

- **Hand Tools**

Many cuts, abrasions and injuries are caused by defective or improvised tools. Never use the wrong tool for the job, as this generally leads to some injury, or to a poor job.

Never use

- A hammer with a loose head or split handle.
- Spanners or wrenches with splayed or worn jaws.
- Spanners or files as hammers; or drills, clevis pins or bolts as punches.

For removing or replacing hardened pins use a copper or brass drift rather than a hammer.

For dismantling, overhaul and re-assembly of major and sub components, always use the Special Service Tools recommended. These will reduce the work effort, labour time and the repair cost.

Always keep tools clean and in good working order.

- **Electricity**

Electricity has become so familiar in day to day usage, that its potentially dangerous properties are often overlooked. Misuse of electrical equipment can endanger life.

Before using any electrical equipment – particularly portable appliances – make a visual check to ensure that the cable is not worn or frayed and that the plugs, sockets, etc., are intact. Make sure you know where the nearest isolating switch for your equipment is located.

GENERAL CONSIDERATIONS

- **Solvents**

Use only cleaning fluids and solvents that are known to be safe. Certain types of fluid can cause damage to components such as seals, etc., and can cause skin irritation. Solvents should be checked that they are suitable not only for the cleaning of components and individual parts, but also that they do not affect the personal safety of the user.

- **Housekeeping**

Many injuries result from tripping or slipping over, or on, objects or material left lying around by a careless worker. Prevent these accidents from occurring. If you notice a hazard, don't ignore it – remove it.

A clean hazard-free place of work improves the surroundings and daily environment for everybody.

- **Fire**

Fire has no respect for persons or property. The destruction that a fire can cause is not always fully realised. Everyone must be constantly on guard.

- Extinguish matches/cigars/cigarettes, etc., before throwing them away.
- Work cleanly, disposing of waste material into proper containers.
- Locate the fire extinguishers and find out how to operate them.
- Do not panic – warn those near and raise the alarm.
- Do not allow or use an open flame near the tractor fuel tank, battery or component parts.

- **First Aid**

In the type of work that mechanics are engaged in, dirt, grease, fine dusts, etc., all settle upon the skin and clothing. If a cut, abrasion or burn is disregarded it may be found that a septic condition has formed within a short time. What appears at first to be trivial could become painful and injurious. It only takes a few minutes to have a fresh cut dressed, but it will take longer if you neglect it. Make sure you know where the First Aid box is located.

- **Cleanliness**

Cleanliness of the tractor hydraulic system is essential for optimum performance. When carrying out service and repairs plug all hose ends and component connections to prevent dirt entry.

Clean the exterior of all components before carrying out any form of repair. Dirt and abrasive dust can reduce the efficiency and working life of a component and lead to costly replacement. Use of a high pressure washer or steam cleaner is recommended.

INSPECTION AND REPAIR

NOTE: Current production engines may have a crankshaft with main or crankpin journals ground 0.010 in. (0.25 mm) undersize. These are identified with the letters '010 MUS' and/or '010 PUS' respectively. The letters are stamped on one of the crankshaft counterbalance weights.

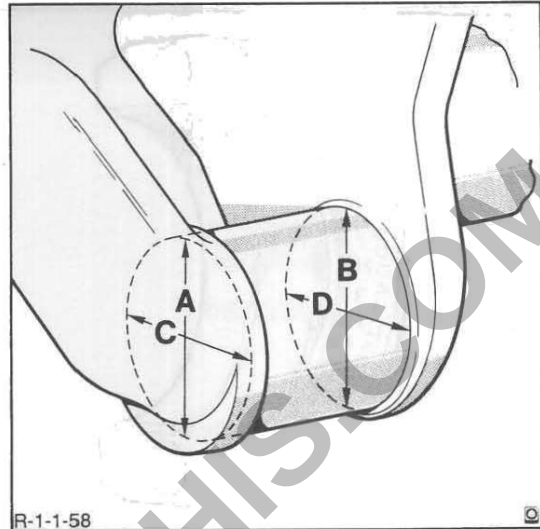


Figure 55

Crankshaft Journal Measurements

1. If the crankshaft gear teeth are excessively worn or chipped, install a new crankshaft gear which must be fully located on the shoulder of the crankshaft.

If the journal exceeds the specified wear limit, refinish the journals to the next undersize bearing, see "Specifications" – Chapter 4. Always reproduce the original journal side radii and after refinishing chamfer the oil holes.

2. Clean the crankshaft and drilled passages. Dress minor imperfections with an oil stone and re-finish severely marked journals to the next undersize bearing.

4. Examine the rear oil seal journal for score marks, remove minor imperfections with fine emery cloth and if severely damaged renew the crankshaft.

3. Measure the diameter of each journal in four places to determine out-of-round, taper or wear, Figure 55. Measurement 'A' compared with 'B' indicates vertical taper whilst measurement 'C' compared with 'D' indicates horizontal taper. Measurements 'A' and 'B' compared with 'C' and 'D' indicate journal out-of-round.

RE-ASSEMBLY

1. Check the crankshaft bearing clearance with micrometers or preferably using Plastigauge as follows:
 - Position a piece of correct size Plastigauge across the full width of the bearing cap and approximately 0.25 in. (6.35 mm) off centre.

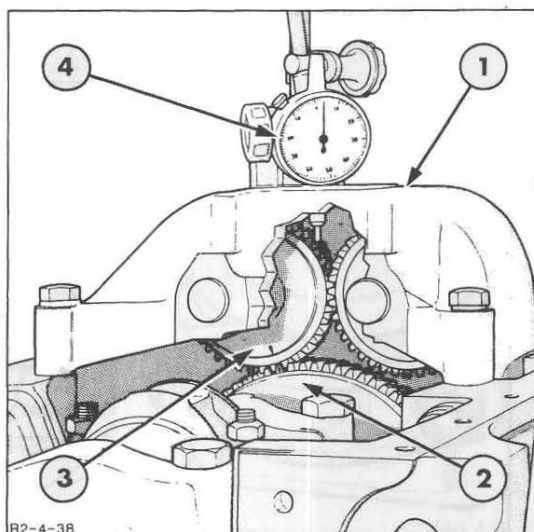


Figure 53
Checking Balancer Backlash

1. Balancer Housing
2. Crankshaft Gear
3. Balancer Drive Gear
4. Dial Indicator Gauge

BALANCER

REMOVAL

1. Remove the oil pan sump as previously described in this Chapter.

2. Use a dial indicator gauge to check the backlash between the crankshaft gear and the balancer drive gear, Figure 53. Position the dial plunger perpendicular to the face of one of the drive gear teeth then rock the drive gear to measure the backlash. Take the backlash reading at 90° intervals around the drive gear. If the backlash exceeds the specified limits see "Specifications" – Chapter 4, install new balancer gears.

3. Withdraw the retaining bolts and remove the balancer assembly.

DIASSEMBLY

1. Drive out the roll pins securing the shafts to the housing, and disassemble the balancer components as shown in Figure 54.

INSPECTION AND REPAIR

1. Measure the outside diameter of the shafts and the inside diameter of the gear bushings and establish the clearance, see "Specifications" – Chapter 4. If the bushing clearance exceeds the specification, replace the shaft and/or gear assembly and re-check the clearance.
2. Examine the shafts and balance gear teeth for wear and damage and replace where necessary.

3. Ensure the lubrication holes in the shafts are free from obstruction.

RE-ASSEMBLY

1. Position the balancer gears and thrust washers in the housing with the timing marks aligned and facing the roll pin side of the balancer. Install the shafts from the opposite side and secure with the roll pins, Figure 55.

2. Use the feeler gauges to measure the end float of the assembled gears.

Chapter 8

TROUBLE SHOOTING, SPECIFICATIONS, TEST PLANS AND SPECIAL TOOLS

Section	Page
A. TROUBLE SHOOTING – DIESEL ENGINES	1
B. TROUBLE SHOOTING – TURBOCHARGER	11
C. SPECIFICATIONS	15
D. SPECIAL TOOLS	19
E. TEST PLANS	21

Example of Hartridge 2500:

Method to determine minimum number of strokes for a Test Plan critical fuel value of 30 mm³/stroke using a Hartridge 2500 test machine with 60 cm³ graduates:

Delivery for 100 strokes in

$$\text{cm}^3 = \frac{30 \times 100}{1000} = 3\text{cm}^3.$$

Hartridge 2500 should give at least a 25% fill of graduates, i.e. 25% of 60 cm³ = 15 cm³. Therefore, to achieve at least this fill, it will be necessary to use 500 strokes, giving a delivery of 15 cm³.

Before commencing tests, unscrew the maximum stop screw and the idling stop screw to allow full movement of the throttle arm.

The throttle lever is to be fully open and the stop lever and solenoid stop valve in the "run" condition unless otherwise stated.

Do NOT run the pump for long periods with the shut-off lever closed, particularly at high speed.

Roller to Roller Dimension

The setting given on the Test Plan is approximate and is for use when assembling the pump. Final adjustment of maximum fuel must be carried out on the test machine. If a substantial alteration is required, then the pump cannot be functioning correctly, e.g. plungers sticking, incorrect governor link setting etc.

Transfer Pressure Adjustment

Various end plate transfer pressure adjusting assemblies or sleeve plugs of different thickness can be used to vary the load on the regulating spring. Where this is applicable, it is stated on the Test Plan.

Governor Link Setting

Refer to "Overhaul – Section B" for the method of setting governor link length.

The link length is specified to satisfy two main factors for governor performance:

1. Fuel cut-off at maximum speed.
2. Non-interference with fuel delivery at the maximum fuel setting.

Whilst most governors will operate satisfactorily with the nominal link length, some units fail for the above reasons and can be corrected by an alteration to the link length. The following procedure should, therefore, be adopted:

- a) Set to nominal link length before commencing test.
- b) If unit fails for 'no cut-off at maximum governed speed,' reduce link length.
- c) If unit fails for maximum fuel interference, increase link length.

Note, however, that incorrectly machined, worn or wrongly assembled parts can produce the same faults and alteration to link length, which may already be correct, will not necessarily effect a solution. Should adjustment to the link length fail to correct the fault, then this should be reset to the nominal length and the trouble looked for elsewhere.

4. Fit the latch valve and body with a new "Dowty" seal into the 2 o'clock position in the pump housing when viewed from the rear end of the pump.

5. Tighten the valve body to the specified torque, see "Specifications" – Chapter 8. With a suitable pair of Tweezers, check for free movement of the valve in the valve body.

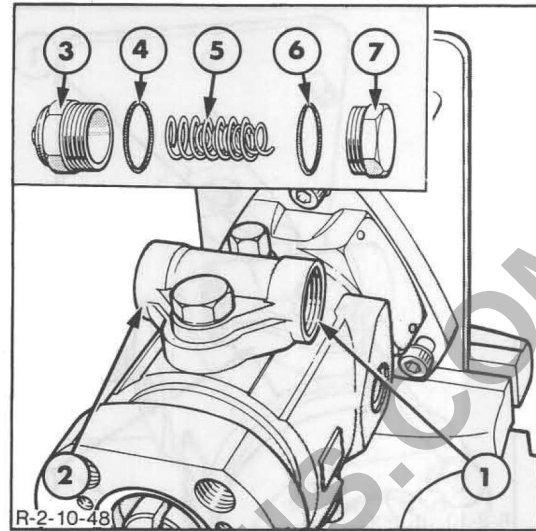


Figure 50
Exploded View of Advance Housing Components

6. Screw on the sleeve nut then fit the spring against the valve.

- | | |
|-------------------------|--------------------|
| 1. Piston Plug Position | 5. Springs (3 off) |
| 2. Spring Cap Position | 6. 'O' Ring Seal |
| 3. Spring Cap | 7. Piston Plug |
| 4. 'O' Ring Seal | |

7. Engage the stem of the adjuster with the spring and screw the adjuster and locknut into the sleeve nut. Tighten the sleeve nut to the specified torque, see "Specifications" – Chapter 8, followed by the adjuster locknut to the specified torque, see "Specifications" – Chapter 8.

3. Using the Protection Sleeve, Tool No. 7044-898 over the threads of the piston plug, fit a new rubber "O" ring. Screw the piston plug into the advance housing and tighten the plug to the specified torque, see "Specifications" – Chapter 8.

Automatic Advance and Start Retard Unit

1. Progressively and evenly tighten both the head locating fitting and cap nut. Tighten the fitting and the cap nut to the specified torque, see "Specifications" – Chapter 8. Check that both cam ring and piston move freely.

4. Using the Protection Sleeve, Tool No. 7044-898, fit a new rubber "O" ring over the threads of the spring cap.

2. Fit the remaining parts of the advance unit as follows:-

5. Fit the advance springs into the piston and screw the spring cap into the housing.

6. Using a suitable socket, tighten the spring cap to the specified torque, see "Specifications" – Chapter 8.

PART 2

FUEL SYSTEMS

Chapter 6

AIR CLEANERS

Section	Page
A. DRY TYPE AIR CLEANER – DESCRIPTION AND OPERATION	1
B. DRY TYPE AIR CLEANER – OVERHAUL	2

A. DRY TYPE AIR CLEANER – DESCRIPTION AND OPERATION

Ford 455C, 555C and 655C models feature a dry element type air cleaner located beneath the engine top hood panel in front of the diesel fuel tank, Figure 1.

Air enters the cleaner in a circular direction and centrifugal actions results in heavier particles being thrown to the outside of the container and collecting in the bottom of the air cleaner for ejection through an evacuator tube. The lighter particles are collected on the primary element.

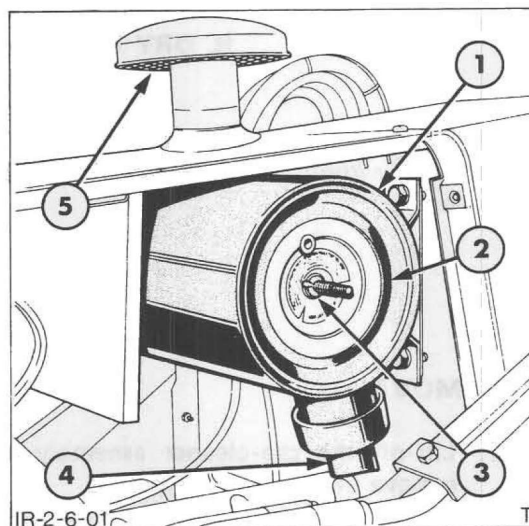


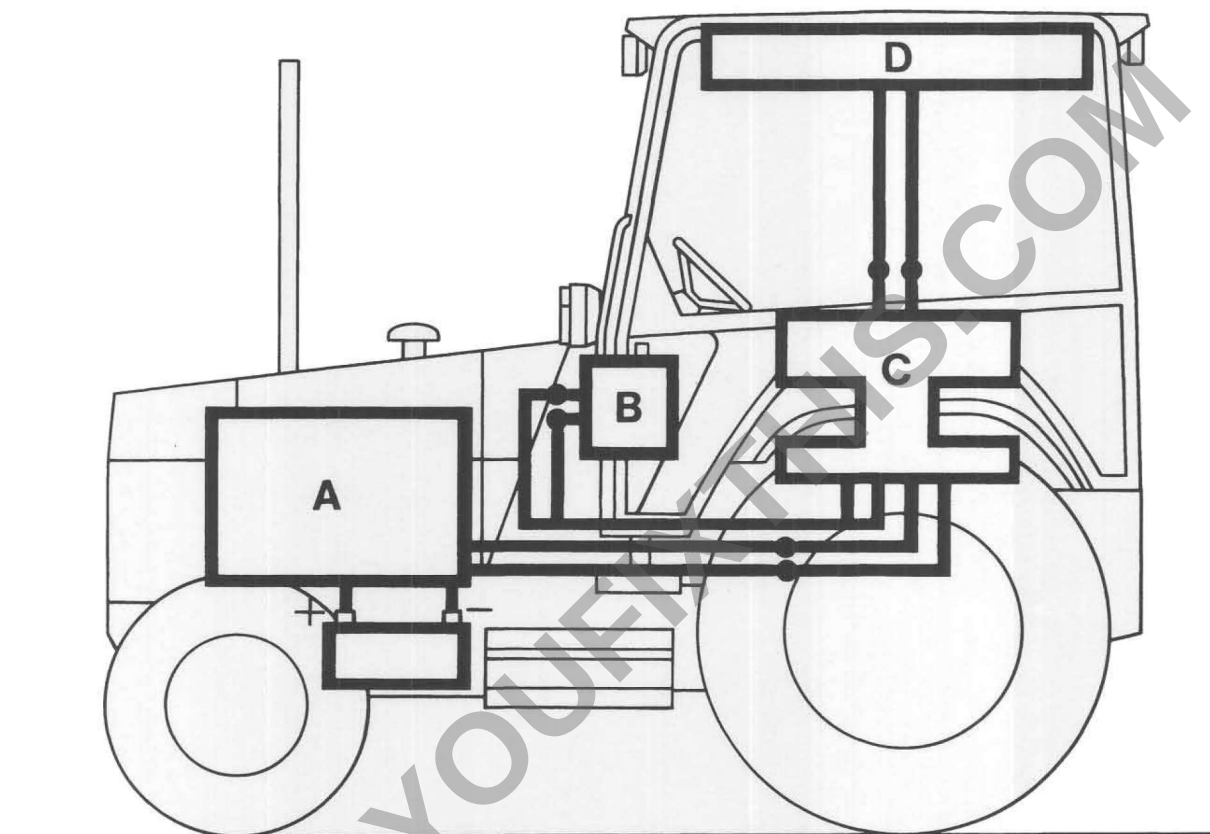
Figure 1
Dry Element Type Air Cleaner Installed

An inner (secondary) safety element is located within the outer element. The safety element protects the engine in the event of dust passing through a damaged outer element

1. Air Cleaner Assembly
2. Outer Element
3. Wing Nut
4. Dust Collector
5. Pre-Cleaner Bowl

TEST PLAN – FORD 655C, 268 cu. in. (4390 cc) Engine continued

Test Operation	RPM	Requirements
1 Priming	200	Obtain delivery from all injectors and backleak
2 Stabilisation	1000	run pump for 3 minutes
3 Transfer pressure check	100	0,4 bar (6 lbf/in ²) minimum
4 Advance setting	700	Adjust transfer pressure screw to obtain advance of 3,5° (2,76 mm)
5 Transfer pressure check	700	4,0 to 5,2 bar (59 to 75 lbf/in ²)
6 Full advance check	900	5,25° to 6,25° (4,14 to 4,93 mm)
7 Back leakage	900	40 to 100 cm ³ per 100 strokes time cycle. (Flow rate 360 to 900 cm ³ /min.)
Stop test machine. Remove transfer pressure gauge. Fit and energise solenoid. Re-start test machine and prime as in test 1.		
8 Maximum delivery setting. See Note 1	*1100	61,0±0,5 mm ³ /stroke Spread between lines not to exceed 5,0 mm ³ /stroke
9 Governor setting	1220	Set throttle by max. speed adjustment screw to give average delivery of between 5,0 and 6,0 cm ³ . Lock stop screw.
10 Governor cut-off check	1280	Average delivery to be not more than 1,6 cm ³
11 Delivery check	1100	Delivery to be as at test 9 ± 0,3 cm ³
Run test machine down to 100 rpm and stop. Screw latch valve adjuster fully in. Re-start test machine.		
12 Latch valve setting	200	Screw latch valve adjuster fully in, then screw out until advance reads 1,25° to 2,0° (0,98 to 1,58 mm). Lock adjuster.
Run test machine down to 100 rpm and stop. Re-start test machine.		
13 Excess fuel delivery check	150	Average delivery to be 20 cm ³ minimum with advance at 0°.
Move throttle lever to closed position for tests 14, 15 and 16		
14 Idling delivery	280	With throttle lever against idle screw, set delivery to 3,0 to 3,5 cm ³ using idle screw. Lock screw.
15 Cut-off operation	280	With shut-off lever closed, average delivery not to exceed 0,5 cm ³
16 Solenoid shut-off check	280	De-energise solenoid and wait for 5 seconds before operating trip gear. Average delivery not to exceed 0,5 cm ³
17 Timing		Using outlet 'X' (55 bar pressure) set indexing tool to 263°. Scribe a line on pump housing flange.



- A. ENGINE AND TRANSMISSION HARNESS**
- B. STEERING CONSOLE HARNESS**
- C. INSTRUMENT AND LIGHTING HARNESS**
- D. ROOF HARNESS**

INITIAL TESTS

The initial tests may be performed without removing any of the charging circuit components from the tractor and enable the following items to be checked:

- Alternator Output Lead
- Battery Temperature Sensor Circuit
- Alternator Charging Current and Controlled Voltage
- Alternator Charging Circuit Voltage Drop
- Alternator Maximum Output Performance

Test equipment required:

- Voltmeter (0-30 Volts Moving Coil Type)
- Millivoltmeter (0-1 Volt)
- Ammeter (0-70 Amperes Moving Coil Type)
- 1.5 Ohm 70 Amperes Variable Load Resistor
- Jumper Lead (0.25in. [6.35mm] Male to Female Blade Terminal)

NOTE: Most commercial test equipment incorporates several testing devices within a single unit. Use such equipment according to the manufacturer's instructions.

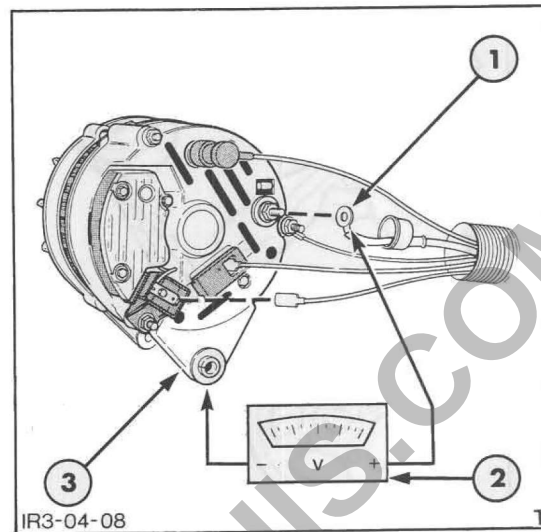


Figure 8
Alternator Plug Connections Test

1. Output Lead
2. Voltmeter (0-30 Volts)
3. Alternator Frame

1. Alternator Output Lead Test

With reference to Figure 8

1. Turn the key start switch on but do not start the engine.
2. Remove the output lead from the alternator and connect a voltmeter between the output lead and the alternator frame (negative side of voltmeter to frame). Battery voltage should be registered.

If battery voltage is not registered, a continuity fault in the external cable circuitry must be traced and remedied, refer to the circuit diagram shown in Figure 5.

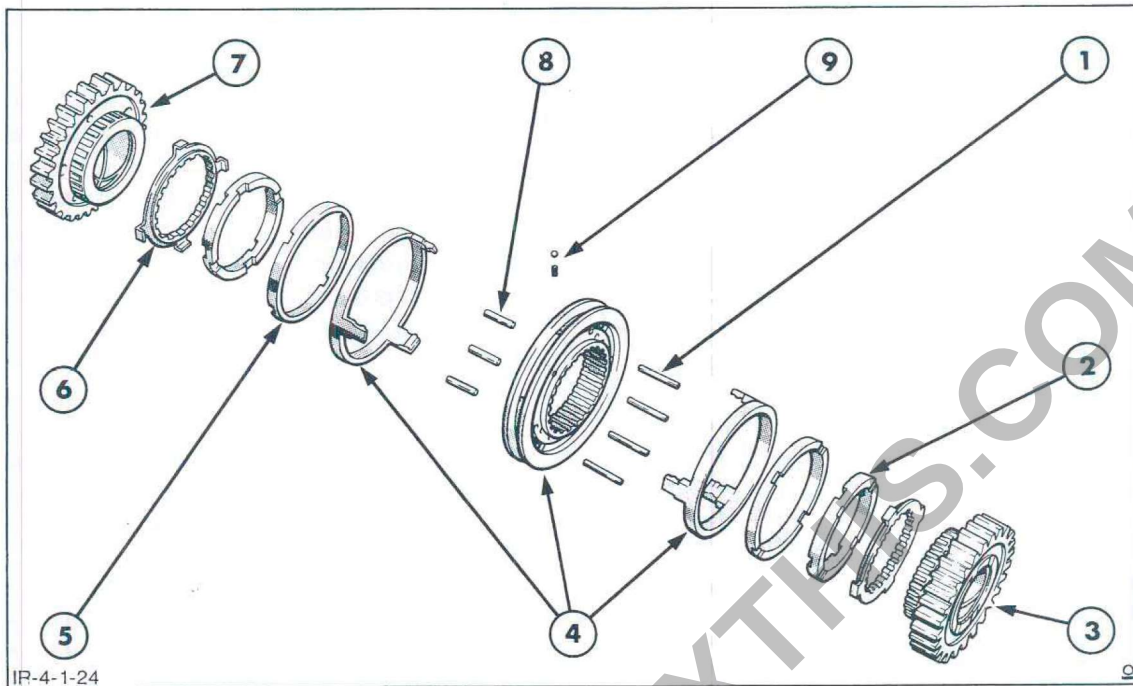


Figure 24
3rd/4th Synchroniser Exploded View

- | | |
|----------------------------|--|
| 1. Inner Cone Drive Pins | 6. Intermediate Cone Locator |
| 2. Inner Cone | 7. 3rd Gear |
| 3. 4th Gear | 8. Synchroniser Ring Locating Pins (3) |
| 4. Coupler and Outer Cones | 9. Detent Ball and Spring (6) |
| 5. Synchroniser Ring | |

Transmission gears are mounted on the output shaft either side of the synchroniser assembly. Splined to the gears are retainers which engage the synchroniser rings to the gears. The synchroniser rings are positioned between the two outer cones and two inner cones. The two inner cones are engaged to the sliding sleeve by four (long) pins which locate within the cut-outs in the cones. Three thicker (short) pins limit the travel of the sliding sleeve in relation to the outer cone.

The operation of the synchroniser, Figure 25, is as follows:-

In the neutral position the sliding sleeve and outer cone are locked together by the balls and springs positioned in the sleeve and tangs of the outer cone.

The inner cone is engaged to the sliding sleeve by the four (long) pins and rotates with the sleeve and outer cone as an assembly.

The synchroniser ring, engaged to the gear via the retainer, and the gear are free to rotate on the output shaft.

As the sliding sleeve is moved from neutral towards the gear to be selected the outer cone also moves and compresses the synchroniser ring between the outer and inner cones.

Further shift pressure causes the synchroniser ring and the inner and outer cones to rotate at the same speed. The synchroniser ring and gear now rotating in synchronisation with the sleeve permits the chamfered teeth on the internal circumference of the sleeve to engage the teeth on the gear.

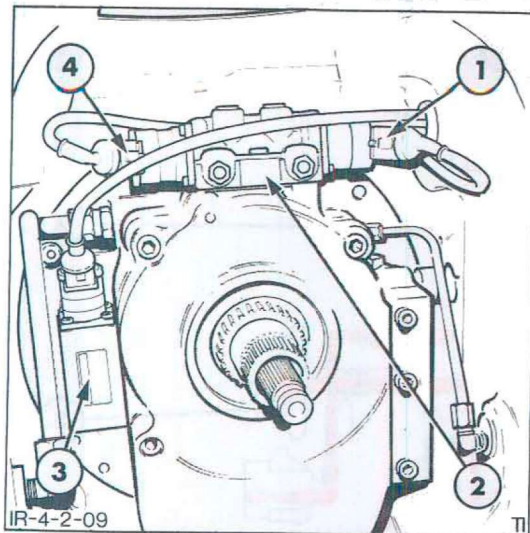


Figure 9
Solenoid Control Valve

- | | |
|---------------------|---------------------|
| 1. Forward Solenoid | 3. Lock-Up Valve |
| 2. Control Valve | 4. Reverse Solenoid |

The bypass valve will open at approximately 75 – 80 lbf/in² (5.2 – 5.5 bar) to bypass oil back to sump; thereby preventing excessive pressure in the converter. Oil leaking past land "A" of the regulating valve also returns to sump.

SOLENOID CONTROL VALVE

The solenoid control valve is mounted on top of the distributor assembly, Figure 9, and consists of two identical spools, two identical solenoids, a return spring and a valve body.

The function of the solenoid control valve is to direct the pressure regulated oil from the hydraulic pump to one of the two clutch packs.

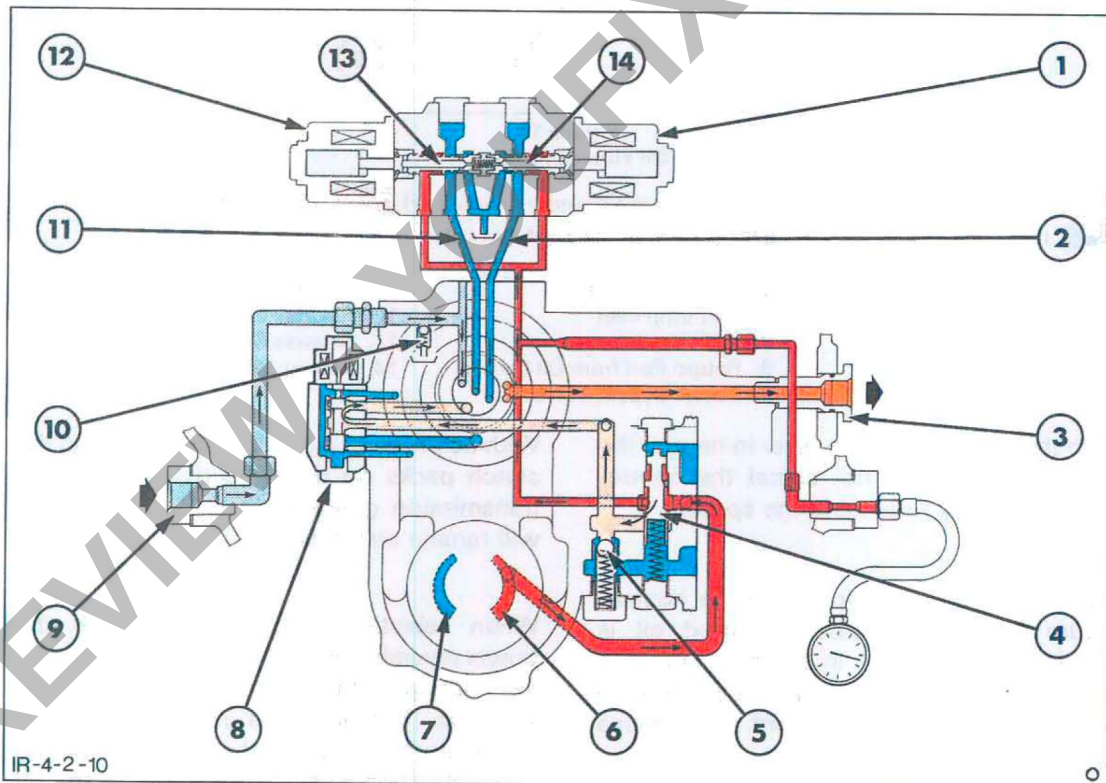


Figure 10
Oil Flow - In Neutral

- | | | |
|---|---|---|
| ■ Pressure Oil | ■ Torque Converter Pressure Oil | ■ Torque Converter Return Oil |
| ■ Lubrication Oil | ■ Reservoir and Exhaust Oil | |
- | | | |
|-------------------------------|---------------------------|--------------------------------|
| 1. Forward Solenoid | 6. Oil Pump Outlet | 11. Reverse Clutch Oil Gallery |
| 2. Forward Clutch Oil Gallery | 7. Oil Pump Inlet | 12. Reverse Solenoid |
| 3. Feed Port to Oil Cooler | 8. Lock-Up Valve | 13. Reverse Spool |
| 4. Regulating Valve | 9. Return from Oil Cooler | 14. Forward Spool |
| 5. Bypass Valve | 10. Cooler Bypass Valve | |

TRACTOR-MANUALS-UK.COM ASSEMBLY

1. Install the regulating valve spool, shim and spring into the respective bore and retain in position with the plug. Tighten the plug to the specified torque, see "Specifications" – Chapter 3.
2. Install the by-pass valve seal, ball, spring and shim into the respective bore and retain with the plug. Tighten the plug to the specified torque, see "Specifications" – Chapter 3.
3. Assemble the transmission hydraulic pump components as shown in Figure 79. Install the pump onto the distributor housing and secure with the retaining bolts. Tighten the bolts to the specified torque, see "Specifications" – Chapter 3.
4. Install the stator support onto the distributor housing and secure with the retaining bolts. Tighten the bolts to the specified torque, see "Specifications" – Chapter 3.
5. Locate the gear onto the stator support, Figure 77.
6. If it was necessary to remove the oil seal from the front cover, install a new seal using Tool No. 630 or 9210 and a press. If the thrust washer was removed, install a new thrust washer using new knock pins.
7. Install the hydraulic pump drive gear and bearings to the front cover, the assembly is a push fit.
8. Do not install the front cover plate at this stage as it is necessary to align the P.T.O. shaft and pump drive gear during assembly.

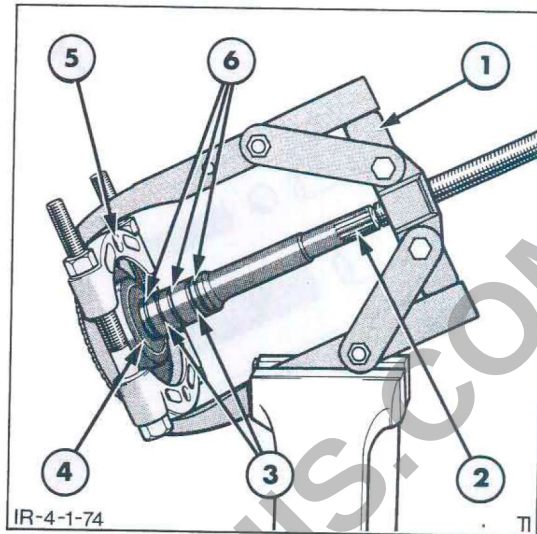


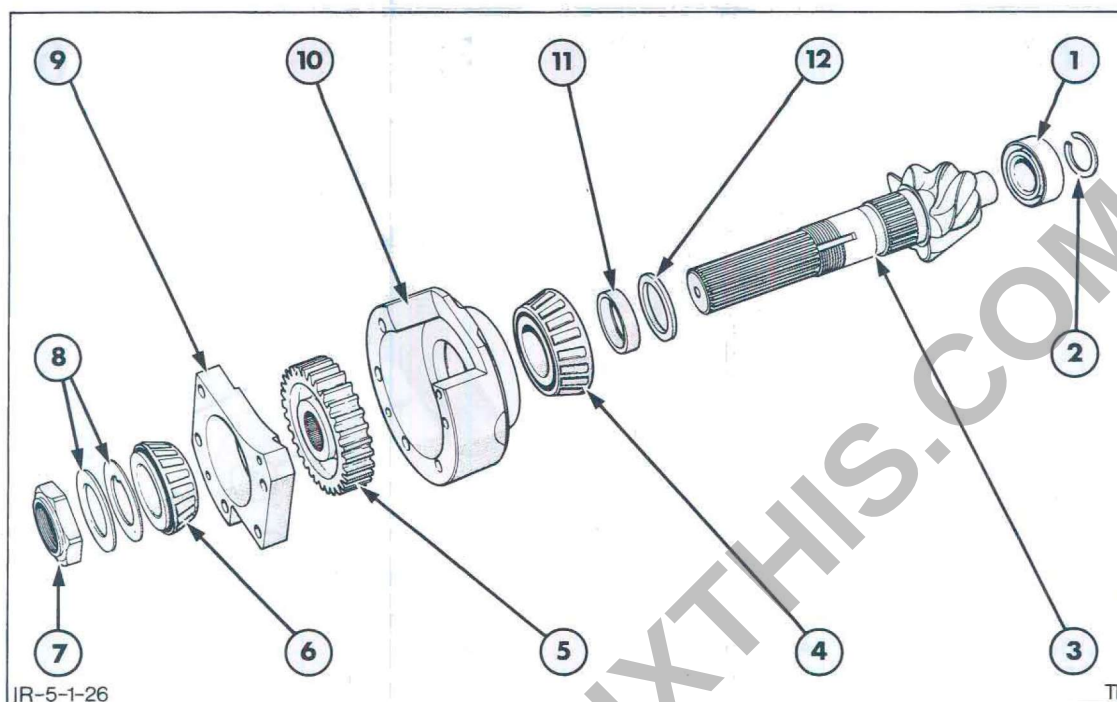
Figure 83
Front Input Shaft Bearing Removal

1. Puller – Tool No. 1003 or 9516
2. Front Input Shaft
3. Oil Passages
4. Front Input Shaft Bearing
5. Pulling Attachment – Tool No. 951 or 9190
6. Sealing Rings

FRONT INPUT SHAFT AND REAR CLUTCH ASSEMBLY

DISASSEMBLY

1. Normally it is not necessary to remove the ball bearing from the front input shaft, or the needle bearing from the rear face of the shaft. If the ball bearing is worn or damaged, it can be removed as shown in Figure 83. To remove the needle bearing, collapse the inner race with a hammer and chisel, then pull the outer race from the shaft with Tool Nos. 1003 and 951 or 9516 and 9190.
2. Unlock the sealing rings by squeezing them together, then remove them from the shaft.
3. If not previously removed, pull the bearings and spacer from the rear clutch hub (reverse idler input) and remove the gear from the clutch plates in the housing. Remove the thrust washer.

**Figure 26**

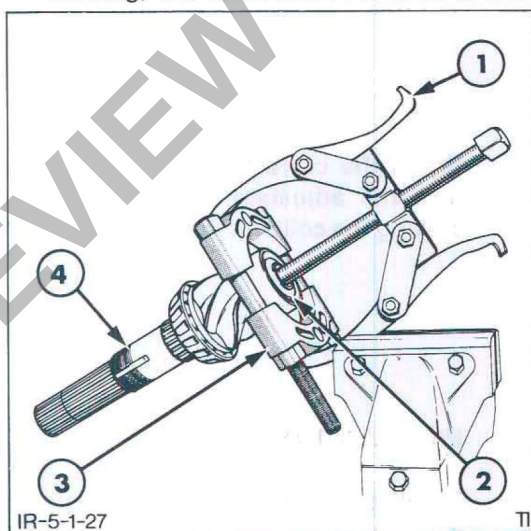
Drive Pinion Assembly - Exploded View

- | | | | |
|-----------------------|------------------|-------------------|---------------------------|
| 1. Pilot Bearing | 4. Rear Bearing | 7. Adjusting Nut | 10. Drive Pinion Retainer |
| 2. Lock Ring | 5. F.W.D. Gear | 8. Thrust Washer | 11. Spacer |
| 3. Drive Pinion Shaft | 6. Front Bearing | 9. Retainer Plate | 12. Spacer |

INSPECTION AND REPAIR

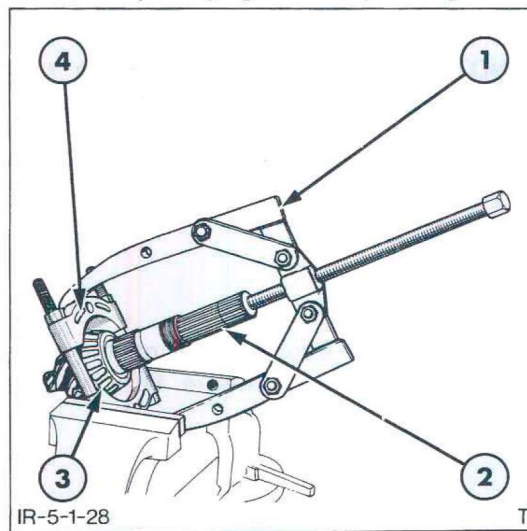
1. Thoroughly clean and inspect all parts and install new parts if worn or damaged.
2. If necessary, to remove the rear pinion bearing, use Tool Nos. 1003 or 9516 and

951 or 9190 as shown in Figure 28. To install a new bearing use the same tool in conjunction with a sleeve of suitable size, Figure 29 to press the inner bearing track squarely against the pinion gear.

**Figure 27**

Removing Drive Pinion Pilot Bearing

- | | |
|--------------------------|-------------------------|
| 1. Tool No. 1002 or 9198 | 3. Tool No. 951 or 9190 |
| 2. Pilot Bearing | 4. Drive Pinion Shaft |

**Figure 28**

Removing Drive Pinion Rear Bearing

- | | |
|--------------------------|-------------------------|
| 1. Tool No. 1003 or 9516 | 3. Bearing Assembly |
| 2. Drive Pinion Shaft | 4. Tool No. 951 or 9190 |

Chapter 3

FOUR WHEEL DRIVE FRONT AXLE ASSEMBLY

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C. AXLE SHAFT – OVERHAUL	10
D. STEERING SWIVEL PIN BEARINGS – OVERHAUL	14
E. STEERING CYLINDER AND TRACK RODS – OVERHAUL	19
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Chapter 4

TRANSFER GEAR ASSEMBLY

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Chapter 5

TROUBLE SHOOTING SPECIFICATIONS AND SPECIAL TOOLS

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C. SPECIFICATIONS – TWO WHEEL DRIVE FRONT AXLE	4
D. SPECIFICATIONS – FRONT WHEEL DRIVE AXLE AND TRANSFER GEAR ASSEMBLY	5
E. SPECIAL TOOLS	9

PREVIEW - YOUFIXTHIS.COM

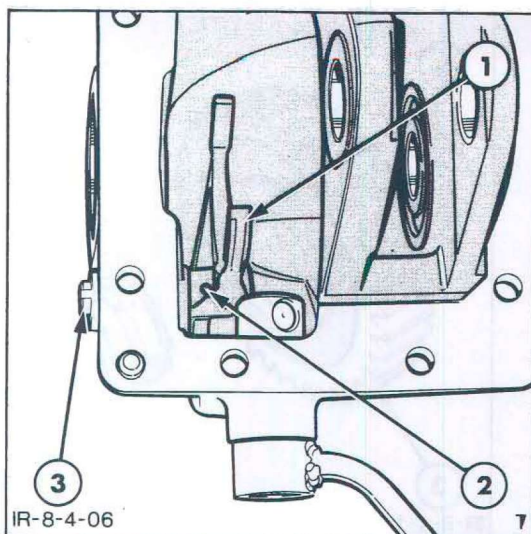


Figure 6
Shaft and Fork Installation

- | | |
|---------|-----------------|
| 1. Fork | 3. Detent Shaft |
| 2. Pin | |

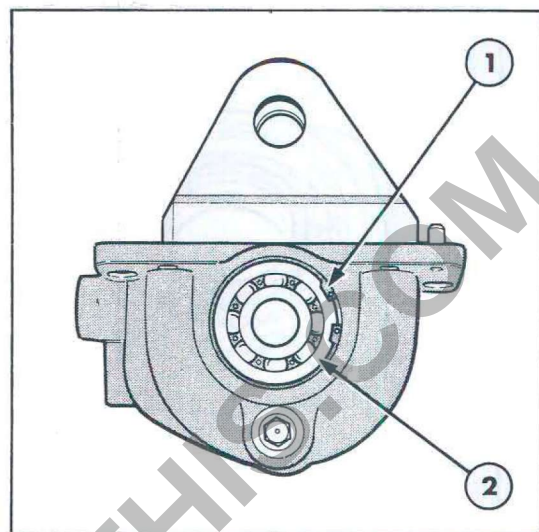


Figure 8
Output Shaft Rear Bearing

- | |
|--------------|
| 1. Snap Ring |
| 2. Bearing |

9. Using a pin punch knock the pin securing the fork on the detent shaft into the "centre" of the shaft, Figure 6.

NOTE: Do not attempt to knock the pin through the shaft as this will prevent removal of shaft.

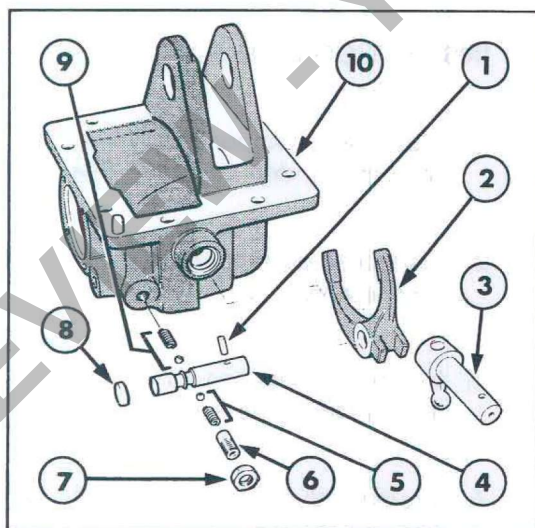


Figure 7
Fork and Detent Shaft Assembly

- | | |
|--------------------|--------------------|
| 1. Pin | 6. Detent Adjuster |
| 2. Fork | 7. Lock Nut |
| 3. Actuating Shaft | 8. Plug |
| 4. Detent Shaft | 9. Ball and Spring |
| 5. Ball and Spring | 10. Transfer Case |

10. Push the detent shaft toward rear of housing and remove fork.

11. Remove detent shaft from casing and "knock" the pin from the shaft. Retrieve the remaining detent ball and spring. Refer to Figure 7.

12. Using a pin punch drive the lever assembly retaining pin from the actuating lever shaft. Remove the lever and shaft from the casing.

13. Remove the rear bearing snap ring, Figure 8 and using a suitable press and step plate adaptors Tool Nos. 630T/14 and 15 or 9211, remove bearing.

14. Using a suitable press and step plate adaptor Tool No. 630T or 9211, remove the dust and oil seal from the output shaft end cap, Figure 9.

Hydraulic oil is supplied to the pump by gravity feed from the hydraulic oil reservoir, through a pipe which connects to the intake port in the pump cover. A set of spur gears, housed in the body of the pump and driven by the driveshaft, supply oil to the hydraulic system circuit.

Oil entering the pump fills the spaces between the teeth of the revolving gears and is then carried around within the pump body to a point where the teeth of the two gears come into mesh, Figure 2. As the oil cannot pass back between the gears it is forced out of the pump body through the outlet port in the pump cover.

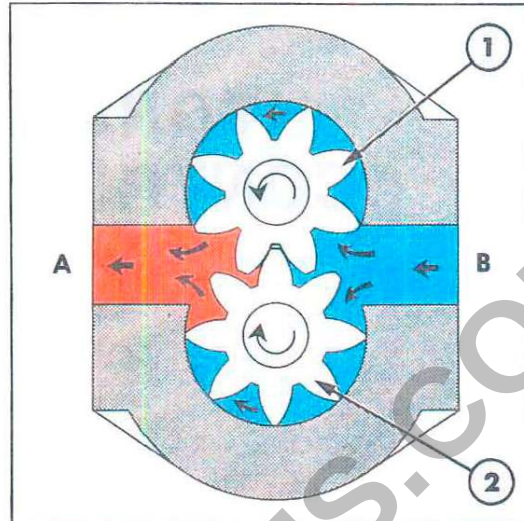


Figure 2
Oil Flow in Hydraulic Gear Type Pump

- | | |
|--|--|
| Pressure Oil | Suction Oil |
| A. To Hydraulic Circuit | B. From Reservoir |
| 1. Driven Gear | 2. Drive Gear |

B. HYDRAULIC PUMP – OVERHAUL

NOTE: The oil seals in the pump are the only serviceable parts that can be renewed. Prior to overhauling the hydraulic pump, the pump performance test – as described in Part 8, Chapter 10, Section E “Hydraulic Pump Performance Testing” – should be conducted to ascertain the efficiency of the pump. If the efficiency is less than 80% the pump should be dismantled to determine the cause.



WARNING: Ensure the backhoe is supported in the transport position or resting on the ground and the loader is in the raised position and supported by the loader safety support prior to commencing overhaul.

REMOVAL

1. Remove the hydraulic oil filter element on the right-hand side of the Unit and drain the hydraulic oil into a suitable container by depressing and holding in the anti-siphon valve, Figure 3.

IMPORTANT: Do not operate the engine with hydraulic reservoir drained otherwise damage to the pump will result.

2. Remove the front grille securing bolts and withdraw the grille.

RE-ASSEMBLY AND INSTALLATION

Reassembly and installation of the valve assembly follows the removal and disassembly procedure in reverse. During reassembly observe the following requirements:

- Lubricate all components with hydraulic oil prior to re-assembly, see 'Specifications' – Chapter 11.
- Tighten the spool detent plug and check valve retaining plug to the specified torque, see 'Specifications' – Chapter 11.

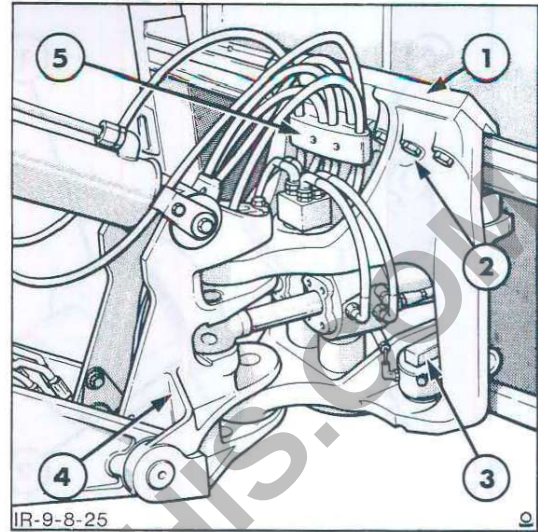


Figure 7
Carriage and Swing Post Assembly

1. Carriage Retaining Plate
2. Carriage Retaining Bolt (6 off)
3. Lower Clamp Cylinder Bellcrank
4. Swing Post
5. Carriage Hose Clamp

CLAMPING CYLINDERS – REMOVAL

1. Park the Unit on a firm level surface, position the carriage in the centre of the frame with the dipstick parallel to the centre line of the Unit, retract the crowd cylinder and lower the dipstick to the ground.
2. Release the pressure on the clamping cylinders by pulling up the 'T' handle on the control console and retracting the stabiliser leg until the system relief valve operates.
3. Lower Clamping Cylinder Removal:
 - Disconnect the feed hose to the cylinder being removed and cap the exposed ends.
 - Remove the bolt securing the clamping cylinder bellcrank pivot pin. Withdraw the pin and remove the bellcrank. Refer to Figure 7.
 - Using a suitable drift, drive the clamping cylinder from the backhoe carriage.

4. Upper Clamping Cylinder Removal:

- Support the carriage using a suitable sling and hoist.
- Remove the six carriage plate retaining bolts and remove the plate.
- Using the boom and dipstick operating elements carefully lower and tilt the carriage forwards to enable access to the upper clamp cylinders.
- Disconnect the feed hose to the cylinder being removed and cap the exposed end.
- Using a suitable drift, drive the clamping cylinder from the backhoe carriage.

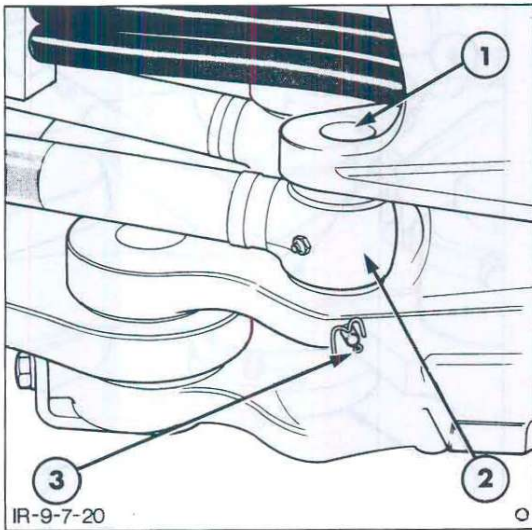


Figure 18

Swing Cylinder Rod End Retainer – Centre Pivot

1. Rod End Pivot Pin
2. Cylinder Rod
3. Pivot Pin Retainer

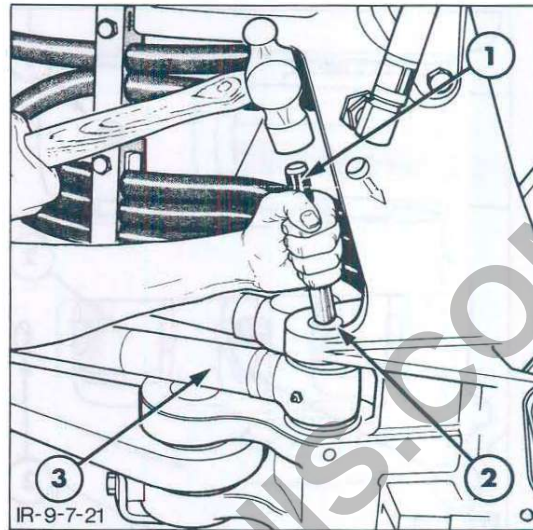


Figure 19

Removing Cylinder Rod Pivot Pin – Centre Pivot

1. Drift
2. Pivot Pin
3. Cylinder Rod

3. Disconnect the hoses and tubes from the swing cylinder to be removed. Ensure the rear feed hose is clear for subsequent removal.

7. Lever the plate upwards from both cylinder upper trunnions.

4. Remove the cotter pins from the rod end pin retainer and drive out the pin. Note that this pin retains both cylinder rod pins, Figure 18.

5. Using a suitable drift, drive out the rod end pivot pin, Figure 19.

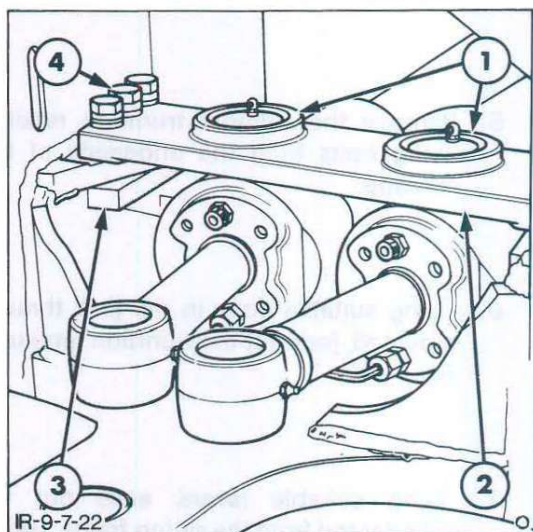


Figure 20

Cylinder Upper Trunnion Retainer Plate

6. Remove the 6 bolts, Figure 20, securing the cylinder trunnion retainer and bushing plate assembly. Collect the loose nut bars.

1. Cylinder Upper Trunnions
2. Retainer and Bushing Plate
3. Nut Bar
4. Fixing Bolts

H. EXCAVATOR CONTROL SYSTEM (MECHANICAL) – OVERHAUL

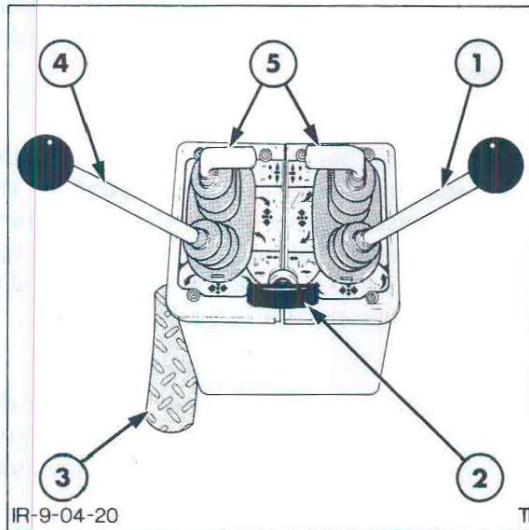


Figure 38
Backhoe Control Console
Sideshift Shown

1. Dipstick Control Lever
2. Carriage Clamp Lever
3. Extendible Dipstick Pedal
4. Boom Control Lever
5. Stabiliser Control Levers

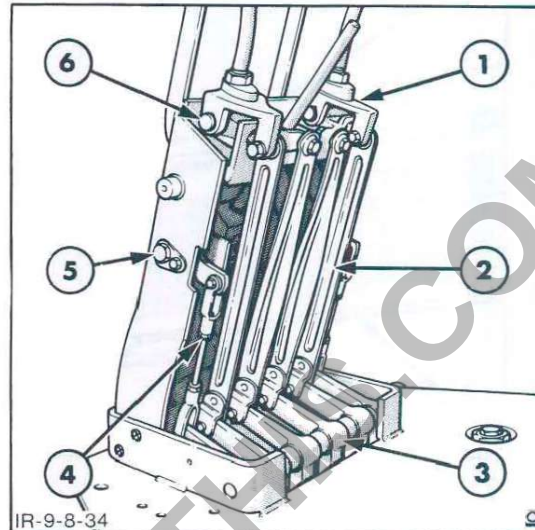


Figure 39
Backhoe Control Lever Linkage – Sideshift

1. Control Lever Pivot
2. Control Lever Link Assembly
3. Bellcrank
4. Stabiliser Lever Link Assembly
5. Stabiliser Lever Shaft
6. Control Lever Shaft

REMOVAL

1. Position the unit on a hard level surface and rest the digging elements on the ground in a safe position.
2. With the engine stopped, relieve residual pressures by moving all control levers in all directions.
3. Unscrew the control lever knobs and remove the rubber gaiters, Figure 38.
4. Sideshift Units:
Using a suitable pin punch drive the retaining pin from the clamp lever 'T' handle and remove the handle.
5. Remove the excavator control levers and top and side covers to expose the control mechanism.

DISASSEMBLY – Side Shift Units

1. Remove the control lever and stabiliser lever link assemblies by disconnecting the pivot pins and removing the lever pivot to link bolts, Figure 39.
2. Disconnect the bellcrank, to valve spool link assembly pivot pins and remove the links, Figure 40.
3. Remove the bellcrank pivot shaft retaining bolt and withdraw the shaft bellcranks and spacers.
4. Remove the stabiliser lever pivot shaft securing bolts and withdraw the shafts and levers.

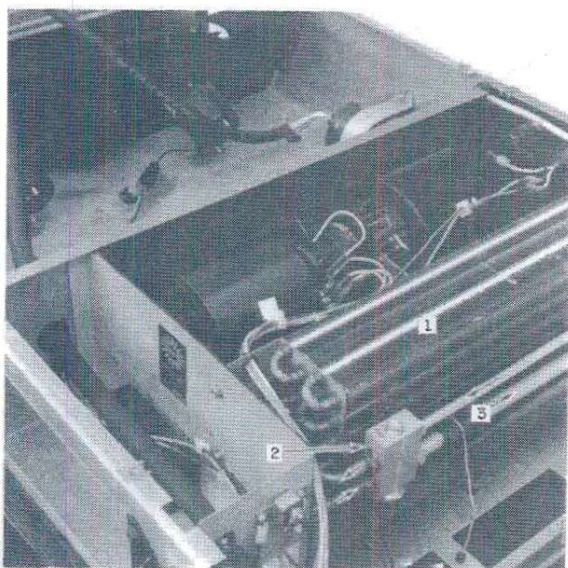


FIGURE 9-18

Air Conditioning Expansion Valve

- 1 Evaporator core
- 2 Expansion valve
- 3 To compressor

EXPANSION VALVE

The expansion valve, Figure 9-18, is located on the pressure line leading from the dehydrator and receiver into the evaporator and performs the following functions:

1. **METERING ACTION** - A metered orifice changes the liquid refrigerant from a high to a low pressure.
2. **MODULATING ACTION** - A thermostatically controlled valve within the expansion valve body controls the volume of liquid refrigerant passing through the orifice and makes sure the refrigerant is fully vaporized within the evaporator. Liquid refrigerant would damage the compressor reed valves or freeze the pistons.
3. **CONTROLLING ACTION** - The valve responds to changes in the cooling requirements. When increased cooling is required, the valve opens to increase the refrigerant flow and when less cooling is

required (or increased compressor volume due to increased engine speed) the valve closes and decreases the refrigerant flow.

EXPANSION VALVE - OPERATION

All of the needed temperature sensing and pressure sensing functions are consolidated into this basic unit and no external tubes are required for these purposes.

The block or "H" type expansion valve gets its name from its construction, Figure 9-19.

There are two refrigerant passages which form the legs of the "H." One passage is in the refrigerant line from the condenser to the evaporator and contains the ball and spring valve. The other passage is in the refrigerant line from the evaporator to the compressor and contains the valve's temperature sensing element.

The thermal element is part of the push-rod mechanism.

Liquid refrigerant flow is controlled by the push-rod forcing the ball off its seat and the valve spring exerting pressure on the ball to keep it on its seat.

During stabilized (vehicle shutdown) conditions, the pressure on the bottom of the expansion valve diaphragm rises above the pressure on the top of the diaphragm allowing the valve spring to close the valve.

When the system is started, the pressure on the bottom of the diaphragm drops rapidly, allowing the valve to open and meter liquid refrigerant to the lower evaporator tubes where it begins to vaporize.

The compressor suction draws the vaporized refrigerant out of the top of the evaporator at the top tube where it passes the temperature sensor.

Pressure in the temperature sensor drops when cooled and the expansion valve starts to close. Its pressure rises with evaporator superheat and opens the expansion valve, allowing more refrigerant to flow.

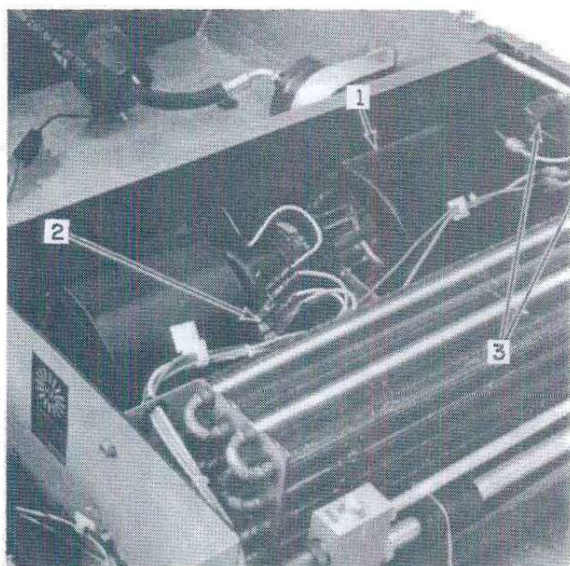


FIGURE 9-39

Blower Assembly Removal

- 1 Blower assembly
- 2 Electrical connections
- 3 High/low switches

Installation

1. Install switch onto the line fittings and tighten.
2. Connect the wires from the switches according to the wire schematic in the air conditioning electrical section.

Blower Motor and Fan Assembly**Removal**

NOTE: Remove the evaporator cover if it has not been removed prior to this operation.

1. Disconnect the wires for the fan motor and the wire to the high/low switches.
2. Remove the 4 attaching screws and lift the blower assembly from the air conditioning unit, Figure 9-39.
3. Remove the fan rotor, Figure 9-40.
4. Remove motor through fan housing.

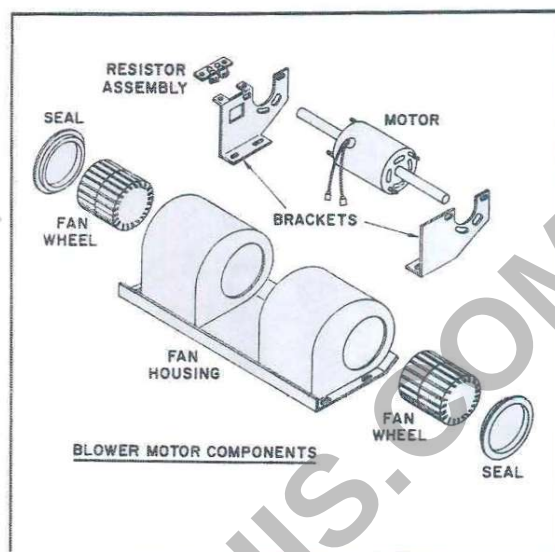


FIGURE 9-40

Inspection and Repair

1. Clean the fan blades and housing with a damp cloth.
2. Inspect the fan blades for damage. If they are bent, the blades can be straightened, but must be replaced if broken.
3. Check the fan drive shaft to be sure they are straight and free to rotate.

Installation

1. Install the fan motor and secure the mounting.
2. Secure the fan rotors to the shaft.
3. Install the end covers.
4. Install the blower assembly into position in the air conditioning unit.
5. Connect the fan motor wire using the wiring diagram in the air conditioning electrical Section. Also connect the wire to the high and low cut-out switches.

BACKHOE REMOVAL

1. Position the unit on a flat surface where the backhoe will be stored.
2. Lower the stabilizers to the ground and position the backhoe parallel to the center line of the unit, with the dipstick vertical and the bucket on the ground.

NOTE: On sideshift units, make sure the backhoe carriage is positioned in the center of the mainframe.

3. Remove the rear window and one end of the boom lock linkage to get the window off, Figure 10-39.
4. Where equipped, remove the extendable dipstick or auxiliary hydraulics pedal by removing the pedal pivot bracket bolts underneath the cab or platform. Disconnect the linkage at the pedal.
5. Remove the rear floor mat.
6. Remove the lower window support, Figure 10-39.
7. Remove the access panels between the cab floor and backhoe deck.

On sideshift units disconnect the wiring to the rear lights, attaching to the backhoe mainframe and remove any clips securing the harness to the rear fenders, cab or platform.

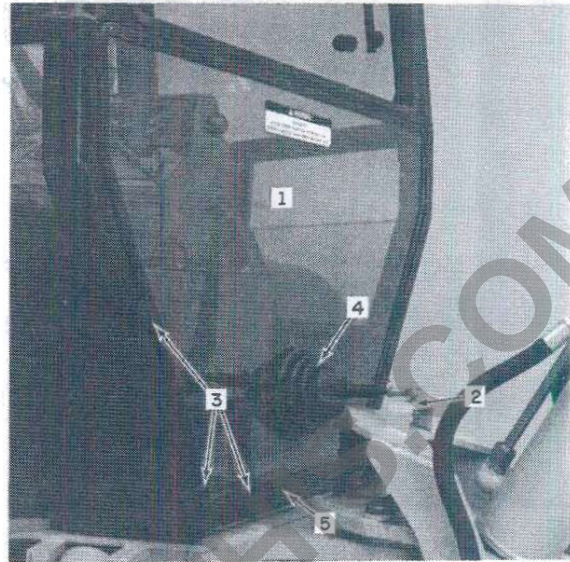


FIGURE 10-39

Backhoe Removal

- 1 Lower rear window
- 2 Boom lock linkage
- 3 Window bolts and clips
- 4 Boom lock linkage boot
- 5 Lower support

This diagram illustrates the exploded view of a vehicle chassis assembly, featuring various components labeled with circled numbers 1 through 27. The components include:

- 1**: A small cylindrical fastener or pin.
- 2**: A bracket or mounting plate.
- 3**: A horizontal plate with multiple circular holes.
- 4**: A small pin or fastener.
- 5**: A small bracket or connector.
- 6**: A small circular washer or spacer.
- 7**: A small rectangular plate or bush.
- 8**: A small circular fastener or pin.
- 9**: A small rectangular plate or bush.
- 10**: A U-bolts assembly.
- 11**: A long, curved metal bracket or arm.
- 12**: A horizontal metal bar or plate.
- 13**: A long, vertical metal bar or plate.
- 14**: A long, curved metal bracket or arm.
- 15**: A small rectangular plate or bush.
- 16**: A long, vertical metal bar or plate.
- 17**: A small circular fastener or pin.
- 18**: A small rectangular plate or bush.
- 19**: A small rectangular plate or bush.
- 20**: A small rectangular plate or bush.
- 21**: A small circular fastener or pin.
- 22**: A small circular fastener or pin.
- 23**: A small rectangular plate or bush.
- 24**: A long, vertical metal bar or plate.
- 25**: A small rectangular plate or bush.
- 26**: A small rectangular plate or bush.
- 27**: A curved metal bracket or arm.

FIGURE 11-37

11-35

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