VERSATILE

Service Manual

FORD
NEW HOLLAND

Tractors
835, 855, 875, 895,
935, and 950

1977 – 1980



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SECTION 1: SERVICING

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SAFETY

This section contains general safety precautions which should be thoroughly studied, and practiced, by all service personnel.

GENERAL SAFETY

1. Mount a fire extinguisher near the service area. Maintain it as recommended by the manufacturer and be familiar with its use.

2. Never operate the tractor in a closed building. If it is absolutely necessary to do so, be sure the building is well ventilated.

3. Always keep sleeves, jackets or other clothing relatively tight and belted, since loose clothing might catch in moving tractor parts.

4. Do not jump from the tractor cab. There is a danger of catching clothing on protruding parts. Use steps and handholds when mounting and dismounting tractor.

5. Before beginning any maintenance procedure, park the tractor on a level, clear area. Shut down the engine and remove the ignition key; set the parkbrake and chock the front and back of at least two wheels. Ensure that all operating controls are in the neutral position. Always disengage the PTO clutch and three-point hitch.

6. Never leave an implement in the raised position; always lower it to the ground.

7. Never attempt to start or operate tractor controls except from the operator's seat.

TOWING AND TRANSPORT SAFETY

1. Use a strong chain, cable or towbar and attach securely to the front frame plate or drawbar of tractor. Do not tow tractor faster than 15 mph (25 km).

2. Use a trailer having a carrying capacity of at least 30,000 lb (13 600 kg) to haul tractors.

3. Securely chain the tractor to the trailer, block the wheels and engage the parkbrake and articulation lock to prevent tractor movement.

JACKING SAFETY

1. Select a jack strong enough to carry the load. The minimum jack required is five ton capacity (4.5 t).

2. Stabilize the tractor by engaging the parkbrake and articulation lock, and chocking or blocking the wheels securely.

3. Brace the center pivot frame by applying a strong wedge on the frame pivot and engaging the articulation lock to prevent jackknifing.

4. Place the jack securely under the axle tube, frame, or drawbar where it is strong enough to support the lifted weight.

5. Use a heavy block as a base for the jack if working on the ground. It should be long enough to keep the jack from tipping, sinking or shifting. Any additional blocking should be under the jack.

6. Jack up the front and/or rear frame just enough to install steel safety stands under the axle tubes or frame.

7. Check the jack position after it has started to lift. Lower the jack immediately if it starts to lean. Reset the jack; block the tractor more securely and lift again.

8. Keep the tractor stable by not raising it so high that it will slide off the jack saddle.

9. Place support stands under the tractor. Lower the jack and let the tractor rest on the stands. This provides solid support for the tractor when the jack is removed.

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TABLE 1-1: Tractor Width, Tire Sizes, Shipping Weights

Model 835 TIRE SIZE	STACK HEIGHT	CAB HEIGHT	TREAD INNER	TREAD OUTER	WIDTH INNER	WIDTH OUTER	FRONT AXLE WEIGHT		TOTAL WEIGHT SHIPPING	
18.4 x 38-R1 Duals	137	123.5	72	118	91.5	137.5	13 433	6092 kg	19 826	8991 kg
† 20.8 x 38-R1 Singles	139.5	126	72	—	93	—	12 570	5701 kg	18 100	8209 kg
20.8 x 38-R1 Duals	139.5	126	72	122	93	143.5	13 852	6282 kg	20 664	9371 kg
24.5x32-R1 Singles	139	125.5	72	—	97.5	—	12 880	5841 kg	18 720	8490 kg
24.5x32-R2 Goodyear R&C	140	126.5	72	—	97.5	—	12 958	5877 kg	18 877	8561 kg
24.5x32-R2 Firestone R&C	140.5	127	72	—	97.5	—	12 997	5894 kg	18 953	8595 kg
30.5x32-R1 Singles	137.5	124	79.125	—	109	—	13 140	5959 kg	19 240	8726 kg
30.5x32-R2 Goodyear R&C	141.5	128	79.125	—	109	—	13 398	6076 kg	19 757	8960 kg
30.5x32-R2 Firestone R&C	140.5	127	79.125	—	109	—	13 529	6136 kg	20 017	9078 kg
18.4x38-R2 Goodyear R&C Duals	140	126.5	72	90.4	118	136.4				
18.4x38-R2 Firestone R&C Duals	139	125.5	72	90.4	118	136.4				
20.8x38-R2 Goodyear R&C Duals	141	127.5	72	93.1	122	143.1				
20.8x38-R2 Firestone R&C Duals	140.75	127.25	72	92.8	122	142.8				
30.5x32 United Singles	137.5	124	79.12	—	110.12					

Models 935, 950 TIRE SIZE	STACK HEIGHT	CAB HEIGHT	TREAD INNER	TREAD OUTER	WIDTH INNER	WIDTH OUTER	FRONT AXLE WEIGHT		TOTAL WEIGHT SHIPPING	
18.4x38-R1 Duals	142.25	124.25	72	118	91.5	137.5	13 238	6004 kg	19 771	8966 kg
† 20.8x38-R1 Singles	144.75	126.75	72	—	93	—	12 375	5612 kg	18 045	8184 kg
20.8x38-R1 Duals	144.75	126.75	72	122	93	143.5	13 657	6194 kg	20 609	9346 kg
24.5x32-R1 Singles	144.25	126.25	72	—	97.5	—	12 685	5753 kg	18 665	8465 kg
24.5x32-R1 Duals	144.25	126.25	72	129	97.5	154.5	14 236	6456 kg	21 767	9872 kg
24.5x32-R2 Goodyear R&C	144.5	126.5	72	—	97.5	—	12 763	5788 kg	18 822	8536 kg
24.5x32-R2 Firestone R&C	145	127	72	—	97.5	—	12 802	5806 kg	18 898	8571 kg
30.5x32-R1 Singles	142.75	124.75	79.125	—	109	—	12 945	5871 kg	19 185	8701 kg
30.5x32-R2 Goodyear R&C	146	128	79.125	—	109	—	13 203	5988 kg	19 702	8935 kg
30.5x32-R2 Firestone R&C	145	127	79.125	—	109	—	13 334	6047 kg	19 962	9053 kg

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4.5 WEIGHTS

Table 1-3 lists the maximum operating weight and recommended range of operating weight for all models. (For shipping weight see Table 1-1).

For detailed recommendations of operating weights, consult Specifications Section of Operator's Manual for each model.

TABLE 1-3: Operating Weights

	835	855	875	895	935	950
Maximum Operating Weight	28 000 lb (12 700 kg)	28 000 lb (12 700 kg)	29 500 lb (13 380 kg)	32 500 lb (14 750 kg)	32 500 lb (14 750 kg)	32 500 lb (14 750 kg)
Recommended Range of Operating Weights	24 000 to 26 000 lb 10 890 to 11 790 kg	24 000 to 26 000 lb 10 890 to 11 790 kg	26 500 to 29 000 lb 12 020 to 13 150 kg	29 300 to 31 000 lb 13 290 to 14 060 kg	29 300 to 31 000 lb 13 290 to 14 060 kg	29 300 to 31 000 lb 13 290 to 14 060 kg

4.6 ENGINES

MODEL 835

Cummins NT-855-C230. 855 cu in. (14 L) turbo-charged Big Cam CONSTANT POWER inline six-cylinder diesel engine

Maximum brake horsepower — 230 (171.5 kW) at 2100 rpm

Maximum torque — 800 lb ft (1085 N·m) at 1400 rpm

Full-load governed speed — 2100 rpm (r/min)

Full-throttle no-load speed — 2400 rpm

Idle speed — 1000 rpm

Bore — 5.50 in. (140 mm)

Stroke — 6.00 in. (152 mm)

Displacement — 855 cu in. (14.0 L)

Compression ratio — 14.1:1

Lubrication system — Oil capacity is 35 qt US (33 L). Full flow oil filter with spin-on bypass oil conditioner filter and oil-to-water cooler. 30° angular capability oil pan.

MODEL 855

Cummins NT-855-C250. 855 cu in. (14 L) turbo-charged Big Cam CONSTANT POWER inline six-cylinder diesel engine

Maximum brake horsepower — 250 (186 kW) at 2100 rpm

Maximum torque — 850 lb ft (1152 N·m) at 1400 rpm

Full load governed speed — 2100 rpm

Full-throttle no-load speed — 2250 to 2300 rpm

Idle speed — 1000 rpm

Bore — 5.50 in. (140 mm)

Stroke — 6.00 in. (152 mm)

Displacement — 855 cu in. (14.0 L)

Compression ratio — 14.1:1

Lubrication system — Oil capacity is 35 qt US (33 L). Full flow oil filter with spin-on bypass oil conditioner filter and oil-to-water cooler. 30° angular capability oil pan.

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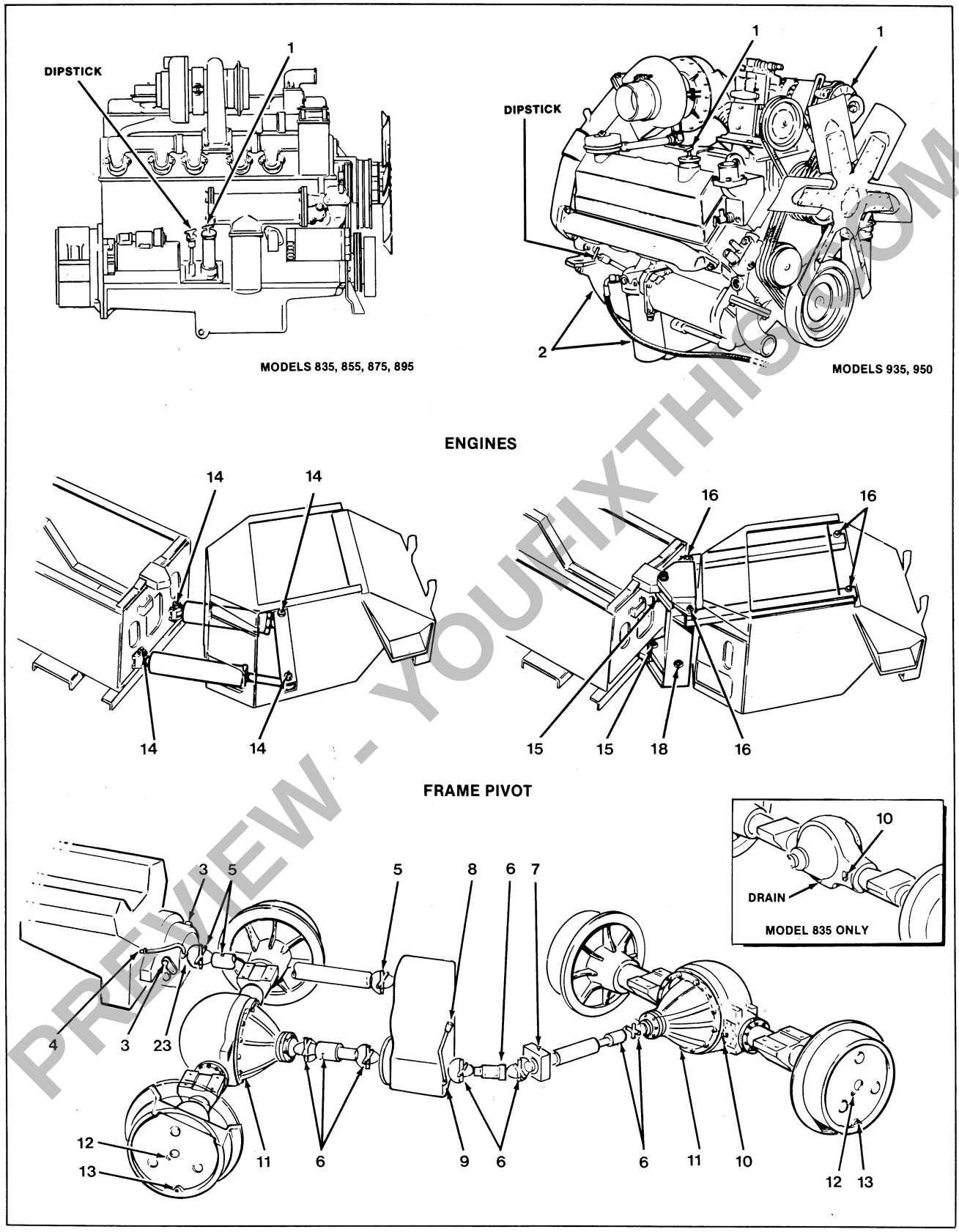


FIGURE 1-1: (Sheet 1) Lubrication Points

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7 Belts and Filters

7.1 GENERAL

Refer to tables 1-10 and 1-11 for correct replacement belts and filters. Refer to Figures 1-2 and 1-3 for location of filters.

7.2 BELTS — REPLACEMENT

Table 1-10 lists the belts used on all models. Purchase and replace belts as sets to ensure proper matching. Avoid overloading the new belt.

7.3 FILTERS

Table 1-11 lists the filters used on all models.

TABLE 1-10: Belt Replacement

Models 835, 855, 875, 895	Part Number
Fan belt (2 per set)	23265
Water pump belt	57260
Alternator belt (2)	57262
Compressor belt	22925
Models 935, 950	
Fan and water pump belt (3 per set)	57822
Alternator belt (2 per set)	19508
Compressor belt	20472

TABLE 1-11: Filters

	835	855	875	895	935	950
AIR CLEANER ELEMENT-INNER	30927	30927	30927	30927	30927	30927
AIR CLEANER ELEMENT-OUTER	30924	30924	30924	30924	30924	30924
CAB PRESSURIZER ELEMENT-INNER	30988	30988	30988	30988	30988	30988
CAB PRESSURIZER ELEMENT-OUTER	30986	30986	30986	30986	30986	30986
CORROSION ELEMENT	25881	25881	25881	25881	25881	25881
ENGINE BYPASS (SPIN-ON) OIL FILTER	57124	57124	57124	57124	57124	57124
ENGINE CRANKCASE OIL FILTER	31133	31133	31133	31133	31133	31133
FUEL FILTER	608T118	608T118	608T118	608T118	608T118	608T118
HYDRAULIC FILTER (RETURN)	36169	36169	36169	36169	36169	36169
HYDRAULIC FILTER (SUCTION)	15799	15799	15799	15799	15799	15799
TRANSMISSION FILTER	SW2854	SW2854	SW2854	SW2854	SW2854	SW2854
PTO OIL FILTER						
ELEMENT	36155	36155	36155	—	36155	36155
AND GASKET	36156	36156	36156	—	36156	36156
DCA PRECHARGED ELEMENT	26206	26206	26206	—	26206	26206

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9 Troubleshooting

9.1 GENERAL

A troubleshooting subsection at the system level is included with each section in the service manual. Troubleshooting information is in the chart form to help identify the problem so that a possible remedy can be found. The sections are arranged as follows:

1. Engine System — Section 2
2. Drive Train — Section 3
3. Controls — Section 4
4. Hydraulic System — Section 5
5. Electrical System — Section 6
6. Environmental Systems — Section 7
7. Structures — Section 8

Each of the above sections generally is divided into five parts:

1. Introduction
2. Description and Operation
3. Troubleshooting
4. Maintenance
5. Repair and Overhaul

9.2 TROUBLESHOOTING GUIDE

TABLE 1-12: Engine

TROUBLE	PROBABLE CAUSE	REMEDY	REFERENCE
Difficult to start or will not start	No fuel in tank	Fill tanks with proper fuel	
	Improper fuel	Drain wrong fuel and refill	
	Dirty or watery fuel	Drain tanks, bleed system and fill with clean fuel	
	Air in fuel system	Bleed fuel system	Cummins Operation and Maintenance Manual
	Improper timing	Check of injector pump by skilled serviceman	
	Dirty injector nozzles	Cleaning and repair by skilled serviceman	
Start, but runs improperly	Dirty or watery fuel, clogged filters, air in fuel system	Check fuel, replace filters and bleed fuel system	Cummins Operation and Maintenance Manual

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minal. Label positive terminal wires in order of removal. Disconnect solenoid relay wire from terminal (3).

4. Remove the three capscrews (4) (flange screws on inline engines) fastening starter to flywheel housing and carefully withdraw drive end of starter from flywheel housing.

NOTE

On the inline engine remove engine oil dipstick tube to facilitate liftout of starter motor.

Installation

To install the starter motor, proceed as follows:

1. Before mounting starter unit, remove the three 1/8 NPT plugs (5) at front and rear bearings and at end of drive shaft (Ref. Figure 2-25). Place several drops of 30 SAE oil into the wicks in plug holes. Replace pipe plugs.

2. Test-fit new starter to flywheel housing to check alignment of bolt holes and clearances of solenoid with adjacent engine and frame components.

3. Insert capscrews, 12 pt. flange or 6 pt. flange screws, as provided, and tighten to torque ratings in Table 2-9.

TABLE 2-8: Mounting Torque Values

Alternator Bracket to Block	75 lb ft (100 N·m)
Alternator to Bracket	60-70 lb ft (80-95 N·m)
Alternator to Adjustment Link	75 lbf ft (100 N·m)
Starter Motor to Flywheel Housing 5/8 in. 12 pt flange screw	75 lbf ft (100 N·m)

4. Connect all battery cables, ground wires and starter relay wire to proper terminals on starter.

5. Connect battery end of cables to batteries.

6 Engine Removal and Installation

6.1 MODEL 935 AND 950 ENGINE

General

This procedure details removing the V-903 engine while disturbing the other structures as little as possible. The method is useful in engine exchange where other equipment does not require replacement. In a major tractor overhaul, however, other systems may require removal. In these cases, the auxiliary equipment is removed first and stripped as closely as possible (e.g. bypass oil filter should be removed with its hoses; hydraulics disconnected at pump; radiator hoses separated at engine block, etc).

The following procedure is based on the assumption that it will be carried out in an equipped shop with level floor and gantry crane with at least a 3000 lb (1365 kg) capacity and with a lifting height of 10 ft (3 m) minimum. Engine removal can be performed in the field where a wheeled lifting device is available.

Special Tools and Equipment

1. Gantry crane, 3000 pound (1400 kg) capacity
2. Engine stand or platform
3. Caps or plugs for hoses and ports
4. Coolant container (11 Imp gal) (50 L)
5. Chain tackle for lifting engine

WARNING



BEFORE ANY PROCEDURE BEGINS, MAKE SURE TRACTOR WHEELS ARE CHOCKED, PARK BRAKE SET, ENGINE IS COLD

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SECTION 3: DRIVE TRAIN

1 INTRODUCTION

The drive train includes all components between the engine and drive wheels that directly transmit power.

2 DESCRIPTION AND OPERATION

2.1 General

The drive train (Ref. Figure 3-1) consists of a dry-type, double-disc, mechanical clutch; a 16 selection manual transmission; and outboard planetary-type front and rear axle units interconnected by means of three drive lines.

The front and rear axle units are identical except for differences in the helical input gearing to account for the different relative direction of rotation of the axles with respect to the drive lines. Each axle unit contains a standard differential (or an optional No-Spin differential) and a planetary drive at each wheel. The planetary drives create gear reduction at the wheels.

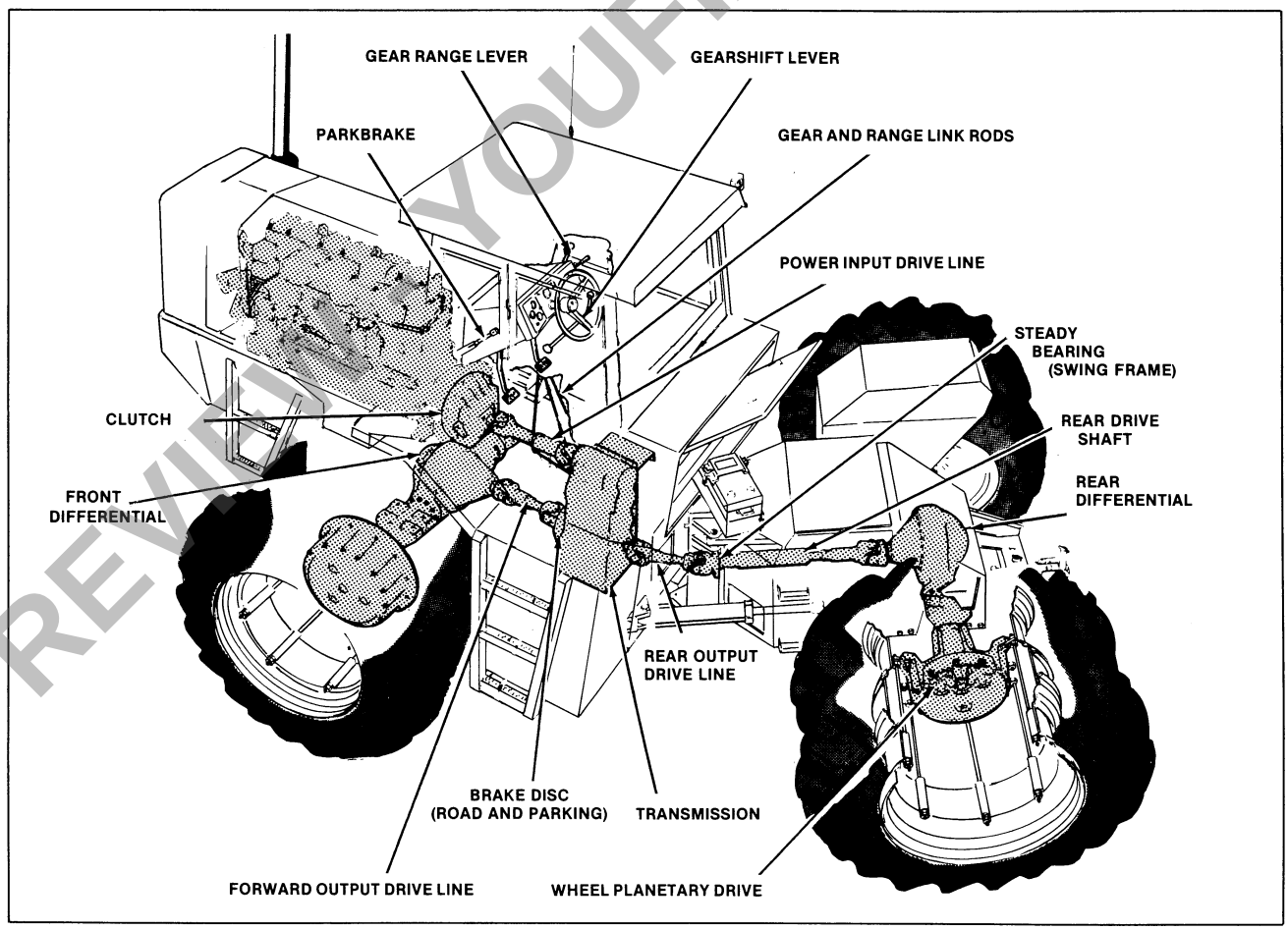


FIGURE 3-1: Drive Train

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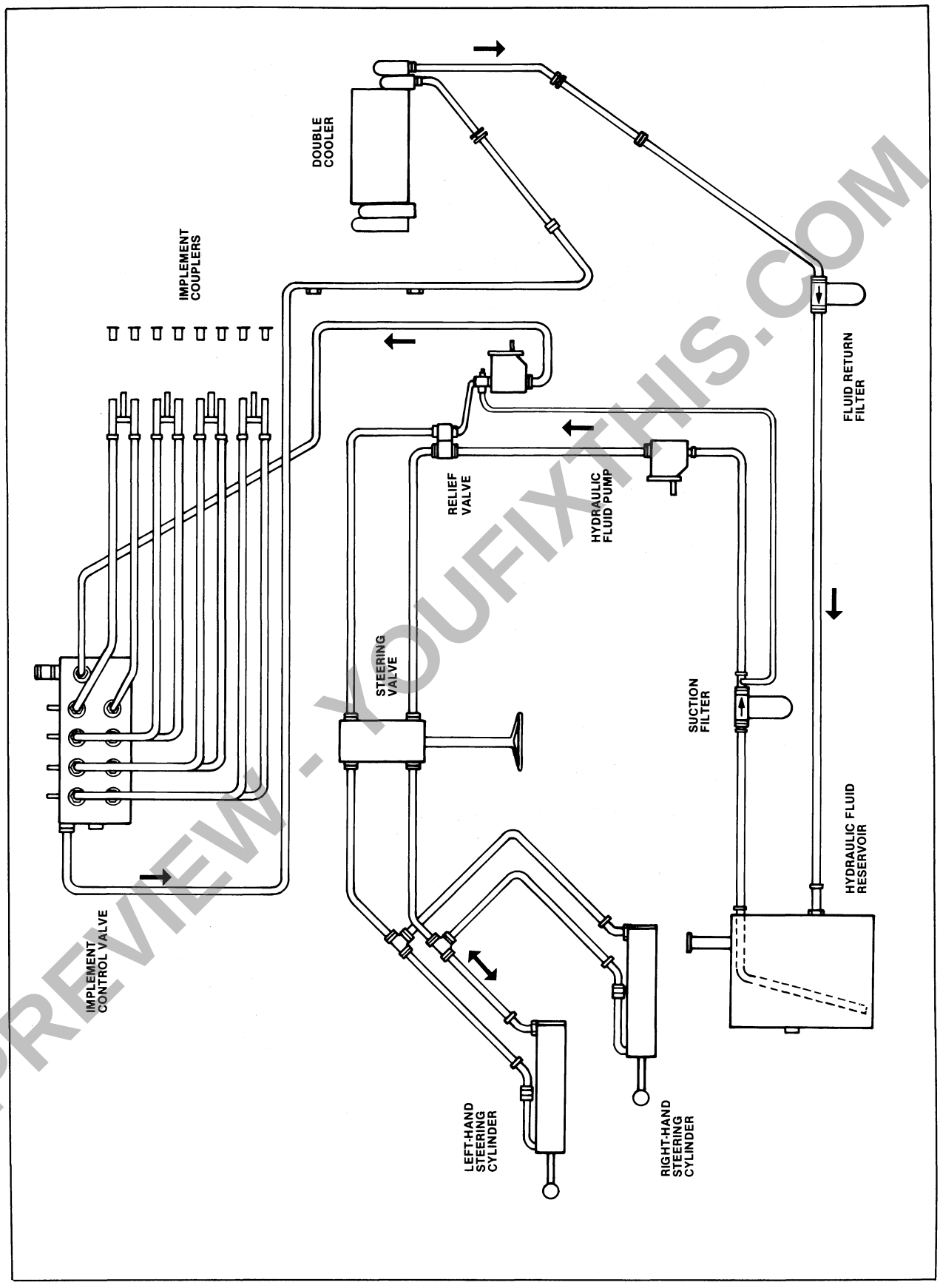


FIGURE 5-2: Hydraulic Circuit Diagram

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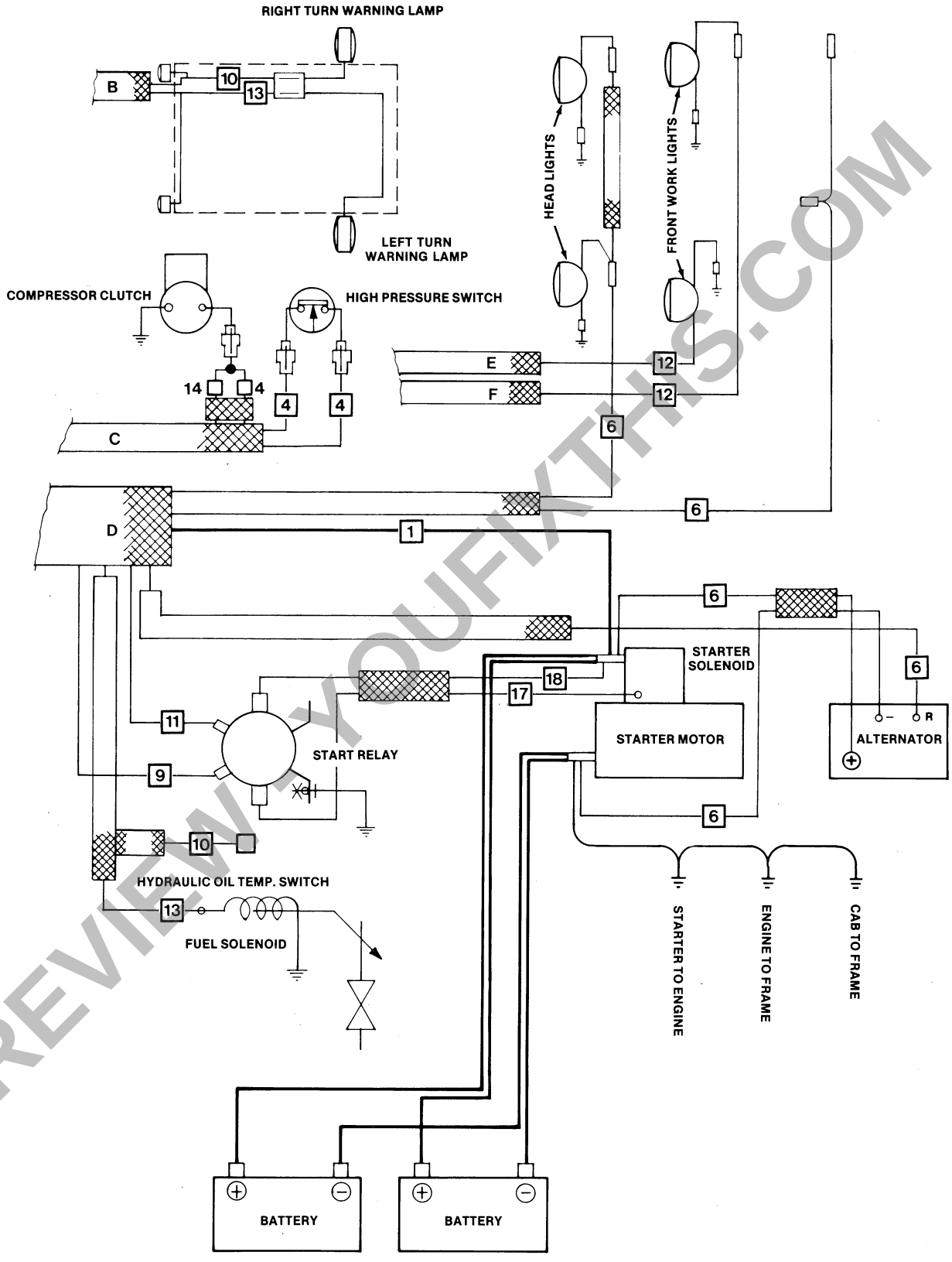


FIGURE 6-24: (Sheet 1 of 4) Wiring Diagram — Engine Compartment, Battery Compartment

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Fuel Tank Repair

Minor leaks that are not associated with hose connections and draincocks, and not under structural stress may be repaired with a selection of epoxy resin cements designed for such applications.

For more serious leaks, accidental damage or weld failure, replace the tank.

WARNING

WELDING FUEL TANKS IS DANGEROUS AND NOT RECOMMENDED.

BE ALERT

Send fuel tanks to a shop where fuel tank repair is a common procedure and the experience and equipment necessary to carry out the job safely is available.

5.5 REPLACEMENT OF FUEL GAUGE SENDER

To replace the fuel gauge sender in the fuel tank proceed as follows (Ref. Figure 2-17):

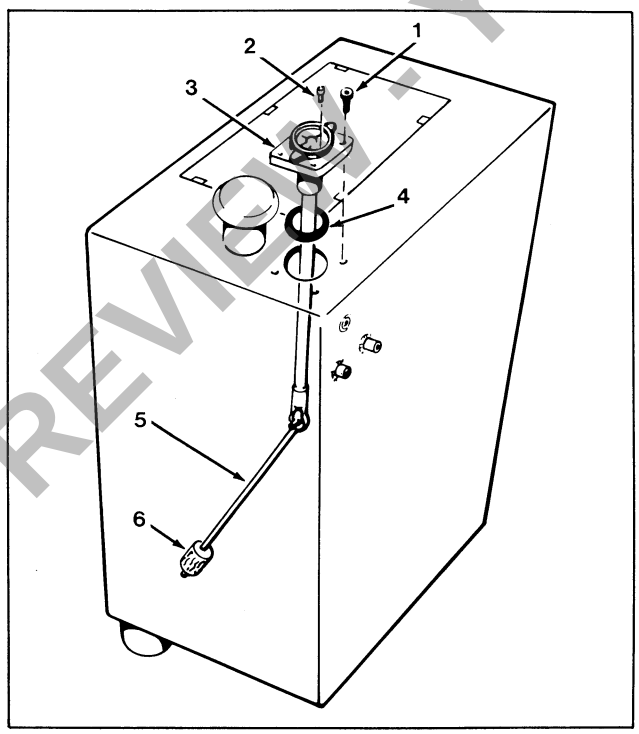


FIGURE 2-17: Replacement of Fuel Gauge Sender

1. Disconnect electric wire from terminal (2) or remove the dial face by backing out the two small Phillips screws beside the dial.

2. Remove the four fillister head screws (1) in corners of mounting flange (3).

3. Lift gauge assembly out of tank, taking care to preserve rubber gasket (4).

NOTE

Where gauge is being removed from a full tank, rotate and tilt the assembly to allow float arm (5) to extend and not jam against top of tank or filler neck.

4. Install new gauge assembly with cork float (6) oriented toward front of tractor. Tighten screws. (Use new gasket if present.)

5. Mount dial face or connect wire to terminal (2).

Refer to Section 6 for procedures to test the fuel gauge sender.

5.6 REMOVAL AND INSTALLATION OF SURGE TANK

Removal

To remove the surge tank, proceed as follows (Ref. Figure 2-18):

1. Drain two gal (9 L) from cooling system.

2. Raise hinged section of hood and loosen clamp (3) on makeup hose. Pull hose off tank connection.

3. Pull overflow hose (2) off its connection to surge tank fill neck.

4. Pry vent hoses (4) off surge tank connectors, using a screwdriver. Do not pull on these hoses.

5. Remove surge tank mounting bolts (5) and take out tank.

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5 AXLE ASSEMBLIES

5.1 Description and Operation

5.1.1 AXLES AND PLANETARY GEARS

Description

The main support members for the axles (Ref. Figure 3-43) consist of a cast iron differential housing and two cast iron axle tubes. The axle tubes are bolted to the differential housing and to the bottom of the tractor frame. The differential housing contains the differential carrier assembly, refer to para 5.1.2.

The main components of the outboard planetaries are the wheel hub, ring gear and hub, sun gear, and planet carrier assembly. The hollow cast iron hub is bearing mounted on the axle tube by two taper roller bearings, one of which mounts on a shoulder on the ring gear hub. The ring gear hub fits inside the wheel hub and is splined to the end of the axle tube. The sun gear is splined to the end of the axle shaft and is driven by it. The planet carrier assembly, containing three needle bearing-mounted planet gears, is bolted to the wheel hub — the planet gears being in mesh with both the sun and ring gears. The complete axle assembly, including the axle tubes and planetaries, is filled with oil and sealed by gaskets. A vent tube is connected from the upper side of the differential housing to a vent cover mounted on the tractor frame.

Operation

The input torque to the axle is split into two components by the differential and is applied via the axle shaft to rotate the sun gear. Since the ring gear is held stationary relative to the axle, the planetary gears track the inside of the ring gear but at a slower rate than the rotation of the sun gear. The planet gears are attached to the planet carrier, power flow is transferred from the sun gear, through the planet gears and shafts to the planet carrier and wheel hub (Ref. Figure 3-44). Since the rate of rotation of the sun gear is greater than the consequent rate of rotation of the wheel hub, gear reduction is achieved.

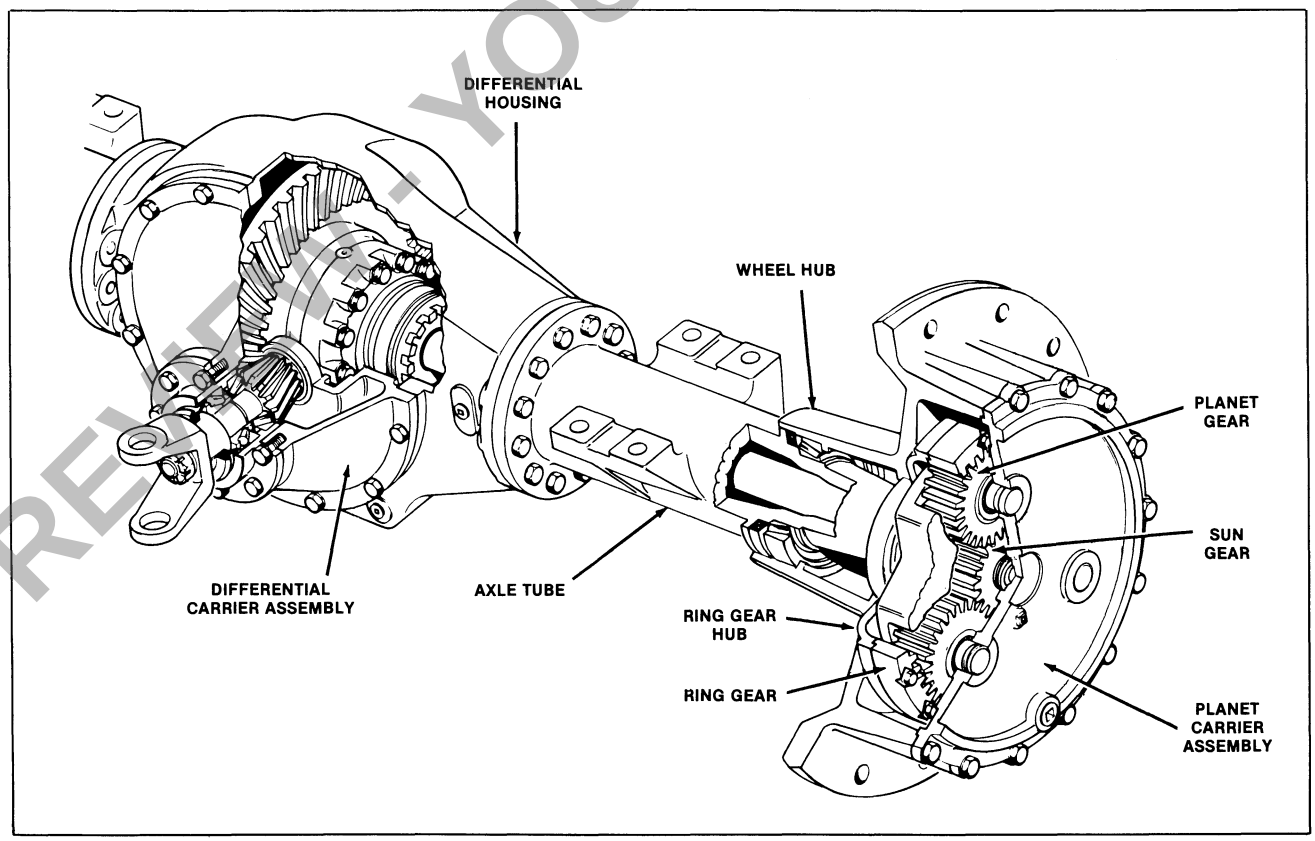


FIGURE 3-43: Axles

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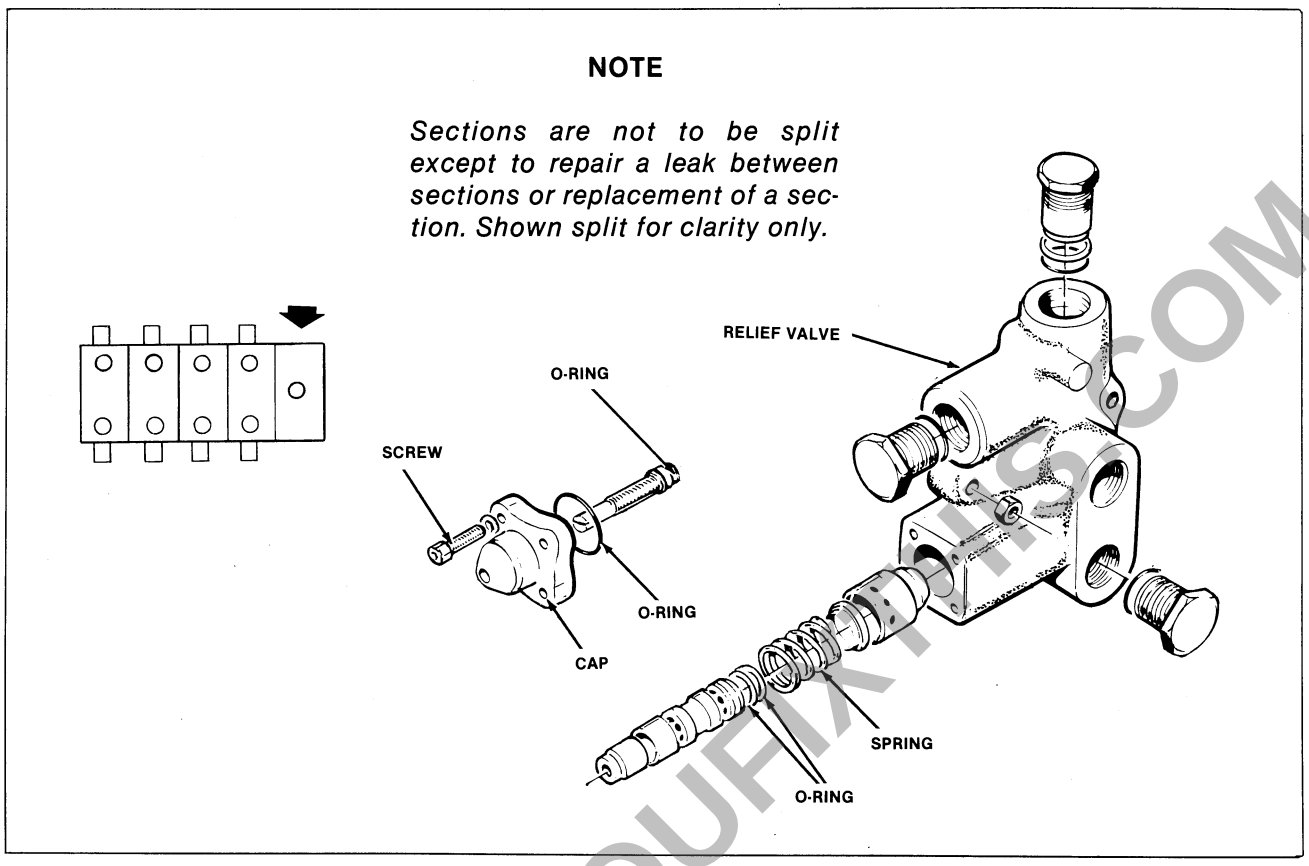


FIGURE 5-33: Flow Control Section

Flow Control Section

DISASSEMBLY

Refer to Figure 5-33 and proceed as follows:

1. Remove four Allen head screws fastening control cap to the section body.
2. Remove assembly from bore and place all parts in a container labelled to identify the section from which it was removed.
3. Remove and discard all O-rings.

INSPECTION

1. Using a clean petroleum base solvent, thoroughly clean the bore, O-ring counter bore and grooves and all machined surfaces.
2. Blow dry all parts and surfaces.
3. Inspect all machined surfaces of the body and parts for scratches, burrs and dirt. The surfaces must be clean and unmarked.
4. Inspect the compression spring for straightness and any evidence of cracking. Replace spring if defective.

ASSEMBLY

Refer to Figure 5-33 and proceed as follows:

1. Lightly wet O-rings with hydraulic fluid before putting them in place.
2. Assemble and install the parts in the bore with the parts in the proper sequence and facing in the proper direction.
3. Install control cap with new O-ring in cap. Secure with the four screws.

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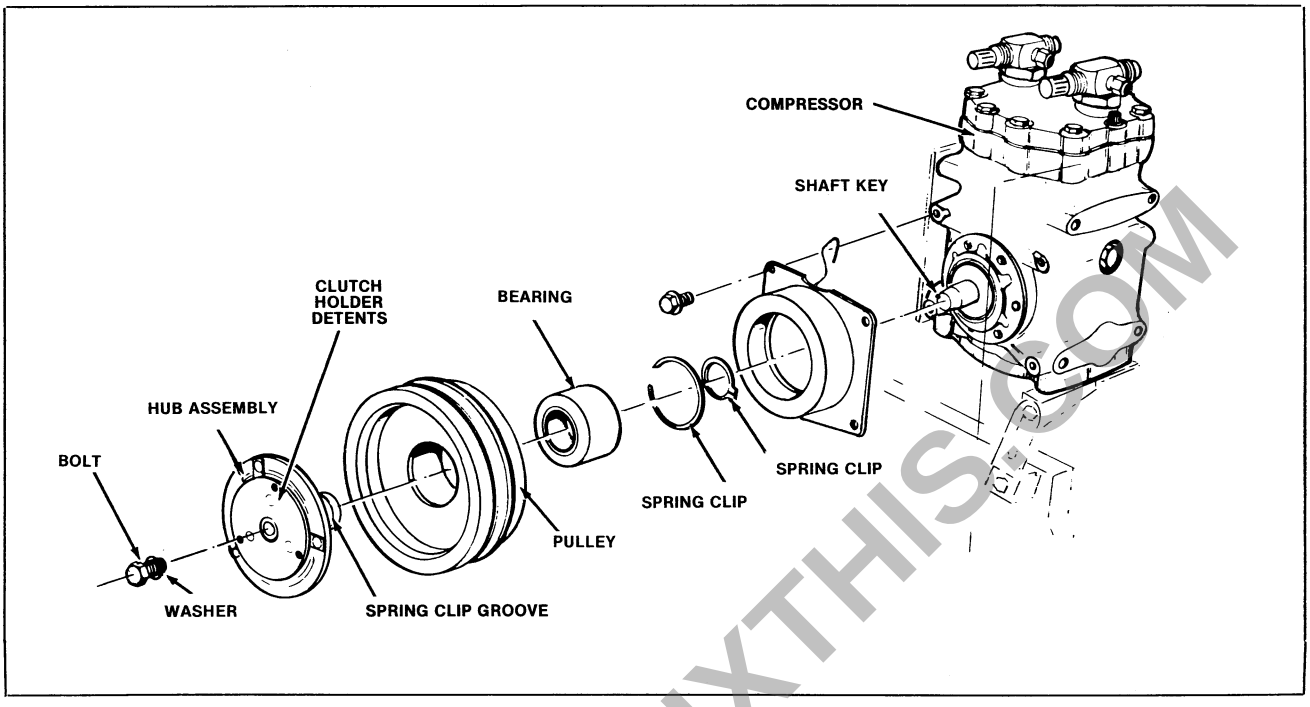


FIGURE 7-20: Replacement of Compressor Clutch Bearing

3. Remove pulley assembly from compressor driveshaft using a puller. Do not remove shaft key unless damaged.

4. Remove spring clip from groove in hub of armature and hub assembly. Slide pulley and bearing from hub.

5. Remove spring clip from pulley groove. Slide bearing out.

6. Slide replacement bearing into place. Install spring clips.

7. Slide pulley onto armature hub. Install spring clip.

8. Ensure shaft key is in place, then slide pulley assembly onto compressor driveshaft. Ensure that shaft key fits into pulley groove.

9. Install washer and bolt. Tighten finger tight.

10. Using clutch holder, torque bolt to 25 to 30 lbf ft (35 to 40 N·m).

11. Rotate pulley to check that it rotates freely without binding.

12. Install fan belt. Tighten belt to 100 pounds (45.3 kg). Check with a belt tension gauge.

5.8 REPLACEMENT OF AIR CONDITIONER THERMOSTAT

To replace the air conditioner thermostat, proceed as follows (Ref. Figure 7-21):

1. Remove access panel from top of cab to gain access to thermostat; refer to Section 8.

2. Pry off control knob. Remove nut from control shaft.

3. Tag electrical wires to prevent mixup, then pry off electrical connectors.

4. Push grommet out of partition, remove thermostat.

5. Push sensor tube forward into heater/evaporator core until its looped end clears core at front.

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