



2120 Tractor



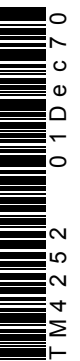
JOHN DEERE

TECHNICAL MANUAL 2120 Tractor

TM4252 (01Dec70) English

John Deere Werke Mannheim
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ENGLISH



CONTENTS

SECTION 10 — GENERAL INFORMATION

- Group 5 - Specifications
- Group 10 - Pre-delivery, delivery and after-sales inspections
- Group 15 - Lubrication and service
- Group 20 - Engine and tractor tune-up and adjustment
- Group 25 - Removal and installation of assemblies

SECTION 20 — ENGINE

- Group 5 - General information, diagnosing malfunctions
- Group 10 - Cylinder head, camshaft and balancer shafts
- Group 15 - Cylinder block, liners, pistons and connecting rods
- Group 20 - Crankshaft, crankshaft bearings and flywheel
- Group 25 - Timing gear train
- Group 30 - Oil pump, oil pressure regulating valve and oil filter
- Group 35 - Engine cooling system
- Group 40 - Speed control

SECTION 30 — FUEL SYSTEM

- Group 5 - Diagnosing malfunctions
- Group 10 - Fuel tank, transfer pump, fuel filters
- Group 15 - ROTO-DIESEL injection pump
- Group 20 - ROOSA-MASTER injection nozzles
- Group 25 - Cold weather starting aids

SECTION 40 — ELECTRICAL SYSTEM

- Group 5 - Diagnosing malfunctions
- Group 10 - Components and wiring diagrams

SECTION 50 — POWER TRAIN

- Group 5 - Engine clutch and clutch linkage
- Group 10 - HIGH-LOW shift unit
- Group 15 - Transmission
- Group 20 - Differential assembly
- Group 25 - Final drives
- Group 30 - Continuous-running power shaft
- Group 35 - Independent power shaft

SECTION 60 — FRONT AXLE, STEERING AND BRAKES

- Group 5 - Front axle
- Group 10 - Steering
- Group 15 - Brakes

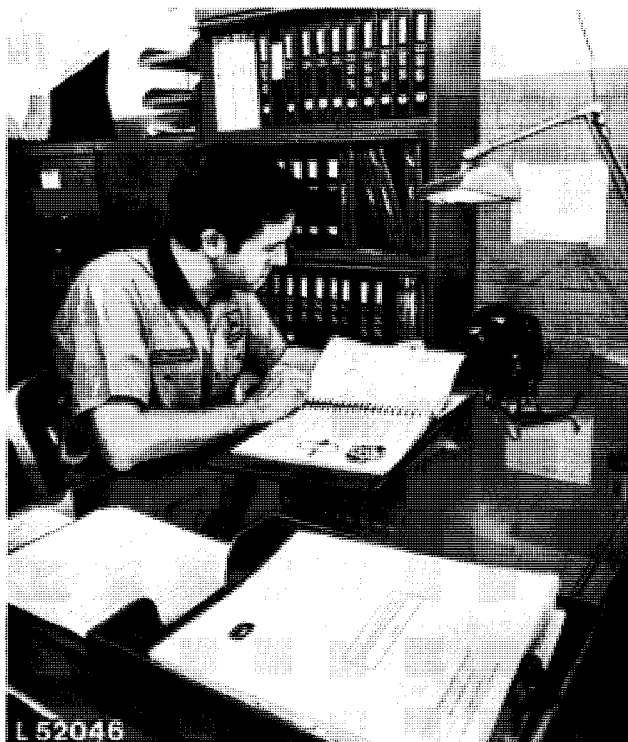
SECTION 70 — HYDRAULIC SYSTEM

- Group 5 - General information, diagnosing malfunctions, pressure tests
- Group 10 - Oil reservoir, filter, valves and oil cooler
- Group 15 - Hydraulic pump and transmission oil pump
- Group 20 - Rockshaft
- Group 25 - Selective control valves (spool type)
- Group 30 - Selective control valve (poppet valve type)
- Group 35 - Remote hydraulic cylinder

SECTION 80 — MISCELLANEOUS

- Group 5 - Belt pulley
- Group 10 - DE LUXE seat
- Group 15 - Front and rear wheels
- Group 20 - Hydraulic hitch
- Group 25 - Roll guard

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.



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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.

Section 10

GENERAL INFORMATION

CONTENTS OF THIS SECTION

GROUP 5 — SPECIFICATIONS

	Page
Serial numbers	5-2
Model numbers	5-2
Engine	5-2
Engine clutch	5-2
Electrical system	5-2
Transmission	5-3
HIGH-LOW shift unit	5-3
Differential and final drives	5-3
Differential lock	5-3
Powershafts	5-3
Hydraulic system	5-3
Hydraulic steering	5-3
Manual steering	5-3
Hydraulic brakes	5-3
Handbrake	5-3
Capacities	5-3
Travel speeds	5-3
Front and rear wheels	5-3
Dimensions and weights	5-3

GROUP 10 — PREDELIVERY, DELIVERY AND AFTER-SALES INSPEC- TIONS

Predelivery inspection	10-1
Delivery inspection	10-4
After-sales inspection	10-4

GROUP 15 — LUBRICATION AND PERIODIC SERVICE

	Page
Lubrication and periodic service	15-1

GROUP 20 — ENGINE AND TRACTOR TUNE-UP AND ADJUSTMENT

General information	20-1
Preliminary engine testing	20-1
Engine checks and adjustment	20-2
Performance test	20-3
Tractor adjustment	20-3
Standard torques	20-5
Special tools	20-5

GROUP 25 — REMOVAL AND INSTALLATION OF ASSEMBLIES

Separating between engine and tractor front end	25-1
Removal and installation of engine	25-3
Removal and installation of clutch housing	25-5
Removal and installation of final drives	25-7
Removal and installation of rockshaft	25-8
Torques for hardware	25-9
Special tools	25-10

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 ²)
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 ¹ at 2500 rpm	
Net	67 HP (68 PS)
Gross ²	71 HP (72 PS)
PTO horsepower ³ (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/cm²)

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 10

PREDELIVERY, DELIVERY AND AFTER-SALES INSPECTIONS

PREDELIVERY INSPECTION

Every new JOHN DEERE Tractor leaves the factory in such a condition that it can be delivered to the customer after a minimum of service.

To promote complete customer satisfaction, proper predelivery service including mending of possible shipping damage and giving the finishing touches to the tractor, are of prime importance to the dealer.

A tag pointing out the factory-recommended procedure for predelivery service is attached to

every new tractor before it leaves the factory. The reverse side of this tag is filled in by the factory after the tractor has undergone a thorough inspection prior to shipping.

After completing the factory-recommended dealer checks and services listed on the predelivery tag, remove the tag from the tractor and file it with the shop order for the job. The tag will then serve as a basis for certifying that the unit has received the proper predelivery service.


TEMPORARY TRACTOR STORAGE

Service	Specifications	Reference
Check radiator for coolant loss and antifreeze protection (gravity of anti-freeze and rust inhibitor mixture)	Coolant level should be midway between radiator core and bottom edge of filler neck	Operator's manual
CAUTION: On tractors equipped with a generator and shipped with dry-charged batteries or without batteries which are to be started by means of a slave battery, do not remove insulating tape on terminal of cable to starter under any circumstances. Also, do not remove – contrary to earlier statements – wire between terminals D+ of regulator and D+ of generator. If this advice is disregarded, damage to generator and regulator may result.	.....	.....
CAUTION: On tractors equipped with an alternator, do not remove or disconnect the bridge piece which connects D+, DF and D-terminals.		
Remove batteries.	Store at room temperature	.....
Reduce shipping pressure of tires	.....	Operator's manual
Cover tractor and tires for protection and cleanliness	.....	.....

BEFORE DELIVERING TRACTOR

Service	Specifications	Reference
COOLING SYSTEM		
Check radiator for coolant loss	Coolant level should be midway between radiator core and bottom edge of filler neck.	Operator's manual
Check gravity of antifreeze and rust inhibitor mixture	.....	Operator's manual
ELECTRICAL SYSTEM		
CAUTION: On tractors equipped with a generator which are to be started by means of a slave battery, do not remove insulating tape on terminal of cable to starter under any circumstances. Also, do not remove - contrary to earlier statements - wire between terminals D+ of regulator and D+ of generator. If this advice is disregarded, damage to generator and regulator may result.	.....	Section 40, group 10
If the batteries are to be installed in the tractor, remove insulating tape on terminal of battery cable. This is to be done if the tractor was shipped with dry-charged batteries or without batteries, on tractors supplied with a generator.		
CAUTION: If a tractor equipped with alternator is to be started by means of a slave battery, do not remove bridging wire connecting alternator terminals D+, DF and D- under any circumstances. Removing this wire will result in immediate destruction of diodes.	.....	Section 40, group 10
If the batteries are to be installed in the tractor, proceed as follows: Remove bridging wire from terminals D+, DF and D- and connect wires to alternator.	.....	Section 40, group 10

BEFORE DELIVERING TRACTOR - Continued

Service	Specifications	Reference
Fill batteries with electrolyte, charge batteries and install in tractor.	 "Fundamentals of Service, Electrical Systems" manual under "Batteries"
First connect positive (+) and then negative (-) wire of each battery. Only then start tractor engine.	Section 40, group 10
TIRES AND WHEELS		
Check tire inflation pressure	Operator's manual
Retighten wheel bolts and ball nuts	Section 80, group 15 and Operator's manual
LUBRICATION		
Check crankcase oil level	Top mark on dip stick	Operator's manual
Check transmission-hydraulic system oil level	Operator's manual
Lubricate all lubrication points on the tractor	Operator's manual
ENGINE		
Check oil bath air cleaner	Fill with oil to "Full"	Operator's manual
Check dry type air cleaner	Operator's manual
Fill fuel tank and start engine	Capacity: 16.25 Imp. (19.5 US) Gals = 73.8 lit.	Operator's manual
Check lighting system, indicator lights and instruments for proper operation	Operator's manual
Check if speed control linkage moves easily	Section 20, group 40
Check engine idle speeds	Section 20, group 40
Check injection timing	Section 30, group 15
TESTING OPERATION		
Check clutch pedal adjustment	Approx. 1 in. (25 mm) clutch pedal free travel	Section 50, group 5
Check operation of HIGH-LOW shift	Section 50, group 10
Shift transmission through all speeds	Operator's manual
Check differential lock operation	Operator's manual
Check power shaft operation	Operator's manual
Check 3-point hitch operation	Operator's manual
Check hydraulic system operation	Section 70, group 5
Check brake system	Section 60, group 15

BEFORE DELIVERING TRACTOR - Continued

Service	Specifications	Reference
Check steering operation	Section 60, group 10
Check seat adjustment	Operator's manual
Check operation of remote hydraulic cylinder (if equipped)	Section 70, group 5
GENERAL INFORMATION		
Tighten accessible nuts and attaching screws	Section 10, group 20
Attach roll guard	Tighten nuts and bolts to 94 ft.lbs. (13 mkg)	Section 80, group 25
Clean tractor and touch up paint

DELIVERY INSPECTION

A thorough discussion of the operation and service of the tractor at the time of its delivery helps to assure complete customer satisfaction.

Proper delivery should be an important phase of the dealer's program.

It is a well-known fact that many complaints have arisen simply because the owner was not shown how to operate and service his new tractor properly. Therefore, enough time should be devoted, at the customer's convenience, to introducing him to his new tractor and explaining to him how to operate and service it.

Using the tractor operator's manual as a guide, be sure that the owner understands the following points properly.

1. Adjusting the seat
2. Operation of control levers and instruments
3. Starting and shutting off the engine
4. The importance of the tractor break-in period
5. Use of counterweights and proper inflation pressure as well as filling of tires with water and magnesium chloride, if required.
6. Operating the complete hydraulic system
7. Operating the power shaft and belt pulley (if equipped)
8. The importance of the safety rules
9. The importance of lubrication and periodic service

AFTER-SALES INSPECTION

In the interest of the purchaser and the dealer an after-sales inspection should be carried out by the dealer after the first 100 hours of using a new John Deere tractor.

The purpose of this inspection is to make sure that the customer is receiving satisfactory performance from his tractor. At the same time, the inspection should reveal whether or not the tractor is being operated, lubricated and serviced properly.

Through this inspection a needless volume of service work can be eliminated by preventing

minor difficulties from developing into serious problems later on. It also will promote stronger dealer-customer relations and give the customer an opportunity to ask questions that may have arisen during the first few days of use.

Thereby the dealer has the further opportunity of promoting the possible sale of other new equipment.

The following inspection program is recommended:

AFTER-SALES INSPECTION

Service	Specifications	Reference
COOLING SYSTEM		
Check coolant level	Coolant level should be midway between radiator core and bottom edge of filler neck	Operator's manual
Clean exterior of radiator	.....	.....
Check hose connections	.....	.....
FUEL SYSTEM		
Check sediment bowls and elements of fuel filter for water or sediment and clean transfer pump screen	.....	Operator's manual
Check line connections	.....	.....
ELECTRICAL SYSTEM		
Check gravity of battery electrolyte	Gravity should be 1.260 at an electrolyte temperature of 80°F (27°C)	
Check electrolyte level of batteries	To bottom of filler neck in each cell	Operator's manual
Check tension of fan belt	3/4 in. (19 mm) deflection with a 20 lbs (9 kg) force	Operator's manual and section 20, group 35
Start engine and check operation of lights, indicator lamps and instruments	.....	Operator's manual
LUBRICATION		
Check crankcase oil level	Top mark on dip stick	Operator's manual
Check transmission oil level	.....	Operator's manual
Check oil level of manual steering gear housing	Add oil up to filler hole	Operator's manual
Check oil level of belt pulley housing	Add oil up to filler hole	Operator's manual
Lubricate clutch throw-out bearing	.....	Operator's manual
Lubricate 3-point hitch	.....	Operator's manual

AFTER-SALES INSPECTION

Service	Specifications	Reference
ENGINE		
Check oil level in oil-bath air cleaner	Fill with oil to level mark	Operator's manual
Check dry-type air cleaner	.....	Operator's manual
Check valve clearance	Intake valve: 0.014 in. (0.35 mm) Exhaust valve: 0.018 in. (0.45 mm)	Section 20, group 10
Check engine speed under load as well as fast and slow idle speed	.....	Section 20, group 40
Check engine performance	.....	Section 10, group 20
GENERAL INFORMATION		
Check clutch pedal adjustment	Approx. 1 in. (25 mm) free travel	Section 50, group 5
Check operation of HIGH-LOW shift unit	.....	Section 50, group 10
Shift transmission through all speeds	.....	Operator's manual
Check operation of power shaft	.....	Operator's manual
Check differential lock	.....	Operator's manual
Check operation of hydraulic system	.....	Section 70, group 5
Check steering system	.....	Section 60, group 10
Check brakes	.....	Section 60, group 15
Tighten accessible nuts and cap screws	.....	Section 10, group 20
Tighten roll guard attaching screws and nuts	94 ft.lbs. (13 mkg)	Section 80, group 25
Tighten accessible hydraulic lines	.....	.....
Visual inspection of tractor	Damaged paint, loose connections, proper positioning of hoses and lines, leaks, operation of all mechanical parts	.....

Group 15
**LUBRICATION AND PERIODIC
SERVICE**

For brands of oil and lubricants to be used as well as for lubricating and servicing the model 2120 tractor, see operator's manual.



Group 20

ENGINE AND TRACTOR TUNE-UP

GENERAL INFORMATION

Before tuning up the engine, determine whether a tune-up will restore operating efficiency. If there is doubt, the following preliminary tests will help to determine if the engine can be tuned up.



PRELIMINARY ENGINE TESTING

Service	Specifications	Reference
Checking air intake system by means of vacuum gauge	14 to 25 in. (355-635 mm) water head; engine running at fast idle speed	 "Fundamentals of Service, Engine" manual under "Diagnosis and Testing"
Check radiator for air bubbles or oil film	.....	.....
Measure blow-by at crankcase vent tube *	436 Imp.gals./h. 524 US.gals./h. 1982 liters/h.	
Check compression which should be at least (using special tool No. 19.58-90.578)	300 psi (21 kg/cm ²)	 "Fundamentals of Service, Engine" manual under "Diagnosis and Testing"
Measure engine horsepower at powershaft (using a dynamometer)	Record measured performance and compare with performance measured after carrying out "Engine Tune-up"	.....


* Measure with a standard gas gauge, placing hose over end of crankcase vent tube. The engine must be tested at 2500 rpm, normal running temperature and should be run in (at least 100 hours). Measure over a period of 5 minutes and multiply measured value by 12 (for hourly rate). Compare with values quoted above.

There is no undue wear on piston rings and cylinder liners if the measured value is lower than that quoted above. Should a further test be desired, carry out a compression test. If the "blow-by" reading is more than that quoted above, the decline in performance is due to excessive wear and the engine should be overhauled.

ENGINE TUNE-UP-Continued

Service	Specifications	Reference
AIR INTAKE SYSTEM		
Oil-bath air cleaner - clean oil cup and fill with fresh engine oil to "Full" mark	 Operator's manual and "Fundamentals of Service, Engine" manual.
Dry-type air cleaner - clean filter element and dust unloading valve	 Operator's manual and "Fundamentals of Service, Engine" manual
Check crankcase vent tube for foreign particles (restriction)
Tighten cylinder head cap screws	110 ft.lbs. (15 mkg)	Section 20, group 10
Check and adjust valve clearance	Intake valve 0.014 in. (0.35 mm) Outlet valve 0.018 in. (0.45 mm)	Section 20, group 10
BATTERIES		
Thoroughly clean wires, connections and batteries
Tighten cable clamp screws
Liberally coat battery terminals and cable connectors with petroleum jelly
Check electrolyte level of battery	Operator's manual
Check specific gravity of electrolyte	Operator's manual
GENERATOR (ALTERNATOR)		
Check fan belt tension	3/4 in. (19 mm) deflection with 20 lbs (9 kg) force	Section 20, group 35
FUEL SYSTEM		
Check fuel tank and lines for leaks or restriction
Clean screen of fuel transfer pump	Operator's manual
Check first stage filter element and replace, if necessary	Section 30, group 10
Check injection timing and adjust, if necessary	Section 30, group 15
Bleed fuel system	Section 30, group 15
Check engine speeds and adjust speed control linkage, if necessary	Section 20, group 40

ENGINE TUNE-UP - Continued

Service	Specifications	Reference
ENGINE LUBRICATION SYSTEM		
Check engine oil pressure	50 to 60 psi (3.5 to 4.2 kg/cm ²) at 2500 rpm	Section 20, group 30
COOLING SYSTEM		
Clean and flush cooling system	.....	"Fundamentals of Service, Engine" manual
Check radiator hoses for damage and leaks	.....	.....
Clear radiator core of restrictions	.....	.....

CHECKING ENGINE PERFORMANCE



After the engine has been tuned up as explained above, determine powershaft horsepower by means of a dynamometer, see "Fundamentals of Service, Engine" manual.

Compare measured performance in HP with output measured before carrying out "Engine tune-up".

TRACTOR TUNE-UP




After carrying out engine tune-up, make the following adjustments on the tractor:

Service	Specifications	Reference
ENGINE CLUTCH		
Adjust clutch pedal free travel	Approx. 1 in. (25 mm)	Section 50, group 5
FRONT WHEELS		
Clean and lubricate front wheel bearings	.....	Section 80, group 15
Adjust front wheel bearings	.....	Section 80, group 15
Check toe-in	1/8 to 1/4 in. (3 to 6.5 mm)	Section 60, group 5
Check torque of front wheel bolts	87 ft.lbs (12 mkg)	.....
HYDRAULIC BRAKES		
Bleed brake system	.....	Section 60, group 15

TRACTOR TUNE-UP - Continued

Service	Specifications	Reference
HYDRAULIC SYSTEM		
Check stand-by pressure of hydraulic pump	156 to 160 kg/cm ² (2220 to 2280 psi)	Section 70, group 5
Check rockshaft lift cycle time at 2500 rpm engine speed	1.8 sec. to 2.3 sec.	Section 70, group 5
Check time required for extending or retracting remote cylinder at 2100 rpm engine speed	2 sec.	Section 70, group 5
Check operating pressure of HIGH-LOW shift unit:	. . . . .	. . . . .
on tractors without independent power shaft	95-105 psi (6.7 to 7.3 kg/cm ²)	Section 50, group 10
on tractors with independent power shaft	140-160 psi (9.8 to 11.2 kg/cm ²)	Section 50, group 10
Check operating pressure of power shaft clutch and brake	140 to 160 psi (9.8 to 11.2 kg/cm ²)	Section 50, group 35
TIRES		
Check tire inflation pressure	. . . . .	Operator's manual
TORQUES		
Check all accessible cap screws and nuts of tractor for proper torque	. . . . .	Torque chart

STANDARD TORQUES

Recommended torques in ft. lbs. and mkg for UNC and UNF cap screws						
Head marking (identifying strength)	 or 6.8 (6. S)*		 or 10.9 (10 K)**		 or 12.9 (12 K)***	
	Thread-O.D. (in.)	ft.lbs.	mkg	ft.lbs.	mkg	ft.lbs.	mkg
1/4	7	1	10	1,5	14	2
5/16	14	2	20	3	30	4
3/8	21	3	35	5	50	7
7/16	35	5	55	8	80	11
1/2	55	8	85	12	130	18
9/16	75	10	130	18	185	26
5/8	105	15	170	23,5	250	34,5
3/4	185	25,5	300	41,5	420	58
7/8	160****	22****	445	61,5	670	92,5
1	250	34,5	670	92,5	1000	138.5

NOTE: A variation of $\pm 10\%$ is permissible for all torques indicated in this chart.

Torque figures indicated above and in the Specifications sections of this manual are valid for non-greased or non-oiled threads and heads unless otherwise specified. Therefore, do not grease or oil bolts or cap screws unless otherwise specified in this manual.

- * Regular bolts and cap screws
- ** Tempered steel high strength bolts and cap screws
- *** Tempered steel extra high strength bolts and cap screws
- **** Bolts and screws 7/8 in. and larger are often formed hot rather than cold, which accounts for the lower torque.

SPECIAL TOOLS

Part No. if ordered through		Description	Use
JD Parts Depot	Manufacturer		
19.58-90-578		Special adapter	Checking compression pressure
19.58-90-260*		Special tool	Checking oil pressure

* Details see section 70, group 5

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.

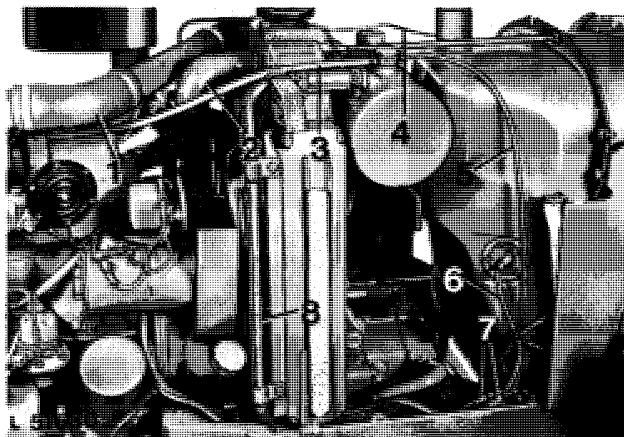


Fig. 1 — Separating between Tractor Front End and Engine

- 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.

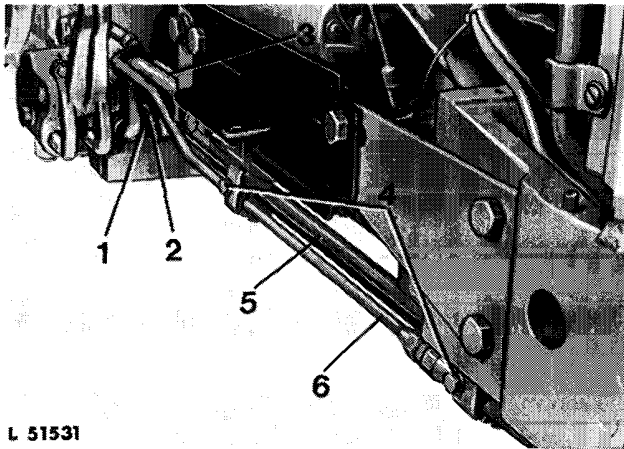


Fig. 2 — Disconnecting Hydraulic Lines

- 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.

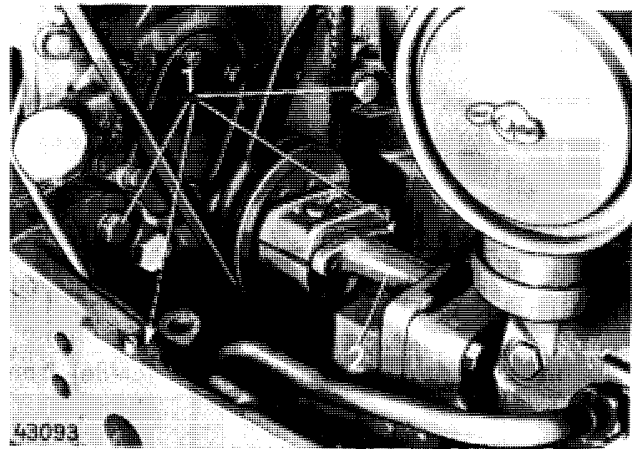


Fig. 3 — Attaching Points of Tractor Front End

- 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.

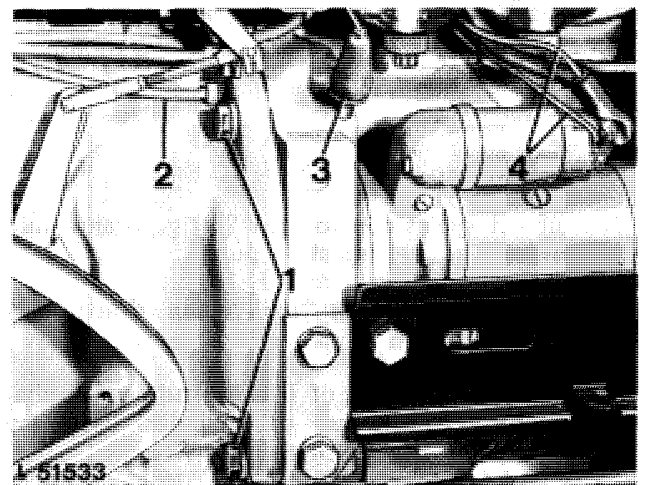


Fig. 4 — Separating between Engine and Clutch Housing, R.H. Side

- 1 Engine attaching screws
- 2 Flexible shaft of tractormeter
- 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 tractormeter 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.

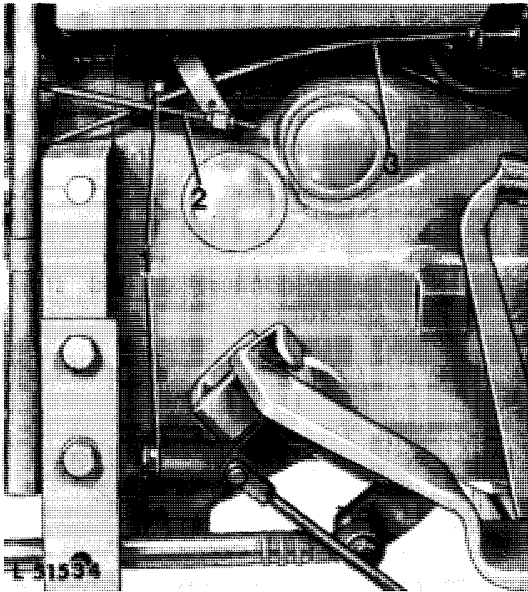


Fig. 5 — Separating between Engine and Clutch Housing, L.H. Side

- 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 tractormeter 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.

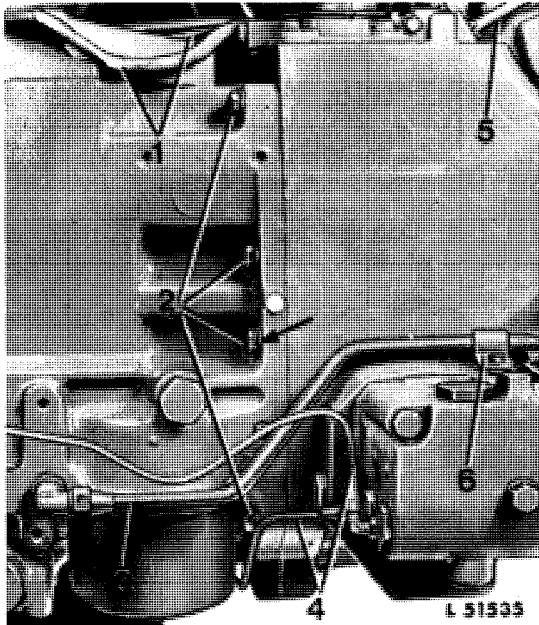


Fig. 6 — Separating between Clutch Housing and Transmission Case, R.H. Side

- | | |
|--------------------------------|-------------------------------------|
| 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.

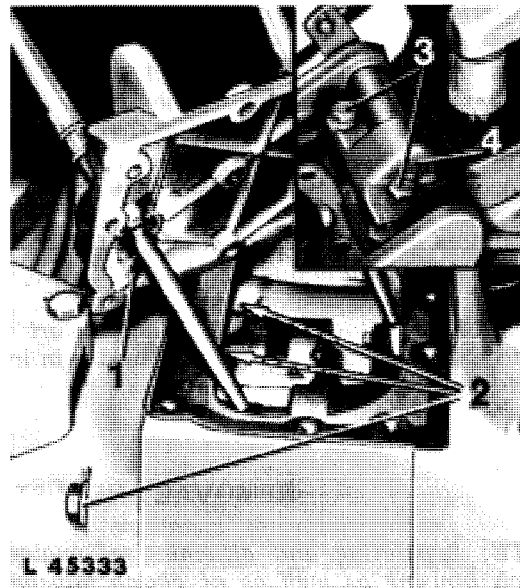


Fig. 7 — Removing Gear Shift Cover

- | | |
|-----------------------------------|--------------------|
| 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.

* On earlier tractors
** On later tractors

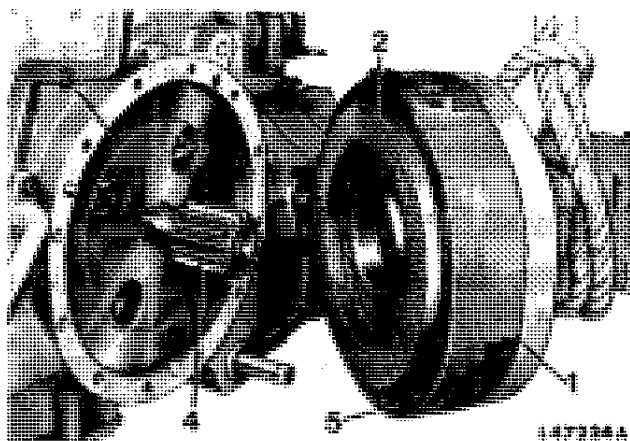


Fig. 8 — Removing Final Drive

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

Remove selective control valve(s).

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.

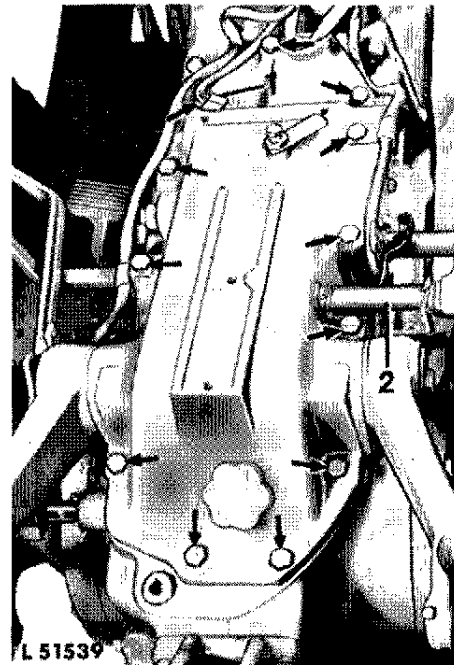


Fig. 9 — Rockshaft, Installed

- 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

CONTENTS OF THIS SECTION

<p>GROUP 5 — GENERAL INFORMATION, DIAGNOSING MALFUNCTIONS</p> <p style="text-align: right; margin-right: 20px;"><small>Page</small></p> <p>General information 5-2 Diagnosing malfunctions 5-2</p> <p>GROUP 10 — CYLINDER HEAD, CAMSHAFT AND BALANCER SHAFTS</p> <p>General information 10-1 Cylinder head 10-1 Removal 10-1 Repair 10-1 Installation 10-3 Adjusting valve clearance 10-3 Camshaft 10-4 Removal 10-4 Repair 10-4 Installation 10-5 Balancer shafts 10-6 Removal 10-6 Repair 10-6 Installation 10-8 Specifications 10-9 Torques for hardware 10-11 Special tools 10-12</p> <p>GROUP 15 — CYLINDER BLOCK, LINERS, PISTONS AND CONNECTING RODS</p> <p>General information 15-1 Removal 15-1 Repair 15-1 Assembly 15-4 Installation 15-4 Specifications 15-7 Torques for hardware 15-8 Engine break-in 15-9 Tune-up data 15-9 Special tools 15-9</p> <p>GROUP 20 — CRANKSHAFT, MAIN BEARINGS AND FLYWHEEL</p> <p>General information 20-1 Removal 20-1 Repair 20-1 Installation 20-4</p>	<p>Specifications 20-6 Torques for hardware 20-7 Special tools 20-7</p> <p>GROUP 25 — TIMING GEAR TRAIN</p> <p>General information 25-1 Removal 25-1 Repair 25-2 Installation 25-3 Specifications 25-5 Torques for hardware 25-6 Special tools 25-6</p> <p>GROUP 30 — OIL PUMP, OIL PRESSURE REGULATING VALVE AND OIL FILTER</p> <p>General information 30-1 Removal 30-2 Repair 30-2 Installation 30-4 Adjusting engine oil pressure 30-4 Specifications 30-5 Torques for hardware 30-6 Tune-up data 30-6 Special tools 30-6</p> <p>GROUP 35 — COOLING SYSTEM</p> <p>General information 35-1 Diagnosing malfunctions 35-2 Repair 35-2 Radiator 35-2 Adjusting fan belt 35-2 Water pump 35-2 Checking thermostat 35-4 Specifications 35-5 Torques for hardware 35-5 Special tools 35-5</p> <p>GROUP 40 — SPEED CONTROL LINKAGE</p> <p>General information 40-1 Removal and disassembly 40-1 Repair 40-3 Assembly and installation 40-3 Adjustment 40-4 Specifications 40-5</p>
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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

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

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 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

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

Incorrect engine timing

Defective water pump

Too low crankcase oil level

Defective radiator cap

HIGH OIL CONSUMPTION

Oil control rings worn or broken

Scored cylinder liners or pistons

Excessive resistance in air intake system

Oil passages restrict free oil flow

Worn valve guides or stems

Too low viscosity crankcase oil

Excessive oil pressure

Piston ring grooves excessively worn

Piston rings sticking in ring grooves

Insufficient piston ring tension

Piston ring gaps not staggered

Excessive main or connecting rod bearing clearance

Crankcase oil level too high

External oil leaks

Front and rear crankshaft oil seal faulty

LOW OIL PRESSURE

Low crankcase oil level

Leakage at internal oil passages

Defective oil pump

Excessive main and connecting rod bearing clearance

Improper regulating valve adjustment

Improper crankcase oil

Defective oil pressure warning switch or indicator lamp

HIGH OIL PRESSURE

Stuck or improperly adjusted regulating valve

Stuck or damaged filter by-pass valve

EXCESSIVE FUEL CONSUMPTION

Engine overloaded

Compression too low

Leaks in fuel system

Air cleaner restricted or dirty

Fuel injectors dirty or faulty

Injection pump defective (delivers too much fuel)

Incorrect engine timing

BLACK OR GREY EXHAUST SMOKE

Excess fuel

Engine overloaded

Air cleaner restricted or dirty

Defective muffler (causing back-pressure)

Fuel injectors dirty or faulty

Incorrect engine timing

WHITE EXHAUST SMOKE

Engine compression too low

Defective fuel injectors

Incorrect engine timing

Thermostat defective

COOLANT IN CRANKCASE

Cylinder head gasket defective

Cylinder head or block cracked

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