



# 2120 Tractor



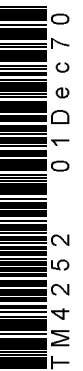
JOHN DEERE

## TECHNICAL MANUAL 2120 Tractor

TM4252 (01Dec70) English

**John Deere Werke Mannheim**  
**TM4252 (01Dec70)**

LITHO IN U.S.A.  
ENGLISH



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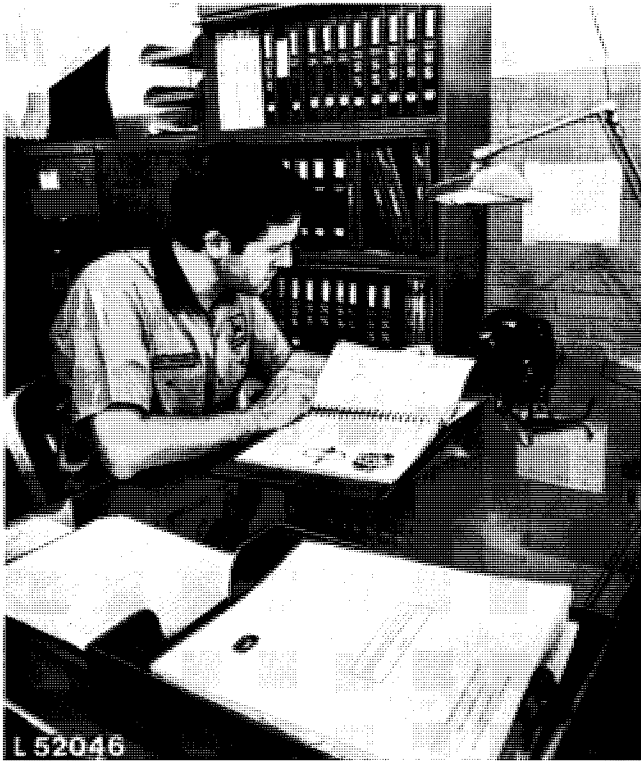
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## INTRODUCTION



L 52046

*Use FOS Manuals for Reference*

This technical manual is part of a twin concept of service:

- FOS Manuals – for reference
- Technical Manuals – for actual service

The two kinds of manuals work as a team to give you both the general background and technical details of shop service.

*Fundamentals of Service (FOS) Manuals cover basic theory of operation, fundamentals of trouble shooting, general maintenance, and basic types of failures and their causes. FOS Manuals are for training new men and for reference by experienced men.*

*Technical Manuals are concise service guides for a specific machine. Technical Manuals are on-the-job guides containing only the vital information needed by a journeyman mechanic.*



When a serviceman should refer to a FOS Manual for more information, a FOS symbol like the one at the left is used in the TM to identify the reference.



L 42047

*Use Technical Manuals for Actual Service*

Some features of this technical manual:

- *Table of contents at front of whole Manual.*
- *Contents at front of each Section*
- *Specifications at end of each Group*
- *Special tools at end of each Group*

This technical manual was planned and written for you – a journeyman mechanic. Keep it in a permanent binder in the shop where it is handy. Refer to it whenever in doubt about correct service procedures or specifications.

Using the technical manual as a guide will reduce error and costly delay. It will also assure you the best in finished service work.

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# Section 10

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# Group 5

## SPECIFICATIONS

### SERIAL NUMBERS

The engine serial number is stamped into the name plate at the lower right of the front cylinder block.

*NOTE: If ordering engine parts, indicate all digits of the serial number on the name plate.*

The name plate showing the tractor serial number is located on the right-hand side of the front support.

*NOTE: If ordering tractor parts, (excluding engine parts), indicate all digits of the serial number on the name plate.*

### MODEL NUMBERS

The injection pump, injection nozzles, the generator (alternator), starter and the main hydraulic pump have model numbers to facilitate identification of different makes of a given unit.

### SPECIFICATIONS

#### ENGINE

Number of cylinder	4
Cylinder liner bore	4.02 in. (102 mm)
Stroke	4.33 in. (110 mm)
Displacement	219 cu.in. (3590 cm <sup>2</sup> )
Compression ratio	16.7 : 1
Maximum torque at 1500 rpm	170 ft.lbs. (23.5 mkg)
Firing order	1 - 3 - 4 - 2
Valve clearance (engine hot or cold)	
Intake valve	0.014 in. (0.35 mm)
Outlet valve	0.018 in. (0.45 mm)

Fast idle	2650 rpm
Slow idle	650 rpm
Working speed range	1500 to 2500 rpm
Flywheel horsepower <sup>1</sup> at 2500 rpm	
Net	67 HP (68 PS)
Gross <sup>2</sup>	71 HP (72 PS)
PTO horsepower <sup>3</sup> (at 2500 rpm engine speed and 650 or 1210 rpm powershaft speed)	60 HP (61 PS)

#### ENGINE CLUTCH

Dual dry disk clutch, foot operated.

Single dry disk clutch with torsion damper (isolator), foot-operated (on tractors with independent PTO)

#### ELECTRICAL SYSTEM

Batteries	2 x 12 Volts, 55 Ah
Starter	12 Volts, 4 HP (4 PS)
Alternator	12 Volts, 28 A
Generator	12 Volts, 11 A
Battery terminal grounded	negative

1) 1 PS = 1 ch = 0.736 KW; 1 KW = 1.36 PS = 1.36 ch; 1 PS = 0.986 HP; 1 HP = 1.01 PS

2) Less water pump, fan, generator (alternator), air cleaner and muffler.

3) With the engine run in (above 100 hours of operation) and having reached operating temperature (engine and transmission); measured by means of a dynamometer. Permissible variation  $\pm$  5%.

**TRANSMISSION**

Collar shift transmission with helical cut gears.

This transmission is available in three variations:

- 8 speed transmission with parking lock, without independent hand brake;
- 8 speed transmission without parking lock and with independent hand brake;
- 8 speed transmission without parking lock, with blocked 8th gear and independent hand brake.

With this transmission 8 or 7 forward and 4 reverse speeds are available.

**HIGH-LOW SHIFT UNIT**

Hydraulically controlled reduction gear which can be shifted under load, with "wet" multiple disk clutch and "wet" multiple disk brake. Allows reduction of the individual gear speeds by 26%.

**DIFFERENTIAL AND FINAL DRIVES**

Planetary reduction gear and differential with spiral bevel gears.

**DIFFERENTIAL LOCK**

Hand or foot operated; spring-loaded out of engagement.

**POWER SHAFTS**

*Continuous Running Power Shafts*

The power shafts are independent of the transmission if the tractor is equipped with a dual stage engine clutch.

*Independent Power Shafts*

Independent of transmission, can be engaged and disengaged under load.

The independent power shaft is engaged by a hydraulically operated disc clutch. Disengaging the clutch is achieved by operating the hydraulically actuated band type brake.

*Power Shaft Speeds (in rpm)*

Engine Speed in rpm	540 rpm shaft	1000 rpm shaft
650	169	315
2067	538	1000
2075	540	1004
2500	650	1210
2650	689	1283

**HYDRAULIC SYSTEM**

Closed center, constant pressure system; also includes rockshaft, power steering and selective control valves.

*System pressure* . . . . . 2220 to 2280 psi  
 (156 to 160 kg/cm<sup>2</sup>)

*Pump* . . . . . 4 or 8-piston pump driven by the engine

**POWER STEERING**

The steering system is a "closed center" type incorporated by the hydraulic system and supplied with oil by the main hydraulic pump. It is connected to the front wheels by means of a steering linkage.

**MANUAL STEERING**

The manual steering is a recirculating ball bearing, worm and nut type. A number of steel balls between ball nut and steering wheel shaft provide for positive engagement of steering wheel and steering linkage.

**HYDRAULIC BRAKES**

The disk brakes run in an oil bath and are hydraulically controlled.

**HANDBRAKE**

Band-type locking brake acting on differential.

**CAPACITIES**

	Imp. Gals.	US Gals.	Liters
Fuel tank . . . . .	16.25	19.5	73.8
Cooling system . . . . .	2.5	3.0	11.4
Engine crankcase incl. filter . . . . .	1.25	1.5	5.7
Transmission-hydraulic system			
Dry system . . . . .	7.9	9.5	36.0
At service intervals . . . . .	6.5	7.4	28.0
Oil-bath air cleaner . . . . .	0.22	0.26	1.0
Belt pulley . . . . .	0.25	0.30	1.1

**TRAVEL SPEEDS**

See Operator's Manual

**FRONT AND REAR WHEELS**

For tire sizes, treads, inflation pressure and weights see Operator's Manual.

**DIMENSIONS AND WEIGHTS**

See Operator's Manual.

## Group 25

# SEPARATING ASSEMBLIES

### SEPARATING BETWEEN ENGINE AND TRACTOR FRONT END

#### REMOVAL

For safety disconnect ground strap (cable) from battery.

Remove front end weights (if equipped).

Remove radiator and fuel tank caps. Remove radiator side grilles and hood. Install radiator and fuel tank caps.

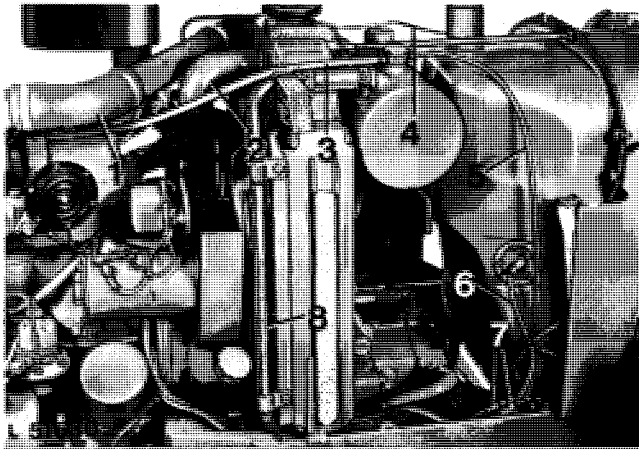


Fig. 1 — Separating between Tractor Front End and Engine

- 1 Air intake hose
- 2 Upper water hose
- 3 Leak-off and vent line
- 4 Fuel return line
- 5 Leak-off and vent line
- 6 Cable of fuel gauge sending unit
- 7 Distributor
- 8 Hydraulic line (on tractors without oil cooler)

Disconnect air intake hose (see 1, fig. 1) at engine intake manifold and air cleaner.

Disconnect leak-off and vent lines 3 and 5 at hydraulic oil reservoir.

Remove support rod at top of radiator. Disconnect fuel return line 4 at fuel tank.

Disconnect headlight wires at distributors 7.

Drain coolant and disconnect upper and lower water hoses at radiator.

*Only on tractors without oil cooler:* Disconnect hydraulic oil line (see 8, fig. 1) at top and bottom hose and remove.

*Only on tractors equipped with oil cooler:* Remove hose elbow between hydraulic oil reservoir and oil cooler at oil cooler end. Disconnect return oil line at bottom of oil cooler.

*NOTE: Plug lines and openings immediately with plugs or caps to prevent loss of oil and entering of dirt into the system.*

Remove screws securing fan shroud to radiator and slide over fan to the rear.

Remove screws securing radiator to front axle support and lift out radiator to the left of tractor.

Close fuel shut-off valve at bottom of fuel tank.

Disconnect fuel inlet line at fuel tank and fuel transfer pump. Remove transfer pump and fuel inlet line.

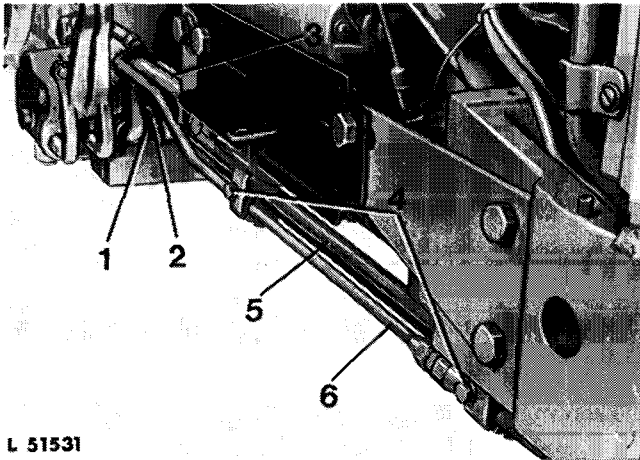


Fig. 2 — Disconnecting Hydraulic Lines

- 1 Retainer
- 2 Cap screw
- 3 Return line to transmission case
- 4 Pipe clamps
- 5 Hydraulic pump inlet line
- 6 Hydraulic pump pressure line

Remove side frames.

Remove pipe clamps (see 4, fig. 2).

Unscrew cap screw 2 and remove retainer 1 which supports the hydraulic pump inlet line 5 and return line 3 of oil cooler (oil reservoir if not equipped with oil cooler).

*On tractors not equipped with HIGH-LOW transmission:* Take care that the check valve installed in hydraulic pump inlet line 5 is not lost when the inlet line is removed.

Disconnect pressure line 6 at connector situated at front of engine.

Disconnect drag link at bell crank.

Remove securing screw of hydraulic pump drive shaft.

Securely support rear of tractor under clutch housing by placing assembly stand 19.58-90.619 under transmission case.

Insert wooden blocks between front axle and front support to prevent the latter from slipping sideways.

Suspend front of tractor to a suitable hoist or support with assembly stand 19.58-90.618.

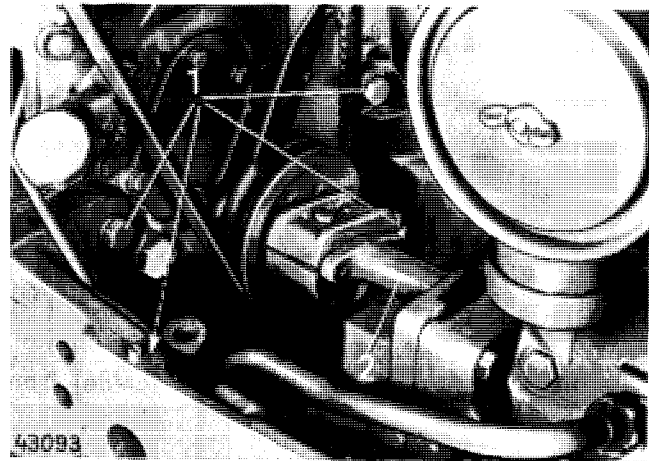


Fig. 3 — Attaching Points of Tractor Front End

- 1 Attaching screws of front axle support
- 2 Hydraulic pump drive shaft

Remove cap screws (see 1, fig. 3) of front support and separate front end from engine. Take measures to prevent front of tractor from tipping forwards. (Drain fuel tank if it contains too much fuel or support front end of tractor).

## INSTALLATION

Make sure woodruff key is installed in shaft of hydraulic pump.

Move front of tractor towards engine.

Engage pump shaft in hydraulic pump drive shaft and at the same time connect return line of oil cooler (reservoir if not equipped with oil cooler). Slide hydraulic pump inlet line into clutch housing and tighten both lines (see fig. 2). Tighten cap screw (see 2, fig. 2) securing retainer 1 to the specified torque.

**CAUTION:** On tractors not equipped with HIGH-LOW transmission: Ensure check valve is inserted in hydraulic pump inlet line before it is installed.

Attach front end of tractor to engine, using cap screws (see 1, fig. 3). Tighten cap screws to specified torque. Tighten hydraulic pump drive shaft cap screw to specified torque.

*NOTE:* Do not tighten securing screw of hydraulic pump drive shaft until tractor front end is secured to engine.

Install fuel transfer pump and connect fuel lines.

Make sure transfer pump inlet line is behind and below fuel pressure line.

Open fuel shut-off valve.

Connect cable to fuel gauge sending unit.

Connect headlight cables to junctions.

Lift and slide radiator into location from the left side of tractor. Slide fan shroud forward over radiator, insert and tighten set screws. Secure radiator to front axle support. Install upper and lower water hoses.

*Only on tractors not equipped with oil cooler:* Connect oil line to oil reservoir and tighten both hose clamps (see fig. 1).

*Only on tractors equipped with oil cooler:* Connect hose elbow between hydraulic oil reservoir and oil cooler at top of oil cooler and return line at bottom of oil cooler.

Connect air vent lines to hydraulic reservoir.

Connect hydraulic pump pressure line and install line clamps (see fig. 1).

Connect air intake pipe at manifold and air filter.

Attach drag link to bell crank and tighten castellated nut to specified torque.

Install hood and radiator side grilles.

Fill radiator with clear, soft water, adding an anti-freeze-rust inhibitor mixture (see operators manual).

Connect ground strap to battery.

**CAUTION:** Always connect ground strap to negative(-) pole of battery.

Start engine and check fuel lines, hydraulic lines and water hoses for leaks.

## REMOVING AND INSTALLING ENGINE

*NOTE: For most engine service operations the engine need not be removed. However, if the crankshaft has to be removed or in case of major overhaul, remove engine.*

### REMOVAL

For safety disconnect ground strap (cable) from battery.

Separate front of tractor from engine, as explained previously.

*On tractors equipped with power steering:* Disconnect power steering pressure line at steering housing and hydraulic pump pressure line.

*On tractors equipped with an alternator:* Disconnect cable between alternator and regulator by removing plug at alternator. Immediately connect terminals D+, D and DF with bridge piece supplied with the tractor. Disconnect terminal B+ at alternator.

*On tractors equipped with a generator:* Disconnect cable to starter and generator indicator lamp at regulator.

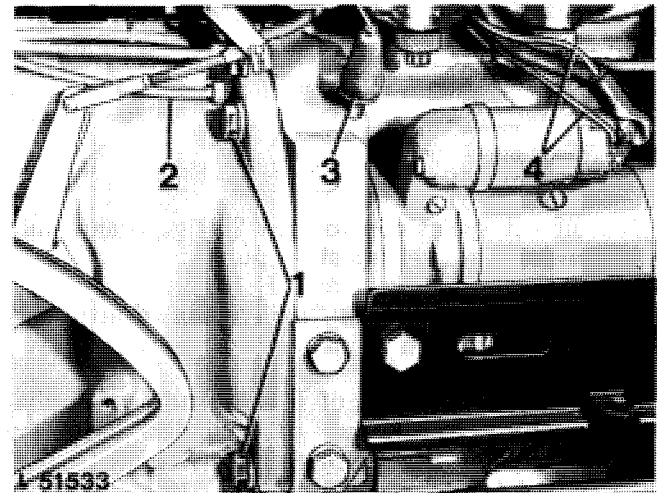


Fig. 4 — Separating between Engine and Clutch Housing, R.H. Side

- 1 Engine attaching screws
- 2 Flexible shaft of tractorometer
- 3 Oil pressure switch
- 4 Starter cable

Disconnect all cables at starter (see fig. 4). Disconnect oil pressure switch cable 3 and cable at signal horn.

Disconnect flexible shaft of tractorometer 2 at clutch housing and camshaft. If necessary, renew gasket.

*On tractors equipped with starting fluid adapter:* Disconnect starting fluid line at intake manifold.

*On tractors equipped with Thermostart aid:* Disconnect cable at heater of intake manifold.

Disconnect air vent line of hydraulic oil reservoir at cylinder head cover.

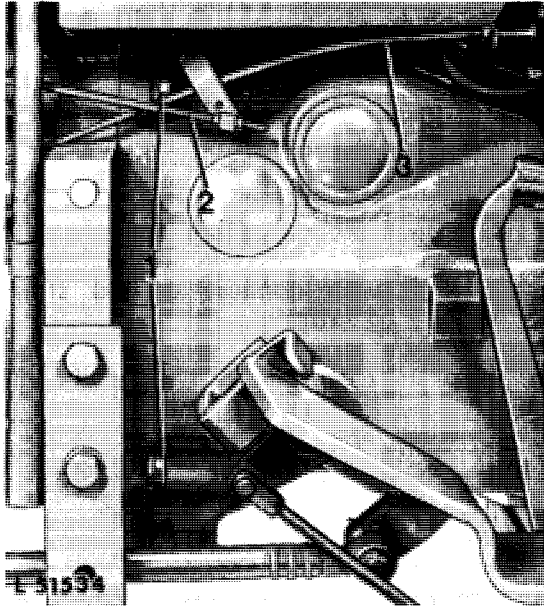


Fig. 5 — Separating between Engine and Clutch Housing, L.H. Side

- 1 Engine attaching screws
- 2 Speed control rod
- 3 Shut-off cable

Disconnect speed control rod 2 (fig. 5) and shut-off cables 3 at fuel injection pump.

*On tractors with muffler facing downwards:* Remove muffler.

Screw retaining screw of flexible tube of coolant temperature gauge out of cylinder head and withdraw from cylinder head.

Remove left dash panel as well as both batteries.

Remove cap screws attaching dashboard to flywheel housing.

Attach JD 244-1 and 244-2 engine lifting eyes to cylinder head and attach engine to a suitable hoist.

Remove cap screws 1 (figs. 4 and 5) attaching flywheel housing to clutch housing and both cap screws securing oil pan to clutch housing.

Lift engine out to the front by means of the hoist.

**CAUTION:** Move engine properly in line with drive shaft and hollow drive shaft until these shafts come loose of the driven disks of the engine dual-stage clutch, or free of driven disk and torsion damper if tractor is equipped with a single-stage clutch.

## INSTALLATION

Align engine properly with drive shaft and hollow drive shaft. Move engine towards rear of tractor. Align splines of both shafts with internal splines of driven disks (tractor with dual-stage clutch), or (if equipped with a single-stage clutch) with splines of driven disk and torsion damper. Align screw holes of flywheel housing with holes in clutch housing. Slide engine evenly towards clutch housing. Engage two dowels of flywheel housing in bores of clutch housing until engine is in full contact with clutch housing.

**CAUTION:** Make sure flywheel housing is flush against clutch housing before tightening cap screws to specified torque.

Secure oil pan to clutch housing, tightening both cap screws to the specified torque.

Attach dashboard to flywheel housing.

Connect speed control rod and shut-off cable to fuel injection pump.

Insert flexible tube of coolant temperature gauge in cylinder head and tighten retaining screw.

*On tractors equipped with an alternator:* Disconnect bridge piece from terminals D+, D- and DF and connect harness plug to terminals. Connect cable from starter to terminal B+ on alternator.

*On tractors equipped with a generator:* Connect cables from starter and generator indicator lamp to regulator.

Connect cables to starter.

Connect cables to signal horn and oil pressure warning switch.

Install both batteries.

**CAUTION: Connect battery cable to positive poles of batteries.**

Lubricate rubber seal of tractorometer flexible shaft and attach shaft to clutch housing (see 2, fig. 4). Make sure driving tab of flexible shaft engages in slot of camshaft. Do not tighten excessively to avoid damage to the seal resulting in leakage.

*On tractors equipped with starting fluid adapter:* Connect starting fluid line to intake manifold.

*On tractors equipped with Thermostart aid:* Connect Thermostart aid wire to heater in intake manifold.

*On tractors equipped with muffler facing downward:* Install muffler.

Secure oil reservoir bleed line to cylinder head cover.

Attach front of tractor to engine.

**CAUTION: Connect ground strap of batteries to negative (-) poles.**

*NOTE: If engine has been overhauled, tune up engines as explained in group 20.*

## REMOVAL AND INSTALLATION OF CLUTCH HOUSING

*NOTE: Separating and attaching of engine and clutch housing as well as of clutch housing and transmission case is explained below. Where the tractor is to be separated depends on the individual repair operation. If, e.g., repair work has to be carried out on the transmission, separation between the clutch housing and the transmission case will be sufficient.*

### REMOVAL

Disconnect battery ground strap.

Drain transmission oil.

Separate engine from clutch housing as explained under "REMOVING ENGINE", the tractor front end may remain attached to the engine.

Disconnect drag link at steering arm.

Disconnect hydraulic oil reservoir vent line (see 5, fig. 6) at connector on gear shift cover.

Remove pipe clamps (see 4, fig. 2), screws 2 and retainer 1 which secure suction line 5 of hydraulic pump and return line 3 of oil cooler (oil reservoir if not equipped with oil cooler) to front side of clutch housing.

*On tractors not equipped with HIGH-LOW transmission and independent PTO:* Take care not to lose check valve installed in hydraulic pump pressure line when latter is removed.

*On tractors equipped with power steering:* Disconnect power steering pressure line at connectors.

Remove clamp (see 6, fig. 6) and hydraulic pump pressure line 3.

Insert wooden blocks between front axle and front support to prevent front support from tipping sideways.

Suspend tractor front end and engine to a suitable hoist or support under the engine by means of assembly stand 19.58-90.618. Similarly the rear of tractor should be suspended to a suitable hoist or be supported under the transmission case by means of assembly stand 19.58-90.619.

Roll engine and tractor front end away from clutch housing.

**CAUTION: Move engine properly in line with drive shaft until these shafts come loose of the driven disks of the engine dual-stage clutch, or on tractors with single-stage clutch, free of driven disk and torsion damper.**

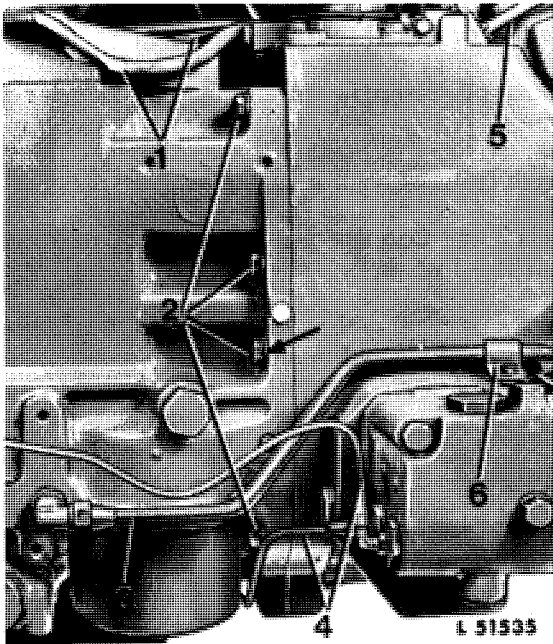


Fig. 6 — Separating between Clutch Housing and Transmission Case, R.H. Side

- |                                |                                     |
|--------------------------------|-------------------------------------|
| 1 Wiring harness               | 4 Brake lines                       |
| 2 Attaching screws             | 5 Hydraulic oil reservoir vent line |
| 3 Hydraulic pump pressure line | 6 Line clamp                        |

Disconnect brake line (see 4, fig. 6) at master cylinder.

Remove transmission cover.

Disconnect both harnesses to rear fenders at connectors. Disconnect cable at starter safety switch and cables at stop light switch.

*On tractors equipped with HIGH-LOW transmission:* Remove screws (see 3, fig. 7). Disconnect connecting rod from lever shaft and remove cover 4 complete with lever shaft and control arm.

*On tractors equipped with independent PTO:* Before removing cover (see 4, fig. 7), move PTO shift lever in engaged position. After cover 4 has been removed, do not move PTO shift lever otherwise lock balls and springs will drop out of cover.

Remove screws attaching transmission shift cover to clutch housing. Remove gear shift cover complete with shift levers.

Remove transmission oil filter.

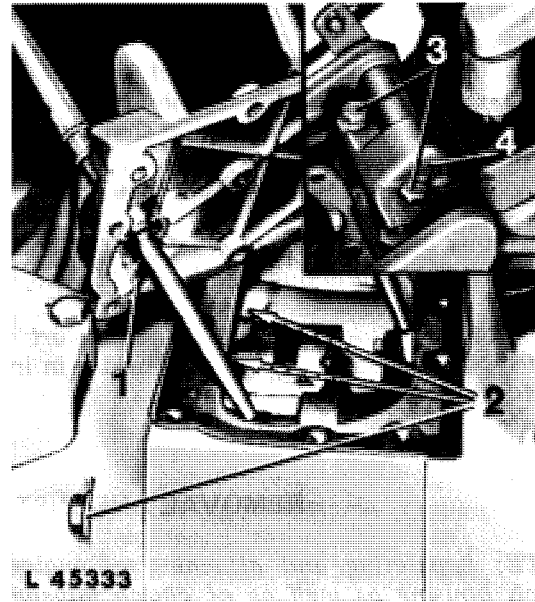


Fig. 7 — Removing Gear Shift Cover

- |                                   |                    |
|-----------------------------------|--------------------|
| 1 Shift cover                     | 3 Attaching screws |
| 2 Clutch housing attaching points | 4 Cover            |

Remove cap screws 2 (figs. 6 and 7) securing clutch housing to transmission case, and separate clutch housing from transmission case.

Discard seal rings provided between the two housings.

*On tractors with continuous-running PTO:* Be sure ball and spring provided on some PTO shaft types do not get lost (see section 50, group 30).

## INSTALLATION

Install new seal rings in clutch housing front facing transmission case.

Slide clutch housing against transmission case.

Slide PTO drive shaft into needle bearing sleeve of front PTO shaft or, if front PTO is not provided, into needle bearing sleeve of bearing cover.

*On tractors with continuous-running PTO:* Make sure, spring and ball provided on some powershaft types are installed in PTO drive shaft, bearing housing or front powershaft. Align clutch housing with centerline of PTO drive shaft and slide against transmission case. Mesh powershaft gears with splines of hollow PTO drive shaft.

Make sure clutch housing is flush against transmission case before tightening cap screws to the specified torque.

*NOTE: Before inserting the third retaining screw in clutch housing (see arrow, fig. 6) coat it with a film of oil-resistant sealant.*

*NOTE: If clutch housing has also been separated from engine, assemble as explained under "Installation of Engine."*

Insert hydraulic pump inlet line (see 5, fig. 2) and oil cooler return line 3\* in bore of clutch housing and secure by means of screw and retainer. Tighten screw to correct torque.

\* Oil reservoir when not equipped with oil cooler.

*On tractors not equipped with HIGH-LOW Shift unit: Ensure check valve is installed in feed line to hydraulic pump before connecting.*

Connect hydraulic pump pressure line.

*On tractors equipped with power steering: Connect power steering pressure line.*

As regards further installation operations reverse removal procedure.

**CAUTION: Connect ground cable of batteries to negative(-)poles.**

## REMOVAL AND INSTALLATION OF FINAL DRIVES

### REMOVAL

*NOTE: The removal of both final drives is explained below. If only one final drive is to be removed, remove only one wheel, wiring harness etc.*

For safety disconnect ground strap at batteries.

Lift up rear of tractor by means of a suitable jack or hoist and remove rear wheels.

**CAUTION: Support transmission safely to prevent tipping of tractor.**

Disconnect both rear wiring harnesses at connectors.

Remove rear fenders and roll-over guard.

Disconnect cables at stop light switch located in left-hand rear axle housing.

Disconnect brake lines on both brake housings.

*On tractors equipped with selective control valve(s):* Disconnect hydraulic lines and remove two screws securing the bracket\* or hydraulic manifold\*\* onto the right-hand final drive assembly.

Cover connections and exposed openings with plastic plugs or caps to prevent particles of dirt from entering the system.

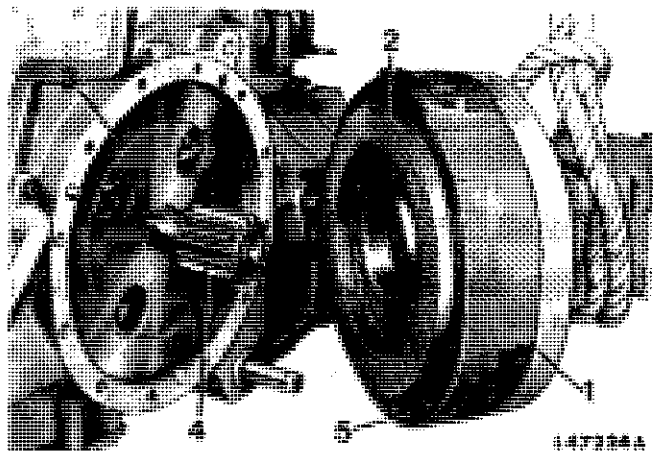


Fig. 8 — Removing Final Drive

- 1 Final drive housing
- 2 Pressure ring
- 3 Brake disk
- 4 Final drive shaft
- 5 Brake housing

Remove selective control valve(s).

\* On earlier tractors

\*\* On later tractors

Attach final drive to hoist. Remove final drive attaching screws. Separate final drive housing together with brake housing from transmission case. Withdraw housing evenly until final drive shaft gear is no longer in mesh with planetary gears of final drive.

**CAUTION:** Take care that the brake housing does not fall down (DANGER OF ACCIDENTS).

#### INSTALLATION

*NOTE: If the brake disk and the "floating" facing were removed, install bonded two-layer facing so that the brass-interwoven upper layer faces the brake surface of the transmission case.*

Position new gaskets between final drive housing and brake housing as well as between transmission case and brake housing.

Attach final drive to transmission case by means of a suitable hoist. Make sure final drive shaft gear engages with planetary gears and that the dowels are guided into their respective bores.

Tighten final drive attaching screws to the specified torque.

*On tractors with selective control valve(s):* Attach control valves with bracket\* or manifold\*\* onto the right hand final drive housing. Connect hydraulic lines.

Connect brake lines and bleed brakes, as explained in section 60, group 15.

Install rear fenders and roll-over guard. Tighten hex. nuts to specified torque.

Connect lines of wiring harnesses to connectors.

Connect cable to brake warning switch.

Install rear wheels and tighten to the specified torque.

**CAUTION:** Tighten ground strap to negative (-) poles of batteries.

### REMOVAL AND INSTALLATION OF ROCKSHAFT

#### REMOVAL

**IMPORTANT:** Work on the hydraulic system requires extreme care and cleanliness. Minute dirt or foreign particles, scratches, nicks or burrs may put the hydraulic system out of function. Before removing the rockshaft, check hydraulic system for leaks.

For safety, disconnect ground cable from batteries.

Remove transmission shield. Disconnect line 1 (fig. 9) of starter safety switch.

Remove operator's seat. Disconnect both lift links at lift arms.

Disconnect oil return line (see 2, fig. 9) of selective control valve (if equipped) at elbow on rockshaft.

Disconnect lines of rear quick couplers (if equipped) at selective control valves.

Free both rear wiring harnesses.

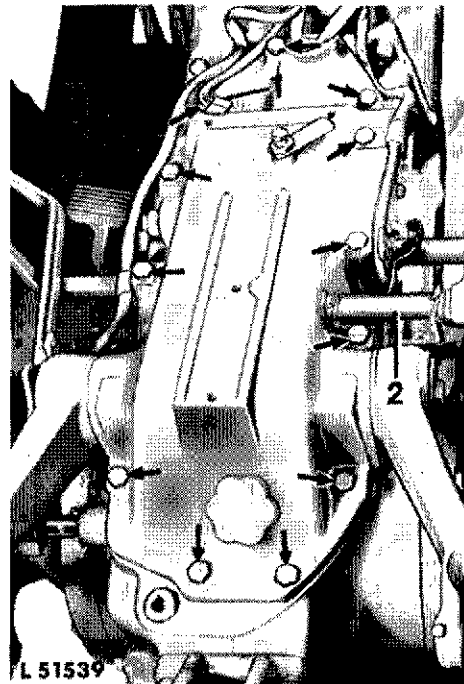


Fig. 9 — Rockshaft, Installed

- 1 Line of safety starter switch
- 2 Oil return line

- \* On earlier tractors
- \*\* On later tractors

Move selector lever in position "L" (load control) so that the control linkage roller slides along the cam of the control arm when removing the rockshaft.

Attach engine lifting eye No. JD 244-2 to top of rockshaft housing.

Remove rockshaft attaching screws (see arrows in fig. 9). Lift rockshaft assembly off transmission case by means of a hoist.

Take care not to damage two rear harnesses.

*NOTE: After removing rockshaft, cover transmission case to prevent foreign particles from falling into the transmission.*

**INSTALLATION**

Use a new gasket between transmission case and rockshaft. Make sure dowels in transmission case and seal ring of oil inlet passage are installed.

Move selector lever in position "L" so that the control linkage with roller can be slid over the cam.

Lift rockshaft on transmission case, using a suitable hoist.

If equipped: connect oil return line 2 (fig. 9) of selective control valve to rockshaft housing.

Connect lines to quick couplers.

Tighten rockshaft attaching screws to the specified torque.

Connect cable of starter safety switch.

Connect both rear wire harnesses to rockshaft. Install transmission shield on transmission case.

Attach lift links to lift arms. Install operator's seat.

For adjustment of rockshaft see section 70, group 20.

**CAUTION: Tighten ground strap to negative (-) poles of batteries.**

**TORQUES FOR HARDWARE**

Front support to engine, cap screws . . . . .	170 ft.lbs.	23,5 mkg
Hydraulic pump drive shaft, cap screw . . . . .	32 ft.lbs.	4.4 mkg
Drag link to bell crank or steering arm, castellated nut* . . . . .	55 ft.lbs.	7.7 mkg
Clutch housing to engine, cap screws . . . . .	170 ft.lbs.	23.5 mkg
Oil pan to clutch housing, cap screws . . . . .	170 ft.lbs.	23.5 mkg
Clutch housing to transmission, cap screws . . . . .	85 ft.lbs.	11.7 mkg
Securing bracket, hydraulic lines to clutch housing, cap screw . . . . .	32 ft.lbs.	4.5 mkg
Final drive housings to transmission case, cap screws . . . . .	85 ft.lbs.	11.7 mkg
Roll-over guard to final drive housings, securing bracket, cap screws . . . . .	94 ft.lbs.	13 mkg

\* *NOTE: If cotter pin cannot be inserted when tightening to the specified torque, turn nut to next slot and secure with cotter pin.*

**TORQUES FOR HARDWARE (Continued)**

Rockshaft housing to transmission case, cap screws . . . . .	85 ft.lbs.	11,7 mkg
Rear wheels to rear axle, ball nuts (on rear wheels with steel disks) .	195 ft.lbs.	27 mkg
Rear wheels to rear axle, wheel securing bolts (on rear wheels with cast disks) . . . . .	130 ft.lbs.	18 mkg
Wheel disk to hub (on tractors equipped with rack-and-pinion axle), wheel securing bolts . . . . .	300 ft.lbs.	41.5 mkg

**SPECIAL TOOLS**

Part No. when ordering from		Description	Use
JD Parts Depot	Manufacturer		
L 48524 . . . . .	JD 244-1* . . . . .	Lifting eye, straight . . . . .	Removing and installing assemblies
L 48525 . . . . .	JD 244-2* . . . . .	Lifting eye, bent . . . . .	Ditto
19.58-90.618 . . . . .		Assembly stand . . . . .	Separating tractor front end and engine.
19.58-90.619 . . . . .		Assembly stand . . . . .	Ditto

\* SERVICE TOOLS INC., 1901 INDIANA AVENUE, ILLINOIS 60616, USA

# Section 20

# ENGINE

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## Group 5

# GENERAL INFORMATION, DIAGNOSING MALFUNCTIONS

### GENERAL INFORMATION

The tractor is equipped with a 4-cylinder vertical in-line, valve-in-head, 4-cycle Diesel engine with direct fuel injection. The engine is our own design. The "wet" cylinder liners can be replaced one at a time. The pistons are of forged aluminium alloy and cam-ground. Each piston has two single, cast-iron compression rings and one oil control ring. All ring grooves are above the piston pin. The case-hardened piston pins are full floating and are held in place by two snap rings each.

The crankshaft is a one-piece, heat-treated, steel forging. It is supported in five replaceable two-piece main bearings machined to close tolerances.

The connecting rods are provided with a bronze bushing and a two-piece, replaceable bearing cap each.

A camshaft supported in the cylinder block controls the valves and drives the fuel transfer pump.

The intake and outlet valves are supported in the cylinder head. The valve stems slide in bores in the cylinder head. The rocker arm shaft assembly is fitted on top of the cylinder head.

The engine is supplied with lubricating oil by a gear pump. The lubricating oil passes through a full-flow oil filter in the main oil circuit. To ensure engine lubrication, the oil filter is provided with a by-pass valve which opens when the filter element is clogged.

The engine has a pressure cooling system consisting of the radiator, water pump, multi-blade fan and thermostat.

### DIAGNOSING MALFUNCTIONS

#### ENGINE WILL NOT CRANK

Dead batteries

Bad battery connections

Defective main switch or starter safety switch

Starter solenoid defective

Starter defective

Water, dirt or air in fuel system

Fuel filter clogged

Stuck shut-off knob

Dirty or faulty fuel injectors

Defective injection pump

Defective fuel transfer pump

Shut-off valve at fuel tank closed

Injection pump out of time

#### ENGINE HARD TO START OR WILL NOT START

Loose or corroded battery connections

Low battery output

Excessive resistance in starter circuit

Too high viscosity crankcase oil

#### ENGINE RUNS IRREGULARLY OR STALLS FREQUENTLY

Coolant temperature too low

Insufficient fuel supply

Injector tips defective or leaking  
Fuel filter or fuel lines clogged  
Defective fuel transfer pump  
Incorrect engine timing  
Improper valve clearance  
Cylinder head gasket leaking  
Worn or broken compression rings  
Valves stuck or burnt  
Excessive back pressure  
Engine compression too low  
Engine overheated  
Defective fuel injection pump

#### ENGINE MISSES

Water in fuel  
Mixture of petrol (gasoline) and Diesel fuel  
Air in fuel system  
Defective fuel injectors  
Defective fuel injection pump  
Fuel injectors improperly installed  
Leaking fuel injector seals  
Engine overheated  
Cams of camshaft worn  
Worn valve springs  
Worn or defective fuel transfer pump  
Engine backfiring  
Incorrect engine timing  
Engine compression too low  
Improper valve clearance  
Burnt, damaged or stuck valves

LACK OF ENGINE POWER  
Air cleaner clogged or dirty  
Excessive resistance in air intake system  
Fuel filter clogged  
Defective fuel transfer pump  
Defective fuel injection pump  
Defective fuel injectors  
Improper crankcase oil  
Engine overheated  
Engine clutch drags  
Defective cylinder head gasket  
Cams of camshaft worn  
Improper valve clearance  
Improper valve timing\*  
Burnt, damaged or stuck valves\*  
Worn valve springs\*  
Incorrect engine timing  
Piston rings and cylinder liners excessively worn  
Engine compression too low\*  
Improper coolant temperature

#### ENGINE OVERHEATS

Lack of coolant in cooling system  
Radiator core and/or side grille screens dirty  
Loose or defective fan belt  
Defective thermostat  
Cooling system limed up  
Engine overloaded  
Injection pump delivers too much fuel  
Damaged cylinder head gasket

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\* Measure blow-by at crankcase vent tube or carry out cylinder compression test. See section 10, group 20.

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Incorrect engine timing	HIGH OIL PRESSURE
Defective water pump	Stuck or improperly adjusted regulating valve
Too low crankcase oil level	Stuck or damaged filter by-pass valve
Defective radiator cap	
	EXCESSIVE FUEL CONSUMPTION
HIGH OIL CONSUMPTION	Engine overloaded
Oil control rings worn or broken	Compression too low
Scored cylinder liners or pistons	Leaks in fuel system
Excessive resistance in air intake system	Air cleaner restricted or dirty
Oil passages restrict free oil flow	Fuel injectors dirty or faulty
Worn valve guides or stems	Injection pump defective (delivers too much fuel)
Too low viscosity crankcase oil	Incorrect engine timing
Excessive oil pressure	
Piston ring grooves excessively worn	BLACK OR GREY EXHAUST SMOKE
Piston rings sticking in ring grooves	Excess fuel
Insufficient piston ring tension	Engine overloaded
Piston ring gaps not staggered	Air cleaner restricted or dirty
Excessive main or connecting rod bearing clearance	Defective muffler (causing back-pressure)
Crankcase oil level too high	Fuel injectors dirty or faulty
External oil leaks	Incorrect engine timing
Front and rear crankshaft oil seal faulty	
	WHITE EXHAUST SMOKE
	Engine compression too low
LOW OIL PRESSURE	Defective fuel injectors
Low crankcase oil level	Incorrect engine timing
Leakage at internal oil passages	Thermostat defective
Defective oil pump	
Excessive main and connecting rod bearing clearance	COOLANT IN CRANKCASE
Improper regulating valve adjustment	Cylinder head gasket defective
Improper crankcase oil	Cylinder head or block cracked
Defective oil pressure warning switch or indicator lamp	



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Cylinder liner seals leaking

#### ABNORMAL ENGINE NOISE

Incorrect engine timing

Worn main or connecting rod bearings

Excessive crankshaft end play

Loose main bearing caps

Foreign material in combustion chamber

Worn piston pin bushings and pins

Scored pistons

Worn timing gears

Excessive valve clearance

Worn cam followers

Bent push rods

Worn camshaft

Worn rocker arm shaft

Insufficient engine lubrication

#### DETONATION OR PRE-IGNITION

Oil picked up by intake air stream (intake manifold)

Dirty or faulty fuel injectors

Improper engine timing

Injector tip holes enlarged

Injector tips broken

Carbon build-up in compression chamber



*NOTE: Overall and detailed information on engine troubles and repair see also "Fundamentals of Service, Engines" manual.*

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