B. CYLINDER HEAD, VALVES AND RELATED PARTS

The cylinder head can be removed from the engine for service with the engine installed in the tractor.

REMOVAL TW-5

1. Remove the pre-cleaner and fuel tank cap.
2. Unbolt the muffler pipe from the exhaust manifold and remove the muffler, muffler support bracket and muffler pipe from the tractor.
3. Remove the two side panels, three radiator grille panels and hood panel, Figure 1.

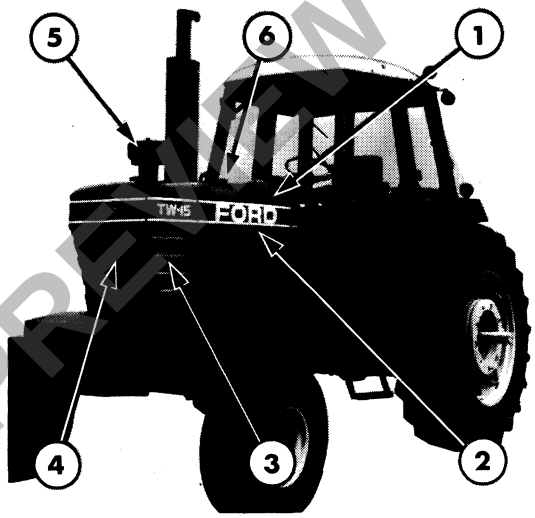


Figure 1
Sheet Metal: TW-5 and TW-15

1. Hood Panel
2. Side Panel
3. Side Panel
4. Front Grille
5. Pre-cleaner
6. Fuel Cap

4. Remove the air intake pipe at the intake manifold to the radiator bracket flange and remove from the tractor.

TW-15

With reference to Figures 5 and 6.

1. Remove the pre-cleaner and the fuel tank cap. Remove the muffler.
2. Remove the two side panels, three radiator grille panels and hood panel, Figure 1.
3. Unbolt and remove the muffler-to-turbocharger tube and remove the heatshield.
4. Remove the air intake pipe from the turbocharger to the radiator support. Remove the intake manifold hose, Figure 3.
5. Remove the turbocharger oil lines and the four bolts attaching the turbocharger to the exhaust manifold. Remove two turbocharger oil cooler bracket bolts. Withdraw the turbocharger and plug all openings to prevent the entry of dirt.

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PART 2
FUEL SYSTEM

Chapter 1
FUEL SYSTEM — GENERAL

Section		Page
A.	DESCRIPTION AND OPERATION	1
B.	AIR CLEANER — OVERHAUL	4
C.	FUEL TANK, FILTERS AND LINES — OVERHAUL	5
D.	ADJUSTMENTS	8

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A. DESCRIPTION AND OPERATION

AIR CLEANER

The air cleaner is a paper element, dry-type air cleaner. The air intake for the air cleaner extends above the top hood panel. The air passes through the pre-cleaner stack to the air cleaner and through the double filter. Any coarse particles are stopped by the filter and are collected in a rubber boot at the bottom of the cleaner, Figure 1. The boot allows dirt to escape through a slot in its bottom. On the TW-25 and TW-35 Tractors, these particles are discharged into the exhaust system.

The air cleaner restriction warning light mounted on the instrument panel monitors the vacuum level in the air cleaner intake hose.

When the air cleaner requires servicing the warning light will glow continuously.

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Figure 2
Electrical System — Tractors with "C" Prefixed Serial Numbers

1. Fuel Tank Selector Switch
2. Head Light Switch
3. Air Cleaner Restriction Switch
4. Coolant Temperature Sender Switch
5. Implement Lamp Ground-Wire
6. Implement Lamp
7. Alternator
8. Oil Pressure Sender Switch
9. Fuse Link
10. Starter Motor
11. 12 Volt Battery
12. Front Main Harness
13. Alternator Regulator
14. Dual Power Switch
15. Rear Main Harness
16. To Cab Roof Harness
17. Front Main Harness
18. Flasher Light
19. Tail Light
20. Main Extension Harness
21. Main Extension Harness
22. L.H. Fender Harness
23. Main Extension Harness
24. R.H. Fender Harness
25. R.H. Flasher Warning Lamp
26. Work Light
27. Implement Lamps
28. Tail Light
29. Head Light
30. L.H. Flasher Warning Lamp
31. Safety Start Switch
32. Rear Main Harness Ground
33. Main Extension Harness
34. Flasher Assembly
35. To Cab Roof Harness
36. Cab Relay
37. To Instrument Panel
38. Rear Main Harness
39. To Ignition Switch
40. Fusebox
41. Light Switch Wires
42. Rear Main Connectors
43. Rear Main Harness Ground
44. Main Extension Harness
45. Flasher Assembly
46. To Instrument Panel
47. Rear Main Harness
48. To Ignition Switch
49. Fusebox
50. Light Switch Wires
51. Rear Main Connectors
52. Safety Start Switch

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WIRING DIAGRAMS

FORD TW-25, TW-35
WITH CAB/WITH ELECTRONIC INSTRUMENT PANEL

The wiring harnesses are shown individually. Figure 1 indicates the approximate harness and connector locations.

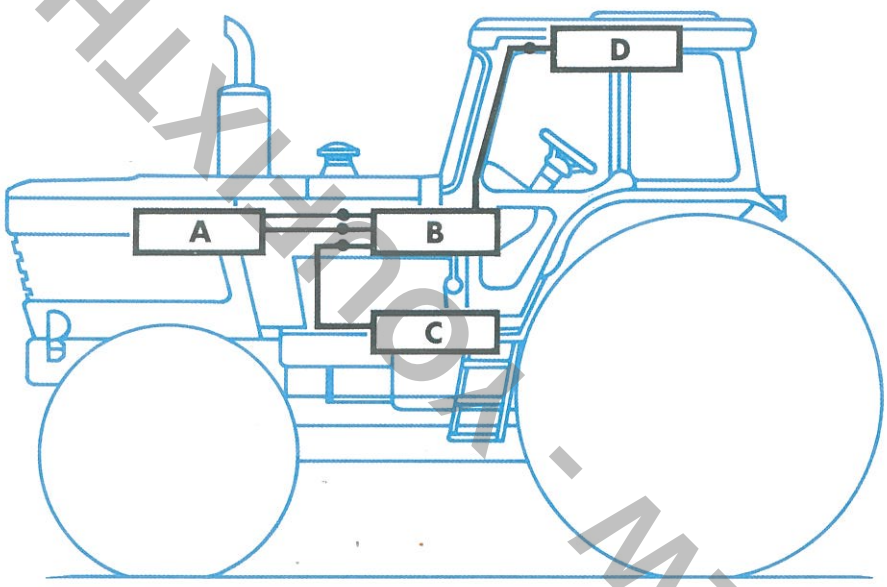


Figure 1

A. Main Front Harness
B. Main Rear Harness
C. Extension Harness
D. Cab Roof Harness

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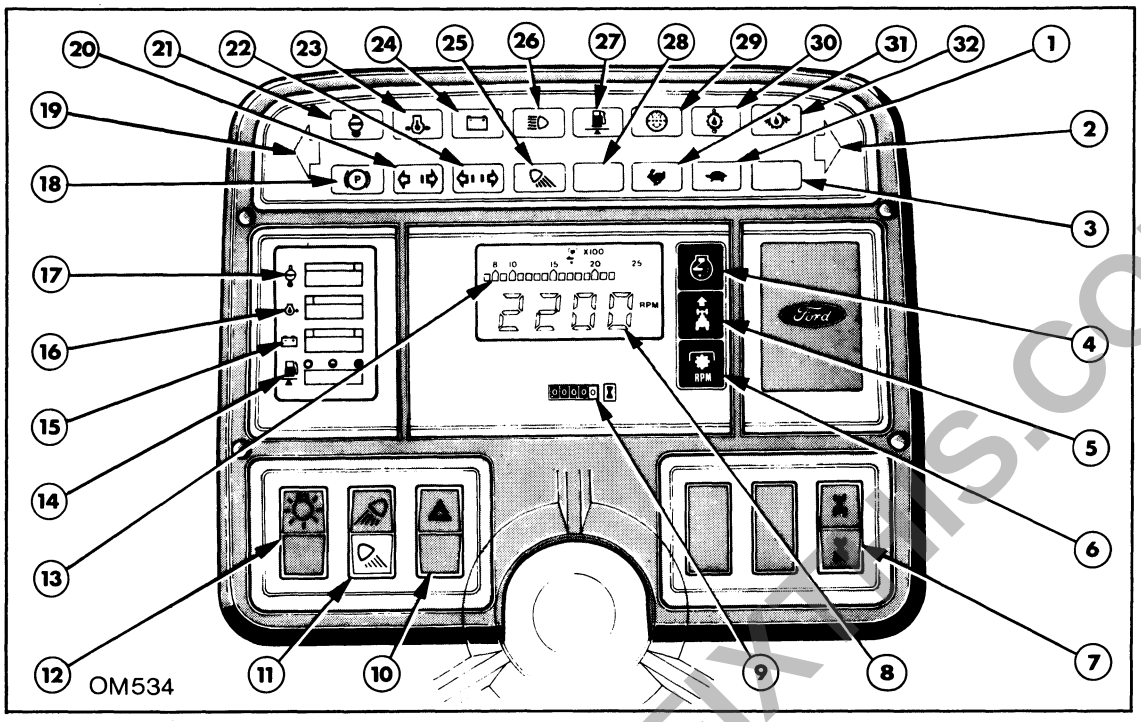


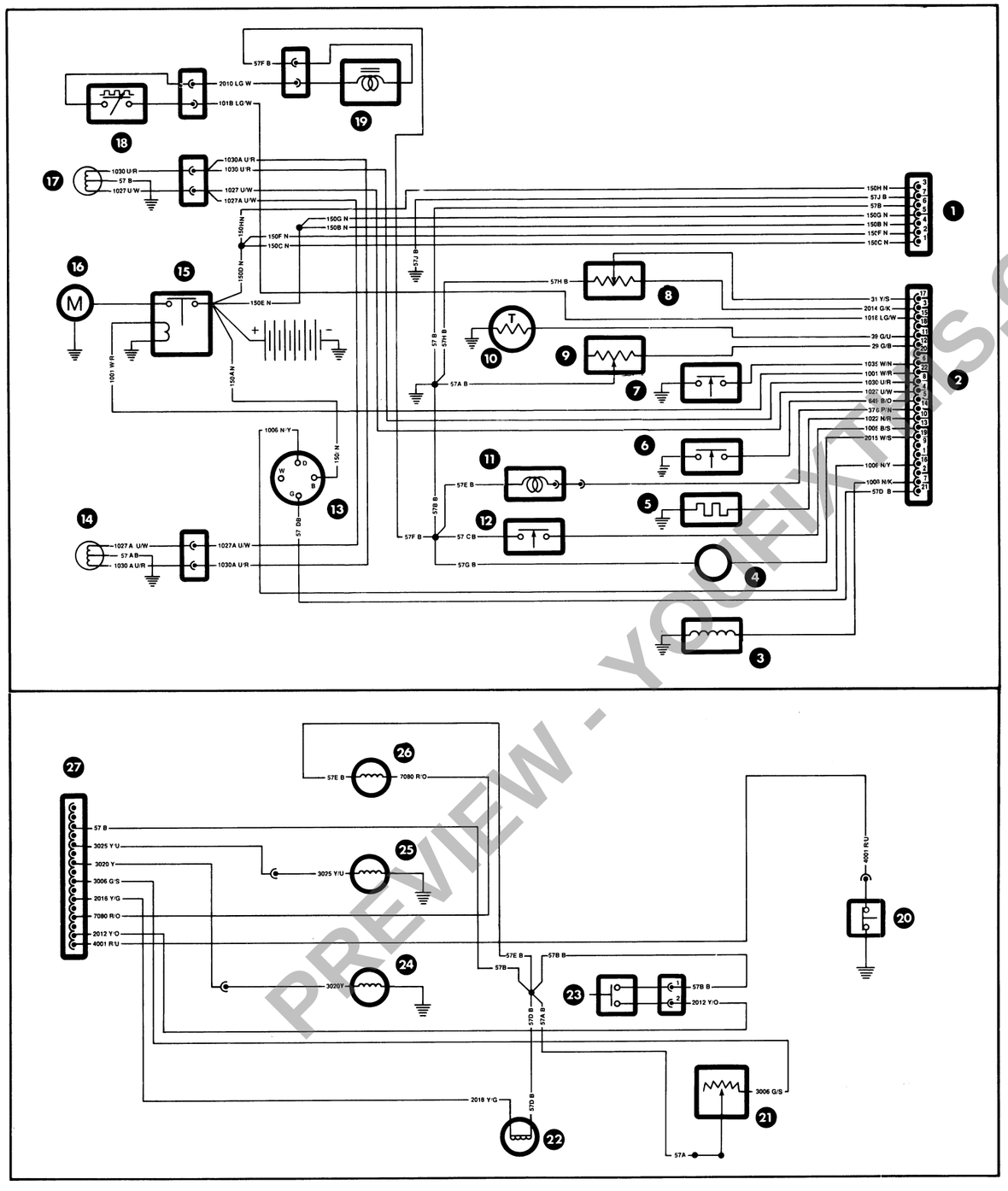
Figure 1
Electronic Instrument Panel

1. Warning Light: Dual Power Engaged
2. Warning Light: Direction Indicator RH
3. Warning Lamp: Not Utilised
4. Selector Switch: Engine Speed Display
5. Selector Switch: Ground Speed Display
6. Selector Switch: PTO Speed Display
7. Switch: Front Wheel Drive
8. Central Digital Display
9. Hourmeter
10. Switch: Hazard Warning
11. Switch: Worklamps
12. Switch: Tractor Lights
13. Bargraph Display: Engine Speed
14. Bargraph Display: Fuel Level
15. Bargraph Display: Battery Condition
16. Bargraph Display: Engine Oil Pressure
17. Bargraph Display: Engine Coolant Temperature
18. Warning Light: Parking Brake
19. Warning Light: Direction Indicator LH
20. Warning Light: Trailer 1 Indicators
21. Warning Light: Engine Coolant Temperature
22. Warning Light: Trailer 2 Indicators
23. Warning Light: Engine Oil Pressure
24. Warning Light: Charging Circuit Failure
25. Warning Light: Worklamps Illuminated
26. Warning Light: Headlight Main Beam
27. Warning Light: Low Fuel Level
28. Warning Light: Not Utilised
29. Warning Light: Air Cleaner Restriction
30. Warning Light: Transmission Oil Temperature
31. Warning Light: Direct Drive Engaged
32. Warning Light: Transmission Oil Pressure

Four rocker switches at the bottom of the panel control the headlamps, worklamps, hazard warning lights and front wheel drive engagement.

An electro-mechanical hour meter beneath the L.C.D. displays true time when the engine is running. The L.C.D. display is illuminated when the tractor lights are switched on.

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A. ENGINE HARNESS (MAIN FRONT HARNESS)

1. Bulkhead Connector (7 pin) Connects into Instrument Console Harness Connector Item 36
2. Bulkhead Connector (22 pin) Connects into Instrument Console Harness Connector Item 37
3. Ether Solenoid (where fitted)
4. Tachometer Sensor
5. Thermostart (where fitted)
6. Engine Coolant Temperature Switch
7. Engine Oil Pressure Switch
8. Engine Oil Pressure Sender
9. Fuel Level Sender
10. Engine Coolant Temperature Sender
11. Horn
12. Air Cleaner Restriction Switch
13. Alternator
14. Left Hand Headlight
15. Starting Motor Solenoid
16. Starting Motor
17. Right Hand Headlight
18. Air–Conditioning Pressure Switch
19. Clutch Air–Conditioning Compressor

B. EXTENSION HARNESS

20. Transmission Oil Temperature Switch
21. Auxiliary Fuel Level Sender
22. Axle Speed Sensor
23. Transmission Oil Pressure Switch
24. Dual Power Solenoid (16 x 4 Transmission)
25. Four Wheel Drive Solenoid
26. Differential Lock Solenoid
27. Bulkhead Connector (16 pin) Connects into Instrument Console Harness Connector Item 34

WIRING COLOUR CODES					
B	–	Black	P	–	Purple
G	–	Green	R	–	Red
K	–	Pink	S	–	Grey
LG	–	Light Green	TQ	–	Turquoise
LN	–	Light Brown	U	–	Blue
N	–	Brown	W	–	White
O	–	Orange	Y	–	Yellow

NOTE: *Where a wire is colour coded with 3 colours the black colour is applied to the wire insulation as a spiral stripe.*

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4. Check the control rod and turnbuckle for correct assembly by measuring the length of the exposed threads at each end of the turnbuckle. If the difference between the lengths of the exposed threads of each clevis end exceeds 0.1 in (2.5 mm) then the clutch control rod and turnbuckle should be correctly re-assembled as follows:

   (i) Disconnect the control rod upper clevis from the clutch pedal shank.

   (ii) Loosen the turnbuckle locknut until it bottoms on the lower clevis end threads.

   (iii) Adjust the turnbuckle so that when the locknut is retightened against the turnbuckle, the exposed threads on each clevis are of equal length to within 0.1 in (2.5 mm).

   (iv) Reconnect the control rod upper clevis to the clutch pedal shank.

5. Loosen the locknut and adjust the turnbuckle until the clutch pedal free travel is as specified, see Page 3, 'Specifications' — Chapter 3.

6. Tighten the locknut to the specified torque, see Page 3, 'Specifications' — Chapter 3.

C. CLUTCHES — OVERHAUL

The overhaul and adjustment procedure for the 13 in (330 mm) and 14 in (355 mm) clutch differ. The TW-5 procedure is under but for the TW-15, TW-25 and TW-35 procedure refer to Page 12.

TW-5 CLUTCH OVERHAUL

REMOVAL

With reference to Figure 2.

1. Separate the tractor between the engine and the front transmission, see "SEPARATING THE TRACTOR" — Part 12.

2. Before removing the clutch assembly mark the clutch cover at one flywheel dowel hole and mark the mating dowel. (The dowels are of different diameters).

3. Withdraw the bolts securing the clutch pressure plate and cover assembly to the flywheel and remove the pressure plate assembly together with the clutch disc.

IMPORTANT: *The bolts must be slackened evenly and diagonally across the clutch to prevent distortion of the cover.*

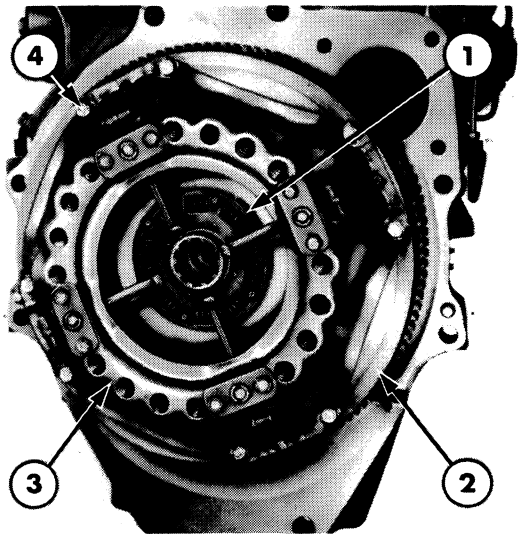


Figure 2
TW-5 Clutch Assembly Installed
1. Clutch Disc
2. Flywheel
3. Clutch Cover
4. Cover-to-Flywheel Bolts

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PART 5
TRANSMISSION SYSTEMS

Chapter 1
SEVEN AND EIGHT SPEED TRANSMISSION

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A.	TRANSMISSION — DESCRIPTION AND OPERATION	1
B.	PARKING BRAKE ACTUATOR, ROD AND LINKAGE ADJUSTMENT	4
C.	GEARSHIFT MECHANISM — OVERHAUL AND ADJUSTMENT	8
D.	GEARSHIFT COVER AND INTERLOCK MECHANISM — OVERHAUL	16
E.	TRANSMISSION REAR END — OVERHAUL	22
F.	TRANSMISSION FRONT END — OVERHAUL	29
G.	EIGHT-SPEED TRANSMISSION — COMPLETE OVERHAUL	32
H.	SEVEN-SPEED TRANSMISSION — COMPLETE OVERHAUL	40

A. TRANSMISSION — DESCRIPTION AND OPERATION

The basic eight-speed transmission for the Ford TW-5, TW-15, TW-25 and TW-35 Tractors is of a constant mesh design and provides eight forward and two reverse speeds.

The speeds are selected by two levers, located forward of the hydraulic control console, which are connected through linkage to the gearshift arm and the high-low shift arm on the right-hand side of the transmission case. The gearshift arm selects four forward and one reverse ratio, whilst the high-low arm provides the high and low range as well as the parking brake. The gear train connections are made through an interlock mechanism and a shift finger to slide the couplings and connectors to engage the gears. See Figure 1. Power flow and gearshift positions are shown in Figure 2.

The Dual Power transmission has a planetary gear set enclosed in a housing and mounted in the forward compartment of the transmission case. The unit transmits power received from the engine through a planetary gear system to the transmission mainshaft. It is hydraulically operated to provide a direct drive or underdrive ratio for each of the eight forward and two reverse gear ratios, thereby providing sixteen forward speeds and four reverse speeds. Refer to 'Dual Power Transmission' — Chapter 2.

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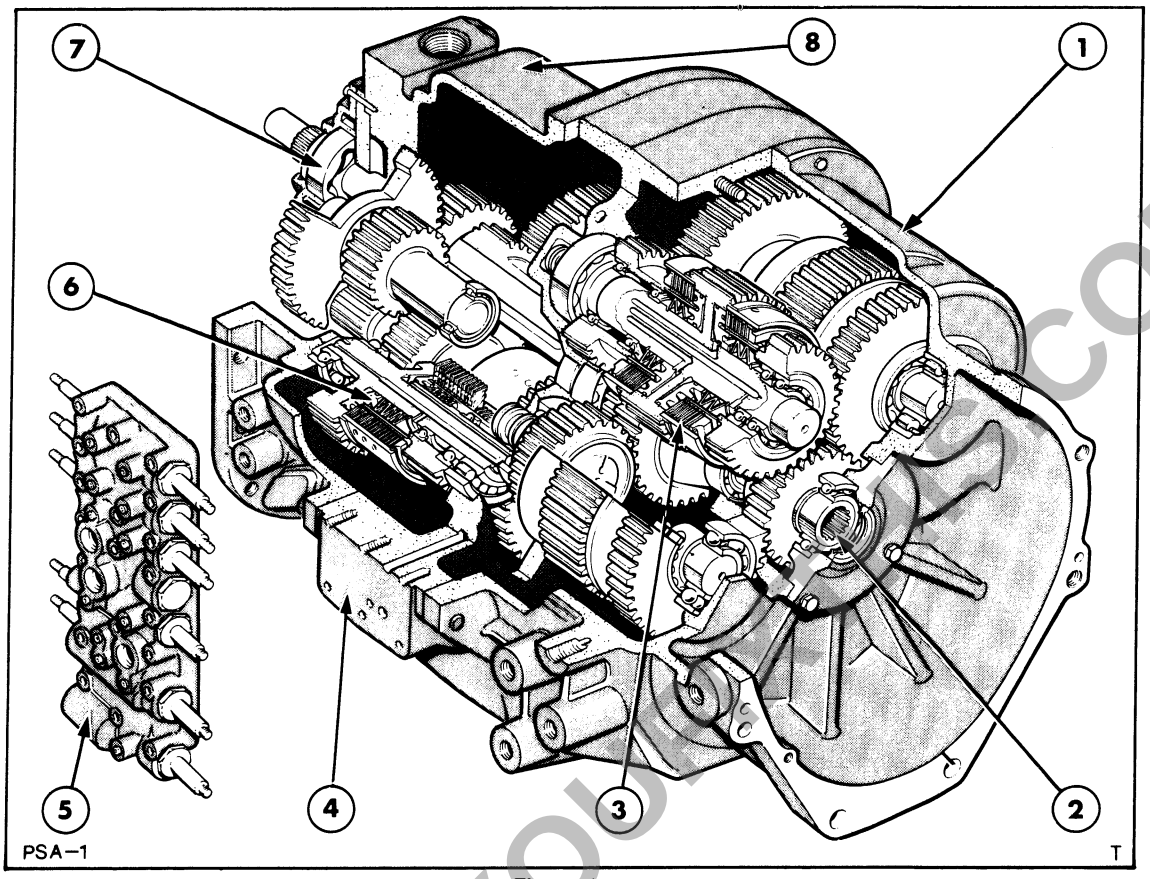


Figure 1
Mechanical Components of the powershift Transmission

1. Front Housing
2. Main Input and Drive Gear
3.. Sectioned Speed Clutch Assembly (one of three paired clutches)
4. Centre Section
5. Hydraulic Control Valve
6. Sectioned Directional Clutch (one of three single clutches)
7. Hydraulic Pump
8. Rear Housing

housing contains the components providing speeds 10 to 18 and reverse speeds. This housing also provides support for the rear bearings of these components.

The transmission housings together with the rear axle centre housing form a common oil reservoir.

Clutches

Nine multi–plate clutches are used in conjunction with twenty two gears. The clutches can be divided into two groups. The first group, consists of six clutches positioned in the transmission front housing; the second group of 3 clutches are positioned in the transmission rear housing.

The first group of clutches are termed "speed" clutches and control the selection of the first nine ratios. The clutches provide the early stages of engine speed reduction. The second group of clutches are termed "directional" clutches and working with the speed clutches, provide a further two stages of engine speed reduction to the required final output level and additionally provide reverse direction.

Illustrated in Figure 2 is a sectional view of a speed clutch assembly. In fact, two speed clutches are shown sharing a common centre shaft. This illustration is representative of all six speed clutches in that they are all paired and share common shafts. The only differences in these three pairs of speed clutches are the centre shaft of one of them and the number of gear teeth and hub shape of the related gears.

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PART 5
TRANSMISSION SYSTEMS
Chapter 8
CREEPER REDUCTION GEARSET

Section		Page
A	DESCRIPTION AND OPERATION	1
B.	OVERHAUL	3

A. DESCRIPTION AND OPERATION

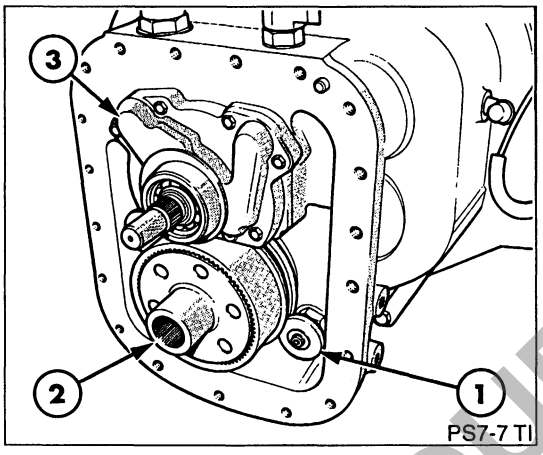


Figure 1
Reduction Gearbox Installed on Rear of Transmission

1. Actuating Piston
2. Creeper Reduction Gearset
3. Transmission Hydraulic Pump

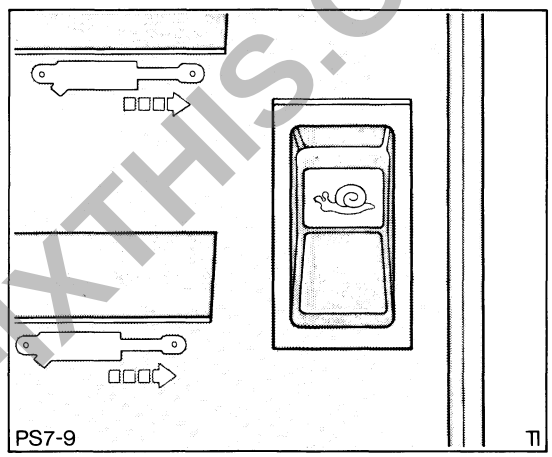


Figure 2
Creeper Switch

8030 Series Tractors installed with the 18 x 9 powershift transmission, can be ordered with an optional 'creeper' two stage planetary reduction gearset.

The reduction gearset is mounted on the output shaft at the rear of the transmission, Figure 1 and when engaged reduces the transmission output speed by a ratio of 10.609:1. This option enables a further 18 forward and 9 reverse gears in a 'creep' mode to be selected.

The creeper gear is engaged using the following procedure:–

1. Ensure tractor is stationary by either depressing inching pedal or moving shift lever to neutral.

2. Depress creeper switch, Figure 2 and wait 5 seconds with the tractor stationary.

NOTE: *When creeper switch is depressed the liquid crystal display will flash* ***'CR'*** *followed by the gear speed selected, eg CR F18. The creeper gear selected by the transmission control module during initial start up is that which relates closest to the ground speed of the same gear in direct drive.*

3. Release inching pedal or move shift lever forward to engage drive.

4. Use shift lever to select other creep speeds.

To Disengage Creep

1. Ensure tractor is stationary.

2. Depress creeper switch.

3. Depress inching pedal for approximately 5 seconds or move shift lever to neutral and leave in neutral with tractor stationary for approximately 5 seconds.

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PART 6
POWER TAKE-OFF

Chapter 1
SERVICING THE INDEPENDENT POWER TAKE-OFF

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A.	I.P.T.O. — DESCRIPTION AND OPERATION	1
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C.	I.P.T.O. CLUTCH — OVERHAUL	8
D.	I.P.T.O. CONTROL VALVE — OVERHAUL	13
E.	I.P.T.O. SHAFTS AND GEARS — OVERHAUL	14
F.	I.P.T.O. CONTROL LEVER ADJUSTMENT	20

A. I.P.T.O. — DESCRIPTION AND OPERATION

The independent power take-off (I.P.T.O.) input shaft is driven by a splined hub attached to the centre of the engine flywheel, Figure 1. The input shaft passes through the centre of the transmission upper shaft to the rear of the transmission.
Splined to the rear end of the input shaft is the I.P.T.O. clutch hub.

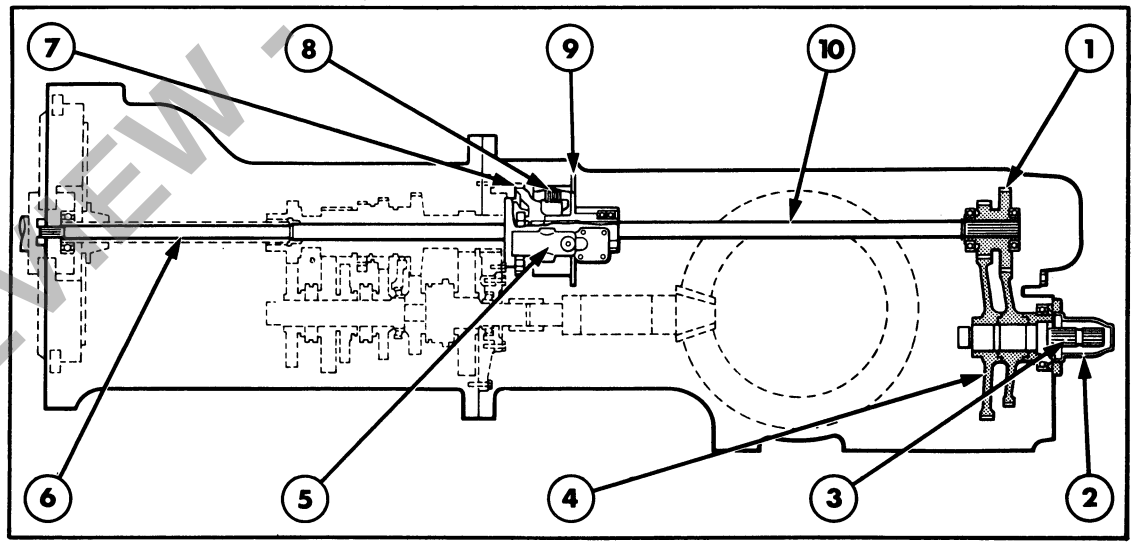


Figure 1
I.P.T.O.Schematic

1. Drive Gears
2. I.P.T.O. Output Shaft Cap
3. I.P.T.O. Output Shaft
4. Driven Gears
5. I.P.T.O. Control Valve Assembly
6. I.P.T.O. Input Shaft
7. Clutch Hub
8. I.P.T.O. Clutch Assembly
9. Brake Disc
10. I.P.T.O. Rear Shaft

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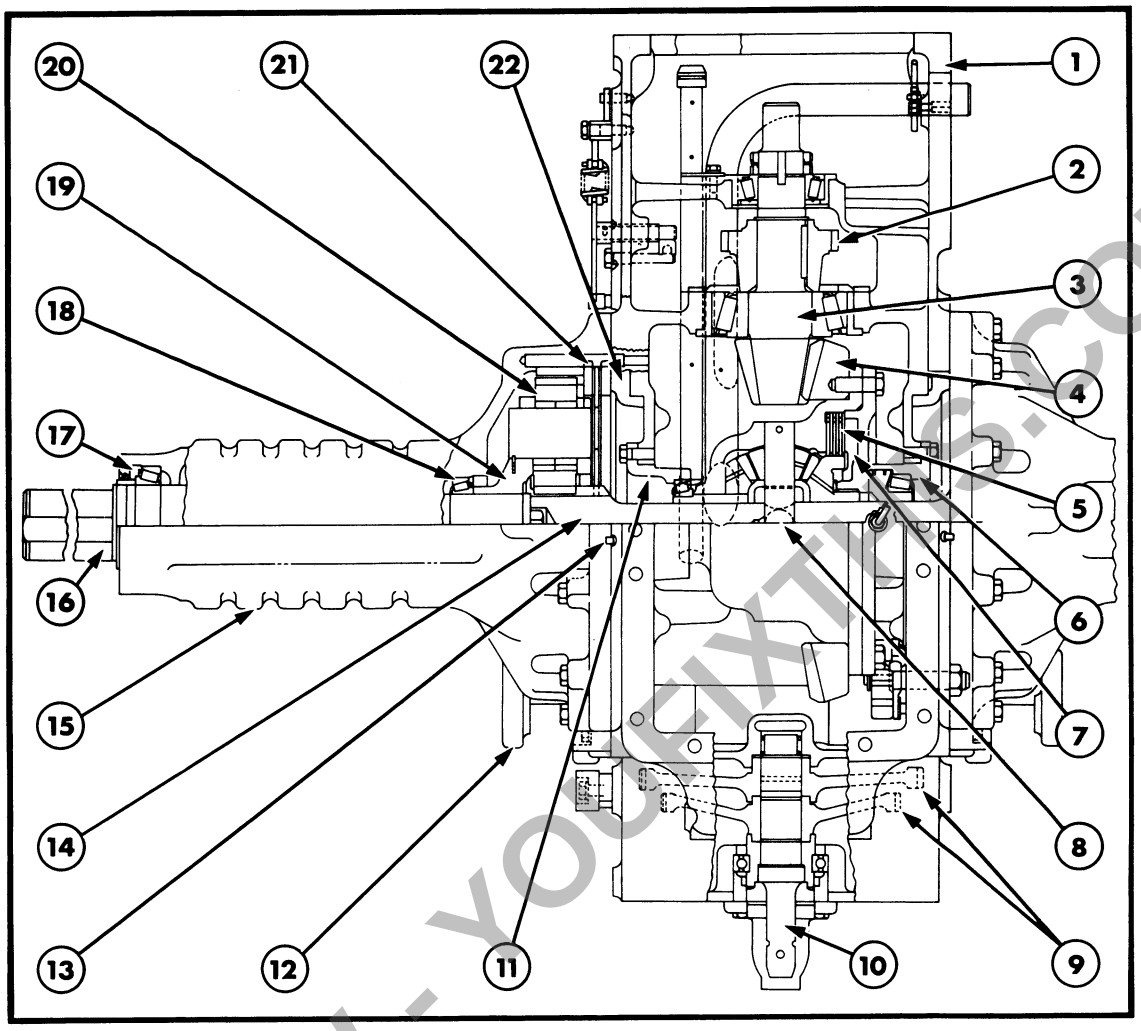


Figure 1
Rear Axle Assembly —
Ford TW-5, TW-15 and TW-25

1. Rear Axle Centre Housing
2. Front Wheel Drive/Handbrake Drive Gear
3. Drive Pinion
4. Ring Gear
5. Differential Lock Plates
6. Right-Hand Differential Support
7. Differential Lock Piston
8. Differential Assembly
9. P.T.O. Driven Gears
10. P.T.O. Output Shaft
11. Left-Hand Differential Support
12. Lower Link Torsion Bar Hanger
13. Brake Bleed Screw
14. Sun Gear
15. Left-Hand Axle Housing
16. Left-Hand Axle Shaft
17. Axle Shaft Outer Bearing
18. Axle Shaft Inner Bearing
19. Planetary Gear Carrier
20. Planet Gear
21. Rear Wheel Brake Assembly
22. Brake Piston

With reference to Figure 1.

The drive from the transmission output shaft is transmitted to the spiral bevel pinion by a drive shaft coupling. The pinion is located in the front of the rear axle centre housing by two pre-loaded, taper roller bearings and meshes with the differential ring gear.

The ring gear is bolted to the differential case and cover assembly which is supported between taper roller bearings mounted in supports bolted to the centre housing.

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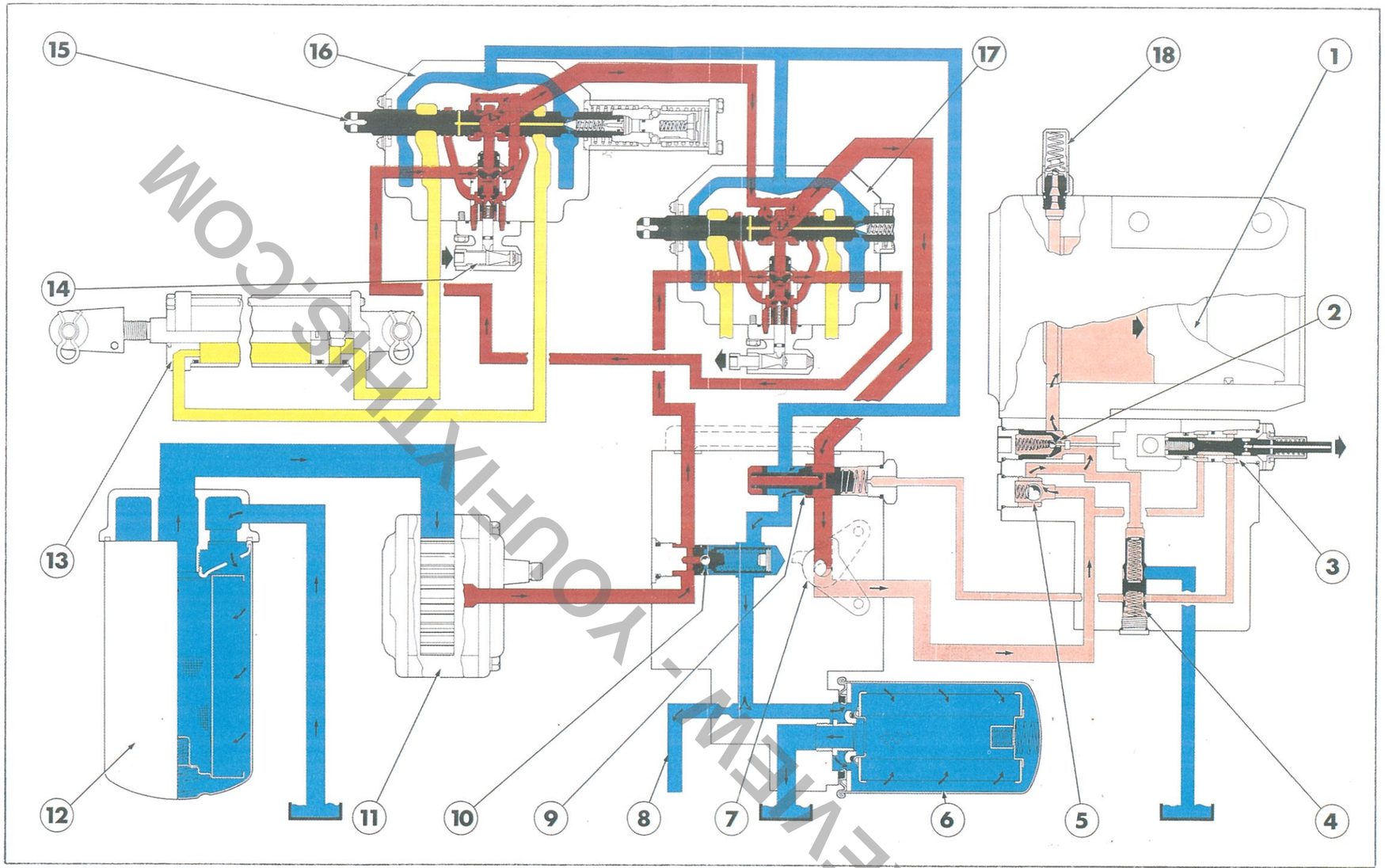


Figure 2

Hydraulic System Oil Flow — Raising

Supply Pressure Oil

Reduced Pressure and Pilot Pressure Oil

Reservoir Suction and Exhaust Oil

Trapped Oil

1. Lift Piston
2. Drop Valve
3. Control Valve
4. Exhaust Valve
5. Check Valve
6. Return Filter
7. Variable Flow Valve
8. Return to Sump
9. Flow Control Valve
10. System Relief Valve
11. Hydraulic Pump
12. Intake Filter
13. Remote Cylinder
14. Flow Valve in Minimum Flow Setting
15. Remote Control Valve Spool
16. Remote Control Valve
17. Remote Control Valve
18. Lift Cylinder Safety Valve

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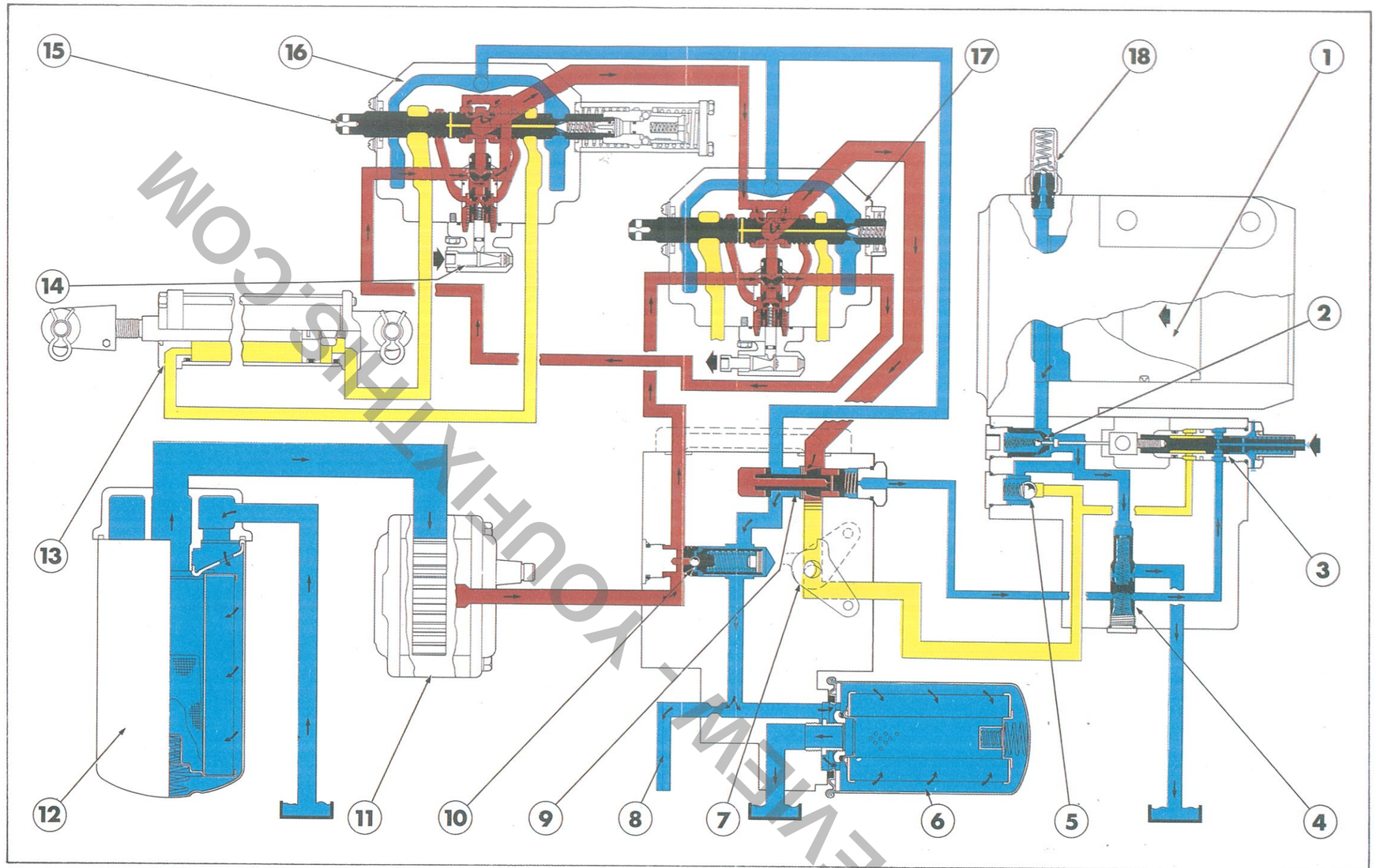


Figure 3

Hydraulic System Oil Flow — Lowering

Supply Pressure Oil

Reservoir, Suction and Exhaust Oil

Trapped Oil

1. Lift Piston
2. Drop Valve
3. Control Valve
4. Exhaust Valve
5. Check Valve
6. Return Filter
7. Variable Flow Valve
8. Return to Sump
9. Flow Control Valve
10. System Relief Valve
11. Hydraulic Pump
12. Intake Filter
13. Remote Cylinder
14. Flow Valve in Minimum Flow Setting
15. Remote Control Valve Spool
16. Remote Control Valve
17. Remote Control Valve
18. Lift Cylinder Safety Valve

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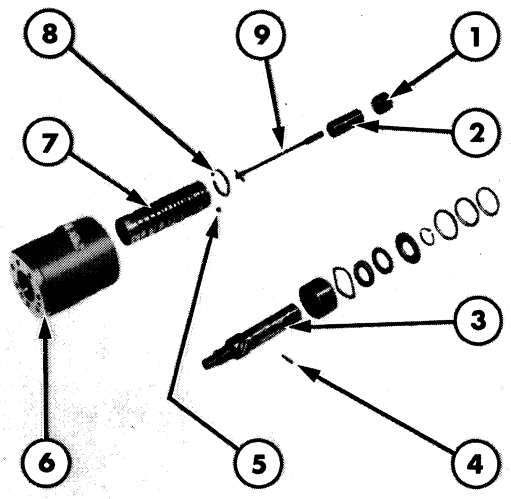


Figure 1
Steering Motor Control Valve Section

1. Drive Ring
2. Spacer
3. Input Shaft
4. Pin
5. Actuating Ball
6. Valve Housing
7. Spool
8. Retainer Spring
9. Torsion Bar

STEERING MOTOR CONTROL VALVE SECTION

With reference to Figure 1.

The control valve section directs the hydraulic oil to and from the metering unit, to and from the front steering cylinder and also regulates the pressure of the oil flowing to the front steering cylinder. The lower end of the input shaft is bored to receive the top of the torsion bar. The torsion bar is pinned to the input shaft, extends through the spool and is linked with the drive link in the metering system.

The drive link is splined to, and turns the rotor of, the rotor and stator assembly. The torsion bar is the principal link between the input shaft and the metering system in the power steering mode of operation.

The lower end of the input shaft is splined to engage the drive ring. The drive ring is externally splined to engage and drive the spool. The drive ring splines are wider than those on the input shaft to allow a pre-determined amount of free-play. This design provides a mechanical link between the shaft and spool for manual steering in the event of pump failure and limits the amount of twist on the torsion bar.

A helical groove is machined in the side of the input shaft and the actuating ball is held captive between the helical groove and a pocket inside the spool.

When the steering wheel is turned the torsion bar twists and moves the spool up or down to uncover oil ports leading to the metering system.

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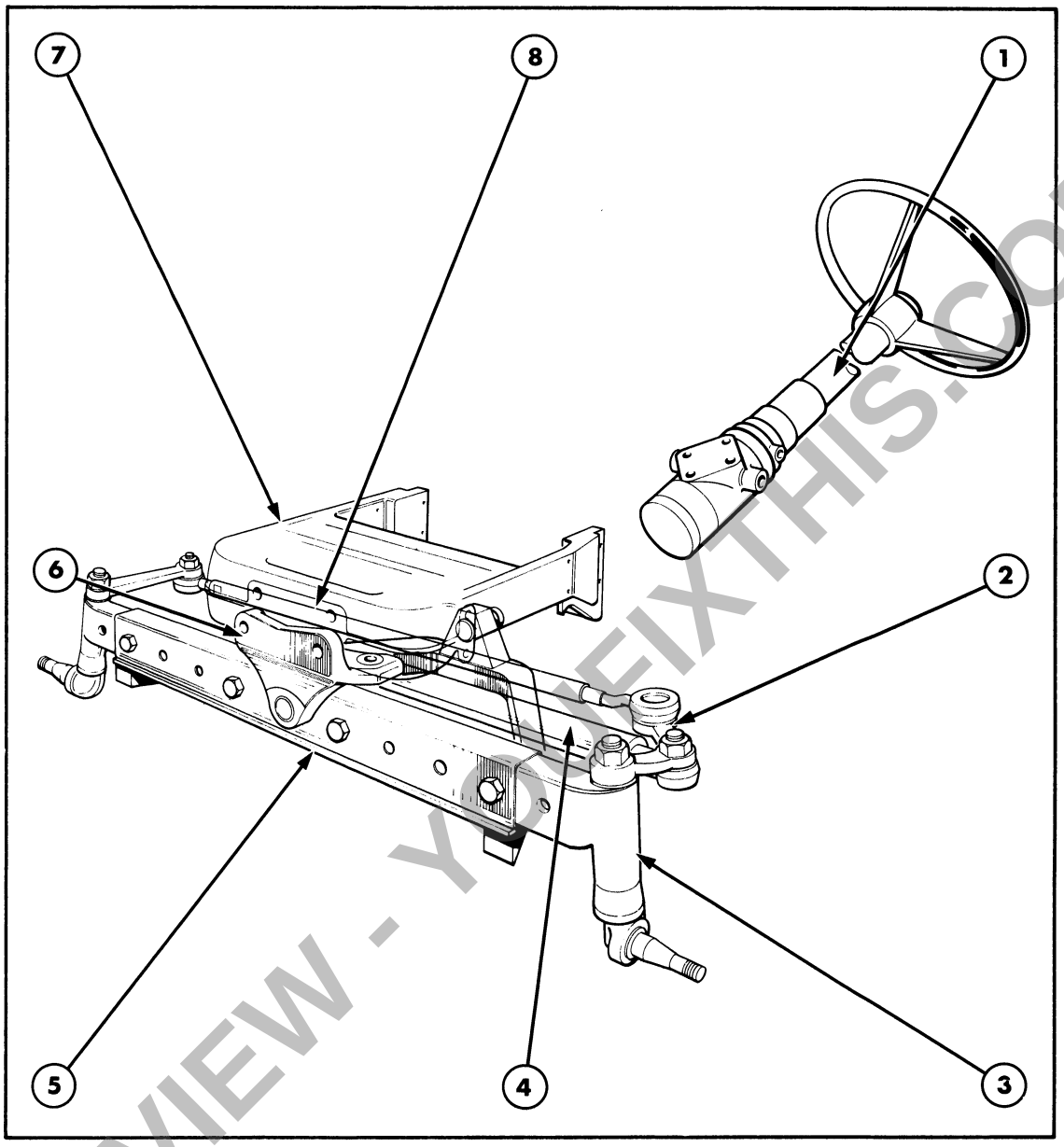


Figure 1
Front Axle Assembly

1. Hydrostatic Steering Motor
2. Left-Hand Steering Spindle Arm
3. Left-Hand Outer Axle Section
4. Steering Power Cylinder
5. Centre Axle Assembly
6. Front Support Pin Bracket
7. Front Axle Support Housing
8. Track Rod

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The front wheel drive axle is attached to the front of the tractor on pivot pins which permit articulation of the axle when traversing rough terrain.

The axle differential is driven from the transfer box assembly, mounted beneath the rear axle centre housing, via the driveshaft connected to the transfer box output shaft and front axle differential pinion.

Both types of axle contain a centrally located limited slip differential. On APL 355 Axles the differential is mounted directly in the cast steel axle housings.

Two universally jointed shafts transmit the drive from the differential to the axle hubs and front wheels.

It should be noted that some axles of the APL 355 type feature an 8 bolt hub to wheel fixing as opposed to the more usual 10 bolt fixing.

On APL 365 Axles the differential is housed in a differential carrier which is in turn mounted in the centre of the axle assembly.

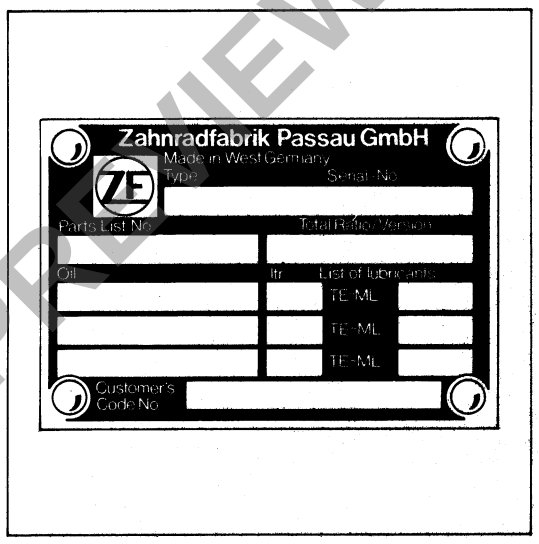


Figure 1
Axle Identification Plate

Each axle hub contains a planetary reduction gear set. On APL 355 axles a 4 planetary reduction gear set is used and on APL 365 axles a 3 planetary reduction gear set is utilised.

The ring gear on both axle designs is locked to the hub support/swivel casing by a spline and retained in position by a single central nut. Each hub assembly is then mounted on the axle by a pair of swivel pins.

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PART 11
FORD TRACTOR SAFETY CABS AND PLATFORMS

Chapter 1
FORD TRACTOR SAFETY CABS AND PLATFORMS PRIOR TO NOVEMBER 1985 – DESCRIPTION AND SERVICEABILTIY

Section		Page
A.	FORD TRACTOR SAFETY CABS AND PLATFORMS – DESCRIPTION	1
B.	FORD TRACTOR SAFETY CABS AND PLATFORMS – SERVICEABILITY	2

A. FORD TRACTOR SAFETY CABS AND PLATFORMS – DESCRIPTION

The Ford Tractor Safety Cabs, Figure 1, are of all steel monocoque construction with an integral 6-post roll over protective structure. The flat deck cab features a flat platform positioned above the transmission housings.

The cabs are isolated from the base tractor by four rubber block bushes, of which two are horizontally mounted at the rear and two are vertically mounted at the front. The bushes are designed to absorb vibration thereby decreasing the noise level and improving the ride characteristics.

Various access panels are provided in the floor and steering console area to assist in the servicing of such items as the steering gear, front transmission and external hydraulic components.

The platform, as installed on the less cab tractors, is of an all steel construction with a flat floor area.

The rear section of the platform is raised to accommodate the operator's seat and the fenders are bolted directly to the sides of the platform. The hydrostatic steering and hydraulics control consoles are bolted to the platform assembly.



Figure 1
Ford TW-15 Tractor with Ford Safety Cab

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PART 12
SEPARATING THE TRACTOR

Chapter 1
COMPONENT REMOVAL

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D.	REMOVING THE FRONT TRANSMISSION WITH THE CAB IN SITU	13

A. SEPARATING THE TRACTOR BETWEEN FRONT TRANSMISSION AND REAR AXLE ASSEMBLY

NOTE: *It will be necessary to remove the cab or platform prior to separating the tractor, see "FORD TRACTOR SAFETY CABS AND PLATFORMS" — Part 11.*

1. Disconnect the battery.

2. Drain the oil from the rear axle centre housing. Be prepared to drain approximately 17 Imp. gallons (20 U.S. gallons) (76 litres).

3. Disconnect the interlock, parking brake, high/low shift and gear shift control rods, Figure 1.

4. Withdraw the securing bolts and remove the gear shift support and mechanism assembly from the tractor.

5. Where necessary, to facilitate splitting of the tractor, separate all wiring harness and hydraulic tube connections between the front transmission and rear axle assembly. Separate the air conditioning hoses (where fitted) from the rear axle assembly but do not discharge the system. For tractors with Front Wheel Drive, remove the drive shaft.

6. Remove the auxiliary fuel tank and step assembly.

7. Install either Tractor Splitting Kit, Tool No. MS.2700 or Tractor Splitting Stand, Tool No. 201387, and insert wooden wedges between the support assembly and the front axle to prevent movement.

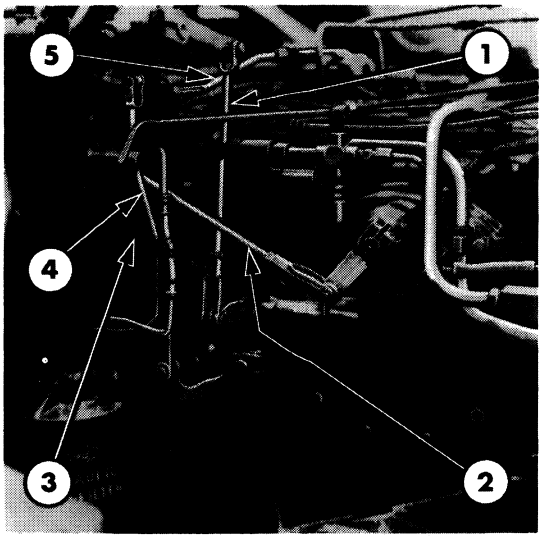


Figure 1
Front and Rear Transmission Linkage
1. Interlock Control Rod
2. Gear Shift Control Rod
3. High/Low Shift Control Rod
4. Gear Shift Mechanism
5. Parking Brake Control Rod

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PART 13
ACCESSORIES AND GENERAL

Chapter 1

AIR CONDITIONING SYSTEMS — TRACTORS PRIOR TO NOVEMBER 1985

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A. AIR CONDITIONING SYSTEMS — DESCRIPTION AND OPERATION

The optional air conditioning system improves the comfort and health of the operator by controlling the temperature, humidity, cleanliness and circulation of the air within the cab.

Heat reduction is effected by circulating the air through a cooling unit called an evaporator. This unit also serves to reduce the moisture content of the air for the wet surface of the evaporator collects dust and pollen particles which drain off with the condensed moisture.

The tractor cab air conditioning system, Figure 1, consist of two heat exchangers and a pump inter-connected by tubing. One heat exchanger (evaporator) is located in the roof of the cab while the second heat exchanger (condenser) is situated in front of the engine coolant radiator.

A special refrigerant, which can be easily heated or cooled, is circulated through the two heat exchangers by the pump (Compressor).

Heat always flows from hot to cold and, based on this fact, the tractor cab is air conditioned in the following manner:

A low temperature refrigerant in the evaporator absorbs heat from the hotter air in the operator's compartment, thereby cooling the air.

The now warmer refrigerant is pumped by the compressor to the condenser.

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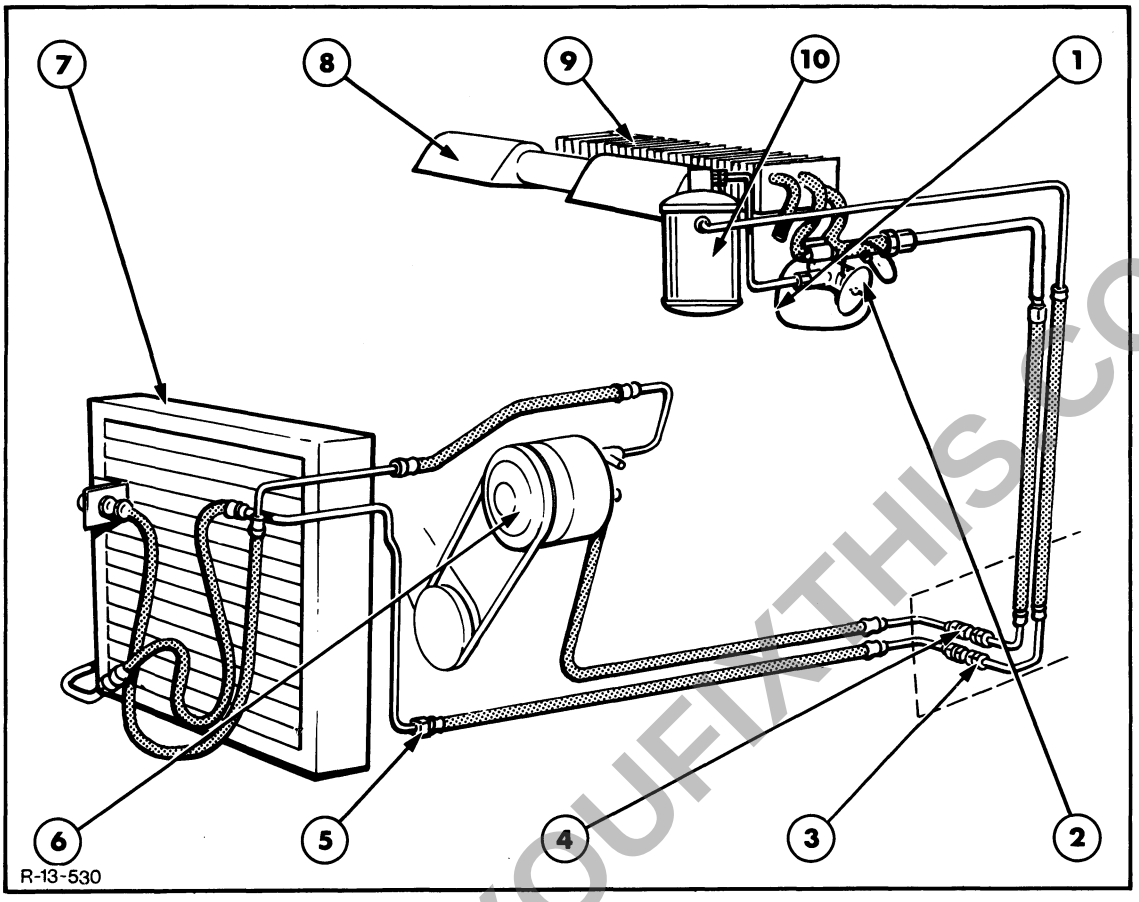


Figure 1
Ford Tractor Air Conditioning System Operation (Schematic)

1. Capillary Tube
2. Expansion Valve
3. Self-Sealing Coupling (High Pressure)
4. Self-Sealing Coupling (Low Pressure)
5. Sight Glass
6. Compressor
7. Condenser
8. Blower Motor and Fan
9. Evaporator
10. Dehydrator and Receiver

The compressor action raises the temperature of the refrigerant above that of the outside air and, through the condenser, the heat of the refrigerant is absorbed by the outside air thereby cooling the refrigerant.

In summary, the tractor air conditioning system serves to create a temperature differential inside the cab so that the heat will move from the warmer air to the cooler refrigerant in the evaporator. Outside the cab, a temperature differential is created to move heat from the warmer refrigerant in the condenser to the cooler outside air.

REFRIGERANT R-12

To achieve the absorption and the release of heat which is, in essence, the function of an air conditioning system, requires the use of a suitable "refrigerant" — a liquid that has a relatively low temperature boiling point, plus certain desirable safety and stability features.

The refrigerant selected for the Ford Tractor cab air conditioning systems is Refrigerant R-12. (Trade names include Freon 12, Arcton 12, Genetron 12 and Freeze 12).

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Chapter 3
INTERCOOLER

Section		Page
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B.	INTERCOOLER OVERHAUL	2
C.	HEAT EXCHANGER SERVICE AND OVERHAUL	8

Chapter 4
COOLING SYSTEM

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Chapter 5
TROUBLE SHOOTING

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Chapter 6
SPECIFICATIONS AND SPECIAL TOOLS

Section		Page
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E. PERFORMANCE MONITOR – SPECIFICATIONS

RADAR FREQUENCY:

U.K. Usage	–	24.3 GHz
U.S.A. Usage	—	24.125 GHz

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STEP	QUESTION AND INSTRUCTION	GO TO STEP IF YES	GO TO STEP IF NO	COMMENTS
E332	There does not appear to be a short or open. If adjusting the Inching Pedal per E328 has not corrected the problem or it is not possible to adjust the pedal, suspect the TCM module.	—	—	
E333	Disconnect the Transmission to Front Console Harness Connector B3/C1. Measure the resistance from Pin 17 to Pin 34 of the TCM Connector D3 (Harness side]. Does it show open circuit?	E335	E334	Test for isolation of the Inching Pedal voltage source wire.
E334	Suspect a short to Earth (probably to chassis Earth) on Wire 7420 between the Transmission to Front Console Connector C1 and the TCM Connector D3.	—	—	
E335	With the Transmission to Front Console Harness Connector B3/C1 still disconnected, measure the resistance from Pin 8 to Pin 34 of the TCM Connector D3 (Harness side). Does it show open circuit?	E337	E336	Test for isolation of the Inching Pedal Position signal wire.
E336	Suspect a short to Earth (Probably to chassis Earth) on Wire 7430 between the Transmission to Front Console Harness Connector C1 and the TCM Connector D3.	—	—	
E337	With the Transmission to Front Console Harness Connector C1 still disconnected and the Speed Control Lever in Neutral, measure the resistance from Pin 31 to Pin 34 of the TCM Connector D3 (Harness side). Does it show open circuit?	E339	E338	
E338	A short exists on the Inching Pedal potentiometer Earth line to Power Earth. Suspect Wires 7570 B, 7570A B, 7570C B, 7570B B, and 7570D B.	—	—	

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RE-ASSEMBLY

1. Insert a new drive shaft seal in the pump flange and replace the circlip.

2. Install the pressure relief and flow control valves. Tighten the valve plugs to the specified torque, see Page 3, 'Specifications' — Chapter 2.

3. Assemble the gear set and the bearing assemblies and insert them in the pump body.

4. Replace the inner and outer seals. Assemble the pump flange on the drive shaft and replace the Woodruff key.

5. Replace the cover and pump bolt seals and install the pump cover with the four through bolts. Tighten the through bolts to the correct torque, see Page 3, 'Specifications' — Chapter 2.

6. At the drive end, install the drive gear, tab washer and nut. Tighten the nut to the correct torque, see Page 3, 'Specifications' — Chapter 2.

7. Bend the tab on the lockwasher to lock the nut.

8. Install the filter, O-ring, reservoir, washer and reservoir bolt. Tighten the bolt until it engages the washer, then turn it an additional ¾ to 1 turn.

INSTALLATION

1. Install the pump assembly in place and secure with the two bolts. Tighten the bolts to the correct torque, see Page 3, 'Specifications' — Chapter 2.

2. Attach the pressure and return hoses.

3. Install the engine oil cooler line.

4. Fill the reservoir with the correct grade of power steering oil, see Page 2, 'Specifications' — Chapter 2. Start the engine and let it idle.

5. Add oil to the reservoir as required. Do not let the oil level drop below the pump outlet.

6. With one finger on a spoke of the steering wheel, spin the wheel rapidly to bleed the air in the steering cylinders and lines.

7. As soon as the steering motor valve spool is actuated, oil must be added to the reservoir to replenish the oil flowing into the circuit.

8. Rotate the steering wheel to keep the valve spool actuated. Do this until the front wheels have reached the stop in one direction, then quickly reverse the steering wheel rotation to actuate the valve spool in the opposite direction.

9. Keep rotating the steering wheel left and right (from stop to stop) to bleed out the air, replenishing the oil as necessary.

10. The air will bleed out only at the reservoir, therefore, the oil must be circulated in both directions repeatedly until the air has bled out. (The oil in the lines to the power cylinder reaches a 'dead end' at the piston. The oil in the cylinder does not flow in a circuit. As the piston moves back and forth, the oil moves back and forth in the lines. therefore, air in these lines and the cylinder may be slow in moving into the steering motor control valve and to the reservoir).

    Do not operate the vehicle until all the air is bled from the hydraulic steering system.

11. When the oil in the reservoir is clean (not cloudy or creamy), the system is free of air. (A slight creep or drift of the steering wheel is normal).

12. Add oil to the recommended level in the reservoir and assemble the reservoir cover.

13. Check for leaks.

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