HITACHI

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360ND/350HD
SERVICE
MANUAL
EDITION 2

PUBLICATION
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MACHINE:

SERIAL NO . . . . . .

ENGINE TYPE NO . . . . . .

HYDRAULIC TRANSM. TYPE/NO . . . . . .

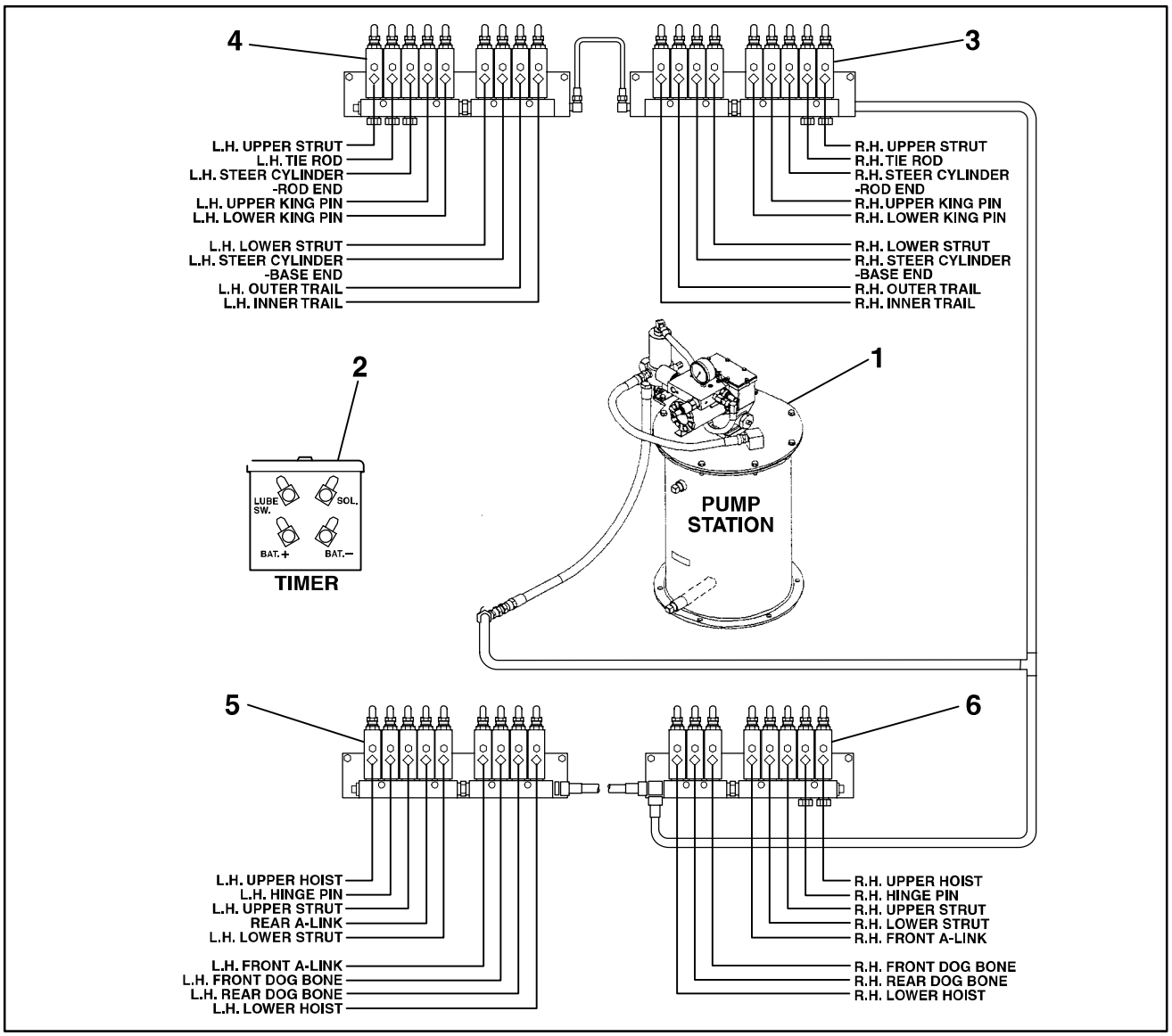
MASTER KEY SWITCH NO . . . . . .

CAB KEY NO . . . . . FUEL FILLER CAP KEY NO. . . . . .

11/01

PRINTED IN U.S.A.

AUTOMATIC CENTRALIZED LUBRICATION SYSTEM



EL19177

Figure 1 -Lincoln Centralized Lubrication System, Single Line Parallel

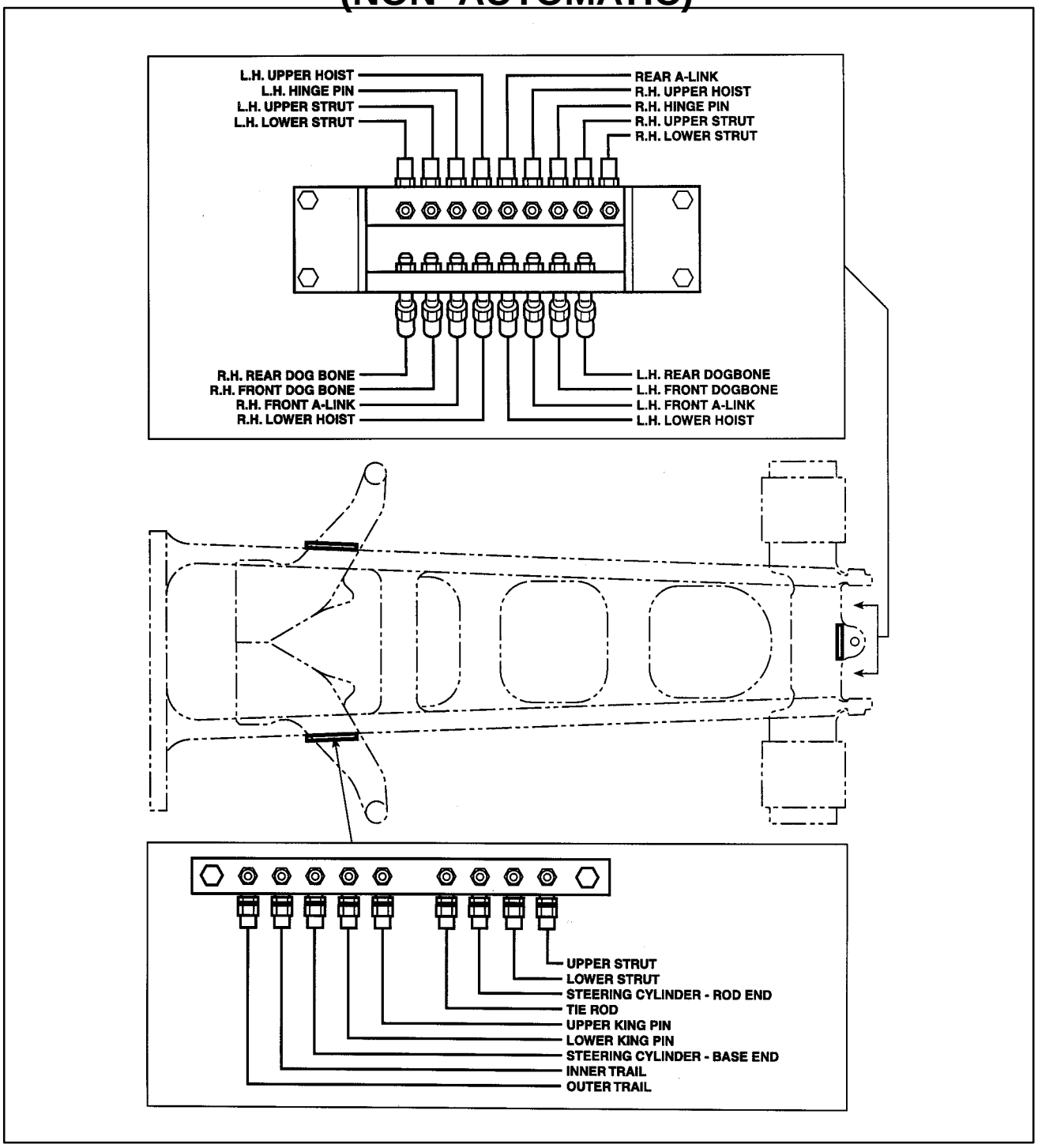
1. Electric Pump Station
2. Timer
3. Right Front Injectors
4. Right Front Injectors
5. Left Rear Injectors
6. Right Rear Injectors

DESCRIPTION

Numbers in parentheses refer to Figure 1.

The Lincoln Centralized Lubrication System provides a systematic method of lubricating a machine. While the machine is in motion, the lubricant is automatically delivered in time controlled and metered quantities to all connected lube points in the system. The major components of the system are: the electric pump station (1), the timer (2), and the injectors (3, 4, 5, 6 & 7) that direct lubricant to the various components on the machine. Typical wiring of this system is shown in Figure 2.

CENTRALIZED LUBRICATION SYSTEM (NON–AUTOMATIC)



EL19179

Figure 1 –Centralized Lubrication System

DESCRIPTION

The Centralized Lubrication System provides a systematic method of lubricating a machine by grouping the necessary lube points into easily accessed manifolds on the frame.

MACHINE SPECIFICATIONS

Put the machine in the **SERVICE POSITION**

Brake System (Group 5)

Control System . . . . . All Hydraulic
Brake Accumulator Precharge (Dry Nitrogen) . . . . . 8274 kPa (1200 psi).

Front
- Type . . . . . Dry Disc
- Location . . . . . Wheel
- Size-Disc Diameter . . . . . 101,6 cm (40 in.)
- Number of Disc per Axle 2
- Number of Pads per Axle 8
- Lining Area per Axle . . . . . 4,129 cm^2 (640 sq. in.)
- Braking Surface per Axle . . . . . 14,194 cm^2 (2,200 sq. in.)
- Brake Pressure (Maximum) . . . . . 18,960 kPa (2,750 psi)

Rear
- Type . . . . . Wet Disc
- Location . . . . . Wheel
- Size-Disc Diameter . . . . . 82,8 cm (32.6 in.)
- Number of Friction Discs per Axle . . . . . 16 (32 Surfaces)
- Area per Friction Disc Surface . . . . . 2,478 cm^2 (384 sq. in.)
- Braking Surface per Axle . . . . . 79,282 cm^2 (12,288 sq. in.)
- Brake Pressure (Maximum) . . . . . 13,790 kPa (2,000 psi)

Parking Brake
- Type . . . . . Disc, Dry
- Location . . . . . Differential Input, Flange
- Size . . . . . 69 cm (27.0 in.)
- Number of Discs per Axle 1
- Number of Pads 2
- Lining Area per Axle . . . . . 284 cm^2 (44 sq. in.)

Filter (Brake Cooling)
- Type . . . . . Return Line
- Beta 6 Ratio 200
- Rating . . . . . 6 Microns - Absolute

Retarder
- Type . . . . . Foot operated, all hydraulic actuation of oil cooled wet disc brakes on the rear axle
- Capacity (Continuous) . . . . . 1051 kW (1410 hp)
- Capacity (Intermittent) . . . . . 1820 kW (2440 hp)

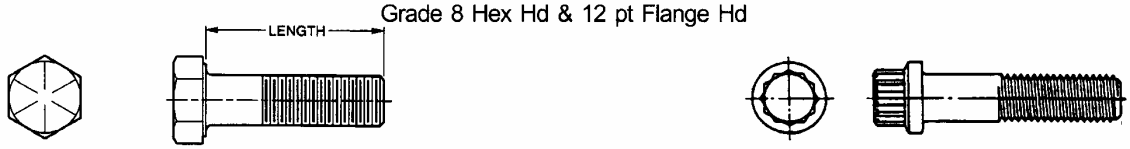
Put the machine in the **SERVICE POSITION**

35511,1
PAGE 2 of 29

Standards

TORQUE VALUES

Grade 8 Hex Hd & 12 pt Flange Hd



Plain Finish with Oil, Black Oxide with Oil or Zinc Phosphate with Oil

No Loctite

Thread Size		Dia	Clamp Lbs	Calculated Torque Ft - Lbs * = in-lbs	Calculated Torque N-M
1/4	-20	0.2500	3,244	* 122	14
1/4	-28	0.2500	3,713	* 139	16
5/16	-18	0.3125	5,345	21	28
5/16	-24	0.3125	5,916	23	31
3/8	-16	0.3750	7,905	37	50
3/8	-24	0.3750	8,956	42	57
7/16	-14	0.4375	10,843	59	80
7/16	-20	0.4375	12,107	66	90
1/2	-13	0.5000	14,474	90	123
1/2	-20	0.5000	16,310	102	138
9/16	-12	0.5625	18,564	131	177
9/16	-18	0.5625	20,706	146	197
5/8	-11	0.6250	23,052	180	244
5/8	-18	0.6250	26,112	204	277
3/4	-10	0.7500	34,068	319	433
3/4	-16	0.7500	38,046	357	484
7/8	-9	0.8750	47,124	515	699
7/8	-14	0.8750	51,918	568	770
1	-8	1.0000	61,812	773	1048
1	-14	1.0000	69,258	866	1174
1 1/4	-7	1.2500	98,838	1544	2094
1 1/4	-12	1.2500	109,446	1710	2319
1 1/2	-6	1.5000	143,310	2687	3644
1 1/2	-12	1.5000	161,262	3024	4100

The torque value used should be within ±5% of the calculated torque.

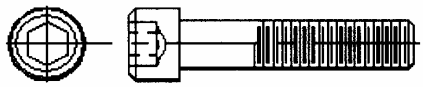
ISSUED	REVISED	REFERENCE
1988-JUN-15	ISS 5 03-01-20	ISO 898/1, CLARK DS-M13, EEPS 15

Put the machine in the **SERVICE POSITION**

35511,1
Standards
PAGE 12 of 29

TORQUE VALUES

A574 Alloy Steel -- Hex socket hd



Plain Finish with Oil, Black Oxide with Oil or Zinc Phosphate with Oil
No Loctite

Thread Size		Dia	Clamp Lbs	Calculated Torque Ft - Lbs * = in-lbs	Calculated Torque N-M
1/4	-20	0.2500	3,784	* 142	16
1/4	-28	0.2500	4,332	* 162	18
5/16	-18	0.3125	6,236	24	33
5/16	-24	0.3125	6,902	27	37
3/8	-16	0.3750	9,223	43	59
3/8	-24	0.3750	10,448	49	66
7/16	-14	0.4375	12,650	69	94
7/16	-20	0.4375	14,125	77	105
1/2	-13	0.5000	16,886	106	143
1/2	-20	0.5000	19,028	119	161
9/16	-12	0.5625	20,885	147	199
9/16	-18	0.5625	23,294	164	222
5/8	-11	0.6250	25,934	203	275
5/8	-18	0.6250	29,376	230	311
3/4	-10	0.7500	38,327	359	487
3/4	-16	0.7500	42,802	401	544
7/8	-9	0.8750	53,015	580	786
7/8	-14	0.8750	58,408	639	866
1	-8	1.0000	69,539	869	1179
1	-14	1.0000	77,915	974	1321
1 1/4	-7	1.2500	111,193	1737	2356
1 1/4	-12	1.2500	123,127	1924	2609
1 1/2	-6	1.5000	161,224	3023	4099
1 1/2	-12	1.5000	181,420	3402	4613

The torque value used should be within ±5% of the calculated torque.

ISSUED	REVISED	REFERENCE
1988-JUN-15	ISS 5 03-01-20	ISO 898/1, CLARK DS-M13, EEPS 15

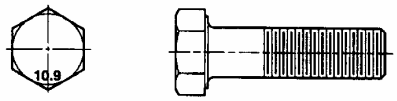
Put the machine in the **SERVICE POSITION**

Standards

35511,1
PAGE 22 of 29

TORQUE VALUES

Property Class 10.9 Hex hd cap screw



Zinc Plated with Yellow Dichromate
No Loctite

Size	Pitch mm	Dia Inches	Clamp Lbs	Calculated Torque Ft - Lbs * = in-lbs	Calculated Torque N-M
M 5	0.80	0.1969	2,253	* 93	11
M 6	1.00	0.2362	3,188	* 158	18
M 8	1.25	0.3150	5,806	32	43
M 10	1.50	0.3937	9,200	63	86
M 12	1.75	0.4724	13,372	111	150
M 14	2.00	0.5512	18,242	176	239
M 16	2.00	0.6299	24,904	275	372
M 20	2.50	0.7874	38,864	536	726
M 24	3.00	0.9449	55,995	926	1256
M 30	3.50	1.1811	88,990	1839	2494
M 36	4.00	1.4173	129,599	3214	4359

The torque value used should be within ±5% of the calculated torque.

ISSUED	REVISED	REFERENCE
1988-JUN-15	ISS 5 03-01-20	ISO 898/1, CLARK DS-M13, EEPS 15

SPECIAL TOOLS

Figure 5 - Flowmeter Kit, E12977829

The flowmeters illustrated in Figure 5, are used in troubleshooting the steering system, hydraulic system, and the hydraulic brake system.

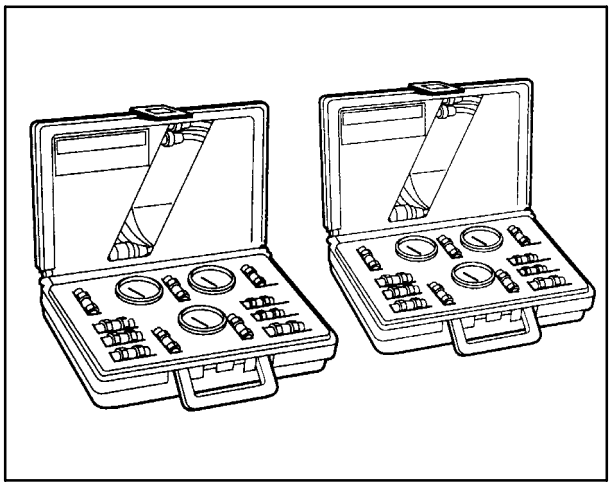


Figure 6 - Pressure Testing Kit, E12979919

The Kit Includes:

QTY.	PART NO.	DESCRIPTION
2	E12978340	Plastic cases
2	E12978341	Foam insert
1	E12979920	Gauge, Combination 15 In Hg to 30 psi
1	E12978343	Gauge, 600 psi.
3	E12978344	Gauge, 3000 psi.
1	E12978345	Gauge, 5000 psi.
6	E12612957	Oil Sampling Adapter
6	E12978346	Union
2	E12978347	Coupling, M16 x 1/8” NPT
3	E12978348	Coupling, M16 x 1/4” NPT
2	E4093187	Coupling, M16 x 7/16”-20 SAE
2	E12978350	Coupling, M16 x 9/16”-18 SAE
3	E12977798	Hose, 24”
2	E12977801	Hose, 96”
1	E12978351	Ball Valve

The pressure testing kit shown in Figure 5, is available for checking and setting pressures and measuring vacuum readings within the steering system, hydraulic system, and the transmission. See **Group 640, STEERING LINES AND FITTINGS**, **Group 900, HYDRAULIC LINES AND FITTINGS**, and **Group 421, TRANSMISSION.**

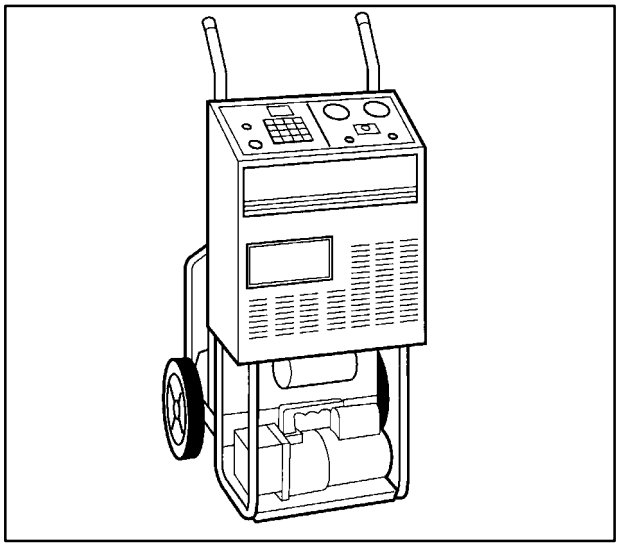


Figure 7 - Air Conditioning Recovery/Recycle/ Charge & Test Kit E12977823

The unit in Figure 7 removes the refrigerant from the air conditioning system, recycles it and recharges it.

INCLUDES:

1-Ratchet for compressor valve
1-Thermometer
1-Leak detector

SPECIAL TOOLS

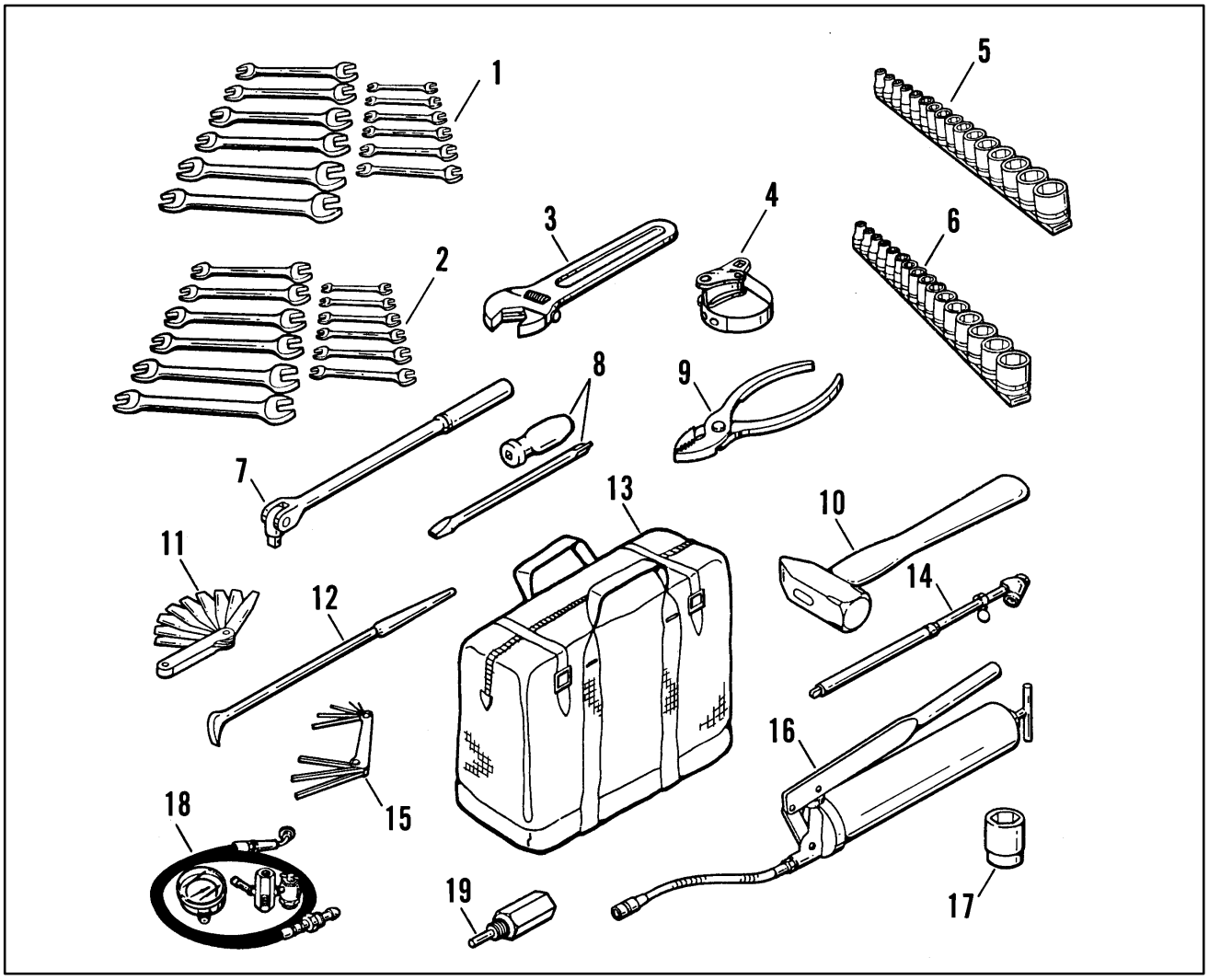


Figure 24 - Basic Hand Tool Kit, E12592281

1-E12992142 Wrench Set - Standard
2-E12593568 Open-End Metric Wrenches
3-E12592143 Adjustable Wrench
4-E12592144 Strap Wrench
5-E12592145 Standard, 12 Pt. Socket Set
6-E12593569 Metric, 12 Pt. Socket Set
7-E12592146 Breaker Bar
8-E12592147 Screwdriver
9-E12592148 Pliers
10-E12592149 Hammer
11-E12592150 Feeler Gauges
12-E12592151 Bar
13-E12592152 Tool Bag
14-E12592153 Air Gauge
15-E12592154 U.S. Hex Wrench Set
16-E12592155 Grease Gun
17-E12592156 Socket
18-E12592157 Accumulator Gauge
19-E4086789 Brake Wear Kit

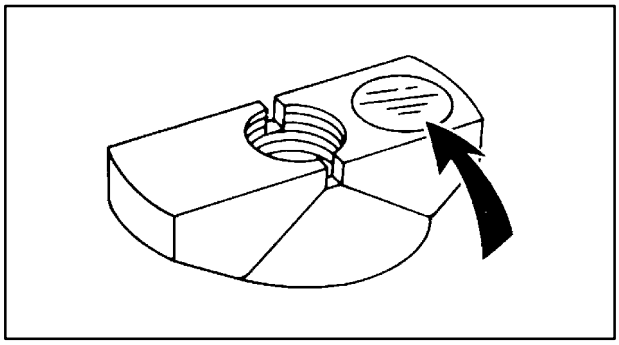
The Basic Hand Tool kit shown in Figure 24 contains the basic tools required to service the machine. They are supplied in a bag to assist the operator on those ”quick fixes” or adjustments that do not require taking the machine out of service.

filter element (5), and the safety filter element (3). The safety filter element removes any last trace of dirt. Upon exiting through the air cleaner outlet, the filtered air is drawn into the engine via sealed tubing.

SERVICING THE AIR CLEANERS

Numbers in parentheses refer to Figure 6 and other figures as noted.

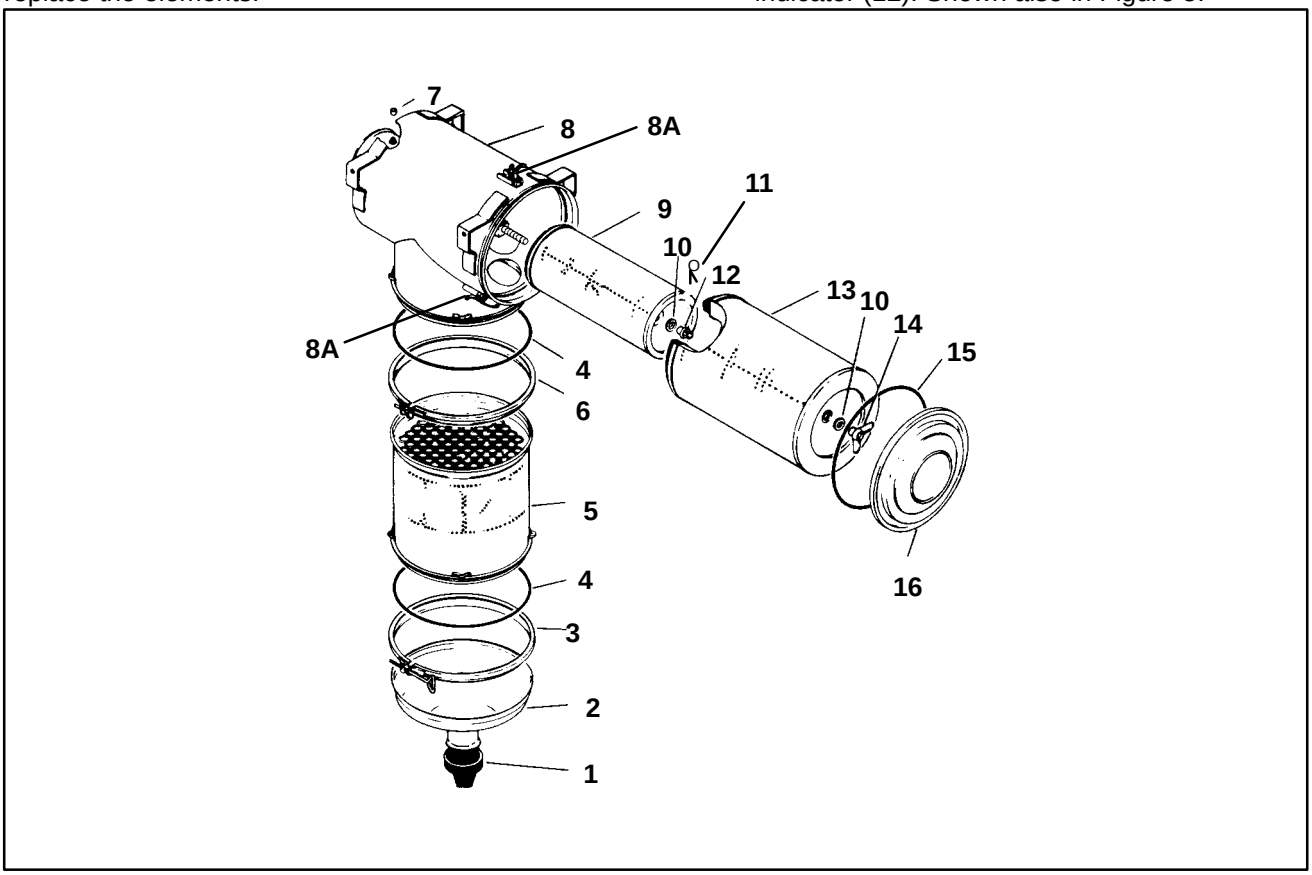
The air cleaners should be serviced at regular intervals. A filter restriction indicator (low pressure) switch, (11, Figure 1) constantly monitors the condition of the elements. Dirty elements restrict air flow through the cleaner system. When the maximum restriction is reached, the air cleaner restriction indicator lamp, Figure 3, in the warning light cluster on the instrument panel will light. It is now time to clean or replace the elements.



EL14034

Figure 5 - Service Indicator Nut

1. The safety filter element (9) is not intended to be cleaned. For maximum engine protection and air cleaner service life, replace the safety element every third primary element change or cleaning - or as indicated by the safety signal service indicator (12). Shown also in Figure 5.



ELI19838

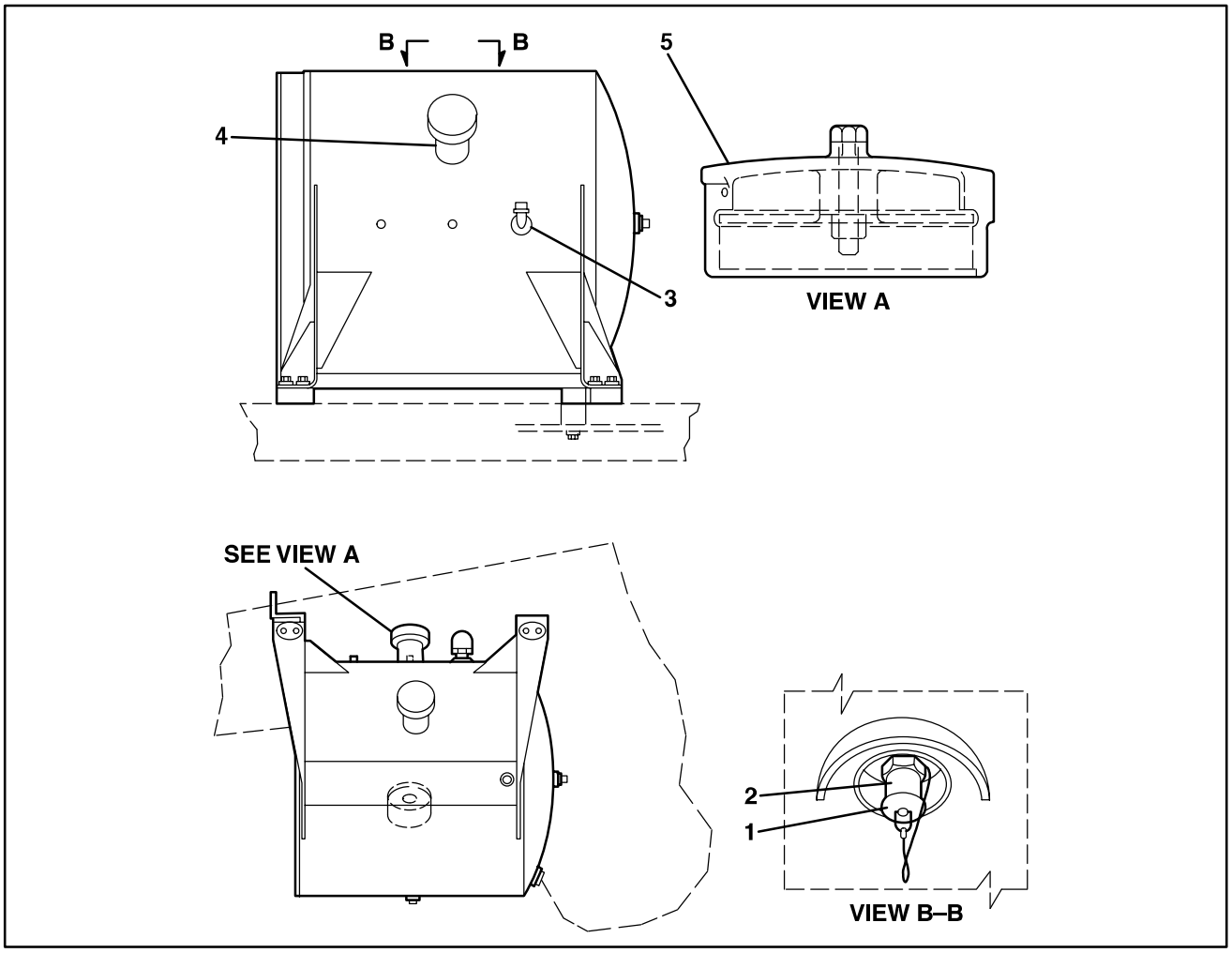
Figure 6 - Exploded View of Air Cleaner

1. Vacuator Valve
2. Dust Cup
3. Clamp
4. O-Ring
5. Lower Body
6. Clamp
7. Cap
8. Upper Body

8A. Clamp

9. Safety Filter Element
10. Gasket
11. Cotter Pin
12. Service Indicator
13. Primary Filter Element
14. Wing Nut
15. Gasket
16. Access Cover

FAST FUELING



EL19362

Figure 1 – Fast Fueling Components

1. Cap Assembly
2. Nipple Assembly
3. Vent
4. Filler Tube
5. Filler Tube Cap

DESCRIPTION AND OPERATION

Numbers in parentheses refer to Figure 1.

The fast fueling system allows faster refueling. The system consists of an unvented cap (5) on the regular filler tube (4), a spillproof automatic vent (3), and a self–closing nipple assembly (1) with a protective dust cap (2).

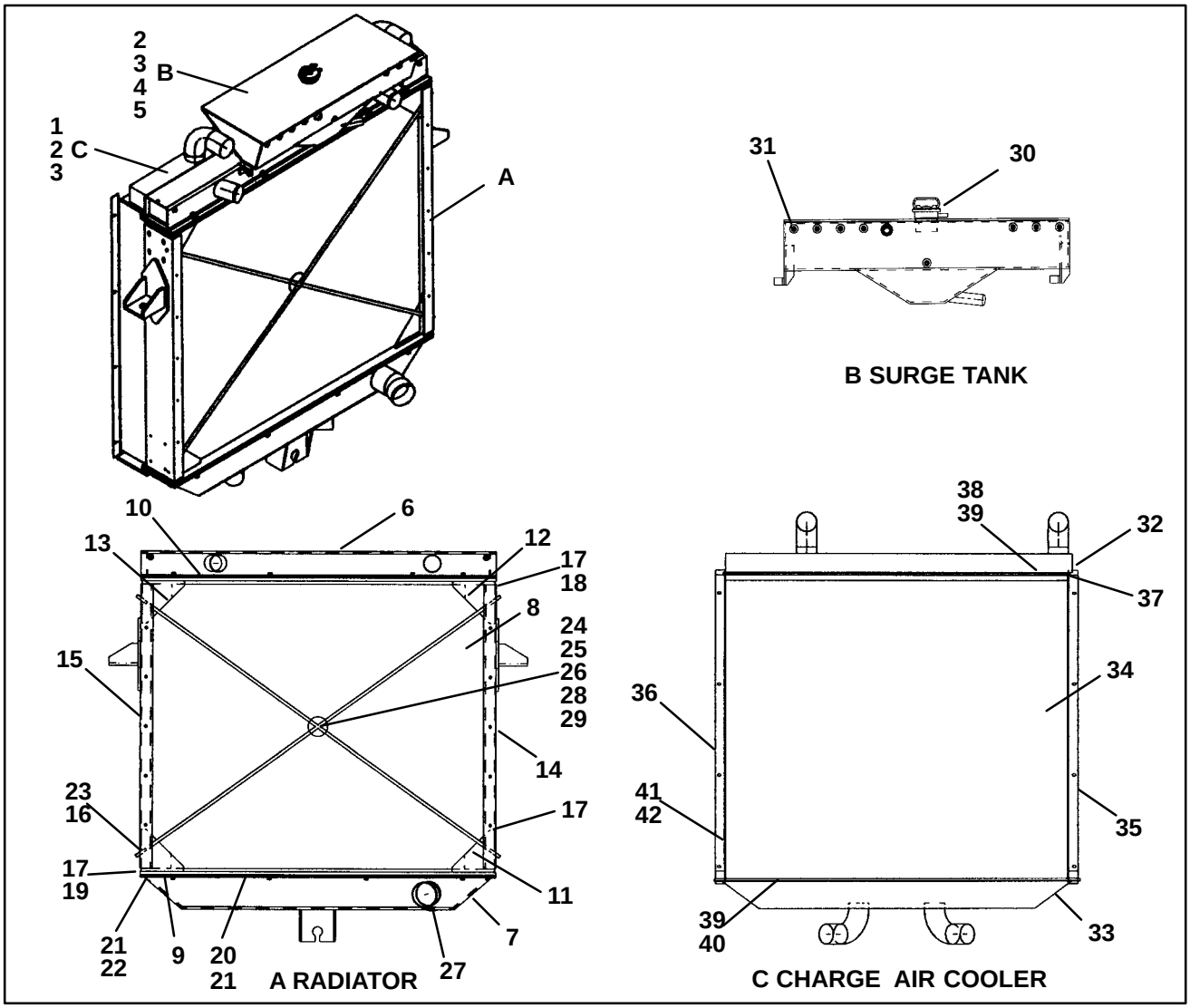
In refueling, a special nozzle is connected to the nipple assembly (2). The vent (3) has a float extending down several inches into the fuel tank. As fuel enters the fuel tank through the nipple assembly (2), air exits through the vent (3). When the fuel level reaches the float of the vent (3), the vent automatically closes, causing pressure to build up in the fuel tank. When the pressure reaches 14 to 41 kPa (2 to 6 psi), the nozzle shuts off automatically, ending the refueling operation.

SERVICING

Numbers in parentheses refer to Figure 1.

Inspect the fittings periodically for dirt, abnormal wear or damage, and check to see that the vent (3) is not obstructed by mud or encrusted dirt. Make certain that the dust cap (1) is placed securely on the nipple assembly (1) after each refueling operation. Wash the dust cap (2) and the nipple assembly (1) out with clean fuel whenever necessary.

RADIATOR



ELI19856

Figure 1 - Exploded View of the Radiator

1. Screw
2. Washer
3. Washer
4. Screw
5. Nut

A. Radiator

6. Tank, Top
7. Tank, Bottom
8. Core
9. Gasket, Bottom
10. Gasket, Top
11. Gusset
12. Gusset
13. Gusset
14. Plate, Right Hand
15. Plate, Left Hand
16. Nut
17. Screw
18. Washer
19. Screw
20. Screw
21. Screw
22. Nut
23. Tie Rod
24. Clamp, Tie Rod
25. Screw
26. Washer
27. Plug
28. Washer
29. Nut

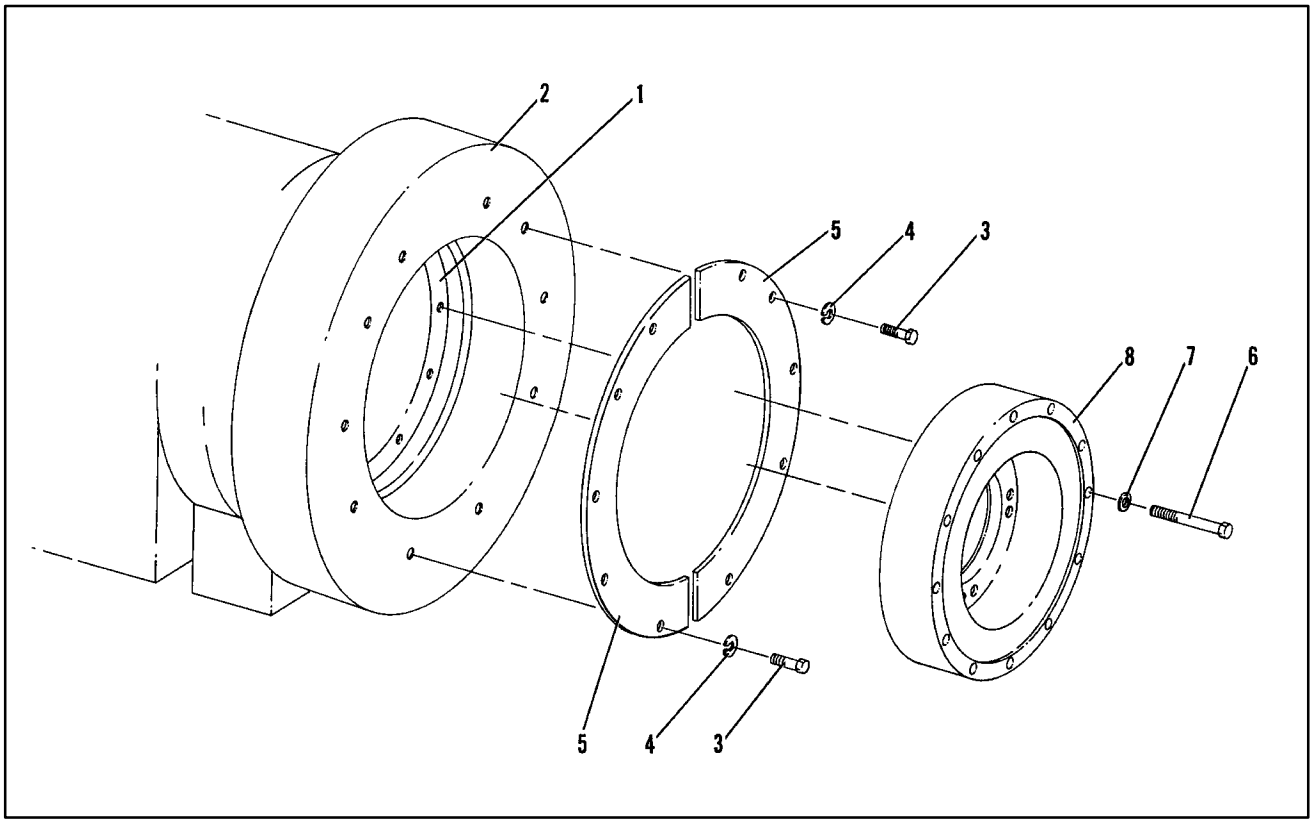
B. Tank, Surge

30. Cap, Pressure
31. Plug

C. Cooler, Charge Air

32. Tank, Top
33. Tank, Bottom
34. Core
35. Plate, Right Hand
36. Plate, Left Hand
37. O-Ring
38. Screw
39. Nut
40. Screw
41. Bracket
42. Sleeve

DRIVE COUPLING



EL16294

Figure 1 - Exploded View of Drive Coupling

1. Engine Flywheel
2. Flywheel Housing
3. Bolt
4. Washer
5. Cover
6. Bolt
7. Washer
8. Coupling Assembly

Description

All Numbers in parentheses refer to Figure 1.

The torsionally flexible coupling assembly (8) is bolted to the engine flywheel (1). It serves as a drive and also cushions out torque fluctuations between the engine and the drive line.

The coupling consists of an elastomeric member sandwiched between the steel outer mounting ring and the steel inner member.

Removal

1. Remove the front drive line, Refer to **Group 451, Front Drive Shaft**.
2. Remove cover (5) from flywheel housing (2) by removing bolts (3) and washers (4).
3. Remove the coupling assembly (8) from the engine flywheel by removing bolts (6) and washers (7).
4. Place all the components in a clean work area for inspection.

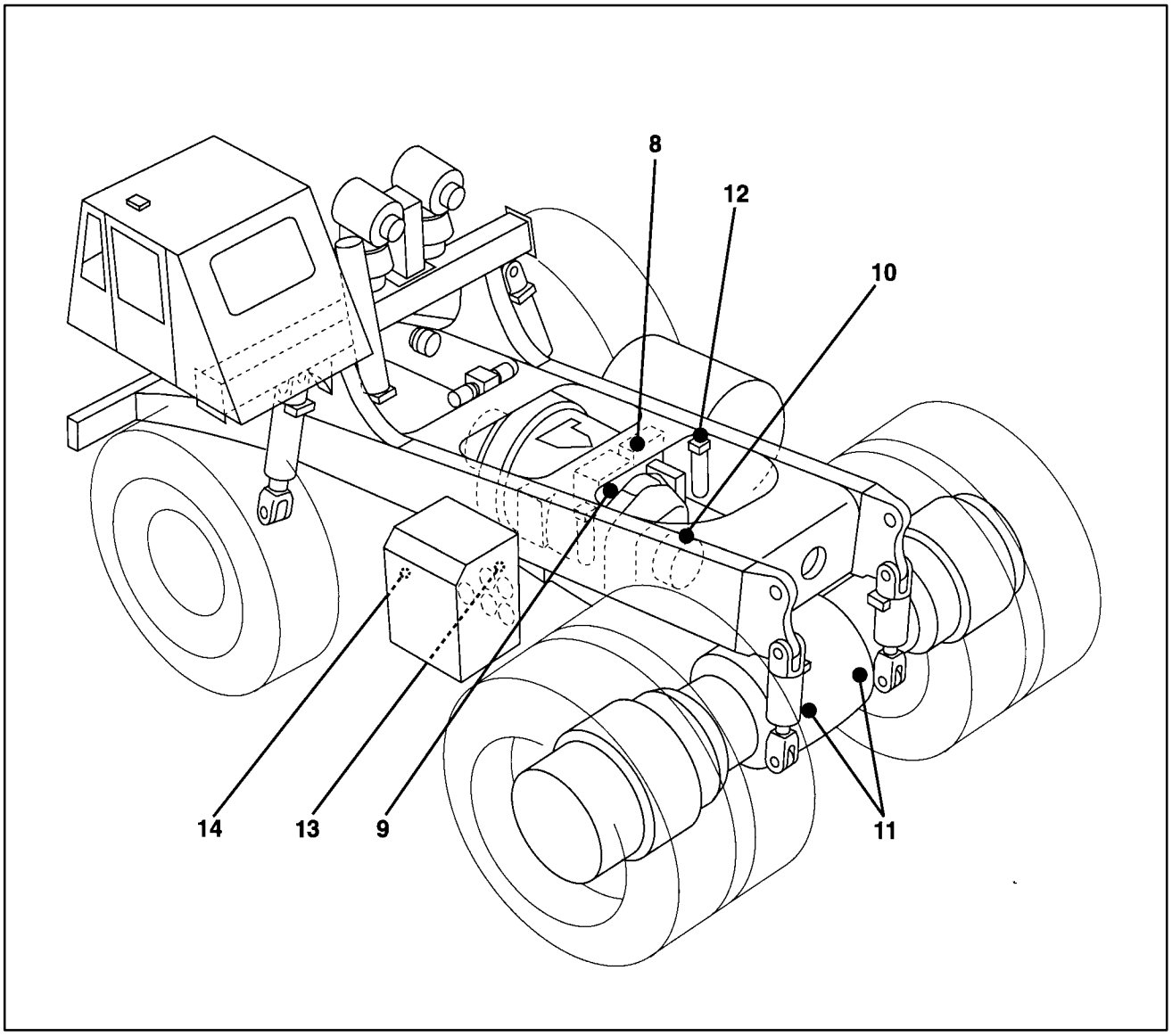
Inspection

Inspect the inner member for fatigue, cracks and distortion. Inspect the elastomeric ring for cracking. Minor surface cracking is acceptable as long on no signs of separation are present at inner and or outer member joints.

Installation

1. Attach coupling assembly (8) to engine flywheel (1) with bolts (6) and washers (7). Tighten bolts to specified torque. **Refer to Group 170, Machine Specifications**.
2. Attach covers (5) to flywheel housing (2) with bolts (3) and washers (4). Tighten bolts to specified torque. **Refer to Group 170, Machine Specifications**.
3. Install the front driveshaft, Refer to Group 451, **FRONT DRIVESHAFT**.

ELECTRICAL SYSTEM



EL19513

Figure 10–Switch and Sensor Locations

8. Transmission Pressure Transducer
9. Trans. Converter Temp. Sensor
10. CEC Speed Sensor–Trans. Mag Pickup
11. Wheel Speed Sensors(ATC Option)
12. Hoist/Brake Cooling Filter Switch
13. Hoist/Brake Coolant Temp. Sensor
14. Steering Filter Restriction Switch

ELECTRICAL SYSTEM

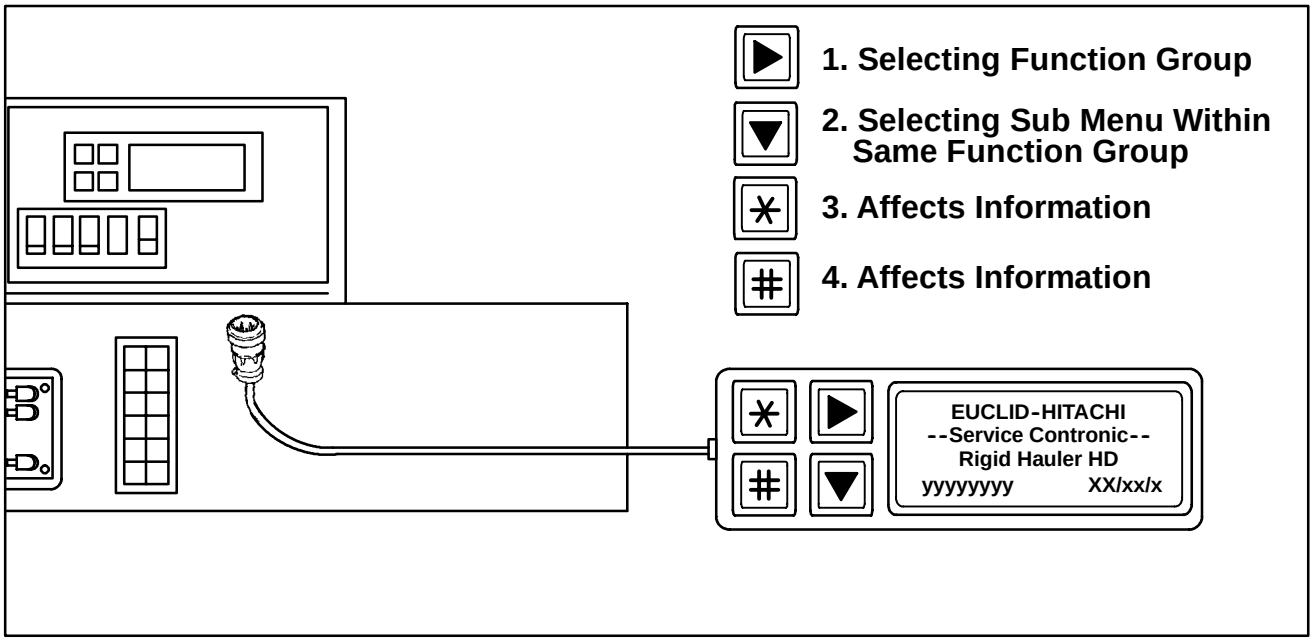


Figure 17 – Service Contronic Display Unit Connection

CONNECTION

The service display is connected to the ECU at the instrument panel, under the dashboard.

STARTING UP

The display is started by depressing the ▶ key and the ▼ key at the same time. Only one LCD will display at once. Displaying information on the service tool takes away the information on the dash mounted LCD.

GENERAL

- The top line on the screen shows the name of the selected function and any alarm messages.
- Five different languages can be selected (English, Swedish, German, French and Spanish).
- Two different sets units of measurements can be selected (° C, km/h, km, bar, m–ton) (° F, mph, mile, psi, s–ton).

FUNCTION GROUPS

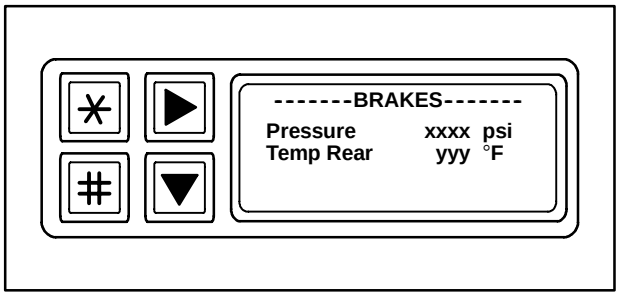
The various functions are divided into the following eight function groups;

1. Initial information and settings, see Screens 1.1 to 1.4.
2. General operating information, stop watch and service interval, see Screens 2.1 to 2.5.
3. Engine, see Screens 3.1 to 3.3.
4. Electrical system, see Screens 4.1 to 4.4.
5. Transmission, see Screens 5.1 to 5.8.
6. Brakes, see Screens 6.1 to 6.2.
7. Steering, see Screens 7.1 to 7.2.
8. Struts, see Screens 8.1 to 8.2.

Selection between these groups of functions is done with the ▶ key.
There might be more information within the group which can be found by using the ▼ key.

ELECTRICAL SYSTEM

Brakes (Screen 6.1)

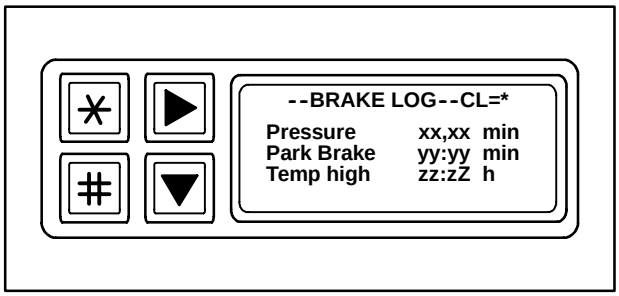


ELI

Screen 6.1

xxxx = Main Pressure, or ERo/ERs when faulty sender circuit.
yyy = Temperature, of ERo/ERs when faulty sender circuit.

Brake Log (Screen 6.2)



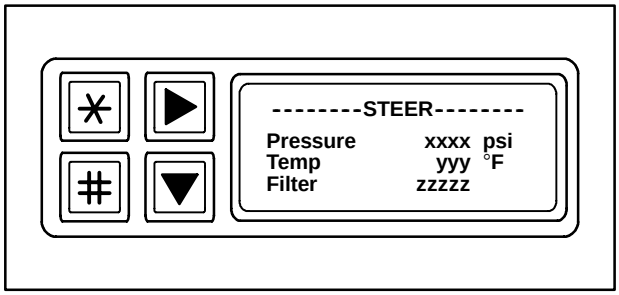
ELI

Screen 6.2

xx,xx = Total time with low brake pressure (speed >0.5 mph)
yy:yy = Total time park brake requested (speed >0.5 mph)
zz:zz = Total time with brake temp high

Reset data with ✱ key.

Steering (Screen 7.1)

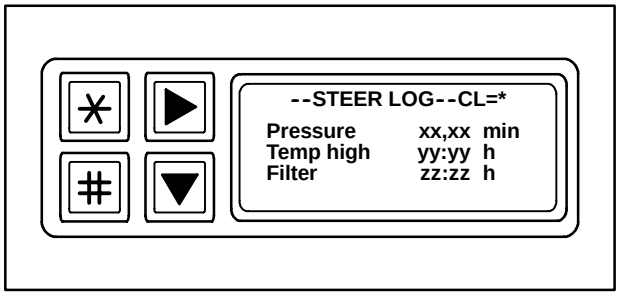


ELI

Screen 7.1

xxxx = Main Pressure, or ERo/ERs when faulty sender circuit.
yyy = Temperature, of ERo/ERs when faulty sender circuit.
zzzzz = Steer filter condition "normal", "dirty", or "ER"

Steer Log (Screen 7.2)



ELI

Screen 7.2

xx,xx = Total time with low steer pressure (speed >0.5 mph)
yy:yy = Total time with high steer temperature
zz:zz = Total time steer filter restriction has occured

Reset data with ✱ key.

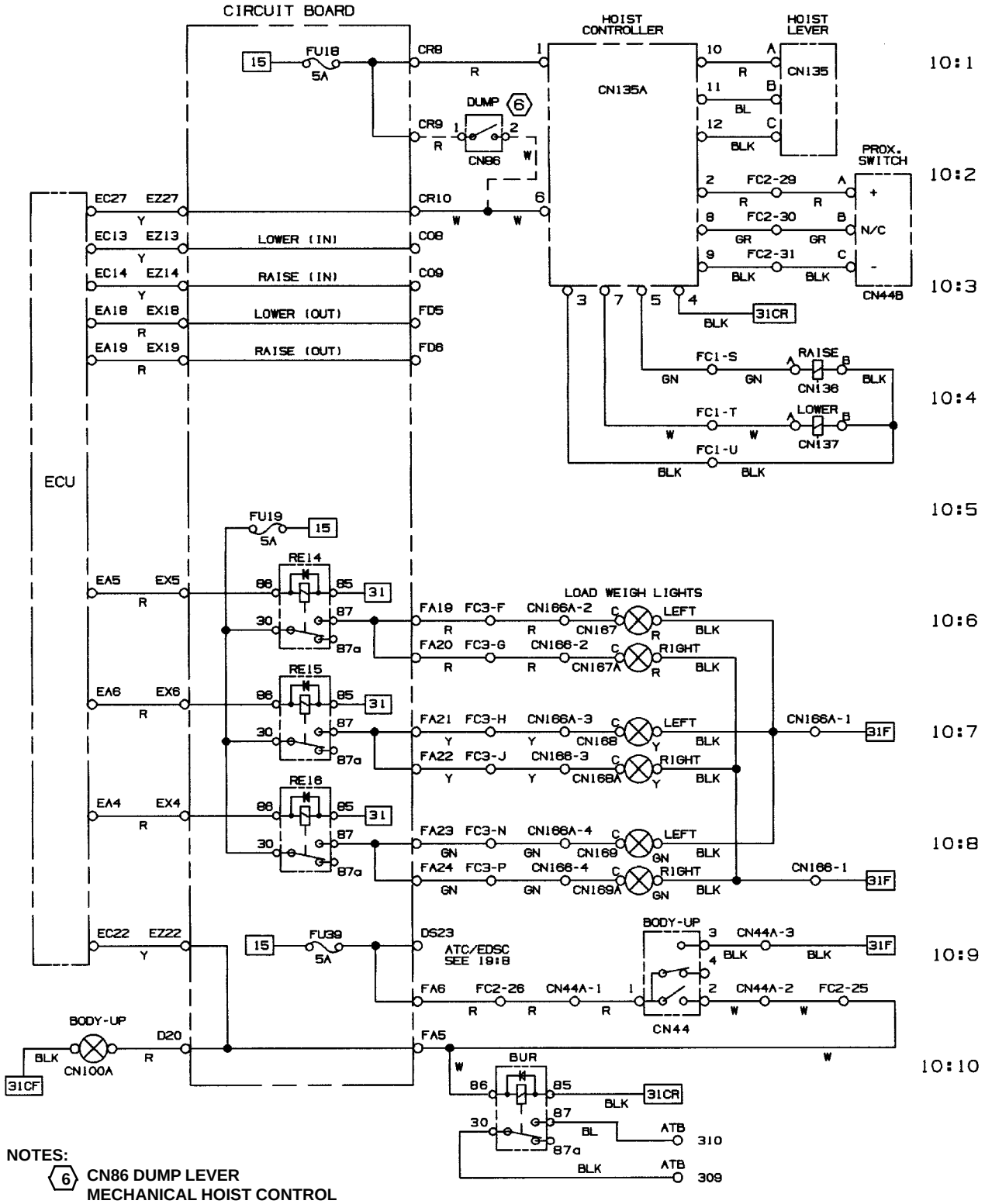
ELECTRICAL SYSTEM

CONNECTORS

CONNECTOR NUMBER	VEHICLE LOCATION	SCHEM POS*	CONNECTOR NUMBER	VEHICLE LOCATION	SCHEM POS*
CN144	DASH	3:2			
CN151	LEFT COWL	12:7			
CN152	FRAME	23:6			
CN153, CN154	FRAME REAR	VAR			
CN157	LEFT COWL	11:7			
CN158	CAB REAR	15:8			
CN161, CN162	LEFT/RIGHT FENDER	VAR			
CN165	FRAME	9:3			
CN166, CN169	SERVICE PLATFORM	10:6			
CN171	DASH	19:5			
CN176, CN181	CAB REAR	21:7			
CN184	DASH	20:3			
CN185	CAB REAR	16:4			
CN194	DASH	19:7			
CN204, CN204A	SHUTTER	22:6			

***Schematic Position**
(Location Reference Number
Found in the Column at the Right Hand
Side of Each Electrical Schematic)

ELECTRICAL SYSTEM

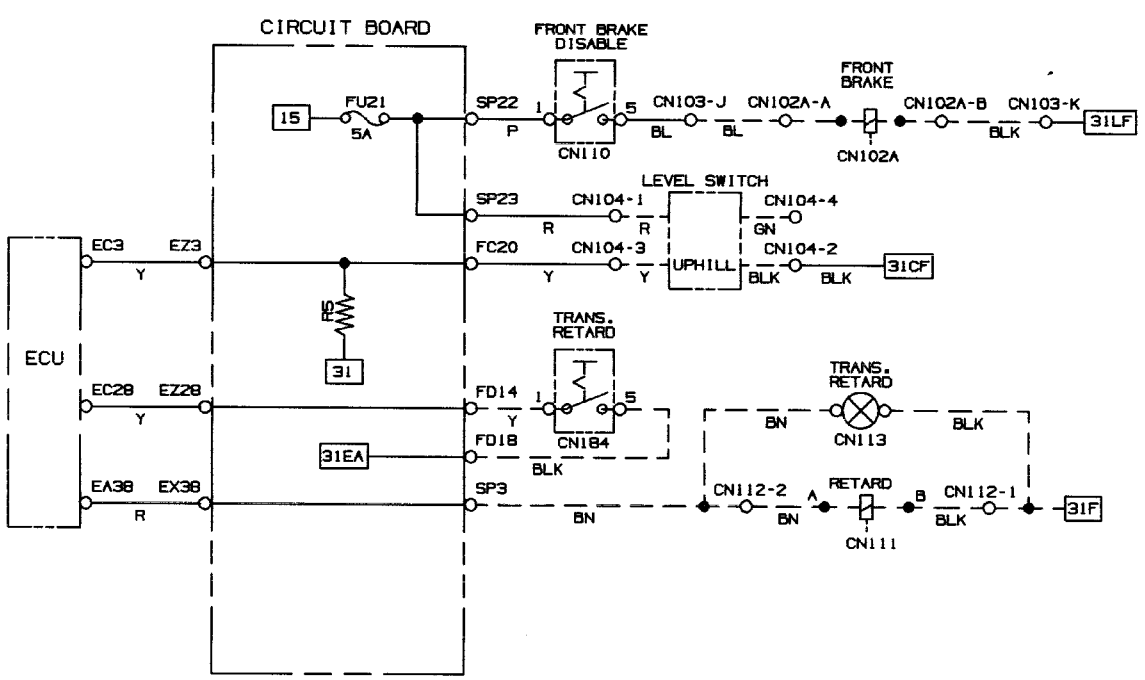


NOTES:

(6) **CN86 DUMP LEVER MECHANICAL HOIST CONTROL**

ELECTRICAL SYSTEM

HILL HOLD / TRANS. RETARD / HID LIGHTS / FRONT BRAKE DISABLE OPTIONS



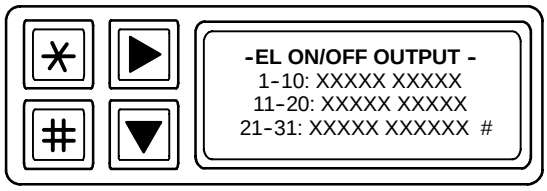
CONTRONIC TROUBLESHOOTING GUIDE

Error description	P/S	SID	FMI	Fault Lamp
Fuel shutoff valve component shorted high or open	17	X	3	YWLF
Fuel shutoff valve component shorted low	17	X	4	Red
Fuel shutoff valve component stuck or open	17	X	7	YWLF
Fuel control valve component data out of range	18	X	2	YWLF
Fuel control valve component shorted high or open	18	X	3	Red
Fuel control valve component shorted low	18	X	4	Red
Fuel control valve actuator mechanically stuck open	18	X	7	Red
Timing actuator data out of range	20	X	2	YWLF
Timing actuator mechanically stuck	20	X	7	Red
Timing actuator component shorted high	20	X	3	YWLF
Timing actuator component shorted low	20	X	4	YWLF
Throttle position sensor component shorted high	91		3	Red
Throttle position sensor component shorted low	91		4	Red
Throttle position idle validation switch invalid	91		2	YWLF
Throttle pos idle valid sw - pos and throttle per mismatch failure	91		13	YWL
Fuel delivery pressure component shorted high	94		3	YWLF
Fuel delivery pressure component shorted low	94		4	YWLF
Fuel delivery pressure component data out of range	94		2	YWLF
Oil pressure sensor component shorted high	100		3	EOPWLF
Oil pressure sensor component shorted low	100		4	EOPWLF
Oil pressure sensor data below normal range	100		1	EOPWL
Crankcase blowby pressure data above normal range	101		0	YWL
Crankcase blowby pressure component shorted high	101		3	YWLF
Crankcase blowby pressure component shorted low	101		4	YWLF
Boost pressure sensor component shorted high	102		3	YWLF
Boost pressure sensor component shorted low	102		4	YWLF
Intake manifold temp sensor component shorted high	105		3	YWLF
Intake manifold temp sensor component shorted low	105		4	YWLF
Intake manifold temp sensor data above normal range	105		0	YWL
Ambient air pressure component shorted high	108		3	YWLF
Ambient air pressure component shorted low	108		4	YWLF
Engine coolant pressure component shorted high	109		3	YWLF
Engine coolant pressure component shorted low	109		4	YWLF
Engine coolant pressure data below normal range	109		1	YWL
Engine coolant temp sensor component shorted high	110		3	ECTWLF
Engine coolant temp sensor component shorted low	110		4	ECTWLF
Engine coolant temp sensor data above normal range	110		0	ECTWL
Engine coolant level data below normal range	111		1	ECLWL
Engine coolant level sensor signals data invalid	111		2	ECLWLF
Engine coolant level sensor component shorted high	111		3	ECLWLF
Engine coolant level sensor component shorted low	111		4	ECLWLF
Alternate droop switch fault	113		2	YWLF
Fuel timing pressure sensor component shorted high	156		3	Red
Fuel timing pressure sensor component shorted low	156		4	Red

Engine Fault List

CONTRONIC TROUBLESHOOTING GUIDE

3. For checking a particular ECU output, see service operators LCD Screen 4.3 S as shown below. The **"x"** will either be a **"0"** or **"1"** depending on the output condition. A **"0"** indicates that an output is not energized and **"1"** indicates that an output is energized.



4. Refer to Contronic ECU output table below for a description of each output.

Contronic ECU Outputs			
Output #	**Description**	**Output #**	**Description**
1	Alternator lamp	16	Trans. oil temperature lamp
2	Trans. oil pressure lamp	17	Hill hold relay
3	Brake temperature lamp	18	Central warning alarm
4	Brake pressure lamp	19	Loadweigh lamp green
5	Engine coolant level lamp	20	Loadweigh lamp red
6	Engine coolant temp lamp	21	Loadweigh lamp yellow
7	Engine oil pressure lamp	22	Trans. filter relay
8	Engine service lamp	23	Reverse relay
9	Spare	24	Wiper relay
10	Filter lamp	25	Spare
11	Spare	26	Spare
12	Spare	27	Spare
13	Park brake lamp	28	Neutral dump relay
14	Steer pressure lamp	29	Max. cooling relay
15	Steer temperature lamp	30	Spare
		31	Central warning lamp

ECU Outputs

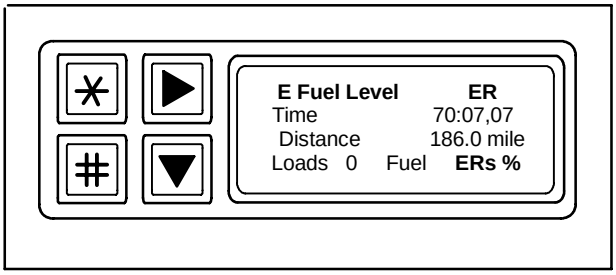
5. For checking an ECU solenoid output, see service operators LCD Screen 4.4 S as shown below. The **"xxx"** number indicates the modulation percentage (0-100 %) since some of the solenoid outputs are pulse width modulated (PWM). For an output that is solenoid only, the LCD will display either **"0"** or **"1"** indicating OFF or ON respectively.

CONTRONIC TROUBLESHOOTING GUIDE

FUEL LEVEL

FAULT–FUEL LEVEL ERROR

CONDITIONS



- LCD display: First line of display – flashing

TROUBLESHOOTING STEPS

1. Check the service operators LCD Screen 2.2 S for open or short circuit conditions.

2. If the display shows an open or short circuit condition, check the sensor operation. Disconnect the wires at the sensor and measure the resistance at the sensor terminals. If the resistance is not within a range of about 240 to 30 ohms, replace the sensor.

3. If the resistance is within this range, check the harness for an open or short between ECU pin EC33 and sensor CN67. Repair or replace harness as necessary.

4. If the display shows an open or short circuit condition, check the harnesses for an open or short between ECU pin EC33 and sensor ground "31EA". Repair or replace harness as necessary.

5. Check the circuit board traces for open or short circuit conditions. Replace circuit board if trace damage is found.

6. If no open or short circuits are found, replace the ECU.

HILL HOLD

FAULT–HILL HOLD FUNCTION INOPERATIVE

CONDITIONS

- Hauler on an incline > 10%
  ECU input: EC3
- Brake pedal switch depressed
  ECU input: EB31
- Engine speed < 1200rpm

TROUBLESHOOTING STEPS

1. If the Hill Hold feature does not operate correctly, check the first line of the LCD screen for an **"E Engine link ER"** or **"E CED link ER".** If either situation exists, repair the link error before proceeding.

   Note: The Hill Hold feature uses the CEC (Allison) data link to receive the lever position. If the link is down, feature will not be operational. For electronic engines, the engine data link is used as well for engine speed.

   If:
   a.) No incline switch input to ECU, go to step 2.
   b.) No brake switch input to ECU, go to step 6.
   c.) Hill Hold relay does not energize, go to step 9.

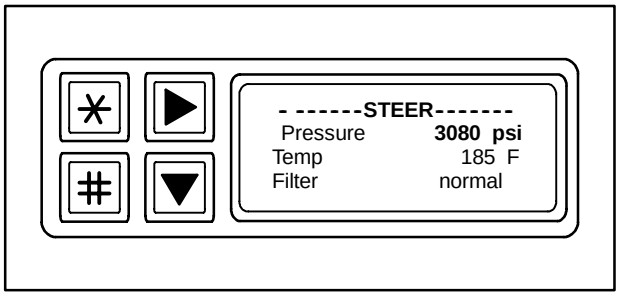
Note: The relay is energized if both the brake pedal switch and the incline switch are closed and hauler speed is < 2.2 km/h (1.4mph).
The relay is de-energized by shifting to R (reverse), by increasing the engine speed > 1200 rpm, or when the engine speed is < 400 rpm.

2. Check fuse 21 on the circuit board and check for 24V to the level switch input at ECU pin EC 3. See appropriate schematic. Replace the fuse if blown.

3. If there is still no voltage measured at the ECU, first check the switch operation. Unbolt the switch. Measure the switch input voltage (24 V) and the switch output voltage (CN 104) while tilting the switch in an uphill direction.

   Note: The incline switch orientation is important. If the switch is facing the opposite direction, the hill hold relay could engage on a 10% downhill grade.

CONTRONIC TROUBLESHOOTING GUIDE

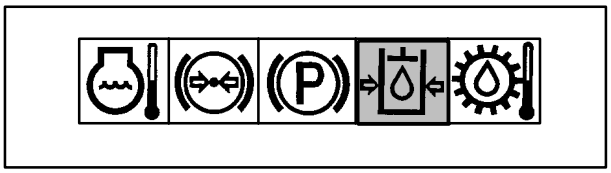


2. If the pressure is above 206.8bar (3000 psi), the steer pressure warning light, central warning light, and the alarm will illuminate.

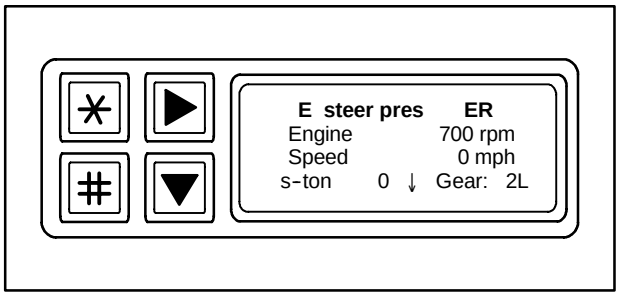
3. If the pressure reading is questionable, connect a pressure gauge and compare the values. If the readings vary considerably, replace the transducer.

FAULT -STEER PRESSURE LIGHT ON (RED)

CONDITIONS



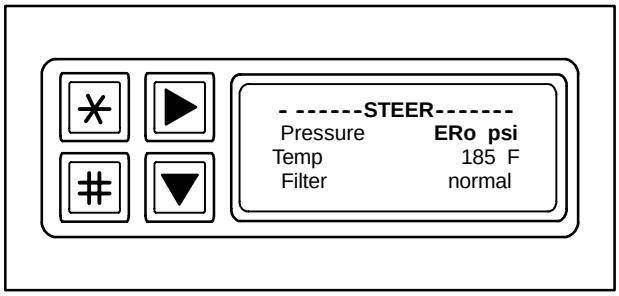
- Light Display: Steer pressure light ON-flashing ECU output: EA33



- LCD Display: First line of display- flashing
- Engine off

TROUBLESHOOTING STEPS

1. Check LCD Screen 7.1 S as shown below for the steer pressure error message or an **"ERo"** or **'"ERs"** indicating an open or short circuit condition.



2. If the display shows an open or short circuit condition, unplug the steer pressure transducer connector CN6 at the accumulator and verify supply voltage. Measure the voltage from pin A to pin B. See the chart below for transducer pinout. The voltage should be 24V± 10%.

Transducer Pin	Function
A	+ 24 V
B	Ground
C	Output

3. If the voltage is not within this rage, check the sensor supply voltage at the ECU between pin EB4 and ground "31EA". Ground is referenced at pin EC19. This is a regulated 24 Vdc to the sensors and should be 24 Vdc± 10%.

4. Check the input voltage at pin EC34 of the ECU for the steer pressure transducer. The steer pressure transducer has a pressure range of 0-34473 kPa (0 to 5,000 psi). For this pressure range, the input voltage should in the range of approximately 0.95 to 4.76 V.

5. If the voltage is not within this range, try plugging in a replacement transducer at CN6. The LCD screen will display 0 psi and the error will go away if the transducer was faulty.

6. If the display still shows an open or short circuit condition, check the harnesses for an open or short between ECU pin EC 34 and sensor ground "31EA". Repair or replace harness as necessary.

7. Check the circuit board traces for open or short circuit conditions. Replace circuit board if trace damage is found.

8. If no open or short circuits are found, replace the ECU.

BATTERY CHARGING PROCEDURE

charge a battery, follow the fast charge with a slow charge. Table 3 gives the charge times and rates for various battery capacity ranges.

RATED BATTERY CAPACITY (Reserve)	FAST CHARGE TIME	FAST CHARGE CURRENT
≤ 80 min.	2.5 hrs.	20 Amps
	1.5 hrs.	30 Amps
80 < min. ≤ 125	3.75 hrs	20 Amps
	1.5 hrs	50 Amps
125 < min. ≤ 170	5 hrs.	20 Amps
	2 hrs.	50 Amps
170 < min. ≤ 250	7.5 hrs.	20 Amps
	3 hrs.	50 Amps
> 250 min.	6 hrs.	40 Amps
	4 hrs.	60 Amps

Table 3 – Fast Charge

Boosting Charge

Batteries will self–discharge slowly when left in storage. This self–discharge is increased dramatically with increasing temperature. To make up for the loss of charge while standing in stock, a boosting charge without excessive overcharge should be given to batteries whenever they fall .040 in specific gravity. This will happen after about 15–40 weeks storage at –1° C (30° F). The specific gravity will drop faster at warmer temperatures and slower at colder temperatures.

The batteries should be charged at a rate of 3% of the reserve capacity rate until three consecutive hourly specific gravity readings are constant.

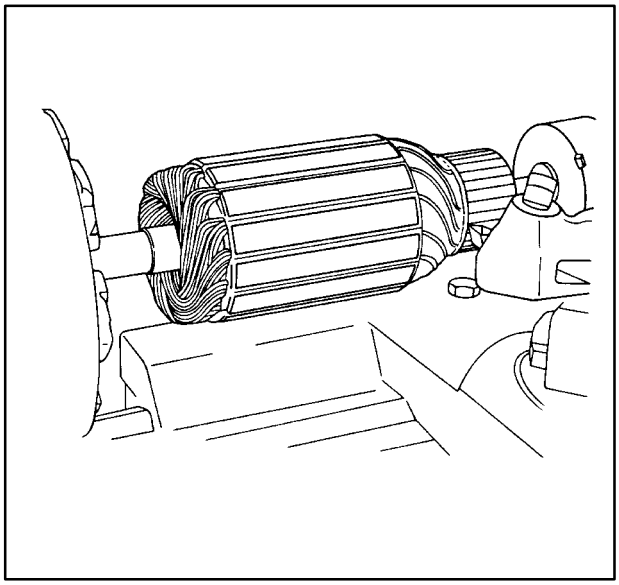
Note: Storage for long periods without recharging could result in the loss of both cold cranking and reserve capacity.

Load Test

1. Disconnect the battery cables, negative first.
2. Measure the temperature of a center cell.
3. Connect digital voltmeter and load test leads to the battery terminals. Clean battery terminals if necessary.
4. Apply a test load equal to 50% of the cranking performance rating of the battery for 15 seconds.
5. Record the voltage after 15 seconds then remove the test load leads.
6. Determine the minimum voltage at the electrolyte temperature from Table 4.
7. The battery passes the load test if the voltage is above the minimum. If the voltage is below the minimum, replace the battery.

ELECTROLYTE TEMPERATURE	MINIMUM VOLTAGE UNDER 15 sec LOAD
21° C (70° F) & ABOVE	9.6 V
16° C (60° F)	9.5 V
10° C (50° F)	9.4 V
4° C (40° F)	9.3 V
–1° C (30° F)	9.1 V
–7° C (20° F)	8.9 V
–12° C (10° F)	8.7 V
–18° C (0° F)	8.5 V

Table 4 – Load Test



L1047

Figure 11 – Turning Commutator in Lathe

Grounded field coils may sometimes be repaired by removing and reinsulating them. Care must be used in applying new insulation to avoid bulkiness since this might cause the pole shoe to cut through and produce another ground when the coils are reinstalled.

The drive, armature and field coils should not be cleaned in any degreasing tank, or with grease dissolving solvents, since these would dissolve the lubricant in the drive and damage the insulation in the armature and field oils. All parts except the drive should be cleaned with mineral spirits and a brush. The drive should be wiped with a clean cloth. Inspect all parts for wear or other damage.

The main contact disc on the solenoid may sometimes become corroded creating resistance in the power switch. This can be eliminated by wire brushing the disc.

Examine the contact points on the solenoid terminal plate assembly. On rare occasions these may be pitted and require replacement.

ASSEMBLY

HEAVY DUTY SPRAG DRIVE

Numbers in parentheses refer to Figure 10.

The sprag drive should not be cleaned in any degreasing tank or degreasing solvents since these would dissolve the lubricant in the clutch mechanism. The clutch should be wiped with a clean cloth.

1. Do not attempt to lubricate the sprags on the heavy duty drive as it is lubricated for life with special oil at the factory. However, the spiral spline should be lubricated lightly with SAE No. 10 oil.

Note: Heavier oil may cause failure to mesh at low temperatures.

2. Place the spacer (2) and large washer (3) over the spiral spline on the drive assembly (1) in that order.

3. Place the cup (4) over the spiral so the enclosed end will butt against the large washer (3).

4. Place the spring (5) over the spiral spline so it seats in the recess of the cup (4).

5. Place the small washer (6) and pinion (7) over the spiral spline.

6. Place a new cupped pinion stop (8) over the spiral spline so the small end butts against the pinion (7).

7. Place the two halves of the split washer (9) into the groove in the spiral spline.

8. Pull the cupped pinion stop (8) over the split washer (9) and hold in place by crimping the edge of the pinion stop (8) around the split washer (9).

MOTOR

Numbers in parentheses refer to Figure 1.

Assembly is the reverse of disassembly with the following additions:

1. Careful reinstallation of the field coils (28) is necessary to avoid shorting or grounding the field coils as the pole shoes (30) are tightened into place. Both rectangular and triangular insulating strips are used to prevent the field leads from grounding to the field frame. Be sure these are in place upon reassembly. Where the pole shoe (30) has a long lip on one side and a short lip on the other, the long lip should be assembled in the direction of the armature rotation so it becomes the trailing (not leading) edge of the pole shoe.

2. To reassemble the end frame having eight brushes onto the field frame, pull the armature (29) out of the field frame (27) just far enough to permit the brushes (3) to be placed on the com-

HAULTRONIC II - LOAD WEIGHING SYSTEM

INSTALLATION

Place the installation CD in the drive. On most systems, the setup program will begin automatically. If this does not happen after 30 seconds, start the setup manually by selecting **Start-> Run** and type in the dialob box (substitute the correct letter of your CD-ROM drive for Y):

Y:\setup

and press **ENTER**. This will bring up the Haultronics Installation window. Select one of the two option buttons for either the U.S. version or Asian version and press **Install**.

Note: For additional information, press either the Readme first or Info buttons.

This will bring up the Setup window. Unless you have a special reason to change them, leave the suggested entries for the input screens as given. When installation is complete, you may be asked to restart your computer.

UPGRADING FROM PREVIOUS VERSIONS

Note: If you are upgrading from an earlier version of Haultronics, these special instructions must be followed.

1. All files in the \Haultronics\Data folder must be either deleted or moved to a different folder. Your old download files will not be recognized by the new Haultronics program in the “downloaded Files” window.

Note: When upgrading from an earlier version of Haultronics, old downloaded files may not show up after the upgrade, but they are not deleted. They will show up if you add the directory path to the Haultronic.ini file.

2. Remove the Haultronic program currently installed. Select Start-> Settings-> Control Panel-> Add/Remove Programs. Choose “Euclid Haultronics” from the list of programs shown, and click on the Add/Remove key.
3. The uninstaller may ask before removing some shared files. If this happens, click on the “Yes to All” button.
4. Proceed with installation of the new program.

HAULTRONIC II SETUP AND CALIBRATION PROCEDURE

1. Contact your local authorized HITACHI dealer to install the updated Haultronic/Contronic software if necessary. This is required if Haultonic II is installed in the field or if a new ECU is purchased.
2. Park the Hauler on a flat level surface.
3. Start the Hauler and release the park, service & load/dump brakes.
4. Check the LCD screen to verify the incline. Adjust the nuts on the Incline sensor, located behind the seats or under the buddy (trainer’s) seat, until the readings are 0.0% grade ±0.5%.

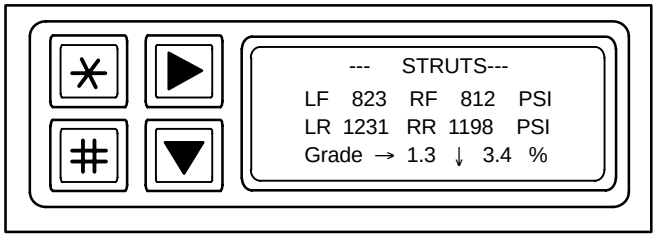


Figure A

5. Check the STRUTS screen for errors. The display below, Figure B, indicates a FAILED Right Front Strut pressure transducer.

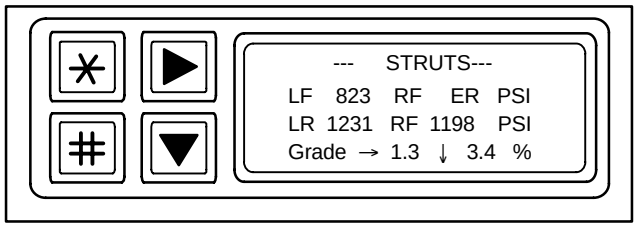
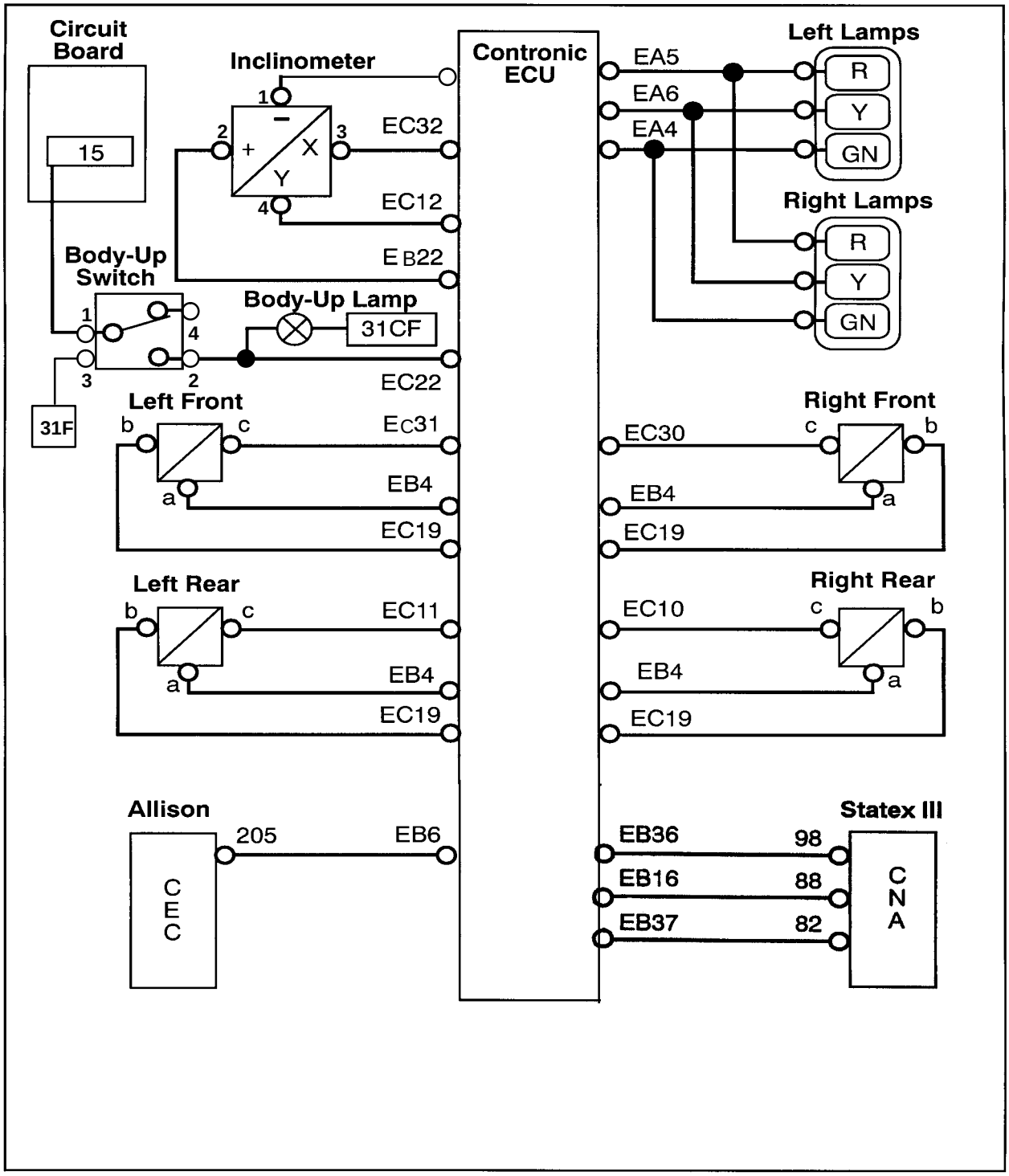


Figure B

HAULTRONIC II - LOAD WEIGHING SYSTEM



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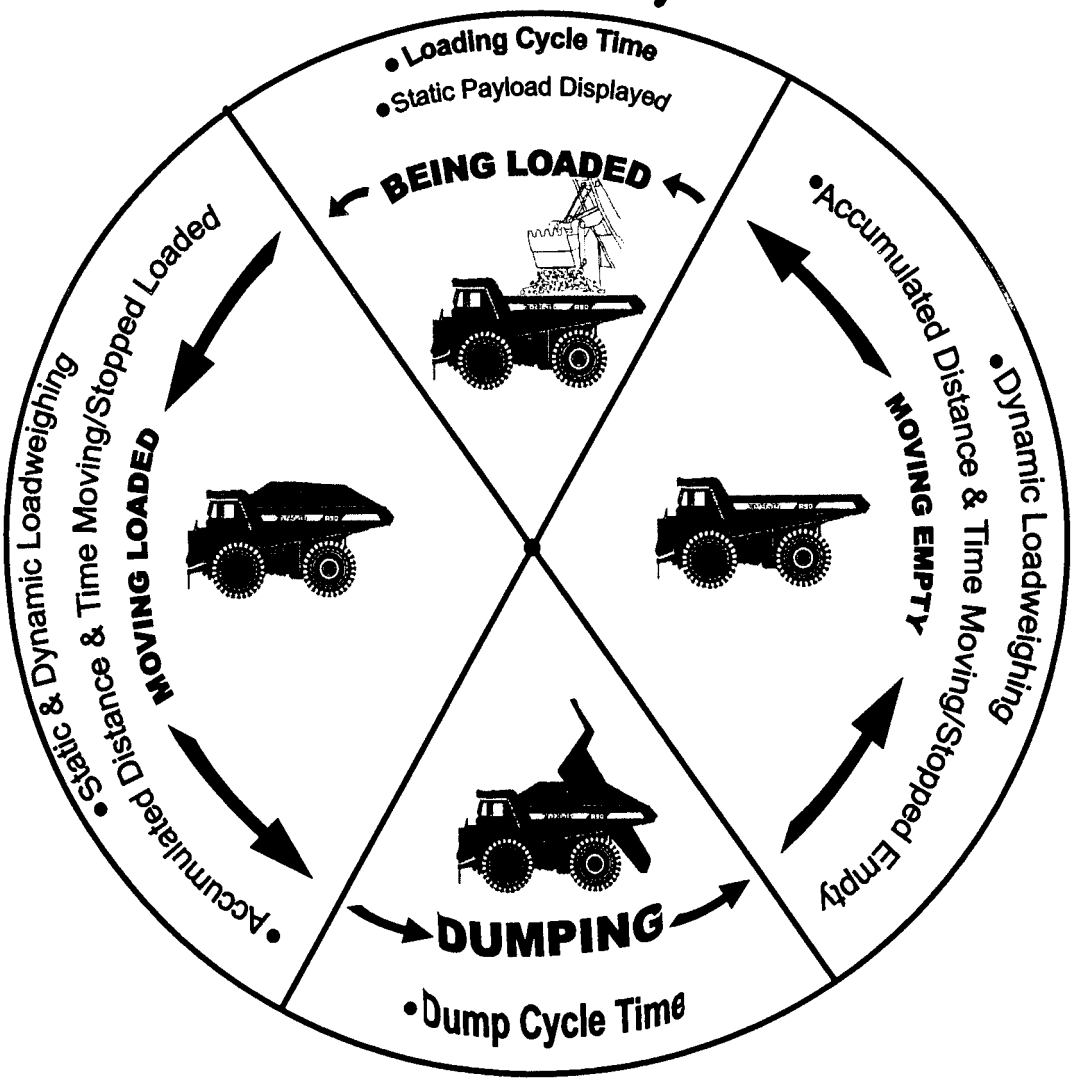
Typical Haultronic II - Load Weighing System Schematic

HAULTRONIC II - LOAD WEIGHING SYSTEM



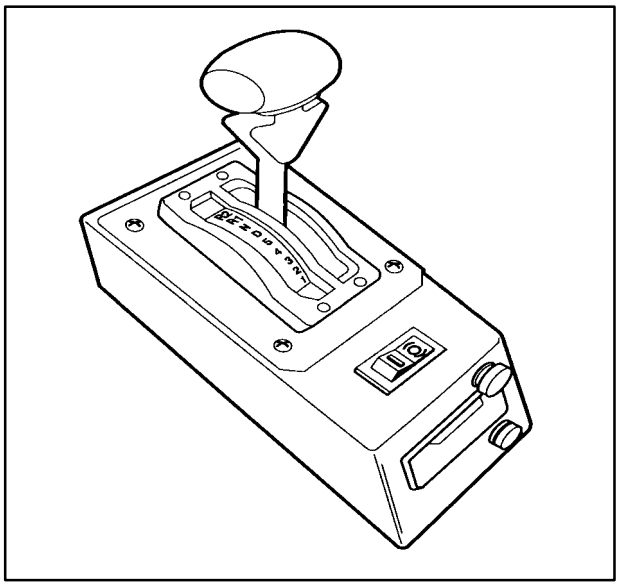
Allison Series

Refer to the Allison Transmission CL(B)T9000 Series Service Manual SA 1833C for the description and a thorough explanation for the operation of this transmission. Complete details for disassembly, inspection and assembly of this transmission are also covered in this Allison Manual.

The 9000 series Allison Transmission Commercial Electronic Control (CEC) transmission system consists of four components:

1. Shift Selector, Figure 3
2. Speed Sensor, Figure 4
3. Control Valve, Figure 5
4. Electronic Control Unit (ECU), Figure 6

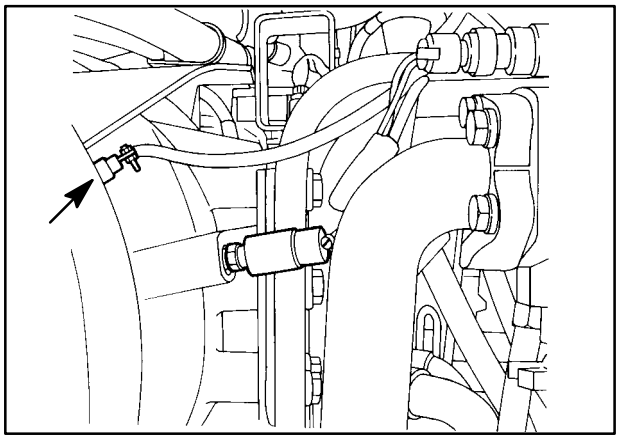
1. Shift Selector



EL15901

Figure 3 - Shift Selector
Located next to operator's seat

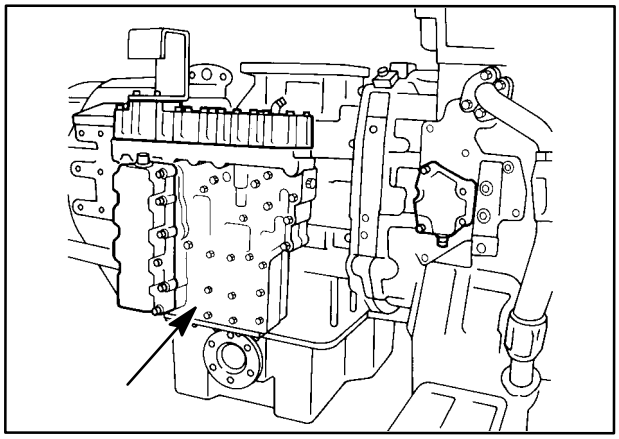
2. Speed Sensor



EL16009

Figure 4 - Speed Sensor, Transmission Output
Located on the right side, rear of transmission

3. Control Valve



EL16006

Figure 5 - Main Control Valve
Located on the right side of transmission

TRANSMISSION - ELECTRONIC RETARDER (Option)

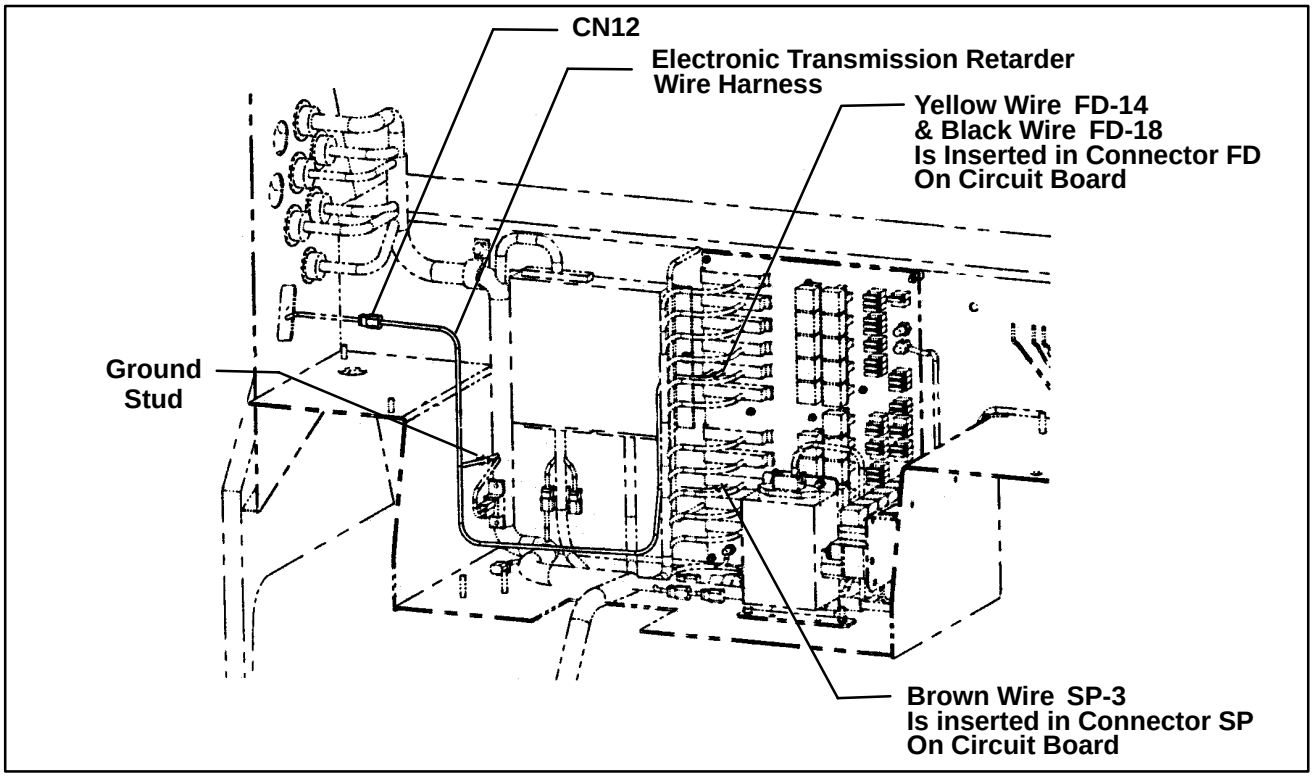


Figure 3 - Front View of Electrical Panel

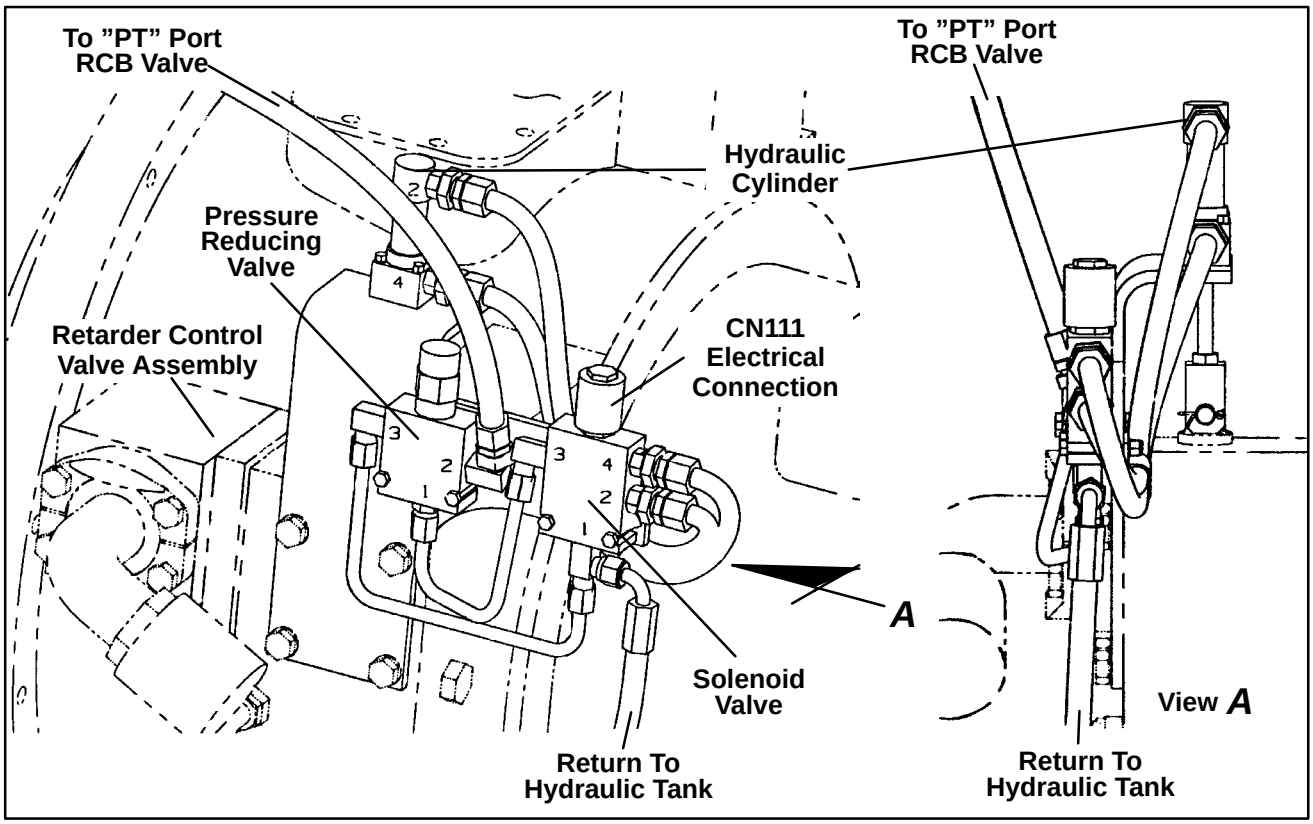


Figure 4 - Retarder Hydraulics

NOTES

3. Loosen and remove the cap bolts (4) securing the bearing caps (5) to the sleeve yoke (15). Remove the universal joint kit.

INSPECTION

Numbers in parentheses refer to Figure 5.

1. Clean the bearing assemblies (1) in a suitable solvent and dry with compressed air, being careful not to damage the thrust washer (1C). Work a small amount of lubricant into each needle bearing (1A), inside the bearing case (1B).

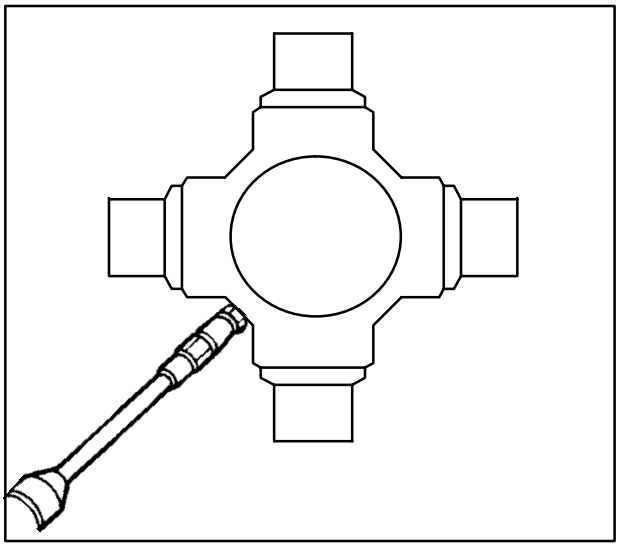
2. Place the bearing assemblies (1) on the cross (2) and rotate to check for excessive bearing wear.

3. Replace the complete universal joint kit if either or both the bearing assembly and cross assembly if either or both are worn

UNIVERSAL JOINT KIT INSTALLATION

1. Install universal joint kits in reverse order.

Note: Replacement universal joint kits contain only enough grease to provide needle bearing protection during storage. It is therefore necessary to completely lubricate each replacement kit prior to assembly into the driveshaft yokes. Each journal cross lube reservoir should be fully packed with a recommended grease and each bearing assembly should also be wiped with the same grease; filling all the cavities between the rollers and applying a liberal grease coating on the bottom of each race. After the kits are installed into the driveshaft yokes and prior to placing into service, they should be relubricated, through the zerks, using the same grease.



ELI16338

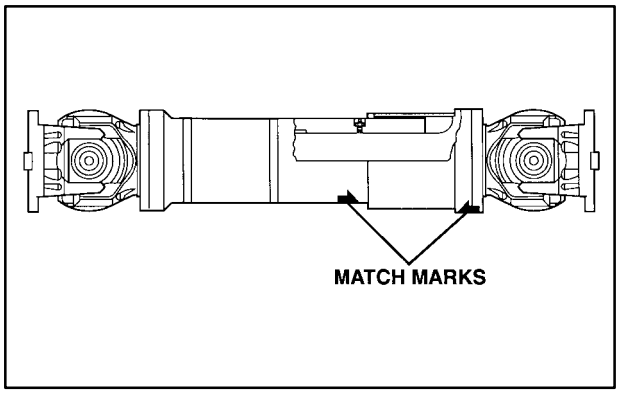
Figure 5 - Lubrication of Cross

INSTALLATION/RUN-OUT INSPECTION

Numbers in parentheses refer to Figure 1.

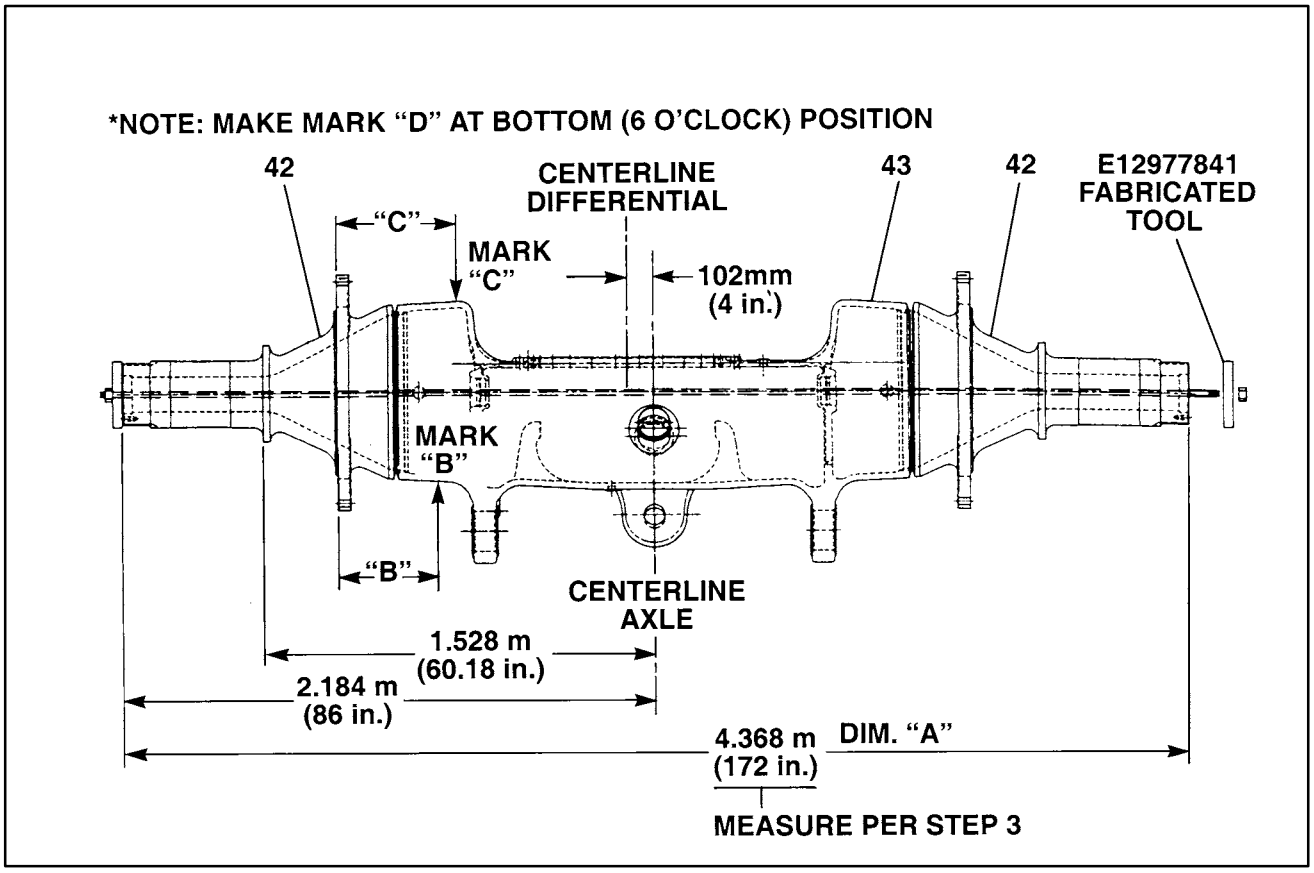
Note: Before beginning the installation procedures, clean all the mating surfaces with brake cleaner or an equivalent solvent and all bolts holes must be free of paint, oil, and grease.

1. Match marks are stamped on the shaft assembly (5) and sleeve assembly (6). Be sure the marks are aligned to each other. Refer to Figure 6.



EL19854

Figure 6 - Match Marks



EL19657

Figure 10 - Spindle and Axle Housing Welding Dimensions

DISASSEMBLY OF SPINDLE FROM AXLE HOUSING

Numbers in parentheses refer to Figure 1 and 8.

At times it may be necessary to replace the spindle on a machine without the need to also replace the axle housing. Since the spindles are welded to the axle housing, the following procedures for spindle replacement should be followed to insure proper assembly and operation of the affected components.

1. Thread puller bolts into the holes of ring (39). Pull ring (39) out of spindle. Remove and discard outer O-ring (40) and inner the inner O-ring (41).

Note: Remove one spindle at a time.

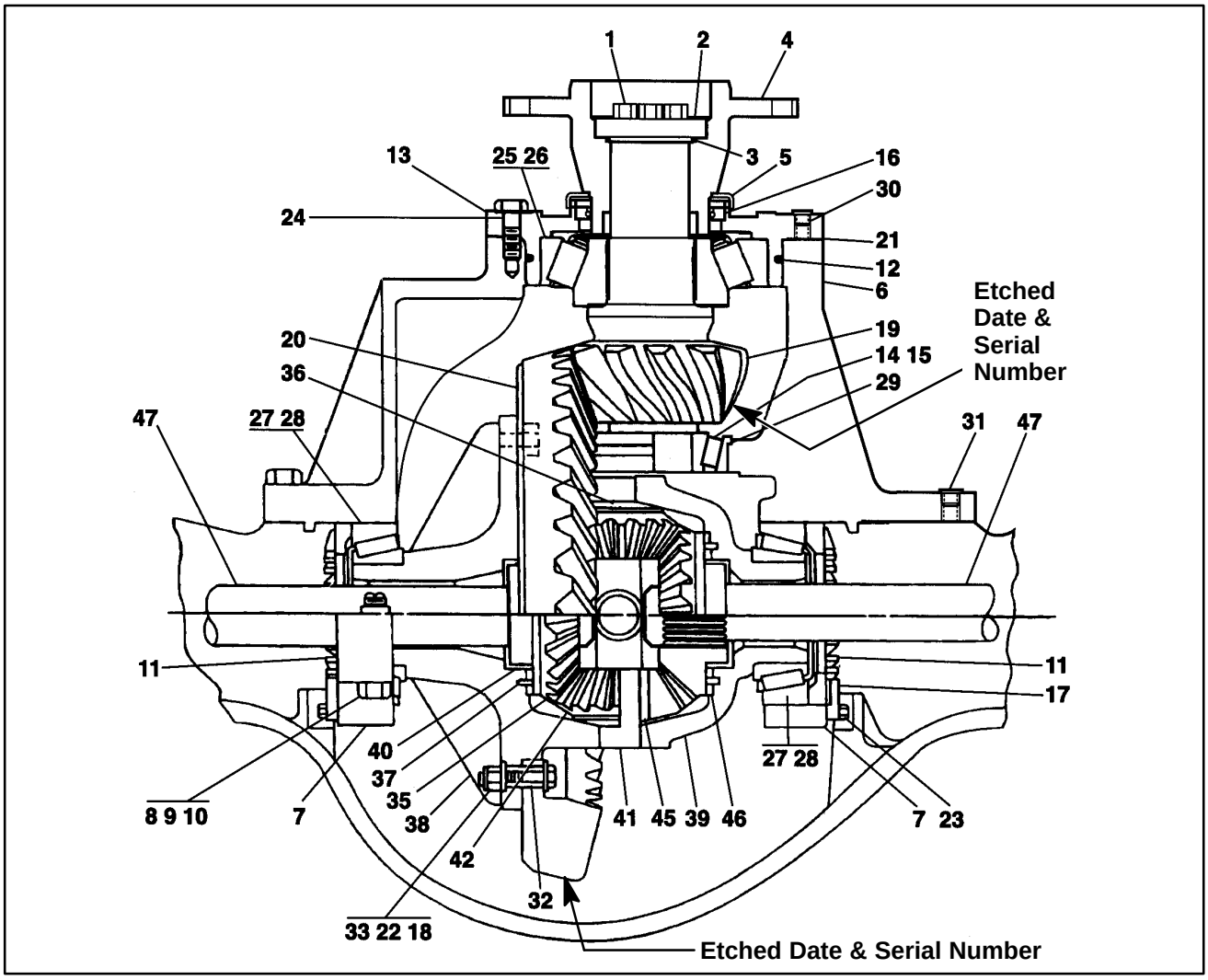
2. Carefully remove tube (30) from spindle (42) and axle housing (43). Remove O-ring (41) from axle housing (43). The inner O-ring (41) can be removed through the differential mounting hole.

3. Before cutting off the spindle, pass a tape measure through the axle. Measure the axle from outside to outside of the spindles. Record the length in Table 1, **"OLD A"**. Also, in 3 places about the old spindle (2, 6, and 10 O'clock), measure from the brake flange to the main housing and mark (with paint) the housing. In the table mark "**B, C, and D"**. Be sure to place the mark far enough away from the weld so it will not be affected by the pre-heat operation. Record the dimension of **"B, C, and D"** in Table 1. These dimensions will ensure the new spindle is straight before welding

4. Refer to Figure 8 for location of weld.

5. Support the rear axle and using an air arc or suitable tool, remove the weld. Since, the spindle will not be reused cutting through the pilot aids in the removal.

DIFFERENTIAL



EL19597

Figure 9 - Cutaway View of Differential Assembly

Differential Yoke

1. Bolt
2. Plate
3. O-Ring
4. Flange
5. Collar

Differential Assembly

6. Housing, Carrier
7. Cap, Bearing
8. Dowel Bushing
9. Bolt
10. Washer
11. Bearing Adjuster
12. O-Ring
13. Retainer
14. Bearing Cone
15. Bearing Cup
16. Oil Seal
17. Lock Adjuster
18. Washer
19. Drive Pinion
20. ring gear
21. Shims
22. Lock Nut
23. Bolt
24. Bolt
25. Bearing Cone
26. Bearing Cup
27. Bearing Cone
28. Bearing Cup
29. Shims
30. Shield
31. Shield, Thread
32. Pin
33. Bolt

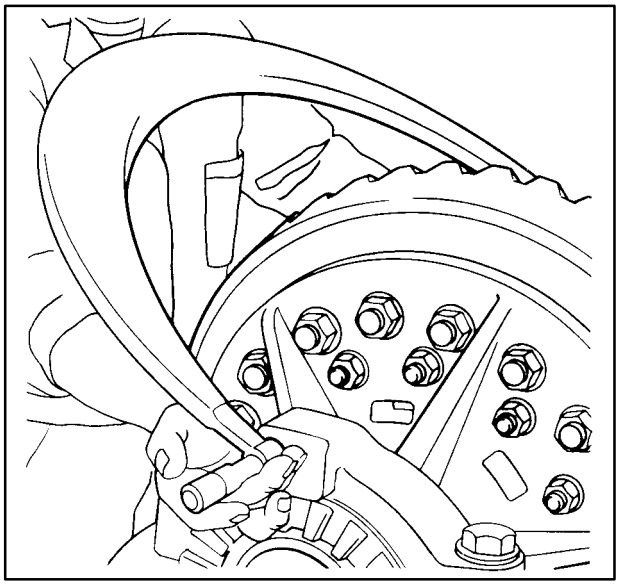
Body Assembly

34. Bolt (Not Shown)
35. Gear
36. Thrust Washer
37. Dowel Pin
38. Case, Flanged Half
39. Case. Plain Half
40. Thrust Washer
41. Spider
42. pinion gear set
43. Washer (Not Shown)
44. Nut (Not Shown)
45. Bearing, Caged Roller
46. Washer, Case

47. Axle Shaft (Reference)

DIFFERENTIAL

Note: The measurement on Line a should be within ± .025 mm (± .001") of Line b.

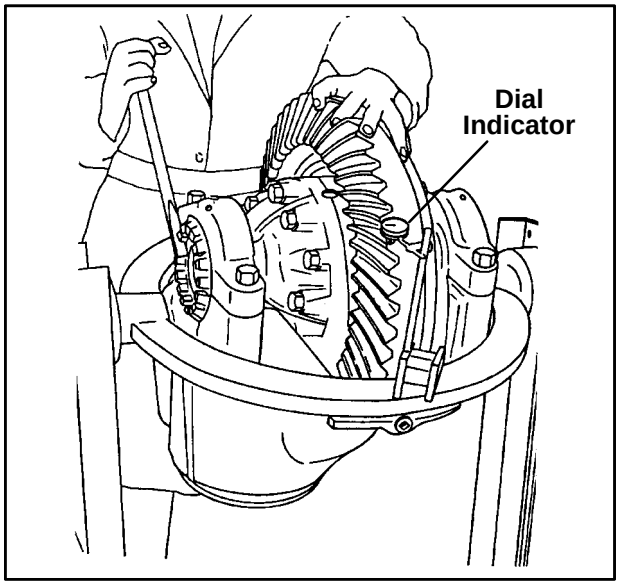


EL18453

Figure 27 - Preload Side Bearings

18. Set the bearing adjuster (11) on the side of the flanged half case so that there is a small amount of backlash, seen visually. Set the other bearing adjuster on the side of the plain half case to approximately zero bearing end play. Watch the rollers in bearing cones (27) as ring gear (20) is turned. At zero end play most of the rollers will be rotating with only one or two sliding. All rollers turning indicates a preload.

19. Preload bearing cones (27) and cups (28) by tightening each bearing adjuster (11) until the expansion between bearing caps (7) is 0.0254 to 0.101 mm (.001 to .004 in.) over the "relaxed" dimension as recorded under Line b of the worksheet. Record the preload expansion on Line c. Be sure when adjusting the preload, that a groove in the bearing adjuster is in position for the installation of lock adjuster (17). Maintain a small amount of ring gear backlash at all times. Refer to Figure 28.



EL10254

Figure 28 - Adjusting Ring Gear Backlash

Note: For a specific gear set, the backlash will change slightly as different teeth on the drive pinion (19) mate with different teeth on the ring gear (20).

20. Install a dial indicator as shown in Figure 28 and check the runout of ring gear (20). The ring gear runout must not exceed ±.102 mm (±.004 in.). If the runout exceeds ±.102 mm (±.004 in), check for improper seating between the flanged half case (38) and the plain half case (39) or between the ring gear (20) and the flanged half case (38).

21. Install a dial indicator as shown in Figure 29. It must be rigidly mounted with the stem perpendicular to the tooth surface at the extreme outside diameter. Clamp the shaft of the drive pinion (19) so it will not rotate. (A flat bar bolted to the end of the pinion and C-clamped to the supporting fixture will prevent rotation). Check the backlash and record on the work sheet "Backlash", Line a. Adjust the backlash to be within 0.4064 to 0.5588 mm (.016 to .022 in.) by rotating both side bearing adjusters (11) in and out the same amount and direction. Record the backlash on line 11a of the work sheet.

DIFFERENTIAL ASSEMBLY WORK SHEET (Continued)

PRELIMINARY INNER SHIM PACK

1)	ETCHED DIMENSION	_____
2)	FLAT BAR THICKNESS If used, 0.00 if not used	_____
3)	MEASUREMENT	_____
4)	Line 3 - Line 2	_____
5)	Line 1 - Line 4	_____

Value on Line 5 = Preliminary Inner Shim Pack

Table 1
Preliminary Inner Shim Pack

INNER SHIM PACK

1)	From Table 1, Line 5	_____
	Shim 1	_____
	Shim 2	_____
	Shim 3	_____
	Shim 4	_____
	Shim 5	_____
	Shim 6	_____
	Shim 7	_____
2)	Total Add Shim 1 Through Shim 7	_____
3)	Line 2 - Line 1	_____

Line 2 must be within + 0.0254/-0.0509 mm (0.001/-0.002 in.) of Line 1.

Table 2
Inner Shim pack

FINAL DRIVE PINION DEPTH CHECK

1)	ETCHED DIMENSION	_____
2)	FLAT BAR THICKNESS If used, 0.00 if not used	_____
3)	MEASUREMENT	_____
4)	Line 3 - Line 2	_____
5)	Line 1 - Line 4	_____

Value on Line 5 = Final Drive Pinion Depth
Final Drive Pinion Must be Within +0.000/-0.0508 mm (+0.000/-0.002 in.) of Etched Dimension.

Table 3
Final Drive Pinion Depth Check

OUTER SHIM PACK (Preload Setting)

1)	ACTUAL SHIM PACK SETUP	
	Shim 1	_____
	Shim 2	_____
	Shim 3	_____
2)	TOTAL ACTUAL SHIM PACK Add Shim 1 through Shim 3	_____
3)	FLAT BAR THICKNESS If used, 0.00 if not used	_____
4)	FINAL DRIVE PINION DEPTH From Table 3, Line 5	_____
5)	MEASURED DEPTH Step 7 under heading, Outer Shim Pack	_____
6)	Line 5 - Line 3	_____
7)	Line 6 - Line 4	_____
8)	CONSTANT To obtain desired preload	0.004”
9)	Line 7 - Line 8 Calculated Shim Pack	_____

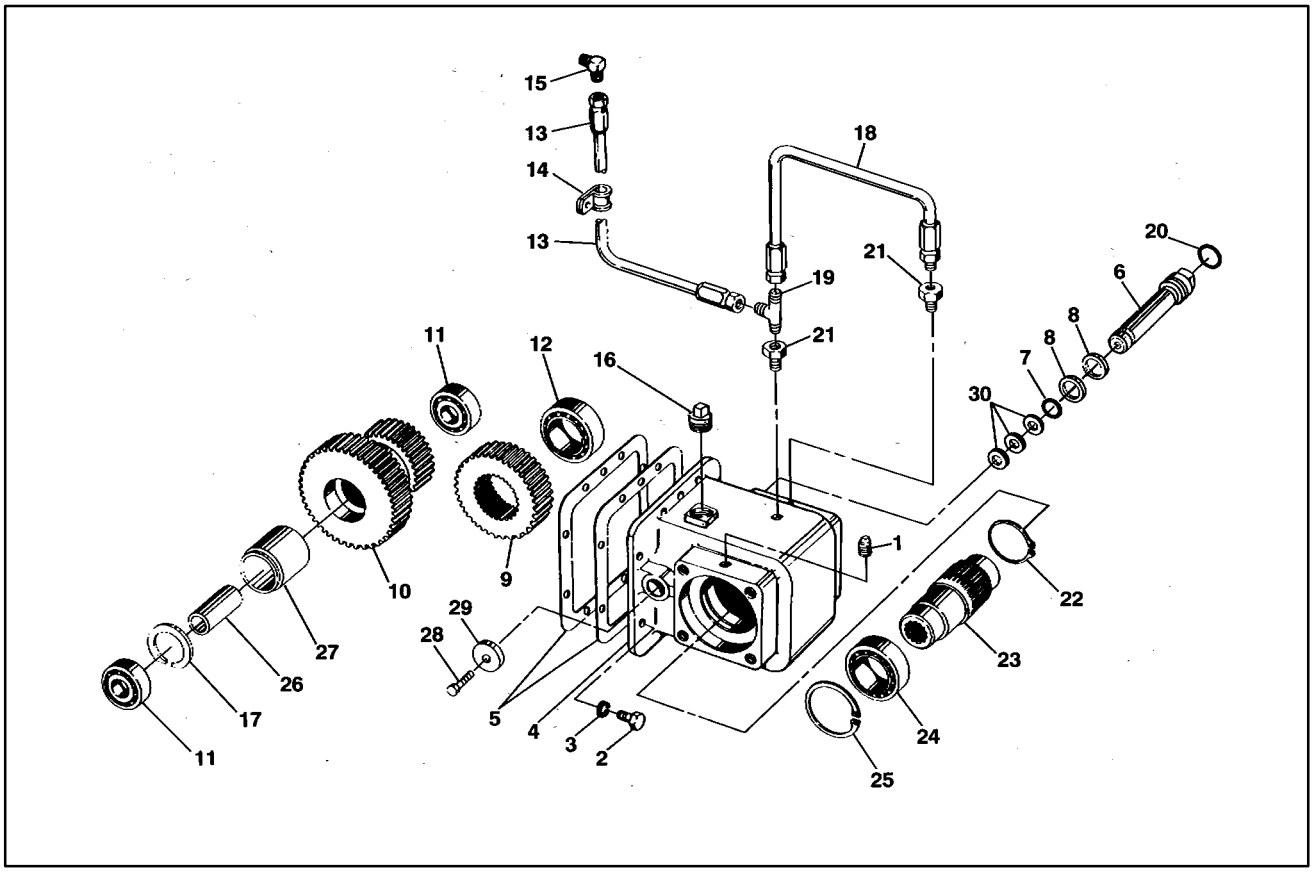
ACTUAL SHIM PACK

10)	ACTUAL SHIM PACK	
	Shim 1	_____
	Shim 2	_____
	Shim 3	_____
	Shim 4	_____
	Shim 5	_____
	Shim 6	_____
	Shim 7	_____
11)	TOTAL ACTUAL SHIM PACK Add Shim 1 Through Shim 7	_____
12)	TOLERANCE CHECK Line 11 - Line 9	_____

Line 12 Must Be +0.0254/-0.0508 mm (+0.001/-0.002 in.)

Table 4
Shim Pack Calculations

POWER TAKE-OFF



EL19108

Figure 2 - Exploded View of Typical Power Take-Of f Assembly

1. Plug
2. Bolt
3. Lockwasher
4. Housing
5. Shims
6. Idler Shaft
7. O- Ring
8. Harden Washer
9. Driven Gear
10. Idler Gear
11. Bearing
12. Bearing
13. Hose Assembly
14. Clip
15. Elbow
16. Plug
17. Retainer Ring
18. Hose Assembly
19. Tee
20. O- Ring
21. Orfice
22. Snap Ring
23. Output Shaft
24. Bearing
25. Snap Ring
26. Spacer
27. Spacer
28. Bolt
29. Plate
30. Shims

REMOVAL

Numbers in parentheses refer to Figure 2.

1. Remove the transmission drain plug and drain the oil from the transmission. See Group 421 **TRANSMISSION MOUNTING**.

2. Remove the hydraulic steering pump. **See Group 645 HYDRAULIC STEERING PUMP AND MOUNTING**.

3. Remove the hydraulic pump. **See Group 913 HYDRAULIC PUMP AND MOUNTING**.

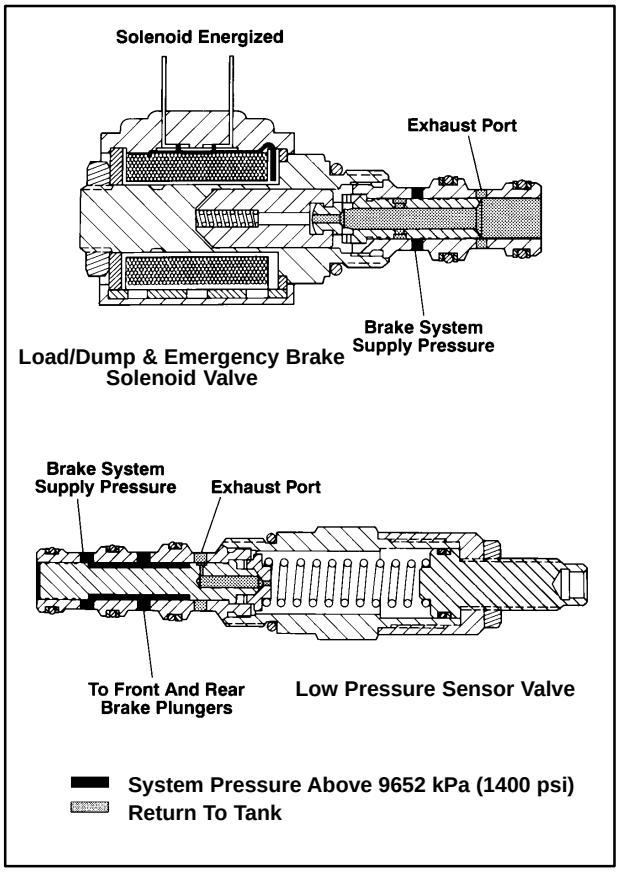
4. Disconnect the lubrication hose assembly (13) from tee (19).

5. Disconnect the hose assembly (18) from tee (19) and orfice (21) and remove the hose assembly (18).

6. Remove tee (19) and orfices (21) from the power take-of f assembly.

7. Support the power take-off assembly with a suitable lifting device, and remove bolts (2) and lockwashers (3) which mount the power take-off as-

HYDRAULIC BRAKE SYSTEM



ELI16036

Figure 7

WARNING!

The load/dump brake is not a parking brake. Hydraulic brake pressure is released when the engine is shut down, and the brakes will release. Always apply the parking brake even when leaving the cab of a machine with the engine running.

The parking brake must be used to hold the machine with the engine off.

Refer to your Operator's Manual for proper operating and usage instructions on load/dump and parking brakes.

If the steering system pressure drops below 12755 kPa (1850 PSI) the steer warning light, central warning light and alarm will activate. See Figure 5. If the steering pressure drops below 11376 kPa (1650 PSI) the brake warning light will activate also.

Since the brake accumulators are isolated from the steer system by the check valves in the brake control valve, full brake system pressure is still available to stop the machine by using the brake pedal.

All of the following must occur before the low pressure sensor will automatically apply the front and rear brakes.

a. Steering pressure must drop below 9653 - 9997 kPa (1400 - 1450 PSI).

b. The steer pressure warning light, central warning light and alarm are activated.

c. The brake pressure warning light is activated.

d. The machine operator must fail to react to the alarms.

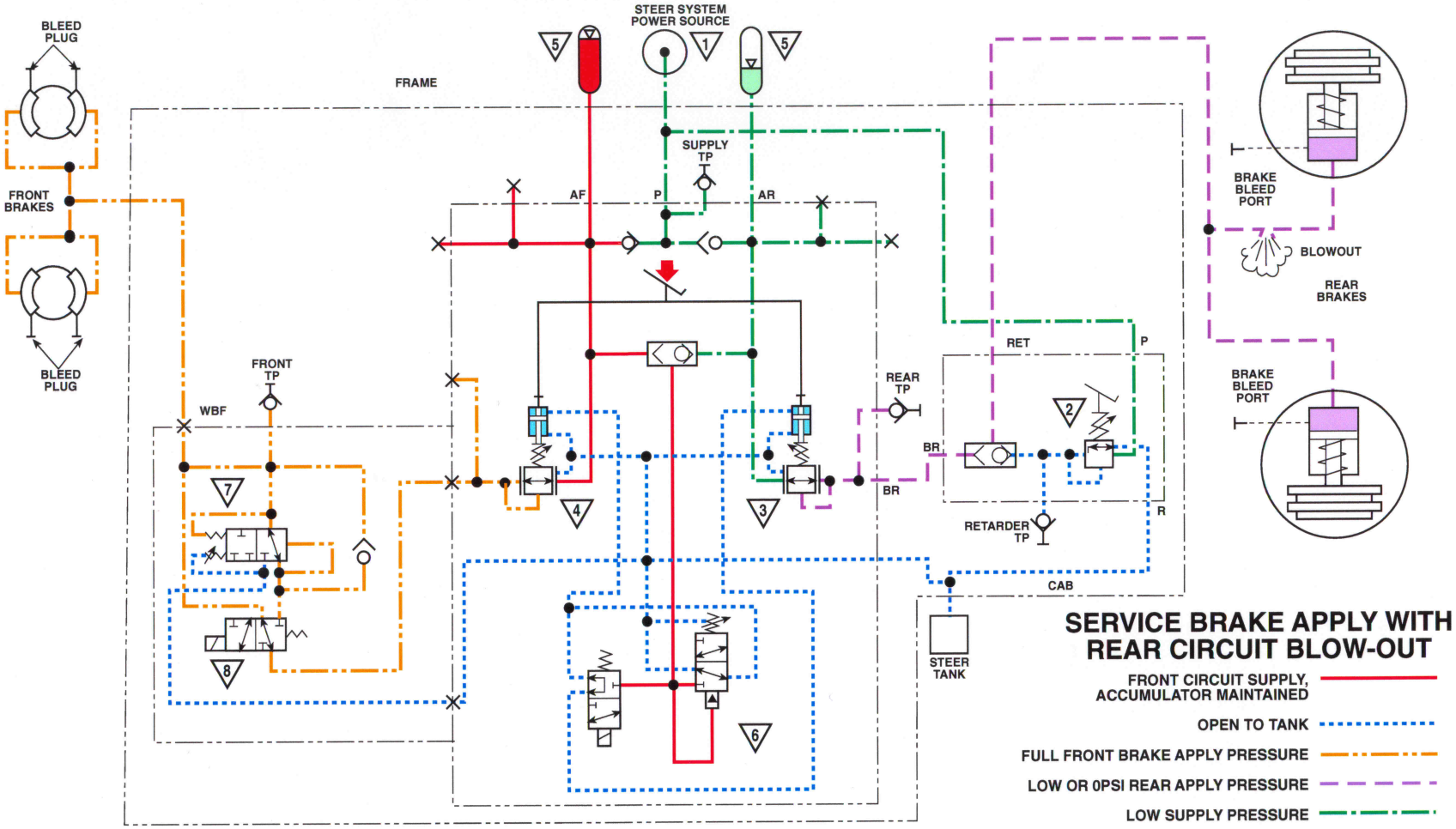
e. Both brake accumulators must also drop below 9653 - 9997 kPa (1400 - 1450 PSI).

The pressure will now be too low to hold off the sensor spring; the sensor will shuttle, opening accumulator pressure 9997 kPa (1450 PSI) or less to pilot the plungers. The plungers will apply the brake control valve in the same manner as a pedal application and this reduced pressure will be supplied to the brakes.

SERVICE BRAKE APPLY WITH REAR CIRCUIT BLOW-OUT

Should the front circuit lose pressure, the front brake accumulator will drain as the brakes are applied. The steering accumulator will also begin to drain; but the

EH1600/1700 BRAKE SYSTEM



1. SUPPLY PRESSURE FROM THE STEER SYSTEM (18960 ± 345 kPa (2750 ± 50 PSI)
2. RETARDER APPLY CARTRIDGE RANGE 0-13790 kPa, ± 173 kPa (0-2000 PSI, ± 25 PSI)
3. REAR SERVICE BRAKE APPLY CARTRIDGE RANGE 0-13790 kPa, ± 173 kPa (0-2000 PSI, ± 25 PSI)
4. FRONT SERVICE BRAKE APPLY CARTRIDGE RANGE 0-18960 kPa, ± 173 kPa (0-2750 PSI, ± 25 PSI)
5. ACCUMULATORS 2.82 LITER (.75 GALLON) DRY NITROGEN VOLUME 8280 ± 173 kPa (1200 ± 25 PSI) DRY NITROGEN PRECHARGE
6. LOW PRESSURE SENSOR VALVE SET TO SHIFT AT 9660 ± 345 kPa (1400 ± 50 PSI)
7. FRONT BRAKE CUT-OFF SEQUENCE VALVE SEQUENCE VALVE IS SET TO SHIFT AT 12758 ± 173 kPa (1850 ± 25 PSI)
8. FRONT BRAKE CUT-OFF SOLENOID SWITCH ACTIVATED BY OPERATOR

REAR BRAKES - WET DISC

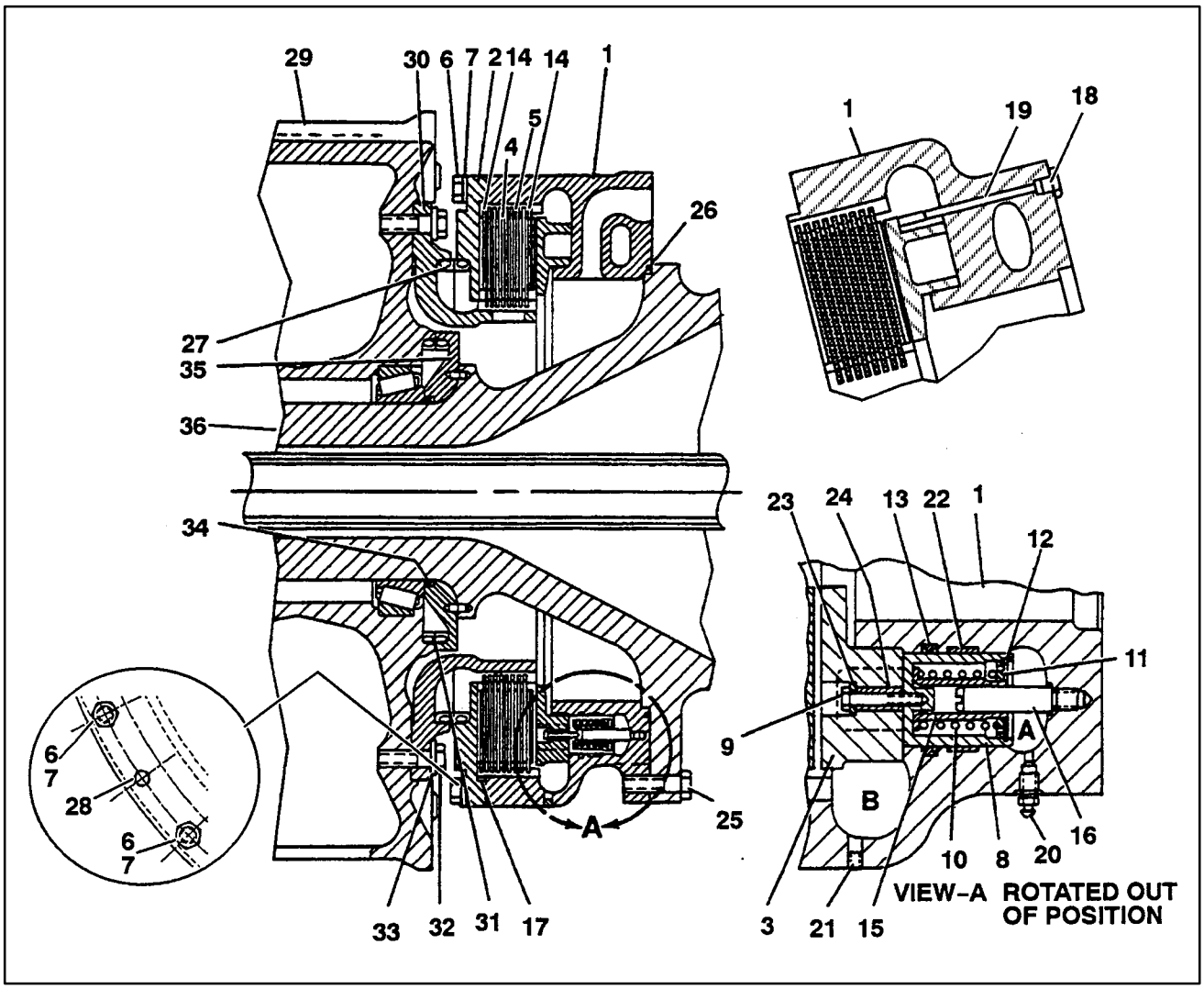


Figure 1 – Cutaway View of Rear Brake

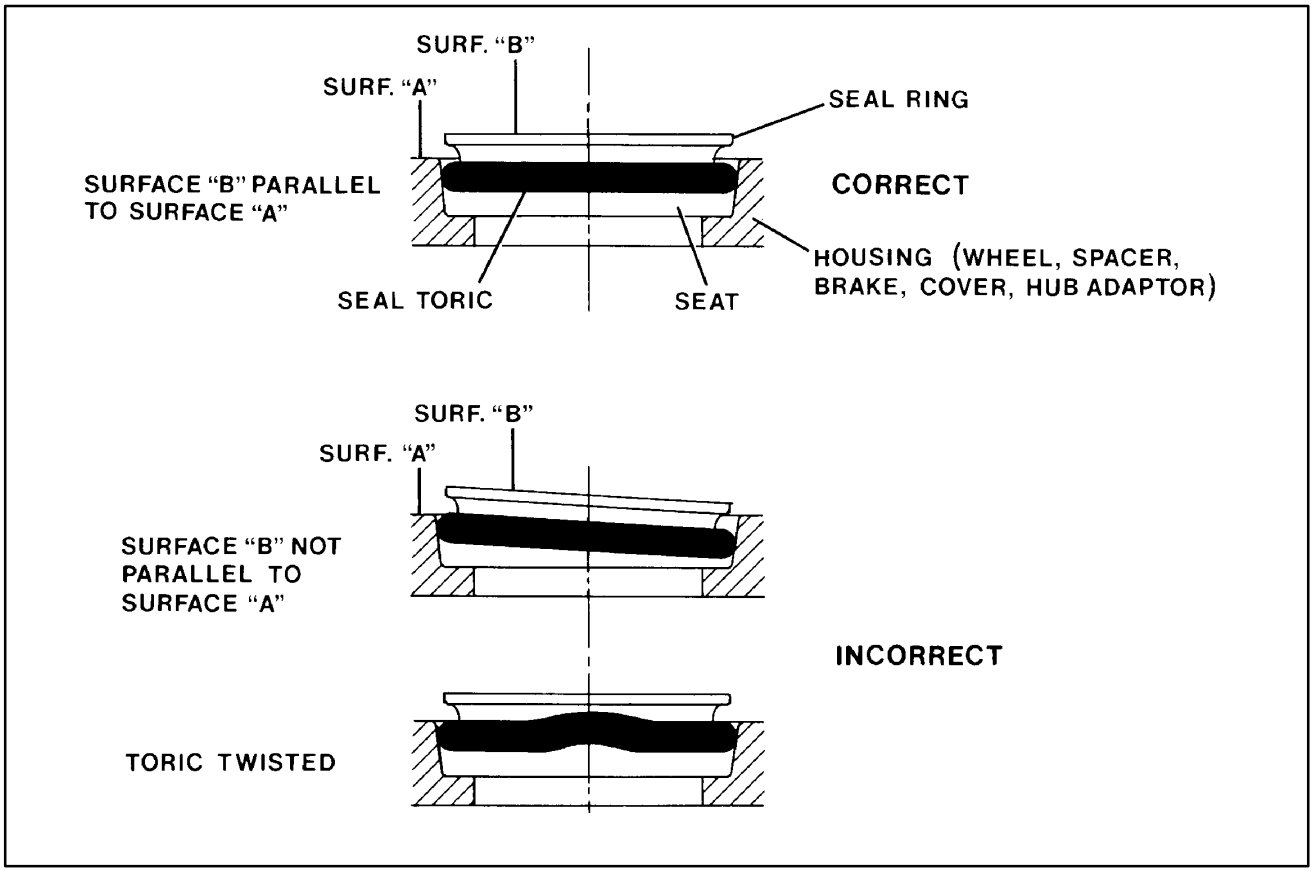
A. Apply Passage
B. Cooling Passage

1. Housing
2. Cover
3. Pressure Plate
4. Friction Disc
5. Reaction Plate
6. Bolt
7. Washer
8. Piston
9. Screw
10. Spring
11. Retainer
12. Snap Ring
13. T-Seal
14. Damper Plate
15. Wear Compensator
16. Post
17. O-Ring
18. Plug
19. Measuring Pin
20. Bleeder
21. Plug
22. Rod Wear Ring
23. Washer
24. Spacer
25. Bolt
26. O-Ring
27. Face Seal
28. Set Screw
29. Wheel
30. Hub
31. Face Seal
32. Bolt
33. Washer
34. O-Ring
35. Spacer
36. Spindle

DESCRIPTION

Numbers in parentheses refer to Figure 1 and 3.

The rear brakes are oil cooled multiple disc. The wet disc brake works in conjunction with the front brakes to slow or stop the machine when the service brake pedal is depressed. The retarder pedal applies only the rear brakes and is used to control the speed of the machine while descending grades.



EL-14752

Figure 11 - Correct and Incorrect Indication

14. Install the rear wheel. Refer to Group 771, **REAR WHEELS**. Be sure that the drive spline engages all the friction discs.

Note: Do not force the wheel into the friction plates or damage to the wheel seal or friction discs may result.

15. Release the applied pressure.

16. Remove the caps from the brake cooling inlets, the outlet lines and connect them to the brake housing with the spilt flanges. Remove the cap from the brake supply line and install them at the connector at the brake housing.

17. Refill the hydraulic reservoir. Refer to the Operators Manual, Basic Preventive Maintenance, **CHANGE HYDRAULIC FLUID**.

18. Brakes must be bled any time a connection in the system has been loosened. See **BLEEDING** in this section.

19. Start the engine, check the system for proper operation. Check for leakage. Check hydraulic fluid level and add if necessary.

BLEEDING

1. Attach a bleeder hose to the bleeder valve (20, Figure 1 and 3) with the other end in a container for drainage.

2. Check oil level and add hydraulic oil as necessary to bring it to the full level.

3. Start engine and let it idle until brake pressure gauge reads normal.

4. While a second person pumps the retarder pedal, open bleeder valve, with hose attached, and bleed fluid until it flows free of air bubbles. Close bleeder valve and remove hose. Repeat at the other rear brake to completely clear the system of air.

5. Replace the oil as necessary to bring the hydraulic reservoir to the full level.

6. Check the brake performance by operating the machine under controlled conditions before returning it to service.

ACTIVE TRACTION CONTROL/ELECTRONIC DOWNHILL SPEED CONTROL

1. To enter the diagnostic mode, press the Boost Switch during power up (key ON). When the Boost Switch is released, the AATC and EDSC lamps will flash up to 5 times and then remain ON. Also note that the LED on top of the BCU will be ON, not flashing as in normal operation. The BCU will begin to slowly ramp up the signal to the left retard solenoid. When the signal has reached its maximum, the ATC and EDSC Lights will turn OFF. The siganl will then again ramp up slowly (lights ON). This cycle will continue until step 2.

2. Press and release the Boost Switch again. The ATC and EDSC Lights will flash up to 5 times and remain ON. The BCU will begin to slowly ramp up the signal to the right retard solenoid. When the signal has reached its maximum, the ATC and EDSC Lights will turn OFF. The signal will then again ramp up slowly (lights ON). This cycle will continue until step 3.

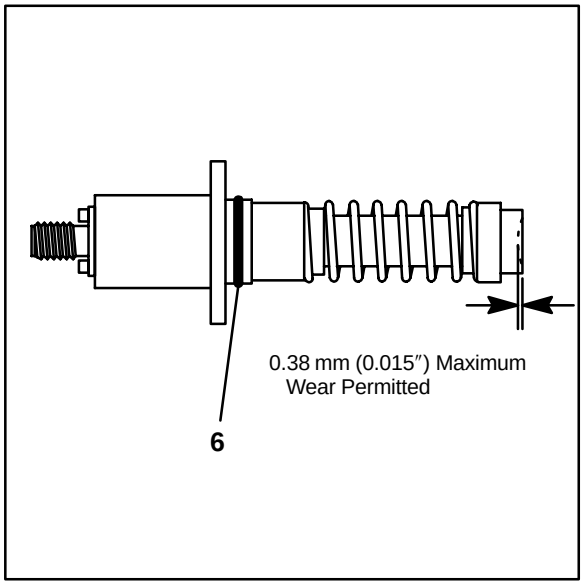
   Note: The signal ramp up begins at 20% and increases in the increments of 10% every 4 to 5 seconds ending at 70% after which, the ramp up will repeat again starting from 20%.

3. Press and release the Boost Switch again. The ATC and EDSC Lights will flash 3-5 times and remain ON. The BCU will then begin to check the left wheel speed sensor. The hauler should be driven at this time. Note that the ATC and EDSC Lights will be ON steady until the left wheel speed reaches 30 rpm. The light will be OFF for speeds above 30 rpm. This test will continue until step 4.

4. Press and release the Boost Switch again. The ATC and EDSC Lights will flash 3-5 times and remain ON. The BCU will begin to check the right wheel speed sensor. The hauler should be driven at this time. Note that the ATC and EDSC Lights will be ON steady until the right wheel speed reaches 30 rpm. The light will be OFF for speeds above 30 rpm. This test will continue until step 5.

   Note: If the lights do not follow this pattern as in steps 3 and 4, there is a problem with the respective wheel speed sensor. The left and right wheel speeds may be monitored in Service Tool Screen 6.3S during steps 3 and 4.

5. Press and release the Boost Switch again. The EDSC Light will flash 5 times and the diagnostic procedure will end, resuming normal BCU operation. Note that the LED on top of the BCU will be flashing indicating normal operation.



ELI16159

Figure 4 - Wheel Speed Sensor

REMOVAL/INSTALLATION

The numbers in parentheses refer to Figure 3.

1. Remove the two mounting bolts (5), securing wheel speed sensor (4) to the rear axle housing (3).

2. Carefully pull wheel speed sensor (4) straight out from rear axle housing (3).

3. Inspect the wear shoe. Replace the tip if wear exceeds 0.38 mm (0.015”). Refer to Figure 4.There is a tip replacement kit available.

WARNING!

If old wear shoe is worn through, DO NOT attempt to repair the sensor. Premature failure may occur.

4. Remove old wear shoe by unthreading in a counterclockwise direction until threads disengage. Discard old wear shoe.

5. Remove old compression spring and two O-rings (on sensor housing and plunger) and discard. Do not attempt to disassemble the sensor further.

BRAKE VALVE

FRONT BRAKE CUT-OFF VALVE

The front brake cut-off valve (refer to Figure 4) is mounted to the brake control valve. The front brake cut-of f valve changes the brake proportioning between the front and rear brakes. With the front brake cut-of f switch in the “Normal” position, the front and rear brakes apply simultaneously as the service brake pedal is depressed. With the switch in the “Active” position and the service brake partially depressed, only the rear brakes will be applied. When the service brake is approximately 80% depressed, the front brakes will also apply.

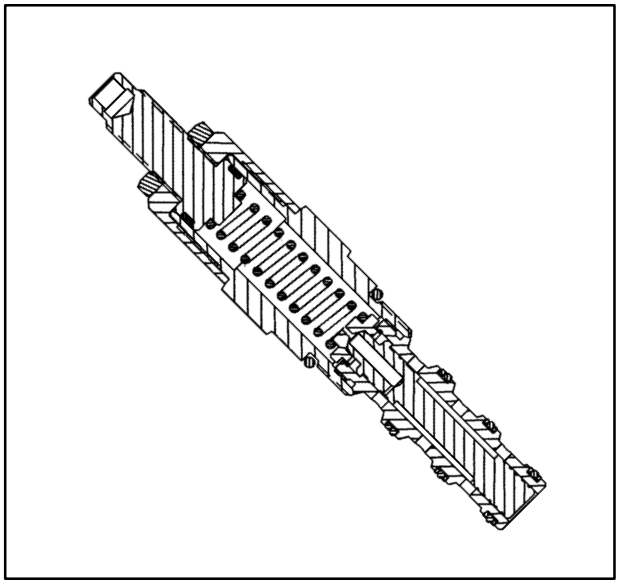


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Figure 4 - Front Brake Cut-Off Valve

FRONT BRAKE CUT-OFF BELOW 12755 kPa (1850 psi)

When the operator applies the front brake cut-off switch, which energizes the solenoid in the front brake cut-off valve, the solenoid shifts directing front brake apply pressure to a pilot operated sequence valve. This valve prevents front brake application.

FRONT BRAKE CUT-OFF ABOVE 12755 kPa (1850 psi)

When the operator applies an aggressive stop, the brake pedal is depressed enough to send a front brake apply pressure above 12755 kPa (1850 psi) to the sequence valve. This apply pilot pressure will overcome spring tension in the valve allowing it to shift which directs the brake apply pressure to the front brakes.

REMOVAL

Numbers in parentheses refer to Figures 3.

WARNING!

Before working on the machine, park it on a level surface and put it in the SERVICE POSITION. Refer to Group 091, Service and Safety Instructions. Make certain that the system pressure is relieved before disconnecting any hose or disassembling any component.

1. Remove front access cover at cab.
2. Remove the tube assemblies from brake valve (73). Cap the tubes to prevent contamination and loss of fluid.

Note: When removing brake tubes, mark all lines to facilitate reassembly.

3. Disconnect the brake switch connector near the pedal assembly and load/dump solenoid connector.
4. Remove bolts (75) securing valve plate to firewall and remove.

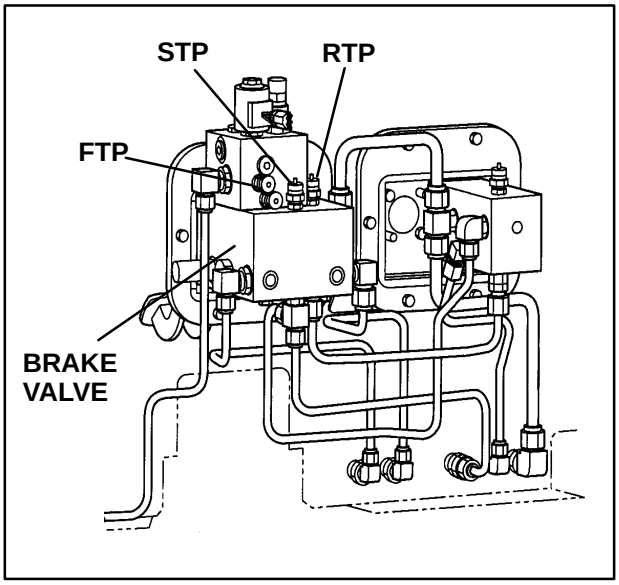
DISASSEMBLY

Numbers in parentheses refer to Figures 1 - 1A.

1. Remove E-ring (28) from shaft (27). Push out shaft and let spring (22) drop free.
2. Remove the E - ring (25) from the shaft (23). Push out the shaft (23) and the nylon washer (24) to remove the pedal assembly (6) with its associated hardware intact.
3. Remove bolts (32 & 33) securing mounting plate (5) to brake valve (1) and remove brake valve. Set plate (5) aside with bracket (15), eye screw (20), brake switch (17) and related hardware still intact.
4. Front brake cartridge (2) and rear brake cartridge (3) may be removed by pulling them carefully straight out of valve (1), they are retained by plate (5).
5. Remove and discard O-rings (34) and back-up rings (35) from valve (1).
6. Remove and discard O-rings (59, 57 & 50) and back-up rings (58 & 56) from front and rear brake cartridges.

9. Screw shaft collar (47) onto plunger (48). Install springs (53, 54 & 55) and screw plunger guide (49) into body (42).

10. Install cartridge into manifold (1) and readjust pressure using shaft collar (47) as instructed previously in this group.



EL20050

Figure 6 - Brake Valve Test Ports

1. Supply Test Port (STP)
2. Front Test Port (FTP)
3. Rear Test Port (RTP)

CHECKING RESIDUAL BRAKE PRESSURE

Refer to Figure 6.

The following material will be needed for checking the residual brake pressure:

a. 1 - 414 kPa (60 psi) or less gauge

b. 1 - 20684 kPa (3000 psi) gauge

c. 1 - Four-Way Tee

d. 1 - Shut-Off Valve

e. 1 - 2 m (6 ft.) Hose

Note: The engine must be running when making this test.

1. Prepare a two gauge setup that has a hose going from one of the brake valve test ports into a four - way tee. Connect the 20684 kPa (3000 psi) gauge into the tee, the the shut off valve into the tee, and the 414 kPa (60 psi) gauge into the shut off valve.

2. Place the hose on the **FTP** or the **RTP**, of the brake valve, depending on which brake valve you want to test.

3. Close the brake valve that you are testing to protect the low pressure, 414 kPa (60 psi), gauge.

4. Apply the brakes and then release them. Watch the pressure until it is within the low pressure range [414 kPa (60 psi)], then open the valve.

5. Observe the pressure fall and note it after 10 and 60 seconds.

6. The residual pressure should be less than 34 kPa (5 psi) after 60 seconds.

Note: If the residual pressure is not corrected, less than 34 kPa (5 psi), this will cause premature wearing of the brake pads and excessive heat.

BRAKE ACCUMULATOR

If at anytime, the pressure at the piston would drop due to severe leakage or pump failure, one way check valves, in the brake valve, will close to prevent the escape of oil in the accumulator.

This stored oil will then be directed under pressure to the rear brakes thus stopping the unit. Do not attempt to move the machine until the brake pressure problem is corrected.

REMOVAL

Numbers in parentheses refer to Figure 1, 2 and 9.

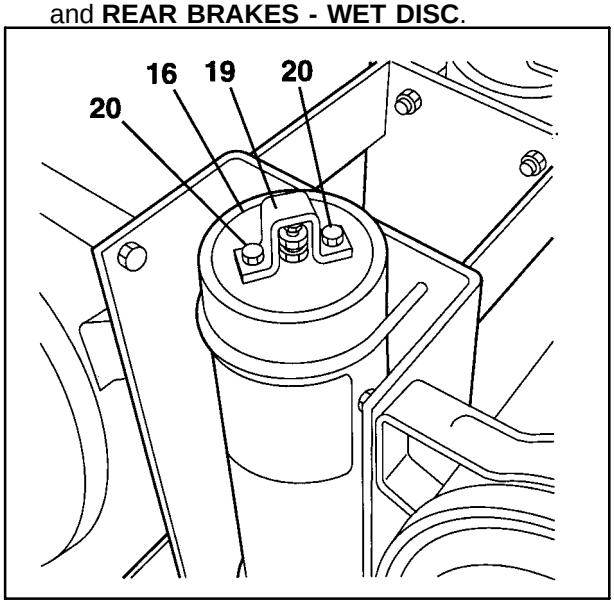
1. Park the machine on level ground and place in Service Position. Refer to Group 091, **Service Position/Safety Instructions**.

WARNING!

Before removing or disassembling the accumulators, bleed the front and the rear brake lines and discharge the accumulators to prevent possible injury.

2. Attach a bleeder hose to the bleeder valve at each brake head, front and rear. Place the loose end of the hose in a clean container to catch the brake fluid at each brake head.

3. Open the bleeder valves on each brake head and bleed the brake lines. Pump the brake pedal Refer to Group 500 **FRONT BRAKES** and **REAR BRAKES - WET DISC**.

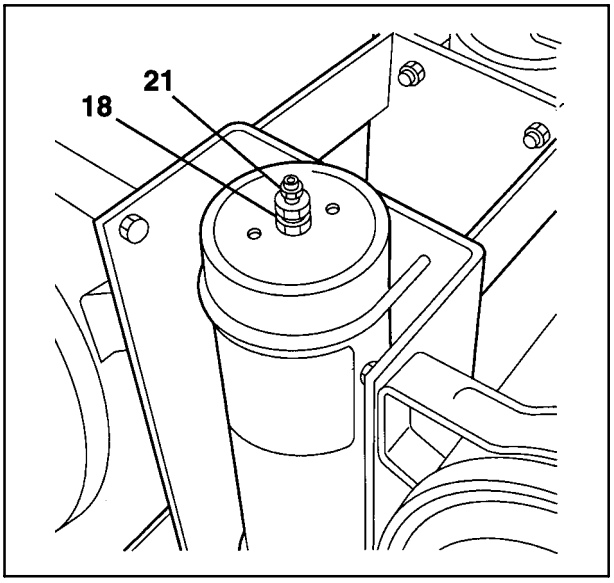


EL19485

Figure 3

4. Remove the two bolts (20) and plate (19) from the end cap (16).

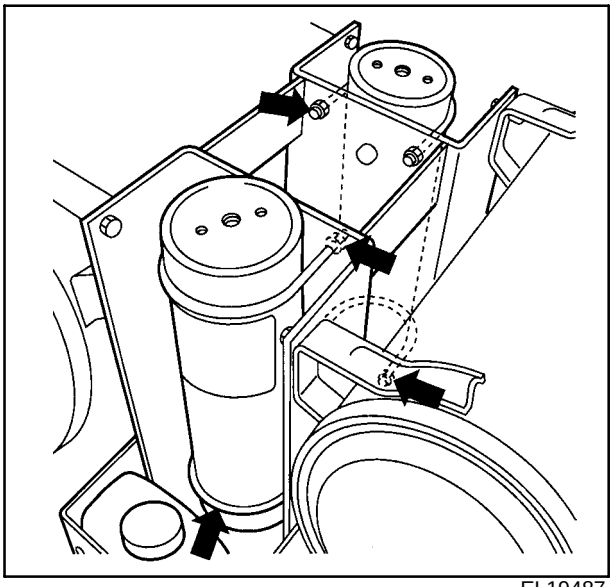
Note: An inflation kit is available to check pressures and to charge the brake accumulators. Refer to Group 179, SPECIAL TOOLS.



EL19486

Figure 4

5. Slowly turn the upper nut on the charge valve (18) counter-clockwise to remove the nitrogen precharge. Remove the valve cap (21) from the charge valve (18). Refer to Figure 9.



EL19487

Figure 5

6. Loosen the nuts on the four U-bolts.

PARKING BRAKE

DESCRIPTION

Numbers in parentheses refer to Figure 2.

The machine parking brake is located at the input shaft of the rear axle differential. The brake is operated by an actuator that uses the “spring applied and hydraulic released” principle explained in the next paragraph. The hydraulic fluid to the brake actuator is controlled by the park brake switch on the right hand side of the instrument panel. The brake disc is secured to the input flange of the rear axle differential. The caliper and the linings produce the braking force. The parking brake can be manually adjusted to compensate for wear on the brake linings.

The spring/oil caliper brake consists of a caliper (7), an automatic slack adjuster (15), and a spring/ oil actuator (13). The caliper (7) houses two lining and carrier assemblies (1), a piston assembly (6) threaded to a power screw shaft (19), and a piston seal (5) installed in an ID groove in the caliper (7). The piston seal (5) helps to align the piston assembly (6) in the caliper (7) and prevents contamination of the piston bore area. The caliper (7) is mounted to a brake support plate, which is attached to the differential carrier housing.

The cap assembly (22), is fastened to the caliper (7) with 4 bolts (2), and washers (3). It supports the power screw shaft (19) seated on a thrust bearing (20) and a press fitted journal bearing (23). A welded bracket on the cap assembly supports the actuator (13) secured with 2 nuts (11) each, flat washer (27), and lock washers (12).

The slack adjuster (15) is attached to the splined end of the power screw shaft (19) which protrudes from the cap assembly (22). A packing (18) is seated against the journal bearing (23) in the cap assembly (22). A flat washer (16) and a wave spring washer (17) are installed on the power screw shaft (19) between the cap assembly (22) and the slack adjuster (15). A retaining ring (14) secures the slack adjuster (15) on the splined end of the power screw shaft (19).

The yoke (10) attaches the slack adjuster (15) to the actuator (13) with a yoke pin (9) which is secured by the cotter pin (8).

Note: The parking brake is for static holding only. It is not designed for dynamic braking. The brake apply logic contains safety interlocks to prevent application while the machine is in motion and to lock the transmission in Neutral if the brake is applied.

OPERATION

Numbers in parentheses refer to Figure 2.

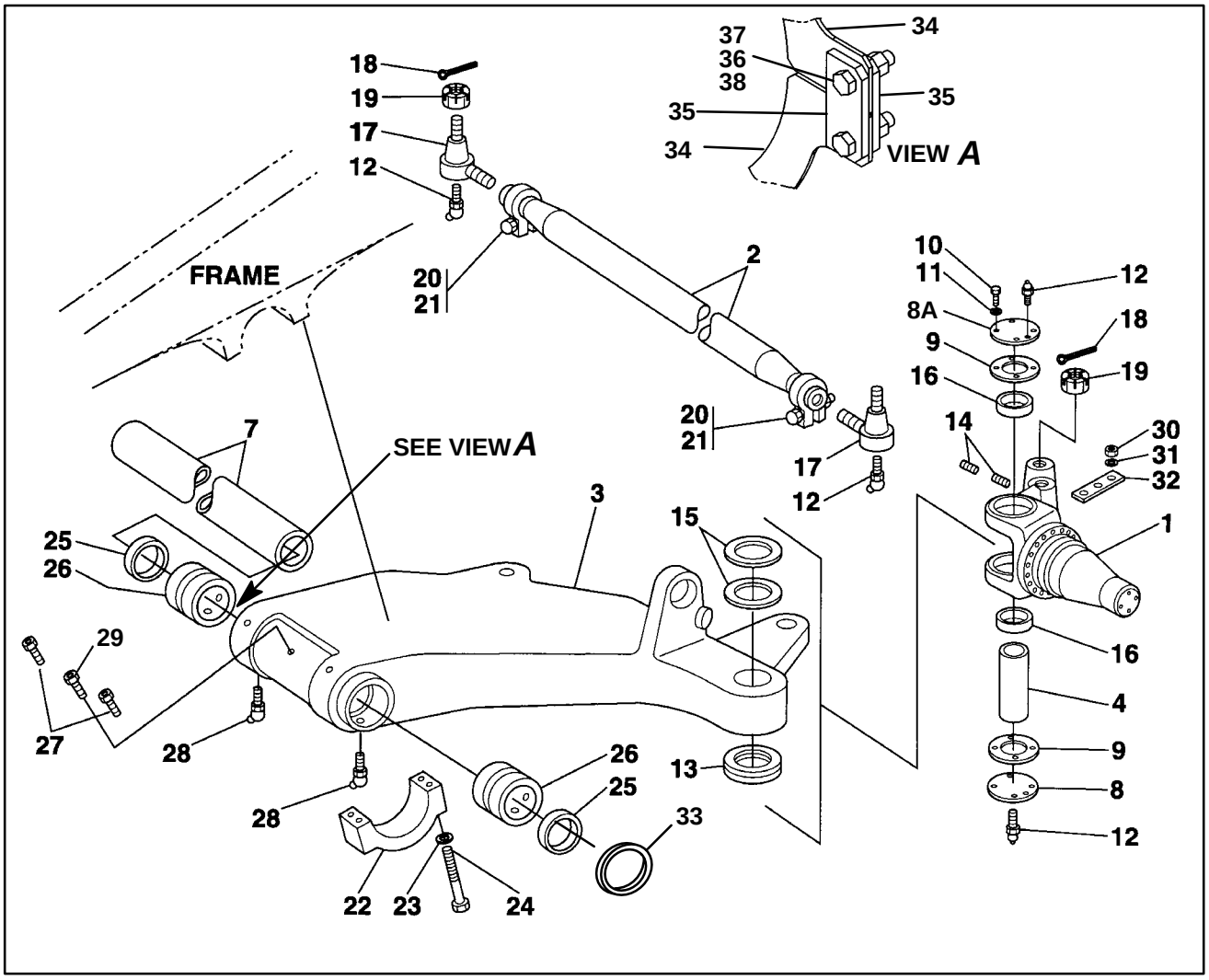
WARNING!

Do not attempt to remove springs from actuator (13), they are not serviceable. Do not cut, saw, torch or modify the spring chamber of actuator (13). Serious injury may result. This is not a serviceable item.

When the parking brake switch in the machine cab is placed in the **“ON”** position, the solenoid in the RCB valve (reference Group 645, **Relief Check Bleed Valve**) exhausts the hydraulic pressure in the parking brake actuator. The spring caliper is actuated by dumping the hydraulic oil from the spring oil actuator (13) inlet port, releasing the compressed spring in the actuator. The spring pulls the yoke (10) and the slack adjuster (15) arm down, turning the attached power screw shaft (19) that is threaded into the piston assembly (6) housed in the caliper (7). This transmitted force moves the piston assembly (6) forward against the lining and carrier assembly (1) until it presses against the disc

Placing the switch to the **“OFF”** position causes the solenoid to pressurize the actuator with hydraulic oil which compresses the spring inside the actuator chamber, allowing the actuator rod to extend. Releasing the brake allows the oil pressure to re-enter the actuator (13) compressing the actuator spring and retracting the attached components.

FRONT AXLE



ELI19553

Figure 3- Exploded View of Front Axle (Left Side Shown)

1. Spindle
2. Tie Rod
3. Trailing Arm
4. Kingpin
7. Suspension Tube
8. Cover Plate
8A. Cover Weldment
9. Gasket
10. Bolt
11. Washer
12. Grease Fitting
13. Spherical Thrust Bearing
14. Set Screws
15. Shims
16. Bushing
17. Ball Socket Assembly
18. Cotter Pin
19. Nut
20. Bolt
21. Nut
22. Suspension Tube Cap
23. Bolt
24. Washer
25. Seal Ring
26. Bushing
27. Plug
28. Grease Fitting
29. Relief Valve
30. Nut
31. Washer
32. Plate
33. Thrust Washer
34. Shims
35. Plate
36. Washer
37. Lock Nut
38. Bolt
39. Bar (See Figure 11)

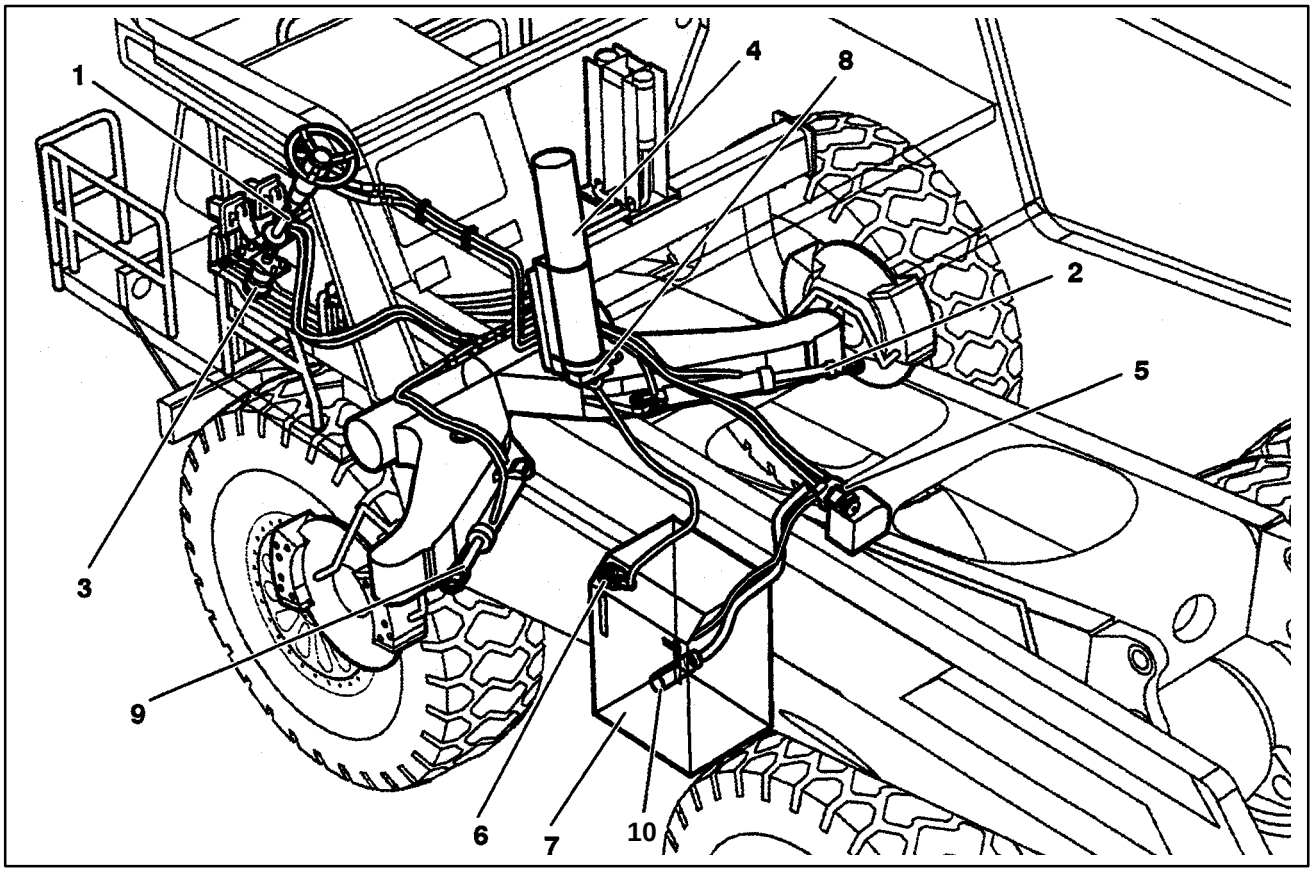
TOOLS AND EQUIPMENT REQUIRED

The following tools and equipment will be required for the disassembly and assembly of the trailing arm and kingpin:

Disassembly

Boring mill with a 13 to 15 cm. (5″ to 6″ spindle)
Welding Equipment
Hammer and driving tool or 45-55 tonne (50-60 ton) hydraulic jack and Kingpin Removal Tool
See Group 179, **SPECIAL TOOLS**

STEERING SYSTEM



ELI16027

Figure 1 - Steering Components

1. Steering Column
2. Right Steer Cylinder
3. Steer Valve
4. Accumulator
5. Steer Pump
6. Steer Filter
7. Hydraulic Tank
8. Relief-Check-Bleed Valve (RCB)
9. Left Steer Cylinder
10. Strainer

DESCRIPTION

Numbers in parenthesis refer to Figure 1.

The steering system illustrated in Figure 1 is a closed center, hydrostatic power steering system using two double acting cylinders (2 & 9), piston type hydraulic pump (5), and brake actuation/steering system reservoir (7).

The system contains the following:

Steering Column (1)

Located in the operator's cab. A two cross drive line, splines into the steering column at its top and the steering valve (3) at its bottom.

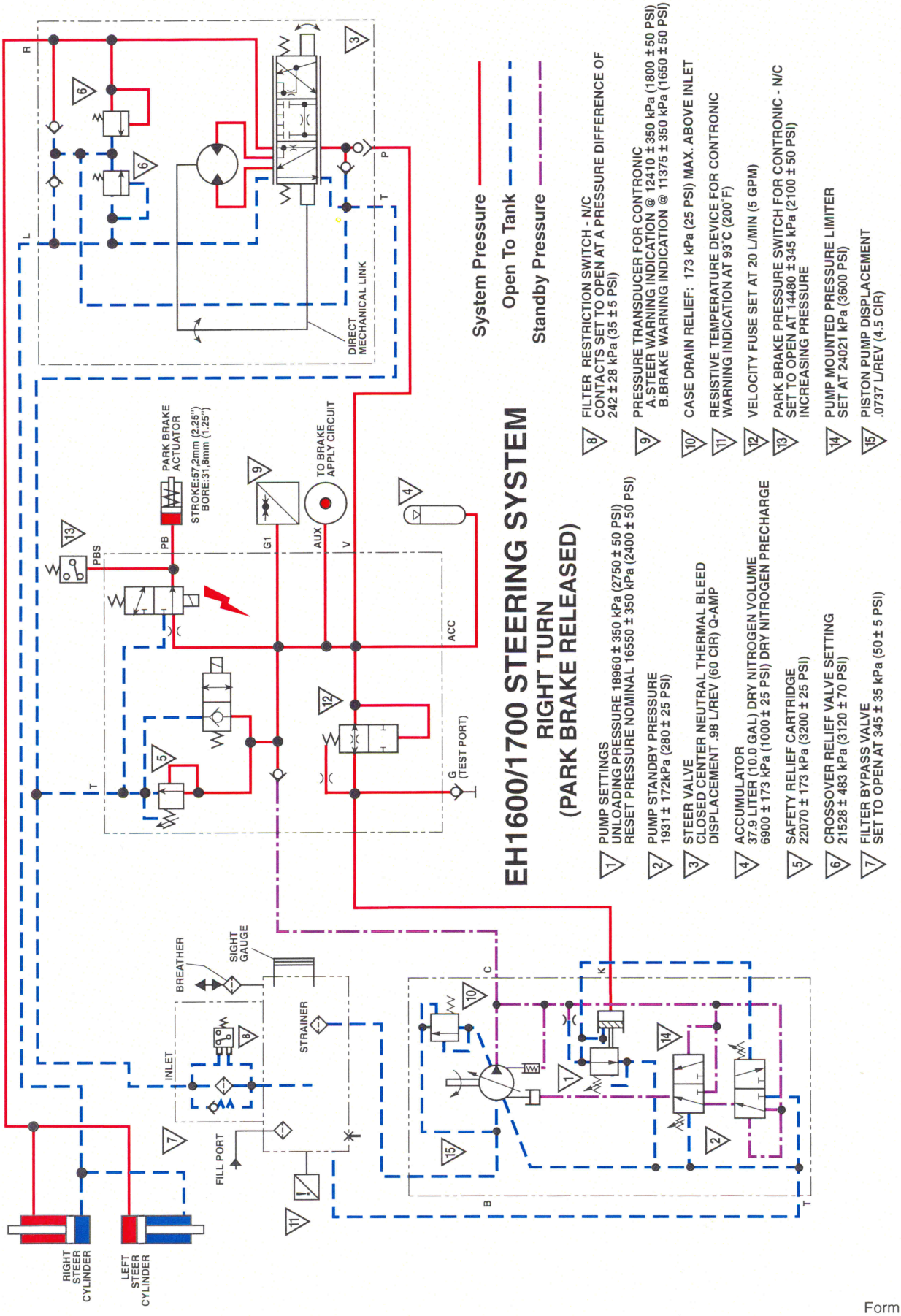
Right Steer Cylinder (2)
Left Steer Cylinder (9)

The two hydraulic steering cylinders are mounted with the base end attached to a trailing arm and the rod end attached to a spindle. The steering cylinders are single stage, double acting units. Each cylinder has one stage of expansion plus the ability to receive pressurized oil at either side of the piston to extend or retract the piston rod and consequently move the spindle in a given direction to perform a left or right turn.

Steering Valve (3)

Mounted below the cab floor plate, the valve adapter column mounts to the steering valve and between the mounting plate. The output splines are connected to a two cross drive line.

The main steer valve controls the flow of hydraulic fluid in the steering system to the steering cylinders. It

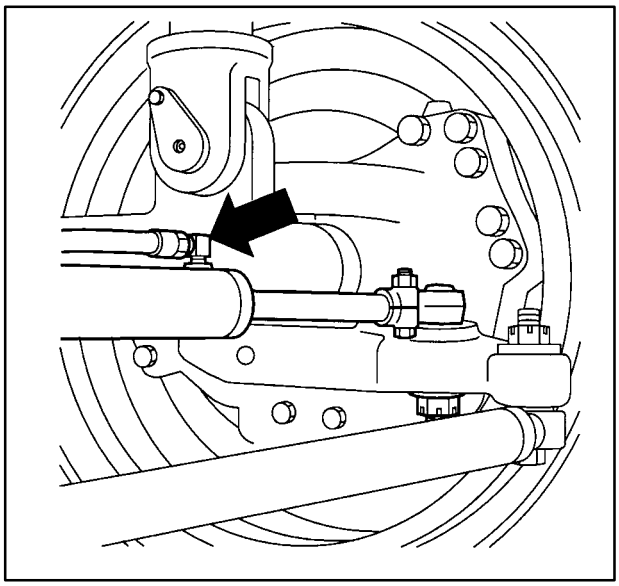

EH1600/1700 STEERING SYSTEM
RIGHT TURN
(PARK BRAKE RELEASED)
System Pressure
Open To Tank
Standby Pressure
1 PUMP SETTINGS
UNLOADING PRESSURE 18960 ± 350 kPa (2750 ± 50 PSI)
RESET PRESSURE NOMINAL 16550 ± 350 kPa (2400 ± 50 PSI)
2 PUMP STANDBY PRESSURE
1931 ± 172kPa (280 ± 25 PSI)
3 STEER VALVE
CLOSED CENTER NEUTRAL THERMAL BLEED
DISPLACEMENT .98 L/REV (60 CIR) Q-AMP
4 ACCUMULATOR
37.9 LITER (10.0 GAL) DRY NITROGEN VOLUME
6900 ± 173 kPa (1000 ± 25 PSI) DRY NITROGEN PRECHARGE
5 SAFETY RELIEF CARTRIDGE
22070 ± 173 kPa (3200 ± 25 PSI)
6 CROSSOVER RELIEF VALVE SETTING
21528 ± 483 kPa (3120 ± 70 PSI)
7 FILTER BYPASS VALVE
SET TO OPEN AT 345 ± 35 kPa (50 ± 5 PSI)
8 FILTER RESTRICTION SWITCH - N/C
CONTACTS SET TO OPEN AT A PRESSURE DIFFERENCE OF
242 ± 28 kPa (35 ± 5 PSI)
9 PRESSURE TRANSDUCER FOR CONTRONIC
A.STEER WARNING INDICATION @ 12410 ± 350 kPa (1800 ± 50 PSI)
B.BRAKE WARNING INDICATION @ 11375 ± 350 kPa (1650 ± 50 PSI)
10 CASE DRAIN RELIEF: 173 kPa (25 PSI) MAX. ABOVE INLET
11 RESISTIVE TEMPERATURE DEVICE FOR CONTRONIC
WARNING INDICATION AT 93˚C (200˚F)
12 VELOCITY FUSE SET AT 20 L/MIN (5 GPM)
13 PARK BRAKE PRESSURE SWITCH FOR CONTRONIC - N/C
SET TO OPEN AT 14480 ±345 kPa (2100 ± 50 PSI)
INCREASING PRESSURE
14 PUMP MOUNTED PRESSURE LIMITER
SET AT 24021 kPa (3600 PSI)
15 PISTON PUMP DISPLACEMENT
.0737 L/REV (4.5 CIR)
DIRECT MECHANICAL LINK
PARK BRAKE ACTUATOR
STROKE:57.2mm (2.25")
BORE:31.8mm (1.25")
TO BRAKE APPLY CIRCUIT
PB
PBS
G1
AUX
V
ACC
G (TEST PORT)
BREATHER
SIGHT GAUGE
STRAINER
INLET
FILL PORT
RIGHT STEER CYLINDER
LEFT STEER CYLINDER

STEERING CYLINDER

REMOVAL (A lifting device of 113 kg. (250 lbs.) will be required for removal.)

Note: Only one steering cylinder will be discussed in the following text since the steering cylinders are identical.

Note: Before working on the machine, park it on a level surface and put it in the SERVICE POSITION. See Group 091, Service Position/Safety instructions.

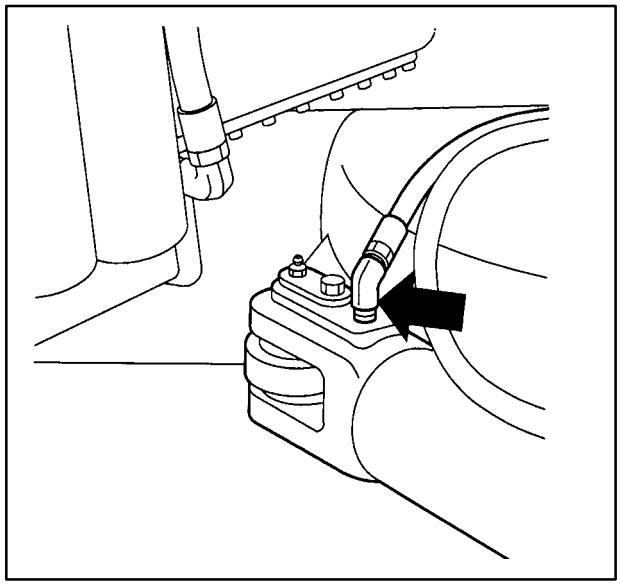


EL19372

Figure 5 - Rod End Hose Assembly

Numbers in parentheses refer to Figure 9.

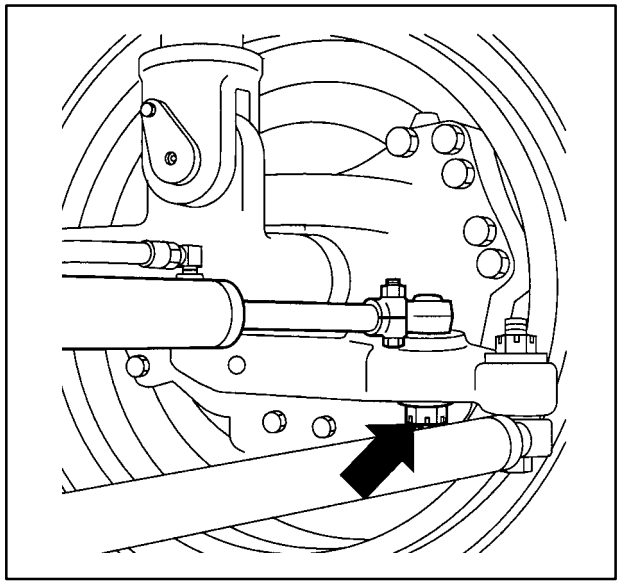
1. Disconnect the hose assembly from the 90° adapter (35) at the rod end of tube weldment (1). Drain and cap the hose assembly to keep dirt from entering. Refer to Figure 5.



EL19373

Figure 6 - Base End Hose Assembly

2. Disconnect the hose assembly from the 45° adapter (32) at the base end of tube weldment (1). Drain and cap the hose assembly to keep dirt from entering. Refer to Figure 6.

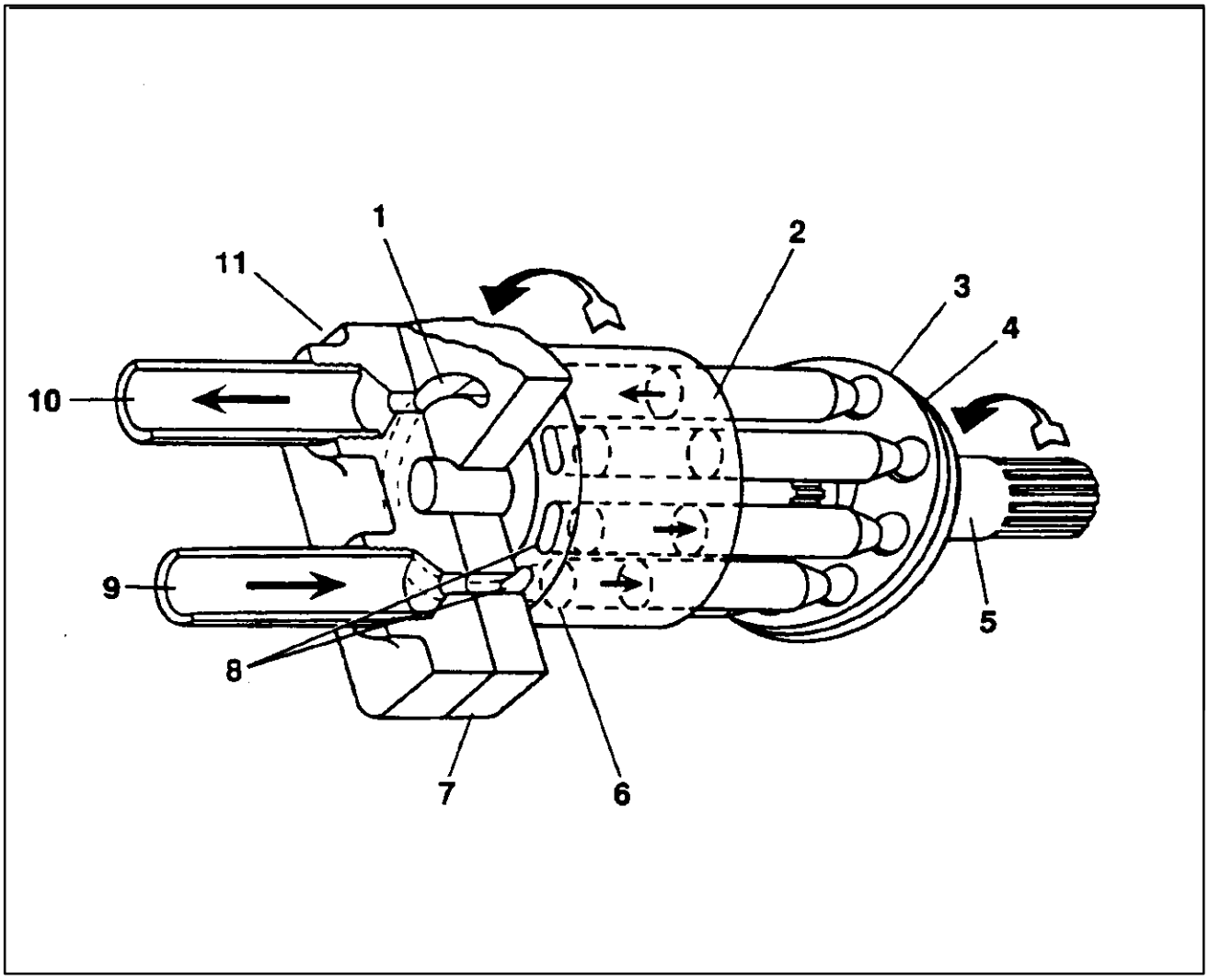


EL19374

Figure 7 - Steering Cylinder Assembly Rod End Mounting

3. Support the steering cylinder assembly with the required lifting device. Remove cotter pin (20) and nut (21), which secures the steering cylinder socket assembly in the wheel spindle. Refer to Figure 7.

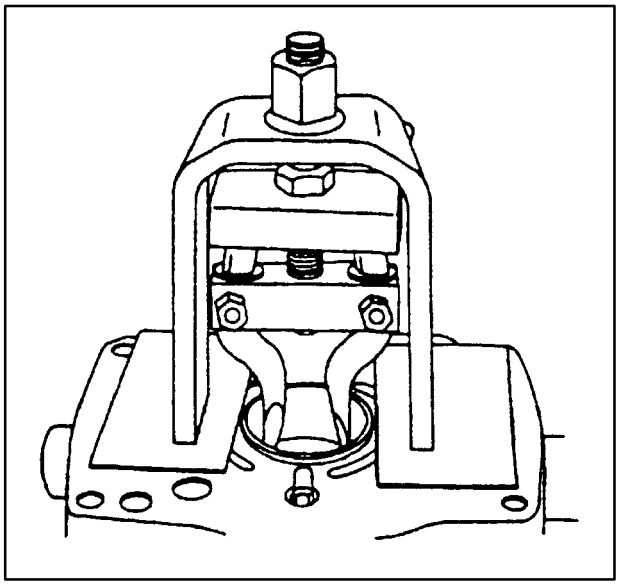
STEERING PUMP



EL15086

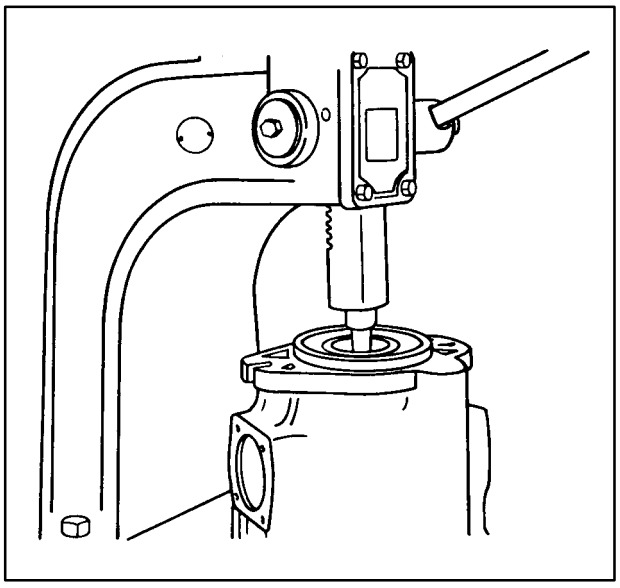
Figure 3- Typical Pump Operation

1. Outlet Valve Plate Slot
2. Piston Subassemblies
3. Shoe Plate
4. Yoke Plate
5. Drive Shaft
6. Cylinder Block Bore
7. Valve Plate
8. Intake Valve Plate Slot
9. Inlet Port
10. Outlet
11. Valve Block



ELI5095A

Figure 9 - Removal of Bearing Race From Valve Block



ELI5095

Figure 10 - Removal of Front Bearing Race

DISASSEMBLING LOAD SENSING/PRESSURE LIMITING CONTROL

Numbers in parentheses refer to Figure 7, Item 3.

WARNING!

Do not attempt to disassemble or remove the load/sensing limiting control while the engine is running. Make sure the power is "OFF" and the hydraulic cylinders are lowered. Discharge accumulators and block any load whose movement could generate pressure. See Group 647, "Steering Accumulator".

Note: In the following step if the pump control is mounted at the twelve (12) o'clock position, complete draining of the pump will not be required. Some draining will occur until fluid level reaches the drain port level of the control.

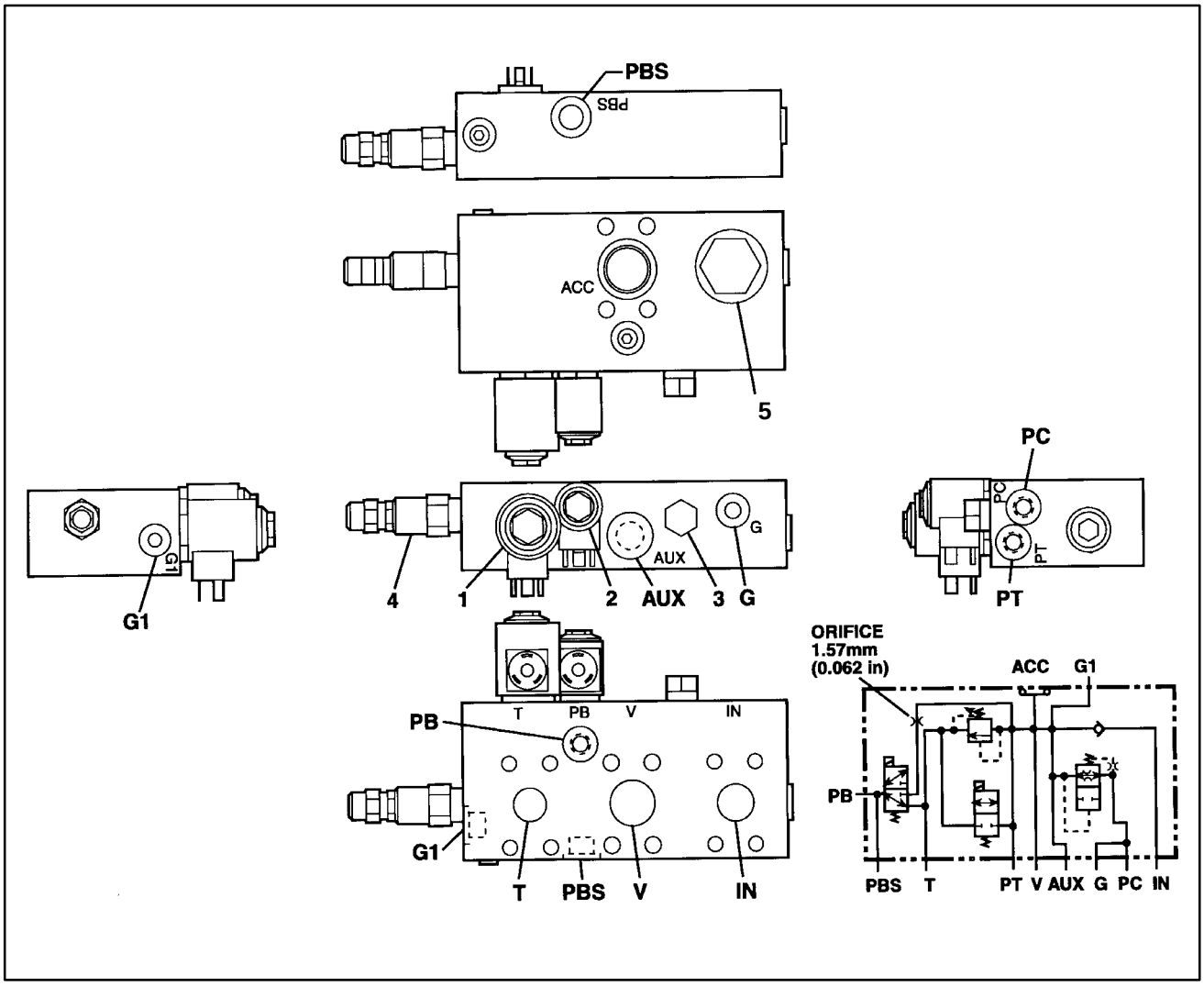
1. Remove plug (18) and O-ring (19) from the pump body (1) and drain fluid from the pump.
2. Remove the load sensing/pressure control by loosening four screws (2) that holds the control to the valve block (28). Remove three O-rings (24) and discard.
3. Place the control in a vise with the jaws resting on the outside of the pump's body (1).
4. Remove parts (4 through 17) then remove the plugs (20) and O-rings (21). Slide spools (22-23) from the body. Discard all O-rings.

INSPECTION REPAIR AND REPLACEMENT

Note: All parts must be thoroughly cleaned and kept clean during inspection and assembly. Clean all removed parts with with a solvent that is compatible with system fluid. Compressed air may be used in the cleaning process, however, it must be filtered to remove water and other contamination. Clean compressed air is especially useful in cleaning body passages.

1. Inspect the threads and O-ring grooves on adjustment plugs (5 and 11). If the threads are worn, replace the plugs (5 and 11). If the O-ring grooves have burrs, remove the burrs with an India stone.
2. Inspect springs (9 and 16) for wear on the outside edges. Check spring ends for squareness. The spring ends must be parallel within 76 mm (3″). if spring is bent or worn, replace the spring.
3. Check the spring guides (8 and 14) for burrs. Clean up with India stone if burrs are present.
4. Check spools (22 and 23) for erosion, burr and scratches. If the spool (22 and 23) is eroded or scratched across a land, check pump body (1)

RELIEF CHECK-BLEED VALVE



EL19395

Figure 1 - Cutaway View of Relief Check-Bleed Valve

IN	Inlet Port	AUX.	Brake Supply Port	1.	Accumulator Bleed Down Solenoid
V	Outlet Port to Steer Valve	G	Test Port	2.	Park Brake Solenoid
PBS	Park Brake Switch Port	PC	Pump Control Port (Load Sensing)/ Hoist Valve Port	3.	Velocity Fuse
T	Return to Tank Port			4.	Relief Valve Cartridge
PB	Park Brake Port	PT	Extra Pressure Port	5.	Check Valve Cartridge
G1	Test Port (Brake/Steer Pressure Transducer)				

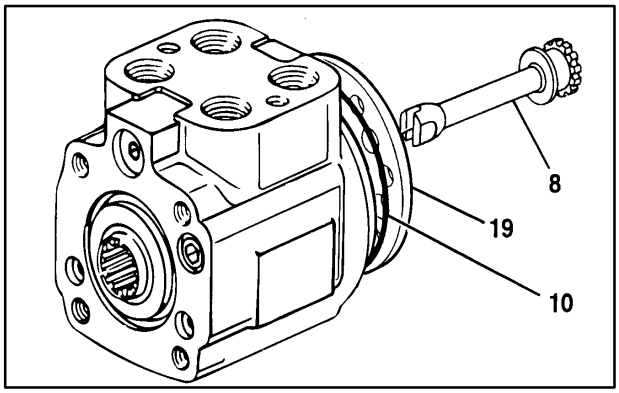
DESCRIPTION

Numbers and Letters in parentheses refer to Figure 1.

The relief check-bleed (RCB) valve contains several components which serve as controls in the operation of the steering and hydraulic brake systems. It receives hydraulic fluid through Inlet Port (IN). The relief check-bleed valve contains a relief valve cartridge (4), set to relieve steering pressure at 22063 ± 172 kPa (3200 ± 25 psi).

The accumulator bleed down solenoid (1) is activated through the ignition switch and serves to bleed down the steering accumulator at machine shut down. The Park Brake Switch port (PBS) provides a signal to the warning light and alarm located in the cab to warn the operator that steering pressure is low and the problem must be corrected. An, “auxiliary”, Brake Valve Port (AUX.) is provided to supply oil to the brake valve.

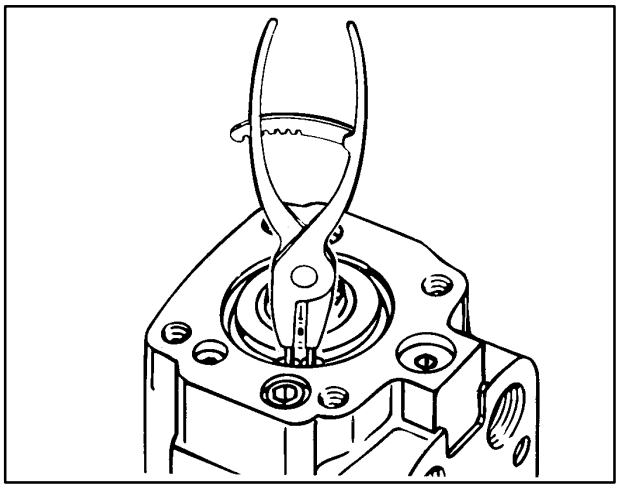
unit. Be careful not to drop the rotor (13). Remove the O-ring (10) from the stator (14). Refer to Figure 9.



EL18755

Figure 10

4. Remove the wear plate (19), the second O-ring (10), driveshaft (8) and the springs (29, not shown refer to Figure 6) from the housing (20). Refer to Figure 10.



EL18756

Figure 11

5. . Remove the housing (20) from the vise. Place the housing (20) on a clean soft cloth to protect the surface finish. Use the retaining ring ratchet pliers to remove the snap ring (2) from the housing (20). Refer to Figure 11

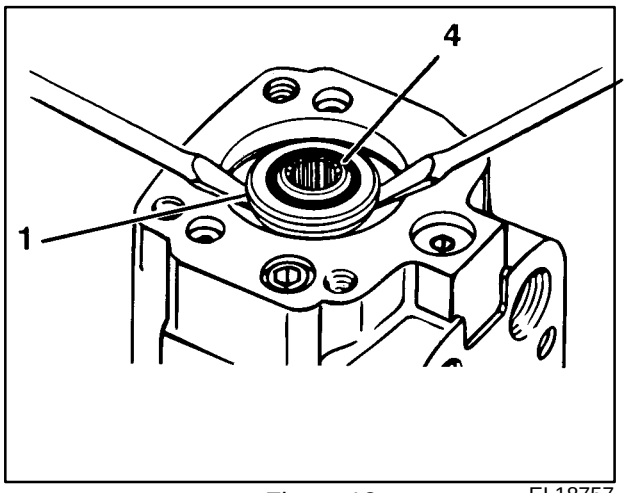
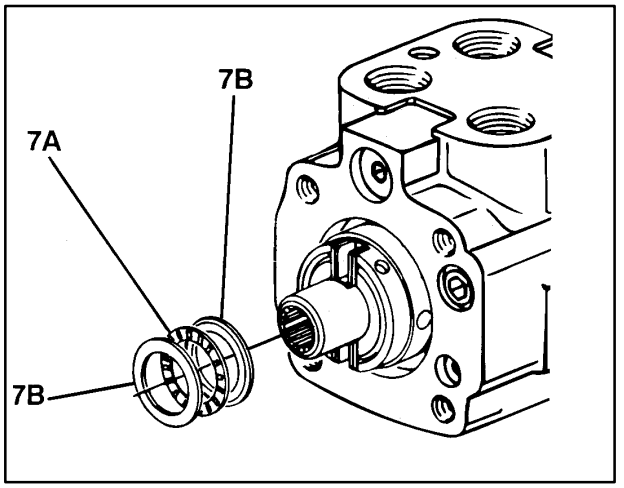


Figure 12 EL18757

6. Position two flat blade screwdrivers 180° apart in the groove of the seal retainer (1). Pry the seal retainer (1) upward until it is flush with the housing (20). Be careful not to damage the ring groove of the front retainer. Remove the screwdrivers. Push the spool (4) down while removing the seal retainer (1) from the housing (20) by hand. Refer to Figure 12.

Note: Use a thin blade screwdriver to pry the dust seal (3) from the seal retainer (1). Be careful not to damage the seal retainer (1).

7. Remove the seal (5), O-ring (6), and the dust seal (3) from the seal retainer (1). Refer to Figure 6.



EL18758

Figure 13

8. Remove the two bearing races (7B) and the needle thrust bearing (7A) from the spool (4) and the sleeve assembly (9). Refer to Figure 13 and Figure 16.

ACCUMULATOR

DESCRIPTION

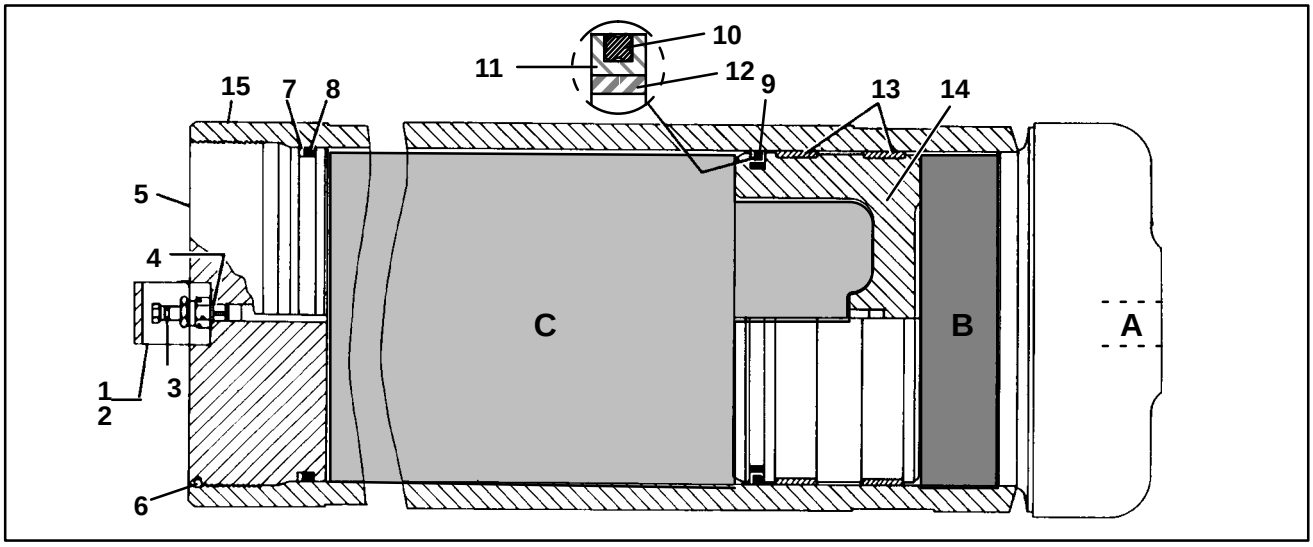
The steer accumulator is mounted to a bracket, which is bolted to the machines support cross member, to the right of the operators cab.

The steer accumulator stores steering oil in sufficient volume, under pressure, to provide supplementary steering in case of a steering pump malfunction. The steer accumulator is a free piston type and is under a dry nitrogen precharge of 6894 ± 172 kPa (1000 ± 25 psi).

OPERATION

Numbers in parentheses refer to Figures 1 and 4.

Hydraulic oil pressure enters the steer accumulator at the inlet port (A) located in tube housing (15). This pressure pushes the piston (14) in the direction of the charge valve (3). The area between the piston (14) and the inlet port (A) in the tube housing (15) is filled with hydraulic oil (B) and the area behind the piston (14) is under nitrogen gas (C) pressure. If at any time the pressure in the piston (14) should drop, due to a steering pump malfunction, a one way check valve in the relief check bleed valve (RCB, refer to Figure 3), will close to prevent the escape of stored oil in the accumulator. Refer to **Group 645, RELIEF CHECK BLEED VALVE**. The stored oil will then be directed, under pressure, to the steering control valve to allow sufficient oil to operate the steering system to assist in safely stopping the machine.



ELI14596

Figure 1 - Cutaway View of Accumulator

1. Bolt (Not Shown)
2. Plate
3. Charge Valve
4. O-Ring
5. End Cap
6. Friction Plug
7. Back-Up Ring
8. O-Ring
9. AQ Seal Assembly
10. Quad Ring
11. AQ Seal
12. Square Ring
13. Wear Ring
14. Piston
15. Tube Housing
- A. Oil Port
- B. Hydraulic Oil
- C. Nitrogen Gas

FRAME - GENERAL

WELDING ON MACHINES WITH ALLISON TRANSMISSION COMMERCIAL ELECTRONIC CONTROL SYSTEM AND CONTRONIC SYSTEM (Figures 2, 3, 4, 7, 8, and are located behind the operators seat)

When performing any welding operation on a machine with Allison Commercial Electronic Control (CEC) System follow these precautions:

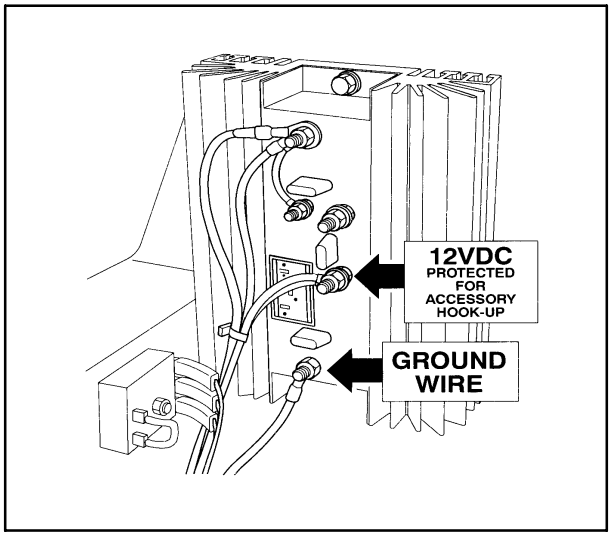
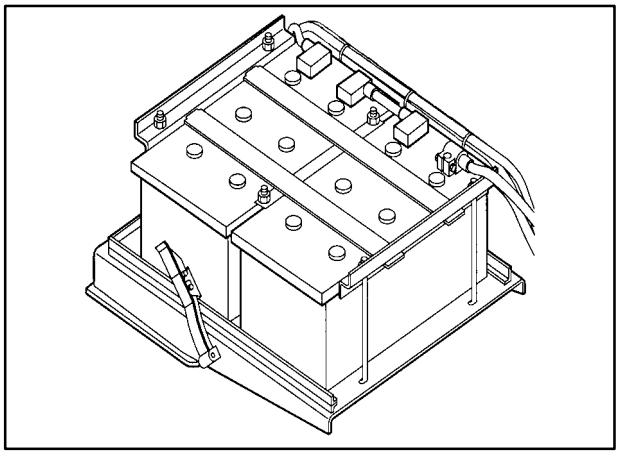


Figure 2 - Disconnect Ground Wire

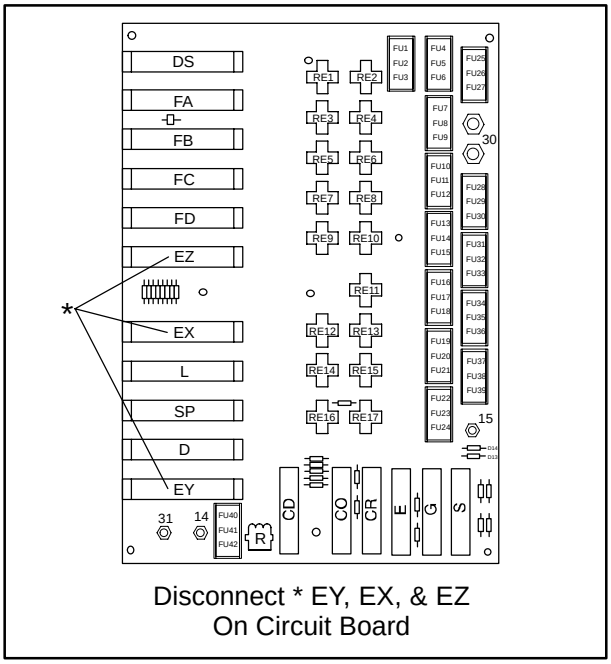
1. Disconnect the ground wires from the battery equalizer. Refer to Figure 2.



ELI19706

Figure 3 -Disconnect Battery Negative and Positive Connectors

2. Disconnect the battery ground (negative) and positive (+). Refer to Figure 3.

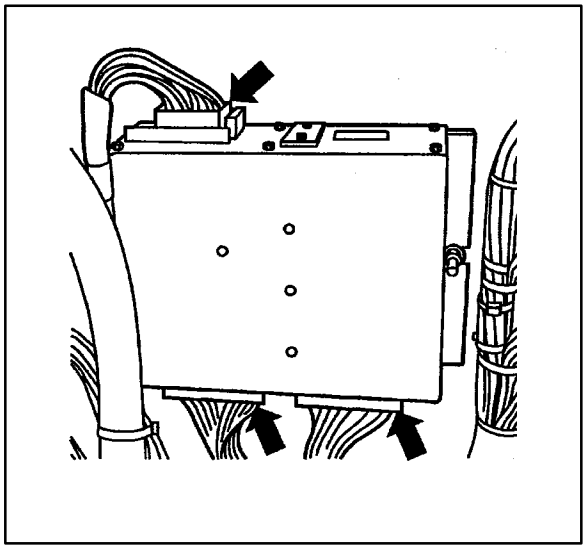


Disconnect * EY, EX, & EZ
On Circuit Board

EL17114

Figure 3

3. Disconnect the EX, EY, and EZ connectors on the printed circuit board to isolate the Contronic Electronic Control Unit (ECU). Refer to Figure 3.



EL18681

Figure 4 - Harnesses to The Electronic Control Unit

4. Disconnecting the 3 wire harnesses to the Electronic Control Unit (ECU) will also isolates the Contronic ECU. Refer to Figure 4.

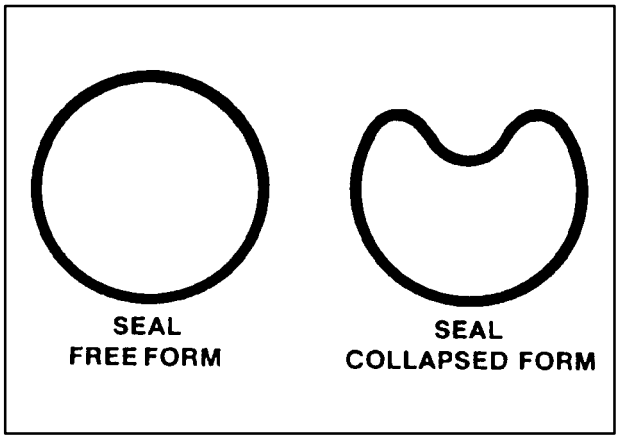
Note: ***Steps 3 and 4 will also isolate the Haultronic system.***

FRAME - GENERAL

WELD I.D.	FRAME LOCATION OF CRACK	WELD LOCATION OF CRACK (A, B, C)	L1 (POSITION OF CRACK)	L2 (LENGTH OF CRACK)	DEPTH OF CRACK	DESCRIPTION OF WELD FACE	DESCRIPTION OF CRACKS
F43							
F44							
F45							
F46							
F47							
F48							
F49							
F50							
F51							
F52							
F53							
F54							
F55							
F56							
EXAMPLE: F01	MAIN RAIL CRACK - REGION "D"	A	L1-5	L2-6	THROUGH	SEE ATTACHED PHOTO, DEFECT FOUND	CRACK STARTED AT DEFECT

EUCLID MODEL: ________ S/N: ________ HOURMETER READING: ________

Frame Inspection Form (Sheet 4 of 6)
(Use these sheets as a master and make copies as needed.)



EL13420

Figure 11 – Seal Installation

3. Install the T–seal (6), ring bearing (16), the two rod seals (17), the U–cup rod seal (19) and the rod wiper (20).

Note: When collapsing the rod seal (17), do not bend sharply, doing so will cause damage to the lip of the seal. Seals may be warmed in oil to ease with the assembly. See Figure 11 for seal installation.

4. Hold the rod assembly (2) firmly in a vertical position. Slide the damper (1) onto the rod assembly.

5. Carefully slide the guide gland (5), with the installed rod wiper (20) towards the clevis of the rod assembly (2).

6. Install the four check balls (15) into the rod assembly (2).

7. Apply heat to evenly warm the new guide piston (7) to 232 ° C (450° F). With the temperature stabilized, slide the guide piston down the rod assembly (2). Make sure the check balls (15) remain in their seats.

8. Coat threads of cap screws (10) with a medium locking adhesive. Install the cap screws and washers (9) into guide piston (7). Torque cap screws to 163 N•m (120 ft. lbs.) to secure the guide piston to the rod assembly (2).

Note: Follow locking adhesive manufactures instructions for cure time.

9. Make sure that there are no sharp edges on ring (8) and install on guide piston (7). Let the assembly cool to room temperature.

10. Prior to the final assembly, coat the inside of the tube assembly (11) and all the seals with a thin layer of Neocon. (Same as used in the ride struts.)

11. Secure the tube assembly (11) in an upright position. With the lifting device attached to the clevis end of the rod assembly (2) lift and gently slide the rod assembly into the tube assembly.

12. Coat the cap screws (3) with Neocon. Install the cap screws and washers (4) in the guide gland (5). Torque cap screws to 393 N•m (290 ft. lbs.) to secure the guide gland to the tube assembly (11).

13. Install plug (12) and O–ring (13). Torque the plug to 46 – 50 N•m (34 – 37 ft. lbs.). Install the inflation valve (21). Tighten the outer lock nut (21B) to 6 – 8 N•m (50 –70 in. lbs.) and the lower lock nut (21A) to 11 – 12 N•m (100 – 110 in. lbs.). Refer to Figure 4.

LIQUID FILL

Numbers in parentheses refer to Figure 10.

1. With the required lifting device, hold the strut in a vertical position, with the rod end down.

Note: Refer to Figure 12 - Helium/Neocon Inflation Illustration.

2. Remove the plug (12) and O–ring (13) and allow the strut to extend fully. Verify that strut dimension fully extended is the **X–1** dimension covered in **Strut Charging Data, Figure 14**.

3. Connect the fill line to the plug (12) port and open the inflation valve (21).

4. Fill the strut with Neocon–E until it flows through the inflation valve (21) clearly with no bubbles. Close the inflation valve.

5. Disconnect the fill line and install the plug (12) and O–ring (13). Torque the plug to 46 – 50 N•m (34 – 37 ft. lbs.). Take care not to lose the Neocon liquid and ensure that strut is accurately bled of all air.

Note: Once the strut has been filled with liquid, the plug (12), and inflation valve (21) are closed, the strut must not be extended until charged with helium. Extending the strut will cause air to enter the strut past the seals.

8. Slide the damper (1) from the rod assembly (2).

Note: An interference (shrink) fitted, guide piston (7) is used in this ride strut. The guide piston should be removed from the rod assembly (2) by heating it up to a maximum of 232 ° C (450 ° F). It is recommended that two heating sources be utilized to provide even temperature distribution on both sides of the piston. (This should be done with the guide gland (5) positioned as far away from the piston as possible). Removing the piston will allow removal of the gland from the rod assembly for T-seal (6), rod seal (17), U-cup rod seal (19), back-up ring (18) and rod wiper (20) and/or gland replacement. This will also allow access to the guide gland (5) for removal or replacement. The guide piston should start to move prior to obtaining the 232 ° C (450 ° F) temperature.

INSPECTION

Numbers in parentheses refer to Figure 11

1. Wash all parts in a suitable solvent. Dry with compressed air. Make sure that the guide piston (7) and guide gland (5) are thoroughly cleaned.

2. Inspect all threaded surfaces for damage. Inspect tubes, bushings and bearings for scoring, pitting or excessive wear.

Note: Normally seal damage is caused by a failure of the rod wiper (20) allowing contamination to destroy the seals or excessive wear of the ring (8) and the ring bearing (16), which results in seal deformation. Damaged or worn parts must be replaced.

3. The rod diameter should be 152.40 – 152.35 mm (6.000 – 5.998″) with a micro finish of 8 – 12 RMS. If the rod assembly (2) does not meet these specifications, consideration should be given to replacing the rod.

4. Inspect the rear axle and the frame strut connection points.

5. Inspect the tube assembly (11), the rod assembly (2), the guide gland (5) and the guide piston (7) for cracks or distortion. Repair or replace as necessary.

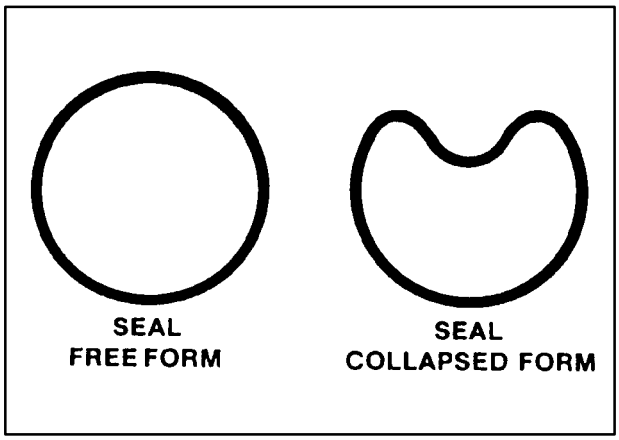
ASSEMBLY

Numbers in parentheses refer to Figure 2 and Figure 11.

Note: When a strut has been disassembled, all seals should be replaced. Coat lightly with strut fluid prior to assembly.

1. Before assembly, all threaded areas must be clean and free of grease.

2. First install the new back up ring (18) with the chamfered side of the ring facing toward the U–cup rod seal (19) and rod wiper (20) in the guide gland (5). Note inserts in Figure 11.



EL13420

Figure 10 – Seal Installation

Note: When collapsing the rod seal (17), do not bend sharply. Doing so will cause damage to the lip of the seal. See Figure 11 for seal installation. Heating the oil, with the seals, will aid in installation.

3. Install the ring T–seal (6), rod seal (17), and the ring bearing (16), as shown in Figure 11.

4. Hold the rod assembly (2) firmly in a vertical position.

5. Carefully slide the guide gland assembly (5) onto the rod assembly (2) with the rod wiper (20) towards the clevis of the rod assembly.

6. Install the four check balls (15) in the rod assembly (2), making sure the check balls remain seated.

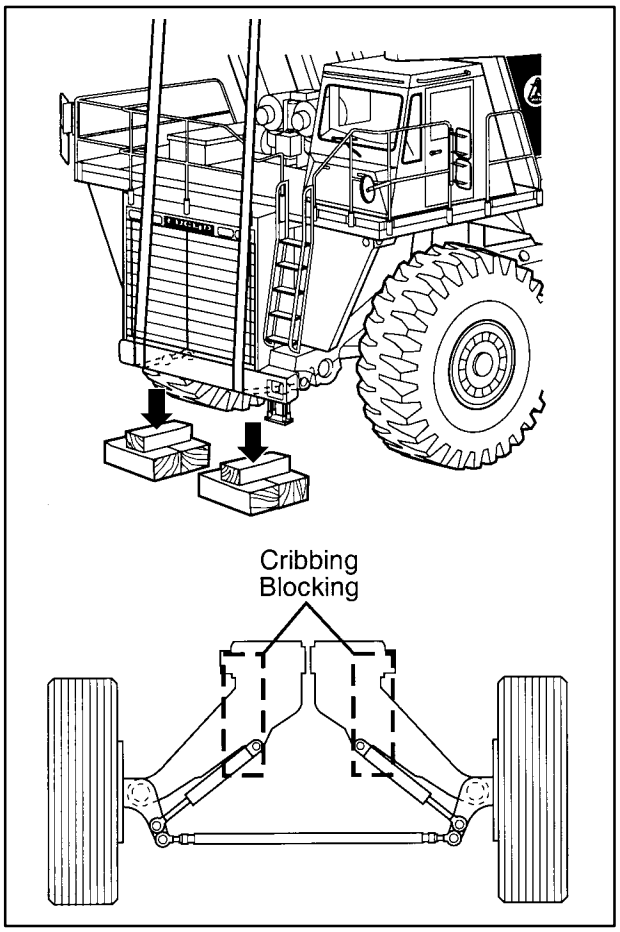
7. Apply heat to evenly warm the new guide piston (7) to 232 ° C (450° F). With the temperature stabilized, slide the guide piston down the rod assembly (2). Make sure the check balls (15) remain in their seats.

LIFTING/JACKING PROCEDURES

3. Check lifting/tow eyelets for any previous damage.

4. Secure the other end of the chains or nylon cables around the lifting bar or through the eyelets (see Figure 3). Then lift the machine to the desired height.

5. After the machine is lifted to the desired height, place “cribbing/blocking” in position to support the machine in the area you are going to be working in.



EL19827

Figure 4

Note: DO NOT place supports in the center of the bumper. Cribbing/blocking should be done left or right of the appropriate lift/tow eyelet.

6. After checking the cribbing/blocking to make sure that is is blocked properly and the machine’s weight is supported and balanced, lower the machine onto the cribbing. The cable or chain can stay attached to the eyelet if needed.

Note: It may or may not be necessary to block both sides of the machine. It depends on the situation or the type of repairs being done.

REMOVAL OF CRIBBING/BLOCKING

1. With the work completed lift the machine high enough to remove the cribbing/blocking.

2. With the cribbing/blocking removed and all other personnel at a safe distance from the machine, carefully lower the machine to the ground.

INSPECTION

1. Inspect the machine and work area to make sure all equipment has been removed and put into its proper location. Also, check to see that there are no obstacle in the path of the machine.

2. After all safety checks have been made take the machine out of the Service Position. **Refer to GROUP 091, SERVICE POSITION/SAFETY INSTRUCTIONS**.

B. FRONT AXLE- JACKING MINIMUM JACKING DEVICE CAPACITY: 18.1 TONNES (20 TONS)

WARNING!

Always chock tire and wheel on the opposite side of the machine prior to positioning the jack. Always crib/block the machine after jacking in the event the jack slips from position.

WARNING!

The jacking device must be placed on a level and firm surface.

Note: The machine must be empty prior to jacking or lifting for repairs.

1. Using a proper capacity jacking device, place a jack underneath either side of the front bumper. See Figure 5.

Note: The jacking device must be located to the outside of the lift/towing eyelets.

FRONT WHEEL

3. Fill the wheel through the drain hole while watching the grease level rise by look through the rollers in the bearing using a flashlight.

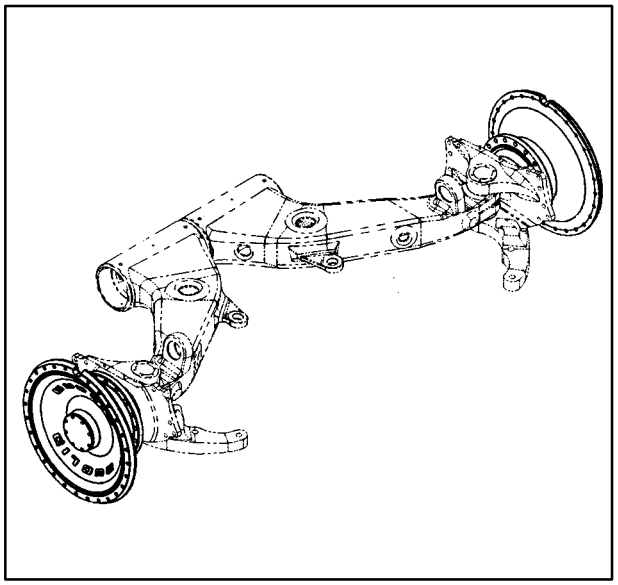
4. When the grease level has reached halfway up the bearing, stop the grease gun.

Note: Do not fill more than halfway, overheating and leakage may occur.

5. Rotate the wheel ten times in each direction to pack the bearings.

6. Wipe a thin coat of grease on the bolts (16) and the front wheel cover (14).

7. Install a new gasket (13) between the wheel (17) and the cover (14). Install a bolt (16) in every hole of the cover. Tighten the bolts per the Bolt Torque Chart, General in Group 170 **MACHINE SPECIFICATIONS**.



EL19814

Figure 8 - Front Wheels Installed on Front Axle

8. Install the tire and rim. Refer to Group 772 **TIRES/RIMS/INFLATION.**

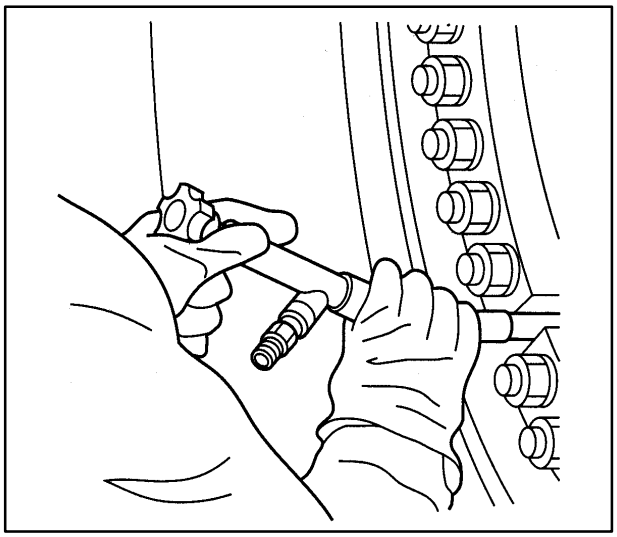
Tire/Rim Assembly Removal for Component Access

3. If the tire and rim assembly is being removed to gain access to the wheel, brake assembly, and/or axle, deflate the tires to 138-172 kPa (20-25 psi) to retain the bead seal.

   A.) Remove the valve cap (1, Figure 3) from the valve stem assembly (11).

   B.) Use a one-half inch wrench and loosen the valve core housing. This will make it easier to pull out the core housing.

   C.) Attach a deflator adapter to the valve, Figure 4. This will allow the air to be expelled more quickly.



EL20094

Figure 4 - Deflator Adapter

   D.) Attach a deflation hose system. This will enable you to deflate the tire from a safe distance.

   E.) Install a muffler on the deflation end of the deflation hose. This will help reduce the noise of the tire as it deflates.

   F.) With the deflator adapter, withdraw the core and deflate the tire to 138-172 kPa (20-25 psi) to retain the bead seal. Return the core into the tire with the deflator adapter.

Note: Inspect all the rim components. If the condition of the rim assembly is questionable, such as cracks, remove the valve core housing from the valve stem assembly to completely deflate the tire.

Tire/Rim Assembly Removal for Dismounting/Mounting of Tire

If the tire and rim assembly is being removed to dismount/mount the tire from the rim, remove the valve core housing from the valve stem assembly (11, Figure 3) to completely deflate the tire.

Note: Tires can be dismounted/mounted with the tire and rim assembly remaining on the machine. Such work should only be done by trained and certified personnel. It is recommended that a certified tire repair service be hired to perform dismounting/mounting of tires from rims

   A.) Remove the valve cap (1) from the valve stem assembly (11).

   B.) Use a one-half inch wrench and loosen the valve core housing. This will make it easier to pull out the core housing.

   C.) Attach a deflator adapter to the valve, Figure 4. This will allow the air to be expelled more quickly.

   D.) Attach a deflation hose system. This will enable you to deflate the tire from a safe distance.

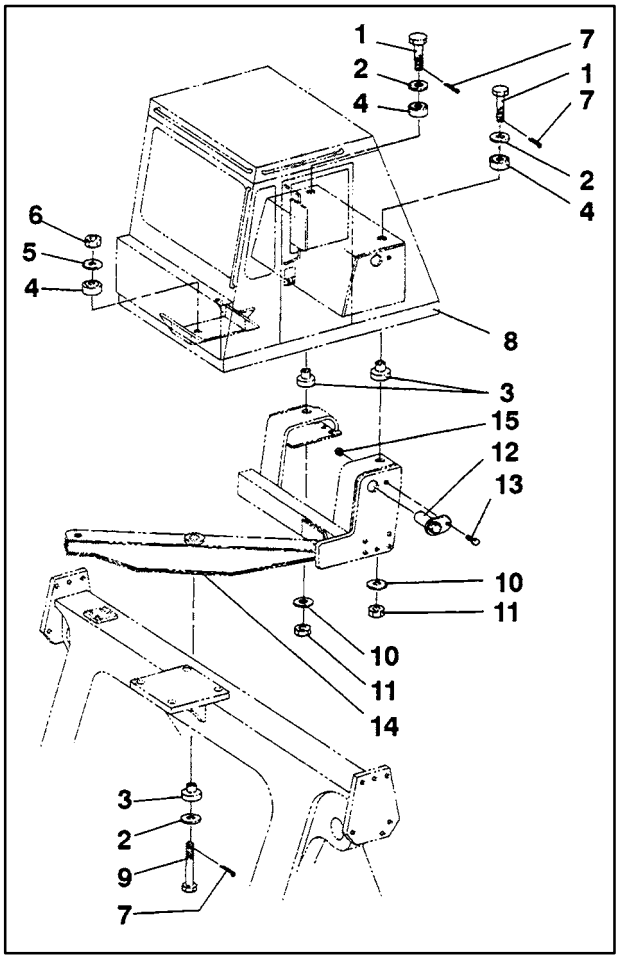
   E.) Install a muffler on the deflation end of the deflation hose. This will help reduce the noise of the tire as it deflates.

   F.) With the deflator adapter, remove the core and deflate the tire.

   G.) After the tire is deflated, run a wire down the valve to make sure no foreign material has clogged it and thus all the air is out of the tire.

4. Support the tire with a tire handling device with the lifting capacity to support the tire. Chain or rope wheel/tire sling illustrated in Figure 5. Tirehands installed on a forklift truck illustrated in Figure 6.

CAB MOUNTING



EL16168

Figure 1 - Exploded View of Cab Mounting

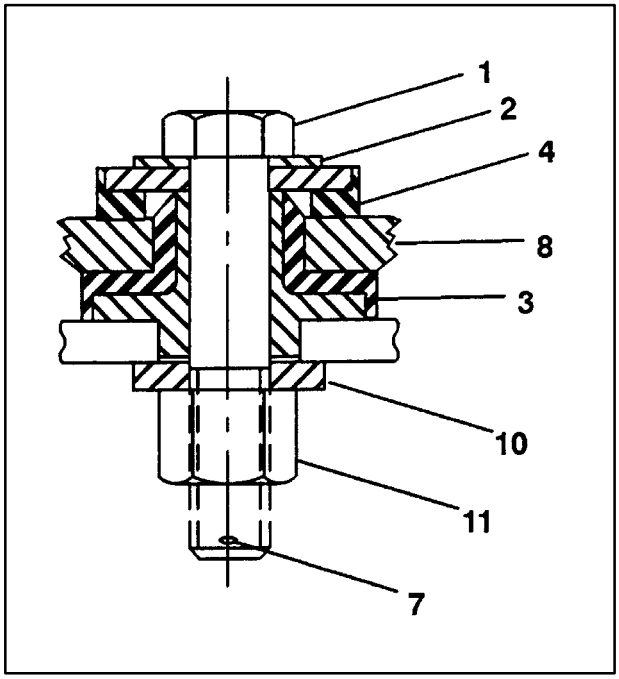
1. Bolt
2. Washer
3. Cab Mount
4. Mount
5. Washer
6. Nut
7. Cotter Pin
8. Cab
9. Bolt
10. Washer
11. Lock Nut
12. Support Bar
13. Screw
14. ROPS Support
15. Lock Nut

DESCRIPTION

Numbers in parentheses refer to Figure 1, 2, and 3.

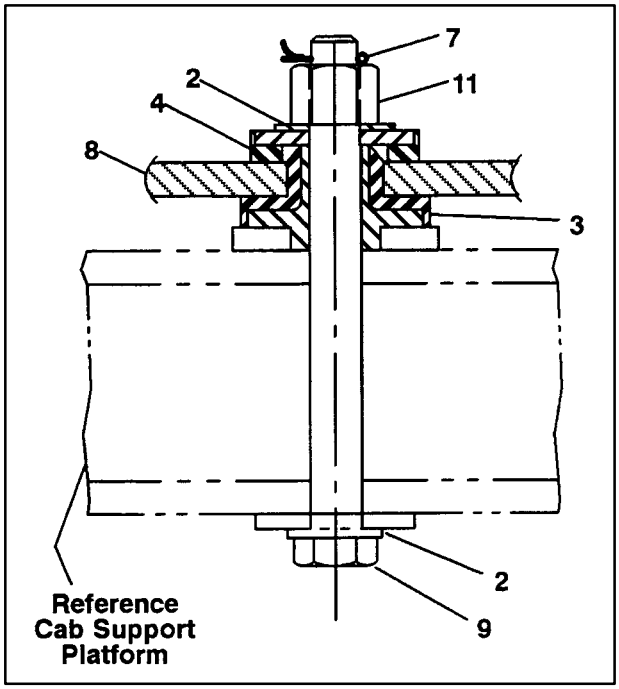
The cab is held in place by three semi-rigid cab mounts (3) located beneath the floor of the cab (8), attached to the ROPS assembly (14). Each mount consists of bolts (1 and 9), washers (2 and 5), mounts (3 and 4), nuts (6), and cotter pins (7).

If the cab mounts are removed, they are to be reinstalled in the exact order of removal. Bolts and nuts are to be torqued as specified in **GROUP 170, MACHINE SPECIFICATIONS.** These bolts should be checked periodically for proper torque.



ELI16420

Figure 2 - Cutaway View Rear Cab Mount



ELI16421

Figure 3 - Cutaway View Front Cab Mount

6. Inspect compressor front seal and pressure relief valve for leaks.

Manifold Gauge, Connection

System pressures and refrigerant flow are checked with the manifold gauge. Making a check of the system's overall performance will assist in properly diagnosing problems in the air conditioning system.

1. Put on safety goggles and cover the machine's interior and painted surfaces to protect them from damage during all service operations.

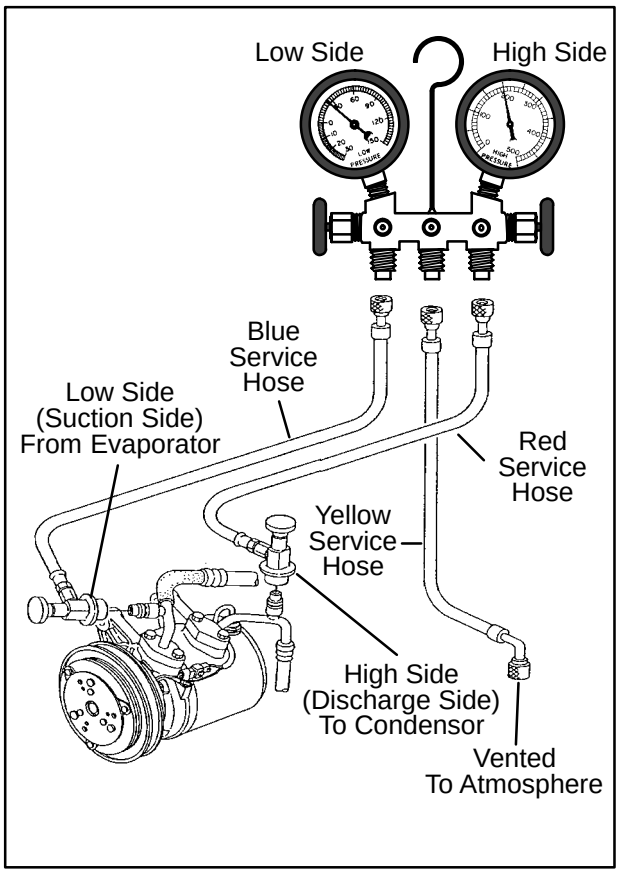


Figure 23 - Manifold Gauge Connection

2. Remove the protective caps from the service valves on the compressor. Be sure that the hand valves on the manifold gauge are closed before attaching test hoses to the service valves.

3. Connect the low side service hose (blue) to the low (suction) side of the compressor. Connect the high side service hose (red) to the high (discharge) side of the compressor. The center service hose (yellow) vented to the atmosphere. See Figure 23.

4. Air must be purged from test connection hoses before proceeding with any system testing. Crack the high side hand valve for about four seconds. Purging of air will take place as the R-134a from the system forces air out of the center hose at the manifold gauge set. Close the high side hand valve.

5. Repeat step four for the low side hand valve.

6. The air conditioning system must now be operated for a few minutes to stabilize the system. Make sure all test hoses, gauges, and other test equipment is away from moving engine parts. Also, make sure that hoses are not touching hot manifolds.

7. Start engine, run at high idle. Place air conditioning control in the "ON" position and turn fan control speed to high. Operate air conditioning system for 5-10 minutes.

Note: On R-134a systems, "topping off" system refrigerant is not recommended. If an R-134a system is suspected of not having a complete charge, first check for leaks and repair system as necessary. Evacuate system and refill with correct amount of refrigerant as identified on air conditioning system label. R-134a systems are to be filled only by weight method.

Gauge Readings

Normal operating pressure range of the low side is 15 to 20 PSIG. Normal operating pressure range of the high side is 110 to 125 PSIG. The operating pressures will vary depending on the ambient and cab temperature. These are normal pressures assuming an idle speed of approximately 600 RPM.

Normal Functioning Air Conditioning System

Low Side Gauge - Normal
High Side Gauge - Normal
Discharge Air - Cold
Diagnosis - Normal functioning air conditioning system

Some Moisture in Air Conditioning System

Low Side Gauge - Normal, then sometimes drops to below zero.

High Side Gauge - Normal, then sometimes goes high

AIR CONDITIONING SYSTEM

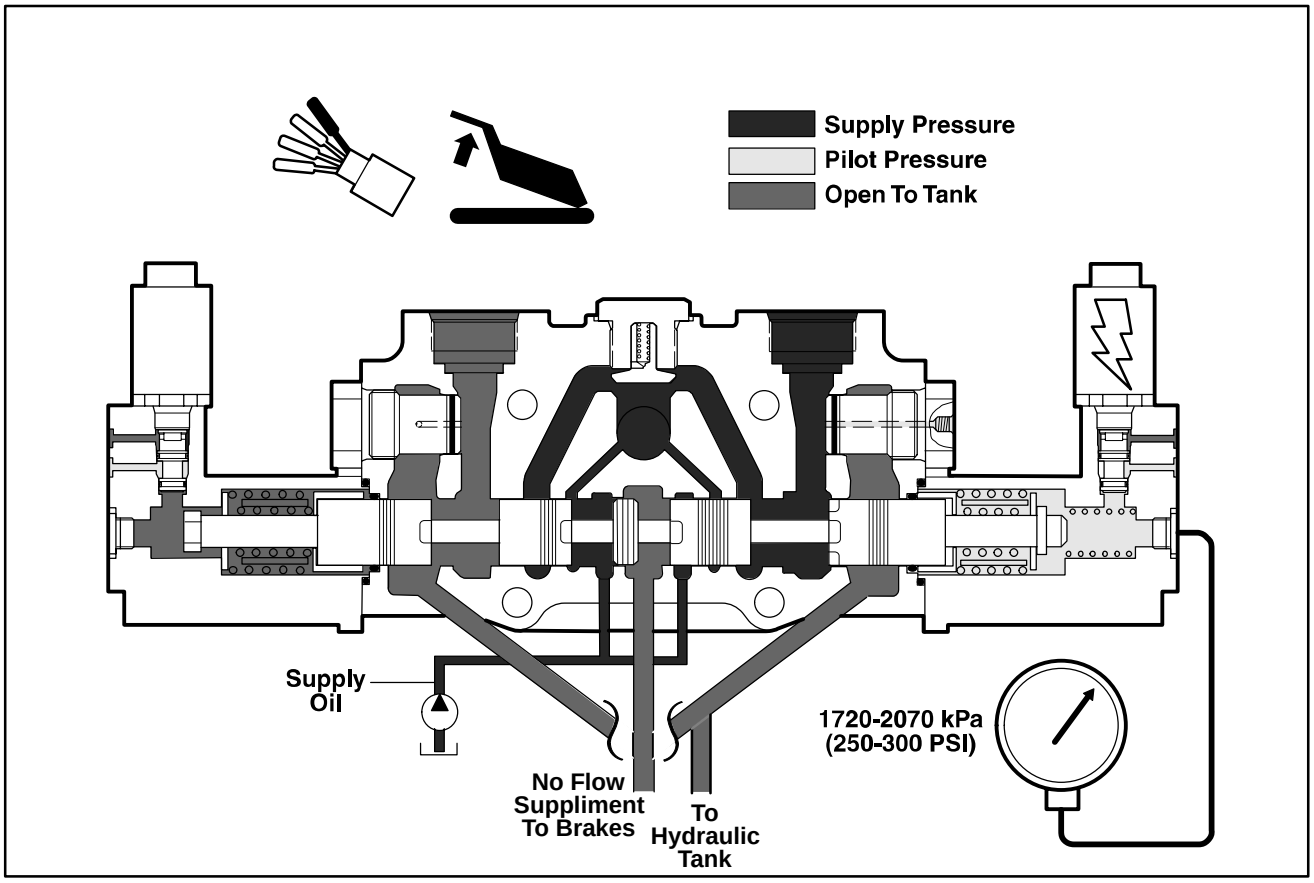
TROUBLESHOOTING THE SYSTEM

TROUBLE	PROBABLE CAUSE	REMEDY
B. INTERMITTENT COOLING (Continued) Unit provides cool air for a time then begins and continues to blow warm air.	1. Extremely high ambient air temperature causing over heat safety switch to open. 2. Overcharged system. 3. Condenser fan not working. 4. Condenser coil is plugged with bugs or other debris.	1. Allow system to cool down enough to permit overheat switch to reset. 2. Discharge excess refrigerant until high pressure gauge drops within specifications. 3. Check electrical system. 4. Clean out condenser core using air hose.
Clutch disengages prematurely during operation.	1. Partial open, improper ground, or loose connection in compressor clutch coil.	1. Check connections or remove clutch coil for service or replacement.
Unit ices up intermittently. Note: Any unit will ice up under certain operating conditions of refrigerant temperature, humidity, and ambient temperature.	1. Moisture in system. 2. Incorrect superheat adjustment. 3. Thermostat adjusted too low.	1. Install new drier; evacuate system and recharge. 2. Replace expansion valve. 3. Adjust thermostat.
C. AIR FLOW Cool air at outlet, but not enough air flow to keep cab cool.	1. Blower side of evaporator coil plugged with lint, dust,or feathers. 2. Faulty evaporator blower. 3. Refrigerant low. 4. Outside air entering machine cab.	1. Remove blower assembly and blow out evaporator coil with air hose. 2. Check electrical connections and motor. 3. Check refrigerant level, recharge if required. 4. Close outside air vent and windows.
D. BLOWER Blower does not operate regardless of selector position.	1. Blown fuse. 2. Loose terminal connections or incorrect wiring. 3. Selector control cable broken or disconnected from selector link pin. 4. Defective selector switch. 5. Defective motor	1. Check for short circuits, replace fuse. 2. Tighten terminal connections and check wiring. 3. Repair or replace as required. 4. Replace switch. 5. Replace motor.

HYDRAULIC HOIST SYSTEM

NOTES

HYDRAULIC CONTROL VALVE



EL18866

Figure 2 - Oil Flow in The Control Valve in The **"RAISE POSITION"**

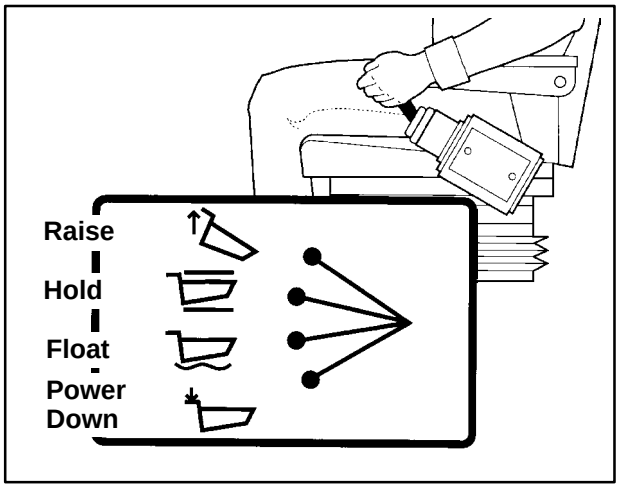


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Figure 3 - Hoist Control Lever

"RAISE" POSITION

When the body is to be raised off of the frame rail the hydraulic control valve lever is moved to the furthest upward position, the **"RAISE"** position. With the hoist control lever in the **"RAISE"** position the hoist lever rheostat sends a 3-4 volt signal to the hoist controller. The hoist controller interprets the voltage as the **"RAISE"** position then directs a pulsed voltage signal to the pulse width modulating (PWM) valve of the hoist control valve. The **"RAISE"** PWM valve shuttles to allow the hydraulic pilot pressure 1725-2070 kPa (250-300 psi) to the end of the hoist control valve spool. The valve spool shifts into the **"RAISE"** position allowing the hoist system hydraulic pressure to flow to the base end of the hoist cylinders, extending them upwards to dump the load. With all supply flow diverted to raising the body, supply oil does not supplement brake cooling pump flow.

HYDRAULIC CONTROL VALVE

5. Once the desired system pressure is obtained, tighten the jam nut. Raise and lower the body three times with the engine at W.O.T., each time checking the system pressure with the hoist cylinders at full extension.

Note: ***It is recommended that the hoist control lever not be held in the "RAISE" position, with the hoist cylinders fully extended, for a period longer than 10 seconds without release.***

6. If the hoist system pressure is properly set to 20340 ± 345 ± 172 kPa (2950 ± 50 psi), tighten the end cap back on the relief valve assembly, if not, if not repeat steps 4 - 6.

7. Remove the pressure gauge and line from the test port connection and replace the connector cap.

ELECTRICAL TROUBLESHOOTING (Contd.)

Error code: 2 – output(s) short circuit error

Description: the electrical wiring harness between the hoist controller and the Raise or Lower PWM valves has a short to ground.

- **Remedy:** identify which hoist controller-to-PWM electrical wiring harness has the short to ground condition.

1. Turn the ignition switch to the OFF position.
2. Remove electrical harness connection, CN135A, at the hoist controller.
3. Using an ohmmeter, measure the resistance across pin 5 (green wire) and pin 3 (black wire) to verify the resistance value of the Raise PWM.
4. The resistance should fall between 30-33 ohms for a functional PWM. If the PWM has a short to ground, the resistance will be 0 to 1 Ohms.
5. Using an ohmmeter, measure the resistance across pin 7 (green wire) and pin 3 (black wire) to verify the resistance value of the Lower PWM.
6. The resistance should fall between 30-33 ohms for a functional PWM. If the PWM has a short to ground, the resistance will be 0 to 1 Ohms.

Error code: 3 – open circuit in output to Raise PWM

Description: the electrical wiring harness between the hoist controller and the Raise PWM has an open circuit.

- **Remedy:** verify that an open exists in the electrical wiring harness.

1. Turn the ignition switch to the OFF position.
2. Remove electrical harness connection, CN135A, at the hoist controller.
3. Using an ohmmeter, do a continuity check across pin 5 (green wire) and pin 3 (black wire) to verify the open circuit in the electrical wiring harness between the hoist controller and the Raise PWM.

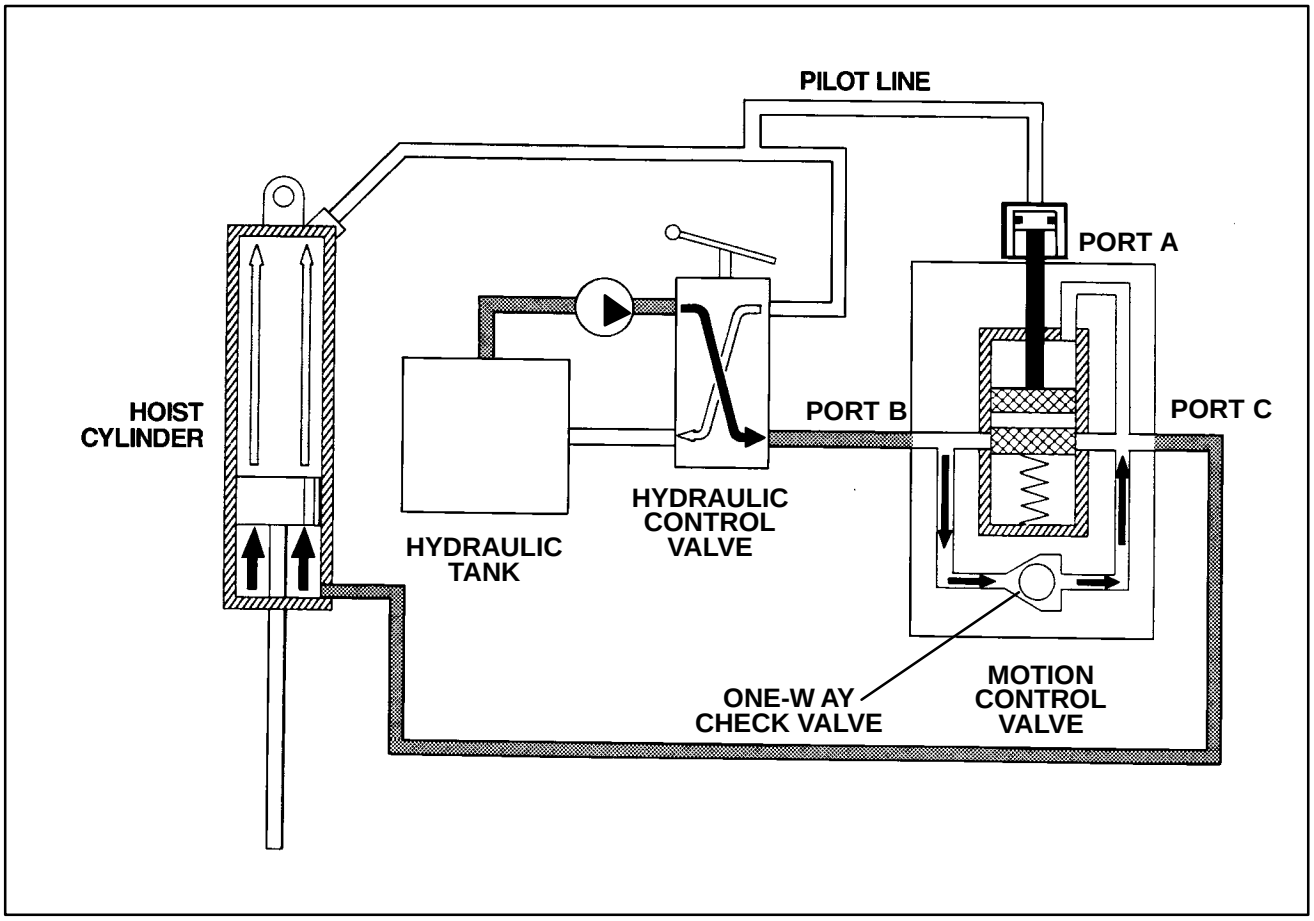
Error code: 4 – open circuit in output to Lower PWM

Description: the electrical wiring harness between the hoist controller and the Lower PWM has an open circuit.

- **Remedy:** verify that an open exists in the electrical wiring harness.

1. Turn the ignition switch to the OFF position.
2. Remove electrical harness connection, CN135A, at the hoist controller.
3. Using an ohmmeter, do a continuity check across pin 7 (white wire) and pin 3 (black wire) to verify the open circuit in the electrical wiring harness between the hoist controller and the Lower PWM.

MOTION CONTROL VALVE



ELI15300

Figure 4 - Lower (Normal)

Load Shift, Figure 4

When the hydraulic control valve is placed in the LOWER position, hydraulic oil enters the motion control valve at port (B), passes through the one-way check valve and exits at port (C). Hydraulic oil flow is unrestricted to the rod end of the cylinders.

Relief Valve

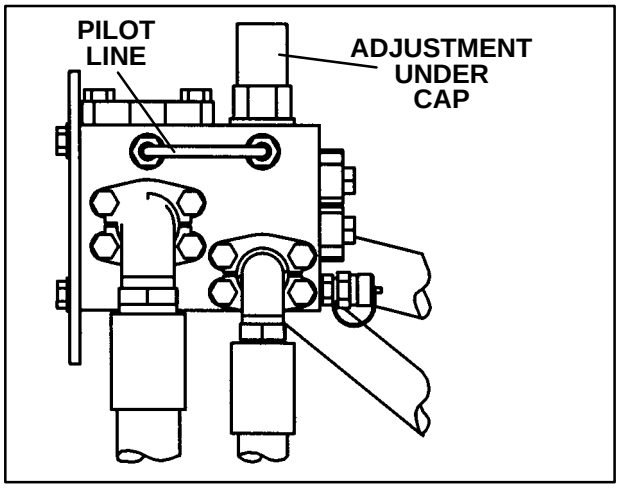
Cylinder rod end back pressure, low during normal raise and high during normal lower, acts on the shoulder of the relief poppet. If this pressure, in an attempt to slow down the cylinder, should increase above the setting of the stem return spring, the relief poppet will act as a relief valve and unseat and maintain the rod end pressure at this level.

SERVICING

The motion control valve and counter balance valve are serviced as a complete assembly. O-rings can be serviced with a kit.

CONTER BALANCE VALVE ADJUSTMENT

1. Place the dump body in the **SERVICE POSITION**, See Group 091, **Service Position/Safety Instructions** and shutdown the engine.



ELI19325

Figure 5 - Motion Control Valve

HYDRAULIC PUMP AND MOUNTING

4. Place a new back-up ring (36) into position on the opposite side of the bore from the lower isolation plate (39). Refer to Figure 8.

5. Place a new O- ring (37) in position next to the back-up ring, being sure it seats against the groove in the back-up ring (36). Refer to Figure 8.

6. Insert the ring retainer (38) between the O- ring (37) and the side of the rear body (40) with the rounded edge against the bottom of the rear body. Refer to Figure 8.

7. Install the lower pressure plate (35) so the bronze side will be up against the gears and the counterbored relief is on the outlet port (small port) side of the pump. Do not force this plate.

8. While facing the inlet port in the body (40) install the rear drive gear (33) in the left-hand bore and the idler gear (34) in the right-hand bore.

Note: ***Do not drop the gears into place. The gears should be placed in the bores carefully to avoid damage to the bronze pressure plate surface. If the drive gear and the idler gear are being reused, align the identification marks made at disassembly and install the gears into their respective locations.***

9. Install the upper pressure plate (32) with the bronze side towards the gears and the counterbored relief on the outlet port (small port) side of the pump.

10. Install the upper isolation plate (28) in place on the inlet (large port) side of the pump. Either side up is correct.

11. Install a new back-up ring (29) as in Step 4.

12. Install a new O- ring (30) ensuring that it seats in the backup ring as in Step 5.

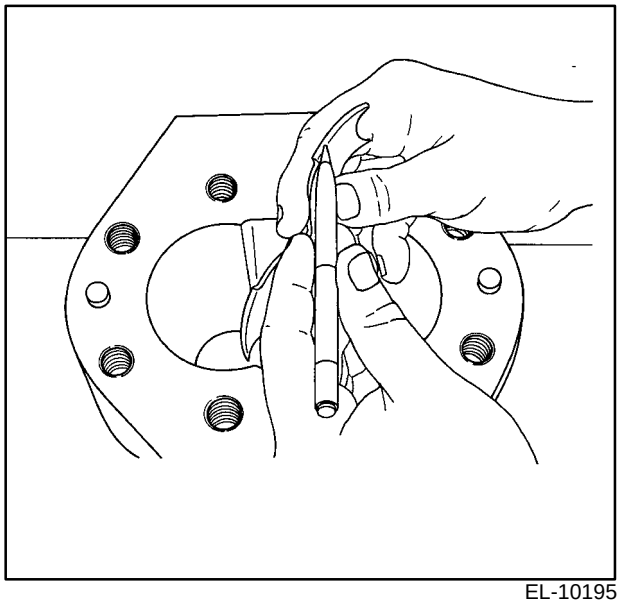


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Figure 9 - Identifying Lower Isolation Plate

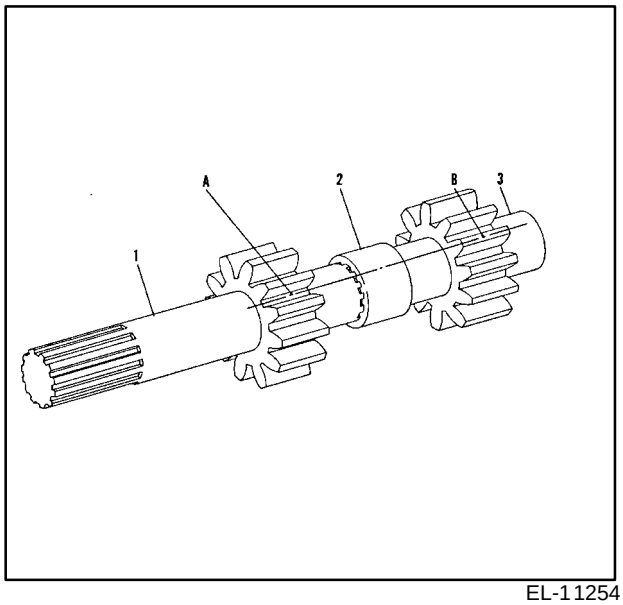

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Figure 10 - Drive Gear Alignment

A. Valley
B. Tooth

1. Front Drive Gear
2. Coupling
3. Rear Drive Gear

13. Install the ring retainer (31) as in Step 6. Either side up is correct.

14. If the dowel pins (21) were removed, install them in the rear body. Align the marks on the center housing (27) and the rear body (40) made during disassembly, and install the center housing on the rear body. Make sure the O- ring (8) remains in place in its groove.

BODY CYLINDER

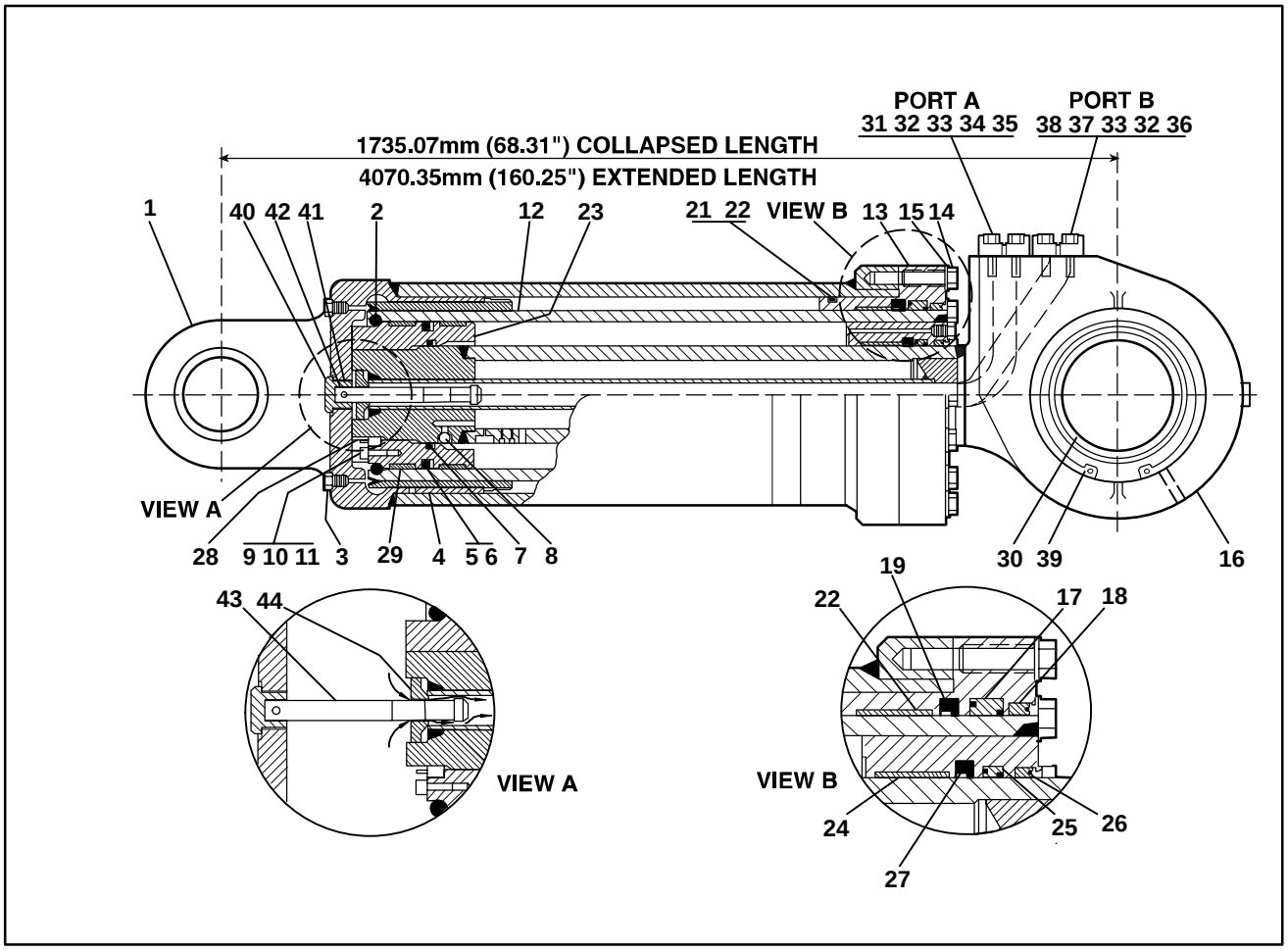

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Figure 1- Cutaway View of Body Cylinder with Cushioning (Both Directions)

1. Tube Base and Assembly
2. Snap Ring
3. Plug
4. Slotted Wear Ring
5. Inner Seal Ring
6. Outer Seal Ring
7. O-Ring
8. Check Ball
9. Socket Head Screw
10. Washer
11. Adhesive
12. Intermediate Tube Assembly
13. Gland Cap
14. Cap Bolts
15. Washer
16. Piston Rod Assembly
17. U-Cup Rod Seal
18. Wiper Seal
19. Buffer Ring Assembly
20. O-Ring
21. Back-Up Ring
22. Ring
23. Piston
24. Bearing, Rod
25. U-Cup Rod Seal
26. Wiper Rod
27. Buffer Ring
28. Dowel Pin
29. Wear Ring
30. Spherical Bushing
31. Split Flange
32. Bolt
33. Lock Washer
34. Ring
35. Plug, Flange
36. Split Flange
37. O-Ring
38. Flange
39. Ring
40. Plug
41. O-Ring
42. Pin
43. Spool
44. Disc

Port A. (Raised)
Port B. (Return)

DESCRIPTION

Two hydraulically operated cylinders raise the body for dumping. Mounted outboard for easy access, the cylinders are inverted. That is, the base end is secured to the body while the rod end pivots on the frame. This way, there is less chance for dirt or dust to collect on the stages, and there is less wear and tear on the body hydraulic lines and fittings. Each of the tube assembly of the cylinders are equipped with wiper rings and seals to prevent leakage.

BODY AND MOUNTING

REMOVAL: A lifting device with the lifting Capacity of 13 Metric Tonnes (14 Tons) will be required. This applies to a standard hauler body.

A crane **with the required lifting capacity** will be necessary when lifting the body assembly from the truck's frame.

Numbers in parentheses refer to Figure 3.

9. Snap Ring
10. Pivot Pin
11. Bolt
12. Grease Fitting
13. Bushing
14. Nut
15. Shims

1. Remove bolt (11) and nut (14) from the pivot pin assembly (10).

2. Remove the snap ring (9) from the pivot pin (10).

3. Using a driver and a hammer remove the pivot pin (10) from the hinge bracket securing the rear of the body to the frame.

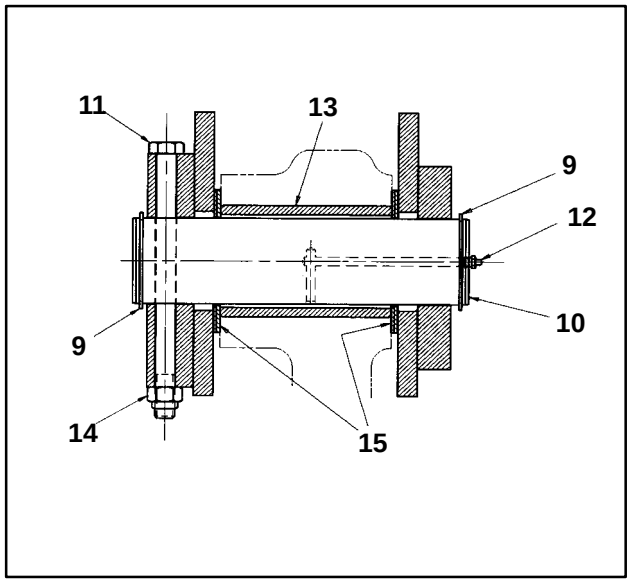

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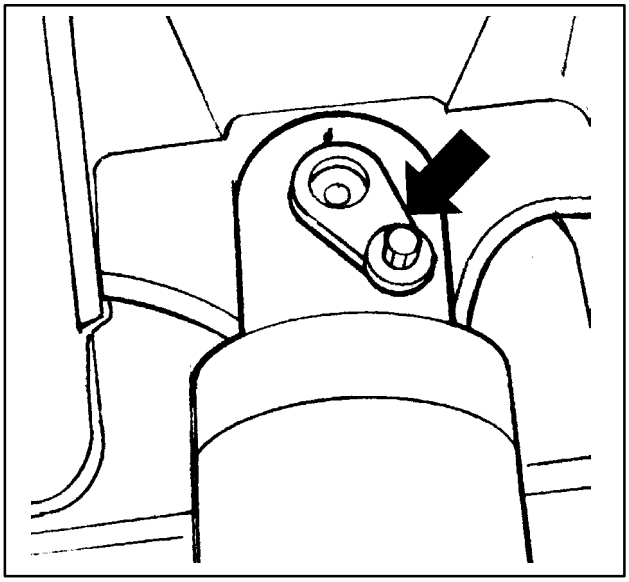
Figure 3 - Pivot Pin Removal



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4. Remove the bolt, washer, and tube from the hoist cylinder. Using a pry bar remove the pin assembly from the hoist cylinder. Reference Group 915, **HYDRAULIC CYLINDER** for additional references.