DG611
9/90

Shop Manual

325M

DUMP TRUCK

KOMATSU

MAJOR COMPONENT DESCRIPTION

ENGINE

The standard 325M HAULPAK® is powered by a Cummins KT-38-C diesel engine. Other optional engines may be specified.

TRANSMISSION

The diesel engine supplies power through an Allison DP8963 transmission.
The transmission is equipped with a lock-up TC-860 torque converter, hydraulic retarder, and Allison Transmission Electronic Controls (ATEC) for automatic shifting.

FINAL DRIVE ASSEMBLY

The final drive consists of a plug-in differential assembly with planetary wheel drive.

OPERATOR'S CAB

The HAULPAK® Operator's Cab has been engineered for operator comfort and to allow for efficient and safe operation of the truck. The cab is rubber mounted to reduce noise and vibration. It includes a tinted safety-glass windshield and sliding side windows for excellent visibility, a deluxe interior, controls mounted within easy reach of the operator, and an instrument panel which provides the operator with all instruments and gauges which are necessary to control and monitor the truck's operating systems.

POWER STEERING

The HAULPAK® truck is equipped with a full time power steering system which provides positive steering control with a minimum of effort by the operator. The system includes a nitrogen-charged accumulator which automatically provides emergency power if the steering hydraulic pressure is reduced below an established minimum.

HYDRAULIC RETARDER

The hydraulic retarder is an integral part of the transmission. It is controlled by the operator through the activation of the retarder pedal in the operator cab. During normal operation, the hydraulic retarder is used to slow the truck and to control speed coming down a grade without use of service brakes.

BRAKE SYSTEM

The service brake system is an air-over-hydraulic, wedge actuated shoe and drum type. Depressing the brake pedal actuates front and rear drum brakes. Automatic emergency application as well as manual control for "Dry" and "Slippery" road conditions are provided.

SUSPENSION

HYDRAIR® II suspension cylinders located at each wheel provide a smooth and comfortable ride for the operator and dampens shock loads to the chassis during loading. Properly maintained suspensions will extend the service life of both tires and main frame.

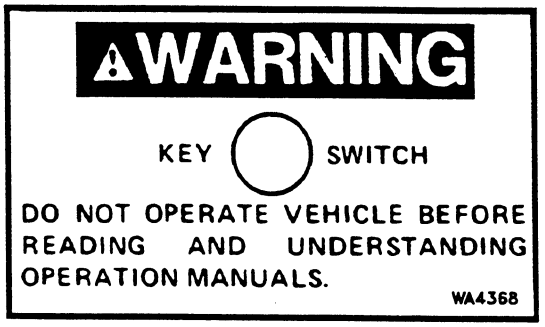
WARNINGS AND CAUTIONS

The following paragraphs give an explanation of the Warning, Caution, and Service Instruction plates and decals attached to the HAULPAK® truck. The plates and decals listed here are typical of this HAULPAK® model, but because of customer options, individual trucks may have plates and decals that are different from those shown here.

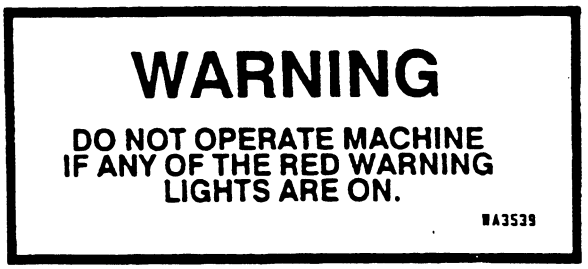
The plates and decals must be kept clean and legible. If any decal or plate becomes worn or unable to be read, it should be replaced with a new one.

A warning plate is mounted around the key switch on the instrument panel.

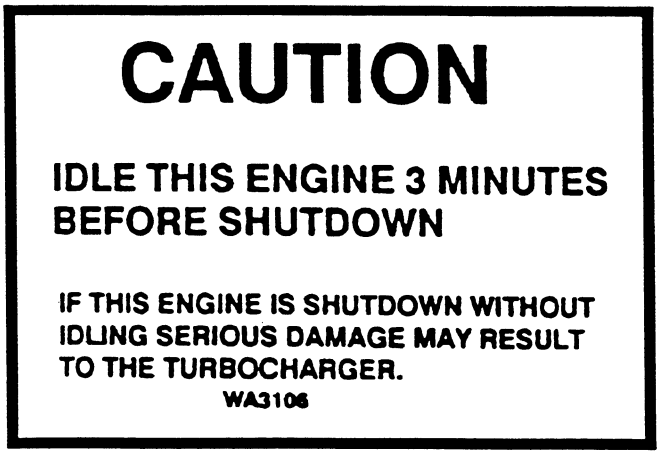
The warning stresses the importance of reading and understanding the operator's manual before operation.



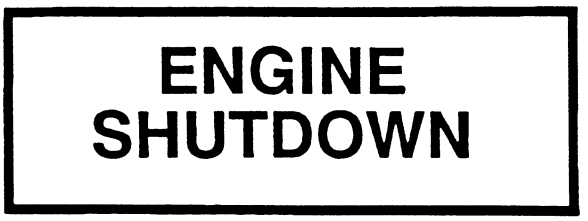
A warning plate is mounted directly under the red warning lights in the instrument panel. The warning plate stresses that if any of the red warning lights are on, the truck should be safely stopped and the engine shut down. ***Truck should not be operated with any red warning lights on.***



In the HAULPAK® cab, located above the windshield is a "Caution" to idle the engine before shutdown. Damage may result to the turbocharger if the engine has not idled the **minimum three minutes.** The turbocharger needs at least three minutes at engine idle to cool to a safe temperature.



An **OPTIONAL** engine shutdown plate is mounted on the front left hand corner by the ladder and locates the ground level engine shutdown switch.



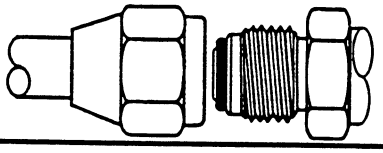


TABLE IV TORQUE CHART FOR JIC 37° SWIVEL NUTS WITH OR WITHOUT O-RING SEAL			
SIZE CODE	TUBE SIZE (O.D.)	THREADS UNF – 2B	TORQUE FT. LBS.
– 2	0.125	0.312–24	4 ±1
– 3	0.188	0.375–24	8 ±3
– 4	0.250	0.438–20	12 ±3
– 5	0.312	0.500–20	15 ±3
– 6	0.375	0.562–18	18 ±5
– 8	0.500	0.750–16	30 ±5
– 10	0.625	0.875–14	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

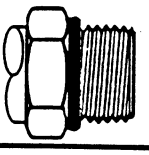


TABLE VI TORQUE CHART FOR O-RING BOSS FITTINGS			
SIZE CODE	TUBE SIZE (O.D.)	THREADS UNF – 2B	TORQUE FT. LBS.
– 2	0.125	0.312–24	4 ±2
– 3	0.188	0.375–24	5 ±2
– 4	0.250	0.438–20	8 ±3
– 5	0.312	0.500–20	10 ±3
– 6	0.375	0.562–18	13 ±3
– 8	0.500	0.750–16	24 ±5
– 10	0.625	0.875–14	32 ±5
– 12	0.750	1.062–12	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

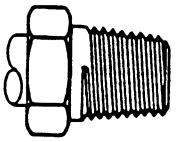


TABLE V TORQUE CHART FOR PIPE THREAD FITTINGS			
SIZE CODE	PIPE THREAD SIZE	WITH SEALANT FT. LBS.	WITHOUT SEALANT FT. LBS.
– 2	0.125–27	15 ±3	20 ±5
– 4	0.250–18	20 ±5	25 ±5
– 6	0.375–18	25 ±5	35 ±5
– 8	0.500–14	35 ±5	45 ±5
– 12	0.750–14	45 ±5	55 ±5
– 16	1.000–11.50	55 ±5	65 ±5
– 20	1.250–11.50	70 ±5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

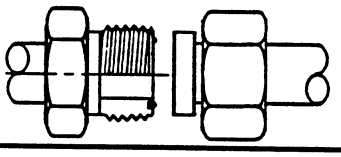


TABLE VII TORQUE CHART FOR O-RING FACE SEAL FITTINGS			
SIZE CODE	TUBE SIZE (O.D.)	THREADS UNF – 2B	TORQUE FT. LBS.
– 4	0.250	0.438–20	11 ±1
– 6	0.375	0.562–18	18 ±2
– 8	0.500	0.750–16	35 ±4
– 10	0.625	0.875–14	51 ±5
– 12	0.750	1.062–12	71 ±7
– 16	1.000	1.312–12	98 ±6
– 20	1.250	1.625–12	132 ±7
– 24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

Body Pad Adjustment

1. Lower empty dump body until in contact with frame rail. Check each body pad to determine if proper contact has been achieved at each pad. (See Note). If not, adjust with shims.

NOTE: The pads on each side should be in contact with the frame rail.

BODY GUIDE

At time of body pad replacement, wear plates, which the body guides contact, should be inspected for serviceability. Prior to checking the gap between the body guides and wear plates, insure the body is centered on the frame. The gap between the guides and wear plates should be no greater than 0.12 in. max. (3.05 mm). If the gap is greater than 0.12 in. (3.05 mm) refer to Parts Catalog for parts replacement.

NOTE: Size of weld for body guide and wear plate is 0.31 inch (7.87 mm) unless otherwise specified. Use AWS E 70 Series, Low Hydrogen Type Welding Rods, such as E7016 or E7018.

BODY POSITION INDICATOR

The body position indicator is a structure mounted to the canopy of the dump body. The indicator is located to the front right of the operators cab and is designed as a visual reference for the dump body being in the down position.

BODY SLING

The body sling is a cable located under the dump body at the rear of the truck. This cable is intended to be used as a safety cable to hold the body in the up position while the technicians work under it.

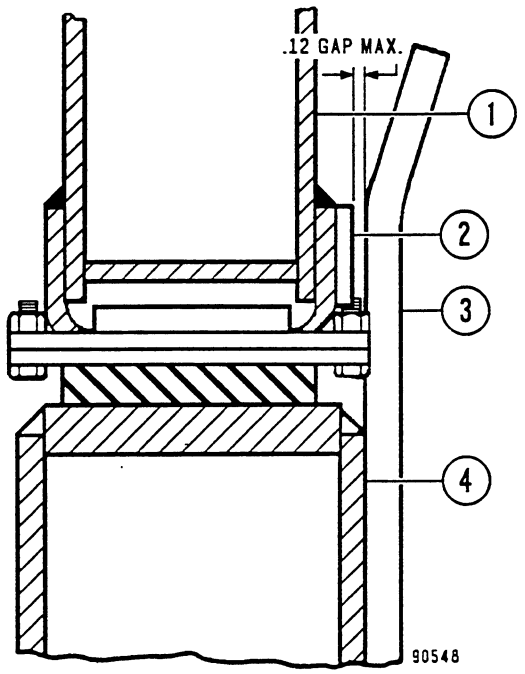


FIGURE 3-6. BODY GUIDE AND WEAR PLATE

1. Dump Body
2. Wear Plate
3. Body Guide
4. Frame

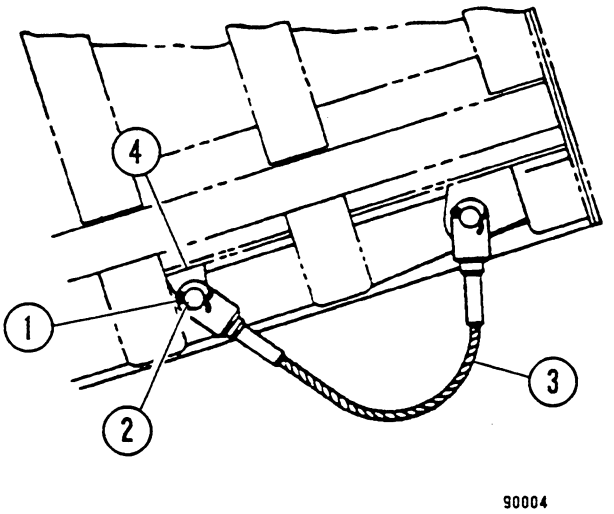


FIGURE 3-7. BODY SLING CABLE

1. Cotter Pin
2. Clevis pin
3. Cable
4. Mounting Bracket

ENGINE

The Model 325M HAULPAK® truck is equipped with a Cummins KTA38C turbocharged diesel engine. Engine power is transmitted to the Allison ATEC transmission by a short drive line consisting of a drive shaft and two universal joints.

Removal

1. Position the truck in work area with adequate overhead clearance to permit raising the dump body.
2. Apply parking brake and block wheels to prevent truck movement. Raise body and install safety cable.

⚠WARNING

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

3. Prior to disassembly or removal tag or mark all air lines, oil lines, fuel lines and electrical connections to assure correct assembly at time of engine installation. Plug all ports and cover all hose fittings or connections when disconnected to prevent dirt or foreign material from entering.
4. Remove grille according to procedure in Section "B". Remove radiator according to "Radiator Removal" procedure in this section.
5. Turn Off the ATEC switch, disconnect the negative, then the positive battery cables. Disconnect the electrical lead from the battery charging alternator.
6. Disconnect exhaust pipes from engine turbochargers and move pipes clear of engine. Cover turbocharger exhaust openings to prevent entrance of foreign material.
7. Remove oil filter inlet and outlet lines at the primary filter. Cap lines and plug filter openings. Tie hose assemblies to side of engine.
8. Close inlet and outlet water heater valves, disconnect water lines and drain water from the heater core. Secure water lines away from the engine compartment to prevent interference with engine removal.
9. Disconnect the engine ground wire, all electrical connections to the engine, and tie wiring clear of the engine. Tag or mark all wires prior to removal to aid in proper connection at installation.
10. Disconnect the electrical leads (1, Figure 4-1) from the tachometer drive generator (2), fuel pump solenoid (4) and tie leads away from engine compartment.
11. Remove coolant temperature bulb (3) from engine and coil capillary tube to prevent kinking. Do not cut tubing. Secure tubing away from center deck and engine compartment.
12. Disconnect fuel supply and return lines from the engine. Plug or cap lines and fittings to prevent entry of foreign material.
13. Disconnect the air compressor supply line at the air inlet pipe and tie supply line to engine.
14. Remove the front and rear belly guard sections if installed.

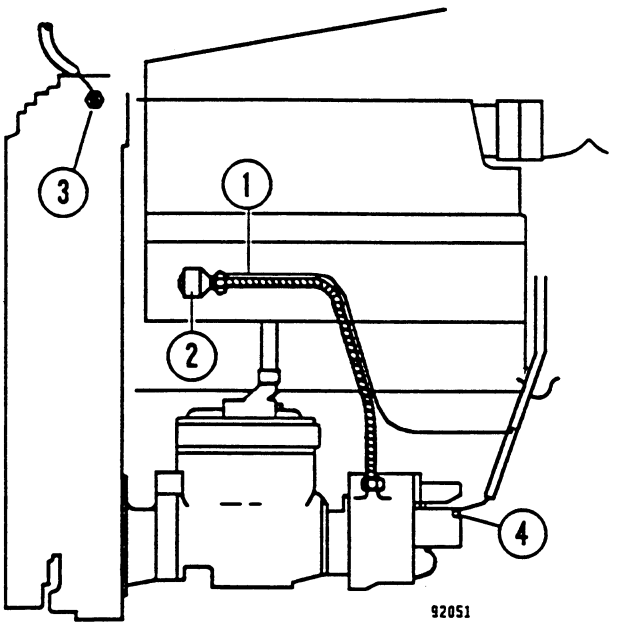


FIGURE 4-1. ENGINE ELECTRICAL CONNECTIONS

1. Electrical Lead
2. Tach Drive Generator
3. Temperature Bulb
4. Pump Solenoid

ENGINE COMPONENTS

THROTTLE CONTROL

The Cummins Engine is equipped with a throttle control lever mounted on the fuel pump. The upper end of the arm is connected to the throttle control cable and routed to the operator's throttle control pedal mounted in the cab. The lower end is connected to the ATEC Throttle Position Sensor cable and provides information to the ATEC system as the throttle pedal is depressed or released.

THROTTLE CONTROL PEDAL

Removal and Installation

1. Removal, installation, and disassembly of the foot throttle control pedal (1, Figure 6-1) is described in Section "N".

THROTTLE CONTROL LEVER

1. Removal, installation, and disassembly of the throttle control assembly is described in Section "C", Engine Removal and Installation.

Adjustment

The following procedure describes the adjustment procedure for the throttle cable. Refer to "ATEC Throttle Position Sensor", page C6-3 for sensor cable adjustment.

1. Adjust throttle control pedal stop limit screw (2, Figure 6-1) for a comfortable full throttle foot position. Tighten jam nut (5).
2. Adjust pedal start (3) for 2.00 in. (51 mm) of downward travel to the head of the pedal stop limit screw.

NOTE: Do Not adjust the pedal stop limit screw without also adjusting the pedal start position adjustment.

3. Position cable anchor (4) in holes which permit the cable to be fully retracted to the pedal start position when the pedal is in the "idle" (closed) throttle position. Secure cable anchor to mounting holes.
4. Loosen cable anchor (7, Figure 6-1) at the mounting plate on the engine.
5. With throttle control lever (8) in the "Idle" position, loosen the jam nut (9) on accelerator control cable clevis (10).
6. Remove the cotter pin and clevis pin (11) from cable clevis.
7. Adjust the accelerator cable (6) by turning the clevis (10) on or off the cable. Turn the clevis eye so that it aligns with the eye in the governor control lever (8) in the "Idle" position.
8. Install clevis pin and cotter pin (11) into clevis and tighten jam nut (9) holding clevis to accelerator control cable.
9. Tighten cable anchor (7) in position. Check that the throttle end of the cable is properly shimmed and the anchor secures the cable in the cable groove.
10. Start engine and check operation of the throttle control pedal.
11. Run engine up to full throttle and release. Engine should return to "Idle" (750 RPM). Cable should work freely without binding.
12. Adjust the ATEC Throttle Position Sensor Cable (see "ATEC Throttle Position Sensor").

24VDC ELECTRICAL SYSTEM COMPONENTS

ALARM INDICATING DEVICE (AID) SYSTEM

The AID system used on the HAULPAK® is a device which is connected in the electrical accessories circuits to provide the operator with a warning indication of a malfunction. The Alarm Indicating Device (AID) consists of an alarm module mounted at the rear of the passenger seat and indicating lights mounted in the right side of the instrument panel in the operator's cab.

The AID enables the indicating lights to be flashing or constant. The AID also has the capability of operating an audible alarm along with the light.

The following outline briefly describes each circuit and its' functions. (Refer to Figure 3-1.)

The Coolant Level Circuit

The Coolant Level Probe connected to pin "D" of P1 grounds the circuit when the coolant in the radiator is above the probe position. The coolant saturates the probe and electrically grounds the circuit. When the circuit is grounded, Q1 transistor is "Off", resulting in no alarm indication. When Q1 transistor is "Off", it is biased to be saturated, showing no malfunction, resulting in 24 volts positive input at pin "E".

When coolant level drops below the probe, the circuit is no longer grounded. Q1 transistor turns "On" to ground the Coolant Level Lamp through D1 diode to pin "G" at P1 and ground the buzzer through D7 diode to pin "C" of P2. The Coolant Level Lamp turns "On" and the warning buzzer sounds.

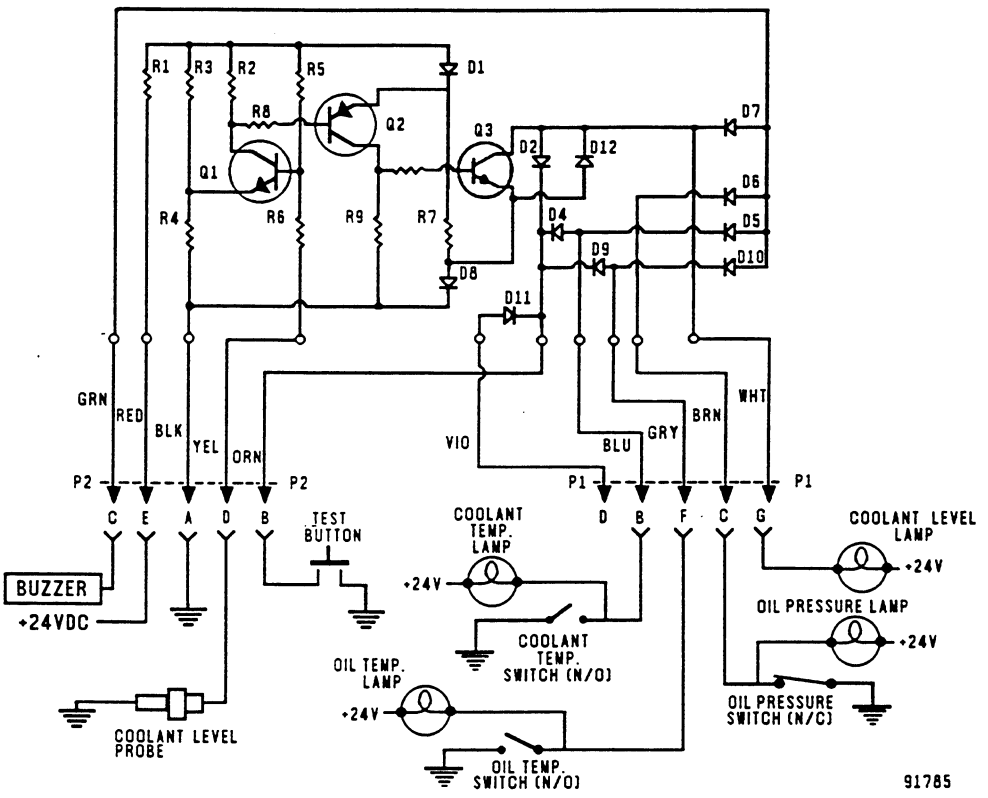


FIGURE 3-1. ALARM SYSTEM SCHEMATIC

The following provision is available, but not currently utilized on the 325M Transmission.

11. When the retarder is fully applied, the retarder pressure switch provides 24V + on wire (211). This causes the ECU to make downshifts for gears sixth, fifth and fourth, slightly higher than wide open throttle downshifts, even though the operator is not depressing the throttle. This feature provides maximum retarding effort through selection of the most effective gear ratio.

12. Optional, wire (309) is a logic return circuit for the ECU. The hoist pressure switch controlled by the hoist control lever connects wire (305) to wire (309) when the body is being raised, which immediately tells the ECU to shift the transmission to "Neutral" if it is in "Reverse". While the hoist lever is in the "Body Up" position, "Reverse" cannot be obtained. "Reverse" can be obtained only by having the Range Selector in "Neutral" after the hoist lever is released from the "Body Up" position.

    The purpose of this feature is to prevent accidental rearward movement of the truck when the operator begins to raise the body. There is no body interlock function to inhibit "Forward" operation.

    a. If the truck moves in reverse when the hoist control lever is held in "Power Up" position:

        1). Shut down engine and turn key switch "Off".
        2). Remove ATEC plug J3 from ECU.
        3). Connect an ohmmeter between pin J and E of the J3 harness.
        4). Ohmmeter should indicate continuity through pressure switch of hoist interlock circuit.
        5). Turn keyswitch "On", move hoist control lever to "Power Up" position. Ohmmeter should indicate infinity (air system must be fully charged to obtain a proper reading).
        6). If ohmmeter does not indicate hoist pressure switch opening when hoist control lever is moved to "Power Up" position, replace the pressure switch.
        7). If ohmmeter indicates hoist pressure switch opens when hoist switch is moved to "Power Up" position, refer to *"ATEC Off-Highway Troubleshooting Manual".*
        8). Install J3 plug into ECU.

    b. Transmission will not shift to "Reverse" range when range selector is moved to "Reverse" position.

        1). Turn keyswitch "Off".
        2). Remove J3 plug from ECU.
        3). Check for continuity between pins J and E of J3 harness plug with an ohmmeter.
        4). If ohmmeter reads infinity, correct HAULPAK® circuit problem.
        5). If ohmmeter indicates continuity, refer to *"ATEC Off-Highway Troubleshooting Manual".*

13. The Manual/Automatic Maintenance Switch, located under the passenger seat box, **should only** be used by skilled technicians. When placed in the "MAN" position, the switch is closed and connects circuits (311), (313) and (315) to circuit (309). The result is the ECU shifts the transmission to whatever position the Range Selector is in. This function should only be used to perform service checks of clutch functions by skilled technicians. The switch must be in the "AUTO" position for normal automatic upshift and downshifts.

    Check operation of the switch by verifying continuity when in the "MAN" position and no continuity when in the "AUTO" position.

⚠CAUTION

Improper use of the Manual/Automatic Maintenance Switch can cause damage to the drive train.

14. The Battery Equalizer is connected from the batteries to the 24 volt terminal on the Battery Equalizer by wire (1). The 12V terminal is connected to the ECU by going through CB-1 using wire (1T). Wire (1T) is also connected to one of the two batteries.

⚠CAUTION

Before welding on truck, be sure alternator and battery equalizer are completely disconnected. Remove equalizer ground first, then disconnect 12 and 24 volt positive terminals. When connecting back in system, connect 24 and 12 volt positive terminals first, ground terminal last.

OIL COOLER AND STRAINER

TRANSMISSION OIL COOLER (HEAT EXCHANGER)

Removal

NOTE: The heat exchanger (transmission cooler) may be removed and replaced with the radiator in place or after the radiator has been removed. Radiator and heat exchanger must be drained of coolant and the heat exchanger drained of transmission oil prior to removal.

⚠CAUTION

If the heat exchanger must be removed due to an internal malfunction in the transmission, all oil lines and the transmission strainer must also be removed, flushed and serviced to remove any possible contaminants. This should be done while the transmission is being repaired or replaced.

1. After coolant and transmission oil have been drained, disconnect all coolant and oil lines from the heat exchanger. Plug or cap all lines to prevent contamination.
2. Remove nuts and lockwashers (9, Figure 3-1) and straps (5). Remove heat exchanger from truck and move to work area for service.

Installation

1. Position heat exchanger on frame brackets and install straps (5, Figure 3-1). Secure each strap with lockwasher and nut (9). Tighten nuts to **25 ft. lbs. (34 N.m)** torque.
2. Using new gaskets, position both coolant lines at ends of heat exchanger, seat fully and secure each with capscrews and lockwashers. Tighten capscrews evenly to **25 ft. lbs. (34 N.m)** torque.
3. Uncap transmission oil lines and connect to heat exchanger ports. Use new O-rings and tighten split clamp capscrews evenly to standard torque.
4. Install and close drain cock in left hand bonnet of heat exchanger, if removed.
5. Service transmission oil and engine coolant as necessary. Check for static leaks before engine start and recheck for leakage with the engine running.

Oil Cooler Service

Repair of tubes in a heat exchanger should be done by a suitably equipped radiator shop. Leaking tubes may be plugged to reuse a heat exchanger but no more than a total of 4-5% of the tubes should be plugged to insure complete and adequate cooling capacity. Serious leakage or extreme corrosion will require replacement of the heat exchanger assembly.

Disassembly

1. To gain access to the heat exchanger core, remove the capscrews and bonnet (10, Figure 3-1) from each end of the assembly. Remove and discard sealing gasket (11).

Assembly

1. After core has been cleaned or repaired, install new sealing gaskets (11) (with sealer) and the bonnets (10). Secure each bonnet with capscrews. Tighten capscrews evenly to **25 ft. lbs. (34 N.m)** torque.

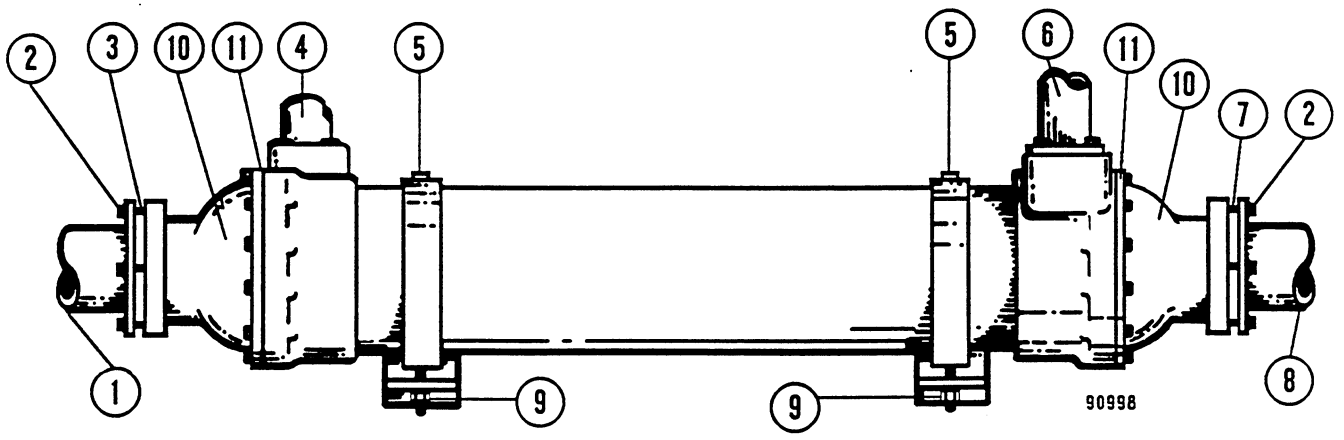


FIGURE 3-1. TRANSMISSION COOLER

1. Coolant Inlet
2. Capscrew
3. Inlet Flange
4. Oil Inlet
5. Mounting Strap
6. Oil Outlet
7. Outlet Flange
8. Coolant Outlet
9. Nut & Lockwasher
10. Bonnet
11. Gasket

SECTION G
DRIVE AXLE, SPINDLE AND WHEELS
INDEX

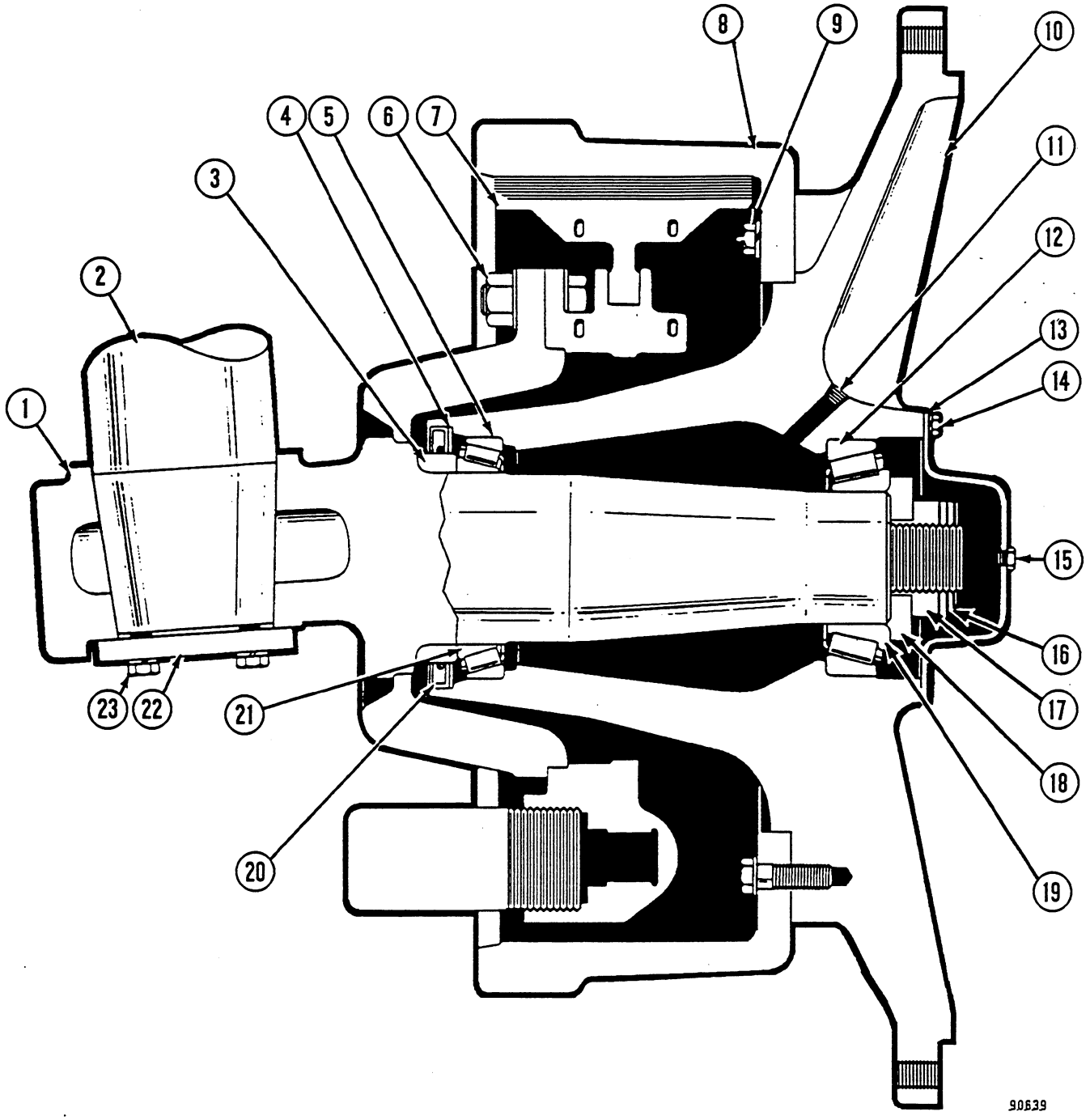


FIGURE 3-3. SPINDLE AND HUB ASSEMBLY

1. Spindle
2. Suspension Rod
3. Seal Runner
4. Spacer
5. Bearing Cup
6. Capscrew, Washer, & Nut
7. Brake Assembly
8. Brake Drum
9. Capscrew & Lockwasher
10. Wheel Hub
11. Drain Plug
12. Bearing Cup
13. Hub Cap & Gasket
14. Capscrew & Lockwasher
15. Check Valve
16. Pin
17. Nut
18. Spacer
19. Bearing Cone
20. Oil seal
21. Bearing Cup
22. Retainer Plate
23. Capscrew & Lockwasher

DIFFERENTIAL CARRIER

The 15 in. (38 cm) severe service differential is used in Model 325M/85D HAULPAK® Trucks. This differential is equipped with a 3.88:1 ratio ring gear and pinion set. The differential assembly is a "plug-in" unit which allows the assembly to be removed from the final drive for complete service.

NOTE: Several special tools are available for servicing the differential carrier. The tool part numbers are referenced during the following procedures. For additional information, refer to Section M, "Special Tools".

⚠CAUTION

The differential carrier assembly weighs approximately 3100 lbs. (1400 kg). Be sure all lifting devices are of adequate capacity to handle this component.

Removal

1. Remove drain plug from bottom of final drive case and drain oil. Replace drain plug after oil has been drained.
2. Apply parking brake to keep companion flange from rotating while splined locknut (3, Figure 5-4) is removed. Remove lock plug (2) and loosen splined nut (3).

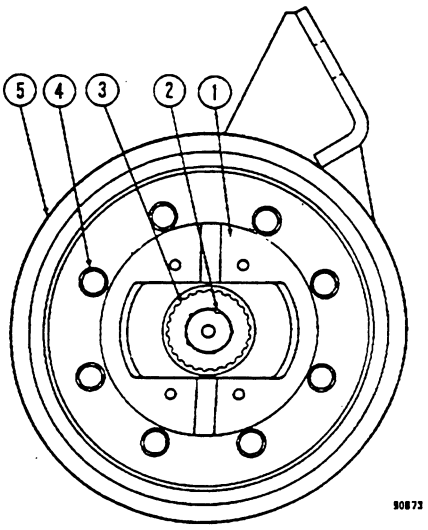


FIGURE 5-4. PARKING BRAKE DRUM REMOVAL

1. Companion Flange
2. Lock Plug
3. Splined Locknut
4. Capscrew & Washer
5. Brake Drum

NOTE: Some models may use a retainer plate and capscrews in place of the splined locknut. Refer to Figure 5-22 in this Section.

3. Loosen capscrews (4), but do not remove. Release parking brake, remove capscrews (4) and brake drum (5). Remove locknut (3) and companion flange (1).
4. Remove capscrews and washers (1, Figure 5-5) and remove brake retainer (2) and parking brake assembly (5). For further service of the parking brake see Section "J".
5. Remove capscrews (1, Figure 5-6), cover plate (4) and O-ring (5).

NOTE: When removing parts from the planetaries, parts should be clearly marked right (R) or left (L) and returned to the proper side at assembly.

6. Remove thrust pin (3) and thread the sun shaft handling tool, shown in Figure 5-7, into the sun shaft (8). Attach a lifting device to handling tool and carefully remove sun shafts (8) from planetaries. Remove thrust ring (7) as sun shaft is removed.

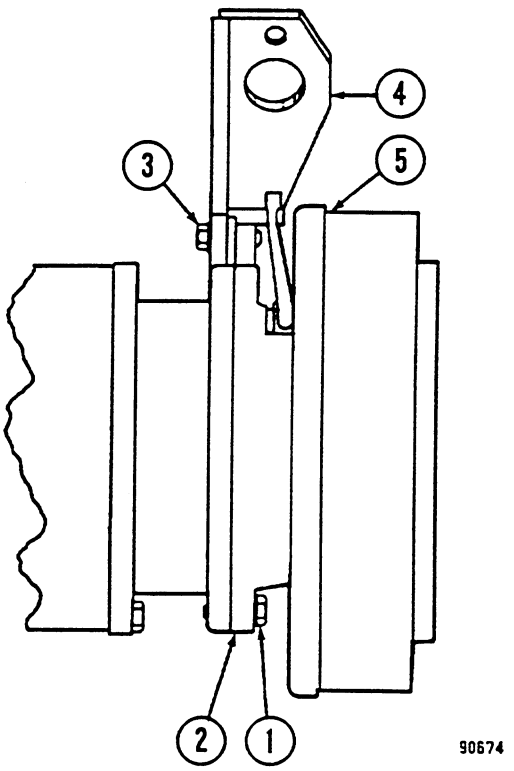


FIGURE 5-5. PARKING BRAKE RETAINER REMOVAL

1. Capscrew & Washer
2. Brake Retainer
3. Capscrew & Washer
4. Actuator Bracket
5. Brake Assembly

REQUIRED SHIM STACK		SHIM PART NUMBER AND QUANTITY TO INSTALL				
INCHES	MILLIMETERS	TB4235 0.060 in. (1.524 mm)	TB4236 0.062 in. (1.575 mm)	TB4237 0.064 in. (1.626 mm)	TB4238 0.068 in. (1.727 mm)	TB4239 0.076 in. (1.930 mm)
.390	9.906	2	1	1	1	1
.388	9.855	3	0	1	1	1
.386	9.804	3	1	0	1	1
.384	9.754	4	0	0	1	1
.382	9.703	3	1	1	0	1
.380	9.652	4	0	1	0	1
.378	9.601	4	1	0	0	1
.376	9.550	5	0	0	0	1
.374	9.500	3	1	1	1	0
.372	9.449	4	0	1	1	0
.370	9.398	4	1	0	1	0
.368	9.347	5	0	0	1	0
.366	9.296	4	1	1	0	0
.364	9.246	5	0	1	0	0
.362	9.195	5	1	0	0	0
.360	9.144	0	0	1	1	3
.358	9.903	0	1	0	1	3
.356	9.042	1	0	0	1	3
.354	8.992	0	1	1	0	3
.352	8.941	1	0	1	0	3
.350	8.890	1	1	0	0	3
.348	8.839	2	0	0	0	3
.346	8.788	0	1	1	1	2
.344	8.738	1	0	1	1	2
.342	8.687	1	1	0	1	2
.340	8.636	2	0	0	1	2
.338	8.585	1	1	1	0	2
.336	8.534	2	0	1	0	2
.334	8.484	2	1	0	0	2
.332	8.433	3	0	0	0	2
.330	8.382	1	1	1	1	1
.328	8.331	2	0	1	1	1
.326	8.280	2	1	0	1	1
.324	8.300	3	0	0	1	1
.322	8.179	2	1	1	0	1
.320	8.128	3	0	1	0	1
.318	8.077	3	1	0	0	1

FIGURE 5-18. PINION SHIM STACK CHART

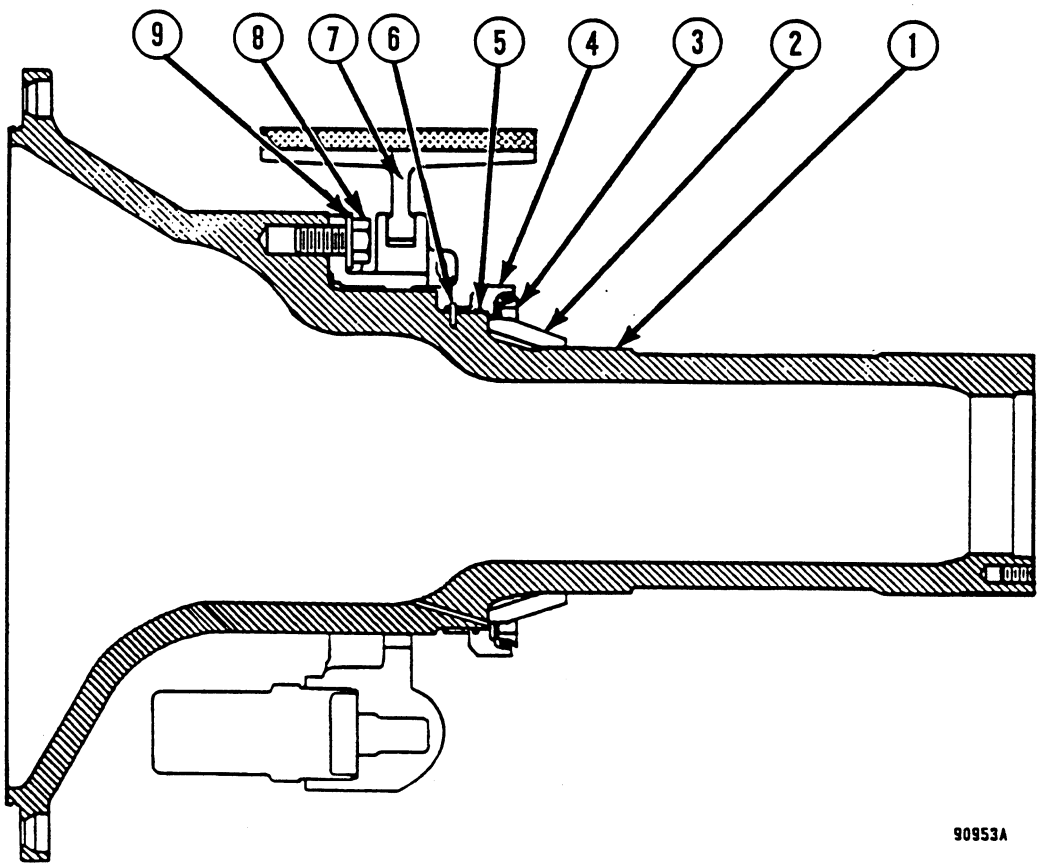


FIGURE 6-9. AXLE HOUSING

1. Axle Housing
2. Spacer
3. Face Seal
4. Seal Carrier
5. O-Ring
6. Roll Pin
7. Brake Assembly
8. Capscrew
9. Flatwasher

7. After seal installation has been completed, wipe the seal face with a lint free cloth to remove any foreign material or fingerprints and place a few drops of light oil on a clean cloth and completely coat the seal face.

⚠CAUTION

Do not allow oil to contact the rubber portion of seal or seat.

8. Install both bearing cups (9, Figure 6-8) in wheel hub and seat fully against bore shoulder.
9. Position inboard bearing cone (3) in bearing cup. Lubricate cone with oil before installing.
10. Install O-ring (10) (lightly lubricated with petroleum jelly) into groove of seal carrier (5). Position seal carrier on wheel hub and secure with capscrews and lockwashers. Tighten capscrews to standard torque.
11. Install face seal (4) using procedure outlined in Step 6.
12. Install shield (2) with new gasket (11) on wheel hub and secure with capscrews and lockwashers (1). Tighten capscrews to standard torque.

REAR SUSPENSIONS

The HYDRAIR® II suspensions are hydro-pneumatic components containing oil and nitrogen gas. The oil and gas in the four suspensions carry the gross truck weight less wheels, spindles and final drive assembly. The rear suspension cylinders consist of two basic components; a suspension housing attached to the truck frame and a suspension rod attached to the final drive center case.

The HYDRAIR® II suspension cylinder requires only normal care when handling as a unit. However, after being disassembled these parts must be handled carefully to prevent damage to the machined surfaces. Surfaces are machined to extremely close tolerances and are precisely fitted. All parts must be completely clean during assembly.

An overhead crane is recommended to lift the rear of the truck during rear suspension removal and installation. If a crane is unavailable, the frame can be raised and lowered as required by utilizing the suspension as jack by charging with nitrogen to raise the frame and releasing the nitrogen to lower the frame.

Removal

1. Remove suspension boot clamp and boot. Remove charging valve cap, (1, Figure 3-1) loosen small hex (4) on charging valve and turn counterclockwise three full turns to unseat valve seal, connect suspension charging kit. Charge the suspension to be removed with dry nitrogen to fully extend suspension piston. After suspension is charged, disconnect charging kit.

⚠WARNING

Make certain only the swivel nut turns. Turning the complete charging valve assembly may result in the valve assembly being forced out of the suspension by the gas pressure inside.

2. With suspension piston fully extended, place a block between frame and axle pad. Refer to Figure 3-2.

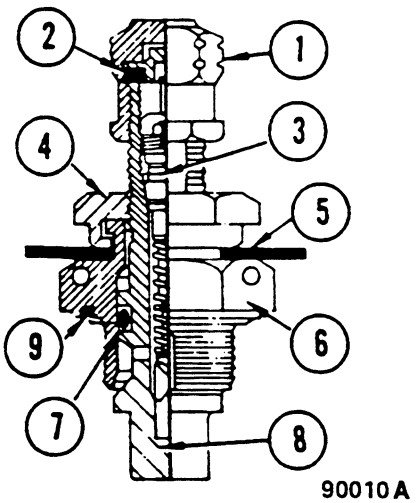


FIGURE 3-1. CHARGING VALVE

1. Valve Cap
2. Seal
3. Valve Core
4. Swivel Nut
5. Rubber Washer
6. Valve Body
7. O-Ring
8. Valve Stem
9. O-Ring

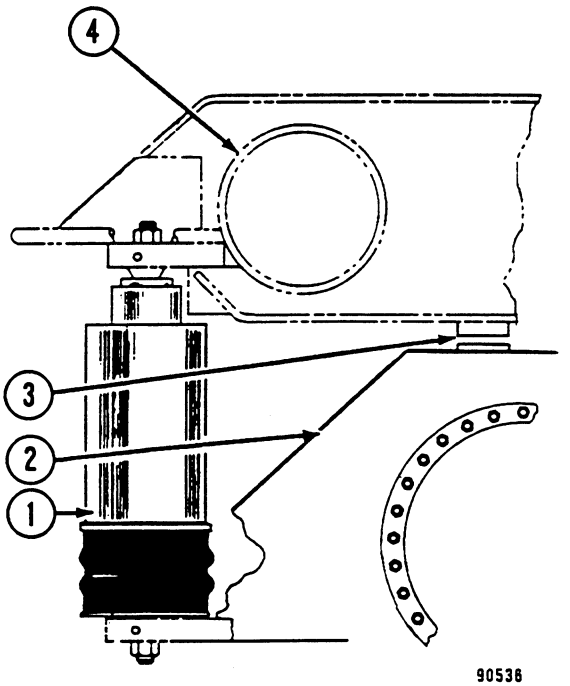


FIGURE 3-2. REAR SUSPENSION BLOCK PLACEMENT

1. Rear Suspension
2. Rear Drive Case
3. Place Blocks Here
4. Frame

⚠WARNING

Make certain all personnel are clear and support blocks are secure before relieving nitrogen pressure from the suspension. Use a face mask or goggles when venting nitrogen.

2. Remove charging valve cap (1, Figure 4-3). Turn the charging valve swivel nut (4) counterclockwise three full turns to unseat valve seat. DO NOT TURN LARGE HEX (6). The charging valve body has a bleeder groove in its mounting threads but for safety of all personnel the valve body MUST NOT be loosened until ALL nitrogen pressure has been vented from the suspension.
3. Depress the charging valve core to release nitrogen pressure from the suspension.

   When nitrogen pressure has been vented to atmosphere, loosen and remove the charging valve. The suspension should have collapsed slowly as gas pressure was released. Truck weight is now supported by the support blocks.
4. Using a funnel or plastic tube to help bleed off trapped air inside the cylinder, service the suspension with clean HYDRAIR® oil until the cylinder is full to top of charging valve bore. Drip pans should be used and all spillage cleaned from outside of suspension. Allow suspension to stand for at least 15 minutes to clear any trapped nitrogen and/or air bubbles from the oil. Add oil if necessary. Loosely install charging valve.

Rear Suspension Nitrogen Charging

⚠WARNING

Lifting equipment (crane or hydraulic jacks) must be of sufficient capacity to lift the truck weight. Be certain that all personnel are clear of lift area before lift is started.

1. With nitrogen charging support blocks at hand raise rear of truck with crane or jacks to provide clearance for these support blocks (Figure 4-4).
2. Install nitrogen charging dimension support blocks. Lower the truck frame until supports are firmly and squarely seated between the final drive mounting bracket and suspension cylinder barrel.
3. Install charging valve with new lubricated "O" ring (9, Figure 4-3). Use clean HYDRAIR® oil.
4. Tighten valve body (large hex, 6) to **16.5 ft. lbs. (22.4 N.m)** torque. The valve swivel nut (small hex, 4) must be unseated counterclockwise three full turns.

⚠WARNING

Dry nitrogen is the only gas approved for use in HYDRAIR® II suspensions. Charging of these components with oxygen or other gases may result in an explosion which could cause fatalities, serious injuries and/or major property damage. Use only nitrogen gas meeting the specifications shown in charts (Figure 4-5).

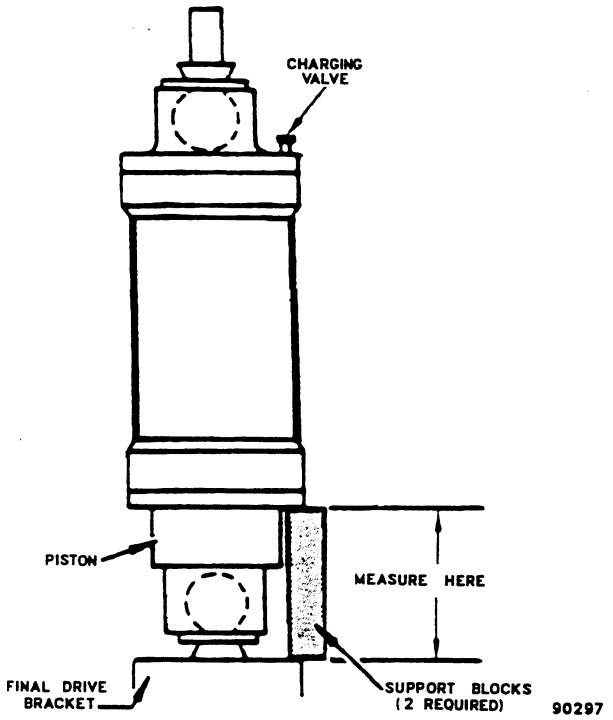


FIGURE 4-4. REAR SUSPENSION

REAR SUSPENSION DIMENSIONS			
TRUCK MODEL SIZE	OILING HEIGHT in. (mm)	CHARGING HEIGHT in. (mm)	CHARGING PRESSURE psi (kPa)
85D/325M	11.0 (279)	14.5 (368)	265 (1827)
100T/385M	7.4 (187)	13.8 (349)	165 (1137)

PRESSURE CONVERTER

There are six pressure converters on the truck. Two pressure converters supply hydraulic pressure to the front wheel cylinders and four pressure converters supply hydraulic pressure to the rear wheel cylinders.

The pressure converters are devices that convert air pressure into hydraulic force for actuation of the wheel brakes. The pressure converters for the front and rear wheel brake assemblies are located on the deck, to the right of the operator's cab.

Air pressure entering the air chamber acts against the piston head, forcing the piston to move. The piston rod moves against the plunger assembly of a hydraulic master cylinder. Movement of the plunger forces hydraulic fluid out of the master cylinder to actuate wheel cylinders of the brake assemblies.

BRAKE FLUID RESERVOIR

The six brake fluid reservoirs located to the right of the operator's cab above the pressure converters provide brake fluid to the pressure converters. Hydraulic brake fluid level in these reservoirs should be properly maintained.

MOISTURE EJECTION VALVE

The main air tank is equipped with a moisture ejection valve. When tank pressure drops slightly (approximately 2 psi (14 kPa)), air pressure in the sump cavity of the valve opens the exhaust valve allowing moisture and contaminants to be ejected. The exhaust valve will remain open until pressure in sump cavity drops sufficiently to close the exhaust valve. The length of time the exhaust valve remains open and amount of moisture ejected depends upon sump pressure and the tank pressure drop each time air is used from the system.

Manual draining can be accomplished by moving the wire in the exhaust port upward and holding until draining is completed.

LIMITING AND QUICK RELEASE VALVE

The limiting and quick release valve is actuated through the Dry/Slippery Road switch located on the instrument panel.

The limiting and quick release valve permits full air pressure delivery to the front brake pressure converters when operating on dry roads or limits pressure delivered to the front wheel brake pressure converters to 50 per cent of the brake circuit pressure delivered to the rear brakes when operating on slippery roads.

This valve also serves as a quick release valve upon release of the brakes.

BRAKE LOCK CONTROL VALVE

Removal

⚠CAUTION

Release air system pressure before disconnecting any air lines.

NOTE: The following service procedure also applies to the "Parking Brake Valve" and "Emergency Brake Valve".

1. Disconnect and tag air lines at brake lock control valve. Cap all lines to prevent possible contamination.
2. Remove screws from instrument panel face and remove valve. Move to a clean work area for service.

Installation

1. Position valve behind instrument panel and install mounting screws.
2. Reconnect air lines in the appropriate valve locations.

Disassembly

1. Clean exterior of valve thoroughly with solvent.
2. Press out lever pin (4, Figure 3-6), remove lever.
3. Remove plunger (11) and plunger return spring (6) from the body.
4. Unscrew cap nut (9) at bottom of the valve and remove valve spring (7) and valve (10) from body.
5. Remove grommets (5) from plunger (11) and cap nut (9).

Cleaning and Inspection

⚠WARNING

Before using any solvent or cleaning solution, read the instructions and warnings on package. Make sure solvent will not damage cylinder parts.

1. Wash metal parts in solvent.
2. Check plunger for damage. Bore of plunger must be clean and free of all foreign material.

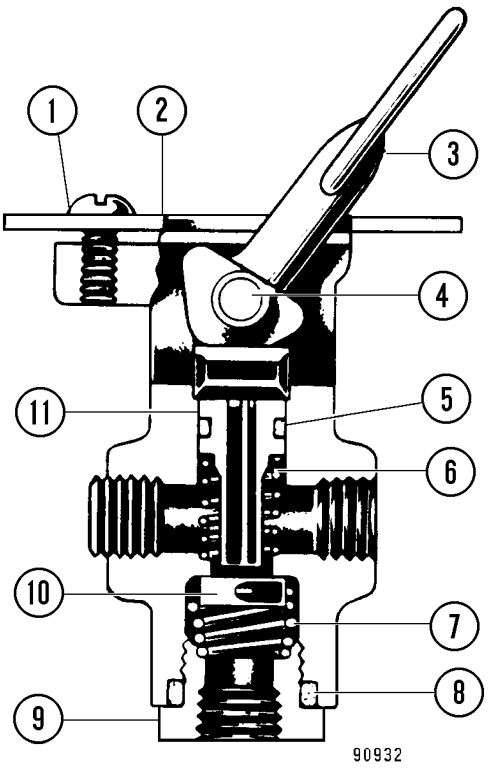


FIGURE 3-6. BRAKE LOCK CONTROL VALVE

1. Screw
2. Instrument Panel Face
3. Lever
4. Pin
5. Plunger Grommet
6. Plunger Return Spring
7. Valve Spring
8. O-Ring
9. Cap Nut
10. Valve
11. Plunger

3. Examine exhaust seat of plunger carefully. If chipped, worn or distorted, replace plunger.
4. Check inlet valve seat in body. If seat is worn excessively or damaged, replace the body.
5. Check plunger return spring and valve spring for damage. Replace if necessary.

Assembly

1. Install new grommet (5, Figure 3-6) or plunger (11). Coat plunger with grease and insert plunger return spring (6) and plunger in the body. Plunger must move freely in the body. Depress plunger and release. Plunger spring must return plunger.
2. Install inlet valve (10) and valve spring (7) in bottom bore of valve body. Install new O-ring (8) on cap nut (9) and install cap nut in body.
3. Install lever (3) on top of plunger, aligning hole in lever with hole in body. Install lever pin (4).

BRAKE CIRCUIT CHECKOUT AND ADJUSTMENT PROCEDURE

Effective brake application is dependent upon availability of brake pressure and proper operation of all mechanical components. Verification of adequate brake circuit pressure (See Figure 4-1) will allow for systematic determination of the component causing the brake circuit malfunction.

⚠CAUTION

Before disconnecting brake pressure lines, replacing components in the brake circuit or installing test gauges, make sure all brakes have been released. Visually inspect to see that the Brake Lock and Emergency Brake levers are in the "Off" position and the brake treadle is fully released.

⚠WARNING

Before disabling the brake circuit, block all wheels to prevent possible movement of the truck.

BRAKE CIRCUIT ISOLATION TEST

If the brake circuit on the truck is not functioning properly the isolation test will lead the technician to the area causing the problem (mechanical, hydraulic or air).

⚠WARNING

Relieve pressure before disconnecting brake lines. Tighten all connections before applying pressure.

Escaping fluid under pressure can have sufficient force to penetrate the skin causing serious injury and possibly death if proper medical treatment is not received immediately.

NOTE: The following procedure can be simplified if all gauges are connected to enable the gauges to be read from the deck, thus enabling the technician to communicate with the person operating the controls.

1. Before starting the following checkout procedure, check the fluid level in the brake fluid reservoirs and check for line restrictions between the pressure converters and the brake fluid reservoir.
2. Install a 0-3000 psi (21 MPa) pressure gauge in brake line at a wheel cylinder. Bleed off all entrapped air from the brake lines before taking any pressure readings. Failure to bleed off all air may result in improper pressure readings.
3. Install a "T" fitting and a 0-250 psi (1723 kPa) pressure gauge at the inlet port of the pressure converter supplying the wheel cylinder in step 2.
4. Apply service brakes and check readings on pressure gauges at wheel cylinder and pressure converter. Air pressure and hydraulic pressure readings should comply with pressure values for the front and rear brakes as shown in Figure 4-1.
5. If proper hydraulic pressure readings are obtained at the wheel cylinder, check brake cylinder assembly for proper mechanical operation and adjustment.
6. If hydraulic pressure reading is low, check air pressure reading on gauge at the inlet port of the pressure converter.
7. If air pressure reading at pressure converter is low, refer to the "Brake Checkout" procedure. If air pressure reading at inlet port of pressure converter is acceptable and hydraulic pressure reading at wheel cylinder is low, check brake lines for restrictions or check for faulty pressure converter.
8. If brake pedal is released, no pressure should be observed at the inlet port of the pressure converter. If air pressure is observed, check air system for leakage or faulty components. (Refer to "Brake Checkout" procedure).
9. After completing the isolation test:
   a. If the problem has been determined to be mechanical, refer to Section "J" for repair, replacement or adjustment of the service brake assemblies.
   b. If the problem has been determined to be hydraulic, check for leakage or restrictions in the brake lines. Check pressure converter for proper operation. If pressure converter is determined to be faulty, refer to Section "J" for repair or replacement.
   c. If the problem has been determined to be in the air system, refer to the "Brake Checkout" procedure.

Brake Lining Replacement

The original equipment brake linings are bonded and riveted to the shoe. It is recommended that the replacement shoes also be bonded in addition to installing the attaching bolts supplied in the lining kit.

Removal

1. If the linings being replaced are original equipment, drill and remove the rivets.
2. To remove the bonded lining, it may be necessary to heat the shoe assembly in an oven or apply heat lamps. If the lining has to be chipped off, use care to avoid damage to the shoe surface caused by gouging or excessive grinding.
3. After the old lining has been removed, clean the shoe surface thoroughly to remove dirt, paint, grease and particles of old lining material. A wire brush may facilitate cleaning.
4. Continue cleaning process as follows:

⚠WARNING

Follow manufacturer's recommendations when using solvents. Wear protective clothing and work in an area with adequate ventilation.

   a. Clean surface thoroughly using trichlorethane.
   b. Wash shoe surface with hot dishwashing detergent such as Cascade®.
   c. Rinse shoe surface with warm water.
   d. Repeat rinse with warm water.
   e. Wipe lining surface clean and dry thoroughly.

5. If linings are to be bonded, refer to the bonding agent instructions for additional preparation that may be required.

Installation

A bonding agent such as "*3M 1838 B/A Structural Adhesive*" (commonly refered to as *"Scotch Weld® " Green Epoxy Cement No. 1838 B/A*) is recommended. This epoxy cement is normally available from a local industrial supply house.

1. Mix the adhesive according to the manufacturer's instructions.
2. Apply adhesive uniformly to the shoe surface. Avoid application of epoxy to the fasteners if possible.
3. Position new, clean lining on the shoe and install the bolts, lockwashers and nuts within 1 hour.
   a. Tighten the bolts to **20 to 22 ft. lbs. (27 to 30 N.m)** torque if using 82° tapered head, .375 - UNC bolts.
   b. Tighten the bolts to **30 to 35 ft. lbs. (41 to 47 N.m)** torque if using 150° tapered head, .375 - UNC bolts.
4. Remove excess adhesive from the shoe.
5. Before installing the shoe assembly, allow adhesive to cure using one of the following schedules:

☐ 72°F (22.2°C) — 72 hours (room temperature)

☐ 100°F (37.8°C) — 24 hours

☐ 200°F (93.3°C) — 12 hours

BRAKE ADJUSTMENT AND BLEEDING

Adjustment Procedure

The brake shoes are secured to the spider with springs therefore, the lower brake shoe will hang slightly. When attempting to adjust the brakes, first pry the lower brake shoe up against the anchor plunger and the actuator adjusting bolt, then refer to the following procedure for adjusting the brakes.

1. Center brake shoes in brake drum and rotate star wheel of actuator clockwise. Continue turning star wheel on the actuator and centering brake shoes until shoes are out tight against brake drum.
2. Bend edge of lock away from capscrew flat. Remove capscrew, lock, spring and guide pawl. Back off the actuator eight notches by turning star wheel counterclockwise.
3. Install guide pawl assembly and lock plate, making sure to line up tab with slot in hole of brake spider. Tighten guide pawl assembly to **20 ± 5 ft. lbs. (27 ± 7 N.m)** torque. Secure guide pawl in place by bending edge of lock plate up against the flats of guide pawl capscrew.

NOTE: The above steps are necessary because teeth on the pawl and adjusting bolt are "one-way" type allowing the adjusting bolt to be rotated clockwise without removing the guide pawl but will not allow counterclockwise rotation. The guide pawl must be installed with the chamfer or unthreaded end toward the adjusting bolt head.

Brake Lining Replacement

The original equipment brake linings are bonded and riveted to the shoe. It is recommended that the replacement shoes also be bonded in addition to installing the attaching bolts supplied in the lining kit.

Removal

1. If the linings being replaced are original equipment, drill and remove the rivets.
2. To remove the bonded lining, it may be necessary to heat the shoe assembly in an oven or apply heat lamps. If the lining has to be chipped off, use care to avoid damage to the shoe surface caused by gouging or excessive grinding.
3. After the old lining has been removed, clean the shoe surface thoroughly to remove dirt, paint, grease and particles of old lining material. A wire brush may facilitate cleaning.
4. Continue cleaning process as follows:

⚠WARNING

Follow manufacturer's recommendations when using solvents. Wear protective clothing and work in an area with adequate ventilation.

   a. Clean surface thoroughly using trichlorethane.
   b. Wash shoe surface with hot dishwashing detergent such as Cascade®.
   c. Rinse shoe surface with warm water.
   d. Repeat rinse with warm water.
   e. Wipe lining surface clean and dry thoroughly.

5. If linings are to be bonded, refer to the bonding agent instructions for additional preparation that may be required.

Installation

A bonding agent such as "*3M 1838 B/A Structural Adhesive*" (commonly referred to as *"Scotch Weld®" Green Epoxy Cement No. 1838 B/A*) is recommended. This epoxy cement is normally available from a local industrial supply house.

1. Mix the adhesive according to the manufacturer's instructions.
2. Apply adhesive uniformly to the shoe surface. Avoid application of epoxy to the fasteners if possible.
3. Position new, clean lining on the shoe and install the bolts, lockwashers and nuts within 1 hour.
   a. Tighten the bolts to **20 to 22 ft. lbs. (27 to 30 N.m)** torque if using 82° tapered head, .375 - UNC bolts.
   b. Tighten the bolts to **30 to 35 ft. lbs. (41 to 47 N.m)** torque if using 150° tapered head, .375 - UNC bolts.
4. Remove excess adhesive from the shoe.
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☐ 72°F (22.2°C) — 72 hours (room temperature)

☐ 100°F (37.8°C) — 24 hours

☐ 200°F (93.3°C) — 12 hours

BRAKE ADJUSTMENT AND BLEEDING

Adjustment Procedure

The brake shoes are secured to the spider with springs therefore, the lower brake shoe will hang slightly. When attempting to adjust the brakes, first pry the lower brake shoe up against the anchor plunger and the actuator adjusting bolt, then refer to the following procedure for adjusting the brakes.

1. Center brake shoes in brake drum and rotate star wheel of actuator clockwise. Continue turning star wheel on the actuator and centering brake shoes until shoes are out tight against brake drum.
2. Bend edge of lock away from capscrew flat. Remove capscrew, lock, spring and guide pawl. Back off the actuator eight notches by turning star wheel counterclockwise.
3. Install guide pawl assembly and lock plate, making sure to line up tab with slot in hole of brake spider. Tighten guide pawl assembly to **20 ± 5 ft. lbs. (27 ± 7 N.m)** torque. Secure guide pawl in place by bending edge of lock plate up against the flats of guide pawl capscrew.

NOTE: The above steps are necessary because teeth on the pawl and adjusting bolt are "one-way" type allowing the adjusting bolt to be rotated clockwise without removing the guide pawl but will not allow counterclockwise rotation. The guide pawl must be installed with the chamfer or unthreaded end toward the adjusting bolt head.

BRAKE LINING-PARK BRAKE

Replacement

Inspect brake periodically for wear. Linings must be replaced before lining material has been worn to the top of the rivets. Use of linings beyond this wear limit will result in decrease of braking action, and damage to the brake drum.

Worn brake drums may be machined to remove wear grooves and ridges. The maximum material that can be removed from brake drum inside diameter is 0.100 in. (2.54 mm) or 0.050 in. (1.27 mm) per side. If maximum material removal does not clean up the wear pattern on the drum, the drum should not be reused. When machining brake drums remove the minimum amount of drum material necessary to clean up the inside diameter of the brake drums.

Replacement brake shoe lining kits (containing linings, and rivets for mounting the new shoes) are available in standard size only.

1. To change linings, refer to "Park Brake Removal" and "Disassembly" procedure for removal and installation of brake shoes and linings earlier in this section.
2. Remove rivets securing the worn lining to the brake shoes and remove linings.
3. Install new lining and secure lining to shoes with rivets.
4. Adjust brake shoe clearance per "Park Brake Adjustment", this section.
5. After lining replacement, brake shoes should be burnished as described in "Lining Conditioning".

Lining Conditioning

The shoe type parking brake is designed to hold the truck stationary after the truck has stopped. Conditioning of the parking brake (after brake rebuild or lining material replacement) will require operating the truck with the parking brake applied.

NOTE: The parking brake is normally to be applied only while truck is stationary and with transmission in a neutral position. DO NOT apply parking brake with truck in motion or damage will result to drive components.

The following four steps are to be used for the conditioning process of new lining and then only temporarily under technician's guidance.

1. Adjust parking brake in accordance with "Park Brake Adjustment" procedure.
2. Drive the empty truck on level ground at approximately 10 MPH (16 km/h) and apply parking brake to meet the following conditions:
   a. 300°-350°F (149°)-177(°C) maximum temperature measured on outside of drum after each stop.
   b. Cool to 200°F (93°C) measured on outside of drum between each stop.
3. Repeat Step 2. fifteen times.
4. Allow drum and brake lining to cool and readjust park brake according to "Park Brake Adjustment" procedure.

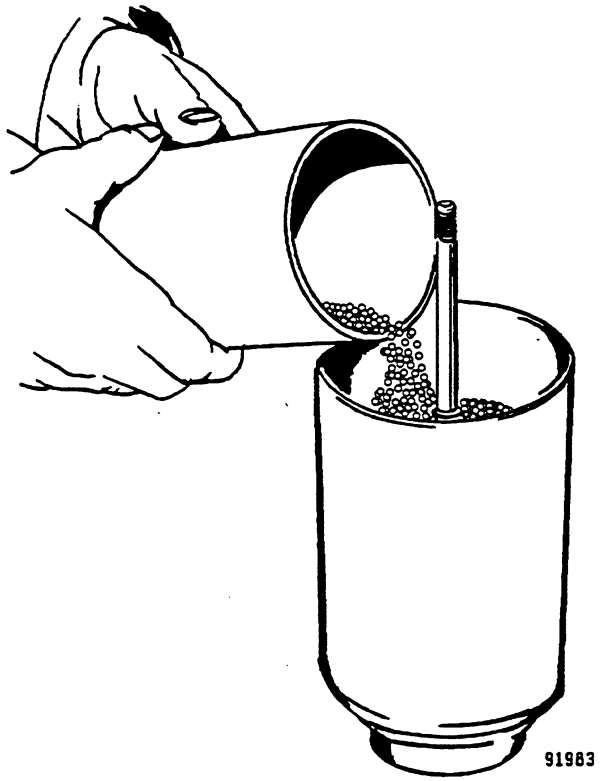


FIGURE 3-3. ADDING DESICCANT

4. Pour the entire package of desiccant material into the shell, making sure none is lost. Handle carefully to prevent the bolt from falling out. (Refer to Figure 3-3).
5. Level the desiccant material and install second perforated plate (19) with the felt cloth down, making sure the shoulder of the bolt is centered, and extends slightly above the top of the perforated plate. (Refer to Figure 3-4).

NOTE: If the shoulder of the bolt does not extend above the perforated plate (2, Figure 3-4), tap the side of the cartridge shell (1).

6. Set conical spring (2, Figure 3-5) on top of the perforated plate (large diameter down-small diameter up).
7. Place the spring retainer (1) on top of the spring.
8. Install the previously rebuilt desiccant sealing plate (20, Figure 3-2) on the cartridge bolt (18) with the ball check retaining clip on top.

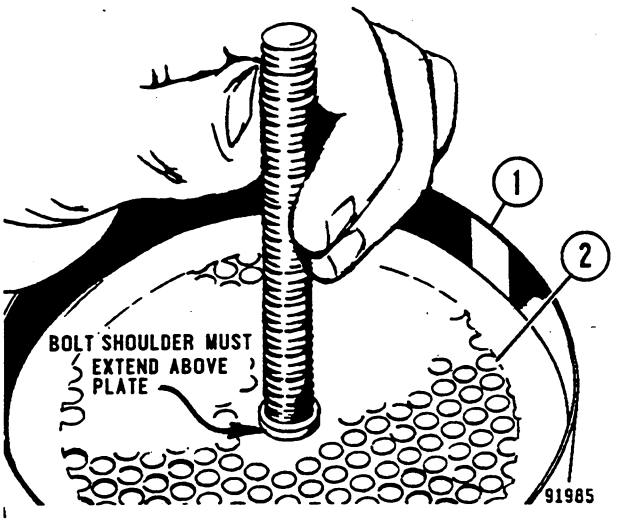


FIGURE 3-4. INSTALLING PERFORATED PLATE

1. Cartridge Shell
2. Perforated Plate

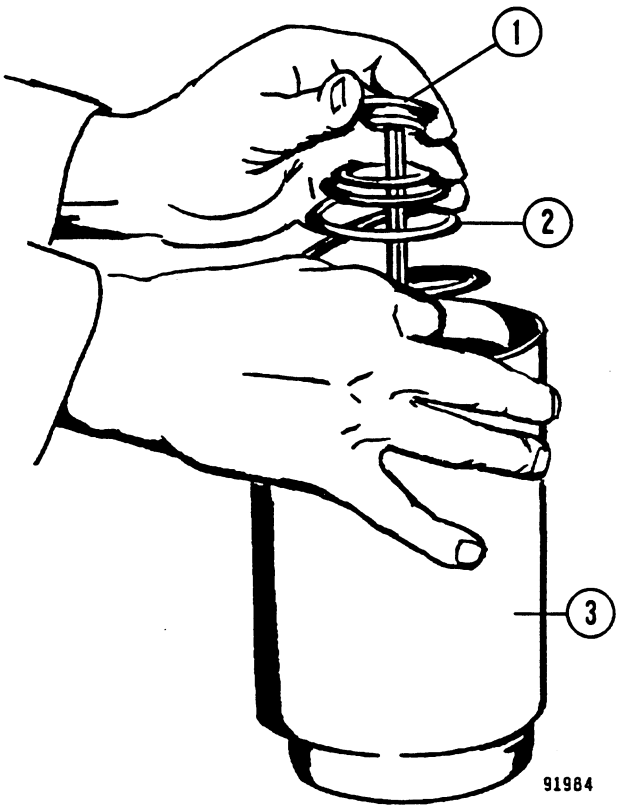
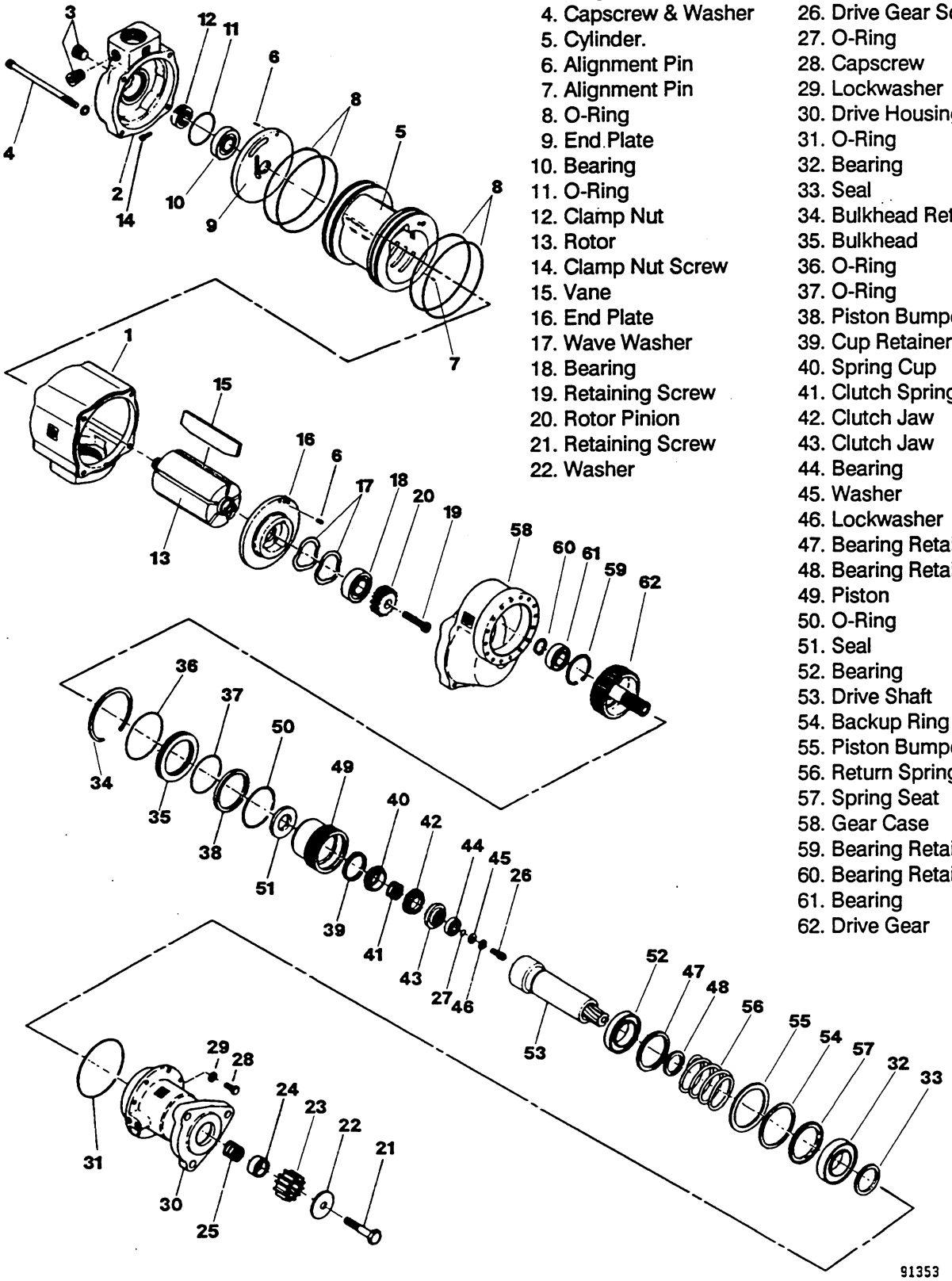


FIGURE 3-5. SPRING INSTALLATION

1. Spring Retainer
2. Conical Spring
3. Cartridge Shell

FIGURE 4-6. AIR STARTER

1. Motor Housing
2. Motor Housing Cover
3. Plug
4. Capscrew & Washer
5. Cylinder.
6. Alignment Pin
7. Alignment Pin
8. O-Ring
9. End Plate
10. Bearing
11. O-Ring
12. Clamp Nut
13. Rotor
14. Clamp Nut Screw
15. Vane
16. End Plate
17. Wave Washer
18. Bearing
19. Retaining Screw
20. Rotor Pinion
21. Retaining Screw
22. Washer
23. Drive Pinion
24. Spring Sleeve
25. Spring
26. Drive Gear Screw
27. O-Ring
28. Capscrew
29. Lockwasher
30. Drive Housing
31. O-Ring
32. Bearing
33. Seal
34. Bulkhead Retainer
35. Bulkhead
36. O-Ring
37. O-Ring
38. Piston Bumper
39. Cup Retainer
40. Spring Cup
41. Clutch Spring
42. Clutch Jaw
43. Clutch Jaw
44. Bearing
45. Washer
46. Lockwasher
47. Bearing Retainer
48. Bearing Retainer
49. Piston
50. O-Ring
51. Seal
52. Bearing
53. Drive Shaft
54. Backup Ring
55. Piston Bumper
56. Return Spring
57. Spring Seat
58. Gear Case
59. Bearing Retainer
60. Bearing Retainer
61. Bearing
62. Drive Gear



5. To disassemble barrier plate assembly, remove spiral retainer ring (14, Figure 5-4). Use caution as spring pressure will force out disc ring (13), exhaust poppet (12), poppet support plate (11) and spring (10) from cage (6).

6. Push piston (2) down until fully depressed and remove retainer ring (9) from groove in end of piston. Remove cage (6) from barrier plate (5) and tap cage on a block of wood to remove support disc (8) and inlet poppet (7). Remove sleeve (3), O-ring (4), piston (2) and "U" cup (1) from the barrier plate.

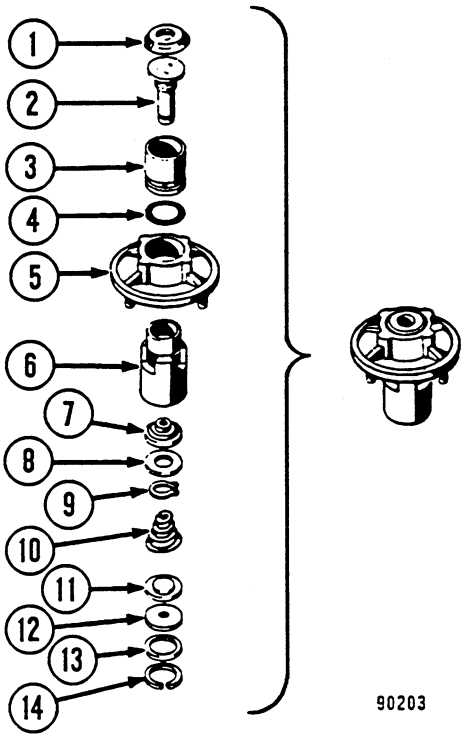


FIGURE 5-4. BARRIER PLATE ASSEMBLY

1. U-Cup Seal
2. Piston
3. Sleeve
4. O-Ring
5. Barrier Plate
6. Cage
7. Inlet Poppet
8. Support Disc
9. Retainer Ring
10. Spring
11. Poppet Plate
12. Exhaust Poppet
13. Disc Ring
14. Retainer Ring

Inspection

1. Discard O-rings, "U" cups and poppet seals and replace with new. Check all parts for wear, cracks or breakage and replace if necessary.

Assembly

1. Lightly coat all moving parts with moly grease.

2. Install piston sleeve (3, Figure 5-4) with new O-ring (4) into top of barrier plate (5). Install piston (2) and U-cup (1), open side down, into piston sleeve (3) making sure U-cup seal is properly seated. Place cage assembly (6) over the piston rod end and into the barrier plate. Install inlet poppet (7) and support disc (8) on the piston rod end (2). Fully depress piston into cage and install retaining ring (14) into the groove on the bottom of the piston rod end.

3. Install spring (10), small end up, poppet support plate (11), exhaust poppet (12) and disc ring (13) into lower end of cage (6). Compress spring and install new retainer ring (14).

4. Install thrust ring (10, Figure 5-3) and "U" cup (9), open side up, on balance piston (11). Install shim (13) and spring (12) into outlet portion of valve body (14).

5. Install new O-rings (6 & 7, Figure 5-3), into the inlet housing (2). Install new seal washer (4) under capscrew (5).

6. Install barrier plate assembly into inlet housing (2).

7. Place inlet body and barrier plate assembly over outlet body. Match the marks on the inlet and outlet body and align barrier plate assembly and balance piston prior to assembling inlet and outlet bodies.

8. Install machine screws (5) and tighten.

9. Attach valve body assembly to the mounting plate (8, Figure 5-2) with nut (13). Match marks on body and plate must align.

10. Install push rod (11) into top of valve assemblies and install dust boot (12) around push rod.

11. Install push rod pin (10) and roller (9) on pedal (2) and retain with E-clip (5).

12. Install spring ends (3) in holes of mounting plate (8) and align spring with bores in the mounting plate bosses. Using the pedal (2) to compress spring, install treadle pin (4) through mounting plate bosses, pedal bosses and spring eyes. Secure pin in place with a E-clip (5).

HYDRAULIC SYSTEM

HYDRAULIC SYSTEM OPERATION

The steering and hoist circuits use a common hydraulic tank located behind the cab. Oil used in the steering and hoist circuits flows from the bottom of the tank through a 100 micron mesh wire suction strainer to the inlet housing of the pump mounted on the transmission PTO.

A vacuum/pressure relief valve maintains a maximum 25 psi (172 kPa) pressure in the tank to reduce foaming and to assure full pump inlet oil supply. Pressurization occurs during the tank fill procedure and is maintained during truck operation as the hoist cylinders are retracted and oil returns to the tank. When lowering the dump body during normal dumping operations, air pressure increases in the hydraulic tank. Air pressure in excess of approximately 25 psi (172 kPa) is vented to atmosphere. When raising the dump body, or during the cooling down period after shutdown, the internal tank pressure may decrease. To prevent a vacuum in the tank, the valve will open to atmosphere at 0 ±3 psi.

NOTE: For proper hydraulic system operation, this valve must function correctly. Excess build-up of oil, dirt, or debris on top of the hydraulic tank may cause an air restriction and not allow the valve to function properly. Daily inspection and external cleaning of this area may be required in adverse operating conditions. Periodic cleaning or replacement of the filter may also be required.

The unloader valve, mounted on the left frame rail, divides the oil supply between the steering and hoist circuits with priority to the steering circuit. Steering circuit oil is routed to the accumulator (pre-charged with nitrogen to 1050 psi (7.35 MPa)), compressing the nitrogen gas and providing a source of pressurized oil for steering, and emergency steering if there is a loss of oil from the hydraulic pump. When the unloader valve senses 2500 psi (17.5 MPa) oil pressure, a check valve closes to maintain steering circuit pressure and pump flow is diverted to the hoist valve. When steering circuit pressure drops to 2100 psi (14.7 MPa), the unloader valve diverts pump flow back to the steering circuit until pressure returns to 2500 psi (17.5 MPa).

The hoist valve, located on the left hand fuel tank, receives oil from the shaft end cartridge of the hydraulic pump and from the unloader valve as described above. The hoist valve is controlled by the operator to direct oil to the hoist cylinders to extend them to raise the dump body or to retract them to lower the body. An internal relief valve protects the hoist circuit from pressures in excess of 2500 psi (17.5 MPa).

A 3000 psi (21 MPa) relief valve provides protection against excessive pressure in the steering circuit for oil entering the unloader valve.

Excess oil from both the unloader valve and the hoist valve is returned to the tank. Oil being returned to the tank is filtered through two filters located inside the hydraulic tank. Should either of the filters become restricted, a bypass valve within the filter assembly will open when the pressure differential across the element exceeds 25 psi (172 kPa), allowing the oil to bypass the filter element.

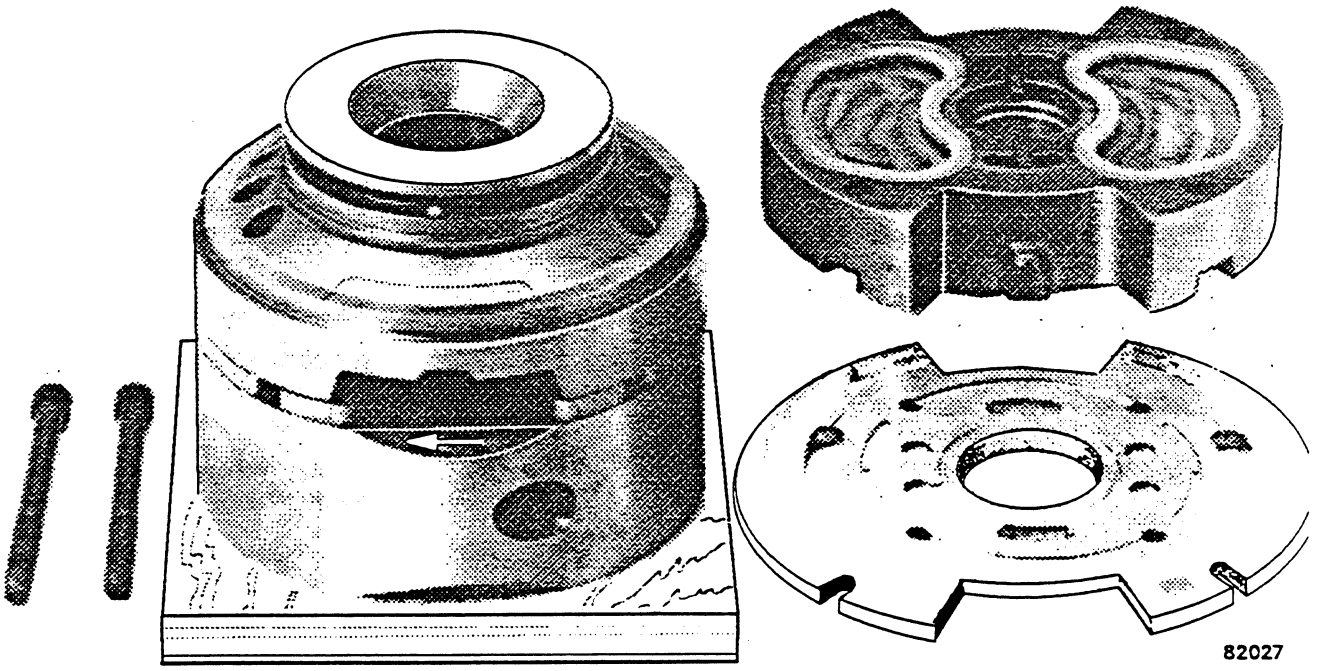


FIGURE 3-10. CARTRIDGE DISASSEMBLY

⚠CAUTION

Replacement ring width must be identified to the ring being replaced or reduced life or output flow will result. The minimum ring to rotor clearance limit is 0.0015 in. (0.0381 mm).

NOTE: All cartridge kit parts must be free of burrs. Stone the mating surfaces of each part with an oiled honing stone prior to assembly. Clean parts after honing.

7. Vane to rotor wear can be checked by inserting the vane in the rotor slot and checking for excessive play. Replace rotor (10, Figure 3-5) and vanes (11) if wear is evident.
8. Rotate bearing (21) while applying pressure to check for wear, looseness and pitted or cracked races.
9. Inspect the seal and bushing mating surfaces on shaft (22) for scoring or wear. Replace the shaft if wear exceeds 0.005 in. (0.127 mm) diametrical change, or if marks cannot be removed by light polishing. If wear is found in the bushing area in the inlet support plate (15), a new bushing will be required.

Cartridge Assembly

NOTE: Coat all parts except seals and backup rings with clean Type C-3 hydraulic oil to facilitate assembly and provide initial lubrication. Use small amounts of petroleum jelly to hold the O-rings in place during assembly.

1. The direction of rotation is viewed from the shaft end. Right hand rotation is clockwise; left hand rotation is counterclockwise. Be certain pump assembly provides same rotation as found during disassembly.

NOTE: Assemble shaft end cartridge in the direction of rotation noted at disassembly. Assemble cover end cartridge in reverse of the shaft end cartridge.

NOTE: If locating pins (16, Figure 3-5) were removed from inlet support plate (15), install new pins with locking flutes located within the inlet support plate. Drive the new pins into the support plate with a soft tipped hammer.

2. Place the inlet and outlet support plates on a flat surface. Install seal pack sub-assemblies (8 & 14) into cavities with seal retainer surface up (O- rings facing downward into the cavities).

HYDRAULIC SYSTEM FLUSHING PROCEDURE

The following instructions outline the procedure for flushing the hydraulic system.

1. Shut down engine and turn key switch "Off". Allow at least 90 seconds for the accumulator to bleed down. Release pressure from hydraulic tank by depressing the pressure release valve (1, Figure 3-12).
2. Thoroughly clean the exterior of the tank. Drain the hydraulic tank and flush the interior with a cleaning solvent. Inspect all hydraulic hoses for deterioration or damage.
3. Remove, clean and replace the hydraulic tank strainer and diffuser. Change hydraulic filter elements.
4. Fill the hydraulic tank with clean, filtered Type C-3 hydraulic oil.

NOTE: The final filter in the filling apparatus must be 3 micron.

5. Set all controls in the "Neutral" position. Do not steer the truck or operate controls until the next step is completed.
6. Start the engine and run at 1000 RPM for four minutes. This will circulate oil with all valves in the neutral position.
7. To increase flow and turbulence in the system, increase engine speed to full throttle and maintain for four minutes. This will carry contaminates to the hydraulic tank filters.
8. Shut down engine and turn key switch "Off". Allow at least 90 seconds for the accumulator to bleed down. This will return all contaminants in accumulator to the hydraulic tank filters.

NOTE: Hydraulic tank oil temperature should be 110°-130°F (43°-54°C) after accomplishing Step 11. If not, repeat Step 9 to increase oil temperature to the proper operating range.

9. Start engine and run at 1000 RPM while performing the following:
   a. Steer truck full left then full right - repeat four times.
   b. Steer full left (keeping pressure against the steering wheel) and hold for 10 seconds.
   c. Steer full right (keeping pressure against the steering wheel) and hold for 10 seconds.
10. Increase engine speed to full throttle and steer full left and full right.
11. Return all controls to "Neutral".
12. Reduce engine speed to 1000 RPM and perform the following:
    a. Extend hoist cylinders fully and "FLOAT" down - repeat four times.

NOTE: As hoist cylinders approach full extension in the Power Up mode, slowly decrease engine speed to prevent sudden bottoming of the 3rd stage.

    b. Extend hoist cylinders and hold at full extension for 10 seconds. Hoist control lever must be held in the "Up" position.
    c. Lower hoist cylinders and hold lever in "Down" position for 10 seconds after cylinders are fully retracted.
13. Increase engine speed to full throttle and perform the following:
    a. Hoist up to full extension (see *NOTE* above), then allow cylinders to float down.
    b. Return hoist control to "Neutral".
14. Shut down engine and turn key switch "Off". Allow at least 90 seconds for the accumulator to bleed down.

NOTE: If a system component fails, all flexible hoses should be removed and back flushed with a cleaning solvent. Inspect for small particles which may be trapped inside the hose.

15. Remove hydraulic filters, clean housings and install new filters.
16. With hydraulic system charged, inspect all connections and fittings for leaks. Tighten or repair any leaking connections.

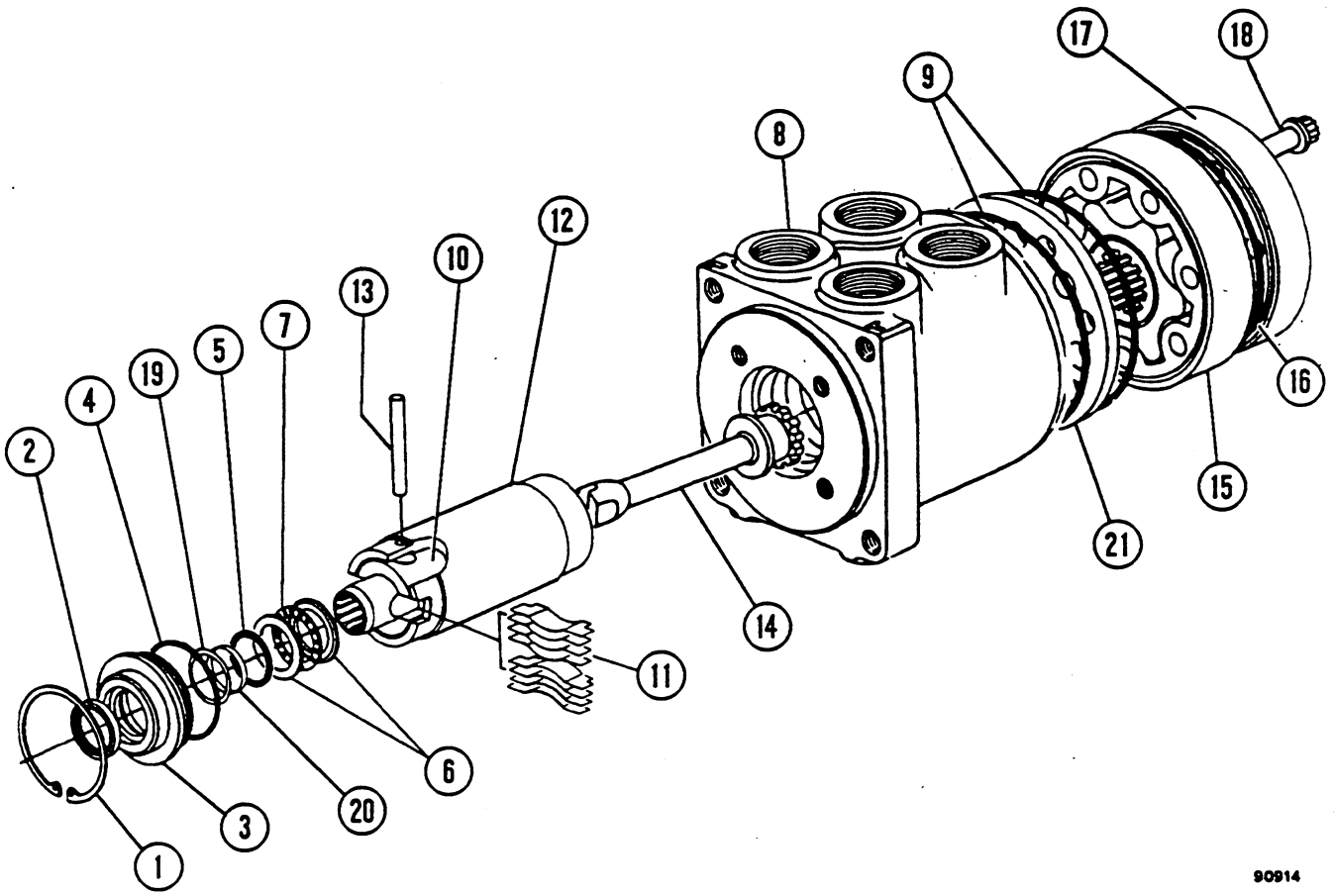


FIGURE 5-5. STEERING CONTROL VALVE ASSEMBLY

1. Retaining Ring
2. Dust Seal
3. Front Retainer
4. O-ring Seal
5. Seal
6. Bearing Race
7. Needle Thrust Bearing
8. Housing
9. Seal
10. Control Spool
11. Centering Springs
12. Control Sleeve
13. Pin
14. Drive
15. Meter (Gerotor)
16. Seal
17. End Cap
18. Capscrew
19. Backup Ring
20. Teflon Seal
21. Wear Plate

4. Remove seal (9) from meter (15).
5. Remove wear plate (21).
6. Remove seal (9) from housing (8).
7. Remove drive (14).
8. Remove housing from vise. Place housing on a clean soft cloth to protect the finish. Use Tru-Arc retainer ring pliers and remove retaining ring from housing, as shown in Figure 5-6.
9. Position screwdrivers 180° apart in groove of retainer. (See Figure 5-7). Pry retainer upward until flush with housing. Be careful not to damage ring groove of front retainer. Remove screwdrivers and push spool down while removing retainer from housing by hand.
10. Remove teflon seal (20, Figure 5-5), O-ring seal (5), backup ring (19), O- ring seal (4) and dust seal (2) from front retainer (3).
11. Remove bearing races (6) and the needle thrust bearing (7) from spool and sleeve assembly.

ACCUMULATOR

Removal

1. Insure key switch has been "Off" for at least 90 seconds to allow accumulator oil to drain back to tank. Check by turning steering wheel. Relieve hydraulic tank pressure by depressing pressure release valve on tank.
2. Remove charging valve guard (2, Figure 6-6) and loosen small hex on charging valve (2, Figure 6-7) three complete turns. Depress the valve core until all nitrogen pressure has been relieved.

⚠DANGER

Make certain only the small swivel hex nut turns. DO NOT TURN MORE THAN THREE TURNS. Turning the complete charging valve assembly may result in the valve assembly being forced out of the accumulator by the nitrogen pressure inside.

⚠CAUTION

Wear protective face mask when discharging nitrogen gas.

3. Remove oil lines from bottom of accumulator. Plug all hoses and openings to prevent possible contamination of the system. Disconnect and mark electrical wiring to pressure switch (3, Figure 6-6).
4. Attach a lifting device to the top of the accumulator.
5. Remove capscrews, nuts and lockwashers (5) securing the accumulator clamps (4) to the mounting brackets.
6. Raise the accumulator until clear of mounting brackets and move to a clean work area for disassembly.

Installation

1. Lift accumulator (1, Figure 6-6) into position on the mounting bracket. Accumulator should be positioned with the antirotation block positioned between the two stop blocks on the lower mounting bracket.
2. Secure the accumulator to the mounting bracket using mounting clamps (4), capscrews, lockwashers and nuts (5). **Do not overtighten nuts, as this could distort the accumulator.**
3. If pressure switch (3) was removed, install at this time. Connect electrical wiring to pressure switch and reconnect oil lines to the bottom of the accumulator.
4. Precharge accumulator with pure dry nitrogen as outlined in "Steering Accumulator Charging Procedure".

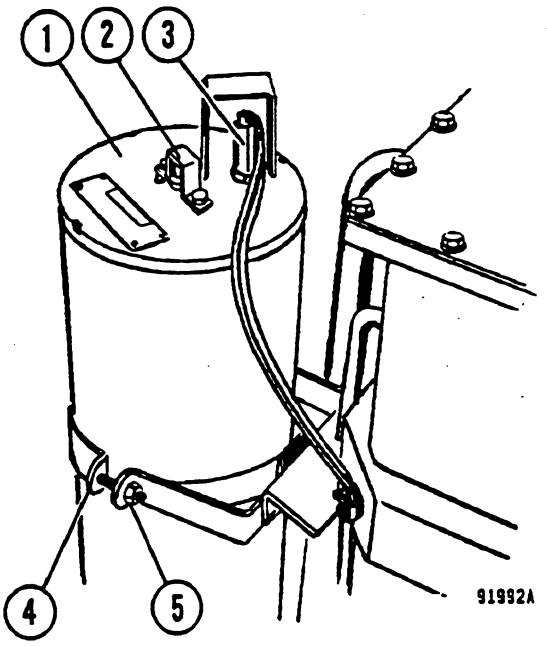


FIGURE 6-6. ACCUMULATOR INSTALLATION

1. Accumulator
2. Charging Valve Guard
3. Precharge Pressure Switch
4. Clamp
5. Capscrews, Washers & Nuts

Disassembly

1. Remove charging valve (2, Figure 6-7).
2. Use a spanner wrench (Part Number TW9425) to remove gland (4) at top of accumulator.
3. Push piston (10) out of cylinder (7).

Cleaning and Inspection

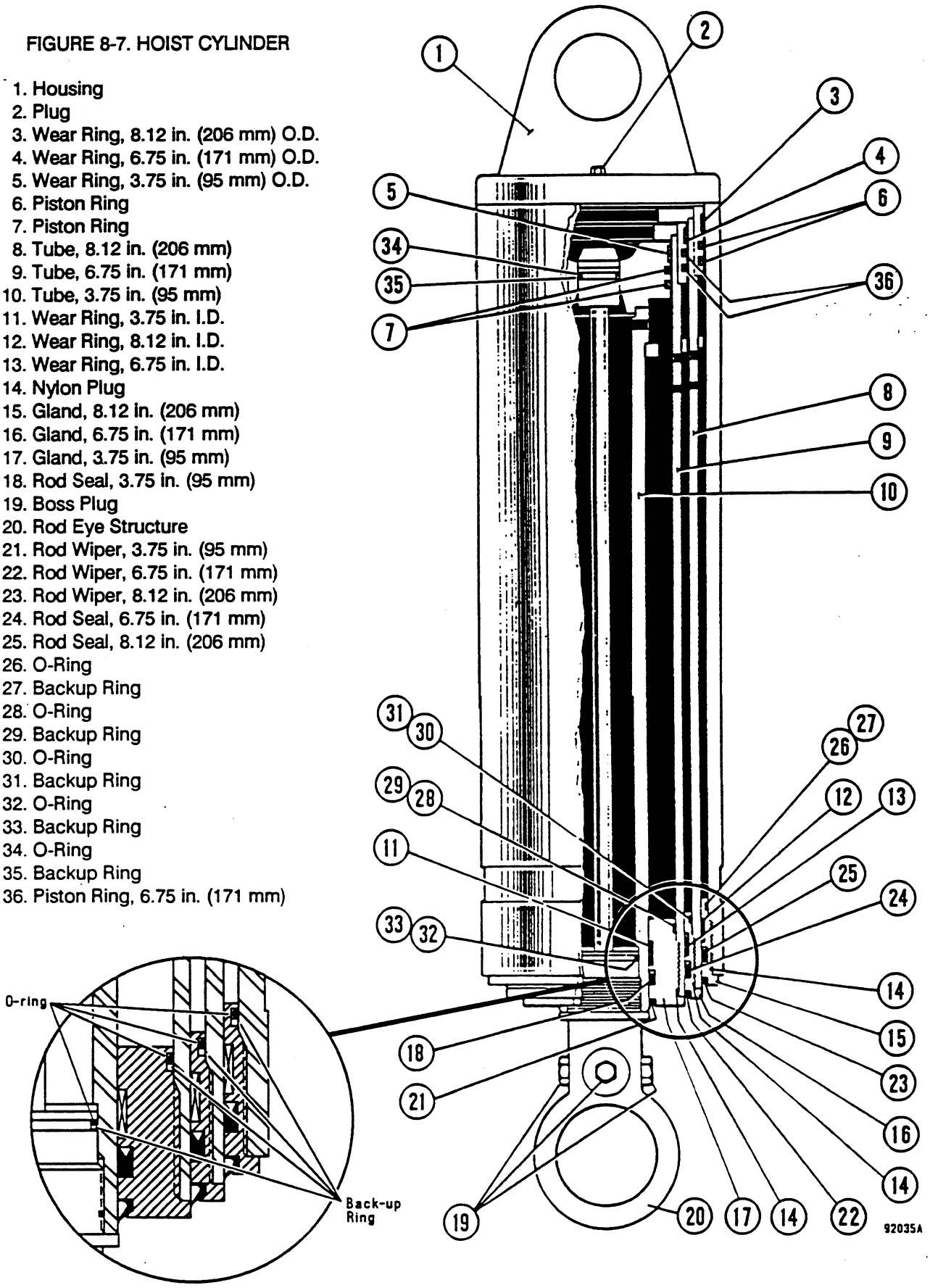
1. Replace all O-rings (6, Figure 6-7), backup rings (5) and "T" ring (9).
2. Clean parts using fresh cleaning solvent, lint free wiping cloth and filtered compressed air. All parts must be absolutely free of any foreign matter.

TROUBLESHOOTING CHART (Continued)

POSSIBLE CAUSES	SUGGESTED CORRECTIVE ACTION
TROUBLE: Steering Wheel Oscillates or Turns By Itself	
Lines connected to wrong ports.	Check line routing and connections.
Parts assembled wrong. Steering control valve improperly timed.	Reassemble correctly and retime control valve.
TROUBLE: Steered Wheels Turn in Opposite Direction When Operator Turns Steering Wheel	
Lines connected to wrong cylinder ports.	Check proper line connections.

FIGURE 8-7. HOIST CYLINDER

1. Housing
2. Plug
3. Wear Ring, 8.12 in. (206 mm) O.D.
4. Wear Ring, 6.75 in. (171 mm) O.D.
5. Wear Ring, 3.75 in. (95 mm) O.D.
6. Piston Ring
7. Piston Ring
8. Tube, 8.12 in. (206 mm)
9. Tube, 6.75 in. (171 mm)
10. Tube, 3.75 in. (95 mm)
11. Wear Ring, 3.75 in. I.D.
12. Wear Ring, 8.12 in. I.D.
13. Wear Ring, 6.75 in. I.D.
14. Nylon Plug
15. Gland, 8.12 in. (206 mm)
16. Gland, 6.75 in. (171 mm)
17. Gland, 3.75 in. (95 mm)
18. Rod Seal, 3.75 in. (95 mm)
19. Boss Plug
20. Rod Eye Structure
21. Rod Wiper, 3.75 in. (95 mm)
22. Rod Wiper, 6.75 in. (171 mm)
23. Rod Wiper, 8.12 in. (206 mm)
24. Rod Seal, 6.75 in. (171 mm)
25. Rod Seal, 8.12 in. (206 mm)
26. O-Ring
27. Backup Ring
28. O-Ring
29. Backup Ring
30. O-Ring
31. Backup Ring
32. O-Ring
33. Backup Ring
34. O-Ring
35. Backup Ring
36. Piston Ring, 6.75 in. (171 mm)



TROUBLESHOOTING CHART

POSSIBLE CAUSES	*SUGGESTED CORRECTIVE ACTION*
TROUBLE: Pump Does Not Operate.	
Low air pressure.	Adjust air pressure to 60 – 65 psi (414 – 448 kPa), if necessary [90 psi (621 kPa) during cold weather].
Lube system not grounded.	Correct grounding connections to pump assembly and truck chassis.
Electrical power loss.	Locate cause of power loss and repair. 24 VDC power required.
Timer malfunction.	Replace timer assembly
Solenoid valve malfunctioning.	Replace the solenoid valve assembly
Pump malfunction.	Replace pump assembly

NOTE: On intial startup of the lube system, the timing capacitor will not contain a charge, therefore the first timing cycle will be about double in length compared to the normal interval. Subsequent timer cycles should be as specified.

TROUBLE: Pump Will Not Prime	
Low lubricant supply.	Check lubricant level in reservoir and service reservoir with specified grease until grease weeps from vent plug.
Dirt in reservoir, pump inlet clogged.	Clean reservoir completely, remove and clean pump assembly thoroughly.
Air trapped in pump.	Open vent plug counterclockwise with pump running. When grease flows freely from vent, close vent plug clockwise.

NOTE: System air applied to the lube system air pump is also applied to the vent valve. When the pump is operating, air pressure keeps the vent valve closed and grease is directed from the pump outlet and to the injectors. When air supply to the air motor is interrupted, the vent valve opens and supply pressure vents back to the reservoir.

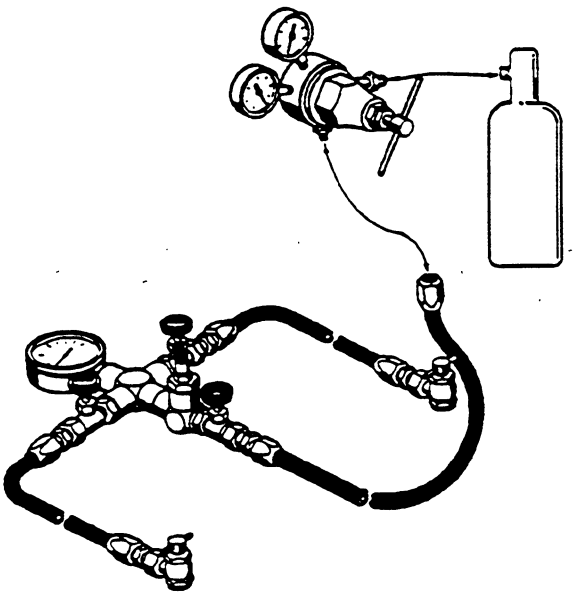
Safety unloader valve faulty.	Replace safety unloader valve.

NOTE: The safety unloader valve prevents buildup of excessively high pressure in the lube system which could damage components. This valve is factory preset to open between 3750 - 4250 psi (25.9 - 29.3 MPa). The valve is not serviceable, nor is it adjustable.

Outlet check valve clogged.	Remove check valve from pump outlet, clean thoroughly or replace.

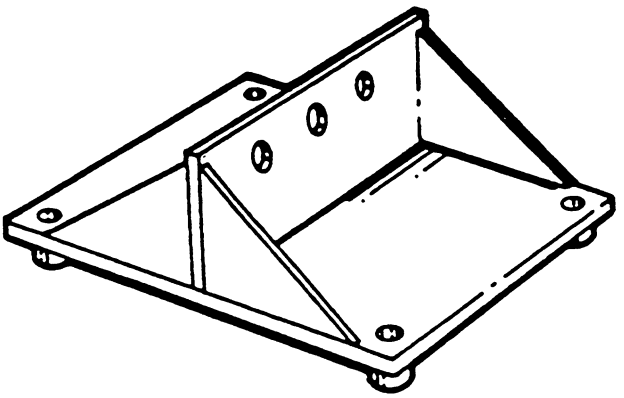
SPECIAL TOOLS

PART NUMBER	DESCRIPTION	USE
VD4665	Nitrogen Charging Kit	Suspension and accumulator nitrogen charging

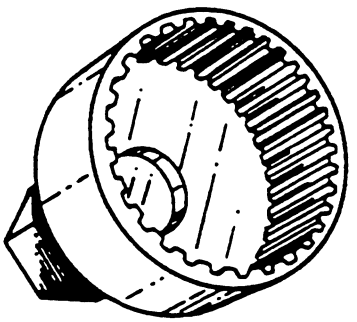


PART NUMBER	DESCRIPTION	USE
J-29855*	Transmission Lifting Tool	Transmission installation & removal

* Kent-Moore Part Number



PART NUMBER	DESCRIPTION	USE
SS0967	Wrench	Pinion nut removal



REFRIGERATION - THE ACT OF COOLING

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

THE REFRIGERATION CYCLE

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

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

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

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

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

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

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

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

5. When the gauges show a normal reading, close the hand valve on the refrigerant container.

Stabilizing the AC System

⚠WARNING

During this stabilization period, do not open hand valves on manifold for any reason. Equipment damage and personal injury may result.

1. Start the engine and return to an idle speed of 1200 to 1500 RPM. Turn on the air conditioner.
2. After a performance check of the control functions, blower speeds and air flow, set the AC system controls to maximum cooling and blower speed on high. All windows must be closed. If the cab temperature is hot, open the windows long enough to allow the hot air to move out of the cab.
3. Run the engine and air conditioner about 5 minutes for the system to stabilize.
4. If the humidity is high it will be necessary to place a fan in front of the AC condenser to help the air flow across the condenser. This helps to stabilize the system by simulating normal operating conditions.
5. It is then possible to observe the gauge readings and the temperature coming out of the air ducts with a thermometer.

NOTE: If low refrigerant is indicated by lower than normal pressure readings, add refrigerant to enable adequate system testing.

Adding Refrigerant and Stabilizing the System (with a recovery/recycling station)

When using a recovery/recycling station the procedure is the same as previously described. The difference is that instead of just opening the refrigerant container the refrigerant should be added 0.5 to 1 pound at a time. After each instance of adding the refrigerant, pause long enough to observe the gauge reading to determine if the system is full. Again using the pressures that were mentioned above.

⚠WARNING

Do not open high side hand valve. High side system pressure is greater than refrigerant container. Serious personal injury may result if the container explodes.
Use hand valve to regulate low side reading during charging. DO NOT EXCEED 40 psi maximum. Exceeding this pressure may cause compressor failure.

RECOVERING AND RECYCLING THE REFRIGERANT

Draining the Oil from the Previous Recovery Cycle

1. Place the power switch and the controller on the recovery unit in the OFF position.
2. Plug in the recovery station to the correct power source.
3. Drain the recovered oil through the valve marked OIL DRAIN on the front of the machine.
4. Place the controller knob in the ON position. The low pressure gauge will show a rise.
5. Immediately switch to the OFF position and allow the pressure to stabilize. If the pressure does not rise to between 5 psi and 10 psi, switch the controller ON and OFF again.
6. When the pressure reaches 5 to 10 psi, open the OIL DRAIN valve, collect oil in an appropriate container, and dispose of container as indicated by local, state or Federal Regulation. THE OIL IS NOT REUSABLE, DUE TO CONTAMINANTS ABSORBED DURING ITS PREVIOUS USE.

Performing the Recovery Cycle

1. Be sure the equipment being used is designed for the refrigerant you intend to recover.
2. Observe the sight glass oil level. Having drained it, it should be zero.
3. Check the cylinder refrigerant level before beginning recovery to make sure you have enough capacity.
4. Confirm that all shut-off valves are closed before connecting to the AC system.
5. Attach the appropriate hoses to the system being recovered.

Excessive Air and/or Moisture in the System

Indications:

Gauge Reading- Low Side High
High Side High
Air from the vents in the cab is only slightly cool.

Cause- System contains excessive air and/or moisture.

Repair Procedure: Test for leaks, recover refrigerant from the system and repair the leak. Depending on the type of system, replace the receiver-drier or accumulator. Check and replace any compressor oil lost due to leakage. Evacuate and recharge the system, then check AC operation and performance.

Expansion Valve Stuck or Plugged

Indications:

Gauge Reading- Low Side Low or Vacuum
High Side High
Air from vents in the cab is only slightly cool.
The expansion valve body is frosted or sweating.

Cause- An expansion valve malfunction could mean the valve is stuck in the closed position, the filter screen is clogged (block expansion valves do not have filter screens), moisture in the system has frozen at the expansion valve orifice, or the sensing bulb is not operating. If the sensing bulb is accessible, perform the following test. If not then proceed to the Repair Procedure.

Test: Warm diaphragm and valve body with your hand, or very carefully with a heat gun. Activate system and watch to see if the low pressure gauge rises.
Next, carefully spray a little nitrogen, or any substance below 32° F, on the capillary coil (bulb) or valve diaphragm. The low side gauge needle should drop and read at a lower (suction) pressure on the gauge. This indicates the valve was part way open and that your action closed it. Repeat the test, but first warm the valve diaphragm or capillary with your hand. If the low side gauge drops again, the valve is not stuck.

Repair Procedure: Inspect the expansion valve screen (except block type valves). To do this, remove all refrigerant from the system. Disconnect the inlet hose fitting from the expansion valve. Remove, clean and replace the screen, then reconnect the hose. Replace the receiver-drier. Then evacuate and recharge the system with refrigerant, and check AC operation and performance. If the expansion valve tests did not cause the low pressure gauge needle to rise and drop, and if the other procedure described did not correct the problem, the expansion valve is defective. Follow the procedure for component replacement.

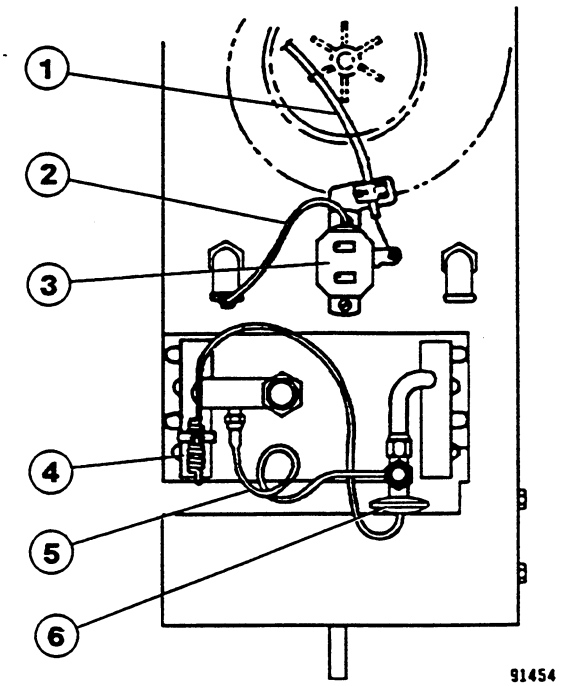


FIGURE 9-5. EVAPORATOR ASSEMBLY COMPONENTS

1. Thermostat Control Cable
2. Capillary Tube
3. Thermostat Switch
4. Sensing Bulb
5. Pressure Equalizing Capillary Tube
6. Expansion Valve

2. Remove covers from heater/air conditioner cabinet (1, Figure 9-4) for access to components.
3. Remove hoses from expansion valve extension (7) and evaporator coil outlet (5).
4. Remove heater hoses per instructions in "Blower Removal".
5. Remove thermostat control cable (1, Figure 9-5) and wires from thermostat switch (3).
6. Loosen and remove thermostat mounting screws.

⚠CAUTION

Use extreme care in removing the thermostat switch sensing capillary tube. If tube is damaged or kinked, it must be replaced.

7. Carefully pull the end of the thermostat switch capillary tube (8, Figure 9-4) from bottom of evaporator coil (9) and bend and straighten just enough to allow removal from top side of coil. Remove thermostat switch and capillary tube.
8. Slide evaporator coil assembly out of heater/air conditioner cabinet.
9. Remove insulating tape from expansion valve and bulb.
10. Replace components as required.

Installation

1. Mount inlet extension (6, Figure 9-4) to expansion valve (7), parallel to outlet tube (5).
2. Connect pressure equalizing capillary tube (5, Figure 9-5) to outlet line.
3. Clamp the sensing bulb (4) to outlet manifold.
4. Wrap expansion valve and expansion valve bulb with insulating tape to prevent condensation and freeze-up of valve.
5. Slide evaporator coil assembly into cabinet bracket slots.
6. Feed thermostat switch capillary tube through grommet in side of cabinet.
   a. Route capillary tube above and to the center of the evaporator coil.
   b. Route tube down through the fins at a point 5 in. (127 mm) from the right side of the cabinet.
   c. Bend the tube and route it horizontally and insert tip up through evaporator lower surface. (Refer to Figure 9-4.)
7. Reinstall cables, hoses and covers.
8. Check for leaks, evacuate and recharge the system per instructions in **"Air Conditioning System"**.

BLOWER MOTOR ASSEMBLY

⚠WARNING

The engine cooling system is pressurized by system air pressure and by thermal expansion of coolant during operation. DO NOT remove the radiator cap while the engine is hot. Severe scalding burns can result.

PART INSPECTION	WEAR LIMITS
Turbine Wheel (5)	
Check for cracks, corrosion, erosion, broken edges, bore and keyway wear.	Minor damage acceptable. Bore and keyway wear not acceptable.
Spacer (11)	
Check parallelism of end surfaces.	Ends to be parallel within .0005 in. (.0127 mm). No scoring or dents on end surfaces permitted.
Needle Bearings (34, 50)	
Check freedom of needle rollers.	Replace bearings as required.
Ball Bearings (7, 21, 36, 42)	
Check for freedom of rotation without excessive play between races.	Reuse bearings (36, 42) if acceptable. Replace bearings (7, 21).

TRUCK CAB

Removal

The operators cab shell is removable as an assembly to provide clearance for all interior cab components if this is desirable.

1. To remove the cab shell, disconnect electrical wiring to dome lights and/or fans if these are installed. Disconnect windshield wiper and remove windshield washer bottle.
2. Remove the threshold plate (2, Figure 2-1) from both door openings. Remove capscrews, flat washers and lockwashers securing the cab shell perimeter to the truck deck.
3. Loosen the lower heater mounting hardware and bracket to break the seal between the heater and filter plenum.
4. Position a wide , (6 in. [150 mm] minimum) nylon lifting strap through both door openings and attach to an overhead crane, have the doors open, do not lift on top edges of the doors. Making sure all necessary disconnects have been made, lift cab shell carefully straight up until clear of the instrument panel and seats. Move cab shell clear of truck and move to work area for necessary service.

Installation

1. When service procedures are complete, lift cab back into position on the truck deck, making sure the rubber sealing strips are in good condition and properly located.
2. Position the two threshold plates in the door openings. Secure the cab to the truck deck with capscrews. Tighten capscrews to **25 ft.lbs. (34 N.m)** torque.

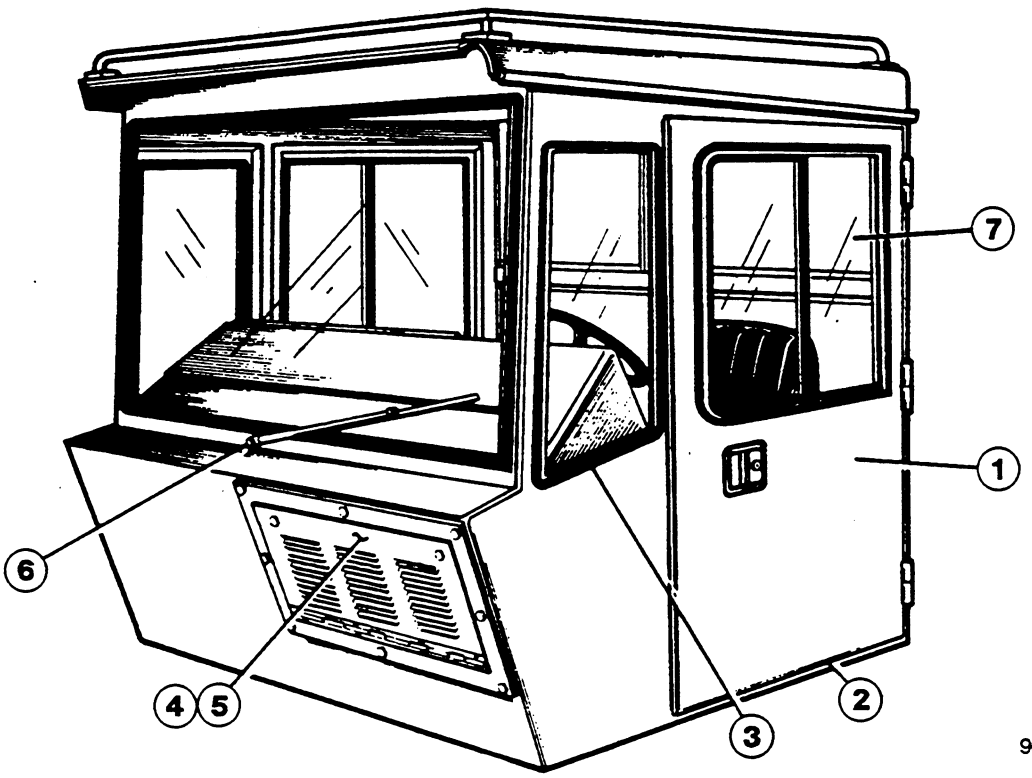


FIGURE 2-1. CAB ASSEMBLY

1. Door Assembly
2. Threshold Plate
3. Side Glass
4. Cover
5. Air Filter Element
6. Windshield Wiper
7. Sliding Window

OPERATOR COMFORT

OPERATOR SEAT

The operator's seat provides a fully adjustable cushioned ride for the driver's comfort and ease of operation. The seat is independently mounted from the cab for easy maintenance and repair.

Adjustment

The following adjustments must be made while sitting in the seat.

1. To adjust fore/aft location of seat:
   a. Raise slide adjustment lever (2, Figure 4-1).
   b. Move seat backward or forward as desired.
2. To adjust seat height:
   a. Depress the "Height Adjust" lever (1).
   b. Adjust seat assembly to desired height.
3. To adjust weight:
   a. Turn knob "Weight Adjust" (3).
   b. Moving knob clockwise decreases cushioning effect of seat and turning counterclockwise increases cushioning effect.

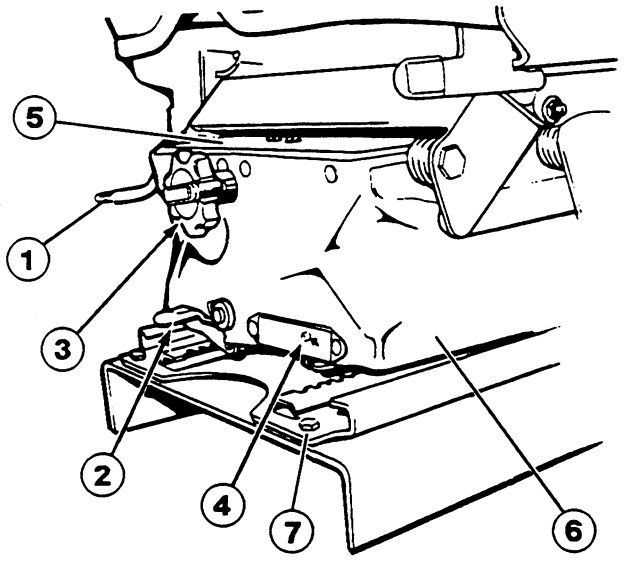


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FIGURE 4-1. SEAT ADJUSTMENT CONTROLS

1. Height Adjustment
2. Slide Adjustment
3. Weight Adjustment
4. Weight Indicator
5. Lower Housing
6. Boot
7. Capscrews, Lockwashers & Nuts

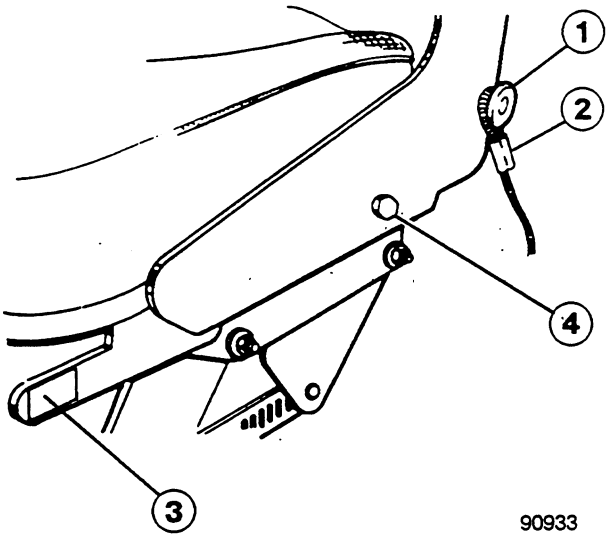

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FIGURE 4-2. STOP CABLE & TILT LATCH

1. Capscrew , Washer & Nut
2. Stop Cable
3. Tilt Latch
4. Capscrew

   c. Proper adjustment results in Weight Indicator (4) being flush with seat base while operator is seated.
4. To adjust seat cushion:
   a. Raise "Cushion Tilt Latch" lever (3, Figure 4-2) on left side of seat.
   b. When lever is unlatched, choose between two different positions.

Removal

1. Remove capscrews, lockwashers and nuts (7, Figure 4-1) that secure seat base to seat riser.
2. Remove seat assembly from cab to clean work area for disassembly.

   Seat Weight: 102 lbs. (46.3 kg).

Installation

1. Mount seat assembly to seat riser. Install capscrews, lockwashers and nuts. Tighten capscrews to **35 ft. lbs. (47.5 N.m)** torque.
2. Install stop cable ends (2, Figure 4-2) if they were removed.

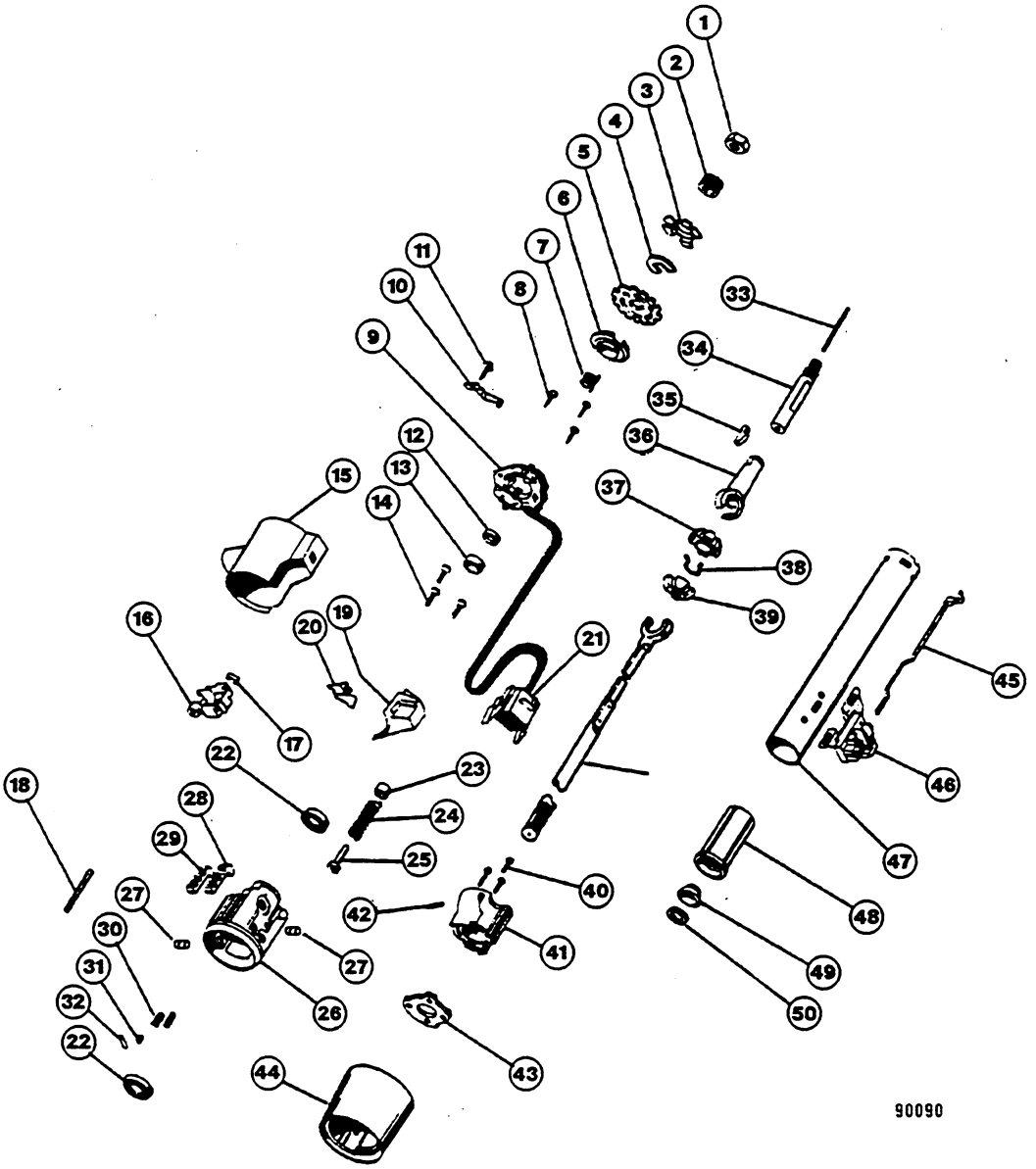


FIGURE 5-5. STEERING COLUMN ASSEMBLY

1. Jam Nut
2. Steering Shaft Bumper
3. Carrier Retainer
4. Lock Retainer
5. Steering Shaft Lock
6. Carrier Assembly
7. Upper Bearing Spring
8. Machine Screw
9. Turn Signal Switch Assembly
10. Turn Signal Assembly
11. Machine Screw
12. Race Seat
13. Inner Race
14. Machine Screw
15. Cover Assembly
16. Actuator Pivot
17. Preload Spring
18. Pivot Pin
19. Cover End Cap
20. Tilt Lever Shield
21. Connector
22. Bearing Assembly
23. Spring Retainer
24. Tilt Wheel Spring
25. Spring Guide
26. Column Housing
27. Pivot Pin
28. Wheel Lock Shoe
29. Wheel Lock Shoe
30. Shoe Spring
31. Release Spring
32. Release Pin
33. Telescope Locking Rod
34. Upper Steering Shaft
35. Locking Wedge
36. Yoke Assembly
37. Centering Sphere
38. Preload Spring
39. Lower Steering Shaft
40. Machine Screw
41. Housing Support
42. Dowel Pin
43. Lock Plate
44. Housing Shroud
45. Turn Signal Rod
46. Turn Signal Spring
47. Jacket Assembly
48. Bearing Adapter
49. Bearing Assembly
50. Steering Shaft Spacer

(11) TACHOMETER

The tachometer records engine crankshaft revolutions. The gauge registers in hundreds of revolutions per minute (RPM).

Governed RPM:

Cummins KTA-38-C

- Low Idle - 750 RPM
- High Idle, No load - 2300 ±50 RPM

(12) PARKING BRAKE CONTROL

To apply parking brake, move control to "On". To release, move control to "Off". The parking brake is spring applied and air released. When the parking brake is actuated, indicator light (24) will be illuminated on the instrument panel.

(13) EMERGENCY BRAKE

When the emergency brake switch is placed in the "On" position, all service brakes will be fully applied.

⚠WARNING

Due to the sudden and unmodulated application of service brakes, this switch should not be used to stop the truck except in an emergency situation.

(14) WHEEL BRAKE LOCK

The brake lock switch actuates the hydraulic brake system which locks the wheel brakes. When pulling into shovel or dump area, stop the truck using the brake pedal until truck is in position; then apply the brake lock.

⚠WARNING

Do not use to stop truck. Use at shovel and dump only.

Do not use brake lock for parking. Use of the brake lock for extended periods of time with the engine shut down may cause damage to the brakes. In addition, the brakes will release as the air pressure bleeds down.

(15) DRY/ROAD, SLIPPERY/ROAD SWITCH

The dry/road, slippery/road control switch permits the operator to select a braking action to compensate for "Dry" or "Slippery" road conditions.

⚠WARNING

Slippery road position reduces front wheel braking effort while maintaining full braking of the rear wheels. Reduced braking of the front wheels assists in steering control on slippery road conditions.

(16) PANEL LIGHT DIMMER

The panel light dimmer control is a rheostat which allows the operator to vary the brightness of the instruments and panel lights.

(17) LIGHT SWITCH

The instrument panel lights and the headlights are controlled by this three position rotary type switch. Turning the switch clockwise from the "Off" position to the second position completes the circuit from the battery to the instrument panel lights and taillights. Turning the switch clockwise to the third position completes the circuit to the headlights in addition to the panel and taillights.

(18) WINDSHIELD WASHER SWITCH

If equipped with air operated windshield wipers, this switch activates the windshield washer system. The wipers should be "On" when the washer is used.

(19) WINDSHIELD WIPER CONTROL

Air Operated Wipers:

The air operated windshield wiper control switch is a "push–pull" type switch. Pulling the knob out actuates the windshield wipers. Turning the knob clockwise places the wiper in the "high" or fast cycle, turning the knob counterclockwise places the wiper in the "low" or slow cycle.

Electric Wipers:

When equipped with electric windshield wiper, this switch is rotated to select the wiper speed. To operate the windshield washer, press and hold the switch knob.

100 HOUR LUBRICATION AND MAINTENANCE CHECKS

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

Include 10 and 50 Hour service schedule in addition to the following:

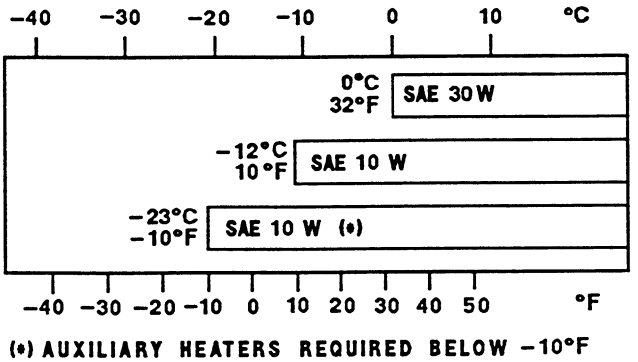
1. **BODY HINGE PINS** - Add one or two applications of grease to each grease fitting. Lube Key "E".
2. **STEERING DRIVE SLIP JOINT** - One or two applications of grease to slip joint fitting in cab. Lube Key "E".
3. **HOIST CYLINDER PIVOT PINS** - Add one or two applications of grease to each grease fitting for bearing and pivots. Lube Key "E".
4. **ANTI-SWAY BAR** - Add one or two applications of grease to each grease fitting for pin and bearings. Use Lube Key "E".
5. **STEERING BALL STUD PIVOTS** - Add one or two applications of grease to each grease fitting for ball stud and bearing. Use Lube Key "E". Check torque on ball stud nuts; **2000 ft. lbs. (2712 N.m)** torque.
6. **REAR SUSPENSION** - Add one or two applications of grease to each grease fitting for the ball studs. Use Lube Key "E".
7. **FUEL TANKS** - Drain water and sediment from bottom of tank.
8. **FRONT WHEEL** - Check oil every 100 hours. Check bearing preload after first 500 hours and every 5000 hours thereafter, as covered in Section "G". Use Lube Key "C". Capacity 1.5 gal. (5.6 l).
9. **TRANSMISSION** - Check transmission oil level. Use Lube Key "D". Refer to Section "F" in Service Manual or Allison Manual for filling procedure.
10. **FINAL DRIVE** - Check oil level. Use Lube Key "C".
11. **DRIVE SHAFT U-JOINTS** - Add one or two applications of grease to each grease fitting. Use Lube Key "G".
12. **FAN DRIVE BEARING** - Add 1 or 2 applications of grease to each grease fitting. Use Lube Key "B".
13. **THROTTLE LINKAGE** - Oil linkage as required. Use Lube Key "AA".
14. **TRANSMISSION RETARDER LINKAGE** - Oil linkage as required. Use lube Key "AA".
15. **FINAL DRIVE BREATHER** - Clean breather.

COMMENTS	√'d	INITIALS

325M SERVICE CAPACITIES		
	Gallons	Liters
Cooling System	82	310
Crankcase – Cummins (includes lube oil filters)	34	129
Hydraulic System (incl tank)	96	363
Hydraulic Tank	65	246
Fuel Tank	320	1211
Final Drive	62	235
Front Spindle	1.5	5.6
Transmission (Sump, Filters, Lines, etc.)	28	106

COOLING SYSTEM ANTI–FREEZE RECOMMENDATIONS Ethylene Glycol Permanent Type Anti-Freeze		
Percentage of Anti-Freeze	Protection to:	
	°F	°C
10	+23	-5
20	+16	-9
25	+11	-11
30	+4	-16
35	-3	-19
40	-12	-24
45	-23	-30
50	-34	-36
55	-48	-44
60	-62	-52

Use only antifreeze that is compatible with engine as specified by engine manufacturer.



TEMPERATURE CHART FOR C-3 FLUIDS