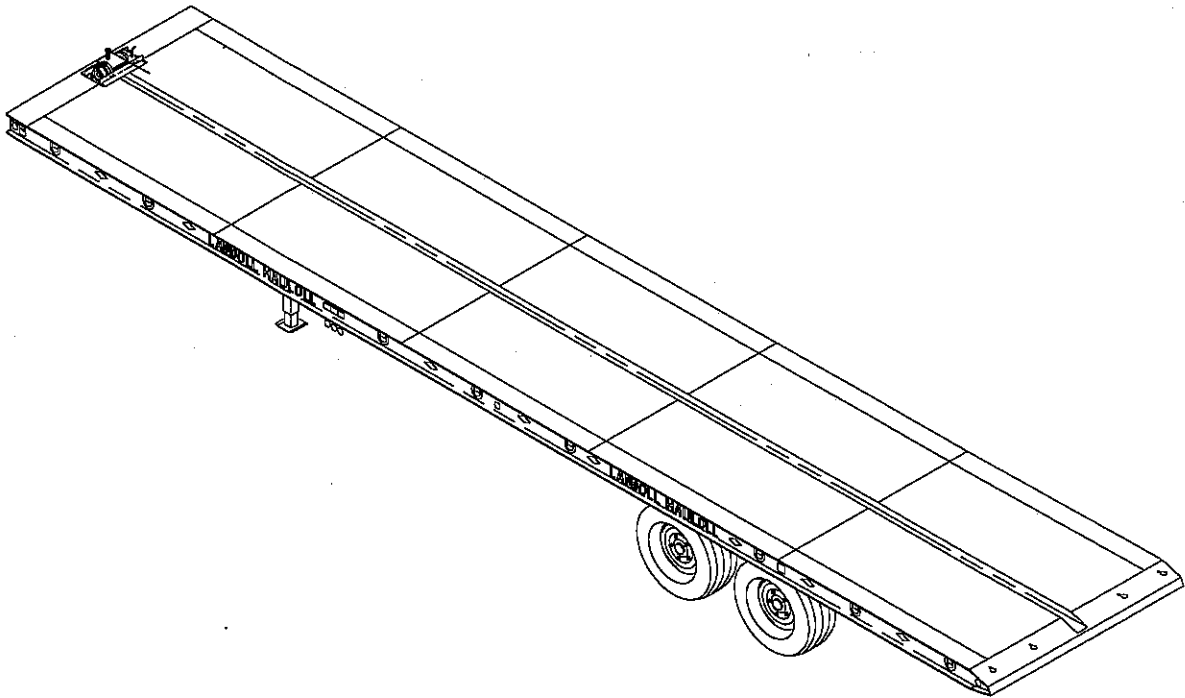




**MODEL 330  
SEMITRAILER  
OPERATOR'S MANUAL**



**1900 North Street  
Marysville, KS 66508  
(785)562-5381**

# WARRANTY

## MANUFACTURER'S GUARANTEE POLICY

### LANDOLL CORPORATION WARRANTY

LANDOLL warrants each new and unused LANDOLL machine, when properly assembled, adjusted, and operated, to be free of defects in material and workmanship, in normal use and when properly serviced, for a period of twelve (12) months after date of delivery by the Dealer to the original retail purchaser. LANDOLL shall repair or replace, at its option, freight on board (f.o.b.) at its factory or designated DEALER location, any part or parts of such new and unused machine which shall have been reported in writing to LANDOLL within thirty (30) days from date of failure thereof and which LANDOLL inspection shall disclose to have been defective. Defective parts must be returned to the LANDOLL factory, freight prepaid. LANDOLL will not be liable for labor, transportation, or any other charges resulting from replacement of a defective part. This warranty is void if any part not supplied by LANDOLL is used in assembly or repair, or if the machine has been altered, abused, or neglected. LANDOLL repair parts are warranted for ninety (90) days from date of replacement or for the unexpired warranty period of the applicable LANDOLL machine, whichever period is longer. LANDOLL makes no warranty, whatsoever, as to purchased component parts and other trade accessories, except to the extent that such items are warranted by the manufacturer thereof. THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESSED, IMPLIED, OR STATUTORY (INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PURPOSE), AND LANDOLL SHALL NOT BE LIABLE FOR SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY KIND ON ACCOUNT OF ANY LANDOLL PRODUCT.

NO EMPLOYEE OR REPRESENTATIVE IS AUTHORIZED TO CHANGE THIS WARRANTY, VERBALLY OR IN WRITING, OR GRANT ANY OTHER WARRANTY.

LANDOLL CORPORATION, WHOSE POLICY IS ONE OF CONTINUOUS IMPROVEMENT, RESERVES THE RIGHT TO MAKE CHANGES WITHOUT OBLIGATION TO MODIFY PREVIOUSLY PRODUCED EQUIPMENT.



**MODEL 330  
SEMITRAILER  
OPERATOR'S MANUAL**

**PURCHASED FROM:** \_\_\_\_\_ **DATE** \_\_\_\_ / \_\_\_\_ / \_\_\_\_

**ADDRESS:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**PHONE NO.:** \_\_\_\_\_ **SERIAL NO.:** \_\_\_\_\_

# **REPORTING SAFETY DEFECTS**

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If you believe that your vehicle has a defect which could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Landoll Manufacturing.

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or Landoll Manufacturing.

To contact NHTSA, you may either call the Auto Safety Hotline toll-free at 1-800-424-9393 (or 366-0123 in Washington, D.C. area) or write to: NHTSA, U.S. Department of Transportation, Washington, D.C. 20590. You can also obtain other information about motor vehicle safety from the Hotline.

In the event of a defect or problem with your LANDOLL equipment, please notify LANDOLL CORPORATION:

**LANDOLL CORPORATION  
SALES AND SERVICE  
1900 NORTH STREET  
MARYSVILLE, KANSAS 66508**

**OR PHONE:  
(785)562-5381  
1-800-HAULLOLL  
(1-800-428- 5655)  
FAX NO.: (785) 562-4893**

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# **SAFETY PRECAUTIONS**

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THIS IS THE INTERNATIONAL SAFETY ALERT SYMBOL. IT ALERTS THE OPERATOR TO IMPORTANT SAFETY MESSAGES ON THE MACHINE AND IN THIS MANUAL. CAREFULLY READ AND STUDY THESE LABELS AND MESSAGES BEFORE MACHINE ASSEMBLY AND OPERATION. THERE ARE THREE TYPES OF SAFETY ALERT MESSAGES:

## **DANGER**

A LIFE THREATENING SITUATION EXISTS. DEATH CAN OCCUR if safety measures or instructions on this label are not properly followed.

## **WARNING**

SERIOUS INJURY OR DEATH CAN OCCUR if safety measures or instructions on this label are not properly followed.

## **CAUTION**

SERIOUS EQUIPMENT OR OTHER PROPERTY DAMAGE CAN OCCUR if instructions on this label are not properly followed.



This manual provides operating, servicing, and maintenance instructions, with detailed parts lists for Model 330 semitrailer, manufactured by Landoll Corporation, Marysville, Kansas 66508.

- SECTION 1** gives basic instructions on the use of this manual.
- SECTION 2** gives specifications for the semitrailer, including measurements and component specifications. A Standard Bolt Torque Table is provided to give guidelines for bolt torques to be used when servicing this product.
- SECTION 3** gives instructions for the proper operation of the equipment.
- SECTION 4** gives general maintenance procedures, a maintenance schedule, and a lubrication schedule. Improper maintenance will void your warranty.

**IF YOU HAVE ANY QUESTIONS CONTACT:**

**LANDOLL CORPORATION  
1900 NORTH STREET  
MARYSVILLE, KANSAS 66508  
or phone:  
(785) 562-5381 or  
(800) 428-5655  
or FAX:  
(785) 562-4893**

- SECTION 5** is a troubleshooting guide to aid in diagnosing and solving problems with the semitrailer.
- PARTS LIST** is a separate manual showing the various assemblies, subassemblies, and systems. Refer to that manual when ordering Landoll replacement parts. Order parts from your Landoll dealer.

**WARRANTY** The Warranty Registration form is located with the product documents. Fill it out and mail it within 15 days of purchase. The Warranty is printed inside the front cover.

**NOTE: IMPROPER ASSEMBLY, MODIFICATION, OR MAINTENANCE OF YOUR LANDOLL MACHINE CAN VOID YOUR WARRANTY.**

**COMMENTS** Address comments or questions regarding this publication to:

**LANDOLL CORPORATION  
1900 NORTH STREET  
MARYSVILLE, KANSAS 66508  
ATTENTION: PUBLISHING -DEPT. 55**





# STANDARD SPECIFICATIONS

2

## CAPACITY\*:

SINGLE AXLE..... 16,000 LB. DISTR. - 10,000 LB. in 10 FT.  
TANDEM AXLE..... 50,000 LB. DISTR. - 20,000 LB. in 10 FT.

KING PIN SETTING: ..... 30"

UNDERCARRIAGE TRAVEL: ..... 10'-6"

STANDARD LOAD ANGLE: ..... 12°

LOW LOAD ANGLE 48' (OPTION)..... 9 1/2°

## SPECIFIC BOLT TORQUES

### AIR RIDE SUSPENSION:

EQUALIZER BEAM PIVOT BOLT: ..... 600 FT.-LBS.  
SHOCK ABSORBER MOUNTING: ..... 150 FT.-LBS.  
AXLE CLAMP U-BOLTS\*\* ..... 680 FT.-LBS.  
AIR SPRING MOUNTING: 1/2" ..... 25 FT.-LBS.  
                                  3/4" ..... 50 FT.-LBS.

### FOUR SPRING SUSPENSION:

AXLE CLAMP U-BOLTS\*\* ..... 300 FT.-LBS.  
EQUALIZER BEAM PIVOT BOLT ..... 480-500 FT.-LBS.  
TORQUE ARM BOLT ..... 250 FT.-LBS.  
TORQUE ARM CLAMP NUTS ..... 60 FT.-LBS.

### WHEEL FASTENERS - ALL MODELS:

OUTER SPINDLE NUTS ..... 250-400 FT.-LBS.  
INNER WHEEL NUTS ..... 450-500 FT.-LBS.  
OUTER WHEEL NUTS ..... 450-500 FT.-LBS.

\* TIRE, BRAKE, AXLE, OR WHEEL SELECTION MAY LIMIT CAPACITY.

\*\* AXLE U-BOLTS MUST BE TIGHTENED EVENLY TO EQUAL TENSION IN INCREMENTS OF 50 FT.-LBS.

**LANDOLL CORPORATION  
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 IS 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	[16]	18	[22]	5/16-24	9	[11]	14	[17]	20	[25]
3/8-16	15	[19]	23	[29]	35	[43]	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]	110	[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	Standard Torque		Nominal Thread Diameter mm	Standard Torque					
	Newton-Meters	Foot-Pounds		Newton-Meters	Foot-Pounds				
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	[101]	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]					

Table 2-1 General Torque Specifications

**LANDOLL CORPORATION  
HYDRAULIC FITTING TORQUE SPECIFICATIONS  
37° JIC, ORS, & ORB (REV. 10/97)**

THIS CHART PROVIDES TIGHTENING TORQUES FOR HYDRAULIC FITTING APPLICATIONS WHEN SPECIAL TORQUES ARE NOT SPECIFIED ON PROCESS OR DRAWING.

ASSEMBLY TORQUES APPLY TO PLATED CARBON STEEL AND STAINLESS STEEL FITTINGS ASSEMBLED WITHOUT SUPPLEMENTAL LUBRICATION (AS RECEIVED CONDITION). THEY DO NOT APPLY IF SPECIAL GRAPHITE MOLY-DISULFIDE OR OTHER EXTREME PRESSURE LUBRICANTS ARE USED.

BRASS FITTINGS AND ADAPTERS - 65% OF THE TORQUE VALUE FOR STEEL. STAINLESS STEEL, ALUMINUM AND MONEL - THREADS ARE TO BE LUBRICATED.

**TORQUE IS SPECIFIED IN FOOT POUNDS**

**PARKER BRAND FITTINGS**

Dash Size	37 Degree JIC	O-Ring (ORS)	O-Ring Boss (ORB)
-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	57.5-62.5
-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

**LANDOLL CORPORATION  
HYDRAULIC FITTING TORQUE SPECIFICATIONS  
37° JIC, ORS & ORB (REV. 10/97)**

THIS CHART PROVIDES TIGHTENING TORQUES FOR HYDRAULIC FITTING APPLICATIONS WHEN SPECIAL TORQUES ARE NOT SPECIFIED ON PROCESS OR DRAWING.

ASSEMBLY TORQUES APPLY TO PLATED CARBON STEEL AND STAINLESS STEEL FITTINGS ASSEMBLED WITHOUT SUPPLEMENTAL LUBRICATION (AS RECEIVED CONDITION). THEY DO NOT APPLY IF SPECIAL GRAPHITE MOLY-DISULFIDE OR OTHER EXTREME PRESSURE LUBRICANTS ARE USED.

BRASS FITTINGS AND ADAPTERS - 65% OF THE TORQUE VALUE FOR STEEL.

**TORQUE IS SPECIFIED IN FOOT POUNDS.**

**AEROQUIP BRAND FITTINGS**

Dash Size	37 Degree JIC	O-Ring (ORS)	O-Ring Boss (ORB)
-4	11-12	10-12	14-16
-5	15-16	—	18-20
-6	18-20	18-20	24-26
-8	38-42	32-35	50-60
-10	57-62	46-50	72-80
-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
-32	245-258	—	—

Table 2-2 Hydraulic Fitting Torque Specifications



This section provides instructions for the proper operation of the semitrailer. A description of the location and use of each of the controls on this semitrailer is provided. Read all instructions, warnings, cautions and danger notes before attempting to operate the semitrailer.

A hydraulic pump must be coupled to the trailer hydraulic system, or the optional hydraulic engine package started, before using hydraulic controls.

The towing vehicle's air system must be coupled to the semitrailer and charged to 90 psi minimum before the brakes will function.



## WARNING

**DO NOT OPERATE THE SEMITRAILER WITH ANY KNOWN FAULT THAT MIGHT ENDANGER THE OCCUPANTS, NEARBY WORKERS, OTHER TRAFFIC, THE LOAD, OR THE EQUIPMENT.**

### 3-1 PRE-COUPLING OF SEMITRAILER AND TRACTOR

**3-1.1** Slowly back the tractor up to the front end of the semitrailer so the kingpin of the semitrailer is centered between the tractor fifth wheel jaws. Stop the tractor several inches ahead of the semitrailer. Set tractor parking brake.

**3-1.2** The king pin plate should be the same height as, or slightly lower than, the latch area of the fifth wheel plate of the tractor. If necessary, connect the tractor hydraulic lines or start the trailer hydraulic power engine. Use the **5th WHEEL** lever (see **Figure 3-2**) to raise or lower the kingpin plate sufficiently to allow proper coupling. Drain all air and moisture from the tractor air brake system in accordance with the tractor manufacturer's instructions.

**3-1.3** Connect the service and emergency air hoses of the tractor to their respective gladhand on the front of the semitrailer. The tractor's air hose couplings are then attached and locked to the appropriate gladhands; the **red emergency line** to the gladhand with the "**EMERGENCY**" tag, and the **blue service line** to the gladhand with the "**SERVICE**" tag (see **Figure 3-1**). Chock the semitrailer wheels before activating the semitrailer air supply valve in the tractor. Set the semitrailer brakes.

**3-1.4** Check the air brake operations of the semitrailer as follows:

a. Apply brakes and inspect brake action on all wheels for prompt application.

b. Release brakes. All brakes should release immediately. Air pressure should discharge quickly from the relay emergency valve.

c. Disconnect the emergency air line from the semitrailer gladhand. Semitrailer brakes should promptly set.

d. Re-connect the emergency air line to the semitrailer and activate the semitrailer air supply valve. The semitrailer brakes should set.

## 3-2 COUPLING OF THE TRACTOR TO THE SEMITRAILER

### DANGER

KEEP ALL PERSONNEL CLEAR OF FRONT, REAR, AND SIDES OF TRACTOR AND SEMITRAILER DURING COUPLING, COMPONENT OPERATIONS, AND UNCOUPLING. FAILURE TO STAY CLEAR CAN RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

3-2.1 Verify the semitrailer wheels are chocked and brakes function properly.

3-2.2 Make sure the tractor's fifth wheel coupler is open.

3-2.3 Slowly back the tractor so its fifth wheel contacts the front of the kingpin plate on the semitrailer and slips under it. Continue backing until the fifth wheel coupler locks onto the semitrailer kingpin.

3-2.4 Try to pull the tractor forward a few inches to verify the vehicle coupling is secure. If the tractor disconnects from the semitrailer: locate the source of the coupling failure; repair before continuing; and repeat Steps c and d.

### CAUTION

PUSHING SEMITRAILER BACKWARDS CAN DAMAGE LANDING GEAR.

3-2.5 Check that the tractor couples securely to the semitrailer before setting tractor and semitrailer parking brakes.

**NOTE: Keep brakes engaged for remainder of coupling, check-out, and parking.**

## 3-3 CONNECTING TRACTOR SERVICES TO THE SEMITRAILER

3-3.1 Connect the tractor 7-way electrical plug to the electrical receptacle on the front of the semitrailer (see Figure 3-1).

**NOTE:** The key on the plug and the keyway in the socket must be properly aligned before inserting the plug into the semitrailer socket.

3-3.2 If you have not already done so, connect the tractor hydraulic lines to the semitrailer, unless your semitrailer is equipped with the auxiliary hydraulic power engine package.

**NOTE:** Some oil may need to be removed from the tractor reservoir to allow room for 12 gallons of additional oil displaced from the semitrailer hydraulic system.

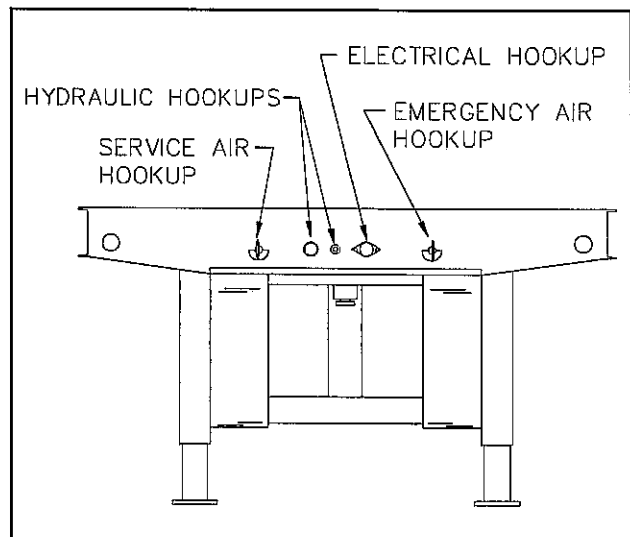


Figure 3-1 Service Hookups (Front View)

### 3-4 TRACTOR AND SEMITRAILER CHECK-OUT

3-4.1 While hydraulic power is operating, raise the front end of the semitrailer with the 5th WHEEL lever (see Figure 3-2) until weight is off the landing gear. Raise landing gear. Secure each leg with a park stand retaining pin in fully retracted position before transporting.

 <b>WARNING</b>
<b>LANDING GEAR LEGS MUST BE FULLY RETRACTED AND SECURED WITH PINS BEFORE OPERATING OR MOVING SEMITRAILER.</b>

3-4.2 Lower the front end with the 5th WHEEL lever until the semitrailer is fully lowered. Hold lever in the down position until hydraulic system works against the bottomed out hydraulic tilt cylinders.

3-4.3 Verify that the traveling undercarriage is completely slid back to transport position. Shut off hydraulic power.

3-4.4 Check the operation of all lights and signals on the semitrailer for proper response to switch positions (stop, right turn, left turn and clearance).

3-4.5 Check that tire inflation matches the pressure listed on the tire.

3-4.6 Check tractor/semitrailer rig for air leaks. If air leakage is found, repair the defect before transporting.

3-4.7 Check that the oil in each hub is at the proper level and free from contamination. If hubs contain water, dirt, or other foreign matter, clean them before transporting.

3-4.8 Check tractor air pressure. Pressure must not fall below 65 psi, even after activating brakes a couple of times. Set parking brake and carefully remove all wheel chocks. Set emergency brake and try pulling forward. The semitrailer wheels must not rotate. If semitrailer brakes do not apply, do not transport until defect, or defects, are repaired.

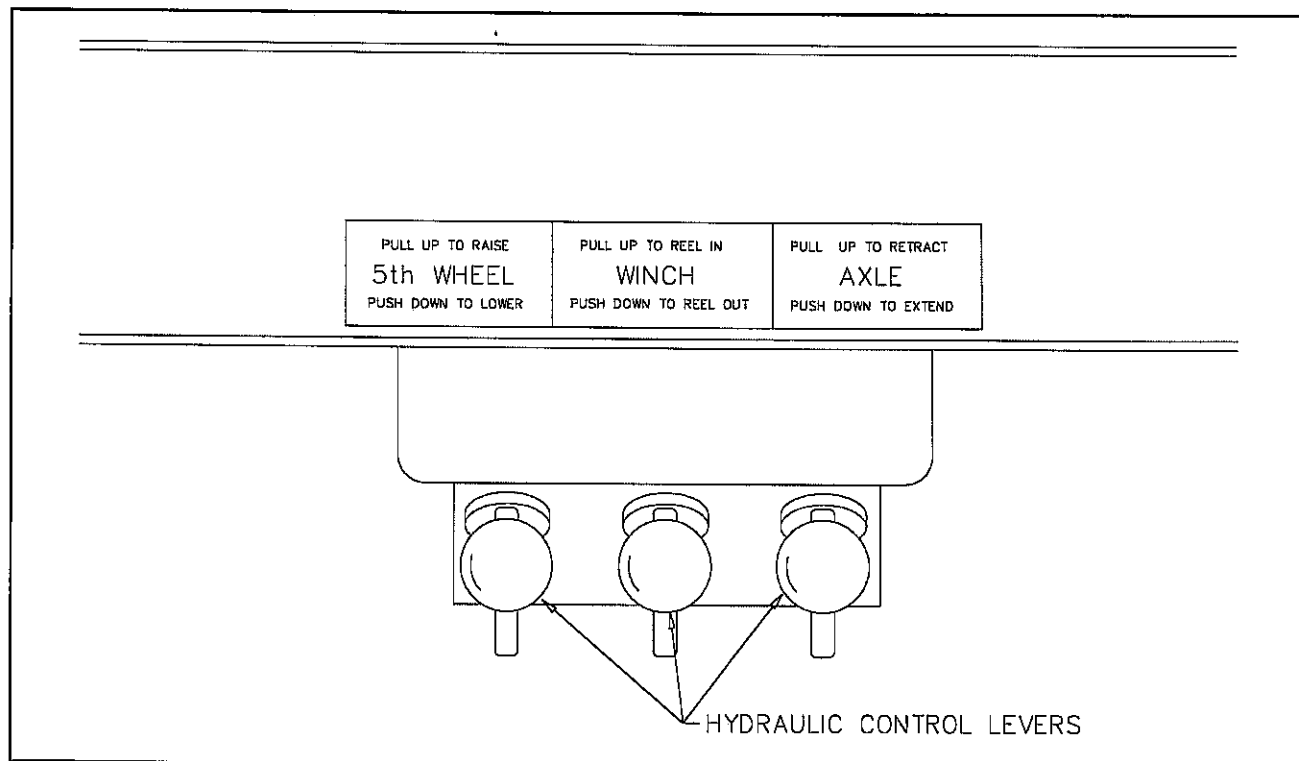


Figure 3-2 Hydraulic Control Levers

### 3-5 TOWING THE SEMITRAILER

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3-5.1 Driving the tractor with the semitrailer coupled behind requires constant attention to the overall length. Turning, passing, accelerating, braking, stopping, and back-up require special considerations. When executing steep grades or turning tight curves, the semitrailer must not be allowed to push the tractor, or jackknifing may result. Application of the semitrailer brakes to keep the semitrailer in tow will help prevent this situation. To assure control, brake before descending a hill or attempting a curve,

3-5.2 Make a moving test of the semitrailer brakes at low, and medium speeds before traveling at highway speed.

3-5.3 Monitor the air pressure gauge on the dash of the tractor. Pressure should not fall below 90 psi at any time.



**WHEN OPERATING TRAILER, DO NOT BACK OVER CURB. THIS WILL CAUSE SEVERE DAMAGE TO UNDERCARRIAGE AND UNDERCARRIAGE CYLINDER.**

3-5.4 The semitrailer wheels track to the inside of the tractor during turns. Thus, turning corners requires a wide swing to prevent "curb hopping", and to allow the semitrailer wheels to clear any obstacle on the inside of the corner.

3-5.5 To stop, use a gradual and smooth application of brakes. If grabbing occurs, apply less pressure. Grabbing brakes are not efficient.



**ALWAYS CHECK BEHIND AND UNDER THE TRACTOR AND SEMITRAILER FOR PERSONS OR OBJECTS BEFORE MOVING. FAILURE TO CHECK CAN LEAD TO SERIOUS PERSONAL INJURY, DEATH, OR DAMAGE TO PROPERTY.**

3-5.6 Backing should be done with care. Tail overhang, semitrailer length, and allowable space must be taken into consideration.

### 3-6 PARKING THE SEMITRAILER

---

3-6.1 Position tractor/trailer rig on a level, solid surface.

3-6.2 Set the **PARKING BRAKE**, not the semitrailer emergency hand brake, and check for proper brake holding.

3-6.3 Chock wheels.

3-6.4 Check for any air leaks in lines, relay valve, brake pods, or any other air system component.



**WHEN LEAVING THE SEMITRAILER UNATTENDED, POSITION ALL HYDRAULIC CONTROLS TO THE NEUTRAL OR "OFF" POSITION AND SHUT OFF THE HYDRAULIC ENGINE POWER SUPPLY, OR DISCONNECT THE TRACTOR HYDRAULIC HOOK-UP.**



### 3-7 UNCOUPLING TRACTOR FROM SEMITRAILER

---

3-7.1 Park the semitrailer according to instructions in Paragraph 3-6.

3-7.2 Remove retaining pin and lower landing gear to the ground. Hydraulically raise the front end of the semitrailer until the next hole in the landing gear is available. Insert pin through both inner and outer legs of the landing gear. Hydraulically lower semitrailer onto the legs.



**SECURE EACH LEG WITH PIN BEFORE LEAVING SEMITRAILER UNATTENDED.**

3-7.3 Pull the tractor fifth wheel plate latch release.

3-7.4 Disconnect emergency and service air lines and attach them to the tractor gladhand holders.

3-7.5 Disconnect the 7-way cable and hydraulic lines from the semitrailer and store with the tractor.

3-7.6 Attempt to pull the tractor forward. If the tractor uncouples, verify that all service lines are disconnected and semitrailer wheels are chocked. If tractor does not disconnect, repeat Steps 3-7.5 and 3-7.6.

3-7.7 Pull the tractor away from the semitrailer.

### 3-8 LOADING AND UNLOADING THE SEMITRAILER

---



**1. THE SEMITRAILER MUST BE COUPLED TO A TRACTOR AND THE LANDING GEAR RAISED OFF THE GROUND BEFORE OPERATING.**

**2. DO NOT EXCEED THE GROSS AXLE WEIGHT RATINGS FOR ANY AXLE ON YOUR VEHICLE. THE COMBINED WEIGHT OF THE TRACTOR, SEMITRAILER, AND CARGO MUST NOT EXCEED THE GROSS VEHICLE WEIGHT RATING (GVWR) OF THE TRACTOR.**

#### 3-8.1 5th WHEEL Lever

The 5th WHEEL Lever is located on the driver side of the semitrailer under the outer frame beam (see Figure 3-2). It has three positions:

**PULL** In this position, the front end of the semitrailer rises to the load position.

**CENTER** This is neutral. The semitrailer stays in its current position.

**PUSH** In this position, the front end of the semitrailer lowers to the transport position.

#### 3-8.2 AXLE Control Lever

The AXLE control lever (see Figure 3-2) is the control on the right with three positions:

**PULL** In this position, the undercarriage slides forward for loading.

**CENTER** This is the neutral position.

**PUSH** In this position, the undercarriage slides to the rear. The undercarriage must be in the rear-most position for transport.

### 3-8.3 Loading Procedure

a. Park the tractor/trailer in a straight line on a level even surface. Set the tractor brakes and release the semitrailer brakes.

b. Engage the tractor P.T.O. or start and warm up the auxiliary hydraulic power engine following engine operating instructions in paragraph 3-10.

c. Move axles forward out of pockets.

d. Using the 5th WHEEL lever and the AXLE lever, alternate between raising the semitrailer and pulling the axles forward, until the approach plate touches the ground.



**DO NOT ALLOW THE BACK SEMITRAILER AXLE TO LEAVE THE GROUND. THIS CAN RESULT IN DAMAGE TO THE SEMITRAILER.**

e. Winch or drive the load onto the semitrailer. Insure that the load is steering straight up onto the semitrailer and does not maneuver off the side of the semitrailer. Continue until load center of gravity is just ahead of the axles. The load should never place more weight on the kingpin than on the rear axles during loading or unloading.



**THE CENTER OF GRAVITY OF THE LOAD MUST BE IN FRONT OF THE CENTER OF THE UNDERCARRIAGE WHENEVER THE APPROACH PLATE IS NOT SUPPORTED BY THE GROUND. FAILURE TO DO THIS CAN CAUSE THE SEMITRAILER TO TILT BACK RESULTING IN INJURY OR DEATH.**

f. Securely tiedown the load and securely attach the winch cable to the front of the load, if it is not already attached. Reel in winch cable until it becomes tight. (Winch cable serves as a safety in case load tiedown fails but is not to replace tiedowns.)

g. Alternate between lowering the front of the semitrailer and moving the axles to the rear until the semitrailer is in transport position.



**MAXIMUM CONCENTRATED LOAD IN A 10 FT. AREA IS 10,000 LBS.**

h. Disengage the P.T.O. system of the tractor or shut down the auxiliary hydraulic power engine following operating instructions in paragraph 3-10.

### 3-8.4 Unloading Procedure (see Figure 3-3):

a. Park the tractor/trailer in a straight line on a level even surface. Set the tractor brakes and release the semitrailer brakes.

b. Engage tractor P.T.O. or start and warm up the auxiliary hydraulic power engine following engine operating instructions in paragraph 3-10.

c. Insure that the winch cable is firmly attached to the load and sufficient tension is on the cable so load securing devices can be safely removed.

d. Using the 5th WHEEL lever, raise the front of the semitrailer 1 to 2 feet.

e. Using the AXLE lever, pull the axles forward until they are just behind the center of gravity of the loaded semitrailer.

f. Alternate between raising the semitrailer and pulling the axles forward until the approach plate touches the ground.

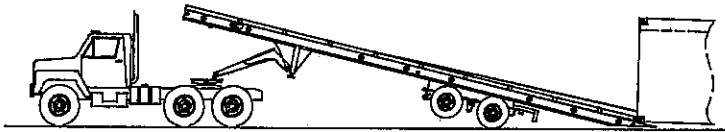
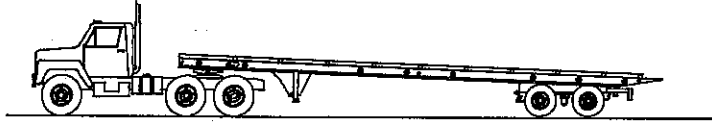
g. With load securing devices removed, reel out the winch so that the load moves back towards the rear of the semitrailer. Insure that the load is steering straight so it does not maneuver off the side of the semitrailer.

h. After load is completely off the rear of the semitrailer, secure it so it will not move, and disconnect winch cable.

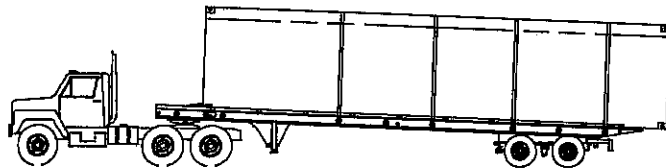
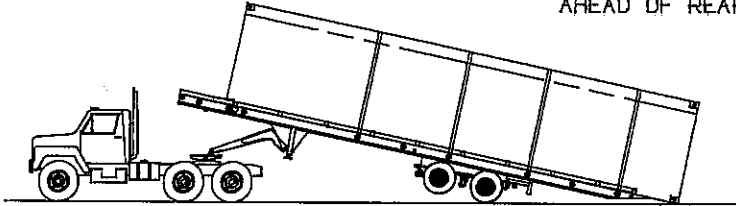
i. Lower the semitrailer and slide the undercarriage all the way back.

j. Disengage the P.T.O. system of the tractor or shut down the auxiliary hydraulic power engine following operating instructions in paragraph 3-10.

LOADING



CENTER OF GRAVITY  
OF LOAD IS JUST  
AHEAD OF REAR AXLE.



UNLOADING

3-410-011503

Figure 3-3 Steps for Loading and Unloading

## 3-9 WINCH CONTROLS



**1. THE WINCH IS NOT DESIGNED OR INTENDED TO BE USED FOR LIFTING OR MOVING PEOPLE. USING IT THIS WAY CAN CAUSE SERIOUS INJURY OR DEATH.**

**2. NEVER ATTEMPT TO DISENGAGE THE WINCH CABLE SPOOL WHEN THE CABLE IS UNDER TENSION. THE LOAD CAN ROLL AWAY. SERIOUS INJURY OR DEATH CAN RESULT IF PEOPLE ARE IN THE PATH OF THE ROLLING LOAD.**

**3. FAILURE TO LEAVE AT LEAST FIVE WINCH CABLE WRAPS ON THE WINCH CABLE SPOOL COULD ALLOW THE CABLE TO COME OFF THE SPOOL, RESULTING IN SERIOUS PERSONAL INJURY OR DEATH.**

**3-9.1** The Winch Clutch (see Figure 3-5) is on the curbside of the winch assembly. It engages or disengages the winch.

**a. 12,000# Winch Clutch.**

The winch clutch handle must be pulled out to change positions and pushed in to lock into one of two positions:

**DOWN** In this position, the winch is disengaged and The cable can "free-wheel".

**UP** In this position, the winch is engaged and the cable can be "power" spooled in or out. The winch is now controlled by the WINCH hydraulic lever.

**b. 20,000# Winch Clutch.**

The winch clutch handle has two positions:

**RIGHT** In this position, the winch is disengaged and The cable can "free-wheel".

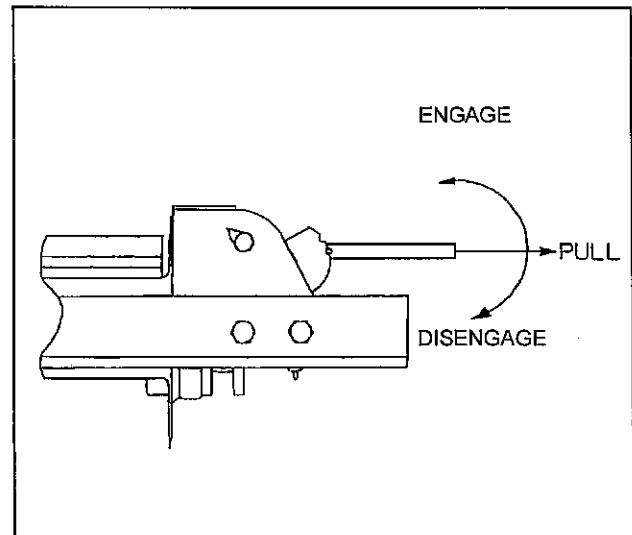
**LEFT** In this position, the winch is engaged and the cable can be "power" spooled in or out. The winch is now controlled by the WINCH hydraulic lever.

**3-9.2** The WINCH hydraulic lever (see Figure 3-2) is the center lever. It is a three position control:

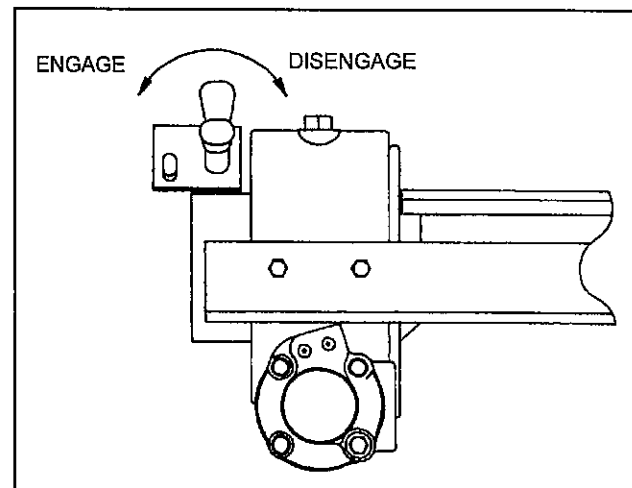
**PULL** In this position, cable is "power" spooled onto the spool.

**CENTER** This is neutral position.

**PUSH** In this position, cable is "power" spooled off the spool.



**Figure 3-4 12,000# Winch Clutch**



**Figure 3-5 20,000# Winch Clutch**

### 3-10 AUXILIARY HYDRAULIC POWER ENGINE OPERATION

**3-10.1** The Hydraulic Power Supply Engine is used to power the hydraulic functions, should the tractor not be equipped with hydraulic hookups.

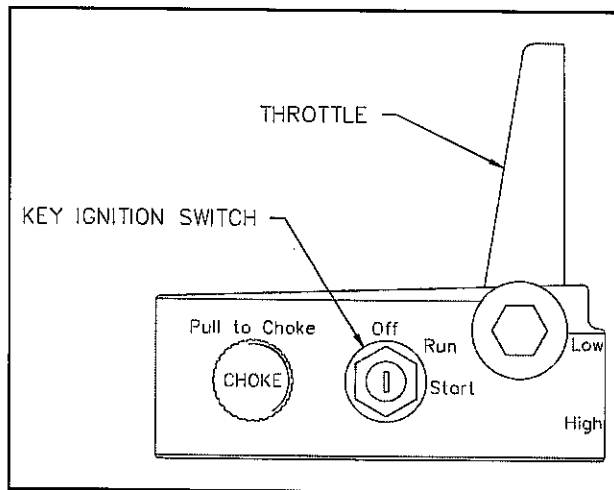
**NOTE:** 1. Check the following fluid levels before starting the engine package: engine oil, fuel supply, hydraulic oil. (Check oil level while semitrailer is not tilted as tilting will change the oil level in the tank.)

2. If the engine does not crank, check the following on the battery: charge, fluid, terminals, and cables. Take corrective actions as needed.



**IF THE HYDRAULIC FLUID LEVEL IS LOW DURING OPERATION, THE SEMITRAILER MAY NOT OPERATE CORRECTLY, RESULTING IN DAMAGE TO THE SEMITRAILER.**

**3-10.2** The Engine Ignition Switch, Choke and Throttle are on the Engine Control Panel mounted on the drivers side of the engine package. (see Figure 3-6).



**Figure 3-6 Engine Control Panel**

**3-10.3** The Hydraulic Power Supply Engine Throttle controls the speed at which the engine operates (see Figure 3-6). It is a variable position control:

**HIGH** In this position, the engine throttle is fully open, letting it run at full speed.

**LOW** In this position, the engine throttle is closed, letting the engine run at a slow idle.

**3-10.4** To start pull the choke completely out and set the throttle to the LOW position.

**3-10.5** Turn the ignition key to the START position. The engine should crank and then start.



**DO NOT CRANK ENGINE FOR MORE THAN 30 SECONDS. IF ENGINE DOES NOT START CONSULT THE OWNER'S MANUAL SUPPLIED WITH THE ENGINE.**

**3-10.6** When the engine starts, release the key. Gradually push the choke lever in until the engine runs smoothly.

**3-10.7** Black smoke from the exhaust and a rough running engine usually indicate over-choking.

**3-10.8** To adjust the speed, turn the throttle control in or out, as needed, until the engine runs smoothly at a speed capable of withstanding use of the hydraulic controls. The hydraulic controls should now be functional.

**3-10.9** Before shutting it off, allow the engine to cool down by running at a slow idle for one to two minutes. Then turn the ignition switch to the off position.

**3-10.10** Once the engine is cool, turn or push the throttle and choke control completely in and turn the key to the OFF position.

## 3-11 BULKHEADS

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**DANGER**

**TO AVOID SERIOUS INJURY ALL REMOVABLE ATTACHMENTS MUST BE FIRMLY ATTACHED WITH FASTENERS PROVIDED AT ALL TIMES.**

To remove a bulkhead, take out the pins holding the bulkhead into the pockets on the semitrailer front and lift the bulkhead off.

## 3-12 OPERATION UNDER UNUSUAL CONDITIONS

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### 3-12.1 Cold Weather Operation

a. Cold weather causes lubricants to congeal, and insulation and rubber parts to become hard, which may lead to problems in bearings, electrical systems, and air systems. Moisture attracted by warm parts can condense, collect and freeze to immobilize equipment. The tractor/trailer operator must always be alert for indicators of cold weather malfunctions.

b. During any extended stop period, neither the service nor parking brake should be used as they can freeze up. Use wheel chocks to secure the vehicle from moving.

c. Check all structural fasteners, air system fittings, gaskets, seals and bearings for looseness that can develop due to contraction with cold. Do not over-tighten.

d. Check tire inflation. Tire inflation decreases when the temperature decreases.

e. Periodically check drain holes in the bottom of the relay valve and storage compartments. They must be open at all times to avoid moisture entrapment.

### 3-12.2 Hot Weather Operation

a. Hot weather operation can cause expansion of parts resulting in tightening of bearings, fasteners, and moving parts. Failure of gaskets or seals can occur.

b. The semitrailer should be parked in the shade if possible. Long exposure to the sun will shorten service life of rubber components (i.e., tires, light and hose grommets, hoses, etc.) and paint life.

c. Check tire pressure early in the day before beginning operations while the tire is cool. Put all valve stem caps back on after checking.

d. If the area is extremely humid, protect electrical terminals with ignition insulation spray. Coat paint and bare metal surfaces with an appropriate protective sealer.

e. The use of a filter-lubricator in the tractor's air delivery system is recommended.

This section contains instructions necessary for proper maintenance of the semitrailer. The 330 semitrailer is designed for years of service with minimal maintenance. However, proper maintenance is important for durability and safe operation and is an owner/user responsibility.



**OPERATING THE TRACTOR OR SEMITRAILER WITH DEFECTIVE, BROKEN OR MISSING PARTS MAY RESULT IN SERIOUS INJURY OR DEATH; DAMAGE TO THE TRACTOR/TRAILER, ITS CARGO, OR PROPERTY IN ITS PATH.**

## 4-1 MAINTENANCE SCHEDULE.

Semitrailer maintenance includes periodic inspection and lubrication. **Table 4-2, Maintenance Schedule**, lists the recommended maintenance and lubrication tasks by time interval and by accumulated mileage (use whichever occurs first). **Table 4-3, Hydraulic Engine Maintenance Schedule**, lists the recommended maintenance tasks for the hydraulic engine package.

### 4-1.1 Inspection

a. Inspect the tractor, the semitrailer, and semitrailer parts periodically for damage or signs of pending failure. Damaged or broken parts must be repaired or replaced at once. Determine the cause of any binding or hydraulic leakage at once. Correct the problem before using the tractor or semitrailer.

b. Use the Troubleshooting Guide to check for "SYMPTOMS" and "PROBLEMS" of any semitrailer system not functioning correctly, or where wear, distortion, or breakage are found. Administer "REMEDY" according to the right-hand column of the Troubleshooting Guide.

### 4-1.2 Lubrication.

**Table 4-1** details lubrication points and intervals, method of application, and lubricant required, and illustrates the location of each part to be lubricated. During inspections of the semitrailer, if lubricants are found to be fouled with dirt or sand, those parts should be cleaned with paint thinner, dried, and relubricated immediately. Dirt in a lubricant forms an abrasive compound that will wear parts rapidly.



**PAINT THINNER AND OTHER SOLVENTS ARE FLAMMABLE AND TOXIC TO EYES, SKIN, AND RESPIRATORY TRACT. AVOID SKIN AND EYE CONTACT. GOOD GENERAL VENTILATION IS NORMALLY ADEQUATE. KEEP AWAY FROM OPEN FLAMES OR OTHER COMBUSTIBLE ITEMS.**

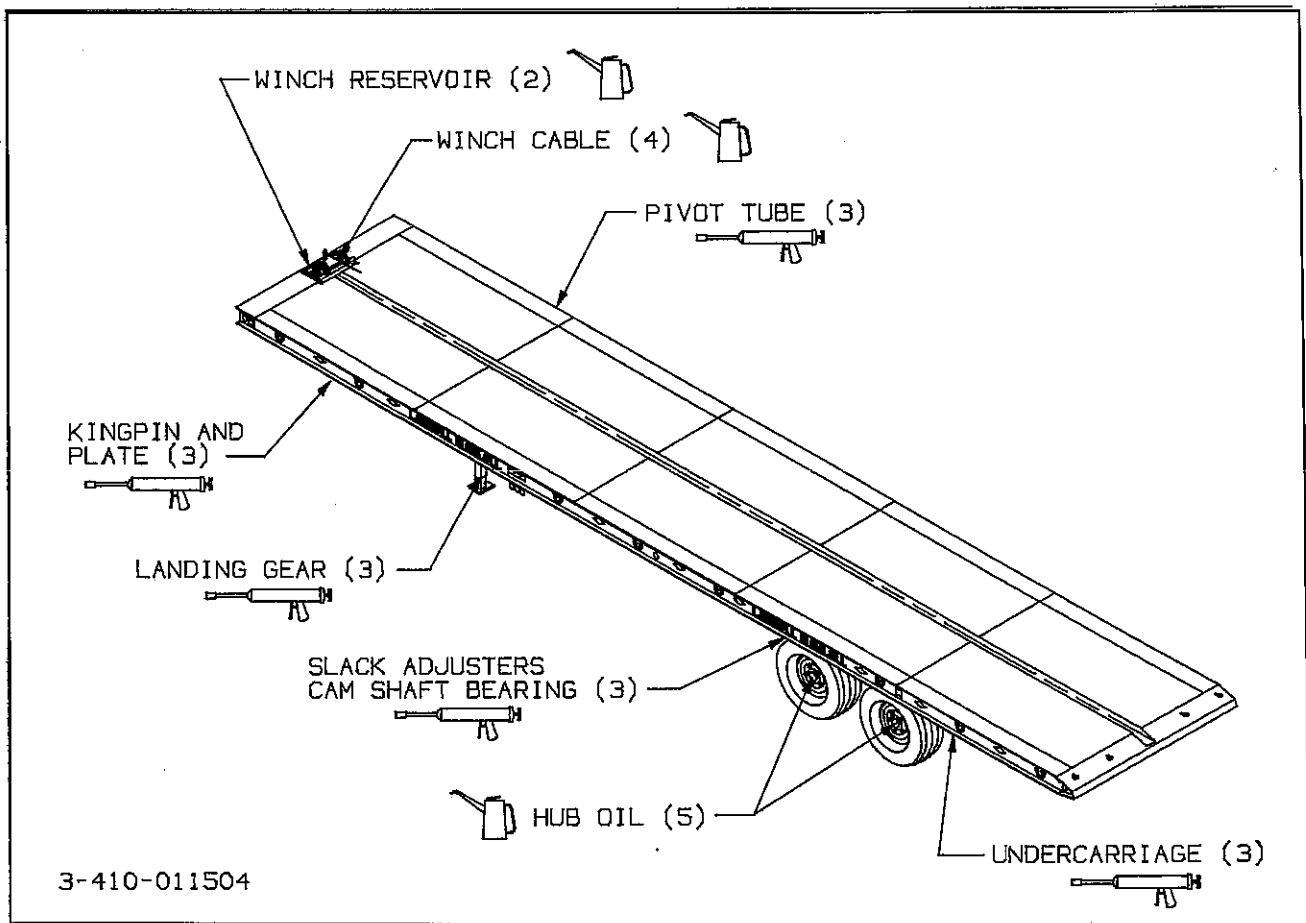


Figure 4-1 Lubrication Points

LUBE	SEASON	BRAND AND PRODUCT (WEIGHT AND/OR TYPE)			
		AMOCO	EXXON	PHILLIPS	TEXACO
1	ALL YEAR	Rycon MV	HDX Plus 10W	Mangus Oil 150	Rando HD-AZ
2	SUMMER	Multi-purpose 140	Gear Oil GX 85W-140	Worm Gear Oil SAE 90 #9332D1	Maropa SAE 90 #3
	WINTER	Multi-purpose 90	Gear Oil GX 85W-140	Worm Gear Oil SAE 90 #9332D1	Maropa SAE 90 #3
3	ALL YEAR	Lit-Multi-purpose Grease	Rondex Multi-purpose Grease	Phil Lube M.W. Grease	MarFax All Purpose
4	ALL YEAR	Industrial Oil 32	Estic 32	Condor 150 or Magnus 150	Regal Oil R&O 32
5	ALL YEAR	Multi-purpose 90	Gear Oil GX 85W-140	Phil Lube All-purpose Gear SAE 90 #90501	Multi-gear EP 80W90

Table 4-1 Lubrication Specifications



NORMAL OPERATING SERVICE INTERVALS <sup>a</sup>								
SERVICE INTERVAL :	TIMES	1st 5 Hrs	Weekly	Monthly	6 Months	Yearly	LUBE #	NOTES
ITEM	MILES	50	500	2,000	12,000	25,000		
LIGHTS		I	I					
WIRING & CONNECTIONS		I		I				
FASTENERS		I, T		I				b
KING PIN & PLATE		I		C, I, L			3	c
BRAKE AIR SYSTEM		I	I	I				
RELAY VALVES						I, C		
BRAKE ADJ & WEAR		I		I, T				d
SLACK ADJUSTERS		I	I			L	3	c
CAMSHAFT ASSYS		I	I			L	3	c
HUB OIL		I	I, L			R	5	c
WHEEL BEARINGS		I			I, T		5	c
TIRE INFLATION & WEAR		I	I					e
WHEEL LUG NUTS		I, T	I	I, T				f
SUSPENSION ALIGNMENT		I		I				
UNDERCARRIAGE ROLLERS				L			3	c
HYDRAULIC OIL		I	I			R	1	c
HYDRAULIC FILTER		R			R			
HOSES (Inspect & Replace as needed)		I		I		I, R		
WINCH GEAR CASE		I		I			2	c

**I – Inspect, R – Replace, T– Tighten/ Adjust Torque, L – Lubricate, C – Clean**

**NOTES:**

a. Perform at the time shown. Shorten service intervals when operating in severe or dirty conditions.  
b. See Table 2-1 (Bolt Torque Chart) for correct torque.  
c. See Table 4-1 (Lube Specification Chart) for recommended lubricant.  
d. Call Landoll Customer Services for procedures to replace.  
e. See Serial Number Plate on the front of the semitrailer for proper inflation requirements.  
f. See Figure 4-17 , Stud Tightening Sequence.

Table 4-2 Maintenance Schedule

ENGINE MAINTENANCE SCHEDULE							
OPERATION	AFTER EACH CYCLE OF INDICATED HOURS						
	8	25	50	100	200	500	1000
Inspect Engine Generally	X <sup>1</sup>						
Check Oil Level	X						
Service Air Cleaner Element And Element Wrapper		X <sup>2</sup>					
Change Crankcase Oil (20 hp engine)		X <sup>3</sup>	X <sup>2</sup>				
Change Crankcase Oil (24 hp engine)		X <sup>3</sup>		X <sup>2</sup>			
Replace Oil Filter		X <sup>3</sup>		X <sup>2</sup>			
Check Battery Electrolyte Level			X				
Clean Cooling Fins			X <sup>2</sup>				
Replace Air Cleaner Element					X <sup>2</sup>		
Replace Fuel Filter					X		
Check or Replace Spark Plugs						X	
Check Valve Clearance							X <sup>4</sup>
Clean Carbon and Lead Deposits (cylinder head)							X <sup>5</sup>
<b>NOTES:</b>							
<p>X<sup>1</sup>. Check for fuel leaks. With engine running, visually and audibly check exhaust system for leaks.  X<sup>2</sup>. Perform more often when running under severe operating conditions.  X<sup>3</sup>. Required for initial break-in only.  X<sup>4</sup>. For detailed maintenance, contact an Onan Service Center or refer to the Service Manual.  X<sup>5</sup>. Clean carbon more frequently when running under continuous light load and/or on leaded fuel. Use of Onan 4C carburetor and combustion cleaner is recommended every 200 hours to help reduce carbon buildup.</p>							

 **WARNING**

**BREATHING EXHAUST GASES CAN RESULT IN SEVERE PERSONAL INJURY OR DEATH. DO NOT USE AIR CLEANER, EXHAUST ELBOW, OR CONNECTING PARTS AS A SUPPORTING STEP. DAMAGE TO THESE AND CONNECTING PARTS CAN CAUSE AN EXHAUST LEAK.**

Table 4-3 Hydraulic Engine Maintenance Schedule

## 4-2 MAINTENANCE PROCEDURES.

**4-2.1 Tools and Equipment.** Tools, equipment, and personnel normally found in a facility capable of making truck repairs will be adequate for maintenance of the semitrailer. No other special tools or equipment should be necessary.

**4-2.2 Standard Torque Values.** Table 2-1 lists torque values for standard hardware and is intended as a guide for average applications involving typical stresses and mechanical surfaces. Values are based on the physical limitations of clean, plated, and lubricated hardware. In all cases, when an individual torque value is specified, it takes priority over values given in this table. Replace original fasteners with hardware of equal grade. Table 3-2 illustrates the markings on the heads of steel bolts and screws that indicate their ASTM and SAE grades.

### 4-2.3 Cleaning



**PAINT THINNER AND OTHER SOLVENTS ARE FLAMMABLE AND TOXIC TO EYES, SKIN, AND RESPIRATORY TRACT. AVOID SKIN AND EYE CONTACT. GOOD GENERAL VENTILATION IS NORMALLY ADEQUATE. KEEP AWAY FROM OPEN FLAMES OR OTHER COMBUSTIBLE ITEMS.**

a. Wash semitrailer to remove all accumulated dirt and grime.

b. Use any mineral spirits paint thinner (or its equivalent) to remove grease and oil from all parts of the semitrailer. Rinse degreasing solution off with cold water.

c. Inspect semitrailer for cause of any reported troubles.

d. Scrape, sand, prime, and repaint areas where finish is missing or where there is evidence of corrosion.

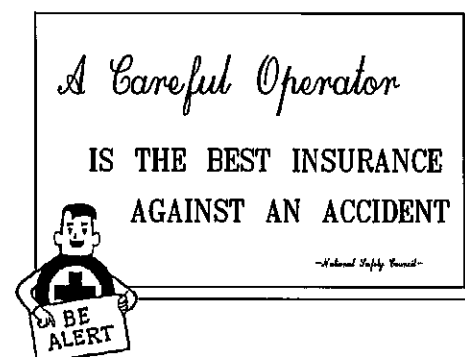
e. After disassembling any components, thoroughly clean dirt and old lubricant from all parts. Do not use a wire brush on any bearing parts or surfaces — use a stiff bristle brush. Do not use compressed air, or spin bearing parts when cleaning. These practices can throw solvents, dirt, or metal particles into your eyes. Dry clean parts with lint free, clean, soft, absorbent, cloth or paper. Wash and dry hands.

f. Inspect seals, seal wiping surfaces, bearing caps, and bearing cones for wear, pitting, chipping, or other damage.

## 4-3 FRAME, AND DECK

### 4-3.1 Repairing Structural Defects

If any structural defect is found, the fault must be corrected before further use of the vehicle. To continue usage could endanger the semitrailer, its load, personnel, traffic, and properties. If any cracks or breaks are found, return the semitrailer to Landoll factory for repairs. Inspect the deck daily for broken or missing planks or missing attachments. Replace any defective parts promptly.



## 4-4 HYDRAULIC SYSTEM.

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### 4-4.1 General

a. Check the oil level of the tractor wet kit hydraulic tank weekly, or after any leakage. See **Table 4-1** for proper hydraulic oil. Check the hydraulic oil level with hydraulic cylinders in the retracted position. Disengage the hydraulic pump.

b. Overfilling can cause hydraulic fluid overflow during operation.

c. Hydraulic system pressure relief valves should be set at 2500 PSI.

### 4-4.2 Hydraulic Engine Package

a. Check the hydraulic oil level weekly, or after any leakage. See **Table 4-1** for proper hydraulic oil.

Check oil level with hydraulic cylinders in the retracted position and with the engine stopped.

b. Check hoses weekly for cracks or leaks. If a valve or line leaks, it should be replaced immediately.

c. Check the engine oil each time before using. Oil level should be maintained between the "ADD" and "FULL" marks on the oil dip stick.

d. Replace hydraulic filter with new filter at least *every 6 months* or more often under adverse conditions.

e. Use the fuel recommended for the engine package installed on your semitrailer.

f. For further maintenance procedures and proper lubrication specifications, please refer to the engine owners manual that was supplied with the hydraulic engine package.

## 4-5 ELECTRICAL SYSTEM

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4-5.1 Maintenance of the electrical system consists of inspection and minor servicing. Any wire, connection or electrical component showing signs of corrosion, wear, breakage or unraveling must be repaired or replaced.

4-5.2 Frayed or unraveling wire must have the defective section removed and replaced with wire of the same color and gauge. Seal all connections and insulate.

4-5.3 Corroded terminals must have the corrosion removed, source of corrosion neutralized and the terminals resealed, protected, and insulated.

4-5.4 Fuse or circuit breaker burn-out or blow-out

usually indicates an electrical short-circuit, although a fuse can occasionally fail from vibration. Insert a second fuse or reset the breaker. If this fuse immediately burns out or the breaker trips, locate the cause of the electrical short and repair.

4-5.5 A light that repeatedly burns-out usually indicates a loose connection, poor system ground, or a malfunctioning voltage regulator. Locate the source of the problem and repair. System grounds must be grounded to bare metal surfaces. Paint, grease, wax, and other coatings act as insulators. Replacement lamps must be equivalent to the factory installed lamp.

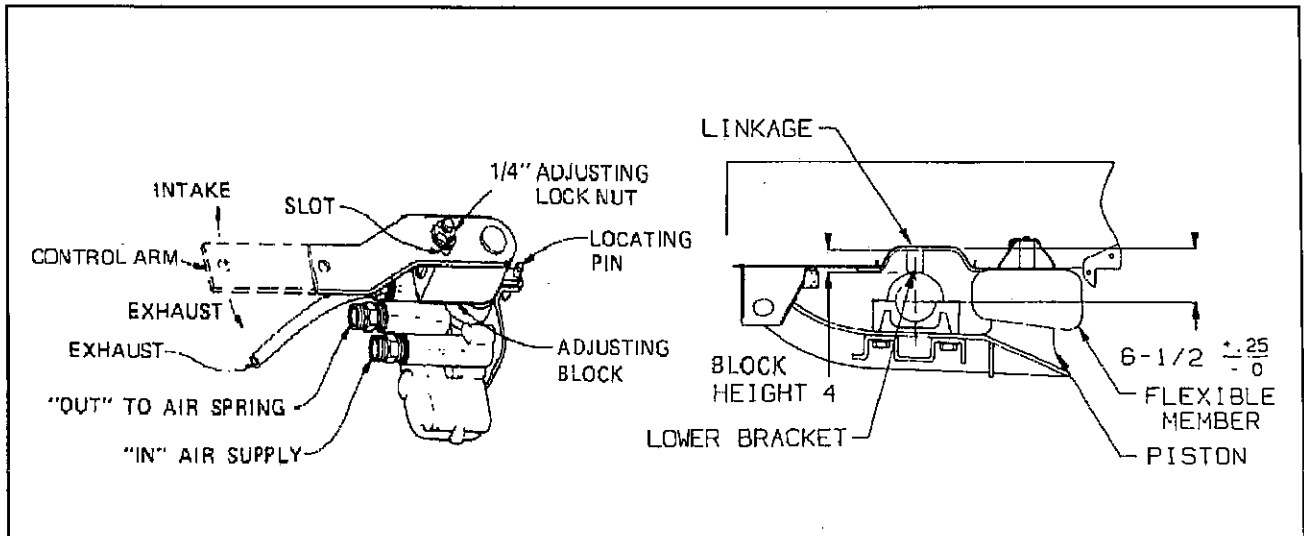


Figure 4-2 Air Ride Height Adjustment

## 4-6 SUSPENSION MAINTENANCE

### 4-6.1 Spring Suspension

a. Make certain that all springs are properly located on the wear pads. Twisted springs or cocked hangers will cause uneven spring contact with wear pad and will result in excessive wear on the spring suspension. Check the shocks for excessive wear.

b. Replacing the equalizer bushings and the torque arm bushings on the spring suspension is a complex operation and should be left to trained service personnel. If the bushings need to be replaced contact a Landoll authorized service center or the Landoll factory for servicing.

### 4-6.2 Air Ride Height Adjustment. (See Figure 4-2 for parts identification).

a. Before adjusting, the vehicle must be empty with the kingpin at operating height and have air supplied to the semitrailer.

b. Disconnect linkage at the control arms and raise the semitrailer to the "up" position, raising the semitrailer the full extent of suspension travel.

c. Position a 4" wood block between the axle caps and frame.

d. Lower the semitrailer by exhausting all air from the system. Recheck the ride height.

e. Move the control arms to the "down" position (about 45°) for 10-15 seconds. Slowly return the control arms to the center position and insert locating pins into the adjusting block and bracket on the automatic height control valves (see Figure 4-2).

f. Loosen the 1/4" adjusting lock nut located on the adjusting blocks, allowing the control arm to move approximately 1 inch.

g. Reconnect the linkage to the control arm lower brackets and re-tighten the 1/4" adjusting lock nut to 2-4 ft.lbs.

h. Repeat this procedure for the other valve.

i. Remove the locator pins, pressurize the semitrailer air system, and raise the semitrailer. The height control valves may be used as an improvised jack by disconnecting the control arms at the lower bracket and pushing the control arms to an "up" position.

j. Remove the spacers, exhaust the system and reconnect the linkage. This allows the Automatic Height Control Valves to resume normal operation.

k. Check the air ride height. If necessary, go through the adjustment procedure again until the proper air ride height is achieved.

Check the air ride height periodically and adjust as needed.

## 4-7 ALIGNMENT

### 4-7.1 Wheel Alignment



**TO PREVENT A POTENTIALLY LIFE THREATENING ACCIDENT:**

**1. SUPPORT SEMITRAILER AND UNDERCARRIAGE SO TIRES ARE OFF THE GROUND.**

**2. SUPPORT THE SEMITRAILER AND UNDERCARRIAGE ON JACK STANDS WITH SUFFICIENT CAPACITY TO SUPPORT THE TOTAL WEIGHT OF THE SEMITRAILER AND ANY LOAD WHICH IT MAY BE CARRYING.**

When semitrailer tires show signs of scuffing, feather-edging or uneven wear, examine the semitrailer for damaged suspension (frame, shocks, linkage, etc.), axle, wheel bearings and wheels. Proper wheel alignment and wheel bearing adjustment is essential for proper tire wear. The simplest form of checking wheel alignment "toe" is by running the semitrailer over a

"SCUFF GAUGE". A scuff gauge reading of 16 feet or less per mile is considered satisfactory. If a scuff gauge is not readily available, or edge wear on one side of a tire is occurring signifying positive or negative camber, alignment can be checked as follows:

- a. Remove wheel, hub and bearing assemblies.
- b. Place a 3-point axle gauge against the front side of the axle, and adjust each axle gauge point to the axle. (Double point end against the inner and outer wheel bearing surfaces of the spindle being checked and the other point on the inner bearing surface on the other spindle)(see Figure 4-3).
- c. Move the axle gauge and place against the back side of the axle. If either of the points of double point end fails to touch the axle surface, a bent spindle is evident. A point gap of .015" or more is considered excessive tire "toe" and the axle must be replaced (see Figure 4-3).
- d. Follow the same procedures as in Paragraph 4-7.1 b and c, except place the axle gauge above and below the axle. If gauge point gap is found, the axle has positive or negative camber. The semitrailer axle has no camber from the factory. If it is found to have positive or negative camber, axle replacement is necessary (see Figure 4-4 for examples of camber).

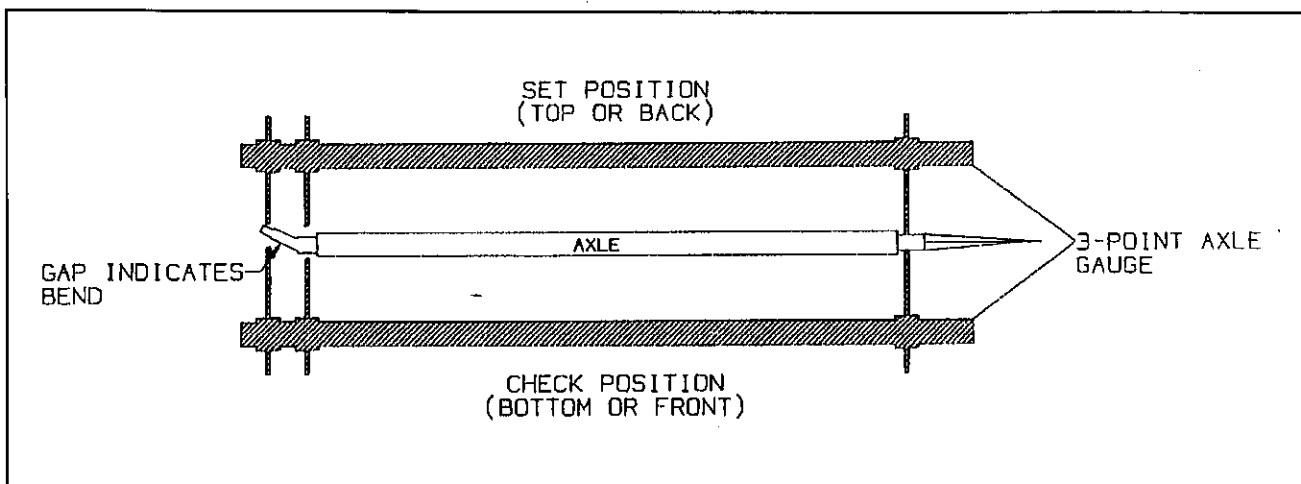


Figure 4-3 Checking Axle for Bend

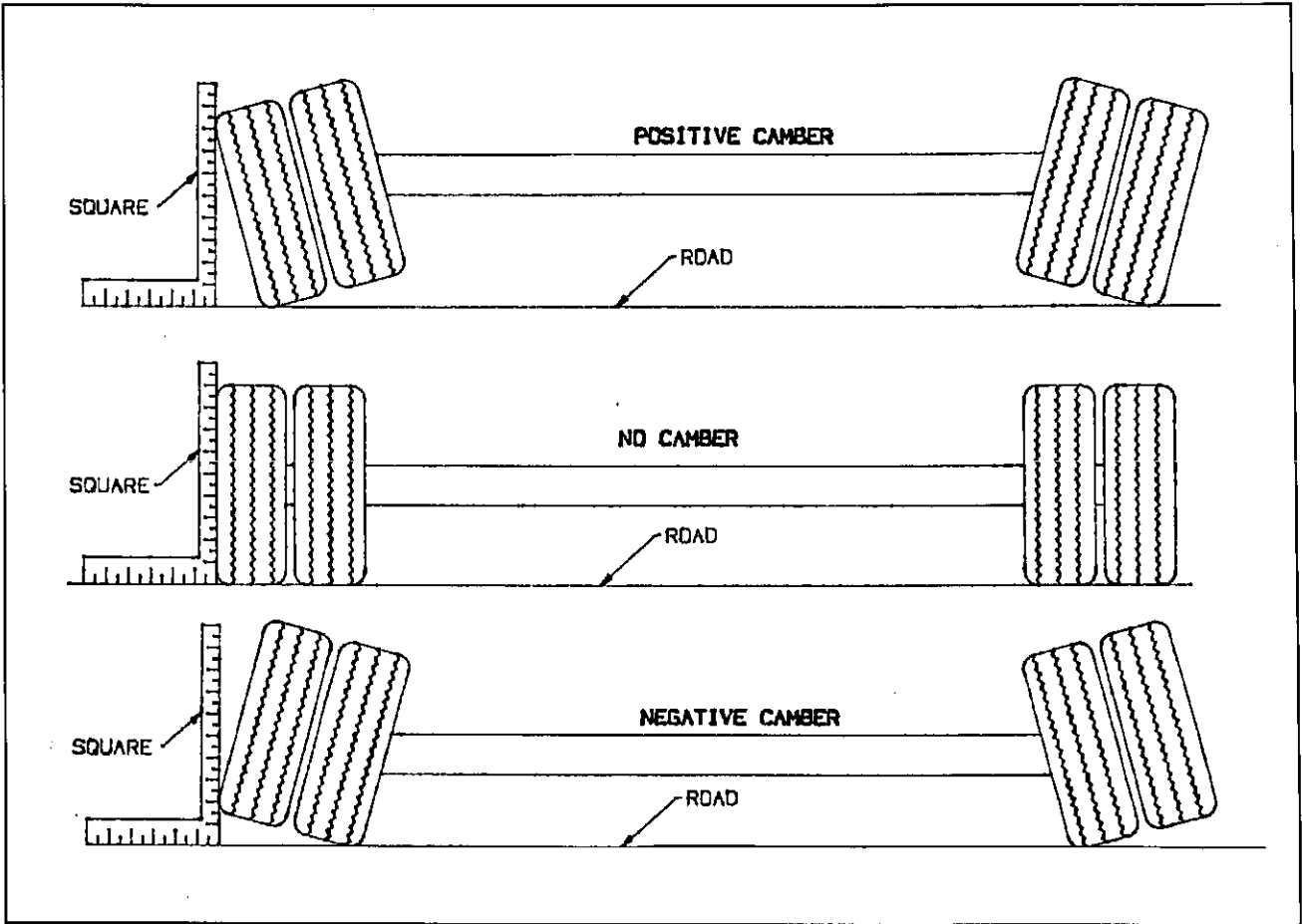


Figure 4-4 Examples of Camber

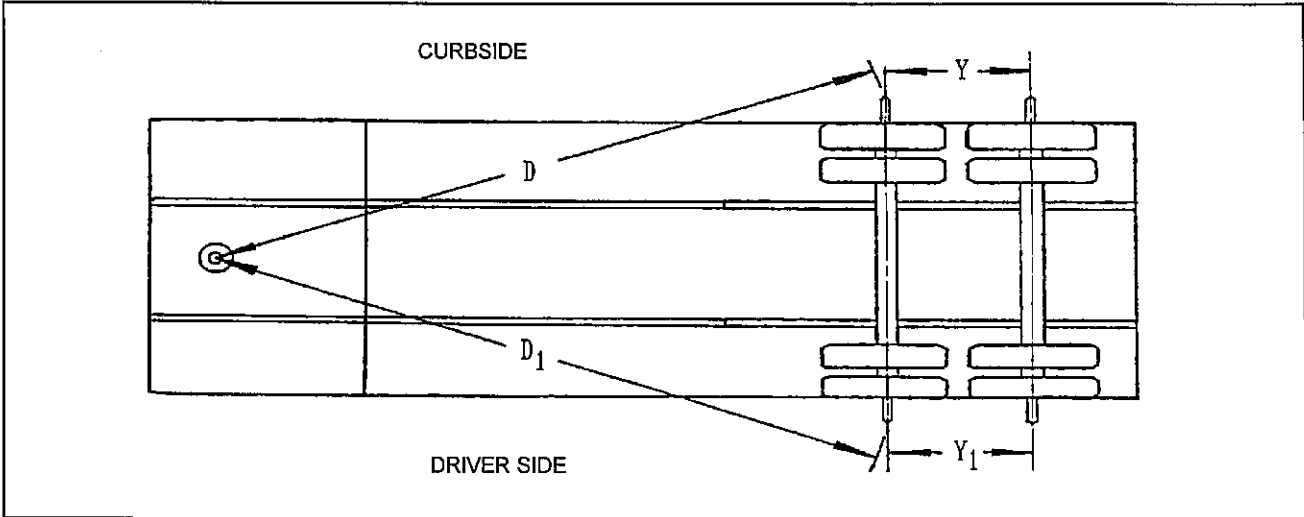


Figure 4-5 Checking Axle Alignment

#### 4-7.2 Axle Alignment

Proper axle to king pin alignment is necessary to obtain straight tracking. If axle alignment is off, "dog-tracking" occurs. Check alignment manually or by using a semitrailer alignment machine. In either case, a thorough inspection of the complete suspension must be performed and all defects corrected before aligning.

##### a. Manual Alignment Procedure

1. Position semitrailer on a firm and level surface. Insure that the undercarriage is in the rear most position. Eliminate any suspension binding due to sharp turns or unusual maneuvers.
2. Detach tractor from the semitrailer and jack the semitrailer up sufficiently to permit measuring from the underside of the semitrailer.
3. Suspend a plumb bob at axle height from the center of the king pin.
4. Measure (D) from the plumb bob to the center point on one end of the axle. Record this measurement (See Figure 4-5).
5. Measure (D1) to the other end of the axle in the same manner as in Step 4. Record this measurement (See Figure 4-5).
6. Set D about 1/8" shorter than D1 to insure proper semitrailer tracking on slope of road.
7. The suspensions must be in good repair with no binding or other restrictions before aligning. All defective parts of the suspension or axles must be replaced immediately.

##### b. Air Ride Suspension Axles

The air ride suspension is aligned and welded at the factory and it should not be necessary to align the axles. If, however it does become necessary to align the axles, the procedure is as follows:

1. To align air ride suspension axles, locate the welded washer for the front axle in front of the

drivers side equalizer beam. Cut this washer loose and loosen the suspension pivot bolt.

2. Align the front axle using the method outlined in paragraph 4-7.2 a.
3. After proper alignment has been obtained, tighten the suspension pivot bolt nut to the torque listed in Table 2-1, and reweld the washer.
4. Align the rear axle to the front axle. The rear axle should be parallel with the front axle, with the dimensions Y and Y1 being the same.
5. Tighten the suspension pivot bolt nut to the torque listed in Table 2-1 and reweld the washer.

##### c. Spring Suspension Axles

1. Loosen the torque arm clamp bolts on the adjustable torque arms and loosen the axle U-bolts.
2. Turn the adjustable torque arm on the front axle until the proper alignment has been achieved using the procedure outlined in paragraph 4-7.2 a.
3. Tighten the axle U-bolts to the torques listed in Table 2-1.
4. Tighten the front axle torque arm clamp bolts to the torque listed in Table 2-1.
5. Align the rear axle to the front axle in the same manner using the torque arm for adjusting. The rear axle should be parallel with the front axle, with the dimensions Y and Y1 being the same.
6. Tighten the rear axle U-bolts to the torque values listed in Table 2-1.
7. Tighten the rear axle torque arm clamp bolts to the torque listed in Table 2-1.



## 4-8 BRAKE SYSTEM MAINTENANCE



**USE GREAT CARE IF WHEELS OR BRAKE DRUMS MUST BE HANDLED. THEY MAY BE VERY HOT AND CAN CAUSE SERIOUS INJURY.**

### 4-8.1 General.

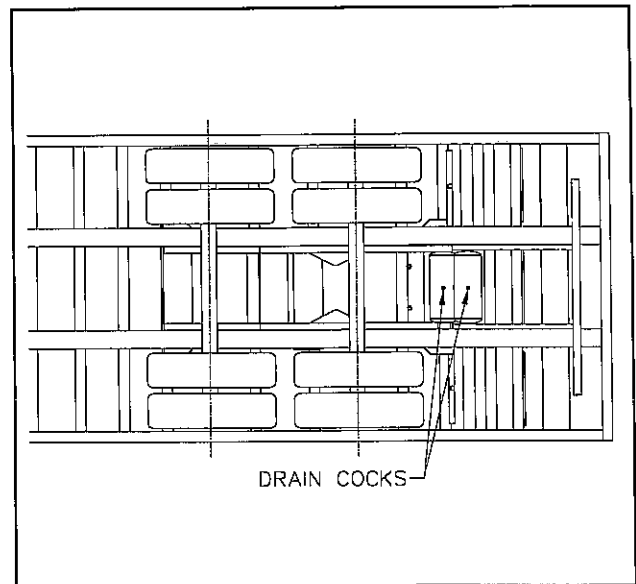
- a. Check air hoses for chafing, bends, kinks, or damaged fittings. Replace defective hoses.
- b. Check the brake system for loose, missing, deformed, or corroded fastenings. Replace and tighten defective hardware.
- c. Check brake linings for excessive wear or distortion.
- d. Drain air reservoir daily. A drain cock on the bottom of each air reservoir vents the tank to drain collected water and oil. If held open, air pressure in the tanks is relieved, causing the emergency or parking brakes to be applied (see Figure 4-6).

### 4-8.2 Spring Air Brake Chamber

Repair or replace faulty units. Check the condensation holes on the underside of the brake chambers to make sure they are open. The spring brake has two brake chambers, a service chamber and an emergency chamber or spring chamber. Service brake chambers should be disassembled and cleaned at 50,000 miles or yearly. The diaphragm and any marginal parts should be replaced. The spring chamber should not be serviced. Replace entire unit if spring chamber becomes faulty. When replacing the service diaphragm, replace the corresponding parts for the other chamber on the same axle (to aid in even brake application and release). Examine yoke pin for wear and replace as necessary.



**THE SPRING BRAKE CHAMBER EMPLOYS A SPRING WITH HIGH FORCES. SERVICE SHOULD NOT BE ATTEMPTED. SERIOUS INJURY OR DEATH MAY RESULT.**



**Figure 4-6 Drain Cock Locations**

- a. Caging the Power Spring
  1. Chock the semitrailer wheels.
  2. Remove dust cap from spring brake chamber.
  3. Remove the release bolt from its holding brackets and insert it into the spring brake chamber. **DO NOT USE AN IMPACT WRENCH TO CAGE THE SPRING BRAKE!**
  4. Turn the bolt until the spring brake is caged. This should be 2-1/4 to 2-1/2 inches of release bolt extension.
  5. The brakes should now be released. Do not operate loaded semitrailer with brake manually released.
  6. To reset the spring brake, turn the release bolt until the spring is released. Remove the release bolt and store it in its brackets.
  7. Snap the dust cap back in place on the chamber.
- b. Removal
  1. Chock all tractor and semitrailer wheels and drain the air system.
  2. Mark the brake chamber for proper air line port alignment for reassembly.
  3. **CAGE THE POWER SPRING** following the steps outlined in Paragraphs 4-8.2 a.
  4. Disconnect the slack adjuster from the connecting rod by removing the clevis pin (See Figure 4-9).

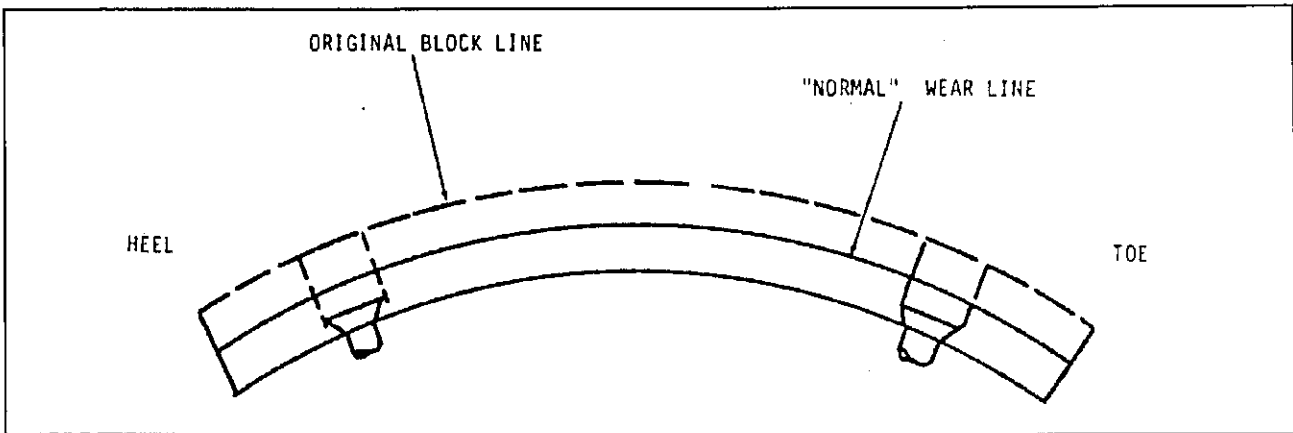


Figure 4-7 Brake Lining Wear

5. Mark all air service lines for proper re-installation and disconnect from the brake chamber.
  6. Remove the brake chamber from the axle brackets.
- c. Installation
1. CAGE THE POWER SPRING following the steps outlined in Paragraphs 4-8.2a.
  2. Position the inlet ports by loosening the service chamber clamp bands and rotating the center housing so the ports align with marks made during disassembly. Then re-tighten the clamp bands.
  3. Loosen the clamp bands on the spring brake chamber and rotate the chamber housing until the breather hole faces downward. Re-tighten the clamp bands.
  4. Remount the brake chamber on the axle brackets and reconnect the air service hoses and the slack adjuster connecting rod (See Figure 4-9).

**NOTE: Be sure the service line is on the service chamber port and the emergency line is on the spring brake port.**

d. Check for leakage by charging the air system to a minimum of 90 psi and applying soap suds to the brake chamber and connections. If a growing bubble is detected or bubbles are blown away, locate the source of the leak and repair.

e. Insure that the clamp band is properly seated and tight before uncaging the power spring.

#### 4-8.3 Tandem Relay Valve Maintenance

Every 3600 operating hours, 100,000 miles, or yearly, the Relay Emergency Valve should be disassembled, cleaned, and lubricated by a trained technician.

### WARNING

**REPAIR OR REPLACEMENT OF THE RELAY/EMERGENCY VALVE IS A COMPLEX OPERATION AND SHOULD BE PERFORMED BY TRAINED SERVICE PERSONNEL. CONTACT A LANDOLL AUTHORIZED SERVICE CENTER OR THE LANDOLL FACTORY FOR SERVICING.**

#### 4-8.4 Brake Assembly Maintenance.

The brake assemblies should be inspected and adjusted every 2,000 miles or monthly. Examine the brake linings visually to locate the lining showing the greatest amount of wear. The wheel and drum should be removed and the linings replaced if the thinnest portion of the lining is 3/8 in. (9.5 mm) or less. Do not allow the linings to wear thin enough that the lining rivet contacts the drum. (see Figure 4-9).

### WARNING

**DO NOT ALLOW GREASE TO CONTACT BRAKE LININGS AS THIS COULD RESULT IN REDUCED BRAKING PERFORMANCE.**

a. **Brake Adjustment** . Slack adjusters provide the means for routine brake adjustment to compensate for lining wear. Inspect and adjust slack adjusters weekly or at 2,000 mile intervals.

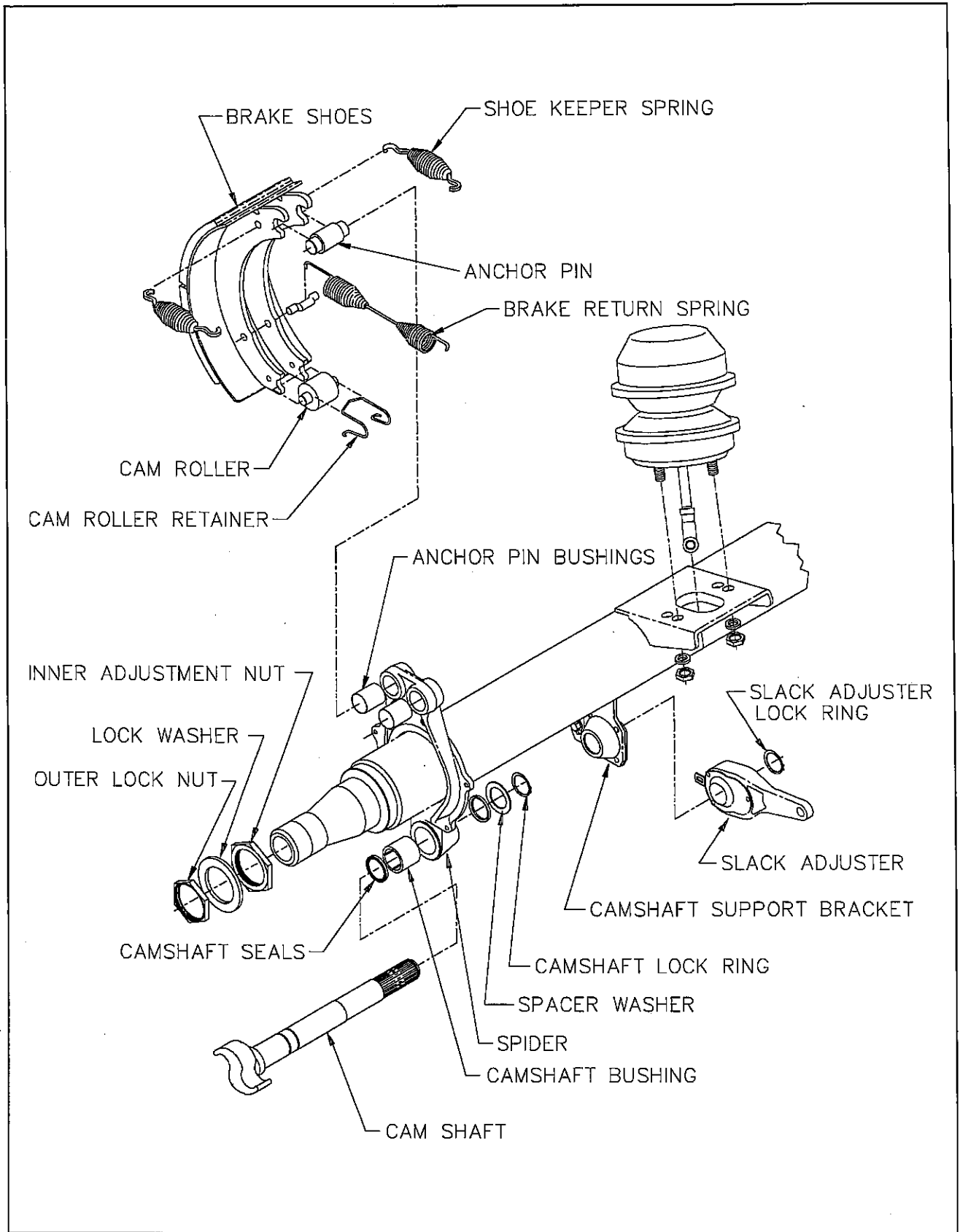
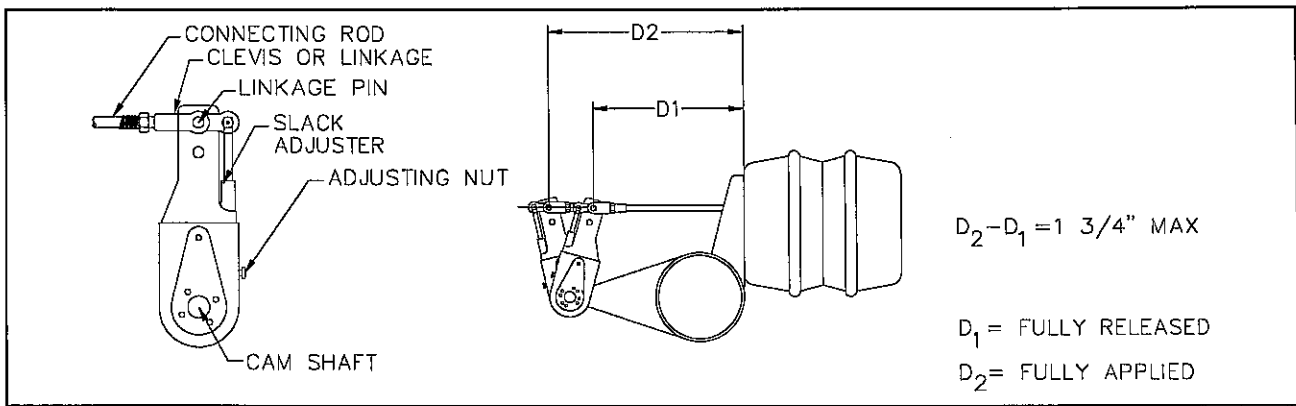


Figure 4-8 Axle and Brake Assembly



**Figure 4-9 Checking Brake Adjustment**

1. To check adjustment release brakes.
2. Measure the distance (D1) from the face of the brake air chamber to the center of the slack adjuster linkage pin (see Figure 4-9)
3. Apply brakes.
4. Repeat step 2 to measure the distance (D2).
5. Subtract the two distances to find the air chamber push rod travel. The total travel of the brake push rod must be less than 1-3/4" to meet Federal "IN-SERVICE" criteria. It is advisable to adjust all brakes on the same axle to within 1/2" of each other to prevent unbalanced braking.
6. To adjust, release brakes.
7. Place a 9/16" box end or socket wrench on the slack adjuster adjusting nut (see Figure 4-9), and push in on the locking sleeve.
8. Adjust by rotating the adjusting nut counterclockwise to loosen the brake and clockwise to tighten the brake.
9. Remeasure air chamber push rod travel from release to full brake application. If the adjustment is not within the "IN-SERVICE" criteria readjust. If the adjustment has brought the travel to within specifications, proceed to the next step.
10. Remove wrench from slack adjuster. Check locking sleeve to verify that it has sprung back out and is locking the adjusting nut. If not, the adjuster will have to be rotated slightly.

**b. Disassembly (see Figure 4-8)**

1. Release brakes and back off slack adjuster.
2. Remove slack adjuster lock ring and slack adjuster.
3. Remove drum assembly (see page 4-).
4. Disengage the roller retainers from the rollers.
5. Press down on the bottom brake shoe and remove the lower cam roller. Lift the top shoe and take out the top cam roller.

6. Lift out the shoe retractor spring, which is now free of tension.
7. Swing the lower shoe back approximately 180° to relieve the tension on the shoe keeper springs. Remove the springs and slip the shoes off the anchor pins.
8. Remove camshaft lock ring, spacer washer(s) and camshaft.
9. After removing the shoes, completely inspect all brake components, servicing as necessary.

**c. Reassembly**

1. Install new anchor pin bushings, camshaft bushing, and camshaft seals into the spider.

**NOTE: When installing camshaft seals, the seal on the slack adjuster side is installed facing into the spider. This allows grease to purge outside the brake assembly when greasing the camshaft bushing.**

2. Install cam roller, retainer clip and retractor spring retainers onto the brake shoes.
3. Install 1/8" thick camshaft washer onto the camshaft.
4. Install the cam shaft into the spider. Install spacer washer and lock ring retainer on camshaft before sliding the camshaft through the camshaft support bracket. Install the slack adjuster, washer, and lock ring retainer.
5. Install the brake keeper springs onto the shoes. Install shoes onto the spider by placing shoes in place on the anchor pins, then "wrap" the two shoes into place about the spider.
6. Install the shoe retractor spring onto the shoes.
7. Connect the slack adjuster to the brake chamber pushrod.
8. Adjust brakes as outlined in brake adjustment procedures.

## 4-9 HUB AND DRUM MAINTENANCE

**4-9.1** Clean and inspect the brake drums whenever relining the brakes. To be suitable for further service, the brake drum should pass the following checks.

- a. The brake surface should be free of scoring, excessive heat checks and cracks.
- b. The brake surface diameter should be within the maximum diameter cast or stamped on the drum.
- c. The mounting holes and pilot must be round and true.
- d. The mounting surface must be clean and flat.



**FAILURE TO REPLACE FAULTY BRAKE DRUMS WILL RESULT IN AN UNRELIABLE BRAKING SYSTEM, AND MAY LEAD TO AN ACCIDENT.**

**4-9.2** It may be necessary to turn or resurface the braking surface to remove small heat checks or other surface defects resulting from normal use.

- a. The maximum diameter cast into the back plate portion of the brake drum is the maximum diameter or discard diameter to which the brake drum may be turned or worn and still be usable. If any portion of the brake surface exceeds the maximum diameter it must be discarded. The maximum is .120 over the nominal new diameter unless stated otherwise on the casting. The maximum diameter cast into the brake drum supersedes all published information.
- b. When resurfacing a drum, allow at least 0.040 inches under the maximum diameter for additional wear.



**TURNING A BRAKE DRUM BEYOND 0.040 INCHES UNDER THE MAXIMUM DIAMETER WILL RESULT IN A WEAKER BRAKE DRUM AND MAY RESULT IN AN ACCIDENT.**

**4-9.3** Replacement of the brake drum is required if any of the following conditions exist:

- a. The brake drum is cracked.
- b. The brake surface is heat checked, grooved or worn beyond the rebore limit or the maximum diameter.
- c. The back plate is cracked.
- d. The bolt holes are elongated.
- e. The brake drum has been severely overheated.
- f. The brake drum is out-of-round.



**REPLACE BRAKE DRUMS IN PAIRS TO ACHIEVE THE SAME BRAKING POWER ON BOTH WHEELS AND MAINTAIN AN EVEN BRAKING LOAD ON THE AXLE. FAILURE TO DO THIS MAY SIGNIFICANTLY REDUCE THE PERFORMANCE, SERVICE LIFE, AND/OR SAFETY OF YOUR VEHICLE.**

**4-9.4** Replace the hub and drum as follows (see Figures 4-10, 4-11, and 4-12):

- a. For outboard mount hub and drum remove the brake drum (see Figure 4-11). It may be necessary to release the slack adjuster. For inboard mount (see Figure 4-12) and spoke wheel (see Figure 4-10) remove drum after hub.
- b. Remove hub cap and catch lubricant in a pan.
- c. Remove outer spindle nut, spindle locking washer, inner spindle nut, and bearing. Remove hub from axle.
- d. Using an appropriate driver, remove inner bearing cone, and seal.
- e. Using an appropriate driver, remove bearing cups from hub.
- f. Check that the hub cavity is clean. If the hub is to be reused, clean it thoroughly.
- g. Insert bearing cups into the hub.
- h. Install the drum to the hub or wheel unless the drum is outboard mount.

i. Clean the mounting surfaces with a good grade commercial cleaner and soft rag. Dry all component parts with a clean, absorbent cloth or paper. Lubricant will not adhere to surfaces wet with solvent.

j. For hub and drum, make sure the drum seats flat against the hub flange and mates properly with the hub pilot. There should be no interference between the brake drum pilot chamfer and the corner radius on the hub.

k. For spoke wheels, there should be clearance between the spoke and the brake drum or the brake drum will not function properly.

l. Install inner bearing, cone, and seal.

**NOTE: Do not mix new cups with old cones or new cones with old cups.**

m. If studs are marked "R" or "L", right hand (R) hubs should be installed on the curbside of the vehicle, left hand (L) hubs should be installed on the driver side.

n. Place the hub or wheel over the axle spindle being careful to align the hub bore with the axle. Do not damage the seal. Support the hub assembly until the outer bearing cone and spindle nut are installed, to avoid damaging the seal.

o. Install the outer bearing cone and inner spindle nut, tightening the nut until it is snug against the outer bearing cone. Remove the hub support allowing the hub to rest on the bearings.

p. Install and adjust bearings (see **Wheel Bearing Lubrication and Adjustment**).

q. Install the hub cap with the proper gasket. Tighten the cap screws of the hub cap to 15 to 20 ft-lbs. of torque.

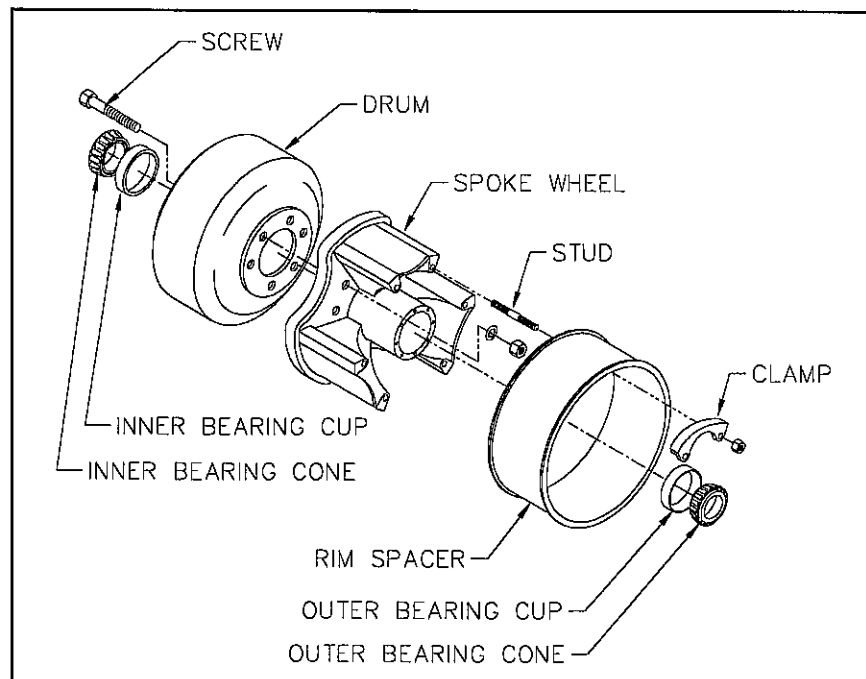
r. Remove the filler plug and fill the hub cavity to the recommended level with a gear type oil.

s. For Outboard Mounted Brake Drum (see **Figure 4-11**) place the drum over the hub and brake shoes being careful not to damage the threads on the studs. Make sure the drum seats flat against the hub flange and mates properly with the hub pilot. There should be no interference between the brake drum pilot chamfer and the corner radius on the hub. If interference exists, the hub will not be able to function properly.

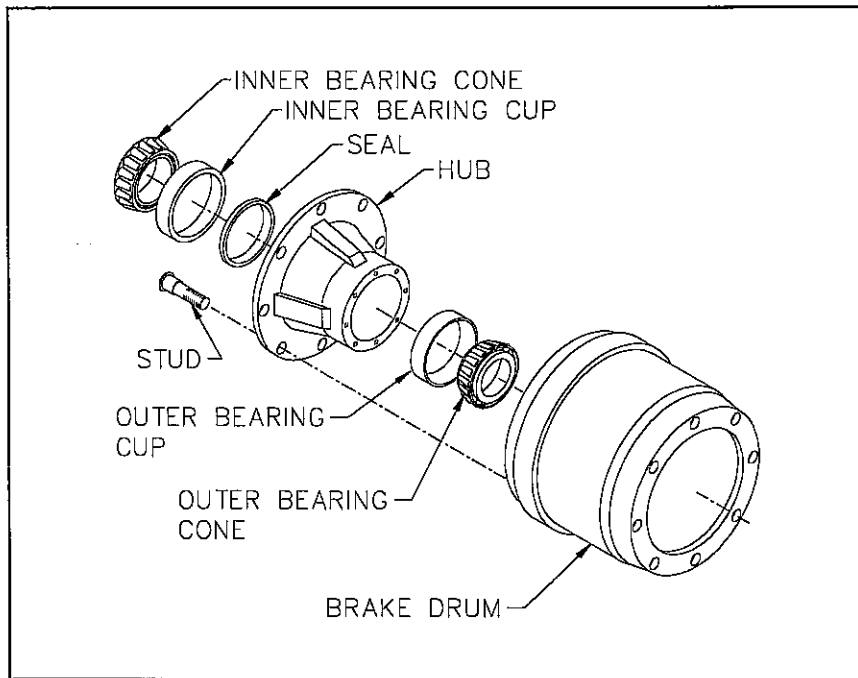


**CAUTION**

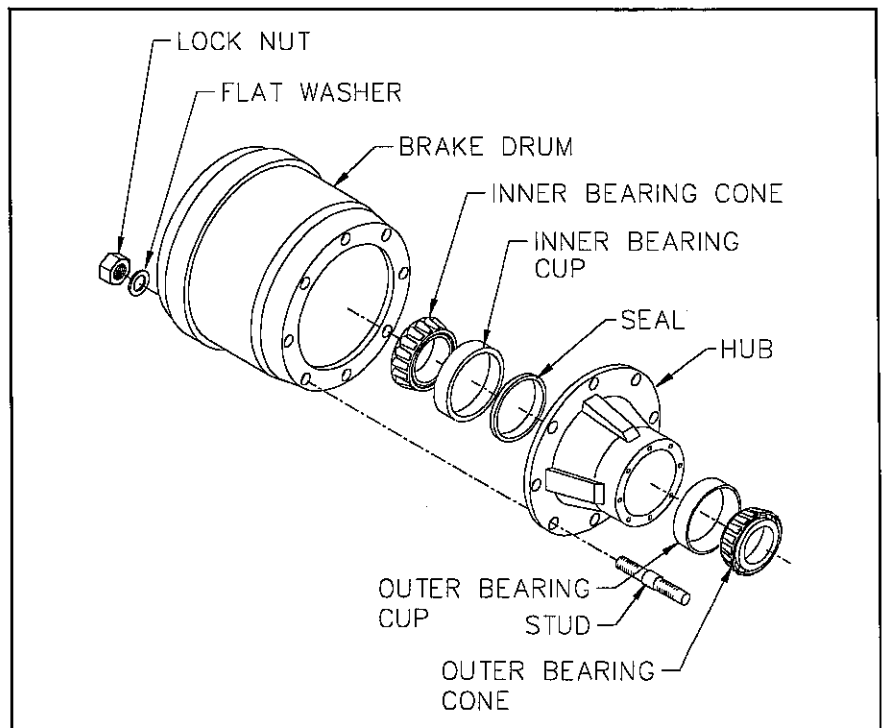
**FAILURE TO USE THE CORRECT STUD ON THE CORRECT SIDE MAY CAUSE LOOSENING OF THE HUB STUDS DURING OPERATION, RESULTING IN LOSS OF A WHEEL.**



**Figure 4-10 Three Spoke Wheel and Drum**



**Figure 4-11 Outboard Mount Hub and Drum**



**Figure 4-12 Inboard Mount Hub and Drum**

## 4-10 WHEEL BEARING LUBRICATION AND ADJUSTMENT

With semitrailer sitting level, the oil level must be checked daily and maintained between the "ADD" and "FULL" lines on the hub cap window. Check for cracked windows, missing filler plugs, and oil leaks. Add hub oil through the "POP-IN" filler plug located in the center of the hub windows. Re-install the "POP-IN" plugs after filling each hub. Adjust wheel bearings and change oil every 50,000 miles or with each brake lining replacement, whichever occurs first.

### 4-10.1 Adjustment

- a. With a drain pan under the hub cap, remove the hub cap assembly allowing oil to drain.
- b. Lift the wheel off of the ground.
- c. Adjust slack adjuster to eliminate brake drag during tire/wheel rotation.
- d. Remove outer lock nut and inner nut and lock washer.
- e. Tighten the inner adjustment nut to a minimum of 75 ft.-lbs., while rotating wheel to insure proper seating of the bearings and cups in the wheel hub.
- f. Loosen the inner adjustment nut so that the wheel will turn freely.
- g. Retighten the inner adjustment nut to 50 ft.-lbs. while rotating the wheel, to properly position the bearings for the final adjustment.
- h. Loosen the inner adjustment nut 1/3 turn.
- i. Install the spindle nut lock washer so that the dowel on the inner nut will align with a hole in the lock washer and the washer tang fits in the spindle keyway.
- j. Install the outer lock nut and tighten to 250-300 ft.-lbs. End-play of .001" to .010" must be present in the adjusted wheel bearing assembly.
- k. Install the hub cap with a new gasket and fill with oil to the full mark. Use 90 weight gear oil.
- l. Adjust brakes according to Paragraph 4-9.5 b. steps 12-14.
- m. Check hub oil level after the wheel has set level in one position for a few minutes to allow the oil to work into the bearings.

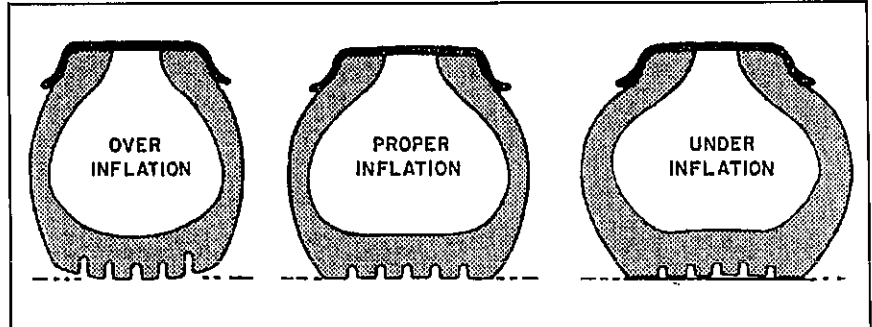


**FAILURE TO TORQUE THE OUTER LOCK NUT PROPERLY COULD CAUSE THE WHEEL TO COME OFF DURING VEHICLE OPERATION RESULTING IN PROPERTY DAMAGE OR LOSS OF LIFE.**



## 4-11 TIRE MAINTENANCE.

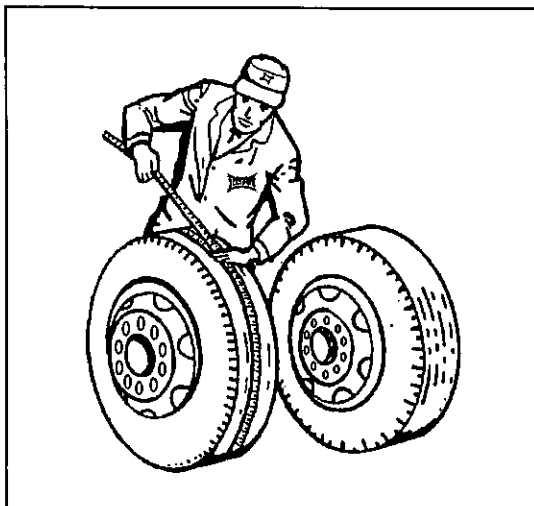
**4-11.1 Tire Inflation.** Tire inflation will cause tire to ground contact characteristics as shown in **Figure 4-13**. Tire inflation should be checked daily while the tire is cold, and during road stops. Checking the tire pressures while tires are hot will give a faulty increased pressure reading. Adjusting tire air pressure to the specified amount while tires are hot will produce improper tire to road contact and thus abnormal wear. Do not exceed cold inflation pressure listed on the semitrailer VIN plate located on the front of the semitrailer. Exceeding cold inflation pressure will result in damaged tire bodies, rims, and wheels. Replace all valve stem caps when pressure checking/adjusting has been completed. remove any foreign objects from between duals.



**Fig. 4-13 Tire Inflation Examples**

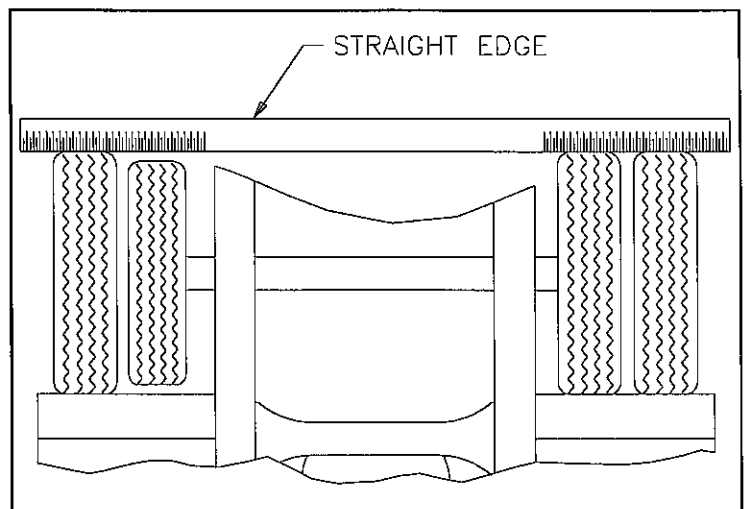
**4-11.2 Tire Matching.** Both tires on the same spindle must be the same size in order to properly distribute the load and braking forces between them. The tire must be mounted on a rim and properly inflated before measuring. If there is an allowable difference in size the smaller tire should be mounted to the inside position of the duals.

**a. Tape Measuring Method:** Measure around each tire on the tread surface. A maximum difference of  $3/4$ " is allowed between the two mating tires of a dual (See **Figure 4-14**).



**Fig. 4-14 Measuring Tape Method**

**b. Straight Edge or String Method:** (This method can not be used if tire and wheel assemblies are not mounted on the axle.) Jack semitrailer up until the wheels are off of the ground. Hold a straight edge against the tires of both ends of an axle. A gap at one tire indicates a smaller tire. A maximum of  $1/8$ " gap is allowed (See **Figure 4-15**).



**Fig. 4-15 Straight Edge Method**

### 4-11.3 Mounting Tire and Wheel

a. Make sure that all mounting surfaces are clean and free of rust, dirt or paint. A wire brush may be used to clean these surfaces (see Figure 4-16).

b. Position the inner disc wheel over the studs, being careful not to damage the stud threads. Make sure that the disc wheel is flat against the mounting surface and that there is clearance between the disc wheel taper and brake drum.

c. Install the inner capnuts on the studs and tighten to fifty foot-pounds using the sequence illustrated in Figure 4-17. Make certain that the left-handed threads are installed on the driver side of the vehicle and the right-handed threads are installed on the curbside of the vehicle.

d. Tighten the inner capnuts to full torque of 450 to 500 foot-pounds using the sequence shown in Figure 4-17.

e. Position the outer disc wheel over the capnuts being careful not to damage the inner capnut threads. Be sure the valve stems for both the inner and outer tire are accessible.

f. Install the outer capnuts and tighten to 50 foot-pounds using the sequence in Figure 4-17. Then tighten to full torque of 450 to 500 foot-pounds using the same sequence.

g. Torque will drop after the first 50 to 100 miles of operation. Check the capnuts for proper torque after this interval and retighten them. Loosen the outer capnuts and retighten the inner and outer capnuts per steps d to f.



## WARNING

**USE A TORQUE WRENCH TO ASSURE PROPER TORQUE. INSUFFICIENT TORQUE CAN CAUSE STUD BREAKAGE AND DAMAGE WHEEL PILOTS. OVERTORQUE CAN OVERSTRESS THE STUDS AND STRIP THE THREADS.**

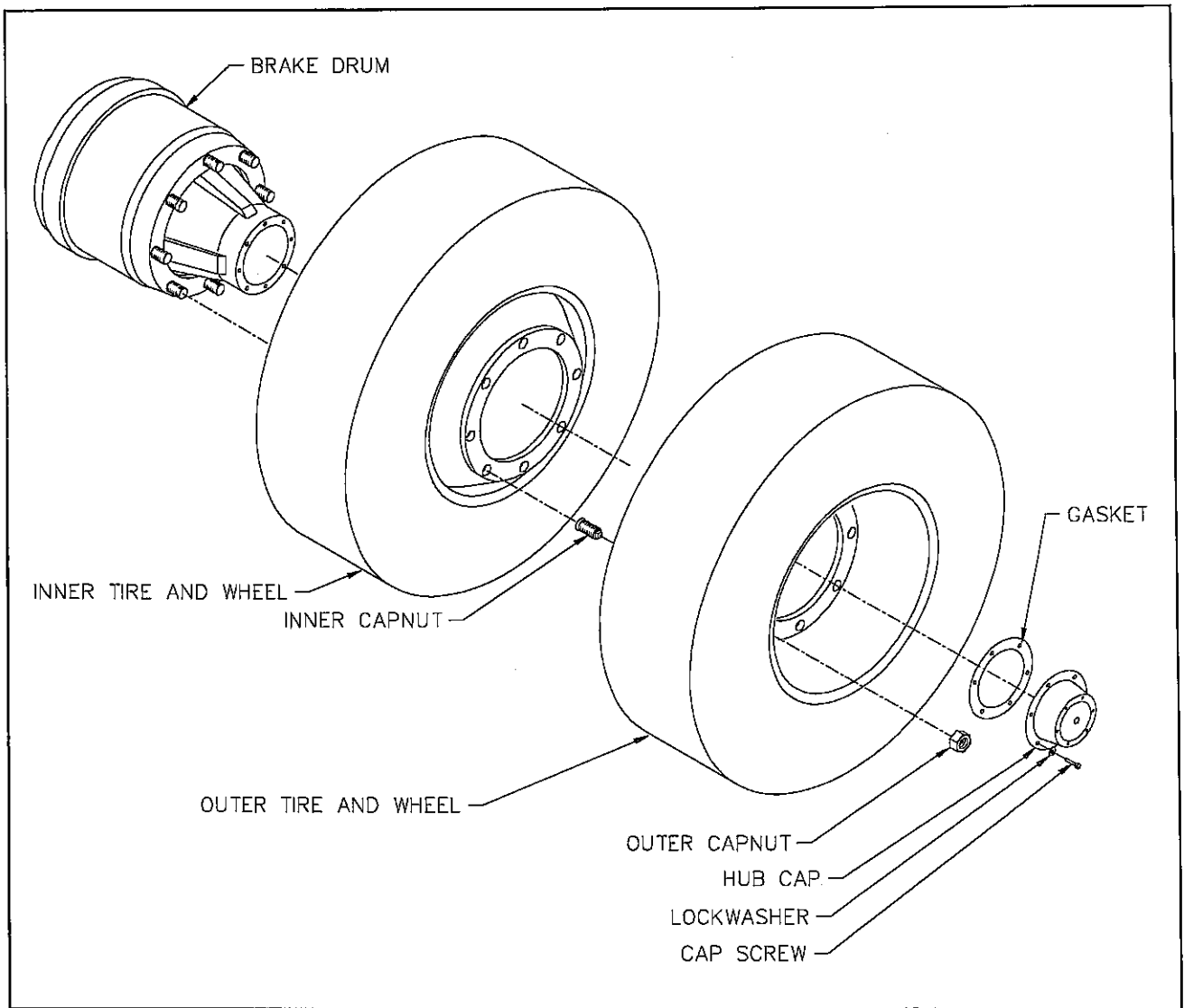


Figure 4-16 Mounting Tires and Wheels

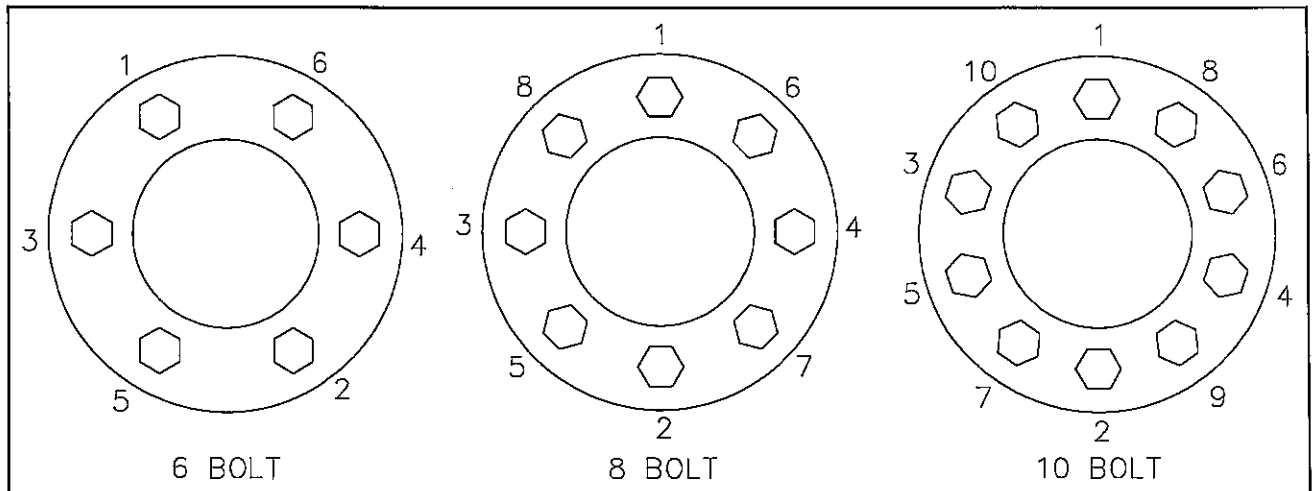


Figure 4-17 Stud Tightening Sequence

## 4-12 WINCHES

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Inspect the winch cable before and after every usage. If frayed wires, nicks, kinks, worn spots, breaks or any other sign of deterioration or damage is found, immediate replacement is mandatory before further usage. If the semitrailer is going to be out in the weather for any length of time, it is advisable to oil the winch cable to prevent untimely rusting and deterioration of the cable.

Inspect the winch mechanism thoroughly each week to insure safe, efficient operation.

Troubleshooting should be performed by a trained technician. Landoll Corporation is not responsible for equipment that is improperly maintained. Contact an authorized Landoll Service center or the Landoll factory for servicing.

## 5-1 HYDRAULIC SYSTEM

Most hydraulic system failures start as a gradual or sudden loss of pressure or flow with a resulting loss of cylinder or motor power. Any one of the system's components may be at fault. For maintenance procedures see **Paragraph 4-4**.

SYMPTOM	PROBLEM: REMEDY
<b>TRAILER TILT:</b> TRAILER LOCKED IN TILTED POSITION	<b>Velocity fuse activated:</b> Raise the trailer slightly (to reset the velocity fuse), then lower the trailer slowly.
SYSTEM INOPERATIVE	<b>Not enough oil in system:</b> Fill and check for leaks. <b>Wrong oil in system:</b> Change oil, <i>see specifications</i> . <b>Filter dirty or clogged:</b> Drain oil and replace filter. <b>Oil lines dirty or collapsed:</b> Clean or replace as necessary. <b>Air leaks in pump suction line:</b> Repair or replace as necessary. <b>Worn or dirty pump:</b> Clean, repair or replace. Check for contaminated oil. Drain and flush. <b>Badly worn parts:</b> Examine for internal leakage. Replace faulty parts. Check for cause of wear. <b>Leakage:</b> Check all parts, and relief valve for proper settings. <b>Excessive load:</b> Check unit specifications for load limits. <b>Slipping or broken pump drive:</b> Repair or replace couplings. Hydraulic supply hooked up backwards.
SYSTEM OPERATES ERRATICALLY	<b>Air in the system:</b> Check suction side of system for leaks. Repair leaks. <b>Cold oil:</b> Allow ample warm-up time. Use proper weight oil for operating temperature. <b>Dirty or damaged parts:</b> Clean or repair as needed. <b>Restriction in filters or lines:</b> Clean and/or replace filter or lines.
SYSTEM OPERATES TOO SLOW	<b>Oil viscosity too high, or "cold oil":</b> Allow oil to warm up before operating. <b>Low pump drive speed:</b> Check <i>Pump Owner's Manual</i> for engine speed (RPM's) and pump specifications. <b>Low oil level:</b> Check reservoir and add oil as needed. <b>Air in system:</b> Check suction side for leaks. Repair leaks. <b>Badly worn pump, valves, cylinders, etc.:</b> Repair or replace faulty part(s) as needed. <b>Restrictions in lines or filter:</b> Replace filter and flush lines. <b>Improper adjustments:</b> Check ports, relief valves, etc., adjust as needed. <b>Oil leaks:</b> Tighten fittings. Replace seals, gaskets and damaged lines.

## Hydraulic System, Continued

SYMPTOM	PROBLEM: REMEDY
SYSTEM OPERATES TOO FAST	<b>Engine running too fast:</b> Reduce engine speed. <b>Call Factory or see Landoll Dealer.</b>
OVERHEATING OF OIL IN SYSTEM	<b>Incorrect, low, dirty oil:</b> Use recommended oil. Fill reservoir with clean oil. Replace filter. <b>Engine running too fast:</b> Reduce engine speed. <b>Excessive internal leakage:</b> Repair or replace part(s) as needed. <b>Restriction in filters or lines:</b> Replace filter or flush lines. <b>Insufficient heat radiation:</b> Clean dirt and mud from reservoir, hydraulic lines and parts. <b>Malfunctioning part(s):</b> Repair or replace.
OIL FOAMY	<b>Oil is low:</b> Add or replace oil. <b>Wrong oil type:</b> Replace oil. <b>Foamy oil:</b> Add or replace oil. <b>Water in oil:</b> Replace oil. <b>Air leaks:</b> Check suction line and component seals for suction leaks. Replace defective parts.
NOISY PUMP	<b>Oil is low:</b> Add or replace oil. <b>Wrong oil type:</b> Replace oil. <b>Foamy oil:</b> Add or replace oil. <b>Suction line plugged:</b> Clean out obstruction or replace line. Flush system, replace filter. <b>Pump damaged:</b> Repair or replace.
LEAKY PUMP	<b>Damaged or worn shaft seal:</b> Replace seal and/or shaft. Check for misalignment. <b>Loose or broken parts:</b> Tighten or replace.
CYLINDERS MOVE WITH CONTROL VALVE IN NEUTRAL POSITION	<b>Leaking cylinder seals or fittings:</b> Replace worn seals or fittings. <b>Control valve not centering when released:</b> Check linkage for binding, repair or replace as needed. <b>Valve damaged:</b> Repair or replace.
CONTROL VALVE LEAKS CYLINDER LEAKS	<b>Seals damaged or worn:</b> Replace. <b>Seals worn or damaged:</b> Replace. <b>Rod damaged:</b> Replace. <b>Barrel damaged:</b> Replace.
CYLINDERS DO NOT FUNCTION, OR CREEP WITH PTO DISENGAGED	<b>Leaking fittings or cylinder seals:</b> Tighten loose fittings, replace seals. Replace worn seals or fittings.

## 5-2 HYDRAULIC POWER SUPPLY ENGINE PACKAGE

To troubleshoot the engine in the hydraulic engine package, please refer to the owners manual that was provided with the engine package.

## 5-3 ELECTRICAL

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Most electrical system problems show up as a burned out light or fuse, or inoperative electrical component. Wiring, grounds or components may be at fault. Locate the symptom in this section that best identifies your electrical problem. Check out each possible problem under that symptom. If the problem cannot be located, see an automotive electrical specialist. For maintenance procedures see Paragraph 4-5.

<b>SYMPTOM</b>	<b>PROBLEM: REMEDY</b>
NO LIGHTS	<b>Fuse blown on tractor:</b> Replace fuse. <b>Loose connection at plug-in:</b> Tighten connection. <b>Broken or corroded wires:</b> Replace wire. <b>Ground wire loose:</b> Clean and tighten ground.
LIGHTS FLICKERING	<b>Wires shorted or loose:</b> Locate, insulate, replace, or tighten.
LIGHTS DIM	<b>Voltage difference between trailer &amp; tractor:</b> Tractor supply wire or circuit components are too low a capacity. - Enlarge wire or component. Match bulbs with tractor voltage.
LIGHTS BRIGHT & BURN OUT	<b>Ground wire disconnected:</b> Connect ground wire. <b>Voltage difference between trailer &amp; tractor:</b> Tractor supply wire or circuit components are too low a capacity. - Enlarge wire or component. Match bulbs with tractor voltage.
FUSE BLOW-OUT OR CIRCUIT BREAKER TRIPPING	<b>Vibration:</b> Locate source of vibration and repair. <b>Short circuit:</b> Replace fuse and try all accessories. If fuse blows right away, locate short and repair.
LAMP BULB BURN OUT	<b>Vibration:</b> Locate source of vibration and repair. <b>Short circuit:</b> Replace fuse and try all accessories. If fuse blows right away, locate short and repair. <b>Loose connection:</b> Check lamp sockets and ground connections. <b>Intermittent short:</b> Locate short and repair. <b>Improper voltage:</b> Check voltage regulator output.

## 5-4 TIRES - WHEELS - SUSPENSION

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Most tire, wheel, and suspension related problems are due to excessive loads, extreme conditions, and improper maintenance. Tire, wheel, and suspension problems can be easily detected and solved by checking the following guide. For maintenance procedures see Paragraphs 4-6, 4-7, and 4-11.

<b>SYMPTOM</b>	<b>PROBLEM: REMEDY</b>
VIBRATIONS WHILE DRIVING	<b>Improper tire inflation:</b> Inflate to proper pressure. <b>Tires cupped or have flat spots:</b> Replace tires. <b>Wheels bent or loose:</b> Replace or tighten. <b>Tires incorrectly mounted:</b> Remount. <b>Mud in wheels:</b> Clean wheels. <b>Tire(s) out of balance:</b> Balance tires. <b>Brakes dragging:</b> Locate cause and repair. <b>Object(s) stuck between duals:</b> Remove object(s).
<b>RAPID TIRE WEAR/DETERIORATION: CENTER TREAD WEAR</b>	<b>Over inflation:</b> Deflate to correct inflation.

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## Tires - Wheels - Suspension, Continued

<b>SYMPTOM</b>	<b>PROBLEM: REMEDY</b>
SHOULDER TREAD WEAR - BOTH SHOULDERS	<b>Under inflation:</b> Increase inflation to correct psi. Check axle alignment. <b>Overload:</b> Do not load above rated tire capacity.
SHOULDER TREAD WEAR - ONE SHOULDER	<b>Axle damage:</b> Straighten or replace axle. <b>Axles not parallel:</b> Check axle alignment.
OVERALL TREAD WEAR	<b>Overloading:</b> Check tire load rating. <b>High speeds:</b> Adjust speed according to road and load conditions. <b>Incorrect dual matching:</b> Properly match dual tires
TIRE FLAT SPOTS	<b>Quick stops:</b> Adjust braking practices. <b>Grabbing brakes:</b> Adjust brakes properly. <b>Worn or loose wheel bearings:</b> Adjust or replace as needed. <b>Out of balance wheels and tire:</b> Balance wheels and tires.
UNEVEN WEAR	<b>Suspension bushings worn:</b> Replace bushings. <b>Worn or loose wheel bearings:</b> Adjust or replace as needed. <b>Out of balance wheels and tires:</b> Balance wheels and tires.
<b>RIM FAILURE*:</b> CRACKING	<b>Overinflated tires:</b> Deflate tire to proper psi. <b>High speeds:</b> Adjust speed according to road and load conditions. <b>High speed cornering:</b> Adjust cornering practices. <b>Over loading:</b> Check rim load rating.
<b>*In all instances of rim failure, replace the rim immediately!</b> BENDING OR WARPING	<b>Curb-hopping or potholes:</b> Adjust turning practices and speed according to road conditions. <b>Improper tightening sequence:</b> Follow proper tightening sequence.
BROKEN STUDS*	<b>Over-tightening:</b> Use correct torque and tightening sequence when mounting.
<b>*Replace broken studs before using the semitrailer!</b> <b>TRAILER TRACKING PROBLEMS:</b> TRACKS TO ONE SIDE TRACKS TO EITHER SIDE	<b>Axle alignment:</b> Re-align axle. <b>Broken or bent springs or equalizer bushings:</b> Replace worn parts. <b>Axles not parallel:</b> Adjust axle spacing to be parallel.



## 5-5 BRAKES

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For maintenance procedures see Paragraphs 4-8.

SYMPTOM	PROBLEM: REMEDY
NO BRAKES OR BRAKES ARE INTERMITTENT	<b>Brake air system improperly connected:</b> Reconnect gladhands properly. <b>Relay/Emergency valve plugged:</b> Clean valve. <b>Defective tractor protection valve:</b> Repair or replace. <b>Restricted tubing or hose line:</b> Locate and eliminate restriction. <b>Broken line:</b> Locate break and repair. <b>Tractor air system failure:</b> Troubleshoot tractor air system and repair.
SINGLE BRAKE DRAGGING OR LOCKED	<b>Broken internal brake component:</b> Locate and replace broken part. <b>Flat spot on cam roller or cam shaft:</b> Replace and lubricate. <b>Improper adjustment:</b> Adjust slack adjusters. <b>Spider bushing or cam bracket bushing binding:</b> Lubricate or replace bushing. <b>Improper lubrication:</b> Lubricate per Figure 4-1. <b>Worn brake shoe bushing:</b> Replace bushing. <b>Brake drum distortion:</b> Replace drum. <b>Broken brake chamber spring:</b> Replace spring. <b>Brake chamber pushrod binding:</b> Realign brake chamber bracket. <b>Air brake line loose or broken:</b> Tighten or repair. <i>See "SINGLE BRAKE DRAGGING OR LOCKED"</i> <b>Restriction in hose:</b> Locate restriction and remove. <b>Worn brake linings:</b> Reline brakes. <b>Grease on linings:</b> Reline brakes. <b>Broken slack adjuster:</b> Replace slack adjuster. <b>Call Factory or see qualified Trailer/Brake Technician.</b>
UNEVEN BRAKES	<b>Leaking brake chamber diaphragm:</b> Replace diaphragm.
BRAKES APPLY TOO SLOWLY	<b>Brakes need adjusting or lubrication:</b> Adjust or lubricate as needed. <b>Low air pressure in brake system (below 90 psi):</b> Check tractor air system. <b>Restricted tubing or hose:</b> Locate restriction and remove. <b>Worn or broken relay valve:</b> Replace. <b>Call Factory or see qualified Trailer/Brake Technician.</b>
BRAKES RELEASE TOO SLOWLY	<b>Brakes need adjusting or lubrication:</b> Adjust or lubricate as needed. <b>Brake rigging binding:</b> Align brakes or replace bent parts. <b>Exhaust port of relay valve restricted or plugged:</b> Replace valve.

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## Brakes, Continued

SYMPTOM	PROBLEM: REMEDY
ALL BRAKES DO NOT RELEASE	<b>Air system improperly connected to tractor:</b> Tighten or adjust connections. <b>Brake valve on tractor is applied:</b> Release brake. <b>Relay emergency valve in emergency position:</b> Check line pressure and check valve. <b>Restricted tubing or line:</b> Locate restriction and remove. <b>Tractor protection valve failure:</b> Troubleshoot tractor air system. <b>Parking brakes locked:</b> Troubleshoot air system. <b>Moisture in air system:</b> Check air system.
INSUFFICIENT BRAKES	<b>Brakes need adjusting:</b> Adjust brakes. <b>Cams need lubricating:</b> Lubricate cams. <b>Brakes need relining:</b> Reline brakes. <b>Low air pressure:</b> Troubleshoot air system. <b>Relay emergency valve failure:</b> Replace. <b>Brakes overheated:</b> Stop and allow brakes to cool, locate cause of overheating.
BRAKES GRABBING	<b>Grease on brake linings:</b> Reline brakes. <b>Brake rigging binds:</b> Align brakes or replace bent parts. <b>Brake valve on tractor failed or worn:</b> Replace valve. <b>Relay emergency valve failed or worn:</b> Replace valve.
EXCESSIVE LEAKAGE WITH BRAKES RELEASED	<b>Relay emergency valve leaking:</b> Replace valve. <b>Leaking tube or hose:</b> Replace part(s).
EXCESSIVE LEAKAGE WITH BRAKES APPLIED	<b>Relay emergency valve leaking:</b> Replace valve. <b>Leaking brake chamber diaphragm:</b> Replace brake chamber. <b>Call Factory or see qualified Trailer/Brake Technician</b> <b>Leaking tubing or hose:</b> Replace part(s).
EXCESSIVE LEAKAGE WITH EMERGENCY SYSTEM ONLY APPLIED - NO LEAKAGE WITH NORMAL BRAKING	<b>Relay emergency valve failure:</b> Replace valve.
EXCESSIVE WATER PRESENT IN BRAKE SYSTEM	<b>Reservoir not drained often enough:</b> Drain reservoir daily.
EXCESSIVE OIL PRESENT IN BRAKE SYSTEM	<b>Compressor on tractor passing excessive oil:</b> Refer to <i>Tractor Repair manual</i> .
BRAKE WILL NOT APPLY PROPERLY	<b>Flat spot on cam roller or camshaft:</b> Replace and lubricate.
BRAKES WILL NOT APPLY WHEN EMERGENCY LINE IS DISCONNECTED	<b>Initial air pressure too low:</b> Allow air system to build up to minimum 90 psi and stabilize. <b>Relay valve failure:</b> Replace valve. <b>Air line leak:</b> Locate leak and repair. <b>Brake chamber leak:</b> Replace brake chamber.

## 5-6 BRAKE DRUMS

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For maintenance procedures see See Paragraphs 4-9.

<b>SYMPTOM</b>	<b>PROBLEM: REMEDY</b>
EXCESSIVE LOSS OF BRAKES OR FADING	<b>Overheated brake drums:</b> Check for defective or misadjusted brake linings, distorted or over-machined drums. Also check for operating conditions or loads that create severe or excessive brake applications.
BRAKES PULL TO EITHER SIDE	<b>Drums of different diameters:</b> Replace with drums of same diameter. <b>Foreign matter in drums:</b> Clean drums out.
ROUGH OR NOISY BRAKING ACTION	<b>Worn drums:</b> Pull drums and inspect for any of the following; Heat spotted drums, grease spotting, blue drums, scored drums, excessive wear at rivet holes or edges, polished drums, out of round drums, unbalanced drums, worn/damaged brake components, foreign matter in drums. Correct situation or replace worn part(s). <b>Worn or out-of-round drums:</b> Replace drums.
VIBRATION IN RIDE	<b>Out-of-balance drums:</b> Balance drums.

## 5-7 WINCH

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<b>SYMPTOM</b>	<b>PROBLEM: REMEDY</b>
POWER SPOOL DOES NOT DISENGAGE	<b>Load on cable:</b> Properly secure trailer load as required and reel out cable to remove load. <b>Tension on winch gears:</b> When reeling winch, momentarily rotate reel in opposite direction to relieve tension on winch gears. Disengage winch..

**NOTES:**

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