Model SLT30/35 AC

Maintenance Manual

LANDOLL CORPORATION
1900 North Street
Marysville, Kansas 66508
(785) 562-5381
800-428-5655 ~ WWW.LANDOLL.COM

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Chapter 1

Intro, Safety, Inspection and Dash Operations

Introduction

This manual is intended for the service technician who is seeking information on product maintenance and service replacement parts. It contains troubleshooting tips and information on repair which will help the technician solve problems that may occur.

Operating Instructions

This manual does not contain operating instructions. Operating instructions are sent with each truck. If the operators manual is missing on your SLT30/35 AC truck, call Landoll Corporation to order a replacement.

Service Training

Service Training is available for the forklift technician from Landoll Corporation. This includes operation, repair, maintenance, hydraulic system, electrical system and wire guidance. Contact your regional Landoll service representative for more information.

Tools Needed

The tools needed will be the same tools that are often found in well-equipped service centers, in both SAE and metric sizes. For example, an assortment of open-end and box-end wrenches, sockets, as well as Allen and adjustable wrenches, assorted screwdrivers and non-marring mallets should be available.

Replacement Parts

When ordering parts that will be used for the repair and maintenance of your Landoll SLT30/35 AC truck, the model and serial number of the truck being repaired will be required. This information is located on the serial number and capacity plate located on the right operators console. **See Figure 1-1.**

Figure 1-1: Serial Number and Capacity Plate

Below are the Notice, Caution, Warning and Danger safety notices and their descriptions that will be used in this book.

NOTICE

Special notices that include helpful maintenance hints. Read and thoroughly understand.

CAUTION

Proceed with caution. Failure to heed may cause injury to person or damage product.

WARNING

Proceed with caution. Failure to heed warning will cause injury to person or damage product.

DANGER

Proceed with caution. Failure to heed warning will cause injury to person or damage product.

General Maintenance Instructions

CAUTION

Steel toe shoes and eye protection are required when maintaining or repairing a lift truck. Ear protection may also be required if the repair facilities are excessively noisy, per OSHA standards. Keep feet, hands and all other body parts away from all mast areas and pinch points. Powered industrial trucks may become hazardous if scheduled maintenance is neglected. Therefore, adequate maintenance facilities, trained personnel and procedures should be provided.

IMPORTANT

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

1. A scheduled planned maintenance, lubrication and inspection system should be followed. A daily check before each shift is an OSHA requirement.
2. Only qualified and authorized personnel shall be permitted to inspect, maintain and service the truck.
3. Before leaving the truck:
   - Stop the truck.
   - Completely lower the mast.
   - Place directional controls in neutral.
   - Turn off the power and disconnect the battery.
   - Block the wheels, especially if the truck is on an incline.
4. Before working on the truck:
   - Perform a Lock Out/Tag Out operation on the truck.
   - Raise drive wheel free of floor or disconnect the power sources.
   - Use chocks or other positive positioning devices.
   - Block load engaging means, inner masts or chassis before working under them.
   - Operation to check performance of truck or attachments shall be conducted in an safe clearance area.
5. Before starting to operate the truck:
   - Be in an operating position.
   - Apply brake.
   - Place directional control in neutral.
   - Check functions of lift systems, directional control, speed control, steering, warning devices, brakes and any attachments if any are used.
6. To avoid fire hazards have fire protection equipment present. Do not use an open flame to check fluid levels or for leakage of electrolyte and fluids or oil. Do not use open pans of fuel or flammable cleaning fluids to clean 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 safe operating condition.
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 an 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.
15. Care must be taken to assure that all replacement parts are interchangeable with the original and are of equal quality to what was originally installed on the truck at the factory.
16. Be sure that any optional equipment added to the truck is positioned so that it does not block the vision of the operator or interfere with safe and efficient operation of the truck.

For your Safety

NOTICE

Lock Out/Tag Out

In the interest of operator safety and operator compliance with OSHA regulations, guidelines have been developed to perform service and maintenance on the truck.

Before performing service and maintenance on the truck, review the following sections in this manual for addition procedures to be followed.

When doing maintenance or repair on the SLT30/35 AC truck, unless the truck must be on for testing, remove the key from the key switch. In addition, because it’s possible to have a duplicate key, remove the main power fuse and install a commercially available Lock Out/Tag Out device on the battery connectors. Also, install a lockout warning reminder on the steering wheel warning that the truck is not available for use.

Battery Safety Rules:

⚠ CAUTION

- **Wear protective clothing, rubber apron, boots gloves 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 contacts eyes, flush immediately with clean water. OBTAIN MEDICAL ATTENTION IMMEDIATELY! Should electrolyte be spilled on skin, rinse promptly with clean water and soap. A baking soda solution (one pound to one gallon of water) will neutralize acid spilled on clothing, floor or other surfaces. Apply solution until bubbling stops and rinse with clean water.**
- **Keep battery vent plugs firmly in place at all times, except when adding water or taking hydrometer readings.**
- **DO NOT bring any type of flame or spark near the battery.**
- **DO NOT place any electrically conductive tool on the battery that could cause a spark. Gas formed while the battery is charging is highly explosive. This gas remains in the cells long after charging is complete.**
- **Keep the battery clean. Foreign matter in the electrolyte will result in poor battery performance.**
- **Follow the battery manufacturer’s instructions concerning maintenance and repair.**

Battery Care and Charging

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. See Figure 1-1.**
- **Before connecting or disconnecting batteries to the charger, make sure the charger is OFF. Attempts made to do this while the charger is ON could result in serious injury to the operator and damage could occur to the charger, with sparks or electrical spikes.**
- **Keep sparks or open flame away from the battery or the charging area. BATTERY FUMES ARE EXPLOSIVE!**
- **NEVER smoke or have an open flame near the battery. Gas formed during charging is explosive and can cause injury. Consult the charger manufacturer's manual covering your charger for operation and maintenance.**
- **The battery must meet size, weight and voltage requirements of the truck.**

Battery Removal and Installation

CAUTION

Battery Removal: When removing the battery move the truck to an area intended for battery care, on a level floor.

- **Turn the key switch to the OFF position and remove the key.**
- **Disconnect battery and lock out the truck as described in the Lock Out/Tag Out section described on page 1-3.**
- **Never remove the battery partially from the truck without a roller stand in place.**
- **Lower load completely. If battery is removed with load raised, use hoist attached to mast to protect against tip over.**
- **DO NOT allow any metallic object to come in contact with the top of the battery. This may cause a short circuit when removing or transporting the battery. Use an insulator (such as plywood) to cover the top of the battery during removal.**

CAUTION

Battery Installation:

- **When installing the battery move truck to an area intended for battery care.**
- **The load forks must be all the way down to the floor.**
- **Turn key or toggle switch to OFF position and put the key in a secure place.**

Good Battery Care Recommendations:

- *Add approved water only - never add acid.*
- *Keep electrolyte levels proper.*
- *Keep Battery top clean and dry.*
- *Keep flame and metal away from battery top.*
- *Keep vent caps tightened.*
- *Cool before charging/operating battery above 115ºF.*
- *Use only approved correct voltage/current charger.*
- *Keep battery cover open while charging.*
- *If in doubt, call your local Landoll service technician.*

Hydraulic System

WARNING

- **High pressure fluids are dangerous and can puncture the skin and cause severe injury!**
- **Relieve all pressure from the hydraulic system before attempting to work on it.**
- **Make sure all hydraulic lines are tight before starting the system. Any fluid injected into the skin under high pressure should be considered a medical emergency despite a normal appearance of the skin. Medical attention should be given immediately.**

IMPORTANT

When maintenance is to be performed on the hydraulic system, make sure the system hydraulic pressure is relieved by:

- **Moving the truck to a level area.**
- **Have no load on the forks.**
- **Completely lower the mast, or if the mast is the object of repair, have blocks under the mast.**

Towing the Truck

General Safety Tips:

WARNING

- **Have the service brake applied when hooking up the tow chain.**
- **Release the emergency brake only when ready to tow the truck and the operator is on the truck being towed.**
- **Tow the truck at a speed of 2 mph or less.**
- **DO NOT make sharp turns when towing the truck. The towed truck will be difficult to steer. USE EXTREME CAUTION and keep the towed vehicle at a slow, manageable speed.**
- **Forks must be empty and preferably not more than 12" off the floor.**
- **With the emergency brake disabled, the truck can roll easily - USE EXTREME CARE!**

Towing Vehicle Requirements

- **The towing vehicle must have a pull and braking capacity greater than 8000 lbs.**
- **Brakes on a towed truck will operate, but could operate differently versus an operational truck.**
- **Maximum towing speed should not exceed 2mph.**
- **Always tow the truck in the reverse direction.**
- **Towed vehicle's forks should be empty and no higher than 12 in. off the ground.**
- **Be careful. With the emergency brake released, vehicle will roll and steering will be difficult.**

Towing a Truck in the Reverse Direction

1. Key must be in the OFF position.
2. When attaching the towing vehicle to lift truck to be towed, 2 towing chain slots have been provided on the rear bottom side of the counter weight. **See Figure 1-2.** Firmly attach tow device to these slots.
3. Keep towing speed below 2 mph. Remember that the person on the towed lift has to turn his head to observe operations.

Figure 1-2: Forklift Tow Slots

4. To easily disarm the braking system for towing, open the rear compartment on the forklift and disconnect the jumper connector and re-connect the connection to the "Tow Plug". **See Figure 1-3.**

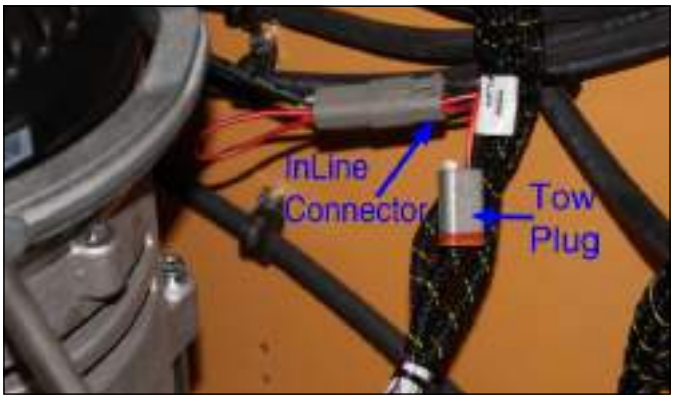


Figure 1-3 Tow Plug Connection

Lifting and Blocking the Truck

Figure 1-4: Truck Blocking

- **Move truck to a level area designated for repair.**
- **Keep forks empty and low to the ground.**
- **Turn the key off and remove it from the console.**
- **Unhook the battery.**
- **Attach Lock Out/Tag Out device to the truck.**
- **Use a jack or hoist with a 8000 lb. minimum lift.**
- **Set the lift on designated hardwood blocks. See Figure above for block(s) placement. Four blocks are required on all four corners of the truck to provide a safe, stable repair position.**
- **Keep the height of the lifted truck to a minimum.**

Cleaning the truck

Landoll Corporation recommends that their fork trucks NOT be cleaned with a power washer. Electrical boards, circuitry and wiring can be damaged by high pressure water and soap. Moisture and soap left on components can rust, corrode or leave a residue that can damage everything that it comes in contact with. The preferred method of removing dust is compressed air. For localized cleaning, use a non-flammable solvent parts washer and compressed air after the part or area is cleaned.

Maintenance Introduction

Preventative maintenance is an important part of all industrial equipment.
A well planned preventative maintenance program is essential to keeping the working environment safe for the operator and the longevity of the affected equipment. Regular and planned maintenance is the responsibility of both the daily operator and the forklift technician.

Inspection Sheets

The following pages are OSHA (Occupational Safety and Health Administration) required check sheets. These sheets should be copied and the copies used for maintenance checks on your SLT30/35 AC lift. The pre-shift inspection on your SLT30/35 AC lift is an OSHA requirement. It is the operator's duty to inspect the lift before each shift and report all problems to the person in charge of forklift maintenance. Have a qualified mechanic correct all noted problems.

Daily pre-shift inspection is an OSHA requirement.
These inspections must be documented.

Operator's Daily Checklist

Static Straps	Check Condition		
Battery	Check Water, Electrolyte and Charge		
Battery Restraint System	Check Adjustment		
	Check Rollout Switch Operation		
Seat Belt, Seat Slides, & Seat Switch	Check Operation		
Steer Column Tilt & Telescope Levers	Check Operation and Torque		
Parking Brake	Check Operation		
Service Brakes	Check Operation		
	Check Fluid Level		
Accelerator Pedal	Check Operation		
Lift Chains	Check Condition		
Forks	Check Condition		
Load Back Rest	Torque Fasteners		
Hang-on Attachment (Optional)	Check Operation		
	Check Fittings and Fasteners		
Hydraulic Oil	Check Fluid Level		
Hydraulic Cylinders	Check for Leaks		
Hydraulic Hoses/Fittings	Check for Wear and Leaks		
Joystick	Check Lift/Lower Control		
	Check Tilt Control		
	Check Side-shift Control		
	Check Pivot Control		
	Check Auxiliary Functions (Optional)		
	Check Directional Switch Operation		
	Check Horn Operation		
Lights and Alarm	Check Operation		
Steering	Check Operation		
Dash Display	Check BDI Operation		
	Check Hourmeter Operation		
Major Structural Points	Check Overhead Guard for Cracks		
	Check Frame for Cracks		
	Check Mast Pivot and Slides for Cracks and Wear (Lubricate as Necessary)		
Safety Labels	Replace as Necessary		
Capacity Plate	Info Matches Model, Serial No., and Atachments		

Date: Inspector:	Truck No.	Model No.	Location	Serial No.	Shift	Hr Meter	Hydraulic Oil

These checks must be done after 50-100 hours of use.

Gear Box	Drain, flush and refill		
Hydraulic Tank	Check fluid level		
Shift Assy	Lubricate bearing pads daily.		

Date:	Inspector:	Truck No.	Model No.	Location	Serial No.	Shift	Hr Meter	Hydraulic Oil

To be performed after 250 hrs of truck operation in addition to the required pre-shift daily inspection.

Technicians 250 Hour Checklist	Action Needed	Status	Landoll / Drexel Lift
SAFETY & OPERATIONAL CHECKS Have a **qualified** technician correct all problems.	Description	OK - Yes, No	Comments
Mast, Carriage or Attachment	**Clean, inspect for wear and lube.**		
Lift Chains	**Clean and lubricate**		
Front Carry Position Setting	**Distance between truck and sides of mast must be even**		
90° Pivot and Reach Setting	**Forks must have 3" reach and mast must have 90° pivot**		
Pivot Arm Deflection	**Check pivot arm's deflection when pivoting to travel position**		
Tilt Cylinder Racking & Degree Adjust	**Check mast for racking when tilting. Check fwd/rwd tilt angles**		
Attachment Control	**Operational**		
Accelerator	**Functioning smoothly**		
Controls (turn power on)	**investigate unusual noises**		
Joystick	**Check all functions**		
Dash Display	**Check BDI, hourmeter**		
Parking Brake	**Check for function**		
Service Brake	**Check for leaks, shoe wear**		
Hydraulic Fluid Level	**Check and fill**		
Exterior of Hydraulic Tank & Tank Breather	**Clean**		
Lift and Power Steering Pumps	**Clean dust from motors**		
Battery Box and Connector	**Neutralize and clean**		
Battery	**Thoroughly clean**		
	Check electrolyte level		
	Check structure and electrical conditions		
Traction Motor	**Clean dust from compartment**		
Seat Belt, Buckle, and Retractor	**Functioning smoothly**		
Tires/Wheels	**Remove debris, torque lug nuts**		
Wheel Bearings	**Clean and fill with grease**		
Leaks	**Gearbox, brake components, hydraulic oil, battery**		
Hydraulic Hoses and Connections	**Check for wear**		
Switches (Interlock, Direction, Parking/Seat, Key)	**Check for proper operation**		
Wire Harness	**Check for abrasions**		
Pivot/Shift Assembly	**Service bearing pads, grease zerks, lubricate shift chain**		
OHG Mounting Bolts	**Check and Retorque**		
Steering Gear	**Inspect and Lube**		
Electrical Power Connections	**Inspect & Retorque**		

Date	Inspector:	Truck No.	Model No.	Location	Serial No.	Shift	Hr Meter	Battery Fluid	Hydraulic Oil

To be performed each 500 hrs of truck operation in addition to the required pre-shift daily inspection

Technicians 500 Hour Inspection	Action Needed	Status	Landoll / Drexel Lift
SAFETY & OPERATIONAL CHECKS Have a **qualified** technician correct all problems.	**Description**	OK - Yes, No	Maintenance Note if Applicable
Forks, Top Clip Retaining Pin	**Function & condition**		
Load Rollers	**No greater than 1/16" movement**		
Steering Operation	**Functions smoothly**		
Brake Fluid	**Check Level**		
Hydraulic Oil Filter	**Change element**		
Battery	**Check B+ and B to frame current must be less than 1.0 milliamp**		
Battery Rollers	**Clean, repack, check for wear**		
Contactor Points & Microcswitches	**Check operation**		
Controllers	**Clean surfaces**		
Operational Compartment Capacity Plate	**Make sure it is attached & that info matches model, serial number & attachments**		
All Fasteners	**Retorque**		

Date	Inspector:	Truck No.	Model No.	Location	Serial No.	Shift	Hr Meter	Battery Fluid	Hydraulic Oil

To be performed each 1000 hrs of truck operation in addition to the required pre-shift daily inspection.

Technicians 1000 Hour Inspection	Action Needed	Status	Landoll /Drexel Lift
SAFETY & OPERATIONAL CHECKS Have a **qualified** technician correct all problems.	**Description**	OK (X)	Maintenance Note if Applicable
Motors	**Clean cooling holes of debris**		
Primary Lift Chain	**Check**		
Secondary Lift Chain	**Check**		
Rear Channel Roller Inspection	**Check**		
Carriage Channel Roller Inspection	**Check**		
Inspect Side Shift Chains	**Check**		

Date	Inspector:	Truck No.	Model No.	Location	Serial No.	Shift	Hr. Meter	Battery Fluid	Hydraulic Oil

To be performed each 2000 hrs of truck operation in addition to the required pre-shift daily inspection.

Technicians 2000 Hour Checklist	Action Needed	Status	Landoll /Drexel IC
SAFETY & OPERATIONAL CHECKS Have a **qualified** technician correct all problems.	**Description**	OK (X)	Maintenance Note if Applicable
Hydraulic Oil	**Change**		
Hydraulic Reservoir Suction Screen	**Clean with solvent**		
Gear Box	**Drain, flush & refill**		

Date	Inspector:	Truck No.	Model No.	Location	Serial No.	Shift	Hr. Meter	Battery Fluid	Hydraulic Oil

Technicians 4500 Hour Checklist	Action Needed	Status	Landoll /Drexel IC
SAFETY & OPERATIONAL CHECKS Have a **qualified** technician correct all problems.	**Description**	OK (X)	Maintenance Note if Applicable
Hydraulic Oil	**Change**		

Date	Inspector:	Truck No.	Model No.	Location	Serial No.	Shift	Hr. Meter	Battery Fluid	Hydraulic Oil

Lubrication Specifications

Name	Lubrication	Notes
Mast Chain/Shift Chain	SAE 40W. oil or Bowman Heavy Load Red Grease	Clean and re-oil
Mast Rail	Chassis Lube or Kendall Sr-12X	Lube inner side of upright rail
Rotation Bearings	Texaco Ref. C&C #880	Use standard lubrication gun
Steering Knob	Light weight oil	Lightly oil
Reservoir Cap	SAE 30W oil	Clean in solvent and re-oil
Hydraulic Reservoir	Conoco Power flow HE (ISO Grade 46) Filtered to ISO 4406 cleanliness code 15/13/11 or equivalent Grade oil filtered to 15/13/11.	Drain, flush, and refill
Gear Case	8SW/40 gearlube	Drain, flush, and refill
Master Cylinder	Heavy duty brake fluid DOT 3	Check level. Add if necessary
Steering Gears	Exposed Gear Lube, Mobil 375 NC, C & C #880	Aerosol Spray/Brush application
Cylilnder Cleavis	Texaco Ref. C & C #880	Use standard lubrication gun
Shift Chain Rollers	Texaco Ref. C & C #880	Brush or spray on lubricant
Splines of the Drive Motor and Gearbox	Kluberplex BEM 34-132	Apply to splines
Carriage Slide Pads	Gredag 741 or AeroShell 33MS	Brush on slide pads
***Failure to refill with oil that meets ISO 4406 cleanliness code 15/31/11 may void the warranty. Typical "NEW" oil DOES NOT meet this specification. Contact Landoll Corporation or your lubricant supplier for recommendation.**		

Torque Specifications

Component	Torque
Drive Wheel	125 ft. lbs. (305 Nm.)
Fluid draining and filling plug	16 ft. lbs. (22 Nm.)
Hydraulic braking unit	37 ft. lbs. (50 Nm.)
Electrical Connection M6	35 in. lbs. (4 Nm.)
Electrical Connection M8	85 in. lbs. (10 Nm.)
Electrical Connection M10	170 in. lbs. (19 Nm.)
Drive Plate	150 ft. lbs.
Drive Motor Mount	60 ft. lbs.
Mast and Side Shift Mechanism	
Chain guard capscrews	48-52 ft. lbs. (65-71 Nm.)
Main lift cyl. plunger retainer	95-125 ft. lbs. (129-169 Nm.)
Free lift cyl. plunger retainer	275-300 ft. lbs. (373-407 Nm.)
Carriage roller capscrews	70-80 ft. lbs. (95-108 Nm.)
Chain and hose sheave screws	26-30 ft. lb. (35-41 Nm.)
Lift chain adjusting nuts	50-70 ft. lbs. (68-90 Nm.)
Backrest screws	145 ft. lbs. (197 Nm.)
Side shift mounting hooks	115-125 ft. lbs. (156-170 Nm.)
Overhead Guard Bolts	170 Ft-lbs (230 Nm.)

Fluid Capacities

Item	Capacity - Quarts (Liters)
Hydraulic Tank	11.6 gallons (44 liters)
Brake Fluid	0.21 quarts (0.20 liters)
Gear Box	1.85 gallons (7 liters)

General Torque Specifications (rev. 4/97)

This chart provides tightening torques for general purpose applications when special torques are not specified on process or drawing. Assembly torques apply to plated nuts and capscrews assembled without supplemental lubrication (as received condition). They do not apply if special graphite moly-disulfide or other extreme pressure lubricants are used. When fasteners are dry (solvent cleaned) add 33% to as received condition torque. Bolt head identification marks indicate grade and may vary from manufacturer to manufacturer. Thick nuts must be used on grade 8 capscrews. Use value in [ ] if using prevailing torque nuts.

TORQUE SPECIFIED IN FOOT POUNDS

UNC SIZE	SAE Grade 2	SAE Grade 5	SAE Grade 8	UNF SIZE	SAE Grade 2	SAE Grade 5	SAE Grade 8
1/4-20	4 [5]	6 [7]	9 [11]	1/4-28	5 [6]	7 [9]	10 [12]
5/16-18	8 [10]	13 [13]	18 [22]	5/16-24	9 [11]	14 [17]	20 [25]
3/8-16	15 [19]	23 [29]	35 [42]	3/8-24	17 [21]	25 [31]	35 [44]
7/16-14	24 [30]	35 [43]	55 [62]	7/16-20	27 [34]	40 [50]	60 [75]
1/2-13	35 [43]	55 [62]	80 [100]	1/2-20	40 [50]	65 [81]	90 [112]
9/16-12	55 [62]	80 [100]	110 [137]	9/16-18	60 [75]	90 [112]	130 [162]
5/8-11	75 [94]	110 [137]	170 [212]	5/8-18	85 [106]	130 [162]	180 [225]
3/4/10	130 [162]	200 [250]	280 [350]	3/4-16	150 [188]	220 [275]	320 [400]
7/8-9	125 [156]	320 [400]	460 [575]	7/8-14	140 [175]	360 [450]	500 [625]
1-8	190 [237]	408 [506]	680 [850]	1-14	210 [263]	540 [675]	760 [950]
1-1/8-7	270 [337]	600 [750]	960 [1200]	1-1/8-12	300 [375]	660 [825]	1080 [1350]
1-1/4-7	380 [475]	840 [1050	1426 [1782]	1-1/4-12	420 [525]	920 [1150]	1500 [1875]
1-3/8-6	490 [612]	1010 [1375]	1780 [2225]	1-3/8-12	560 [700]	1260[1575]	2010 [2512]
1-1/2-6	650 [812]	1460 [1825]	2360 [2950]	1-1/2-12	730 [912]	1640[2050]	2660 [3325]

METRIC:

Coarse thread metric class 10.9 fasteners and class 10.0 nuts and through hardened flat washers, phosphate coated, Rockwell “C” 38-45. Use value in [ ] if using prevailing torque nuts.

Nominal thread diameter (mm)	Newton Meters (Standard Torque)	Foot Pounds (Standard Torque)	Nominal Thread Diameter (mm)	Newton Meters (Standard Torque)	Foot Pounds (Standard Torque
6	10 [14]	7 [10]	20	385 [450]	290 [335]
7	16 [22]	12 [16]	24	670 [775]	500 [625]
8	23 [32]	17 [24]	27	980 [1105]	730 [825]
10	46 [60]	34 [47]	30	1330 [1470]	990 [1090]
12	80 [125]	60 [75]	33	1790 [1950]	1340 [1450]
14	125 [155]	90 [115]	36	2325 [2515]	1730 [1870]
16	200 [240]	150 [180]	39	3010 [3210]	2240 [2380]
18	275 [330]	205 [245]			

Hydraulic Fitting Torque Specifications

37 degree JIC, ORS, &ORB (REV. 10/97)

This chart provides tightening torques for general purpose applications when special torques are not specified on process or drawing. Assembly torques apply to plated nuts and capscrews assembled without supplemental lubrication (as received condition). They do not apply if special graphite moly-disulfide or other extreme pressure lubricants are used. When fasteners are dry (solvent cleaned) add 33% to as received condition torque. Bolt head identification marks indicate grade and may vary from manufacturer to manufacturer. Thick nuts must be used on grade 8 capscrews. Use value in [ ] if using prevailing torque nuts.

TORQUE SPECIFIED IN FOOT POUNDS

PARKER® BRAND FITTINGS

Dash Size	37 Deg. JIC	O-ring (ORS)	O-ring boss
-4	11-13	15-17	13-15
-5	14-16	----------	21-23
-6	20-22	34-36	25-29
-8	43-47	58-62	40-44
-10	55-65	100-110	58-62
-12	80-90	134-146	75-85
-16	115-125	202-218	109-121
-20	160-180	248-272	213-237
-24	185-215	303-327	238-262
-32	250-290	----------	310-340

AEROQUIP® BRAND FITTINGS

Dash Size	37 Deg. JIC	O-ring (ORS)	O-ring boss
-4	11-12	10-12	14-16
-5	15-16	----------	16-20
-6	18-20	18-20	24-26
-8	38-42	32-35	50-60
-10	57-62	46-50	75-80
-12	79-87	65-70	125-135
-14	----------	----------	160-180
-16	108-113	92-100	200-220
-20	127-133	125-140	210-280
-24	158-167	150-165	270-360

GATES® BRAND FITTINGS

Dash Size	37 Deg. JIC	O-ring (ORS)	O-ring boss
-4	10-11	10-12	14-16
-5	13-15	----------	----------
-6	17-19	18-20	24-26
-8	34-38	32-40	37-44
-10	50-56	46-56	50-60
-12	70-78	65-80	75-83
-14	----------	65-80	----------
-16	94-104	92-105	111-125
-20	124-138	125-140	133-152
-24	156-173	150-180	156-184
-32	219-243	----------	----------

Chapter 2

Tires, Brakes and Drivetrain

Floor Plate

NOTE

This panel provides access to the accelerator assembly which is mounted to the underside of the floor plate. The master cylinder, service brake pedal and linkage are mounted within the frame well, easily accessible when the floor plate has been removed.

Floor Plate Removal and Assembly

1. Thoroughly clean the floor area using a vacuum.
2. Lift up the rubber floor mat, carefully separating it from the accelerator and brake pedal. **See Figure 2-1.**
3. Remove the M10 floor plate fasteners.
4. Remove the left floor plate from the truck frame.
5. Carefully lift up the right floor plate a few inches. The accelerator pedal assembly will still be attached to the floor plate by the accelerator wiring harness. Unhook the accelerator harness and lift away the floor plate.
6. Assemble in reverse procedure.

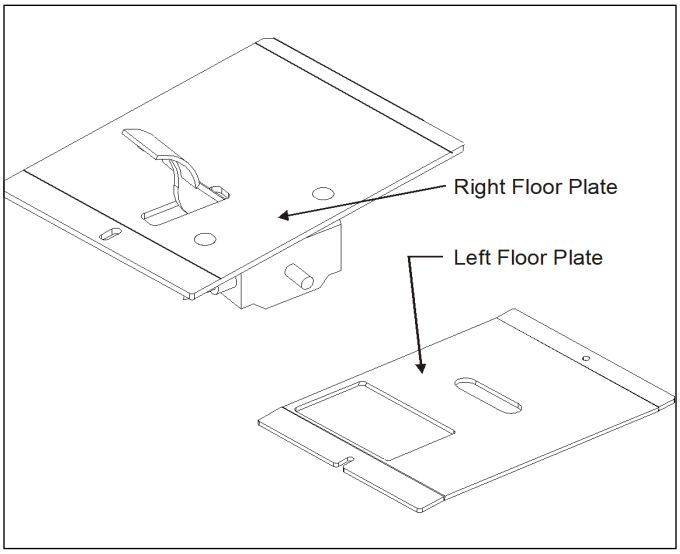


Figure 2-1 Floor Plate Assembly

Tire Inspection

WARNING

The truck is equipped with tires of a size and hardness that provide the necessary traction and still maintain a proper shape to minimize tipping. To maintain stability and maximum reliability, you must always replace tires with the type originally supplied and torqued to specification, as listed on the specification sheet on page 1-12.

IMPORTANT

It is recommended to replace worn front tires in pairs. Careful driving habits add additional miles to tire life.

NOTE

- *Check the drive wheel lug nuts after 2 to 5 hours of operation when new lift trucks begin operation and on all lift trucks when the drive wheel has been removed and installed.*
- *Tighten the nuts in a cross pattern to the correct torque value of 125 ft. lbs. (90 Nm).* ***See Figure 2-2.*** *When the nuts stay tight for eight hours, the interval for checking the torque can be extended to 200 hrs.*

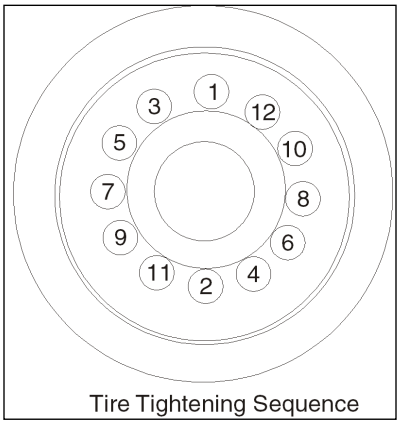


Figure 2-2 Tire Tightening Sequence

Visual Inspection

1. Inspect the tires for chunking (or chipping), embedded foreign material (wire, rocks, glass, metal, etc.), cuts, gouges, undercutting or uneven wear. Remove any object that will cause damage.
2. Check for loose or missing hardware.
3. Remove any wire strapping or other material that is wrapped around the inside of wheel.
4. Make sure drive wheel nuts are tight. Tighten the wheel nuts in a criss-cross pattern to a correct torque value of 125 ft. lbs. (90 Nm). **See Figure 2-2.**

Chunked Tires or Embedded Objects

IMPORTANT

- **Chunking or chipping is caused by repeatedly running over objects on a littered floor, which can chip away or produce deep cuts to the rubber surface of the tire. Embedded objects, such as glass, metal chips, or nails left in a tire, and truck overloading, cause the same effect.**
- **Sharp rapid turns at quick speeds, jack-rabbit starts and stops and other such bad driving habits can cause the same kind of damage.**

1. Remove any embedded foreign material from the tire as soon as it is noticed. Also remove torn pieces of tread.
2. To avoid overloading, always center the payload on the truck to equalize the load on all tires. Do not dangle the load on the ends of the forks. Also avoid fast cornering, which can cause an overload affect.
3. If the tires are chunked bad enough to produce a bouncy ride, replace them.

Undercutting and Uneven Wear

IMPORTANT

- **Undercutting is caused by continuous overloads, rapid, sharp turns, operating on slopes, transporting loads with a high center of gravity, or transporting off-center loads.**
- **Uneven tire wear is usually the result of mechanical defects, such as badly adjusted brakes, misaligned wheels, or a faulty drive train.**

1. Undercutting causes the rubber to bulge out over the edge of the steel band, cutting the rubber just above the base band.
2. Check that the tires remain centered on the wheels to prevent splitting of the base band and tread separation.
3. Correct such defects as soon as possible.

Flat-spotting

IMPORTANT

Flat-spotting occurs when:

- **The truck has been sitting idle for some time after heavy use and is usually caused by the tires overheating.**
- **The truck has standing load (loads left on the forks overnight).**
- **Locking the brakes while traveling in either direction on grades (slopes), with or without a load, causing excessive skidding. Polyurethane tires are extremely susceptible to this type of abuse.**

1. Avoid excessive heat. Where possible, avoid contact with hot metal or operation for long periods in hot oven rooms. Excessive heating will break-down the tire structure.
2. Avoid standing loads. In addition to being unsafe, solid tires will flat-spot when loads are left standing on the truck overnight. In extreme cases, a flat spot develops and the tire bounces with every revolution.
3. If the tires are flat-spotted bad enough to produce a bouncy ride, replace them.
4. Do not indulge in stunt driving or horseplay where excessive hard braking is needed, especially on grades (slopes).

Extending Tire Life

A few simple measures can help increase tire life, reduce maintenance (downtime) and overall cost of operation.

1. Inspect tires regularly and remove embedded objects when they are found.
2. Check that the tires remain centered on the wheels.
3. Use a replacement tire that meets Landoll's Drexel SLT30/35 AC new tire specifications.
4. Keep runways clean and maintain floors in good repair, free from breaks, ruts, cracks and debris.
5. Avoid excessive heat, overloading and standing loads.
6. Regularly check axle alignment and steering.
7. Avoid sharp turns and quick starts and stops.
8. Avoid contact with oil, grease, gasoline and acid. Wipe these compounds off as soon as possible.
9. Do not allow hydraulic oil to drip onto the tires.

Replacing the Drive Tire

WARNING

Make sure that a replacement drive tire is of the same size and composition as the original tire supplied by Landoll Corporation. Tire composition can affect braking, capacity, turning and operator safety. Landoll Drexel SLT30/35 AC tires are an interference type, meaning the tires are pressed on and pressed off. The rear drive tire can be replaced separately, but the two front tires should be replaced in pairs to maintain performance and stability.

CAUTION

Replacing pressed-on tires should be done only by technicians who have been specifically trained for this procedure and have the specific tools to perform this job.

1. Park the truck at a level, designated work area.
2. Lower the forks and chock the load wheels.
3. Turn the steer wheel all the way to the right to expose the wheel mounting nuts.
4. Remove the ignition key and place in a secure area.
5. Perform a Lock Out/Tag Out procedure.
6. Lift the truck so that the tire being replaced is just off the floor.
7. Remove the lug nuts to replace the rear drive tire.
8. Replace tire only with a Landoll approved replacement part.
9. Press the replacement tire onto hub. The replaced tire gets pressed off during this procedure. Make sure the outside of the new tire is flush with the hub.
10. Install tire/hub assembly onto the truck and torque lug nuts to 125 ft. lbs. (90 Nm.) in a cross-cross pattern. **See Figure 2-2.**

Load Wheel Bearing Maintenance

1. Remove the ignition key and place in a secure area.
2. Perform a Lock Out/Tag Out procedure.
3. Jack and block the truck so the load wheel being serviced is clear of the floor and free to rotate. Make sure other wheels are securely blocked so the truck cannot move.
4. Spin the wheel and check for noise, rolling resistance and free play. Rock the wheel in and out on the spindle. If there is noticeable movement the bearings should be checked and repacked with grease or replaced if necessary.
5. To remove the wheel pry off wheel hub cover. Bend back tangs on the lock washer to free them from the notches in the wheel spindle nut. **See Figure 2-3.**
6. Using a spanner wrench, unscrew the spindle lock nut and pull hub/wheel assembly from the spindle being careful not to damage the inner grease seal.
7. Remove outer wheel bearing from hub.
8. To remove the inner wheel bearing turn the tire face down and pry the old grease seal from the wheel. Note how seal is installed.
9. Remove the inner wheel bearing from the hub.
10. Carefully inspect the bearings for cracks, heat discoloration, worn rollers, etc. Check the bearing race for wear and/or damage.
11. If bearings need to be replaced, use a punch or wood block to tap out the inner and outer races.

NOTE

Spindle nut can best be removed using Landoll p/n 176168, Tool, M-10SPANNER NUT.

12. Use solvent to remove all traces of old grease from the wheel hub, spindle and bearings if new ones are not being installed. Allow the parts to air dry.
13. Install a new inner and outer race (one each) in the wheel hub if the bearings are being replaced. A seal and race tool is required to press in the race.
14. Pack the bearings with high-temperature bearing grease, making sure the grease penetrates the rollers, cone and cage from the back side.
15. Also apply a thin coat of grease to the spindle at the outer bearing seat, and to the inner surfaces of the race.
16. Place the grease-packed inner bearing into the rear of the wheel and put a little grease around the outer edge of the bearing.
17. Place the new seal over the inner bearing and tap the seal evenly into place using the seal and race tool. The seal must be flush with the wheel hub.
18. Carefully place the wheel onto the spindle and push the outer grease-packed bearing into position.
19. Install the tanged lock washer, then install the spindle nut and tighten to 22 (±2) ft. lbs., 30 (±3) Nm. to seat the bearings.

20. Spin the wheel to make sure it turns free, then back off the wheel nut 1/2 turn and re-tighten to the specified torque. Again, check to make sure the wheel turns freely.
21. Bend the tangs of the lock washer into the nearest notches in the wheel nut. Back-off the nut slightly as necessary to align it with the nearest lock washer tangs.
22. Apply a thin layer of grease to the hub cap o-ring and press hub cap into the hub.

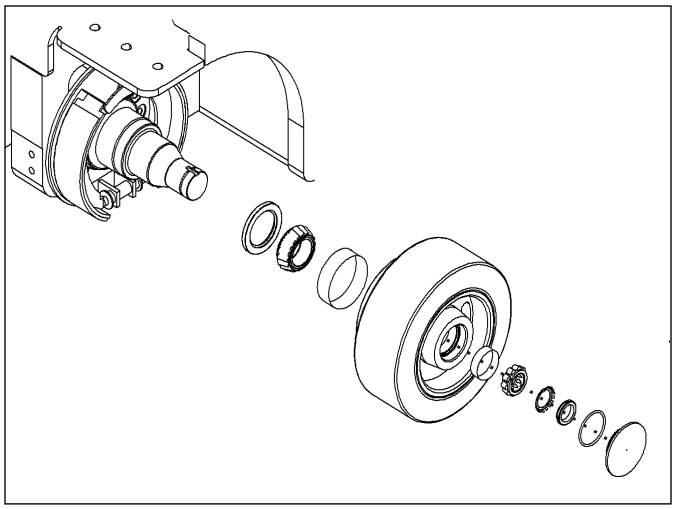


Figure 2-3 Load Wheel Bearing Assembly

Replacing the Load Tires

NOTE

Front load tires must be replaced in pairs, but do this procedure one tire at a time. Replacement load tires must have same size and composition as factory tires.

⚠ CAUTION

Replacing pressed-on tires should be done only by technicians who have been specifically trained for this procedure and have the specific tools to perform this job.

1. Follow steps 1-8 on “Load Wheel Bearing Maintenance” on page 2-3.
2. Press the replacement tire onto the hub. The replaced load tires get pressed off as the new tire gets pressed on. Make sure the outside of the new tire is flush with the hub.
3. Pack outer wheel bearing with grease and continue with steps 19-23 on “Load Wheel Bearing Maintenance” on page 2-3.

Brake System

The drum brakes are self-adjusting and should require no maintenance after the initial technician setup. For typical brake assembly illustration, ***See Figure 2-4.***

- **Safety must always be paramount when working on brake system components.**
- **Parts that are not in perfect working condition should not be used. It is recommended to use only genuine Landoll parts.**
- **Whenever servicing a brake component, it is recommended to service both sides of the truck to ensure that both sides have equal braking and to prevent premature wear and uneven braking action.**
- **If you are unsure about a procedure, consult a trained technician.**
- **Wear eye protection. If brake fluid comes in contact with eyes, immediately rinse with water and seek medical attention.**
- **Use only DOT #3 brake fluid. Brake fluid will damage paint. Cover all body parts and be careful not to spill brake fluid during brake maintenance.**
- **Do not use petroleum based solvents to clean brake parts. Use only brake cleaner or denatured alcohol.**
- **When changing brakes, it is recommended that the return and hold-down springs be replaced. These springs are subjected to continuous heating and cooling cycles and over a period of time, may lose their tension, allowing the shoes to drag on the drum and wear at a faster rate.**
- **Do not used compressed air to blow particles from the brake assembly.**
- **Make sure you strictly adhere to all clearances and torque specifications. See page 1-12.**
- **When you are finished working on the brakes, test them carefully in a controlled area before releasing truck for operation.**
- **If the contact surfaces of the drums show cracks, score marks, deep grooves, a raised lip on the outer edge, or signs of overheating or warping, the drum must be replaced.**
- **If a problem is suspected, do not release or drive the truck until the problem is corrected.**

Brake System Service

NOTE

Landoll SLT30/35 AC truck braking is accomplished by using the drive motor to restrain the truck, or by applying pressure to the brake pedal. When the accelerator pedal is released, the moving motion of the truck is restrained by the drive motor in both the forward and reverse direction. Stopping the truck can also be done by the normal applied pressure to the brake pedal.

Check Service Drum Brakes

- **The service brakes are hydraulically-actuated drum brakes, similar to an automotive drum brake system. The brake drums are installed on the two front load wheels only and are self adjusting.**
- **The brakes should be checked every 200 hours of operation. Normal brake shoes can last 3,000 hours of operation, but that figure can vary widely as determined by the operator and driving conditions. If you are near or beyond this time frame, you must thoroughly inspect the brakes.**
- **New brake shoes are approximately 0.265" (6.7 mm) thick. Replace them when the shoe thickness is 0.0625" (1.588 mm) or less.**

NOTE

A few indications of possible brake shoe replacement are:

- *Excess travel of the service brake pedal.*
- *The truck pulling to one side or the other when the brakes are applied.*
- *Squealing or grinding is heard when brakes are applied.*

Drive the truck at creep speed and apply brakes lightly, to determine if brakes pads are contacting the drum. You should feel pedal resistance as the shoes contact the drum.

If any of the above occurs during brake inspection, see "Checking/Changing Brake Shoes," beginning on page 2-6.

The service brake pedal must also have about 1/2" (12.7 mm) of the travel remaining when the brakes are fully applied. If less than 1/2" (12.7 mm) is available, adjust or check the shoes for wear and replace as needed.

Brake Adjustment

1. Remove the ignition key and place in a secure area
2. Perform a Lock Out/Tag Out procedure.
3. Jack up and block the truck so the load wheel being serviced is just clear of the floor and free to rotate. Make sure other wheels are securely blocked so the truck cannot move.
4. Rotate the tire until you can see the front cylinder shaft and star wheel adjuster through the access hole.

NOTE

Unlike an automobile that has "one" star wheel to adjust the brake shoes, SLT trucks use a dual star wheel design. Each brake shoe half, front and back, is adjusted separately by its own star wheel.

5. Note the amount of cylinder shaft visible, then rotate the wheel to expose the back brake shoe. Again check the amount of visible cylinder shaft. The lesser of the two is where you want to start.
6. Using the brake adjusting tool or flat blade screw driver, adjust the brake shoe until *light* pressure is applied to the drum.

NOTE

The star wheel adjusters use a right-handed thread (clockwise rotation). A soft click is also heard as you tighten the brake.

CAUTION

- **Adjust the brake slowly and carefully. You cannot release the adjustment (rotate the star wheel in the opposite direction) without dislodging the locking spring clip. Forcing the adjusters in this direction will render the self-adjusters inoperable and/or require complete dis-assembly of the wheel to prevent further damage to the brake system.**
- **Do not overtighten the brakes. Brake shoes that are too tight generate excessive heat causing premature brake shoe and tire wear, that could eventually damage an electric motor.**

7. Adjust the shoe until it touches the drum. Rotating the wheel should require only light force.
8. Rotate the wheel to place the plug hole over the other brake shoe star wheel adjuster.

9. Repeat preceding, “Steps 8 through 10” to adjust the other brake shoe. When you are finished, rotate the wheel a few times to get a feel for the amount of effort needed. You want to duplicate this feel on the other side of the truck to insure both sides are adjusted evenly.
10. Remove the support stand and lower the truck. Reposition the tire support blocks for the next wheel to be serviced.
11. Repeat this procedure for the other side of the truck.
12. Connect the battery and perform a road test. Road test the truck by getting up to speed and apply the brakes ten (10) times in forward and reverse. Do not lock the brakes when stopping to avoid flat-spotting.
13. Observe the braking of the truck. If the truck pulls to one side, recheck and adjust the star wheel.

Checking/Changing Brake Shoes

The brakes are located in the front drum/wheel assembly and are attached to a backing plate. For typical brake assembly illustration, **See Figure 2-4.**

1. Follow steps 1-7 on “Load Wheel Bearing Maintenance” on page 2-3.

NOTE

In extreme cases of wear, the brake shoes must be fully returned (retracted) before the wheel can be removed. This involves loosening the star adjusters, which is done through the access holes in the wheel hub. Brake fluid will damage paint. Have a container and shop rags available to manage spills. Cover all body parts and be careful not to spill fluid during this procedure.

CAUTION

Do not use forced air to clean brake parts.

2. Check the inside contact surfaces of the wheel rim for cracks, score marks, deep grooves, a raised lip on the outer edge and signs of overheating. If the wheel rims show blue spots, indicating overheated areas, the wheel rim must be replaced. Also, look for surface glazing, grease or brake fluid on the shoe contact surfaces. Grease and brake fluid can be removed from metal surfaces, but if the shoes are contaminated, they must be replaced. Surface glazing, which is a glossy, highly polished finish, can be removed with medium grit emery cloth (100-120 grit).

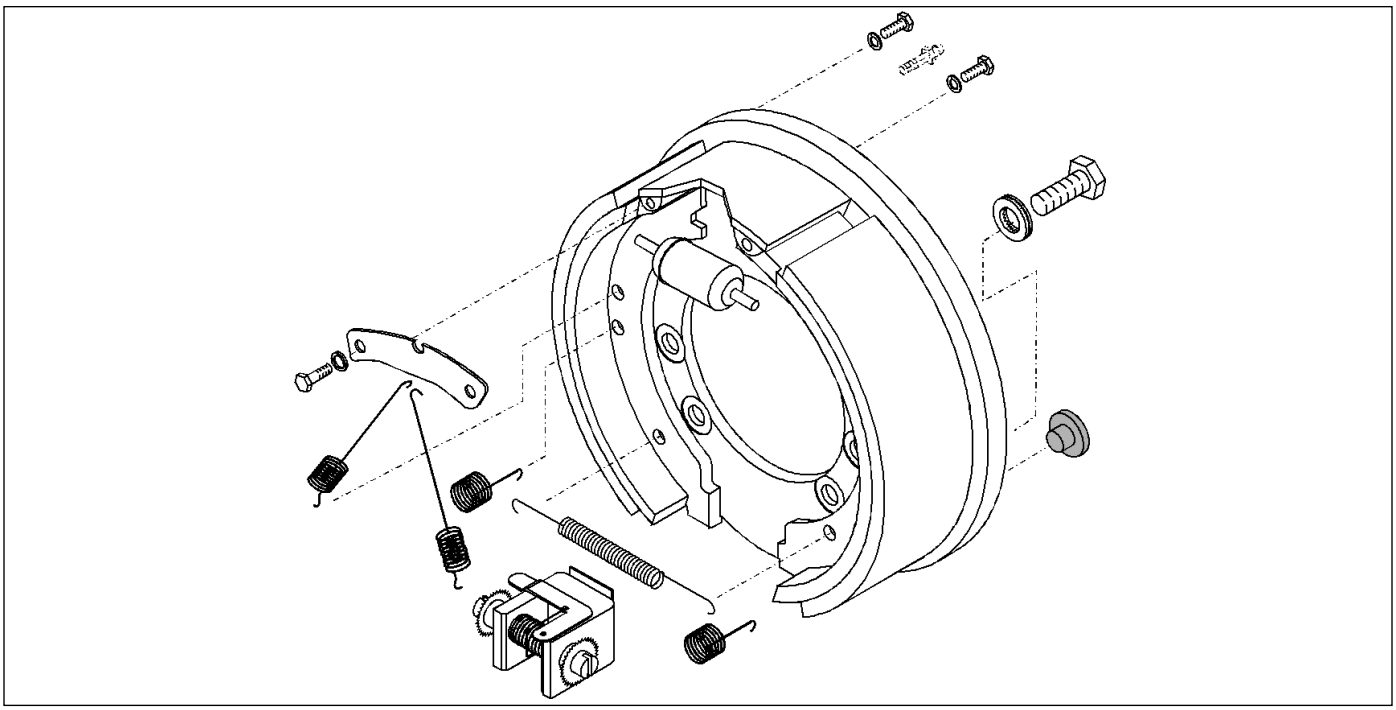


Figure 2-4: Brake Assembly

3. Before removing the internal brake components, wash (spray) them with brake cleaner and allow to dry. Position a container under the brake assembly to catch the excess residue.
4. Pull or press to release the star wheel adjuster latches and turn the star wheel to retract both the front and rear brake shoes of each drum.

5. Loosen one clamp hold-down screw and remove the other screw to allow the clamp to drop down making it easier to remove the front and rear return springs.
6. Unhook and remove both return springs.
7. Press in on the hold-down spring and pop it to one side (opposite of where hook is attached) to free the spring hook from the rear of the brake backing plate. This will require some force to compress the spring to pop it free.
8. Remove both hold down screws and the hold down clamp. Carefully separate the front and rear shoes from the wheel cylinder.
9. Clean the area and check the wheel cylinder for leaks. Pull back on the bottom portion of the rubber boot on both sides of the cylinder. If it is not dry, see "Repairing Brake Wheel Cylinders," page 2-7.

NOTE

Check the brake lines for cracking, splits, or any apparent weakness - replace as needed.

10. SPARINGLY lubricate the brake shoe contact areas of the backing plate with high temperature grease. Install the new brake shoes and install the brake drum (two outer hex head screws and hardware). Do not allow any grease to come on contact with braking area of the shoe. Torque the screws to specifications shown on page 1-12 on the "General Torque Specification" chart.
11. Install the new brake shoes by following the above instruction in reverse order. Be sure that all springs are properly hooked at both ends and that they hold-down clamp screws are tight.
12. Wiggle the brake assembly to ensure that the shoes are centered on the backing plate.
13. Reinstall wheel assembly by following steps 19-23 on "Load Wheel Bearing Maintenance" on page 2-3.
14. Pump the brakes several times to seat the new brake shoes.
15. Using the brake pedal, make a few normal stops in forward and reverse to allow the brakes to further seat themselves. DO NOT lock the brakes which could cause flat spots.

Repairing Brake Wheel Cylinders

NOTE

The wheel cylinder, if it freezes-up or shows signs of leakage, must be replaced before returning the truck to operation.

1. Set the key switch of OFF and place the key in a secure place.
2. Initiate a Lock Out/Tag Out procedure.
3. Raise the side of the truck being serviced.
4. Remove the wheel. See "Replacing Brake Drum Assemblies", page 2-8.
5. Remove the brake shoes. See "Changing Brake Shoes", on page 2-6.
6. Using a flare-nut wrench, disconnect the brake fluid inlet line from the wheel cylinder. Have shop rags available to manage spills. **See Figure 2-5.**
7. Do not pull the brake line away from the cylinder. Plug the end to reduce fluid loss and contamination.
8. Remove the two bolts holding the cylinder to the backing plate.
9. Install the new cylinder and tighten fasteners to the specified torque as shown in "General Torque Specifications" on page 1-12.
10. Connect the brake inlet line and install the brake shoe assembly and drum. To avoid stripping the brass threads, do not overtighten the brake line fittings.
11. Reinstall the components in reverse order.
12. Bleed the brakes. See "Bleeding Brakes" on page 2-12.

NOTE

When replacing a brake assembly, a wheel cylinder or a master cylinder, it is advisable to purge and replace the entire brake system of old, possibly contaminated fluid.

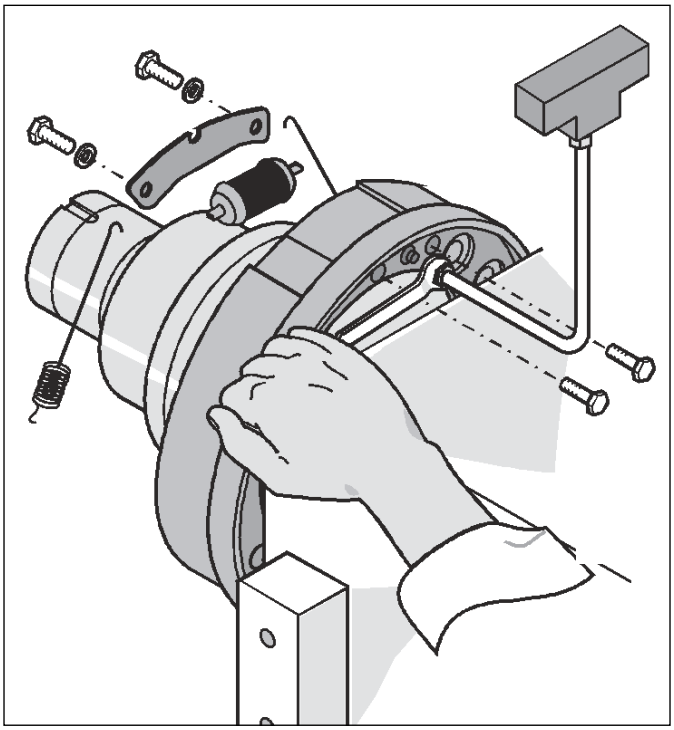


Figure 2-5 Wheel Cylinder Repair

Hydraulic Brake Drums

NOTE

Whenever servicing and/or replacing a brake drum assembly, you must service both sides of the truck to prevent premature wear and uneven braking action. The drum and the wheel are an integrated assembly.

Measure Brake Drum Diameter

Repeat steps 1 through 8 of preceding section “Checking/Changing Brake Shoes”, beginning on page 2-6.

Check the drums for scoring, cracks, deep grooves, a raised lip on the outer edge, signs of overheating, out of round or other damage.

Drum diameter measurements may be checked with the drum removed from the truck. Using a brake drum gauge, measure the diameter at four or more points on the drum and make sure all measurements are taken at the same distance in from the outer edge of the drum. **See Figure 2-6.**

Thickness variations of more then 0.005” (0.13 mm) can cause pedal pulsation and/or vibration when applying the brakes. A drum that does not meet these specifications must be machined or replaced.

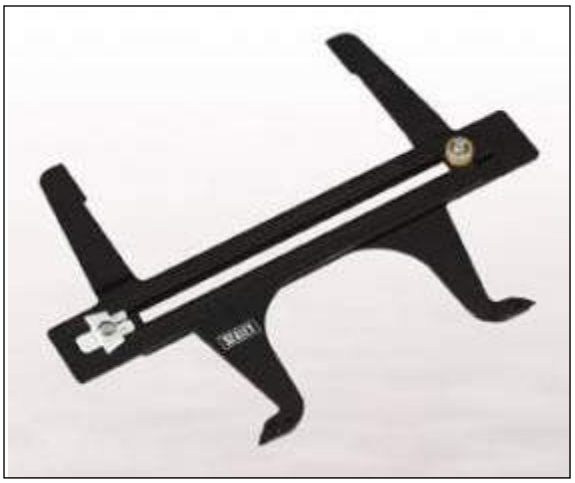


Figure 2-6 Typical Brake Drum Gauge

Replacing Brake Drum Assemblies

1. Repeat Steps 1 through 9 of preceding section “Checking/Changing Brake Shoes”, beginning on page 2-6.
2. Check the brake lines for cracks, splits or any apparent weaknesses. Replace as needed.
3. Loosen the locknut and hardware from the spindle. DO NOT remove nut from the assembly at this time.
4. Rock the drum while gently pulling on the drum.
5. If needed, using the rubber mallet (dead-blow hammer), hit the drum on the opposite side, driving it towards the loosened nut.
6. Repeatedly hit the drum evenly in a circular motion until it pops free, then remove the nut.
7. Remove the drum and tire assembly.

NOTE

Brake drum/wheel assemblies are heavy. When handling the new drum, protect the finish surfaces from damage. Damage to the braking surfaces renders the brake drum useless. The tire must be pressed on the new drum before assembly.

8. Install the new drum and tire assembly to the spindle, being careful not to damage the grease seal during assembly. Make sure the spindle is clean and free of dirt and grease and then install.
9. Carefully place the wheel onto the spindle and push the outer grease-packed bearing into position.
10. Install the tanged lock washer, then install the spindle nut and tighten to 22 (±2) ft. lbs., 30 (±3) Nm. to seat the bearings.
11. Spin the wheel to make sure it turns free, then back off the wheel nut 1/2 turn and re-tighten to the specified torque. Again, check to make sure the wheel turns freely.
12. Bend the tangs of the lock washer into the nearest notches in the wheel nut. Back-off the nut slightly as necessary to align it with the nearest lock washer tangs.
13. Apply a thin layer of grease to the hub cap o-ring and press hub cap into the hub.

Parking Brake Assembly

The parking brake is electronic and automatically locks the rear drive wheel when the key is off or if the operator is off the seat for 3 seconds or more.

Checking the Parking Brake

⚠ CAUTION

The intention of this test is to have the drive wheel lock up.

Do not do this test at high speeds!

Do this at a slow creep speed only with no load on the forks.

The parking brake system is controlled by the truck’s control system.

To check the park brake:

1. Sit in the driver's seat and turn the key switch to ON.
2. With the seat belt on, put the directional switch in the forward position and drive forward at a very slow speed.
3. While truck is creeping forward, turn the key switch to the off position.
4. The park brake should click on immediately after the key switch is turned OFF, bringing the truck to an abrupt stop. If this doesn't happen, refer to "Park Brake Maintenance".

NOTE

This test can also be done on a ramp without having the lift move, if your facility is so equipped. The ramp method is less likely to flat-spot the tires.

NOTICE

DO NOT release or operate the truck if you are in doubt about the effectiveness of the parking brake system. Contact your Landoll service representative for assistance.

Park Brake Installation and Mounting

1. Remove the dust cover (if applicable).
2. Remove the three socket head cap screws from the top of the brake assembly to remove the mounting plate.
3. Screw the mounting plate onto the motor using three M8 hex bolts and lock washers.
4. Re-install the park brake onto the mounting plate using the three socket head cap screws.
5. Using a feeler gauge, leave a gap of .034" (.86mm) between the mounting plate and brake case. Loosen the three hex bolts and adjust the air gap nuts as necessary. It is important to measure this in at least 3 locations around the brake. The air gap should not vary.
6. Replace dust cover (if applicable).

Park Brake Maintenance

- The brake surface must be free of debris and contaminants.
- At certain intervals the air gap may need readjustment. Refer to step 5 from "Park Brake Installation and Mounting".
- Excessive wear may make it necessary to readjust the Power-On nuts to allow proper function. The rotor and shaft will rotate freely 8-10° of the Power-On release. Adjust the two Power-On nuts, shown in **Figure 2-7**, as necessary.
- It is normal for brakes to become hot to the touch. The brakes are insulation rated to 311° F (155° C).

Figure 2-7: Park Brake Adjustments

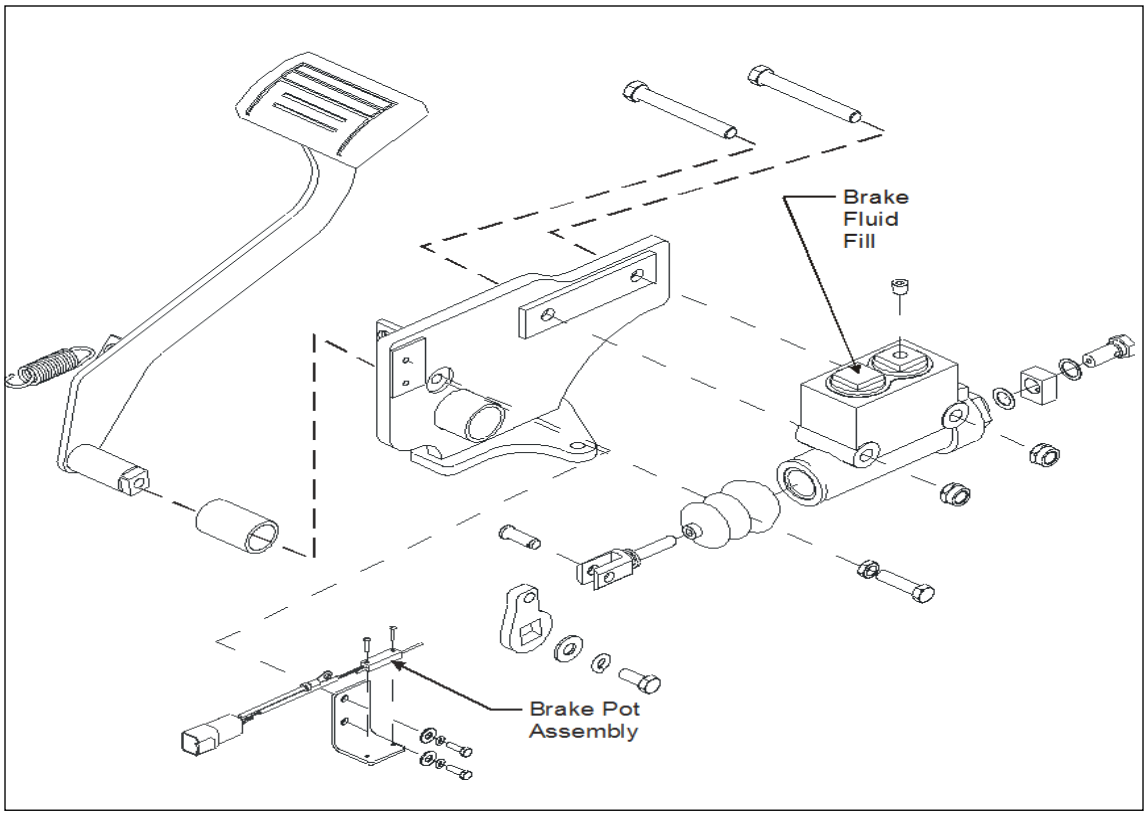


Figure 2-8: Brake Pedal and Pot Assembly

Brake Pedal Assembly

NOTE

The two piece floor plate is removed to provide access to the brake pedal and accelerator pedal which is mounted to the underside of the floor plate. The master cylinder, service brake pedal and linkage are mounted within the frame well.

Brake Pedal

The service brake pedal has 1" maximum free-travel before any pressure is applied to the brakes or before the pedal moves the master cylinder plunger.

The pedal also has a maximum range of travel of 0.500" (12.7 mm) before it contacts the positive stop hex screw. The brake light/accelerator switch is factory set to trip just as the brake pedal begins its downward stroke.

Service Brake Linkage

NOTE

The linkage between the brake pedal and the master cylinder is not adjustable.

Some other areas that can affect the braking system include:

- Low fluid level in the master cylinder reservoir.
- Air or leaks in the system.
- Worn brake shoes. See “Checking/Changing Brake Shoes,” on page 2-6.

Any of these conditions can affect pedal free-travel.

Replacing the linear pot

To replace the linear pot, disconnect the wiring harness to the assembly and remove the 2 screws holding the assembly into position and replace the assembly. Calibration is required through the dashboard calibration procedure. See calibration procedures starting on page 5-1.

Master Cylinder

Replacing Master Cylinder

1. Set the key switch to OFF, remove the key from the key switch and put in a secure place
2. Perform a lockout/tagout procedure.

3. Apply the parking brake, disconnect the battery and block the wheels.
4. Remove the floor plates.
5. Remove the master cylinder fill cap.

NOTE

Note: Siphon out as much fluid as possible. Install and tighten the fill cap before removing the cylinder.

6. Place rags under the brake line connections. Have a plastic cap or bag handy to cover the end of the line to limit fluid spillage.

IMPORTANT

Brake fluid will damage paint. Cover truck body parts and be careful not to spill fluid during this procedure.

7. Using a flare-nut wrench, disconnect the brake fluid line at the rear of the cylinder.

NOTE

Flare-nut wrenches should be used to prevent rounding off the corners of the brake line fitting.

8. Carefully pull the brake line away from the cylinder. Seal or plug the brake line and master cylinder port to prevent fluid loss and/or contamination.
9. Remove pin from clevis adjoined to the master cylinder crank plate.
10. Remove the two master cylinder mounting bolts and remove the cylinder from the truck.
11. Remove the reservoir cap and discard any fluid remaining in the reservoir.
12. Remove rubber boot and clevis from the master cylinder.
13. Remove fittings from the opposite end of the master cylinder.

NOTE

*Whenever the master cylinder is removed and/or replaced, the hydraulic brake system must be bled. See "Bench Bleed the Master Cylinder". **See Figure 2-9.***

14. Install the new master cylinder in reverse order.

NOTE

Since high pressure is not involved in the bench bleed procedure, your finger can be used to plug the cylinder hole and prevent the intake of air. Wash hands after this procedure or wear protective latex glove. Kits to aid in the bench-bleeding of master cylinders are also available at your local auto parts store.

Bench Bleed the Master Cylinder

1. Support the cylinder in a vise. **See Figure 2-9.**
2. Remove filler cap assembly.
3. Fill the master cylinder with SAE J1703 or DOT 3 brake fluid.
4. Connect a length of tubing to fitting block and immerse the other end below fluid level.
5. Apply power cylinder push rod full stroke. Repeat until air bubbles have ceased.
6. Remove brake tubing from fitting block and reservoir.
7. Install plugs and filler cap to hold fluid in cylinder.
8. Install unit on truck.
9. Connect brake lines.
10. Bleed brake system as described on page 2-12.

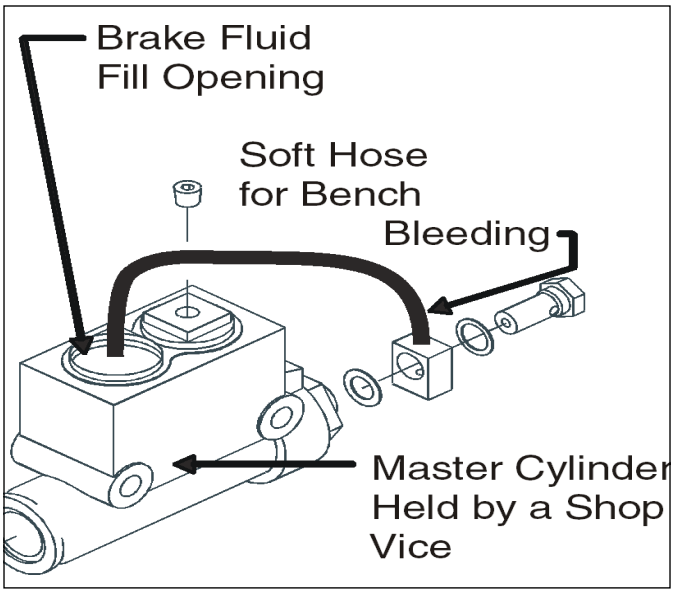


Figure 2-9 Bench Bleeding the Master Cylinder

Check Master Cylinder Fluid Level

The master cylinder is located below the driver's compartment floor plate.

1. Remove the left floor plate. See page 2-1.
2. First clean the reservoir cap to avoid fluid contamination, then remove the fill cap.
3. Additional fluid is needed when the fluid level is 1/2" from the top surface of the master cylinder.
4. Add fluid as needed. DO NOT OVER FILL. Use only DOT3 brake fluid from a clean, sealed source.
5. Reinstall the reservoir fill cap.

Bleeding Brakes

NOTE

Bleeding the brake system is necessary to remove any air that is trapped when replacing brake lines, brake calipers or the master cylinder. To avoid extensive damage to the system, use only DOT 3 brake fluid.

⚠ WARNING

Wear eye protection. If brake fluid comes in contact with your eyes, immediately rinse them with water and seek medical attention.

NOTE

Check the fluid level often during the bleeding operation and add fluid as needed to prevent the level from falling low enough to allow air bubbles into the master cylinder. Use only new DOT 3 brake fluid from a sealed container. NEVER use old or used brake fluid. It contains moisture which will deteriorate the brake system components.

IMPORTANT

It is necessary to bleed both wheels if air has entered the system. Air in the brake system can be caused by low fluid level, a leaking brake line or a brake line that has been disconnected. If the brake pedal feels spongy when pressed and travels almost to the mechanical stop but regains height when pumped, air has entered the system. The system must be bled. If no fittings were recently opened for service, check for leaks that would have allowed air into the system and repair leaks before attempting to bleed the system.

DO NOT allow fluid to go inside of the brake drum and onto the brake pad. It will contaminate the brake shoes and cause failure.

NOTE

Have an assistant available, as well as a supply of brake fluid, an empty container, a length of 3/16" (4.763 mm) clear plastic or vinyl tubing to fit over the cylinder bleeder fitting and a six point wrench to open and close the fitting.

1. Set the key switch to OFF, remove the key from the key switch and put in a secure place.
2. Apply the parking brake, perform a Lock Out/Tag Out procedure and disconnect the battery.
3. Block the wheels so that the truck can't move.
4. Start with the right wheel (the wheel farthest from the master cylinder).

IMPORTANT

Be careful when handling bleeder screws. Rust may cause the fitting to break. Spray the fitting with penetrating oil before attempting to loosen. Use a 6-sided wrench or socket instead of a 12-sided.

5. Loosen the bleeder fitting slightly, then tighten it where it is snug but can be loosened quickly and easily.
6. Fit a length of tubing over the bleed screw and immerse the other end in the container of new brake fluid. Check that the tubing fits tightly over the bleeder fitting.**See Figure 2-10.**
7. Check fluid level in the master cylinder. Fill before you begin.
8. Have someone slowly press on the brake pedal several times to build pressure in the system, then hold the pedal down.
9. Loosen the cylinder bleed screw until fluid starts to flow. Watch for air bubbles at the immersed end of the tube.
10. When the brake pedal bottoms, tighten the bleed screw, then release the pedal. **DO NOT** release pressure on the pedal until the bleed screw is tightened.
11. Repeat Steps 8 through 11 as many times as needed until the fluid draining in the container is free of air bubbles.
12. Fill the master cylinder fluid level and add as needed before bleeding the other side.
13. Check the operation of the brakes. The pedal should feel solid when depressed, with no softness. If necessary, repeat this procedure.

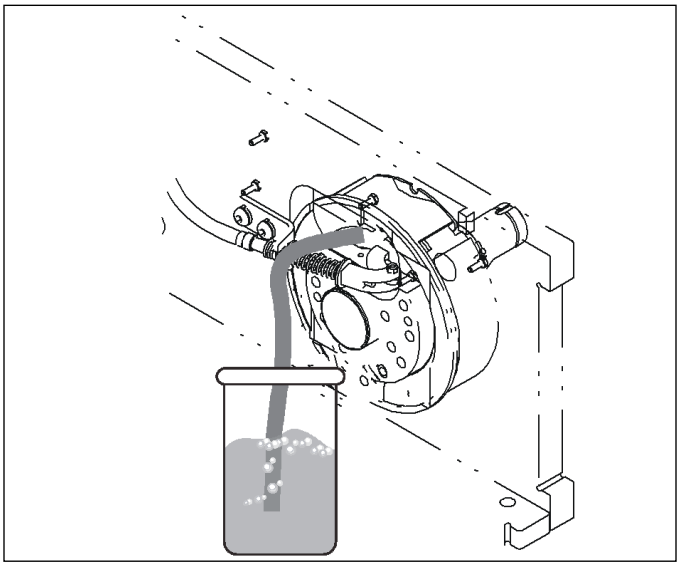


Figure 2-10 Bleeding Brakes

Service Brake Pedal Assembly

NOTE

The service brake assembly (brake pedal) includes the mechanical brake pedal assembly, containing a pivot bushing. The only normal repair items are the pivot bushing, linear brake potentiometer or the brake return spring.

Replacing Any Other Hydraulic Brake Component

1. Set the key switch to OFF, remove the key from the key switch and place in a secure area.
2. Perform Lock Out/Tag Out procedure and disconnect the battery.
3. Apply the parking brake.
4. Make sure all the other wheels are securely blocked so that the truck cannot move.
5. Remove covers as needed.
6. Replace the damaged component.

Traction Motor and Gear Box

NOTE

This section explains rear tire/gearbox maintenance.

Removing the Drive Wheel

1. Set the key to OFF, remove the key and place in a secure area.
2. Apply the parking brake.
3. Disconnect the battery.
4. Perform a Lock Out/Tag Out as required.
5. Block both front wheels so the truck cannot move.
6. Lift and support the truck so that the drive wheel is clear of the floor by about an inch.
7. Remove the lug nuts.
8. Using adequate support, remove the drive wheel.

NOTE

Wheel and tire combination weigh over 200 lbs. (90.7 kg).

9. When installing the new wheel, tighten the lug nuts to 125 ft. lbs. (90 Nm) in a staggered order. **See Figure 2-2.**

Checking Drive Wheel Gearbox

1. With the rear tire raised and supported, spin the drive wheel and check for noise, rolling resistance and free play.
2. Rock the wheel in and out on the gearbox. If there is any noticeable movement, the gearbox must be checked or replaced.

NOTE

There are no user serviceable parts for the gearbox assembly. The unit must be replaced as a complete assembly.

Servicing the Drive Train Assembly

DANGER

Perform service only in a well-ventilated area. Do not breathe vapors. Wear protective goggles, aprons and gloves. Avoid contact with skin, eyes and clothes. Keep away from heat and flame. Failure to observe these precautions may result in injury or death. If you become dizzy, get fresh air and medical help immediately. If solvent contacts your eyes, immediately treat in accordance with the recommendations on the container.

Do not mix different types of lubricants. Always read the label affixed to the fluid container for all safety information before use.

1. Position the truck on a flat surface and block the front wheels to prevent movement.
2. Set the key switch to OFF, remove the key from the key switch and place in a secure area.
3. Disconnect the battery and install Lock Out/Tag Out.

IMPORTANT

Always place an appropriate support stand under the truck if it is being lifted. Lower the truck to the stand, having both the lifting device and stand supporting the weight of the truck.

DANGER

Getting under a truck when it is lifted or jacked is dangerous and could cause serious injury or death. NEVER go under a truck that is supported only by a jack.

4. To drain, carefully clean the area around the oil filler and oil drain plug. **See Figure 2-11.**
5. Place a drain pan capable of storing up to 32 ounces (1.0 liter) of fluid under the drain plug.
6. Remove the oil filter plug (Item 01) with a 6mm Allen wrench and the sealing ring (Item 02).
7. Remove the oil drain plug (Item 03) with a 6mm Allen wrench and the sealing ring (Item 02). Allow oil to drain completely.

⚠ CAUTION

If truck has just been in operation for a period of time the oil could be very hot. Use special gloves and/or allow the truck to cool before changing the oil. It is best to drain fluid while the unit is warm, but not HOT! Never drain oil into sewer lines.

8. Clean any metal filings from the drain plug magnet.
9. Once the fluid has been drained, replace the sealing ring and drain plug (Item 02 and 03) and torque plug to 16 ft. lb.(22 Nm).
10. Fill with transmission oil until oil is at the bottom of the fill plug threads. For oil specifications, see “Lubrication Specifications” on page 1-8. Torque plugs (Items 01 and 03) to 16 ft. lb.(22 Nm).
11. Turn the gear box a few times to eliminate any air pockets and recheck fluid level. The oil level should be checked again after a short driving period. If necessary, re-fill the oil.

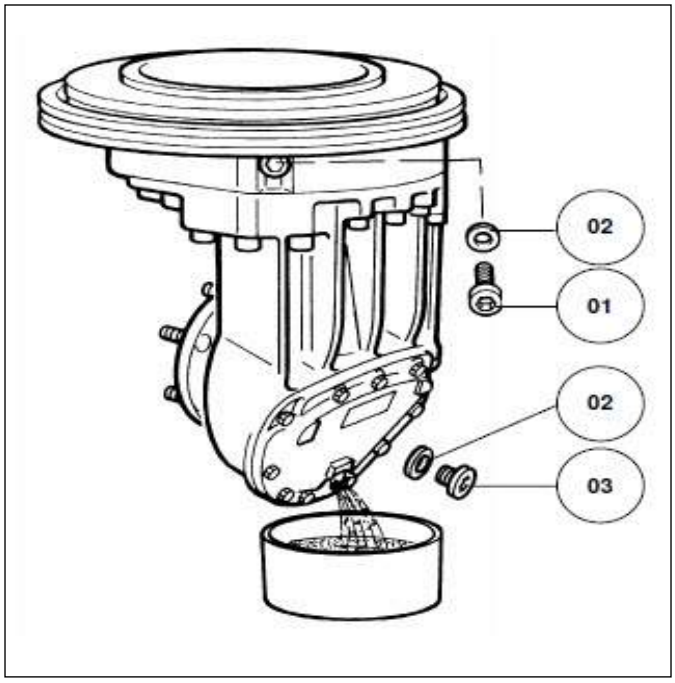


Figure 2-11: Draining the Gear Box

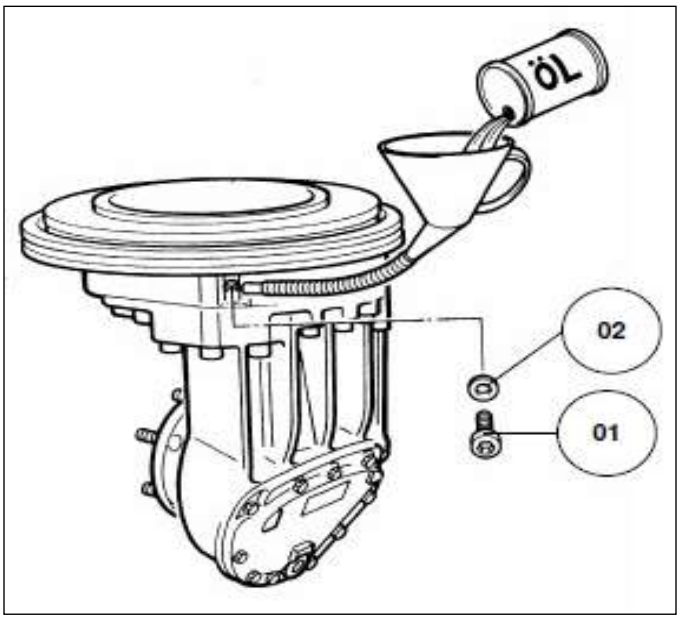


Figure 2-12 Refilling the Gear Box

Gearbox Replacement

To repair and/or replace the traction motor:

1. Set the key switch to OFF. Remove the key from the key switch and place in a secure area.
2. Disconnect the battery.
3. Perform a LockOut/TagOut procedure.
4. Elevate and block the rear of the truck and remove the drive wheel.
5. Unhook the electrical connectors and remove the three M8-1.25 X 30 screws and take off the electric emergency brake that is located on top of the drive motor.
6. Mark and remove the drive motor electrical connectors.
7. Remove steer motor electrical connectors.
8. Remove the steering motor by removing the four bolts that hold it to the drive plate.
9. Remove the six M8-1.25 X 30 screws that hold down the drive motor, and using a hoist, lift motor out.
10. Remove the twelve M16-2 X 55 screws that fasten the drive plate and gearbox to the frame, and using a hoist, lift out the gear box.
11. Remove the six bolts that fasten the gearbox to the drive plate.
12. Fill the replacement gear box with the specified oil.

NOTE

This is best done while gearbox is still on the bench.

NOTICE

The splines of the drive motor and gearbox take a special grease. See “Lubrication Specifications” onpage 1-12.

13. Reassemble in reverse order and torque bolts to specifications on page 1-10 and 1-11.

Figure 2-13 Gear Box Cover Removal

Traction Drive Motor Service

1. Repeat steps 1-4, 6, 7, and 9 in “Gearbox Replacement” on page 2-14.
2. Reassemble in reverse order.

NOTICE

The splines of the drive motor and gearbox take a special grease. See “Lubrication Specifications” on page 1-10.

Accelerator Pedal

NOTE

The accelerator assembly consists of the potentiometer, harness, and accelerator pedal.

Adjusting Accelerator Pedal

1. Set the key switch to OFF, remove the key from the key switch and put it in a secure area.
2. Apply the parking brake, perform a Lock Out/Tag Out procedure, disconnect the battery and block all wheels.
3. Remove the floor plates. See “Floor Plate Removal”, on page 2-1.

NOTE

It is recommended to hold the right hand floor plate in a vice while doing this procedure.

4. Loosen the allen head fastener on the pedal arm so that it can rotate freely. Rotate the pedal until the pedal touches the rear of the slot. Tighten the fastener.
5. Install floor plate assembly back on the forklift.
6. Install left hand floor plate.
7. Refer to Landoll Setup Procedure, located in “Calibration of Steering and Throttle Pot” starting on page 5-9 to re-calibrate the accelerator module.

Replacing Accelerator Module

1. Set the key switch to OFF, remove the key from the key switch and put it in a secure area.
2. Apply the parking brake, perform a Lock Out/Tag Out procedure, disconnect the battery and block all wheels.
3. Remove the floor plates. See “Floor Plate Removal”, on page 2-1.
4. Remove the two round head screws (5/16-18 x 1) and hardware securing the accelerator to the floor panel. **See Figure 2-1.**
5. Disassemble the accelerator from the floor plate and install the replacement accelerator in its place.
6. Loosen the allen headed fastener on the pedal arm and orient the pedal 90º up. Insert the flat part of the arm through the slot, rotate and mate the accelerator mounting surface to the underside of the floor plate. Align with the 5/16” bolts and tighten to secure the accelerator.
7. Adjust the pedal. See “Adjusting Accelerator Pedal” on page 2-15.
8. Refer to Landoll Setup Procedure, located in “Calibration of Steering and Throttle Pot” starting on page 5-9 to re-calibrate the accelerator module.

Table provided for general use.

NOTES:

Chapter 3

Hydraulic Oil, Motors, Pumps and Cylinders

Hydraulic Components

NOTE

This section explains the following:

- **Hydraulic System Maintenance**
- **Checking Hydraulic Oil Level**
- **Changing Hydraulic Oil**
- **Changing the Hydraulic Filter**
- **Checking Hydraulic Pressure**
- **Servicing the Lift Motor and Pump**

1. Set the key switch to OFF. Remove the key from the key switch and place in a secure area.
2. Perform a Lock Out/Tag Out procedure and disconnect the battery.
3. Make sure all the other wheels are securely blocked so that the truck cannot move.
4. Remove the floor plate, if necessary.

Hydraulic System Maintenance

Maintain the hydraulic system and associated components, as required by the various checklists beginning on page 1-6.

CAUTION

Do not allow:

- **Hydraulic fluid level to drop significantly or allow the reservoir to run dry. This will induce air into the system and cause damage to hydraulic system components.**
- **Prevent dirt or other foreign matter from entering the hydraulic system; clean filler caps before checking oil level.**

Cylinders and Valves: **Check these components for drift and leakage. Refer to Landoll Corporation and other vendor service information for specifications.**

Hoses and Tube lines: **Check for cracks, hardening, or other signs of wear. Reroute any usable hoses that are kinked, severely bent or rest against hot parts. Look for leaks, especially at couplings and fittings. Replace any hoses or tube lines that do not meet system flow and pressure ratings.**

Hydraulic Fluid: **Check fluid level and look for air bubbles. Check the filter. See "Change the Hydraulic Oil Filter" on page 3-2.**

Other Hydraulic System Components: **Visually check other components to see if they are loosely mounted, show signs of leaks, or other damage or wear.**

The hydraulic pump in your Drexel SLT30/35 truck is powered by an AC motor. The pump supplies hydraulic pressure and mast movements.

CAUTION

After prolonged truck use, hydraulic oil will be hot and can burn human skin. Allow hydraulic oil to cool before performing this procedure.

Checking Hydraulic Oil Level

IMPORTANT

- **It is important that the proper level of specified oil be maintained at all times. Failure to maintain the oil level as recommended could cause serious mast function operating problems.**
- **The oil level indicated on the dipstick is most accurate when the oil is at operating temperature (130°F to 200°F (53°C to 93°C)).**
- **Do not overfill. Having the level above the FULL line does not allow enough area for expansion when the oil heats during normal operation.**

1. Lower the mast to the floor, then tilt it back completely.
2. Turn the key switch to OFF, remove the hydraulic tank access cover.
3. Remove the dipstick, holding the dipstick tip level, check the oil level. If the oil level is at the FULL line or between the FULL and ADD lines, the level is correct and no oil is needed. If the oil is at or below the ADD line, you will need to add oil to bring it up to the FULL line (maximum).

4. Add hydraulic oil as needed. See page 1-7 for hydraulic oil specifications.
5. If the fluid appears very dirty or dark in color, check the truck's maintenance log for the last fluid and filter change, and change accordingly.
6. Install dipstick, making sure it is seated.
7. Install the hydraulic access cover.

Changing Hydraulic Oil

1. Park the truck on a level, designated service area.
2. Block the front wheels.
3. Perform Lock Out/Tag Out procedure.
4. Set the key to OFF, remove the key from the key switch and place in a secure area.
5. Disconnect the battery.
6. Remove the hydraulic access cover.
7. Open the fill/dipstick cap.
8. The hydraulic reservoir drain plug is located in the right side of the truck, as shown in figure 3-1 photo.
9. Slide a flat collection pan, (minimum 10 gallons - 40 liters) under the drain plug, then remove the plug.
10. Change the hydraulic filter. See "Change the Hydraulic Oil Filter**".**
11. Clean the magnetic trap on the drain plug of any contaminants. When the tank is empty, clean and reinstall the drain plug.
12. Add hydraulic oil. See page 1-12 for recommended lubricants. DO NOT overfill.
13. Replace the fill/cap, turn clockwise and make sure it is tightened securely.
14. Make sure the drain plug is tight enough to prevent oil leaks, but do not over tighten.
15. Run lift to check for leaks.
16. With the lift OFF and the forks down, check the oil level on the dipstick and add oil accordingly.

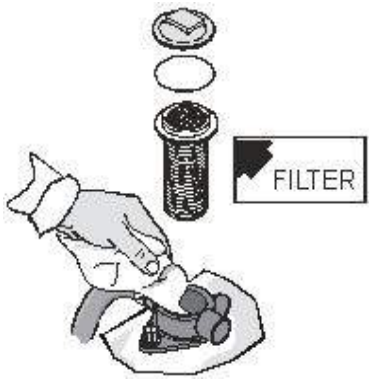
Figure 3-1: Hydraulic Tank Drain

Change the Hydraulic Oil Filter

⚠ CAUTION

After prolonged truck use, hydraulic oil will be hot and can burn human skin. Allow hydraulic oil to cool before performing this procedure.

1. Park the truck on a level, designated service area and block the wheels.
2. Set the key to OFF, remove the key from the key switch and place in a secure area.
3. Perform Lock Out/Tag Out procedure.
4. Disconnect the battery.
5. Remove the access cover.
6. Using a clean, lint-free cloth, clean the area around the filter element housing.



7. Unscrew oil filter cap and pull the filter element from the tank.
8. Install the new filter element and tighten fill cap.
9. Operate the hydraulic system by running the mast functions and observe the filter for oil leaks.
10. Reinstall the access cover.

Figure 3-2: Hydraulic Filter Housing Access

Checking and Adjusting Hydraulic Pressure

WARNING

HIGH PRESSURE FLUIDS CAN BE DANGEROUS! Before continuing with this section, read about the warnings of pressurized hydraulic oil under "Hydraulic System" Warning page 1-4.

NOTE

For ease of checking hydraulic pressure, Landoll offers a Pressure Check Kit (P.N. 0018152) which includes a 5000 psi (344.7 bar) gauge, hose and a quick-coupler assembly. If you are using your own system, have shop rags, oil absorbent and a small container ready to manage oil spills.

1. For this test, make sure that the hydraulic tank has plenty of oil.
2. Set the key to OFF, remove the key from the key switch.
3. Remove the control valve cover, located to the right of the driver's seat.
4. Connect the pressure check kit quick-coupler (female end) to the coupler (male end) on the control valve. **See Figure 3-3.**

- Allow a few minutes time before disconnecting any hydraulic fittings or hose assemblies to relieve the system pressure to zero psi.
- If you are not using the pressure check kit, remove the quick-coupler and install an appropriate fitting to accept your pressure gauge arrangement.
- Have rags handy to manage oil leakage.
- Install your 5000 psi (344.7 bar) gauge arrangement.
- All parts connected to the gauge port must be capable of handling up to 5000 psi (344.7 bar).
- To adjust pressure, the truck (pump) must be running to create hydraulic pressure. Always pay careful attention when servicing, while the truck is running. To check or set the pressure, you must pull the tilt lever to dead head (bottomed out) allowing the cylinder to build pressure, then set the relief valve.

5. Loosen the relief valve jam nut.
6. Start the truck.
7. Adjust the valve stem by turning clockwise to increase pressure, counterclockwise to decrease pressure. This procedure adjusts the pressure relief valve setting.
8. Release the joystick immediately once the pressure is set at 3000 psi (206 bar).

IMPORTANT

Do not hold a hydraulic joystick (bottomed out) for excessive periods of time. Extreme pressure is applied to the system which can, over periods of time, generate heat and damage oil and internal components.

9. If the pressure is low and cannot be adjusted to the proper value, check the pump and make sure there are no leaks in the hydraulic system. If the pressure is too high and cannot be adjusted to the proper pressure, replace the relief valve.
10. Tighten the relief valve lock nut.
11. Set the key to OFF, remove the key from the key switch and disconnect the battery.
12. Remove the pressure gauge quick coupler or remove your gauge arrangement.
13. Start the truck.
14. Lift and lower the mast a few times to check for leaks.
15. Set the key to OFF and disconnect the battery.
16. Reassemble all covers and panels.

Figure 3-3: Hydraulic Valve

Hydraulic Pump Service

NOTE

The hydraulic lift pump used on the SLT30/35 AC has no serviceable parts and is repaired by replacement only.

When replacing the lift pump, make sure that the hydraulic oil is clean and that the hydraulic system has a new clean filter. See “Changing Hydraulic Oil” and “Changing Hydraulic Filter” on page 3-2.

Replacing the Hydraulic Pump and Motor

NOTE

The AC motor and pump are located in the center of the truck on the right side of the driver’s feet.

1. Remove the key and place in a secure area.
2. Perform the Lock Out/Tag Out procedure.
3. Disconnect the battery.
4. Remove the floor plate and the main side cover to expose the hydraulic pump and motor.
5. Using the exposed female threads on the motor, attach the hoist using a threaded bolt and washers.
6. To relieve any static pressure, SLOWLY loosen and disconnect the pressure and suction hoses from the hydraulic pump. Place shop rags under the connections to catch hydraulic oil.
7. Mark and disconnect the Deutsch electrical connectors.
8. Mark and disconnect the 3 heavy gauge electrical cables.
9. Remove four M8-1.25 X 20 motor fasteners, to allow the pump and motor assembly to be moved out of the frame.
10. Using an overhead hoist, remove the pump and motor assembly from the truck and place it the repair area. NOTE: Assembly is very heavy.
11. Assemble in reverse procedure.

Figure 3-4: Hydraulic Motor and Pump Assembly

Hydraulic Control Valve Assembly

General

While a leaky control valve may be fixed by installing a service kit, if there are more serious problems to the hydraulic spool, Landoll recommends a complete hydraulic valve replacement.

The following procedure explains how to replace a specific valve should a sluggish or sticking valve spool be suspect.

If you remove the valve from the truck for servicing (hex head screws and hardware), when reinstalling the valve be certain to tighten the mounting screws in a staggering fashion while applying equal pressure to all screws. If the screws are not tightened and torqued evenly, you could create a stress crack, thus internal oil leaks, rendering the valve defective.

NOTE

- *The main hydraulic pump for lift, tilt, pivot, and shift (mast functions) is a fixed displacement gear pump (2.008 cu. inch/rev). System pressure must not exceed 3,000 psi, ±65 psi (206 bar, ±4 bar) maximum.*
- *The main pump pressure relief valve is part of the hydraulic control valve.*

NOTE

- *A pressure gauge port is provided, with a "quick-coupler" (pressure service kit, Landoll p.n. 0018152), for reading the pump pressure on the hydraulic control valve. The pressure check port on the forklift is attached to the inlet port on the hydraulic control valve.*

IMPORTANT

- *Before you service this valve for possible pressure problems, make sure there are no leaks in the hydraulic system and that there is sufficient oil in the tank. Both conditions can contribute to low pressure problems.*

Mast Service Precautions

WARNING

When servicing the mast or sections of the mast, hardwood blocks (4"X4", 100 X 100mm minimum) should be used to keep individual sections of the mast from falling. In addition to the wood blocks, chains should be used to hold the mast sections from moving, in both the vertical and horizontal directions.

- **Mast work to be done in a flat, designated area.**
- **NEVER walk under or stand upon forklift forks.**
- **Remove forks before starting mast repairs.**
- **NEVER reach through the upright open areas of the mast.**
- **NEVER maintain or repair the mast without supports or while anyone is near the truck. (ASME B56.1-2000)**
- **Raise mast and position blocks under the second stage mast.**
- **Using an appropriate set of C-clamps, secure wooden blocks to mast channel.**
- **Lower mast until it sits firmly on wooden blocks.**
- **Disable the truck as described in the Lock Out/Tag Out section, page 1-3.**
- **For mast inspection, use only an approved safety platform or step ladder.**
- **NEVER repair chains, they are to be replaced.**
- **NEVER replace only one chain. All chains are to be replaced in pairs.**

Disconnecting the Tilt Cylinder

WARNING

- **Steel toed shoes and eye protection are required when doing maintenance or repair work on a lift truck.**
- **Do not place feet or hands in any areas through the mast or in truck pinch points.**
- **Servicing the tilt cylinders requires the use of an overhead hoist, hoist slings and wheel blocks. The overhead hoist and slings must have a rating of 8,000 lb. or greater.**
- **Do not work under or around a truck that is not properly secured. The battery must be disconnected and removed from the truck.**

- **Truck repair must be in a level, designated area.**
- **Turn the lift off and remove the key.**
- **Lower the mast completely to the floor.**
- **Chock wheels so that the truck cannot move.**
- **Attach a sling and hoist to all the top cross-members of the mast so the mast sections cannot move.**

Mast Removal Precautions

1. Move the truck to a level, designated area.
2. Remove the key and place it in a secure place.
3. Perform the Lock Out/Tag Out procedure.
4. Remove the battery.
5. Remove the forks.
6. Slowly and carefully remove the lift cylinder lines. Use a container to catch oil and an oil absorbent product to absorb any spills.
7. Disconnect all wiring (if used) between the mast and the truck body.
8. Support the mast using the sling and the overhead hoist.
9. Chain the individual sections of mast together at the upper cross braces. Chain the lower mast carriage to the lower section of the mast, keeping the sections from moving when the mast is laid down on the floor.
10. Remove all pins holding the tilt cylinders to the mast.
11. Unscrew the four bolts clamping the mast trunnions to the truck.
12. Remove mast and CAREFULLY place the mast in a horizontal position.

Hydraulic Fittings and Hoses

1. Set the key switch to OFF and remove the key from the key switch.
2. Perform a Lock Out/Tag Out procedure, disconnect the battery and block the wheels.
3. Allow a few minutes time before disconnecting any hydraulic fittings or hose assemblies to relieve the system pressure to zero psi. When working on hydraulic fittings, SLOWLY crack the fitting when loosening it.

⚠ WARNING

High pressure hydraulic oil leaks can pierce the body and cause SEVERE injury to personnel. Allow a few minutes of time for the system pressure to drop to zero before opening any hydraulic pressure line.

⚠ CAUTION

Oil spills can cause falls. To avoid injury, make sure all spills are cleaned well with oil dry/wipes.

4. Remove the hose coupling from the defective fitting. Use two wrenches; one wrench to loosen the hose coupling, and one to prevent the fitting from turning. Be prepared to clean up any oil spillage.
5. Always tag the hoses and fittings for identification. If necessary, keep notes and put markings on parts using a non-destructive marker.
6. Remove the defective fitting and replace with a new fitting. Use two wrenches; one wrench to tighten the hose coupling, and one to prevent the fitting from turning.

NOTE

SAE fittings do not need a thread sealant. They are straight thread and include an O-ring seal.

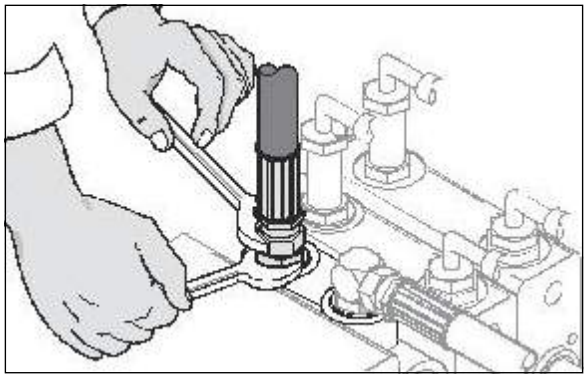


Figure 3-5: Removing Hose Coupling

Check Hydraulic Functions

1. Position the truck on a level, flat surface. Clear area around the truck.
2. Check hydraulic fluid level.
3. Turn the key switch to the ON (RUN) position.
4. Make sure your right foot is on the floor of the operator's compartment and prepared to brake.
5. Use any joystick function to see if hydraulics are working.
6. Visually check cylinders, valves, and hoses for leaks or other signs of wear.

Steering Motor

NOTE

The motor used to steer the SLT30 /35 AC is electric and has no brushes. If this motor fails, it is to be repaired by replacement only. ***See Figure 3-6.***

Steer Motor (with gearbox attached) Replacement

1. For instructions below, **See Figure 3-6.**
2. Remove the key and place in a secure area.
3. Perform the Lock Out/Tag Out procedure.
4. Disconnect the battery.
5. Unhook the electrical Deutsch connector.
6. Label and remove the electrical connectors from the steering controller.
7. Remove the four M8-1.125 X 30 hold down screws.
8. Lift motor up to remove.
9. Remove steering pinion gear.
10. Reassemble using the reverse procedure.

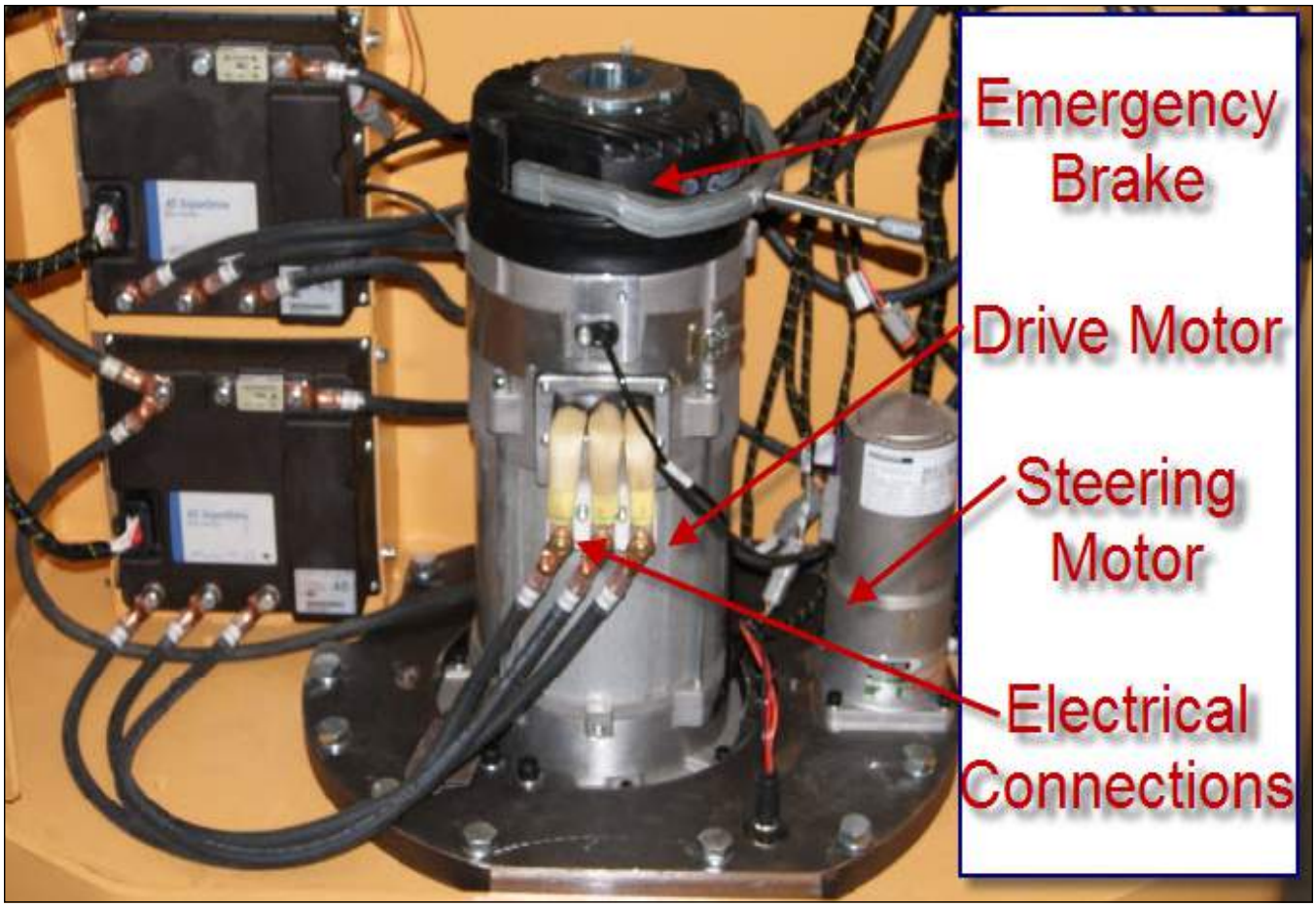


Figure 3-6: Drive and Steering Motor

Table for your general use with this manual

NOTES:

Chapter 4

Electrical System

Steering Column/Dash Assembly

Removing the Display Panel

1. Set the key switch to OFF and remove the key from the key switch.
2. Perform a Lock Out/Tag Out procedure and disconnect the battery. Make sure all the wheels are securely blocked so that the truck cannot move.
3. Remove the M6 - 1.0 X 16 bolts to allow the display cover to separate from the display weldment. **See Figure 4-1.**
4. Unhook wiring from display and remove display.
5. Assemble in reverse order.

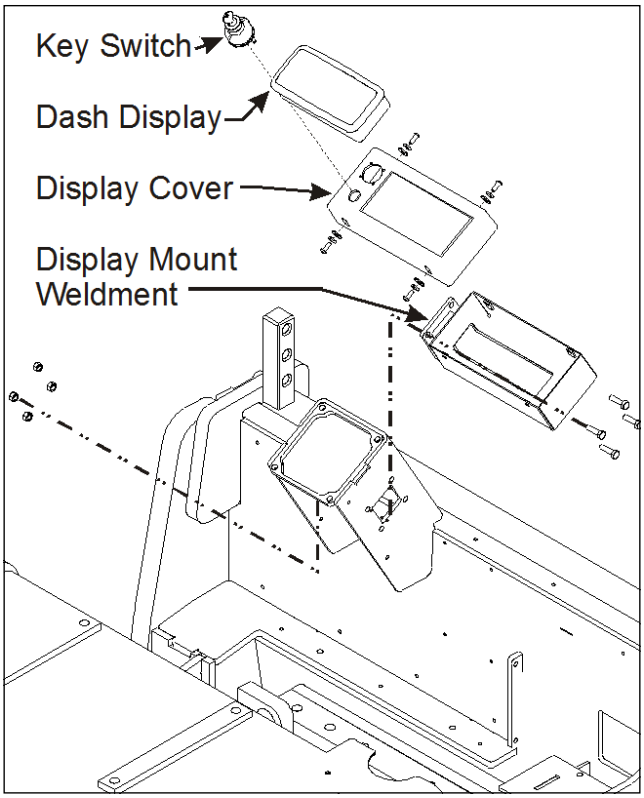


Figure 4-1 Dash Console Assembly

Key Switch

1. Set the key switch to OFF and remove the key from the key switch.
2. Perform a Lock Out/Tag Out procedure and disconnect the battery.
3. Make sure all the wheels are securely blocked so that the truck cannot move.
4. Remove the display cover to expose the back side of the key switch.
5. Unscrew the knurled switch collar ring to separate the switch from the base plate. **See Figure 4-2.**
6. Disconnect the wires from the switch terminals noting how they are connected to ensure proper orientation when connecting the new switch.
7. Install the key switch by reversing the preceding steps.

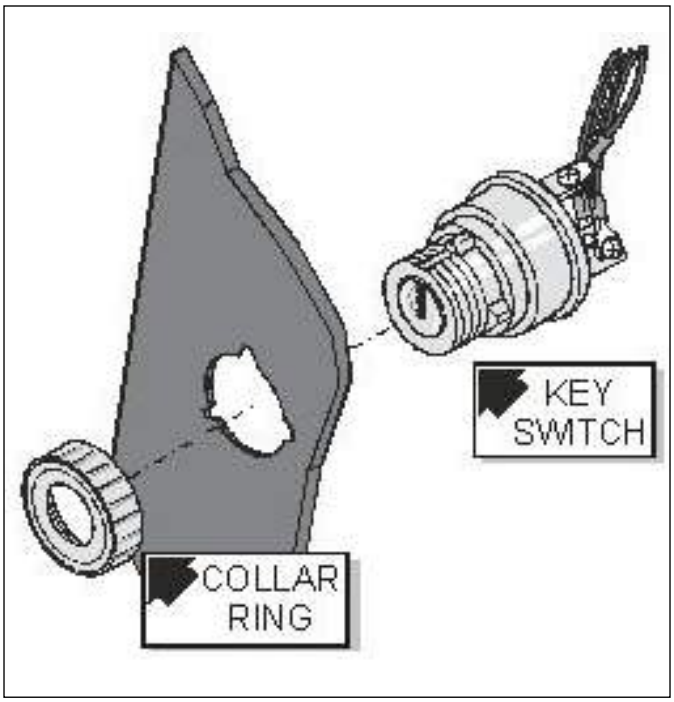


Figure 4-2 Key Switch Assembly

Steering Wheel Removal

1. Pry the plastic cover from the steering wheel using your finger tips. See Figure 4-3. If you cannot grab the cover, you can start it by carefully using a medium sized flat blade screw driver and gently prying upwards. **DO NOT** force it or the cover may crack.
2. Loosen the steering wheel nut.
3. Remove the steering wheel.

NOTE

If the steering wheel is difficult to remove, use a commercial puller. With this tool, it should remove easily.

4. Install the steering wheel by placing it over the shaft, aligning the wheel and shaft splines and pushing downward evenly until the nut can be installed.
5. Tighten the nut.

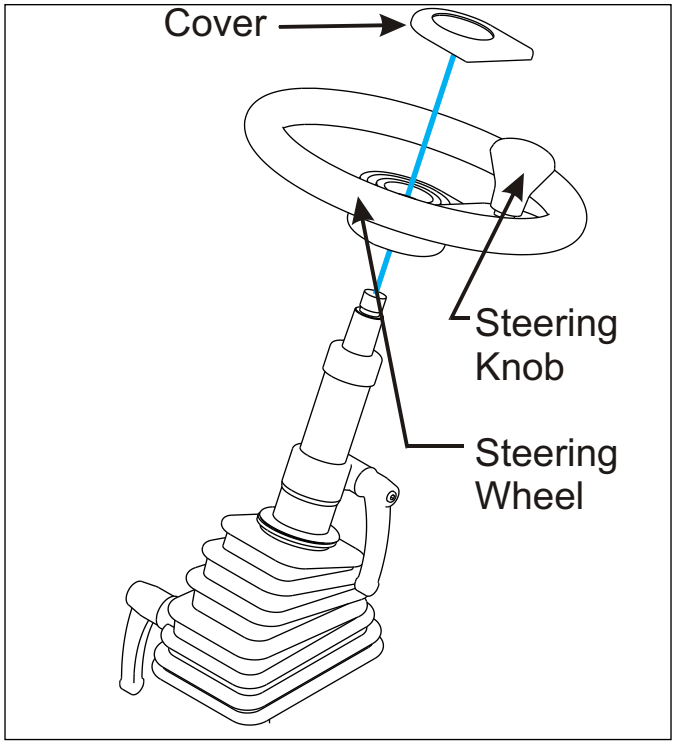


Figure 4-3 Steering Wheel and Knob

Steering Column (Console) Removal

NOTE

This is a two man operation, due to weight of steering column (approximately 30 pounds/14 kgs.). If an overhead crane is available, the crane could be strapped to the steering wheel for support.

1. Remove the lower dash cover.
2. Pry (up) the bellows (rubber boot) free from the bellows retainer plate. This exposes the mounting plate for the steering column and the TFD (Torque Feedback Device).

Four screws secure the assembly to the orbital steering mount bracket for stability. Once loosened, the wiring to the Torque Feedback Device must be unhooked.

3. Remove the four bolts and hardware, securing the TFD to the steering column.
4. Remove the four bolts and hardware, securing the steering column console to the bellows retainer plate. **See Figure 4-4.**
5. With help, lift the steering column upwards to disengage the shaft from the orbital unit, then remove the steer column from the truck.
6. When installing the new steer column, you must turn the steering shaft until it aligns with the orbital unit and drops into place.
7. Continue by reversing the preceding steps making sure to tighten and torque all mounting screws. See General Torque, Hydraulic Fitting Torque, and Bendi AC Special Torque Tables in on page 1-12.

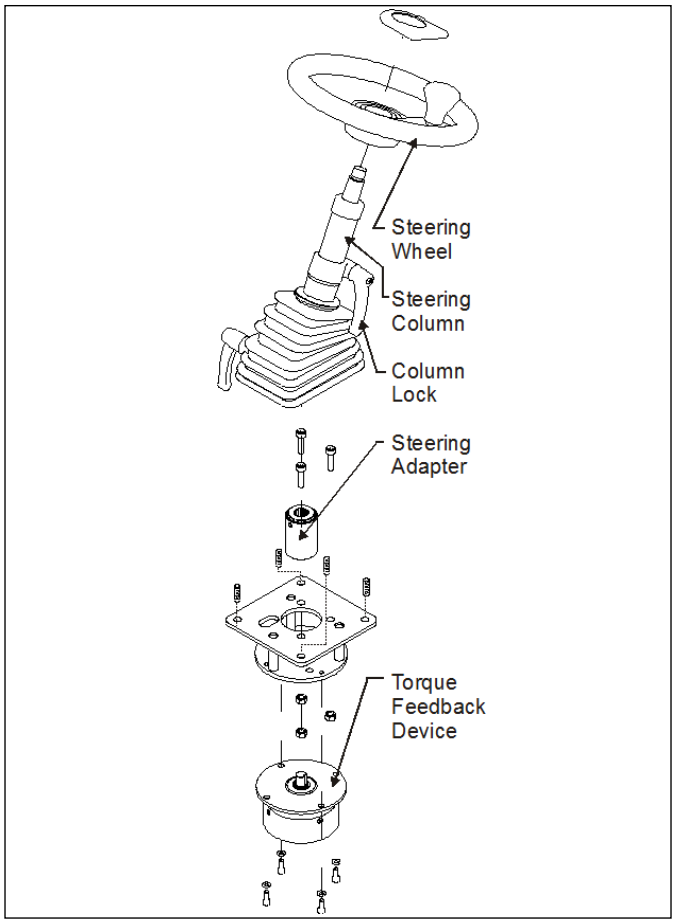


Figure 4-4 Steering Column Removal

Steering Torque Feedback Device

1. Remove the lower dash cover weldment.
2. Tag each electrical connections and disconnect from the torque feedback device.
3. Install the new steering torque feedback device to the steering column by following the preceding steps in reverse order.
4. Check for proper steering action.

CAUTION

Before any maintenance or work is performed on the electrical system of the truck, perform a Lock Out/Tag Out procedure, disconnect the battery, raise the lift and put blocks on the underside of the truck.

Inspecting the Contacts

NOTE

Contactors are set at the factory and do not require any adjustment. During the life of the contactor, they may become discolored, blacken or corroded. Cleaning or maintenance should be avoided. Replacement is recommended instead of maintenance. If one contactor requires replacement, it is recommended that they are all replaced as a set.

Batteries - Care and Replacement

Battery Safety - Duplicate of Chapter 1.

WARNING

Forklift batteries give off explosive gasses during use. Do not smoke, strike a welding arc, or create any flame while using, working in the area or maintaining a forklift. Charge the forklift battery in a designated area with adequate ventilation. Batteries also contain sulfuric acid which can cause severe skin and eye burns. Avoid sulfuric acid contact to all parts of the body, including the eyes. In case of contact, flush immediately and thoroughly with clean water. If the eyes have been effected, get medical attention. Do not lay metallic items or tools on the battery. Arcing or an explosion may result. Battery gas is explosive. Keep all flames and arcing away from the battery.

IMPORTANT

Keep all areas of the battery and the battery cables clean. Dirt or corrosion in these areas can drain the battery or cause erratic performance. Battery corrosion can also cause a voltage drop to the electrical components of the forklift.

Battery Safety

CAUTION

Wear protective clothing when working around batteries, including rubber aprons, gloves, boots, eye and face shields. Do not allow your body to become in contact with battery electrolyte. If contact with electrolyte is made, wash effected area immediately. In case of contact with eyes, flush immediately with clean water and get medical attention. A baking soda solution (1 pound baking soda to one gallon of water) will neutralize electrolyte acid spilled on clothing, the floor or most other surfaces. Apply the solution until the bubbling stops, rinse with clean water.

IMPORTANT

- **If any repairs to the battery are needed, follow the instructions given by the battery manufacturer.**
- **Keep the battery clean. Impurities can weaken and eventually discharge the battery.**
- **Keep battery vent plugs firmly in place, except when checking or charging the battery.**

Checking Batteries

NOTE

The electrolyte fluid level of the battery should be checked after each charge of the battery. The optimum level of the electrolyte should be about 1/2” (13 mm) over the top of the plates, or just below the lowest bottom part of the lip on the battery filler vent hole. If low, add distilled water OR the solution recommended by the battery manufacturer. Do not overfill.

For increased battery life reference “Battery Care” on page 1-4 and check the specific gravity readings daily. Since the water must be mixed with the electrolyte for an accurate reading, do not check the gravity readings right after adding water. Unless the electrolyte is below the top level of the plates, do not add water right before the battery is scheduled to be charged. Normal full charged specific gravity should be between 1.265 and 1.285.

- **Always assume the battery is emitting hydrogen gases and follow proper safety precautions.**
- **Do not smoke, use an open flame, or create arcs or sparks near the battery.**
- **Packaged with every battery are specific instructions for battery safety, care and use, plus a Material Safety Data Sheet (MSDS). Read these documents thoroughly before servicing the battery.**
- **Always disconnect the battery before performing any service.**
- **Do not lay objects on the battery as they may cause a short circuit. Shorting battery terminals can release enormous amounts of energy, causing electrical shock, sparks or flame, or heating nearby components to dangerous temperatures.**
- **Truck batteries contain concentrated sulfuric acid which can cause severe chemical burns. When adding water to the battery, wear rubber gloves, protective clothing and safety glasses or a full-face shield. Use a plastic container or an automatic cell filler to prevent container breakage.**
- **Neutralize acid spills immediately with Bicarbonate of Soda. If acid contacts the skin or eyes, wash with water immediately and seek medical help at once.**
- **Use caution when changing battery connectors to ensure that correct polarity is maintained.**
- **Keep vent plugs in place, fully tightened and clean at all times.**
- **Be sure to replace and retighten any battery restraints which have been installed on the truck.**

Battery Care

- *Only charge the battery in the designated area.*
- *Make sure that the charger being used matches the voltage and amperage of the truck battery.*
- *Before connecting and disconnecting the battery charger to the battery, make sure the charger is OFF. Connecting or disconnecting the charger when it is ON, could damage the charger or cause an arc.*
- *Before charging, make sure the electrolyte covers the top of the battery plates.*
- *Before connecting the battery cable to the truck's receptacle, make sure the key to the truck is off and that the controls are in the off position.*
- *Make sure the battery terminals and cables are cleaned of corrosion regularly. Clean battery terminals are important not only to the operation of the lift, but for proper battery charging.*
- *Make certain that the battery used meets weight and size requirements of the truck. NEVER operate the truck with an undersized battery. Reference data plate information for this information.*

Charging the Battery

NOTE

Charging time and requirements will vary with the battery size and condition. Whenever the truck needs to be troubleshot, the battery must be fully charged.

⚠ CAUTION

- **Never smoke or bring open flame to a charging or idle battery. Gas from a battery is highly explosive and can cause serious injury.**
- **Avoid over filling as it will cause overflow (flooding) of the electrolyte, resulting in loss of electrolyte, battery tray corrosion, ground paths and loss of capacity or working ability.**
- **Connecting the charger cable to the truck cable can cause damage to the forklift**

IMPORTANT

1. **Park the truck at the designated charge area with forks down and key OFF.**
2. **Make sure charger is in the OFF position.**
3. **Connect battery to the charger and make certain cables are firmly connected.**
4. **Turn the charger on and set the timer, if equipped. For an overnight fill, set charger to NORMAL.**
5. **View the charger gauge to be positive of charge.**

Removing the Battery From the Charger

1. Make sure the charger is off and disconnect the charger cables from the battery with a straight pulling motion. Store the charging cables appropriately.
2. Check the battery for the appropriate electrolyte level and measure specific gravity, if needed.

Cleaning the Battery

When properly maintained, the battery will remain relatively clean and dry. It may be necessary to clean the top of the battery. Occasionally it may be necessary to remove excessive electrolyte. If this happens, remove the battery from the truck and clean with a solution of baking soda and water (1 pound baking soda to 1 gallon of water). Rinse the battery off with water and allow to air dry.

Battery Removal

CAUTION

Don't allow metallic objects to be on top or near the battery. A short could cause an electrical arc and personal injury may result. When moving the battery, keep the top of the battery covered with an insulator, such as a piece of plywood or tarp.

Rollout Battery Removal - optional

1. Remove the safety retainer bar, activating the safety switch.
2. Position battery roll out stand next to the truck and align the stand with the path of the battery.
3. Roll and secure the battery onto the stand.

Battery Installation

1. Change and charge batteries in accordance with ANSI/NFPA 505.
2. Check to be sure the key is off.
3. Open the right hand door.
4. If using a rollout stand, position the battery stand next to the truck. Align stand with battery compartment. Battery roller stand should be the same height as the truck.
5. Push battery into the truck's battery compartment or lower if using a hoist.
6. Install battery retainer safety bar or the truck will not operate.
7. Connect the battery.

Electrical Controls and Levers

Joystick

NOTE

The directional control lever (forward-neutral-reverse) is located on the joystick. The joystick is replaced as a complete unit only.

Replacing the Joystick

1. Set the key switch to OFF, remove the key from the key switch and place in a secure area
2. Set the key switch to OFF, remove the key from the key switch and place in a secure area.
3. Perform a Lock Out/Tag Out procedure and disconnect the battery.
4. Make sure all the other wheels are securely blocked so that the truck cannot move.
5. Remove the boot that covers the joystick fasteners.
6. Remove the four screws that hold down the joystick.
7. Gently lift up on the joystick to expose the wiring harness.
8. Unhook wiring harness.
9. Replace in reverse order.
10. Test for proper operation.

Check the Return-to-Neutral

1. Sit in the driver's seat, and turn the key switch ON.
2. Set the direction control lever to FORWARD.
3. Slowly move the truck forward, then stop by using the service brake.
4. Turn the key switch OFF, then back on again.
5. Press on the accelerator pedal.
6. The truck must not move.
7. If the truck does not move, take your foot off the accelerator pedal. Place the directional control lever in NEUTRAL then back to FORWARD again.
8. Slowly push on the accelerator pedal. The truck should move forward. If it does not move, Refer to Programming Troubleshooting Chart and the dash display.
9. Repeat preceding Steps through, but instead of turning the key switch OFF in Step, lift yourself from the driver's seat to allow the switch interlock to release. The truck must react as stated in Steps 5 through 8.

Replacing a Complete Control Panel

1. Set the key switch to OFF, remove the key from the key switch and place in a secure area.
2. Apply the parking brake, perform a Lock Out/Tag Out procedure and disconnect the battery.
3. Make sure all the other wheels are securely blocked so that the truck cannot move. See page 1-5.
4. Remove the control compartment cover.
5. Mark and remove all cables connected to high current terminals of the panel and disconnect the main harness. **See Figure 4-6.**
6. Remove mounting hardware that secures the assembly to the truck and remove the panel or single component from the truck.
7. Reassemble in reverse order. All cables installed on the motor controllers must use all the required Landoll approved fasteners and be in the correct assembled order. **See Figure 4-5.** Refer to the SLT30/35 AC Parts Manual for replacement parts.

8. Tighten cables connected to the high current terminals, identified on the controller housing as B+, B-, U, V and W to 85 +/- 1- in-lbs(10.2 +/- 1.1 Nm). **See Figure 4-5.**

NOTE

After replacing the controller it must be reprogrammed. See Chapter 5 "Calibration and Programming".

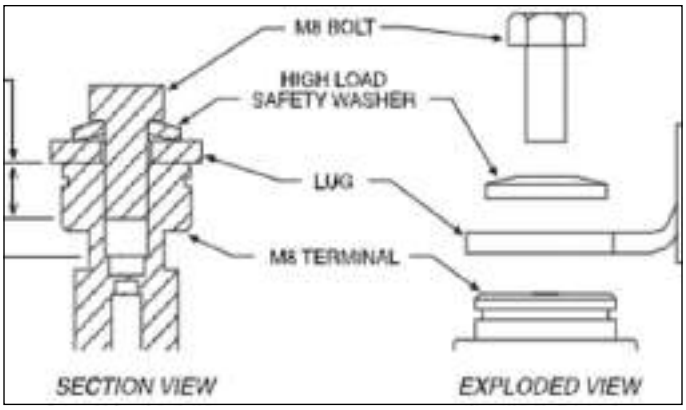


Figure 4-5: Heavy Cable Hardware and Assembly

HIGH CURRENT CONNECTIONS DEFFINITION:

B+ = Positive Battery to Controller.

B- = Negative Battery to Controller.

U = Motor phase U.

V = Motor phase V.

W = Motor phase W.

Figure 4-6: AC Controllers

Horn Service

NOTE

The horn is located between the frame and the mast.

Removing the horn

1. Turn the key switch is OFF, remove the key, perform Lock Out/Tag Out procedure and disconnect battery.
2. Disconnect the electrical plugs from the truck harness.
3. Remove the hex bolts and hardware to separate the horn from the frame.
4. Install the new horn by reversing the preceding steps.
5. Connect the battery and test the horn.

Seat Switch Assembly

The driver's seat micro switch and cable assembly are mounted to the bottom of the seat cushion.

Check Driver's Seat Switch

This procedure checks the physical mechanics (actuation) of the driver's seat switch only.

1. Start the truck and release the parking brake.
2. The seat switch and actuator are internal to the seat cushion, located on the under side of the seat cushion between the cushion and the bottom plate.
3. Set the direction control lever in either FORWARD or REVERSE and very slowly apply acceleration. As the truck begins to slowly move in either direction, lift yourself from the driver's seat just enough to release the switch in the seat cushion.
4. The truck will not come to an immediate stop. You should lose forward direction (or reverse). The truck will coast unless you use the brakes.
5. If the truck continues, see Replacing the Seat Switch," on page 4-6 or refer to Troubleshooting the controller - Chapter 5.

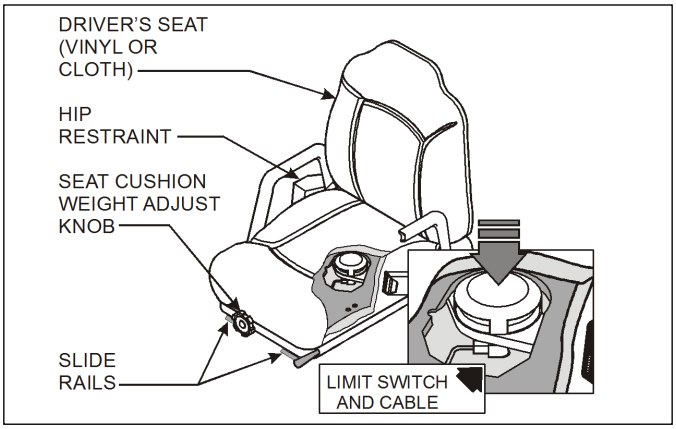


Figure 4-7 Seat Safety Switch

Replacing the Seat Switch

1. Set the key switch to OFF, remove the key from the key switch and place in a secure area.
2. Apply the parking brake, perform a Lock Out/Tag Out procedure, disconnect battery and block all wheels.
3. Remove the hardware securing the front portion of the seat slide rails to the cover. Then loosen the back two sets of hardware.
4. Raise the front of the seat up to expose the switch and cable mounting.
5. Have a helper disconnect the switch cable from the main harness, then unscrew the switch assembly.
6. Install the new switch and cable by performing the preceding steps in reverse order.
7. Before placing the truck back into operation, test it to be sure the switch functions properly. See “Check Driver’s Seat Switch” on page 4-6.

Truck Lighting

Trucks equipped with optional lighting, flashing or spot lights may contain replaceable bulbs, or the housing may be replaced as a whole. Lighting replacement varies according to the manufacturer.

Headlights

These lights have non-replaceable LED elements and are replaced as an entire unit.

Brake and Tail Lights

1. Set the key switch to OFF and remove the key.
2. Apply the parking brake and disconnect the battery.
3. The complete LED light assembly must be replaced to repair a faulty light assembly.
4. Pull off the complete LED light assembly. Exercise care to avoid breaking the LED assembly.
5. Disconnect the wire connector and remove the bracket that is attached to the overhead guard.
6. If shielding or guard covers are involved, make certain that the guard is replaced after the repair.
7. Reassemble in reverse order.

Back Up Alarms

1. Set the key switch to OFF and remove the key.
2. Disconnect the battery.
3. To replace the alarm assembly, disconnect the wire connector and remove the mounting hardware holding the alarm to the overhead guard.
4. Reassemble in reverse order.

Overhead Guard, Lighting and Alarms

Trucks equipped with optional LED flood / headlights, tail and stop lights, flashing or spot lights (strobe lights), etc. do not contain replaceable bulbs. Bulb replacement must be done as a complete assembly. **See Figure 4-8.**

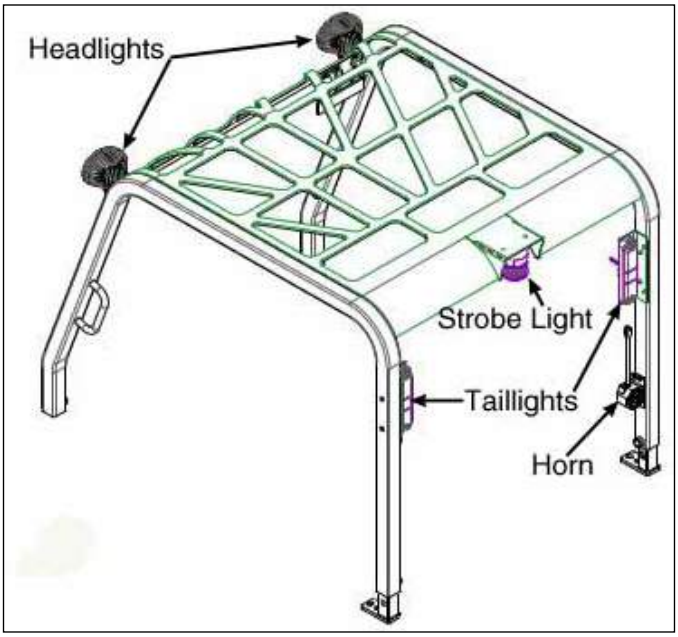


Figure 4-8 Overhead Guard

Side Shift Circuit Maintenance

The following information is provided for authorized service facilities ONLY.
Perform maintenance on the side shift circuit as required by the Hourly Checklists.
Check the hydraulic system pressure at the control valve fitting. Refer to the truck service manual for details on measuring hydraulic system pressure, see page 3-3.
System pressure must not exceed 3000 psi (206 bar).

⚠ CAUTION

- **Before you remove any hoses or tubes, relieve hydraulic system pressure. With the truck off, manipulate the truck auxiliary control valve(s) several times in both directions.**
- **Check for hydraulic fluid leaks using a piece of cardboard or wood. Do not use your hands.**
- **Remember to wear safety glasses.**

DANGER

Hydraulic oil can be under very high pressure. A pinhole leak is not easily seen and if it pierces your skin, can cause injury and possible death.

Check Side Shift Circuit Performance

1. Side shift completely to the left and hold the control handle in this position for 5 seconds. Check for external leaks at the cylinder, fittings and hoses.
2. Side shift completely to the right and hold the control handle in this position for 5 seconds. Check for external leaks at the cylinder, fittings and hoses.

Fuses

Notice the location of the SLT30/35 AC System and Controller fuses. **See Figure 4-9**.

The fuse box is located in the back compartment on the right side. Exact size and amperage rating must but be retained when replacing.

Figure 4-9 Fuse Location

ESD Strap

Shown below, **Figure 4-10,** is the ESD Strap which will be installed just in board of the front wheels. This straps will drain all static electricity build up that may occur on the SLT30/35 AC forklift.

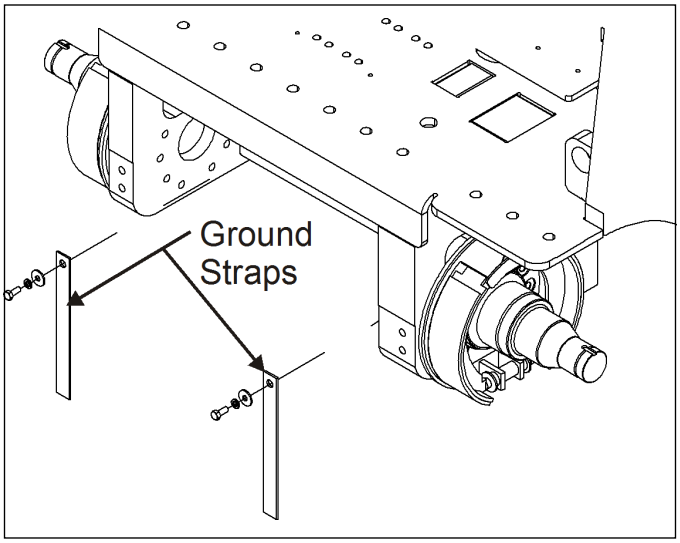


Figure 4-10: Ground Straps

Chapter 5

Drexel SLT30/35 AC Calibration Programming

Dashboard Truck Calibration

The Drexel SLT30/35 AC truck has many feedback devices and parameters that are accessible and programmable using the dash display.

Below is shown the main dash display for reference.

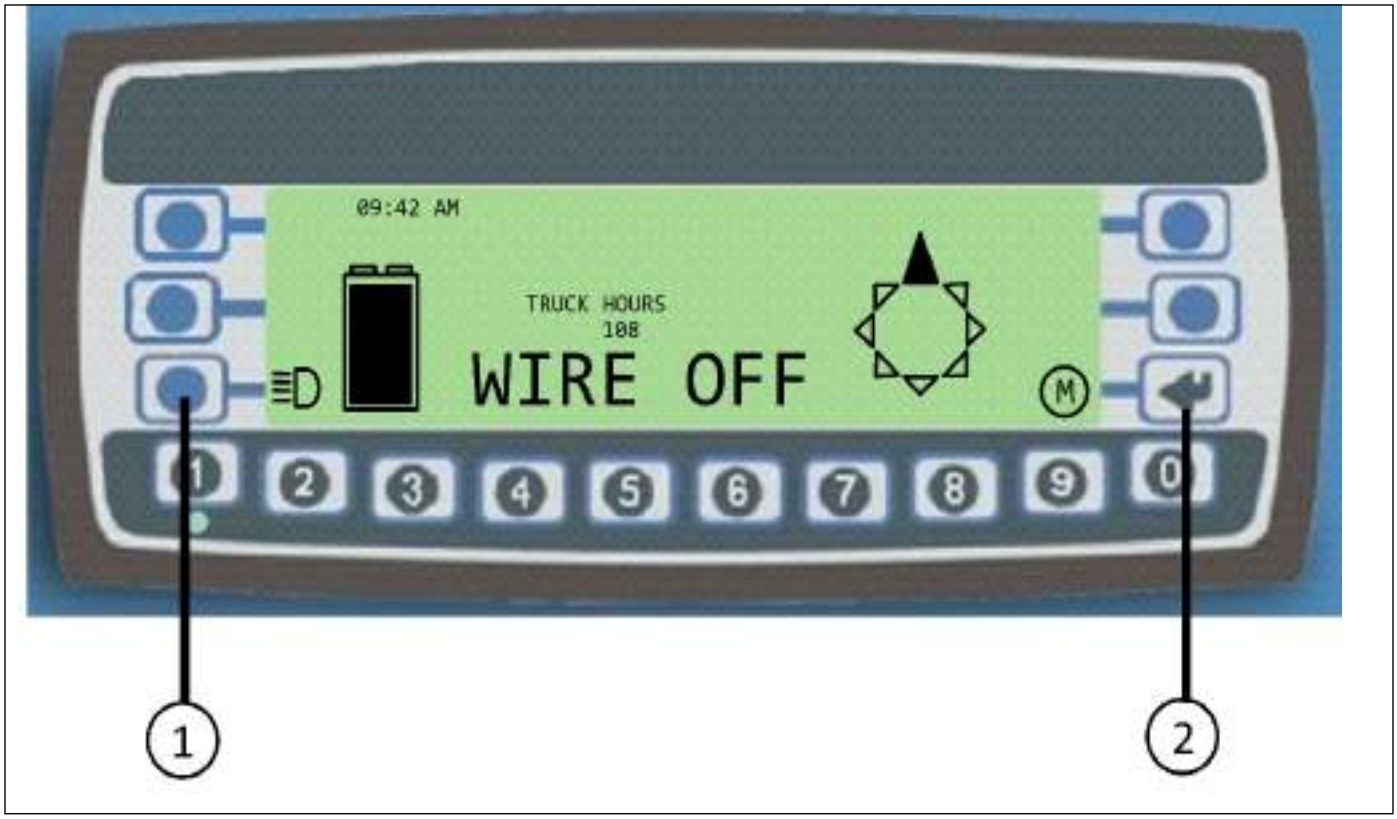


Figure 5-1: Headlights and Menu Buttons

#1- Headlight Key-Press this button to turn the headlights on (if equipped). Once the headlights are on, press and hold the button for 3 seconds to turn them off.

See Figure 5-1.

#2- Menu Key”- Press and hold this button to enter the dash display menu.

See Figure 5-1.

When prompted, enter the truck password (currently “55555”).

See Figure 5-2.

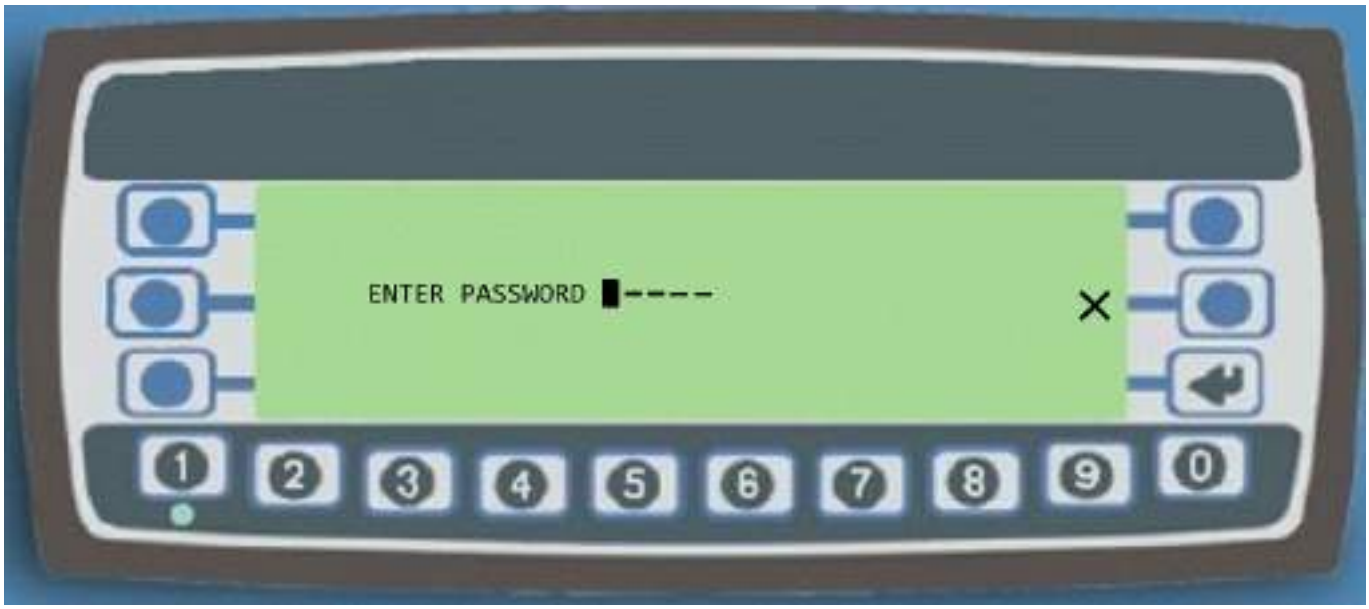


Figure 5-2: Password Screen

Once you have correctly entered the truck password, you will enter the dash display menu. This is where you can access and program the truck's many feedback devices and parameters. Below is shown the main dash display menu screen for reference.

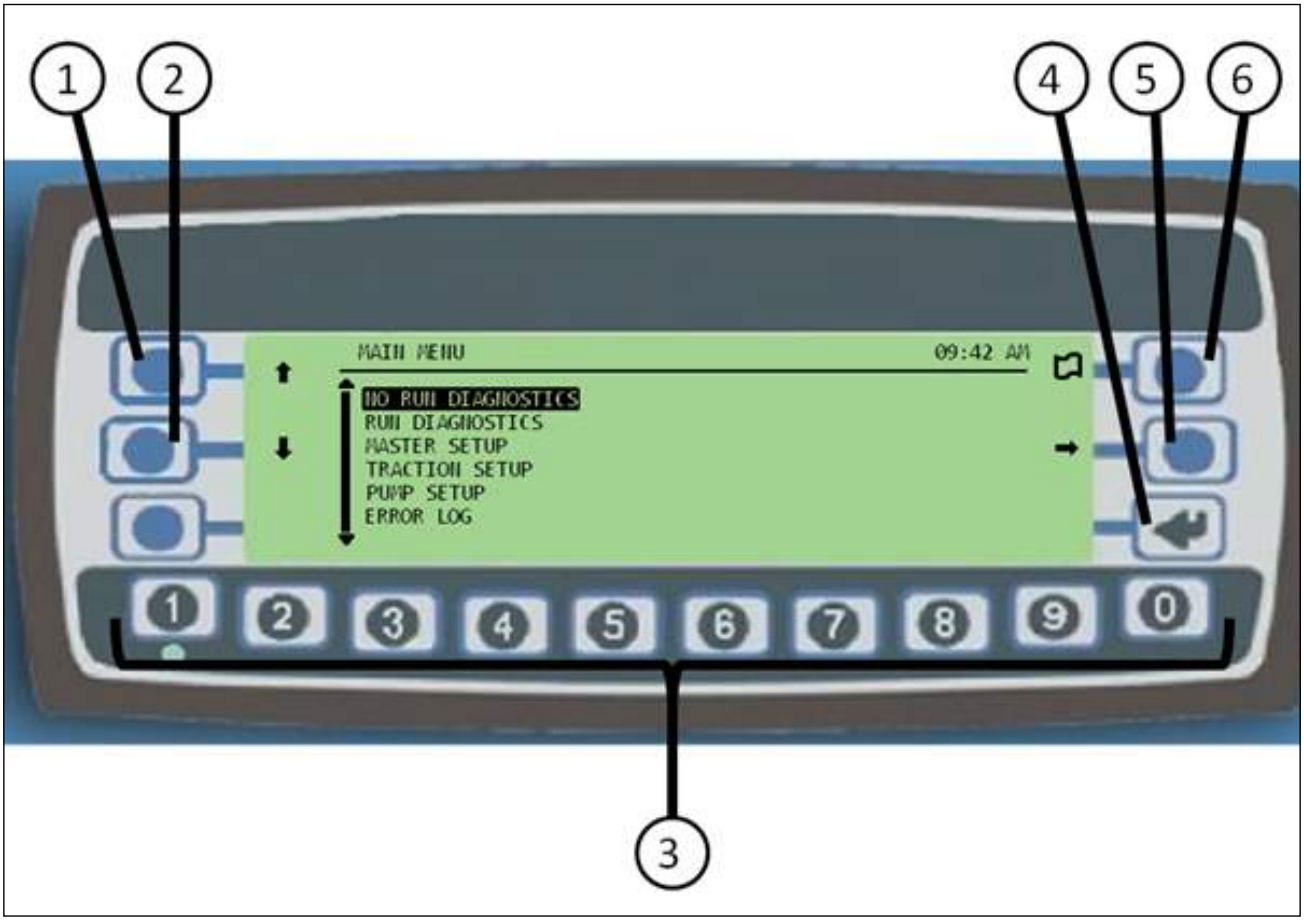


Figure 5-3: Dash Display

#1 “Up Key”- Used to move “UP” through the possible menu selections.

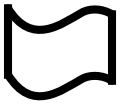
#2 ”Down Key” Used to move “DOWN” through the possible menu selections.

#3 “Number Key” Used to enter and change the value of a parameter.

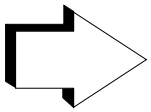
#4 “Return Key” Used after entering a new value for a parameter to enter it into the system.

#6 & #7 “Soft Keys”- Used to navigate through the dash display menu structure. The exact function of these keys changes as the various menu/submenus are entered and exited, depending on the icon that is next to the key.

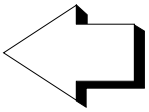
Below is a list of possible icons and their functions:



When this icon appears next to the button, pressing the button will allow you to exit the menu and return to the dash display main screen.



When this icon appears next to the button, pressing the button will allow you to enter the submenu that is highlighted.



When this icon appears next to the button, pressing the button will allow you to exit the submenu and return to the main menu.

When this icon appears next to the button, pressing the button will allow you to change the value of the highlighted parameter.

X

When this icon appears next to the button, pressing the button will allow you to exit out of editing a parameter value and return to the submenu.

Below are “No Run” diagnostics.

Parameter	Units	Min	Max
Throttle Voltage	unit	0	1000
Brake Pot Voltage	unit	0	1000
TFD Current	Amp		
E-Brake Current	Amp		
Pump Contactor Current	%	0	100
Main Contactor Current	%	0	100
Seat Switch	On/Off	0	1
Battery Rollout Switch	On/Off	0	1
JS Forward Switch	On/Off	0	1
JS Reverse Switch	On/Off	0	1
JS Horn Switch	On/Off	0	1
JS WGU Switch	On/Off	0	1
JS Aux Switch	On/Off	0	1
JS Function Switch	On/Off	0	1
JS Y-Axis Position	%	-1000	1000
JS X-Axis Position	%	-1000	1000
Battery Voltage	Volt	0	55
Wheel Angle	Degree	-90	90

The above submenu contains diagnostic information that is useful to view when the truck is not moving.

Run Diagnostics

Parameter	Units	Min	Max
Traction Motor Temp	Degrees C		
Traction Drive Temp	Degrees C		
Traction Motor Current	Amp		
Traction Motor Speed	RPM		
Pump Motor Temp	Degrees C		
Pump Drive Temp	Degrees C		
Pump Motor Current	Amp		
Pump Motor Speed	RPM		
Steer Motor Temp	Degrees C		
Steer Drive Temp	Degrees C		
Steer Motor Current	Amp		
Wheel Angle	Degree	-90	90

The above submenu contains diagnostic information that is useful to view when the various truck systems (Traction, Pump, and Steering) are running.

Master Setup

Parameter	Units	Min	Max	Default	Description
Operating Mode	0,1,2	0	2	0	Selects 1 of 3 user customizable operating modes
Steer Nominal Resistance	%	0	1000	70	Sets the minimum resistive feel for the steering wheel
Steer Max Resistance	%	0	1000	500	Setrs the maximum resistive feel for the steering wheel
Steer Ratio A	%	0	1000	300	Sets the resolution of the steering wheel at low speeds
Steer Ratio B	%	0	1000	200	Sets the resolution of the steering wheel at high speeds
Lift Lockout %	%	0	30	25	Sets the BDI % for the truck to go into lift lockout mode
Seat Timer	.1 Sec	0	30	30	Sets the time delay that is allowed before the seat switch is considered interrupted
Steer Wheel Offset	Deg			100	Sets the offset for the steer wheel sensor
WGU Installed	On/Off	0	1	0	Set to 1 when truck is equipped with WGU system
Auxillary Function Installed	On/Off	0	1	0	Set to 1 when truck is equipped with auxiliary hydraulic function
Next Service Due	Hrs	0	max hrs	0	Sets the truck hours for when the next truck service is due
RESTORE FACTORY DEFAULTS					Set to 1 to restore truck default values
STORE CHANGES					Set to 1 to store changes made to any Master Setup parameters

Master Setup - This submenu contains all of the adjustable parameters that are available in the truck master controller.

Traction Setup

Parameter	Units	Min	Max	Default	Description
Throttle High	%	0	1000	15	Sets the throttle high value when calibrating the throttle pot
Throttle Low	%	0	1000	925	Sets the throttle low value when calibrating the throttle pot
Brake Pot High	%	0	1000	200	Sets the brake pot high value when calibrating the brake pot
Brake Pot Low	%	0	1000	700	Sets the brake pot low value when calibrating the brake pot
M1 Acceleration	%	0	1000	65	Sets the maximum acceleration percentage for mode 1
M1 Neutral Braking	%	0	100	20	Sets the maximum regenerative braking percentage for mode 1
M1 Max Speed	%	0	100	100	Sets the maximum truck speed percentage for mode 1
M2 Acceleration	%	0	100	65	Sets the maximum acceleration percentage for mode 1
M2 Neutral Braking	%	0	100	20	Sets the maximum regenerative braking percentage for mode 1
M2 Max Speed	%	0	100	100	Sets the maximum truck speed percentage for mode 1
M3 Acceleration	%	0	100	65	Sets the maximum acceleration percentage for mode 1
M3 Neutral Braking	%	0	100	20	Sets the maximum regenerative braking percentage for mode 1
M3 Max Speed	%	0	100	100	Sets the maximum truck speed pecentage for mode 1
STORE CHANGES					Sets to 1 to store changes made to any Traction Setup parameters

Traction Setup - This submenu contains all the adjustable parameters that are available in the traction controller.

Pump Setup

Parameter	Units	Min	Max	Default	Description
M1 Max Lift Speed	%	0	100	100	Sets the maximum lift speed percentage for mode 1
M1 Max tilt Speed	%	0	100	65	Sets the maximum tilt speed percentage for mode 1
M1 Max Side Shift Speed	%	0	100	80	Sets the maximum side shift speed percentage for mode 1
M1 Max Pivot Speed	%	0	100	65	Sets the maximum pivot speed percentage for mode 1
M2 Max Lift Speed	%	0	100	100	Sets the maximum lift speed percentage for mode 2
M2 Max Tilt Speed	%	0	100	65	Sets the maximum tilt speed percentage for mode 2
M2 Side Shift Speed	%	0	100	80	Sets the maximum side shift speed for mode 2
M2 Max Pivot Speed	%	0	100	65	Sets the maximum pivot speed percentage for mode 2
M3 Max Lift Speed	%	0	100	100	Sets the maximum lift speed percentage for mode 3
M3 Max Tilt Speed	%	0	100	65	Sets the maximum tilt speed percentage for mode 3
M3 Max Side Shift Speed	%	0	100	80	Sets the maximum side shift speed percentage for mode 3
M3 Max Pivot Speed	%	0	100	65	Set to maximum pivot speed percentae for mode 3
STORE CHANGES					Set to 1 to store changes made to any Pump Setup parameters

Pump Setup - This submenu contains all the variable parameters that are available in the pump controller.

Clock Set

Parameter	Description
Year	Sets the year in YY format
Month	Sets the month in MM format
Date	Sets the date in DD format
Hour	Sets the hour in military format
Minute	Sets the minute
Second	Sets the second

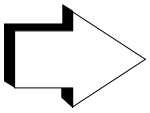
Error Log - This submenu contains a log of all the truck errors.

Clear Error Log - Enter this submenu to clear all truck errors.

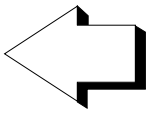
Password Setup - This submenu allows you to view, add, edit and delete password profiles.

Throttle and Brake Calibration

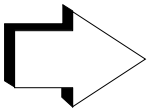
1. Enter the dash display menu by pressing and holding the menu button from the main dash display screen. When prompted, enter the password (currently “55555”).
2. Use the up/down buttons to highlight the “No Run Diagnostic” submenu and press the button with the icon shown below next to it to enter the “No Run Diagnostic” submenu.



3. Record the throttle voltage with your foot completely off the accelerator pedal. Add 5 to this value to get the “Throttle Low” value.
4. Make sure that the direction selector switch on the joystick is in the neutral position. Press the accelerator pedal all the way to the floor and record the throttle voltage. Add 5 to this value to get the “Throttle High” value.
5. Record the brake pot voltage with your foot completely off the brake pedal. Add 150 to this value to get the “Brake Pot Low” value.
6. Press the brake pedal all the way to the floor and record the brake voltage. Add 5 to this value to get the “Brake Pot High” value.
7. Press the button with the icon shown below next to it to exit the “No Run Diagnostic” submenu and return the main menu.



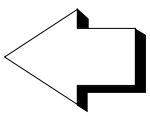
8. In the main menu, use the up/down buttons to highlight the “Traction Setup” submenu and press the button with the icon shown below next to it to enter the “Traction Setup” submenu.



9. Use the up/down buttons to highlight the “Throttle High” parameter press the button with the icon that is shown below next to it. The current parameter value for Throttle High should now be highlighted.

10. Use the number buttons to enter the new value you recorded for “Throttle High”. Press the return button to enter the new value into the controller.
11. Repeat steps 9 & 10 for “Throttle Low,” “Brake Pot High,” and “Brake Pot Low”.
12. Use the up/down buttons to highlight the “Store Changes” parameter next to it and press the button with the icon shown below. Use the number buttons to enter a value of “1” to the highlighted field and press the return button. This will store all of the new values to the controller.

13. Press the button with the icon shown below next to it to exit back tot he main dash display menu.



14. Press the button with the icon shown below next to it to exit back to the main dash display screen.

Wire Guidance Calibration

1. Make sure the main dash display screen says “WIRE OFF”.
2. Align the truck at a 45° angle to the wire.
3. Press and hold the middle buttons on either side of the display screen until the screen says “WIRE CAL”.
4. Drive the truck completely across the wire at the 45° angle.
5. Approximately 5 seconds after the rear antenna has cleared the wire, the words “CAL DONE” should appear on the display screen.
6. Press and hold the top button on the right hand side of the display screen until the screen reads “WIRE OFF” to exit calibration mode.
7. The truck is now calibrated and will return to normal operations.

During truck calibration and /or truck operation, warnings may appear on the Dash Display.

The warnings shown below will “NOT” disable truck operation. These warnings (Fault Codes) will “NOT” be logged into the truck error log.

Attention needs to be given to these warnings to prevent damage to the truck.

CODE	Display Message	Possible Explanation	Possible Solutions
30	Lo Voltage Traction Warning	Traction controller voltage is below the low warning setpoint.	Bring traction controller voltage above the low warning setpoint. If the voltage continues to drop, an error will occur.
31	Hi Voltage Traction Warning	Traction controller voltage is above the high warning setpoint.	Bring traction controller voltage below the high warning setpoint. If the voltage continues to rise, an error will occur.
33	Lo Traction Motor Temp Warning	Traction motor temperature is below the low warning setpoint.	Bring the traction motor temperature above the low warning setpoint. If the temperature continues to drop, an error will occur.
34	Hi Traction Motor Temp Warning	Traction motor temperature is above the high warning setpoint.	Bring the traction motor temperature below the high warning setpoint. If the temperature continues to rise, an error will occur.
35	Traction Motor Temp Warning	Traction motor temperature sensor is not connected to truck harness. --- Faulty traction motor temperature sensor.	Check to see if traction motor temperature sensor is connected to the truck harness. --- Replace traction motor temperature sensor.
37	Hi Traction Drive Temp Warning	Traction controller temperature is above the high warning setpoint.	Bring the traction controller temperature below the high warning setpoint. If the temperature continues to rise, an error will occur.
39	Lo Traction Drive Temp Warning	Traction controller temperature is below the low warning setpoint.	Bring the traction controller temperature above the low warning setpoint. If the temperature continues to drop, an error will occur.
40	Traction Drive Temp Warning	Faulty traction controller temperature sensor.	Replace traction controller.
42	Traction Motor Warning	Traction motor is not connected to the truck. --- Faulty traction motor.	Check to see if the traction motor is connected to the truck harness. --- Replace traction motor.

See table below. If the warnings shown below appear, Truck operation “WILL” be disabled. These warnings(Fault Codes) will “NOT” be logged into the truck error log.

IMPORTANT

Immediate attention needs to be given to these warnings.

CODE	Display Message	Possible Explanation	Possible Solutions
1	Return Throttle to Neutral	Throttle was depressed when the truck was started up or when an error occurred.	Release Throttle.
2	Return Direction Switch to Neutral	Direction Switch was in FWD or REV when the truck was started up or when an error occurred.	Return the direction switch to neutral.
3	Battery Gate Switch Open	Battery gate is not properly installed. --- The battery gate switch is not connected to the truck harness.	Insure battery gate is installed properly. --- Check the battery gate switch plug to see if it is connected to the truck harness.
4	Seat Switch Open	Operator is not properly seated on the seat when operating the truck. --- Seat switch is not connected to the truck harness. --- Faulty seat switch.	Insure operator is properly seated before operating the truck. --- Check seat switch plug to see if it is connected to the truck harness. --- Replace seat switch.
5	Steer System Not Active	An error or fault has occurred that has caused the VMC30 to disable the steer system until the error is corrected.	Fix the condition that caused the error or fault and cycle the key switch.
62	Lift Lockout	Battery voltage has fallen below the lift lockout threshold.	Recharge battery.

See table below. If the warnings shown below appear, truck operation “WILL” be disabled. These warnings (Fault Codes) “WILL” be logged into the truck error log.

IMPORTANT

Immediate attention needs to be given to these warnings.

CODE	Display Message	Possible Explanation	Possible Solutions
100	Hi Current Traction	External short of phase U, V or W motor connections. --- Faulty traction controller.	Insure cables are not shorted. --- Replace traction controller.
101	Lo Voltage Traction	Battery voltage is too low. --- Traction contactor precharge circuit is faulty or missing. --- Faulty traction contactor.	Charge battery. --- Replace traction contactor precharge circuit. --- Replace traction contactor.
102	Hi Voltage Traction	Bad connections between battery and traction controller. --- Traction contactor open.	Check connections between battery and traction controller. --- Replace traction contactor.
103	Hi Traction Motor Temp	Traction motor temperature is at or above the programmed high temperature setpoint.	Bring the traction motor temperature below the high temperature setpoint and cycle the key switch.
104	Hi Traction Drive Temp	Traction controller temperature is at or above the programmed high temperature setpoint. --- Excessive load on vehicle. --- Improper mounting of traction controller.	Bring the traction controller temperature below the high temperature setpoint. --- Reduce load on vehicle. --- Check to see if traction controller is properly mounted.
105	Traction Comm Fault	Traction controller is not connected to truck harness. --- Traction controller is not properly flashed with correct code. --- Faulty traction controller. --- Faulty truck harness.	Check to see if traction controller is connected to the truck harness. --- Check to see if traction controller is properly flashed with the correct code. --- Replace traction controller. --- Replace truck harness.
106	Traction Drive Fault	Faulty traction controller.	Replace traction controller.
107	Traction Contactor Shorted	Contacts of traction contactor shorted together.	Replace traction contactor and insure precharge circuit is properly installed.

CODE	Display Message	Possible Explanation	Possible Solutions
120	Hi Current Pump	External short of phase U, V or W motor connections. --- Faulty pump controller.	Insure that motor cables are not shorted. --- Replace pump controller.
121	Lo Voltage Pump	Battery voltage is too low. --- Pump contactor precharge circuit is faulty or missing. --- Faulty pump contactor.	Charge battery. --- Replace pump contactor precharge circuit. --- Replace pump contactor.
122	Hi Voltage Pump	Bad connections between battery and pump controller. --- Pump contactor is open.	Check connections between battery and pump controller. --- Replace pump contactor.
123	Hi Pump Motor Temp	Pump motor temperature is at or above the programmed high temperature setpoint.	Bring the pump motor temperature below the high temp setpoint and cycle the key switch.
124	Hi Pump Drive Temp	Pump controller temperature is at or above the programmed high temp setpoint. --- Excessive load on vehicle. --- Improper mounting of pump controller.	Bring pump controller temperature below the high temperature setpoint. --- Reduce load on vehicle. --- Check to see if pump controller is properly mounted.
125	Pump Comm Fault	Pump controller is not connected to the truck harness. --- Pump controller is not properly flashed with correct code. --- Faulty pump controller. --- Faulty truck harness.	Check to see if pump controller is connected to the truck harness. --- Check to make sure pump controller is properly flashed with the correct code. --- Replace pump controller. --- Replace truck harness.
126	Pump Drive Fault	Faulty pump controller.	Replace pump controller.
127	Pump Contactor Shorted	Contacts of pump contactor shorted together.	Replace pump contactor and check to make sure precharge circuit is properly installed.
140	Steer Hi Current	External short of phase U, V or W motor connections. --- Faulty steer controller.	Check to make sure motor cables are not shorted. --- Replace steer controller.

CODE	Display Message	Possible Explanation	Possible Solutions
141	Steer Lo Voltage	Battery voltage is too low. --- Traction contactor precharge circuit is faulty or missing. --- Faulty traction contactor.	Charge battery. --- Replace traction contactor precharge circuit. --- Replace traction contactor.
142	Steer Hi Voltage	Bad connections between battery and steer controller. --- Traction contactor is open.	Check connections between battery and steer controller. --- Replace traction contactor.
143	Steer Hi Motor Temp	Steer motor temperature is at or above the programmed high temp setpoint.	Bring the steer motor temperature below the high temp setpoint and cycle the key switch.
144	Steer Hi Drive Temp	Steer controller temperature is at or above a programmed high temp setpoint. --- Excessive load on vehicle. --- Improper mounting of steer controller.	Bring steer controller temperature below the high temp setpoint. --- Reduce load on vehicle. --- Check to see if steer controller is properly mounted.
145	Steer Comm Fault	Steer controller is not connected to the truck harness. --- Steer controller is not properly flashed with correct code. --- Faulty steer controller. --- Faulty truck harness.	Check to see if steer controller is connected to the truck harness. --- Check to make sure steer controller is properly flashed with the correct code. --- Replace steer controller. --- Replace truck harness.
146	Steer Drive Fault	Faulty steer controller.	Replace steer controller.

CODE	Display Message	Possible Explanation	Possible Solutions
147	Steer Wheel Fault	Steer wheel encoder is not connected to truck harness. --- Faulty steer motor encoder.	Check to see if steer motor encoder is connected to the truck harness. --- Replace steer motor.
148	Angle Fault	Steer motor is not rotating the steer wheel properly.	Check steer motor rotation.
149	Steer Calibration Fault	Steer centering calibration has failed or timed out.	Check to see if the prox switch is connected; check to see if the steer motor is turning the wheel at an appropriate speed during calibration.
150	Steer Pot Sensor Fault	Prox switch is not connected to the truck harness. --- Faulty prox switch.	Check to see if prox switch is connected to the truck harness. --- Replace prox switch.
166	WGU Comm Fault	WGU is not connected to the truck harness. --- WGU is not properly flashed with correct code. --- Faulty WGU. --- Faulty truck harness.	Check to see if WGU is connected to truck harness. --- Check make sure WGU is properly flashed with correct code. --- Replace WGU. --- Replace truck harness.
170	Joystick Comm Fault	Joystick is not connected to truck harness. --- W/Faulty joystick. --- Faulty truck harness.	Check to see if joystick is connected to truck harness. --- Replace joystick. --- Replace truck harness.

Table provided for general use.

NOTES:

Chapter 6

Truck Lubrication and Chain Maintenance

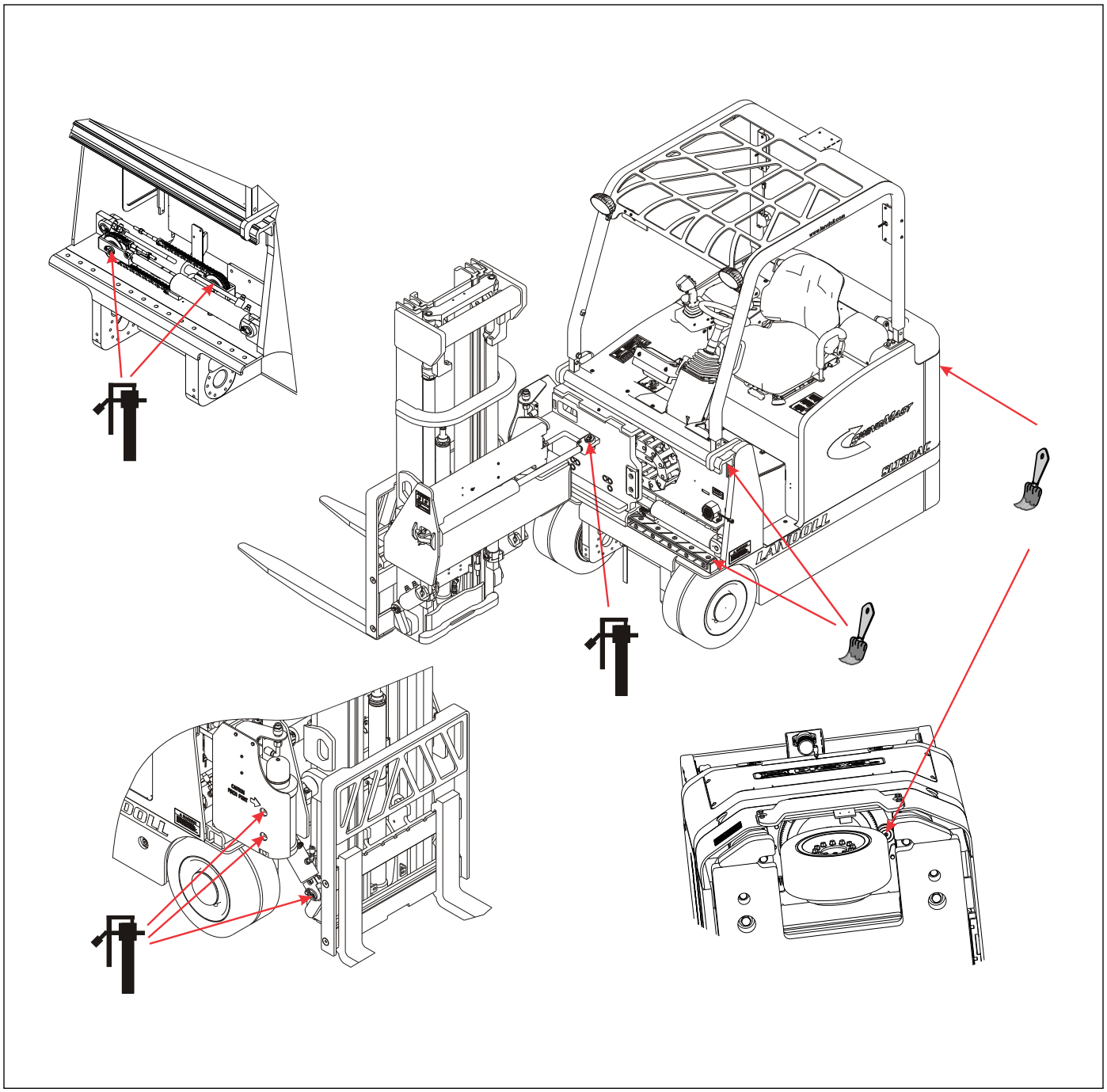


Figure 6-1: Grease Locations

Lubricating the Truck

1. Before lubricating the truck, lower the forks, set the key switch to the OFF position.
2. Certain grease fittings may include protective plastic caps. Remove them before applying grease. Remember to replace the caps when finished.
3. In the following procedures, the location of grease fittings or surfaces to be greased are by either a grease-gun or brush respectively. **See Figure 6-1.**
4. Make sure all grease fittings are wiped clean before lubricating. If any of the fittings are corroded or blocked, replace them. Before brush applying grease to bearing pad surfaces, wipe out the channel to remove any foreign matter that may have accumulated since your last lubrication.
5. After a truck cleaning, lubricate all unprotected grease fittings and metal-to-metal surfaces, located outside the truck.
6. Interval frequency can be recorded from the running hours read on the hour meter in the driver's compartment.
7. See "Lubrication Specifications" on page 1-14. for recommended lubricants.

WARNING

Do not service the truck and/or mast area while the key switch is ON. If a joystick, steering wheel or accelerator pedal is accidentally moved, serious injury could occur.

Main Rotation Bearings

1. Turn the truck off and remove the key and place in a secure area.
2. Perform a Lock Out/Tag Out procedure.
3. Grease the upper and lower front rotation bearing fittings until fresh grease is squeezed from the lower bearing. **See Figure 6-2**.
4. Wipe off excess grease.

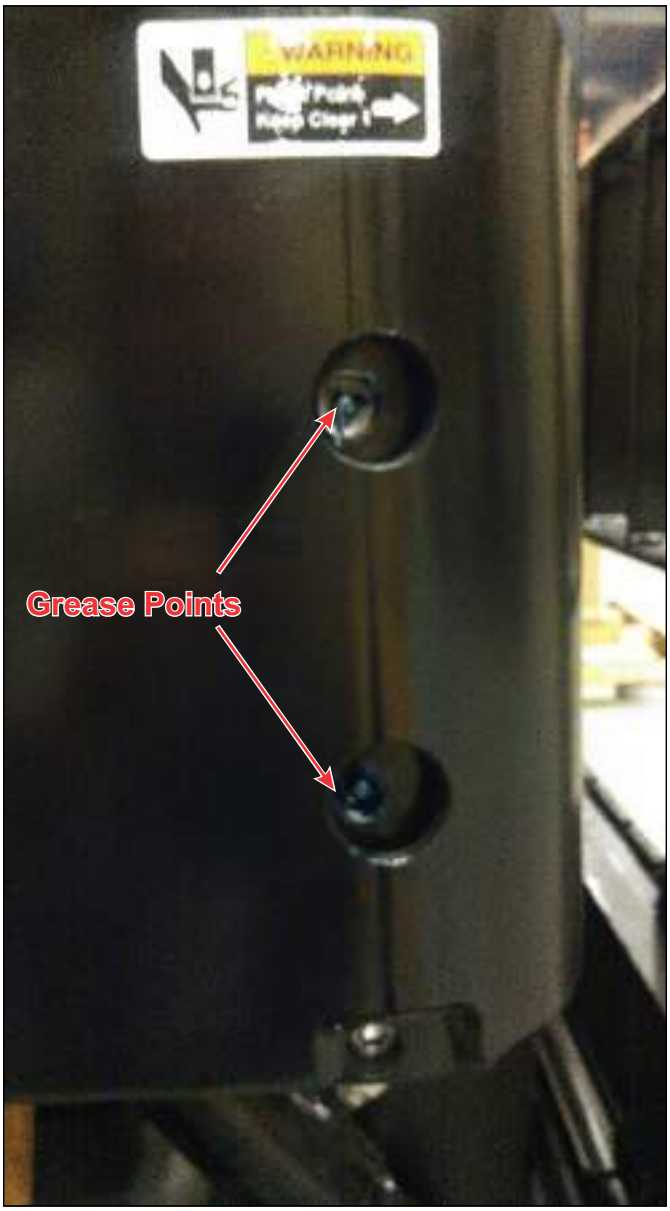


Figure 6-2 Main Rotation Bearings

Steering Gear

1. Start the truck and turn the steering wheel counterclockwise, (to the left) until the wheel stops.
2. Turn the truck off and remove the key and place in a secure area.
3. Perform a Lock Out/Tag Out procedure.
4. Locate steering pinion by looking up under the right rear of the frame near the rear drive wheel.
5. Apply grease to the steering gear. Coat exposed gear face and as much of the pinion as possible. See **Figure 6-3.**
6. Repeat steps 1-5 so that you have adequate coverage of gear and pinion.

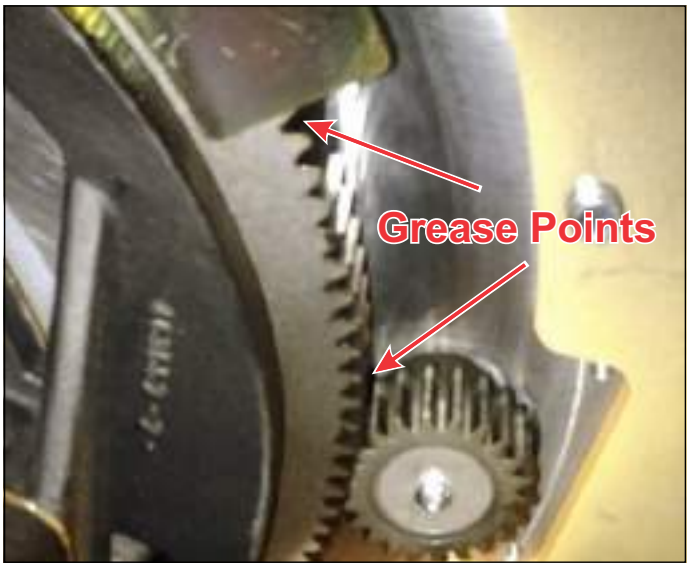


Figure 6-3: Steering Gears

Tilt Cylinder Clevis

1. Turn the truck off and remove the key and place in a secure area.
2. Perform a Lock Out/Tag Out procedure.
3. Grease the clevis pin fitting on each side of the mast until fresh grease is squeezed from the clevis. Wipe off excess grease. **See Figure 6-7**.

Shift Chain Rollers/Pivot Cylinder Clevis Pin

1. Start the truck and pivot the mast 90 degrees to the right.
2. Turn the truck off and remove the key and place in a secure area.
3. Perform a Lock Out/Tag Out procedure.
4. Grease the pivot cylinder clevis until fresh grease is squeezed from the clevis. Wipe off excess grease. **See Figure 6-4**.
5. Grease the shift chain rollers. There is one roller on each shift cylinder. You can reach the right side roller from the front with mast pivoted 90 degree. **See Figure 6-5.** The left side roller grease fitting is found by lifting the floor mat. The fitting can be seen in **Figure 6-6**. Grease the roller until fresh grease is squeezed out between the roller and roller bracket.
6. Lubricate shift chains

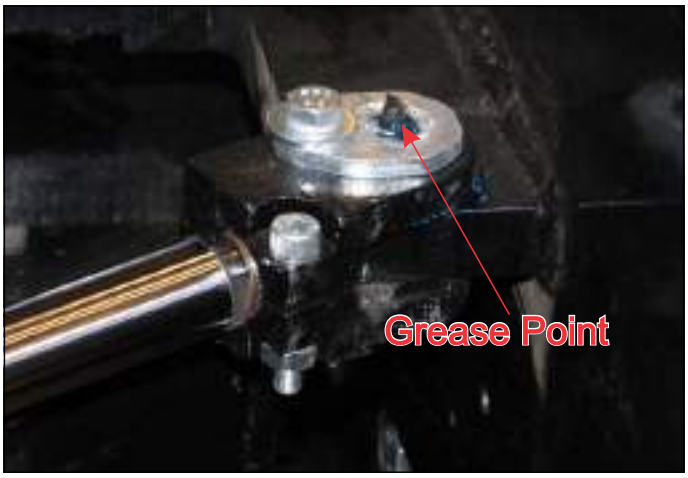


Figure 6-4: Pivot Pin Clevis Lubricating

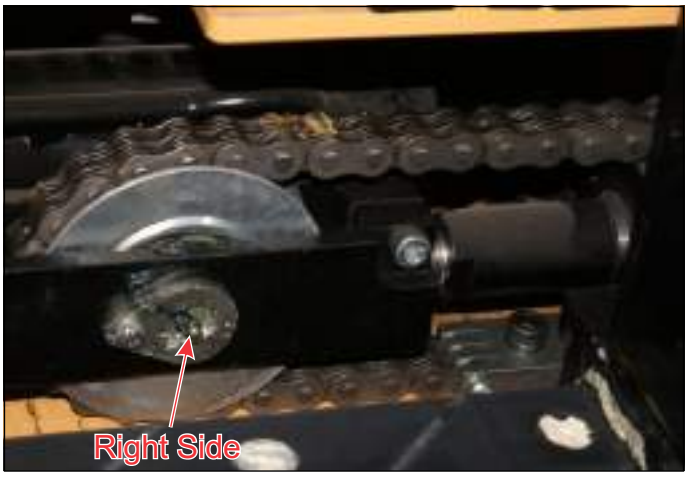


Figure 6-5: RIght Side Shift Roller

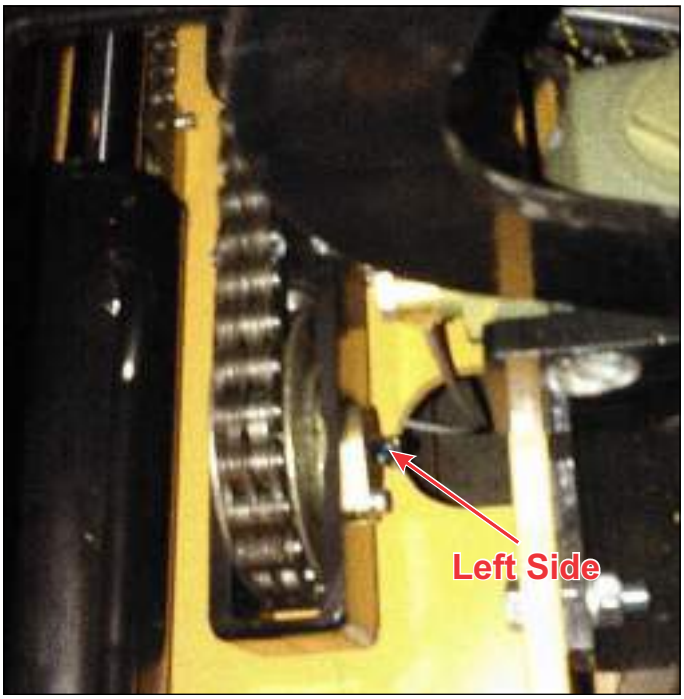


Figure 6-6: Left Side Shift Roller

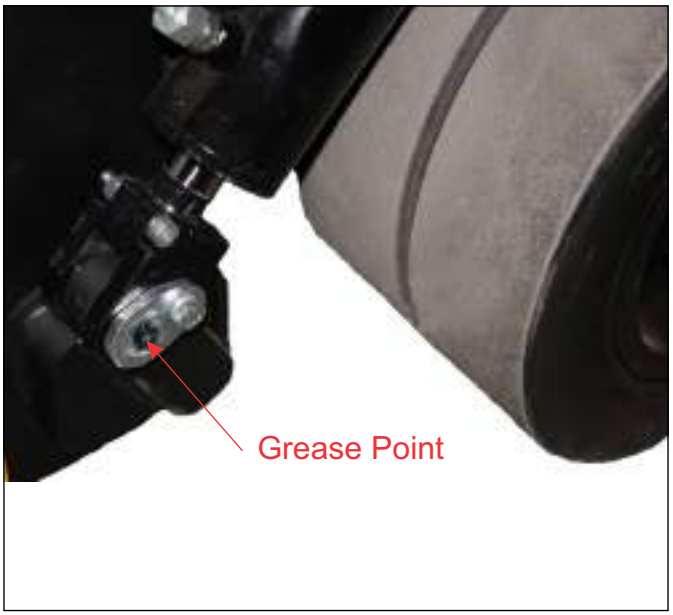


Figure 6-7 Lubricating Tilt Cylinder Clevis

Shift Bearing Pads

1. Start the truck and pivot the mast 90 degrees to the right.
2. Shift fully to the right.
3. Turn the truck off and remove the key and place in a secure area.
4. Perform a Lock Out/Tag Out procedure.
5. Apply a light coating of grease to the bottom slide bearings. Apply a light coating of grease to the upper channel. **See Figure 6-8.**
6. Start the truck and shift the mast fully to the left.
7. Repeat steps 3 and 4.
8. Apply a light coating of grease to right side of lower bearing and upper channel.
9. Shift the front end fully to the left and right 2 times and wipe up excess grease.
10. Note: For optimum performance, lubricate shift bearing pads daily for the first 50-100 hours of truck operation.

Figure 6-8: Shift Bearing Pads

Fork Positioner Lubrication, Non-Side Shifting (Option)

1. Start the truck and position the mast straight ahead.
2. Set the key switch to OFF, remove the key from the key switch and place in a secure area.
3. Before lubricating the positioner rails, wipe off excess lubricant and dirt buildup from within the rail channels and dirt from the top and bottom of the rail grooves.
4. Using a brush, lubricate the top areas on the fork rails, including a thin film on the front face of both rails. Using a grease gun apply grease to the lower fork rails. **See Figure 6-9.**
5. Wipe off excess grease.

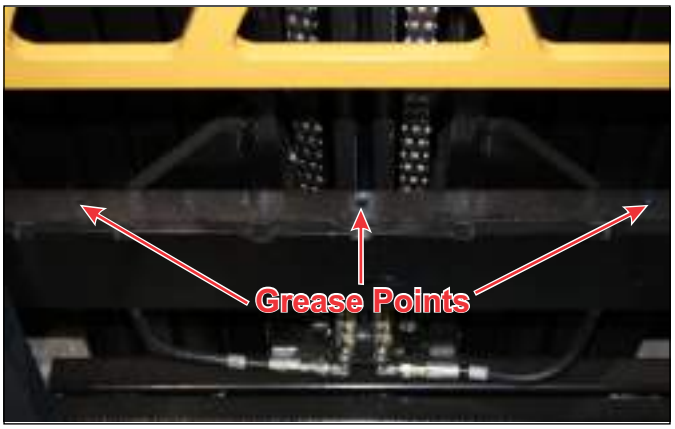


Figure 6-9: Fork Positioner Lubrication Areas

Chain Lubrication

CAUTION

The chains must be coated with a film of lubricant at all times.

- Lubricate the chains as required by the Operator's Daily Checklist beginning on page 1-7.
- Use lubricant listed on the Lubrication Chart located on page 1-12. Brush lube along all chain surfaces.
- Each pair of chains has been factory-lubricated using heat and pressure to force the lubricant thoroughly into the chain links. Avoid removal or contamination of this factory applied lubricant. Do not wash, sand blast, etch, steam clean, or paint the chains.

Chain Adjustment

The chain must be adjusted so each strand is under equal tension for proper load distribution and mast operation.

To determine whether the chains are properly adjusted:

1. Remove load from forks.
2. Extend the mast to put the chains under tension.
3. Press the center of a strand of chain with your thumb, then press at the same place on the other chain of the pair.
4. Each chain in a pair should have equal "give". If tension is not equal, adjust them as described in the manufacturer's mast service manual.

Measuring Chain Stretch

If the chains stretch beyond the recommended amount, they should be replaced in pairs. Chain stretch can be measured with a chain wear scale. **See Figure 6-10.** The scale indicates whether the distance between two chain links is within tolerance. The shaded area in the illustration, compares a stretched chain, to a new chain. Measure the chains according to the instructions printed on the chain wear scale, without load on the carriage.

- To check the free lift chains, raise the carriage 1 ft. (30 cm) off the ground to put tension on the chains.
- To check the main lift chains, raise the mast until the inner upright starts to extend putting tension on the chains.

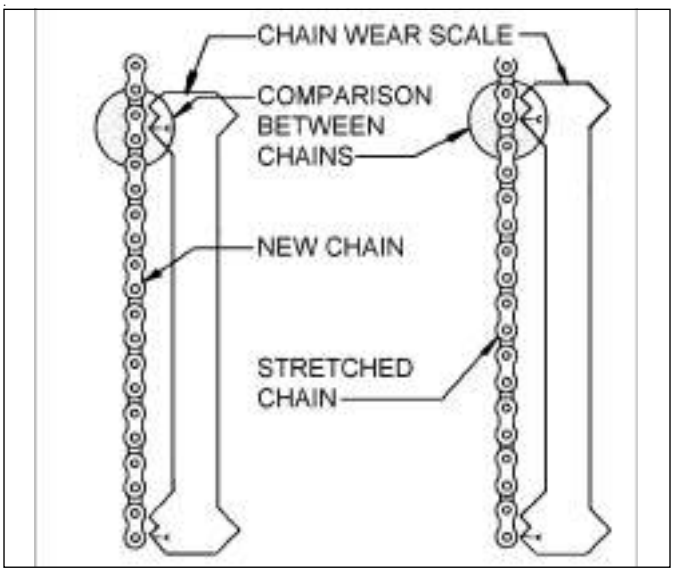


Figure 6-10: Measuring Chain Stretch

Check Primary Lift Chain

1. Park the truck on a flat, level surface.
2. Set the mast in the center of the truck, facing straight ahead, level to the floor and empty (unloaded).
3. Set the key switch to OFF, remove the key and place the key in a secure area.
4. Measure the distance from the floor to the bottom heel of each fork tine. Measurement must be 1/8" (3.175 mm) minimum to 1/4" (6.35 mm) maximum. If it is not within 1/8" to 1/4" (3.175 mm to 6.35 mm), adjust the primary lift chain accordingly.

Check Lift Operation

1. Check the lift cylinders to ensure proper sequencing. If adjustment is needed, see supplier information in Chapter 7.

2. Check to see that an unloaded mast will completely lift to full lift height (the relief valve opens). If it will not, check the hydraulic oil level in the reservoir and add oil if necessary.
3. Load the mast and raise it approximately to 5’ (1.524 m), then quickly lower the mast until it is about 6” (1.524 mm) above the floor and stop the mast abruptly.
4. Make sure the elevating channel rollers maintain proper contact with the mast channel.
5. Look for signs of galling where the rollers contact the rail. Galling is indicated by track marks in the rails that are 1/4” to 1/2” (6.35 mm to 12.7 mm) wide running up the rail. Normal track marks are no more than 1/4” (6.35 mm) wide.
6. If galling is detected, adjust the rollers for the proper clearance over the full length of the mast rails. See “Inspection Check List” beginning on page 1-7

Checking and Adjusting Degree of Tilt

1. To check degree of tilt, be certain the truck is on a smooth, level surface.
2. Tilt the mast completely back. Place the tilt gauge against the rear outer mast rail on the right side of the truck.
3. Available tilt is limited to 3° forward and 4° back.
4. To adjust the degree of tilt, tilt the mast fully backward.
5. Set the key switch to OFF and remove the key from the key switch.

⚠ WARNING

Do not service the tilt cylinder while the key switch is ON. If a joystick, steering wheel or accelerator pedal is accidentally moved, you could be caught between the mast and the truck, causing serious injury.

6. Loosen the tilt cylinder adjuster bolt.
7. Continue to loosen the tilt cylinder adjuster bolt until there is no bolt pressure on the tilt cylinder clevis.
8. Place the tilt gauge against the rear outer mast rail on the right side of the truck, about 6” (152 mm) above the mast cross member. **See Figure 6-11.**

⚠ CAUTION

NEVER exceed 4.0° rear tilt for masts. Rear tilt in excess of recommended values can cause instability.

9. Relieve the hydraulic pressure on the tilt cylinder. Rotate the tilt cylinder rod using a 1-3/4 open end wrench on the tilt cylinder rod. Looking at the rod end of the cylinder turn clockwise to shorten the rear tilt or counterclockwise to increase the rear tilt. It is best to turn the rod only a 1/2 turn at a time. **See Figure 6-12.**
10. You may have to tilt the mast a number of times, repeating steps 4 thru 9, until the adjustment is correct.

NOTE

At this time, make sure all hydraulic hoses, electrical wiring and all parts of the mast move smoothly and clear the frame when the mast is going through the complete tilt movement. Also check and correct mast flex, a misadjustment of the tilt cylinders that causes one tilt cylinder to bottom out before the other one has completed travel.

11. When the adjustment is complete, reinsert the key and turn to the ON position. Using the tilt cylinder lever, tilt the mast back to its full stroke.
12. Tighten and torque the tilt cylinder adjuster bolt against the cylinder clevis. See General Torque, Hydraulic Fitting Torque, and SLT30/35 AC Torque Tables on page 1-12.

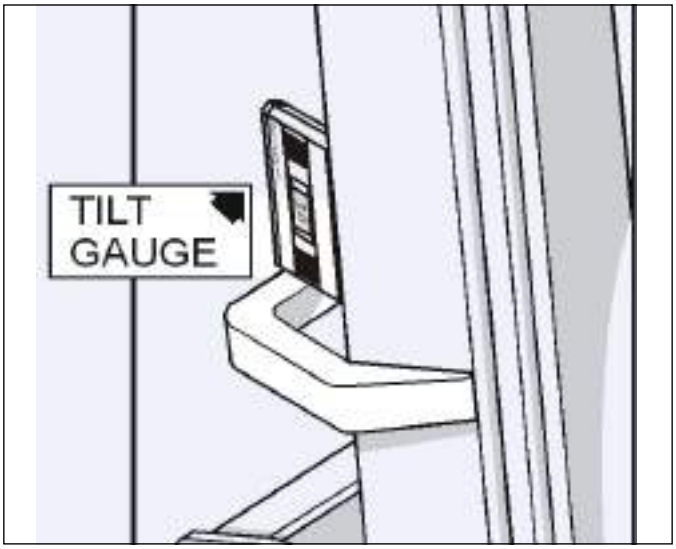


Figure 6-11 Mast Tilt Gauge

Figure 6-12 Adjusting Tilt Cylinder.

Removing the Tilt Cylinders

WARNING

Steel toed shoes and eye protection are required when doing maintenance or repair work on a lift truck. Do not place feet or hands in any areas through the mast or in truck pinch points. Servicing the tilt cylinders requires the use of an overhead hoist, hoist slings and wheel blocks. The overhead hoist and slings must have a rating of 8,000 lb. or greater. Do not work under or around a truck that is not properly secured. The battery must be disconnected and removed from the truck.

- **Truck repair must be in a level, designated area.**
- **Turn the lift off, pull the key and put it in a secure place.**
- **Lower the mast completely to the floor.**
- **Chock the wheels so that the truck cannot move.**
- **Relieve any hydraulic pressure by moving all levers back and forth and turning the steering wheel both ways.**
- **Slowly loosen the hydraulic fittings and catch all oil with a pan or shop rag.**
- **Attach a sling and hoist to all the top cross braces so the mast sections cannot move.**

1. If the cylinder is being removed, disconnect the two hydraulic hoses from the tilt cylinder. Mark, cap and plug all hoses and cylinder ports.
2. If replacing the cylinder, mark the cylinder jam nut for reassembly on new cylinder.

WARNING

The mast will fall forward if not being held up. Make sure mast is held up by a hoist and sling.

3. On the mast end of the cylinder, remove the bolt and the hardware from the tilt cylinder pin weldment and remove the pin from the tilt cylinder clevis.
4. Remove cotter pins and other two pins.

Removing the Mast From Truck

WARNING

- **Only trained and experienced technicians or your Landoll service representative must be allowed to service the mast assembly. Never place any part of one's body into the working area of the mast. Never work on the mast while it is loaded; remove the load first.**
- **Observe all safety precautions while operating the overhead crane and lifting apparatus.**
- **Steel toed shoes and eye protection are required when doing maintenance or repair work on a lift truck. Do not place feet or hands in any areas through the mast or in truck pinch points.**
- **Servicing the tilt cylinders requires the use of an overhead hoist, hoist slings and wheel blocks. The overhead hoist and slings must have a rating of 8,000 lb. or greater.**
- **Do not work under or around a truck that is not properly secured.**
- **The battery must be disconnected and removed from the truck.**

1. Remove the forks.
2. Remove the four bolts and hardware holding the backrest to the mast. Carefully remove the backrest. The backrest is heavy; use an appropriate lifting device or a helper.
3. At the mast, disconnect the lift cylinder hose.
4. Oil will drain from these hoses. Plug, mark and cap all oil lines and cylinder ports.
5. Attach an overhead crane (rated at 6,000 or higher) to the mast and lift slightly.
6. Disconnect the two tilt cylinders. See "Removing the Tilt Cylinders") on page 6-7.

7. With the tilt cylinders disconnected from the mast, move the overhead crane forward slightly to provide a gap between the mast and the front mounting plate.

WARNING

- **The mast will fall forward if not being held up. Make sure mast is held up by a hoist and sling.**
- **Be careful if the top of the mast is tower than the bottom of the mast when laying flat. The carriage may slide and cause damage or injury.**
- **Always secure the carriage to the mast.**

8. Lay down the mast horizontally on planks of wood.
9. Dismantle, clean and inspect the mast assemblies and subassemblies.
10. Reassemble the mast in reverse order.

Side-Shift Chains Adjustment

IMPORTANT

WARNING

- **DO NOT ATTEMPT THIS REPAIR YOURSELF! Contact your authorized Landoll service representative. The shimming and mast adjustment procedure involves working in the pinch points of the truck and should not be performed by anybody unfamiliar with this procedure.**

1. Set the pivot-to-frame clearance by bringing the mast back to the frame. Adjust it so that a piece of paper stays in place between the mast and the frame pad and can't be pulled out with mast pressure applied. DO NOT ADJUST MAST TOO TIGHT! The mast will tend to "rise" or "jump" if adjusted too tight when it is brought back against the frame. **See Figure 6-13.**

Figure 6-13 Mast to Front Frame Clearance

2. Once pivot-to-frame has been adjusted, tighten the pivot cylinder clevis lock bolt. **See Figure 6-14.** Pivot cylinder length is adjusted by turning on the cylinder shaft with an open end wrench.

Figure 6-14 Pivot Adjustment and Lock Bolt

3. Pivot the mast 90° to the right.
4. With the mast at 90° from the truck frame, move the mast all the way to the right. The goal is to have the front of the vertical section of the forks be 3 inches outside of the frame. See Figure 6-15.
5. Use a straight edge clamped to the vertical sections of the forks and measure the distance between the straight edge and the frame. The desired 3" is achieved by adjusting the front side-shift cylinder. **See Figures 6-15 and 6-16.**

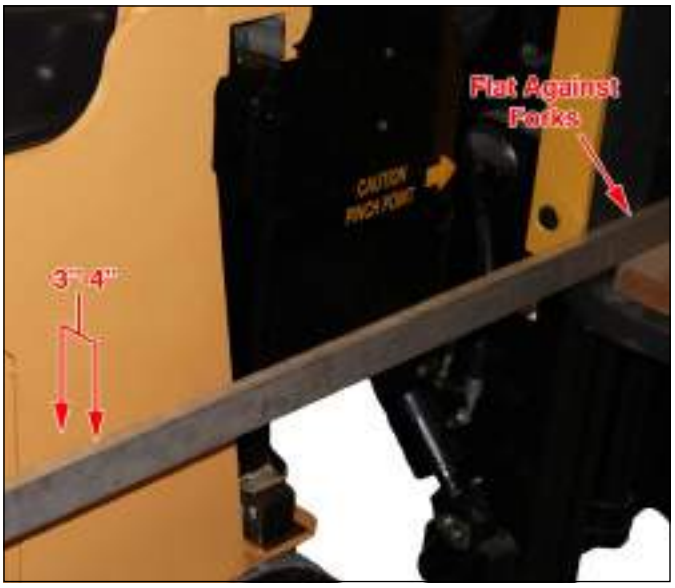


Figure 6-15 Setup for Straightedge/Frame Gap

Figure 6-16 Adjusting Mast Travel to the Left

6. With the mast still in the 90° position and the desired mast at 3 inches outside of the frame, unclamp the straight edge and mark the mast position on the truck frame. **See Figure 6-17.**

7. Move the mast all the way to the right. The full travel length (right to left) should be set at 20". **See Figure 6-17.** This rear side shift cylinder is adjusted to achieve this travel by adjusting the length of the chain. **See Figure 6-18.**

Figure 6-17 Marking the Frame

8. When finished, apply removable thread locker to the adjustment nuts of both the front and the rear cylinder chain adjusters and to the cylinder clevis lock bolts. **See Figures 6-18 and 6-19.**

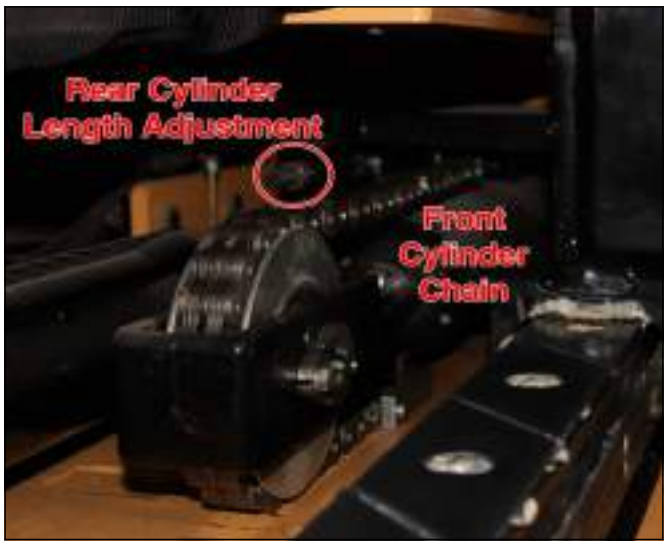


Figure 6-18 Sideshift Chain Adjustment

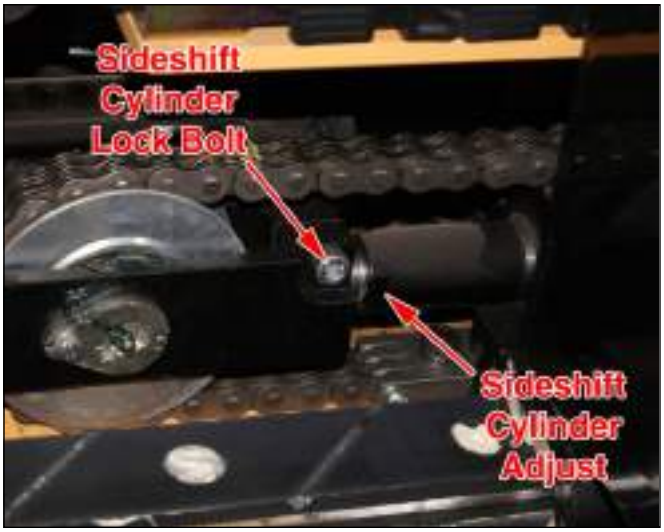


Figure 6-19 Right Side Lock Bolt

Table for your general use with this manual.

NOTES:

Document Control Revision Log:

Date	Revision	Improvement(s) Description and Comments
05/26/15	F-459-R1	Initial Release
10/31/16	F-459-R1	Hydraulic fluid changes - Joshua

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LANDOLL CORPORATION

1900 North Street

Marysville, Kansas 66508

(785) 562-5381

800-428-5655 ~ WWW.LANDOLL.COM