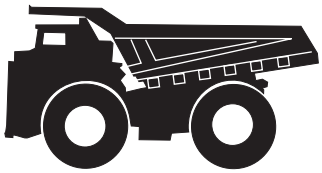
CEBM010800

Shop Manual

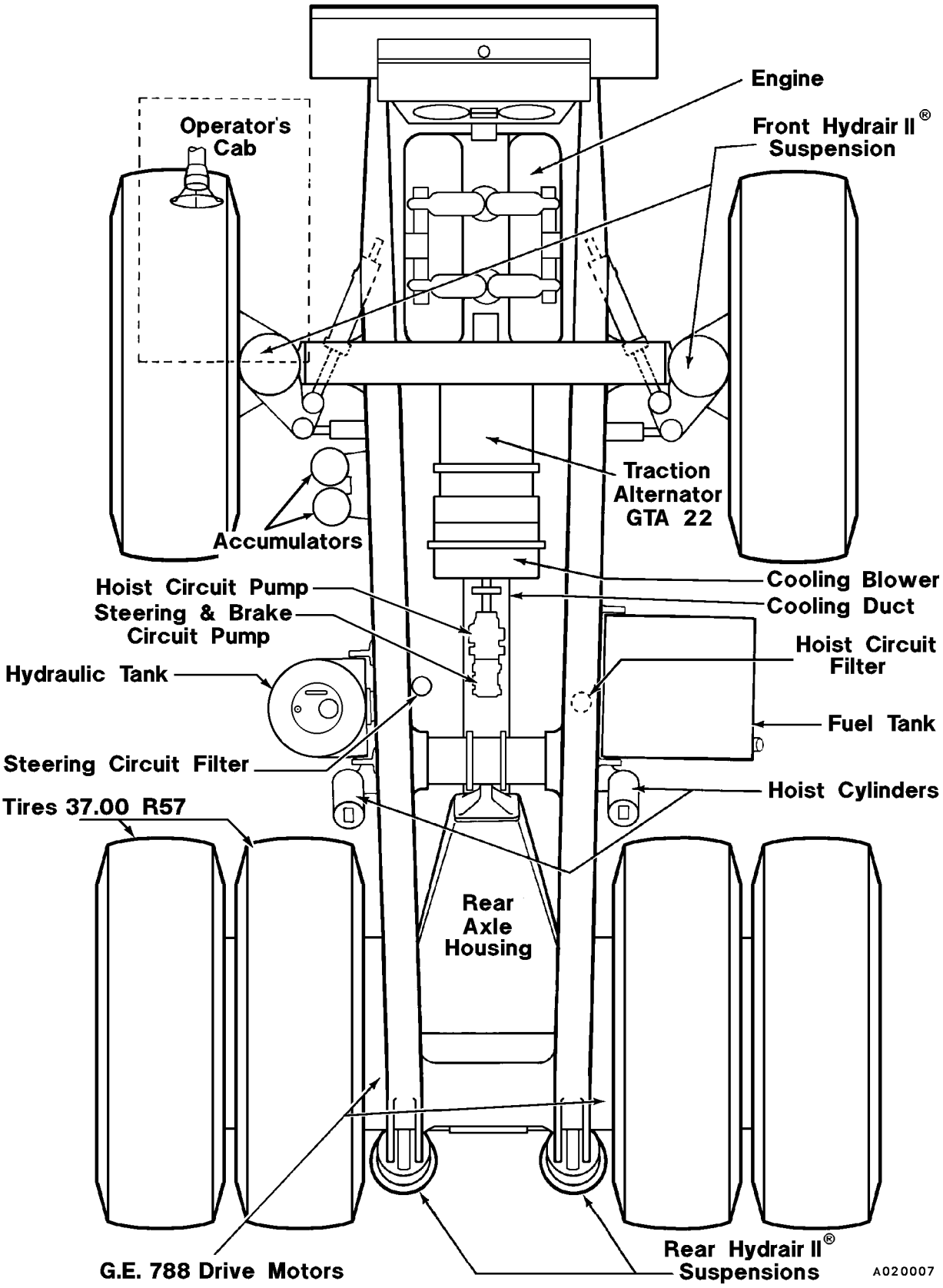


730E

DUMP TRUCK

SERIAL NUMBER **A30133 - A30180**

KOMATSU



730E MAJOR COMPONENTS

PRECAUTIONS FOR MAINTENANCE

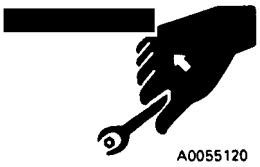
BEFORE PERFORMING MAINTENANCE

WARNING TAG

- If others start the engine or operate the controls while you are performing service or lubrication, you could suffer serious injury or death.
- ALWAYS attach the WARNING TAG to the control lever in the operator's cab to alert others that you are working on the machine. Attach additional warning tags around the machine, if necessary.
- These tags are available from your Komatsu distributor. (Part No. 09963-03000)

PROPER TOOLS

- Use only tools suited to the task. Using damaged, low quality, faulty, or makeshift tools could cause personal injury.



PERIODIC REPLACEMENT OF CRITICAL PARTS

- Periodically replace parts used to insure safety or prevent accident. (See "Periodic Replacement Of Component Parts For Safety Devices", Section 4, of the "Operation & Maintenance Manual".)
- Replace these components periodically with new ones, regardless of whether or not they appear to be defective. These components deteriorate over time.
- Replace or repair any such components if any defect is found, even though they have not reached the time specified.

STOPPING THE ENGINE BEFORE SERVICE

- When carrying out inspection or maintenance, always stop the machine on firm flat ground, lower the dump body, then stop the engine.
- If the engine must be run during service, such as when cleaning the radiator, always set the shift control lever to the neutral position (N) and the parking brake lever to the PARKING position. Always carry out the work with two people. One person should sit on the operator's seat so that he can stop the engine if necessary. NEVER move any controls you do not need to operate.
- When servicing the machine, be careful not to touch any moving part or get your clothes caught.
- Put blocks under the wheels.
- When carrying out service with the dump body raised, always place the dump lever at the HOLD position, apply the lock, and insert the safety pins securely.

DURING MAINTENANCE

PERSONNEL

- Only authorized personnel can service and repair the machine. Extra precaution should be used when grinding, welding, and using a sledge-hammer.

ATTACHMENTS

- Place attachments that have been removed from the machine in a safe place so that they do not fall. If they fall on you or others, serious injury could result.

6. Do not use the fire extinguisher for any purpose other than putting out a fire! If extinguisher is discharged, report the occurrence so the used unit can be refilled or replaced.

7. Do not allow unauthorized personnel to ride in the truck. Do not allow anyone to ride on the ladder of the truck.

8. Do not leave truck unattended while engine is running. Shut down engine and apply park brake before getting out of cab.

MACHINE OPERATION SAFETY PRECAUTIONS

After the truck engine is started and all systems are functioning properly, the operator must follow all local safety rules to insure safe machine operation.

⚠WARNING

If any of the red warning lights come "On" or if any gauge reads in the red area during truck operation, a malfunction is indicated. Stop truck as soon as safety permits, shut down engine if problem indicates and have problem corrected before resuming truck operation.

Operating truck with stalled or free spinning wheel motors may cause serious damage to wheel motors! If truck does not begin to move within 10 seconds after depressing throttle pedal (Selector Switch in a drive position), release throttle pedal and allow wheels to regain traction before accelerating engine again.

1. Always look to the rear before backing the truck. Watch for and obey ground spotter's hand signals before making any reverse movements. Sound the warning horn (3 blasts). Spotter should have a clear view of the total area at the rear of the truck.

2. Operate the truck only while properly seated with seat belt fastened. Keep hands and feet inside the cab compartment while truck is in operation.

3. Check gauges and instruments frequently during operation for proper readings.

4. Observe all regulations pertaining to the job site's traffic pattern. Be alert to any unusual traffic pattern. Obey the spotter's signals.

5. Match the truck speed to haul road conditions and slow the truck in any congested area. Keep a firm grip on steering wheel at all times.

6. Do not allow engine to run at "Idle" for extended periods of time.

7. Check parking brake periodically during shift. Use parking brake **ONLY** for parking. Do not use park brake for loading / dumping.
   Do not attempt to apply parking brake while truck is moving!

⚠WARNING

Do not use "Brake Lock" or "Emergency Brake" (if equipped) for parking.
With engine stopped, hydraulic pressure will bleed down, allowing brakes to release!

8. Check brake lock performance periodically for safe loading and dump operation.

9. Proceed slowly on rough terrain to avoid deep ruts or large obstacles. Avoid traveling close to soft edges and the edge of fill area.

10. Truck operation requires concentrated effort by the driver. Avoid distractions of any kind while operating the truck.

LOADING

1. Pull into the loading area with caution. Remain at a safe distance while truck ahead is being loaded.

2. Do not drive over unprotected power cables.

3. When approaching or leaving a loading area, watch out for other vehicles and for personnel working in the area.

4. When pulling in under a loader or shovel, follow "Spotter" or "Shovel Operator" signals. The truck operator may speed up loading operations by observing the location and loading cycle of the truck being loaded ahead, then follow a similar pattern.

5. When being loaded, operator should stay in truck cab with engine running.
   Place Selector Switch in "**N**eutral" and apply Wheel Brake Lock.

6. When loaded, pull away from shovel as quickly as possible but with extreme caution.

A plate on the side of the hydraulic tank furnishes instructions for filling the hydraulic tank.

Keep the system open to the atmosphere only as long as absolutely necessary to lessen chances of system contamination. Service the tank with clean Type C-4 hydraulic oil. All oil being put into the hydraulic tank should be filtered through 3 micron filters.

ATMOSPHERIC BREATHER SYSTEM

FILLING INSTRUCTIONS:

1. **WITH ENGINE STOPPED, KEY SWITCH OFF, AND BODY DOWN, FILL TANK TO TOP SIGHT GLASS.**
2. **RAISE AND LOWER BODY 3 TIMES.**
3. **REPEAT STEPS 1 AND 2 AND ADD OIL UNTIL LEVEL IS AGAIN AT TOP SIGHT GLASS.**
4. **IF LEVEL FALLS BELOW LOWER SIGHT GLASS WITH ENGINE STOPPED, BODY DOWN AND KEY OFF, REPEAT STEP 1.**

WA6629

A CAUTION decal is attached below the hydraulic tank oil level sight gauge. Check level with body down, engine stopped, and key switch “Off”. Add oil per filling instructions, if oil level is below top of sight glass.

CAUTION

DO NOT ADD OIL UNLESS ENGINE IS STOPPED, KEY IS OFF, AND BODY IS DOWN

WA6628

TEST BOTH STEERING AND BRAKE SYSTEM OPERATION BEFORE TOWING.

A warning plate is attached to the frame above the hydraulic system (APU) quick disconnect fittings to alert technicians that high pressure hydraulic oil is present during operation. Care must be taken when it is necessary to open the hydraulic system. There is always a chance of residual pressure being present. Open fittings slowly to allow any pressure to bleed off before removing any connections.

WARNING

HIGH PRESSURE

DO NOT LOOSEN OR DISCONNECT ANY HYDRAULIC LINE OR COMPONENT UNTIL ENGINE IS STOPPED AND KEY SWITCH IS OFF.

WA2998

WARNING

Any operating fluid, such as hydraulic oil, escaping under pressure can have sufficient force to enter a person’s body by penetrating the skin. Serious injury and possibly death may result if proper medical treatment by a physician familiar with this injury is not received immediately.

A warning plate is located above the hydraulic system (APU) quick disconnect fittings in front of the hydraulic tank which provides instructions to the operator or technician for towing a disabled truck. This plate specifies the requirements for an auxillary source of supply for hydraulic oil and the proper hookup.

WARNING

STEERING PROCEDURE FOR DISABLED TRUCK

1. ENGINE MUST BE STOPPED AND ACCUMULATOR(S) BLED DOWN (OIL DISCHARGED).
2. CONNECT EXTERNAL SUPPLY HOSE TO .75 INCH FEMALE QUICK DISCONNECT.
3. CONNECT EXTERNAL RETURN HOSE TO 1.00 INCH FEMALE QUICK DISCONNECT.
4. SECURE HOSES TO TRUCK.
5. PROCEED WITH TOWING OPERATION.

WA8889

TABLE XIII –
COMMON CONVERSION MULTIPLIERS

COMMON CONVERSION MULTIPLIERS ENGLISH to METRIC		
TO CONVERT FROM	**TO**	**MULTIPLY BY**
inch – in.	millimeter (mm)	25.40
inch – in.	centimeter (cm)	2.54
foot – ft.	meter (m)	0.3048
yard – yd.	meter (m)	0.914
mile – mi.	kilometer (km)	1.61
sq. in. – $in.^2$	sq. centimeters (cm^2)	6.45
sq. ft. – $ft.^2$	sq. centimeters (cm^2)	929
cu. in. – $in.^3$	cu. centimeters (cm^3)	16.39
cu. in. – $in.^3$	liters (l)	0.016
cu. ft. – $ft.^3$	cu. meters (m^3)	0.028
cu. ft. – $ft.^3$	liters (l)	28.3
ounce – oz.	kilogram (kg)	0.028
fluid ounce – fl. oz.	milliliter (ml)	29.573
pound (mass)	kilogram (kg)	0.454
pound (force) – lbs.	Newton (N)	4.448
in. lbs. (force)	Newton.meters (N.m)	0.113
ft. lbs. (force)	Newton.meters (N.m)	1.356
ft. lbs. (force)	kilogram.meters (kg.m)	0.138
kilogram.meters (kg.m)	Newton.meters (N.m)	9.807
psi (pressure)	kilopascals (kPa)	6.895
psi (pressure)	megapascals (MPa)	0.007
psi (pressure)	kilograms/cm^2 (kg/cm^2)	0.0704
ton (short)	kilogram (kg)	907.2
ton (short)	metric ton	0.907
quart – qt.	liters (l)	0.946
gallon – gal.	liters (l)	3.785
HP (horsepower)	Watts	745.7
HP (horsepower)	kilowatts (kW)	0.745

COMMON CONVERSION MULTIPLIERS METRIC to ENGLISH		
TO CONVERT FROM	**TO**	**MULTIPLY BY**
millimeter (mm)	inch – in.	0.0394
centimeter (cm)	inch – in.	0.3937
meter (m)	foot – ft.	3.2808
meter (m)	yard – yd.	1.0936
kilometer (km)	mile – mi.	0.6210
sq. centimeters (cm^2)	sq. in. – $in.^2$	0.1550
sq. centimeters (cm^2)	sq. ft. – $ft.^2$	0.001
cu. centimeters (cm^3)	cu. in. – in.3	0.061
liters (l)	cu. in. – $in.^3$	61.02
cu. meters (m^3)	cu. ft. – $ft.^3$	35.314
liters (l)	cu. ft. – $ft.^3$	0.0353
grams (g)	ounce – oz.	0.0353
milliliter (ml)	fluid ounce – fl. oz.	0.0338
kilogram (kg)	pound (mass)	2.2046
Newton (N)	pound (force) – lbs.	0.2248
Newton.meters (N.m)	kilogram.meters (kg.m)	0.102
Newton.meters (N.m)	ft. lbs. (force)	0.7376
kilogram.meters (kg.m)	ft. lbs. (force)	7.2329
kilogram.meters (kg.m)	Newton.meters (N.m)	9.807
kilopascals (kPa)	psi (pressure)	0.1450
megapascals (MPa)	psi (pressure)	145.038
kilograms/cm^2 (kg/cm^2)	psi (pressure)	14.2231
kilograms/cm^2 (kg/cm^2)	kilopascals (kPa)	98.068
kilogram (kg)	ton (short)	0.0011
metric ton	ton (short)	1.1023
liters (l)	quart – qt.	1.0567
liters (l)	gallon – gal.	0.2642
Watts	HP (horsepower)	0.00134
kilowatts (kW)	HP (horsepower)	1.3410

ENGINE STORAGE-CUMMINS

Engine Storage-(Short Term)

1 Month to 6 Months

This procedure describes the proper method for the short term storage of an engine.

Prepare the Engine for Short Term Storage

1. Operate the engine at "HIGH IDLE" until the coolant temperature is **160° F** (70° C).
2. Turn the engine "OFF".
3. Disconnect the fuel lines to the engine fuel filter and the injector return line.
4. Use a preservative oil. Use Dauber T Chemical NoxRust No. 518, or equivalent. The oil **must** meet Military Specification MIL-L-644, Type P-9.
5. Fill **two** containers, **one** with diesel fuel, and the **second** with preservative oil. Put both fuel lines in the container of diesel fuel.
6. "START" the engine.
7. After the engine is operating smoothly, transfer the fuel supply line to the container of preservative oil. Operate the engine until the preservative oil flows out of the injector return line.
8. Turn the engine "OFF". Connect the fuel lines to the fuel filter and the injector return line.
9. Drain the oil pan sump, oil filters, and fuel filters.
10. Install the drain plugs in the oil sump. The sump can remain empty until the engine is ready to be returned to service.

⚠WARNING

Put a warning tag on the engine. The tag must indicate:

- ***The engine does not contain oil.***
- ***Do not operate the engine.***

11. Disconnect the electrical wiring from the fuel pump solenoid.
12. Turn the fuel pump manual shutoff valve **counterclockwise** until it stops.
13. Crank the engine slowly. Spray lubricating oil into the intake manifold and the inlet of the air compressor.
14. Cover all of the openings with tape to prevent dirt and moisture from entering the engine.
15. Drain the coolant.

NOTE: It is not necessary to drain the coolant if it is a permanent type antifreeze with a rust inhibitor.

16. Store the engine in an area that is dry and has a uniform temperature.
17. Bar turn the Crankshaft two or three revolutions every 3 to 4 weeks.

Remove the Engine from Short Term Storage

1. Prime the lubricating system.
   Refer to Cummins Engine Shop Manual, (Section 14-01, Engine Run-in-Period).
2. Fill the coolant system if necessary.
3. Adjust the injector and the valve clearance. Refer to Cummins Engine Shop Manual, (Section 00-02, Engine Assembly).
4. Tighten the intake manifold mounting capscrews to specified torques, refer to the Cummins Service Manual for specifications.
5. Fill the oil pan sump, oil filters, and fuel filters with recommended lubricants and fuels..

NOTES

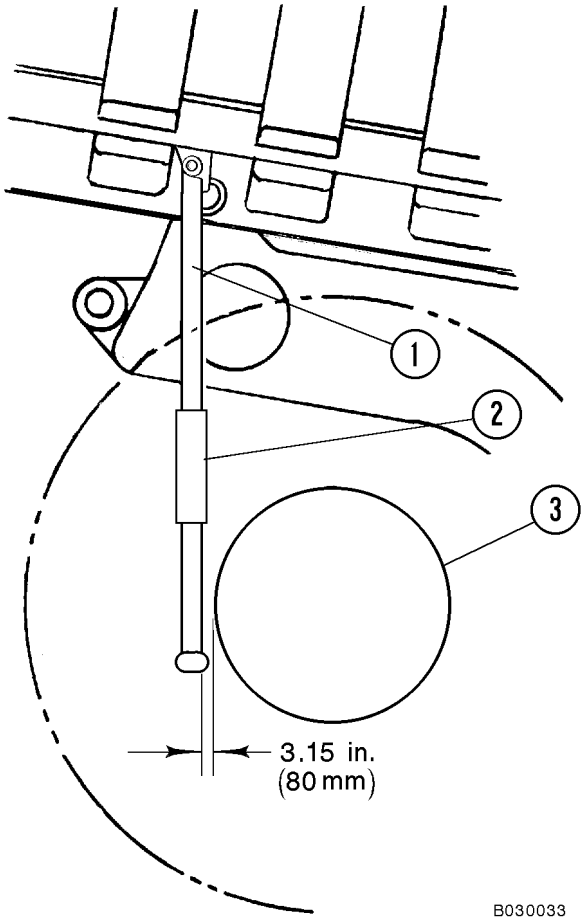


FIGURE 3-6. ROCK EJECTOR INSTALLATION

1. Rock Ejector Arm
2. Wear Plate
3. Rear Wheel Spacer Ring

ROCK EJECTORS

Rock ejectors are placed between the rear dual wheels to keep rocks or other material from lodging between the tires.

The rock ejectors should be inspected during tire inspections. If the ejectors are bent or worn excessively, they must be repaired or replaced to prevent possible tire damage.

Inspection

1. The ejectors must be positioned on the vertical center line between the rear tires within 0.19 in. (5.0 mm).
2. With the truck parked on a level surface, the arm structure (2, Figure 3-6) should be approximately 3.15 in. (80 mm) from the wheel spacer ring (3).
3. If the arm (1) becomes bent, it must be removed and straightened.
4. The wear plates (2) must be replaced if severely worn.
5. Inspect the mounting brackets, pins, and stops for wear and/or damage and repair as necessary.

Hoist Limit Switches

Refer to Section 'D', Electrical System (24VDC) for adjustment procedure of the hoist limit switches.

22. Connect wheel motor cooling blower air outlet hose. Tighten all clamps securely to insure a positive air seal.

23. Lift main alternator blower intake duct into position and install hardware at mounts. (Refer to Figure 2-2)
    a. Install hardware at transition structure to blower inlet joint, electrical cabinet, and deck mounts.
    b. Install control cabinet air hose, electrical cables and any other hoses and wiring removed during power module removal.
    c. Lift rear, center deck structure in place and install hardware.

24. Connect the hydraulic pump drive shaft from the alternator to the companion flange on the pump. (Refer to Figure 2-1). Tighten capscrews to standard torque. Install driveshaft guard.

25. If equipped with an air system, connect hoses from air compressor to tubes routed to the main air tank. Reconnect the air compressor air supply hose at the engine air inlet duct.

26. Connect all remaining electric, oil, and fuel lines.

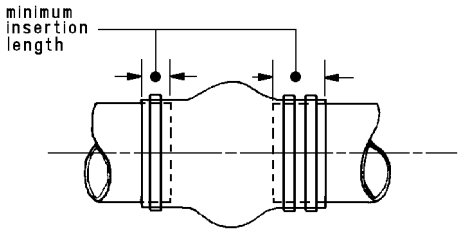
27. Connect the air filter restriction indicator hoses.

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 battery disconnect switch.

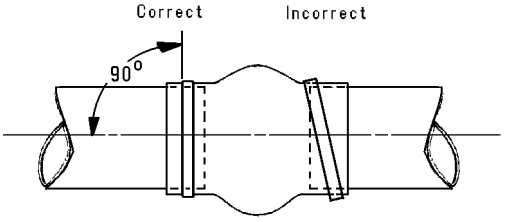
29. If truck is equipped with air conditioning, connect hoses routed from cab to receiver/drier and air-conditioning compressor.

30. Service radiator and engine with appropriate fluids. Refer to Section “P” for capacity and fluid specifications.

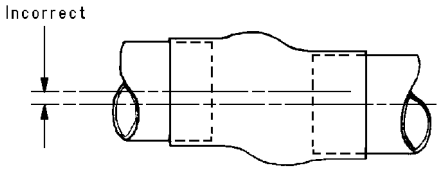
31. Recharge air conditioner system per instructions in Section M, *Air Conditioning System.*



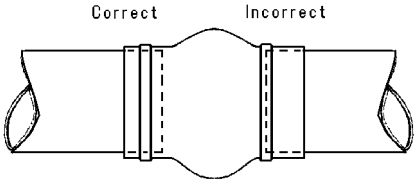
☐ Insert tube 1.25 in. (3.18 cm) minimum for one clamp.
☐ Insert tube 2.25 in. (5.72 cm) minimum for two clamps.



☐ Align clamps perpendicular to tube centerline.



☐ Align tubes to reduce stress on hoses

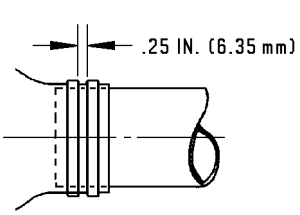


☐ Never position clamps at end or past end of tube.

☐ If two clamps are used, position with .25 in. (6.35 mm) space between each clamp.
Rotate adjusters to allow at least 90° separation.

☐ Position tube hangers to support weight of tube.

☐ All tubes, hoses, clamps etc. should be installed and aligned prior to tightening clamps.



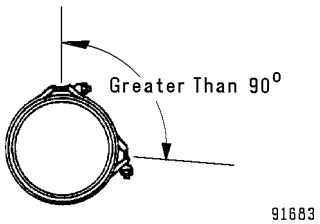


FIGURE 2-9. AIR INLET PIPING CONNECTIONS

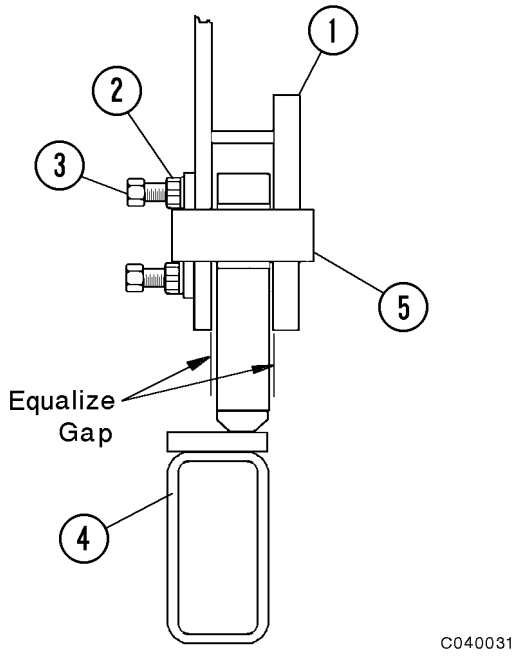


FIGURE 4-8. CRADLE GAP EQUALIZTION

1. Cradle Structure
2. Jam Nut
3. Adjustment Setscrew
4. Subframe
5. Pin

11. Check crankshaft end play with a magnetic base dial indicator at the front of the crankshaft. Refer to the “Alternator Mounting Specifications” chart for the engine installed.

⚠CAUTION

Do not pry against the crankshaft damper.

12. If end play cannot be obtained, repeat engine/alternator mating procedure.
13. Rotate the crankshaft one full revolution and listen for any unusual noise caused by moving components contacting stationary parts. Install engine sidecover if removed.
14. Install lockwire on all alternator mounting capscrews.

⚠WARNING

1. Electric shock can cause serious or fatal injury. Only qualified electrical maintenance personnel should perform electrical testing.
2. ***This system is capable of causing physical harm. Use caution during test procedures to protect personnel from injury.***
3. ***All potential testing should be considered hazardous. Proper precautions are necessary.***
4. ***Any time one of the plug-in circuit cards must be removed or reinstalled, be certain that the control power switch is 'OFF'.***
5. ***Extreme care should be exercised to prevent damage to the various semi-conductor devices and low impedance circuits under test. When using an ohmmeter to check diodes, transistors and low power conductors, care must be used when using the ohms x1 scale. Excessive current can damage the meter. When using the Hi-pot tester, megger, or when welding is to be performed on the truck, remove the printed circuit cards.***
6. ***Check wiring and cables for proper routing and termination.***

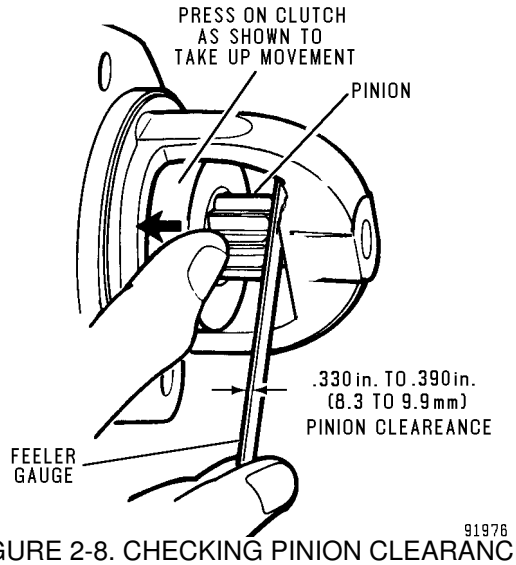


FIGURE 2-8. CHECKING PINION CLEARANCE

Pinion Clearance

To adjust pinion clearance, follow the steps listed below.

1. Make connections as shown in Figure 2-7.
2. **Momentarily** flash a jumper lead from terminal "G" to terminal "MTR". The drive will now shift into cranking position and remain so until the batteries are disconnected.
3. Push the pinion or drive back towards the commutator end to eliminate slack movement.
4. The distance between the drive pinion and housing should be between .330 in. to .390 in. (8.3 mm to 9.9 mm) as shown in Figure 2-8.
5. Adjust clearance by turning shaft nut (64, Figure 2-3).

Magnetic Switch

The magnetic switch is a sealed unit and not repairable.

Removal

1. Remove battery power as described in Cranking Motor "Removal".
2. Disconnect cables from the switch terminals and wires from coil terminals (Figure 2-9).

NOTE: If the magnetic switch has a diode across the coil terminals, mark the leads prior to removal to ensure correct polarity during installation.

3. Remove mounting capscrews and washers. Remove switch from mounting bracket.
4. The switch coil circuit can be tested as described below.

Installation

1. Attach magnetic switch to the mounting bracket using the capscrews and lockwashers removed previously.
2. Inspect cables and switch terminals. Clean as required and install cables.
3. Install the diode across the coil terminals if required. Be certain diode polarity is correct. (Refer to the wiring diagrams on the following pages.) Attach wires from the truck harness to the coil terminals (See Figure 2-9).
4. Connect battery power as described in Canking Motor "Installation".

Coil Test

1. Using an ohmmeter, measure the coil resistance across the coil terminals.
   a. The coil should read approximately 28 Ω at 72°F (22.2° C).
   b. If the ohmeter reads ∞, the coil is open and the switch must be replaced.
   c. If the ohmmeter reads 0 Ω, the coil is shorted and the switch must be replaced.

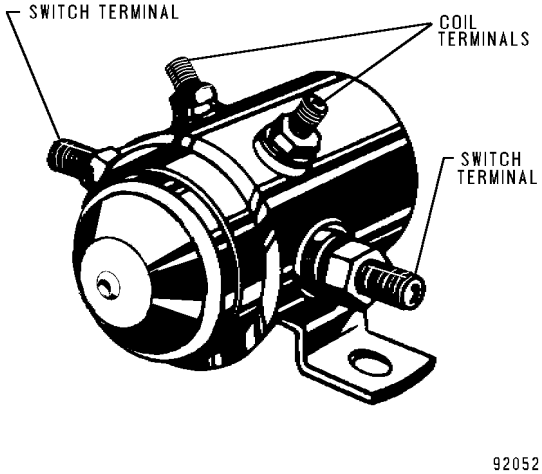


FIGURE 2-9. MAGNETIC SWITCH ASSEMBLY

Temperature and Latch

The Temperature and Latch Card has two circuits to operate two different indicating lights. The temperature circuit is controlled by a coolant temperature sensor which decreases electrical resistance as its temperature increases. It will have a resistance of approximately 1000 ohms at 185°F (85°C) and 500 ohms at 250°F (122°C). Normal setting is 204°F (96°C).

When the temperature is low and the resistance is high, Q1 is off no high temperature indication occurs. When the coolant temperature is excessive, resistance decreases to a point where Q1 will turn on and ground the flasher through D8, the alarm horn through D12, and the High Temperature Light through terminal D8. R14 can adjust the temperature (resistance) at which the circuit is activated.

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

The Latch Circuit monitors the accumulator precharge pressure switches. When one of the pressure switches closes, Q5 will be turned off which supplies power to the gate of SCR Q7. With Q7 turned on, Q9 will supply the ground path to turn on the Low Accumulator Precharge Indicator Light and sound the alarm horn. The Indicator Light is connected to 12F and will flash off and on. The SCR will remain on until power is removed from the card by turning the key switch "Off".

Hot Switch Inverter

The Hot Switch Inverter Card **(Slot 3)** is used to operate and test the service brake indicator light. In normal conditions Q4 transistor is off and the Indicator Light is off. When the stoplight switch is activated, 24 volts is sent to pin "E" of the Hot Switch Inverter Card. Transistor Q4 is turned on by this voltage and, in turn, grounds the service brake Indicator Light. There is no alarm horn operation with this card.

A second circuit on this card is used to operate and test the Retard Speed Control indicator light. When RSC is turned Off, transistor Q7 is off and the indicator light is off. When RSC is turned on, 24 volts is sent to pin "J" of the card. This voltage turns on Q7, grounding the indicator light circuit.

Hot Switch Inverter Card (Slot 4)

This card is not used on trucks equipped with the Statex III control system.

Oil Level

The Oil Level Card (**Optional**) is used to turn on the Low Oil Level Indicator Light to warn the operator engine oil/hydraulic tank oil level is below acceptable levels. The oil float is connected to a variable resistor. As the oil level decreases, the resistance goes down causing Q3 to turn on, grounding the indicator light and alarm horn.

Temperature

The Temperature Card (**Optional**) is used to turn on the High Oil Temperature Indicator Light. The indicator light tells the operator hydraulic tank oil temperature has exceeded acceptable levels. Normal temperature setting is 250°F (121°C). As the temperature goes up the resistance in the probe decreases providing a ground path for the indicator light and alarm horn.

Diode Matrix (Without Sound)

The Diode Matrix **Without Sound** Card consists of a series of diodes capable of working with eight different indicator circuits. The indicator light can be a flashing light by connecting it to the 12F circuit or a steady light by connecting it to the 12M circuit. When an indicator circuit is not activated, there is no ground circuit for the bulb. When the Indicator detecting switch activates the circuit, it grounds the lamp and grounds the flasher circuit through the diodes. Any circuits connected to terminals C1 through C8 will operate in the same manner. The alarm horn is not activated by this card.

Diode Matrix (With Sound)

The Diode Matrix **With Sound** Card works very much like the other Diode Matrix Card, except that it contains extra diodes to activate the alarm horn in addition to the flasher. The circuits connected to terminals A1 through A8 operate in the same manner.

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.

CIRCUIT BREAKERS			
	AMPS	**DEVICE(S) PROTECTED**	**LOCATION**
CB13	15	Turn Signal & Clearance Lights	RB1, Control Cabinet
CB14	15	Flashing Lights	RB1, Control Cabinet
CB15	15	RD1, RD2, & Tail Lights	RB1, Control Cabinet
CB16	15	Dynamic Retard Lights	RB3, Control Cabinet
CB17	15	Manual Back-up Lights	RB3, Control Cabinet
CB18	15	Stop Lights	RB3, Control Cabinet
CB19	15	Back-up Horn	RB3, Control Cabinet
CB20	5	Parking Brake Failure Relay	RB4, Control Cabinet
CB21	15	Fluid Components Cabinet Service Lights, Rear Axle Service Light, Horn Solenoid, Steering Accumulator Bleed Down Solenoid, Hourmeter	RB4, Control Cabinet
CB22	5	DDEC Master ECM Control Power (DDEC Engine Only)	RB4, Control Cabinet
CB23	15	Low Beam Headlight, L.H.	RB5, Control Cabinet
CB24	15	Low Beam Headlight, R.H.	RB5, Control Cabinet
CB25	15	High Beam Headlight, L.H.	RB5, Control Cabinet
CB26	15	High Beam Headlight, R.H.	RB5, Control Cabinet
CB27	15	Clearance Light Relay, Panel Lights, High Beam Indicator	RB5, Control Cabinet
CB28	15	Payload Meter (Optional)	RB2, Control Cabinet
CB29	15	Payload Meter (Optional)	RB2, Control Cabinet
CB30	15	Ladder, Engine Service & (Optional) Fog Lights	Operator Cab, Power Distribution Module
CB31	15	Heater/AC Blower Motor	Operator Cab, Power Distribution Module
CB32	15	Warning Lights, A.I.D. Module, Voltmeter, Turn Signal Relays & Indicator Lights	Operator Cab, Power Distribution Module
CB33	15	Hoist Solenoid	Operator Cab, Power Distribution Module
CB34	10	Air Dryer Heater	Operator Cab, Power Distribution Module
CB35	10	Lincoln Lube Solenoid (Optional)	Operator Cab, Power Distribution Module
CB37	10	Windshield Washer & Wiper	Operator Cab, Power Distribution Module
CB38	5	Fuel gauge, Engine Temperature Gauge	Operator Cab, Power Distribution Module
CB39	5	Radiator Pressure Solenoid	Operator Cab, Power Distribution Module
CB40	5	12VDC Accessory Receptacle (DDEC Engine Only)	Operator Cab, Power Distribution Module
CB40A	5	12VDC Accessory Receptacle	Operator Cab, Power Distribution Module
CB40B	10	Radio/Cassette Player	Operator Cab, Power Distribution Module
CB41A	15	Cab Door Window, L.H.	Operator Cab, Power Distribution Module
CB41B	15	Cab Door Window, R.H.	Operator Cab, Power Distribution Module
CB42	15	Air Seat	Operator Cab, Power Distribution Module
CB43	10	Starter Solenoid, Oil Pressure Latch Relay	Operator Cab, Power Distribution Module
CB44	20	DDR Connections, Coolant Level Module (DDEC Engine Only)	Vanner Box
CB45	20	DDEC Main ECM 12VDC Power (DDEC Engine Only)	Vanner Box
CB46	20	DDEC Main ECM 12VDC Power (DDEC Engine Only)	Vanner Box
CB47	20	DDEC Receiver ECM 12VDC Power (DDEC Engine Only)	Vanner Box
CB48	20	DDEC Receiver ECM 12VDC Power (DDEC Engine Only)	Vanner Box
CB50	20	Communications Radio	Operator Cab, Power Distribution Module
CB51	20	Dispatch Radio	Operator Cab, Power Distribution Module
CB52	10	Spare	Operator Cab, Power Distribution Module
CB53	10	Spare	Operator Cab, Power Distribution Module

2-DIGIT DISPLAY PANEL

The 2-Digit Display panel (Figure 2-1.), located in the control cabinet, consists of the following:

- Two digit “event” number display,
- “First” LED
- “Last” LED
- “Previous” (up arrow) search key
- “Next” (down arrow) search key
- “Reset” key

Under normal operation, with no events having been recorded, the 2-Digit Display Panel will display only two zeros (00). The “first” LED and the “last” LED will be dark (not illuminated). The “previous” and “next” search keys will be illuminated (green). The “reset” key will also be illuminated (red).

NOTE: The terms “event” and “fault” are used interchangeably to indicate a system occurrence which has been recorded into memory. The system recognizes each as an event, that is, a fault is nothing more to the system than an event. Some events (or faults) result in restrictions being placed on truck operation. Therefore, when discussing a fault situation, the term “fault” seems more appropriate and less confusing.

THE CODED NUMBER

The 2-Digit Display panel displays a coded two digit number. This number indicates certain data stored in the memory of the CPU card regarding the recent operating history of the truck’s propulsion and control systems. Refer to Table I for a description of the two digit code numbers ranging from 00 to 99.

If an active fault condition exists, in which a fault has not been locked out or reset, the corresponding fault number will appear on the display. For example, if the P1 contactor is out of position, a number thirteen (13) will be displayed. By referring to Table I, you can quickly determine that a 13 refers to P1 contactor. Troubleshooting tips are provided for isolating the cause of the fault.

If another fault were to occur, such as the RP1 feedback indicating that RP1 contactor is in the wrong position, a number seventeen (17) would be displayed. Referring to Table I, you could see that a problem exists with the RP1 contactor. You can also see that the “last” LED is illuminated and the “first” LED is extinguished. This means that event 17 is the last one stored in the 2-Digit Display. To view the first event, simply press the “previous” search key (up arrow).

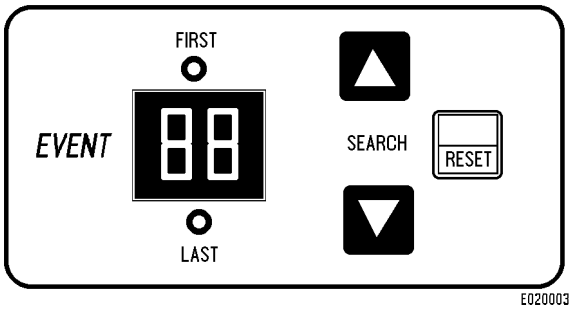


FIGURE 2-1. 2-DIGIT DISPLAY PANEL

If the first event were being displayed, the “first” LED would be illuminated and the “last” LED would be off. This indicated that the event being displayed is the first one in the CPU memory and that there are additional events to be displayed. To view the last event, press the “next” search key (down arrow).

Once a fault has been serviced, press the “reset” key and the event will be reset. If the problem has not been corrected, the fault will be relogged the next time it occurs.

*NOTE: Resetting the fault from the 2-Digit Display **does not** remove the event from the CPU memory on the FB101 card in the FL275 panel. This can only be done using the Portable Test Unit (PTU).*

EVENTS

This panel provides a variety of operational and fault codes which electronically document certain system events. For this reason, these codes are referred to as “event” codes.

The diagnostic system on the CPU card stores up to 500 events. If more are encountered after the storage is full, the system will purge the oldest event to make room for the newest event. It will then record the fact that this purge has occurred.

Stored events can only be removed from the system using the PTU, or by being purged by the system when new events occur after the storage is full.

When an event is reported, the system records the time and date, as well as the event’s code, subcode, and 2 floating point values. This data, besides the time and date, are determined by the section of software reporting the event. This data is stored in the computer’s memory and the “event” code is displayed on the 2-Digit Display panel.

TABLE II: TWO-DIGIT DISPLAY PANEL SUBCODES

PRIMARY CODE NO.	SUB-CODE NO.	TERM	DESCRIPTION
			ANALOG OUTPUT
30:	54	AF_CURR_REF	D/A Commanded to output >10 volts for over 0.05 seconds
	55	MF_CURR_REF	D/A Commanded to output >10 volts for over 0.05 seconds
	56	BRKBLV	D/A Commanded to output >10 volts for over 0.05 seconds
	57	ENGRPMCMD	D/A Commanded to output >10 volts for over 0.05 seconds
	61	SIG1	D/A Commanded to output >10 volts for over 0.05 seconds
	62	SIG2	D/A Commanded to output >10 volts for over 0.05 seconds
	63	SIG3	D/A Commanded to output >10 volts for over 0.05 seconds
	64	SIG4	D/A Commanded to output >10 volts for over 0.05 seconds
	65	SIG5	D/A Commanded to output >10 volts for over 0.05 seconds
			ANALOG INPUT
32:	18	GND	A/D Scaled output > 16 or <-16 for 0.02 seconds
	19	GAINCHK	A/D Scaled output > 1675 or <-1600 for 0.02 seconds
	20	GROUND_FAULT	A/D Scaled output > 523 or <-523 for 0.3 seconds
	21	M1_AMPS	A/D Scaled output > 3500 or <-3500 for 1.0 second
	22	M2_AMPS	A/D Scaled output > 3500 or <-3500 for 1.0 second
	23	MF_AMPS	A/D Scaled output > 1500 or <-1500 for 1.0 second
	24	ALT_F_AMPS	A/D Scaled output > 800 or <-30 for 0.5 seconds
	25	ENGHPCUT	A/D Scaled output > 4.95 or <-4.95 for 1.0 second
	26	SRS	A/D Scaled output > 23 or <-1 for 1.0 second
	27	RPINHI	A/D Scaled output > 23 or <-1 for 1.0 second
	28	ALTFVOLT	A/D Scaled output > 1000 or <-25 for 1.0 second
	29	ALT_OUT_VOLT	A/D Scaled output > 2250 or <-50 for 1.0 second
	30	M2_VOLTS	A/D Scaled output > 1200 or <-1200 for 1.0 second
	31	APINHI	A/D Scaled output > 25 or <-1.0 for 1.0 second
	32	SVBE	A/D Scaled output > 5.2 or <-5.2 for 1.0 second
	33	TMFSE	A/D Scaled output > 5.2 or <-5.2 for 1.0 second
	34	ATOC	A/D Scaled output > 2400 or <-50 for 1.0 second
	35	MTOC	A/D Scaled output > 2400 or <-50 for 1.0 second
	36	M1TS	A/D Scaled output > 5.2 or <-5.2 for 10.0 seconds
	37	M2TS	A/D Scaled output > 5.2 or <-5.2 for 10.0 seconds
	38	TAFSE	A/D Scaled output > 5.0 or < 0 for 1.0 second
	39	PAYLOAD	A/D Scaled output > 10.0 or < 0 for 1.0 second
	40	COOLT	A/D Scaled output > 5.2 or <-5.2 for 10.0 seconds
	41	COOLP	A/D Scaled output > 5.2 or <-5.2 for 10.0 seconds
	42	CRANKP	A/D Scaled output > 5.2 or <-5.2 for 10.0 seconds
	43	OILP	A/D Scaled output > 5.2 or <-5.2 for 10.0 seconds

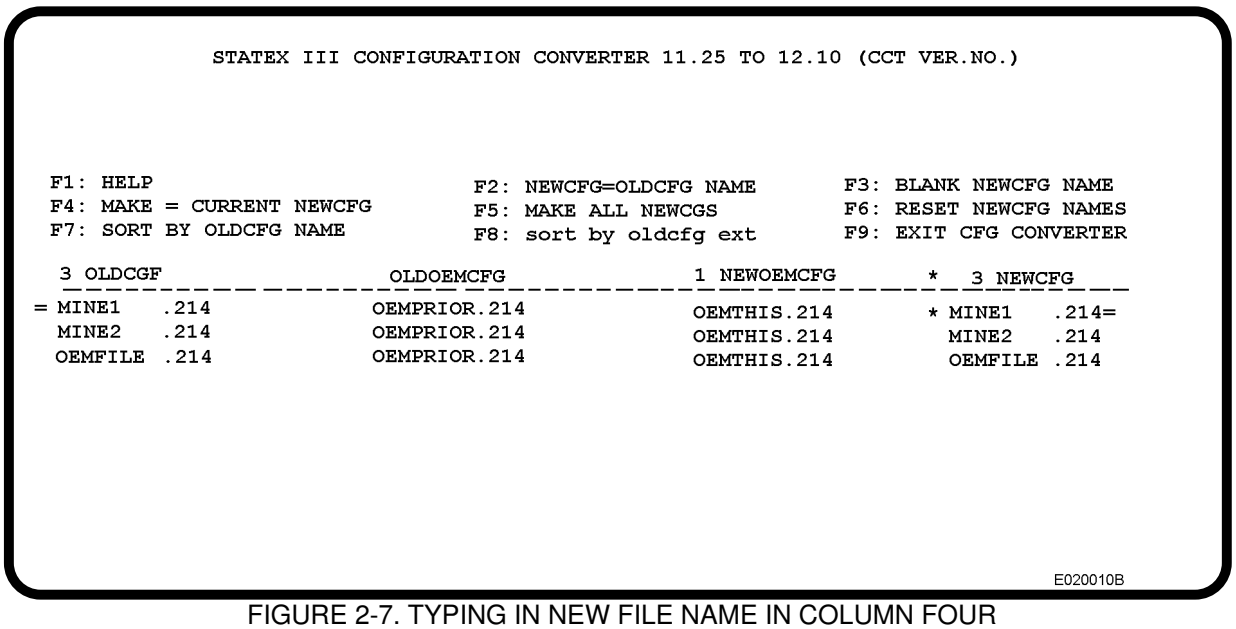


FIGURE 2-7. TYPING IN NEW FILE NAME IN COLUMN FOUR

» Files listed under “NEWOEMCFG” are the new OEM files created by KMS and given to the mine for the current software release version to create the new configuration files.

» Files listed under “NEWCFG” are the names of the new configuration files to be created by the Configuration Conversion Tool. The cursor is there, blinking in front of the first file name in the last column to indicate that the computer is ready to edit these file names. The numbers which precede each column heading indicate the number of different files listed.

9. Note equal (=) signs appear at the beginning and the end of the first file name line, and follows the cursor up and down the list of files.

10. Using the RIGHT arrow key, move the cursor to the right. The cursor will fall under the first letter of the first file name in the last column. The UP, DOWN and LEFT arrow keys are now ineffective. See Figure 2-7.

11. Type in the name for the new file over the old name.

If an error is made in naming this file, the operation can be cancelled any time before [ENTER] is pressed by first pressing [ESC]. This returns the cursor to its original starting position where it can once again be moved with the arrow keys. A note to this effect is displayed at the bottom of the screen.

The example shows the new file name to be “TEST1.” There is room for eight characters. If there are more letters in the old name than in the new, simply erase them using the space bar.

Note the asterisk (*) which appears in front of the new name, and another asterisk appears in front of the column heading when you begin typing. This means the file name is being changed, but the file has not yet been created. The asterisks disappear if [ESC] is pressed to cancel the renaming operation.

12. After the new name has been typed in, press [ENTER]. This records the new file name. Note the cursor moves back to its starting position at the left of the file name asterisk.

This operation can be cancelled, even after [ENTER] has been pressed by pressing [F6]. This resets the file back to its original name.

e. *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 should 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 down 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 f. 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".

f. *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.

g. *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.

h. *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.

i. *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.

j. *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.

k. *Event data collection interval (sec)*

Used to set the time interval in seconds that the CPU collects fault data.

l. *Stopped advance engine idle*

For future use.

m. *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

n. *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**.

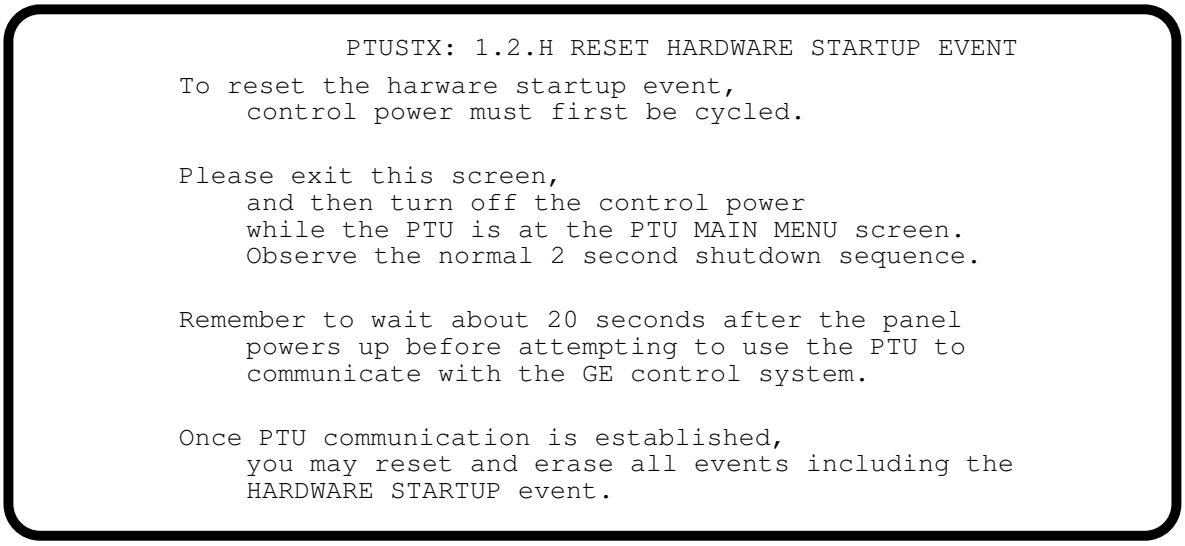


FIGURE 2-29. RESET HARDWARE STARTUP EVENT INSTRUCTIONS

b. When the **EVENT DATA DISPLAY SCREEN** is displayed, press the help key [F1] for additional information regarding the event description and troubleshooting tips.

Note: Moving too quickly between Event Menu, Event Summary, and Event Details screens may cause the PTU to issue an error message at the bottom of the screen. If this occurs, press the [SPACE] bar to continue.

7. To upload event data for future review, return to the **EVENT DATA MENU** and move the cursor to select "GE engineering format event data" and press [ENTER]. A screen titled **UPLOAD GE EVENT DATA YES/NO MENU** will appear.
   a. Select "YES, UPLOAD GE FORMAT EVENT DATA to a File". Press [ENTER]. A screen asking for a path name will appear.
      1.) If only the file name is entered, the data will be saved, under the file name typed, to the GE default directory.
      2.) If a specific directory has been setup on the PTU hard drive for storing event data files, type in the full path name followed by the file name chosen. For example, if a directory named *EVENTDAT* has been setup on drive "C" for storing event data files, and the name of the file is to be EV001, this entry would be typed as:

          `C:\eventdat\ev001`

      3.) If the event data is to be stored on a floppy disk, insert a formatted floppy disk in drive "A". If the file name used above is chosen, the entry would be typed as:

          `A:ev001`

   b. After entering the appropriate name, press [ENTER]. The information will then be transferred from the CPU to the PTU and stored under the file name assigned. The transfer may take several minutes to complete depending on the number of events being saved to the file. After the file transfer is complete, a message will appear stating "Received xxxxxx bytes. . . Returning to PTU. Press Space". Press [SPACE] bar to return to the **UPLOAD GE EVENT DATA YES/NO MENU**.
8. When the recorded events are no longer needed, they may be erased by selecting "erase event data yes/no menu" from the **EVENT DATA MENU**.

*NOTE: **ALL EVENTS WILL BE ERASED!** Only certain privilege levels are authorized to erase event data.*

   a. With the cursor on "erase event data yes/no menu", press [ENTER]. A screen titled **RESET "ALL" YES/NO MENU** appears.
   b. To erase the event data, move the cursor to "YES, Erase Truck Events" and press [ENTER].
   c. Exit back to the desired menu following screen instructions as they appear.

PAR NO.	DESCRIPTION	COUNT CONDITIONS	BUCKET NO.	TEMP RANGE (°C)
88	M1 Temp °C (in seconds)	This is a histogram of Motor #1 temperature. . . . Sample time is 60.0 seconds . . . The clock will start whenever control power (CPR) is on. The histogram breaks the temperature spectrum into 17 buckets defined at right, and displays the time spent in each bucket.	1	-40 to 100
			2	101 to 110
			3	111 to 120
			4	121 to 130
			5	131 to 140
			6	141 to 150
			7	151 to 160
			8	161 to 170
89	M2 Temp °C (in seconds)	This is a histogram of Motor #2 temperature. . . . Sample time is 60.0 seconds . . . The clock will start whenever control power (CPR) is on. The histogram breaks the temperature spectrum into 17 buckets defined at right, and displays the time spent in each bucket.	9	171 to 180
			10	181 to 190
			11	191 to 200
			12	201 to 210
			13	211 to 220
			14	221 to 230
			15	231 to 240
			16	241 to 250
			17	251 to 9999

PAR NO.	DESCRIPTION	COUNT CONDITIONS	BUCKET NO.	TRUCK SPD MPH	ENGINE SPD RPM
90	Truck Speed MPH (in seconds)	This is a histogram of truck speed for all modes of operation. . . . Sample time is 1.0 second . . . The clock will start whenever control power (CPR) is on. The buckets are defined in the Truck Speed column at right:	1	0 to 1	600 & below
			2	2 to 3	601 to 800
			3	4 to 6	801 to 900
			4	7 to 9	901 to 1000
			5	10 to 12	1001 to 1100
			6	13 to 15	1101 to 1200
			7	16 to 18	1201 to 1300
			8	19 to 21	1301 to 1400
91	Engine Speed RPM (in seconds)	This is a histogram of engine speed in RPM for all modes of operation. . . . Sample time is 1.0 second . . . The clock will start whenever control power (CPR) is on. The buckets are defined in the Engine Speed column at right:	9	22 to 24	1401 to 1500
			10	25 to 27	1501 to 1600
			11	28 to 30	1601 to 1700
			12	31 to 33	1701 to 1800
			13	34 to 36	1801 to 1900
			14	37 to 39	1901 to 2000
			15	40 to 42	2001 to 2100
			16	43 to 45	2101 to 2200
			17	46 & above	2201 & above

TABLE IV. STATISTICAL DATA CODES - PROFILES (Cont.)

ELECTRICAL CONTROL CABINET

The following pages illustrate the electrical control cabinet and components located inside the cabinet (Figure 2-36), the control cabinet junction box located on the rear of the cabinet (Figure 2-41). All contactors and the reverser in this control cabinet are electrically operated - no air supply is required.

The retarding grid package (retarding grids and blower) and the retarding grid contactor box are shown in Figure 2-40.

This information should be used in conjunction with applicable electrical schematics and checkout procedures when troubleshooting the electrical system.

NOTE: The illustrations shown are typical of various truck models. Actual components installed on the truck will vary depending on the truck model and optional equipment installed.

Components in the electrical control cabinet and other areas of the truck are identified with abbreviated name labels. These abbreviations also appear on schematics and may be referenced in checkout procedures. Refer to the list of abbreviations at the end of this section for a full name description.

⚠WARNING

This system is capable of developing high voltage. Use caution when working with the system.

⚠CAUTION

Some of the components on the cards are sensitive to static electricity. To prevent damage, it is recommended that a properly connected ground strap be worn whenever removing, handling or installing a card. It is also recommended that after a card has been removed, it is carried and stored in a static proof bag or container.

NOTE: There are no adjustment potentiometers on the control cards. ***Cards should not be removed*** *during troubleshooting unless it has been determined that a card is at fault.*

COMMUNICATIONS PORT CHECK

PTU Hookup

NOTE: The following procedure will verify correct PTU hookup and verify communication between the PTU and the CPU. Additionally, all previous event data can be cleared prior to performing the checkout procedure. If the truck has not been previously programmed, refer to "Electrical Propulsion Components", Section E of this manual for instructions.

1. Connect PTU communication cable male plug to connector "A" located in control cabinet near two digit display as shown in Figure 3-1 or to cab Communications Port located near bottom right side of selector switch console. Turn Control Power On.
2. Connect female end of cable to serial port connector on rear of PTU.
3. Turn PTU power on. After warm-up and self-test, type "gemenu" at the C:> prompt and press the [ENTER] key. (Do not type quotes.)
4. From the **GEOHV STATEX III (Main) MENU,** select "PTU TALK TO TRUCK" and press [ENTER].
5. At **PTU LOGON** screen, enter your name and assigned password. Press [ENTER].
6. When the **GE STATEX III PTU MAIN MENU** appears, move the cursor to "SPECIAL OPERATION" and press [ENTER].
   a. A screen will appear that states: "Selection of SPECIAL OPERATION will override truck driver controls until you exit to the PTU main menu. Continue?"
   b. With the cursor next to "Yes", press [ENTER].
7. The **SPECIAL OPERATION MENU** will appear.
8. Use the arrow keys to move the cursor to the "EVENT DATA MENU" selection and press [ENTER]. The Event Data Menu screen will be displayed.
   a. If no event data has been stored, the screen will indicate 0 (zero) events stored. If no events have been stored, the cursor will be positioned on "EXIT". Press the [ENTER] key to return to the previous menu.

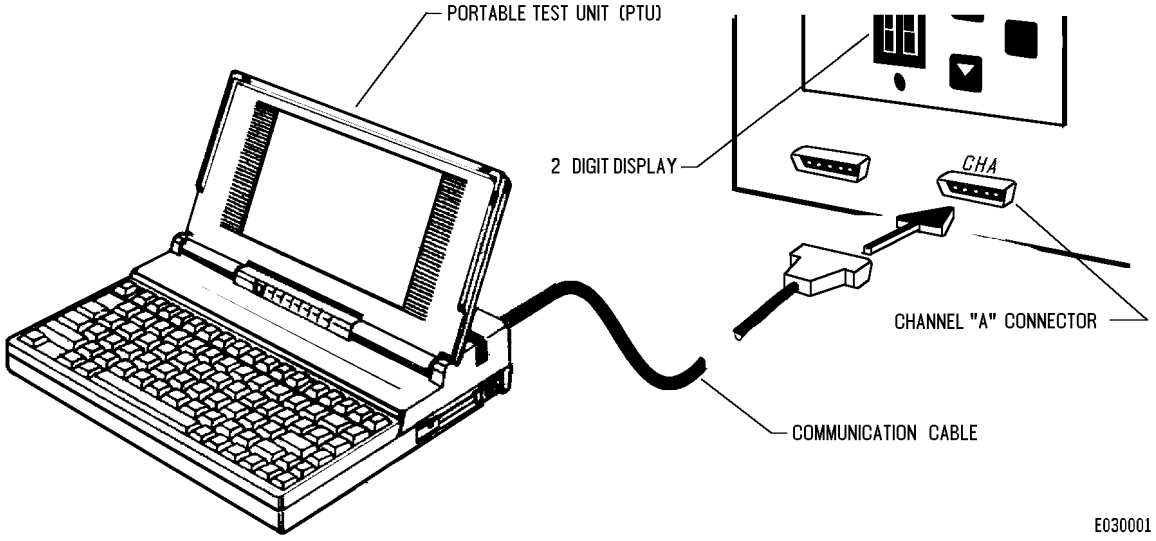


FIGURE 3-1. PTU HOOKUP

6. Depress throttle until AS contact is closed, and propulsion contactors MF, P1/(P2), GF, and GFR are picked up in this sequence.

AS	MF	P1	(P2)	GF	GFR

7. Verify feedback signals are present:

MFFB	P1FB	(P2FB)	GFFB	GFRFB

8. Release throttle. Propulsion contactors should drop out.

9. Move Selector Switch to REVERSE.

10. Verify that Reverser shifts to reverse position (to the left).

REVIN

a. Verify the feedback signal:

REVFB

11. Verify rear back-up lights and back-up horn are energized.

12. Depress throttle until AS contact is closed, and propulsion contactors MF, P1/(P2), GF, and GFR are picked up.

AS	MF	P1	(P2)	GF	GFR

13. Verify feedback signals are present:

MFFB	P1FB	(P2FB)	GFFB	GFRFB

14. Release throttle. All contactors should drop out and will no longer be highlighted on the PTU screen.

15. Move Selector Switch to NEUTRAL.

16. Verify that Reverser shifts to forward position (to the right) and back-up lights and horn are de-energized.

1.4. Propulsion Lockout Test (DDEC & MTU Engine Trucks Only)

1. Move Selector Switch to FORWARD, turn Control Power Switch to On, and depress throttle pedal until propulsion contactors MF, P1/(P2), GF, and GFR pick up.

AS	MF	P1	(P2)	GF	GFR

a. Verify feedback signals are present:

MFFB	P1FB	(P2FB)	GFFB	GFRFB

Detroit Diesel DDEC engine trucks:

2A. For 16 cylinder engines, jumper circuits 509M & 509S to ground, one at a time. For 20 cylinder engines (3 ECM's) jumper circuits 509M, 509R1 & 509R2 to ground. On DDEC III engines, jumper circuit 509 to ground. The propulsion contactors should drop out after approximately a 7 second time delay.

MTU engine trucks:

2B. Jumper circuit 31MS to ground. The propulsion contactors should drop out after approximately a 7 second time delay.

3. Turn control power Off. Remove jumpers to restore wiring to its original condition.

2.3. Digital Output Checks

- For each of the digital outputs listed in the following tables, perform the procedure as specified in steps 1 and 2, and verify the results on the **MANUAL DIGITAL OUTPUT TEST SCREEN** as noted in the following table. Be sure to restore any switch settings and wiring changes to their original condition before moving on to check the next digital output.

1. Set digital output driver On.
   a. Move cursor with the arrow keys to the output name (DO NAME) of the desired output.
   b. Press [ENTER] key to change status of selected output from off to on.
   c. The display status of the output name **DO NAME** on the **MANUAL DIGITAL OUTPUT TEST SCREEN** changes from off (regular display) to **= on** (inverse display) in a flashing mode.
   d. Output device will be energized, or take voltage reading to verify that output driver is turned on, as noted in the **OUTPUT DEVICE CHECKOUT** column.
   e. Status of related feedback input name **DI NAME** (if used) on the **MANUAL DIGITAL OUTPUT TEST SCREEN** changes from false (regular display) to **= true** (inverse display).
2. Set digital output driver Off.
   a. With cursor still on the same output name **DO NAME** press [ENTER] key again to change status of selected output from on to off.
   b. The display status of the output name **DO NAME** on the **MANUAL DIGITAL OUTPUT TEST SCREEN** changes from = **on** (inverse display) to **off** (regular display).
   c. Output device will be de-energized, or take voltage reading to verify that output driver is turned off as noted in the **OUTPUT DEVICE CHECKOUT** column.
   d. Status of related feedback input name **DI NAME** (if used) on the **MANUAL DIGITAL OUTPUT TEST SCREEN** changes from = **true** (inverse display) to **false** (regular display).
   e. Be sure to restore any metering or wiring changes to their original condition before moving on to check the next output.
3. After all digital outputs have been checked, move cursor to (select) “EXIT” on the menu and press [ENTER] key.
4. Repeat step 3. as required until returned to **GE STATEX III PTU MENU**.

3.3. Frequency Input Checks

- For each of the frequency inputs listed below, perform the test procedure specified, and verify the results on the **MONITOR ANALOG INPUT CHANNELS** screen as noted. Be sure to restore any switch settings and wiring changes to their original condition before moving on to check the next frequency input.

1. ENGINE SPEED . . . . . engine speed = 0.0 rpm

(Screen value rpm = 1.2 x input frequency)

a. Connect an oscillator to circuits 74X and 74Z at control cabinet terminal board. Increase oscillator frequency until PTU reads 1900 ± 10 rpm.

☐ Verify tachometer in the cab reads 1900 ± 10 rpm.

b. If necessary, adjust tachometer calibration pot (located under plug on rear of tach).

c. Remove oscillator.

2. ENGINE COMMAND . . . . . engine command = 0.0 rpm

Applicable to "Fuel Saver" equipped trucks only. The value displayed is the engine RPM command controlled by the FL275 panel based on various truck operating condition inputs. (Input cannot be tested.)

3. MOTOR 1 SPEED . . . . . Motor 1: 0.0 rpm; 0.0 mph

(Screen value rpm = 1.0 x input frequency; 787, or 788 motors)
(Screen value rpm = 2.0 x input frequency; 772, 776 or 791 motors)
(Screen value mph = screen value rpm x conversion factor mph/rpm)

a. Connect an oscillator to circuits 77 and 77A at control cabinet terminal board.

b. Increase the oscillator frequency to obtain 3 MPH (5 KPH) value on the PTU screen.

☐ Verify the cab speedometer reads 3 MPH (5 KPH)

c. Increase oscillator to obtain 25 MPH (40 KPH) value on the PTU screen.

☐ Verify cab speedometer reads 25 ± 2 MPH (40 ± 3 KPH)

d. If necessary, adjust speedometer calibration pot (located under plug at rear of speedometer).

e. Remove oscillator.

4. MOTOR 2 SPEED . . . . . Motor 2: 0.0 rpm; 0.0 mph

a. Connect oscillator to circuits 714 and 714A at control cabinet terminal board. Repeat same test procedure for Motor 2 as used for Motor 1.

5. CONVERSION FACTOR - RPM TO MPH . . rpm x 0.00000 = mph

Value displayed 0.00000 is conversion factor to convert from wheelmotor rpm to mph. Compare value displayed with value given in **MAXIMUM TRUCK SPEED CHART**. (Refer to "Miscellaneous Charts; Maximum Allowable Truck Speeds.")

8. MISCELLANEOUS COMPONENT TEST AND ADJUSTMENT

8.1. Brake System Interlocks Check

!! WARNING !!

Block truck wheels securely to prevent rolling when the brakes are released.

NOTE: On brake and steering checks, the engine is to be started and run until proper hydraulic and air pressures are achieved and all instrument panel warning lights are turned Off.

Preparation

- After normal pressures are reached, the engine is then shut down and the key switch is left in the RUN (On) position.
- On 830E trucks the key switch must first be turned Off to shut down the engine, and then returned to the RUN (On) position to maintain hydraulic pressures.

!! WARNING !!:

The hydraulic pressures will bleed off if the key switch is not left in the RUN (On) position.

1. With air tanks fully charged to 120 PSI or more for trucks with air brakes, or hydraulic pressure at normal operating pressure or more for trucks with hydraulic brakes, and all brakes released, place selector switch in FORWARD and depress the throttle pedal.
   - ☐ The propulsion contactors should energize.
   - ☐ It should be possible to remove jumper between 73R and 73P (if installed) and still get the propulsion contactors to energize.
2. With brake lock switch On, depress the throttle pedal.
   - ☐ Propulsion contactors should not energize.
3. Turn brake lock switch Off, turn emergency brake switch On and depress the throttle pedal.
   - ☐ Propulsion contactors should not energize. (Some trucks do not have emergency brake switch.)
4. Turn emergency brake switch Off, turn operational parking brake switch On and depress the throttle pedal.
   - ☐ Propulsion contactors should not energize. Park brake light on instrument panel should come On.
5. Turn park brake switch Off.
6. With selector switch in REVERSE, depress the throttle pedal.
   - ☐ Propulsion contactors should energize.
7. Depress the service brake pedal.
   - ☐ Propulsion contactors should drop out.
   - ☐ Service brake light on instrument panel should come On.

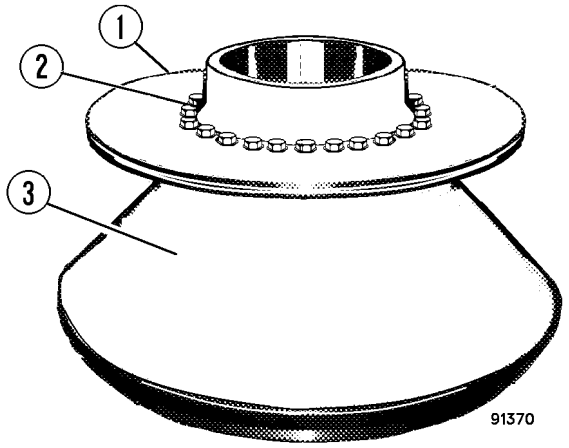


FIGURE 3-5. BRAKE DISC REMOVAL

1. Brake Disc
2. Capscrews & Hardened Flatwashers
3. Wheel Hub

7. Attach a lifting device to the wheel hub and carefully lift it straight up and off the spindle. Remove outer bearing cone (5). Remove outboard bearing cup (4) from hub if replacement is required.

NOTE: Half of the face seal (22) will remain in the bore of the hub. Do not remove seal unless replacement or bearing cup replacement is required. Use extreme caution when handling face seals. Seals must be replaced in a matched set. ***If one seal is damaged, both seals must be replaced.***

8. If necessary, remove face seal (22) and inboard bearing cup (21) from hub.
9. Remove bearing cone (20), and spacer (19) from spindle.
10. Remove capscrews and washers (26) securing seal carrier (24) to spindle. Remove seal carrier (with face seal) and O-ring (23).
11. If brake disc replacement is required, attach a lifting device to the brake disc (1, Figure 3-5), remove capscrews, hardened flatwashers (2), and lift brake disc from hub (3).
12. If brake adapter replacement is necessary, remove capscrews and hardened flatwashers (25, Figure 3-3) and remove adapter (15).

Cleaning and Inspection

1. Clean all metal parts in fresh cleaning solvent.
2. Replace any worn or damaged parts.
3. Replace O-rings and face seals if worn or damaged.
4. Inspect wheel hub and spindle for damage.
5. Check all lips and cavities in seal carrier (23, Figure 3-3) attached to spindle and wheel hub (12) for nicks or tool marks that may damage the rubber seal ring on the face seals.

Assembly

1. Assemble brake adapter, (15, Figure 3-3) to the spindle (18).
2. Align the brake support so the center line of one of the brake head mounting surfaces is above the horizontal center line, and in line with the vertical center line of the tapered bore on the inboard end of the spindle. The completely machined side of the brake support plate should face the outboard end. Install capscrews and flat washers and tighten to **1,675 ft. lbs. (2271 N.m)** torque.
3. Install spacer (19). If necessary, tap lightly to seat spacer against spindle. Spacer must fit tightly against spindle shoulder.
4. Install Seal Carrier (24) and O-ring (23). Tighten capscrews (with lockwashers) to standard torque.
5. If face seal (22) requires replacement, install one half of seal assembly on seal carrier (24) using seal installation tool, TY2150 and soft tipped mallet (see Figure 3-6). For proper installation, refer to the following instructions:
   a. Handle all parts with care to avoid damaging critical areas. The sealing face of seal must not be nicked or scratched.
   b. Remove all oil and protective coating from seal and from the seal seat using nonflammable cleaning solvent, make certain all surfaces are absolutely dry.
   c. Check seal seat retaining lip for rough tool marks or nicks. Smooth any nicks and re-clean.
   d. Install rubber sealing ring so it seats uniformly in the relief of seal. Be sure that it rests uniformly against the retaining lip.
   e. Using seal installation tool, install the floating ring seal assembly in the seal seat. The depth around the circumference of the seal should be uniform.

10. Release nitrogen from rear suspension and charge according to procedure in “Oiling and Charging Procedure”, Section “H”.

⚠WARNING

Before removing blocks from the wheels, make sure parking brake is applied.

11. Remove blocks from wheels.

PIVOT EYE BEARING

Disassembly

1. Remove capscrews (9, Figure 4-2) and locknuts (10) and bearing retainers (7 & 8).
2. Press spherical bearing (6) from bearing carrier (5).

Note: If bearing carrier (5) is damaged or worn, refer to “Pivot Eye Repair”.

3. Inspect bearing and all parts for wear or damage. Replace any parts showing wear or damage.

Assembly

1. Setup an appropriate tool to press spherical bearing (6) into bearing carrier (5). Be certain bearing is properly aligned with the bearing carrier as the bearing is pressed into position.

   Lube groove in bearing outer diameter must align with lube holes in bearing carrier.

   Refer to NOTE: (Figure 4-2).

2. Install bearing retainers (7 & 8) with capscrews (9) and locknuts (10).
   Tighten capscrews (9) to **310 ft. lbs. (420 N.m)** torque.

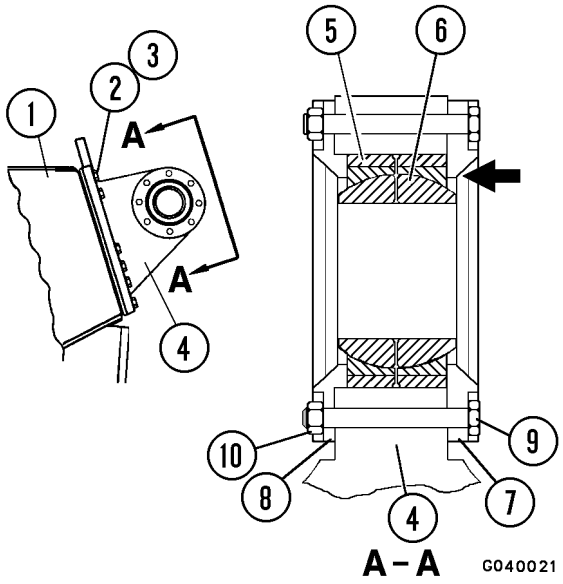


FIGURE 4-2. SPHERICAL BEARING INSTALLATION

1. Rear Axle Structure	6. Spherical Bearing
2. Capscrew	7. Bearing Retainer
3. Flat Washer	8. Bearing Retainer
4. Pivot Eye Str.	9. Capscrew
5. Bearing Carrier	10. Locknut

NOTE: Bearing Retainers (7 & 8) are different. Refer to ARROW above; Sides of Pivot Eye Str. (4), Bearing Carrier (5), & Outer Race of Bearing (6), must be FLUSH to to one side.

"TURN-OF-THE-NUT" Tightening Procedure

a. Tighten all fourteen capscrews (1, 6, 8, Figure 2-4) to **400 ±40 ft.lbs. (542 ±5 N.m)** torque. Use a torque wrench of known calibration.

b. Maintain this torque on the top two corner capscrews and the bottom outer two capscrews (8) on each side (the 4 bottom capscrews with nuts).

c. Loosen the eight remaining capscrews and then tighten again using "TURN-OF-THE-NUT" Tightening Procedure as follows:

d. For the **four upper, 6.0 in. (15 cm) long capscrews** (1, Figure 2-4), tighten capscrews initially to **70 ft.lbs. (95 N.m)** torque; then advance 60° using steps d-1) through d-3).
Refer to Figure 2-5.

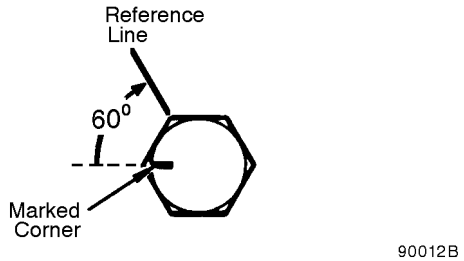


FIGURE 2-5. REFERENCE MARKS FOR 60° ADVANCE

For the four **bottom, inner, 10.75 in. (27.3 cm) long capscrews** (6, 8, Figure 2-4), tighten capscrews initially to **150 ft.lbs. (203 N.m)** torque; then advance 90° using steps d-1) through d-3).
Refer to Figure 2-6.

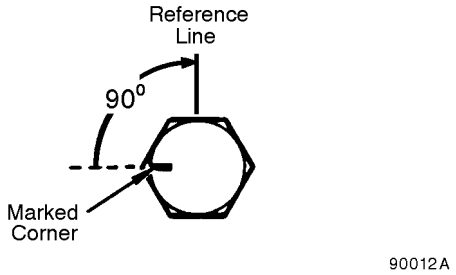


FIGURE 2-6. REFERENCE MARKS FOR 90° ADVANCE

1.) Mark a reference line on a corner of the hexagonal capscrew head or nut and the mounting surface opposite this corner as shown. Then mark the position located 60° or 90° clockwise relative to the first reference line on the mounting surface.
Refer to Figures 2-5 and 2-6.

2.) To insure that the opposite end of the turning member, either the capscrew head or nut remains stationary, scribe a reference mark for this check.

3.) Each corner of a hexagon represents 60°. The turning members, either the capscrew head or nut, is turned until the marked corner is adjacent with the marked reference line. Check to make sure that the opposite end of the turning member has NOT turned during the tightening procedure.
NOTE: Do not exceed 4 RPM tightening speed. Do not hammer or jerk wrench during the tightening procedure.

e. Loosen the top two corner capscrews and the bottom outer two capscrews on each side (the 4 bottom capscrews with nuts) and repeat "Turn-of-the-Nut" procedure steps d-1) through d-3) for these remaining six capscrews.

NOTE:
If for any reason, these fasteners need to be checked for tightness after completing the above procedure; loosen and inspect all fourteen capscrews and repeat entire process, starting with cleaning and lubricating capscrews, washers, and nuts. In addition, the capscrew head will need to be appropriately marked to show an additional use.

7. Charge suspension with dry nitrogen to fully extend suspension piston before installing front wheel hub and spindle.

8. Install wheel, spindle, and tire according to instructions in Section "G".

9. Service the suspension. For instructions refer to HYDRAIR®II "Oiling and Charging Procedure".

10. Install suspension boot and secure with clamp.

SUSPENSION PRESSURE TEST

The suspension assembly should be tested for leakage after rebuild procedures are completed. If leakage occurs, the cause for the leakage must be identified and repaired before suspension is installed.

⚠WARNING

The entire suspension assembly must be placed in a containment device that will keep the suspension piston in the retracted position and prevent it from extending during pressurization. Be certain the containment device is capable of withstanding the force applied.

1. If necessary, collapse suspension until piston is fully retracted in the housing.
2. Be certain all plugs and charging valve are installed. Attach pressurization line to the charging valve (12, Figure 3-4).
3. Place suspension assembly in a containment device and submerge entire assembly in water tank.
4. Pressurize the suspension with air or nitrogen to 1100 ±200 psi (7584 ±1379 kPa).
5. Maintain pressure for 20 minutes (minimum) and observe for bubbles at the following locations:
   - Housing bearing/housing joint
   - Piston/piston seal area
   - Charging valve and plugs.
6. After test is complete, remove assembly from water tank, release air or nitrogen pressure. DO NOT remove charging valve from suspension.
7. Remove suspension from containment device.
8. Coat any exposed, unpainted areas with rust preventive grease.
9. Store suspension in a collapsed position to protect piston chrome surface.

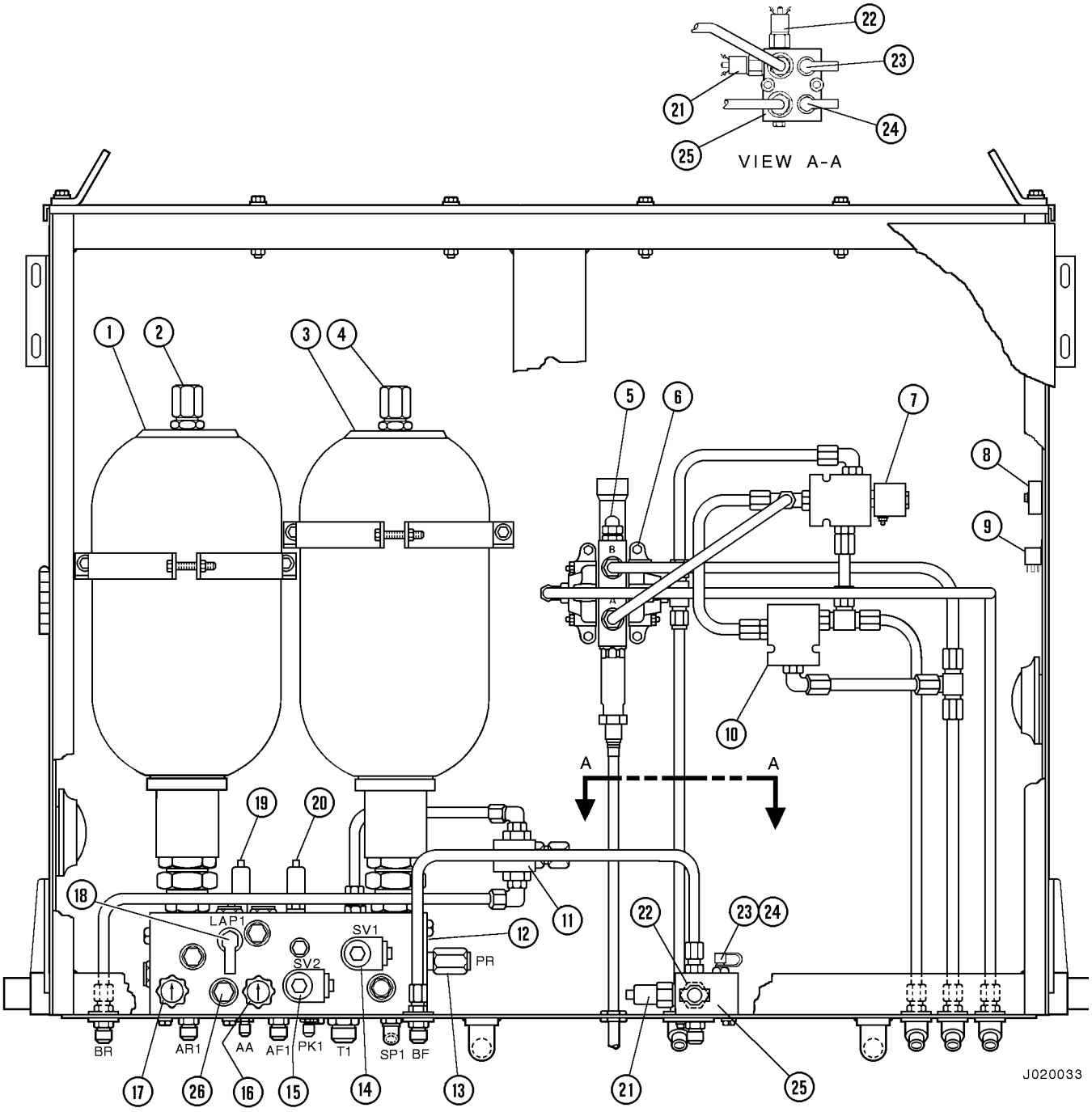


FIGURE 2-1. HYDRAULIC BRAKE CABINET

1. Rear Brake Accumulator
2. Charging Valve
3. Front Brake Accumulator
4. Charging Valve
5. Relief Valve (Hoist-Power Down)
6. Hoist Pilot Valve
7. Hoist-Up Limit Solenoid.
8. Brake Warning Delay Timer
9. Brake Warning Light Relay
10. Check Valve (Hoist Circuit)
11. Brake Lock Shuttle Valve
12. Brake Manifold
13. Pressure Reducing Valve (PR)
14. Brake Lock Solenoid (SV1)
15. Park Brake Solenoid (SV2)
16. Front Brake Accum. Bleed Valve
17. Rear Brake Accum. Bleed Valve
18. Low Accum. Test Port (LAP1)
19. Low Brake Pressure Switch
20. Park Brake Pressure Switch
21. Stop Light Pressure Switch
22. Brake Lock Degradation Switch
23. Rear Brake Pressure Test Port (BR)
24. Front Brake Pressure Test Port (BF)
25. Manifold
26. Automatic Apply Valve

20. Turn the valve on its side on the work bench and remove the regulator sleeves (19) from the valve body.

NOTE: Throughout the following steps, it is important to keep the circuits and circuit components identified as to which side of the unit they came from. For a given circuit, all the components have a tolerance stack which could vary. Keep the "B1" and "B2" parts separate. ***Springs (8 & 9) are also different in "B1" and "B2" bores.***

21. Remove the spools (12), reaction plungers (21, 22) and spool return springs (20) from the regulator sleeves (19).
22. Remove the plunger return springs (10), regulator springs (8 & 10), and spring seats (11) from the valve body.
23. Remove the actuator plungers (3) by pushing down (toward the bottom of the valve) on the actuator plunger with your hand until the actuator plunger slides out.
24. Remove the staging seat (6). Remove and discard packing (5).
25. Remove the glyde ring assembly (7) from the actuator plunger.
26. Remove the O-rings (14, 16 & 18) and teflon back-up rings (13, 15 & 17) from the regulator sleeves and discard.
27. Remove the wiper seals (23), poly-pak seals (25), and the orange back-up rings (24) from the actuator section of the valve and discard.

Cleaning and Inspection

1. Clean all metal parts with solvent and air dry.
2. Inspect the plunger (3, Figure 3-5) for wear on the sides where it moves through the seals. If axial grooves are seen or if any wear is apparent, replace the plunger. Plungers with diameter worn below 0.747 in (18.974 mm) must be replaced.
3. Place the regulating spool (12) into its sleeve (19). Push the spool lightly through the sleeve. The spool must be able to move freely and smoothly the entire length of the sleeve. If it cannot, it must be replaced. Never replace just the spool or sleeve. They must be replaced as a matched set.
4. Inspect each spring carefully for cracks or breaks. Any spring with a crack or break must be replaced. Also, if the valve was not reaching proper regulated pressure, replace all regulator springs.
5. Inspect the threaded inserts (7, Figure 3-4) in the actuator base. If any of the threads are damaged, the inserts must be replaced.
6. Lubricate all parts with a thin coat of clean type C-3 hydraulic oil. Take care to keep components protected from contamination.

ASSEMBLY

Actuator Base Threaded Inserts

1. If any inserts (7, Figure 3-4) were removed from the actuator base (6), position the actuator base upside down on the work bench and support directly under each of the four floor mounting holes.
2. Install the threaded inserts into the actuator base by tapping lightly with a small hammer until the insert flanges become flush with the actuator base. Be sure the base is supported to avoid breaking the base.
3. Thoroughly clean the actuator base and set aside.

Boot and Cap

1. Examine the boot (2, Figure 3-4) for any cracks, tears, or other damage. If damage is evident, the boot must be replaced To replace the boot, follow the procedure below.
2. Remove the boot from the actuator cap (1) and discard the old boot. Thoroughly clean the sides of the cap by scraping the lip where the cap contacts the boot. Use a knife or suitable scraper. Clean thoroughly to remove all residual adhesive or particles of the old boot.
3. Apply a thin bead of Loctite Prism 410 onto the upper sides of the cap. Apply the bead to the two long sides only. Do not apply it to the rounded ends, these must not be sealed to allow the boot to "breathe".
4. Carefully position the cap into the new boot groove wiping off the excess glue.
5. Position the boot such that it conforms to the contour of the cap, then set aside.
   Adhesive requires about 30 minutes to cure.

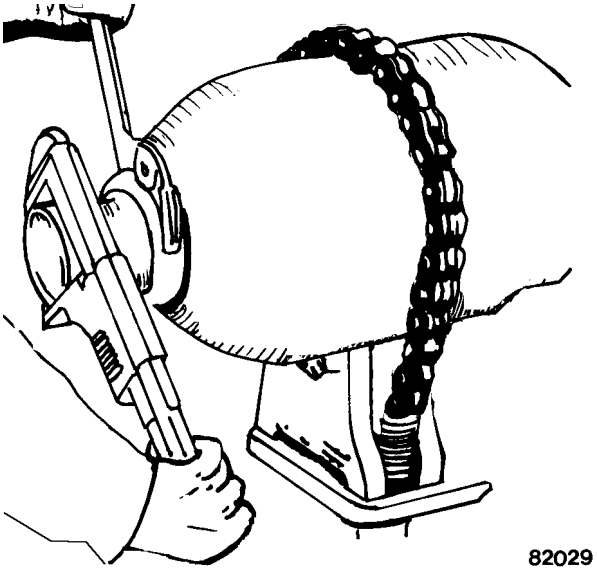


FIGURE 3-14. LOCKNUT REMOVAL

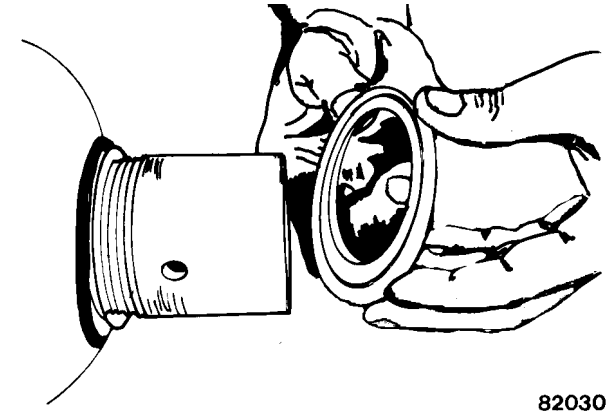


FIGURE 3-15. SPACER REMOVAL

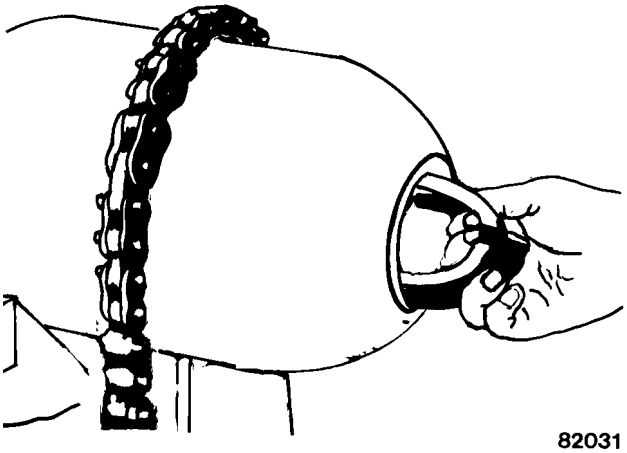


FIGURE 3-16. ANTI-EXTRUSION RING REMOVAL

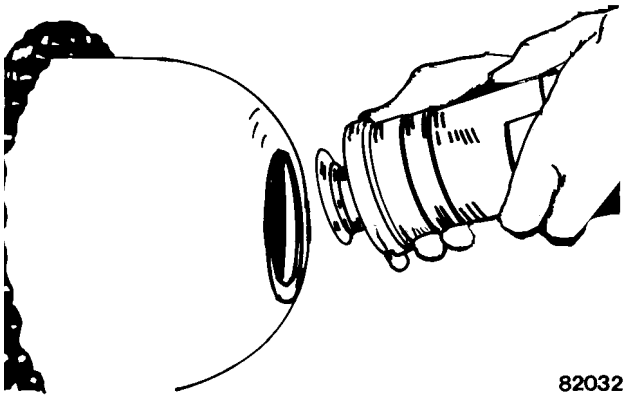


FIGURE 3-17. PLUG AND POPPET REMOVAL

9. With wrench on valve stem flats, remove the nut from the valve stem.
10. Insert hand into shell fluid opening. Depress bag and eliminate as much gas pressure as possible.
11. Grasp heel of the bladder and withdraw from shell. (Refer to Figure 3-18).

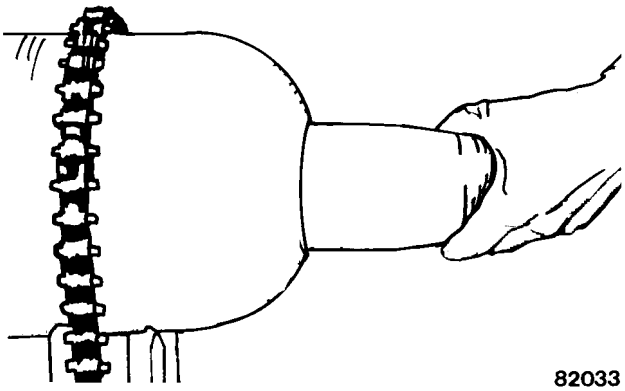


FIGURE 3-18. BLADDER REMOVAL

Cleaning and Inspection

1. After disassembly, clean all parts with an approved cleaning solution.
2. Blow all parts dry with air and keep free from foreign matter.
3. Check all rubber items for deterioration, abrasion marks, cracks, holes, bubbles or any similar defects.
4. Replace all O-rings and any other items deemed unsuitable for further usage.
5. Bladder may be checked by inflating to normal size and checking with a soapy solution. After testing, deflate immediately.
6. Check plug and poppet valve for proper functioning.

POSSIBLE CAUSES	SUGGESTED CORRECTIVE ACTION
TROUBLE: Differential Pressure Warning Circuit activates Briefly When Brakes are Applied or Released	
Brake valve out of balance (not tracking).	Adjust collars according to instructions.
Differential pressure switch is defective or is improperly adjusted.	Check the switch and replace if necessary. Check differential pressure switch adjustment. *NOTE: Refer to Step 39, Table I - Differential Pressure Switch Adjustment. If the differential pressure switch is O.K. and the differential pressure indicates a "red" spring is being used, replace "red" spring in Differential Pressure Switch Assembly with "green" spring and re-adjust differential pressures according to Table I.*
Accumulator precharge/leak.	Check accumulators and recharge if necessary.
Problem in brake valve subassembly.	Remove, disassemble, clean, and inspect brake valve assembly or replace it.
Air in one brake circuit.	Bleed brakes.
Small leak in one circuit.	Inspect brake system and repair leaks.
Brake warning delay timer defective	Replace timer.
TROUBLE: Differential Pressure Warning Circuit is not Operating	
Low Brake Pressure lamp is burned out.	Replace bulb.
Electrical problem.	Check wiring.
Differential pressure switch is defective or is improperly adjusted.	Check the switch and replace if necessary. Check differential pressure switch adjustment. Refer to Table I - Differential Pressure Switch Adjustment. See *NOTE:* above.
Problem in brake valve assembly.	Remove, disassemble, clean, and inspect, or replace brake valve.
Brake warning relay defective.	Replace relay.
TROUBLE: A Low Brake Pressure Warning Occurs When Brakes are Applied	
Leak or other malfunction in one brake circuit.	Inspect brake system and repair leaks.
Brake valve balance is out of adjustment.	Adjust collars according to instructions.
Differential pressure switch is defective or is improperly adjusted.	Check the switch and replace if necessary. Check differential pressure switch adjustment. Refer to Table I - Differential Pressure Switch Adjustment. See *NOTE:* above.

SERVICE BRAKE CONDITIONING (BURNISHING) PROCEDURE

After any brake lining replacement, or at new truck start up, the brake linings and discs must be burnished. A surface pyrometer will be necessary to accurately record disc temperature during brake burnishing procedure.

⚠WARNING

Rear brakes must be disconnected when burnishing the front brakes.
Refer to "Temporary Disconnect Procedures".

Front Brake Conditioning

1. To prevent overheating and possible destruction of rear brakes, refer to "Temporary Disconnect Procedures" to temporarily disconnect the REAR brakes while burnishing front wheel speed brakes. ***Front brakes will require burnishing independently from rear brakes in order to control disc temperatures***.

⚠WARNING

Extreme safety precautions should be used when making high-energy/high-speed brake stops on any downgrade. Safety berms or adequate run off ramps are necessary for any stopping performance tests. Rear brakes must be disconnected when burnishing the front brakes.

NOTE: Heavy smoke and foul odor from brake linings is normal during burnishing procedures.

2. Drive trucks at speeds of 5 to 10 MPH with brake alternately applied and released using sufficient pressure to make engine "work" to a noticeable extent during apply.

NOTE: The Override Switch on the instrument panel must be depressed and held by the operator in order to propel with the brakes applied.

3. Apply front brakes at full pressure until discs reach 900^{o}- 1000^{o}F (482^{o}-538^{o}C). Hold in override switch to maintain propulsion to obtain disc temperature. Check temperature after 200 yards (182 meters).
4. Let discs cool to 400^{o}F (204^{o}C) and repeat procedure two more cycles.
5. Allow front disc to cool to 300^{o}F (149^{o}C).
6. RECONNECT rear brakes (refer to **"Temporary Disconnect Procedures"**). Insure all brakes are functioning properly.

Temporary Disconnect Procedures For Rear Brakes

Before disabling any brake circuit, insure truck wheels are blocked to prevent possible rollaway.

⚠WARNING

Before disconnecting pressure lines, replacing components in the hydraulic circuits, or installing test gauges, ALWAYS bleed down hydraulic steering and brake accumulators. The steering accumulators can be bled down with engine shut down, turning the keyswitch "Off" and waiting 90 seconds. Confirm the steering pressure is released by turning the steering wheel - No front wheel movement should occur. Open the two valves at the bottom of the brake accumulators (inside brake cabinet) to bleed down the two brake accumulators.

The location for disconnecting the rear brakes is different for the model 830E than for the 630E and 685E Komatsu Truck Models.
Refer to next page for these locations.

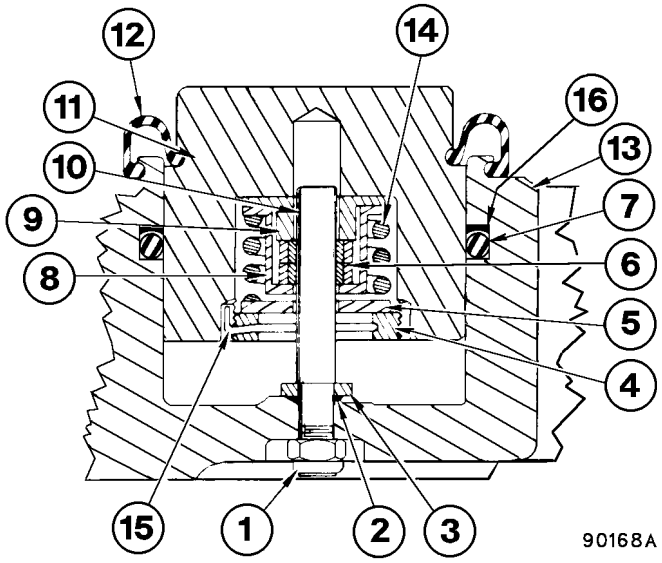


FIGURE 6-7. DISC BRAKE PISTION ASSEMBLY

1. Return Pin Nut
2. O-Ring
3. Washer
4. Retaining Ring
5. Spring Retainer
6. Grip Assembly
7. O-Ring
8. Outer Spring Guide
9. Inner Spring Guide
10. Return Pin
11. Piston
12. Dust Shield
13. Brake Caliper
14. Piston Return Spring
15. Lockwire Ring
16. Backup Ring

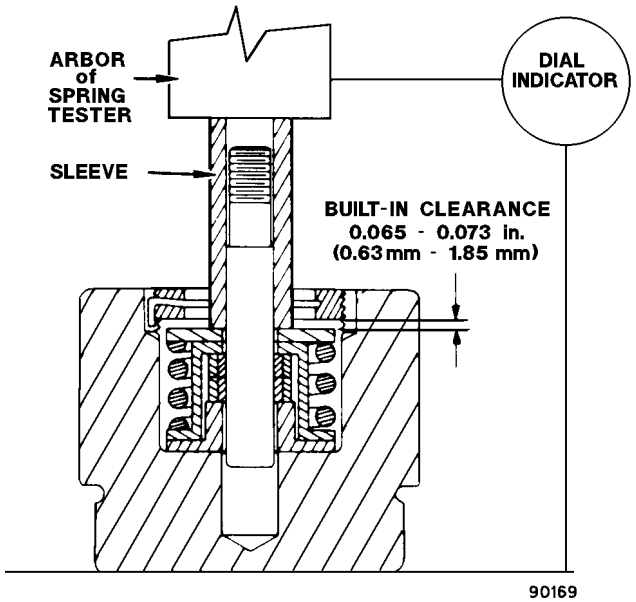


FIGURE 6-8. CHECKING SPRING FORCE AND BUILT-IN CLEARANCE ADJUSTMENT

8. Return spring force indication, Step 6, should be a minimum of 180 lbs. (808 N) when fully compressed in the piston subassembly. Although sufficient force will still exist to return the piston when force is as low as 135-140 lbs. (606- 628 N) and under emergency conditions may continue to be used, although it is recommended that piston assembly be disassembled and the spring replaced. Return spring (14, Figure 6-7) should then be inspected for evidence of permanent set.

NOTE: Whenever a spring is found to exert too low a force, it is probable that all other return springs from the same brake assembly will measure the same low value. High brake temperature can cause permanent spring set, hardening of piston seals and blue coloring of lining backer plates.

Grip Force

This is the force that is required to make the pair of grip assemblies (6, Figure 6-7) slip on return pin (10). Grip force should always be a minimum of approximately two times the return spring force. The slip force of a pair of grips will normally measure between 400 (1779 N) and 800 lb. (3558 N). If it is necessary to measure force required to slip the return pin in grip assemblies while installed in this piston assembly, it will be necessary to provide several special tools, such as those illustrated in Figure 6-9 & 6-10 or tools that will perform equivalent functions. Special tool as shown in Figure 6-9, (calibrated spring pod) need not be provided if a hydraulic press is available with a pressure gauge calibrated to read pounds of force exerted by the ram. A typical hydraulic press with an effective ram area of 3.53 sq. in. (22.7 cm^2 will exert a force of 400 lb. (1779 N) at a pressure reading of 113 psi (779 kPa) and 800 lb. (3558 N) at a pressure reading of 226 psi (1558 kPa). Gauge readings of 110 psi (758 kPa) minimum and 230 psi (1558 kPa) maximum will be sufficient for the measurement of grip force. A gauge of about 500 psi (3447 kPa) should be used, with a shutoff valve provided between pump and gauge to protect gauge from damage when press is used for higher pressure duty. Pump pressure should be applied slowly. Where a hydraulic press is not available, refer to illustration in Figure 6-10 for special tool, (or similar), used in conjunction with a standard arbor press, to make grip force measurements. To make grip force measurements, use the special tools illustrated in Figures 6-9 & 6-10.

NOTES

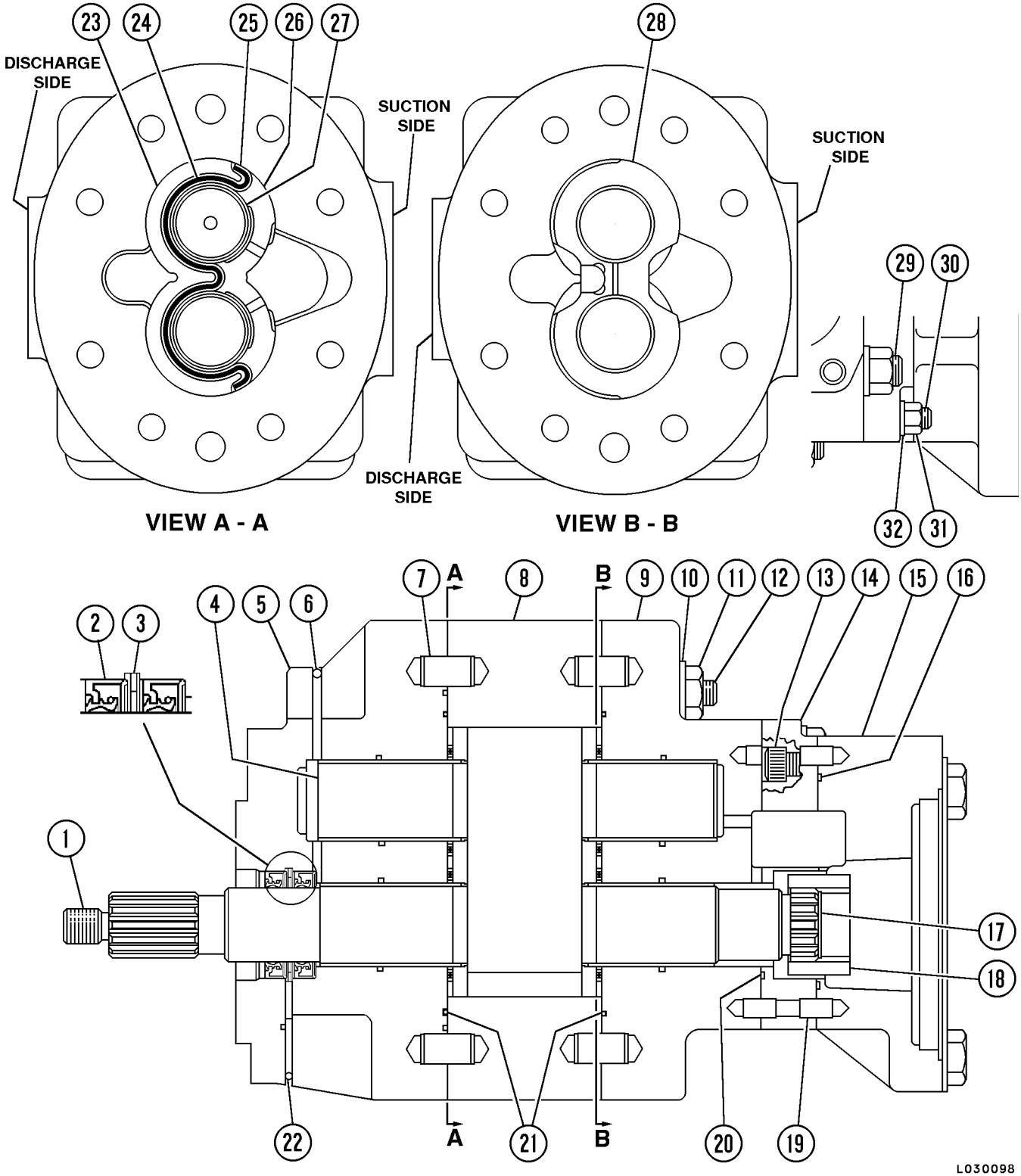


FIGURE 3-3. HOIST PUMP

1. Drive Gear
2. Seal
3. Snap Ring
4. Idler Gear
5. Flange
6. Steel Ball
7. Dowel
8. Gear Plate
9. Connector Plate
10. Washer
11. Nut
12. Stud
13. Capscrew
14. Transition Plate
15. Adapter Plate
16. O-Ring
17. Internal Snap Ring
18. Coupling
19. Dowel
20. O-Ring
21. O-Ring
22. Plug
23. Retainer Ring
24. Steel Ring
25. O-Ring
26. Back-up Ring
27. Isolation Plate
28. Pressure Plate
29. Stud
30. Stud
31. Nut
32. Flatwasher

NOTES:

Steering Left

(Refer to Figure 4-13):

When the operator turns the steering wheel “left”, the steering control valve is opened to allow oil coming in port “P” to pass to the gerotor section of the control unit to turn the rotor. Oil in the other side of the gerotor flows through other passages in the control unit valve and out steering control unit port “L”. This oil enters port “L” of the flow amplifier assembly and goes to a closed area “B” in the directional valve.

As pressure in this area builds, it also passes into the spool through orifice “C” to the spring area on the end of the directional valve. The pressure then moves the spool compressing the springs on the opposite end. This movement allows the oil entering area “B” to pass through the directional valve to area “D” of the amplifier valve through sleeve “E” holes to a passage between sleeve “E” and valve “F”, through hole “G” in sleeve “E” where it initially is blocked by the valve body.

As pressure builds up in this area, oil also flows from area “D”, around the outside of sleeve “E”, around pin “H”, through orifice “J” to build pressure on the end of the amplifier valve and opens hole “G” only enough to allow the flow of oil coming from the steering control unit to pass to the control area of the directional valve.

At the same time, the movement of sleeve “E” opened the holes near the spring end to allow the oil from the priority valve to flow into the center of sleeve “E”.

This oil now inside sleeve “E” pushes valve “F” against its spring to give the oil access to a series of holes “K”, that are in the same plane as hole “G”. The passage of oil through holes “K” past the valve body is metered by holes “K” being opened the same proportion as is hole “G”. The number of holes “K” (7) in sleeve “E” determine the amount of additional oil that is added to the steering control unit oil passing through hole “G”.

This combined oil going to the center area “Q” of the directional valve passes out port “CL” of the flow amplifier assembly and travels to the steering cylinders to steer the front wheels to the left. As the cylinders move, oil is forced to return out the opposite ends, enter port “CR” of the flow amplifier assembly, pass through the directional valve to area “M”, passes through the return check valve “N”, and exit port “HT” to the hydraulic reservoir.

At the steering control unit, when the operator turned the steering wheel, supply oil from port “P” was also delivered through the control unit valve to port “LS”. This oil enters the flow amplifier assembly through its “LS” port and builds pressure in the spring area of the priority valve. This additional force on the spring end of the priority valve causes area “A” to open and allow the necessary flow and pressure to pass through the amplifier valve to operate the steering cylinders.

The flow amplifier valve includes a relief valve in the priority valve spring area that is used to control maximum steering working pressure to 2500 psi (17.2 MPa) even though supply pressure coming in to port “HP” is higher. When 2500 psi (17. 2MPa) is obtained, the relief valve prevents the “LS” pressure from going higher and thereby allows the priority valve to compress the spring enough to close off area “A” when 2500 psi (17.2 MPA) is present.

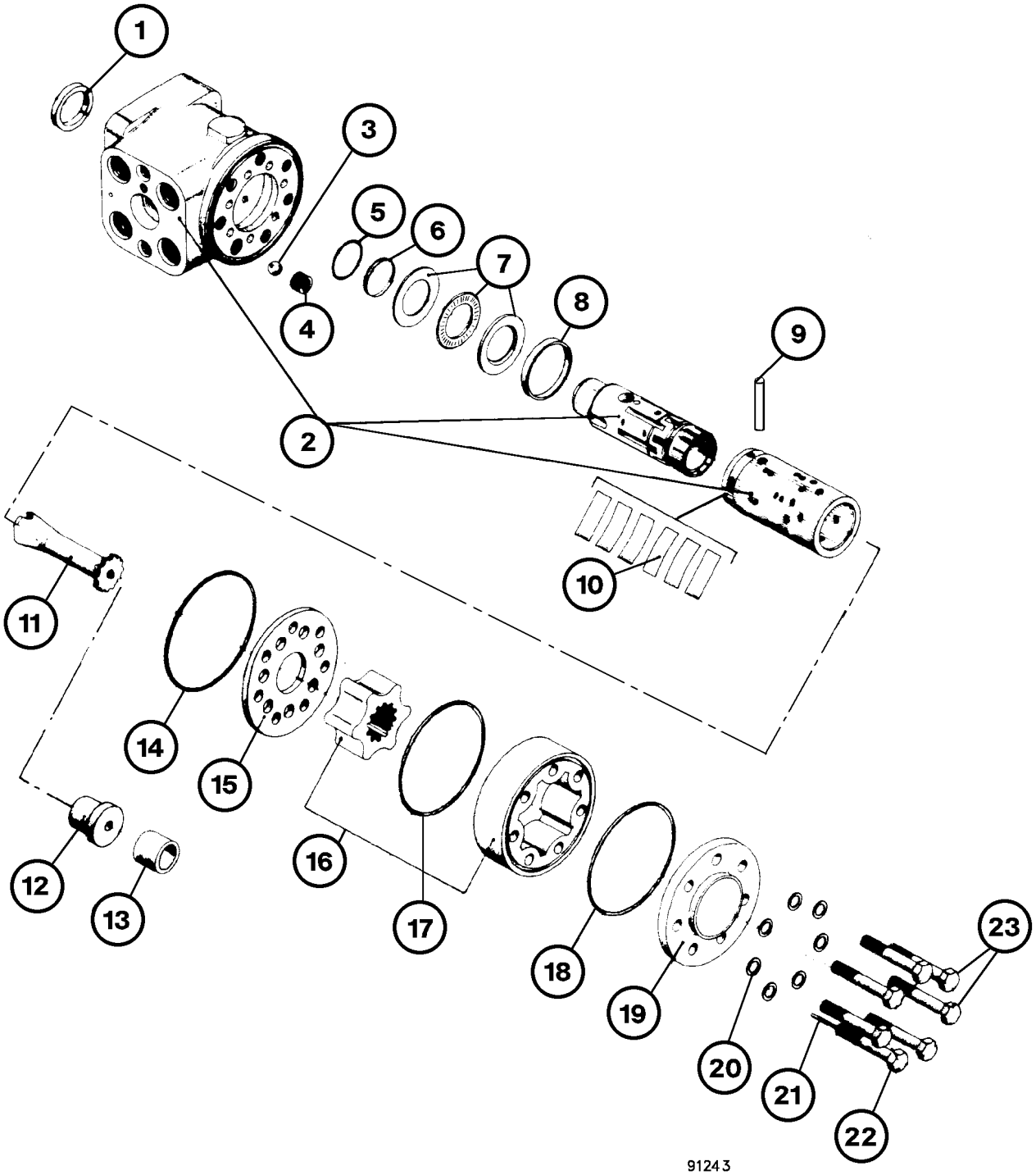


FIGURE 5-8. STEERING CONTROL VALVE

1. Dust Seal
2. Housing & Spools
3. Ball
4. Threaded Bushing
5. O-ring
6. Kin Ring
7. Bearing Assembly
8. Ring
9. Pin
10. Neutral Position Springs
11. Cardan Shaft
12. Spacer
13. Tube
14. O- ring
15. Distribution Plate
16. Gear Wheel Set
17. O-ring
18. O-ring
19. End Cover
20. Washers
21. Rolled Pin
22. Capscrew With Bore
23. Capscrews

ACCUMULATORS

Removal

1. Insure key switch has been “Off” for at least 90 seconds to allow accumulator oil to drain back to tank.
2. Remove charging valve guard (3, Figure 6-2) and loosen small hex on charging valve (4) three complete turns. Depress the valve core until all nitrogen pressure has been relieved.

⚠WARNING

Make certain only the small swivel hex nut turns. Turning the complete charging valve assembly may result in the valve assembly being forced out of the accumulator by the nitrogen pressure inside.

Wear protective face mask when discharging nitrogen gas.

3. Remove oil lines from bottom of accumulators. Plug all hoses and openings to prevent possible contamination of the system. Disconnect and mark electrical wiring to pressure switch.
4. Attach a lifting device to the accumulator to be removed.

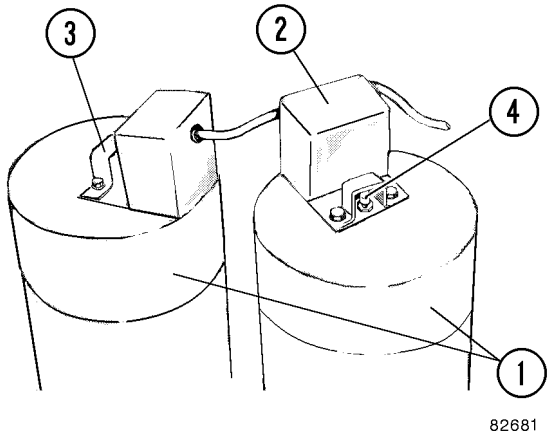


FIGURE 6-2. CHARGING VALVES

1. Accumulator
2. Pressure Switch Cover
3. Charging Valve Guard
4. Charging Valve

⚠WARNING

The accumulator weighs approximately 1,300 lbs. (590 Kg). Use a suitable lifting device that can handle the load safely.

5. Loosen the mounting band (3, Figure 6-3) capscrews and remove the mounting bands.
6. Raise the accumulator until clear of mounting bracket and move to a clean work area for disassembly.

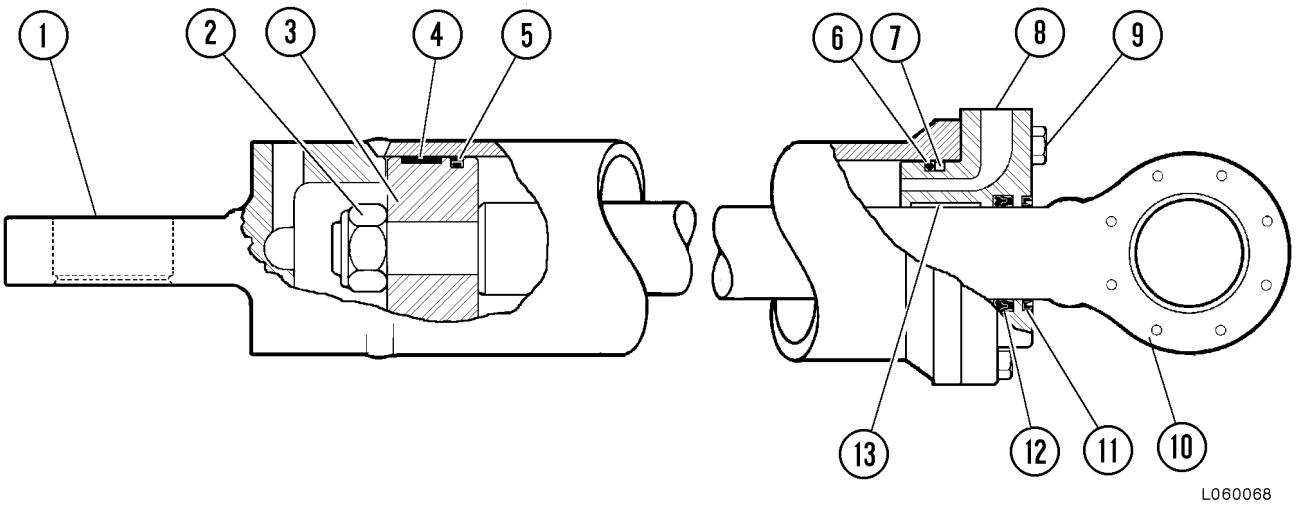


FIGURE 6-11. STEERING CYLINDER ASSEMBLY

1. Housing
2. Locknut
3. Piston
4. Piston Bearing
5. Piston Seal Assembly
6. O-Ring
7. Backup Ring
8. Gland
9. Capscrew
10. Rod Structure
11. Rod Wiper
12. Rod Seal
13. Bearing

Piston Seal & Bearing Installation

1. Install new piston seal (5, Figure 6-11) on piston (3) as follows:
   a. Heat piston seal assembly (5) in boiling water for 3 to 4 minutes.
   b. Remove piston seal from water and assemble on piston. DO NOT take longer than 5 seconds to complete as seal will take a permanent set. The piston bearing (4) may be used to position seal assembly in groove. Apply pressure evenly to avoid cocking seal.
   c. If seal has taken a slightly larger set (loose on piston) a belt type wrench or similar tool can be used to compress O.D. of seal until it fits tightly on piston.
2. Install bearing (4) in piston groove.

Cylinder Assembly

1. Install new bearing (13, Figure 6-11), rod seal (12), rod wiper (11), backup ring (7) and O-ring (6) in gland (8).
2. Push rod (10) through top of gland, slowly advancing rod over rod seal and rod wiper.
3. Install piston assembly (3) on rod. Secure piston to rod with locknut (2). Tighten locknut to **2000 ft. lbs. (2712 N.m)** torque.
4. Carefully install rod and gland assembly into cylinder (1). Insure backup ring and O-ring are not damaged during installation of gland.
5. Install capscrews (9). Tighten capscrews evenly to **310 ft. lbs. (420 N.m)** torque.

Test

After cylinder assembly rebuild, perform the following tests to verify performance is within acceptable limits.

1. Piston leakage must not exceed 1 in^3/min. (1.6 cm^3/min.) at 2500 psi (17.5 MPa), port to port.
2. Rod seal leakage must not exceed 1 drop in 8 cycles of operation.
3. Piston break-away force should not exceed 100 psi. (69 kPa).

POWER DOWN OPERATION (Figure 7-7)

When the operator moves the lever to lower the body, the Hoist Pilot Valve is positioned to direct the pilot supply oil in Ports (12) through Ports (15) to the top of the Rod End Spool (7). Pilot pressure increases to move the spool down compressing the bottom spring. Movement of the spool connects the High Pressure Passage (19) to the rod end (annulus area) of the hoist cylinders. At the same time, the Flow Control Valve (2) is forced to close as pilot pressure increases thus directing the incoming pump oil to the hoist cylinders through Spool (7) and check valve in the overcenter manifold rather than back to the tank.

If the body is at the maximum up position, the hoist limit switch has the hoist limit solenoid activated, therefore closing the raise port (14) on the hoist valve. Power down pilot pressure in Ports (15) pushes open the pilot operated check valve (21) so the pilot pressure in Ports (14) is open to tank through the Pilot Valve spool. As oil attempts to return from the head end of the hoist cylinders, it initially encounters the closed Head End Spool (8). Pressure increases on the bottom end of the spool causing it to move upward. This allows the returning oil to go into the Low Pressure Passage (20), build up 75 psi (517 kPa) to open the Low Pressure Relief (3), and exit the Hoist Valve through Port (10) to the tank. As the body descends and the hoist limit solenoid is no longer activated, the pilot operated check valve is no longer necessary.

FIGURE 7-7 POWER DOWN POSITION

1. Hoist Relief Valve 2500 psi (17 238 kPa)
2. Flow Control Valve
3. Low Pressure Relief Valve 75 psi (517 kPa)
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 1500 psi (10 341 kPa)
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

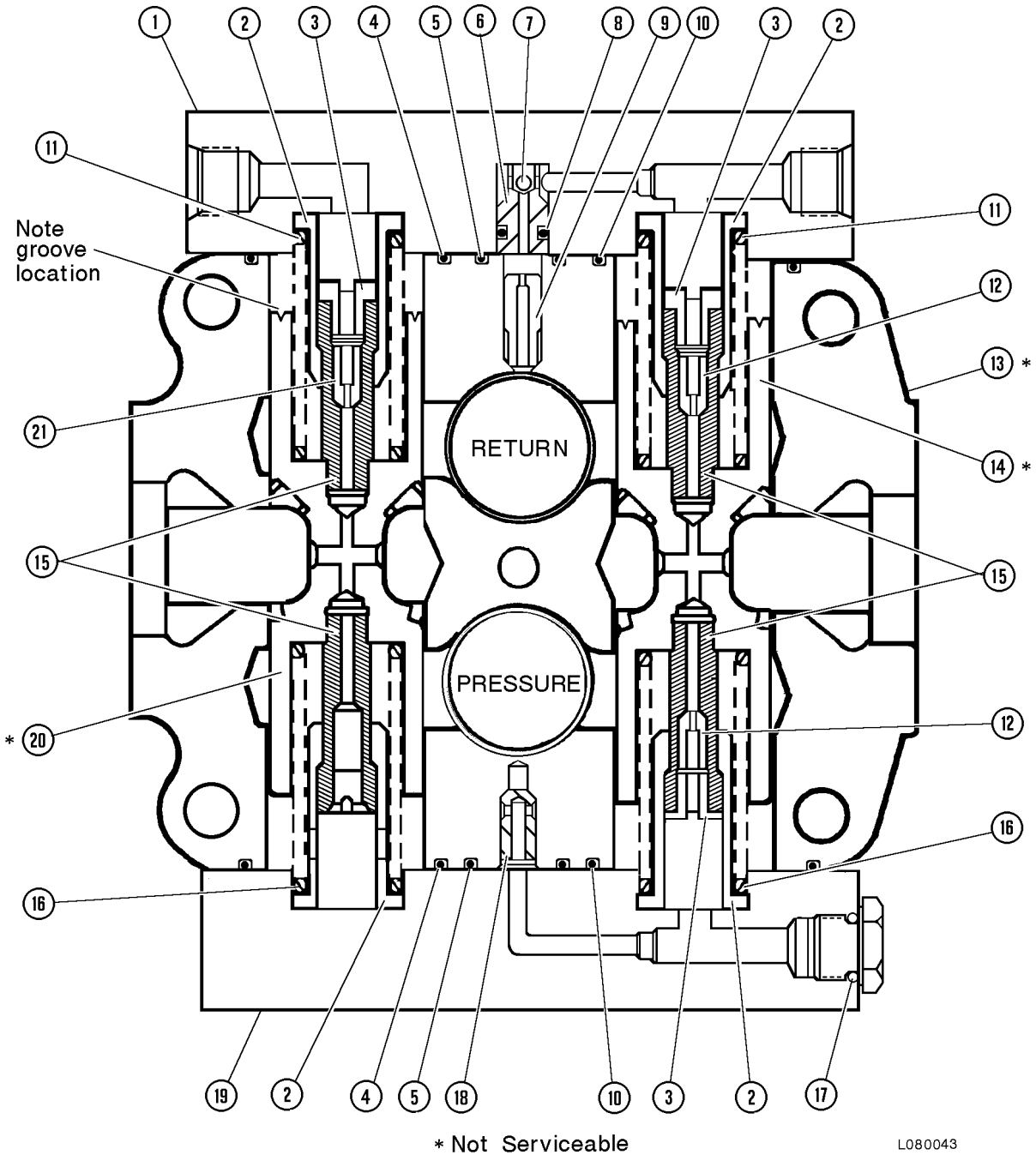


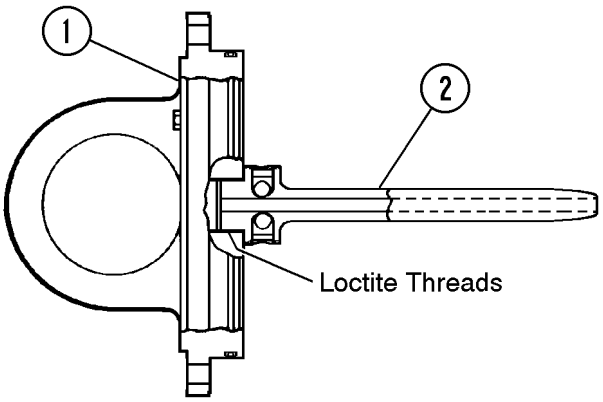
FIGURE 8-9. SPOOL SECTION ASSEMBLY

1. Spool Cover
2. Spring Seat
3. Plug
4. O-Ring
5. O-Ring
6. Poppet
7. Ball
8. O-Ring
9. Restrictor Poppet
10. O-Ring
11. Spring
12. Restrictor Poppet (White)
13. Spool Housing
14. Spool Assembly
15. Spool End
16. Spring (Blue)
17. O-Ring
18. Poppet
19. Spool Cover
20. Spool Assembly
21. Restrictor Poppet (Blue)

Cleaning and Inspection

NOTE: Use only fresh cleaning solvent, lint free wiping cloth and dry filtered compressed air when cleaning and handling hydraulic cylinder parts. Immediately after cleaning and inspection, coat all surfaces and parts with clean hydraulic oil (Type C-4).

1. Thoroughly clean and dry all parts.
2. Visually inspect all parts for damage or excessive wear.
3. If cylinder bores or plated surfaces are excessively worn of grooved, the parts must be replaced or, if possible, replated and machined to original specifications.
4. The quill (2, Figure 8-20) should be checked for tightness <u>if it has not previously been tack welded</u>.
   a. Check the quill for tightness by using special tool SS1143 (Figure 8-20) and applying a tightening torque of **1000 ft. lb. (1356 N.m)**.
   b. If the quill moves, remove quill, clean threads in cover assembly and quill, and reinstall using the procedure in "Quill Installation".
5. When a cylinder assembly is dismantled, the 12-point capscrews (7, Figure 8-19) and washers (5) should be checked carefully for distress and, if in doubt, replace them.



SS1143 Tightening Tool

FIGURE 8-20. QUILL INSTALLATION
1. Cap Assembly 2. Quill Assembly

NOTE: SS1143 Tightening Tool can be made locally. Request the following drawings from your Area or Regional Service Manager:

SS1143 Tightening Tool - Assembly Drawing
SS1144 – Square Tube (3.50" x 3.50" x 0.19" wall x 2.0" long)
SS1145 – Plate (2.50" x 2.50" x 0.25" thick)
SS1146 – Square Tube (3.00" x 3.00" x 0.25" wall x 15.50" long)
SS1147 – Tube, Brass (1.75"O.D. x 1.50" I.D. x 13.50" long)
SS1148 – Square Cut (2.50" x 2.50" x 0.75" thick)
SS1149 – Hex Drive (1.75" Hex stock x 2.50" long)

- <u>All materials are 1020 Steel except SS1147</u>.

NOTES

Hoist Counterbalance Valve Adjustment

Preparation:

1. With the engine shut down, the body resting on the frame, the hoist valve in the FLOAT position and hydraulic system pressure bled down, loosen locknut on adjustment stem of needle valve (4, FIGURE 10-7) on overcenter manifold (2). Turn adjustment stem fully clockwise.
2. Remove plug from "PILOT VENT" port (3) on overcenter manifold. This port will remain open to atmosphere during adjustment; *do not allow dirt to enter open port.*

Note: It is suggested a clean SAE # 4 (1/4") hydraulic hose is installed in the open port and the hose pointed downward.

3. Install a 5000 psi (35,000 kPa) gauge at test port "TROD" on overcenter manifold. (Gauge will measure rod end pressure; the pressure controlled by the counterbalance valve.)

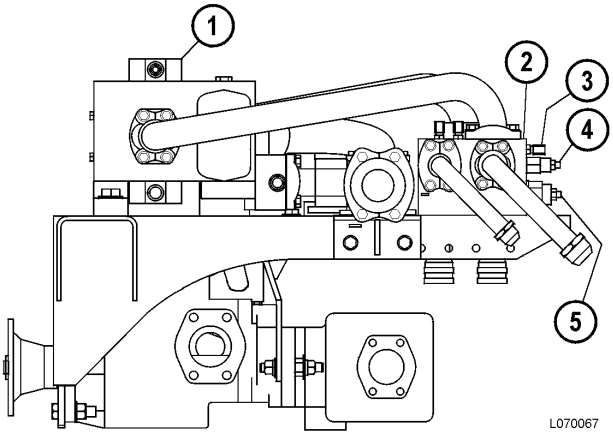


FIGURE 10-7. COUNTERBALANCE VALVE ADJUSTMENT

1. Hoist Valve
2. Overcenter Manifold
3. "Pilot Vent" Port Plug
4. Needle Valve
5. Counterbalance Valve

Counterbalance Valve Pressure Check Only:

1. Start the engine. At low idle, raise the body and as it extends to the third stage, read the pressure on the gauge connected to the "TROD" port. (All counterbalance valve pressures are read/adjusted while hoist cylinders are in third stage.)
   a. *If pressure is 3000 psi (20.7 MPa) or above,* stop hoisting immediately.

Pressure is adjusted too high and must be lowered. Go to "Counterbalance Valve Adjustment" and perform adjustment procedure.

   b. *If pressure is below 3000 psi (20.7 MPa),* increase engine speed by approximately 300 rpm and observe pressure on gauge.
      1.) If pressure is still below 3000 psi (20.7 MPa), continue increasing engine speed in steps of 300 rpm, while in third stage and observing pressure gauge.
      2.) Continue monitoring pressure gauge until engine high idle is attained.
   c. If gauge indicates 3000 psi (20.7 MPa) while at high idle, in POWER UP and in third stage, counterbalance valve adjustment is correct.
   d. If gauge does not indicate 3000 psi (20.7 MPa) while in third stage and at high idle (or a lesser rpm during step 1b, 1.) perform "Counterbalance Valve Adjustment" procedure.

Counterbalance Valve Adjustment

1. Loosen locknut on adjustment stem of counterbalance valve (2, FIGURE 10-7) (Labeled "CBV" on manifold). Turn adjustment stem fully clockwise to start adjustment procedure so counterbalance valve pressure is as low as possible.

Note: Turning adjustment stem in (clockwise) decreases the pressure. Turning the stem out (counterclockwise) increases the pressure. ***Complete valve adjustment range is 3 turns.***

2. Start the engine and operate at high idle. Raise the body while observing the pressure gauge. Slowly adjust counterbalance valve to obtain 3000 psi (20.7 MPa) as the hoist cylinder 3rd stage extends while in POWER UP. When adjustment is complete, secure locknut on adjustment stem.
3. Repeat Counterbalance Valve Pressure Check, step 1. to verify proper adjustment.
4. Replace plug in "PILOT VENT" port. Remove pressure gauge.
5. Turn needle valve adjustment stem fully out and secure locknut.

d. Make sure mounting hardware has not come loose or been broken, either of which would allow the tubing to sag or droop from its original location.

9. Weigh the actuation cartridge on the DAD. Replace cartridge if the weight is 1/4 oz. (7 g) less than that stamped on the cartridge. Check the cartridge threads for nicks, burrs, cross threading and rough or feathered edges. Examine gasket in bottom of DAD for elasticity. If the temperature is below freezing, warm the gasket with body heat to ensure a good seal. Clean and coat lightly with high heat resistant grease.

10. Recharge system following "Charging Procedure".

CHARGING PROCEDURE

1. Check all detection tubing connections to ensure they are tight.
2. If the cartridge receiver/adapter has not been removed from the PMD, remove at this time. Refer to Figure 2.2-8.
3. Check to see that the large O-ring is in its position in the receiver/adapter assembly. Refer to Figure 2.2-9.

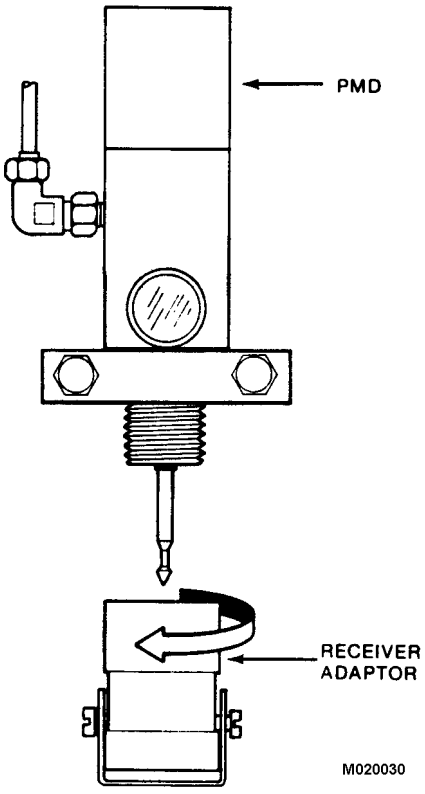


FIGURE 2.2-8. RECEIVER/ADAPTER REMOVAL

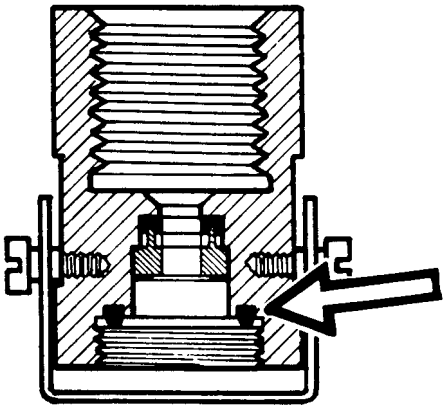


FIGURE 2.2-9. RECEIVER/ADAPTER O-RING SEAL

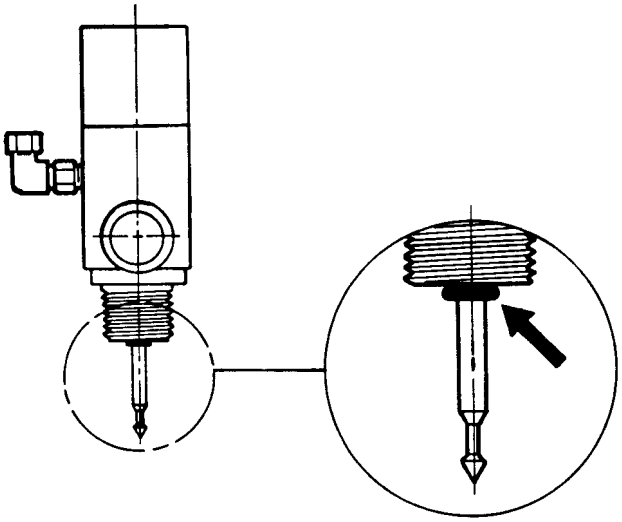


FIGURE 2.2-10. PUNCTURE PIN O-RING

NOTE: If either O-ring is dry, remove and lubricate with silicone or similar grease before proceeding with installation.

4. Check to see that the puncture pin O-ring is in position. Refer to Figure 2.2-10.
5. Insert the cartridge through the preventer on the cartridge receiver/adapter assembly and handtighten firmly. Refer Figure 2.2-11.

! CAUTION ! ***When installing the cartridge receiver/adapter onto the PMD, the puncture pin will gradually penetrate the seal on the cartridge. At about the two thirds point of turning the assembly onto the PMD, the nitrogen gas will begin to escape the cartridge, flowing through the detection tubing and on into the DAD.***

The pressure within the DAD should reach a level of approximately 85 psi (586 kPa) when the PMD cartridge is fully installed.

What to Expect

When a fire suppression system discharges, there is some noise, accompanied by clouds of dry chemical. While breathing foreign particles is not pleasant, the agent is non-toxic.

What to Do After the Fire is Out

The machinery should not be restarted until it has been serviced and cleaned (water spray or steam may be used to remove the dry chemical). If the Electric Detection and Actuation System cannot be recharged immediately, at least recharge the remainder of the fire suppression system so that manually actuated protection is available.

Recharging the Electric Detection and Actuation System

The recharge of the Electric Detection and Actuation System is similar to the original procedure for installing and placing the automatic detection system into service. Follow these procedures as outlined previously in this manual, omitting the section which deals with mounting the bracket and power wire.

Replace the entire length(s) of detection wire involved in the fire area.

Before the system is put back into service, it is important that the inside chamber of the actuator be cleaned thoroughly. Failure to do so may cause excessive carbon build-up on the internal O-ring and piston chamber. This build- up will also stop the puncture pin from returning to its upmost position.

To clean actuator (See Figure 2.3-22):

1. Remove squib.
2. Remove actuator from bracket and loosen upper portion of body.
3. Apply pressure to the bottom of the puncture pin. This will force out the puncture pin and spring.
4. Thoroughly clean carbon deposits from base of stem, puncture pin, spring and inside surface of body.
5. After all components are clean and dry, liberally lubricate O-rings with silicone grease.
6. Reassemble actuator and push buttom manually several times to insure free movement of puncture pin.

NOTE: When puncture pin is fully reset, cutting point of pin will be located approximately 0.06 in. (1.6 mm) below thread on lower actuator body (Figure 2.3-22).

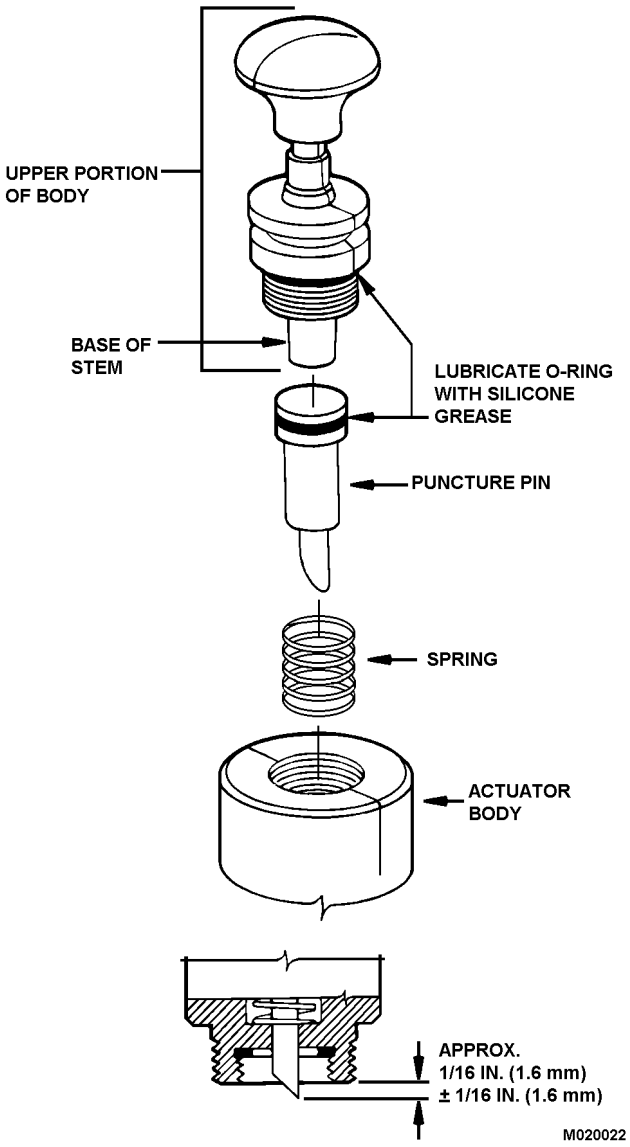


FIGURE 2.3-22. ACTUATOR ASSEMBLY

a. To remove the dowels, use a rod or punch and hammer to drive them out. Place driver inside of dowel and against end of dowel on opposite side and tap out.

12. Repeat steps 6 and 7 for remaining seals.

13. Slide a punch of appropriate size through the bearing and against the metal casing of the seal (3, Figure 4-4). Hold the punch away from the bearings and drive the seal out without damaging seal bore or bearing. Move the punch around the seal as it is driven out. Do not allow the punch to rest against the seal bore or bearing while driving the seal out.

14. Check the seal bore for scratches. If scratches are apparent, us a four hundred grit sandpaper to clean up the bore. Do not use coarse grit sandpaper. It will cut heavy grooves in the bore and will allow the seal to leak around the O.D.

15. Wash all motor parts in clean solvent and wipe dry with clean shop towel or blow dry with shop air.

Inspection Of Parts

Visually inspect all parts. After a visual inspection those parts which are in questionable condition should be replaced with new ones.

1. Examine the bores in the gear plate.
   a. If any grooves are cut deeper than .015" (.38 mm) or the plate is cracked or damaged in some other way, it should be rejected.
2. Examine the gears.
   a. If excessive wear is visible on the journals, sides, or faces of the gears, or at the point where the drive gear shaft rotates in the lip seal, reject them. If keyway is excessively worn, replace the drive gear.
3. Examine the pressure plates.
   a. They should not show excessive wear on the bronze side. If deep curved wear marks are visible, replace the plate with a new one.
4. Shaft seals should be replaced. All O-ring seals and back-up rings or strips should be replaced with new.
5. Bearing I.D.'s should have a gray coating.
   a. If bronze can be seen shining through the teflon on the inlet side, the bearings and plate they are in, should be replaced.

Assembly

1. Using an arbor press, press the new seal (3, Figure 4-4) into flange bore.
   a. Center the seal over the seal bore with metal face of the seal facing out.
   b. Make sure the seal is started and pressed straight into the bore.
   c. Place a socket wrench (having an O.D. just slightly smaller than seal bore) against seal.
   d. Press against socket and press seal in until seal has just cleared snap ring groove in seal bore.
3. Apply two or three drops of # 290 Locite against seal bore and O.D. of seal.
   a. Hold the flange at a 45 degree angle and rotate it slowly to allow the locite to flow all the way around the O.D. of the seal.
4. Install the snap ring and wipe the excess Locite out of seal bore and seal lip.
5. Install O-ring (1, Figure 4-5) in cover plate (5). After O-ring has been placed in groove, spread a light coat of grease on the O-ring to hold it in place.
6. If for any reason, gear plate (3, Figure 4-6) had to be replaced, dowels (4) must be pressed into both sides of replacement gear plate before assembling it to cover plate. Dowels can be tapped in with hammer, but it is best to use a dowel guide and press. Whichever method is used, make sure they are straight in dowel bores. If press is used, do not apply rapid force on dowels. If a hammer is used, do not drive the dowels in aggressively. Tap them lightly until they are against the shoulder.
7. With matching marks made in step 2 toward you, and the four cast recesses in the outer edge of gear plate toward cover plate, line up dowels. Tap gear plate lightly until it is against O-ring in cover plate.
8. Install back-up ring (3, Figure 4-5) and O-ring (2).
9. Install O-ring (5, Figure 4-6) in pressure plate (2). With trap (small oblong hole) in pressure plate toward inlet side of gear plate and bronze side up, slide pressure plate down gear bores.
10. Install drive gear in gear bore nearest to matching mark and idler gear in opposite bore.
11. Install O-ring in remaining pressure plate . With trap toward inlet side and bronze side down, place pressure plate down against gear faces.

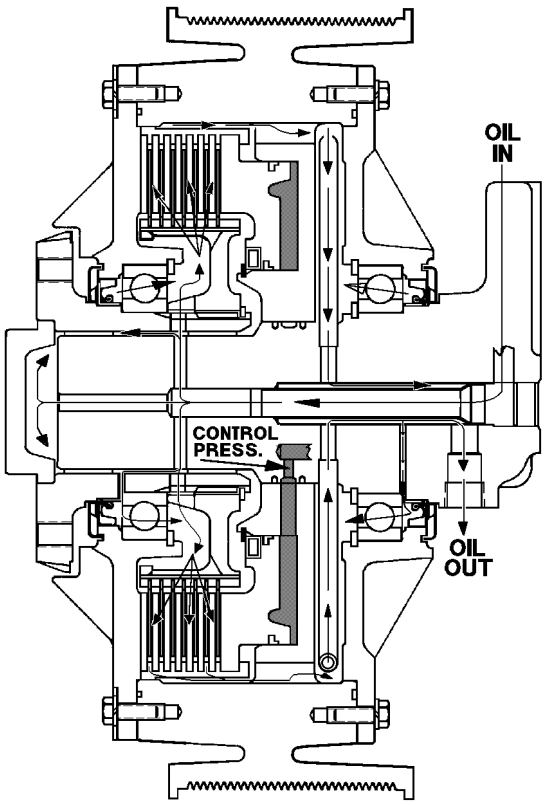


FIGURE 6-6. LUBRICATING AND COOLING OIL

Oil then travels through the orifice, through the bracket, and into the fan clutch shaft. Oil passages in the shaft distribute lubricating oil to the bearings and other internal parts, and into the clutch hub cavity. Centrifugal force drives oil through holes in the clutch hub to cool the clutch plates. The grooved configuration of the facing plates allows oil to pass over the clutch plates at all times. It is this flow of cooling oil over the clutch plates which permits continuous clutch slip and variable fan speeds.

Centrifugal force carries the oil outward to the inside diameter of the pulley. The rotational movement of the pulley carries the oil in the direction of input rotation. Pitot tubes face into the direction of input rotation. The rotational movement of the oil rams the oil into the pitot tubes, which direct the oil through a passage into and through the fan shaft and bracket, to an external "out" port. A line from the "out" port carries the oil to a non-pressurized port on the engine where the engine oil is returned to the engine oil sump.

⚠CAUTION

The pitot tubes pump oil from the pulley, maintaining low internal pressure in the fan clutch. Do not run the engine without belts driving the fan clutch pulley.

MAINTENANCE

The fan drive system requires a minimum of maintenance. A few simple checks made periodically will assure correct operation and long life.

⚠WARNING

Observe all safety precautions when working in the area of the fan. If working with a running engine, the fan will come on automatically without warning when engine temperature rises.

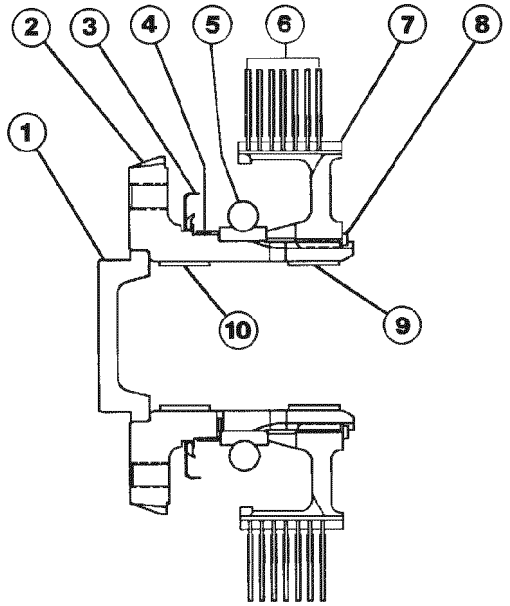
Maintenance Checks To Be Made

1. Fan bracket to engine bolts: Check torque after first week of operation and every 500 hours thereafter.
2. Fan-to-fan mounting hub bolts: Check torque after first week of operation and every 500 hours thereafter.
3. Fan belts: Maintain proper belt tension. Refer to Section "C" for belt tension adjustment.
4. Hoses and fittings: Check all hoses and fittings every 500 hours. Replace all soft, brittle or frayed hoses. Tighten all loose or leaking fittings.
5. Thermal sensor(s): Check corrosion buildup on thermal tip after each 5000 hours. Clean if necessary and check for proper operation.

DO NOT DISASSEMBLE OR DISTURB THERMAL SENSOR SETTING.

6. Electrical: All electrical connections should be checked for tightness after each 5000 hours. All electrical lines should be checked for breaks and frays. Check to insure all grounding points are intact.
7. Shutters (Optional): After each 1000 hours, visually check the shutters to make sure they completely open before the fan comes on.

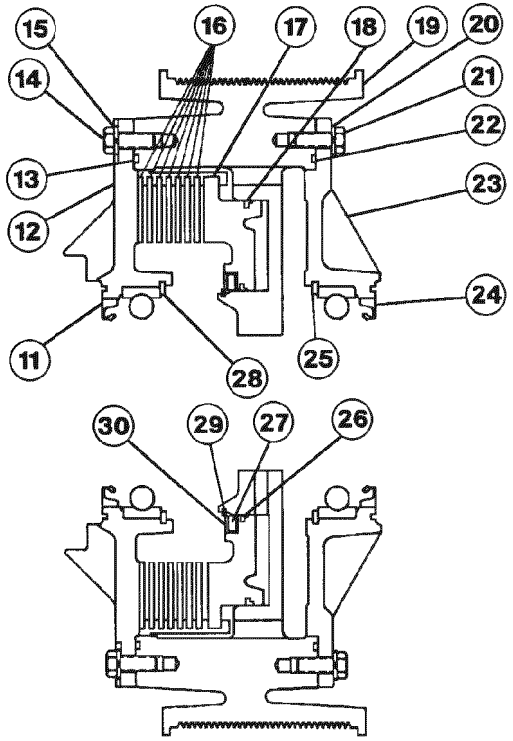
OUTPUT COMPONENTS



91108

REF.	DESCRIPTION
1	End Cap
2	Fan Mounting Hub
3	Front Retainer/Seal Assembly
4	Front Wear Sleeve (Without Notch)
5	Front Bearing
6	Facing Plates
7	Clutch Hub
8	External Snap Ring
9	Sleeve Bearing
10	Sleeve Bearing
11	Front Oil Seal
12	Front Bearing Retainer
13	"O" Ring Seal

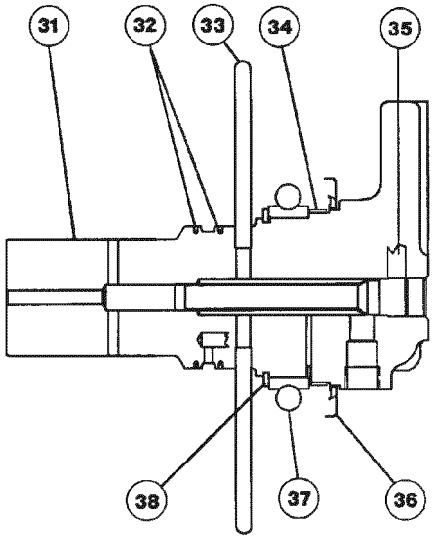
INPUT COMPONENTS



91109

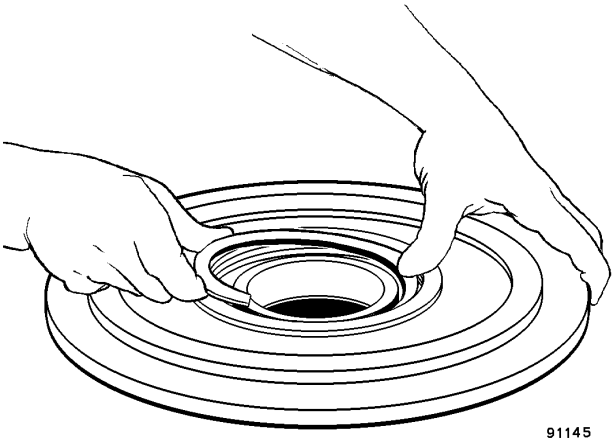
REF.	DESCRIPTION
14	Bolt
15	Lockwasher
16	Steel Clutch Plate
17	Piston
18	Sealring (large)
19	Pulley
20	Lockwasher
21	Bolt
22	"O" Ring Seal
23	Rear Bearing Retainer
24	Rear Oil Seal
25	Internal Snapring
26	Sealring (small)

STATIONARY COMPONENTS



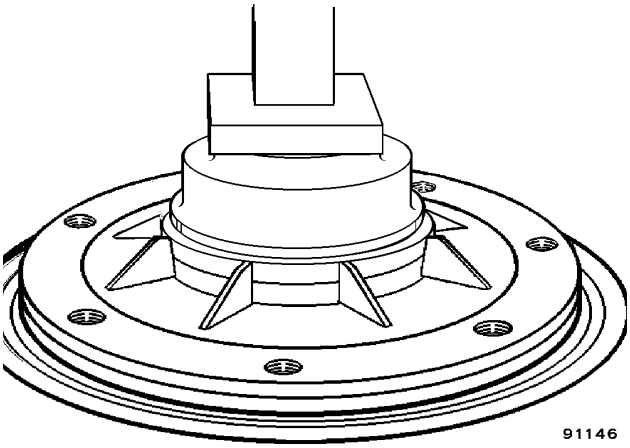
91170

REF.	DESCRIPTION
27	Spring Washer
28	Internal Snapring
29	External Snapring
30	Shim
31	Shaft/Bracket Assembly (Typical)
32	Sealring
33	Pitot Tube
34	Rear Wear Sleeve (With Notch)
35	Orifice (Not Shown: in "OIL IN" Port)
36	Rear Retainer/Seal Assembly
37	Rear Bearing
38	External Snap Ring



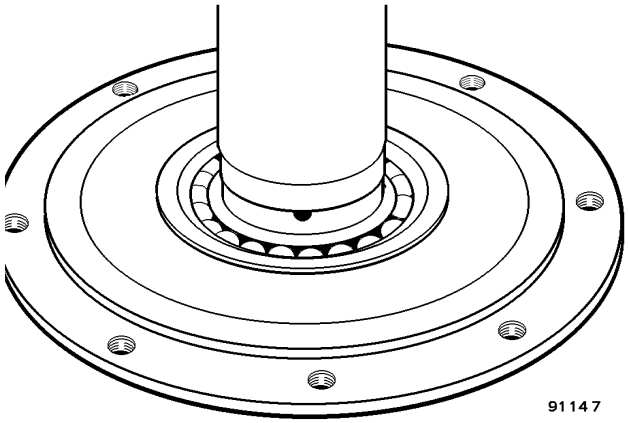
Step # 36

Install internal snapring (25).



Step # 37

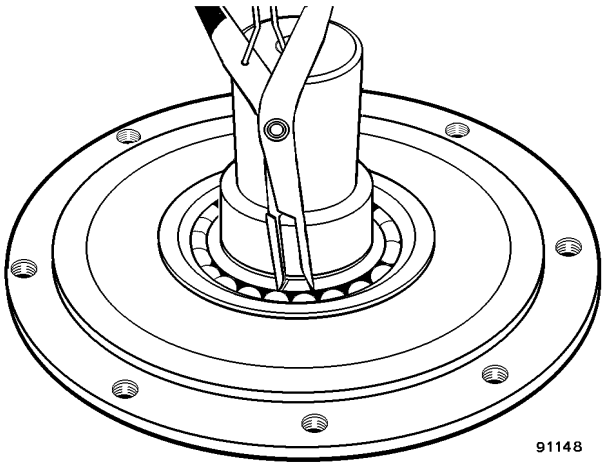
Turn the retainer over on the press bed. Coat the O.D. of rear oil seal (24) with Loctite® # 290 (or equivalent). Install the oil seal in the rear bearing retainer, flush with the rear face.



Step # 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 be sure 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.



Step # 39

Install external snapring (38).

(14), (15), (20), (21): Bolts and Lockwashers

Re-use unless damaged.

(5), (37): Bearing Assembly

Replace

(8), (29), (38): External Snapring

Re-use unless worn, damaged or distorted.

(32): Seal Rings

Replace

(17): Piston

General:	Should be free of nicks. Sealing grooves must be smooth so as not to cut seal rings. O.D. must not have nicks which extend above the O.D. surface. I.D. must not be elongated from wear.

(18), (26): Piston Seal Rings

Replace

(7): Clutch Hub

Replace if I.D. teeth are severely worn.

Replace if wear notches made by facing plates have straight sides.

If the wear marks have smooth entry and exit marks the notches will not restrict plate movement and the clutch hub can be re-used.

(6): Facing Clutch Plates

Must pass between two plate surfaces 11 x 11 in. (280 x 280 mm) spaced 0.188 in. (4.78 mm) apart set at 45° angle. Facing grooves are 0.005 in. (0.127 mm) mimimum deep when new. Plate is worn out at the bottom of the grooves.

Internal teeth must not be worn in excess of 0.005 in. (0.127 mm) per side and the tooth driving contact surface must not be worn to a point or to a wedge shape.

(16): Steel Clutch Plates

Must pass between two plate surfaces 11 x 11 in. (280 x 280 mm) spaced 0.130 in. (3.30 mm) apart, set at a 45° angle.

Replace if wear on drive surfaces of the external tangs exceeds 0.005 in. (0.127 mm) per side.

Mimimum thickness: 0.121 in. (3.07 mm).

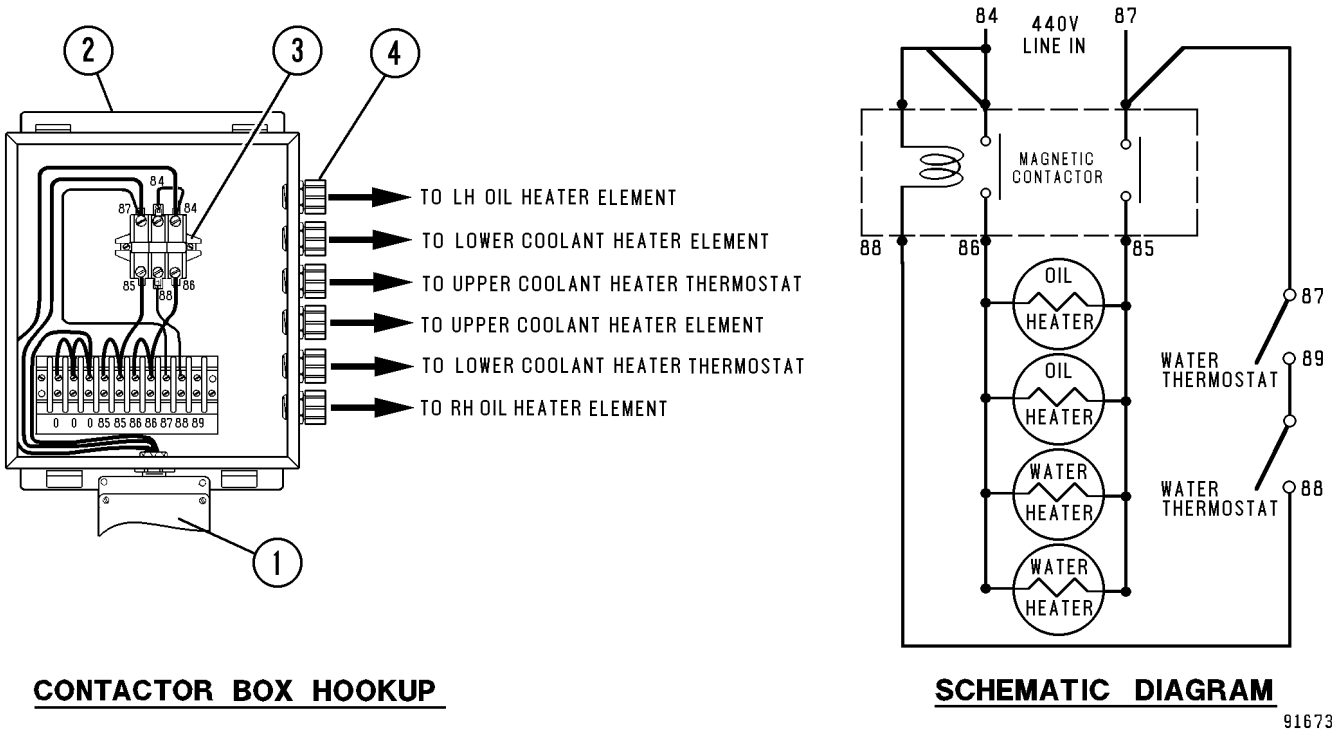


FIGURE 7-2. HEATER SYSTEM ELECTRICAL HOOKUP

1. Line Power Receptacle
2. Contactor Junction Box
3. Magnetic Contactor
4. Cord Grip

Troubleshooting

To check for proper operation of the heating units, the coolant outlet water hoses (10, Figure 7-1) and the oil pan heater mounting bosses (3, Figure 7-4) should feel warm to the touch.

If none or only several of the heaters feel warm to the touch after allowing sufficient time for warm-up, perform the following checks:

1. Open the magnetic contactor box located on the lower left of the radiator shroud (2, Figure 7-1). Visually check all electrical connections in the box and to the heating units.
2. With line voltage applied to the system, verify a nominal 440 volts across terminals “84” and “87” at the magnetic contactor (3, Figure 7-2).
3. With the coolant temperature below 120°F (48°C), verify a nominal 440 volts across terminals “85” and “86”.
4. If voltage is not present on terminals “85” and “86”, disconnect the power cable at the junction box receptacle and check the thermostat contacts using an ohmmeter. Verify continuity across terminals “87” and “88” at the magnetic contactor.
5. If the circuit between terminals “87” and “88” is open:
   a. Remove each of the thermostat covers 1, Figure 7-7) and check for continuity between the terminals.
   b. If no continuity exists and coolant temperature is below 120° (48°C), the thermostat is defective and should be replaced. (Refer to “Thermostat”.)
6. If the circuit between terminals “87” and “88” at the magnetic contactor is closed, but operating voltage was not present at terminals “85” and “86”, the magnetic contactor is defective and must be replaced.

NOTES

MANIFOLD GAUGE SET

A typical manifold gauge set (Figure 9-7) has two screw type hand valves to control access to the system, two gauges and three hoses. The gauges are used to read system pressure or vacuum. The manifold and hoses are for access to the inside of an air conditioner, to remove air and moisture, and to put in, or remove, refrigerant from the system. Shutoff valves are required within 12 inches of the hose end(s) to minimize refrigerant loss.

A gauge set for R-134a will have a blue hose with a black stripe for the low side, a red hose with a black stripe for the high side, and a yellow hose with a black stripe for the utility (center) hose. The hoses use a 1/2 in. ACME female nut on the gauge end. Special quick disconnect couplings are normally combined with a shutoff valve on the high and low side hoses. The free end of the center hose contains a 1/2 in. ACME female nut and a shutoff device within 12 inches of the hose end. These special hoses and fittings are designed to minimize refrigerant loss and to preclude putting the wrong refrigerant in a system.

NOTE: When hose replacement becomes necessary, the new hoses must be marked "SAE J2916 R-134a".

Functions of the manifold gauge set are included in many of the commercially available recovery or recovery/recycle stations.

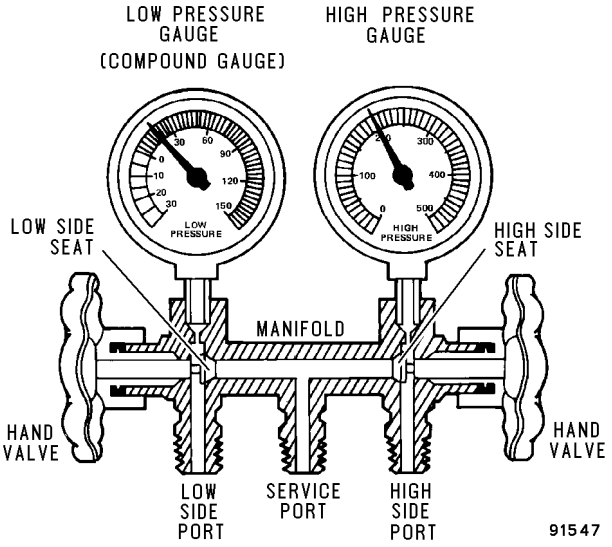


FIGURE 9-7. MANIFOLD GAUGE SET

Low Side Gauge

The Low Side Gauge, registers both vacuum and pressure. The vacuum side of the scale is calibrated from 0 to 30 inches of mercury (in. Hg). The pressure side of the scale is calibrated to 150 psi.

⚠WARNING

Never open the hand valve to the high side at anytime when the air conditioning system is operating. High side pressure, if allowed, may rupture charging containers and potentially cause personal injury.

High Side Gauge

The High Side Gauge is used to measure pressure only on the discharge side of the compressor. The scale is calibrated from 0 to 500 psi.

5. Carefully feel the hoses and components on the high side. All should be warm-hot to the touch. Check the inlet and outlet of receiver-drier for even temperatures, if outlet is cooler than inlet, a restriction is indicated.

⚠WARNING

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

6. Feel the hoses and components on the low side. They should be cool to the touch. Check connections near the expansion valve, inlet side should be warm and cold-cool on the outlet side.

7. If these conditions are met, the system is considered normal. Shut down engine. Remove gauges and install the caps on the service valves.

DIAGNOSIS OF GAUGE READINGS & SYSTEM PERFORMANCE

The following Troubleshooting Chart lists typical malfunctions encountered in air conditioning systems. Indications and or problems may differ from one system to the next. Read all applicable situations, service procedures, and explanations to gain a full understanding of the system malfunction. Refer to information listed under “Suggested Corrective Action” for service procedures.

Corrosion creates resistance in the charging circuit which causes undercharging and gradual starvation of the battery.

NOTE: When washing batteries, make sure cell caps are tight to prevent cleaning solution from entering the cells.

Addition of acid will be necessary if considerable electrolyte has been lost through spillage. Before adding acid, make sure battery is fully charged. This is accomplished by putting the battery on charge and taking hourly specific gravity readings on each cell. When all the cells are gassing freely and three successive hourly readings show no rise in specific gravity, the battery is considered charged. Additional acid may now be added. Continue charging for another hour and again check specific gravity. Repeat the above procedure until all cells indicate a specific gravity of 1.260-1.265 corrected to 80°F (27°C).

NOTE: Use 1.400 strength sulphuric acid when making specific gravity adjustments. Acid of higher strength will attack the plates and separators before it has a chance to diffuse into the solution.

If the temperature of the electrolyte is not reasonably close to 80°F (27°C) when the specific gravity is taken, temperature should be corrected to 80°F (27°C):

- For every 10°F (5°C) below 80°F (27°C), 0.004 should be SUBTRACTED from the specific gravity reading.
- For every 10°F (5°C) above 80°F (27°C), 0.004 should be ADDED to the reading.

Idle batteries should not be allowed to stand unattended. If equipment is to stand unused for more than two weeks, the batteries should be removed and placed in a cool, dry place where they may be checked periodically and charged when necessary. Remember, all lead-acid batteries discharge slowly when not in use. This self discharge takes place even though the battery is not connected in a circuit and is more pronounced in warm weather than in cold.

The rate of self-discharge of a battery kept at 100°F (38°C) is about six times that of a battery kept at 50°F (19°C) and self-discharge of a battery kept at 80°F (27°C) is about four times that one at 50°F (10°C). Over a thirty day period, the average self-discharge runs about 0.002 specific gravity per day at 80°F (27°C).

To offset the results of self-discharge, idle batteries should receive a booster charge (not a quick charge) at least once every thirty days. Batteries allowed to stand for long periods in a discharged condition are attacked by a crystallization of the lead sulfate on the plates. Such batteries are called sulfated and are, in the majority of cases, irreparably damaged. In less severe cases, the sulfated battery may be restored to limited service by prolonged charging at a low rate (approximately ½ normal rate).

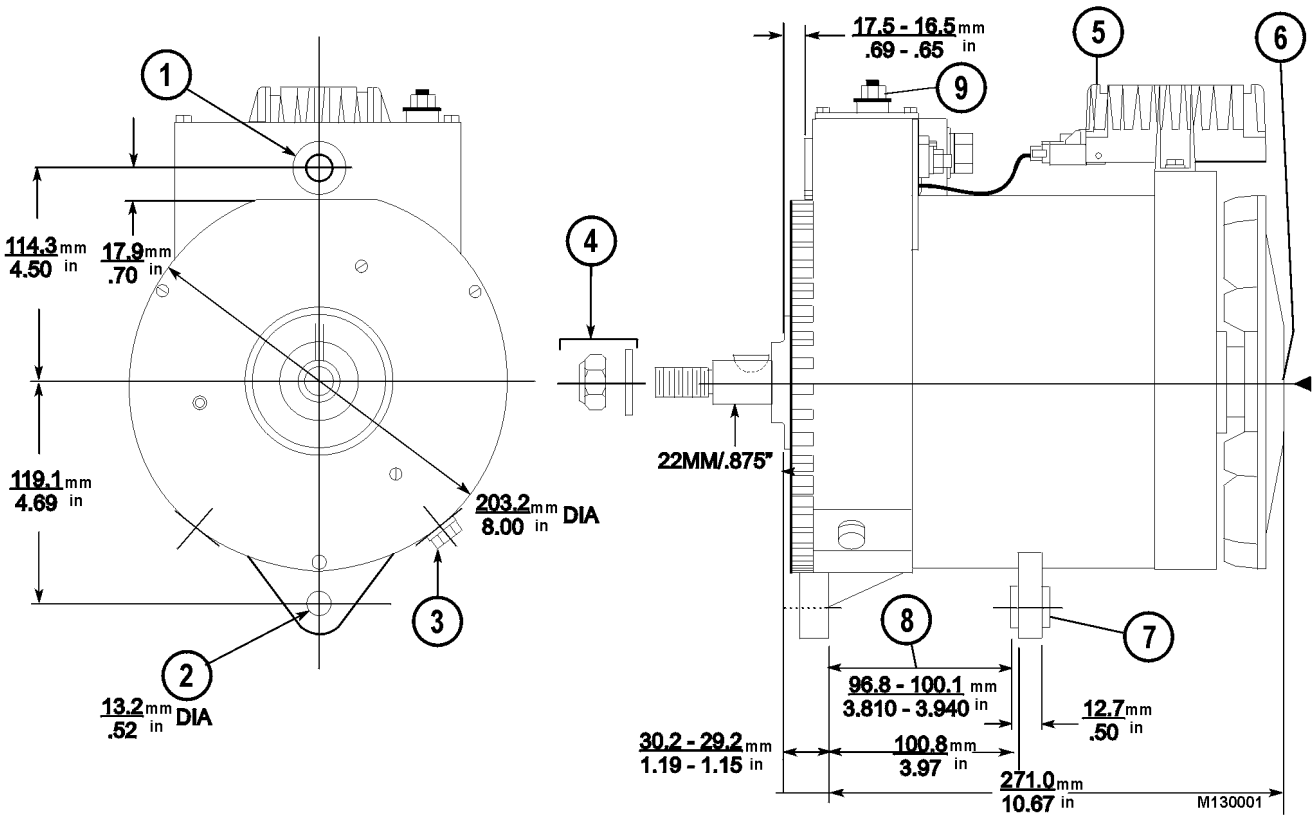
An undercharged battery is extremely susceptible to freezing when allowed to stand in cold weather.

The electrolyte of a battery in various stages of charge will start to freeze at temperatures indicated in the table.

The temperatures in table I indicate the points at which the first ice crystals appear. Lower temperatures must be reached for a solid freeze. Solid freezing of the electrolyte may crack the battery case and damage the positive plates. As will be noted, a ¾ charged battery is in no danger of freezing, therefore, a ¾ charge or better is desirable, especially during winter weather.

Specific Gravity Corrected to 80°F (27°C)	Freezing Temperature Degrees
1.280	-90°F (-70°C)
1.250	-60°F (-54°C)
1.200	-16°F (-27°C)
1.150	+5°F (-15°C)
1.100	+19°F (-7°C)

TABLE I



ALTERNATOR DIMENSIONS

1. Mounting Bolt - 1/2 UNC; 45 ft.lbs. (61 N.m) torque
2. Mounting Bolt - 12/50 Dia; 65 ft.lbs. (88 N.m) torque
3. Ground Bolt, 3/8 - 16; 11 ft.lbs. (15 N.m) torque
   Either Side; R.H. side shown
4. Locknut (5/16 - 18 UNF-2B) & Washer (to secure Pulley)
5. Voltage Regulator
6. Fan Nut; 50 ft.lbs. (68 N.m) torque
7. Slip Bushing
8. Allowable Mounting Bracket Dimensional Span
9. F+ Stud (NOTE: F+ Stud Not On All Models)

FASTENER DESCRIPTION	TORQUE SPECIFICATIONS	
	SAE	METRIC
Pulley Nut	120 ft. lbs	162.7 Nm
Heat Sink, Cover Plate, Control Box Hold Down & Relay Terminal Screw	20 in. lbs.	2.3 Nm
Phase Terminal Screw	20 in. lbs.	2.3 Nm
Ground Bolt	11 ft. lbs.	15 Nm
Front & Rear Housing Hold Down Nut	18 in. lbs.	2.0 Nm
Tension Adjust Bolt	18 ft. lbs.	24.4 Nm
Rotor Hold Down Screws	45 ft. lbs.	61.0 Nm
Output Lead Bolt	11 ft. lbs.	15 Nm
Output Nut	20 – 22 ft. lbs.	27.1 – 29.8 Nm
Energize Terminal Nut	60 – 70 in. lbs.	6.8 – 7.9 Nm
Regulator Hold Down Screw (for taptite screws)	32 in. lbs. 45 in. lbs.	3.6 Nm 5 Nm
Fan Nut	50 ft. lbs.	67.8 Nm
Field Coil Screw	8 – 10 in. lbs.	.9 – 1.1 Nm

ALTERNATOR DISASSEMBLY

Notes: Disassemble alternator only as far as necessary to replace defective part(s).

For stator removal, refer to BF4822 Stator Service Tool Instructions.

In this publication, Front Housing refers to the Drive End Housing, and Rear Housing refers to the opposite end housing.

FAN REMOVAL

1. Remove fan guard.
2. Use a 3/4” socket wrench to loosen nut attaching fan to alternator. Keep shaft from rotating by holding the pulley in a vise, jaws padded with brass or aluminum (Figure 13-7).
3. Remove nut and hardened washer.
4. Remove fan assembly from alternator.

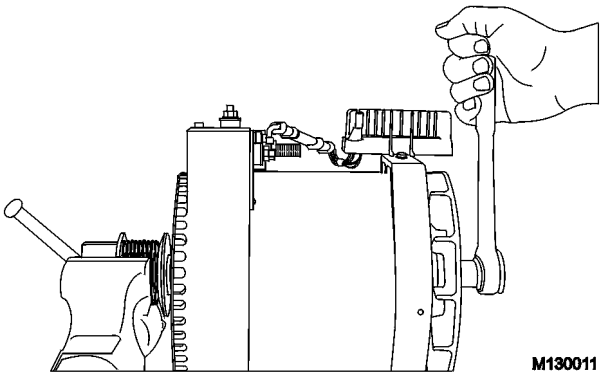


FIGURE 13-7.

PULLEY REMOVAL

1. Use a 15/16” socket wrench on the pulley nut. Clamp the pulley in a vise, jaws padded with brass or aluminum, and loosed pulley nut (Figure 13-8).
2. Remove pulley nut and hardened washer.
3. With a gear puller remove the pulley from the shaft.
4. Remove woodruff key from shaft.
5. Remove pulley bushing from shaft.

REGULATOR REMOVAL

1. Disconnect regulator from alternator harness.
2. Remove mounting hardware from regulator mounting feet (Figure 13-9).
3. Remove regulator.

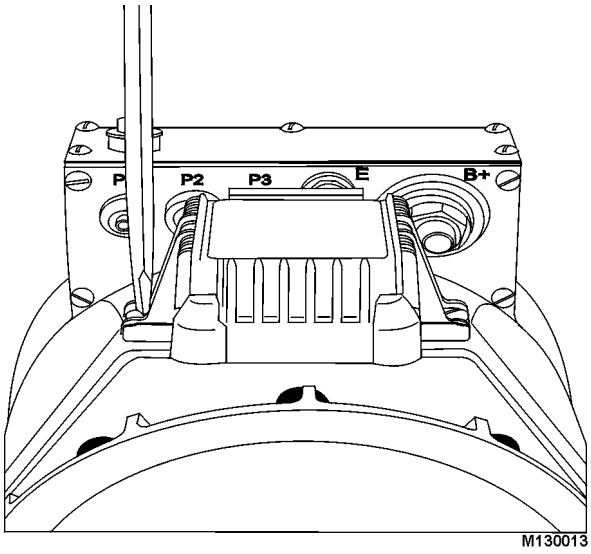


FIGURE 13-9.

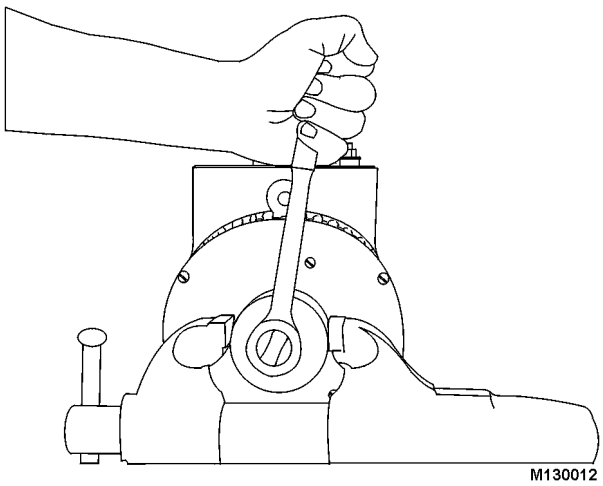


FIGURE 13-8.

8. Position the control unit-face plate and attach the regulator harness lead “4” to “E” terminal on the face plate.

9. Attach the alternator phase lead to “R” terminal (or phase terminals) on the face plate.

10. Use RTV #732 on the face of the housing. Use Loctite in mounting screw holes for the face plate.

11. Install the face plate onto the housing while sliding slot in the face plate onto grommet on regulator harness. Attach the face plate to the housing with 4 screws.

12. Attach “B+” buss leads from rectifier to the back of “B+” terminal.

13. Position “B+” buss leads from rectifier so that the leads will not contact inside ends of “E” or “R” terminals (or phase terminals).

14. Attach leads from the field coil to the terminal block at “F” and “B+” positions.

15. Use RTV #732 to reseal the housing where the field coil leads enter the housing.

16. Use RTV #3140 on inner ends of “R” (or phase terminals) and “E” terminals, on the terminal block, and all exposed wires on inner end of “B+” stud to prevent corrosion.

17. Apply RTV #732 on the top of the housing.

18. Use five screws (coat with Loctite) to attach control box cover to control box. Tighten screws to 20 in. lbs. (2.2 Nm) torque.

REAR ROTOR ASSEMBLY

1. Place rotor assembly on shaft and core assembly inside stator, field coil and shell assembly (Figure 13-32).

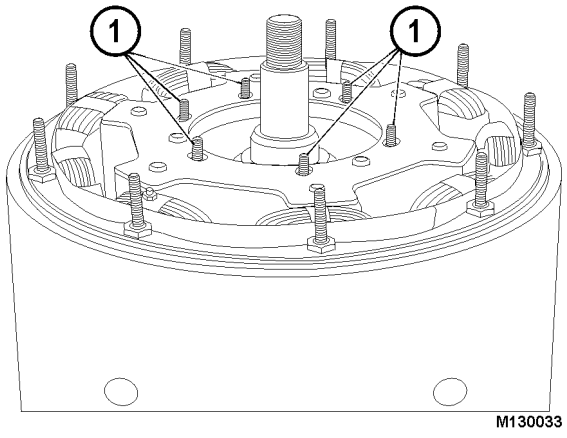


FIGURE 13-32.

1. Studs or Screws

NOTE:Align stud or screw holes of core with scribe marks on rotor, or center studs or screw holes of core in the center of slots in rotor plate as shown in Figure 13-32.

2. Use six flanged locknuts or self tapping screws to fasten rotor assembly to shaft and core assembly (Apply loctite to studs before installing locknuts). Torque flanged locknuts to 45 in. lbs. (5.0 Nm), screws to 65 in. lbs. (7.3 Nm).

END HOUSING ASSEMBLY

1. Stand alternator on front end.Observe extra care when installing housing if rotor shaft is equipped with dust cap and ring seal carrier, as ring seal must compress to enter into housing bore.

NOTE: If shaft has ring seal, rear housing must have chamfer on bearing bore. Studs from stator, field coil and shell assembly will come through holes in end housing.

2. **Ring Seal Conversion**
   The fan and shaft/core assemblies have been modified to accommodate a new bearing ring seal design (Figure 13-33). These changes affect alternators manufactured after January 1996. The changes affect the shaft and fan hub diameters on full units and service parts. When new service parts are used to repair units manufactured before January 1996, the ring seals and lip seals must be removed.

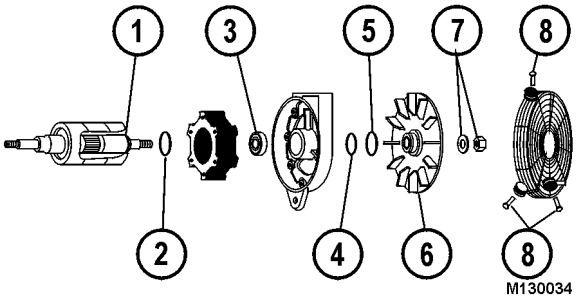


FIGURE 13-33.

1. Ring Seal Groove
2. Ring Seal
3. Bearing
4. O-Ring
5. Ring Seal
6. Ring Seal Groove
7. Fan Mounting Hardware
8. Fan Guard Screws

Engine ON/OFF Data

When the engine is started or stopped, the following data is recorded.

ITEM	UNIT	RANGE	REMARKS
Engine Operation Number	Number	1 - 65535	Advances by one each time the engine is started.
Last Two Digits Of The Year	Year	0 - 99	Indicates when the engine was started.
Month	Month	1 - 12	
Day	Day	1 - 31	
Time Hour	Hour	24 Hour Clock	
Time Minute	Minute	0 - 59	
Last Two Digits Of The Year	Year	0 - 99	Indicates when the engine was shut off.
Month	Month	1 - 12	
Day	Day	1 - 31	
Time Hour	Hour	24 Hour Clock	
Time Minute	Minute	0 - 59	
Total Payload	Metric tons Short tons	0 - 999900.0	Total payload from the time when the engine was started until the time the engine was shut off.
Total Number Of Cycles	Number	0 - 9999	Totals for the time that the engine was running.

Fault Codes and Warning Data

ITEM	UNIT	RANGE	REMARKS
Error Code	Displayed by a combination of letters and numbers representing a specific error code.		
Engine Operation Number At Time Of Occurrence	Number	1 - 65535	Every time the engine is started the number advances by one.
Number Of Times Of Occurrence Since The Engine Was Switched ON	Number	1 - 255	
Last Two Digits Of Year	Year	0 - 99	
Month	Month	1 - 12	
Day	Day	1 - 31	
Time Hour	Hour	24 Hour Clock	
Time Minute	Minute	0 - 59	

- Condition of the Engine Oil Pressure signal.

  The panel will display “:C3:XX” for 3 seconds, then indicate:

  “C3:oo” Engine is running.

  “C3:– –” Engine is not running.

- Condition of Alternator ’R’ terminal signal.

  The panel will display “C4:XX” for 3 seconds, then indicate:

  “C4:oo” Engine is running.

  “C4:– –” Engine is not running.

- Condition of the Spare Analog Input 1 signal.

  The panel will display “C5:XX” for 3 seconds with XX: as an input signal (V).

- Condition of the Spare Analog Input 2 signal.

  The panel will display “C6:XX” for 3 seconds with XX: as an input signal (V).

- Condition of the Spare Digital Input 1 signal.

  The panel will display “C7:XX” for 3 seconds, then:

  “C7:oo” High.

  “C7:– –” Low.

- Condition of the Spare Digital Input 2 signal.

  The panel will display “C8:XX” for 3 seconds, then:

  “C8:oo” High.

  “C8:– –” Low.

4. Press the TOTAL/SFT switch to view faults again or press the MODE switch to return to normal operation.

CONNECTIONS

CN1 - AMP MIC-MKII 13 Pins White Connector		
No.	**Description**	**Comments**
1	Power +24V (Battery)	
2	Lamp Relay 1	
3	Lamp Relay 2	
4	Lamp Relay 3	
5	Lamp Relay 4	
6	Lamp Relay 5	
7	Speed Sensor (Signal)	
8	Speed Sensor (GND)	
9	Alternator R Terminal (Charge Signal)	Running - 28VDC Off - 0VDC
10	Key Switch ACC Terminal (ACC Signal)	
11		
12		
13	GND (Power GND)	

CN3 - AMP MIC-MKII 9 Pins White (RS-232C Port)	
No.	**Description**
1	RTS
2	SG
3	RD
4	TX
5	CTS
6	DTR
7	DSR
8	

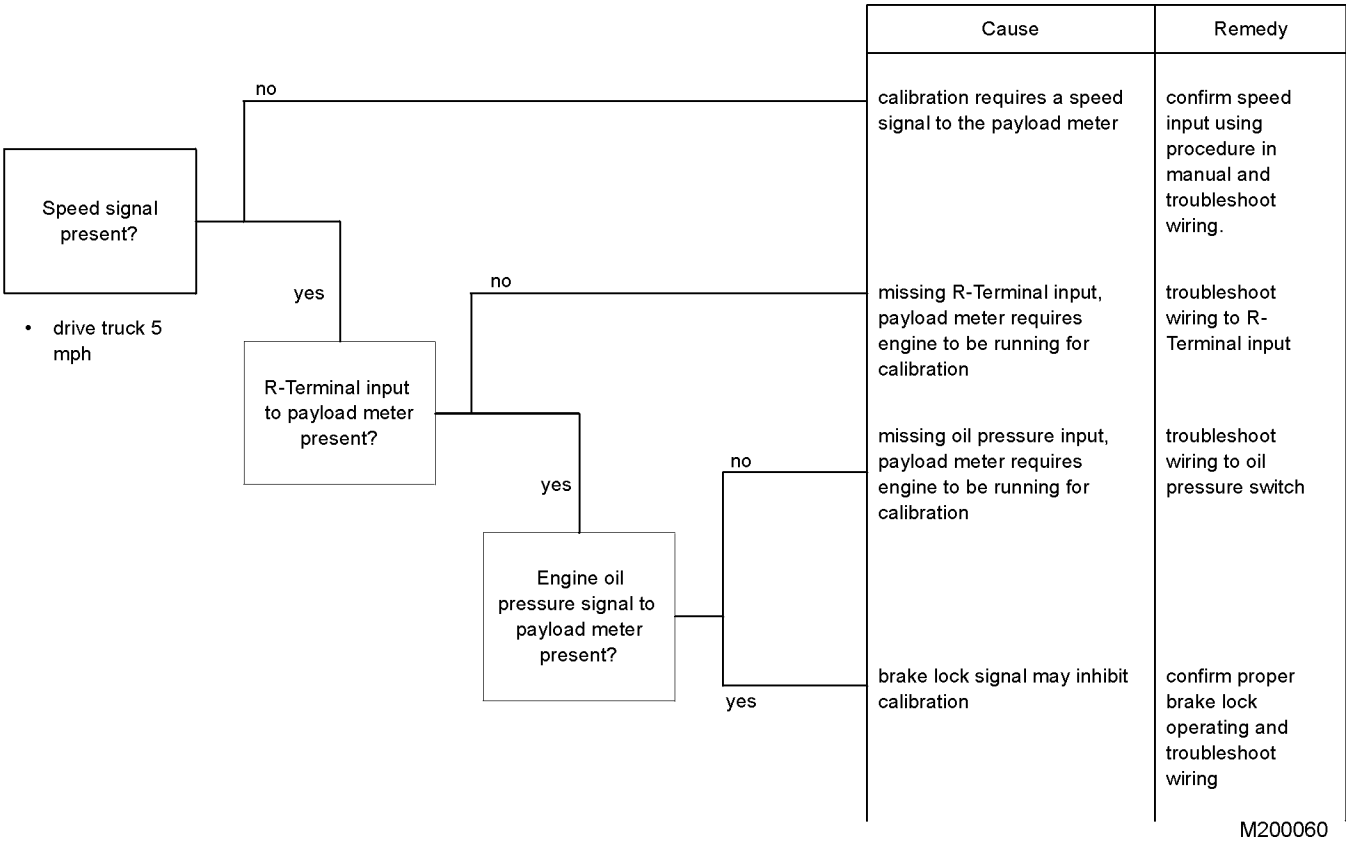
CN2 - AMP 040 12 Pins Black Connector		
No.	Description	**Comments**
1	Engine Oil Pressure Switch	Running Open Off - Closed
2	Sensor Power Out	+18V
3	Sensor GND	
4	Left Front Suspension Pressure Sensor	1-5VDC Normal
5	Right Front Suspension PressureSensor	1-5VDC Normal
6	Left Rear Suspension Pressure Sensor	1-5VDC Normal
7	Right Rear Suspension Pressure Sensor	1-5VDC Normal
8	Inclinometer	
9	Body Rise Signal	Body Down - Open Body Up - Gnd
10	Brake Lock Signal/Neutral Signal	Lock Off - Open Lock On - Gnd
11		
12		

CN4 - AMP 040 8 Pins Black (Optional Input, Reserved)	
No.	**Description**
1	Optional Input GND
2	Analog Input 1
3	Analog Input 2
4	Digital Input 1
5	Digital Input 2
6	
7	

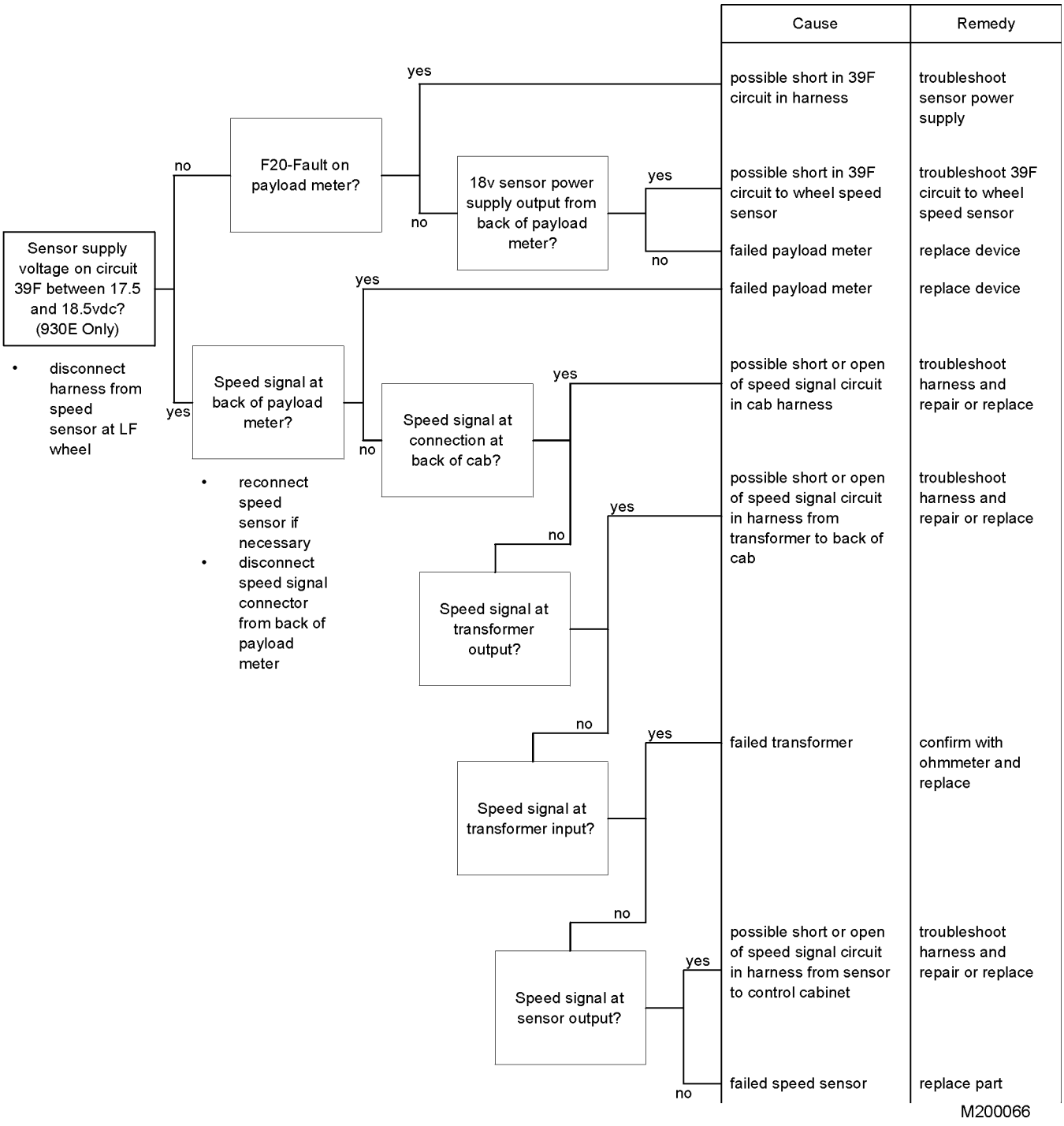
F.CAL: Payload Meter Won't Calibrate

The most common cause for failure to calibrate is a missing speed signal to the payload meter. Check the inputs to the payload meter to confirm that the speed signal is being received. Refer to “Monitoring Input Signals”.

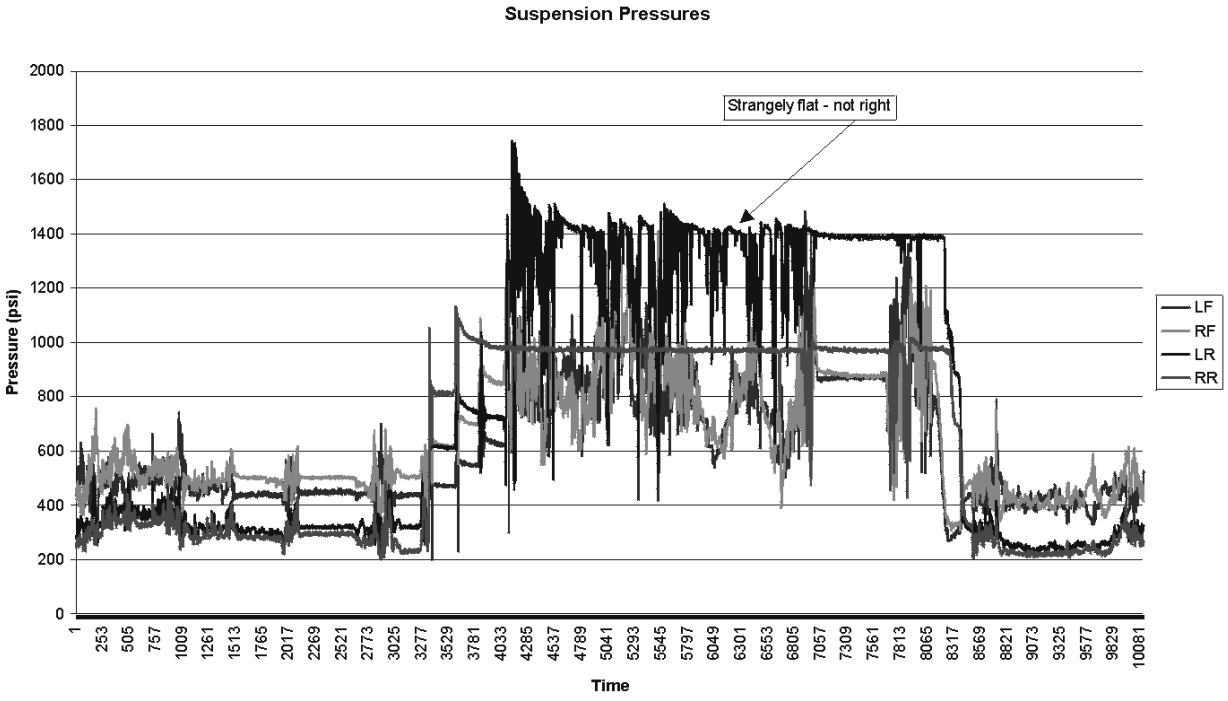
The payload meter also uses the R-terminal and oil pressure signals for calibration. These signals indicate that the engine is running. Verify these signals are being properly received.



SPEED SIGNAL FAULT TREE



11. Close the Scope program
12. Start Excel or Lotus 123.
13. Graph the four suspension pressures for the haul cycle. If a long haul cycle has been recorded, there may be more data points than your graphing program can use. The most important part of the haul cycle to analyze is the loaded portion. It is possible to look at the truck 'state' in the data to determine when the truck was loaded and graph only this portion.



CAB DOOR

The cab door assemblies are similar except for the hinge side. Each is hinged on the rear edge with a heavy duty hinge. For repairs on the door latches or window controls it is usually better, but not necessary, to remove the door from the cab and lower it to the floor for service.

Removal

1. If overhead space is available, raise body to allow access to door with overhead hoist. Secure body in raised position with safety cables.
2. Lower door glass far enough to allow insertion of lifting sling when door is removed.
3. Remove door panel for access to power window motor harness connector. Disconnect motor and remove cab harness from door.
4. Remove the retainer clip and bolt clip from the travel limiting strap.
5. Insert lifting sling through door and attach to hoist. Remove capscrews (a swivel socket wporks best) securing door hinge to cab and lift door from cab.
6. Place door on blocks or on a work bench to protect the window glass and allow access to internal components for repair.

Installation

1. Attach sling and hoist to door assembly, lift door up to the deck and position door hinges to cab.
2. Align door hinges with cab and install capscrews securing door to cab.
3. Attach the travel limiting strap with the bolt and clip removed previously.
4. Reconnect door harness to receptacle mounted in the cab floor.
5. Verify proper operation of power window and door latch adjustment.
6. Install door panel.

Door Adjustment

If adjustment is necessary to insure tight closure of door, loosen striker bolt in the door jam, adjust, and retighten.

A rubber sealer strip is mounted with adhesive around the perimeter of the door assembly to exclude dirt and drafts. This sealer strip should be kept in good condition and replaced if it becomes torn or otherwise damaged.

Door Jam Bolt Adjustment

Over a period of time, the door latch mechanism and door seals may wear and allow dirt and moisture to enter the cab. To insure proper sealing of the door seals, the door jam bolt may need to be adjusted periodically.

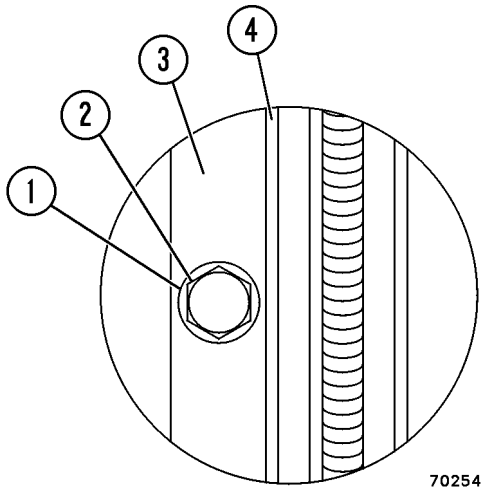


FIGURE 2-3. DOOR JAM BOLT ADJUSTMENT

1. Washer
2. Striker Bolt
3. Frame
4. Seal

Step A. If the door closes, but not tightly enough to give a good seal between the seal on the door and the cab skin:

1. Mark the washer location (1, Figure 2-3) portion of the door jam bolt with a marker, pen, or pencil by circumscribing the outside edge of the washer onto the jam.
2. Loosen the door jam bolt (2) and move straight inwards 1/16” and retighten.

WINDSHIELD & REAR GLASS

Two people are required to remove and install the windshield and rear glass. One inside the cab, and the other on the outside.

Special tools are available from local tool suppliers that are helpful in removing and installing automotive glass.

Removal

1. Lift windshield wiper arms out of the way if windshield is to be replaced.
2. Starting at the lower center of the glass, pull the glass weatherstrip locking lip out (2, Figure 2-18). Use a non-oily rubber lubricant and a screwdriver to to release the locking lip.
3. Remove glass from weatherstrip by pushing out from inside the cab.
4. Clean weatherstrip grooves of dirt, sealant etc. Be certain perimeter of cab glass opening is clean and free of burrs etc.

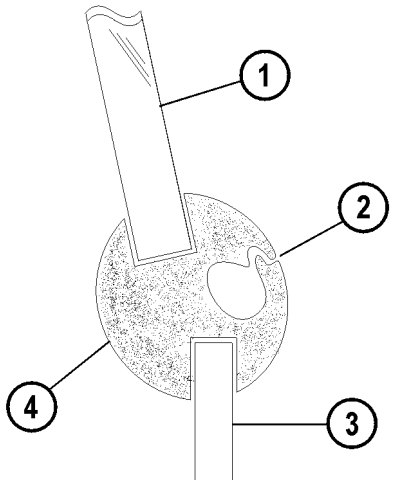


FIGURE 2-18.

1. Glass
2. Locking Lip
3. Sheet Metal
4. Weatherstrip Material

Installation

1. If the weatherstrip material previously removed is broken, weathered, or damaged in any way, use new rubber weatherstrip material.

   NOTE: Using a non-oily rubber lubricant on the weatherstrip material and cab opening, will make the following installation easier:

   a. Install the weatherstrip around the opening in the cab for the glass. Start at the lower center of the cab opening and press the weatherstrip over the edge of the opening (3 & 4, Figure 2-18).

   b. Continue installing weatherstrip while going all the around the opening. When the ends of the weatherstrip meet at the starting lower center of the cab opening, there must be 0.5 in. of overlapping material.

   NOTE: The ends of the weatherstrip material need to be square-cut to assure a proper fit.

   c. Lift both ends so that they meet squarely, then while holding ends together, force them back over the lip of the opening.

2. Lubricate the groove of the weatherstrip where the glass is to be seated.

   a. Lower the glass into the groove along the bottom of the opening (1 & 4, Figure 2-18).

   Note: Two persons should be used for the following installation:

   b. Have one person on the outside of the cab push in on glass against opening, while the person inside uses a soft flat tool (plastic knife) and goes around the glass to work the weatherstrip over the edge of the glass.

3. After the glass is in place, go around the weatherstrip and push in on the locking lip (2, Figure 2-18) to secure the glass in the weatherstrip.
4. If windshield was being replaced, lower windshield wiper arms/blades back to the glass.

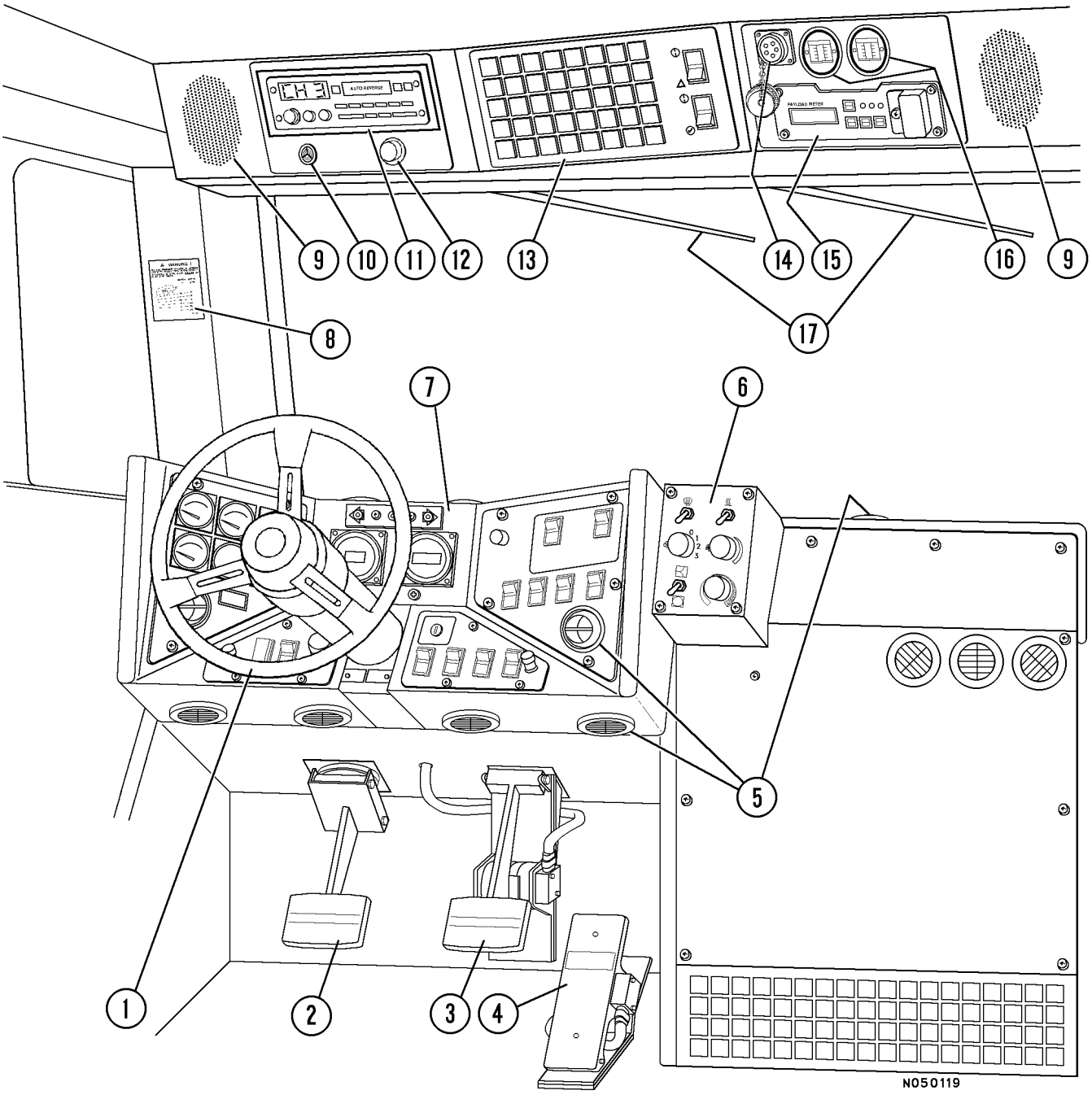


FIGURE 5-2. CAB INTERIOR - OPERATOR CONTROLS

1. Steering Wheel
2. Service Brake Pedal
3. Retarder Pedal
4. Throttle (Accelerator) Pedal
5. Heater/Air Conditioner Vents
6. Heater/Air Conditioner Controls
7. Instrument Panel
8. Grade/Speed Chart
9. Radio Speakers
10. Warning Alarm Buzzer
11. Radio, AM/FM Cassette
12. Warning Lights Dimmer Control (May not be installed on all trucks)
13. Warning/Status Indicator Lights
14. Payload Meter Download Connector
15. Payload Meter II
16. Air Cleaner Vacuum Gauges
17. Windshield Wipers

- If the light illuminates at higher truck speed and high engine RPM, **DO NOT OPERATE TRUCK**.

⚠WARNING

If the low steering warning light continues to illuminate and the alarm continues to sound, low steering pressure is indicated. The remaining pressure in the accumulators allows the operator to control the truck to a stop.

Do not attempt further operation until the malfunction is located and corrected.

Refer to Section L for steering system troubleshooting and repair procedures.

C1. Low Accumulator Precharge Pressure

The low accumulator precharge warning lamp, if illuminated, indicates a low nitrogen precharge in the steering accumulator(s). To check for proper steering accumulator precharge:

- ☐ Stop the engine and turn the key switch OFF to bleed the steering accumulators
- ☐ After approximately 90 seconds, turn the key switch ON.
- If the accumulators are properly charged, the warning lamp will not illuminate.
- If the nitrogen precharge in one or both of the accumulators is below 1100 ±45 psi, (7585 ±310 kPa) the warning lamp will flash.

⚠WARNING

If the low accumulator precharge warning lamp flashes, do not operate the truck. Investigate the problem and repair or recharge accumulator(s) as necessary. Sufficient energy for emergency steering may not be available if the system is not properly charged.

Refer to Section L for steering and accumulator system troubleshooting and repair procedures.

D1. Electric System Fault

The Electric System fault warning light will flash on and off when a malfunction occurs in the electrical system. The warning horn will also sound intermittently. When the light illuminates, propulsion will be dropped automatically. Reset by pushing the override button. If the fault occurs again, the truck should be stopped and the problem investigated.

NOTE: The STATEX III system records the number of faults (events) that occur during operation. When the number of allowable faults (events) recorded within a given time frame has been exceeded, the operator will not be able to reset the system using the override switch.

Refer to Section E for information regarding troubleshooting and determining the cause of the fault.

E1. Low Brake Pressure

This red light indicates a malfunction within the hydraulic brake circuit. If this light comes on and the buzzer sounds, **shut down truck operation, troubleshoot and repair the problem.**

NOTE: Adequate hydraulic fluid is stored to allow the operator to safely stop the truck.

Refer to Section J for hydraulic brake system troubleshooting and repair procedures.

A2. Low Hydraulic Tank Level (optional)

This warning light indicates the oil level in the hydraulic tank is below recommended level. Damage to hydraulic pumps may occur if operation continues. Shut truck down and determine cause of oil loss.

Refer to Section L for hydraulic tank filling procedure, system troubleshooting, and repair procedures.

B2. Blank (Reserved for future use)

C2. Circuit Breaker Tripped

This lamp will illuminate if any of the circuit breakers on the relay circuit boards are tripped.

Refer to Section D for relay board troubleshooting and repair procedures and Section R for electrical schematics.

GENERAL INSTRUCTIONS

Lubricant Required for System

Refer to "Lubrication Chart" Section P, Lube Key E, for correct lubricant specifications.

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

Initial Reservoir Fill

NOTE: The 730E is factory equipped with a fill port in a Service Center, mounted on the left side of the front bumper and marked "GREASE".

1. Remove pipe plug from "GREASE" port and attach a supply hose from external fill source.
4. Fill reservoir with approximately 214 lbs. (97 kg) of grease. When reservoir is filled, grease will appear at vent line (9, Figure 3-2).
5. Remove supply hose from GREASE port. Install pipe plug in fill port and tighten to standard torque. Remove excess grease from vent line.

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 reprime the system to eject all entrapped air.

NOTE: To run the grease pump when priming the lube system, connect a jumper wire between the ignition and solenoid posts on the solid state timer.

1. Fill lube reservoir with lubricant, if necessary.
2. Remove plugs from all injector manifold dead ends and supply lines.
3. Run grease pump until grease flows from any one plug opening in the system. Replace plug in this opening.
4. Repeat step 3 until all lines are full and all plugs replaced.

NOTE: Fill each feed line with grease before connecting lines to the injector outlets and bearings. This will prevent having to cycle the individual injectors once for each 1.0 in. (25 mm) length of feed line between the injector and bearing fitting.

⚠WARNING

Over pressurizing of the system, modifying parts, using incompatible chemicals and fluids, or using worn or damaged parts, may result in equipment damage and/or serious personal injury.

- ***DO NOT exceed the stated maximum working pressure of the pump, or of the lowest rated component in the system.***
- ***Do not alter or modify any part of this system unless approved by factory authorization.***
- ***Do not attempt to repair or disassemble the equipment while the system is pressurized.***
- ***Make sure all fluid connections are securely tightened before using this equipment.***
- ***Always read and follow the fluid manufacturer's recommendations regarding fluid compatibility, and the use of protective clothing and equipment.***
- ***Check all equipment regularly and repair, or replace, worn or damaged parts immediately.***

This equipment generates very high grease pressure. Extreme caution should be used when operating this equipment as material leaks from loose or ruptured components can inject fluid through the skin and into the body causing serious bodily injury including possible need for amputation. Adequate protection is recommended to prevent splashing of material onto the skin or into the eyes.

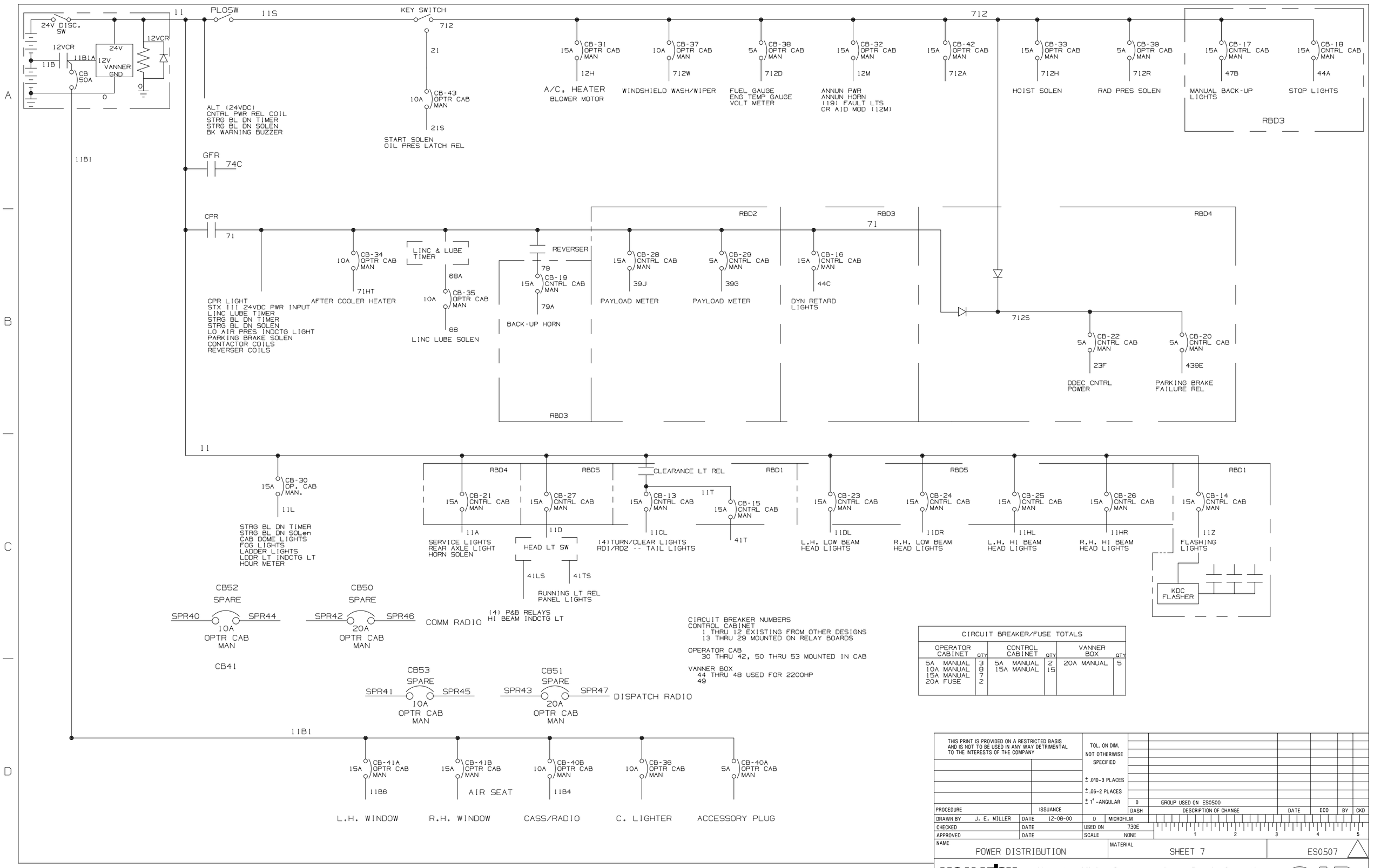
If any fluid appears to penetrate the skin, get emergency medical care immediately! Do not treat as a simple cut. Tell attending physician exactly what fluid was injected.

If overpressurizing of the equipment is believed to have occurred, contact a factory authorized warranty and service center for inspection of the pump. Specialized equipment and knowledge is required for repair of the pump or adjustments other than the maintenance specified in this manual.

Annual inspection by the factory authorized warranty and service center is recommended.

NOTES

NOTES



CIRCUIT BREAKER/FUSE TOTALS					
OPERATOR CABINET	QTY	CONTROL CABINET	QTY	VANNER BOX	QTY
5A MANUAL	3	5A MANUAL	2	20A MANUAL	5
10A MANUAL	8	15A MANUAL	15		
15A MANUAL	7				
20A FUSE	2				

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TOL. ON DIM. NOT OTHERWISE SPECIFIED
± .010-3 PLACES
± .06-2 PLACES
± 1°-ANGULAR

DASH	DESCRIPTION OF CHANGE	DATE	ECO	BY	CKD
0	GROUP USED ON ES0500				

PROCEDURE	ISSUANCE	D	MICROFILM
DRAWN BY J. E. MILLER	DATE 12-08-00	USED ON	730E
CHECKED	DATE	SCALE	NONE
APPROVED	DATE		

NAME: POWER DISTRIBUTION | MATERIAL | SHEET 7 | ES0507

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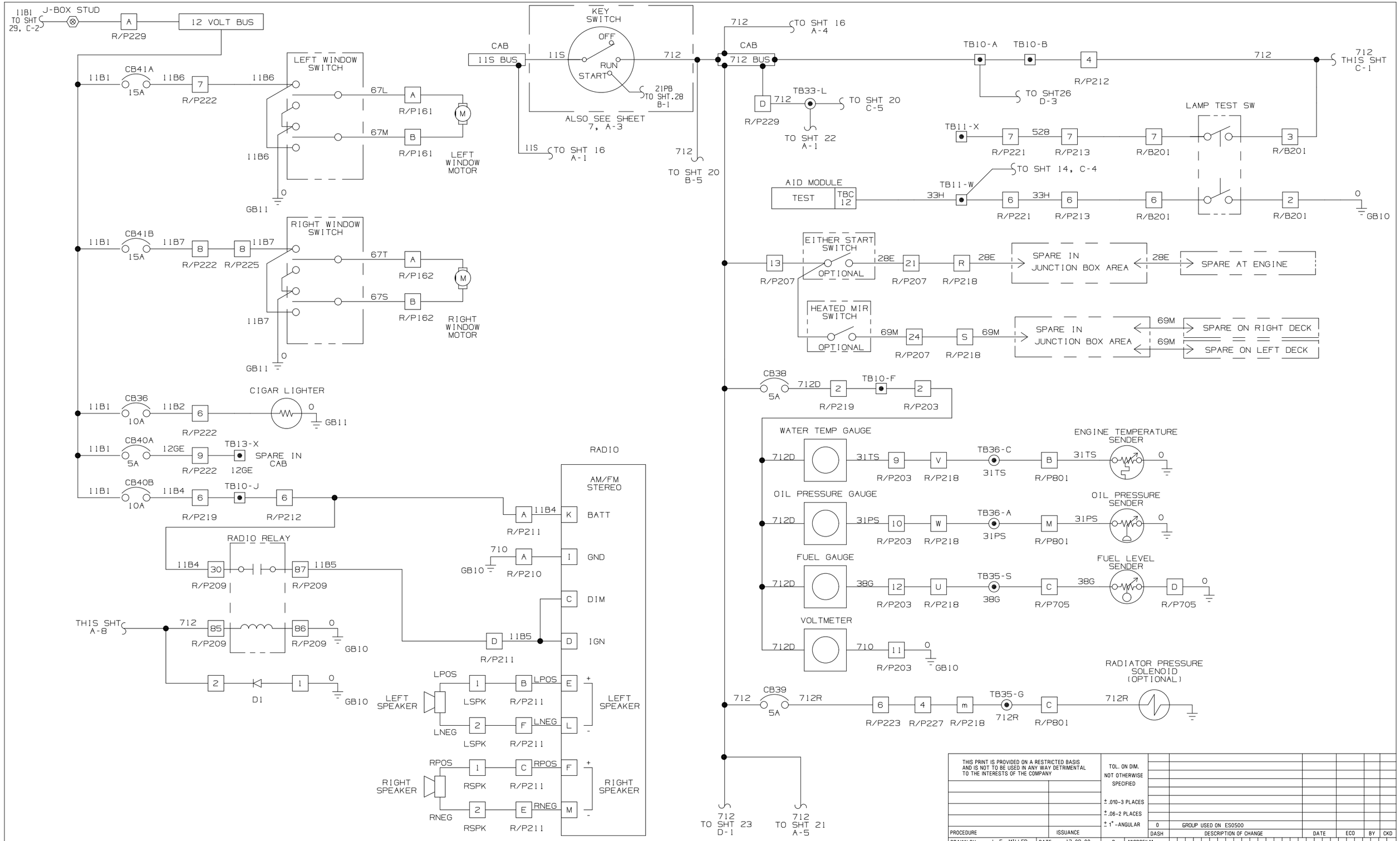

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TOL. ON DIM. NOT OTHERWISE SPECIFIED
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± .06-2 PLACES
± 1°-ANGULAR

PROCEDURE	ISSUANCE

DASH	DESCRIPTION OF CHANGE	DATE	ECO	BY	CKD
0	GROUP USED ON ES0500				

DRAWN BY	J. E. MILLER	DATE	12-08-00
CHECKED		DATE	
APPROVED		DATE	

D MICROFILM
USED ON 730E
SCALE NONE

NAME: WINDOWS, RADIO, GAUGES
MATERIAL: SHEET 17
ES0517

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