DG734

Shop Manual

830E

DUMP TRUCK

SERIAL NUMBERS **A30544 - A30606**

KOMATSU®

SPECIFICATIONS

These specifications are for the standard 830E Haulpak Truck. Customer Options may change this listing.

ENGINES -

MTU/DDC 16V4000 Series

Number of Cylinders 16
Operating Cycle . . . . . 4- Stroke
Rated Brake HP . . 2500 HP (1887 kW) @ 1900 RPM
Flywheel HP . . . 2409 HP (1818 kW) @ 1900 RPM
Weight* (Dry) . . . . . 15,835 pounds (7183 kg)
* Weight does not include Radiator, Sub-frame, or Alternator

ELECTRIC DRIVE SYSTEM - STATEX III

(AC/DC Current)
Alternator . . . . . General Electric GTA - 26
Dual Impeller, In-Line Blower 9000 cfm (255 m^3/min)
Motorized Wheels . . . . . General Electric 787
Ratio 28.125:1
Maximum Speed* . . . . . 35.3 MPH (56.9 km/h)
(*w/40.00-57 Tires and 28.125:1 gear train)

DYNAMIC RETARDING

Extended Range Retarding With Fully Blown
18-Resistor Grids and Reverse Retarding Standard
Maximum Rating . . . . . 4000 HP (2983 kW)

TIRES

Rock Service, Deep Tread . . . . . (E-4) Tubeless
Standard Tire . . . . . 40.00 - 57, 68 Ply Rating
(w/787 Wheelmotor)
Separable Tire Rims *
5 Piece New Generation™ Rims *
Rims* are interchangeable with different positions on the truck, but due to improved design for greater load support, rims are not interchangeable with other manufacturer's rims.

Rim Size:
29 in. (737 mm) X 57 in. (1448 mm) X 6 in. (152 mm)

24 VDC ELECTRIC SYSTEM

Batteries . . . . . Two 12 Volt Batteries in Series
. 220 Ampere-Hour Capacity w/Disconnect Switch
Battery Charging Alternator . . . . . .
. . . . . 24 Volt, 240 Ampere Output
Lighting . . . . . 24 Volt
Starters . . . . . (2) Delco-Remy 24 Volt

SERVICE CAPACITIES

	U.S. Gallons	(Liters)
Crankcase *	66.0	250.0
* Includes Lube Oil Filters		
Cooling System	150	568
Fuel	1200	4543
Hydraulic System	250	947
Hydraulic Tank	238	901
Wheel Motor Gear Box (each)	10.5	39.7

AIR SYSTEM

Compressor . . . . . B-W TU-FLO 501
Capacity . . . . . 12 cfm (0.34 m^3/min.)
Starter with Interlock . Varies with Customer Option
Main Tank Capacity . . . . . 15 $ft.^3$ (425 liters)

HYDRAULIC SYSTEMS*

Pumps
Hoist . . . . . Tandem Gear Pumps
Rated @ . . . . 230 GPM (870 l/min.) @ 1900 RPM
Steering . . Radial Piston-Pressure Compensating
(also Brake) . . 65 GPM (246 l/min.) @ 1900 RPM
System Relief Pressures
Hoist/Steering . . . . . 2500 psi (17.2 MPa)
Brakes . . . . . 3500 psi (24.1 MPa)
Hoist Cylinders (2) 3-Stage
Tank (Vertical/Cylindrical) . . . . . Non-Pressurized
Filtration . Remote-mounted, Replaceable, Elements
Suction . . . . . Single, Full Flow, 100 Mesh
Hoist & Steering . . . . . .
. . . . . Full Flow, Dual In-Line, High Pressure
. . . . . Beta 12 Rating = 200
*With Quick Disconnects for powering disabled
. . . . . truck and system diagnostics.

STEERING (w / Accumulators)

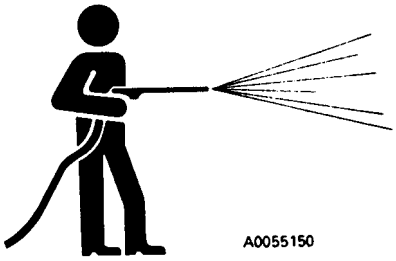
Turning Circle - Front Wheel Track . 93 ft. (28.4 m)
Full Time Power Steering . . . . . Twin Cylinders
Automatic Emergency Steering . . . . . Standard

WORK UNDER THE MACHINE

- Always lower all movable work equipment to the ground or to their lowest position before performing service or repairs under the machine.
- Always block the tires of the machine securely.

- Never work under the machine if the machine is poorly supported.

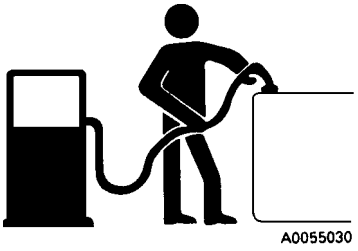
KEEP THE MACHINE CLEAN

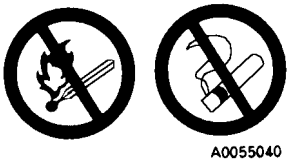


- Spilled oil or grease, or scattered tools or broken pieces are dangerous because they may cause you to slip or trip.
  Always keep your machine clean and tidy.
- If water gets into the electrical system, there is danger that the machine may not move or may move unexpectedly.
  Do not use water or steam to clean the sensors, connectors, or the inside of the operator's compartment.

RULES TO FOLLOW WHEN ADDING FUEL OR OIL

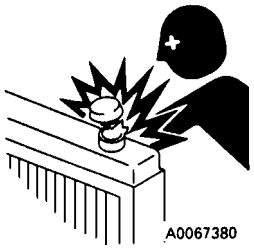
- Spilled fuel and oil may cause you to slip, so always wipe it up immediately.
- Always tighten the cap of the fuel and oil fillers securely.
- Never use fuel for washing any parts.
- Always add fuel and oil in a well-ventilated place.





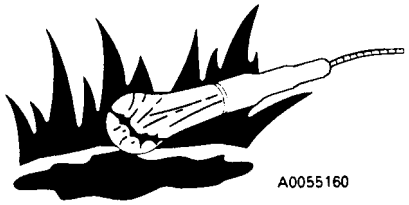
RADIATOR WATER LEVEL

- If it is necessary to add water to the radiator, stop the engine and allow the engine and radiator to cool down before adding the water.
- Slowly loosen the cap to relieve pressure before removing the cap.



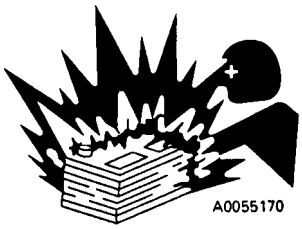
USE OF LIGHTING

- When checking fuel, oil, coolant, or battery electrolyte, always use lighting with anti-explosion specifications. If such lighting equipment is not used, there is danger or explosion.



PRECAUTIONS WITH BATTERY

- When repairing the electrical system or when carrying out electrical welding, remove the negative (-) terminal of the battery to stop the flow of current.



DUMPING

1. Pull into dump area with extreme caution. Make sure area is clear of persons and obstructions, including overhead utility lines. Carefully maneuver truck into dump position. Obey signals directed by the spotter, if present.
2. Avoid unstable areas. Stay a safe distance from edge of dump area.
   Position truck on a solid, level surface before dumping.

⚠DANGER

As body raises, the truck Center of Gravity (CG) will move. Truck must be on level surface to prevent tipping / rolling!

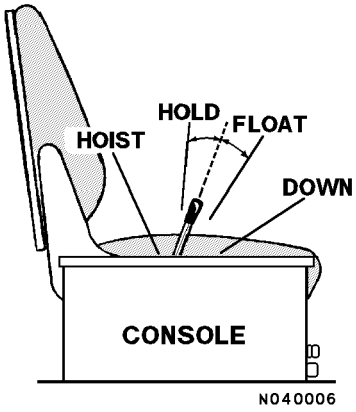
3. When in dump position, apply Brake Lock and move Selector Switch to the "**N**eutral" position.

To Raise dump body:

⚠WARNING

The dumping of very large rocks (10% of payload, or greater) or sticky material (loads that do not flow freely from the body) may allow the material to move too fast and cause the dump body to move RAPIDLY and SUDDENLY. This sudden movement may jolt the truck violently and cause possible injury to the operator, and/or damage to the hoist cylinders, frame, and/or body hinge pins. If it is necessary to dump this kind of material, refer to the CAUTION in the following procedure:

4. Pull the lever to the rear to actuate hoist circuit.
   (Releasing the lever anywhere during "hoist up" will place the body in "hold" at that position.)



5. Raise engine RPM to accelerate hoist speed. Refer to the CAUTION below.

⚠CAUTION

If dumping very large rocks ,or sticky materials, as described in the previous WARNING, slowly accelerate engine RPM to raise body.
When the material starts to move, release hoist lever to "HOLD" position.
If material does not continue moving and clear body, repeat this procedure until material has cleared body.

6. Reduce engine RPM as last stage of hoist cylinder begins to extend and let engine go to low idle as last stage reaches half-extension.
7. Release hoist lever as last stage of hoist cylinder reaches full extension.
8. After material being dumped clears body, lower body to frame.

To Lower Body

(When dumping over a berm or into a crusher):

8. Move hoist lever forward to "down" position and release. Releasing the lever places hoist control valve in the "float" position allowing the body to return to frame.

NOTE: If dumped material builds up at the rear of the body and the body cannot be lowered, perform steps "a" & "b" below:

a. Move hoist lever back to the "hoist" position to fully raise the dump body. Then release the hoist lever so it returns to the "hold" position.

*NOTE: **DO NOT** drive forward if the tail of body will not clear the crusher wall in the fully raised position.*

b. Shift Selector Switch to "Forward", release Brake Lock, depress Override button and drive forward to clear the material. Stop, shift Selector Switch to "Neutral", apply Brake Lock and lower body again.

*NOTE: Failure to "hoist" the body after making an unsuccessful attempt at lowering the body may result in the dump body **suddenly lowering** after the truck has pulled ahead of the material that was previously preventing the body from lowering.*

STANDARD TORQUE CHARTS AND CONVERSION TABLES

This manual provides U.S. standard and metric (SI) units for most specifications.

References throughout the manual to standard torques or other standard values will be to one of the following charts or tables. For values not shown in these charts or tables, standard conversion factors for most commonly used measurements are provided in Table XIII.

Standard torque values are not to be used when “turn-of-the-nut” tightening procedures are recommended.

INDEX OF TABLES

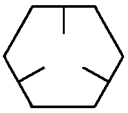
EFFECT OF SPECIAL LUBRICANTS On Fasteners and Standard Torque Values

Komatsu does not recommend the use of special friction-reducing lubricants, such as Copper Coat, Never-Seez®, and other similar products, on the threads of standard fasteners where standard torque values are applied. The use of special friction-reducing lubricants will significantly alter the clamping force during the tightening process.

If special friction-reducing lubricants are used, excessive stress and possible breakage of the fasteners may result.

When the torque tables specify “lubricated threads” for the standard torque values listed, these standard torque values are to be used with simple lithium base chassis grease (multi-purpose EP NLGI) or a rust-preventive grease (see list, page A5-2) on the threads and seats unless specified otherwise.

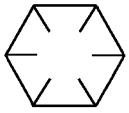
Verify threads and tapped holes are free of burrs and other imperfections before installing hardware.



Grade 5

TABLE I. -STANDARD TORQUE CHART
SAE HEX HEAD CAPSCREW AND NUT ASSEMBLY
(LUBRICATED THREADS) - TOLERANCES ±10%

Grade 8



Cap-screw Thread Size	TORQUE - GRADE 5			TORQUE - GRADE 8			Cap-screw Thread Size	TORQUE - GRADE 5			TORQUE - GRADE 8		
	ft lbs	kg•m	N•m	ft lbs	kg•m	N•m		ft lbs	kg•m	N•m	ft lbs	kg•m	N•m
1/4-20	7	0.97	9.5	10	1.38	13.6	3/4-16	235	32.5	319	335	46.3	454
1/4-28	8	1.11	10.8	11	1.52	14.9	7/8-9	350	48.4	475	500	69.2	678
5/16-18	15	2.07	20.3	21	2.90	28	7/8-14	375	51.9	508	530	73.3	719
5/16-24	16	2.21	22	22	3.04	30	1.0-8	525	72.6	712	750	103.7	1017
3/8-16	25	3.46	34	35	4.84	47	1.0-12	560	77.4	759	790	109.3	1071
3/8-24	30	4.15	41	40	5.5	54	1.0-14	570	78.8	773	800	110.6	1085
7/16-14	40	5.5	54	58	8.0	79	1 1/8-7	650	89.9	881	1050	145	1424
7/16-20	45	6.2	61	62	8.57	84	1 1/8-12	700	96.8	949	1140	158	1546
1/2-13	65	9	88	90	12.4	122	1 1/4-7	910	125.9	1234	1480	205	2007
1/2-20	70	9.7	95	95	13.1	129	1 1/4-12	975	134.8	1322	1580	219	2142
9/16-12	90	12.4	122	125	17.3	169	1 3/8-6	1200	166	1627	1940	268	2630
9/16-18	95	13.1	129	135	18.7	183	1 3/8-12	1310	181	1776	2120	293	2874
5/8-11	125	17.3	169	175	24.2	237	1 1/2-6	1580	219	2142	2560	354	3471
5/8-18	135	18.7	183	190	26.2	258	1 1/2-12	1700	235	2305	2770	383	3756
3/4-10	220	30.4	298	310	42.8	420							

1 ft lbs = 0.138 kg•m = 1.356 N•m

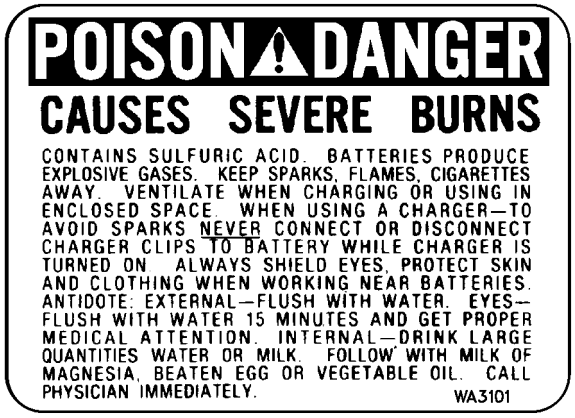
RECONDITIONING AN IDLE VEHICLE

⚠WARNING

NEVER attempt operation of a vehicle which has been standing idle for a long period until all systems which affect steering, brakes, engine, transmission and running gear have been completely reconditioned. An unsafe vehicle can cause serious injuries and/or major property damage - DON'T TAKE CHANCES!

At times a vehicle is subjected to long idle periods without being properly serviced for storage - merely shut down and left to the elements for an extended period. Reconditioning of this vehicle can and does present a major expenditure of time and money when it is to be put into operating condition.

1. Remove all trash and thoroughly clean the vehicle before starting any inspection or maintenance.



2. Remove vehicle batteries and move to battery shop for service and charging or replacement as necessary.

⚠WARNING

Do not disassemble an inflated tire. Remove valve core slowly, and allow pressure to bleed off, before attempting to remove lockring. Also, eye protection should be worn during tire deflation to protect against any foreign object being projected into the eyes.

3. Inspect tires thoroughly for tread and side wall condition, weathering, cuts and cracks.
   a. Any tire suspected of being unserviceable should be dismounted and thoroughly inspected inside and out before being inflated.

⚠WARNING

Do not mix rim parts of different rim manufacturers. Rim parts may resemble those of a different manufacturer, but the required tolerances may be wrong. Use of mismatched rim parts is hazardous.

   b. If tires are dismounted, all wheel components must be cleaned, inspected, all rust and corrosion removed and parts repainted as applicable before remounting the tires. Follow the safety rules when mounting and inflating tires.
   c. Mount and inflate tires as shown in Operation and Maintenance Manual or service manual.
4. Inspect vehicle service brakes carefully.

⚠WARNING

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

   a. If dust covers are installed on the inboard side of the wheels, remove the covers to allow for inspection of brake calipers/shoes and/or brake discs/drums.

⚠WARNING

The use of vapor degreasing or steam cleaning is not recommended, either for brake assemblies or the component parts. Corrosion and rusting may occur.

   b. All brake lines, connections and pressure converters must be clean, serviced and free of rust and corrosion.
   c. Check condition of brake fluid; fill or replace fluid as necessary.

ELECTRIC DRIVE TRUCKS

Storage Instructions and Procedures

This instruction provides the recommended procedures for protecting equipment from damage during both short-term and long-term storage periods and for maintaining adequate protection while in storage. Also included are instructions for placing this equipment into service after having been stored.

For the purposes of this instruction, a short-term storage period is considered to be less than three months; a long-term storage period is considered to be three months or longer.

General Electric recommends a maximum storage period of three years, with these storage procedures being repeated after each year. After a storage period of three years or more, the Motorized Wheels should be removed and sent to an overhaul facility for teardown and inspection of seals and bearings. These should be replaced if necessary.

Periodic (every three months) inspections should be made to determine the lasting qualities of long-term storage protection measures. Such inspections will indicate the need for renewing protective measures when necessary to prevent equipment deterioration.

Proper storage of this equipment is vital to equipment life. Bearings, gears, and insulation may deteriorate unless adequate protective measures are taken to protect against the elements. For example, bearings and gears in the Motorized Wheel gear case are susceptible to the formation of rust; insulation in rotating electrical equipment can accumulate moisture; and bearings may become pitted.

⚠WARNING

NEVER APPLY ANY SPRAY, COATING OR OTHER PROTECTIVE MATERIALS TO AREAS NOT SPECIFICALLY RECOMMENDED.

It is also important to note that these instructions cannot possibly anticipate every type of storage condition and, therefore, cannot prevent all equipment deterioration problems caused by inadequate storage. However, these instructions should be considered as a minimum procedure to achieve the best possible equipment life and the lowest operating cost when the equipment is returned to service.

NOTE: Local conditions and/or experience may require ADDITIONAL procedures and/or additional storage precautions.

Placing Equipment Into Storage

Perform the following instructions when preparing General Electric equipment for storage. There are three main equipment categories to consider:

1. When storing a truck that is operational.
2. When storing a truck that is not operational.
3. When storing major components (Motorized Wheel, alternator, etc.).

These three major categories are the basis for determining required protective measures.

NOTE: In addition to these instructions, refer to truck storage instructions.

When Storing A Truck That Is Operational

When a fully operational truck is being placed into storage for less than three months, the best protective measure which can be taken is to drive the truck once a week for at least 30 minutes. Prior to driving the truck, the rotating equipment should be Meggered and:

1. If greater than 2 megohms, run normally.
2. If less than 2 megohms, isolate condition and correct before running.

Driving the truck circulates oil in the gear case to keep gears and bearings lubricated and free from rust. It also prevents deterioration of the brushes, commutators and slip rings.

When a fully operational truck is being placed into storage for three months or longer, and the truck **cannot** be operated weekly throughout the storage period as indicated above, perform the following instructions:

1. Drain oil from the gear case and install rust preventive 4161 (product of Van Straaten Chemical Co.)or equivalent. Fill per General Electric Motorized Wheel Service Manual.
2. Megger the wheels as indicated in the instructions above. Operate the truck for at least 30 minutes to insure that the rust preventive compound has been thoroughly circulated throughout the gear case. Stop the truck and drain the rust preventive compound.

NOTE: Do not run a LOADED truck with rust preventive compound in Motorized Wheel gear cases.

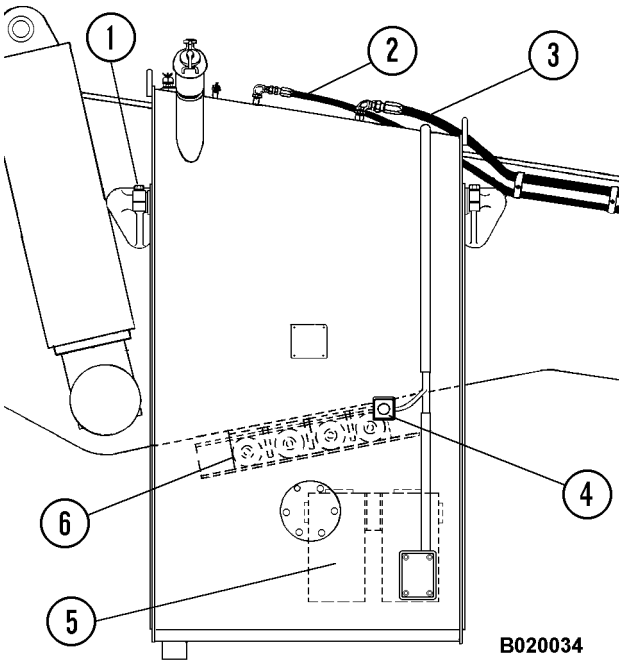


FIGURE 2-4. FUEL TANK

1. Upper Mounting Trunnion
2. Fuel Return Hose
3. Fuel Supply Hose
4. Fuel Gauge
5. Hydraulic Filters
6. Lower Mounting Bracket

FUEL TANK

Removal

1. Raise truck body and install body safety lock pin.
2. Drain sediment from tank and dispose of properly. Drain remainder of fuel into clean containers.
3. Disconnect fuel tank wire harness and remove clamps (9, Figure 2-5).
4. Remove ground wire (7).
5. Remove fuel supply (3, Figure 2-4) and return hoses (2) and plug to prevent contamination.
6. Remove hydraulic filter assembly (5) mounting hardware from fuel tank. Support filters by placing a chain over the frame rail. (It is not necessary to disconnect hydraulic hoses.)
7. Attach lifting device to tank lift eyes.
8. Remove capscrews (4), and flat washers (3).
9. Remove capscrews, lockwashers, and caps (1, Figure 2-4) from upper mounting brackets.
10. Lift tank from brackets and move to work area.
11. Inspect rubber dampeners (2, Figure 2-5) and replace, if necessary.

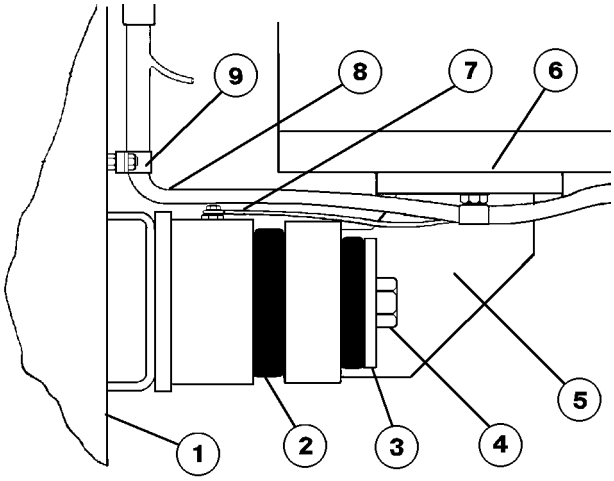


FIGURE 2-5. FUEL TANK MOUNTING BRACKET (Lower)

1. Fuel Tank
2. Rubber Dampener
3. Flat Washer
4. Cap Screw
5. Frame Bracket
6. Main Frame
7. DGround Wire
8. Wire Harness
9. Harness Clamp

Installation

1. Lower tank into position over upper mounting brackets.
2. Install caps, lockwashers, and capscrews (3, 4, Figure 2-5) and tighten to **310 ft. lbs. (420 N.m)** torque.
3. Install lower mount flatwashers and capscrews and tighten to **459 ft. lbs. (622 N.m)** torque.
4. Attach ground wire, connect wire harness and clamp in place.
5. Attach fuel supply (3) and return (2) hoses. (Refer to Figure 2-4)
6. Attach hydraulic filter (5) assembly to fuel tank.
7. Refill tank with clean fuel.

POWER MODULE

The radiator, engine and alternator/blower assemblies are mounted on a roller equipped subframe which is contained within the truck's main frame and is referred to as a "Power Module". This arrangement permits removal and installation of these components with a minimum amount of disconnect being made and by utilizing the unique "Roll In/Roll Out" feature.

Although the instructions in this section are primarily based upon the "Rollout" method for major component removal, the radiator and fan may be removed as separate items. Instructions for radiator and fan removal are contained later in this section.

General Information

⚠WARNING

The complete power module weighs approximately 32,000 lbs. (14,528 kg). Make sure lifting device to be used is of an adequate capacity.

1. Position the truck in a work area with a flat, level surface and 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 lock pin and body cable.

⚠WARNING

Do not work under raised body without first making sure the body lock pin and body cable is installed.

3. Tag or mark all air lines, oil lines, fuel lines and electrical connections to assure correct hookup at time of power module installation. Plug all ports and cover all hose fittings or connections when disconnected to prevent dirt or foreign material from entering.
4. It is not necessary to remove the radiator prior to the removal of the power module. If radiator removal is desired or if only radiator repair is necessary, refer to "Cooling System" in this section.

Removal

1. Disconnect batteries using the following procedure *in this order:*
   a. Open battery disconnect switch located on battery equalizer box on deck of truck.
   b. Remove battery equalizer GND (-) terminal.
   c. Remove +12V (output) terminal at equalizer.
   d. Remove +24V (input) terminal at equalizer.
   e. Disconnect battery negative (-) terminal at battery box.
   f. Disconnect battery positive (+) terminal.

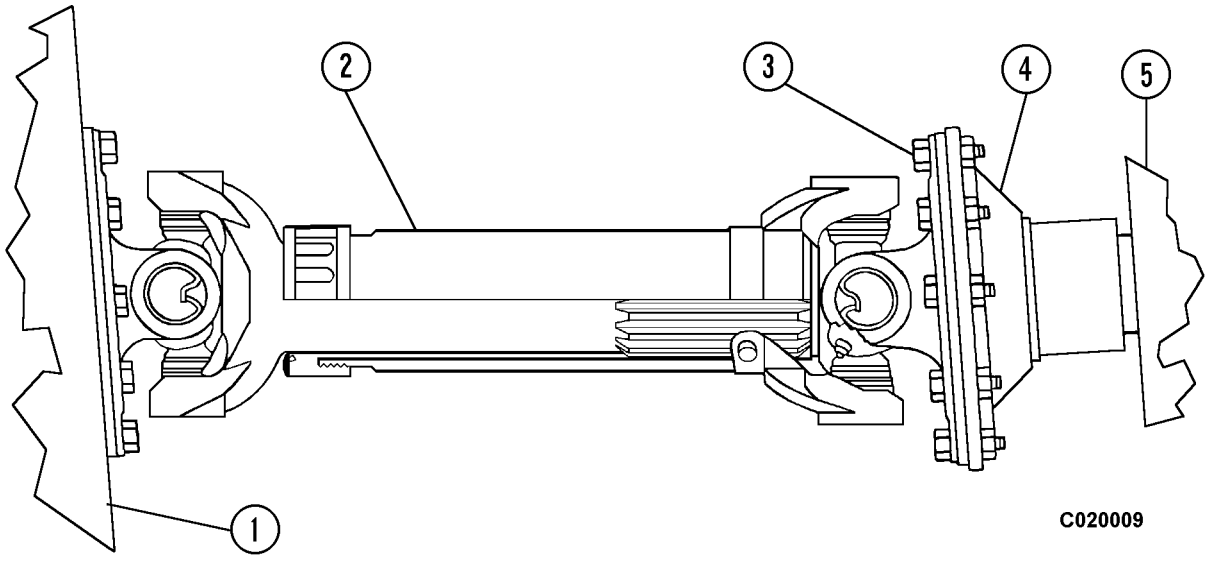


FIGURE 2-1. HYDRAULIC PUMP DRIVE SHAFT

1. Alternator/Blower
2. Pump Drive Shaft
3. Capscrews, Lockwashers, Nuts
4. Companion Flange
5. Hoist Pump

8. If belt tension is incorrect, repeat steps 1 through 5.

NOTE: Keep belt free from lubricating oil, paint and/or grease. If necessary, the belt can be cleaned by scrubbing with a detergent soap and water. Never use belt dressing on Poly-V belts!

Fan Belt Replacement

⚠WARNING

Unguarded rotating and moving engine components can cause injury. Disable engine start before working in fan belt area.

1. Loosen fan coupling capscrews (2, Figure 3-6).
2. Loosen bearing cap stud (1) and remove the belt.
3. Check belt pulleys on the fan coupling and crankshaft for cleanliness and replace if necessary.
4. Install new belt.
5. Secure the new belt with the adjusting screw (1) and adjust belt as described under "Fan Belt Adjustment".
6. Tighten fan coupling capscrews (2) to **74 ft. lbs. (100 N.m).**
7. Operate engine for 30 minutes with a low load and recheck belt tension. If belt tension is incorrect, repeat belt tension ajustment procedure.

NOTE: After running the engine for 8 hours with a load, recheck the belt tension and adjust as necessary.

AIR FILTRATION SYSTEM

AIR CLEANER

Operation

Intake air, required by the diesel engine and by the truck air system, passes through the air cleaner assemblies mounted on each side of the radiator. These air cleaners discharge heavy particles of dust and dirt by centrifugal action and then remove finer particles by passing air through filter cartridges. The air compressor inlet line is connected to the engine filtered air supply.

The engine demand for air creates a vacuum in the air cleaners and causes outside air to be drawn in through air inlets on the air cleaners. Dirty air entering here is drawn through a series of tubes that are designed to produce a cyclonic action. As the air passes through the outer portion of the tubes, a circular motion is set up causing dust and dirt particles to be thrown from the air stream into dust collector cups. At the same time, the air stream turns and is directed up through the center of the tubes into the filter chamber. Here the air passes through the main filter element and safety filter element and out the clean air outlet to the engine's air intake system.

General Service Information

1. Inspect dust collector cups (1, Figure 5-1) at regular intervals - daily inspection is recommended. Never allow dust level build up to the tube chamber.

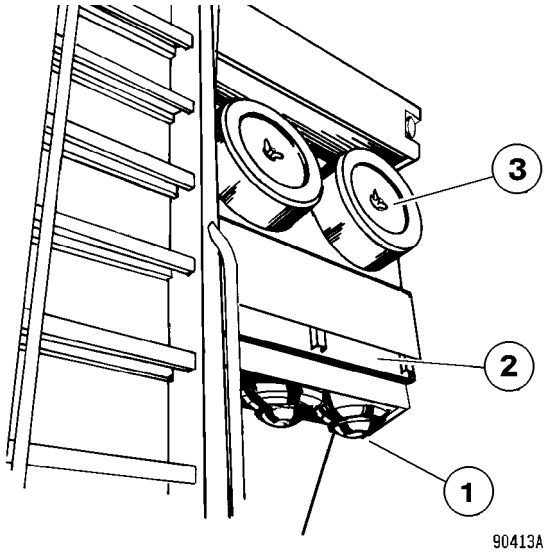


FIGURE 5-1. AIR CLEANERS

1. Dust Collector
2. Precleaner Section
3. Element Cover

2. Check filter restriction gauges, during operation. The filters should be cleaned or replaced when the gauges read between 20 and 25 inches H_2O vacuum or when a warning message is presented on the overhead display by the HMS system. Refer to Filter Service Procedure for maintenance and cleaning instructions.
3. Check to insure air inlet is not obstructed, plugged or damaged.
4. Check all connections between air cleaner outlet and engine intake manifold to insure they are tight and make a positive seal.
5. Check all air cleaner housing capscrews to insure they are tight.

MAIN FILTER ELEMENT

Removal

Remove and inspect the main filter element as outlined below.

⚠CAUTION

The truck engine must be shut down before servicing the air cleaner assemblies or opening the engine air intake system.

1. Shut down engine. Clean dirt and dust off air cleaner assembly exterior surfaces.
2. Loosen large wing nut (5, Figure 5-2) on air cleaner cover to free main element assembly (10). Pull main element clear of assembly.
3. Inspect filter element carefully for possible damage, holes, breaks, etc., which might affect reuse of element. If element appears serviceable other than being dirty, proceed with the cleaning procedure. If defects are found in filter element, wing nut assembly (5) must be removed from element assembly and installed on the new filter element.
4. Check safety filter element indicator nut (7). If solid red area is showing, safety filter service is required. If center is green, safety element does not require replacement.

BATTERY CHARGING SYSTEM (Niehoff)

General Description

The Niehoff model N1227 or C609 (Figure 2-1) is a heavy duty, 24 VDC unit rated at 220 amps. A solid state voltage regulator (6) mounted externally on the end housing assembly provides voltage control during operation. A single output connection (5) is located on the face of the control unit (4) for connection to the truck battery positive circuit. The ground circuit cable can be attached to either of two terminals (10) located on the front housing. A fan guard (7) protects maintenance personnel from the rotating fan when the engine is operating.

TROUBLESHOOTING PROCEDURES (On-Truck)

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

Equipment Required:

- Belt tension scale
- Voltmeter, 0 - 40 volt range
- Ammeter, 0 - 400 amp range

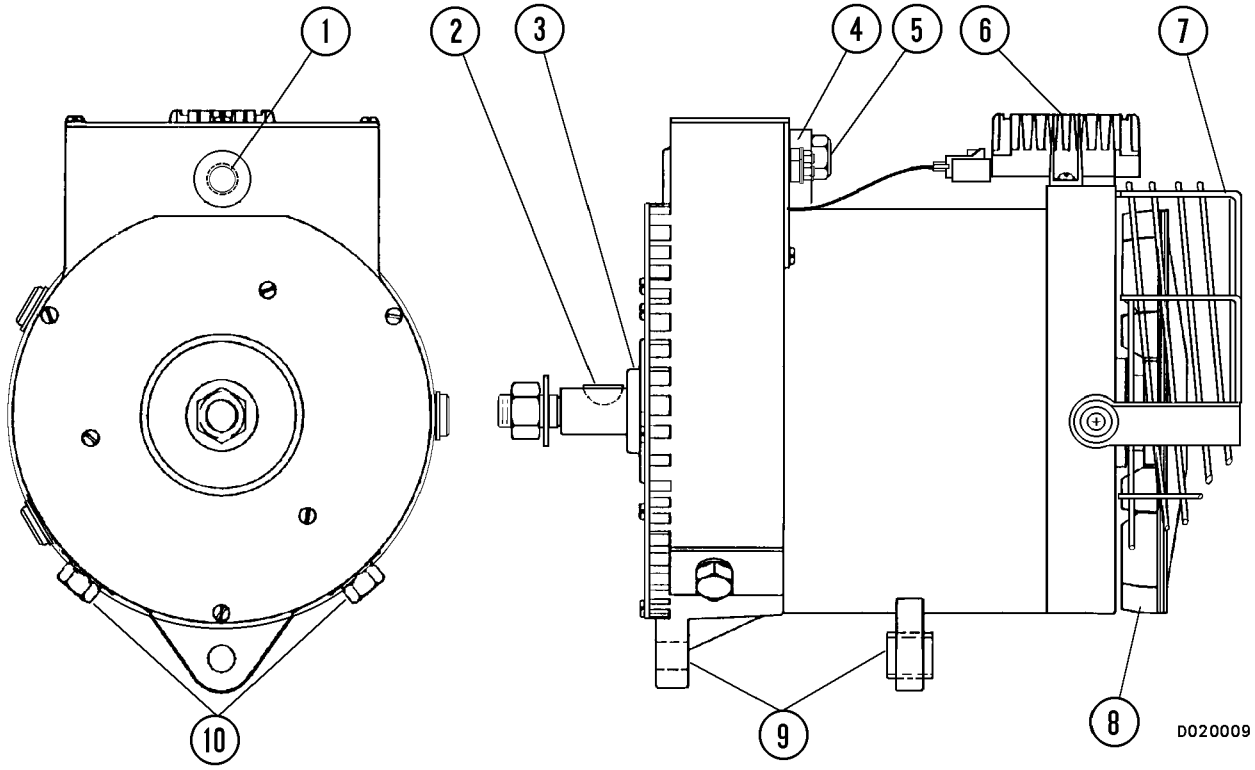


FIGURE 2-1. ALTERNATOR ASSEMBLY

1. Belt tension Adjustment Capscrew
2. Shaft Key
3. Pulley Bushing
4. Control Unit
5. Battery Positive Terminal
6. Voltage Regulator
7. Fan Guard
8. Cooling Fan Assembly
9. Mounting Lugs
10. Ground Terminals

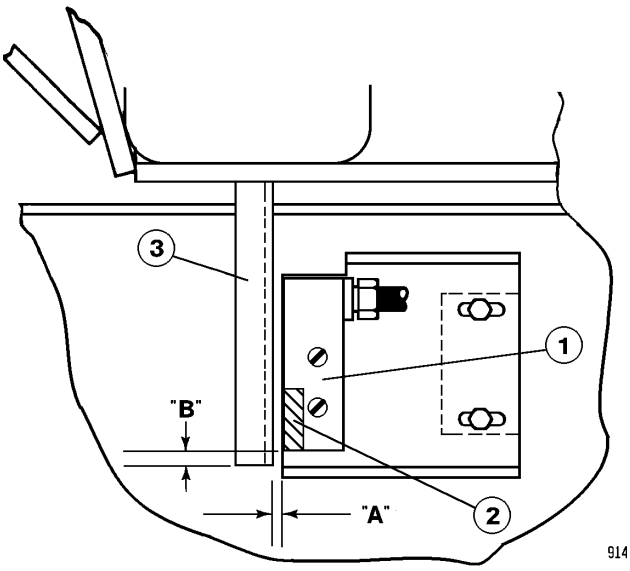


FIGURE 3-2. BODY-UP SWITCH ADJUSTMENT

1. Proximity Switch
2. Sensing Area
3. Actuator

Adjustment

Adjust the proximity switch bracket to maintain an air gap (Dimension "A", Figure 3-2) between the sensing area and actuator bracket, of between 0.50 in. (12.7 mm) minimum and 0.62 in. (15.7 mm) maximum. Set up measurement "B" should be approximately 1.00 in. (25.4 mm).

Service

Keep sensing area clean, free of metallic dust and other debris that may damage or inhibit operation of the proximity switch. If the switch is not functioning or damaged the unit must be replaced.

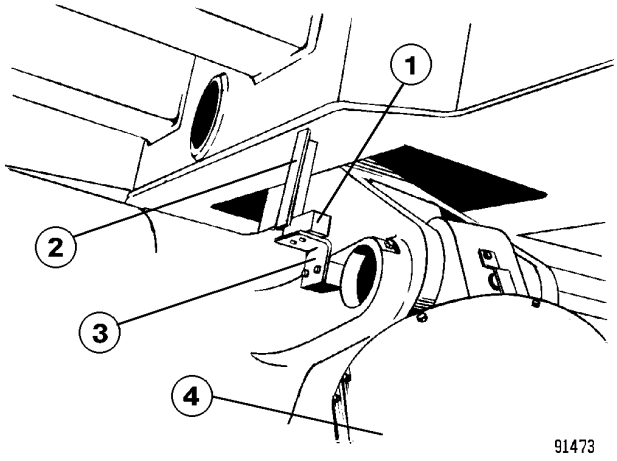


FIGURE 3-3. HOIST LIMIT SWITCH

1. Proximity Switch
2. Actuator
3. Mounting Bracket
4. Rear Suspension (RH

HOIST LIMIT SWITCH

The hoist limit switch (Figure 3-3) is designed to stop the hoist cylinders short of full extension and prevent possible damage to the dump body or hoist cylinders.

The hoist limit switch is located inside the right frame rail above the rear suspension. The switch must be properly adjusted at all times. Improper adjustment or loose mounting bolts may cause false signals or damage to the switch assembly.

The hoist limit switch should be checked daily and the sensing area cleaned of any dirt or metallic dust accumulation.

Adjustment

With body raised and hoist cylinders within 10 in. (254 mm) of maximum travel, make the following adjustments:

Adjust the proximity switch bracket to maintain an air gap (Dimension "A", Figure 3-4) between the sensing area and actuator bracket, of between 0.50 in. (12.7 mm) minimum and 0.62 in. (15.7 mm) maximum. Set up measurement "B" should be approximately 1.50 in. (38.1 mm).

Service

Keep sensing area clean, free of metallic dust and other debris that may damage or inhibit operation of the limit switch. If the switch is not functioning or damaged the unit must be replaced.

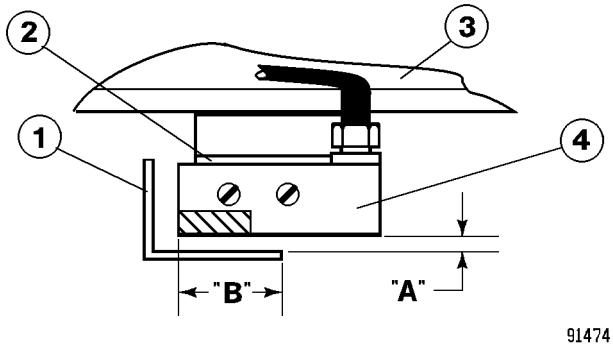


FIGURE 3-4. HOIST LIMIT SWITCH ADJUSTMENT

1. Actuator
2. Mounting Bracket
3. Frame
4. Proximity Switch

SECTION D5
DDEC ELECTRONIC ENGINE CONTROL
INDEX

ELECTRICAL PROPULSION COMPONENTS

GENERAL SYSTEM DESCRIPTION

The electric propulsion and control system of the Haulpak truck consists of an engine driven alternator and cooling air blower, control system, wheel motors, retarding grids and blower motor. The alternator produces A.C. current which is rectified to D.C. current. The wheel motors use D.C. current to operate as motors in propulsion and generators in retarding.

When the operator selects FORWARD or REVERSE propulsion, the armatures of the motors drive planetary gear sets connected to the rear wheels to propel the truck in FORWARD or REVERSE.

During truck operation, the operator initiates command signals to the engine and control system. The signals are received at the FL275 electronic card panel initiating a series of checks to determine the status of system components. After checking the control system, the FL275 panel energizes the necessary contactors to set up the control system for propulsion or retarding and send a control signal to the static exciters.

During it's operation, the FL275 panel maintains the propulsion system within the design limits of the alternator, engine, and wheel motors. Regulation of alternator field current and engine speed determine traction motor armature current. Regulation of motor field current determines traction motor horsepower.

The control system responds to electrical signals generated by the operator and by "feedback" signals generated by various devices within the system. These feedback signals monitor voltage, current, speed, etc. of the various control and propulsion equipment.

When the operator depresses the retard pedal or the truck exceeds the automatic overspeed setting, the dynamic retarding circuit is activated causing the wheel motors to become generators. The truck momentum causes the armatures of the wheel motors to rotate, generating a D.C. output that is applied across the retarding grids. This load opposes armature rotation to slow the truck. The energy from the wheel motor is dissipated in the retarding grids in the form of heat.

Retarding grid cooling is provided by a motor-driven fan, blowing air across the grids. The cooling air blower connected in-line to the rear of the alternator provides cooling air for the static exciters, alternator and wheel motors during truck operation.

Refer to the following information for detailed descriptions of component functions.

CONTROL SYSTEM

The Statex III control system electronics provide all of the functions necessary to initiate and regulate operation of the truck. It monitors operator input and system feedback signals, calculates a response, and initiates the appropriate control action.

The system . . . .

- Establishes the propulsion circuit by energizing contactors P1, P2 (if installed), MF, GF, and GFR to power the wheelmotors.
- Establishes the retarding circuit by energizing contactors MF, GF, GFR, RP1, RP2, RP3, RP4, RP5, (and optionally RP6, RP7, RP8 and RP9) for extended range retarding to connect grid resistors RG1 and RG2 in the motor circuits. Extended range retarding is regulated automatically by sequentially energizing the RP3-RP9 contactors.
- Provides current limit control so that specific rates may be maintained in both motoring and retarding.
- Provides Retard Speed Control for automatic speed regulation on long down-hill runs.
- Provides two-speed overspeed control which allows a higher overspeed restriction when traveling empty.
- Provides Alternator Tertiary Winding protection and Wheelmotor overcurrent protection.
- Initiates the necessary operating restrictions, including the shut down of the truck if a system fault is detected. Lesser faults or events cause respective indicating lights to light. All events are recorded for future review by technicians.
- Provides fault/event information to the operator/technician as to the status of the system via the 2-digit display panel, located in the control cabinet. This panel, showing a two digit display of 00 to 99, indicates to the technician the existence of possible faults or other events which have occurred within the control and/or propulsion system.
- Provides automatic and manual diagnostic self-test routines to detect faults and to assist maintenance personnel in locating a poorly operating system/subsystem.
- Provides a statistical data history log which indicates lifetime, quarterly, monthly and daily performance data. This history log can be accessed using a "laptop" computer, and can be a valuable aid in determining equipment use and maintenance schedules.

NOTE: The information listed under “Event Values” provides additional detail for each event and is described as follows:

Decay Time . . . How long events are held in “active count” memory (in seconds).

Lock Limit . . . Operator cab reset is disabled when lock limit is reached within decay time.

Acceptable Limit: . . . . . Maximum number of occurrances of an event code which can be recorded in FL275.

Window Limit: . . Maximum number of an event with 51 frame windows.

TABLE I: TWO-DIGIT DISPLAY PANEL CODES

EVENT CODE	EVENT DESCRIPTION	EVENT RESTRICTION	DETECTION INFORMATION	EVENT VALUES			
				Decay Time	Lock Limit	Accept Limit	Window Limit
00	Reset All (no events displayed)	None	Used to reset all events				
01	Low level ground fault	System Event In ACCEL: No propel and turn on SYSFLT light. In RETARD: Turn on SYSFLT light only.	A ground fault is detected if leakage current to ground (truck chassis) exceeds 114 ma.There is a 0.2 second delay on shutdown. In the following order, check for: Moisture in motors, grids, power cables, motor flash, insulation failure in power circuit, defective FB102/140 card.	1800	5	20	5
02	High Level Ground Fault	System Event In ACCEL: No propel and turn on SYSFLT light. In RETARD: Turn on SYSFLT light only.	A ground fault is detected if leakage current to ground (truck chassis) exceeds 400 ma.There is a 0.05 second delay on shutdown. Same checks as No. 01.	N/A	1	1	1
08	Pedal Accel	System Event Turn on SYSFLT light only.	Incorrect accelerator output.	3600	3	10	2
09	Pedal Retard	System Event Turn on SYSFLT light only.	Incorrect retard pedal output.	3600	3	10	2
10	GF Contactor	System Event In ACCEL: No propel and turn on SYSFLT light. In RETARD: Turn on SYSFLT light only.	GF Contactor command and feedback do not agree. In the following order, Check for: welded tips, blocked armature, defective coil or position sensor, loose wiring connections, mechanical obstruction, defective FB104 card.	3600	3	10	2
11	GFR Relay	System Event In ACCEL: No propel and turn on SYSFLT light. In RETARD: Turn on SYSFLT light only.	GFR Relay command and feedback do not agree. Check for: Same as No. 10.	N/A	1	20	5

PORTABLE TEST UNIT (PTU)

DESCRIPTION

The minimum requirements for the laptop computer to be used for the PTU are as follows:

- IBM compatible, portable PC
- 20 megabyte hard disk drive
- 3.5" floppy diskette drive
- 2 megabytes RAM
- Serial Port & cable
- Battery charger

A larger capacity hard disk, additional RAM, and a spare battery pack are desirable.

Control software provided by GE or KMS on 3.5" floppy disks must be transferred to the PTU hard disk drive prior to transferring the Control Program to the truck.

All adjustments, setup procedures and diagnostic troubleshooting of the truck's control system can be made via this PTU. Most of the procedures are menu driven, with function screens provided as part of the operating software. Figure 2-2. illustrates the "Main Menu" which appears when the software program opens. Figure 2-3 illustrates the "menu tree" showing the various screen menus available from the main menu and the path required to reach the next level sub-menu.

Sample PTU screens illustrated on the following pages show menus and data screens as they appear in the version 12.10, March 1996 STATEX III software release. Earlier and later versions of the software may differ.

The information that follows is presented in the sequence that would most likely be used at a mine site that was receiving new Statex III trucks or a mine that was updating software from previous release versions. It is assumed the technician is familiar with the basic operation of a laptop computer.

OPERATIONAL HINTS

Here are a few things to remember about the use of the PTU and software:

- ☐ Some instructions in this manual call for the user to type certain operating commands. These commands are shown in a typewriter style type font within quotation marks to indicate the characters to be typed from the keyboard. The operating commands should be typed in lower case letters. Do not type the quotation marks when entering commands on the PTU.
  (Refer to the chart below.)
  Other operations require pressing an individual key on the keyboard; these keys are shown in square brackets. For example, if an operation requires pressing the key labelled "Enter", it will be shown as [ENTER]. Keys shown as [F1] through [F10] refer to the Function keys across the top of the keyboard. Note that many portable computers require pressing another key (usually labelled "Fn") in conjunction with each Function key.
- ☐ Keep the PTU plugged into its charger when possible to maintain a full charge on the battery.
- ☐ There is an indicator light on the PTU which, when lit, indicates low battery power. If this light should come on while using the PTU, continue until you reach a convenient break point. Return to the main menu and turn off the PTU. Then, replace the battery with a spare and continue.
- ☐ If a spare battery pack is available, switch the PTU battery occasionally to ensure that both batteries are kept fully charged. Battery life can be extended by fully discharging and recharging every 3 months.

CONVENTION	APPLIES TO:	SAMPLE
Bold Type	Menu & Screen Titles	**GE OHV STATEX III MENU**
Quotation Marks	Menu Selection Choice	"PTU TALK TO TRUCK"
Typewriter Font in Quotes	Command to be typed from keyboard	"gemenu"
[Brackets]	Keyboard Key To Press	[ENTER], [CTRL], [ALT], [F1] etc.
NOTE: When sample file names are listed as *"this_release"* or "prior_release", make the following substitutions:		
"this_release"	STXMAR96	
"prior_release"	STXOCT95	
"ver"	2.10	
"oldver"	1.25	

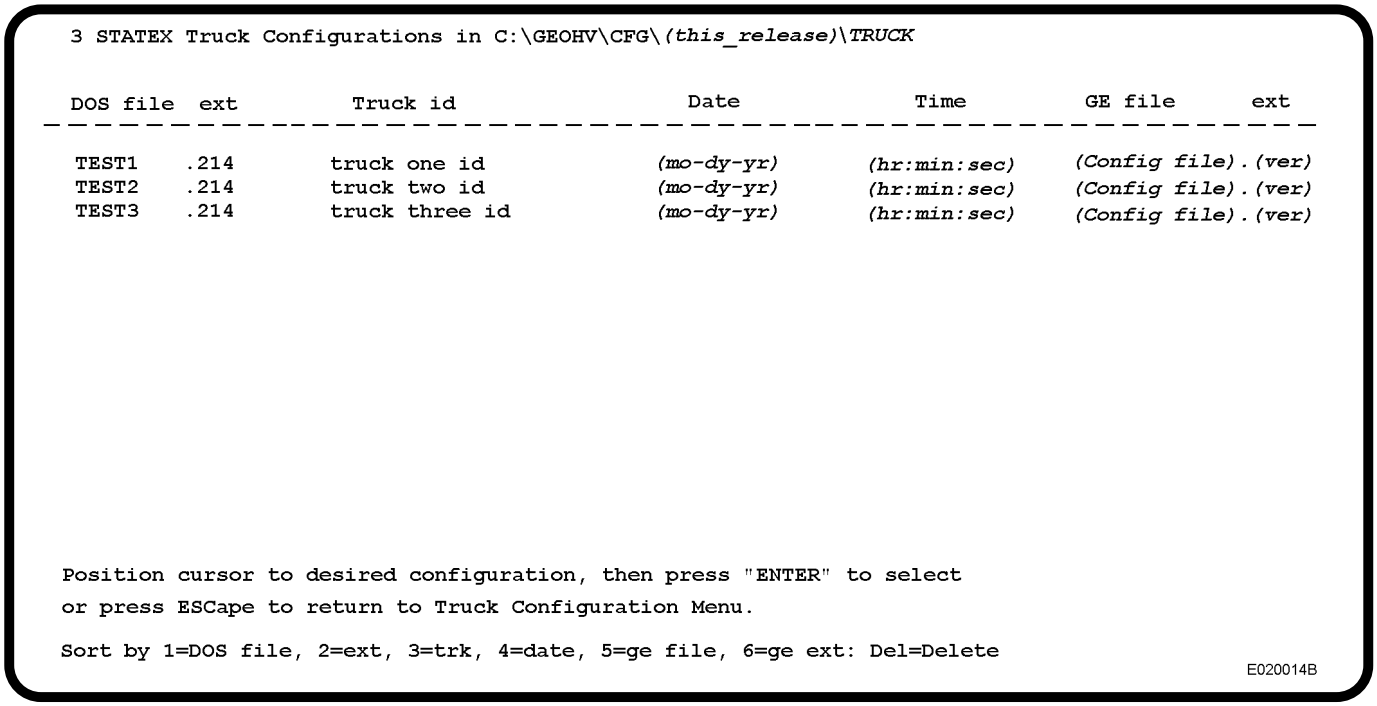


FIGURE 2-11. CONVERTED TRUCK CONFIGURATION FILE LIST

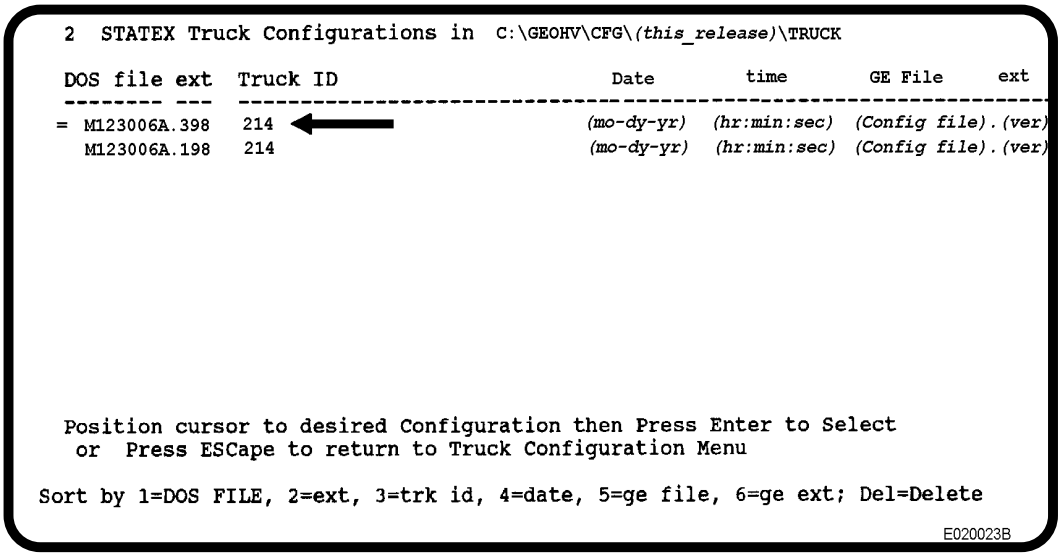


FIGURE 2-21. TRUCK CONFIGURATIONS FILE LIST
(Sample file name shown added to list)

"8) Save Directory: . . ."

At the end of line 8) a directory is displayed for storing the new truck configuration file. The sample in Figure 2-20 shows:
"C:\GEOHV\CFG*(this_release)*\TRUCK".
This directory will be the same as the directory shown in line A).

If the newly created configuration file is to be stored in this directory, it is not necessary to change line 8). When line 7) is selected and the file saved, it will automatically be saved to the directory shown in line 8).

If the configuration file is to be saved in a different directory, use the following procedure BEFORE selecting line 7) to save the file:

1. Move the cursor to line 8) and press [ENTER] or press [8].
2. Type in the full DOS path name of the directory in which to store the new configuration file. Press [ENTER].

*NOTE: If a new directory is specified, the directory name **MUST** exist on the PTU hard drive. The software is not capable of creating a new directory. New directories must be created using DOS.*

3. Move the cursor to line 7) and press [ENTER] or press [7].
4. The current file name will appear at the end of line 7).
5. Type in the new file name (M123006A.398 in the example shown). The original filename will disappear as the new name is typed.
6. Press [ENTER] to save the new file name into the directory shown on line 8).
7. Move the cursor to line 1) and press [ENTER] or press [1]. This will display the list of configuration files as shown in Figure 2-21. Verify the new file name has been added to the list.
8. When finished with the **TRUCK SETUP CONFIGURATION MINE MENU**, move the cursor to line 9) and press [ENTER] or press the [9] key to Quit.
   a. The prompt, "Quitting, Are you sure (Y/N):" appears as a warning against quitting without saving the modified configuration file. Press [Y] key if you are sure that the Mine renamed configuration file has been properly saved.
9. The **GE OHV STATEX III MENU** will appear on the PTU screen.

NOTE: It is advisable to make a backup copy (to a floppy disk) of the current Truck Configuration File whenever changes are made to the file. This will provide a backup copy of configuration information which will not have to be manually re-entered in the event data on the PTU hard disk drive is lost. Refer to the DOS operating system manuals supplied with the PTU for specific procedures for copying files from the PTU to a floppy disk.

PAR NO.	DESCRIPTION	UNITS	COUNT CONDITIONS
1	Engine Operating Hours	Hours	Number of hours engine has operated above 450 RPM
2	Wheel #1 Operating Hours	Hours	Number of hours wheel was powered in either propulsion or retard mode and: . . . Speed is above 50 RPM . . . Current is above 50 amps (absolute value)
3	Wheel #2 Operating Hours	Hours	Number of hours wheel was powered in either propulsion or retard mode and: . . . Speed is above 50 RPM . . . Current is above 50 amps (absolute value)
4	Alternator Operating Hours	Hours	Number of hours alternator has been rotating at or above 450 RPM
5	Propulsion Mode Hours	Hours	Number of hours in propulsion mode when propulsion mode is active and: . . . Wheel #1 or wheel #2 speed is above 50 RPM and . . . Motor #1 or motor #2 current is above 50 amps (absolute value)
6	Retard Mode Hours	Hours	Number of hours in retarding mode when retard mode is active and: . . . Wheel #1 or wheel #2 speed is above 50 RPM and . . . Motor #1 or motor #2 current is above 50 amps (absolute value)
7	Coast Mode Hours	Hours	Number of hours in coast mode when coast mode is active and: . . . Wheel #1 or wheel #2 speed is above 50 RPM and . . . Motor #1 or motor #2 current is below 50 amps (absolute value)
8	Idle Hours	Hours	Number of hours engine is idling, truck is stationary and: . . . Engine speed is above 450 RPM . . . Wheel #1 and wheel #2 speeds are both less than 50 RPM
9	Fault Down Time Hours	Hours	Number of hours truck has propulsion system faults and the accelerator pedal is depressed. . . . Clock will start anytime a fault is recorded that restricts propulsion and . . . the propulsion mode is requested. . . . Clock will stop when propulsion mode is no longer requested or . . . when all restrictive faults are reset
10	Truck Operating Hours	Hours	Sum of propulsion mode, retard mode, coast mode and idle hours
11	Propulsion Mode Net KW Hours	Hours	Net KW hours generated by the alternator in propulsion mode
12	Retard Mode KW Hours	Hours	KW hours generated by the alternator in retard mode
13	Truck Distance Travelled	Miles	Value is calculated by integrating the higher of the two wheel speed signals and displaying the cumulative value in miles . . . Active when control power (CPR) is on . . . Not sensitive to vehicle direction
14	Truck Distance Travelled	Kilometers	Value is calculated by integrating the higher of the two wheel speed signals and displaying the cumulative value in kilometers. . . . Active when control power (CPR) is on . . . Not sensitive to vehicle direction
19	Spin Mode	Occurrences	Number of times the spin/stall mode has been entered
20	Speed Override	Occurrences	Number of times Speed Override mode condition has changed from false to true
21	Body Up Switch	Occurrences	Number of times Dump Body Switch input has changed from false to true
22	RS Switch	Occurrences	Number of times Retard Switch input has changed from false to true
23	AS Switch	Occurrences	Number of times Accel Switch input has changed from false to true
24	Override Switch	Occurrences	Number of times Override Switch input has changed from false to true
25	Forward Switch	Occurrences	Number of times Selector Switch was moved to FORWARD position
26	Reverse Switch	Occurrences	Number of times Selector Switch was moved to REVERSE position
27	Neutral Switch	Occurrences	Number of times Selector Switch was moved to NEUTRAL position
28	Retard Mode	Occurrences	Number of times Retard Contactor sequence has been completed or Retard mode entered

TABLE III. STATISTICAL DATA CODES - COUNTERS

TEMPORARY TRUCK SETTINGS

When troubleshooting a truck, it is sometimes necessary to make temporary changes to the system. The **TEMPORARY TRUCK SETTINGS MENU** allows changes to be made to speed settings, retard current or event data collection intervals. Since any changes made on these screens are temporary, changes made using the options on this menu will be lost when control power is turned off. If the changes made using this menu should be made permanent, the truck configuration file must be changed accordingly and the CPU reprogrammed.

⚠WARNING

Selecting "SPECIAL OPERATION" in the following procedures may present a safety hazard if the engine is running. Control of the propulsion system may transfer to the PTU operator from the truck driver with this software operation. Refer to Step 1. below:

1. With the **GE STATEX III PTU MAIN MENU** displayed, select "SPECIAL OPERATION" and press [ENTER].
   The screen shown in Figure 2-30 will be displayed to alert the operator about the state of the truck software.
   This warning notifies the operator when control of the truck is being transferred from the truck driver to the PTU, based on the PTU selection of "SPECIAL OPERATION".
   When finished and the PTU is returned to the **GE STATEX III PTU MAIN MENU**, control of the propulsion system is returned to the truck driver. Before activating this command, the screen shown in Figure 2-31 will be displayed.
   The PTU user should always keep the truck driver appraised of this control.
2. Select "YES" on the caution screen (Figure 2-30) and press [ENTER]. The **SPECIAL OPERATION MENU** will be displayed.
3. Use the arrow keys to move the cursor to the "TEMPORARY TRUCK SETTINGS MENU" selection and press [ENTER].

Selections available on this menu are:

» "SPEED SETTINGS"

New speed setting values may be typed over the existing values to override the current configuration file settings.

1. Move the cursor to the speed to be changed and type the first digit of the speed desired.
2. A screen will appear with the instruction "ENTER FLOATING POINT NUMBER". Type the remaining digits and press [ENTER].

NOTE: It is not necessary to enter values for every line. For example, if only Loaded Speed Limit is to be changed, select that line with the cursor, and type in the desired value. The remaining speeds will be determined by the values in the truck configuration file.

3. When the new values have been entered, move the cursor to "ACTIVATE TEMPORARY SPEED SETTINGS and TRKSPD SCALE" and press [ENTER].
4. The **TEMPORARY SPEED SET SCREEN** will change to reflect the new values entered.
5. Select "EXIT" to return to the previous menu.

» "RETARD CURRENT ADJUST"

This screen allows entering a value to adjust retard current. Enter the amount to be added or subtracted from the nominal retard current limit value to make the computer control the proper current limit as measured at the shunt.

1. For example, if the shunt reads 1300 amps, and the retard current limit is 1320 amps, enter "20" to add 20 amps to what the computer receives as feedback. This will cause the control to current limit at 1300 + 20 amps instead of the 1300 amps.
2. In another example, if the shunt reads 1340 amps, enter "-20" to subtract 20 amps from what the computer receives as feedback. This will cause the control to current lmit at 1340 - 20 amps instead of 1340 amps.
3. Select "ACTIVATE TEMPORARY RETARD CURRENT ADJUST" and press [ENTER]. Exit to the **PTU MAIN MENU**.

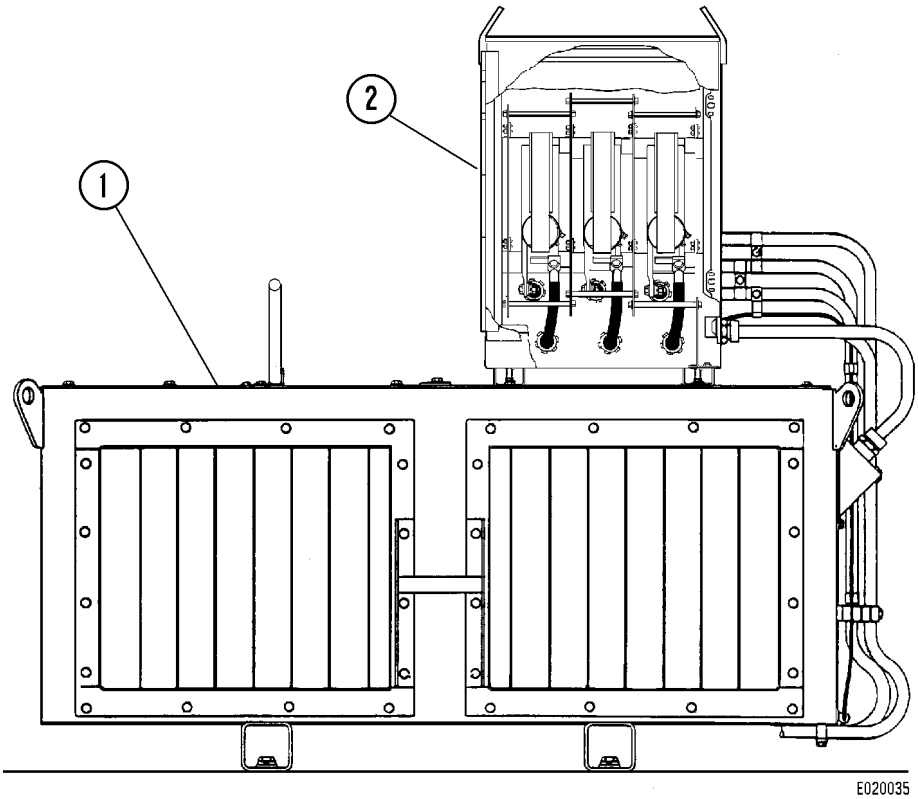


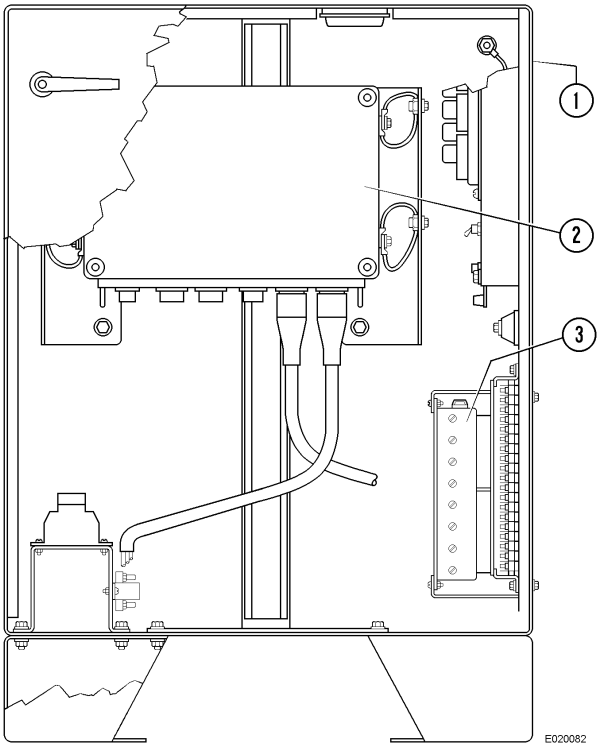
FIGURE 2-42. RETARDING GRIDS AND CONTACTORS (R.H. DECK)

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

FIGURE 2-43. ENGINE GOVERNOR CABINET
(MTU Engine Only)

1. Governor Cabinet
2. MTU Governor
3. Terminal Board (TB-50)

NOTE: Governor cabinet is mounted on left hand deck, behind cab.



7. The Special Operation menu will appear.
8. Use the arrow keys to move the cursor to the “EVENT DATA MENU” selection and press [ENTER]. The Event Data Menu screen will be displayed.
   a. If no event data has been stored, the screen will indicate 0 (zero) events stored. If no events have been stored, the cursor will be positioned on “EXIT”. Press the [ENTER] key to return to the previous menu.

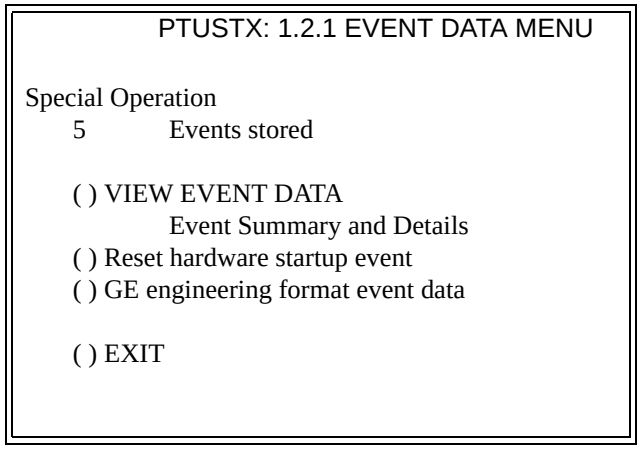


FIGURE 3-2. EVENT DATA MENU
(Requires Control System Reset)

9. If one or more events have been stored, a screen, as shown in either Figure 3-2 or 3-3, will be displayed.
10. If Figure 3-2 is displayed, select “reset hardware startup event” with the cursor and press [ENTER].
    a. A screen will appear with instructions for cycling control power to reset the system. Follow the on-screen instructions to cycle power to the control system.
    b. After the system is powered up, repeat Steps 4 through 8 to return to the event data.
11. If Figure 3-3 is displayed, you may select “VIEW EVENT DATA” and press [ENTER] to view events currently stored. A screen displaying a list of stored events appears.
12. Any stored events may be uploaded to a file for storage by selecting “GE engineering format event data” and following directions on the subsequent screens.
13. To erase the event data currently stored, select “erase event data yes/no menu” from the EVENT DATA MENU screen.
    a. On the screen titled RESET ALL YES/NO MENU, move the cursor to YES, Erase Truck Events, and press [ENTER].
    b. Exit back to the GE STATEX III MENU following screen instructions as they appear.

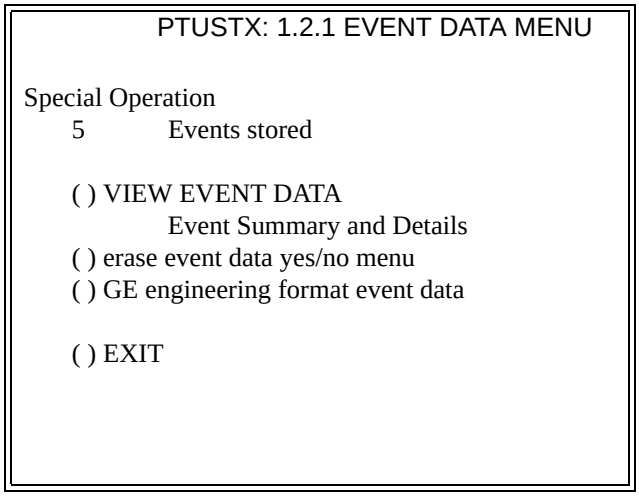


FIGURE 3-3. EVENT DATA MENU

4.0 SEQUENCE TESTS - (ENGINE NOT ON)

Preparation and Setup

It is assumed the truck has been programmed using the correct truck configuration file and GE Statex III enhanced version 1.00 (if truck is equipped with a 17FB144 CPU card), or version 14.00 (if truck is equipped with a 17FB101 CPU card) or later software prior to proceeding with the following tests. If not, refer to Electrical Propulsion Components for instructions for preparing the truck configuration file, programming the truck, and usage of the GE software menu system.

- Disconnect 74C at GFR for static testings (engine not on). Failure to do so may result in damage to battery boost SCR and/or dead batteries.
- If the truck body has not been installed or the body is raised, place a steel washer on body up switch or jumper circuit 71F to circuit 71, to simulate body down condition.
- If hydraulic pressure is low, connect a jumper wire between circuit 73S and 710. This step will be necessary if all hydraulic brakes are installed and engine is not on.

DI NAME	DESCRIPTION	PROCEDURE TO ACTIVATE	FUNCTION
SRVBRKPSW	SERVICE BRAKE PRESSURE SWITCH	In control cabinet, jumper 28 Volts from 712 to 44R to simulate service brake applied.	= true (inverse display) = brake applied = 28v input
		Remove jumper.	false (regular display) = brake released = 0v input
FORIN	SELECTOR SWITCH FORWARD SIGNAL	Move selector switch to FORWARD position.	= true (inverse display) = FORWARD selected
REVIN	SELECTOR SWITCH REVERSE SIGNAL	Move selector switch to REVERSE position.	= true (inverse display) = REVERSE selected
DSTORE	DATA STORE SWITCH	Press data store switch.	= true (inverse display) = switch closed = 28v input
		Release switch.	false (regular display) = switch open = 0v input
BLOWP	BLOWER PRESSURE SWITCH	Remove 75A1 wire.	= true (inverse display) = ok pressure = 0v input
		Re-attach wire 75A1.	false (regular display) = no pressure = 28v input
PARKBRKSW	PARK BRAKE	Turn park brake switch to ON.	= true (inverse display) = apply brake request = 0v input
		Turn park brake switch to OFF.	false (regular display) = release brake request = 28v input
KEYSW	KEY SWITCH	Key switch on.	= true (inverse display)
		Key switch off.	false (regular display)
CPSFB	CONTROL POWERSWITCH	Control power switch on.	= true (inverse display)
		Control power switch off.	false (regular display)
ENGSERV	ENGINE SERVICE SIGNAL	Jumper 419 to GND at the junction box.	= true (inverse display) = with jumper = 0v input Verify engine check light in cab turns on.
		Remove jumper.	false (regular display) = w/o jumper = 28v input

5.3 DIGITAL OUTPUT CHECKS

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

1. Set digital output driver on.

   a. Move cursor with the arrow keys to the output name (DO NAME) of the desired output.

   b. Press [ENTER] key to change status of selected output from off to on.

   c. The display status of the output name DO NAME on the MANUAL DIGITAL OUTPUT TEST SCREEN changes from off (regular display) to = on (inverse display) in a flashing mode.

   d. Output device will be energized, or take voltage reading to verify that output driver is turned on, as noted in the OUTPUT DEVICE CHECKOUT column.

   e. Status of related feedback input name DI NAME (if used) on the MANUAL DIGITAL OUTPUT TEST SCREEN changes from false (regular display) to = true (inverse display).

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

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

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

- Value displayed 0.00000 is conversion factor to convert from wheel motor rpm to mph. Compare value displayed with value given in Maximum Truck Speed chart. Refer to Miscellaneous Charts; Maximum Allowable Truck Speeds.

Return to Main Menu

1. This completes Analog and Frequency Input Checks.
2. Move cursor to select “EXIT” on the menu and press [ENTER] key.
3. Select “EXIT” as necessary until returned to GE STATEX III PTU MAIN MENU.
4. Move cursor to select “EXIT” on this menu and press [ENTER] key.
5. At “QUIT PTU?” menu screen prompt, press [Y] key (or any key except [N]) to exit back to the GE OHV STATEX III MENU.
6. Turn control power switch off.
7. Turn key switch off.

7.0 SPEED EVENT CHECKS

Preparation and Setup

- Disconnect 74C at GFR for static testings. Failure to do so may result in damage to battery boost SCR and/or dead batteries.
- If the truck is equipped with the two speed overspeed, remove and insulate circuit wire 73LS going to the control cabinet junction box. There will be one circuit wire 73LS from the terminal block to the FL275 card panel.

⚠WARNING

If the 73LS circuit wire going to the control cabinet junction box hasn't been removed and insulated, damage may result to the rear suspension pressure switches.

- Wheel motor speed sensors:a. Disconnect external 714 wire and external 77 wire at control cabinet terminal board.b. Jumper from 77 to 714 and jumper from 77A to 714A. c. Connect an oscillator to 714 and 714A.
- All checks are to be made with control power on and the selector switch in FORWARD.
- Obtain speed event setting information and extended range retarding pickup speeds from the truck configuration file and use the retard state logic screen as instructed below:

Setup PTU

1. With the GE OHV STATEX III MENU on the screen, select TRUCK SETUP (CFG).
2. At the TRUCK SETUP CONFIGURATION MINE MENU screen, select the proper truck configuration file.
3. From the TRUCK SETUP CONFIGURATION MINE MENU screen, select “6) Change/View Overspeeds.”
4. Record the values shown on the OVERPEEDS ENTRY SCREEN.
5. Exit back to the TRUCK SETUP CONFIGURATION MINE MENU and select “1) View truck configuration screen; data curves screen”.
6. Record the values for “EXT RANGE PICK_UPS” listed on the second screen that appears.
7. Exit back to the GE OHV STATEX III MENU and select “PTU TALK TO TRUCK”.
8. After logging on, select “NORMAL OPERATION” from the GE STATEX III PTU MAIN MENU.
9. From the NORMAL OPERATION menu, select “RETARD STATE LOGIC”. Information will be read from this screen for the following procedures.

12.2 MAXIMUM ALLOWABLE TRUCK SPEEDS

MAX TRUCK MPH = (MAX. WHEEL RPM x ROLLING RADIUS) ÷ (GEAR RATIO x 168)

RPM/MPH CONVERSION FACTOR = MAX. WHEEL RPM ÷ MAX. TRUCK SPEED

MPH/RPM CONVERSION FACTOR = MAX. TRUCK SPEED ÷ MAX. WHEEL RPM

MAXIMUM TRUCK SPEED CHART FOR GIVEN WHEEL MOTOR

WHEEL MOTOR	GEAR RATIO XX.X:1	TIRE SIZE	ROLLING RADIUS	MAX. WHEEL RPM	MAX. TRUCK MPH	CONV. FACTOR RPM/MPH	CONV. FACTOR MPH/RPM
772	28.8	30 x 51	55.1	2750	31.32	87.81	0.01139
776	28.8	30 x 51	55.1	2750	31.32	87.81	0.01139
776	23.0	36 x 51	61.1	2750	43.48	63.24	0.01581
776	28.8	36 x 51	61.1	2750	34.73	79.19	0.01263
791	23.0	33 x 51	57.0	2750	40.57	67.79	0.01475
791	28.8	33 x 51	57.0	2750	32.40	84.88	0.01178
788	26.1	36 x 51	61.1	2320	32.33	71.76	0.01394
788	26.1	37 x 57	65.4	2320	34.60	67.05	0.01491
788	21.7	37 x 57	65.4	2320	41.62	55.74	0.01794
788	21.7	36 x 51	61.1	2320	38.88	59.67	0.01676
788	26.825	36 x 51	61.1	2320	31.48	73.69	0.01357
788	26.825	37 x 57	65.4	2320	33.67	68.92	0.01451
788	22.354	36 x 51	61.1	2320	37.75	61.45	0.01627
788	22.354	37 x 57	65.4	2320	40.40	57.42	0.01741
787	28.125	40 x 57	68.4	2320	33.58	69.06	0.01448
787	36.4	40 x 57	68.4	2320	25.95	89.40	0.01119
787	32.4	40 x 57	68.4	2320	29.15	79.58	0.01256
787	31.9	40 x 57	68.4	2320	29.61	78.35	0.01276
787	26.6	40 x 57	68.4	2320	35.51	65.33	0.01531

7. Secure inner and outer dual tire inflation lines to bracket on outer rim. Tighten capscrews to standard torque.
8. Install wheel cover. Remove blocks from under truck and lower truck to the ground.
9. Operate truck for one load and retighten wheel nuts as specified in Step 6. Recheck nut torque daily (each 24 hours of operation) to insure proper torque is maintained on each nut. Once torque is maintained, daily checking is no longer required. Check intermittently to insure torque is maintained.

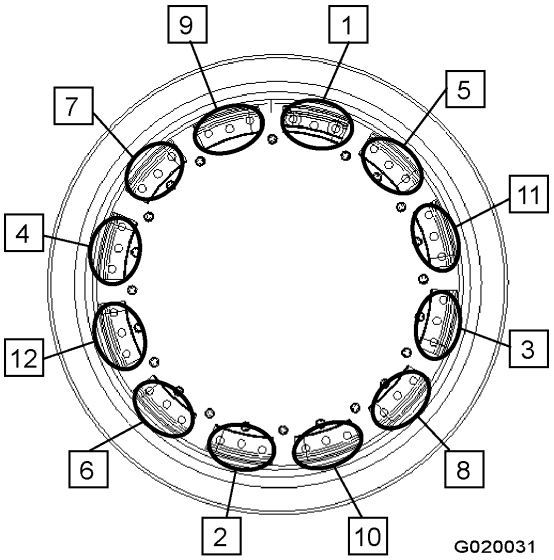


FIGURE 2-7. REAR WHEEL TIGHTENING SEQUENCE

RIM

Tire Removal

⚠DANGER

DO NOT weld or apply heat on the rim assembly with the tire mounted on the rim. Resulting gases inside the tire may ignite causing explosion of tire.
When inflating tires always use a safety cage. Never inflate a tire until the lockring is securely in place. Do not stand in front of, or over the lockring during inflation procedures. Never overinflate a tire. Refer to tire manufacturers recommendations.

1. Place tire and wheel assembly in safety cage and discharge all air pressure from tire.
2. Attach a hydraulic bead breaker to the rim by slipping the jaws of frame assembly over the outer edge of flange (5, Figure 2-8). Make sure the jaws of the frame are as far in on the flange as possible.
3. Following tool manufacturers instructions, move tire bead in far enough to permit placing a wedge between tire and flange at side of tool.
4. Repeat this procedure at locations approximately 90° from the first application. Continue this procedure until tire bead is free from rim.
5. After bead is broken loose, insert flat of tire tool in beading notch on lockring (6, Figure 2-8). Pry lockring up and out of groove on rim.
6. Pry in on bead seat band (2) until O-ring (4) is exposed. Remove O-ring.
7. Remove bead seat band (2) from rim (3) and remove flange (5).
8. Reposition wheel assembly and repeat removal procedure on opposite side of tire. Remove tire from rim.

RIM AND TIRE PREPARATION

The first step in mounting radial off-road tires is to properly prepare the tire and rim assembly.

1. Clean the rim base, bead seat band, and flanges with a wire brush. Remove all paint from knurling on bead seat band and back section.

⚠DANGER

Never weld or repair damaged rims.

2. Check rim assembly for damage or corrosion. Replace any damaged or broken components. Verify that the rim does not have any burrs.
3. Apply rust inhibitor to any corrosion.
4. Clean the tire and bead area.
5. Check for and remove any object(s) from the interior of the tire that could cause damage to the tire.
6. Check the tire bead area and inner liner for damage that would allow air to leak from the tire. Replace or repair any tire with bead damage.

b. Install cups in wheel hub bores.

c. After cups have warmed to ambient temperature, press the cups tight against hub shoulder as follows:

1.) Inner Cup (20) - Apply **30,000 lbs. (133,450 N)** force.

2.) Outer Cup (10) - Apply **23,000 lbs. (102,300 N)** force.

9. Install the other half of the seal assembly (16) in the hub using installation tool (TY2150) and soft tipped mallet. Follow procedure outlined in step 6.

10. Check bearing cone (9) for free fit on the spindle (17), then remove.

11. Referring to Figure 3-8, lift the hub and carefully lower it down over the spindle. To aid installation and to prevent damaging the seal, the spindle and hub should be level.

NOTE: All parts must be in place before wheel hub (1) is installed.

12. Install outboard pin (25, Figure 3-5) into slot on spindle (17) and install inner bearing cone (9) on spindle over pin (25).

13. Refer to *Wheel Bearing Adjustment* for final assembly.

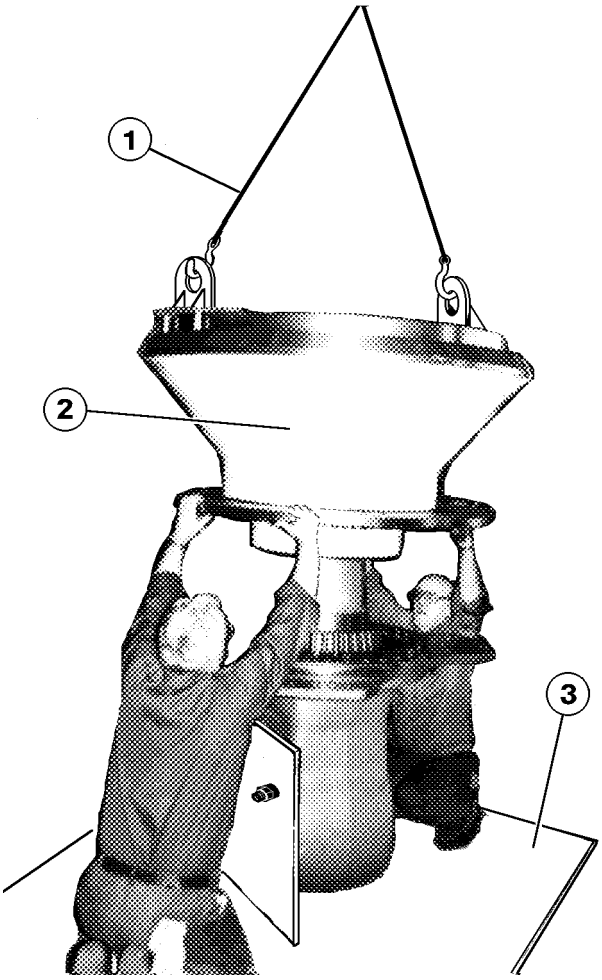


FIGURE 3-8. WHEEL HUB INSTALLATION

1. Support Chains
2. Wheel Hub
3. Fabricated Support Stand

PIVOT EYE REPAIR

If damage occurs to the pivot eye (4, Figure 4-3), it may be necessary to remove it from the rear axle structure (1) to facilitate repair and bearing replacement.

Removal

To remove the axle housing pivot eye:

1. Follow all the preceeding instructions for **"Pivot Pin Removal"**.

Be certain axle housing (1) and wheels are blocked securely!

2. Attach a lifting device to the pivot eye (4).
3. Remove cap screws (2) and flatwashers (3). Remove pivot eye to work area.

Disassembly

1. Remove spherical bearing (7, Figure 4-2) as described in **"Pivot Eye Bearing, Disassembly"**.
2. If bearing carrier (13) is damaged or worn, setup an appropriate tool to press bearing carrier out of the pivot eye structure bore.

   Bearing Carrier (new):

   I.D. 8.7484 ± 0.0005 in. (222.209 ± 0.013 mm)

   O.D. 9.7520 ± 0.0005 in. (247.701 ± 0.013 mm)
3. Inspect pivot eye structure bore for excessive wear or damage.

   Pivot Eye Bore (new):

   9.7500 ± 0.0005 in. (247.650 ± 0.013 mm)

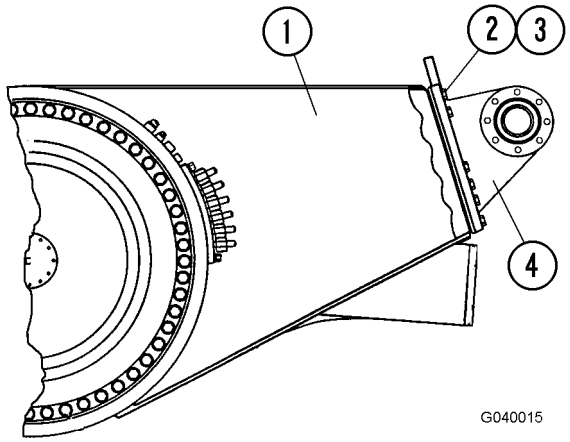


FIGURE 4-3. PIVOT EYE ATTACHMENT

1. Rear Axle Structure
2. Cap Screw
3. Flatwasher
4. Pivot Eye

Assembly

1. Setup an appropriate tool to press bearing carrier (13, Figure 4-2) into the bore of the pivot eye structure (9). Be certain the bearing carrier is pressed fully into the pivot eye bore, flush with sides. Lube groove in bearing carrier outer diameter must align with lube fitting hole in pivot eye structure.

NOTE: With parts to correct size, the fit of the bearing carrier into the bore of the pivot eye structure may be: 0.0010 in. - 0.0030 in. (0.025 mm - 0.08 mm) ***interference*** *fit.*

Freezing the bearing carrier will ease installation.

2. Install spherical bearing (7) as described in **"Pivot Eye Bearing, Assembly"**.

Installation

1. Be certain mating surfaces of axle housing (1, Figure 4-3), and pivot eye (4) are clean and not damaged.
2. Lift pivot eye into position on front of axle housing. Insert several cap screws (2) and flatwashers (3) to align the parts. Remove the lifting device.
3. Install the remaining cap screws and flatwashers. Tighten alternately until the pivot eye is properly seated. Tighten cap screws to **1480 ft. lbs. (2007 N.m)** final torque.

Disassembly

NOTE: Refer to your HAULPAK® Distributor for HY-DRAIR® II repair information and instructions not covered in this manual.

1. With suspension held in a vertical position (end cap up), remove capscrews and hardened washers (1, Figure 2-7). Attach hoist to end cap (3) and lift end cap out of suspension housing (12) until spacer (8) contacts bearing retainer (4). Remove capscrews (5). Lift end cap (3) and bearing retainer from housing (12).
2. Remove roll pin (10), nut (9) and spacer (8). Separate end cap and bearing retainer. Remove O-rings and backup rings (2).
3. Rotate the suspension 180^{o}.

NOTE: Steel balls (13) will fall free when the housing is rotated.

4. Attach lifting device to the piston (11, Figure 2-7) and carefully lift out of housing (12).
5. Remove capscrews and washers (24, 28, Figure 2-8) and remove bearing retainer (20).
6. Remove and discard rod seal (21) step seal (22) and rod wiper (23). Remove and discard O-ring and backup ring (9 and 10).

Cleaning and Inspection

⚠WARNING

When using cleaning agents follow the solvent manufacturer's instructions.

1. Clean all parts thoroughly in fresh cleaning solvent. Use a solvent that does not leave a film after evaporation such as Trichlorethylene, Acetone or Laquer Thinner.
2. Inspect all parts for evidence of wear or damage. Inspect plated surfaces for scratches, nicks or other defects. Replace or repair defective parts.

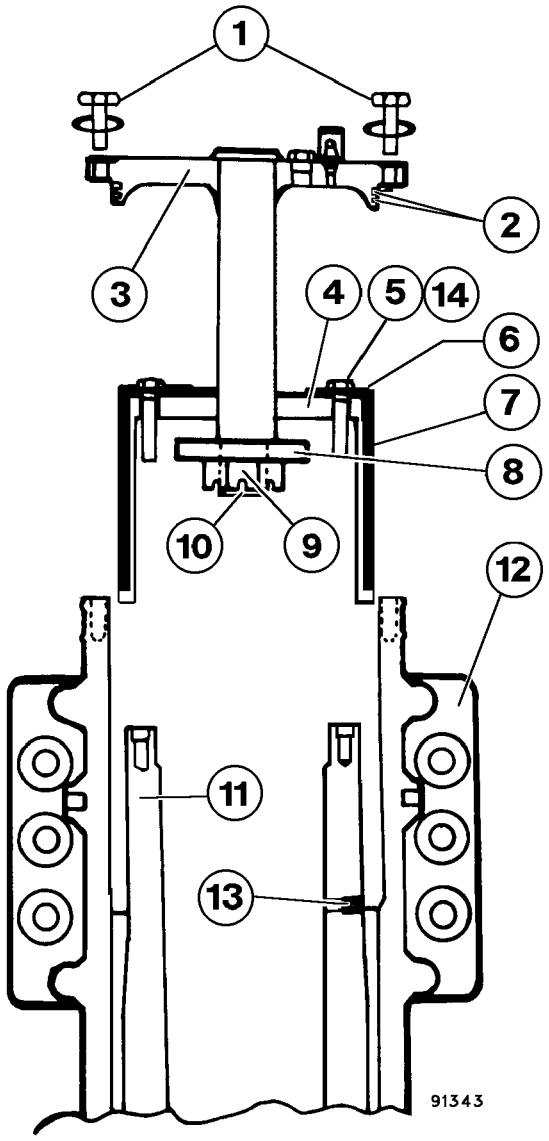


FIGURE 2-7. PISTON ROD REMOVAL

1. Capscrews
2. O-ring & Backup Ring
3. End Cap
4. Bearing Retainer
5. Capscrew
6. Ring
7. Bearing
8. Spacer
9. Nut
10. Roll Pin
11. Piston
12. Housing
13. Steel Ball
14. Hardened Washer

FRONT SUSPENSION

1. Park the unloaded truck on a hard, level surface. Apply the parking brake, and chock the wheels.
2. Thoroughly clean area around the charging valve on the suspensions. Remove the protective covers from the charging valves.

⚠WARNING

All HYDRAIR®II suspensions are charged with compressed nitrogen gas with sufficient pressure to cause injury and/or damage if improperly handled. Follow all the safety notes, cautions and warnings in these procedures to prevent accidents during servicing and charging.

Front Suspension Oiling

⚠WARNING

When blocks are in place on a suspension, they must be secured with a strap or other means to avoid accidental discharge. An unsecured block could fly loose as weight is applied, presenting the possibility of serious injury to nearby personnel and/or damage to the equipment. Overhead clearance may be reduced rapidly and suddenly when nitrogen pressure is released!

NOTE: For longer life of suspension components, a Friction Modifier should be added to the suspension oil. See Specifications Chart, Figure 4-5 at the end of this chapter.

1. Position and secure oiling height dimension blocks in place (Figure 4-2). When nitrogen pressure is released, suspensions will lower to rest on the blocks. Ensure the blocks do not mar or scratch the plated surfaces of the pistons or damage wiper seals in the lower bearing retainer. Support blocks must seat on the spindle and the cylinder housing. The blocks should be positioned 180° apart to provide stability.

⚠WARNING

Wear a face mask or goggles while relieving nitrogen pressure.

2. Remove charging valve cap. Turn the charging valve swivel nut (small hex) counterclockwise three full turns to unseat valve seal. DO NOT TURN LARGE HEX. 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 all nitrogen has been vented to the atmosphere, the suspension should have collapsed slowly and be seated solidly on the support blocks. Remove top fill plug next to the charging valve (Figure 4-2).

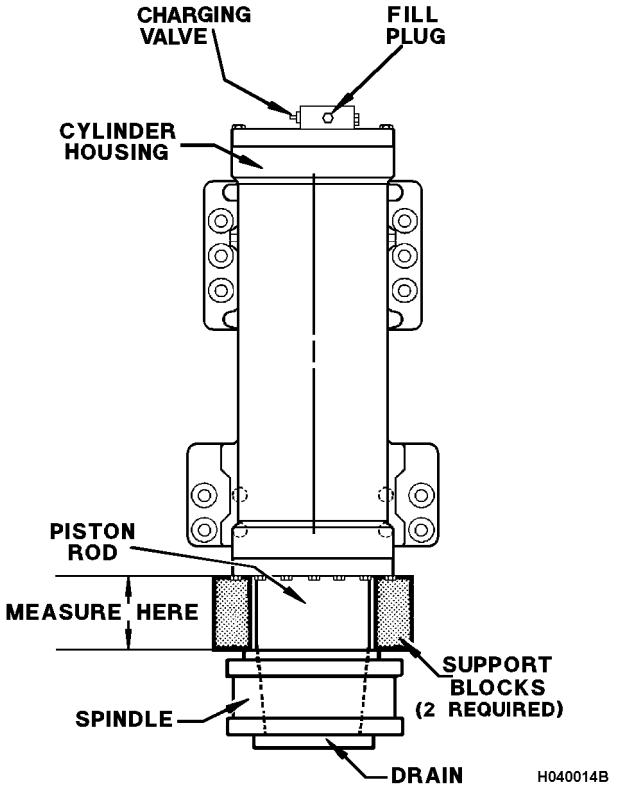


FIGURE 4-2. FRONT SUSPENSION

FRONT SUSPENSION DIMENSIONS (EMPTY)			
TRUCK MODEL & OPTIONS	OILING HEIGHT IN. (mm)	CHARGING HEIGHT IN. (mm)	CHARGING PRESSURE psi (kPa)
730E*	1.5 (38.1)	9.0 (229)	400 (2758)
830E*	1.0 (25.4)	9.0 (229)	390 (2689)
830E**	1.0 (25.4)	9.0 (229)	410 (2827)
930E*	1.0 (25.4)	9.0 (229)	440 (3034)
930E-2*	1.0 (25.4)	9.0 (229)	425 (2930)

* with standard Rock Body
** with Combination Body / Tailgate
Note: If truck starts to lift off blocks before charging pressure is attained, STOP CHARGING.

SECONDARY BRAKING AND AUTOMATIC APPLY

A fundamental function of the brake system is to provide reserve braking in the event of any single failure. For this reason, the system is divided into multiple circuits, each with its own isolation check valve, accumulator, and circuit regulator. The secondary system becomes whatever circuit(s) is operable after a failure. If the failure is a jammed treadle valve, then the brake lock becomes the secondary system, otherwise, either of the two brake circuits would be the secondary system.

The brake accumulators (1 & 3, Figure 2-1), (as described under service brake circuit) perform two functions; rapid flow for good response and store energy for secondary braking. The circuit check valve assures this energy is retained should a failure occur in brake system supply or an accumulator circuit.

If a failure occurs in the pump, steering or either brake accumulator circuit, a low brake pressure warning light (on the instrument panel) and an audible alarm (in the cab) will actuate and the vehicle should be stopped as soon as practical. When the pressure in one accumulator circuit is less than the preset level, all the service brakes will be automatically applied. Automatic brake application is accomplished by the "Automatic Apply Valve" (PSV), located in the brake manifold. This valve senses the lower brake accumulator pressure, and when the pressure is less than 2000 ±75 psi (13800 ±520 kPa), the valve shifts, operating the brake treadle valve and applying all the brakes full on.

Regardless of the nature of location of a failure, sensing the lowest brake accumulator circuit pressure assures two to four full brake applications after the low brake warning light and buzzer, and before automatic apply. This allows the operator the opportunity to safely stop the truck after the warning has turned on.

PARKING BRAKE CIRCUIT

The parking brake is spring applied and hydraulically released.

NOTE: Whenever the park brake solenoid is de-energized, a spring in the solenoid valve will shift the spool to the position to allow the park brake to be applied.

Normal Operation (key switch on, engine running)

- **Parking brake switch "ON"**
  The parking brake solenoid (21) is de-energized. The oil pressure in the parking brake lines return to tank and the springs in the parking brake will apply the brake. The parking brake pressure switch (23) will close, completing a path to ground, and illuminating the parking brake light on the instrument panel.
- **Parking brake switch "OFF"**
  The parking brake solenoid is energized. The pressure oil is routed from the park brake solenoid, to the parking brake pressue regulator (4) (reducer), then to the park brake calipers for release. The parking brake circuit is protected against accidental apply by monitoring a wheel motor speed sensor. The park brake with not apply until the truck is virtually stopped. This eliminates park brake damage and will extend brake adjustment intervals.
- If the **key switch is turned "OFF"** (park brake switch "ON" or "OFF"), the park brake will not apply until vehicle speed is less than 1/3 MPH, due to the monitoring of the wheel motor speed.
- If loss of hydraulic supply pressure occurs, **with Parking brake switch "OFF"**, the parking brake solenoid will still be energized. The hydraulic supply circuit is still open to the parking brake calipers. A check valve in the park brake hydraulic supply circuit traps the oil, holding the parking brake in the release position.

NOTE: Normal internal leakage in the parking brake solenoid and the pressure reducing valve may allow leakage of the trapped oil to return back to tank, and eventually allow park brake application.

- If 24 volt power to the solenoid is interupted, the park brake will apply at any vehicle speed. The spring in the solenoid will cause it to shift, opening a path for the oil pressure in the park brake line to return to tank and the springs in the parking brake will apply the brake. The parking brake pressure switch (23) will close, completing a path to ground, and illuminating the parking brake light on the instrument panel.

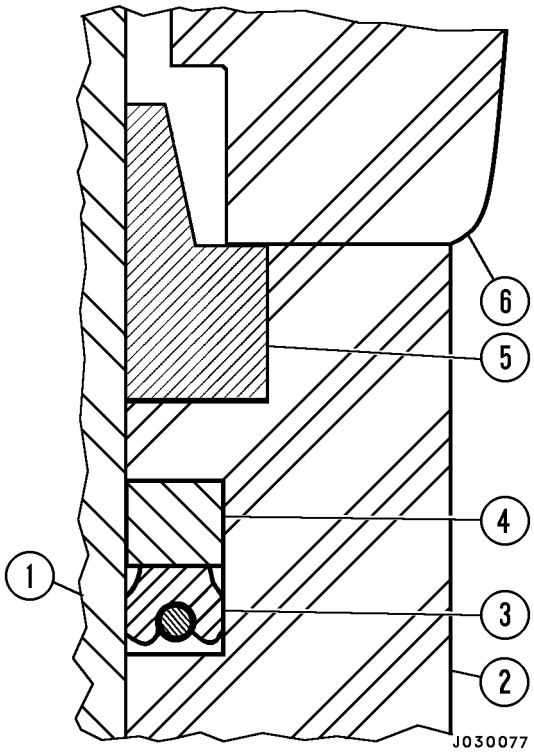


FIGURE 3-6. VALVE BODY SEAL INSTALLATION

1. Actuator Plunger
2. Valve Body
3. Poly-Pak Seal
4. Back-Up Ring
5. Wiper Seal
6. Actuator Base

Valve Body Seal Installation

1. Install the poly-pak seal (3, Figure 3-6) in the seal groove first. Position the seal in the groove so that the internal O-ring inside the poly-pak seal is facing down toward the bottom of the valve.
2. Make sure the internal O-ring is still seated inside the poly-pak seal (3) and did not get dislodged during installation. Position the poly-pak seal to the bottom of the groove.
3. Install the orange back-up ring (4) on top of the poly-pak seal. Start by hand and then continue to work into the groove either by hand or by using an O-ring installation tool.
4. Install the wiper seal (5) in the top counterbore. Position the seal in the groove so that the register lip is facing up toward the actuator.
5. Repeat Steps 1- 4 for the second bore.

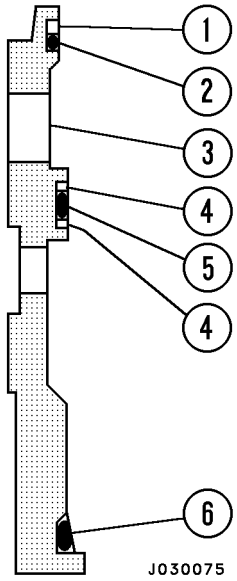


FIGURE 3-7. SLEEVE SEAL PLACEMENT

1. Back-Up Ring
2. O-Ring
3. Regulator Sleeve
4. Back-Up Ring
5. O-Ring
6. O-Ring

Regulator Sleeve O-Ring Installation

1. Install an O-ring (2, Figure 3-7) onto the smallest groove (on the top) of the regulator sleeve (3). Install O-ring (5) onto the middle groove on the regulator sleeve. Install O-ring (6) onto the largest groove (on the bottom) on the regulator sleeve.
2. Install a split nylon back-up ring (4) onto each side of the O-ring (5) located in the middle of the regulator sleeve.
3. Install one split nylon back-up ring behind the O-ring (2) located at the top end of the sleeve. This O-ring is the smallest of the three O-rings. Position the back-up ring so that it is next to the top of the regulator sleeve. The top of the sleeve is the end with the smallest O.D.
4. Repeat Steps 1-3 for the second regulator sleeve.

Actuator Plunger O-ring Installation

1. Install an O-ring (7, Figure 3-5) into the O-ring groove located at the large diameter end of the actuation plunger (3).
2. Install a split Glyde ring over the O-ring. (Twist and squeeze the split Glyde ring into a small circle before installing to insure a tight fit over the O-ring).

Assembly

1. Replace shell in vise, if removed.
2. Pour a liberal amount of clean C-4 hydraulic oil into shell to serve as a cushion.
3. With bladder assembly on bench, expel all air to completely collapse bladder and fold bladder longitudinally into a compact roll. To maintain rolled condition of bladder, install gas valve core into the valve stem, thereby preventing air from entering the bladder.
4. Attach bladder pull rod to bladder valve stem.
5. Pass bladder pull rod through shell oil port and out through valve stem opening. (Refer to Figure 3-19).
6. Pull bladder pull rod out of shell with one hand while feeding bladder into shell with other hand.

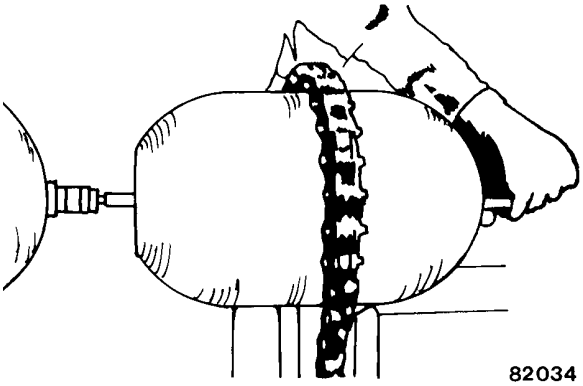


FIGURE 3-19. BLADDER INSTALLATION

7. Position name plate over valve stem and install valve stem nut by hand (Figure 3-20). Remove bladder pull rod.
8. Grasp threaded section of plug and insert poppet end into shell mouth.

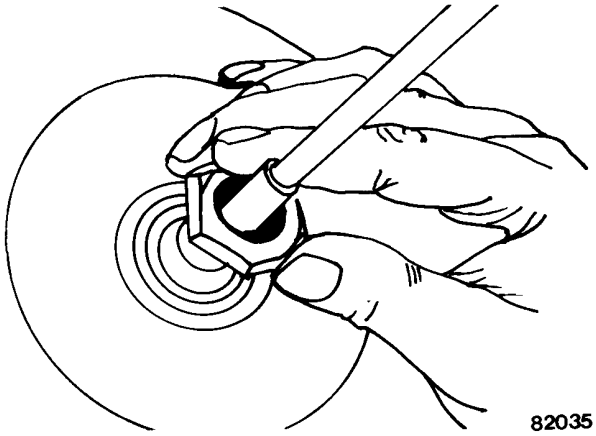


FIGURE 3-20. VALVE STEM INSTALLATION

9. Install anti-extrusion ring inside shell. Fold anti-extrusion ring to enable insertion into shell. Place anti-extrusion ring on plug and poppet assembly with its steel collar toward shell mouth.
10. Withdraw threaded end of plug through shell mouth. (Refer to Figure 3-21).
11. Pull plug until seated solidly into position on shell mouth opening.

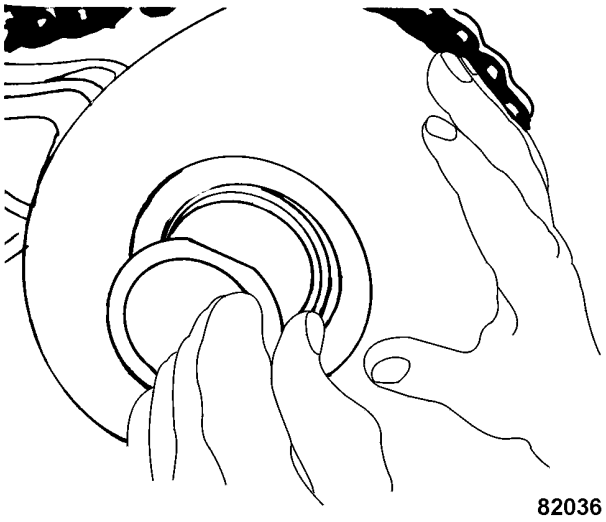


FIGURE 3-21. PLUG ASSEMBLY

12. Install valve core. Using dry nitrogen, slowly pressurize bladder with sufficient pressure [approximately 5 psi (34 kPa)] to hold plug and poppet assembly in place.
13. Install washer onto plug and poppet assembly and push until seated against anti-extrusion ring. (Refer to Figure 3-22).

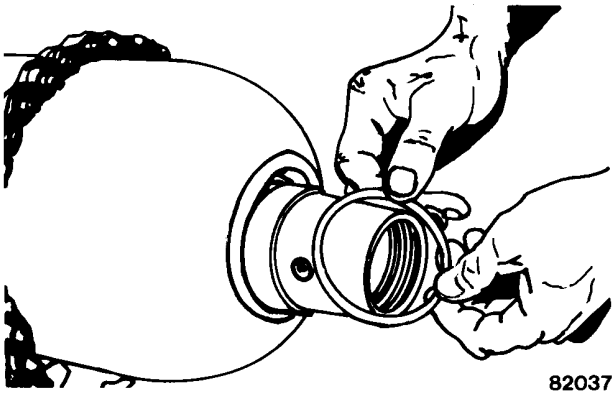


FIGURE 3-22. WASHER INSTALLATION

BRAKE CIRCUIT AND BRAKE VALVE TROUBLESHOOTING

POSSIBLE CAUSES	SUGGESTED CORRECTIVE ACTION
TROUBLE: The Brakes are Locked, Service and/or Parking	
Parking brake solenoid is de-energized.	Check power to solenoid
Connections to tank and pressure ports reversed.	Correct the plumbing.
Parking brake solenoid coil defective.	Replace coil.
Parking brake solenoid valve defective.	Replace solenoid valve.
Tank line is plugged or restricted.	Remove restriction.
TROUBLE: Both Brake Circuits are Dragging	
Tank line has back pressure.	Ensure tank line has no back pressure.
Pedal set screw out of adjustment; residual pressure.	Adjust pedal deadband with set screw.
TROUBLE: One Brake Circuit is Dragging	
Obstruction in the brake valve subassembly.	Remove obstruction.
Brake valve is out of balance.	Adjust balance according to instructions.
Actuator piston defective.	Replace piston.
Brake valve is defective.	Rebuild or replace Brake Valve assembly.
TROUBLE: The Brakes are Not Going to Full Pressure	
Internal malfunction of modulating section of Brake Valve.	Remove, disassemble, clean, and inspect brake valve.
Supply pressure is low.	Check steering/brake pump system and accumulators.
Improper collar adjustment inside brake valve.	Adjust collars according to instructions.
TROUBLE: A Brake Accumulator Bleeds Off Quickly When Supply Pressure is Cut Off	
Accumulator bleeddown valve is open.	Close valve, check precharge.
Accumulator precharge is low.	Recharge accumulator.
Leak in one circuit.	Check plumbing.
Malfunction in brake valve.	Remove, disassemble, clean, reassemble; or replace.

9. Inspect retainer plates (7 & 8) for bent or cracked condition, replace if such damage is found. Inspect retainer plate bolts (6), and tapped holes in housing.

NOTE: These bolts are highly stressed and should be replaced whenever their condition appears questionable. A 3/4-16UNF-28 tap lubricated with a light oil may be used to inspect tapped holes in housings for thread damage and to clean up any minor thread roughness.

10. Brake housings and pistons should be thoroughly cleaned. After cleaning, passages, cavities, and external surfaces should be blown dry with clean, dry, compressed air. Piston should also be cleaned and blown dry.

NOTE: Cleaned and dried parts should not be left exposed for any appreciable time without a protective coating of lubricant; for short term storage, coating all internal cavities, passages, and bosses with hydraulic fluid will be adequate protection; for longer term storage wipe cavities, connector bosses, and threads with a protective grease, such as petroleum jelly.

BRAKE LINING

Replacement

Each front wheel speed disc assembly has three (some 830E's may have four) calipers on one disc. Each caliper has six pistons and two linings, three apply pistons and one lining for each side of disc. Lining should be changed when friction material is worn to 0.125 in. (3.22 mm) thickness.

⚠WARNING

Failure to replace lining when worn to limits will result in loss of braking and possible catastrophic failure.

1. To replace front linings, remove front tire and rims, refer to "Wheel and Tire Installation", Section "G".
2. Remove end plates (7 or 8) Figure 5-2 from either end of caliper.
3. Pry between lining and disc to force pistons to bottom in caliper housing.
4. Remove lining from inboard and outboard sides of disc.
5. Inspect dust seals. Seals should be soft, pliable, and show no evidence of hardening or rupture. If damage is observed, the dust covers must be replaced. This will require disassembly of the caliper.
6. Inspect end plates for wear. Replace if grooves will not allow lining back plate to slide freely.
7. Inspect disc for wear limits, Figure 5-4. If disc is worn below the limits shown, the disc must be replaced. Refer to "Wheel and Tire Installation", Section "G".
8. If original linings have sufficient lining material for reuse, inspect lining back plate for cracks or excessive yielding where plate fits into end plates 7 or 8 (Figure 5-2).

⚠CAUTION

When replacing linings, never mix new and used linings in a brake assembly.

9. Slide linings (9) into caliper. It may be necessary to again pry pistons into housing (1).
10. Install end plates (7 & 8), apply Loctite 271 to threads of end plate capscrews (6). Install capscrews and tighten to **403 ft.lbs. (54.6 N.m)** torque. Check that linings (9) slide freely between end plates.
11. After completing lining replacement, reinstall front wheels. Refer to "Wheel and Tire Installation", Section "G".

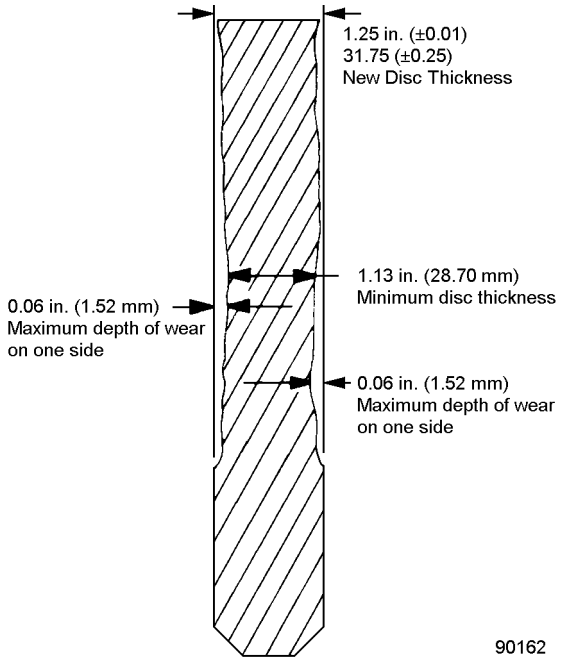


FIGURE 5-4. DISC WEAR LIMITS

NOTE: If desired, installation of brake housing components may be temporarily withheld to perform a "Functional Test".

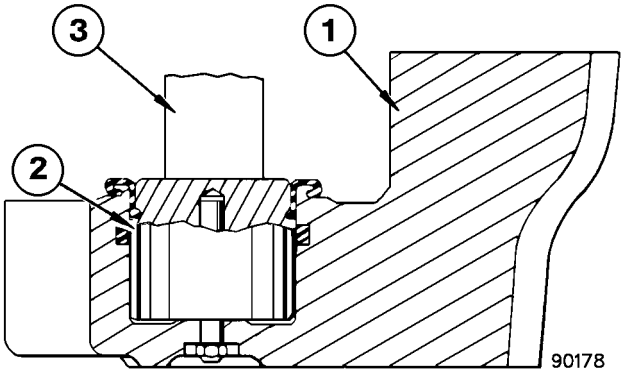


FIGURE 6-5. PISTON INSTALLATION
(Retracted Position)

1. Brake Housing
2. Piston Assembly
3. Arbor Press

8. Install all fittings with new packings into correct position in brake housings.
9. For ease of brake caliper installation do not install linings and retaining plates in calipers. "Bench Test" should be performed on brakes calipers before installation.

FUNCTIONAL TEST OF PISTON ASSEMBLY

NOTE: Perform functional test prior to disassembling piston assembly to determine if any components require replacement. To assure proper operation, also perform functional test prior to installing piston assembly in caliper housing, if disassembled.

Return Spring Force

Return spring (14, Figure 6-7) captured between outer spring guide (8) and spring retainer (5), exerts a return force, through spring retainer (5) and threaded retaining ring (4) on piston (11). With brake applied (spring compressed to a minimum height) return spring force should be between **180-250 lb. (800-1112 N)**.

Built-In Clearance

This is the amount piston will retract when brake pressure is released. Piston is retracted by force of piston return spring (14, Figure 6-7). Required built-in clearance is 0.065-0.073 in. (1.65-1.85 mm), obtained by the setting of threaded retaining ring (4).

1. The piston subassembly can be inspected for required return spring force and built-in clearance adjustment at the same time. Use the set-up on a spring checker as shown in Figure 6-8.
2. Set up dial indicator between arbor of spring checker and table.
3. Place sleeve (A, Figure 6-6) over return pin, lower arbor and fully compress spring (indicator pointer will stop moving).

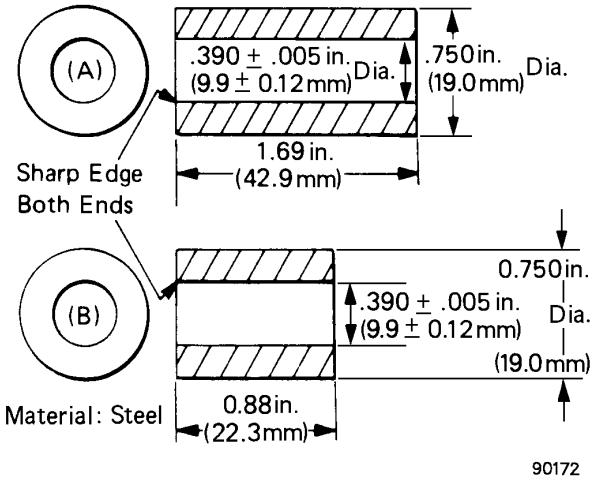


FIGURE 6-6. GRIP SPACE AND INSTALLATION SLEEVES

NOTE: The ends of both pieces must be flat and parallel.

4. With spring compressed, set indicator dial to zero.
5. Raise arbor slowly until spring checker force scale reads zero, reading on indicator dial will be the built-in clearance which should be 0.055-0.073 in. (1.65-1.85 mm).
6. Lower arbor slowly until dial indicator reads zero, reading on spring checker force scale will now indicate the return spring force which should be 180-250 lbs. (808-1112 N) force.
7. Slowly raise and lower arbor several times to verify both built-in clearance and spring force measurements. If measurements are outside this range, remove lockwire (15, Figure 6-7), lower arbor until spring is fully compressed, screw threaded retaining ring clockwise until bottomed (a spanner wrench is recommended for this) then back off one full turn (minimum), plus any additional amount to reach the next locking position, raise arbor and install lockwire. Recheck for correct built-in clearance adjustment by repeating Steps 3, 4 & 5).

TEMPORARY DISCONNECT PROCEDURES for Disabling Front Brakes For Models 630E and 685E Komatsu Trucks

1. Relieve pressure in hydraulic system according to the previous **"WARNING"** instructions.
2. Disconnect "BF" line (1, Figure 5-19) from tee fitting on differential pressure manifold inside the brake control cabinet.
3. Install a #8, 0.75 x 16UNF-2B, 37° flare Cap Nut (WA2567 or equivalent) on fitting. Tighten Cap Nut to standard torque. Cap or plug line to prevent contamination of system.
4. Close accumulator "T" handles.
5. Condition (burnish) rear brakes according to procedures described on previous pages.
6. Relieve pressure in hydraulic system according to the previous **"WARNING"** instructions.
7. Remove cap nuts and plugs (installed, step 3) and reconnect line (1). Tighten to standard torque.
8. Close accumulator valves.
9. Start engine and check for leaks. Bleed brakes according to bleeding procedures.

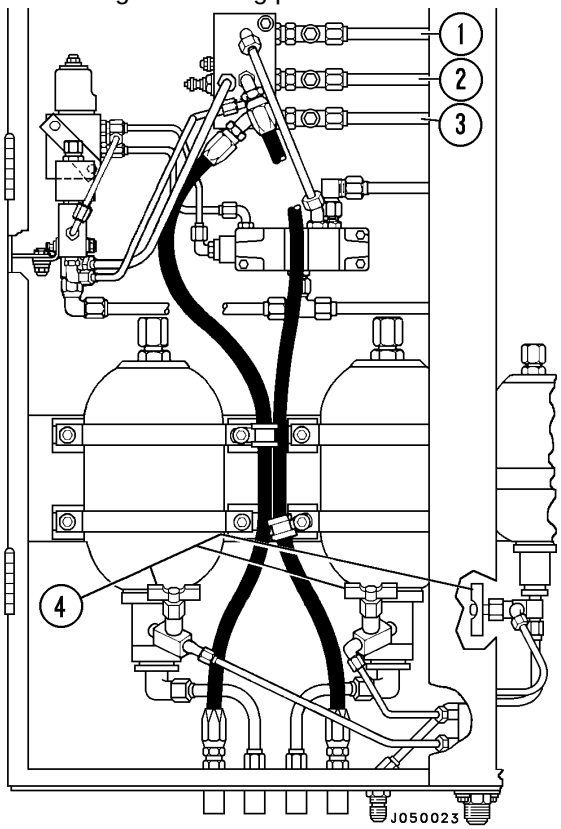


FIGURE 6-19. 630E/685E BRAKE CONTROL CABINET

1. “BF” Brake Line
2. “B2” Brake Line
3. “B1” Brake Line
4. Bleed Valve Han-

TEMPORARY DISCONNECT PROCEDURES for Disabling Front Brakes For Model 830E Komatsu Trucks

1. Relieve stored pressure in hydraulic system according to the previous **"WARNING"** instructions.
2. Disconnect "BF" hydraulic tube (5, Figure 5-20) at both ends inside brake control cabinet. Install a #8, 0.75 x 16UNF-2B, 37° flare Cap Nut (WA2567, or equivalent) on each fitting where tube was removed. Tighten caps to standard torque to prevent leakage. Cap or plug tube to prevent contamination.

NOTE: This will disconnect the hydraulic supply from the operator's brake pedal to the front brakes. There will be a noticeable loss of "braking action" at the pedal. However, this method of temporarily disabling the brakes will still permit the application of Brake Lock, in the event of an emergency.

3. Close accumulator bleed valves handles.
4. Condition (burnish) rear brakes according to procedures described on previous pages.
5. Relieve pressure in hydraulic system according to the previous **"WARNING"** instructions.
6. Remove Cap Nuts and reinstall tube (5). Tighten tube nuts to standard torque.
7. Close accumulator bleed valves handles.
8. Start engine and check for leaks. Bleed brakes according to bleeding procedures.

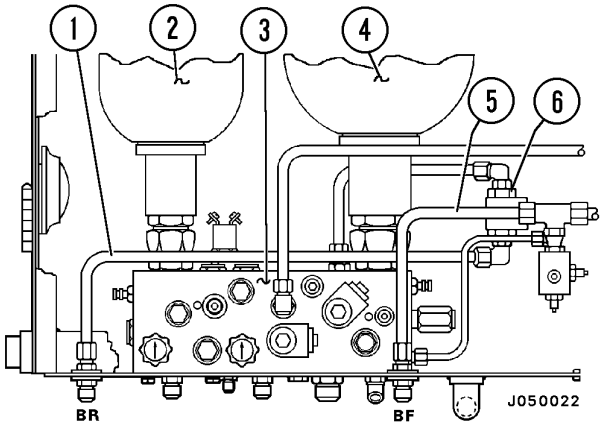


FIGURE 6-20. 830E BRAKE CABINET

1. “BR” Hydraulic Tube
2. Rear Brake Accum.
3. Brake Manifold
4. Front Brake Accum.
5. “BF” Hydraulic Tube
6. Brake Lock Shuttle Valve

SECTION “K”

AIR SYSTEM

INDEX

NOTE 1:

Due to several different customer options for Air Dryers and/or Aftercooler, service for this component is not covered in this section. When Air Dryer or Aftercooler service is required, refer to section “M”, Options and Accessories, in this manual.

NOTE 2:

Refer to either Section “M”, Options Accessories, in this manual, or to the Engine Manufacturer’s Shop Manual for this repair coverage.

Cleaning and Inspection

1. Discard all O-rings and gaskets.
2. Clean all metal parts with a cleaning solvent and blow dry with low pressure air.
3. Inspect all parts for wear or damage. Pay particular attention to the diaphragm (8, Figure 3-4), valve seat (12), and plunger (15).
4. Lubricate all metal surfaces with number 7 Lubriplate and all rubber parts with Dow Corning Number 55 Pneumatic grease.

Assembly

1. Install O-ring (19, Figure 3-4), washer (18), spring (17). Position O-ring (16) on plunger (15) and install plunger.
2. position gasket (14), O-ring (13) and valve seat (12) in body (20).
3. Install gasket (11), baffle (10). Secure baffle in place with screws (9).
4. Install diaphragm (8), diaphragm follower (7), spring (6) and spring seat (5). Install bonnet (4) and secure in place with screws (3).
5. Install adjusting screw (1) with jam nut (2). Do not attempt to tighten adjusting screw at this time. Refer to “Adjustment”.

AIR STARTER CIRCUIT (If Equipped)

Due to many different customer options for starters, service for this component is not covered in this section. When starter service is required, refer to either Section "M", Options and Accessories, in this manual, or to the engine manufacturer’s shop manual.

3. Lubricate the steering pump spline shaft and align with coupling (9). Install hoist pump to steering pump and install capscrews (10) with hardened washers and tighten to standard torque. Raise pumps up into position.

4. Attach front support bracket to the "T" bracket and to the pump with capscrews, lockwashers and nuts. Tighten capscrews to standard torque.

5. Connect hoist pump drive flange with drive shaft with capscrews, lockwashers and nuts. Tighten to standard torque.

6. Tighten support bracket capscrew (on rear of steering pump) to standard torque.

7. Uncap inlet and outlet hoses and install to pumps using new O-rings. Tighten capscrews securely.

8. Service the hydraulic tank with C-4 type hydraulic fluid. Refer to Hydraulic Tank this section for filling instructions.

9. Open the three suction line shut-off valves (13 & 18, Figure 3-1). Loosen capscrews (at the pump) on suction hoses (12 & 16) to bleed trapped air. Then loosen capscrews (at the pump) on pressure hoses to bleed any trapped air. Tighten all capscrews securely.

10. Reconnect blower tube and install blower tube support strap.

NOTE: If trapped air is not bled from steering pump, possible pump damage and no output may result.

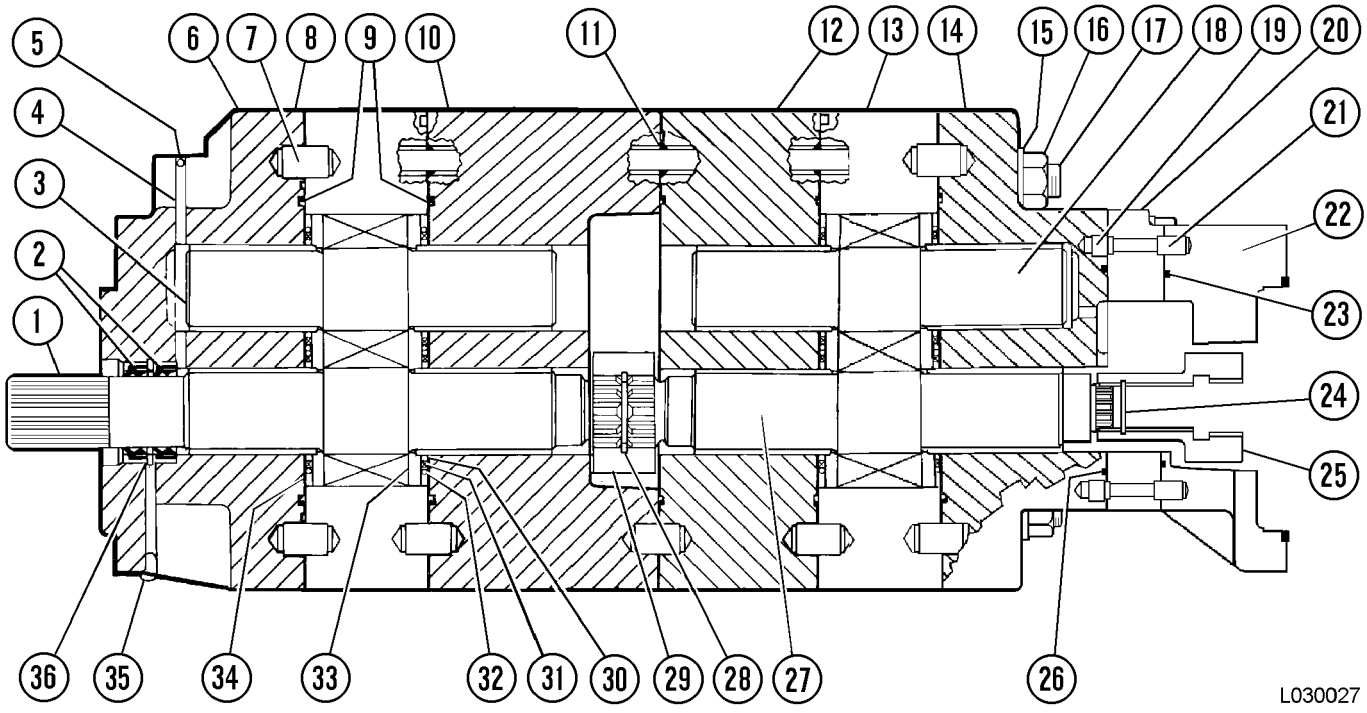


FIGURE 3-3. HOIST PUMP

1. Drive Gear & Shaft
2. Seal
3. Idler Gear
4. Stud
5. Steel Ball
6. Flange
7. Dowel
8. Gear Plate
9. O-ring
10. Connector Plate
11. O-ring
12. Bearing Plate
13. Gear Plate
14. Connector Plate
15. Washer
16. Nut
17. Stud
18. Idler Gear
19. Dowel
20. Bearing Plate
21. Dowel
22. Transition Plate
23. O-ring
24. Snap Ring
25. Coupler
26. O-ring
27. Drive Gear (Rear)
28. Snap Ring
29. Coupler
30. Steel Ring
31. Backup Ring
32. O-ring
33. Pressure Plate
34. Isolation Plate
35. Plug
36. Snap Ring

Installation

1. Install hydraulic tank and secure with capscrews and lockwashers. Tighten to standard torque.
2. Uncap hydraulic lines and attach to the proper connections.
3. Replace breather filters if required.
4. Fill the hydraulic tank with clean, filtered C-4 hydraulic oil. Refer to “Filling Instructions”.
5. Bleed all air from hydraulic lines.
6. Bleed trapped air inside steering pump. Refer to "Pump Pressure Setting", Section "L" for air bleeding procedure.

NOTE: If trapped air is not bled from steering pump, possible pump damage and no output may result.

HYDRAULIC TANK STRAINERS

Removal

⚠WARNING

Prior to opening the hydraulic tank, allow at least 90 seconds for the accumulator to bleed down after engine shutdown with the key switch “Off”.

1. Shut down the engine and the key switch “Off” for at least 90 seconds.

NOTE: If the oil is to be reused, clean containers must be used with a filtering (3-micron) system available for refill.

2. Be prepared to contain approximately 238 gal. (901 l) of hydraulic oil. Drain hydraulic oil from tank.
3. Disconnect pump suction hoses. (4, Figure 3-18).
4. Remove capscrews and lockwashers (2) securing cover (5) to the hydraulic tank. Remove and discard gasket.
5. Remove capscrews and lockwashers securing suction strainers. Remove suction strainers.

Inspect and Clean

NOTE: Inspect the strainers thoroughly for metallic particles and varnish build up (if oil has been overheated). The quantity and size of any particles may be an indication of excessive wear of components in the hydraulic system.

1. Clean the strainers with fresh cleaning solvent from the inside out.
2. Inspect the strainers for cracks or wear. Replace, if necessary.
3. Clean any sediment from bottom of hydraulic tank.

Installation

1. Install suction strainers and secure in place with capscrews and lockwashers. Tighten capscrews to standard torque.
2. Using new cover gasket move cover into place and install capscrews and lockwashers. Tighten capscrews to standard torque.
3. Fill the hydraulic tank, refer to Hydraulic Tank Filling Instructions. Open both suction line shutoff valves.
5. Loosen suction line connections at both pumps to bleed any trapped air. Tighten hose connections.
6. Bleed trapped air inside steering pump. Refer to "Pump Pressure Setting", Section "L" for air bleeding procedure.

NOTE: If trapped air is not bled from steering pump, possible pump damage and no output may result.

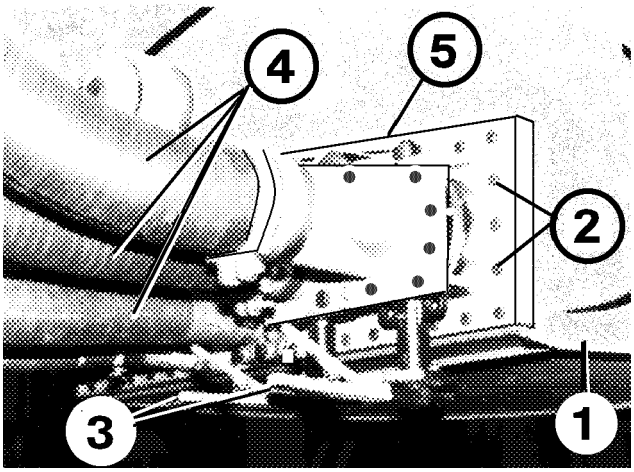


FIGURE 3-18. STRAINER REMOVAL 91218

1. Hydraulic Tank
2. Capscrews & Lockwashers
3. Shutoff Valve
4. Pump Inlet Lines
5. Cover

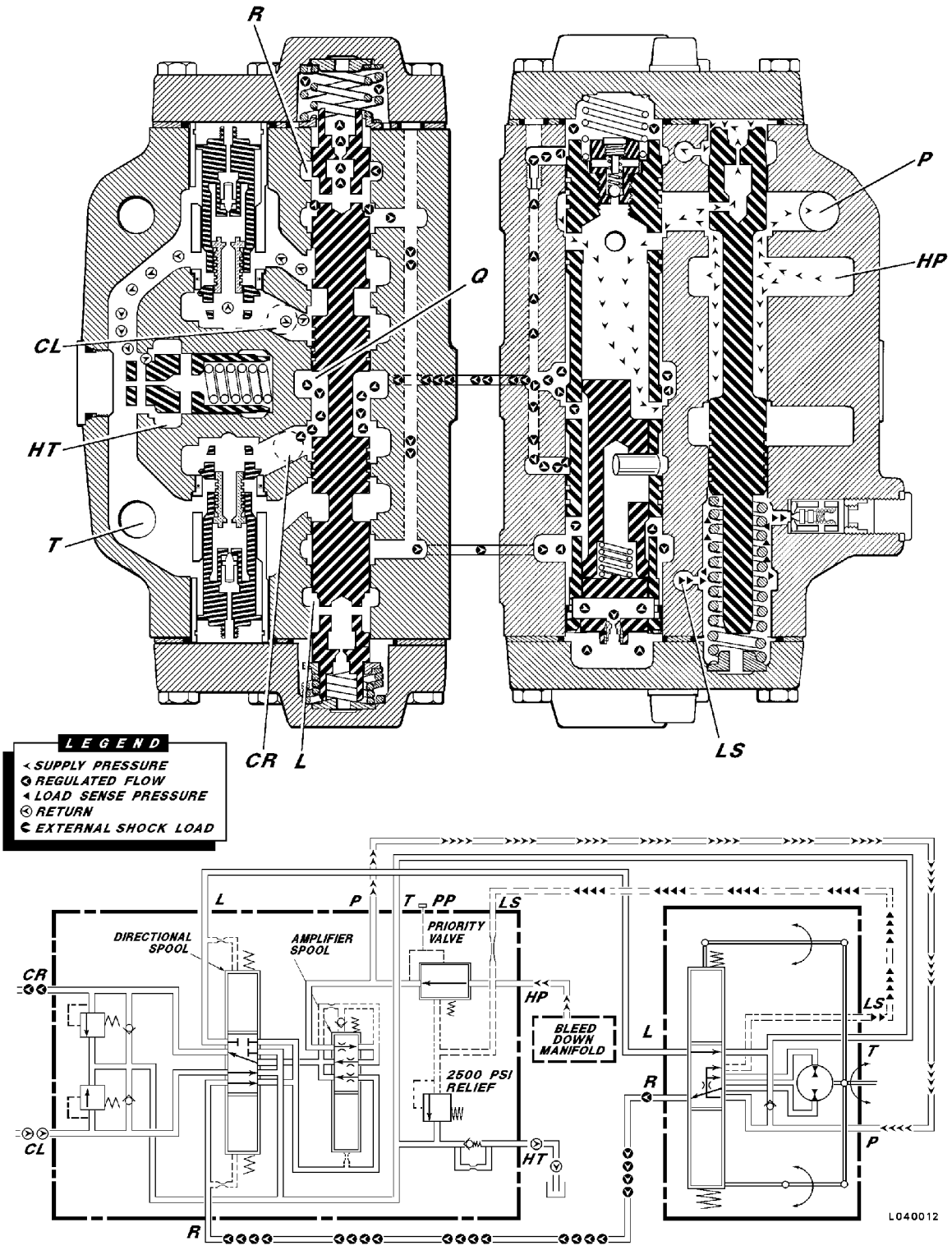


FIGURE 4-5. FLOW AMPLIFIER
(Steering Right)

⚠WARNING

Make certain only the small swivel hex nut turns. Turning the complete charging valve assembly may result in the valve assembly being forced out of the accumulator by the nitrogen pressure inside.
Wear protective face mask when discharging nitrogen gas.

3. Loosen small hex nut (4, Figure 5-2) three complete turns. Remove valve cap (1). Depress the valve stem until all nitrogen pressure has been relieved.
4. Disconnect electrical leads at the pressure switch located on top of the accumulator (15, Figure 5-3).
5. Disconnect and plug the hydraulic line at the bottom of the accumulator.
6. Connect a lifting device to the top section of the accumulator and take up slack.

⚠WARNING

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

7. Remove the capscrews, nuts and lockwashers securing the accumulator clamps to the mounting brackets.
8. Lift accumulator clear of the mounting brackets and move to a clean work area for disassembly.
9. Clean exterior of accumulator before starting disassembly.

Installation

New or rebuilt accumulators have three pints of oil in the gas end to prevent rusting of the accumulator walls and to provide for piston seal lubrication.

NOTE: If accumulator has just been rebuilt and three pints of oil have already been added to the gas end of accumulator, do not add any additional oil. Proceed to Step 2.

1. Add three pints of oil.
   a. Remove charging valve (3) if not already removed.

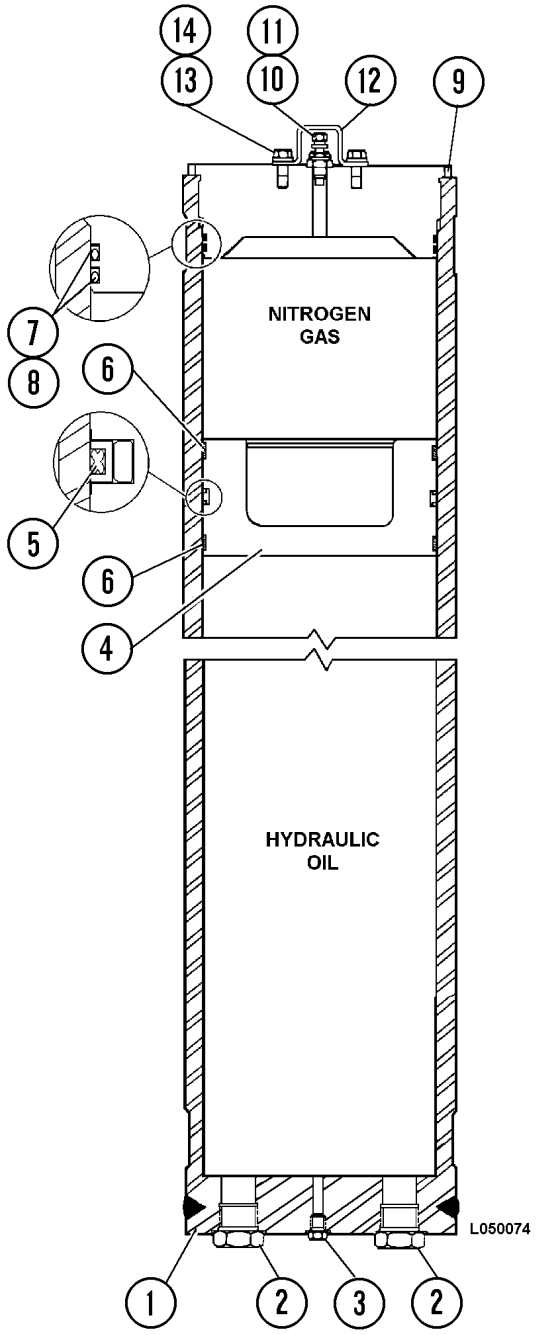


FIGURE 5-3. ACCUMULATOR ASSEMBLY

1. Tube
2. Plug
3. Plug
4. Piston
5. Seal
6. Bearing
7. O-Ring
8. Back-up Ring
9. Gland
10. Charging Valve
11. Gasket
12. Guard
13. Capscrew
14. Lockwasher

2. Inspect all parts carefully and make any replacements necessary.

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

Assembly

NOTE: When assembling the spool and sleeve, only one of the two possible matching positions of the spring slots can be used. The reason is that in the other end of the sleeve and spool (opposite end of the spring slots) there are three slots in the spool and three holes in the sleeve. These must be opposite each other on assembly so that the holes are partly visible through the slots in the spool, refer to Figure 5-13.

1. To install the neutral position springs, place a screwdriver in the spool slot as shown in Figure 5-14.
2. Place one flat neutral position spring on each side of the screwdriver blade. Do not remove screwdriver.
3. Push two curved neutral position springs in between one side of the screwdriver blade and a flat spring. Repeat for the opposite side. Remove the screwdriver.

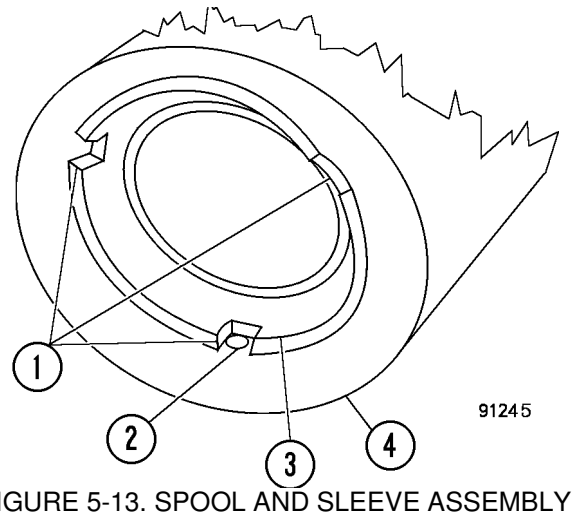


FIGURE 5-13. SPOOL AND SLEEVE ASSEMBLY

1. Slots
2. Hole
3. Spool
4. Sleeve

4. Slide the inner spool in the sleeve. Compress the ends of the neutral position springs and push the neutral position springs in place in the sleeve. Install the cross pin.

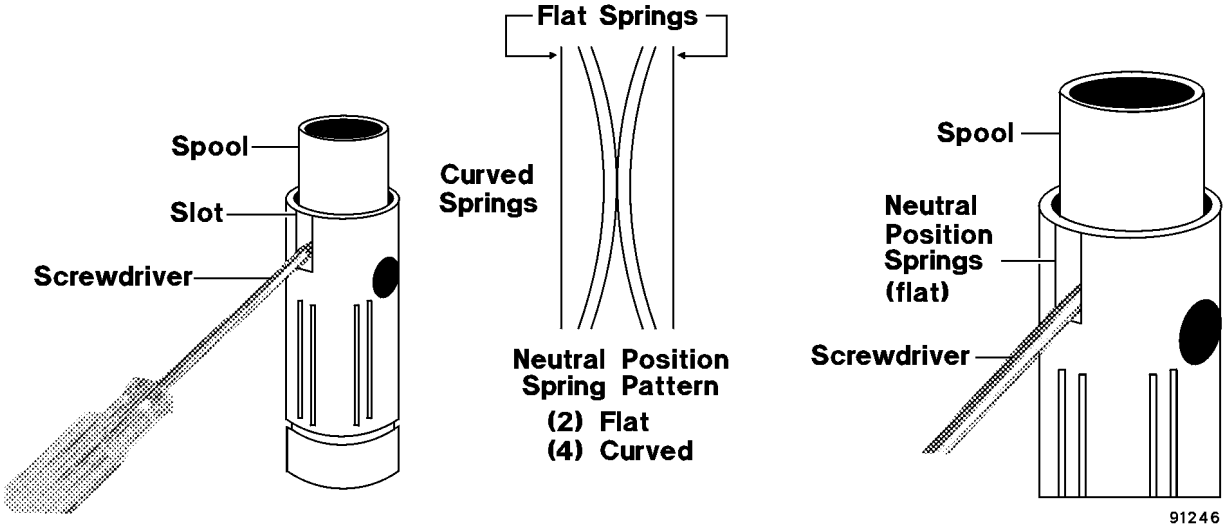


FIGURE 5-14. NEUTRAL POSITION SPRING INSTALLATION

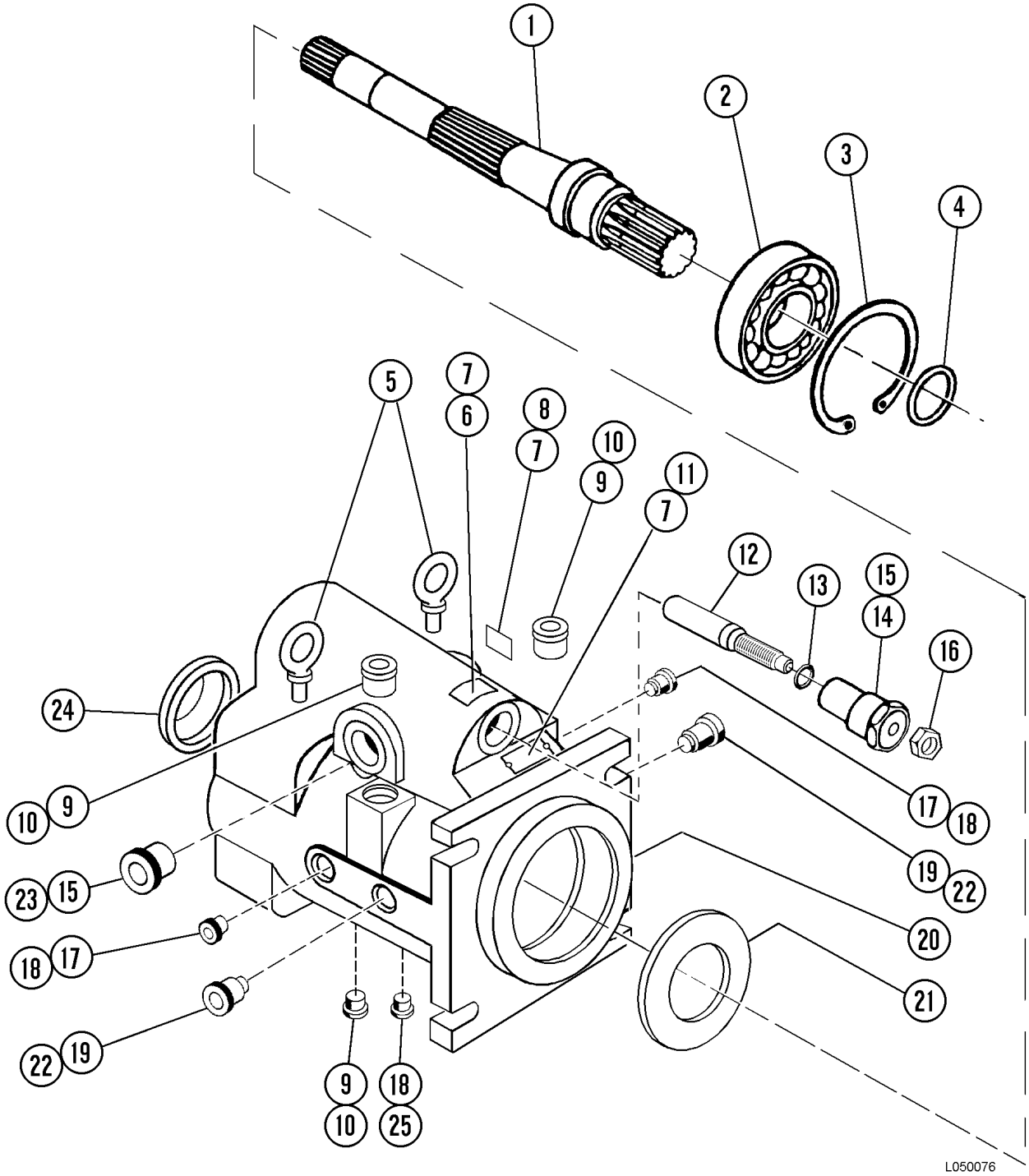


FIGURE 5-26. PUMP, FRONT HOUSING

1. Shaft
2. Bearing
3. Snap Ring
4. Retainer Ring
5. Lifting Eyes
6. Name Plate
7. Screw, Drive
8. Name Plate
9. Plug
10. O-Ring
11. Plate
12. Adjusting Screw
13. O-Ring
14. Gland
15. O-Ring
16. Jam Nut
17. Pin
18. O-Ring
19. Pin
20. Housing
21. Seal Retainer
22. O-Ring
23. Plug
24. Seal
25. Plug

SHOCK & SUCTION VALVES

Shock & Suction Valve Settings

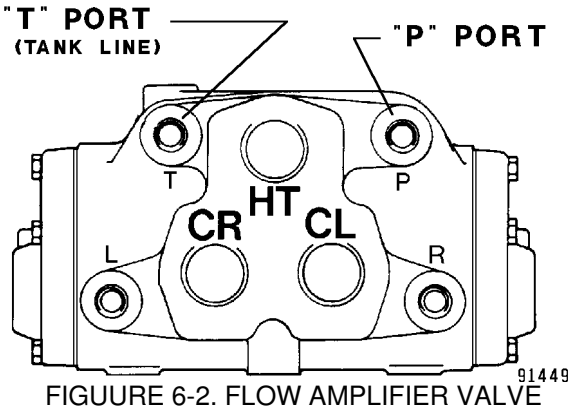
⚠DANGER

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

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

Be sure accumulator oil pressure has been bled down. Turn steering wheel; the wheels should not move if oil pressure has been relieved.

1. Shut down engine, turn keyswitch "Off" and allow accumulator to completely bleed down before opening circuits to take measurements, to make repairs, or to install or remove gauges.
2. Install a calibrated 5000 psi (35,000 kPa) gauge at port "PP" (Figure 6-3) of flow amplifier.
3. Prior to checking the shock & suction valves in the flow amplifier, raise the steering relief pressure.
   a. Remove steering relief valve external plug using an 8 mm metric allen wrench. Refer to Figure 6-3.
   b. Gently bottom out the steering relief valve using a 5 mm metric allen wrench. Refer to Figure 6-3 for relief valve location.
4. Check flow amplifier shock & suction valve pressure. Pressure check can be accomplished by steering away from steering cylinder stops, then steering into stop and continue to turn steering wheel. Gauge at flow amplifier should read 2900 psi (19,996 kPa). If shock & suction valve pressure is not correct, replace valves.



FIGUURE 6-2. FLOW AMPLIFIER VALVE

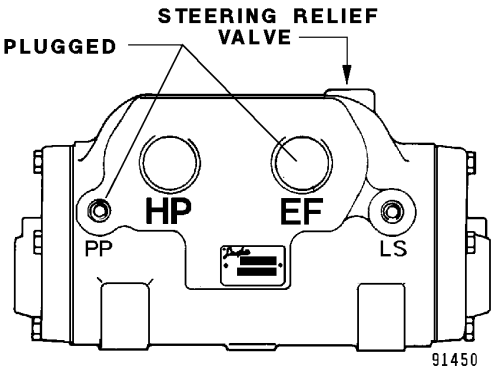


FIGURE 6-3. FLOW AMPLIFIER VALVE

NOTE: The shock & suction valves are only serviced as complete units, and cannot be adjusted while installed in the flow amplifier valve.

5. After checking shock & suction valves, lower the steering relief pressure to 2500 psi (17,237 kPa). Steering relief pressure can be adjusted by steering full left or right and adjusting steering pressure at the flow amplifier while holding slight pressure on the steering wheel. Replace the external steering relief valve plug.
6. Remove test equipment and reconnect all lines and hoses to the proper location.

LEAKAGE TESTS

⚠DANGER

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

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

NOTE: The hydraulic system must be at normal operating temperature (110° F or 43° C) or higher before performing leakage tests.

HOIST CIRCUIT

HOIST CIRCUIT OPERATION

The following hoist circuit operation description describes the basic hoist circuit. Further circuit description is outlined under the individual component descriptions.

Hydraulic fluid is supplied by a tank located on the left frame rail. The tank's service capacity is approximately 238 gal. (901 L). Refer to (10, Figure 7-1), Hoist Circuit Schematic. Hydraulic oil is routed to a tandem gear type pump, (9). The pump is driven by an accessory drive at the end of the traction alternator.

Pump output is directed to two, high pressure filters (5 & 7)mounted on the side of the fuel tank.

Hydraulic oil from the filters is directed to the hoist valve (2) which is mounted above the hoist and steering pumps.

The hoist valve directs oil to the body hoist cylinders (1) for raising and lowering of the dump body. The hoist valve functions are controlled by the operator through a flexible cable to the hoist pilot valve (6) in the hydraulic component cabinet located behind the operator's cab. Also in the hydraulic cabinet is the hoist-up limit solenoid (4). (Reference Figure 7-2.) The hoist-up limit solenoid prevents the hoist cylinders from extending to maximum physical limit.

⚠WARNING

Hydraulic hoses deteriorate with age and use. Prevent possible malfunctions by inspecting all hoses periodically. Replace any hose showing wear, damage or deterioration.

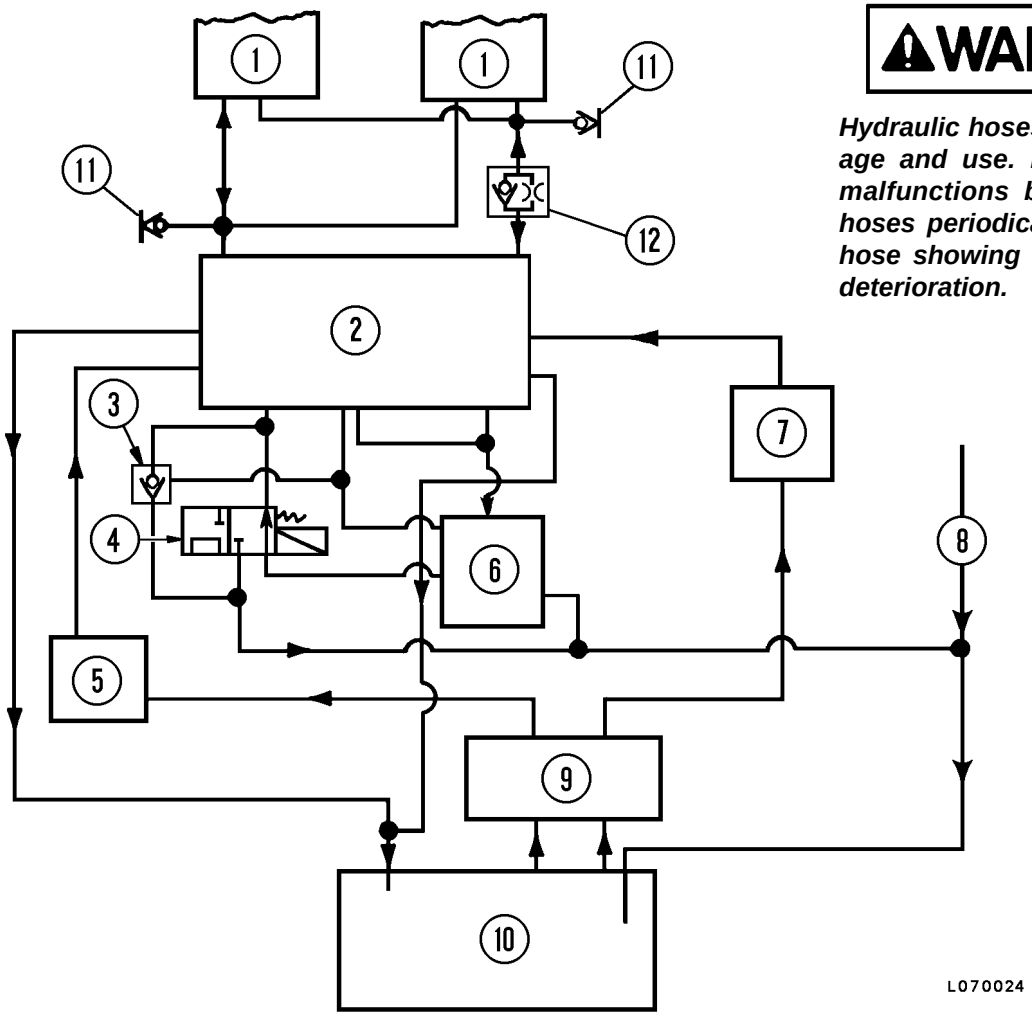


FIGURE 7-1. HOIST CIRCUIT SCHEMATIC

1. Hoist Cylinder
2. Hoist Valve
3. Pilot Operated Check Valve
4. Hoist Up Limit Solenoid
5. Filter
6. Hoist Pilot Valve
7. Filter
8. Return From Flow Amplifier Valve
9. Pump
10. Hydraulic Tank
11. Quick Disconnect
12. Snubber Valve

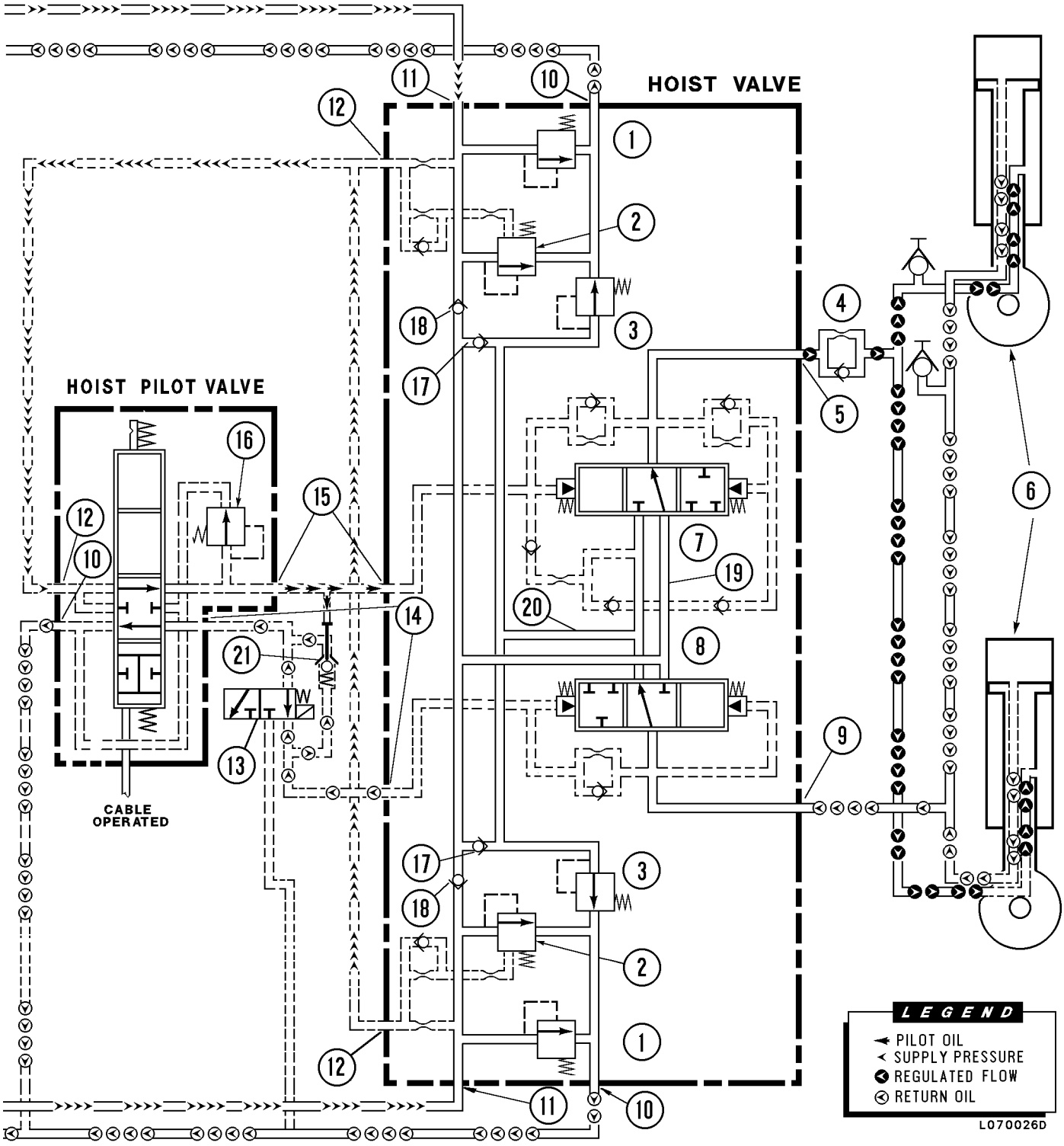


FIGURE 7-7. POWER DOWN

HOIST PILOT VALVE

Removal

1. Place the hoist control lever in the body down position. Make sure the body is in the full down position. Release the hoist control lever to return the hoist valve spool to the neutral position.
2. Disconnect hydraulic lines at the hoist pilot valve (1, Figure 8-11). Remove capscrews (4).
3. Loosen and unthread jam nut (7). Unthread sleeve (6) until cotter pin (5) and pin (9) are exposed.
4. Remove cotter pin (5) and pin (9).
5. Remove the hoist pilot valve mounting capscrews (10). Remove hoist pilot valve. Refer to hoist pilot valve disassembly for repair instructions.

Installation

1. Move the hoist pilot valve into position on the mounting bracket. Secure valve in place with capscrews (10, Figure 8-11).
2. Move hydraulic lines (2) into position. Tighten hydraulic line connections securely.
3. Place hoist control lever in FLOAT position. Adjust pilot valve spool until the centerline of the cable attachment hole extends 1.16 in. (29.5 mm) from the face of the valve body.
4. Align spool pin hole with hoist control cable eye and install pin (9). Secure pin in place with cotter pin (5).
5. Thread sleeve (6) upward until contact is made with valve body. Move flange (3) into position and secure in place with capscrews (4).
6. Thread jam nut (7) against sleeve (6). Tighten jam nut securely.
7. Start the engine and check for proper hoist operation. Observe for leaks.

Disassembly

1. Thoroughly clean the exterior of the valve. Place the valve in a clean work area for disassembly.

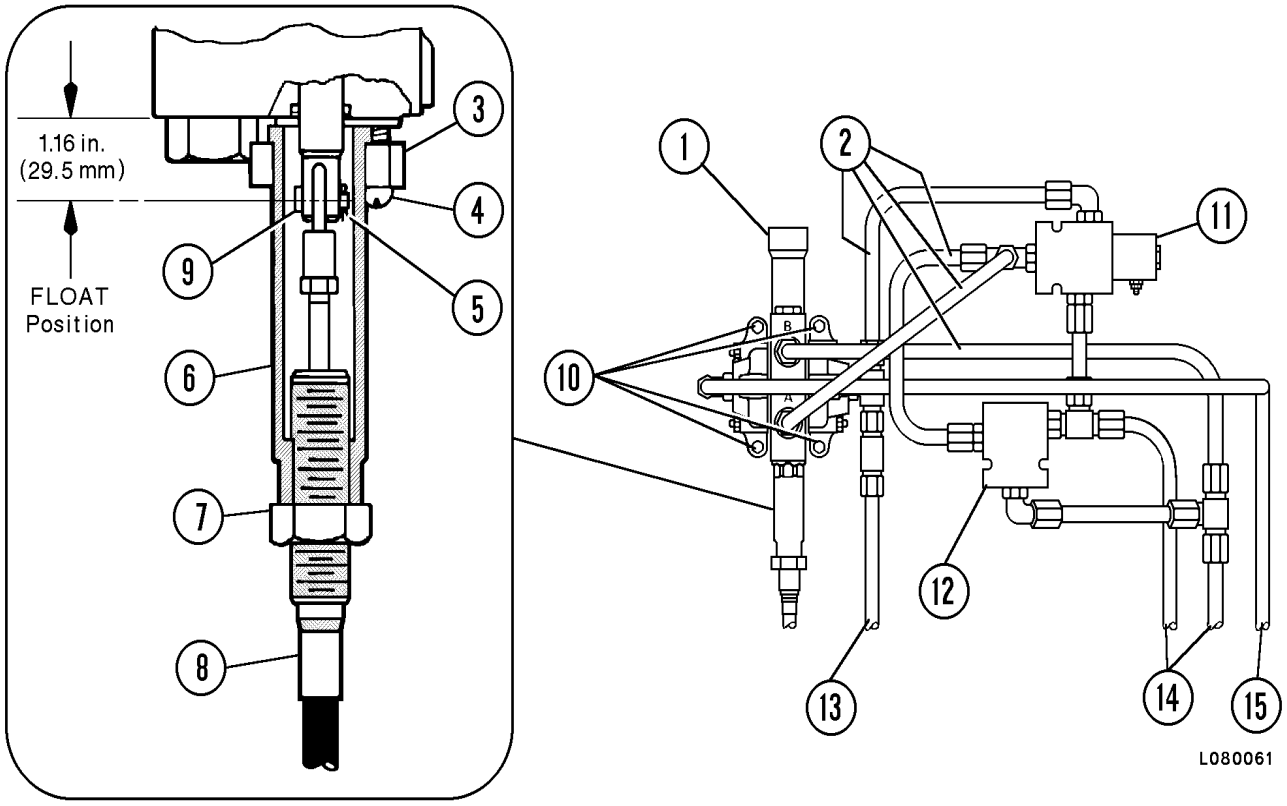


FIGURE 8-11. HOIST PILOT VALVE REMOVAL

1. Hoist Pilot Valve
2. Hydraulic Lines
3. Flange
4. Capscrew
5. Cotter Pin
6. Sleeve
7. Jam Nut
8. Control Cable
9. Pin
10. Capscrews
11. Solenoid Valve (Body Up Limit)
12. Pilot Operated Check Valve
13. Return Line
14. Pilot Pressure to Hoist Valve
15. Supply Pressure From Hoist Valve

Assembly of Cylinder

1. Install seals (15, Figure 8-18) and bearing (14) on second stage cylinder. Install bearings (19) and buffer seal (18), rod seal (20) and rod wiper (21) on first stage cylinder. Lubricate with clean hydraulic oil (Type C-4).
2. Align and slide the second stage cylinder (2) inside the first stage cylinder (3). Allow the second stage to protrude far enough to install the snap ring (9) on the inside of the first stage cylinder.
3. Mount the housing (4) in the fixture with the cover end positioned at the top. Install bearings (19) and buffer seal (18), rod seal (20) and rod wiper (21) in the housing.
4. Install lifting tool used during disassembly in the second and first stage cylinder assembly.
5. Install bearings (13) on the first stage cylinder (3). Lift and align this assembly over the housing (4). Lower the second and first stage cylinders into the housing.
6. Install retainer used during disassembly to hold the second and first stage cylinder in place when the housing is rotated. Rotate housing 180^{o} to position the lower mounting eye at the top.
7. Install bearings (19) and buffer seal (18), rod seal (20) and rod wiper (21) in the second stage cylinder (2).
8. Attach a lifting device to the rod eye (1) and align it over the housing (4). Lower the rod into the housing. Lubricate the rod with hydraulic oil.
9. Rotate housing 180° to position the cover end at the top. Remove retainer installed in Step 5. Install bearings (17) and seal (16) on the rod bearing retainer (6).
10. Thread two guide bolts 4 in. (100 mm) long in the end of the rod (1). Install seal (8) on the end of the rod.
11. Align piston rod bearing retainer (6) over guide bolts and lower it over the end of the rod (1). Remove guide bolts.

NOTE: Check capscrews carefully for distress and, if in doubt, replace them with new.

12. Make certain threads on capscrews (1, Figure 8-22) and threads in rod are clean and dry (free of oil and solvent).
13. Use Loctite "LOCQUIC" Primer "T" (TL8753, or equivalent), to spray mating threads on capscrews and threads in rod.
    Allow primer to dry 3 to 5 minutes.
14. Apply Loctite Sealant #277 (VJ6863, or equivalent) to threads of capscrews and threads in rod.
15. Install capscrews (1) with hardened washers (2) and tighten capscrews to **575 ft. lbs. (780 N.m) torque**.

NOTE: Allow parts to cure for 2 hours before exposing threaded areas to oil.*

* Note: If "LOCQUIC" primer "T" (TL8753) was not used, the cure time will require 24 hours instead of 2 hours.

16. Install O-ring (12, Figure 8-18) and backup ring (23) on cover (10). Align and lower cover onto housing (4). Install capscrews (11) and lockwashers. Tighten capscrews to standard torque.
17. Install hoist cylinder eye bearing (5, Figure 8-17) and retainer rings (4) if removed.

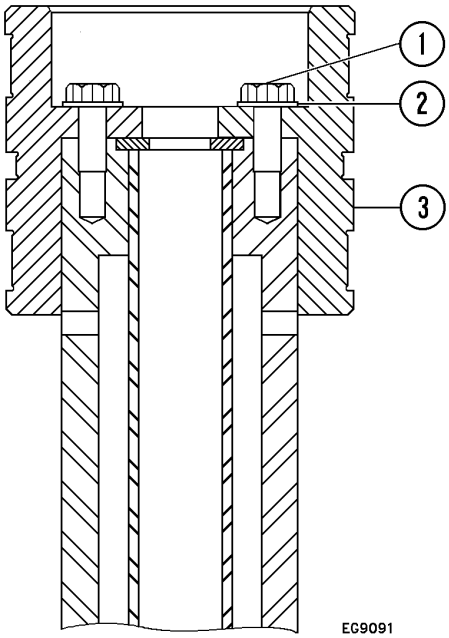


FIGURE 8-22. 3rd STAGE PISTON

1. Capscrew (12-point, Gr. 9)
2. Plate
3. Piston

TROUBLESHOOTING CHART
(STEERING PUMP)

POSSIBLE CAUSES	SUGGESTED CORRECTIVE ACTION
TROUBLE: No Pump Output	
Trapped air inside steering pump.	Bleed trapped air. Refer to "Pressure Check And Adjustment Procedure", Section "L".
Broken pump drive shaft.	Replace pump drive shaft.
Excessive circuit leakage.	Check for loose fittings, broken or cracked tubes.
No oil to pump inlet.	Check hydraulic tank oil level. Make sure shut-off valve is open.
TROUBLE: Low Pump Output	
Low pump pressure.	Check or adjust compensator pressure setting.
Compensator valve, seat, spring or packing failure.	Repair or replace compensator.
Worn or scored pistons and bores.	Repair or replace pistons or pump housings.
Maximum volume stop limiting pump stroke.	Turn volume stop screw counterclockwise. Tighten jam nut.
Worn or damaged piston shoes, swashblock or swashblock wear plate.	Repair or replace defective parts.
Worn or grooved cylinder wear plate and/or port plate.	Repair or replace defective parts.
Restricted inlet.	Clear restriction. Make sure suction line shut-off valve is open. Clean suction strainer.
Insufficient inlet oil.	Check for proper hydraulic tank oil level and make sure suction line shut-off valve is open.
TROUBLE: Unresponsive or Sluggish Control	
Control piston seals broken or damaged.	Repair or replace broken parts.
Swashblock saddle bearings worn or damaged.	Repair or replace broken parts.

SECTION M
OPTIONS AND SPECIAL TOOLS
INDEX

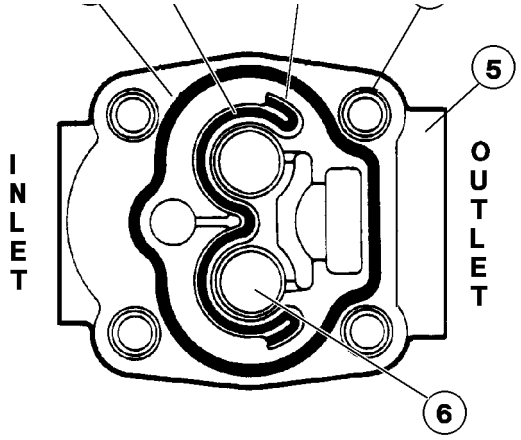


FIGURE 4-5. COVER PLATE SEALS

1. 1. O-Ring
2. 2. O-Ring
3. 3. Backup Ring
4. Dowel
5. Cover Plate
6. Drive Gear Bore

11. Install back-up ring, O-ring, and O-ring in flange plate. Use clean, heavy grease to hold O-rings in grooves.
12. Attach a piece of tape over shaft keyway to protect seal during assembly.

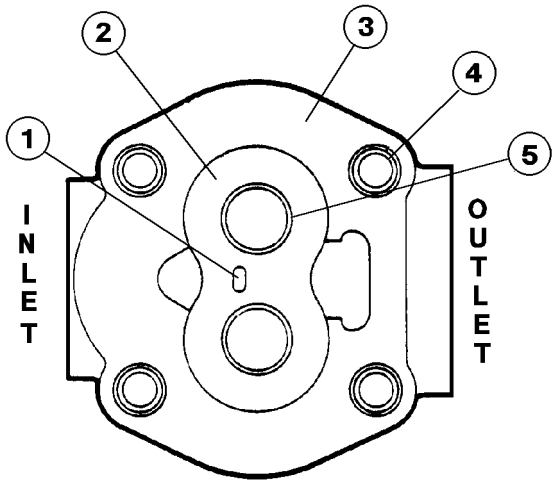


FIGURE 4-6. PRESSURE PLATE INSTALLATION

1. Trap
2. Pressure Plate
3. Gear Plate
4. Dowel

13. With O-ring in flange plate facing down and keeping plate true with shafts, slide it down until it contacts dowels in gear plate. Bump flange very lightly with hands or plastic hammer to force the plate down on dowels, at the same time making sure grease is holding O-rings in grooves. Once plate is in position, remove tape protecting seal from shaft keyway.
14. Coat capscrew (13, Figure 4-4) threads with clean hydraulic oil. Install washers (14) on capscrews. Tighten to **80 ft. lbs (108 N-m)** torque.
15. Using a twelve inch wrench, check to see if shaft will turn. It will be tight but should turn free with a **15 lbs (6.8 Kg)** maximum force on wrench.

Installation

1. Slide motor shaft with key into flex coupling on blower wheel shaft. Tighten set screw of flex coupling to **65 ft. lbs. (88 N-m)** torque.
2. Install motor mounting capscrews, tighten to standard torque.
3. Connect all hoses, tighten split flange capscrews to standard torque.

BLOWER BEARING REPAIR

Removal

1. Remove blower inlet and outlet hoses.
2. Loosen setscrew in flex coupling (3, Figure 4-3) on blower wheel shaft.
3. Remove all nuts, washers and capscrews securing housing halves. Remove inlet half of blower housing.
4. Loosen setscrews in blower wheel. Slide wheel from shaft.
5. Remove four blower housing retainer plates from blower housing and mount bracket.
6. Slide bearing housing and remaining blower housing half from mount brackets and flex coupling.

Replacement

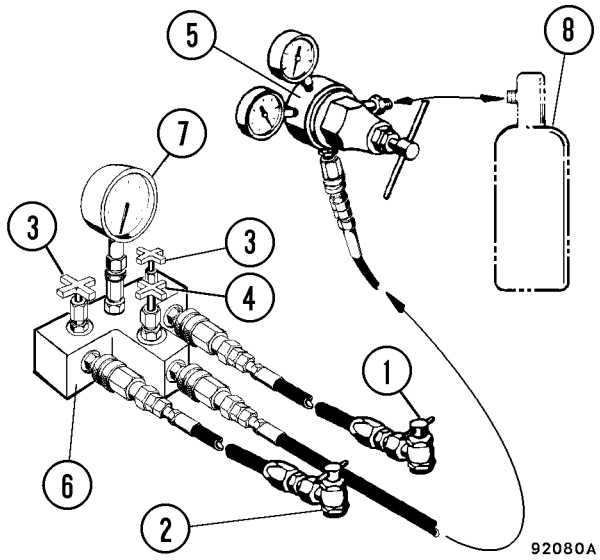
1. Loosen clamp ring setscrew in locking collar (6, Figure 4-3) of one bearing.
2. Push other bearing with shaft out of housing.
3. Remove bearing remaining in housing.

SPECIAL TOOLS

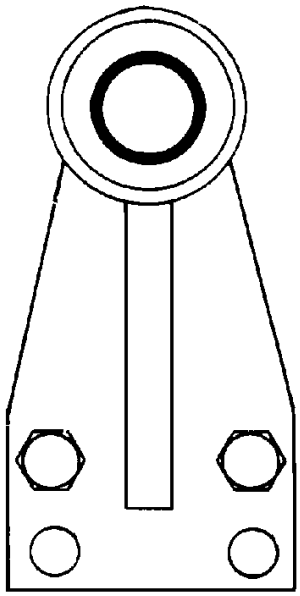
Part Number	Description	Use
EB1759	Nitrogen Charging Kit	Suspension & Accumulator Nitrogen Charging

1. “T” Handle Valve
2. Charging Valve Adapter
3. Manifold Outlet Valves (from gauge)
4. Inlet Valve (from regulator)
5. Regulator Valve (Nitrogen Pressure)
6. Manifold
7. Charging Pressure Gauge (Suspensions)
8. Dry Nitrogen Gas

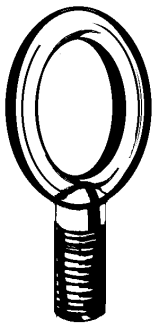
NOTE: Arrangement of parts may vary from illustration shown, depending on Charging Kit P/N.



Part Number	Description	Use
TY2930	Roller Assy.	Power Module Remove & Install



Part Number	Description	Use
TG1106	Eye Bolt, 0.75-10 UNC	Misc. lifting requirements
WA4826	Eye Bolt, 1.25-7 UNC	



Expansion Block Valve

The expansion block valve controls the amount of refrigerant entering the evaporator coil. Both internally and externally equalized valves are used.

The expansion valve is located near the inlet of the evaporator and provides the functions of throttling, modulating, and controlling the liquid refrigerant to the evaporator coil.

The refrigerant flows through a restriction creating a pressure drop across the valve. Since the expansion valve also separates the high side of the system from the low side, the state of the refrigerant entering the valve is warm to hot high pressure liquid; exiting it is low pressure liquid and gas. The change to low pressure allows the flowing refrigerant to immediately begin changing to gas as it moves toward the evaporator. This produces the desired cooling effect.

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

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

This system uses an internally equalized, block type expansion valve. With this type valve, the refrigerant leaving the evaporator coil is also directed back through the valve so the temperature of the refrigerant is monitored internally rather than by a remote sensing bulb. The expansion valve is controlled by both the temperature of the power element bulb and the pressure of the liquid in the evaporator.

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

Evaporator

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

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

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

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

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

Purging Air From Service Hoses

The purpose of this procedure is to remove all the air trapped in the hoses prior to actual system testing. Environmental regulations require that all service hoses have a shutoff valve within 12 inches of the service end. These valves are required to ensure only a minimal amount of refrigerant is lost to the atmosphere. R-134a gauge sets have a combination quick disconnect and shutoff valve on the high and low sides. The center hose also requires a valve.

The initial purging is best accomplished when connected to recovery or recycle equipment. With the center hose connected to the recovery station, service hoses connected to the high and low sides of the system, we can begin the purging. The manifold valves and service valves should be closed. Activating the vacuum pump will now pull any air or moisture out of the center hose. This will require only a few minutes of time. The hose is the only area that is being placed in a vacuum and this will not require a lengthy process. Closing the valve will then insure the hose is purged. It is now safe to open the other manifold valves.

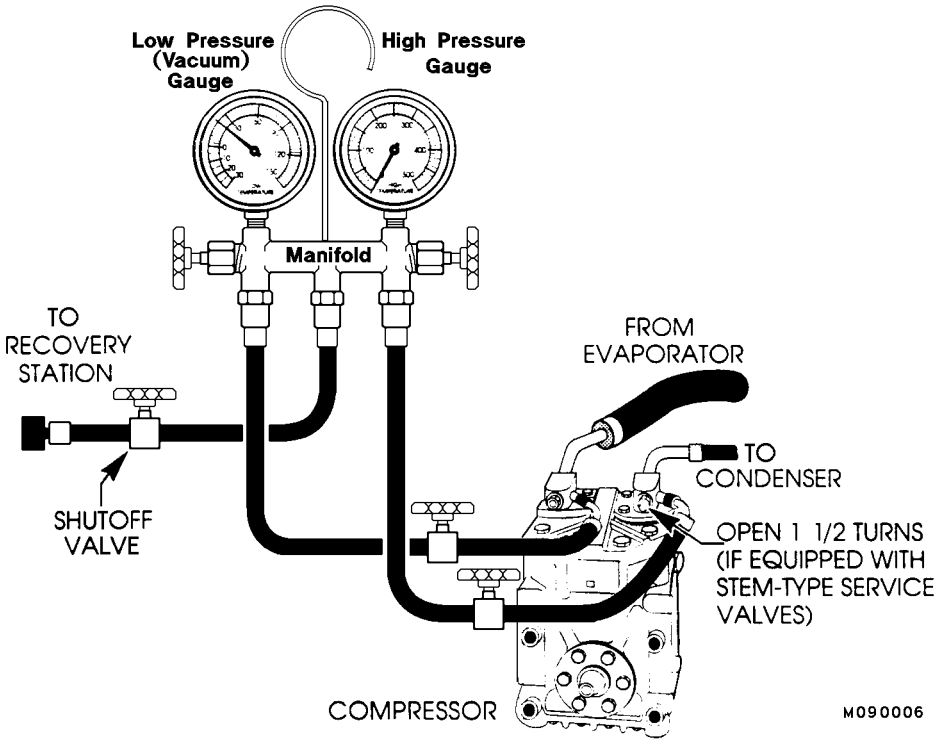


FIGURE 9-9. PURGING SYSTEM

EVACUATING THE SYSTEM

Evacuating the complete air conditioning system is required in all new system installations, and when repairs are made on systems requiring a component replacement (system opened), or a major loss of refrigerant has occurred. All these conditions will require that a vacuum be pulled using a vacuum pump that completely removes any moisture from the system. Once properly evacuated, the system can be recharged again.

Using a pump to create a vacuum in the air conditioning system effectively vaporizes any moisture, allowing the water vapor to be easily drawn out by the pump. The pump does this by reducing the point at which water boils (212°F at sea level with 14.7 psi). In a vacuum, water will boil at a lower temperature depending upon how much of a vacuum is created.

As an example, if the ambient air outside the truck is 75°F at sea level, by creating a vacuum in the system so that the pressure is below that of the outside air (in this case, at least 29.5 inches of vacuum is needed), the boiling point of water will be lowered to 72°F. Thus any moisture in the system will vaporize and be drawn out by the pump if the pump is run for approximately an hour. The following steps indicate the proper procedure for evacuating all moisture from the heavy duty air conditioning systems.

Do not use the air conditioning compressor as a vacuum pump or the compressor will be damaged.

NOTE: Lower the vacuum requirement one inch for every 1000 feet above sea level at your location.

1. With the manifold gauge set still connected (after discharging the system), connect the center hose to the inlet fitting of the vacuum pump as shown in Figure 9-10. Then open the low side hand valves to maximum.
2. Open the discharge valve on the vacuum pump or remove the dust cap from the discharge outlet. Turn the pump on and watch the low side gauge. The pump should pull the system into a vacuum (if not, the system has a leak).
3. Run the pump for five minutes and close the hand valves and shut off the pump.

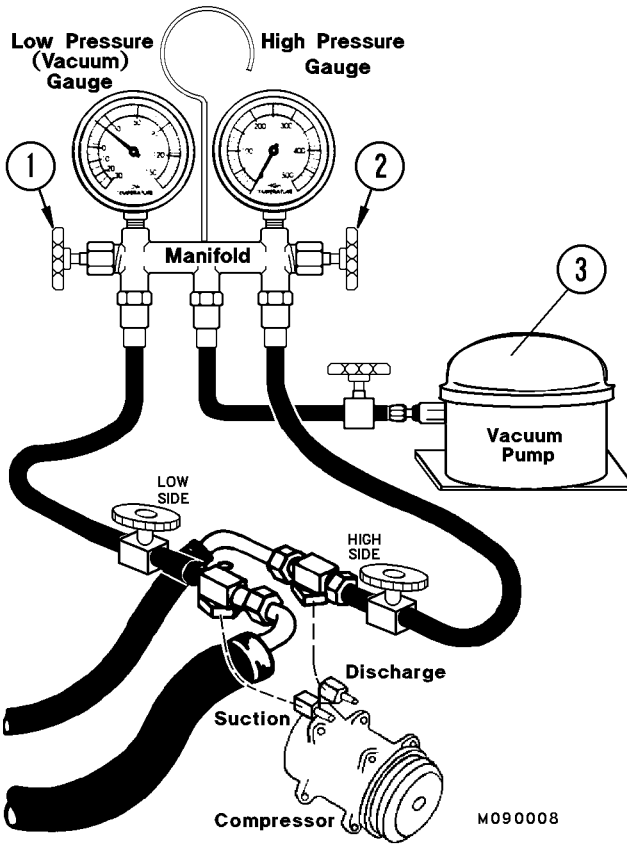


FIGURE 9-20. VACUUM PUMP HOOKUP

1. Low Pressure Hand Valve
2. High Pressure Hand Valve
3. Vacuum Pump

4. Observe gauge reading and wait 10 minutes. Reading should not vary more than 1-2 in. hg. After waiting, if more vacuum is lost than this, a serious leak is indicated and the system must be recharged, leak tested, repaired and evacuated.
5. Turn on pump, open hand valves and continue evacuation for at least one hour.

NOTE: If system has excessive amounts of moisture, 60 minutes evacuation may not be sufficient since the water must turn to a vapor to be drawn out of the system. If it has been verified that no system leaks exist and gauge readings increase after 1 hour, extend the evacuation time to ensure total moisture removal.

6. Close the manifold hand valves and turn off vacuum pump, watching the low side gauge reading. If vacuum remains for a few minutes, the system is ready for charging.

PREVENTATIVE MAINTENANCE SCHEDULE FOR AC SYSTEM

Truck Serial Number_____

Site Unit Number_____

Date:_____Hour Meter:_____

Last Maintenance Check:_____

Name of Service Technician_____

NOTE: Compressor should be run at least 5 minutes (40°F minimum ambient temperature) every month, in order to circulate oil and lubricate components.

COMPONENT	Maintenance Interval (months)			
	3	6	12	Done
1. Compressor Check noise level Check clutch pulley Check oil level Run system 5 minutes Check belt tension (80-100) lbs; V-belt Inspect shaft seal for leakage Check mounting bracket (tighten bolts) Check clutch alignment w/ crankshaft pulley (within 0.06 in.) Perform manifold gauge check Verify clutch is engaging				
2. Condenser Clean dirt, bugs, leaves, etc. from coils (w/compressed air) Verify engine fan clutch is engaging (if installed) Check inlet/outlet for obstructions or damage				
3. Receiver-Drier Check inlet line from condenser (should be hot to touch) Replace, if system is opened				

COMPONENT	Maintenance Interval (months)			
	3	6	12	Done
4. Expansion Valve Inspect capillary tube (if used) for leakage, damage, looseness			X	
5. Evaporator Clean dirt, bugs, leaves, etc. from fins (w/ compressed air) Check solder joints on inlet/ outlet tubes (leakage) Inspect condensation drain				
6. Other Components Check discharge lines (hot to touch) Check suction lines (cold to touch) Inspect fittings/clamps/hoses Check thermostatic switch for proper operation Outlets in cab: 40°F to 50° F Inspect all wiring connections Operate all manual controls through full functions				

TIPS FOR OPERATION

To assure the On Board Weighing System records the most accurate and consistent data, these important steps should be followed:

- Always keep suspension oil and nitrogen properly charged. The most common failure for causing inaccurate payload data is due to improperly charged suspensions. Always follow shop manual procedures when charging a suspension. Refer to Section "H". It is crucial to maintain the proper oil and nitrogen levels at all times.
- For most Komatsu Trucks:

  Use only the brake lock switch to hold the truck stationary at the loading and dumping area.

  For Komatsu 330M/HD785 Trucks ONLY: Use the **park brake switch** to hold the truck stationary at the loading and dumping area.

  Any other method will not allow the payload system to register properly.
- Do not activate the "Lamp Test" switch during loading. Inaccurate and inconsistent data may be stored.
- At the loading area do not release the Brake Lock (or Park Brake switch) until the loading is **complete** and the load shock from the last load dumped has settled.
- The loading area surface **must be** maintained as flat and level as possible. The On Board Weighing System can compensate for slight variations in grade and unevenness, but ruts, berms, rocks, etc. will cause the system to record inaccurate and inconsistent data.
- Regularly remove "carryback" from the dump body.
- Calibrate regularly. Refer to "Calibrating a Truck".
- Do not focus on single payloads when viewing data from the payload meter. Use the average of several payloads to get a more accurate calculation of payload productivity.

EXTERNAL DISPLAY LIGHTS

The Payload Meter II™ controls three light relays. The relays operate three deck mounted lights on each side of the truck. There is one green light, one amber light, and one red light. (Figure 20-2)

While the truck is stopped being loaded and the hoist lever is in the float position, the appropriate lights will remain on according to the following schedule:

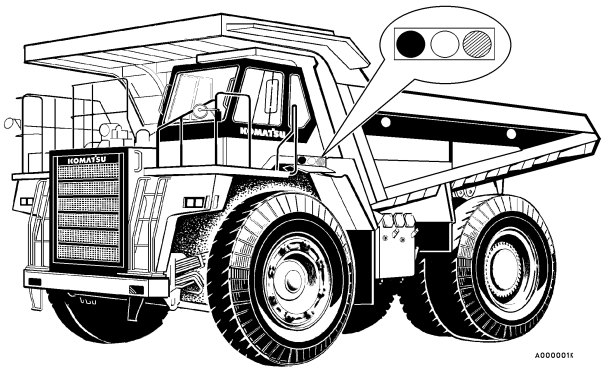


FIGURE 20-2. LOAD INDICATOR LIGHTS

INDICATOR LIGHTS			PAYLOAD WEIGHT
Off	Off	Green	50% and Greater
Off	Amber	Green	90% and Greater
Red	Amber	Green	105% and Greater

The shovel or loader operator can predict the payload weight by observing these lights. During the loading operation, a forecast feature flashes a deck mounted light predicting the payload weight after the next bucket of material is loaded into the body. The logic is as follows:

1. If the measured payload is varying 3% or less of the rated load for more than 3 seconds, the current load is deemed a steady value.
2. If the difference between the previous steady value and the current steady value is greater than 15% of the rated load, the difference is taken to be the size of the current bucket.
3. The average size of previous buckets is added to the current load. One of the deck mounted lights will turn on, if another "average" size load is put in the body, and will blink at one second intervals.

Checking the Operator Check Mode

The Operator Check Mode is used to check and change several settings. These should be checked before the payload meter is put into service.

1. Press and hold the MODE switch. The display will show: 
2. Press the MODE switch once. The display will show: Refer to "Data All Clear" to clear the haul cycle data. 
3. Press the MODE switch once. The display will show: Refer to "Display of Fault Codes" for viewing fault codes. 
4. Press the MODE switch once. The display will show: This is the truck ID number. Refer to "Setting The Machine ID" to change Machine ID. 
5. Press the MODE switch once.The display will show. 

   Refer to "Setting The Operator ID" to change operator.
6. Press the MODE switch once. The display will show: 

   "SP:62" should be displayed. The speed limit should be set to 62 to avoid unnecessary faults and warnings. Refer to "Setting The Speed Limit" to make adjustments.
7. Press the MODE switch once. The display will show: 

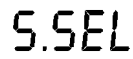
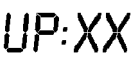
   Refer to "Setting The Option Code" to change the option.
8. Press the MODE switch once.The current time should be displayed with the minutes flashing. Refer to "Setting The Time And Date" to change the time and date. 
9. Push the MODE switch to return to normal operation.

Checking the Service Check Mode

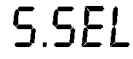
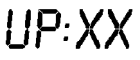
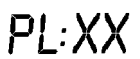
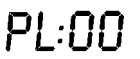
⚠ IMPORTANT ⚠

Refer to page 24 for additional information on UP Factor and PL Mode prior to setting these values.

Setting "UP:XX"

1. Press and hold the LIGHT/INC and MODE switches. The display will show: 
2. Press and hold the LIGHT/INC and TOTAL/SFT switches. The display will show: 
3. Press the CAL/CLR switch once. The display will show: 
4. Press the LIGHT/INC switch until "XX" is set to the desired gain (± 9%).
5. Press MODE. The display will show: 
6. Press MODE and the meter will return to normal operation.

Setting "PL:00"

1. Press and hold the LIGHT/INC and MODE switches. The display will show: 
2. Press and hold the LIGHT/INC and TOTAL/SFT switches.The display will show: 
3. Press the CAL/CLR switch once. The display will show: 
4. Press the CAL/CLR switch once. The display will show: 
5. Press the LIGHT/INC switch until "PL:00" is displayed. **ONLY "PL:00" IS RECOMMENDED.** 
6. Press the MODE switch. The display will show. 
7. Press MODE and the meter will return to normal operation.

UP FACTOR - PAYLOAD CALCULATION GAIN

Description of UP Factor

The payload calculation gain, or UP factor is multiplied to the actual calculated load. From the example shown in Figure 20-4, the calculated load is 143.8 tons. If the UP factor is set to +5% the displayed load will be 143.8 x 1.05 = 151 tons. This factor can be used to minimize the effects of systematic error for a particular truck. The UP factor is not applied uniformly to all load calculations. There are three operating modes for the payload meter and the UP factor is applied differently to each mode. Therefore, it is recommended that this percentage be set to 0. There are significant differences in final calculated load that can be introduced by adjusting this gain.

⚠ IMPORTANT ⚠

Payload meters sent from the factory are typically set to "UP: 5" indicating a +5% gain in final load. This should be checked on all new meters and changed to "UP: 0".

PL MODE -LOAD CALCULATION TIMING

Load Calculation Timing

The PL mode controls when the payload meter takes a sample of the data and calculates the load. There are three modes available. There are two sets of data that are affected by the PL mode setting.

- Modular Mining Transmission
- Memory Storage

The PL mode setting can have a significant impact on the perceived accuracy of the payload meter.

PL:00 is the only recommended setting.

⚠ IMPORTANT ⚠

Use of settings other than PL:00 is NOT recommended.

Careful consideration must be given to the use of PL:01 and PL:10. These modes divide the data transmitted by Modular Mining and the data stored in the payload meter's memory. Additionally, each mode handles the UP factor differently and can calculate different loads for the same haul cycle. For these reasons **it is recommended that the payload meter be set to use PL:00 in all cases**.

PL:00

Modular Mining Transmission - The data is captured at the last transition from 0 to 1 MPH prior to traveling 160 meters from the shovel. The captured data is transmitted when the truck travels 160m from the shovel. This load calculation **will use** the UP factor percentage.

Memory Storage - Same as above, the data is captured at the last transition from 0 to 1 MPH prior to traveling 160 meters from the shovel. The captured data is stored into memory when the body rises at the dump. This load calculation **will use** the UP factor percentage.

PL:01

Modular Mining Transmission - The data is captured at the last transition from 0 to 1 MPH prior to traveling 160 meters from the shovel. The captured data is transmitted when the truck travels 160m from the shovel. This load calculation **will use** the UP factor percentage.

Memory Storage - The data is captured and stored when the body rises from the frame. This calculation **will not use** the UP factor percentage.

PL:10

Modular Mining Transmission - The data is captured and transmitted when the truck travels 160 meters from the shovel. This calculation **will not use** the UP factor percentage.

Memory Storage - The data is captured and stored when the body rises from the frame. This calculation **will not use** the UP factor percentage.

Symptom Table

PROBLEM	PROBABLE CAUSE
Payload meter is not recording haul cycles.	Broken or missing body-up signal. The body up signal triggers the PLM II™to start a new haul cycle. Check using the "Monitoring Input Signals" procedure.
Only one haul cycle in memory.	
Display shows payload all the time.	Broken or missing speed signal. Check using the "Monitoring Input Signals" procedure.
Display does not show time when the truck is traveling.	
No distance or speed information is recorded in the haul cycle data.	
Payload meter does not 'count up' while driving away from the shovel.	
Payload meter will not calibrate.	
F-18 fault	Missing alternator R-terminal signal. Troubleshoot signal or make modification to eliminate signal. Refer to the “F-18: R-Terminal, Oil Pressure Signals” on the following page.
F20 - F28 faults flashing	Shorted sensor power or ground. Troubleshoot wiring. Refer to the "Shorted 18v Sensor Power Supply" fault tree in this section.
Pressure sensor value drifts up or down erratically.	

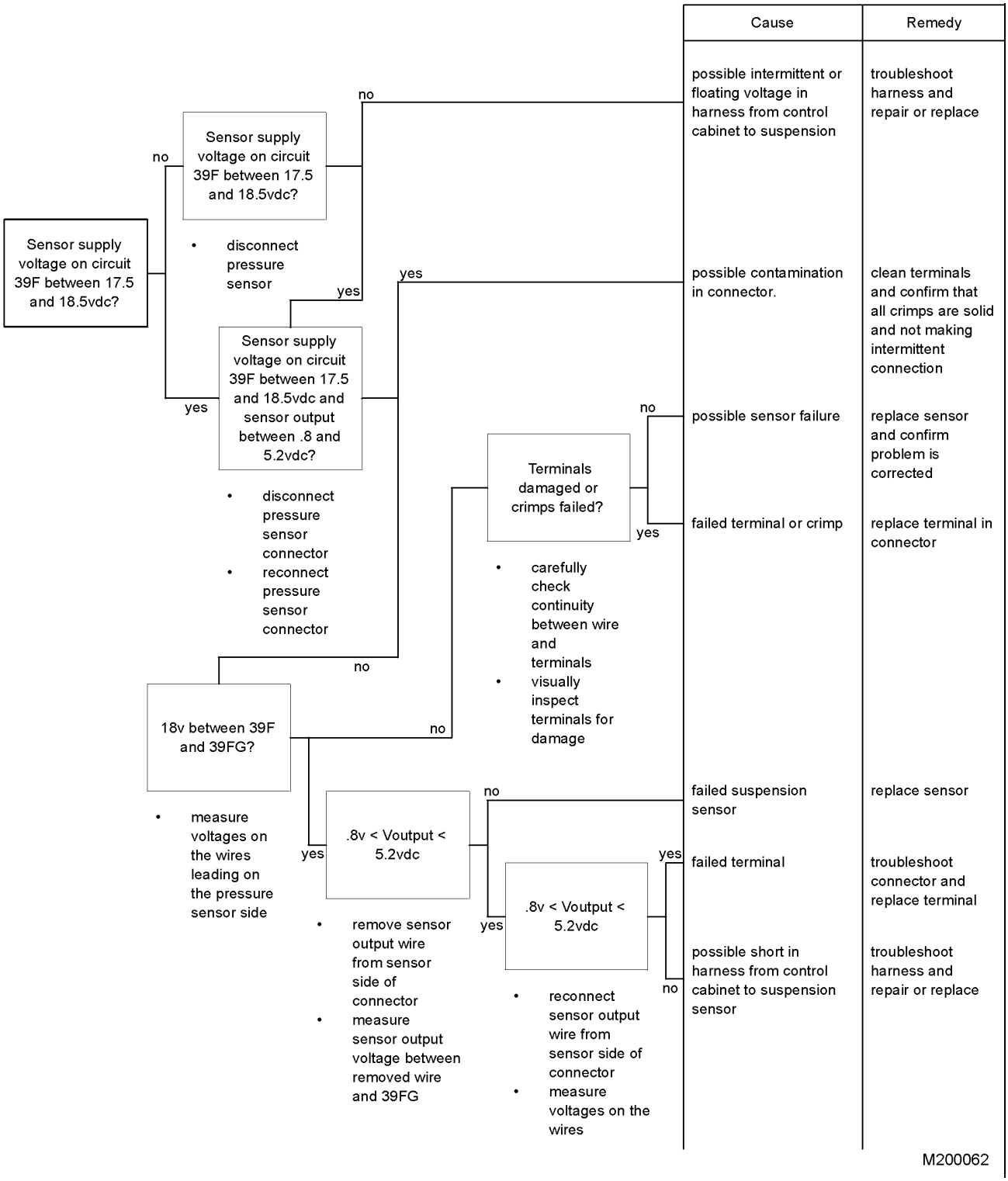
Missing Body-Up Signal

The payload meter starts a new haul cycle after the body comes down from dumping the last haul cycle. Each new haul cycle starts at the dump. Without a body-up signal, the payload meter does not know that a new haul cycle has started. The payload meter will not record new haul cycles without the body-up signal. This is the most common sign that the signal is missing.

The body-up input signal is received from a magnetic switch located on the inside of the truck frame forward the pivot pin of the truck body. This is the same switch typically used for input to the drive system. When the body is down, the switch closes and completes the circuit to 71-Control Power. 24vdc indicates the body is down. Open circuit indicates that the body is up. This input can be checked using the "Monitoring Input Signals" procedure.

Pressure Sensor Fault Tree

NOTE: Confirm the sensor voltages using the Sensor Power Fault tree to confirm that the problem is not a failure in the harnesses coming from the cab to the control cabinet. If all the pressure sensor faults are active, check the power supply first.



REAL-TIME PAYLOAD METER II™ MONITOR PROGRAM

Originally, this program was designed for engineering testing purposes only. It was not designed for general distribution or use. This program sets the Komatsu Mining Systems Payload Meter II™ into real-time data transfer mode. This allows the technician to monitor all inputs into the system. Scope also allows for the logging of this real-time data. These files can be used to analyze the inputs over a period of time.

Scope is used to record suspension pressures during a haul cycle. These pressures can be imported into Microsoft Excel or other spreadsheet programs to graph each suspension. Visually, a service technician can look for flat or undercharged suspensions. In addition, all the input to the payload meter can be checked using the PC instead of the switches on the front panel of the payload meter

System Requirements - Microsoft Windows 95, access to serial communications port 1, EF9159 & EF9160 harnesses to connect the Payload Meter II™ to the serial port of the PC. Payload Meter II™ must also be set up to use MMS Communications Mode. This is indicated on power up of the Payload Meter by OP12. Changing this setting is described in “Setting the Option Code”.

Downloading Scope – Scope is available on the internet. It can be found at the following address:

http://www.kms-peoria.com/payload

The program, *Scopezipped.exe*, is a self-extracting executable. Save it into its own directory on your hard drive and run it. The program will unzip and be ready to run.

NOTE: This program has not been tested on all versions of Windows and may not work on all operating systems.

SECTION N
OPERATOR'S CAB
INDEX

Lift door glass up in the frame (1, Figure 2-12) so that it is near the top. Holding the glass in place, tilt frame out at the top. Lift frame and glass straight up and out of door.

⚠CAUTION

Bracket (2, Figure 2-12) at bottom of glass must clear the door frame, if still on glass.

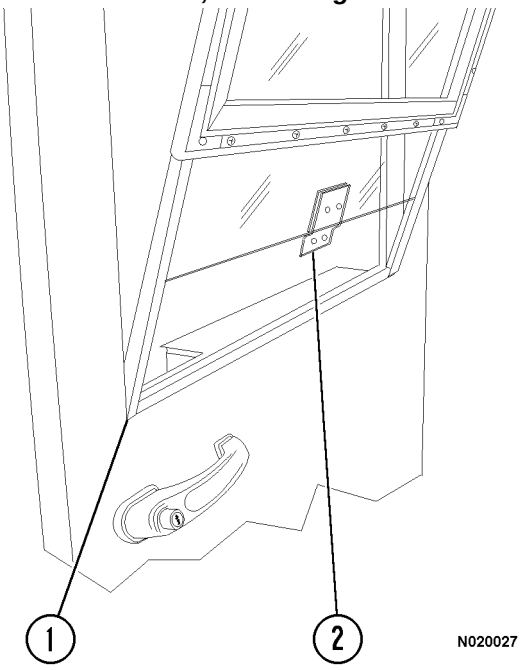


FIGURE 2-12.

1. Window Frame 2. Window Bracket

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

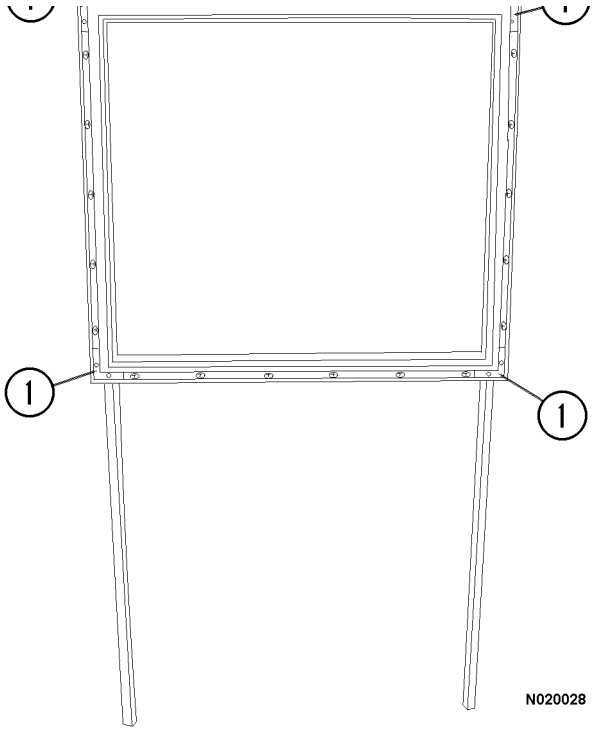


FIGURE 2-13.

1. "L" Shaped Brackets

⚠IMPORTANT⚠

Be sure the one channel (5, Figure 2-14) which is next to the door latch passes to the inside of the latch assembly (4).

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

⚠CAUTION

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

16. Install trim material over the top of screws that holds the window frame to the door. Use a flat blade screwdriver to assist with installing the trim material. See Figure 2-15. Be careful not to cut the retainer lip on the trim material.

OPERATOR COMFORT

OPERATOR SEAT

The operator's seat provides a fully adjustable cushioned ride for the driver's comfort and ease of operation.

Adjustment

The following adjustments must be made while sitting in the seat.Refer to Figure 4-1 for the following:

- **Headrest (1)**: Move up, down, fore, or aft by moving headrest to desired position.
- **Armrests (2)**: Rotate adjusting knob at front of armrest (either side) until armrest is in desired position.
- **Seat Belt (3)**: Make all other seat adjustments first. Then fasten seatbelt to other side (not shown) and adjust to a firm, but comfortable, restraint. *The seat belt should always be fastened when operating Truck*
- **Lumbar Support Adjustment (4, 5):** Each rocker switch controls an air pillow. Switch (5) controls the lower air pillow and switch (4) controls the upper air pillow. To inflate, press on top of rocker switch and hold for desired support, then release. To deflate, press on bottom of rocker switch and hold for desired support, then release. Adjust each pillow for desired support.
- **Seat Height (6)**: Press rocker switch on top to increase ride height. Press on lower part of rocker switch to lower ride height.
- **Backrest (7)**: Pull control upward and hold; select backrest angle; release control handle.
- **Fore/Aft Location of Seat (8)**: Raise adjustment lever; move seat to desired position; release lever.
- **Front Height and slope Adjustment of Seat Cushion (9):** Lift up control lever and hold; bend knees to move seat to a comfortable position; release control lever to lock adjustment

Seat Removal

1. Remove capscrews (10, Figure 4-1) and hardware that secures the seat base to the riser. Remove capscrews (11) that secures tether to floor.
2. Remove seat assembly from cab to clean work area for disassembly.

Seat Installation

1. Mount seat assembly to seat riser. Install capscrews (10, Figure 4-1), lockwashers, flatwashers and nuts. Tighten capscrews to standard torque.
2. Fasten tether straps to floor with capscrews (11), flatwashers and lockwashers. Tighten capscrews to standard torque.

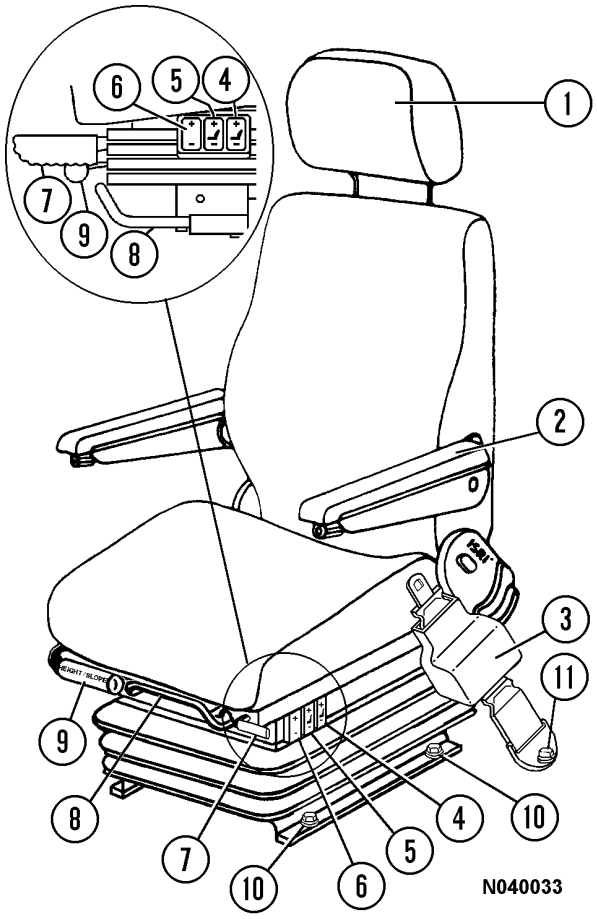


FIGURE 4-1. OPERATOR'S SEAT AND ADJUSTMENT CONTROLS

1. Headrest
2. Armrests
3. Seat Belt
4. Upper Lumbar Support Adjustment
5. Lower Lumbar Support Adjustment
6. Seat Suspension Adjustment
7. Backrest Angle Adjustment
8. Fore and Aft Adjustment
9. Height and Slope Adjustment
10. Seat Mounting Hardware
11. Seat Belt Anchor Hardware

HEATER / AIR CONDITIONER COMPARTMENT AND CONTROLS

The heater/air conditioner compartment contains the heater/air conditioner controls (6, Figure 5-1) and the heater/air conditioner components, such as the blower motor assembly and heater coils. Optimum cab air climate can be selected by using the following controls in various combinations.

DEFROSTER VENT CONTROL SWITCH

The defroster control switch (1, Figure 5-4) directs heated air for windshield defrosting.
"Down" position of the toggle switch is OFF.
"Up" position of the toggle switch is On.

HEAT VENT CONTROL SWITCH

The heater control (2, Figure 5-4) directs heated air to the cab floor for heating of the cab.
"Down" position of the toggle switch is OFF.
"Up" position of the toggle switch is On.

FAN CONTROL KNOB

The fan control knob (3, Figure 5-4) is provided to control the cab air fan motor. The fan motor is a 3-speed motor (low, medium and high). Speeds are selected by rotating the control knob clockwise to the desired position. "Off" is full counter-clockwise position.

AIR CONDITIONER CONTROL KNOB

The Air Conditioner control knob (4, Figure 5-4) controls the air conditioner to cool the cab air. Cooler temperatures are selected by rotating the control knob clockwise to the desired temperature. Full clockwise position is coldest setting. "Off" is full counter-clockwise position.

OUTSIDE/INSIDE AIR CONTROL SWITCH

The outside/inside air control switch (5, Figure 5-4) allows either outside or inside air to be circulated through the cab heater assembly.

Moving the switch "Up" directs outside air to be circulated through the heater assembly and through the cab.

Moving the switch "Down" directs inside air to be recirculated through the heater assembly.

SELECTION CONTROL SWITCH

The Selection Control knob (6, Figure 5-4) is provided for the operator to select a comfortable temperature.

Rotating the knob counter-clockwise (blue arrow) will select cooler temperatures.
Full counter-clockwise position is the coldest air conditioning setting.

Rotating the knob clockwise (red arrow) will select warmer temperatures. Full clockwise position is the warmest heater setting.

HEATER/AIR CONDITIONER VENTS

These heater/air conditioner vents (7, Figure 5-4) may be rotated 360°. Air flow through the vents is controlled by manually opening/closing or turning the louvers.

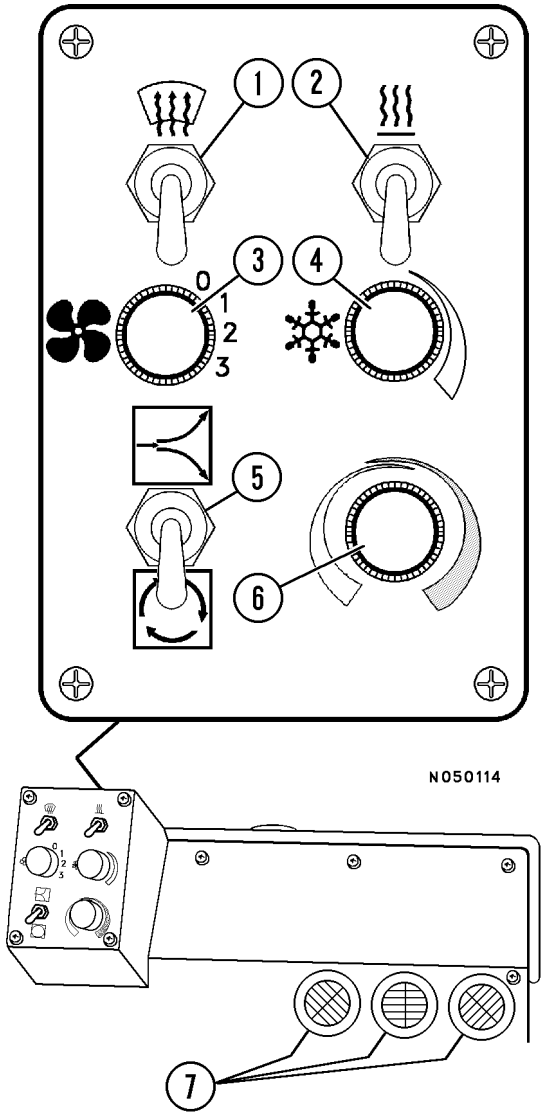


FIGURE 5-4. A/C & HEATER CONTROLS

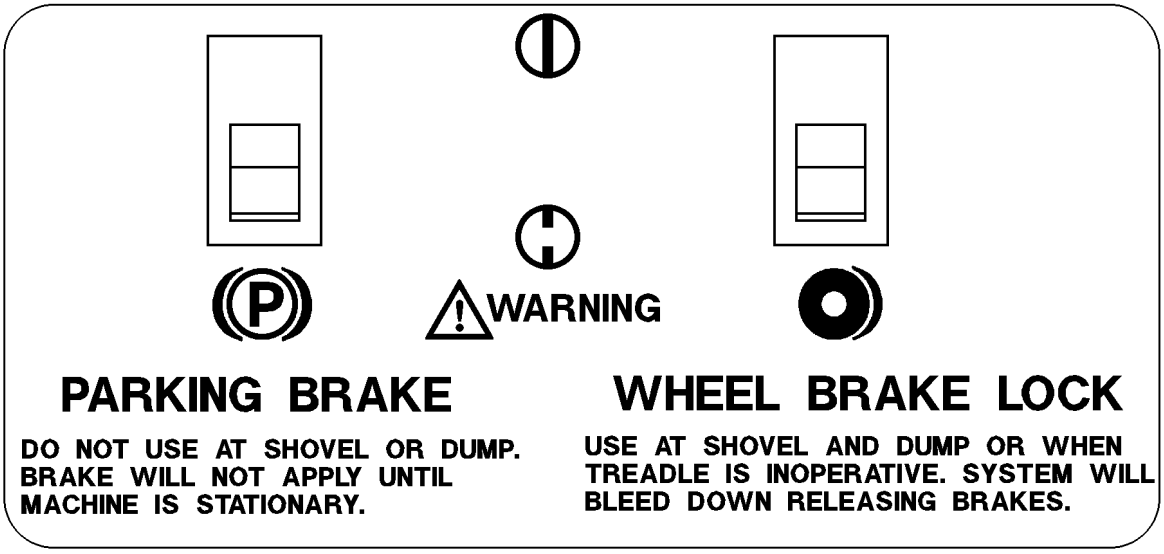
(12, Figure 5-6) WHEEL BRAKE LOCK CONTROL

The Wheel Brake Lock should be used with engine running for dumping and loading operations only. The brake lock switch actuates the hydraulic brake system which locks the **rear wheel service brakes only**. When pulling into shovel or dump area, stop the truck using the foot-operated service brake pedal. When truck is completely stopped and in loading position, apply the brake lock by pressing the rocker switch toward the “On” symbol. To release, press the rocker switch toward the “Off”symbol.

Use at shovel and dump only to hold truck truck in position.

Do not use this switch to stop truck, unless foot-operated treadle valve is inoperative. Use of this switch applies rear service brakes at full, unmodulated pressure!

Do not use brake lock for parking. With engine stopped, hydraulic pressure will bleed down, allowing brakes to release!



(13, Figure 5-6) PARKING BRAKE CONTROL

The Parking Brake is spring applied and hydraulically released. It is designed to hold a stationary truck when the engine is shutdown and keyswitch is turned “Off”. The truck must be completely stopped before applying the parking brake, or damage may occur to parking brake.
To apply the parking brake, press the rocker switch toward the “On” symbol. To release the parking brake, press the rocker switch toward the “Off”symbol. When the keyswitch is “On” and Parking Brake switch is applied, the Parking Brake indicator light (A3, Overhead Panel) will be illuminated.

NOTE: Do not use the parking brake at shovel or dump. With keyswitch “on” and engine running, sudden shock caused by loading or dumping could cause the system’s motion sensor to RELEASE the park brake.

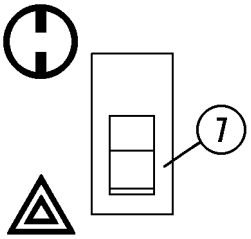
(14, Figure 5-6) TACHOMETER

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

Governed RPM (MTU/DDC 4000 Series):

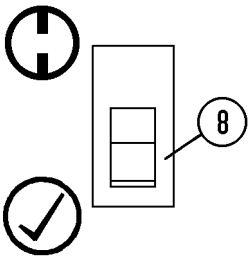
Low Idle — 600 RPM
High Idle, No load — 1920 RPM
High Idle, Full Load — 1900 RPM

(7) HAZARD WARNING LIGHTS



The hazard warning light switch flashes all the turn signal lights.
Pressing the bottom side of the rocker switch (toward the triangle) activates these lights. Pressing the top side of the rocker switch (toward the “OFF” symbol) turns these lights off.

(8) LAMP TEST SWITCH



The Lamp Test switch is provided to allow the operator to test the indicator lamps prior to starting the engine. To test the lamps, and the warning horn, turn the key switch (1, Figure 5-6) to the “Run” position and press the bottom side of the rocker switch for the “Check” position. All lamps should illuminate, except those which are for optional equipment that is not installed. The warning horn should also sound. Any lamp bulbs which do not illuminate should be replaced before operating the truck.
Releasing the spring-loaded switch will allow the switch to return to the “Off” position.

250 HOUR LUBRICATION AND MAINTENANCE CHECKS

Maintenance for every 10 & 50 hour Lubrication and Maintenance Checks should also be carried out at this time.

Truck Serial Number _____

Site Unit Number _____

Date:_____Hour Meter_____

Name of Service person_____

NOTE: "Lube Key" references are to the Lubrication Specification Chart.

1. HYDRAULIC SYSTEM FILTERS - Change filter elements after the ***initial 250 hours***; then at each 500 hours of operation thereafter.
2. FUEL FILTER AND STRAINER - Change filter and strainer element.
3. MOTORIZED WHEEL GEAR CASE - Refer to the G.E. planned maintenance manual and specific motorized wheel service manual.
4. STEERING LINKAGE - Add one or two applications of grease to each grease fitting for pin and bearing. Check torque on steering pin nuts **525 ft. lbs. (712 N.m)** torque. Use Lube Key "E".

   NOTE: This "grease application" can be omitted, if truck is equipped with Automatic Lubrication System. However, all lube points should be checked to be certain that all points are receiving grease. Look for broken lines, or signs that injectors may be inoperative.

5. COOLING SYSTEM DCA WATER FILTER - Change spin-off filter. Check cooling system for proper coolant mixuture. Add water mixture as required.

COMMENTS	√'d	INITIALS

POSSIBLE CAUSES	*SUGGESTED CORRECTIVE ACTION*
TROUBLE: Pump Will Not Build Pressure	
Pump not primed.	See items in “Pump Will Not Prime”.
Air trapped in lubricant supply line.	Prime system to remove trapped air.
Lubricant supply line leaking.	Check lines and connections to repair leakage.
Vent valve leaking.	Clean or replace vent valve.
Pump cylinder scored, by-passing air.	Repair or replace pump cylinder or pump assembly.

TROUBLE: Injector Indicator Stem Does Not Operate

NOTE: Normally, during operation, the injector indicator stem (Figure 3-4) will move into the body of the injector when pressure builds properly. When the system vents (pressure release) the indicator stem will again move out into the adjusting yoke.

Malfunctioning injector - usually indicated by the air pump building pressure and then venting.	Replace individual injector assembly.
All injectors inoperative - pump build up not sufficient to cycle injectors.	Service and/or replace pump assembly.

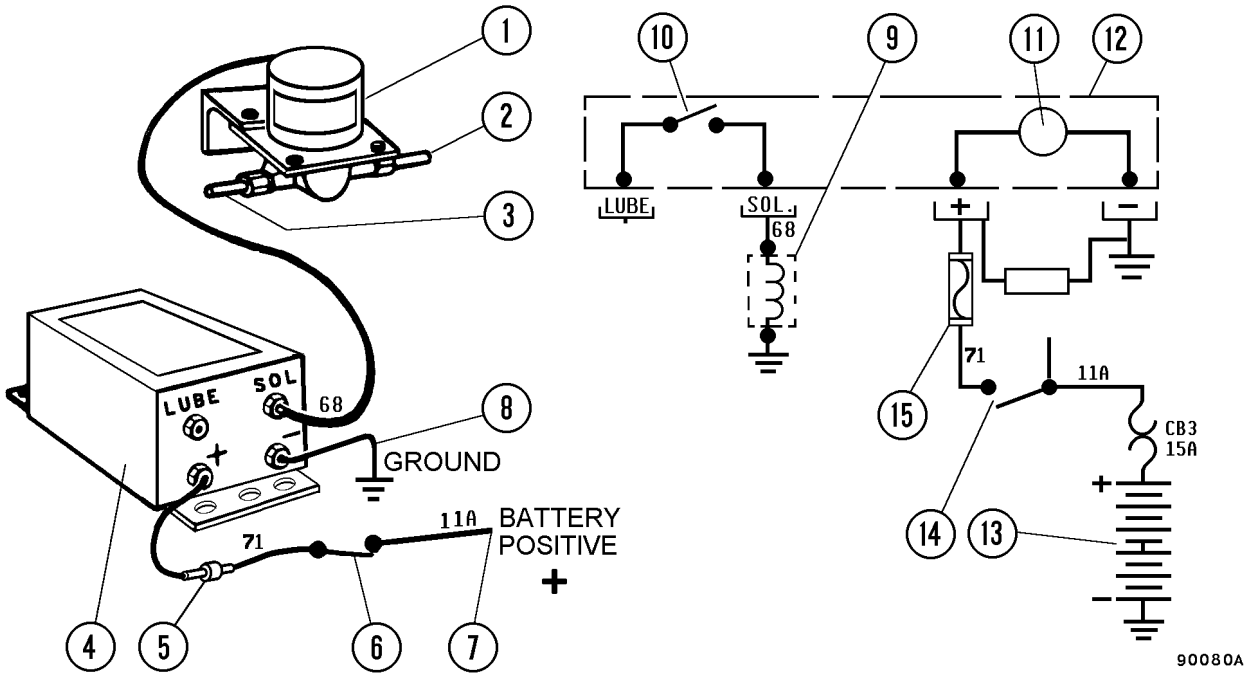


FIGURE 3-5. TYPICAL ELECTRICAL HOOKUP FOR AUTOMATIC LUBE

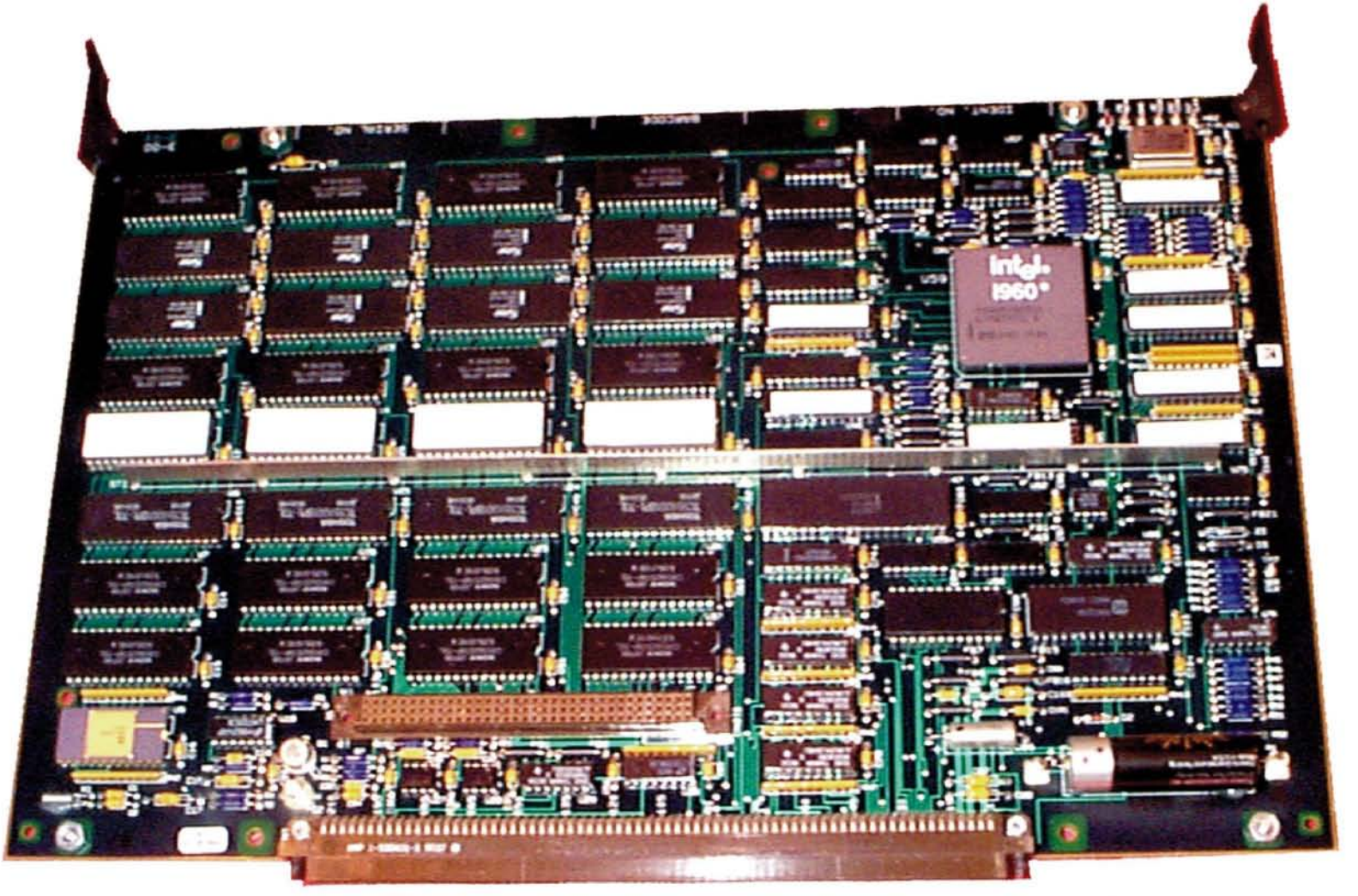
1. Solenoid Air Valve
2. Main Air Supply
3. To Air Pump Motor
4. Timer *
5. Fuse Holder
6. Keyswitch
7. To Battery (+)
8. To Ground (-)
9. Solenoid
10. Relay
11. Timer (solid State)
12. Timer (Housing)
13. Battery
14. Keyswitch
15. 7.5 Amp Fuse

* Keyswitch (6) must be closed ("ON") to energize Timer (4).

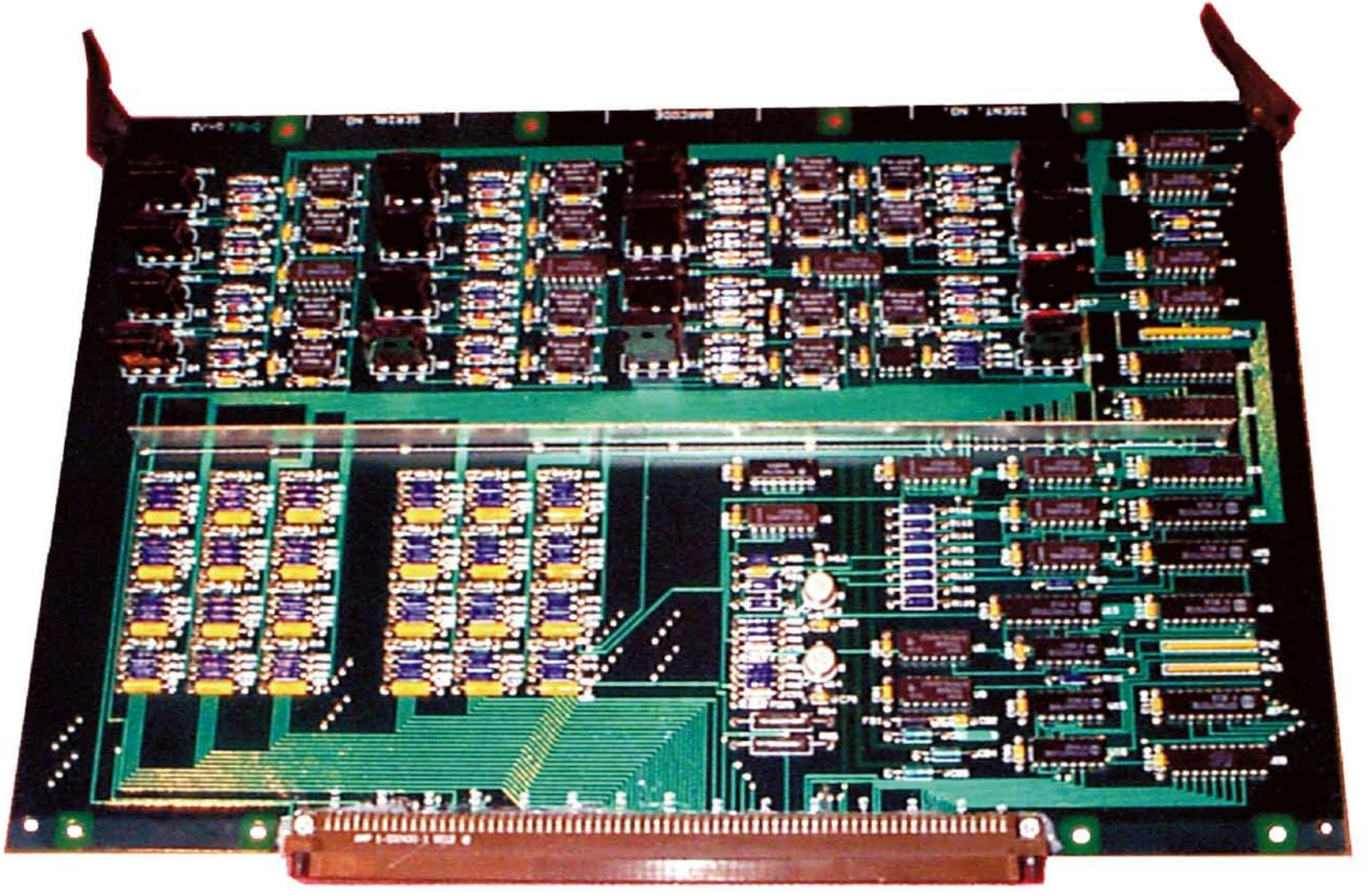
SECTION R

SYSTEM SCHEMATICS

INDEX



FB101 Processor Card



FB 103 Digital I/O Card

Figure D (Continued)
CONNECTOR D
(All Signals Digital)
(* signal for trolley only)

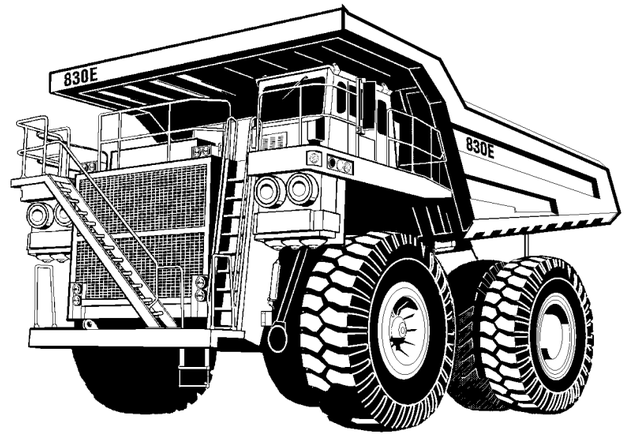
SIGNAL NAME	DESCRIPTION	CONNECTOR PIN NO. [ ] = +5V < > = GROUND ( ) = SHIELD	TYPE OF SIGNAL
SPARE	Spare (Not Currently Used)	86	INPUT
SPARE	Spare (Not Currently Used)	90	INPUT
SPARE	Spare (Not Currently Used)	102	INPUT
SPARE	Spare (Not Currently Used)	101	INPUT
SPAREOUT2	Spare (Not Currently Used)	22 <99>	OUTPUT
SPAREOUT3	Spare (Not Currently Used)	9 <10>	OUTPUT
SPAREOUT4	Spare (Not Currently Used)	85 <23>	OUTPUT
* SRSW1	Trolley Speed Reduction sw 1	17	INPUT
* SRSW2	Trolley Speed Reduction sw 2	16	INPUT
* SRSW3	Trolley Speed Reduction sw 3	15	INPUT
* SRSW4	Trolley Speed Reduction sw 4	33	INPUT
* TC1	Energizes TC1 Contactor Coil Low Side Driver	70, <58>	OUTPUT
* TC11	Energizes TC1 Contactor Coil Low Side Driver	59, <71>	OUTPUT
* TC1FB	TC1 Contactor is Closed	1	INPUT
* TC2	Energizes TC2 Contactor Coil Low Side Driver	94, <81>	OUTPUT
* TC21	Energizes TC2 Contactor Coil Low Side Driver	93, <80>	OUTPUT
* TC2FB	TC2 Contactor is Closed	21	INPUT

HE465
May 99

830E

(AFE50)

Statex III / 4000 DDC
24Volt Electrical Schematic



KOMATSU

HE465 SCHEMATIC CONNECTOR & TERMINAL BOARD INDEX AND LOCATOR

CONNECTOR INDEX AND LOCATOR	
R - 1	Engine Sub-Frame
R - 7	DDEC - Electric Control Module (ECM)
R - 8	Fuel Tank
R - 10	LR Suspension (Payload)
R - 11	R.R. Suspension (Payload)
R - 100	
R - 161	Left Cab Door Window
R - 162	Right Cab Door Window
R - 200	
R - 201	Overhead Display Panel Area
R - 202	Overhead Display Panel Area
R - 203	Left Upper Panel - Dash
R - 204	Left Lower Panel - Dash
R - 205	W/s Wiper Switch
R - 206	Right Lower Panel - Dash
R - 207	Right Upper Panel - Dash
R - 208	Overhead Display Panel Area
R - 209	Overhead Display Panel Area
R - 210	Overhead Display Panel Area
R - 211	Overhead Display Panel Area
R - 212	Overhead Display Panel Area
R - 213	Overhead Display Panel Area
R - 214	Heater Control
R - 215	Heater Solenoid (Not Used with Heater Water Control Module)
R - 216	Steering Column
R - 217	Cab Rear (Lower Right Side)
R - 218	Cab Rear (Lower Right Side)
R - 219	Passenger Seat Area
R - 220	Passenger Seat Area
R - 221	Passenger Seat Area
R - 222	Passenger Seat Area
R - 223	Passenger Seat Area
R - 224	Passenger Seat Area
R - 225	Passenger Seat Area
R - 226	Passenger Seat Area
R - 227	Passenger Seat Area
R - 228	Air Pump - Driver Seat
R - 229	Cab Rear (Lower Right Side)
R - 230	Passenger Seat Area
R - 231	Passenger Seat Area
R - 232	Passenger Seat Area
R - 233	Cab Rear (Lower Right Side)
R - 234	5 - min. Timer Relay
R - 235	Retard Pedal
R - 236	Throttle Pedal
R - 238	Passenger Seat Area
R - 239	Cab Rear (Lower Right Side)
R - 240	Brake/Hydraulic Cabinet
R - 241	Cab Rear (Lower Right Side)
R - 242	Cab Rear (Lower Right Side)
R - 243	Overhead Display Area (Payload Meter)
R - 244	Overhead Display Area (Payload Meter)
R - 247	Right Upper Panel - Dash
R - 259	Overhead Display Light Dimmer
R - 261	Overhead Display Panel Area
R - 262	Overhead Display Panel Area
R - 300	
R - 301	Right Deck Lights (Payload)
R - 302	Left Deck Lights (Payload)
R - 303	Right Front Sensor (Payload)
R - 304	Left Front Sensor (Payload)
R - 305	Rear Sensors (Payload)
R - 500	
R - 504	Left Front Sensor (On Suspension)
R - 505	Right Front Sensor (On Suspension)
R - 506	Retarding Grids
R - 700	
R - 701	L.R. Two Speed Overspeed Sensor
R - 702	R.R. Two Speed Overspeed Sensor
LRS	Left Rear Sensor
RRS	Right Rear Sensor
PR	Radio
LDC	Left Deck Connector
RDC	Right Deck Connector

TERMINAL BOARD INDEX AND LOCATOR	
TB - 2	Control Cabinet (Rear Door - 24V Junction Box)
TB - 3	Control Cabinet (Rear Door - 24V Junction Box)
TB - 4	Control Cabinet (Rear Door - 24V Junction Box)
TB - 6	Control Cabinet (Rear Door - 24V Junction Box)
TB - 10	Cab Left Front (Behind Fresh Air Vent)
TB - 11	Cab Passenger Seat
TB - 12	Cab Passenger Seat
TB - 13	Cab Passenger Seat
TB - 15	Rear Axle Housing
TB - 16	Right Side Frame (Front)
TB - 16 A	Right Side Frame (Front)
TB - 17	Left Side Frame (Front)
TB - 18	Left Side Frame (Front)
TB - 21A	Control Cabinet (Right Door - Right Side Wall)
TB - 21B	Control Cabinet (Right Door - Right Side Wall)
TB - 21J	Control Cabinet (Right Door - Right Side Wall)
TB - 21D	Control Cabinet (Right Door - Left Side Wall)
TB - 21E	Control Cabinet (Right Door - Left Side Wall)
TB - 21F	Control Cabinet (Right Door - Left Side Wall)
TB - 21G	Control Cabinet (Right Door - Left Side Wall)