flushing and bleeding procedures.

1. Remove tilt and side-shift manifold cover.
2. Use an absorbent towel or receptacle to collect the hydraulic fluid.
3. Loosen caps from "tee" fittings, ports (1) and (2) at top of tilt-side-shift manifold. Refer to Figure 17161.
4. To bleed air from the mast accessory hoses, energize retract at maximum speed. Hold retract energized for 30 seconds. This will flush all air out of mast accessory circuit.
5. Extend reach carriage to maximum extension and hold for 15 seconds. Retract reach to home position at maximum speed and hold for 15 seconds.
6. Tilt up carriage to maximum extension and hold for 15 seconds. Tilt down to home position and actuate tilt down for 15 seconds.
7. Extend side-shift cylinder to maximum extension. Energize side-shift right and hold for 15 seconds. Actuate side-shift left at maximum speed to home position and hold for 15 seconds.
8. Tighten caps to "tee" fittings, ports (1) and (2) at top of tilt and side-shift manifold. Torque 15.8 Nm (139.5 in lb). Refer to Figure 17061.
9. Clean area thoroughly.

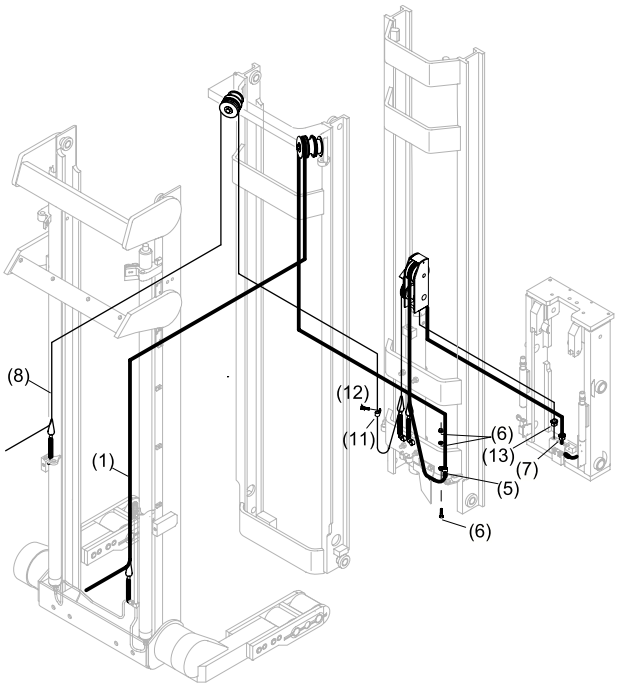


Figure 17061

Lift Chains

Lift chains are highly important components on fork lift trucks. The chain system on your mast was designed for efficient, reliable transmission of lifting force from hydraulic cylinder(s) to the mast, platform (if present) and forks. Safe, uninterrupted use of your lift truck depends on the proper care and maintenance of the lift chains.

Most complaints of unsatisfactory chain performance can be traced directly to inadequate maintenance. Highly stressed precision chains require periodic maintenance to deliver maximum service life.

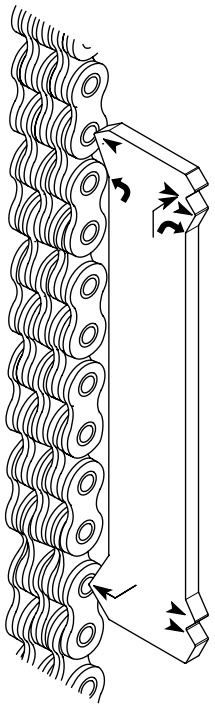
Inspection

After every 100 hours of truck operation, lift chains should be inspected and lubricated. When used in an extremely corrosive environment, inspect chains every 50 working hours. During inspection, check for the following:

Wear

As the chain flexes on and off pulleys, the joints gradually wear.

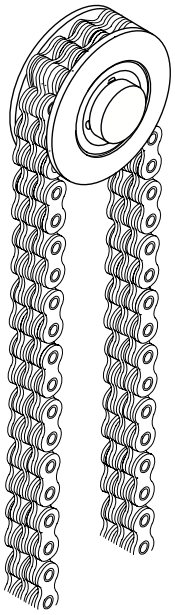
The "stretch" a chain develops during usage is due to material being worn off of pin outside diameter and pin hole inside diameter on the inside plates.



Roller and Leaf
Chain Wear Scale

Figure 16844

Chain wear can be measured by using a 106440 wear scale or a steel tape (Refer to Figure 16844). When chains have elongated 3%, as represented on scale "A" (19 mm [0.75 in] or 25 mm [1.0 in] pitch chain) or scale "B" (16 mm [0.625 in] pitch chain) of the wear scale, they should be discarded. On chain with 19 mm (0.75 in) between pins, for example, 305 mm (12.0 in) of chain contains 16 pitches or links. When 16 pitches measure 314 mm (12.375 in) the chain should be replaced. On chain with 16 mm (0.625 in) between pins, 20 pitches or links equal 318 mm (12.5 in). When 20 pitches measure 327 mm (12.875 in) the chain should be replaced. Crown currently uses 16 mm (0.625 in) pitch (20 links in 318 mm [12.5 in]), 19 mm (0.75 in) pitch (16 links in 305 mm [12.0 in]) and 25 mm (1.0 in) pitch (12 links in 305 mm [12.0 in]) chain. When checking chain wear, be sure to measure a segment of chain that operates over a pulley. Do not repair chain(s) by cutting out the worn section and splicing in a new piece. If part of a chain is worn, replace lift chain(s). If truck has a matched set of lift chains replace both chains at same time.



With Forks Lowered
Check Either Front
or Rear Pulley for
Chain Wear

Figure 16845

Rust and Corrosion

Chains used on lift trucks are highly stressed precision components. It is very important that "as-manufactured" ultimate strength and fatigue strength be maintained throughout the chain service life.

Corrosion will cause a major reduction in the load-carrying capacity of lift chain or roller chain because corrosion causes side plate cracking.

It is extremely important to protect lift chains from corrosion, whether in service or in storage. The initial factory lubrication on chains is an excellent rust and corrosion inhibitor. Factory lube is applied in a hot dip tank to insure complete penetration into the joint. Do not steam clean or degrease new chains. After the chain has been placed in service, factory lube must be supplemented by a maintenance lubrication program.

Refer to applicable lubrication and adjustment section for your particular truck series and/or the lubrication information later in this section.

Corroded Chain
(with Stress-Corrosion Cracks)

Figure 16846

Heavy motor oil serves both as a joint lubricant and corrosion inhibitor. During inspection, carefully examine external chain surfaces for the presence of an oily film. Under certain operating or environmental conditions it may be necessary to oil chains more frequently than 100 hour intervals. In all cases, the external surface of the chain must be protected with a film of oil.

Corroded chains should be inspected for cracked plates. Outside plates are particularly susceptible to stress corrosion cracking. If chains are heavily rusted or corroded they should be removed from the mast for a thorough inspection for cracked plates. If plates are cracked, both chains on the truck must be replaced. Oil chains when they are reinstalled on the mast.

Cracked Plates

The most common cause of plate cracking is fatigue failure. Fatigue is a phenomenon that affects most metals and many plastics. After many repeated heavy loads the plates may crack and the chains will eventually break.

Fatigue Cracks

Figure 16847

Fatigue cracks are almost always found through the pin holes perpendicular to the pitch line. (Refer to Figure 16847) Contrast this failure mode to the random failures caused by stress-corrosion cracking. (Refer to Figure 16846) If any fatigue cracks are discovered during planned maintenance (PM) inspections, both lift chains should be replaced. Many apparently sound plates will be on the verge of cracking, making chain failure very likely.

Tight Joints

All joints in lift chain should flex freely. Tight joints resist flexure, increase internal friction, thus increasing chain tension required to lift a given load. Increased tension accelerates wear and fatigue problems. Refer to Figure 16848.

Tight Joints

Figure 16848

Tight joints in lift chains can be caused by:

1. Bent pins or plates,
2. Rusty joints,
3. Peened plate edges.

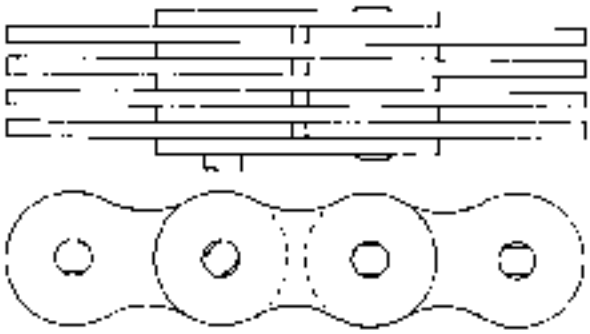
Oil rusty chains and replace chains that appear bent or peened. Peening of plate edges may be caused by worn pulleys, unusually heavy loads, or chain sliding past a guide or obstruction in the mast.

Protruding or Turned Pins

Heavily loaded chains operating with little lube generate tremendous friction between pin and plates (pin and bushing in roller chain). In extreme cases, the frictional torque in the joint can actually turn pins in the press-fit outside plates.

If chain is allowed to operate in this condition, the pins slowly work out of the chain, causing chain failure. Turned pins can be quickly spotted because the flats on the "V" heads are no longer in line. Refer to Figure 16849, pin has turned 45 degrees. Chains with turned or protruding pins should be replaced immediately.

Never attempt to repair the chain by driving pins back into the chain.



Protruding & Turned Pin

Figure 16849

Chain Side Wear

A continuous wear pattern on pin heads and outside plates indicates misalignment. Misalignment can be caused by two different factors: unequal chain tension or nonalignment between pulleys and chain anchors.

- **Unequal Chain Tension** - When a lift chain is installed or adjusted, care should be taken to "load" the chains evenly. When changing fork heel height or platform height for example, the chain anchors should be loosened until both forks come in contact with the floor. At this point both chains should display the same tension or slack. The chain anchor nuts should be tightened an equal number of revolutions on both chain anchors to put equal tension on chains. When the desired height setting is achieved the locking nut should be tightened to secure setting.
- **Non Alignment of Lifting Components** - Non alignment of the pulley and chain due to incorrect shimming of the mast or bent or damaged mast or cylinder components can also contribute to chain side wear. A check for this condition is to place the truck on a level area in your maintenance area. After supporting the fork carriage, disconnect each end of the lift chain at the chain anchor and visually inspect its alignment with the anchor slots.

Lift Chain Lubrication

The most important consideration in field maintenance of lift chains is LUBRICATION. Hard working, heavily loaded chains cannot be expected to give satisfactory wear life without scheduled periodic lubrication. Like all bearing surfaces, the precision-manufactured, hardened-steel, joint-wearing surfaces require a film of oil between mating parts to prevent rapid wear.

Maintaining an oil film on all chain surfaces will:

- Minimize joint wear (chain stretch).
- Prevent corrosion.
- Reduce the possibility of pin turning.
- Minimize tight joints in roller chain.
- Promote smooth, quiet chain action.
- Lower chain tension by reducing internal friction in the chain system.

Heavy motor oil is an excellent chain lubricant-even used motor oil is adequate to lubricate exposed lift chains.

Laboratory wear tests show SAE 40 oil to have greater ability to prevent wear than SAE 10 oil. Also, SAE 40 oil is superior to hydraulic fluid or automatic transmission fluid. Generally, the heaviest (highest viscosity) oil that will penetrate the joint works best.

Laboratory wear testing shows dry film lubes to be less effective in preventing joint wear than fluid petroleum based products.

Some aerosol spray lubes, such as Crown part number 063001-009, are effective, more convenient and less messy than applying motor oils.

Whatever method is used, the oil must penetrate the chain joint to prevent wear. Applying oil to external surfaces will prevent rust, but oil must flow into the live bearing surfaces for maximum wear life. (Refer to Figure 16850).

Apply oil to chains with a narrow paint brush. A plastic liquid detergent bottle makes a handy lube applicator. Flood the chain with oil over its entire length every lube-inspection period.

Frequency of lubrication will vary with operating conditions and environment. The best estimate of lube period is 100 hours actual operating truck time. Trucks parked outdoors, used in freezers or trucks in extremely severe service, may require more frequent lubrication to maintain an oil film on all chain surfaces.

In dusty operating conditions, lubed chains will gather dust. Even under these conditions wear life will be greatly improved by periodic lubrication. Joints may acquire a "paste" made up of oil and dirt, but joint wear will still be much less than if the chain is allowed to run dry with metal-to-metal contact between pins and plates.

At 100 hour intervals, clean chains to remove accumulation of dirt-and lubricate immediately. (Do not steam clean chains.)

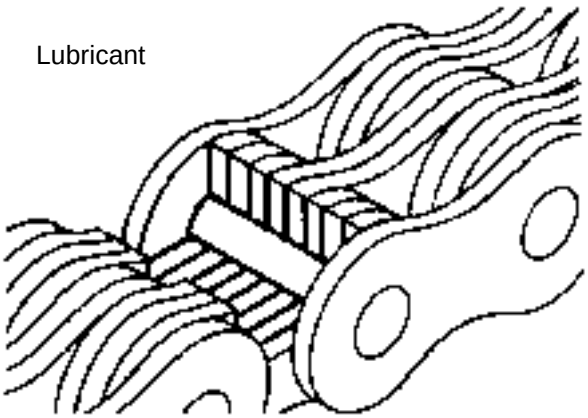


Figure 16850

Lift Chain Replacement

The first step in chain replacement is to find the chain part number in your service manual parts list.

An important factor in ordering replacement chain from the truck manufacturer is that special chains may be specified for your truck with certified minimum ultimate strength.

If the unit is equipped with two strands, replace chains as a pair. It will be virtually impossible to maintain uniform loading between the strands if a new chain is put into service opposite an old chain. The joints in the old chain will have worn through the hardest layer of the case-hardened pin. Therefore, the wear rate on the old chain will be greater than that on the new chain, greatly complicating the problem of maintaining equal chain tension.

The new chain will wear more slowly, causing it to bear the major portion of the load, resulting in premature wear and fatigue failure.

Never steam clean or degrease new chains. The manufacturer's grease is effective in reducing wear and corrosion. If the original factory lube is dried out or wiped off, soak the new chain in heavy engine oil for at least 0.5 hour prior to installing on truck.

After the existing chains have been removed from the mast, very carefully inspect chain anchors and sheaves. Broken, cracked, or worn anchors must be replaced. Replace worn sheaves, and check sheave bearings for wear. Do not paint the replacement chain before or after it has been installed. Paint will help prevent corrosion, but will prevent oil from reaching the pin surface for good joint lubrication.

Install the new chains, using new anchor pins. Existing pins may contain invisible fatigue cracks that could lead to pin failure. After chains have been connected to the anchors, adjust chain tension to obtain proper fork or platform height.

Correct chain installation and mast adjustment will increase chain service life.

Chain Anchors and Pulleys

An inspection of the chain system should include a close examination of chain anchors, anchor tension devices and pulleys.

Check chain anchors for wear, breakage, and radial misalignment. Anchors with worn or broken fingers should be replaced. Anchors should be adjusted to eliminate twisting or other misalignment in the chain. When chain is misaligned, the load is not distributed uniformly between the plates-prolonged operation will result in premature fatigue failure.

Pulleys with badly worn flanges and outside diameter should be replaced. Heavy flange wear indicates chain misalignment. Investigate cause by checking chain tension and mast shimming.

Leaf Chain Disconnect

To minimize the risk of damaging (cracking, etc.) the chain, refer to the following when disconnecting leaf chain.

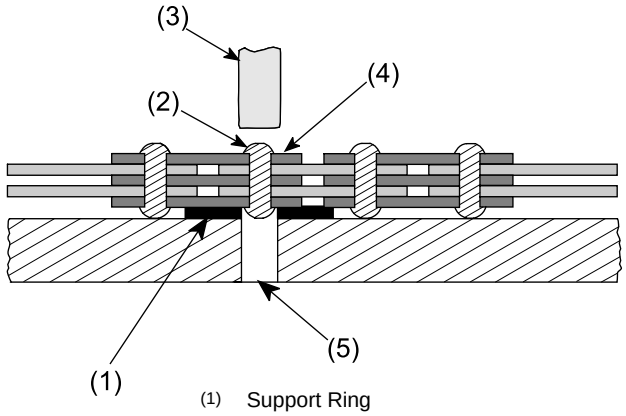
Tools Required:

1. A sturdy work surface with an opening slightly greater than the pin diameter, and should be thick enough to allow the pin to extend beneath the work surface as it is driven through the bottom pin link plate.
2. A support ring (flatwasher) with an inside diameter slightly greater than the pin diameter and a height equal to the head height of the pin.
3. Grinding wheel.
4. Pin punch with a diameter slightly less than the pin diameter, hammer or pressing equipment.

Disconnect Procedures:

(Refer to Figure 16851)

1. Grind the top head of the pin flush with the pin link plate. Be careful not to grind or damage the pin link plate.
2. Position the support ring over opening of the work surface. The support ring serves to support the bottom pin link plate and avoids damage to chain components while driving the pin through the chain.
3. Stand the chain on its side and seat pin in the support ring.
4. Remove the pin from the chain through the top pin link plate.



(1) Support Ring
(2) Grind Pin Flush with Link Plate
(3) Grinding Wheel
(4) Pin Link Plate
(5) Work Surface Knock Out Aperture

Figure 16851

This page available for **NOTES.**

Fork Inspection

WARNING

The following causes of fork failure may mean loss of equipment, damaged materials, bodily injury or loss of life. Make an inspection and measurement of the forks at each planned maintenance interval to check for wear, overload, fatigue, bends, etc. Refer to “Lubrication and Adjustment” chapter.

WARNING

- *Use the proper fork for how it was designed to be used.*
- *Avoid using fork extensions.*
- *Do not modify forks.*
- *Only qualified personnel should make repairs.*
- *Visually inspect forks each work day.*

Abrasion

Abrasion gradually reduces the thickness of the fork. Be sure the fork thickness is within specifications. Do not allow forks to rub the floor during normal operation. If forks rub floor, check lift chain adjustment. Fork wear at the heel must not exceed 10 percent of the original thickness. At this point forks are adequate for approximately 80 percent of rated capacity. Refer to Chart 2. Use fork wear calipers, part no. 107330, or a measuring instrument such as a vernier or good 160 mm (6.0 in) scale. For allowable fork wear thickness, refer to Chart 1.

Allowable Wear Thickness Chart 1

Standard Fork Thickness		Allowable 10% Wear Fork Thickness	
mm	in	mm	in
31.5	1.25	28.5	1.12
38.0	1.50	35.0	1.38
44.5	1.75	39.5	1.56
51.0	2.00	46.0	1.81
57.0	2.25	51.0	2.00
63.5	2.50	57.0	2.25

If using the fork wear calipers, refer to the following:

Refer to Figure 16854-01. The fork wear calipers have two measuring points or jaws. The inside jaws (2) measure 10% less than the outside jaws (1).

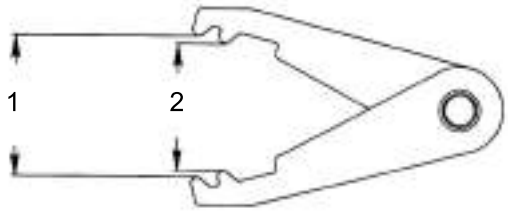


Figure 16854-01

1 Outside Jaws 100% (Fork Shank)

2 Inside Jaws 90% (Fork Blade)

Refer to Figure 16855-01. To set the outside jaws, measure the thickness of the middle of the shank (this point receives almost no wear). Set the calipers to the “feel” of the shank by lightly tapping on them with a metal object.

NOTE

Care should be taken when using the calipers to hold them square across the shank or an incorrect reading will result.

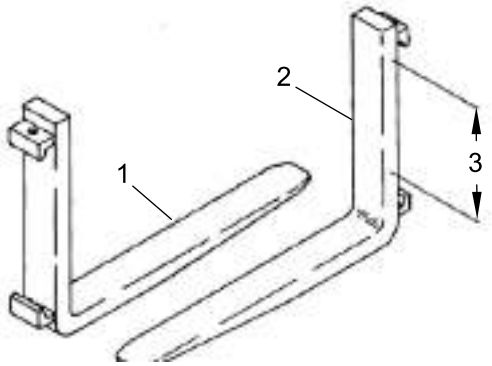


Figure 16855-01

1 Fork Blade

2 Fork Shank

3 Measure Here to Set Outside Jaws

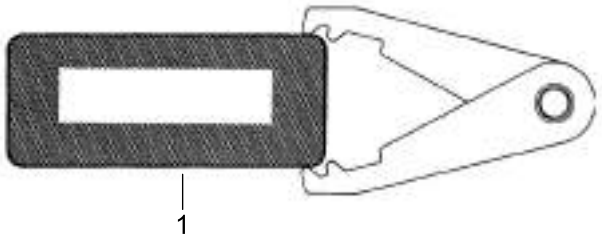


Figure 16856-01

1 Fork Shank Cross Section

Once the outside jaws are set, check to see if the inside jaws of the calipers pass over the flanks of the fork blade at any point between the end of the taper and the heel of the fork blade. After checking the blade, re-check the caliper setting by measuring the shank again making sure the setting was not inadvertently changed.

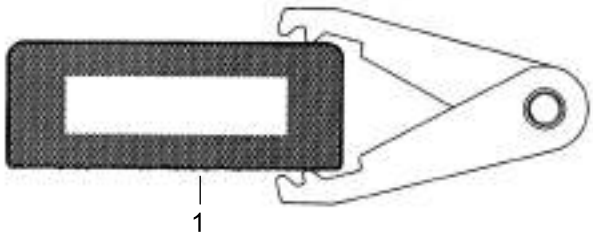


Figure 16857-01

1 Fork Blade Cross Section

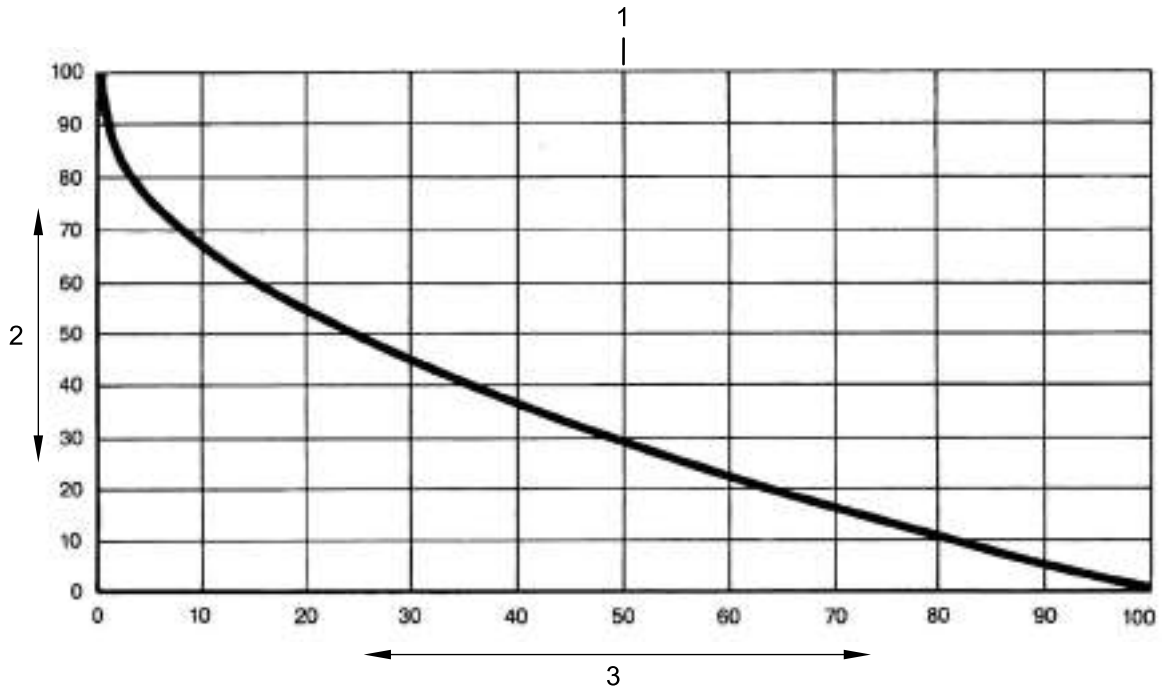


Figure 16858-01

1 Chart 2 - Wear vs. Capacity

2 Percentage Reduction in Fork Blade Thickness

3 Percentage Remaining of Specified Fork Capacity

Overloading

Know the capacity of the forks and truck. Fork capacity and load center is stamped on the fork. Refer to Figure 16859-01. Overloading can cause permanent deformation or serious fatigue conditions.

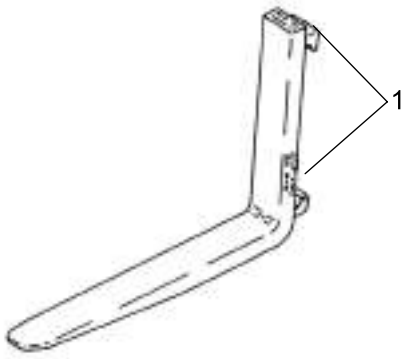


Figure 16859-01

1 Location of Capacity and Load Center Rating

Fatigue

A fatigue crack will normally start in the heel area of the fork. Cracks can usually be detected in the early stages by inspection of the heel area. Check for cracks that transverse the fork in an area up to 130 mm (5.0 in) either side of the outer heel radius. These cracks are a sign that the area has weakened and the fork needs to be replaced. Make a visual inspection for cracks each work day. If a more accurate inspection is necessary, use dye penetrants or magnaflux fork.

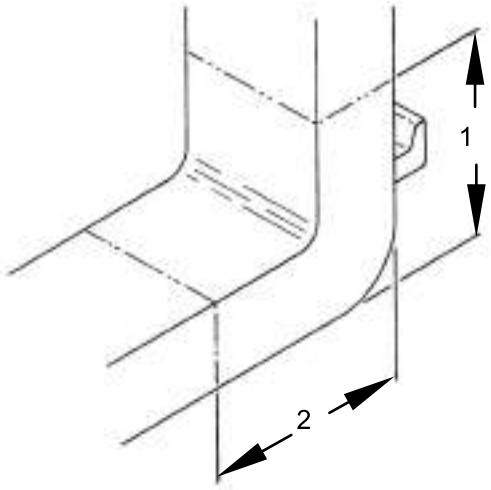


Figure 16860-01

1 130 mm (5.0 in)

2 130 mm (5.0 in)

Bent or Twisted Forks

Overloading, glancing blows against solid objects or picking up loads unevenly can bend or twist a fork, making fork replacement necessary. The maximum allowable difference in fork tip elevation from one fork to another is 3% of the fork length.

The angle between the top of the fork (blade) to the back surface of the vertical leg (shank) shall be less than 93°. Any angle greater will require fork repair or replacement. The fork manufacturer or service technician with the expertise of equal competence are the only parties that should attempt to make such repairs.

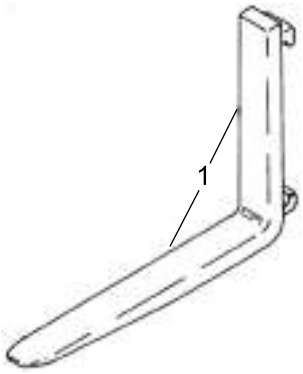


Figure 16861-01

1 93° Maximum

Use a carpenter's square to check the fork. Refer to Figure 16862-01. Hold the square against the shank staying above the radius of the heel as shown. Measure the distance closest to the radius of the heel of the fork blade and square (2). Add 31.8 mm (1.25 in) to this measurement and record. If the distance between the end of the square and blade (3) is greater than this calculation, replace blade (fork is deformed more than 93°).

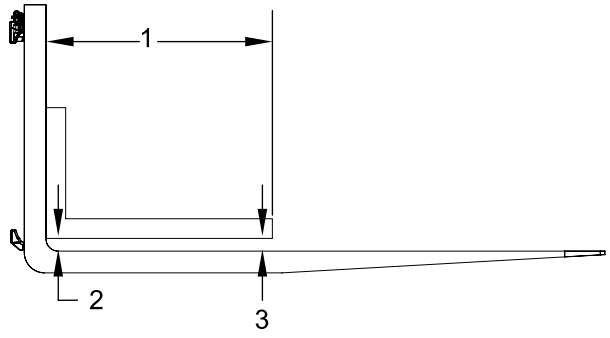


Figure 16862-01

1 609 mm (2.0 ft)

2 "x"

3 "x" + 31.8 mm (1.25 in)

Hanger

Check for cracks or damage to the fork pins and the area of fork attachment. Check carriage for excessive wear or cracks. Repair or replace parts if necessary.

Check condition of fork locking pin, spring, cam, etc. for proper operation (if forks are so equipped).

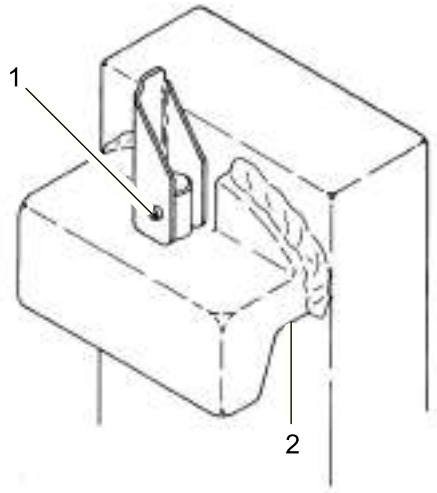


Figure 16863

1 Check Locking Pin, Spring, etc.

2 Check for Cracks Under Hanger

RR/RD 5200/5200S
RR/RD 5200(AC)/5200S(AC)

CYLINDER REMOVAL
Right & Left Hand Lift

The right or left hand lift cylinder can be removed from the truck and replaced as described below. DO NOT try to remove both cylinders at the same time, one cylinder should be removed and replaced completely before the second cylinder removal is started.

1. Move truck to service area on level floor below hoist, if available, chock wheels and remove forks.

WARNING

Wear appropriate safety items, such as safety glasses and shoes, whenever performing maintenance work. To avoid injury, do not place fingers, hands, arms or feet through mast or position them at pinch points.

Make sure lifting device is sufficiently rated to lift various parts of the mast sections either individually or as a group. Make sure that the blocking material is strong enough to withstand the weight. Never work under or around a truck that is not properly blocked.

2. Using two 100 x 100 x 305 mm (4 x 4 x 12 in.) hardwood blocks, raise and block second stage mast 305 mm (12 in.) above bottom cross brace of main frame. Lower mast completely.

3. Turn key switch OFF and disconnect battery.

4. Remove screw holding ram to mount at top of 2nd stage mast. Do not remove screw from both cylinders, only the one that is going to be removed from truck. Refer to Illustration 1.

8161P
010328

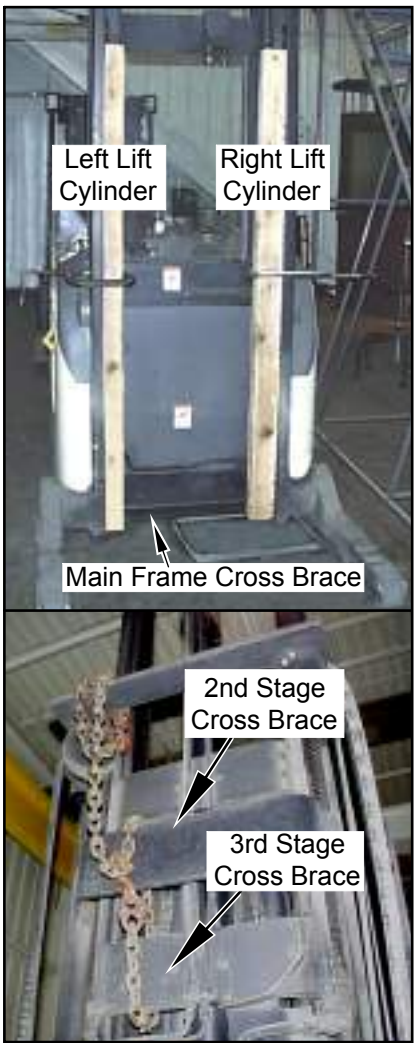
ILLUSTRATION 1

WARNING

Make sure the platform the maintenance person rides on is secure and the individual is using an operator harness

5. Connect battery, turn key switch ON, raise mast and remove blocking.

6. Raise mast sufficiently to block at 1220 mm (4 ft.) if the truck has a collapsed height of 2260 or 2413 mm (89 or 95 in.), or at 1830 mm (6 ft.) if the trucks collapsed height is 2720 mm (107 in.) or above. Use hardwood blocks, one beneath each I-beam of the second stage mast, resting on the lower main frame cross brace, securely clamp both blocks in place. See Illustration 2. Lower mast completely. The right and left hand lift cylinders will be defined as viewed from in front of the forks.



8162P

ILLUSTRATION 2

4263

7. Wrap and secure a large chain around the 2nd stage cross brace and the third stage cross brace as shown in Illustration 2 as a safety precaution. When removing a lift cylinder, one of the two mast chains must also be disconnected, leaving the remaining mast chain holding the third stage mast in position.

8. Turn key switch OFF and disconnect battery. Remove console and open Manual Lowering Valve (MVL) on manifold block to relieve system pressure, see Illustration 3.

7815P ILLUSTRATION 3

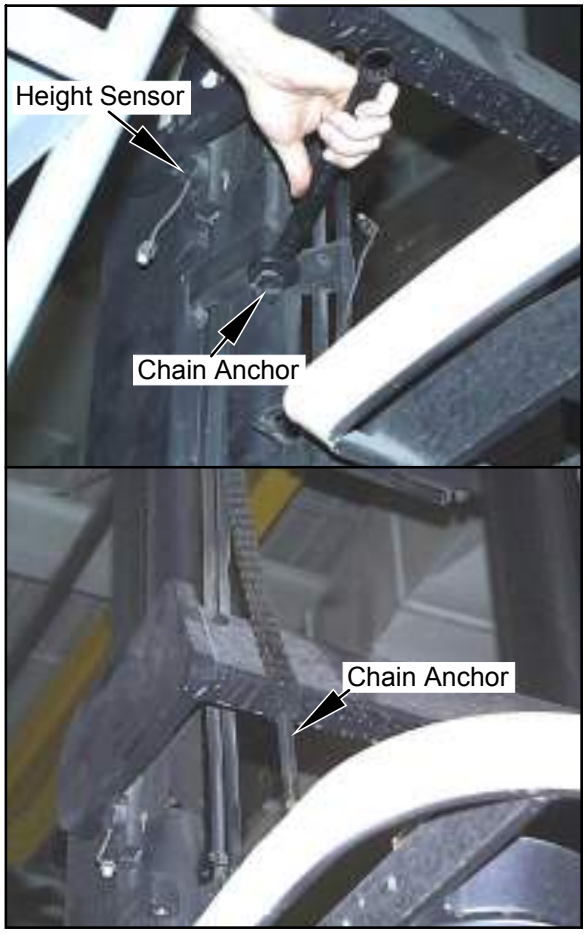
WARNING

AVOID HIGH PRESSURE FLUIDS—Escaping fluid under high pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic lines. Tighten all connections before applying pressure. Keep hands and body away from pin holes which could eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.

Any fluid injected into the skin under high pressure should be considered as a serious medical emergency despite an initial normal appearance of the skin. There is a delayed onset of pain, and serious tissue damage may occur. Medical attention should be sought immediately by a specialist who has had experience with this type of injury.

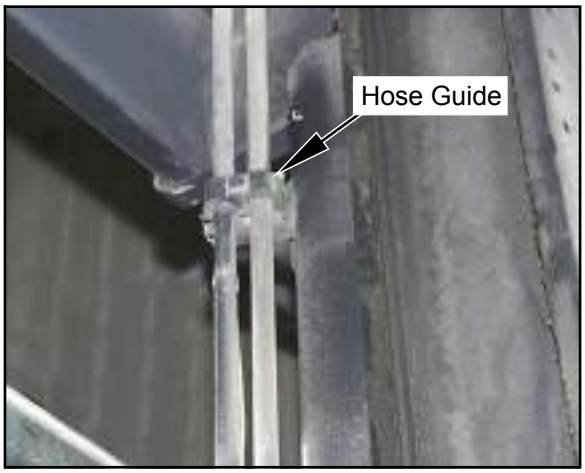
9. Place a shallow pan beneath the main frame and below the cylinder to be removed. Remove hydraulic line from bottom of cylinder. Cap cylinder fitting and line fitting to prevent contamination of hydraulic fluid, to protect fittings from damage, and to help contain hydraulic fluid.

10. Unplug height sensor and move wires to side. Remove chain anchor from main frame mount and drape over cross brace. See Illustration 4.



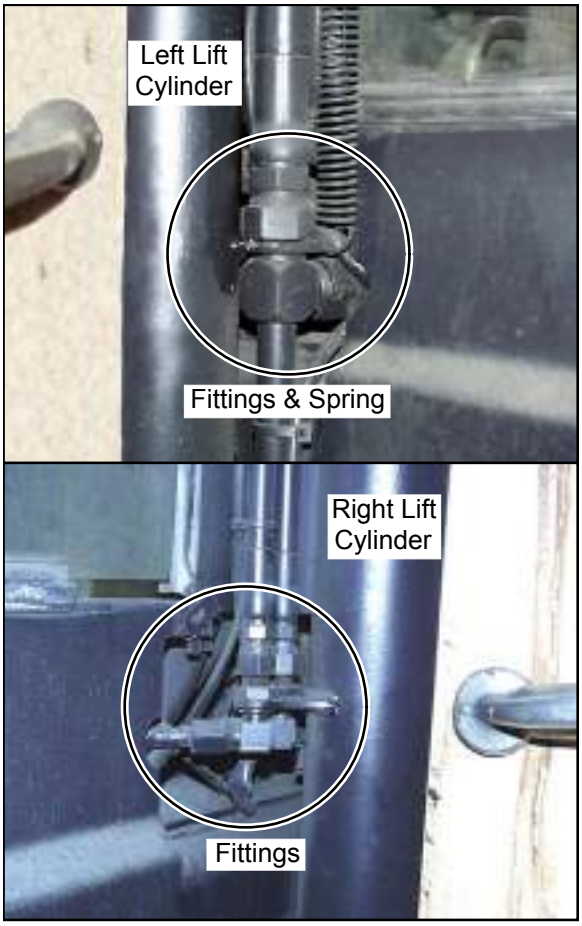
8163P ILLUSTRATION 4

11. Remove hose guide at top of lift cylinder. See Illustration 5.



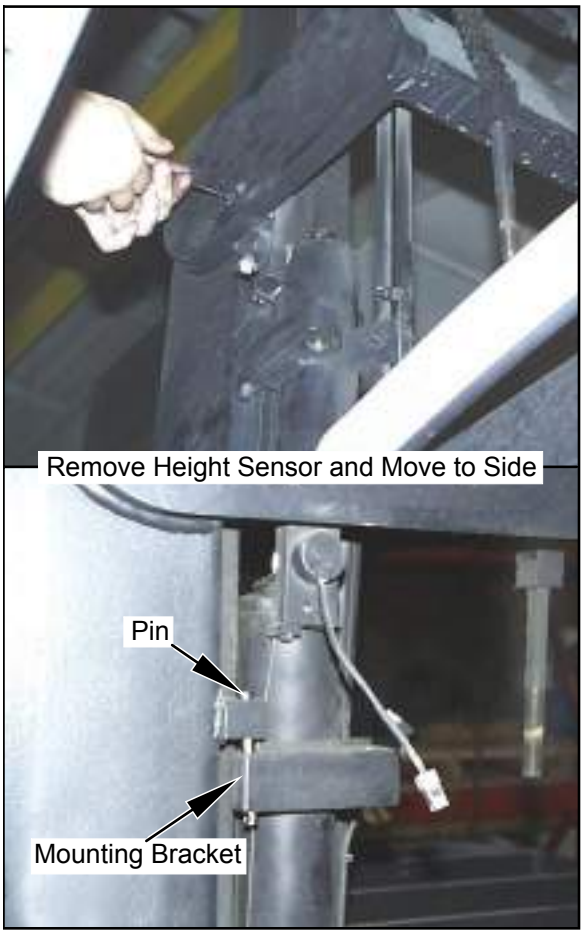
8164P ILLUSTRATION 5

12. Remove hydraulic lines, hoses and spring (if removing left lift cylinder) from mounting bracket approximately 840 mm (33 in.) from bottom of cylinder. Cap all hydraulic lines and hoses that were removed. Clean up any spilled hydraulic oil from truck.



8165P ILLUSTRATION 6

13. Remove two screws holding height sensor and move height sensor to side. See Illustration 7.

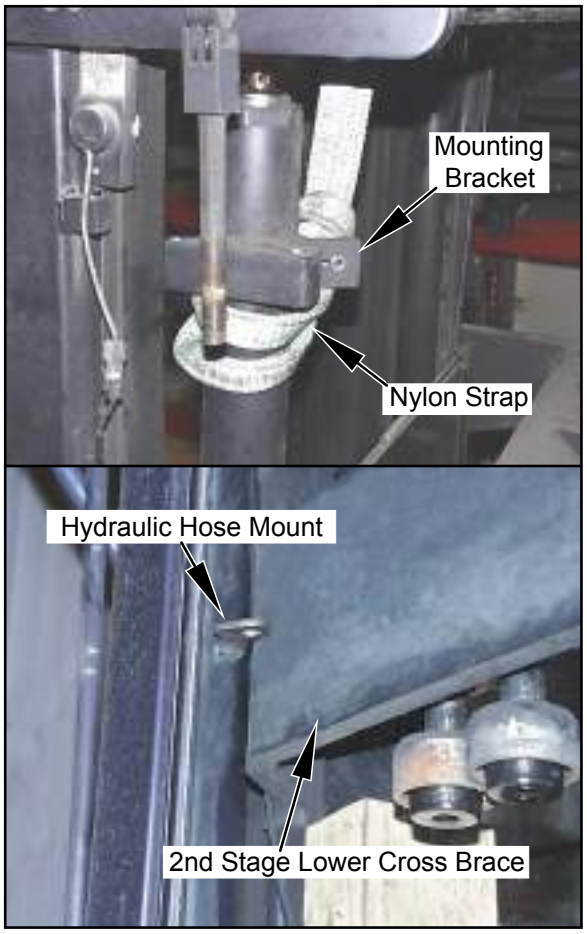


8166P ILLUSTRATION 7

14. Remove pin holding top of cylinder to main frame.

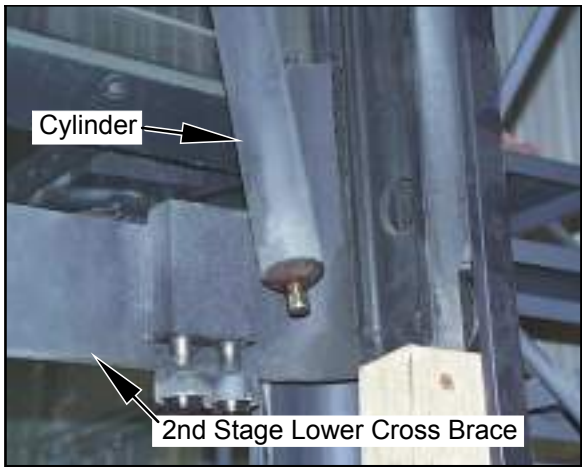
15. Put nylon strap around top of cylinder just below mounting bracket as shown in Illustration 8.

16. Connect hoist to strap and carefully lift cylinder above 2nd stage cross brace. Be very careful when lifting cylinder not to catch hydraulic hose mount on 2nd stage cross brace.



8167P ILLUSTRATION 8

17. Once cylinder base is above 2nd stage cross brace bring cylinder out front, fork side, of mast.



8168P ILLUSTRATION 9

CYLINDER REPLACEMENT

18. Put cap on fitting at bottom of lift cylinder, if one is not already present.

19. Put nylon strap around top of cylinder just below mounting bracket and connect to hoist.

WARNING

Wear appropriate safety items, such as safety glasses and shoes, whenever performing maintenance work. To avoid injury, do not place fingers, hands, arms or feet through mast or position them at pinch points.

Make sure lifting device is sufficiently rated to lift various parts of the mast sections either individually or as a group. Make sure that the blocking material is strong enough to withstand the weight. Never work under or around a truck that is not properly blocked.

20. Raise until bottom of cylinder is over top of 2nd stage lower cross brace and lower cylinder into position.

WARNING

Make sure the platform the maintenance person rides on is secure and the individual is using an operator harness.

21. Put pin back through main frame and cylinder mounting bracket. Install cotter pin through bottom of pin to secure in place. See Illustration 7 in Cylinder Removal. Then remove strap from cylinder.

22. Using two screws removed at disassembly remount height sensor back in position.

23. Remove cap and reattach hydraulic line to bottom of cylinder.

24. Put hose guide, at top of cylinder, and hoses back in position and secure using screw previously removed.

25. Connect hydraulic hoses, lines and spring (if left lift cylinder was removed) to bracket on cylinder. See Illustration 6 in Cylinder Removal.

26. Put chain anchor back in position and replace both nuts. Try to put about same amount of tension on chain anchor as before so that mast will remain straight.

27. Connect plugs on height sensor and harness.

28. Close Manual Lowering Valve (MVL), connect battery, turn key switch ON, and very slowly raise mast. Guide cylinder ram back into position in top of 2nd stage mast making sure hole in ram and hole in bracket will line up.

WARNING

AVOID HIGH PRESSURE FLUIDS—Escaping fluid under high pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic lines. Tighten all connections before applying pressure. Keep hands and body away from pin holes which could eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.

Any fluid injected into the skin under high pressure should be considered as a serious medical emergency despite an initial normal appearance of the skin. There is a delayed onset of pain, and serious tissue damage may occur. Medical attention should be sought immediately by a specialist who has had experience with this type of injury.

29. Put screw through hole in mast and ram as seen in Illustration 1 in Cylinder Removal.

30. Raise mast enough to remove mast blocking, remove blocking, then lower mast completely and bleed right and left stage cylinders and free lift cylinder as described in section M8.0 of this manual.

31. Raise mast and check to be sure mast is straight when raised. If not, adjust chain anchor tension to correct. Put cotter pin back into chain anchor to secure in position.

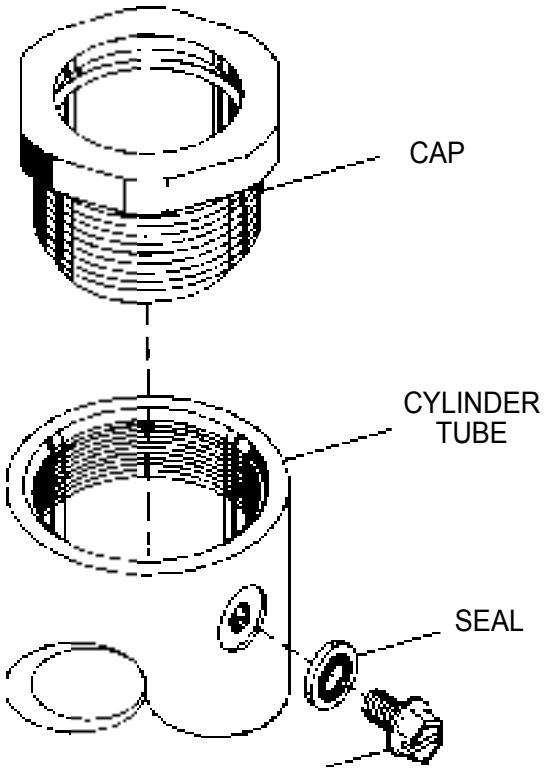
32. Lower mast completely, turn key switch OFF. Check hydraulic fluid level and fill as required. Replace console, forks and remove wheel chocks.

33. Restart truck and check operation.

Great care and cleanliness should be exercised in disassembly and assembly of any hydraulic cylinders. Wipe all surfaces clean of dirt and oil before attempting disassembly. Care should be taken when removing the ram from the cylinder to prevent damage to the packing on the piston end. After cylinder and wipers are removed, thoroughly wash all metallic parts in solvent and blow dry with compressed air. Carefully inspect the ram assembly and cylinder bore. Replace if scored, grooved, pitted, or worn. Minor damage to the cylinder bore can be removed with the use of a cylindrical honing tool. Place washed components in a clean container until assembly. Whenever new packings are required, new wiper rings should also be installed.

Lift Cylinder

Material covered in this section applies to all TT lift cylinders.



0388S ILLUSTRATION 10

Disassembly

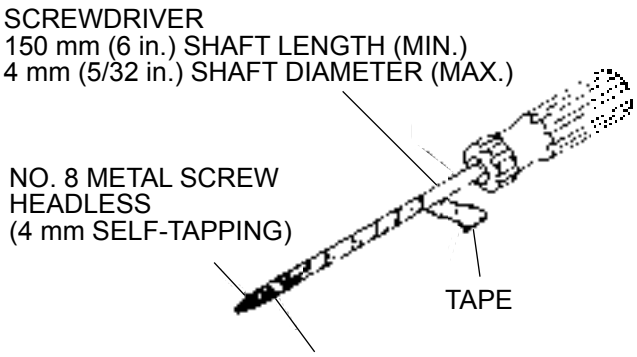
Turn the cap counterclockwise and unscrew it from the cylinder tube. Remove the cap and carefully extract the ram assembly from the cylinder bore, never allowing the ram to come in contact with any sharp edges.

Seals

The seals used in the cylinders are made of an extremely durable, hard polyurethane material which can be deformed temporarily to allow for installation without permanent damage.

Seal Removal

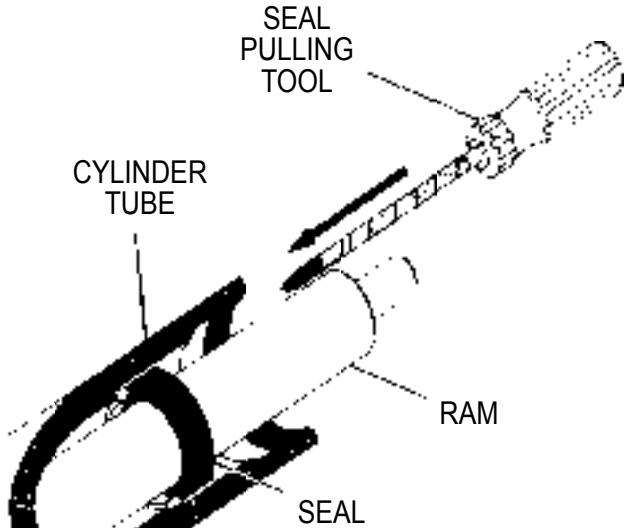
When an excessive amount of hydraulic oil is evident on the cylinder, where the ram exits from the cap, the rod packing is probably bad and should be replaced. The replacement of the packing can be accomplished without removing the ram assembly from the cylinder tube or truck.



0389S-01 ILLUSTRATION 11

Unfasten and remove the cap as explained in “Disassembly”. If the packing is seated in the cap itself, a hooked tool should be used to remove the packing. If the packing is located below the cap and remains in the cylinder bore after the cap is removed, a pair of special tools can be used to facilitate packing removal (See Illustration 11). To make these tools, weld or braze a headless 4 mm self-tapping (No. 8 metal) screw to the end of a screwdriver. The screwdriver must have at least 150 mm (6 in.) of shank length with no larger than 4 mm (5/32 in.) shank diameter. After attaching the screw to the screwdriver, grind off excess weld to a diameter of 4 mm (5/32 in.) Wrap the shank with electrical tape from the tip of the screw to the screwdriver handle. This will prevent scratching of the cylinder bore or the ram.

Insert the tools between the ram and the cylinder walls, 180 degrees apart, and screw into the face of the packing (See Illustration 12). After the threads are sufficiently secured into the packing, evenly pull on the screwdriver handles until the packing is removed.



0390S ILLUSTRATION 12

NOTE

Extreme care should be taken to prevent damage to cylinder wall and ram assembly.

At this time, the wiper ring should also be removed since packings and wiper rings should always be replaced in pairs. Thoroughly clean the area where the seals seat. Any burrs, dirt or seal debris must be removed before reinstalling new seals.

CAUTION

Close inspection of seal seating critical areas should be made before the new seal is installed (See Illustration 13 AND 18). Your seal failure may not have been caused by a worn seal, but rather, by burrs, nicks and dirt located on the seal seating area, causing the seal to deform and lose its sealing ability.

Seal Installation - General

Tools used to install hydraulic seals should be of soft metal or suitable plastic, free of burrs and sharp edges. Screwdrivers and other similar tools should not be used as they may damage the sealing edges.

The area in contact with the seal should be free of burrs, sharp edges and nicks.

If necessary to force seal over sharp edges, slots or undercuts, protective devices should be used.

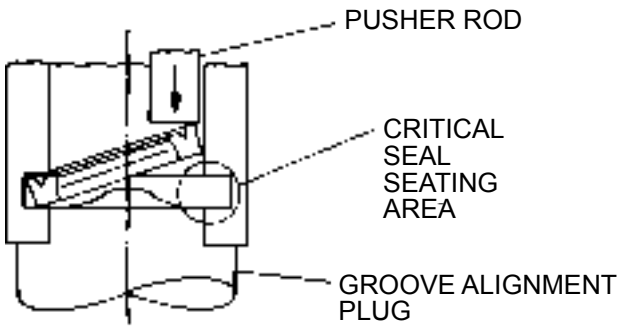
Light lubrication should be applied to the seal and installation groove prior to installation. The same oil as will be used later in the cylinder should be applied.

Rod U-Cup Installation

A. SMALL U-CUP

1. Installation Tools

a. A groove alignment plug (See Illustration 13) is needed which should be flush with groove edge. Any metal or plastic material which is smooth and lubricated may be used.



1901S ILLUSTRATION 13

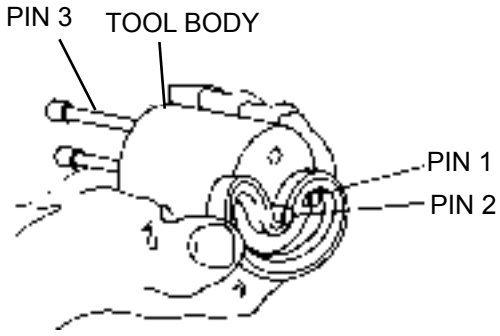
b. A soft metal or plastic pusher rod is needed.

2. Squeeze U-cup together and insert end into bore first. When lower end is engaged in installation groove, release U-cup and force upper end downward using pusher rod until U-cup snaps into groove.

B. LARGE U-CUP

1. Installation Tool

An installation tool made of any soft metal or hard plastic machined smooth and free of burrs with a fixed steel pin (PIN 1) and two movable pins (PINS 2 & 3) is required for this installation method. (See Illustration 14).



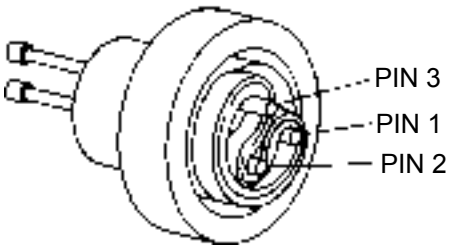
1902S ILLUSTRATION 14

2. Installation Procedure

a. Slip the U-cup over the fixed pin (See Illustration 14, PIN 1) and bend it over PIN-2 as shown.

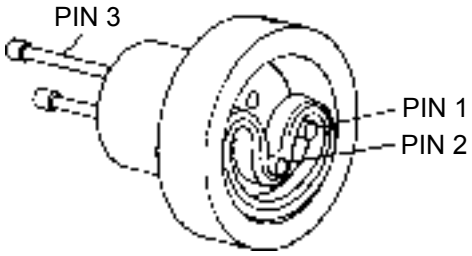
b. Continue bending U-cup until PIN 3 can be pushed through the U-cup loop which locks U-cup in position.

c. Insert installation tool with mounted U-cup into cylinder bore until aligned with U-cup installation groove (See Illustration 15).



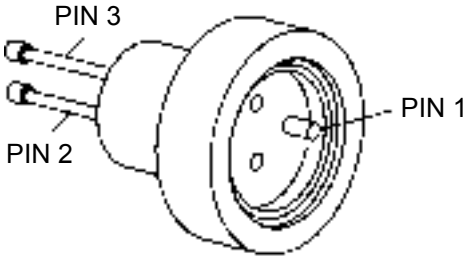
1903S ILLUSTRATION 15

d. Withdraw PIN 3 so that U-cup loop snaps into installation groove (Illustration 16).



1904S ILLUSTRATION 16

e. Withdraw PIN 2 and U-cup will completely snap into installation groove (Illustration 17).

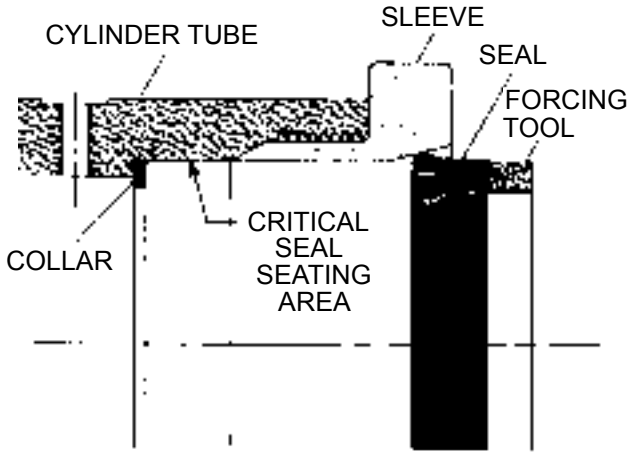


1905S ILLUSTRATION 17

f. Withdraw installation tool.

Cylinder U-cup Installation

For “lip first” installation, a sleeve similar to that shown in Illustration 18 should be used to protect the seal from damage on the threads and shoulders.



1906S ILLUSTRATION 18

Cylinder Assembly

After packings and seals are in place and the ram assembly has been installed, reattach the cap.

CAUTION

Care should be taken when inserting the cylinder cap, to prevent threads and sharp edges from damaging new seals and packings.

Cylinder - Summary

Occasionally, a slight creep of the fork assembly may occur. This may be due to internal leakage in the piston pak but it can also be caused by leakage in the solenoid or check valve. To seat these valves properly when this occurs, raise and lower the forks to flush out any foreign material from the valve seat. A thorough check of the system for leaks should be conducted if abnormal oil losses occur. The hydraulic system is designed to eliminate mechanical damage even if fittings become loose.

Cylinder Bleeding and Flushing

Mast hydraulic circuits need to be flushed after repair of lift cylinders and bled of all air. Before flushing and bleeding of system inspect all hydraulic connections and verify that all filters are installed and hydraulic fluid levels are adequate for test. Hydraulic system must be pressurized during the flushing and bleeding procedures.

WARNING

AVOID HIGH PRESSURE FLUIDS—Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic lines. Tighten all connections before applying pressure. Keep hands and body away from pin holes which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.

Any fluid injected into the skin under high pressure should be considered as a serious medical emergency despite an initial normal appearance of the skin. There is a delayed onset of pain, and serious tissue damage may occur. Medical attention should be sought immediately by a specialist who has had experience with this type of injury.

Bleeding - Free Lift Cylinder

- Slowly elevate carriage in free lift to approximately 1220 mm (4 ft.).
- Slowly open free lift cylinder bleed screw and bleed air from cylinder until a solid stream of hydraulic fluid flows out of bleed screw.
- Tighten bleed screw.

Bleeding - Stage Lift Cylinders

- Slowly elevate carriage in free lift to approximately 1220 mm (4 ft.).
- Slowly open stage lift cylinder bleed screw and bleed air from cylinder until a solid stream of hydraulic fluid flows out of bleed screw.
- Tighten bleed screw.
- Repeat above steps for the other stage lift cylinder.

Tilt Cylinder

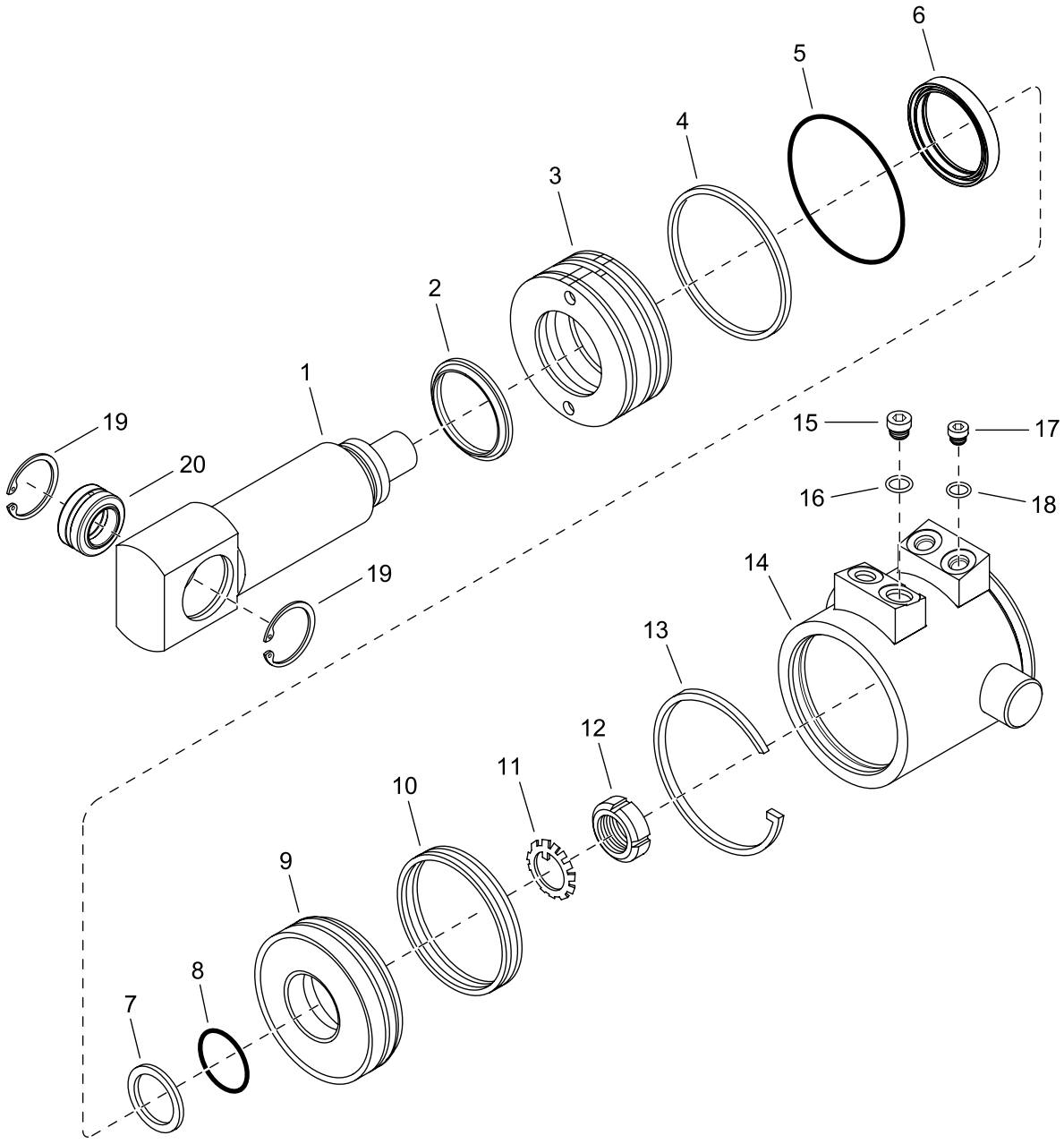


Figure 21651

Tilt Cylinder (Optional)

The tilt cylinder is mounted at the base of the carriage assembly. This tilt cylinder is a double acting piston type cylinder. Extreme care should be taken when performing any type of repair. In the event of excessive oil leakage around the cap end of the cylinder or its inability to tilt the load, the cylinder will have to be removed from the truck and repaired.

Disassembly

Before proceeding with disassembly, thoroughly clean the outside of the cylinder to remove all grease and dirt build-up. Place the cylinder in a vise. Care should be taken to avoid over tightening the tube assembly (item 14) may be easily damaged. The use of an adjustable spanner wrench, similar to the one shown in Figure, is required for disassembly. A face spanner wrench with 3/16 inch pins and a spread of at least 67 mm (2.625 in) is sufficient. Rotate the gland until the wire retaining ring (item 13) is completely unwound from the inside of the cylinder.

NOTE

Check the wire retaining ring to determine correct turning direction for removal. If the cap is turned in the wrong direction, and the end of the retaining ring is allowed to slip inside the cylinder, removal of the ring is very difficult.

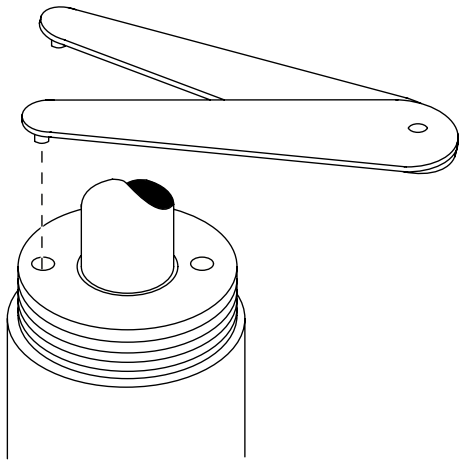


Figure 19204

Before removing the rod assembly, push the gland, (Item 3), down into the cylinder, away from the retaining ring groove area. Using a scraper or similar tool, remove any raised material or burrs from the edge of the groove. If burrs, etc., are not removed, piston removal may be difficult.

Carefully remove the rod assembly which includes the gland (Item 3), the rod (Item 1), the piston (Item 9), the lockwasher (Item 11), and the locknut (Item 2) out of the end of the tube assembly. Inspect the tube assembly for any signs of scoring. If scoring is evident, the tube assembly must be replaced. The tube assembly should be honed to remove any remaining burrs.

Rod Disassembly

Clamp the end of the rod containing the ball bushing in a vise. Unlock and remove the locknut with the appropriate size spanner wrench. Slide all components off the end of the rod. Inspect the rod for scoring or damaged material. If damages or scoring is evident, the rod must be replaced.

Seal Replacement

With the use of a small hooked tool, carefully remove the seals from their mounting grooves.

CAUTION

Never use a screwdriver to remove seals, as irreparable damage and leakage may occur.

After all the seals have been removed, inspect the contact surfaces on both the piston and the gland for scoring. If slight scoring is evident, sand with a fine emery paper until all high surfaces have been removed. Heavily scored components must be replaced. After all parts have been disassembled and inspected, wash all cylinder components in a good grade solvent and dry with air pressure.

NOTE

When cleaning the piston and gland, be sure to clean the seal seating areas. Protect eyes and face when using compressed air.

After all the parts have been thoroughly cleaned, place in a dirt free area until ready for reassembly.

Cylinder Reassembly

Apply a light coating of hydraulic oil (Crown No. 063001-001) to all seals before they are assembled. Install all seals by hand. After the seals have been installed, slide the gland onto the piston end of the rod. Install the piston and fasten the locknut; be sure piston is seated properly against the rod shoulder. After installing the rod assembly into the tube assembly, align the hole in the gland with the slot in the cylinder wall and carefully press the gland into position.

CAUTION

Care should be taken when inserting the gland to prevent sharp edges from damaging the new seals and packing's.

Once the gland is in place and the positioning hole is visible through the cylinder slot, insert the hooked end of the wire retaining ring into the positioning hole. Turn the gland clockwise until the tapered end of the retainer is flush with the cylinder tube.

Tilt Cylinder Flushing and Bleeding Procedures

Carriage hydraulic circuits need to be flushed after repair of tilt cylinder and bled of all air. Before flushing and bleeding of the system inspect all hydraulic connections and verify that all filters are installed and hydraulic fluid levels are adequate for test. Hydraulic system must be pressurized during the flushing and bleeding procedures.

WARNING

AVOID HIGH PRESSURE FLUIDS-Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic lines. Tighten all connections before applying pressure. Keep hands and body away from pin holes which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.
Any fluid injected into the skin under high pressure should be considered as a serious medical emergency despite an initial normal appearance of the skin. There is a delayed onset of pain, and serious tissue damage may occur. Medical attention should be sought immediately by a specialist who has had experience with this type of injury.

Flushing

- Remove the hoses from the sideshift cylinder and connect them together using a male connector.
- Energize the SVS sideshift solenoid selector valve, actuate manual valve at full speed in order to pump hydraulic oil through carriage hydraulics and then back through the filter.
- Flush carriage hydraulics for at least 2 minutes, reversing flow frequently.
- Reconnect hoses to the sideshift cylinder.

Bleeding

- Fully extend the tilt cylinder and tilt the forks up.
- Securely block the carriage so it can not tilt down. Refer to Control Of Hazardous Energy, Lifting Blocking, for procedures on blocking the carriage.
- Loosen the fitting at port T2 on the tilt manifold block and remove the hose from the rod side of the tilt cylinder.
- Energize SVT tilt solenoid selector valve, actuate the manual valve to pressurize the **A** port to the carriage, and hold until a solid stream of hydraulic fluid flows out through the hose. This is passing hydraulic fluid through mast hoses, reach manifold and through the tilt-sideshift manifold block.
- Reconnect the hose at the tilt cylinder and tighten the fitting in port T2 on the tilt-sideshift manifold block.
- Remove the block under the carriage. Fully retract the tilt cylinder and tilt the forks down.
- Loosen the fitting at port T1 on the tilt manifold block and remove the hose from the piston side of the tilt cylinder.
- Energize the SVT tilt solenoid selector valve, actuate the manual valve to pressurize the **B** port to the carriage, and hold until a solid stream of hydraulic fluid flows out through the hose. This is passing hydraulic fluid through the mast hoses, reach manifold and through the tilt-sideshift manifold block.
- Connect hose at tilt cylinder and tighten fitting in port T1 on the tilt-sideshift manifold block.

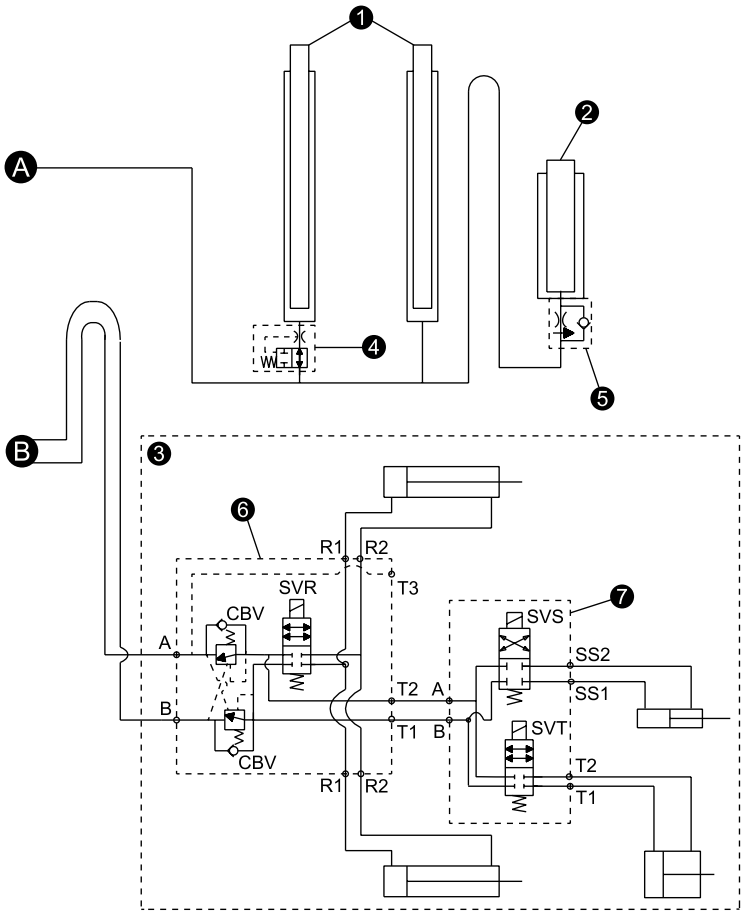


Figure 20944

1 Secondary Lift Cylinder
2 Primary Lift Cylinder
3 Carriage Hydraulics
4 Velocity Fuse
5 Flow Control
6 Reach Manifold - Contains CBV & SVR
7 Tilt/Sideshift Manifold - Contains SVS & SVT

Reach Assembly

The reach assembly on your truck is designed to lift, transport, and deposit materials from racks where outriggers cannot enter into or under. After the truck has been positioned in front of the load and the forks adjusted to the proper height, the reach carriage can then be extended. The carriage is extended by *rolling* the thumbwheel, located on multi-task handle, away from the operator. Retracting the carriage is accomplished by *rolling* the thumbwheel towards the operator. Reach carriage speed is varied by the amount of thumbwheel rotation. After extending to engage the forks under load properly, load is lifted, fully retracted and lowered to a safe travel height.

WARNING

Wear appropriate items, such as safety glasses and steel-toed shoes whenever performing maintenance work. Do not place fingers, hands or arms through mast or position them at pinch points.
In this section you may be required to lift and block the truck and mast or raise and lower different components for removal and installation. Make sure lifting device and sling are sufficiently rated to withstand the weight being lifted. Never work under or around a truck that is not properly secured. Refer to truck Data Plate for truck weight information.
It will be necessary to disconnect and remove the battery from the truck, disconnect tilt cylinders from the mast, disconnect electrical connections and hydraulic lines. "Control of Hazardous Energy" section provides information for performing the above procedures along with some additional information on other procedures dealing with truck maintenance. This section should be read and reviewed prior to mast removal, installation and maintenance as outlined in this section.

Reach Inspection

Poly Stop

Located at the bottom and center of the support assembly is a poly stop. This poly stop prevents metal to metal contact when the reach assembly is fully retracted. The poly stop should be shimmed to make contact with the carriage assembly as the reach cylinders are fully retracted.

The poly stop at the top of the inner arm uses spacers for correct position. Tighten the socket head screw, do not over tighten. The number of washers can be determined with the truck operational. The poly stop bumper should compress 6 - 13 mm (0.25 - 0.50 in) when fully retracted with a 905 kg (2000 lb) load. Use thread locking adhesive to secure the screw into position. Torque the screw 32 - 36 Nm (28 - 32 in lb).

Reach Cylinder Adjustment

Extend the mechanism completely. From the retracted position, the distance to the top front edge of the fork carriage assembly should be 590 mm (23.3 in). (Measurement must be taken at top of reach mechanism). With the reach cylinders fully extended, the cylinder rod can be turned to obtain the correct dimension. Refer to Figure 17053.

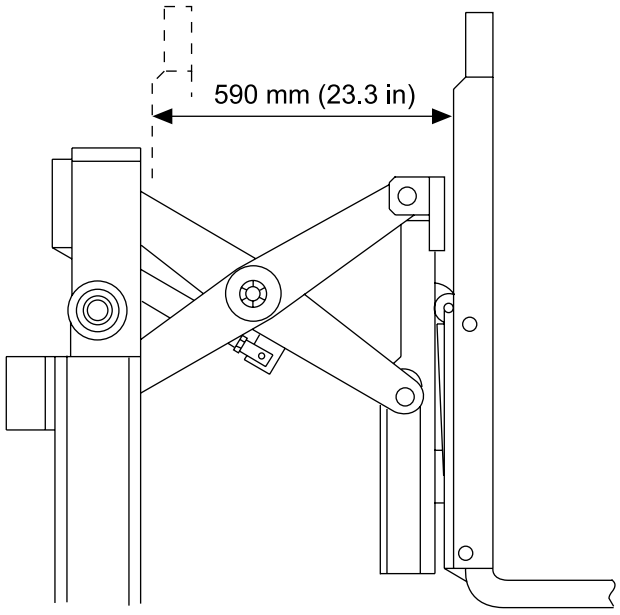


Figure 17053

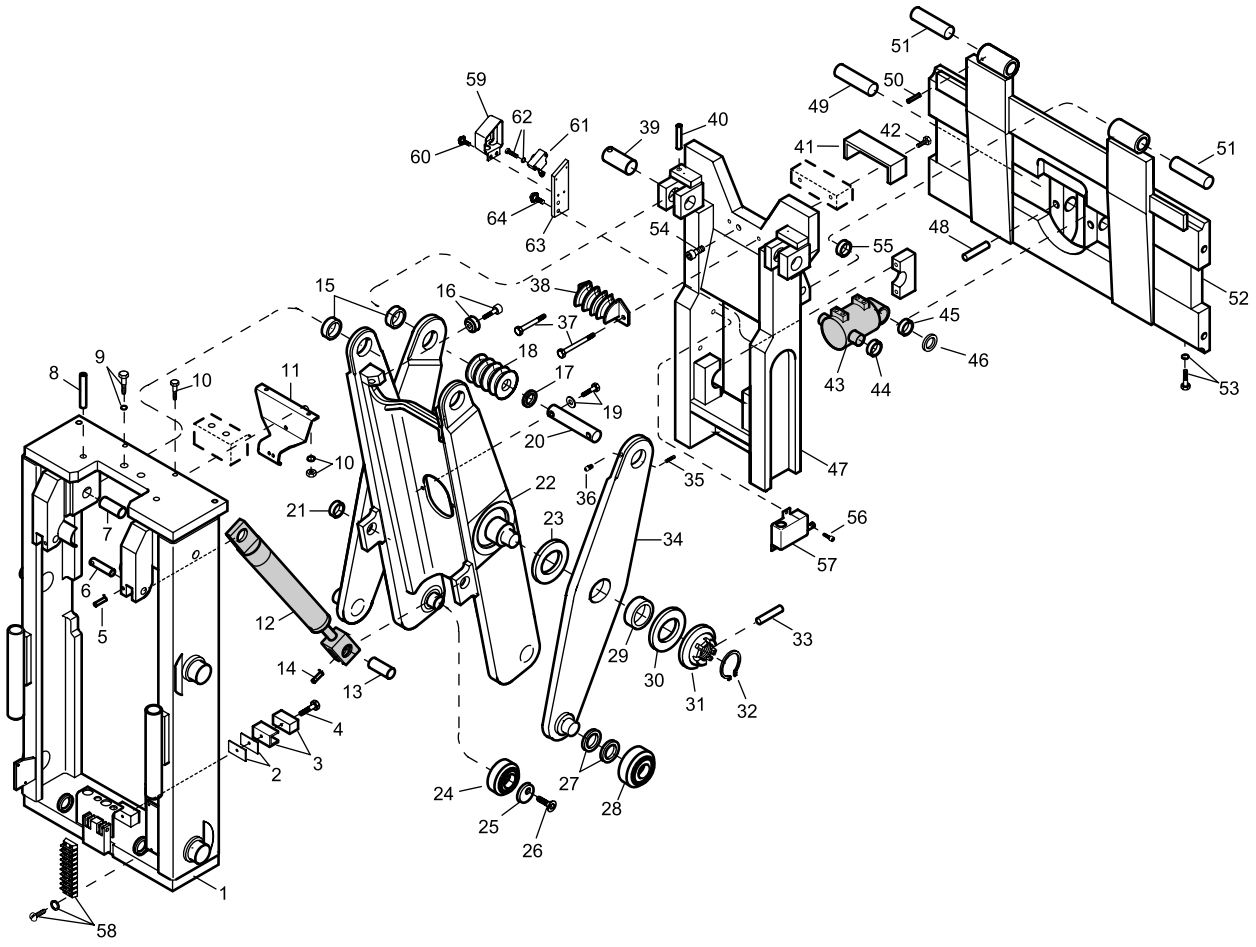


Figure 17054

Disassembly

(Refer to Figure 17054)

NOTE

Disconnect the battery. If complete disassembly of the reach assembly is required, removal of entire reach assembly from the mast assembly will ease the disassembly procedure.

1. Remove the four screws holding the load backrest (not shown) to the fork plate (52) and remove the load backrest.
2. (Disregard if truck is not equipped with tilt). Remove screw (53) in the bottom cross member of the fork plate.
3. Remove the forks (not shown) from the fork plate.
4. Extend the reach assembly and place a 50 x 100 x 200 mm (2 x 4 x 8 in) hardwood block in either the left or right channel of support assembly (1).
5. Retract the reach assembly until the column roller (28) on the outer arm (34) is resting on the hardwood block. The hardwood block will not allow the assembly to retract when the reach cylinders are removed.
6. (Disregard if truck is not equipped with tilt). Remove the roll pin (48) from the tilt cylinder shaft (49) with a brass punch or other soft material rod.

NOTE

Ensure hoist has a lifting capacity of at least 905 kg (2000 lb).

7. Remove the two roll pins (50) from the pivot shafts (51) at top of fork plate. Use a hoist or other suitable means to support the fork plate, and remove the pivot shafts.
8. Remove the hydraulic lines from the tilt cylinder (43) to manifold block (not shown) on the support assembly. Allow the hydraulic pressure to bleed off slowly.
9. Remove the four screws holding the tilt cylinder in the carriage assembly (47).
10. Remove the tilt cylinder; if further disassembly is required, take to a clean working area. Consult Cylinder for proper disassembly procedure.
11. If ball bushing (45) in the tilt cylinder rod end requires replacement, remove the retaining rings (46) and use an arbor press to remove and replace it.
12. Attach a hoist to the top cross bar of the carriage assembly. Remove roll pins (40) in the pivot shafts (39) which connect the outer arms to the carriage assembly. Remove the pivot shafts and raise the carriage assembly to clear the carriage rollers (24) on the inner arm assembly (22).
13. Remove the roll pin (14) from the pivot shaft (13) at the rod end of the reach cylinders (12). Remove the pivot shafts (13) at the rod end.
14. Disconnect the hydraulic lines from the bulkhead located near the top of the reach cylinders.
15. Remove the roll pin (5) from the upper pivot shafts (6) and remove the pivot shafts. The reach cylinders should be installed in same position on the support assembly they were removed.
16. Connect a hoist to the inner arm assembly cross brace and lift until the column rollers on the outer arm assemblies can be rotated out of the support assembly channel.
17. Remove the column rollers from the outer arms. Record the number and the position of all spacers for reference during reassembly.
18. Remove the roll pin (33) and retaining ring (32) from the locknut (31) at the pivot center. Remove the locknut with a hook type spanner wrench.
19. Remove the outer arm and thrust washers. Record the location of the thrust washers for reference during reassembly.
20. Remove the roll pins (8) in the pivot shafts (7) of the inner arm assembly.

Bushing Replacement (Reach Assembly Components)

When removing an old bushing, be sure the seating area of the bushing is not damaged in any manner. If damage has occurred remove all burrs and rough edges completely.

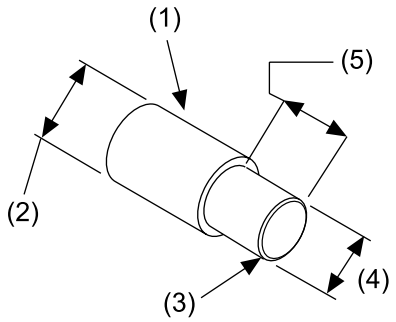
When installing the replacement bushings in a lubricated area, be sure hole in the bushing is in the proper alignment with the lubrication fitting to allow proper lubrication flow.

Apply a light coat of grease to the bushing seat to ease installation and reduce the possibility of damage to the replacement bushings.

NOTE

An installation tool can be used effectively to remove worn or damaged bushings. Various sizes of bushings will necessitate use of various sizes of installation tools.

A bushing installation tool, shown in Figure 17055, will aid greatly in the correct installation of replacement bushings.



(1) Bushing Installation Tool

(2) 0.13 mm (0.005 in) Smaller than the Bushing Outside Diameter

(3) 1.6 mm (0.062 in) Chamfer

(4) 0.13 mm (0.005 in) Smaller than the Bushing

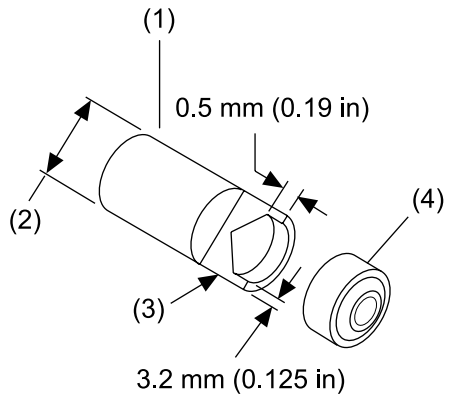
(5) Equal to the Length of the Bushing

Figure 17055

NOTE

Close inspection of all replacement bushings after installation is necessary to be sure the wear surfaces are intact.

Ball bushings are removed and installed with greater ease when using an installation tool similar to the one shown in Figure 17056.



(1) Ball Bushing Installation Tool

(2) 0.13 mm (0.005 in) Smaller than the Bushing Outside Diameter

(3) Cut-away View of the Counterbore

(4) Ball Bushing

Figure 17056

Center Pivot Repair and Adjustment

NOTE

Be sure all areas of contact are thoroughly cleaned and free of any burrs or debris that could damage the replacement thrust washers.

When replacing the thrust washers (23, 30) on both sides of the outer arm assembly, apply a light coat of grease to all surfaces.

To properly adjust, tighten the nut on the center pivot assembly snug to eliminate any abnormal drag. Loosen the nut and torque to 73 Nm (65 in lb), then continue to tighten to the next nearest groove pin location.

Reassembly

NOTE

Before proceeding with reassembly, all parts should be clean and free of any burrs or rough edges which could damage the replacement bushings or other parts during assembly. Apply a thin coat of grease to all bushings, thrust washers and pivot shafts.

1. Install the inner arm assembly (22) into the support assembly (1).
2. Install the pivot shafts (7) simultaneously, rather than one at a time. Pivot shafts are slotted on the end to obtain proper alignment for installation of the roll pin (8).

NOTE

Refer to Center Pivot Repair and Adjustment (located in this section) for proper adjustment information of center pivot.

3. Install the thrust washer (23) at the center pivot. Slide the outer arms (34) onto the center pivot stud. Install the thrust washer (30), locknut (31), roll pin (33) and retaining ring (32).
4. Use an inside caliper to measure the area of support assembly where the column roller (28) on the outer arm will travel, record the measurement.
5. Install the column rollers to the outer arms. Measure the distance between the column rollers with an outside caliper. Subtract this dimension from the dimension obtained in step 4 to determine the number of shims required. Balance out the number of shims (Example: 2 shims right, 2 shims left). If an uneven number of shims are required, note to which side the extra shim was added and install all other odd shims to that side.

NOTE

Failure of the outer arms to fit into the carriage assembly properly indicates an inner arm assembly, carriage assembly, or outer arm assembly is bent or deformed in some way.

6. Measure the distance between the outer arms at top. (TT is 335 mm [13.25 in]). Measure the distance between the pivot blocks welded on the fork carriage assembly (47). These dimensions should indicate the outer arms will fit properly in the fork carriage assembly.

7. Attach the carriage rollers (24) to the inner arm assembly studs.
8. Raise the inner arm assembly until the column rollers on the outer arms can be fitted into the channels of the support assembly. Place a 50 x 100 x 200 mm (2 x 4 x 8 in) approximate length, hardwood block in either channel beneath the column roller. Lower the inner arm assembly until the weight of the arm assembly is on the hardwood block.
9. Guide the fork carriage assembly (47) onto the inner arm carriage rollers.
10. Install the pivot shafts (39) and roll pins (40).
11. Install the reach cylinders.
12. Install the pivot shafts (6) and roll pins (5).
13. Extend the cylinder manually and install the pivot shafts (13) and roll pins (14).
14. Connect the hydraulic lines from the reach cylinders to the bulkheads near top of the reach cylinders.

NOTE

Disregard steps 15, 16, 17 and 18 of reassembly procedure if truck is not equipped with the tilt function.

15. Place the bushings (44) on the tilt cylinder (43) pivot studs and install the tilt cylinder assembly in the carriage assembly. Check the serial number plate to obtain the capacity of the truck to install the correct tilt cylinder assembly. This information is also needed to obtain the proper fork plate assembly (52) and tilt cylinder shaft (49).
16. Connect all the hydraulic lines from the tilt cylinder to manifold block at top of the support assembly.

NOTE

Ensure the hoist has a lifting capacity of at least 905 kg (2000 lb).

17. Position the fork plate assembly (52) using a hoist and install the pivot shafts (51) and pins (50).
18. Extend the tilt cylinder piston rod and install the tilt cylinder shaft (49) and pin (48).
19. Run an operational check. Refer to Reach Cylinder Adjustment in this section for adjustment procedure.
20. Install the forks and load backrest. Add bolt (53).

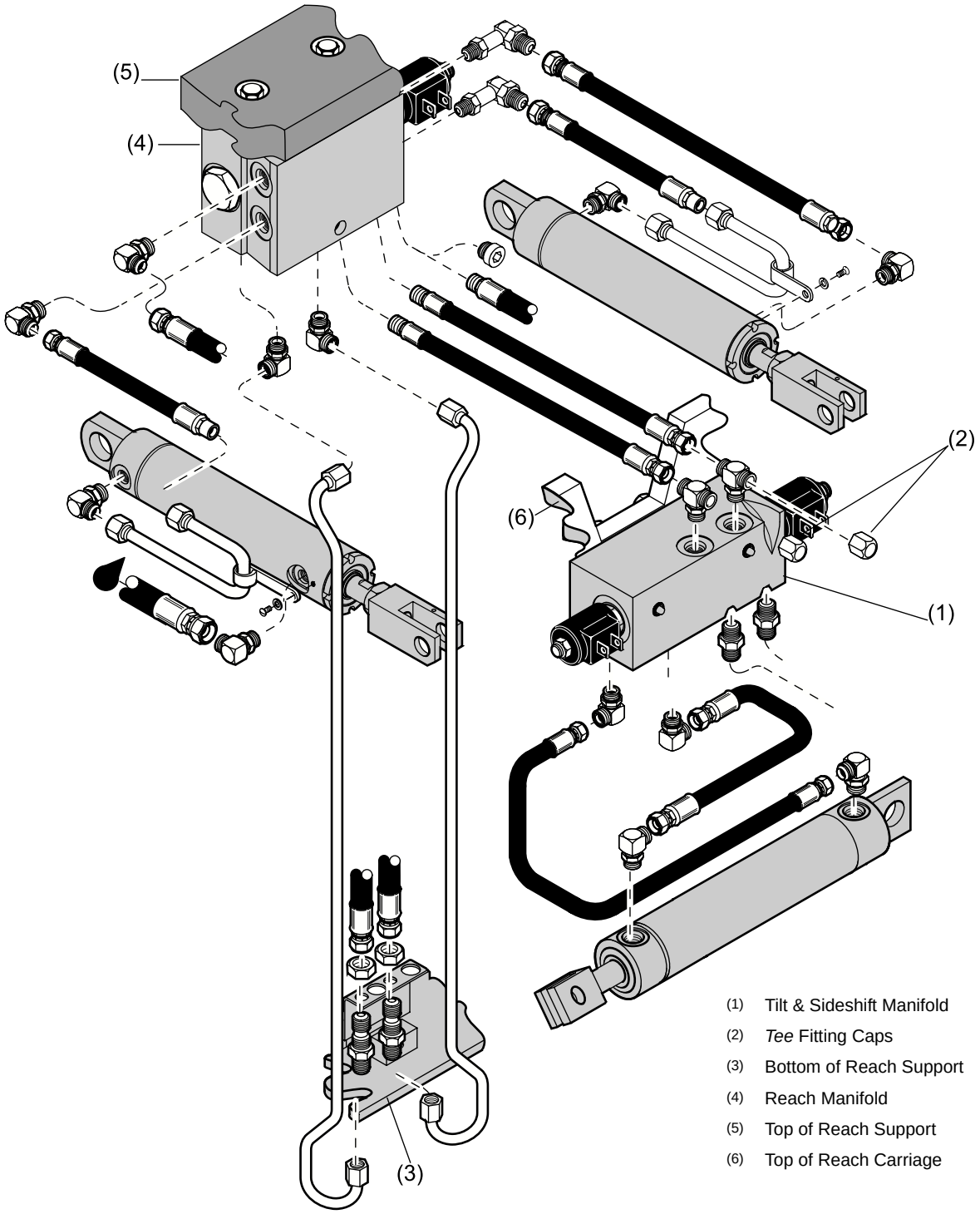
Reach Cylinders Flushing and Bleeding Procedures

Bleeding

WARNING

AVOID HIGH PRESSURE FLUIDS - Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic lines. Tighten all connections before applying pressure. Keep hands and body away from pin holes which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.
Any fluid injected into the skin under high pressure should be considered as a serious medical emergency despite an initial normal appearance of the skin. There is a delayed onset of pain, and serious tissue damage may occur. Medical attention should be sought immediately by a specialist who has had experience with this type of injury.
Carriage hydraulic circuits need to be flushed after repair of reach cylinders and bled of all air. Before flushing and bleeding of system inspect all hydraulic connections and verify that all filters are installed and hydraulic fluid levels are adequate for test. Hydraulic system must be pressurized during the flushing and bleeding procedures.

1. Remove the tilt and side-shift manifold cover.
2. Use an absorbent towel or receptacle to collect the hydraulic fluid.
3. Loosen the caps from *tee* fittings, ports (1) and (2) at top of tilt-side-shift manifold. Refer to Figure 17161.



(1) Tilt & Sideshift Manifold
(2) *Tee* Fitting Caps
(3) Bottom of Reach Support
(4) Reach Manifold
(5) Top of Reach Support
(6) Top of Reach Carriage

Figure 17161

4. To bleed air from the mast accessory hoses, energize retract at maximum speed. Hold retract energized for 30 seconds. This will flush all air out of mast accessory circuit.
5. Extend reach carriage to maximum extension and hold for 15 seconds. Retract reach to home position at maximum speed and hold for 15 seconds.

6. Tilt the carriage up to maximum extension and hold for 15 seconds. Tilt down to home position and actuate tilt down for 15 seconds.
7. Extend the side-shift cylinder to maximum extension. Energize side-shift right and hold for 15 seconds. Actuate side-shift left at maximum speed to home position and hold for 15 seconds.
8. Tighten the caps on the *tee* fittings, ports (1) and (2) at top of the tilt and side-shift manifold. Torque to 15.8 Nm (139.5 in lb). Refer to Figure 17161.
9. Clean area thoroughly.

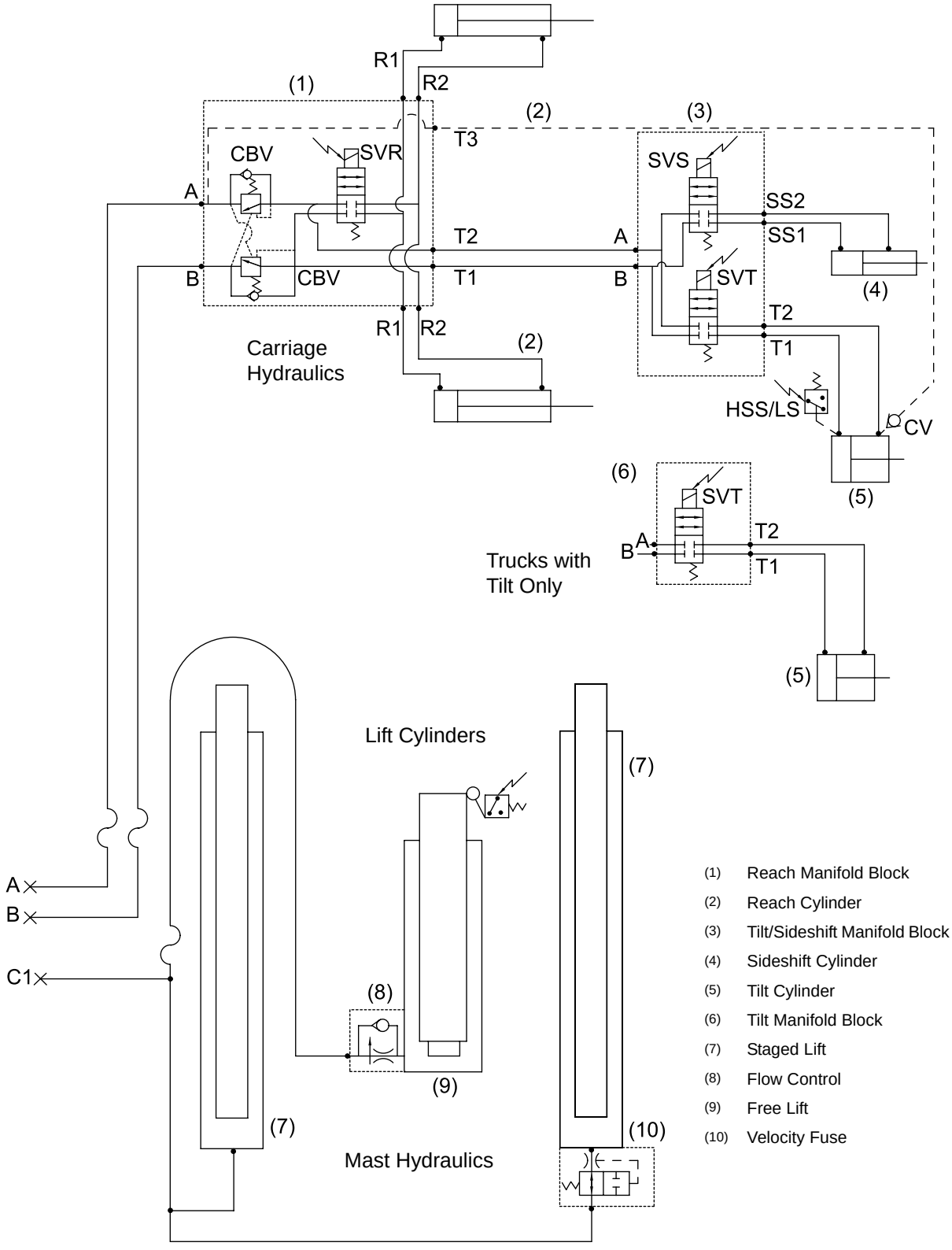


Figure 17057

Reach Assembly

The reach assembly on your truck is designed to lift, transport and deposit materials from racks where outriggers cannot enter into or under. After the truck has been positioned in front of the load and the forks adjusted to the proper height, the reach carriage can be extended. The carriage is extended by "rolling" the thumbwheel, located on the multi-task control handle, away from the operator. Retracting the carriage is accomplished by "rolling" the thumbwheel towards the operator. Reach carriage speed is varied by the amount of thumbwheel rotation. After extending to engage forks under the load properly, the load is lifted, fully retracted and lowered to a safe travel height.

WARNING

Wear appropriate items, such as safety glasses, steel-toed shoes, whenever performing maintenance work. Do not place fingers, hands or arms through mast or position them at pinch points.
In this section you may be required to lift and block the truck and mast or raise and lower different components for removal and installation. Make sure lifting device and sling are sufficiently rated to withstand the weight being lifted. Never work under or around a truck that is not properly secured. Refer to truck Data Plate for truck weight information.
It will be necessary to disconnect and remove the battery from the truck, disconnect tilt cylinders from the mast, disconnect electrical connections and hydraulic lines. "Control of Hazardous Energy" section provides information for performing the above procedures along with some additional information on other procedures dealing with truck maintenance. This section should be read and reviewed prior to mast removal, installation and maintenance as outlined in this section.

Reach Inspection

Poly Stop

Located at top of the support assembly on either side are poly stops. The poly stop prevents metal to metal contact when the reach assembly is fully retracted. The poly stop should be shimmed to make contact with the carriage assembly as reach cylinders are fully retracted.

The poly stop uses spacers for correct position. Tighten socket head screw, do not over tighten. The number of washers can be determined with the truck operational. The poly stop bumper should compress 6 mm (0.25 in) to 13 mm (0.50 in) when fully retracted with a 905 kg (2000 lb) load. Use thread locking adhesive to secure the screw into position. Torque screw 3.2 - 3.6 Nm (28 - 32 in lb).

Reach Cylinder Adjustment

Extend mechanism completely. From retracted position, the distance to the top front edge of fork carriage assembly should be 1080 mm (42.50 in) or 1030 mm (40.50 in) if equipped with side shift. (The measurement must be taken at the top of the reach mechanism). With reach cylinders fully extended, the cylinder rod can be turned to obtain the correct dimension. Refer to Figure 17067.

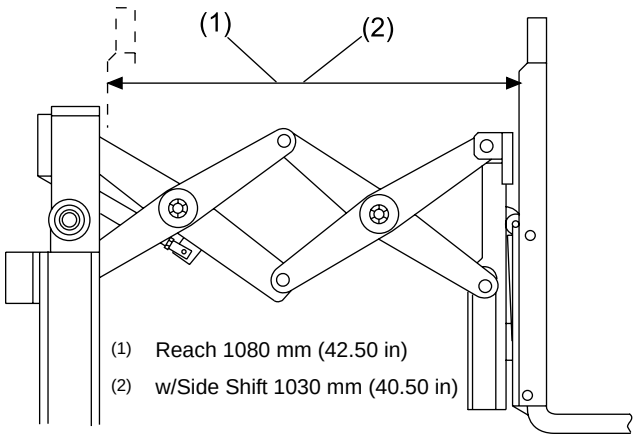


Figure 17067

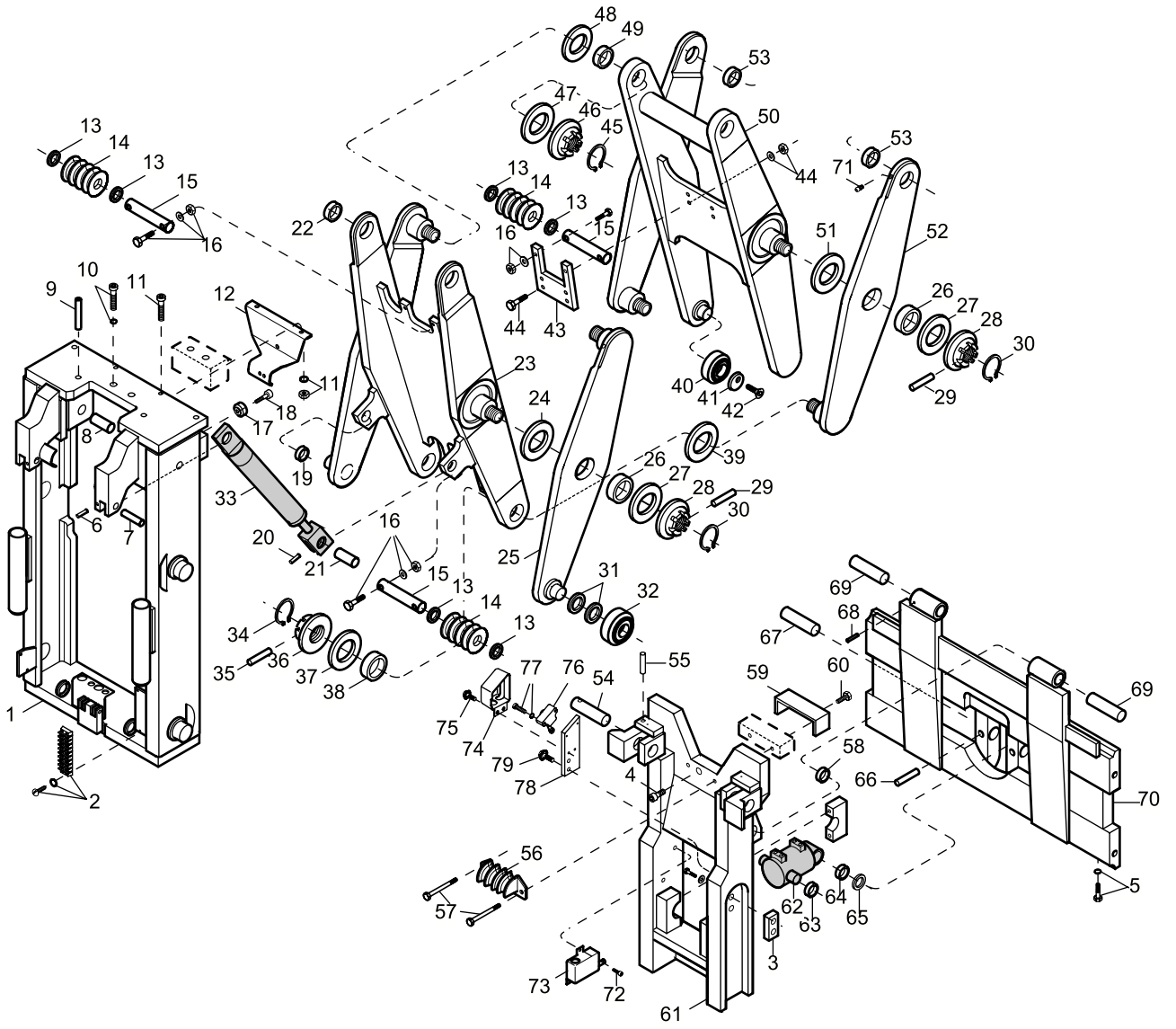


Figure 17068

Disassembly

(See Figure 17068)

1. Remove four screws holding load backrest (not shown) to fork plate (70) and remove load backrest.
2. Remove screw (5) in bottom cross member of fork plate.
3. Remove forks (not shown) from fork plate.
4. Raise mast and put two 50 x 100 x 690 mm (2 x 4 x 27 in) hardwood blocks under second stage of TT mast. Extend reach assembly and place 50 x 100 x 200 mm (2 x 4 x 8 in) hardwood block in either left or right channel of reach support assembly (1).
5. Retract reach assembly until column roller (32) on outer arm (25) is resting on hardwood block. The hardwood block will not allow assembly to retract when the reach cylinders are removed.
6. Disconnect battery, chock wheels.

7. Remove roll pin (66) from tilt cylinder shaft (67) with brass punch or other soft material rod. Remove two roll pins (68) from pivot shafts (69) at top of fork plate. Use lifting device or other suitable means to support fork plate, and remove pivot shafts.
   Remove hydraulic lines from tilt cylinder (62) to manifold block (not shown) on support assembly. (Allow hydraulic pressure to bleed off slowly). Remove four screws holding tilt cylinder in carriage assembly (61). Remove tilt cylinder, if further disassembly is required take to a clean working area. Consult cylinder section of this manual for proper disassembly procedure.
   If ball bushing (64) in tilt cylinder rod end requires replacement, remove retaining rings (65) and use an arbor press to remove and replace it.
8. Attach lifting device to top cross bar of carriage assembly (61). Remove roll pins (55) in pivot shafts (54) which connect outer arms to carriage assembly. Remove pivot shafts and raise carriage assembly to clear carriage rollers (40) on inner arm assembly (50).
9. Remove roll pin (20) from pivot shaft (21) at rod end of reach cylinders (33). Remove pivot shafts (21) at rod end. Disconnect hydraulic lines from bulkhead located near top of reach cylinders. Remove roll pin (6) from upper pivot shafts (7) and remove pivot shafts. Reach cylinders should be replaced on support assembly in same position as they were removed.
10. Using two lifts connect hoists to primary inner arm assembly cross brace (23) and to secondary inner arm assembly cross brace (50). Lift until column rollers on outer arm assemblies can be rotated out of support assembly channel.
11. Remove column rollers (40) from secondary inner arm assembly (50).
12. Remove column rollers (32) from outer arms (25). Record the number and position of all spacers. Use for reference during reassembly.
13. Remove roll pins (35) and retaining rings (34) from locknuts (36) at lower end of secondary outer arms (52). Remove locknut with a hook type spanner wrench.
14. Remove roll pins and retaining rings from locknuts (28) at pivot center of secondary outer arms.
15. Remove secondary outer arms (52) and thrust washers. Record the location of thrust washers. Use for reference during reassembly.
16. Remove roll pins (29) and retaining rings (45) from locknut (46) at upper end of primary outer arm (25). Remove locknut with a hook type spanner wrench.
17. Remove roll pin (29) and retaining ring (30) from locknut (28) at pivot center of primary outer arm (25) only.
18. Carefully remove primary outer arm (25) and thrust washers. Record the location of thrust washers. Use for reference during reassembly.
19. Carefully remove secondary inner arm assembly (50). Record the location of thrust washers on primary outer arm (25). Use for reference during reassembly.
20. Remove roll pin (29) and retaining ring (30) from locknut (28) at pivot center of primary outer arm (25).
21. Remove primary outer arm (25). Record the location of thrust washers. Use for reference during reassembly.
22. Remove lifting device from primary inner arm (23) and attach to reach support (1).
23. Disconnect chains and hydraulic lines from reach support (1). Remove rest of reach assembly from truck and set on floor.
24. Remove roll pins (9) in pivot shafts (8) of primary inner arm. Use lifting device or other suitable means to support primary inner arm and remove pivot shafts.

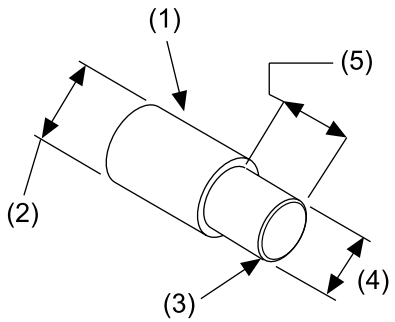
Bushing Replacement (Reach Assembly Components)

When removing old bushing be sure seating area of bushing is not damaged in any manner. If damage does occur remove all burrs and rough edges completely.

When installing new bushings in a lubricated area make sure hole in bushing is in proper alignment with the lubrication fitting to allow proper lubrication flow.

Apply a light coat of grease to bushing seat to ease installation and reduce possibility of damage to new bushings.

A bushing installation tool, refer to Figure 17055, will aid greatly in proper installation of new bushings.



(1) Bushing Installation Tool

(2) 0.13 mm (0.005 in) Smaller than the Bushing Outside Diameter

(3) 1.6 mm (0.062 in) Chamfer

(4) 0.13 mm (0.005 in) Smaller than the Bushing

(5) Equal to the Length of the Bushing

Figure 17055

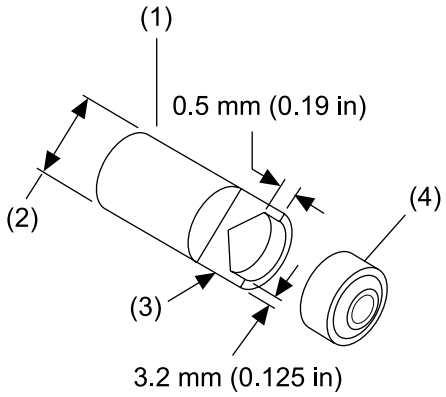
NOTE

The installation tool can also be used effectively to remove worn or damaged bushings. Various sizes of bushings will necessitate use of various sizes of installation tools.

Ball bushings are removed and installed with greater ease when using an installation tool, refer to Figure 17056

NOTE

Close inspection of all new bushings after installation is necessary to be sure wear surfaces are intact.



(1) Ball Bushing Installation Tool

(2) 0.13 mm (0.005 in) Smaller than the Ball Bushing Outside Diameter

(3) Cut-away View of the Counterbore

(4) Ball Bushing

Figure 17056

Center Pivot Repair and Adjustment

When replacing thrust washers items 24, 27 and 51 on both sides of the outer arm assembly, apply a light coat of grease to all surfaces.

NOTE

Be sure all areas of contact are thoroughly cleaned and free of any burrs or debris that could damage new thrust washers.

To properly adjust, tighten the nut on the center pivot assembly snug to eliminate any abnormal drag. Loosen nut and retighten to 460 Nm (65 in lb), then continue to tighten to next nearest groove pin location.

Reassembly

WARNING

Wear appropriate items, such as safety glasses, steel-toed shoes, whenever performing maintenance work. Do not place fingers, hands or arms through mast or position them at pinch points.
In this section you may be required to lift and block the truck and mast or raise and lower different components for removal and installation. Make sure lifting device and sling are sufficiently rated to withstand the weight being lifted. Never work under or around a truck that is not properly secured. Refer to truck Data Plate for truck weight information.
It will be necessary to disconnect and remove the battery from the truck, disconnect tilt cylinders from the mast, disconnect electrical connections and hydraulic lines. "Control of Hazardous Energy" section provides information for performing the above procedures along with some additional information on other procedures dealing with truck maintenance. This section should be read and reviewed prior to mast removal, installation and maintenance as outlined in this section.

NOTE

Before proceeding with reassembly, all parts should be clean and free of any burrs or rough edges which could damage new bushings or other parts during assembly. Apply a thin coat of grease to all bushings, thrust washers and pivot shafts.

1. Refer to Figure 17068. Install inner arm assembly (23) into reach support (1).
   Install pivot shafts (8) simultaneously, rather than one at a time. Pivot shafts are slotted on the end to obtain proper alignment for installation of roll pin (9).
2. Install reach support assembly and primary inner arm back into mast and reconnect chain. Remove lifting device from reach support and connect to primary inner arm (23).
3. Install thrust washer (24) at center pivot. Slide one outer arm (25) onto center pivot stud. Install thrust washer (27), locknut (28), roll pin (29) and retaining ring (30).

NOTE

Refer to Center Pivot Repair and Adjustment, (located in this section) for proper adjustment information of center pivot.

4. Install thrust washer (48) on upper pivot of primary outer arm (25). Using second lifting device, install the secondary inner arm (50) on outer stud of primary outer arm (25). Install thrust washer (47), locknut (46), roll pin (29) and retaining ring (45).
5. Place thrust washer (24) on center pivot of primary inner arm (23) and thrust washer (16) on primary outer arm (25).
6. Install primary outer arm (25) on secondary inner arm (50) and on primary inner arm (23). Install thrust washer (27), locknut (28), roll pin (29) and retaining ring (30) on center pivot, and thrust washer (47), locknut (46), roll pin (29) and retaining ring (45) on outer pivot.
7. Place thrust washer (39) on lower pivot of secondary outer arms (52) and thrust washer (51) on center pivots of secondary inner arm (50).
8. Slide both secondary outer arms over center pivot of secondary inner arm (50) as well as into lower hole on primary inner arm (23). Install thrust washer (27), locknut (28), roll pin (29) and retaining ring (30) on center pivots of inner arm (50), and thrust washer (37), locknut (36), roll pin (35) and retaining ring (34) on lower pivots.
9. Use an inside caliper to measure area of support assembly where column roller (32) on outer arm will travel, record measurement.
10. Install column rollers (32) to outer arms (25). Measure distance between column rollers with an outside caliper. Subtract this dimension from dimension obtained in step 9 to determine the amount of shims required. Balance out the number of shims (Example: 2 shims right, 2 shims left). If an uneven number of shims are required, note to which side the extra shim was added and install all other odd shims to that side.
11. Lift unit and install column rollers back into support assembly channel. Place 50 x 100 x 200 mm (2 x 4 x 8 in) hardwood block in right or left channel of reach support assembly. Lower reach assembly until column roller (32) is resting on hardwood block.
12. Remove hoist from cross brace of secondary inner arm (50).
13. Measure distance between outer arms at top. 335 mm (13.25 in). Measure distance between pivot blocks welded on fork carriage assembly (61). These dimensions should indicate that the outer arms will fit properly in the fork carriage assembly.

NOTE

Failure of the outer arms to fit into carriage assembly properly indicates inner arm assembly, carriage assembly, or outer arm assembly is bent or deformed in some way.

14. Attach carriage rollers (40) to inner arm assembly studs.
15. Guide fork carriage assembly onto inner arm carriage rollers.
16. Install pivot shafts (54) and roll pins (55).
17. Install reach cylinders.
    – Install pivot shafts (7) and roll pins (6).
    – Extend cylinder manually and install pivot shafts (21) and roll pins (20).
    – Connect hydraulic lines from reach cylinders to bulkheads near top of reach cylinders.
18. Place bushings (63) on tilt cylinder (62) pivot studs and install tilt cylinder assembly in carriage assembly. (Check serial number plate to obtain capacity of truck to obtain proper tilt cylinder assembly. This information is also needed to obtain proper fork plate assembly (70) and tilt cylinder shaft (67).
19. Connect all hydraulic lines from tilt cylinder to manifold block at top of support assembly.
20. Position fork plate assembly (70) with a lifting device and install pivot shafts (69) and pins (68).
21. Extend tilt cylinder piston rod and install tilt cylinder shaft (67) and pin (66). Remove hardwood block from reach support channel and two hardwood blocks from mast second stage. Remove lifting device from primary inner arm (23) cross brace.
22. Run an operational check on reach assembly. Refer to "Reach Cylinder Adjustment" for adjustment procedure.
23. Install forks and load backrest. Install bolt (5).

WARNING

AVOID HIGH PRESSURE FLUIDS - Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic lines. Tighten all connections before applying pressure. Keep hands and body away from pin holes which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.
Any fluid injected into the skin under high pressure should be considered as a serious medical emergency despite an initial normal appearance of the skin. There is a delayed onset of pain, and serious tissue damage may occur. Medical attention should be sought immediately by a specialist who has had experience with this type of injury.

Carriage hydraulic circuits need to be flushed after repair of reach cylinders and bled of all air. Before flushing and bleeding of system inspect all hydraulic connections and verify that all filters are installed and hydraulic fluid levels are adequate for test. Hydraulic system must be pressurized during the flushing and bleeding procedures.

Flushing

1. Remove hoses from side-shift cylinder and connect them together using a male connector.
2. Energize SVS side-shift solenoid selector valve, actuate manual valve at full speed in order to pump hydraulic oil through carriage hydraulics and then back through the filter.
3. Flush carriage hydraulics for at least 2 minutes, reversing flow frequently.
4. Reconnect hoses to side-shift cylinder.

Bleeding

1. Fully extend reach cylinders.
2. Block carriage so it can not retract.
3. Remove hose from rod side of left reach cylinder.
4. Energize SVR reach solenoid selector valve, actuate the manual valve to pressurize "A" port to the carriage, and hold until a solid stream of hydraulic fluid flows out through the hose. This is passing hydraulic fluid through mast hoses, reach manifold and through the tilt-side-shift manifold.
5. Connect hose on left reach cylinder.
6. Repeat above steps for the right reach cylinder.
7. Remove blocks from carriage.
8. Fully retract the reach cylinders.
9. Remove hose from piston side of left reach cylinder.
10. Block carriage so it cannot extend.
11. Energize SVR reach solenoid selector valve, actuate manual valve to pressurize "B" port to the carriage, and hold until a solid stream of hydraulic fluid flows out through hose. This is passing hydraulic fluid through mast hoses, reach manifold and through the tilt-side-shift manifold.
12. Connect hose on left reach cylinder.
13. Repeat above steps for the right reach cylinder.
14. Remove blocks from carriage.

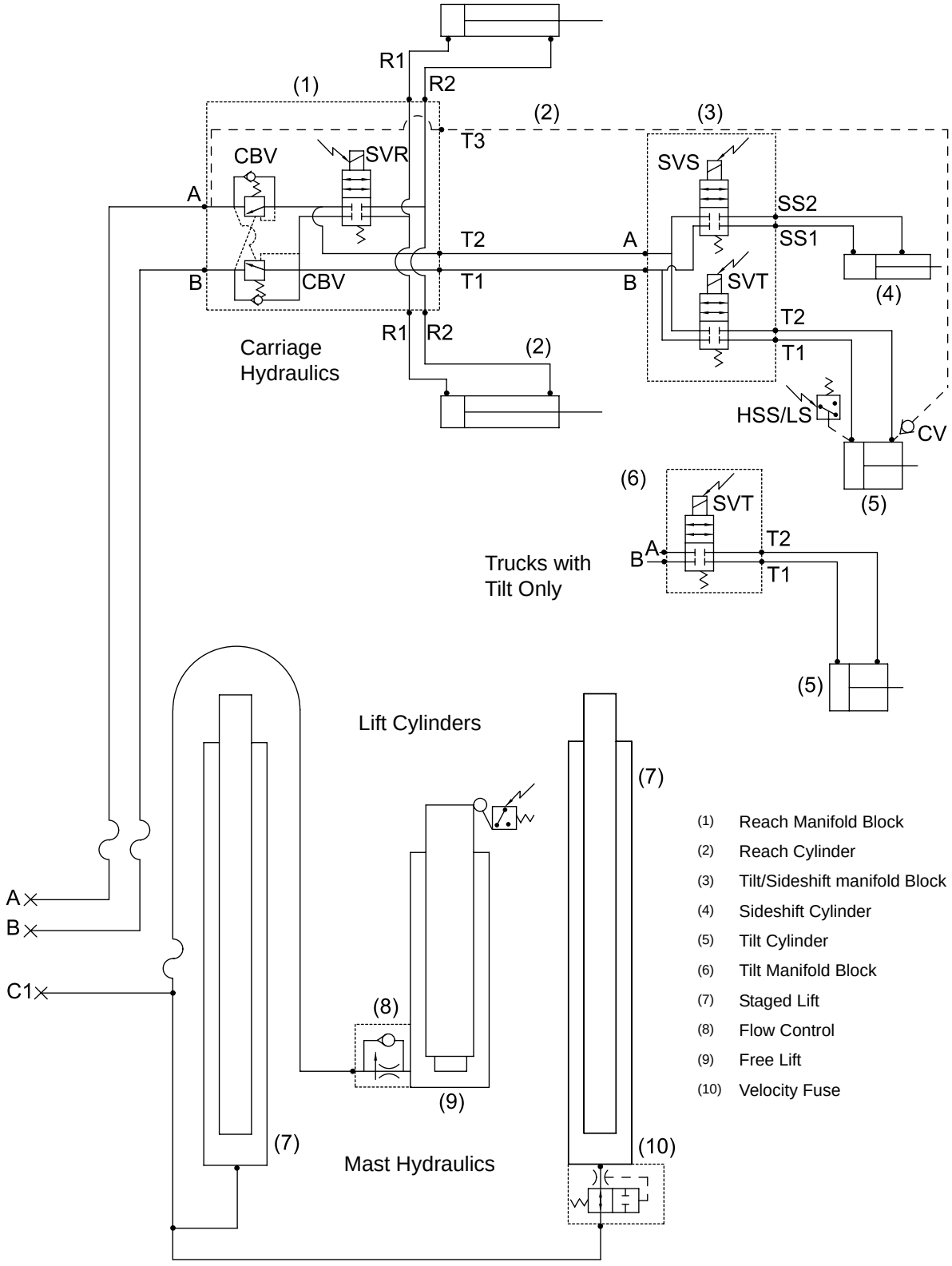


Figure 17057

RR/RD SERIES 5200

Components of the RR/RD Series 5200 truck have been listed in chart form to assist the maintenance mechanic in locating these components on the Electrical Diagrams and Exploded Parts pages.

The chart is in columns: COMPONENT; LOCATION; FUNCTION; DIAGRAM; PARTS PAGE. The COMPONENT column contains the abbreviation of the component as it appears on the Diagrams in the Maintenance Section. The LOCATION column gives the general location on the truck such as on platform or in power unit. the FUNCTION column then explains the function or circuit of that device. The DIAGRAM column gives the page number of the diagram on which the component can be found. The callout in parenthesis following the page number corresponds to the grid callouts on that diagram, locating that component. The PARTS PAGE column includes the exploded parts page number on which the component is located along with the index number, in parenthesis, if applicable.

AUDIBLE INDICATORS

	Location	Function	Diagram	Parts Page
ALM1	Distribution Panel	Status Alarm	DIA–1452–002 (B-3) DIA–1452–003 (B-3) DIA–1452–006 (B-3)	04.3–1452–001
ALM2	Traction Motor Compartment	Travel Alarm	DIA–1452–002 (A-2) DIA–1452–003 (A-2) DIA–1452–006 (A-2)	04.0–1452–001 (22)
HN	Traction Motor Compartment	Horn	DIA–1452–002 (B-4) DIA–1452–003 (B-4) DIA–1452–006 (C-2)	04.0–1452–001 (19)

BATTERY

	Location	Function	Diagram	Parts Page
Battery	Power Unit	Power	DIA–1452–002 (B-4) DIA–1452–003 (B-4) DIA–1452–007 (C-1) DIA–1452–008 (C-1) DIA–1452–018 (C-3) DIA–1452–020 (A-4)	01.2–1452–100 (20)

CONNECTORS

	Location	Function	Diagram	Parts Page
CA201	Distribution Panel	TMM Switches & Thermostats	DIA–1452–006 (A-3)	04.3–1452–001
CA202	Distribution Panel	Override Switch	DIA–1452–006 (A-3)	04.3–1452–001
CA203	Distribution Panel	Battery Restraint Switch (es)	DIA–1452–006 (A-3)	04.3–1452–001
CA204	Distribution Panel	Access 2	DIA–1452–006 (A-2)	04.3–1452–001
CA205	Distribution Panel	Travel Alarm ALM 2	DIA–1452–006 (A-2)	04.3–1452–001
CA206	Distribution Panel	Access 3	DIA–1452–006 (C-3)	04.3–1452–001
CA207	Distribution Panel	Truck-KYS, EDS, HN, etc.	DIA–1452–006 (C-2)	04.3–1452–001
CA208	Distribution Panel	CAN Connection	DIA–1452–006 (B-3)	04.3–1452–001
CA209	Distribution Panel	Mast Cable	DIA–1452–006 (A-2)	04.3–1452–001
CA210	Distribution Panel	Load Sense II	DIA–1452–006 (B-2)	04.3–1452–001
CA211	Access 1 Mtg Brkt	KYS Suppressor Block	DIA–1452–006 (C-2)	04.0–1452–001
NB213	Bus Bar Access 2 & 3	Battery Negative Bus	DIA–1452–007 (B-1)	04.0–1452–001 (7)
CA215	Top of Motor Compt	HN Relay Driver Block	DIA–1452–007 (B-1)	04.0–1452–001

CONNECTORS **(Continued)**

	Location	Function	Diagram	Parts Page
CA401	Key Switch	Key Switch	DIA–1452–006 (C-2)	04.0–1452–001 (12, 17)
CA402	Access 3	Inputs & Outputs	DIA–1452–007 (B-2)	04.0–1452–001
CA403	Access 3	Inputs & Outputs	DIA–1452–007 (C-2, B-3)	04.0–1452–001
CA404	Access 2	Inputs & Outputs	DIA–1452–008 (B-1)	04.0–1452–001
CA405	Access 2	Inputs & Outputs	DIA–1452–008 (C-10, B-3)	04.0–1452–001
TB406	Fork Carriage	SVR, SVS, SVT, & FLS	DIA–1452–009 (B-1)	09.0–1452–001 (58)
			DIA–1452–020 (C-1)	09.0–1452–100 (70)
				09.0–1652–001 (2)
				09.0–1652–100 (2)
CA407	Access 1 Std & Enhanced	Display CAN, Pwr/Sw Inputs	DIA–1452–011 (B-2)	04.8–1452–001
			DIA–1452–012 (B-1)	
CA408	Access 1 Enhanced	Display Load Sense/Sw Input	DIA–1452–012 (B-2)	04.8–1452–001
CA409	Contactor Panel	Contactor Panel Connector	DIA–1452–013 (B-1)	04.1–1452–001
				04.1–1452–051
CA410	Access 1 Mtg Brkt	Dome Light Resistor RES1	DIA–1452–013 (B-2)	04.8–1452–001
CA601	Access 1 Mtg Brkt	PC Service Terminal	DIA–1452–002 (B-3)	04.8–1452–001
			DIA–1452–003 (B-3)	
			DIA–1452–007 (A-2)	
CA602	Access 3	Access 3 ECR1	DIA–1452–007 (A-4)	04.0–1452–001
CA604	Access 1 RH Side	Display Sw Brd Connector	DIA–1452–011 (B-2)	04.8–1452–001
			DIA–1452–012 (B-1)	
CA605	Access 1 LH Side	Display Sw Brd Connector	DIA–1452–012 (A-2)	04.8–1452–001
CA607	Under Floorboard	Floorboard Switches	DIA–1452–015 (B-1)	01.0–1452–050
CA609	Traction Motor Brake	Traction Brake Connector	DIA–1452–015 (B-2)	05.3–1452–100
CA611	Multi-Task Brkt	POT1, POT2 & Direction Sw	DIA–1452–017 (B-1)	04.6–1452–001
			DIA–1452–020 (C-2)	
CA612	Multi-Task Brkt	POT3 & Handle Sw	DIA–1452–017 (B-2)	04.6–1452–001
			DIA–1452–020 (C-2)	
CA615	Access 1 Brkt	Operator Fan Resistors	DIA–1452–013 (C-3)	04.8–1452–001
CA616	Power Unit Frt Wall	Worklights Connector	DIA–1452–013 (B-4)	
CA617	Fork Carriage	FKS/HSS or Load Sense Opt	DIA–1452–009 (B-1, B-2)	02.0–1452–600
				04.8–1452–500
CA618	Fork Carriage	FKS/HSS or Load Sense Opt	DIA–1452–009 (B-1, B-2)	02.0–1452–600
				04.8–1452–500
CA619	Fork Carriage	FKS/HSS or Load Sense Opt	DIA–1452–009 (C-1, C-2)	02.0–1452–600
				04.8–1452–500
CA620	Fork Carriage	FKS Heater	DIA–1452–009 (C-2)	04.8–1452–500
			DIA–1452–020 (C-2)	
CA621	Fork Carriage	FKS Heater	DIA–1452–009 (C-2)	04.8–1452–500
			DIA–1452–020 (C-2)	
CA622	Reach Carriage	Reach Solenoid	DIA–1452–009 (B-1)	02.0–1452–600
				02.0–1452–800
CA623	Reach Carriage	Reach Solenoid	DIA–1452–009 (B-1)	02.0–1452–600
				02.0–1452–800
CA624	Reach Carriage	Tilt/Side Shift Solenoid	DIA–1452–009 (B-1)	02.0–1452–800
CA625	Reach Carriage	Side Shift Solenoid	DIA–1452–009 (B-1)	02.0–1452–800
CA626	Reach Carriage	Tilt Solenoid	DIA–1452–009 (B-1)	02.0–1452–600
				02.0–1452–800
CA645	Main Frame Mast	Height Switch	DIA–1452–009 (B-3)	07.2–1452–001
				07.2–1452–100

***CONNECTORS* (Continued)**

	Location	Function	Diagram	Parts Page
CA646	Main Frame Mast	Height Reset	DIA–1452–009 (B-4)	07.2–1452–001 07.2–1452–100
CA647	Carriage	Tilt Position Assist POT4	DIA–1452–009 (C-2)	09.0–1452–001 09.0–1452–100
CA648	Carriage	Tilt Position Assist POT4	DIA–1452–009 (C-2)	09.0–1452–001 09.0–1452–100
CA649	Carriage	Tilt Position Assist POT4	DIA–1452–009 (C-2)	09.0–1452–001 09.0–1452–100
CA652	Power Unit Top	Tilt Position Assist	DIA–1452–006 (B-1)	04.0–1452–001
CA653	Power Unit Top	Tilt Position Assist	DIA–1452–006 (B-1)	04.0–1452–001
CA654	Power Unit Top	Tilt Position Assist	DIA–1452–006 (B-1)	04.0–1452–001
CA655	Power Unit Top	Tilt Position Assist	DIA–1452–006 (B-1)	04.0–1452–001
CA656	Power Unit Top	Tilt Position Assist	DIA–1452–006 (B-1)	04.0–1452–001
CA802	Power Unit Top	Oper Fan/Strobe Lgt Conn	DIA–1452–013 (B-3)	04.9–1452–050
CA803	Batt Restraint Sw LH	Heater BRES2	DIA–1452–020 (C-1)	01.2–1452–100
CA804	Batt Restraint Sw LH	Heater BRES2	DIA–1452–020 (C-1)	01.2–1452–100
CA805	Batt Restraint Sw RH	Heater BRES1	DIA–1452–020 (C-1)	01.2–1452–100
CA806	Batt Restraint Sw RH	Heater BRES1	DIA–1452–020 (C-1)	01.2–1452–100
CA807	Freezer Dist Board	Output to Heaters	DIA–1452–020 (B-1)	04.9–1452–002
CA808	Freezer Dist Board	Battery Input	DIA–1452–020 (A-2)	04.9–1452–002
CA809	Dist Panel	Heater FLS/FKS	DIA–1452–006 (B-1) DIA–1452–020 (B-1, B-2)	04.9–1452–001 07.2–1452–001 07.2–1452–100
CA810	Dist Panel	Heater FLS/FKS	DIA–1452–006 (B-1) DIA–1452–020 (B-1, B-2)	04.9–1452–001 07.2–1452–001 07.2–1452–100
CA812	Multi-Task Base	Heater EDS	DIA–1452–020 (B-2)	04.6–1452–001
CA813	Multi-Task Base	Heater EDS	DIA–1452–020 (C-2)	04.6–1452–001
CA814	Power Unit Top	Heater HGTS12 or HGTRS	DIA–1452–020 (B-2)	04.9–1452–001
CA815	Power Unit Top	Heater HGTS12 or HGTRS	DIA–1452–020 (B-2)	04.9–1452–001
CA816	Floorboard	Floorboard Heater/THS5	DIA–1452–020 (B-3)	04.9–1452–001
CA819	Mast Top LH	Heater Height Encoder	DIA–1452–020 (B-1)	04.9–1452–001
CA820	Mast Top LH	Heater Height Encoder	DIA–1452–020 (B-1)	04.9–1452–001
CA823	Contactor Panel	Fuses F/C	DIA–1452–020 (A-2)	04.9–1452–002
CA824	Motor Compartment	Fans	DIA–1452–006 (C-3)	01.0–1452–001

CONTACTORS

	Location	Function	Diagram	Parts Page
ED	Contactor Panel	Emergency Disconnect	DIA–1452–002 (A-3, B-2) DIA–1452–003 (A-3, B-2) DIA–1452–007 (B-1, C-1) DIA–1452–008 (B-1, C-1) DIA–1452–013 (B-1) DIA–1452–018 (C-2)	04.1–1452–001 (16) 04.1–1452–050 (16)
P2	Contactor Panel	Pump 2 Contactor	DIA–1452–002 (A-1, A-2) DIA–1452–003 (A-1, A-2) DIA–1452–008 (B-1) DIA–1452–013 (B-1) DIA–1452–018 (B-2)	04.1–1452–050 (37)

FUSES

	Location	Function	Diagram	Parts Page
FU1	Contactor Panel	Control HN, Access 1,2,3 Pwr & Precharge	DIA–1452–002 (A-4) DIA–1452–003 (A-4) DIA–1452–013 (B-1) DIA–1452–020 (A-3)	04.1–1452–001 (25) 04.1–1452–050 (25)
FU2	Contactor Panel	Accessory Cable	DIA–1452–002 (A-1) DIA–1452–003 (A-1) DIA–1452–013 (B-1)	04.1–1452–001 (26) 04.1–1452–050 (26)
FU3	Contactor Panel	Fan/Strobe Lgt/Work Lgts	DIA–1452–002 (A-1) DIA–1452–003 (A-1) DIA–1452–013 (B-1)	04.1–1452–001 (27) 04.1–1452–050 (27)
FU4	Contactor Panel	ALM2/P2/Solenoid Valve	DIA–1452–002 (A-2) DIA–1452–003 (A-2) DIA–1452–013 (B-1)	04.1–1452–001 (28) 04.1–1452–050 (28)
FU5	Contactor Panel	Traction Brk Outer Coil	DIA–1452–002 (A-3) DIA–1452–003 (A-3) DIA–1452–013 (B-1)	04.1–1452–001 (29) 04.1–1452–050 (29)
FU6	Contactor Panel	Traction Brk Inner Coil	DIA–1452–002 (A-3) DIA–1452–003 (A-3) DIA–1452–013 (B-1)	04.1–1452–001 (30) 04.1–1452–050 (30)
FU7	Contactor Panel	P2 Lift Pump	DIA–1452–002 (A-1) DIA–1452–003 (A-1) DIA–1452–008 (B-1) DIA–1452–018 (B-2)	04.1–1452–050 (34)
FU8	Contactor Panel	Access 2	DIA–1452–002 (A-1) DIA–1452–003 (A-1) DIA–1452–008 (C-1) DIA–1452–018 (C-2)	04.1–1452–001 (12) 04.1–1452–050 (12)
FU9	Contactor Panel	Access 3	DIA–1452–002 (A-3) DIA–1452–003 (A-3) DIA–1452–007 (C-1) DIA–1452–018 (C-2)	04.1–1452–001 (11) 04.1–1452–050 (11)
FU10	Distribution Panel	Access 3 Logic Common	DIA–1452–002 (B-3) DIA–1452–003 (B-3) DIA–1452–006 (B-3)	04.3–1452–001 (2)
FU11	Distribution Panel	Access 2 Logic Common	DIA–1452–002 (B-1) DIA–1452–003 (B-1) DIA–1452–006 (A-3)	04.3–1452–001 (3)
FU12	Freezer Dist Board	Freezer Dist Board	DIA–1452–002 (A-1) DIA–1452–003 (A-1) DIA–1452–020 (A-2, A-3)	04.9–1452–002 (27)
FU13	Freezer Dist Board	Freezer Dist Board	DIA–1452–020 (A-3, B-1)	04.9–1452–002 (28)
FU14	Freezer Dist Board	Freezer Dist Board	DIA–1452–020 (A-3, B-2)	04.9–1452–002 (28)

LIGHTS

	Location	Function	Diagram	Parts Page
LGT1	Lower Mast LH Side	Dome Light	DIA–1452–002 (C-3) DIA–1452–003 (C-3) DIA–1452–013 (C-2)	04.9–1452–050 (24)
LGT2	Mast LH Side	Left Worklight	DIA–1452–013 (C-4)	04.9–1452–050 (31)
LGT3	Mast RH Side	Right Worklight	DIA–1452–013 (C-4)	04.9–1452–050 (31)
LGT4	Overhead Guard	Strobe Light	DIA–1452–013 (C-3)	04.9–1452–050 (17)

MISCELLANEOUS

	Location	Function	Diagram	Parts Page
Access 1	Power Unit Top	Display	DIA–1452–002 (C-3) DIA–1452–003 (B-3) DIA–1452–011 DIA–1452–012	04.8–1452–001
Access 2	Power Unit Top	Control Hyd Functions	DIA–1452–002 (B-1) DIA–1452–003 (B-1) DIA–1452–008 DIA–1452–018 ((A-1)	04.0–1452–001 (10)
Access 3	Power Unit Top	Control Traction	DIA–1452–002 (B-3) DIA–1452–003 (B-3) DIA–1452–007 DIA–1452–018 (B-1)	04.0–1452–001 (1)
BRK1	Traction Mtr Compt	Traction Brake	DIA–1452–002 (B-3) DIA–1452–003 (A-3) DIA–1452–015 (C-3)	05.3–1452–100
ECR1	Traction Mtr Compt	Traction Encoder	DIA–1452–002 (B-3) DIA–1452–003 (B-4) DIA–1452–007 (A-4)	04.0–1452–001 (24)
ECR2	Height Sensor	Height Encoder	DIA–1452–002 (B-3) DIA–1452–003 (A-3) DIA–1452–009 (C-3)	04.8–1452–100 (5)
FN	Overhead Guard	Operator Fan	DIA–1452–013 (C-3)	04.9–1452–050 (7)
FN1	Motor Compt Door	Motor Compartment Fan	DIA–1452–006 (C-3)	01.0–1452–001 (30, 31)
FN2	Motor Compt Door	Motor Compartment Fan	DIA–1452–006 (C-3)	01.0–1452–001 (31)
TPA	Power Unit Top	Tilt Position Assist	DIA–1452–002 (C-2) DIA–1452–003 (C-2) DIA–1452–006 (A-1)	04.0–1452–001 (44)

MOTORS

	Location	Function	Diagram	Parts Page
M1	Drive Unit	Traction Motor	DIA–1452–002 (B-2) DIA–1452–003 (B-3) DIA–1452–007 (B-1) DIA–1452–012 (B-3) DIA–1452–018 (A-2)	03.1–1452–001 03.1–1452–100
M2	Power Unit	Lift Pump 1 Motor	DIA–1452–002 (B-1) DIA–1452–003 (B-1) DIA–1452–008 (C-1) DIA–1452–012 (B-3) DIA–1452–018 (A-2)	02.2–1452–001 02.2–1452–050 02.2–1452–100

MOTORS (Continued)				
	Location	**Function**	**Diagram**	**Parts Page**
M3	Power Unit	Lift Pump 2 Motor	DIA–1452–002 (B-1) DIA–1452–003 (B-1) DIA–1452–008 (B-1) DIA–1452–012 (A-3) DIA–1452–018 (B-2)	02.2–1452–001 02.2–1452–050

POTENTIOMETERS				
	Location	**Function**	**Diagram**	**Parts Page**
POT1	Multi-Task Control	Traction Pot	DIA–1452–002 (B-4) DIA–1452–003 (B-4) DIA–1452–017 (C-1)	04.6–1452–001 (13)
POT2	Multi-Task Control	Raise/Lower	DIA–1452–002 (B-2) DIA–1452–003 (B-2) DIA–1452–017 (C-2)	04.6–1452–001 (15)
POT3	Multi-Task Control	Accessory Pot	DIA–1452–002 (B-2) DIA–1452–003 (B-2) DIA–1452–017 (C-2)	04.6–1452–001 (31)
POT4	Carriage	TPA Sensor	DIA–1452–002 (C-2) DIA–1452–003 (C-2) DIA–1452–009 (C-2)	09.0–1452–001 (61) 09.0–1452–100 (73)

RELAYS				
	Location	**Function**	**Diagram**	**Parts Page**
K1	Distribution Panel	Power Up	DIA–1452–002 (A-4, B-4) DIA–1452–003 (A-4, B-4) DIA–1452–006 (B-2, B-3) DIA–1452–020 (A-3)	04.3–1452–001 (4)
K2	Distribution Panel	Horn	DIA–1452–002 (B-4) DIA–1452–003 (B-4) DIA–1452–006 (B-2)	04.3–1452–001 (5)
K3	Access 1 Brkt	OptionsFan/Strobe/Wk Lgt Accy Cable	DIA–1452–002 (A-1, B-4) DIA–1452–003 (A-1, B-4) DIA–1452–013 (B-2)	04.8–1452–001 (27)
K11	Freezer Dist Board	Control for K12	DIA–1452–020 (A-4, A-2)	04.9–1452–001 (25)
K12	Freezer Dist Board	Energizes Heaters	DIA–1452–020 (A-3, B-2)	04.9–1452–001 (26)
RDB1	Top of Motor Compt	Horn	DIA–1452–002 (A-3) DIA–1452–003 (A-4) DIA–1452–006 (C-1)	04.0–1452–001 (32)

RESISTORS/HEATERS				
	Location	**Function**	**Diagram**	**Parts Page**
RES1	Access 1 Mtg Brkt	Volt Drop Res Dome Lt	DIA–1452–013 (B-2)	04.8–1452–001 (29)
RES2	Access 1 Mtg Brkt	Volt Drop Res Fan	DIA–1452–013 (B-3)	04.8–1452–001 (30)
RES3	Access 1 Mtg Brkt	Volt Drop Res Fan	DIA–1452–013 (B-3)	04.8–1452–001 (31)
RES4	LH Battery Gate	Heater for BRES2	DIA–1452–020 (B-3, C-1)	01.2–1452–100 (3)
RES5	RH Battery Gate	Heater for BRES1	DIA–1452–020 (B-3, C-1)	01.2–1452–100 (3)
RES6	Fork Carriage	Heater for FLS	DIA–1452–020 (B-4, C-1)	04.9–1452–001 (15)
RES7	Fork Carriage	Heater for FKS	DIA–1452–020 (B-4, C-2)	04.8–1452–500 (9)

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***RESISTORS/HEATERS* (Continued)**

	Location	Function	Diagram	Parts Page
RES8	Multi-Task Control Brkt	Heater for EDS	DIA–1452–020 (B-4, C-2)	04.9–1452–002 (35)
RES9	Multi-Task Control Brkt	Volt Drop Res for RES10	DIA–1452–020 (B-3, C-2)	04.9–1452–002 (33)
RES10	Multi-Task Control Brkt	Patch Heater POT3	DIA–1452–020 (B-3, C-2)	04.9–1452–002 (32)
RES11	Multi-Task Control Brkt	Patch Heater for POT1	DIA–1452–020 (B-3, C-2)	04.9–1452–002 (31)
RES13	Floorboard	Heater for DMS1	DIA–1452–020 (B-3, C-3)	04.9–1452–001 (2)
RES14	Floorboard	Heater for BRS1	DIA–1452–020 (B-3, C-3)	04.9–1452–001 (2)
RES15	Floorboard	Heater for ENS	DIA–1452–020 (B-3, C-3)	04.9–1452–001 (2)
RES19	Height Sensor	Heater for ECR2	DIA–1452–020 (A-1,B-4)	04.9–1452–001 (9)
RES22	Multi-Task Control Brkt	Patch Heater for POT2	DIA–1452–020 (B-3, C-2)	04.9–1452–002 (14)
RES23	Multi-Task Control Brkt	Volt Drop Res for RES11	DIA–1452–020 (B-3, C-2)	04.9–1452–002 (33)
RES24	Multi-Task Control Brkt	Volt Drop Res for RES22	DIA–1452–020 (B-4, C-2)	04.9–1452–002 (33)

SOLENOIDS/TANSDUCER/PROPORTIONAL VALVES

	Location	Function	Diagram	Parts Page
LS	Fork Carriage Manifold	Pres Transducer Load Sense II	DIA–1452–003 (B-4) DIA–1452–009 (C-2)	02.0–1452–600 (15) 02.0–1452–800 (18)
PVA	Manifold	Prop Valve Accy	DIA–1452–002 (A-2) DIA–1452–003 (A-2) DIA–1452–009 (B-3)	02.4–1452–001 (18)
PVH	Manifold	Prop Valve Raise/Lower	DIA–1452–002 (A-2) DIA–1452–003 (A-2) DIA–1452–009 (B-3)	02.4–1452–001 (15)
SVA	Manifold	Ctl Direction Accy Functions	DIA–1452–002 (B-2) DIA–1452–003 (A-2) DIA–1452–009 (B-2)	02.4–1452–001 (17)
SCV6	Manifold	Bypass Valve	DIA–1452–002 (A-2) DIA–1452–003 (A-2) DIA–1452–009 (B-3)	02.4–1452–001 (20)
SVL	Manifold	Allows Lowering Along w/PVH	DIA–1452–002 (A-2) DIA–1452–003 (A-2) DIA–1452–009 (B-3)	02.4–1452–001 (19)
SVP	Manifold	Pilot Valve	DIA–1452–002 (B-2) DIA–1452–003 (A-2) DIA–1452–009 (B-2)	02.4–1452–001 (14)
SVR	Fork Carriage	Reach	DIA–1452–002 (A-1) DIA–1452–003 (A-1) DIA–1452–009 (B-1)	02.4–1452–050 (1)
SVS	Fork Carriage	Side Shift	DIA–1452–002 (A-1) DIA–1452–003 (A-1) DIA–1452–009 (C-1)	02.4–1452–050 (6)
SVT	Fork Carriage	Tilt	DIA–1452–002 (A-1) DIA–1452–003 (A-1) DIA–1452–009 (C-1)	02.4–1452–050 (6, 8)

SUPPRESSOR BLOCKS				
	Location	**Function**	**Diagram**	**Parts Page**
SB20	Below Access 1	Key Sw Inrush Current Prot	DIA–1452–002 (A-4) DIA–1452–003 (A-4) DIA–1452–006 (C-2)	04.0–1452–001 (36)
SB40	ED Contactor Coil	Coil Suppressor	DIA–1452–013 (B-1)	04.1–1452–001 (17) 04.1–1452–050 (17)
SB42	FN2	Supressor	DIA–1452–006 (C-3)	01.0–1452–001 (31)
SB80	Overhead Guard	Fan Suppressor	DIA–1452–013 (C-3)	04.9–1452–050 (5)
SB81	Overhead Guard	Strobe Light Suppressor	DIA–1452–013 (C-3)	04.9–1452–050 (22)

SWITCHES				
	Location	**Function**	**Diagram**	**Parts Page**
BRES1	Battery Compartment	RH Battery Gate In Place	DIA–1452–002 (B-1) DIA–1452–003 (B-2) DIA–1452–006 (A-3)	01.2–1452–100 (9)
BRES2	Battery Compartment	LH Battery Gate In Place	DIA–1452–002 (B-1) DIA–1452–003 (B-2) DIA–1452–006 (A-3)	01.2–1452–100 (9)
BRS1	Floorboard	Brake Switch 1	DIA–1452–002 (B-3) DIA–1452–003 (B-3) DIA–1452–015 (C-1)	01.0–1452–051 (23)
BWS1	M1	Brush Wear	DIA–1452–003 (C-3) DIA–1452–012 (B-3)	
BWS2	M2	Brush Wear	DIA–1452–003 (C-3) DIA–1452–012 (B-3)	
BWS3	M3	Brush Wear	DIA–1452–003 (C-3) DIA–1452–012 (A-2)	
DMS1	Floorboard	Foot BreakDIA–1452–002 (B-3)	DIA–1452–003 (B-3) DIA–1452–015 (C-2)	01.0–1452–050 (23)
DPS1	Access 1	Up Arrow	DIA–1452–002 (C-4) DIA–1452–003 (C-4) DIA–1452–011 (B-2) DIA–1452–012 (A-1)	04.8–1452–001 (9)
DPS2	Access 1	Down Arrow	DIA–1452–002 (C-4) DIA–1452–003 (C-4) DIA–1452–011 (B-2) DIA–1452–012 (A-1)	04.8–1452–001 (9)
DPS3	Access 1	Enter	DIA–1452–002 (C-4) DIA–1452–003 (C-4) DIA–1452–011 (B-2) DIA–1452–012 (A-1)	04.8–1452–001 (9)
DPS4	Access 1	Performance	DIA–1452–003 (C-4) DIA–1452–012 (A-2)	04.8–1452–001 (9)
DPS5	Access 1	Truck Hours	DIA–1452–003 (C-4) DIA–1452–012 (A-2)	04.8–1452–001 (9)
DPS6	Access 1	Service Codes	DIA–1452–003 (C-4) DIA–1452–012 (A-2)	04.8–1452–001 (9)

SWITCHES (Continued) Location	Function	Diagram	Parts Page
EDS RH Side of Multi-Task Brkt	Emergency Disconnect	DIA–1452–002 (B-4) DIA–1452–003 (B-4) DIA–1452–006 (C-2) DIA–1452–020 (A-3)	04.6–1452–001(7)
ENS Floorboard	Oper Comp Entry Switch	DIA–1452–002 (B-3) DIA–1452–003 (B-3) DIA–1452–015 (C-2)	01.0–1452–050 (10)
FKS Fork Carriage	Forks Tilted Up/Down	DIA–1452–002 (B-2) DIA–1452–003 (B-2) DIA–1452–009 (C-1, C-2)	04.8–1452–500 (7)
FLS Fork Carriage	Free Lift Switch	DIA–1452–002 (B-2) DIA–1452–003 (B-2) DIA–1452–009 (B-1)	07.2–1452–001 (69) 07.2–1452–100 (69)
FNS Access 1	Operator Fan Switch	DIA–1452–013 (B-3)	04.8–1452–001 (3)
FS Multi-Task Control	Forward Travel Optical Switch	DIA–1452–002 (B-1) DIA–1452–003 (B-1) DIA–1452–017 (C-2)	04.6–1452–001 (16)
HGTS12 Main Frame Mast	12 In from Top (P2 Cutout)	DIA–1452–002 (B-3) DIA–1452–003 (A-3) DIA–1452–009 (B-3)	07.2–1452–001 (81) 07.2–1452–100 (81)
HGTRS Main Frame Mast	Mast Staging Switch	DIA–1452–002 (B-3) DIA–1452–003 (B-3) DIA–1452–009 (B-4)	07.2–1452–001 (58) 07.2–1452–100 (58)
HNS Multi-Task Control	Horn Switch	DIA–1452–002 (B-4) DIA–1452–003 (B-4) DIA–1452–017 (B-3)	04.6–1452–001 (27)
HSS Tilt Cylinder	Pressure Sw to Limit High Spd	DIA–1452–002 (B-2) DIA–1452–003 (B-2) DIA–1452–009 (C-1)	02.0–1452–600 (15) 02.0–1452–800 (18)
KYS Power Unit Top	Key Switch	DIA–1452–002 (A-4) DIA–1452–003 (A-4) DIA–1452–006 (C-2) DIA–1452–020 (A-3)	04.0–1452–001 (12, 17)
LGS1 Access 1	Dome Lgt Switch	DIA–1452–002 (B-2) DIA–1452–003 (B-3) DIA–1452–013 (B-2)	04.8–1452–001 (2)
LGS2 Access 1	Worklight Switch	DIA–1452–013 (B-4)	04.8–1452–001 (4)
ORS Access 1	Lift Cutout Override Switch	DIA–1452–002 (B-1) DIA–1452–003 (B-1) DIA–1452–006 (A-3)	04.8–1452–001 (5)
RS Multi-Task Control	Reverse Travel Optical Switch	DIA–1452–002 (B-1) DIA–1452–003 (B-1) DIA–1452–017 (C-2)	04.6–1452–001 (16)
SSS Multi-Task Control	Sideshift Select Switch	DIA–1452–002 (B-2) DIA–1452–003 (B-2) DIA–1452–017 (C-3)	04.6–1452–001 (27)

SWITCHES **(Continued)**				
	Location	**Function**	**Diagram**	**Parts Page**
TBS	Multi-Task Control	Tilt Forks Back Switch	DIA–1452–002 (B-2) DIA–1452–003 (B-2) DIA–1452–017 (B-3)	04.6–1452–001 (27)
TDS	Multi-Task Control	Tilt Forks Down Switch	DIA–1452–002 (B-2) DIA–1452–003 (B-2) DIA–1452–017 (B-3)	04.6–1452–001 (27)
THS1	Traction Motor	Traction Mtr Over Temp Sw	DIA–1452–003 (C-3) DIA–1452–012 (B-3)	
THS2	Lift Pump Motor M2	Over Temp Switch M2	DIA–1452–003 (C-3) DIA–1452–012 (B-3)	
THS3	Lift Pump Motor M3	Over Temp Switch M3	DIA–1452–003 (C-4) DIA–1452–012 (A-3)	
THS4	Power Unit Top Front	Ambient Temp for Htr Relay	DIA–1452–020 (A-4, C-3)	04.9–1452–002 (29)
THS5	Floorboard	Control Thermostat Heaters	DIA–1452–020 (A-4, C-3)	04.9–1452–001 (2)

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Introduction to Diagram Usage

Schematic

- Power up diagram. Illustrates the circuitry involved in getting the truck system to an operating mode (Can Interface, Access 1,2,3, Controller, Contactor, ect.).
- Circuitry which stands alone and is separate from truck operation is shown in block form with the pictorials detailing the circuitry (e.g. light package, displays, wire guidance, freezer condition).

Pictorials

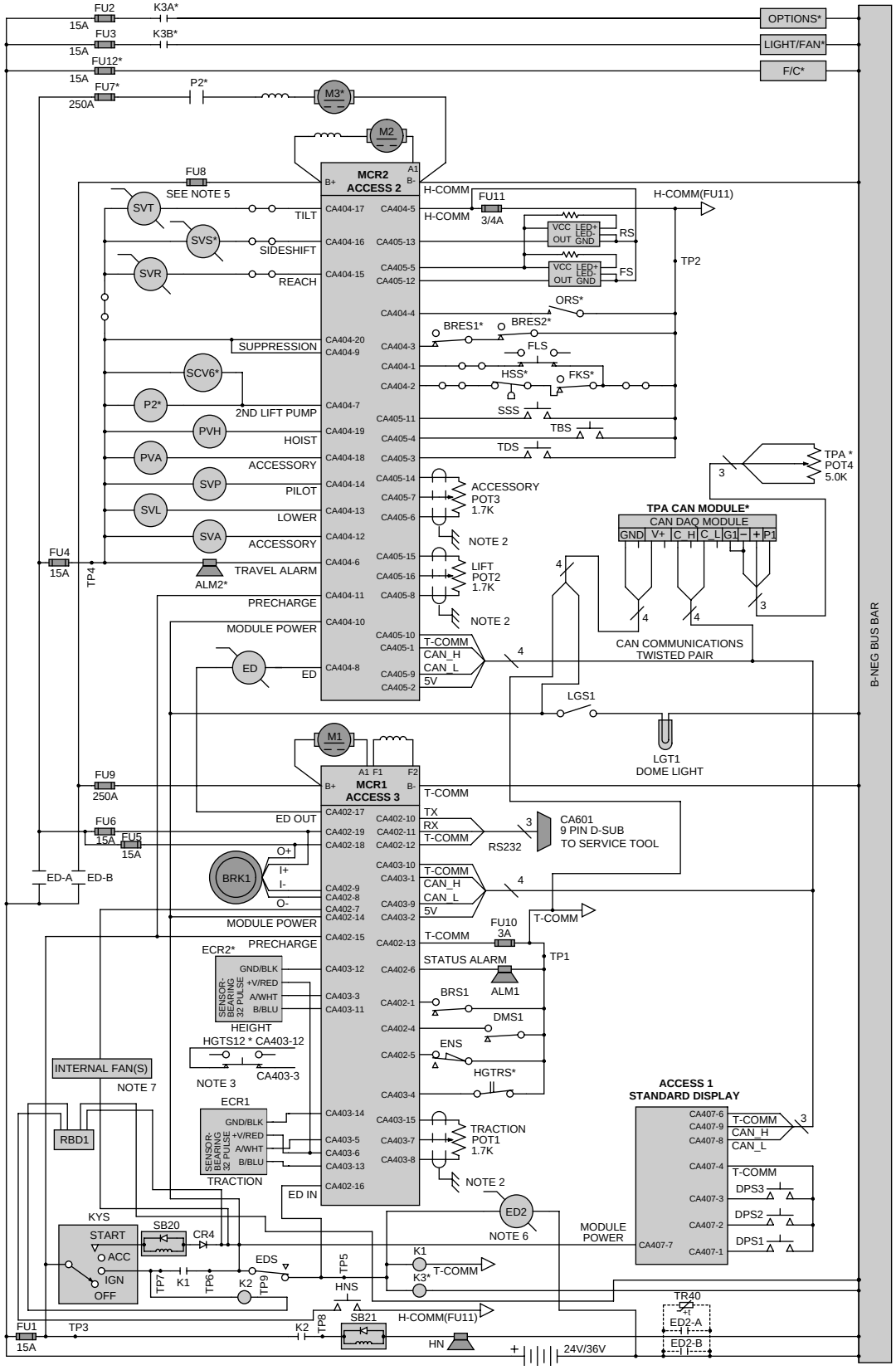
- Terminal board and connector numbering on the pictorials are in two classes; power unit and platform. Power unit TB's and CA's are even 100's (200, 400, 600 etc.) and platform TB's and CA's are odd 100's (100, 300, 500 etc.). On manup trucks (SP, TS, TSP etc.), odd and even 100's will be present on the wiring diagrams. Man-down trucks, which don't have a platform (stand-up rider, pallet etc.), only even 100's will be present.
- Wiring starts at a central location (e.g. distribution board) and wiring connection points are numbered with the lowest number odd or even. The next wiring connection point from the distribution board are then numbered with the next group of 100's and so on for each connection point removed from the central location.
- Terminal board and connector numbering is sequential on each consecutive page. In this way a wiring address giving a connector number or terminal board number will indicate which direction to look in the diagrams for the other end of the wire. When wiring goes to a component and not a terminal board or connector, a reference terminal board is used and is shown with a dashed line box with the reference terminal board number in parenthesis. This terminal board will not appear on the truck and only present as a wiring directory.
- Input/Output arrows may appear at terminal boards and connectors. These indicate whether what the wire is carrying is incoming or outgoing. This is helpful when tracing the origin of the signal or voltage.
- The truck has been sectioned with one page covering each section. When options affect the wiring in a section, an additional page is added which duplicates wiring that is identical and adds the option wiring. In this way only one page of the truck section is required for the applicable truck configuration.
- Wiring that is identified by color rather than number will typically be a cable or wires with vendor componentry.
- Page titles, listed at the beginning of the electrical diagrams, indicate the subsystem or section of truck wiring that is covered by each page.

ELECTRICAL DIAGRAMS INDEX

This electrical diagram index for the RR/RD 5200/5200S, DC drive truck, lists the diagrams with portion of truck covered by each diagram.

† Includes supplemental information.

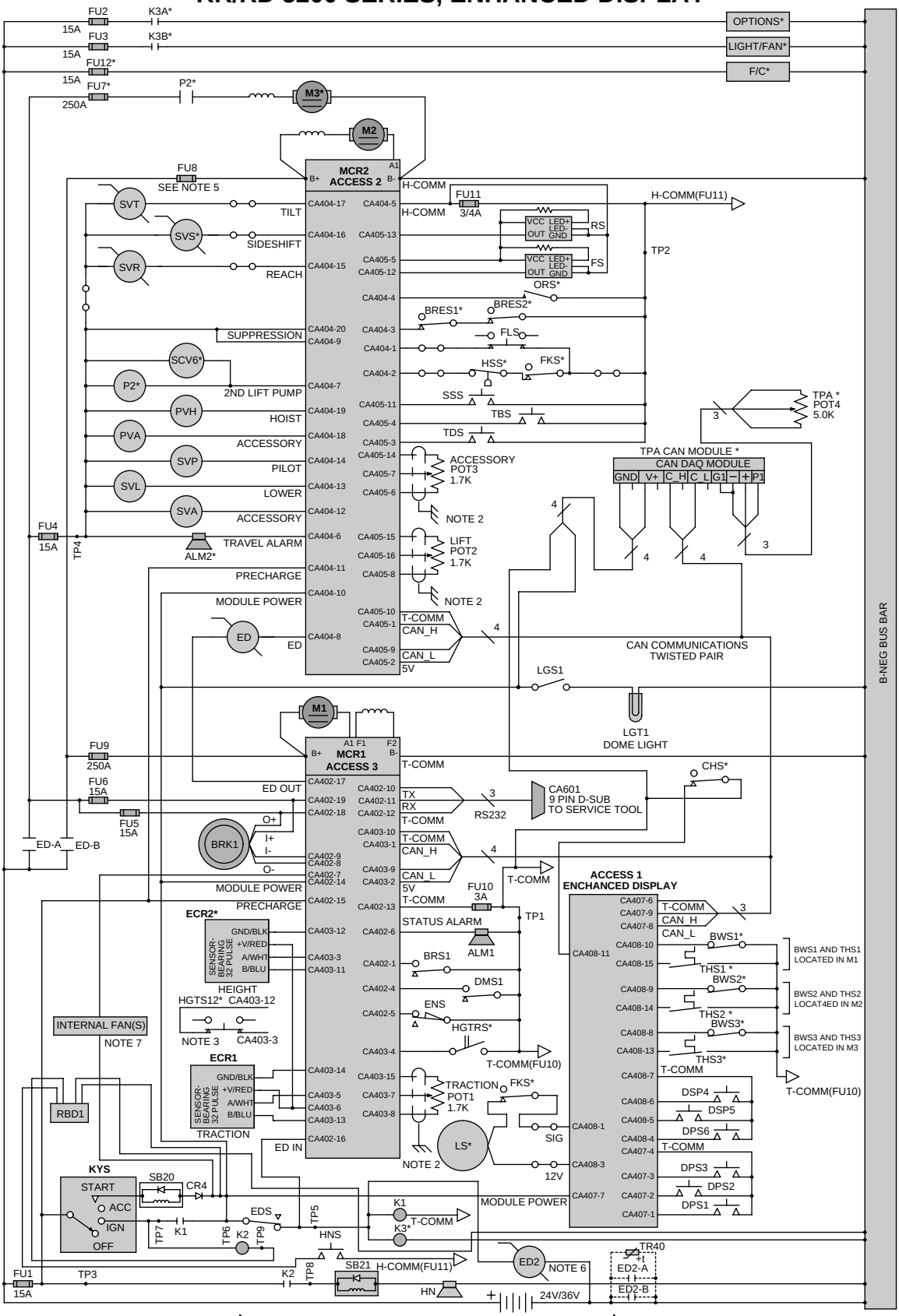
RR/RD 5200 SERIES, STANDARD DISPLAY



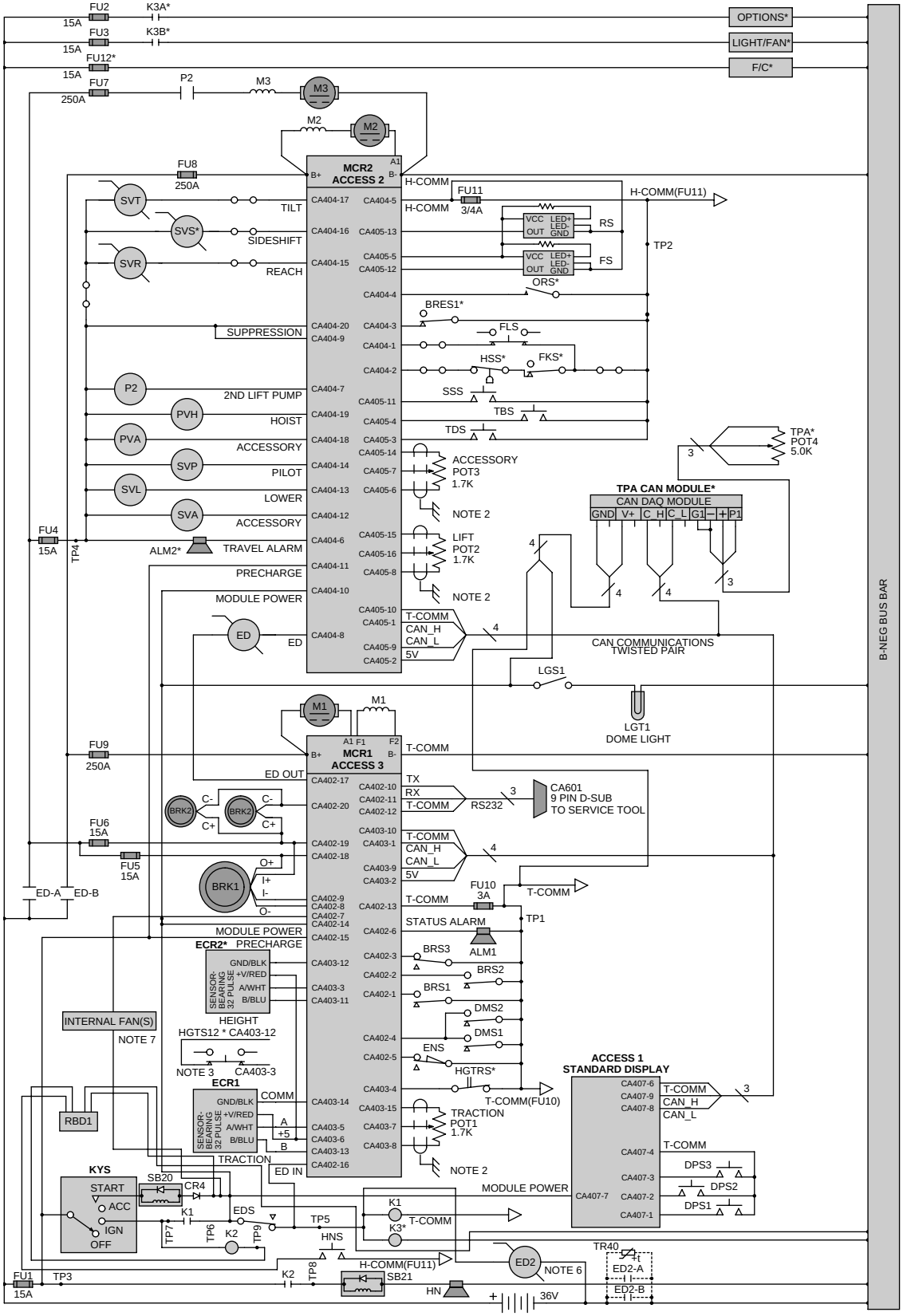
NOTES:

1) * THIS FEATURE IS OPTIONAL
2) DENOTES CONNECTION TO TRUCK FRAME
3) HGTS12 USES SAME INPUT AS ECR2 SINCE BOTH ARE NOT PRESENT AT THE SAME TIME.
4) THIS SCHEMATIC REPRESENTS THE TRUCK IN ITS HOME POSITION WITH NO OPERATOR PRESENT.
5) 250A FUSE FOR 36V TRUCK. 300A FUSE FOR 24V TRUCK.
6) ED2 IS USED ONLY ON EUROPEAN TRUCKS.
7) DUAL FANS ARE STANDARD FOR RR/RD5220 TRUCKS.
SINGLE FAN IS STANDARD FOR RR/RD5210, RR/RD5260, RR/RD5280, AND EE TRUCKS.

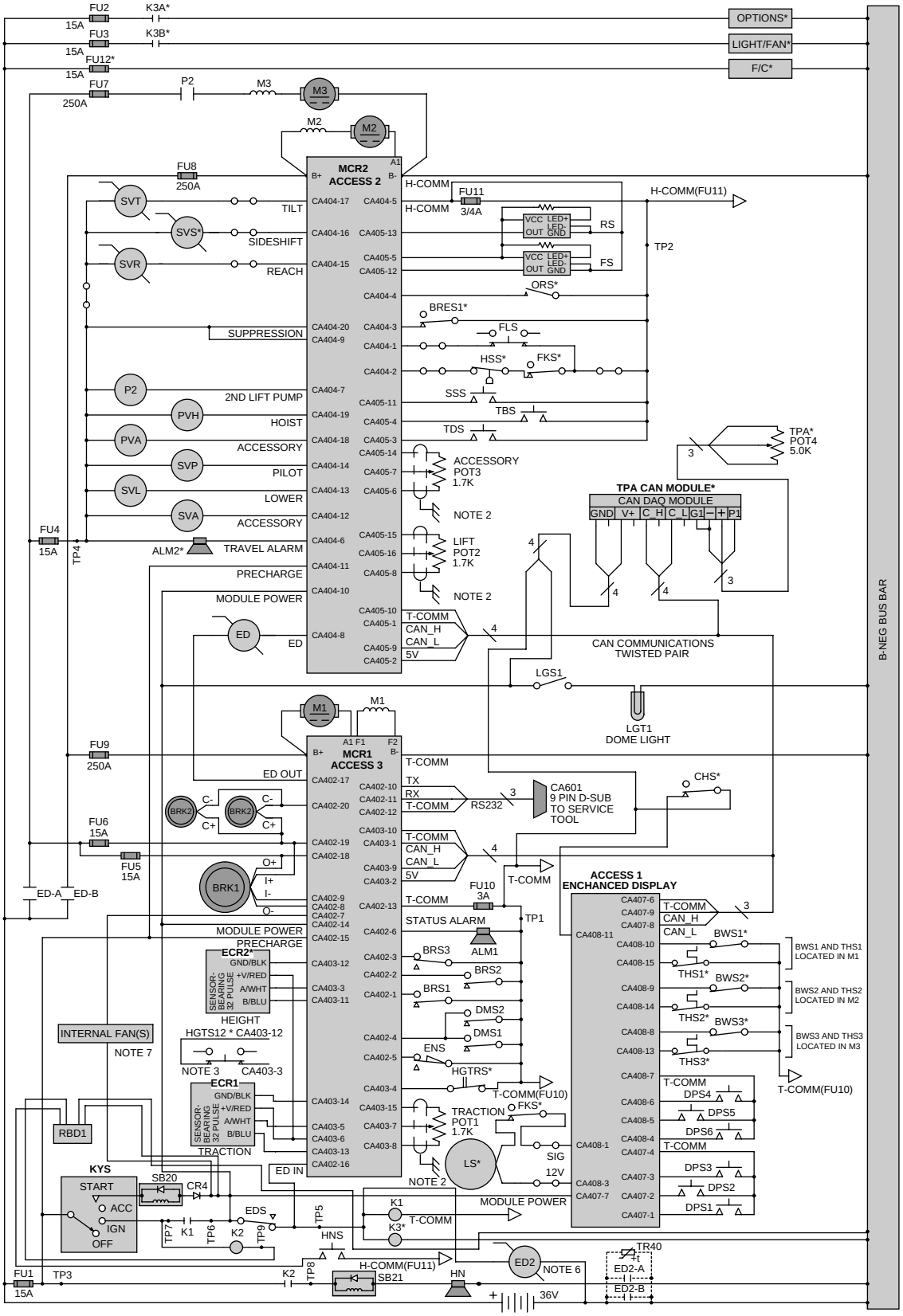
RR/RD 5200 SERIES, ENHANCED DISPLAY



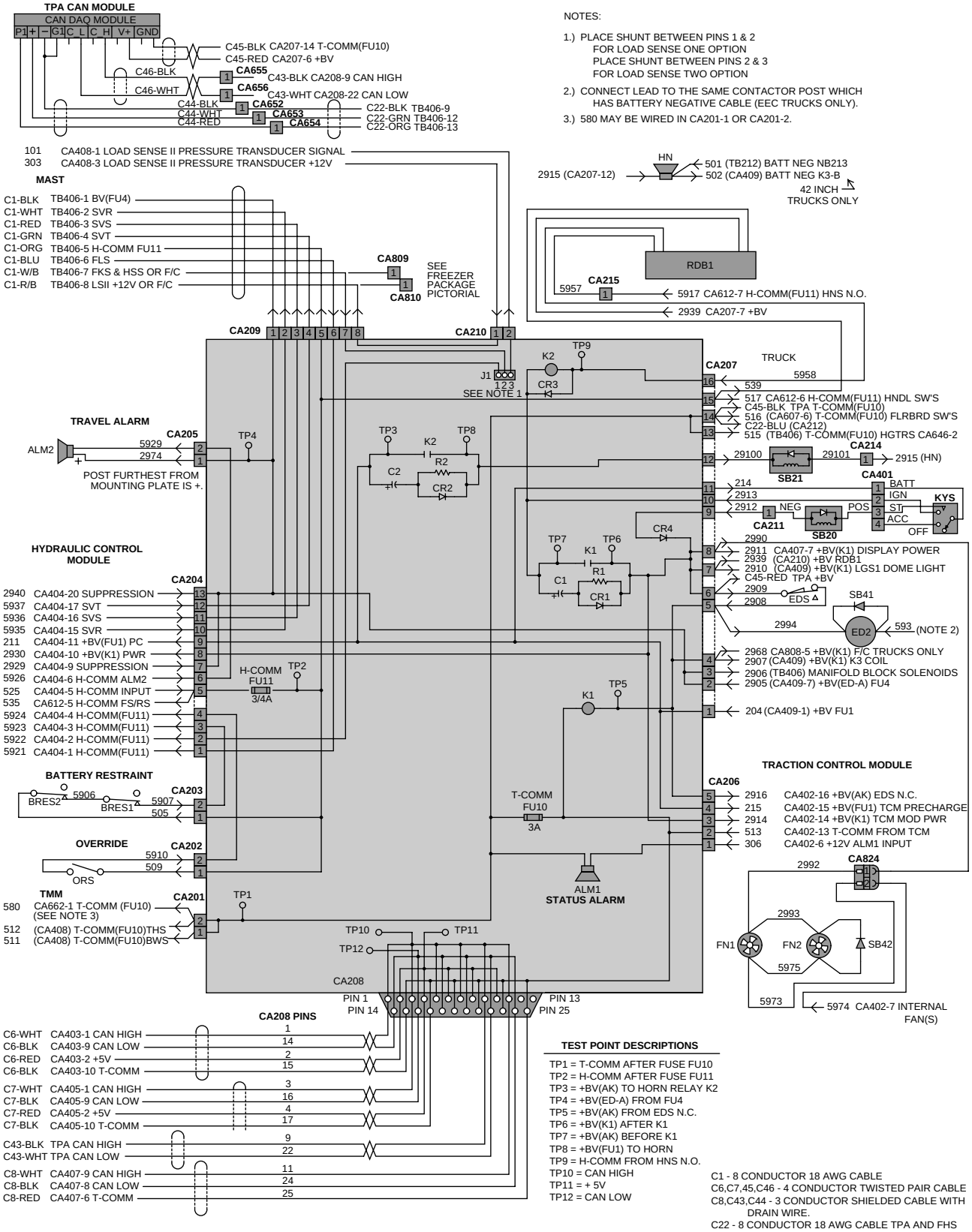
RR/RD 5200S SERIES, STANDARD DISPLAY



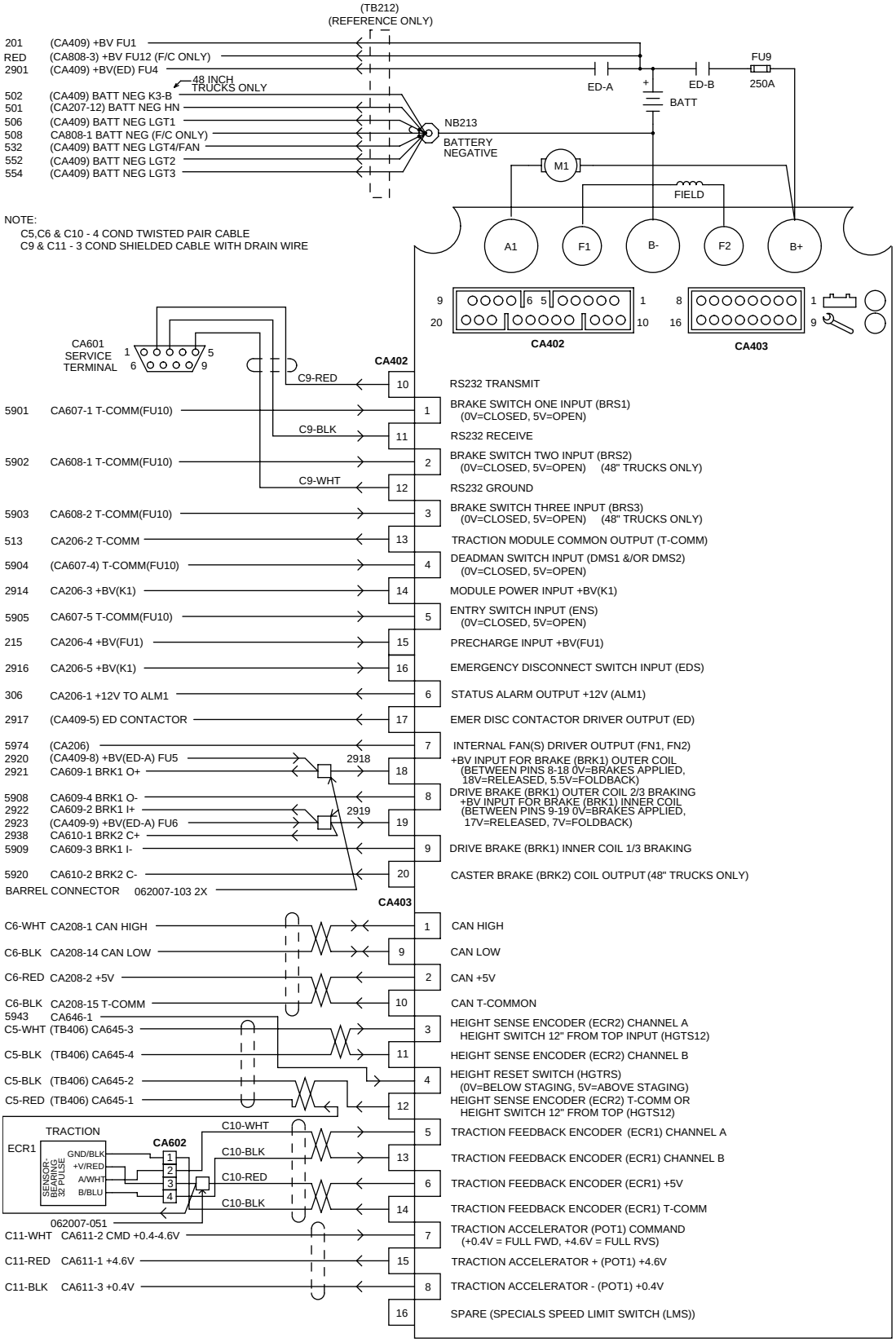
RR/RD 5200S SERIES, ENHANCED DISPLAY



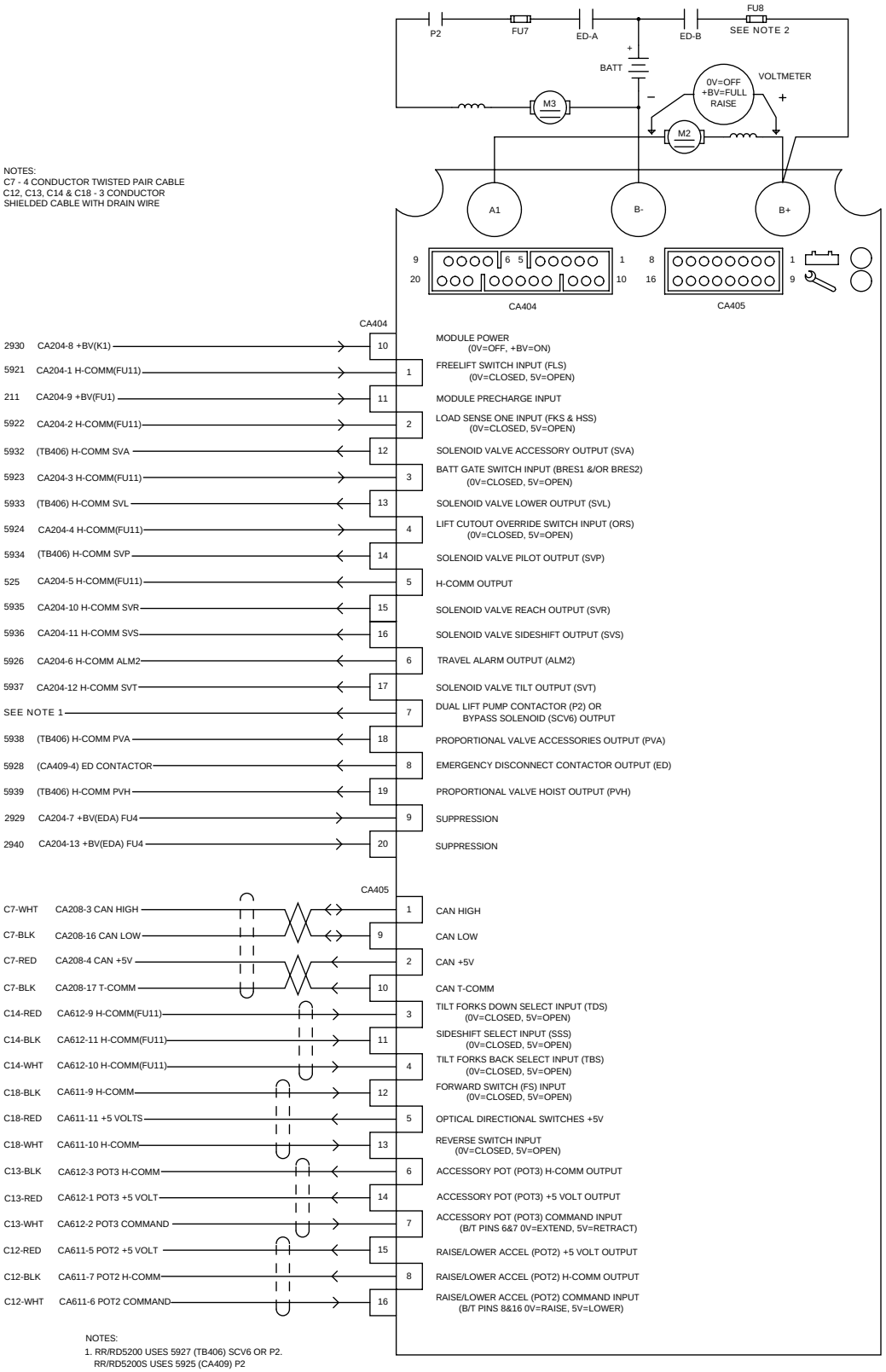
RR/RD 5200/5200S SERIES



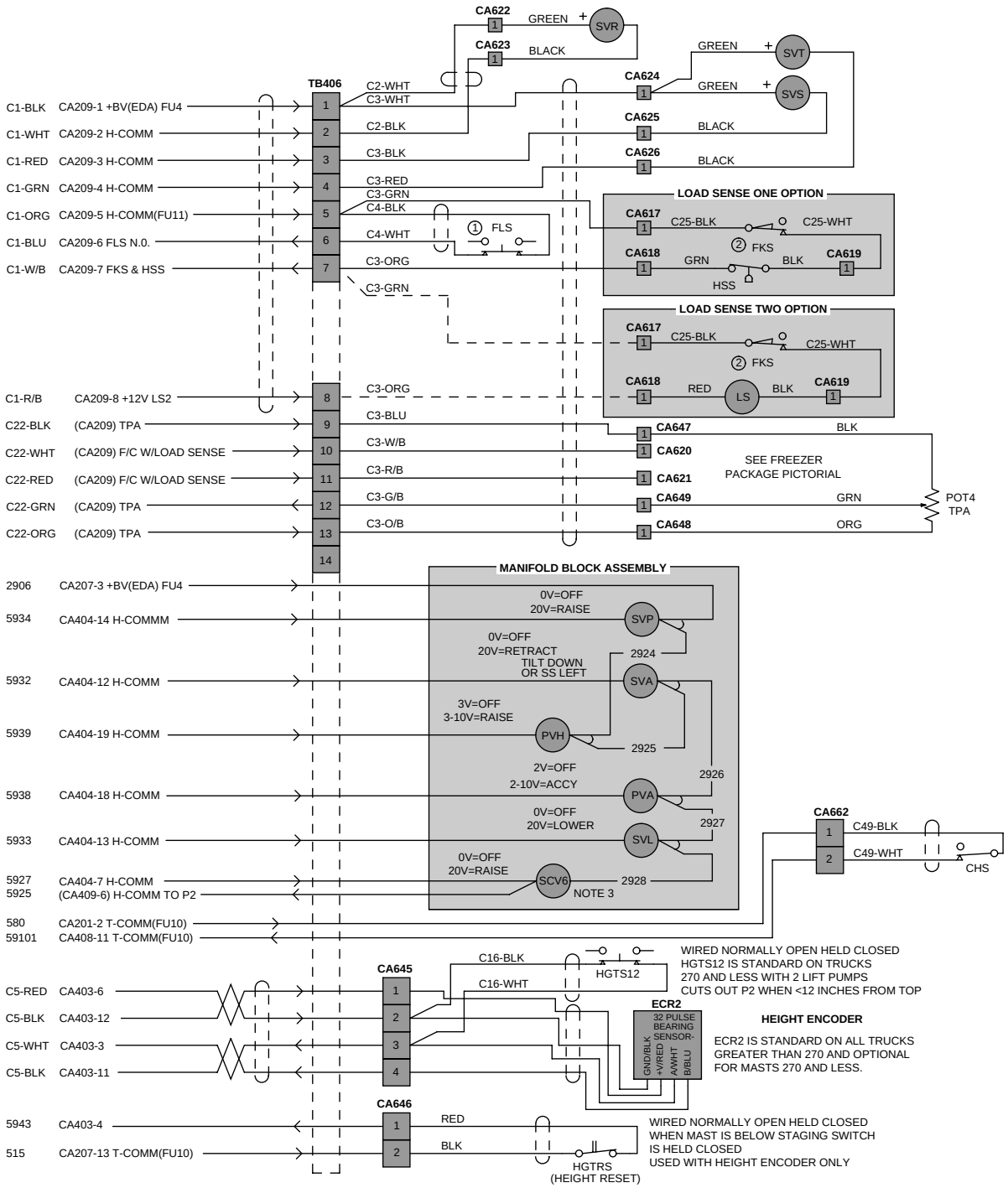
RR/RD 5200/5200S SERIES



RR/RD 5200/5200S SERIES



RR/RD 5200 SERIES



NOTES:

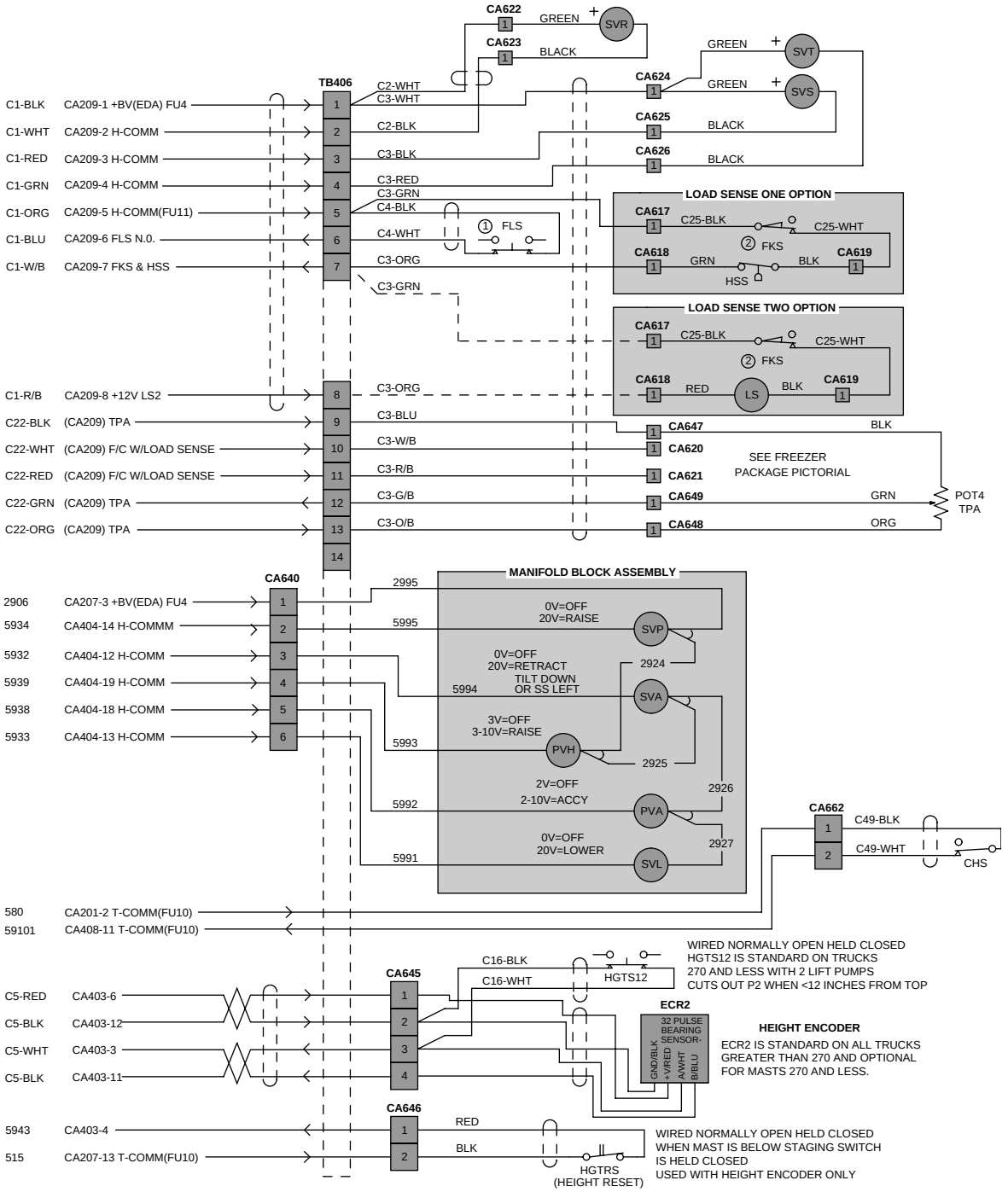
① FREE LIFT SWITCH (FLS)
WIRED NORMALLY OPEN HELD CLOSED.
WHEN MAST IS BELOW FREELIFT
CONTACTS ARE CLOSED AND TRUCK
OPERATION IS -NOT- INHIBITED

② FORK SWITCH (FKS)
WIRED NORMALLY OPEN HELD CLOSED
SWITCH CONTACTS ARE CLOSED ANYWHERE
BETWEEN FULLY TILTED UP OR DOWN

③ SOLENOID SCV6 IS PRESENT ONLY ON 24 VOLT TRUCKS

C1 - 8 CONDUCTOR 18 AWG CABLE
C2 - 2 CONDUCTOR 18 AWG CABLE
C3 - 3 CONDUCTOR 18 AWG CABLE STANDARD
- 5 CONDUCTOR 18 AWG CABLE LOAD SENSE 1 OR 2
- 8 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC
- 10 CONDUCTOR 18 AWG CABLE TPA
C4 - 2 CONDUCTOR 18 AWG CABLE
C5 - 4 CONDUCTOR TWISTED PAIR CABLE
C16 - 2 CONDUCTOR 18 AWG CABLE
C22 - 3 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC
- 5 CONDUCTOR 18 AWG CABLE TPA
C25 - 2 CONDUCTOR 18 AWG CABLE LOAD SENSE
- 5 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC
C49 - 2 CONDUCTOR 18 AWG CABLE
- 5 CONDUCTOR 18 AWG CABLE CHS W/FC

RR/RD 5200S SERIES



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SWITCH CONTACTS ARE CLOSED ANYWHERE
BETWEEN FULLY TILTED UP OR DOWN

C1 - 8 CONDUCTOR 18 AWG CABLE
C2 - 2 CONDUCTOR 18 AWG CABLE
C3 - 3 CONDUCTOR 18 AWG CABLE STANDARD
- 5 CONDUCTOR 18 AWG CABLE LOAD SENSE 1 OR 2
- 8 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC
- 10 CONDUCTOR 18 AWG CABLE TPA
C4 - 2 CONDUCTOR 18 AWG CABLE
C5 - 4 CONDUCTOR TWISTED PAIR CABLE
C16 - 2 CONDUCTOR 18 AWG CABLE
C22 - 3 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC
- 5 CONDUCTOR 18 AWG CABLE TPA
C25 - 2 CONDUCTOR 18 AWG CABLE LOAD SENSE
- 5 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC
C49 - 2 CONDUCTOR 18 AWG CABLE
- 5 CONDUCTOR 18 AWG CABLE CHS W/FC

A | B | C

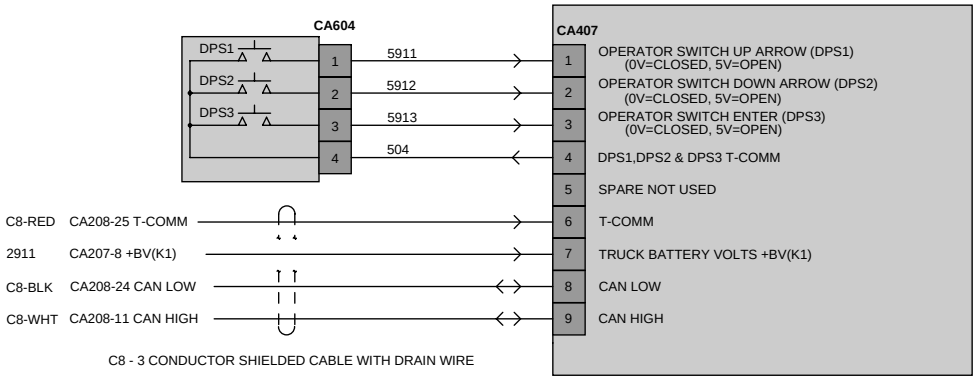
RR/RD 5200/5200S SERIES, ACCESS 1

1 1

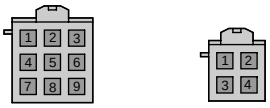
2 2

3 3

4 4



CONNECTOR PIN NUMBERING
MATING SIDE

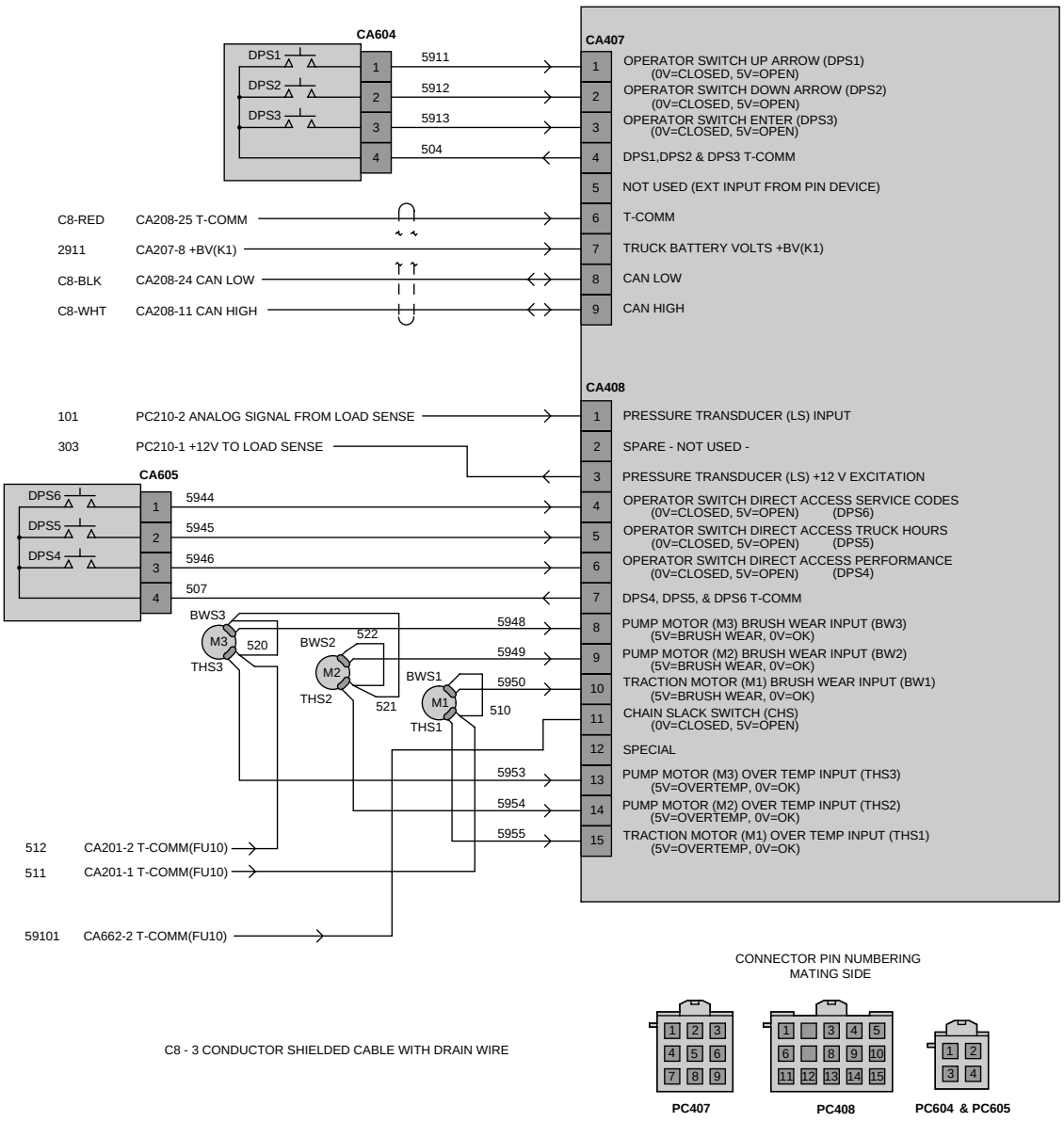


PC407

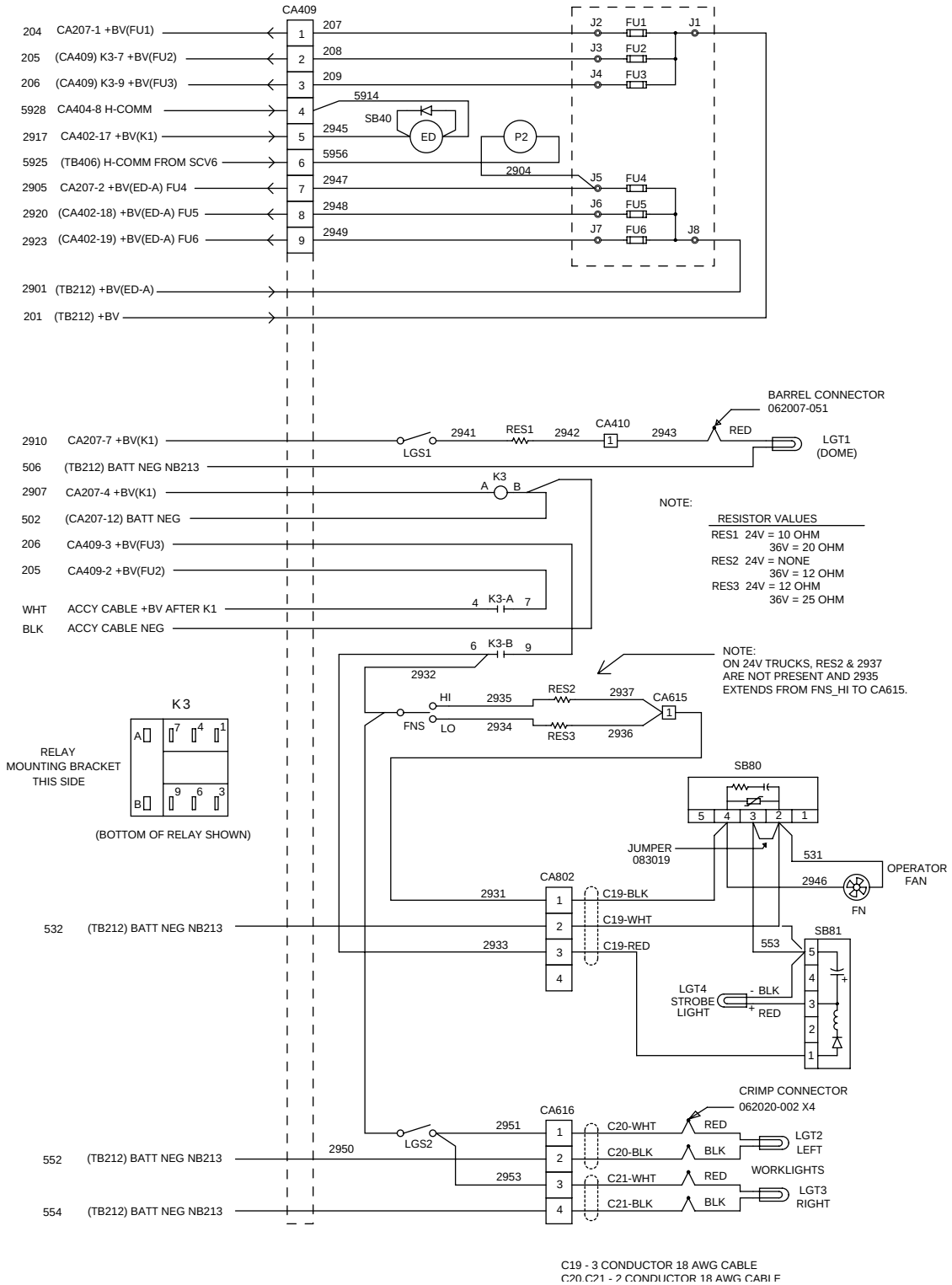
PC604

A | B | C

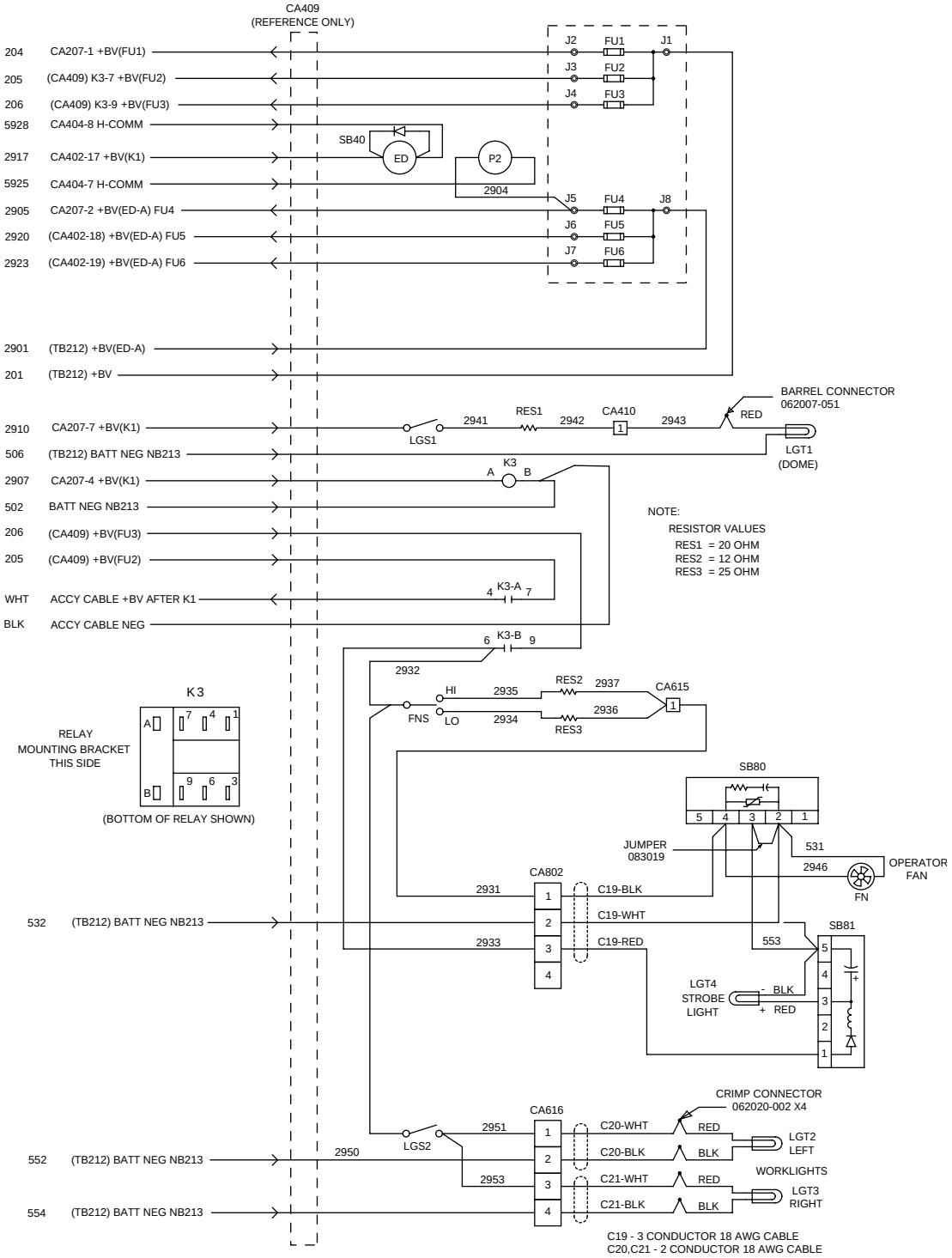
RR/RD 5200/5200S SERIES, ACCESS 1



RR/RD 5200 SERIES



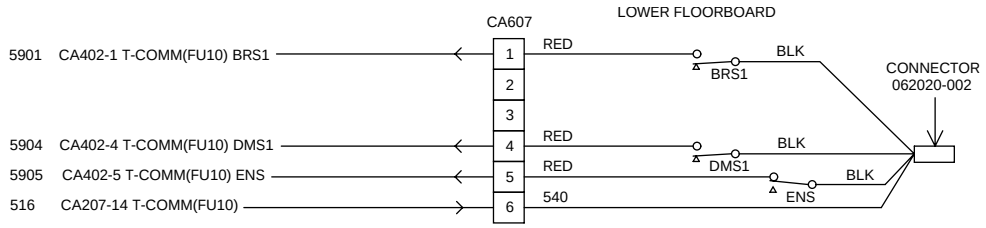
RR/RD 5200S SERIES



A | B | C

RR/RD 5200 SERIES

1



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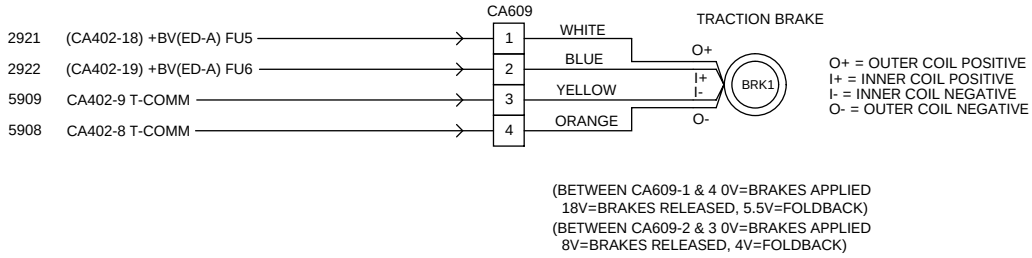


(BETWEEN CA609-1 & 4 0V=BRAKES APPLIED
18V=BRAKES RELEASED, 5.5V=FOLDBACK)
(BETWEEN CA609-2 & 3 0V=BRAKES APPLIED
8V=BRAKES RELEASED, 4V=FOLDBACK)

3

NOTES:

BRS1 & DMS1 ARE BOTH WIRED NORMALLY CLOSED - HELD OPEN

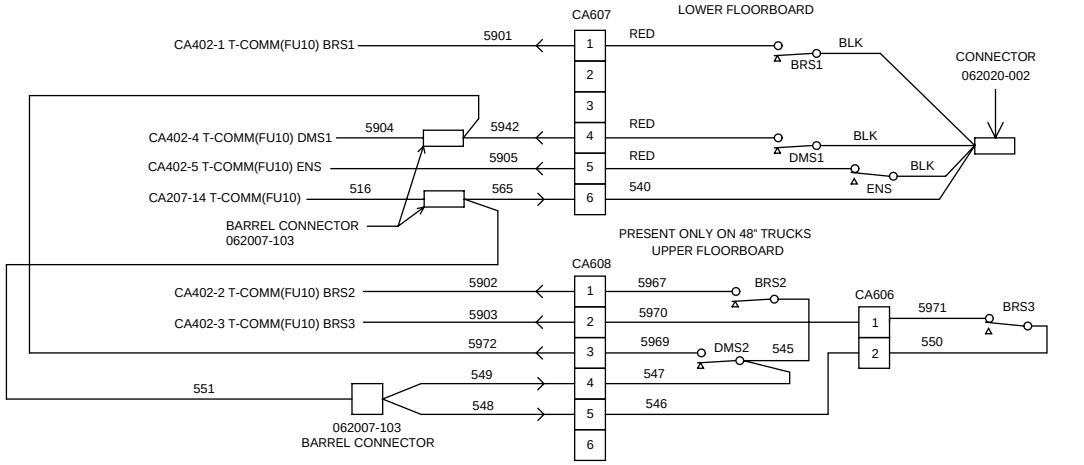
ENS IS WIRED NORMALLY CLOSED AND IS NOT ACTUATED UNTIL THE ENTRY BAR PEDAL IS DEPRESSED

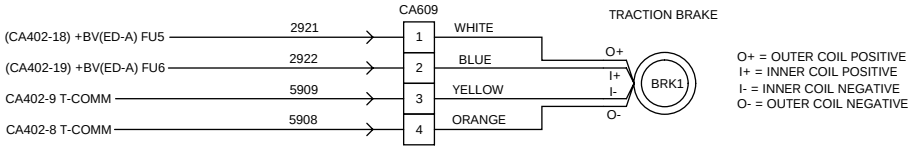
ALL SWITCHES SHOWN WITH NO OPERATOR ON PEDALS

A LOGIC ZERO (T-COMM) RELEASES BRAKES

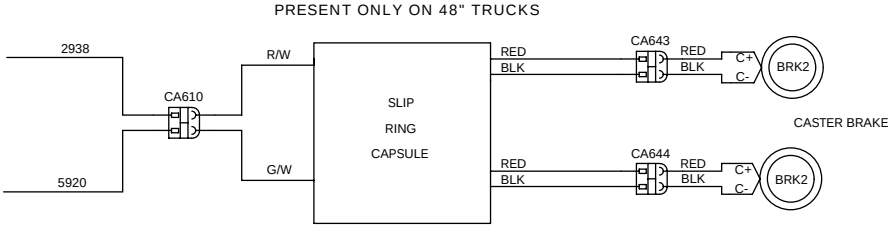
4

RR/RD 5200S SERIES





(BETWEEN CA609-1 & 4 0V=BRAKES APPLIED
18V=BRAKES RELEASED, 5.5V=FOLDBACK)
(BETWEEN CA609-2 & 3 0V=BRAKES APPLIED
8V=BRAKES RELEASED, 4V=FOLDBACK)



NOTES:

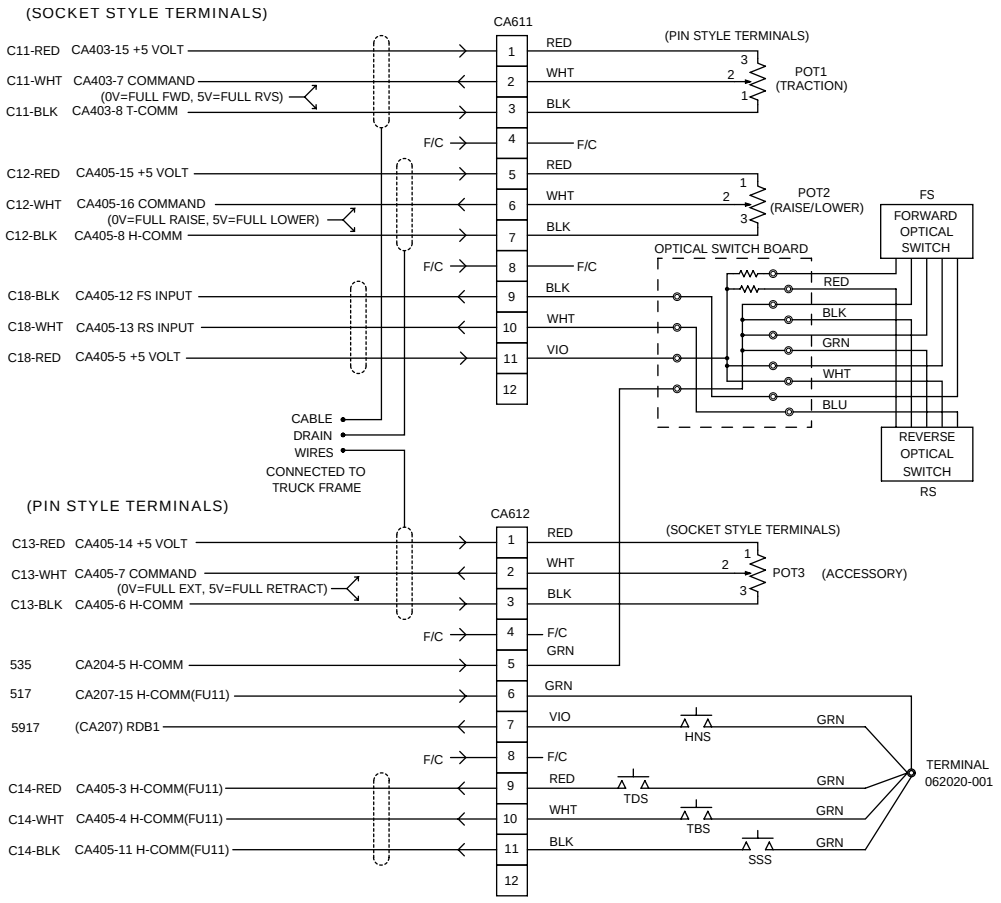
BRS1, BRS2, DMS1 & DMS2 ARE ALL WIRED NORMALLY CLOSED - HELD OPEN

BRS3 & ENS ARE WIRED NORMALLY CLOSED AND ARE NOT ACTUATED UNTIL THE CORRESPONDING PEDALS ARE DEPRESSED

ALL SWITCHES SHOWN WITH NO OPERATOR ON PEDALS

A LOGIC ZERO (T-COMM) RELEASES BRAKES

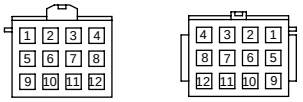
RR/RD 5200/5200S SERIES



NOTES:

C11, C12, C13, C14 & C18 - 3 CONDUCTOR SHIELDED CABLES WITH DRAIN WIRES

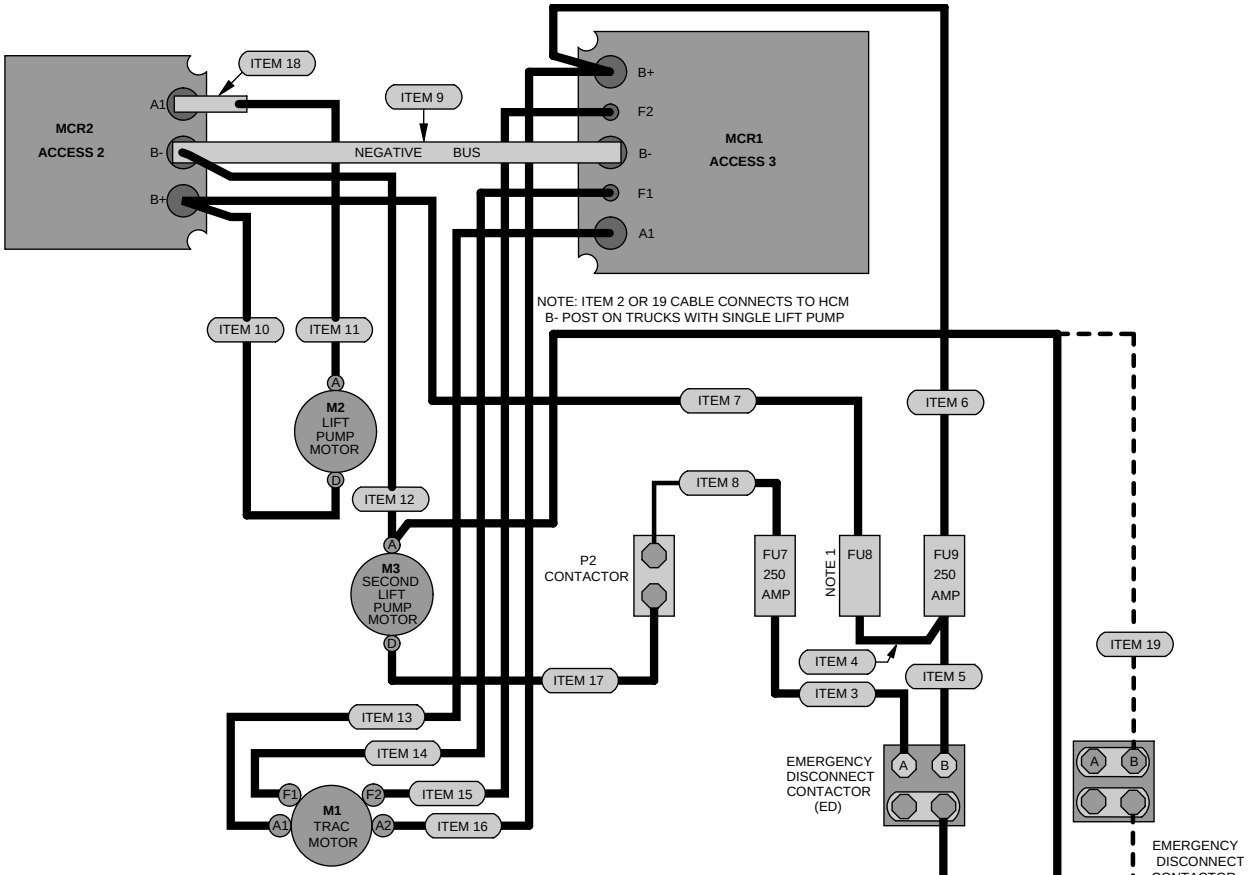
CONNECTOR PIN NUMBERING
"MATING SIDE"



PC611 & PC612 JC611 & JC612

DIA–1452–017

RR/RD 5200 SERIES



ITEM	CABLE NO.	NUMBER OF LIFT PUMPS				TRUCK VOLTAGE
		EUROPEAN		NON EUROPEAN		
		1	2	1	2	
1.	PC 2/0-183			X	X	24/36V
	PC 2/0-190	X	X			24/36V
2.	PC 2/0-182				X	36V
	PC 2/0-188			X		24V
	PC 2/0-190	X	X			24/36V
3.	123086	X	X	X	X	36V
4.	123083	X	X	X	X	24/36V
5.	123088	X	X	X	X	24/36V
6.	PC 1/0-218	X	X	X	X	24/36V
7.	PC 1/0-217	X	X	X	X	24/36V
8.	123087		X		X	36V
9.	123287	X	X	X	X	24/36V
10.	PC 1/0-215	X	X	X	X	24/36V
11.	PC 1/0-216	X	X	X	X	24/36V
12.	PC 1/0-220		X		X	36V
13.	PC 1/0-213	X	X	X	X	24/36V
14.	PC #6-041	X	X	X	X	24/36V
15.	PC #6-042	X	X	X	X	24/36V
16.	PC 1/0-214	X	X	X	X	24/36V
17.	PC 1/0-219		X		X	36V
18.	123893	X	X	X	X	24/36V
19.	PC 2/0-192	X				24V
	PC 2/0-193		X			36V

X IN THE COLUMN INDICATES THAT THE CABLE IS REQUIRED.

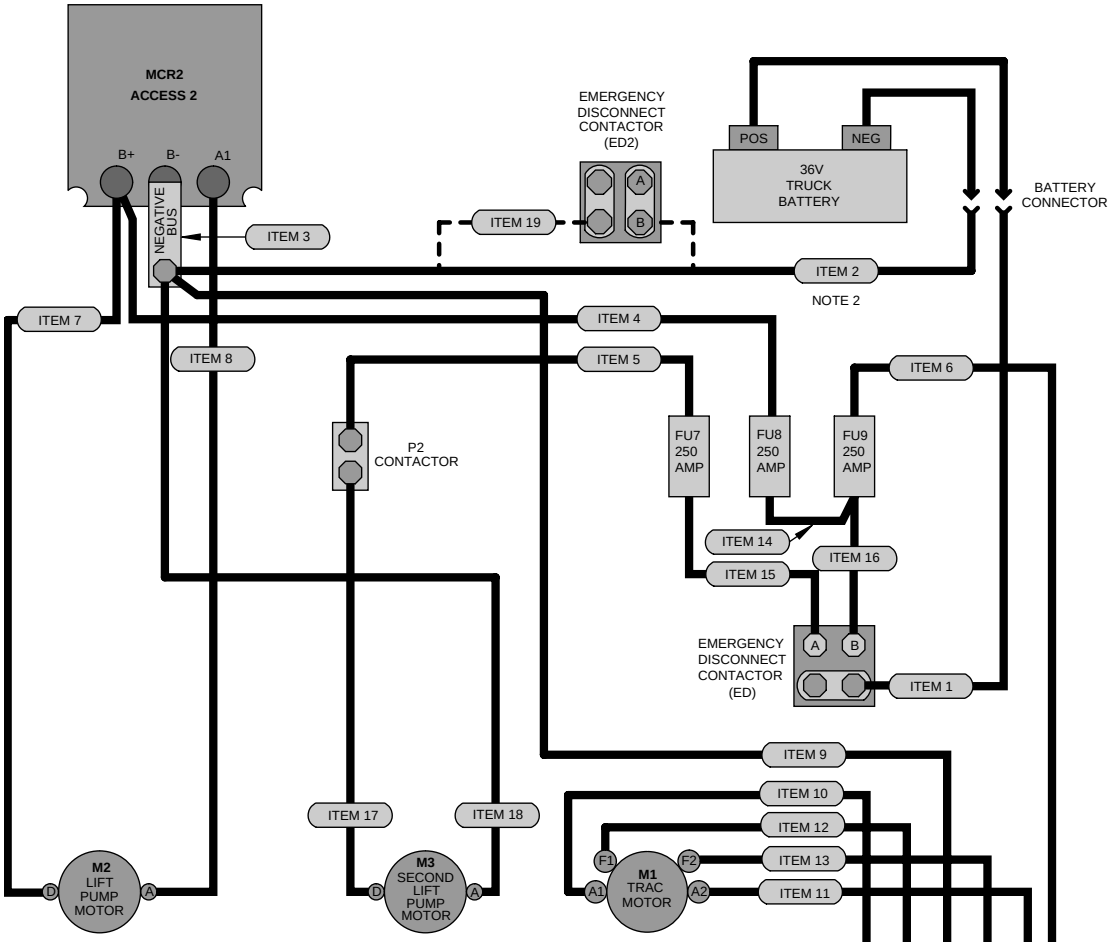
POWER CABLE ABBREVIATION	CROWN PART NO.
PC#6	084568-
PC#4	084569-
PC#2	084570-
PC#1	084571-
PC1/0	084572-
PC2/0	084573-
PC3/0	086749-

NOTES:

1.) 250A FUSE FOR 36V TRUCK, 300A FUSE FOR 24V TRUCK.

2.) ITEM 2 IS CONNECTED TO ED2 WHICH IS CONNECTED TO M3 OR B- POST ON ACCESS 2 BY ITEM 19 ON EUROPEAN TRUCKS ONLY.

RR/RD 5200S SERIES

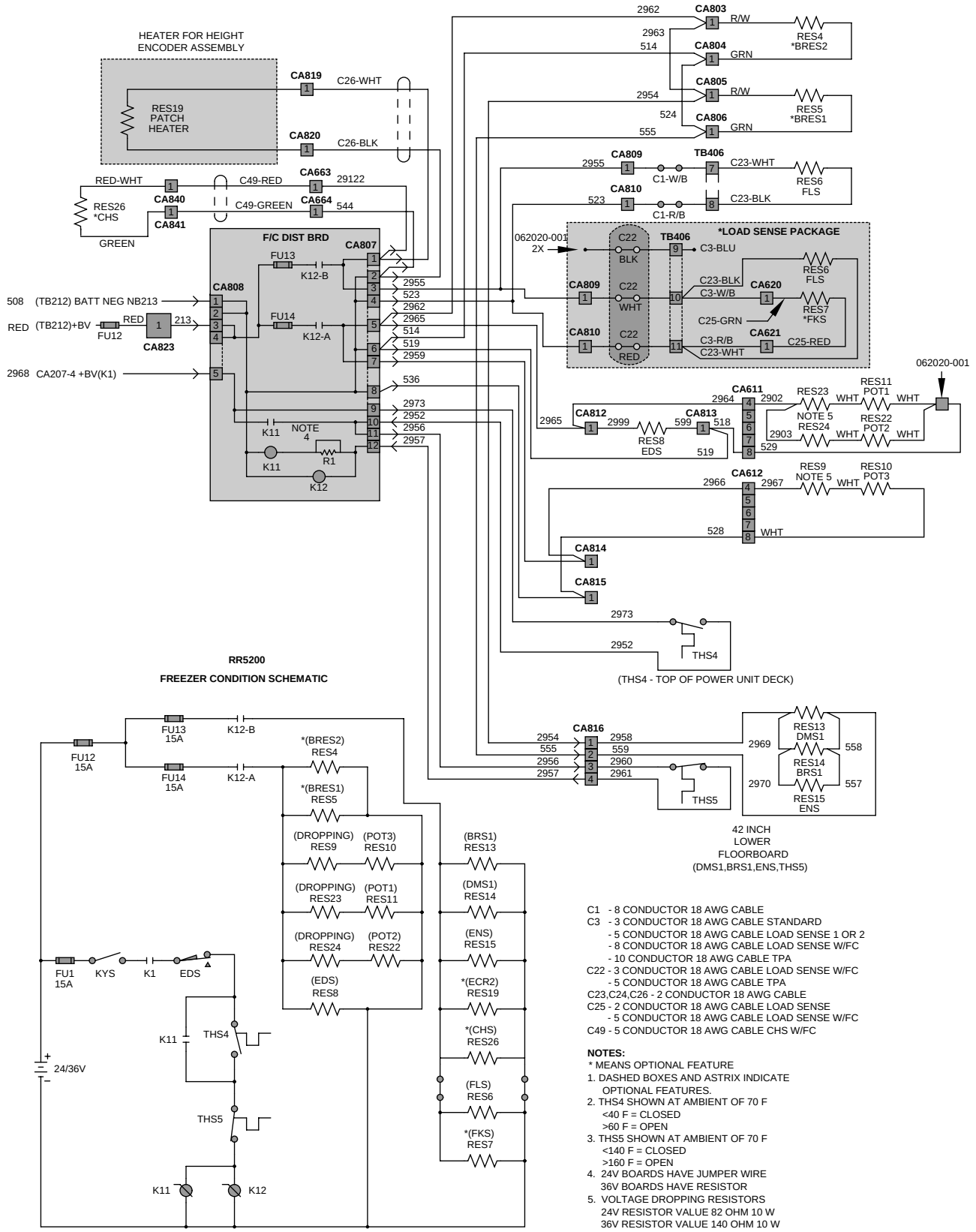


ITEM	CABLE NO.	EUROPEAN		NON EUROPEAN	
		"C" BATTERY COMPARTMENT	"E" BATTERY COMPARTMENT	"C" BATTERY COMPARTMENT	"E" BATTERY COMPARTMENT
1.	PC 2/0-181 PC 2/0-189	 X	 X	X	X
2.	PC 2/0-183 PC 2/0-190	 X	 X	X	X
3.	126020	X	X	X	X
4.	PC 1/0-204	X	X	X	X
5.	PC 1/0-205	X	X	X	X
6.	PC 1/0-206	X	X	X	X
7.	PC 1/0-207	X	X	X	X
8.	PC 1/0-208	X	X	X	X
9.	PC 1/0-209	X	X	X	X
10.	PC 1/0-210	X	X	X	X
11.	PC 1/0-211	X	X	X	X
12.	PC #6-039	X	X	X	X
13.	PC #6-040	X	X	X	X
14.	123083	X	X	X	X
15.	121532	X	X	X	X
16.	121533	X	X	X	X
17.	PC 1/0-207 PC 1/0-221	X	 X	X	 X
18.	PC 1/0-208 PC 1/0-222	X	 X	X	 X
19.	PC 2/0-191	X	X		

X IN THE COLUMN INDICATES THAT THE CABLE IS REQUIRED.

POWER CABLE ABBREVIATION	CROWN PART NO.
PC#6	084568-
PC#4	084569-
PC#2	084570-
PC#1	084571-
PC1/0	084572-
PC2/0	084573-
PC3/0	086749-

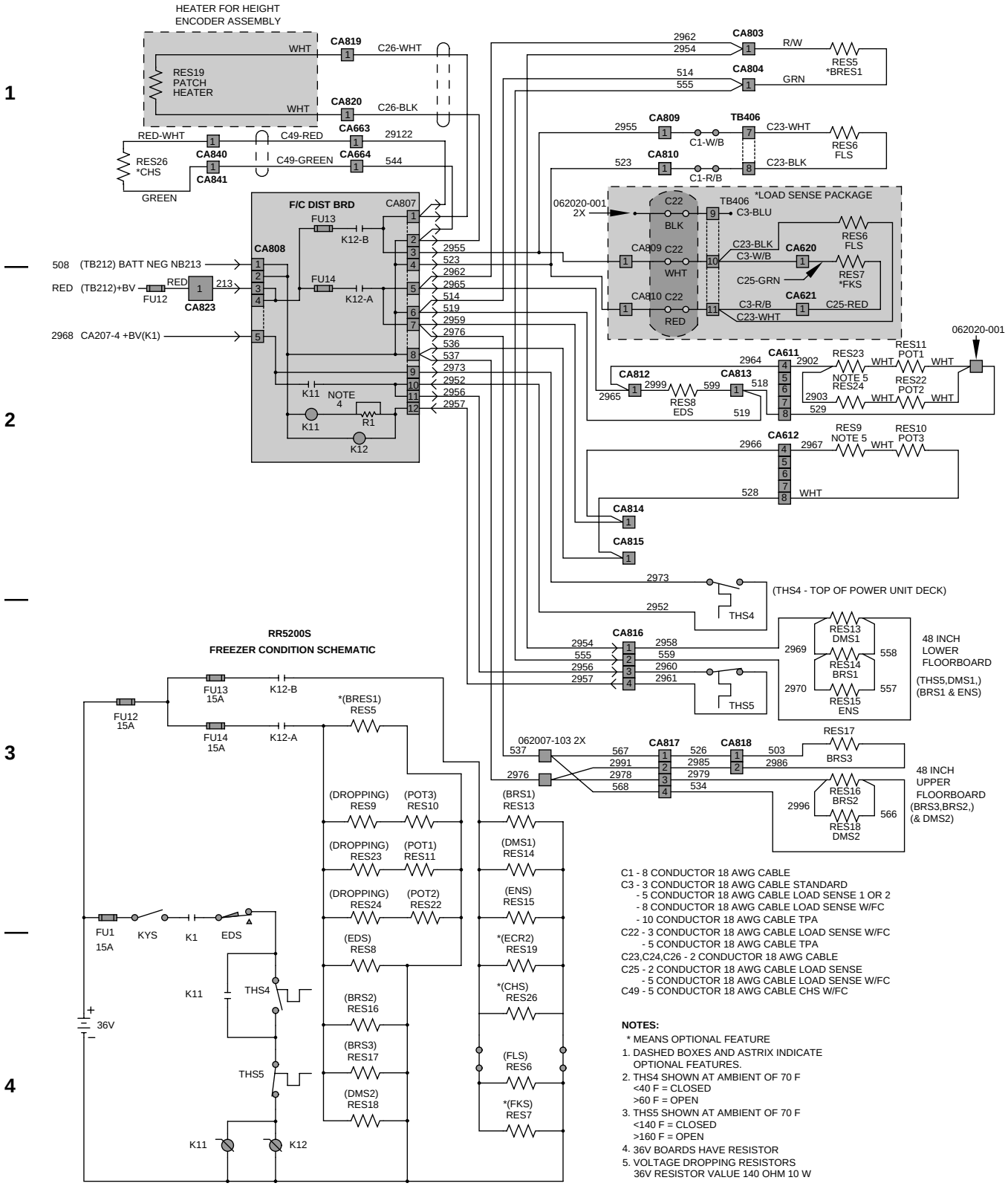
RR/RD 5200 SERIES



C1 - 8 CONDUCTOR 18 AWG CABLE
C3 - 3 CONDUCTOR 18 AWG CABLE STANDARD
- 5 CONDUCTOR 18 AWG CABLE LOAD SENSE 1 OR 2
- 8 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC
- 10 CONDUCTOR 18 AWG CABLE TPA
C22 - 3 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC
- 5 CONDUCTOR 18 AWG CABLE TPA
C23,C24,C26 - 2 CONDUCTOR 18 AWG CABLE
C25 - 2 CONDUCTOR 18 AWG CABLE LOAD SENSE
- 5 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC
C49 - 5 CONDUCTOR 18 AWG CABLE CHS W/FC

NOTES:
* MEANS OPTIONAL FEATURE
1. DASHED BOXES AND ASTRIX INDICATE OPTIONAL FEATURES.
2. THS4 SHOWN AT AMBIENT OF 70 F
<40 F = CLOSED
>60 F = OPEN
3. THS5 SHOWN AT AMBIENT OF 70 F
<140 F = CLOSED
>160 F = OPEN
4. 24V BOARDS HAVE JUMPER WIRE
36V BOARDS HAVE RESISTOR
5. VOLTAGE DROPPING RESISTORS
24V RESISTOR VALUE 82 OHM 10 W
36V RESISTOR VALUE 140 OHM 10 W

RR/RD 5200S SERIES

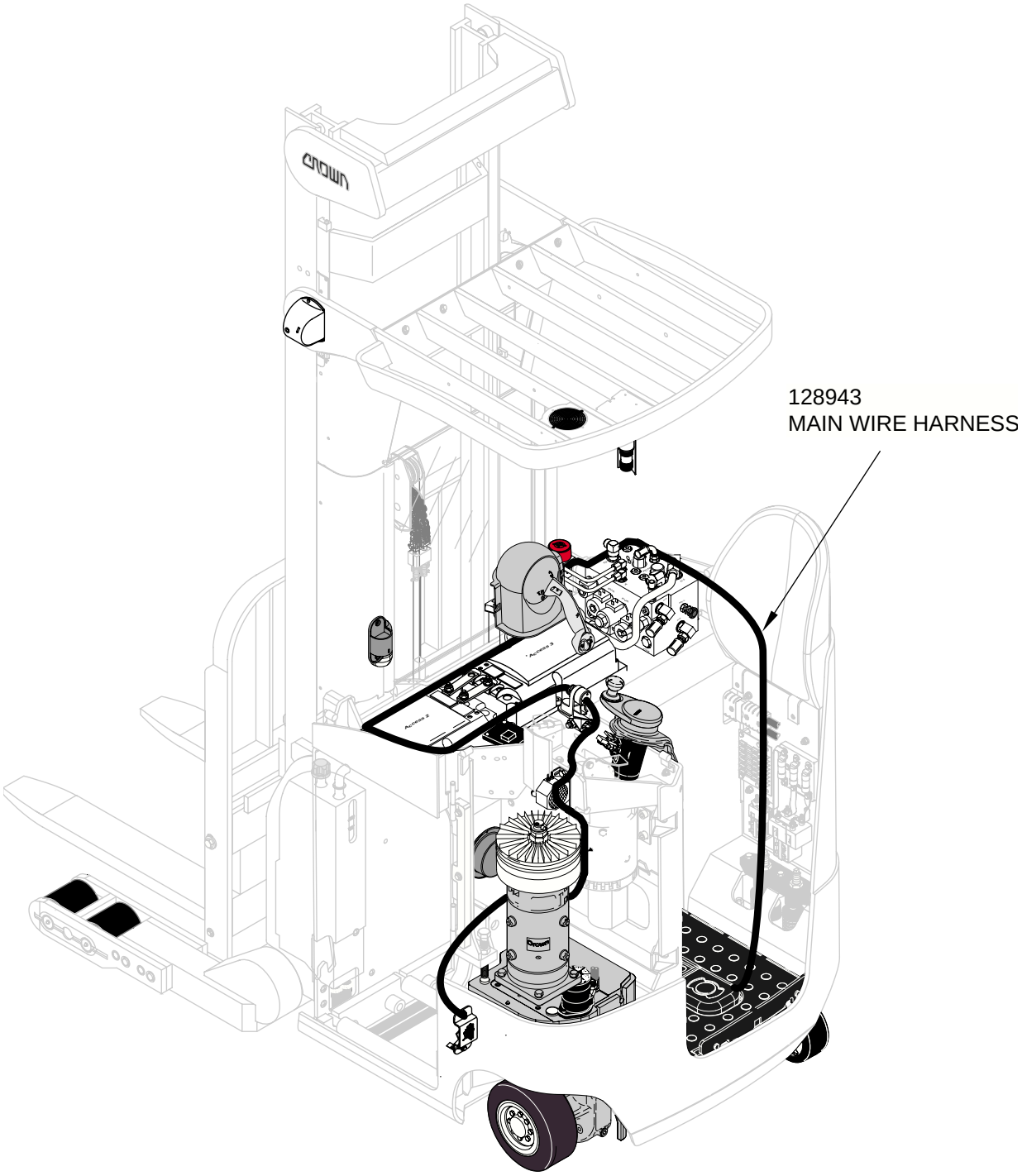


Below are the wire harness numbers for the RR/RD 5200/5200S Series. The list also indicates the components of the truck connected by each wire harness.

Harness No.	Components Connected By:
128943	RR/RD 5200 Main Truck Wire Harness, JC601, JC655, PC204, PC206, PC207, PC208, PC211, PC215, PC401, PC402, PC403, PC404, PC405, PC407, PC409, PC410, PC602, PC603, PC604, PC607, PC609, PC611, PC612, PC645, PC646, PC656, PC824
129253	RR/RD 5200S Main Truck Wire Harness, JC601, JC610, JC655, PC204, PC206, PC207, PC208, PC211, PC215, PC401, PC402, PC403, PC404, PC405, PC407, PC602, PC604, PC607, JC608, PC609, PC611, PC612, PC640, PC645, PC646, PC656, PC824
127748	RR/RD 5200 Main Freezer Condition Wire Harness, PC803, PC804, PC805, PC806, PC807, PC808, PC809, PC810, PC812, PC813, PC814, PC815
128232	RR/RD 5200S Main Freezer Condition Wire Harness, PC803, PC804, PC807, PC808, PC809, PC810, PC812, PC813, PC814, PC815, PC816, PC817
123311	RR/RD 5200 Contactor Panel, JC409
121857	RR/RD 5200/5200S Enhanced Display, PC408, PC605
127716	RR/RD 5200/5200S Floorboard, JC607
127749-001	RR/RD 5200/5200S 36 Volt Floorboard Freezer Condition, JC816
127749-002	RR/RD 5200/5200S 24 Volt Floorboard Freezer Condition, JC816
125793	RR/RD 5200S Upper Floorboard, JC606
125815	RR/RD 5200S Freezer Condition Upper Floorboard, JC818, JC606, RES17
123313	RR/RD 5200 Fan and Lights, JC615, PC616, PC802
123975	RR/RD 5200S Fan and Lights, JC615, PC616, PC802
123967	RR/RD 5200/5200S Fan and/or Strobe Option JC802
127690	RR/RD 5200 36 Volt Internal Fans, JC824
128896	RR/RD 5200 24 Volt Internal Fans, JC824
128296	RR/RD 5200S Internal Fans, JC824
123972	RR/RD 5200 Battery Restraint, PC203
123973	RR/RD 5200S Battery Restraint, PC203
123314-002	RR/RD 5200/5200S, Over Ride Switch, PC202
122176-001	RR 5200/5200S Tilt & Sideshift Cable, JC624, PC625, PC626
122176-002	RD 5200/5200S Tilt & Sideshift Cable, JC624, PC625, PC626
124000-001	RR 5200/5200S Tilt/Sideshift/Load Sense, JC624, PC617, PC618, PC625, PC626
124000-002	RD 5200/5200S Tilt/Sideshift/Load Sense, JC624, PC617, PC618, PC625, PC626
124001-001	RR 5200/5200S Tilt/Sideshift/Load Sense w/Freezer Condition, JC624, PC617, PC618, PC620, PC621, PC625, PC626
124001-002	RD 5200/5200S Tilt/Sideshift/Load Sense w/Freezer Condition, JC624, PC617, PC618, PC620, PC621, PC625, PC626
129324-001	RR 5200/5200S Tilt/Sideshift/Load Sense w/Freezer Condition, Tilt Position Assist, JC624, JC648, JC649, PC617, PC618, PC620, PC621, PC625, PC626, PC647
129324-002	RD 5200/5200S Tilt/Sideshift/Load Sense w/Freezer Condition, Tilt Position Assist, JC624, JC648, JC649, PC617, PC618, PC620, PC621, PC625, PC626, PC647
124002-001	RR/RD 5200/5200S 24 Volt Fork Tilted Switch, FKS Freezer Condition, JC617, JC619, JC620, JC621
124002-002	RR/RD 5200/5200S 36 Volt Fork Tilted Switch, FKS Freezer Condition, JC617, JC619, JC620, JC621
125275	RR/RD 5200/5200S Load Sense II, PC210
123343	RR/RD 5200/5200S Keyless Key Switch, JC401
123971	RR/RD 5200 Motor Sensors, PC201
123974	RR/RD 5200S Motor Sensors, PC201
123976	RR/RD 5200/5200S Travel Alarm, PC205
087245-062	RR/RD 5200/5200S Pos/Neg Cable
126222	RR/RD 5200 EEC Control Panel
126224	RR/RD 5200S EEC Control Panel

8815

RR/RD 5200

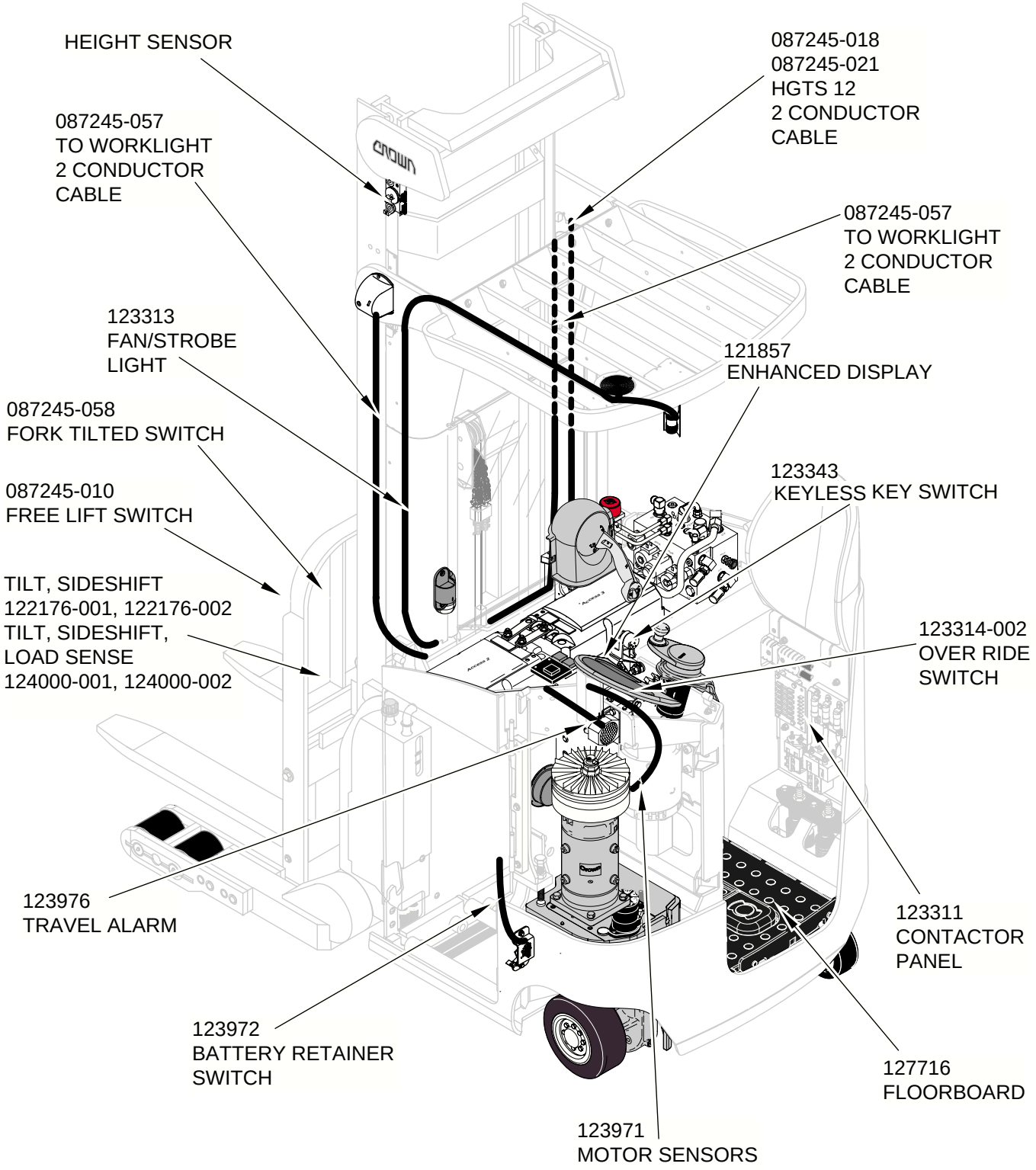


7019

DIA–1452–022-SUP-1

8816

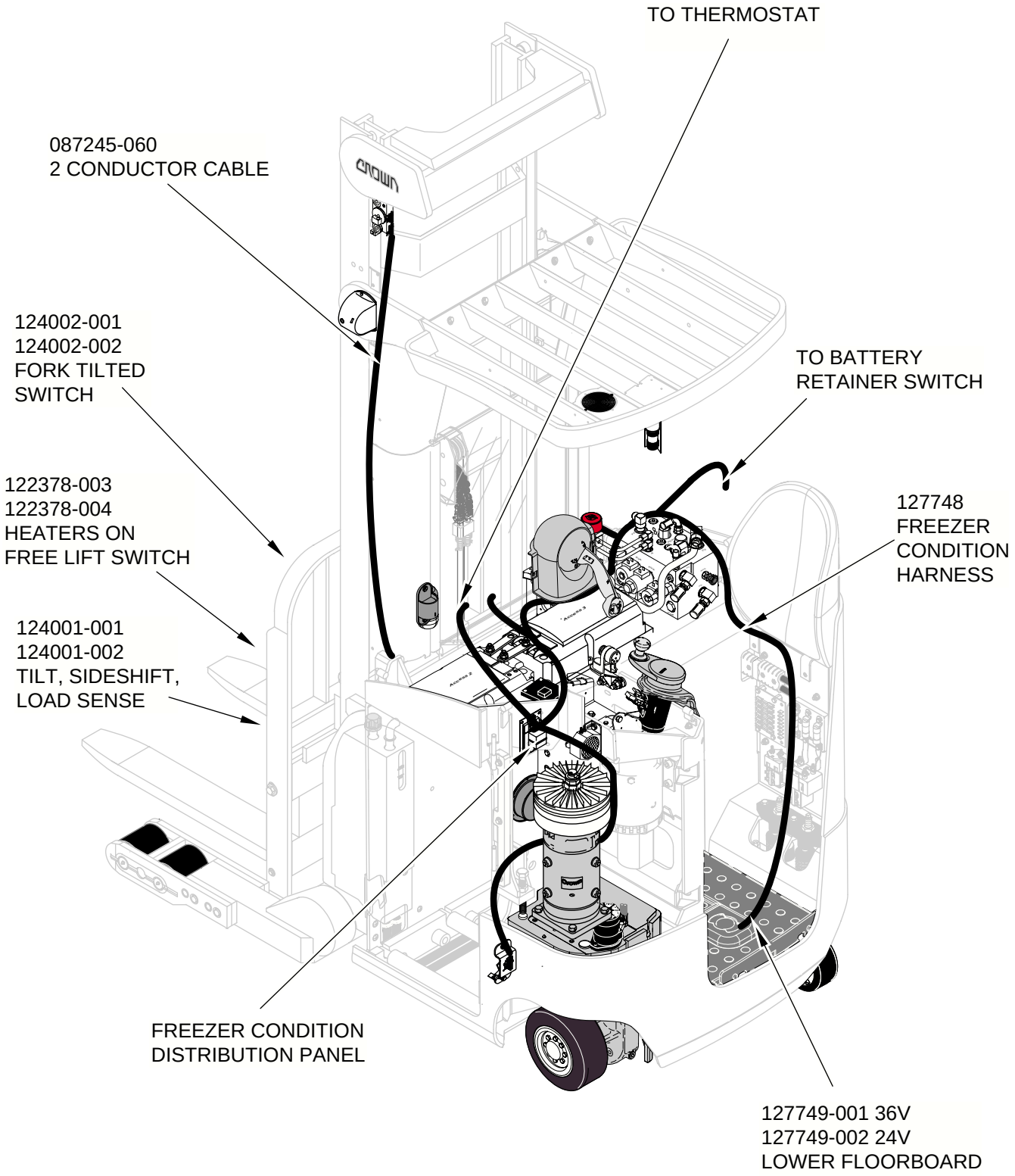
RR/RD 5200



7019

8817

RR/RD 5200
FREEZER/CORROSION

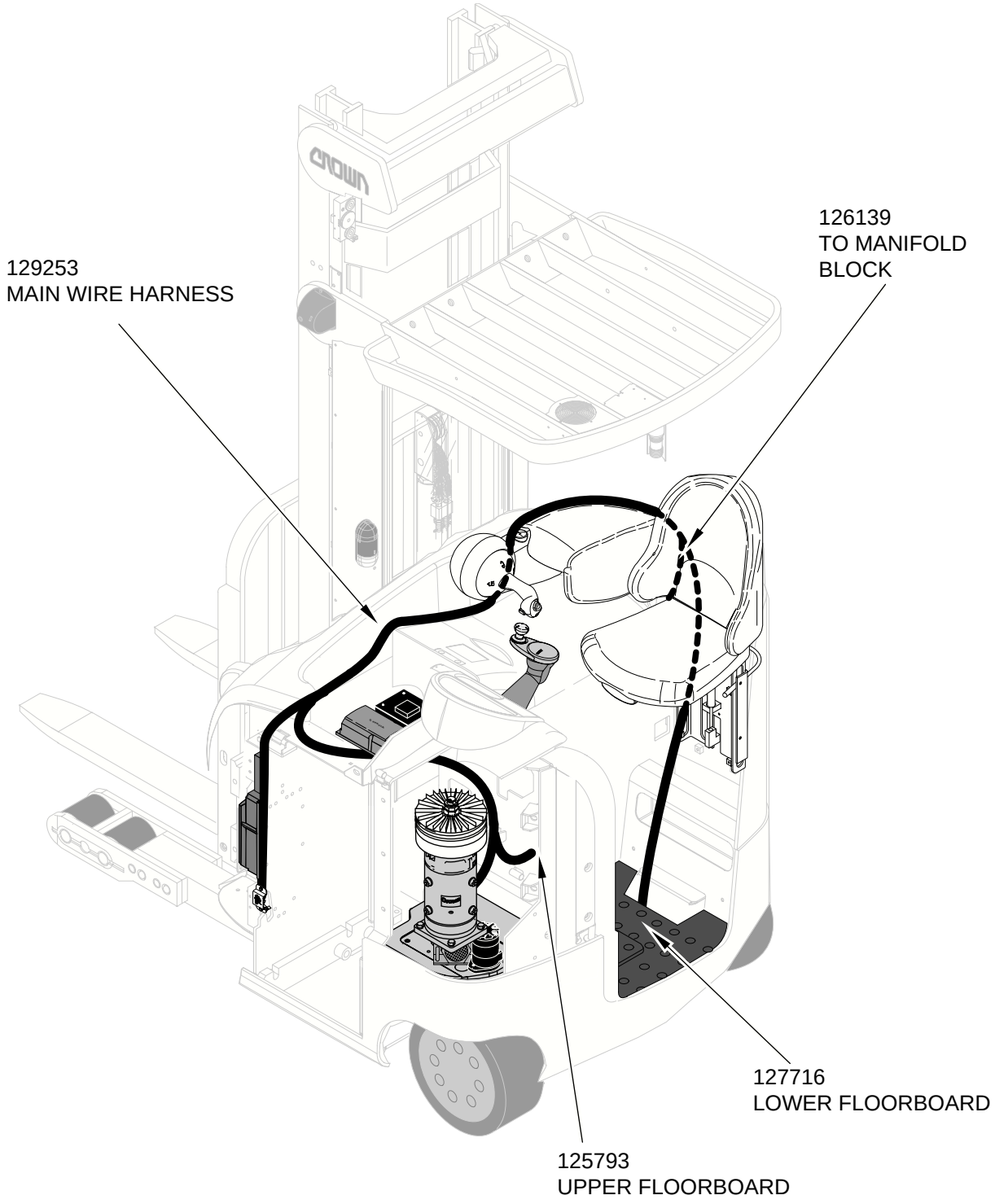


7019

DIA–1452–022-SUP-3

8818

RR/RD 5200S



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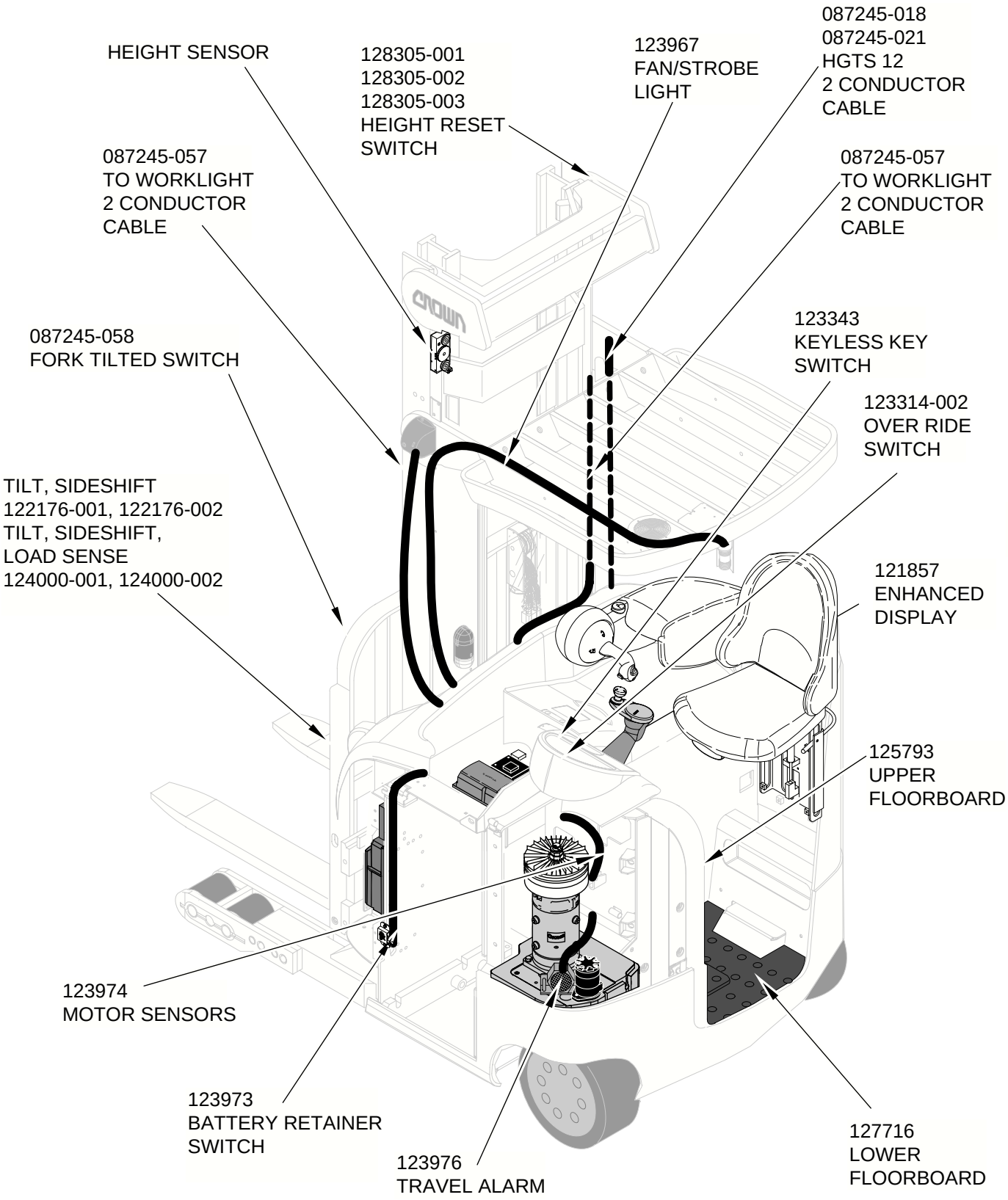
8819

RR/RD 5200S



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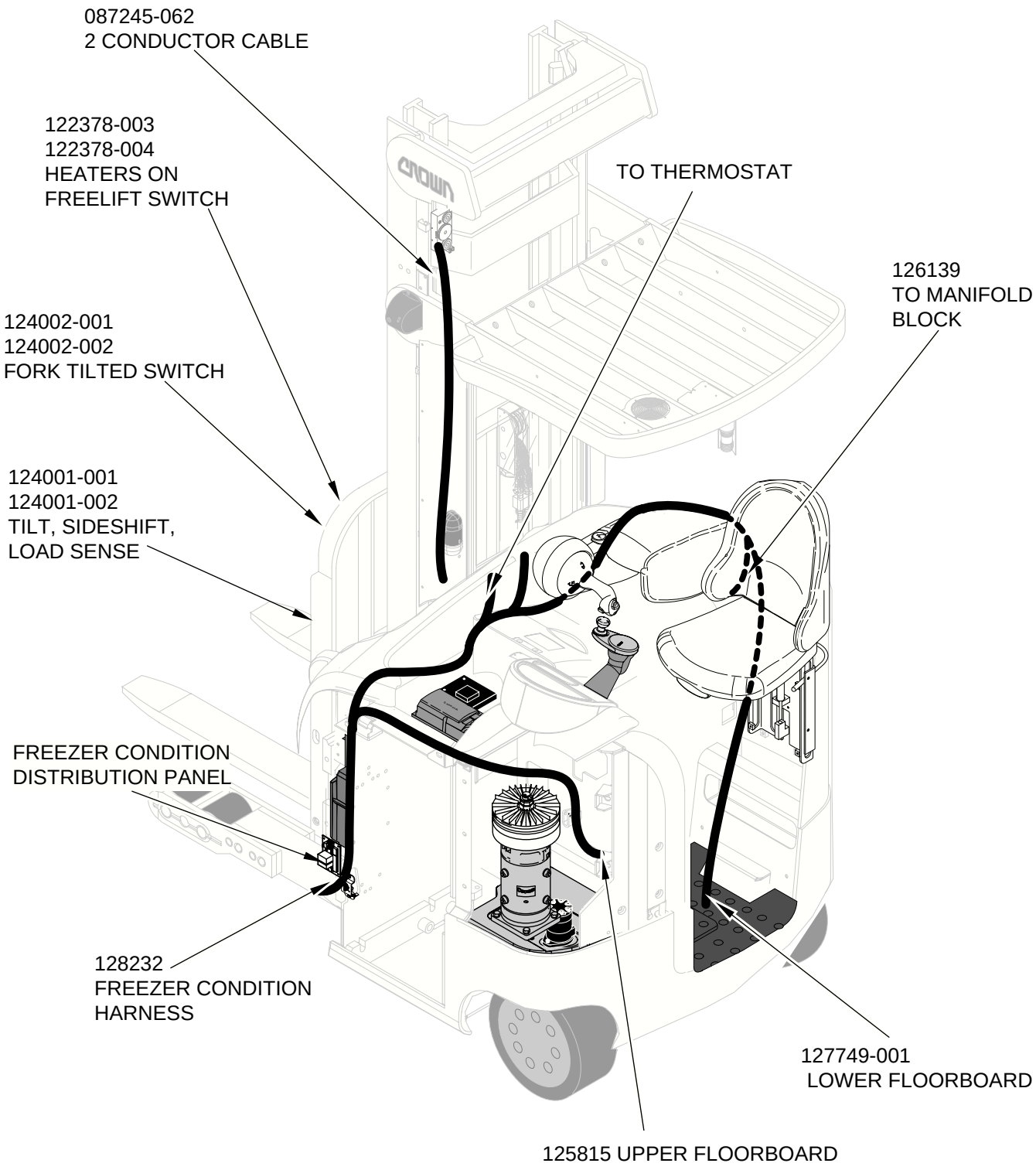
8820

RR/RD 5200S
FREEZER/CORROSION



7019

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Title	Page Number	Revision
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Electrical Schematic, RR/RD 5200 Enhanced Display	DIA-1452-038	
Electrical Schematic, RR/RD 5200S Standard Display	DIA-1452-039	
Electrical Schematic, RR/RD 5200S Enhanced Display	DIA-1452-040	
Distribution Panel, RR/RD 5200/5200S	DIA-1452-041	
Distribution Panel, RR/RD 5200/5200S W/InfoLink™	DIA-1452-042	
ACCESS 3 (VCM), RR/RD 5200/5200S	DIA-1452-043	
ACCESS 3 (VCM), RR/RD 5200/5200S W/InfoLink™	DIA-1452-044	
ACCESS 2, (HCM) RR/RD 5200/5200S	DIA-1452-045	
ACCESS 2, (HCM) RR/RD 5200/5200S W/InfoLink™	DIA-1452-046	
Hydraulic, Height & Load Sense, RR/RD 5200	DIA-1452-047	
Hydraulic, Height & Load Sense, RR/RD 5200 W/InfoLink™	DIA-1452-048	
Hydraulic, Height & Load Sense, RR/RD 5200S	DIA-1452-049	
Hydraulic, Height & Load Sense, RR/RD 5200S W/InfoLink™	DIA-1452-050	
ACCESS 1 Standard Display, RR/RD 5200/5200S	DIA-1452-051	
ACCESS 1 Enhanced Display, RR/RD 5200/5200S	DIA-1452-052	
Fan, Lights, Contactors, RR/RD 5200	DIA-1452-053	
Fan, Lights, Contactors, RR/RD 5200S	DIA-1452-054	
Traction Brake, RR/RD 5200	DIA-1452-055	
Traction Brake, RR/RD 5200 W/InfoLink™	DIA-1452-056	
Traction & Caster Brake, RR/RD 5200S	DIA-1452-057	
Traction & Caster Brake, RR/RD 5200S W/InfoLink™	DIA-1452-058	
Multi-Function Handle, RR/RD 5200/5200S	DIA-1452-059	
Multi-Function Handle, RR/RD 5200/5200S (AC) W/InfoLink™	DIA-1452-060	
Power Cables, RR/RD 5200	DIA-1452-061	
Power Cables, RR/RD 5200S	DIA-1452-062	
Freezer Condition, RR/RD 5200	DIA-1452-063	
Freezer Condition, RR/RD 5200S	DIA-1452-064	
InfoLink™, RR/RD 5200/5200S (AC)	DIA-1452-065	
Wire Harnesses	DIA-1452-066	
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Harness Routing RR/RD 5200	DIA-1452-069	

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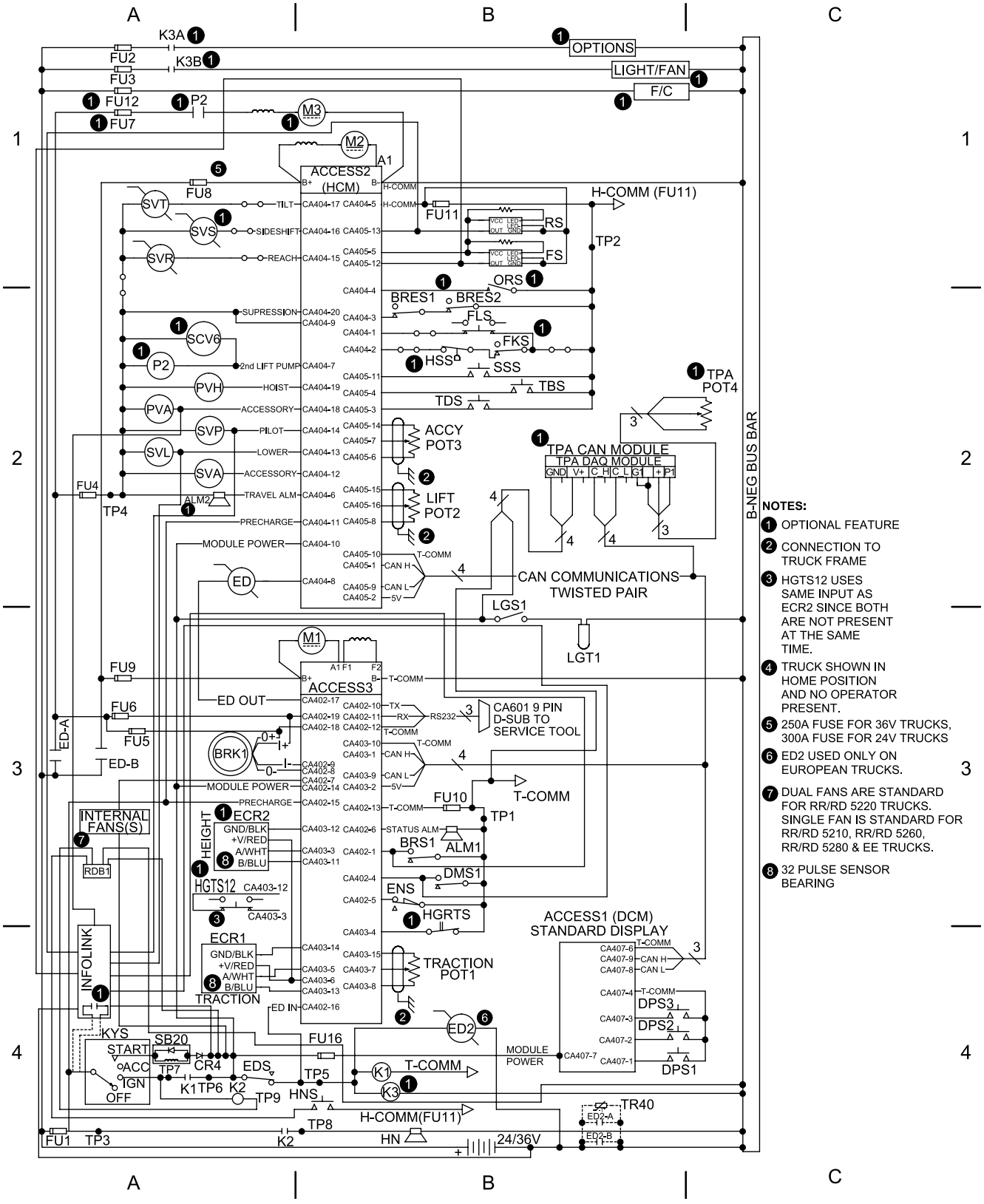
Harness Routing RR/RD 5200S	DIA-1452-072	
Harness Routing, Freezer Corrosion RR/RD 5200S	DIA-1452-073	



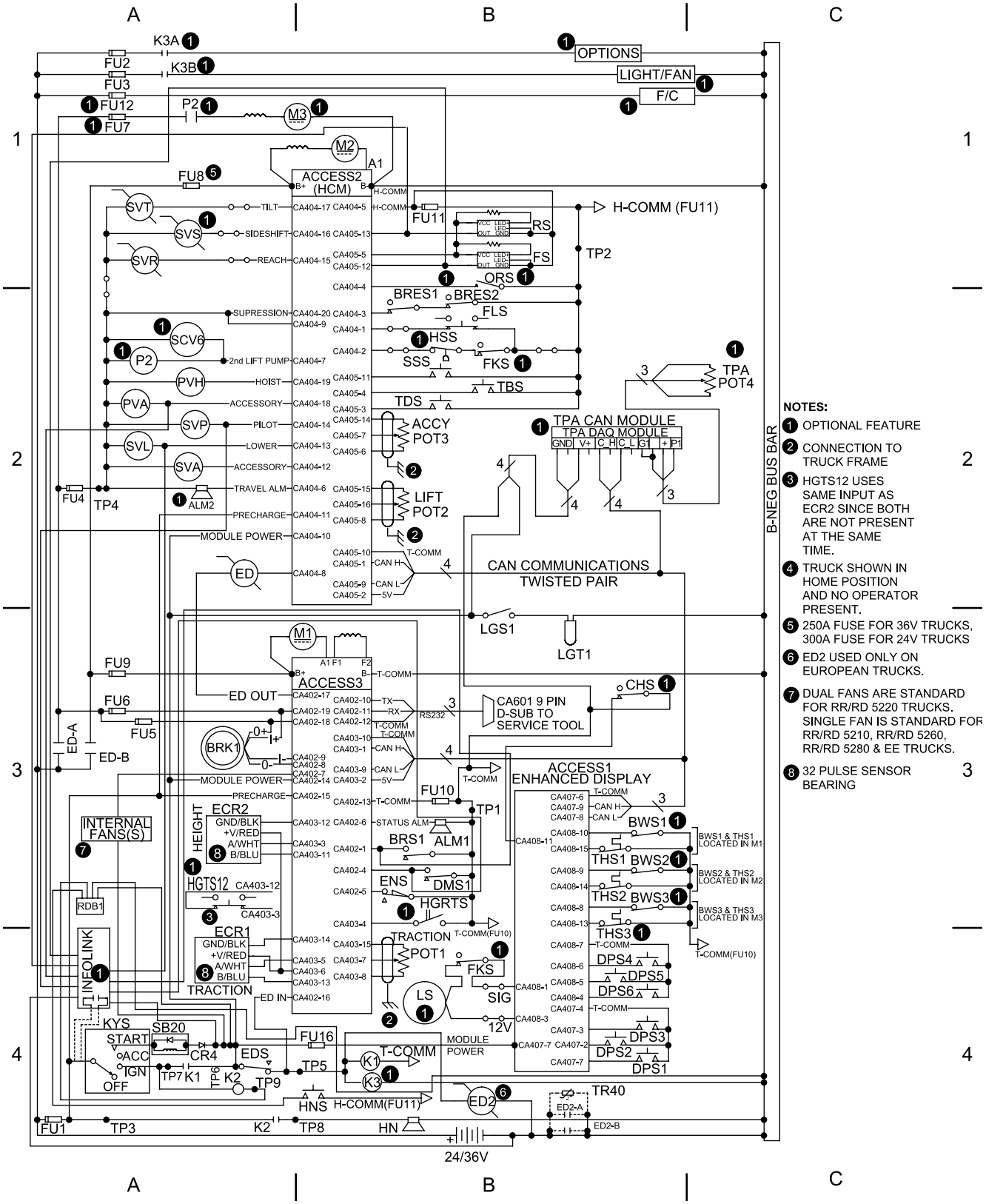
NOTES:

1. OPTIONAL FEATURE
2. CONNECTION TO TRUCK FRAME
3. HGTS12 USES SAME INPUT AS ECR2 SINCE BOTH ARE NOT PRESENT AT THE SAME TIME.
4. TRUCK SHOWN IN HOME POSITION AND NO OPERATOR PRESENT.
5. 250A FUSE FOR 36V TRUCKS, 300A FUSE FOR 24V TRUCKS
6. ED2 USED ONLY ON EUROPEAN TRUCKS.
7. DUAL FANS ARE STANDARD FOR RR/RD 5220 TRUCKS. SINGLE FAN IS STANDARD FOR RR/RD 5210, RR/RD 5260, RR/RD 5280 & EE TRUCKS.
8. 32 PULSE SENSOR BEARING

129333 G sh 1

WIRING DIAGRAMS

Electrical Schematic, RR/RD 5200 Enhanced Display



NOTES:

1. OPTIONAL FEATURE
2. CONNECTION TO TRUCK FRAME
3. HGTS12 USES SAME INPUT AS ECR2 SINCE BOTH ARE NOT PRESENT AT THE SAME TIME.
4. TRUCK SHOWN IN HOME POSITION AND NO OPERATOR PRESENT.
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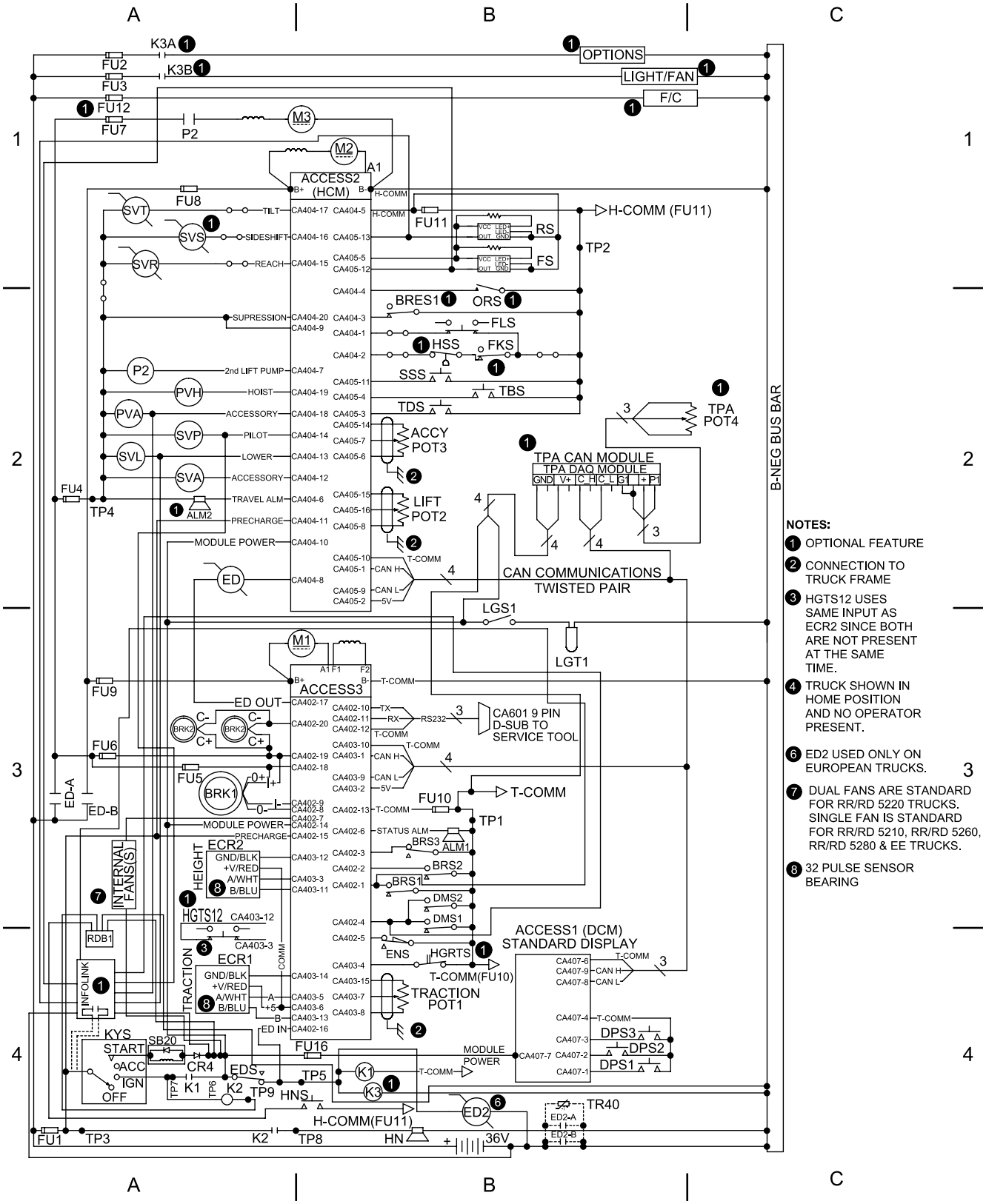
6. ED2 USED ONLY ON EUROPEAN TRUCKS.
7. DUAL FANS ARE STANDARD FOR RR/RD 5220 TRUCKS. SINGLE FAN IS STANDARD FOR RR/RD 5210, RR/RD 5260, RR/RD 5280 & EE TRUCKS.
8. 32 PULSE SENSOR BEARING

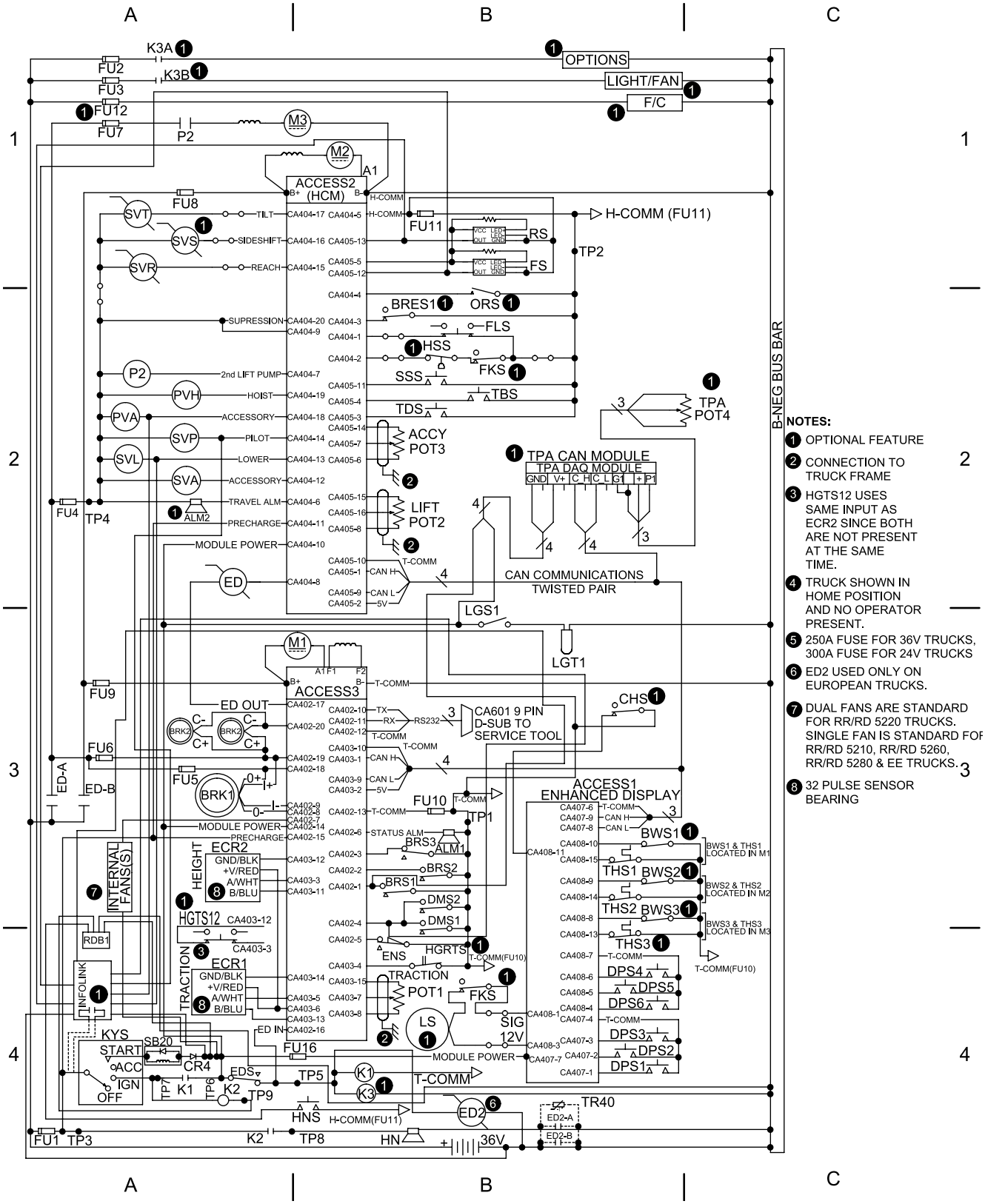
129333 G sh 2



NOTES:

1. OPTIONAL FEATURE
2. CONNECTION TO TRUCK FRAME
3. HGTS12 USES SAME INPUT AS ECR2 SINCE BOTH ARE NOT PRESENT AT THE SAME TIME.
4. TRUCK SHOWN IN HOME POSITION AND NO OPERATOR PRESENT.
6. ED2 USED ONLY ON EUROPEAN TRUCKS.
7. DUAL FANS ARE STANDARD FOR RR/RD 5220 TRUCKS. SINGLE FAN IS STANDARD FOR RR/RD 5210, RR/RD 5260, RR/RD 5280 & EE TRUCKS.
8. 32 PULSE SENSOR BEARING

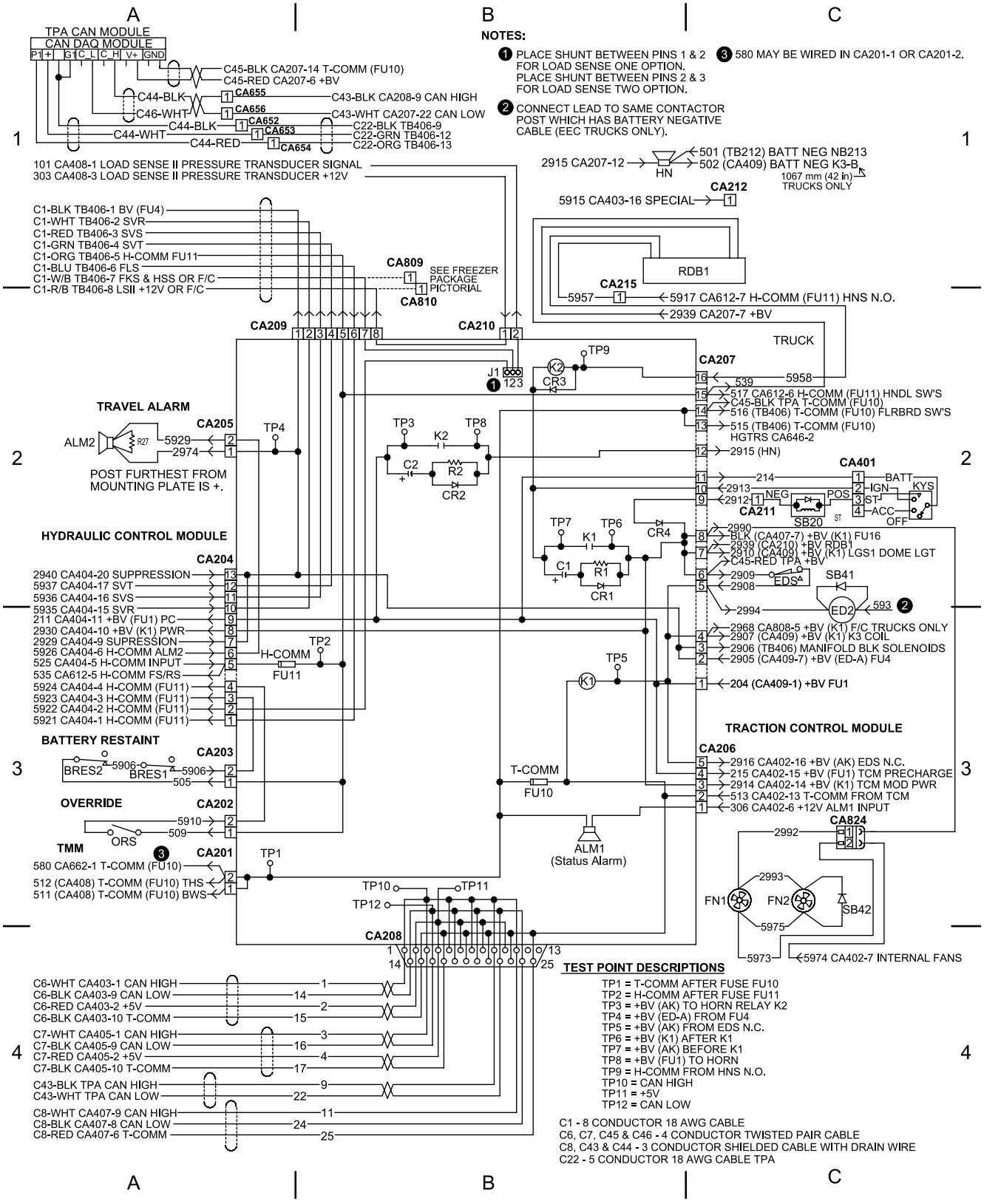
129333 G sh 3



NOTES:

1. OPTIONAL FEATURE
2. CONNECTION TO TRUCK FRAME
3. HGTS12 USES SAME INPUT AS ECR2 SINCE BOTH ARE NOT PRESENT AT THE SAME TIME.
4. TRUCK SHOWN IN HOME POSITION AND NO OPERATOR PRESENT.
5. 250A FUSE FOR 36V TRUCKS, 300A FUSE FOR 24V TRUCKS
6. ED2 USED ONLY ON EUROPEAN TRUCKS.
7. DUAL FANS ARE STANDARD FOR RR/RD 5220 TRUCKS. SINGLE FAN IS STANDARD FOR RR/RD 5210, RR/RD 5260, RR/RD 5280 & EE TRUCKS.
8. 32 PULSE SENSOR BEARING

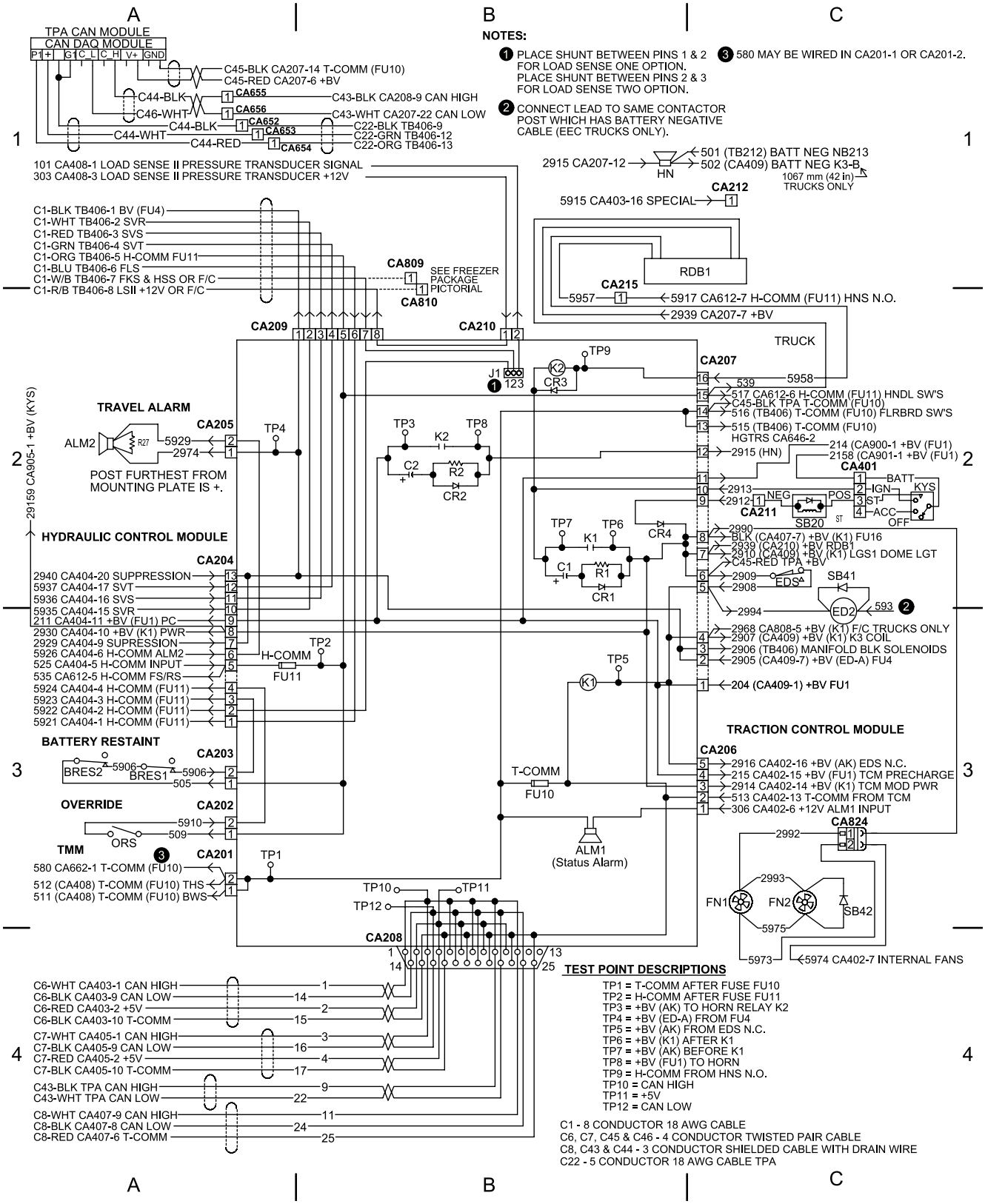
129333 G sh 4



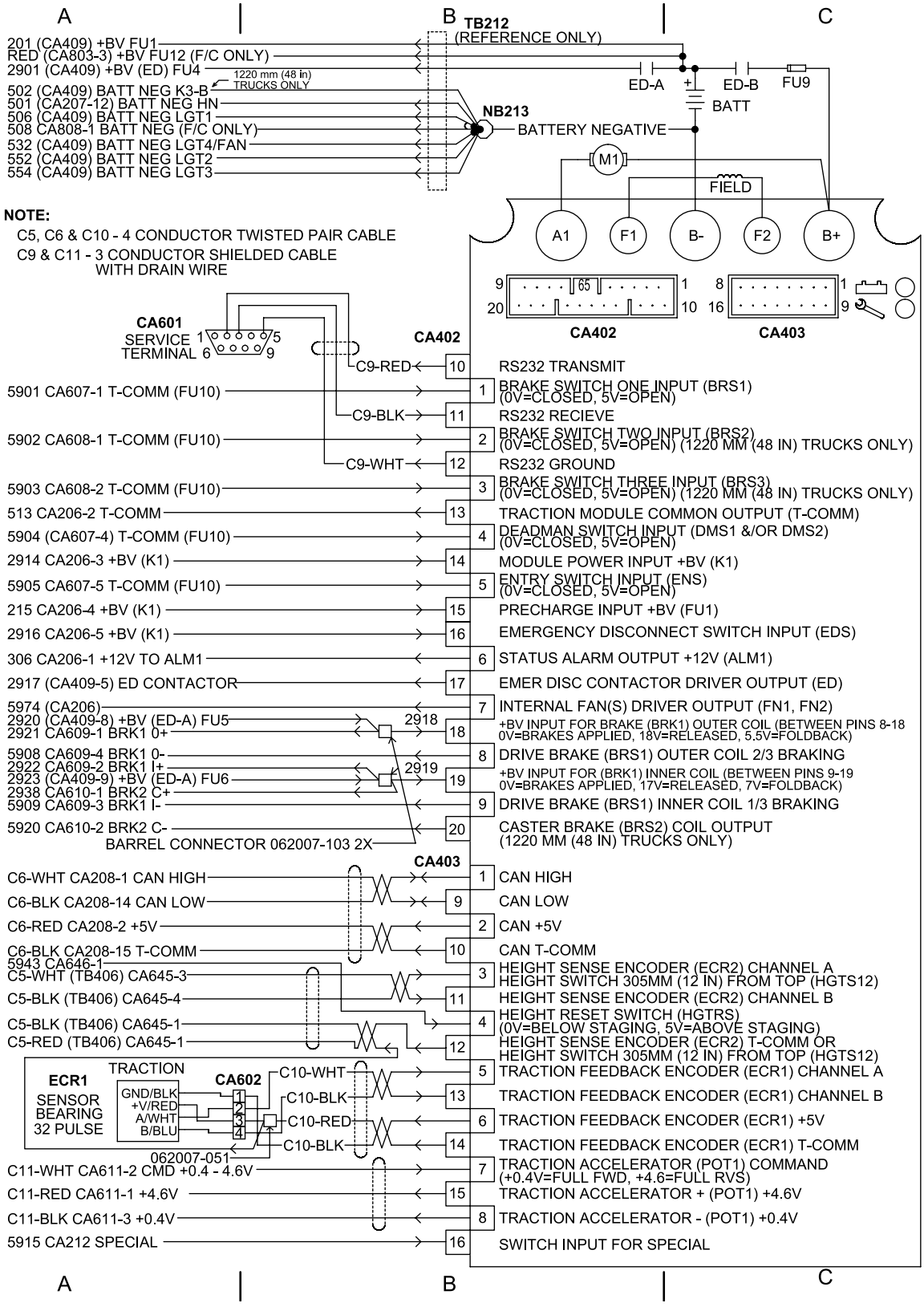
129334 G sh 1

WIRING DIAGRAMS

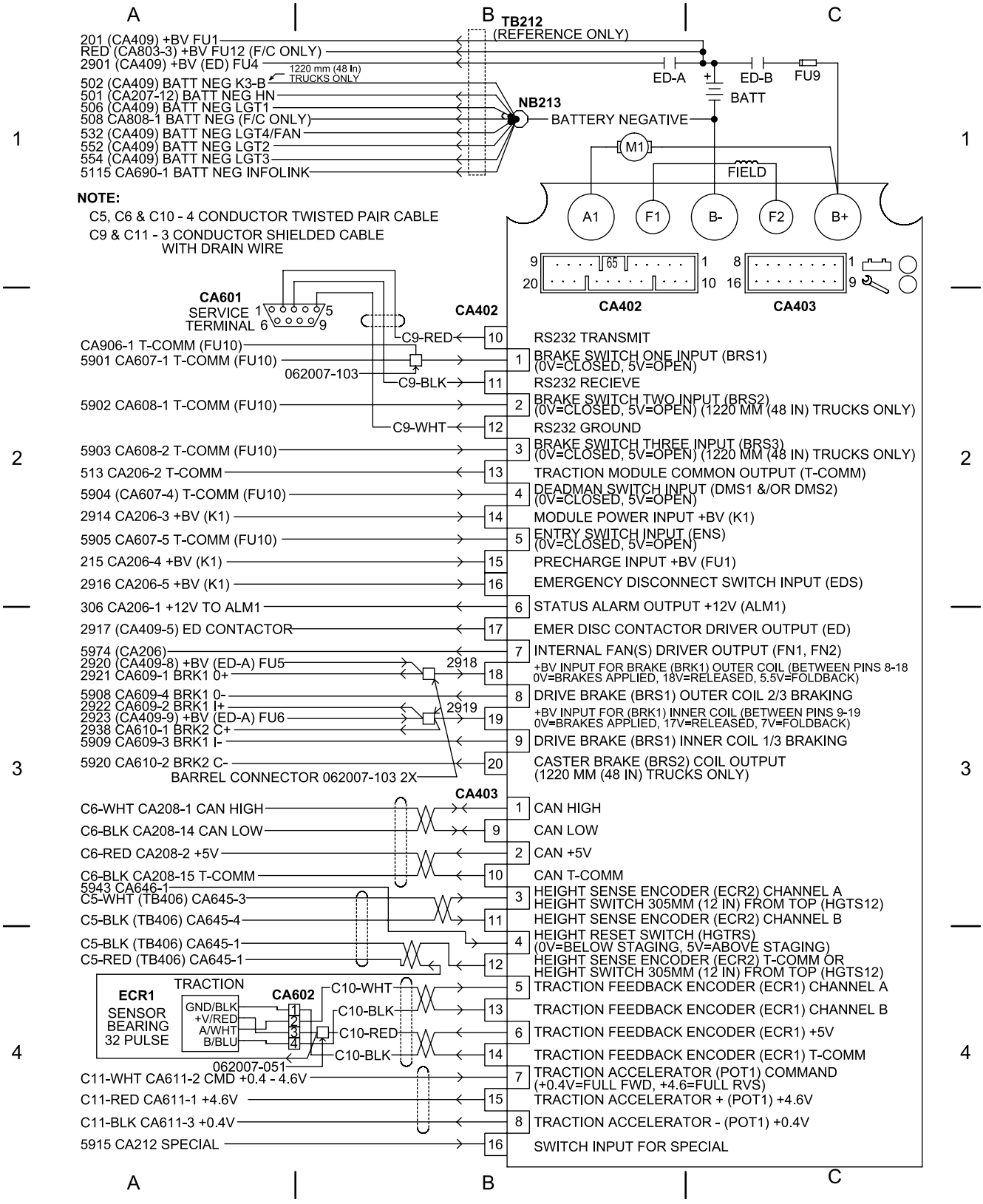
Distribution Panel, RR/RD 5200/5200S w/InfoLink



129334 G sh 2



129335 D sh 1



129335 D sh 2

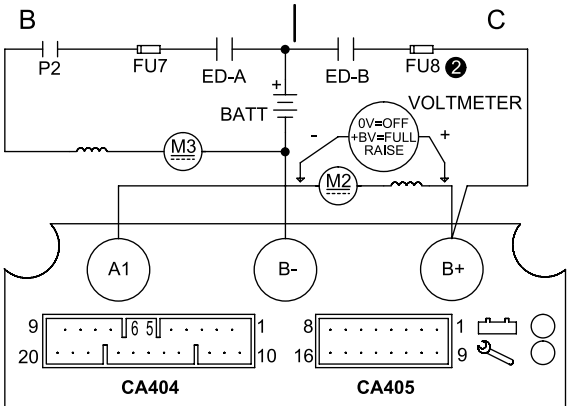
NOTE:

❶ RR/RD 5200 USES 5927 (TB406) SCV6 OR P2.
RR/RD 5200S USES 5925 (CA409) P2.

❷ 250A FUSE FOR 36V TRUCKS.
300A FUSE FOR 24V TRUCKS.

NOTE:

C7 - 4 CONDUCTOR TWISTED PAIR CABLE
C12 & C13, C14 & C18 - 3 CONDUCTOR SHIELDED CABLE WITH DRAIN WIRE



2930 CA204-8 +BV (K1)	→	10	MODULE POWER (0V=OFF, +BV=ON)
5921 CA204-1 H-COMM (FU11)	→	1	FREELIFT SWITCH (FLS) INPUT (0V=CLOSED, 5V=OPEN)
211 CA204-9 +BV (FU1)	→	11	MODULE PRECHARGE INPUT
5922 CA204-2 H-COMM (FU11)	→	2	LOAD SENSE 1 INPUT (FKS & HSS) (0V=CLOSED, 5V=OPEN)
5932 (TB406) H-COMM SVA	←	12	SOLENOID VALVE ACCY (SVA) OUTPUT
5923 CA204-3 H-COMM (FU11)	→	3	BATT GATE SWITCH (BRES1 &/OR BRES2) INPUT (0V=CLOSED, 5V=OPEN)
5933 (TB406) H-COMM SVL	←	13	SOLENOID VALVE LOWER (SVL) OUTPUT
5924 CA204-4 H-COMM (FU11)	→	4	LIFT CUTOUT OVERRIDE SWITCH (ORS) INPUT (0V=CLOSED, 5V=OPEN)
5934 (TB406) H-COMM SVP	←	14	SOLENOID VALVE PILOT (SVP) OUTPUT
525 CA204-5 H-COMM (FU11)	←	5	H-COMM OUTPUT
5935 (TB406) H-COMM SVR	←	15	SOLENOID VALVE REACH (SVR) OUTPUT
5936 CA204-11 H-COMM SVS	←	16	SOLENOID VALVE SIDESHIFT (SVS) OUTPUT
5926 CA204-6 H-COMM ALM2	←	6	TRAVEL ALARM (ALM2) OUTPUT
5937 CA204-12 H-COMM SVT	←	17	SOLENOID VALVE TILT (SVT) OUTPUT
❶	←	7	DUAL LIFT PUMP CONTACTOR (P2) OR BYPASS SOLENOID (SCV6) OUTPUT
5938 (TB406) H-COMM PVA	←	18	PROPORTIONAL VALVE ACCY. (PVA) OUTPUT
5928 (CA409-4) ED CONTACTOR	←	8	EMERGENCY DISCONNECT CONTACTOR (ED) OUTPUT
5939 (TB406) H-COMM PVH	←	19	PROPORTIONAL VALVE HOIST (PVH) OUTPUT
2929 CA204-7 +BV (ED-A) FU4	→	9	SUPPRESSION
2940 CA204-13 +BV (ED-A) FU4	→	20	SUPPRESSION

CA405

C7-WHT CA208-3 CAN HIGH	↔	1	CAN HIGH
C7-BLK CA208-16 CAN LOW	↔	9	CAN LOW
C7-RED CA208-4 CAN +5V	→	2	CAN +5V
C7-BLK CA208-17 T-COMM	→	10	CAN T-COMM
C14-RED CA612-9 H-COMM (FU11)	→	3	TILT DOWN FORKS (TDS) SELECT INPUT (0V=CLOSED, 5V=OPEN)
C14-BLK CA612-11 H-COMM (FU11)	→	11	SIDESHIFT (SSS) SELECT INPUT (0V=CLOSED, 5V=OPEN)
C14-WHT CA612-10 H-COMM (FU11)	→	4	TILT BACK FORKS (TBS) SELECT INPUT (0V=CLOSED, 5V=OPEN)
C18-BLK CA611-9 H-COMM	→	12	FORWARD SWITCH (FS) INPUT (0V=CLOSED, 5V=OPEN)
C18-RED CA611-11 +5V	→	5	OPTICAL DIRECTIONAL SWITCHES +5V
C18-WHT CA611-10 H-COMM	→	13	REVERSE SWITCH (RS) INPUT (0V=CLOSED, 5V=OPEN)
C13-BLK CA612-3 POT3 H-COMM	→	6	ACCESSORY POT (POT3) H-COMM OUTPUT
C13-RED CA612-1 POT3 +5V	→	14	ACCESSORY POT (POT3) +5V OUTPUT
C13-WHT CA612-2 POT3 COMMAND	→	7	ACCESSORY POT (POT3) COMMAND INPUT (B/T PINS 6 & 7 0V=EXTEND, 5V=RETRACT)
C12-RED CA611-5 POT2 +5V	→	15	RAISE/LOWER ACCEL (POT2) +5V OUTPUT
C12-BLK CA611-7 POT2 H-COMM	→	8	RAISE/LOWER ACCEL (POT2) H-COMM OUTPUT
C12-WHT CA611-6 POT2 COMMAND	→	16	RAISE/LOWER ACCEL (POT2) COMMAND INPUT (B/T PINS 8 & 16 0V=RAISE, 5V=LOWER)

129336 B sh 1

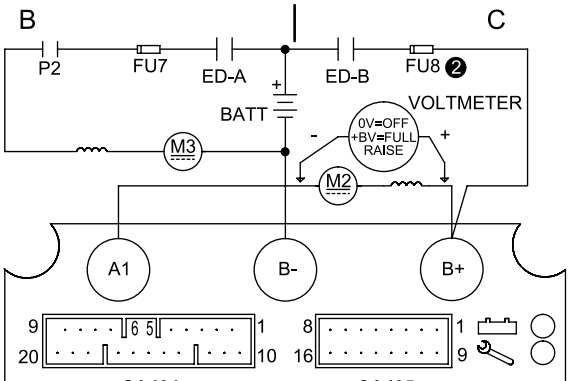
NOTE:

❶ RR/RD 5200 USES 5927 (TB406) SCV6 OR P2.
RR/RD 5200S USES 5925 (CA409) P2.

❷ 250A FUSE FOR 36V TRUCKS.
300A FUSE FOR 24V TRUCKS.

NOTE:

C7 - 4 CONDUCTOR TWISTED PAIR CABLE
C12 & C13, C14 & C18 - 3 CONDUCTOR SHIELDED CABLE WITH DRAIN WIRE

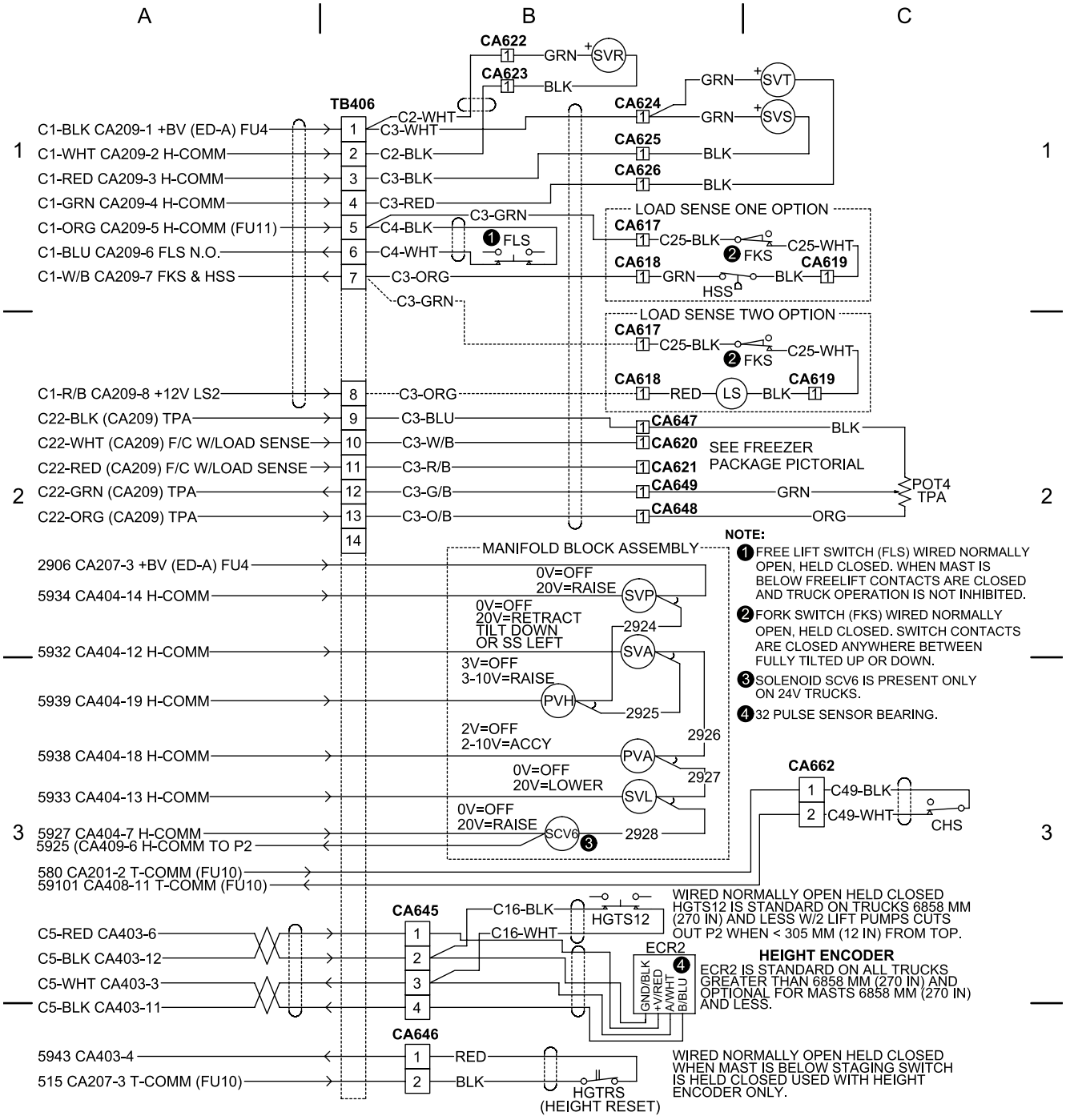


2930 CA204-8 +BV (K1)	10	MODULE POWER (0V=OFF, +BV=ON)
5921 CA204-1 H-COMM (FU11)	1	FREELIFT SWITCH (FLS) INPUT (0V=CLOSED, 5V=OPEN)
211 CA204-9 +BV (FU1)	11	MODULE PRECHARGE INPUT
5922 CA204-2 H-COMM (FU11)	2	LOAD SENSE 1 INPUT (FKS & HSS) (0V=CLOSED, 5V=OPEN)
5932 (TB406) H-COMM SVA	12	SOLENOID VALVE ACCY (SVA) OUTPUT
5923 CA204-3 H-COMM (FU11)	3	BATT GATE SWITCH (BRES1 &/OR BRES2) INPUT (0V=CLOSED, 5V=OPEN)
5933 (TB406) H-COMM SVL	13	SOLENOID VALVE LOWER (SVL) OUTPUT
5924 CA204-4 H-COMM (FU11)	4	LIFT CUTOUT OVERRIDE SWITCH (ORS) INPUT (0V=CLOSED, 5V=OPEN)
5934 (TB406) H-COMM SVP	14	SOLENOID VALVE PILOT (SVP) OUTPUT
525 CA204-5 H-COMM (FU11)	5	H-COMM OUTPUT
5935 (TB406) H-COMM SVR	15	SOLENOID VALVE REACH (SVR) OUTPUT
5936 CA204-11 H-COMM SVS	16	SOLENOID VALVE SIDESHIFT (SVS) OUTPUT
5926 CA204-6 H-COMM ALM2	6	TRAVEL ALARM (ALM2) OUTPUT
5937 CA204-12 H-COMM SVT	17	SOLENOID VALVE TILT (SVT) OUTPUT
❶	7	DUAL LIFT PUMP CONTACTOR (P2) OR BYPASS SOLENOID (SCV6) OUTPUT
5938 (TB406) H-COMM PVA	18	PROPORTIONAL VALVE ACCY. (PVA) OUTPUT
5928 (CA409-4) ED CONTACTOR	8	EMERGENCY DISCONNECT CONTACTOR (ED) OUTPUT
5939 (TB406) H-COMM PVH	19	PROPORTIONAL VALVE HOIST (PVH) OUTPUT
2929 CA204-7 +BV (ED-A) FU4	9	SUPPRESSION
2940 CA204-13 +BV (ED-A) FU4	20	SUPPRESSION

CA405

C7-WHT CA208-3 CAN HIGH	1	CAN HIGH
C7-BLK CA208-16 CAN LOW	9	CAN LOW
C7-RED CA208-4 CAN +5V	2	CAN +5V
C7-BLK CA208-17 T-COMM	10	CAN T-COMM
C14-RED CA612-9 H-COMM (FU11)	3	TILT DOWN FORKS (TDS) SELECT INPUT (0V=CLOSED, 5V=OPEN)
C14-BLK CA612-11 H-COMM (FU11)	11	SIDESHIFT (SSS) SELECT INPUT (0V=CLOSED, 5V=OPEN)
C14-WHT CA612-10 H-COMM (FU11)	4	TILT BACK FORKS (TBS) SELECT INPUT (0V=CLOSED, 5V=OPEN)
C18-BLK CA611-9 H-COMM	12	FORWARD SWITCH (FS) INPUT (0V=CLOSED, 5V=OPEN)
C18-RED CA611-11 +5V	5	OPTICAL DIRECTIONAL SWITCHES +5V
C18-WHT CA611-10 H-COMM	13	REVERSE SWITCH (RS) INPUT (0V=CLOSED, 5V=OPEN)
C13-BLK CA612-3 POT3 H-COMM	6	ACCESSORY POT (POT3) H-COMM OUTPUT
C13-RED CA612-1 POT3 +5V	14	ACCESSORY POT (POT3) +5V OUTPUT
C13-WHT CA612-2 POT3 COMMAND	7	ACCESSORY POT (POT3) COMMAND INPUT (B/T PINS 6 & 7 0V=EXTEND, 5V=RETRACT)
C12-RED CA611-5 POT2 +5V	15	RAISE/LOWER ACCEL (POT2) +5V OUTPUT
C12-BLK CA611-7 POT2 H-COMM	8	RAISE/LOWER ACCEL (POT2) H-COMM OUTPUT
C12-WHT CA611-6 POT2 COMMAND	16	RAISE/LOWER ACCEL (POT2) COMMAND INPUT (B/T PINS 8 & 16 0V=RAISE, 5V=LOWER)

129336 B sh 2



NOTE:

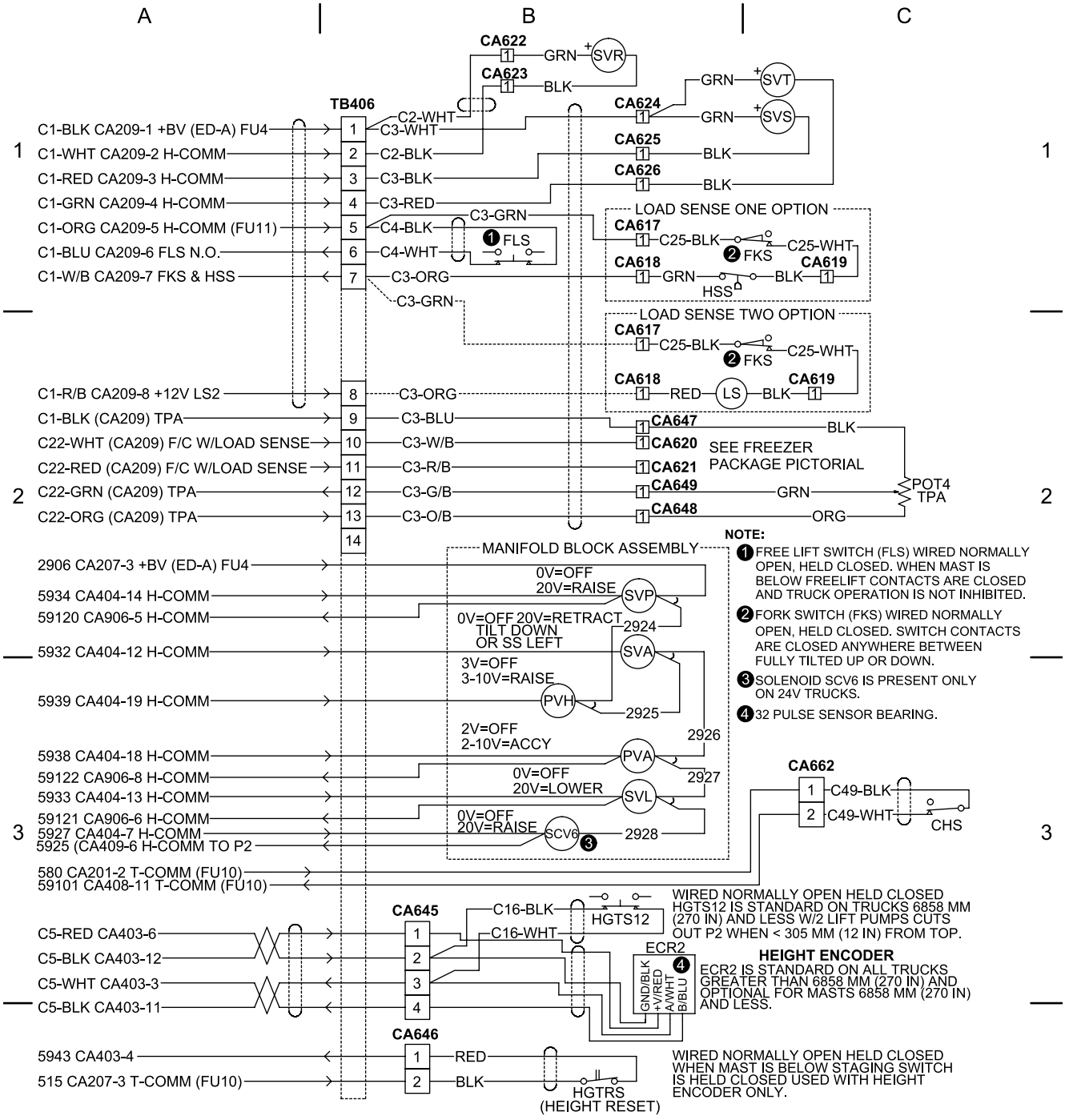
C1 - 8 CONDUCTOR 18AWG CABLE
C2, C4, C16 - 2 CONDUCTOR 18 AWG CABLE
C3 - 3 CONDUCTOR 18 AWG CABLE STANDARD
- 5 CONDUCTOR 18 AWG CABLE LOAD SENSE 1 OR 2
- 8 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC
- 10 CONDUCTOR 18 AWG CABLE TPA

C5 - 4 CONDUCTOR TWISTED PAIR
C22 - 3 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC
- 5 CONDUCTOR 18 AWG CABLE TPA

C25 - 2 CONDUCTOR 18 AWG CABLE LOAD SENSE
- 5 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC

C49 - 2 CONDUCTOR 18 AWG CABLE
- 5 CONDUCTOR 18 AWG CABLE CHS W/FC

129337 D sh 1



NOTE:

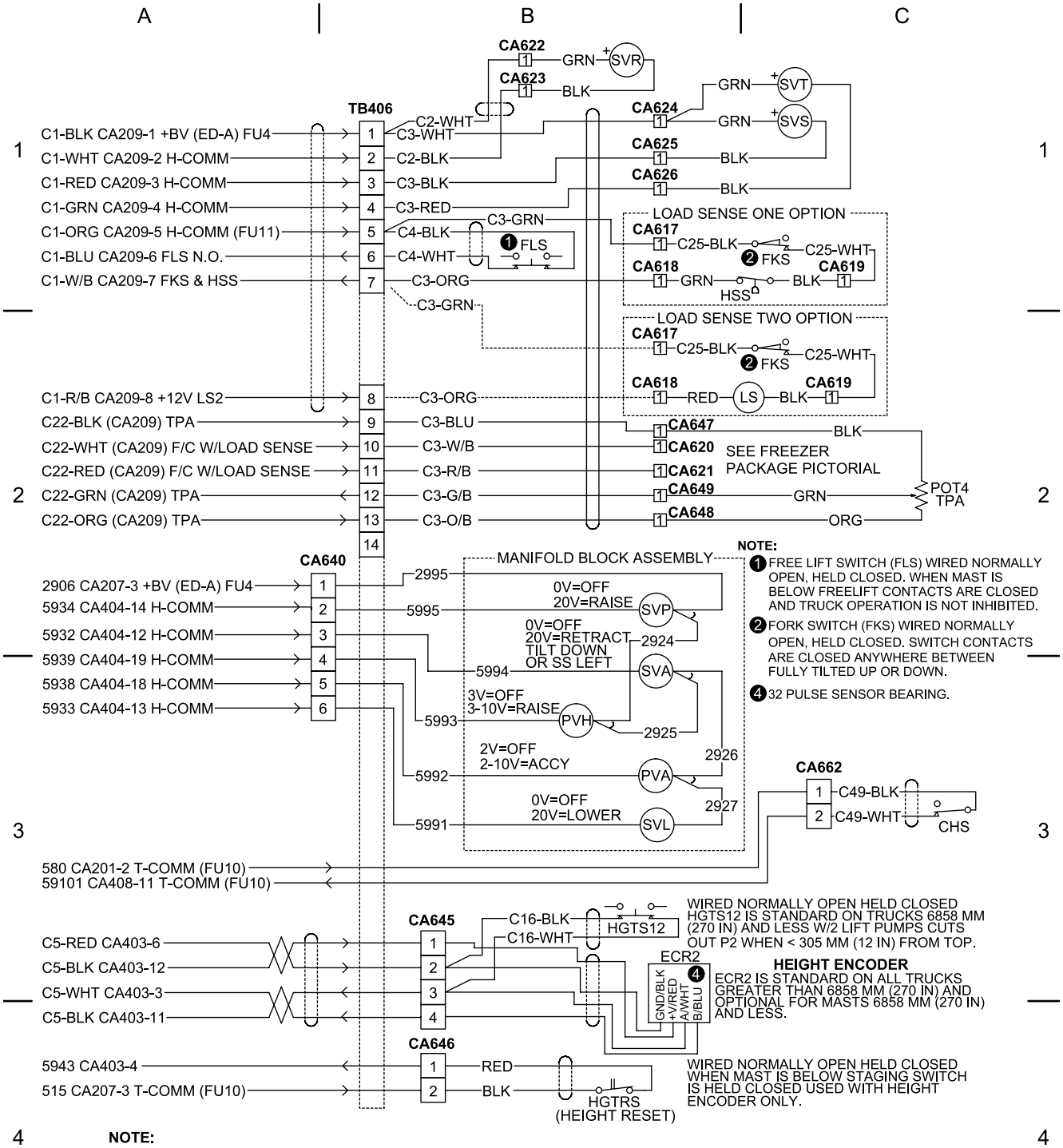
C1 - 8 CONDUCTOR 18AWG CABLE
C2, C4, C16 - 2 CONDUCTOR 18 AWG CABLE
C3 - 3 CONDUCTOR 18 AWG CABLE STANDARD
- 5 CONDUCTOR 18 AWG CABLE LOAD SENSE 1 OR 2
- 8 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC
- 10 CONDUCTOR 18 AWG CABLE TPA

C5 - 4 CONDUCTOR TWISTED PAIR
C22 - 3 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC
- 5 CONDUCTOR 18 AWG CABLE TPA

C25 - 2 CONDUCTOR 18 AWG CABLE LOAD SENSE
- 5 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC

C49 - 2 CONDUCTOR 18 AWG CABLE
- 5 CONDUCTOR 18 AWG CABLE CHS W/FC

129337 D sh 2



NOTE:

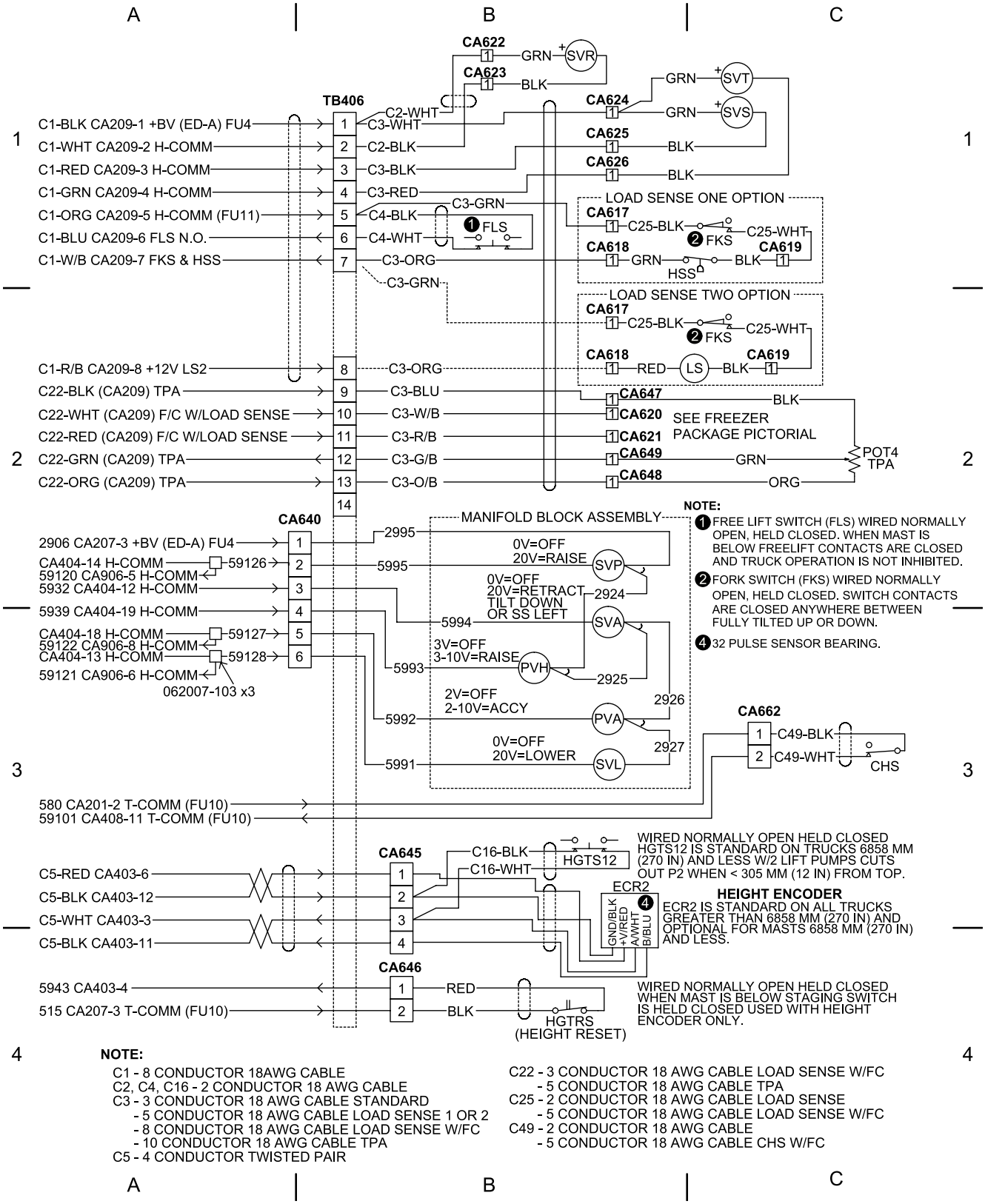
C1 - 8 CONDUCTOR 18AWG CABLE
C2, C4, C16 - 2 CONDUCTOR 18 AWG CABLE
C3 - 3 CONDUCTOR 18 AWG CABLE STANDARD
- 5 CONDUCTOR 18 AWG CABLE LOAD SENSE 1 OR 2
- 8 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC
- 10 CONDUCTOR 18 AWG CABLE TPA

C5 - 4 CONDUCTOR TWISTED PAIR
C22 - 3 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC
- 5 CONDUCTOR 18 AWG CABLE TPA

C25 - 2 CONDUCTOR 18 AWG CABLE LOAD SENSE
- 5 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC

C49 - 2 CONDUCTOR 18 AWG CABLE
- 5 CONDUCTOR 18 AWG CABLE CHS W/FC

129337 D sh 3



NOTE:

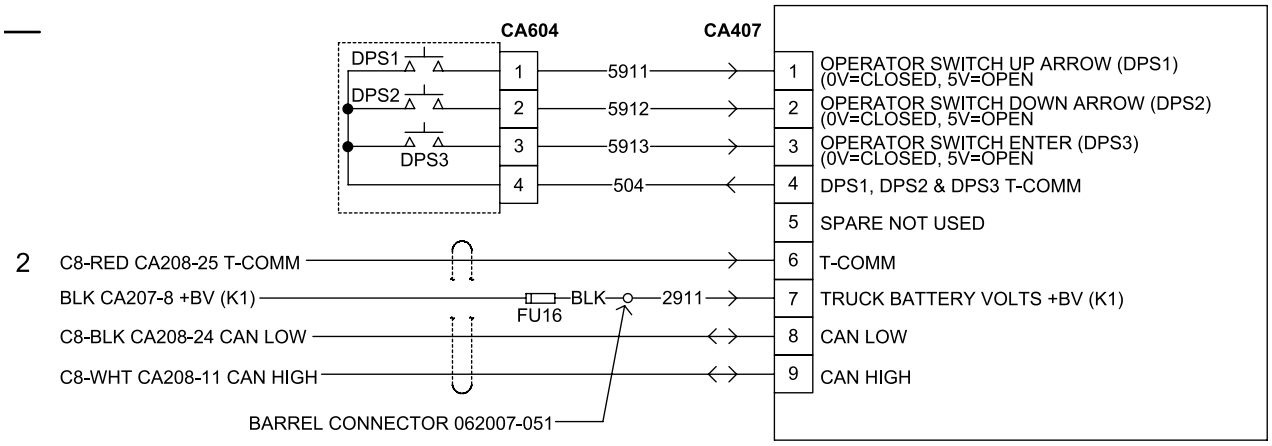
C1 - 8 CONDUCTOR 18AWG CABLE
C2, C4, C16 - 2 CONDUCTOR 18 AWG CABLE
C3 - 3 CONDUCTOR 18 AWG CABLE STANDARD
- 5 CONDUCTOR 18 AWG CABLE LOAD SENSE 1 OR 2
- 8 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC
- 10 CONDUCTOR 18 AWG CABLE TPA

C5 - 4 CONDUCTOR TWISTED PAIR
C22 - 3 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC
- 5 CONDUCTOR 18 AWG CABLE TPA

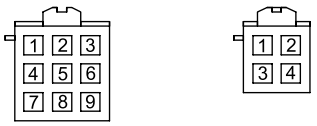
C25 - 2 CONDUCTOR 18 AWG CABLE LOAD SENSE
- 5 CONDUCTOR 18 AWG CABLE LOAD SENSE W/FC

C49 - 2 CONDUCTOR 18 AWG CABLE
- 5 CONDUCTOR 18 AWG CABLE CHS W/FC

129337 D sh 4

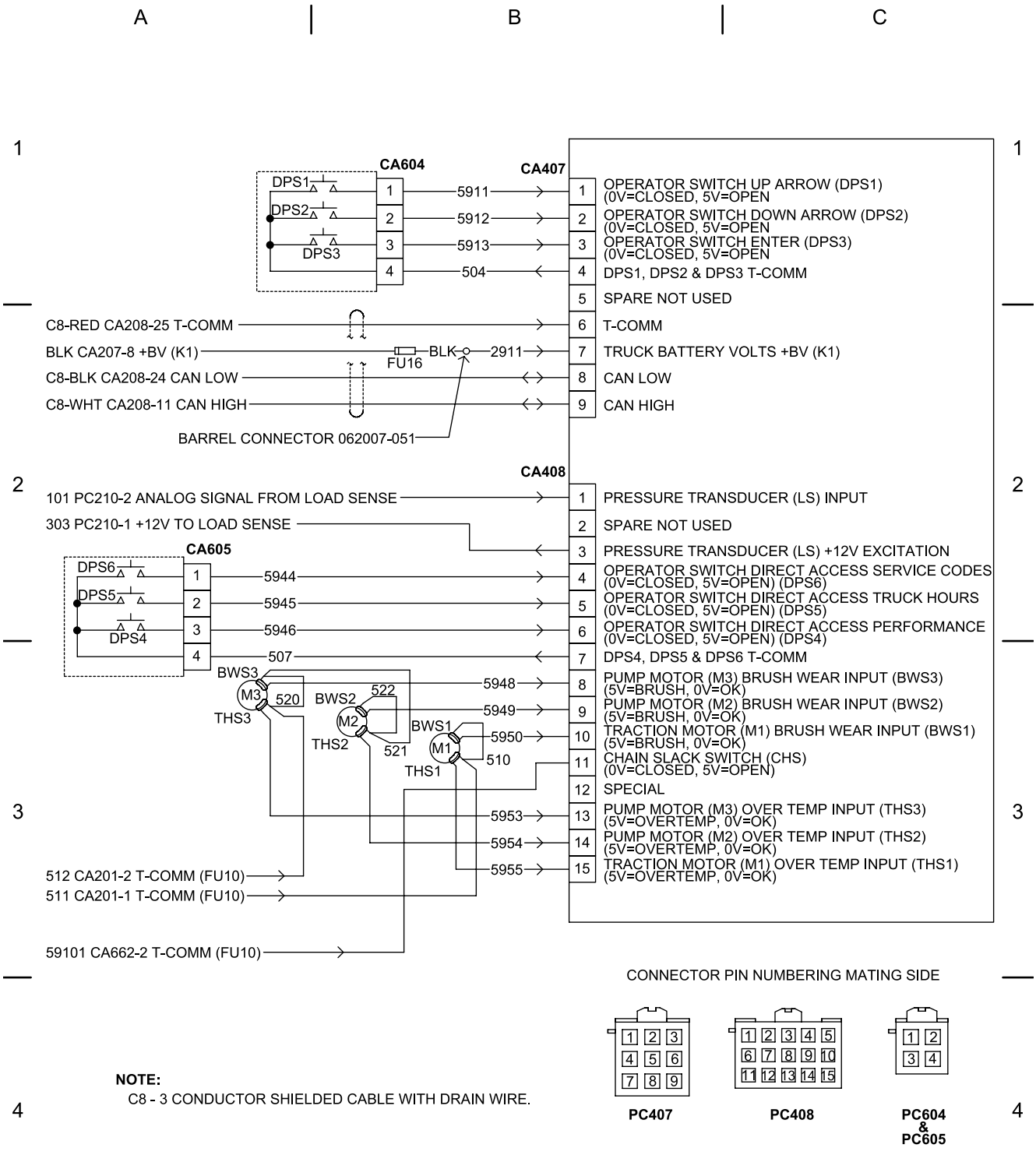


CONNECTOR PIN NUMBERING MATING SIDE

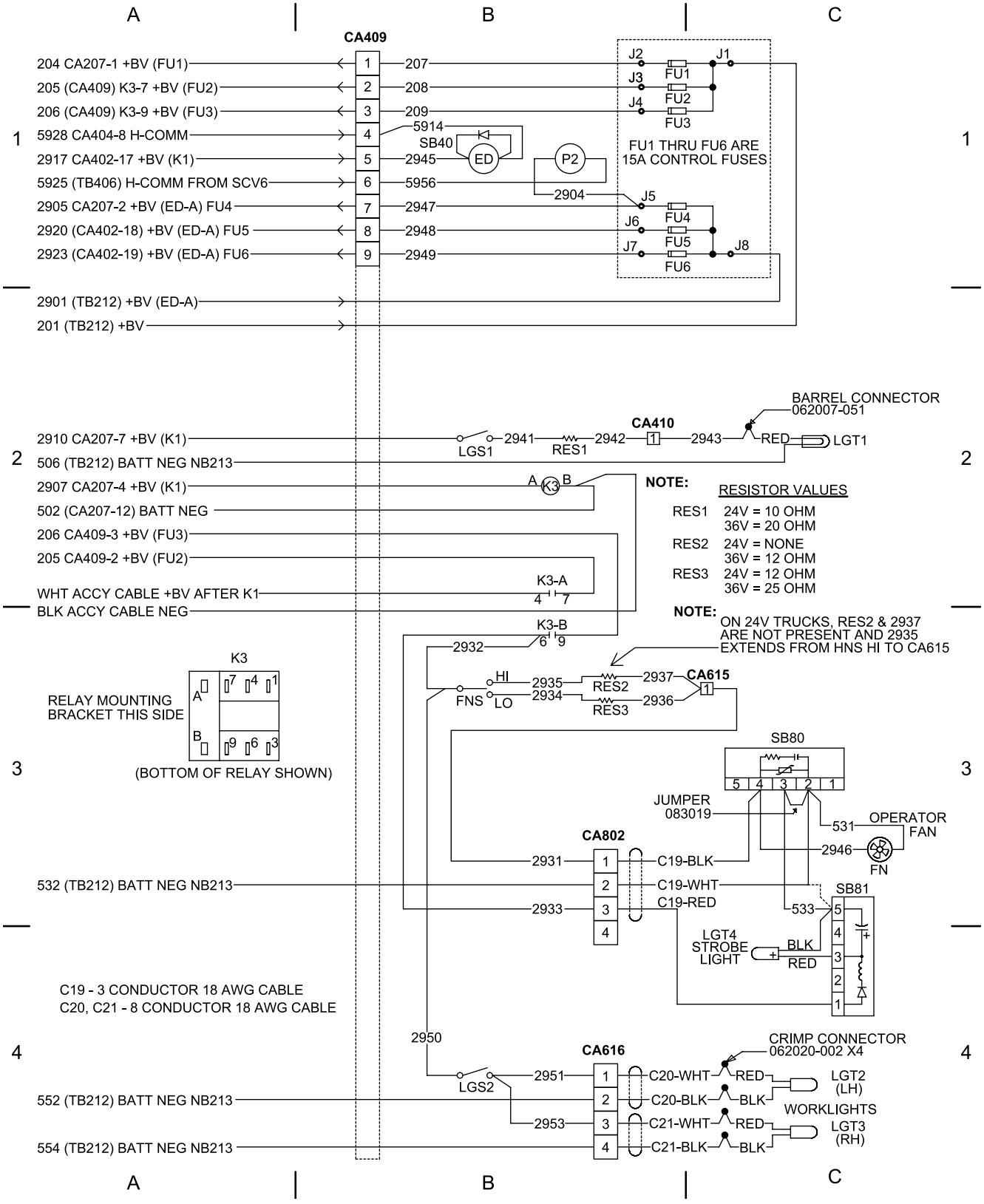


NOTE:
C8 - 3 CONDUCTOR SHIELDED CABLE WITH DRAIN WIRE.

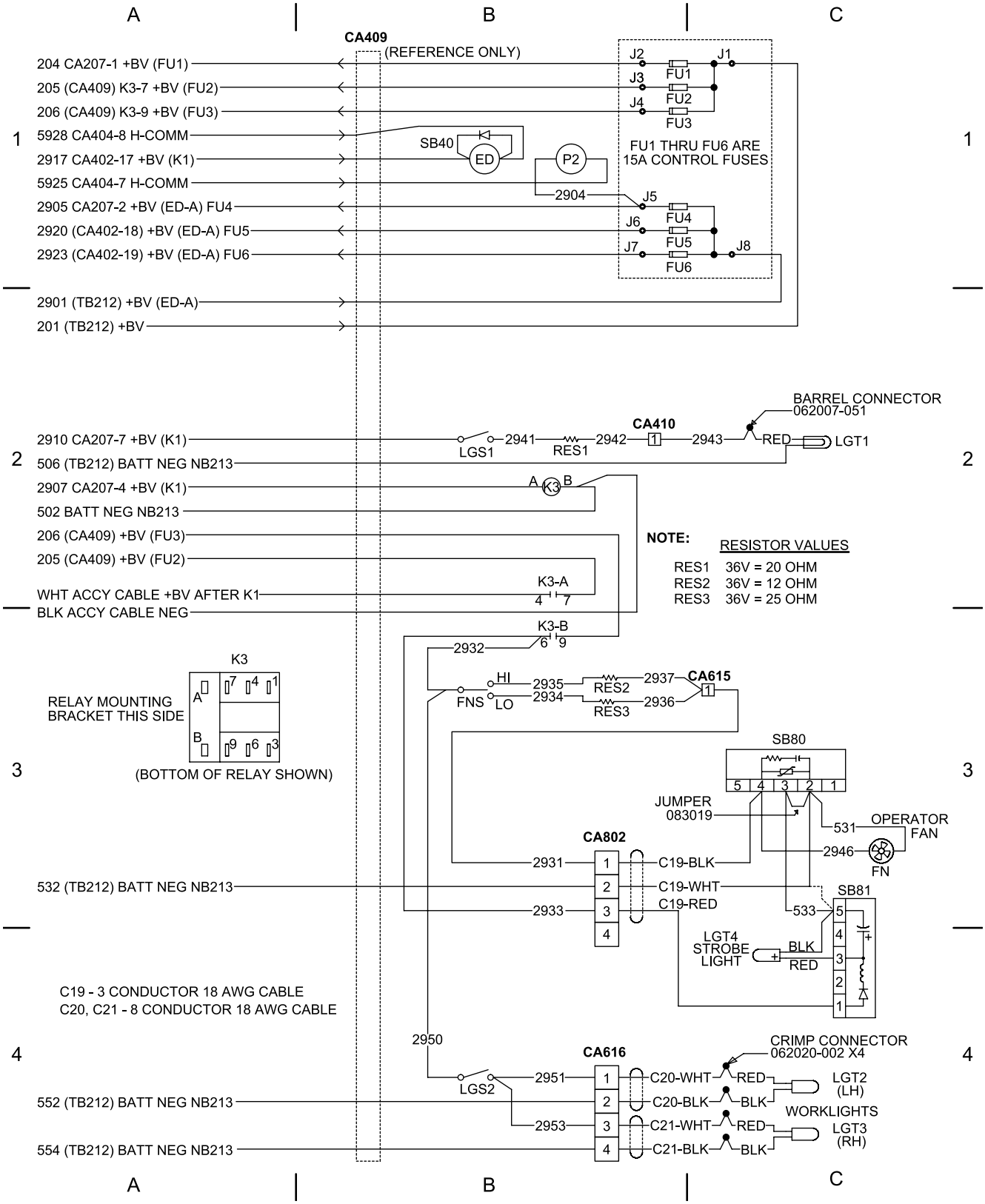
129338 D sh 1



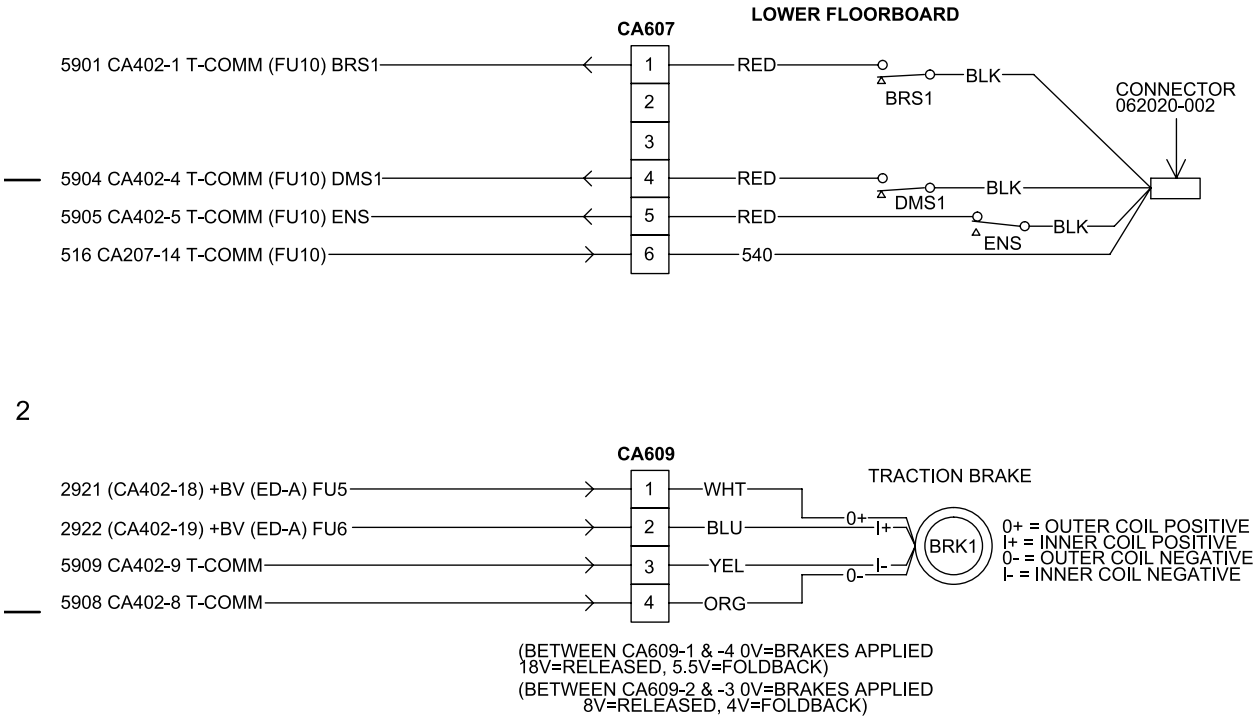
129338 D sh 2



129341 A sh 1



129341 A sh 2



NOTES:

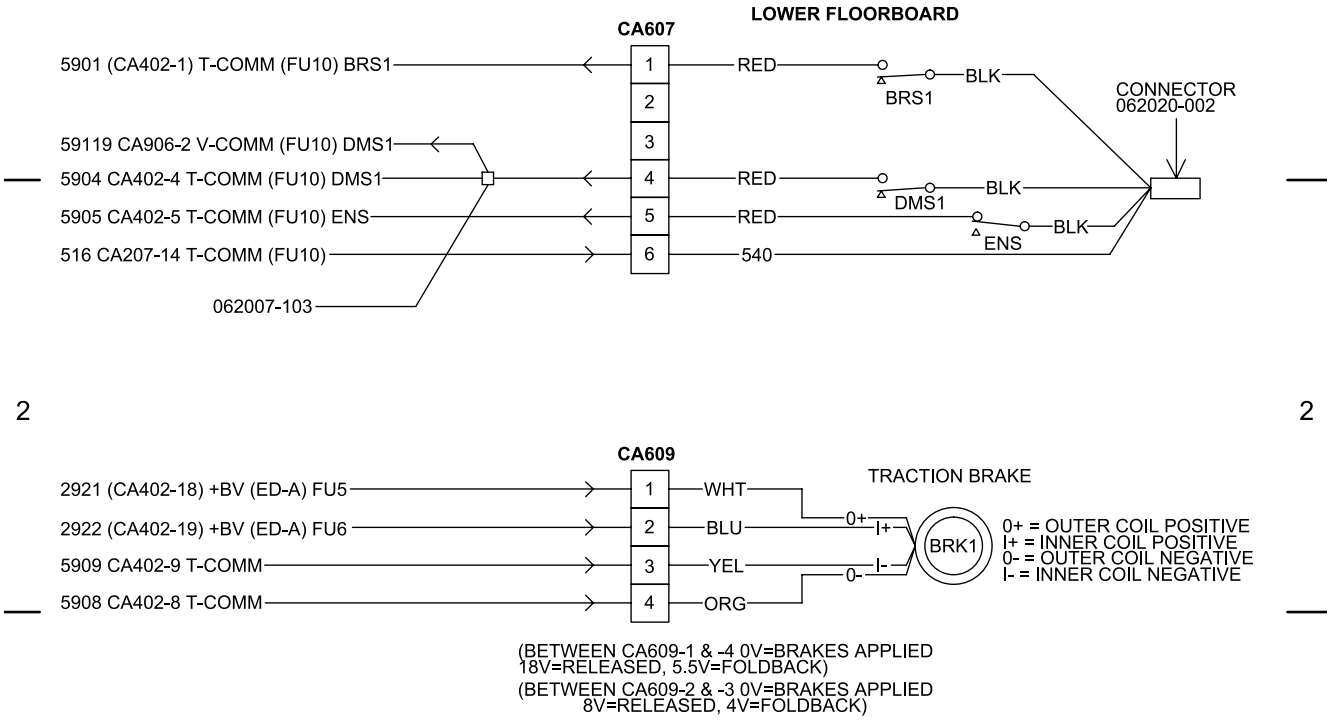
BRS1 & DMS1 ARE BOTH WIRED NORMALLY CLOSED - HELD OPEN.

ENS IS WIRED NORMALLY CLOSED AND IS NOT ACTUATED UNTIL THE ENTRY BAR PEDAL IS DEPRESSED.

ALL SWITCHES SHOWN WITH NO OPERATOR ON PEDALS.

A LOGIC ZERO (T-COMM) RELEASES BRAKES.

129339 B sh 1



NOTES:

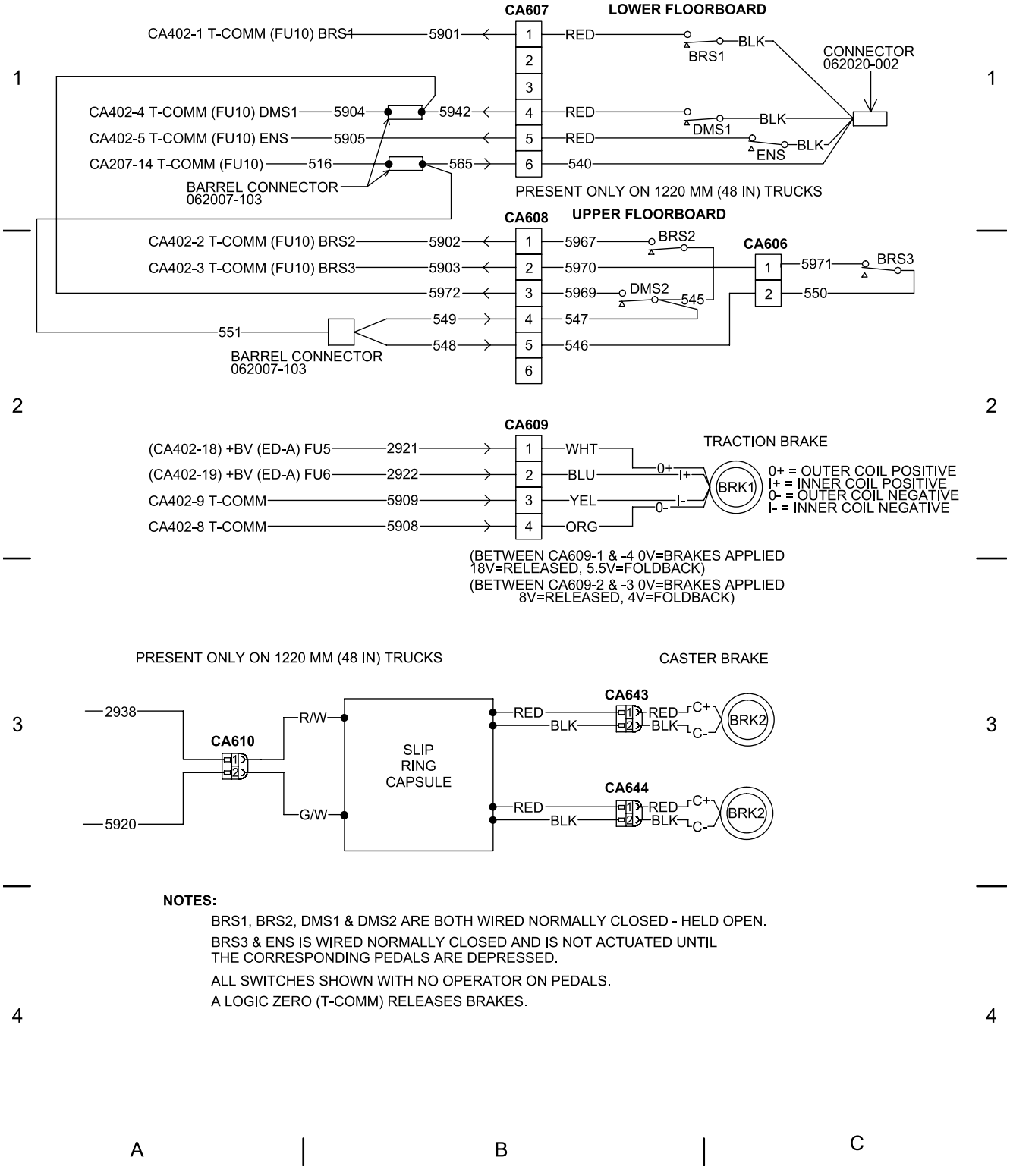
BRS1 & DMS1 ARE BOTH WIRED NORMALLY CLOSED - HELD OPEN.

ENS IS WIRED NORMALLY CLOSED AND IS NOT ACTUATED UNTIL THE ENTRY BAR PEDAL IS DEPRESSED.

ALL SWITCHES SHOWN WITH NO OPERATOR ON PEDALS.

A LOGIC ZERO (T-COMM) RELEASES BRAKES.

129339 B sh 2



NOTES:

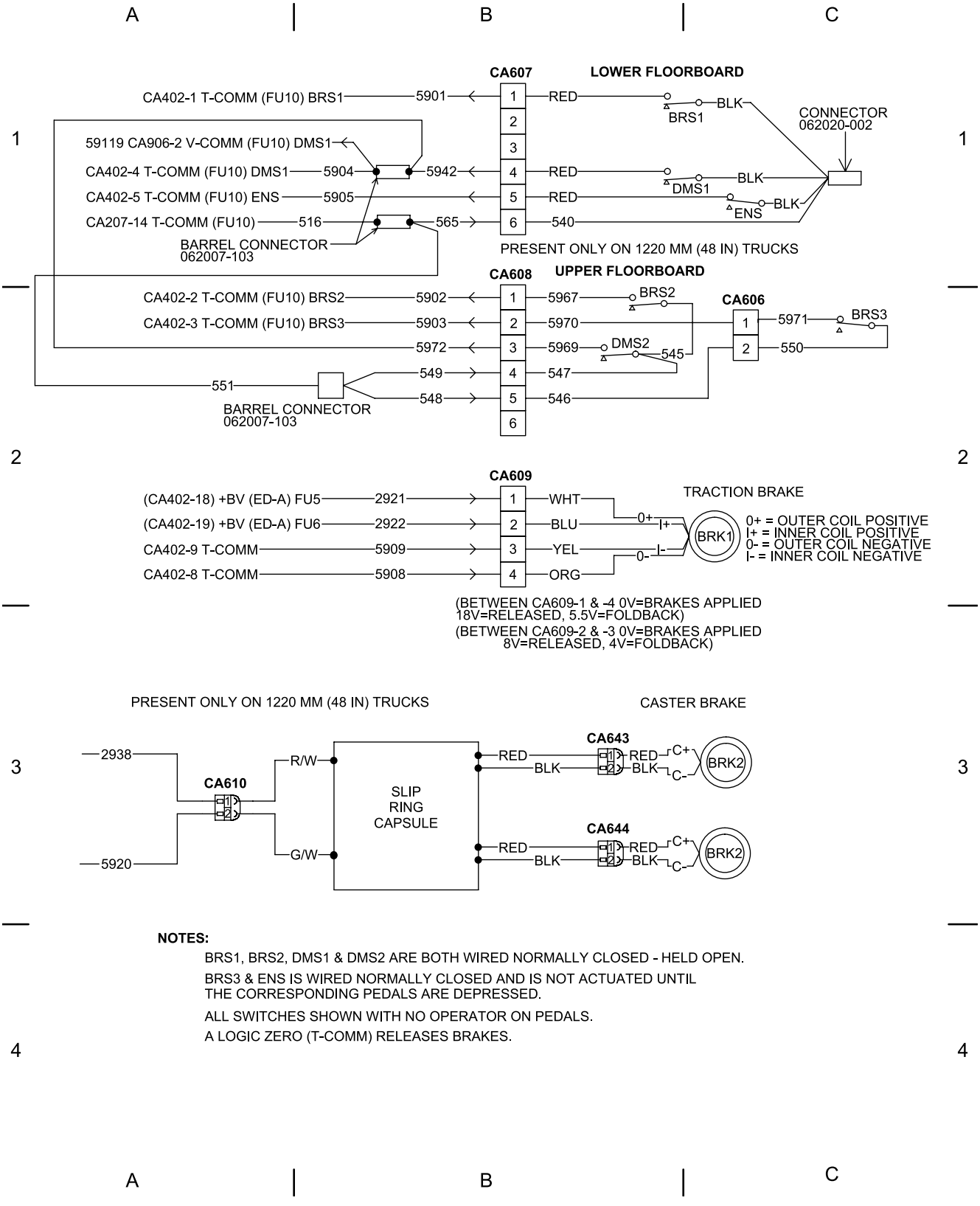
BRS1, BRS2, DMS1 & DMS2 ARE BOTH WIRED NORMALLY CLOSED - HELD OPEN.

BRS3 & ENS IS WIRED NORMALLY CLOSED AND IS NOT ACTUATED UNTIL THE CORRESPONDING PEDALS ARE DEPRESSED.

ALL SWITCHES SHOWN WITH NO OPERATOR ON PEDALS.

A LOGIC ZERO (T-COMM) RELEASES BRAKES.

129339 B sh 3



NOTES:

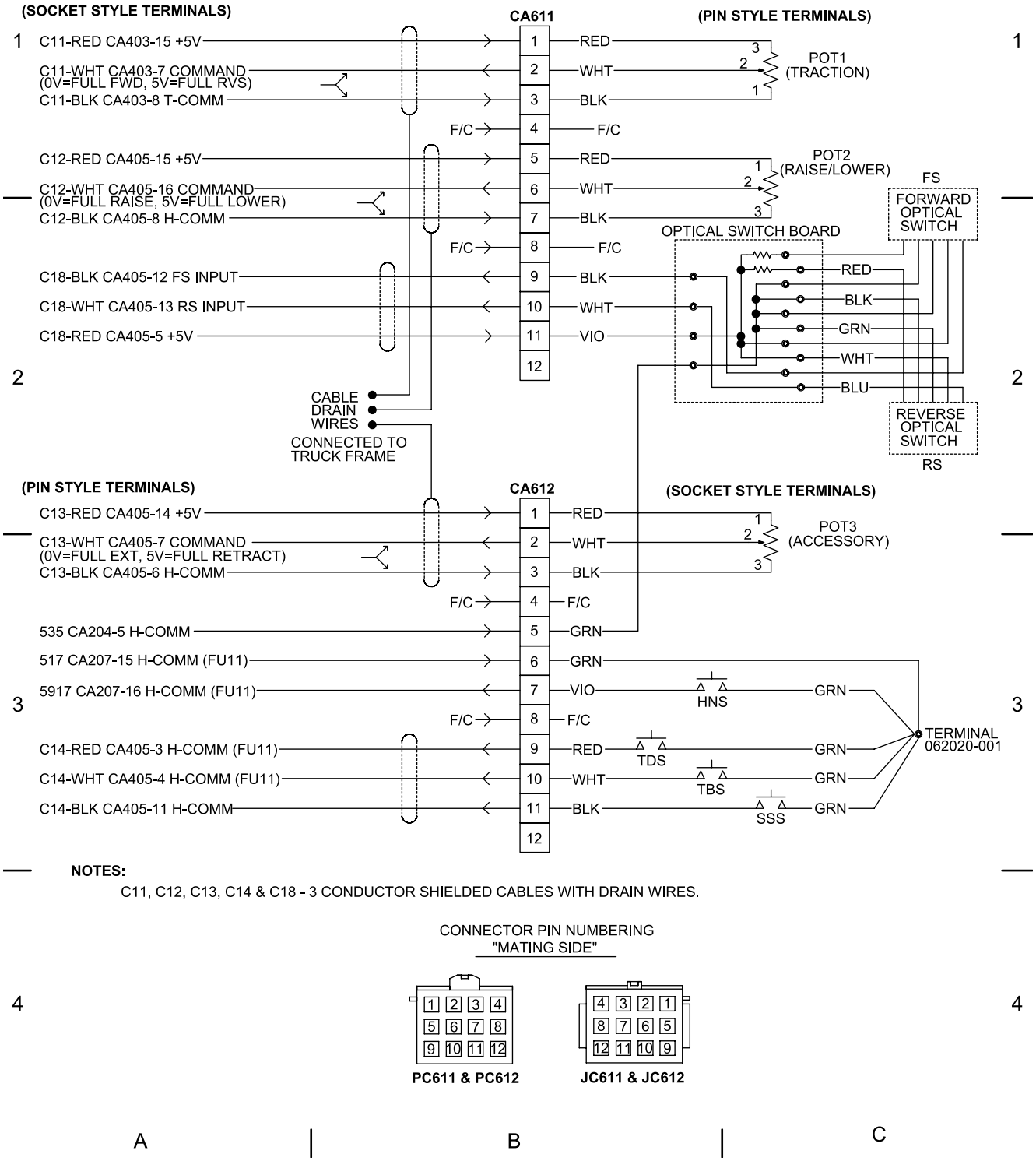
BRS1, BRS2, DMS1 & DMS2 ARE BOTH WIRED NORMALLY CLOSED - HELD OPEN.

BRS3 & ENS IS WIRED NORMALLY CLOSED AND IS NOT ACTUATED UNTIL THE CORRESPONDING PEDALS ARE DEPRESSED.

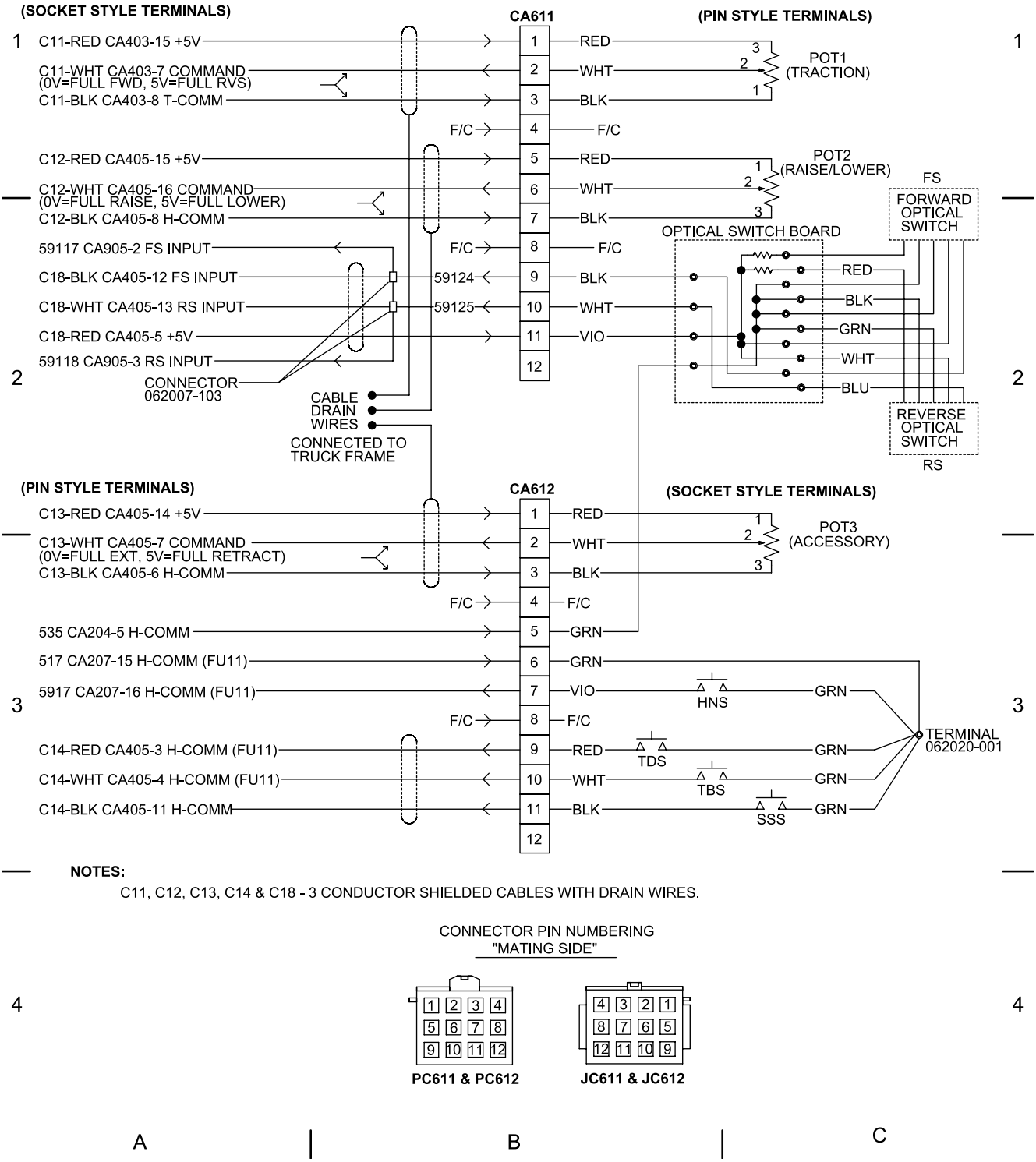
ALL SWITCHES SHOWN WITH NO OPERATOR ON PEDALS.

A LOGIC ZERO (T-COMM) RELEASES BRAKES.

129339 B sh 4



129340 B sh 1



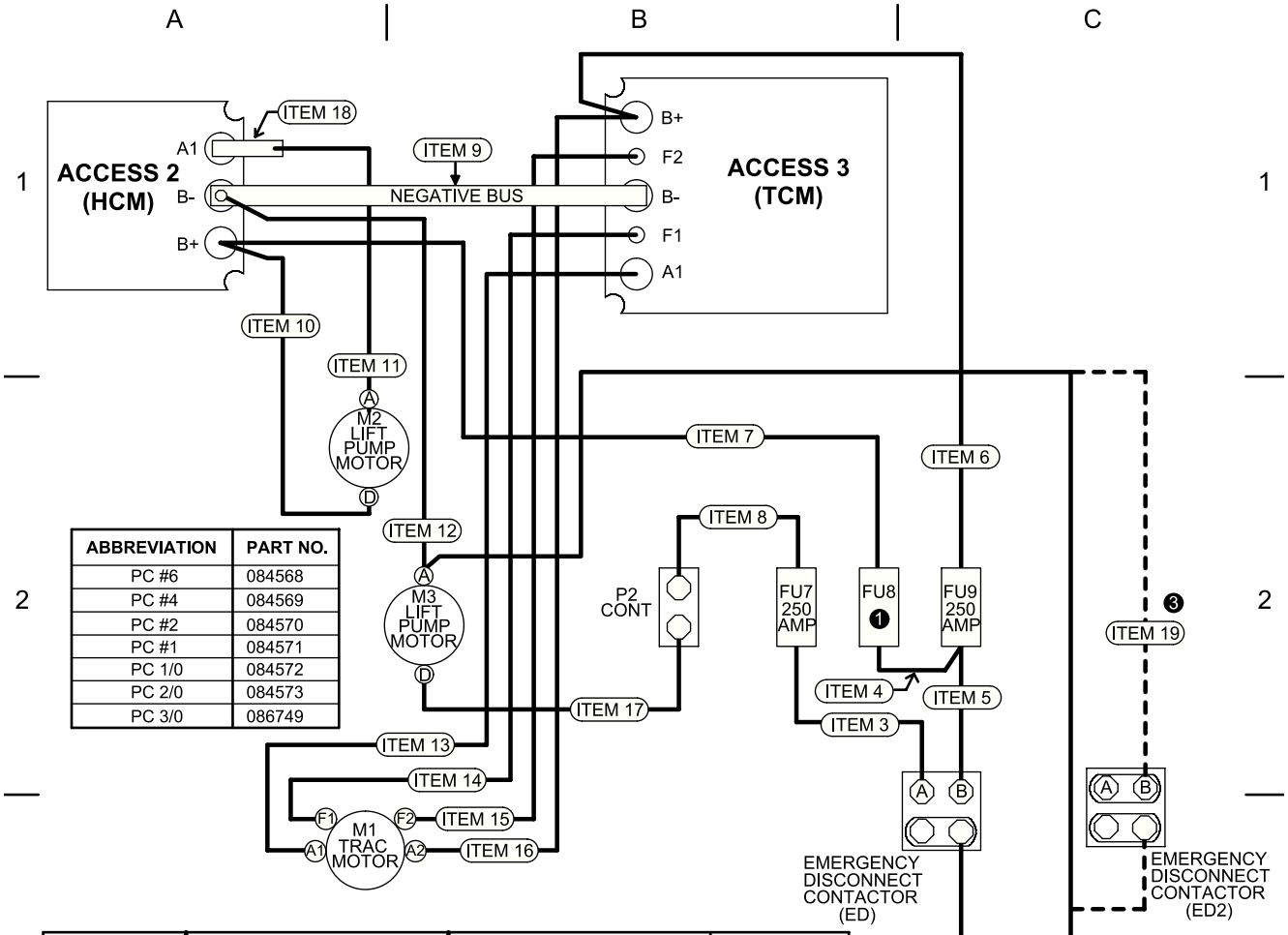
NOTES:

C11, C12, C13, C14 & C18 - 3 CONDUCTOR SHIELDED CABLES WITH DRAIN WIRES.

CONNECTOR PIN NUMBERING
"MATING SIDE"

PC611 & PC612 JC611 & JC612

129340 B sh 2



ABBREVIATION	PART NO.
PC #6	084568
PC #4	084569
PC #2	084570
PC #1	084571
PC 1/0	084572
PC 2/0	084573
PC 3/0	086749

		ANSII		EUROPEAN		TRUCK VOLTAGE
ITEM	CABLE NO.	1 LIFT PUMP	2 LIFT PUMPS	1 LIFT PUMP	2 LIFT PUMPS	
1	PC 2/0-183	X	X			24/36V
	PC 2/0-190			X	X	24/36V
2	PC 2/0-182		X			36V
	PC 2/0-188	X				24V
	PC 2/0-190			X	X	24/36V
3	123086	X	X	X	X	36V
4	123083	X	X	X	X	24/36V
5	123088	X	X	X	X	24/36V
6	PC 1/0-218	X	X	X	X	24/36V
7	PC 1/0-217	X	X	X	X	24/36V
8	123087		X		X	36V
9	123287	X	X	X	X	24/36V
10	PC 1/0-215	X	X	X	X	24/36V
11	PC 1/0-216	X	X	X	X	24/36V
12	PC 1/0-220		X		X	36V
13	PC 1/0-213	X	X	X	X	24/36V
14	PC #6-041	X	X	X	X	24/36V
15	PC #6-042	X	X	X	X	24/36V
16	PC 1/0-214	X	X	X	X	24/36V
17	PC 1/0-219		X		X	36V
18	123893	X	X	X	X	24/36V
19	PC 2/0-192	X		X		24V
	PC 2/0-193				X	36V

"X" IN THE COLUMN INDICATES THAT THE CABLE IS REQUIRED FOR THAT TRUCK.

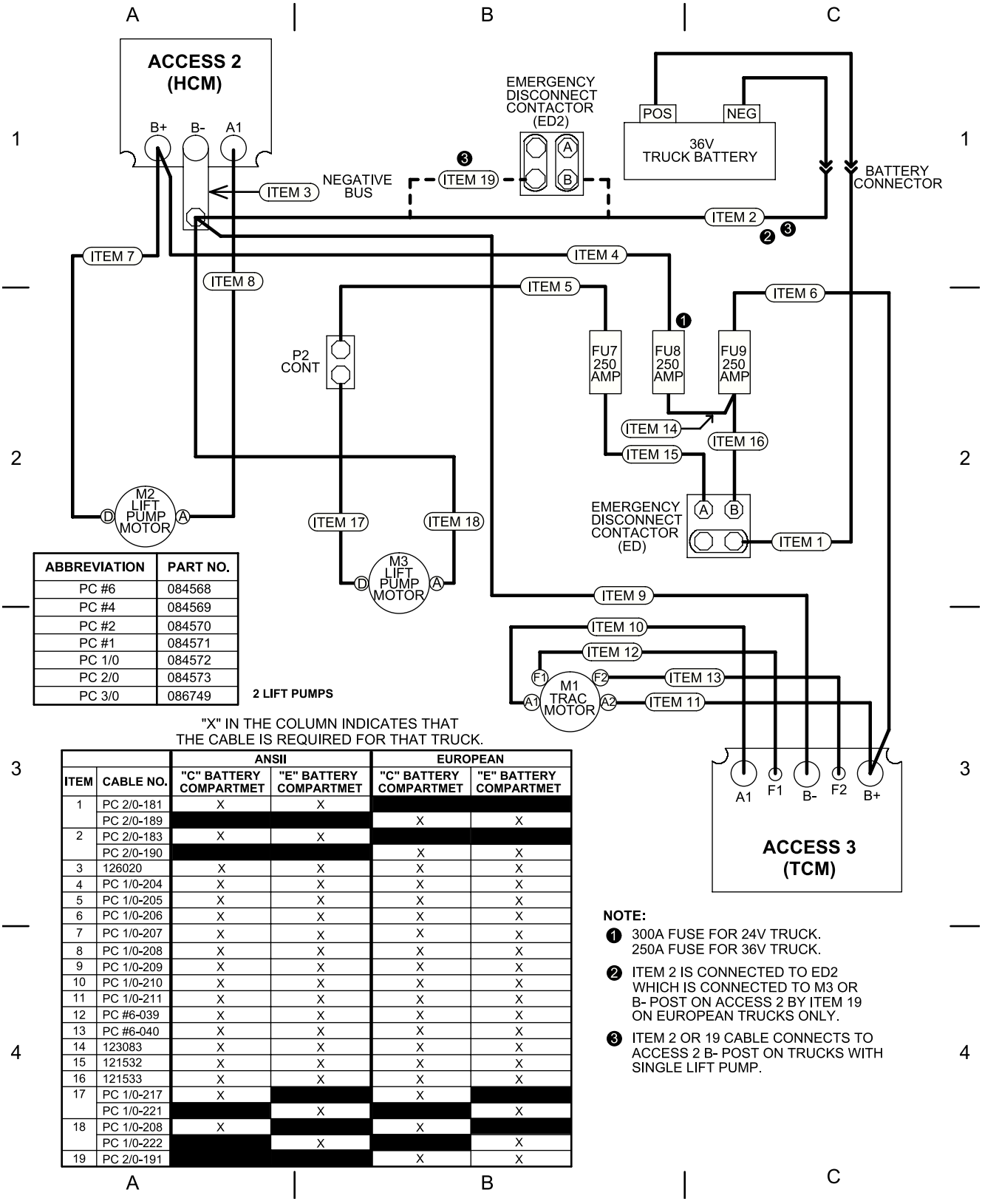
NOTE:

❶ 300A FUSE FOR 24V TRUCK.
250A FUSE FOR 36V TRUCK.

❷ ITEM 2 IS CONNECTED TO ED2 WHICH IS CONNECTED TO M3 OR B- POST ON ACCESS 2 BY ITEM 19 ON EUROPEAN TRUCKS ONLY.

❸ ITEM 2 OR 19 CABLE CONNECTS TO ACCESS 2 B- POST ON TRUCKS WITH SINGLE LIFT PUMP.

129342 B sh 1



ABBREVIATION	PART NO.
PC #6	084568
PC #4	084569
PC #2	084570
PC #1	084571
PC 1/0	084572
PC 2/0	084573
PC 3/0	086749

2 LIFT PUMPS

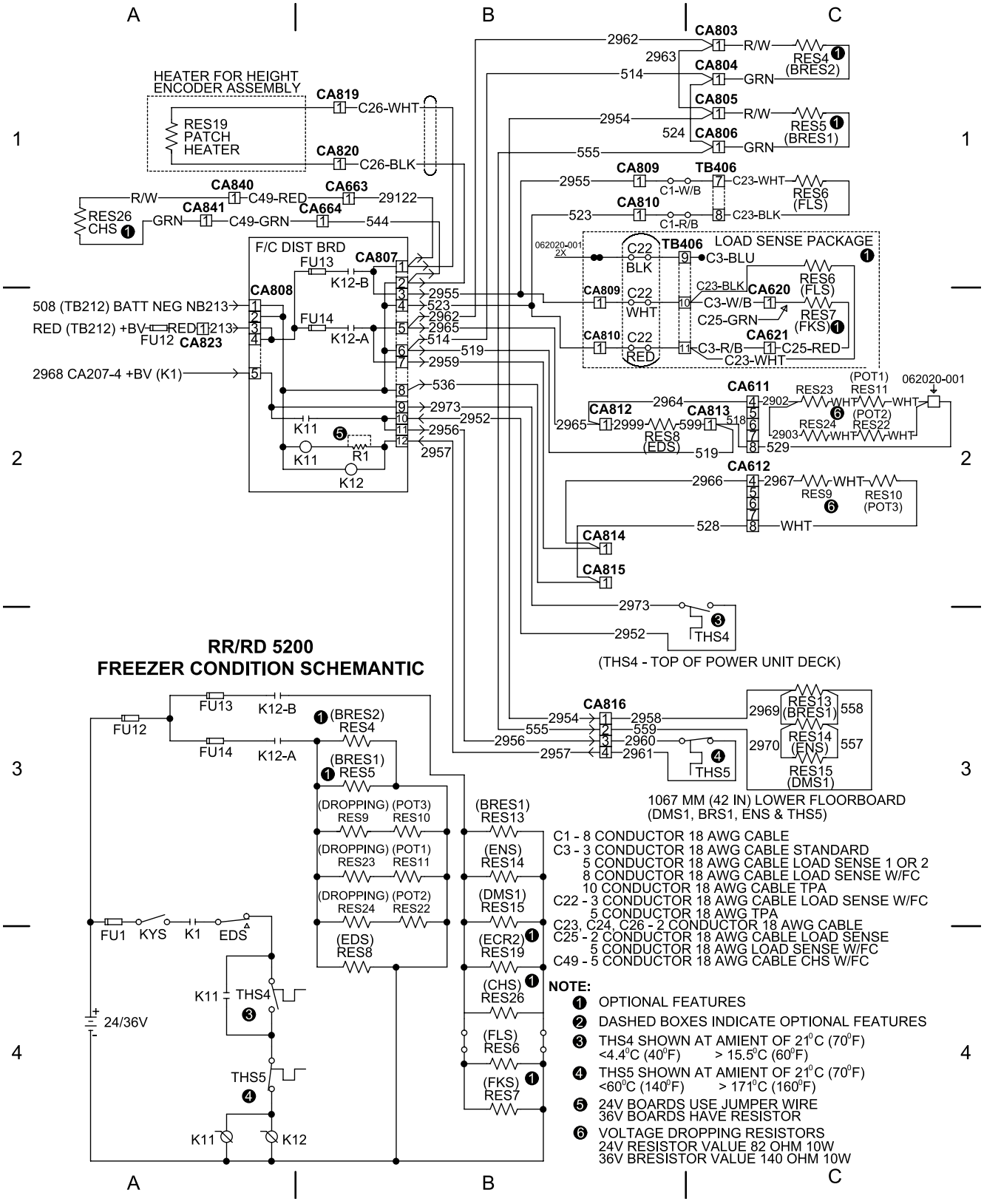
"X" IN THE COLUMN INDICATES THAT THE CABLE IS REQUIRED FOR THAT TRUCK.

		ANSII		EUROPEAN	
ITEM	CABLE NO.	"C" BATTERY COMPARTMET	"E" BATTERY COMPARTMET	"C" BATTERY COMPARTMET	"E" BATTERY COMPARTMET
1	PC 2/0-181	X	X		
	PC 2/0-189			X	X
2	PC 2/0-183	X	X		
	PC 2/0-190			X	X
3	126020	X	X	X	X
4	PC 1/0-204	X	X	X	X
5	PC 1/0-205	X	X	X	X
6	PC 1/0-206	X	X	X	X
7	PC 1/0-207	X	X	X	X
8	PC 1/0-208	X	X	X	X
9	PC 1/0-209	X	X	X	X
10	PC 1/0-210	X	X	X	X
11	PC 1/0-211	X	X	X	X
12	PC #6-039	X	X	X	X
13	PC #6-040	X	X	X	X
14	123083	X	X	X	X
15	121532	X	X	X	X
16	121533	X	X	X	X
17	PC 1/0-217	X		X	
	PC 1/0-221		X		X
18	PC 1/0-208	X		X	
	PC 1/0-222		X		X
19	PC 2/0-191			X	X

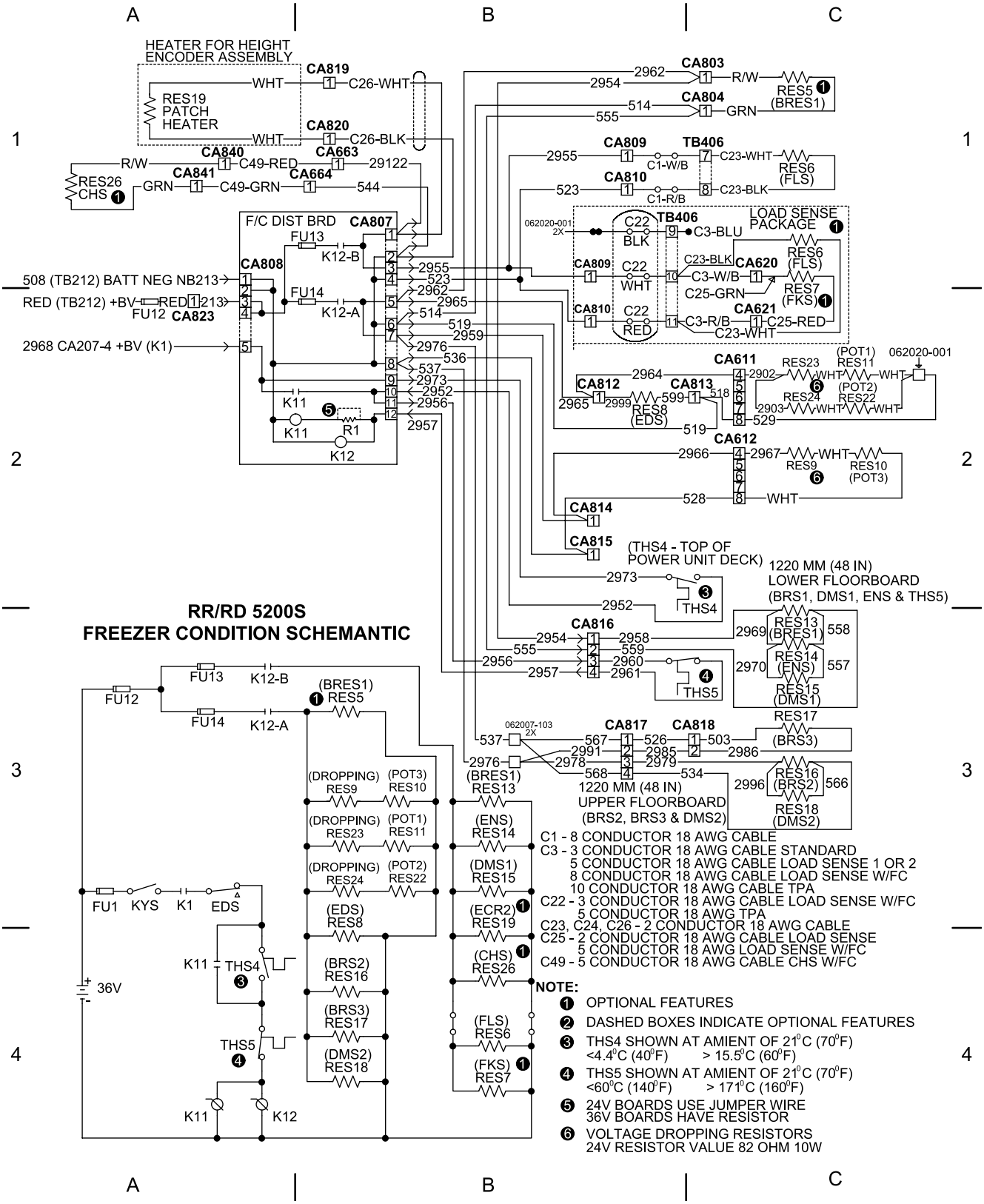
NOTE:

1. 300A FUSE FOR 24V TRUCK. 250A FUSE FOR 36V TRUCK.
2. ITEM 2 IS CONNECTED TO ED2 WHICH IS CONNECTED TO M3 OR B- POST ON ACCESS 2 BY ITEM 19 ON EUROPEAN TRUCKS ONLY.
3. ITEM 2 OR 19 CABLE CONNECTS TO ACCESS 2 B- POST ON TRUCKS WITH SINGLE LIFT PUMP.

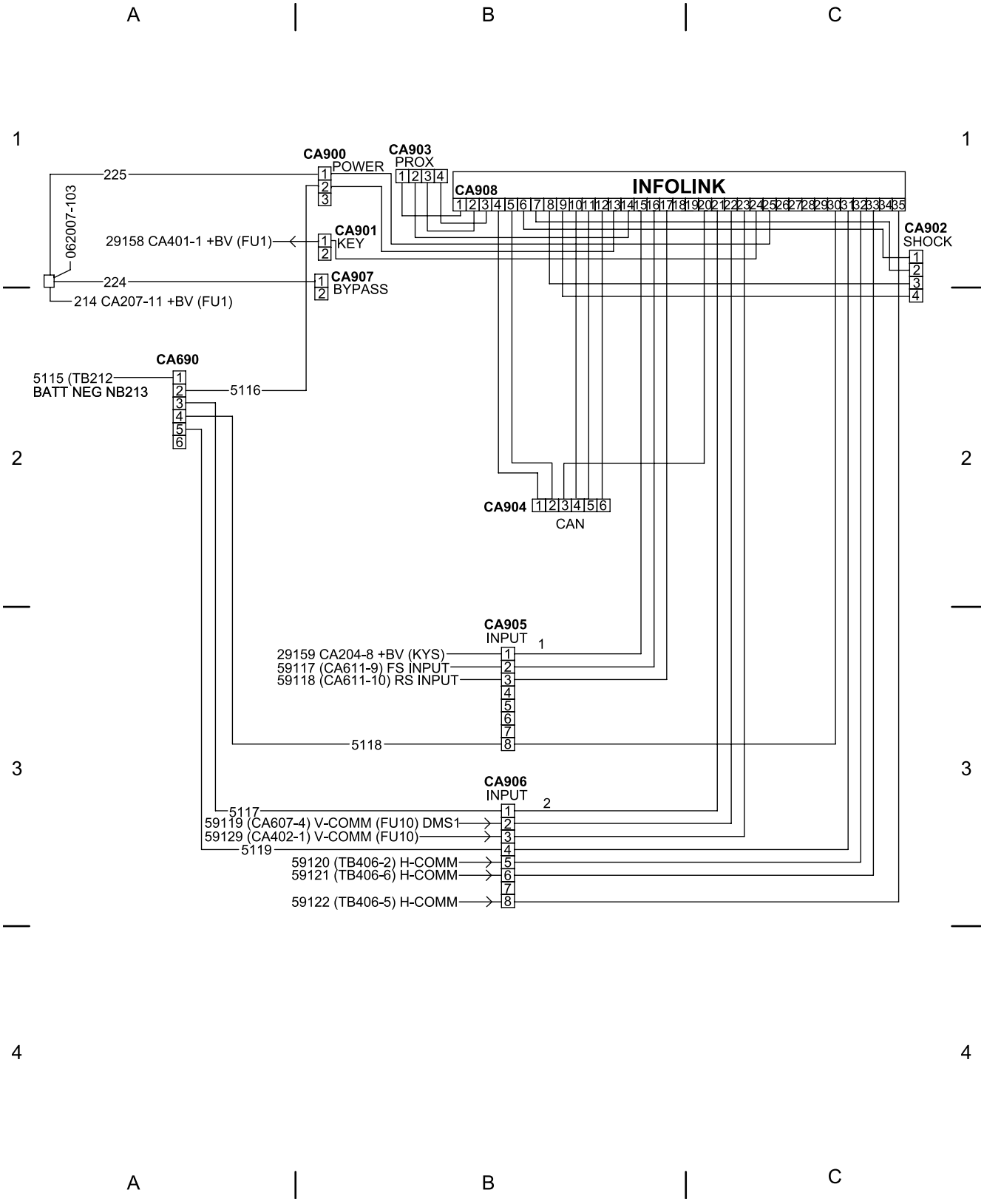
129342 B sh 2



129343 C sh1



129343 C sh 2



129338 D sh 3

Wire Harness Chart	
Harness No.	Components Connected By:
087245-062	RR/RD 5200/5200S, Positive/Negative Cable
121857	RR/RD 5200/5200S, Enhanced Display, PC408, PC605
122176-001	RR/RD 5200/5200S, Tilt/Sideshift Cable, JC624, PC625, PC626
122176-002	RR/RD 5200/5200S, Tilt/Sideshift Cable, JC624, PC625, PC626
123311	RR/RD 5200, Contactor Panel, JC409
123313	RR/RD 5200, Fan & Lights JC615, PC616, PC802
123314-002	RR/RD 5200/5200S, Override Switch PC202
123343	RR/RD 5200/5200S, Keyless Key Switch JC401
123967	RR/RD 5200/5200S, Fan And/Or Strobe Option JC802
123971	RR/RD 5200, Motor Sensors, PC201
123972	RR/RD 5200, Battery Restraint PC203
123973	RR/RD 5200S, Battery Restraint, PC203
123974	RR/RD 5200S, Motor Sensors, PC201
123975	RR/RD 5200S, Fan & Lights JC615, PC616, PC802
123976	RR/RD 5200/5200S, Travel Alarm, PC205
124000-001	RR/RD 5200/5200S, Tilt/Sideshift/Load Sense, JC624, PC617, PC618, PC625, PC626
124000-002	RR/RD 5200/5200S, Tilt/Sideshift/Load Sense, JC624, PC617, PC618, PC625, PC626
124001-001	RR/RD 5200/5200S, Tilt/Sideshift/Load Sense With Freezer Condition, JC624, PC617, PC618, PC620, PC621, PC625, PC626
124001-002	RR/RD 5200/5200S, Tilt/Sideshift/Load Sense With Freezer Condition, JC624, PC617, PC618, PC620, PC621, PC625, PC626
124002-001	RR/RD 5200/5200S, 24V, Fork Tilt Switch, FKS With Freezer Condition, JC617, JC619, JC620, JC621,
124002-002	RR/RD 5200/5200S, 36V, Fork Tilt Switch, FKS With Freezer Condition, JC617, JC619, JC620, JC621,
125275	RR/RD 5200/5200S, Load sense II, PC210
125793	RR/RD 5200S, Upper Floorboard, JC606
125815	RR/RD 5200S, Upper Floorboard Freezer Condition, JC606, JC818. RES17
126222	RR/RD 5200, EEC Control Panel
126224	RR/RD 5200S, EEC Control Panel
127690	RR/RD 5200, 36V, Internal Fans, JC824
127716	RR/RD 5200/5200S, Floorboard, JC607

Wire Harness Chart	
127748	RR/RD 5200, Main Wire Harness With Freezer Condition, PC803, PC804, PC805, PC806, PC807, PC808, PC809, PC810, PC812, PC813, PC814, PC815
127749-001	RR/RD 5200/5200S, 36V, Floorboard Freezer Condition, JC816
127749-002	RR/RD 5200/5200S, 24V, Floorboard Freezer Condition, JC816
128232	RR/RD 5200S, Main Freezer Condition Wire Harness, PC803, PC804, PC807, PC808, PC809, PC810, PC812, PC813, PC814, PC815, PC816, PC817
128296	RR/RD 5200S, Internal Fans, JC824
128896	RR/RD 5200, 24V, Internal Fans JC824
128943	RR/RD 5200 Main Truck Wire Harness, JC601, JC655, PC204, PC206, PC207, PC208, PC211, PC215, PC401, PC402, PC403, PC404, PC405, PC407, PC409, PC410, PC602, OC603, PC604, PC607, PC609, PC611, PC612, PC645, PC646, PC656, PC824
129253	RR/RD 5200S Main Truck Wire Harness, JC601, JC610, JC655, PC204, PC206, PC207, PC208, PC211, PC215, PC401, PC402, PC403, PC404, PC405, PC407, PC602, PC604, PC607, PC608, PC609, PC611, PC612, PC640, PC645, PC646, PC656, PC824
129324-001	RR/RD 5200/5200S, Tilt/Sideshift/Load Sense, Tilt Position Assist With Freezer Condition, JC624, JC648,JC649,PC617, PC618, PC620, PC621, PC625, PC626, PC647
129324-002	RR/RD 5200/5200S, Tilt/Sideshift/Load Sense, Tilt Position Assist With Freezer Condition, JC624, JC648,JC649,PC617, PC618, PC620, PC621, PC625, PC626, PC647
138939	RR/RD 5200, Heat Exchanger Harness (Optional), JC415
145133	RR/RD 5200S, ThermoAssist Power Supply Harness (Optional), JC422

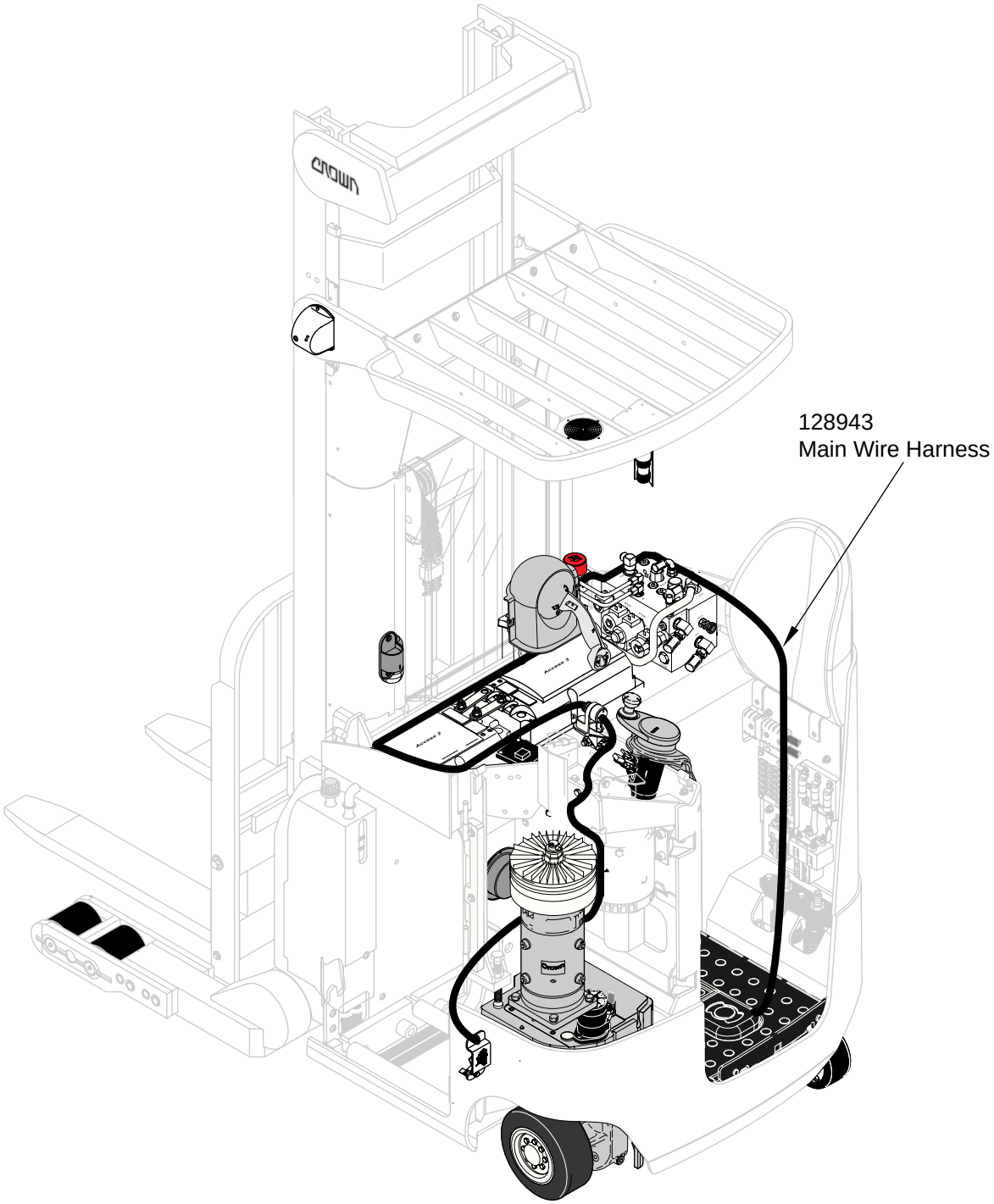


Figure 8815-01

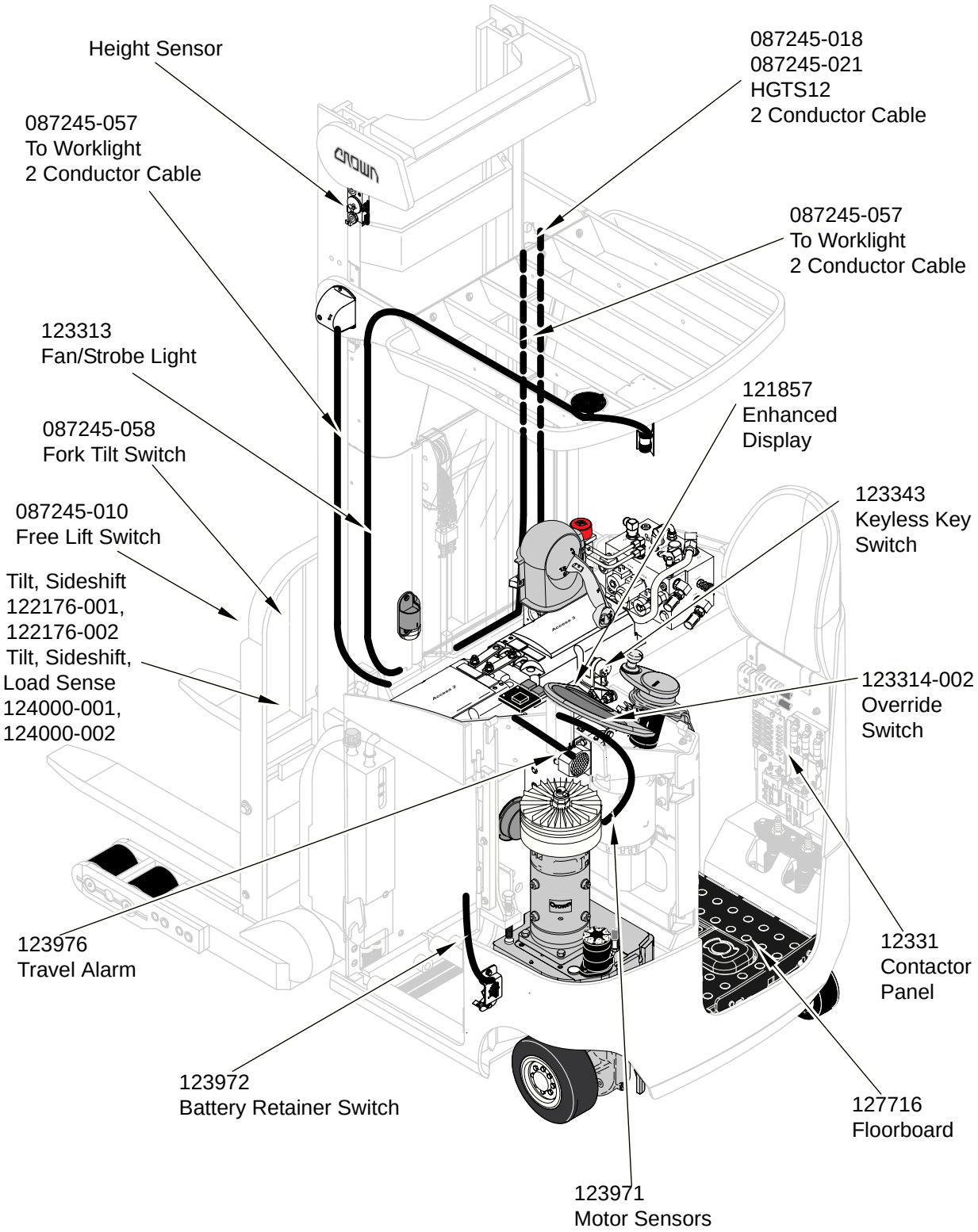


Figure 8816-01

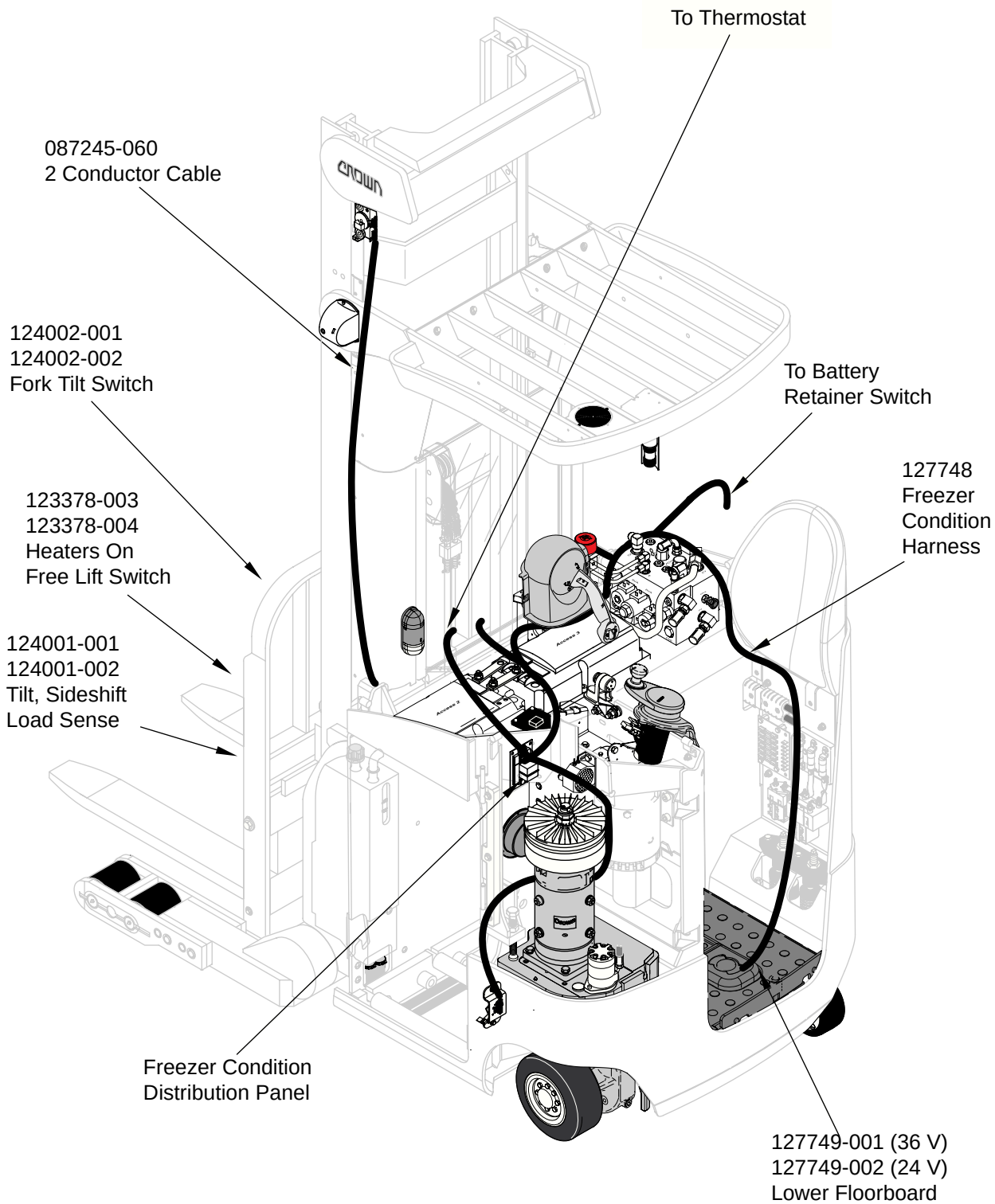


Figure 8817-01

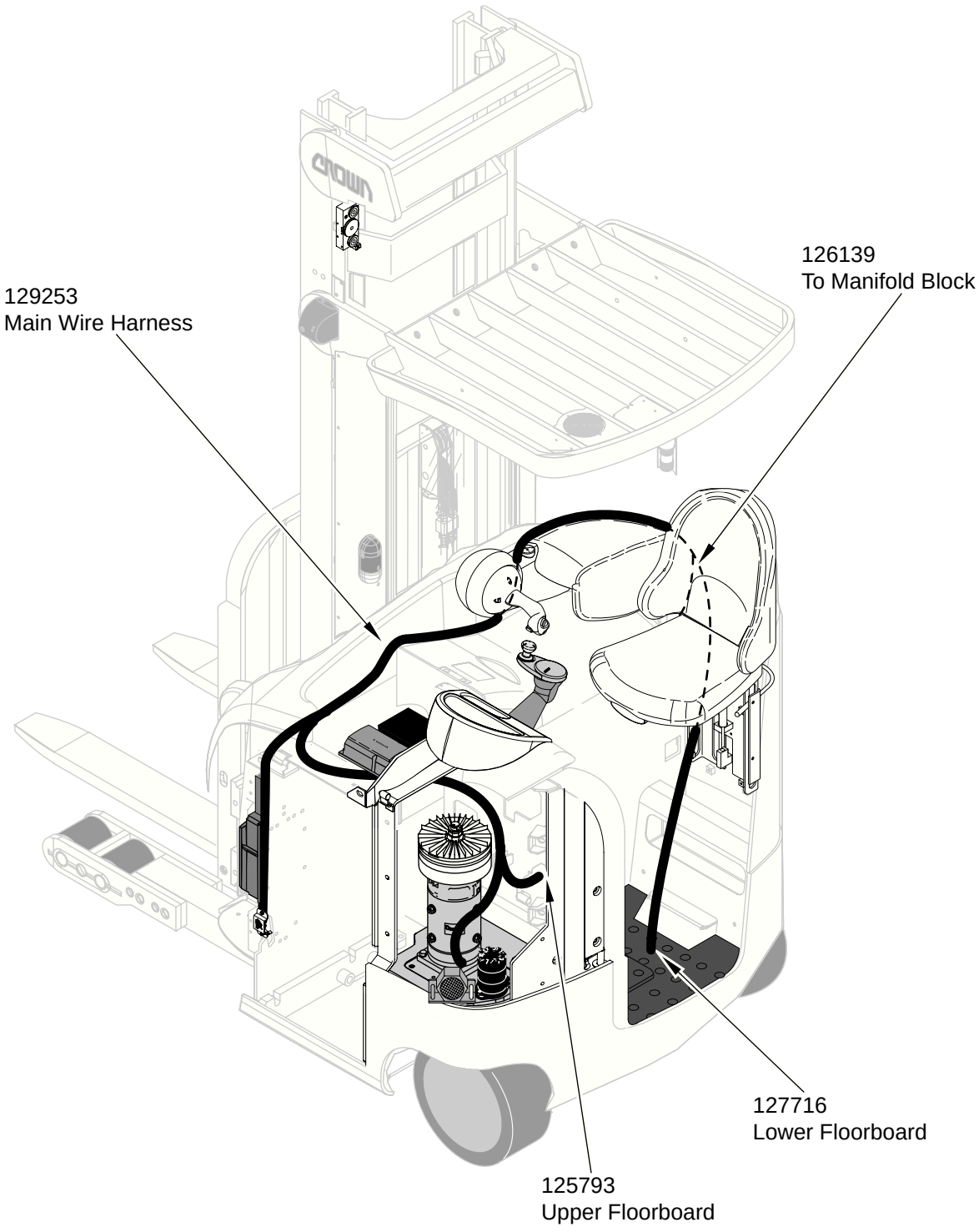


Figure 8818-01

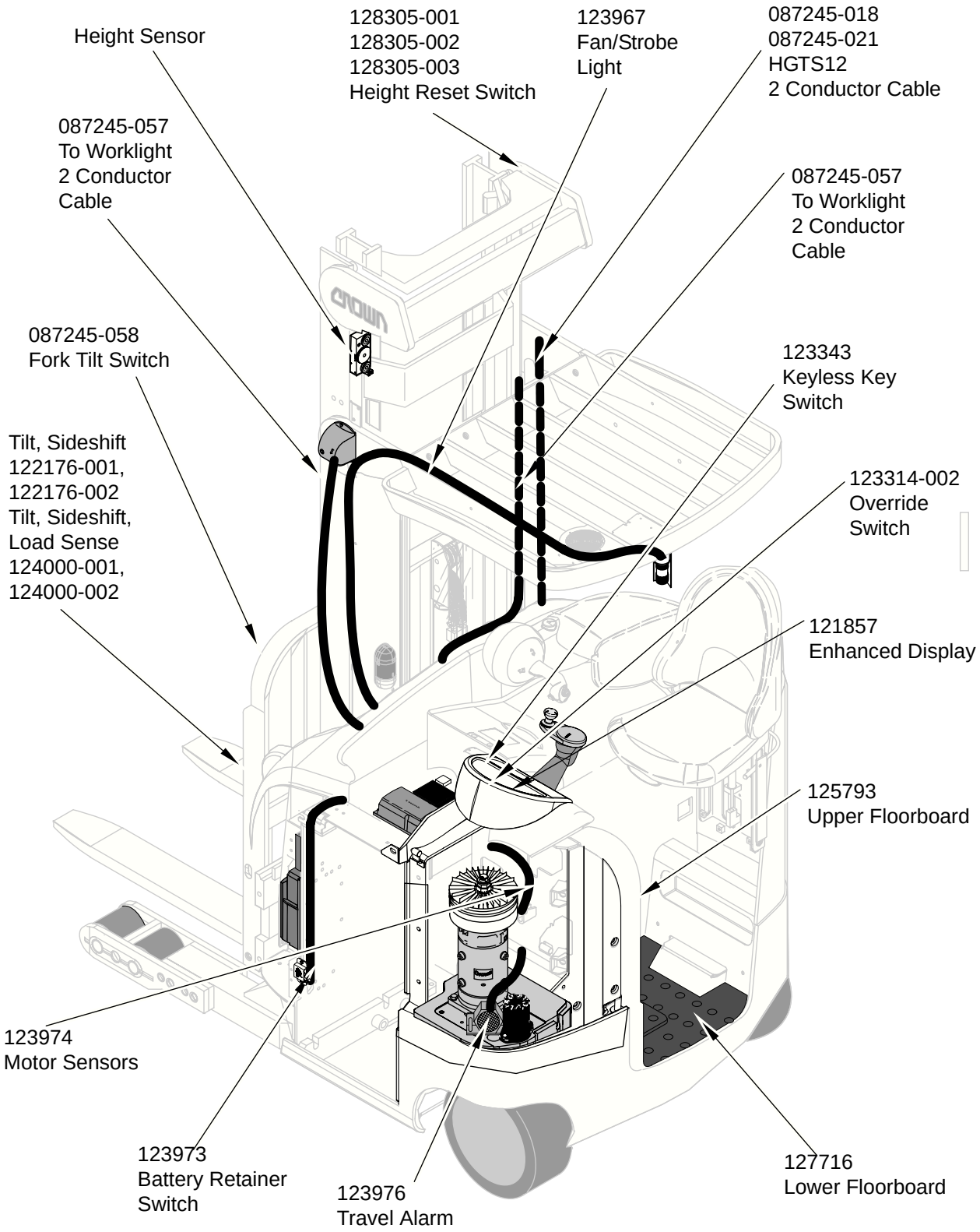


Figure 8819-01

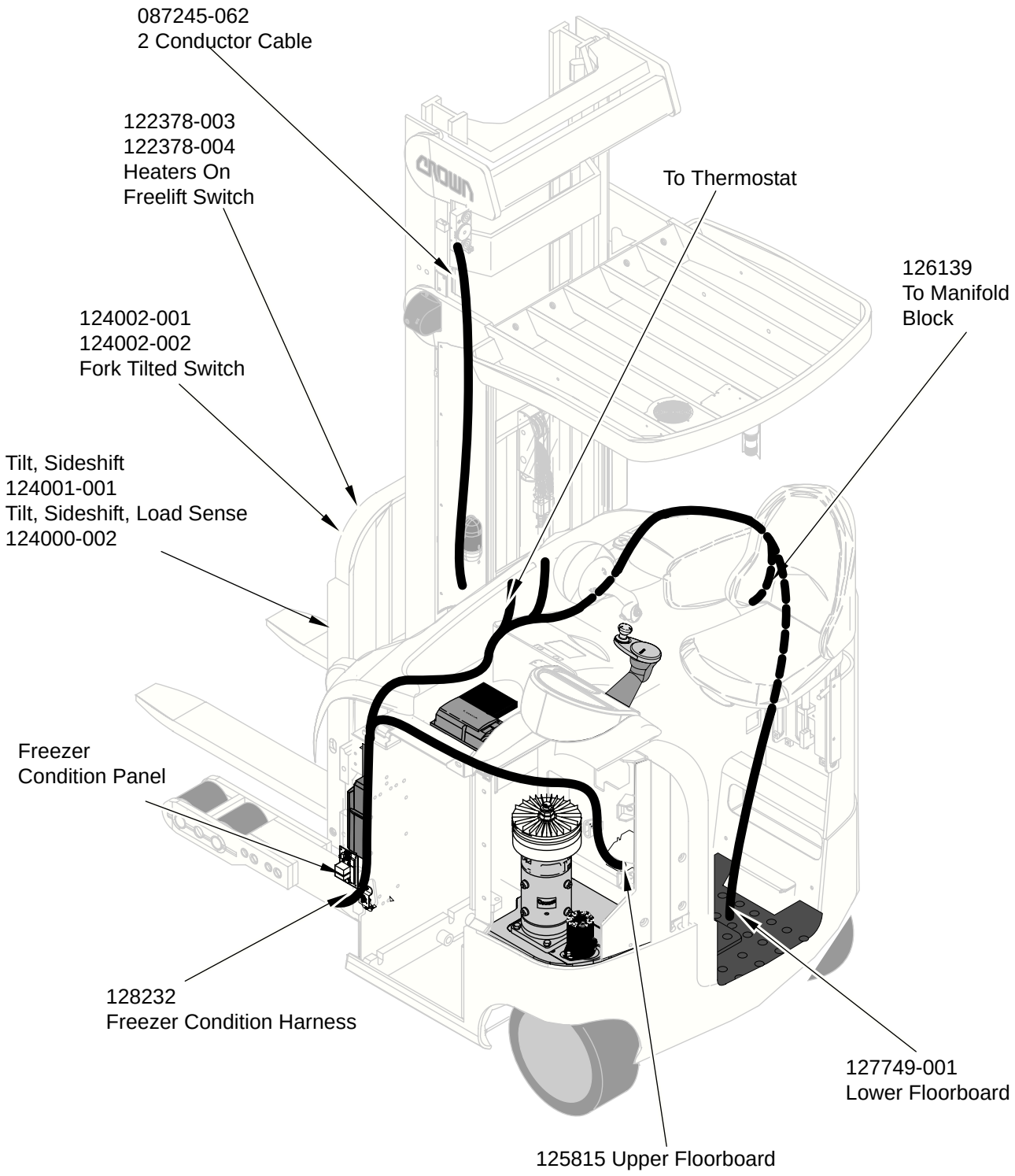


Figure 8820-01

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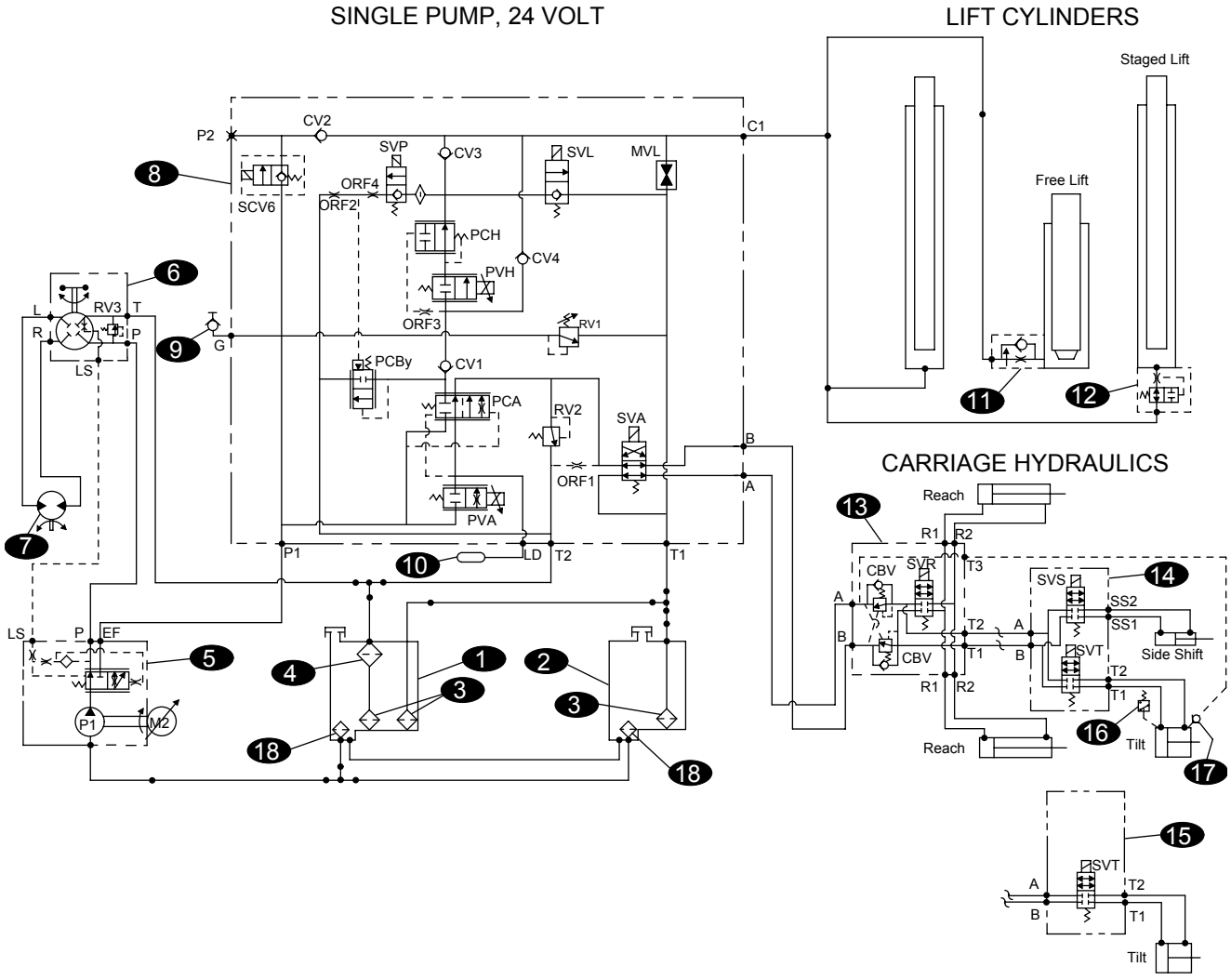
8728-01

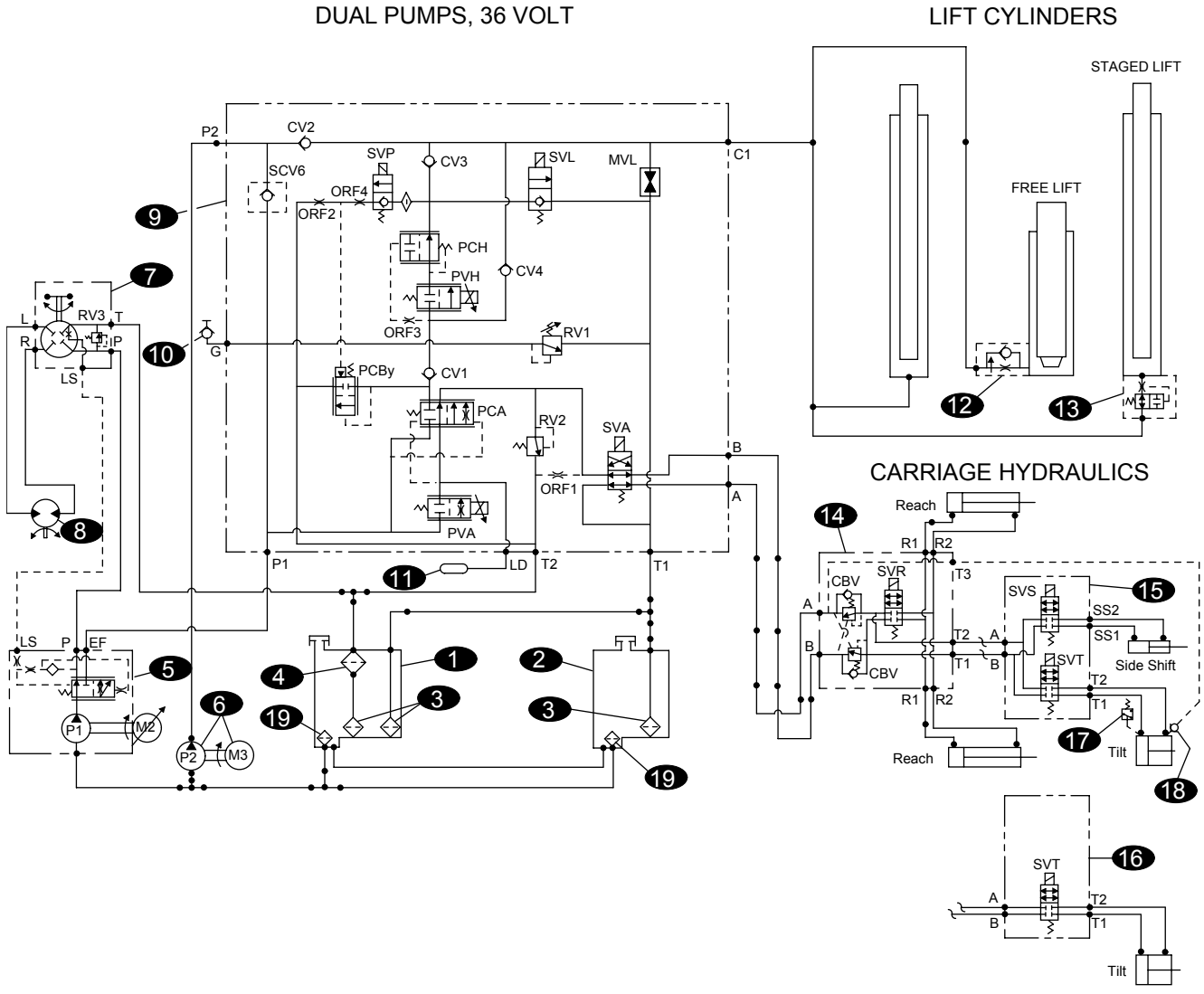
RR/RD MODEL 5210



1. Reservoir Right Hand
2. Reservoir Left Hand
3. Diffuser
4. Return Filter 10 Micron
5. Hydraulic Pump P1, and Motor M2
6. Steer Unit Control
7. Steering Hydraulic Motor
8. Manifold Assembly Contains - CV1,CV2, CV3, CV4, MVL, PC1, PC2, PCA, PCBy, PCH, PVA, PVH, RV1, RV2, SCV6, SVA, SVL, & SVP
9. Quick Disconnect Test Point
10. Hydraulic Expansion Chamber
11. Flow Control
12. Velocity Fuse
13. Reach Manifold - Contains CBV & SVR
14. Tilt/Side Shift Manifold - Contains SVS & SVT
15. Tilt Manifold - Contains SVT
16. Pressure Switch HSS/Pressure Transducer LS
17. Check Valve CV (Used with Pressure Switch/Pressure Transducer)
18. Strainer

8729-01

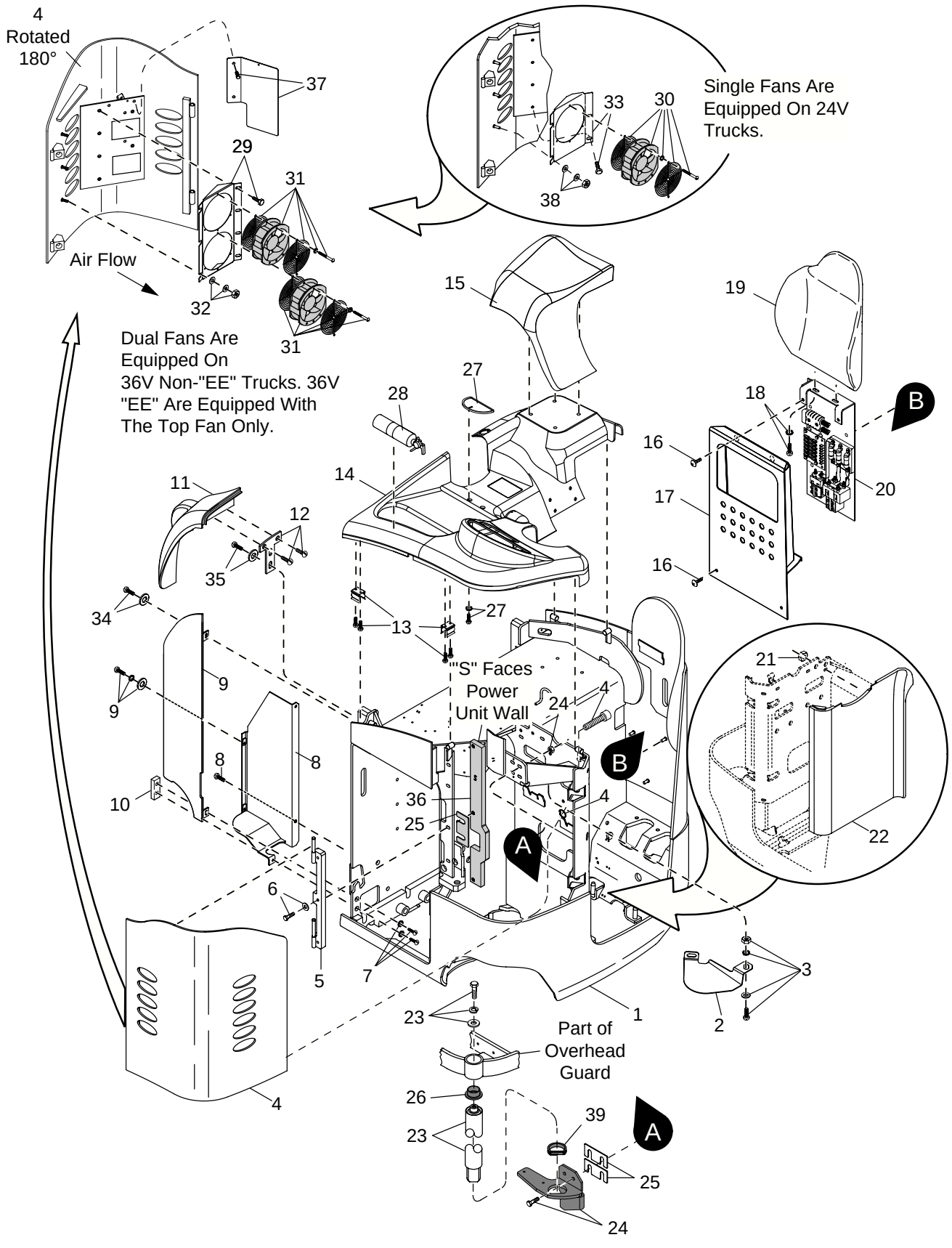
RR/RD MODEL 5220
RR/RD 5200 (AC)



1. Reservoir Right Hand
2. Reservoir Left Hand
3. Diffuser
4. Return Filter 10 Micron
5. Hydraulic Pump P1, and Motor M2
6. Hydraulic Pump P2, and Motor M3
7. Steer Unit Control
8. Steering Hydraulic Motor
9. Manifold Assembly Contains - CV1, CV2, CV3, CV4, MVL, PC1, PC2, PCA, PCby, PCH, PVA, PVH, RV1, RV2, SCV6, SVA, SVL, & SVP
10. Quick Disconnect Test Point
11. Hydraulic Expansion Chamber
12. Flow Control
13. Velocity Fuse
14. Reach Manifold - Contains CBV & SVR
15. Tilt/Side Shift Manifold - Contains SVS & SVT
16. Tilt Manifold - Contains SVT
17. Pressure Switch HSS/Pressure Transducer LS
18. Check Valve CV (Used with Pressure Switch/Pressure Transducer)
19. Strainer

8764-02

RR/RD5200 SERIES



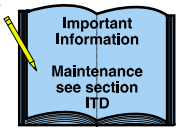
Index	Part No.	Part Name	No. Req.
1		Power Unit Contact Factory	1
2	123997	Drip Plate	1
3	060017-077	Screw	1
	060017-010	Screw	1
	060030-026	Flatwasher	2
	060005-009	Lockwasher	2
	060021-011	Nut	2
4	128620	Drive Guard Shown	1
	060019-067	Screw	2
	060009-136	Ring Retaining	2
5	127994	Hinge	1
6	060017-024	Screw	3
	060030-335	Flatwasher	3
7	060015-030	Screw	4
	060005-007	Lockwasher	4
8	122930	Guard Inside RH	1
	122936	Guard Inside LH	1
	060016-030	Screw	4
9	* 128627-001	Guard Outside RH "A" Battery Comp.	1
	* 128627-002	Guard Outside RH "B" Battery Comp.	1
	* 128627-003	Guard Outside RH "C" Battery Comp.	1
	* 128627-004	Guard Outside RH "D" Battery Comp.	1
	* 128627-005	Guard Outside RH "E" Battery Comp.	1
	* 128625-001	Guard Outside LH "A" Battery Comp.	1
	* 128625-002	Guard Outside LH "B" Battery Comp.	1
	* 128625-003	Guard Outside LH "C" Battery Comp.	1
	* 128625-004	Guard Outside LH "D" Battery Comp.	1
	* 128625-005	Guard Outside LH "E" Battery Comp.	1
	060016-042	Screw	4
	060030-017	Flatwasher	4
	060005-008	Lockwasher	4
10	122998	Block Tapped	2
11	123333	Tank Cover RH	1
	123334	Tank Cover LH	1
12	* 123643	Bracket RH "A" Battery Comp.	1
	* 123644	Bracket RH "B" Battery Comp.	1
	* 123645	Bracket RH "C" Battery Comp.	1
	* 123646	Bracket RH "D" Battery Comp.	1
	* 123647	Bracket RH "E" Battery Comp.	1
	* 123666	Bracket LH "A" Battery Comp.	1
	* 123667	Bracket LH "B" Battery Comp.	1
	* 123668	Bracket LH "C" Battery Comp.	1
	* 123669	Bracket LH "D" Battery Comp.	1
	* 123670	Bracket LH "E" Battery Comp.	1
	060015-082	Screw	2
13	061073	Clip Spring	5
	060012-014	Screw	10
14	* 126091-001	Console “A” Battery Comp.	
	* 126091-002	Console “B” Battery Comp.	
	* 126091-003	Console “C” Battery Comp.	
	* 126091-004	Console “D” Battery Comp.	
	* 126091-005	Console “E” Battery Comp.	
	* 126091-101	Console “A” Battery Comp. With 3rd Post	
	* 126091-102	Console “B” Battery Comp. With 3rd Post	
	* 126091-103	Console “C” Battery Comp. With 3rd Post	
	* 126091-104	Console “D” Battery Comp. With 3rd Post	
	* 126091-105	Console “E” Battery Comp. With 3rd Post	
15	123632	Arm Pad	1
	060015-082	Screw	8
	060005-006	Lockwasher	8
16	060015-082	Screw	4
17	123074	Cover	1
18	060016-068	Screw	2
	060030-017	Flatwasher	2
19	128640	Back Pad	1
20		Contactor Panel See Section 4.1	1
21	060080-004	Nut Flange	4
22	123654	Knee Pad	1
23	* 125891-001	Post 3rd 2415 mm (95 in.) Collapsed Height/5335 mm (210 in.) Lift Height or Greater	1
	* 125891-002	Post 3rd 2260 mm (89 in.) Collapsed Height/5025 mm (198 in.) Lift Height	1
	060023-014	Screw	1
	060005-023	Lockwasher	1
	060030-292	Flatwasher	1

Index	Part No.	Part Name	No. Req.
24	132401	Bracket	1
	060017-014	Screw	4
	060080-001	Nut	4
25	123890	Plate Shim 1.5 mm (0.06 in.)	AR
26	132248-003	Grommet Upper	1
27	123594	Clipboard Clip	1
	060013-030	Screw	2
	060005-053	Lockwasher	2
	109127-001	Clip Arrow	1
	109127-002	Clip Arrow	1
	109127-003	Clip Arrow	1
28	079528	Fire Extinguisher	1
	060014-022	Screw	2
	060021-005	Nut	2
	060005-005	Lockwasher	2
	N01203	Fire Extinguisher Assembly Includes Mounting Hardware	1
29	126484	Bracket 36V Trucks	1
	060016-096	Screw	4
30	126489	Fan 24V Trucks	1
	128458	Guard	2
	060013-044	Screw	4
	060030-045	Flatwasher	8
	060042-015	Nut	4
31	126489	Fan (36V Trucks - Lower Fan Not Equipped on "EE" Trucks)	2
	128458	Guard	4
	060013-044	Screw	8
	060030-045	Flatwasher	16
	060042-015	Nut	8
32	060030-187	Flatwasher 36V Trucks	3
	060030-119	Flatwasher	3
	060042-020	Nut	3
33	127887	Bracket 24V Trucks	1
	060016-096	Screw	2
34	060078-026	Screw	4
	060030-012	Flatwasher	4
35	060078-026	Screw	2
	060030-012	Flatwasher	2
36	129273	Plate Fastener	2
37	128905	Guard Finger Not Equipped On "EE" Trucks	1
	060016-096	Screw	2
38	060030-187	Flatwasher 24V Trucks	2
	060030-119	Flatwasher	2
	060042-020	Nut	2
39	132179-003	Grommet	1

Always Specify Model, Data & Serial Numbers

"A" Battery Compartment = 280 mm (11.12 in.)
"B" Battery Compartment = 360 mm (14.25 in.)
"C" Battery Compartment = 415 mm (16.25 in.)
"D" Battery Compartment = 460 mm (18.00 in.)
"E" Battery Compartment = 530 mm (20.75 in.)

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



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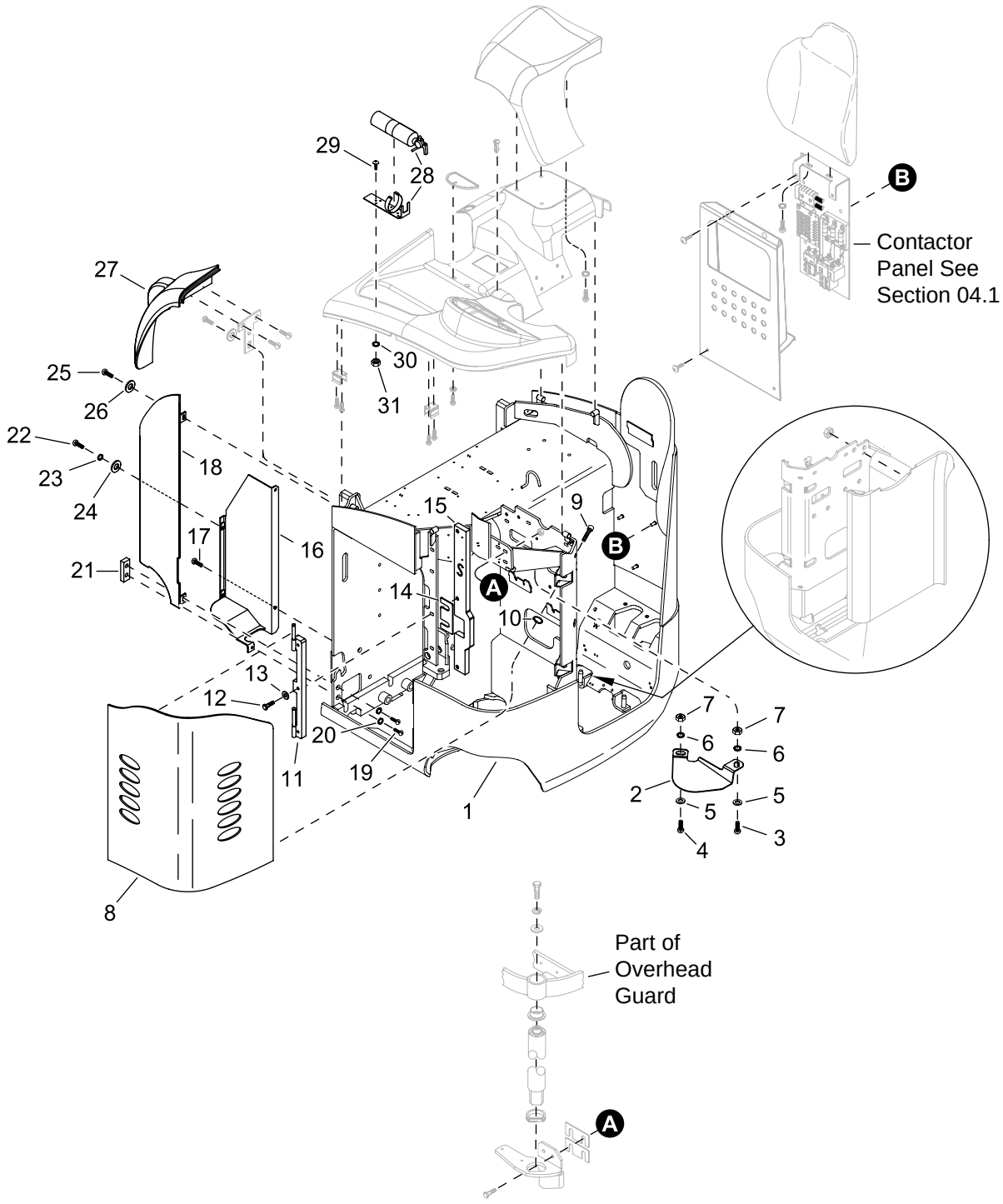


Figure 15733

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1		Power Unit Contact Factory	1
2	123997	Drip Plate	1
3	060017-077	Screw	1
4	060017-010	Screw	1
5	060030-026	Flatwasher	2
6	060005-009	Lockwasher	2
7	060021-011	Nut	2
8	128620	Door Panel	1
9	060019-067	Screw	2
10	060009-136	Retaining Ring	2
11	127994	Hinge	1
12	060017-024	Screw	3
13	060030-335	Flatwasher	3
14	123890	Shim Plate 1.5 mm (0.06 in)	AR
15	129273	Plate Fastener	2
16	122930	Inside Guard RH	1
	122936	Inside Guard LH	1
17	060016-030	Screw	4
18	128627-001*	Outside Guard RH "A" Battery Compartment	1
	128627-002*	Outside Guard RH "B" Battery Compartment	1
	128627-003*	Outside Guard RH "C" Battery Compartment	1
	128627-004*	Outside Guard RH "D" Battery Compartment	1
	128627-005*	Outside Guard RH "E" Battery Compartment	1
	128625-001*	Outside Guard LH "A" Battery Compartment	1
	128625-002*	Outside Guard LH "B" Battery Compartment	1
	128625-003*	Outside Guard LH "C" Battery Compartment	1
	128625-004*	Outside Guard LH "D" Battery Compartment	1
	128625-005*	Outside Guard LH "E" Battery Compartment	1
19	060015-030	Screw	4
20	060005-007	Lockwasher	4
21	122998	Tapped Block	2
22	060016-042	Screw	4
23	060030-017	Flatwasher	4
24	060005-008	Lockwasher	4
25	060078-026	Screw	4
26	060030-012	Flatwasher	4
27	123333	Tank Cover RH	1
	123334	Tank Cover LH	1
28	N01203	Fire Extinguisher Assembly Includes Index 28 - 31	1
	079528	.Fire Extinguisher & Bracket	1
29	060014-022	.Screw	2
30	060005-005	.Lockwasher	2
31	060021-005	.Nut	2

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number

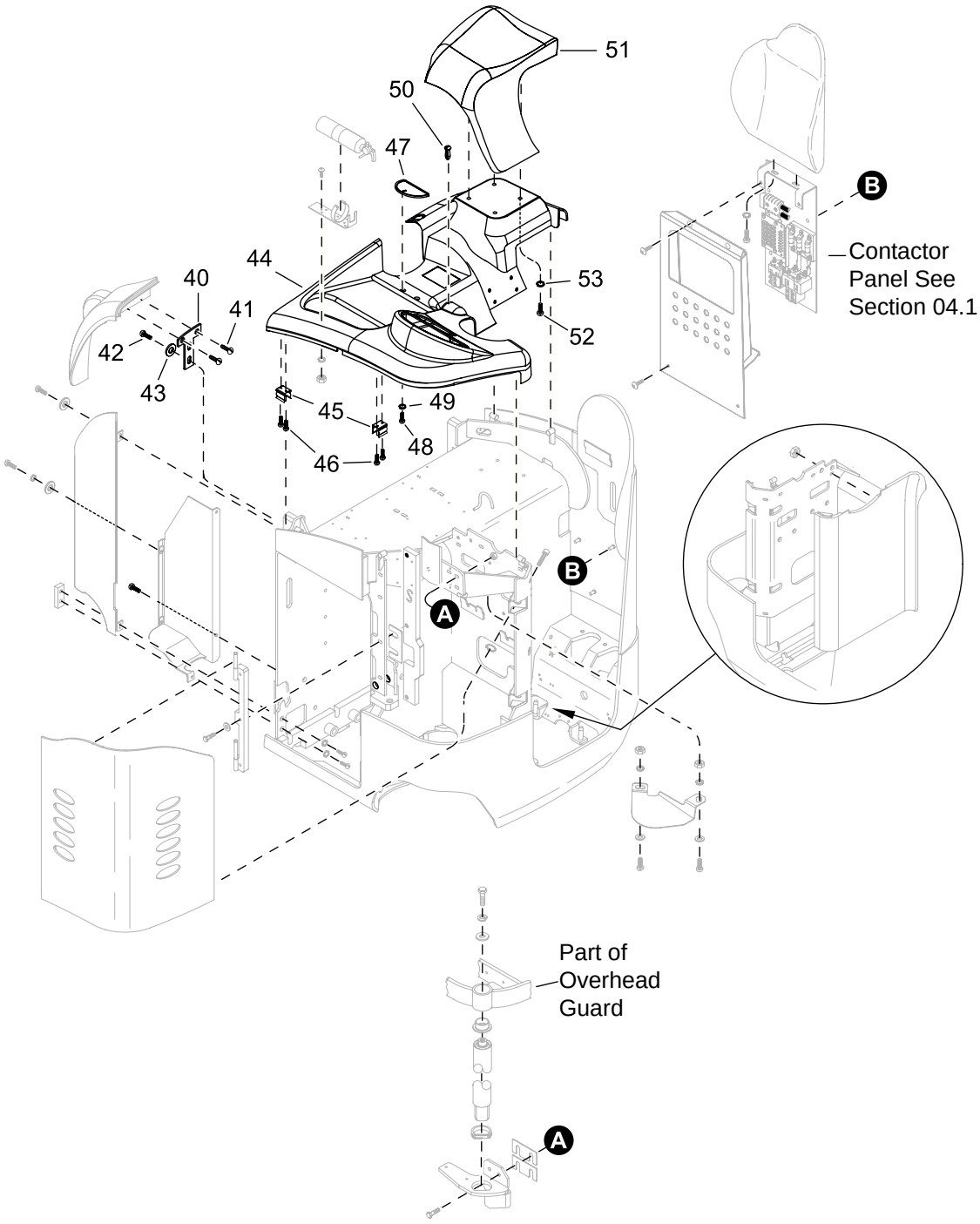


Figure 15734

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
40	123643*	Bracket RH "A" Battery Compartment	1
	123644*	Bracket RH "B" Battery Compartment	1
	123645*	Bracket RH "C" Battery Compartment	1
	123646*	Bracket RH "D" Battery Compartment	1
	123647*	Bracket RH "E" Battery Compartment	1
	123666*	Bracket LH "A" Battery Compartment	1
	123667*	Bracket LH "B" Battery Compartment	1
	123668*	Bracket LH "C" Battery Compartment	1
	123669*	Bracket LH "D" Battery Compartment	1
	123670*	Bracket LH "E" Battery Compartment	1
41	60015-082	Screw	2
42	060078-026	Screw	2
43	060030-012	Flatwasher	2
44	123743-011-01*	Console "A" Battery Compartment (1)	1
	123743-011-02*	Console "A" Battery Compartment with InfoLink (1)	1
	123743-012-01*	Console "B" Battery Compartment (1)	1
	123743-012-02*	Console "B" Battery Compartment with InfoLink (1)	1
	123743-013-01*	Console "C" Battery Compartment (1)	1
	123743-013-02*	Console "C" Battery Compartment with InfoLink (1)	1
	123744-011-01*	Console "D" Battery Compartment (1)	1
	123744-011-02*	Console "D" Battery Compartment with InfoLink (1)	1
	123744-012-01*	Console "E" Battery Compartment (1)	1
	123744-012-02*	Console "E" Battery Compartment with InfoLink (1)	1
45	061073	Spring Clip	5
46	060012-014	Screw	10
47	123594	Clipboard Clip	1
48	060013-030	Screw	2
49	060005-053	Lockwasher	2
50	109127-001	Arrow Clip Green	1
	109127-002	Arrow Clip Yellow	1
	109127-003	Arrow Clip Red	1
51	123632	Arm Pad	1
52	060015-082	Screw	8
53	060005-006	Lockwasher	8

(1) Includes Index 44 - 46

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number

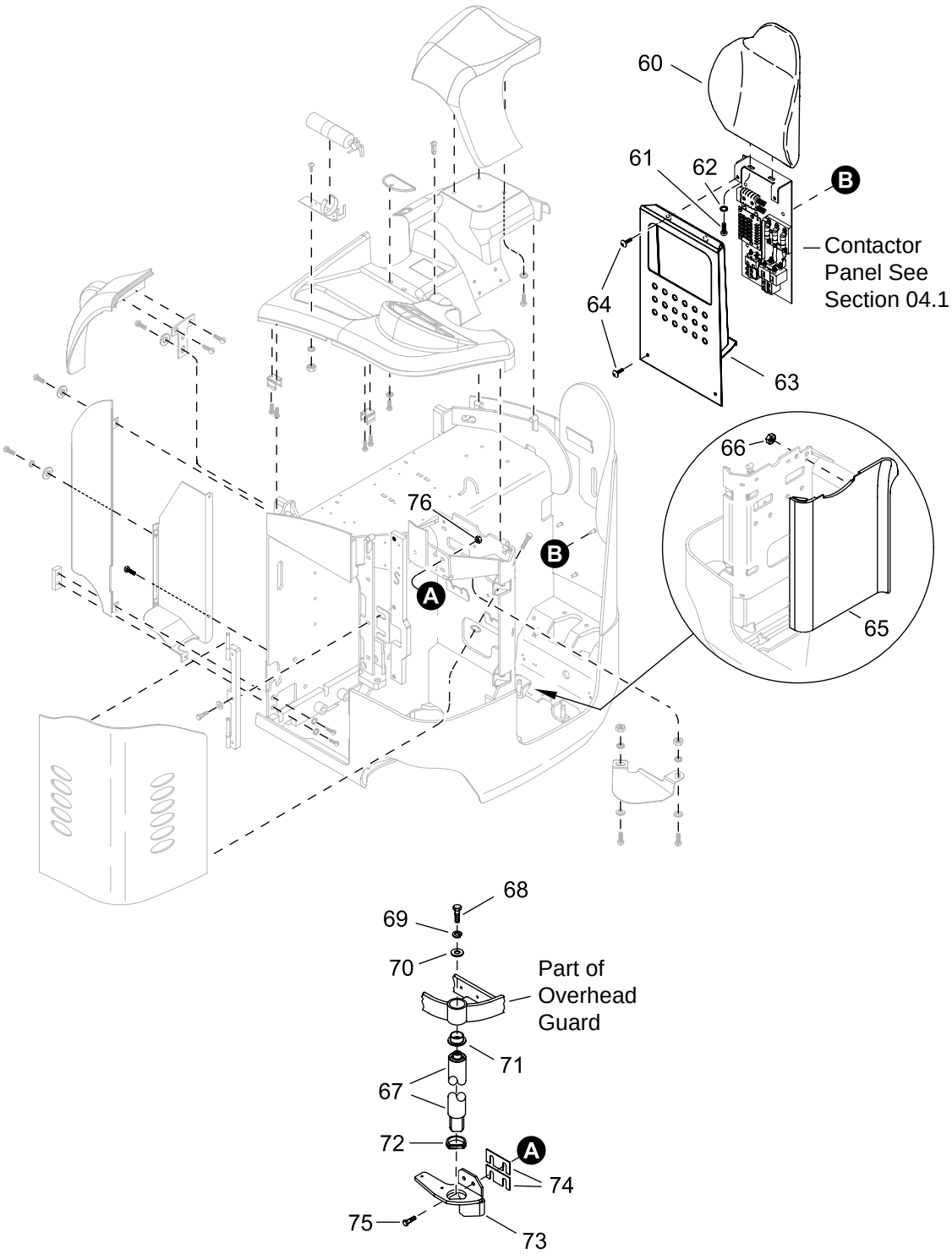


Figure 15735

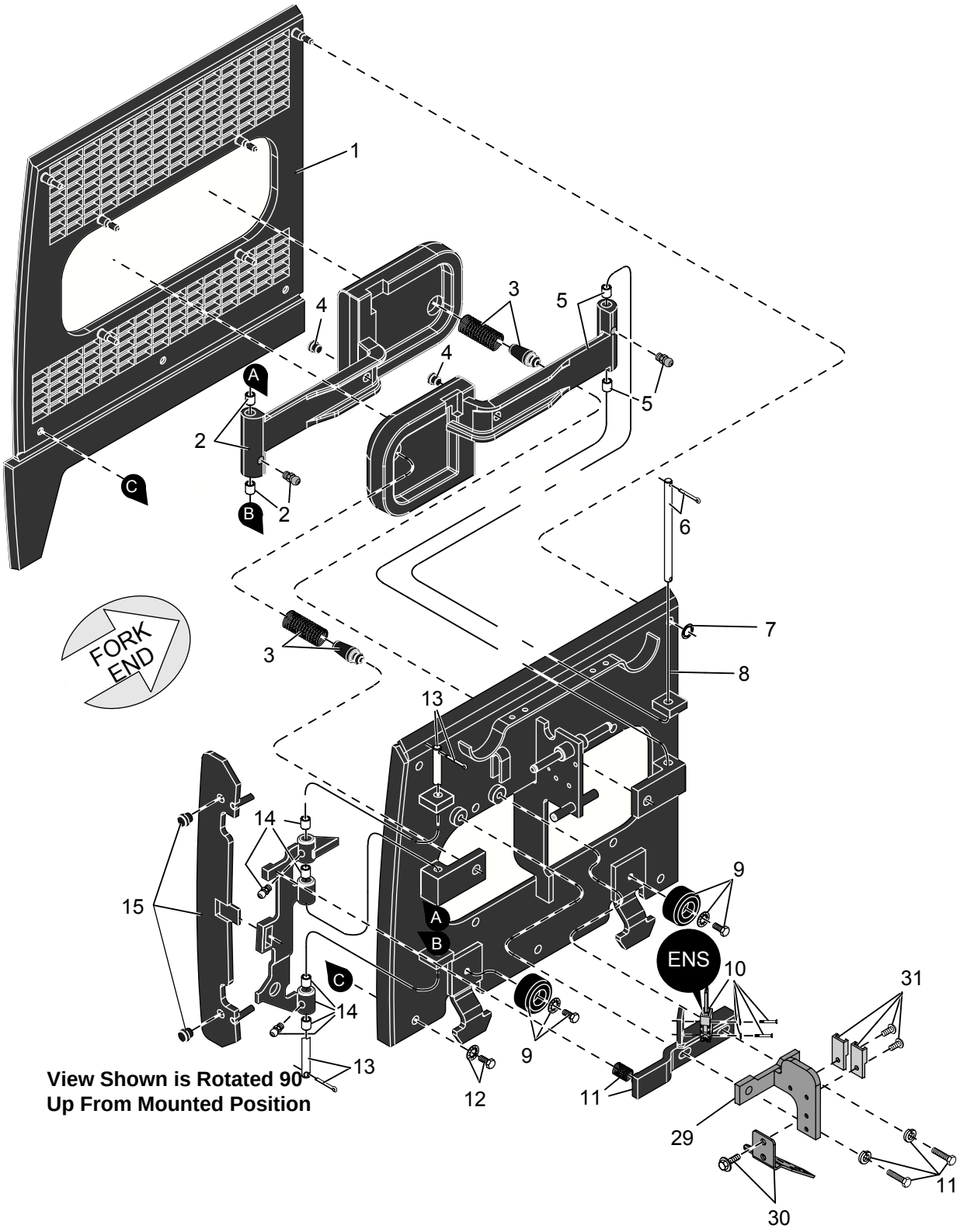
INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
60	128640	Back Pad	1
61	060016-068	Screw	2
62	060030-017	Flatwasher	2
63	123074	Cover	1
64	060015-082	Screw	4
65	123654	Knee Pad	1
66	060080-004	Flange Nut	4
67	125891-001*	3rd Post 2415 mm (95 in) Collapsed Height or Greater	1
	125891-002*	3rd Post 2260 mm (89 in) Collapsed Height	1
68	060023-014	Screw	1
69	060005-023	Lockwasher	1
70	060030-292	Flatwasher	1
71	132248-003	Upper Grommet	1
72	132179-003	Lower Grommet	1
73	132401	Bracket	1
74	123890	Shim Plate 1.5 mm (0.06 in) Thick	AR
75	060017-014	Screw	4
76	060080-001	Nut	4

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number

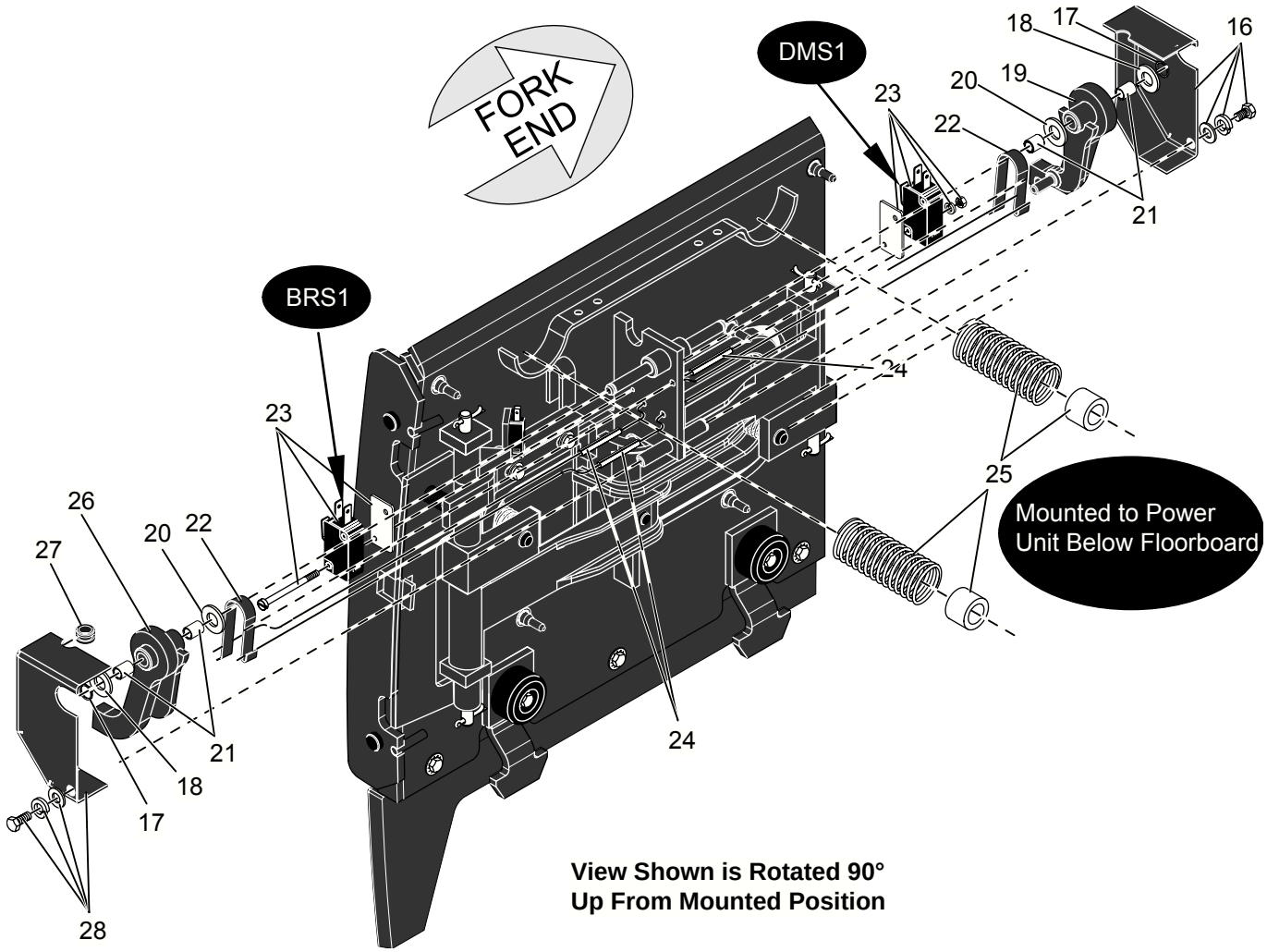
7157-03

RR/RD 5200/5200S



6231

RR/RD 5200/5200S



View Shown is Rotated 90° Up From Mounted Position

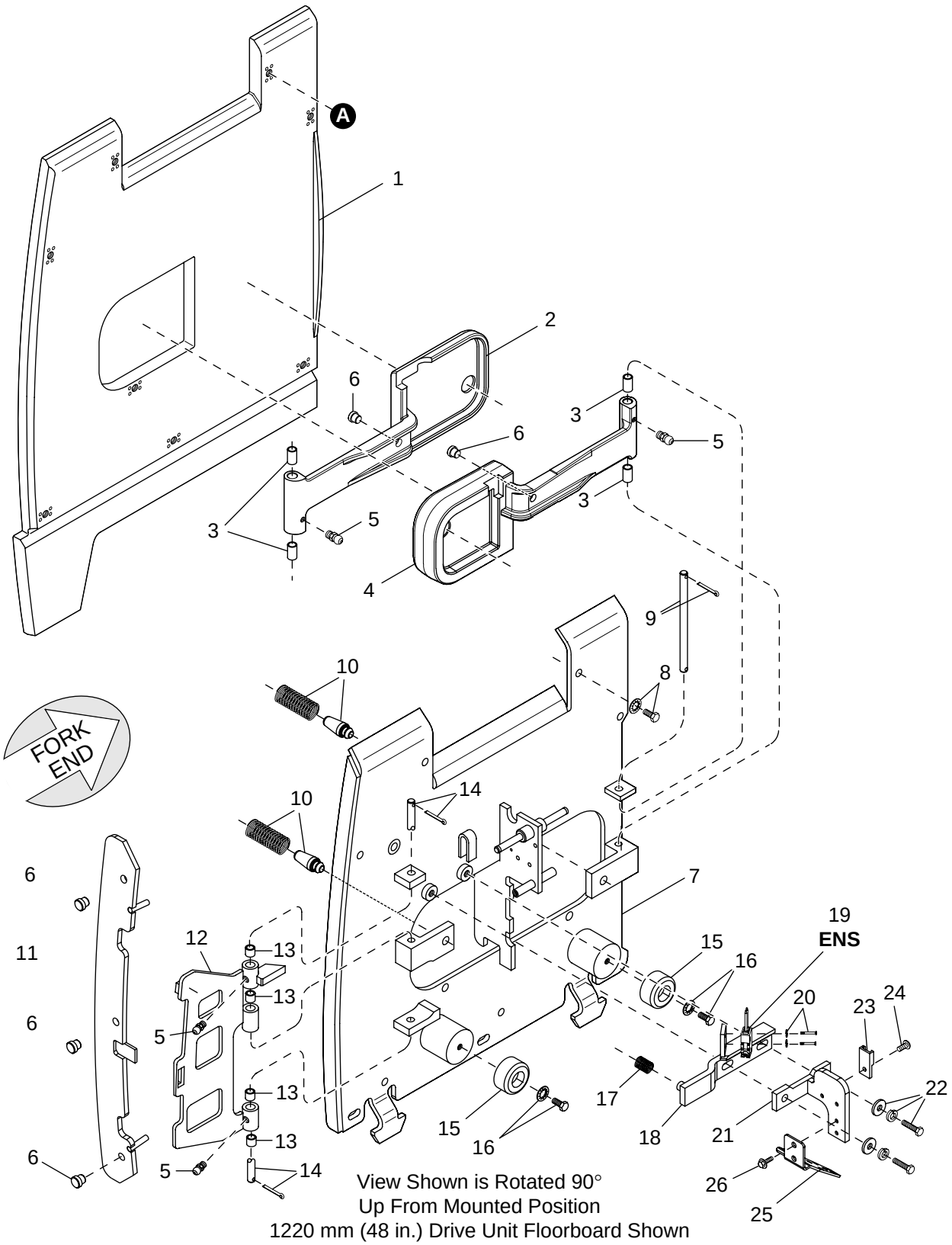
Index	Part No.	Part Name	No. Req.
1	123134	Mat RR/RD 5200 Shown	1
	125127	Mat RR/RD 5200S	1
2	126614	Pedal	1
	065038-009	Bearing	2
	076048	Fitting Lubrication	1
3	122834	Spring	2
	123482	Stop	2
4	123724	Slide	2
5	126613	Brake Pedal	1
	065038-009	Bearing	2
	076048	Fitting Lubrication	1
6	122807	Pin	1
	060038-017	Cotter Pin	2
7	060031-016	Speed Nut	6
8	123009	Floorboard RR/RD 5200 Shown	1
	125107	Floorboard RR/RD 5200S	1
9	123852	Cushion	2
	060015-006	Screw	2
	060005-022	Lockwasher	2
10	127695	Switch	1
	093603	Insulator	1
	060011-003	Screw	2
	060005-049	Lockwasher	2
11	126435	Stop	1
	123135	Spring RR/RD 5200 Shown	1
	125172	Spring RR/RD 5200S	1
	060016-004	Screw	2
	060005-008	Lockwasher	2
	060030-017	Flatwasher	2
12	060016-018	Screw	3
	060005-020	Lockwasher	3
13	123037	Pin	1
	060038-017	Cotter Pin	2
14	127699	Entry Bar RR/RD 5200 Shown	1
	127700	Entry Bar RR/RD 5200S	1
15	127648	Bar RR/RD 5200 Shown	1
	127647	Bar RR/RD 5200S	1
	123724	Slide	2
16	123872-002	Cover R.H.	1
	060015-003	Screw	1
	060005-007	Lockwasher	1
	060030-010	Flatwasher	1
17	060009-001	Retaining Ring	2
18	060030-037	Flatwasher	2
19	124005	Actuator R.H.	1
20	060030-161	Flatwasher	2
21	065007-084	Bearing Sleeve	4
22	123859	Actuator	2
23	127695	Switch	2
	093603	Insulator	2
	060011-027	Screw	2
	060005-049	Lockwasher	2
	060021-023	Nut	2
24	060000-075	Pin	3
25	123965	Spring	2
	123871	Spacer RR/RD 5200 Only	2
26	123986	Actuator L.H.	1
27	065004-044	Grommet	1
28	123872-001	Cover L.H.	1
	060015-003	Screw	1
	060005-007	Lockwasher	1
	060030-010	Flatwasher	1
29	127642	Bracket	1
30	127575	Cover	1
	060014-088	Screw	2
31	062749-001	Clip	2
	060014-087	Screw	2

Always Specify Model, Data & Serial Numbers

061003-003 Tie Cable 2

This page available for **NOTES.**

12153

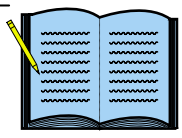


View Shown is Rotated 90°
Up From Mounted Position
1220 mm (48 in.) Drive Unit Floorboard Shown

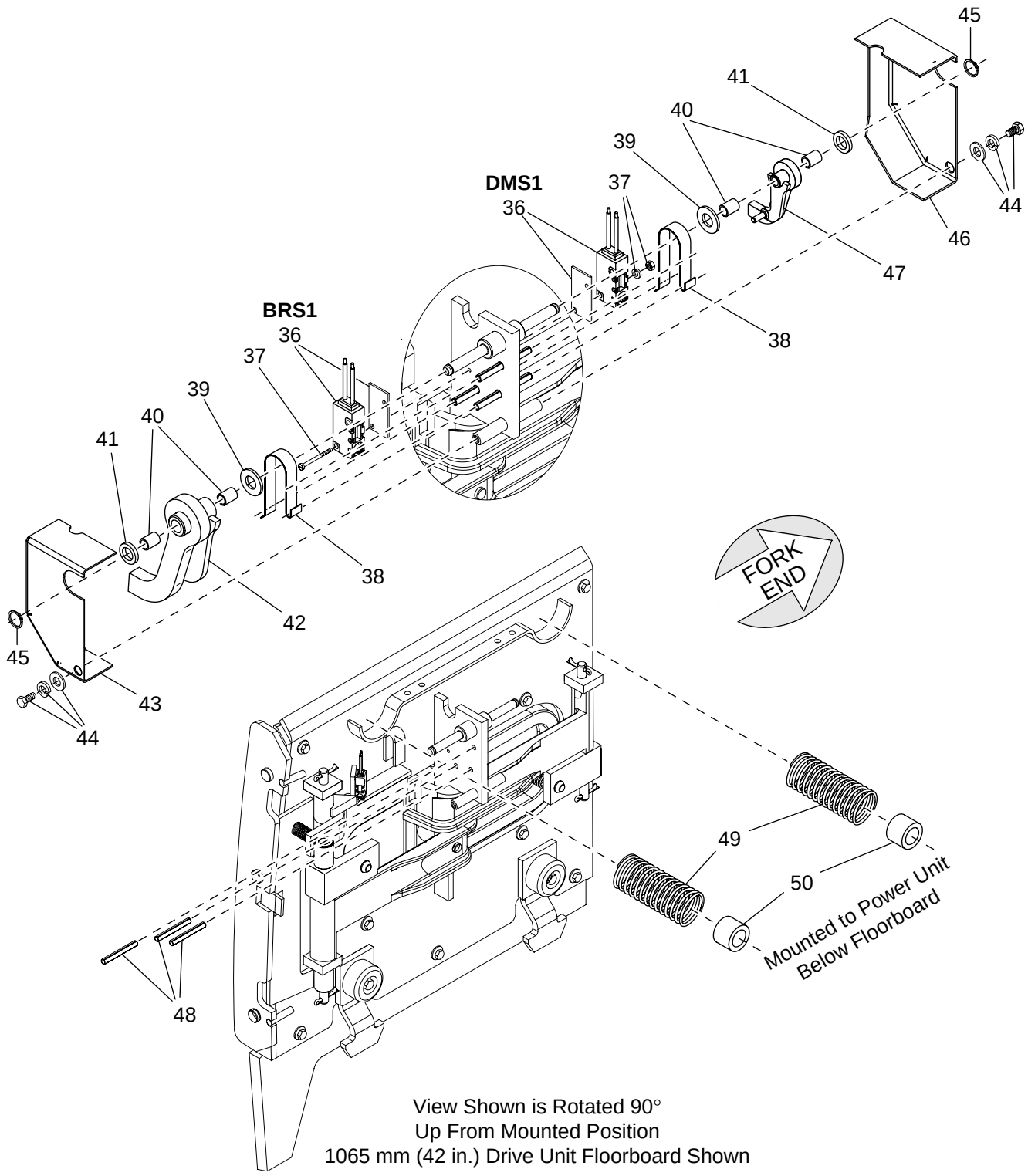
See Page -055 for Additional Parts.

Index	Part No.	Part Name	No. Req.
1	* 130923	Operator Mat - 42 in.	1
	* 131325	Operator Mat - 48 in. Shown	1
2	131715	Pedal Presence	1
3	065038-009	Bearing	4
4	131155	Pedal Brake	1
5	076048-001	Fitting Lubrication	4
6	123724	Slide Poly	5
7	* 132118	Floorboard Weldment 42 in.	1
	* 132454	Floorboard Weldment 48 in. Shown	1
8	060016-018	Screw 5/16 in.	8
	060005-008	Lockwasher	8
9	122807	Pin Pivot	1
	060038-017	Pin Cotter	2
10	122834	Spring Compression	2
	123482	Stop Poly	2
11	* 127648	Entry Bar Weldment 42 in.	1
	* 127647	Entry Bar Weldment 48 in. Shown	1
12	* 127699	Entry Bar Ass'y 42 in.	1
	* 127700	Entry Bar Ass'y 48 in. Shown	1
13	065038-017	Bearing	4
14	123037	Pin Pivot	1
	060038-017	Pin Cotter	2
15	123852	Cushion	2
16	060015-006	Screw 1/4 in.	2
17	125172	Spring Compression	1
18	126435	Stop Weldment	1
19	127716	Harness - RR5000 Floorboard 42 in. Includes BRS1, DMS1 & ENS	1
	127695	Switch Asm Sealed ENS	1
	093603	Switch Insulator	1
20	060011-003	Screw #4	2
	060005-049	Lockwasher	2
21	127642	Bracket Harness Mount	1
22	060016-004	Screw 5/16 in.	2
	060005-008	Lockwasher	2
	060030-017	Flatwasher	2
23	062749-001	Clip Attachment Deutsch	1
24	060014-087	Screw #10	1
25	127575	Cover - Harness Mount	1
26	060014-088	Screw #10	2

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



12154



View Shown is Rotated 90°
Up From Mounted Position
1065 mm (42 in.) Drive Unit Floorboard Shown

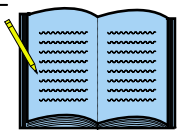
See Page -053 for Additional Parts.

Index	Part No.	Part Name	No. Req.
36	* 127716	Harness - RR5000 Floorboard 42 in. Includes BRS1, DMS1 & ENS	1
	127695	Switch Asm Sealed BRS1 & DMS1	2
	093603	Switch Insulator	2
37	060011-027	Screw #4	2
	060005-049	Lockwasher	2
	060021-023	Nut #4	2
38	123859	Actuator	2
39	060030-161	Flatwasher	2
40	065007-084	Bearing Sleeve	4
41	060030-037	Flatwasher	2
42	123986	Actuator L.H.	1
43	123872-001	Cover L.H.	1
44	060015-003	Screw 1/4 in.	2
	060005-007	Lockwasher	2
	060030-010	Flatwasher	2
45	060009-001	Ring Retaining	2
46	123872-002	Cover R.H.	1
47	131694	Actuator R.H.	1
48	060000-075	Pin Roll	3
49	123965	Spring Compression	2
50	* 123871	Spacer 42 in. Truck Only	2

Always Specify Model, Data & Serial Numbers

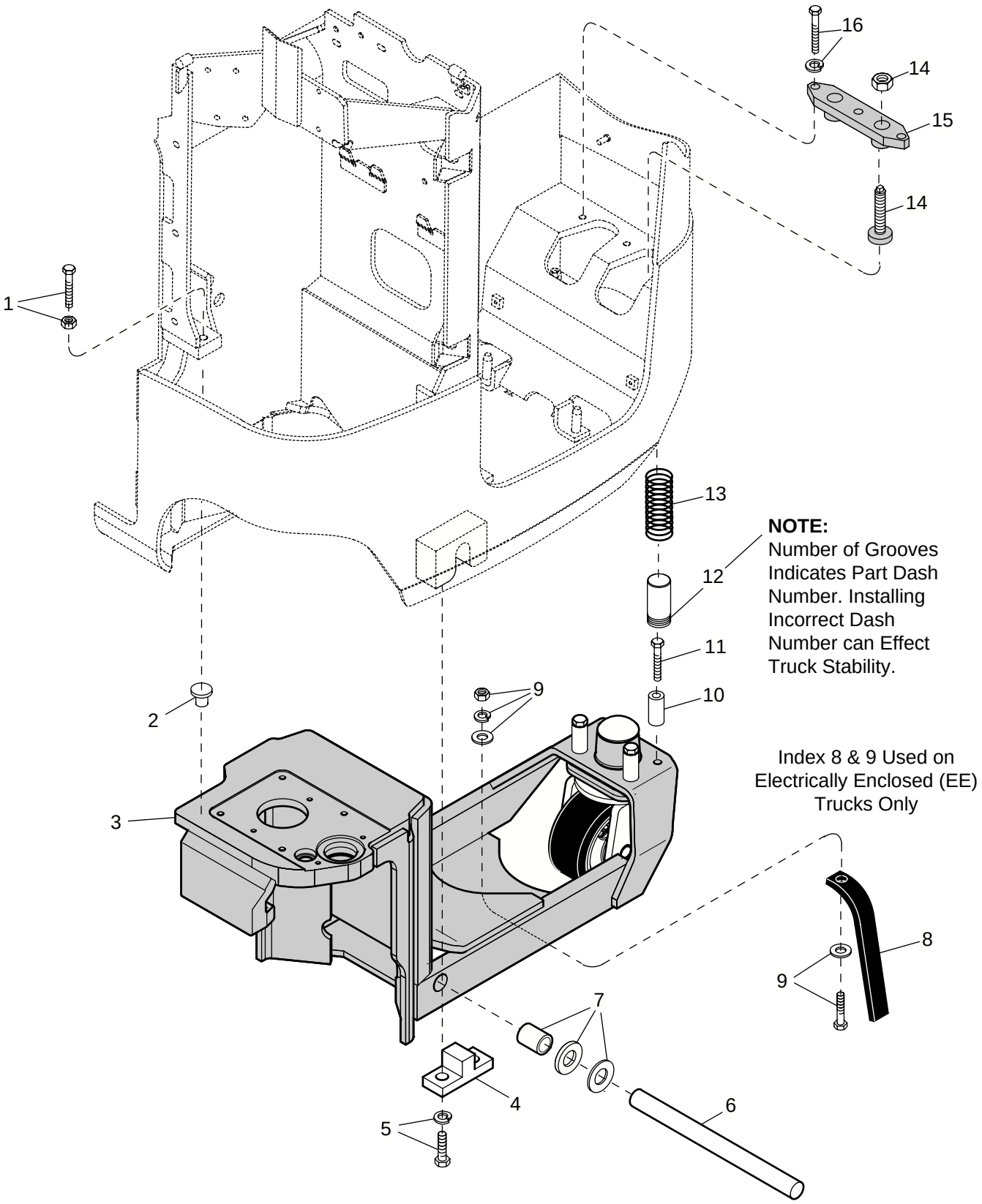
061003-004	Tie Cable	4
063002-017	Lubricant - Low Temp Tube	1
065005-003	Permatex Anti-Seize	1

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



7421-02

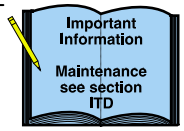
RR/RD 5200



Index		Part No.	Part Name	No. Req.
1		060041-002	Screw	1
		060021-034	Nut	1
2		127792	Wear Plug	1
3		128209	Drive Carriage	1
4		125679	Block Mounting Rear	1
		086991	Block Mounting Front	1
5		060023-028	Screw	4
		060005-046	Lockwasher	4
6	*	121709	Shaft	1
	*	121764	Shaft Freezer Corrosion	1
7		065007-092	Bushing	2
		060030-311	Flatwasher 1.5 mm (.06 in.) Thick	AR
		060030-324	Flatwasher .75 mm (.03 in.) Thick	AR
8		102126-002	Grounding Strap	1
9		060017-014	Screw	1
		060005-009	Lockwasher	1
		060030-019	Flatwasher	2
		060021-011	Nut	1
10		126781	Spacer	4
11		060019-072	Screw	4
		061004-019	Thread Locking Adhesive	1
12	*	126780-001	Spacer Cap, All Lift Heights Without Sideshift	2
	*	126780-002	Spacer Cap, With Sideshift and 5030 mm/198 in. Thru 5335 mm/210 in. Lift Height	2
	*	126780-004	Spacer Cap, With Sideshift and 5360 mm/211 in. Thru 10160 mm/400 in. Lift Height	2
13	*	122457	Spring (Red) 5030 mm/198 in. Thru 6860 mm/270 in. Lift Height	2
	*	122456	Spring (Blue) 6885 mm/271 in. Thru 10160 mm/400 in. Lift Height	2
14		126784	Bolt Stop	2
		060021-034	Nut	2
15		126787	Stop	1
16		060019-029	Screw	3
		060005-012	Lockwasher	3

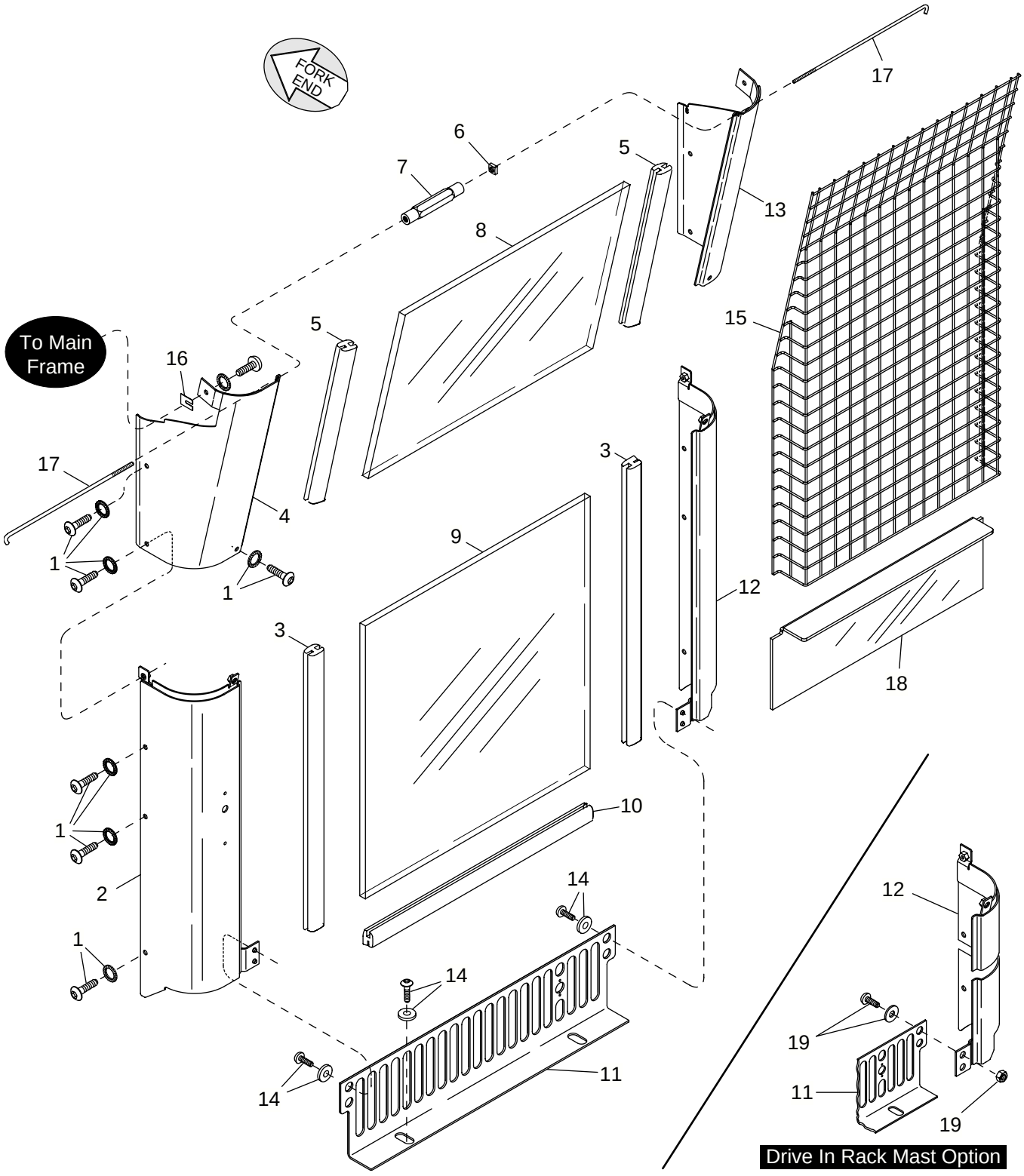
Always Specify Model, Data & Serial Numbers

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



8736-02

RR/RD 5200/5200S
RR/RD 5200 (AC)/5200S (AC)
2260 mm/89 in. COLLAPSED HEIGHT
5030 mm/198 in. LIFT HEIGHT



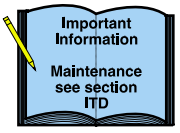
Index	Part No.	Part Name	No. Req.
1	060032-066	Screw	14
	060089-005	Wedge Washer	14
2	127987-003	Guard Mast LH Screen	1
	127987-001	Guard Mast LH Glass	1
	† 129625-003	Guard Mast LH Screen,Drive In Rack Mast Option	1
3	123459-003	Rubber Molding	2
4	128726	Pulley Cover LH	1
5	123459-002	Rubber Molding	2
6	060021-024	Nut	1
7	125615	Turnbuckle	1
8	074745-016	Glass Shield Option	1
9	074745-017	Glass Shield Option	1
10	123459-002	Rubber Molding	1
11	* 127919	Support Shield "A" Battery Compartment	1
	* 127921	Support Shield "B", "D" & "E" Battery Compartments	1
	* 127923	Supprot Shield "C" Battery Compartment	1
	* 129064	Support Shield "A" Battery Compartment, Drive In Rack Mast Option	1
	* 129089	Support Shield "B", "D" & "E" Battery Compartments, Drive In Rack Mast Option	1
	* 129087	Support Shield "C" Battery Compartment, Drive In Rack Mast Option	1
12	127980-003	Guard Mast RH Screen	1
	127980-001	Guard Mast RH Glass	1
	† 129626-003	Guard Mast RH Screen, Drive In Rack Mast Option	1
13	128728	Pulley Cover RH	1
14	060078-026	Screw	6
	127722	Spacer	6
15	* 123722-001	Screen Standard "A" & "B" Battery Compartment	1
	* 123722-003	Screen Standard "C", "D" & "E" Battery Compartment	1
16	128895-001	Shim 16 GA (1.5 mm/0.06 in.)	AR
	128895-002	Shim 13 GA (2.3 mm/0.09 in.)	AR
	128895-003	Shim 12 GA (2.8 mm/0.11 in.)	AR
17	125614-001	Rod Tension RH Thread	1
	125614-002	Rod Tension LH Thread	1
18	* 125686-001	Shield "A" & "B" Battery Compartment	1
	* 125686-002	Shield "C", "D" & "E" Battery Compartment	1
19	* 060015-006	Screw, Drive In Rack Mast Option	4
	060078-026	Screw	2
	127722	Spacer, Drive In Rack Mast Option	6
	* 060042-006	Nut, Drive In Rack Mast Option	4

Always Specify Model, Data & Serial Numbers

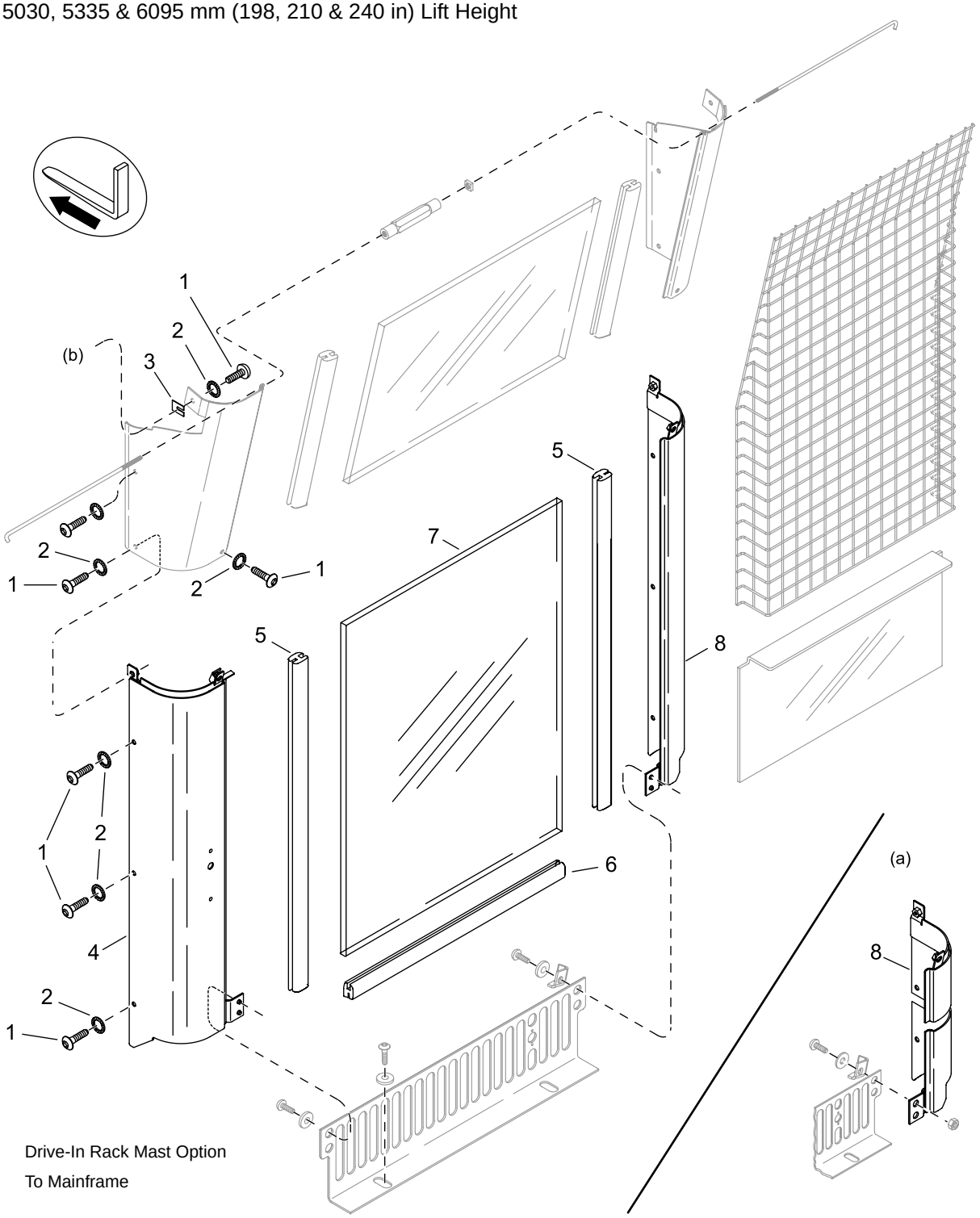
"A" Battery Compartment = 280 mm (11.12 in.)
"B" Battery Compartment = 360 mm (14.25 in.)
"C" Battery Compartment = 415 mm (16.25 in.)
"D" Battery Compartment = 460 mm (18.00 in.)
"E" Battery Compartment = 530 mm (20.75 in.)

† Glass Shield Option Not Available with 2260 mm/89 in. Collapsed Height Drive In Rack Mast Option

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



2260, 2415 & 2720 mm (89, 95 & 107 in) Collapsed Height
5030, 5335 & 6095 mm (198, 210 & 240 in) Lift Height



(a) Drive-In Rack Mast Option

(b) To Mainframe

Figure 16032-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	060032-066	Screw	14
2	060089-005	Wedge Washer	14
3	128895-001	Shim 16 Gage, 1.5 mm (0.06 in) Thick	AR
	128895-002	Shim 13 Gage, 2.3 mm (0.09 in) Thick	AR
	128895-003	Shim 12 Gage, 2.8 mm (0.11 in) Thick	AR
4	127987-003*	LH Mast Guard (1) Screen	1
	127987-001*	LH Mast Guard (1) Glass Shield	1
	127987-004*	LH Mast Guard (2) Screen	1
	127987-002*	LH Mast Guard (2) Glass Shield	1
	129625-003*	LH Mast Guard (1) Screen & Drive-In Rack Mast	1
	129625-001*	LH Mast Guard (1) Glass Shield & Drive-In Rack Mast	1
	129625-004*	LH Mast Guard (2) Screen & Drive-In Rack Mast	1
	129625-002*	LH Mast Guard (2) Glass Shield & Drive-In Rack Mast	1
5	123459-003*	Rubber Molding (1)	2
	123459-004*	Rubber Molding (2)	2
6	123459-002	Rubber Molding	1
7	074745-017*	Glass Shield (1)	1
	074745-018*	Glass Shield (2)	1
8	127980-003*	RH Mast Guard (1) Screen	1
	127980-001*	RH Mast Guard (1) Glass Shield	1
	127980-004*	RH Mast Guard (2) Screen	1
	127980-002*	RH Mast Guard (2) Glass Shield	1
	129626-003*	RH Mast Guard (1) Screen & Drive-In Rack Mast	1
	129626-001*	RH Mast Guard (1) Glass Shield & Drive-In Rack Mast	1
	129626-004*	RH Mast Guard (2) Screen & Drive-In Rack Mast	1
	129626-002*	RH Mast Guard (2) Glass Shield & Drive-In Rack Mast	1
	131425-003*	RH Mast Guard (1) Screen & Work Assist Tube	1
	131425-001*	RH Mast Guard (1) Glass Shield & Work Assist Tube	1
	131425-004*	RH Mast Guard (2) Screen & Work Assist Tube	1
	131425-002*	RH Mast Guard (2) Screen & Work Assist Tube	1
	132160-003*	RH Mast Guard (1) Screen, Drive-In Rack Mast & Work Assist Tube	1
	132160-001*	RH Mast Guard (1) Glass Shield, Drive-In Rack Mast & Work Assist Tube	1
	132160-004*	RH Mast Guard (2) Screen, Drive-In Rack Mast & Work Assist Tube	1
	132160-002*	RH Mast Guard (2) Glass Shield, Drive-In Rack Mast & Work Assist Tube	1

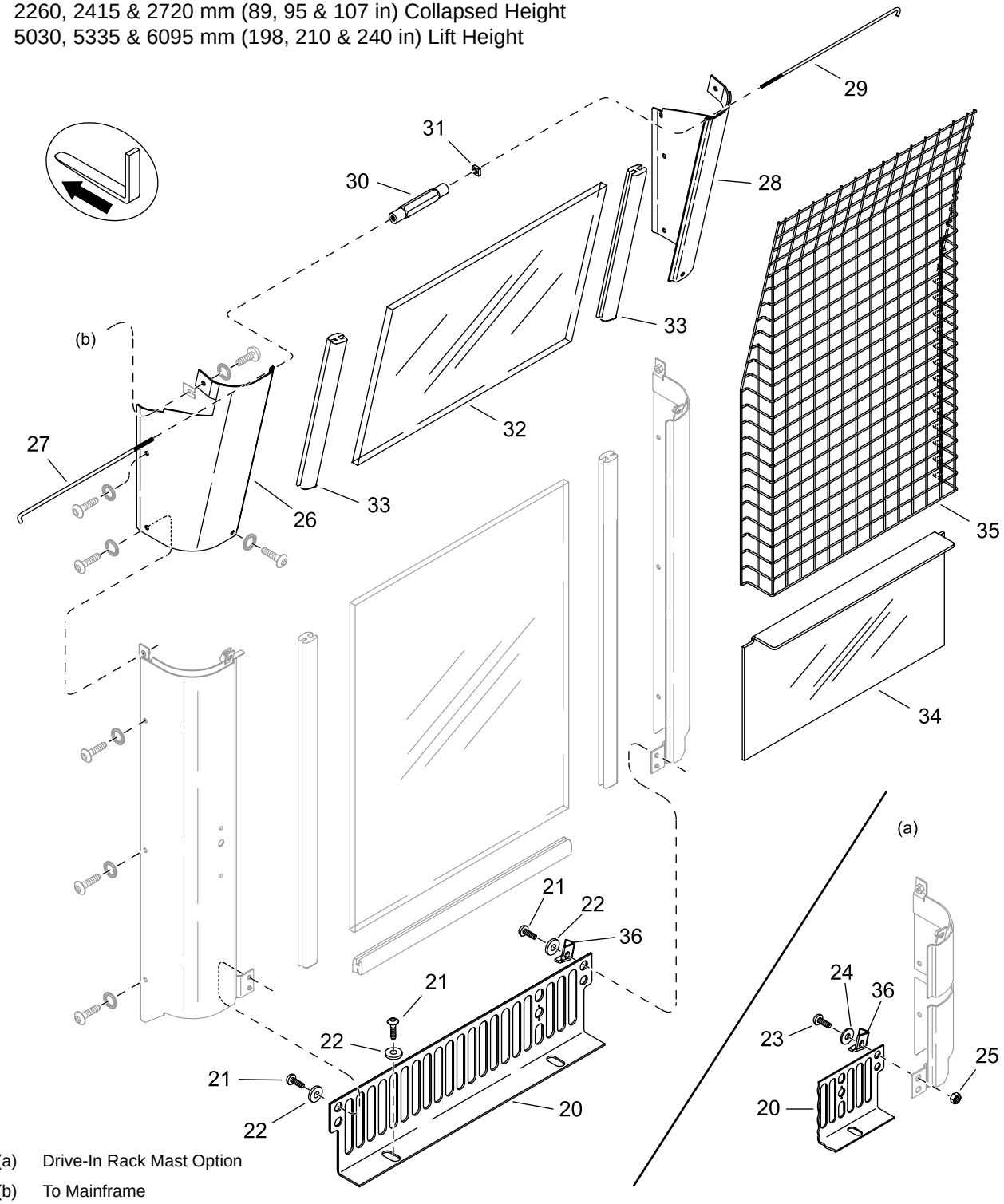
(1) 2260 mm (89 in) Overhead Guard

(2) 2415 mm (95 in) Overhead Guard - Not Available on 2260 mm (89 in) Collapsed Height Truck as a Standard Option.

***** To select appropriate part number, use the data number to determine truck features. Refer to Introduction.

Always Specify Model, Data & Serial Number

2260, 2415 & 2720 mm (89, 95 & 107 in) Collapsed Height
5030, 5335 & 6095 mm (198, 210 & 240 in) Lift Height



(a) Drive-In Rack Mast Option

(b) To Mainframe

Figure 16035-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
20	127919*	Shield Support "A" Battery Compartment	1
	127921*	Shield Support "B", "D" & "E" Battery Compartment	1
	127923*	Shield Support "C" Battery Compartment	1
	129064*	Shield Support "A" Battery Compartment, Drive-In Rack Mast	1
	129089*	Shield Support "B", "D" & "E" Battery Compartment, Drive-In Rack Mast	1
	129087*	Shield Support "C" Battery Compartment, Drive-In Rack Mast	1
21	060078-026	Screw	6
22	127722	Spacer	6
23	060078-026	Screw	2
	060015-006	Screw Drive-In Rack Mast	4
24	127722	Spacer Drive-In Rack Mast	6
25	060042-006	Nut Drive-In Rack Mast	4
26	128726	LH Pulley Cover	1
27	125614-002	Tension Rod LH Thread	1
28	128728	RH Pulley Cover	1
29	125614-001	Tension Rod RH Thread	1
30	125615	Turnbuckle	1
31	060021-024	Nut	1
32	074745-016	Glass Shield	1
33	123459-002	Rubber Molding	2
34	125686-001*	Shield "A" & "B" (1) or "C" (2) Battery Compartment	1
	125686-002*	Shield "C", "D" & "E" (1) or "D" & "E" (2) Battery Compartment	1
	125686-003*	Shield "C", "D" & "E" Battery Compartment, Operator Comfort Package	1
35	123722-001*	Screen (3) "A" & "B" Battery Compartment	1
	123722-003*	Screen (3) "C", "D" & "E" Battery Compartment	1
	123722-002*	Screen (4) "A" & "B" Battery Compartment	1
	123722-004*	Screen (4) "C", "D" & "E" Battery Compartment	1
36	129095-003	Support Bracket	2
	129095-004	Support Bracket (Not Shown)	2

(1) Used on 1065 mm (42 in) Power Unit

(2) Used on 1220 mm (48 in) Power Unit

(3) 2260 mm (89 in) Overhead Guard

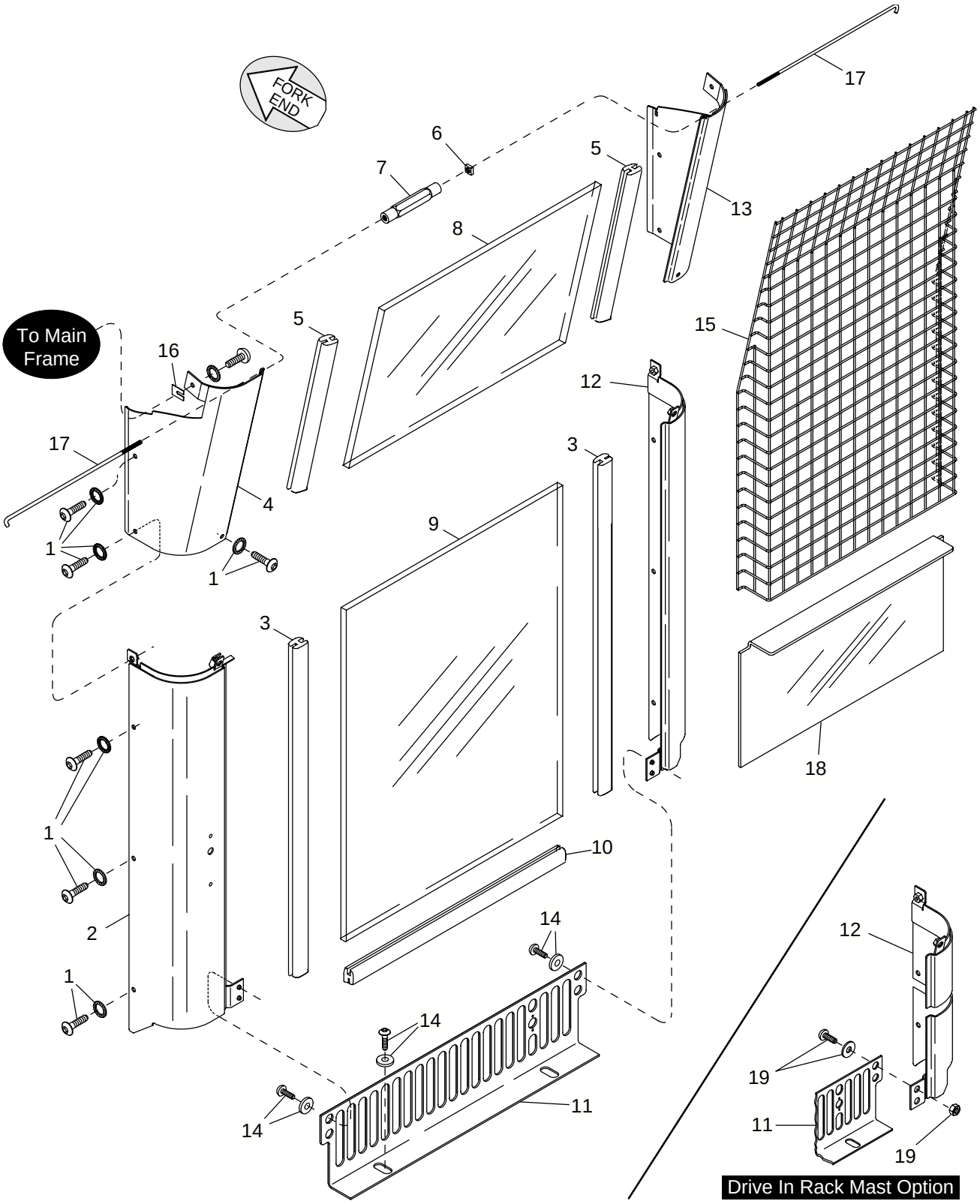
(4) 2415 mm (95 in) Overhead Guard - Not Available on 2260 mm (89 in) Collapsed Height Truck as a Standard Option.

***** To select appropriate part number, use the data number to determine truck features. Refer to Introduction.

Always Specify Model, Data & Serial Number

8737-02

RR/RD 5200/5200S
RR/RD 5200 (AC)/5200S (AC)
2415 mm & 2720 mm/95 & 107 in. COLLAPSED HEIGHT
5335 mm & 6095 mm/210 & 240 in. LIFT HEIGHT



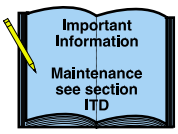
Index	Part No.	Part Name	No. Req.
1	060032-066	Screw	14
	060089-005	Wedge Washer	14
2	127987-004	Guard Mast LH Screen	1
	127987-002	Guard Mast LH Glass	1
	† 129625-004	Guard Mast LH Screen, Drive In Rack Mast Option	1
3	123459-004	Rubber Molding	2
4	128726	Pulley Cover LH	1
5	123459-002	Rubber Molding	2
6	060021-024	Nut	1
7	125615	Turnbuckle	1
8	074745-016	Glass Shield Option	1
9	074745-018	Glass Shield Option	1
10	123459-002	Rubber Molding	1
11	* 127919	Support Shield "A" Battery Compartment	1
	* 127921	Support Shield "B", "D" & "E" Battery Compartment	1
	* 127923	Support Shield "C" Battery Compartment	1
	* 129089	Support Shield "B", "D" & "E" Battery Compartments, Drive In Rack Mast Option	1
	* 129087	Support Shield "C" Battery Compartment, Drive In Rack Mast Option	1
12	127980-004	Guard Mast RH Screen	1
	127980-002	Guard Mast RH Glass	1
	† 129626-004	Guard Mast RH Screen, Drive In Rack Mast Option	1
13	128728	Pulley Cover RH	1
14	060078-026	Screw	6
	127722	Spacer	6
15	* 123722-002	Screen Standard "A" & "B" Battery Compartment	1
	* 123722-004	Screen Standard "C", "D" & "E" Battery Compartment	1
16	128895-001	Shim 16 GA (1.5 mm/0.06 in.)	AR
	128895-002	Shim 13 GA (2.3 mm/0.09 in.)	AR
	128895-003	Shim 12 GA (2.8 mm/0.11 in.)	AR
17	125614-001	Rod Tension RH Thread	1
	125614-002	Rod Tension LH Thread	1
18	* 125686-001	Shield "A" & "B" Battery Compartment	1
	* 125686-002	Shield "C", "D" & "E" Battery Compartment	1
19	* 060015-006	Screw, Drive In Rack Mast Option	4
	060078-026	Screw	2
	127722	Spacer, Drive In Rack Mast Option	6
	* 060042-006	Nut, Drive In Rack Mast Option	4

Always Specify Model, Data & Serial Numbers

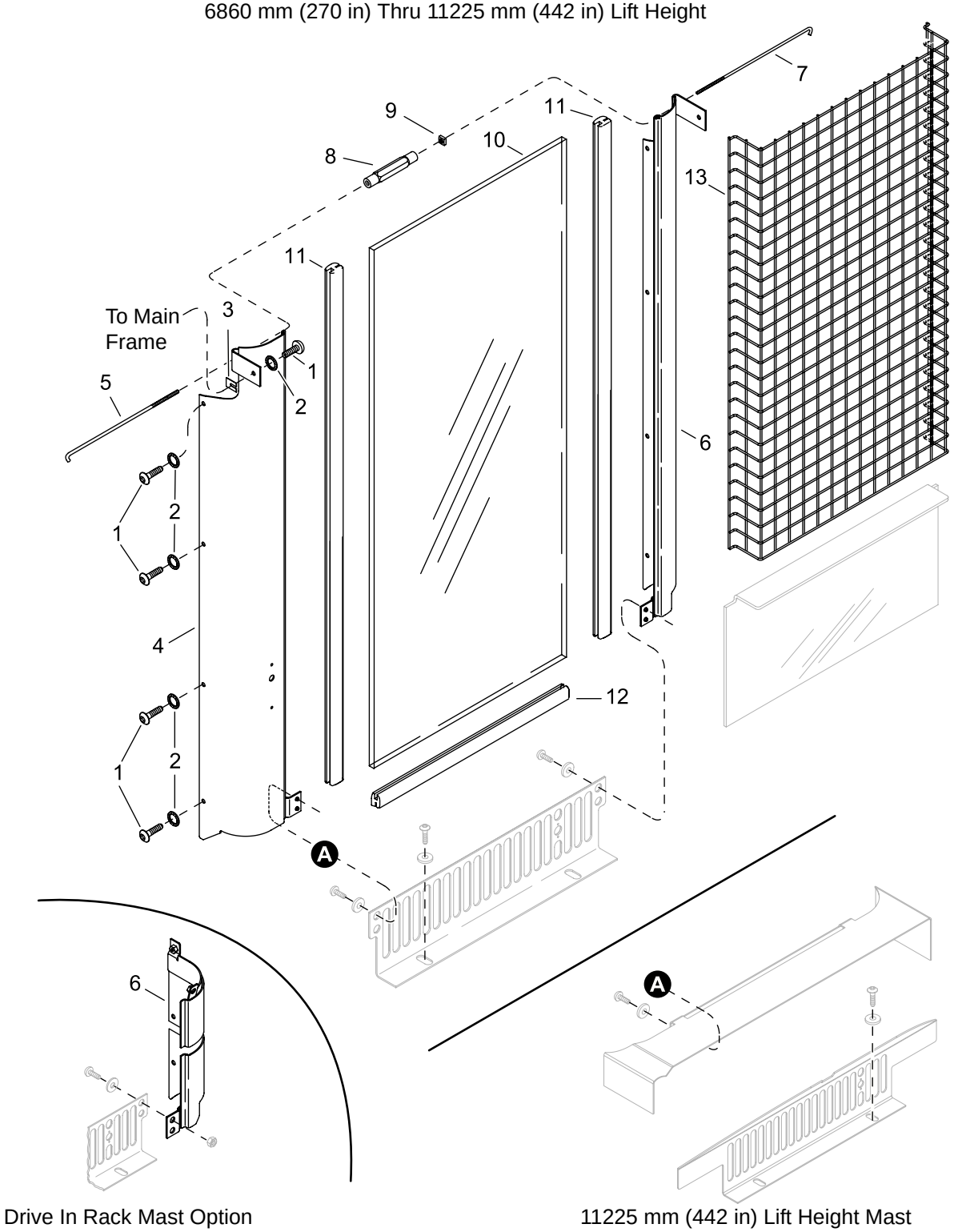
"A" Battery Compartment = 280 mm (11.12 in.)
"B" Battery Compartment = 360 mm (14.25 in.)
"C" Battery Compartment = 415 mm (16.25 in.)
"D" Battery Compartment = 460 mm (18.00 in.)
"E" Battery Compartment = 530 mm (20.75 in.)

† Glass Shield Option Not Available with 2415 mm & 2720 mm/ 95 & 107 in. Collapsed Height Drive In Rack Mast Option

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



3025 mm (119 in) Thru 4826 mm (190 in) Collapsed Height
6860 mm (270 in) Thru 11225 mm (442 in) Lift Height



Drive In Rack Mast Option

11225 mm (442 in) Lift Height Mast

Figure 16057

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	060032-066	Screw	10
2	060089-005	Wedge Washer	10
3	128895-001	Shim 16 Gage, 1.5 mm (0.06 in) Thick	AR
	128895-002	Shim 13 Gage, 2.3 mm (0.09 in) Thick	AR
	128895-003	Shim 12 Gage, 2.8 mm (0.11 in) Thick	AR
4	127966*	LH Mast Guard	1
	129623*	LH Mast Guard Drive In Rack Mast	1
	133807*	LH Mast Guard (1)	1
5	125614-002	Tension Rod LH Thread	1
6	127969*	RH Mast Guard	1
	129624*	RH Mast Guard Drive In Rack Mast	1
	131423*	RH Mast Guard & Work Assist Tube	1
	132159*	RH Mast Guard, Drive In Rack Mast & Work Assist Tube	1
	133809-001*	RH Mast Guard (1)	1
	133809-002*	RH Mast Guard & Work Assist Tube((1)	1
7	125614-001	Tension Rod RH Thread	1
8	125615	Turnbuckle	1
9	060021-024	Nut	1
10	074745-015	Glass Shield	1
11	123459-001	Rubber Molding	2
12	123459-002	Rubber Molding	1
13	123944-001*	Screen 1220 mm (48 in) Power Unit, "C" Battery Compartment	1
	123944-002*	Screen (2)	1
	138795*	Screen (2) With Operator Comfort Package	1

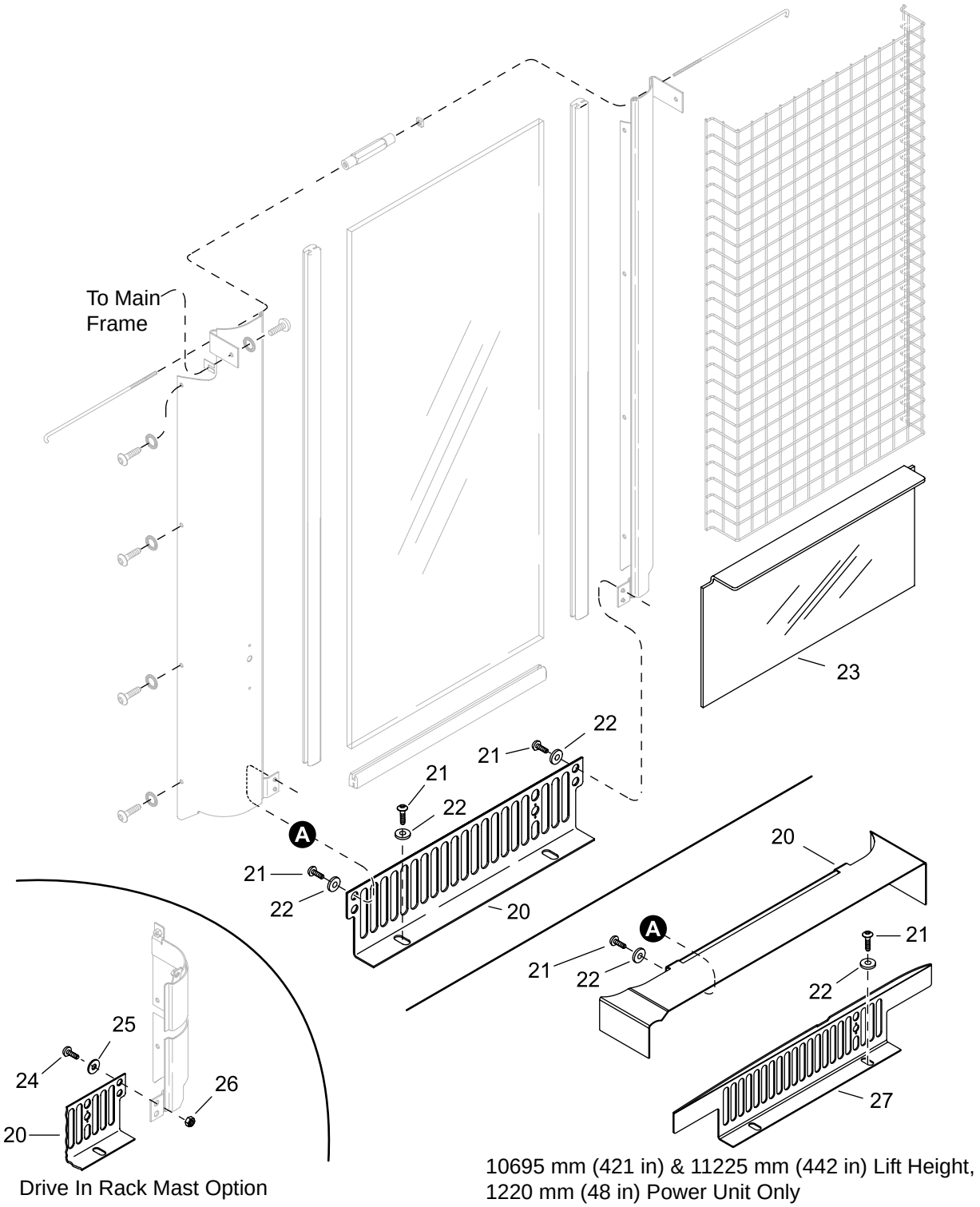
(1) 11225 mm (442 in) Lift Height, 1220 mm (48 in) Power Unit Only

(2) 1065 mm (42 in) Power Unit, "C", "D" & "E" Battery Compartment 1220 mm (48 in) Power Unit Truck, "D" & "E" Battery Compartment

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number

3025 mm (119 in) Thru 4826 mm (190 in) Collapsed Height
6860 mm (270 in) Thru 11225 mm (442 in) Lift Height



Drive In Rack Mast Option

10695 mm (421 in) & 11225 mm (442 in) Lift Height,
1220 mm (48 in) Power Unit Only

Figure 16058

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
20	127919*	Shield Support "A" Battery Compartment	1
	129064*	Shield Support "A" Battery Compartment, Drive In Rack Mast	1
	127921*	Shield Support "B", "D" & "E" Battery Compartment	1
	127923*	Shield Support "C" Battery Compartment	1
	129089*	Shield Support "B", "D" & "E" Battery Compartment, Drive In Rack Mast	1
	129087*	Shield Support "C" Battery Compartment, Drive In Rack Mast	1
	137173*	Shield Support (1)	1
	138685*	Shield Support "D" & "E" Battery Compartment & (2)	1
	139789*	Shield Support "D" & "E" Battery Compartment, Drive In Rack Mast & (2)	1
	140449*	Shield Support "C" Battery Compartment & (2)	1
	140450*	Shield Support "C" Battery Compartment, Drive In Rack Mast & (2)	1
21	060078-026	Screw	6
22	127722	Spacer	6
23	125686-001*	Shield "A" & "B" (3) or "C" (4) Battery Compartment	1
	125686-002*	Shield "C", "D" & "E" (3) or "D" & "E" (4) Battery Compartment	1
	125686-003*	Shield "C", "D" & "E" Battery Compartment & (2)	1
24	060078-026*	Screw Drive In Rack Mast	2
	060015-006*	Screw Drive In Rack Mast	4
25	127722*	Spacer Drive In Rack Mast	6
	127722*	Spacer (1) Drive In Rack Mast	4
26	060042-006	Nut Drive In Rack Mast	4
27	133803*	Guard (1)	1

(1) 10695 mm (421 in) & 11225 mm (442 in) Lift Height, 1220 mm (48 in) Power Unit Only

(2) Operator Comfort Package

(3) Used on 1065 mm (42 in) Power Unit

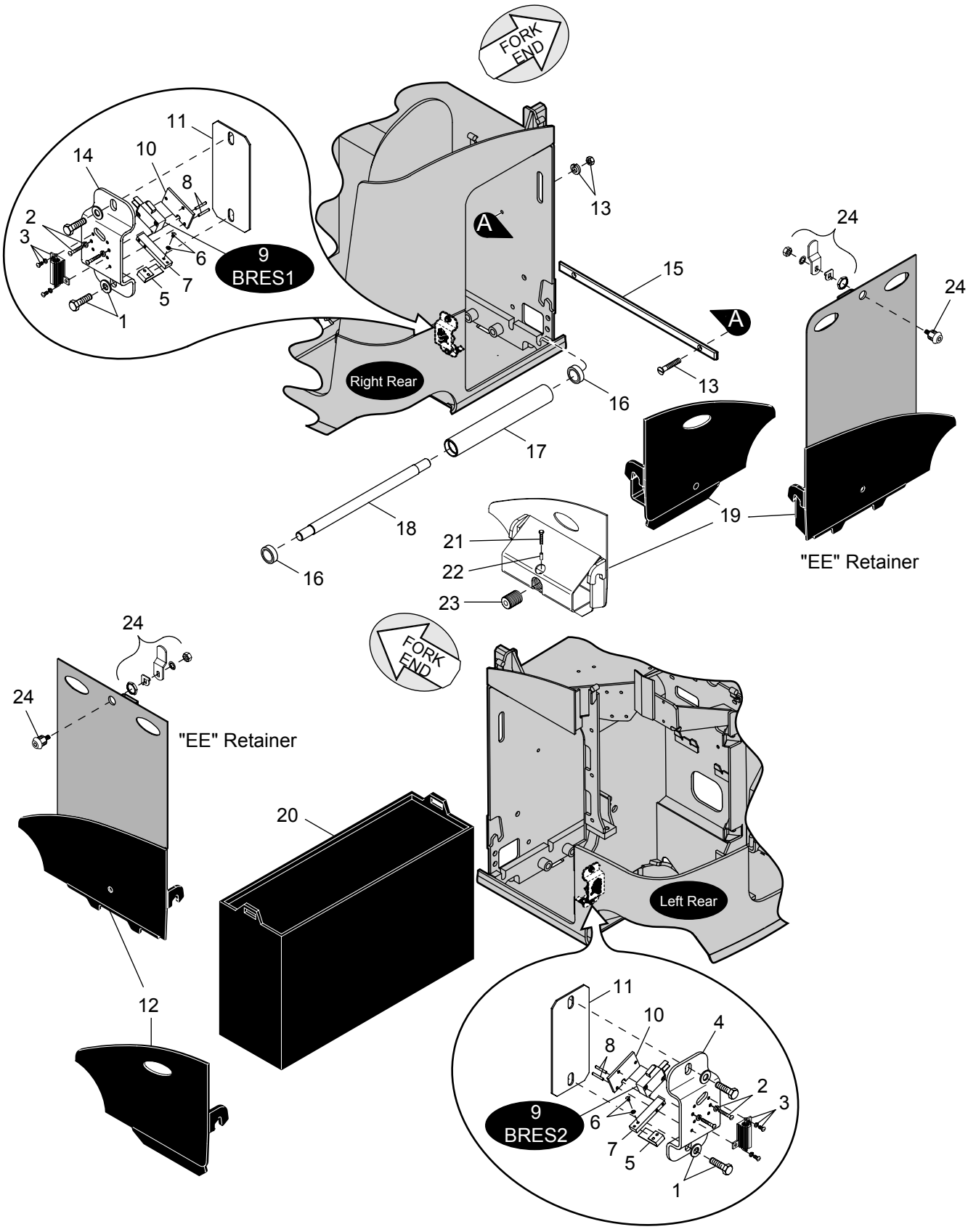
(4) Used on 1220 mm (48 in) Power Unit

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number

5900-03

RR/RD 5200



Index	Part No.	Part Name	No. Req.
1	060078-024	Screw	4
	060030-012	Flatwasher	4
2	060011-021	Screw	4
	060005-049	Lockwasher	4
3	119274-002	Resistor 24V F/C	2
	119274-003	Resistor 36V F/C	2
	060011-001	Screw	4
	060005-036	Lockwasher	4
4	123900	Bracket L.H.	1
5	123901	Spring Lever	2
6	060010-004	Screw	4
	060005-001	Lockwasher	4
7	123898	Lever	2
8	060000-046	Pin Roll	4
9	062683	Switch	2
10	123899	Retainer	2
11	123978	Insulator F/C	2
12	* See Note 1	Retainer L.H	1
	* See Note 1	Retainer L.H "EE"	1
13	* See Note 1	Screw	2
	* See Note 1	Lockwasher	2
	* See Note 1	Nut	2
14	123897	Bracket R.H.	1
15	* See Note 1	Spacer	1
16	065081-018	Bearing	†2
17	* 121618-001	Roller "A" Batt.	†1
	* 121618-002	Roller "B" Batt.	†1
	* 121618-003	Roller "C" Batt.	†1
	* 121618-004	Roller "D" Batt.	†1
	* 121618-005	Roller "E" Batt.	†1
18	* 121619-001	Shaft "A" Batt.	†1
	* 121619-002	Shaft "B" Batt.	†1
	* 121619-003	Shaft "C" Batt.	†1
	* 121619-004	Shaft "D" Batt.	†1
	* 121619-005	Shaft "E" Batt.	†1
	* 121620-001	Roller Asm. Includes 16, 17 & 18 "A" Batt.	†1
	* 121620-002	Roller Asm. Includes 16, 17 & 18 "B" Batt.	†1
	* 121620-003	Roller Asm. Includes 16, 17 & 18 "C" Batt.	†1
	* 121620-004	Roller Asm. Includes 16, 17 & 18 "D" Batt.	†1
	* 121620-005	Roller Asm. Includes 16, 17 & 18 "E" Batt.	†1

Index	Part No.	Part Name	No. Req.
19	* See Note 1	Retainer R.H.	1
	* See Note 1	Retainer R.H. "EE"	1
20	N/A	Battery	1
	078723-001	SB-350 Connector Gray	1
	078723-002	SB-175 Connector Gray	1
	078723-003	SB-350 Connector Red	1
	078723-004	SB-175 Connector Yellow	1
	078723-006	SB-350 Connector Blue	1
	078723-007	SB-175 Connector Red	1
	078723-008	SB-175 Connector Blue	1
	078723-009	SB-350 Connector Yellow	1
	078724-001	Contacts	2
21	060016-004	Screw	1
22	119218	Block	1
23	119219-002	Screw Battery Adjuster	1
24	126100	Lock & Key	2
	126174	Cam	2

Always Specify Model, Data & Serial Numbers

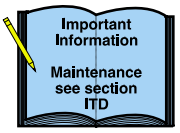
Note 1: See The Following Supplemental Forms

EE = Electrically Enclosed

† **No. Req. are for one (1) battery roller assembly. "A" "B", "C", "D" & "E" Size Battery compartments require four (4) battery roller assemblies.**

"A" Battery Compartment = 310 mm (12.19 in.)
"B" Battery Compartment = 360 mm (14.25 in.)
"C" Battery Compartment = 415 mm (16.25 in.)
"D" Battery Compartment = 455 mm (18.00 in.)
"E" Battery Compartment = 525 mm (20.75 in.)

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



Code No. (See Next Page)	* INDEX 12 Retainer L.H.	* INDEX 19 Retainer R.H.	* INDEX 15 Spacer (See Size Below)	* INDEX 13 (Qty. 2 required) Screw	Lockwasher	Nut
Models: RR 5210-35, 5210-40, 5220-35, & 5220-45 & RD 5220-30 1065 mm (42 in.) P/U						
01	**122288-001**	**127733-001**	Not Required		Not Required	
02	**122288-001**	**127733-006**	123168-002	060017-041	060005-009	060021-011
03	**122288-001**	**127733-006**	123168-006	060017-020	060005-009	060021-011
04	**122288-001**	**127733-001**	123168-006	060017-020	060005-009	060021-011
05	**122288-002**	**127733-002**	Not Required		Not Required	
06	**122288-002**	**127733-007**	Not Required		Not Required	
07	**122288-002**	**127733-002**	123168-004	060017-041	060005-009	060021-011
08	**122288-002**	**127733-007**	123168-005	060017-020	060005-009	060021-011
09	**122288-002**	**127733-002**	123168-005	060017-020	060005-009	060021-011
10	**122288-003**	**127733-003**	Not Required		Not Required	
11	**122288-003**	**127733-008**	Not Required		Not Required	
12	**122288-003**	**127733-008**	123168-004	060017-041	060005-009	060021-011
13	**122288-003**	**127733-003**	123168-007	060017-020	060005-009	060021-011
14	**122288-003**	**127733-003**	123168-002	060017-041	060005-009	060021-011
15	**122288-003**	**127733-003**	123168-004	060017-041	060005-009	060021-011
24	**122288-004**	**127733-004**	Not Required		Not Required	
25	**122288-004**	**127733-004**	123168-001	060017-069	060005-009	060021-011
26	**122288-004**	**127733-004**	Not Required		Not Required	
27	**122288-004**	**127733-004**	123168-001	060017-069	060005-009	060021-011
28	**122288-005**	**127733-005**	Not Required		Not Required	
29	**122288-005**	**127733-005**	123168-001	060017-069	060005-009	060021-011
30	**122288-005**	**127733-005**	123168-003	060017-041	060005-009	060021-011
31	**122288-005**	**127733-005**	123168-001	060017-069	060005-009	060021-011
32	**122288-005**	**127733-005**	123168-003	060017-041	060005-009	060021-011
(EE) Electrically Enclosed Models: RR 5220-35, RR 5220-45, & RD 5220-30 1065 mm (42 in.) P/U						
05 EE	126300	126301-001	Not Required		Not Required	
06 EE	126300	126301-002	Not Required		Not Required	
07 EE	126300	126301-001	123168-004	060017-041	060005-009	060021-011
08 EE	126300	126301-002	123168-005	060017-020	060005-009	060021-011
09 EE	126300	126301-001	123168-005	060017-020	060005-009	060021-011
10 EE	126051	126052-001	Not Required		Not Required	
11 EE	126051	126052-002	Not Required		Not Required	
12 EE	126051	126052-002	123168-004	060017-041	060005-009	060021-011
13 EE	126051	126052-001	123168-007	060017-020	060005-009	060021-011
14 EE	126051	126052-001	123168-002	060017-041	060005-009	060021-011
15 EE	126051	126052-001	123168-004	060017-041	060005-009	060021-011
24 EE	130239	130240	Not Required		Not Required	
25 EE	130239	130240	123168-001	060017-069	060005-009	060021-011
26 EE	130239	130240	Not Required		Not Required	
27 EE	130239	130240	123168-001	060017-069	060005-009	060021-011

*** Index 12 & 19, Retainer and Index 15, Spacer Part No. Dependent on Battery Code No.**

Spacer Sizes

Part Number	mm	in.
123168-001	32 x 940 x 6	1.25 x 37.0 x 0.25
123168-002	32 x 940 x 10	1.25 x 37.0 x 0.38
123168-003	32 x 940 x 13	1.25 x 37.0 x 0.50
123168-004	32 x 940 x 16	1.25 x 37.0 x 0.62
123168-005	32 x 940 x 22	1.25 x 37.0 x 0.88
123168-006	32 x 940 x 25	1.25 x 37.0 x 1.00
123168-007	32 x 940 x 29	1.25 x 37.0 x 1.12

CODE NO. - 24V

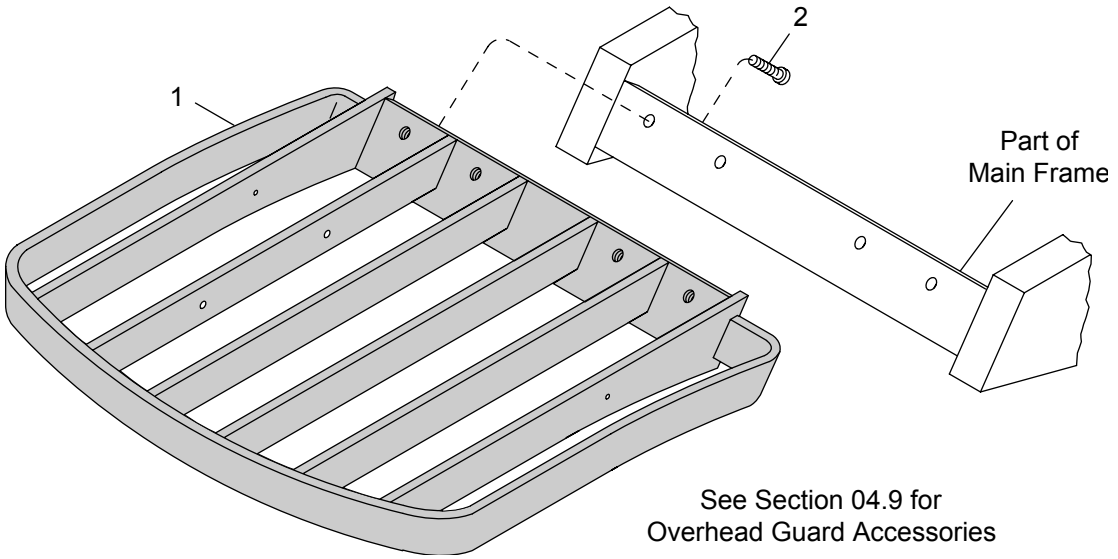
Code No.	Battery Comp. Size	Max. Battery Size +.00/-6.0 mm mm	Max. Battery Size +.00/-.25 in. in.	Amp Hour Range	Battery Wgt. Min. - Max. kg	Battery Wgt. Min. - Max. lbs.
01	A	310 x 975 x 785	12.19 x 38.38 x 31.00	700 - 840	560 - 850	1240 - 1870
02	A	300 x 925 x 785	11.75 x 36.38 x 31.00	520 - 680	560 - 850	1240 - 1870
03	A	280 x 900 x 785	11.12 x 35.38 x 31.00	580 - 640	560 - 850	1240 - 1870
05	B	360 x 975 x 785	14.25 x 38.38 x 31.00			
06	B	360 x 925 x 785	14.25 x 36.38 x 31.00	650 - 850	640 - 955	1410 - 2110
07	B	345 x 975 x 785	13.62 x 38.38 x 31.00	880	640 - 955	1410 - 2110
08	B	340 x 900 x 785	13.38 x 35.38 x 31.00	725 - 875	640 - 955	1410 - 2110
10	C	410 x 975 x 785	16.25 x 38.38 x 31.00			
11	C	410 x 925 x 785	16.25 x 36.38 x 31.00	780 - 1020	775 - 1090	1710 - 2400
12	C	400 x 900 x 785	15.62 x 35.38 x 31.00	870 - 960	775 - 1090	1710 - 2400
13	C	385 x 975 x 785	15.12 x 38.38 x 31.00	990 -1080	775 - 1090	1710 - 2400

CODE NO. - 36V

04	A	280 x 975 x 785	11.12 x 38.38 x 31.00	400 - 480	590 - 780	1305 - 1725
05	B	360 x 975 x 785	14.25 x 38.38 x 31.00			
07	B	360 x 975 x 785	14.25 x 38.38 x 31.00	500 - 550	725 - 950	1595 - 2090
09	B	360 x 975 x 785	14.25 x 38.38 x 31.00	550 - 600	725 - 950	1595 - 2090
10	C	410 x 975 x 785	16.25 x 38.38 x 31.00	600 - 720	850 - 1130	1880 - 2490
14	C	405 x 975 x 785	15.88 x 38.38 x 31.00	600 - 660	850 - 1175	1880 - 2585
15	C	400 x 975 x 785	15.62 x 38.38 x 31.00	660 - 720	850 - 1130	1880 - 2490
24	D	455 x 980 x 785	18.00 x 38.69 x 31.00	700 - 1000	960 - 1350	2120 - 2980
25	D	450 x 980 x 785	17.75 x 38.69 x 31.00	770 - 875	960 - 1270	2120 - 2800
26	D	455 x 975 x 785	18.00 x 38.44 x 31.00	770 - 1085	960 - 1350	2120 - 2980
27	D	450 x 975 x 785	17.75 x 38.44 x 31.00	770 - 875	960 - 1270	2120 - 2800
28	E525 x 980 x 785		20.75 x 38.69 x 31.00	880 - 1120	1090 - 1395	2400 - 3070
29	E520 x 980 x 785		20.50 x 38.69 x 31.00	840 - 1120	1090 - 1395	2400 - 3070
30	E515 x 980 x 785		20.25 x 38.69 x 31.00	800 -1000	1090 - 1395	2400 - 3070
31	E520 x 975 x 785		20.50 x 38.44 x 31.00	880 - 1000	1090 - 1395	2400 - 3070
32	E515 x 975 x 785		20.25 x 38.44 x 31.00	880 - 1000	1090 - 1395	2400 - 3070

5713

RR/RD 5200/5200S
RR/RD 5200(AC)/5200S(AC)



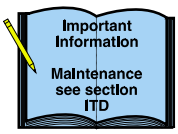
Index 1 – Overhead Guard

Overhead Guard	Guard with Center Spotlight	Guard with Wire Mesh Cover	Guard with Third Post	Battery Size	Compartment Width	
RR/RD 5200 Series						
122870-001	*N01551-001	*N01553-001	*N01554-001	A	310 mm	12.19 in.
122870-002	*N01551-002	*N01553-002	*N01554-002	B	360 mm	14.25 in.
122870-003	*N01551-003	*N01553-003	*N01554-003	C	415 mm	16.25 in.
122870-004	*N01551-004	*N01553-004	*N01554-004	D	455 mm	18.00 in.
122870-005	*N01551-005	*N01553-005	*N01554-005	E	525 mm	20.75 in.
RR/RD 5200S Series						
122870-006	*N01551-006	*N01553-006	*N01554-006	C	415 mm	16.25 in.
122870-008	*N01551-008	*N01553-008	*N01554-008	E	525 mm	20.75 in.

Index	Part No.	Part Name	No. Req.
2	060023-026	Screw	4
	061004-019	Adhesive Thread Lock	1

Always Specify Model, Data & Serial Numbers

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



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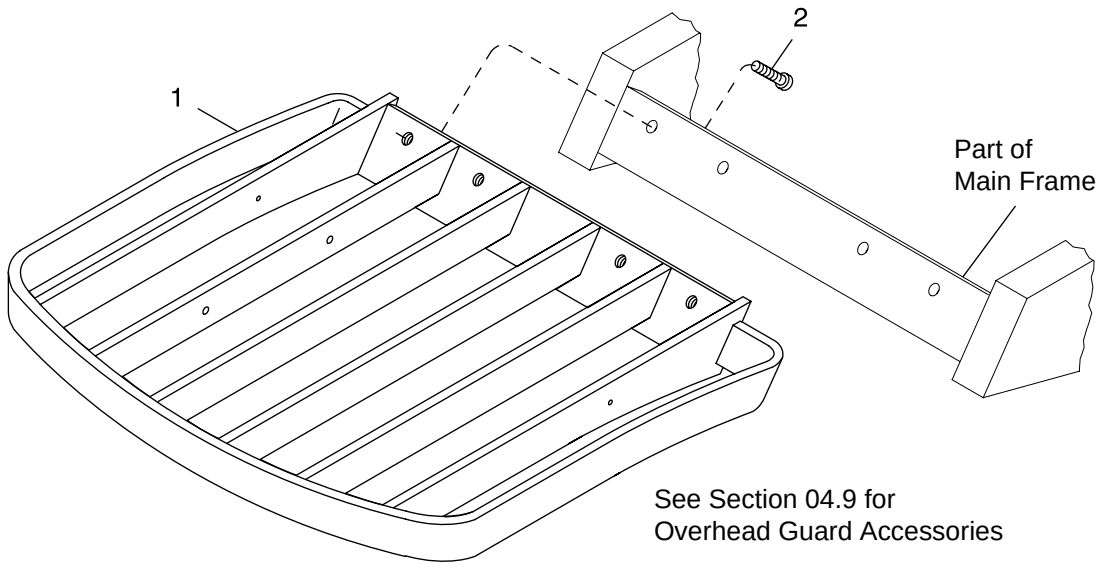


Figure 15630

*INDEX 1 OVERHEAD GUARD CHART 1						
Overhead Guard	Overhead Guard & Work Assist	Overhead Guard & Work Light	Overhead Guard Work Light & RF Terminal Mount	Overhead Guard Work Light & Work Assist	Battery Size	Battery Compt. Size
RR/RD 5200 SERIES						
139740-001	140286-000-21	140286-001-01	140286-001-11	140286-001-21	A	310 mm (12.19 in)
139740-002	140286-000-22	140286-001-02	140286-001-12	140286-001-22	B	360 mm (14.25 in)
139740-003	140286-000-23	140286-001-03	140286-001-13	140286-001-23	C	415 mm (16.25 in)
139740-004	140286-000-24	140286-001-04	140286-001-14	140286-001-24	D	455 mm (18.00 in)
139740-005	140286-000-25	140286-001-05	140286-001-15	140286-001-25	E	525 mm (20.75 in)
RR/RD 5200S SERIES						
139791-003	140286-000-26	140286-001-06	140286-001-16	140286-001-26	C	415 mm (16.25 in)
139791-004	140286-000-27	140286-001-07	140286-001-17	140286-001-27	D	455 mm (18.00 in)
139791-005	140286-000-28	140286-001-08	140286-001-18	140286-001-28	E	525 mm (18.00 in)

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

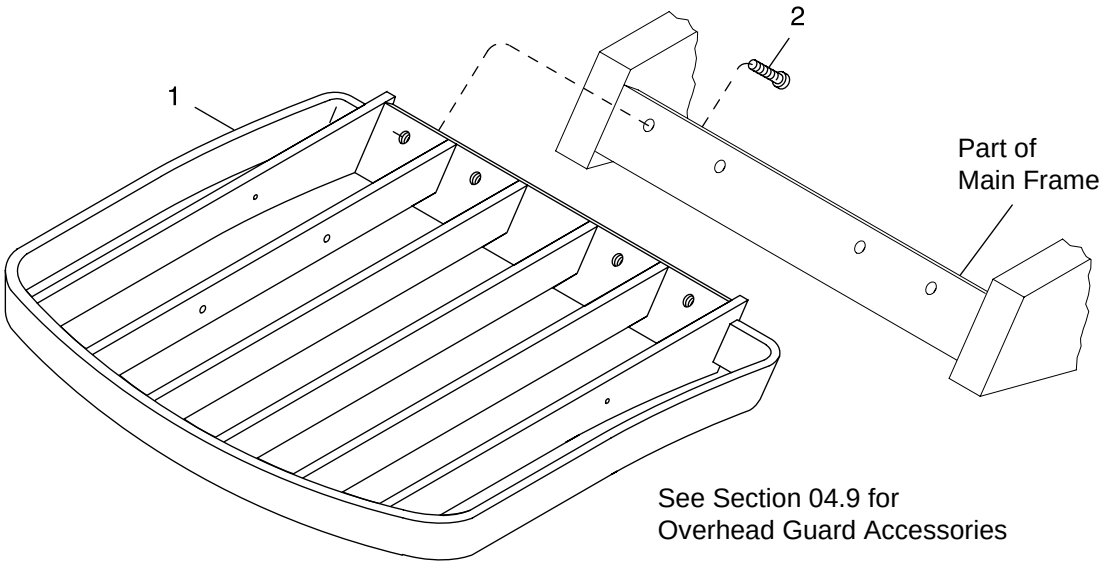


Figure 15630

*INDEX 1 OVERHEAD GUARD CHART 2				
Overhead Guard & Wire Mesh Cover	Overhead Guard Wire Mesh Cover & RF Terminal Mount	Overhead Guard Wire Mesh Cover & Work Assist	Battery Size	Battery Compartment Size
RR/RD 5200 SERIES				
140286-010-01	140286-010-11	140286-010-21	A	310 mm (12.19 in)
140286-010-02	140286-010-12	140286-010-22	B	360 mm (14.25 in)
140286-010-03	140286-010-13	140286-010-23	C	415 mm (16.25 in)
140286-010-04	140286-010-14	140286-010-24	D	455 mm (18.00 in)
140286-010-05	140286-010-15	140286-010-25	E	525 mm (20.75 in)
RR/RD 5200S SERIES				
140286-010-06	140286-010-16	140286-010-26	C	415 mm (16.25 in)
140286-010-07	140286-010-17	140286-010-27	D	455 mm (18.00 in)
140286-010-08	140286-010-18	140286-010-28	E	525 mm (18.00 in)

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

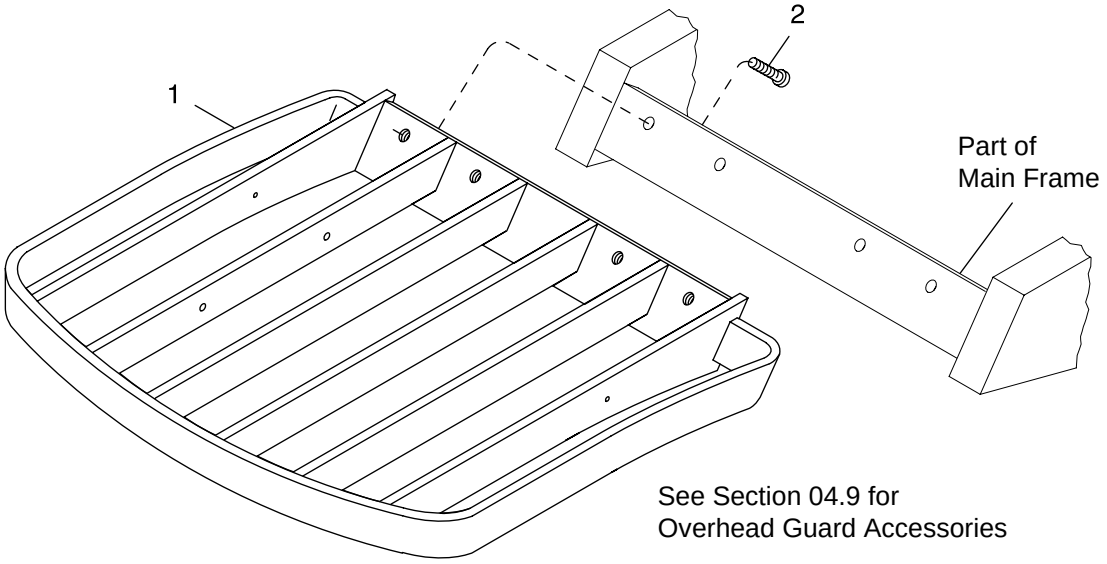


Figure 15630

INDEX PART NUMBER PART NAME NUMBER REQUIRED

*INDEX 1 OVERHEAD GUARD CHART 3				
Overhead Guard Wire Mesh Cover & Work Light	Overhead Guard Wire Mesh Cover Work Light & RF Terminal Mount	Overhead Guard Wire Mesh Cover Work Light & Work Assist	Battery Size	Battery Compartment Size
RR/RD 5200 SERIES				
140286-011-01	140286-011-11	140286-011-21	A	310 mm (12.19 in)
140286-011-02	140286-011-12	140286-011-22	B	360 mm (14.25 in)
140286-011-03	140286-011-13	140286-011-23	C	415 mm (16.25 in)
140286-011-04	140286-011-14	140286-011-24	D	455 mm (18.00 in)
140286-011-05	140286-011-15	140286-011-25	E	525 mm (20.75 in)
RR/RD 5200S SERIES				
140286-011-06	140286-011-16	140286-011-26	C	415 mm (16.25 in)
140286-011-07	140286-011-17	140286-011-27	D	455 mm (18.00 in)
140286-011-08	140286-011-18	140286-011-28	E	525 mm (18.00 in)

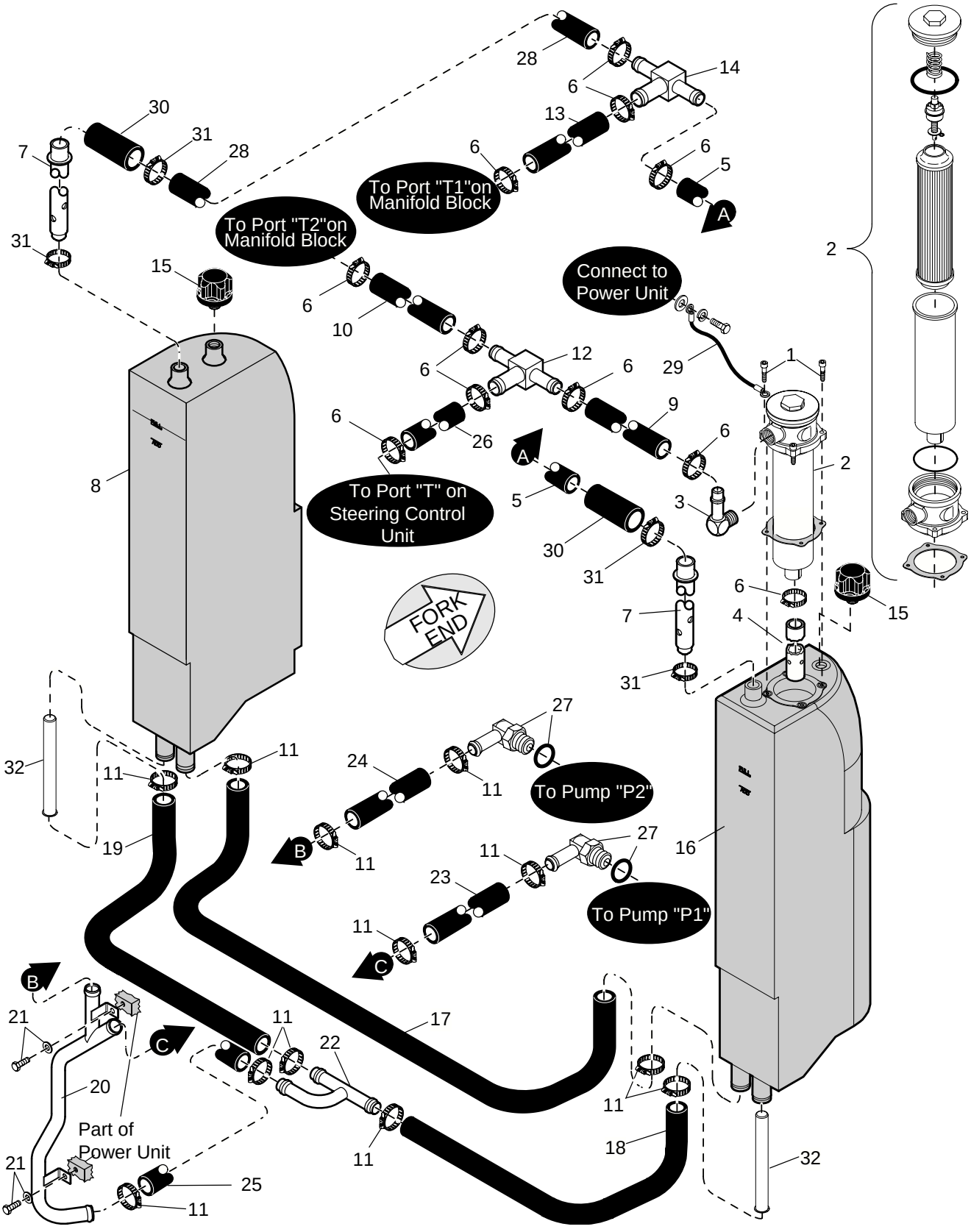
2 . . . . . 060023-026. . . . . Screw 6
061004-019. . . . . Thread Lock Adhesive 1

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number

5824-06

RR/RD 5200
RR/RD 5200 (AC)

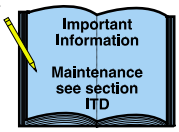


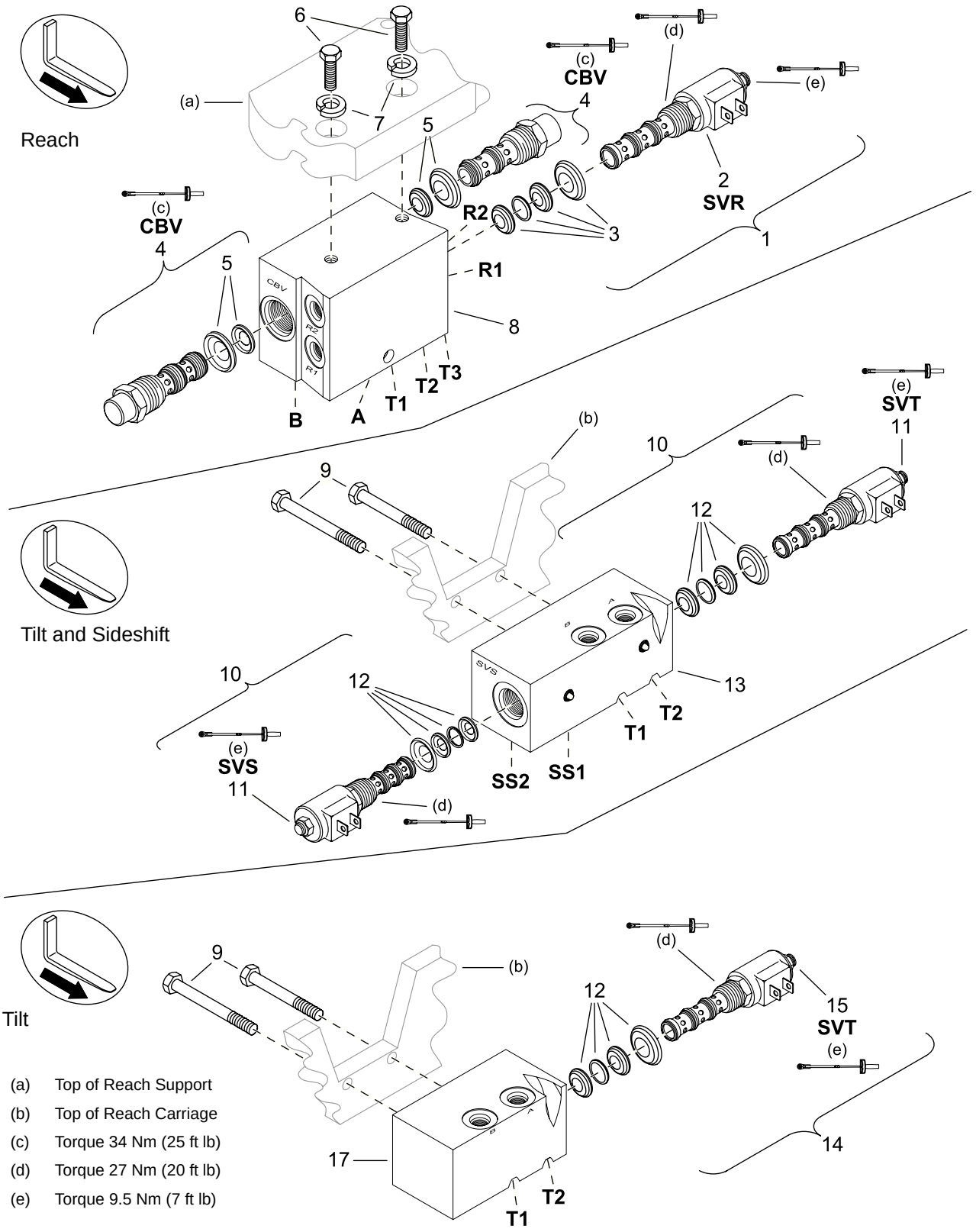
Index	Part No.	Part Name	No. Req.
1	060014-089	Screw	4
2	127740	Filter Assembly (Includes Cap, Spring, O-Rings, By-Pass, Filter Element, Tank, Tank Gasket & Housing)	1
	127741	Filter Element	1
	128005	O-Ring Kit (Includes Both O-Rings & Tank Gasket)	1
	128292	Cap	1
	128293	By-Pass	1
3	064143-001	Hose Nipple Includes O-Ring	1
	064019-030	O-Ring	1
4	127915	Tube Drop	1
5	064100-101	Hose "A" Battery	1
	064100-103	Hose "B, C, D & E" Battery	1
6	061022-003	Clamp Hose	AR
7	122338	Tube	2
8	121872	Reservoir LH	1
9	064100-107	Hose "A" Battery	1
	064100-108	Hose "B" Battery	1
	064100-110	Hose "C" Battery	1
	064100-110	Hose "D" Battery	1
	064100-111	Hose "E" Battery	1
10	064100-104	Hose "A" Battery	1
	064100-106	Hose "B, C, D & E" Battery	1
11	061022-001	Clamp Hose	AR
12	064270-002	Tee	1
13	064100-098	Hose "A" Battery	1
	064100-114	Hose "B" Battery	1
	064100-115	Hose "C" Battery	1
	064100-116	Hose "D" Battery	1
	064100-117	Hose "E" Battery	1
14	064270-001	Tee	1
15	127742	Breather	2
16	127901	Reservoir RH	1
17	123283	Hose	1
18	123327	Hose RH	1
19	123284	Hose LH	1
20	123285	Tube Suction 2 Pumps 5220	1
	123286	Tube Suction 1 Pump 5210	1
21	060078-024	Screw	2
	060030-010	Flatwasher	2
22	122341	Tee	1
23	064173-024	Hose Suction 1 Pump 5210	1
	064173-022	Hose Suction 2 Pumps 5220	1
24	064173-025	Hose 2 Pumps Only	1
25	064173-022	Hose "A, B & C" Battery	1
	064173-026	Hose "D & E" Battery	1
26	064100-112	Hose "A" Battery	1
	064100-113	Hose "B, C, D & E" Battery	1
27	064143-003	Fitting Beaded	AR
	064019-075	O-Ring	AR
28	064100-099	Hose "A" Battery	1
	064100-100	Hose "B, C, D & E" Battery	1
29	085653-347	Wire Ground	1
30	127706	Tube	2
31	061022-010	Clamp Hose	AR
32	128903	Strainer	2

Always Specify Model, Data & Serial Numbers

"A" Battery Compartment = 280 mm (11.12 in.)
"B" Battery Compartment = 360 mm (14.25 in.)
"C" Battery Compartment = 415 mm (16.25 in.)
"D" Battery Compartment = 460 mm (18.11 in.)
"E" Battery Compartment = 530 mm (20.75 in.)

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.





(a) Top of Reach Support
(b) Top of Reach Carriage
(c) Torque 34 Nm (25 ft lb)
(d) Torque 27 Nm (20 ft lb)
(e) Torque 9.5 Nm (7 ft lb)

Figure 19503-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	122167-001	Solenoid Valve Assembly	1
2	104164-015	Coil 24 V	1
3	123977	Seal Kit	1
4	121819	Check Valve	2
5	111790-002	Seal Kit	1
6	060016-088	Screw	2
7	060005-008	Lockwasher	2
8	125928	Manifold Block Assembly (includes expansion plugs)	1
9	060015-064*	Screw	1
	060015-069	Screw	1
10	122167-001*	Solenoid Valve Assembly	2
11	104164-015	Coil 24 V	1
12	123977	Seal Kit	1
13	125929*	Manifold Block Assembly (includes expansion plugs)	1
14	122167-001	Solenoid Valve Assembly	1
15	104164-015	Coil 24 V	1
16	123977	Seal Kit	1
17	122172*	Manifold Block Assembly (includes expansion plugs)	1

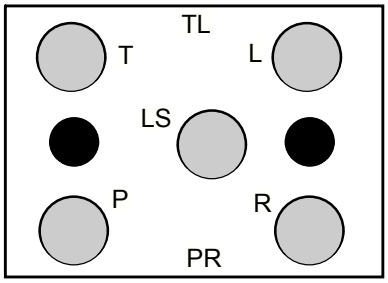
Note: Regardless of truck battery voltage, the ACCESS 123 system powers solenoids with 24 V.

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

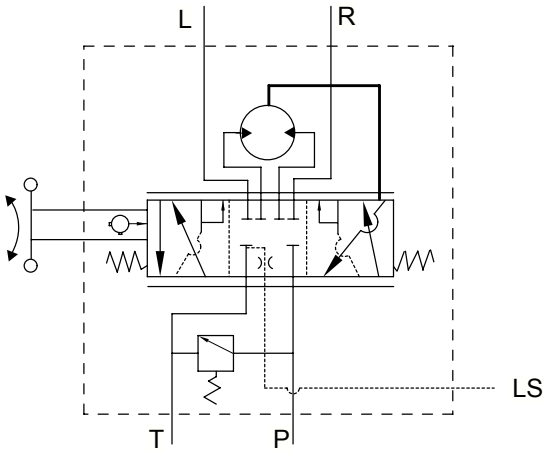
Always Specify Model, Data & Serial Number

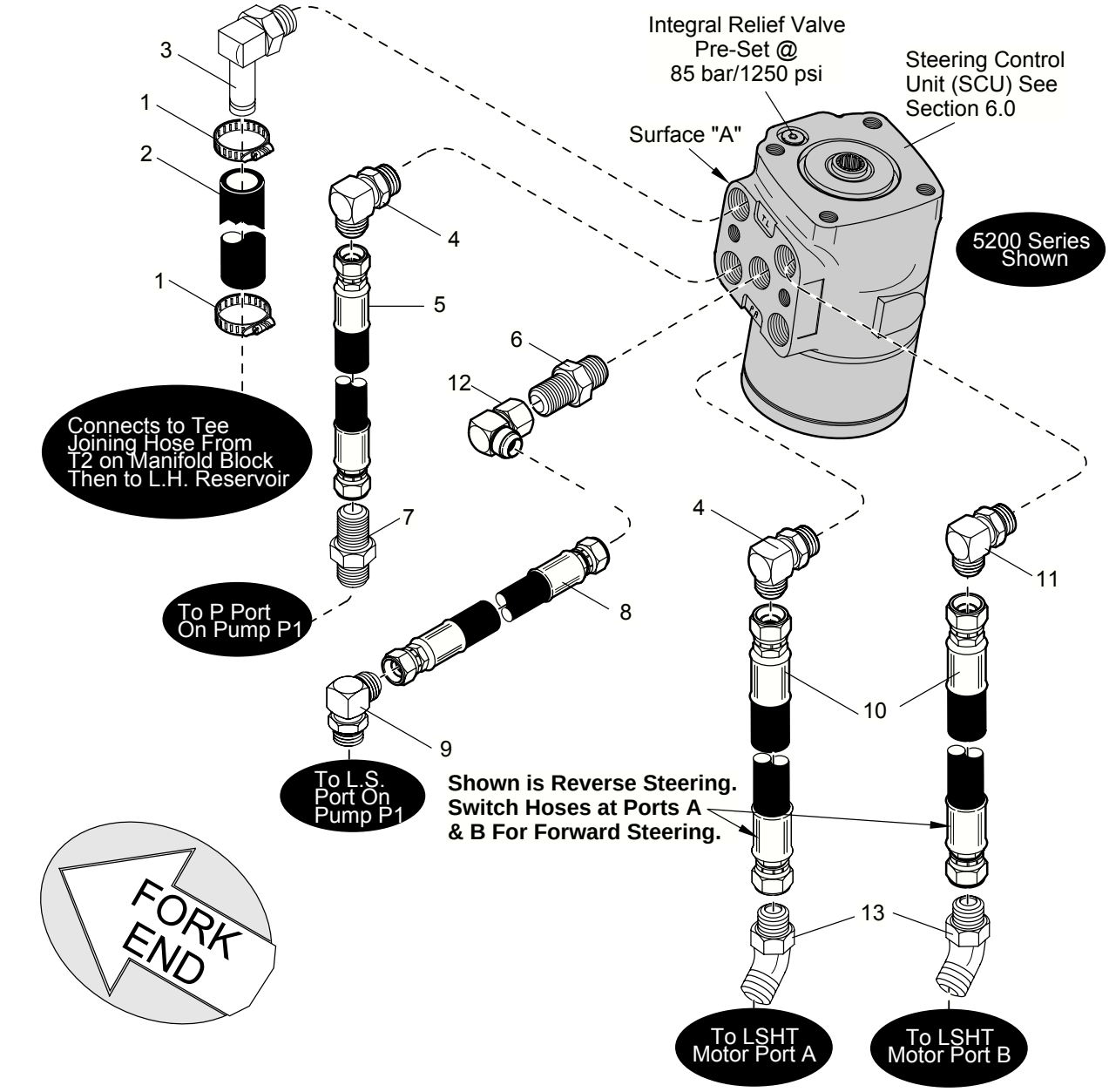
5830-02

RR/RD 5200/5200S



Surface "A"



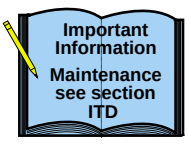


Index	Part No.	Part Name	No. Req.
1	061022-003	Clamp	2
2 *	064100-112	Hose “A” Battery	1
*	064100-113	Hose “B, C, D, E” Battery	1
	064100-118	Hose 5200S	1
3	064143-012	Elbow Beaded Includes O-Ring	1
	064143-013	Elbow Beaded 5200S Includes O-Ring	1
	064019-075	O-Ring	1
4	064061-002	Elbow Includes O-Ring	2
	064019-029	O-Ring	2
506425	4-257	Hose	1
	064103-070	Hose 5200S	1
6	064004-007	Connector Includes O-Ring	1
	064019-031	O-Ring	1
7	064004-004	Connector Includes O-Ring	1
	064019-030	O-Ring	1
	064061-009	Elbow 5200S Includes O-Ring	1
	064019-003	O-Ring	1
8	064252-038	Hose	1
	064103-071	Hose 5200S	1
9	064061-004	Elbow Includes O-Ring	1
	064019-031	O-Ring	1
10	064254-256	Hose	2
	064254-256	Hose “L” 5200S	1
	064254-259	Hose “R” 5200S	1
11	064061-002	Elbow Includes O-Ring	1
	064019-029	O-Ring	1
	064061-002	Elbow 5200S Includes O-Ring	1
	064019-029	O-Ring	1
12	064065-003	Elbow Swivel	1
13	064098-002	Elbow Includes O-Ring	2
	064019-029	O-Ring	2
	064061-002	Elbow 5200S Includes O-Ring	2
	064019-029	O-Ring	1

Always Specify Model, Data & Serial Numbers

“A” Battery Compartment = 280 mm (11.12 in.)
“B” Battery Compartment = 360 mm (14.25 in.)
“C” Battery Compartment = 415 mm (16.25 in.)
“D” Battery Compartment = 460 mm (18.00 in.)
“E” Battery Compartment = 530 mm (20.75 in.)

* Choice of part number depends on battery compartment size. Battery compartment size information is included in the truck data number (located on truck data plate).



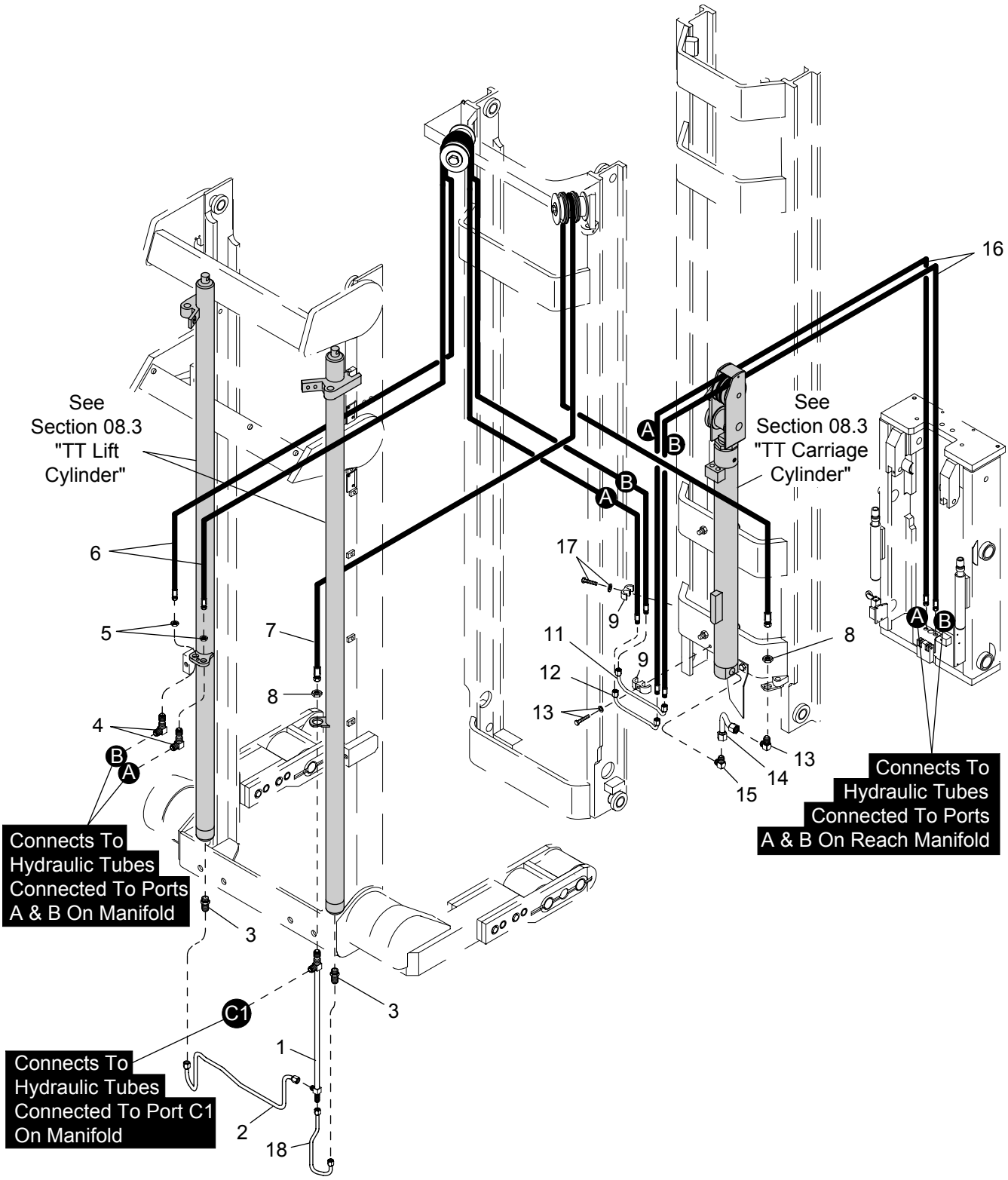
Truck Data Number Example

Battery Compartment Size

-TT270C36-2PSF-BS-Q--

6773

RR/RD 5200/5200S

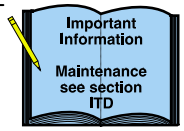


Index	Part No.	Part Name	No. Req.
1	126130	Tube	1
2	121856	Tube	1
3	064090-004	Connector Long	2
	064019-030	O-Ring	2
4	064034-002	Fitting Bulkhead	2
5	064030-003	Nut Bulkhead	2
6	* See Note 1	Hose	2
	061004-023	Sealant Hydraulic 10cc	1
7	* See Note 1	Hose	1
	061004-023	Sealant Hydraulic 10cc	1
8	064030-010	Nut Bulkhead	3
9	123281	Clamp	2
10	060015-048	Screw	1
	060005-007	Lockwasher	1
11	121729	Tube	1
12	121728	Tube	1
13	064097-004	Union Elbow	1
14	121737	Tube	1
15	064061-016	Elbow 90°	1
	064019-075	O-Ring	1
16	* See Note 1	Hose	2
	061004-023	Sealant Hydraulic 10cc	1
17	060015-049	Screw	1
	060042-006	Nut Self Locking	1
18	126129	Tube	1

Note 1: See The Following Supplemental List

Always Specify Model, Data & Serial Numbers

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



INDEX 6 - HOSE ASSEMBLY

Part No.	Collapsed Height/Lift Height mm	in.	No. Req.
064254-204	2260/5025	89/198	2
064254-205	2415/5335	95/210	2
064254-206	2720/6100	107/240	2
064254-207	3025/6860	119/270	2
064254-208	3325/7620	131/300	2
064254-209	3555/8155	140/321	2
064254-210	3785/8660	149/341	2
064254-211	4065/9300	160/366	2
064254-212	4370/10160	172/400	2
064254-309	4520/10695	178/421	2

INDEX 7 - HOSE ASSEMBLY

064263-001	2260/5025	89/198	1
064263-002	2415/5335	95/210	1
064263-003	2720/6100	107/240	1
064263-004	3025/6860	119/270	1
064263-005	3325/7620	131/300	1
064263-006	3555/8155	140/321	1
064263-007	3785/8660	149/341	1
064263-008	4065/9300	160/366	1
064263-009	4370/10160	172/400	1
064263-010	4520/10695	178/421	1

INDEX 16 - HOSE ASSEMBLY

064254-214	2260/5025	89/198	2
064254-215	2415/5335	95/210	2
064254-216	2720/6100	107/240	2
064254-217	3025/6860	119/270	2
064254-218	3325/7620	131/300	2
064254-219	3555/8155	140/321	2
064254-220	3785/8660	149/341	2
064254-221	4065/9300	160/366	2
064254-222	4370/10160	172/400	2
064254-310	4520/10695	178/421	2

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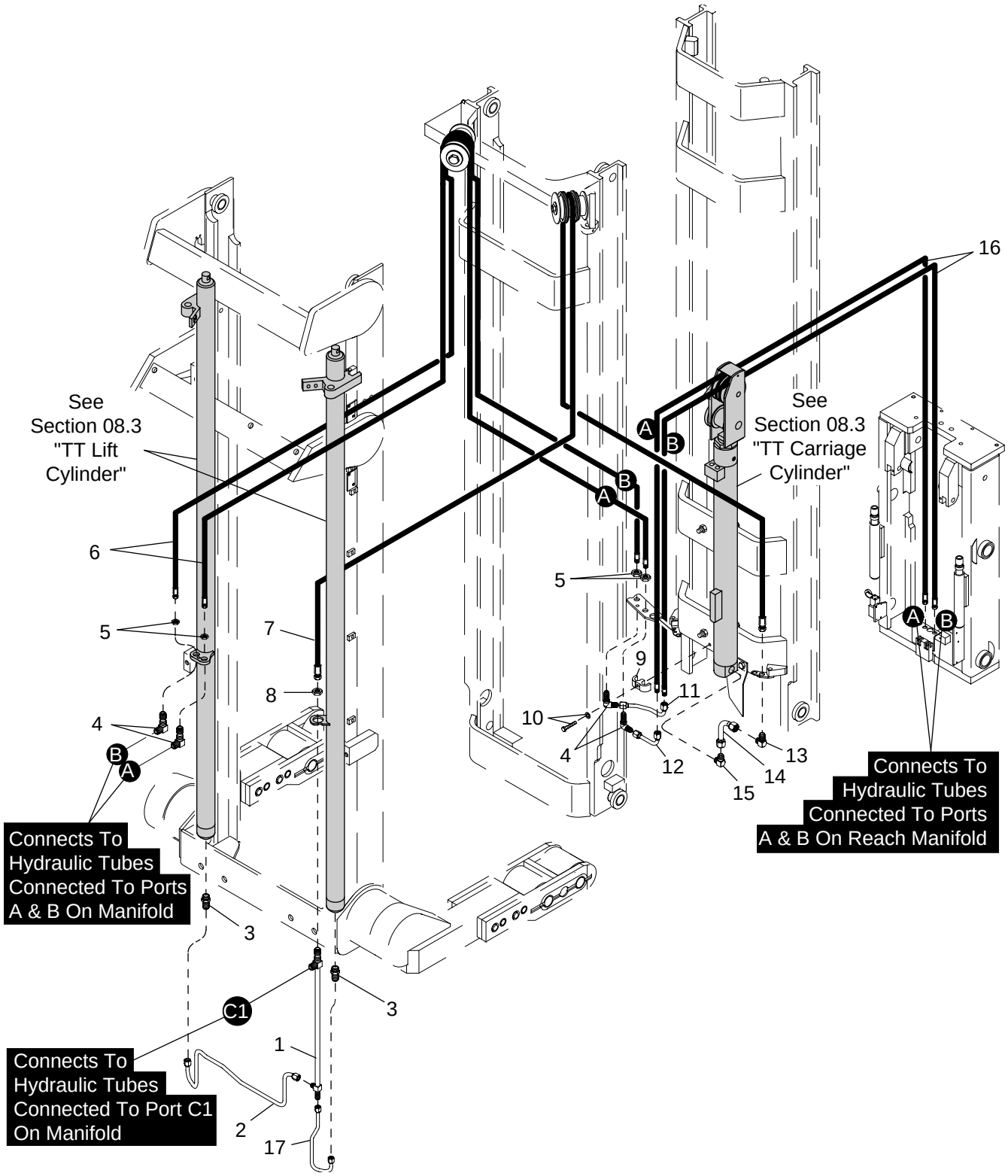
10659

RR/RD 5200/5200S
RR/RD 5200 (AC)/5200S (AC)

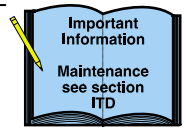


Index	Part No.	Part Name	No. Req.
1	126130	Tube	1
2	129081	Tube	1
3	064090-004	Connector Long	2
	064019-030	O-Ring	2
4	064034-002	Fitting Bulkhead	4
5	064030-003	Nut Bulkhead	4
6	* See Note 1	Hose	2
	061004-023	Sealant Hydraulic 10cc	1
7	* See Note 1	Hose	1
	061004-023	Sealant Hydraulic 10cc	1
8	064030-010	Nut Bulkhead	1
9	123281	Clamp	1
10	060015-048	Screw	1
	060005-007	Lockwasher	1
11	129086	Tube	1
12	129085	Tube	1
13	064097-004	Union Elbow	1
14	129084	Tube	1
15	064061-016	Elbow 90°	1
	064019-075	O-Ring	1
16	* See Note 1	Hose	2
	061004-023	Sealant Hydraulic 10cc	1
17	129083	Tube	1

Note 1: See The Following Supplemental List

Always Specify Model, Data & Serial Numbers

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



INDEX 6 - HOSE ASSEMBLY

Part No.	Collapsed Height/Lift Height mm	in.	No. Req.
064254-287	2260/5025	89/198	2
064254-288	2415/5335	95/210	2
064254-289	2720/6100	107/240	2
064254-290	3025/6860	119/270	2
064254-291	3325/7620	131/300	2
064254-292	3555/8155	140/321	2
064254-293	3785/8660	149/341	2
064254-294	4065/9300	160/366	2
064254-295	4370/10160	172/400	2

INDEX 7 - HOSE ASSEMBLY

064263-001	2260/5025	89/198	1
064263-002	2415/5335	95/210	1
064263-003	2720/6100	107/240	1
064263-004	3025/6860	119/270	1
064263-005	3325/7620	131/300	1
064263-006	3555/8155	140/321	1
064263-007	3785/8660	149/341	1
064263-008	4065/9300	160/366	1
064263-009	4370/10160	172/400	1

INDEX 16 - HOSE ASSEMBLY

064254-214	2260/5025	89/198	2
064254-215	2415/5335	95/210	2
064254-216	2720/6100	107/240	2
064254-217	3025/6860	119/270	2
064254-218	3325/7620	131/300	2
064254-219	3555/8155	140/321	2
064254-220	3785/8660	149/341	2
064254-221	4065/9300	160/366	2
064254-222	4370/10160	172/400	2

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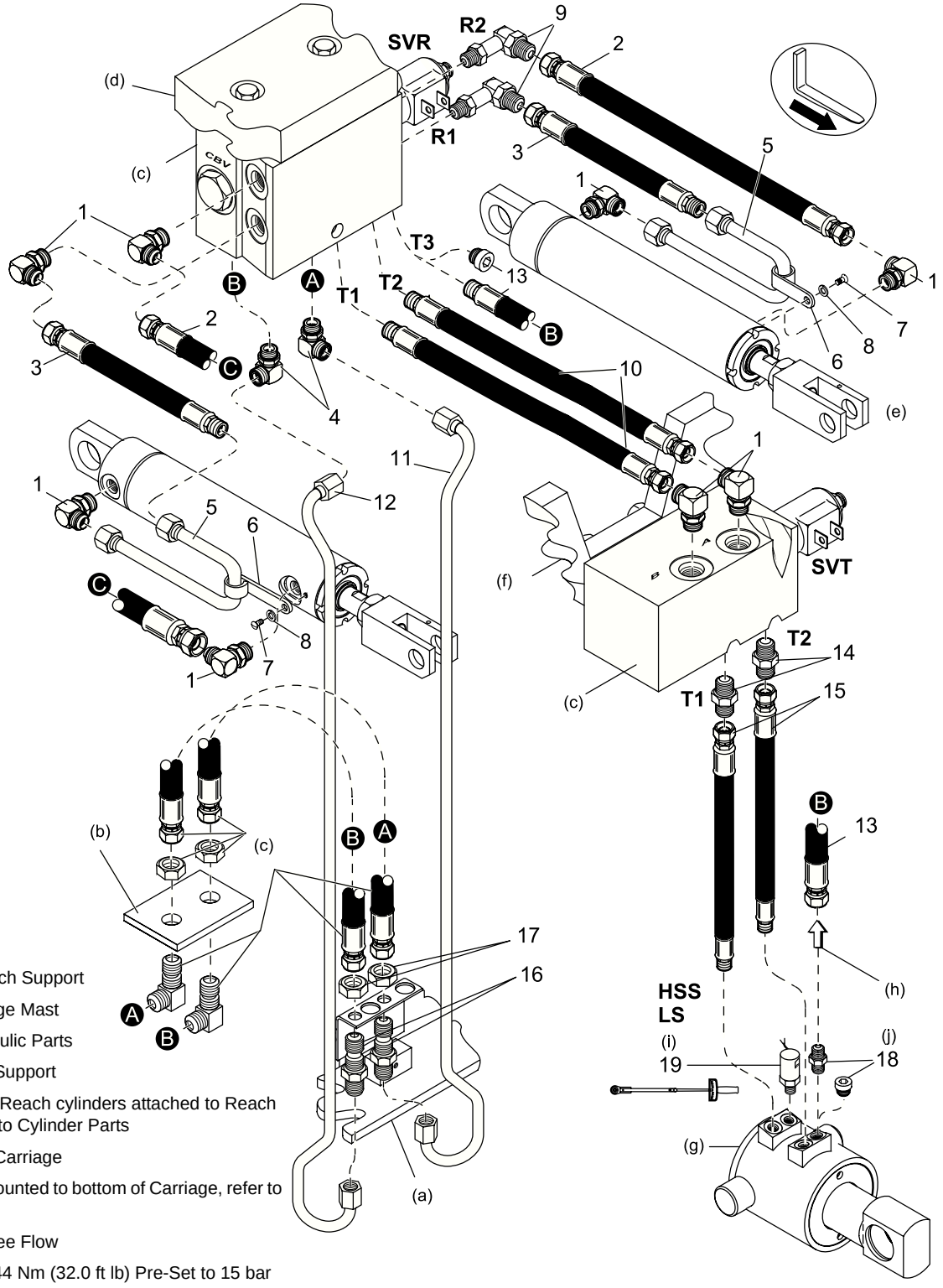


(a) Bottom of Reach Support

(b) Part of 1st Stage Mast

(c) Refer to Hydraulic Parts

(d) Top of Reach Support

(e) Left and Right Reach cylinders attached to Reach Support, refer to Cylinder Parts

(f) Top of Reach Carriage

(g) Tilt Cylinder mounted to bottom of Carriage, refer to Cylinder Parts

(h) Direction of Free Flow

(i) Torque Value 44 Nm (32.0 ft lb) Pre-Set to 15 bar (225 psi)

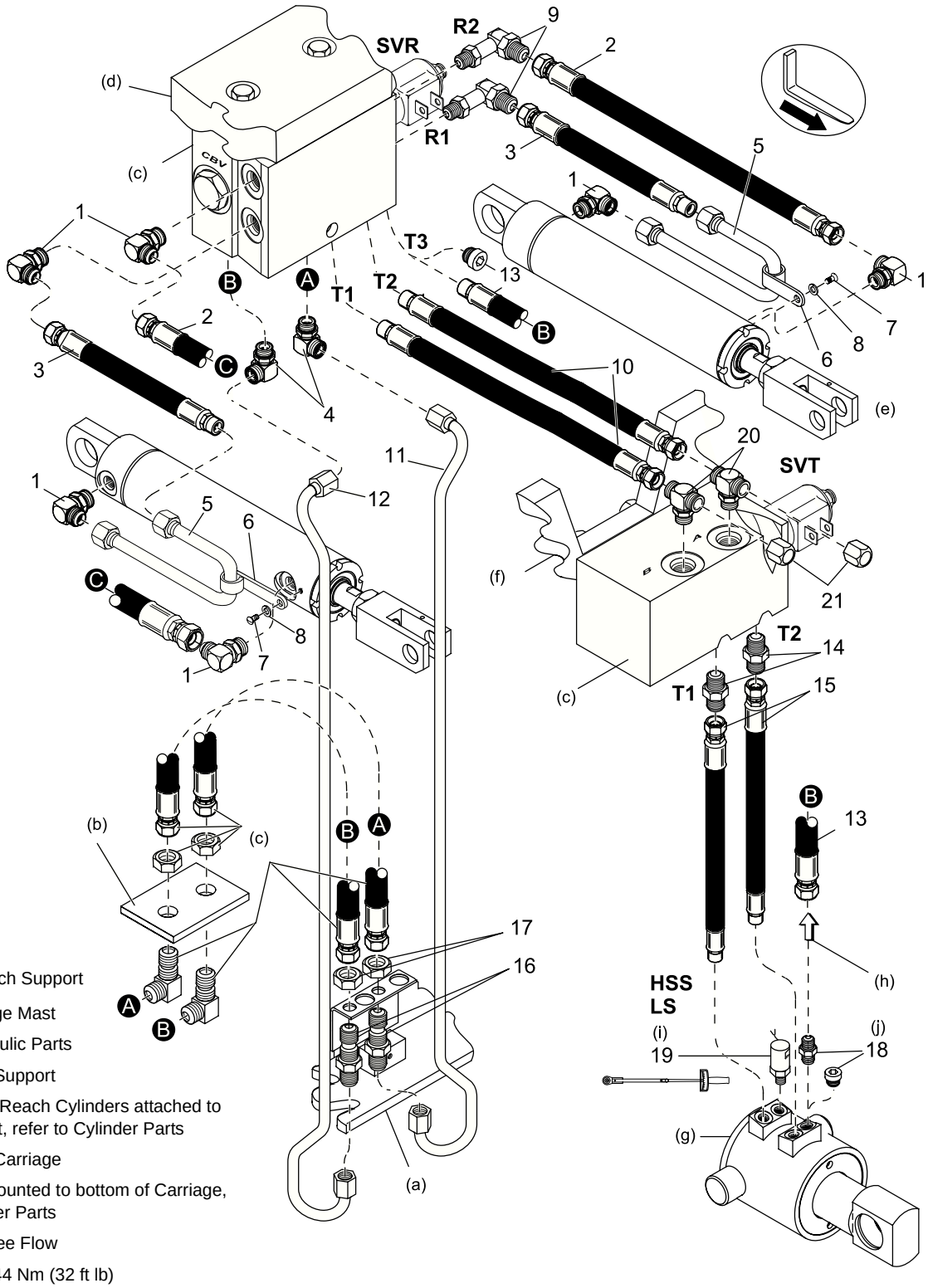
(j) Crack Pressure 0.345 bar (5 psi)

Figure 19504

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	064061-004	Elbow	8
	064019-031	O-ring	16
2	064252-042	Hose RR	1
	064252-044	Hose RD	1
3	064252-041	Hose RR	1
	064252-043	Hose RD	1
4	064061-001	Elbow	2
	064019-031	O-ring	2
5	077389-003	Tube RR	2
	077389-004	Tube RD	2
6	061002-001	Clamp	2
7	060013-002	Screw	2
8	060005-004	Lockwasher	2
9	064171-004	Elbow	2
	064019-031	O-ring	2
10	064253-079	Hose RR	2
	064253-080	Hose RD	2
11	122277	Left Hand Tube Capacity 1588 kg (3500 lb) RR	1
	122242	Left Hand Tube Capacity 2040 kg (4500 lb) RR, 1360 kg (3000 lb) RD	1
12	122276	Right Hand Tube Capacity 1588 kg (3500 lb) RR	1
	122241	Right Hand Tube Capacity 2040 kg (4500 lb) RR, 1360 kg (3000 lb) RD	1
13	064253-071*	Hose RR (with Load Sense Option)	1
	064253-072*	Hose RD (with Load Sense Option)	1
14	064004-007	Connector	2
	064019-031	O-ring	2
15	064253-081	Hose RR or RD	2
	064019-031	O-ring	2
16	064033-002	Bulkhead Connector	2
17	064030-003	Nut	2
18	122493*	Check Valve Crack Pressure	1
	064091-002*	Plug (not shown)	1
	064019-029	O-ring	1
19	123888*	Pressure Switch	1
	126512*	Pressure Sensor Transducer assembly (with Capacity Data Monitor)	1
	126491*	Pressure Sensor Transducer	1
	062007-050	Terminal	1
	062007-063	Terminal	1
	064091-006	Plug (not shown)	1
	064019-031	O-ring	1
	124000-001	Harness (Tilt, SS, LS) RR	1
	124000-002	Harness (Tilt, SS, LS) RD	1

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number



(a) Bottom of Reach Support

(b) Part of 1st Stage Mast

(c) Refer to Hydraulic Parts

(d) Top of Reach Support

(e) Left and Right Reach Cylinders attached to Reach Support, refer to Cylinder Parts

(f) Top of Reach Carriage

(g) Tilt Cylinder mounted to bottom of Carriage, refer to Cylinder Parts

(h) Direction of Free Flow

(i) Torque Value 44 Nm (32 ft lb)
Pre-Set to 15 bar (225 psi)

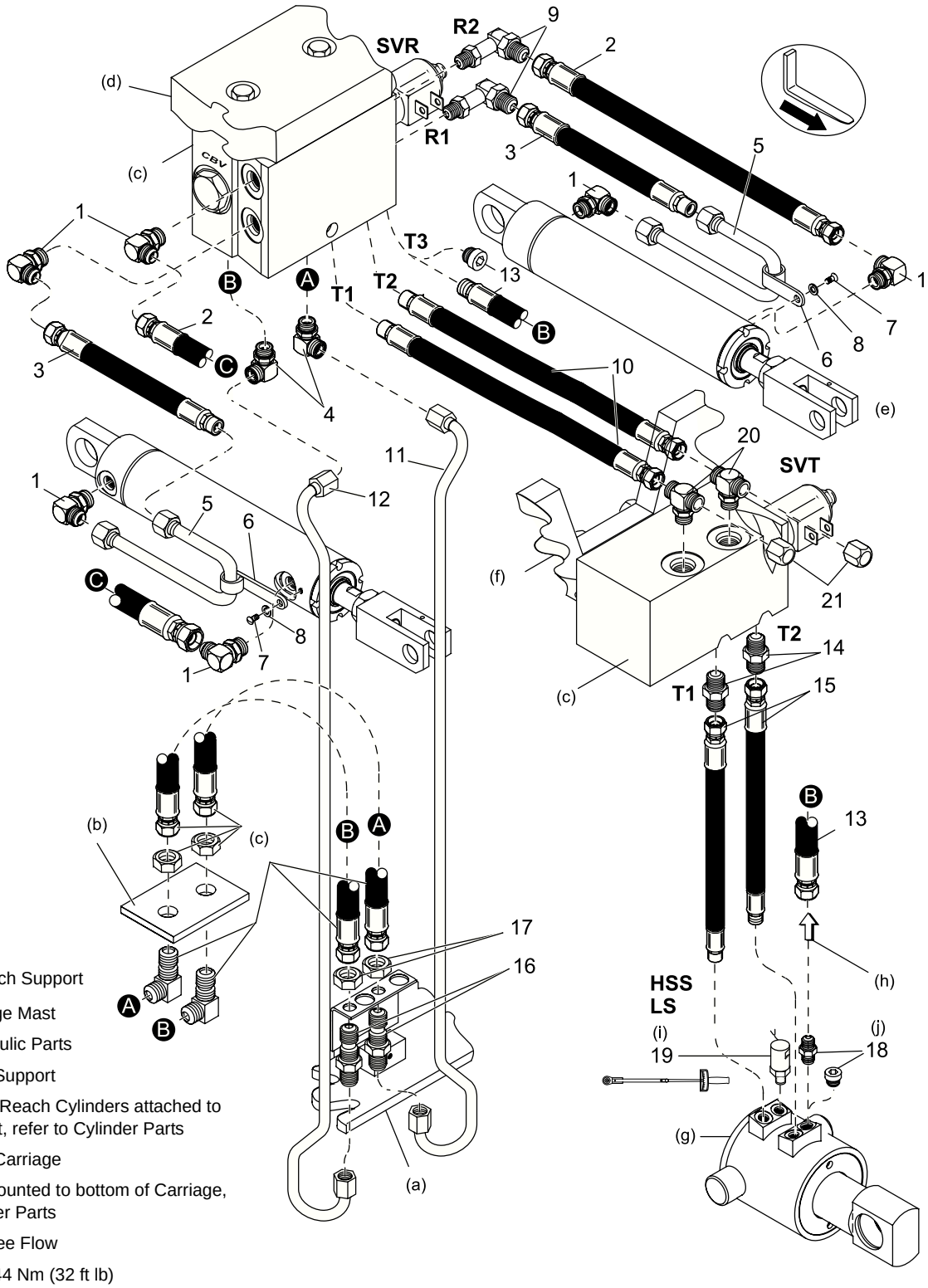
(j) Crack Pressure 0.345 bar (5 psi)

Figure 19356

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	064061-004	Elbow	6
	064019-031	O-ring	12
2	064252-042	Hose RR	1
	064252-044	Hose RD	1
3	064252-041	Hose RR	1
	064252-043	Hose RD	1
4	064061-001	Elbow	2
	064019-031	O-ring	2
5	077389-003	Tube RR	2
	077389-005	Tube RD	2
6	061002-001	Clamp	2
7	060013-002	Screw	2
8	060005-004	Lockwasher	2
9	064171-004	Elbow	2
	064019-031	O-ring	2
10	064253-079	Hose RR	2
	064253-080	Hose RD	2
11	122277	Left Hand Tube Capacity 1588 kg (3500 lb) RR	1
	122242	Left Hand Tube Capacity 2040 kg (4500 lb) RR, 1360 kg (3000 lb) RD	1
12	122276	Right Hand Tube Capacity 1588 kg (3500 lb) RR	1
	122241	Right Hand Tube Capacity 2040 kg (4500 lb) RR, 1360 kg (3000 lb) RD	1
13	064253-071*	Hose RR (with Load Sense Option)	1
	064253-072*	Hose RD (with Load Sense Option)	1
	064091-006*	Plug (without Load Sense Option)	1
	064019-029	O-ring	1
14	064004-007	Connector	2
	064019-031	O-ring	2
15	064253-081	Hose RR or RD	2
	064019-031	O-ring	2
16	064033-002	Bulkhead Connector	2
17	064030-003	Nut	2
18	122493*	Check Valve Crack Pressure (used with load sense option)	1
	064091-002*	Plug (without load sense option)	1
	064019-029	O-ring	1
19	123888*	Pressure Switch	1
	126512*	Pressure Sensor Transducer assembly (with Capacity Data Monitor)	1
	062007-050	Terminal	1
	062007-063	Terminal	1
	064091-006	Plug (not shown)	1
	064019-031	O-ring	1
	124000-001	Harness (Tilt, SS, LS) RR	1
	124000-002	Harness (Tilt, SS, LS) RD	1
20	064080-004	Tee	2
21	064128-003	Cap	2

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number



(a) Bottom of Reach Support

(b) Part of 1st Stage Mast

(c) Refer to Hydraulic Parts

(d) Top of Reach Support

(e) Left and Right Reach Cylinders attached to Reach Support, refer to Cylinder Parts

(f) Top of Reach Carriage

(g) Tilt Cylinder mounted to bottom of Carriage, refer to Cylinder Parts

(h) Direction of Free Flow

(i) Torque Value 44 Nm (32 ft lb)
Pre-Set to 15 bar (225 psi)

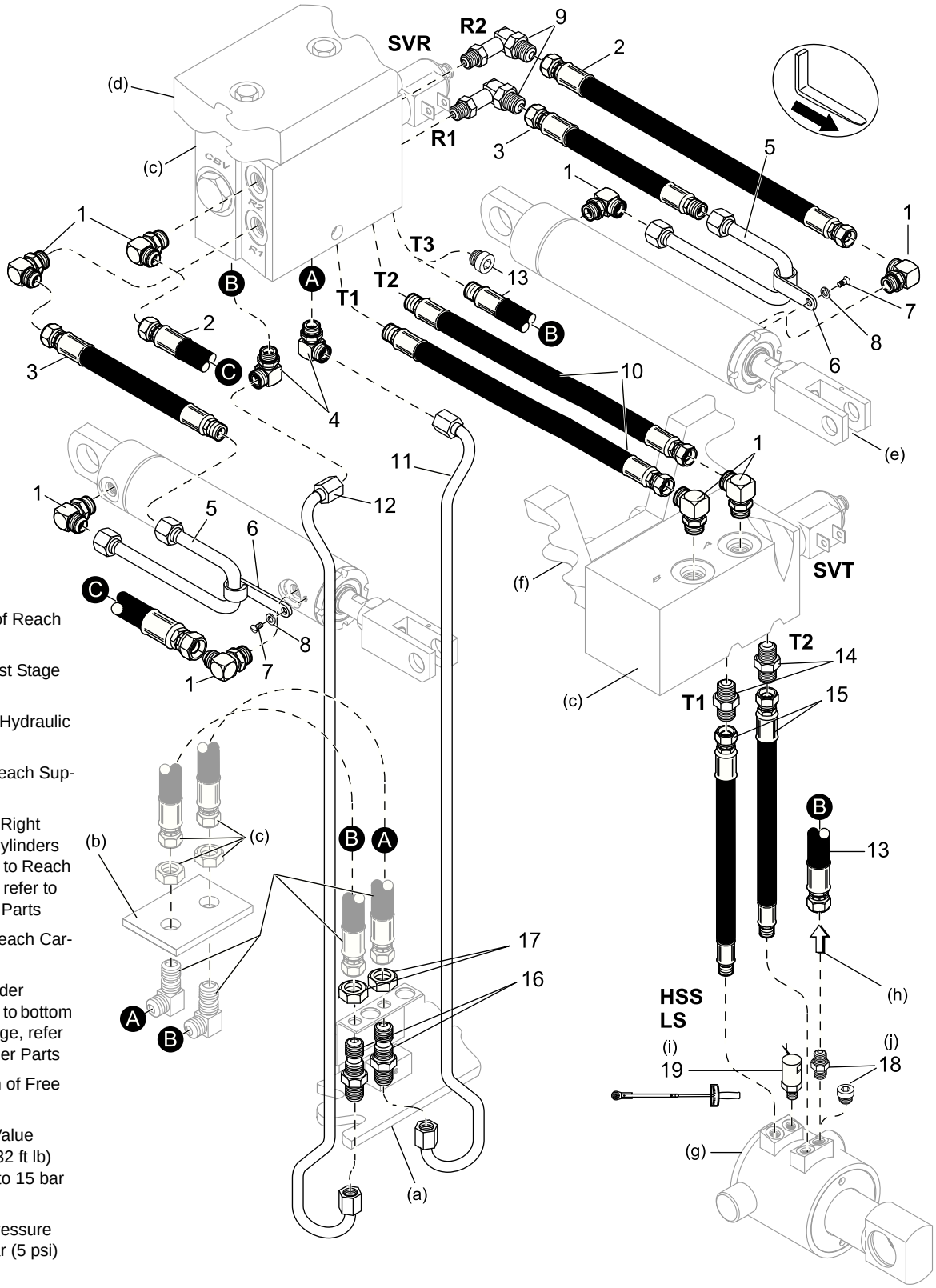
(j) Crack Pressure 0.345 bar (5 psi)

Figure 19356

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	064061-004	Elbow	6
	064019-031	O-ring	12
2	064252-046	Hose RR	1
	064252-047	Hose RD	1
3	064252-045	Hose RR	1
	064252-043	Hose RD	1
4	064061-001	Elbow	2
	064019-031	O-ring	2
5	077389-005	Tube RR	2
	077389-006	Tube RD	2
6	061002-001	Clamp	2
7	060013-002	Screw	2
8	060005-004	Lockwasher	2
9	064171-004	Elbow	2
	064019-031	O-ring	2
10	064253-079	Hose RR	2
	064253-080	Hose RD	2
11	122277	Left Hand Tube Capacity 1588 kg (3500 lb) RR	1
	122242	Left Hand Tube Capacity 2040 kg (4500 lb) RR, 1360 kg (3000 lb) RD	1
12	122276	Right Hand Tube Capacity 1588 kg (3500 lb) RR	1
	122241	Right Hand Tube Capacity 2040 kg (4500 lb) RR, 1360 kg (3000 lb) RD	1
13	064253-071*	Hose RR (with Load Sense Option)	1
	064253-072*	Hose RD (with Load Sense Option)	1
	064091-006*	Plug (without Load Sense Option)	1
	064019-029	O-ring	1
14	064004-007	Connector	2
	064019-031	O-ring	2
15	064253-081	Hose RR or RD	2
	064019-031	O-ring	2
16	064033-002	Bulkhead Connector	2
17	064030-003	Nut	2
18	122493*	Check Valve Crack Pressure (used with load sense option)	1
	064091-002*	Plug (without load sense option)	1
	064019-029	O-ring	1
19	123888*	Pressure Switch	1
	126512*	Pressure Sensor Transducer assembly (with Capacity Data Monitor)	1
	062007-050	Terminal	1
	062007-063	Terminal	1
	064091-006	Plug (not shown)	1
	064019-031	O-ring	1
	124000-001	Harness (Tilt, SS, LS) RR	1
	124000-002	Harness (Tilt, SS, LS) RD	1
20	064080-004	Tee	2
21	064128-003	Cap	2

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number



(a) Bottom of Reach Support

(b) Part of 1st Stage Mast

(c) Refer to Hydraulic Parts

(d) Top of Reach Support

(e) Left and Right Reach Cylinders attached to Reach Support, refer to Cylinder Parts

(f) Top of Reach Carriage

(g) Tilt Cylinder mounted to bottom of Carriage, refer to Cylinder Parts

(h) Direction of Free Flow

(i) Torque Value 44 Nm (32 ft lb) Pre-Set to 15 bar (225 psi)

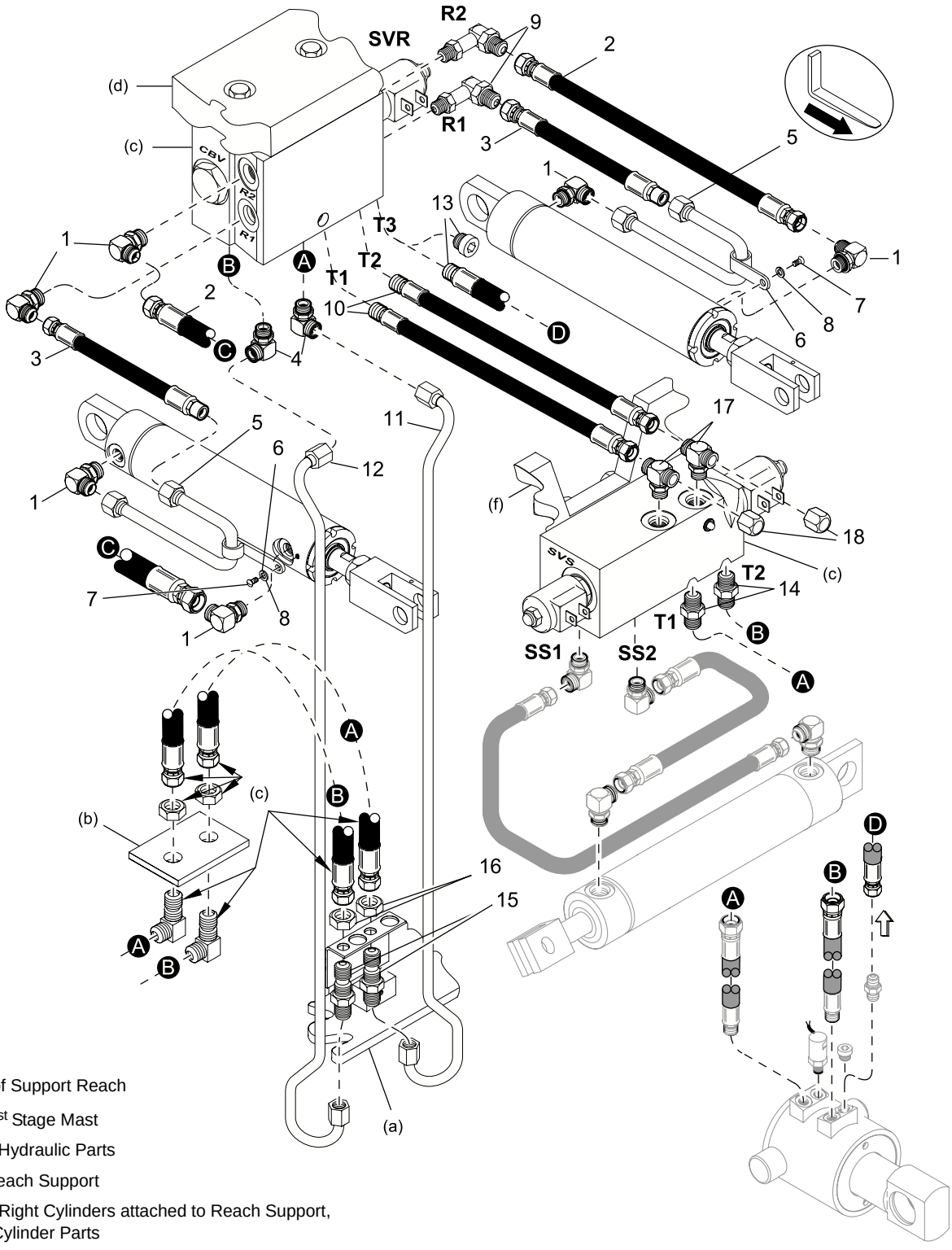
(j) Crack Pressure 0.345 bar (5 psi)

Figure 19504-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	064061-004	Elbow	8
	064019-031	O-ring	16
2	064252-042	Hose RR	1
	064252-044	Hose RD	1
3	064252-041	Hose RR	1
	064252-043	Hose RD	1
4	064061-001	Elbow	2
	064019-031	O-ring	2
5	077389-003	Tube RR	2
	077389-004	Tube RD	2
6	061002-001	Clamp	2
7	060013-002	Screw	2
8	060005-004	Lockwasher	2
9	064171-004	Elbow	2
	064019-031	O-ring	2
10	064253-079	Hose RR	2
	064253-080	Hose RD	2
11	122277	Left Hand Tube Capacity 1588 kg (3500 lb) RR	1
	122242	Left Hand Tube Capacity 2040 kg (4500 lb) RR, 1360 kg (3000 lb) RD	1
12	122276	Right Hand Tube Capacity 1588 kg (3500 lb) RR	1
	122241	Right Hand Tube Capacity 2040 kg (4500 lb) RR, 1360 kg (3000 lb) RD	1
13	064253-071*	Hose RR (with Load Sense Option)	1
	064253-072*	Hose RD (with Load Sense Option)	1
14	064004-007	Connector	2
	064019-031	O-ring	2
15	064253-081	Hose RR or RD	2
16	064033-002	Bulkhead Connector	2
17	064030-003	Nut	2
18	122493*	Check Valve (used with load sense option)	1
	064091-002*	Plug (used without load sense option)	1
	064019-029	O-ring	1
19	123888*	Pressure Switch (without capacity data monitor)	1
	126512*	Pressure Sensor Transducer (with capacity data monitor)	1
	126491*	Pressure Sensor Transducer LS	1
	062007-050	Terminal	1
	062007-063	Terminal	1
	064091-006	Plug (Not Shown)	1
	064019-031	O-ring	1
	124000-001	Harness (Tilt, SS, LS) RR	1
	124000-002	Harness (Tilt, SS, LS) RD	1

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number



(a) Bottom of Support Reach

(b) Part of 1st Stage Mast

(c) Refer to Hydraulic Parts

(d) Top of Reach Support

(e) Left and Right Cylinders attached to Reach Support, refer to Cylinder Parts

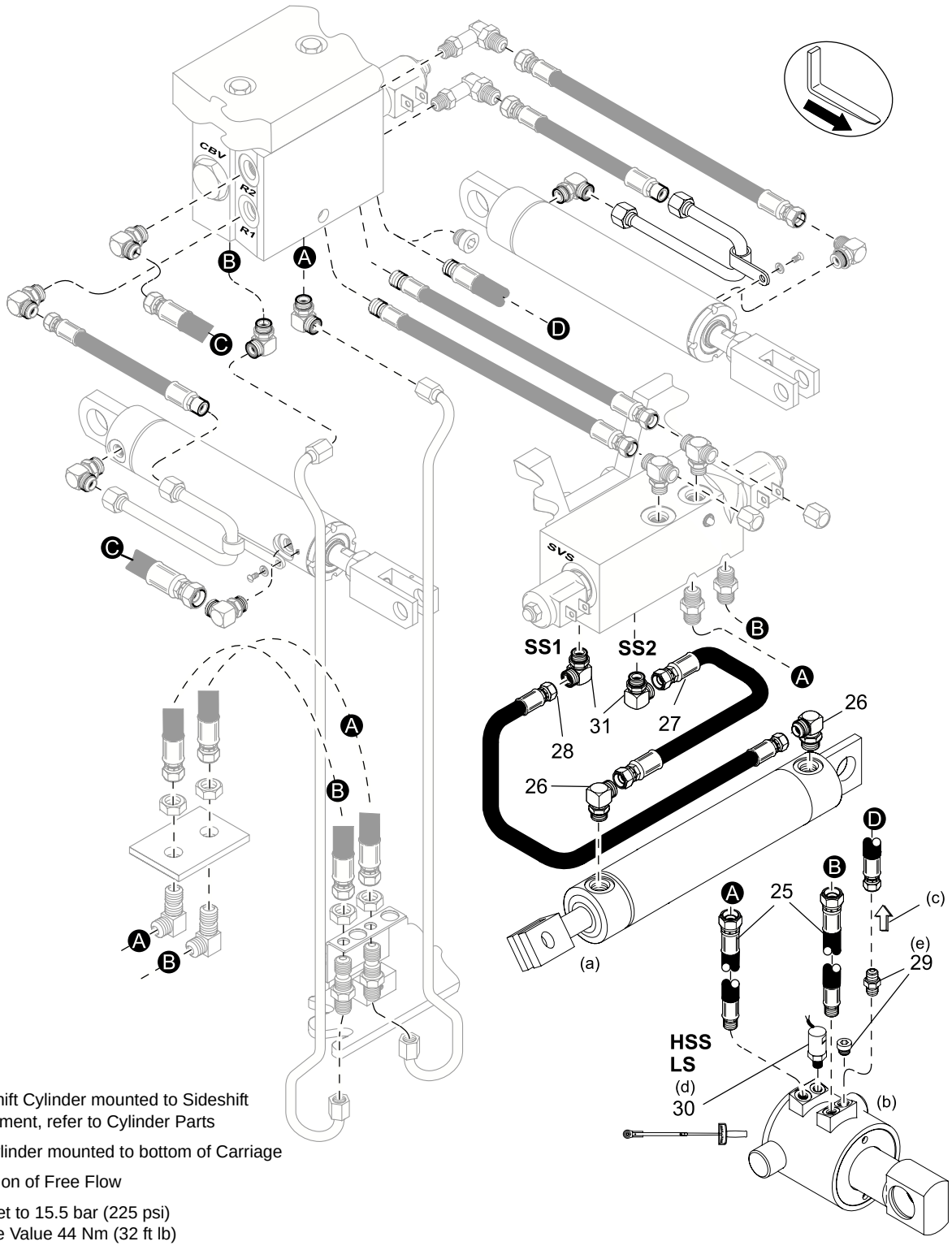
(f) Top of Reach Carriage

Figure 19416

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	064061-004	Elbow	4
	064019-031	O-ring	8
2	064252-042	Hose RR	1
	064252-044	Hose RD	1
3	064252-041	Hose RR	1
	064252-043	Hose RD	1
4	064061-001	Elbow	2
	064019-031	O-ring	2
5	077389-003	Tube RR	2
	077389-004	Tube RD	2
6	061002-001	Clamp	2
7	060013-002	Screw	2
8	060005-004	Lockwasher	2
9	064171-004	Elbow	2
	064019-031	O-ring	2
10	064253-079	Hose RR	2
	064253-080	Hose RD	2
11	122277	Left Hand Tube Capacity 1588 kg (3500 lb) RR	1
	122242	Left Hand Tube Capacity 2040 kg (4500 lb) RR, 1360 kg (3000 lb) RD	1
12	122276	Right Hand Tube Capacity 1588 kg (3500 lb) RR	1
	122241	Right Hand Tube Capacity 2040 kg (4500 lb) RR, 1360 kg (3000 lb) RD	1
13	064253-071*	Hose RR (with Load Sense Option)	1
	064253-072*	Hose RD (with Load Sense Option)	1
	064091-006*	Plug (without Load Sense Option)	1
	064019-031	O-ring	1
14	064004-007	Connector	2
	064019-031	O-ring	2
15	064033-002	Bulkhead Connector	2
16	064030-003	Nut	2
17	064080-004	Tee	2
18	064128-003	Cap	2

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number



(a) Sideshift Cylinder mounted to Sideshift attachment, refer to Cylinder Parts

(b) Tilt Cylinder mounted to bottom of Carriage

(c) Direction of Free Flow

(d) Pre-Set to 15.5 bar (225 psi)
Torque Value 44 Nm (32 ft lb)

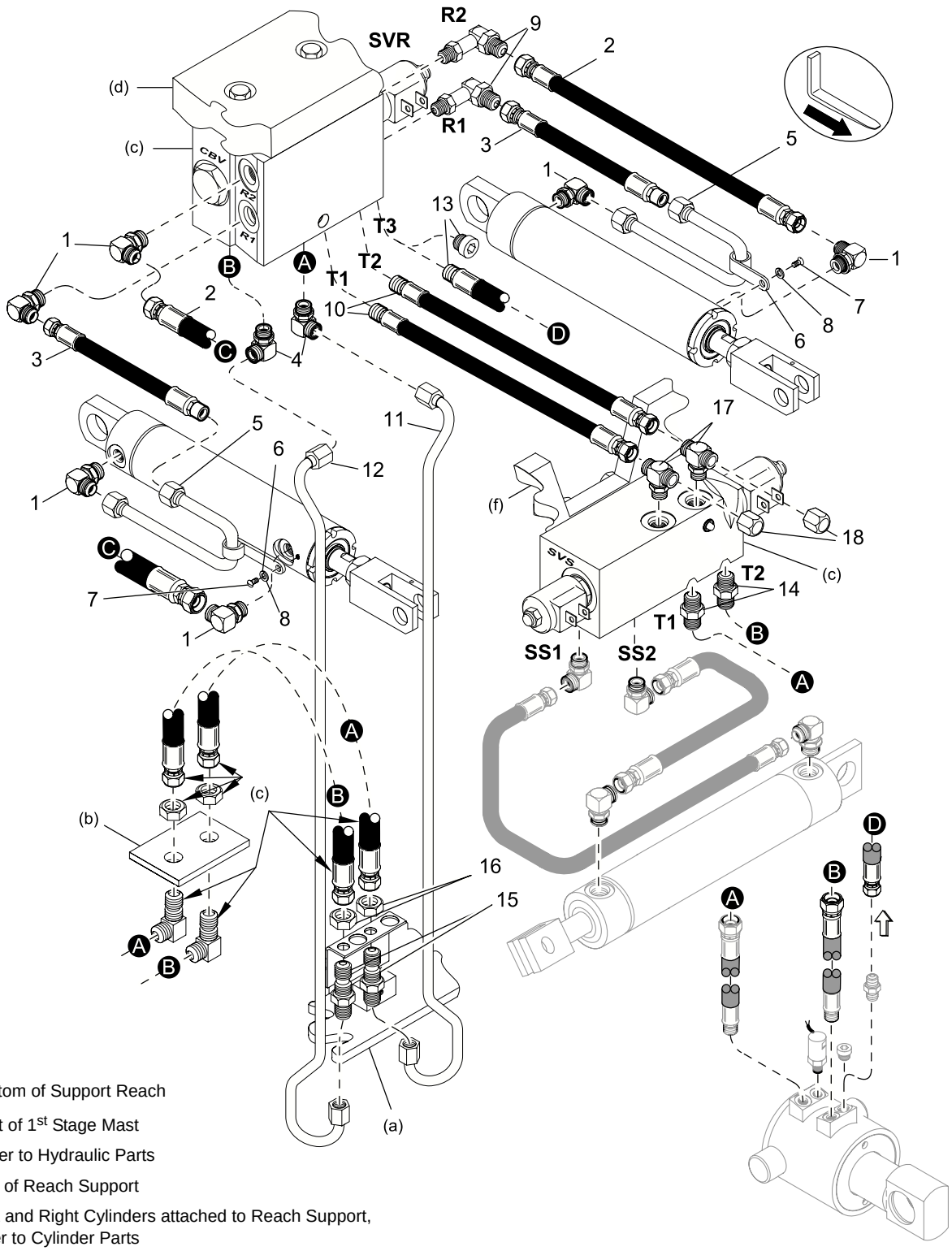
(e) Crack Pressure 0.345 bar (5 psi)

Figure 19545

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
25	064253-081	Hose RR or RD	2
	064019-031	O-ring	2
26	064061-004	Elbow	2
	064019-031	O-ring	2
27	064253-010	Hose RR or RD	1
28	064253-009	Hose RR or RD	1
29	122493*	Check Valve Crack Pressure (used with load sense option)	1
	064091-002*	Plug (without load sense option)	1
	064019-029	O-ring	1
30	123888*	Pressure Switch	1
	126512*	Pressure Sensor Transducer assembly (with Capacity Data Monitor)	1
	062007-050	Terminal	1
	062007-063	Terminal	1
	064091-006	Plug (not shown)	1
	064019-031	O-ring	1
	124000-001	Harness (Tilt, SS, LS) RR	1
	124000-002	Harness (Tilt, SS, LS) RD	1
31	064061-004	Elbow	2
	064019-031	O-ring	4

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number



(a) Bottom of Support Reach

(b) Part of 1st Stage Mast

(c) Refer to Hydraulic Parts

(d) Top of Reach Support

(e) Left and Right Cylinders attached to Reach Support, refer to Cylinder Parts

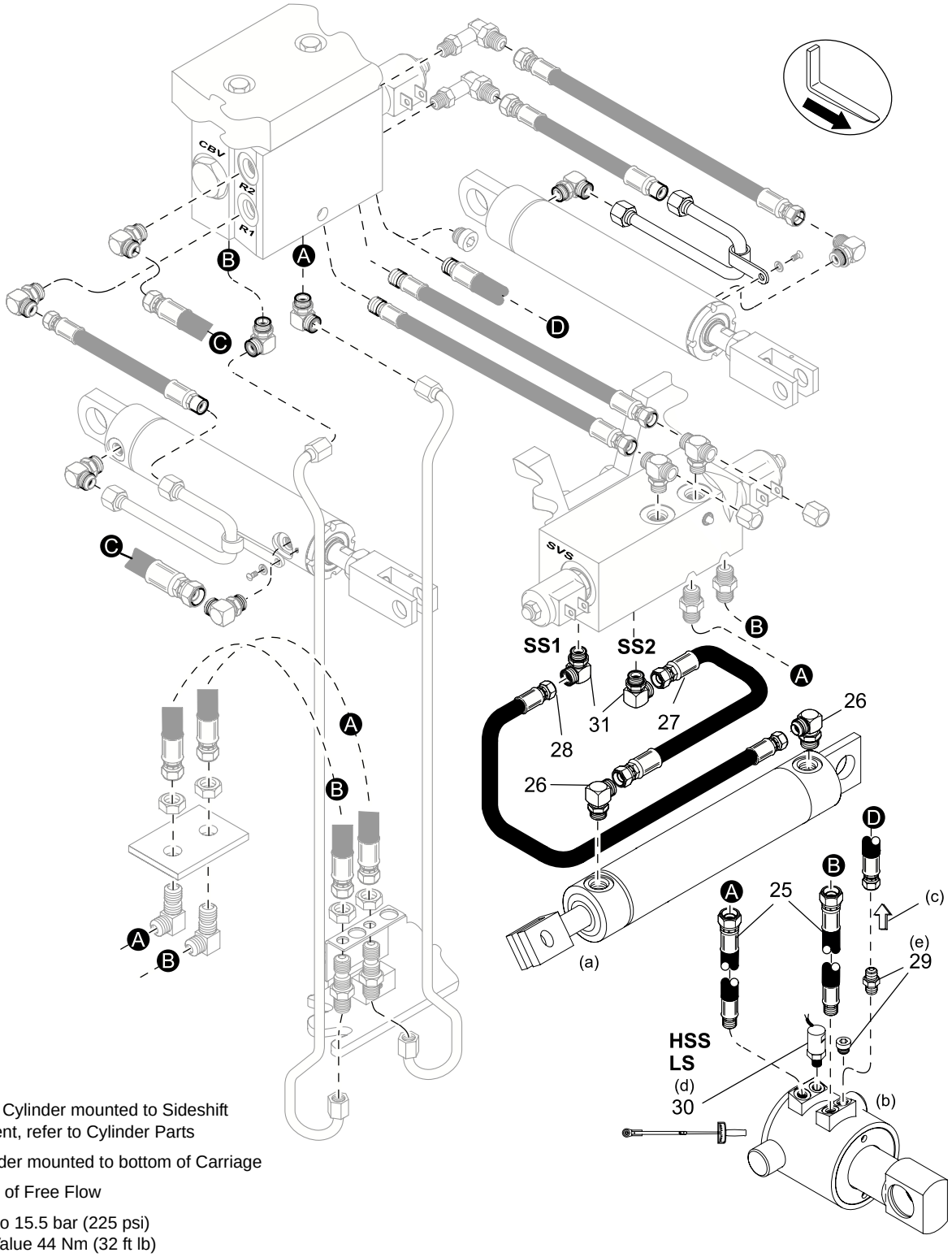
(f) Top of Reach Carriage

Figure 19416

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	064061-004	Elbow	6
	064019-031	O-ring	12
2	064252-046	Hose RR	1
	064252-047	Hose RD	1
3	064252-045	Hose RR	1
	064252-043	Hose RD	1
4	064061-001	Elbow	2
	064019-031	O-ring	2
5	077389-005	Tube RR	2
	077389-006	Tube RD	2
6	061002-001	Clamp	2
7	060013-002	Screw	2
8	060005-004	Lockwasher	2
9	064171-004	Elbow	2
	064019-031	O-ring	2
10	064253-079	Hose RR	2
	064253-080	Hose RD	2
11	122277	Left Hand Tube Capacity 1588 kg (3500 lb) RR	1
	122242	Left Hand Tube Capacity 2040 kg (4500 lb) RR, 1360 kg (3000 lb) RD	1
12	122276	Right Hand Tube Capacity 1588 kg (3500 lb) RR	1
	122241	Right Hand Tube Capacity 2040 kg (4500 lb) RR, 1360 kg (3000 lb) RD	1
13	064253-071*	Hose RR (with Load Sense Option)	1
	064253-072*	Hose RD (with Load Sense Option)	1
	064091-006*	Plug (without Load Sense Option)	1
	064019-029	O-ring	1
14	064004-007	Connector	2
	064019-031	O-ring	2
15	064033-002	Bulkhead Connector	2
16	064030-003	Nut	2
17	064080-004	Tee	2
18	064128-003	Cap	2

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number



(a) Sideshift Cylinder mounted to Sideshift attachment, refer to Cylinder Parts

(b) Tilt Cylinder mounted to bottom of Carriage

(c) Direction of Free Flow

(d) Pre-Set to 15.5 bar (225 psi)
Torque Value 44 Nm (32 ft lb)

(e) Crack Pressure 0.345 bar (5 psi)

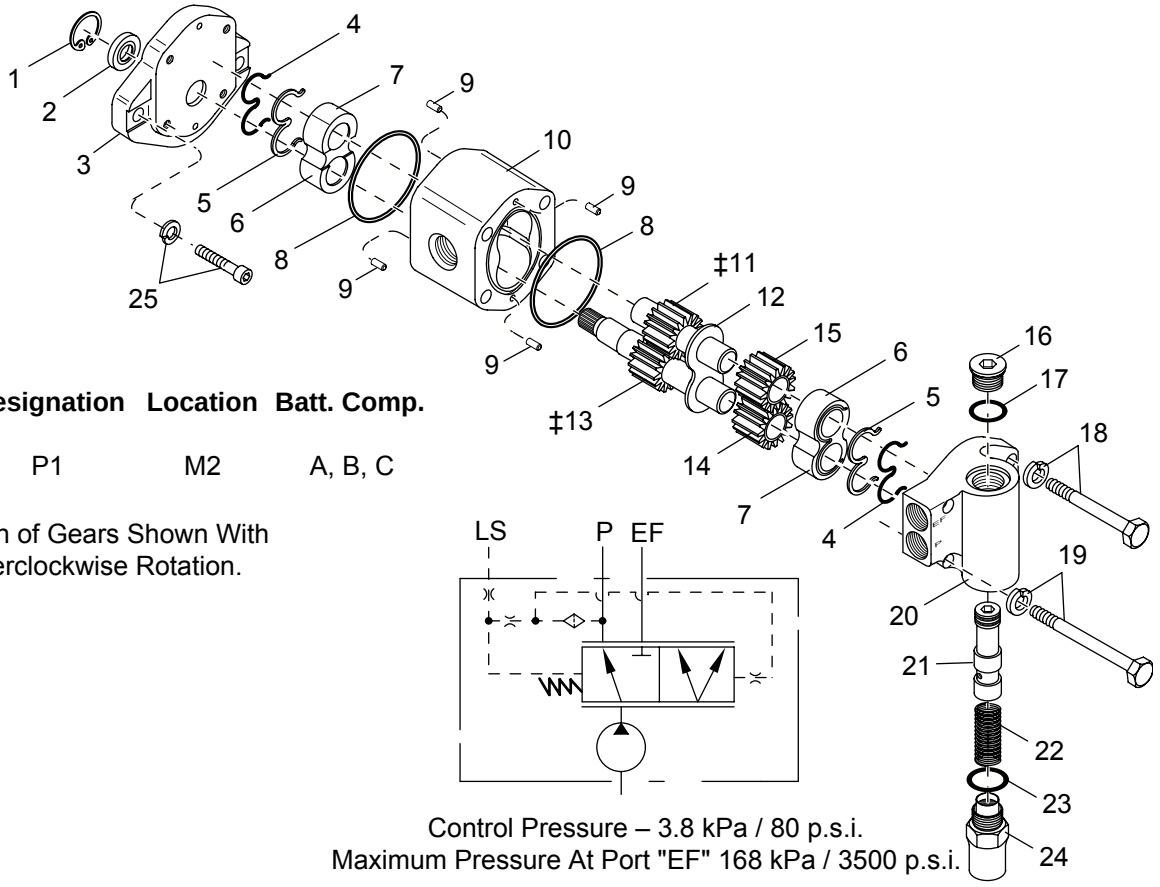
Figure 19545

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
25	064253-081	Hose RR or RD	2
	064019-031	O-ring	2
26	064061-004	Elbow	2
	064019-031	O-ring	2
27	064253-010	Hose RR or RD	1
28	064253-009	Hose RR or RD	1
29	122493*	Check Valve Crack Pressure (used with load sense option)	1
	064091-002*	Plug (without load sense option)	1
	064019-029	O-ring	1
30	123888*	Pressure Switch	1
	126512*	Pressure Sensor Transducer assembly (with Capacity Data Monitor)	1
	062007-050	Terminal	1
	062007-063	Terminal	1
	064091-006	Plug (not shown)	1
	064019-031	O-ring	1
	124000-001	Harness (Tilt, SS, LS) RR	1
	124000-002	Harness (Tilt, SS, LS) RD	1
31	064061-004	Elbow	2
	064019-031	O-ring	4

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

8726

RR MODEL 5210 (24V TRUCKS)
LOAD SENSING PRIORITY FLOW DIVIDER
(9cc DISPLACEMENT)



Model	Designation	Location	Batt. Comp.
RR5210-40	P1	M2	A, B, C

‡ Position of Gears Shown With Counterclockwise Rotation.

Control Pressure – 3.8 kPa / 80 p.s.i.
Maximum Pressure At Port "EF" 168 kPa / 3500 p.s.i.

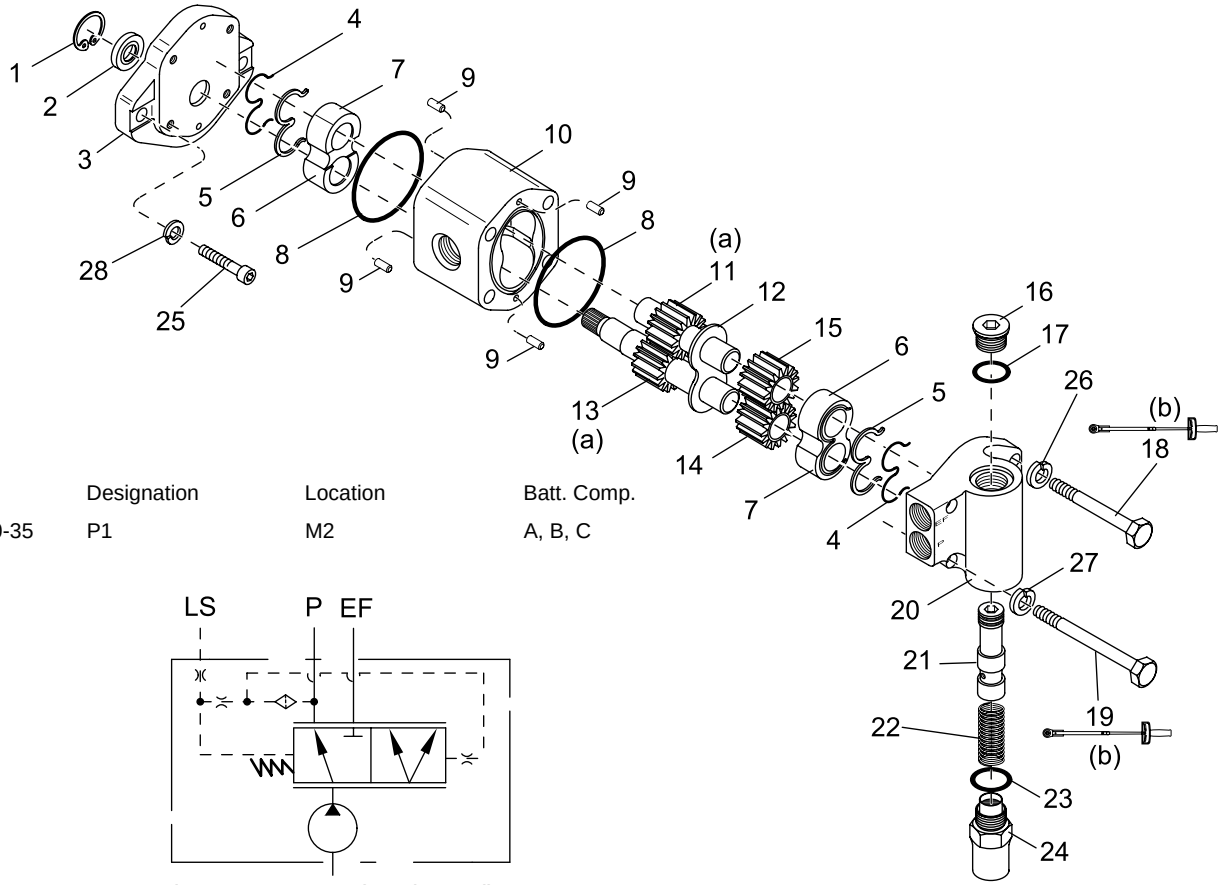
126316 LIFT PUMP

Index		Part No.	Part Name	No. Req.
1	†		Retaining Ring	1
2	*		Seal	1
3	†		Mounting Flange	1
4	*		Back-Up Seal	2
5	*		Seal	2
6	†		Bushing	2
7	†		Bushing	2
8	*		O-Ring	2
9	†		Key	4
10	†		Body	1
11	†		Drive Gear	1
12	†		Balance Plate	1
13	†		Drive Shaft And Gear	2
14	†		Gear Keyed	1
15	†		Gear	1
16	†		Plug	1
17	*		O-Ring	1
18	†		Screw Tighten to 45 - 50 Nm/ 34 - 38 ft. lbs.	2
	†		Lockwasher	2
19	†		Screw Tighten to 45 - 50 Nm/ 34 - 38 ft. lbs.	2
	†		Lockwasher	2
20	†		Body	1
21	†		Spool	1
22	†		Spring	1
23	*		Seal	1
24	†		Spring Seat/Orfice	1
25		060017-054	Screw	2
		060005-009	Lockwasher	2
*		125864	Kit Pump Seal Includes Index 2, 4, 5 & 8	1
*		125863	Kit Valve Seal Includes Index 17 & 23	1

Always Specify Model, Data & Serial Numbers

† Internal pump components are not available, except seals, due to matched set requirements. Since components must be replaced as matched sets, pump replacement is more economical.

This page available for **NOTES.**



Model	Designation	Location	Batt. Comp.
RR5210-35	P1	M2	A, B, C

Control Pressure - 5.6 bar (81 psi)
Maximum Pressure at Port EF 215 bar (3118 psi)
Maximum Pressure at Port P 180 bar (2611 psi)

(a) Position of Gears shown with Counterclockwise Rotation

(b) Torque to 45 - 50 Nm (24 - 38 ft lb)

Figure 22034

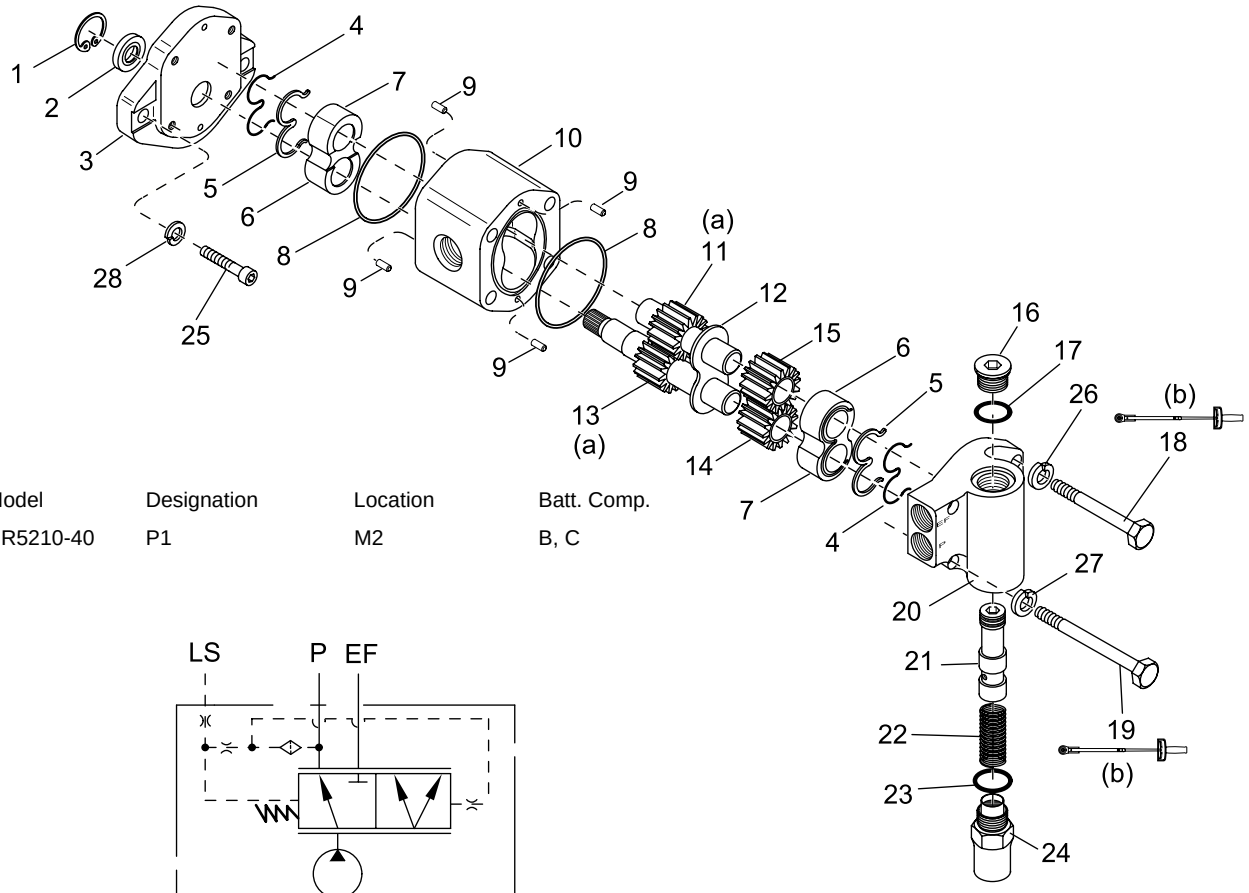
INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	130706	Lift Pump	
1	(1)	Retaining Ring	1
2	(2)	Seal	1
3	(1)	Mounting Flange	1
4	(2)	Back-Up Seal	2
5	(2)	Seal	2
6	(1)	Bushing	2
7	(1)	Bushing	2
8	(2)	O-Ring	2
9	(1)	Key	1
10	(1)	Body	1
11	(1)	Drive Gear	1
12	(1)	Balance Plate	1
13	(1)	Drive Shaft And Gear	2
14	(1)	Keyed Gear	1
15	(1)	Gear	1
16	(1)	Plug	1
17	(3)	O-Ring	1
18	(1)	Screw	2
19	(1)	Screw	2
20	(1)	Body	1
21	(1)	Spool	1
22	(1)	Spring	1
23	(3)	Seal	1
24	(1)	Spring Sear/Orifice	1
25	060017-054	Screw	2
26	(1)	Lockwasher	2
27	(1)	Lockwasher	2
28	060005-009	Lockwasher	2

(1) Internal Pump Components Are Not Available, Except Seals, Due To Matched Set Requirements. Since Components Must Be Replaced As Matched Sets, Pump Replacement Is More Economical.

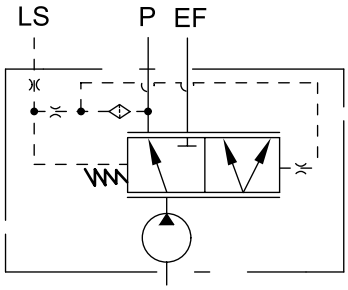
(2) 133570 Pump Seal Kit Includes Index 2, 4, 5 & 8

(3) 125863 Valve Seal Kit Includes Index 17 & 23

Always Specify Model, Data & Serial Number



Model	Designation	Location	Batt. Comp.
RR5210-40	P1	M2	B, C



Control Pressure - 5.6 bar (81 psi)
Maximum Pressure at Port EF 215 bar (3118 psi)
Maximum Pressure at Port P 180 bar (2611 psi)

(a) Position of Gears Shown with Counterclockwise Rotation

(b) Torque to 45 - 50 Nm (24 - 38 ft lb)

Figure 22035

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	130707	Lift Pump	1
1	(1)	Retaining Ring	1
2	(2)	Seal	1
3	(1)	Mounting Flange	1
4	(2)	Back-Up Seal	2
5	(2)	Seal	2
6	(1)	Bushing	2
7	(1)	Bushing	2
8	(2)	O-Ring	2
9	(1)	Key	1
10	(1)	Body	1
11	(1)	Drive Gear	1
12	(1)	Balance Plate	1
13	(1)	Drive Shaft And Gear	2
14	(1)	Keyed Gear	1
15	(1)	Gear	1
16	(1)	Plug	1
17	(3)	O-Ring	1
18	(1)	Screw	2
19	(1)	Screw	2
20	(1)	Body	1
21	(1)	Spool	1
22	(1)	Spring	1
23	(3)	Seal	1
24	(1)	Spring Sear/Orifice	1
25	060017-054	Screw	2
26	(1)	Lockwasher	2
27	(1)	Lockwasher	2
28	060005-009	Lockwasher	2

(1) Internal Pump Components Are Not Available, Except Seals, Due To Matched Set Requirements. Since Components Must Be Replaced As Matched Sets, Pump Replacement Is More Economical.

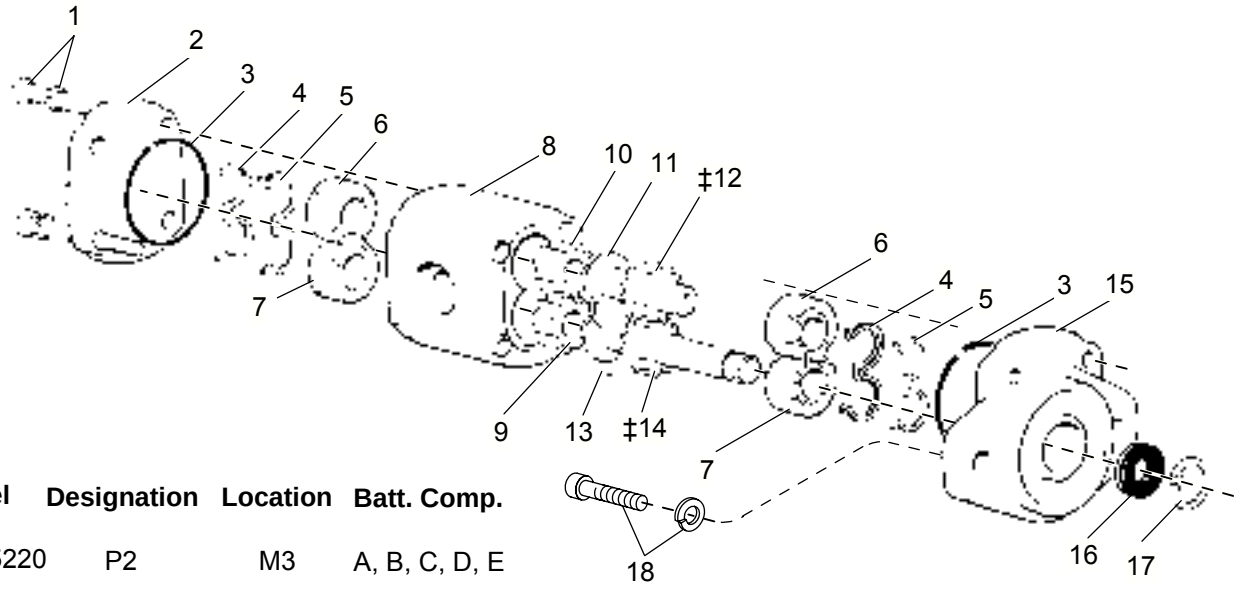
(2) 133570 Pump Seal Kit Includes Index 2, 4, 5 & 8

(3) 125863 Valve Seal Kit Includes Index 17 & 23

Always Specify Model, Data & Serial Number

6243S-03

RR/RD 5200
36V NO LOAD SENSING
(10cc DISPLACEMENT)



Model	Designation	Location	Batt. Comp.
RR/RD 5220	P2	M3	A, B, C, D, E

‡ Position of Gears Shown With Counterclockwise Rotation.

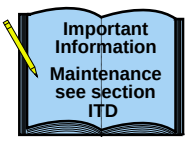
* 123991 LIFT PUMP

Index	Part No.	Part Name	No. Req.
1	†	Screw Tighten to 34 - 38 ft. lbs. (45 - 50 Nm)	2
	†	Lockwasher	2
2	†	End Cover	1
3	††	O-Ring	2
4	††	Back-Up Seal	2
5	††	Seal	2
6	†	Bushing	2
7	†	Bushing	2
8	†	Body	1
9	†	Keyed Gear	1
10	†	Floating Gear	1
11	†	Balance Plate	1
12	†	Driven Gear	1
13	†	Key	1
14	†	Drive Shaft And Gear	1
15	†	Mounting Flange	1
16	††	Seal	1
17	†	Retaining Ring	1
18	060017-054	Screw	2
	060005-009	Lockwasher	2
††	125864	Kit Pump Seal Includes Index 3, 4, 5 & 16	1

Always Specify Model, Data & Serial Numbers

† Internal pump components are not available, except seals, due to matched set requirements. Since components must be replaced as matched sets, pump replacement is more economical.

* Choice of part number depends on display. Display information is included in the truck data number (located on truck data plate).



Truck Data Number Example

Display

-TT270C36-2PSF-BS-Q--

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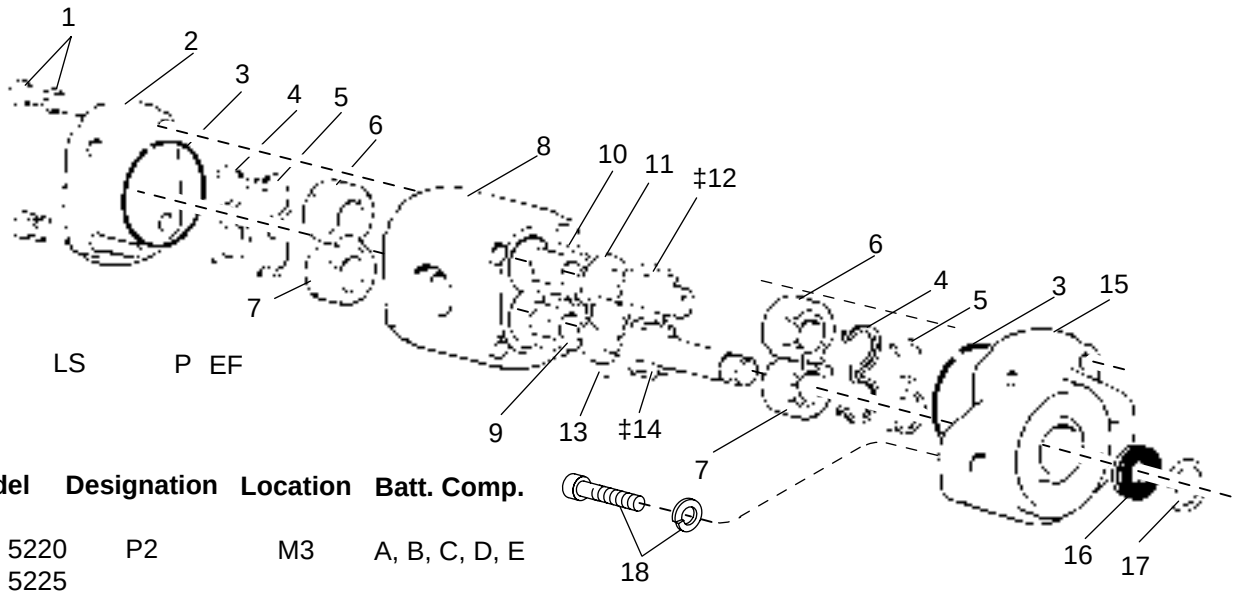
6243S-04

RR/RD 5200
RR/RD 5200 (AC)
36V NO LOAD SENSING
(10cc DISPLACEMENT)



Model	Designation	Location	Batt. Comp.
RR/RD 5220 RR/RD 5225	P2	M3	A, B, C, D, E

‡ Position of Gears Shown With Counterclockwise Rotation.

* 130709 LIFT PUMP

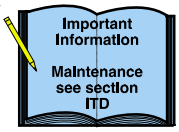
Index	Part No.	Part Name	No. Req.
1 †		Screw Tighten to 45 - 50 Nm (34 - 38 ft. lbs.)	2
†		Lockwasher	2
2 †		End Cover	1
3††		O-Ring	2
4††		Back-Up Seal	2
5††		Seal	2
6 †		Bushing	2
7 †		Bushing	2
8 †		Body	1
9 †		Keyed Gear	1
10 †		Floating Gear	1
11 †		Balance Plate	1
12 †		Driven Gear	1
13 †		Key	1
14 †		Drive Shaft And Gear	1
15 †		Mounting Flange	1
16††		Seal	1
17 †		Retaining Ring	1
18	060017-054	Screw	2
	060005-009	Lockwasher	2

Always Specify Model, Data & Serial Numbers

††	133570	Kit Pump Seal Includes Index 3, 4, 5 & 16	1

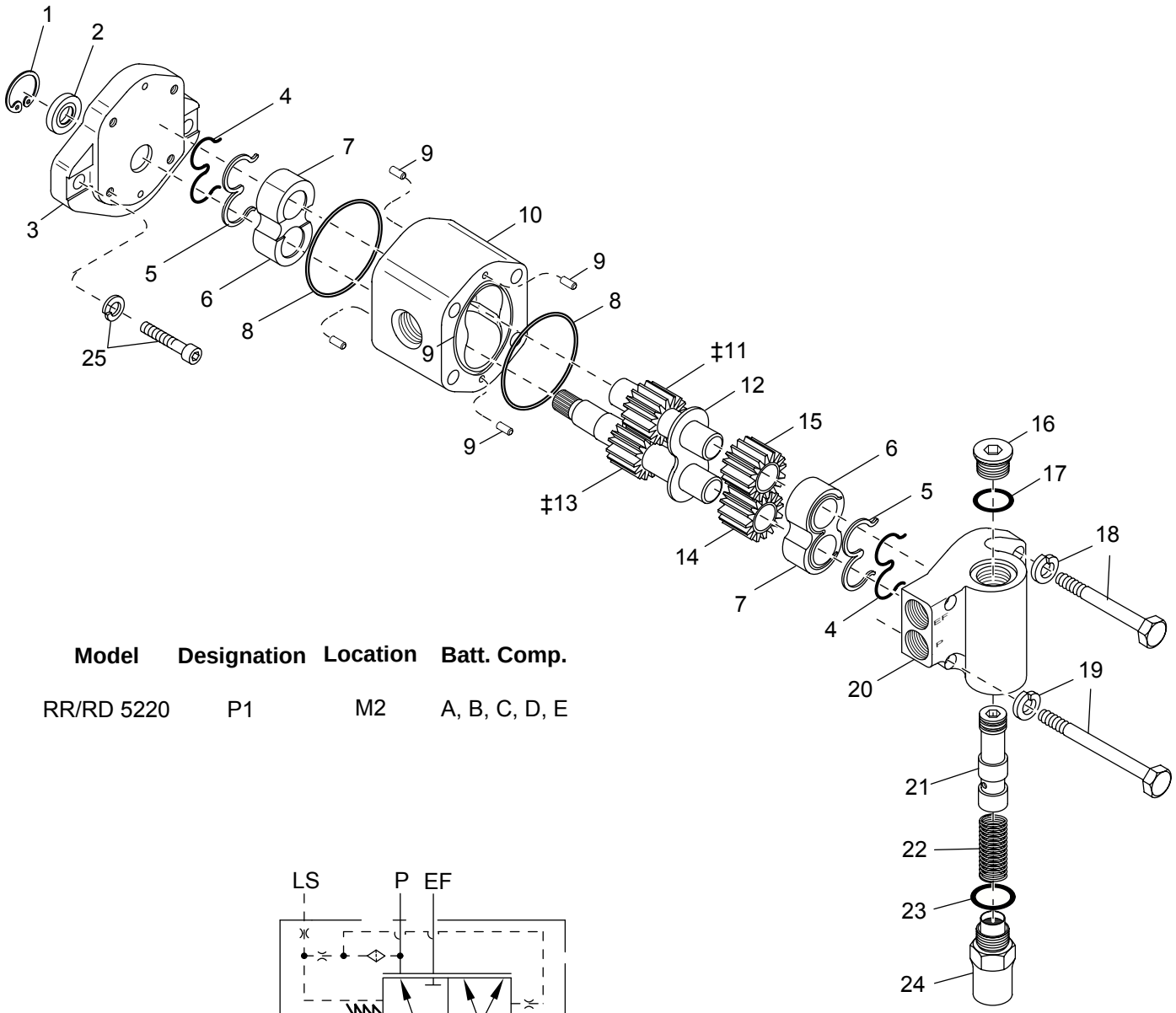
† Internal pump components are not available, except seals, due to matched set requirements. Since components must be replaced as matched sets, pump replacement is more economical.

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.

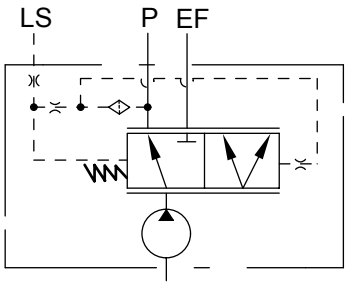


6757-01

RR/RD 5200 36V TRUCKS
LOAD SENSING PRIORITY FLOW DIVIDER
(10cc DISPLACEMENT)



Model	Designation	Location	Batt. Comp.
RR/RD 5220	P1	M2	A, B, C, D, E



Control Pressure – 5.5 bar (80 psi)
Maximum Pressure At Port "EF" 240 bar (3500 psi)

‡ Position of Gears Shown With Counterclockwise Rotation.

* 123992 LIFT PUMP

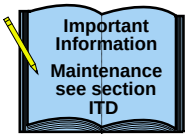
Index	Part No.	Part Name	No. Req.
1	†	Retaining Ring	1
2	††	Seal	1
3	†	Mounting Flange	1
4	††	Back-Up Seal	2
5	††	Seal	2
6	†	Bushing	2
7	†	Bushing	2
8	††	O-Ring	2
9	†	Key	4
10	†	Body	1
11	†	Drive Gear	1
12	†	Balance Plate	1
13	†	Drive Shaft And Gear	2
14	†	Gear Keyed	1
15	†	Gear	1
16	†	Plug	1
17	††	O-Ring	1
18	†	Screw Tighten to 45 - 50 Nm (34 - 38 ft. lbs.)	2
	†	Lockwasher	2
19	†	Screw Tighten to 45 - 50 Nm (34 - 38 ft. lbs.)	2
	†	Lockwasher	2
20	†	Body	1
21	†	Spool	1
22	†	Spring	1
23	††	Seal	1
24	†	Spring Sear/Orfice	1
25	060017-054	Screw	2
	060005-009	Lockwasher	2

††	125864	Kit Pump Seal Includes Index 2, 4, 5 & 8	1
††	125863	Kit Valve Seal Includes Index 17 & 23	1

Always Specify Model, Data & Serial Numbers

† Internal pump components are not available, except seals, due to matched set requirements. Since components must be replaced as matched sets, pump replacement is more economical.

* Choice of part number depends on display. Display information is included in the truck data number (located on truck data plate).



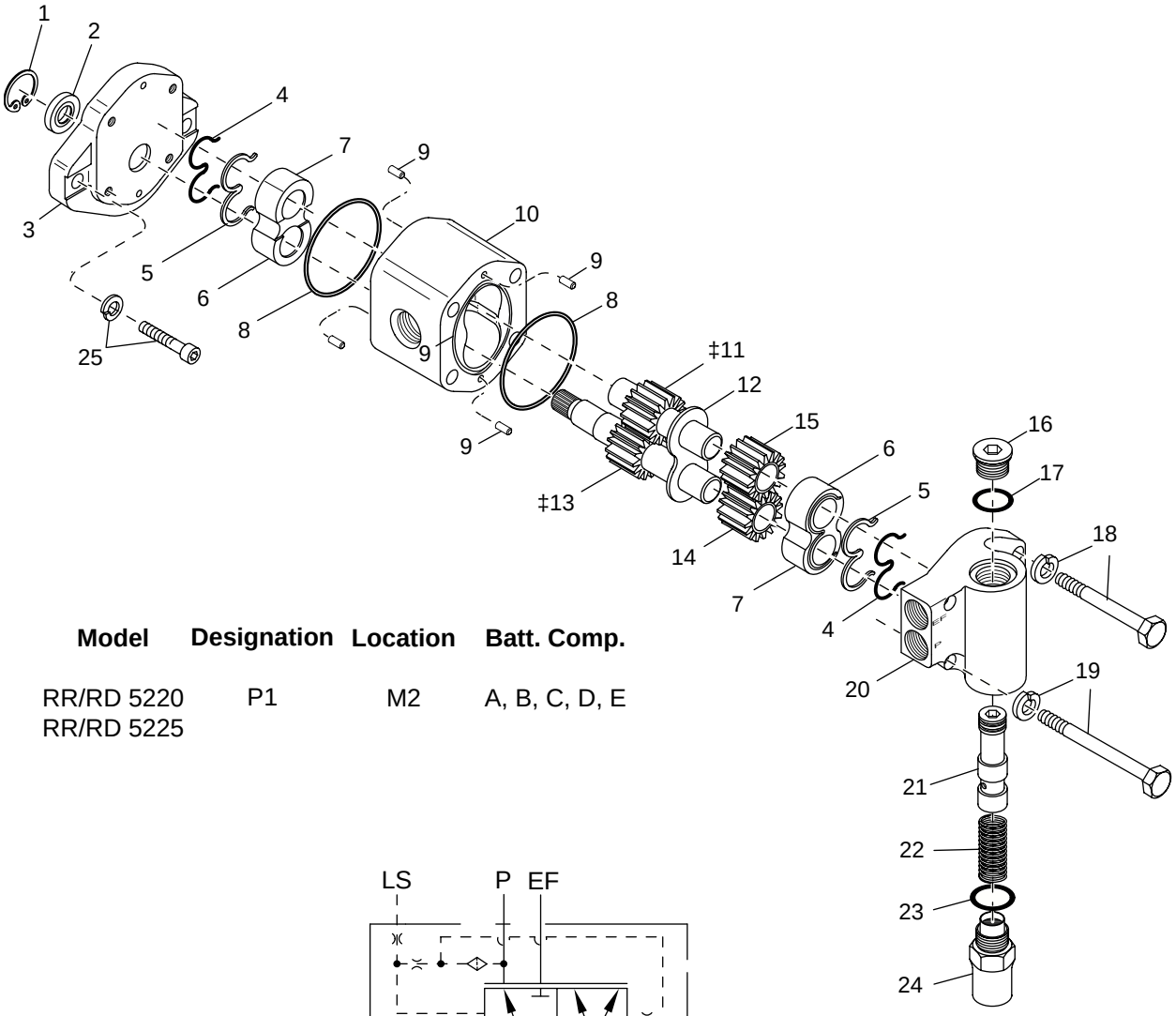
Truck Data Number Example

Display

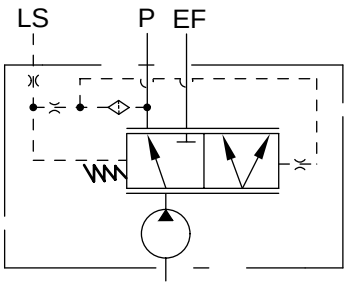
-TT270C36-2PSF-BS-Q--

6757-02

RR/RD 5200
RR/RD 5200 (AC)
36V LOAD SENSING PRIORITY FLOW DIVIDER
(10cc DISPLACEMENT)



Model	Designation	Location	Batt. Comp.
RR/RD 5220 RR/RD 5225	P1	M2	A, B, C, D, E



Control Pressure – 5.6 bar (81 psi)
Maximum Pressure At Port "EF" 215 bar (3118 psi)
Maximum Pressure At Port "P" 180 bar (2611 p.s.i.)

‡ Position of Gears Shown With
Counterclockwise Rotation.

* 130708 LIFT PUMP

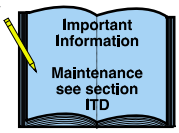
Index	Part No.	Part Name	No. Req.
1 †		Retaining Ring	1
2††		Seal	1
3 †		Mounting Flange	1
4††		Back-Up Seal	2
5††		Seal	2
6 †		Bushing	2
7 †		Bushing	2
8††		O-Ring	2
9 †		Key	4
10 †		Body	1
11 †		Drive Gear	1
12 †		Balance Plate	1
13 †		Drive Shaft And Gear	2
14 †		Gear Keyed	1
15 †		Gear	1
16 †		Plug	1
17††		O-Ring	1
18 †		Screw Tighten to 45 - 50 Nm (34 - 38 ft. lbs.)	2
†		Lockwasher	2
19 †		Screw Tighten to 45 - 50 Nm (34 - 38 ft. lbs.)	2
†		Lockwasher	2
20 †		Body	1
21 †		Spool	1
22 †		Spring	1
23††		Seal	1
24 †		Spring Sear/Orfice	1
25	060017-054	Screw	2
	060005-009	Lockwasher	2

Always Specify Model, Data & Serial Numbers

†† 133570	Kit Pump Seal Includes Index 2, 4, 5 & 8	1
†† 125863	Kit Valve Seal Includes Index 17 & 23	1

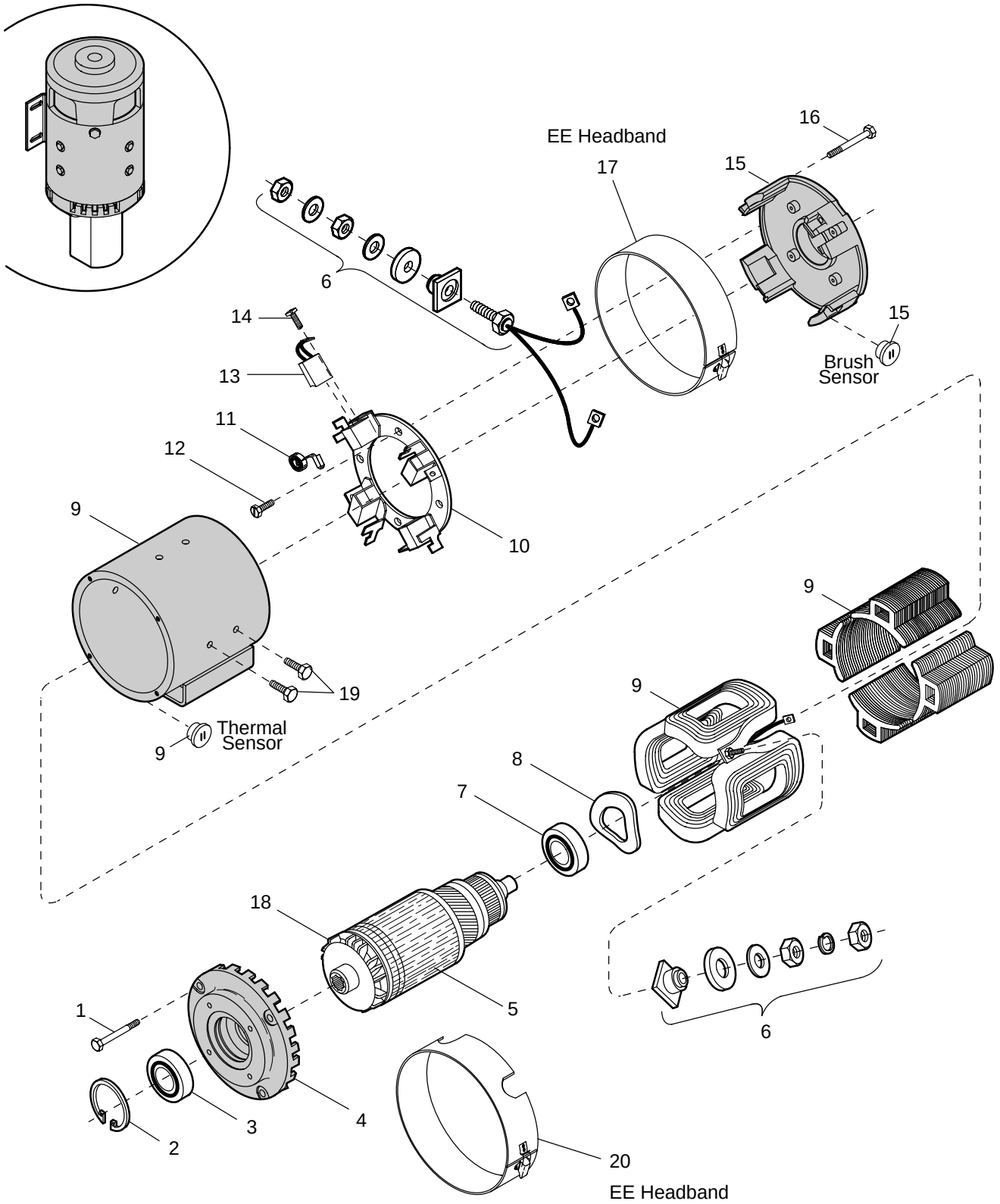
† Internal pump components are not available, except seals, due to matched set requirements. Since components must be replaced as matched sets, pump replacement is more economical.

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



8694

RR/RD 5200/5200S
36V - 170 mm (6.6 in.) DIA.
Standard Performance
With Sensors



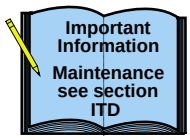
*020575-003-0S LIFT MOTOR 36V WITH SENSORS
*020575-002-0S LIFT MOTOR 36V WITH SENSORS EE

Index	Part No.	Part Name	No. Req.
1	† 060078-006	Screw Thread Forming	4
2	060009-144	Ring Retaining	1
3	065081-054	Bearing Ball	1
4	020131	Head Drive End	1
	020143	Head Drive End Includes 2 & 3	1
5	020135	Armature Includes 18	1
6	113653	Kit Terminal Stud	1
7	065081-051	Bearing Ball	1
8	060046-016	Washer Spring	1
9	020578	Frame & Field	1
	062547	Connector BWS/Thermal	1
10	020577	Brush Box Includes 11	1
11	113329	Kit Spring Brush Includes 4 Springs	1
12	060032-033	Screw Self-Tapping	4
13	113652	Kit Brush Includes 4 Brushes 16 x 32 mm	1
14	060078-011	Screw Thread Rolling	4
15	020597	Head Commutator End	1
	062547	Connector BWS/Thermal	1
	020591	Head Commutator End Includes 10 thru 14	1
16	† 060078-004	Screw Thread Forming	2
17	020423	Headband EE	1
18		Fan (Not Servicable)	1
19	060078-003	Screw Thread Forming	8
20	020425	Headband EE	1

Always Specify Model, Data & Serial Numbers

† Torque Screws to 16 - 17 Nm (140 - 150 in. lbs.)

* Choice of part number depends on if truck is equipped with brush wear /over temperature indicator and lift pump option. This information is included in the truck data number (located on truck data plate).



Truck Data Number Example

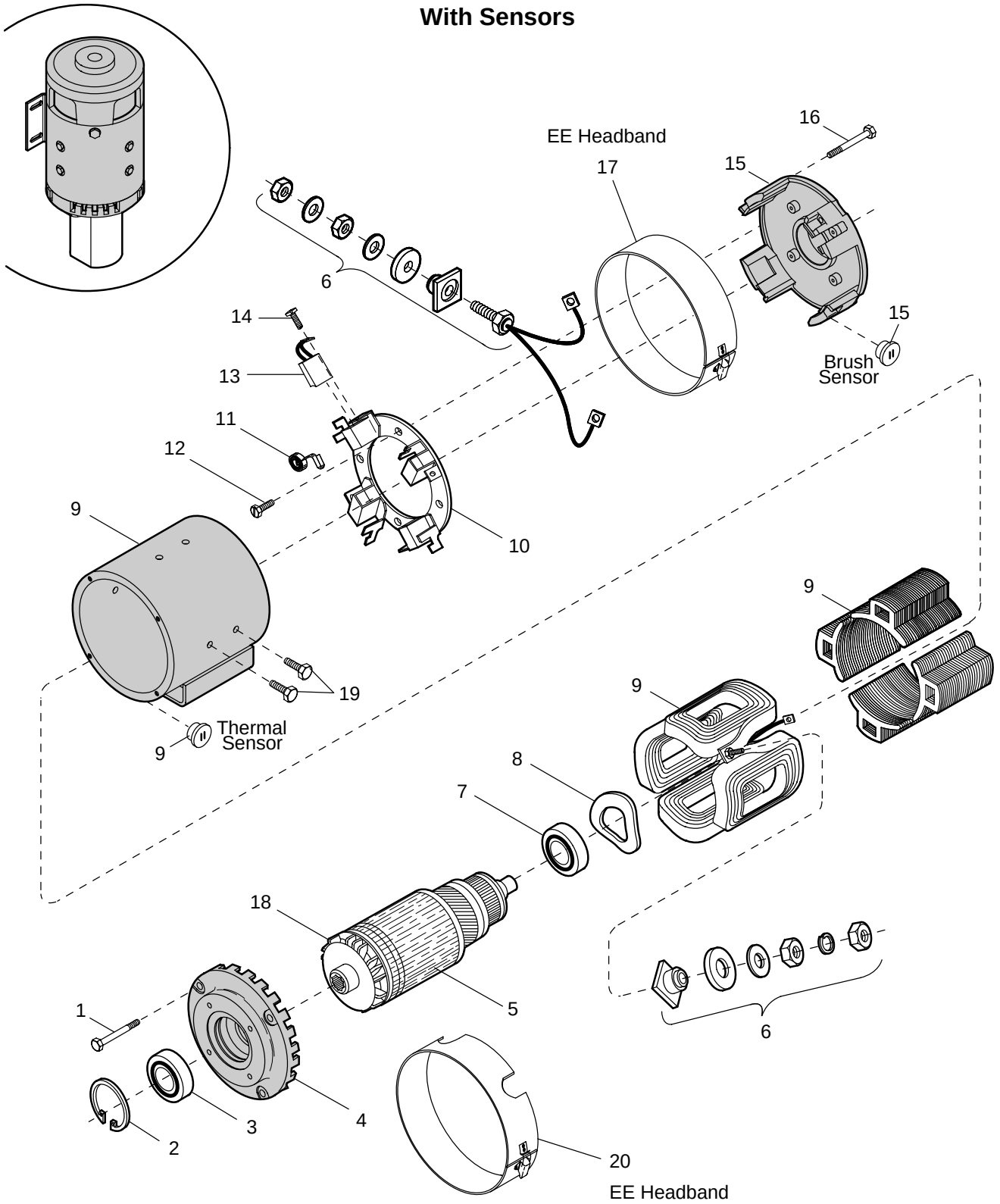
Brush Wear/Over Temperature Indicator

-TT270C36-2PSF-BS-QB-

Lift Pump

8694

RR/RD 5200/5200S
RR/RD 5200 (AC)/5200S (AC)
36V - 170 mm (6.6 in.) DIA.
Standard Performance
With Sensors



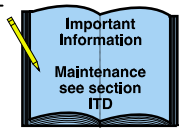
*020942-003 LIFT MOTOR 36V WITH SENSORS
*020942-002 LIFT MOTOR 36V WITH SENSORS EE

Index	Part No.	Part Name	No. Req.
1	† 060078-006	Screw Thread Forming	4
2	060009-144	Ring Retaining	1
3	065081-054	Bearing Ball	1
4	020131	Head Drive End	1
	020143	Head Drive End Includes 2 & 3	1
5	020948	Armature Includes 18	1
6	113653	Kit Terminal Stud	1
7	065081-051	Bearing Ball	1
8	060046-016	Washer Spring	1
9	020578	Frame & Field	1
	062547	Connector BWS/Thermal	1
10	020577	Brush Box Includes 11	1
11	113329	Kit Spring Brush Includes 4 Springs	1
12	060032-033	Screw Self-Tapping	4
13	113652	Kit Brush Includes 4 Brushes 16 x 32 mm	1
14	060078-011	Screw Thread Rolling	4
15	020597	Head Commutator End	1
	062547	Connector BWS/Thermal	1
	020591	Head Commutator End Includes 10 thru 14	1
16	† 060078-004	Screw Thread Forming	2
17	020423	Headband EE (Used on RR/RD 5220 Only)	1
18		Fan (Not Servicable)	1
19	060078-003	Screw Thread Forming	8
20	020425	Headband EE (Used on RR/RD 5220 Only)	1

Always Specify Model, Data & Serial Numbers

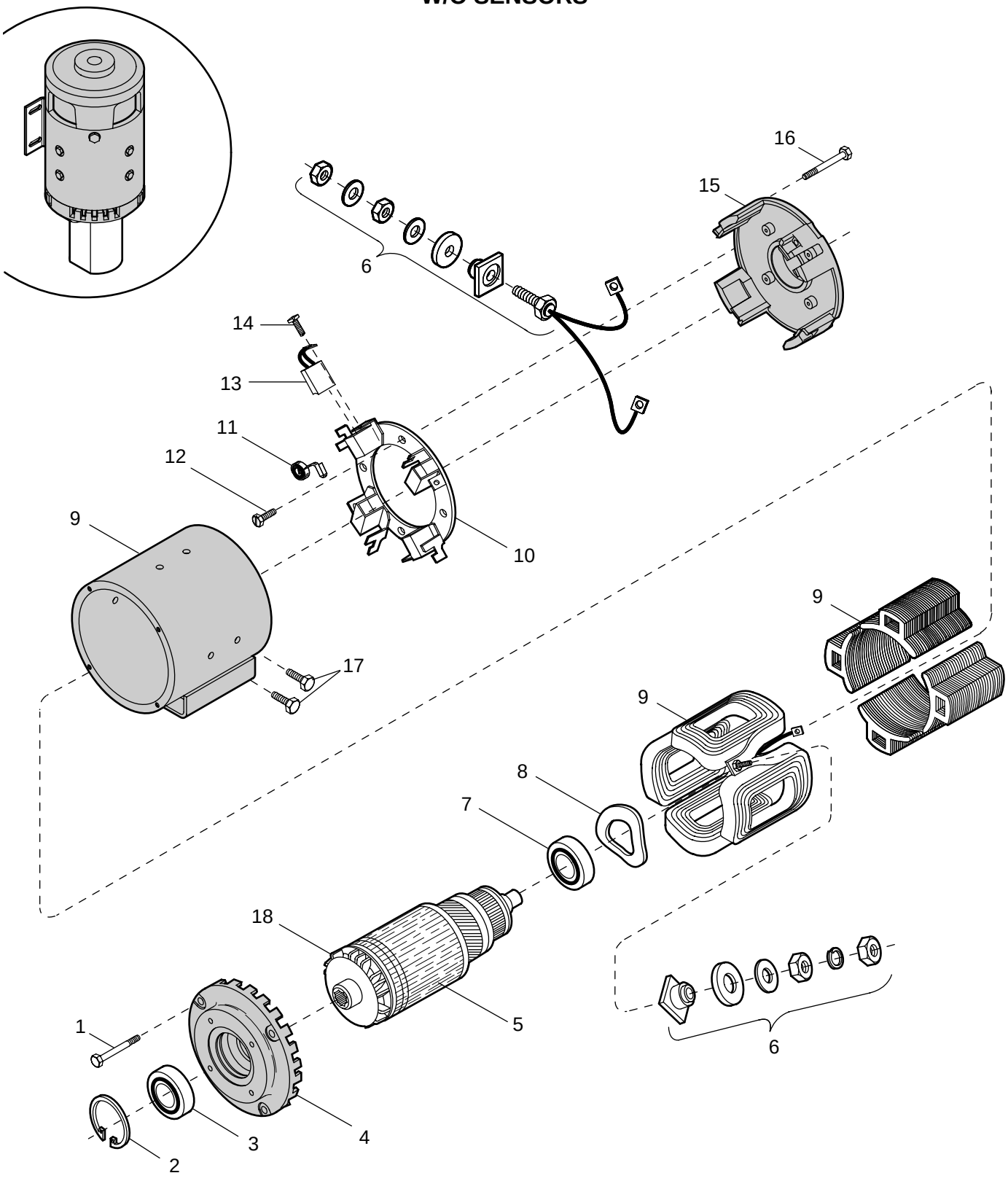
† Torque Screws to 16 - 17 Nm (140 - 150 in. lbs.)

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



8695

RR/RD 5200/5200S
36V - 170 mm (6.6 in.) DIA.
STANDARD PERFORMANCE
W/O SENSORS



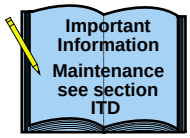
*020614-002 LIFT MOTOR 36V
STANDARD PERFORMANCE
W/O SENSORS

Index	Part No.	Part Name	No. Req.
1	† 060078-006	Screw Thread Forming	4
2	060009-144	Ring Retaining	1
3	065081-054	Bearing Ball	1
4	020131	Head Drive End	1
	020143	Head Drive End Includes 2 & 3	1
5	020135	Armature Includes 18	1
6	113653	Kit Terminal Stud	1
7	065081-051	Bearing Ball	1
8	060046-016	Washer Spring	1
9	020617	Frame & Field	1
10	020018	Brush Box Includes 11	1
11	113329	Kit Spring Brush Includes 4 Springs	1
12	060032-033	Screw Self Tapping	4
13	113652	Kit Brush Includes 4 Brushes 16 x 32 mm	1
14	060078-011	Screw Thread Rolling	4
15	020081	Head Commutator End	1
	020072	Head Commutator End Includes 10 thru 14	1
16	† 060078-004	Screw Thread Forming	2
17	060078-003	Screw Thread Forming	8
18		Fan (Not Servicable)	1

Always Specify Model, Data & Serial Numbers

† Torque Screws to 16 - 17 Nm (140 - 150 in. lbs.)

* Choice of part number depends on if truck is equipped with brush wear /over temperature indicator and lift pump option. This information is included in the truck data number (located on truck data plate).



Truck Data Number Example

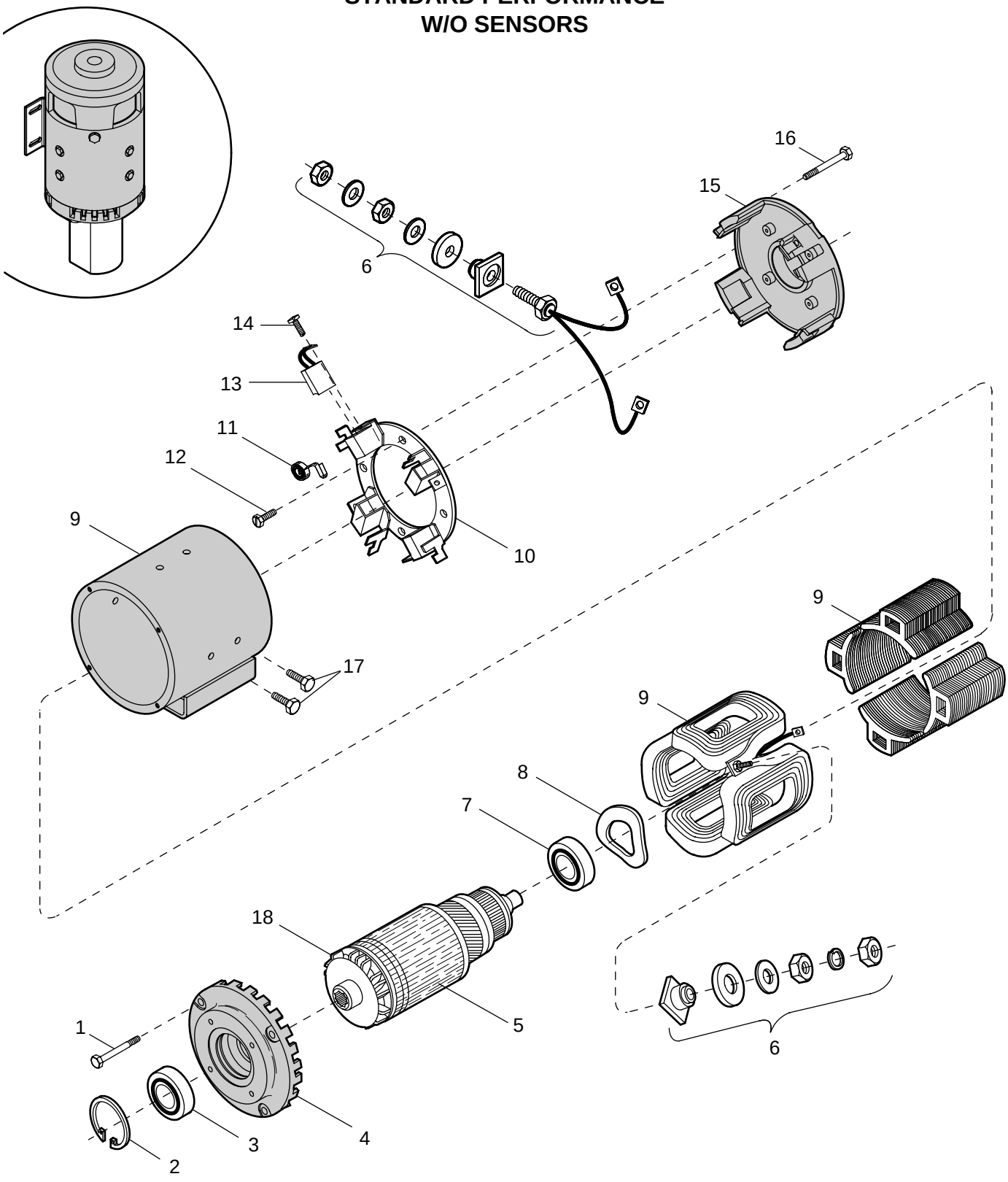
Brush Wear/Over Temperature Indicator

-TT270C36-2PSF-BS-QB-

Lift Pump

8695

RR/RD 5200/5200S
RR/RD 5200 (AC)/5200S (AC)
36V - 170 mm (6.6 in.) DIA.
STANDARD PERFORMANCE
W/O SENSORS



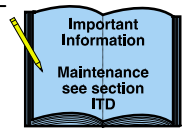
*020943 LIFT MOTOR 36V
STANDARD PERFORMANCE
W/O SENSORS

Index		Part No.	Part Name	No. Req.
1	†	060078-006	Screw Thread Forming	4
2		060009-144	Ring Retaining	1
3		065081-054	Bearing Ball	1
4		020131	Head Drive End	1
		020143	Head Drive End Includes 2 & 3	1
5		020948	Armature Includes 18	1
6		113653	Kit Terminal Stud	1
7		065081-051	Bearing Ball	1
8		060046-016	Washer Spring	1
9		020617	Frame & Field	1
10		020018	Brush Box Includes 11	1
11		113329	Kit Spring Brush Includes 4 Springs	1
12		060032-033	Screw Self Tapping	4
13		113652	Kit Brush Includes 4 Brushes 16 x 32 mm	1
14		060078-011	Screw Thread Rolling	4
15		020081	Head Commutator End	1
		020072	Head Commutator End Includes 10 thru 14	1
16	†	060078-004	Screw Thread Forming	2
17		060078-003	Screw Thread Forming	8
18			Fan (Not Servicable)	1

Always Specify Model, Data & Serial Numbers

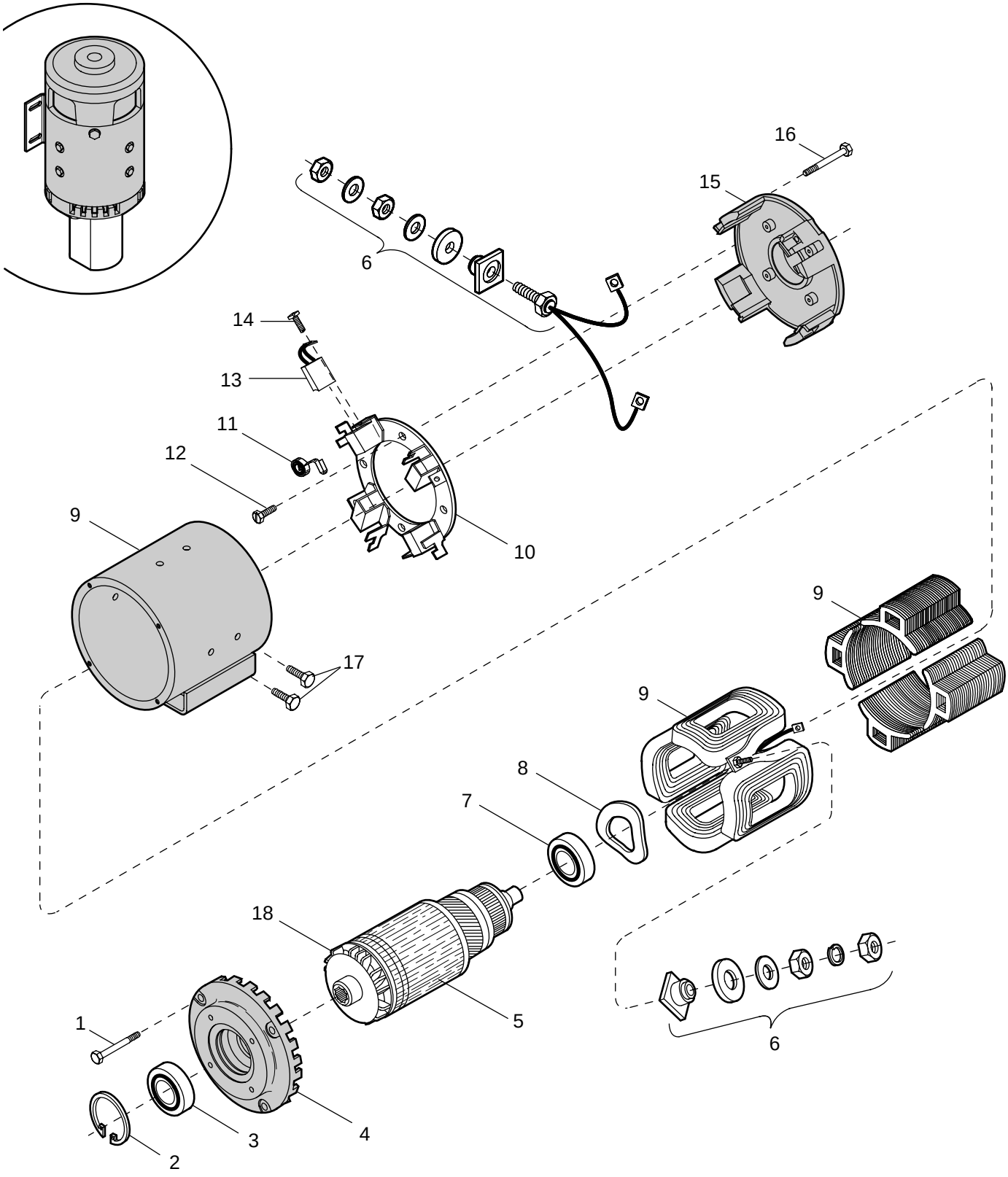
† Torque Screws to 16 - 17 Nm (140 - 150 in. lbs.)

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



8695

RR 5200 - 24 VOLT
Standard Performance
No Sensors



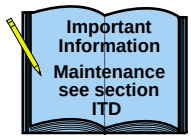
*020893 - 24 Volt
STANDARD PERFORMANCE
NO SENSORS

Index		Part No.	Part Name	No. Req.
1	†	060078-006	Screw Thread Forming	4
2		060009-144	Ring Retaining	1
3		065081-054	Bearing Ball	1
4		020131	Head Drive End	1
		020143	Head Drive End Includes Index 2 & 3	1
5		020135	Armature Includes Index 18	1
6		125782	Kit Terminal Stud Includes Index 12	1
7		065081-051	Bearing Ball	1
8		060046-016	Washer Spring	1
9		020604	Frame & Field	1
		060078-003	Screw Thread Forming	8
10		020018	Brush Box Includes Index 11	1
11		113329	Kit Spring Brush Includes 4 Springs	1
12		060032-033	Screw Self-Tapping	4
13		120860	Kit Brush Includes 4 Brushes 16 x 32 mm	1
14		060078-011	Screw Thread Rolling	4
15		020081	Head Commutator End	1
		020419	Head Commutator End Includes Index 10, 11, 12, 13 & 14	1
16	†	060078-004	Screw Thread Forming	2
17		060032-061	Screw	4
18		020536-001	Fan	1

Always Specify Model, Data & Serial Numbers

† Torque Screws to 15.8 - 16.9 Nm (140 - 150 in. lbs.)

* Choice of part number depends on if truck is equipped with brush wear /over temperature indicator and lift pump option. This information is included in the truck data number (located on truck data plate).



Truck Data Number Example

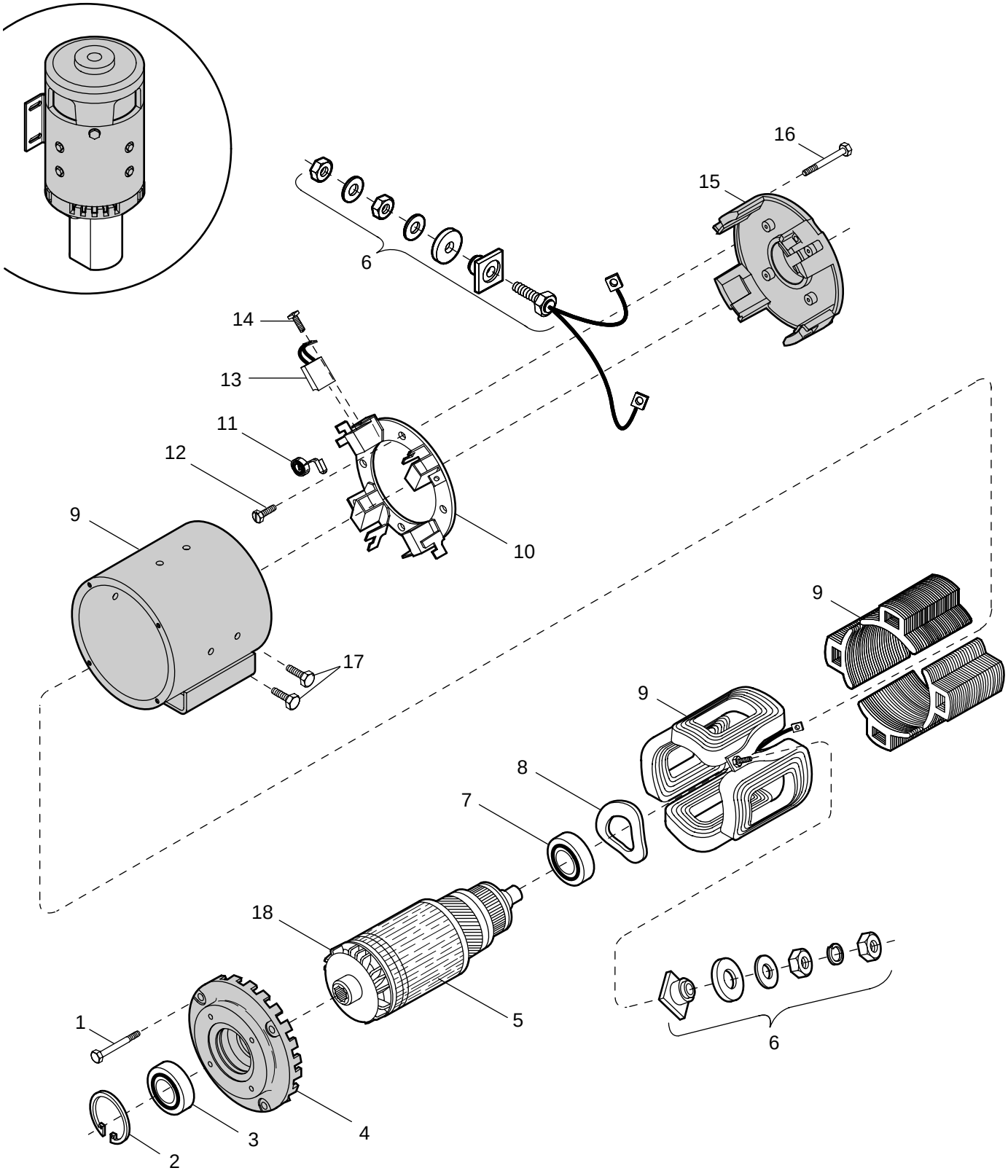
Brush Wear/Over Temperature Indicator

-TT270C36-2PSF-BS-QB-

Lift Pump

8695

RR 5200 - 24 VOLT
Standard Performance
No Sensors



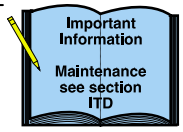
*020944 - 24 Volt
STANDARD PERFORMANCE
NO SENSORS

Index		Part No.	Part Name	No. Req.
1	†	060078-006	Screw Thread Forming	4
2		060009-144	Ring Retaining	1
3		065081-054	Bearing Ball	1
4		020131	Head Drive End	1
		020143	Head Drive End Includes Index 2 & 3	1
5		020948	Armature Includes Index 18	1
6		125782	Kit Terminal Stud Includes Index 12	1
7		065081-051	Bearing Ball	1
8		060046-016	Washer Spring	1
9		020604	Frame & Field	1
		060078-003	Screw Thread Forming	8
10		020018	Brush Box Includes Index 11	1
11		113329	Kit Spring Brush Includes 4 Springs	1
12		060032-033	Screw Self-Tapping	4
13		120860	Kit Brush Includes 4 Brushes 16 x 32 mm	1
14		060078-011	Screw Thread Rolling	4
15		020081	Head Commutator End	1
		020419	Head Commutator End Includes Index 10, 11, 12, 13 & 14	1
16	†	060078-004	Screw Thread Forming	2
17		060032-061	Screw	4
18		020536-001	Fan	1

Always Specify Model, Data & Serial Numbers

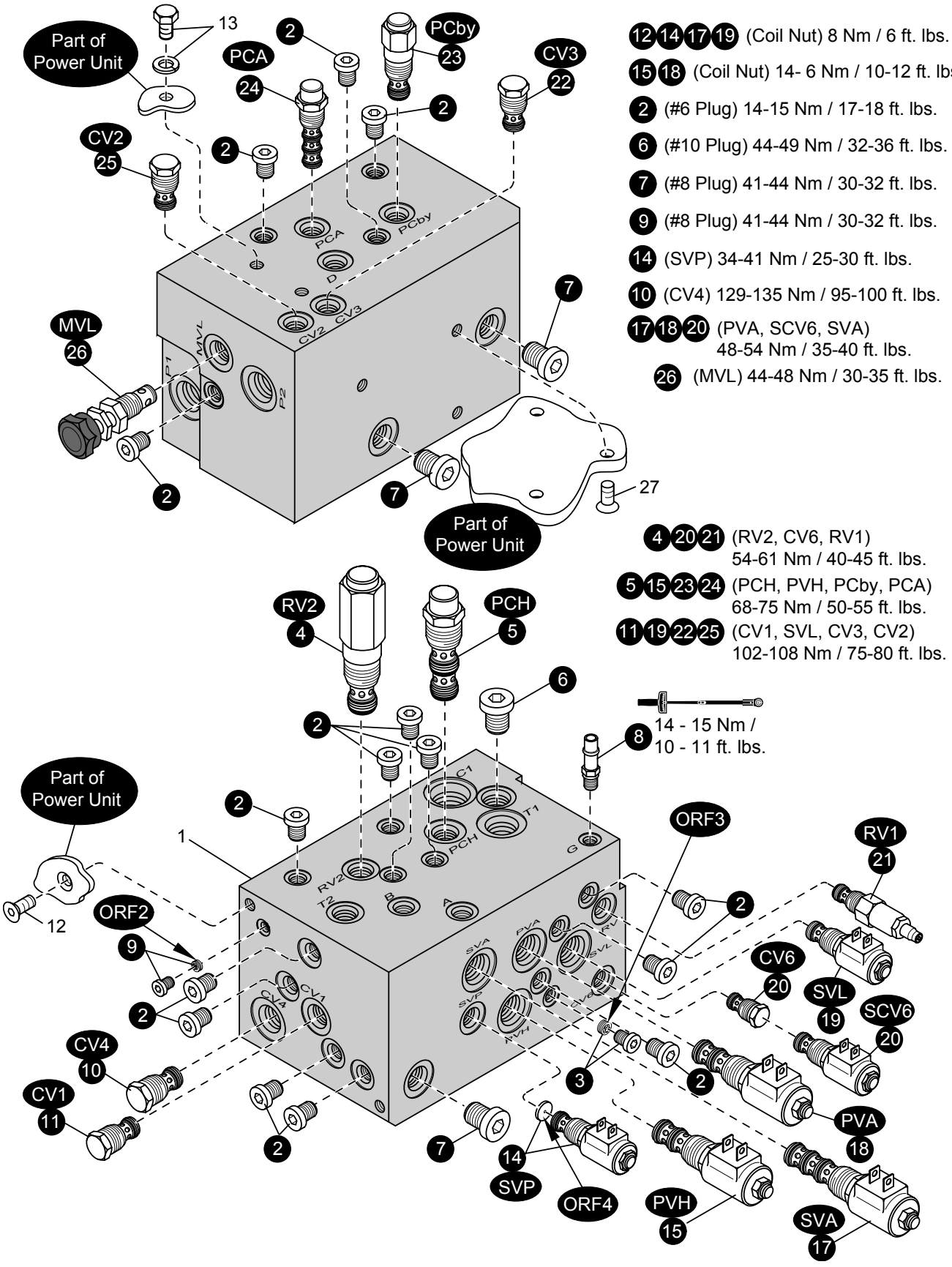
† Torque Screws to 15.8 - 16.9 Nm (140 - 150 in. lbs.)

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



8731

RR/RD 5200/5200S SERIES



128348 MANIFOLD BLOCK ASSEMBLY
(Does Not Include Index 2, 12, 13, 20 & 27)

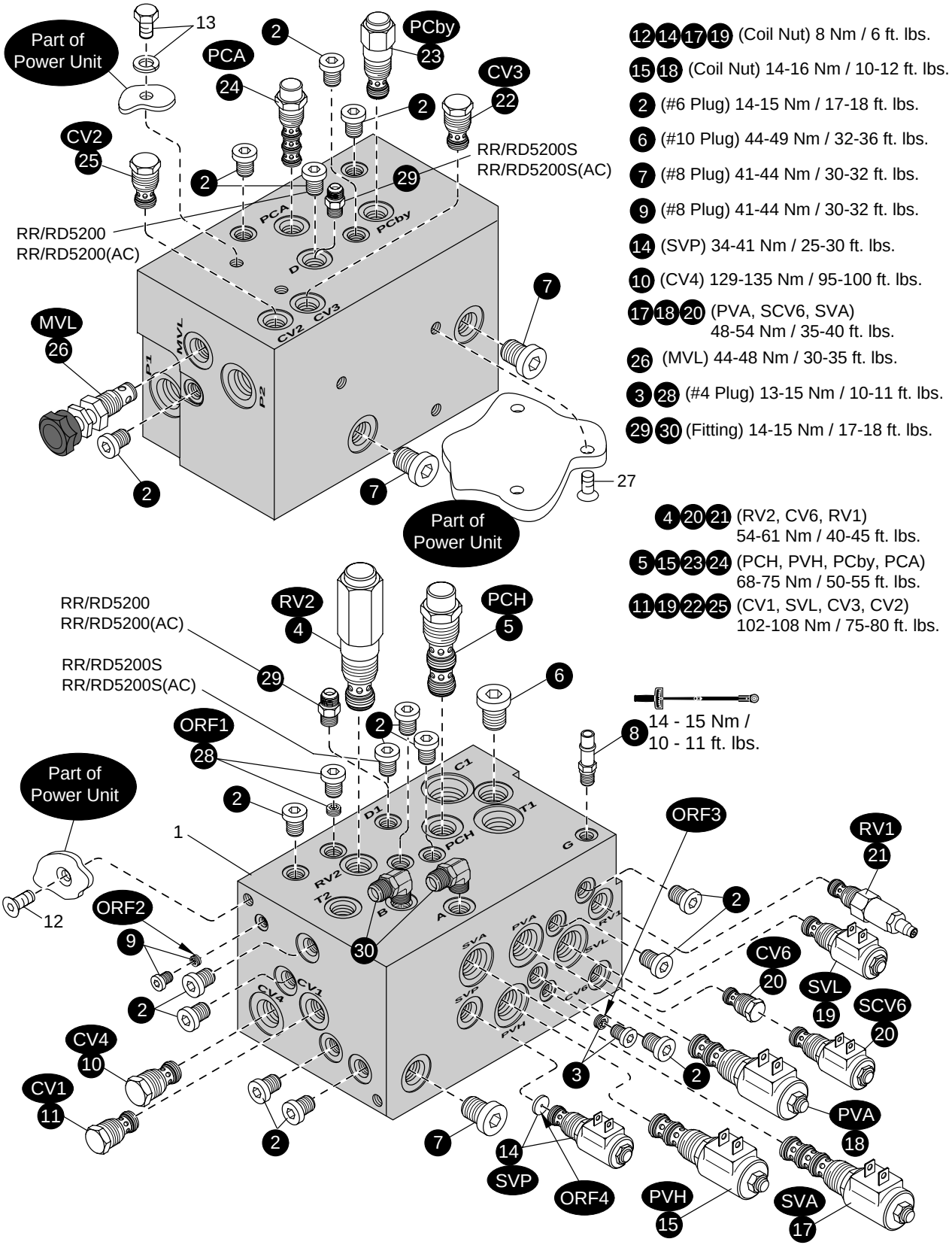
Index	Part No.	Part Name	No. Req.
1		Block Manifold Not Serviceable	1
2	064091-002	Plug Port #6	15
3	064091-006	Plug Port #4	1
	123270-001	Orifice	1
4	122334-002	Valve Relief Accessory	1
	111790-003	Kit Seal	1
5	123261	Compensator Hoist	1
	111790-010	Kit Seal	1
6	064091-007	Plug Port #10	1
7	064091-001	Plug Port #8	3
8	123887	Nipple Quick Disconnect	1
9	064091-004	Plug Port #2	1
	123270-004	Orifice	1
10	123255-002	Valve Check	1
	111790-012	Kit Seal	1
11	123255-001	Valve Check	1
	111790-009	Kit Seal	1
12	060017-047	Screw	2
13	060017-007	Screw	2
	060005-009	Lockwasher	2
	060030-026	Flatwasher	2
14	123258	Valve Solenoid Pilot	1
	104164-002	Coil Solenoid	1
	111790-001	Kit Seal	1
	123270-003	Orifice	1
15	123257-001	Valve Proportional Solenoid Hoist	1
	104164-012	Coil Solenoid	1
	111790-014	Kit Seal	1
16	123270-005	Orifice	2
17	117385-003	Valve Solenoid	1
	104164-005	Coil Solenoid	1
	111790-007	Kit Seal	1
18	123257-002	Valve Solenoid Proportional	1
	104164-012	Coil Solenoid	1
	111790-013	Kit Seal	1
19	117305-003	Valve Solenoid	1
	104164-005	Coil Solenoid	1
	111790-012	Kit Seal	1
20	117304-003	Valve Solenoid Used with 1 Lift Pump	1
	104164-005	Coil Solenoid	1
	111790-003	Kit Seal	1
	125379	Valve Check Used with 2 Lift Pumps	1
	111790-003	Kit Seal	1
21	117913-002	Valve Relief Hoist	1
	111790-003	Kit Seal	1
22	123255-001	Valve Check	1
	111790-009	Kit Seal	1
23	123260	Valve Compensator By-Pass	1
	111790-010	Kit Seal	1
24	123259	Valve Compensator 4-Way Accessory	1
	111790-011	Kit Seal	1
25	123255-001	Valve Check	1
	111790-009	Kit Seal	1
26	117739	Valve Manual Lower	1
	111790-005	Kit Seal	1
27	060017-033	Screw	3

Always Specify Model, Data & Serial Numbers

127866	Manifold O-Ring Kit	1

10521-01

RR/RD 5200/5200S
RR/RD 5200(AC)/5200S(AC)



12 14 17 19 (Coil Nut) 8 Nm / 6 ft. lbs.

15 18 (Coil Nut) 14-16 Nm / 10-12 ft. lbs.

2 (#6 Plug) 14-15 Nm / 17-18 ft. lbs.

6 (#10 Plug) 44-49 Nm / 32-36 ft. lbs.

7 (#8 Plug) 41-44 Nm / 30-32 ft. lbs.

9 (#8 Plug) 41-44 Nm / 30-32 ft. lbs.

14 (SVP) 34-41 Nm / 25-30 ft. lbs.

10 (CV4) 129-135 Nm / 95-100 ft. lbs.

17 18 20 (PVA, SCV6, SVA)
48-54 Nm / 35-40 ft. lbs.

26 (MVL) 44-48 Nm / 30-35 ft. lbs.

3 28 (#4 Plug) 13-15 Nm / 10-11 ft. lbs.

29 30 (Fitting) 14-15 Nm / 17-18 ft. lbs.

4 20 21 (RV2, CV6, RV1)
54-61 Nm / 40-45 ft. lbs.

5 15 23 24 (PCH, PVH, PCby, PCA)
68-75 Nm / 50-55 ft. lbs.

11 19 22 25 (CV1, SVL, CV3, CV2)
102-108 Nm / 75-80 ft. lbs.

128348 MANIFOLD BLOCK ASSEMBLY
(Does Not Include Index 2, 12, 13, 20, 27, 29 & 30)

Index	Part No.	Part Name	No. Req.
1		Block Manifold Not Serviceable	1
2	064091-002	Plug Port #6	15
3	064091-006	Plug Port #4	1
	123270-002	Orifice	1
4	122334-002	Valve Relief Accessory	1
	111790-003	Kit Seal	1
5	123261	Compensator Hoist	1
	111790-010	Kit Seal	1
6	064091-007	Plug Port #10	1
7	064091-001	Plug Port #8	3
8	123887	Nipple Quick Disconnect	1
9	064091-004	Plug Port #2	1
	123270-004	Orifice	1
10	123255-002	Valve Check	1
	111790-012	Kit Seal	1
11	123255-001	Valve Check	1
	111790-009	Kit Seal	1
12	060017-047	Screw	2
13	060017-007	Screw	2
	060005-009	Lockwasher	2
	060030-026	Flatwasher	2
14	123258	Valve Solenoid Pilot	1
	104164-002	Coil Solenoid	1
	111790-001	Kit Seal	1
	123270-003	Orifice	1
15	123257-001	Valve Proportional Solenoid Hoist	1
	104164-012	Coil Solenoid	1
	111790-014	Kit Seal	1
16	123270-005	Orifice	2
17	117385-003	Valve Solenoid	1
	104164-005	Coil Solenoid	1
	111790-007	Kit Seal	1
18	123257-002	Valve Solenoid Proportional	1
	104164-012	Coil Solenoid	1
	111790-013	Kit Seal	1
19	117305-003	Valve Solenoid	1
	104164-005	Coil Solenoid	1
	111790-012	Kit Seal	1
20	117304-003	Valve Solenoid Used with 1 Lift Pump	1
	104164-005	Coil Solenoid	1
	111790-003	Kit Seal	1
	125379	Valve Check Used with 2 Lift Pumps	1
	111790-003	Kit Seal	1
21	117913-002	Valve Relief Hoist	1
	111790-003	Kit Seal	1
22	123255-001	Valve Check	1
	111790-009	Kit Seal	1
23	123260	Valve Compensator By-Pass	1
	111790-010	Kit Seal	1
24	123259	Valve Compensator 4-Way Accessory	1
	111790-011	Kit Seal	1
25	123255-001	Valve Check	1
	111790-009	Kit Seal	1
26	117739	Valve Manual Lower	1
	111790-005	Kit Seal	1
27	060017-033	Screw	3
28	064091-006	Plug Port #4	1
	123270-005	Orifice	1
29		Connector See Section 02.0	1
30		Elbow 90° See Section 02.0	2

Always Specify Model, Data & Serial Numbers

127866	Manifold Valve O-Ring Kit	1

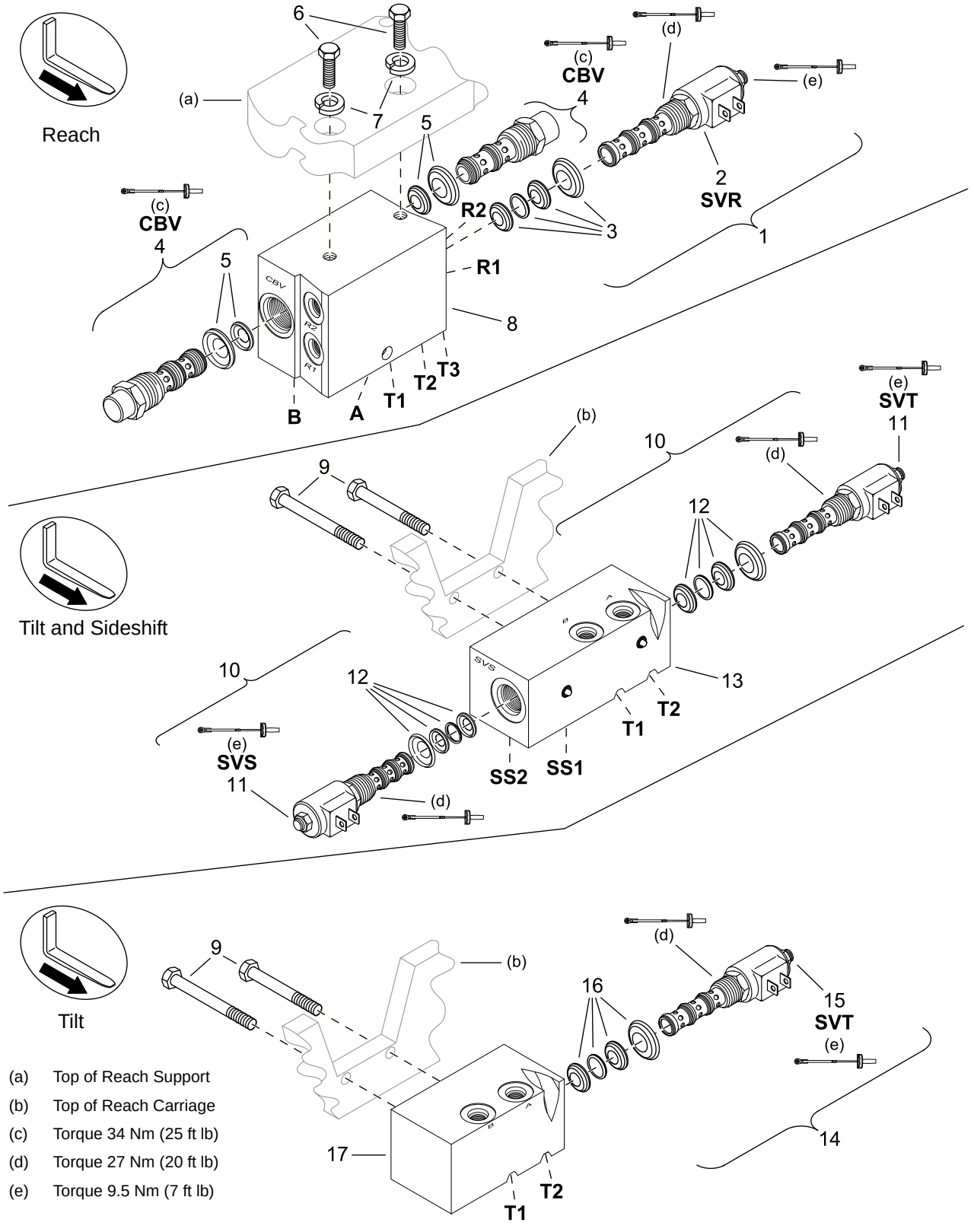


Figure 19503-02

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	122167-001	Solenoid Valve Assembly	1
2	104164-015	Coil 24 V	1
3	123977	Seal Kit	1
4	121819	Check Valve	2
5	111790-002	Seal Kit	1
6	060016-088	Screw	2
7	060005-008	Lockwasher	2
8	125928	Manifold Block Assembly (includes expansion plugs)	1
9	060015-064*	Screw	1
	060015-069	Screw	1
10	122167-001*	Solenoid Valve Assembly	2
11	104164-015	Coil 24 V	1
12	123977	Seal Kit	1
13	125929*	Manifold Block Assembly (includes expansion plugs)	1
14	122167-001	Solenoid Valve Assembly	1
15	104164-015	Coil 24 V	1
16	123977	Seal Kit	1
17	122172*	Manifold Block Assembly (includes expansion plugs)	1

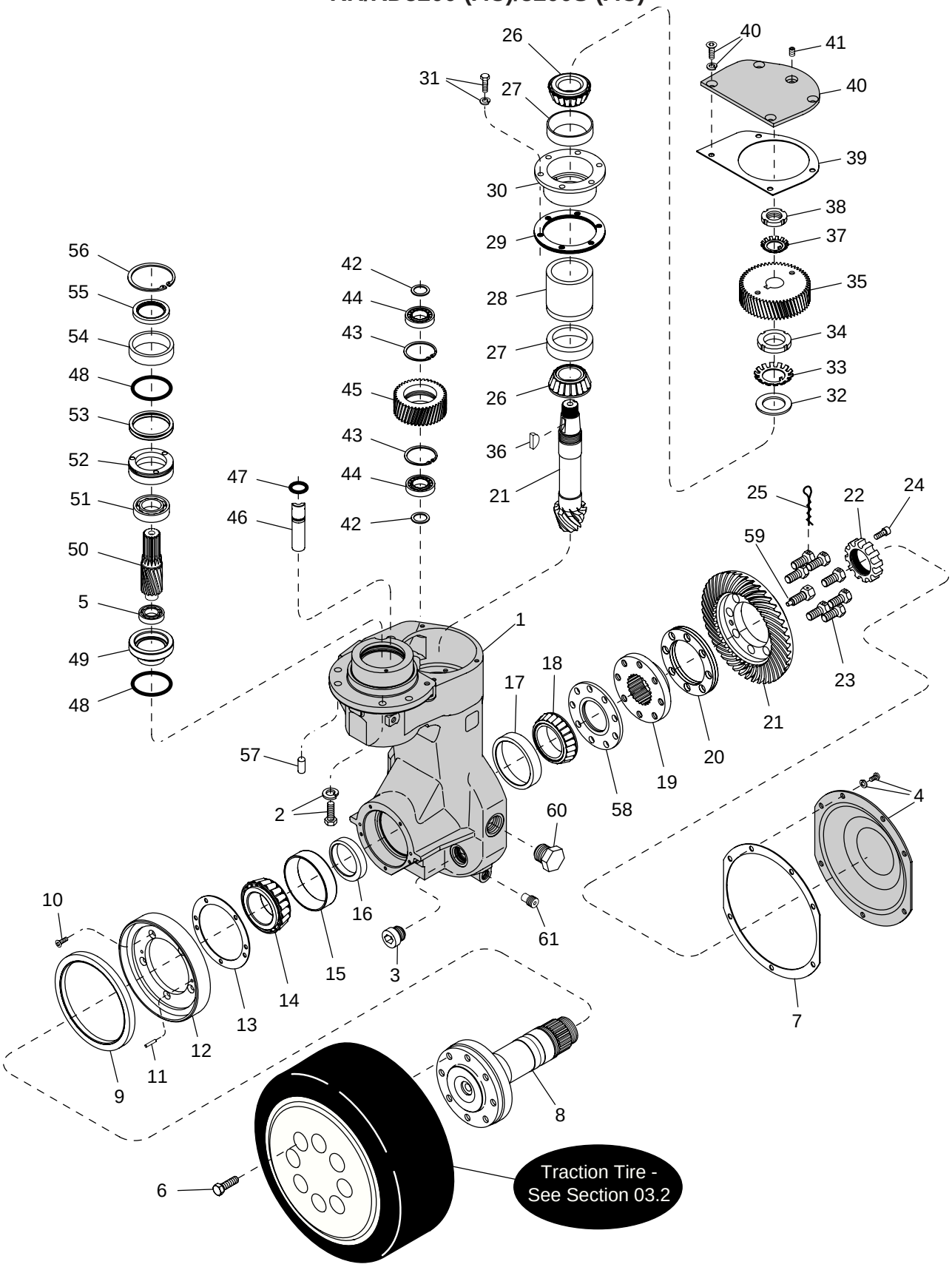
Note: Regardless of truck battery voltage, the ACCESS 123 system powers solenoids with 24 V.

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number

8749-01

RR/RD 5200/5200S
RR/RD5200 (AC)/5200S (AC)



Index		Part No.	Part Name	No. Req.
1		128990	Housing Drive Unit	1
2		060017-007	Screw	2
		060005-009	Lockwasher	2
3		064091-005	Plug	1
4		128447-001	Cover	1
		060016-031	Screw	7
		060005-008	Lockwasher	7
5		065081-065	Bearing	1
6		078885-001	Bolt	8
7		083500	Gasket	1
8	*		Axle	1
9		087412	Seal	1
		065005-001	Sealer Gasket	AR
10		060015-053	Screw	5
11		060000-005	Roll Pin	2
12		087461	Retainer Seal	1
13		087408	Gasket	1
14		065024	Bearing Cone	1
15		065023	Bearing Cup	1
16		083513	Cam	1
17		065018	Bearing Cup	1
18		065019	Bearing Cone	1
19	*		Hub	1
		065005-003	Anti-Seize	1
20		089248-001	Shim 0.13 mm (.005 in.) Thick	AR
		089248-002	Shim 0.18 mm (.007 in.) Thick	AR
		089248-003	Shim 0.51 mm (.020 in.) Thick	AR
21	*		Gear and Pinion Matched	1
22		128725	Locknut	1
23		078885-003	Bolt	7
		061004-026	Adhesive Thread Locking	1
24		110559	Screw Cap	2
25		089239-002	Wire Lock	
			Cut to Length Required	1
26		065052	Bearing Cone	2
27		065051	Bearing Cup	2
28		083514	Spacer	1
29		083516-001	Shim 0.20 mm (.008 in.) Thick	AR
		083516-002	Shim 0.25 mm (.010 in.) Thick	AR
		083516-003	Shim 0.33 mm (.013 in.) Thick	AR
30		083517	Retainer Bearing	1
31		060016-004	Screw	6
		060005-008	Lockwasher	6
32		083511	Flatwasher Special	1
33		060044-006	Lockwasher	1
34		060043-006	Locknut	1
35		087386	Gear 1st Reduction	1
36		061008-004	Key Woodruff	1
37		060044-005	Lockwasher	1
38		060043-005	Locknut	1
39		083501	Gasket	1
		065005-002	Sealer Gasket	AR
40		086618	Cover	1
		060016-030	Screw Tighten to 20 - 27 Nm	
			(15 - 20 ft. lbs.)	4
		061004-026	Adhesive Thread Locking	1
		060005-037	Lockwasher	4
41		064020-004	Plug Vented Pipe	1
42		083531	Spacer	2
43		060009-039	Ring Retaining	2
44		065081-003	Bearing Ball	2
45		086016	Gear Idler	1
46		086015	Shaft Idler	1
47		064019-061	O-Ring	1
48		064019-033	O-Ring	2
49		127413	Retainer	1
50		085586	Shaft Pinion	1
51		065089-004	Bearing Ball	1
		061004-019	Adhesive Thread Locking	1
52		085580	Retainer	1
		061004-026	Adhesive Thread Locking	1
53		085928-001	Shim 0.20 mm (.008 in.) Thick	AR
		085928-002	Shim 0.25 mm (.010 in.) Thick	AR
		085928-003	Shim 0.33 mm (.013 in.) Thick	AR
54		085927	Spacer	1
55		064138-003	Seal Oil	1
56		060009-097	Ring Retaining	1
57		061011-020	Pin Dowel	2
58		128942	Nut Preload	1
59		131101	Locking Bolt	1
60		064198-002	Plug	1
		061004-002	Adhesive Hydraulic Sealant	1
61		064020-003	Plug	1
		061004-002	Adhesive Hydraulic Sealant	1

Always Specify Model, Data & Serial Numbers

129474 Drive Unit Replacement Kit (Does Not Include Index 2 & 57) 1

*** Not Servicable**

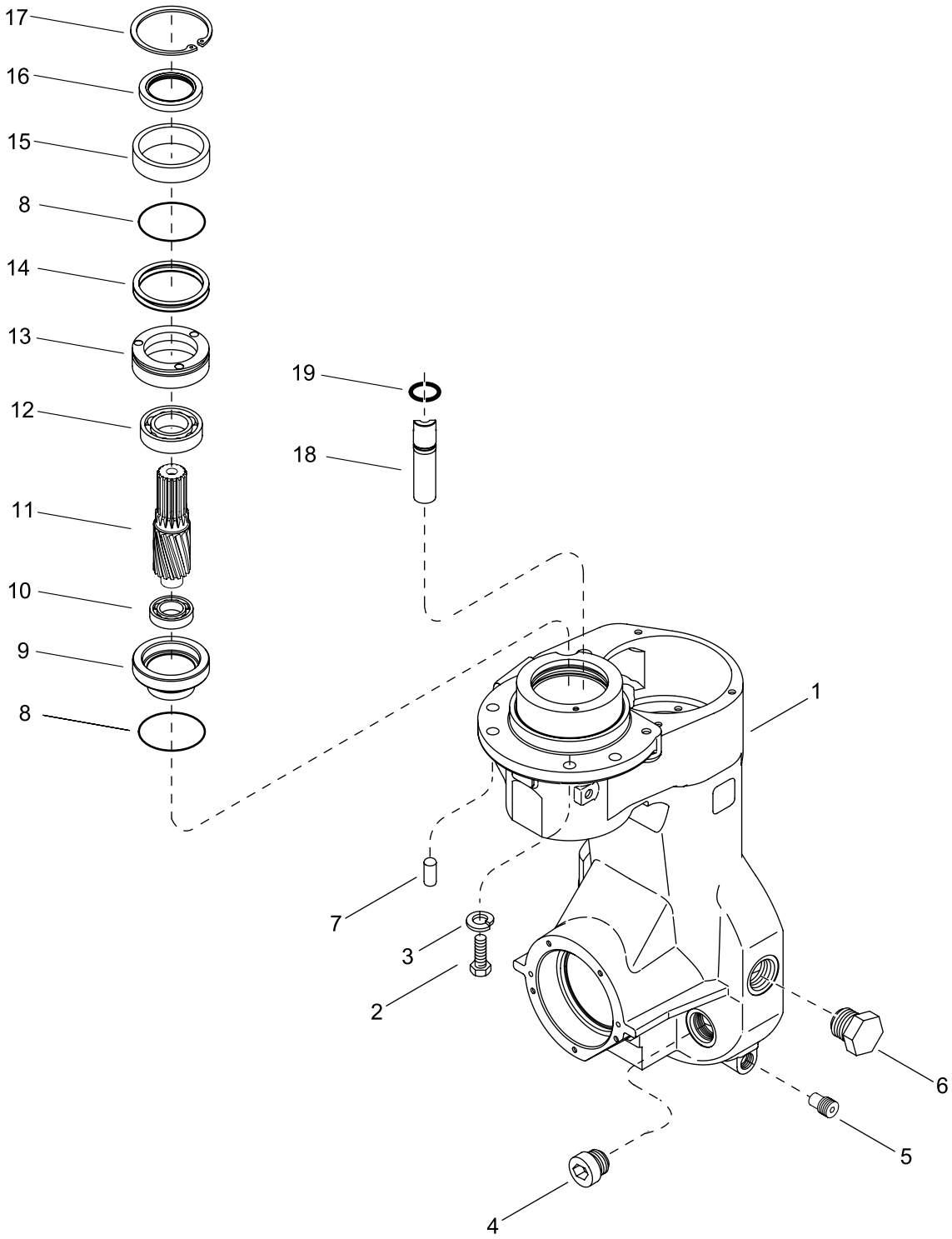
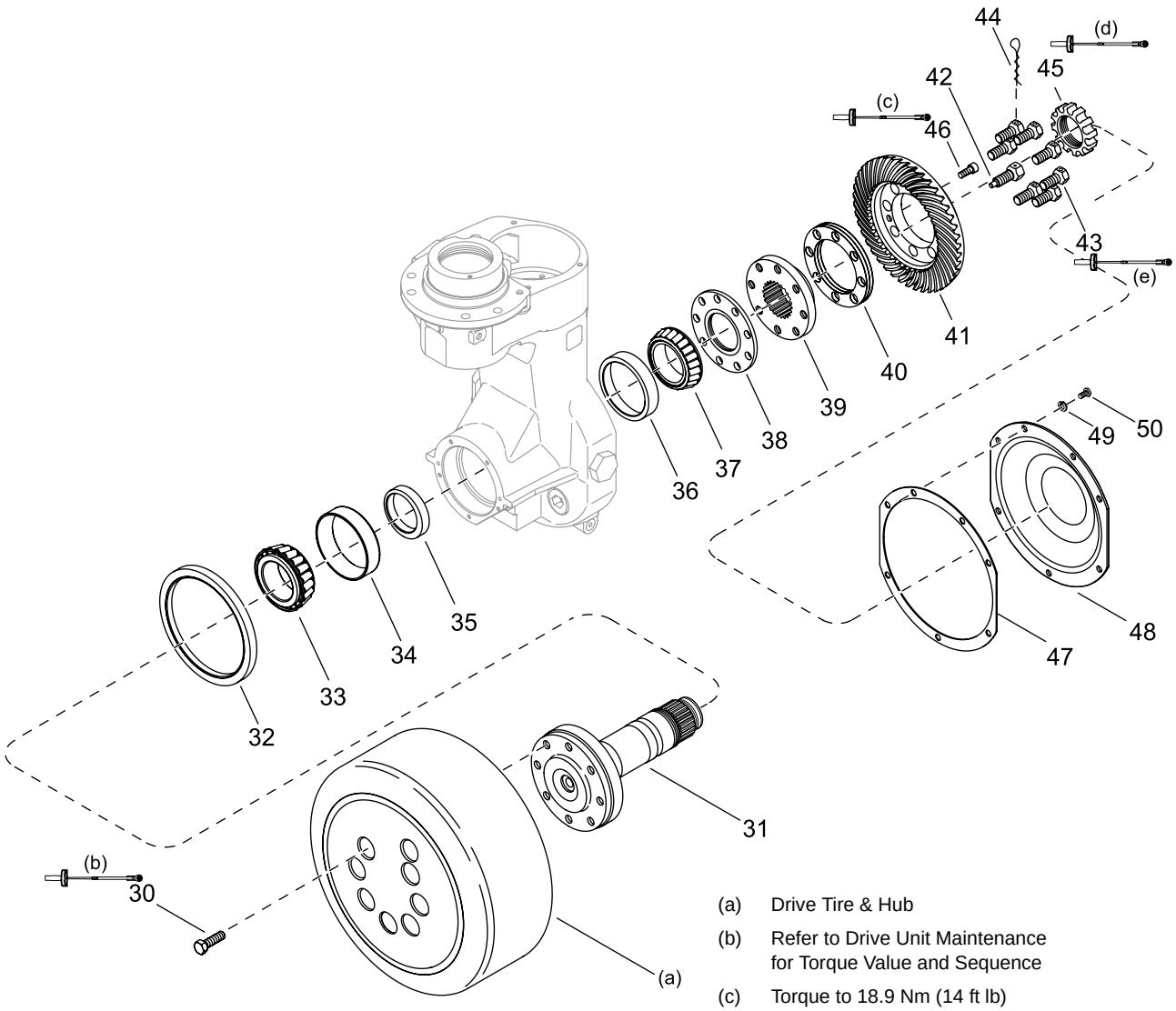


Figure 18438

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	134469	Drive Unit Service Assembly	1
1	131877	Housing Drive Unit	1
2	060017-007	Screw	2
3	060005-009	Lockwasher	2
4	064091-005	Plug	1
	061004-005	Hydraulic Sealant Adhesive	1
5	064020-003	Plug	1
	061004-005	Hydraulic Sealant Adhesive	1
6	064198-002	Plug	1
	061004-005	Hydraulic Sealant Adhesive	1
7	061011-020	Pin Dowel	2
8	064019-033	O-Ring	2
9	127413	Retainer	1
10	065081-065	Bearing Ball	1
11	085586	Shaft Pinion	1
12	065089-004	Bearing Ball	1
13	085580	Retainer	1
	061004-026	Thread Locking Adhesive	1
14	085928-001	Shim 0.20 mm (0.008 in) Thick	AR
	085928-002	Shim 0.25 mm (0.010 in) Thick	AR
	085928-003	Shim 0.36 mm (0.014 in) Thick	AR
	085928-004	Shim 1.02 mm (0.040 in) Thick	AR
15	085927	Spacer	1
16	064138-003	Seal Oil	1
17	060009-097	Ring Retaining	1
18	086015	Shaft Idler	1
19	064019-061	O-Ring	1

Always Specify Model, Data & Serial Number



(a) Drive Tire & Hub

(b) Refer to Drive Unit Maintenance for Torque Value and Sequence

(c) Torque to 18.9 Nm (14 ft lb)

(d) Torque to 610 Nm (450 ft lb)

(e) Torque to 135.6 Nm (100 ft lb)

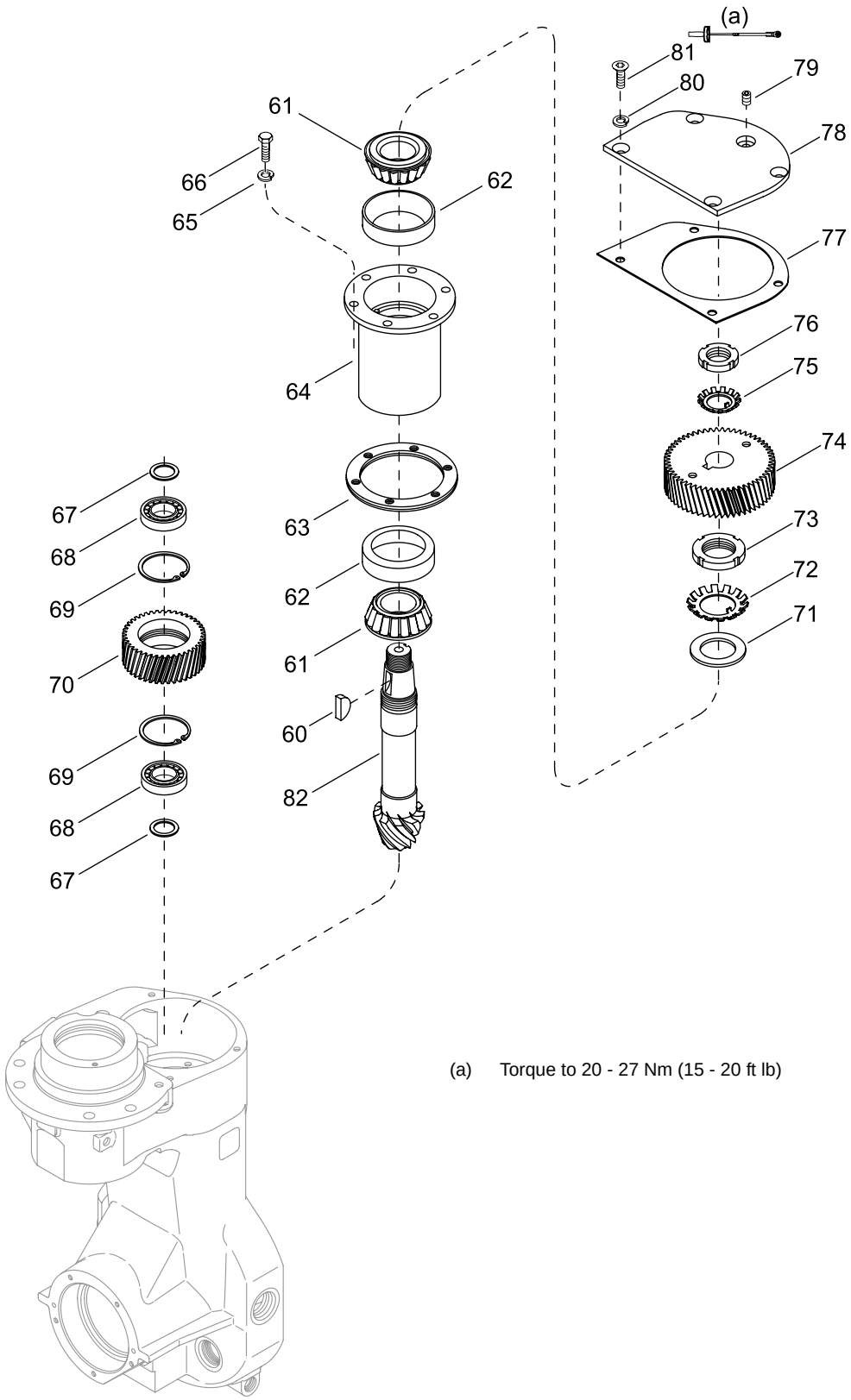
Figure 18439

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
30	078885-001	Bolt	8
31	127974[2]	Axle	1
	065005-003	Anti-seize	1
32	087412	Seal	1
	065005-001	Gasket Sealer	AR
33	065024	Bearing Cone	1
34	065023	Bearing Cup	1
35	083513	Cam	1
36	065018	Bearing Cup	1
37	065019	Bearing Cone	1
38	128942	Nut Preload	1
39	128941[2]	Hub	1
40	085928-001	Shim 0.20 mm (0.008 in) Thick	AR
	085928-002	Shim 0.25 mm (0.010 in) Thick	AR
	085928-002	Shim 0.33 mm (0.013 in) Thick	AR
41	128297[2]	Matched Gear & Pinion[1]	1
42	131101	Locking Bolt	1
43	078885-003	Bolt	7
	061004-026	Adhesive Thread Locking	1
44	089239-001	Wire Lock Cut to Length Required	1
45	128725	Locknut	1
46	110559	Screw Cap	2
47	083500	Gasket	1
48	128447-001	Cover Gear	1
49	060005-008	Lockwasher	7
50	060016-031	Screw	7

[1] Gear and Pinion are Matched Set

[2] Parts are Not Serviceable

Always Specify Model, Data & Serial Number



(a) Torque to 20 - 27 Nm (15 - 20 ft lb)

Figure 18440-01

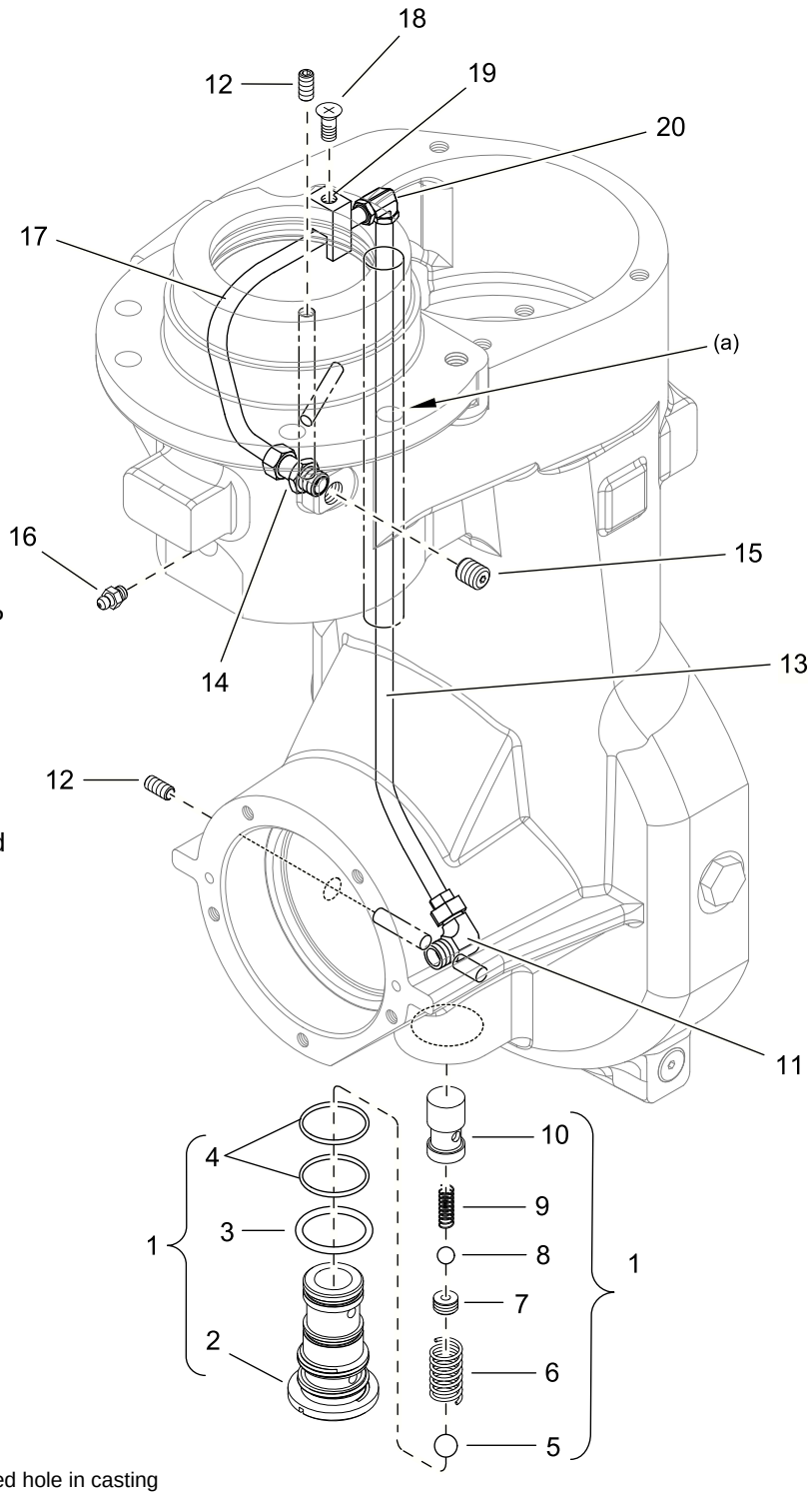
INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
60	061008-004	Key Woodruff	1
61	065052	Bearing Cone	2
62	065051	Bearing Cup	2
63	083516-001	Shim 0.20 mm (0.008 in) Thick	AR
	083516-002	Shim 0.25 mm (0.010 in) Thick	AR
	083516-003	Shim 0.33 mm (0.013 in) Thick	AR
64	134258	Retainer	1
65	060005-008	Lockwasher	6
66	060016-004	Screw	6
67	083531	Spacer	2
68	065081-003	Bearing Ball	2
69	060009-039	Ring Retaining	2
70	086016	Gear Idler	1
71	083511	Flatwasher Special	1
72	060044-006	Lockwasher	1
73	060043-006	Locknut	1
74	087386	Gear 1st Reduction	1
75	060044-005	Lockwasher	1
76	060043-005	Locknut	1
77	083501	Gasket	1
	065005-001	Gasket Sealer	AR
78	086618	Cover	1
79	064020-004	Plug Pipe	1
80	060005-037	Lockwasher	4
81	060016-030	Screw	4
	061004-006	Thread Locking Adhesive	1
82	128297[2]	Matched Gear & Pinion[1]	1
	134469	Drive Unit Replacement Kit	1

[1] Gear and Pinion are a matched set

[2] Parts are not serviceable

Always Specify Model, Data & Serial Number

TS, TSP, SP 3000, SP 3200, SP 3400, SP 3470, SP 3480, SP 3471, SP 3481, SP 3505, SP 3510, SP 3511, SP 3512, SP 3520, SP 3521, SP 3522, SP 3550 SP 3570, SP 3571, SP 3580, SP 3581, RR/RD 5200, RR/RD 5200S, RR/RD 5700 and RR/RD 5700S



(a) Tubing is installed through cored hole in casting

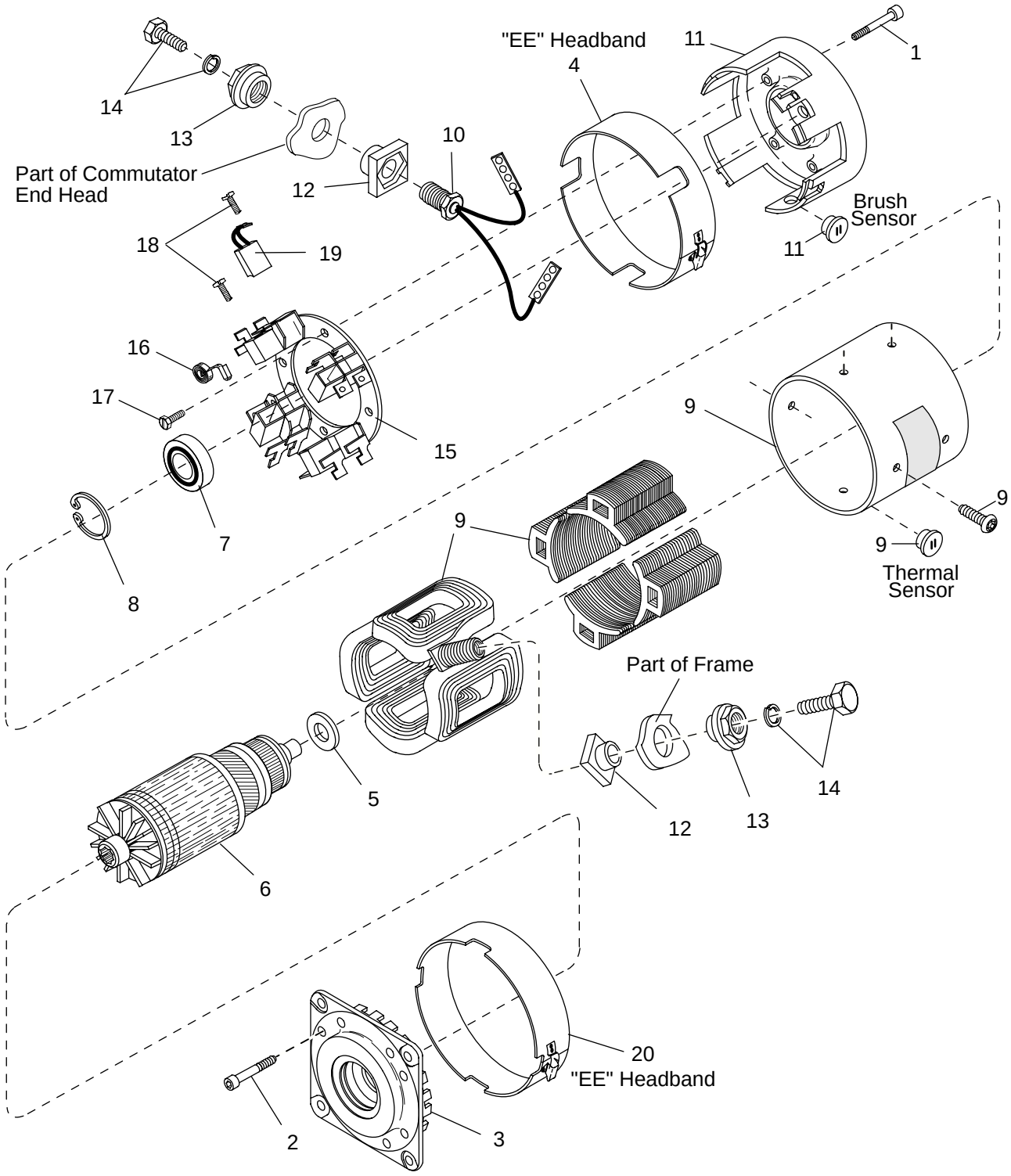
Figure 21934

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	091780	Oil Pump Assembly	1
2	085990	Pump Housing	1
3	064019-059	O-Ring	1
4	064019-047	O-Ring	2
5	065002-003	Ball	1
6	085987	Spring	1
7	085988	Plug	1
8	065002-007	Ball	1
9	083479	Spring	1
10	085989	Piston	1
11	064169-001	Elbow	1
12	060015-125	Set Screw	2
	061004-005	Thread Locking Adhesive	AR
13	085936	Tube	1
14	064168-001	Connector	1
15	064020-002	Plug	1
	061004-005	Thread Locking Adhesive	AR
16	076048-001	Lubrication Fitting	1
17	085935	Tube	1
18	060015-010	Screw	1
	061004-005	Thread Locking Adhesive	AR
19	085584	Spacer Block	1
20	064170-001	Elbow	1

Always Specify Model, Data & Serial Number

8697-01

RR/RD 5200 36V



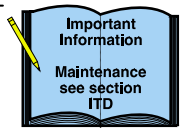
*020512-002 TRACTION MOTOR 36V WITH SENSORS
*020627 TRACTION MOTOR 36V WITH SENSORS "EE"
*020615-002 TRACTION MOTOR 36V NO SENSORS

Index		Part No.	Part Name	No. Req.
1	†	060078-019	Screw Thread Forming	4
2	†	060078-009	Screw Thread Forming	8
3		020642	Drive End Head	1
4		020407-001	Headband "EE"	1
5		020412	Washer 2.0 mm (.0788 in.) Thick	1
6		020527	Armature Includes Fan	1
			Fan (Not Serviceable)	1
7		065089-003	Bearing Ball	1
8		060009-144	Ring Retaining	1
9	*	020551	Frame & Field With Sensors	1
	*	020610	Frame & Field No Sensors	1
		060078-003	Screw Thread Forming	8
10		020594	Terminal & Lead	2
11	*	020521	Commutator End Head With Sensors	1
	*	020637	Commutator End Head With Sensors "EE"	1
	*	020607	Commutator End Head No Sensors	1
12		020196	Insulator Terminal	2
13		020197	Nut Terminal	2
14		060016-003	Screw	4
		060005-008	Lockwasher	4
15	*	020528	Brush Box Includes Index 16 With Sensors	1
	*	020240-002	Brush Box Includes Index 16 No Sensors	1
16		125918	Spring	8
17		060032-051	Screw Self Tapping	4
18		060078-011	Screw Thread Forming	8
19		020252-001	Brush 16 x 25 mm	8
		118942	Kit Brush	1
20		020418	Headband "EE"	1

Always Specify Model, Data & Serial Numbers

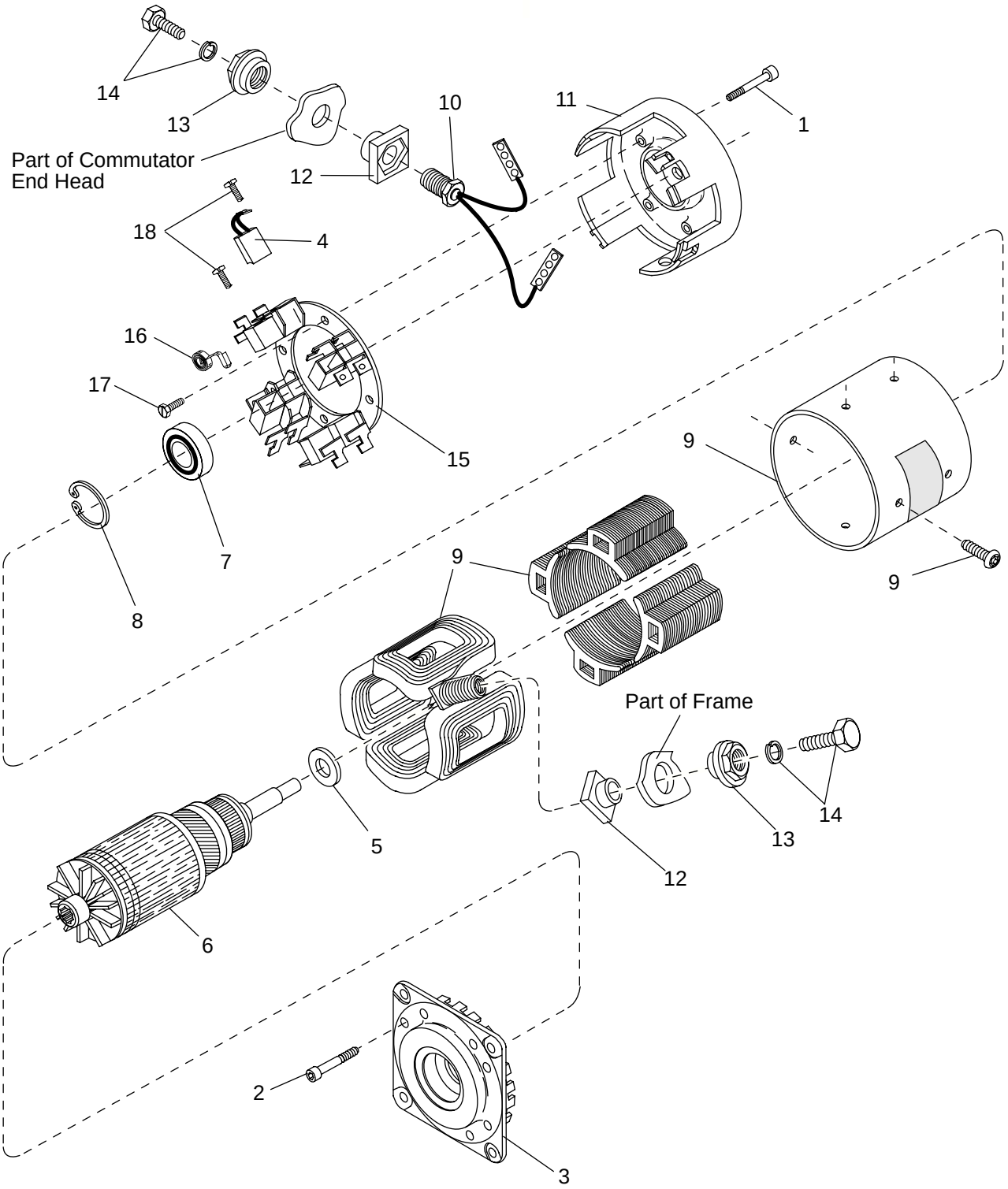
†Tighten to 16 - 17 Nm (140 - 150 in. lbs.)

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



8696-01

RR 5200 24V
NO SENSORS



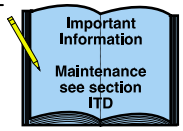
*020600-002 TRACTION MOTOR 24V NO SENSORS

Index	Part No.	Part Name	No. Req.
1	† 060078-007	Screw Thread Forming	4
2	† 060078-009	Screw Thread Forming	8
3	020642	Drive End Head	1
4	118942	Kit Brush Includes 8 Brushes	1
5	020412	Washer 2.00 mm (.0788 in.) Thick	1
6	020527	Armature Includes Fan	1
		Fan (Not Servicable)	1
7	065089-003	Bearing Ball	1
8	060009-144	Ring Retaining	1
9	020611	Frame and Field	1
	060078-003	Screw Thread Forming	8
10	020594	Terminal & Lead	2
11	020632	Commutator End Head	1
12	020196	Insulator Terminal	2
13	020197	Nut Terminal	2
14	060016-003	Screw	4
	060005-008	Lockwasher	4
15	020240-002	Brush Box Includes Index 16	1
16		Spring (Not Servicable)	8
17	060032-051	Screw Self Tapping	4
18	060078-011	Screw Thread Forming	8

Always Specify Model, Data & Serial Numbers

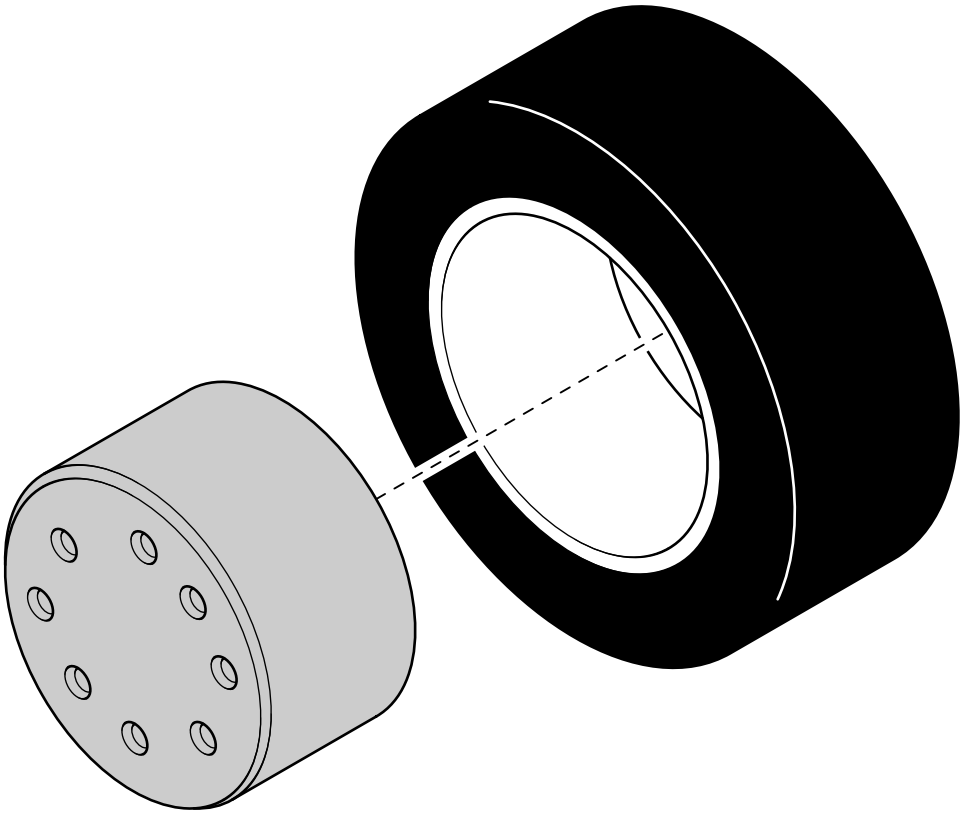
† Tighten to 16 - 17 Nm (140 - 150 in. lbs.)

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



5827-01

RR/RD 5200/5200S
RR/RD 5200 (AC)/5200S (AC)

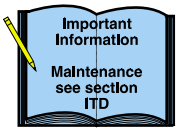


POLY TIRES - Size: 330 x 140 x 240mm (13 x 5.5 x 9.5 in.)

Tire Assembly (Includes Hub)	Tire	Hub	Tread	Color	Durometer
121500-001	121501-010-01	121502	Smooth	Black	80-86
121500-005	121501-010-02	121502	Center Groove	Black	80-86
121500-006	121501-010-03	121502	22 Degree Siped	Black	80-86
—	121501-010-04	121502	Razor Siped	Black	80-86
121500-008	121501-011-01	121502	Smooth	Cream	80-86
121500-010	121501-027-01	121502	Smooth	Black	89-93
121500-011	121501-027-02	121502	Center Groove	Black	89-93
121500-012	121501-027-03	121502	22 Degree Siped	Black	89-93
121500-013	121501-028-01	121502	Smooth	Cream	89-93
121500-014	121501-037-01	121502	Smooth	Black	88-92
121500-015	121501-037-02	121502	Center Groove	Black	88-92
121500-016	121501-037-03	121502	22 Degree Siped	Black	88-92
—	121501-037-04	121502	Razor Siped	Black	88-92
121500-017	121501-038-01	121502	Smooth	Cream	88-92

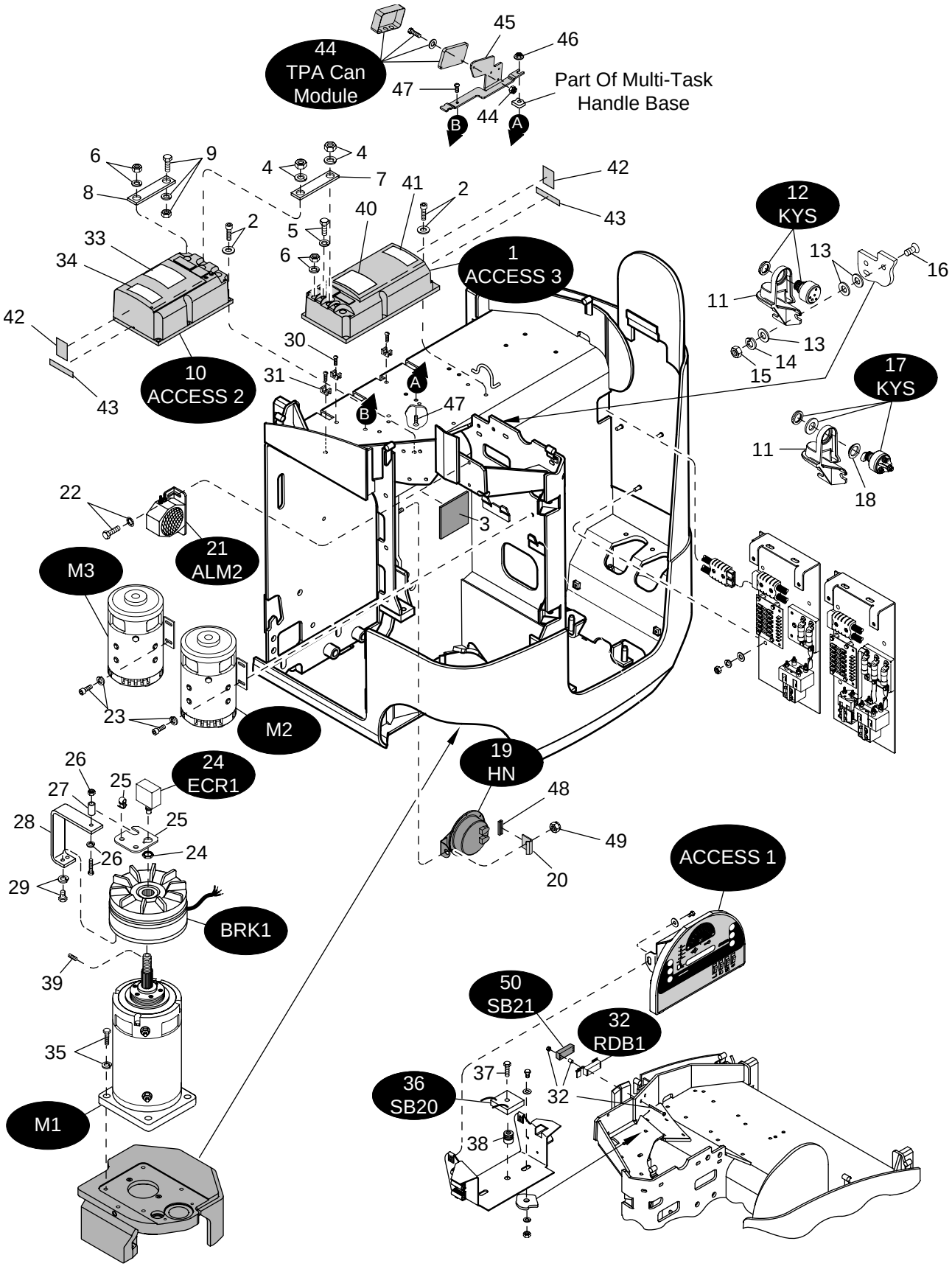
Always Specify Model, Data & Serial Numbers

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



8811-02

RR/RD 5200

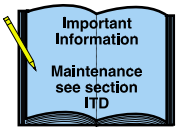


Index	Part No.	Part Name	No. Req.
1 *	121607-001-0S	ACCESS 3 Standard Trucks	1
	121607-002-0S	ACCESS 3 Trucks with Remote Raise/Lower	1
	121607-004-0S	ACCESS 3 EE Trucks Only	1
	063002-029	Lubricant 5 oz.	1
2	060078-026	Screw	12
	060030-010	Flatwasher	12
3	129275	Pad	1
4	060021-053	Nut	2
	060005-054	Lockwasher	2
5	060014-005	Screw	2
	060005-005	Lockwasher	2
6	060021-009	Nut	4
	060005-008	Lockwasher	4
7	123287	Bar Bus	1
8	123893	Bar Bus	1
9	060016-003	Screw	1
	060005-008	Lockwasher	1
	060021-009	Nut	1
10 *	121611-00S	ACCESS 2	1
	063002-029	Lubricant 5 oz.	1
11	123757	Mount	1
12	123455	Switch Key Includes Switch, Connector & Contacts	1
	105606-401	Label JC	1
	062037-012	Connector	1
	062036-003	Contact	4
	107739	Keys (2) & Ring	1
	107151-002	Key	1
	107763	Ring Key	1
13	060030-026	Flatwasher	6
14	060005-009	Lockwasher	2
15	060021-011	Nut	2
16	060017-041	Screw	2
17	062623	Switch Keyless	1
	060030-075	Flatwasher	1
	123343	Harness	1
18	119240	Insert	1
19	129244-001	Horn	1
20	129271	Retainer	1
21	115565	Alarm Travel	1
22	060078-026	Screw	2
	060030-012	Flatwasher	2
23	060017-033	Screw	8
24	126699	Encoder Traction	1
25	126545	Plate	1
	061085-001	Clip	2
26	060014-023	Screw	1
	060005-005	Lockwasher	1
	060021-005	Nut	1
27	062488-004	Spacer	1
28	122293	Bracket 24 V	1
29	060014-060	Screw 24 V	2
	060005-005	Lockwasher 24 V	2
30	060015-013	Screw	5
31	061074-001	Cable Tie Mount	5
	061003-005	Cable Tie Not Shown	5
32	128829-001	Module PCB Relay Driver Block 24 V	1
	128829-002	Module PCB Relay Driver Block 36 V	1
	060013-044	Screw	2
	060042-015	Nut Self Locking	2
	062488-003	Spacer	2
33	069194	ACCESS 2 Label	1
34	069172	Hydraulic Module Label	1
35	060018-005	Screw	4
	060005-043	Lockwasher	4
36	125024	Suppressor Key Switch	1
37	060015-008	Screw	1
38	060091-001	Nut Insert	1
39	060013-001	Set Screw	1
40	069195	ACCESS 3 Label	1
41	069173	Traction Module Label	1
42	069171	Warning Module	2
43	069159	Security Label	2
44	129415-001	Module Assembly Includes Hardware, Harnesses and Index 45	1
45	129215	Bracket	1
46	060080-001	Nut	1
47	060015-013	Screw	1
48	065060-011	Grommet	1
49	060042-018	Nut	1
50	129567	Suppressor Horn	1

Always Specify Model, Data & Serial Numbers

***** When applying ACCESS module, apply a thin coating of thermal grease to the bottom of the module to permit better heat dissipation. Grease should be uniformly applied then a straight edge should be used to scrape excess grease off. The grease is only useful to fill microscopic gaps in the mounting surfaces. Too much grease can be worse than none at all. Limit torque of the fasteners to 3.4 Nm (30 in. lbs.).

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



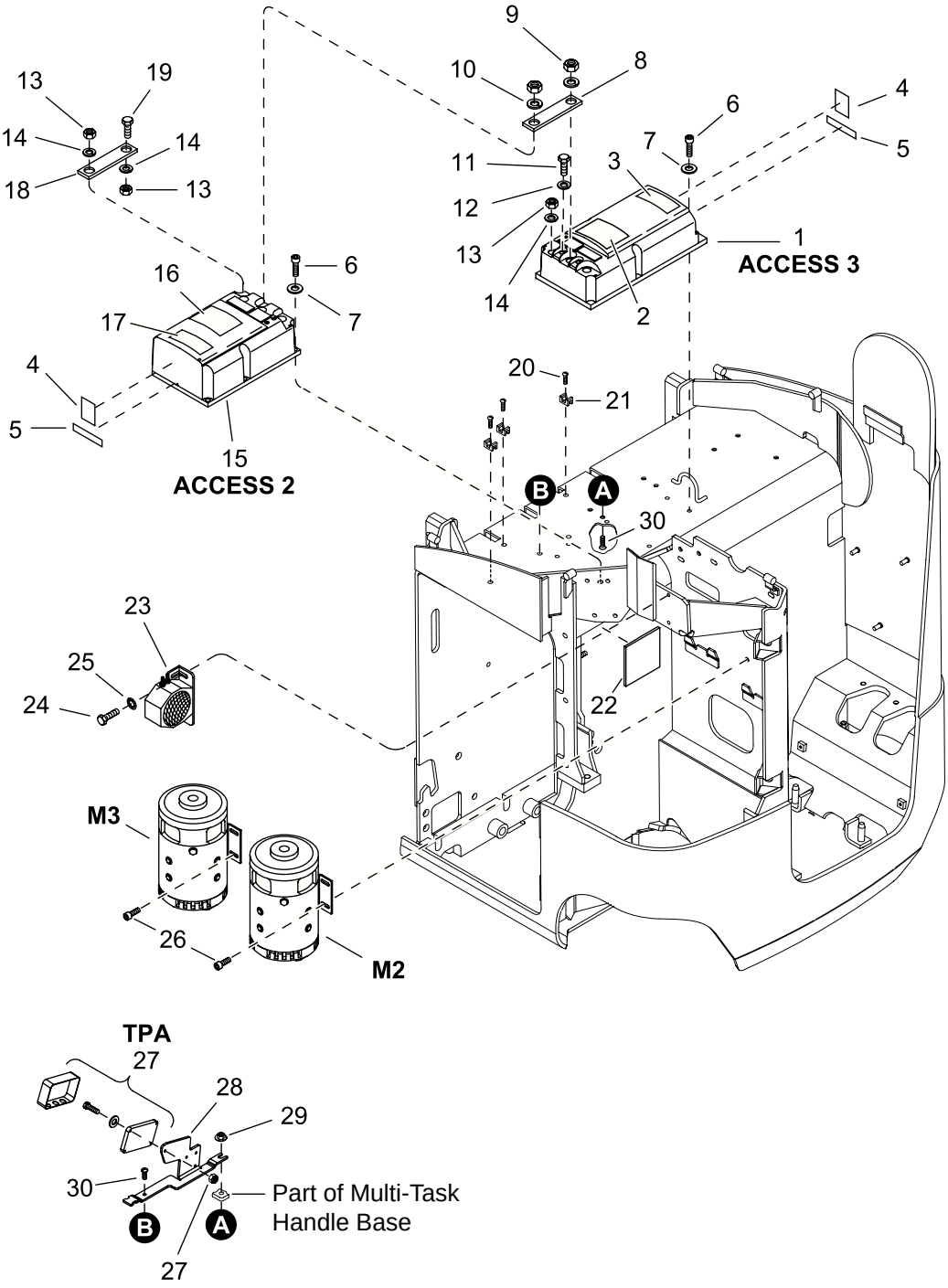


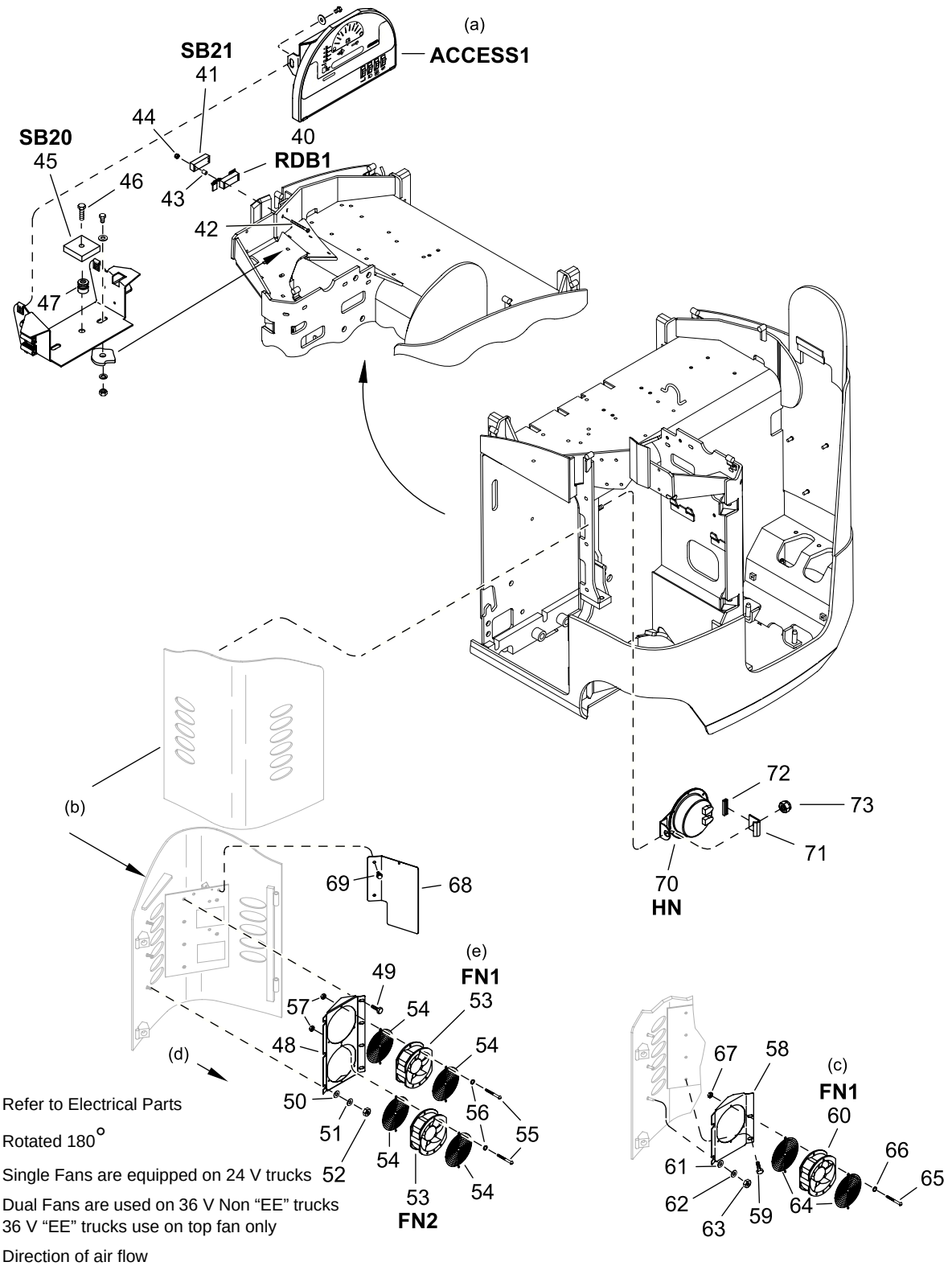
Figure 15852

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	121607-001-0S*	ACCESS 3 Module (1) Standard Trucks	1
	121607-002-0S*	ACCESS 3 Module (1) Trucks With Remote Raise/Lower	1
	121607-004-0S*	ACCESS 3 Module (1) EE Trucks Only	1
2	069195	ACCESS 3 Label	1
3	069173	Traction Module Label	1
4	069171	Warning Module Label	2
5	069159	Security Label	2
6	060078-026	Screw	12
7	060030-010	Flatwasher	12
8	123287	Bus Bar	1
9	060021-053	Nut	2
10	060005-054	Lockwasher	2
11	060014-097	Screw	2
12	060005-005	Lockwasher	2
13	060021-009	Nut	5
14	060005-008	Lockwasher	5
15	121611-00S	ACCESS 2 Module (1)	1
16	069194	ACCESS 2 Label	1
17	069172	Hydraulic Module Label	1
18	123893	Bus Bar	1
19	060016-077	Screw	1
20	060015-013	Screw	5
21	061074-001	Cable Tie Mount	5
	061003-005	Cable Tie (Not Shown)	5
22	129275	Pad	1
23	115565	Travel Alarm	1
24	060078-026	Screw	2
25	060030-012	Flatwasher	2
26	060017-033	Screw	8
27	129415-001	Module Assembly (Includes Hardware, Harnesses and Index 28)	1
28	129215	Bracket	1
29	060080-001	Nut	1
30	060015-013	Screw	1

(1) When installing ACCESS modules, apply a thin coating of thermal grease, 063002-029, to the bottom of the module to permit better heat dissipation. Grease should be uniformly applied, then use a straight edge to scrape the excess grease off. The grease is only useful to fill microscopic gaps in the mounting surfaces. Too much grease can be worse than none at all. Limit torque of the fasteners to 3.4 Nm (30 in lb).

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number



(a) Refer to Electrical Parts

(b) Rotated 180°

(c) Single Fans are equipped on 24 V trucks

(d) Dual Fans are used on 36 V Non “EE” trucks
36 V “EE” trucks use on top fan only

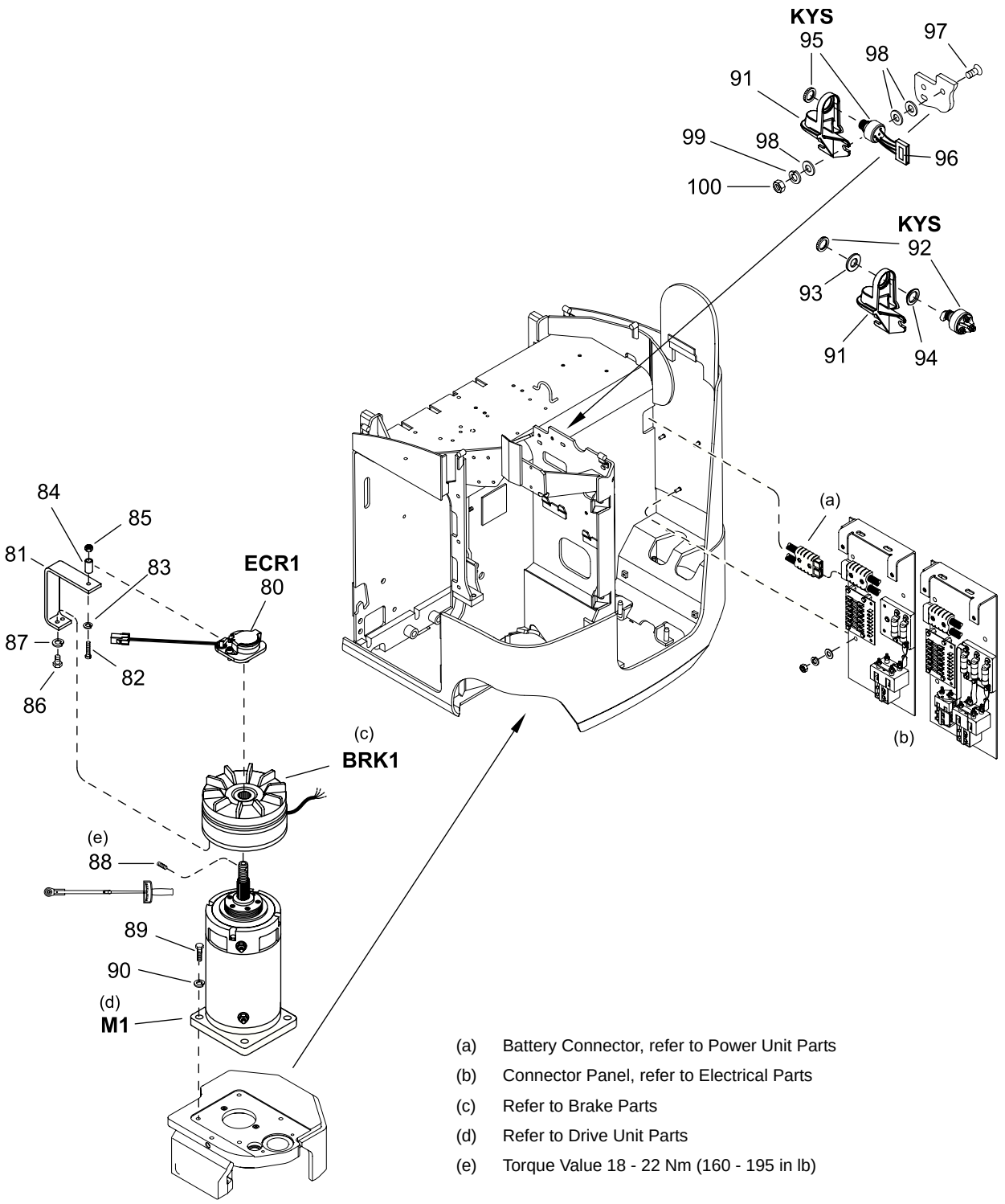
(e) Direction of air flow

Figure 15853-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
40	128829-001*	Relay Driver Block 24V	1
	128829-002*	Relay Driver Block 36V	1
41	129567	Suppressor Block Horn	1
42	060013-044	Screw	2
43	062488-003	Spacer	2
44	060042-015	Nut Self Locking	2
45	125024	Suppressor Block Key Switch	1
46	060015-008	Screw	1
47	060091-001	Insert Nut	1
48	126484	Bracket	1
49	060016-096	Screw	4
50	060030-187	Flatwasher	3
51	060030-119	Flatwasher	3
52	060042-020	Nut	3
53	126489*	Fan (Lower Fan Not Equipped on "EE" Trucks)	2
	062312	Diode (SB42) Part of Fan Wire Harness	1
54	128458	Guard	4
55	060013-044	Screw	8
56	060030-045	Flatwasher	16
57	060042-015	Nut	8
58	127887	Bracket	1
59	060016-096	Screw	2
60	126489*	Fan	1
	062312	Diode (SB42) Part of Fan Wire Harness	1
61	060030-187	Flatwasher	2
62	060030-119	Flatwasher	2
63	060042-020	Nut	2
64	128458	Guard	2
65	060013-044	Screw	4
66	060030-045	Flatwasher	8
67	060042-015	Nut	4
68	128905*	Finger Guard (Not Equipped on "EE" Trucks)	1
69	060016-096	Screw	2
70	129244-001	Horn	1
71	129271	Retainer	1
72	065060-011	Grommet	1
73	060042-018	Nut	1

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number



(a) Battery Connector, refer to Power Unit Parts

(b) Connector Panel, refer to Electrical Parts

(c) Refer to Brake Parts

(d) Refer to Drive Unit Parts

(e) Torque Value 18 - 22 Nm (160 - 195 in lb)

Figure 15854-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
80	130993	Traction Encoder Requires Version 13 or Greater Software	1
81	122293	Bracket	1
82	060014-023	Screw	1
83	060005-005	Lockwasher	1
84	062488-004	Spacer	1
85	060021-005	Nut	1
86	060014-060	Screw	2
87	060005-005	Lockwasher	2
88	060013-001	Set Screw	1
89	060018-005	Screw	4
90	060005-043	Lockwasher	4
91	123757	Mount	1
92	062623*	Keyless Switch	1
	123343	Harness (1)	1
93	060030-075	Flatwasher	1
94	119240	Insert	1
95	123455*	Key Switch Includes Connector and Contacts	1
	062037-012	Connector (1)	1
	062036-003	Contact (1)	4
	107739	Two Keys and Ring (1)	1
	107151-002	Key (1)	1
	107763	Key Ring (1)	1
96	105606-401	Label JC	1
97	060017-041	Screw	2
98	060030-026	Flatwasher	6
99	060005-009	Lockwasher	2
100	060021-011	Nut	2

(1) Not Shown

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number

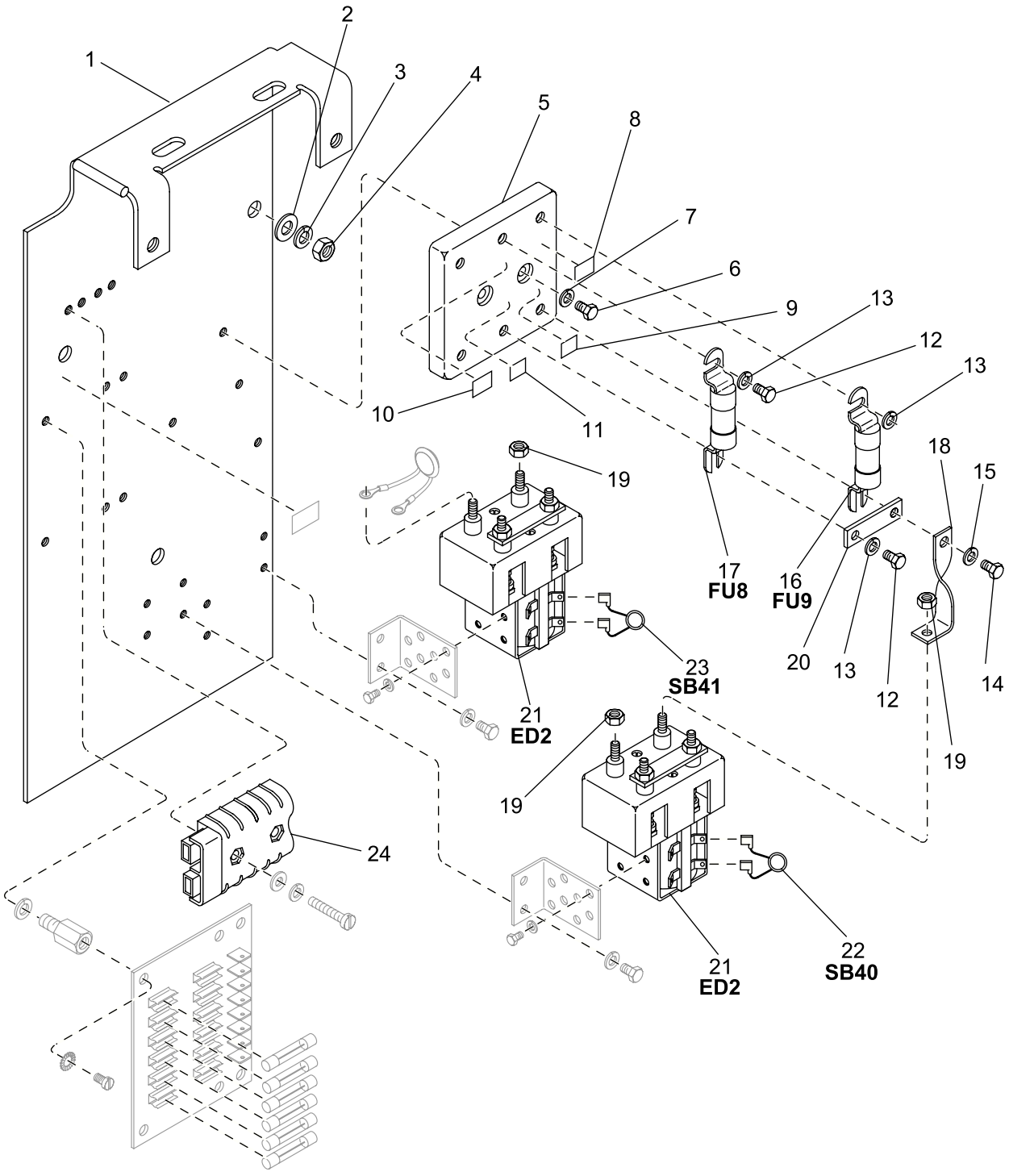


Figure 19583-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	123198-001	Contactor Panel	1
0	126216-001	Contactor Panel (EEC)	1
1	123851	Plate	1
2	060030-119	Flatwasher	3
3	060005-009	Lockwasher	3
4	060021-011	Nut	3
5	123208	Fuse Panel	1
6	060015-037	Screw	2
7	060005-006	Lockwasher	2
8	113729-017	Label ACK/ECK-250	1
9	079566-051	Label	1
10	113729-018	Label AOK/ALS-250	1
11	079566-051	Label	1
12	060015-089	Screw	3
13	060005-026	Lockwasher	3
14	060015-066	Screw	1
15	060005-026	Lockwasher	1
16	076924-020	Fuse ACK/ECK-250	1
17	076924-010	Fuse ACK/ALS-300	1
	076924-009	Fuse ACK/ALS-250 (1)	1
18	123088	Bus Bar	1
19	060059-003	Nut	8
20	123083	Bus Bar	1
21	118396	Contactor, refer to Electrical Parts	2
22	114285	Diode Suppressor	1
23	114285	Diode Suppressor (1)	1
24	078723-001	SB-350 Connector Gray	1
	078723-002	SB-175 Connector Gray	1
	078723-003	SB-350 Connector Red	1
	078723-004	SB-175 Connector Yellow	1
	078723-006	SB-350 Connector Blue	1
	078723-007	SB-175 Connector Red	1
	078723-008	SB-175 Connector Blue	1
	078723-009	SB-350 Connector Yellow	1
	078724-001	Contacts	2
	108801-001	SBE-320 Connector Gray (1)	1
	108801-003	SBE-320 Connector Red (1)	1
	108801-006	SBE-320 Connector Blue (1)	1
	108801-008	SBE-320 Connector Yellow (1)	1
	108802-001	Contacts (1)	2
	126222	Harness (not shown)	1

(1) Only used on EEC trucks

Note: 123198-001 Contactor Panel and 126216-001 Contactor Panel (EEC) does not include Index 21 and 40 thru 42 on following parts list.

Always Specify Model, Data & Serial Number

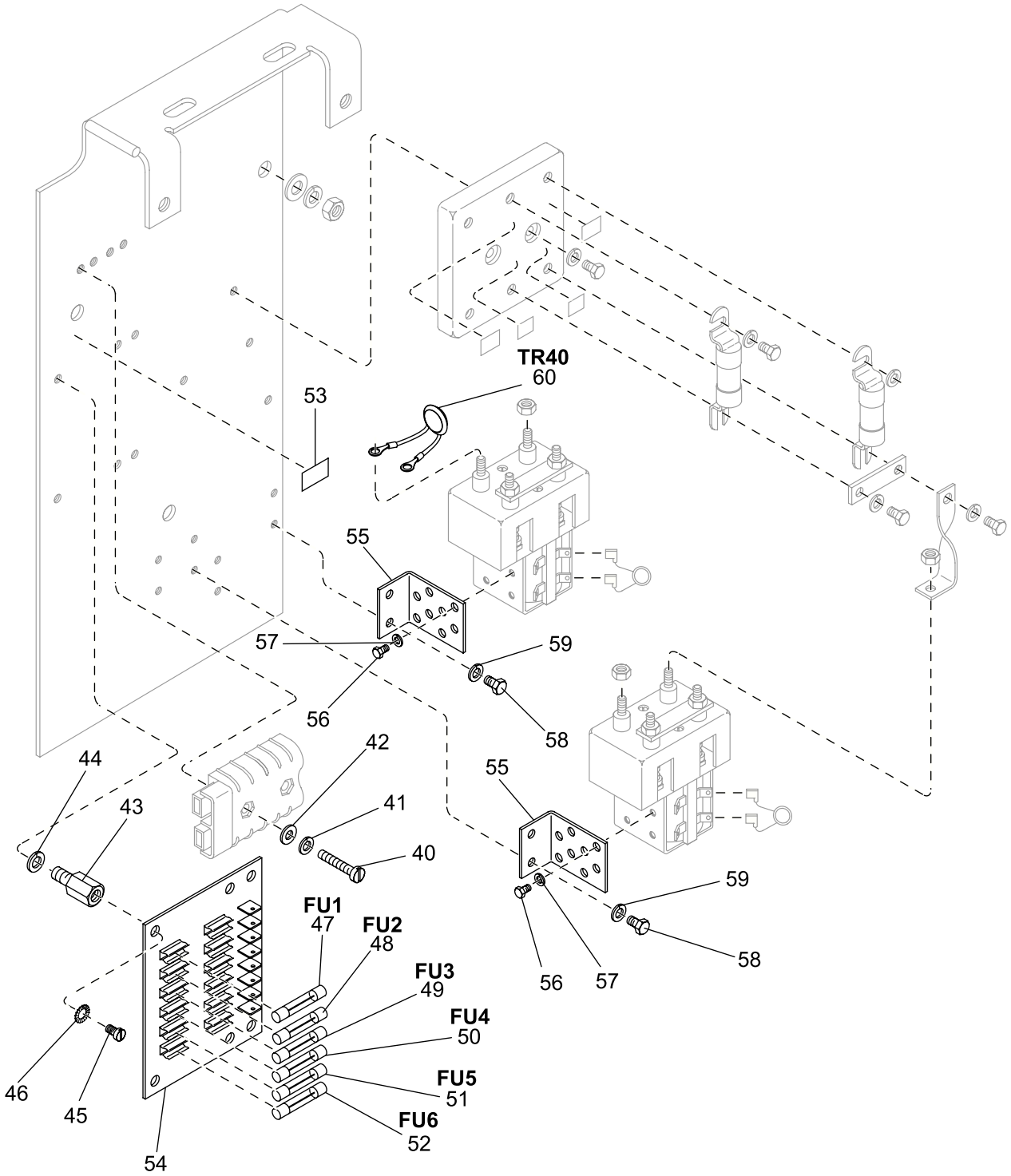


Figure 19584-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
40	060015-008	Screw	2
41	060005-007	Lockwasher	2
42	060030-037	Flatwasher	2
43	104401-014	Spacer	4
44	060005-053	Lockwasher	4
45	060013-039	Screw	4
46	060030-337	Lockwasher	4
47	094362-002	Fuse 15A, ABC-15	1
48	094362-002	Fuse 15A, ABC-15	1
49	094362-002	Fuse 15A, ABC-15	1
50	094362-002	Fuse 15A, ABC-15	1
51	094362-002	Fuse 15A, ABC-15	1
52	094362-002	Fuse 15A, ABC-15	1
53	113729-001	Label, ABC-15	1
54	123524	Panel Fuse	1
55	123084	Mounting Bracket (1)	2
56	060061-007	Screw (1)	4
57	060005-005	Lockwasher (1)	4
58	060015-003	Screw (1)	4
59	060005-007	Lockwasher (1)	4
60	062627-001	Thermistor	1
	061003-005	Cable Tie	4
	125588-001	Boot	2
	062020-001	Wire Connector	2

(1) Only used on EEC trucks

Note: 123198-001 Contactor Panel and 126216-001 Contactor Panel (EEC) does not include Index 21 from previous part list and 40 thru 42.

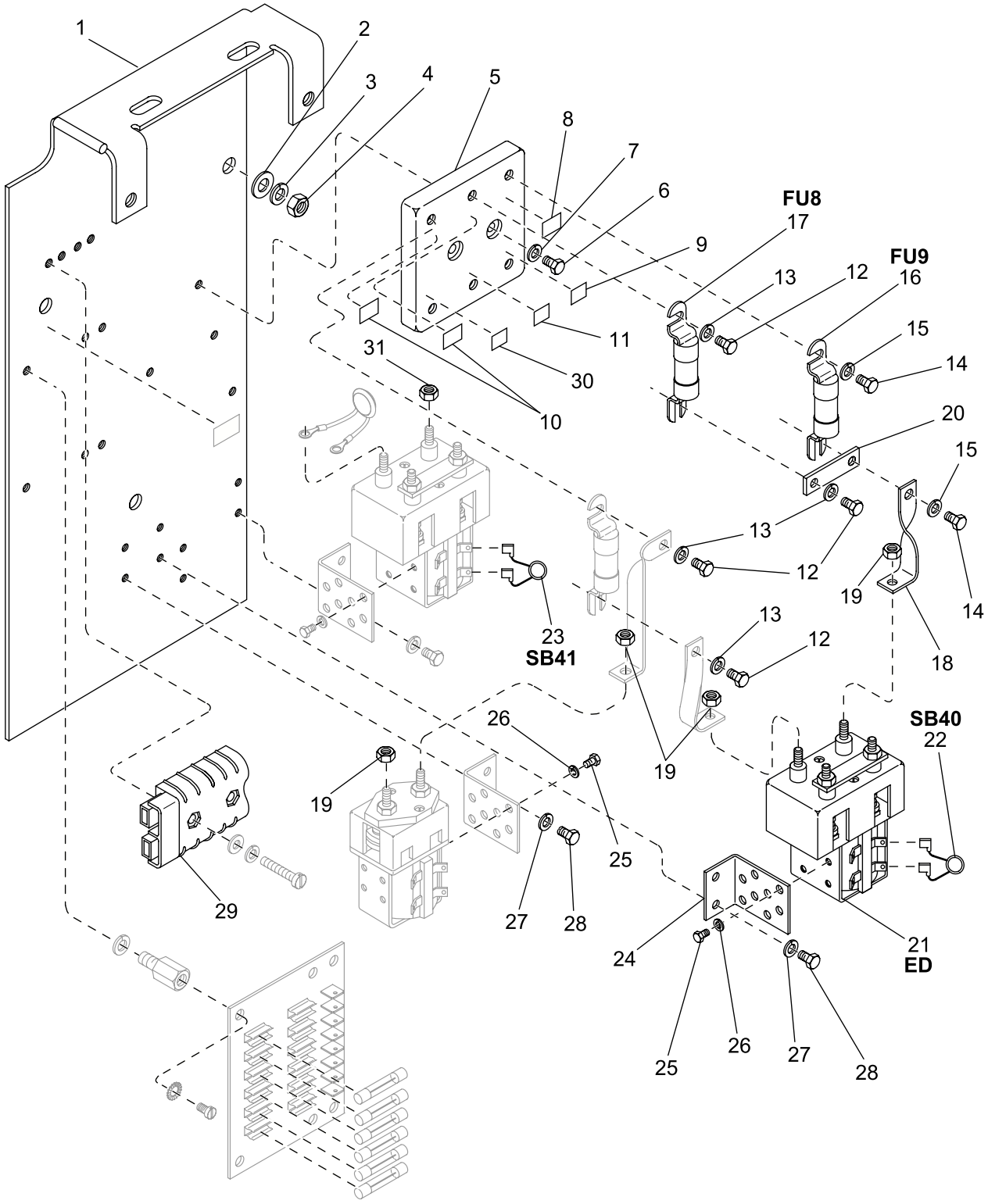


Figure 19598

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	123198-001	Contactor Panel	1
0	126216-001	Contactor Panel (EEC)	1
1	123851	Plate	1
2	060030-119	Flatwasher	3
3	060005-009	Lockwasher	3
4	060021-011	Nut	3
5	123208	Panel Buss Fuse	1
6	060015-037	Screw	2
7	060005-006	Lockwasher	2
8	113729-017	Label ACK/ECK-250	1
9	079566-051	Label	1
10	113729-018	Label AOK/ALS-250	1
11	079566-065	Label	1
12	060015-089	Screw	3
13	060005-026	Lockwasher	3
14	060015-066	Screw	1
15	060005-026	Lockwasher	1
16	076924-020	Fuse ACK/ECK-250	1
17	076924-009	Fuse ACK/ALS-250	1
18	123088	Buss Bar	1
19	060059-003	Nut	8
20	123083	Buss Bar	1
21	131304	Contactor, refer to Electrical Parts [(1)]	1
22	114285	Diode Suppressor	1
23	114285	Diode Suppressor	1
24	123084	Bracket	1
25	060061-007	Screw	4
26	060005-005	Lockwasher	4
27	060015-003	Screw	4
28	060005-007	Lockwasher	4
29	078723-001	SB-350 Connector Gray	1
	078723-002	SB-175 Connector Gray	1
	078723-003	SB-350 Connector Red	1
	078723-004	SB-175 Connector Yellow	1
	078723-006	SB-350 Connector Blue	1
	078723-007	SB-175 Connector Red	1
	078723-008	SB-175 Connector Blue	1
	078723-009	SB-350 Connector Yellow	1
	078724-001	Contacts	2
	108801-001	SBE-320 Connector Gray	1
	108801-003	SBE-320 Connector Red	1
	108801-006	SBE-320 Connector Blue	1
	108801-008	SBE-320 Connector Yellow	1
	108802-001	Contacts	2
	126222	Harness (not shown)	1
30	079566-064	Label	1
31	060059-003	Nut	4

(1) Requires V14 or greater software

Note: 123198-001 Contactor Panel and 126216-001 Contactor Panel (EEC) does not include Index 29 and 40 thru 42 on following parts list.

Always Specify Model, Data & Serial Number

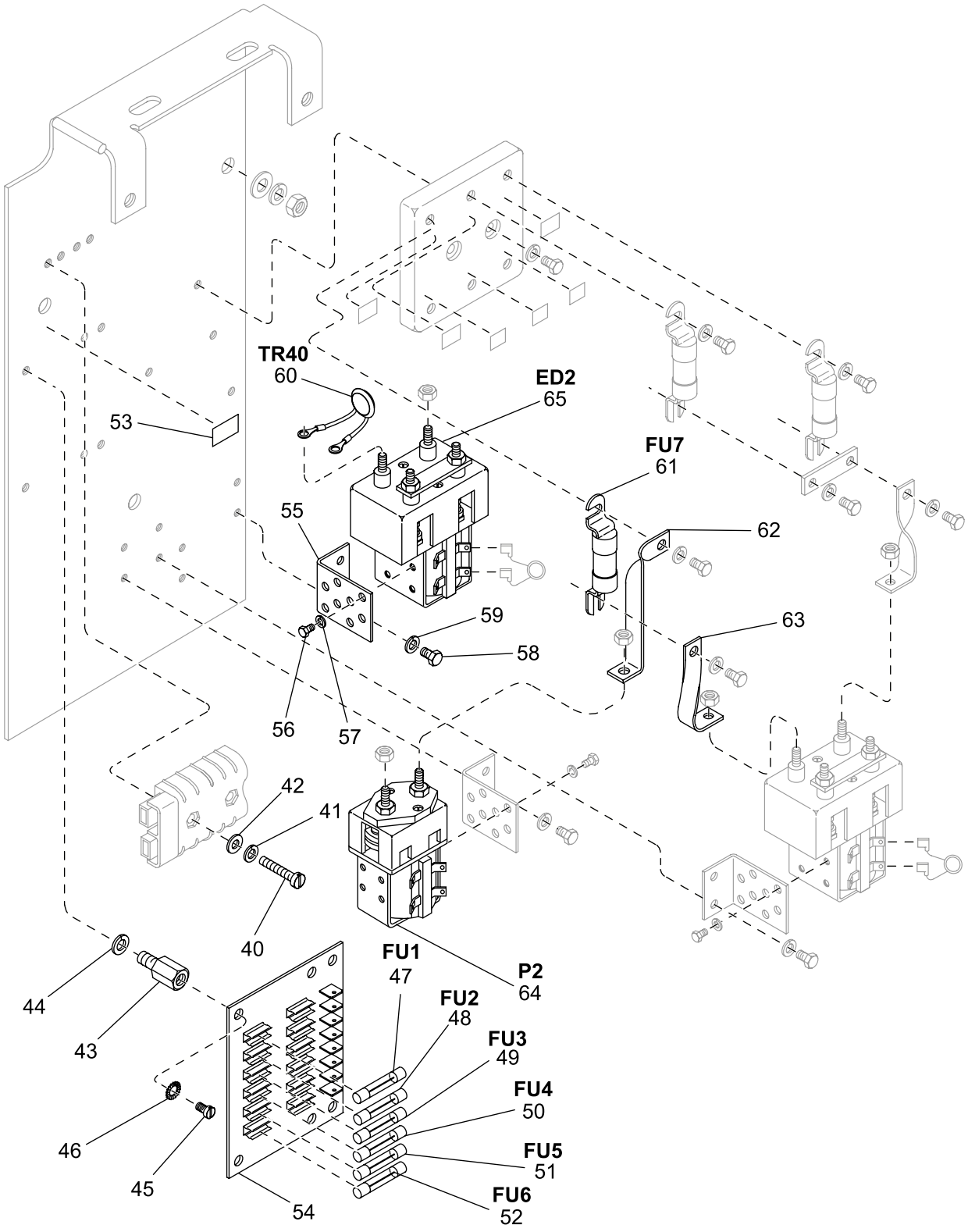


Figure 19599

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
40	060015-008	Screw	2
41	060005-007	Lockwasher	2
42	060030-037	Flatwasher	2
43	104401-014	Spacer	4
44	060005-053	Lockwasher	4
45	060013-039	Screw	4
46	060030-337	Lockwasher	4
47	094362-002	Fuse 15A, ABC-15	1
48	094362-002	Fuse 15A, ABC-15	1
49	094362-002	Fuse 15A, ABC-15	1
50	094362-002	Fuse 15A, ABC-15	1
51	094362-002	Fuse 15A, ABC-15	1
52	094362-002	Fuse 15A, ABC-15	1
53	113729-001	Label, ABC-15	1
54	123524	Fuse Panel	1
55	123084	Mounting Bracket (2)	2
56	060061-007	Screw (2)	4
57	060005-005	Lockwasher (2)	4
58	060015-003	Screw (2)	4
59	060005-007	Lockwasher (2)	4
60	062627-001	Thermistor	1
61	076924-009	Fuse AOK/ALS-250	1
62	123087	Buss Bar	1
	065003-175	Sleeving (not shown)	1
63	123088	Buss Bar	1
64	110613-003	Contactor, refer to Electrical Parts	1
65	126175-001	Contactor, refer to Electrical Parts (2)	1
	061003-005	Cable Tie	4
	125588-001	Boot	2
	062020-001	Wire Connector	2

(2) Only used on EEC trucks

Note: 123198-001 Contactor Panel and 126216-001 Contactor Panel (EEC) does not include Index 29 from previous part list and 40 thru 42.

Always Specify Model, Data & Serial Number

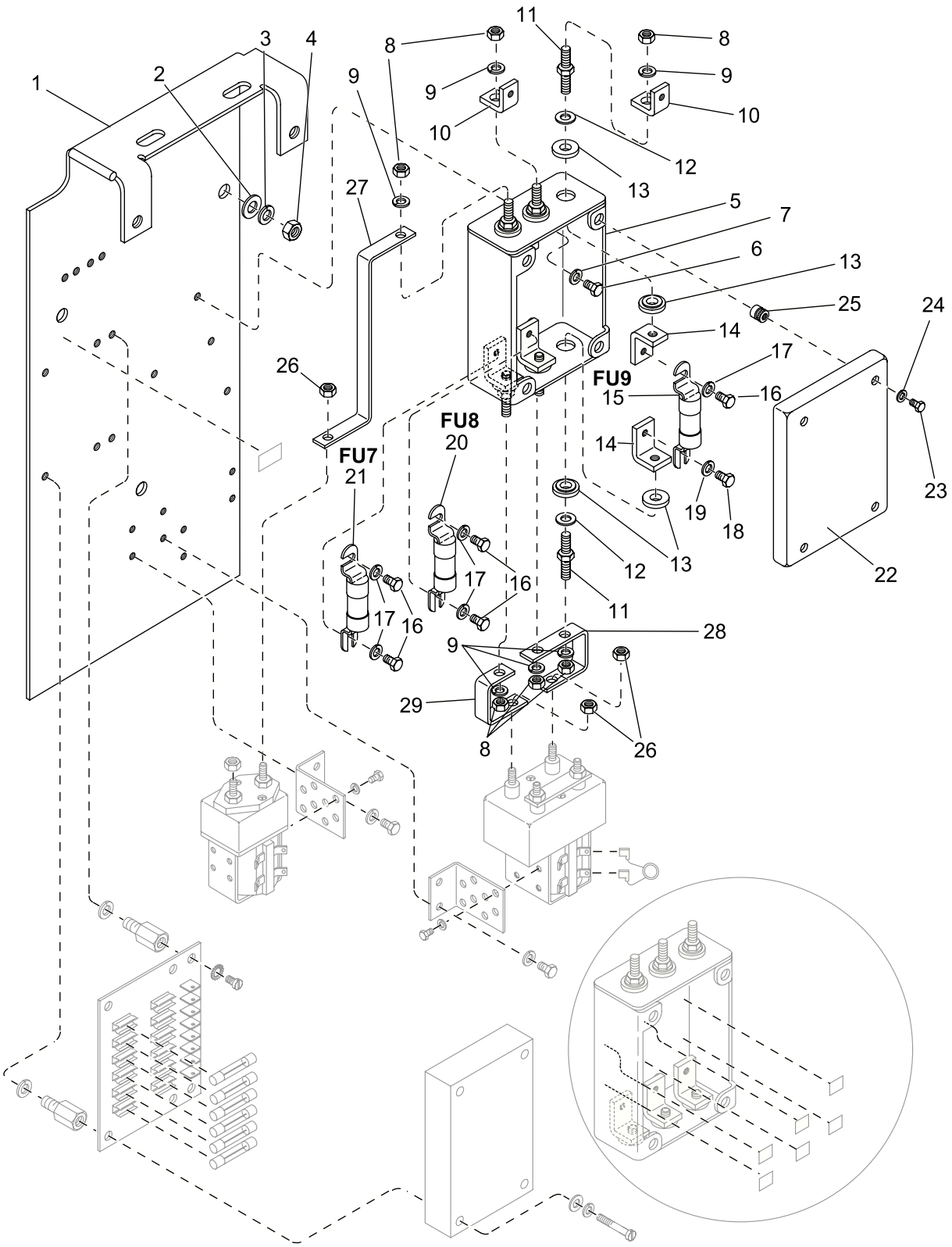


Figure 19601-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	126096	Contactor Panel Assembly Electronically Enclosed (EE)	1
1	123851	Plate	1
2	060030-119	Flatwasher	3
3	060005-009	Lockwasher	3
4	060021-011	Nut	3
5	123090	Box	1
6	060015-003	Screw	2
7	060005-007	Lockwasher	2
8	060021-043	Nut	6
9	060005-031	Lockwasher	6
10	126176	Bus Bar	2
11	123050	Stud	6
12	060030-017	Flatwasher	6
13	119323	Insulator	12
14	126104	Buss Bar	6
15	076924-020	Fuse ACK/ECK-250	1
16	060015-089	Screw	5
17	060005-026	Lockwasher	5
18	060015-066	Screw	1
19	060005-026	Lockwasher	1
20	073924-009	Fuse ACK/ALS-250	1
21	073924-009	Fuse ACK/ALS-250	1
22	123089	Cover	1
23	060015-003	Screw	4
24	060005-007	Lockwasher	4
25	060091-001	Nut Insert	4
26	060059-003	Nut	6
27	126047	Bus Bar	1
	065003-175	Sleeving (not shown)	1
28	123095	Bus Bar	1
29	123096	Bus Bar	1

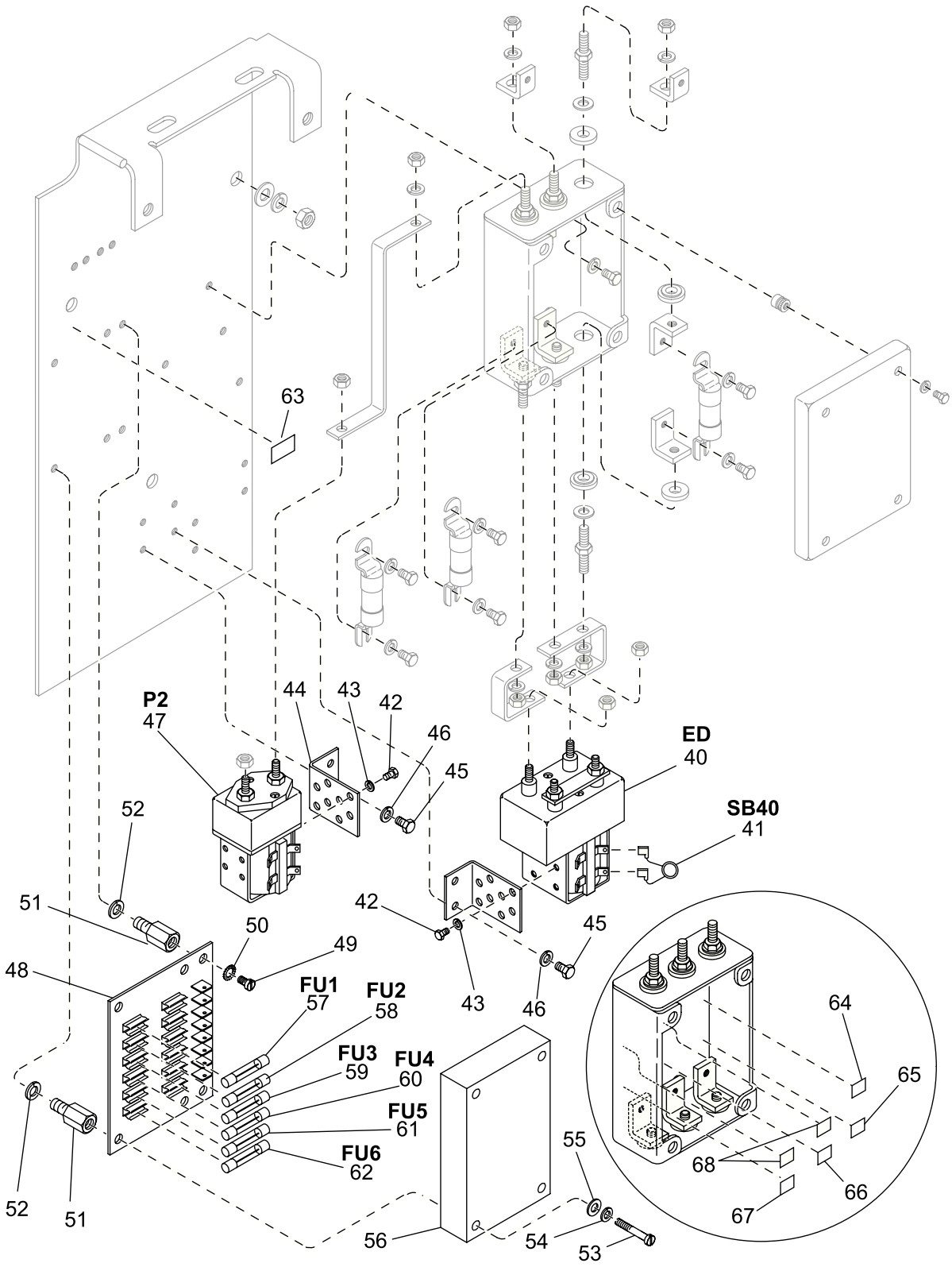


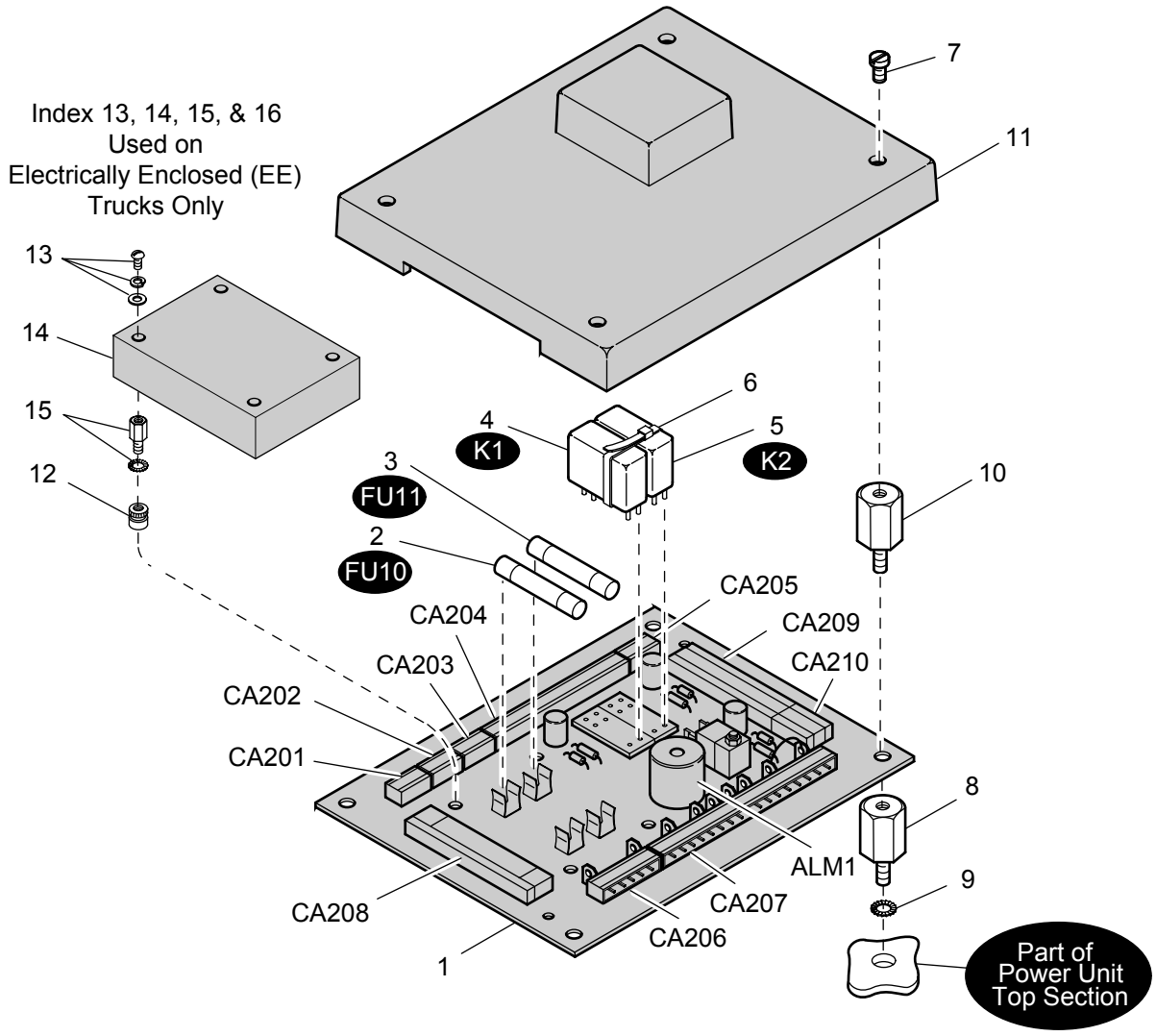
Figure 19602-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
40	119784	Contactor, refer to Electrical Parts	1
41	114285	Suppressor Diode	1
42	060061-007	Screw	4
43	060005-005	Lockwasher	4
44	123084	Bracket	2
45	060015-003	Screw	4
46	060005-007	Lockwasher	4
47	118280-003	Contactor, refer to Electrical Parts	1
48	123524	Panel	1
49	060013-039	Screw	2
50	060030-337	Lockwasher	2
51	104401-014	Spacer	6
52	060005-053	Lockwasher	6
53	060013-011	Screw	4
54	060005-004	Lockwasher	4
55	060030-096	Flatwasher	4
56	125713	Enclosure	1
57	094362-002	Fuse 15A, ABC-15	1
58	094362-002	Fuse 15A, ABC-15	1
59	094362-002	Fuse 15A, ABC-15	1
60	094362-002	Fuse 15A, ABC-15	1
61	094362-002	Fuse 15A, ABC-15	1
62	094362-002	Fuse 15A, ABC-15	1
63	113729-01	Label ABC-15	1
64	113729-017	Label ACK/ECK-250	1
65	079566-051	Label	1
66	079566-065	Label	1
67	079566-064	Label	1
68	113729-018	Label ALS/AOK-250	2
	125588-001	Boot	1
	061003-005	Cable Tie	4

Always Specify Model, Data & Serial Number

5736-02

RR/RD 5200/5200S SERIES



Index	Part No.	Part Name	No. Req.	Index	Part No.	Part Name	No. Req.
1	122179-001	Panel Distribution 24 V		7	060013-040	Screw	4
		Includes 1 thru 6	1	8	104401-017	Standoff	4
	122179-002	Panel Distribution 36 V		9	060005-006	Lockwasher	4
		Includes 1 thru 6	1	10	104401-019	Standoff	4
2	094362-008	Fuse 3 Amp	1	11	123822	Cover	1
3	094362-004	Fuse 3/4 Amp	1	12	060091-001	Nut Insert	4
4	062640-001	Relay 24 V	1	13	060013-011	Screw	4
	062640-002	Relay 36 V	1		060005-004	Lockwasher	4
5	062640-001	Relay 24 V	1		060030-096	Flatwasher	4
	062640-002	Relay 36 V	1	14	123098	Cover	1
6	061003-004	Tie Cable	1	15	104401-017	Spacer	4
					060005-006	Lockwasher	4

Always Specify Model, Data & Serial Numbers

This page available for **NOTES.**

Model	Function
PE 3500	A, B
PC 3500	A, B
TR 3500	A, B
SP 3000	P1, P2
SP 3200	P1, P2
SP 3400	P1, P2
SP 3500	P1, P2
SP 7434	P1, P2
SP 7530	P1, P2
SP 7534	P1, P2
SP 7535	P1, P2
SP 7634	P1, P2
RR 3000	1A, P1
RR 3500	1A, P1
RS 3000	1A, P1
RS 3500	1A, P1
RD 3000	1A, P1
RD 3500	1A, P1
*RR/RD 5000	P2
*RR/RD 5000S	P2
*RR/RD 5200	P2
*RR/RD 5200S	P2
*RR/RD 5200 (AC)	P2
*RR/RD 5200S (AC)	P2
*RR/RD 5700	P2
*RR/RD 5700S	P2

*Regardless of truck battery voltage, the Access 1,2,3 system powers contactors with 24 volts.

NOTE: On EV100 SCR motor control systems, the contactors controlled by the control card (eg. forward, reverse, 1A, FW), regardless of battery voltage, require 24 volt coils. Refer to the applicable contactor panel page (section 04.1) for the correct contactor part number and function.

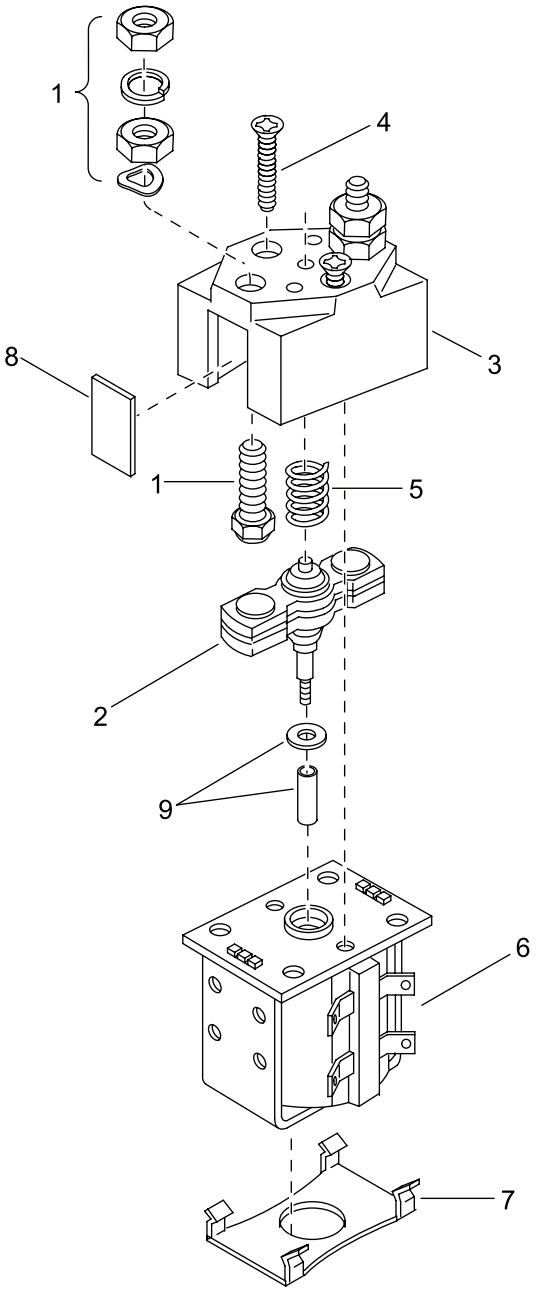
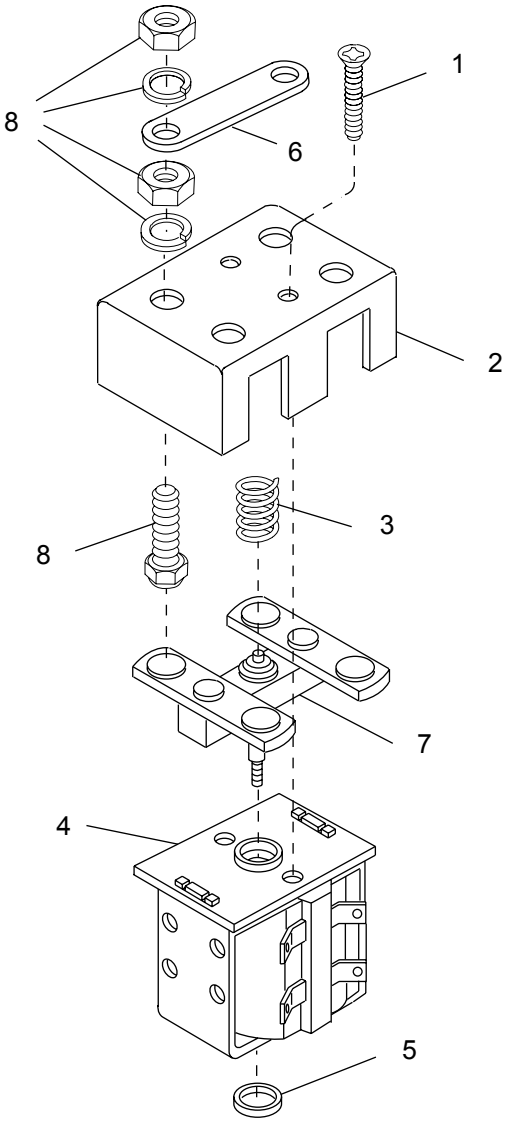


Figure 17843-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	110613-003	24 V Contactor	1
1	117157	Fixed Contact	2
2	117158	Moving Contact	1
3	114436	Cover	1
4	107351	Screw	2
5	117159	Return Spring	1
6	117160	Coil	1
7	118935	Cap End	1
8	117161	Dust Shield	2
9	123601	Bushing	1
	117162	Contact Kit Includes Indexes 1, 2 & 9	1

MODEL	FUNCTION
SP 3000	ED
SP 3200	ED
*RR/RD 5000	ED
*RR/RD 5000S	ED
*RR/RD 5200	ED
*RR/RD 5200S	ED
*RR/RD 5200(AC)	ED
*RR/RD 5200S(AC)	ED

*Regardless of truck battery voltage, the Access 1, 2, 3 system powers contactors with 24 volts.



118396 24V CONTACTOR

Index	Part No.	Part Name	No. Req.	Index	Part No.	Part Name	No. Req.
1	107351	Screw	2	6	118936	Link Terminal	1
2	118932	Cover Top	1	7	118937	Contact Moving	1
3	118933	Spring Return	1	8	114434	Contact Fixed	4
4	118934	Coil	1				
5	118935	Cap End	1				

Always Specify Model, Data & Serial Numbers

118938	Kit Contact Includes Index 7 & 8	1

ED (EE)

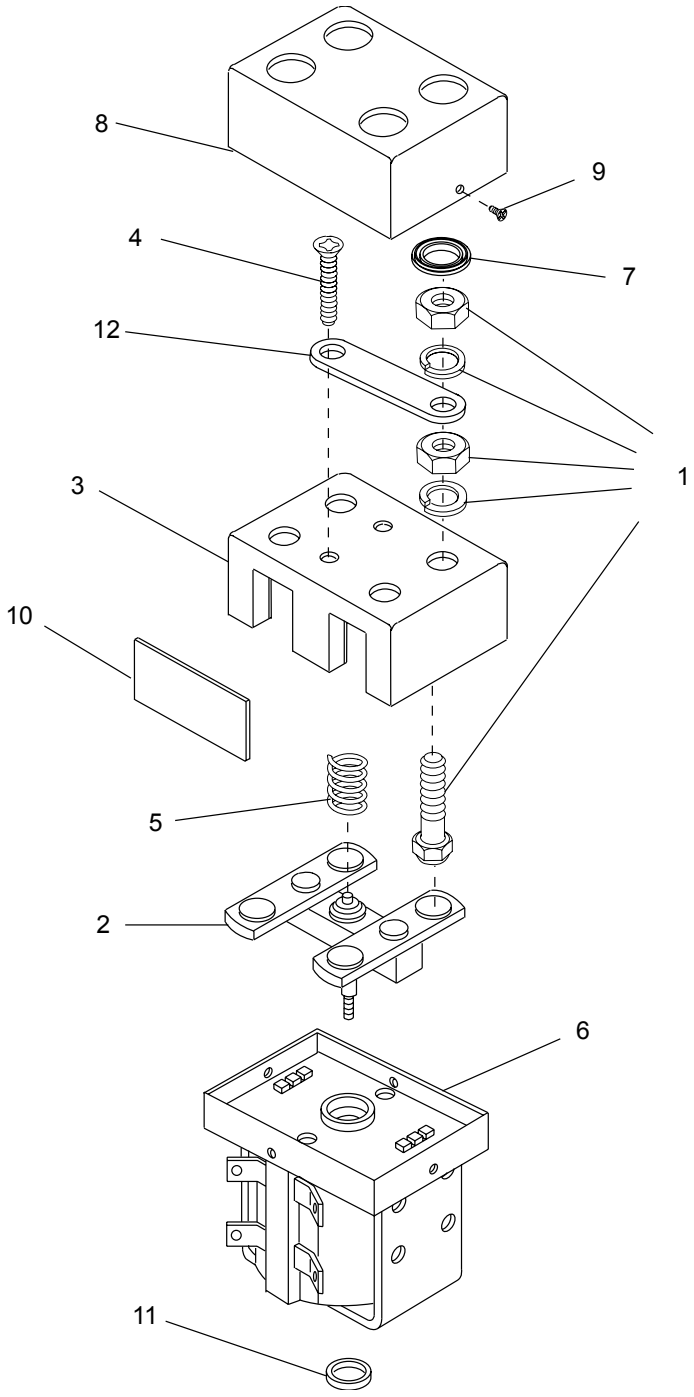
MODEL	FUNCTION
SP 3000	ED
SP 3200	ED
RR 5000	ED
RD 5000	ED
RR 5200	ED
RD 5200	ED

119784 CONTACTOR ASSEMBLY 24 VOLT (EE)

Index	Part No.	Part Name	No. Req.
1	114434	Contact Fixed	2
2	120710	Contact Moving	1
3	118932	Cover Top	1
4	107351	Screw	2
5	118933	Spring Return	1
6	120711	Coil & Frame with Lower Shroud	1
7	119126	Insulator	2
8	120712	Shroud Upper	1
9	119128	Screw Shroud	4
10	120713	Cover Aperature	2
11	118935	Cap End	1
12	118936	Bar Bus	1

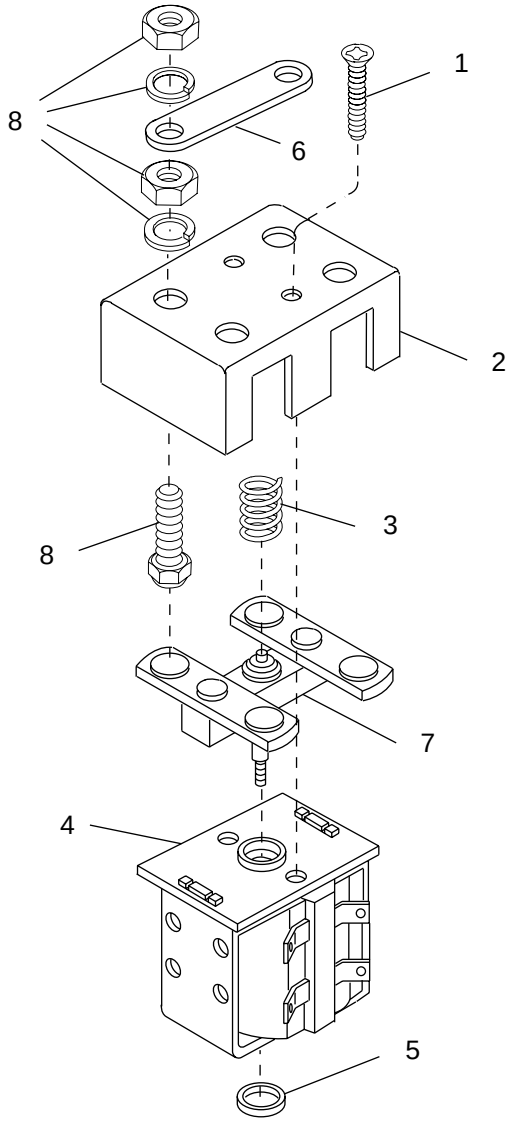
Always Specify Model, Data & Serial Numbers

118938	Kit Contact Replacement Includes Index 5 and 9	1



MODEL	FUNCTION
*RR/RD 5200 V14 or Greater Software	ED
*RR/RD 5200S V14 or Greater Software	ED
*RR/RD 5200(AC) V03 or Greater Software	ED
*RR/RD 5200S(AC) V03 or Greater Software	ED

*Regardless of truck battery voltage, the Access 1, 2, 3 system powers contactors with 24 volts.



131304 24V CONTACTOR

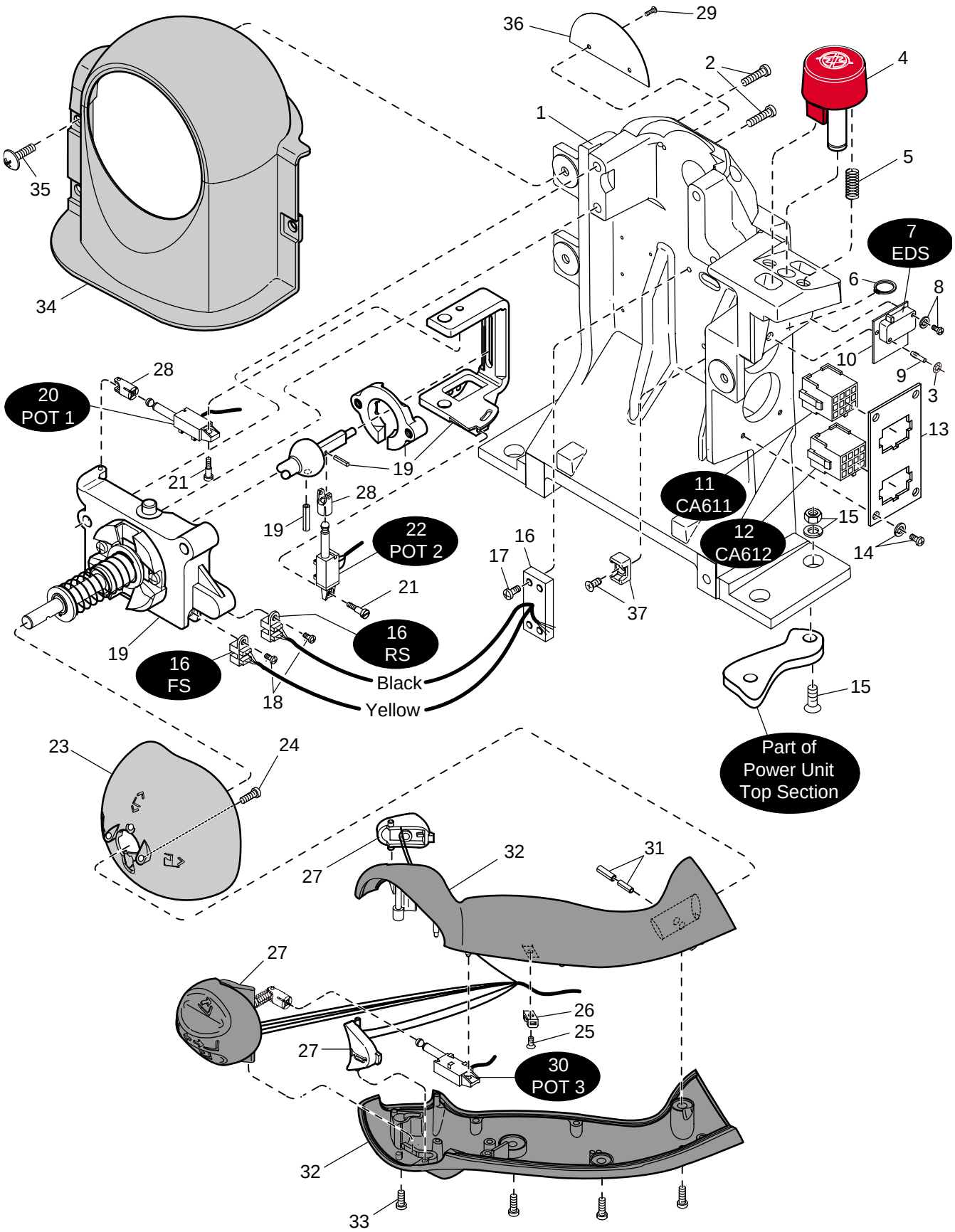
Index	Part No.	Part Name	No. Req.
1	107351	Screw	2
2	118932	Cover Top	1
3		Spring Return	1
4		Coil	1
5	118935	Cap End	1
6	118936	Link Terminal	1
7	118937	Contact Moving	1
8	114434	Contact Fixed	4

Always Specify Model, Data & Serial Numbers

118938	Kit Contact Includes Index 7 & 8	1

7315-04

RR/RD 5200

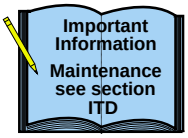


Index	Part No.	Part Name	No. Req.
1	* 123746-001	Support	1
	* 123746-002	Support Freezer/Corrosion	1
2	060014-086	Screw	4
3	060031-017	Speed Nut	1
4	123747	Button	1
5	094606	Spring	2
6	060009-002	Ring Retaining	1
7	062753	Switch	1
8	060011-003	Screw	1
	060005-049	Lockwasher	1
9	060077-008	Pin Roll	1
10	093603	Insulator	1
11		Connector See Section 04.8	1
	105606-611	Label	1
12		Connector See Section 04.8	1
	105606-612	Label	1
13	123750	Mount	1
14	060012-020	Screw	4
	060005-003	Lockwasher	4
15	060017-079	Screw	4
	060005-009	Lockwasher	4
	060021-011	Nut	4
16	126583-00S	Includes FWD/REV Optic Switches, Board & Harness Assembly And Instructions	1
17	060012-070	Screw	2
18	060011-026	Screw	2
	061004-028	Adhesive Thread Locking	1
19	122322	Base Includes Index 28	1
20	* 126575-001-0S	Includes POT1 Traction Potentiometer Assembly And Instructions	1
	* 126575-002-0S	Freezer/Corrosion Includes POT1 Traction Potentiometer Assembly And Instructions	1
21	060045-030	Screw	2
22	* 126574-001-0S	Includes POT2 Hydraulic Potentiometer Assembly And Instructions	1
	* 126574-002-0S	Freezer/Corrosion Includes POT2 Hydraulic Potentiometer Assembly And Instructions	1
23	123673	Cover Dust	1
24	060032-057	Screw	3
25	060012-075	Screw	1
26	122255	Mount Tie	1
	061003-002	Tie Wire	4
27	* 128654-00S	Includes Thumbwheel Harness Assembly (POT3,HNS, TBS, TDS & SSS), Raised Poly Grip Thumbwheel, Index 30 And Instructions	1
	* 128655-00S	Freezer/Corrosion Includes Thumbwheel Harness Assembly (POT3,HNS, TBS,TDS & SSS), Raised Poly Grip Thumbwheel, Index 30 And Instructions	1
28	122969	Yoke	2
29	* 060012-074	Screw "A" Batt. Comp.	2
30		Potentiometer Accessory See Index 27	1
		Potentiometer F/C Accessory See Index 27	1
31	060000-117	Pin Roll	1
	060000-118	Pin Roll	1
32	126725	Handle Includes Both Handle Halves & Index 31	1
33	060013-039	Screw	4
34	* 124006	Cover "A" Batt. Comp.	1
	* 123751	Cover "B, C, D & E" Batt.Comp.	1
35	060015-100	Screw	3
36	* 126027	Plate Cover "A" Batt. Comp.	1
37	122255	Mount Cable Tie	2
	060012-075	Screw	2
	061003-002	Tie Cable	2

Always Specify Model, Data & Serial Numbers

"A" Battery Compartment = 310 mm (12.19 in.)
"B" Battery Compartment = 360 mm (14.25 in.)
"C" Battery Compartment = 415 mm (16.25 in.)
"D" Battery Compartment = 455 mm (18.00 in.)
"E" Battery Compartment = 525 mm (20.75 in.)

* Choice of part number depends on battery compartment size and if truck is equipped with freezer condition option. Battery compartment size and freezer condition information is included in the truck data number (located on truck data plate).



Truck Data Number Example

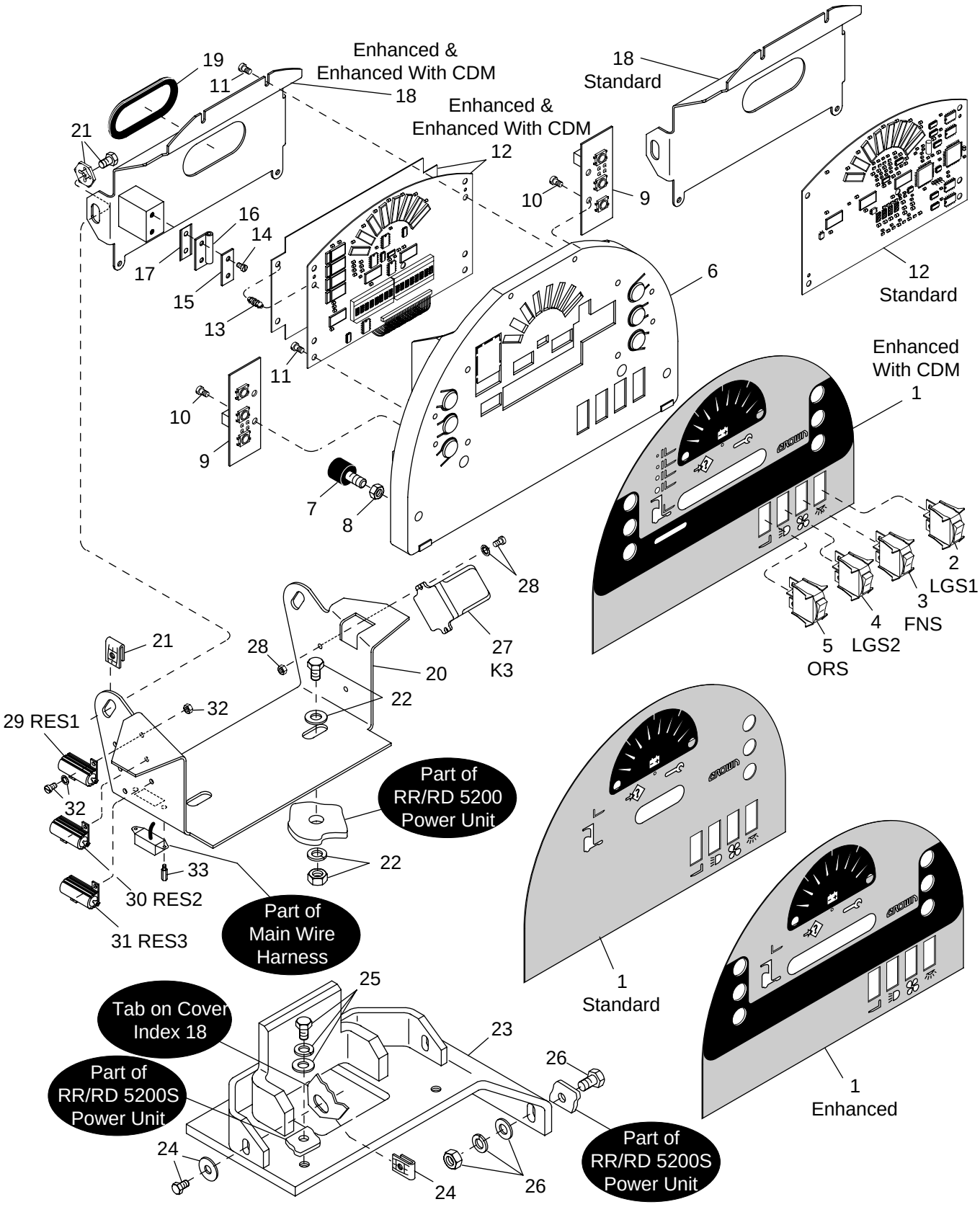
Battery Compartment Size

-TT270C36F2PSF-BS-Q--

Freezer Condition Option

5747-02

RR/RD 5200/5200S



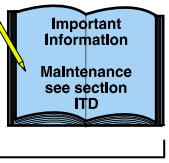
* 122315 STANDARD DISPLAY ASSEMBLY (Includes Index 1, 6 thru 10, 12, 17, 18 & 19)
* 122316 ENHANCED DISPLAY ASSEMBLY (Includes Index 1, 6 thru 10, 12, 15, 16, 18 & 19)
* 123337 ENHANCED DISPLAY W/CDM ASSEMBLY (Includes Index 1, 6 thru 10, 12, 15, 16, 18 & 19)

Index	Part No.	Part Name	No. Req.
1	122858	Overlay Standard	1
	122860	Overlay Enhanced	1
	123338	Overlay Enhanced with CDM	1
2	062595-002	Switch Dome Light	1
3	062595-001	Switch Fan	1
4	062595-002	Switch Work Lights	1
5	062595-003	Switch Lift Cutout Override	1
6	122855-001	Panel Interface Standard	1
	122855-002	Panel Interface Enhanced & Enhanced with CDM	1
7	123151	Mount Cushion	2
8	060021-086	Nut	2
9	125416	Board PCB Switch Standard Display	1
	125416	Board PCB Switch Enhanced & Enhanced with CDM	2
10	060012-074	Screw Standard	2
	060012-074	Screw Enhanced & Enhanced with CDM	4
11	060012-074	Screw	8
12	† 124014	Board Display Standard	1
	† 124015	Board Display Enhanced & Enhanced with CDM	1
13	062666-001	Post Support Enhanced & Enhanced with CDM	5
14	060012-020	Screw Enhanced & Enhanced with CDM	2
15	117774-003	Retainer Enhanced & Enhanced with CDM	1
16	062580-004	Strap Grounding Enhanced & Enhanced with CDM	1
17	062686-001	Tape Conductive Foil Enhanced & Enhanced with CDM	1
18	122856-001	Cover Standard	1
	122859	Cover Enhanced & Enhanced with CDM	1
19	065004-042	Grommet	1
20	123191	Bracket Display Mounting 5200 Series	1
21	060015-117	Screw	2
	061092-001	Pyramidal Lockwasher	2
	060031-026	Nut	2
22	060017-014	Screw	2
	060030-080	Flatwasher	2
	060005-009	Lockwasher	2
	060021-011	Nut	2
23	122246	Bracket Display Mounting 5200S Series	1
24	060015-006	Screw	2
	060030-012	Flatwasher	2
	060031-026	Nut Speed	2
25	060017-019	Screw	2
	060005-009	Lockwasher	2
	060030-026	Flatwasher	2
26	060017-014	Screw	2
	060005-009	Lockwasher	2
	060030-026	Flatwasher	2
	060021-011	Nut	2
27	062337-008	Relay 24V	1
	062337-009	Relay 36V	1
28	060012-016	Screw	2
	060005-048	Lockwasher	2
	060021-003	Nut	2
29	062033-055	Resistor 24V	1
	062033-028	Resistor 36V	1
30	062033-032	Resistor 36V Only	1
31	062033-032	Resistor 24V	1
	062033-034	Resistor 36V	1
32	060011-012	Screw	6
	060005-036	Lockwasher	6
	060021-076	Nut	6
33	104401-018	Spacer	2

Always Specify Model, Data & Serial Numbers

† Not Serviceable. Replace Display Assembly.

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



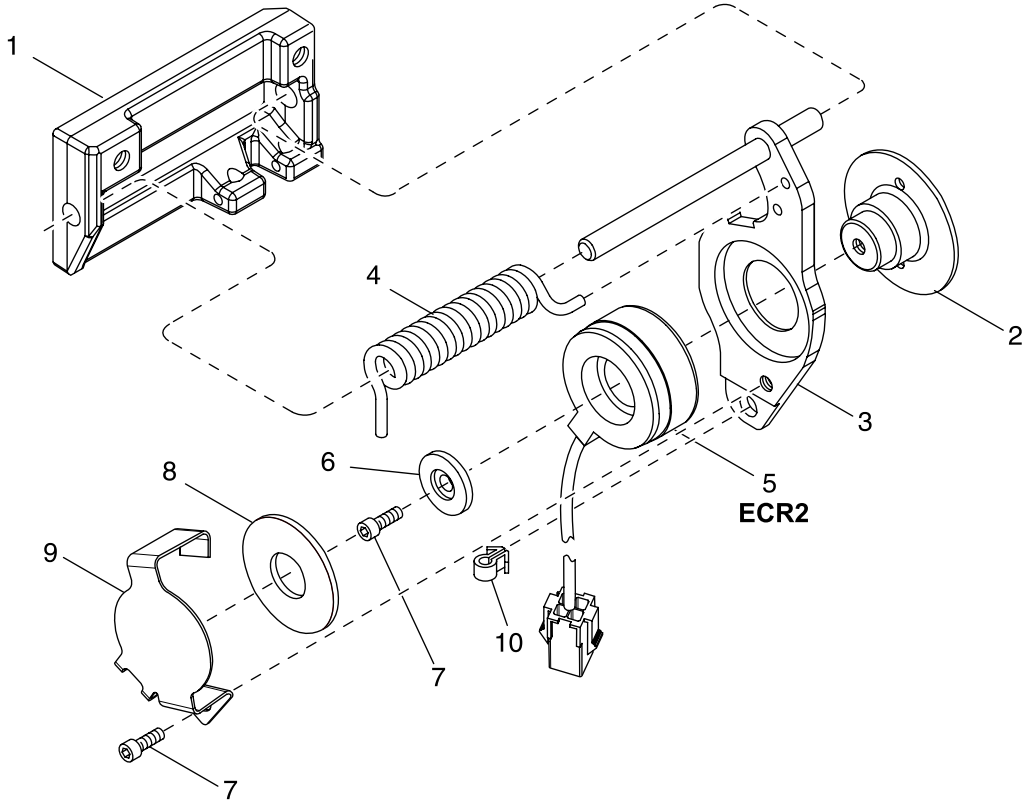
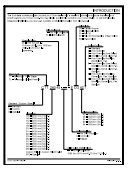


Figure 8792-01

INDEX		PART NUMBER	PART NAME	NUMBER REQUIRED
1		127704	Bracket	1
2		128688	Wheel	1
3		127707	Arm	1
4		127684	Spring	1
5	*	128886-001	Encoder 5025, 5335 & 6100 mm (198, 210 & 240 in.) Lift Height	1
	*	128886-002	Encoder 6860, 7620 & 8155 mm (270, 300 & 321 in.) Lift Height	1
	*	128886-003	Encoder 8660, 9300, 10130 & 10695 mm (341, 366, 400 & 421 in.) Lift Height	1
	*	128886-004	Encoder 11225 mm (442 in.) Lift Height	1
6		128898	Washer	1
7		060014-094	Screw	2
8		128888	Gasket	1
9		128912	Retainer	1
10		061085-001	Clip	1

Always Specify Model, Data & Serial Numbers

* To select appropriate part number, refer to truck data number. The truck data number represents truck features. Refer to Introduction.



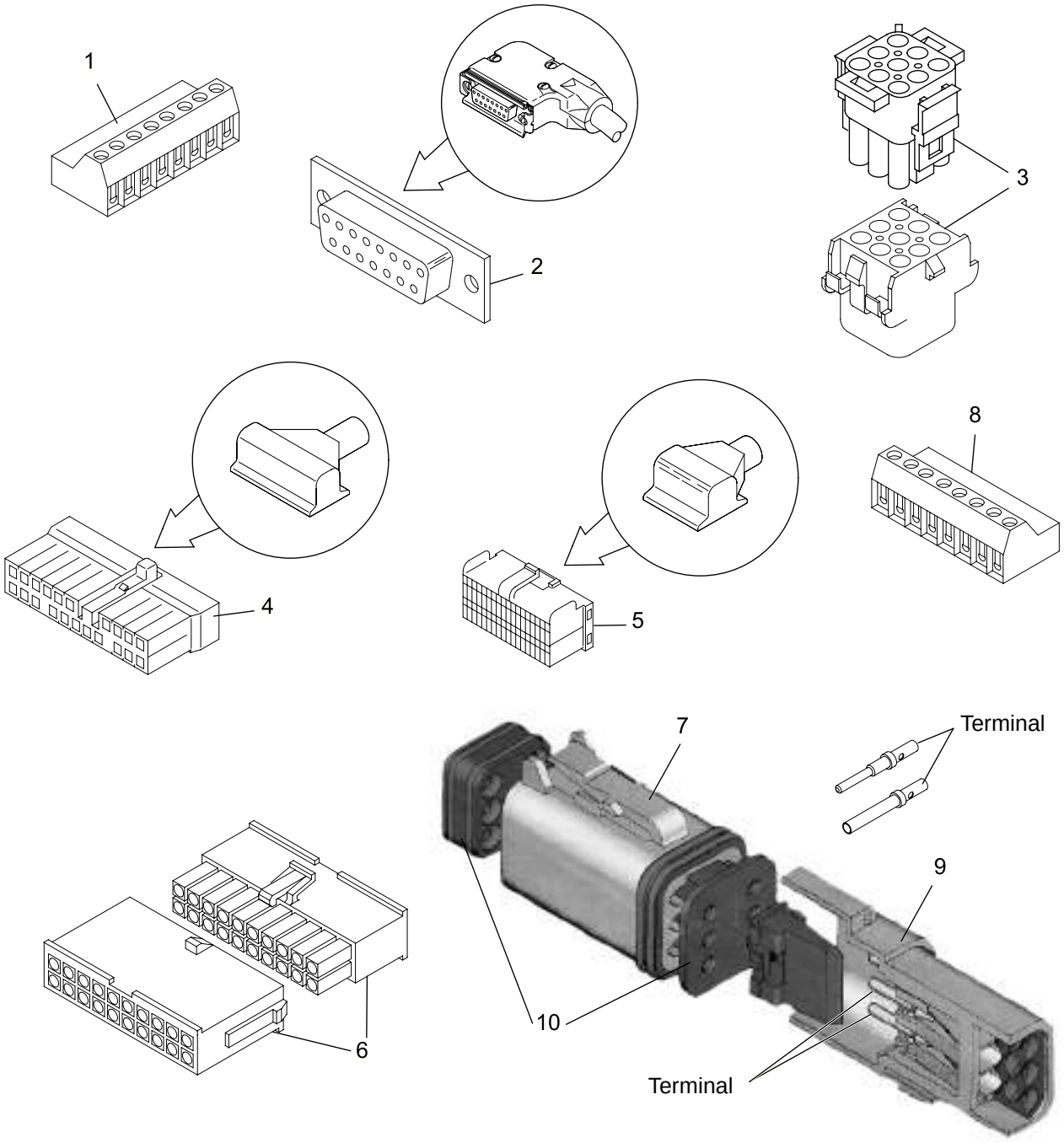


Figure 19608

Chart 1 - Connectors							
Designation	Index	Connector	Number of Terminals	Terminal	Insert (Index 10)	Extraction Tool	Crimping Tool
PC201	1	062643-002	N/A	N/R		N/R	N/R
PC202	1	062643-002	N/A	N/R		N/R	N/R
PC203	1	062643-002	N/A	N/R		N/R	N/R
PC204	1	062643-002	N/A	N/R		N/R	N/R
PC205	1	062643-002	N/A	N/R		N/R	N/R
PC206	1	062643-004	N/A	N/R		N/R	N/R
PC207	1	062643-001	N/A	N/R		N/R	N/R
PC208	2(3)	062525--002(4)	13	062526-001			
PC209	1	062643-003	N/A	N/R		N/R	N/R
PC210	1	062643-002	N/A	N/R		N/R	N/R
PC211		N/R	1	062007-063		N/R	090118
PC215		N/R	1	062007-063		N/R	090118
JC215		N/R	1	062007-050		N/R	090118
PC401	3	062037-011	2	062036-004		100380	090118
JC401	3	062037-012	3	062036-003		100380	090118
PC402	4(2)	062662-001(4)	17	062663-001			
PC403	5(1)	062661-001(4)	15	062663-002			
PC404	4(2)	062662-001(4)	20	062663-001			
PC405	5(1)	062661-001(4)	16	062663-002			
PC407	6	062535-004	8	(5)		118993	
PC408	6	062535-005	4	062536-001		118993	
PC409	3	062037-001	9	062036-004		100380	090118
JC409	3	062037-002	9	062036-003		100380	090118
PC410		N/R	1	062007-063		N/R	090118
JC601	2(3)	062525-004	3	062526-001			
(1) Use 126924 Boot if required on Index 5							
(2) Use 126923 Boot if required on Index 4							
(3) Use 062744-001 Boot if required on Index **2**							
(4) Cover/Boot Required							
(5) Use 062536-001 for terminals 1 thru 4 and 6. Use 062536-003 for terminals 5, 7 and 8.							

Chart 1 - Connectors							
Designation	Index	Connector	Number of Terminals	Terminal	Insert (Index 10)	Extraction Tool	Crimping Tool
PC602	6	062535-006	4	062536-003		118993	
PC603	7	062701-004	4	062704-004	062703-008	062706	062737-002
PC605	6	062535-006	4	062536-001		118993	
PC606	6	062535-008	2	062536-001		118993	
JC606	6	062535-009	2	062536-002		118993	
PC607	7	062701-004	4	062704-004	062703-008	062706	062737-002
JC607	9	062702-004	4	N/R	062703-007	062706	062737-002
PC608	6	062535-002	5	062536-001		118993	
JC608	6	062535-003	5	062536-002		118993	
PC609	7	062701-003	4	062704-004	062703-006	062706	062737-002
JC610	9	062702-001	2	062704-003	062703-001	062706	062737-002
PC611	6	062535-011	9	062536-003		118993	
JC611	6	062535-012	9	062536-002		118993	
PC612	6	062535-011	9	062536-002		118993	
JC612	6	062535-012	9	062536-003		118993	
PC615		N/R	1	062007-076		N/R	090118
JC615		N/R	1	062007-063		N/R	090118
PC616	6	062535-006	4	062536-001		118993	
JC616	6	062-535-006	4	062536-001		118993	
PC617		N/R	1	062007-050		N/R	090118
JC617		N/R	1	062007-063		N/R	090118
PC618		N/R	1	062007-050		N/R	090118
JC618		N/R	1	062007-063		N/R	090118
PC619		N/R	1	062007-050		N/R	090118
JC619		N/R	1	062007-063		N/R	090118
PC620		N/R	1	062007-050		N/R	090118
JC620		N/R	1	062007-063		N/R	090118
JC625		N/R	1	062007-063		N/R	090118
PC626		N/R	1	062007-050		N/R	090118
JC626		N/R	1	062007-063		N/R	090118
PC640	6	062535-002	6	062663-001		118993	N/R
JC640	6	062535-003	6	062663-002		118993	N/R

Chart 1 - Connectors							
Designation	Index	Connector	Number of Terminals	Terminal	Insert (Index 10)	Extraction Tool	Crimping Tool
PC645	6	062535-006	4	062536-003		118993	N/R
PC646	6	062535-008	2	062536-001		118993	N/R
PC647		N/R	1	062007-063		N/R	090118
JC648		N/R	1	062007-063		N/R	090118
JC649		N/R	1	062007-050		N/R	090118
PC652		N/R	1	062007-063		N/R	090118
JC653		N/R	1	062007-050		N/R	090118
PC654		N/R	1	062007-063		N/R	090118
PC655		N/R	1	062007-063		N/R	090118
JC655		N/R	1	062007-050		N/R	090118
PC656		N/R	1	062007-063		N/R	090118
JC656		N/R	1	062007-050		N/R	090118
PC802	6	062535-006	3	062536-001		118993	N/R
JC802	6	062535-007	3	062536-002		118993	N/R
PC803		N/R	1	062007-076		N/R	090118
JC803		N/R	1	062007-063		N/R	090118
PC804		N/R	1	062007-076		N/R	090118
JC804		N/R	1	062007-063		N/R	090118
PC805		N/R	1	062007-076		N/R	090118
JC805		N/R	1	062007-063		N/R	090118
PC806		N/R	1	062007-076		N/R	090118
JC806		N/R	1	062007-063		N/R	090118
JC809		N/R	1	062007-063		N/R	090118
PC810		N/R	1	062007-050		N/R	090118
JC810		N/R	1	062007-063		N/R	090118
PC812		N/R	1	062007-076		N/R	090118
JC812		N/R	1	062007-063		N/R	090118
PC813		N/R	1	062007-076		N/R	090118
JC813		N/R	1	062007-063		N/R	090118
PC814		N/R	1	062007-076		N/R	090118
JC814		N/R	1	062007-063		N/R	090118
PC815		N/R	1	062007-076		N/R	090118

Chart 1 - Connectors							
Designation	Index	Connector	Number of Terminals	Terminal	Insert (Index 10)	Extraction Tool	Crimping Tool
JC815		N/R	1	062007-063		N/R	090118
PC816	7	062701-003	4	062704-006	062703-006	062706	062737-002
JC816	9	062702-003	4	062704-003	062703-005	062706	062737-002
PC817	6	062535-006	4	062536-001		118993	N/R
JC817	6	062535-007	4	062536-002		118993	N/R
PC818	6	062535-008	2	062536-001		118993	N/R
JC818	6	062535-009	2	062536-002		118993	N/R
PC824	7	062701-001	2	062704-004	062703-002	062706	062737-002
JC824	9	062702-001	2	062704-003	062703-001	062706	062737-002
PC825		N/R	1	062007-063		N/R	090118

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NOTE: Index 8 Thru 13 & 15 - Used Only
When Truck Requires Second Control Cable

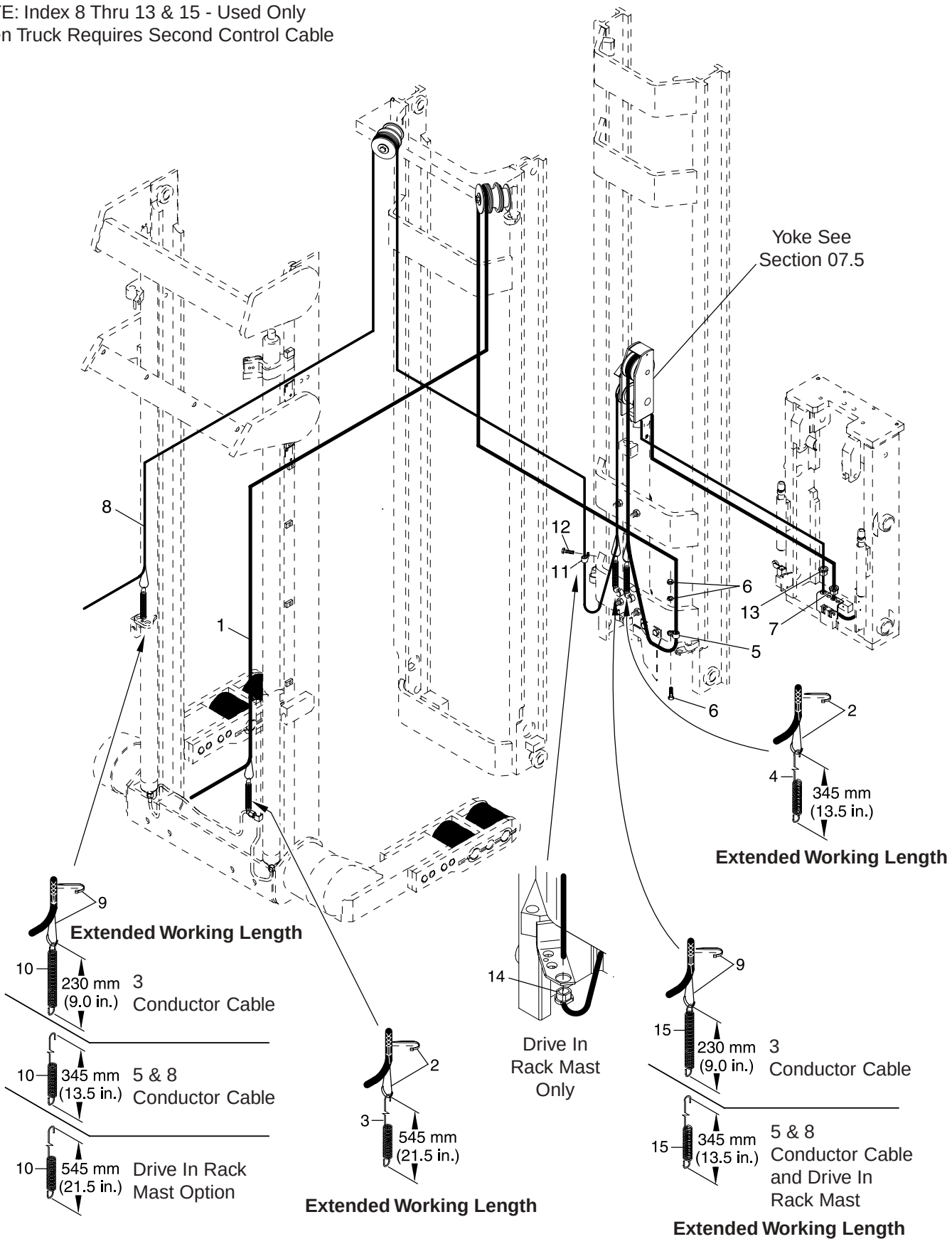
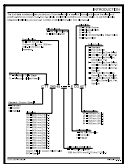


Figure 5861-04

INDEX		PART NUMBER	PART NAME	NUMBER REQUIRED
1		See Chart 1	Control Cable 8 Conductor	1
2		105449	Cable Grip	2
		061003-004	Cable Tie	4
3		122914	Extension Spring	1
4		085429	Extension Spring	1
		122914	Extension Spring Drive In Rack Mast	1
5		061002-011	Harness Clamp	1
6		060015-008	Screw	1
		060030-012	Flatwasher	1
		060042-006	Nut	1
7		073805-006	Strain Relief Bushing	1
8		See Charts 2, 3 & 4	Control Cable	1
9	*	107204	Cable Grip (3 Conductor Cable)	2
	*	084531	Cable Grip (5 Conductor Cable)	2
	*	105449	Cable Grip (8 Conductor Cable)	2
	*	061003-004	Cable Tie	4
10	*	089544	Extension Spring (3 Conductor Cable)	1
	*	085429	Extension Spring (5 & 8 Conductor Cable)	1
	*	122914	Extension Spring (Drive In Rack Mast)	1
11	*	061002-026	Harness Clamp (3 & 5 Conductor Cable)	1
	*	061002-011	Harness Clamp (8 Conductor Cable)	1
12	*	060015-008	Screw	1
	*	060042-006	Nut	1
13	*	073805-001	Strain Relief Bushing	1
14	*	073805-001	Strain Relief Bushing Drive In Rack Mast Option	1
15	*	089544	Extension Spring (3 Conductor Cable)	1
	*	085429	Extension Spring (5 & 8 Conductor Cable)	1
	*	085429	Extension Spring (Drive In Rack Mast)	1

Always Specify Model, Data & Serial Numbers

* To select appropriate part number, refer to truck data number. The truck data number represents truck features. Refer to Introduction.



INDEX 1 119203-001 CABLE 8 CONDUCTOR

CHART 1							
Collapsed Height		Lift Height		Length Required		ORDER NUMBER	MINIMUM ORDER QUANTITY - EACH
mm	in.	mm	in.	mm	in.		
2260	89	5025	198	7695	303	**119203-001**	**26**
2415	95	5335	210	8155	321	**119203-001**	**27**
2720	107	6100	240	9070	357	**119203-001**	**30**
3025	119	6860	270	9980	393	**119203-001**	**33**
3325	131	7620	300	10895	429	**119203-001**	**36**
3555	140	8155	321	11580	456	**119203-001**	**38**
3785	149	8660	341	12270	483	**119203-001**	**41**
4065	160	9300	366	13105	516	**119203-001**	**43**
4370	172	10160	400	14020	552	**119203-001**	**46**
4520	178	10695	421	14480	570	**119203-001**	**48**
4825	190	11225	442	15520	611	**119203-001**	**51**

When ordering index 1 (Cable - 8 Conductor), order the number of feet required for your particular truck. The approximate minimum order quantity is listed in the above chart. The cable can also be purchased in 75m (250 ft.) rolls (P/N **119203-002**) or 150m (500 ft.) rolls (P/N **119203-003**). Cut the cable to the length required for your truck.

***INDEX 8 119203-007 With Options Requiring 2nd CABLE 3 CONDUCTOR**

CHART 2							
Collapsed Height		Lift Height		Length Required		ORDER NUMBER	MINIMUM ORDER QUANTITY - EACH
mm	in.	mm	in.	mm	in.		
2260	89	5025	198	7695	279	**119203-007**	**24**
2415	95	5335	210	8155	297	**119203-007**	**25**
2720	107	6100	240	9070	333	**119203-007**	**28**
3025	119	6860	270	9980	369	**119203-007**	**31**
3325	131	7620	300	10895	405	**119203-007**	**34**
3555	140	8155	321	11580	432	**119203-007**	**36**
3785	149	8660	341	12270	459	**119203-007**	**39**
4065	160	9300	366	13105	492	**119203-007**	**41**
4370	172	10160	400	14020	528	**119203-007**	**44**
4520	178	10695	421	14480	546	**119203-007**	**46**
4825	190	11225	442	14910	587	**119203-007**	**49**

When ordering index 8 (Cable - 3 Conductor), order the number of feet required for your particular truck. The approximate minimum order quantity is listed in the above chart. The cable can also be purchased in 75m (250 ft.) rolls (P/N **119203-008**) or 150m (500 ft.) rolls (P/N **119203-009**). Cut the cable to the length required for your truck.

***INDEX 8 119203-004 With Options Requiring 2nd CABLE 5 CONDUCTOR**

CHART 3							
Collapsed Height		Lift Height		Length Required		ORDER NUMBER	MINIMUM ORDER QUANTITY - EACH
mm	in.	mm	in.	mm	in.		
2260	89	5025	198	7695	279	**119203-004**	**24**
2415	95	5335	210	8155	297	**119203-004**	**25**
2720	107	6100	240	9070	333	**119203-004**	**28**
3025	119	6860	270	9980	369	**119203-004**	**31**
3325	131	7620	300	10895	405	**119203-004**	**34**
3555	140	8155	321	11580	432	**119203-004**	**36**
3785	149	8660	341	12270	459	**119203-004**	**39**
4065	160	9300	366	13105	492	**119203-004**	**41**
4370	172	10160	400	14020	528	**119203-004**	**44**
4520	178	10695	421	14480	546	**119203-004**	**46**
4825	190	11225	442	14910	587	**119203-004**	**49**

When ordering index 8 (Cable - 5 Conductor), order the number of feet required for your particular truck. The approximate minimum order quantity is listed in the above chart. The cable can also be purchased in 75m (250 ft.) rolls (P/N **119203-005**) or 150m (500 ft.) rolls (P/N **119203-006**). Cut the cable to the length required for your truck.

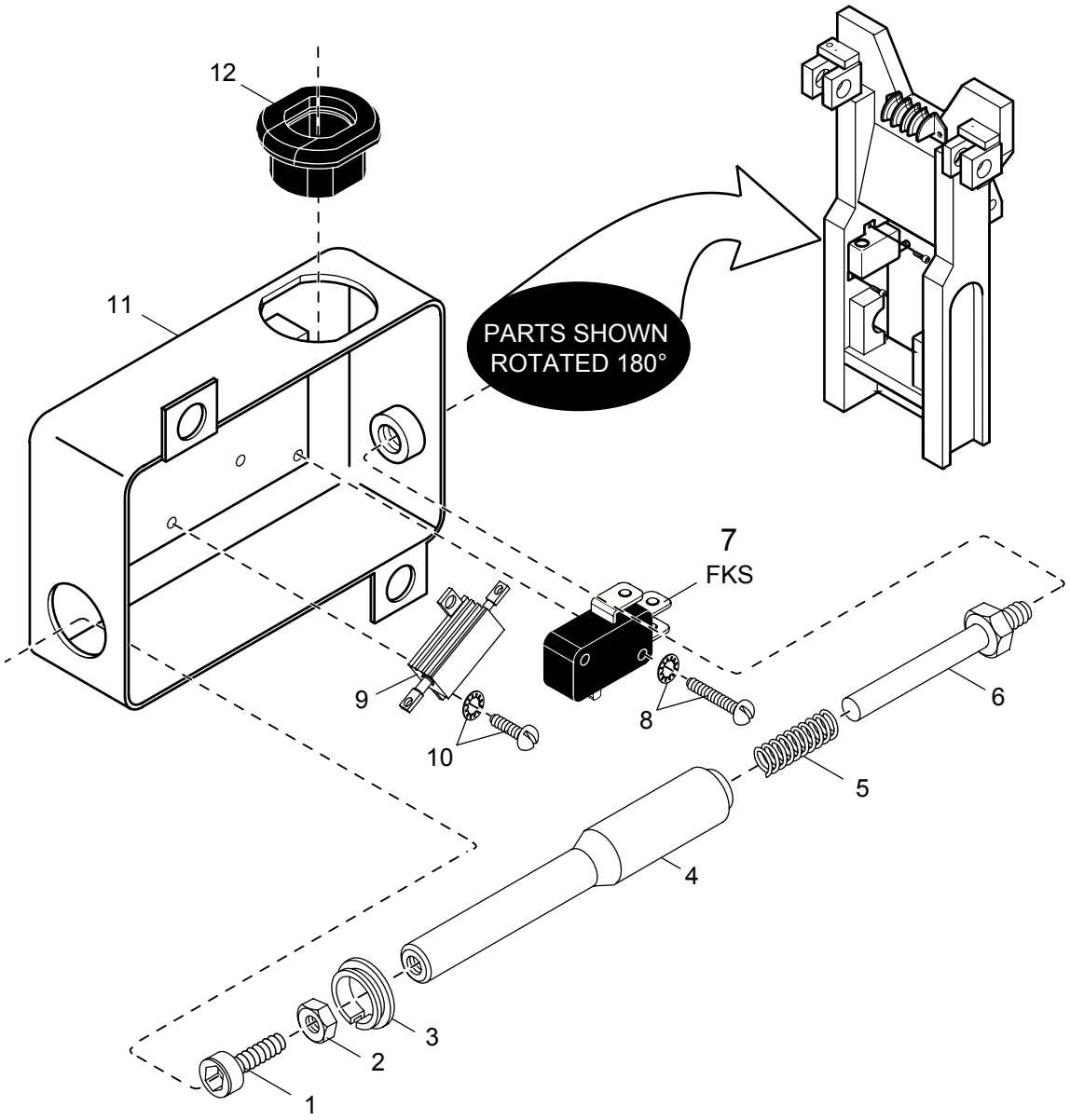
***INDEX 8 119203-001 With Options Requiring 2nd CABLE 8 CONDUCTOR**

CHART 4							
Collapsed Height		Lift Height		Length Required		ORDER NUMBER	MINIMUM ORDER QUANTITY - EACH
mm	in.	mm	in.	mm	in.		
2260	89	5025	198	7695	279	**119203-001**	**24**
2415	95	5335	210	8155	297	**119203-001**	**25**
2720	107	6100	240	9070	333	**119203-001**	**28**
3025	119	6860	270	9980	369	**119203-001**	**31**
3325	131	7620	300	10895	405	**119203-001**	**34**
3555	140	8155	321	11580	432	**119203-001**	**36**
3785	149	8660	341	12270	459	**119203-001**	**39**
4065	160	9300	366	13105	492	**119203-001**	**41**
4370	172	10160	400	14020	528	**119203-001**	**44**
4520	178	10695	421	14480	546	**119203-001**	**46**
4825	190	11225	442	14910	587	**119203-001**	**49**

When ordering index 8 (Cable - 8 Conductor), order the number of feet required for your particular truck. The approximate minimum order quantity is listed in the above chart. The cable can also be purchased in 75m (250 ft.) rolls (P/N **119203-002**) or 150m (500 ft.) rolls (P/N **119203-003**). Cut the cable to the length required for your truck.

6214

RR/RD 5200/5200S
RR/RD 5200(AC)/5200S(AC)



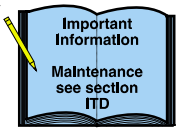
*123937-001 (Does Not Include Index 9 & 10)
*123937-002 (24V Freezer Corrosion)
*123937-003 (36V Freezer Corrosion)

Index		Part No.	Part Name	No. Req.
1		060015-004	Screw	1
2		060021-006	Nut	1
3		105450-003	Bushing	1
4		123934	Plunger	1
5		123941	Spring	1
		063002-025	Lubricant	1
6		123939	Rod	1
		060021-006	Nut	1
		061004-006	Adhesive Thread Locking	1
7		062683	Switch	1
8		060011-003	Screw	2
		060005-036	Lockwasher	2
9	*	062033-051	24V Resistor Freezer Corrosion (Included With Harness)	1
	*	062033-026	36V Resistor Freezer Corrosion (Included With Harness)	1
10	*	060010-003	Screw Freezer Corrosion	2
	*	060005-036	Lockwasher Freezer Corrosion	2
11		123936	Box	1
12		073805-001	Strain Relief	1

Always Specify Model, Data & Serial Numbers

087245-058 Conductor Lead 1

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



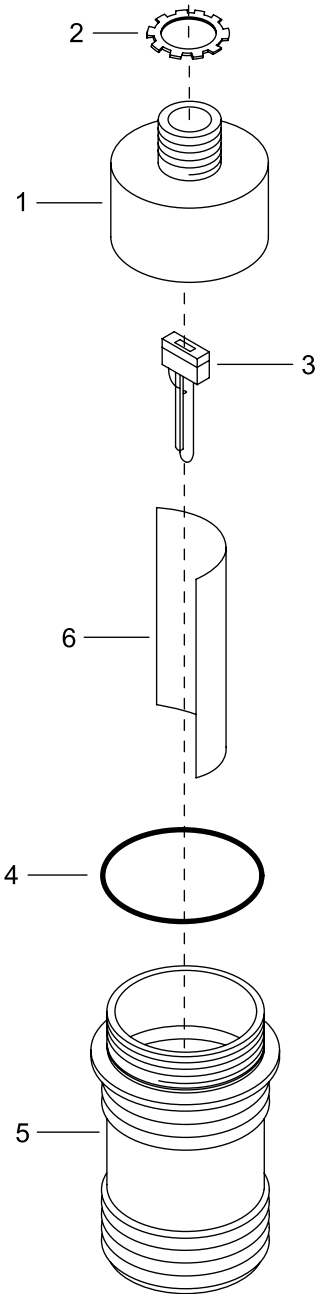
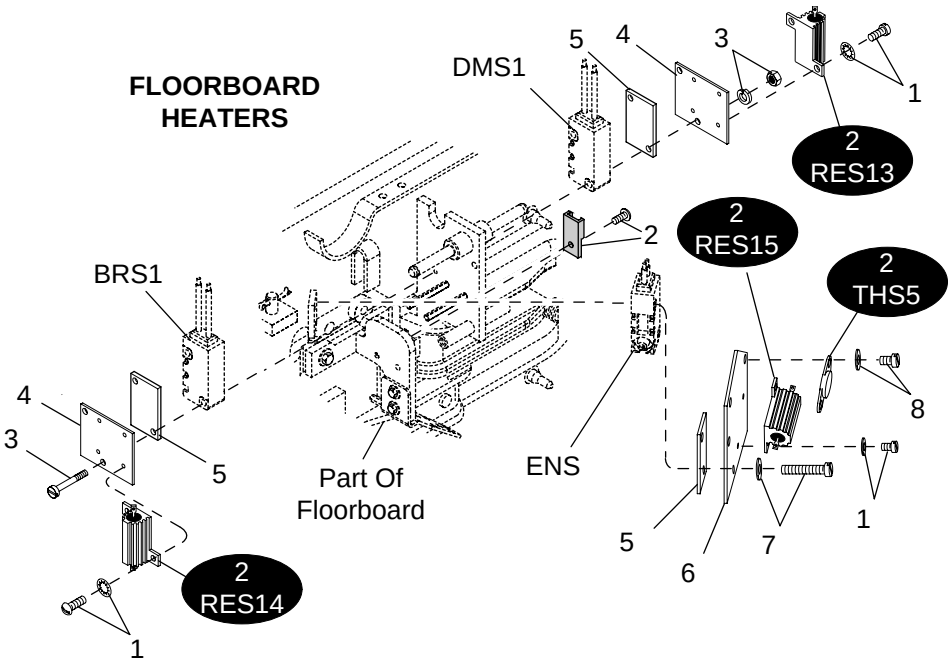


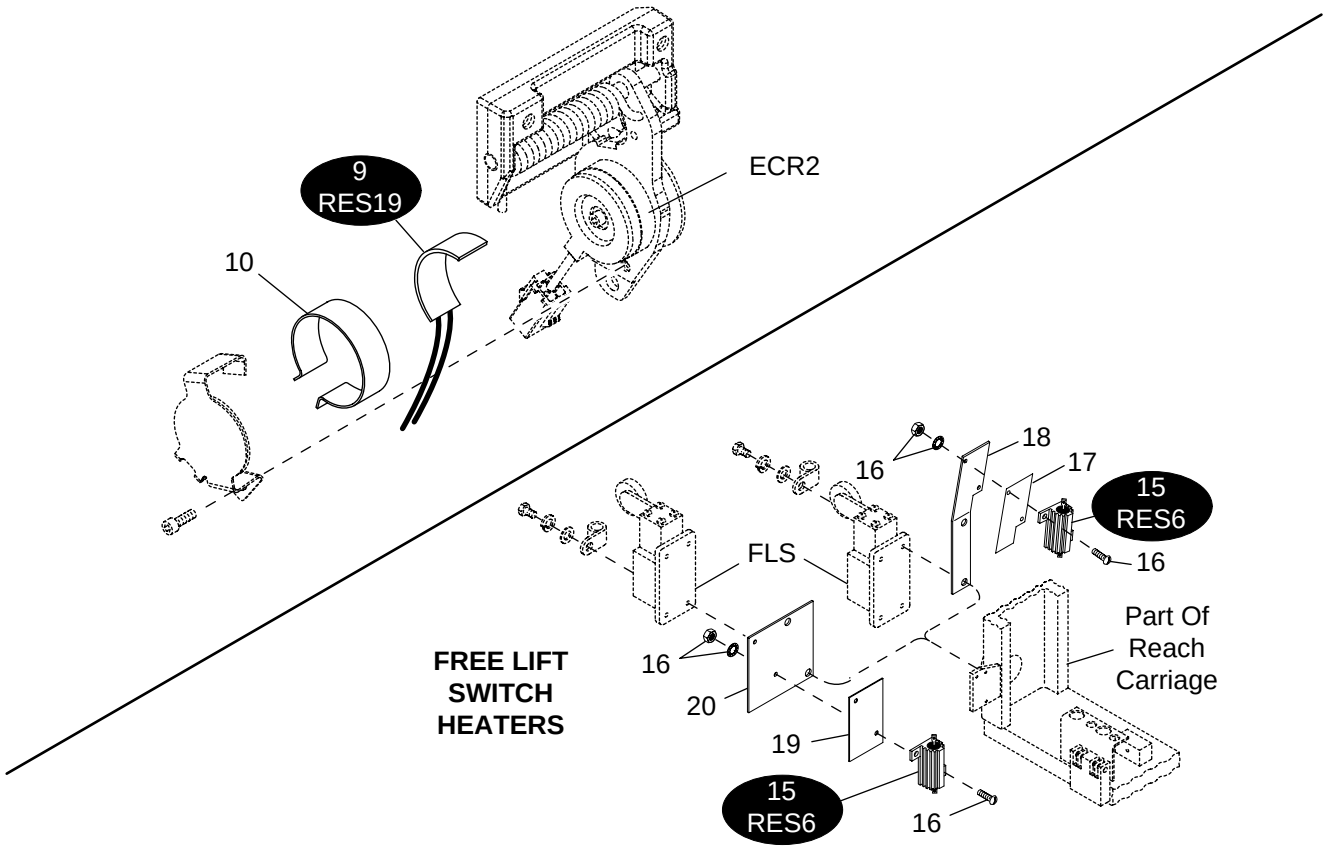
Figure 1228-04

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	112951-001	Strobe Light Amber	1
	112951-002	Strobe Light Red	1
	112951-003	Strobe Light Blue	1
1	*	Power Supply (*Strobe Light Replacement is More Economical)	1
2	113619	Locknut 12.5 mm (0.5 in.)	1
3	113615	Strobe Lamp	1
4	113614	O-Ring	1
5	113611	Lens Amber	1
	113612	Lens Blue	1
	113613	Lens Red	1
6	113620	Lens Blackout (FC/FP, SP3000, SP3200 & SP3400)	1

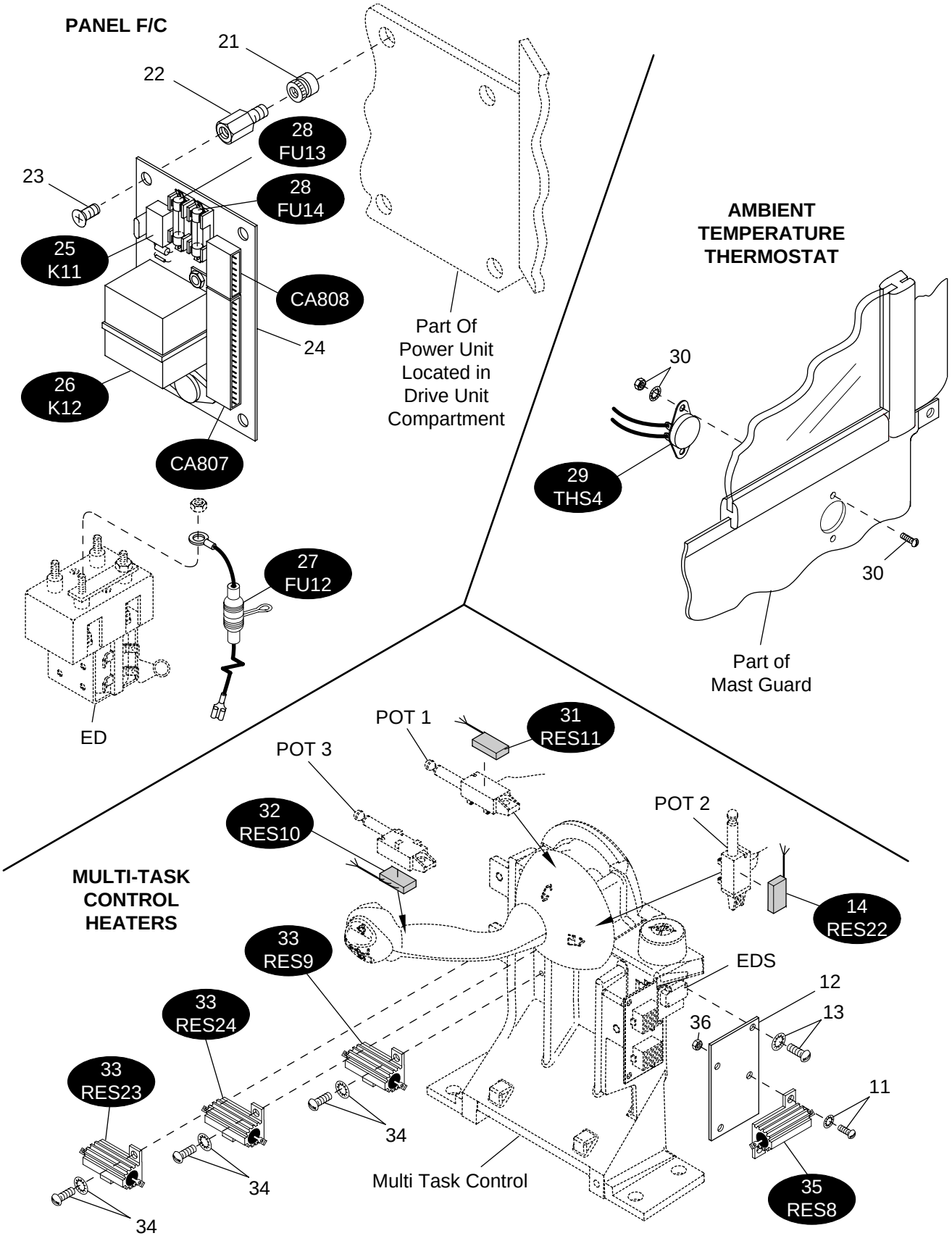
8797-01

RR/RD 5200
RR/RD 5200 (AC)





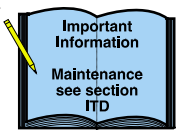
6269-04



Index		Part No.	Part Name	No. Req.
1		060010-004	Screw	6
		060005-001	Lockwasher	6
2	*	127749-001	Harness 36 Volt, Includes RES13, RES14,RES15 and THS5	1
	*	127749-002	Harness 24 Volt, Includes RES13, RES14, RES15 and THS5	1
		062749-001	Clip Attachment	1
		060014-087	Screw	1
		105606-816	Label	1
3		060011-033	Screw	2
		060005-049	Lockwasher	2
		060021-023	Nut	2
4		123895	Plate	2
5		123891	Spacer	3
6		123879	Plate	1
7		060011-013	Screw	2
		060005-049	Lockwasher	2
8		060011-001	Screw	2
		060005-036	Lockwasher	2
9	*	129132-001	Heater Flat 24V	1
	*	129132-002	Heater Flat 36V	1
		062007-063	Terminal Heater	2
		062007-095	Terminal Harness	2
10		125256	Retainer	1
11		060011-010	Screw	2
		060005-036	Lockwasher	2
		060021-023	Nut	2
12		123945	Bracket	1
13		060010-003	Screw	2
		060005-001	Lockwasher	2
14		125302	Heater	1
		065031-005	Sealant RTV	1
15	*	122378-004	Harness 24V	1
	*	122378-003	Harness 36V	1
	*	062033-041	Heater 24V	1
	*	062033-018	Heater 36V	1
		062007-015	Terminal	2
16		060011-012	Screw	2
		060005-036	Lockwasher	2
		060021-023	Nut	2
17		122278	Insulator RR 1585 Kg. (3500 lb.) Mast	1
18		122279	Bracket RR 1585 Kg. (3500 lb.) Mast	1
19		122281	Insulator RR 2040 Kg. (4500 lb.) & RD 1360 Kg. (3000 lb.) Mast	1
20	*	122280	Bracket RR 2040 kg. (4500 lb.) & RD 1360 kg. (3000 lb.) Mast	1
	*	129372	Bracket RR 2040 kg. (4500 lb.) & RD 1360 kg. (3000 lb.) Drive In Rack Mast Option	1
21		060091-002	Insert Nut	4
22		104401-001	Spacer	4
23		060012-076	Screw	4
24	*	123903-002	Panel F/C 24V	1
	*	123903-001	Panel F/C 36V	1
25		062496-003	Relay 24V & 36V	1
26	*	062337-003	Relay 24V	1
	*	062337-006	Relay 36V	1
		062339	Clip Spring	1
27		114270	Fuse Holder	1
		094362-002	Fuse	1
28		094362-002	Fuse 15 A	2
29		062524	Thermostat Part of Main Wire Harness	1
30		060011-005	Screw	2
		060005-036	Lockwasher	2
		060021-023	Nut	2
31		125302	Heater	1
		065031-005	Sealant RTV	1
32		125302	Heater	1
		065031-005	Sealant RTV	1
		062536-001	Terminal	1
33	*	062033-053	Resistor 24V	3
	*	062033-054	Resistor 36V	3
34		060010-003	Screw	6
		060005-001	Lockwasher	6
35	*	062033-003	Heater 24V	1
	*	062033-007	Heater 36V	1

Always Specify Model, Data & Serial Numbers

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



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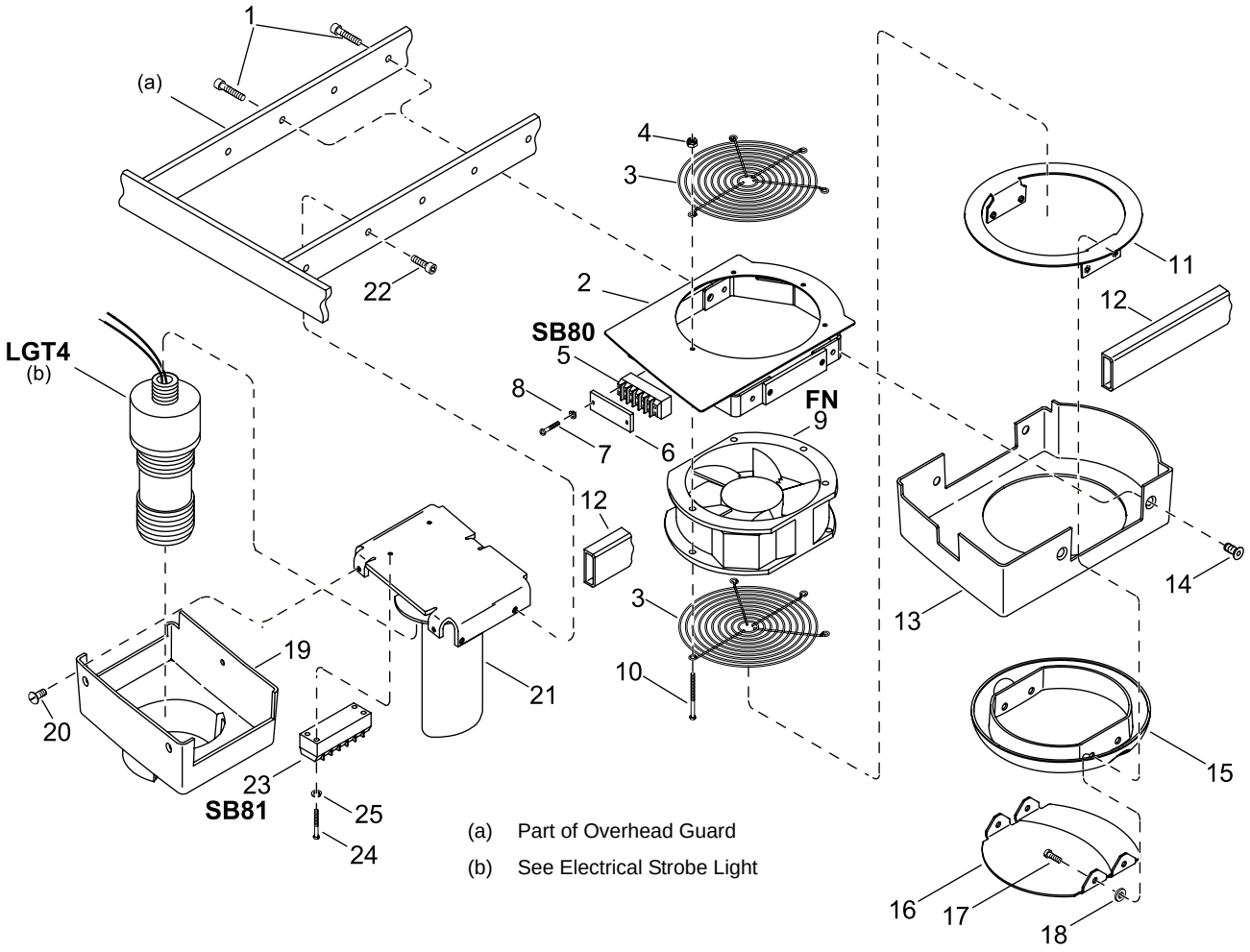


(a) Part of Overhead Guard

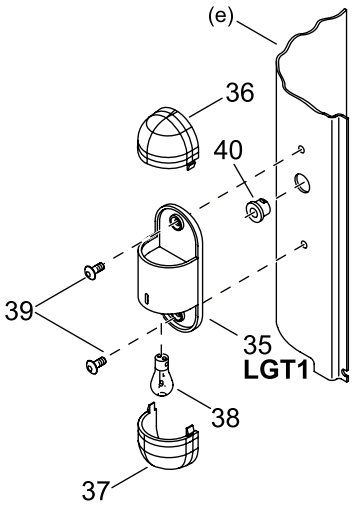
(b) See Electrical Strobe Light

Figure 18478-01

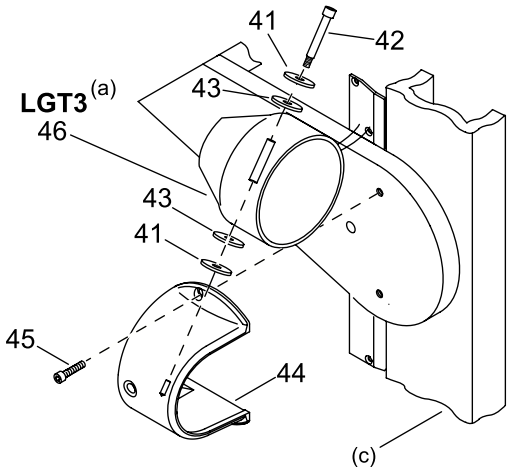
INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	060015-037	Screw	4
	061004-026	Thread Locking Adhesive	1
2	123787	Support	1
3	128458	Guard	2
4	060042-015	Self-Locking Nut	4
	061004-026	Thread Locking Adhesive	1
5	107853	Suppressor	1
	108026-080	Label	1
6	143900	Cover (1)	1
7	060013-008	Screw	2
8	060005-004	Lockwasher	2
9	108682	Fan	1
10	060013-044	Screw	4
11	123795	Support	1
12	123958	Cable Duct	AR
13	123786	Console	1
14	060015-031	Screw	4
15	123794	Console	1
16	123793	Louver	2
17	060012-076	Screw	4
18	012510	Washer	4
19	123884	Console	1
20	060014-043	Screw	3
21	123880	Bracket	1
22	060015-037	Screw	3
23	112533	Filter	1
24	060013-008	Screw	2
25	06005-004	Lockwasher	2

(1) Only on Trucks with Drive Thru OHG and No Strobe Light

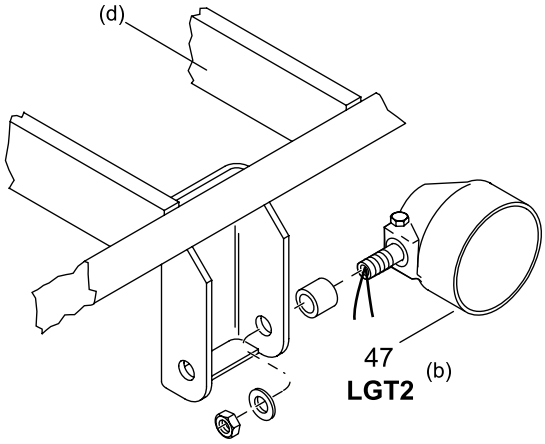
Always Specify Model, Data & Serial Number



Mast Mounted Worklights



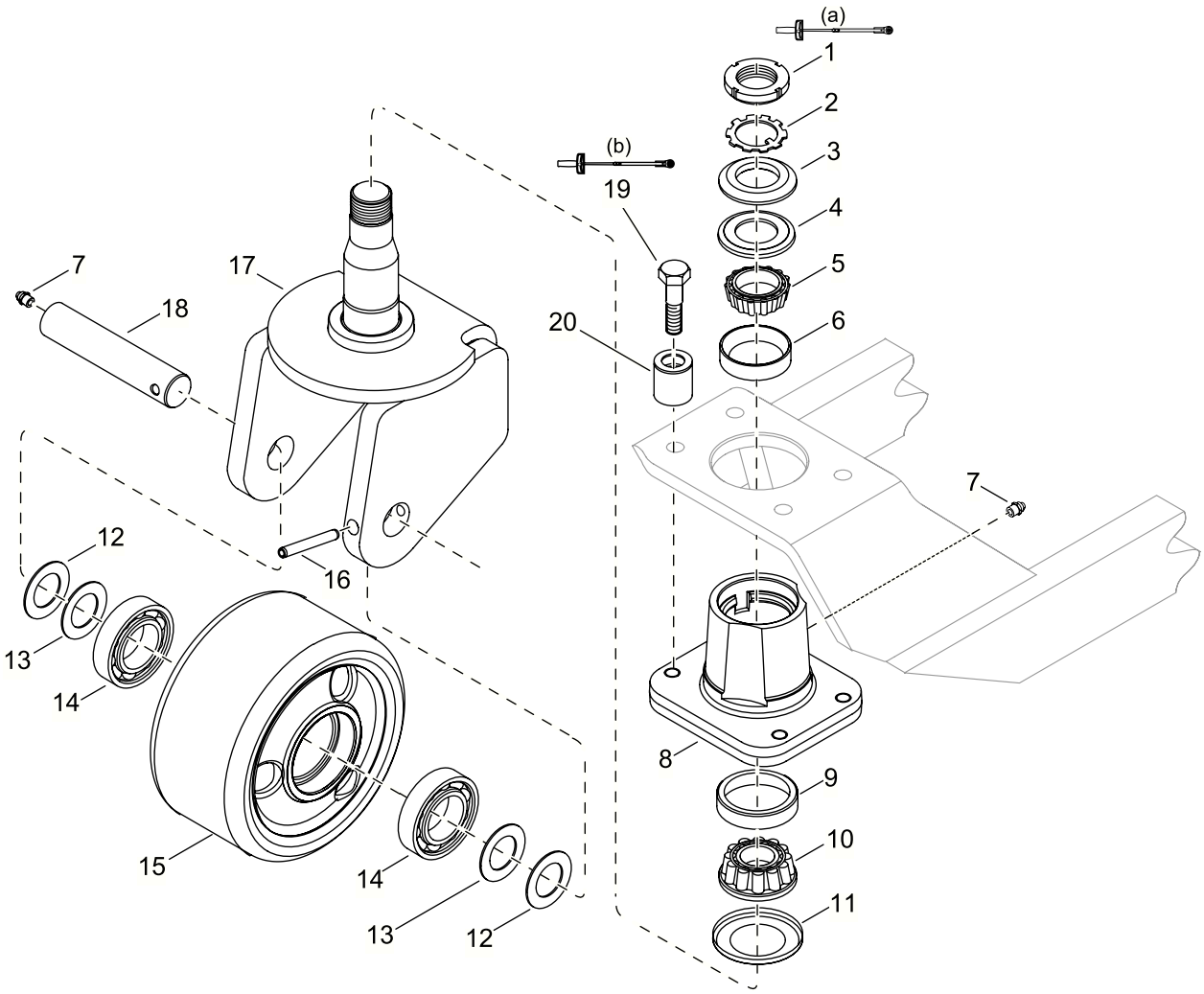
(a) LGT3 Right Worklight
(b) LGT2 Left Worklight
(c) Part of Mainframe Assembly
(d) Part of Overhead Guard
(e) Part of LH Mast Guard



Overhead Guard
Mounted Worklights

Figure 18479-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
35	123683	Dome Light	1
	123782	Housing	1
36	123783	Black Lens	1
37	123781	Clear Lens	1
38	116364	Bulb	1
39	060078-024	Screw	2
40	061021-002	Bushing	1
41	060030-161	Flatwasher	4
42	060045-026	Screw	2
43	123980	Spacer	4
44	123962	Housing	2
45	060017-086	Screw	4
46	104296-004	Spotlight 36 V	2
	102195	Bulb 36 V.	2
	104296-005	Spotlight 24 V	2
	087195-001	Bulb 24 V.	2
47	104296-002	Spotlight 36 V	2
	102195	Bulb 36 V.	2
	104296-003	Spotlight 24 V	2
	087195-001	Bulb 24 V.	2



(a) Torque 68 - 75 Nm (50 - 55 ft lb)

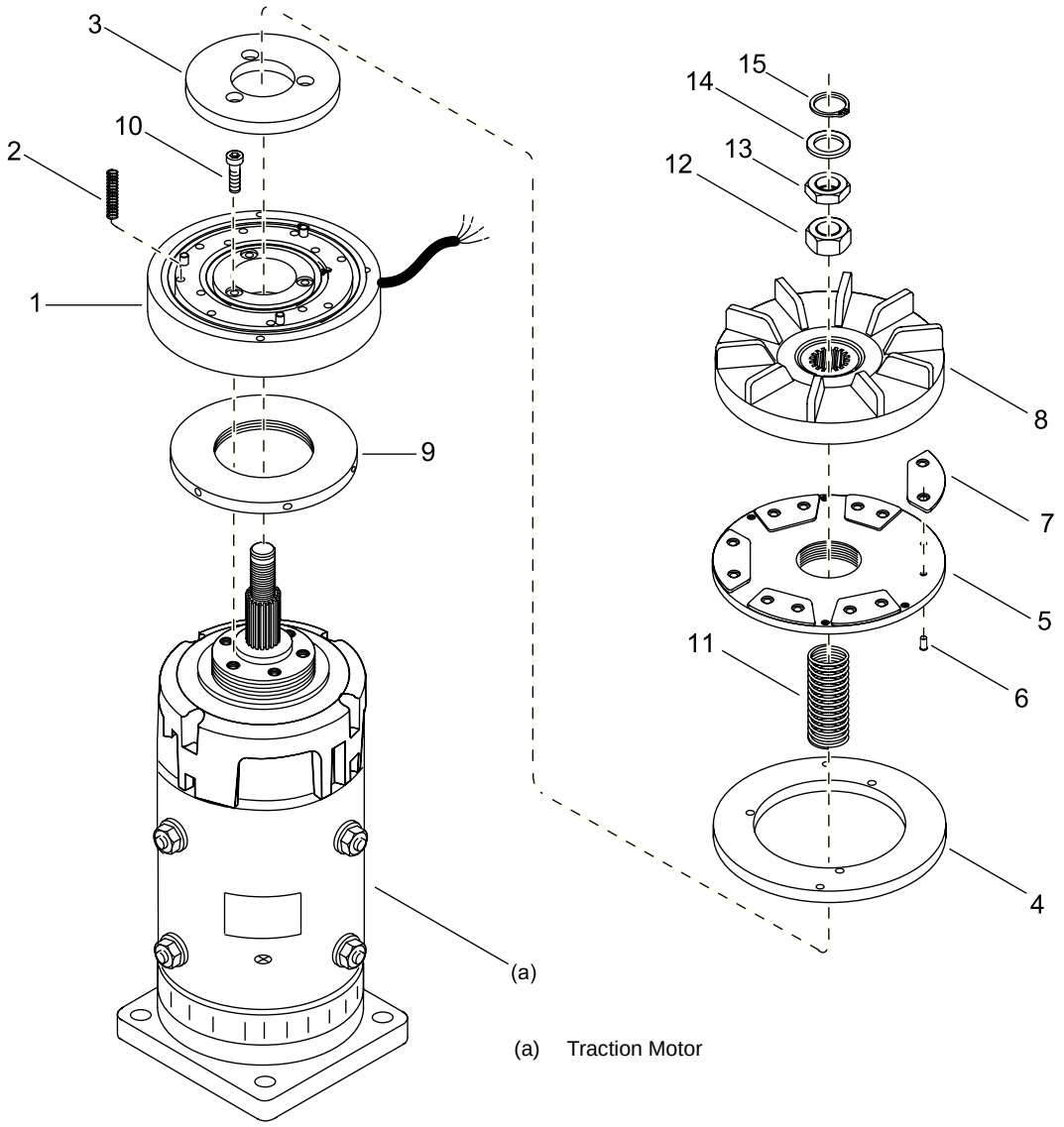
(b) Torque 136 - 163 Nm (100 - 120 ft lb)

Figure 21244

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	127817	Caster Assembly	1
	127846*	Caster Assembly F/C	1
1	060043-008	Locknut	1
2	060044-008	Lockwasher	1
3	125506	Spacer	1
4	065129-003	Metallic Seal	1
5	065131	Bearing Cone	1
6	065118	Bearing Cup	1
7	076048-001	Lubrication Fitting	2
8	125488	Pivot Hub	1
9	065132	Bearing Cup	1
10	065133	Bearing Cone	1
11	065129-004	Metallic Seal	1
12	060030-331	Flatwasher	AR
13	060030-311	Flatwasher	2
14	065081-067	Ball Bearing	2
15	127723-302	Caster Wheel	1
16	060000-029	Roll Pin	1
17	125490	Caster Bracket Assembly	1
18	127818	Axle	1
19	060019-072	Screw	4
	061004-019	Thread Locking Adhesive	AR
20	126781	Spacer	4

***** To select appropriate part number, use the data number to determine truck features. Refer to Introduction.

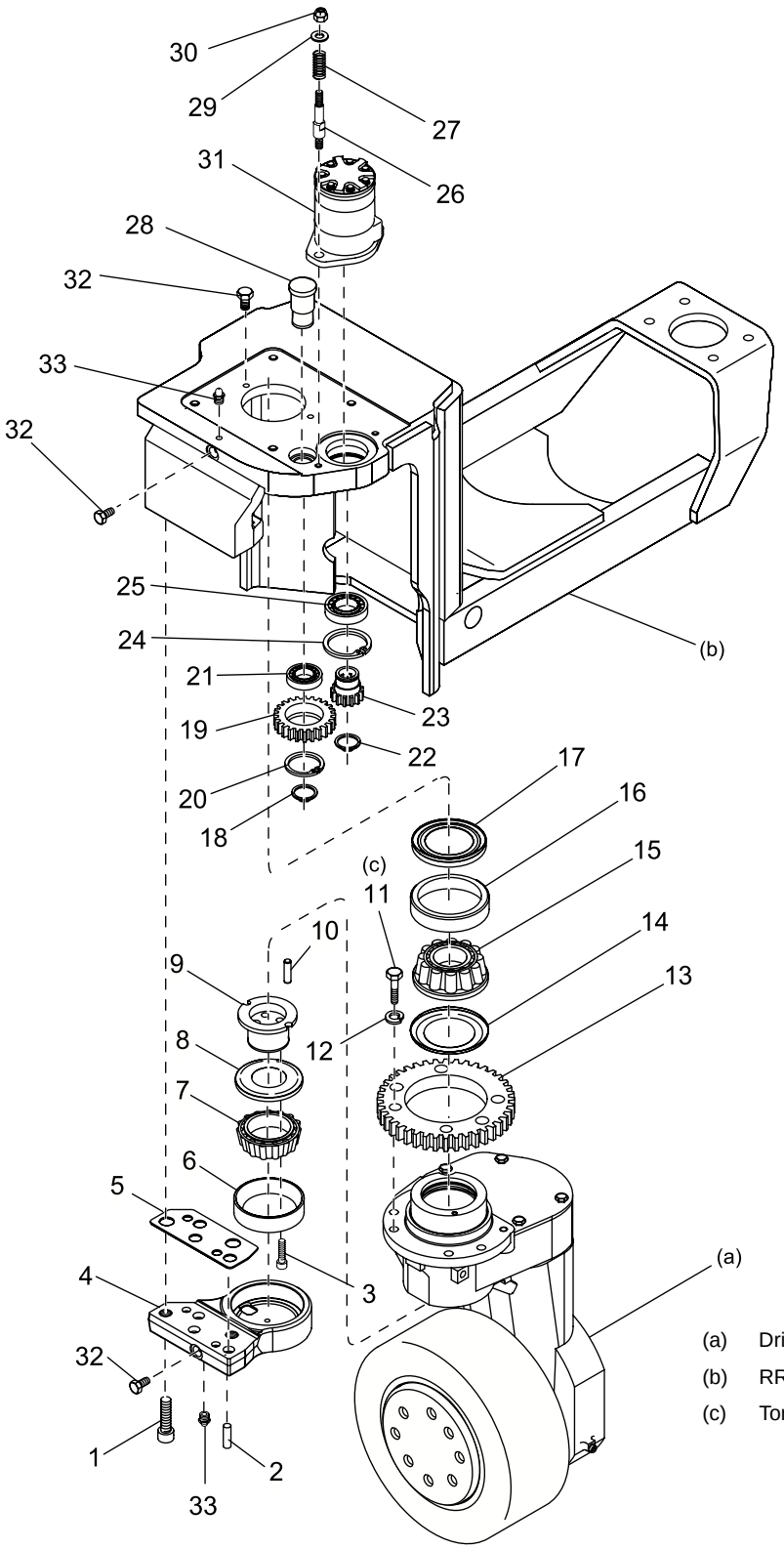
Always Specify Model, Data & Serial Number



(a) Traction Motor

Figure 21233

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	127633	Brake	1
1	125807	Magnet Coil & Body	1
	062037-012	Connector	1
	062036-003	Contact Pin	4
	105606-609	Label	1
2	119042	Compression Spring	15
3	119044	Inner Armature	1
4	119043	Outer Armature	1
5	119046	Brake Pad Assembly	1
6		Rivet	12
7		Brake Pad	6
8	125808	Brake Rotor	1
9	118167	Adjuster	1
10	060016-058	Screw	3
	061004-026	Thread Locking Adhesive	AR
11	119677	Compression Spring	1
12	118166-001	Nut	1
13	118166-002	Nut	1
14	060030-082	Flatwasher	AR
	060030-067	Flatwasher	AR
15	060009-153	Retaining Ring	1
	127373	Brake Service Release Tool	1
	129694	Brake Release Tool Adapter Harness	1



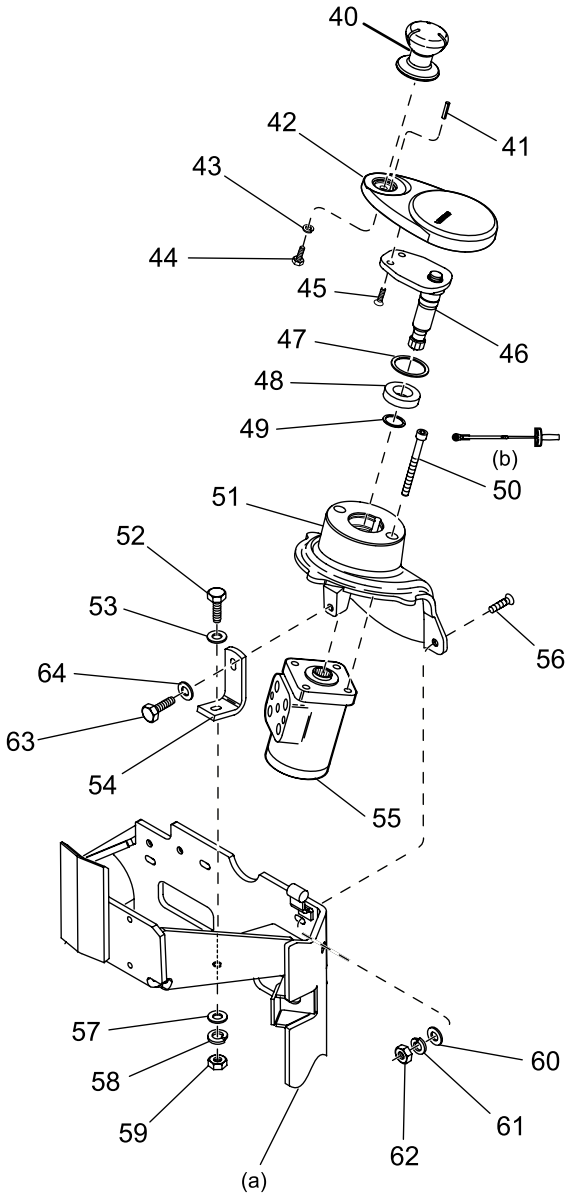
(a) Drive Unit, Refer to Drive Unit Parts

(b) RR/RD 5200 Undercarriage

(c) Torque Value 31 - 41 Nm (25 - 30 ft lb)

Figure 19649

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	060020-052	Screw	5
	061004-026	Thread Locking Adhesive	1
2	125845-001	Pull Dowell Pin	2
3	060017-024	Screw	4
4	125362	Cup Holder	1
5	125475-088	Shim 2 mm (0.088 in) Thick	AR
	125475-092	Shim 2.2 mm (0.092 in) Thick	AR
	125475-096	Shim 2.4 mm (0.096 in) Thick	AR
	125475-100	Shim 2.5 mm (0.100 in) Thick	AR
	125475-104	Shim 2.6 mm (0.104 in) Thick	AR
	125475-108	Shim 2.7 mm (0.108 in) Thick	AR
	125475-112	Shim 2.8 mm (0.112 in) Thick	AR
6	065127	Bearing Cup	1
7	065127	Bearing Cone	1
8	065129-002	Metallic Seal	1
9	127412	Stud	1
10	060000-249	Roll Pin	1
11	060017-066	Screw	2
	060017-007	Screw	2
	061004-026	Thread Locking Adhesive	1
12	060005-009	Lockwasher	2
13	125304	Ring Gear	1
14	065129-001	Metallic Seal	1
15	065126	Bearing Cone	1
16	065125	Bearing Cup	1
17	064214-002	Seal	1
18	060009-036	Retaining Ring	1
19	092157	Gear Idler Assembly	1
	084586	.Idler Gear	1
20	060009-095	.Retaining Ring	1
21	065010-005	.Ball Bearing	1
22	060009-018	Retaining Ring	1
23	121710	Pinion Gear	1
24	060009-035	Retaining Ring	1
25	065081-033	Ball Bearing	1
26	128134	Threaded Shaft	2
27	121837	Compression Spring	2
28	121711	Stud	1
29	060030-288	Flatwasher	2
30	060042-020	Lock Nut	2
31		Hydraulic Motor, refer to Steering Parts	1
32	060016-076	Screw	4
	061004-026	Thread Locking Adhesive	1
33	100779	Lubrication Fitting	2



(a) Part of Power Unit

(b) Torque Value 53 - 61 Nm (39 - 45 ft lb)

Figure 19650

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
40	123678	Knob	1
41	060000-002	Roll Pin	1
42	123674	Tiller	1
43	060016-019	Screw	1
44	060005-008	Lockwasher	1
45	060016-091	Screw	2
46	123675	Mount	1
47	060009-156	Retaining Ring	1
48	065081-063	Ball Bearing	1
49	060009-036	Retaining Ring	1
50	060017-102	Screw	2
	061004-006	Thread Locking Adhesive	1
51	123574	Support	1
52	060017-032	Screw	1
53	060030-119	Flatwasher	1
54	123694	Brace	1
55		Steering Unit, refer to Steering Parts	1
56	060017-077	Screw	2
57	060030-119	Flatwasher	1
58	060005-009	Lockwasher	1
59	060021-011	Nut	1
60	060030-119	Flatwasher	2
61	060005-009	Lockwasher	2
62	060021-011	Nut	2
63	060017-010	Screw	1
64	060030-119	Flatwasher	1

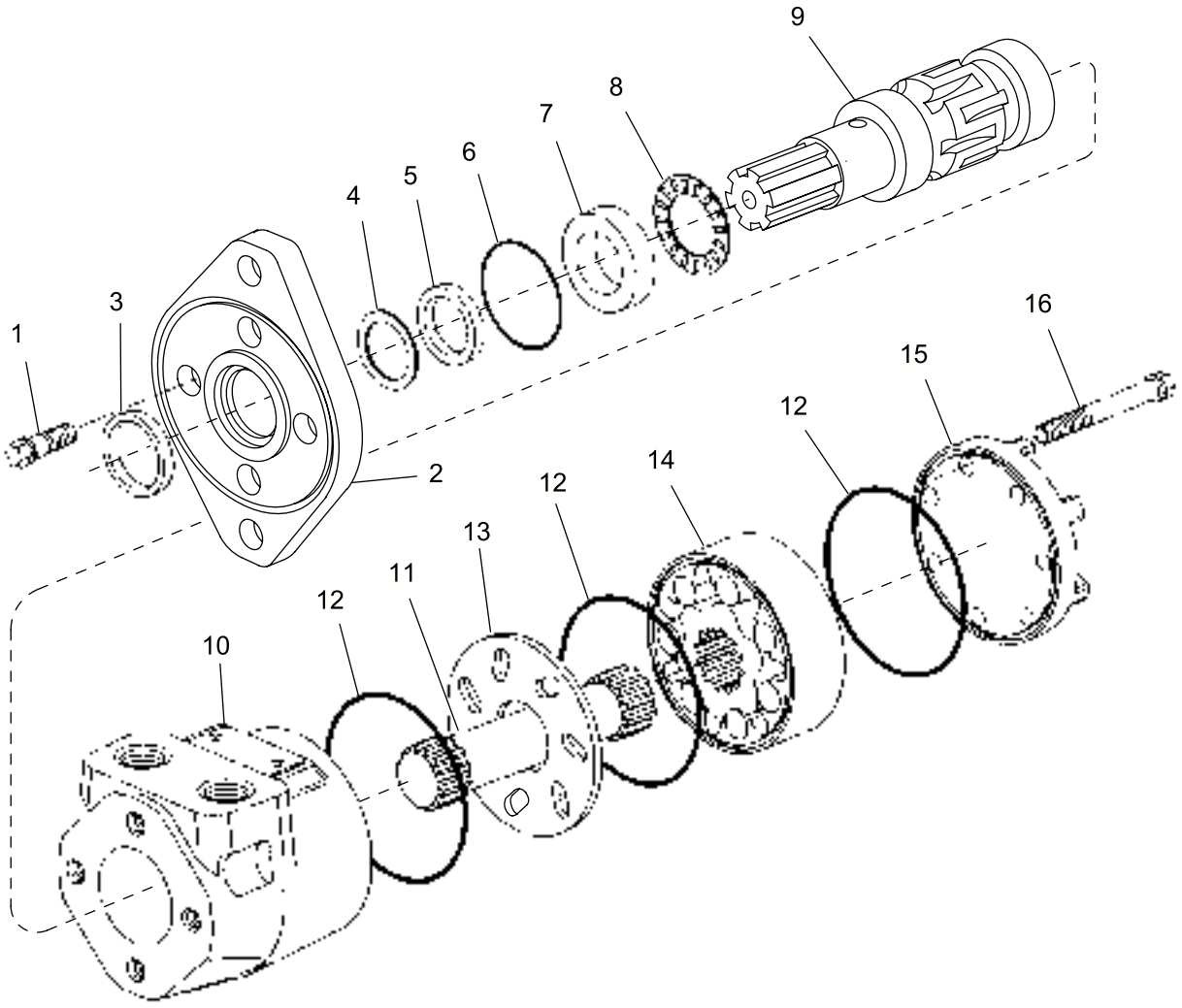
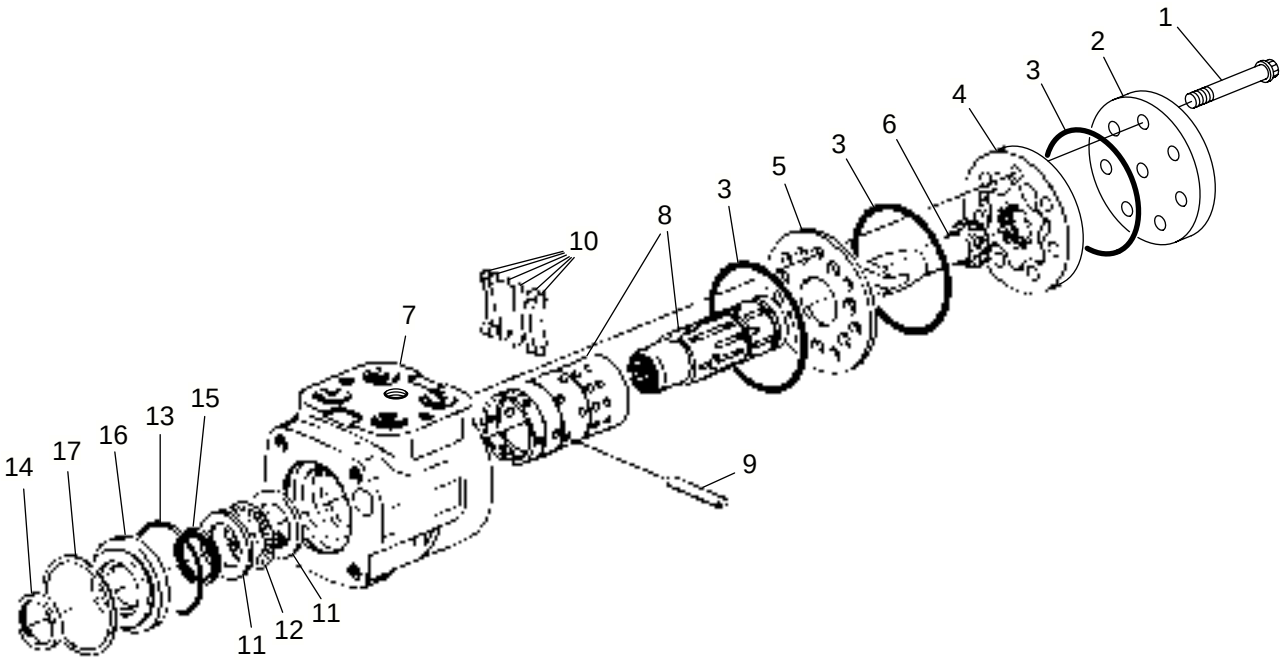


Figure 5836S-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	121659	Steer Motor Assembly	1
1	125175	Screw	4
2	125176	Flange	1
3	125177	Exclusion Seal	1
4	125178	Backup Washer	1
5	125179	Pressure Seal	1
6	125180	Seal	1
7	125181	Thrust Bearing Race	1
8	125182	Thrust Needle Bearing	1
9	125183	Output Shaft	1
10	125184	Output Shaft	1
11	125185	Drive	1
12	125186	Seal	3
13	125187	Spacer Plate	1
14		Geroler (Not Serviceable)	1
15	125189	End Cap	1
16	125190	Screw	7
	125191	Seal Kit Includes 3, 4, 5, 6 and 12	1

RR/RD 5200/5200S



121658 STEER UNIT

Index		Part No.	Part Name	No. Req.
1		125120	Screw Cap	7
2		123909	Cap End	1
3		123910	Seal	3
4		123911	Gerotor	1
5		123912	Plate Spacer	1
6		123913	Drive	1
7	*		Housing	1
8	*		Sleeve Control	1
	*		Spool Control	1
9		123914	Pin Centering	1
10		123915	Package Spring/Spacer	1
11			Bearing Race See 12	2
12		125121	Package Bearing Needle Thrust Includes 11	1
13		123917	Seal	1
14		123918	Seal	1
15		123919	Seal Quad Ring	1
16		123920	Bushing Seal Gland	1
17		123921	Ring Retaining	1
123932			Package Spacer & End Cap Includes 1, 2 & 5	1
123916			Kit Seal Includes 3, 13, 14 & 15	1

*** Not Available - Order Steer Unit**

Always Specify Model, Data & Serial Numbers

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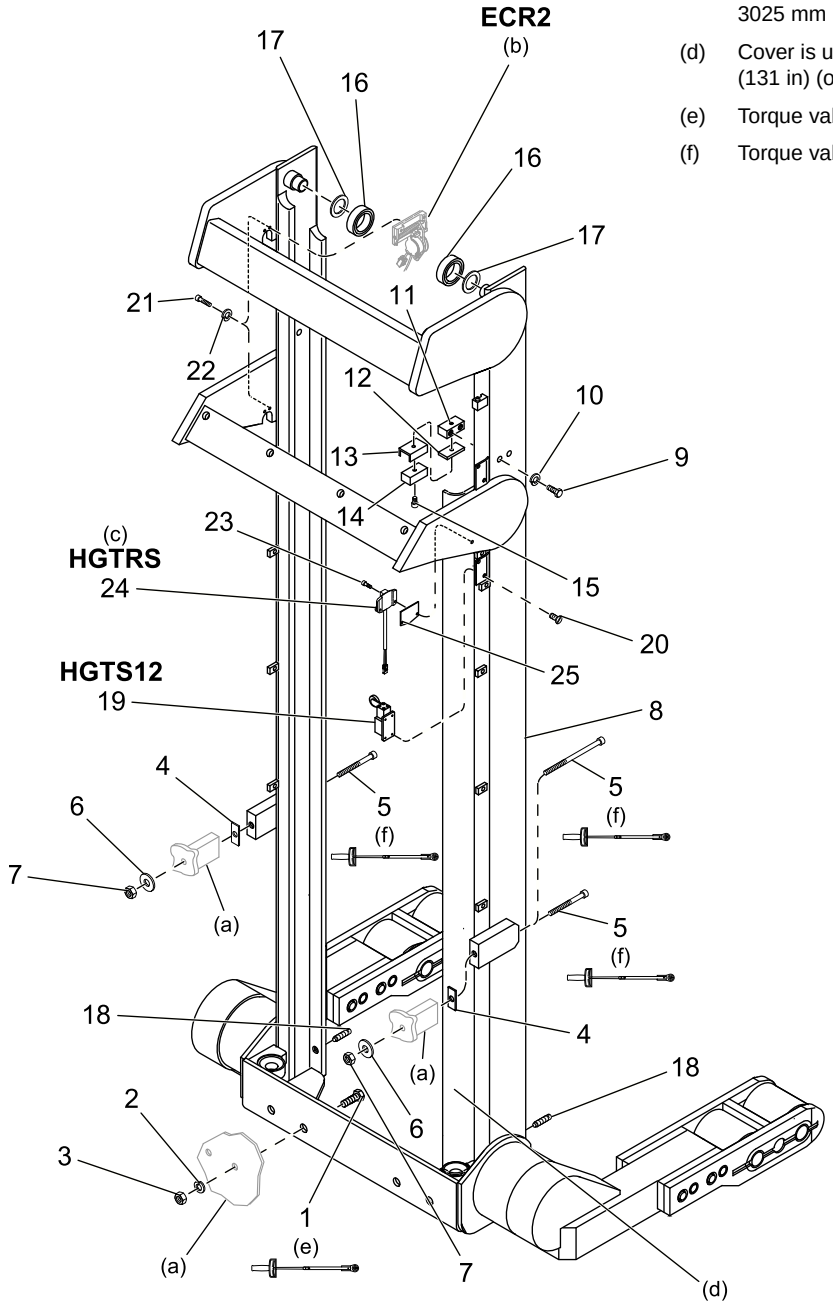


(a) Part of Power Unit

(b) ECR2 is standard on collapsed heights more than 3025 mm (119 in) and optional on 3025 mm (119 in) and below

(c) HGTS12 is standard on collapsed heights on or less than 3025 mm (119 in) and is not required if ECR2 is present

(d) Cover is used on trucks with collapsed height of 3325 mm (131 in) (one side shown)

(e) Torque value 305 - 340 Nm (225 - 250 ft lb)

(f) Torque value 190 - 215 Nm (140 - 160 ft lb)

Figure 19267-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	060023-009	Screw	4
2	060005-046	Lockwasher	4
3	060021-049	Nut	4
4	121681-006	Shim	AR
	121681-012	Shim	AR
5	060020-048	Long Screw 5000 series	2
	060020-042	Long Screw 5000S series left side	1
	060020-048	Long Screw 5000S series right side	1
6	060030-260	Flatwasher	2
7	060042-019	Self Locking Nut	2
8		Mainframe, refer to chart	1
9	060020-015	Screw	4
10	060005-014	Lockwasher	4
11	080069	Block Stop	2
12	074481-001	Shim Stop	AR
13	107563-001	Bracket	2
14	092747-001	Poly Stop	2
15	060015-004	Screw	2
	061004-026	Thread Locking Adhesive	1
16	123400	Column Roller	2
17	060030-130	Shim	AR
18	060095-001	Set Screw	2
	061004-026	Thread Locking Adhesive	1
19	123316-001	Switch Assy. 2260 & 2415 mm (89 & 95 in) collapsed height	1
	123316-002	Switch Assy. 2720 & 3025 mm (107 & 119 in) collapsed height	1
20	060061-008	Screw	2
	061004-019	Thread Locking Adhesive	1
21	060015-064	Screw	2
22	060005-007	Lockwasher	2
23	060014-090	Screw	2
24	128305-001*	Proximity Sensor Enhanced Display with CDM (1)	1
	128305-002*	Proximity Sensor Enhanced Display with CDM (2)	1
	128305-003*	Proximity Sensor Enhanced Display with CDM (3)	1
25	126901	Shim	1

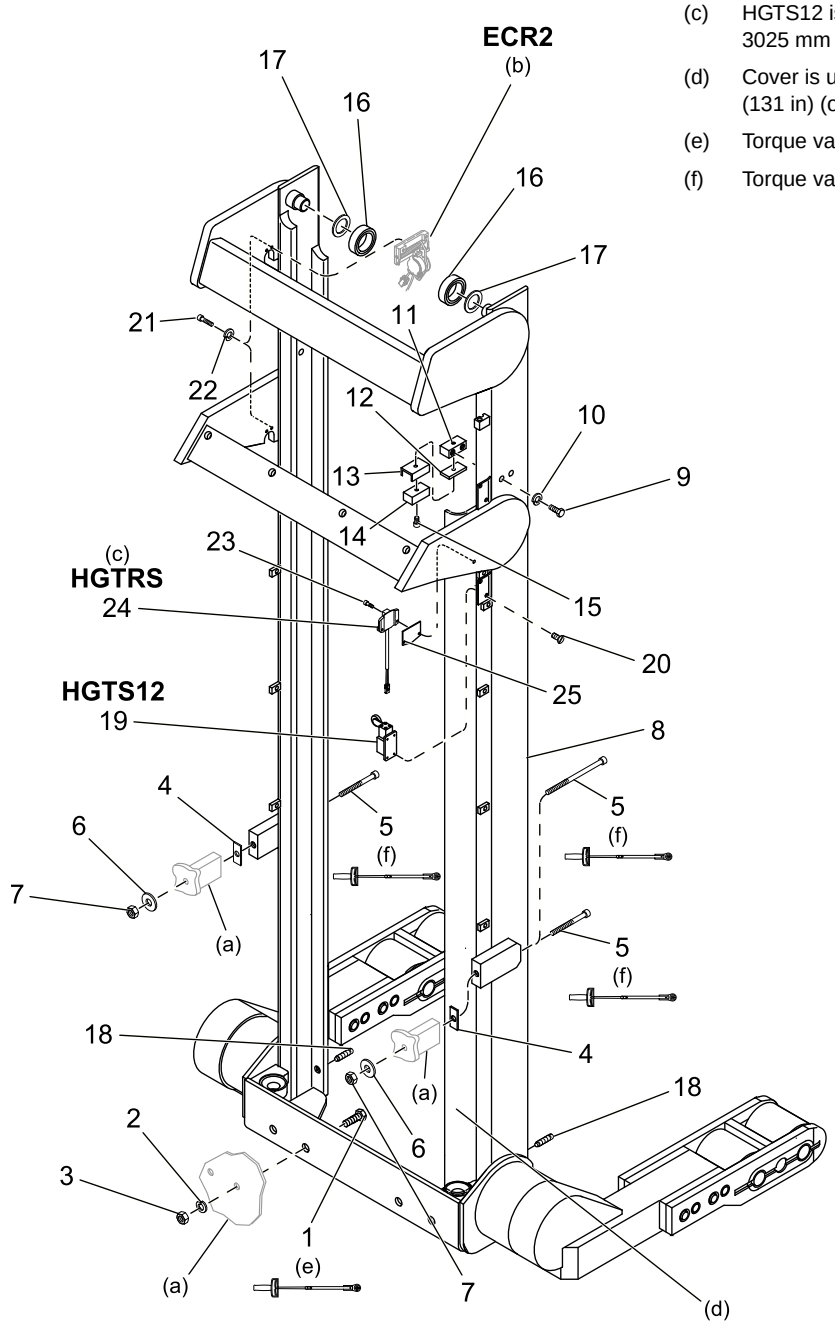
(1) 36 V and 2260 - 2720 mm (89 - 107 in) collapsed height/5025 - 6100 mm (198 - 240 in) lift height

(2) 36 V and 3025 - 3555 mm (119 - 140 in) collapsed height/6860 - 8155 mm (290 - 321 in) lift height

(3) 3785 - 4520 mm (149 - 178 in) collapsed height/8660 to 10695 mm (341 - 421 in) lift height

***** To select appropriate part number, use the data number to determine truck features. Refer to Introduction.

Always Specify Model, Data & Serial Number



(a) Part of Power Unit

(b) ECR2 is standard on collapsed heights more than 3025 mm (119 in) and optional on 3025 mm (119 in) and below

(c) HGTS12 is standard on collapsed heights on or less than 3025 mm (119 in) and is not required if ECR2 is present

(d) Cover is used on trucks with collapsed height of 3325 mm (131 in) (one side shown)

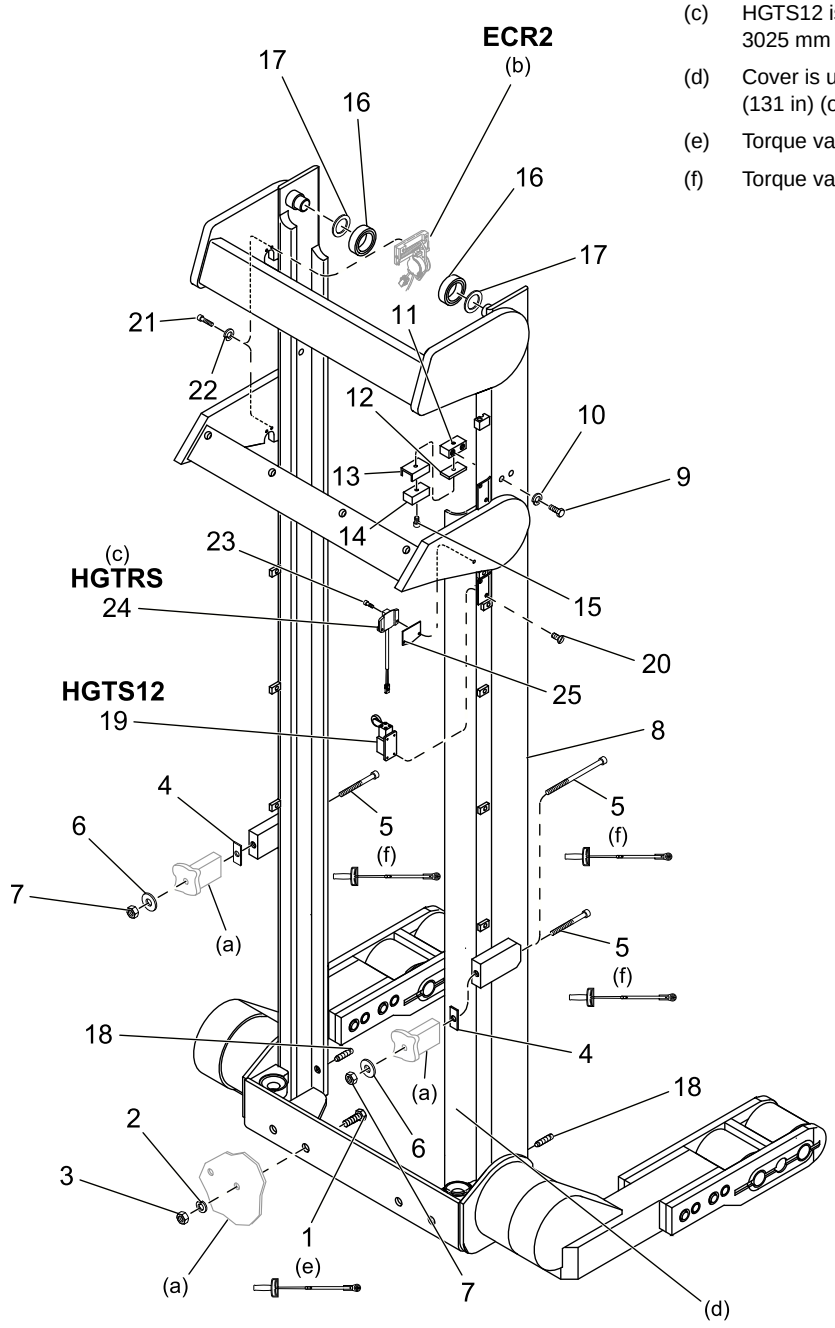
(e) Torque value 305 - 340 Nm (225 - 250 ft lb)

(f) Torque value 190 - 215 Nm (140 - 160 ft lb)

Figure 19267-01

INDEX 8 - Mainframe (Non-removable Outrigger Ends) (RR5200/5200 (AC) 2040 kg (4500 lb) Capacity)										
	Load Wheel Size					1st Dash Number Collapsed Height/Lift Height				
Part Number	100 X 75 mm (4.0 x 2.88 in)	100 X 105 mm (4.0 X 4.12 in)	125 X 75 mm (5.0 X 2.88 in)	125 X 105 mm (5.0 X 4.12 in)	265 X 115 mm (10.5 X 4.5 in)	2260/5030 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)
129028-	X					104	105	106	107	108
129028-		X				304	305	306	307	308
129028-			X			204	205	206	207	208
129028-				X		404	405	406	407	408
129028-					X	504	505	506	507	508
Note: The second dash number is the same as the truck's inside straddle dimension 863 - 1550 mm (34 - 61 in).										

INDEX 8 - Mainframe (Non-removable Outrigger Ends) (Tapered) (RR5200/5200 (AC) 2040 kg (4500 lb) Capacity)									
	Load Wheel Size				1st Dash Number Collapsed Height/Lift Height				
Part Number	100 X 75 mm (4.0 x 2.88 in)	100 X 105 mm (4.0 X 4.12 in)	125 X 75 mm (5.0 X 2.88 in)	125 X 105 mm (5.0 X 4.12 in)	2260/5030 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)
129028-	X				604	605	606	607	608
129028-		X			804	805	806	807	808
129028-			X		704	705	706	707	708
129028-				X	904	905	906	907	908
Note: The second dash number is the same as the truck's inside straddle dimension 863 - 1550 mm (34 - 61 in).									



(a) Part of Power Unit

(b) ECR2 is standard on collapsed heights more than 3025 mm (119 in) and optional on 3025 mm (119 in) and below

(c) HGTS12 is standard on collapsed heights on or less than 3025 mm (119 in) and is not required if ECR2 is present

(d) Cover is used on trucks with collapsed height of 3325 mm (131 in) (one side shown)

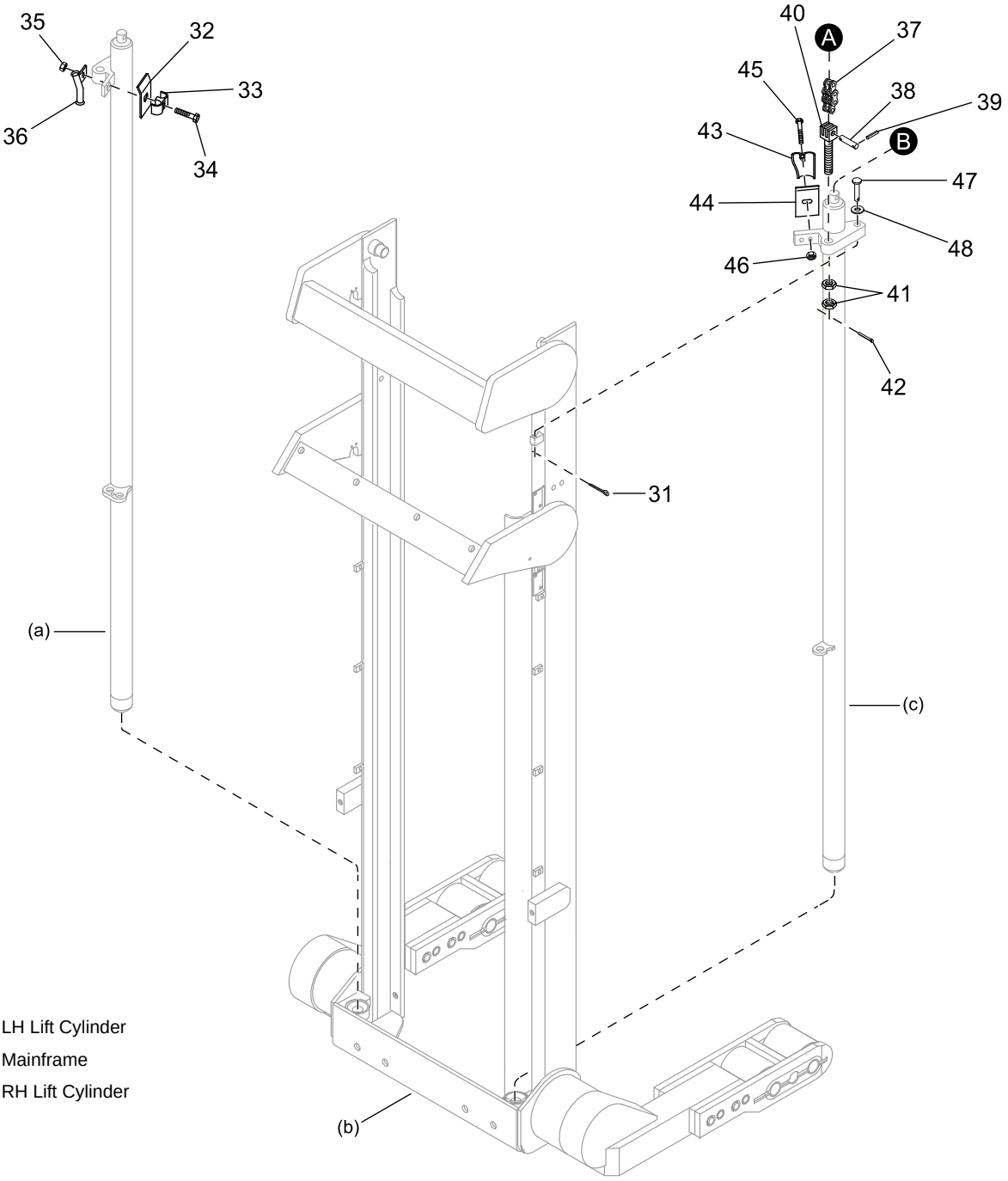
(e) Torque value 305 - 340 Nm (225 - 250 ft lb)

(f) Torque value 190 - 215 Nm (140 - 160 ft lb)

Figure 19267-01

INDEX 8 - Mainframe (Removable Outrigger Ends) (RR5200/5200 (AC) 2040 kg (4500 lb) Capacity)										
	Load Wheel Size					1st Dash Number Collapsed Height/Lift Height				
Part Number	100 X 75 mm (4.0 x 2.88 in)	100 X 105 mm (4.0 X 4.12 in)	125 X 75 mm (5.0 X 2.88 in)	125 X 105 mm (5.0 X 4.12 in)	265 X 115 mm (10.5 X 4.5 in)	2260/5030 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)
129029-	X					104	105	106	107	108
129029-		X				304	305	306	307	308
129029-			X			204	205	206	207	208
129029-				X		404	405	406	407	408
129029-					X	504	505	506	507	508
Note: The second dash number is the same as the truck's inside straddle dimension 863 - 1550 mm (34 - 61 in).										

INDEX 8 - Mainframe (Removable Outrigger Ends) (Tapered) (RR5200/5200 (AC) 2040 kg (4500 lb) Capacity)									
	Load Wheel Size				1st Dash Number Collapsed Height/Lift Height				
Part Number	100 X 75 mm (4.0 x 2.88 in)	100 X 105 mm (4.0 X 4.12 in)	125 X 75 mm (5.0 X 2.88 in)	125 X 105 mm (5.0 X 4.12 in)	2260/5030 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)
129029-	X				604	605	606	607	608
129029-		X			804	805	806	807	808
129029-			X		704	705	706	707	708
129029-				X	904	905	906	907	908
Note: The second dash number is the same as the truck's inside straddle dimension 863 - 1550 mm (34 - 61 in).									



(a) LH Lift Cylinder
(b) Mainframe
(c) RH Lift Cylinder

Figure 19462-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
31	060038-017	Cotter Pin	2
32	121679	Guide	1
33	123281	Clamp	1
34	060015-015	Screw	1
35	060042-006	Self Locking Nut	1
36	124010	Load Sensor Guide	1
37		Mast Chain, refer to chart	2
38	086499	Pin	8
39	060000-055	Roll Pin	16
40	075385	Anchor Chain	2
41	060021-028	Nut	12
42	060038-003	Cotter Pin	6
43	121677	Guide	1
44	121679	Guide	1
45	060015-015	Screw	1
46	060042-006	Self Locking Nut	1
47	076470-025	Clevis Pin	2
48	060030-191	Flatwasher	2

INDEX 37 - Mast Chain

Lift Height		Collapsed Height Length		Required (When Cutting From Bulk)			Part Number	Minimum Order Quantity		
								Quantity	Box Length	
mm	in	mm	in	mm	in	Links			m	ft
5030	198	2260	89	2115	83.25	111	073991-123	1	4.5	15
5335	210	2415	95	2265	89.25	119	073991-123	1	4.5	15
6100	240	2720	107	2572	101.25	151	073991-124	1	6	20
6860	270	3025	119	2875	113.25	151	073991-124	1	6	20
7620	300	3325	131	3180	125.25	167	073991-125	1	7.5	25

Note: Replace both mast chains at the same time. When ordering chain, order the number of feet required for your particular truck. The appropriate minimum order quantity is listed in the above chart. Cut the chain to the length required for your truck. Refer to Lifting Mechanism Maintenance for cutting chain procedure.

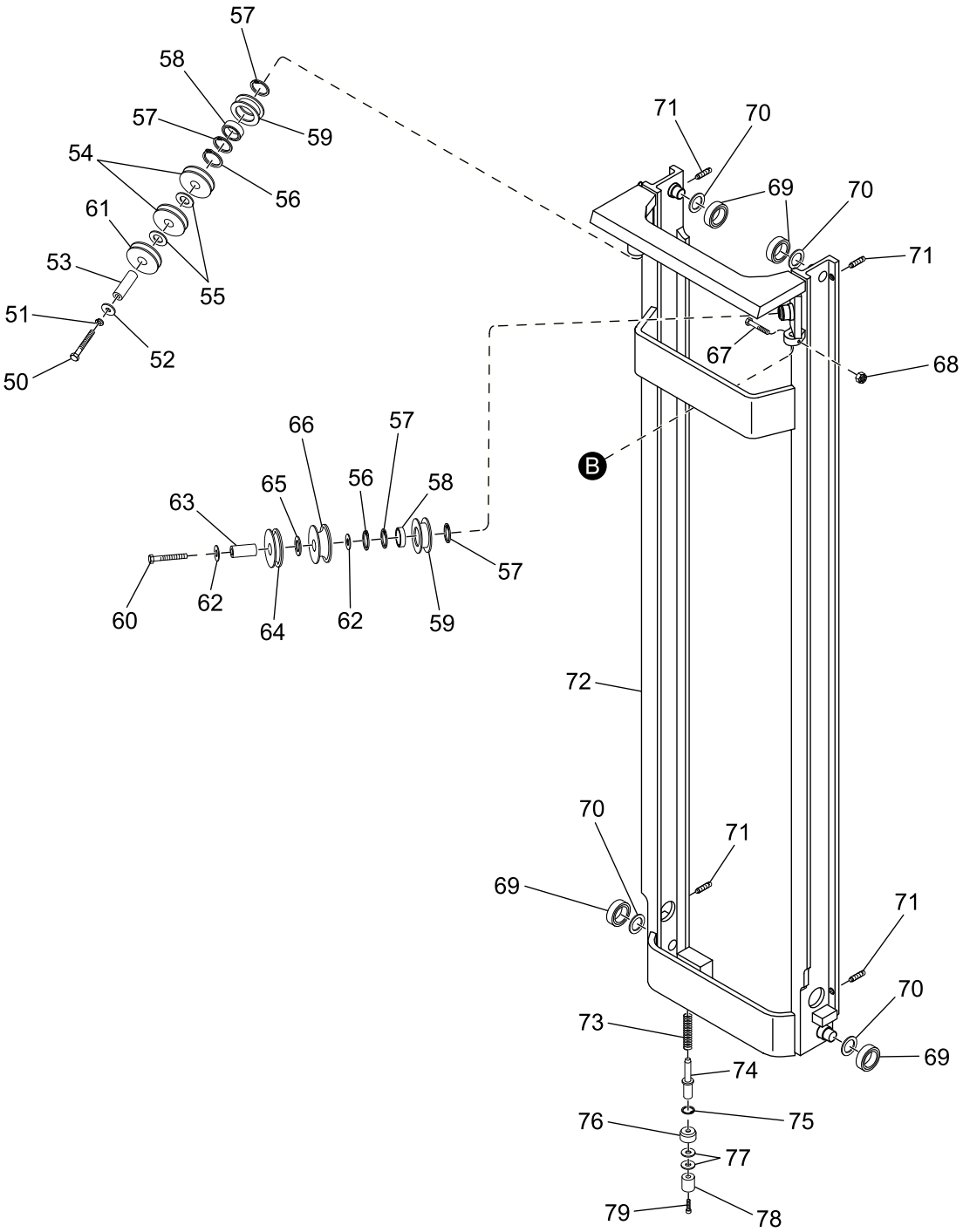


Figure 19268-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
50	060017-059	Screw	1
	060017-094	Screw with Load Sensor and F/C	1
	061004-019	Thread Locking Adhesive	1
51	060005-009	Lockwasher	1
52	060030-078	Flatwasher	1
53	121624-001	Shaft	1
	121624-003	Shaft with Load Sensor and F/C	1
54	119655-001	Pulley	2
55	060030-192	Flatwasher	1
56	060009-043	Retaining Ring	2
57	060009-062	Retaining Ring	4
58	065081-045	Ball Bearing	2
59	117556-001	Chain Pulley (includes Index 57 and 58)	2
	117557-001	Chain Pulley	2
60	060019-071	Screw	1
61	127513-001	Pulley with Load Sensor and F/C	1
62	060030-332	Flatwasher	2
63	127874-001	Shaft	1
64	127513-001	Cable Pulley	1
65	060030-192	Flatwasher	1
66	121623	Hose Pulley	1
67	060015-043	Screw	2
68	060042-006	Self Locking Nut	2
69	123400	Column Roller	4
70	060030-130	Shim	AR
71	060095-001	Set Screw	4
72		2nd Stage Mast, refer to chart	1
73		Spring, refer to chart	2
	063002-007	Lubricant	1
74	128014	Spring Ram 2260 - 3025 mm (89 - 119 in) Collapsed Height	2
	128013	Spring Ram 3325 - 4370 mm (131 - 172 in) Collapsed Height	2
75	060009-101	Retaining Ring 2260 - 3025 mm (89 - 119 in) Collapsed Height	2
	060009-045	Retaining Ring 3325 - 4370 mm (131 - 172 in) Collapsed Height	2
76	121622	Lower Stop	2
77	060030-277	Flatwasher	AR
78	124019	Bumper	2
79	060017-056	Screw	2
	061004-026	Thread Locking Adhesive	1

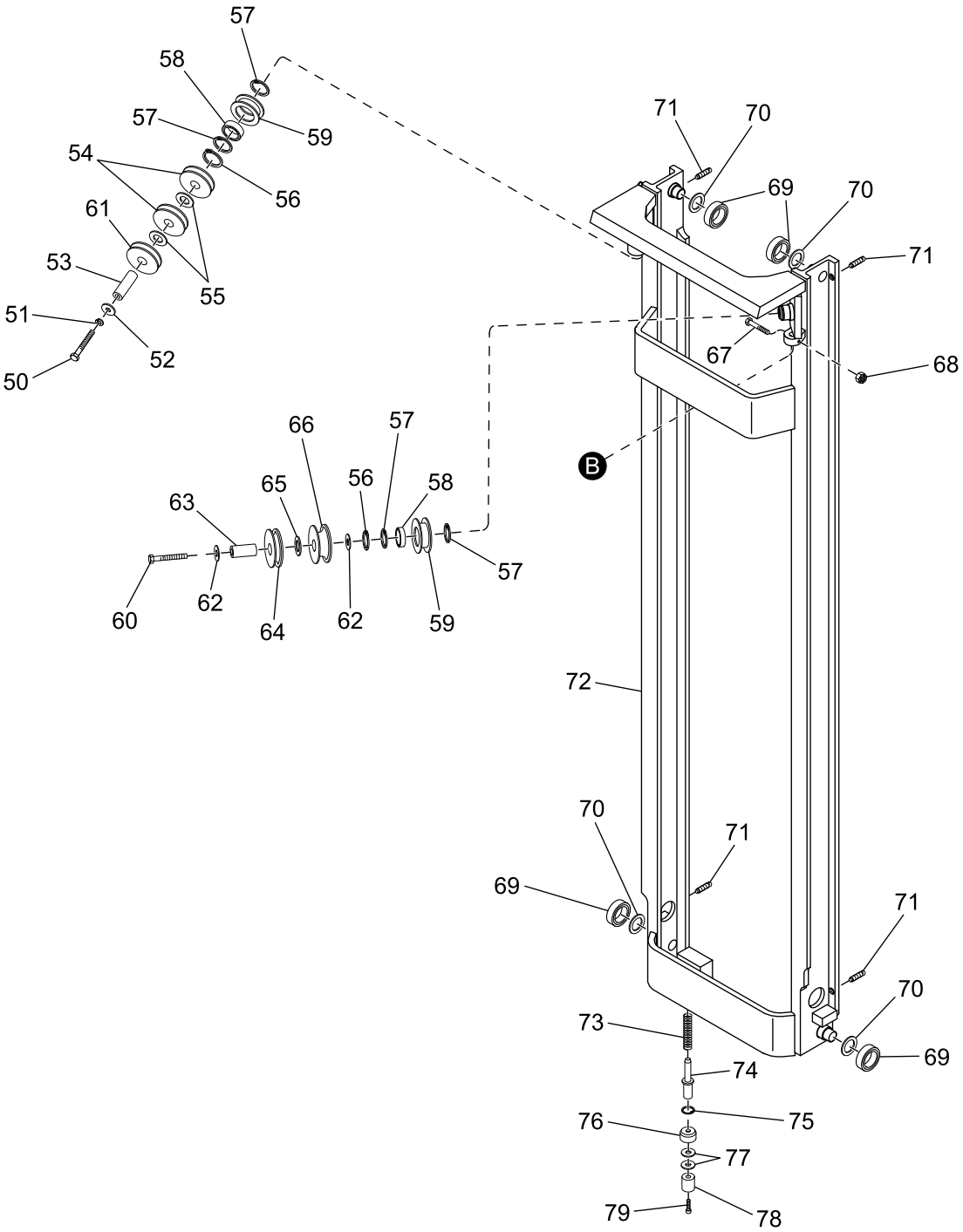
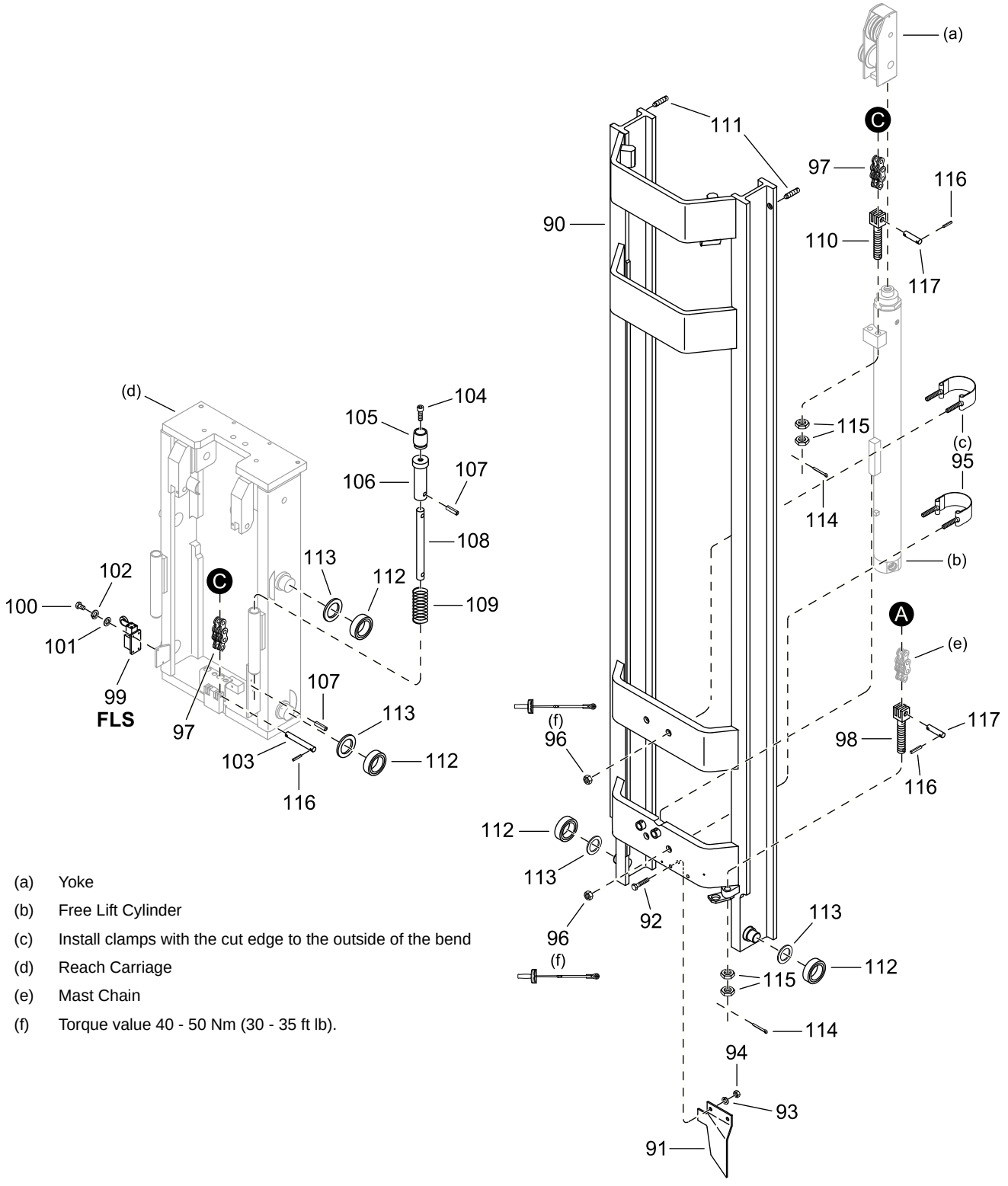


Figure 19268-01

INDEX 72 and 90 - 2nd and 3rd Stage Mast (RR5200/5200 (AC) 2040 kg (4500 lb) Capacity)						
Index Number	Part Number	1st Dash Number Collapsed Height/Lift Height				
		2260/5025 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)
72	127876-	004	005	006	007	008
90	124891-	004	005	006	007	008
Note: The second dash number is the same as the truck's inside straddle dimension 863 - 1550 (34 - 61 in).						

INDEX 73 - Mast Spring							
Lift Height*		Collapsed Height		One Each Required			
mm	in	mm	in	Spring		Spring	
5030	198	2260	89	122399	Bronze	128011	Red
5335	210	2415	95	122399	Bronze	122399	Bronze
6100	240	2720	107	122399	Bronze	119031	Gray
6860	270	3025	119	119031	Gray	119031	Gray
7620	300	3325	131	119031	Gray	119031	Green

***** To select appropriate part number, use the data number to determine truck features. Refer to Introduction.

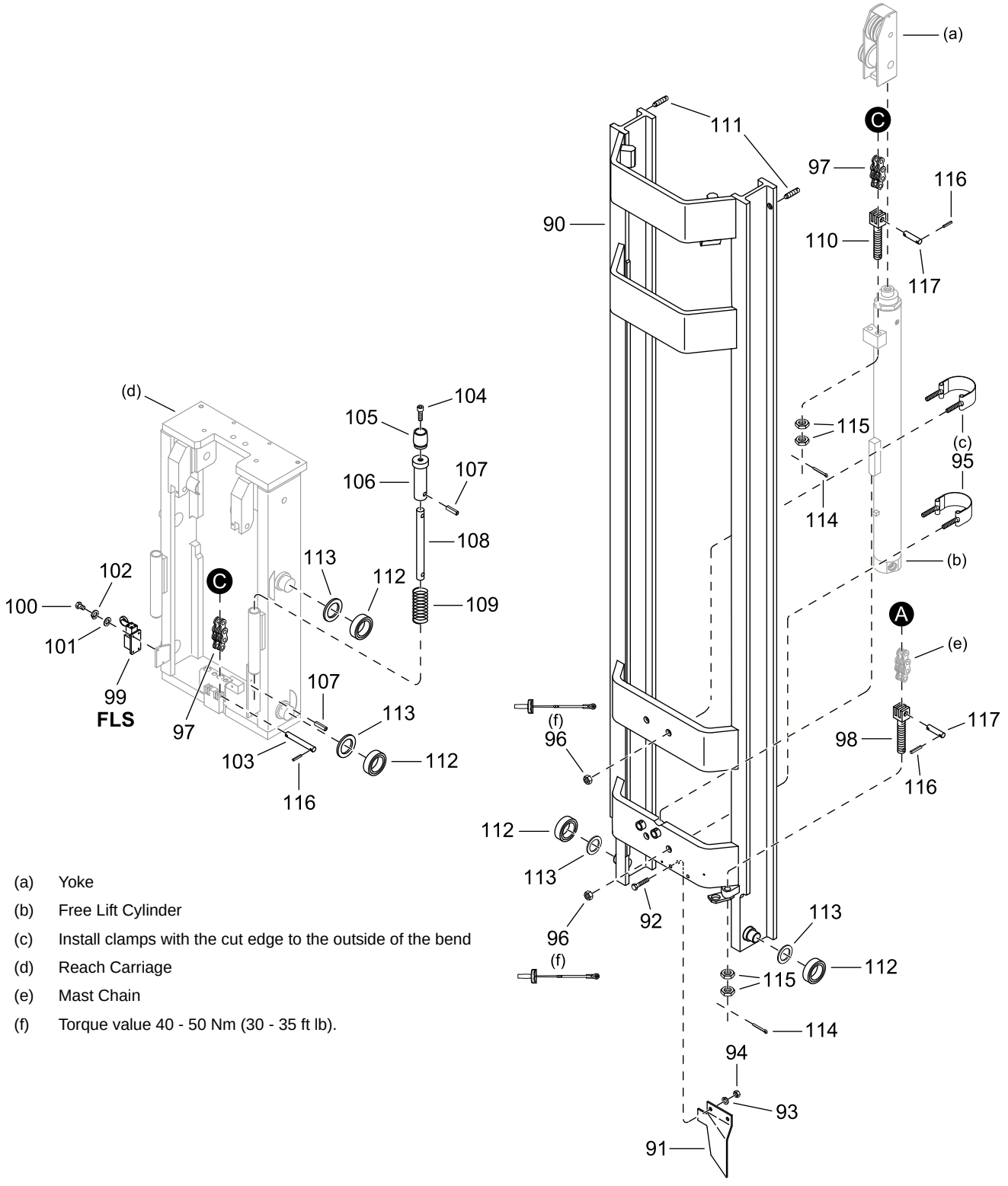


(a) Yoke
(b) Free Lift Cylinder
(c) Install clamps with the cut edge to the outside of the bend
(d) Reach Carriage
(e) Mast Chain
(f) Torque value 40 - 50 Nm (30 - 35 ft lb).

Figure 19269-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
90		3rd Stage Mast, refer to chart	1
91	121738	Guard	1
92	060017-032	Screw	2
93	060005-009	Lockwasher	2
94	060021-011	Nut	2
95	121795	Clamp	2
96	060042-018	Self Locking Nut	4
97		Carriage Chain, refer to chart	2
98	075385-004	Chain Anchor	2
99	123316-003	Switch (includes switch, leads, terminals and JC label)	1
	108306	Switch	1
100	060061-005	Screw	2
101	060030-012	Flatwasher	2
102	060005-005	Lockwasher	2
103	084985	Pin	2
104	060017-050	Screw	2
	061004-019	Thread Locking Adhesive	1
105	103270	Poly Stop	2
106	128016	Spring Ram	2
107	060000-080	Roll Pin	4
108	122919	Rod	2
109		Carriage Spring, refer to chart	2
110	075385-003	Chain Anchor	2
111	060095-001	Set Screw	2
112	123400	Roller Column	6
113	060030-130	Shim	AR
114	060038-003	Cotter Pin	4
115	060021-028	Nut	8
116	060000-055	Roll Pin	10
117	086499	Pin	2
	061003-004	Cable Tie 140 mm (5.6 in)	AR
	061003-005	Cable Tie 290 mm (11.4 in)	AR

Always Specify Model, Data & Serial Number



(a) Yoke

(b) Free Lift Cylinder

(c) Install clamps with the cut edge to the outside of the bend

(d) Reach Carriage

(e) Mast Chain

(f) Torque value 40 - 50 Nm (30 - 35 ft lb).

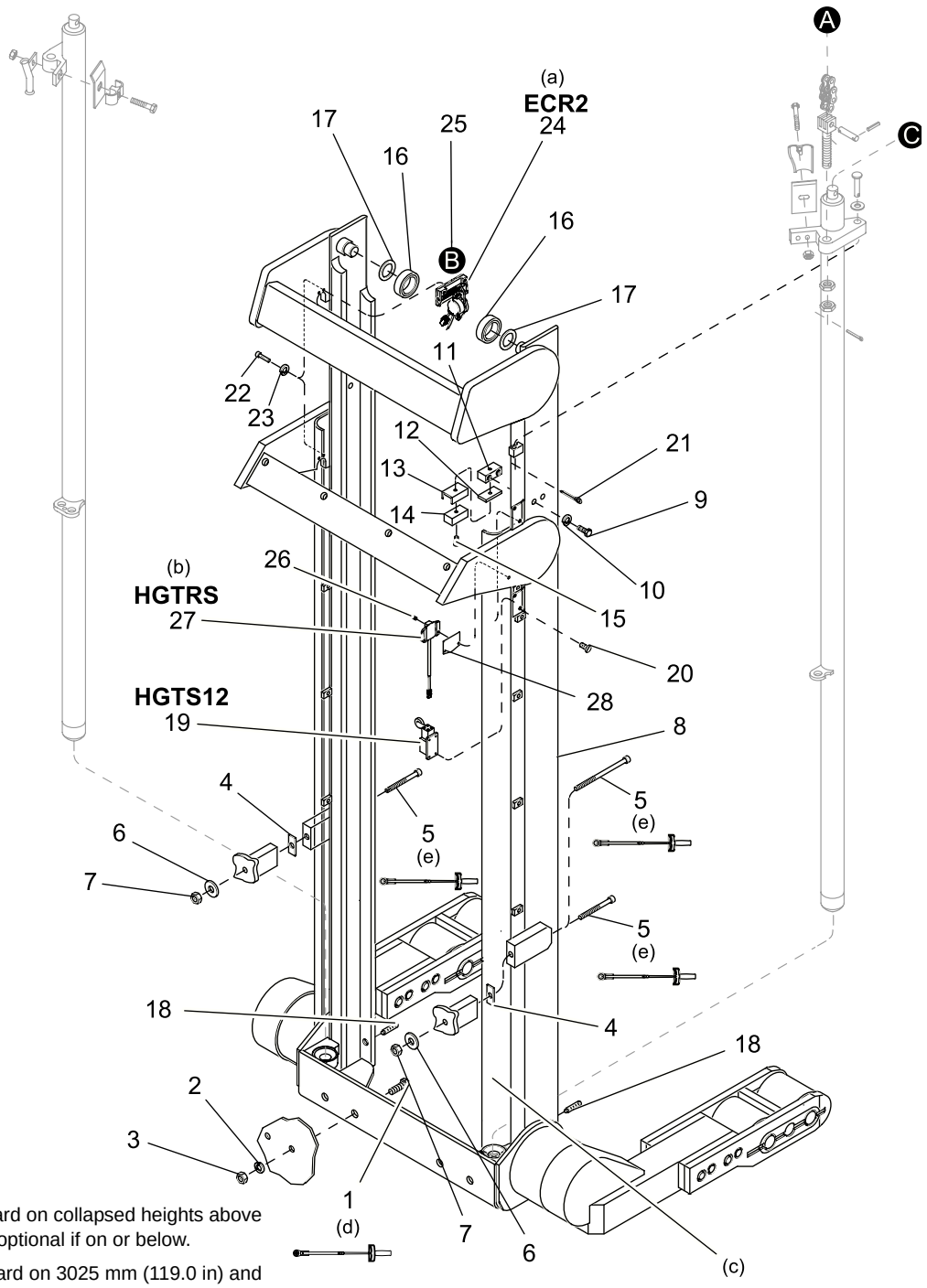
Figure 19269-01

INDEX 97 - Carriage Chain									
Lift Height*		Collapsed Height Length		Required (When Cutting From Bulk)			Part Number	Minimum Order Quantity Box Length	
mm	in	mm	in	mm	in	Links		m	ft
5030	198	2260	89				073991-122	3	10
5335	210	2415	95				073991-122	3	10
6100	240	2720	107				073991-123	4.5	15
6860	270	3025	119				073991-123	4.5	15
7620	300	3325	131				073991-123	4.5	15

Note: Replace both mast chains at the same time. When ordering chain, order the number of feet required for your particular truck. The appropriate minimum order quantity is listed in the above chart. Cut the chain to the length required for your truck. Refer to Lifting Mechanism Maintenance for cutting chain procedure.

INDEX 109 - Carriage Spring							
Lift Height*		Collapsed Height		One Each Required			
mm	in	mm	in	Spring		Spring	
5030	198	2260	89	128012	Red	119049	Gray
5335	210	2415	95	128012	Red	119049	Gray
6100	240	2720	107	119049	Gray	119049	Gray
6860	270	3025	119	119049	Gray	119049	Gray
7620	300	3325	131	119049	Gray	119049	Gray

***** To select appropriate part number, use the data number to determine truck features. Refer to Introduction.



(a) Height Encoder is standard on collapsed heights above 3025 mm (119.0 in) and optional if on or below.

(b) HGTS12 Switch is standard on 3025 mm (119.0 in) and below and is not required if Height Encoder is present.

(c) Cover is used on trucks with collapsed height of 3325 mm (131.0 in).

(d) Torque value 305 - 340 Nm (225 - 250 ft lb).

(e) Torque value 190 - 215 Nm (140 - 160 ft lb).

Figure 19267

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	060023-009	Screw	4
2	060005-046	Lockwasher	4
3	060021-049	Nut	4
4	121681-006	Shim	AR
	121681-012	Shim	AR
5	060020-048	Long Screw 5000 series	2
	060020-042	Long Screw 5000S series left side	1
	060020-048	Long Screw 5000S series right side	1
6	060030-260	Flatwasher	2
7	060042-019	Self Locking Nut	2
8		Main Frame, refer to chart	1
9	060020-015	Screw	4
10	060005-014	Lockwasher	4
11	080069	Block Stop	2
12	074481-001	Shim Stop	AR
13	107563-001	Bracket	2
14	092747-001	Poly Stop	2
15	060015-004	Screw	2
	061004-026	Thread Locking Adhesive	1
16	123400	Column Roller	2
17	060030-130	Shim	AR
18	060095-001	Set Screw	2
	061004-026	Thread Locking Adhesive	1
19	123316-001	Switch Assy. 2260 & 2415 mm (89.0 & 95.0 in) collapsed height	1
	123316-002	Switch Assy. 2720 & 3025 mm (107.0 & 119.0 in) collapsed height	1
20	060061-008	Screw	2
	061004-019	Thread Locking Adhesive	1
21	060038-017	Cotter Pin	2
22	060015-064	Screw	2
23	060005-007	Lockwasher	2
24		Height Sensor, refer to chart	1
25		Cable, refer to chart	1
26	060014-090	Screw	2
27		Switch Assembly, refer to Electrical Parts	1
28	126901	Shim	1

INDEX 8 - Mainframe (Non-removable Outrigger Ends) (RR5200/5200 (AC) 2040 kg (4500 lb) Capacity)															
	Load Wheel Size						1st Dash Number Collapsed Height/Lift Height								
Part Number	100 X 105 mm (4.0 x 4.12 in)	125 X 70 mm (5.0 X 2.88 in)	125 X 105 mm (5.0 X 4.12 in)	150 X 70 mm (6.0 X 2.88 in)	150 X 105 mm (6.0 X 4.12 in)	265 X 115 mm (10.5 X 4.5 in)	2260/5025 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)	3555/8155 mm (140/321 in)	3785/8660 mm (149/341 in)	4065/9300 mm (160/366 in)	4370/10160 mm (172/400 in)
128899-	X						304	305	306	307	308	309			
128899-		X					204	205	206	207	208	209	210	211	212
128899-			X				404	405	406	407	408	409	410	411	412
128899-						X	504	505	506	507	508	509			
129030-				X								109	110	111	112
129030-					X							209	210	211	212
Note: The second dash number is the same as the truck's inside straddle dimension 863 thru 1550 mm (34 thru 61 in).															

INDEX 8 - Mainframe (Non-removable Outrigger Ends) (Tapered with side shift only) (RR5200/5200 (AC) 2040 kg (4500 lb) Capacity)															
	Load Wheel Size					1st Dash Number Collapsed Height/Lift Height									
Part Number	100 X 105 mm (4.0 x 4.12 in)	125 X 70 mm (5.0 X 2.88 in)	125 X 105 mm (5.0 X 4.12 in)	150 X 70 mm (6.0 X 2.88 in)	150 X 105 mm (6.0 X 4.12 in)	2260/5025 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)	3555/8155 mm (140/321 in)	3785/8660 mm (149/341 in)	4065/9300 mm (160/366 in)	4370/10160 mm (172/400 in)
128899-	X					804	805	806	807	808	809			
128899-		X				704	705	706	707	708	709	710	711	712
128899-			X			904	905	906	907	908	909	910	911	912
129030-				X								310	311	312
129030-					X							410	411	412
Note: The second dash number is the same as the truck's inside straddle dimension 863 thru 1550 mm (34 thru 61 in).														

INDEX 8 - Mainframe (Removable Outrigger Ends) (RR5200/5200 (AC) 2040 kg (4500 lb) Capacity)														
	Load Wheel Size					1st Dash Number Collapsed Height/Lift Height								
Part Number	100 X 105 mm (4.0 x 4.12 in)	125 X 70 mm (5.0 X 2.88 in)	125 X 105 mm (5.0 X 4.12 in)	150 X 70 mm (6.0 X 2.88 in)	150 X 105 mm (6.0 X 4.12 in)	2260/5025 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)	3555/8155 mm (140/321 in)	3785/8660 mm (149/341 in)	4065/9300 mm (160/366 in)	4370/10160 mm (172/400 in)
128900-	X					304	305	306	307	308	309			
128900-		X				204	205	206	207	208	209	210	211	212
128900-			X			404	405	406	407	408	409	410	411	412
129030-				X								510	511	512
129030-					X							610	611	612
Note: The second dash number is the same as the truck's inside straddle dimension 863 thru 1550 mm (34 thru 61 in).														

INDEX 8 - Mainframe (Removable Outrigger Ends) (Tapered with side shift only) (RR5200/5200 (AC) 2040 kg (4500 lb) Capacity)														
	Load Wheel Size					1st Dash Number Collapsed Height/Lift Height								
Part Number	100 X 105 mm (4.0 x 4.12 in)	125 X 70 mm (5.0 X 2.88 in)	125 X 105 mm (5.0 X 4.12 in)	150 X 70 mm (6.0 X 2.88 in)	150 X 105 mm (6.0 X 4.12 in)	2260/5025 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)	3555/8155 mm (140/321 in)	3785/8660 mm (149/341 in)	4065/9300 mm (160/366 in)	4370/10160 mm (172/400 in)
128900-	X					804	805	806	807	808	809			
128900-		X				704	705	706	707	708	709	710	711	712
128900-			X			904	905	906	907	908	909	910	911	912
129030-				X								810	811	812
129030-					X							910	911	912
Note: The second dash number is the same as the truck's inside straddle dimension 863 thru 1550 mm (34 thru 61 in).														

INDEX 8 - Mainframe (Non-removable Outrigger Ends) (RR5200/5200S (AC) 2040 kg (4500 lb) Capacity)																
	Load Wheel Size						1st Dash Number Collapsed Height/Lift Height									
Part Number	100 X 105 mm (4.0 x 4.12 in)	125 X 70 mm (5.0 X 2.88 in)	125 X 105 mm (5.0 X 4.12 in)	150 X 70 mm (6.0 X 2.88 in)	150 X 105 mm (6.0 X 4.12 in)	265 X 115 mm (10.5 X 4.5 in)	2260/5025 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)	3555/8155 mm (140/321 in)	3785/8660 mm (149/341 in)	4065/9300 mm (160/366 in)	4370/10160 mm (172/400 in)	4520/10695 mm (178/421 in)
128899-	X						304	305	306	307	308	309				
128899-		X					204	205	206	207	208	209	220	221	222	223
128899-			X				404	405	406	407	408	409	420	421	422	423
128899-						X	504	505	506	507	508	509				
129030-				X								109	120	121	122	123
129030-					X							209	220	221	222	223
Note: The second dash number is the same as the truck's inside straddle dimension 863 thru 1550 mm (34 thru 61 in).																

INDEX 8 - Mainframe (Non-removable Outrigger Ends) (Tapered with side shift only) (RR5200/5200S (AC) 2040 kg (4500 lb) Capacity)																
	Load Wheel Size					1st Dash Number Collapsed Height/Lift Height										
Part Number	100 X 105 mm (4.0 x 4.12 in)	125 X 70 mm (5.0 X 2.88 in)	125 X 105 mm (5.0 X 4.12 in)	150 X 70 mm (6.0 X 2.88 in)	150 X 105 mm (6.0 X 4.12 in)	2260/5025 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)	3555/8155 mm (140/321 in)	3785/8660 mm (149/341 in)	4065/9300 mm (160/366 in)	4370/10160 mm (172/400 in)	4520/10695 mm (178/421 in)
128899-	X					804	805	806	807	808	809				
128899-		X				704	705	706	707	708	709	720	721	722	723
128899-			X			904	905	906	907	908	909	920	921	922	923
129030-				X								320	321	322	323
129030-					X							420	421	422	423
Note: The second dash number is the same as the truck's inside straddle dimension 863 thru 1550 mm (34 thru 61 in).															

INDEX 8 - Mainframe (Removable Outrigger Ends) (RR5200/5200S (AC) 2040 kg (4500 lb) Capacity)															
	Load Wheel Size					1st Dash Number Collapsed Height/Lift Height									
Part Number	100 X 105 mm (4.0 x 4.12 in)	125 X 70 mm (5.0 X 2.88 in)	125 X 105 mm (5.0 X 4.12 in)	150 X 70 mm (6.0 X 2.88 in)	150 X 105 mm (6.0 X 4.12 in)	2260/5025 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)	3555/8155 mm (140/321 in)	3785/8660 mm (149/341 in)	4065/9300 mm (160/366 in)	4370/10160 mm (172/400 in)	4520/10695 mm (178/421 in)
128900-	X					304	305	306	307	308	309				
128900-		X				204	205	206	207	208	209	220	221	222	223
128900-			X			404	405	406	407	408	409	420	421	422	423
129030-				X								520	521	522	523
129030-					X							620	621	622	623
Note: The second dash number is the same as the truck's inside straddle dimension 863 thru 1550 mm (34 thru 61 in).															

INDEX 8 - Mainframe (Removable Outrigger Ends) (Tapered with side shift only) (RR5200/5200S (AC) 2040 kg (4500 lb) Capacity)															
	Load Wheel Size					1st Dash Number Collapsed Height/Lift Height									
Part Number	100 X 105 mm (4.0 x 4.12 in)	125 X 70 mm (5.0 X 2.88 in)	125 X 105 mm (5.0 X 4.12 in)	150 X 70 mm (6.0 X 2.88 in)	150 X 105 mm (6.0 X 4.12 in)	2260/5025 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)	3555/8155 mm (140/321 in)	3785/8660 mm (149/341 in)	4065/9300 mm (160/366 in)	4370/10160 mm (172/400 in)	4520/10695 mm (178/421 in)
128900-	X					804	805	806	807	808	809				
128900-		X				704	705	706	707	708	709	720	721	722	723
128900-			X			904	905	906	907	908	909	920	921	922	923
129030-				X								820	821	822	823
129030-					X							920	921	922	923
Note: The second dash number is the same as the truck's inside straddle dimension 863 thru 1550 mm (34 thru 61 in).															

INDEX 8 - Mainframe (Removable Outrigger Ends) (Tapered) (RR5200/5200 (AC) 1360 kg (3000 lb) Capacity)																
		Load Wheel Size					1st Dash Number Collapsed Height/Lift Height									
Part Number	100 X 70 mm (4.0 X 4.12 in)	100 X 105 mm (4.0 x 4.12 in)	125 X 70 mm (5.0 X 2.88 in)	125 X 105 mm (5.0 X 4.12 in)	150 X 70 mm (6.0 X 2.88 in)	150 X 105 mm (6.0 X 4.12 in)	2260/5025 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)	3555/8155 mm (140/321 in)	3785/8660 mm (149/341 in)	4065/9300 mm (160/366 in)	4370/10160 mm (172/400 in)
128893-	X						104	105	106	107	108	109			
128893-		X					304	305	306	307	308	309			
128893-			X				204	205	206	207	208	209	210	211	212
128893-				X			404	405	406	407	408	409	410	411	412
129031-					X								310	311	312
129031-						X							410	411	412
Note: The second dash number is the same as the truck's inside straddle dimension 863 thru 1550 mm (34 thru 61 in).															

INDEX 8 - Mainframe (Removable Outrigger Ends) (Tapered) (RR5200/5200 (AC) 1360 kg (3000 lb) Capacity)																
		Load Wheel Size					1st Dash Number Collapsed Height/Lift Height									
Part Number	100 X 70 mm (4.0 X 4.12 in)	100 X 105 mm (4.0 x 4.12 in)	125 X 70 mm (5.0 X 2.88 in)	125 X 105 mm (5.0 X 4.12 in)	150 X 70 mm (6.0 X 2.88 in)	150 X 105 mm (6.0 X 4.12 in)	2260/5025 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)	3555/8155 mm (140/321 in)	3785/8660 mm (149/341 in)	4065/9300 mm (160/366 in)	4370/10160 mm (172/400 in)
128893-	X														
128893-		X					804	805	806	807	808	809			
128893-			X				704	705	706	707	708	709	710	711	712
128893-				X			904	905	906	907	908	909	910	911	912
129031-					X								810	811	812
129031-						X							910	911	912
Note: The second dash number is the same as the truck's inside straddle dimension 863 thru 1550 mm (34 thru 61 in).															

INDEX 8 - Mainframe (Non-removable Outrigger Ends) (Tapered) (RR5200/5200S (AC) 1360 kg (3000 lb) Capacity)																
	Load Wheel Size						1st Dash Number Collapsed Height/Lift Height									
Part Number	100 X 105 mm (4.0 x 4.12 in)	125 X 70 mm (5.0 X 2.88 in)	125 X 105 mm (5.0 X 4.12 in)	150 X 70 mm (6.0 X 2.88 in)	150 X 105 mm (6.0 X 4.12 in)	265 X 115 mm (10.5 X 4.5 in)	2260/5025 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)	3555/8155 mm (140/321 in)	3785/8660 mm (149/341 in)	4065/9300 mm (160/366 in)	4370/10160 mm (172/400 in)	4370/10160 mm (172/400 in)
128893-	X						104	105	106	107	108	109				
128893-		X					304	305	306	307	308	309				
128893-			X				204	205	206	207	208	209	220	221	222	223
128893-				X			404	405	406	407	408	409	420	421	422	423
129031-					X								320	321	322	323
129031-						X							420	421	422	423
Note: The 2nd dash number is the same as the truck's inside straddle dimension 863 -1550 mm (34 - 61 in).																

INDEX 8 - Mainframe (Removable Outrigger Ends) (Tapered) (RR5200/5200S (AC) 1360 kg (3000 lb) Capacity)																
		Load Wheel Size					1st Dash Number Collapsed Height/Lift Height									
Part Number		100 X 105 mm (4.0 x 4.12 in)	125 X 70 mm (5.0 X 2.88 in)	125 X 105 mm (5.0 X 4.12 in)	150 X 70 mm (6.0 X 2.88 in)	150 X 105 mm (6.0 X 4.12 in)	2260/5025 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)	3555/8155 mm (140/321 in)	3785/8660 mm (149/341 in)	4065/9300 mm (160/366 in)	4370/10160 mm (172/400 in)	4370/10160 mm (172/400 in)
128893-	X						604	605	606	607	608	609				
128893-		X					804	805	806	807	808	809				
128893-			X				704	705	706	707	708	709	720	721	722	723
128893-				X			904	905	906	907	908	909	920	921	922	923
129031-					X								820	821	822	823
129031-						X							920	921	922	923
Note: The 2nd dash number is the same as the truck's inside straddle dimension 863 - 1550 mm (34 - 61 in).																

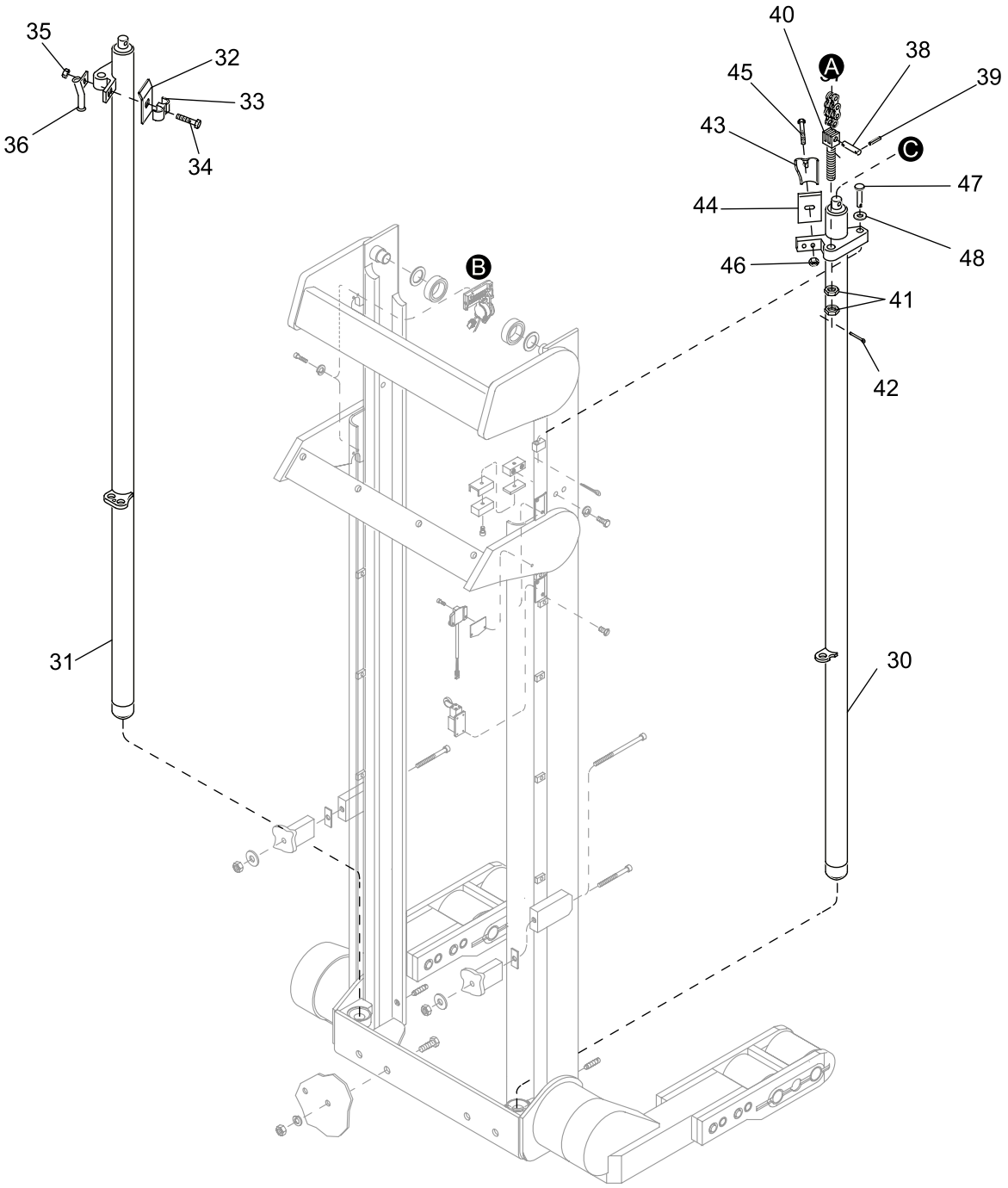


Figure 19462

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
30		Right Hand Cylinder, refer to Cylinder Parts	1
31		Left Hand Cylinder, refer to Cylinder Parts	1
32	121679	Guide	1
33	123281	Clamp	1
34	060015-015	Screw	1
35	060042-006	Self Locking Nut	1
36	124010	Load Sensor Guide	1
37		Mast Chain, refer to chart	2
38	086499	Pin	8
39	060000-055	Roll Pin	16
40	075385	Anchor Chain	2
41	060021-028	Nut	12
42	060038-003	Cotter Pin	6
43	121677	Guide	1
44	121679	Guide	1
45	060015-015	Screw	1
46	060042-006	Self Locking Nut	1
47	076470-025	Clevis Pin	2
48	060030-191	Flatwasher	2

INDEX 37 - Mast Chain

Lift Height		Collapsed Height Length		Required (When Cutting From Bulk)			Part Number	Minimum Order Quantity		
								Quantity	Box Length	
mm	in	mm	in	mm	in	Links			m	ft
5030	198	2260	89	2115	83.25	111	073991-123	1	4.5	15
5335	210	2415	95	2265	89.25	119	073991-123	1	4.5	15
6100	240	2720	107	2572	101.25	151	073991-124	1	6	20
6860	270	3025	119	2875	113.25	151	073991-124	1	6	20
7620	300	3325	131	3180	125.25	167	073991-125	1	7.5	25
8155	321	3555	140	3410	134.25	179	073991-125	1	75	25
8660	341	3785	149	3640	143.25	191	073991-125	1	7.5	25
9300	366	4065	160	3945	155.25	205	073991-123	2	4.5	15
10160	400	4370	172	4210	167.25	221	073991-123	2	4.5	15
10695	421	4520	178	4365	171.75	229	073991-123	2	4.5	15

Note: Replace both mast chains at the same time. When ordering chain, order the number of feet required for your particular truck. The appropriate minimum order quantity is listed in the above chart. Cut the chain to the length required for your truck. Refer to Lifting Mechanism Maintenance for cutting chain procedure.

Always Specify Model, Data & Serial Number

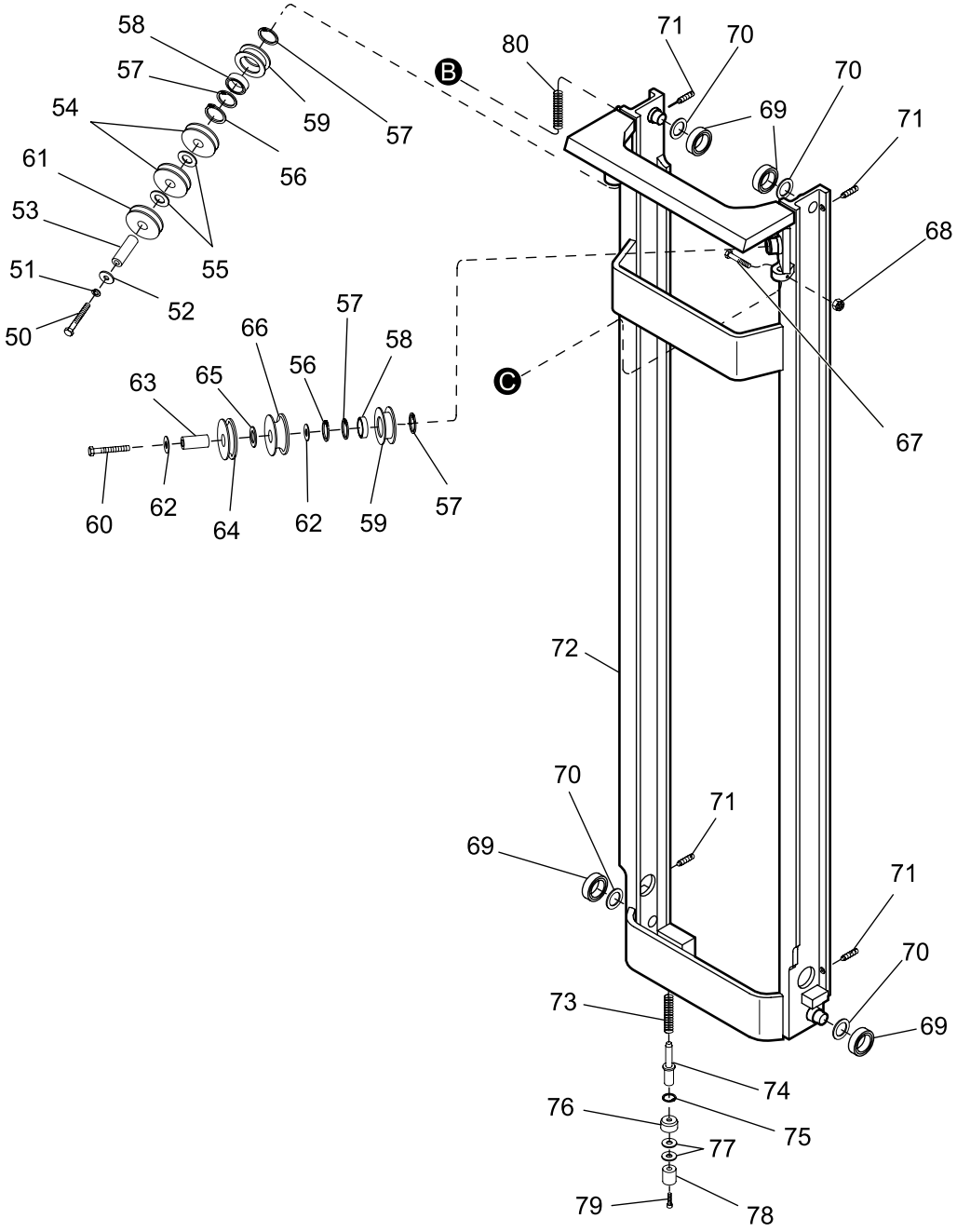


Figure 19268

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
50	060017-059	Screw	1
	060017-094	Screw with Load Sensor and F/C	1
	061004-019	Thread Locking Adhesive	1
51	060005-009	Lockwasher	1
52	060030-078	Flatwasher	1
53	121624-001	Shaft	1
	121624-003	Shaft with Load Sensor and F/C	1
54	119655-001	Pulley	2
55	060030-192	Flatwasher	1
56	060009-043	Retaining Ring	2
57	060009-062	Retaining Ring	4
58	065081-045	Ball Bearing	2
59	117556-001	Chain Pulley (includes Index 57 and 58)	2
	117557-001	Chain Pulley	2
60	060019-071	Screw	1
61	127513-001	Pulley with Load Sensor and F/C	1
62	060030-332	Flatwasher	2
63	127874-001	Shaft	1
64	127513-001	Cable Pulley	1
65	060030-192	Faltwasher	1
66	121623	Hose Pulley	1
67	060015-043	Screw	2
68	060042-006	Self Locking Nut	2
69	123400	Column Roller	4
70	060030-130	Shim	AR
71	060095-001	Set Screw	4
72		2nd Stage Mast, refer to chart	1
73		Spring, refer to chart	2
	063002-007	Lubricant	1
74	128014	Spring Ram 2260 - 3025 mm (89.0 - 119.0 in) Collapsed Height	2
	128013	Spring Ram 3325 - 4370 mm (131.0 - 172.0 in) Collapsed Height	2
75	060009-101	Retaining Ring 2260 - 3025 mm (89.0 - 119.0 in) Collapsed Height	2
	060009-045	Retaining Ring 3325 - 4370 mm (131.0 - 172.0 in) Collapsed Height	2
76	121622	Lower Stop	2
77	060030-277	Flatwasher	AR
78	124089	Bumper	2
79	060017-056	Screw	2
	061004-026	Thread Locking Adhesive	1
80	123231-001	Spring	1

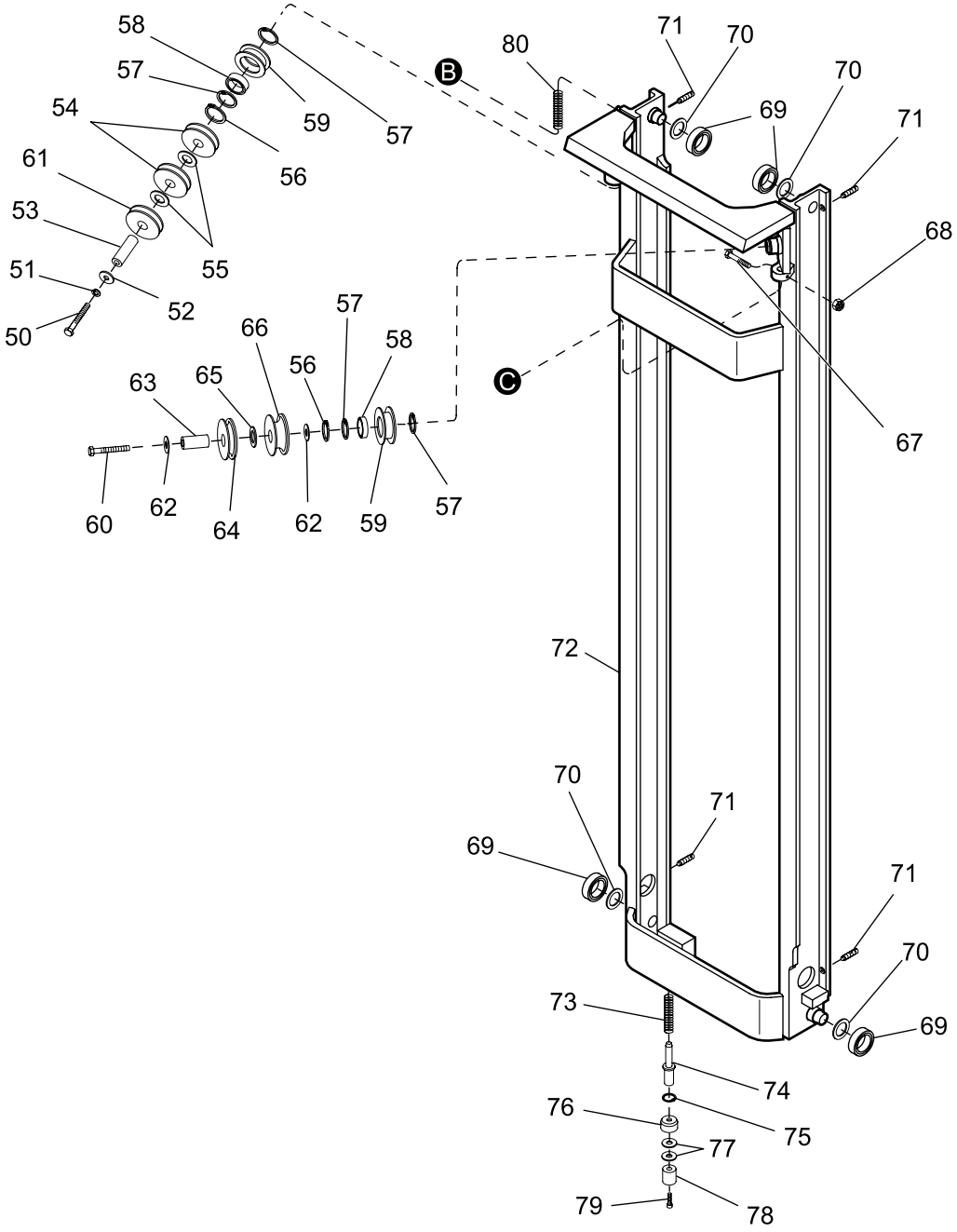


Figure 19268

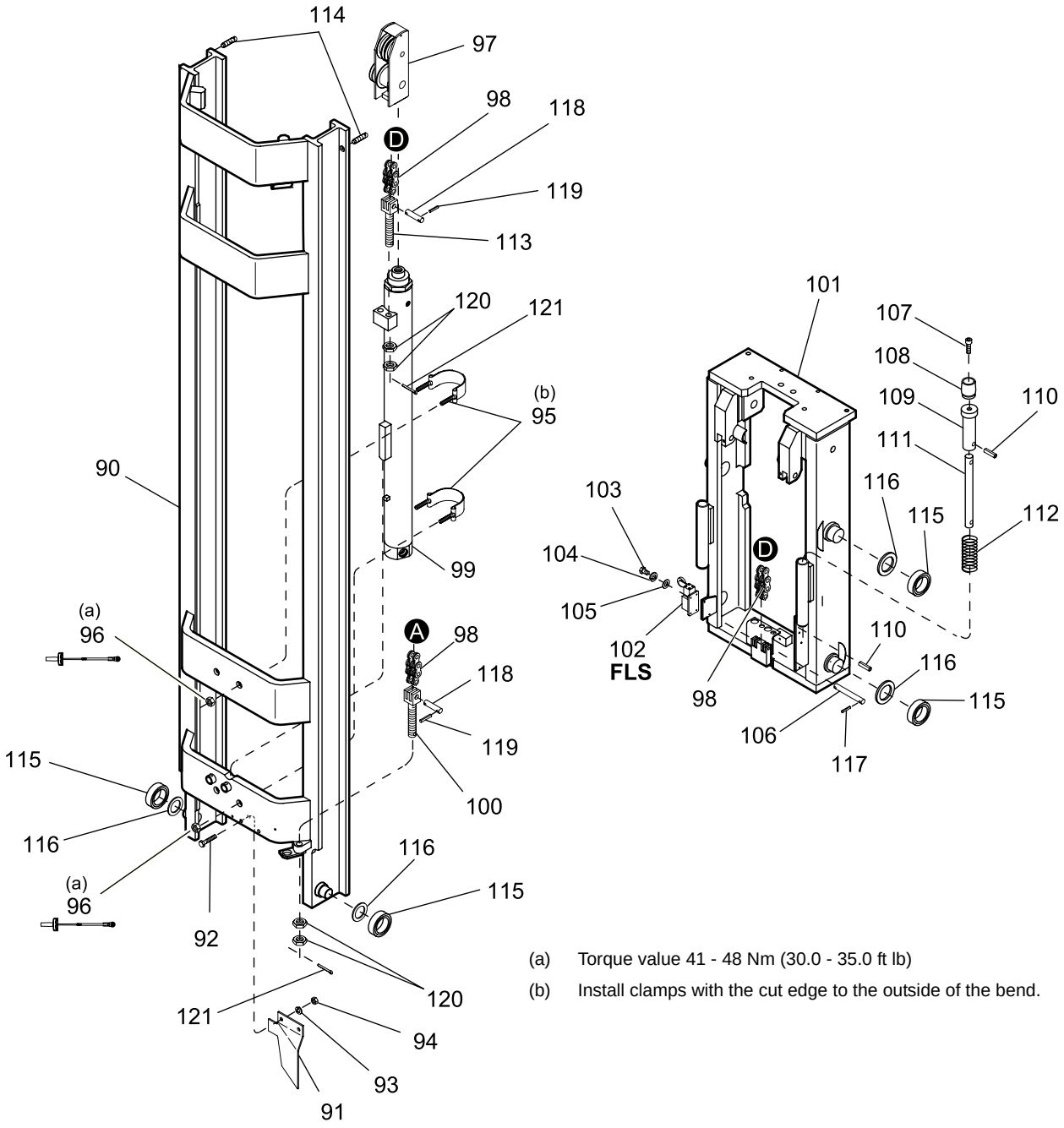
INDEX 73 - Mast Spring							
Lift Height*		**Collapsed Height**		**One Each Required**			
mm	**in**	**mm**	**in**	**Spring**		**Spring**	
5030	198	2260	89	122399	Bronze	119031	Gray
5335	210	2415	95	119031	Gray	119031	Gray
6100	240	2720	107	119031	Gray	119031	Gray
6860	270	3025	119	119031	Gray	119031	Gray
7620	300	3325	131	128010	Bronze	122422	Green
8155	321	3555	140	128010	Bronze	122422	Green
8660	341	3785	149	122422	Green	122422	Green
9300	366	4065	160	122422	Green	122422	Green
10160	400	4370	172	122422	Green	122422	Green
10695	421	4520	178	122422	Green	122422	Green

INDEX 72 and 90 - 2nd and 3rd Stage Mast (RR5200/5200 (AC) 2040 kg (4500 lb) Capacity)										
		1st Dash Number Collapsed Height/Lift Height								
Index Number	Part Number	2260/5025 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)	3555/8155 mm (140/321 in)	3785/8660 mm (149/341 in)	4065/9300 mm (160/366 in)	4370/10160 mm (172/400 in)
72	123233-	004	005	006	007	008	009	010	011	012
90	127877-	004	005	006	007	008	009	010	011	012
Note: The second dash number is the same as the truck's inside straddle dimension 863 thru 1550 mm (34 thru 61 in).										

INDEX 72 and 90 - 2nd and 3rd Stage Mast (RR5200/5200S (AC) 2040 kg (4500 lb) Capacity)											
		1st Dash Number Collapsed Height/Lift Height									
Index Number	Part Number	2260/5025 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)	3555/8155 mm (140/321 in)	3785/8660 mm (149/341 in)	4065/9300 mm (160/366 in)	4370/10160 mm (172/400 in)	520/10695 mm (178/421 in)
72	123233-	004	005	006	007	008	009	010	011	012	013
90	127877-	004	005	006	007	008	009	010	011	012	013
Note: The second dash number is the same as the truck's inside straddle dimension 863 thru 1550 mm (34 thru 61 in).											

INDEX 72 and 90 - 2nd and 3rd Stage Mast (RR5200/5200S (AC) 2040 kg (4500 lb) Capacity)										
		1st Dash Number Collapsed Height/Lift Height								
Index Number	Part Number	2260/5025 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)	3555/8155 mm (140/321 in)	3785/8660 mm (149/341 in)	4065/9300 mm (160/366 in)	4370/10160 mm (172/400 in)
72	123233-	004	005	006	007	008	009	010	011	012
90	127762-	004	005	006	007	008	009	010	011	012
Note: The second dash number is the same as the truck's inside straddle dimension 863 thru 1550 mm (34 thru 61 in).										

INDEX 72 and 90 - 2nd and 3rd Stage Mast (RR5200/5200S (AC) 2040 kg (4500 lb) Capacity)										
		1st Dash Number Collapsed Height/Lift Height								
Index Number	Part Number	2260/5025 mm (89/198 in)	2415/5535 mm (95/198 in)	2720/6100 mm (107/240 in)	3025/6860 mm (119/270 in)	3325/7620 mm (131/300 in)	3555/8155 mm (140/321 in)	3785/8660 mm (149/341 in)	4065/9300 mm (160/366 in)	4370/10160 mm (172/400 in)
72	123233-	004	005	006	007	008	009	010	011	012
90	127877-	004	005	006	007	008	009	010	011	012
Note: The second dash number is the same as the truck's inside straddle dimension 863 thru 1550 mm (34 thru 61 in).										



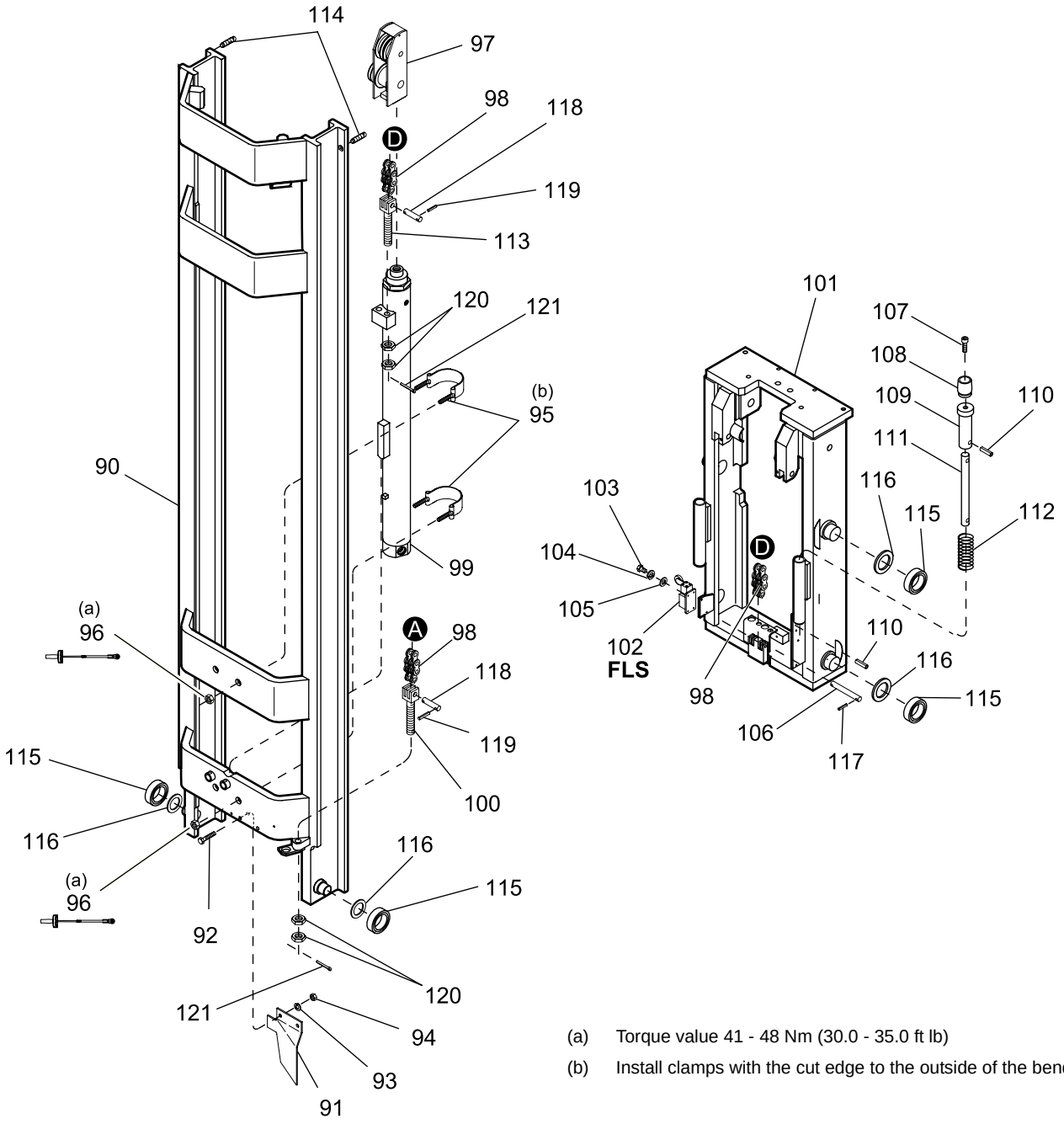
(a) Torque value 41 - 48 Nm (30.0 - 35.0 ft lb)

(b) Install clamps with the cut edge to the outside of the bend.

Figure 19269

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
90		3rd Stage Mast, refer to chart	1
91	121738	Guard	1
92	060017-032	Screw	2
93	060005-009	Lockwasher	2
94	060021-011	Nut	2
95	121795	Clamp	2
96	060042-018	Self Locking Nut	4
97		Yoke, refer to Lifting Mechanism Parts	1
98		Carriage Chain, refer to chart	2
99		Free Lift Cylinder, refer to Cylinder Parts	1
100	075385-004	Chain Anchor	2
101		Reach Carriage, refer to Platform Parts	1
102	123316-003	Switch (Includes switch, leads, terminals and JC label)	1
	108306	Switch	1
103	060061-005	Screw	2
104	060030-012	Flatwasher	2
105	060005-005	Lockwasher	2
106	084985	Pin	2
107	060017-050	Screw	2
	061004-019	Thread Locking Adhesive	1
108	103270	Poly Stop	2
109	128016	Spring Ram	2
110	060000-080	Roll Pin	4
111	122919	Rod	2
112		Spring, refer to chart	2
113	075385-003	Chain Anchor	2
114	060095-001	Set Screw	2
115	123400	Roller Column	6
116	060030-130	Shim	AR
117	060005-055	Roll Pin	8
118	086499	Pin	8
119	060000-055	Roll Pin	8
120	060021-028	Nut	2
121	060038-003	Cotter Pin	6
	061003-004	Cable Tie 140 mm (5.6 in)	AR
	061003-005	Cable Tie 290 mm (11.4 in)	AR

Always Specify Model, Data & Serial Number



(a) Torque value 41 - 48 Nm (30.0 - 35.0 ft lb)

(b) Install clamps with the cut edge to the outside of the bend.

Figure 19269

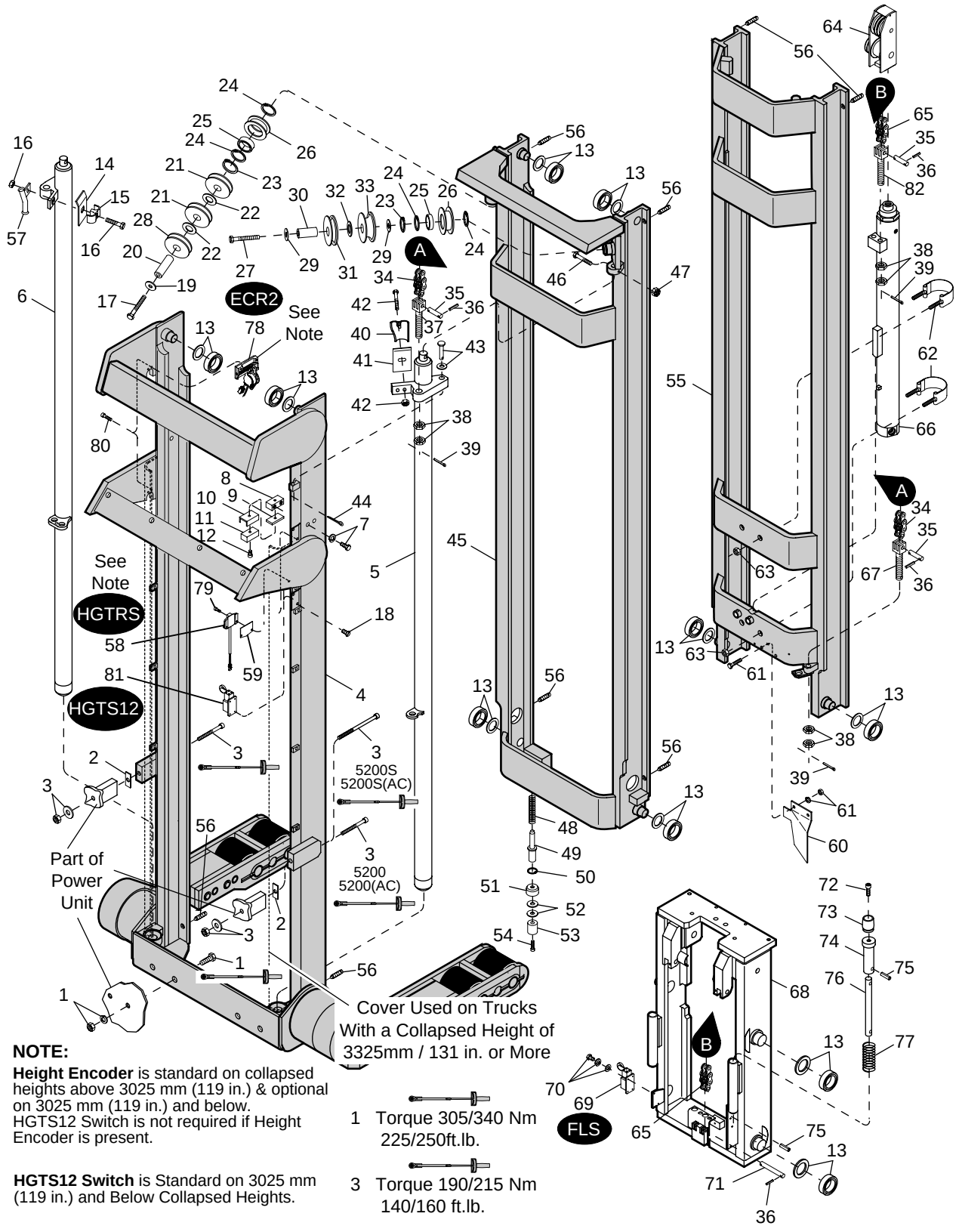
INDEX 98 - Carriage Chain									
Lift Height		Collapsed Height Length		Required (When Cutting From Bulk)			Part Number	Minimum Order Quantity	
								Box Length	
mm	in	mm	in	mm	in	Links		m	ft
5030	198	2260	89	1390	54.75	73	073991-122	3	10
5335	210	2415	95	1465	57.75	77	073991-122	3	10
6100	240	2720	107	1620	63.75	85	073991-123	4.5	15
6860	270	3025	119	1770	69.75	93	073991-123	4.5	15
7620	300	3325	131	1925	75.75	101	073991-123	4.5	15
8155	321	3555	140	2040	80.25	107	073991-123	4.5	15
8660	341	3785	149	2155	84.75	113	073991-123	4.5	15
9300	366	4065	160	2305	90.75	121	073991-124	6	20
10160	400	4370	172	2460	96.75	129	073991-124	6	20
10695	421	4520	178	1535	99.75	133	073991-124	6	20

Note: Replace both mast chains at the same time. When ordering chain, order the number of feet required for your particular truck. The appropriate minimum order quantity is listed in the above chart. Cut the chain to the length required for your truck. Refer to Lifting Mechanism Maintenance for cutting chain procedure.

INDEX 112 - Carriage Spring							
Lift Height*		Collapsed Height		One Each Required			
mm	in	mm	in	Spring		Spring	
5030	198	2260	89	122398	Red	119031	Red
5335	210	2415	95	122398	Red	119031	Red
6100	240	2720	107	122398	Red	122421	Bronze
6860	270	3025	119	122398	Red	122421	Bronze
7620	300	3325	131	122398	Red	122421	Bronze
8155	321	3555	140	122421	Bronze	122421	Bronze
8660	341	3785	149	122421	Bronze	122421	Bronze
9300	366	4065	160	122421	Bronze	122421	Bronze
10160	400	4370	172	122421	Bronze	122421	Bronze
10695	421	4520	178	122421	Bronze	122421	Bronze

10638-02

RR 5200/5200S/5200(AC)/5200S(AC) 2040kg (4500 lb.) CAPACITY
RD 5200/5200S/5200(AC)/5200S(AC) 1360 kg (3000 lb.) CAPACITY
185 mm (7.25 in.) CHANNEL



NOTE:

Height Encoder is standard on collapsed heights above 3025 mm (119 in.) & optional on 3025 mm (119 in.) and below. HGTS12 Switch is not required if Height Encoder is present.

HGTS12 Switch is Standard on 3025 mm (119 in.) and Below Collapsed Heights.

1 Torque 305/340 Nm 225/250ft.lb.

3 Torque 190/215 Nm 140/160 ft.lb.

Index		Part No.	Part Name	No. Req.
1		060023-009	Screw	4
		060005-046	Lockwasher	4
		060021-049	Nut	4
2		121681-006	Shim 1.5 mm (.06 in.) Thick	AR
		121681-012	Shim 3 mm (.12 in.) Thick	AR
3	*	060020-048	Screw 190 mm (7.50 in.) Long 5200/5200(AC)	2
	*	060020-047	Screw 255 mm (10.0 in.) Long 5200S/5200S(AC) RH Side	1
	*	060020-048	Screw 190 mm (7.50 in.) Long 5200S/5200S(AC) LH Side	1
		060030-260	Flatwasher	2
		060042-001	Nut Self Locking	2
4	*	See Note 1	Main Frame	1
5			Cylinder Lift RH See Section 08.0	1
6			Cylinder Lift LH See Section 08.0	1
7		060020-015	Screw	4
		060005-014	Lockwasher	4
8		080069	Block Stop	2
9		074481-001	Shim Stop	AR
10		107563-001	Bracket	2
11		092747-001	Stop Poly	2
12		060015-004	Screw	2
		061004-026	Adhesive Thread Lock	1
13		123400	Roller Column	12
		060030-130	Shim .79 mm (.031 in.) Thick	AR
14		121679	Guide	1
15		123281	Clamp	1
16		060015-015	Screw	1
		060042-006	Nut Self Locking	1
17	*	060019-071	Screw	1
	*	060019-061	Screw Load Sense & F/C, or TPA	1
		061004-019	Adhesive Thread Lock	1
18		060061-008	Screw	2
		061004-019	Adhesive Thread Lock	1
19		060030-332	Flatwasher	2
20	*	127874-003	Shaft	1
	*	127874-004	Shaft Load Sense & F/C, or TPA	1
21		119655-001	Pulley	2
22		060030-192	Flatwasher	2
23		060009-043	Ring Retaining	2
24		060009-062	Ring Retaining	4
25		065081-045	Bearing Ball	2
26		117556-001	Pulley Chain Includes Index 24 & 25	2
		117557-001	Pulley Chain	2
27		060019-071	Screw	1
28	*	128883	Pulley Load Sensor & F/C	1
29		060030-332	Flatwasher	2
30		127874-001	Shaft	1
31		127513-001	Pulley Cable	1
32		060030-192	Flatwasher	1
33		127791	Pulley Hose	1
34	*	See Note 1	Chain Mast	2
35		086499	Pin	6
36		060000-055	Pin Roll	14
37		075385-001	Anchor Chain	2
38		060021-028	Nut	12
39		060038-003	Pin Cotter	6
40		121667	Guide	1
41		121679	Guide	1
42		060015-015	Screw	1
		060042-006	Nut Self Locking	1
43		076470-025	Pin Clevis	2
		060030-191	Flatwasher	2
44		060038-017	Pin Cotter	2
45	*	See Note 1	Mast 2nd Stage	1
46		060015-043	Screw	2
47		060042-006	Nut Self Locking	2
48	*	See Note 1	Spring	2
		063002-025	Lubricant	AR
49	*	128014	Ram Spring 2260 to 3025 mm (89 to 119 in.) Collapsed Height/ 5025 to 6860 mm (198 to 270 in.) Lift Height	2
	*	128013	Ram Spring 3325 to 4520 mm (131 to 178 in.) Collapsed Height/ 7620 to 10695 mm (300 to 421 in.) Lift Height	2
50	*	060009-101	Ring Retaining 2260 to 3025 mm (89 to 119 in.) Collapsed Height/ 5025 to 6860 mm (198 to 270 in.) Lift Height	2
	*	060009-045	Ring Retaining 3325 to 4520 mm (131 to 178 in.) Collapsed Height/7620 to 10695 mm (300 to 421 in.) Lift Height	2
51		121622	Stop Lower	2
52		060030-277	Flatwasher .78 mm (.031 in.) Thick	AR
53		124019	Bumper	2
54		060017-056	Screw	2
		061004-026	Adhesive Thread Lock	1
55	*	See Note 1	Mast 3rd Stage	1
56		060019-076	Brass Set Screw	8
		061004-026	Adhesive Thread Locking	1

Index		Part No.	Part Name	No. Req.
57	*	124010	Guide Load Sensor & F/C	1
58	*	128305-001	Sensor Proximity Enhanced Display with CDM, 36V and 2260 to 2720 mm (89 to 107 in.) Collapsed Height/5025 to 6100 mm (198 to 240 in.) Lift Height	1
	*	128305-002	Sensor Proximity Enhanced Display with CDM, 36V and 3025 to 3555 mm (119 to 140 in.) Collapsed Height/6860 to 8155 mm (270 to 321 in.) Lift Height	1
	*	128305-003	Sensor Proximity Enhanced Display with CDM and 3785 to 4520 mm (149 to 178 in.) Collapsed Height/8660 to 10695 mm (341 to 421 in.) Lift Height	1
59		128901	Shim 1.6 mm (0.06 in.) Thick	AR
60		129088	Guard	1
61		060017-032	Screw	2
		060005-009	Lockwasher	2
		060021-011	Nut	2
62		132466	Clamp	2
63		060042-018	Nut Self Locking	4
64			Yoke See Section 07.5	1
65	*	See Note 1	Chain Carriage	2
66			Cylinder Free Lift See Section 08.0	1
67		075385-004	Anchor Chain	2
68			Carriage Reach See Section 09.0	1
69	†	123316-003	Switch Includes Switch, Leads, Terminals & JC Label	1
	†	108306	Switch	1
70		060061-005	Screw	2
		060030-012	Flatwasher	2
		060005-005	Lockwasher	2
		061003-004	Tie Cable	3
71		084985	Pin	1
72		060017-050	Screw	2
		061004-019	Adhesive Thread Lock	1
73		103270	Stop Poly	2
74		128016	Ram Spring	2
75		060000-080	Pin Roll	4
76		122919	Rod	2
77	*	See Note 1	Spring	2
78			Height Encoder See Section 04.8	1
79		060014-090	Screw	2
80		060015-123	Screw	2
81	†	123316-001	Switch 2260 & 2415 mm (89 & 95 in.) Collapsed Height Includes Switch, Leads, Terminals & JC Label	1
	†	123316-002	Switch 2720 & 3025 mm (107 & 119 in.) Collapsed Height Includes Switch, Leads, Terminals & JC Label	1
	†	108306	Switch	1
82		075385-003	Anchor Chain	2

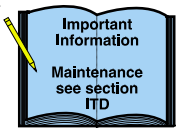
Always Specify Model, Data & Serial Numbers

061003-004	Tie Cable 140 mm (5.6 in.) Length	AR
061003-005	Tie Cable 290 mm (11.4 in.) Length	AR

Note 1: See The Following Supplemental Form

† Internal switch replacement is not economical. Switch arm is not available.

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



RR5200/5200(AC) 2040kg (4500 lb.) CAPACITY

Index	Part No.	Load Wheel Size: 100 x 105mm/4.0 x 4.12 in.	125 x 70mm/5.0 x 2.88 in.	125 x 105mm/5.0 x 4.12 in.	150 x 70mm/6.0 x 2.88 in.	150 x 105mm/6.0 x 4.12 in.	265 x 115mm/10.5 x 4.5 in.	1st Dash No. Collapsed Height/Lift Height: 2260/5025mm 89/198 in.	2415/5335mm 95/210 in.	2720/6100mm 107/240 in.	3025/6860mm 119/270 in.	3325/7620mm 131/300 in.	3555/8155mm 140/321 in.	3785/8660mm 149/341 in.	4065/9300mm 160/366 in.	4370/10160mm 172/400 in.	*2nd Dash No.
4	Non-removable Outrigger Ends																34 thru 61
	129309-	X						**304**	**305**	**306**	**307**	**308**	**309**				
	129309-		X					**204**	**205**	**206**	**207**	**208**	**209**	**210**	**211**	**212**	
	129309-			X				**404**	**405**	**406**	**407**	**408**	**409**	**410**	**411**	**412**	
	129309-						X	**504**	**505**	**506**	**507**	**508**	**509**				
	129310-				X								**109**	**110**	**111**	**112**	
	129310-					X							**209**	**210**	**211**	**212**	
	Non-removable Outrigger Ends (Tapered w/side shift only)																
	129309-	X						**804**	**805**	**806**	**807**	**808**	**809**				
	129309-		X					**704**	**705**	**706**	**707**	**708**	**709**	**710**	**711**	**712**	
	129309-			X				**904**	**905**	**906**	**907**	**908**	**909**	**910**	**911**	**912**	
	129310-				X									**310**	**311**	**312**	
	129310-					X								**410**	**411**	**412**	
	Removable Outrigger Ends																
	129291-	X						**304**	**305**	**306**	**307**	**308**	**309**				
	129291-		X					**204**	**205**	**206**	**207**	**208**	**209**	**210**	**211**	**212**	
	129291-			X				**404**	**405**	**406**	**407**	**408**	**409**	**410**	**411**	**412**	
	129310-				X									**610**	**611**	**612**	
	129310-					X								**710**	**711**	**712**	
	Removable Outrigger Ends (Tapered w/side shift only)																
	129291-	X						**804**	**805**	**806**	**807**	**808**	**809**				
	129291-		X					**704**	**705**	**706**	**707**	**708**	**709**	**710**	**711**	**712**	
	129291-			X				**904**	**905**	**906**	**907**	**908**	**909**	**910**	**911**	**912**	
	129310-				X									**810**	**811**	**812**	
	129310-					X								**910**	**911**	**912**	
45	**129068-**							**004**	**005**	**006**	**007**	**008**	**009**	**010**	**011**	**012**	
55	**129059-**							**004**	**005**	**006**	**007**	**008**	**009**	**010**	**011**	**012**	

*** The 2nd dash number is the same as the truck's inside straddle dimension in inches.**

RR5200S/5200S(AC) 2040kg (4500 lb.) CAPACITY

Index	Part No.	Load Wheel Size: 100 x 105mm/4.0 x 4.12 in.	125 x 70mm/5.0 x 2.88 in.	125 x 105mm/5.0 x 4.12 in.	150 x 70mm/6.0 x 2.88 in.	150 x 105mm/6.0 x 4.12 in.	265 x 115mm/10.5 x 4.5 in.	1st Dash No. Collapsed Height/Lift Height: 2260/5025mm 89/198 in.	2415/5335mm 95/210 in.	2720/6100mm 107/240 in.	3025/6860mm 119/270 in.	3325/7620mm 131/300 in.	3555/8155mm 140/321 in.	3785/8660mm 149/341 in.	4065/9300mm 160/366 in.	4370/10160mm 172/400 in.	*2nd Dash No.
																	34 thru 61
4	Non-removable Outrigger Ends																
	129309-	X						**304**	**305**	**306**	**307**	**308**	**309**				
	129309-		X					**204**	**205**	**206**	**207**	**208**	**209**	**210**	**211**	**212**	
	129309-			X				**404**	**405**	**406**	**407**	**408**	**409**	**410**	**411**	**412**	
	129309-						X	**504**	**505**	**506**	**507**	**508**	**509**				
	129310-				X								**109**	**110**	**111**	**112**	
	129310-					X							**209**	**210**	**211**	**212**	
	Non-removable Outrigger Ends (Tapered w/side shift only)																
	129309-	X						**804**	**805**	**806**	**807**	**808**	**809**				
	129309-		X					**704**	**705**	**706**	**707**	**708**	**709**	**710**	**711**	**712**	
	129309-			X				**904**	**905**	**906**	**907**	**908**	**909**	**910**	**911**	**912**	
	129310-				X									**310**	**311**	**312**	
	129310-					X								**410**	**411**	**412**	
	Removable Outrigger Ends																
	129291-	X						**304**	**305**	**306**	**307**	**308**	**309**				
	129291-		X					**204**	**205**	**206**	**207**	**208**	**209**	**210**	**211**	**212**	
	129291-			X				**404**	**405**	**406**	**407**	**408**	**409**	**410**	**411**	**412**	
	129310-				X									**610**	**611**	**612**	
	129310-					X								**710**	**711**	**712**	
	Removable Outrigger Ends (Tapered w/side shift only)																
	129291-	X						**804**	**805**	**806**	**807**	**808**	**809**				
	129291-		X					**704**	**705**	**706**	**707**	**708**	**709**	**710**	**711**	**712**	
	129291-			X				**904**	**905**	**906**	**907**	**908**	**909**	**910**	**911**	**912**	
	129310-				X									**810**	**811**	**812**	
	129310-					X								**910**	**911**	**912**	
45	**129068-**							**004**	**005**	**006**	**007**	**008**	**009**	**010**	**011**	**012**	
55	**129059-**							**004**	**005**	**006**	**007**	**008**	**009**	**010**	**011**	**012**	

*** The 2nd dash number is the same as the truck's inside straddle dimension in inches.**

RD5200/5200(AC) 1360 kg (3000 lb.) CAPACITY

Index	Part No.	Load Wheel Size: 100 x 70mm/4.0 x 2.88 in.	100 x 105mm/4.0 x 4.12 in.	125 x 70mm/5.0 x 2.88 in.	125 x 105mm5.0 x 4.12 in.	150 x 70mm/6.0 x 2.88 in.	150 x 105mm6.0 x 4.12 in.	1st Dash No. Collapsed Height/Lift Height: 2260mm/5025mm 89 in./198 in.	2415mm/5335mm 95 in./210 in.	2720mm/6100mm 107 in./240 in.	3025mm/6860mm 119 in./270 in.	3325mm/7620mm 131 in./300 in.	3555mm/8155mm 140 in./321 in.	3785mm/8660mm 149 in./341 in.	4065mm/9300mm 160 in./366 in.	4370mm/10160mm 172 in./400 in.	*2nd Dash No. 34 thru 61
4	Non-removable Outrigger Ends (Tapered)																
	129077-	X						**104**	**105**	**106**	**107**	**108**	**109**				
	129077-		X					**304**	**305**	**306**	**307**	**308**	**309**				
	129077-			X				**204**	**205**	**206**	**207**	**208**	**209**	**210**	**211**	**212**	
	129077-				X			**404**	**405**	**406**	**407**	**408**	**409**	**410**	**411**	**412**	
	129311-					X								**310**	**311**	**312**	
	129311-						X							**410**	**411**	**412**	
	Removable Outrigger Ends (Tapered)																
	129077-	X						**604**	**605**	**606**	**607**	**608**	**609**				
	129077-		X					**804**	**805**	**806**	**807**	**808**	**809**				
	129077-			X				**704**	**705**	**706**	**707**	**708**	**709**	**710**	**711**	**712**	
	129077-				X			**904**	**905**	**906**	**907**	**908**	**909**	**910**	**911**	**912**	
	129311-					X								**810**	**811**	**812**	
	129311-						X							**910**	**911**	**912**	
45	**129068-**							**004**	**005**	**006**	**007**	**008**	**009**	**010**	**011**	**012**	
55	**129059-**							**004**	**005**	**006**	**007**	**008**	**009**	**010**	**011**	**012**	

*** The 2nd dash number is the same as the truck's inside straddle dimension in inches.**

RD5200S/5200S(AC) 1360 kg (3000 lb.) CAPACITY

Index	Part No.	Load Wheel Size						1st Dash No. Collapsed Height/Lift Height									*2nd Dash No.
		100 x 70mm/4.0 x 2.88 in.	100 x 105mm/4.0 x 4.12 in.	125 x 70mm/5.0 x 2.88 in.	125 x 105mm5.0 x 4.12 in.	150 x 70mm/6.0 x 2.88 in.	150 x 105mm/6.0 x 4.12 in.	2260/5025mm 89/198 in.	2415/5335mm 95/210 in.	2720/6100mm 107/240 in.	3025/6860mm 119/270 in.	3325/7620mm 131/300 in.	3555/8155mm 140/321 in.	3785/8660mm 149/341 in.	4065/9300mm 160/366 in.	4370/10160mm 172/400 in.	34 thru 61
4	Non-removable Outrigger Ends (Tapered)																
	129077-	X						**104**	**105**	**106**	**107**	**108**	**109**				
	129077-		X					**304**	**305**	**306**	**307**	**308**	**309**				
	129077-			X				**204**	**205**	**206**	**207**	**208**	**209**	**210**	**211**	**212**	
	129077-				X			**404**	**405**	**406**	**407**	**408**	**409**	**410**	**411**	**412**	
	129311-					X								**310**	**311**	**312**	
	129311-						X							**410**	**411**	**412**	
	Removable Outrigger Ends (Tapered)																
	129077-	X						**604**	**605**	**606**	**607**	**608**	**609**				
	129077-		X					**804**	**805**	**806**	**807**	**808**	**809**				
	129077-			X				**704**	**705**	**706**	**707**	**708**	**709**	**710**	**711**	**712**	
	129077-				X			**904**	**905**	**906**	**907**	**908**	**909**	**910**	**911**	**912**	
	129311-					X								**810**	**811**	**812**	
	129311-						X							**910**	**911**	**912**	
45	**129068-**							**004**	**005**	**006**	**007**	**008**	**009**	**010**	**011**	**012**	
55	**129059-**							**004**	**005**	**006**	**007**	**008**	**009**	**010**	**011**	**012**	

*** The 2nd dash number is the same as the truck's inside straddle dimension in inches.**

INDEX 34 - Chain (Mast)

Collapsed Height		Lift Height		Length Required (When Cutting from Bulk)			Chain (Mast) Part No.	† Qty/Length/Pkg
mm	in.	mm	in.	mm	in.	Links		
2260	89	5030	198	2115	83.25	111	**073991-123**	**(1) 15 ft. box**
2415	95	5335	210	2265	89.25	119	**073991-123**	**(1) 15 ft. box**
2720	107	6095	240	2875	113.25	151	**073991-124**	**(1) 20 ft. box**
3025	119	6860	270	2875	113.25	151	**073991-124**	**(1) 20 ft. box**
3325	131	7620	300	3180	125.25	167	**073991-125**	**(1) 25 ft. box**
3555	140	8155	321	3410	134.25	179	**073991-125**	**(1) 25 ft. box**
3785	149	8660	341	3640	143.25	191	**073991-125**	**(1) 25 ft. box**
4065	160	9295	366	3905	153.75	205	**073991-123**	**(2) 15 ft. boxes**
4370	172	10160	400	4210	165.75	221	**073991-123**	**(2) 15 ft. boxes**

† Replace both chains at the same time. Qty/Length/Pkg includes enough chain to replace both chains.

INDEX 65 - Chain (Carriage)

Collapsed Height		Lift Height		Length Required (When Cutting from Bulk)			Chain (Carriage) Part No.	Length/Pkg
mm	in.	mm	in.	mm	in.	Links		
2260	89	5030	198	1390	54.75	73	**073991-122**	**10 ft. box**
2415	95	5335	210	1465	57.75	77	**073991-122**	**10 ft. box**
2720	107	6095	240	1620	63.75	85	**073991-123**	**15 ft. box**
3025	119	6860	270	1770	69.75	93	**073991-123**	**15 ft. box**
3325	131	7620	300	1925	75.75	101	**073991-123**	**15 ft. box**
3555	140	8155	321	2040	80.25	107	**073991-123**	**15 ft. box**
3785	149	8660	341	2155	84.75	113	**073991-123**	**15 ft. box**
4065	160	9295	366	2305	90.75	121	**073991-124**	**20 ft. box**
4370	172	10160	400	2460	96.75	129	**073991-124**	**20 ft. box**

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Collapsed Height		Lift Height		ONE EACH REQUIRED	
mm	in.	mm	in.	**SPRING**	**SPRING**
2260	89	5025	198	**122399 (Bronze)**	**119031 (Gray)**
2415	95	5335	210	**119031 (Gray)**	**119031 (Gray)**
2720	107	6100	240	**119031 (Gray)**	**119031 (Gray)**
3025	119	6860	270	**119031 (Gray)**	**119031 (Gray)**
3325	131	7620	300	**128010 (Bronze)**	**122422 (Green)**
3555	140	8155	321	**128010 (Bronze)**	**122422 (Green)**
3785	149	8660	341	**122422 (Green)**	**122422 (Green)**
4065	160	9300	366	**122422 (Green)**	**122422 (Green)**
4370	172	10160	400	**122422 (Green)**	**122422 (Green)**

INDEX 77 SPRING — CARRIAGE

2260	89	5025	198	**122398 (Red)**	**122398 (Red)**
2415	95	5335	210	**122398 (Red))**	**122398 (Red)**
2720	107	6100	240	**122398 (Red)**	**122421 (Bronze)**
3025	119	6860	270	**122398 (Red)**	**122421 (Bronze)**
3325	131	7620	300	**122398 (Red)**	**122421 (Bronze)**
3555	140	8155	321	**122421 (Bronze)**	**122421 (Bronze)**
3785	149	8660	341	**122421 (Bronze)**	**122421 (Bronze)**
4065	160	9300	366	**122421 (Bronze)**	**122421 (Bronze)**
4370	172	10160	400	**122421 (Bronze)**	**122421 (Bronze)**

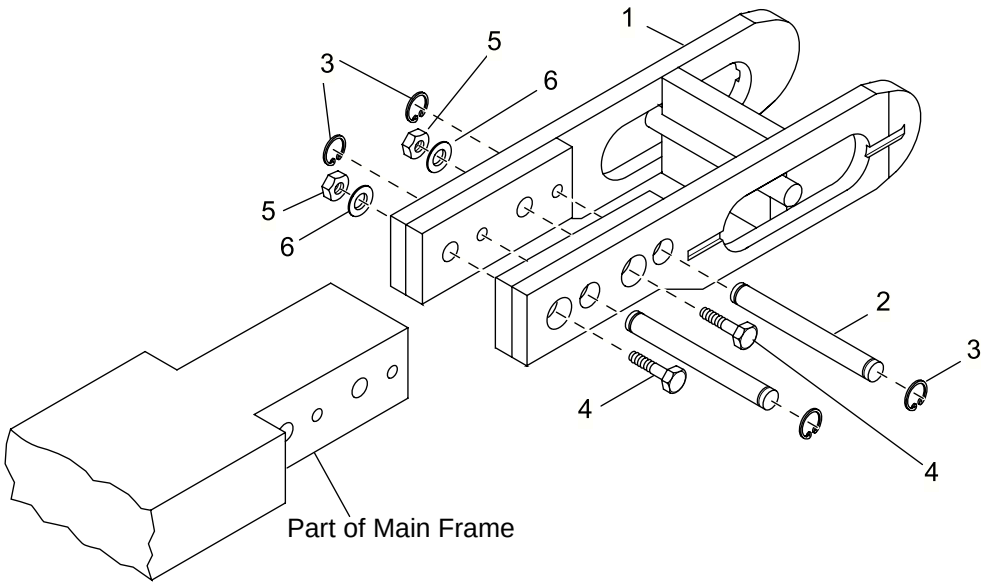


Figure 19502

*Load Wheel Size 100 X 75 mm (4.0 X 2.88 in)			
Index	Part Number	Part Name	Number Required
1	123415-001	Outrigger End	2
	123425-001	Outrigger End with Tip	2
2	115003-002	Location Pin	4
3	060009-059	Retaining Ring	4
4	060020-041	Screw	4
5	060030-279	Flatwasher	4
6	060021-092	Nut	4
* Choice of part number depends on load wheel size. Load wheel is included in the truck data number (located on the truck data plate). Quantity listed is per truck.			

*Load Wheel Size 125 X 75 mm (5.0 X 2.88 in)			
Index	Part Number	Part Name	Number Required
1	123415-002	Outrigger End	2
	123425-002	Outrigger End with Tip	2
2	115003-002	Location Pin	4
3	060009-059	Retaining Ring	4
4	060020-041	Screw	4
5	060030-279	Flatwasher	4
6	060021-092	Nut	4
* Choice of part number depends on load wheel size. Load wheel is included in the truck data number (located on the truck data plate). Quantity listed is per truck.			

***** To select appropriate part number, refer to truck data number. The truck data number represents truck features. Refer to Introduction.

*Load Wheel Size 150 X 75 mm (6.0 X 2.88 in)			
Index	Part Number	Part Name	Number Required
1	123415-005	Outrigger End	2
	123425-005	Outrigger End with Tip	2
2	115003-001	Location Pin	4
3	060009-011	Retaining Ring	4
4	060020-039	Screw	4
5	060030-279	Flatwasher	4
6	060021-092	Nut	4
* Choice of part number depends on load wheel size. Load wheel is included in the truck data number (located on the truck data plate). Quantity listed is per truck.			

*Load Wheel Size 100 X 105 mm (4.0 X 4.12 in)			
Index	Part Number	Part Name	Number Required
1	123415-003	Outrigger End	2
	123425-003	Outrigger End with Tip	2
2	115004-001	Location Pin	4
3	060009-011	Retaining Ring	4
4	060020-039	Screw	4
5	060030-279	Flatwasher	4
6	060021-092	Nut	4
* Choice of part number depends on load wheel size. Load wheel is included in the truck data number (located on the truck data plate). Quantity listed is per truck.			

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

*Load Wheel Size 125 X 105 mm (5.0 X4.12 in)			
Index	Part Number	Part Name	Number Required
1	123415-004	Outrigger End	2
	123425-004	Outrigger End with Tip	2
2	115003-001	Location Pin	4
3	060009-011	Retaining Ring	4
4	060020-039	Screw	4
5	060030-279	Flatwasher	4
6	060021-092	Nut	4
* Choice of part number depends on load wheel size. Load wheel is included in the truck data number (located on the truck data plate). Quantity listed is per truck.			

*Load Wheel Size 150 X 105 mm (6.0 X 4.12 in)			
Index	Part Number	Part Name	Number Required
1	123415-006	Outrigger End	2
	123425-006	Outrigger End with Tip	2
2	115003-001	Location Pin	4
3	060009-011	Retaining Ring	4
4	060020-039	Screw	4
5	060030-279	Flatwasher	4
6	060021-092	Nut	4
* Choice of part number depends on load wheel size. Load wheel is included in the truck data number (located on the truck data plate). Quantity listed is per truck.			

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

100 mm (4 in) O.D. Tandem Load Wheels

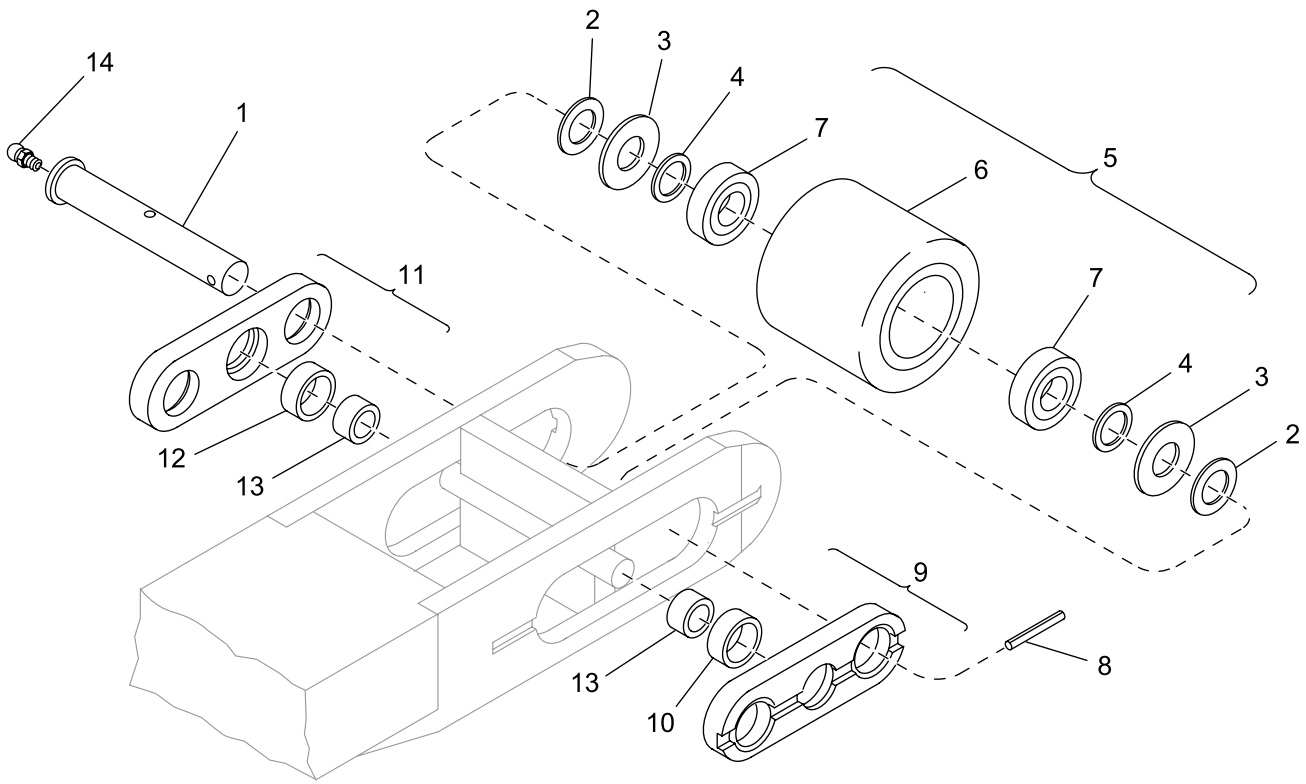


Figure 13101-03

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	073962-006* [1]	Axle 75 mm (2.88 in) Load Wheel Width	4
	073962-003* [1]	Axle 105 mm (4.12 in) Load Wheel Width	4
2	060030-068	Flatwasher 0.8 mm (0.03 in) Thick, 40 mm (1.62 in) O.D.	AR
3	060030-109	Flatwasher 3.0 mm (0.12 in) Thick, 60 mm (2.25 in) O.D.	8
4	060030-110	Flatwasher 1.5 mm (0.06 in) Thick, 30 mm (1.19 in) O.D.	AR
5	113021-[2]-88	Poly Wheel Assembly 100 mm x 75 mm (4.0 in x 2.88 in)	4
	113020-[2]-88	Poly Wheel Assembly 100 mm x 105 mm (4.0 in x 4.12 in)	4
6	083585-[2]	Poly Wheel 100 mm x 75 mm (4.0 in x 2.88 in)	4
	088628-[2]	Poly Wheel 100 mm x 105 mm (4.0 in x 4.12 in)	4
7	065081-021	Ball Bearing	8
8	060000-030	Roll Pin	4
9	122451-001	Pivot Plate Assembly 75 mm (2.88 in) & 105 mm (4.12 in)	2
10	065084-013	Bearing	2
11	122451-002	Pivot Plate Assembly 75 mm (2.88 in) & 105 mm (4.12 in)	2
12	065084-013	Bearing	2
13	111859-002	Sleeve	4
	061004-027	Thread Locking Adhesive	AR
14	076048-001	Lubrication Fitting	4

[1] 100 mm (4.0 in) O.D. Tandem Load Wheels

[2] Choice of dash no. depends on load wheel application. When ordering load wheels, refer to Chart 1 - Application and complete the part no. with the correct dash no.

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number

125 mm (5 in) O.D. Tandem Load Wheels

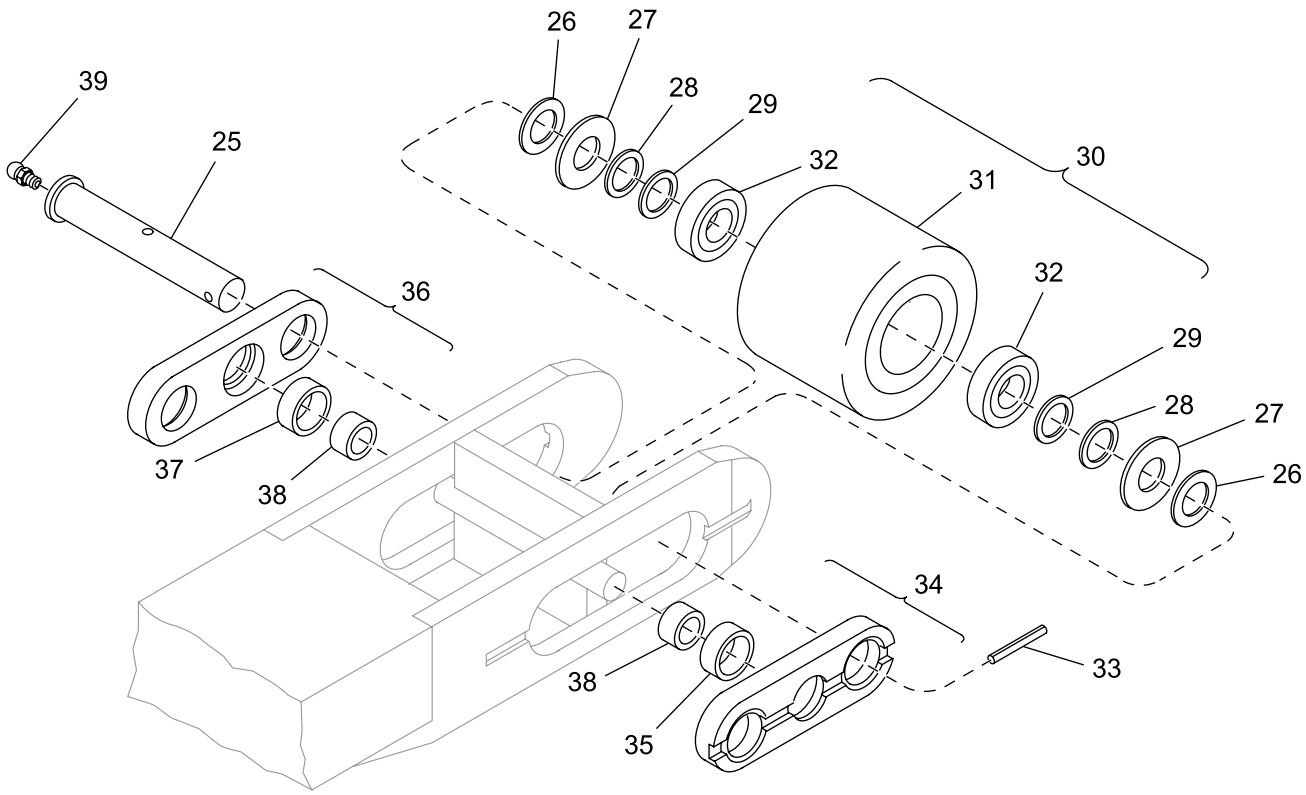


Figure 13102-03

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
25	073962-006* [1]	Axle 75 mm (2.88 in) Load Wheel Width	4
	073962-003* [1]	Axle 105 mm (4.12 in) Load Wheel Width	4
26	060030-127	Flatwasher 0.8 mm (0.03 in) Thick, 50 mm (2.0 in) O.D.	8
27	060030-278	Flatwasher 3.0 mm (0.12 in) Thick, 75 mm (3.0 in) O.D.	8
28	060030-093	Flatwasher 1.5 mm (0.06 in) Thick, 40 mm (1.50 in) O.D.	8
29	060030-289	Flatwasher 0.8 mm (0.03 in) Thick, 40 mm (1.50 in) O.D.	AR
30	115819-[2]-88	Poly Wheel Assembly 125 mm x 75 mm (5.0 in x 2.88 in)	4
	115820-[2]-88	Poly Wheel Assembly 125 mm x 105 mm (5.0 in x 4.12 in)	4
31	115032-[2]	Poly Wheel 125 mm x 75 mm (5.0 in x 2.8 in)	4
	115033-[2]	Poly Wheel 125 mm x 105 mm (5. in x 4.12 in)	4
32	065081-057	Ball Bearing	8
33	060000-030	Roll Pin	4
34	121786-002	Pivot Plate Assembly 75 mm (2.88 in) & 105 mm (4.12 in)	2
35	065084-015	Bearing	2
36	121786-001	Pivot Plate Assembly 75 mm (2.88 in) & 105 mm (4.12 in)	2
37	065084-015	Bearing	2
38	111858-002	Sleeve	4
	061004-027	Thread Locking Adhesive	AR
39	076048-001	Lubrication Fitting	4

[1] 125 mm (5.0 in) O.D. Tandem Load Wheels

[2] Choice of dash no. depends on load wheel application. When ordering load wheels, refer to Chart 1 - Application and complete the part no. with the correct dash no.

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

150 mm (6 in) O.D. Tandem Load Wheels

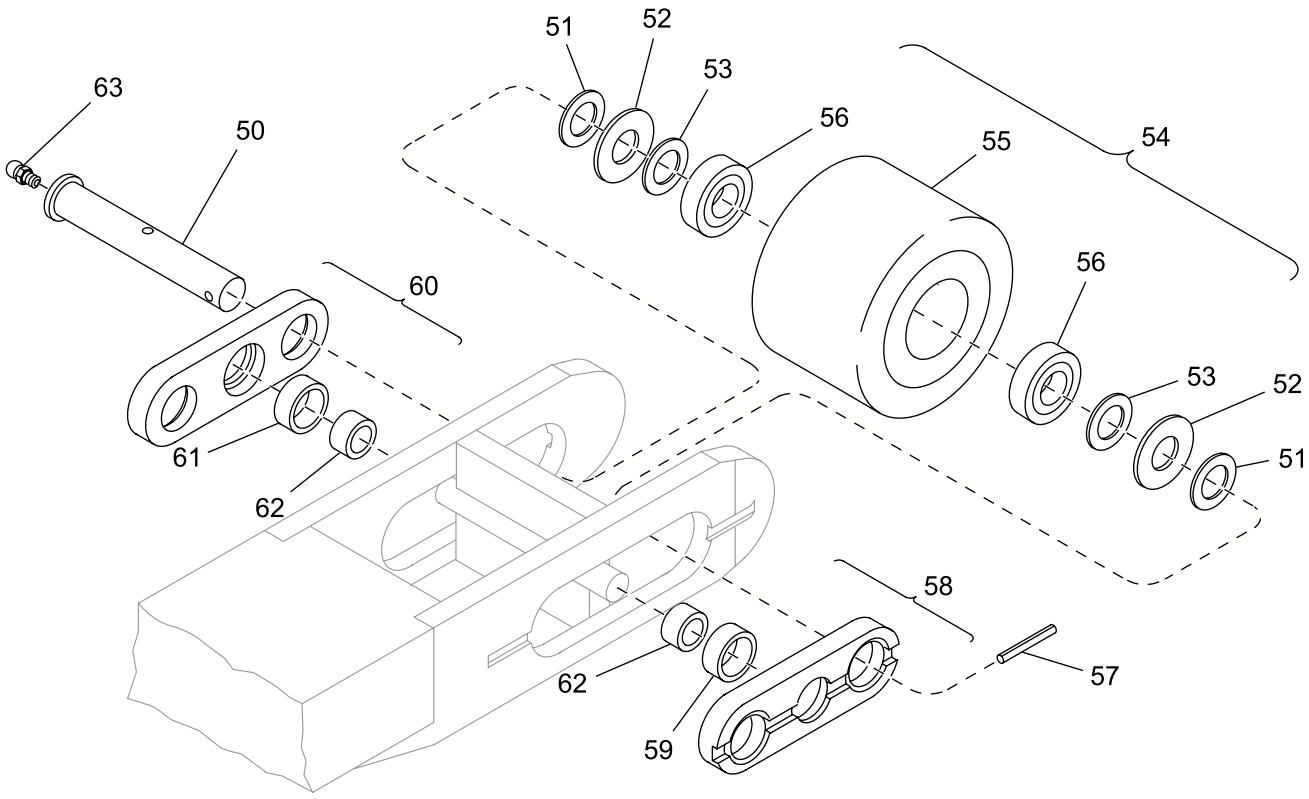


Figure 13103-03

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
*50	074659-006* [1]	Axle 75 mm (2.88 in) Load Wheel Width	4
	074659-004* [1]	Axle 105 mm (4.12 in) Load Wheel Width	4
51	060030-317	Flatwasher 0.8 mm (0.03 in) Thick, 45 mm (1.87 in) O.D.	AR
52	060030-315	Flatwasher 4.0 mm (0.16 in) Thick, 95 mm (3.75 in) O.D.	8
53	060030-316	Flatwasher 1.5 mm (0.06 in) Thick, 45 mm (1.87 in) O.D.	8
54	125206-[2]-88	Poly Wheel Assembly 150 mm x 75 mm (6.0 in x 2.88 in)	4
	125207-[2]-88	Poly Wheel Assembly 150 mm x 105 mm (6.0 in x 4.12 in)	4
55	125069-[2]	Poly Wheel 150 mm x 7 mm (6.0 in x 2.88 in)	4
	125070-[2]	Poly Wheel 150 mm x 105 mm (6. in x 4.12 in)	4
56	065081-008	Ball Bearing	8
57	060000-051	Roll Pin	4
58	125205	Pivot Plate Assembly 75 mm (2.88 in) & 105 mm (4.12 in)	2
59	065084-015	Bearing	2
60	125204	Pivot Plate Assembly 75 mm (2.88 in) & 105 mm (4.12 in)	2
61	065084-015	Bearing	2
62	111858-002	Sleeve	2
	061004-027	Thread Locking Adhesive	AR
63	076048-001	Lubrication Fitting	4

[1] 15 mm (6.0 in) O.D. Tandem Load Wheels

[2] Choice of dash no. depends on load wheel application. When ordering load wheels, refer to Chart 1 - Application and complete the part no. with the correct dash no.

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number

265 mm (10.5 in) O.D. Load Wheels

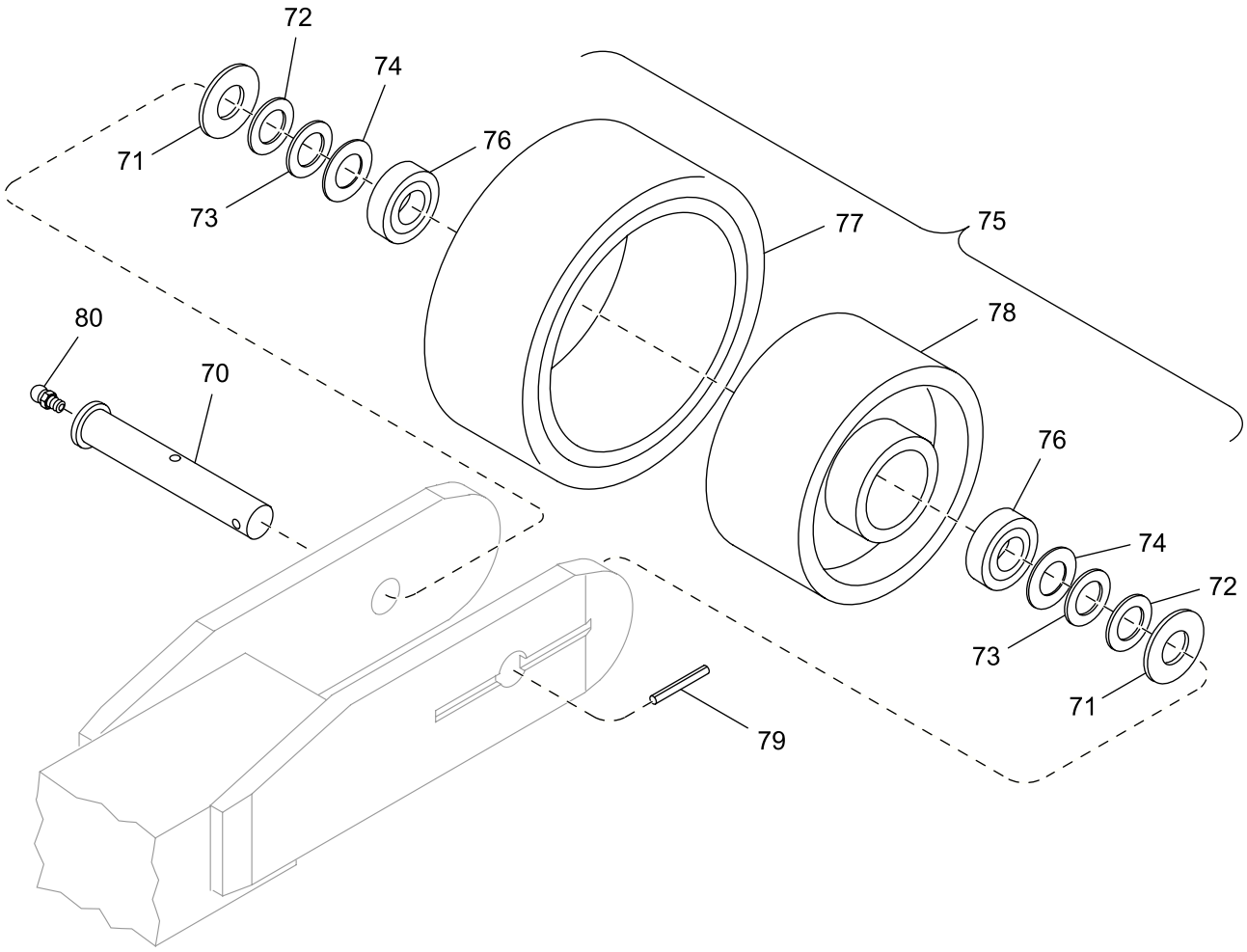


Figure 13104-03

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
70	074659-004* (1)	Axle 100 mm (4.0 in) Load Wheel Width	2
	074659-005* (1)	Axle 115 mm (4.5 in) Load Wheel Width	2
71	060030-111	Flatwasher 3.2 mm (0.12 in) Thick, 75 mm (3.0 in) O.D.	AR
72	060030-113	Flatwasher 2.4 mm (0.09 in) Thick, 45 mm (1.75 in) O.D.	AR
73	060030-112	Flatwasher 1.5 mm (0.06 in) Thick, 45 mm (1.75 in) O.D.	AR
74	060030-085	Flatwasher 0.8 mm (0.03 in) Thick, 50 mm (2.0 in) O.D.	AR
75	113018-060*	Wheel Assembly 265 mm x 100 mm (10.5 in x 4.0 in)	2
	113019-060*	Wheel Assembly 265 mm x 115 mm (10.5 in x 4.5 in)	2
76	065081-008	Ball Bearing	4
77	105090-060*	Tire Assembly 265 mm x 100 mm (10.5 in x 4.0 in)	2
	105091-060*	Tire Assembly 265 mm x 115 mm (10.5 in x 4.5 in)	2
	105088-060-01*	Tire 265 mm x 100 mm (10.5 in x 4.0 in)	2
	105089-060-01*	Tire 265 mm x 115 mm (10.5 in x 4.5 in)	2
78	105086	Hub 265 mm x 100 mm (10.5 in x 4.0 in)	2
	105087	Hub 265 mm x 115 mm (10.5 in x 4.5 in)	2
79	060000-051	Roll Pin	2
80	076048-001	Lubrication Fitting	2

(1) 265 mm (10.5 in) O.D. Load Wheels

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

100 mm (4 in) O.D. Tandem Load Wheels

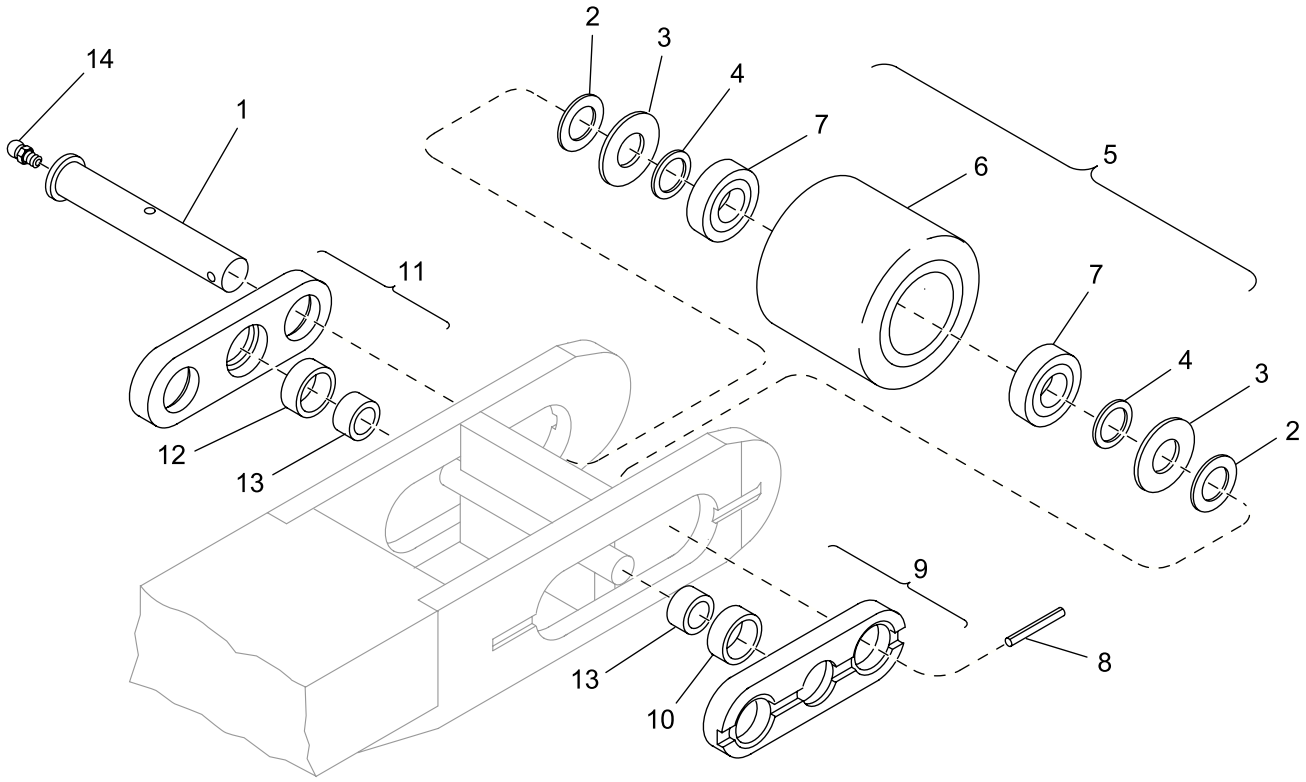
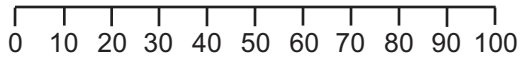


Figure 13101-03

Chart 1 - Application							
				Application Type			
Wheel Series	**Compound Number**	**Shore A Hardness**	**Composition**	**Wet/Freezer** Resistant to Chunking	**Dock Boards Rough Floors Floor Debris** Resistant to Chunking	**Heavy Loads Long Runs** Resistant to Extreme Heat	**Floor Debris** Resistant to Flat Spotting
100 Series Light Duty	101	93A	polyether	•	•		
	102	95A	polyester	•	•		
200 Series Mid-Range	201	83A	polyester	•	•		
	202	83A	polyester	•	•		
	203	83A	polyester	•	•		
	204	85A	polyester	•	•		
	205	87A	polyether	•	•		•
300 Series High Capacity	301	95A	polyether	•	•	•	•
	302	95A	polyester	•	•	•	•
	303	95A	polyester	•	•	•	•
	304	95A	polyester	•	•	•	•
	305	95A	polyether	•	•	•	•
	306	97A	polyether	•		•	•
400 Series Heavy Duty	401	93A	vulkollan				
	402	99A	polyether				

100 Series Light Duty wheel compounds are best suited for light loads and intermittent use.
200 Series Mid-Range wheels are designed for light to medium loads and short to medium runs.
300 Series High Capacity are for the typical demands of most applications. High capacity wheels feature compounds designed for high capacities and long runs.
400 Series Heavy Duty wheels are designed for maximum capacities and extreme runs.

Shore A Hardness Scale



30A is comparable to a rubber band. Typically more cut and tear resistant and provide a smoother ride.
60A is comparable to a car tire. Provide improved travel speeds (less rolling resistance) and generate less heat.

Polyester vs. Polyether

These elements of polyurethane chemical composition can be found in each compound series.
Polyester - provides greater cut and tear resistance and overall durability.
Polyether - provides greater load bearing capacity and heat resistance.

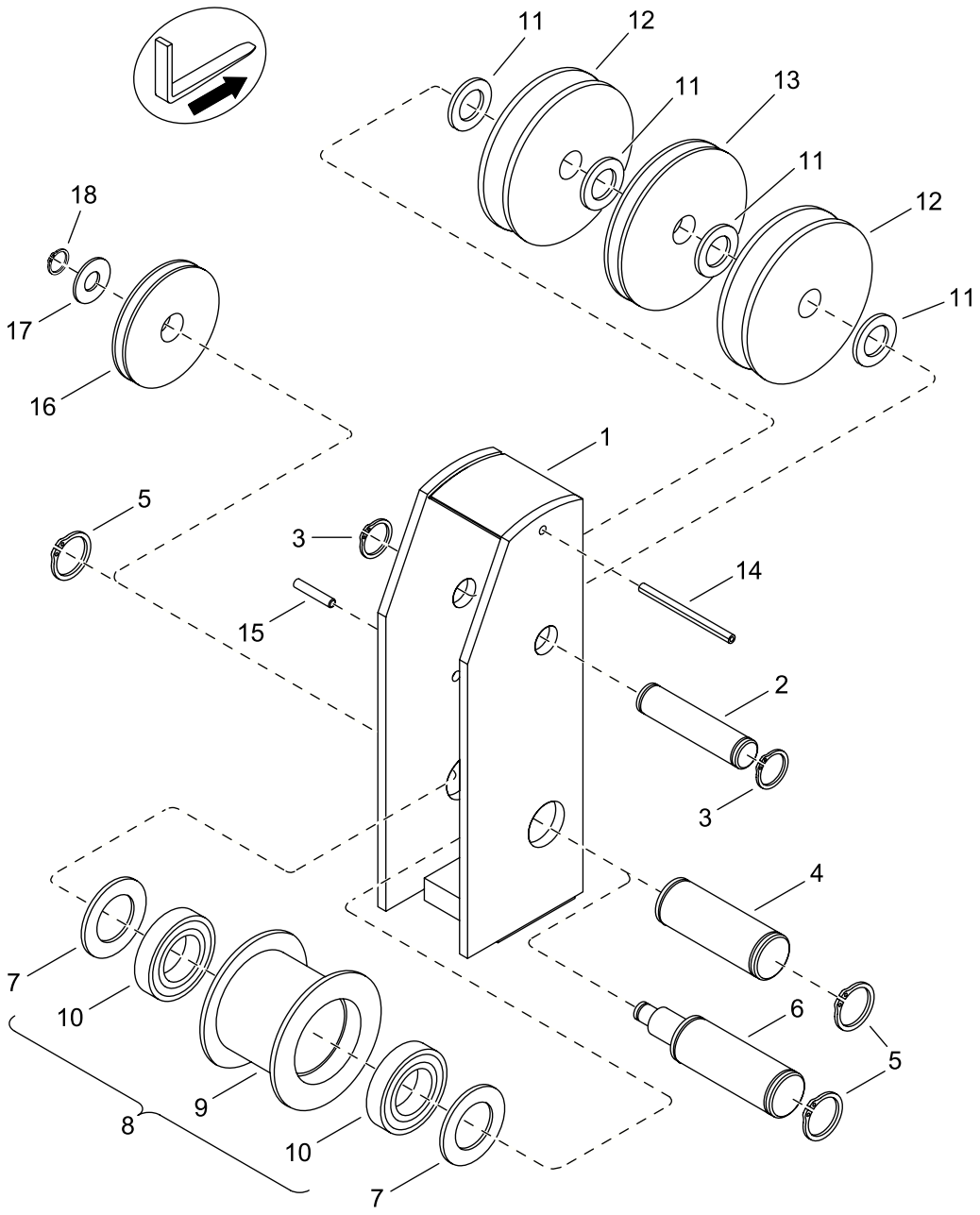
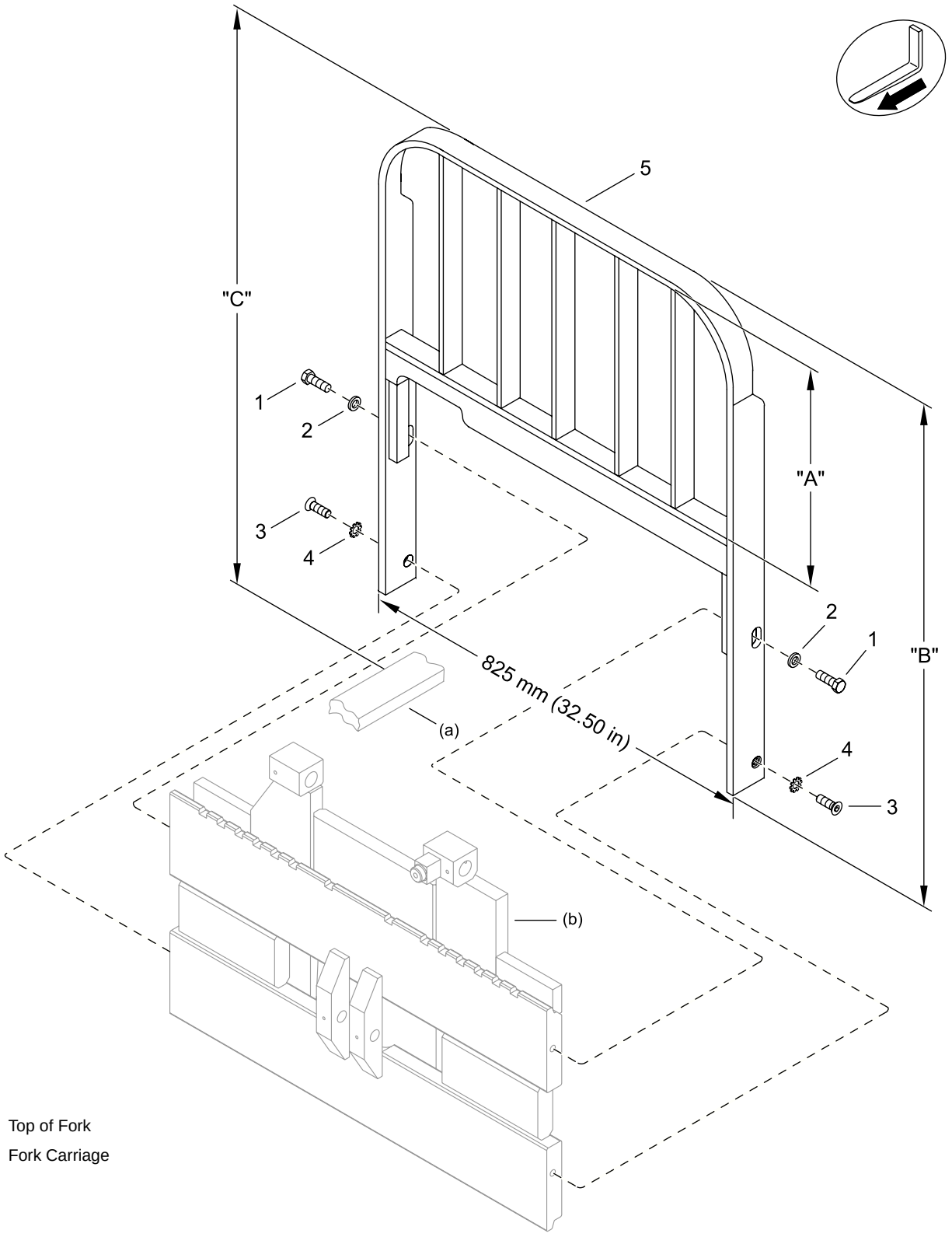


Figure 21638

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	121802	Yoke Assembly	1
	124013-001*	Yoke Assembly with Freezer/Corrosion and Load Sense	1
1	121628	Yoke	1
2	123183-002	Shaft	1
3	060009-011	Retaining Ring	2
4	123181-003	Shaft	1
5	060009-018	Retaining Ring	2
6	123401-001*	Shaft with Freezer/Corrosion and Load Sense	1
7	060030-057	Flatwasher	2
8	117575-003	Pulley Assembly	1
9	117576-003	Pulley	1
10	065081-027	Ball Bearing	2
11	060030-329	Flatwasher	4
12	119655-002	Pulley Hose	2
13	127583-001	Pulley Wire	1
14	060000-112	Roll Pin	1
15	060000-067*	Roll Pin with Freezer/Corrosion and Load Sense	1
16	127513-002*	Pulley Wire with Freezer/Corrosion and Load Sense	1
17	060030-192*	Flatwasher with Freezer/Corrosion and Load Sense	1
18	060009-011*	Retaining Ring with Freezer/Corrosion and Load Sense	1

***** To select appropriate part number, use the data number to determine truck features. Refer to Introduction.

Always Specify Model, Data & Serial Number



(a) Top of Fork

(b) Fork Carriage

Figure 21639

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	060019-019	Screw	2
2	060005-012	Lockwasher	2
3	060019-031	Screw	2
4	060005-029	Lockwasher	2
5	*(1)	Load Backrest	1

(1) See Chart 1 - Load Backrest

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

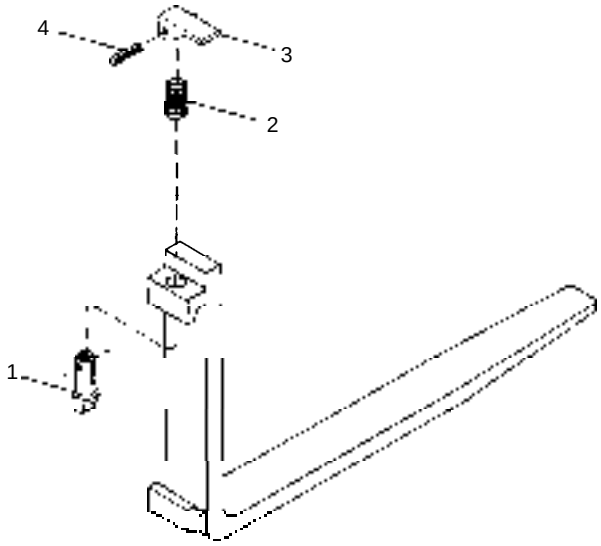
Chart 1 - Load Backrest

Series	Index 5 Load Backrest	Overall Dimension		Dimension “A”		Dimension “B”		Dimension “C”	
		mm	in	mm	in	mm	in	mm	in
RR & RD	125608-036	825 x 915	32.5 x 36	215	8.5	810	31.88	915	36
RR & RD	125608-042	825 x 1070	32.5 x 42	370	14.5	960	37.88	1070	42
RR & RD	125608-048	825 x 1220	32.5 x 48	520	20.5	1115	43.88	1220	48
RR & RD with Sideshift	125367-036	825 x 915	32.5 x 36	215	8.5	810	31.88	915	36
RR & RD with Sideshift	125367-042	825 x 1070	32.5 x 42	370	14.5	960	37.88	1070	42
RR & RD with Sideshift	125367-048	825 x 1220	32.5 x 48	520	20.5	1115	43.88	1220	48

This page available for **NOTES.**

Index	Part No.	Part Name	No. Req.
1	103443	Pin	1
	103442	Pin Bundle Includes Index 1 thru 4	1
2	104329	Spring	1
3	075248	Handle	1
4	060000-061	Pin Roll	1

Always Specify Model, Data & Serial Numbers



The Fork Assemblies Below Include Index 1 Thru 4

Series	Capacity	Fork Assembly Part Number		
		075324-	094182-	*088228-
W 4.0	3000 lbs. (1360 kg)	X		
	4000 lbs. (1815 kg)		X	
WB 5.0	1000 - 3000 lbs. (455 - 1360 kg)	X		
	4000 lbs. (1815 kg)		X	
WR 8.0	2000 - 3000 lbs. (910 - 1360 kg)	X		
RC 10.0,	3000 lbs. (1360 kg)	X		X
RC 3000	3500 - 4000 lbs. (1585 - 1815 kg)		X	X
SC 11.0,	3000 lbs. (1360 kg)	X		X
SC 4000	3500 - 4000 lbs. (1585 - 1815 kg)		X	X
RR 14.0, 3000, RR 3500, 5000 5200	3500 - 4500 lbs. (1585 - 2040 kg)		X	X
RS 15.0, 3000, RS 3500	4000 lbs. (1815 kg)		X	X
RD 16.0, 3000, RD 3500, 5000, 5200	3000 lbs. (1360 kg)	X	X	X

*** Polished Fork (Full Taper)**

Fork Length	Fork Assembly Part Number		
	075324-	094182-	*088228-
760 mm (30 in.)	1	1	1
915 mm (36 in.)	2	2	2
990 mm (39 in.)	6	6	6
1065 mm (42 in.)	3	3	3
1145 mm (45 in.)	5	5	5
1220 mm (48 in.)	4	4	4
1370 mm (54 in.)	†7	†7	†7
1525 mm (60 in.)	†8	†8	†8

† Not Used On RR, RS, RD

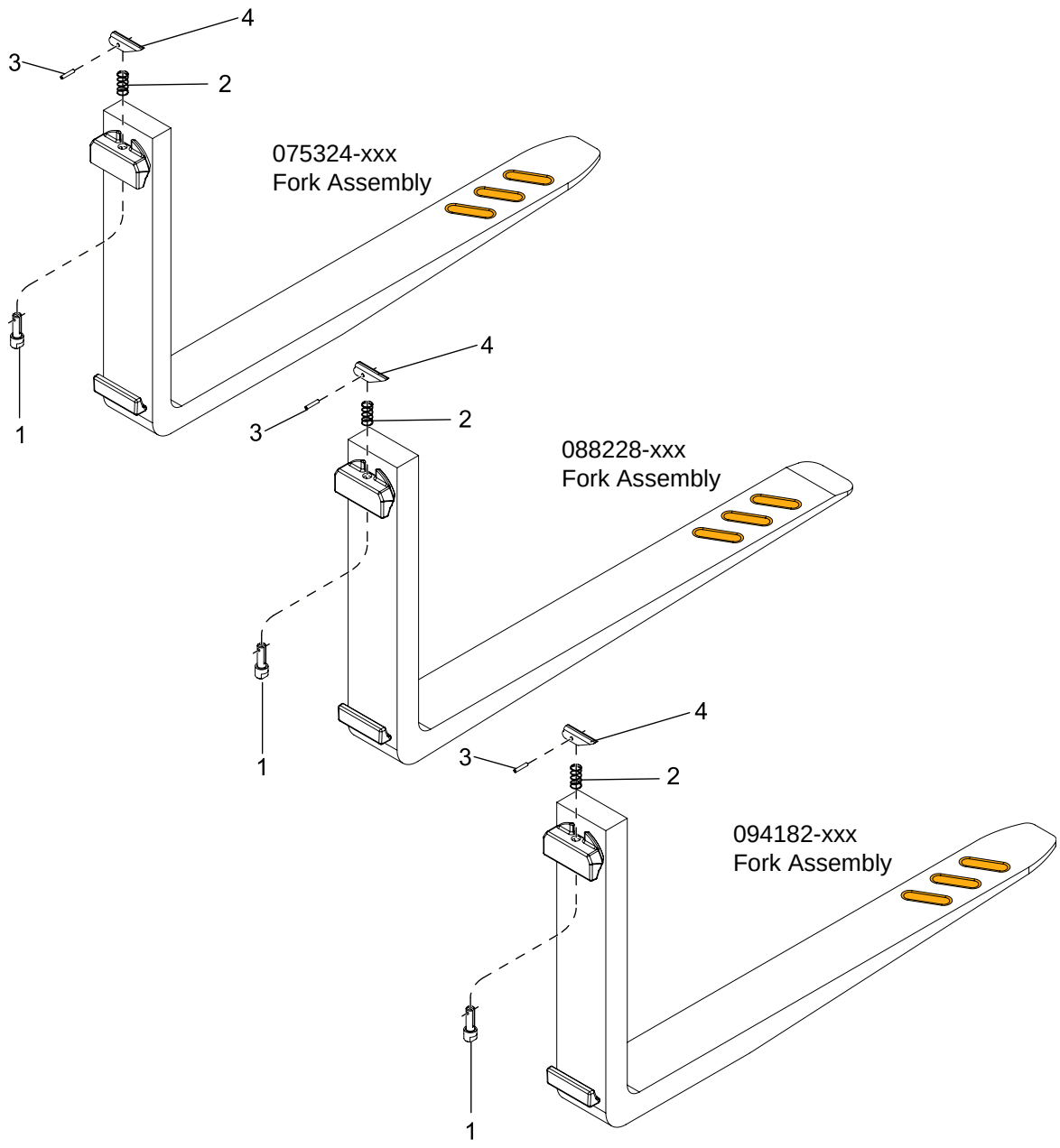


Figure 14309

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	103442	Pin Assembly	1
	103443	Pin	1
2	104329	Spring	1
3	060000-061	Roll Pin	1
4	075248	Handle	1

Fork Assemblies noted in Charts include Index 1 through 4

Always Specify Model, Data & Serial Number

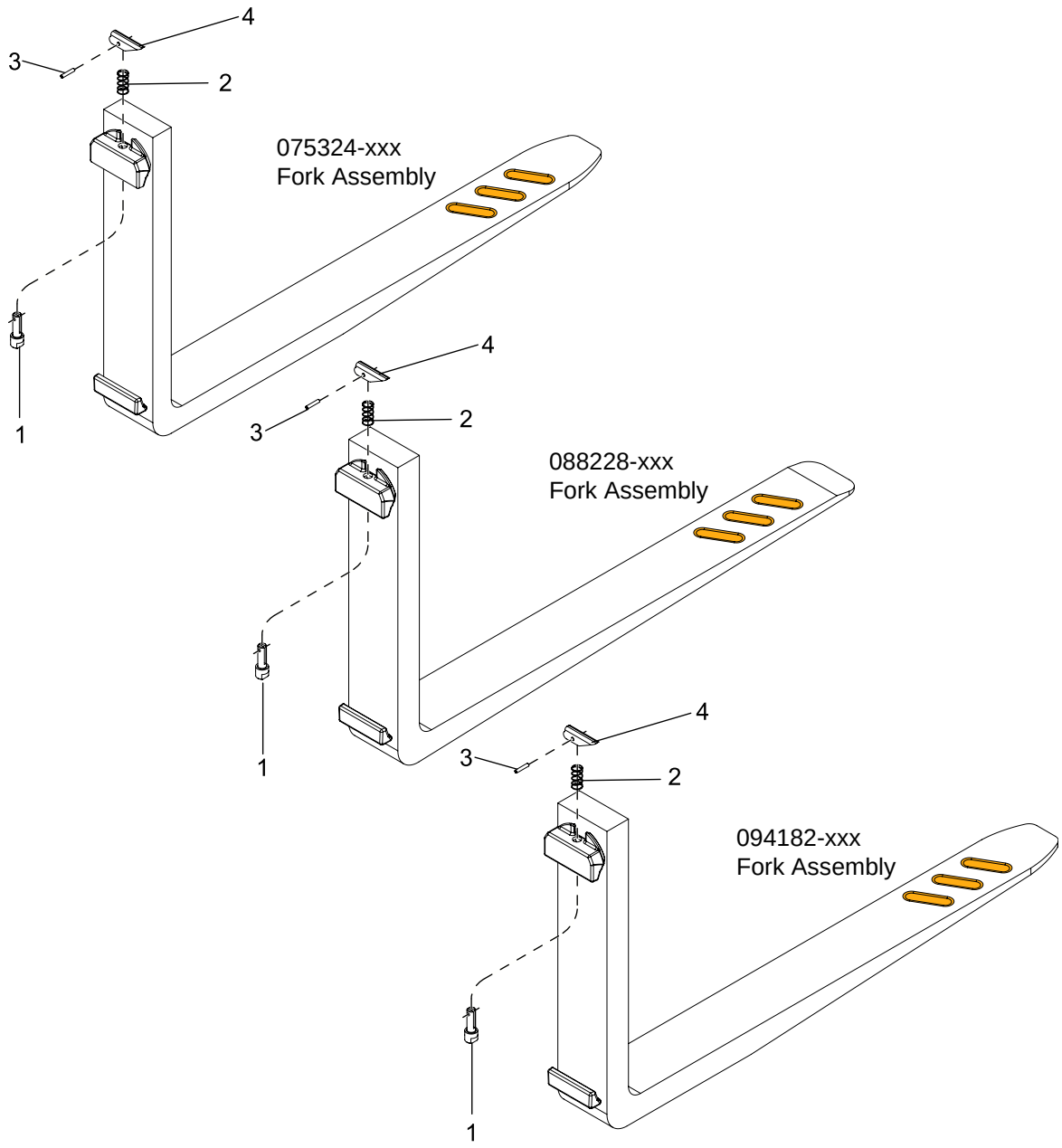
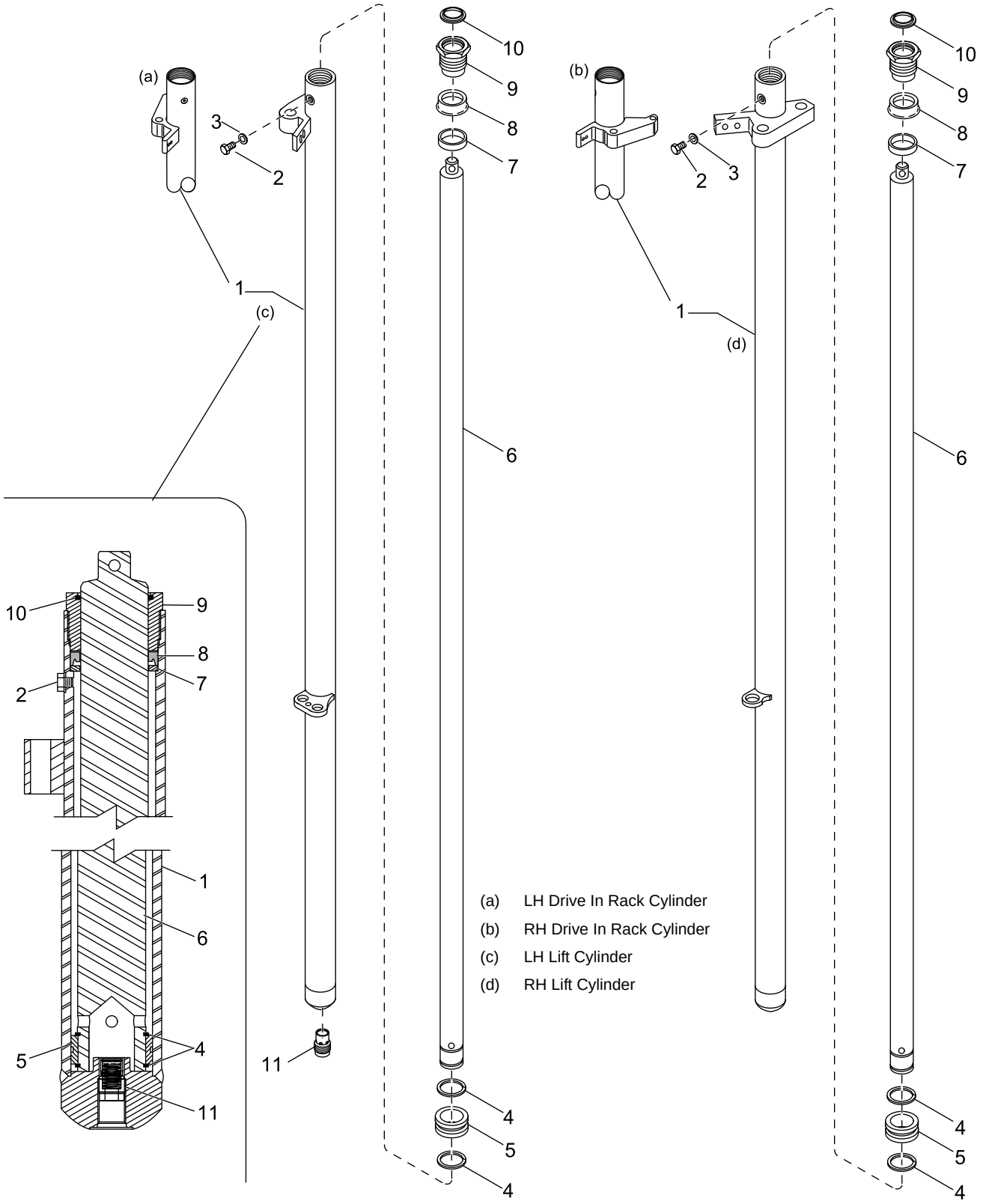


Figure 14309

Model, Fork Designation Chart				
Series	Capacity	Fork Assembly Base Part Number		
		075324-xxx	094182-xxx	Polished Fork Full Taper 088228-xxx
W	1815 kg (4000 lbs)		X	
WB	455 - 1360 kg (1000 - 3000 lbs) 1815 kg (4000 lbs)	X	X	
WR	910 - 1360 kg (2000 - 3000 lbs)	X		
RC RC 3000 RC 5500	1360 kg (3000 lbs) 1585 - 1815 kg (3500 - 4000 lbs)	X	X	X X
SC SC 4000, 4500	1360 kg (3000 lbs) 1585 - 1815 kg (3500 - 4000 lbs)	X	X	X X
RR 3000, 3500 RR 5000, 5200 RR 5700	1585 - 2040 kg (3500 - 4500 lbs)		X	X
RS 3000, 3500	1815 kg (4000 lbs)		X	X
RD 3000, 3500 RD 5000, 5200 RR 5700	1360 kg (3000 lbs)	X	X	X
SH	1815 kg (4000 lbs)		X	X
SHR	1130 - 1360 kg (2500 - 3000 lbs) 1585 kg (3500 lbs)	X	X	X X

Fork Length Chart				
Fork Length		Fork Assembly Part Number		
mm	in	075324-xxx	094182-xxx	Polished Fork Full Taper 088228-xxx
760	30	-001	-001	-001
915	36	-002	-002	-002
990	39	-006	-006	-006
1065	42	-003	-003	-003
1145	45	-005	-005	-005
1220	48	-004	-004	-004
Following Part Numbers Not Used on RR, RS, & RD Series Trucks				
1370	54	-007	-007	-007
1525	60	-008	-008	-008



(a) LH Drive In Rack Cylinder
(b) RH Drive In Rack Cylinder
(c) LH Lift Cylinder
(d) RH Lift Cylinder

Figure 21697

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	(1)*	RH Cylinder Assembly	1
	(1)*	LH Cylinder Assembly	1
	(2)*	RH Drive In Rack Mast Cylinder Assembly	1
	(2)*	LH Drive In Rack Mast Cylinder Assembly	1
1	(1)*	RH Cylinder Tube	1
	(1)*	LH Cylinder Tube	1
	(2)*	RH Drive In Rack Mast Cylinder Tube	1
	(2)*	LH Drive In Rack Mast Cylinder Tube	1
2	060015-078	Screw	1
	061004-026	Thread Locking Adhesive	1
3	074240	Seal	1
4	060009-067	Retaining Ring	2
5	073975-004	Bushing	1
6	(1)*	Ram	1
	(2)*	Ram, Drive-In Rack Mast	1
7	081161-018	Collar	1
8	064132-046	Packing Rod	1
9	100512	Cap	1
10	064135-003	Wiper Ring	1
11	124251-003	Velocity Fuse (LH Cylinder Only)	1
	123868	Seal Kit (Includes Index 3, 8, & 10)	1
	091240-004	Poly Pak Tool (Used for Seal Installation)	1

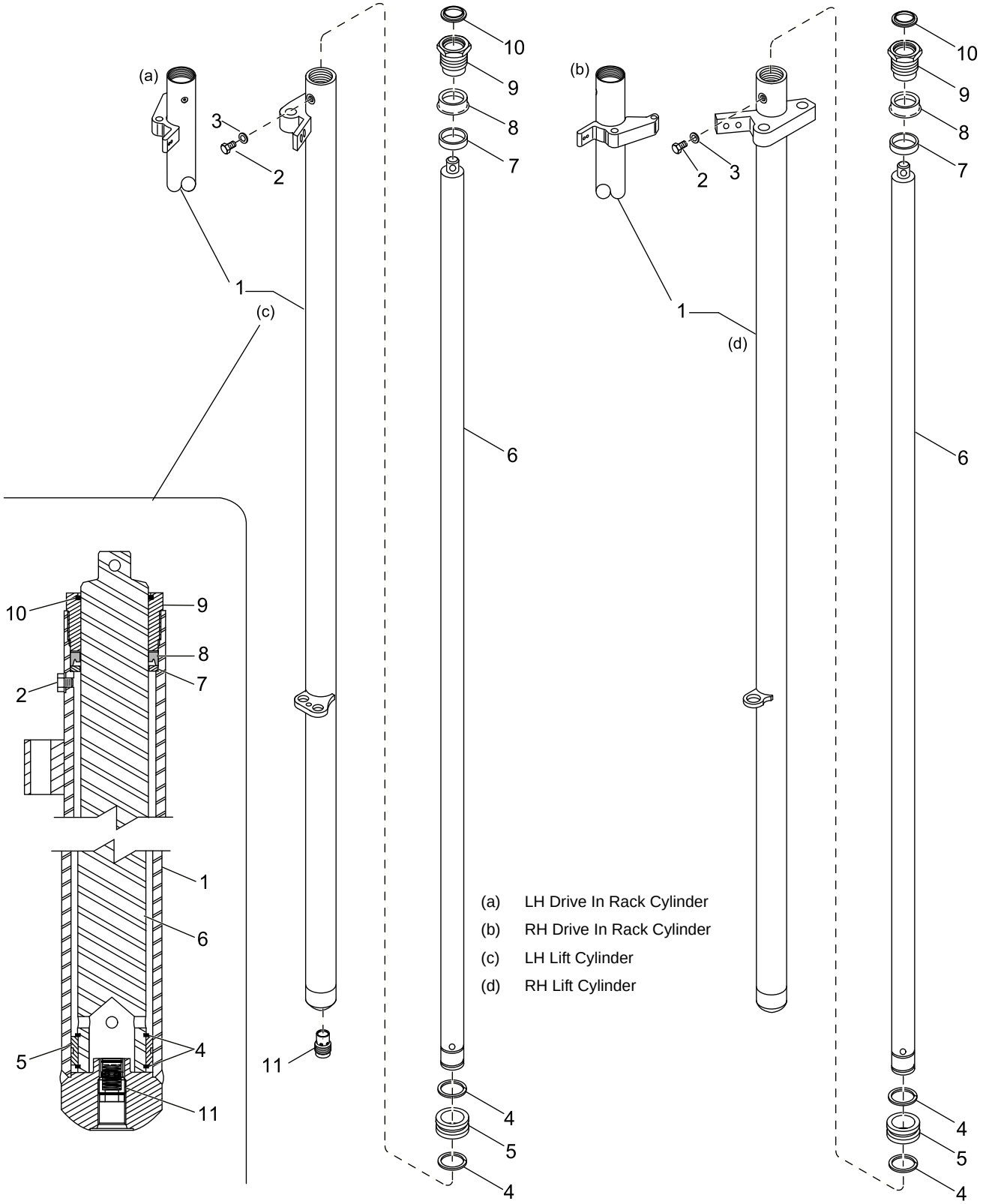
(1) See Chart 1 - TT Mast

(2) See Chart 2 - Drive-In Rack Mast

***** To select appropriate part number, use the data number to determine truck features. Refer to Introduction.

Always Specify Model, Data & Serial Number

CYLINDER PARTS
TT Lift Cylinder



(a) LH Drive In Rack Cylinder
(b) RH Drive In Rack Cylinder
(c) LH Lift Cylinder
(d) RH Lift Cylinder

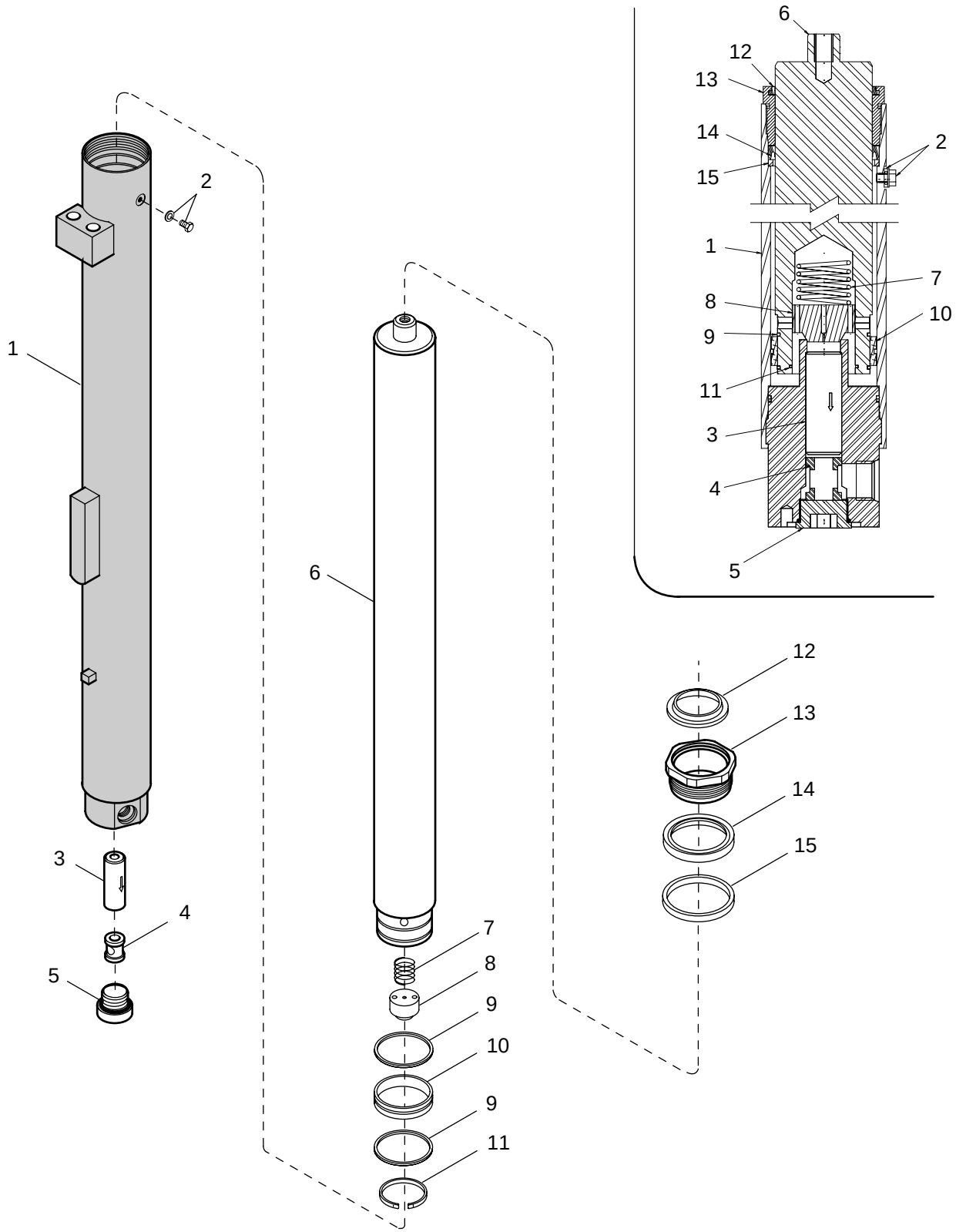
Figure 21697

Chart 1 - TT Mast								
Collapsed Height		Lift Height		LH Cylinder Assembly Index 0	RH Cylinder Assembly Index 0	LH Cylinder Tube Index 1	RH Cylinder Tube Index 1	Ram Index 6
mm	in	mm	in					
2260	89	5025	798	121676-004	121663-004	121677-004	121664-004	121672-004
2415	95	5335	210	121676-005	121663-005	121677-005	121664-005	121672-005
2720	107	6100	240	121676-006	121663-006	121677-006	121664-006	121672-006
3025	119	6860	270	121676-007	121663-007	121677-007	121664-007	121672-007
3325	131	7620	300	121676-008	121663-008	121677-008	121664-008	121672-008
3555	140	8155	321	121676-009	121663-009	121677-009	121664-009	121672-009
3785	149	8660	341	121676-010	121663-010	121677-010	121664-010	121672-010
4065	160	9300	366	121676-011	121663-011	121677-011	121664-011	121672-011
4370	172	10160	400	121676-012	121663-012	121677-012	121664-012	121672-012
4520	178	10695	421	121676-013	121663-013	121677-013	121664-013	121672-013
4825	190	11225	442	121676-014	121663-014	121677-014	121664-014	121672-014

Chart 2 - Drive-In Rack Mast								
Collapsed Height		Lift Height		LH Cylinder Assembly Index 0	RH Cylinder Assembly Index 0	LH Cylinder Tube Index 1	RH Cylinder Tube Index 1	Ram Index 6
mm	in	mm	in					
2260	89	5025	798	129053-004	129056-004	129054-004	129057-004	131272-004
2415	95	5335	210	129053-005	129056-005	129054-005	129057-005	131272-005
2720	107	6100	240	129053-006	129056-006	129054-006	129057-006	131272-006
3025	119	6860	270	129053-007	129056-007	129054-007	129057-007	131272-007
3325	131	7620	300	129053-008	129056-008	129054-008	129057-008	131272-008
3555	140	8155	321	129053-009	129056-009	129054-009	129057-009	131272-009
3785	149	8660	341	129053-010	129056-010	129054-010	129057-010	131272-010
4065	160	9300	366	129053-011	129056-011	129054-011	129057-011	131272-011
4370	172	10160	400	129053-012	129056-012	129054-012	129057-012	131272-012
4520	178	10695	421	129053-013	129056-013	129054-013	129057-013	131272-013
4825	190	11225	442	129053-014	129056-014	129054-014	129057-014	131272-014

5829

RR/RD 5200/5200S



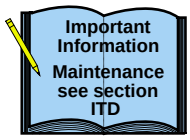
*121717- CYLINDER ASSEMBLY

Index	Part No.	Part Name	No. Req.
1	* See Below	Cylinder Tube	1
2	060015-078	Screw	1
	074240	Seal	1
3	125233	Valve Flow Control	1
4	125232	Spacer	1
5	064091-008	Plug Internal Hex with O-Ring	1
	061004-026	Adhesive Thread Lock .5cc	1
6	* See Below	Ram 65 mm (2.625 in.) O.D.	1
7	103487	Spring Compression	1
8	127489-002	Piston Shutoff	1
9	060009-096	Ring Retaining	2
10	084882-001	Bushing	1
11	060009-100	Ring Retaining	1
12	064135-007	Ring Wiper	1
13	121727	Cap	1
14	064132-042	Seal Rod	1
15	081161-020	Collar	1

123894	Kit Seal (Includes Index 2, 12 & 14)	1
091240-009	Poly Pack Tool (Used for Seal Installation)	1

Always Specify Model, Data & Serial Numbers

* Choice of part number depends on lift height. Lift height information is included in the truck data number (located on truck data plate).



Truck Data Number Example

Lift Height

-TT270C36-2PSF-BS-Q--

Collapsed Height mm	Collapsed Height in.	Lift Height mm	Lift Height in.	Cylinder Assembly	Index 1	Index 6
2260	89	5025	198	**121717-004**	**121718-004**	**121725-004**
2415	95	5335	210	**121717-005**	**121718-005**	**121725-005**
2720	107	6100	240	**121717-006**	**121718-006**	**121725-006**
3025	119	6860	270	**121717-007**	**121718-007**	**121725-007**
3325	131	7620	300	**121717-008**	**121718-008**	**121725-008**
3555	140	8155	321	**121717-009**	**121718-009**	**121725-009**
3785	149	8660	341	**121717-010**	**121718-010**	**121725-010**
4065	160	9300	366	**121717-011**	**121718-011**	**121725-011**
4370	172	10160	400	**121717-012**	**121718-012**	**121725-012**

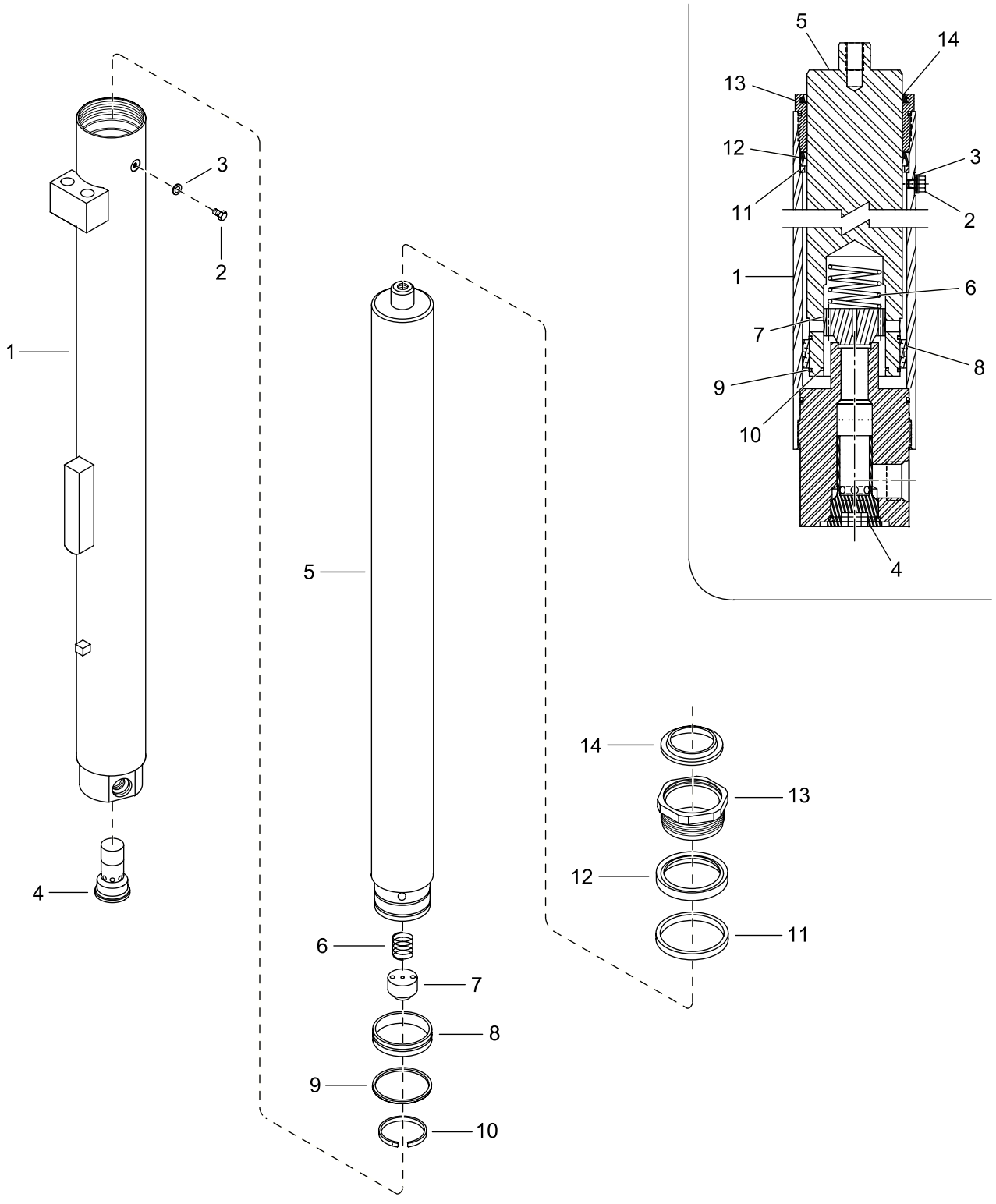


Figure 21640

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	*(1)	Cylinder Assembly	1
1	*(1)	Cylinder Tube	1
2	060015-078	Screw	1
3	074240	Seal	1
4	064336	Flow Regulator	1
	061004-006	Thread Locking Adhesive	AR
5	*(1)	Ram 65 mm (2.625 in) O.D.	1
6	103487	Compression Spring	1
7	127489-002	Shutoff Piston	1
8	084882-001	Bushing	1
9	060009-096	Retaining Ring	1
10	060009-100	Retaining Ring	1
11	081161-020	Collar	1
12	064132-042	Seal Rod	1
13	121727	Cap	1
14	064135-007	Wiper Ring	1
	123894	Seal Kit (Includes Index 2, 3, 12 & 14)	1
	091240-009	Poly Pak Tool (Used for Seal Installation)	1

(1) See Chart 1 - Cylinder Assembly

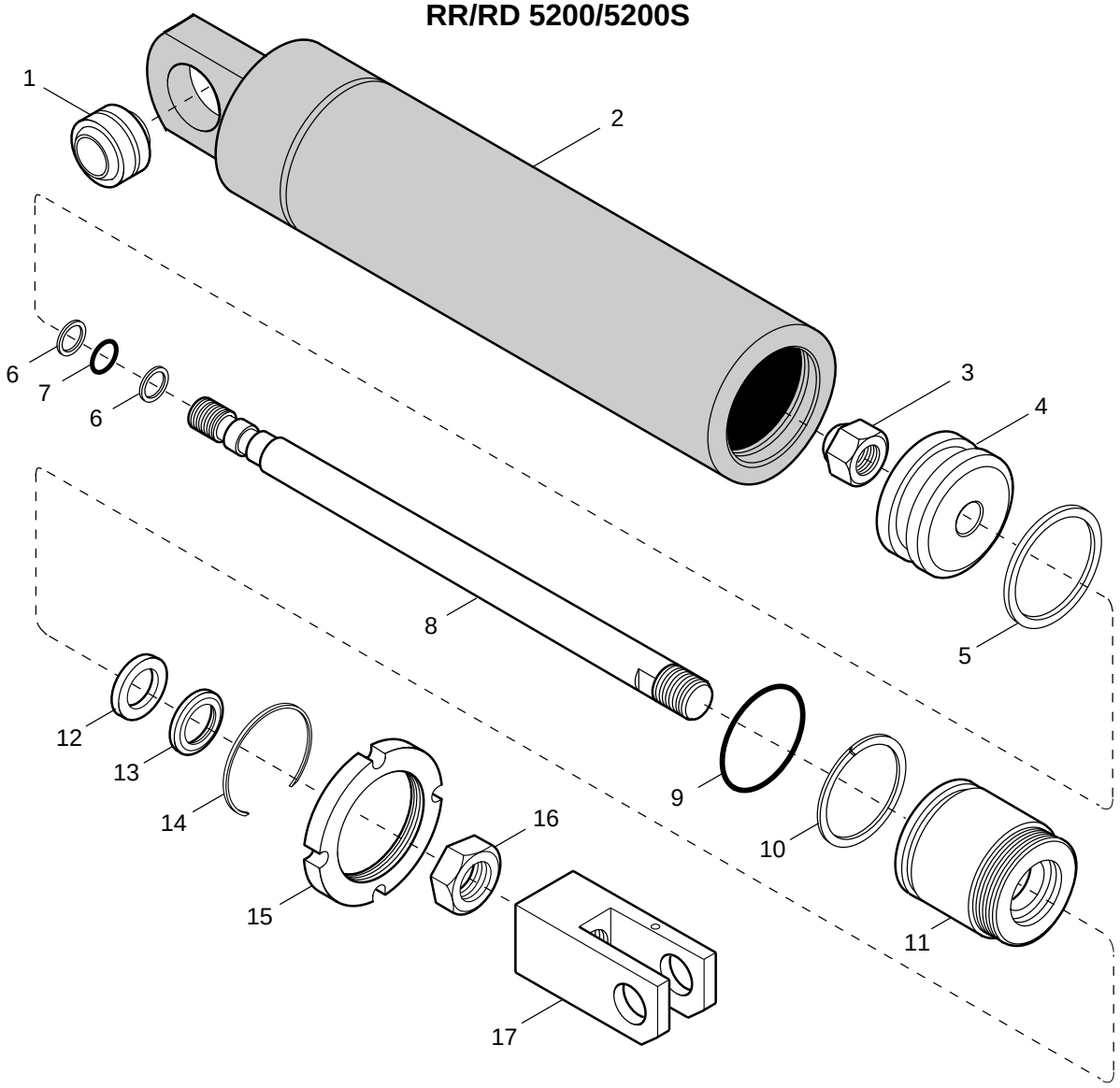
Chart 1 - Cylinder Assembly

Collapsed Height		Lift Height		Cylinder Assembly Index 0	Cylinder Tube Index 1	Ram Index 5
mm	in	mm	in			
2260	89	5025	198	130395-004	130394-004	121725-004
2415	95	5335	210	130395-005	130394-005	121725-005
2720	107	6100	240	130395-006	130394-006	121725-006
3025	119	6860	270	130395-007	130394-007	121725-007
3325	131	7620	300	130395-008	130394-008	121725-008
3555	140	8155	321	130395-009	130394-009	121725-009
3785	149	8660	341	130395-010	130394-010	121725-010
4065	160	9300	366	130395-011	130394-011	121725-011
4370	172	10160	400	130395-012	130394-012	121725-012
4520	178	10695	421	130395-013	130394-013	121725-013
4825	190	11225	442	130395-014	130394-014	121725-014

Always Specify Model, Data & Serial Number

5831

RR/RD 5200/5200S



112987 RD REACH CYLINDER ASSEMBLY
122298-001 RR REACH CYLINDER ASSEMBLY RH (Shown)
122298-002 RR REACH CYLINDER ASSEMBLY LH

Index	Part No.	Part Name	No. Req.
1	065012-001	Bushing Ball	1
2	112974	RD Tube	1
	122299	RR Tube RH	1
	122300	RR Tube LH Not Shown	1
3	060042-001	Nut	1
4	111924	Piston	1
5	064216-005	Seal Piston	1
6	064074-020	Ring Backup	2
7	064019-042	O-Ring	1
8	111923-001	RR Rod Piston	1
	111923-002	RD Rod Piston	1
9	064019-015	O-Ring	1
10	064074-005	Ring Backup	1
11	111927-001	Rod End	1
12	064132-037	Packing Rod	1
13	064135-009	Ring Wiper	1
14	111936	Retainer Wire	1
15	111937	Nut End Rod	1
16	060021-040	Nut	1
17	082469	Rod End	1
113745		Kit Seal (Includes Index 5, 6, 7, 9, 10, 12, 13, & 14)	1

Always Specify Model, Data & Serial Numbers

010328

7020 - E0-4469

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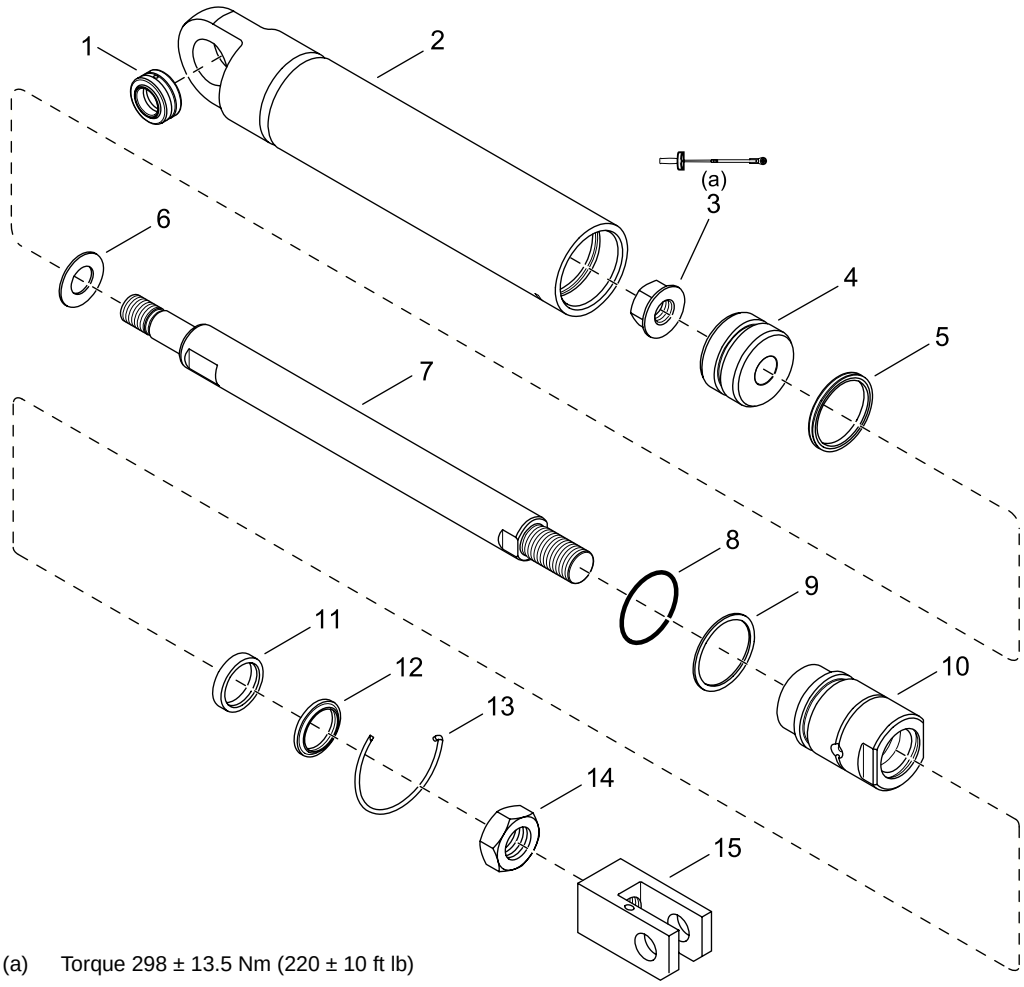


(a) Torque 298 ± 13.5 Nm (220 ± 10 ft lb)

Figure 21644

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	*(1)	Reach Cylinder Assembly	1
1	065012-010	Bushing Ball	1
2	*(1)	Tube	1
3	060080-011	Flange Nut	1
4	132396	Piston	1
5	064216-005	Piston Seal	1
6	060030-344	Flatwasher	1
7	*(1)	Piston Rod	1
8	064019-015	O-Ring	1
9	064074-005	Back-Up Ring	1
10	132398	Guide Rod	1
11	064132-050	Packing Rod	1
12	064135-019	Wiper Ring	1
13	133459-001	Retainer Wire	1
14	060021-040	Nut	1
	061004-004	Thread Locking Adhesive	AR
15	136694	End Rod	1
	134137	Seal Kit (Includes Index 5, 8, 9, 11, 12 & 13)	1

(1) See Chart 1 - Reach Cylinder Assembly

***** To select appropriate part number, use the data number to determine truck features. Refer to Introduction.

Chart 1 - Reach Cylinder Assembly

Series	Orientation	Index 0 Reach Cylinder Assembly	Index 2 Tube	Index 7 Piston Rod
RR	RH	132419	132420	132397-001
	LH	133460	132421	132397-001
RD	RH	132388	132389	132397-002
	LH	132393	132394	132397-002

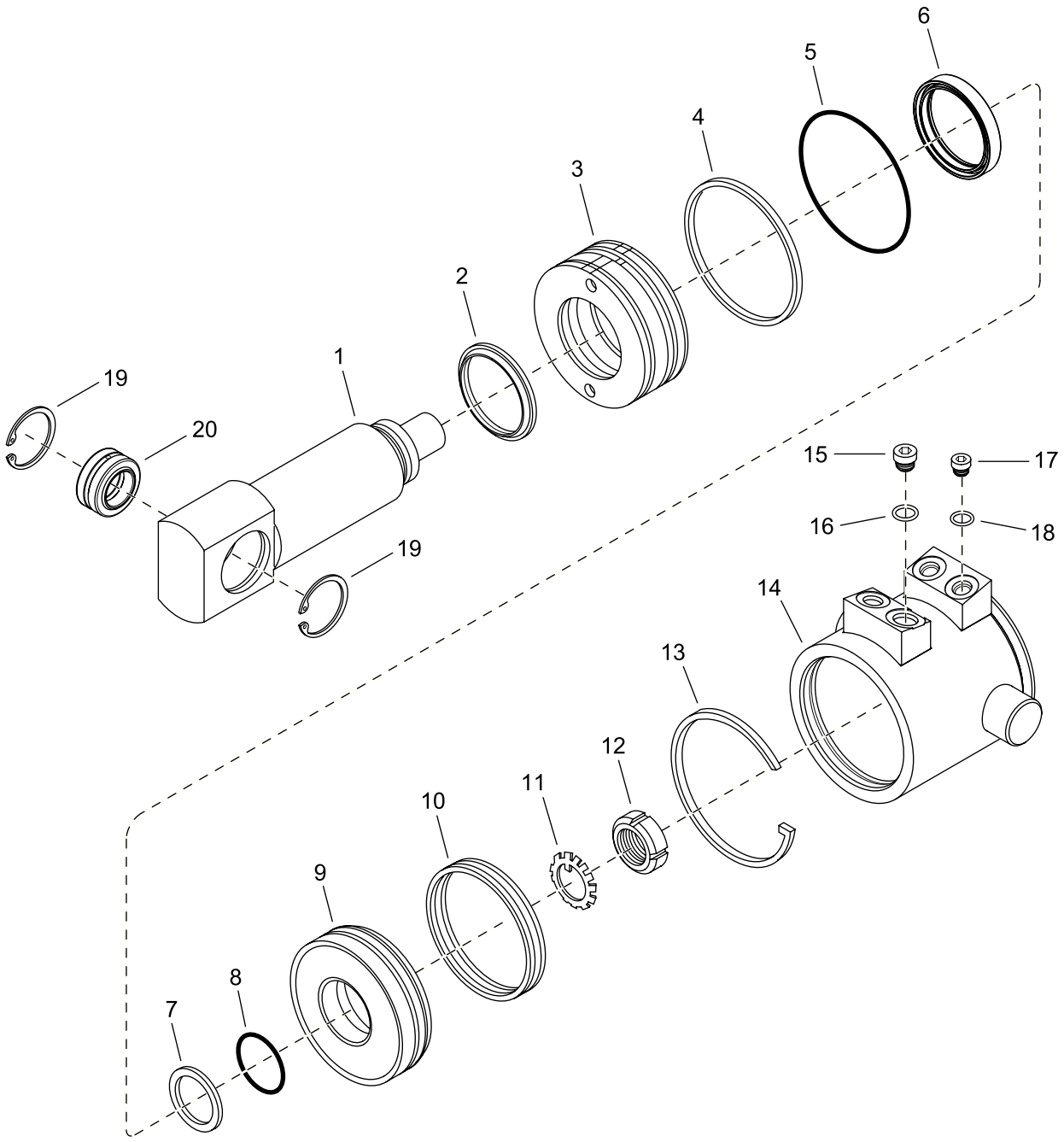


Figure 21651

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	123399-001	Tilt Cylinder	1
1	088579	Piston Rod	1
2	064135-002	Wiper Ring	1
3	082305	Cap	1
4	064074-012	Back-Up Ring	1
5	064019-040	O-Ring	1
6	064132-010	Packing Rod	1
7	064074-013	Back-Up Ring	1
8	064019-041	O-Ring	1
9	105206	Piston	1
10	064216-002	Piston Seal	1
11	060044-004	Lockwasher	1
12	060043-004	Locknut	1
13	073981-003	Square Wire Retainer	1
14	122492-001	Cylinder Tube	1
15	064091-006	Plug	1
16	064019-031	O-Ring	1
17	064091-002	Plug	1
18	064019-029	O-Ring	1
19	060009-030	Retaining Ring	2
20	065012-004	Ball Bushing	1
	089178	Seal (Includes Index 2, 4, 5, 6, 7, 8 & 10)	1

Always Specify Model, Data & Serial Number

CYLINDER PARTS
Sideshift Cylinder

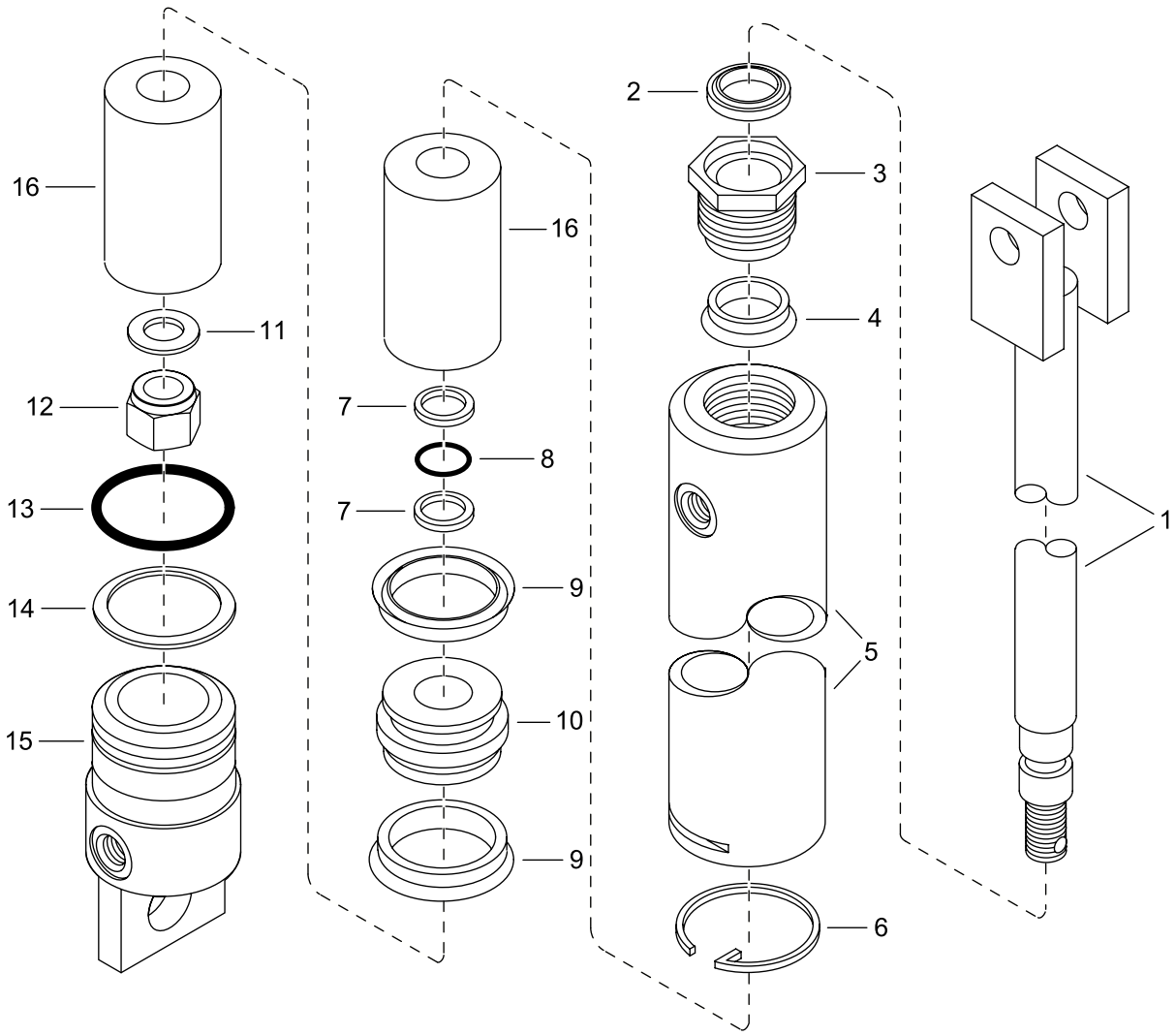


Figure 21652

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	093559-002*	Cylinder Assembly 100 mm (4.0 in)	1
	093559-004*	Cylinder Assembly 50 mm (2.0 in)	1
1	085130-002*	Rod 100 mm (4.0 in) Sideshift	1
	085130-004*	Rod 50 mm (2.0 in) Sideshift	1
2	064069-007	Ring Wiper	1
3	083397	Adjustor Seal	1
4	064132-011	Packing Rod	1
5	085262	Tube Cylinder	1
6	073981-009	Ring Retaining	1
7	064074-004	Ring Back-Up	2
8	064019-025	O-Ring	1
9	064133-005	U-Cup Piston	2
10	085132	Piston	1
11	060030-041	Flatwasher	1
12	060042-005	Nut Self-Locking	1
13	064019-006	O-Ring	1
14	064074-018	Ring Back-Up	1
15	093558	Chamber Cushion	1
16	088587*	Spacer 50 mm (2.0 in) Sideshift	2
	101343	Kit Seal (Includes Index 2, 4, 6, 7, 8, 9, 13, & 14)	1

***** To select appropriate part number, use the data number to determine truck features. Refer to Introduction.

Always Specify Model, Data & Serial Number

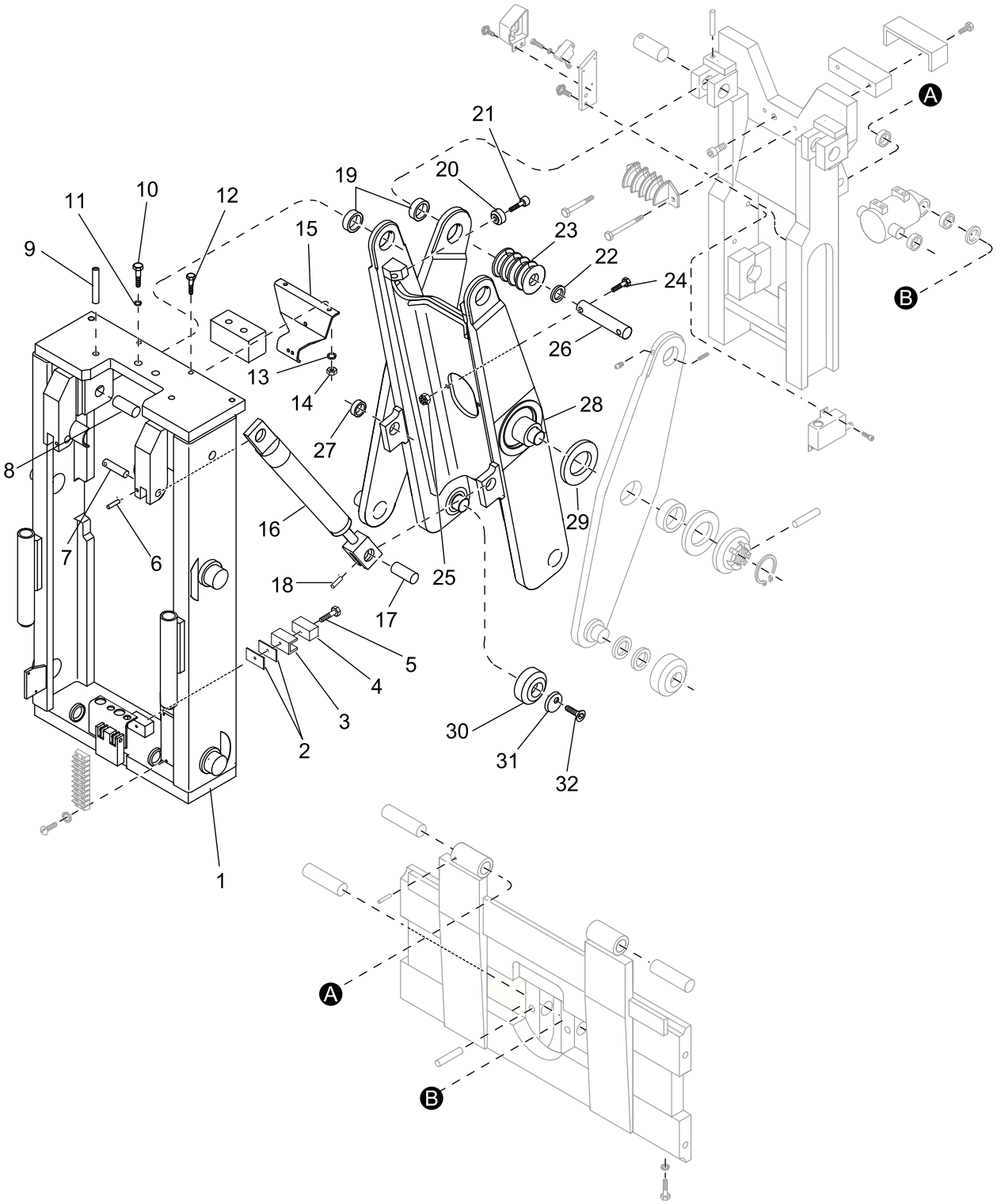


Figure 19535-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	122273-002	Reach Support - 35 Models	1
	122159-002	Reach Support - 45 Models	1
	129292-002	Reach Support - 45 Models (drive in rack mast option)	1
2	074481-001	Shim	AR
	074481-004	Shim	AR
	074481-005	Shim	AR
3	092746-001	Bracket	1
4	092747-001	Poly Stop	1
5	060015-068	Screw	1
	061004-019	Thread Locking Adhesive	1
6	060000-104	Roll Pin	2
7	113516	Pivot Shaft	2
8	093680	Shaft	2
9	060000-029	Roll Pin	2
10	060016-065	Screw	2
11	060005-008	Lockwasher	2
12	060016-088	Screw	2
13	060005-008	Lockwasher	2
14	060021-009	Nut	2
15	122168	Hose Guide	1
16		Reach Cylinder, refer to Cylinder Parts	1
17	082579*	Pivot Shaft	2
	088892*	Pivot Shaft (Freezer/Corrosion)	2
18	060000-090	Roll Pin	2
19	065012-007	Ball Bushing	2
20	124018	Poly Stop	2
21	060017-050	Cap Screw	2
	061004-019	Thread Locking Adhesive	1
22	060030-279	Flatwasher	2
23	123474-001	Pulley	1
24	060015-048	Screw	2
25	060042-006	Lock Nut	2
26	122927	Mounting Pin	1
27	065012-001	Ball Bushing	2
28	122922-001	Inner Arm	1
29	082381	Thrust Washer	2
30	076293	Carriage Roller	2
31	076143	Cap	2
32	060016-022	Screw	2
	061004-019	Thread Locking Adhesive	1

***** To select appropriate part number, use the data number to determine truck features. Refer to Introduction.

Always Specify Model, Data & Serial Number

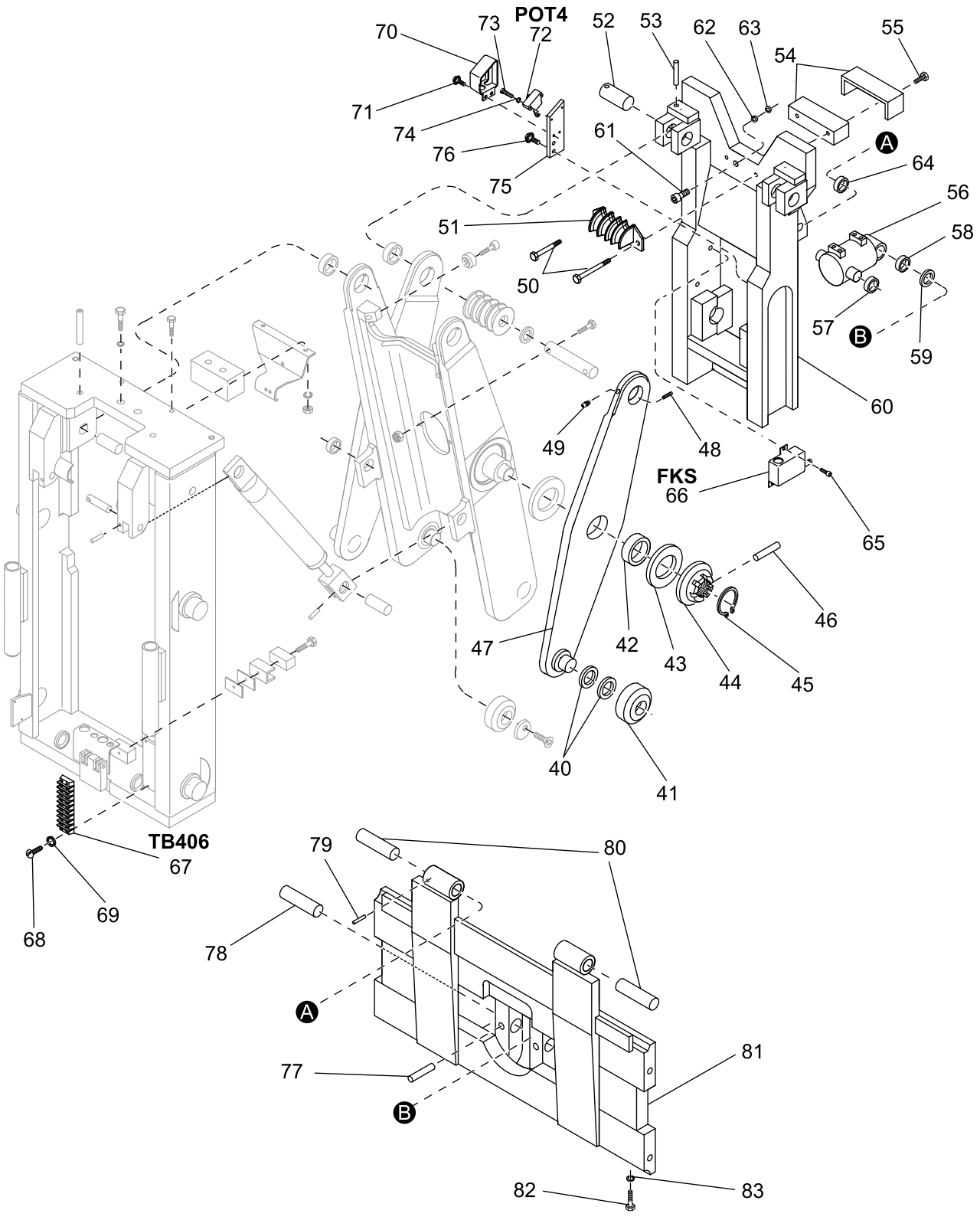
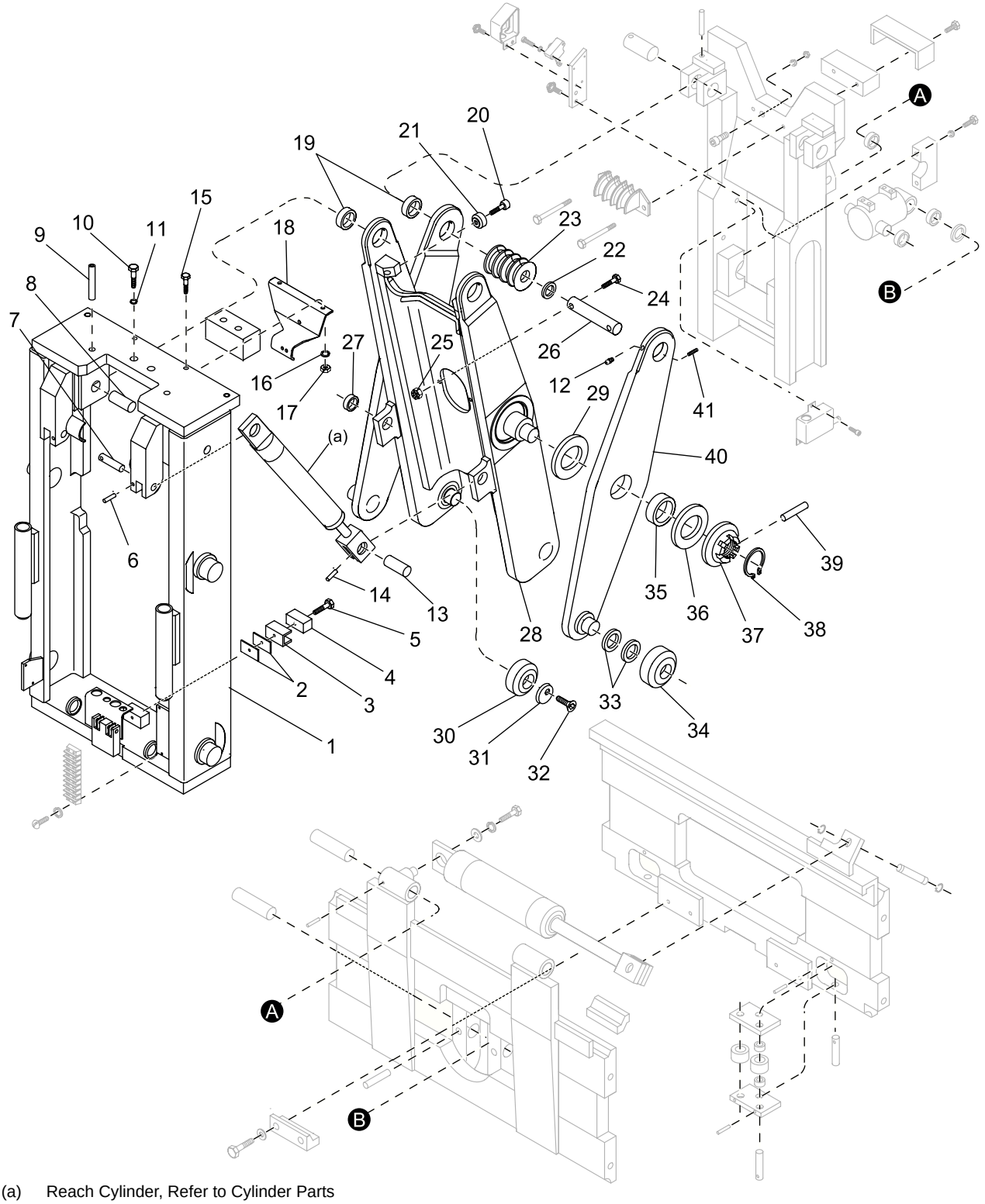


Figure 19536

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
40	060030-085	Flatwasher	AR
41	074668-001	Column Roller	2
42	065007-052	Bushing	2
43	082381	Thrust Washer	2
44	082384	Lock Nut	2
45	060009-049	Retaining Ring	2
46	060077-002	Roll Pin	2
47	100116-001	Outer Arm	2
48	060015-050	Set Screw	2
	061004-019	Thread Locking Adhesive	1
49	076048-002	Lubrication Fitting	6
50	060015-064	Screw	1
	060015-069	Screw	1
51	123402	Guide	1
52	093680	Shaft	2
53	060000-029	Roll Pin	2
54	129830-002	Cover	1
55	060015-004	Screw	2
56		Tilt Cylinder, refer to Cylinder Parts	1
57	065007-018	Bearing Sleeve	2
58	065012-004	Ball Bushing	1
59	060009-030	Retaining Ring	2
60	123393-001	Carriage	1
61	060015-019	Screw	1
62	060005-007	Lockwasher	1
63	060021-006	Nut	1
64	065007-017	Sleeve Bearing	4
65	060015-003	Screw	2
66		Tilt Switch, refer to Electrical Parts	1
67	079564-001	Terminal Block	1
	079565-001	.Marking Strip	1
	105605-406	.TB Label	1
68	060013-017	Screw	2
69	060005-004	Lockwasher	2
70	128003	Cover	1
71	060014-088	Hex Flange Screw	2
72	127842	Tilt Position Assist Sensor	1
73	060012-023	Screw	2
74	060005-048	Lockwasher	2
75	127845	Mounting Plate	1
76	060015-117	Hex Flange Screw	2
77	060000-066	Roll Pin	1
78	143654	Cylinder Shaft	1
79	060000-054	Roll Pin	2
80	143655	Pivot Shaft	2
81	093560-002	Fork Plate	1
82	060016-035	Screw	2
83	060005-008	Lockwasher	2



(a) Reach Cylinder, Refer to Cylinder Parts

Figure 19537

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	122273-002	Reach Support - 35 Models	1
	122159-002	Reach Support - 45 Models	1
	129292-002	Reach Support - 45 Models (drive in rack mast option)	1
2	074481-001	Shim	AR
	074481-004	Shim	AR
	074481-005	Shim	AR
3	092746-001	Bracket	1
4	092747-001	Poly Stop	1
5	060015-068	Screw	1
	061004-019	Thread Locking Adhesive	1
6	060000-104	Roll Pin	2
7	113516	Pivot Shaft	2
8	093680	Shaft	2
9	060000-029	Roll Pin	2
10	060016-065	Screw	2
11	060005-008	Lockwasher	2
12	076048-002	Lubrication Fitting	6
13	082579	Pivot Shaft	2
	088892	Pivot Shaft (Freezer/Corrosion)	2
14	060000-090	Roll Pin	2
15	060016-088	Screw	2
16	060005-008	Lockwasher	2
17	060021-009	Nut	2
18	122168	Hose Guide	1
19	065012-007	Ball Bushing	2
20	124018	Poly Stop	2
21	060017-050	Cap Screw	2
	061004-019	Thread Locking Adhesive	1
22	060030-279	Flatwasher	2
23	123474-001	Pulley	1
24	060015-048	Screw	2
25	060042-006	Lock Nut	2
26	122927	Mounting Pin	1
27	065012-001	Ball Bushing	2
28	122922-001	Inner Arm	1
29	082381	Thrust Washer	2
30	076293	Carriage Roller	2
31	076143	Cap	2
32	060016-022	Screw	2
	061004-019	Thread Locking Adhesive	1
33	060030-085	Flatwasher	AR
34	074668-001	Column Roller	2
35	065007-052	Bushing	2
36	082381	Thrust Washer	2
37	082384	Lock Nut	2
38	060009-049	Retaining Ring	2
39	060077-002	Roll Pin	2
40	100116-001	Outer Arm	2
41	060015-050	Set Screw	2
	061004-019	Thread Locking Adhesive	1

Always Specify Model, Data & Serial Number

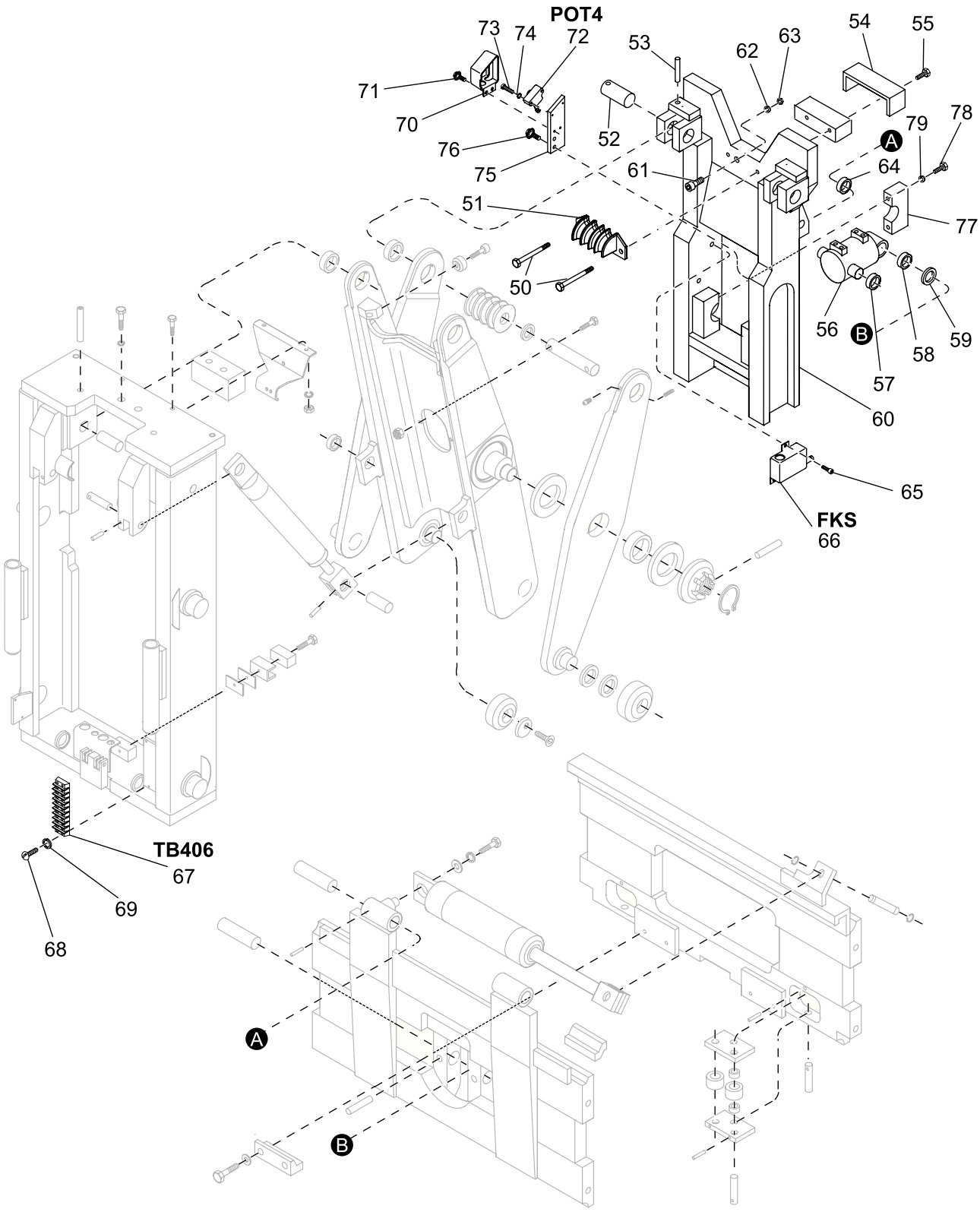


Figure 19540

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
50	060015-064	Screw	2
	060015-069	Screw	1
51	123402	Guide	1
52	093680	Shaft	2
53	060000-029	Roll Pin	2
54	129830-001	Cover	1
55	060015-004	Screw	2
56		Tilt Cylinder, refer to Cylinder Parts	1
57	065007-018	Bearing Sleeve	2
58	065012-004	Ball Bushing	1
59	060009-030	Retaining Ring	2
60	123393-001	Carriage	1
61	060015-019	Screw	1
62	060005-007	Lockwasher	1
63	060021-006	Nut	1
64	065007-017	Sleeve Bearing	4
65	060015-003	Screw	2
66		Tilt Switch, refer to Electrical Parts	1
67	079564-001	Terminal Block	1
	079565-001	Marking Strip	1
	105605-406	TB Label	1
68	060013-017	Screw	2
69	060005-004	Lockwasher	2
70	128003	Cover	1
71	060014-088	Hex Flange Screw	2
72	127842	Tilt Position Assist Sensor	1
73	060012-023	Screw	2
74	060005-048	Lockwasher	2
75	127845	Mounting Plate	1
76	060015-117	Hex Flange Screw	2
77	082262	Bracket	2
78	060017-026	Screw	4
79	060005-008	Lockwasher	4

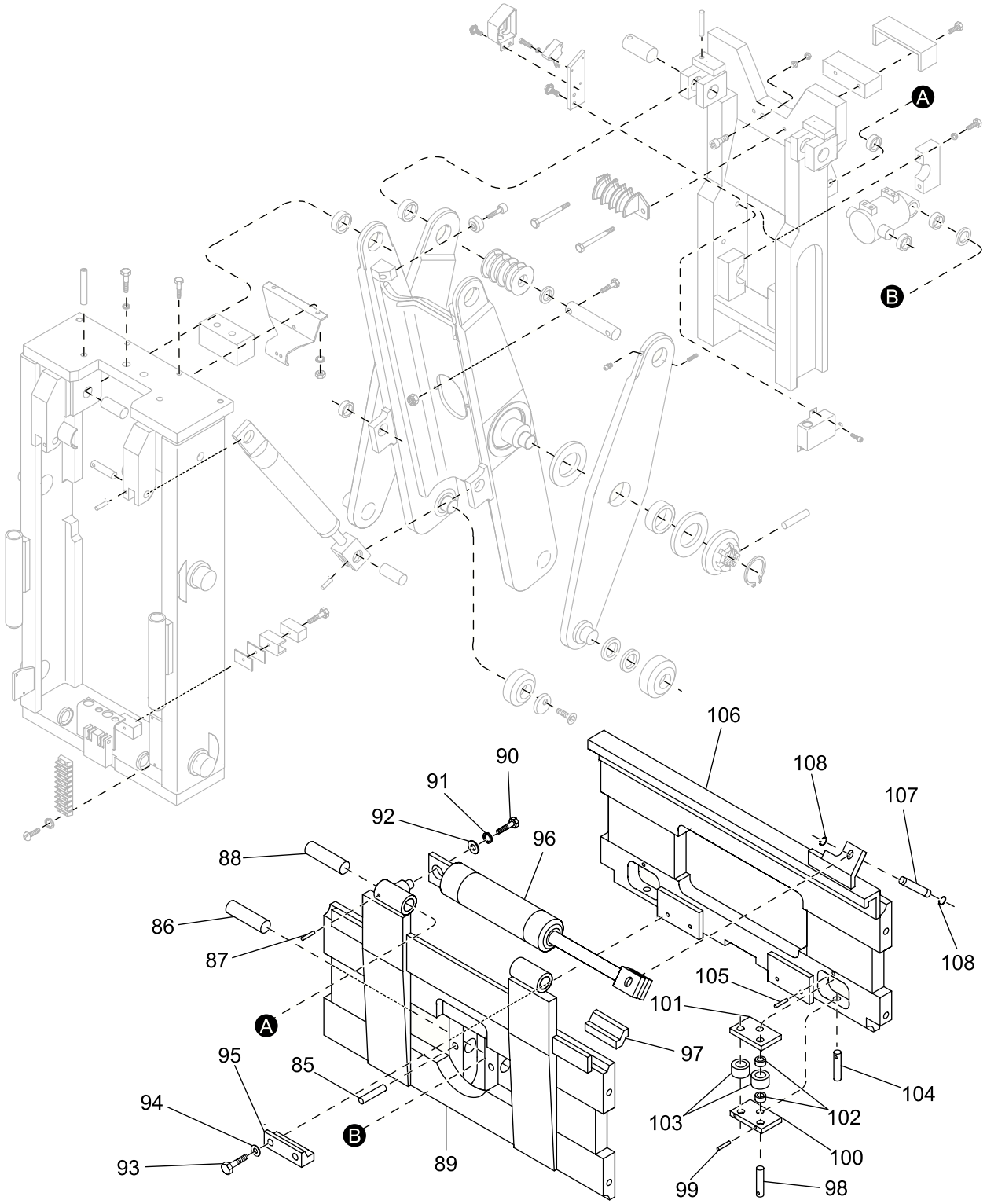


Figure 19541

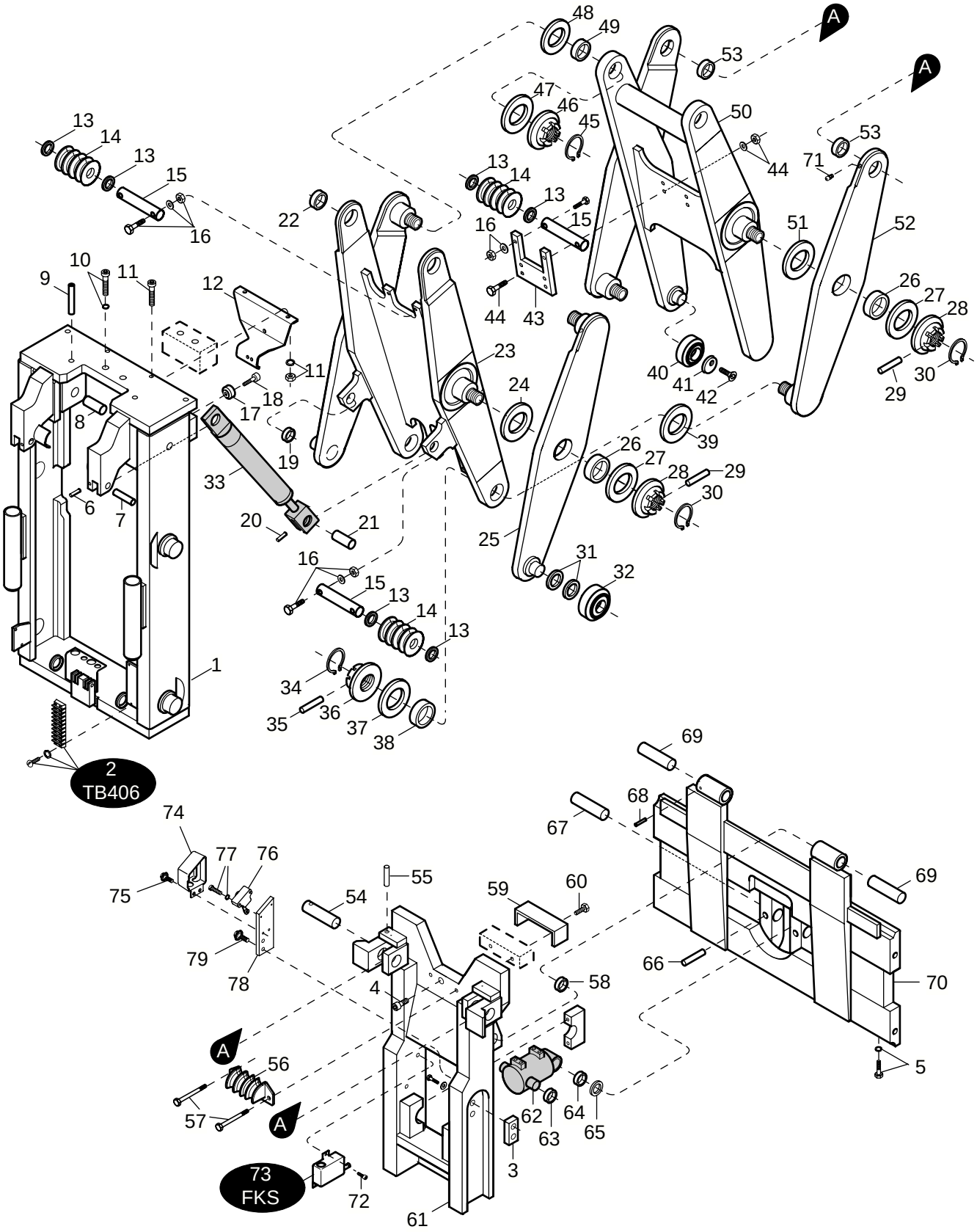
INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
85	060000-066	Roll Pin	1
86	143654	Cylinder Shaft	1
87	060000-054	Roll Pin	2
88	143655	Pivot Shaft	2
89	093560-002	Fork Plate	1
90	060017-007	Screw	1
91	060005-009	Lockwasher	1
92	060030-078	Flatwasher	1
93	060019-039	Screw	4
94	060005-029	Lockwasher	4
95	085144	Lower Hanger	2
96		Sideshift Cylinder, refer to Cylinder Parts	1
97	085188	Slide	6
98	085143*	Shaft	4
	088910*	Shaft Freezer/Corrosion	4
99	060000-030	Roll Pin	4
100	085137-001	Lower Support	2
101	085137-002	Upper Support	2
102	065007-026	Bushing	8
103	085142	Roller	4
104	085239*	Shaft	2
	088909*	Shaft Freezer/Corrosion	2
105	060000-018	Roll Pin	2
106	085152	Fork Carriage	1
107	076235-003*	Pivot Shaft	1
	088893-002*	Pivot Shaft Freezer/Corrosion	1
108	060009-005	Retaining Ring	2

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number

5912-01

RD 5200/5200S
RD 5200(AC)/5200S(AC)

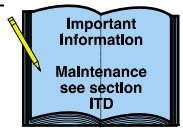


Index	Part No.	Part Name	No. Req.
1	122301	Reach Support	1
	129090	Reach Support, Drive In Rack	
		Mast Option	1
2	079564-001	Block Terminal	1
	079565-001	Strip Marking	1
	105605-406	Label TB	1
	060013-017	Screw	2
	060005-004	Lockwasher	2
3	090440-004	Spacer	2
	060005-009	Lockwasher	4
	060017-007	Screw	4
4	060015-019	Screw	1
	060005-007	Lockwasher	1
	060021-006	Nut	1
5	060016-035	Screw	2
	060005-008	Lockwasher	2
6	060000-104	Roll Pin	2
7	113516	Shaft Pivot	2
8	* 093680	Shaft	2
	* 093735	Shaft Freezer/Corrosion	2
9	060000-029	Roll Pin	2
10	060016-065	Screw	2
	060005-008	Lockwasher	2
11	060016-088	Screw	2
	060005-008	Lockwasher	2
	060021-009	Nut	2
12	122168	Hose Guide	1
	060016-082	Screw	1
	060042-010	Lockwasher	1
13	060030-279	Flatwasher	6
14	123474-001	Pulley	3
15	122927	Pin Mtg.	3
16	060015-079	Screw	6
	060005-007	Lockwasher	6
	060021-006	Nut	6
17	124018	Stop Poly	2
18	060017-050	Screw Cap	2
	061004-019	Adhesive Thread Locking	1
19	065012-001	Bushing Ball	2
20	060000-079	Roll Pin	2
21	* 082579	Shaft Pivot	2
	* 088892	Shaft Pivot Freezer Corrosion	2
22	065012-007	Bushing Ball	2
23	122924-001	Arm Inner Primary	1
24	082381	Washer Thrust	2
25	100103-001	Arm Outer RH	1
	100103-002	Arm Outer LH	1
26	065007-052	Bushing	2
27	082381	Washer Thrust	4
28	082384	Nut Lock	4
29	060077-002	Pin Groove	4
30	060009-049	Ring Retaining	4
31	060030-085	Flatwasher	AR
32	074668-001	Roller Column	2
33		Cylinder Reach Section 8.5	2
34	060009-049	Ring Retaining	2
35	060077-002	Pin Groove	2
36	085161	Nut Lock	2
37	085158-002	Washer Thrust	2
38	065007-077	Bearing Sleeve	2
39	085158-001	Washer Thrust	2
40	076293	Roller Carriage	2
41	076143	Cap	2
42	060016-022	Screw	2
	061004-019	Adhesive Thread Locking	1
43	122926	Plate	1
44	060016-019	Screw	4
	060005-008	Lockwasher	4
	060021-009	Nut	4
45	060009-049	Ring Retaining	2
46	085161	Nut Lock	2
	060077-002	Pin Groove	2
47	085158-002	Washer Thrust	2
48	085158-001	Washer Thrust	2
49	065007-077	Bearing Sleeve	2
50	112943-001	Arm Inner Secondary	1
51	082381	Washer Thrust	2
52	100116-002	Arm Outer RH	1
	100116-003	Arm Outer LH	1
53	065012-007	Bushing	2
54	* 093680	Shaft	2
	* 093735	Shaft Freezer Corrosion	2
55	060000-029	Roll Pin	2
56	123402	Guide	1
57	060015-064	Screw	1
	060015-069	Screw	1
58	065007-017	Bearing Sleeve	4
59	129830-002	Cover	1
60	060015-004	Screw	2
61	123393-002	Carriage	1
62		Cylinder Tilt Section 8.6	1
63	065007-018	Bearing Sleeve	2
64	065012-004	Bushing Ball	1
65	060009-030	Ring Retaining	2
66	060000-066	Roll Pin	1
67	* 093554	Shaft Cylinder	1
	* 093736	Shaft Cylinder Freezer/Corrosion	1
68	060000-054	Roll Pin	2
69	* 082205	Shaft Pivot	2
	* 088891	Shaft Pivot Freezer/Corrosion	2
70	093560-002	Fork Plate	1
71	076048-001	Fitting Lubrication	8
	076048-002	Fitting Lubrication	4
72	060015-003	Screw	2

Index	Part No.	Part Name	No. Req.
73		Tilt Switch See Section 04.8	1
74	128003	Cover	1
75	060014-088	Screw Hex Flange	2
76	127842	Sensor Tilt Position Assist	1
77	060012-023	Screw	2
	060005-048	Lockwasher	2
78	127845	Plate Mounting	1
79	060015-117	Screw Hex Flange	2

Always Specify Model, Data & Serial Numbers

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



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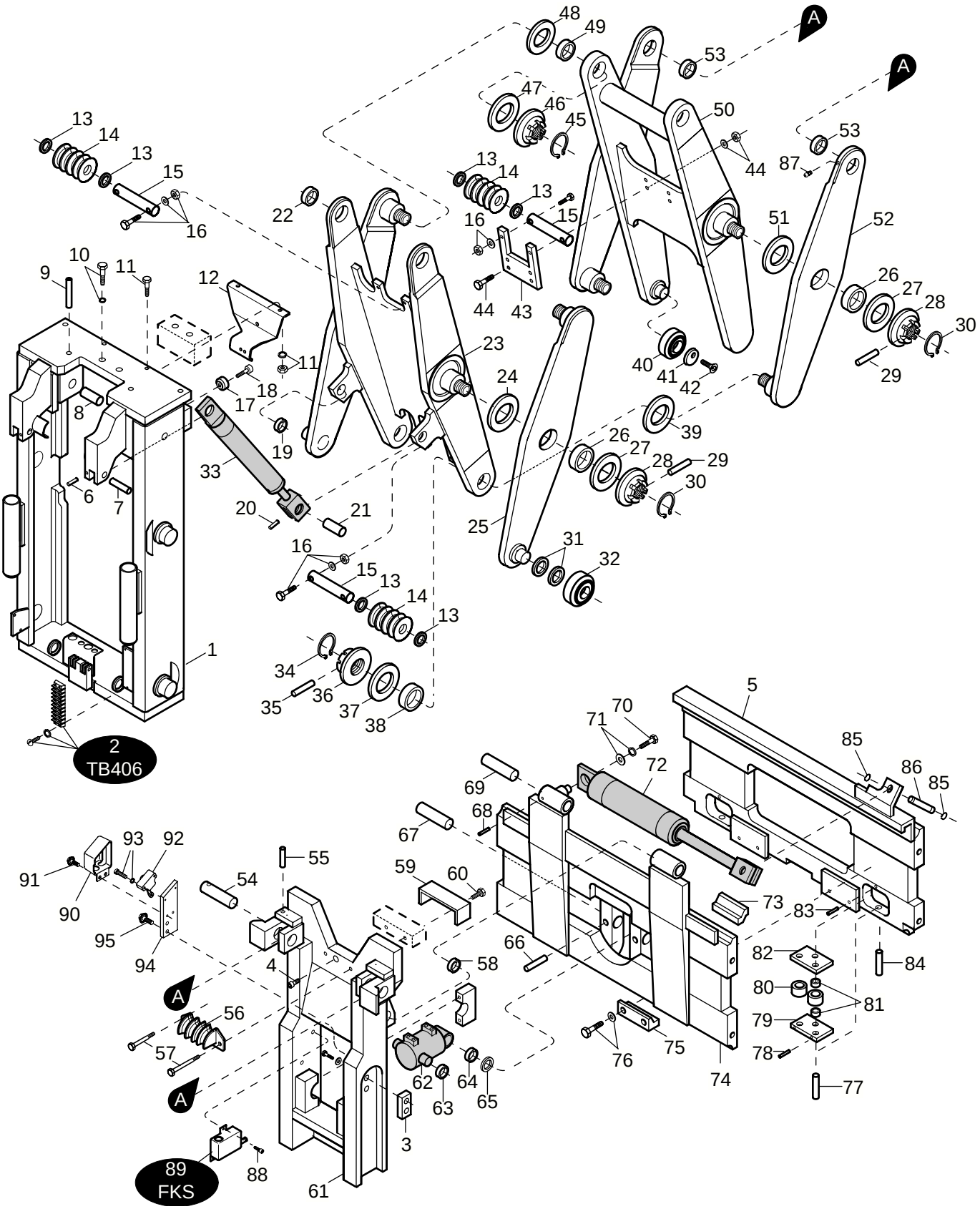
5865-01

RD 5200/5200S
RD 5200 (AC)/5200S (AC)

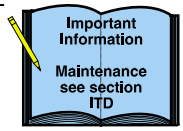


Index	Part No.	Part Name	No. Req.
1	122301	Reach Support	1
	129090	Reach Support, Drive In Rack	
		Mast Option	1
2	079564-001	Block Terminal	1
	079565-001	Strip Marking	1
	105605-406	Label TB	1
	060013-017	Screw	2
	060005-004	Lockwasher	2
3	090440-003	Spacer	2
	060005-009	Lockwasher	4
	060017-007	Screw	4
4	060015-019	Screw	1
	060005-007	Lockwasher	1
	060021-006	Nut	1
5	085152	Fork Carriage	1
6	060000-104	Roll Pin	2
7	113516	Shaft Pivot	2
8	* 093680	Shaft	2
	* 093735	Shaft Freezer/Corrosion	2
9	060000-029	Roll Pin	2
10	060016-065	Screw	2
	060005-008	Lockwasher	2
11	060016-088	Screw	2
	060005-008	Lockwasher	2
	060021-009	Nut	2
12	122168	Hose Guide	1
	060016-082	Screw	1
	060042-010	Lockwasher	1
13	060030-279	Flatwasher	6
14	123474-001	Pulley	3
15	122927	Pin Mtg.	3
16	060015-079	Screw	6
	060005-007	Lockwasher	6
	060021-006	Nut	6
17	124018	Stop Poly	2
18	060017-050	Screw Cap	2
	061004-019	Adhesive Thread Locking	1
19	065012-001	Bushing Ball	2
20	060000-079	Roll Pin	2
21	* 082579	Shaft Pivot	2
	* 088892	Shaft Pivot Freezer Corrosion	2
22	065012-007	Bushing Ball	2
23	122924-001	Arm Inner Primary	1
24	082381	Washer Thrust	2
25	100103-001	Arm Outer R.H.	1
	100103-002	Arm Outer L.H.	1
26	065007-052	Bushing	2
27	082381	Washer Thrust	4
28	082384	Nut Lock	4
29	060077-002	Pin Groove	4
30	060009-049	Ring Retaining	4
31	060030-085	Flatwasher	AR
32	074668-001	Roller Column	2
33		Cylinder Reach Section 8.5	2
34	060009-049	Ring Retaining	2
35	060077-002	Pin Groove	2
36	085161	Nut Lock	2
37	085158-002	Washer Thrust	2
38	065007-077	Bearing Sleeve	2
39	085158-001	Washer Thrust	2
40	076293	Roller Carriage	2
41	076143	Cap	2
42	060016-022	Screw	2
	061004-019	Adhesive Thread Locking	1
43	122926	Plate	1
44	060016-019	Screw	4
	060005-008	Lockwasher	4
	060021-009	Nut	4
45	060009-049	Ring Retaining	2
46	085161	Nut Lock	2
	060077-002	Pin Groove	2
47	085158-002	Washer Thrust	2
48	085158-001	Washer Thrust	2
49	065007-077	Bearing Sleeve	2
50	112943-001	Arm Inner Secondary	1
51	082381	Washer Thrust	2
52	100116-002	Arm Outer R.H.	1
	100116-003	Arm Outer L.H.	1
53	065012-007	Bushing	2
54	* 093680	Shaft	2
	* 093735	Shaft Freezer Corrosion	2
55	060000-029	Roll Pin	2
56	123402	Guide	1
57	060015-064	Screw	1
	060015-069	Screw	1
58	065007-017	Bearing Sleeve	4
59	129830-002	Cover	1
60	060015-004	Screw	2
61	123393-002	Carriage	1
62		Cylinder Tilt Section 8.6	1
63	065007-018	Bearing Sleeve	2
64	065012-004	Bushing Ball	1
65	060009-030	Ring Retaining	2
66	060000-066	Roll Pin	1
67	* 093554	Shaft Cylinder	1
	* 093736	Shaft Cylinder Freezer/Corrosion	1
68	060000-054	Roll Pin	2
69	* 082205	Shaft Pivot	2
	* 088891	Shaft Pivot Freezer/Corrosion	2
70	060017-007	Screw	1
71	060005-009	Lockwasher	1
	060030-078	Flatwasher	1
72		Cylinder Side-Shift Section 8.7	1
73	085188	Slide	6

Index		Part No.	Part Name	No. Req.
74		093560-002	Fork Plate	1
75		085144	Hanger Lower	2
76		060019-039	Screw	4
		060005-029	Lockwasher	4
77	*	085143	Shaft	4
	*	088910	Shaft Freezer/Corrosion	4
78		060000-030	Roll Pin	4
79		085137-001	Support Lower	2
80		085142	Roller	4
81		065007-026	Bushing	8
82		085137-002	Support Upper	2
83		060000-018	Roll Pin	2
84	*	085239	Shaft	2
	*	088909	Shaft Freezer/Corrosion	2
85		060009-005	Ring Retaining	2
86	*	076235-003	Shaft	1
	*	088893-002	Shaft Freezer/Corrosion	1
87		076048-001	Fitting Lubrication	8
		076048-002	Fitting Lubrication	4
88		060015-003	Screw	2
89			Tilt Switch See Section 04.8	1
90		128003	Cover	1
91		060014-088	Screw Hex Flange	2
92		127842	Sensor Tilt Position Assist	1
93		060012-023	Screw	2
		060005-048	Lockwasher	2
94		127845	Plate Mounting	1
95		060015-117	Screw Hex Flange	2

Always Specify Model, Data & Serial Numbers

* To select part number, refer to truck data number. The data number consists of letters and numbers that represent truck features. Refer to section ITD.



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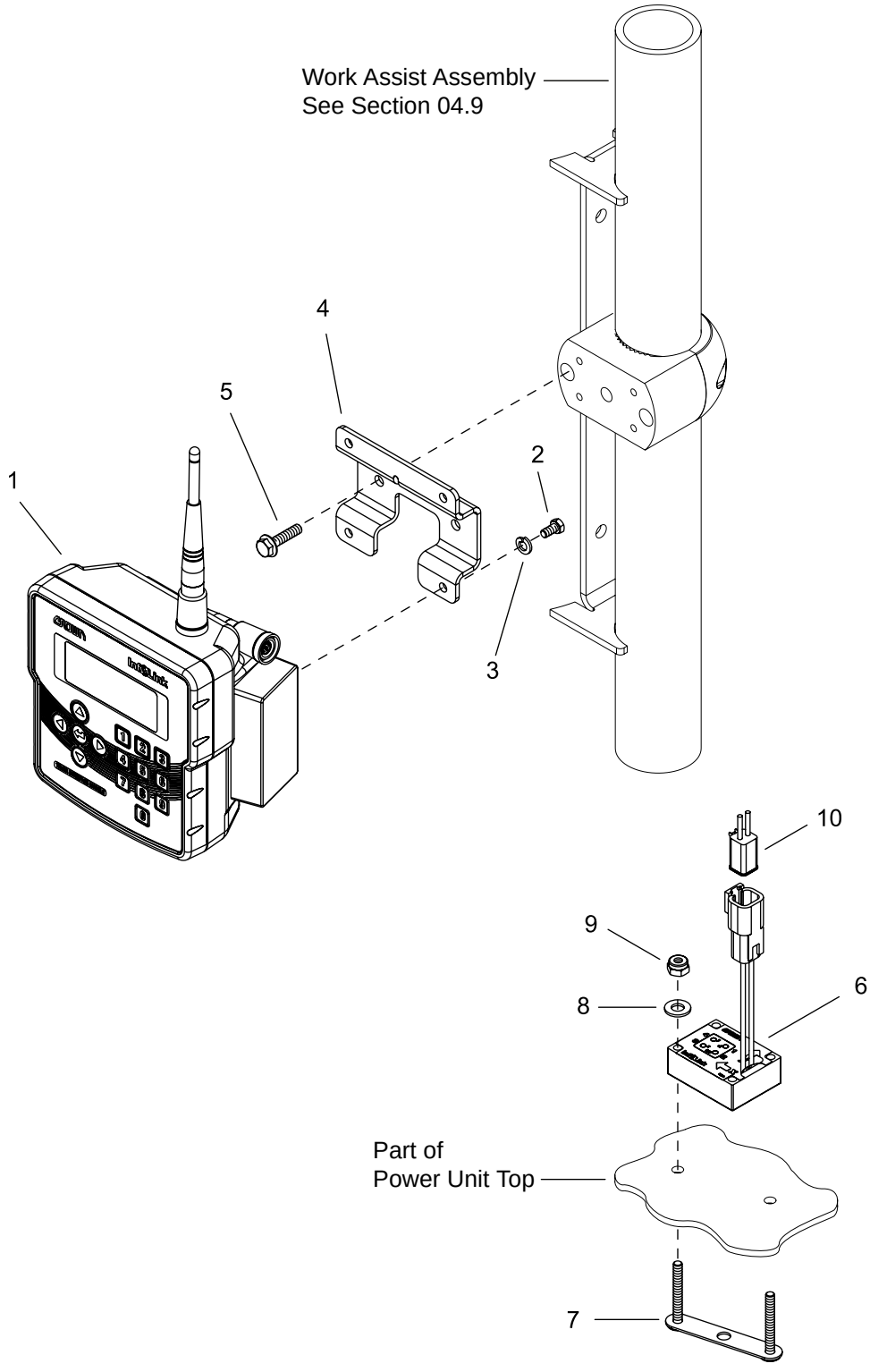


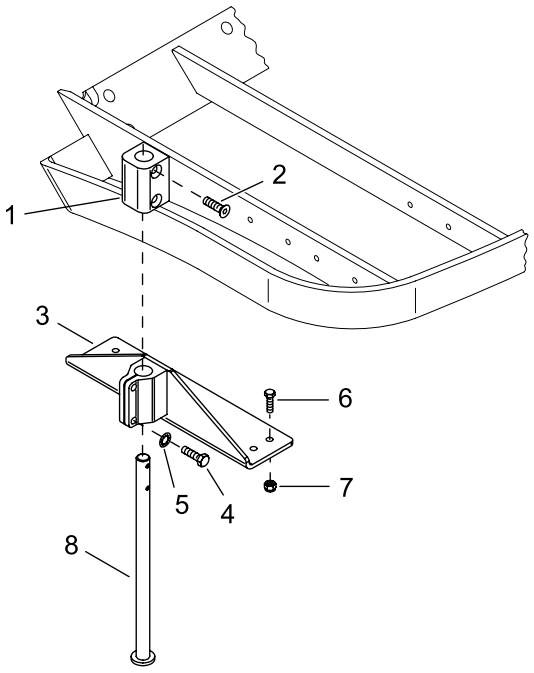
Figure 16023

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	140253-001*	InfoLink Kit With Proximity Reader Includes Index 1 - 4	1
	140253-002*	InfoLink Kit Without Proximity Reader Includes Index 1 - 4	1
1	134791-001*	InfoLink Module With Proximity Reader Included in -001 Kit	1
	134791-002*	InfoLink Module Without Proximity Reader Included in -002 Kit	1
2	060061-006	Screw	4
3	060005-005	Lockwasher	4
4	139899	Bracket	1
5	060062-038	Screw	2
6	140382	Impact Sensor Module	1
7	145969	Bracket	1
8	060030-074	Flatwasher	2
9	060042-016	Locking Nut	2
10	140557	Impact Sensor Harness Extension	1

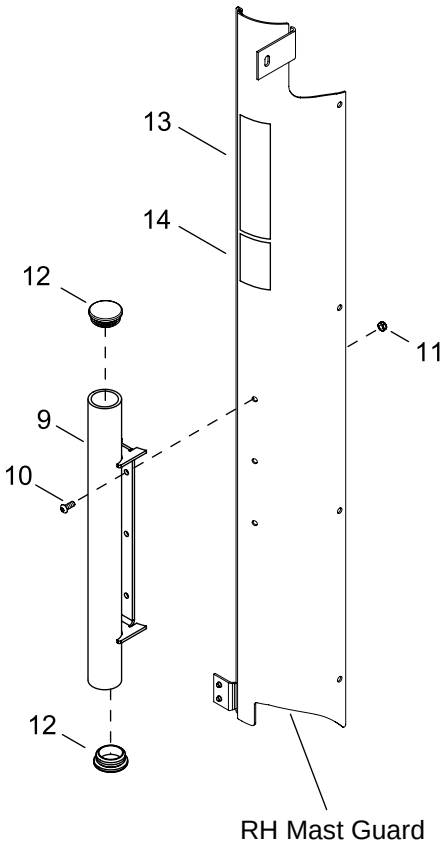
***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number

Terminal Bracket Kit 129572



RH Tube Kit 131414



Terminal Tube and Mounting Kit 131416

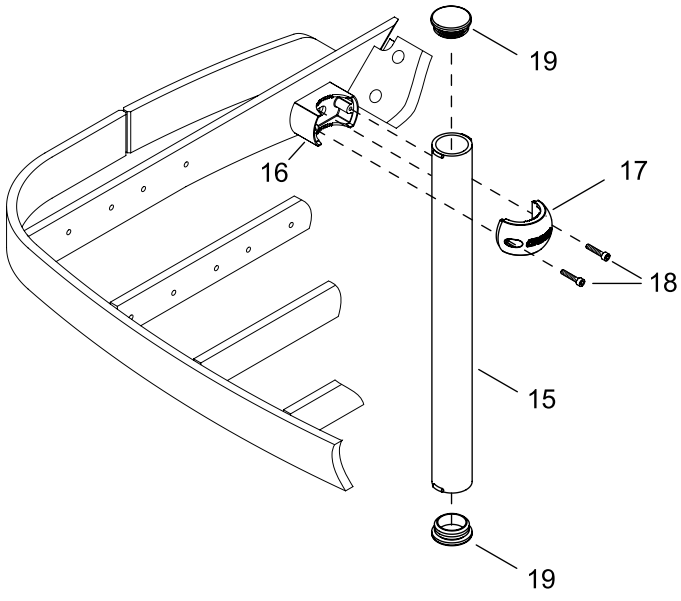
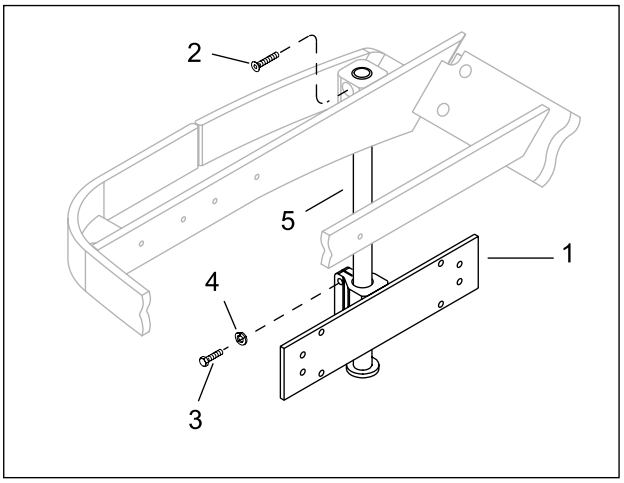


Figure 16093

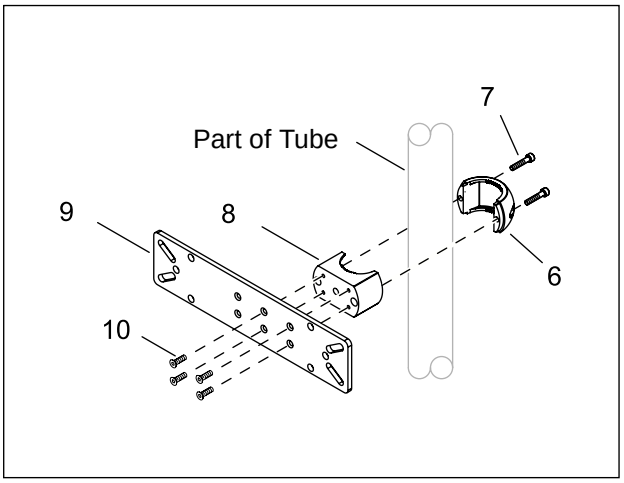
INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	129572*	Terminal Bracket Kit	1
1	128846	Mounting Block	1
2	060017-047	Screw	2
3	129571	Mounting Plate	1
4	060017-006	Screw	2
5	060005-010	Lockwasher	2
6	060016-068	Screw	4
7	060042-010	Locking Nut	4
8	128858	Adjusting Bar	1
0	131414*	RH Tube Kit	1
9	131236	Tube Bracket	1
10	060016-003	Screw	3
11	060042-010	Locking Nut	3
12	124530	Tube Plug	2
13	069169	Operator Warning Label	1
14	069199	Platform Warning Label	1
0	131416*	Terminal Tube And Mounting Kit	1
15	131401	Tube	1
16	128362-002	Upper Clamp	1
17	127697	Lower Clamp	1
18	060062-012	Screw	2
19	124530	Tube Plug	2

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

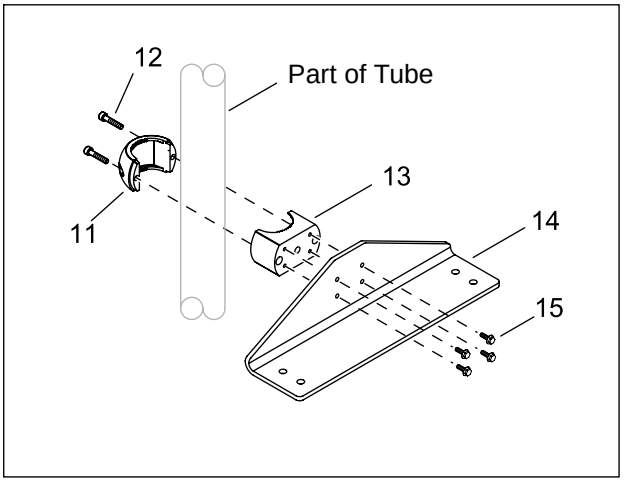
Terminal Mounting Kit
126236-001, -002 & -003



Universal Terminal Mounting Kit 131417



Terminal Mounting Kit 131418



Clip Pad and Hook Kit 130144

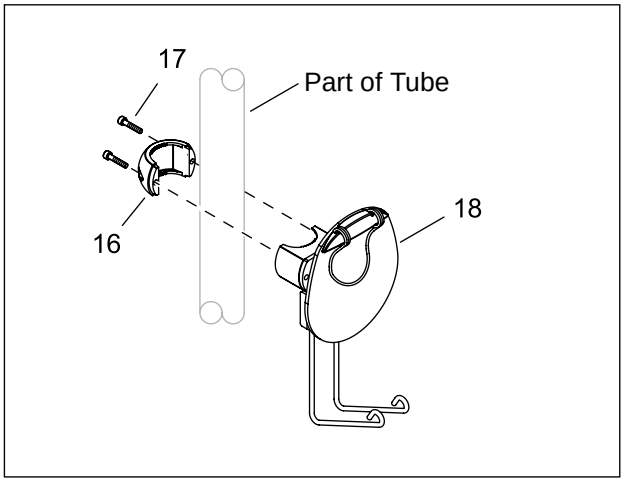


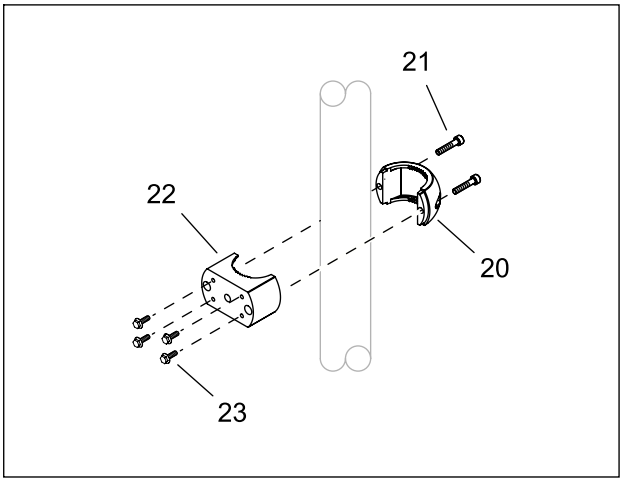
Figure 16094-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	126236-001	Terminal Mounting Kit for LXE Terminal	1
	126236-002	Terminal Mounting Kit for Norand Terminal	1
	126236-003	Terminal Mounting Kit for Telxon Terminal	1
1	128855-001	Mounting Plate for LXE Terminal	1
	128855-002	Mounting Plate for Norand Terminal	1
	128855-003	Mounting Plate for Telxon Terminal	1
	128855-004	Mounting Plate for Janus Terminal	1
2	060017-047	Screw	2
3	060017-006	Screw	2
4	060005-010	Lockwasher	2
5	128858	Adjusting Bar	1
0	131417	Universal Terminal Mounting Kit	1
6	127697	Lower Clamp	1
7	060062-012	Screw	2
8	128362	Upper Clamp	1
9	131365	Mounting Plate	1
10	050003-014	Screw	4
0	131418	Terminal Mounting Kit	1
11	127697	Lower Clamp	1
12	060062-012	Screw	2
13	128362	Upper Clamp	1
14	131366	Mounting Plate	1
15	060061-013	Screw	4
0	130144	Clip Pad and Hook Kit	1
16	127697	Lower Clamp	1
17	060062-012	Screw	2
18	130154	Clip Pad and Hook Assembly	1

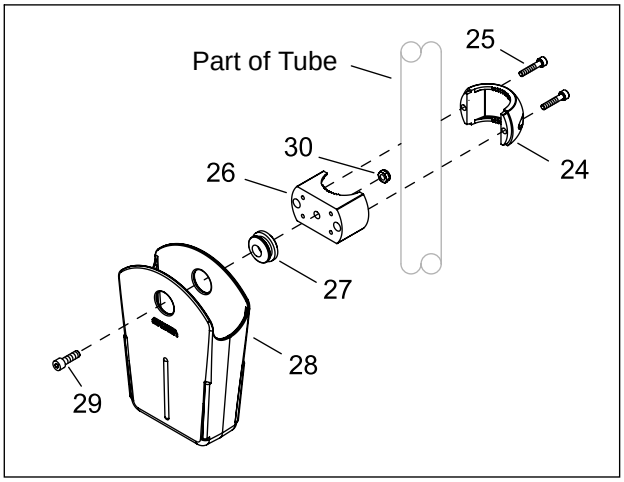
If truck is not equipped with Work Assist Tube see section 10.0 "Work Assist Tube" parts page.

Always Specify Model, Data & Serial Number

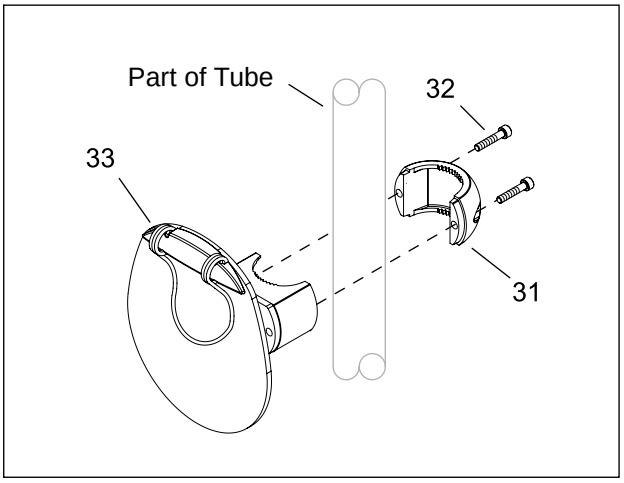
Universal Accessory Clamp Kit 130145



Storage Pocket Kit 130868



Clip Pad Kit 131415



Hanger Kit 131419

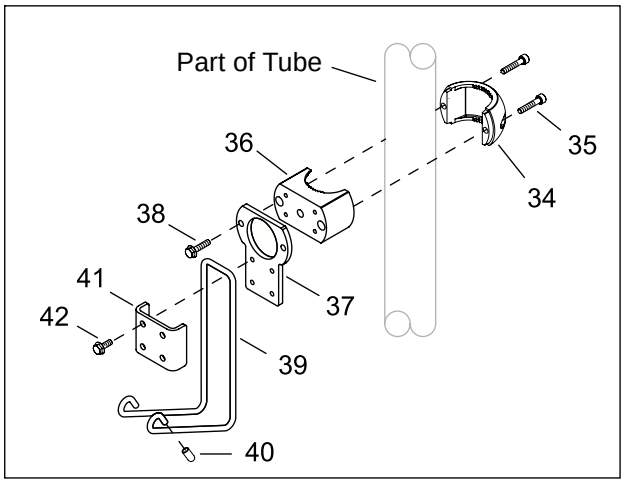
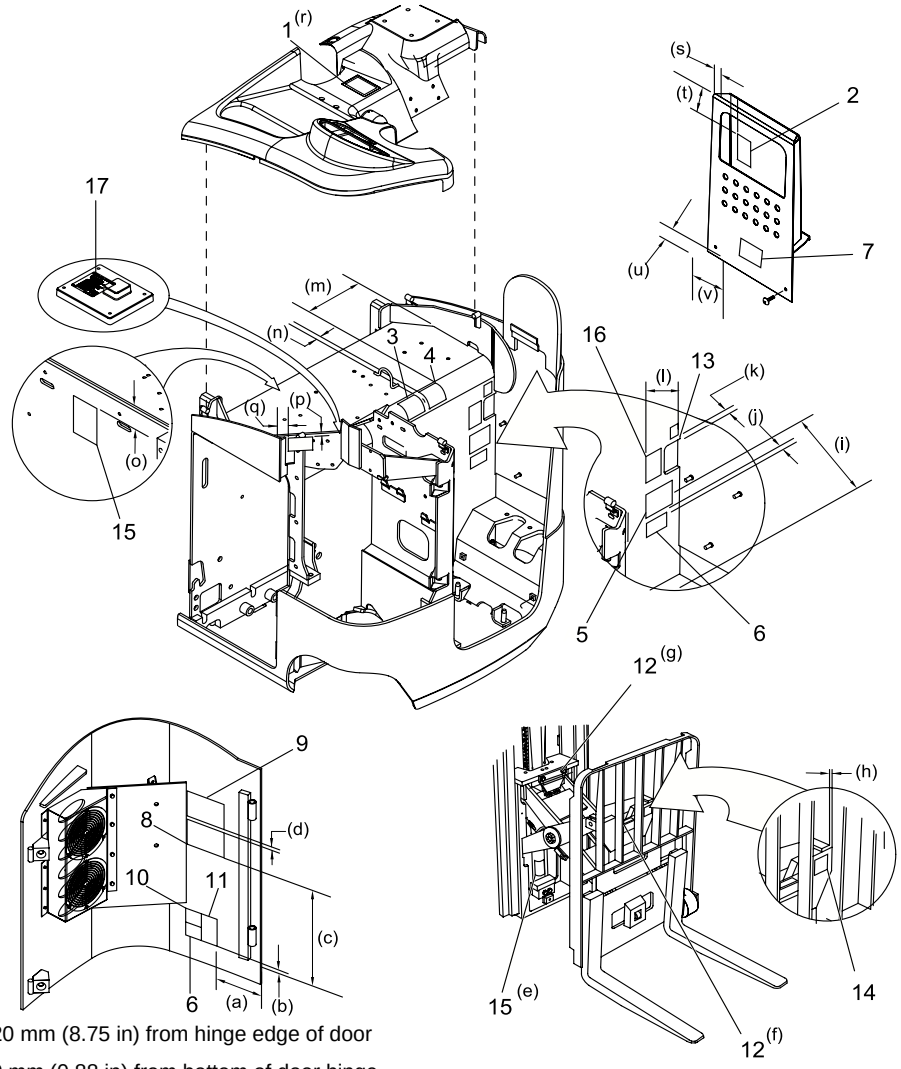


Figure 16095

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
0	130145	Universal Accessory Clamp Kit	1
20	127697	Lower Clamp	1
21	060062-012	Screw	2
22	128362	Upper Clamp	1
23	060061-013	Screw	4
0	130868	Storage Pocket Kit	1
24	127697	Lower Clamp	1
25	060062-012	Screw	2
26	128362	Upper Clamp	1
27	125503-002	Pocket Mount	1
28	125502	Storage Pocket	1
29	060016-013	Screw	1
30	060042-010	Nut	1
0	131415	Clip Pad Kit	1
31	127697	Lower Clamp	1
32	060062-012	Screw	2
33	132088	Clip Pad Assembly	1
0	131419	Hanger Kit	1
34	127697	Lower Clamp	1
35	060062-012	Screw	2
36	128362	Upper Clamp	1
37	130050-002	Mounting Plate	1
38	060062-015	Screw	2
39	130071	Wire Holder	1
40	130125	Round Vinyl Cap	2
41	130060	Clamp Bracket	1
42	060062-016	Screw	4

If truck is not equipped with Work Assist Tube see section 10.0 "Work Assist Tube" parts page.

Always Specify Model, Data & Serial Number



(a) Patent Decal 220 mm (8.75 in) from hinge edge of door

(b) Patent Decal 20 mm (0.88 in) from bottom of door hinge

(c) Pump Motor Decal lower edge 310 mm (12.19 in) above bottom of door hinge

(d) Pump Motor Decal upper edge 15 mm (0.5 in) from Traction Motor Decal lower edge

(e) Warning (Stand Under) Decal is centered 75 mm (3.0 in) up from bottom of Cylinder

(f) Warning (No Hands) centered on Carriage

(g) Warning (No Hands) centered on Plate

(h) Warning (No Stand) 15.5 mm (0.62 in) from edge of Carriage

(i) Warning (Electrical Add-on) Decal 340 mm (13.5 in)

(j) Warning (Articulation) Decal 13 mm (0.5 in) below Warning (Electrical Add-on) Decal

(k) Caution (Charger Hookup) Decal 13 mm (0.5 in) above Caution (Hydraulics) Decal

(l) Caution (Hydraulics) Decal left edge 130 mm (512 in) from edge of Power Unit Weldment

(m) Power Component Label 188 mm (7.42 in) from edge of Power Unit Weldment on center of curve

(n) Control Label 6 mm (0.25 in) apart from Power Component Label on Power Unit curve

(o) Warning (Stand Under) Decal centered on Front Power Unit 75 mm (3.0 in)

(p) Warning (Electrical Add-on) below Console

(q) Warning (Electrical Add-on) 25 mm (1.0 in) from edge of Power Unit Weldment

(r) Capacity Plate centered in Console recess

(s) Data Plate affixed to back side of cover 25 mm (1.0 in) from edge

(t) Data Plate 115 mm (4.5 in) below top edge of cover

(u) Contactor Panel Label affixed to back side of cover 50 mm (2.0 in) above bottom edge of cover

(v) Contactor Panel Label 150 mm (6.0 in) from edge of cover

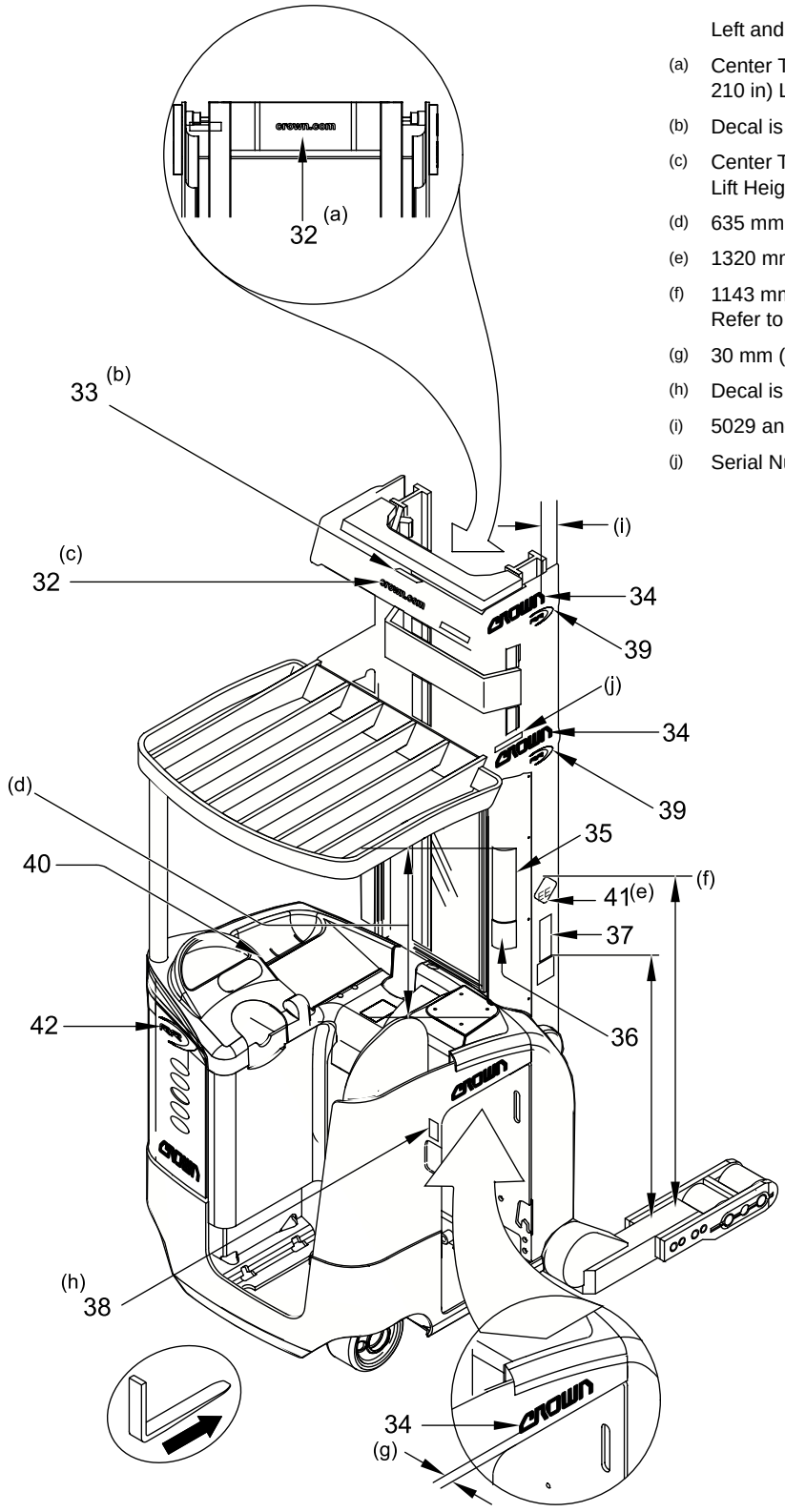
Figure 17189-01

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	(1)*	RR Capacity Plate	1
	(1)*	RD Capacity Plate	1
2	(1)	Plate Data	1
3	069201	Label Control	1
4	069198	Label Power Components	1
5	069012	Warning Electrical Add-on	2
6	069168	Warning Articulation	2
7	069197	Label Contactor Panel	1
8	069202	Label Pump Motor	1
9	069196	Label Traction Motor	1
10	069177	Warning Brake Adjustment	1
11	069320-001	Patent Label	1
12	069105	Warning No Hands	5
13	069047	Caution Charger Hookup	1
14	069009	Warning No Stand	1
15	069010	Warning Stand Under	2
16	069310	Caution Hydraulics	1
17	069093	Label EE	2

(1) Contact Factory

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number



Left and Right is Determined from Operator's Perspective

(a) Center Top and Bottom on 5029 and 5334 mm (198 and 210 in) Lift Heights

(b) Decal is Centered on Top Main Frame Brace

(c) Center Top and Bottom on 6096 mm (240 in) and Greater Lift Heights

(d) 635 mm (25 in)

(e) 1320 mm (52 in) from Floor Centered on Beam

(f) 1143 mm (45 in) from Floor Centered on Beam, Refer to Chart 1 for Battery Label Options

(g) 30 mm (1.19 in) centered over Battery Door opening

(h) Decal is centered and 13 mm (0.5 in) above Access Door

(i) 5029 and 5334 mm (198 and 210 in) Lift Heights

(j) Serial Number and Date stamped in Mast

Figure 20277

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
32	069374-001	crown.com Decal	1
33	069105	Warning No Hands	5
34	106158-021	Crown Decal	4
35	069169	Warning Operator	1
36	069199	Warning Platform	1
37	069107	Danger Battery	1
38	069047	Caution Charger Hookup	1
39	069372-001*	Momentum RR Decal	1
	069372-066*	Momentum RD Decal	1
40	069395	Label Distribution Panel	1
41	069093	Label EE	2
42	069372-054*	Momentum RR Decal	1
	069372-065*	Momentum RD Decal	1
	126270	Kit Label (Includes Items 5, 6, 10, 12, 13, 14, 15, 35, 36 and 37)	1
	126271-(1)	Kit Label EEC (Includes Items 5, 6, 10, 12, 13, 14, 15, 35, 36 and 37)	1
	126350	Quick Reference Guide Cover	1

(1) See Chart 2

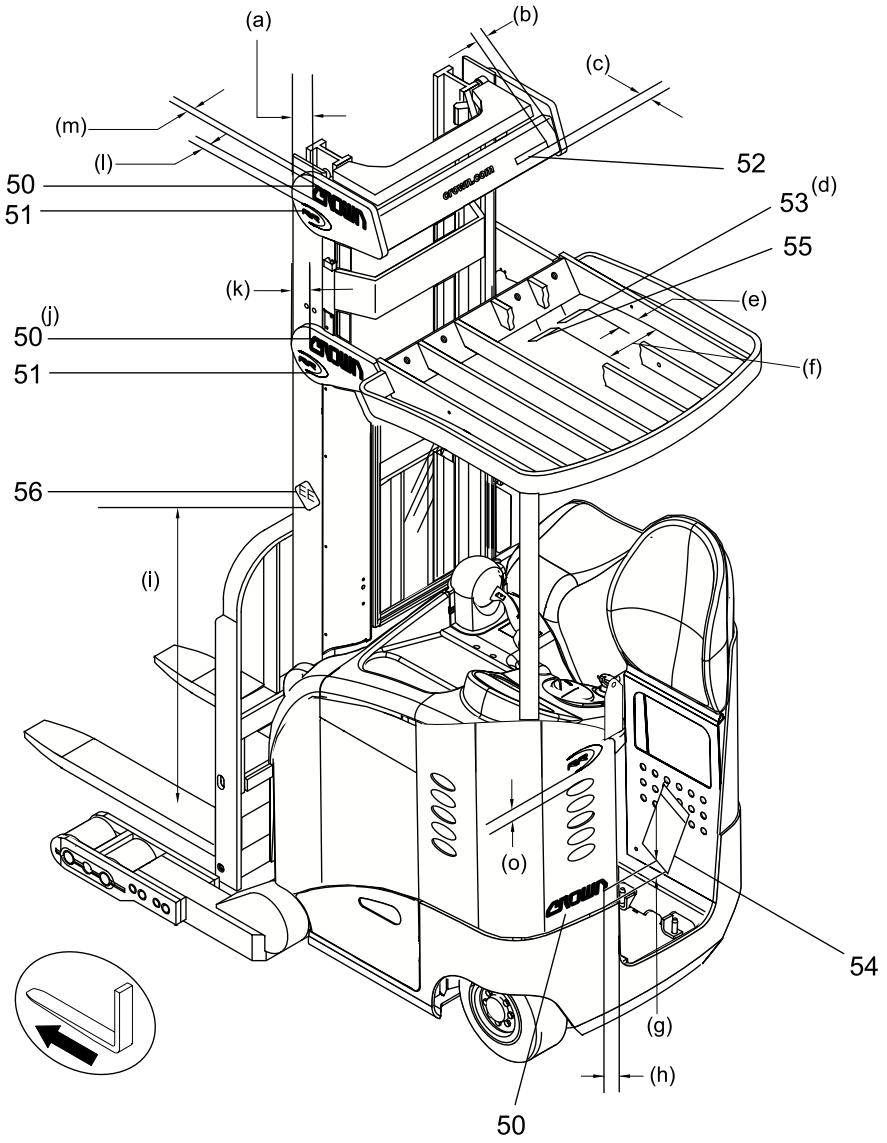
***** To select appropriate part number, refer to truck data number. The truck data number represents truck features. Refer to Introduction.

Language Chart 2

Choice of dash number depends on language. When ordering, refer to Chart 2 and complete the part number with the correct dash number. Example: Refer to Figure 17189. If item 5 with German language is requested, order 869012-001.

Dash Numbers	Language
001	German
002	French
003	Spanish
004	Dutch
005	Italian
006	English

Always Specify Model, Data & Serial Number



Left and Right is Determined from Operator's Perspective

(a) Crown Detail 117 mm (4.59 in) with 184 mm (7.25 in) I-beam or 75 mm (2.95 in) with 145 mm (5.69 in) I-beam

(b) Warning (No Hands) Decal right center Mast face 25 mm (1.0 in) from right edge

(c) Warning (No Hands) Decal 19 mm (0.75 in) from bottom edge of Mast face

(d) Warning (No Hands) Decal 25 mm (1.0 in) space between Label U.L.

(e) Warning (No Hands) Decal 25 mm (1.0) in from right overhead guard rail

(f) Label U.L. 140 mm (5.50 in) from right overhead guard rail

(g) Crown Decal 30 mm (1.19 in) from Power Unit Weldment seam

(h) Crown Decal 30 mm (1.19 in) from operator opening

(i) Label E.E. Decal 1320 mm (52.0 in) from floor centered on beam

(j) Crown Decal 5029 mm and 5334 (198 and 210) Lift Heights (Omit with Light Options)

(k) Crown Decal 95 mm (3.72 in) from front edge of beam

(l) 21 mm (0.81 in) with 184 mm (7.25 in) I-beam or 35 mm (1.36 in) with 145 mm (5.69 in) I-beam

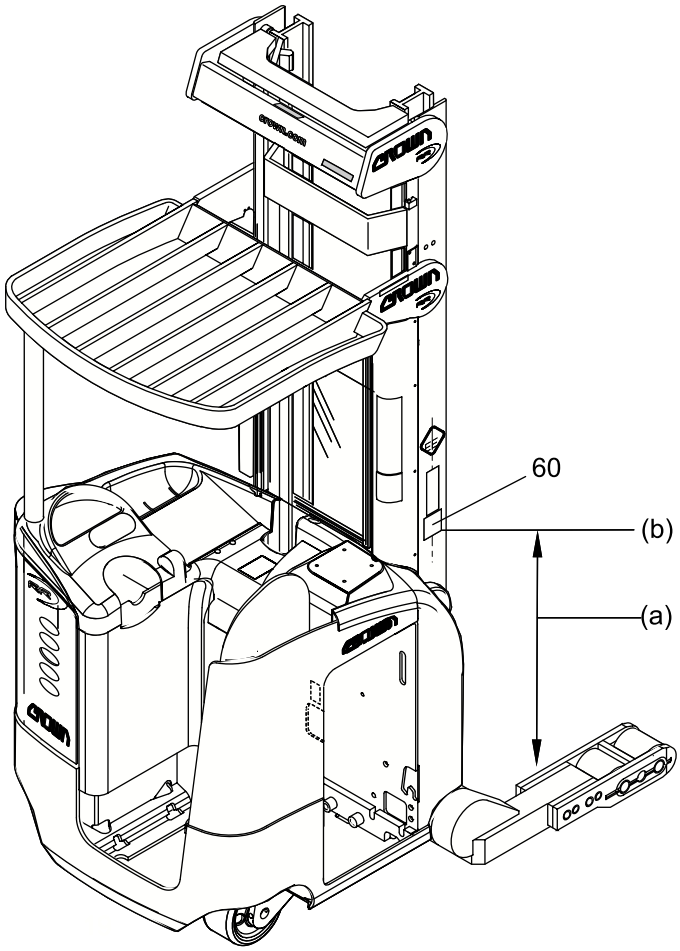
(m) Crown Decal for 6096 mm (240 in) and greater Lift Heights

Figure 20278

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
50	106158-021	Crown Decal	4
51	069372-001*	Momentum RR Decal	1
	069372-066*	Momentum RD Decal	1
52	069105	Warning No Hands	4
53	069105	Warning No Hands Overhead Guard	1
54	121257-001	Envelope Manual	1
	061003-002	Cable Tie	1
	086609	Clip	1
55	069111	Label U.L.	1
56	069093	Label EE	2

***** To select appropriate part number, refer to truck data number.
The truck data number represents truck features.
Refer to Introduction.

Always Specify Model, Data & Serial Number



(a) 1143 mm (45.0 in) from Floor Centered on Beam

(b) Refer to Chart 1 for Battery Label Options

Figure 20279

Labels and Decals Chart 1			
Index	Part Number	Part Name	Number Required
60	069112-021	Warning Battery Size 305 x 970 mm (12.00 x 38.12 in)	1
60	069112-022	Warning Battery Size 295 x 920 mm (11.62 x 36.12 in)	1
60	069112-023	Warning Battery Size 280 x 890 mm (11.00 x 35.12 in)	1
60	069112-024	Warning Battery Size 280 x 970 mm (11.00 x 38.12 in)	1
60	069112-025	Warning Battery Size 360 x 920 mm (14.12 x 36.12 in)	1
60	069112-026	Warning Battery Size 345 x 970 mm (13.50 x 38.12 in)	1
60	069112-027	Warning Battery Size 335 x 890 mm (13.25 x 35.12 in)	1
60	069112-028	Warning Battery Size 335 x 970 mm (13.25 x 38.12 in)	1
60	069112-029	Warning Battery Size 410 x 970 mm (16.12 x 38.12 in)	1
60	069112-030	Warning Battery Size 412 x 920 mm (16.25 x 36.12 in)	1
60	069112-031	Warning Battery Size 395 x 890 mm (15.50 x 35.12 in)	1
60	069112-032	Warning Battery Size 380 x 970 mm (15.00 x 38.12 in)	1
60	069112-033	Warning Battery Size 400 x 970 mm (15.75 x 38.12 in)	1
60	069112-034	Warning Battery Size 395 x 970 mm (15.50 x 38.12 in)	1
60	069112-035	Warning Battery Size 455 x 975 mm (17.88 x 38.38 in)	1
60	069112-036	Warning Battery Size 450 x 975 mm (17.62 x 38.38 in)	1
60	069112-037	Warning Battery Size 455 x 970 mm (17.88 x 38.12 in)	1
60	069112-038	Warning Battery Size 450 x 970 mm (17.62 x 38.12 in)	1
60	069112-039	Warning Battery Size 520 x 975 mm (20.50 x 38.38 in)	1
60	069112-040	Warning Battery Size 515 x 975 mm (20.25 x 38.38 in)	1
60	069112-041	Warning Battery Size 510 x 970 mm (20.00 x 38.38 in)	1
60	069112-042	Warning Battery Size 515 x 970 mm (20.25 x 38.12 in)	1
60	069112-043	Warning Battery Size 510 x 970 mm (20.00 x 38.12 in)	1
60	069112-044	Warning Battery Size 360 x 970 mm (14.12 x 38.12 in)	1

The following information covers pertinent technical service bulletins pertaining to the Rider Reach and Rider Double Reach (RR/RD) 5200/5200S Series lift trucks.

TECHNICAL SERVICE BULLETIN NO.	DESCRIPTION
TSB-147	Paints
TSB-196	Chain 73991
TSB-248	Lift Truck Paints
TSB-425	Version 12 Software Enhancements
TSB-428	New Electronic Horn
TSB-431	Plugging Distance
TSB-432	Damage to Reach Carriage Comp Due to Excessive Reach Speeds
TSB-436	Control Cable Pulley Cross Reference
TSB-441	Flow Control Valve Life

The following information covers part numbers of various service kits pertaining to the Rider Reach and Rider Double Reach (RR/RD) 5200/5200S Series lift trucks.

Service Kits

Part No.	Description
129474	Drive Unit Replacement Kit (Ref. PF16553)
129572	Power Terminal Bracket Installation Kit (Ref. PF16554)