CEBM018000

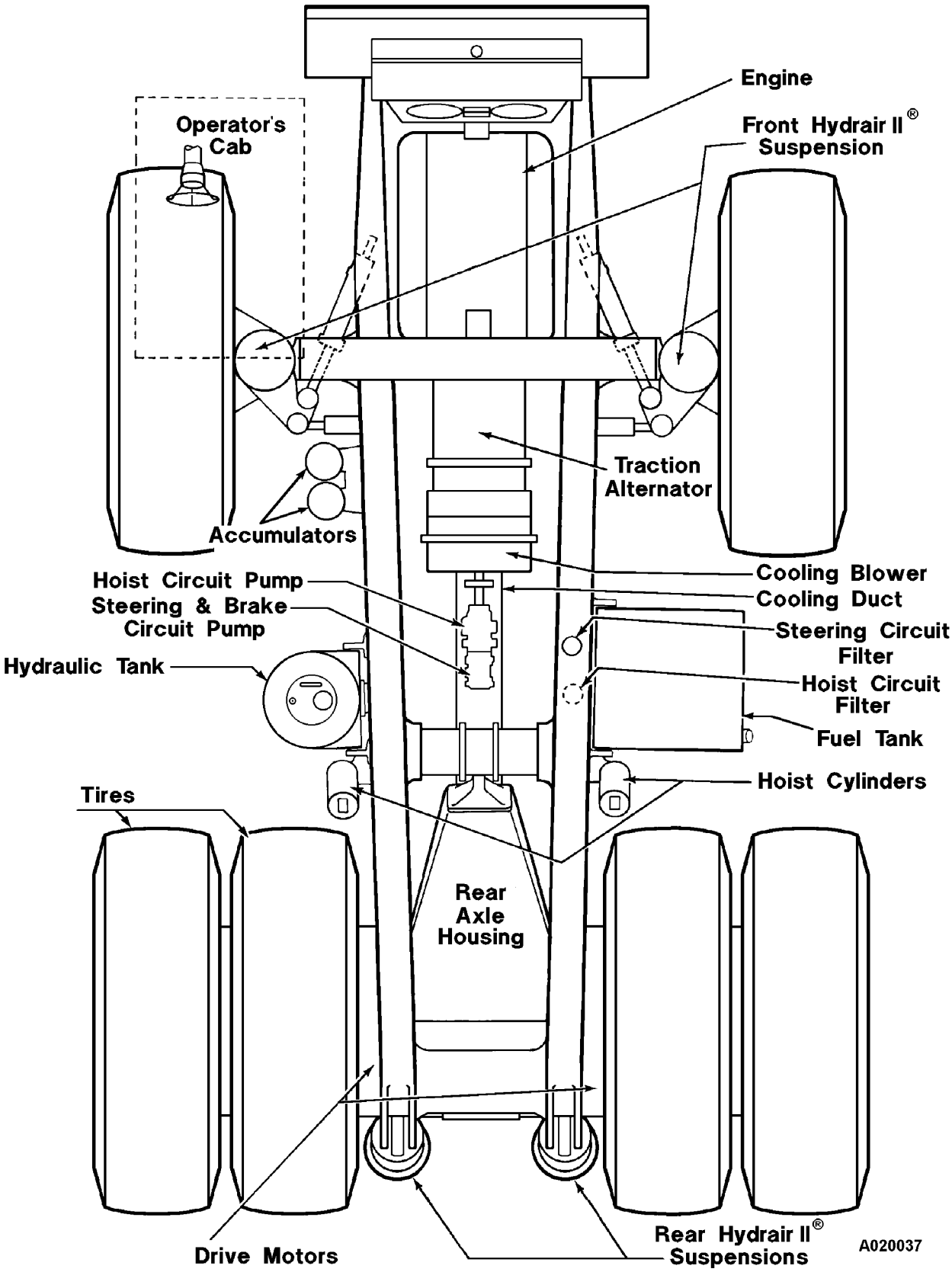
Shop Manual

730E

DUMP TRUCK

SERIAL NUMBERS **A30427 - A30538**

KOMATSU®



730E MAJOR COMPONENTS

- When traveling downhill, use the retarder to reduce speed. DO NOT turn the steering wheel suddenly. DO NOT use the foot brake, except in an emergency.
- If the engine stops on a slope, apply the service brakes fully and stop the machine. Apply the parking brake after the machine has stopped.

Ensuring Good Visibility

- When working in dark places, install work lamps and headlamps.
- Safely stop the truck if visibility is poor, such as in mist, snow, or rain. Wait for the weather to improve to allow safe travel.

Operating On Snow

- When working on snowy or icy roads, there is danger that the machine may slip on even the slightest slope. Travel slowly and avoid sudden starting, turning, or stopping in these conditions.
- Use caution when clearing snow. The road shoulder and other objects may be buried in the snow and cannot be seen. When traveling on snow-covered roads, install tire chains.

Avoid Damage To The Dump Body

- When working in tunnels, on bridges, under electric cables, or when entering an enclosed area where there are height limits, use extreme caution. The dump body must be completely lowered before driving.

⚠WARNING

Driving with a raised dump body, or raising the dump body in an enclosed area, may result in serious damage and bodily injury or death. Drive with the dump body resting on the frame.

Driving Near High-Voltage Cables

- Driving near high-voltage cables can cause electric shock. Maintain the safe distances between the machine and the electric cable, as listed below.

Voltage	Minimum Safe Distance	
6.6 kV	3 m	10 ft
33.0 kV	4 m	14 ft
66.0 kV	5 m	17 ft
154.0 kV	8 m	27 ft
275.0 kV	10 m	33 ft

The following actions are effective in preventing accidents while working near high voltages:

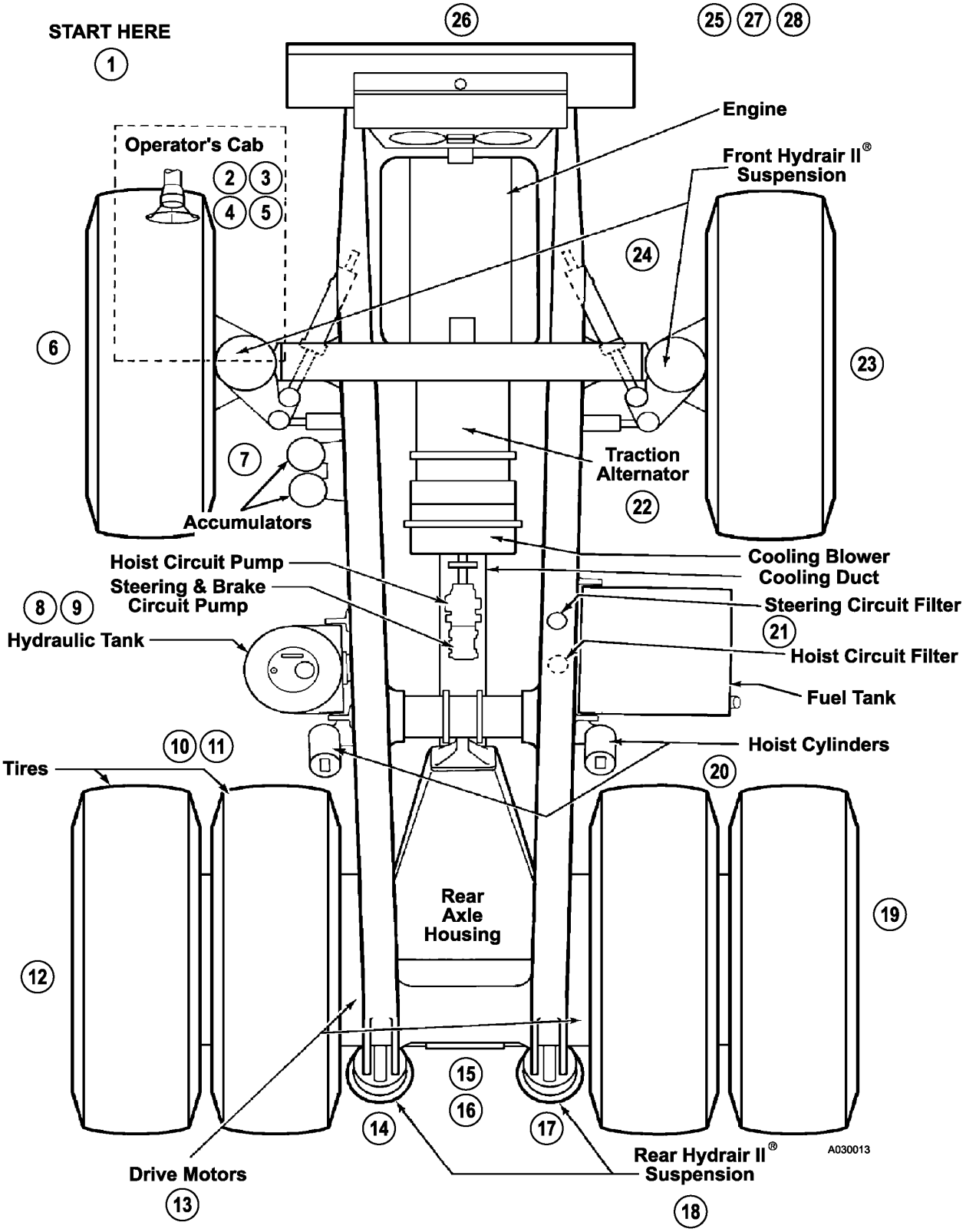
- Wear shoes with rubber or leather soles.
- Use a signalman to give warning if the machine approaches an electric cable.
- If the work equipment must touch an electric cable, the operator must remain in the cab.
- When working near high-voltage cables, DO NOT allow anyone to approach the machine.
- Check with the electrical maintenance department about the voltage of the cables before operating the truck.

When Loading The Truck

- Ensure the surrounding area is safe. If so, stop the machine in the correct loading position and evenly load the body.
- DO NOT leave the operator's seat during loading.

When Dumping

- Before starting, check that there is no person or objects behind the machine.
- Stop the machine in the desired location. Check again for persons or objects behind the machine. Give the determined signal, then slowly operate the dump body. If necessary, use blocks for the wheels or position a flagman.
- When dumping on slopes, machine stability is poor and there is danger of tip over. Avoid dumping on slopes whenever possible.
- DO NOT travel with the dump body raised.


START HERE
1
26
25
27
28
Engine
Operator's Cab
2
3
4
5
Front Hydrair II®
Suspension
24
6
23
7
Traction
Alternator
22
Accumulators
Cooling Blower
Cooling Duct
Hoist Circuit Pump
Steering & Brake
Circuit Pump
8
9
Steering Circuit Filter
21
Hydraulic Tank
Hoist Circuit Filter
Fuel Tank
10
11
Hoist Cylinders
Tires
20
Rear
Axle
Housing
19
12
15
16
14
17
A030013
Rear Hydrair II®
Suspension
Drive Motors
13
18

Testing

This test can only be performed with an empty truck.

1. Ensure no one is near the front tires during this test. Use a spotter to keep the area around the front tires clear of personnel during this test.
2. Start the engine. Allow the hydraulic system to reach full pressure and the accumulators to fill with oil.
3. Shut the engine off by using the engine stop button located on the center console. DO NOT turn the key switch OFF.
4. Turn the steering wheel.
    a. If the front tires respond when the steering wheel is turned, the emergency steering system is functioning properly. Turn the key switch OFF.
    b. If the front tires do not steer, turn the key switch OFF and notify maintenance personnel immediately. DO NOT drive the truck until the problem has been repaired and the truck can pass this test.

If the truck passes this test, the emergency steering system is functioning properly.

STANDARD ASSEMBLY TORQUES For 12-Point, Grade 9 Capscrews (SAE)

The following specifications apply to required assembly torques for all 12-point, grade 9 (170,000 psi minimum tensile) capscrews.

- Capscrew threads and seats shall be lubricated when assembled.

NOTE: Unless the instructions specifically recommend otherwise, these standard torque values are to be used with simple lithium base chassis grease (multi-purpose EP NLGI) or a rust preventive grease (see list, this page) on the threads.

- Torques are calculated to give a clamping force of approximately 75% of proof load.
- The maximum torque tolerance shall be ±10% of the torque value shown.

TABLE II. STANDARD ASSEMBLY TORQUE for 12-Point, Grade 9 Cap screws

CAPSCREW SIZE*	TORQUE ft lbs	TORQUE N•m	TORQUE kg•m
0.250 - 20	12	16	1.7
0.312 - 18	24	33	3.3
0.375 - 16	42	57	5.8
0.438 -14	70	95	9.7
0.500 -13	105	142	14.5
0.562 - 12	150	203	20.7
0.625 - 11	205	278	28.3
0.750 - 10	360	488	49.7
0.875 - 9	575	780	79.4
1.000 - 8	860	1166	119
1.000 - 12	915	1240	126
1.125 - 7	1230	1670	170
1.125 - 12	1330	1800	184
1.250 - 7	1715	2325	237
1.250 - 12	1840	2495	254
1.375 - 6	2270	3080	313
1.375 - 12	2475	3355	342
1.500 - 6	2980	4040	411
1.500 - 12	3225	4375	445
* Shank Diameter (in.) - Threads per inch			
This table represents standard values only. Do not use these values to replace torque values which are specified in assembly instructions.			

STANDARD ASSEMBLY TORQUES For Class 10.9 Capscrews & Class 10 Nuts

The following specifications apply to required assembly torques for all metric Class 10.9 finished hexagon head capscrews and Class 10 nuts.

- Capscrew threads and seats shall not be lubricated when assembled. These specifications are based on all capscrews, nuts, and hardened washers being phosphate and oil coated.

NOTE: If zinc-plated hardware is used, each piece must be lubricated with simple lithium base chassis grease (multi-purpose EP NLGI) or a rust preventive grease (see list, this page) to achieve the same clamping forces provided below.

- Torques are calculated to give a clamping force of approximately 75% of proof load.
- The maximum torque tolerance shall be within ±10% of the torque value shown.

TABLE III. STANDARD ASSEMBLY TORQUE for Metric Class 10.9 Cap screws & Class 10 Nuts

CAPSCREW SIZE*	TORQUE N•m	TORQUE ft lbs	TORQUE kg•m
M6 x1	12	9	1.22
M8 x 1.25	30	22	3.06
M10 x 1.5	55	40	5.61
M12 x 1.75	95	70	9.69
M14 x 2	155	114	15.81
M16 x 2	240	177	24.48
M20 x 2.25	465	343	47.43
M24 x 3	800	590	81.6
M30 x 3.5	1600	1180	163.2
M36 x 4	2750	2028	280.5
* Shank Diameter (mm) - Threads per millimeter			
This table represents standard values only. Do not use these values to replace torque values which are specified in assembly instructions.			

Suggested* Sources for Rust Preventive Grease:

- American Anti-Rust Grease #3-X from Standard Oil Company (also American Oil Co.)
- Gulf Norust #3 from Gulf Oil Company.
- Mobilarma 355, Product No. 66705 from Mobil Oil Corporation.
- Rust Ban 326 from Humble Oil Company.
- Rustolene B Grease from Sinclair Oil Co.
- Rust Preventive Grease - Code 312 from the Southwest Grease and Oil Company.

NOTE: This list represents the current engineering approved sources for use in Komatsu manufacture. It is not exclusive. Other products may meet the same specifications of this list.

3. Inspect tires thoroughly for wear, cuts, and cracks on the treads and side walls.
   a. Any tire suspected of being unserviceable must be removed and thoroughly inspected before being inflated.
   b. If the tires are removed, clean and inspect all the wheel components. All rust and corrosion must be removed and parts repainted, as needed, before mounting the tires.
   c. Mount and inflate the tires, as shown in the Operation and Maintenance manual. Follow all safety rules.
4. Inspect the service brakes carefully. Before disabling the brake circuit, block all the wheels to prevent possible movement of the vehicle.
   a. All brake lines and connections must be clean and free of rust, corrosion, and damage.
   b. When reconditioning the braking system, the service brake hydraulic circuits must be checked out according to the instructions in Section J, Brake Circuit Check-Out procedure.
5. The engine must be inspected and serviced according to the Engine Manufacturer's Operation and Maintenance manuals.
   a. Ensure that the exhaust is clear and clean. If water entry is suspected, disconnect the air tubes at the turbochargers to check for water before attempting to start the engine.
   b. Replace the fuel filters, and fill the filter cans with fresh fuel for engine priming.

⚠CAUTION

Have a new safety filter (secondary) element on hand before removing the old one. DO NOT keep the intake system open to the atmosphere any longer than absolutely necessary.

   c. Replace both the primary and safety filter (secondary) elements in the air cleaners. Check all intake lines between the air cleaners and the engine. All clamps must be tight. The plunger in the filter condition indicators must move freely.
   d. Inspect the tubes in the precleaner section of the air cleaner assembly. Use a light to inspect the tubes. The light must be visible through the end of the tube. If clogging is evident, the precleaner must be cleaned according to the instructions in Section C, Air Cleaners.
   e. Drain and flush the engine cooling system. Fill with coolant and inhibitors after checking all lines, hoses, and connections. Refer to Section P, Lubrication and Service, for antifreeze recommendations. The radiator cores must be clear of dirt and debris.

⚠WARNING

To prevent injuries, release the spring tension before replacing the fan belt.

   f. Check and tighten the engine fan drive belts. If necessary, install a new belt set.
   g. Check and tighten the engine mounts.
6. If fuel was left in the tanks, it must be removed. DO NOT attempt to use old diesel fuel.
   a. With the tanks empty, remove the inspection plates and thoroughly check the interior of the tanks. Remove any sediment and contamination. If the fuel was contaminated, the lines must be disconnected and blown clear.
   b. Check all fuel lines for deterioration or damage. Replace lines, as necessary.
   c. Install the inspection covers with new gaskets.

NOTES

DUMP BODY

Removal

1. Park the truck on a hard, level surface and block all the wheels. Connect the cables and lifting device to the dump body and take up the slack, as shown in Figure 3-1.

⚠WARNING

Before raising or lifting the body, ensure there is adequate clearance between the body and overhead structures or electric power lines.

Body weight can vary substantially, depending on liner plate installation, etc. Ensure the lifting device is rated for at least a 45 ton capacity.

2. Remove the mud flaps and rock ejectors from both sides of the body. Remove the electrical cables, lubrication hoses, etc. attached to the body.
3. Attach chains around the upper end of the hoist cylinders to support them after the mounting pins are removed.
4. Remove pin retainer cap screw (4, Figure 3-2) from each of the upper hoist cylinder mounting eyes. With adequate means of supporting the hoist cylinders in place, remove mounting pins (2).
5. Remove cap screws (4, Figure 3-3) from each pivot pin.

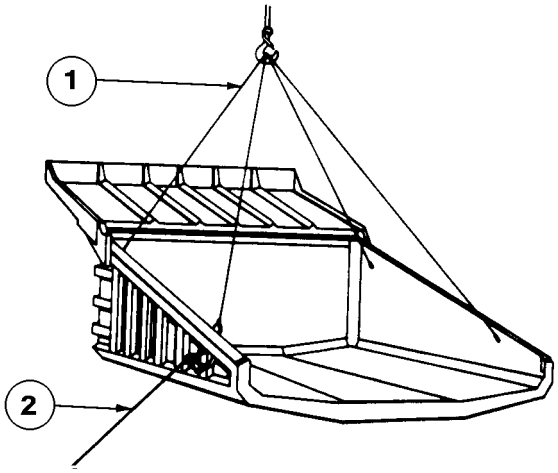


FIGURE 3-1. DUMP BODY REMOVAL

1. Lifting Cables
2. Guide Rope

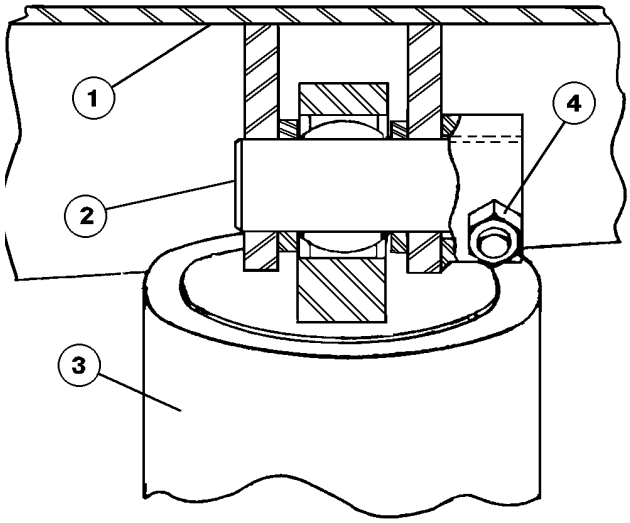


FIGURE 3-2. HOIST CYLINDER MOUNT (UPPER)

1. Dump Body
2. Hoist Cylinder Pin
3. Hoist Cylinder
4. Pin Retainer

6. Remove body pivot pins (6). Spacer shims (3) will drop out as the pin is removed.
7. Lift the dump body clear of the chassis and move to the storage or work area. Block the body to prevent damage to the body guide, pads, etc.
8. Inspect bushings (2) and the pivot pins. Replace the bushings and/or body pivot pins if damaged or worn excessively.

TANK BREATHER VALVE

The fuel tank is vented through the tank breather valve, installed on top of the tank. This valve contains a screen that must be cleaned periodically and reused. The area around the vent must be free of mud and debris that would cover the vent, causing improper fuel suction and return.

Removal

Unscrew breather valve (2, Figure 4-5) from fuel tank (1).

Installation

Screw the breather valve into the tank and tighten securely.

Disassembly

1. Remove spring clamp (4, Figure 4-6) from the outlet.
2. Pull off rubber cover and screen (3).
3. Unscrew nut (5) from the top of the breather valve. Remove cover (6), spring (7), and steel ball (8).
4. Slide valve assembly (9) from the housing.
5. Disengage tapered spring (1) containing three float balls (2) from the valve stem.

Assembly

1. Clean and inspect all the parts. If the valve, body, or springs are damaged, replace the complete breather valve.
2. Install in order; tapered spring, one steel ball, one cork ball, and one hollow aluminum ball.
3. Engage three coils of the spring on the small end of the valve stem with the hollow aluminum ball on the top.
4. Install the valve into the housing.
5. Place steel ball (8) on top of the valve. Install spring (7).
6. Place cover (6) over the spring. Screw on large nut (5).
7. Install rubber cover and screen (3) over the outlet.
8. Install spring clamp (4).

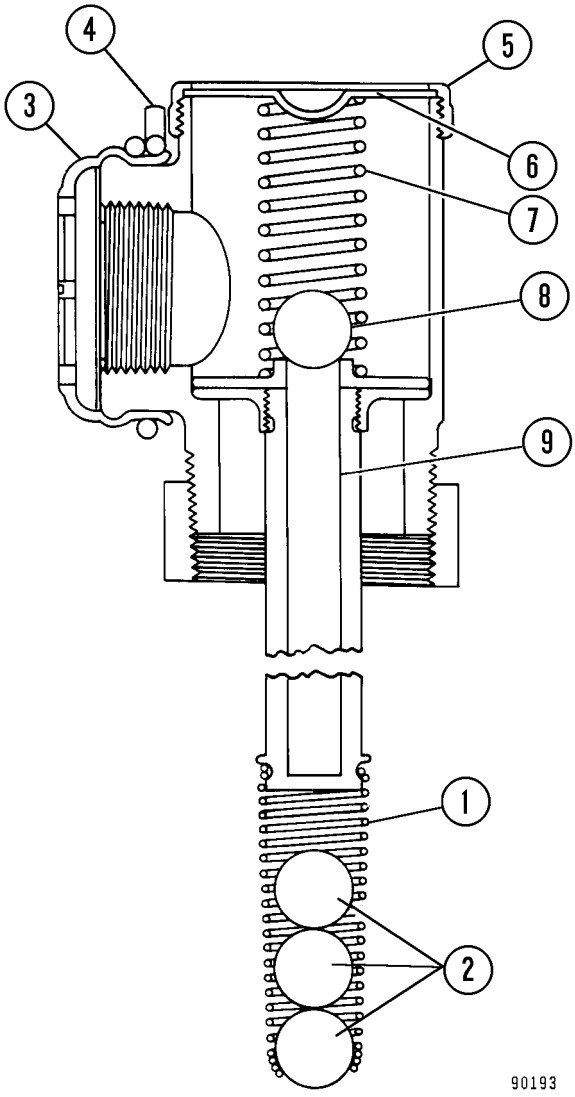


FIGURE 4-6. BREATHER VALVE

1. Tapered Spring
2. Float Balls
3. Cover and Screen
4. Spring Clamp
5. Nut
6. Cover
7. Spring
8. Steel Ball
9. Valve Assembly

14. Lower the rear portion of the subframe until subframe rubber bushings (5, Figure 2-5) are seated in mounting brackets (3) located on the main frame of the truck.
15. After the subframe is seated in the frame mounts, the safety chain may be removed from the front subframe member.
16. Install the cap screws and lock washers in the front mount and tighten the cap screws to **551 N·m (407 ft lb)**. Refer to Figure 2-4.
17. Install the rear subframe mounting caps and secure the caps in place with the lubricated capscrews. Tighten the cap screws to **551 N·m (407 ft lb)**. Refer to Figure 2-5.
18. Install all the ground straps between the frame and subframe.
19. Install vertical and diagonal ladders on the mounting pads at the front bumper.
20. Attach the hoist to the front center deck and lift into position. Install rubber dampeners and attach inner, front deck supports to the grille. Tighten the cap screws to standard torque.
21. Install the air duct supports and connect the exhausts at the engine turbochargers. Connect all the engine air intake ducts. Tighten the clamps securely to ensure a positive seal is made. Refer to Figures 2-3 and 2-9.
22. Connect the cab heater inlet and outlet hoses and open both valves.
23. Connect the wheel motor cooling blower air outlet hose. Tighten all the clamps securely to ensure a positive air seal.
24. Lift the main alternator blower intake duct into position and install the hardware at the mounts. Refer to Figure 2-2.
    a. Install the hardware at the transition to the blower inlet joint, electrical cabinet, and deck mounts.
    b. Install the control cabinet air hose, electrical cables, and any other hoses and wiring removed during power module removal.
    c. Lift the rear, center deck in place and install the hardware.
25. Connect the hydraulic pump drive shaft from the alternator to the companion flange on the pump. Refer to Figure 2-1. Tighten the cap screws to standard torque. Install the drive shaft guard.
26. Connect all the remaining electric, oil, and fuel lines.
27. Connect the air filter restriction indicator hoses.
28. Connect the batteries as follows:
    a. Install battery positive (+) cable.
    b. Install battery ground (-) cable.
    c. Install battery equalizer +24V (input) terminal.
    d. Install equalizer +12V (output) terminal.
    e. Install equalizer GND (-) terminal.
    f. Close the battery disconnect switch.
29. If the truck is equipped with air conditioning, connect the hoses routed from the cab to the receiver/drier and air conditioning compressor.
30. Service the radiator and engine with the appropriate fluids. Refer to Section P for capacity and fluid specifications.
31. Recharge the air conditioner system. Refer to Section N, Operator Comfort - Air Conditioning System.

NOTES

SECTION C5
AIR CLEANERS
INDEX

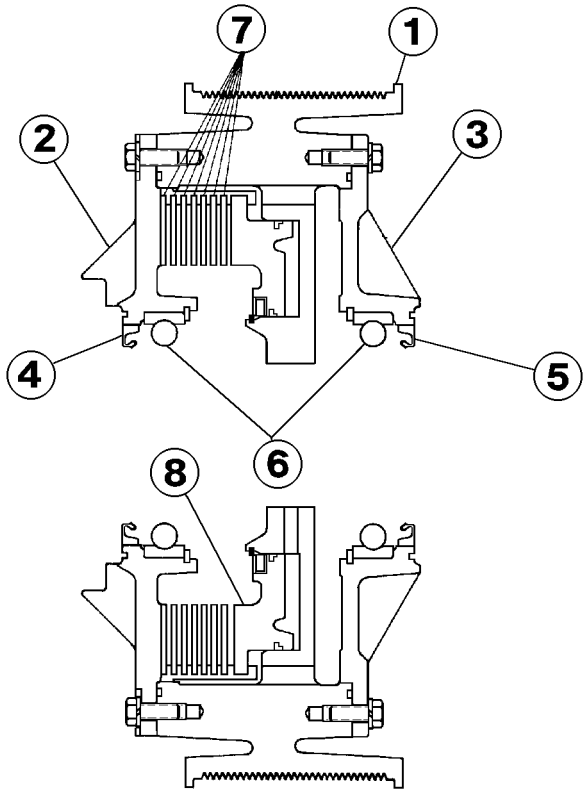


FIGURE 7-2. INPUT COMONENTS

1. Pulley
2. Front Bearing Retainer
3. Rear Bearing Retainer
4. Front Oil Seal
5. Rear Oil Seal
6. Ball Bearings
7. Steel Clutch Plates
8. Clutch Piston

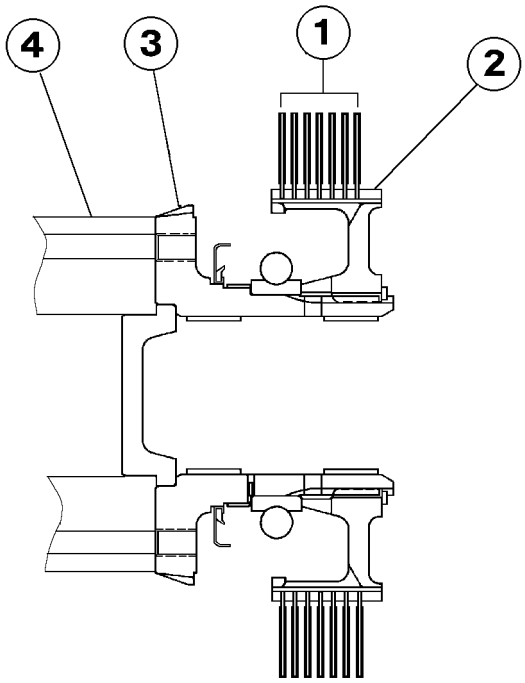


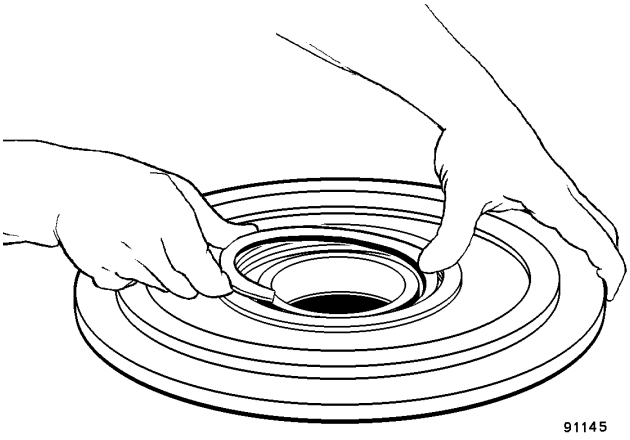
FIGURE 7-3. OUTPUT COMPONENTS

1. Facing Plates
2. Clutch Hub
3. Fan Mounting Hub
4. Fan Spacer

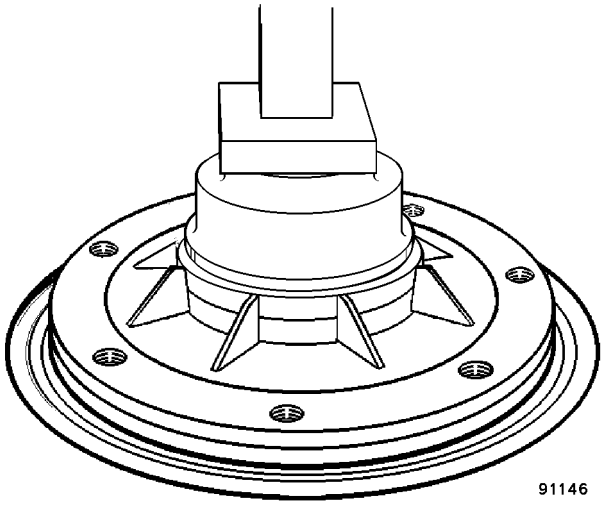
Stationary Components

(Refer to Figure 7-4): Shaft and bracket assembly (1) is bolted to the engine and supports the fan clutch components. Pilot tubes (2) secured to the shaft pump oil from the clutch, directing it back to the oil reservoir (engine oil pan).

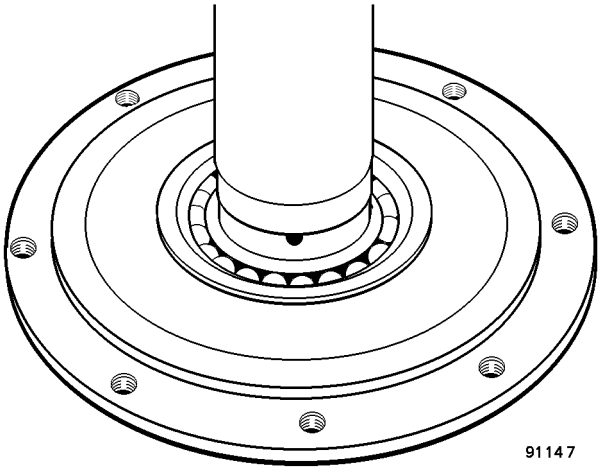
PROBABLE CAUSES	SUGGESTED CORRECTIVE ACTIONS
TROUBLE: Engine runs cold, fan runs continuously at engine speed.	
Control pressure line restricted, not allowing oil to exhaust from clutch.	Relieve restriction.
Cooling system bypassing excessive water.	Repair in accordance with engine manufacturer's recommendations.
Thermostat seal leaking.	Replace seal and/or thermostat.
Thermostat stuck open.	Replace thermostat.
Compressor override system (if vehicle is equipped with air conditioning and override controls).	Check components of the system to ensure false signal is not being sent to solenoid causing full lockup.
TROUBLE: Fan drive cycles off and on continuously at abnormally high rate.	
Coolant level low.	Fill radiator to proper level.
Radiator partially plugged internally or externally causing too much heat retention.	Clean radiator.
Heat range setting of thermostat and thermal sensor not compatible.	Replace either thermostat or thermal sensor with correct temperature setting to obtain proper sequential operation. Refer to Parts catalog.
TROUBLE: Noisy operation	
Noise originating elsewhere, but telegraphing to appear as though fan clutch is noisy.	On some engines, a severe noise originates in the air conditioner compressor and telegraphs thru belts to be heard in fan clutch. Check using steps below. If OK, fan clutch is OK.
Internal wear.	Move fan blade tip in and out between engine and radiator. There must be no forward-rearward movement of the fan mounting hub. If movement exists, replace or repair fan drive. With clutch locked up by an external oil pressure source, rotate fan tip clockwise-counterclockwise. OK if within specs shown in item 9b page M6-5. If excessive movement is found, replace or repair fan drive. Excessive wear has occurred between tangs of steel plates and driving slots in bearing retainer.
TROUBLE: Fan clutch squeals as it engages.	
Bolts securing fan-to-fan mounting hub too long and contacting front retainer.	Remove and replace with bolts of proper length. Grade 8 bolts required. Check to ensure bearings in clutch are not damaged.
Check for forward-reverse and axial movement on fan. If movement exists	Replace or repair fan clutch. Bearings may be failed. Determine cause of oil starvation.



36. Install internal snap ring (25).

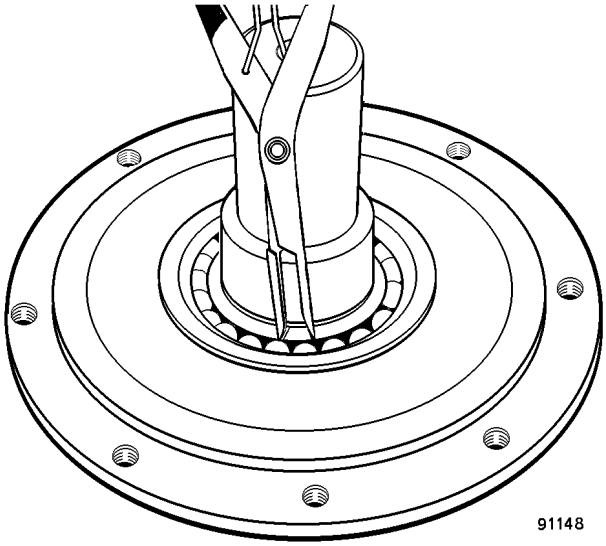


37. Turn the retainer over on the press bed. Coat the O.D. of rear oil seal (24) with Loctite® #290, or equivalent, Install the oil seal in the rear bearing retainer, flush with the rear face.



38. Place the shaft sub-assembly on the press bed. Coat the bearing I.D., O.D., shaft, and bearing retainer bore with Loctite® #609, or equivalent. Install the rear bearing retainer sub-assembly in place on the shaft. Press the bearing onto the shaft until it stops at the bottom of the shoulder.

    Spin the bearing retainer to ensure there is no sound or other indication of contact between the retainer/seal assembly and the bearing retainer. If interference is found, remove the bearing retainer and eliminate the point of interference.



39. Install external snap ring (38).

PART INSPECTION	WEAR LIMITS
(16): Steel Clutch Plates	Must pass between two plate surfaces 280 x 280 mm (11 x 11 in.) spaced 3.30 mm (0.130 in.) apart, set at a 45° angle. Replace if wear on drive surfaces of the external tangs exceeds 0.127 mm (0.005 in.) per side. Minimum thickness: 3.07 mm (0.121 in.). Replace if tracked with grooves, darkened or discolored by heat, damaged, or warped.
Groove for snap ring (8)	3.683 mm (0.145 in.) maximum.
Wear sleeve diameter	Free of Nicks above surface.
Bore for bearings (9) and (10)	74.600 mm (2.9370 in.).
Bearing journal for (5) bearing	94.999 mm (3.7401 in.) minimum.
End cap bore	Free of nicks, 85.80 mm (3.378 in.).
General:	Snap ring grooves must have straight sides and square edges. Bearing bore must not have nicks or scratches which extend above the bore surface. Splines must not be excessively worn. Bolt holes must not be worn or damaged severely.
(9), (10): Sleeve Bearings	Replace if necessary. See Figure 7-8 for information concerning determination of amount of wear.
(1): End Cap	O.D. free of nicks above the surface.

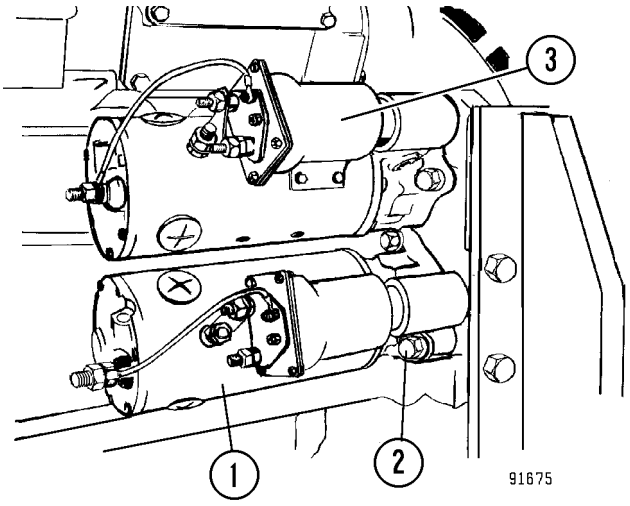


FIGURE 2-1. TYPICAL STARTER INSTALLATION

1. Cranking Motor
2. Cap Screws and Lock Washers
3. Solenoid

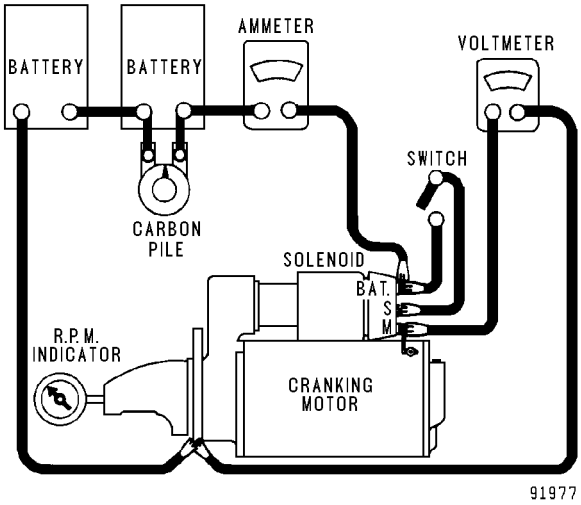


FIGURE 2-2. NO-LOAD TEST CIRCUIT

Installation

1. Align cranking motor (1, Figure 2-1) with the flywheel housing adapter mounting holes and slide into position.
2. Insert motor mounting cap screws and lock washers (2).
3. Connect the previously marked wires and cables to the motor and solenoid terminals.
4. If the truck is equipped with a battery equalizer, install the battery cables:
   a. Install the battery negative (-) cables.
   b. Install the battery positive (+) cables.
   c. Close the battery disconnect switch.

CRANKING MOTOR TROUBLESHOOTING

If the cranking system is not functioning properly, check the following to determine which part of the system is at fault:

Batteries - Verify the proper working condition of the batteries, cables, connections, and charging circuit.

Wiring - Inspect all the wiring for damage or loose connections at the key switch, magnetic switches, solenoids, and cranking motor(s). Clean, repair, or tighten, as required.

If the above inspection indicates the starter motor is the cause of the problem, remove the motor and perform the following tests prior to disassembly. This will determine the condition of the motor and solenoid and possible repairs required.

TROUBLESHOOTING PRELUB STARTER CIRCUIT

Two distinct phases are involved in a complete prelubrication cycle. The two phases are:

1. Prelubrication Phase - Begins when the key switch is held in the START position. A circuit is provided to ground through the normally closed pressure switch. The circuit is interrupted upon opening of the pressure switch when the Prelub pressure reaches 17 kPa (2.5 psi).
2. Delay and Crank Phase - Begins when the pressure switch opens. A three second delay precedes the crank mode.

PROBLEM	PROBABLE CAUSE
• Starter prelubricates only. Does not delay or crank.	• Indicates oil pressure is not sufficient to open the pressure switch. a. No oil or low oil in engine. The pump can not build sufficient pressure to open switch. b. Gear pump failure. c. Pressure switch does not close and remains grounded. d. Oil pressure switch wire chafed and shorting to block.
• Starter prelubricates continuously regardless of key switch position.	• Indicates prelub timer solenoid contacts have welded. a. Low voltage can cause relay failure. b. Jump starting of the vehicle, with a voltage that is higher than was designed for the system, can cause solenoid contacts to weld.
• Starter delays and cranks. No prelubrication mode.	• If the operator indicates the ignition is totally dead, ensure the key is being held in the crank position for three to four seconds. If the engine cranks after a short delay, this indicates that a ground connection to the pressure switch has been broken. Without a ground path, the prelubrication unit will proceed to delay and crank. a. Check the wire to the pressure switch. If the wire is removed or cut, replace it. b. Check the ground strap to engine block. If the ground strap is missing, the block is not grounded. c. Check the pressure switch for an open circuit. Remove the wire, then check for an open circuit between the switch terminal and the switch base. If open, replace the pressure switch.

Coolant Level/Flasher

Coolant level and flasher card (6, Figure 3-2) contains two separate circuits. The flasher circuit at the top of the card has Q12 transistor biased to be saturated when no malfunction is present, resulting in there being 24-Volt positive output on pin H of the card and on wire 12F. When a indicating circuit is activated, the ground side of the circuit connected to card pin K is grounded. Q12 will turn off initially and then after a delay, adjusted by R20, will turn on and off to give the intermittent 24-Volt output.

The other half of the circuitry on the coolant level and flasher card operates the coolant level light. The water level probe connected to terminal B11 grounds the 31L circuit when the coolant in the radiator is above the probe position. The coolant saturates the probe and electrically grounds the circuit. When the circuit is grounded, Q6 transistor is off, resulting in no indication. When the coolant level drops below the probe, 31L is no longer grounded and Q6 turns on to ground the flasher through D5, ground the coolant level light through terminal D11, and ground the alarm horn through D6. The light and alarm horn will operate intermittently as their 24-Volt supply is from circuit 12F, the flasher output.

NOTE: Some electronic engine controls monitor the coolant level. If the engine controls monitor the circuit, a 2KΩ resistor is installed to replace the probe and disable the AID system circuit.

Lamp Test

All of the card circuits are connected to the lamp test switch on the overhead display area. In normal operation, these circuits are open and not functional. When the operator pushes the lamp test switch, it activates all the indicator circuits by grounding them. This is used to verify that all lamps are functional.

BATTERY EQUALIZER BOX

Most truck control and accessory circuits operate at 24VDC. However, a 12VDC power source is available for the cigar lighter socket, power window motors, and AM/FM, communications and dispatch radios.

For this purpose, a battery equalizer system is utilized to obtain the required 12VDC and ensure that the two pairs of 12-Volt, series wired batteries, are charged and discharged equally.

The battery equalizer is mounted in a box on the right-hand deck. This box also contains the 12VDC control relay, 12VDC circuit breaker, and the main battery disconnect switch. See Figure 3-3.

Troubleshooting

Refer to the Battery information in this section of the manual for detailed instructions regarding proper battery maintenance and service procedures. Prior to troubleshooting the battery equalizer system, inspect all battery circuit connections for excessive corrosion, loose cables, ground connections, etc.

Use the following procedure to check the battery equalizer.

1. Check the circuit breakers.
   a. If a circuit breaker has opened, check the circuits and repair the cause.
   b. Reset the circuit breaker.
2. Check the battery voltage with the battery equalizer connected and the engine on.
   a. Verify the battery charging alternator output is 27.8 to 28.2 Volts.
3. If the alternator voltage is outside the above limits, adjust the voltage regulator, as described in the Battery Charging System.
4. With the engine on, verify the voltages at the battery equalizer terminals.
   a. Measure the voltage between the 24-Volt and 12-Volt terminals.
   b. Measure the voltage between the 12-Volt terminal and ground.

PERIODIC MAINTENANCE

Alternator performance depends on the condition of the components in the charging system. The most important components in the charging system are the alternator drive belt, battery, and related cables and connections. A loose drive belt, weak battery, or corroded cables and connections can cause the alternator to work extra hard, leading to overheating and a reduction in performance. When performing any scheduled maintenance on your vehicle, ensure these components are working properly. The alternator itself requires little maintenance.

1. The most important maintenance requirement for an alternator is to keep the air cooling passages free of dirt and obstruction.
2. To ensure that air cooling passages are clean, the alternator can be washed using a garden hose.
3. During washing, avoid spraying high pressure water directly on the regulator and regulator connector. This can cause moisture to get past the seals in the connector and cause performance problems.
4. After washing, dry the alternator by operating the engine and alternator a few minutes. Maintenance requirements for internal components, such as alternator bearings, depend on the application, usage, and environment.

TESTING

GENERAL INFORMATION

Troubleshooting Alternator (On-Truck)

Most 24-Volt charging system problems can be diagnosed with the alternator installed on the truck, operating under normal conditions. Many problems can be attributed to loose or corroded cable connectors. It is essential that all battery charging cables are in satisfactory condition and all connections are clean and securely tightened.

Equipment Required

- Voltmeter, 0-40 Volt range (Digital type preferred)
- Ammeter, 0-400 amp range (Digital, inductive type preferred)
- Jumper wires

Preliminary Checks

Ensure that an undercharged battery condition has not been caused by accessories having been left on for extended periods.

1. Check the alternator drive belt.
2. Ensure the automatic belt tensioner is working correctly.
3. If a battery defect is suspected, check the battery.
4. Inspect the wiring for defects. Check all connections for tightness and cleanliness. Remove and clean the battery cables.
5. The truck is equipped with a battery equalizer system. Verify the proper operation of the equalizer and the individual battery voltages. Refer to Battery Equalizer, Section D, 24VDC Electrical Supply System.
6. Check the (B-) cable, (B+) cable, and alternator-to-regulator wiring harness connections. Repair or replace any damaged component before troubleshooting.
7. Ensure the thermal switch is functioning properly. Refer to the Thermal Switch section in this chapter for additional information.

3. Move the drive lead from pin A (F-) to pin F (F+) in the harness plug. The DMM must show a very high resistance. If the ohmmeter shows less than 100K ohms, the field coil is grounded. Replace the field coil.

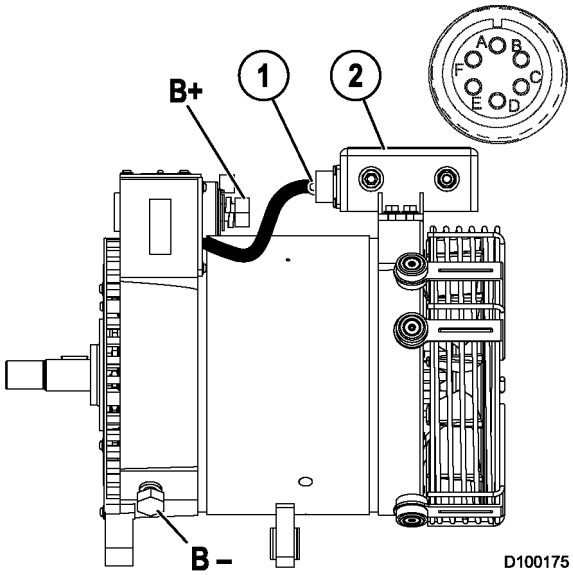


FIGURE 10-14. WIRING HARNESS PLUG JUMPER WIRE CONNECTION

1. Wiring Harness Plug 2. Regulator

STATOR TESTS

These alternators have delta-wound stators. Test 1 will show the condition of the phase lead from the ring terminal at the diode end of the lead to the soldered connection at the phase winding. Test the phase coil windings on a bench stator tester, following the tester's instructions.

Before performing tests:

1. Check the stator for signs of damage, such as burnt insulation or a loose coil.
2. Disconnect the phase lead wire from the mounting terminals.

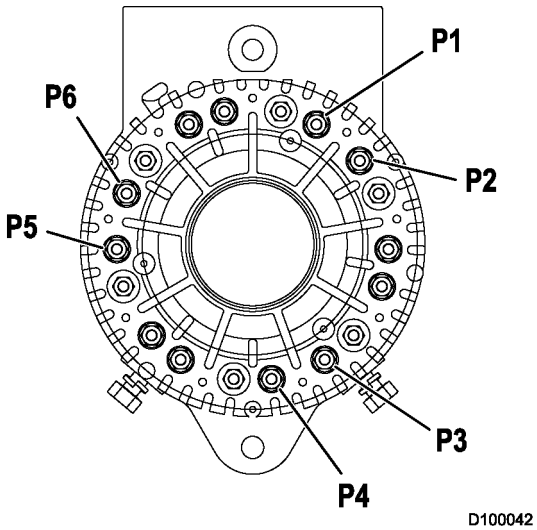


FIGURE 10-15. PHASE LEAD LOCATIONS

Stator Test 1: Check For Stator-To-Stator Continuity

1. Set the DMM to the ohms scale and zero the meter.
2. Connect one meter lead to phase lead P1 (Figure 10-15), connect other meter lead (one at a time) to each phase lead P4, P5, and P6. Repeat for P2 and P3.
3. The DMM must show OL (out of limits) each time. If the DMM shows a value, replace the stator.

Table 10-10: REQUIRED TOOLING
XA3320 Field Coil Removal/Installation Tool
XA3322 Stator Installation Tool
Customer-supplied dealer manufactured support stand
Three jaw gear puller (rotor removal, anti-drive end housing, and anti-drive end shaft bearing)
Air impact wrench (pulley nut and fan nut)
Air chisel with a rounded point hammer bit (to loosen rust from rotor, item 47)
Torque wrench (inch pounds)
Torque wrench (foot pounds)
Torx bit T15 (field coil screws, item 53)
Torx bit T20 (drive end cover plates and control unit cover plates, item 6)
Torx bit T25 (rotor screws, item 46)
Allen socket wrench 3 mm (fan guard, item 69)
Deep well socket 6 mm (nut, item 54)
Socket 8 mm (voltage regulator screws, item 38)
Socket 9 mm (drive end and anti-drive end housings lock flange nuts, item 14)
Socket 11 mm (stator wire hex jam nut, item 11)
Socket 24 mm (fan nut, item 67)
Socket 30 mm (pulley nut, item 1)
Small screwdriver (to release sockets in electrical plug, item 30)
Expandable pliers (studs, item 61, and pulley bushing, item 4)
Internal heavy-duty snap ring pliers (items 8, 10)
Hydraulic Press

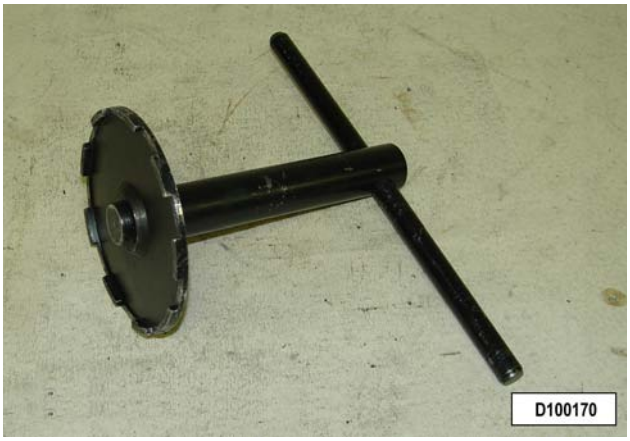


FIGURE 10-24. XA3320 FIELD COIL REMOVAL/INSTALLATION TOOL

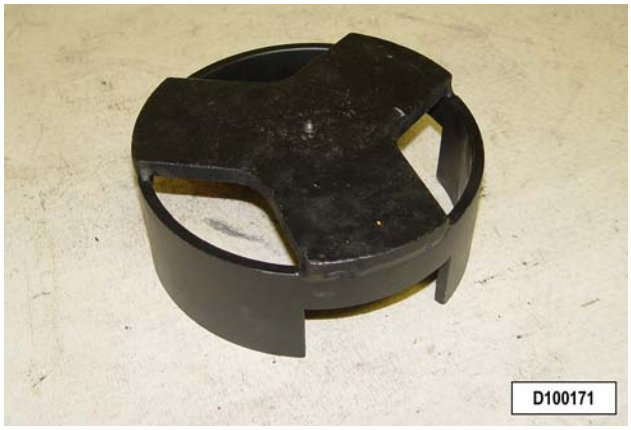


FIGURE 10-25. XA3322 STATOR INSTALLATION TOOL

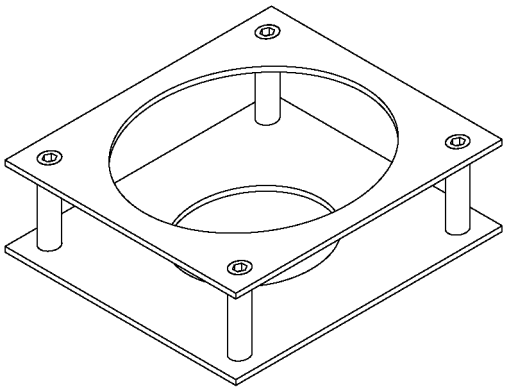


FIGURE 10-26. CUSTOMER-SUPPLIED DEALER MANUFACTURED SUPPORT STAND

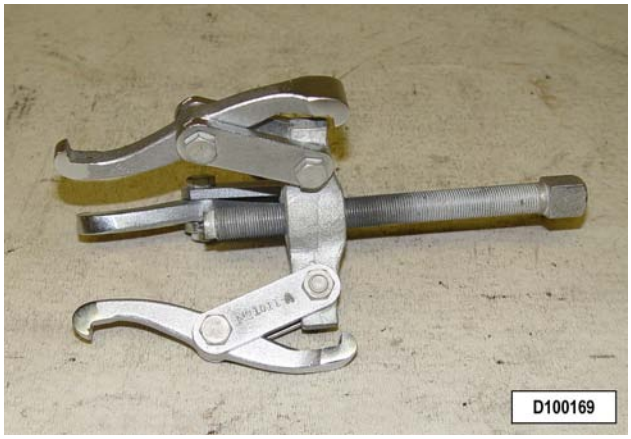


FIGURE 10-27. THREE JAW GEAR PULLER

4. Remove six hex jam nuts (11, Figure 10-54) using an 11 mm socket. Remove the phase leads from the terminals. If necessary, remove flat washers (12, Figure 10-55) and insulators (13).

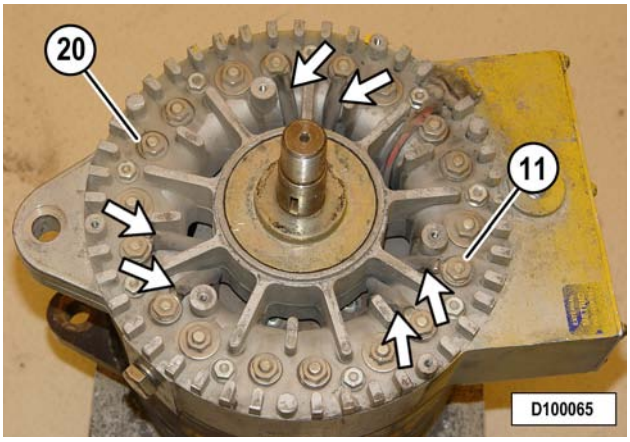


FIGURE 10-54.

11. Hex Jam Nuts 20. Drive End Housing

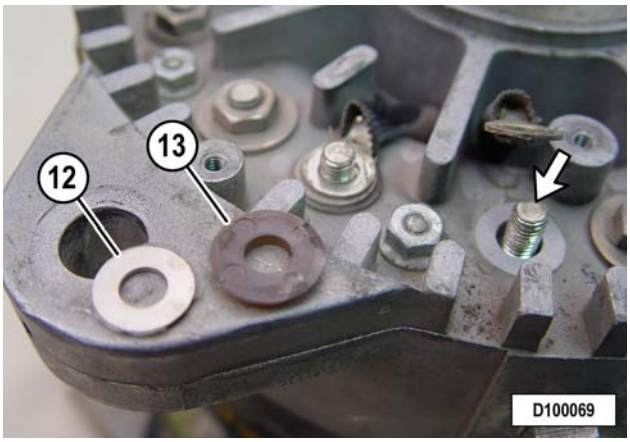


FIGURE 10-55.

12. Flat Washers 13. Insulators

5. Mark the location of the six phase leads for proper reassembly. Place a different identification mark on both the housing and each phase lead terminal.

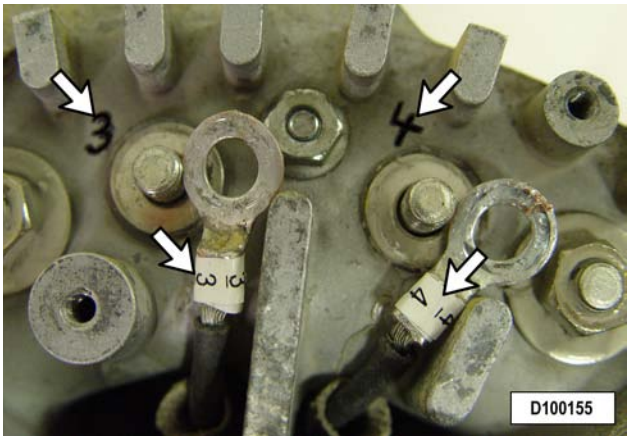


FIGURE 10-56.

6. Remove and discard nine lock flange nuts (14) using a 9 mm socket.

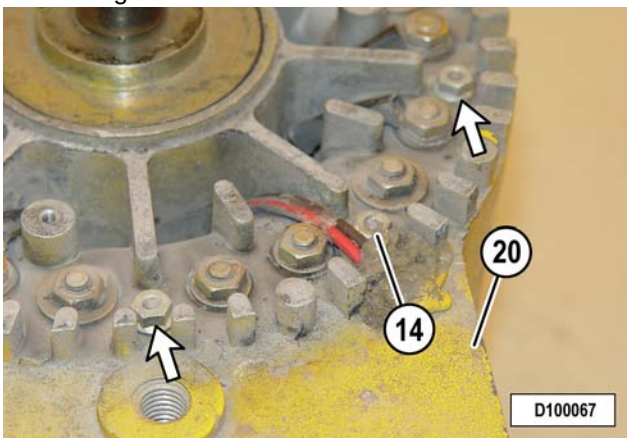


FIGURE 10-57.

14. Lock Flange Nuts 20. Drive End Housing

NOTE: If the drive end stator will not be replaced, route the phase leads from the replacement anti-drive end stator through the corresponding spaces (marked in Step 7a of the Disassembly procedure, page 55) between the drive end stator windings. New insulation sleeves and terminals will be installed on the phase leads during final assembly.

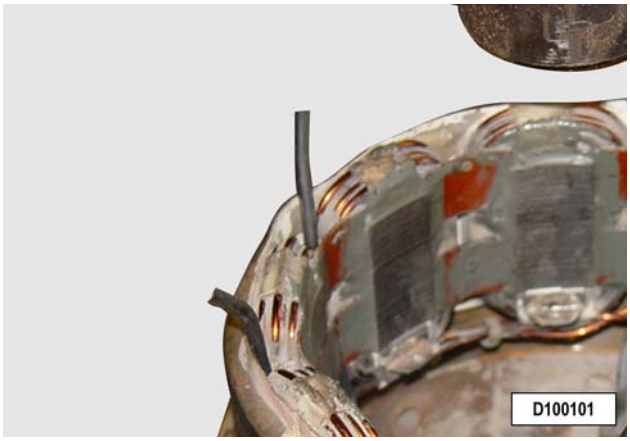


FIGURE 10-89.

3. Align the two scribed marks on the stator with the scribed marks on shell (58). It is critical that these scribed marks be carefully aligned. If the marks are not precisely aligned, the wiring and the mounting holes will not properly align.

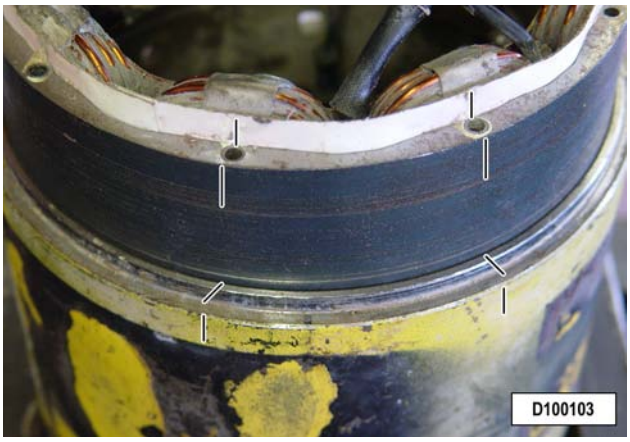


FIGURE 10-90.

4. Insert six alignment studs through the holes in anti-drive end stator (59) aligning them with the holes in drive end stator (56).

.

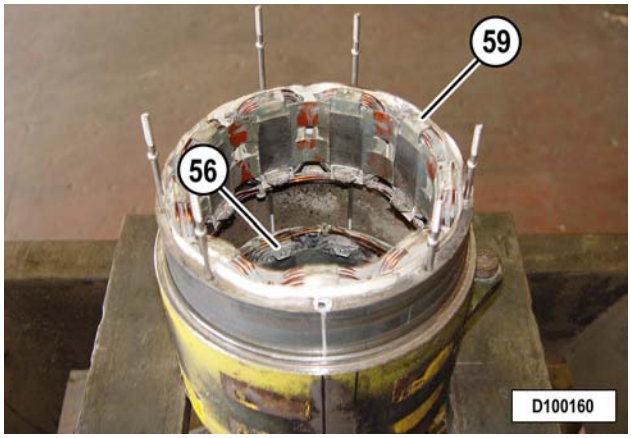


FIGURE 10-91.

56. Drive End Stator

59. Anti-Drive End Stator

5. Place the shell with the stator into a hydraulic press. Place stator installation tool XA3322 on top of the stator.

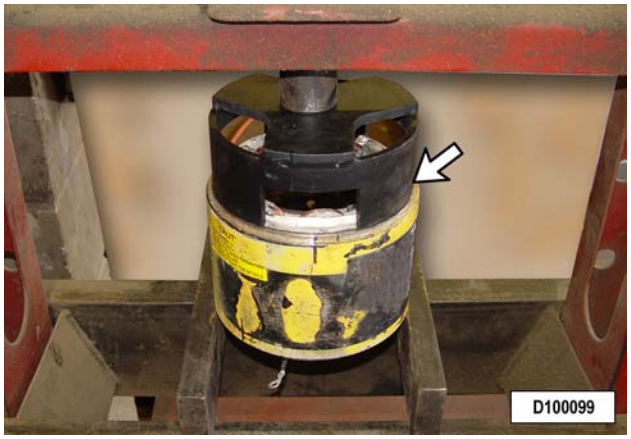


FIGURE 10-92.

7. Lubricate the spiral ring with Komatsu grease XA3401. Wind new spiral ring (5) into the groove around pulley bushing (4).

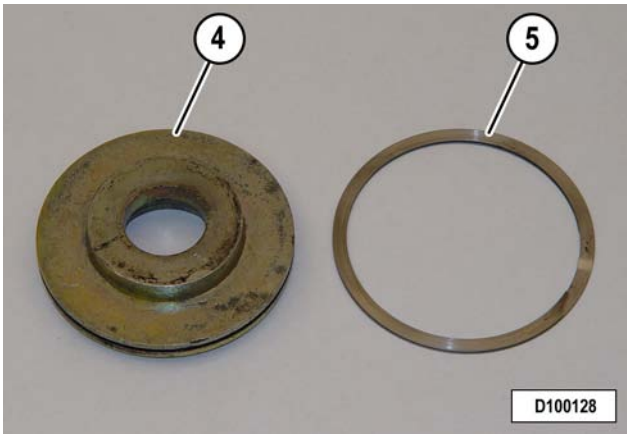


FIGURE 10-125.

4. Pulley Bushing
5. Spiral Ring

8. Compress spiral ring (5) and install pulley bushing assembly (4) into the outside of drive end housing (20). Position the thickest flange of the pulley bushing facing up (towards the outside of the alternator).

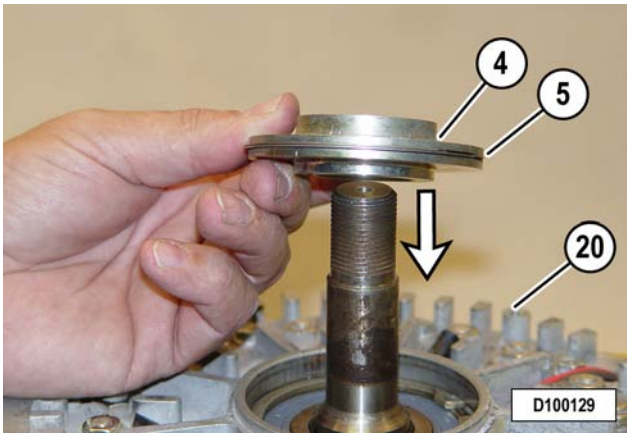


FIGURE 10-126.

4. Pulley Bushing Assembly
5. Spiral Ring
20. Drive End Housing

9. Guide the two field coil leads through the opening in the drive end housing and into the control housing.

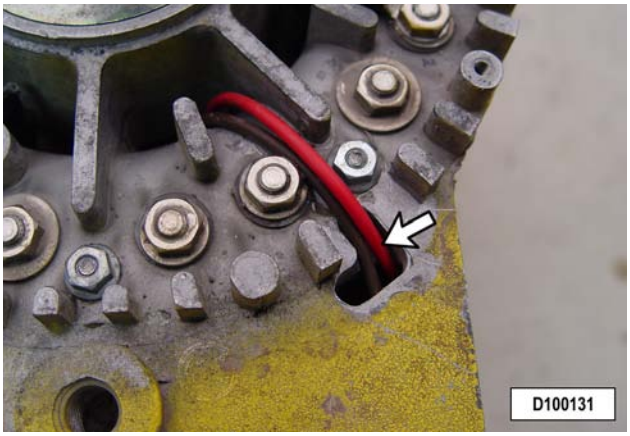
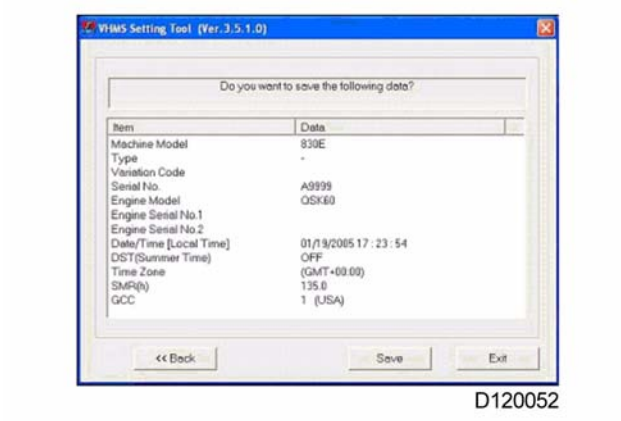


FIGURE 10-127.

Table 6: Alarm and Snapshot Triggers 730E Only (Continued)					
VHMS Fault Code	**VHMS Fault Description**	**Source**	**Sent via OrbComm**	**Snapshot Trigger**	**Model Notes**
C00143	Low Oil Pressure	Engine	X	X	
C00151	High Coolant Temperature	Engine	X	X	
C00155	High IMT LBF	Engine	X	X	
C00158	High IMT LBR	Engine	X	X	
C00162	High IMT RBF	Engine	X	X	
C00165	High IMT RBR	Engine	X	X	
C00214	High Oil Temperature	Engine	X	X	
C00219	Remote Oil Level Low	Engine	X	X	
C00233	Low Coolant Pressure	Engine	X	X	
C00234	Engine Overspeed	Engine	X	X	
C00235	Low Coolant Level	Engine	X	X	
C00555	High Blow-By Pressure	Engine	X	X	
C00641	High Exh Temp #1 LB	Engine		X	
C00642	High Exh Temp #2 LB	Engine		X	
C00643	High Exh Temp #3 LB	Engine		X	
C00644	High Exh Temp #4 LB	Engine		X	
C00645	High Exh Temp #5 LB	Engine		X	
C00646	High Exh Temp #6 LB	Engine		X	
C00647	High Exh Temp #7 LB	Engine		X	
C00648	High Exh Temp #8 LB	Engine		X	
C00651	High Exh Temp #1 RB	Engine		X	
C00652	High Exh Temp #2 RB	Engine		X	
C00653	High Exh Temp #3 RB	Engine		X	
C00654	High Exh Temp #4 RB	Engine		X	
C00655	High Exh Temp #5 RB	Engine		X	
C00656	High Exh Temp #6 RB	Engine		X	
C00657	High Exh Temp #7 RB	Engine		X	
C00658	High Exh Temp #8 RB	Engine		X	

NOTES

3. Click the “Save” button.



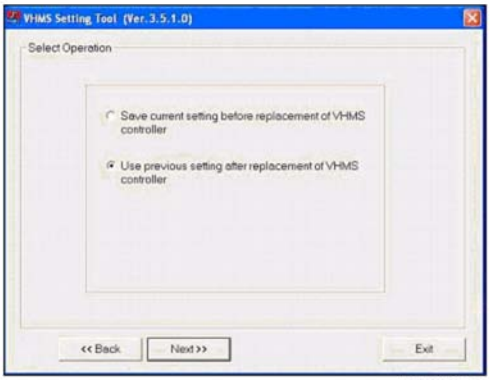
D120052

4. Click the ”OK” button.

D120053

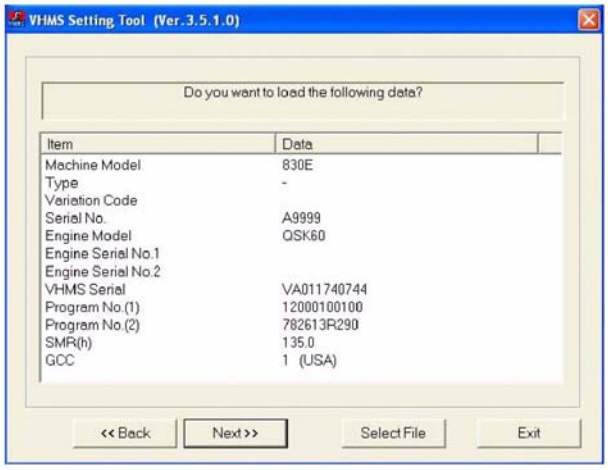
5. Replace the VHMS controller as described elsewhere in this section.

6. Select the “Use previous setting after replacement of VHMS controller” function.



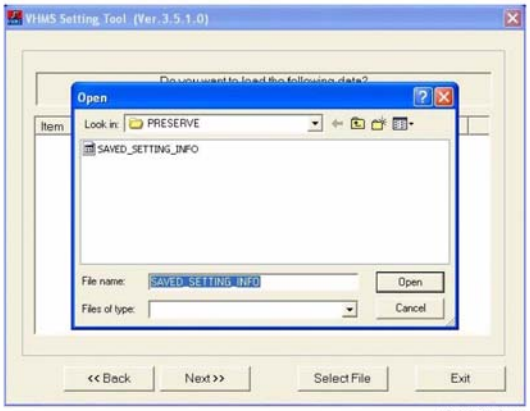
D120054

7. Verify that the data showing is the data to be loaded. Then click the “Next” button.



D120055

8. If the correct data is not showing, click the “Select File” button and choose the correct data. Then click the “Next” button.



D120056

Checking Outputs From The Interface Module

For 830E only:

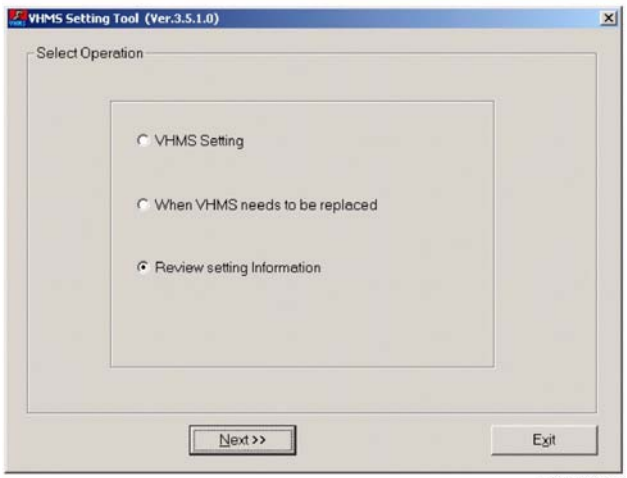
35. Check the high hydraulic temperature lamp by pressing the lamp test rocker switch. The lamp will illuminate.

For 930E & 960E only:

36. Check the output of Brake Cooling RPM Advance 1, Brake Cooling RPM Advance 2, Brake Oil Temperature Gauge, and High Brake Oil Temp Lamp by placing a 1690 ohm resistor (a range of 1590 to 1790 will work) in place of any of the four input temperature probes.
37. Brake Cooling RPM Advance 1 will go to 24-Volts.
38. Brake Cooling RPM Advance 2 will go to 24-Volts.
39. The brake oil temperature gauge will read near the middle of the red band.
40. The high brake oil temp light will illuminate.
41. If the output functions DO NOT turn on, read the value of the temperature for the selected input in VHMS Realtime Monitor Software. It must be 126° - 140°C (259° - 284°F).
42. If the temperature reading is low, check the wiring for high resistance between the probe and interface module.
43. If the temperature reading is high, check for shorts in the wiring.
44. It the temperature is in the proper range but the output functions do not work, check the interface module output circuit and the wiring associated with any non-working function.

VHMS CONTROLLER CHECKOUT

1. With the key switch off, verify the seven segment LED display on the VHMS controller is off.
2. Turn the key switch to the ON position, but DO NOT start the engine.
3. Allow the VHMS controller to boot up. Watch the red, two digit LED display on the VHMS controller to show a circular sequence of seven flashing segments on each digit. After a short time, the two digit display will start counting up from 00 - 99 at a rate of ten numbers per second.
4. If not already connected, use a serial cable to connect the laptop PC to the VHMS RS232 serial port.
5. Start the VHMS Setting Tool program by clicking on the icon on the laptop PC screen.
6. Select the “Review setting information” function. Then click the “Next” button.



D120063

Table 4: Engine Fault Codes (continued)					
VHMS Fault Code	**VHMS Fault Description**	**Source**	**Sent via OrbComm**	**Snapshot Trigger**	**Model Notes**
C159	RBF IMT Ckt Failed High	Engine			All
C161	RBF IMT Ckt Failed Low	Engine			All
C162	High IMT RBF	Engine	X	X	All
C163	RBR IMT Ckt Failed High	Engine			All
C164	RBR IMT Ckt Failed Low	Engine			All
C165	High IMT RBR	Engine	X	X	All
C212	Oil Temp Ckt Failed High	Engine			All
C213	Oil Temp Ckt Failed Low	Engine			All
C214	High Oil Temperature	Engine	X	X	All
C219	Remote Oil Level Low	Engine	X	X	830E, 930E
C221	Ambient Air Press Failed High	Engine			All
C222	Ambient Air Press Failed Low	Engine			All
C223	CORS Burn Valve Open Circuit	Engine			830E, 930E
C225	CORS Makeup Valve Open Circuit	Engine			830E, 930E
C231	Coolant Press Ckt Failed High	Engine			All
C232	Coolant Press Ckt Failed Low	Engine			All
C233	Low Coolant Pressure	Engine	X	X	All
C234	Engine Overspeed	Engine	X	X	All
C235	Low Coolant Level	Engine	X	X	All
C237	Multi Unit Sync Error	Engine			830E, 930E
C252	Oil Level Signal Invalid	Engine			All
C253	Oil Level Low	Engine			All
C254	FSOV Open Circuit	Engine			830E, 930E
C259	FSOV Mech Stuck Open	Engine			830E, 930E
C261	High Fuel Temperature	Engine	X	X	830E, 930E
C263	Fuel Temp Ckt Failed High	Engine			830E, 930E
C265	Fuel Temp Ckt Failed Low	Engine			830E, 930E
C292	OEM Temp out of Range	Engine	X	X	830E, 930E
C293	OEM Temp Failed High	Engine	X		830E, 930E
C294	OEM Temp Failed Low	Engine	X		830E, 930E
C296	OEM Pressure Out of Range	Engine	X	X	830E, 930E
C297	OEM Pressure Failed High	Engine	X		830E, 930E
C298	OEM Pressure Failed Low	Engine	X		830E, 930E
C299	Hot Shutdown	Engine			830E, 930E
C316	Fuel Pump Open Circuit	Engine			830E, 930E

NOTES

Loading Conditions

The final load calculation of the PLMIII system is not sensitive to loading conditions. The final load is calculated as the truck travels away from the shovel. Variations in road conditions and slope are compensated for in the complex calculations performed by the payload meter.

Pressure Sensors

Small variations in sensors can also contribute to payload calculation error. Every pressure sensor is slightly different. The accuracy differences of individual sensors along the range from 0 to 4000 psi can add or subtract from payload measurements. This is also true of the sensor input circuitry within individual payload meters. These differences can stack up 7% in extreme cases. These errors will be consistent and repeatable for specific combinations of payload meters and sensors on a particular truck.

Swingloads

Swingload calculations can be affected by conditions at the loading site. Parking the truck against the berm or large debris can cause the payload meter to inaccurately calculate individual swingloads. While the PLMIII system uses an advanced calculation algorithms to determine swingloads, loading site conditions can affect the accuracy.

Speed and Distance

The payload meter receives the same speed signal as the speedometer. This signal is a frequency that represents the speed of the truck. The payload meter uses this frequency to calculate speeds and distances. The meter assumes a single value for the rolling radius of the tire. The rolling radius may change at difference speeds by growing larger at higher speeds. The actual rolling radius of the tire will also change between a loaded and empty truck. The payload meter does not compensate for these changes.

NOTE: Earlier 730E and 830E models are subject to incorrect speed data due to electrical interference. The incorrect speeds are generated while the truck is stopped. An attenuator was added to newer production models to prevent this error from occurring. A kit was released to update older PLMIII systems with the attenuator. Consult your area service representative for details.

HAUL CYCLE DATA

PLMIII records and stores data in its on-board flash memory. This memory does not require a separate battery. The data is available through the download software.

PLMIII can store 5208 payload records. When the memory is full, the payload meter will erase the oldest 745 payload records and continue recording.

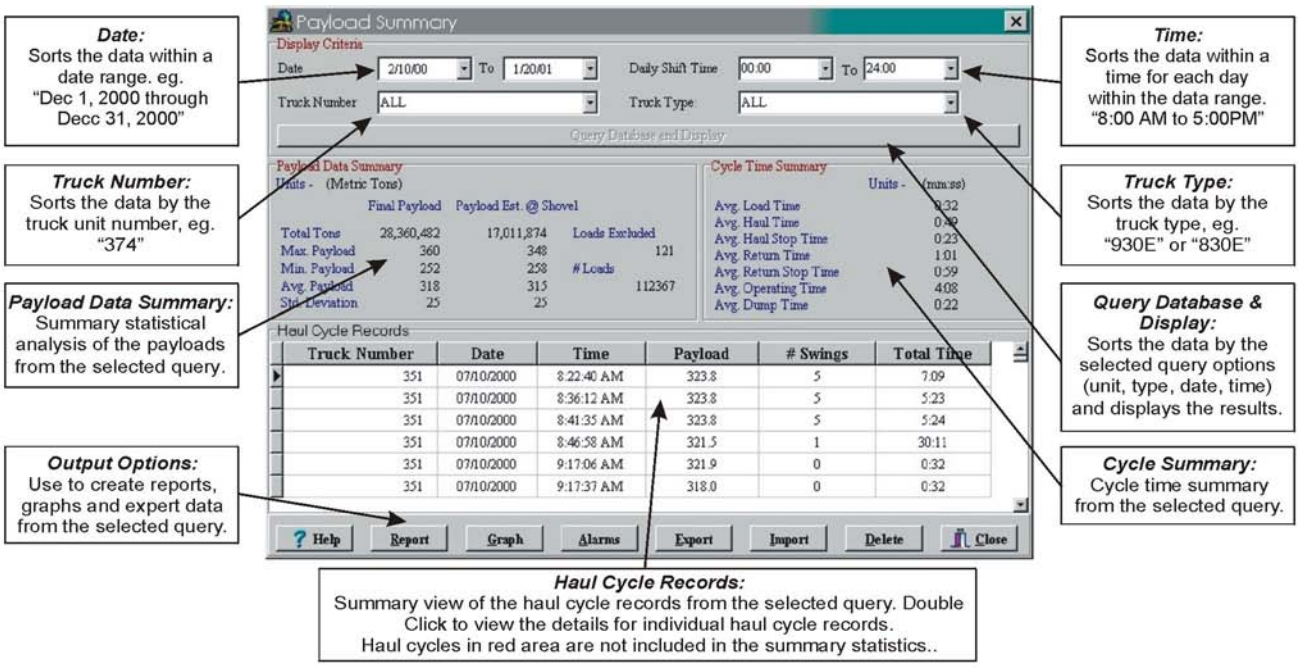
PLMIII can store 512 alarm records in memory. When the memory is full, the payload meter will erase the oldest 312 alarm records and continue recording.

All data is calculated and stored in metric units within the payload meter. The data is downloaded and stored in metric units within the paradox database on the PC. The analysis program converts units for displays, graphs, and reports.

The units noted in the Table 1 are the actual units stored in the data file. The value for the haul cycle start time is the number of seconds since January 1, 1970 to the start of the haul cycle. All other event times are referenced in seconds since the haul cycle start time. The PC download and analysis program converts these numbers into dates and times for graphs and reports.

DATA ANALYSIS

PAYLOAD SUMMARY FORM



The data analysis tools allow the user to monitor the performance of the payload systems across the fleet. Analysis begins when the "View Payload Data" button is pressed. This starts an all trucks, all dates, all times query of the database and displays the results in the Payload Summary form.

The user can change the query by changing the dates, times, or trucks to include in the query for display.

Haul cycles in the data grid box at the bottom can be double clicked to display the detailed results of that haul.

Creating a Query

The program defaults to show all trucks, all types, all dates, and all times for the initial query. The display can be narrowed by selecting which trucks or types to view and for what dates and times.

The query items are added in the AND condition. If the user selects a truck # and date range, the query will sort the data for that truck number and the date range.

Sorting on Truck Unit Number

The truck unit number is the truck unit number entered into the payload meter when it was configured at installation. The query can be set to look for all trucks or one particular truck number. When the program begins, it searches through the database for all the unique truck numbers and creates a list to select from.

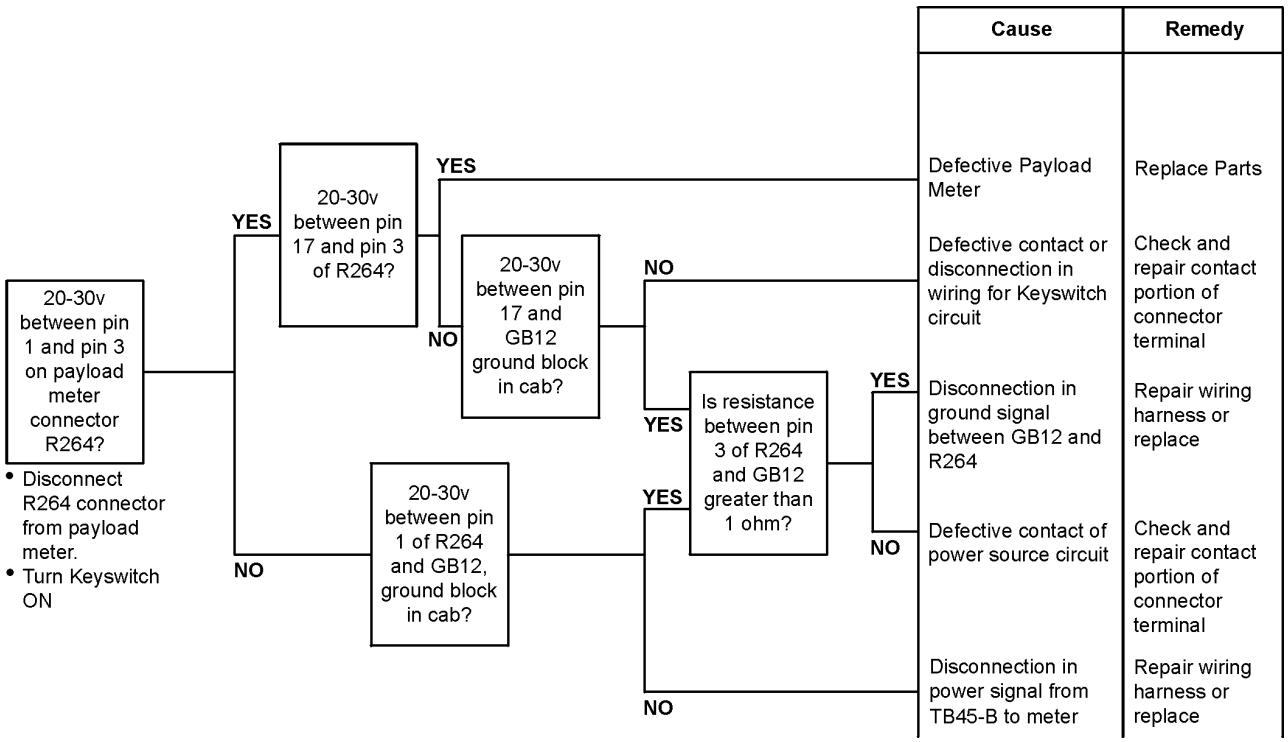
Choosing one particular truck number will limit the data in the displays, summaries and reports to the one selected truck. To create reports for truck number 374, select 374 from the pull-down menu and hit the "Query Database and Display" button.

Sorting on Truck Type

The truck type is the size of the truck from the family of Komatsu trucks. This allows the user to quickly view results from different types of trucks on the property. For example, a separate report can be generated for 830E and 930E trucks.

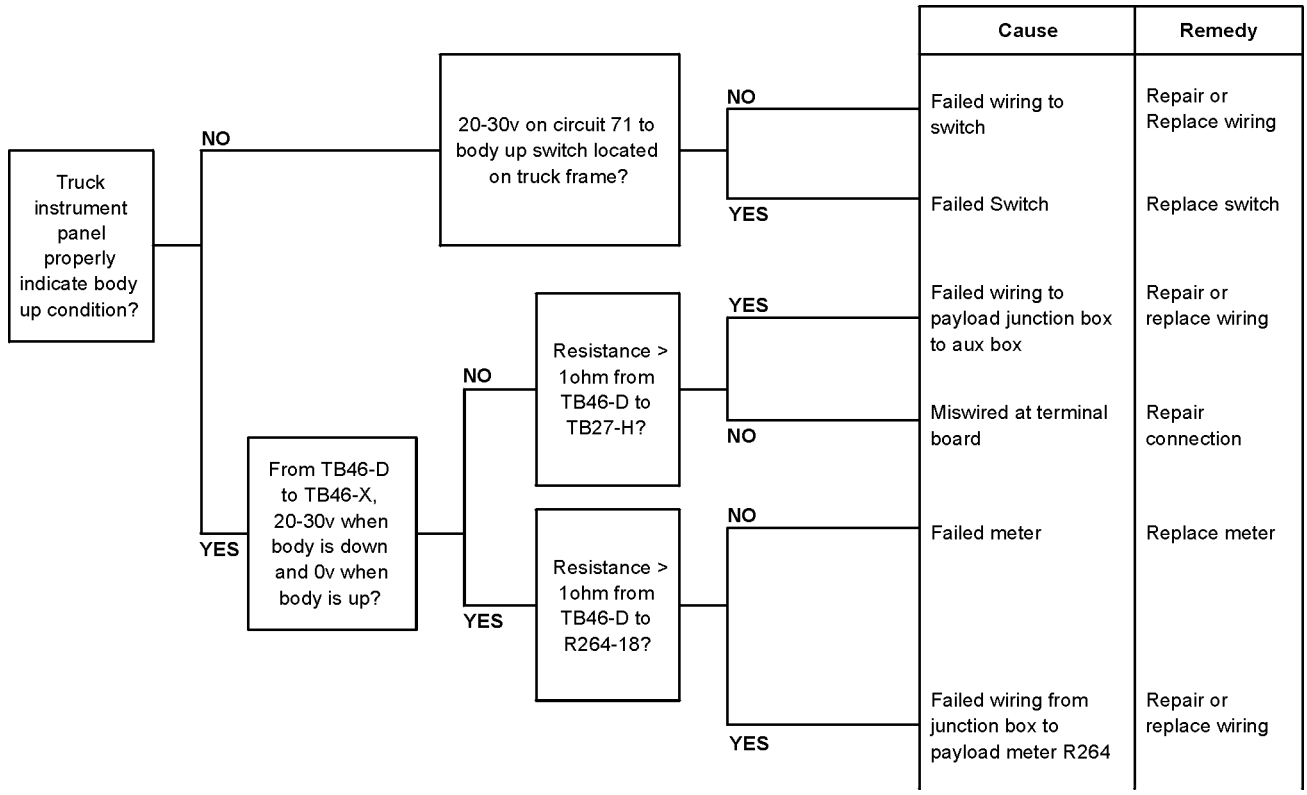
No Payload Display When Key Switch is Turned On

- Confirm battery voltage in PLMIII junction box between TB45-A (positive) and TB45-X (ground).
- Check the 5A circuit breaker (CB A) in PLMIII junction box.
- Check all connectors and terminal connectors in the power circuits to the payload meter.
- If two digit display on payload meter displays 00 then 88 on power-up, continue to No Display on Operator Display. This two digit display normally alternates 0 on each display. In the case of active alarms, this display will show the code for each active alarm. The alarm codes are in the operation section.

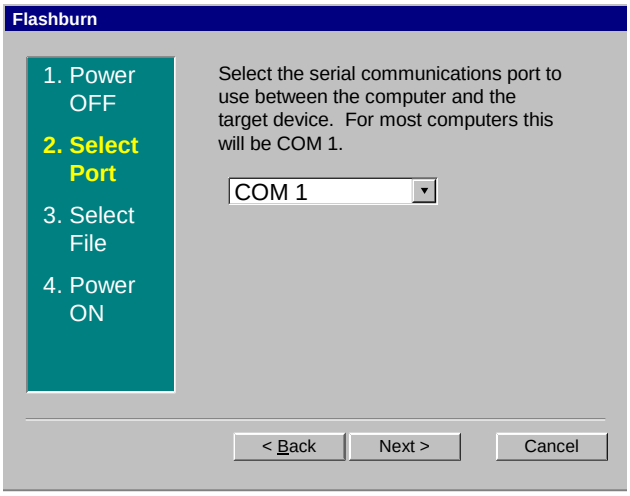


Alarm 13 - Body-Up Input Failure

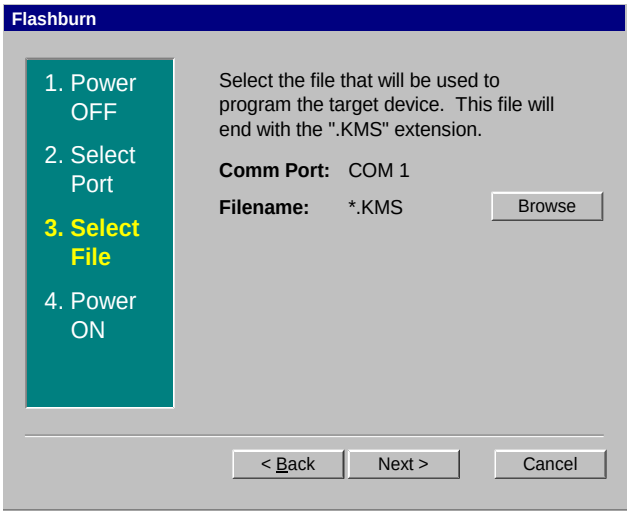
The payload meter senses when the load is dumped without receiving a body-up signal. When the load quickly drops below 50% without the body-up signal, alarm 13 is set. The alarm will be cleared when a normal dump cycle is detected. A normal dump cycle will be detected when the body-up signal is received, the load drops quickly, and the body-down signal is received.



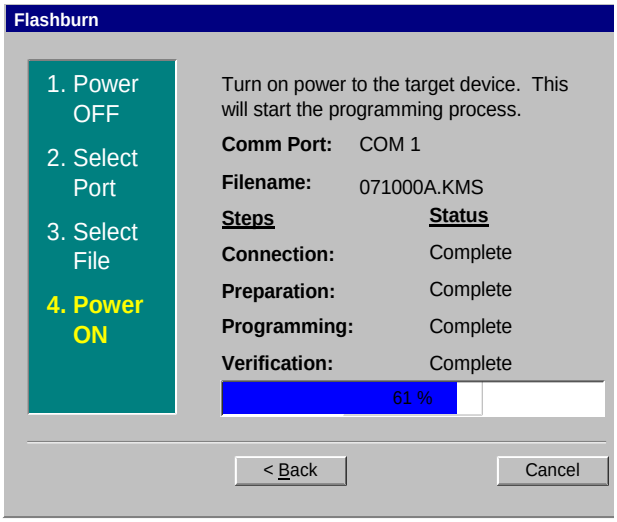
4. Confirm the proper communications port for the programming laptop. This is usually COM 1. Press “NEXT”.



5. Press “BROWSE” and select the .kms file to program into the payload meter. Press “NEXT”.



6. When instructed, turn the key switch on in order to power-up the payload meter. The PC will begin to reprogram the payload meter. This process takes approximately five minutes.



7. After successful programming, turn the key switch off.
8. Wait 20 seconds and turn the key switch on.
9. The payload meter will need to be configured as instructed in the manual using the Payload Data Manager software on the laptop computer.

FL275 Panel

The FL275 electronic card panel contains a microprocessor (CPU), a small computer which monitors a variety of input signals and establishes certain controlling output signals, which result in the regulation of the propulsion system. If a laptop computer, referred to as a Portable Test Unit (PTU) is connected, it can also provide a readout of the memory of the operating history of many of the sub-systems which make up the control system. This is useful to technicians looking for problem areas during troubleshooting.

Setting up new trucks or making changes to truck control system parameters requires a PTU and an authorized technician to operate it. The microprocessor in the electronic card panel can only be changed electronically with appropriate commands and programs using the PTU.

Previous control systems provided on Komatsu trucks required system adjustments to be made by removing the plug-in control cards and adjusting potentiometers mounted on the cards. With the FL275 panel, no control card removal is required. The majority of adjustments are made electronically using a menu-driven software program installed on the hard disk drive of the laptop computer (PTU). The PTU is then connected to a nine-pin connector mounted in the control cabinet or cab of the truck enabling communication with the microprocessor (CPU).

The FL275 panel has five 104-pin connectors mounted above the cards for connecting input and output circuits. They are identified as CNA, CNB, CNC, CND, and CNE. Only four connectors are used. Connector CNC is not used.

The cards in this panel are protected by a cover which is hinged at the bottom, swings up, and latches at the top.

The card complement of the FL275 panel consists of the following five cards:

- 17FB100 - Power Supply (P1)
- 17FB101/144* - Central Processing Unit (CPU)
- 17FB102/140** - Analog Input/Output (A1)
- 17FB103 - Digital Input/Output (D1)
- 17FB104 - Digital Input/Output (D2)

*NOTE: *Later model trucks, shipped July 2001 and later, are equipped with a 17FB144 card, replacing the 17FB101 card.*
*** Trucks equipped with fuel saver circuitry require 17FB140 card to replace 17FB102 card.*

The FL275 panel receives input signals from speed sensors on the alternator and wheel motors, voltage and current feedback signals from various control devices, and command inputs from the operator. Using these inputs, it provides the following:

- Propulsion and dynamic retarding control of the truck.
- Speed restrictions during overspeed and other operating restrictions if faults occur.
- Event data for technicians through the two-digit diagnostic display panel.
- Statistical data of the history of various component and system function operations, accessible only with a PTU.

It is also capable of receiving inputs from the engine (oil pressure, crankcase pressure, engine coolant pressure, and engine coolant temperature), wheel motor temperature, and alternator blower pressure to provide warning signals to the driver if malfunctions in these areas occur.

Additionally, on current production trucks equipped with fuel saver, the FL275 panel monitors alternator intake temperature and static exciter temperatures to provide:

- Engine low idle speed reduced to 650 rpm.
- Control of engine rpm during propel to obtain the most efficient engine speed for the amount of power requested by the operator.
- Control of engine rpm during retarding ranging from a low of 1250 rpm to a high of 1650 rpm.

TABLE I. TWO-DIGIT DISPLAY PANEL CODES (Cont.)

EVENT CODE	EVENT DESCRIPTION	EVENT RESTRICTION	DETECTION INFORMATION	EVENT VALUES			
				Decay Time	Lock Limit	Accept Limit	Window Limit
46	Motor 1 Overcurrent	System Event • In ACCEL: No propel and turn on SYSFLT light. • In RETARD: Turn on SYSFLT light only.	Current in Motor 1 armature exceeds limits for a preset time. Limit is a function of being in retard or acceleration.	3600	3	10	2
47	Motor 2 Overcurrent	System Event • In ACCEL: No propel and turn on SYSFLT light. • In RETARD: Turn on SYSFLT light only.	Current in Motor 2 armature exceeds limits for a preset time. Limit is a function of being in retard or acceleration.	3600	3	10	2
48	Motor Field Fault	System Event • In ACCEL: No propel and turn on SYSFLT light. • In RETARD: Turn on SYSFLT light only.	Motor field current not in correct proportion with motor armature current. Check for defective shunt, iso-amp, wiring, FB102/140 card.	3600	3	10	4
49	Motor Field Overcurrent	System Event • In ACCEL: No propel and turn on SYSFLT light. • In RETARD: Turn on SYSFLT light only.	Current in motor fields exceeds limits. Limit is a function of being in retard or acceleration.	3600	3	10	4
50	Motor Stall	System Event • In ACCEL: No propel and turn on SYSFLT light. • In RETARD: Turn on SYSFLT light only.	Motors stalled with motor current above 1000 amps, inverse time function. Could be caused by overloaded truck, grade or rolling resistance too high. Check for defective speed sensors, shunts, iso-amps, wiring, FB102/140 card.	3600	3	10	2
51	Motor Spin	System Event • In ACCEL: No propel and turn on SYSFLT light. • In RETARD: Turn on SYSFLT light only.	One motor stuck, the other spinning for longer than 10 seconds with motor current >100A. Check for: Same as No. 50.	3600	3	10	4
52	Alternator Tertiary Overcurrent	System Event • In ACCEL: No propel and turn on SYSFLT light. • In RETARD: Turn on SYSFLT light only.	Current in alternator field tertiary windings exceeds limits for a preset time. Check for shorted diodes or SCRs in AFSE.	N/A	1	4	2
53	Motor Tertiary Overcurrent	System Event • In ACCEL: No propel and turn on SYSFLT light. • In RETARD: Turn on SYSFLT light only.	Current in motor field tertiary windings exceeds limits for a preset time. Check for shorted diodes or SCRs in MFSE. Check for low engine rpm in retarding.	N/A	1	4	2

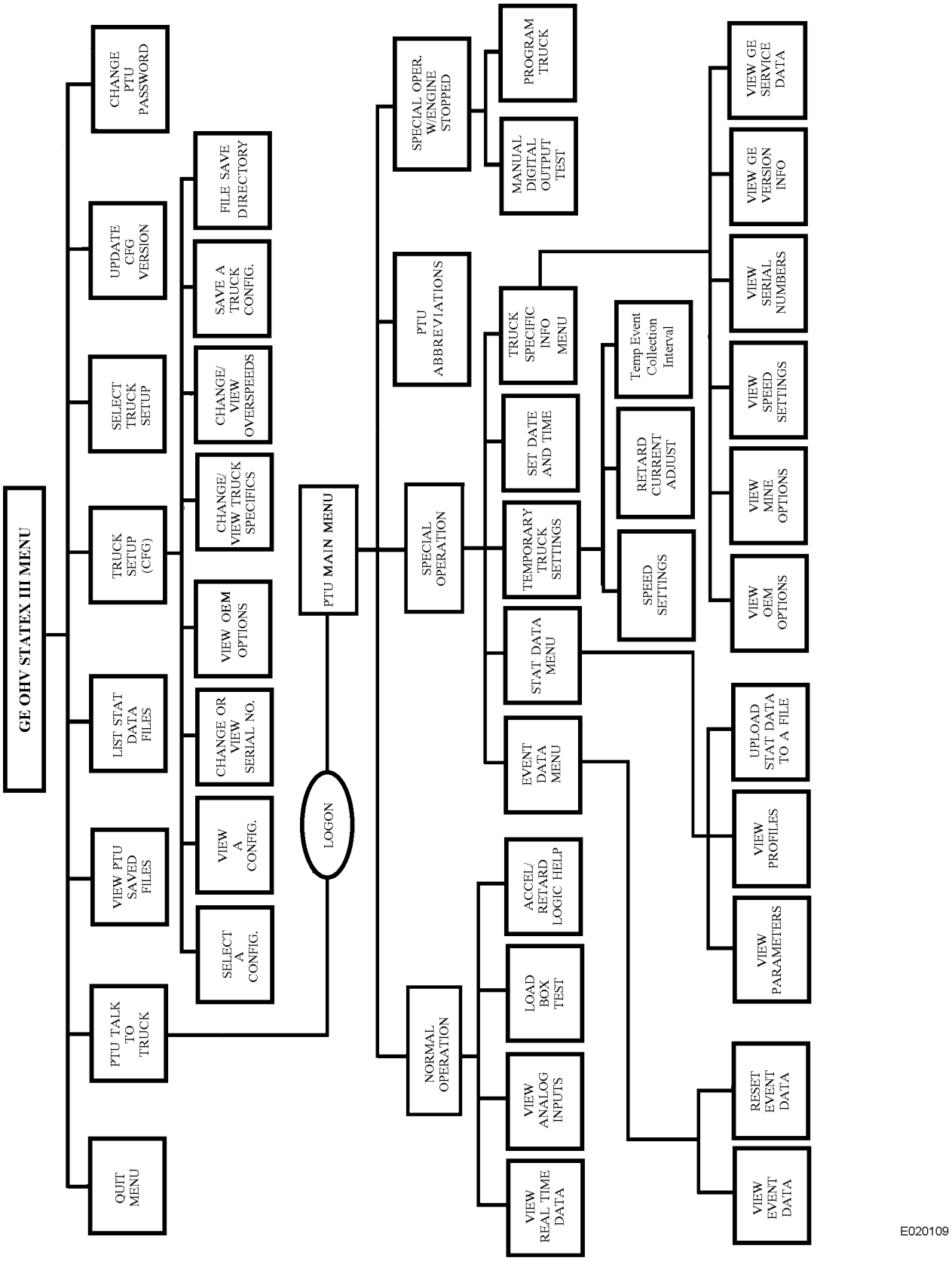


FIGURE 2-3. GE OHV STATEX III MENU

e. Engine full load rpm value

Used when the manual horsepower limit set is N. Sets the engine rpm value that the control system will maintain by automatically adjusting the load. The available range is displayed at the bottom of the screen when this line is selected with the cursor. This generally is set to the rated rpm of the engine.

f. Retard current demand adjust
This line allows entering the adder or reducer to make the system regulate at the proper retard current limit by compensating for the offset error in the isolation amplifiers. Use the Temporary Retard Current Adjust screen to determine what this value will be. The number entered (units are amps) can be + or -, and it will cause the control to change the retard current limit by that amount.

1. With the truck shut off and control power on, measure the output of Iso-amps IA3 and IA4 at terminal D and record the values.
2. Use the higher of the two readings. (1 amp =0.001 volts). For example, if the higher reading was +0.01 volts, the offset is +10 amps.
3. Using the above example, enter -10 amps in the temporary screen.
4. Operate the truck and verify the correct retard limit was obtained.
5. If the correct retard limit was observed in Step 4, enter that number (-10 in this example) on this screen to make it permanent.

NOTE: Items g. through j. are applicable only if truck is equipped with fuel saver system and GE engine control on the OEM-ONLY SETTABLE OPTIONS ENTRY SCREEN is set to Y.

g. Percent accel pedal travel off request
Used to enter the percent of pot reference volts at which the accelerator pedal is calibrated to have zero accel request.

h. Percent accel pedal travel full request
Used to enter the percent of pot reference volts at which the accelerator pedal is calibrated to have full accel request.

NOTE: Refer to Statex III Electrical System Checkout procedure, Throttle System Check and Adjustment for accelerator pedal calibration.

i. Percent retard pedal travel off request
Used to enter the percent of pot reference volts at which the retard pedal is calibrated to have zero retard request.

j. Percent retard pedal travel full request
Used to enter the percent of pot reference volts at which the retard pedal is calibrated to have full retard request.

NOTE: Refer to Statex III Electrical System Checkout procedure, Retard System Check and Adjustment for retard pedal calibration.

k. Blower pressure fault time
Use to set the blower fault time delay in seconds. A value between 30 seconds and 101 seconds may be entered if a delay other than the default setting of 101 seconds is desired.

l. Event data collection interval (sec)
Used to set the time interval in seconds that the CPU collects fault data.

m. Propel with dump body up limit (mph)
Sets maximum forward propulsion speed (0 to 4 mph) with dump body up and override switch not activated.

n. Statistical quarter start month (0=jan, 1=feb, 2=mar)
Used to set the starting month for the active calendar quarters on the CPU clock. Example:

0=Jan, Apr, Jul, Oct

1=Feb, May, Aug, Nov

2=Mar, Jun, Sept, Dec

o. Truck identification number
For use by the mine to enter the truck identification number. Truck ID shows up with the event data and must be unique for each truck.

3. When changes are completed, move the cursor to Leave Truck Specifics Screen and press [ENTER]. This automatically returns the program to the Truck Setup Configuration Mine Menu.

Statistical Data

The statistical data collector uses the memory capability of the computer to record and store hundreds of system parameters unique to each individual truck. These parameters are divided into two types: counters and profiles.

Detailed information concerning the statistical data collector is discussed on the following pages. Tables III and IV list parameter code numbers, descriptions, units of measure, count conditions, etc. The information below outlines the procedures required to view Statistical Data on the PTU and save the information to a file.

⚠WARNING

Selecting Special Operation in the following procedure may present a safety hazard if the engine is on. Control of the propulsion system may transfer to the PTU operator from the truck driver with this software operation. Refer to Step 1. below:

1. Use the arrow keys to move the cursor to the "SPECIAL OPERATION" selection on the GE STATEX III PTU MAIN MENU and press [ENTER]. The screen, shown in Figure 2-21, will be displayed to alert the operator about the state of the truck software. This warning notifies the operator when control of the truck is being transferred from the truck driver to the PTU, based on the PTU selection of "SPECIAL OPERATION". When finished and the PTU is returned to the GE STATEX III PTU MAIN MENU, control of the propulsion system is returned to the truck driver. Before activating this command, the screen, shown in Figure 2-22, will be displayed. The PTU user must keep the truck driver informed of this control.
2. Select "YES" on the caution screen, Figure 2-21, and press [ENTER]. The SPECIAL OPERATION MENU will be displayed.
3. Use the arrow keys to move the cursor to the "STATISTICAL DATA MENU" selection and press [ENTER]. The STATISTICAL DATA MENU screen will be displayed. Selections available on this menu are as follows:

View Counters

The Statistical Counters screen displays the number of times various operations have occurred in the history of the truck operation or in how many seconds or miles the event has lasted. Refer to Table III for a listing of all active counters.

1. While the STATISTICAL DATA MENU is displayed, use the arrow keys to move the cursor to the "VIEW COUNTERS" selection and press [ENTER]. The STATISTICAL COUNTERS SCREEN will be displayed.
2. Use the up and down arrow keys to scroll through the counters. Press [ESC] to return to the exit choice.
3. When finished viewing the information, press [ENTER] again to exit this screen.

View Profiles

This screen displays currents, voltages, and speeds as a history of truck operation. Each profile is broken into a number of bins and each bin has a range of values. In this manner, the entire range of the parameter from minimum to maximum is covered. The result is a histogram for each parameter covered by a profile. Refer to Table IV for a listing of all active profiles.

1. Use the arrow keys to move the cursor to the "VIEW PARAMETER PROFILES" selection and press [ENTER]. The PROFILE screen will be displayed. Use [F3] and [F4] to move through all profiles.
2. When finished viewing this screen, press [ENTER] again to exit this screen.

Upload Statistical Data To A File

Use the arrow keys to move the cursor to the "UPLOAD STATISTICAL DATA TO A FILE" selection and press [ENTER]. The Upload Statistical Data Menu screen will be displayed. Use the directions on this screen to upload data from the truck CPU to your PTU.

TRUCK SPECIFIC INFORMATION

To quickly review the various options on the current truck, the Truck Specific Information menu can be used to view configuration options, speed settings, serial numbers, etc. Information accessed through this menu is for viewing only and cannot be changed. If changes are required, use the Truck Setup (CFG) selection from the GE OHV STATEX III Menu.

⚠WARNING

Selecting Special Operation in the following procedure may present a safety hazard if the engine is on. Control of the propulsion system may transfer to the PTU operator from the truck driver with this software operation. Refer to Step 1. below:

1. With the GE STATEX III PTU Main Menu displayed, select “SPECIAL OPERATION” and press [ENTER]. The screen shown in Figure 2-26 will be displayed to alert the operator about the state of the truck software.This warning notifies the operator when control of the truck is being transferred from the truck driver to the PTU, based on the PTU selection of SPECIAL OPERATION. When finished and the PTU is returned to the GE STATEX III PTU Main Menu, control of the propulsion system is returned to the truck driver. Before activating this command, the screen shown in Figure 2-27 will be displayed. The PTU user must keep the truck driver appraised of this control.
2. Select “YES” on the caution screen (Figure 2-26) and press [ENTER]. The Special Operation menu will be displayed.

Selection of NORMAL OPERATION gives truck control to the driver.
Continue? ( ) Yes
( ) No

OR

Selection of SPECIAL OPERATION will override truck driver controls until you exit to the PTU main menu.
Continue? ( ) Yes
( ) No

FIGURE 2-26. CAUTION SCREEN

3. Use the arrow keys to move the cursor to the Truck Specific Information Menu selection and press [ENTER].

Selections available on this menu are:

- View OEM Configuration Options
  This selection permits reviewing the setup information programmed into the truck configuration file by Komatsu. These options cannot be changed by mine personnel.
- View Mine Configuration Options
  This selection displays options set by mine personnel when the truck configuration file was setup for a specific truck.
- View Speed Settings
  This selection allows viewing the current speed settings contained in the configuration file.
- View Serial and model Numbers
  This selection permits verification of component serial and model numbers.
- View GE Version Information
  This selection lists the truck ID number, model number, and applicable file names. This screen also lists the GE code version number and CFG version number. This information can be useful in determining whether or not the software has been updated to the latest release version.
- View GE Product Service Data
  This selection lists information pertinent to the specific truck.
- Exit
  Select Exit to leave the Truck Specific Information Menu and return to the GE STATEX III PTU Main Menu.

Return to PTU Main Menu gives truck control to the driver. CAUTION: Contactors may move!
Continue? ( ) Yes
( ) No

FIGURE 2-27. CAUTION SCREEN

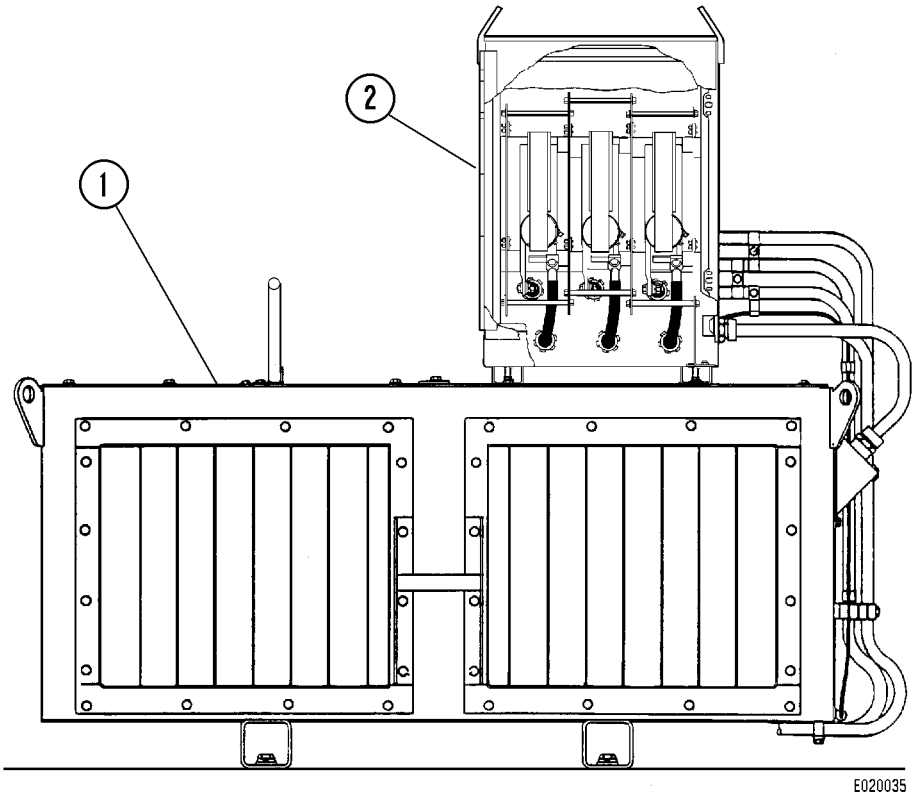


FIGURE 2-37. RETARDING GRIDS AND CONTACTORS (RH DECK)

1. Retarding Grids and Blower(s)
2. Retarding Contactor Box

CONTROL SYSTEM SELF-TEST

1. Set up PTU as described previously using the communication port in the electrical cabinet.
2. Turn control power switch on.
3. Verify the two-digit display shows 00 after a 10 second delay. If only a single digit 8 is displayed, check for a faulty CPU (FB101 or FB144) card.
4. If the two-digit display shows numbers other than 00, refer to Electrical Propulsion Components for a listing of possible codes, code descriptions, event restrictions, detection information, and possible reasons for the problem. An attempt must be made to correct any obvious problems before proceeding.
5. If the problem has not been resolved, select the proper section of this procedure (digital, analog, etc.) and use the PTU to aid in troubleshooting the problem.
6. If the entire electrical system is to be checked, the checkout procedures must be performed in the sequence listed, if possible.

4.1 THROTTLE SYSTEM CHECK AND ADJUSTMENT

4.1.1 Not Used.

4.1.2 Electronic Throttle System (fuel saver system).

NOTE: Instructions are also included in the following procedure for retard pedal setup which can be performed in conjunction with accelerator pedal setup on trucks equipped with the fuel saver circuitry.

- Turn key switch and control power on.
- Set up PTU as described previously using the communication port in the electrical cabinet. Start the GE software program be typing “gemenu3e” if using Statex III enhanced version 1.00 software (or type “gemenu” if using version 14.00 software) from the DOS C:> prompt.
    a. From the GEOHV STATEX III MENU, select “PTU TALK TO TRUCK” and press [ENTER].
    b. At PTU LOGON screen, enter your name and assigned password. Press [ENTER].
    c. When the GE STATEX III PTU MAIN MENU appears (Figure 3-4), move the cursor to “NORMAL OPERATION” and press [ENTER].
    d. A screen appears with the message: “Selection of NORMAL OPERATION gives truck control to the driver - Continue?”. With the cursor at the “Yes” option, press [ENTER].
    e. The NORMAL OPERATION MENU will appear. Select “MONITOR ANALOG INPUT CHANNELS” and press [ENTER]; the screen shown in Figure 3-5. will appear.

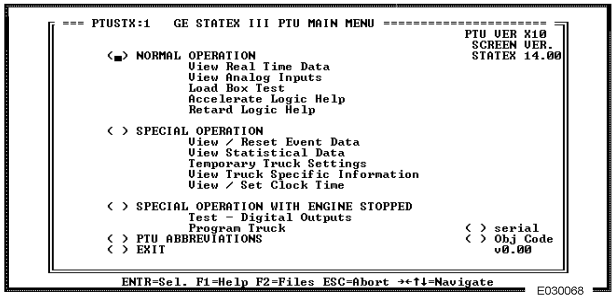


FIGURE 3-4. PTU MAIN MENU

1. Record the accelerator pedal % (percent) values shown on the Monitor Analog Input Channels screen:
    a. Pedal off - note on paper the % value shown on the PTU screen for “acc pedal”. For example, 11.3.
    b. Depress the accelerator pedal and observe the % value increases - note on paper the % value shown on the PTU screen when the pedal is fully depressed. For example, 87.2.

NOTE: It is also necessary to perform the above procedure for the retard pedal as described in the following step. Retard pedal % values will be recorded at this time as follows:

2. Record the retard pedal % (percent) values shown on the Monitor Analog Input Channels screen:
    a. Pedal off - note on paper the % value shown on the PTU screen for “ret pedal”. For example, 9.7
    b. Depress the retard pedal and observe the % value increases - note on paper the % value shown on the PTU screen when the pedal is fully depressed. For example, 89.5

DO NAME	DESCRIPTION	OUTPUT DEVICE CHECKOUT		
		DEVICE STATE	PTU DISPLAY-DEVICE	PTU DISPLAY-FEEDBACK
***NOTE: P11, RP11, and RP22 are digital outputs (not physical devices) wired in parallel with outputs P1, RP1, and RP2 respectively. These outputs are only used if airless contactors are installed. If installed, test by activating both outputs (P1 and P11), (RP1 and RP11), (RP2 adn RP22) at the same time and verifying the corresponding feedback signal.**				
P1	P1 CONTACTOR	P1 energized	P1 = on	P1FB = true
		P1 de-energized	P1 off	P1FB false
***P11**	P11 CONTACTOR OUTPUT	P11 energized	P11 = on	P1FB = true
		P11 de-energized	P11 off	P1FB false
P2 (GTA26 only)	P2 CONTACTOR	P2 energized	P2 = on	P2FB = true
		P2 de-energized	P2 off	P1FB false
GF	GF CONTACTOR	GF energized	GF = on	GFFB = true
		GF de-energized	GF off	GFFB false
GFR	GFR CONTACTOR	GFR energized	GFR = on	GFRFB = true
		GFR de-energized	GFR off	GFRFB false
MF	MF CONTACTOR	MF energized	MF = on	MFFB = true
		MF de-energized	MF off	MFFB false
RP1	RP1 CONTACTOR	RP1 energized	RP1 = on	RP1FB = true
		RP1 de-energized	RP1 off	RP1FB false
***RP11**	RP11 CONTACTOR OUTPUT	RP11 energized	RP11 = on	RP1FB = true
		RP11 de-energized	RP11 off	RP1FB false
RP2	RP2 CONTACTOR	RP2 energized	RP2 = on	RP2FB = true
		RP2 de-energized	RP2 off	RP FB false
***RP22**	RP22 CONTACTOR	RP22 energized	RP22 = on	RP2FB = true
		RP22 de-energized	RP22 off	RP2FB false
RP3	RP3 CONTACTOR	RP3 energized	RP3 = on	RP3FB = true
		RP3 de-energized	RP3 off	RP3FB false
RP4	RP4 CONTACTOR	RP4 energized	RP4 = on	RP4FB = true
		RP4 de-energized	RP4 off	RP4FB false
RP5	RP5 CONTACTOR	RP5 energized	RP5 = on	RP5FB = true
		RP5 de-energized	RP5 off	RP5FB false
RP6 (optional)	RP6 CONTACTOR	RP6 energized	RP6 = on	RP6FB = true
		RP6 de-energized	RP6 off	RP6FB false
RP7 (optional)	RP7 CONTACTOR	RP7 energized	RP7 = on	RP7FB = true
		RP7 de-energized	RP7 off	RP7FB false
RP8 (optional)	RP8 CONTACTOR	RP8 energized	RP8 = on	RP8FB = true
		RP8 de-energized	RP8 off	RP8FB false
RP9 (optional)	RP9 CONTACTOR	RP9 energized	RP9 = on	RP9FB = true
		RP9 de-energized	RP9 off	RP9FB false
FOR	FORWARD COIL ON REVERSER	FORWARD coil energized	FOR = on	FORFB = true
		FORWARD coil de-energized	FOR off	FORFB false
REV	REVERSE COIL ON REVERSER	REVERSE coil energized	REV = on	REVFB = true
		REVERSE coil de-energized	REV off	REVFB false
NOTE: After checking REV operation, silence backup horn by turning on output FOR momentarily to move reverser back to forward position.				

8.4 ACCELERATOR PEDAL OVERRIDE OF RETARD SPEED CONTROL

1. Set the retard speed control switch to the OFF position and the retard speed control potentiometer to mid range.
2. Place selector switch in FORWARD and depress throttle pedal. The propulsion contactors will engage. Release throttle pedal.
3. Turn the retard speed control switch to the ON position. Turn oscillator on and increase frequency until retard contactors pick up.
4. Depress throttle pedal. The throttle pedal will override; the retard contactors will drop out and the propulsion contactors will energize.
5. Release throttle pedal, place selector switch in NEUTRAL, and turn retard speed control off.
6. Turn off and disconnect oscillator.

Return to Main Menu

1. This completes the checkout of the retard speed control system.
2. Leave the PTU Retard State Logic screen by moving cursor to select “EXIT” on the menu and press [ENTER] key.
3. Select “EXIT” as necessary until returned to GE STATEX III PTU MAIN MENU.
4. Move cursor to select “Exit” on the menu and press [ENTER] key.
5. At “QUIT PTU?” menu screen prompt, press [Y] key (or any key except [N]) to exit back to the GE OHV STATEX III MENU.

NOTE: It is necessary to exit back to this menu before turning off control power to avoid lock up of PTU computer screen.

6. Turn control power off, remove jumpers, and restore all wiring back to the original condition.

9.0 LOAD TEST USING TRUCK RETARD GRIDS

NOTE: DO NOT run open circuit test.

NOTE: The single ended grid used on the 772 wheel drive system will be operating at 100% capacity when loaded with a 1200 HP engine. The grid will be monitored closely on extended horsepower tests to avoid overheating.

Setup and Preparation

Engines equipped with Rockford clutch only:

- Disconnect the fan clutch solenoid to fully engage fan.

All trucks:

- Connect swing shunts to load test position:
  a. Top shunt swings to upper position, bottom shunt swings to bottom position.
  b. For 830E or 685E trucks, left shunt swings to left position, right shunt swings to right position.

⚠WARNING

If load test must be run any longer than to just read horsepower, the motor field leads must be disconnected to prevent overheating of the motor fields. Follow disable procedure below:

To disable the motor field:

- Disconnect circuit 716E at -1 terminal on the GFM on the MFSE.
- Disconnect circuit 716F at +2 terminal on the GFM on the MFSE.

PTU Setup

- Select the Automatic Load Box Test screen as follows:
  a. From the GEOHV STATEX III MENU, select “PTU TALK TO TRUCK”, press [ENTER].
  b. At PTU LOGON screen, enter your name and assigned password. Press [ENTER].

SECTION G2
TIRES AND RIMS
INDEX

4. Install the inner flange on the rim. Coat the beads of the tire with the tire mounting soap solution.

⚠CAUTION

Prying against the tire bead may cause damage to the tire bead and will cause air leaks.

5. Position the tire over the rim and work the tire on as far as possible without prying against the beads. Any damage to the tire bead will destroy the air seal and cause air leaks at these points.
6. Install side flange (5, Figure 2-8) in position and replace bead seat band (2). Push in on the bead seat band to expose the O-ring groove in the rim.
7. Lubricate new O-ring (4) with soap solution and install in the groove of the rim.
8. Install lock ring (6) and tap into place with lead hammer. The lock ring lug must fit into the slot of the rim.
9. Remove the valve core from the valve stem and inflate the tire to the seat beads of the tire and O-ring, as specified by the tire manufacturer.

⚠DANGER

Use a safety cage whenever possible. Stand to one side as the tire is being inflated. DO NOT start inflating unless the lock ring is securely in place. DO NOT stand in front of or over the lock ring when inflating.

10. If the beads of the tire and O-ring do not seat within one minute, raise the tire slightly and tap the bead seat band. This will help the air pressure to push the tire bead out into position.
11. As soon as the seating has been accomplished, install the valve core and inflate the tire to the recommended tire pressure.
12. Follow the tire manufacturers recommendations concerning the tire bead seating procedures and the final tire pressure setting for each application.

Wheel Bearing Adjustment (Tire Mounted)

The following procedure outlines the adjustment of the front wheel bearings while the tire and rim, hub, and spindle are installed on the truck.

1. Park the truck in a level area.
2. Apply the parking brake to prevent movement.
3. Lift the truck until the tire of the wheel bearing being adjusted is off the ground. Chock the rear wheels.
4. Wrap chain and binder (2, Figure 3-10) around the top half of the tire. Secure the chain through the frame. The chain must be tightened enough to prevent movement during the bearing adjustment procedure when the retainer plate is removed.
5. Install another chain and binder (3) around the bottom half of the tire and tighten enough to prevent movement during the bearing adjustment procedure.

NOTE: A chain may also be installed to prevent full extension of the suspension cylinder when the truck is raised off the ground. Refer to 1, Figure 3-10.

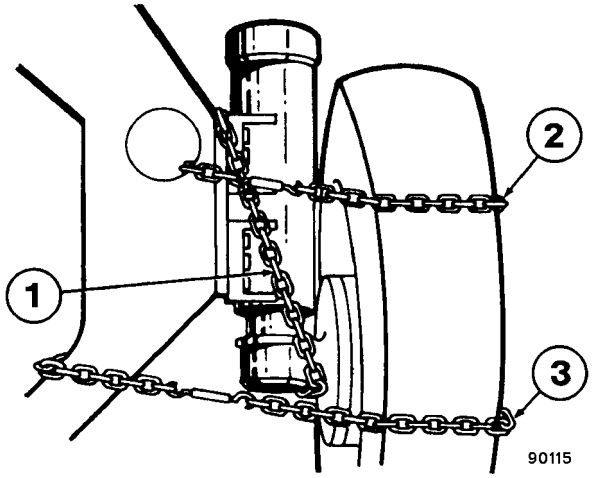


FIGURE 3-10. WHEEL SUPPORT CHAIN INSTALLATION

1. Suspension Support Chain
2. Chain and Binder
3. Chain and Binder

6. Drain the oil at drain plug (1, Figure 3-3). Remove cover (11).
7. Remove cap screws and hardened flat washers (9), bearing retainer plate (7), and shims (10).
8. Place the bearing retainer plate into position on the wheel hub. Position the plate with the dimension stamp facing outward. DO NOT install the shims at this time. Install cap screws and hardened flat washers (9).
9. Remove chain and binders (2 and 3, Figure 3-10).
10. Tighten retainer cap screws and hardened flat washers (9, Figure 3-3) alternately using the following procedure:
    a. Tighten all cap screws to **136 N·m (100 ft lbs)** and rotate the wheel hub a minimum of three revolutions.
    b. Increase torque to **339 N·m (250 ft lbs)** and tighten the cap screws. Rotate the wheel hub a minimum of three revolutions.
11. Loosen all six cap screws until the flat washers are loose, and then rotate the wheel hub a minimum of three revolutions.
12. Choose a cap screw that is adjacent to one of the depth measurement holes and identify it with paint. Now locate the cap screw that is exactly 180° from the painted cap screw and identify with paint. Tighten the two capscrews to **81 N·m (60 ft lbs)**. Rotate the wheel hub a minimum of three revolutions.
13. Tighten the same two cap screws to **149 N·m (110 ft lbs)** and rotate the wheel hub a minimum of three revolutions.
14. Again, tighten the same two cap screws to **149 N·m (110 ft lbs)**.
15. Using a depth micrometer, measure and record the depth to the end of the spindle from the face of retainer plate (1, Figure 3-9) through each of two depth measurement holes (3).
16. Add the two dimensions measured in Step 15 and divide the total by 2 to obtain an averaged depth dimension.
17. Subtract the dimension stamped on the face of the retainer plate from the averaged depth dimension in Step 16 to determine the required shim pack thickness.

Installation

1. Ensure the mating surfaces of rear axle housing (1, Figure 4-3), and rear axle pivot eye (4) are clean and not damaged.
2. Position rear axle pivot eye (4) with the front of the rear axle housing. Insert several cap screws (2) and flat washers (3) to align the parts. Remove the lifting device.
3. Install the remaining cap screws and flat washers. Tighten alternately until the rear axle housing pivot eye is properly seated.

   Tighten the cap screws to **2007 N·m (1480 ft lbs)**.

ANTI-SWAY BAR

Removal

1. Position the frame and the rear axle housing to allow the use of a puller tool to remove pins (1, Figure 4-4) on the rear axle housing and the frame.
2. Install support block between the frame and the axle to secure the frame during pin removal.
3. Disconnect the lubrication lines from the sway bar pins. Position a fork lift or attach a lifting device to anti-sway bar (3) for removal from the truck. The weight of the sway bar is approximately 96 kg.
4. Remove cap screws (4) and locknuts (5) at each mount.
5. Attach the puller and remove pin (1) from each end of the anti-sway bar.
6. Remove the anti-sway bar from the mounting brackets.
7. Remove bearing spacers (2).

Installation

1. Insert pin (1) through the front of the frame mount and one bearing spacer (2, Figure 4-4). Rotate the pin to align the retaining cap screw hole with the hole in the mounting bracket.
2. Raise the anti-sway bar into position and push the pin through the spherical bearing, insert a second bearing spacer, and continue pushing into the opposite ear of the bracket. If necessary, realign the pin with the retainer cap screw hole. Install cap screw (4) and locknut (5).
3. Repeat the procedure to install the remaining pin, spacers, cap screw, and locknut.
4. Attach the lubrication lines to the sway bar pins.
5. Remove the support blocks from between the frame and axle housing.
6. If necessary, recharge the suspensions. Refer to Section H, Oiling and Charging Procedures.

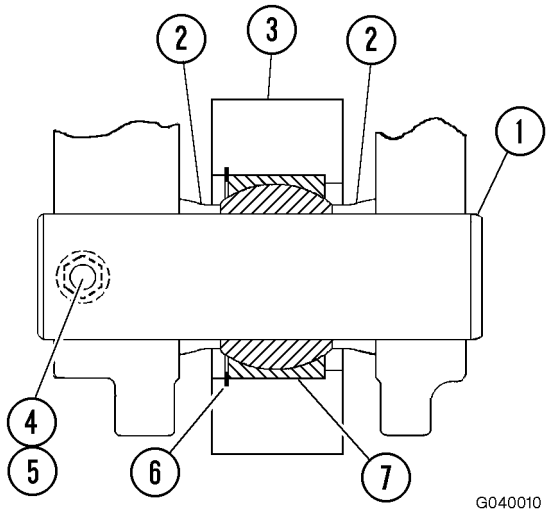


FIGURE 4-4. ANTI-SWAY BAR ASSEMBLY (TYPICAL, BOTH ENDS)

1. Pin
2. Bearing Spacer
3. Anti-Sway Bar
4. Cap Screw
5. Locknut
6. Retainer Ring
7. Bearing

FRONT SUSPENSION
SECTION H2
INDEX

NOTES

SECTION H4
OILING AND CHARGING PROCEDURES
INDEX

NOTES

SECTION J3
BRAKE CIRCUIT COMPONENT SERVICE
INDEX

9. Remove the spool from the sleeve before installing the sleeve into the body.
10. Lightly lubricate O-rings (14, 16, and 18) on the regulator sleeve.
11. Install the regulator sleeve assembly into the correct circuit in the valve. Ensure the spring seat is correctly seated in the regulator spring before installing the regulator sleeve assembly. Push the sleeve into the bore until the sleeve retaining flange at the base of the sleeve contacts the valve body.
12. Install spool return spring (20) into regulator spool (12).
13. Insert reaction plunger (21 and 22) into the regulator spool.
14. Install regulator spool (12) into regulator sleeve (19).
15. Repeat Steps 6 -14 for the second circuit.
16. Lightly lubricate large retainer plate O-ring (30) and install into the counterbore in the bottom end of the valve.
17. Install retainer plug (31) into the counter bore on the bottom of the valve. Ensure the steps on the retainer plug are facing the counterbore or toward the top of the valve.
18. Install base plate (32) on top of the retainer plug. Tighten four allen cap screws (34) evenly, alternating diagonally, to evenly seat the regulator sleeve assembly. Tighten to **15.8 - 16.9 N·m (140 - 150 in. lbs)**.
19. Using new O-ring (27, Figure 3-5) and face seal (28), install differential pressure switch (35) on the valve body.
20. Install actuator base (6, Figure 3-4) on top of the valve. Position properly for correct port direction. Tighten two socket head cap screws (5) and tighten to **20.3 - 21.5 N·m (180 - 190 in. lbs)**.
21. Screw adjustment collars (1, Figure 3-5) onto the top of the actuator plungers. Screw all the way down until they bottom on the threads.

DIFFERENTIAL PRESSURE SWITCH

Differential pressure switch assembly (1, Figure 3-9), mounted on the brake valve, detects an imbalance in the brake apply pressure between the front and rear brake circuits. If the pressures differ more than shown in Table I, Differential Pressure Switch Test, switch assembly (3) will activate a warning horn and lamp in the cab to alert the operator of a potential brake system problem.

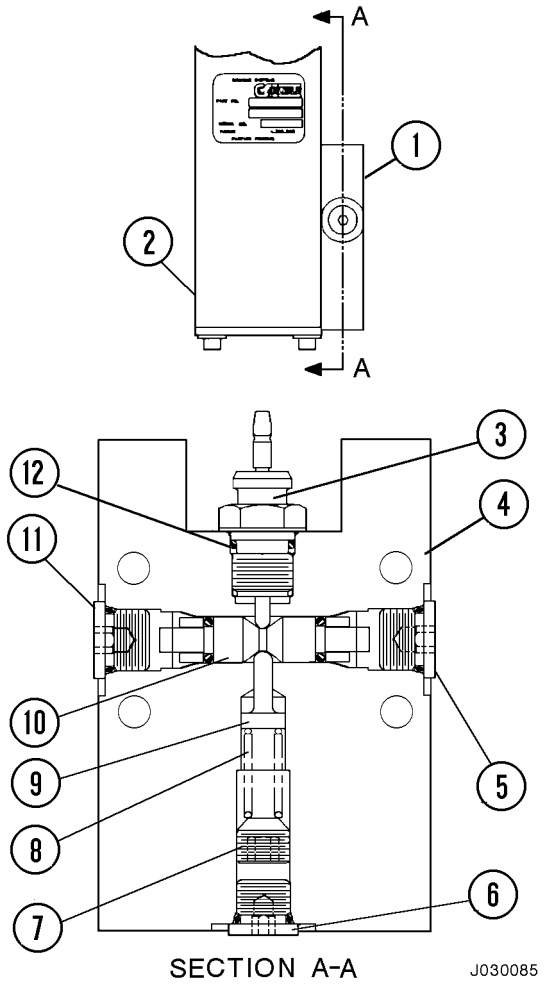


FIGURE 3-9. DIFFERENTIAL PRESSURE SWITCH

1. Differential Pressure Switch Assembly
2. Valve Body
3. Switch Assembly
4. Body
5. Plug
6. Plug
7. Screw Plug
8. Spring
9. Piston
10. Spool Assembly
11. Plug
12. O-Ring

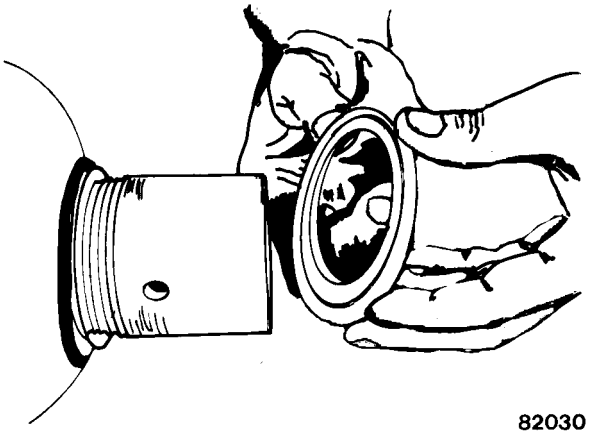


FIGURE 3-17. SPACER REMOVAL

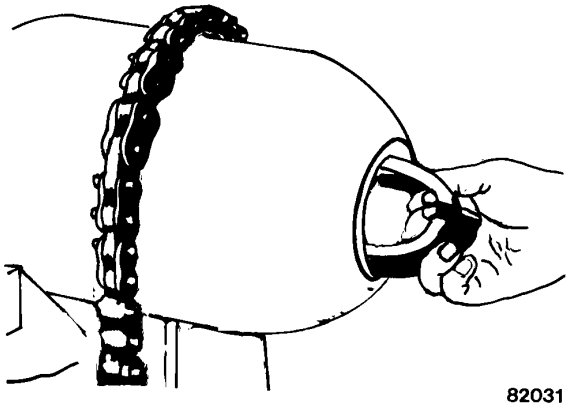


FIGURE 3-18. ANTI-EXTRUSION RING REMOVAL

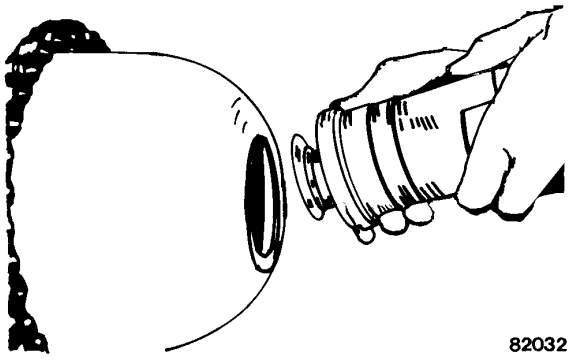


FIGURE 3-19. PLUG AND POPPET REMOVAL

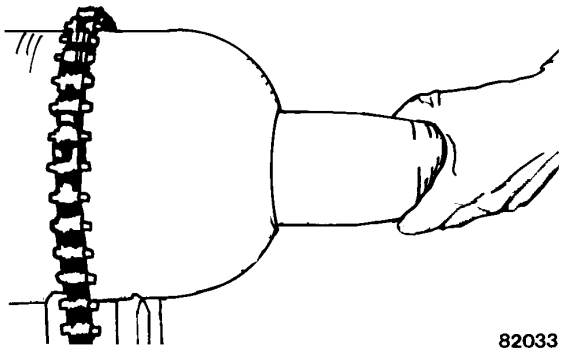


FIGURE 3-20. BLADDER REMOVAL

6. Remove spacer (14, Figure 3-13).
7. With the palm of your hand, push the plug and the poppet assembly into the shell.
8. Insert your hand into the shell and remove the O-ring, washer, and anti-extrusion ring (9, Figure 3-13). Fold the anti-extrusion ring to enable removal.
9. Remove the plug and the poppet assembly from the shell. Refer to Figure 3-19.
10. With the wrench on the valve stem flats, remove nut (4, Figure 3-13) from the charging valve.
11. Insert your hand into the accumulator shell fluid opening. Depress the bag and eliminate as much gas pressure as possible.
12. Fold the bladder and pull out of the accumulator shell. Refer to Figure 3-21. A slight twisting motion, while pulling on the bladder, reduces the effort required to remove the bladder from the shell. If the bladder is slippery, grasp with a cloth.

NOTES

POSSIBLE CAUSES	SUGGESTED CORRECTIVE ACTION
TROUBLE: Low Pressure Warning is On Even Though System Pressure is Correct	
Short in electrical system.	Check wiring.
Pressure switch is defective.	Replace switch.
TROUBLE: Low Pressure Warning Comes On and Pressure is Low	
Steering circuit is malfunctioning.	Check steering circuit pressures.
Pump is worn.	Rebuild or replace pump.
TROUBLE: A Squeal is Heard When Controller is Operated	
Rapid operation of controller.	Normal.
Brake valve assembly is damaged.	Replace brake valve assembly.
Hydraulic oil too hot.	Check entire hydraulic system for restriction, etc.
TROUBLE: Output Pressure At Controller is Correct but Brakes are Not Applying	
Brake lines are blocked or improperly connected.	Check plumbing.
TROUBLE: Brake Pressures Drift Excessively While Pedal is Held Steady	
Contamination in brake valve assembly.	Remove, disassemble, clean, or replace.
Damage in brake valve assembly.	Repair or replace brake valve assembly.
TROUBLE: Oil is Leaking Around the Pedal Base	
Defective seal on top of brake valve.	Replace seal.
TROUBLE: Pump Cycles Too Often Or Low Pressure Warning Comes On At Low Engine RPM	
Excessive internal leakage in a component.	Check all steering and brake system components.
Accumulator precharge too high or too low.	Check accumulator precharge.
Brake valve plumbed incorrectly.	Correct plumbing.
Internal leakage in brake valve assembly.	Replace brake valve assembly.
Pump is worn.	Rebuild or replace pump.

6. Inspect the end caps for wear. Replace if the grooves will not allow the lining back plate to slide freely.
7. Measure the thickness of the disc. If 20 to 25% of the disc wear surface is worn below 28.7 (1.13 in.), the disc must be replaced.
8. If the original linings have sufficient lining material for reuse, inspect the lining back plate for cracks or excessive yielding where the plate fits into end caps (7 or 8, Figure 5-3).

⚠CAUTION

When replacing the linings, DO NOT mix new and used linings in the same caliper.

9. Slide brake linings (9) into the caliper. It may be necessary to again pry the pistons into housing (1).
10. Install end caps (7 and 8). Apply Loctite® 271 to the threads of retainer bolts (6), install and tighten to **546 N·m (403 ft lbs)**. Check that brake linings (9) slide freely between the end plates.
11. Install the front wheels. Refer to Section G, Wheel and Tire Installation.
12. Burnish the front brakes. Refer to Front Service Brake Conditioning (Burnishing) Procedure in this chapter.

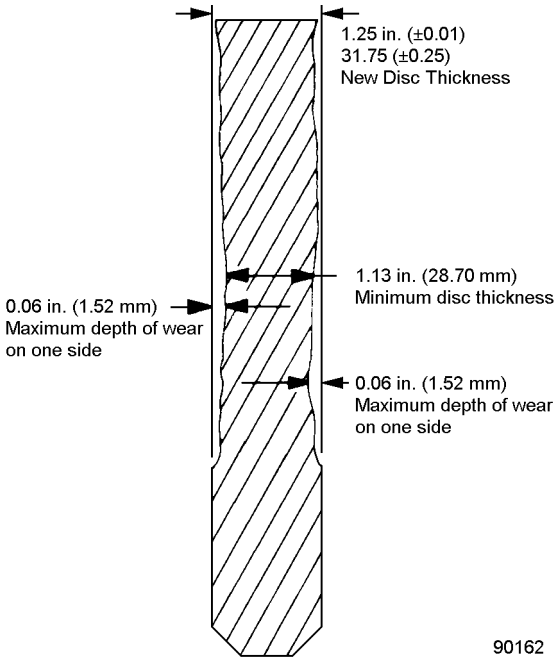


FIGURE 5-4. DISC WEAR LIMITS

23. Install outboard disc (12) with bushing (8). Install cap screws and flat washers (11). Tighten cap screws (11) to standard torque.
24. Install outboard brake caliper half (5) and secure in place with outer cap screws and flat washers (6). Remove the two studs in the center holes and install remaining two cap screws (6) with the washers. Tighten cap screws and flat washers (6) to standard torque.
25. Install the linings. Refer to Lining Replacement.
26. Install bleeders in both brake calipers. Install the crossover tubes and the brake lines.
27. Install the parking brake caliper. Refer to Parking Brake Caliper Installation.
28. The brakes must be bled and burnished before the truck is returned to production. Refer to the Bleeding and Service Brake Conditioning procedure.

CALIPER PISTON

Piston Assembly Removal

1. Position the brake caliper so return pin (1) is in an upright position. Refer to Figure 6-7.
2. Hold return pin (10) in place with a narrow bladed screwdriver or hex key wrench and remove return pin (1).
3. Using a 6.35 mm (0.25 in.) diameter copper or brass drift and a plastic mallet, gently tap on the end of the pin to drive the piston assembly from the housing. Carefully remove dust shield (12) from the groove of the housing and from the groove in the piston.
4. Remove O-ring (7) and back-up ring (16) from the housing using a soft, non-metallic round edged tool.
5. Necessary functional inspections of the piston return mechanism can be made without disassembly of the piston assembly. The piston assembly may be disassembled for detailed inspection, reassembled, and readjusted.
6. If the piston assembly can be cleaned thoroughly without disassembly, and if the piston surface condition is acceptable for reuse, then the piston assembly can be functionally inspected for operation of the return mechanism, and if satisfactory, returned to service.

Inspection

1. Inspect the piston surfaces for nicks, scratches, or rust.
2. Inspect the housing bore for nicks, scratches, or rust. Minor nicks, scratches, and rust can be removed with a fine emery cloth providing the following wear limits are not exceeded:

- Piston O.D. — 66.5 mm (2.621 in.) min.
- Housing Bore I.D. — 66.8 mm (2.630 in.) max.

3. Replace parts if worn beyond above limits.

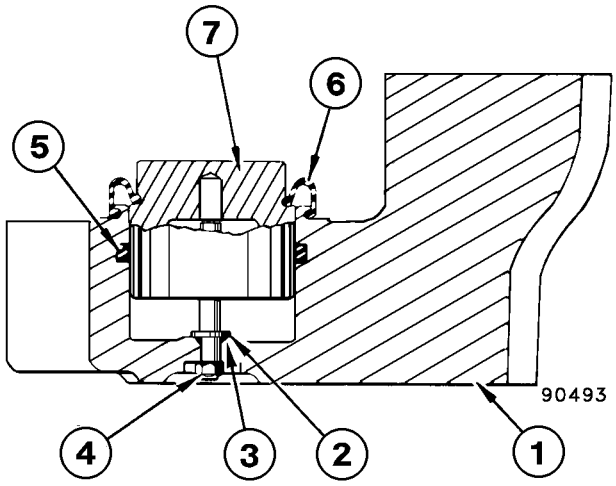


FIGURE 6-4. PISTON ASSEMBLY INSTALLATION

1. Brake Housing
2. Return Pin Washer
3. O-Ring
4. Return Pin Nut
5. Piston Seal Assembly
6. Dust Shield
7. Piston Assembly

4. Inspect the brake discs for wear (Figure 6-18). Place a straight edge across the face of the disc and measure from the straight edge to the worn face. The disc must be replaced when this measurement is 1.52 mm (0.06 in.) or more on either side of the disc, or when the disc thickness is 22.3 mm (0.88 in.) on the worn face (see Note). It may be difficult to use a straight edge on the inner surface of the disc, so a visual comparison may be used with that of the outer surface. Normally, wear will be the same on both sides.

NOTE: The disc only needs to be replaced when 20 to 25% of the disc wear surface is worn below 22.3 mm (0.88 in.).

NOTE: When installing the new linings to be used against a worn disc, useful lining life will be shortened by the depth of the disc wear, since the lining must advance this additional distance before the braking force is effective. In addition, the uneven wear on the disc face will accelerate the lining wear.

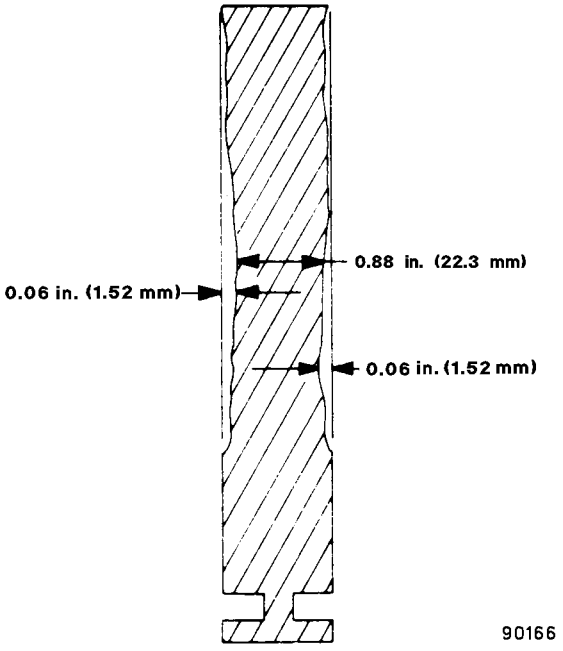


FIGURE 6-18. REAR BRAKE DISC WEAR LIMITS

5. Install new linings and lining retaining plate (2, Figure 6-16).
6. Apply Loctite® 271 to the threads of cap screws (1) and tighten to **258 N·m (190 ft lbs)**. Check that the linings slide freely between the retainer plates.
7. Check the brakes for operation. The linings must be free after release, with a minimum of 0.76 mm (0.03 in.) disc to the lining clearance. If clearance is not present, each piston must be pried completely into the caliper housings.
8. After installing the new brake pads, and before releasing the truck to production, the brakes must be burnished. Refer to Conditioning (Burnishing) procedure.

4. Remove dust boots (8) from spring retainers (15).
5. Remove spring retainers (15) and springs (9). Note the order and orientation of the springs.
6. Remove pistons (10) from the housing.
7. Remove seal assembly (6) and back-up ring (7) from the pistons and discard these parts.
8. Remove screws (14) releasing lining (5) from the pistons.
9. Remove seal assembly (12) and back-up ring (13) from the housing and discard these parts.

Cleaning and Inspection

⚠WARNING

Petroleum base cleaning solvents are flammable. DO NOT use near open flame.

1. Clean all the metal parts of the brake assembly in cleaning solvent.
2. Inspect all the metal parts for cracks. Replace all damaged parts.
3. Measure the pistons and housing bores. Replace the parts if they are worn beyond the following limits:

Piston:

- Large O.D. — 114.1 mm (4.494 in.)
- Small O.D. — 63.3 mm (2.493 in.)
- Seal groove — 104.8 mm (4.126 in.)

Housing Bore:

- Large I.D. — 114.4 mm (4.503 in.)
- Small I.D. — 63.6 mm (2.504 in.)
- Seal groove — 73.6 mm (2.869 in.)

4. Inspect the inlet and bleeder holes in housing (2) for thread damage. If necessary, use the following taps:

- Lining bolt hole in piston — 10-24 UNC-2B tap
- Inlet hole — 7/16-20 UNF-2B tap
- Bleeder hole —1/4-28 UNF-2B tap

⚠CAUTION

After tapping, ensure all metal chips and residue are removed from the openings and hydraulic passages. If the threads are not serviceable, replace the housing.

5. Inspect the housing cylinder walls for damage. Scratches or corrosion to a depth of 0.05 mm (0.002 in.) or less on the cylinder wall can be blended out with 300-500 grit wet or dry sandpaper or emery cloth. Replace the housing if damage is beyond these limits.

⚠CAUTION

Excessive localized polishing of the cylinder wall may result in fluid leakage.

6. Inspect springs (9) for cracks or corrosion. Replace the parts that are cracked or severely corroded.
7. Inspect clamping cap screws (13) and adjustment bolt (16) for cracks, corrosion, or thread damage. Replace damaged bolts.
8. Inspect the threaded hole for adjustment bolt (16). The threaded hole can be reconditioned with a 1-14 UNF-2B tap. If the threads are not serviceable, replace the yoke.
9. Inspect the threaded hole for clamping cap screw (3). The threaded hole can be reconditioned with a 5/8-11UNC-2B tap. If the threads are not serviceable, replace the housing.

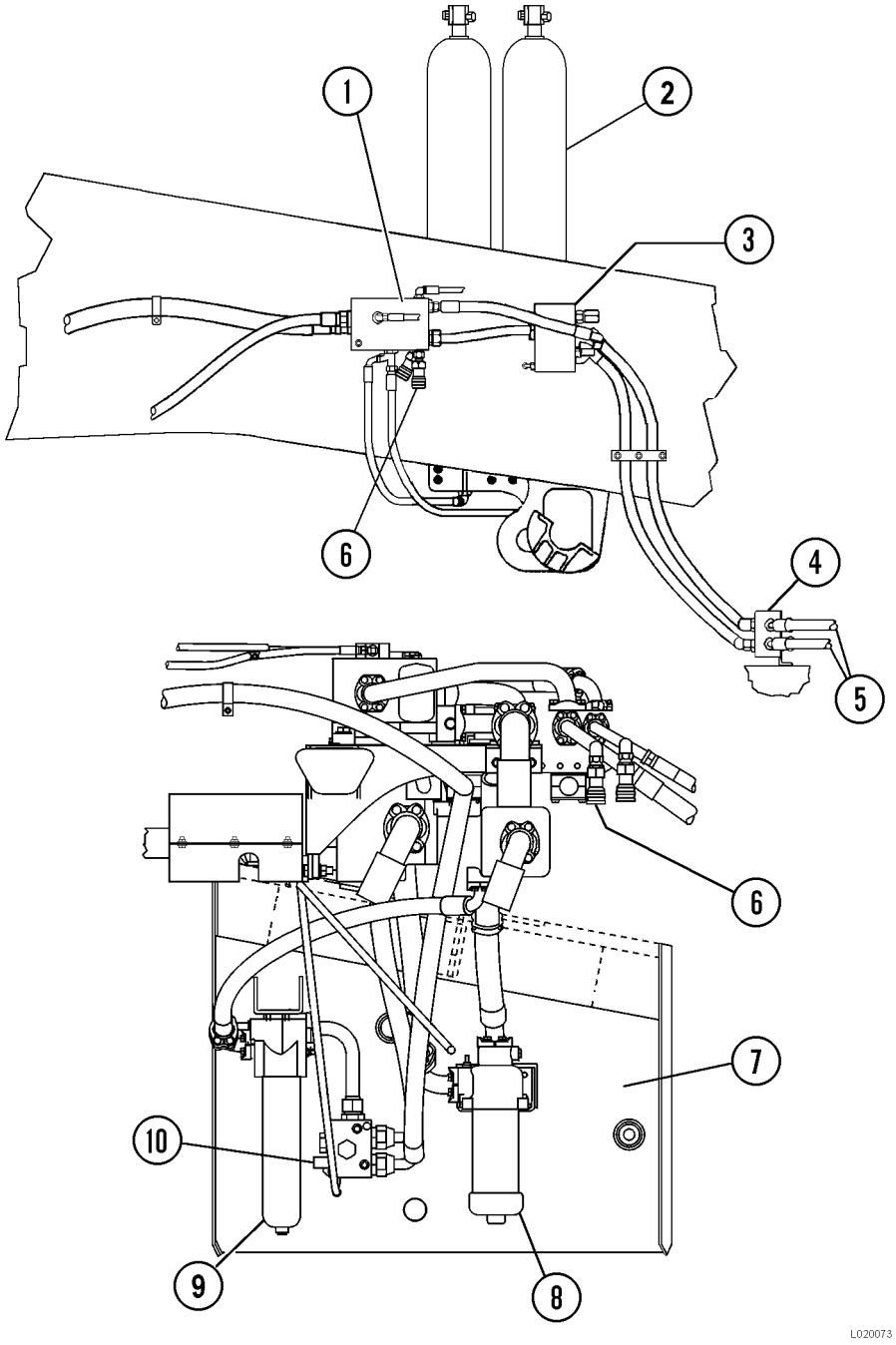


FIGURE 2-2. STEERING AND BRAKE PUMP PIPING

1. Bleed-Down Manifold
2. Steering Accumulators
3. Flow Amplifier Valve
4. Steering Cylinder Manifold
5. Hoses to Steering Cylinders
6. Auxiliary Quick Disconnect Fittings
7. Fuel Tank
8. Hoist Filter
9. Steering/Brake Supply Filter
10. Unloader Valve

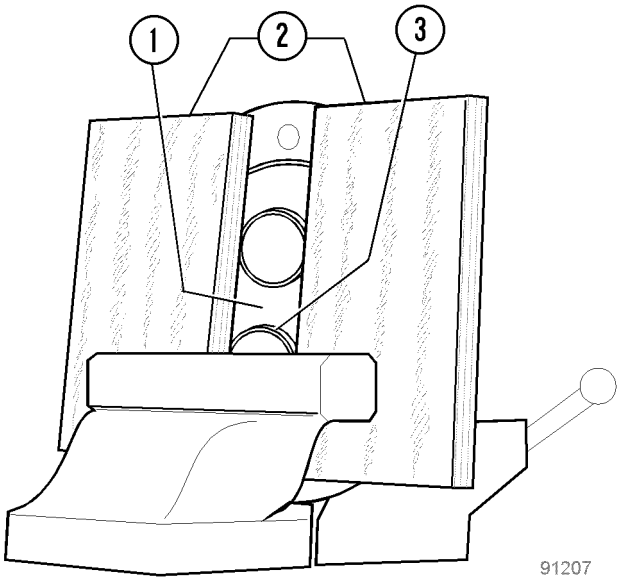


FIGURE 3-7. SHAFT SEAL INSTALLATION

1. Flange
2. Wood Blocks
3. Bearing Projection

5. Position inboard shaft seal (3, Figure 3-8) with the metal face toward the outboard end of the flange and the lip (spring side) facing towards the inside of the pump.
6. Position the seal press ring over the seal. Ensure the seal stays centered and true with the bore, and start applying pressure with the vise. Continue pressing the seal until It just clears the snap ring groove in the bore.
7. Install snap ring (2, Figure 3-8). Ensure the snap ring opening is over weep hole (10).
8. Install outboard shaft seal (1, Figure 3-8) with the metal face facing out until it just contacts the snap ring. Lubricate the seals with hydraulic oil.
9. Lubricate stud threads (14, Figure 3-8) with hydraulic oil. Thread the studs into the flange until snug. There are four long studs (11, Figure 3-9) and four short studs (12). Refer to Figure 3-9 for the stud location.
10. Lubricate and install O-ring (7, Figure 3-8). Install dowel pins (12), if removed. Install gear plate (13) with the recess in the gear plate facing up or toward the connector plate when the gear plate is installed.
11. Install steel rings (5, Figure 3-9). Lubricate and install back-up ring (8), O-ring (7), and retainer ring (6).
12. Install isolation plate (9) on the suction side of the gear plate. The isolation plate has a relief area machined on one side, turn that side up, or toward the pressure plate.

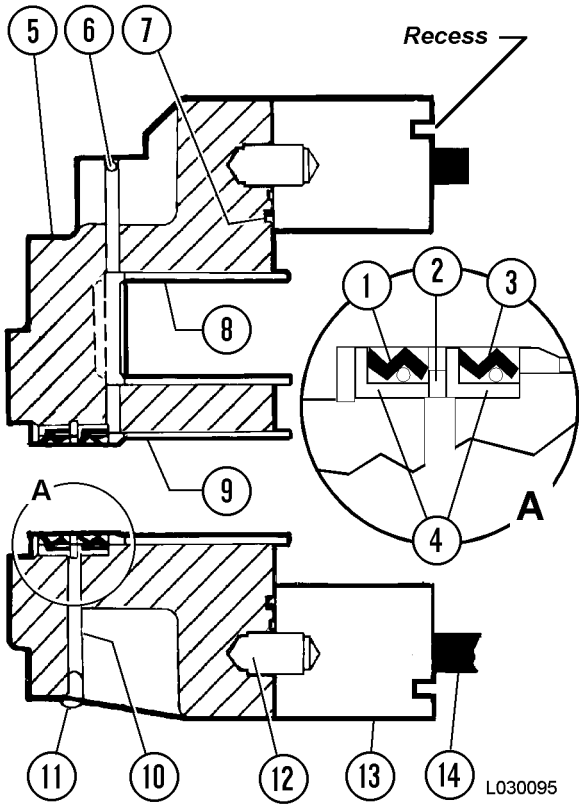


FIGURE 3-8. SHAFT SEAL INSTALLATION

1. Outboard Shaft Seal
2. Snap Ring
3. Inboard Shaft Seal
4. Metal Face Seal
5. Flange
6. Steel Ball
7. O-Ring
8. Bearing
9. Bearing
10. Weep Hole
11. Plug
12. Dowel
13. Gear Plate
14. Stud Threads

⚠WARNING

If a loss in steering pressure occurs, stop the truck immediately. Pressure in the accumulators allows the operator to steer the truck only for a short period. DO NOT attempt further operation until the problem is located and corrected.

Hydraulic oil from the bleed-down valve flows to the closed center steering control valve via the flow amplifier. Oil entering the steering control valve is blocked until the steering wheel is turned in a desired direction. The valve then directs oil to the flow amplifier, which in turn, provides a high volume of oil to the steering cylinders. Hydraulic oil at the opposite ends of the steering cylinders flows back through the flow amplifier, and the bleed-down valve to the hydraulic tank.

COMPONENT DESCRIPTION

Steering Control Valve

The steering control valve (Figure 4-2) is mounted inside the cab and is directly coupled to the steering column.

Operation of the steering valve is both manual and hydraulic in effect. The steering valve incorporates a hydraulic control valve. Steering effort applied to the steering wheel by the operator actuates the valve, which in turn, directs hydraulic oil through the flow amplifier valve to the steering cylinders to provide the operator with power steering.

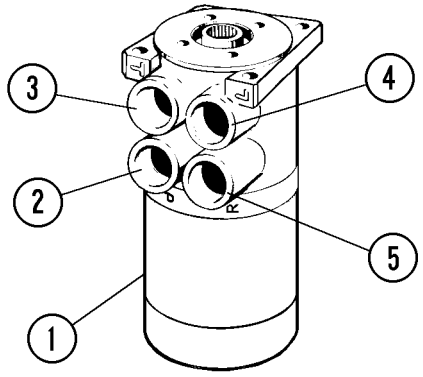


FIGURE 4-2. STEERING CONTROL VALVE

1. Control Valve Assembly
2. Inlet Port
3. Tank Return Port
4. Left Steer Port
5. Right Steer Port

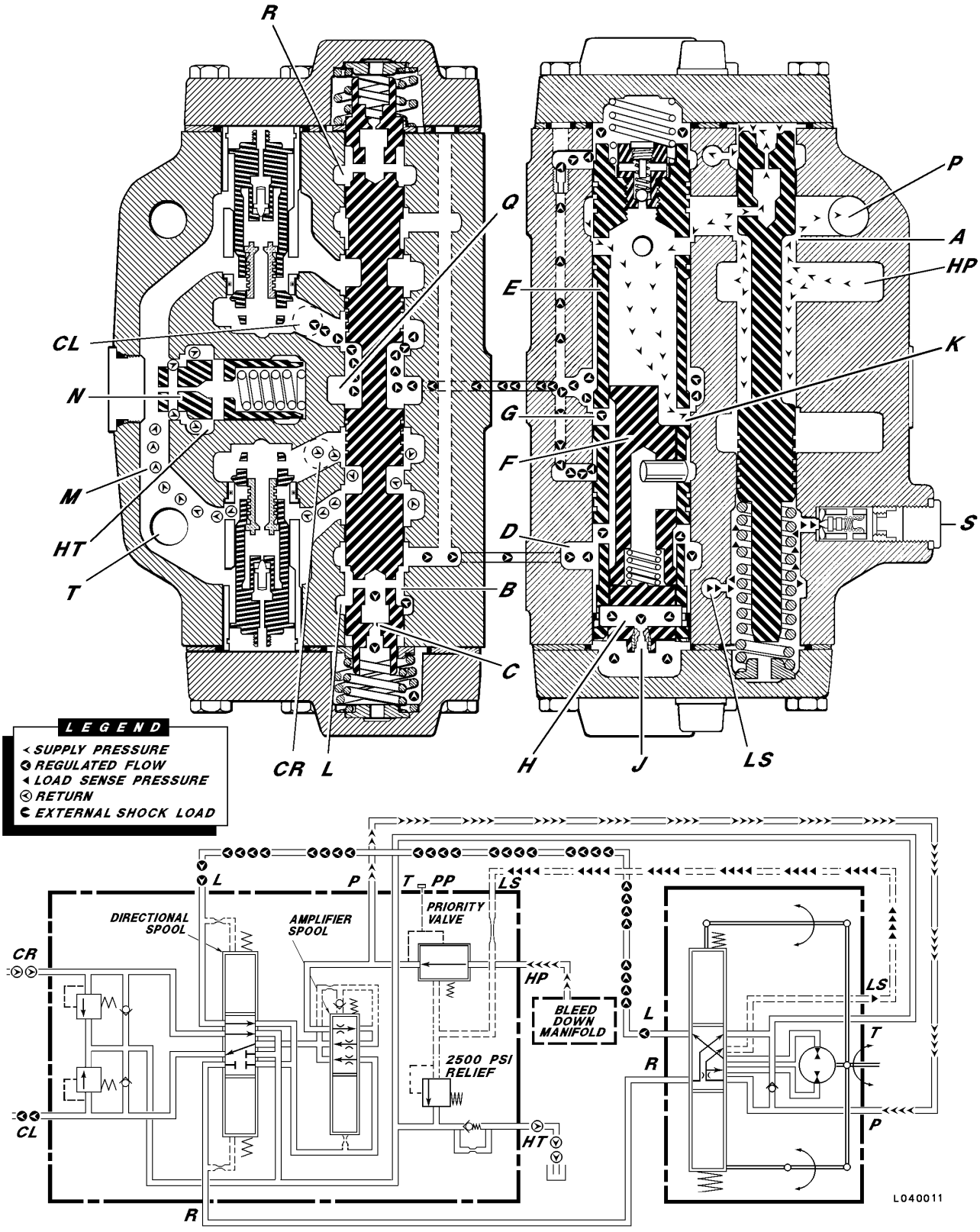


FIGURE 4-13. FLOW AMPLIFIER
(STEERING LEFT)

10. Remove O-ring (5), kin ring (6), and bearing assembly (7).
11. Remove ring (8) and pin (9). Carefully push the inner spool out of the outer sleeve.
12. Press neutral position springs (10) out of their slot in the inner spool.
13. Remove dust seal (2, Figure 5-6) using a screwdriver. Take care not to scratch or damage the dust seal bore.

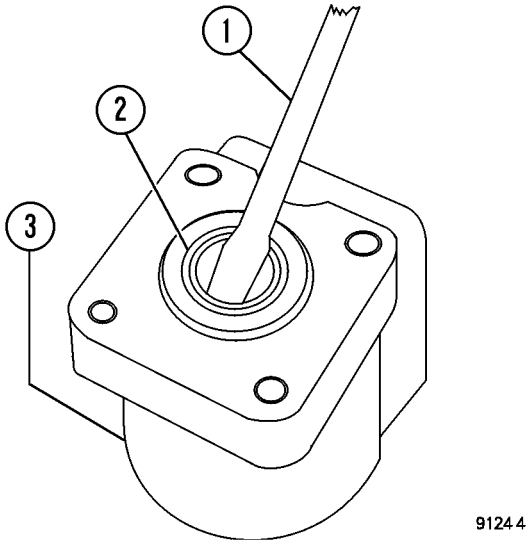


FIGURE 5-6. DUST SEAL REMOVAL

1. Screwdriver
2. Dust Seal
3. Housing

Cleaning and Inspection

1. Clean all the parts carefully with fresh cleaning solvent.
2. Inspect all the parts carefully and make any replacements necessary.

NOTE: All O-rings, seals, and neutral position springs must be replaced with new. Prior to reassembly, thoroughly lubricate all the parts with clean type C-4 hydraulic oil.

SECTION L6
STEERING CIRCUIT COMPONENT REPAIR
INDEX

Temperature During Precharge

Temperature variation can affect the precharge pressure of an accumulator. As the temperature increases, the pressure increases. Conversely, decreasing temperature will decrease the pressure. To ensure accuracy, it is necessary to adjust the charging pressure to offset temperature variations. The temperature variation is determined by the ambient temperature at the time of charging. If the accumulator is mounted on the truck, wait one hour after shutting the engine off. After an hour, measure the ambient temperature to determine the proper charging pressure. Refer to Table 1.

Example: Assuming the ambient temperature is 10°C (50°F), charge the accumulator to 9294 kPa (1348 psi).

TABLE 1. Relationship Between Charging Pressure and Ambient Temperature

Ambient Temperature	Charging Pressure ± 70 kPa (10 psi)
-23°C (-10°F) and below	8232 kPa (1194 psi)
-17°C (0°F)	8412 kPa (1220 psi)
-12°C (10°F)	8584 kPa (1245 psi)
-7°C (20°F)	8763 kPa (1271 psi)
-1°C (30°F)	8943 kPa (1297 psi)
4°C (40°F)	9122 kPa (1323 psi)
10°C (50°F)	9294 kPa (1348 psi)
16°C (60°F)	9473 kPa (1374 psi)
21°C (70°F)	9653 kPa (1400 psi)
27°C (80°F)	9832 kPa (1426 psi)
32°C (90°F)	10011 kPa (1452 psi)
38°C (100°F)	10184 kPa (1477 psi)
43°C (110°F)	10363 kPa (1503 psi)
49°C (120°F)	10542 kPa (1529 psi)

NOTE: Pressures below 8232 kPa (1194 psi) are not recommended. The low accumulator pressure warning switch activates at 7584 ± 310 kPa (1100 ± 45 psi).

ACCUMULATOR STORAGE

The shelf life of bladders, under normal storage conditions, is one year. Normal storage conditions consist of the bladder being heat sealed in a black plastic bag and placed in a cool, dry place away from the sun, ultraviolet, and fluorescent lights, as well as electrical equipment. Direct sunlight or fluorescent light can cause the bladder to weather check and dry rot, which appear on the bladder surface as cracks.

⚠WARNING

When storing an accumulator, pressurize the accumulator to 690-827 kPa (100-120 psi). DO NOT exceed 827 kPa (120 psi). Sudden loss of the accumulator pressure can result in a projectile hazard that can cause serious injury or death.
Only precharge the accumulators to operating pressure while installed on the truck. DO NOT handle the accumulator with a nitrogen precharge greater than 827 kPa (120 psi).

1. If the accumulator has been rebuilt, ensure there is approximately 2.3 l (80 oz) of oil inside the accumulator before adding pressure.
2. Charge the accumulator to 690-827 kPa (100-120 psi). Refer to Steering Accumulator Charging in this chapter.

NOTE: Pressurizing the accumulator fully expands the bladder and holds a film of oil against the inner walls for lubrication and rust prevention.

3. The hydraulic port assembly must be covered with a plastic plug, without threads, to prevent contamination. DO NOT install a threaded plug in the hydraulic port assembly.
4. Store the accumulator in an upright position.

PROBLEM	POSSIBLE CAUSE	SUGGESTED CORRECTIVE ACTION
Low pump output.	1. Low pump pressure.	1. Check unloader valve operation and adjust pressure if necessary. Check compensator adjustment pressure. Check system relief valves.
	2. Internal pump wear.	2. Repair or replace steering pump.
	3. Restricted inlet.	3. Ensure shut-off valve is open. Check suction hose. Clean tank strainers.
	4. Insufficient oil supply.	4. Check hydraulic tank oil level. Ensure shut-off valve is open.
	5. High pressure filter restricted.	5. Replace filter element.
Loss of pressure.	1. Defective pressure control.	1. Check unloader valve operation and adjust pressure if necessary. Check compensator adjustment pressure. Check system relief valves.
	2. Internal steering pump wear.	2. Repair or replace pump.
	3. Excessive leakage in brake system.	3. Inspect brake system and check pressures.
Excessive or high peak pressure.	1. Defective or improperly adjusted pressure control(s).	1. Check unloader valve operation and adjust pressure if necessary. Check compensator adjustment pressure. Check system relief valves and replace if necessary.
Noise or squeal.	1. Low compensator or unloader valve setting.	1. Check pressure and adjust pressure controls.
	2. Fluid too cold or viscosity too high.	2. Warm oil before starting or install proper viscosity oil.
	3. Air leak at pump inlet.	3. Inspect inlet hose, connections, and shut-off valve.
	4. Insufficient inlet oil supply.	4. Check hydraulic tank level. Clean suction strainer. Ensure shut-off valve is open.
	5. Internal pump damage.	5. Repair or replace pump.
Erratic pump (load/unload) cycle.	1. Pressure compensator adjusted incorrectly or defective.	1. Adjust pressure compensator or repair if necessary. Check unloader pressure settings.
	2. Excessive internal leakage in steering circuit.	2. Measure component leakage rates and replace defective components.
	3. Unloader valve pilot seat damaged.	3. Replace unloader valve module.
Excessive heat.	1. Excessive system pressure.	1. Adjust system pressures.
	2. Low hydraulic fluid level.	2. Service hydraulic tank.
	3. Worn steering or hoist pump.	3. Repair or replace pump(s).

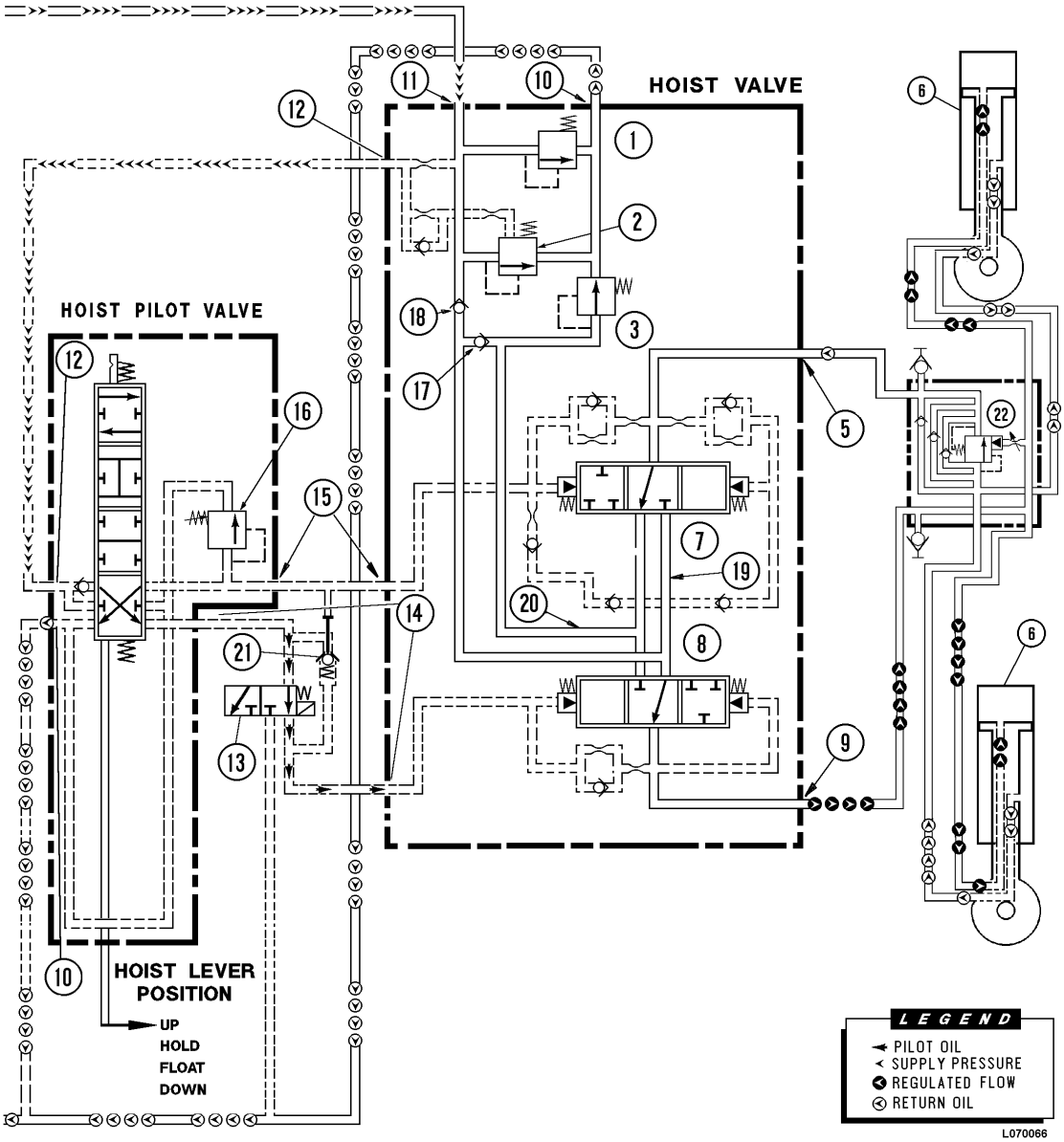


FIGURE 7-5. POWER UP POSITION

1. Hoist Relief Valve 17238 kPa (2500 psi)
2. Flow Control Valve
3. Low Pressure Relief Valve 517 kPa (75 psi)
4. Not Used
5. Rod End Work Port
6. Hoist Cylinders
7. Rod End Spool
8. Head End Spool
9. Head End Work Port
10. Return Port
11. Supply Port
12. Pilot Supply Port
13. Hoist Limit Solenoid
14. Raise Pilot Port
15. Down Pilot Port
16. Power Down Relief Valve 10341 kPa (1500 psi)
17. Anti-Void Check Valve
18. Load Check Valve
19. High Pressure Passage
20. Low Pressure Passage
21. Pilot Operated Check Valve
22. Overcenter Manifold

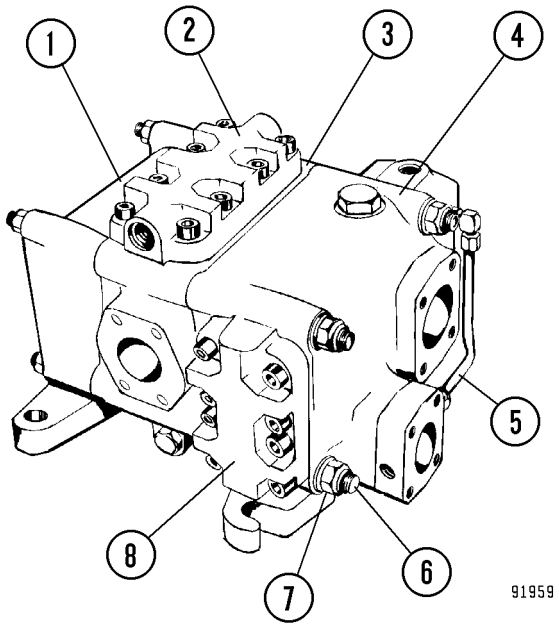


FIGURE 8-2. HOIST VALVE ASSEMBLY

1. Outlet Section
2. Spool Section Cover
3. Spool Section
4. Inlet Section
5. Tube
6. Tie Rods
7. Nuts and Washers
8. Inlet Section Cover

O-Ring Replacement

NOTE: It is not necessary to remove the individual valve sections to accomplish repair, unless emergency field repair is required to replace the O-rings between the sections to prevent leakage. Loosening and retightening of the main valve tie rod nut could cause distortion, resulting in binding or severely sticking the plungers, poppet, and spools.

To replace the O-rings between the valve sections:

1. Remove four tie rod nuts and washers (7, Figure 8-2) from one end of the valve. Slide the tie rods from the valve and separate the sections.
2. Inspect the machined sealing surfaces for scratches or nicks. If scratches or nicks are found, remove by lapping on a smooth flat steel surface with fine lapping compound.

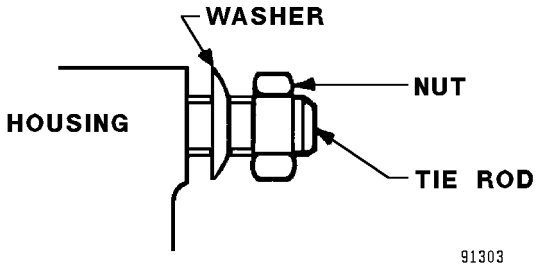


FIGURE 8-3. TIE ROD INSTALLATION

3. Lubricate the new O-rings lightly with multipurpose grease. Replace the O-rings between sections. Stack the sections together ensuring the O-rings between the sections are properly positioned.
4. Install the four tie rods with the dished washer between the nut and housing (Figure 8-3).
5. A torque wrench must be used to tighten the nuts in the pattern, as shown in Figure 8-4. The tie rods must be tightened evenly to **142 N·m (105 ft lbs)** in the following sequence:
   a. Tighten the nuts evenly to **20 N·m (15 ft lbs)** in order 1, 4, 2, 3.
   b. Tighten the nuts evenly to **43 N·m (32 ft lbs)** in order 1, 4, 2, 3.
   c. Tighten the nuts evenly to **142 N.m (105 ft lbs)** in order 1, 4, 2, 3.

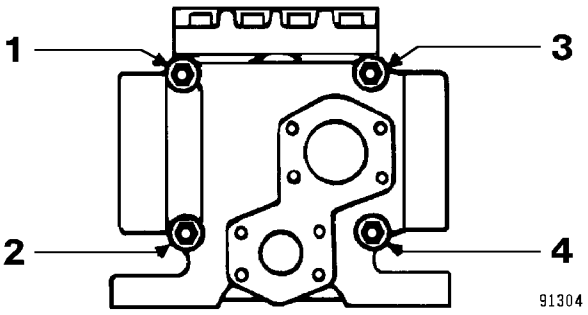


FIGURE 8-4.

⚠WARNING

The hoist cylinder weighs approximately 1000 kg (2200 lbs). Some means of support is necessary to prevent it from falling or causing injury when removing from the truck. Use a suitable lifting device that can handle the load safely.

4. At the upper mount, remove lock nut (4, Figure 8-17) from the pin retaining cap screws. Remove cap screw (5). Use a brass drift and hammer to drive pin (1) from the bore of the mounting bracket.
5. Carefully lower the cylinder until it lays against the inside dual tire. The hoist cylinder weighs approximately 1000 kgs (2200 lbs). Attach a suitable lifting device that can handle the load safely to the upper cylinder mounting eye.
6. Install a retaining strap or chain to prevent the cylinder from extending during handling.
7. At the lower mount, straighten the lock plate tabs to allow cap screw removal. Remove all cap screws (1, Figure 8-18), lock plate (2), and retainer (3).
8. Carefully remove the cylinder from the frame pivot by pulling outward. Move the cylinder to a clean area for disassembly.

NOTE: DO NOT lose spacer (6, Figure 8-18) between the cylinder bearing and the frame.

9. Clean the exterior of the cylinder thoroughly.

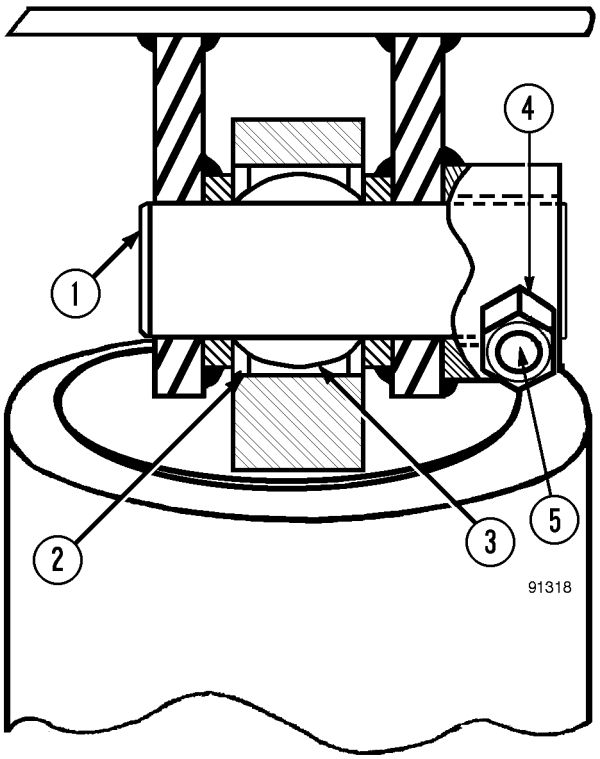


FIGURE 8-17. HOIST CYLINDER UPPER MOUNT

1. Pin
2. Retainer Ring
3. Bearing
4. Locknut
5. Cap Screw

Installation

⚠WARNING

Install a retaining strap or chain to prevent the cylinder from extending during handling. The hoist cylinder weighs approximately 1000 kg (2200 lbs). Use a suitable lifting device that can handle the load safely.

NOTE: Before installing the cylinder, inspect the hoist stub shaft in the inner curvature area for possible cracks.

SECTION L9
HIGH PRESSURE FILTERS
INDEX

7. Fill the hydraulic tank with hydraulic oil until it is visible in the upper sight glass.
8. Remove air from all the pump suction lines by removing the seal in the test block at each pump suction port. When oil appears, replace and tighten the seal.
9. Ensure the hydraulic oil level in the tank is visible in the upper sight glass. Add oil, if necessary.
10. Place the hoist control lever in the FLOAT position.
11. Turn the key switch ON but DO NOT start the engine. Verify the low steering accumulator precharge warning is not displayed. If the warning is displayed, correct the problem before starting the engine. The brake accumulators do not have pressure switches to warn for low precharge, but must still be precharged to 9653 kPa (1400 psi) before starting the engine. DO NOT start the engine without verifying that all steering and all brake accumulators are precharged to 9653 kPa (1400 psi).

    Start the engine and operate at low idle.
12. The pressure at the hoist pump filter will be approximately 24 kPa (75 psi) with 21°C (70°F) oil.
13. The pressure at the steering pump filter will be approximately 3447 kPa (500 psi) with 21°C (70° F) oil.
14. If all pump pressures are as stated in Steps 12 and 13, increase the engine to 1500 rpm and flush the system for 20 minutes. During this time, move the hoist control lever to POWER UP for 30 seconds. Then move the lever to POWER DOWN for 30 seconds. Repeat the hoist control lever cycling five times.
15. After flushing is complete, stop the engine. Remove all hoses/lines used for flushing and reconnect the original hoses/lines. Ensure the oil is visible in the upper sight glass on the hydraulic tank. Add oil, if necessary.
16. Flush the accumulators by starting the engine and operating it until the accumulator pressure is approximately 20512 kPa (2975 psi), until the unloader valve shifts and unloads the steering pump. Stop the engine and let the accumulators completely discharge. Open both needle valves in the brake cabinet to allow the brake accumulators to discharge. Close the needle valves after all the accumulators are completely discharged. Repeat this entire step five times.

NOTE: This procedure cannot be combined with the flushing done in Steps 11-15. This flushing procedure must be performed after Step 15 is completed.

NOTE: DO NOT steer or apply the brakes at any time during the accumulator flushing procedure.

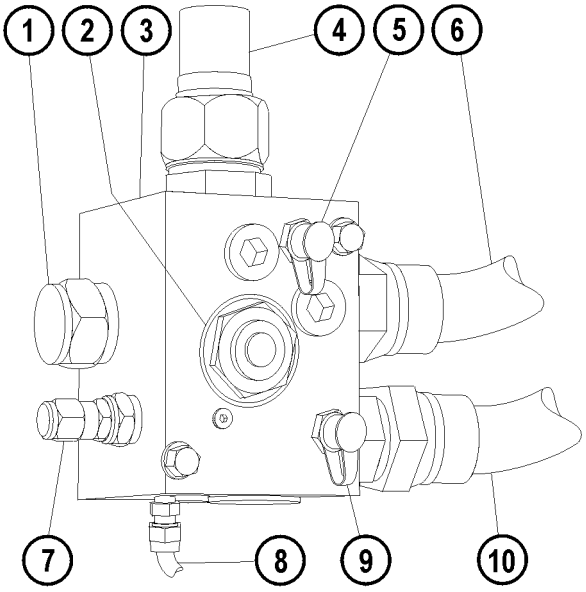
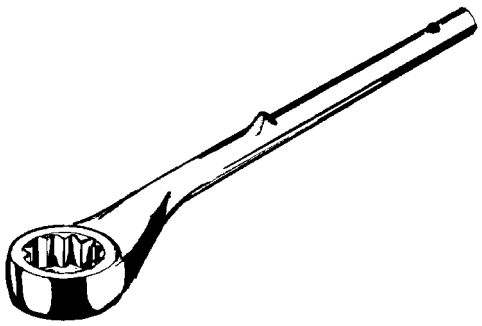


FIGURE 10-1. UNLOADER VALVE

1. Differential Pressure Valve
2. Check Valve
3. Valve Body
4. Inlet From Filter
5. Test Port
6. Return To Tank
7. Pilot Unloading Valve
8. To Drain
9. Test Port
10. Supply To Steering

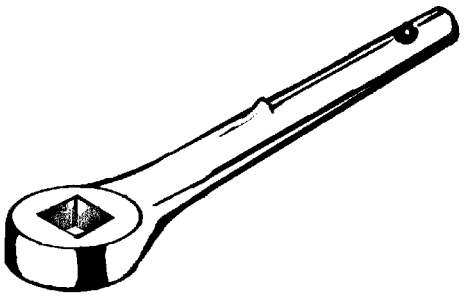
TROUBLESHOOTING CHART
(Steering Circuit)

Trouble	Possible Cause	Suggested Corrective Action
Excessive free play at steered wheels	Broken or worn linkage between cylinder and steered wheels.	Check for loose fitting bearings at anchor points in steering linkage between cylinder and steered wheels.
	Leaky cylinder seals.	Replace cylinder seals.
Binding or poor centering of steered wheels	Binding or misalignment in steering column or splined column or splined input connection.	Align column pilot and spline to steering control valve.
	High back pressure in tank can cause slow return to center. DO NOT exceed 2068 kPa (300 psi).	Reduce restriction in the lines or circuit by removing obstruction or pinched lines, etc.
	Large particles can cause binding between the spool and sleeve.	Clean the steering control unit. If another component has malfunctioned generating contaminating materials, flush the entire hydraulic system.
Steering control valve locks up	Large particles in spool section.	Clean the steering control unit.
	Insufficient hydraulic power.	Check hydraulic oil supply.
	Severe wear and/or broken cardan shaft pin.	Replace pin or the steering control unit.
Steering wheel oscillates or turns by itself	Lines connected to wrong ports.	Check line routing and connections.
	Parts assembled incorrectly.	Reassemble correctly.
Steering wheels turn in opposite direction when operator turns steering wheel	Lines connected to wrong cylinder ports.	Correct cylinder port line connections.



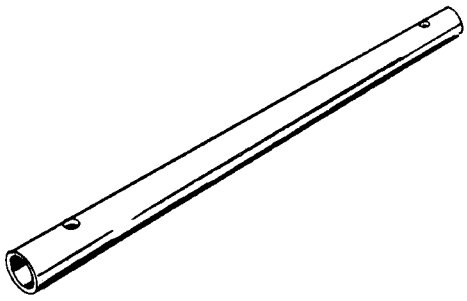
OFFSET WRENCH

Part Number	Description	Use
PB8326	Offset Box End Wrench, 1 7/16”	Miscellaneous and Cab Mounting



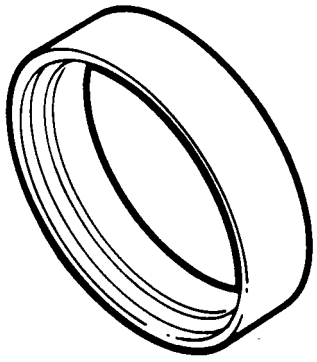
TORQUE ADAPTER

Part Number	Description	Use
TZ2734	3/4” Torque Adapter	Miscellaneous



HANDLE

Part Number	Description	Use
TZ2733	Tubular Handle	Use with PB8326 and TZ2734



SEAL INSTALLER

Part Number	Description	Use
TY2150	Seal Installa-tion Tool	Installation of Front Wheel Bearing Face Seals

SECTION N2
TRUCK CAB
INDEX

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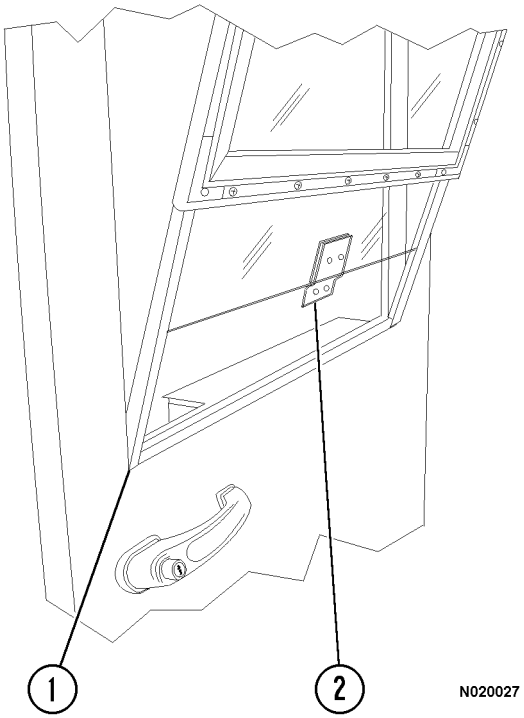


FIGURE 2-12.

1. Window Frame
2. Window Bracket

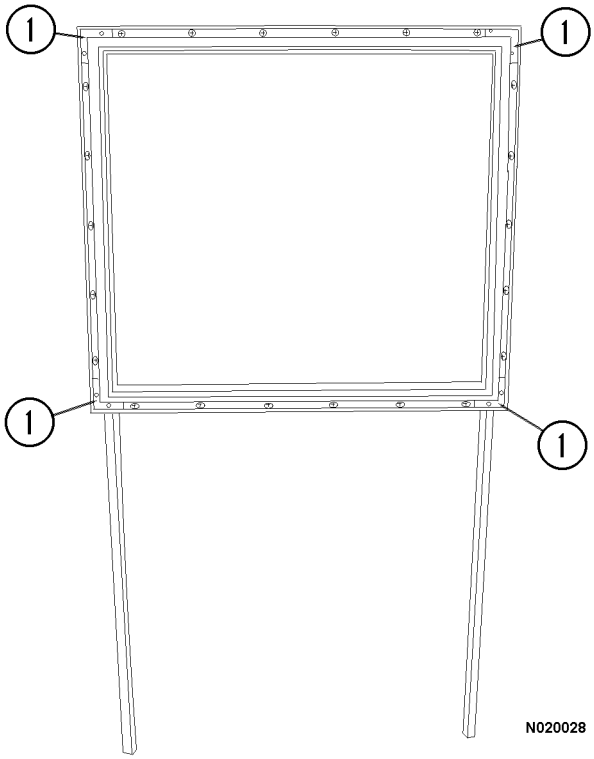


FIGURE 2-13.

1. L Shaped Brackets

7. Move the window glass and frame to an area where the glass can be removed. Slide the glass down and out of the window channels.
8. Before installing the new window glass, first inspect the window frame. In each corner there is an L shaped bracket (Figure 2-13) with two screws in it to hold the corners of the frame together. Check L shaped brackets (1, Figure 2-13) to ensure they are tight. Also, ensure the rubber felt insert in the window channels is in good condition. Replace, if necessary.
9. Slide the new window glass into the window frame glass channels. Move the glass to the top of the frame.
10. Lift the window frame, holding the glass at the top of the frame, and lower the assembly into the door.

⚠ IMPORTANT ⚠

Ensure one channel, which is next to the door latch, passes to the inside of latch (4, Figure 2-14).

11. Lower the glass in the frame and support it, as seen in Figure 2-9.
12. Reinstall the window frame screws which holds it to the door frame.

⚠CAUTION

The screws along the bottom of the window frame may be shorter than the ones along the sides and top. These screws must be used in this area to prevent the window glass from being scratched or cracked. See Figure 2-11.

Installation

1. Place the linkage into position in the wiper compartment.
2. If equipped, place spacer blocks (1, Figure 3-4) into position under pillow blocks (3). Install cap screws (2), the washers, and the nuts that secure the pillow blocks.
3. Install nut (3, Figure 3-2) on each wiper shaft and tighten. Torque the nuts to **18-20 N·m (160-177 in. lbs)**. DO NOT overtighten. The threads on the shafts are easily stripped when improperly tightened.
4. Align the linkage and attach to the wiper motor drive arm using linkage retainer (2, Figure 3-3).

NOTE: When the motor is parked, the drive arm will be in the 3 o'clock position, as shown in Figure 3-4.

5. Install the wiper arms. Refer to Wiper Arm Installation. Ensure the wipers arms operate properly and stop in the proper position after installation is complete.

WINDSHIELD WASHER

Operation

The windshield washer is mounted on the right side of the hydraulic components cabinet behind the cab. It has a 1 gal (3.8 liter) plastic reservoir (1, Figure 3-5) with a 24 Volt electric pump (2).

The windshield washer is controlled by the turn signal switch. It is activated by pressing the knob on the end of the turn signal. When activated, washing solution is pumped through outlet hose (3) into a nozzle in each windshield wiper arm.

Service

If windshield washer maintenance is required:

1. Check the strainer opening for obstructions.
2. Inspect the hoses for damage.
3. Check for voltage to the pump from the control switch.
4. If the pump is inoperable, replace it with a new pump assembly.

NOTE: The pump cannot be repaired. It must be replaced as an assembly.

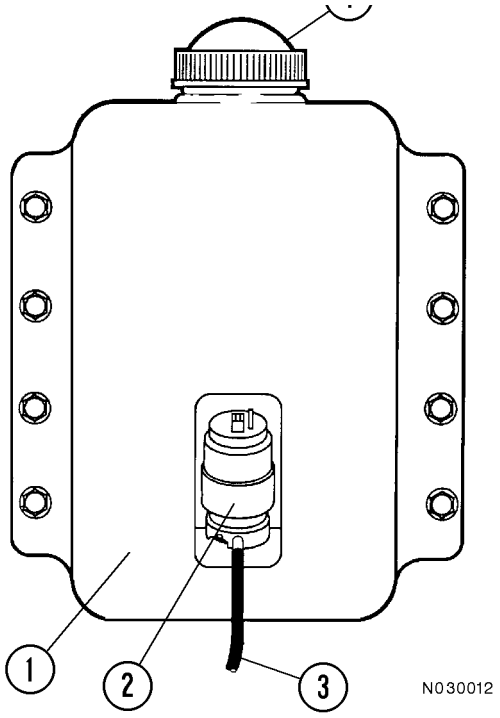


FIGURE 3-5. WINDSHIELD WASHER FLUID RESERVOIR AND PUMP

1. Reservoir
2. Pump
3. Outlet Hose
4. Filler Cap

Refrigeration - The Act of Cooling

- There is no process for producing cold; there is only heat removal.
- Heat travels toward cooler temperatures. This principle is the basis for the operation of a cooling unit. As long as one object has a temperature lower than another, this heat transfer will occur.
- Temperature is the measurement of the intensity of heat in degrees. The most common measuring device is the thermometer.
- All liquids have a point at which they will turn to vapor. Water boiling is the most common example of heating until vapor is formed. Boiling is a rapid form of evaporation. Steam is a great deal hotter than boiling water. The water will not increase in temperature once brought to a boil. The heat energy is used in the vaporization process. The boiling point of a liquid is directly affected by pressure. By changing pressure, we can control the boiling point and temperature at which a vapor will condense. When a liquid is heated and vaporizes, the gas will absorb heat without changing pressure.
- Reversing the process, when heat is removed from water vapor, it will return to the liquid state. Heat from air moves to a cooler object. The moisture in the cooled air will condense on the cooler object.
- Refrigerant - Only R-134a will be used in the new mobile systems which are designed for this refrigerant.

The Refrigeration Cycle

In an air conditioning system, the refrigerant is circulated under pressure through the five major components in a closed circuit. At these points in the system, the refrigerant undergoes predetermined pressure and temperature changes.

The compressor (refrigerant pump) takes in low pressure heat laden refrigerant gas through the suction valve (low side), and as its name indicates, pressurizes the heat laden refrigerant and forces it through the discharge valve (high side) on to the condenser.

Ambient air, passing through the condenser removes heat from the circulating refrigerant resulting in the conversion of the refrigerant from gas to liquid.

The liquid refrigerant moves on to the receiver drier where impurities are filtered out, and moisture removed. This component also serves as the temporary storage unit for some liquid refrigerant.

The liquid refrigerant, still under high pressure, then flows to the expansion valve. This valve meters the amount of refrigerant entering the evaporator. As the refrigerant passes through the valve, it becomes a low temperature, low pressure liquid, and saturated vapor. This causes the refrigerant to become cold.

The remaining low pressure liquid immediately starts to boil and vaporize as it approaches the evaporator, adding to the cooling. The hot, humid air of the cab is pulled through the evaporator by the evaporator blower. Since the refrigerant is colder than the air, it absorbs the heat from the air producing cool air which is pushed back into the cab. The moisture in the air condenses upon movement into the evaporator and drops into the drain pan from which it drains out of the cab.

Refrigerant leaving the evaporator enters the accumulator, if equipped. The accumulator functions as a sump for liquid refrigerant in the system. Because of its design, the accumulator only allows vaporized refrigerant to return to the compressor, preventing compressor slugging from occurring. Desiccant is located at the bottom of the accumulators to remove moisture that is trapped in the system.

The cycle is completed when the heated low pressure gas is again drawn into the compressor through the suction side.

This simplified explanation of the principles of refrigeration does not call attention to the fine points of refrigeration technology. Some of these will be covered in the following discussions of the components, controls, and techniques involved in preparing the unit for efficient operation.

SYSTEM PERFORMANCE TEST

This test is performed to establish the condition of all components in the system. Observe these conditions during testing:

1. Place a fan in front of the condenser to simulate normal ram air flow and allow the system to stabilize.
2. Install a thermometer into the air conditioning vent closest to the evaporator.
3. Start the engine and operate at 1000 rpm.
4. Evaluate the readings obtained from the gauges to see if they match the readings for the ambient temperature.
5. Set air conditioning system at maximum cooling and maximum blower speed operation.
6. Close all windows and doors to the cab.
7. Carefully feel the hoses and components on the high side. All will be warm-hot to the touch. Check the inlet and outlet of the receiver-drier for even temperatures. If the outlet is cooler than the inlet, a restriction is indicated.

⚠WARNING

Use extreme caution when placing hands on high side components and hoses. Under most normal conditions these items can be extremely hot.

8. Feel the hoses and components on the low side. They will be cool to the touch. Check connections near the expansion valve. The inlet side will be warm and the outlet side will be cold.
9. After a minimum of 10 minutes has elapsed, and the system has stabilized, observe the gauge readings. Compare the readings to the specifications in Table 1.

NOTE: Pressures may be slightly higher in very humid conditions and lower in very dry conditions.

NOTE: Pressures listed in the table are during compressor clutch engagement.

10. Check the cab vents for cool air. Outlet air temperature will be approximately 16 - 22°C (30 - 40°F) below ambient air temperature.
11. If pressures and temperatures are not within the specified ranges, the system is not operating properly. Refer to Preliminary Checks near the end of this chapter for tips on diagnosing poor system performance.

TABLE 1. NOMINAL R-134a PRESSURE RANGES

Ambient Air Temperature	High Side Pressure	Low Side Pressure
21°C (70°F)	820 - 1300 kPa (120 - 190 psi)	70 - 138 kPa (10 - 20 psi)
27°C (80°F)	950 - 1450 kPa (140 - 210 psi)	70 - 173 kPa (10 - 25 psi)
32°C (90°F)	1175 - 1650 kPa (170 - 240 psi)	105 - 210 kPa (15 - 30 psi)
38°C (100°F)	1300 - 1850 kPa (190 - 270 psi)	105 - 210 kPa (15 - 30 psi)
43°C (110°F)	1450 - 2075 kPa (210 - 300 psi)	105 - 210 kPa (15 - 30 psi)

NOTE: All pressures in this chart are for reference only. Weight is the only absolute means of determining proper refrigerant charge.

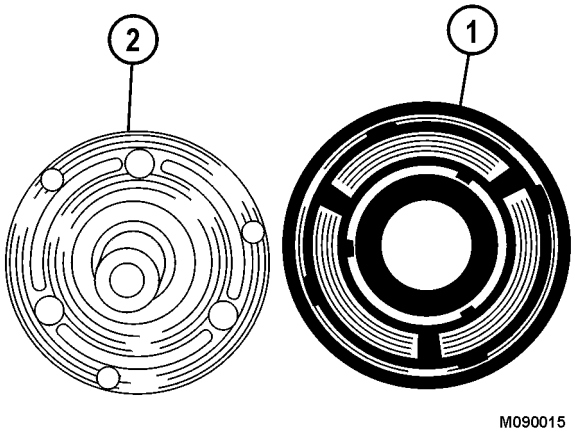


FIGURE 4-17.

1. Clutch Hub
2. Pulley

6. Inspect the friction surface on the clutch hub and the friction surface on the pulley. Scoring on the friction surfaces is normal. DO NOT replace these components for this condition only.

⚠ IMPORTANT ⚠

Inspect the steel friction surface on the clutch, and ensure that it is not damaged by excessive heat. Inspect the other components near the clutch for damage due to heat. If signs of excessive heat are evident, it may be necessary to replace the compressor. Excessive heat may cause leakage in the seals and damage to internal components, as well as external components.

Pulley Removal

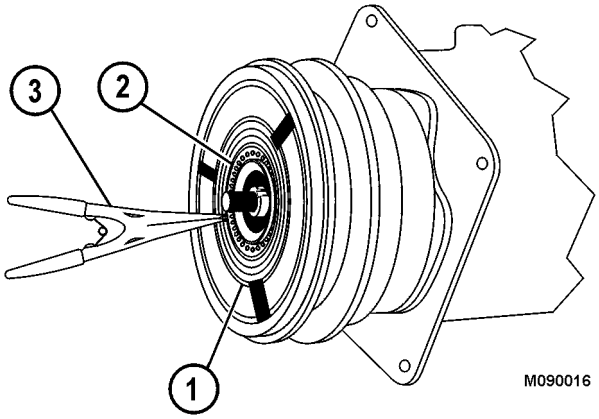


FIGURE 4-18.

1. Pulley Assembly
2. Pulley Retainer Ring
3. Retaining Ring Pliers

7. Use retaining ring pliers (3, Figure 4-18) to remove pulley retainer ring (2) from pulley assembly (1).
8. Pry the absorbent sleeve retainer from the neck of the compressor, and remove the sleeve.

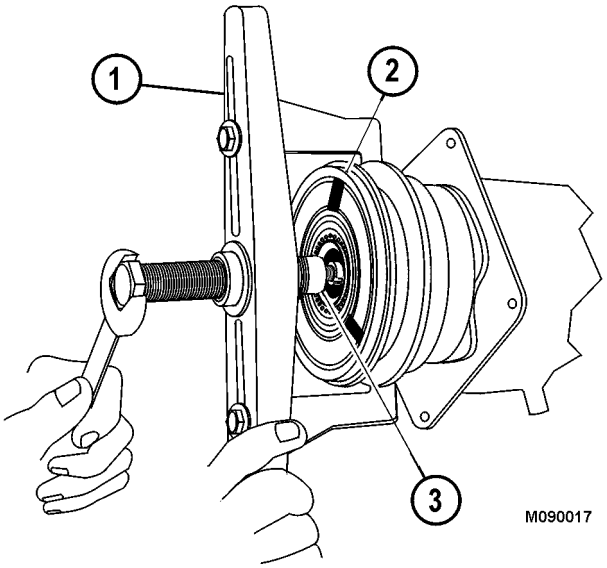


FIGURE 4-19.

1. Pulley Puller
2. Pulley Assembly
3. Puller Pilot

PROBLEM: Air and/or Moisture in the System

Indications:

Low side pressure - HIGH
High side pressure - HIGH
Discharge air is only slightly cool.

Possible Causes	Suggested Corrective Actions
- Leaks in system.	Test for leaks, especially around the compressor shaft seal area. After leaks are found, recover refrigerant from the system and repair leaks. Replace the receiver-drier. Check the compressor and replace any oil lost due to leakage. Evacuate and recharge the system using a scale to ensure proper quantity. Check A/C operation and performance.

PROBLEM: Expansion Valve Stuck or Plugged

Indications:

Low side pressure - VERY LOW or in a Vacuum
High side pressure - HIGH
Discharge air only slightly cool.
Expansion valve body is frosted or sweaty.

Possible Causes	Suggested Corrective Actions
An expansion valve malfunction could mean the valve is stuck in the closed position, the filter screen is clogged (block expansion valves do not have filter screens), moisture in the system has frozen at the expansion valve orifice, or the sensing bulb is not operating. If the sensing bulb is accessible, perform the following test. If not, proceed to the Repair procedure.	**Test:** Warm diaphragm and valve body with your hand, or very carefully with a heat gun. Activate the system and watch to see if the low pressure gauge rises. Next, carefully spray a little nitrogen, or any substance below 0°C (32°F) on the capillary coil (bulb) or valve diaphragm. The low side gauge needle will drop and read at a lower (suction) pressure on the gauge. This indicates the valve was partially open and that your action closed it. Repeat the test, but first warm the valve diaphragm or capillary with your hand. If the low side gauge drops again, the valve is not stuck. **Repair Procedure:** Inspect the expansion valve screen (except block-type valves). To do this, remove all refrigerant from the system. Disconnect the inlet hose fitting from the expansion valve. Remove, clean, and replace the screen. Reconnect the hose and replace the receiver-drier. Evacuate and recharge the system with refrigerant using a scale. Check A/C operation and performance. If the expansion valve tests did not cause the low pressure gauge needle to rise and drop, and if the other procedure described did not correct the problem, the expansion valve is defective. Replace the valve.

Inspection

Whenever the steering column or steering control unit is removed for service, the steering column shaft should be inspected for excessive wear.

1. With steering column assembly removed from truck, thoroughly clean splines on steering column shaft and inspect for damage or excessive wear.
2. Using an outside micrometer or dial caliper, measure the outside diameter of the male splines on the steering column shaft. The minimum diameter is 24.13 mm (0.950 in.)
3. If splines are worn more than minimum diameter specification, replace steering column.

Installation

1. Insert capscrew (10) with lockwashers (11) and flatwashers (5) through brackets (8 & 9) and then through steering column flange. Add second flatwasher (5) and nut (13) to each capscrew to hold parts together. Tighten nuts securely.
2. Slide the entire assembly down the tapered blocks until the brackets (8 & 9) contact the mounting surface in the cab. Install capscrews (4) and (12) with washers (5) and (6). Only tighten capscrews (4).
3. Inspect brackets (8 & 9) to see if they contact the mounting surface evenly, and are flat and inline with the surface. If so, then tighten capscrews (12). If brackets are not quite parallel, then install flat washers (as needed) between brackets and mounting surface to eliminate any gaps. Tighten capscrews (12) to standard torque.
4. After capscrews (4 & 12) are tightened to standard torque, remove nuts (13) and flatwashers (5) that were holding the steering column to the two brackets. Do not remove capscrews (10) from the brackets.
5. Lubricate the male splines on the end of the steering column shaft.

NOTE: There is no lower end bearing in this new steering column assembly, therefore the male end of the shaft will have to be guided into the mating female part of the steering control unit (7).

6. Without removing capscrews (10) from the holes, move the steering control unit (7) into place and start each of the capscrews.
7. Tighten the four capscrews (10) to standard torque.
8. Check for proper steering wheel rotation without binding. Be certain wheel returns to neutral after rotating 1/4 turn left and right.
9. If disconnected, re-connect the hoses to the steering control unit.
10. Connect the steering column wire harness(es) to the harness(es) in the cab.

PEDALS

SERVICE BRAKE PEDAL

Service brake pedal (2, Figure 32-4) is a foot-operated pedal which applies the service brakes.

NOTE: In some optional installations, the service brake pedal may not be present, because it is incorporated into a single pedal function with retarder pedal (3).

DYNAMIC RETARDER PEDAL

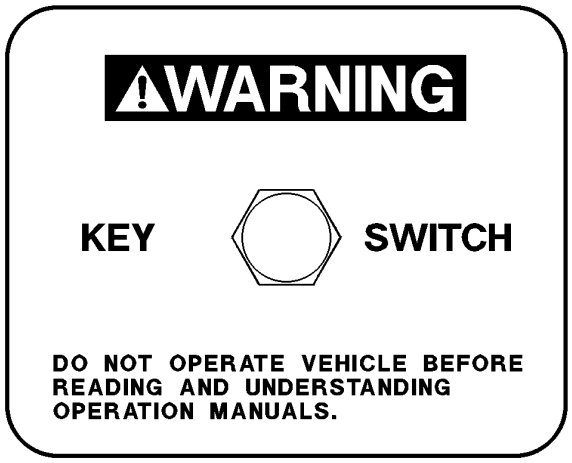
Dynamic retarder pedal (3, Figure 32-4) is a foot-operated pedal which allows the operator to slow the truck and maintain a safe productive speed without the use of the service brakes. For normal truck operation, only dynamic retarding is used to slow and control the speed of the truck. Refer to Grade/Speed Warning chart (8, Figure 32-1) to determine the maximum safe truck speeds for descending various grades with a loaded truck. Apply the service brakes only when dynamic retarding requires additional braking force to slow the truck speed quickly and to completely stop the truck.

Key Switch

Key switch (1, Figure 32-11) is a three-position (OFF, RUN, START) switch. When the switch is rotated one position clockwise, it is in the RUN position and all electrical circuits (except start) are activated.

With the selector switch in neutral, rotate the key switch fully clockwise to the START position, and hold this position until the engine starts. The START position is spring-loaded to return to RUN when the key is released. With the truck stopped, turn the key switch counterclockwise to OFF for normal engine shutdown. Use the engine shutdown switch on the center console if the engine does not shut off with the key switch.

NOTE: A ground level shutdown switch is located on the lower, front left side of the truck.



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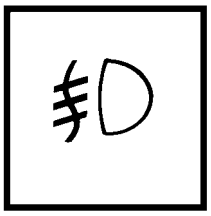
Engine Shutdown Switch With Timer Delay

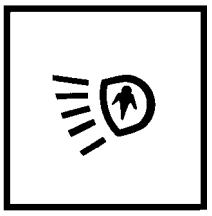
Engine shutdown switch with timer delay (2, Figure 32-11) is a three-position, rocker-type switch (OFF, ON, MOMENTARY). Refer to Timer Delayed Engine Shutdown Switch procedure, Section 30, for a complete detailed operation of this switch.

Fog Light Switch



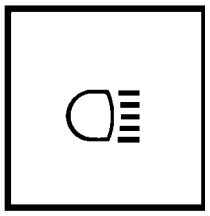
Fog light switch (3, Figure 32-11) is used by pressing the top of the rocker switch to turn the lights on. Pressing the bottom of the switch turns the lights off. The fog lights are optional.

Ladder Light Switch



Ladder light switch (4, Figure 32-11) turns the ladder lights on and off. Pressing the top of the rocker switch turns the lights on. Pressing the bottom of the switch turns the lights off. Another switch is mounted at the front left of the truck near the base of the ladder.

Backup Light Switch



Backup light switch (5, Figure 32-11) allows the backup lights to be turned ON providing added visibility and safety when the selector switch (see operator controls) is not in the REV position. When the switch is pressed toward the ON position, manual backup light indicator (B4, overhead panel) will be illuminated.

Panel Illumination Lights

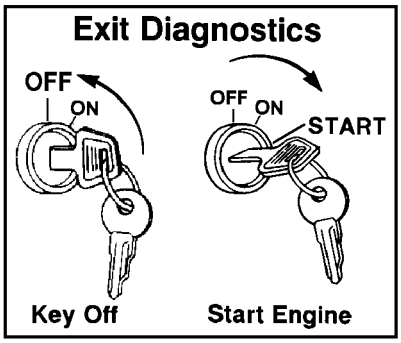
Panel illumination lights (6, Figure 32-11) provide illumination for the instrument panel. Brightness is controlled by panel illumination lights dimmer rheostat (28).

Cab Air Conditioner/Heater Vents

Cab air conditioner/heater vents (7, Figure 32-11) are spherically mounted and may be directed by the operator to provide the most comfortable cabin air flow.

EXITING THE DIAGNOSTICS MODE

Starting the engine or turning the key switch to the OFF position will exit the diagnostics fault flash mode.



If active fault codes have been identified, refer to the Cummins Centry™ System Troubleshooting and Repair Manual, Bulletin No. 3666070, or contact an authorized repair location.

VEHICLE HEALTH MONITORING SYSTEM (VHMS)

BASIC PRECAUTIONS

- DO NOT disassemble, repair, or modify the VHMS system. This may cause failure or fire.
- DO NOT touch any system components when operating the machine.
- DO NOT pull on wiring harnesses, connectors, or sensors. This may cause short circuits or disconnections that lead to failure or fire.
- DO NOT get water, dirt, or oil on the system controllers.
- If there are any problems with the VHMS system, please consult the servicing Komatsu distributor.

OPERATION

The VHMS system automatically monitors the condition of the truck and requires no action from the truck operator and its systems.

This system uses VHMS controller (2, Figure 32-13) to gather data about the operation of the truck from the sensors and other controllers installed on the truck. The data stored in the VHMS controller is collected by personal computer or transmitted directly by communications satellite (utilizing the Orbcomm controller). This data is then compiled by the Komatsu computer server. Based on this information, the servicing Komatsu distributor will suggest improvements or provide information aimed at reducing machine repair costs and downtime.

When data store button (2, Figure 32-14), located on the back of the center console, is pressed, it will store a snapshot of the Statex III drive system. It will also trigger the VHMS system to store a snapshot of the truck operating system. Snapshot light (4, Figure 32-13) is a blue light that illuminates while the VHMS system is recording the snapshot.

10 HOUR LUBE AND MAINTENANCE CHECKS

7.	WHEELS AND TIRES - FRONT AND REAR a. Verify the tires are properly inflated. b. Inspect the tires for abnormal wear or damage. c. Check for embedded debris in the tires. After each wheel installation, recheck the tightness of the wheel nuts after approximately five hours of operation. Check again at the end of the shift, and then periodically until all the nuts remain at **610 N·m (450 ft lbs)**.			
8.	BODY-UP SWITCH - Clean the sensing area of the switch.			
9.	HOIST LIMIT SWITCH - Clean the sensing area of the switch.			
10.	HYDRAULIC TANK - Check the oil level in the tank. The oil must be visible in the top sight glass. Add oil, if necessary, but do not overfill. Refer to Hydraulic Tank Service in this section for additional information. Use Lube Key B.			

NOTES

GENERAL INSTRUCTIONS

LUBRICANT REQUIRED FOR SYSTEM

Grease requirements will depend on ambient temperatures encountered during truck operation:

- Above 32°C (90°F) - Use NLGI No.2 multipurpose grease (MPG).
- -32° to 32°C (-25° to 90°F) - Use NLGI No. 1 multipurpose grease (MPG).
- Below -32°C (-25°F) - Refer to local supplier for extreme cold weather lubricant requirements.

SYSTEM PRIMING

The system must be full of grease and free of air pockets to function properly. After maintenance, if the primary or secondary lubrication lines were replaced, it will be necessary to prime the system to eject all entrapped air.

1. Fill lubrication reservoir with lubricant, if necessary.
2. To purge air from the main supply line, remove the main supply line at outlet port (6, Figure 3-7) and connect an external grease supply to the line.

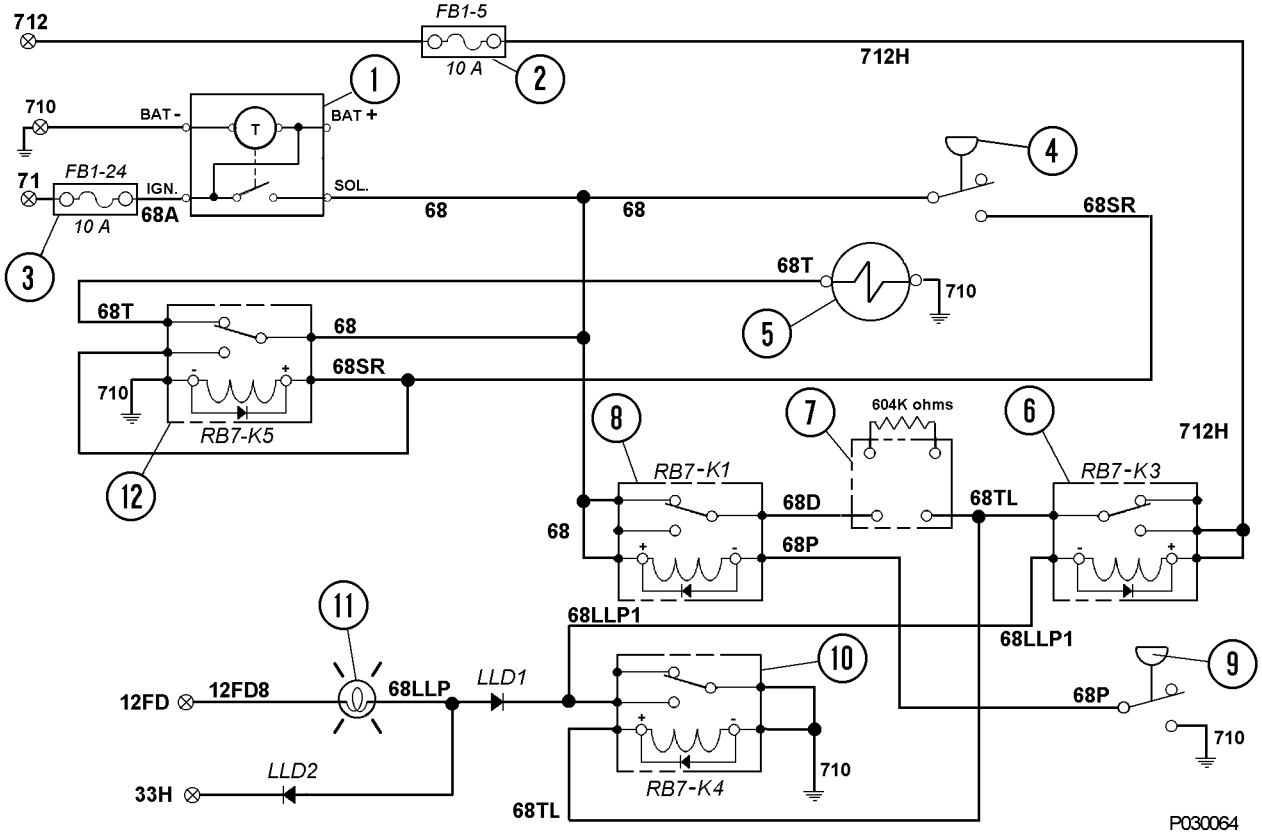


FIGURE 3-6. ELECTRICAL SCHEMATIC

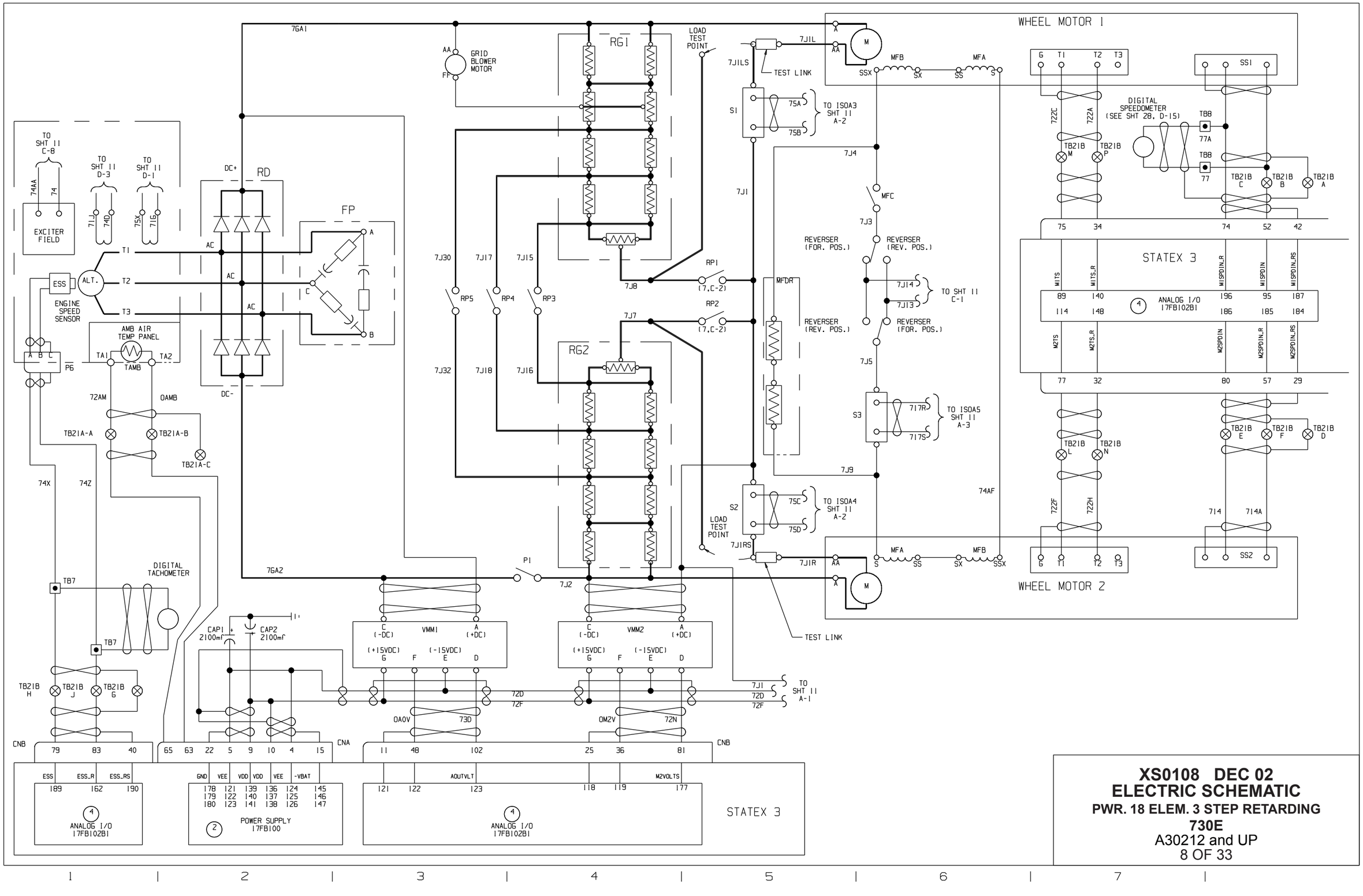
1. Lubrication Cycle Timer
2. Circuit Breaker 33 (Power Distribution Module in Cab)
3. Circuit Breaker 35 (Power Distribution Module in Cab)
4. Pressure Switch (On Grease Pump)
5. Pump Solenoid Valve
6. Relay Board 6, Relay K6
7. Time Delay Module
8. Relay Board 6, Relay K4
9. Pressure Switch (Rear Axle Injector Bank)
10. Relay Board 6, Relay K2
11. Auto Lubrication Low Pressure Warning Lamp
12. Relay Board 6, Relay K1

Assembly

NOTE: Use Loctite® 242 (or equivalent) thread locker on all torqued, threaded connections. Use extreme care to prevent thread locker from flowing into adjacent areas such as clearance fits and ball check. Allow a minimum of 30 minutes cure time before operating the pump.

1. Support ball bearing (8, Figure 3-13) inner race and press eccentric (7) into bore. Install small retaining rings (6).
2. Assemble crankrod assembly parts; large retaining rings (4), inner weights (3), outer weights (2), and install flat head screws (1). Tighten to **11 - 12 N·m (100 - 110 in. lbs)**.
3. Using a new O-ring (10), install plunger tube (11) on outlet pin (9). Tighten to **11 - 12 N·m (100 - 110 in. lbs)**.
4. Assemble wrist pin anchor (14), back-up washer (15), cup seal (16), and plunger link rod (17) onto plunger tube (11). Tighten to **11 - 12 N·m (100 - 110 in. lbs)**.
5. Assemble spring (18), ball (19), and plunger (20) on plunger link rod (17). Tighten plunger to **11 - 12 N·m (100 - 110 in. lbs)**.
6. Install reciprocating tube (21) onto wrist pin anchor (14). Tighten to **27 - 34 N·m (20 - 25 ft. lbs)**.
7. Install cup seal (22), O-ring (23), cylinder (24), ball cage (25), ball (26), O-ring (27), and check seat housing (28) into reciprocating tube (21). Tighten check seat housing to **27 - 34 N·m (20 - 25 ft. lbs)**.
8. Assemble crank rod assembly, to pump with bushings (13) and button head screws (12). Tighten screws to **11 - 12 N·m (100 - 110 in. lbs)**.
9. Place pump subassembly (parts 1 through 28) into pump housing (46).
10. Install new O-ring (54), back-up washer (53,) O-ring (52), and bronze bearing (51) into housing tube (55).
11. Install housing tube assembly onto pump housing (46). Ensure reciprocating tube (21) is inserted through both bushings. Using a 19 mm (0.75 in.) diameter rod through the inlet holes at the bottom of the tube, tighten to **27 - 34 N·m (20 - 25 ft lbs)**.
12. Install shovel plug (56) and retaining ring (57).
13. Install new back-up rings (47), O-rings (48 and 49), and outlet pin nuts (50). Tighten to **41 - 48 N·m (30 - 35 ft lbs)**.
14. Install gasket (41) and hydraulic motor (42) on pump housing (46). Install washers (43) and socket head screws (44).
15. Install shovel plug (56) in housing tube (55). Install retaining ring (57) and inlet strainer (60).
16. Install cover gasket (31), housing cover (30), and six self-tapping screws (29) with gaskets (59) on the pump housing.
17. Using new O-rings (40), install manifold (37) on hydraulic motor (42). Install socket head screws (33).
18. If removed, install pressure reducing valve (38) to manifold (37). Tighten to **27 - 34 N·m (20 - 25 ft lbs)**.
19. If removed, install flow control valve (39) to manifold (37). Tighten to **271 - 34 N·m (20 - 25 ft lbs)**.
20. If removed, install valve cartridge (34) to manifold (37). Tighten to **20 - 27 N·m (15 - 22 ft lbs)**.
21. With the pump assembly in its normal operating position, add SAE 10W30 motor oil to the pump housing until the oil is level with the bottom of pipe plug (45) hole. Install the pipe plug.

SECTION R
SYSTEM SCHEMATICS
INDEX


WHEEL MOTOR 1
WHEEL MOTOR 2
STATEX 3
RG1
RG2
RD
FP
GRID BLOWER MOTOR
LOAD TEST POINT
TEST LINK
EXCITER FIELD
ENGINE SPEED SENSOR
ALT.
ESS
AMB AIR TEMP PANEL
DIGITAL TACHOMETER
DIGITAL SPEEDOMETER (SEE SHT 28, D-15)
MFA
MFB
MFC
MFDR
REVERSER (FOR. POS.)
REVERSER (REV. POS.)
TO ISOA3 SHT II A-2
TO ISOA4 SHT II A-2
TO ISOA5 SHT II A-3
TO SHT II C-1
TO SHT II A-1
VMM1
VMM2
CAP1 2100mf
CAP2 2100mf
ANALOG I/O 17FB102B1
POWER SUPPLY 17FB100
7GA1
7GA2
7J1
7J2
7J3
7J4
7J5
7J7
7J8
7J9
7JIL
7JILS
7JIRS
7JIR
S1
S2
S3
P1
RP1
RP2
RP3
RP4
RP5
7J30
7J32
7J15
7J16
7J17
7J18
72D
72F
OAOV
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73D
72N
72AM
OAMB
74AA
74
74X
74Z
74AF
714
714A
722A
722C
722F
722H
717R
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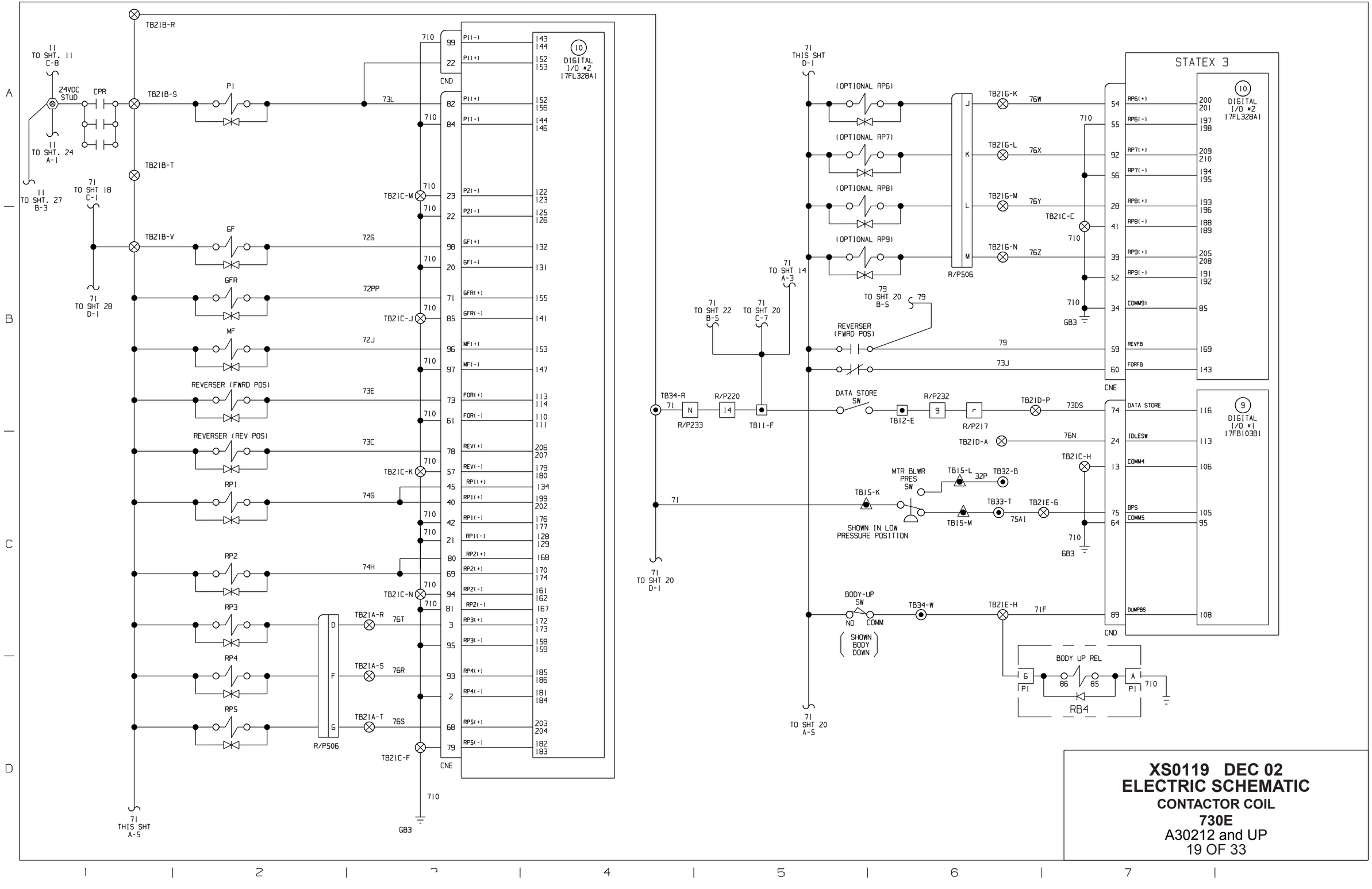
75B
75C
75D
TB21A-A
TB21A-B
TB21A-C
TB21B A
TB21B B
TB21B C
TB21B D
TB21B E
TB21B F
TB21B G
TB21B H
TB21B J
TB21B L
TB21B M
TB21B N
TB21B P
TB7
TB8
77A
SS1
SS2
M2SPDIN
M2SPDIN_R
M2SPDIN_RS
M1SPDIN
M1SPDIN_R
M1SPDIN_RS
M1TS
M1TS_R
M2TS
M2TS_R
AQUTVLT
M2VOLTS
-VBAT
XS0108 DEC 02
ELECTRIC SCHEMATIC
PWR. 18 ELEM. 3 STEP RETARDING
730E
A30212 and UP
8 OF 33



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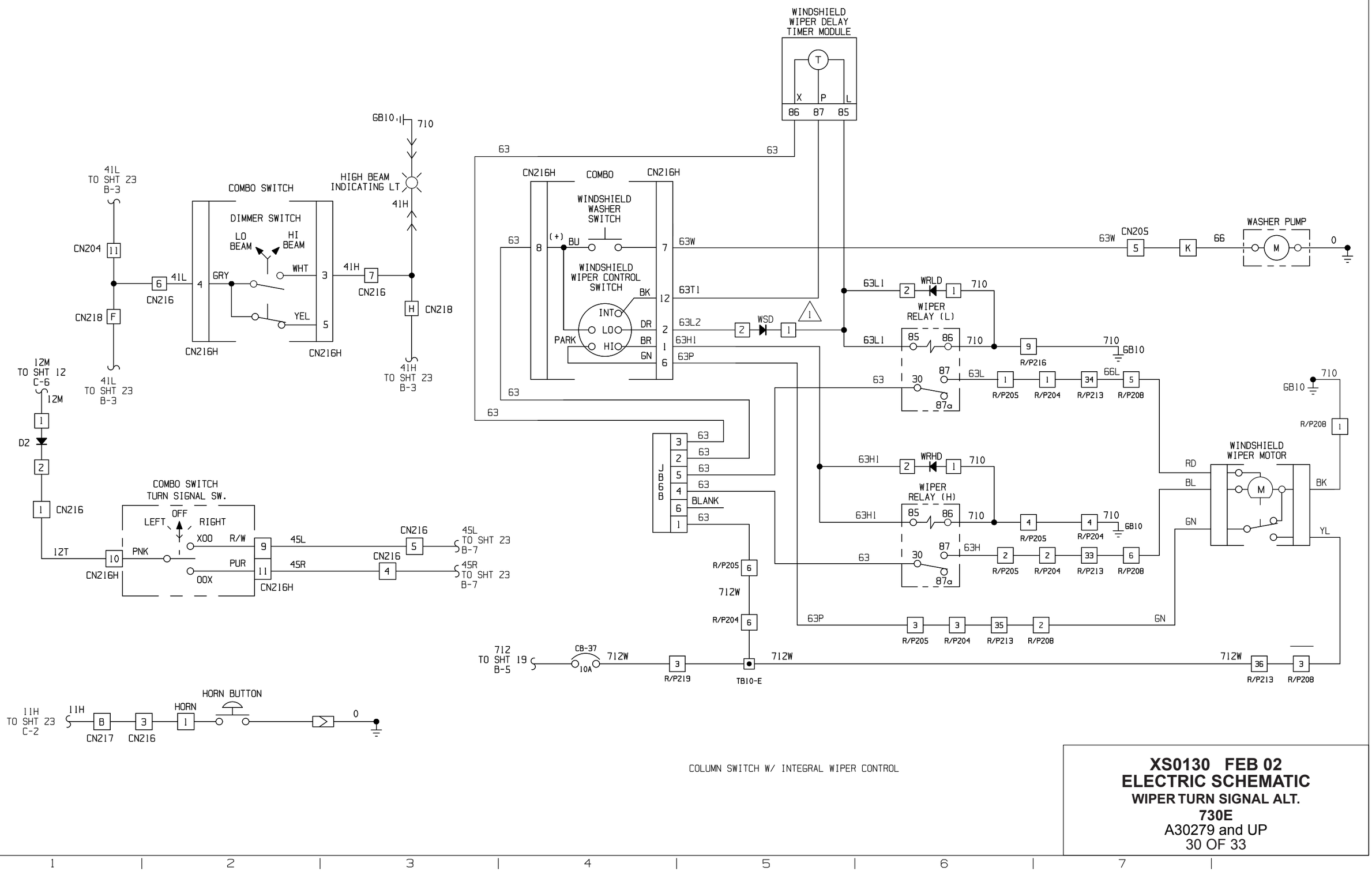
730E
A30212 and UP
19 OF 33



XS0130 FEB 02
ELECTRIC SCHEMATIC
WIPER TURN SIGNAL ALT.
730E
A30279 and UP
30 OF 33