CEBM008300

Shop Manual

530M

DUMP TRUCK

SERIAL NUMBERS **530M** **A30002 thru A30038**

KOMATSU

SPECIFICATIONS

ENGINE

Cummins KTA-50

Number of Cylinders 16

Operating Cycle (diesel) 4-Stroke

Rated 1082 kW **(1450 SAE Brake HP)** @ 1900 RPM

Flywheel . 1027 kW **(1377 SAE HP)** @ 1900 RPM

Weight (dry) . . . . . 4932 kg (**10,873 lbs**)

TORQFLOW TRANSMISSION

Automatic Electronic Shift Control
. . . with Automatic Clutch Modulation In All Gears.

Torque Converter . . . . 3-Element, Single-stage, ... Two-phase

Lockup Clutch . . . . . Wet, Double-disc, ... Activated in F1–F7 gears.

Transmission . . . . 7 Forward Speeds, 1 Reverse . . . . . Planetary Gear, Multiple Disc Clutch, ... Hydraulically Actuated, Force-lubricated

Gear	Km/h	MPH
1	10.3	**6.4**
2	13.8	**8.6**
3	18.4	**11.4**
4	23.2	**14.4**
5	31.1	**19.3**
6	42.0	**26.1**
7	58.0	**36.0**
Rev	9.4	**5.8**

FINAL DRIVE ASSEMBLY

Final Drive . . . . . Plug-in Differential . . . . . with Planetary Wheel Drive

Reduction Ratios:

Bevel Set 2.647:1

Planetary Final Drive 7.235:1

Total Reduction 19.151:1

ELECTRIC SYSTEM

Batteries (series-parallel) . . . 4 x 12V / 220 A. Hr.

Alternator . . . . . 24 Volt, 100 Ampere Output

Lighting . . . . . 24 Volt

Starters . . . . . Two (2) - 24 Volt Electric

SERVICE CAPACITIES

	Liters	U.S. Gallons
Cummins (Includes Lube Oil Filters)	170	**(44.9)**
Cooling System	511	**(135.0)**
Fuel Tank	2120	**(560.0)**
Transmission And Torque Converter	120	**(31.7)**
Hydraulic System (Includes Retarder Cooling)	710	**(187.6)**
Differential	300	**(79.0)**
Final Drive (each planetary)	120	**(31.7)**

HYDRAULIC SYSTEM

Hydraulic Pumps (3)

Hoist (Tandem Gear)
. 805 l/min. **(213 gpm)** @ 18 960 kPa **(2,750 psi)**

Steering (Piston Pump)
221 l/min. **(58.5 gpm)** @ 18 960 kPa **(2,750 psi)**

Brakes (Tandem Gear) . . 1512 l/min. **(400 gpm)**

Hoist Control Valve . . . . . Spool Type

Positions . . . . . Raise, Hold, Float, and Lower

Hydraulic Cylinders

Hoisting . . . . . 3-Stage Telescoping Piston

Steering . . . . . Twin - Double Acting Piston

Relief Valve Setting . . . . . 18 960 kPa **(2,750 psi)**

Filtration . . . . . In-line Replaceable Elements

Suction . . . . . Single, Full Flow, 100 Mesh

Hoist & Steering . . . . . Dual, Full Flow, In-line . . . . . High Pressure. Beta 12 Rating = 200

Transmission . . . . . Dual, High Pressure

SERVICE BRAKES

Actuation: . . . . . All-Hydraulic

Front . . . . . Oil-Cooled, Multiple-Disc

Rear . . . . . Oil-Cooled, Multiple-Disc

Both Act as both Service and Retarder Brakes

Retarder Brakes:

Normally Applied . . . . Manually By Operator.
Automatically Actuated . . . . . when engine speed exceeds the rated revolutions of the shift position for the transmission.

Parking Brake: . . Spring-Applied, Oil Released . Dry Caliper Disc Actuates On Rear Drive Shaft

Emergency Brakes:

An emergency brake valve actuates the brakes automatically, if the hydraulic pressure drops below a pre-set value.
Manual operation is also possible.

switch “in” for three seconds; then release. Turn the key switch to the “start” position. If engine does not start, wait at least 15 sec. before repeating the procedure.

Do not crank an electric starter for more than 30 seconds. Allow two minutes for starter motor cooling before attempting to start engine again. *Severe damage to starter motor can result from overheating*.

5. The truck cannot be push started. Transmission lube and control systems are inoperative when engine is not running.
6. When getting a battery assist from one truck to another, all switches must be “Off” prior to making any connections. Be certain to maintain correct polarity. Connect one lead of booster cable to 24V positive (+) post of battery needing assist, and other lead of the booster cable to the 24V positive (+) post of auxiliary battery. Connect one lead of second booster cable to 24V negative (-) post of auxiliary battery and then connect other lead of the booster cable to a good frame ground on the disabled truck away from the battery needing assist. This procedure will avoid the possibility of causing sparks near the battery where explosive gases may be present.

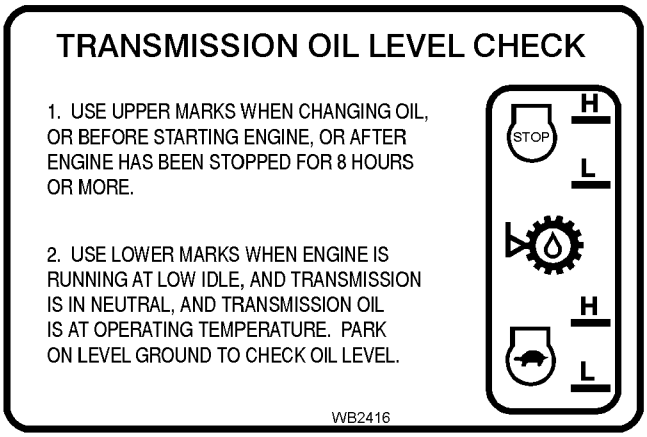
NOTE: The KOMATSU 530M Haulpak Trucks are equipped with four 12 volt batteries connected in series and parallel to provide 24 volt output. Be certain to maintain correct voltage and polarity when connecting booster cables. Damage to electrical components may result if voltage and polarity are not correct.

AFTER ENGINE HAS STARTED

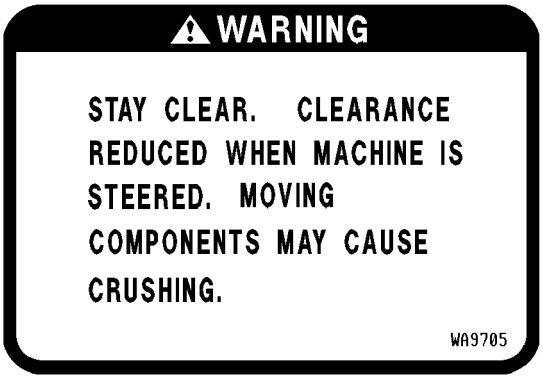
1. Become thoroughly familiar with steering and emergency controls. Test the truck steering in extreme right and left directions. If the steering system is not operating properly, shut engine down immediately. Determine the steering system problem and have repairs made before resuming operation.
2. Operate each of the truck’s brake circuits at least twice prior to operating and moving the truck. These circuits include individual activation from the operator’s cab of the service brake, retarder control lever, parking brake switch, brake lock switch, and emergency brake switch. Activate each circuit individually with the engine running and with the hydraulic circuit fully charged.

   If any application or release of any brake circuit does not appear proper or if sluggishness is apparent on application or release, shut the engine down and notify maintenance personnel. Do not operate truck until brake circuit in question is fully operational.
3. Check gauges, warning lights and instruments before moving the truck to insure proper system operation and proper instrument functioning. Give special attention to braking and steering circuit warning lights. If warning lights come on, shut down the engine immediately and determine the cause.
4. Insure headlights, worklights and taillights are in proper working order. Good visibility may prevent an accident. Check operation of windshield wiper and washer.
5. When truck body is in dump position, do not allow anyone beneath it, unless body-up retaining device is in place.
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 or on the deck of the truck.
8. Do not leave truck unattended while engine is running. Shutdown engine before leaving cab.

A plate is mounted on the left hand side of the transmission oil pan to provide instructions for proper transmission oil level check.

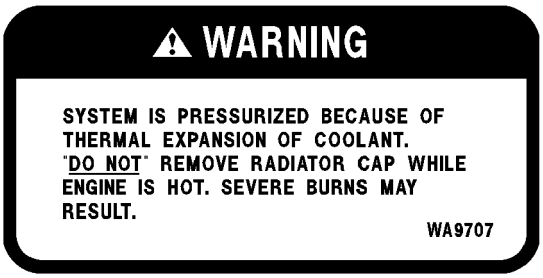


Warning plates are mounted on the truck frame in front of and to the rear of both front tires to alert all persons to stay clear when the truck is being steered.



A warning plate is mounted on top of the radiator surge tank cover near the radiator cap.
The engine cooling system is pressurized. **Always turn the key switch off and allow the engine to cool before removing radiator cap.** Unless the pressure is first released, removing the radiator cap after the engine has been running for a time will result in the hot coolant being expelled from the radiator.
Serious scalding and burning can result.

Service personnel should use caution when servicing radiator. The system is pressurized because of thermal expansion of coolant. "DO NOT" remove radiator cap while engine is hot. Severe burns may result.



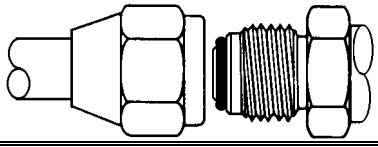


TABLE XIII
TORQUE CHART FOR JIC 37° SWIVEL NUTS WITH OR WITHOUT O-RING SEAL

SIZE CODE	TUBE SIZE (O.D.)	THREADS UNF – 2B	TORQUE FT. LBS.
– 2	0.125	0.312–24	4 ±1
– 3	0.188	0.375–24	8 ±3
– 4	0.250	0.438–20	12 ±3
– 5	0.312	0.500–20	15 ±3
– 6	0.375	0.562–18	18 ±5
– 8	0.500	0.750–16	30 ±5
– 10	0.625	0.875–14	40 ±5
– 12	0.750	1.062–12	55 ±5
– 14	0.875	1.188–12	65 ±5
– 16	1.000	1.312–12	80 ±5
– 20	1.250	1.625–12	100 ±10
– 24	1.500	1.875–12	120 ±10
– 32	2.000	2.500–12	230 ±20

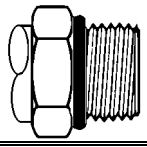


TABLE XV
TORQUE CHART FOR O-RING BOSS FITTINGS

SIZE CODE	TUBE SIZE (O.D.)	THREADS UNF – 2B	TORQUE FT. LBS.
– 2	0.125	0.312–24	4 ±2
– 3	0.188	0.375–24	5 ±2
– 4	0.250	0.438–20	8 ±3
– 5	0.312	0.500–20	10 ±3
– 6	0.375	0.562–18	13 ±3
– 8	0.500	0.750–16	24 ±5
– 10	0.625	0.875–14	32 ±5
– 12	0.750	1.062–12	48 ±5
– 14	0.875	1.188–12	54 ±5
– 16	1.000	1.312–12	72 ±5
– 20	1.250	1.625–12	80 ±5
– 24	1.500	1.875–12	80 ±5
– 32	2.000	2.500–12	96 ±10

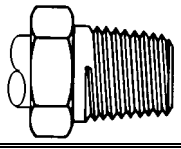


TABLE XIV
TORQUE CHART FOR PIPE THREAD FITTINGS

SIZE CODE	PIPE THREAD SIZE	WITH SEALANT FT. LBS.	WITHOUT SEALANT FT. LBS.
– 2	0.125–27	15 ±3	20 ±5
– 4	0.250–18	20 ±5	25 ±5
– 6	0.375–18	25 ±5	35 ±5
– 8	0.500–14	35 ±5	45 ±5
– 12	0.750–14	45 ±5	55 ±5
– 16	1.000–11.50	55 ±5	65 ±5
– 20	1.250–11.50	70 ±5	80 ±5
– 24	1.500–11.50	80 ±5	95 ±10
– 32	2.000–11.50	95 ±10	120 ±10

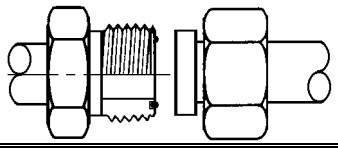


TABLE XVI
TORQUE CHART FOR O-RING FACE SEAL FITTINGS

SIZE CODE	TUBE SIZE (O.D.)	THREADS UNF – 2B	TORQUE FT. LBS.
– 4	0.250	0.438–20	11 ±1
– 6	0.375	0.562–18	18 ±2
– 8	0.500	0.750–16	35 ±4
– 10	0.625	0.875–14	51 ±5
– 12	0.750	1.062–12	71 ±7
– 16	1.000	1.312–12	98 ±6
– 20	1.250	1.625–12	132 ±7
– 24	1.500	1.875–12	165 ±15

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.

DUMP BODY

⚠WARNING

- ***Inspect all lifting devices. Slings, chains, and cables used for lifting components must be inspected daily for serviceable condition. Refer to the manufacturer's manual for correct capacities and safety procedures when lifting components. Replace any questionable items.***
- ***Slings, chains and/or cables used for lifting components must be rated to supply a safety factor of approximately 2X the weight being lifted.***
- ***When in doubt as to the weight of components or any assembly procedure, contact the Haulpak area representative for further information.***
- ***Lifting eyes and hooks should be fabricated from the proper materials and rated to lift the load being placed on them.***
- ***Never stand beneath a suspended load. Guy ropes are recommended for guiding and positioning a suspended load.***
- ***Before lifting the body, be certain there is adequate clearance between the body and overhead structures or electric power lines.***
- ***Be sure the lifting device is rated for at least a 25 ton capacity.***

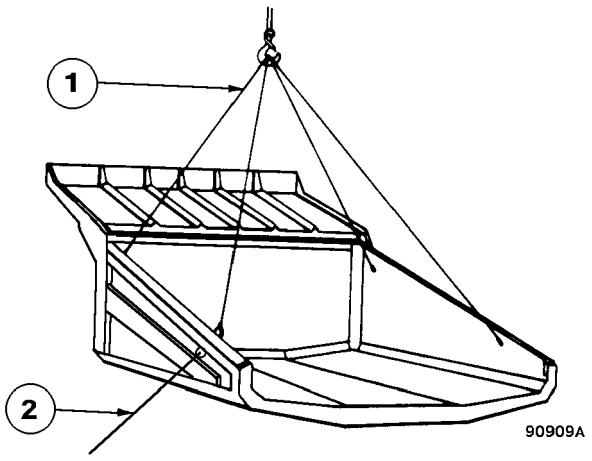


FIGURE 3-1. DUMP BODY REMOVAL

1. Lifting Cables
2. Guide Rope

Removal

1. Park truck on a hard, level surface and block all the wheels. Connect cables and lifting device to the dump body and take up the slack as shown in Figure 3-1.
2. Remove mud flaps and rock ejectors from both sides of the body. Remove electrical cables, lubrication hoses etc. attached to the body.
3. Attach chains around upper end of hoist cylinders to support them after the mounting pins are removed.
4. Remove pin retainer capscrews and washers (2, Figure 3-2) and remove retainers (1) from each of the upper hoist cylinder mounting eyes. With adequate means of supporting the hoist cylinders (6) in place, remove each of the mounting pins (3).

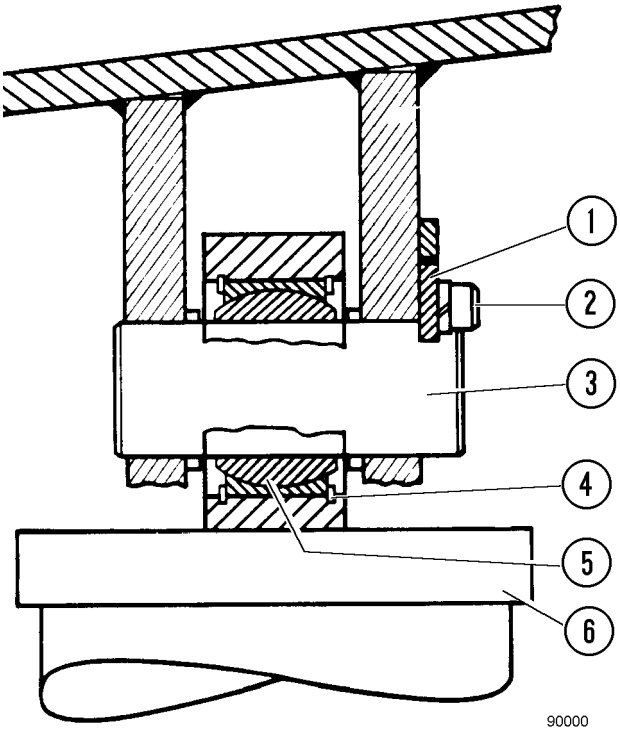


FIGURE 3-2. HOIST CYLINDER MOUNT (UPPER)

1. Retainer
2. Capscrews & Washers
3. Pin
4. Retainer Ring
5. Bearing
6. Hoist Cylinder

COOLING SYSTEM

DESCRIPTION

The 530M cooling system dissipates heat generated in the engine, transmission and wet disc brake system. The front mounted radiator (1, Figure 3-1) is filled with a water/ethylene-glycol mixture which circulates through the engine and brake cooling circuit heat exchanger (7). A heat exchanger located in the lower tank provides oil cooling for the transmission oil circuit.

The engine water pump circulates the coolant with temperature controlled by the thermostat located in the engine. A thermostatically controlled, engine mounted fan draws air through the grille and across the finned radiator tubes, reducing coolant temperature. If coolant temperatures are low, the fan is allowed to freewheel. When coolant temperature rises to a preset temperature, a clutch (3) mounted in the fan hub is engaged to drive the fan blade (2). A ribbed belt (4) drives the fan clutch assembly from a pulley (5) on the front of the crankshaft. (Refer to Section "M" for additional information regarding the fan clutch.)

The cooling system is pressurized to 0.8 kg/cm^2 (12 psi) by compressed air obtained from an engine turbocharger and pressure control valve (6). System pressurization raises the boiling point of the coolant mixture to provide higher operating temperatures for increased engine efficiency. Refer to the engine manufacturer's service publications for additional information regarding the pressure control valve.

RADIATOR

The radiator is mounted above the front bumper and is attached (8, Figure 3-1) to the truck frame near the bottom tank and by support rods (9) near the top tank attached to the left and right uprights. Correct radiator positioning is achieved by shims at the lower mounts and the upper, adjustable length support rods.

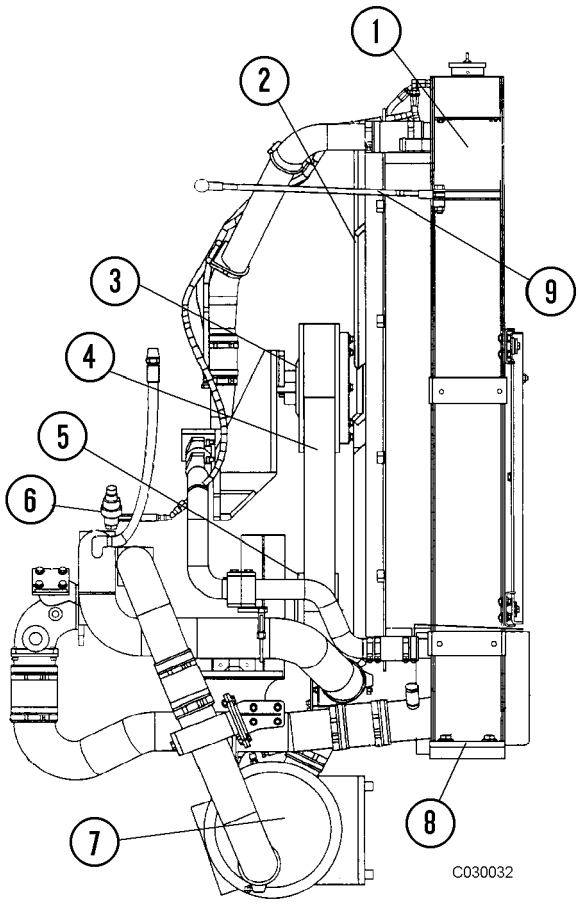


FIGURE 3-1. COOLING SYSTEM

1. Radiator
2. Fan
3. Fan Clutch
4. Fan Belt
5. Fan Drive Pulley
6. Pressure Control Valve
7. Brake Cooling Circuit Heat Exchanger
8. Lower Mount
9. Support Rod

Drive Line Adapter

If a new, or replacement engine, is to be installed, it may be necessary to remove and install the drive line adapter.

Drive Line Adapter Removal

1. Position the truck in work area with adequate overhead clearance to permit raising the dump body.

⚠WARNING

Do not work under raised body without first making sure the safety cable is securely installed.

2. Apply parking brake and block wheels to prevent truck movement. Raise body and install safety cable.
3. Remove drive shaft guard (1, Figure 4-9). Remove capscrews (5, Figure 4-10) from cross and bearing assembly (2) at both ends of drive shaft, and then remove drive shaft assembly (1).
4. Remove output drive flange (6). Remove capscrews (7) and bearing cover (3).
5. Remove snap ring (1, Figure 4-11). Remove retaining capscrews (3) around damper cover (2), and then with sling, eye bolts, and guide bolts, remove damper cover (2).
6. Remove capscrews holding damper assembly to flywheel (12, Figure 4-14). Attach a sling and lifting device and remove output shaft damper assembly (1, Figure 4-12).

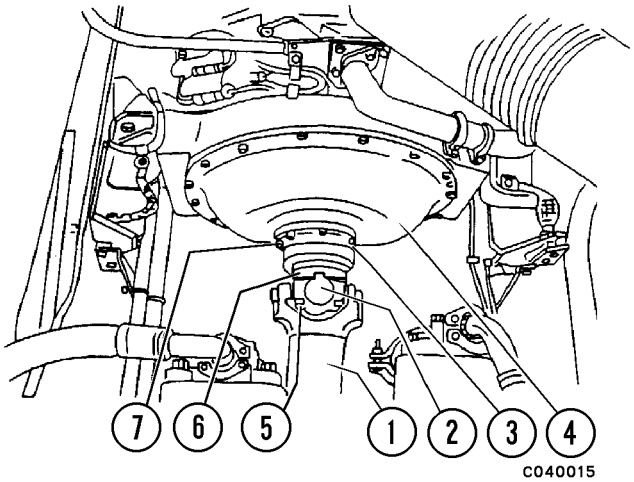


FIGURE 4-10. DRIVE SHAFT

1. Drive Shaft
2. Cross & Bearing Assy.
3. Bearing Cover
4. Damper Cover
5. Capscrews
6. Output Drive Flange
7. Capscrews

7. Remove bearing (1, Figure 4-13) for cleaning, inspection, and fresh lubrication, or replacement, if necessary.

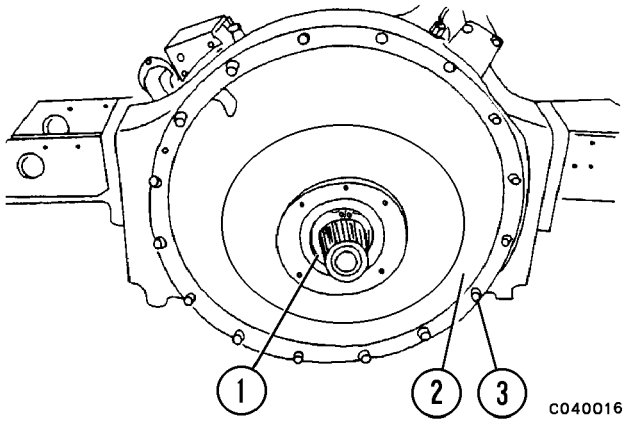


FIGURE 4-11. OUT PUT SHAFT

1. Snap Ring
2. Damper Cover
3. Capscrew

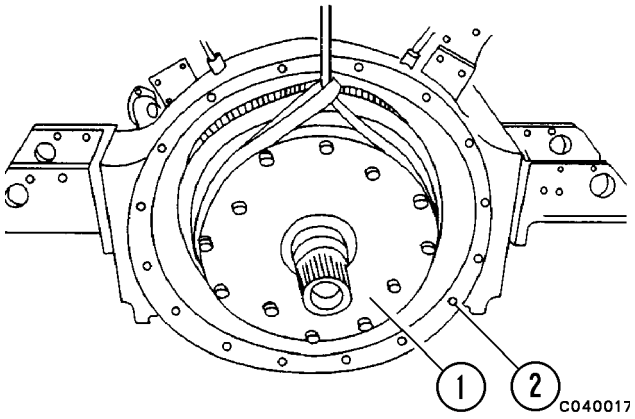


FIGURE 4-12. OUTPUT SHAFT DAMPER ASSEMBLY

1. Output Shaft Damper Assembly
2. Housing

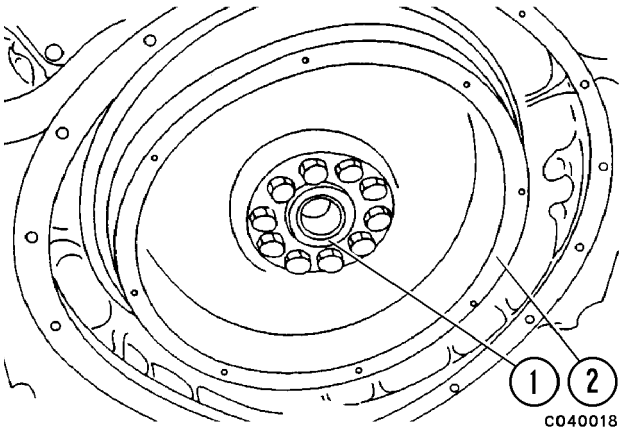


FIGURE 4-13. PILOT BEARING

1. Bearing
2. Flywheel

SECTION D
ELECTRICAL SYSTEM (24VDC NON-PROPULSION)

INDEX

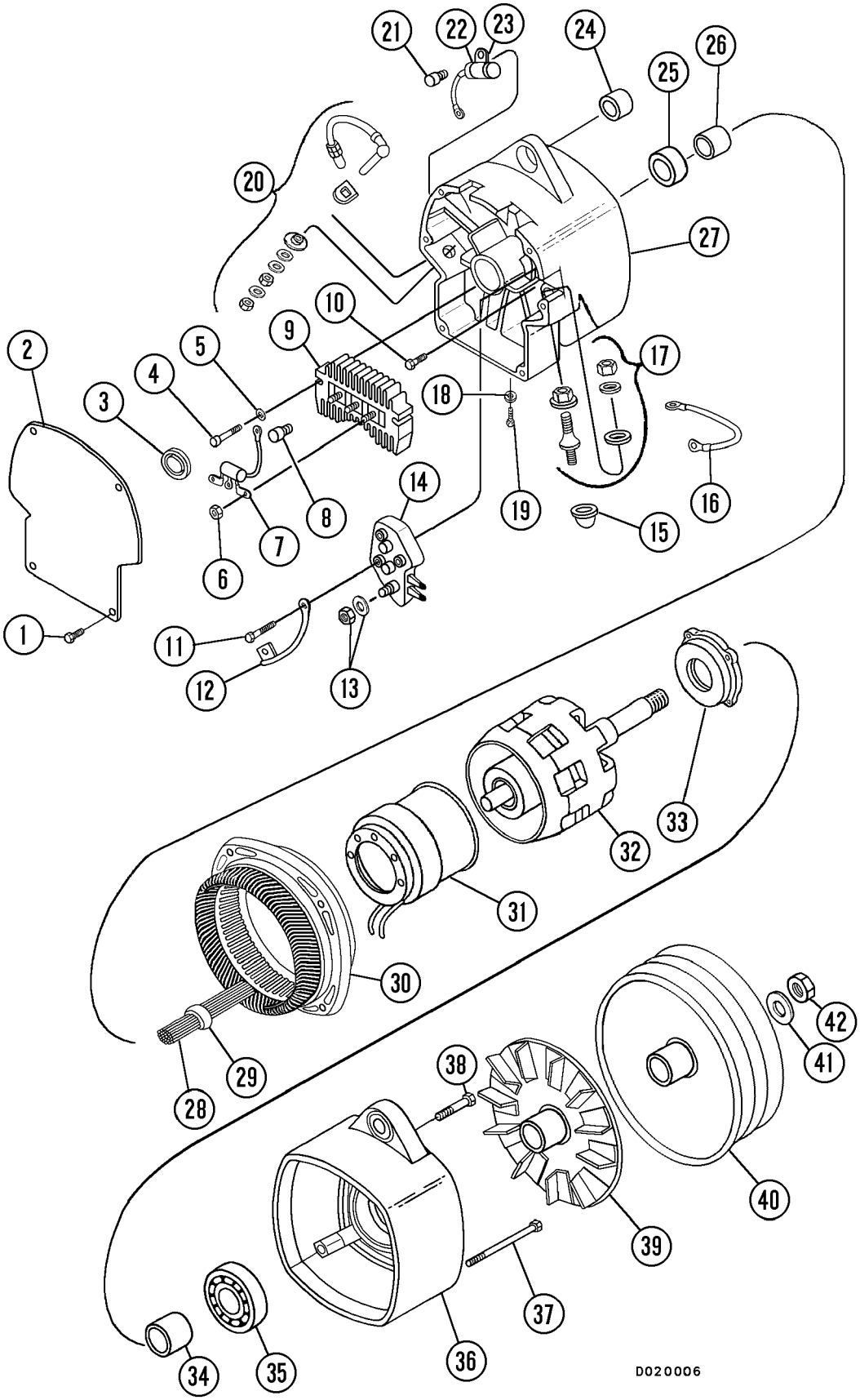


FIGURE 2-10. 30-SI PARTS ILLUSTRATION

3. Failure to operate with high current draw indicates:
   a. A direct ground in the terminal or fields.
   b. "Frozen" bearings (this should have been determined by turning the armature by hand).
4. Failure to operate with no current draw indicates:
   a. Open field circuit. This can be checked after disassembly by inspecting internal connections and tracing circuit with a test lamp.
   b. Open armature coils. Inspect the commutator for badly burned bars after disassembly.
   c. Broken brush springs, worn brushes, high insulation between the commutator bars or other causes which would prevent good contact between the brushes and commutator.
5. Low no-load speed and low current draw indicates:
   a. High internal resistance due to poor connections, defective leads, dirty commutator and causes listed under Number 4.
6. High free speed and high current draw indicates shorted fields. If shorted fields are suspected, replace the field coil assembly and check for improved performance.

Disassembly

The cranking motor should be disassembled only as far as necessary to repair or replace defective parts.

1. Note the relative position of the solenoid (53, Figure 2-15), lever housing (78), nose housing (69), and C.E. frame (1) so the motor can be reassembled in the same manner.
2. Disconnect field coil connector (42) from solenoid motor terminal, and lead from solenoid ground terminal.
3. Remove the brush inspection plates (52), and brush lead screws(15).
4. Remove the attaching bolts (34) and separate the commutator end frame (1) from the field frame (35).
5. Separate the nose housing (69) and field frame (35) from lever housing (78) by removing attaching bolts (70).
6. Remove armature (45) and drive assembly (71) from lever housing (78).
7. Separate solenoid (53) from lever housing by pulling apart.

Cleaning and Inspection

1. The drive (71), armature (45) and fields (46) should not be cleaned in any degreasing tank, or with grease dissolving solvents, since these would dissolve the lubricant in the drive and damage the insulation in the armature and field coils.
2. All parts except the drive should be cleaned with mineral spirits and a clean cloth.
3. If the commutator is dirty, it may be cleaned with No. 00 sandpaper.

NOTE: Never use emery cloth to clean commutator.

4. Inspect the brushes (13, Figure 2-15) for wear.
   a. If worn excessively when compared with a new brush, they should be replaced.
   b. Make sure the brush holders (10) are clean and the brushes are not binding in the holders.
   c. The full brush surface should ride on the commutator. Check by hand to insure that the brush springs (16) are giving firm contact between the brushes (13) and commutator.
   d. If the springs (16) are distorted or discolored, they should be replaced.

Armature Servicing

If the armature commutator is worn, dirty, out of round, or has high insulation, the armature (45) should be put on a lathe and the commutator turned down. The insulation should then be undercut 0.031 in. (.79 mm) wide and 0.031 in. (.79 mm) deep, and the slots cleaned out to remove any trace of dirt or copper dust. As a final step in this procedure, the commutator should be sanded lightly with No. 00 sandpaper to remove any burrs left as a result of the undercutting procedure.

The armature should be checked for opens, short circuits and grounds as follows:

1. Opens are usually caused by excessively long cranking periods. The most likely place for an open to occur is at the commutator riser bars. Inspect the points where the conductors are joined to the commutator bars for loose connections. Poor connections cause arcing and burning of the commutator as the cranking motor is used. If the bars are not too badly burned, repair can often be effected by resoldering or welding the leads in the riser bars (using rosin flux), and turning down the commutator in a lathe to remove the burned material. The insulation should then be undercut.

RELAY BOARDS

The truck is equipped with 5 relay boards to provide control in many of the electrical system circuits. Two types of relay boards are used; one type contains 4, interchangeable relays and a maximum of five circuit breakers. The other type is capable of supporting up to eight relays. The latter type does not contain circuit breakers.

RELAY BOARDS (With Circuit Breakers)

Description

This type circuit board is located under the passenger seat as shown in Figure 3-2. These relays are designated as follows:

- Relay Board RB1 (13, Figure 3-2)
- Relay Board RB4 (4, Figure 3-2)
- Relay Board RB5 (3, Figure 3-2)

Each relay board contains circuit breakers, which are interchangeable between the relay boards. DO NOT interchange or replace any circuit breaker with one of a different capacity other than specified for that circuit. ***Serious damage or fire may result if the wrong capacity circuit breaker is used.***

Each relay board is equipped with four green lights (9, Figure 3-3) and one red light (7). The four green lights are labeled K1, K2, K3, or K4. These lights will be "ON" only when that particular control circuit has been switched "ON" and the relay coil is being energized. The light will not turn on if the relay board does not receive the 24 volt signal to turn "ON" a component, or if the relay coil has an "open" circuit.

The red "Breaker Open" light (if "ON") indicates that a circuit breaker (on that relay board) is in the "OFF" position. The red breaker open light will turn "ON" whenever there is a voltage difference across the two terminals of a circuit breaker.

The function of the light at location 8, Figure 3-3, serves a different function on each relay board RB1, RB4, and RB5. This function can be determined by the label above the lamp.

Preliminary Checks

If a control switch has been turned "ON" and a green (K) light is "ON", but that component is not operating, check the following on the relay board for that circuit:

- ☐ Check for a circuit breaker that is in the "OFF" position or a red (breaker open) light is "ON". If a circuit breaker is "OFF", turn it "ON". Check operation of component. If it trips again, check the wiring or component for defects that could be causing the circuit to be overloaded.
- ☐ The contacts inside the relay may not be closing, preventing an electrical connection. Swap relays and check again. Replace defective relays.
- ☐ Check the wiring and all of the connections between the relay board and the component for an "open" circuit.
- ☐ Defective component. Replace component.
- ☐ Poor ground at the component. Repair the ground connection.

2. If necessary, loosen the capscrews securing the proximity switch to the mounting bracket and slide the switch in or out until dimension “Y” is 45mm (1.77 in). Tighten the capscrews after adjusting.

3. Lower body onto frame.

4. Check operation to verify hoist cylinders extend and stop before reaching maximum cylinder stroke.

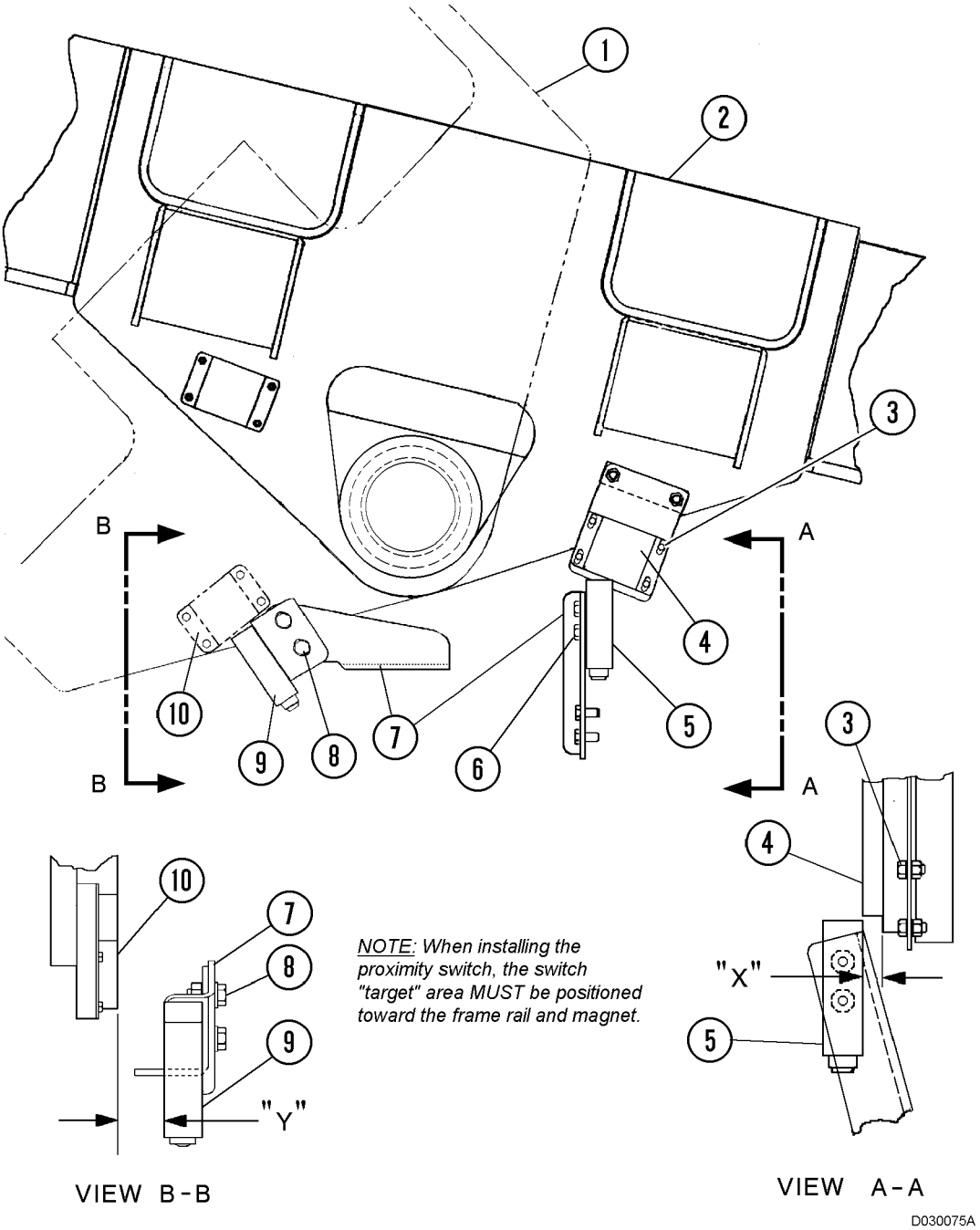


FIGURE 3-7. BODY-UP AND HOIST LIMIT SWITCHES

1. Body – Raised Position
2. Body – Resting on Frame
3. Magnet Adjustment Capscrews
4. Magnet
5. Proximity Switch (Body-Up)
6. Switch Mounting Capscrews
7. Mounting Bracket (On Frame)
8. Switch Mounting Capscrews
9. Proximity Switch (Body Limit)
10. Magnet (Body Limit Switch)

EMERGENCY OPERATION PROCEDURES – TRANSMISSION FAILURE				
No.	**EMERGENCY OPERATION METHOD**	**CONDITION WHEN FAILURE OCCURRED**	**FAULT CODE AND DESCRIPTION**	**TRANSMISSION GEAR FOR STARTING AFTER EMERGENCY OPERATION PROCEDURE**
1	Return range selector to NEUTRAL, then move to travel position again. [N →D, 5, 4, 3, or L or N→R]	Transmission gear suddenly changed to NEUTRAL while running.	b02X: Clutch failure (X= 1 to 3) b03X: Clutch ECMV failure 1 (X= 1, 4, 9) b04X: Clutch ECMV failure 2 b07X: Clutch solenoid failed high (X= 1 to 3, 5, 6, 8)	Start in R or F2. (Even though range selector is in 3, 4, 5 or L, truck starts in F2 and does not shift down to F1.)
			b029: M clutch failure b04X: Clutch ECMV failure 2 b07X: Clutch solenoid failed high (X= 4, 9) b03X: Clutch ECMV failure 1 (X= 3, 5)	Start in R or F1.
			b032: H Clutch ECMV failure 1	Start in R or F3 (Even though selector is in 3, 4, 5, or L, truck starts in F3 and does not shift down to F2 and F1.)
			b036: 3rd clutch ECMV failure 1	Start in R or L and 3rd clutches engaged.
			b038: R Clutch ECMV failure 1	Start in R or N.
		Transmission remains in one gear. Remains in this gear even when truck is stopped and started and range selector is changed to other gears.	b01Z: Speed signal lost b06Z: Speed sensor failure (Z= 1, 2) b05x: Clutch ECMV failure 3 (X= 1, 4, 9)	Start in R or F2. (Even though selector is in 3, 4, 5 or L, truck starts in F2 and does not shift down to F1.)
			b010: Engine speed signal lost b060: Engine speed sensor failure b05X: Clutch ECMV failure 3 (X= 3, 5)	Start in R or F1.
			b052: H Clutch ECMV failure 3	Start in R or F3 (Even though selector is in 3, 4, 5, or L, truck starts in F3 and does not shift down to F2 and F1.)
			b056: 3rd Clutch ECMV failure 3	Start in R or L and 3rd clutches engaged.
			b058: R Clutch ECMV failure 3	Start in R or N.
2	A. Return range selector to NEUTRAL. B. Remove and reconnect 1 pin connector for emergency use while key switch is on. C. Move selector to travel position again. [N →D, 5, 4, 3, or L or N→R] *Do not press accelerator pedal as selector is changed from NEUTRAL to the desired range.*	Transmission gear suddenly changed to NEUTRAL while running.	b02X: Clutch failure (X= 5, 6, 8)	Start in R or F2 (Even though selector is in 3, 4, 5, or L, truck starts in F2 and does not shift down to F1.)
			b024: 1st clutch failure	Start in R or F1.
		Transmission remains in one gear. Remains in this gear even when truck is stopped and started and range selector is changed to other gears.	b013: T/M output speed signal lost b063: T/M output speed sensor failure	Start in R or F2 (Even though selector is in 3, 4, 5, or L, truck starts in F3 and does not shift down to F2 and F1.)
3	Check circuit breaker behind operator seat.	Transmission gear suddenly changed to NEUTRAL while running. Truck cannot be moved even if range selector is returned to NEUTRAL and then moved to a travel position.	b001: Battery voltage low b002: Solenoid voltage failure b0dA: Battery direct voltage failure b0db: Switched voltage failure	If problem is corrected when circuit breaker is reset or component replaced, normal operation should be possible.
4	Replace T/M cut relay		b006: T/M cut relay failure	
5	Replace T/M Controller		b004: ROM sum check fault	
6	Tow truck to shop		b005: Clutch engaged double	Do not operate truck.

RCM FAULT CODE LIST					
No.	**ITEM**	**CATEGORY**	**SYSTEM FAULT CODE**	**ACTION CODE**	**ORIGINAL FAULT CODE**
1	Manual trigger	----	J001	----	01(H)
2	Low brake accumulator pressure	Event	J002	04	02(H)
3	Pressure imbalance	Event	J003	04	03(H)
4	Left rear brake pressure low	Event	J004	02	04(H)
5	Right rear brake pressure low	Event	J005	02	05(H)
6	Left rear brake pressure high	Event	J006	02	06(H)
7	Right rear brake pressure high	Event	J007	02	07(H)
8	Pedal sense and no LR pressure	Event	J008	----	08(H)
9	LR pressure present and no communication	Event	J009	02	09(H)
10	Left rear pressure sensor fault	Sensor	J010	02	10(H)
11	Right rear pressure sensor fault	Sensor	J011	02	11(H)
12	Retard lever sensor fault	Sensor	J012	02	12(H)
13	Auto-retard signal fault	Sensor	J013	02	13(H)
14	RS422 link to PMC fault	Communication	J014	04	14(H)
15	Brake light fault 1	Actuator	J015	02	15(H)
16	Left ASR PPC electrical fault	Sensor	J018	02	18(H)
17	Left ASR hydraulic fault	Sensor	J019	02	19(H)
18	Right ASR PPC electrical fault	Sensor	J020	02	20(H)
19	Right ASR hydraulic fault	Sensor	J021	02	21(H)
20	Left ABS valve hydraulic fault	Event	J022	02	22(H)
21	Left ABS valve electrical fault	Event	J023	02	23(H)
22	Right ABS valve hydraulic fault	Event	J024	02	24(H)
23	Right ABS valve electrical fault	Event	J025	02	25(H)
24	RCM abnormal 1	Controller	J026	----	26(H)
25	RCM abnormal 2	Controller	J028	04	28(H)
26	Battery voltage abnormal	Voltage	J029	02	29(H)
27	Wheel speed sensor (FL) fault	Sensor	J030	02	30(H)
28	Wheel speed sensor (FR) fault	Sensor	J031	02	31(H)
29	Wheel speed sensor (RL) fault	Sensor	J032	02	32(H)
30	Wheel speed sensor (RR) fault	Sensor	J033	02	33(H)
31	Auto-apply	Event	J034	04	34(H)
32	Loss of 18 volt power supply	Voltage	J035	02	35(H)
33	24 volt load switch fault	Event	J036	02	36(H)
34	Brake light fault 2	Actuator	J037	02	37(H)
35	Left PPC electrical fault	Event	J038	02	38(H)
36	Right PPC electrical fault	Sensor	J039	02	39(H)
37	Left ABS valve electrical fault	Event	J040	02	40(H)
38	Right ABS valve electrical fault	Event	J041	02	41(H)

☐ *Electronic Vehicle Speed Limiter-Optional)*

The PMC can limit truck speed by controlling throttle and brake application.

Two appropriate maximum vehicle speeds, under empty and loaded conditions, can be set by the switches located under the passenger seat. (The speeds can also be set by “MOM” or “DAD”.)

- When the truck is moving on a level surface or ascending a hill and vehicle speed reaches the predetermined maximum speed, the PMC controls vehicle speed by reducing the throttle signal sent to Centry regardless of the accelerator pedal position.
- When the truck is descending a hill, the PMC controls maximum vehicle speed by sending a brake signal to the RCM to control brake application.

Note: If the optional, Electronic Speed Limiter is installed, the PMC DIP switch SW2-4 must be set to the ON position. Additional sensors and switches must also be installed on the truck for the system to function.

☐ *Maintenance Monitor:*

The PMC monitors the maintenance items listed in the Table below.

- If the PMC detects a maintenance fault, it provides a description of the fault in the “MOM” display and the Electronic Display panel turns the Maintenance Monitor lamp and the Central Warning Lamp and buzzer on.
  “MOM” displays the fault code, its description, and its action code.

Note: This function is active only when the PMC DIP switch SW 2-7 is set to the ON position.

MAINTENANCE MONITOR DETECTION		
No.	**DESCRIPTION**	**FAULT CODE**
1	Low retard cooling oil level	E0A2
2	Low hydraulic oil level	E0A3
3	Change front brake cooling filter	E0A4
4	Change rear brake cooling filter R	E0A5
5	Change rear brake cooling filter L	E0A6
6	Change hydraulic filter	E0A8
7	Change brake disc FR	E0A9
8	Change brake disc FL	E0b1
9	Change brake disc RR	E0b2
10	Change brake disc RL	E0b3
11	Low battery liquid level	E0b4

E0C2: MACHINE SELECT INFORMATION FAILURE

1. Check whether PMC also detects fault E0C1.

Yes. Refer to troubleshooting fault code E0C1 (PMC).

No. Check whether T/M controller detects b014.

Yes. Refer to b014 fault code, Transmission Controller troubleshooting.

No. Check whether Electronic display panel detects A018.

Yes. Turn key off, return to the first step, and check again.

2. If the result is the same as before, change T/M controller.

No. Turn key off, return to the first step, and check again.

3. If the result is the same as before, change PMC.

E0C3: VEHICLE SPEED INFORMATION FAILURE

1. Check whether PMC detects E0C1 also.

Yes. Refer to fault code E0C1 (PMC) troubleshooting.

2. If the optional Suspension Controller is installed on the truck:

No. Check whether Suspension Controller detects d0C3.

Yes. Turn key off, return to the first step, and check again.

3. If the result is the same as before, replace Electronic Display Panel.

No. Turn key off, return to the first step, and check again.

4. If the result is the same as before, change PMC.

5. If the optional Suspension Controller is not installed on the truck:

No. Turn key off, return to the first step, and check again.

6. If the result is the same as before, change Electronic display panel.

7. Check whether PMC still detects E0C3.

Yes. Turn key off, return to the first step, and check again.

8. If the result is the same as before, change PMC.

No. The fault is recovered.

E029:
PLM COMMUNICATION FAILURE 4

Fault Detecting Logic:

PMC dip switch 1-3 = ON,

AND

When PMC requests PLM to send calibration data,

AND

Correct calibration data is not sent from PLM, or PLM sends nothing for 3 seconds (PMC retries twice).

PMC Operation When Fault is Detected:

- Normal operation.

Fault Recovery Classification:

☐ Fault recovery logic is actively allowed while the key switch remains ON. The fault will be cleared if the recovery logic is met.

☐ When the key is turned ON, the action table is made active prior to attempt for recovery. Fault recovery is checked at first opportunity for checking from initial key-on. This fault can only be checked upon certain unique truck operational conditions. If the recovery logic is met, the recovery logic is activated. The new state of the fault is then assigned if recovery as such was found. If not, the fault remains at the state at which it was found during the checking (the state saved at the key-off preceding this cycle of key-on).

Fault Recovery Logic:

Recovered when the next normal communication starts.

E02A:
PLM COMMUNICATION FAILURE 5

Fault Detecting Logic:

PMC dip switch 1-3 = ON,

AND

When PMC requests PLM to send controller information data,

AND

Correct controller information data not sent from PLM, or PLM sends nothing for 3 seconds (PMC retries twice).

PMC Operation When Fault is Detected:

- Normal operation.

Fault Recovery Classification:

☐ Fault recovery logic is actively allowed while the key switch remains ON. The fault will be cleared if the recovery logic is met.

☐ When the key is turned ON, the action table is made active prior to attempt for recovery. Fault recovery is checked at first opportunity for checking from initial key-on. This fault can only be checked upon certain unique truck operational conditions. If the recovery logic is met, the recovery logic is activated. The new state of the fault is then assigned if recovery as such was found. If not, the fault remains at the state at which it was found during the checking (the state saved at the key-off preceding this cycle of key-on).

Fault Recovery Logic:

Recovered when the next normal communication starts.

Fault Recovery Classification:

- ☐ Fault recovery logic is ignored while the key remains ON. The fault will not clear even though the recovery logic is met. Recovery requires clearing through initial power-up when the key switch is turned ON.
- ☐ When the key is turned ON, the action table is immediately executed for the fault. Then, at this point, fault recovery is checked. If the recovery logic is met, then the recovery logic is activated. The new state of the fault is assigned, usually within a set time after the key switch is turned ON, if recovery as such was found. If not, the fault remains at the state found during the power-up checking (the state saved at key-off preceding this cycle of key-on).

Fault Recovery Logic:

Transmission Controller machine selection set to 4 to 7, A to C, or E,

OR

T/M controller machine selection =D (530M),

AND

APS SIGNAL input voltage is maintained at between 17.4 to 91% of VPOT (5V) voltage,

AND

IVS SIG. 2 is open and SIG. 3 is closed for 1 second.

E056:
ENGINE SPEED SIGNAL LOST

Fault Detecting Logic:

Alternator "R" terminal information sent from S-NET is ON,

AND

The engine speed signal pulse (CN2-5) is not received for 5 seconds.

PMC Operation When Fault is Detected:

- Engine and transmission working history maps are not recorded.

Fault Recovery Classification:

- ☐ Fault recovery logic is ignored while the key remains ON. The fault will not clear even though the recovery logic is met. Recovery requires clearing through initial power-up when the key switch is turned ON.
- ☐ When the key is turned ON, the action table is made active prior to attempt for recovery. Fault recovery is checked at first opportunity for checking from initial key-on. This fault can only be checked upon certain unique truck operational conditions. If the recovery logic is met, the recovery logic is activated. The new state of the fault is then assigned if recovery as such was found. If not, the fault remains at the state at which it was found during the checking (the state saved at the key-off preceding this cycle of key-on).

Fault Recovery Logic:

Alternator "R" terminal information sent from S-NET is ON,

AND

Engine speed signal pulse is received for 5 seconds.

Fault Recovery Classification:

☐ Fault recovery logic is actively allowed while the key switch remains ON. The fault will be cleared if the recovery logic is met.

☐ Fault recovery is checked when the key is turned ON. If the recovery logic is met, then the recovery logic is activated. The new state of the fault is assigned usually within about 1.6 seconds after key-on occurs, if recovery as such was found. If not, the fault remains at the state at which it was found during the power-up checking.

Fault Recovery Logic:

Either (1) or (2) below is established:

1. T/M controller machine selection = 2 to B,
   AND
   PMC dip switch 2-7 = ON,
   AND

Any of the following; (a), (b), or (c) is established:

   a. Engine oil level signal is closed (= low level) for 2 seconds.
   b. Alternator "R" terminal information sent from S-NET is ON
   c. Start signal (key switch terminal C) is closed (= high level)

2. T/M controller machine selection = C or E,
   AND
   PMC dip switch 2-7 = ON,
   AND

Any of the following, (a), (b), or (c) is established:

   a. Engine oil level input voltage is above 3.5 volts for 2 seconds.
   b. Alternator "R" terminal information sent from S-NET is ON
   c. Start signal (key switch terminal C) is closed (= high level)

E0b6:
CHANGE AIR FILTER

Fault Detecting Logic:

T/M controller machine selection = 2 to C or E,
AND

PMC dip switch 2-7 = ON,
AND

Alternator "R" terminal information sent from S-NET is ON,
AND

Air cleaner signal is open (= high level),
AND

The above conditions continue for 2 seconds.

PMC Operation When Fault is Detected:

- Normal operation

Fault Recovery Classification:

☐ Fault recovery logic is ignored while the key remains ON. The fault will not clear even though the recovery logic is met. Recovery requires clearing through initial power-up when the key switch is turned ON.

☐ Fault recovery is checked at first opportunity for checking from initial key switch turn-on. This fault can only be checked under certain unique truck conditions such as engine running, first movement, first time shifting to F3, etc. If the recovery logic is met, then the recovery logic is activated. The new state of the fault is then assigned if recovery as such was found. If not, then the fault remains at the state at which it was found during the checking (the state saved at the key-off preceding this cycle of key-on).

Fault Recovery Logic:

T/M controller machine selection = 2 to C or E,
AND

PMC dip switch 2-7 = ON,
AND

Alternator "R" information sent from S-NET is ON,
AND

Air cleaner signal is close (= low level),
AND

The above conditions continue for 2 seconds.

Safety Functions

Down-shift inhibitor function:

- When the gear shift lever is operated during travel from D to 5 - L, from 5 to 3 - L, from 4 to L, or from 3 to L:

For example, when traveling at position D (F7), and the shift lever is moved to position 5, the transmission is not shifted directly from F7 to F5. It is shifted down F7 - F6 - F5 sequentially according to the engine speed. The engine overspeed prevention circuit prevents the transmission from shifting down two gears at a time if the operator shifts down too far.

Neutral safety function:

- If the shift lever is in any position other than N, this circuit prevents the engine from starting when the key switch is turned to the START position.

The neutral safety circuit prevents the truck from moving when the engine is started.

Abnormal use inhibitor:

- If the shift lever is changed from Neutral to Drive or from Neutral to Reverse while the engine speed is over 1500 rpm, the Transmission Controller will keep the transmission in neutral and reduce engine speed. The Controller sends a throttle modification signal to the PMC, even if the throttle is depressed to the floor. The appropriate clutches will then be engaged, once it has been confirmed that the engine speed is 1500 rpm or less. If the Reverse position is selected, the threshold speed is 1400 rpm.

Directional shift inhibitor:

- When the shift lever is changed quickly from Drive to Reverse or Reverse to Drive and the vehicle speed is over approximately 4 km/h (2.5 mph) or if the engine speed is over 1500 rpm, the Transmission Controller keeps the transmission in neutral. At the same time, vehicle speed is reduced by a brake command signal to the RCM (Retard Control Monitor), and engine speed is reduced by a throttle modification signal to the PMC. After confirming that vehicle speed and engine speed have been reduced to a safe level the appropriate clutches will be engaged. If the Reverse position is selected, the threshold speed is 1400 rpm.

Both of these inhibitors are effective in improving the life of the transmission. The number of abnormal uses are logged in the Transmission Controller and can be shown with “MOM” or “DAD”.

Engine overrun protection:

- When the engine speed exceeds 2350 rpm, the transmission controller automatically sends a brake command to the RCM through the PMC, applying the brakes. The brakes will remain applied until the engine speed drops to 2000 rpm or less.

Maximum shift inhibitor:

- Normally the maximum transmission gear is F7. With the use of “MOM” or “DAD” the maximum gear can be selected anywhere between F4 and F7.

Body-up shift inhibitor:

- Normally there is no inhibit in a forward range when the body is up. Using “MOM” or “DAD” this inhibit can be selected between F1, F2, F3, and F7.

Body-up reverse interlock:

- The Transmission Controller will not allow the truck to shift into reverse when the dump body is up. This feature prevents the truck from inadvertently reversing when the body is raised. The feature can be turned on or off by the “MOM” or “DAD”.

b0A4 : LEFT REAR BRAKE OIL TEMPERATURE SENSOR FAILURE

Turn key off and disconnect ATC3A and ATC3B from T/M controller.
Check whether the resistance between ATC3B, P-26 and ATC3A, P-16 is between 1 and 500 kΩ.

Yes. Turn key off and on again.
Check whether T/M controller still detects b0A4.

Yes. Turn key off, return to the first step, and check again. If the result is the same as before, change T/M controller.

No. The fault is recovered.

No. Turn key off and disconnect the connector near sensor. Verify the resistance between signal line (sensor side) and ground line (sensor side) of sensor is between 1 and 500 kΩ.

Yes. Check harness.

No. Change temperature sensor.

b0b1 : T/M OIL TEMPERATURE SENSOR FAILURE

Turn key off and disconnect ATC3A and ATC3B from T/M controller.
Check whether the resistance between ATC3B, P-23 and ATC3A, P-16 is between 1 and 500 kΩ.

Yes. Turn key off and on again.
Check whether T/M controller still detects b0b1.

Yes. Turn key off, return to the first step, and check again. If the result is the same as before, change T/M controller.

No. The fault is recovered.

No. Turn key off and disconnect the connector near sensor. Verify the resistance between signal line (sensor side) and ground line (sensor side) of sensor is between 1 and 500 kΩ.

Yes. Check harness.

No. Change temperature sensor.

b0b4 : RIGHT REAR BRAKE OIL TEMPERATURE SENSOR FAILURE

Turn key off and disconnect ATC3A and ATC3B from T/M controller.
Check whether the resistance between ATC3B, P-28 and ATC3A, P-16 is between 1 and 500 kΩ.

Yes. Turn key off and on again.
Check whether T/M controller still detects b0b4.

Yes. Turn key off, return to the first step, and check again. If the result is the same as before, change T/M controller.

No. The fault is recovered.

No. Turn key off and disconnect the connector near sensor. Verify the resistance between signal line (sensor side) and ground line (sensor side) of sensor is between 1 and 500 kΩ.

Yes. Check harness.

No. Change temperature sensor.

b0b5 : FRONT BRAKE OIL TEMPERATURE SENSOR FAILURE

Turn key off and disconnect ATC3A and ATC3B from T/M controller.
Check whether the resistance between ATC3B, P-30 and ATC3A, P-16 is between 1 and 500 kΩ.

Yes. Turn key off and on again.
Check whether T/M controller still detects b0b5.

Yes. Turn key off, return to the first step, and check again. If the result is the same as before, change T/M controller.

No. The fault is recovered.

No. Turn key off and disconnect the connector near sensor. Verify the resistance between signal line (sensor side) and ground line (sensor side) of sensor is between 1 and 500 kΩ.

Yes. Check harness.

No. Change temperature sensor.

Fault Recovery Logic:

Fault recovery logic is ignored while key switch remains ON. Recovery requires clearing through initial power-up when the key switch is turned ON.

The following conditions must exist during restarting for recovery from the fault:

- Protection circuit does not detect disconnection and condition exists for 1.5 seconds.

B013
TRANSMISSION OUTPUT SPEED SIGNAL LOST

Fault Detecting Logic:

Protection circuit detects disconnection in speed signal circuit.

ATC Operation When Fault is Detected:

- Transmission holds current range position.
- Remains in NEUTRAL when range selector is returned to N.

"Limp Home" Procedure:

☐ After stopping the truck, set (REV, LOW) by shifting the range selector from N to R, or

☐ After stopping the truck, set (1st, MID) by shifting the lever from N to D, 5, 4, 3 or L.

Fault Recovery Logic:

Fault recovery logic is ignored while key switch remains ON. Recovery requires clearing through initial power-up when the key switch is turned ON.

The following conditions must exist during restarting for recovery from the fault:

- Protection circuit does not detect disconnection and condition exists for 1.5 seconds.

b014:
MACHINE SELECT SIGNAL FAILURE

Note: Fault detection only occurs at truck start-up.

Fault Detecting Logic:

Rotary switch setting agrees with software for truck model , harness model selection does not agree with software for truck model, and conditions exist for 0.1 seconds

ATC Operation When Fault is Detected:

- Transmission shifts to NEUTRAL
- Transmission Cut Relay is turned OFF

Fault Recovery Logic:

Fault recovery logic is ignored while key switch remains ON. Recovery requires clearing through initial power-up when the key switch is turned ON.

The following conditions must exist during restarting for recovery from the fault:

Rotary switch setting agrees with software for truck model and harness model selection agrees with software for truck model

b054:
1st CLUTCH ECMV FAILURE III

Fault Detecting Logic:

1st clutch command ON, 1st clutch not in sliding, 1st fill signal OFF

AND

Conditions exist for 0.8 seconds.

ATC Operation When Fault is Detected:

- Hold current shift range.
- Hold NEUTRAL when range selector is placed in N.

"Limp Home" Procedure:

☐ Cannot shift to REVERSE

☐ After stopping the truck, set (1st, MID) by shifting the range selector from N to D, 5, 4, 3 or L.

Fault Recovery Logic:

1st clutch command ON, 1st clutch not in sliding, 1st fill signal ON

AND

Conditions remain for 0.5 seconds.

Fault will be recovered when truck is restarted.

b055:
2nd CLUTCH ECMV FAILURE III

Fault Detecting Logic:

2nd clutch command ON, 2nd clutch not in sliding, 2nd fill signal OFF

AND

Conditions exist for 0.8 seconds.

ATC Operation When Fault is Detected:

- Hold current shift range.
- Hold NEUTRAL when range selector is placed in N.

"Limp Home" Procedure:

☐ Cannot shift to REVERSE

☐ After stopping the truck, set (2nd, LOW) by shifting the range selector from N to D, 5, 4, 3 or L.

Fault Recovery Logic:

2nd clutch command ON, 2nd clutch not in sliding, 2nd fill signal ON

AND

Conditions remain for 0.5 seconds.

Fault will be recovered when truck is restarted.

b056:
3rd CLUTCH ECMV FAILURE III

Fault Detecting Logic:

3rd clutch command ON, 3rd clutch not in sliding, 3rd fill signal OFF

AND

Conditions exist for 0.8 seconds.

ATC Operation When Fault is Detected:

- Hold current shift range.
- Hold NEUTRAL when range selector is placed in N.

"Limp Home" Procedure:

☐ Cannot shift to REVERSE

b098:
R CLUTCH SOLENOID FAILED LOW

Fault Detecting Logic:

Solenoid output ON and protection circuit detects a disconnection,

AND

The conditions exist for 0.5 seconds

ATC Operation When Fault is Detected:

- No change in operation

Fault Recovery Logic:

Conditions required for recovery during operation

Protection circuit does not detect disconnection for 1.0 second.

Conditions required for recovery when the truck is restarted:

Protection circuit does not detect disconnection for 0.5 seconds.

b099:
M CLUTCH SOLENOID FAILED LOW

Fault Detecting Logic:

Solenoid output ON and protection circuit detects a disconnection,

AND

The conditions exist for 0.5 seconds

ATC Operation When Fault is Detected:

- No change in operation

Fault Recovery Logic:

Conditions required for recovery during operation

Protection circuit does not detect disconnection for 1.0 second.

Conditions required for recovery when the truck is restarted:

Protection circuit does not detect disconnection for 0.5 seconds.

b0A1:
MACHINE SELECT FAILURE

Note: Fault detection only occurs at truck start-up.

Fault Detecting Logic:

Rotary switch setting does not agree with software for truck model, and condition exists for 0.1 seconds

ATC Operation When Fault is Detected:

- Transmission shifts to NEUTRAL
- Transmission Cut Relay is turned OFF

Fault Recovery Logic:

Fault recovery logic is ignored while key switch remains ON. Recovery requires clearing through initial power-up when the key switch is turned ON.

The following conditions must exist during restarting for recovery from the fault:

Rotary switch setting agrees with software for truck model

AND

Harness model selection agrees with software for truck model

b0A2:
TORQUE CONVERTER OIL TEMPERATURE SENSOR FAILURE

Fault Detecting Logic:

Oil temperature is 150°C (302°F) or more and condition exists for 2.0 seconds.

ATC Operation When Fault is Detected:

- No change in operation

Fault Recovery Logic:

Conditions required for recovery during operation

Oil temperature less than 150°C (302°F) for 2 seconds.

Conditions required for recovery when the truck is restarted:

Oil temperature less than 150°C (302°F) for 0.1 seconds.

ELECTRONIC DISPLAY PANEL

The Electronic Display Panel (EDP or EDM), located in the center of the instrument panel, contains the primary display of information for the operator. The EDP also drives the indicator lamps located to the left of the EDP.

The Electronic Display Panel provides a warning to the operator if a fault occurs in the PMC System and can also be used by the technician to locate and diagnose the cause of the fault.

Rotary Switch

The Electronic Display Panel (Figure 25-1) has two 16 position rotary switches located under the protective grommets labeled “2” and “3”. (There are no switches located under grommet “1”.) The rotary switch under grommet “3” is reserved for future use.

Rotary switch 1, under grommet “2” (3, Figure 25-1) is set to inform the Electronic Display Panel of the size of the tires installed on the truck. If, at some time, different size tires are installed on the truck, switch 1 must be reset to assure correct vehicle speed calculations.

The Electronic Display Panel provides the rotary switch setting information to the other controllers in the PMC system through S-NET.

⚠ IMPORTANT ⚠

Set the rotary switch 1, for the model 530M truck equipped with 33.00 R51 tires, to position 3.

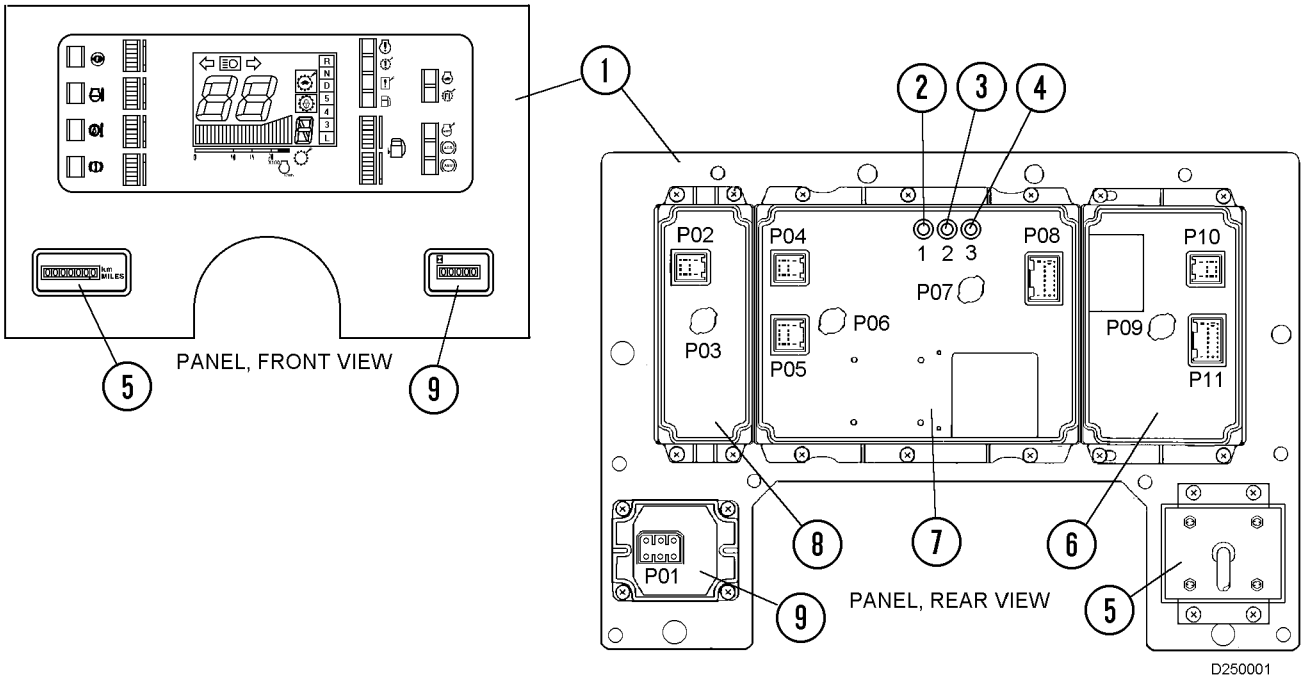


FIGURE 25-1. ELECTRONIC DISPLAY PANEL

1. Electronic Display Panel Assembly
2. Grommet #1
3. Grommet #2 (Switch 1)
4. Grommet #3 (Switch Not Used)
5. Odometer
6. Gauge Module
7. Center Module
8. Gauge Module
9. Service Meter

SERVICE METER DOES NOT WORK:

1. Start engine.
2. Check whether voltage between alternator terminal R and chassis ground is between 20 and 30V.

   Yes. Disconnect P01 and start engine.

3. Check whether voltage between P01 (female) pin 1 and pin 4 is between 20 and 30V.

   Yes. Replace the service meter.

   No. Check and repair or replace the harness between P01, pin 1 and alternator R terminal or between P01, pin 4 and chassis ground.

   No. Check and replace the alternator.

CENTRAL WARNING LAMP DOES NOT WORK:
or
A002: CENTRAL WARNING LAMP OUTPUT FAILED

1. Disconnect Central Warning lamp connector and P08. Turn key ON.
2. Check whether voltage between P08 (female) pin 1 and chassis ground is between 20 and 30V.

   Yes. (Fault code A002) Check and repair or replace the harness between P08, pin 1 and Central Warning lamp connector.

   No. Disconnect P08, connect P08 (female) pin 1 to chassis ground. And turn key ON.

3. Check whether Central Warning lamp lights up.

   Yes. Replace the center module.

   No. Disconnect Central Warning lamp connector, connect ground side terminal of this connector to chassis ground. And turn key ON.

4. Check whether Central Warning lamp lights up.

   Yes. Check and repair or replace the harness between P08 pin 1 and Central Warning lamp connector.

   No. Disconnect Central Warning lamp connector, and turn key ON.

5. Check whether voltage between +24V side of this connector and chassis ground is between 20 and 30V.

   Yes. Replace the Central Warning lamp.

   No. Check and repair or replace the harness between +24V and Central Warning lamp connector.

CENTRAL WARNING LAMP STAYS ON:

1. Disconnect P08 and turn key ON.
2. Check whether Central Warning lamp lights up.

   Yes. Disconnect Central Warning lamp connector and P08. Key switch is OFF.

3. Check whether there is continuity between ground side terminal of Central Warning lamp connector and chassis ground.

   Yes. Check and repair or replace the harness between P08, pin 1 and Central Warning lamp connector.

   No. Check and repair or replace Central Warning lamp assembly.

   No. Replace the center module.

ALARM BUZZER DOES NOT WORK:
or
A003: BUZZER OUTPUT FAILED:

1. Disconnect alarm buzzer connector and P08. Turn key ON.
2. Check whether voltage between P08 (female) pin 2 and chassis ground is between 20 and 30V.

   Yes. (Fault code A003) Check and repair or replace the harness between P08 pin 2 and alarm buzzer connector.

   No. Disconnect P08, connect P08 (female) pin 2 to chassis ground. Turn key ON.

3. Check whether buzzer sounds.

   Yes. Replace the center module.

   No. Disconnect alarm buzzer connector, connect ground side terminal of this connector to chassis ground. Turn key ON.

4. Check whether buzzer sounds.

   Yes. Check and repair or replace the harness between P08, pin 2 and alarm buzzer connector.

   No. Disconnect alarm buzzer connector, and turn key ON.

5. Check whether voltage between +24V side of this connector and chassis ground is between 20 and 30V.

   Yes. Replace the alarm buzzer.

LARGE LATERAL INCLINATION CAUTION LAMP STAYS ON:

1. Disconnect P08 Turn key on.
2. Check whether caution lamp lights up.
   - Yes. Disconnect caution lamp connector and P08. Key switch is OFF.
3. Check whether there is continuity between ground side terminal of caution lamp connector and chassis ground.
   - Yes. Check and repair or replace the harness between P08, pin 13 and caution lamp connector.
   - No. Check and repair or replace Central Warning lamp assembly.
   - No. Replace the center module.

"BODY NOT IN FLOAT" PILOT LAMP DOES NOT WORK:
or
A001: LAMP OUTPUT FAILED

1. Check whether speedometer and tachometer do not work normally.
   - Yes. Refer to troubleshooting: "Speedometer, tachometer, shift indicator and all information from T/M controller do not work normally".
   - No. Disconnect pilot lamp connector and P08. Turn key ON.
2. Check whether voltage between P08 (female) pin 14 and chassis ground is between 20 and 30V.
   - Yes. (Fault code A001) Check and repair or replace the harness between P08, pin 14 and pilot lamp connector.
   - No. Disconnect P08, connect P08 (female) pin 14 to chassis ground. Turn key on.
3. Check whether pilot lamp lights up.
   - Yes. Disconnect T/M controller ATC5A and key switch is OFF.
4. Verify there is no continuity between T/M controller ATC5A, pin 3 and chassis ground when body is not in float position.
   - Yes. Check and repair or replace body float signal switch or harness for the switch signal.
   - No. Turn key ON and press "lamp check switch".
5. Check whether pilot lamp lights up.
   - Yes. Replace the T/M controller.
   - No. Replace the center module.
   - No. Disconnect pilot lamp connector, connect ground side terminal of this connector to chassis ground. Turn key ON.
6. Check whether pilot lamp lights up.
   - Yes. Check and repair or replace the harness between P08, pin 14 and pilot lamp connector.
   - No. Disconnect pilot lamp connector, Turn key on.
7. Check whether voltage between +24V side of this connector and chassis ground is between 20 and 30V.
   - Yes. Replace the pilot lamp.
   - No. Check and repair or replace the harness between +24V and pilot lamp connector.

"BODY NOT IN FLOAT" PILOT LAMP STAYS ON:

1. Disconnect P08 Turn key on.
2. Check whether pilot lamp lights up.
   - Yes. Disconnect pilot lamp connector and P08. Key switch is OFF.
3. Check whether there is continuity between ground side terminal of pilot lamp connector and chassis ground.
   - Yes. Check and repair or replace the harness between P08, pin 14 and pilot lamp connector.
   - No. Check and repair or replace central pilot lamp assembly.
   - No. Replace the center module.

GENERAL TROUBLESHOOTING PROCEDURES

The following information is intended for use by a qualified technician to troubleshoot problems related to the Retard and Control Monitor Controller (RCM) and system components.

If a fault occurs in the brake system, the RCM informs the operator of the fault through the PMC by indicating a problem on the MOM screen.

Fault Code Tables in "Powertrain Management System" list the possible fault codes related to the RCM Controller (and other system controllers) and provide information regarding the item causing the fault for initial troubleshooting.

Specific troubleshooting procedures are listed on the following pages for most of the fault codes listed in the tables.

RCM harness connector charts at the end of this section list the pin number, circuit function, and signal type for each connector referenced in the troubleshooting procedures. Refer to Figure 26-2 for the location of each connector on the RCM housing. This information should be used in conjunction with the electrical schematics in Section R.

⚠WARNING

Be certain the truck wheels are blocked and the parking brake applied to prevent truck movement during troubleshooting procedures.
Be certain steering accumulators and brake accumulators are bled before removing any hydraulic connnections or installing pressure gauges during troubleshooting procedures. (Refer to Section J for brake accumulator bleeddown instructions and brake system test port location.)

⚠WARNING

The AMP connectors used in the harness attached to the RCM are not intended to withstand insertion of anything other than the mating pins into their pin sockets. Extreme care must be taken when probing the pin sockets on the harness connector.

The only acceptable method of testing a harness connector socket is to carefully probe the outside edge of the socket. DO NOT INSERT A CLIP OR OTHER DEVICE INTO THE SOCKETS FOR TESTING!

Inserting a testing device into the sockets will damage the socket and shorten the life of the harness connector.

Note: When testing pins in the harness connector attached to the RCM, it is necessary to first remove the white terminal cover plate.

⇒ ***Is J049 (Rear Right Pressure Present and No Command) active also?***

No. Continue with troubleshooting items below.

Yes. Continue with step 4 below.

2. Shut down the engine. Wait 30 seconds. Remove the harness connector to the left brake pressure sensor and exchange it with the harness connector to the right brake pressure sensor.
3. Start the engine and wait for 60 seconds.

⇒ ***Is the fault J009 (Rear Left Pressure Present and No Command) still active?***

Yes. The fault remained on the left side, even though the wiring connection is now reading feedback brake pressure from the right side. This indicates that the wiring connection from the RCM to the sensor is faulty, or that the RCM itself is faulty. Return the harness connectors to their original positions. Check the wiring connection from the RCM to the left brake pressure sensor. Then, if the fault persists, replace the RCM.

No.

⇒ ***Is the fault J049 (Rear Right Pressure Present and No Command) now active?***

No. Because both faults cleared, it appears that the problem is intermittent, or a combination failure of both the left brake pressure sensor and the wiring has occurred. Return the harness connectors to their original positions. Check the wiring connection from the RCM to the left brake pressure sensor and/or replace the sensor.

Yes. The fault remained associated with a single brake pressure sensor and did not follow the wiring connection. This indicates that the wiring connection from the RCM to the sensor is OK.

4. Shut down the engine. Return the connectors to their original positions. In the hydraulic cabinet, install a calibrated 210kg/cm^2 (3000 psi) pressure gauge to measure the left brake pressure.
5. Start the engine.

⇒ ***Is the measured brake pressure greater than 8.9 kg/cm^2 (127 psi)?***

No. If the MOM display still reports brake pressure greater than 8.9 kg/cm^2 (127 psi), the brake pressure sensor may be faulty. However, before replacing the sensor, ensure that pressure gauge is properly calibrated. Then replace the left brake pressure sensor.

Yes. This verifies that the RCM is reporting a valid brake pressure, and that the problem is in the hydraulic system.

J026:
RCM ABNORMAL

Description

The RCM was reset by the onboard hardware reset circuitry.

Conditions to Generate an ACTIVE Fault

This fault occurs when the RCM detects that the last RCM reset was caused by the onboard hardware reset circuitry.

Note: After the RCM experiences 4 watchdog faults, it is held in continual reset until it is cycled by turning OFF the key switch.

Conditions to CLEAR a Fault

This fault will clear when the RCM detects that the last RCM reset was NOT caused by the onboard hardware reset circuitry.

Possible Causes

- External electrical noise.
- Faulty RCM.

Troubleshooting Suggestions

NOTE: Refer to Warning on page 1 regarding proper procedures when probing connector sockets when measuring voltage or resistance values.

1. Note the location and conditions under which the fault occurs. EMI (electromagnetic interference) can be generated by external devices such as 2-way radios, radio towers, etc. Other electrical noise can be generated by service equipment, such as arc welders. In each case, attempt to eliminate the source of the noise.
2. Check the RCM ground circuit. Turn the key switch OFF. Disconnect the harness connector RCM1. Using an Ohmmeter, measure the resistance from RCM1 pin 3 to ground.

⇒ ***Is the measured resistance less than .3 ohm? (i.e. Is the circuit grounded?)***

No. Check the wiring connection from the RCM to the grounding point.

Yes. If the fault persists, and cannot be associated with a particular EMI event, replace the RCM.

J035:
LOSS OF 18 VOLT POWER SUPPLY

Description

The RCM has lost its internally generated 18 volt power supply.

Conditions to Generate an ACTIVE Fault

The following condition must be present for 0.5 seconds to trigger a fault:

☐ 18 volt power supply voltage (generated internally by RCM) less than 12 volts

NOTE: The 18 volt power supply is required for the retard lever position sensor. When the 18 volt supply is lost, the RCM cannot determine the position of the retard lever. Therefore, when the fault J035 (Loss of 18 Volt Power Supply) occurs, the RCM will disable the retard lever until the key switch is turned OFF.

Conditions to CLEAR a Fault

This fault will NOT clear until the key switch is cycled OFF and then ON. In addition, after cycling the key switch, the following condition must be present for 15 seconds before a fault will clear:

☐ 18 volt power supply voltage (generated internally by RCM) greater than 13 volts.

Possible Causes

- 18 volt power supply shorted to ground. (Such as 18 volt power supplied to a sensor shorted to ground or shield)

Troubleshooting Suggestions for an Active Fault

1. Turn the key switch OFF. Wait 30 seconds. Turn the key switch ON and wait 30 seconds.

⇒ ***Is the fault J035 (Loss of 18 Volt Power Supply) active?***

No. Attempt to recreate the situation that generated the fault.

Yes. Continue with troubleshooting items below.

2. Turn the key switch OFF. Disconnect the harness connectors RCM1 and RCM3. Disconnect all six sensors; left brake pressure sensor, right brake pressure sensor, front left wheel speed sensor, front right wheel speed sensor, rear left wheel speed sensor, and the right rear wheel speed sensor. Each circuit can be independently tested for a short circuit between the 18 volt power line and either the ground line or shield. Taking extreme care not to insert anything inside of the socket, probe the outside edge of the sockets described below with an ohmmeter lead.
3. Test the right brake pressure sensor wiring by measuring the resistance between RCM3 pin 20 (18V) and RCM3 pin 32 (shield).

⇒ ***Is the resistance less than 10 ohms?***

No. This circuit is not shorted. Continue with troubleshooting items below.

Yes. There is a short circuit in the wiring connection from the RCM to the right brake pressure sensor. Replace the wiring.

4. Test the left brake pressure sensor wiring by measuring the resistance between RCM3 pin 8 (18V) and RCM3 pin 33 (shield).

⇒ ***Is the resistance less than 10 ohms?***

No. This circuit is not shorted. Continue with troubleshooting items below.

Yes. There is a short circuit in the wiring connection from the RCM to the left brake pressure sensor. Replace the wiring.

5. Test the front left wheel speed sensor wiring by measuring the resistance between RCM1 pin 27 (18V) and RCM1 pin 29 (shield). Also, measure the resistance between RCM1 pin 27 (18V) and RCM1 pin 22 (ground).

⇒ ***Is the resistance less than 10 ohms in either case?***

No. This circuit is not shorted. Continue with troubleshooting items below.

Yes. There is a short circuit in the wiring connection from the RCM to the front left wheel speed sensor. Replace the wiring.

6. Test the front right wheel speed sensor wiring by measuring the resistance between RCM1 pin 26 (18V) and RCM1 pin 34 (shield). Also, measure the resistance between RCM1 pin 26 (18V) and RCM1 pin 12 (ground).

J053:
COMBINATION FAULT 4

Description

A potentially serious combination of faults has occurred. The 24 volt load switch and the right brake PPC output may both be shorted ON. This condition would result in the application of the rear right brake and the two front brakes without a brake command.

Conditions to Generate an ACTIVE Fault

☐ Fault J020 (Right PPC Electrical Fault) is active

AND

☐ Fault J036 (24 Volt Load Switch Fault) is active

Conditions to CLEAR a Fault

☐ Fault J020 (Right PPC Electrical Fault) is NOT active

OR

☐ Fault J036 (24 Volt Load Switch Fault) is NOT active

Possible Causes

See fault logic for fault J020 and J036.

Troubleshooting Suggestions for an Active Fault

See fault logic for fault J020 and J036.

d021:
SOLENOID OUTPUT 1 FAILURE

Fault Detecting Logic:

Protection circuit detects short to ground.

OR

Protection circuit detects hot short and condition remains for 1 second.

AND

Solenoid 1 command: OFF

Operation When Fault is Detected:

All solenoid outputs turned OFF.

Fault Recovery Logic:

Fault recovery logic is ignored while key switch remains ON. Recovery requires clearing through initial power-up when the key switch is turned ON.

The following conditions must be present to allow recovery when truck is restarted:

Solenoid 1 command: OFF, protection circuit does not detect hot short

AND

Conditions remain for 1 second.

AND

Protection circuit does not detect short to ground

d022:
SOLENOID OUTPUT 2 FAILURE

Fault Detecting Logic:

Protection circuit detects short to ground.

OR

Protection circuit detects hot short and condition remains for 1 second.

AND

Solenoid 2 command: OFF

Operation When Fault is Detected:

All solenoid outputs turned OFF.

Fault Recovery Logic:

Fault recovery logic is ignored while key switch remains ON. Recovery requires clearing through initial power-up when the key switch is turned ON.

The following conditions must be present to allow recovery when truck is restarted:

Solenoid 2 command: OFF, protection circuit does not detect hot short

AND

Conditions remain for 1 second.

AND

Protection circuit does not detect short to ground

d023:
SOLENOID OUTPUT 3 FAILURE

Fault Detecting Logic:

Protection circuit detects short to ground.

OR

Protection circuit detects hot short and condition remains for 1 second.

AND

Solenoid 3 command: OFF

Operation When Fault is Detected:

All solenoid outputs turned OFF.

Fault Recovery Logic:

Fault recovery logic is ignored while key switch remains ON. Recovery requires clearing through initial power-up when the key switch is turned ON.

The following conditions must be present to allow recovery when truck is restarted:

Solenoid 3 command: OFF, protection circuit does not detect hot short

AND

Conditions remain for 1 second.

AND

Protection circuit does not detect short to ground

MOM -- MESSAGE FOR OPERATION AND MAINTENANCE

INTRODUCTION

Purpose

The Message for Operation and Maintenance (MOM) unit, mounted in the Overhead Display Panel, displays data such as truck payload, system faults that occur on the truck, and information required for truck status check and trouble-shooting.

SYSTEM CONFIGURATION

Hardware

The MOM unit (Figure 30-1) is connected to the Power-train Management Controller (PMC) through an RS-422 interface and transfers data to and from the truck.

Table 1 lists the pins used on the RS422, 15 pin connector, the signal symbol, type, and name. This connector is located on the rear of the MOM display as shown in Figure 30-1.

PIN No.	SYMBOL	TYPE	NAME
1	RDB	Input	Receive Data (-)
2	Not Used		
3	SG1		Signal Ground
4	SDB	Output	Send Data (-)
5	Not Used		
6			
7			
8			
9	RDA	Input	Receive Data (+)
10	FG1		Frame Ground
11	SDA	Input	Send Data (+)
12	Not Used		
13			
14			
15			

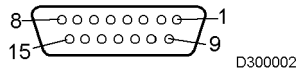


TABLE 1. RS422 CONNECTOR CIRCUITS

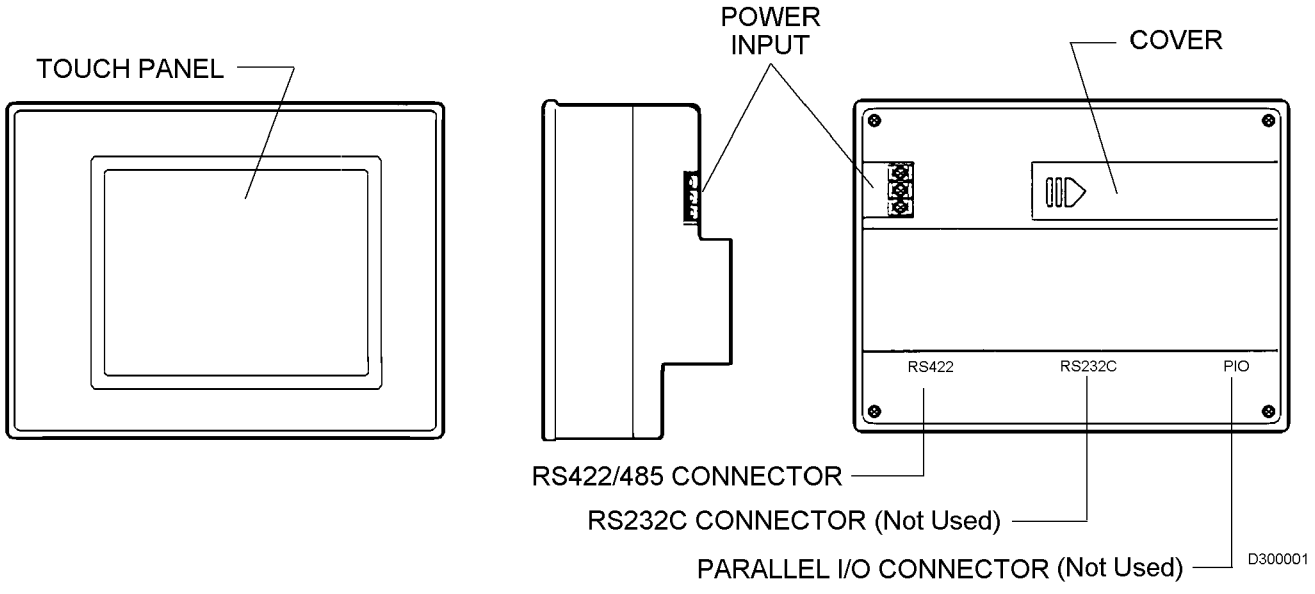


FIGURE 30-1. "MOM" DISPLAY ASSEMBLY

HARDWARE TROUBLESHOOTING AND MAINTENANCE

⚠ IMPORTANT ⚠

- ***The following precautions must be observed when operating and/or repairing the MOM display panel and associated equipment:***
- ***Use only finger pressure to operate the switches on the MOM display panel. Never use a mechanical device (pencil, screwdriver etc.) to depress a switch – permanent screen damage may result!***
- ***The display panel surface is glass – do not use excessive pressure when operating switches. Avoid impact with heavy objects.***
- ***Do not use use organic solvents or strong acid solvents to clean the touch panel or body of the MOM unit.***
- ***Avoid unnecessary disassembly of the unit.***
- ***To prevent damage to the screen due to "image burn-in", change screens periodically if possible or use the "Light Off" function. (Refer to "Setting the Display OFF time".)***

TROUBLESHOOTING THE MOM UNIT

Table 10. (below) lists possible problems, causes and suggested corrective action for repairing problems which may occur in the Message For Operation and Maintenance (MOM) system.

Details for correcting the problems are listed on the following pages.

	CONDITION	POSSIBLE CAUSE	CORRECTIVE ACTION
1	No screen is displayed	Power wiring failure	Check wiring
		Power supply not within specified range	Check power supply voltage
		Display Panel Inoperative	Replace MOM unit
2	System mode screen is displayed after power is applied	No screen data is downloaded	Download screen data
3	Communication unavailable	Communication cable is not connected	Connect communication cable properly
		Wrong communication cable is used	Repair or replace communication cable
		Incorrect communication parameter	Adjust communication Parameter
		Serial port communication port type set incorrectly	Set communication port correctly
		Abnormal communication port	Check operation using self-diagnosis
4	Error message is displayed	Error occurs	Use code to determine nature of fault and correct accordingly (Refer to "Error Codes")

TABLE 10.

MOM SCREEN DISPLAYS

i1 INITIAL MESSAGE

After the MOM system is powered on, the "NOW STARTING UP" message (in Japanese) appears, then "i1 INITIAL MESSAGE" screen, Figure 31-1. appears. This initial message screen shows a screen number, title, and the version of the MOM program.

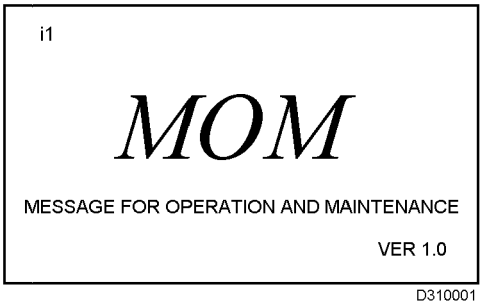


FIGURE 31-1. INITIAL MESSAGE SCREEN

This initial message screen is displayed for three seconds, then "i2 INITIAL CHECK1", Figure 31-2. appears automatically.

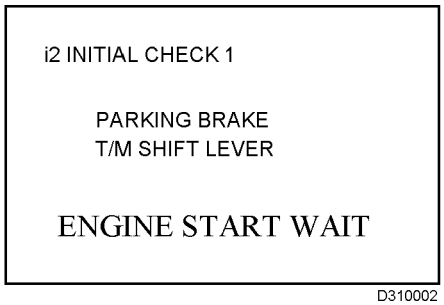


FIGURE 31-2.

The screen displayed after this initial message screen varies according to the current vehicle status. For details, see "Display able/disable by machine status." If any controller detects a fault when the ignition key is turned on, this initial message screen changes to "i6 WARNING MESSAGE" screen automatically.

i2 INITIAL CHECK1

This screen shows whether the engine is ready to be started. When the engine is ready, "ENGINE START OK" is displayed. When something must be done before the engine is started, "ENGINE START WAIT" is displayed together with an item to be done before the engine is started.

Such items are as follows:

- "PARKING BRAKE" appears on-screen when the parking brake remains released.
- "T/M SHIFT LEVER" appears on-screen when the shift lever is not in the neutral position.

The engine can be started even if "PARKING BRAKE" is indicated for emergency use.

If the shift lever is not in NEUTRAL position, it must be moved to NEUTRAL before the engine can be started.

When the engine is started, this screen automatically changes to "i3 INITIAL CHECK2", (Figure 31-3) screen. If any controller detects a fault while the "i2" screen is displayed, "i6 WARNING MESSAGE" screen appears automatically.

i3 INITIAL CHECK2

This screen shows whether the vehicle is ready to go. When the vehicle is ready, "DEPARTURE OK" is displayed. When departure is not acceptable, "DEPARTURE WAIT" is displayed (Figure 31-3) together with the reason why departure is not acceptable. The fault must be corrected before the truck can be operated.

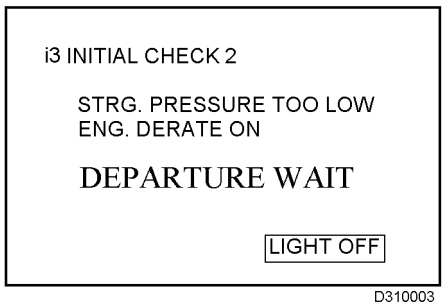


FIGURE 31-3.

s222 MACHINE TREND MENU (T/M)

This screen is used to select a transmission trend menu.

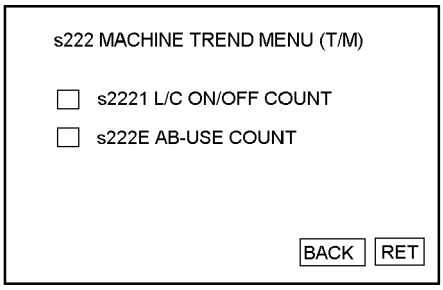


FIGURE 31-18.

When the switch box at the left side of the menu titles is pressed, the selected menu screen appears.

When the BACK switch is pressed, this screen returns to “s22 TRANSMISSION MENU” screen.

When the RET switch is pressed, this screen changes to:

- “i2 INITIAL CHECK1" when the ignition key is turned on (”KEY ON") but engine is not running.

When any controller detects a fault while this screen is displayed, “i6 WARNING MESSAGE" screen is automatically displayed.

s2221 L/C ON/OFF COUNT

This screen (Figure 31-19) shows the number of on/off operations of the lock up clutch.

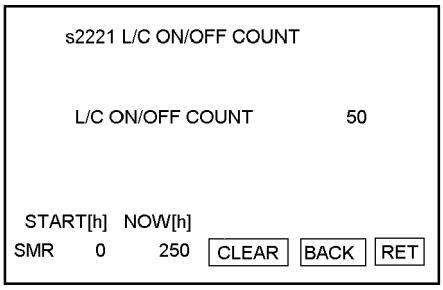


FIGURE 31-19.

> The “START[h] field shows the value of vehicle standard service meter (SMR) at which L/C counting started.

> The “NOW[h] field shows the value of vehicle standard service meter (SMR) at which data is requested.

When the CLEAR switch is pressed, a dialog box appears to ask whether you really want to delete L/C ON/OFF COUNT data.

Press the OK switch to delete the data or the CANCEL switch not to delete the data.

When you press the OK switch to delete the data, the screen turns into “s222 MACHINE TREND MENU (T/M)" screen.

When the BACK switch is pressed, this screen turns into “s222 MACHINE TREND MENU (T/M)" screen.

When the RET switch is pressed, this screen changes to:

- “i2 INITIAL CHECK1" when the ignition key is turned on (”KEY ON") but engine is not running.

When any controller detects a fault while this screen is displayed, “i6 WARNING MESSAGE" screen is automatically displayed.

s262 FAULT CONDITION MENU (ELE. DISPLAY PANEL)

This screen (Figure 31-37) is used to select a fault condition menu of the vehicle monitor panel.

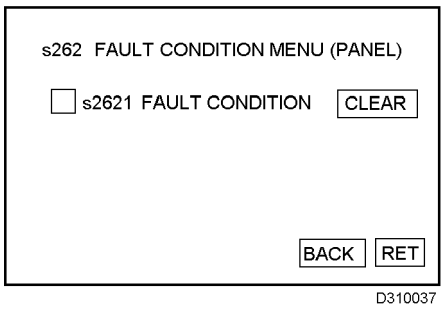


FIGURE 31-37.

When you select a menu and press its switch box, the selected menu screen appears.

When you press the CLEAR switch placed after a menu title (“s2621 FAULT CONDITION”), a dialog box appears to ask whether you really want to delete all vehicle monitor panel fault data.

Press the OK switch to delete all vehicle monitor panel fault data or the CANCEL switch not to delete the data. Current fault data is not deleted.

When the BACK switch is pressed, this screen returns to “s26 ELE. MONITOR MENU" screen.

When RET switch is pressed, this screen changes to:

- “i2 INITIAL CHECK1" when the ignition key is turned on (“KEY ON") but engine is not running.

When any controller detects a fault while this screen is displayed, “i6 WARNING MESSAGE" screen is automatically displayed.

s2621 FAULT CONDITION (ELE. DISPLAY PANEL)

This screen (Figure 31-38) shows the history of vehicle monitor panel faults.

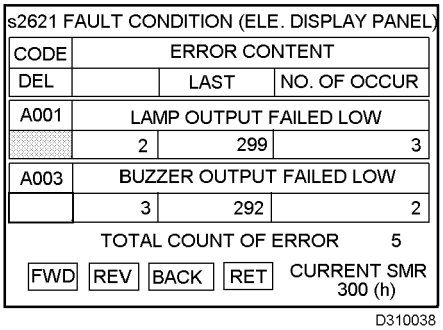


FIGURE 31-38.

MOM handles the following vehicle monitor panel faults:

> CODE: System fault code

> ERROR CONTENT: Contents of a fault

> FIRST: Service meter hour, first occurrence

> LAST: Service meter hour, last occurrence

> NO. OF OCCUR.: Number of occurrences

The DEL field works as a switch to delete the history of the fault code. When the DEL field of a fault code is pressed, a dialog box appears to ask whether you really want to delete the history of the data. Press the OK switch to delete the history or the CANCEL switch not to delete the history. The DEL switch field of the current fault becomes dark and locked. You cannot delete the fault history by pressing the DEL switch.

One page of the screen displays data of two faults. Move up or down the screen by the FWD or REV switch to show another page of faults.

> “TOTAL COUNT OF ERROR” indicates the total number of the fault occurrence.

> “CURRENT SMR” indicates the current vehicle standard SMR (Service Meter) value. When the BACK switch is pressed, this screen returns to “s262 FAULT CONDITION MENU (ELE. MONITOR)" screen.

When RET is pressed, this screen changes to:

- “i2 INITIAL CHECK1" when the ignition key is turned on (“KEY ON") but engine is not running.

When any controller detects a fault while this screen is displayed, “i6 WARNING MESSAGE" screen is automatically displayed.

t1 PARAMETER SET MENU

When you select a menu and press its switch box, the selected menu screen appears.

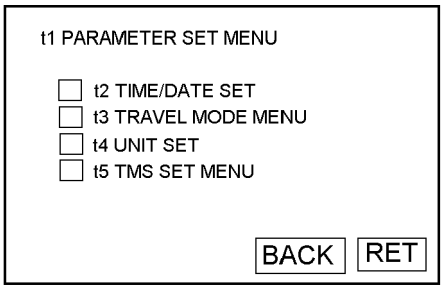


FIGURE 31-53.

When the BACK switch is pressed, this screen returns to “i9 MENU SELECT" screen.

When the RET switch is pressed, this screen changes to:

- “i2 INITIAL CHECK1" when the ignition key is turned on (“KEY ON") but engine is not running.
- “i3 INITIAL CHECK2" when engine is running (“ENGINE ON") but vehicle is not moving.
- “i4 NORMAL RUNNING” when vehicle is running or even when engine is running (“ENGINE ON”) but vehicle is not moving after displaying “i4” screen.

When any controller detects a fault while this screen is displayed, “i6 WARNING MESSAGE" screen is automatically displayed.

Note: The switch box “t5 TMS SET MENU” is light and not selectable when the TMS is not used and the appropriate PMC DIP switch is set to OFF. Refer to “Display Able/Display by Model and Optional Equipment Status.”

t2 TIME/DATE SET

This screen (Figure 31-54) is used to set the date and time to be displayed on the “i4 NORMAL RUNNING" screen.

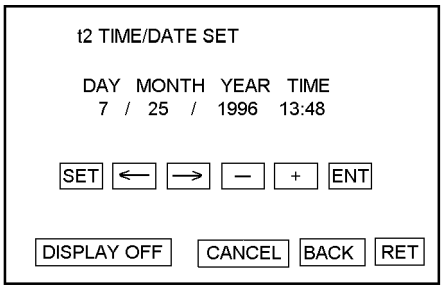


FIGURE 31-54.

Procedure to set a date and a time:

1. Press the SET switch. The cursor appears on the DAY field.
2. Move and position the cursor on a field (DAY, MONTH, YEAR, or TIME) whose value you want to change by using the left or right arrow switches.
3. Increase or decrease the value by pressing the “+” or “-” switch until the desired value appears. Hold down the “+” or “-” switch to change the value continuously.
4. Press the ENT switch to register the date and time or the CANCEL switch to cancel registration.

To stop displaying of the time and date on “i4" screen, press the DISPLAY OFF switch. “DISPLAY OFF” turns to “DISPLAY ON.” To display the time and date on “i4" screen, press the DISPLAY ON switch. “DISPLAY ON” turns to “DISPLAY OFF.”

When the BACK switch is pressed, this screen returns to “t1 MENU SELECT" screen. When the RET switch is pressed, this screen changes to:

- “i2 INITIAL CHECK1" when the ignition key is turned on (“KEY ON") but engine is not running.
- “i3 INITIAL CHECK2" when engine is running (“ENGINE ON") but vehicle is not moving.
- “i4 NORMAL RUNNING” when vehicle is running or even when engine is running (“ENGINE ON”) but vehicle is not moving after displaying “i4” screen.

When any controller detects a fault while this screen is displayed, “i6 WARNING MESSAGE" screen is automatically displayed.

DAD -- DATA ACQUISITION DEVICE

INTRODUCTION

The Data Acquisition Device (DAD) is a personal computer and software which can be connected to the truck through the Powertrain Management Controller (PMC) and is used to display data related to truck systems status, history of operational data, and perform troubleshooting procedures.

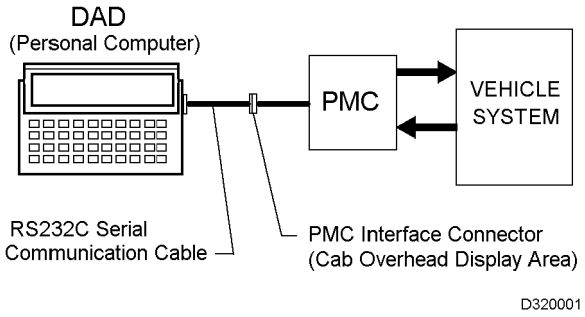


FIGURE 32-1. DAD HOOKUP DIAGRAM

HARDWARE HOOKUP

Figure 32-1 illustrates the DAD hookup and its relation to the truck control systems. The DAD unit is connected to the truck at the PMC Interface connector (3, Figure 32-2) located above the windshield, in the Overhead Display area, using a special RS232C communication cable attached to the serial port of the DAD unit.

Table 1. lists the pins used and shows the connector for the DAD serial port end of the communication cable.

PIN No.	SYMBOL	TYPE	NAME
1	CD	Input	Carrier Detect
2	RD	Input	Receive Data
3	SD	Output	Send Data
4	DTR	Output	Data Terminal Ready
5	GND		Ground
6	DSR	Input	Data Set Ready
7	RS	Output	Request to Send
8	CS	Input	Clear to Send
9	Not Used		

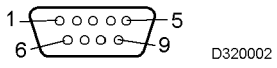


TABLE 1. RS232C CONNECTOR CIRCUITS

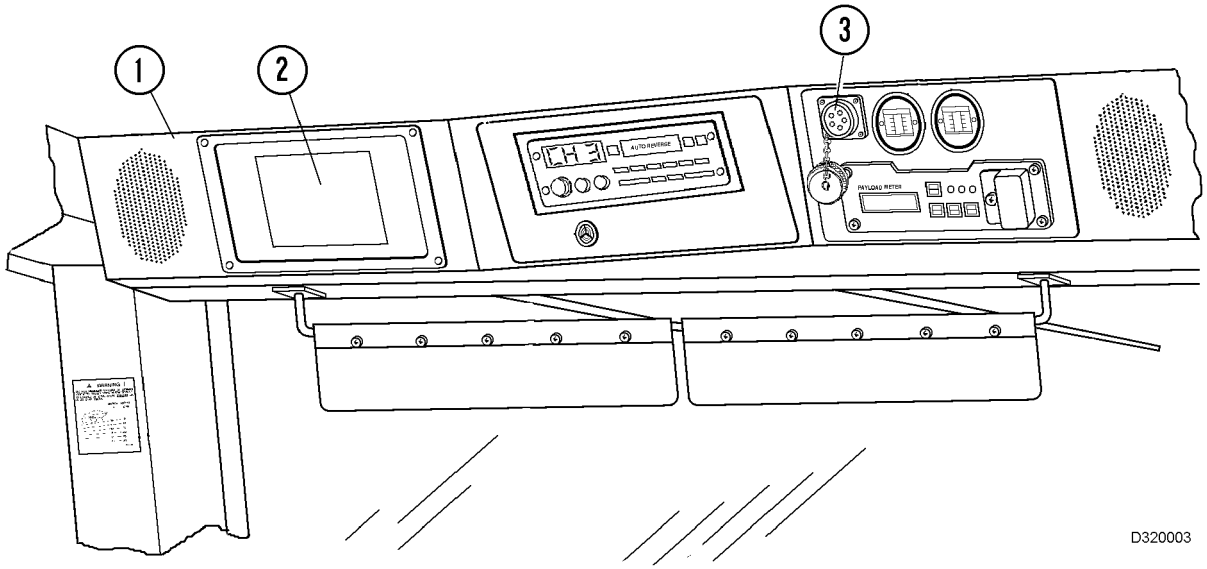


FIGURE 32-2. CAB OVERHEAD DISPLAY AREA

1. Overhead Display Panel 2. “MOM” Display Panel 3. “PMC” Interface Connector

DAD SCREEN DISPLAYS

PASSWORD INPUT

1. With the screen in Figure 33-1 displayed, enter a correct password and press ENT.

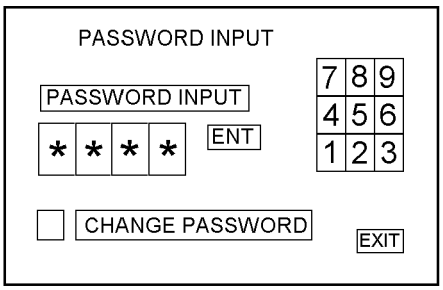


FIGURE 33-1.

Use the keys 1 to 9 of the 10-key pad on the screen to enter a password. The "PASSWORD INPUT" screen changes to "i3 MENU SELECT" screen.

DAD supports five default passwords; 0000, 1111, 2222, 3333, and 4444.

Changing the Password

To change the password, follow the steps below:

1. Press the box switch placed to the left of "CHANGE PASSWORD." The box lamp lights and "OLD PASSWORD INPUT" is displayed.
2. Enter the old password to be changed (using the 10-key pad) and press the ENT switch. When the entered password is valid, "NEW PASSWORD INPUT" is displayed.
3. Enter a new password which you want to use from now on (using the 10-key pad) and press the ENT switch. "ONCE MORE" is displayed for reconfirmation.
4. Enter the new password again. If this password agrees to that entered in step 3, the new password is registered. If the entered password does not agree with the password entered the first time, (step 3), "ERROR" is displayed. Enter a correct password again.
5. To quit, press the box switch (located to the left of "CHANGE PASSWORD.")
6. When the EXIT switch is pressed, the screen will return to Windows.

i3 MENU SELECT

DAD supports two maintenance information menus (see Figure 33-2):

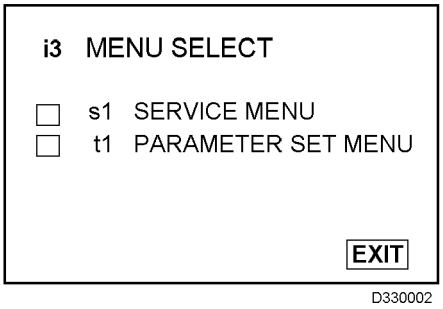


FIGURE 33-2.

- (1) SERVICE MENU
- (2) PARAMETER SET MENU

The SERVICE MENU screen is used to obtain information of each component on the truck (engine, transmission, brake, suspension, power-train management controller, electronic display panel, payload meter, tire management system, etc.) and information on the whole vehicle.

Information for each component is provided on reference screens such as "REAL TIME MONITOR," "MACHINE TREND," and "FAULT CONDITION" and a "MACHINE CHECK" screen for checking vehicle hardware. The "PARAMETER SET MENU" screen is used to change parameters. For hierarchy (tree structure) of maintenance information screens, refer to Tables 2. & 3. in the previous Section.

The menu hierarchy varies according to model types, component types (Komatsu engine or CUMMINS engine) and optional equipment settings (PLM, TMS, etc.). See "Display Able/Disable by Model and Optional Equipment Status" for setup instructions.

When selecting "s1 SERVICE MENU," the "s1 SERVICE MENU" appears.

When selecting "t1 PARAMETER SET MENU," "t1 PARAMETER SET MENU" appears. The "t1" menu is not available while the vehicle is running.

When the EXIT switch is pressed, "i3 MENU SELECT" screen returns to the Windows screen.

The DEL field works as a switch to delete the history of the fault code. When you press the DEL field of a fault code, a dialog box appears to ask whether you really want to delete the history of the data. Press the OK switch to delete the history or the CANCEL switch not to delete the history. The DEL switch field of the current fault becomes dark and locked. You cannot delete the fault history by pressing the DEL switch.

Each page of the screen displays more than one fault. You can move up or down the screen by the FWD or REV switch to show another page of faults.

> "TOTAL COUNT OF ERROR" indicates the total number of the fault occurrence.

> "CURRENT SMR" indicates the current vehicle standard SMR (Service Meter) value.

When BACK switch is pressed, this screen returns to "s233 FAULT CONDITION MENU (BRAKE)" screen.

When the RET switch is pressed, this screen changes to "i3 MENU SELECT" screen.

s234 MACHINE CHECK MENU (BRAKE)

When the switch box at the left side of the menu title (Figure 33-22) is pressed, the selected menu screen appears.

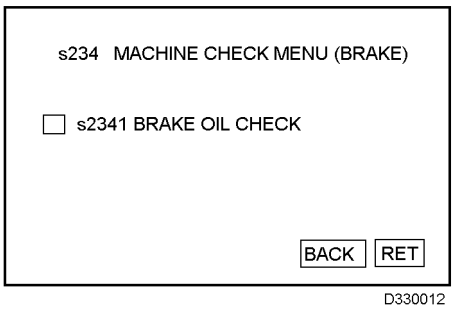


FIGURE 33-22.

When the the BACK switch is pressed, this screen returns to "s23 BRAKE MENU" screen.

When the RET switch is pressed, this screen changes to "i3 MENU SELECT" screen.

s2831 FAULT CONDITION (TMS)

This screen (Figure 33-41) is selectable only when the TMS is mounted on vehicle.

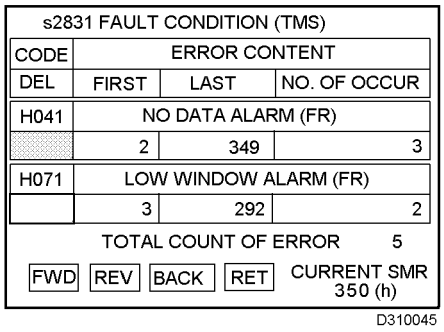


FIGURE 33-41.

See “Display Able/Disable by Model and Optional Equipment Status.”

This screen shows the history of TMS faults. DAD handles the following data for TMS faults:

> CODE: System fault code

> ERROR CONTENT: Contents of a fault

> FIRST: Service meter hour at first occurrence

> LAST: Service meter hour at last occurrence

> NO. OF OCCUR.: Number of occurrences

The DEL field works as a switch to delete the history of the fault code. When you press the DEL field of a fault code, a dialog box appears to ask whether you really want to delete the history of the data. Press the OK switch to delete the history or the CANCEL switch not to delete the history. The DEL switch field of the current fault becomes dark and locked. You cannot delete the fault history by pressing the DEL switch.

Each page of the screen displays data of more than one fault. You can move up or down the screen by the FWD or REV switch to show another page of faults.

> “TOTAL COUNT OF ERROR” indicates the total number of the fault occurrence,

> “CURRENT SMR” indicates the current vehicle standard SMR (Service Meter) value.

When BACK is pressed, this screen returns to “s283 FAULT CONDITION MENU (TMS)" screen.

When the RET switch is pressed, this screen changes to “i3 MENU SELECT” screen.

t4 PARAMETER UNIT SET

This screen (Figure 33-57) is used to set the units of measurement for items displayed on the screen.

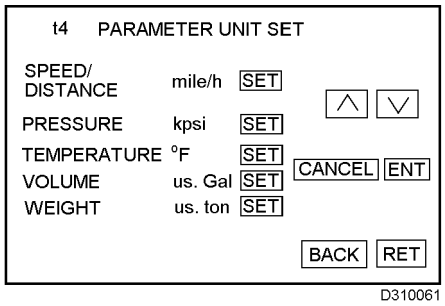


FIGURE 33-57.

Procedure to change units:

1. Select an item whose unit you want to change and press its SET switch. The cursor appears in the entry field of the item.
2. Press the UP or DOWN arrow key until a desired unit appears in the entry field.
3. Press the ENT key to register the selected unit or the CANCEL switch to cancel unit change.

The following units are available:

> SPEED/DISTANCE: km/h (km), mile/h (mile)

> PRESSURE: MPa, kg/cm^2, kpsi

> TEMPERATURE: °F, °C

> VOLUME: us.Gal, l

> WEIGHT: us.ton, ton, klb

When the BACK switch is pressed, this screen returns to the “t1 PARAMETER SET MENU" screen.

When the RET switch is pressed, this screen returns to “i3 MENU SELECT" screen.

Note: Initially, “mile/h”, “kpsi”, “ °C”, “us.Gal”, and “us.ton” are set as default values.

t5 TMS SET MENU

This screen (Figure 33-58) is selectable only when the TMS is installed on the vehicle. Refer to “Display Able/Disable by Model and Optional Equipment Status.”

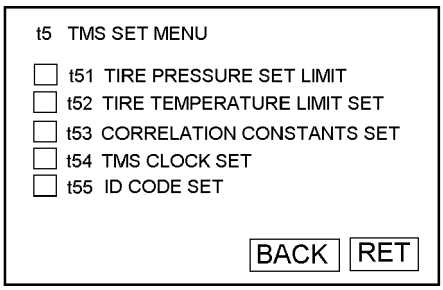


FIGURE 33-58.

When you select a menu and press its switch box, the selected menu screen appears.

When the BACK switch is pressed, this screen returns to the “t1 PARAMETER SET MENU" screen.

When the RET switch is pressed, this screen returns to “i3 MENU SELECT" screen.

REAL TIME DATA TABLES				
No.	**PAGE**	**SIGNAL NAME**	**DATA INDICATION**	**UNITS**
S251	**PMC REAL TIME MONITOR SCREEN (Continued)**			
	6	ENGINE SPEED		rpm
	6	SUS. PRESS. L		kg/cm^2, kpsi, MPa
	6	SUS. PRESS. R		kg/cm^2, kpsi, MPa
	6	TORQUE OUTPUT		%
	6	T/M INPUT SPEED		rpm
	6	MAX. SPEED (LOADED		km/h, mile/h
	6	MAX. SPEED (EMPTY)		km/h, mile/h
	7	DIP SW. 16 STATUS	ON:SW ON, OFF:SW OFF	----
	7	DIP SW. 15 STATUS	ON:SW ON, OFF:SW OFF	----
	7	DIP SW. 14 STATUS	ON:SW ON, OFF:SW OFF	----
	7	DIP SW. 13 STATUS	ON:SW ON, OFF:SW OFF	----
	7	DIP SW. 12 STATUS	ON:SW ON, OFF:SW OFF	----
	7	DIP SW. 11 STATUS	ON:SW ON, OFF:SW OFF	----
	7	DIP SW. 10 STATUS	ON:SW ON, OFF:SW OFF	----
	7	DIP SW. 9 STATUS	ON:SW ON, OFF:SW OFF	----
	8	DIP SW. 8 STATUS	ON:SW ON, OFF:SW OFF	----
	8	DIP SW. 7 STATUS	ON:SW ON, OFF:SW OFF	----
	8	DIP SW. 6 STATUS	ON:SW ON, OFF:SW OFF	----
	8	DIP SW. 5 STATUS	ON:SW ON, OFF:SW OFF	----
	8	DIP SW. 4 STATUS	ON:SW ON, OFF:SW OFF	----
	8	DIP SW. 3 STATUS	ON:SW ON, OFF:SW OFF	----
	8	DIP SW. 2 STATUS	ON:SW ON, OFF:SW OFF	----
	8	DIP SW. 1 STATUS	ON:SW ON, OFF:SW OFF	----
	9	SERVICE METER		h
	9	POWER SUPPLY		V
	9	SOFTWARE VERSION		----
s261	**ELECTRONIC DISPLAY PANEL REAL TIME MONITOR SCREEN**			
	1	ENGINE SPEED		rpm
	1	AISS SWITCH	ON:SW ON, OFF:SW OFF	----
	1	STANDARD SMR		h
	2	ENG. SPEED		rpm
	2	FRONT BRAKE ACCUM. PRE.	ON:Abnormal, OFF:Normal	----
	2	T/M OIL TEMP.	ON:Abnormal, OFF:Normal	----
	2	T/M FILTER RESTRICTION	ON:Abnormal, OFF:Normal	----
	2	BATTERY CHARGE	ON:Abnormal, OFF:Normal	----
	2	BLOW-BY PRESS.	ON:Abnormal, OFF:Normal	----
	2	ENG. OIL PRESS.	ON:Abnormal, OFF:Normal	----
	2	ENG. OIL TEMP.	ON:Abnormal, OFF:Normal	----
	2	COOLANT LEVEL	ON:Abnormal, OFF:Normal	----
	2	PARKING BR. STATUS	ON:BRAKE ON, OFF:BRAKE OFF	----
	2	REAR BRAKE STATUS	ON:BRAKE ON, OFF:BRAKE OFF	----
	2	BODY FLOAT CAUTION	ON:Body not in float, OFF:Body in float	----
	2	LATERAL INCLINATION	ON:Abnormal, OFF:Normal	----
	2	STRG. ACCUM. PRECHARGE	ON:Abnormal, OFF:Normal	----
	3	ENGINE SPEED		rpm
	3	STEERING PRESSURE	ON:Abnormal, OFF:Normal	----
	3	REAR BRAKE ACCUM. PRE.	ON:Abnormal, OFF:Normal	----
	3	BUZZER	ON:BUZZER ON, OFF:BUZZER OFF	----
	3	CENTRAL CAUTION LAMP	ON:LAMP ON, OFF:LAMP OFF	----

MAIN RELIEF VALVE

Function

The Main Relief Valve maintains the main hydraulic pressure in the transmission control circuits and controls the oil flow to the transmission clutches.

Operation

The oil from the hydraulic pump enters port “C” (Figure 2-6), then passes through orifice “B” and goes to chamber “A”.

When hydraulic pressure in the circuit rises, the pressure in chamber “A” also rises. This pushes the main relief spool (1) to the left, in the direction of the arrow, through the movement of piston (2). The oil at port “C” passes through “D” to chamber “E” and to the torque converter circuit.

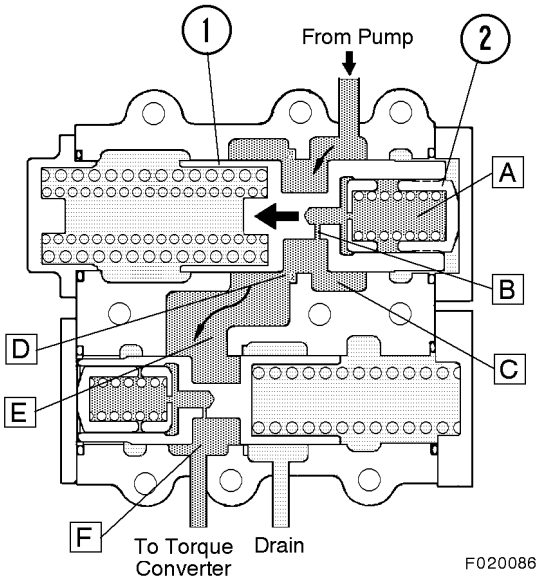


FIGURE 2-6. MAIN RELIEF VALVE

1. Main Relief Spool 2. Main Relief Valve Piston

ACTUATING PRESSURE
Engine @ 2100 RPM,
Oil Temperature @ 70° - 90° (158° - 194°)

. . . . . 44 ±1.5 kg/cm^2 (626 ±21 psi)

TORQUE CONVERTER RELIEF VALVE

Function

The Torque Converter Relief Valve protects the torque converter oil circuit by preventing the oil pressure from rising to an abnormally high pressure.

Operation

Oil from the Main Relief Valve enters port “F” (Figure 2-7) and then passes through orifice “H” and goes to chamber “G”.

When the hydraulic pressure in the circuit rises, the pressure in chamber “G” also rises. This pushes the Torque Converter Relief spool (4) to the right, in the direction of the arrow, through the movement of piston (3). As a result, the oil at port “F” can flow to port “I” and then into the transmission lubrication circuit.

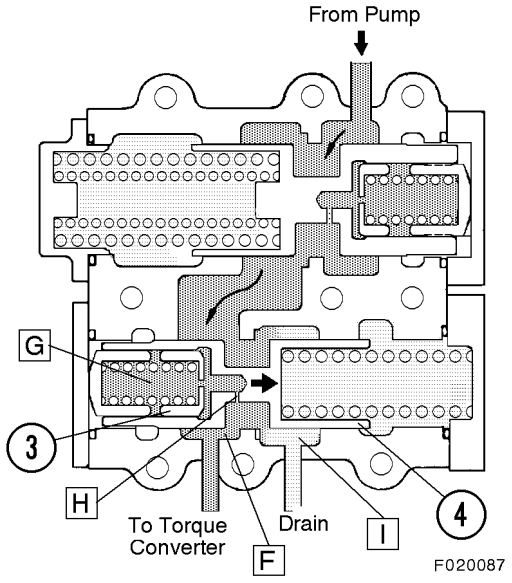


FIGURE 2-7. TORQUE CONVERTER RELIEF VALVE

3. Relief Valve Piston 4. Relief Valve Spool

ACTUATING PRESSURE
Engine @ 2100 RPM
Oil Temperature @ 70° - 90° (158° - 194°)

. . . . . 9.5 ±1.0 kg/cm^2 (135 ±14 psi)

Action of ECMV

The ECMV is controlled by the command current from the transmission controller to the proportional solenoid, and the output signal of the fill switch. The relationship between the ECMV proportional solenoid command current and clutch input pressure and the output signal of the fill switch is as shown in the diagram in Figure 2-20.

- A range: Before gear shifting (drained)
- B range: Filling starts (trigger issued)
- C range: Filling completed
- D range: Regulation
- E range: Filling

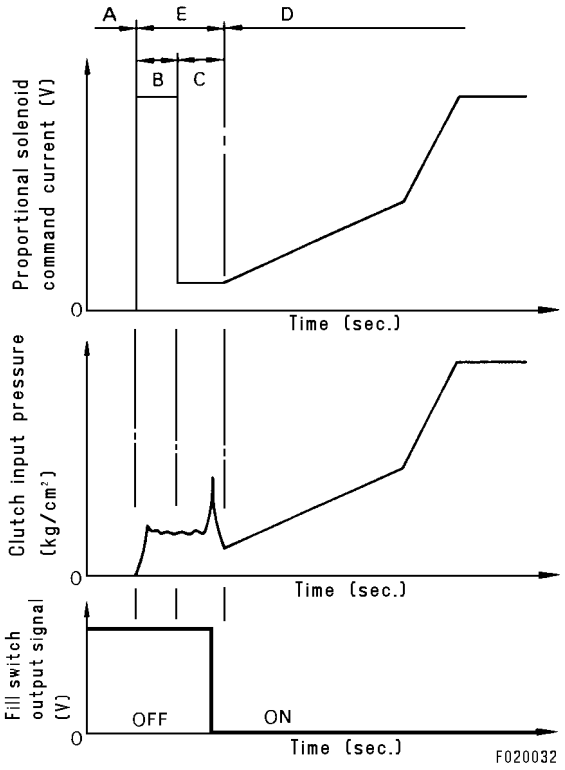


FIGURE 2-20.

☐ ***Before shifting gear (drained) (A range of graph)***

1. (Refer to Figure 2-21): When no current is being sent to proportional solenoid (6), the reaction force for spring (9) of the pressure control valve pushes pressure control valve spool (7). As a result, proportional solenoid (6) is pushed pack, so pressure control valve spool (7) connects the oil at clutch port C to drain port E and drains the oil.
   In this condition, there is no hydraulic force acting on spool (3) of the flow sensor valve, so the reaction force of spring (4) for the fill switch moves flow sensor valve spool (3) away from fill switch (5), and stops it in a position where it is in balance with return spring (2) of the flow sensor valve.

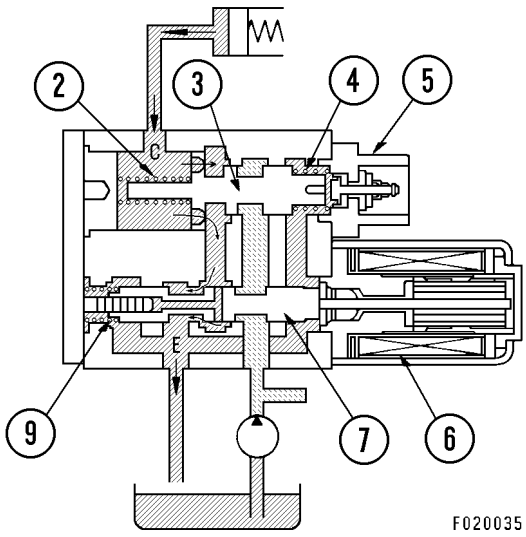


FIGURE 2-21.

13. Loosen suction lines on hydraulic pumps to bleed air from lines. (Refer to *Hydraulic System*, Section "L" for detailed instructions.) Tighten clamps securely after all air has been bled.
14. Start the engine and check for hydraulic leaks.
15. Allow transmission oil to reach normal operating temperature. Recheck transmission oil level with truck level, engine running at low idle, oil at operating temperature and transmission in NEUTRAL. Under the above conditions, oil level should be between the **lower** "H" and "L" marks of the sight gauge.
16. Operate truck to verify proper operation of transmission and controls.

Procedure For Centering The Engine Assembly And Transmission Assembly

NOTE: When the engine assembly, torque converter and transmission assembly, or drive shaft have been removed, the alignment of the engine and transmission must be checked and adjusted.

1. Install alignment tool (2, Figure 2-34) to the couplings at the engine end and torque converter end.

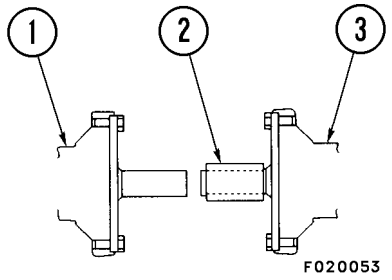


FIGURE 2-34. SHAFT ALIGNMENT

1. Engine End
2. Tool
3. Torque Converter End

NOTE: To raise transmission, place shims between the front mounts and the frame bracket.

2. While turning coupling at torque converter end, carry out centering so that tool (2, Figure 2-35 and 2-36) rotates smoothly on both shafts. Move the torque converter/transmission assembly end when centering.

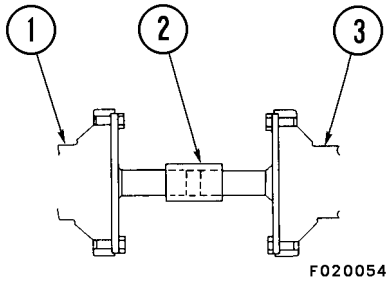


FIGURE 2-35. SHAFT ALIGNMENT

1. Engine End
2. Tool
3. Torque Converter End

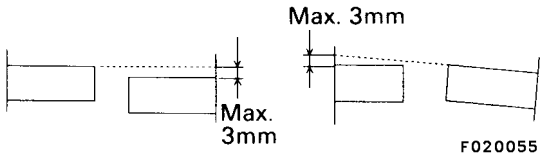


FIGURE 2-36. MAXIMUM SHAFT MISALIGNMENT

NOTE: The misalignment should be within 3.0 mm (0.12 in) in both the up-down and left-right directions. However, if they are not parallel, the distance at the point where they are farthest apart must be within 3.0 mm (0.12 in).

SENSORS, SWITCHES

Transmission Speed Sensors

Speed sensors are installed to monitor the rpm of the input, intermediate, and output gears of the transmission. The sensors generate a pulse voltage which varies with the speed of the gear teeth passing the sensor, sending a signal to the Transmission Controller.

The sensors must be adjusted correctly to ensure an adequate electrical signal is generated. If necessary, adjust as follows:

Adjustment Procedure

1. Disconnect wire connector (1, Figure 6-4), release locknut (4), and remove sensor. Observe location of gear teeth through sensor mounting hole. For proper adjustment, the tip of a gear tooth **must** be aligned with the sensor hole as shown in Figure 6-10. If necessary, reposition gear.
2. Inspect sensor for iron particles or other foreign material and clean if necessary.
3. Reinstall sensor. Adjust by hand until it just contacts the gear tooth.
4. Turn counterclockwise 3/4 turn to obtain proper clearance (“a”, Figure 6-8) and tighten locknut.
5. Reinstall wire connector.

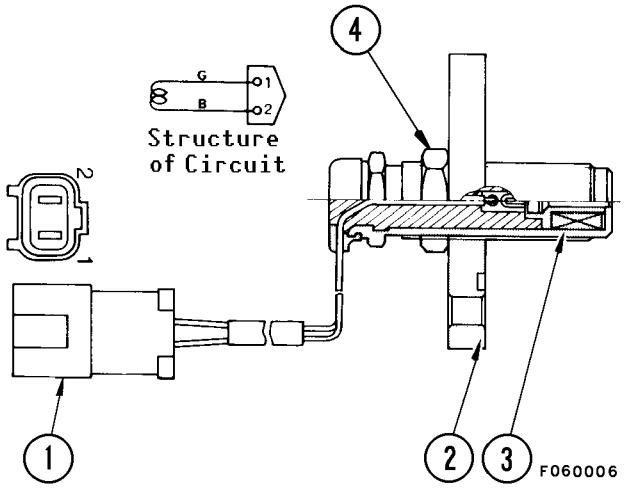


FIGURE 6-4. TRANSMISSION SPEED SENSOR

1. Connector
2. Flange
3. Sensor
4. Locknut

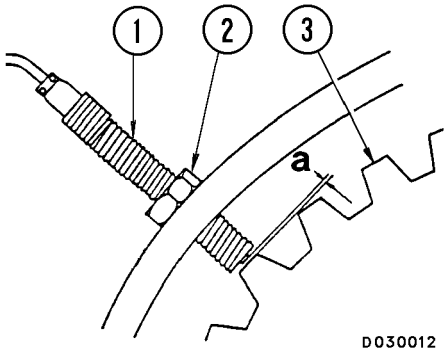


FIGURE 6-5. SPEED SENSOR ADJUSTMENT

1. Sensor
2. Locknut
3. Gear Tooth Tip
a. Clearance Gap

Installation

NOTE: Remove all dirt and rust from mating parts before installing wheel assembly.

1. Grasp tire assembly with the tire handler and move into position on wheel hub. Align the notch in the wheel hub with the wheel rim stopper.
2. Install wheel clamps (1, Figure 2-3) and nuts (2). Tighten the wheel clamp nuts uniformly. Rotate the wheel, then check that the lateral runout of the rim is within 5 mm. (0.20 in.)
3. Continue tightening nuts in increments until the following torque is obtained on each nut:

☐ *Threads coated with LM-P Anti friction compound:* **175 ±20 kg.m (1265 ±145 ft. lbs.)**

☐ *Dry threads:* **225 ±25 kg.m (1630 ±181 ft. lbs.)**

4. Check tire inflation for tire manufacturer's recommended pressure. Raise truck and remove all blocking.
5. Operate truck for one load and tighten wheel nuts again:

☐ *Threads coated with LM-P Anti friction compound:* **175 ±20 kg.m (1265 ±145 ft. lbs.)**

☐ *Dry threads:* **225 ±25 kg.m (1630 ±181 ft. lbs.)**

6. Check torque daily until torque values listed in step 5. is maintained on each nut. Check torque intermittently thereafter.

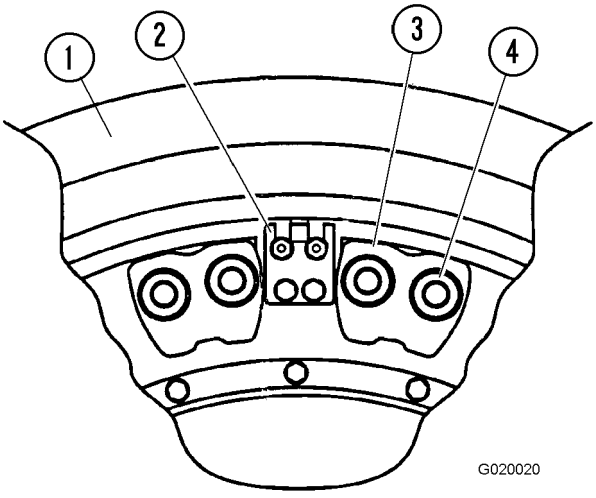


FIGURE 2-4. RIM AND CLAMPS

1. Rim
2. Air Valve Lock Plate
3. Clamp
4. Nut

REAR TIRE AND RIM

Removal

1. Stop the machine on level ground, apply parking brake, and put blocks on both sides of both front wheels.
2. Raise final drive enough for tires to clear the ground surface to be removed. Block the final drive case securely.
3. Remove air valve lock plate (2, Figure 2-4)
4. Remove clamp nuts (4) clamps (3).
5. Remove wedge ring (7, Figure 2-6).
6. Position tire removal apparatus as shown in Figure 2-5 and remove outside wheel assembly.
7. Remove spacer (2, Figure 2-5).

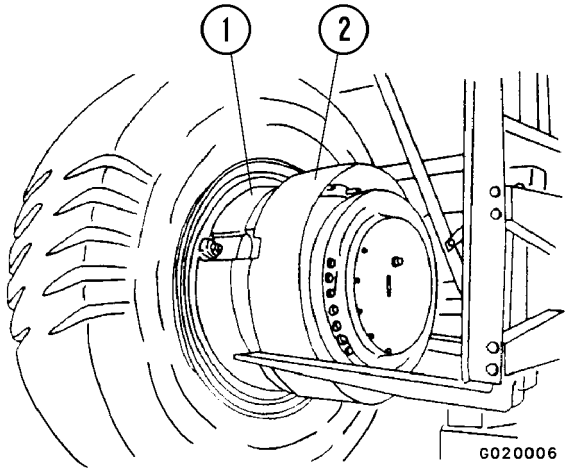


FIGURE 2-5. SPACER AND TIRE

1. Final Drive Housing
2. Spacer

FINAL DRIVE ATTACHMENTS

The rear axle and final drive assembly is attached to the truck frame by four links (1, 4, & 5, Figure 4-1) with spherical bearings at each link end, thus allowing the drive axle to oscillate with the ground contour and maintain a positive wheel contact for maximum drive force. The rear axle case also provides the lower mounts for the rear suspensions.

REAR AXLE ATTACHMENT

The following discussion covers the complete removal of the links and the removal of the spherical bearings from the links. However, depending on the reason for service, it may not be necessary to remove both ends of the links, or the bearings. The service technician should determine the level of disassembly required and proceed only to that point.

If only one end of a link is to be disconnected, be sure to support the free end of the link as necessary, so that it cannot fall and become a hazard to the servicing personnel.

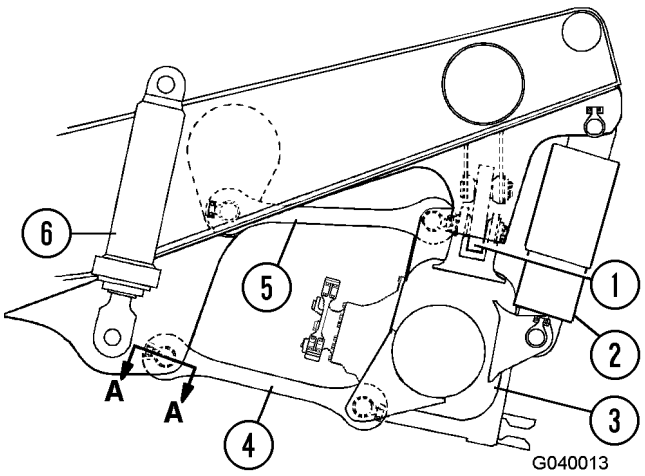


FIGURE 4-1. REAR AXLE ARRANGEMENT

1. Panhard Rod (Diagonal Link)
2. Rear Suspension
3. Rear Axle Housing
4. Lower Link (R.H. & L.H.)
5. Center Link
6. Hoist Cylinder (Ref.)

Lower Side Links and Center Link

Removal

1. Securely block front and rear wheels.
2. Support the rear of the truck frame under the hoist cylinder mounting.
3. Support front and rear side of rear axle housing.

⚠WARNING

Remove only one link at a time. If more than one link is to be removed at the same time, extra supports must be in place to prevent the frame and axle from moving out of position.
**** Each link weighs approximately 120 kg (265 lbs.). Be sure adequate supports and lifting devices are used.***

4. Place jack under the rear suspension mount on the same side as lower link to be removed.

⚠CAUTION

Be sure jack is secure to lower mount so it will not slide off as jack is extended.

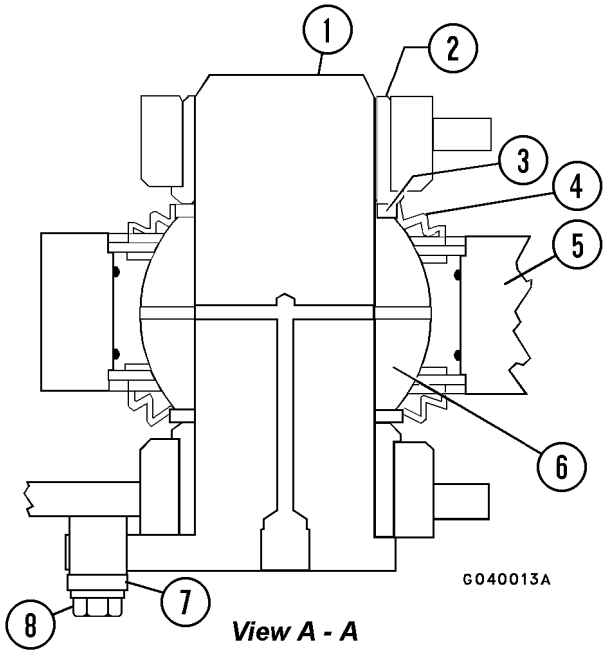


FIGURE 4-2. LINK PIN

1. Link Pin
2. Bushing
3. Spacer
4. Dust Boot/Snap Ring
5. Link
6. Spherical Bearing
7. Retainer Plate
8. Capscrew and Washer

Disassembly of Pinion Carrier Assembly

1. Remove carrier (2, Figure 5-8) together with inner bearing (3) from pinion gear (1).

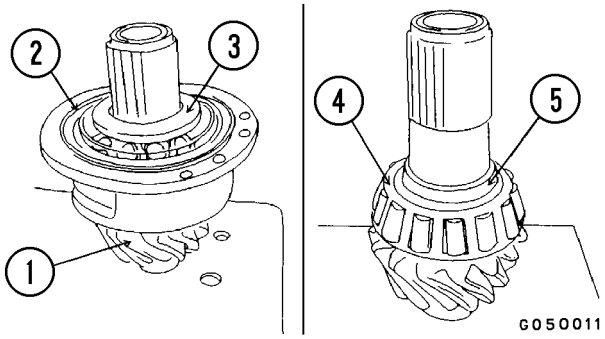


FIGURE 5-8. PINION BEARING

1. Pinion Gear
2. Carrier
3. Inner Bearing
4. Inner Bearing
5. Spacer

2. Remove spacer (5), then remove inner bearing (4).
3. Remove holder (4, Figure 5-9), then remove center bearing inner race (5) from pinion gear (6).
4. Remove bearing outer races (2) and (1) from carrier (3).

NOTE: The bearing is an adjustment-free bearing assembly (2 tapered roller bearings and spacer). Check the matching numbers, and keep as a set in a safe place.

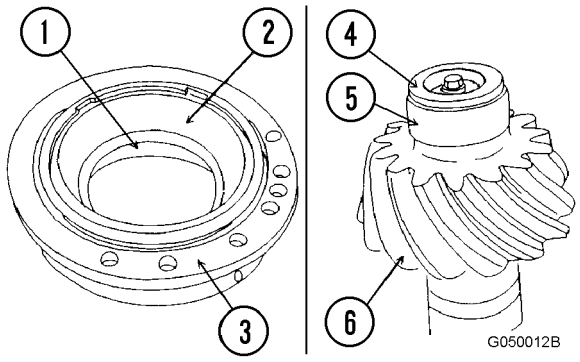


FIGURE 5-9. PINION GEAR AND RACES

1. Outer Race
2. Outer Race
3. Carrier
4. Holder
5. Inner Race
6. Pinion Gear

Differential Gear Unit

1. Remove locks (1, Figure 5-10).

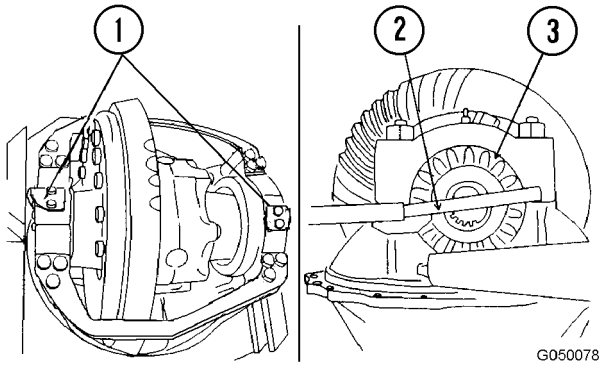


FIGURE 5-10. DIFFERENTIAL

1. Locks
2. Wrench (790-425-1660)
3. Capscrews

2. Using wrench (2), loosen left and right side bearing adjustment nuts (3) until they can be turned by hand.
3. Remove capscrews (2, Figure 5-11). Remove plates (5) and caps (1).
4. Lift off differential gear assembly (4).
5. Remove left and right side bearing adjustment nuts (3).

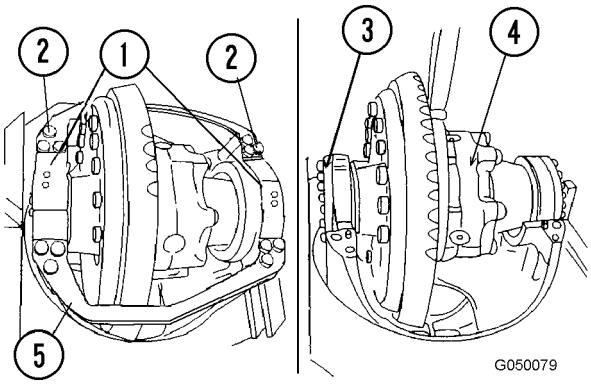


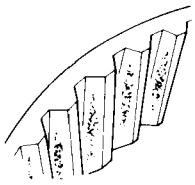
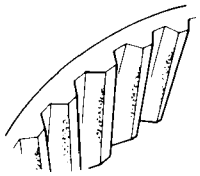
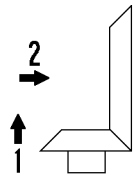
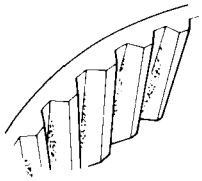
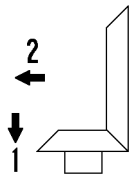
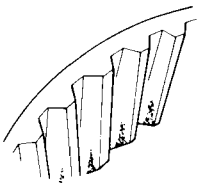
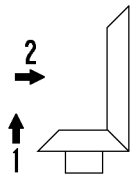
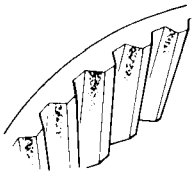
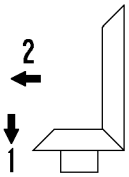
FIGURE 5-11. DIFFERENTIAL MOUNTING

1. Cap
2. Capscrews
3. Adjustment Nuts
4. Gear Assembly
5. Plate

3. Adjusting tooth contact

Mix red lead in spindle oil to form a thin paste, then coat the face of 7 or 8 teeth of the driven gear. Hold down the driven gear by hand to act as a brake, and rotate the drive pinion gear forward and backward, then inspect the pattern left on the teeth.

Adjust the tooth contact as shown in the following illustrations and procedure.

TOOTH CONTACT	CAUSE	PROCEDURE FOR ADJUSTMENT	
 Correct Tooth Contact	The tooth contact pattern should start from about 5 mm (0.19 in.) from the toe of the bevel gear and cover about 50% of the length of the tooth. It should be in the center of the tooth height.	Adjust the drive pinion by adjusting the shims at the drive pinion cage. Adjust the driven gear in the same way as when adjusting backlash.	
 Not Acceptable	Drive pinion is too far from driven gear.	1. Reduce shims at the drive pinion to bring closer to driven gear. 2. Move driven gear further away from the drive pinion and adjust backlash correctly.	
 Not Acceptable	Drive pinion is too close to driven gear.	1. Increase shims at drive pinion to move away from driven gear. 2. Move driven gear closer to drive pinion and adjust backlash correctly.	
 Not Acceptable	Driven gear is too close to drive pinion.	1. Reduce shims at drive pinion to bring closer to driven gear. 2. Move driven gear further away from drive pinion and adjust backlash correctly.	
 Not Acceptable	Driven gear is too far from the drive pinion.	1. Increase shims at drive pinion to move away from driven gear. 2. Move driven gear closer to drive pinion and adjust backlash correctly.	

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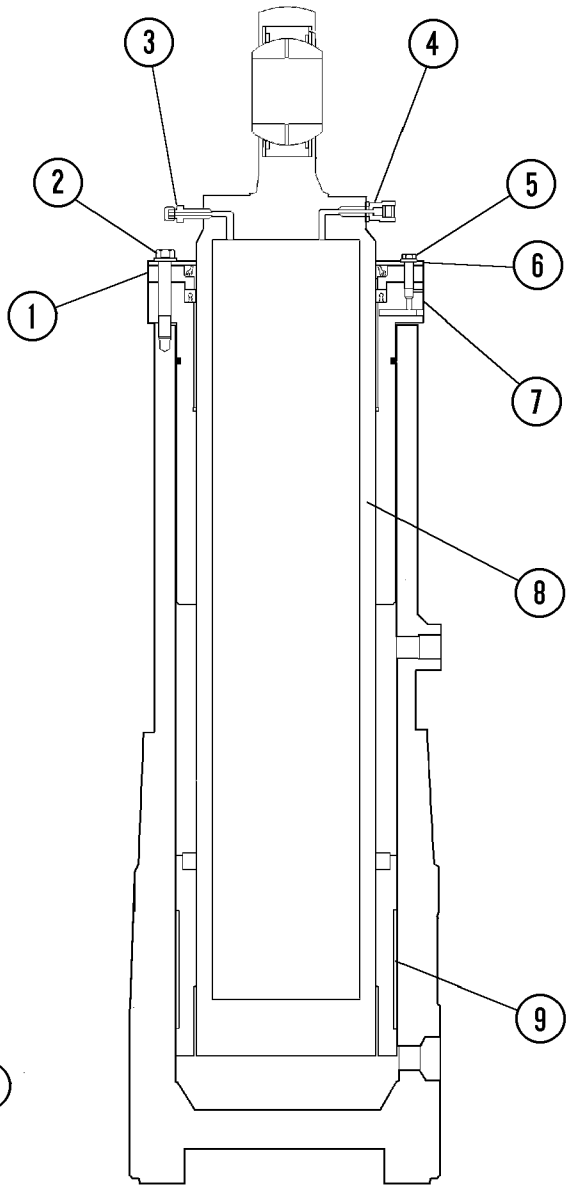
SECTION H

SUSPENSIONS

INDEX

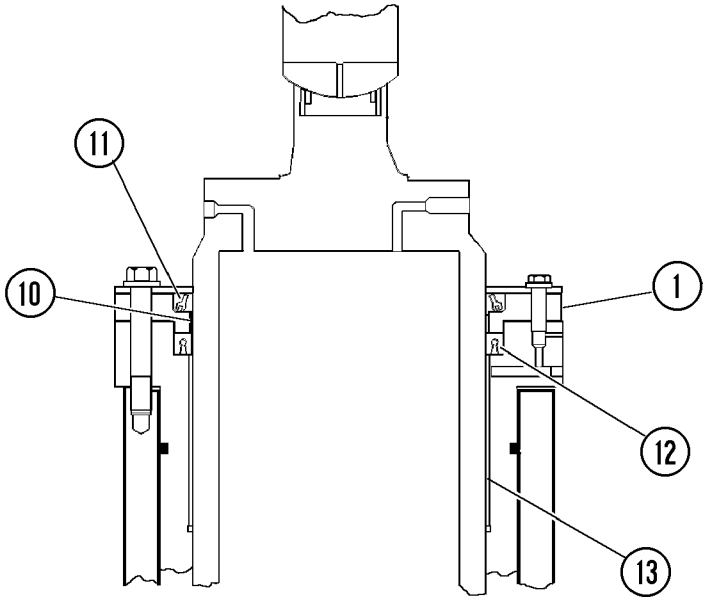
FIGURE 2-13. FRONT SUSPENSION ASSEMBLY

1. Retainer
2. Capscrew
3. Charging Valve
4. Discharge Valve
5. Air Bleed Plug
6. Plate
7. Flange
8. Rod Assembly
9. Wear Ring
10. Bushing
11. Dust Seal
12. Seal
13. Bushing



SUSPENSION CROSS SECTION

SEAL and UPPER BUSHING DETAIL



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OILING AND CHARGING PROCEDURES

GENERAL

These procedures cover oiling and charging of suspensions on Komatsu 530M/HD1500-5 trucks. Suspensions which have been properly charged will provide improved handling and a better ride while improving the service life of the truck main frame and suspensions.

NOTE: Inflation pressures and exposed piston lengths are calculated for a normal truck gross vehicle weight (GVW). Any accumulation of dirt/mud/debris on the truck or in the body should be removed before starting these procedures. Additions to truck weight (tailgates, water tanks, etc.) should be considered part of the payload. Keeping the truck GVW within the specification will result in a better ride and will extend the service life of the truck main frame and suspensions.

Proper charging of suspensions requires that three (3) basic conditions be established in the following order:

1. Oil level must be correct.
2. Suspension piston rod extension for nitrogen charging must be correct and this dimension be maintained during nitrogen charging.
3. Nitrogen charge pressure must be correct.

For best results, suspensions should be charged in pairs (fronts together and rears together).

NOTE: Setup dimensions specified in the charts must be maintained during oiling and charging procedures. However, after truck has been operated, these dimensions may vary.

EQUIPMENT LIST

1. Service Kits:
   a. EC6027 Oil Charging Kit (Figure 4-5)
   b. EC3331Nitrogen Charging Kit (Figure 4-6)
2. Jacks and/or Overhead Crane
3. Spacers (two) for Oiling height; 63.5mm (2.5 in.)
4. Oil (MIL-L-2104C, SAE 10W)
5. Dry Nitrogen (See Nitrogen Specifications Chart)

NITROGEN GAS SPECIFICATIONS		
Nitrogen gas used in suspension cylinders must meet or exceed CGA Specification G-10.1 for Type 1, Grade F Nitrogen Gas.	**PROPERTY**	**VALUE**
	Nitrogen	99.9% Min.
	Water	32 PPM Max.
	Dew Point	-55°C(-68°F) Max.
	Oxygen	0.1% Max.

⚠WARNING

All suspensions are charged with compressed nitrogen gas with sufficient pressure to cause injury or damage if improperly handled. Follow all safety notes, CAUTIONS, and WARNINGS in these procedures to prevent accidents during servicing and charging.

FRONT SUSPENSION

1. Park unloaded truck on a hard level surface. Block wheels, apply parking brake.
2. Check that the bottom of the cylinder cover is within the range marked by arrows (Figure 4-1) for correct nitrogen charge.
3. If the suspension is within the area indicated by arrows, no service is necessary for the front suspensions. See “NOTE” below.
   If suspension is not within the area indicated by the arrows, the front suspensions will have to be serviced.

NOTE: The oil level should be checked:
- *Before charging or adding nitrogen.*
- *When there are signs of oil leakage.*
- *After rebuild/repair and the suspension is installed on the truck.*

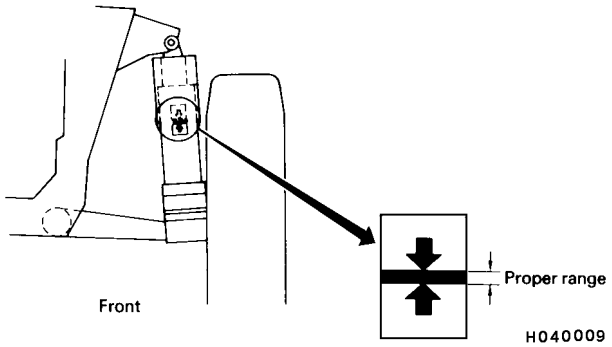


FIGURE 4-1. FRONT SUSPENSION HEIGHT

BRAKE CIRCUIT

The Model 530M truck is equipped with an all-hydraulic actuated wet disc service brake system. A three caliper, disc type parking brake is located on the front of the final drive.

The brake system utilizes oil provided by the brake/steering pump from the front section of the hydraulic tank for brake application. During truck operation, front brake disc cooling oil is provided by a hydraulic pump driven by the transmission PTO gear case. The rear brake cooling oil is supplied by the pump supplying the front brake circuit along with oil returning from the hoist valve.

The fundamental function of the service brake system is to provide the operator the control needed to stop the truck in a slow, modulating fashion in as short a distance as reasonably possible.

Outlined below are the functions Komatsu feels are necessary for safe truck operation:

- Warn the operator as soon as practical of a serious or potentially serious loss of brake pressure so proper action can be taken to stop the truck before the secondary system is exhausted of power.
- Provide secondary brake circuits such that any single brake system malfunction ensures the truck has sufficient stopping power.
- Automatically apply service brakes if low pressure warnings are ignored and pressures continue to decrease.
- A wheel brake lock to relieve the operator from holding the brake pedal while at the dump or shovel.
- A spring applied park brake for holding, not stopping, the truck during periods other than loading or dumping. The parking brake remains effective when the engine is stopped and hydraulic system oil pressure is released.
- A brake system that is easy to diagnose and service.

The following brake circuit description should be used in conjunction with the hydraulic brake system schematic, located in Section “R”.

The brake system consists of several major components: The foot operated dual circuit treadle valve, hydraulic operated relay valves, brake manifold and a Retard Control Module with lever assembly.

The dual circuit treadle valve, Retard Control Module and retard control lever are located in the cab. The remainder of the system, including the relay valves, brake manifold, two accumulators, and electrical components, are located in a weatherproof cabinet (Figure 2-1) to the right of the operator’s cab. The hydraulic components cabinet is easily accessible for brake system diagnostic and service work.

The brake manifold contains circuit isolation check valves, accumulator bleed down valves, and valves for brake lock, park brake and automatic apply functions. All of these components are screw-in cartridge type valves.

There are four independent means of brake actuation on the truck:

- Service brake pedal
- Retarder lever
- Brake lock switch
- Auxiliary brake

SERVICE BRAKE CIRCUIT

This portion of the system provides the operator the precise control needed to modulate (feather) brake pressure to slowly stop the truck or develop full brake effort to stop as quickly as possible. The heart of this circuit is the treadle operated dual circuit brake valve. This valve enables the operator to control the relatively high pressure energy within the brake accumulators directed to the brakes.

There are two valves in the dual brake valve. One provides apply pressure for the brakes on the front axle. The other supplies pressure to a relay valve to provide apply pressure for the brakes on the rear axle.

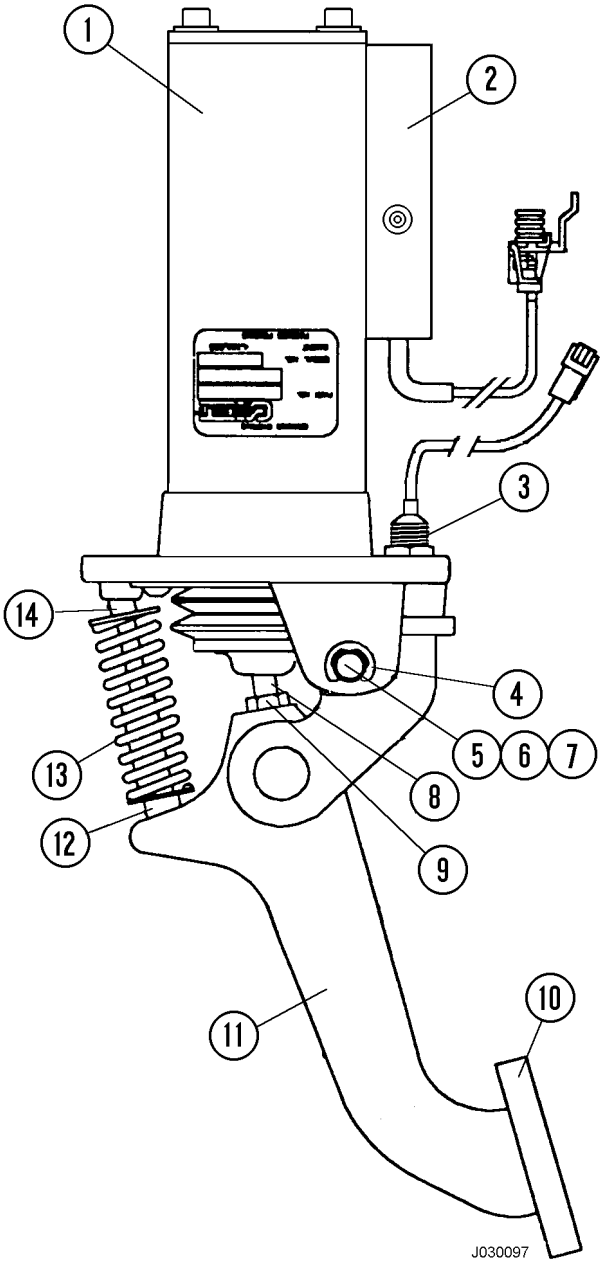


FIGURE 3-2. BRAKE VALVE ASSEMBLY

1. Brake Valve
2. Differential Pressure Switch
3. Proximity Switch
4. Retainer Clip
5. Pivot Shaft
6. Nylon Bushing
7. Shim
8. Bolt
9. Lock Nut
10. Foot Pad
11. Pedal Actuator
12. Pivot Stop
13. Spring
14. Pivot Stop

Disassembly

NOTE: During disassembly, precision machined parts should be ink marked or tagged to ensure proper reassembly and minimize adjustment time. All internal parts must be placed back into the bores from which they were removed.

1. Match mark each section of the brake valve prior to disassembly.
2. Drain oil from all ports of the valve by rotating the valve over a suitable container.
3. Secure brake valve in an upright position in a vice.
4. Remove the brake pedal actuator (11, Figure 3-2) by removing the retaining clips (4), then remove the pivot shaft (5) with a punch and hammer.
5. Remove the four button head allen screws (3, Figure 3-3) securing the boot retainer plate (4).
6. Remove the boot retainer plate (4), boot (2), and actuator cap (1) as an assembly by grasping the boot and gently lifting from the valve body.

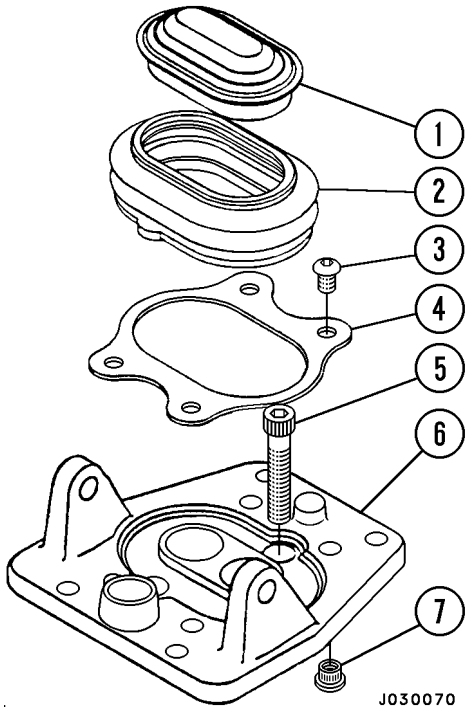


FIGURE 3-3. ACTUATOR CAP & BOOT

1. Actuator Cap
2. Boot
3. Capscrew
4. Retainer Plate
5. Capscrew
6. Actuator Base
7. Threaded Insert

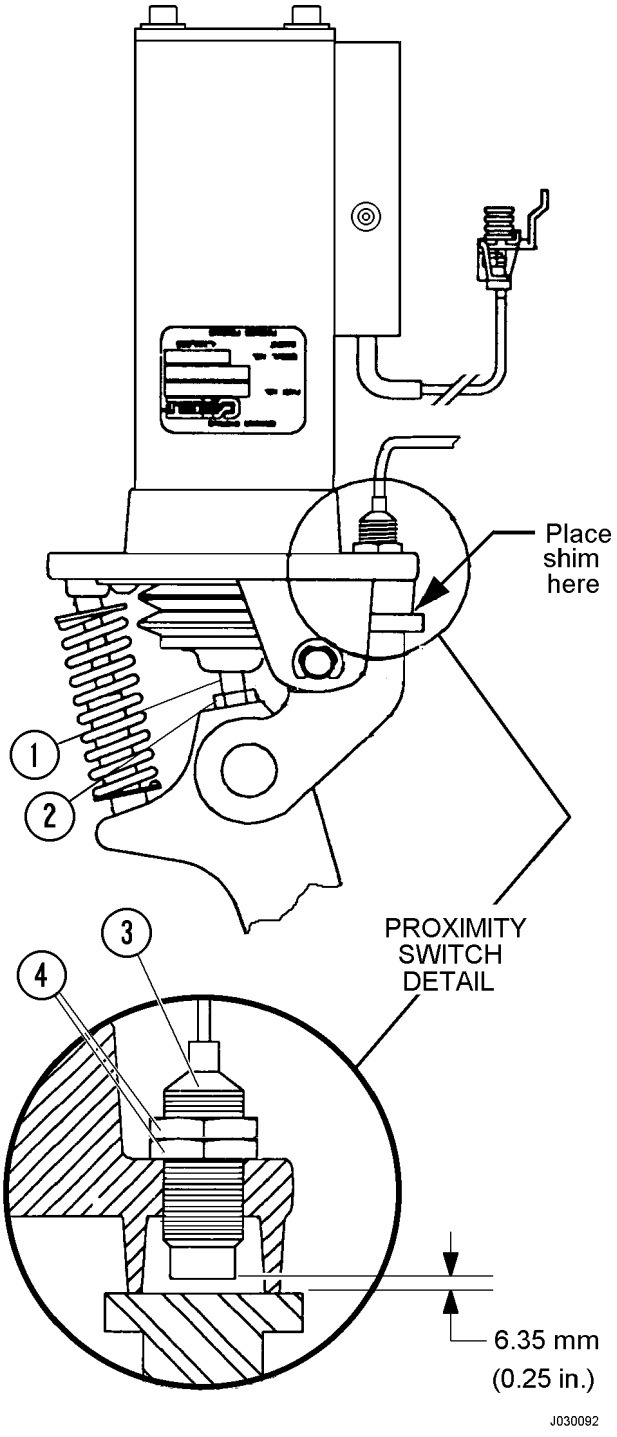


FIGURE 3-10. PEDAL ASSEMBLY ADJUSTMENTS

1. Square Head Bolt
2. Nut
3. Proximity Switch
4. Jam Nuts

24. Adjust square head bolt (1, Figure 3-10) until the bolt is not touching the actuator cap. Apply Loctite® 242 to the adjustment bolt prior to setting the deadband.
25. Set the deadband by placing a 0.254 mm (0.010 in.) thick shim at location shown in figure 3-10 (between the pedal structure and return stop boss on pivot structure).
26. Adjust the bolt (1) until it is just touching the cap.
27. Continue turning the adjustment bolt until pressure begins to rise on one of the brake apply pressure gauges.
28. Back-off the adjustment bolt 1/8 turn.
29. Tighten the jam nut (2) and remove the shim stock inserted in step 25.
30. Fully stroke the brake pedal actuator to check that output pressure at port “B1” and “B2” are within specifications.

NOTE: If pedal is adjusted properly, the spring and spring pivots will not interfere with pedal travel.

31. If pressure is not within specifications, re-adjust. If pressure is within specifications, apply a few drops of Loctite® #262 to the jam nut.
32. Check internal leakage at port “T”. Leakage must be less than 100 cc/minute with the valve in the released position and system pressure supplied to the “P1” and “P2” inlet ports.
33. “T” port leakage must be less than 250 cc/minute with valve pilot pressure or manual applied.

Proximity Switch Installation and Adustment

34. Install the proximity switch (3, Figure 3-10) in the actuator base until the switch is approximately 6.35 mm (0.25 in.) below the boss on the actuator base.
35. Lock switch in position with the two jam nuts (4).

⚠ IMPORTANT ⚠

36. Connect an ohmmeter to the switch harness to check continuity.

b. Verify housing I.D. does not exceed 152 mm (5.999 in.).

c. Check dimensions frequently during honing operation to prevent removal of too much material. **Do not hone gland seal area.**

4. If housing defects can not be removed within the above limits, replace the housing.

⚠ DANGER

Repair of the housing by welding, machining or plating to salvage a worn area is NOT APPROVED. These procedures may weaken the housing and result in serious injury to personnel when pressurized.

5. Clean parts thoroughly to remove abrasive residue after honing.

Assembly

⚠ IMPORTANT ⚠

Assemble the accumulators in a dust and lint free area. Maintain complete cleanliness during assembly to prevent possible contamination.

1. Install a new seal (10, Figure 3-16) on piston. Install new bearings (9). Coat seal and bearings with a small amount of petroleum jelly.
2. Install the piston with the concave side toward gas end (gland end) of accumulator cylinder housing (7). Push the piston to the center of of the housing.
3. Install new O-ring (5) and backup ring (6) on gland (1). Coat seals with a small quantity of type C-4 hydraulic oil.
4. Install gland and tighten to **76 kg.m (550 ft. lbs.)** torque using tool as shown in Figure 3-15.
5. Install charging valve (2) with new O-ring. Tighten charging valve large hex nut to **2.3 kg.m (16.5 ft.lbs.)** torque.
6. Install pressure switch. Install pressure test fittings in bottom of housing. (Refer to “Testing” instructions which follow.)

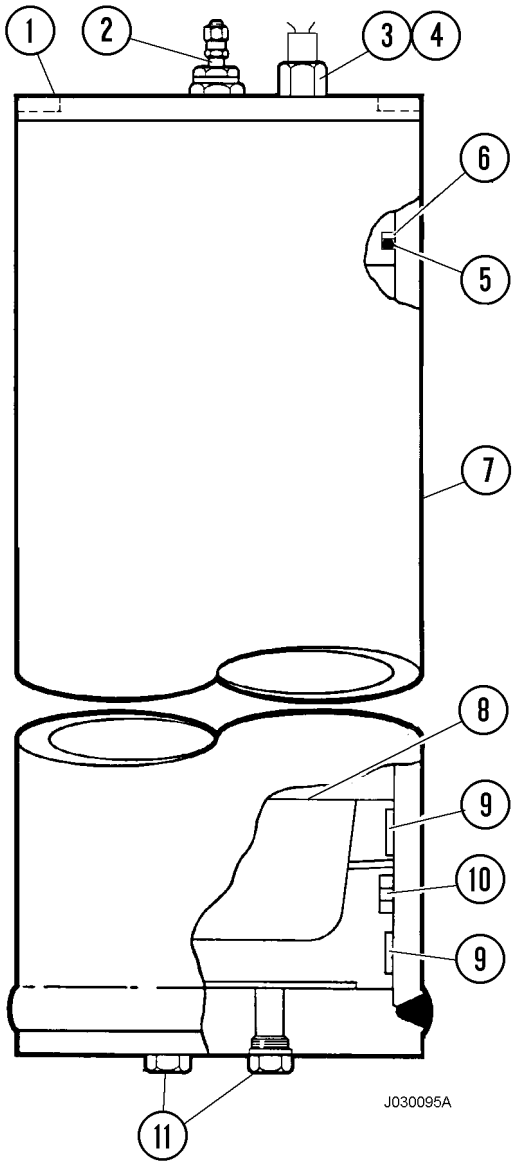


FIGURE 3-16. BRAKE ACCUMULATOR ASSEMBLY

1. Gland
2. Charging Valve
3. Pressure Switch
4. O-Ring
5. O-Ring
6. Backup Ring
7. Tube
8. Piston
9. Bearing
10. “T” Ring Seal
11. Plug

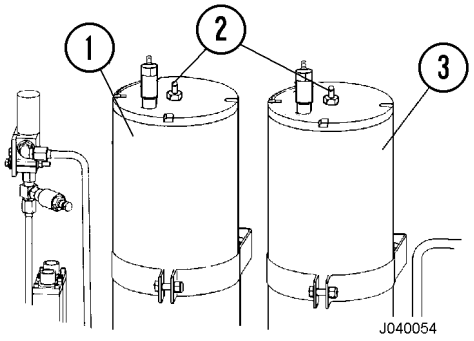


FIGURE 4-4. BRAKE ACCUMULATORS

1. Rear Brake Accumulator
2. Charging Valve
3. Front Brake Accumulator

3. Close both accumulator bleeddown valves.

4. Refer to Figure 4-5 for pressure test diagnostic coupler locations in the hydraulic components cabinet. Install a 3000 psi (21 MPa) pressure gauge at each of the following:
   - Front brake test port (2).
   - Left rear brake test port (7).
   - Right rear brake test port (8).
   - Park brake release pressure port “PK2” (3).
   - Install a 5000 psi (35 MPa) gauge in the Low accumulator pressure test port “LAP1" (5).

5. Apply park brake (3, Figure 4-3). Release brake lock (4).

6. Start engine and observe rising brake pressures as system charges.

   ☐ Front brakes should release between 1350 psi (9.31 MPa) and 1650 psi (11.38 MPa)

   ☐ Rear brakes should release at approximately 1650 psi (11.38 MPa).

* *Record on data sheet.*

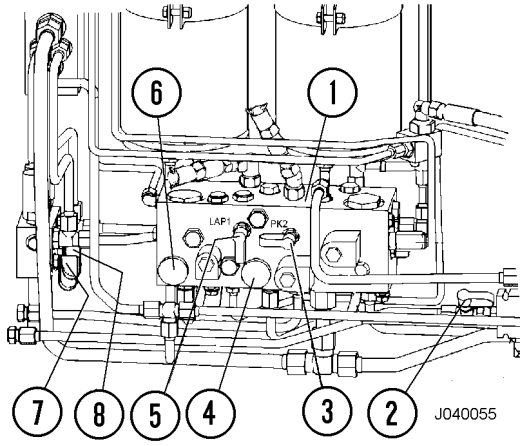


FIGURE 4-5. PRESSURE TEST PORTS

1. Brake Manifold
2. Front Brake Pressure Test Port
3. “PK2” Pressure Test Port
4. Front Brake Accumulator Bleeddown Valve
5. “LAP1” Pressure Test Port
6. Rear Brake Accumulator Bleeddown Valve
7. Left Rear Brake Pressure Test Port
8. Right Rear Brake Pressure Test Port

POSSIBLE CAUSES	SUGGESTED CORRECTIVE ACTION
TROUBLE: Low Pressure Warning is On Even Though System Pressure is Proper	
Short in electrical system.	Check wiring.
Pressure switch is defective.	Replace the switch.
TROUBLE: Low Pressure Warning Comes On and Pressure is Low	
Steering circuit is malfunctioning.	Check steering circuit pressures.
The pump is worn.	Rebuild or replace pump.
TROUBLE: A Brake Accumulator Bleeds Off Quickly When Supply Pressure is Cut Off	
Accumulator bleeddown valve is open.	Close valve, check precharge.
Accumulator precharge is low.	Recharge accumulator
Leak in one circuit.	Check plumbing.
Malfunction in brake valve.	Disassemble and clean, or replace.
TROUBLE: A “Squeal” is Heard When Controller is Operated	
Rapid operation of controller.	Normal
Brake Valve assembly is damaged.	Replace the brake valve assembly.
Hydraulic oil is too hot.	Check entire hydraulic system for restriction etc.
TROUBLE: The Output Pressure At Controller is Correct but Brakes are Not Applying	
Brake lines are blocked or improperly connected.	Check plumbing.
TROUBLE: The Brake Pressures Drift Excessively While Pedal is Held Steady	
Contamination in brake valve assembly.	Disassemble and clean, or replace.
Damage in brake valve assembly.	Repair or replace brake valve assembly.
Relay valve malfunctioning	Repair or replace relay valve assembly.
TROUBLE: Oil is Leaking Around the Pedal Base	
Defective seal on top of brake valve.	Replace the seal.

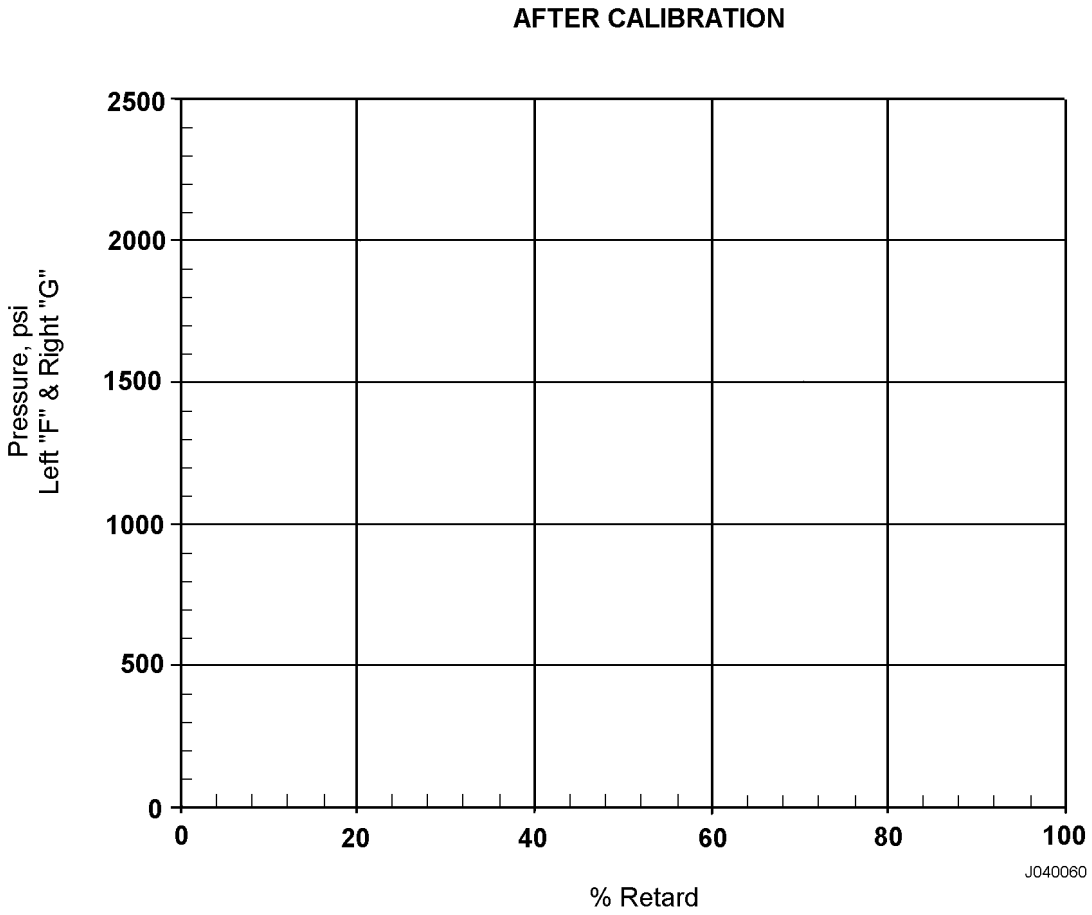


FIGURE 4-21. AFTER RCM CALIBRATION

(Plot both left “F and right “G” MOM display pressures from Table in Figure 4-19 for each retard lever input value.)

Name of Mechanic or Inspector Performing Check-Out _____

6. While fully applying the service brake pedal, check brake wear as follows:
   a. Push the wear gauge in until it contacts the brake piston. Check the position of the stamped mark on the rod (2, Figure 6-2). If the stamped mark goes in beyond the face of the case (5), the disc pack is worn to maximum safe wear limits. Brakes should be scheduled for rebuild.
   b. If the stamped mark on the rod does not go beyond the face of the case, brake disc wear is still within allowable limits.

NOTE: If the mark is close to the face, more frequent inspections should be performed.

7. Release brakes. Shut down engine, allow steering accumulators to bleed down. Open brake accumulator bleeddown valves to remove all pressure from the brake system. Close valves after all pressure is released.
8. Remove the brake disc wear indicator tool and reinstall wear gauge plug.
9. To check the remaining brake assemblies, repeat steps 1. through 8.

*NOTE: **Checking disc wear in all four brake assemblies is recommended.** Disc wear in one brake assembly may be different from the other due to dissimilar operation of parts and/or haul profiles.*

10. Refill hydraulic tank as required.
11. If brake repairs are necessary, refer to *"Disc Brake Rebuild Procedure"*, on the following pages.

WEAR INDICATOR SENSOR

Each wheel is also equipped with a wear indicator sensor which will alert the operator when brake disc wear is excessive. The sensor consists of a switch and a wear rod. The rod, inserted through a port in the brake cylinder, is positioned against the piston and follows piston movement during brake applications. If rod travel exceeds the wear limit, the switch activates and illuminates the Maintenance Monitor lamp on the instrument panel. In addition, a signal is sent to the "MOM" display providing a message describing the location of the sensor that has been activated. Refer to "PMC Fault Code List" E045 - E053; E0A9 - E0b3.

NOTE:
Sensor Switch Circuit OPEN = FAULT
Sensor Switch Circuit CLOSED = O.K.

Parking Brake

DESCRIPTION

The disc type parking brake, mounted on the final drive input, utilizes three brake heads with spring cans (hydraulic cylinders) containing internal springs which apply the parking brake when hydraulic pressure is released.

When the engine is running and the park brake switch is in the OFF position, hydraulic oil is routed to the spring cans to extend the pistons and mechanically retract the disc brake pads to release the park brake.

A slack adjuster, mounted between each brake head and spring can, automatically maintains the correct disc pad adjustment. Automatic adjustment occurs when the parking brake is applied.

⚠WARNING

Before removing any brake lines or brake circuit components, be certain the steering system and brake system accumulators are bled down. To bleed down accumulators:

- ***Block truck wheels***
- ***Turn the key switch OFF and wait approximately 90 seconds for the steering accumulators to bleed down. Rotate the steering wheel; no wheel movement should occur.***
- ***Bleed the brake accumulators (located in the hydraulic components cabinet) by opening (turning counterclockwise) the bleeddown valves (NV1, NV2) located on the brake manifold. Wait approximately 90 seconds to let accumulators bleed down. When brake accumulators are completely bled down, close the bleeddown valves completely by turning clockwise.***

Hoist Pump

Oil from the tandem gear pump (2, Figure 2-2), mounted on the left side of the transmission PTO, is directed to the split spool hoist valve. Whenever the truck body is not being raised, the oil is directed through the rear brake cooling circuit before returning to tank. On its path it will pass through a pair of filters and a heat exchanger. This circuit also utilizes a brake control valve (BCV). If the rear brakes are not applied, 50% of the oil returning from the hoist valve will be bypassed around the rear brake cooling circuit and flow directly to tank.

An internal, adjustable relief valve protects the hoist circuit from pressures in excess of 193 kg/cm^2 (2750 psi).

Brake Cooling Pump

The tandem gear pump (5, Figure 2-2), mounted on the right side of the transmission PTO, directs oil flow to the front and rear brake cooling circuits. The front (drive shaft end) section provides oil for the front brake circuit while the other section provides oil for the rear brake circuit.

Brake Control Valve (BCV)

Each circuit has its own brake control valve (BCV). If the brakes are not applied, 50% of the cooling oil is bypassed around the brakes and heat exchanger to be returned directly to the tank. This reduces power loss caused by excessive oil flowing through the brake housing. Also built into the BCV's is a relief valve which will activate at 9 kg/cm^2 (128 psi). When actuated, the pilot relief valve will cause the main relief valves to open allowing the excess oil to return to tank.

FILTERS

High Pressure Filter

The truck is equipped with one high pressure filter with a Beta 12 = 200 rating, for the steering and brake system. The filter assembly has a built-in bypass system which activates a message in the "MOM" display panel when the differential pressure across the filter exceeds 2.5 kg/cm^2 (35 psi).

The filter should be changed as soon as possible after the indication in "MOM", before actual by-pass occurs. For the regular filter service interval, refer to "Lubrication and Service", Section P, or replace when the indicator light turns on.

Low pressure

The truck is also equipped with three low pressure filters, for the hoist and brake cooling circuits. All three filters have a built in bypass system which also activates a display message in "MOM" when the differential pressure indicates by-pass for any of the filters.

The filter elements should be changed as soon as possible after the indication in "MOM", before actual by-pass occurs. For the regular filter service interval, refer to "Lubrication and Service", Section P, or replace when the indicator light turns on.

9. To remove bottom pressure plate (2, Figure 3-10), insert an expandable bearing puller (1) in the shaft bore of the plate and tighten it.
   a. By applying a light forward and back force to the puller handle, the plate can be dislodged.
   b. Lift the plate straight up and out.
10. If a bearing puller is not available, grind a screwdriver shape on the short end of an Allen wrench. Insert the ground end of the wrench into the shaft bore and lift the plate up.
   a. Move the wrench to the opposite bore and lift up, repeating this action until the plate has been dislodged.
   b. With thumbs in the bores of the plate, lift it straight up and out.

⚠CAUTION

Use extreme care in removing the plate. Do not pry or force. If the plate hangs, work it up and down until free, then lift it out.

11. Remove ring retainer, O-ring, back-up ring, and isolation plate located under the pressure plate removed in step 9 (or 10).
12. Lift the body straight up and off of the studs. If the body is stuck on the dowels, use a plastic hammer or wooden mallet and tap around the body to loosen it.
13. Remove spline coupling (9, Figure 3-6) from the rear drive shaft.

NOTE: Some pumps have O-rings (19) installed around the studs in the top surface of the bearing plate (8). These O-rings are used to prevent vibration of the studs under load conditions.

14. Remove the O-rings and lift the bearing plate off. It may be necessary to tap the plate lightly with the mallet to loosen it from the dowels.
15. To complete the disassembly of the pump repeat steps 5 through 11 as applicable to the rear section.
16. Refer to “Seal Replacement” for flange plate seal removal instructions.
17. Inspect all parts to determine which if any, should be replaced.

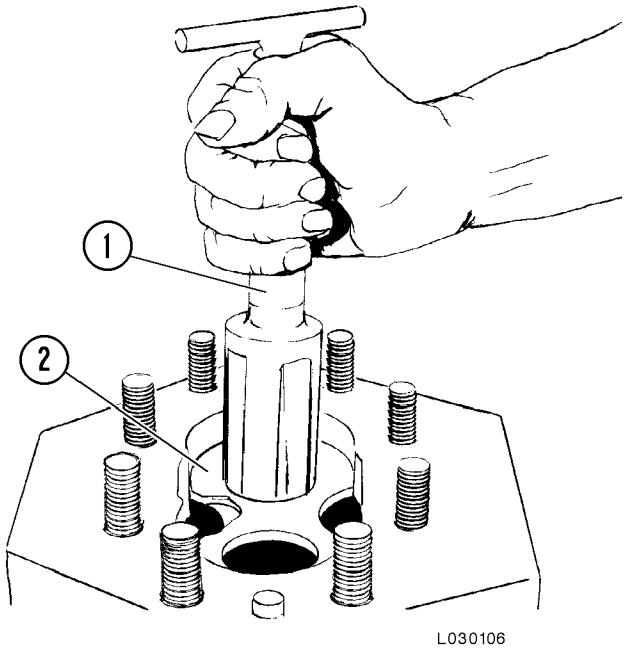


FIGURE 3-10. PRESSURE PLATE REMOVAL
1. Bearing Puller 2. Pressure Plate

Inspection Of Parts

1. Visually inspect the gear bores in the pump bodies. During initial break-in at the factory, the gears cut into the housing. The nominal depth of this cut is 0.20 mm (.008 in.) and should not exceed 0.38 mm (.015 in). Due to the hydraulic loading of the gears, the cut will start on the suction side of the body and will continue about one third of the way around each gear bore. The cut should be smooth with no deep grooves or deep scratches. Reject the body if the depth of the groove is greater than 0.38 mm (.015 in.), or if the gear bores look like they have been sand blasted. Reject the body if it is cracked or otherwise damaged.
2. Examine the pressure plates They should not show excessive wear on the bronze side. If deep curved wear marks are visible, reject them.
3. Examine the gears. If excessive wear is visible on the journals, sides, or face of the gears, or at the point where the drive gear rotates in the lip seal, reject them.

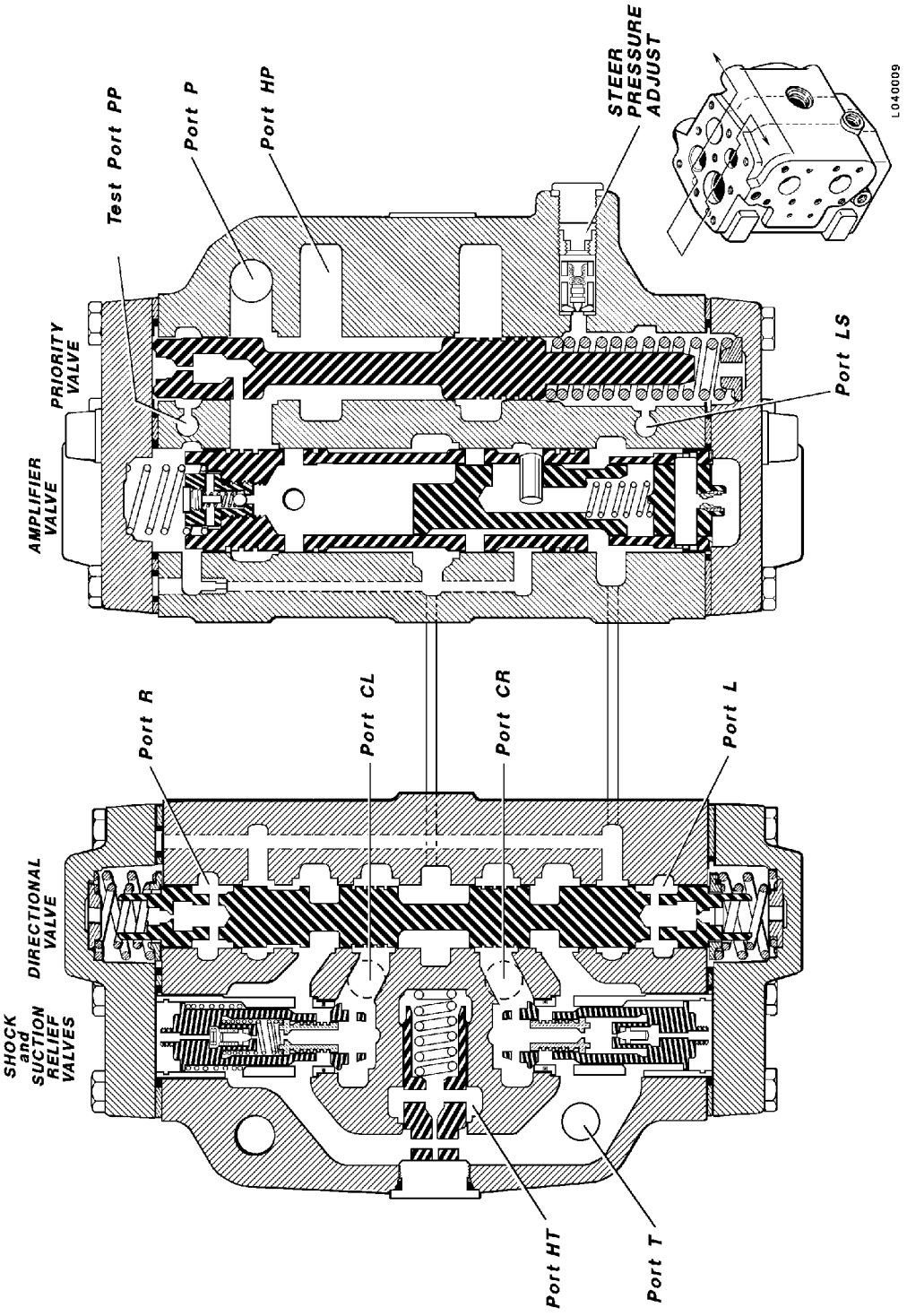


FIGURE 4-2. FLOW AMPLIFIER

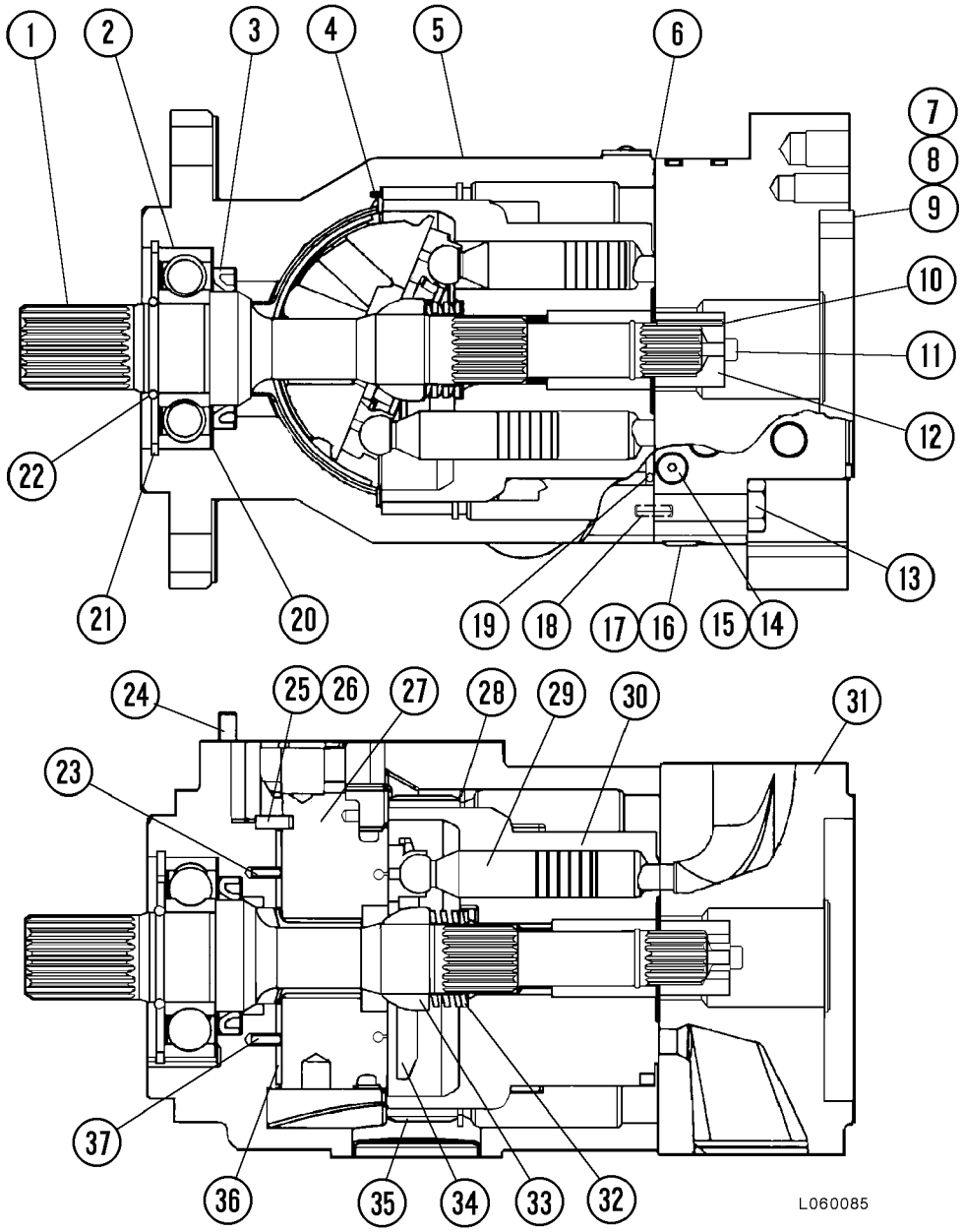


FIGURE 4-7. STEERING/BRAKE PUMP (Cross Section)

1. Drive Shaft
2. Driveshaft Bearing
3. Shaft Seal
4. Roll Pin
5. Housing
6. Gasket
7. Socket Head Screw
8. O-Ring Seal
9. Rear Shaft Cover
10. Roll Pin
11. Socket Head Screw
12. Spline Cover
13. Capscrew
14. Plug
15. O-Ring
16. Plug
17. O-ring
18. Roll Pin
19. O-Ring
20. Seal Retainer
21. Bearing Retainer Ring
22. Shaft Bearing Retainer Ring
23. Roll Pin
24. Roll Pin
25. Guide Plate
26. Flat Head Screw
27. Swashblock
28. Retainer Ring
29. Piston/Shoe Assembly
30. Cylinder Barrel
31. Valve Plate
32. Shoe Retainer Spring
33. Fulcrum Ball
34. Shoe Retainer
35. Cylinder Bearing
36. Saddle Bearing
37. Roll Pin

STEERING CIRCUIT COMPONENT REPAIR

BLEEDDOWN MANIFOLD

⚠WARNING

Do not loosen or disconnect any hydraulic line or component connection until engine is stopped and keyswitch has been "off" for at least 90 seconds.

Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin and cause serious injury and possibly death if proper medical treatment by a physician familiar with this injury is not received immediately.

Removal

NOTE: It may not be necessary to remove the Bleeddown Manifold from the truck to replace components. If a problem area has been isolated, simply remove the inoperative component and replace with a new part.

Adjusting Relief Valve

1. Bleed down the system and install a 350 kg/cm^2 (5000 psi) pressure gauge in the pressure test port (6, Figure 6-1) of the bleeddown manifold.
2. Start engine and run at low idle speed.
3. Loosen locknut on compensator valve on steering pump.
4. Adjust the pump compensator valve, raising pressure until bleeddown manifold relief valve opens at 228 kg/cm^2 (3250 psi).
5. If bleeddown manifold system relief valve setting is above or below 228 kg/cm^2 (3250 psi), carefully loosen the locknut on the relief valve (4) and adjust the bleeddown relief valve pressure setting until 228 kg/cm^2 (3250 psi) is obtained.

NOTE: Each 1/16 turn of the adjusting screw is equivalent to a setting change of approximately 7 kg/cm^2 (100 psi).

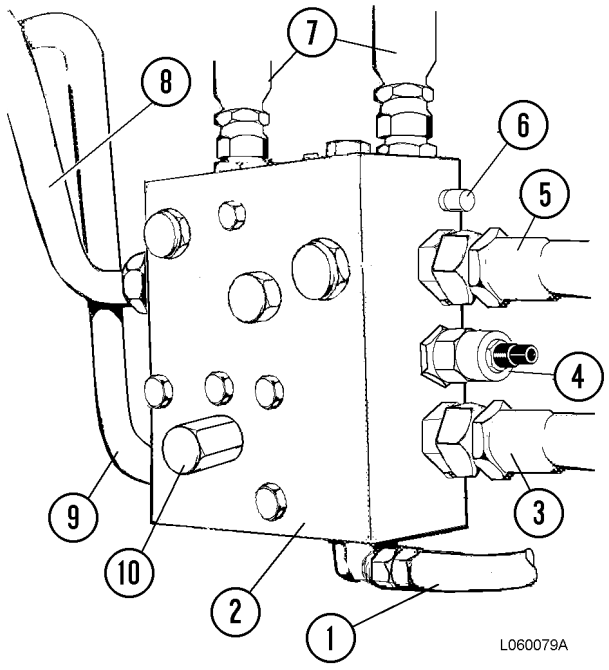


FIGURE 6-1. BLEEDDOWN MANIFOLD

1. Brake Circuit Supply
2. Bleeddown Manifold
3. Return to Tank
4. Pressure Relief Valve
5. Supply From Steering Pump
6. Test Port
7. From Accumulator
8. To Flow Amplifier
9. From Flow Amplifier
10. Accumulator Bleeddown Solenoid

6. Secure bleeddown manifold system relief valve with locknut, install acorn nut and tighten.
7. Turn steering pump pressure compensator adjustment screw counterclockwise to reduce pressure. (Steer truck and adjust to allow circuit pressure to drop to approximately 175 kg/cm^2 (2500 psi)).
8. Turn pressure compensator adjustment screw clockwise to obtain 193.3 kg/cm^2 (2750 psi) on the gauge at the steering bleeddown manifold test port. Tighten jam nut to lock adjustment screw when correct pressure is obtained.

STEERING CYLINDER

Removal

1. Disconnect lubrication lines (if equipped) at mounting pins.
2. Remove head pin (4, Figure 6-11).

NOTE: Support the steering cylinder (5) with a suitable jack. Start the engine and operate the steering to retract the piston rod, then disconnect the cylinder from the frame.

3. Remove head hose (2).
4. Remove rod hose (3).
5. Remove rod pin (1).
6. Remove steering cylinder assembly.

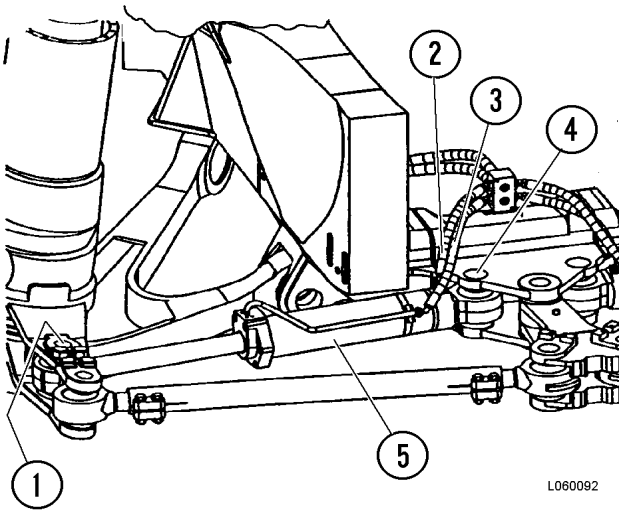


FIGURE 6-11. STEERING CYLINDER PIPING

1. Rod Pin
2. Head Hose
3. Rod Hose
4. Head Pin
5. Steering Cylinder

Installation

1. Lift steering cylinder (5, Figure 6-11) into position. Position rubber boot (1, Figure 6-12) and install head pin. Install pin retaining capscrew with washer and tighten to standard torque.
2. Position piston rod eye in bracket bore. Install rubber boot (1) and pin. Install pin retaining capscrew with washer and tighten to standard torque.
3. Connect lubrication lines (if equipped).
4. Using a new O-ring, install rod hose (3, Figure 6-11).
5. Using a new O-ring, install head hose (2).

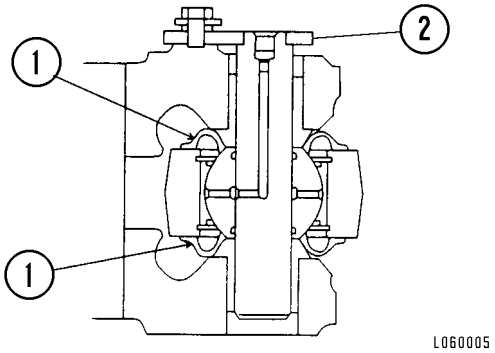


FIGURE 6-12. TYPICAL MOUNTING PIN

1. Rubber Boot
2. Pin

Swashblock Group

19. Inspect the swashblock (14, Figure 6-16) for wear and scoring. If defects are minor, stone the swashblock lightly. If damage is extensive, replace the swashblock.
20. Check the very small holes in the face of the swashblock. These passageways provide "porting" for the hydrostatic balance fluid (of the piston/shoe assembly) to be channelled through the swashblock to the face of the saddle bearing (providing pressure lubrication).
21. Compare saddle bearing (13) thickness in wear area to thickness in a non-wear area. Replace saddle bearing if difference is greater than 0.40 mm (0.015 in.).
22. Check mating surface of swash block for cracks or excessive wear. Replace if necessary.
23. Swashblock movement in saddle and saddle bearing must be smooth. Replace if necessary.

Driveshaft Group

24. Remove shaft seal (5, Figure 6-16).
25. Check the shaft bearing (6) for galling, pitting, binding or roughness. Replace if necessary.
26. Check rear shaft bushing in valve plate.
27. Check shaft and its splines for wear. Replace any parts necessary.

Assembly

The procedure for assembling the pump is basically the reverse order of disassembly procedure. During assembly, install new gaskets, seals, and O-rings.

1. Apply a thin film of CLEAN grease or hydraulic fluid to sealing components to ease assembly. If a new rotating group is used, lubricate thoroughly with CLEAN hydraulic fluid. Apply fluid generously to all wear surfaces.

Swashblock Group

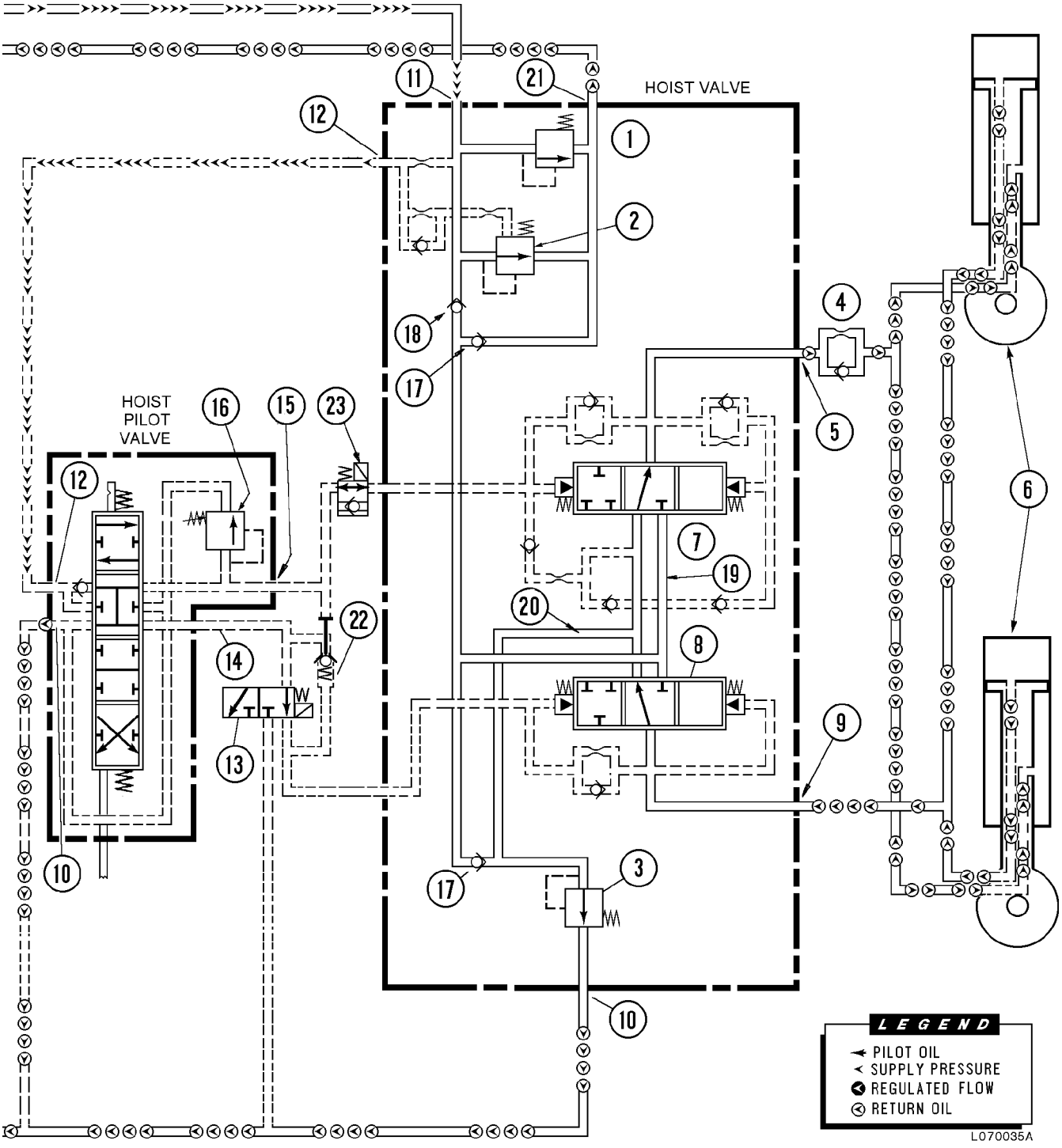
⚠ IMPORTANT ⚠

Extreme care should be used not to damage saddle bearing surfaces while installing the saddle into the pump housing.

2. Press new shaft seal (5, Figure 6-16) into front of pump housing.
3. Place housing on workbench with mounting flange side down.
4. If removed or replaced, press two roll pins (11) into the pump housing until pins extend 1.3 to 1.6 mm (0.050 to 0.065 in.) from case.
5. Grease back side of saddle bearings (13) and place on the pins to locate the bearing in pump case. Make sure the pin does not protrude.
6. Partially insert swashblock (14) into pump housing.
7. Insert insert guide plate (8) into the case, so flat head cap screws (7) can be used to fasten the guide plate to the housing.
8. Place the swashblock on the guide plate making sure the guide plate is in the groove of the swashblock.
9. Once in place, be sure swashblock swivels in the saddle bearings. (With new bearings, swivelling may be stiff -not always smooth).
10. Make sure the two roll pins (8, Figure 6-20) are inserted into the cylinder bearing (7).
11. Position the cylinder bearing with the pins located nearest the control facing the outboard end of the driveshaft. The bearing should be positioned with "scarf" cuts positioned top and bottom with pins (8) located on top of internal cast boss. The bearing should fit into place with little difficulty and be square to the axis of the pump.
12. Tap bearing into place if necessary using extreme care not to damage the bearing.
13. Insert the retaining ring (6) to hold bearing in place.

Driveshaft Group

14. Place the housing on its side with the axis horizontal and then install seal retainer (4, Figure 6-16).
15. Place front driveshaft bearing (3) onto the driveshaft (6) and lock in place with the shaft retaining ring (2).
16. Lubricate the shaft seal (5) and shaft.
17. Insert the driveshaft and bearing assembly into the housing and lock in place with the driveshaft bearing retainer ring (1).


HOIST VALVE
HOIST PILOT VALVE
LEGEND
PILOT OIL
SUPPLY PRESSURE
REGULATED FLOW
RETURN OIL
L070035A

HOIST CIRCUIT COMPONENT REPAIR

HOIST VALVE

⚠DANGER

Relieve pressure before disconnecting hydraulic lines.
Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin and cause serious injury or death if proper medical treatment by a physician familiar with this type injury is not received immediately.

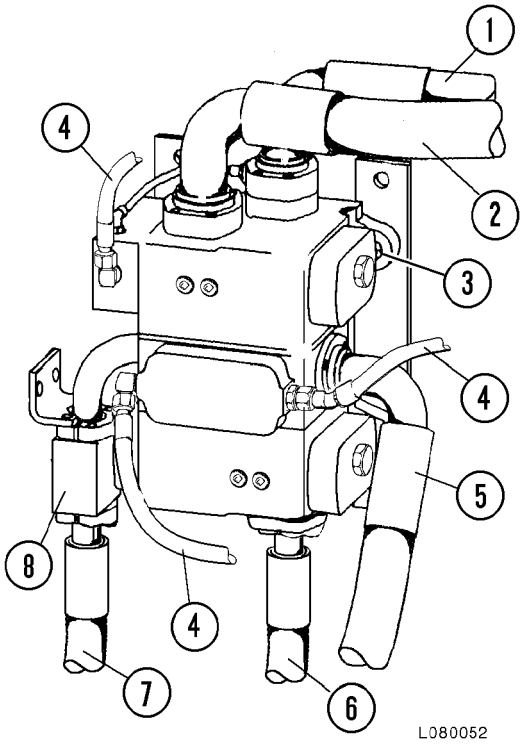


FIGURE 8-1. HOIST VALVE REMOVAL

1. Supply From Pump
2. Return To Manifold/BCV
3. Capscrews, Washers & Nuts
4. To Hydraulic Cabinet
5. To Hoist Cylinders
6. Return To Tank
7. To Hoist Cylinders
8. Snubber Valve

Removal

1. Shut down engine and turn key switch to the off position. Allow at least 90 seconds for the accumulators to bleed down before removing any hydraulic lines.
2. Thoroughly clean the exterior of the hoist valve.
3. Disconnect and cap or plug all line connections to help prevent hydraulic oil contamination, refer to Figure 8-1. Tag lines to ensure proper hookup when valve is re-installed.
4. Remove capscrews, washers and nuts (3, Figure 8-1) securing the hoist valve to its mounting bracket.
5. Attach a suitable lifting device to the hoist valve and remove from truck.

⚠CAUTION

The hoist valve weighs approximately 55 kg (121 lbs.). Use a lifting device capable of handling the load safely.

6. Move the hoist valve to a clean work area for disassembly.

Installation

NOTE: The hoist valve weighs approximately 55 kg (121 lbs.).

1. Move the hoist valve into position and secure in place with capscrews, nuts and washers. Tighten capscrews to standard torque.
2. Using new O-rings at the flange fittings, connect hydraulic lines. Tighten flange capscrews to standard torque. Refer to Figure 8-1 for hydraulic line location.
3. Connect pilot supply lines, tighten fittings securely.
4. Start the engine. Raise and lower body to check for proper operation. Observe for leaks.
5. Service hydraulic tank if necessary.

HOIST CYLINDERS

Removal

⚠WARNING

Relieve pressure before disconnecting hydraulic lines. Tighten all connections securely before applying pressure.

Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin and cause serious injury and possibly death if proper medical treatment by a physician familiar with this type of injury is not received immediately.

1. Insure engine and key switch have been "Off" for at least 90 seconds to allow accumulators to bleed down. Be certain the park brake is applied.
2. To relieve all pressure from the hydraulic circuit, slowly move hoist lever to the LOWER position and **gently** lower body until it rests completely on the frame.
3. Disconnect the lubrication lines to the upper and lower bearings of the hoist cylinder. Disconnect hydraulic lines from hoist cylinder. Cap and plug lines and ports to prevent excessive spillage and contamination. Secure cylinder to frame to prevent movement during next step.

⚠CAUTION

The hoist cylinder weighs approximately 330 kg (730 lbs.). Provide a means of support to prevent it from falling or causing injury when removing from the truck. Use a suitable lifting device that can handle the load safely.

4. At the upper mount, remove capscrews and washers (2, Figure 8-16). Remove retainer plate (1). Use a brass drift and hammer to drive pin (3) from bore of mounting bracket.

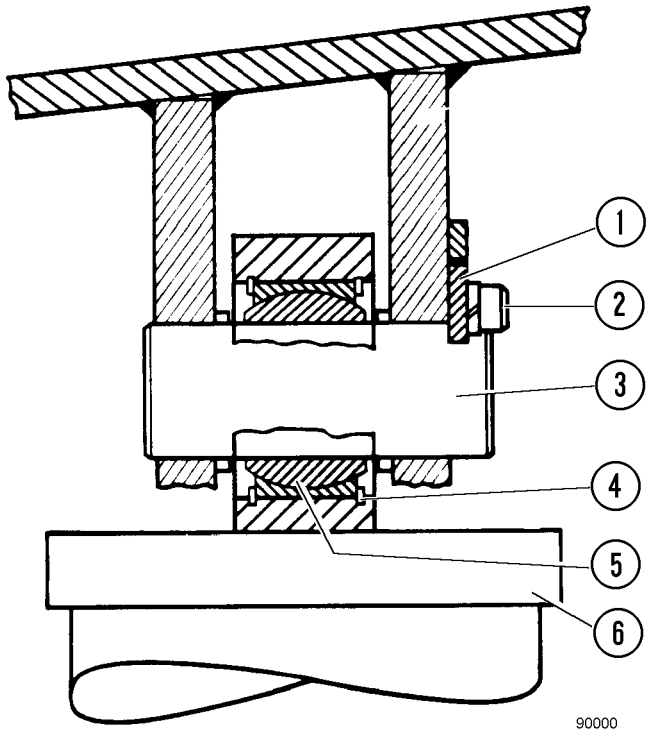


FIGURE 8-16. HOIST CYLINDER UPPER MOUNT

1. Retainer
2. Capscrews & Washers
3. Pin
4. Retainer Ring
5. Bearing
6. Hoist Cylinder

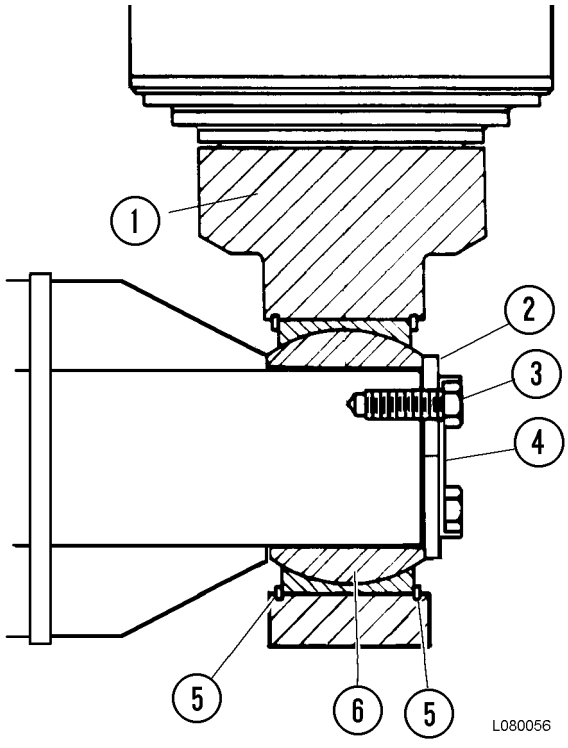


FIGURE 8-17. HOIST CYLINDER LOWER MOUNT

1. Hoist Cylinder
2. Retainer
3. Capcsrew
4. Lock Plate
5. Retainer Ring
6. Bearing

FILTER ELEMENT REPLACEMENT

Relieve pressure before disconnecting hydraulic and other lines. Tighten all connections before applying pressure. Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin and cause serious injury and possibly death if proper medical treatment by a physician familiar with this injury is not received immediately.

Removal

1. Remove plug (6, Figure 9-2) and drain oil from the housing into a suitable container.

Take care to avoid contact with hot oil if truck has been operating. Avoid spillage and contamination!

2. Remove bowl (4) and element (5).
3. Replace seal (3) in filter head.

Installation

1. Install new element (5, Figure 9-2). Install housing (4) and tighten.
2. Replace drain plug (6), and O-ring (7).

NOTE: The indicator switch (2, Figure 9-2) is not repairable. If the indicator switch is inoperative, replace as a unit. The actuation pressure of the indicator switch is factory preset. Switch adjustment is not necessary or recommended.

CHECKFIRE ELECTRIC DETECTION AND ACTUATION SYSTEM - SERIES 1

The Checkfire Electric Detection and Actuation System - Series 1 (Figure 2.3- 1) uses linear detection wire. This is a two conductor heat rated thermo cable. When the detection cable is subjected to 221°F (105°C) the insulating coating of the cable melts allowing the conductors to short together closing the electric circuit to the squib which detonates to depress the puncture pin and actuate the expellant cartridge.

Components of the Checkfire Electric Detection and Actuation System are shown in Figure 2.3-1.

Control Module (Figure 2.3-2):

Provides the electrical connections necessary between the power lead and the linear detection wire to the power lead supplying electrical power, via the squib, to the actuator. Also provides a visual check of power availability - pressing the switch button will illuminate the green indicator light if electrical power is available in the system.

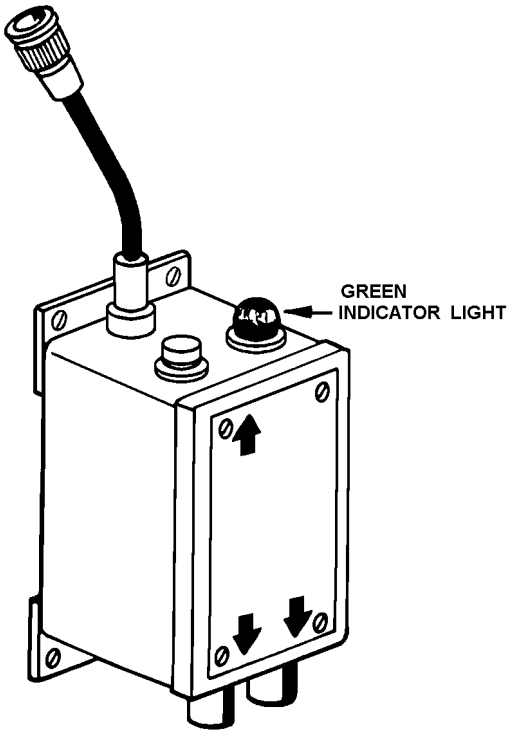


FIGURE 2.3-2. CONTROL MODULE

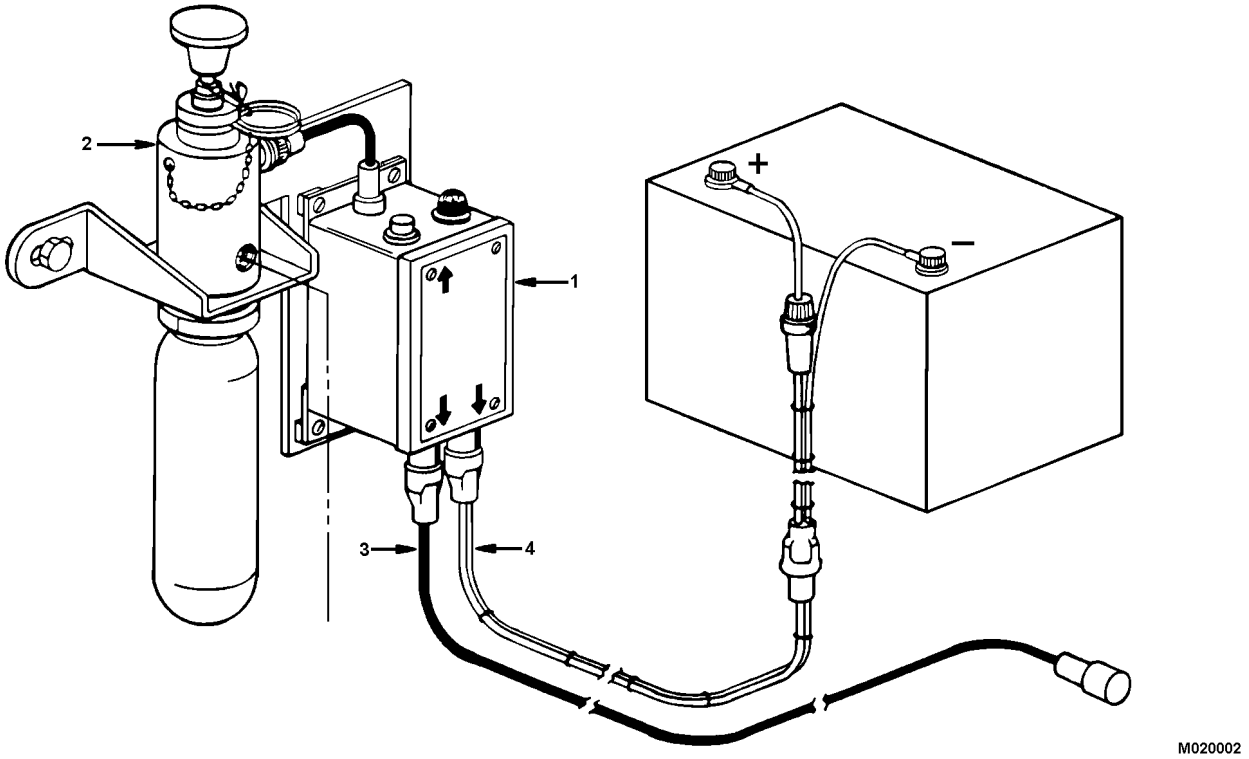


FIGURE 2.3-1. CHECKFIRE ELECTRIC DETECTION/ACTUATION SYS.

1. Control Module
2. Manual/Automatic Actuator
3. Linear Detection Wire
4. Power Wire
5. (Not Shown) Test Kit

FIRE CONTROL SYSTEM (MANUAL)

The fire control system aids in protecting the machine in the event of a fire. The system consists of:

- Actuators
- Pneumatic Actuator/Cartridge Receivers
- Pressure Relief Valve
- Check Valves
- Dry Chemical Tanks
- Hoses And Nozzles.

When either actuator is depressed, a nitrogen cartridge will pressurize the dry chemical tank. Once the dry chemical tank has pressurized to a sufficient pressure, a bursting disc in the tank outlet will break, allowing the fluidized chemical to flow to the nozzles. The nozzles will direct the agent at the fire and extinguish the flames.

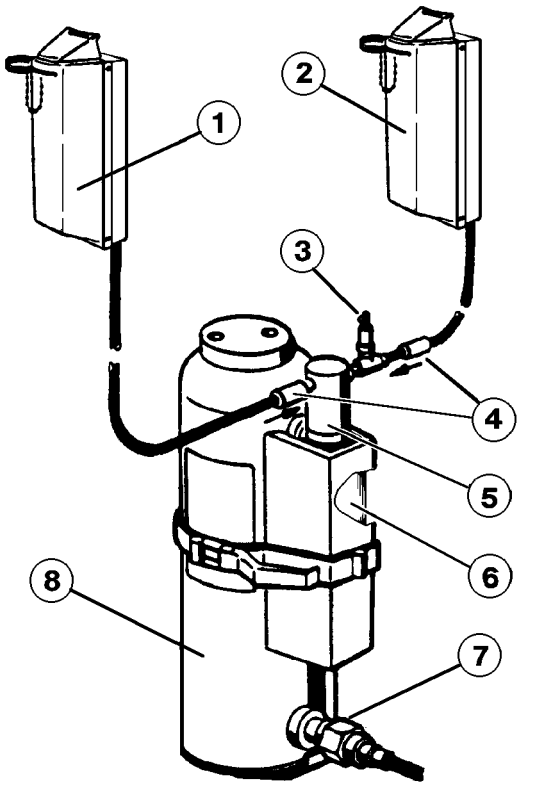


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FIGURE 2-1. FIRE CONTROL SYSTEM

1. Cab Actuator
2. Remote Actuator
3. Safety Relief Valve
4. Check Valves
5. Actuator Receiver
6. Cartridge
7. Bursting Disc Union
8. Dry Chemical Tank

Operation

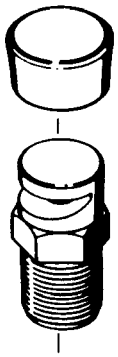
To actuate the fire control system, pull the safety ring on either of the actuators and depress the lever. One actuator is located in the cab near the operator. Another actuator is located on the left fender structure near the bumper.

NOTE: Operating either actuator will activate fire control system.

Inspection and Maintenance

It is imperative that the fire control system is inspected at least every six months. To insure that it will operate effectively:

1. Check the system for general appearance, mechanical damage and corrosion.
2. Inspect each chemical tank fill cap gasket for damage and replace if necessary. Examine cap for nicks, burrs, cross threading or rough edges.
3. Check the level of dry chemical. The level should not be less than three inches (76 mm) from bottom of fill opening. Dry chemical must be free flowing, with no caking.
4. Insure that the vent in the fill opening threads is not obstructed.
5. Remove the cartridge from the extinguisher and examine the disc-seal. Replace seal if necessary. Install cartridge hand tight.



91462

FIGURE 2-2. NOZZLE AND BLOW-OFF CAP

8. Thermostat: The engine thermostat operation should be checked according to engine manufacturer's specifications and recommendations.

9. Fan clutch: After each 1000 hours, the fan clutch should be checked for signs of internal wear as follows:

   a. Bearing wear: With the engine off and no oil supply to the fan clutch, push the fan forward-rearward. No movement of the fan mounting hub should occur.

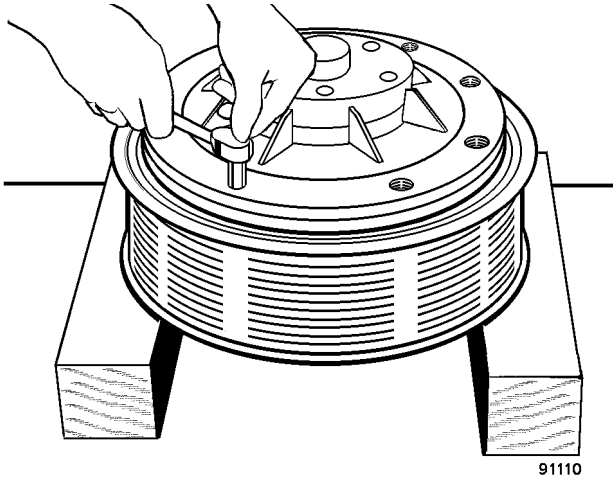
NOTE: For the next tests, it is necessary to provide an external supply of oil pressure at 40 psi (275 KPa) minimum, 100 psi (689 KPa) maximum. The oil supply should be compatible with the the oil being used in the engine.

   b. Clutch Plate Drive Slot Wear: With the engine off and the clutch locked up, rotate the fan with a light force clockwise-counterclockwise. Movement at the tip of a 68 in. (1.7 M) Dia. fan blade should not exceed 1.12 in. (28.4 mm). Excess movement indicates excessive wear at the drive tangs.

   c. Clutch Plate Wear: With the engine off, apply 40 psi (275 kPa) oil pressure to lockup the clutch. Using a pull type scale connected to the fan blade 30 in. (76 cm) from the center of fan, a pull of no less than 250 lbs. (1023 N) should be required to rotate the blade independent of the pulley.

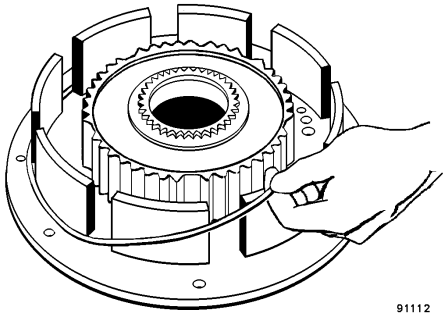
FAN CLUTCH DISASSEMBLY INSTRUCTIONS

Refer to page M6-14 for individual parts referenced in the following instructions:



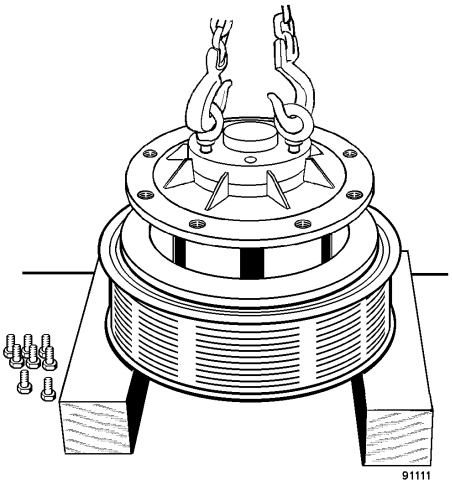
STEP # 1

Support the fan clutch on a bench with the fan mounting hub (2) up. Support beneath the pulley. Remove bolts (14) with lockwashers (15).



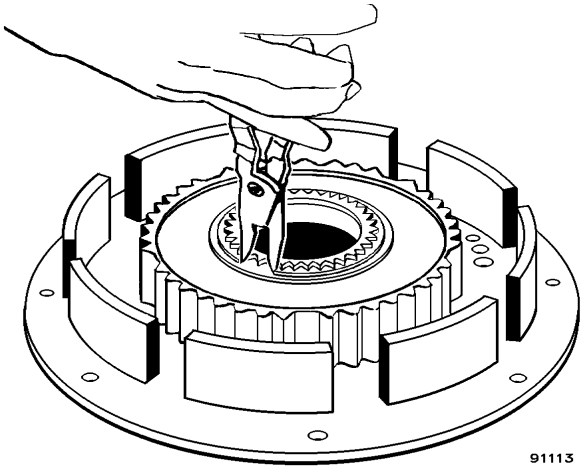
STEP # 3.

Remove “O” ring seal (13).



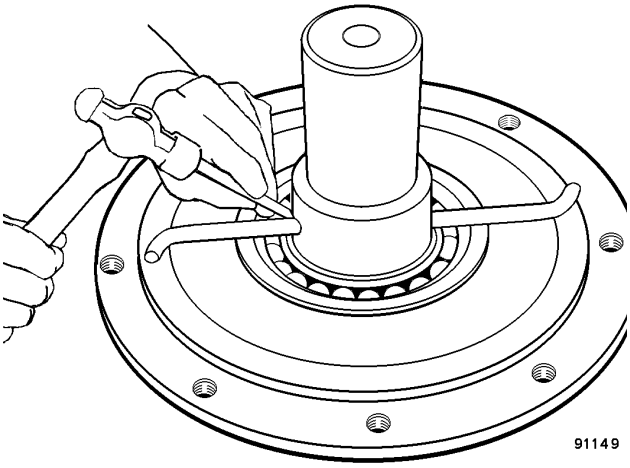
Step # 2

Separate the front bearing retainer from the pulley, lift it off, and set it aside on the bench. (A small screwdriver may be used at the split-line to break the bearing retainer loose from the pulley).



Step # 4

Support the bearing retainer sub-assembly on the bench with the clutch hub (7) up. Remove external snapring (8).

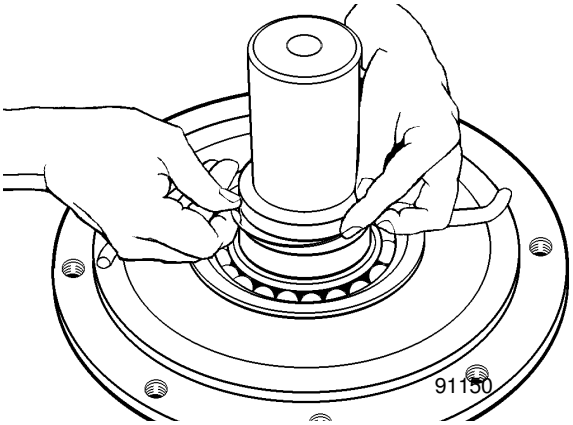


Step # 40

Be sure the pitot tube holes in the shaft are clean and free of burrs and staking material, toallow the pitot tubes to fit into the holes and seat completely to the bottom. Apply a thin coating of Loctite® # 609 (or equivalent) on the straight end of one pitot tube (33). Coat the tube to approximately .75 in. (20 mm) from the end.

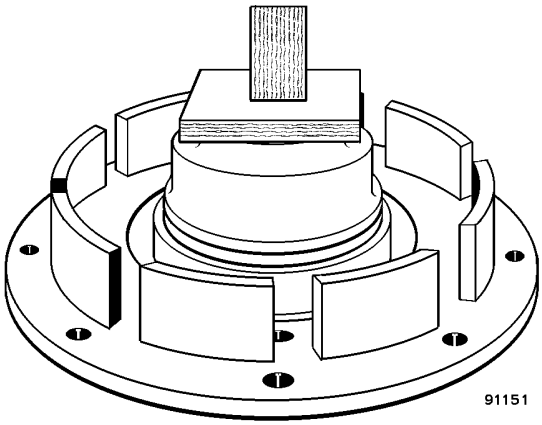
Push the pitot tube to the bottom of the hole. The outer end of the tube should be located well within the pulley-locating shoulder of the bearing retainer. Rotate the tube so the open, bent end faces in a counter-clockwise direction, and is EXACTLY parallel to the surface of the bearing retainer. (A large phillips-head screwdriver inserted in the end of the tube can be conveniently used as an alignment gage).

Install the second pitot tube in the same manner as the first. Stake each pitot tube in three places, (at the 9, 12, and 3 o'clock positions) to prevent the tubes from rotating in operation.



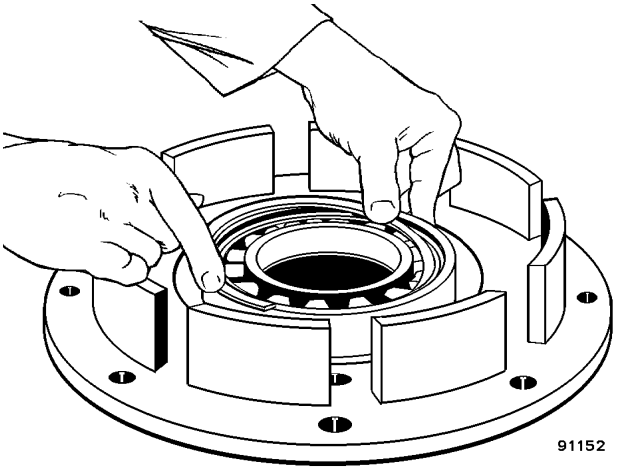
Step # 41

Install both hook-type sealrings (32) in the grooves in the shaft.



Step # 42

Install the front bearing (5) in the front bearing retainer (12). Press ONLY on the outer race of the bearing, and press it to the bottom of the bore.



Step # 43

Install internal snapring (28).

(16): Steel Clutch Plates (cont.)

	Replace if “tracked” with grooves, darkened or discolored by heat, damaged, or warped.

(2): Fan Mounting Hub

Groove for snapring (8)	0.145 in. (3.683 mm) maximum
Wear Sleeve Diameter	Free of Nicks above surface.
Bore for bearings (9) and (10)	2.9370 in. (74.600 mm)
Bearing journal for (5) bearing	3.7401 in. (94.999 mm) minimum
End Cap Bore	Free of nicks, 3.378 in. (85.80 mm)
General:	Snapring grooves must have straight sides and square edges. Bearing bore must not have nicks or scratches which extend above the bore surface. Splines must not be excessively worn. Bolt holes must not be worn or damaged severely.

(9), (10): Sleeve Bearings

	Replace if necessary. See Figure 6-8 for information concerning determination of amount of wear.

(1): End Cap

	O.D. free of nicks above the surface.

(12): Bearing Retainer

Bore for bearing (5)	5.7088 in. (145.004 mm) maximum
Bore for oil seal (11)	5.1265 in. (130.213 mm) maximum
General:	Bearing bore must have straight sides, square bottom, and not be oval due to wear. Oil seal bore must not have nicks that extend above the bore surface. All sealants must be removed. Pilot diameter for pulley must be free of nicks that extend above the pilot surface. Flat surface that mates with the pulley must be free of nicks that extend above the surface. Slots in the bearing retainer must not have worn notches with straight sides. Maximum depth of the wear mark should not exceed 0.020 in.(0.51 mm), but if the notches have smooth entry and exit sides the notch will not resist movement of the steel plate (16).

valve is warm to hot high pressure liquid; exiting it is low pressure liquid and gas. The change to low pressure allows the flowing refrigerant to immediately begin changing to gas as it moves toward the evaporator.

The amount of refrigerant metered into the evaporator varies with different heat loads. The valve modulates from wide open to the nearly closed position, seeking a point between for proper metering of the refrigerant.

As the load increases, the valve responds by opening wider to allow more refrigerant to pass into the evaporator. As the load decreases, the valve reacts and allows less refrigerant into the evaporator. It is this controlling action that provides the proper pressure and temperature control in the evaporator.

The externally equalized expansion valve is controlled by both the temperature of the power element bulb and the pressure of the liquid in the evaporator.

Some systems may use an internally equalized, block type expansion valve. With this type valve, the refrigerant leaving the evaporator coil is also directed back through the valve so the temperature of the refrigerant is monitored internally rather than by a remote sensing bulb.

NOTE: It is important that the sensing bulb, if present, is tight against the output line and protected from ambient temperatures with insulation tape.

EVAPORATOR

The evaporator cools and dehumidifies the air before it enters the cab. Cooling a large area requires that large volumes of air be passed through the evaporator coil for heat exchange. Therefore, a blower becomes a vital part of the evaporator assembly. It not only draws heat laden air into the evaporator, but also forces this air over the evaporator fins and coils where the heat is surrendered to the refrigerant. The blower forces the cooled air out of the evaporator into the cab.

Heat exchange, as explained under condenser operation, depends upon a temperature differential of the air and the refrigerant. The greater the temperature differential, the greater will be the amount of heat exchanged between the air and the refrigerant. A high heat load condition, as is generally encountered when the air conditioning system is turned on, will allow rapid heat transfer between the air and the cooler refrigerant.

The change of state of the refrigerant in and going through the evaporator coil is as important as that of the air flow over the coil.

All or most of the liquid that did not change to vapor in the expansion valve or connecting tubes boils (expands) and vaporizes immediately in the evaporator, becoming very cold. As the process of heat loss from the air to the evaporator coil surface is taking place, any moisture (humidity) in the air condenses on the cool outside surface of the evaporator coil and is drained off as water.

At atmospheric pressure, refrigerant boils at a point lower than water freezes. Therefore, the temperature in the evaporator must be controlled so that the water collecting on the coil surface does not freeze on and between the fins and restrict air flow. The evaporator temperature is controlled through pressure inside the evaporator, and temperature and pressure at the outlet of the evaporator.

SYSTEM PERFORMANCE TEST

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

1. Start engine and operate at 1200 to 1500 RPM.
2. Place fan in front of condenser to simulate normal ram air flow and allow system to stablize.
3. Place a thermometer in air conditioning vent closest to evaporator.
4. Evaluate the readings obtained from the gauges to see if they match the readings for the ambient temperature.

As preliminary steps to begin checkout of the system, perform the following:

1. Close all windows and doors to the cab.
2. Set air conditioning system at maximum cooling and blower speed operation.
3. Readings on the two manifold gauges should be within normal range, adjust for ambient temperature.
4. Compare evaporator discharge air temperature reading to see if it matches the recommended temperature for the ambient temperature and gauge readings obtained.
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.

SYSTEM LEAK TESTING

Refrigerant leaks are probably the most common cause of air conditioning problems, resulting from improper or no cooling, to major internal component damage. Leaks most commonly develop in two or three places. The first is around the compressor shaft seal, often accompanied by an indication of fresh refrigerant oil. If a system is not operated for a while (winter months), the shaft seal may dry out and leak slightly. The centrifugal force of the clutch pulley spinning can also cause the problem. When the system is operated and lubricant wets the seal, the leak may stop. Such leaks can often be located visually, or by feeling with your fingers around the shaft for traces of oil. (The R-134a itself is invisible, odorless, and leaves no trace when it leaks, but has a great affinity for refrigerant oil.)

A second common place for leaks is the nylon and rubber hoses where they are crimped or clamped to the fittings, or where routing allows abrasion. Other threaded joints or areas where gaskets are used should be visually and physically examined. Moving your fingers along the bottom of the condenser and evaporator, particularly near the drain hole for the condensate will quickly indicate the condition of the evaporator. Any trace of fresh oil here is a clear indication of a leak.

Usually, a 50% charged system is enough to find most leaks. If the system is empty, connect the manifold gauge set to the system and charge at least one (1) lb. of refrigerant into the system.

⚠WARNING

Use extreme caution leak testing a system while the engine is running.

In its natural state, refrigerant is a harmless, colorless gas, but when combined with an open flame, it will generate toxic fumes (phosgene gas), which can cause serious injuries or death.

NOTE: The refrigerant is heavier than air and will move down when it leaks. Apply pickup hose or test probe on the undersurface of all components to locate leak.

Electronic leak detector

(Refer to Figure 9-4). As the test probe is moved into an area where traces of refrigerant are present, a visual or audible announcement indicates a leak. Audible units usually change tone or speed as intensity changes.

Compressor Malfunction

Indications:

Gauge Reading- Low Side High
High Side Low
The compressor may be noisy when it operates.

Cause- Defective reed valves or other compressor components. If the compressor is not noisy, there may be a worn or loose compressor clutch drive belt.

Repair Procedure: If the belt is worn or loose, replace or tighten it and recheck system performance and gauge readings. If inspection of the compressor is required, all of the refrigerant must be recovered and the compressor disassembled to the point that inspection can be performed. Replace defective components or replace the compressor. If particles of desiccant are found in the compressor, flushing of the system will be required. It will also be necessary to replace the receiver-drier. Always check the oil level in the compressor, even if a new unit has been installed. Rotary compressors have a limited oil reservoir. Extra oil must be added for all truck installations. Tighten all connections and evacuate the system. Recharge the air conditioner with refrigerant and check the system operation and performance.

Condenser Malfunction or System Overcharge

Indications:

Gauge Reading- Low Side High
High Side High
The air from the vents in the cab may be warm.
The high pressure hoses and lines will be very hot.
Check the engine cooling system components, fan and drive belt, fan clutch operation, and the radiator shutter.

Cause- The condenser is not functioning correctly or there may be an overcharge of refrigerant inside the system. Another possibility is lack of air flow through the condenser fins during testing. Engine cooling system component malfunction can cause high pressure by blocking air flow (radiator shutter) or not providing air flow (fan clutch) in sufficient quantity.

Repair Procedure: Inspect the condenser for dirt, bugs or other debris and clean if necessary. Be sure the condenser is securely mounted and there is adequate clearance (about 1-1/2 inches) between it and the radiator. Check the radiator pressure cap and cooling system, including the fan, fan clutch, drive belts and radiator shutter assembly. Replace any defective parts and then recheck the AC system operation, gauge readings and performance.

If the problem continues, the system may be overcharged. Recover the system refrigerant slowly until low and high pressure gauges read below normal. Then add refrigerant until pressures are normal. Add another quarter to half pound of refrigerant and recheck AC system operation, gauge readings and performance.

If the gauge readings do not change, all of the refrigerant should be recovered and the system flushed. The condenser may be partially blocked - replace condenser. Also replace the receiver-drier or accumulator. Evacuate the system and check operation and performance.

THEORY OF OPERATION

Basic Description

The payload meter uses the four suspension pressures and the inclinometer to determine the load in the truck. These inputs are critical to the calculation of the load. The other inputs to the payload meter (Body Up, Speed, Brake Lock, Alternator R Terminal, and Engine Oil Pressure) are used to indicate where the truck is in the haul cycle. These inputs enable the payload meter to make time and distance measurements for the haul cycle.

The suspension pressures are the key ingredients in determining the sprung weight of the truck. These pressures are converted into forces using the formulas shown below.

$$\text{Sprung Weight} = \frac{\pi}{4} \text{Suspension Diameter}^2 \text{ (Psi Left + Psi Right)}$$

$$\text{Sprung Weight} = \text{Axle Weight(lbs)}/2000$$

These forces are combined with the geometry of the truck to produce the load calculation. It is critical that the suspensions are charged according to shop manaul specifications and the pressure sensors are functioning properly.

Inclinometer

The inclinometer gives the payload meter information regarding the pitch angle of the truck. The front and rear incline factors are determined by the pitch angle. These two factors account for the load transfer that occurs when the truck is inclined nose up or nose down.

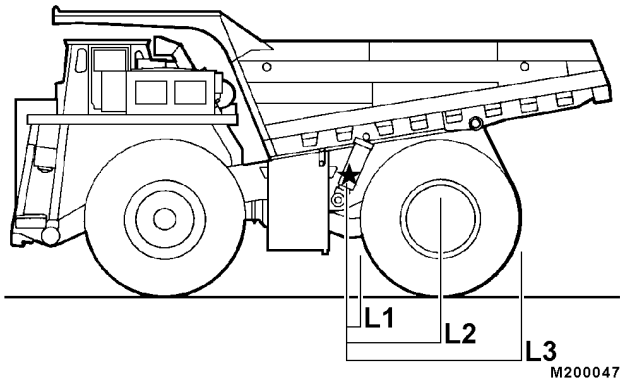


FIGURE 20-3

Linkage Factor

The linkage factor is part of the complex calculations performed by the payload meter to determine the load in the truck. The linkage factor is dependent on the load on the rear suspensions.

Figure 20-3 shows the side view of a truck. The nose pin is marked with a star and there are three arrows pointing to different spots of the rear tire. This figure shows how the support under the rear tire can affect the calculation of the load. The payload meter does not directly measure the load transferred to the frame through the nose pin. To account for portion of the load carried by the nose pin, the linkage factor is multiplied by the rear suspension force. It is assumed that the truck is supported under the center of the tire. In this case the payload meter uses L2 to help compute the linkage factor. If, however, the truck is backed into a berm and the rear tire is supported towards the back of the tire, the actual linkage factor calculation should use L3. Since the payload meter assumes L2 it will overestimate the load in the truck. The opposite is true in the case where the rear tires are supported toward the front of the tire. The linkage factor should use L1 but the payload meter assumes L2. This change in leverage will cause the payload meter to underestimate the load.

Checking the G_t setting:

Refer to "Checking the Gain" and "Adjusting the Gain" for display and adjustment information.

Checking the Inclinometer Settings

Refer to "Viewing Payload Calculation Inputs" for instructions on displaying truck pitch angle. With an empty truck on level ground and suspensions properly charged, the display should indicate 0.0± 1.0. Remember, this is not a live display. After adjustment, Service Check Mode must be entered again to obtain a new reading.

An alternative method is to use a personal computer running the Komatsu Payload Download Program for Microsoft Windows. The "Monitor Pressures" section of the program displays live inclinometer data. The inclinometer can be loosened and adjusted until the live display shows 0.0± 1.0 degrees with an empty truck on level ground, and the suspensions properly charged.

Another method is to use a voltmeter to read the voltage output of the inclinometer. With an empty truck on level ground, and the suspensions properly charged, the output voltage should be 2.6± .1 volts.

Calibrating a Truck

This procedure causes the PLM II™ to calculate a new empty 'tare'(calibration) weight (refer to "Viewing Payload Calculation Inputs) for use with all subsequent payload estimates. Before calibrating, confirm the truck nose up produces a positive incline.

The payload meter should be calibrated whenever one of the following occurs:

1. When a new payload meter is installed.
2. When a suspension sensor has been changed.
3. Whenever the suspensions have been serviced or the Nitrogen levels have changed.
4. Whenever any major change to the truck has been performed that would change the empty vehicle weight.
5. Once a month thereafter.

To calibrate the payload meter:

1. With the engine running and the truck stopped, press and hold the CAL/CLR switch until "CAL" is flashing on the display.
2. Drive the truck until the speed is approximately 20-10 MPH (10-15 Km/H)
3. Press the CAL/CLR switch once.
4. Drive until the display switches back to the time of day. This will take up to 30 seconds.

⚠ IMPORTANT ⚠

Carry out this operation on flat level ground.

Travel in a straight line.

Maintain a steady speed, 20-10 MPH (10-15 Km/H)

5. The payload meter is now calibrated and ready for normal operation.

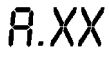
FINAL GEAR RATIO SELECTION

For an 830E truck, the proper gear ratio has to be selected.

1. Press and hold the MODE and LIGHT/INC switches until “CHEC” is displayed.

2. Press and hold the TOTAL/SFT and LIGHT/INC switches until “S.SEL” is displayed.

3. Press the CAL/CLR switch repeatedly until “A.XX” is displayed, where “XX” is one of the following:



“XX”	Gear Ratio	Remarks
00	31.875	Original
01	36.400	High Traction
02	28.125	Standard
03	26.625	High Speed
NOTE: The Payload Meter is originally set to “00".		

4. Press the TOTAL/SFT switch and "XX" will flash.
5. Press the LIGHT/INC switch to select the desired gear ratio.
6. Press the MODE switch and "CHEC" will be displayed.

7. Press the MODE switch and the meter will return to normal operation.

Missing Speed Signal

The payload meter uses the speed signal to measure distances and speeds. It is the speed signal that causes the payload meter to sample pressure data to estimate payload just after loading. After the truck travels 160 m (0.10 mi.) the payload meter records the payload estimated using the data captured just after loading. During the 160 m, the payload meter displays a count. When the payload meter is set to display metric units, it counts up to 160 m. When English units is selected, it counts up to 0.10 mi. This 160 m (0.10 mi) is designed to allow the truck to reposition around the shovel during loading.

If the speed signal is missing, the payload meter captures suspension data when the body rises at the dump. Without the speed signal, the payload meter cannot determine that the truck has begun moving after loading. In addition, it cannot measure the 160 m from the loading site. While the truck is loaded, the payload meter will display live payload estimates. When the truck is empty, the payload meter will display 0. The haul cycle data stored in memory will have 0 recorded to max speed and haul cycle distance.

F-18: Alternator R-Terminal, Oil Pressure Signals

The PLM II™ monitors engine hours using the alternator R-terminal and oil pressure signals. The payload meter will register a fault if both signals are not present.

For the R-terminal input to the payload meter, 24v=engine running and 0v=engine stopped.

For the oil pressure input to the payload meter, open=engine running and ground=engine stopped.

It is recommended that these inputs be modified to indicate that the engine is running at all times. Connect the R-terminal input to payload meter to the keyswitch (712) signal. Disconnect and tape back the oil pressure signal to the payload meter. These changes will cause the payload meter to always consider the engine to be ON.

There are 2 effects from this change.

- On power-up, the payload meter will not show the normal sequence of displays. This is not usually a problem.
- The payload meter cannot be re-initialized. This extremely rare procedure is used to reboot the payload meter.

Shorted 18v Sensor Power Supply (930E)

The 18v sensor power supply, circuit 39F, comes from the payload meter and branches out to the inclinometer and pressure sensors. The connection for this is made approximately 30.5 cm (12 in.) from the connection at the back of the cab, just above the wheel. This can be a common point of failure and should be the first place to check when the pressure sensor values drift erratically while the truck is sitting still or the payload meter indicates shorts on all the pressure sensors.

The harness may be repaired with a butt splice, or a new harness can be purchased and installed.

F-31, F-32: Inclinometer

There are very few problems with the inclinometer in general. The inclinometer allows the payload meter to compensate for front-to-rear weight transfer on a grade.

Verify that when the truck nose is pointed uphill, the inclinometer reads positive. It is possible that the inclinometer is installed backwards. This could significantly reduce the accuracy of payload calculations.

The inclinometer output is voltage that linearly represents the angle of the truck with nose up producing a positive incline. 0° = 2.6vdc and the voltage output decreases with positive incline. For example, with the truck parked 5° nose up:

Using the formula:

$$V_{output} = 2.6_{volts} - 0.103 \frac{volts}{degree} \times incline_{degrees}$$

The inclinometer output should be:

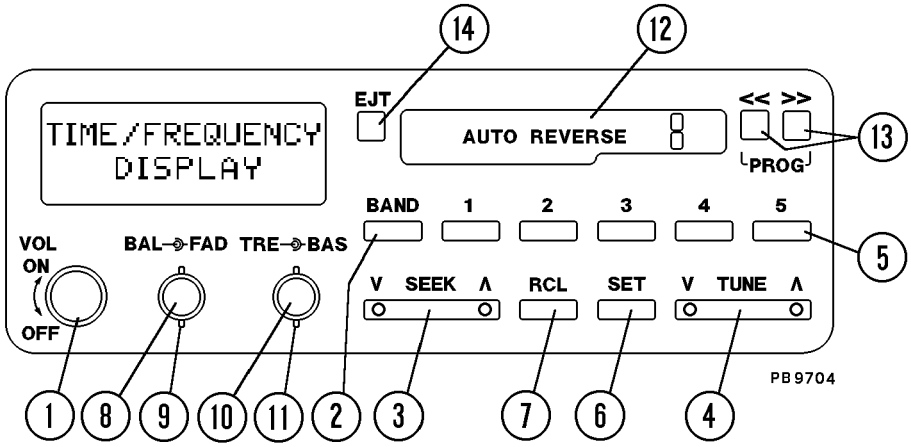
$$V_{output} = 2.6_{volts} - 0.103 \frac{volts}{degree} \times 5^{\circ} = 2.085_{volts}$$

Refer to the following page for the Inclinometer Fault Tree.

Use the following two tables in conjunction with the screen shot on the following page for a description of typical Scope information.

TABLE 1. DATA DEFINITIONS & COMMENTS		
DISPLAY	**DEFINITION**	**COMMENT**
K	K packet data sent	
P	P packet data sent	Final payload data
M4	M4 packet data sent	Swing load data
M2	M2 packet data sent	Real time data
ACK	Initialize real-time	The PLM acknowledges the transmission of a command from Scope
NAK	Acknowledge data	No acknowledgment of the transmission of a command from Scope
Unknown	Unassigned packet data	
Unexpected Data (error 1)		Missed communication packet, Frame started with something other than STX.
Unexpected STX (error 2)		PLM II™ transmitted a re-transmit request or re-initialized communications unexpectedly in middle of frame
BCC error (error 3)		Block check sum error
Program error (error 4)	Scope cannot resolve communication error	
Rep Code		
Final Load		The final load calculated by the PLM II™.
Final Pressure		The pressure used to calculate the final payload.
Swing Load Data		All data used to calculate and transmit the displayed swing load.
RTM Data		Real-time data transmitted to Scope via the RS232 connection. This data is transmitted by the PLM II™ every 200ms.

CAB RADIO



To operate the Radio

1. Rotate the **ON-OFF** control (1) clockwise to turn the radio ON; rotate CCW (counter-clockwise) to turn radio OFF. Rotate **VOL** control clockwise to increase volume. Rotate **VOL** control CCW to decrease volume.

2. **AM/FM** or **WX** - Press **BAND** switch (2) to select desired band. (AM/FM or optional WX*, will be displayed depending on band choice.)

   NOTE: The last station heard on each band will be stored in memory. When switching back to that band, it will automatically return.
   * WX not available on all models.

3. **SEEK** - Press **SEEK** ∧ / ∨ (3) to automatically search for the next higher / lower listenable station and stay there. It will find another station each time that the button is pressed.

4. **Manual Tuning** - Press and hold **TUNE** ∧ button (4) to increase frequency.
   Release as the desired frequency is approached.
   Press **TUNE** ∨ to decrease frequency.

5. **Pushbuttons** - Press one of the five pushbuttons (5) to recall a preset station.

6. The following procedure will set-up pushbuttons:

   Locate a favorite station by using **SEEK** ∧ / ∨ or the **TUNE** ∧ / ∨ buttons.
   Press **SET** pushbutton (6). The station frequency will flash 5 seconds or until set.
   Press the button that is desired to be established for that station.
   The radio will now return to that frequency each time that button is pressed and released.

   NOTE: A total of fifteen stations can be preset - 5 AM, 5 FM, and 5 WX.

7. **Clock** - If time-of-day is not on the display, press **RCL** (7).

   Press and hold **SET** button and at the same time press and hold **TUNE** ∨ until the correct ***hour*** appears.
   Press and hold **SET** button and at the same time, press and hold **TUNE** ∧ until the correct ***minute*** appears. (Seconds will set to 00 when adjusting minutes.)

   Frequency - If radio is turned on and time is being displayed, press **RCL** to display frequency.

   Stereo - The radio will automatically switch to stereo when tuned to an FM station broadcasting stereo, and the stereo indicator light **ST** will be displayed.

8. **Balance** - The left-right stereo balance is adjusted by rotating the **BAL**ance (8) control in the corresponding direction from the detent position.

9. **Fade** - Using the tab behind the **BAL** control, adjust the **FAD**E control (9) to the right to **FAD**E toward the rear speakers. Adjust it to the left to **FAD**E toward the front speakers.

   *NOTE: **BAL**ance (8) and **FAD**E (9) controls have a detent position at the center for a balance of front to rear and left to right*.

10. & 11. **Tone**

    Rotate **TRE** control (10) towards left to decrease treble; rotate **TRE** control towards right to increase treble.

    Rotate **BAS** control (11) to the right to increase bass; rotate **BAS** control to the left to decrease bass.

NOTE: Both controls have a detent position at the center for a balance of treble and bass.

Replace Door Glass

1. Remove hair pin clip (1, Figure 2-6) and bolt (2) from the door check strap closes to the door.

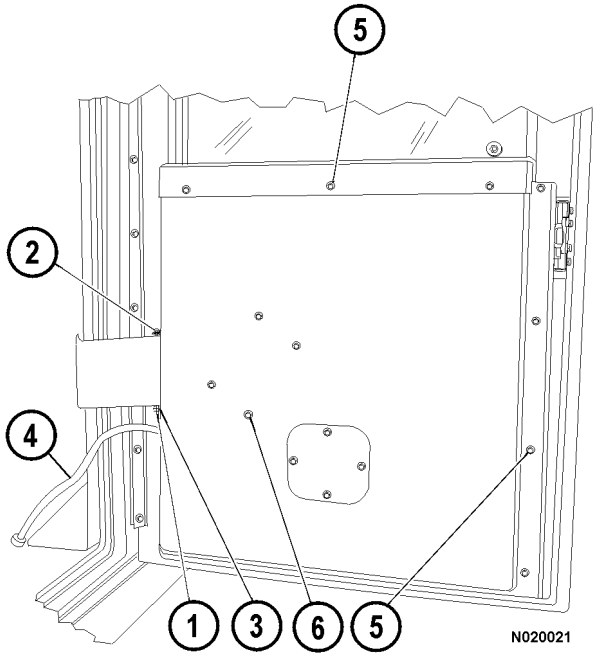


FIGURE 2-6.

1. Hair Pin Clip
2. Door Strap Bolt
3. Strap Bracket
4. Wiring Harness
5. Panel Screws
6. Window Regulator Mounting Screw

2. Remove 2 M8X12 capscrews (3), which hold the door strap bracket to the door.

3. Disconnect wiring harness (4) to the window regulator.

4. Open the door as far as possible in order to remove the internal door panel.

⚠CAUTION

Door glass and internal door panel will drop when door panel screws are removed.

5. Before removing all door panel mounting screws, support the panel to prevent the assembly from dropping. Remove 15 mounting screws (5).

   NOTE: Remove panel screws across the top last.

6. Carefully lower the door panel a few inches (Figure 2-7). Hold glass at top to prevent it from dropping. Slide the door panel toward the cab to disengage the window regulator roller from the track on the bottom of the glass. Then slide the panel away from the cab to disengage the other top roller and the lower roller from their tracks. Place the panel out of the way after removal.

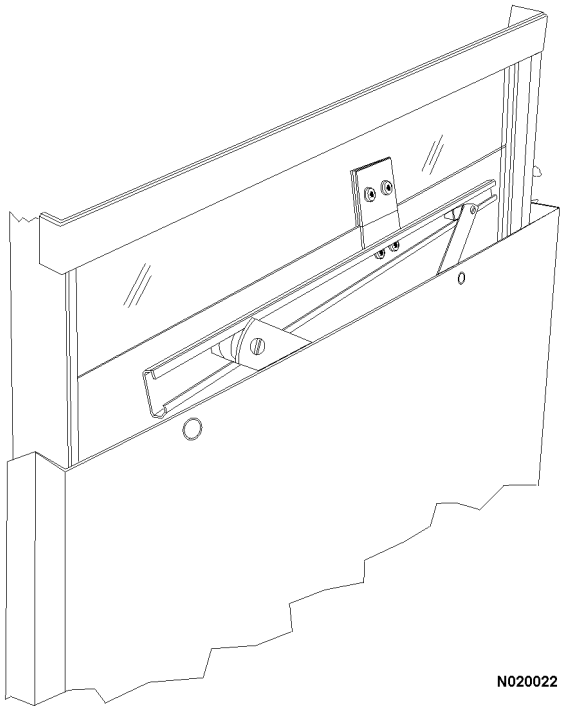


FIGURE 2-7.

HEATER/AIR CONDITIONER

The heater assembly incorporates all the controls necessary for regulating the cab interior temperature; heated air during cold weather operation, outside air during mild temperatures and cooled, de-humidified air during warm weather operation if the optional air conditioning system is installed.

The following information primarily describes the heater system. Refer to Section M, *"Air Conditioning System"* for detailed information concerning the complete air conditioning system operation, repair, and system recharging instructions.

OPERATION

Heat for the cab is provided by passing coolant from the engine cooling system through a heater coil. Blowers move air across the heating coil which warms the air for heating or defrosting.

An engine driven freon compressor passes air conditioning system refrigerant through an evaporator coil mounted in the same enclosure. The same blowers used for heating move air across the evaporator to provide cooled air through the outlet vents.

All heater and air conditioner controls are mounted on a pod on the face of the enclosure.

HEATER COMPONENTS

NOTE: Figures 3-4 and 3-5 illustrate both the heater system and air conditioning system parts contained in the cab mounted enclosure. Refer to Section "M" for additional information regarding air conditioning system components, maintenance and repair.

CIRCUIT BREAKERS

Before attempting to troubleshoot the electrical circuit in the heater enclosure, turn key switch ON and verify circuit breaker CB31 (located on Power Distribution Module behind operator's seat) and the internal heater circuit breaker have not opened by verifying +24VDC is present on the junction block (24, Figure 3-5).

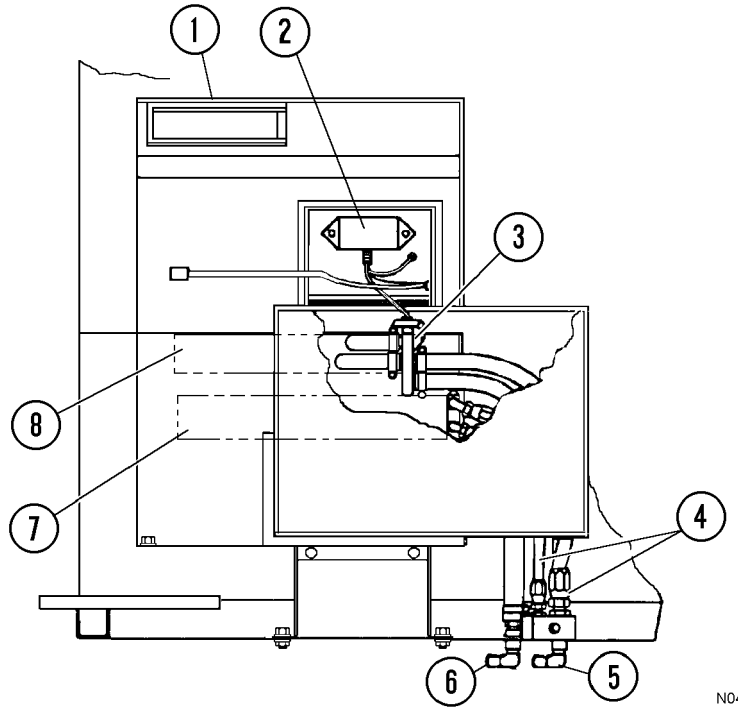


FIGURE 3-4. CAB HEATER/AIR CONDITIONER COMPONENTS

1. Enclosure
2. Heater Control Module
3. Water Control Valve
4. A/C Freon Hoses
5. Water Outlet (To Engine)
6. Water Inlet (From Engine Water Pump)
7. Evaporator Coil
8. Heater Coil

CENTER CONSOLE STRUCTURE

The Center Console (1, Figure 4-4) located to the right of the operator seat, is a housing structure which provides a mounting surface for certain operator controls and a passenger seat.

The housing below the passenger seat provides an easy access to various control components (relays, solenoids, valves, etc.) for the service technican. Refer to the Section D, 24VDC Electric System, for descriptions and service for these devices.

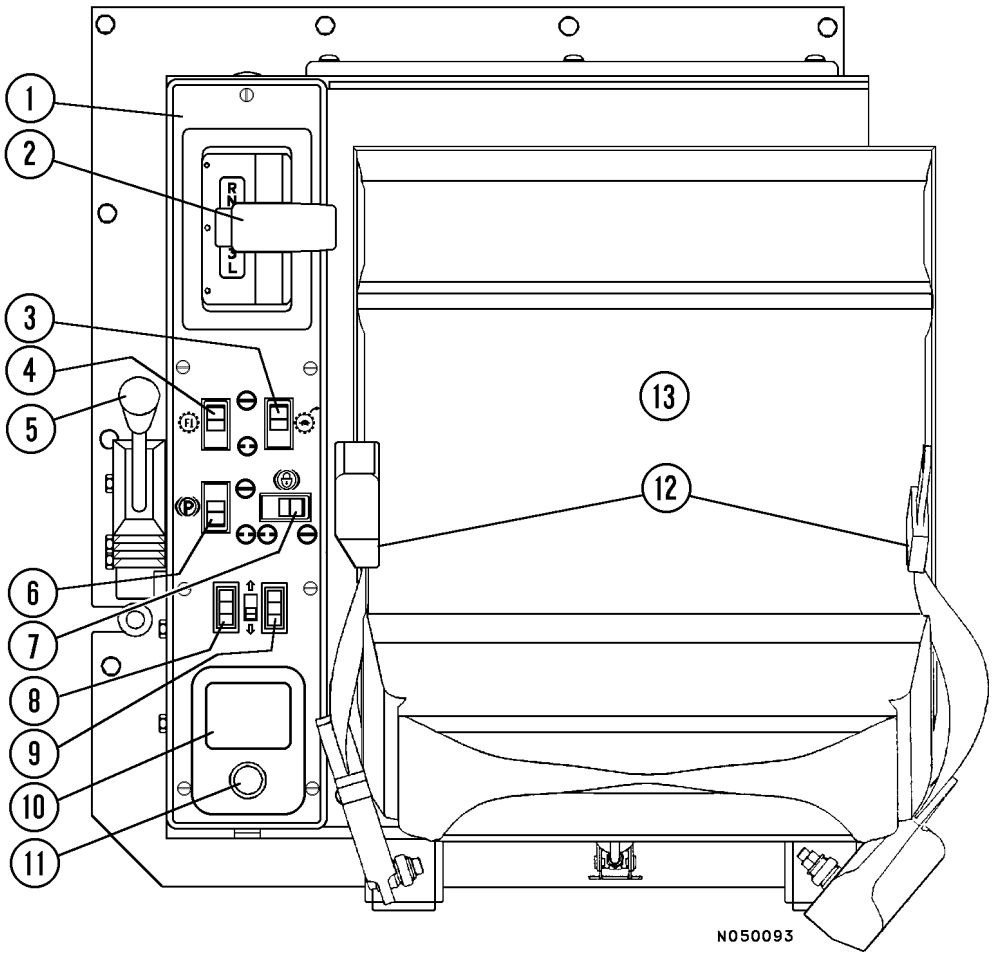
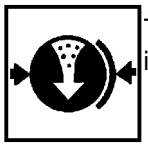


FIGURE 4-4. CENTER CONSOLE

1. Center Console Structure
2. Transmission Range Selector
3. Shift Limit Switch
4. “F1" Start Switch
5. Hoist Control Lever
6. Parking Brake Switch
7. Brake Lock Switch
8. L.H. Window Control Switch
9. R.H. Window Control Switch
10. Ash Tray
11. Cigar/Cigarette Lighter
12. Passenger Seat Belt
13. Passenger Seat

Air Pressure Monitor (NOT USED)



The Air Pressure Monitor (1, Figure 5-3) is NOT USED on this truck.

Air Pressure Gauge (NOT USED)

The Air Pressure Gauge (2, Figure 5-3) is NOT USED on this truck.

Coolant Temperature Monitor

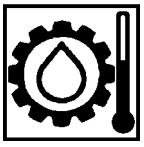
The Coolant Temperature Monitor (3, Figure 5-3) indicates a rise in the cooling water temperature.

When the monitor lamp flashes, run the engine with no load at 1200-1500 RPM until the green range of the engine water temperature gauge lights.

Engine Cooling Water Temperature Gauge

The Engine Cooling Water Temperature Gauge (4, Figure 5-3) indicates the temperature of the cooling water. If the temperature is normal during operation, the green range will light. If the red range lights during operation, the alarm buzzer will sound, the central warning lamp will flash and the coolant temperature monitor lamp will flash at the same time. If this occurs, stop the machine and run the engine with no load at 1200-1500 RPM until the green range lights.

Torque Converter Oil Temperature Monitor



The Torque Converter Oil Temperature Monitor (5, Figure 5-3) indicates a rise in the torque converter oil temperature.

When the monitor lamp flashes, stop the machine and run the engine with no load at 1200-1500 RPM until the green range of the temperature gauge lights.

Torque Converter Oil Temperature Gauge

The Torque Converter Oil Temperature Gauge (6, Figure 5-3) indicates the temperature of the torque converter oil. If the temperature is normal during operation, the green range will light. If the red range lights during operation, the alarm buzzer will sound, the central warning lamp will light up and the torque converter oil temperature monitor lamp will flash at the same time. If this occurs, stop the machine and run the engine with no load at 1200-1500 RPM until the green range lights.

Retarder Oil Temperature Monitor

The Retarder Oil Temperature Monitor lamp (7, Figure 5-3) warns that the retarder oil temperature has risen.

If it flashes, stop the machine, return the Transmission Range Selector lever to Neutral, and run the engine under no load at 1200-1500 RPM until the warning lamp goes out.

Retarder Oil Temperature Gauge

The Retarder Oil Temperature Gauge (8, Figure 5-3) indicates the temperature of the retarder cooling oil. During normal operation, a lamp in the green range should light up.

If the lamp in the red range lights up during operation, the alarm buzzer will sound, the central warning lamp will flash, and the retarder oil temperature monitor lamp will flash at the same time. If this happens, stop the machine, return the Transmission Range Selector lever to Neutral, and run the engine at 1200-1500 RPM under no load, and wait until the lamps in the green range light up.

Left Turn Signal Pilot Lamp

When the turn signal lever is moved downwards, the left turn signal pilot lamp (9, Figure 5-3) flashes.

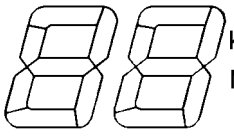
High Beam Pilot Lamp

The High Beam Pilot Lamp (10, Figure 5-3) lights up when the head lamps are on high beam.

Right Turn Signal Pilot Lamp

When the turn signal lever is moved upwards, the right turn signal pilot lamp (11, Figure 5-3) flashes.

Speedometer



The digital Speedometer (12, Figure 5-3) indicates the travel speed of the truck in miles per hour, or kilometers per hour.

This figure will appear momentarily when the keyswitch is first turned “On” to demonstate that all segments are working.

SECTION P

LUBRICATION AND SERVICE

INDEX

EVERY 2000 HOUR SERVICE

Truck Serial Number _____
Site Unit Number _____
Date:_____Hour Meter_____
Serviceperson Name_____

Maintenance for every 250, 500 and 1000 hours should also be carried out at this time.

1. STEERING, BRAKE & COOLING OIL TANK

   Drain oil from tank and refill tank to specified level, capacity 576 liters (152 U.S. gal.).
   Refer to "Lubrication Chart" for type of oil to use. Lube key “C”.
   Refer to "Hydraulic Tank Service", page 2-10.

2. FINAL DRIVE CASE

   Position machine so that casting line is horizontal and drain plug is at the bottom. Drain oil and reinstall plug, remove fill plug at castline and fill to specified level. This operation is performed on the right and left hand final drives.
   Capacity is **240 liters (63.5 U.S. gal.)** each side.
   Refer to "Lubrication Chart" for type of oil to use. Lube key “B”.

3. DIFFERENTIAL CASE

   Drain oil from differential and refill to the specified level: **capacity = 300 liters (79 U.S. gal.)**.

   Refer to "Lubrication Chart" for type of oil to use. Lube key “B”.

COMMENTS	√'d	INITIALS