

### MODEL 600 SERIES SEMITRAILER OPERATOR'S MANUAL



1900 NORTH STREET MARYSVILLE, KANSAS 66508 (785) 562-5381

FORM NO. F-145-793

12/94

### 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 WAR-RANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESSED, IMPLIED, OR STATUTORY (INCLUDING WAR-RANTIES 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 WITH-OUT OBLIGATION TO MODIFY PREVIOUSLY PRODUCED EQUIPMENT.

### MODEL 600 SERIES SEMITRAILER OPERATOR'S MANUAL

PURCHASED FROM:		/	_ /	
ADDRESS:	 			
PHONE NO.:	 SERIAL NO.:			

### **REPORTING SAFETY DEFECTS**

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-HAULOLL (1-800-428- 5655) FAX NO.: (785) 562-4893 FOR REPLACEMENT PARTS: 1-800-423- 4320 FAX NO.: (785) 562-4892

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### SAFETY PRECAUTIONS



THIS IS THE INTERNATIONAL SAFETY ALERT SYMBOL. IT ALERTS THE OPERATOR TO IMPORTANT SAFETY MESSAGES ON THE MA-CHINE 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 OC-CUR if instructions on this label are not properly followed.

A Careful Operator IS THE BEST INSURANCE AGAINST AN ACCIDENT -National Safety Council-

### INTRODUCTION

This manual provides operating, servicing, and maintenance instructions, with detailed parts lists for Model 600 series 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:



- 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 or call the Landoll Parts Distribution Center at:

### FOR REPLACEMENT PARTS:

### 1-800-423- 4320

### FAX NO.: (785) 562-4892

WARRANTY The Warranty Registration Card 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

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### STANDARD SPECIFICATIONS

CAPACITY* (FRAME DESIGN)
FORK LIFT MODEL 60,000 LB. DISTRIBUTED, 50,000 LB. CONCENTRATED IN 10'
GOOSENECK:
KING PIN SETTING:
UNDERCARRIAGE TRAVEL:
GROUND LOAD ANGLE: LOAD ANGLE
DOCK LEVELER CAPACITY:
HYDRAULIC HOOKUP: QUICK COUPLERS
ELECTRICAL HOOKUP:
AIR HOOK UP: GLAD HANDS
SPECIFIC BOLT TORQUES
SPECIFIC BOLT TORQUES AIR RIDE SUSPENSION: EQUALIZER BEAM PIVOT BOLT: SHOCK ABSORBER MOUNTING: AXLE CLAMP U-BOLTS**(AR45) AIR SPRING MOUNTING: 1/2" 35 FTLBS. 3/4"
SPECIFIC BOLT TORQUES   AIR RIDE SUSPENSION:   EQUALIZER BEAM PIVOT BOLT: 800 FTLBS.   SHOCK ABSORBER MOUNTING: 150 FTLBS.   AXLE CLAMP U-BOLTS**(AR45) 680 FTLBS.   AIR SPRING MOUNTING: 1/2"   3/4" 35 FTLBS.   3/4" 30 FTLBS.   FOUR SPRING SUSPENSION: 300 FTLBS.   AXLE CLAMP U-BOLTS**: 300 FTLBS.   TORQUE ARM BOLT. 480-500 FTLBS.   TORQUE ARM BOLT. 250 FTLBS.   TORQUE ARM CLAMP NUTS. 60 FTLBS.
SPECIFIC BOLT TORQUES   AIR RIDE SUSPENSION:   EQUALIZER BEAM PIVOT BOLT: 800 FTLBS.   SHOCK ABSORBER MOUNTING: 150 FTLBS.   AXLE CLAMP U-BOLTS**(AR45) 680 FTLBS.   AIR SPRING MOUNTING: 1/2"   3/4" 35 FTLBS.   SHOUR SPRING SUSPENSION: 300 FTLBS.   AXLE CLAMP U-BOLTS**: 300 FTLBS.   FOUR SPRING SUSPENSION: 480-500 FTLBS.   TORQUE ARM BOLT. 480-500 FTLBS.   TORQUE ARM BOLT. 60 FTLBS.   TORQUE ARM BOLT. 60 FTLBS.   TORQUE ARM CLAMP NUTS. 60 FTLBS.   WHEEL FASTENERS - ALL MODELS: 200-250 FTLBS.   RIM NUTS - SPOKE WHEELS 200-250 FTLBS.   CAP NUTS - BALL SEAT MOUNTED DISC WHEELS (INNER/OUTER). 450-500 FTLBS.   FLANGE NUTS - PILOT MOUNTED DISC WHEELS 500-550 FTLBS.

### 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 CONDI-TION). 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 C	Frade	SAE (	Grade	SAE 0	Grade	UNF Size	SAE G	rade	SAE 6	Grade	SAE 0 8	rade
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 <b>-2-</b> 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	St	tandard Torque Nominal Standar		tandard	d Torque				
Thread Diameter mm	Newt Mete	on- ers	Foo Pour	ot- nds	Thread Diameter mm	New1 Met	con- ers	Foc Pour	ot- nds
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]	<del>99</del> 0	[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]					

# LANDOLL CORPORATION HYDRAULIC FITTING TORQUE SPECIFICATIONS 37<sup>0</sup> 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 TOROUES APPLY TO PLATED CARBON STEEL AND STAINLESS STEEL FITTINGS ASSEMBLED WITHOUT SUPPLEMENTAL LUBRICA-TION (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<sup>o</sup> 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 LUBRICA TION (AS RECEIVED CONDITION). THEY DO NOT APPLY IF SPECIAL GRAPHITE MOLY-DISULFIDE OR OTHER EXTREME PRESSURE LUBRICANTS ARE USED.

	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** 

-

### **OPERATING INSTRUCTIONS**

### 3-1 GENERAL

This section describes, locates, and supplies sufficient information for operation of the semitrailer. It includes necessary instructions for operation under unusual conditions.



1. DO NOT OPERATE THE SEMI-TRAILER WITH ANY KNOWN FAULT THAT MIGHT ENDANGER THE OCCU-PANTS, NEARBY WORKERS, OTHER TRAFFIC, THE LOAD, OR THE EQUIP-MENT.

2. TRAILER MUST BE COUPLED TO TRACTOR AND LANDING GEAR RAISED OFF THE GROUND BEFORE OPERATING.

**3-1.1 Landing Gear.** The landing gear consists of two legs with a tube telescoping within another tube. Pin drop style is standard. Crank or hydraulically operated are optional.

**3-1.2 Parking Brake.** The parking brakes are automatically applied by spring pressure within the air actuators of the braking system when air pressure in the emergency line drops below 50 PSI. This may be done within the truck using the trailer parking/emergency valve or by disconnecting the emergency gladhands.

**3-1.3** Air Brake System. The air brake system of the semitrailer is operated from the towing vehicle after coupling. The towing vehicle's air system must be coupled to the semitrailer and charged to 90 psi minimum before the brakes can adequately function.

**3-1.4 Electrical.** The only electrical operation required of the operator is interconnection of the towing vehicle electrical cable plug with the semitrailer electrical receptacle.

**3-1.5 Hydraulic.** Most controls are located on the driver's side of the trailer. A hydraulic pump must be coupled to the trailer hydraulic system, or the optional hydraulic engine package started, before any hydraulic controls can function. The hydraulic system is designed

to operate at 2500 psi maximum pressure and approximatly 17 gpm flow capacity.

### 3-2 PRE-COUPLING OF SEMITRAILER AND TRACTOR

**3-2.1** Slowly back the tractor/truck (towing vehicle) up to the front end of the semitrailer so the kingpin of the semitrailer is centered between the tractor fifth wheel jaws. Stop the towing vehicle just inches ahead of the semitrailer. Set tractor parking brake.

3-2.2 Check the semitrailer kingpin plate. It should be in a horizontal position. The kingpin plate should be the same height, to slightly lower, than the latch area of the fifth wheel plate of the towing vehicle. If necessary, connect the tractor hydraulic lines, or start the trailer hydraulic power engine, and use the Trailer Tilt Lever (see **paragraph 3-9.1**) or hydraulic landing gear (see **paragraph 3-5.2**) to raise or lower the kingpin plate sufficiently to set proper coupling height. Drain all air and moisture from the towing vehicle air brake system in accordance with the towing vehicle manufacturer's instructions.

**3-2.3** Connect the service and emergency air hoses of the towing vehicle to their respective gladhand on the front of the semitrailer. The gladhand connectors are fitted with dummy couplings to keep dirt and moisture out of the air lines. Disconnect the dummy couplings by turning them backwards one-quarter turn. They are attached to short chains to prevent loss. The towing vehicle's air hose couplings are then attached and locked to the appropriate gladhands; red emergency line to the gladhand with the "EMERGENCY" tag, and the blue service line to the gladhand with the "SERVICE" tag (see Fig. 3-1). Chock the trailer wheels before activating the semitrailer air supply valve in the towing vehicle. Set the trailer brakes.

**3-2.4** 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. Trailer brakes should promptly set.

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

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



KEEP ALL PERSONNEL CLEAR OF FRONT, REAR, AND SIDES OF TOWING VEHICLE AND SEMITRAILER DURING COUPLING, COMPONENT OPERA-TIONS, AND UNCOUPLING. FAILURE TO STAY CLEAR CAN RESULT IN SERI-OUS PERSONAL INJURY OR DEATH.

**3-3.1** Verify the trailer wheels are chocked and brakes function properly.

**3-3.2** Make sure the towing vehicle's fifth wheel coupler is open.

**3-3.3** Slowly back the towing vehicle so it's 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.

**3-3.4** Try to pull the tractor forward a few inches to verify the vehicle coupling is secure. If the tractor disconnects from the trailer: locate the source of the coupling failure; repair, and repeat steps 3-3.3 and 3-3.4.



### PUSHING THE TRAILER BACKWARDS CAN DAMAGE LANDING GEAR.

**3-3.5** Check that the towing vehicle couples securely to the semitrailer before setting towing vehicle and trailer parking brakes.

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

### 3-4 CONNECTING TRACTOR SERV-ICES TO THE SEMITRAILER

**3-4.1** Connect the towing vehicle 7-way electrical plug to the electrical receptacle on the front of the semitrailer (see Figure 3-1).



Figure 3-1 Service Hookups (Front View)

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



### OPERATING PRESSURES GREATER THAN 2500 PSI CAN CAUSE DAMAGE TO THE TRAILER.

**3-4.2** If you have not already done so, connect the tractor hydraulic lines to the semitrailer unless your trailer is equipped with the self-contained 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 trailer hydraulic system.

### 3-5 TRACTOR AND SEMITRAILER CHECK-OUT

3-5.1 With hydraulic power operating, raise landing gear:

**a.** For pin drop landing gear, activate the Trailer Tilt lever "UP" 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.** Retract landing gear by turning hand crank on control panel counterclockwise. Use low gear until the load is off the landing gear. Then shift to high gear and continue cranking until fully retracted. Leave the landing gear in high gear.

## 

### ALWAYS GRIP CRANK HANDLE SE-CURELY WITH BOTH HANDS. NEVER SHIFT LANDING GEAR UNDER LOAD, LEAVE THE GEARS IN NEUTRAL OR LEAVE THE CRANK UNSECURED.

c. For hydraulic landing gear, remove the pin from each landing gear leg. Retract landing gear using lever on engine control panel (see figure 3-8). Secure each leg with a pin in fully retracted position.

**3-5.2** The Landing Gear lever is located on the left side of the Engine Control Panel. It has three positions:

**RETRACT** In this position, the landing gear are pulled up off the ground.

**CENTER** This is neutral position.

**EXTEND** In this position, the landing gear are lowered to the ground.



1. LANDING GEAR LEGS MUST BE FULLY RETRACTED AND SECURED WITH PINS BEFORE OPERATING OR MOVING TRAILER.

2. IF TRAILER IS LOADED WHEN OP-ERATING LANDING GEAR, LOAD MUST BE CENTERED ON THE TRAILER.

3. DO NOT TILT TRAILER WITH HY-DRAULIC LANDING GEAR ON GROUND.

**3-5.3** Activate the Trailer Tilt Lever "DOWN" until the trailer is fully lowered. Hold Trailer Tilt lever in the down position until hydraulic system works against the bottomed out Hydraulic Tilt Cylinders.

**3-5.4 Verify that the traveling undercarriage is completely slid back to transport position.** Shut off hydraulic power. Hold Trailer Axle lever in the transport position until hydraulic system works against the fully extended hydraulic telescopic axle cylinder.

**3-5.5** Check the operation of all lights and signals on the semitrailer for proper response to switch positions (stop, right turn, left turn and clearance).

**3-5.6** Check tire inflation. Adjust as needed to the pressure listed on the tire.

**3-5.7** Check tractor/trailer rig for air leaks. If air leakage is found, repair the defect before transporting.

**3-5.8** Check the oil in each hub for proper level and freedom from contamination. If hubs contain water, dirt, or other foreign matter, clean them before transporting.

**3-5.9** Check tractor air pressure. Pressure must not fall below 90 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 trailer wheels must not rotate. If trailer brakes do not apply, do not transport until defect, or defects, are repaired.

### **3-6 TOWING THE SEMITRAILER**

**3-6.1** Driving the towing vehicle with the semitrailer coupled behind requires constant attention to the overall length of the combination. The "hinged-in-the-middle" configuration of the tractor and trailer, load, and weight effect performance. Turning, passing, acceleration, 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 towing vehicle, or jackknifing may result. Application of the semitrailer brakes to keep the trailer in tow will help prevent this situation. To assure control, brake before descending a hill or attempting a curve,

**3-6.2** Make a moving test of the semitrailer brakes at low, and medium speeds *before* traveling at highway speed.

**3-6.3** Monitor the air pressure gauge on the dash of the towing vehicle. Pressure should not fall below 90 psi at any time.

**3-6.4** The semitrailer wheels track to the inside of the towing vehicle 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.

**3-6.5** 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 MOV-ING. FAILURE TO CHECK CAN LEAD TO SERIOUS PERSONAL INJURY, DEATH, OR DAMAGE TO PROPERTY.

**3-6.6** Backing should be done with care. Tail overhang, trailer length, and allowable space must be taken into consideration.

### 3-7 PARKING THE SEMITRAILER

3-7.1 Position tractor/trailer rig on a level, solid surface.

**3-7.2** Set the *PARKING BRAKE*, not the trailer emergency hand brake, and check for proper brake holding.

3-7.3 Chock wheels.

**3-7.4** Check for any air leaks in lines, relay valve, brake pods, or any other air system component.



Fig. 3-2 Hydraulic Control Panel



WHEN LEAVING THE SEMITRAILER UNATTENDED, POSITION ALL HY-DRAULIC CONTROLS TO THE NEU-TRAL OR "OFF" POSITION AND SHUT OFF THE HYDRAULIC ENGINE POWER SUPPLY, OR DISCONNECT THE TRAC-TOR HYDRAULIC HOOK-UP.

### 3-8 UNCOUPLING TRACTOR FROM SEMITRAILER

3-8.1 Park the semitrailer according to instructions in Paragraph 3-7.

3-8.2 Lower landing gear:

a. Lower the pin drop landing gear to the ground. Hydraulically raise the front end of the trailer until the next hole in the landing gear is available. Insert pin through both inner and outer legs of the landing gear. Hydraulically lower trailer onto legs.



### WITH PIN DROP OR HYDRAULIC LAND-ING GEAR BE SURE TO SECURE EACH LEG WITH PIN BEFORE LEAVING TRAILER UNATTENDED.

**b.** For optional crank landing gear, turn crank handle clockwise to extend. Using high gear, lower the landing gear until the pads make contact with the ground. To reduce the load on the fifth wheel, shift to low gear and crank an additional four to eight turns. Leave the landing gear engaged in low gear.



ALWAYS GRIP CRANK HANDLE SE-CURELY WITH BOTH HANDS. NEVER SHIFT LANDING GEAR UNDER LOAD. NEVER LEAVE THE GEARS IN NEU-TRAL OR THE CRANK UNSECURED. c. For hydraulic landing gear extend landing gear with lever on Engine Control Panel until the full weight of the trailer is on the landing gear. Secure each leg by inserting a pin.

**3-8.3** Disconnect emergency and service air lines and attach them to the tractor gladband holders. Install dummy gladbands on trailer couplings.

**3-8.4** Disconnect the 7-way cable and hydraulic lines from the trailer and store with the tractor.

3-8.5 Release tractor fifth wheel plate latch.

**3-8.6** Attempt to pull the tractor forward. If the tractor uncouples, verify all service lines are disconnected and trailer wheels are chocked. If tractor does not disconnect, repeat Steps 3-8.5 and 3-8.6.

3-8.7 Pull the tractor away from the trailer.

### 3-9 LOADING AND UNLOADING THE TRAILER



1.DO NOT GO NEAR UNDERCARRIAGE WHEN CAM ROLLERS ARE PARTIALLY OUT OF POCKETS. CHECK THAT CAM ROLLERS ARE COMPLETELY IN, OR COMPLETELY OUT OF POCKETS. IF A HYDRAULIC HOSE IS DISCONNECTED FROM THE SYSTEM THE UNDERCAR-RAIGE COULD SLIDE ABRUPTLY INTO THE POCKETS.

2. 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 TRAILER TO TILT BACK AND CAN RE-SULT IN INJURY OR DEATH.

3. KEEP ALL PERSONS CLEAR WHILE TILTING TRAILER TO AVOID SERIOUS INJURY OR DEATH BY BEING PINCHED IN TRAILER BED.

## 

1. DO NOT ALLOW THE BACK TRAILER AXLE TO LEAVE THE GROUND. THIS CAN RESULT IN DAMAGE TO TRAILER. 2 TILTING THE TRAILER DECK WILL INCREASE TENSION ON THE WINCH CABLE, WHICH CAN CAUSE THE LOAD TO BE PULLED FORWARD. DO NOT HOOK THE CABLE TO THE LOWER DECK WHEN TILTING.



DO NOT EXCEED THE GROSS AXLE WEIGHT RATINGS FOR ANY AXLE ON YOUR VEHICLE. THE COMBINED WEIGHT OF THE TRACTOR, TRAILER, AND CARGO MUST NOT EXCEED THE GROSS VEHICLE WEIGHT RATING (GVWR) OF THE TRACTOR. 3-9.1 Trailer Tilt Lever

The Trailer Tilt Lever (see Fig.3-2) is located on the control panel on driver's side of the upper deck. It is the middle lever with three positions:

- **UP** In this position, the front end of the trailer rises to the load position.
- **CENTER** This is neutral position. The semitrailer stays in its current position.
- **DOWN** In this position, the front end of the trailer lowers to the transport position.

#### 3-9.2 Axle Control Lever

The Axle Control Lever (see Fig. 3-2) is located on the control panel. It is the top lever with three positions:

LOAD In this position, the undercarriage slides forward for loading.

**CENTER** This is the neutral position.

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

3-9.3 Outrigger Platform Extension Set-up (See Figure 3-3)

a. Unlatch and fold out swing-out outriggers.

b. Unlatch pull-out extension by pulling spring loaded latch pin. Slide extension out until it latches again.



**Figure 3-3 Outrigger Platform Extension** 

b. Unlatch pull-out extension by pulling spring loaded latch pin. Slide extension out until it latches again.

c. Place planks on outriggers and assemble end to end using braces, 3/8"-16X2-1/4" bolts, washers, and nuts.

d. Plank joints must be centered on outriggers.

e. To remove, reverse steps a through d.

f. Remove only two bolts for each joint as shown in Figure 3-3. Leave braces attached to boards for storage.

3-9.4 Loading Procedure (see Figure 3-4):

### CAUTION

### FAILURE TO FULLY RETRACT TELE-SCOPIC AXLE CYLINDER (UNDERCAR-RIAGE IN FULL FORWARD POSITION) CAN CAUSE DAMAGE TO THE TRAILER.

a. Proper operation requires that the undercarriage be pulled fully forward to the front pockets each time the undercarriage is pulled out of the rear pockets and prior to returning the undercarriage to the rear pockets for transport position.

b. Park tractor/trailer on level even surface.

c. Start operation of hydraulic power system. If the hydraulic engine package is installed start and warm up engine following engine operating instructions in paragraph. (Read engine operator's manual.)

d. Move undercarriage forward (out of pockets) five to eight feet. To insure that the trailer does not rock back, keep undercarriage behind the trailer center of gravity.

e. Tilt the front of the bed up to full tilt position. If winch cable is connected to lower bed, disconnect cable from lower bed or reel out cable as needed to keep it from becoming too tight when tilting bed (see paragraph 3-11).

f. If approach plate has not touched the ground, move undercarriage forward until approach plate just touches the ground.

g. Alternate between lowering bed tilt angle to load angle and moving undercarriage fully forward so weight of the trailer bed rests partly on approach plate and partly on undercarriage as undercarriage is moved forward. Reel winch in or out as needed to keep some tension on cable. The object is to have the approach plate resting on the ground whenever the center of gravity of the trailer and load is behind the center of the undercarriage. At loading position, the approach plate should be resting on the ground and the undercarriage fully forward.

h. Winch or drive the load onto the trailer. Insure that the load is steering straight up onto the trailer and does not maneuver off the side of the trailer. Continue until load center of gravity is in proper position for trailer loading.

### CAUTION

### MAXIMUM CONCENTRATED LOAD IN ANY 10 FT AREA IS 40,000 LB FOR A STANDARD SEMITRAILER AND 50,000 LB WITH THE FORK LIFT PACKAGE.

i. Securely tie down 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 the cable is just beginning to become tight. (Winch cable serves as a safety in case load tiedown fails but is not to replace tiedowns.)

j. Alternate between tilting the front of the bed up to full tilt position and moving the undercarriage to the rear, until the center of gravity of the trailer load is in front of the center of the undercarriage. Keep part of the load on the wheels and part on the approach plate. Reel winch out as needed to keep slight tension on the cable. Never move the undercarriage so far to the rear that the approach plate is lifted off the ground and never allow the wheels to leave the ground while the trailer is tilted.

**k**. When the center of gravity of the trailer and load is in front of the undercarriage or when the trailer is in full tilt and the undercarriage as far back as possible without lifting the approach plate off the ground, fully lower the tilt angle. Reel in the winch cable as needed to keep slight tension on the cable.

1. After bed tilt angle is fully lowered, move the undercarriage to the rear until it is in transport position. The trailer deck will lower as the undercarriage rollers go into pockets. Hold Trailer Tilt lever in the down position until hydraulic system works against the bottomed out Hydraulic Tilt Cylinders (Approximately 2 to 5 seconds). Hold Trailer Axle lever in the transport position until hydraulic system works against the fully extended hydraulic telescopic axle cylinder (Approximately 15 to 30 seconds).

m. If necessary, move load slightly forward or rearward on the load bed to get correct weight distribution on kingpin and the trailer axles.



Fig. 3-4 Steps for Loading and Unloading

### CAUTION

### MAXIMUM CONCENTRATED LOAD IN ANY 10 FT AREA IS 40,000 LB FOR A STANDARD SEMITRAILER AND 50,000 LB WITH THE FORK LIFT PACKAGE.

**n.** Shut down hydraulic supply engine following operating instructions in paragraph .

3-9.5 Unloading Procedure (see Figure 3-4):

a. Park tractor/trailer on level even surface.

**b.** Start and warm up hydraulic power engine following engine operating instructions in paragraph 2-2.12.

c. Move load as far forward as is practical on the trailer and secure with appropriate load tiedowns.

d. Attach the winch cable to the front of load. (Winch cable is to serve as a safety in case load tiedown fails but is not to replace load tiedowns).

e. Move undercarriage forward (out of pockets) five to eight feet.

f. To insure that the trailer does not rock back, keep undercarriage behind the loaded trailer center of gravity. Actual center of gravity will relocate to the rear as the trailer is tilted up.

g. Tilt the front of the bed up to full tilt position, reeling out winch cable as needed to keep slight tension on the cable.

h. If the approach plate has not touched the ground, move the undercarriage forward until the approach plate touches the ground and starts supporting the trailer. Then alternate between moving the undercarriage forward while lowering the tilt angle and reeling in the winch cable. The object is to keep a part of the weight on the approach plate, and part of the weight on the while lowering the tilt angle and keeping slight tension on the winch cable.

i. With the undercarriage fully forward and the load angle as low as possible, 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.

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

**k.** After load is completely off the rear of the trailer, secure it so it will not move, and disconnect winch cable. Do not attach winch cable to bed until the trailer is returned to transport position.

1. Before returning the trailer to transport position insure that there is sufficient distance between the load and the rear of the trailer so that the trailer does not hit the load when being folded back to transport position.

m. Alternate between tilting the front of the bed up to full tilt position and moving undercarriage to the rear as trailer wheels become unloaded. Keep part of the load on the wheels and part on the approach plate. Never move undercarriage so far to the rear that the approach plate is lifted off the ground and never allow wheels to leave the ground while the trailer is tilted.

n. After the trailer is fully tilted and the undercarriage is as far back as possible without lifting the approach plate off the ground, fully lower bed tilt angle.

o. With bed tilt angle fully lowered, move undercarriage rearward to transport position. Hold Trailer Tilt lever in the down position until hydraulic system works against the bottomed out Hydraulic Tilt Cylinders (Approximately 2 to 5 seconds). Hold Trailer Axle lever in the transport position until hydraulic system works against the fully extended hydraulic telescopic axle cylinder (Approximately 15 to 30 seconds).

**p.** Reel in winch cable and secure hook on upper deck.

### 3-10 WORK LIGHT SWITCH (OPTION)

The Work Light Switch is on the Hydraulic Control Panel. It controls the work lights mounted on the bulkhead. The work lights illuminate the upper deck.



### 3-11 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, RE-SULTING IN SERIOUS PERSONAL IN-JURY OR DEATH.

The Winch Clutch (see Figure 3-6 and 3-5) 3-11.1 is on the curbside of the winch assembly. It engages or disengages the winch. For trailers equipped with a pneumatic clutch (20,000# winch only) the control is a switch on the control panel (see Figure 3-2). If the trailer also has the optional winch air tensioner, it will be controlled by the same switch on the control panel. For the 20,000# winch this switch controls both the clutch and the winch air tensioner simultaneously. For the 12,000# winch this switch controls only the air tensioner.

The winch clutch has two positions:



Fig. 3-6 20,000# Winch Clutch

RELEASE In this position, the winch is disengaged and air tension (if present) is released from the cable. Allow up to 15 seconds for release of air tension. The cable can then "free-wheel". The cable may need to be slackened to allow winch to disengage.

#### NOTE: When reeling winch, momentarily rotate reel in opposite direction to relieve tension on winch gears. This will aid in winch release.

TENSION In this position, the winch is engaged and cable can be "power" spooled in or out. The winch is now controlled by the Winch Hydraulic Lever. Winch air tensioner will also be engaged, if present.

Tension or pressure on the cable is control-3-11.2 led by an air pressure regulator located behind the main control panel. It is set at 60 psi but can be adjusted if desired for more or less tension.

a. To adjust turn the regulator adjusting knob. Clockwise rotation increases and counterclockwise rotation decreases outlet pressure and tension.

b. When reducing from a higher to a lower setting. first reduce to some pressure less than that desired, then bring up to the desired point.

c. Push lockring on adjusting knob downward to lock pressure setting. To release, push lockring upward.

The Winch Hydraulic Lever (see Figure 3-2) 3-11.3 is the top lever located on the control panel. It is a three position control:

In this position, cable can be "power" spooled IN onto the spool.

**CENTER** This is neutral position.

In this position, cable can be "power" spooled OUT off the spool.



### **3-12 USE OF DOCK LEVELERS**



BE SURE TO CHECK THAT THE DOCK LEVELERS ARE FULLY RETRACTED BEFORE MOVING THE TRAILER. FAIL-URE TO RETRACT THE DOCK LEVEL-ERS BEFORE OPERATING CAN CAUSE SEVERE DAMAGE TO THE TRAILER.



1. OPERATE DOCK LEVELERS ONLY WHILE TRAILER IS HITCHED TO TRAC-TOR. WHEN USING DOCK LEVELERS, THE TRAILER MUST BE KEPT LEVEL AT ALL TIMES. LOADS BEING PLACED ON THE TRAILER MUST BE KEPT CEN-TERED ON THE TRAILER. AN UNLEVEL TRAILER MAY ALLOW A LOAD TO SLIDE, CAUSING INJURY OR DEATH TO PERSONS NEARBY.

2. DO NOT OPERATE DOCK LEVELERS WITH UNDERCARRAIGE OUT OF REAR POCKETS.

3. DO NOT OPERATE DOCK LEVELERS WITH INSUFFICIENT SPACE ON BOTH SIDES OF THE TRAILER. TRAILER WILL LEAN TOWARD THE SIDE WITH THE SHORTEST CYLINDER. PERSONS OR EQUIPMENT CAN BE CRUSHED BE-TWEEN TRAILER SIDE AND RIGID OB-JECTS.

4. TRACTOR PARK BRAKES MUST BE SET WHEN USING DOCK LEVELERS.

#### 3-12.1 Dock Leveler Controls

a. The Dock Leveler Selector, located on the control panel, switches control of the hydraulics to the Dock Leveler Controls.

IN Dock Leveler Controls are operable.

**OUT** The Tilt, Winch, and Axle functions can be used, and the Dock Leveler is inoperable.

b. The Dock Leveler Controls are dual action controls, located under the deck, on the driver's side, between the axles (see Figure 3-7). They adjust the height of the dock leveler cylinders. The left control adjusts the cylinder on the driver's (street) side of the trailer. The right control adjusts the cylinder on the curb side of the trailer. The three positions are:

- IN Pushing in, toward the center of the trailer, lowers the corresponding side of the trailer.
- **CENTER** This position is neutral for both controls. In neutral, the corresponding dock leveler cylinder is stationary.
- **OUT** Pulling out, away from the center of the trailer, raises the corresponding side of the trailer.

3-12.2 Park the semitrailer in front of the dock according to instructions in Paragraph "Parking the Semitrailer".

**3-12.3** Engage hydraulic power supply. Push in the Dock Leveler Selector so hydraulic power is available to the Dock Leveler circuit. Use the dock leveler controls located between the axles on the drivers side of the trailer to raise the rear corners of the trailer as needed. Operate both controls at the same time. Pull the dock leveler controls to raise the trailer deck by extending the dock leveler legs. Push the dock leveler controls to lower the trailer deck by retracting the dock leveler legs. Use one control to level the trailer bed.

# NOTE: Be sure to lower the dock levelers when finished. Push the dock leveler controls in — at the same time — to retract the dock leveler legs and lower the trailer bed.

**3-12.4** Pull out dock leveler selector to return trailer hydraulics to normal operation. Shut off the hydraulic power.



### **Figure 3-8 Engine Control Panel**

### 3-13 HYDRAULIC POWER SUPPLY EN-GINE OPERATION (OPTIONAL)

**3-13.1** The Hydraulic Power Supply Engine is used to power the hydraulic functions, should the towing vehicle not be equipped with hydraulic hookups. (Read engine owner's manual.)

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 and axles are in transport position.)

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 TRAILER MAY NOT OPERATE COR-RECTLY, RESULTING IN DAMAGE TO THE TRAILER.

**3-13.2** The Engine Ignition Switch, Choke and Throttle are on the Engine Control Panel located on the driver's side above the Hydraulic Control panel (see Figure 3-8).

**3-13.3** The Hydraulic Power Supply Engine Throttle controls the speed at which the engine operates (see Figure 3-8). It is a variable position control:

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

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

**3-13.4** To start pull the choke completely out and turn out the throttle several rotations.

**3-13.5** Turn the ignition key to the "START" position. The engine should crank and then start.



DO NOT CRANK ENGINE FOR MORE THAN 10 SECONDS. IF ENGINE DOES NOT START CONSULT THE OWNER'S MANUAL SUPPLIED WITH THE ENGINE.

**3-13.6** When the engine starts, release the key. After engine warm up, push the choke in completely.

**3-13.7** 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.

**3-13.8** Before shutting it off, move the throttle to the "slow" or low idle position. Allow to idle for 30 seconds.

**3-13.9** Turn or push the throttle and choke control completely in and turn the key to the "OFF position.

### **3-14 REMOTE OPTION**

**3-14.1** The wired remote control plugs into an electrical receptacle usually located on the Hydraulic Control Panel. Optional receptacle locations are on the rear street side or both rear street and rear curb sides. The wired remote is available as a single, dual, or triple function.

**3-14.2** A wireless radio remote control is also available as a dual, triple, or quadruple function (see Fig. 3-9).

3-14.3 The single function wired remote operates like the winch hydraulic in/out lever (see paragraph 3-11.3).

**3-14.4** The dual function wired remote operates the winch in/out and either the tilt, axle, or winch tension; or the tilt and axle.

a. The selector switch at the top of the remote box selects the function to be operated (winch in/out, tilt, axle, or winch tension).

b. The two buttons will function like the control levers for the winch in/out (see paragraph 3-11.3), tilt (see paragraph 3-9.1), axle (see paragraph 6), or winch tension (see paragraph 3-11.1).

**3-14.5** The triple function wired remote operates the winch in/out, tilt, and either the axle or winch tension.

a. There are three switches which function like the control levers for the winch in/out (see paragraph 3-11.3), tilt (see paragraph 3-9.1), axle (see paragraph 6), or winch tension (see paragraph 3-11.1).

3-14.6 The wireless radio remote has two, three, or four switches which function like the control levers for the winch in/out (see paragraph 3-11.3), tilt (see paragraph 3-9.1), axle (see paragraph 6), or winch tension (see paragraph 3-11.1). The power switch on the remote must be turned on for any of the switches to function.

NOTE: ON WINCHES WITH THE AIR TENSION OPTION THE WINCH TENSION IS ENGAGED AUTOMATICALLY WHEN THE SWITCH IS TURNED TO WINCH IN/OUT. THE WINCH TEN-SION SWITCH ON EITHER THE REMOTE OR



Figure 3-9 Examples of Remote Options

### 3-15 BULKHEADS

Optional bulkheads may come with or without chain racks. To remove a bulkhead, disconnect the electrical harness, take out the pins holding the bulkhead into the pockets on the trailer front and lift the bulkhead off.



### TO AVOID SERIOUS INJURY ALL RE-MOVABLE ATTACHMENTS MUST BE FIRMLY ATTACHED WITH FASTENERS PROVIDED AT ALL TIMES.

### 3-16 OPERATION UNDER UNUSUAL CONDITIONS

#### 3-16.1 Cold Weather Operation

a. Cold weather causes lubricants to congeal, insulation and rubber parts to become hard, which may lead to problems found 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 fastenings, 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.

### 3-16.2 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 towing vehicle's air delivery system is recommended.

### **NOTES:**

### 4-1 GENERAL

This section contains instructions necessary for proper maintenance of the semitrailer. The 660 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.

### 4-2 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.

4-2.1 Inspection



OPERATING THE TRACTOR OR TRAILER 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.

Inspect the towing vehicle, the trailer, and trailer 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.

#### 4-2.2 Lubrication.

Table 4-1 details lubrication points and intervals, method of application, and lubricant required, and illustrates the location of the 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 SOL-VENTS ARE FLAMMABLE AND TOXIC TO EYES, THE SKIN, AND RESPIRA-TORY TRACT. AVOID SKIN AND EYE CONTACT. GOOD GENERAL VENTILA-TION IS NORMALLY ADEQUATE. KEEP AWAY FROM OPEN FLAMES OR OTHER COMBUSTIBLE ITEMS.

### 4-3 MAINTENANCE PROCEDURES.

**4-3.1** Repair Parts. Repair parts are illustrated and listed in Section 6 Illustrated Parts Breakdown. Replacement of parts due to wear is determined by examination and measurement in the Maintenance Procedures of this section.

**4-3.2 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.

**4-3.3 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 fastenings with hardware of equal grade. Table 2-1 illustrates the markings on the heads of steel bolts and screws that indicate their ASTM and SAE grades.



### **Figure 4-1 Lubrication Points**

LUBE	SEASON	BRAND AND PRODUCT (WEIGHT AND/OR TYPE)						
		AMOCO	EXXON	PHILLIPS	TEXACO			
		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			
6	ABOVE 0°F	Ultimate Gold 10W-30, 10W-40	Super Flow 10W-30, 10W-40	Tropartic 10W-30, 10W-40	Havoline 10W-30, 10W-40			
	BELOW 32°F	Ultimate Gold 5W-20, 5W-30	Super Flow 5W-20, 5W-30	Tropartic 5W-20, 5W-30	Havoline 5W-20, 5W-30			

**Table 4-1 Lubrication Specifications** 

NORMAL OPERATING SERVICE INTERVALS a								
SERVICE INTERVAL :	TIMES	1st 5 Hrs	Weekly	Monthly	6 Months	Yearly	UBE #	OTES
ITEM	MILES	50	500	2,000	12,000	25,000	<b>ר</b>	Z
LIGHTS	<b>_</b>	ļ	1					
WIRING & CONNE	CTIONS	1		- 1				
FASTENER	s	ι, <b>Τ</b>		l				b
KING PIN & PL	ATE	l		C, I, L			3	c
BRAKE AIR SYS	STEM		1	1				
RELAY VALV	'ES		_			I, C		
BRAKE ADJ & \	NEAR	 I		I, T				d
SLACK ADJUS	TERS						3	С
	SSYS					 L	3	с
							5	с
		I					5	c
VVHEEL BEAR		!	_			- <u>-</u>		
TIRE INFLATION	& WEAR	<u> </u>						
WHEEL LUG	NUTS	I, T		I, T				T
SUSPENSION ALI	GNMENT	l		I				
AIR RIDE SUSPI	ENSION			I,T		<u> </u>		
UNDERCARRIAGE	ROLLERS			L			3	C C
HYDRAULIC	OIL	<u> </u>	1			<u> </u>	1	<u>c</u>
HYDRAULIC F	ILTER	R			R			
HOSES		1		1		R		·
WINCH GEAR	CASE	1		1			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 4-20, Stud Tightening Sequence.

**Table 4-2 Maintenance Schedule** 

OPERATION	AFTER EACH CYCLE OF INDICATED HOURS					
	8	25	100	200		
Fill fuel tank	х					
Check Oil Level	Х			 		
Check air cleaner for dirty, loose, or damaged parts	Х*					
Check air intake and cooling areas, clean as necessary	Х*			 		
Service precleaner element		X*		  =		
Service air cleaner element			X*	<u> </u>		
Change oil			X			
Check spark plug condition and gap	- · · · · ·		X			
Remove cooling shrouds and clean cooling areas			X*			
Change oil filter				X		

\* Perform these maintenance procedures more frequently under extremely dusty, dirty conditions.



## READ ALL WARNING AND CAUTION NOTES IN THE ENGINE OWNER'S MANUAL BEFORE OPERATING OR SERVICING THIS ENGINE.

Table 4-3 Hydraulic Engine Maintenance Schedule

### 4-3.4 Cleaning

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



PAINT THINNER AND OTHER SOL-VENTS ARE FLAMMABLE AND TOXIC TO EYES, THE SKIN, AND RESPIRA-TORY TRACT. AVOID SKIN AND EYE CONTACT. GOOD GENERAL VENTILA-TION IS NORMALLY ADEQUATE. KEEP AWAY FROM OPEN FLAMES OR OTHER COMBUSTIBLE ITEMS. **b.** Use any mineral spirits paint thinner (or its equivalent) to remove grease and oil from all parts of the trailer. 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. Replace any missing or illegible decals. Replace any missing or damaged reflective tape. See page 6-62 for a list of required decals and reflective tape.

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

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

### 4-4 GOOSENECK, FRAME, AND DECK

4-4.1 Fifth Wheel Latch Adjustment. (See Figure 4-2.) To adjust fifth wheel latch assembly, support fifth wheel plate and adjust rear nut until the cam just touches the flat surface on the latch. Then tighten the front nut compressing the spring 1/8" to approximately 10-7/8" or until there is sufficient tension to hold the fifth wheel plate in place. To check the tension on the latch, place a pry bar between the fifth wheel plate and the backing plate and pry down until the latch releases. If it releases too easily, tighten the spring tension. If it will not release, back off the spring tension until it can be released. Too much tension will cause excessive wear on the release and possibly bend the latch rod.



### STAND CLEAR OF FIFTH WHEEL PLATE WHEN PRYING IT DOWN. FALL-ING PLATE COULD CAUSE SERIOUS INJURY.

#### 4-4.2 Repairing Structural Defects

If any structural defect is found in daily or other scheduled inspections, 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 trailer to Landoll factory for repairs. Inspect the deck daily for broken or missing planks or missing attachments. Replace any defective parts promptly.



Figure 4-2 Fifth Wheel Latch Adjustment



IF MORE OIL THAN SPECIFIED IS SENT TO DOCK LEVELER VALVE, DAMAGE TO DOCK LEVELERS AND PERSONAL INJURY CAN OCCUR. IF LESS OIL THAN SPECIFIED IS SENT TO DOCK LEVELER THEY WILL NOT OPERATE OR OPERATION WILL BE ERRATIC.

#### 4-5.1 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 the undercarriage telescopic cylinder extended and all other hydraulic cylinders in the retracted position. Disengage the hydraulic pump.

**b.** Overfilling can cause hydraulic fluid overflow during operation.

c. Dock leveler flow bypass regulator must provide 2.5 to 3.0 gallons per minute to dock leveler valve.

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

#### 4-5.2 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 the undercarriage telescopic cylinder extended and all other 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 "L" and "F" marks on the oil dip stick. For further maintenance procedures and proper lubrication specifications, please refer to the engine owners manual that was supplied with the hydraulic engine package.

**d.** Replace hydraulic filter with new filter at least every 2000 hours or more often under adverse conditions.

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

### 4-6 ELECTRICAL SYSTEM

**4-6.1** 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.

**4-6.2** 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.

**4-6.3** Corroded terminals must have the corrosion removed, source of corrosion neutralized and the terminals resealed, protected, and insulated.

**4-6.4** Fuse or circuit breaker burn-out or "blowout" 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.

4-6.5 Lights with a repeated lamp burn-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.




Fig. 4-3 Wiring Diagram

. . 4-7





WIRING PARTS LIST			
REF. DES.	PART NUMBER	DESCRIPTION	FUNCTION
DS1	10205Y	REFLECTOR LAMP, YELLOW	FRONT LEFT CLEARANCE
DS2	10205Y	REFLECTOR LAMP, YELLOW	FRONT RIGHT CLEARANCE
DS3	10205Y	REFLECTOR LAMP, YELLOW	FRONT LEFT MARKER
DS4	10205Y	REFLECTOR LAMP, YELLOW	FRONT RIGHT MARKER
DS5	10205Y	REFLECTOR LAMP, YELLOW	LEFT SLOPE MARKER
DS6	10205Y	REFLECTOR LAMP, YELLOW	RIGHT SLOPE MARKER
DS7	60015Y	LIGHT, TURN AND CLEARANCE	LEFT SIDE MARKER/TURN
DS8	60015Y	LIGHT, TURN AND CLEARANCE	RIGHT SIDE MARKER/TURN
DS9	10205Y	REFLECTOR LAMP, YELLOW	MID-LEFT SIDE MARKER
DS10	10205Y	REFLECTOR LAMP, YELLOW	MID-RIGHT SIDE MARKER
DS11	10205R	REFLECTOR LAMP, RED	LEFT REAR SIDE MARKER
DS12	10205R	REFLECTOR LAMP, RED	RIGHT REAR SIDE MARKER
DS13	40015R/40002R	4" TAIL LAMP	LEFT TURN/TAIL
DS14	40015R/40002R	4" TAIL LAMP	RIGHT TURN/TAIL
DS15	40015R/40002R	4" TAIL LAMP	LEFT STOP/TAIL
DS16	40015R/40002R	4" TAIL LAMP	RIGHT STOP/TAIL
DS17	15009	LICENSE LAMP	LICENSE PLATE LIGHT
DS18	10205R	REFLECTOR LAMP, RED	IDENTIFICATION RIGHT
DS19	10205R	REFLECTOR LAMP, RED	IDENTIFICATION LEFT
DS20	10205R	REFLECTOR LAMP, RED	IDENTIFICATION CENTER
DS21	26331	PANEL LAMP	CONTROL PANEL, L.H.
DS22	26331	PANEL LAMP	CONTROL PANEL, R.H.
DS23	64181	RECT QUARTZ HALOGEN LAMP	WORK LIGHT
DS24	64181	RECT QUARTZ HALOGEN LAMP	WORK LIGHT
J1	59S-7	RECEPTACLE, 7 PIN	FRONT MAIN CONNECTOR
J2		PART OF HARNESS ASSEMBLY	
<u>J2</u> J3		PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY	BUMPER CONNECTOR
<u>J2</u> <u>J3</u> J4	<u></u> 59S-7	PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN	BUMPER CONNECTOR REMOTE, FRONT
<u>J2</u> J3 J4 J5	<u></u> 59S-7 59S-7	PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN	BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR
<u>J2</u> <u>J3</u> <u>J4</u> <u>J5</u> J6	<u></u> 59S-7 59S-7 59S-7 59S-7	PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN	BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR REMOTE, CURB REAR
<u>J2</u> J3 J4 J5 J6 J7	<u></u> <u>59S-7</u> <u>59S-7</u> <u>59S-7</u>	PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY	BUMPER CONNECTOR BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR REMOTE, CURB REAR ENGINE PANEL LIGHT
<u>J2</u> J3 J4 J5 J6 J7 J8	<u></u> <u>59S-7</u> <u>59S-7</u> <u>59S-7</u> <u></u>	PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY	BUMPER CONNECTOR BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR REMOTE, CURB REAR ENGINE PANEL LIGHT WORK LIGHTS
<u>J2</u> J3 J4 J5 J6 J7 J8 L1	 59S-7 59S-7 59S-7 	PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY PART OF AIR SOLENOID VALVE	BUMPER CONNECTOR BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR ENGINE PANEL LIGHT WORK LIGHTS WINCH IN
J2 J3 J4 J5 J6 J7 J7 J8 L1 L2	 59S-7 59S-7 59S-7 	PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY PART OF AIR SOLENOID VALVE PART OF AIR SOLENOID VALVE	BUMPER CONNECTOR BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR ENGINE PANEL LIGHT WORK LIGHTS WINCH IN WINCH OUT
J2 J3 J4 J5 J6 J7 J8 L1 L2 L3	 59S-7 59S-7  	PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY PART OF AIR SOLENOID VALVE PART OF AIR SOLENOID VALVE PART OF AIR SOLENOID VALVE	BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR REMOTE, CURB REAR ENGINE PANEL LIGHT WORK LIGHTS WINCH IN WINCH OUT ENGAGE
J2 J3 J4 J5 J6 J7 J8 L1 L2 L2 L3 L4	 59S-7 59S-7  	PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY PART OF AIR SOLENOID VALVE PART OF AIR SOLENOID VALVE PART OF AIR SOLENOID VALVE PART OF AIR SOLENOID VALVE	BUMPER CONNECTOR BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR REMOTE, CURB REAR ENGINE PANEL LIGHT WORK LIGHTS WINCH IN WINCH OUT ENGAGE RELEASE
J2 J3 J5 J6 J7 J8 L1 L2 L2 L3 L4 L5	 59S-7 59S-7  	PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY PART OF AIR SOLENOID VALVE PART OF AIR SOLENOID VALVE	BUMPER CONNECTOR BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR REMOTE, CURB REAR ENGINE PANEL LIGHT WORK LIGHTS WINCH IN WINCH OUT ENGAGE RELEASE TILT UP
J2 J3 J4 J5 J6 J7 J7 J8 L1 L2 L2 L3 L4 L5 L6		PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY PART OF AIR SOLENOID VALVE PART OF AIR SOLENOID VALVE	BUMPER CONNECTOR BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR REMOTE, CURB REAR ENGINE PANEL LIGHT WORK LIGHTS WINCH IN WINCH OUT ENGAGE RELEASE TILT UP TILT DOWN
J2 J3 J4 J5 J6 J7 J7 J8 L1 L2 L3 L3 L4 L5 L6 L7		PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY PART OF AIR SOLENOID VALVE PART OF AIR SOLENOID VALVE	BUMPER CONNECTOR BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR ENGINE PANEL LIGHT WORK LIGHTS WINCH IN WINCH OUT ENGAGE RELEASE TILT UP TILT DOWN AXLE LOAD
J2 J3 J4 J5 J6 J7 J7 J8 L1 L2 L3 L2 L3 L4 L5 L6 L6 L7 L8		PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY PART OF AIR SOLENOID VALVE PART OF AIR SOLENOID VALVE	BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR REMOTE, CURB REAR ENGINE PANEL LIGHT WORK LIGHTS WINCH IN WINCH OUT ENGAGE RELEASE TILT UP TILT DOWN AXLE LOAD AXLE TRANSPORT
J2 J3 J4 J5 J6 J7 J7 J8 L1 L2 L3 L4 L5 L6 L7 L8 S1	 59S-7 59S-7      	PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY PART OF AIR SOLENOID VALVE PART OF AIR SOLENOID VALVE	BUMPER CONNECTOR BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR ENGINE PANEL LIGHT WORK LIGHTS WINCH IN WINCH OUT ENGAGE RELEASE TILT UP TILT DOWN AXLE LOAD AXLE TRANSPORT WORK LIGHT
J2 J3 J4 J5 J6 J7 J8 L1 L2 L3 L4 L5 L6 L6 L7 L8 S1 S2		PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY PART OF AIR SOLENOID VALVE PART OF AIR SOLENOID VALVE	BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR REMOTE, CURB REAR ENGINE PANEL LIGHT WORK LIGHTS WINCH IN WINCH OUT ENGAGE RELEASE TILT UP TILT DOWN AXLE LOAD AXLE TRANSPORT WORK LIGHT IN-UP-LOAD-ENGAGE
J2 J3 J4 J5 J6 J7 J8 L1 L2 L3 L4 L2 L3 L4 L5 L6 L7 L7 L8 S1 S2 S3	 59S-7 59S-7      	PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY PART OF AIR SOLENOID VALVE PART OF AIR SOLENOID VALVE	BUMPER CONNECTOR BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR REMOTE, CURB REAR ENGINE PANEL LIGHT WORK LIGHTS WINCH IN WINCH OUT ENGAGE RELEASE TILT UP TILT DOWN AXLE LOAD AXLE LOAD AXLE TRANSPORT WORK LIGHT IN-UP-LOAD-ENGAGE OUT-DOWN-TRANSPORT-RELEASE
J2 J3 J4 J5 J6 J7 J8 L1 L2 L3 L4 L5 L6 L7 L8 S1 S2 S3 S4	 59S-7 59S-7      	PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY PART OF AIR SOLENOID VALVE PART OF AIR SOLENOID VALVE	BUMPER CONNECTOR BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR REMOTE, CURB REAR ENGINE PANEL LIGHT WORK LIGHTS WINCH IN WINCH OUT ENGAGE RELEASE TILT UP TILT DOWN AXLE LOAD AXLE LOAD AXLE LOAD AXLE LOAD AXLE TRANSPORT WORK LIGHT IN-UP-LOAD-ENGAGE OUT-DOWN-TRANSPORT-RELEASE SELECTOR SWITCH
J2 J3 J4 J5 J6 J7 J8 L1 L2 L3 L4 L5 L6 L7 L8 S1 S2 S3 S4 S5		PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY PART OF AIR SOLENOID VALVE PART OF AIR SOLENOID VALVE	BUMPER CONNECTOR BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR REMOTE, CURB REAR ENGINE PANEL LIGHT WORK LIGHTS WINCH IN WINCH OUT ENGAGE RELEASE TILT UP TILT DOWN AXLE LOAD AXLE TRANSPORT WORK LIGHT IN-UP-LOAD-ENGAGE OUT-DOWN-TRANSPORT-RELEASE SELECTOR SWITCH IN-OUT
$\begin{array}{c} J2 \\ J3 \\ J4 \\ J5 \\ J6 \\ J7 \\ J8 \\ L1 \\ L2 \\ L3 \\ L4 \\ L5 \\ L6 \\ L7 \\ L8 \\ S1 \\ S2 \\ S3 \\ S4 \\ S5 \\ S6 \\ \end{array}$		PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY PART OF AIR SOLENOID VALVE PART OF AIR SOLENOID VALVE DART OF REMOTE CONTROL PART OF REMOTE CONTROL	BUMPER CONNECTOR BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR REMOTE, CURB REAR ENGINE PANEL LIGHT WORK LIGHTS WINCH IN WINCH OUT ENGAGE RELEASE TILT UP TILT DOWN AXLE LOAD AXLE TRANSPORT WORK LIGHT IN-UP-LOAD-ENGAGE OUT-DOWN-TRANSPORT-RELEASE SELECTOR SWITCH IN-OUT UP/DOWN-ENGAGE/RELEASE
$\begin{array}{c} J2 \\ J3 \\ J4 \\ J5 \\ J6 \\ J7 \\ J8 \\ L1 \\ L2 \\ L3 \\ L4 \\ L5 \\ L6 \\ L7 \\ L8 \\ S1 \\ S2 \\ S3 \\ S4 \\ S5 \\ S6 \\ S7 \\ \end{array}$		PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY PART OF AIR SOLENOID VALVE PART OF AIR SOLENOID VALVE DART OF REMOTE CONTROL PART OF REMOTE CONTROL	BUMPER CONNECTOR BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR REMOTE, CURB REAR ENGINE PANEL LIGHT WORK LIGHTS WINCH IN WINCH OUT ENGAGE RELEASE TILT UP TILT DOWN AXLE LOAD AXLE TRANSPORT WORK LIGHT IN-UP-LOAD-ENGAGE OUT-DOWN-TRANSPORT-RELEASE SELECTOR SWITCH IN-OUT UP/DOWN-ENGAGE/RELEASE LOAD/TRANSPORT-UP/DOWN
J2 J3 J4 J5 J6 J7 J8 L1 L2 L3 L4 L5 L6 L7 L6 L7 L8 S1 S2 S3 S4 S5 S6 S7 S8		PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY PART OF AIR SOLENOID VALVE PART OF REMOTE CONTROL PART OF REMOTE CONTROL	BUMPER CONNECTOR BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR REMOTE, CURB REAR ENGINE PANEL LIGHT WORK LIGHTS WINCH OUT ENGAGE RELEASE TILT UP TILT DOWN AXLE LOAD AXLE TRANSPORT WORK LIGHT IN-UP-LOAD-ENGAGE OUT-DOWN-TRANSPORT-RELEASE SELECTOR SWITCH IN-OUT UP/DOWN-ENGAGE/RELEASE LOAD/TRANSPORT-UP/DOWN
J2 J3 J4 J5 J6 J7 J8 L1 L2 L3 L4 L5 L6 L7 L8 S1 S2 S3 S4 S5 S6 S7 S8 TB1		PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY PART OF AIR SOLENOID VALVE PART OF REMOTE CONTROL PART OF REMOTE CONTROL	BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR REMOTE, CURB REAR ENGINE PANEL LIGHT WORK LIGHTS WINCH IN WINCH OUT ENGAGE RELEASE TILT UP TILT DOWN AXLE LOAD AXLE TRANSPORT WORK LIGHT IN-UP-LOAD-ENGAGE OUT-DOWN-TRANSPORT-RELEASE SELECTOR SWITCH IN-OUT UP/DOWN-ENGAGE/RELEASE LOAD/TRANSPORT-UP/DOWN TENSION ENGAGE/RELEASE PRIMARY JUNCTION BOX
J2 J3 J4 J5 J6 J7 J8 L1 L2 L3 L4 L5 L6 L7 L8 S1 S2 S3 S4 S5 S6 S7 S8 TB1 TB2		PART OF HARNESS ASSEMBLY PART OF HARNESS ASSEMBLY RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN RECEPTACLE, 7 PIN PART OF LIGHT ASSEMBLY PART OF LIGHT ASSEMBLY PART OF AIR SOLENOID VALVE PART OF REMOTE CONTROL PART OF REMOTE CONTROL	BUMPER CONNECTOR REMOTE, FRONT REMOTE, STREET REAR REMOTE, CURB REAR ENGINE PANEL LIGHT WORK LIGHTS WINCH IN WINCH OUT ENGAGE RELEASE TILT UP TILT DOWN AXLE LOAD AXLE TRANSPORT WORK LIGHT IN-UP-LOAD-ENGAGE OUT-DOWN-TRANSPORT-RELEASE SELECTOR SWITCH IN-OUT UP/DOWN-ENGAGE/RELEASE LOAD/TRANSPORT-UP/DOWN TENSION ENGAGE/RELEASE PRIMARY JUNCTION BOX ACCESSORY JUNCTION BOX

Note: 40015R tail lamp has a reflector and should be used with bumper w/o reflective tape. 40002R tail lamp has no reflector and should be used with bumper with reflective tape.





## 4-7 SUSPENSION MAINTENANCE

#### 4-7.1 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.

#### 4-7.2 Air Ride Suspension

a. Physically check all nuts, bolts, and air line fittings for proper torque (see torque charts below).

AIR SUSPENSION TORQUE CHART					
Size	1"**	1-1/8"	1/2"	3/4"*	3/4"
Torque	680	800	35	35	150
in Ft.Lbs.					

\* Air Spring Connections Only.

\*\* Not included on AR93 suspension.

**b.** Check all other suspension components for any sign of damage, looseness, wear or cracks.

c. With trailer on level surface and air pressure in excess of 65 PSI, all air springs should be of equal firmness. The height control valve on each side controls all air springs on their respective sides.

4-7.3 Air Ride Suspension Height Adjustment. (See Figure 4-5 for parts identification).

a. Before adjusting, vehicle must be empty with the

kingpin at operating height and air supplied to the semitrailer.

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

c. Position a 2-1/2" wood block between the axle caps and frame.

d. Lower the trailer 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 4-5).

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 trailer air system, and raise the trailer. 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 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.



Fig. 4-6 Checking Axle for Bend

## 4-8 ALIGNMENT

4-8.1 Wheel Alignment



TO PREVENT A POTENTIALLY LIFE THREATENING ACCIDENT:

1. SUPPORT TRAILER AND UNDER-CARRIAGE SO TIRES ARE OFF THE GROUND. 2. SUPPORT THE TRAILER AND UN-DERCARRIAGE ON JACK STANDS WITH SUFFICIENT CAPACITY TO SUP-PORT THE TOTAL WEIGHT OF THE TRAILER AND ANY LOAD WHICH IT MAY BE CARRYING.

When trailer tires show signs of scuffing, featheredging 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 trailer 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 4-6).

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 4-6).

d. Follow the same procedures as in Paragraph 4-8.1 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, thus if it is found to have positive or negative camber, axle replacement is necessary (see Figure 4-7 for examples of camber).

#### **Axle Alignment** 4-8.2

Proper axle to king pin alignment is necessary to obtain straight tracking. If axle alignment is off, "dogtracking" occurs. Check alignment manually or by using a trailer 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 trailer 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 trailer and jack the trailer

up sufficiently to permit measuring from the underside of the trailer.

- 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 4-8).
- 5. Measure (D1) to the other end of the axle in the same manner as in Step 4. Record this measurement (See Figure 4-8).
- 6. It is usually necessary to set D about 1/8" shorter than D1 to insure proper trailer tracking on slope of road.
- 7. In all cases, all suspensions must be in good repair with no binding or other restrictions before the alignment process can be undertaken properly. 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 4-8.2a.
- 3. After proper alignment has been obtained, tighten the suspension pivot bolt nut to the torque listed in the table in paragraph 4-7.2, and reweld the washer.
- 4. Align the rear axle to the front axle. Locate the welded washer for the rear axle in front of the drivers side equalizer beam. Cut this washer loose and loosen the suspension pivot bolt. The rear axle should be parallel with the front axle, with the dimensions Y and Y1 being the same.



Fig. 4-8 Checking Axle Alignment

- 5. Tighten the suspension pivot bolt nut to the torque listed in the table in paragraph 4-7.2, and reweld the washer.
- c. Spring Suspension Axles

SPRING SUSPENSION TORQUE CHART				
Size	1"	7/8"	7/8" U-BOLT	1/2"
Torque in Ft.Lbs.	480-500	250	300	55-60

- 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 4-8.2a.
- **3.** Tighten the axle U-bolts to the torques listed in the above table.
- 4. Tighten the front axle torque arm clamp bolts to the torque listed in the above table.
- 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 the above table.
- 7. Tighten the rear axle torque arm clamp bolts to the torque listed in the above table.

#### 4-9 BRAKE SYSTEM MAINTENANCE



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

4-9.1 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 valve 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



Fig. 4-9 Drain Valve Locations

relieved, causing the emergency or parking brakes to be applied (see Figure 4-9).

#### 4-9.2 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 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 EM-PLOYS A SPRING WITH HIGH FORCES. SERVICE SHOULD NOT BE AT-TEMPTED. SERIOUS INJURY OR DEATH MAY RESULT.

- a. Caging the Power Spring
- 1. Chock the trailer wheels.
- 2. Remove dust cap from spring brake chamber.
- 3. Remove the release bolt from it's 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



Fig. 4-10 Brake Lining Wear

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 trailer 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 trailer 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 4-9.2 a.
- 4. Disconnect the slack adjuster from the connecting rod by removing the clevis pin (See Figure 4-12).
- 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 4-9.2 a.
- 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. Position the breather hole in the downward facing position by loosening the clamp bands on the spring brake chamber and rotating 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 4-12).

#### 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 minimum of 90 psi and apply 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.

### 4-9.3 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.



REPAIR OR REPLACEMENT OF THE RELAY/EMERGENCY VALVE IS A COM-PLEX OPERATION AND SHOULD BE PERFORMED BY TRAINED SERVICE PERSONNEL. IF THE RELAY OR EMER-GENCY VALVE NEEDS REPAIR, CON-TACT A LANDOLL AUTHORIZED SERV-ICE CENTER OR THE LANDOLL FAC-TORY FOR SERVICING.

#### 4-9.4 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).



## DO NOT ALLOW GREASE TO CON-TACT BRAKE LININGS AS THIS COULD RESULT IN REDUCED BRAKING PER-FORMANCE.

a. Brake Adjustment. This trailer is equipped with automatic slack adjusters which compensate for brake lining wear and keep brakes adjusted. Brakes should not be adjusted manually except when relining brakes.

b. Disassembly for 12-1/4" X 7-1/2" Brakes (see Figure 3-0)

- 1. Release brakes and back off slack adjuster.
- 2. Remove slack adjuster lock ring and slack adjuster.
- 3. Remove drum assembly (see page 18).
- 4. Remove anchor pin anti-rotation bolt.
- 5. Remove anchor pin retainers and washers.
- 6. Remove anchor pins and brake shoes.
- 7. Remove brake return springs.
- 8. Remove roller pin retainers.
- 9. Remove roller pins and rollers from shoes.
- 10. Remove camshaft bushings and seals from spider.
- 11. After removing the shoes, completely inspect all brake components, servicing as necessary.
- c. Reassembly for 12-1/4" X 7-1/2" Brakes
- 1. Install new camshaft bushing and seals into the spider.

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

- 2. Install cam roller assemblies onto the brake shoes.
- 3. Install "D" shaped camshaft washer onto the camshaft.
- 4. Install the camshaft 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 shoes, anchor pins and spacers onto spider. Install anchor lock rings.

NOTE: Always use all new springs when servicing brakes.

- 6. Install retractor spring.
- 7. Tighten anchor pin anti-rotation screw.
- 8. Connect slack adjuster to brake chamber pushrod.
- 9. Adjust automatic slack adjuster as outlined on page 15.

d. Disassembly for 16-1/2" X 7" Brakes (see Figure )

1. Release brakes and back off slack adjuster.

- 2. Remove slack adjuster lock ring and slack adjuster.
- 3. Remove drum assembly (see page 18).
- 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.
- 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.
- Remove camshaft lock ring, spacer washer(s) and camshaft.
- 9. After removing the shoes, completely inspect all brake components, servicing as necessary.

e. Reassembly for 16-1/2" X 7" Brakes (see Figure )

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 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 slack adjuster to brake chamber pushrod.
- 8. Adjust automatic slack adjuster as outlined on page 18.



## Fig. 4-11 Axle and Brake Assembly

#### 4-9.5 Automatic Slack Adjusters.

The semitrailers automatic slack adjusters provide the means for routine brake adjustment to compensate for lining wear. Inspect slack adjusters every 2,000 miles to assure correct operation.

#### a. Operational Check

- 1. Block wheels to prevent vehicle from rolling.
- 2. Check that the push rod is fully retracted, apply air to release spring brake.
- 3. Turn adjustment hex counterclockwise to create an excessive clearance condition. (A ratcheting sound will occur.)
- 4. Make a full service brake application. On release, allow sufficient time for brake to fully retract. During the brake release, observe rotation of the adjustment hex (attach a wrench on the hex to make this movement easier to see). This rotation indicates that an excessive clearance condition has been determined by the slack adjuster, and it is making an adjustment to compensate. On each subsequent brake release the amount of adjustment and push rod travel will be reduced until the desired clearance is achieved
- 5. The push rod stroke should be 1 1/2" to 2" with an 80 to 90 PSI service brake application.
- 6. Measure the movement of the push rod from the completely released position to the applied position by marking the push rod where it exits the air chamber before and after application.

7. If the brakes have been running tight, the control arm location should be checked.



IF THE ADJUSTER APPEARS NOT TO BE OPERATING, CHECK THE FOUNDA-TION BRAKE FOR PROPER FUNCTION AND ELIMINATE ANY BINDING. RE-CHECK THE AUTOMATIC SLACK AD-JUSTER. IF THE ADJUSTER IS NOT FUNCTIONING, THE UNIT MUST BE RE-PLACED BECAUSE FAILURE OF PROPER ADJUSTMENT FUNCTION WILL RESULT IN LOSS OF BRAKES.

#### b. Replacing Slack Adjuster

- 1. Chock wheels to prevent vehicle from rolling. Release spring and service brake. Air chamber push rod must be fully released.
- 2. To maintain a fully released parking brake, a minimum of 80 psi reservoir pressure must be maintained. If air pressure is not available the spring brake must be manually caged.



Fig. 4-12 Slack Adjuster (Haldex)

# c. Replacing Haldex Slack Adjuster (See Figure 4-12)

- 1. Remove cotter pin and clevis pin, snap ring and anchor stud. Slide old adjuster off cam shaft.
- 2. Apply "Anti-Seize" type lubricant to spline of cam shaft.
- 3. Install the new slack adjuster onto the cam shaft with the adjusting hex pointing away from the brake chamber. Rotate adjustment hex clockwise until adjuster arm enters clevis and holes line up.
- 4. Install clevis pin. Do not install cotter pin at this time.
- 5. Secure adjuster to cam shaft with snap ring.
- 6. Rotate control arm away from adjustment hex, towards the air chamber until it comes to an internal stop. Proceed with adjustment.

## d. Adjusting Haldex Slack Adjuster

1. The Installation Indicator must fall within the slotted area with the brake released.

- 2. Place anchor stud through slotted plate, lock nut and control arm bushing.
- 3. Tighten lock nut (40 to 50 ft.-lbs.). Be sure control arm does not move out of position, and the Installation Indicator remains within the slotted area.
- 4. Manually adjust by rotating adjuster hex clockwise until lining contacts the drum, then counterclockwise 1/2 of a turn. A minimum of 13 ft.lbs. is necessary to overcome the clutch. Ratcheting sound will occur.
- 5. To check adjustment, release spring and service brake, with full air pressure. Installation Indicator should be within the slotted area. Remove clevis pin and check that the clevis hole and adjuster hole remain aligned. If not repeat steps 1 through 5.
- 6. When adjustment is correct install cotter pin into clevis pin.



Fig. 4-13 Slack Adjuster (Crewson Brunner)

e. Replacing Crewson Brunner Slack Adjuster (See Figure 4-13)

- 1. Remove the existing slack adjuster and clevis -DO NOT REMOVE EXISTING JAM NUT.
- Install the new clevis (with 1/2" pin) onto the push rod up to the jam nut -DO NOT TIGHTEN JAM NUT.
- 3. Fit the installation guide over the s-cam splines so the 1/2" pin slots face the air chamber.
- 4. Swing the guide into the clevis until the appropriate slot totally engages 1/2" pin.
- 5. Observe the guide pointer arrow: If the guide pointer is <u>above</u> the clevis, rotate clevis counterclockwise for alignment.

If the guide pointer is <u>below</u> the clevis, rotate clevis clockwise for alignment.

- 6. Reposition clevis until the guide pointer aligns with the clevis pointer.
- 7. Verify by engaging 1/4" pin through the clevis and guide.
- 8. Tighten jam nut to 50 ft.-lbs. torque min.
- 9. Remove the guide from S-cam shaft.
- 10. If the push rod threads extend through the clevis

more than 1/16", remove clevis and cut rod to length.

- 11. If the push rod is not fully engaged in clevis body, install a new push rod cut to length.
- 12. Install the slack adjuster on the S-cam shaft.
- 13. Rotate the manual adjuster shaft clockwise until the slack adjuster arm holes align with the clevis. Install 1/2" and 1/4" pins and cotter pins.

## f. Adjusting Crewson Brunner Slack Adjuster

- 1. Rotate the manual adjuster clockwise until brake shoes contact drum.
- 2. Back off manual adjuster 1/2 turn. (counterclockwise)
- 3. Manually uncage the spring brake.
- 4. Build up vehicle air pressure.
- 5. Fully apply and release the brakes several times to check for adequate clearance to all adjacent components.
- 6. Measure the distance from air chamber to  $1/2^{"}$  pin. Apply brakes with 80-90 psi air pressure and remeasure distance to  $1/2^{"}$  pins.
- 7. The stroke (difference of these two measurements) must be less than 2 inches.

#### 4-10 HUB AND DRUM MAINTENANCE

4-10.1 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.

**4-10.2** 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 RE-SULT IN AN ACCIDENT.

4-10.3 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.

4-10.4 Replace the hub and drum as follows (see Figures 4-15, 4-16 and 4-14):

a. For outboard mount hub and drum remove the brake drum (see Figure 4-15). It may be necessary to release slack adjuster. For inboard mount (see Figure 4-16) and spoke wheel (see Figure 4-14) remove drum after hub.



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 SIGNIFI-CANTLY REDUCE THE PERFORM-ANCE, SERVICE LIFE, AND/OR SAFETY OF YOUR VEHICLE.

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.

g. If hub is to be reused, clean it thoroughly.

h. Insert bearing cups into hub.

i. Install drum to the hub or wheel unless drum is outboard mount.

j. 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. **k.** For hub and drum, make sure 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.

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

m. Install inner bearing, cone, and seal.

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

**n.** 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.



## FAILURE TO USE THE CORRECT STUD ON THE CORRECT SIDE MAY CAUSE LOOSENING OF THE HUB STUDS DUR-ING OPERATION, RESULTING IN LOSS OF A WHEEL.

o. 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. **p.** 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.

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

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

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

t. For Outboard Mounted Brake Drum (see Figure 4-15) 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.





Fig. 4-15 Outboard Mount Hub and Drum



## 4-11 WHEEL BEARING LUBRICATION AND ADJUSTMENT

With trailer 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, which ever occurs first.

#### 4-11.1 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-lb, 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-lb while rotating the wheel, in order 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-lb. End-play of .001" to .010" must be present in the adjusted wheel bearing assembly.



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.

**k.** Install hub cap with new gasket and fill with oil to the full mark. Use 90 weight gear oil.

1. Adjust automatic slack adjuster as outlined on page 18.

**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.



Fig. 4-17 Tire Inflation Examples

### 4-12 TIRE MAINTENANCE.

4-12.1 Tire Inflation. Tire inflation will cause tire to ground contact characteristics as shown in Figure 4-17. 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 trailer VIN plate located on the front of the semitrailer. This 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.

**4-12.2 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 4-19).

b. Straight Edge or String Method: (This method can not be used if tire and wheel assemblies are not mounted on the axle.) Jack trailer 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 4-18).

#### 4-12.3 Mounting Tire and Wheel (Hub Type)

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 4-20).

**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. For ball seat mounted wheels only, install the inner capnuts on the studs and tighten to fifty foot-pounds using the sequence illustrated in Figure 4-21. 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 same sequence in **Figure 4-21**.

e. For pilot mounted wheels skip steps c and d.

f. 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.

g. Install the outer capnuts (ball seat) or flange nut (pilot mount) and tighten to 50 foot-pounds using the sequence in Figure 4-21. Then tighten to full torque of 450 to 500 foot-pounds for ball seat and 450 to 500 foot-pounds for pilot mount, using the same sequence.

**h.** Torque will drop after the first 50 to 100 miles of operation. Check the capruts or flange nuts for proper torque after this interval and retighten them. Loosen the outer capruts and retighten the inner and outer capruts per steps d to g.



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



Fig. 4-19 Measuring Tape Method



Fig. 4-18 Straight Edge Method



Figure 4-20 Mounting Tires and Wheels





4-25



Figure 4-22 Mounting Tires on Spoke Wheels

#### 4-12.4 Mounting Tire and Rim (Spoke Wheel)

**a.** Slide the inside rim over the wheel so the 28° mounting surfaces mate. Be sure the valve stem is pointing out and is centered between two spokes.

**b.** Slide the rim spacer over the wheel and against the inner rim. If the spacer is damaged, replace with a new spacer.

c. Slide the outer rim over the wheel. Be sure the valve stem is pointing in and is centered between the same spokes as the inner valve stem.

d. Install the rim clamp and nuts. Lightly tighten the rim nuts until they are properly seated.

e. After they are properly seated, tighten the rim nuts

one-quarter turn at a time, in the order illustrated in Figure 4-21 to a torque of 200 to 250 foot-pounds.

**f.** Check your rim alignment by placing a block of wood or other object on the floor and rotating the wheel. If the variation exceeds 1/16" for the front wheels or 1/8" for the rear wheels, the rim is not properly mounted. To correct the problem, loosen the nut on the side with the greatest deviation and tighten the nuts opposite to this nut. Recheck the torque.

g. Check space between dual wheels. Side walls should not be in contact.

**h.** Torque will drop after the first 50 to 100 miles of operation. Check the captus or flange nuts for proper torque after this interval and retighten them.

#### **4-13 DOCK LEVELERS**

**4-13.1** Perform the following service procedure on a yearly basis:

a. Change oil with legs fully extended.

**b.** After oil change, operate the dock leveler at least three full cycles (complete leg strokes) to bleed air from system.

c. Fully extend legs. Clean extended legs. Coat lightly with clean grease and grease alemite fitting on each leg and check valve.

**d.** Check all hydraulic lines and fittings for leaks and worn spots. Replace any defective lines and fittings.

e. Check for loose bolts and nuts.

#### 4-13.2 Disassembly/Assembly Procedure

When disassembling and reassembling the leg, care should be taken to keep all parts clean and to prevent parts from being damaged. All seals should be coated lightly with grease before reassembling the leg.

#### 4-13.3 Leg (See Figure 4-23)

a. To remove leg from trailer disconnect the air supply at the gladhand. Bleed off any pressure existing in the system by cycling the master valve back and forth until air is no longer exhausted from the master valve.

**b.** Disconnect the hoses from the leg.

c. To disassemble leg, first remove the check valve assembly (1-14) or the lock valve assembly. Remove o-rings (16 and 18) and back-up washer (17). Using a snap ring pliers, remove snap ring (19). Loosen hex screw (38).

d. Lift well tube (36) off lower leg assembly. Lift piston rod (27) to gain access to top of cylinder head (26).

**e.** Remove four hex screws (22). Lift cylinder head retainer (20). A wire or rubber band may be used to hold (19) to sprocket near the top of the piston rod. Using a small, flat screwdriver, carefully remove spiral retaining ring (21). Lift piston rod assembly out of cylinder tube (29). Using a large snap ring pliers, remove heavy duty snap ring (30). Pull off piston (28), cylinder head (26), retaining ring (21) and cylinder head retainer (20).

f. Before reassembling leg, remove all seals and wear rings. Clean all parts. Inspect all bearing surfaces and sealing surfaces for scratches, nicks or other defects, replace if necessary. Replace all wear rings and lightly lubricate all seals before reassembly. Carefully reassemble the leg reversing the order described above.

g. Return leg to trailer and reconnect all hoses. Apply grease to grease fitting (34) and cycle legs fully several times to bleed air from system. Check oil level.

#### 4-13.4 Check Valve (See Figure 4-23)

a. The check valve may be removed from the leg by unscrewing the check valve body (1) from the piston rod (27). To do this without removing the leg from the trailer requires 2" clearance above the check valve. Make sure all pressure is relieved before check valve is removed.

**b.** To disassemble the check valve remove the plug (4) with o-ring (2). Remove piston (5) and spring (3). Remove o-rings and back-up washer (6,7, and 8). Use a 5/16" punch through the piston bore to drive out the cartridge assembly by the lip at the bottom of the piston stem bore. Remove o-ring (15).

c. Clean all parts and inspect piston O.D., spool O.D. and check valve body bores for scratches, nicks or other defects. Replace if necessary.

**d.** Reassemble by turning the check valve body upside down on a bench. Place the insert top (14) into the counterbore flat side down. Place o-ring (15) into the shallow counterbore being certain that the o-ring is "seated". Place the o-ring washer (11) into the insert body (13) flat side down. Place teflon o-ring (10) into the insert body on top of the o-ring washer. Drop the spring (12) into insert body followed by the 3/8" dia. steel ball (9). The ball will snap into place. Place the insert body assembly into the counterbore in the check valve body and use a large punch and light hammer to drive the insert body in place.

e. Turn check valve body right side up and put in new check valve o-ring and back-up washer (7 and 8). Polish and lubricate piston and piston bores, grease and install new o-ring (6) and reassemble. Reinstall on leg and connect hoses. Cycle legs several times to bleed air from system. Check oil level.



Fig. 4-23 Dock Leveler Leg Assembly

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Fig. 4-24 Lock Valve

#### 4-13.5 Lock Valve (See Figure 4-23)

a. Remove retaining plug (1D).

**b.** Remove o-ring plug (1E) opposite item 1D on rectangular block.

c. Using a drift small enough to fit through the port opened in the previous step, tap out the lock valve cartridges (1C).

d. Install new lock valve cartridges back to back (as illustrated). Grease o-rings.

e. Install two new o-rings and two back-up washers (1B and 1H) on retaining plug (1D).

f. Thread retaining plug (1D) into body (1A) (tap gently to engage threads). Torque plug (1D) to 15 ft.lbs.

g. Install new o-ring on plug (1E), opposite retaining plug (1D). Thread plug into body. Torque to 70 in.lbs.

**h.** Replace spring and poppet (1F and 1G) replace the O-ring on plug (1E) and reinstall.

i. Install new o-rings and back-up washers on top of piston rod (2, 3, 4, and 5).

j. Thread lock valve on piston rod until firmly seated. If the ports need to be relocated, loosen the screw at the top of the well tube and turn lock valve clockwise until ports are at the desired location. Retighten the set screw.

#### 4-14 WINCHES

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 trailer 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.

### 4-15 CRANK LANDING GEAR

**4-15.1** It may be necessary to periodically lubricate to maintain satisfactory performance.

a. Lube both legs through grease fittings provided in the legs two times a year or as required.

**b.** Lube two-speed gears through the grease fitting in the gearbox two times a year or as required.

#### 4-15.2 Gearbox Dismantling (see Figure 4-25)

a. Remove all rust from shafts (1) and (2) and lubricate for easier removal of gearbox cover (3).

**b.** Remove gearbox cover (3) by removing bolts and nuts (5).

c. To remove shaft (1), shaft must be free of rust. Lubricate and tap out from mounting bracket side. Remove shifter gear (14) by removing spiral pin (12) and pin (15). Also remove shifter spring (13) after shaft (1) has been removed.

d. Remove shaft (8) and step gear (9).

e. Remove all worn, bent or broken parts.

#### 4-15.3 Leg Dismantling

**a.** Disconnect cross shaft (36) by removing nuts and bolts (37) and remove the landing gear from the trailer.

**b.** Remove all rust from projecting end of shaft (1,2 or 35) and lubricate for easy removal.

c. Remove screws (16), leg cover (17) and gasket (18).

d. Tap out groove pin (6) from bevel pinion gear (19).

e. Remove shaft (2 or 35) from landing gear making sure not to lose shims (51) or location of shims (51).

f. Next, remove nut (20) from top of elevating screw and inner leg assembly (24).

g. Remove bevel gear (21) from screw in inner leg assembly (24).

h. Tap end of screw with wood block or brass hammer until screw and inner leg assembly (24) drop out. (Be careful not to damage screw threads).

i. Lift out polyethylene bushing (22).

j. Remove thrust bearing (31), thrust washer (32) and woodruff key (50) from screw in assembly. (24).

k. Replace all worn, bent or broken parts.

#### 4-15.4 Leg Assembly

a. Place thrust washer (32) on top of elevating screw. Thrust bearing (31) follows and must be assembled with cup of bearing up.

b. Place outer leg (33 or 34) over screw and nut portion

of inner leg assembly (24). Press down until threaded part of elevating screw is clearly visible through hole in top of the outer leg (33 or 34).

c. Fit polyethylene bushing (22) into place around screw in leg assembly (24) and push all the way down into bearing block.

**d.** Install woodruff key (50) in slot of elevating screw (24) and install bevel gear (21) in place.

e. Secure bevel gear (21). Use Loc-tite on threads of screw and install jam lock nut (20). Make sure bevel gear (21) turns freely.

f. Place bevel pinion gear (19) on top of bevel gear (21) on the opposite side from mounting bracket of single speed outer leg (34), or mounting bracket side of 2-speed outer leg (33).

g. Install shaft (2 or 35) through outer leg (33 or 34). Install shims (51) removed previously and slide shaft (2 or 35) through shims (51) and bevel pinion gear (19).

h. Align holes in bevel pinion gear (19) with hole in shaft (2 or 35), insert groove pin (6) so that shafts turn freely and the two gears are engaged properly.

i. Check for proper shimming. Proper shimming is achieved when the shafts turn freely and there is no more than 1/16" gap between the shims and the outer leg when shaft (2 or 35) is pushed toward the bevel gear.

j. Make sure this assembly is well lubricated with a permanent type lubricant (1/2 pound, minimum).

k. Replace gasket (18), metal cover (17) and self tapping screws (16).

**I.** Install landing gear back on trailer. Adjust both legs to the same length and install cross shaft (36) and bolts and nuts (37). When installing cross shaft make sure there is enough end play and gears crank freely.

#### 4-15.5 Gearbox Assembly

a. To replace shifter gear (14), install pin (15) in shaft (1). Then slide shifter gear on shaft so that recess in shifter gear fits over pin (15). Install spiral pin (12).

b. Insert shaft (1) with gear (14) in lower hole of gearbox and install shifter spring (13) in place.

c. Slide gear (9) on shaft (8) and insert shaft in middle hole of gear box.

**d.** Install step gear (10) on shaft (2) and secure with spiral pin (11).

e. Place idler gear (7) an shaft (8) with shoulder of gear to inside.

**f.** Gears must be coated with permanent type grease in order to obtain successful operation.

g. Replace gasket (4) and gearbox cover (3) and assemble with bolts and nuts (5).



## Fig. 4-25 Crank Landing Gear Assembly

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## **TROUBLESHOOTING GUIDE**

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 4-5.

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

Hydraulic System, Continued

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

5-2

#### 5-3 ELECTRICAL

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 4-6.

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

#### 5-4 TIRES - WHEELS - SUSPENSION

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 4-7, 4-8, and 4-12.

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

5-3

Tires - Wheels - Suspension, Continued

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

#### 5-5 BRAKES

For maintenance procedures see Paragraphs 4-9. SYMPTOM **PROBLEM: REMEDY** 1 NO BRAKES OR BRAKES ARE INTERMITTENT Brake air system improperly connected: Reconnect gladhands properly. Relay/Emergency valve plugged: Clean valve. Defective tractor protection valve: Repair or replace. Restricted tubing or hose line: Locate and eliminate restriction. Broken line: Locate break and repair. Tractor air system failure: Troubleshoot tractor air system and repair. SINGLE BRAKE DRAGGING OR LOCKED Broken internal brake component: Locate and replace broken part. Flat spot on cam roller or cam shaft: Replace and lubricate. Improper adjustment: Adjust slack adjusters. Spider bushing or cam bracket bushing binding: Lubricate or replace bushing. Improper lubrication: Lubricate per Figure 4-1. Worn brake shoe bushing: Replace bushing. Brake drum distortion: Replace drum. Broken brake chamber spring: Replace spring. Brake chamber pushrod binding: Realign brake chamber bracket. Air brake line loose or broken: Tighten or repair. See "SINGLE BRAKE DRAGGING OR LOCKED" UNEVEN BRAKES Restriction in hose: Locate restriction and remove. Worn brake linings: Reline brakes. Grease on linings: Reline brakes. Broken slack adjuster: Replace slack adjuster. Call Factory or see qualified Trailer/Brake Technician. Leaking brake chamber diaphragm: Replace diaphragm. BRAKES APPLY TOO SLOWLY Brakes need adjusting or lubrication: Adjust or lubricate as needed. Low air pressure in brake system (below 90 psi): Check tractor air system. Restricted tubing or hose: Locate restriction and remove. Worn or broken relay valve: Replace. Call Factory or see qualified Trailer/Brake Technician. Brakes need adjusting or lubrication: Adjust or BRAKES RELEASE TOO SLOWLY lubricate as needed. Brake rigging binding: Align brakes or replace bent parts. Exhaust port of relay valve restricted or plugged: Replace valve.

Brakes, Continued

SYMPTOM

Air system improperly connected to tractor: Tighten or ALL BRAKES DO NOT RELEASE adjust connections. Brake valve on tractor is applied: Release brake. Relay emergency valve in emergency position: Check line pressure and check valve. Restricted tubing or line: Locate restriction and remove. Tractor protection valve failure: Troubleshoot tractor air system. Parking brakes locked: Troubleshoot air system. Moisture in air system: Check air system. Brakes need adjusting: Adjust brakes. INSUFFICIENT BRAKES Cams need lubricating: Lubricate cams. Brakes need relining: Reline brakes. Low air pressure: Troubleshoot air system. Relay emergency valve failure: Replace. Brakes overheated: Stop and allow brakes to cool, locate cause of overheating. Grease on brake linings: Reline brakes. BRAKES GRABBING Brake rigging binds: Align brakes or replace bent parts. Brake valve on tractor failed or worn: Replace valve. Relay emergency valve failed or worn: Replace valve. Relay emergency valve leaking: Replace valve. EXCESSIVE LEAKAGE WITH BRAKES RELEASED Leaking tube or hose: Replace part(s). Relay emergency valve leaking: Replace valve. EXCESSIVE LEAKAGE WITH BRAKES APPLIED Leaking brake chamber diaphragm: Replace brake chamber. Call Factory or see qualified Trailer/Brake Technician Leaking tubing or hose: Replace part(s). EXCESSIVE LEAKAGE WITH EMERGENCY SYS- Relay emergency valve failure: Replace valve. TEM ONLY APPLIED - NO LEAKAGE WITH NOR-MAL BRAKING EXCESSIVE WATER PRESENT IN BRAKE SYSTEM Reservoir not drained often enough: Drain reservoir daily. Compressor on tractor passing excessive oil: Refer to EXCESSIVE OIL PRESENT IN BRAKE SYSTEM Tractor Repair manual. Flat spot on cam roller or camshaft: Replace and BRAKE WILL NOT APPLY PROPERLY lubricate. BRAKES WILL NOT APPLY WHEN EMERGENCY Initial air pressure too low: Allow air system to build up to minimum 90 psi and stabilize. LINE IS DISCONNECTED

> Relay valve failure: Replace valve. Air line leak: Locate leak and repair.

Brake chamber leak: Replace brake chamber.

**PROBLEM: REMEDY** 

5-6

#### BRAKE DRUMS 5-6

For maintenance procedures see See Paragraphs 4-10. SVMPTOM

SYMPTOM	PROBLEM: REMEDY
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. Foreign matter in drums: Clean drums out.
ROUGH OR NOISY BRAKING ACTION	Worn drums: 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).
VIBRATION IN RIDE	Worn or out-of-round drums: Replace drums.

#### Out-of-balance drums: Balance drums.

#### **DOCK LEVELERS** 5-7

BOOSTED DOWN AND PRIED UP

For maintenance procedures see See Paragraphs 4-13. SYMPTOM

LEGS LEAK DOWN

#### PROBLEM: REMEDY

Defective check valve seat: Extend legs so that they support the trailer 3-6" above jack stands. Remove both lines at each leg. Wipe any oil from around ports. Leave until oil is noticed leaking from one of the ports. If the TOP PORT leaks, the Check Valve is defective. If the BOTTOM PORT leaks, the leg seals are defective. Reseat ball or replace Check Valve as required.

Defective Leg Seals: See above. Rebuild leg.

Check Valve Piston stuck down: (Leg leaks down fast) Rebuild Check Valve. Polish piston and cavity with fine steel wool.

LEGS WILL NOT FREE TRAVEL AND MUST BE Split collars too tight: Check the gap between the two Split Collar halves. There should be about 1/2". Loosen split collars and retighten to 20 to 25 ft./lbs.

> Swollen or Damaged Seals: Raise the trailer with a trailer jack. Extend legs with booster pump as required. If legs must be boosted over entire stroke, the leg should be rebuilt. If the leg will function normally over part of the stroke, a bent leg is likely. Rebuild legs. Check to see than an approved fluid is being used.

> Bent Piston Rod or other leg parts: If leg operation is tight in only a limited area, this is the most likely reason. Rebuild leg and replace bent parts.

> Kinked or blocked lines: Reroute lines to eliminate kinks and clear out all obstructions in lines.

Dock Leveler, Continued

SYMPTOM	PROBLEM: REMEDY
LEGS EXTEND BUT WILL NOT RETRACT	<b>Dirty or corroded Check Valve Piston:</b> Polish piston and cavity with fine steel wool. <b>Check Valve vent hole plugged:</b> Clear obstruction.
LEGS LEAK FROM RETRACTED POSITION TO GROUND	Master Valve handle left in center position: Keep Master Valve in "up travel " position. Air supply removed: Reconnect air supply.
LEGS FREE TRAVEL BUT LIFT LOAD SLOWLY OR NOT AT ALL	Low oil level in hydraulic tank: Unit lifts load to about the same position each time. If tank level is very low, the unit may not lift at all. Fully retract legs. Fill hydraulic tank to bottom of fill port.

## 5-8 WIRED REMOTE

SYMPTOM	PROBLEM: REMEDY
DOES NOT OPERATE	No power: Check center pin of 7-way connector with voltmeter (+12 VDC). Correct wiring per <i>Tractor Repair manual</i> .
	Remote not plugged in: Plug in remote.
	No current to solenoid: Check wire harness connection to tractor. No air supply to solenoid: Check air line connections.

### 5-9 WIRELESS RADIO REMOTE

To troubleshoot the wireless radio remote, please refer to the owners's manual that was provided with the radio control unit.

## 5-10 WINCH

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

## 5-11 TWO-SPEED CRANK LANDING GEAR

For maintenance procedures see See Paragraphs 4-10.

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SYMPTOM	PROBLEM: REMEDY
LANDING GEAR TURNS HARD	Binding cross shaft: Loosen bolts in the cross shaft to
	allow lateral movement.
	(To determine which leg turns hard, remove the cross shaft and operate each leg individually.)
	Misalignment: Check that leges are parallel and extend
	and retract evenly. Check that crankshaft and crankshaft
	extension are aligned.
	Lack of lubrication: Legs and gearbox may need
	additional lubrication.
	Axle is binding where it goes through legs:
	Damage to nut and screw assembly caused by dropping
	of trailer: Repair or replace damaged parts.
CRANKSHAFT IS JAMMED	Damage to nut and screw assembly caused by dropping of trailer: Repair or replace damaged parts.
CRANKSHAFT JAMS OR SKIPS WHILE TURNING	Worn, broken or missing teeth on gears: Examine all
· · · · · · · · · · · · · · · · · · ·	gears. Replace damaged gears.
WILL NOT STAY IN GEAR WHILE CRANKING	Damaged or worn shifter spring or crankshaft:
	Examine shifter spring and grooves in crankshaft. Repair
	or replace damaged parts.

# NOTES: