2440 AND 2640 TRACTORS (S/N -340999)

JOHN DEERE

TECHNICAL MANUAL

2440 AND 2640 TRACTORS
(S/N -340999)

TM1142 (01MAR81) English

JOHN DEERE TRACTOR WORKS
TM1142 (01MAR81)

LITHO IN THE U.S.A.
ENGLISH

2440 AND 2640 TRACTORS

(Serial No. -340999)

TECHNICAL MANUAL
TM-1142 (Sep-75)

All information, illustrations and specifications contained in this technical manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

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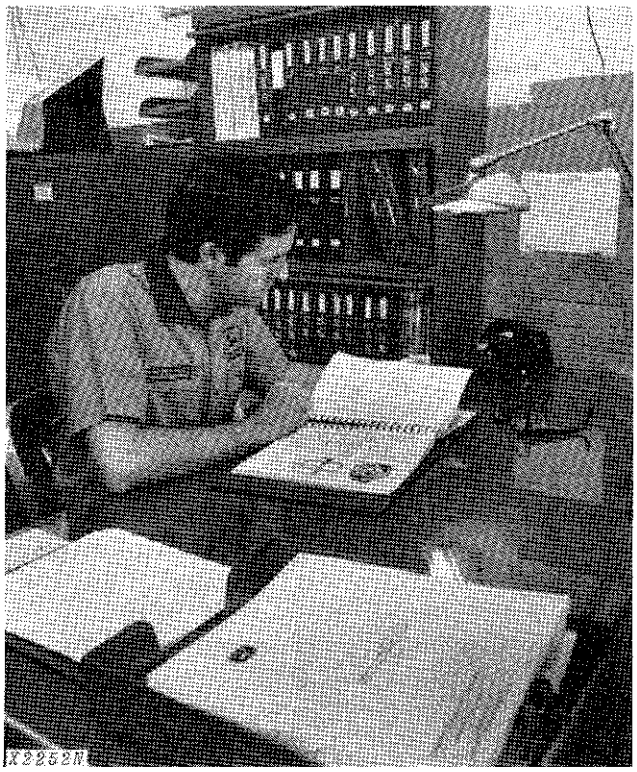
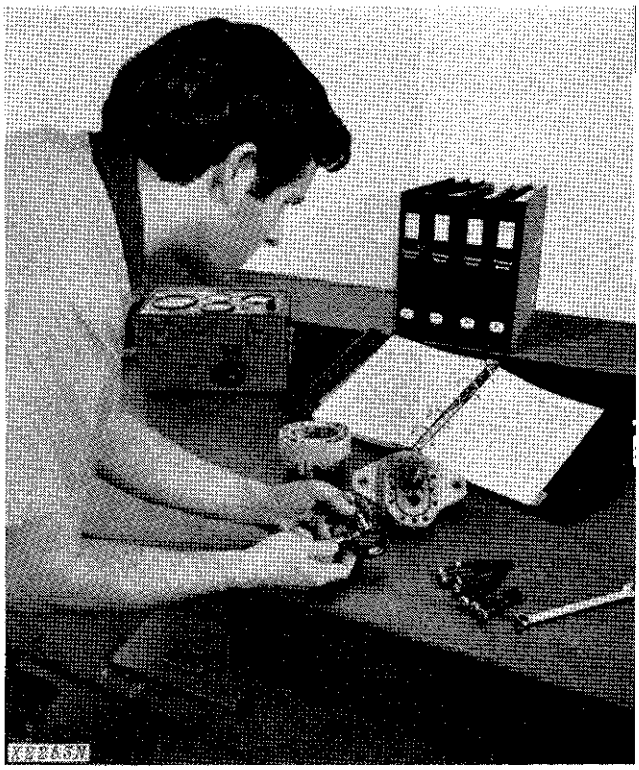
INTRODUCTION



Use FOS Manuals for Reference



Use Technical Manuals for Actual Service

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 personnel and for reference by experienced technicians.

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

When a service person 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.

Some features of this technical manual:

- *Table of contents at front of manual*
- *Exploded views showing parts relationship*
- *Photos showing service techniques*
- *Specifications grouped for easy reference*

This technical manual was planned and written for you—an experienced technician. 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.

This safety alert symbol identifies important safety messages in this manual. When you see this symbol, be alert to the possibility of personal injury and carefully read the message that follows.

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Section 10
GENERAL

CONTENTS OF THIS SECTION

Group 5
GENERAL TRACTOR SPECIFICATIONS (2440)

ENGINE
- Maximum PTO horsepower* .. 60.65 (45.23 kW)
- Number of cylinders 4
- Bore and stroke .....4.02 in. (102 mm) x 4.33 in. (110 mm)
- Displacement ..... 219 in.^{3} (3590 cm^3)
- Compression ratio ..... 16.8 to 1
- Firing Order 1-3-4-2
- Intake valve clearance..... 0.014-in. (0.35 mm)
- Exhaust valve clearance .... 0.018-in. (0.46 mm)
- Slow idle .....800 rpm
- Fast idle .....2650 rpm

**Official test at 2500 engine rpm (650 or 1210 PTO rpm)*

ELECTRICAL SYSTEM
- Battery dry voltage ..... 12 volts
- Battery specific gravity at full charge (corrected to 80°F [27°C]) 1.260
- Battery terminal grounded ..... negative

CAPACITIES
- Fuel tank .....19-1/2 gals. (73.8 L)
- Cooling system ..... 12 qts. (11.4 L)
- Crankcase (including filter) .....6 qts. (5.7 L)
- Transmission-hydraulic system ..... 10 gals. (38 L)
- Belt pulley .....2-1/2 pts. (0.3 L)

CLUTCH ..... Single or dual stage, spring-loaded, dry disk, foot-operated.

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TRANSMISSION
Type ..... Collar shift
Gear selections ..... 8 forward and 4 reverse
Shifting ..... 4 speeds each in high, low, and reverse ranges. Park lock included.

HI-LO SHIFT
Hydrualic wet clutches, no clutching required. Shifting from high to low decreases ground speed 21. 4 percent and increases pull power up to 27 percent in any of the transmission speeds.

REVERSER
Hydraulic wet clutches, no clutching required. Provides reverse speeds for gear selections 1 through 4 which are 16% faster than corresponding forward speeds.

BRAKES ..... Hydraulically actuated, wet-disk type.

DIFFERENTIAL AND FINAL DRIVES
Type ..... Planetary reduction final drives with spiral bevel gear drive differential.
Differential lock .... Hand or foot-operated mechanical lock, spring-loaded out of engagement.

POWER TAKE-OFF
Type ..... Continuous-running or independent types available in 540 and/or 1000 rpm options.

HYDRAULIC SYSTEM
Type ..... Closed center, constant pressure. Actuates power steering and implement control.
Standby oil pressure ..... 2250 psi (15.5 mPa)

STEERING
TYPE ..... Hydraulically actuated, with manual provision in case of hydraulic failure.

FRONT TIRES (Standard Equipment)* 6.00-16

REAR TIRES (Standard Equipment)* 16.9-28

DIMENSIONS
Over-all height to top of muffler . 81.2 in. (206 cm)
Over-all height to top of hood ... 55.7 in. (141 cm)
Over-all width, min. ..... 69.5 in. (177 cm)
Over-all length
(with 3-point hitch) ..... 139.5 in. (354 cm)
Wheelbase (straight axle) ..... 87.8 (218 cm)
Shipping weight (approx.) .. 4800 lbs. (2 182 kg)

**Additional tire sizes available.*

GROUND SPEEDS
Given in MPH (km/h) with 16.9-28 Rear Tires and 2500 Engine RPM

Gear	Collar Shift Transmission	Hi-Lo Shift Transmission		Ground Speed at Rated PTO SPEED (2100 RPM)	
		"Lo"	"Hi"	"Lo"	"Hi"
1st	1.53 (2.46)	1.20 (1.93)	1.53 (2.46)	1.01 (1.62)	1.28 (2.06)
2nd	2.18 (3.51)	1.72 (2.77)	2.18 (3.51)	1.44 (2.32)	1.83 (2.95)
3rd	3.24 (5.21)	2.55 (4.10)	3.24 (5.21)	2.14 (3.44)	2.72 (4.38)
4th	4.53 (7.28)	3.56 (5.72)	4.53 (7.28)	2.99 (4.81)	3.80 (6.12)
5th	6.00 (9.65)	4.71 (7.57)	6.00 (9.65)	3.96 (6.37)	5.04 (8.10)
6th	8.57 (13.78)	6.73 (10.82)	8.57 (13.78)	5.66 (9.09)	7.20 (11.57)
7th	12.71 (20.44)	9.99 (16.06)	12.71 (20.44)	8.39 (13.50)	10.68 (17.17)
8th	17.78 (28.59)	13.97 (22.46)	17.78 (28.59)	11.73 (18.86)	14.93 (24.01)
R1	1.78 (2.86)	1.40 (2.25)	1.78 (2.86)	1.17 (1.88)	1.49 (2.40)
R2	2.54 (4.08)	1.99 (3.20)	2.54 (4.08)	1.67 (2.69)	2.13 (3.43)
R3	3.77 (6.06)	2.96 (4.76)	3.77 (6.06)	2.48 (4.00)	3.16 (5.09)
R4	5.26 (8.46)	4.14 (6.66)	5.26 (8.46)	3.47 (5.59)	4.42 (7.11)

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Group 7
GENERAL TRACTOR SPECIFICATIONS (2640)

ENGINE
- Maximum PTO HORSEPOWER* 70.0 (52.2 kW)
- Numer of cylinders 4
- Bore and stroke, inches (cm) ..... 4.19 x 5.00 (10.65 x 12.70)
- Displacement - cubic inches (cubic centimeters) 276 (4416)
- Compression ratio ..... 16.2 to 1
- Firing order 1-3-4-2
- Intake valve clearance ..... 0.014-in. (0.36 mm)
- Exhaust valve clearance .... 0.018-in. (0.46 mm)
- Slow idle ..... 800 rpm
- Fast idle ..... 2650 rpm
- Transport speed (foot throttle) ..... 2800 rpm

ELECTRICAL SYSTEM
- Battery dry voltage ..... 12 volts
- Battery specific gravity at full charge (corrected to 80°F [27°C]) 1.260
- Battery terminal grounded ..... negative

CAPACITIES (U.S. Standard Measures)
- Fuel tank ..... 19-1/2 gals. (73.8 L)
- Cooling system ..... 12 qts. (11.4 L)
- Crankcase (including filter) ..... 9 qts. (8.5 L)
- Transmission-hydraulic system .... 10 gals. (38 L)
- Belt pulley ..... 2-1/2 pts. (0.3 L)

CLUTCH ..... Single or dual stage, spring-loaded, dry disk, foot-operated.

TRANSMISSION
- Type ..... Collar Shift
- Gear selections ..... 8 forward and 4 reverse
- Shifting ..... 4 speeds each in high, low, and reverse ranges. Park lock included.

HI-LO SHIFT

Hydraulic wet clutches, no clutching required. Shifting from high to low decreases ground speed 21. 4 percent and increases pull power up to 27 percent in any of the transmission speeds.

**Factory observed at 2500 engine rpm (650 or 1210 PTO rpm).*

REVERSER

Hydraulic wet clutches, no clutching required. Provides reverse speeds for gear selections 1 through 4 which are 16% faster than corresponding forward speeds.

BRAKES ..... Hydraulically actuated, wet-disk type.

DIFFERENTIAL AND FINAL DRIVES
- Type ..... Planetary reduction final drives with spiral bevel gear drive differential.
- Differential lock .... Hand or foot-operated mechanical lock, spring-loaded out of engagement.

POWER TAKE-OFF
- Type ..... Continuous-running or independent types available in 540 or 540/1000 rpm options.

HYDRAULIC SYSTEM
- Type ..... Closed center, constant pressure. Actuates power steering and implement control.
- Standby oil pressure ..... 2250 psi (15.5 mPa)

STEERING
- TYPE ..... Hydraulically actuated, with manual provision in case of hydraulic failure.

FRONT TIRES (Standard Equipment)* 6.00-16

REAR TIRES (Standard Equipment)* 16.9-28

DIMENSIONS
- Over-all height to top of muffler . 81.2 in. (206 cm)
- Over-all height to top of hood . . 55.7 in. (141.5 cm)
- Over-all width, min. ..... 69.5 in. (176.5 cm)
- Over-all length (with 3-point hitch) ..... 139.5 in. (354 cm)
- Wheelbase (straight axle) ..... 87.8 in. (21.8 m)
- Shipping weight (approx.) ... 5100 lbs. (2313 kg)

**Additional tire sizes available.*

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GROUND SPEEDS
Given in MPH (Km/h) With 16.9-28 Rear Tires and 2500 Engine RPM

Gear	Collar Shift Transmission	Hi-Lo Shift Transmission		Ground Speed at Rated PTO SPEED (2100 RPM)	
		"Lo"	"Hi"	"Lo"	"Hi"
1st	1.56 (2.50)	1.23 (1.98)	1.56 (2.50)	1.03 (1.66)	1.31 (2.10)
2nd	2.23 (3.58)	1.75 (2.81)	2.23 (3.58)	1.47 (2.36)	1.87 (3.00)
3rd	3.30 (5.30)	2.60 (4.17)	3.30 (5.30)	2.18 (3.50)	2.78 (4.45)
4th	4.62 (7.41)	3.63 (5.83)	4.62 (7.41)	3.05 (4.89)	3.88 (6.23)
5th	5.49 (8.82)	4.32 (6.93)	5.49 (8.82)	3.63 (5.82)	4.61 (7.41)
6th	7.85 (12.61)	6.17 (9.91)	7.85 (12.61)	5.18 (8.32)	6.60 (10.59)
7th	11.64 (18.67)	9.16 (14.70)	11.64 (18.67)	7.69 (12.35)	9.77 (15.69)
8th	16.28 (26.14)	12.79 (20.52)	16.28 (26.14)	10.74 (17.24)	13.68 (21.96)
R1	1.81 (2.91)	1.42 (2.28)	1.81 (2.91)		
R2	2.59 (4.15)	2.03 (3.26)	2.59 (4.15)		
R3	3.84 (6.16)	3.02 (4.84)	3.84 (6.16)		
R4	5.37 (8.62)	4.22 (6.77)	5.37 (8.62)		

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Group 10
PREDELIVERY, DELIVERY, AND AFTER-SALE SERVICES

PREDELIVERY SERVICE

Because of the shipping factors involved, plus extra finishing touches that are necessary to promote customer satisfaction, proper predelivery service is of prime importance to the dealer.

A tag pointing out the factory-recommended procedure for predelivery service is attached to each new tractor before it leaves the factory.

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 certify that the tractor has received the proper predelivery service when that portion of the customer's John Deere Delivery Receipt is completed.

Temporary Tractor Storage

Service	Specification	Reference
Check radiator for coolant loss and antifreeze protection	Midway between core and filler neck	
Remove and store batteries	Store at room temperature	
Reduce shipping pressure of tires		Operator's manual
Cover tractor and tires for protection and cleanliness		

Before Delivering Tractor

Electrical System

Remove resistor and connect wiring lead (red) to alternator output terminal. Do not attempt to polarize alternator		Section 40, Group 10
Charge batteries. Check electrolyte level and specific gravity		FOS-20 Manual
Check battery terminal connections		Section 40, Group 5
Check alternator belt tension	3/4-inch (1.9 cm) deflection, 20 lb. (104 N) force	Operator's manual
Check light operation and adjustment. Remove flasher if required by local government regulations		Operator's manual

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Before Delivering Tractor—Continued

Service	Specification	Reference
Cooling System		
Inspect radiator for coolant loss	Midway between core and filler neck	
Check antifreeze protection		
Tires and Wheels		
Adjust pressure of tires		Operator's manual
Check front wheel hub bolts, rear wheel rim clamp nuts, and rear wheel cap screws for tightness	Front hub bolts-100 ft-lbs (135 Nm) torque Rear hub bolts-300 ft-lbs (407 Nm) torque Rim clamp nuts-170 ft-lbs (230 Nm) torque Rear wheel-to-flanged axle— 130 ft-lbs (176 Nm) torque	Operator's manual
Lubrication		
Check crankcase oil level	To upper marks on dipstick	Operator's manual
Check transmission-hydraulic system oil level	To top of "SAFE" range on dipstick. Hy-GARD Oil	Operator's manual
Lubricate grease fittings	John Deere Multi-purpose Lubricant	Operator's manual
Check belt pulley oil level (if so equipped)		Operator's manual
Engine		
Check air intake system—air cleaner and hose connections		Operator's manual
Drain sediment from fuel filter		Operator's manual
Fill fuel tank and start engine	19-1/2 U.S. gallons (73.8 liters)	Operator's manual
Check operation of starter, alternator, flashers, gauges, and indicator lights		Operator's manual
Check engine timing	TDC	Operator's manual
Check speed control and fuel shut-off linkages for free operation and adjustment		Section 30, Group 20

Service	Specification	Reference
Before Delivering Tractor—Continued		
Check engine speeds	Slow idle, 800 rpm High idle, 2650 rpm Foot throttle, 2800 rpm	Section 30, Group 20
Operation		
Check transmission clutch free travel (tractors without reverser)	Approximately 1-inch (2.54 cm) free pedal travel	Operator's manual
Check clutch wear adjustment (tractors with reverser)	5-1/4 in. (13.34 cm) from engine flange	Operator's manual
Shift transmission through all speeds		Operator's manual
Check power takeoff operation		Operator's manual
Check differential lock operation		Operator's manual
Check steering operation		Operator's manual
Check brakes	Bleed brakes if spongy, check for excessive pedal travel, and even position	Operator's manual
Check hydraulic system operation: Rockshaft, and remote cylinder		Operator's manual
Check 3-point hitch operation		Operator's manual
Check negative stop screw adjustment		
Tractors without independent PTO	1/4 turn	Section 70, Group 30
Tractors with Independent PTO	1/3 turn	Section 70, Group 30
Check operation of reverser, or Hi-Lo Shift		Operator's manual
Check seat operation		Operator's manual
General		
Check Roll-Gard Mounting bolts for correct torque	300 ft-lbs (407 Nm)	Section 10, Group 30
Check front axle-to-knee bolts for correct torque	300 ft-lbs (407 Nm)	Section 80, Group 5

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Before Delivering Tractor—Continued

Service	Specifications	Source
Tighten accessible nuts and cap screws		
Clean tractor and touch up paint		
Remove covering from SCV emblem		

DELIVERY SERVICE

A thorough discussion of the operation and service of a new tractor at the time of delivery helps to assure complete customer satisfaction. Proper delivery should be an important phase of a dealer's program. A portion of the John Deere Delivery Receipt emphasizes the importance of proper delivery service.

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

The following procedure is recommended before the service technician and owner complete the delivery acknowledgments portion of the delivery receipt.

Using the tractor operator's manual as a guide, be sure that the owner understands these points thoroughly:

1. Controls and Instruments.
2. How to start and stop the engine.
3. The importance of the break-in period.
4. How to use liquid or cast-iron ballast.
5. all functions of the hydraulic system.
6. Using the power takeoff and belt pulley.
7. The importance of safety.
8. The importance of lubrication and periodic services

After explaining and demonstrating the above features, have the owner sign the delivery receipt and give the operator's manual to the owner.

AFTER-SALE INSPECTION

The purchaser of a new John Deere tractor is entitled to a free inspection within the warranty period after the equipment has been "run in." The terms of this after-sale inspection are outlined on the back of the John Deere Delivery Receipt.

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

If the recommended after-sale service inspection is followed, the dealer can eliminate a needless volume of service work by preventing minor irregularities from developing into serious problems later on. This will promote strong dealer-customer relations and present the dealer an opportunity to answer questions that may have arisen during the first few days of operation. During the inspection service, the dealer has the further opportunity of promoting the possible sale of other new equipment.

The following inspection program is recommended within the first 100 hours of tractor operation.

Inspection Procedure

Service	Specification	Reference
Cooling System		
Check radiator coolant level	Midway between core and filler neck	

Inspection Procedure—Continued

Service	Specification	Reference
Clean external surface of radiator core		
Check hoses and connections for leaks		
Fuel System		
Remove water and foreign matter from filter sediment bowl		Operator's manual
Bleed fuel system		Operator's manual
Tighten loose connections and check entire system for leaks. Correct if necessary		
Check air cleaner element and unloading valve. Clean element if necessary		Operator's manual
Electrical System		
Check specific gravity of battery(s)	Full charge - 1.260 at 80°F (27°C)	Operator's manual
Check level of battery electrolyte	To bottom of filler neck in each cell	Operator's manual
Check belt tension	3/4-inch (19.1 mm) deflection with a 20 lb. (104 N) force	Operator's manual
Start engine and check operation of starter, lights, and indicator lamps		Operator's manual
Lubrication		
Check crankcase oil level	To upper marks on dipstick	Operator's manual
Check transmission-hydraulic system oil level	In "SAFE" range on dipstick. Use John Deere Hy-GARD	Operator's manual
Engine		
Check valve clearance (static)	Intake: 0.014 in. (0.35 mm) Exhaust: 0.018 in. (0.46 mm)	Operator's manual

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Inspection Procedure—Continued

Service	Specification	Reference
Check engine speed (under load), and horsepower	Specification	Group 15 of this Section.
Operation		
Check transmission clutch free travel (tractors without reverser)	Approximately 1-inch (2.54 cm) free pedal travel	Operator's manual
Check clutch wear adjustment (tractors with reverser)	5-1/4 in. (13.34 cm) from pedal to rear of engine flange	Operator's manual
Shift transmission through all speeds		Operator's manual
Check Reverser, Hi-Lo operation		Operator's manual
Check Power Take-Off operation		Section 50, Groups 35, 40 and 42
Check differential lock operation		Operator's manual
Check rockshaft and remote cylinder operation		Section 70, Group 30
Check negative stop screw adjustment		
Tractors without Independent PTO	1/4 turn	Section 70, Group 30
Tractors with Independent PTO	1/3 turn	Section 70, Group 30
Check steering system operation	Smooth, without excessive freeplay	Section 70, Group 20
Check brakes	Bleed brakes if spongy, check for excessive pedal travel, and even position	Section 70, Group 25
Nuts and Cap Screws		
Tighten accessible nuts and cap screws that require adjustment		

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Group 15
TUNE-UP

GENERAL INFORMATION

Before tuning up a tractor, determine whether a tune-up will restore operating efficiency. When there is doubt, the following preliminary tests will help to determine if the engine can be tuned-up. If the condition is satisfactory, proceed with the tune-up. Choose from the following procedures only those necessary to restore the unit.

Preliminary Engine Testing

Operation	Specification	Section-Group Reference
Dynamometer Test (at 2500 engine rpm, full load—650 or 1210 PTO rpm)	Compare with previous recorded output; compare with output after tune-up	FOS 30 Manual, Chapter 12
Compression Test	300 psi (2067 kPa) at full cranking speed	FOS 30 Manual
Engine Coolant Check Test	No air bubbles or oil film in radiator	FOS 30 Manual, Chapter 12

Engine Tune-Up

Operation	Specification	Section-Group Reference
Air Intake System		
Service air cleaner and check system for leaks		FOS 30 Manual, Chapter 12
Check system for restrictions using water manometer		
Normal reading with clean filter element (inches of water)	3-12 inches (8.89 cm)	FOS 30 Manual, Chapter 12
Maximum permitted reading	25 in. (63.5 cm) at 2500 rpm (full load)	FOS 30 Manual, Chapter 12
Exhaust System		
Check system for leaks		FOS 30 Manual, Chapter 12
Check muffler and exhaust pipe for restrictions		FOS 30 Manual, Chapter 12

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Engine Tune-Up—Continued

Operation	Specification	Section-Group Reference (2440)	Section-Group Reference (2640)
Crankcase Ventilating System			
Check system for restrictions		FOS 30 Manual, Chapter 12	
Cooling System			
Clean grille screen, radiator core, and oil cooler core		20-35	20-35
Clean and flush system; check thermostat opening temperature, if necessary		20-35	20-35
Check pressure cap	6.25 to 7.50 psi (43 to 52 kPa) release pressure	20-35	20-35
Cylinder Head and Valves			
Torque cylinder head cap screws	110 ft-lbs (149 Nm) in sequence	20-10	20-12
Set valve clearance	Intake-0.014 inch (0.36 mm) Exhaust-0.018 inch (0.46 mm)	20-10	20-12
Fuel System			
Check fuel tank for water or other foreign material		.....	.....
Check fuel pump pressure	3-1/2 to 4-1/2 psi (24 to 31 kPa)	30-15	30-15
Change filter		30-15	30-15
Injection Pump:			
Service and check timing	TDC	30-15	30-15
	4° advance at 1100 rpm (2440) and 1200 rpm (2640) (no load)	30-15	30-15
Adjust speed control linkage	Foot throttle - 2800 rpm Hand throttle High idle - 2650 rpm Slow idle - 800 rpm	30-20	30-20
Lubrication System			
Check engine oil pressure	45 to 65 psi (317 to 448 kPa) at high idle	20-30	20-32
Charging System			
Check battery specific gravity	1.240 to 1.260	40-10	40-10
Check battery water consumption and electrolyte level		40-10	40-10
Clean battery, cables, and box		40-10	40-10
Check alternator belt tension	20 lb. (104 N) with 3/4 in. (19.1 mm) belt deflection	40-10	40-10
Check alternator output	25 amps at 13 to 15 volts (2052 engine rpm, 3000 alternator rpm)	40-10	40-10
Check alternator regulated voltage	13.8 to 14.3 volts (operating)	40-10	40-10
Starting System			
Check neutral start switch operation		.....	.....
Check battery voltage when starting	Min. 9 volts (cranking)	40-15	40-15
Check starter current draw	Approx. 400 amps	40-15	40-15
Check operation of alternator and oil pressure indicator lights		40-25	40-25

Final Engine Test

Operation	Specification	Section-Group Reference
Dynamometer	Compare with previous recorded output. Record for future use.	FOS 30 Manual, Chapter 12

Tractor Tune-Up

Operation	Specification	Section-Group Reference (2440)	Section-Group Reference (2640)
Adjust transmission clutch pedal free travel			
Tractors without reverser	1 inch (2.54 cm)	50-5	50-5
Tractors with reverser	5-1/4 inches (13.34 cm) from rear of engine flange	50-5	50-5
Check transmission shifting		50-20	50-20
Check transmission for proper operation without excessive noise		50-20	50-20
Check Hi-Lo reverser operation		50-10&15	50-10&15
Check power take off for proper operation		50-35&40	50-35&42
Check differential lock operation		50-25	50-25
Check brake pedal travel and position	Bleed brakes if spongy	70-25	70-25
Check front wheel bearing adjustment and lubrication	35 ft-lbs (47 Nm) torque; back off to nearest hole	.....	.....
Check front wheel toe-in	1/8 to 3/8 in. (3.2 to 9.5 mm)	.....	.....
Check tire inflation	See operator's manual	.....	.....
Transmission pump	6 gpm (0.38 l/s) at 2500 rpm	70-15	70-15
Main hydraulic pump	2200 to 2300 psi (15.2 to 15.8 mPa) standby; 13 gpm (0.82 l/s) or 23 gpm (1.45 l/s)	70-15	70-15
Pressure control valve	1700 to 1800 psi (11.7 to 12.4 mPa) at 1900 engine rpm	70-10	70-10
Rockshaft lift cycle time (60 degrees rotation)	1.5 to 1.6 seconds at 2100 rpm	70-30	70-30
Check selective control valve and remove cylinder cycle time	Remote cylinder (2.5 x 8 in. [6.35 x 14.35 cm] extends in 1.5 to 2.0 sec.	70-35	70-35

Hydraulic system pressures and flow rates are for conditions specified in Section 70 (tractor at operating temperature, transmission-hydraulic oil at correct temperature, proper test equipment, correct test sequence, etc.)

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Group 20 LUBRICATION

GENERAL INFORMATION

Carefully written and illustrated lubrication instructions are included in the operator's manual furnished with your customer's machine. Remind the customer to follow these instructions.

For your convenience, the following chart shows capacities and types of lubricants for the tractor components and systems. Specifications for lubricants follow the chart.

Item	Capacity	Type of Lubricant	Interval of Service
Engine crankcase	6 U.S. quarts (5.7 l) (2440) 9 U.S. quarts (8.5 l) (2640) (including filter)	See page 20-2	10 Hours—Check 100 Hours—Drain and refill 200 Hours—Change filter
Transmission and hydraulic system	10 U.S. gals. (37.85 l)	Hy-GARD Oil (or its equivalent)	50 Hours—Check 50 Hours—Change filter (end of initial break-in) 500 Hours—Change filter 1000 Hours—Drain and refill. Clean screen.
Belt pulley	2-1/2 pts. (1.18 l)	Hy-GARD Oil (or its equivalent) or SAE 80 multipurpose lubricant	200 Hours—Check 500 Hours—Drain, flush and refill
Grease fittings	.....	John Deere Multi-Purpose Lubricant or its equivalent	See Operator's Manual
Starter	Saturate wicks	SAE 10W engine crankcase oil	1000 Hours
	Lubricate armature shaft splines during assembly	SAE 10W engine crankcase oil	.....

10

LUBRICANTS

Engine Lubricating Oils

X3377N

We recommend John Deere Torq-Gard Supreme Engine Oil for use in the engine crankcase. Torq-Gard Supreme is compounded specifically for use in John Deere engines and provides superior lubrication under all conditions. NEVER PUT ADDITIVES IN THE CRANKCASE. Torq-Gard Supreme Oil was formulated to provide all the protection your engine needs. Additives could reduce this protection rather than help it.

If Torq-Gard Supreme is not used, use an engine oil that conforms to one of the following specifications:

SINGLE VISCOSITY OILS

API Service CD/SD
MIL-L-2104C
Series 3*

MULTI-VISCOSITY OILS

API Service CC/SE, CC/SD, or SD
MIL-L-46152

**As further assurance of quality, the oil should also be identified as suitable for API service designation SD.*

Depending on the expected prevailing temperature for the fill period, use oil of viscosity as shown in the following chart.

Some increase in oil consumption may be expected when SAE 5W-20 or SAE 5W oils are used. Check oil level more frequently.

Air Temperature	John Deere Torq-Gard Oil	Other Oils: Single Viscosity Oil	Other Oils: Multi-Viscosity Oil
Above 32°F (0°C)	SAE 30	SAE 30	Not recommended
−10°F to 32°F (−19°C to 0°C)**	SAE 10W-20	SAE 10W	SAE 10W-30
Below −10°F (−19°C)	SAE 5W-20	SAE 5W	SAE 5W-20

***SAE 5W-20 oil may be used where required to insure optimum lubrication at starting, particularly for an engine subjected to −10°F (−19°C) or lower for several hours.*

Transmission Hydraulic Oils

Use only John Deere Hy-GARD Transmission and Hydraulic Oil or its equivalent in the transmission hydraulic system. Other types of oil will not give satisfactory service and may result in eventual damage. This special oil, available from your John Deere dealer, may be used in all weather conditions.

NOTE: John Deere Hy-GARD Transmission and Hydraulic Oil may be added to or mixed with John Deere Type 303 Special-Purpose Oil.

Greases

John Deere Multi-Purpose Lubricant or an equivalent SAE Multipurpose-type grease is recommended for grease fittings. Application of grease as instructed in the lubrication section of the Operator's Manual will provide proper lubrication and will keep contamination out of bearings.

Storing Lubricants

A tractor can operate at top efficiency only if clean lubricants are used. Use clean containers to handle all lubricants. Store them in an area protected from dust, moisture, and other contamination.

10

Group 25
SEPARATION (2440)

SEPARATING TRACTOR FRONT END FROM ENGINE

Remove battery door from cowling. Remove right-hand or left-hand cowl. Disconnect negative battery cable from both batteries.

Remove side grille screen, muffler, hood, and front ballast (if so equipped).

Drain cooling system. Shut off fuel at fuel cock underneath fuel tank.

Wedge a block on each side between the front support and the axle.

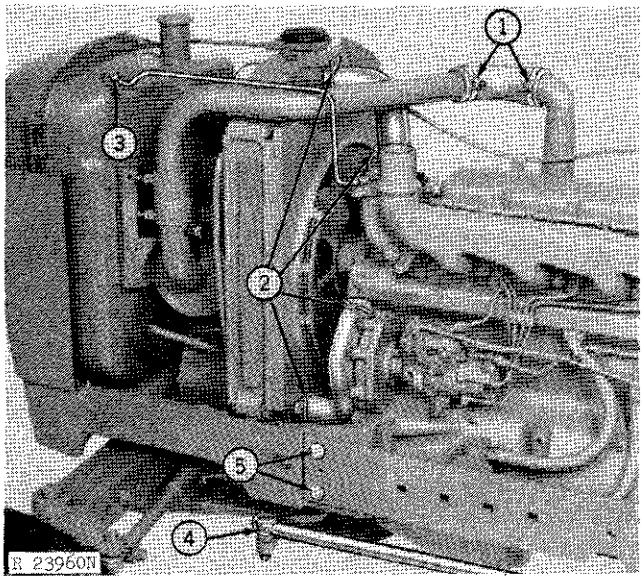


Fig. 1-Left-Hand Removal Procedures

Refer to Fig. 1 for left-hand removal procedures.

1. Remove air intake hose from air intake pipe.

2. Remove upper and lower radiator hoses.

3. Disconnect the fuel leak-off pipe.

4. Disconnect front end of drag link from steering mechanism.

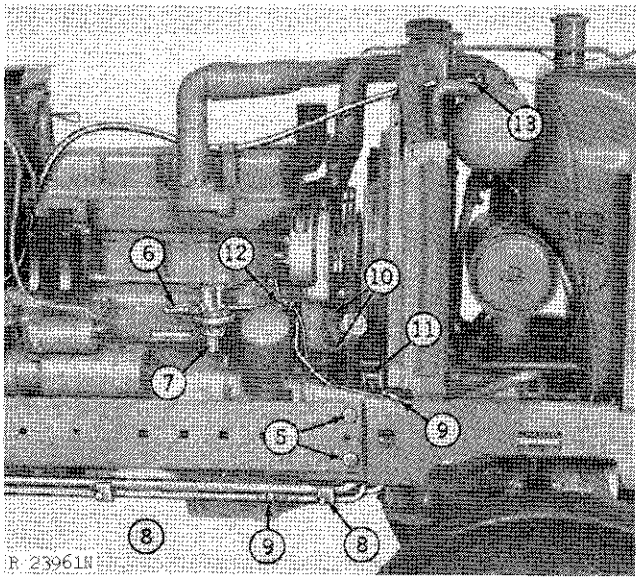


Fig. 2-Right-Hand Removal Procedure

Refer to Fig. 2 for right-hand removal procedures.

5. Remove tool box (if so equipped). Remove side frames from tractor.

6. Remove fuel inlet line from fuel pump.

7. Remove fuel pump from engine block.

8. Remove hydraulic oil pipe clamps from pipes.

9. Disconnect hydraulic oil lines underneath and directly behind the radiator. Disconnect hydraulic pump pressure pipe at connector.

10. Remove oil filler spout from front of engine block.

11. Disconnect and remove hydraulic pump drive coupling.

12. Disconnect fuel tank indicator wire.

13. Disconnect hydraulic reservoir vent hose and remove it from underneath the foam insulation piece.

Install JDG-9 in side frame holes of front support (Fig. 3). Adjust stand to be tight against floor.

10

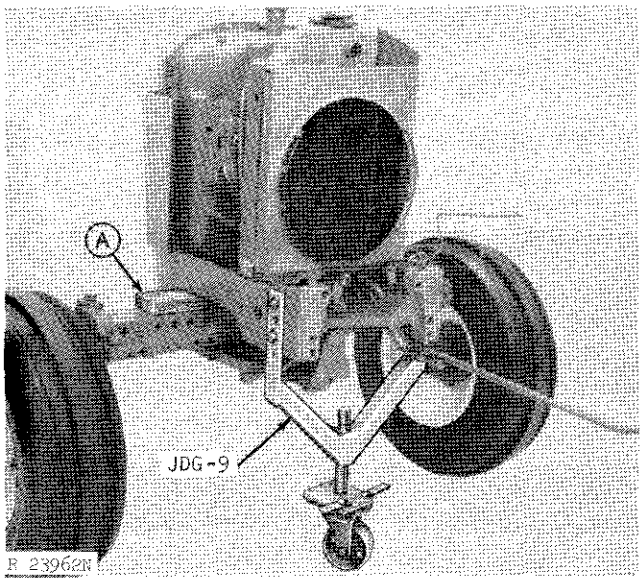
SEPARATING TRACTOR FRONT END FROM ENGINE—Continued

NOTE: A hydraulic pump check valve is located in clutch housing pump inlet pipe bore. Do not lose these parts.

⚠ CAUTION: Place a hydraulic floor jack or floor support under clutch housing or transmission case. Be sure wooden blocks are positioned between front support and front axle before separation is made. Tractor will roll sideways without blocks.

Install JD-244 Lifting Eyes on engine. Using an overhead hoist, attach JDG-1 Engine Lift Sling to JD-244 Lifting Eyes to support engine (Fig. 12).

Remove the six engine-to-front support cap screws.



A—Block of Wood

Fig. 3-Front End Separated from Engine

Carefully separate tractor front end by rolling rear section away from front end (Fig. 3). Place a metal stand under clutch housing. Install caplugs.

ASSEMBLY

IMPORTANT: Be sure hydraulic pump check valve (tractors without Hi-Lo or reverser) is installed in the pump inlet pipe before joining sections. Remove caplugs.

Join sections. Tighten bolts and cap screws to specified torque (Section 10, page 30-1). Remove JDG-1 Lift Sling, and JD-244 Lifting Eyes.

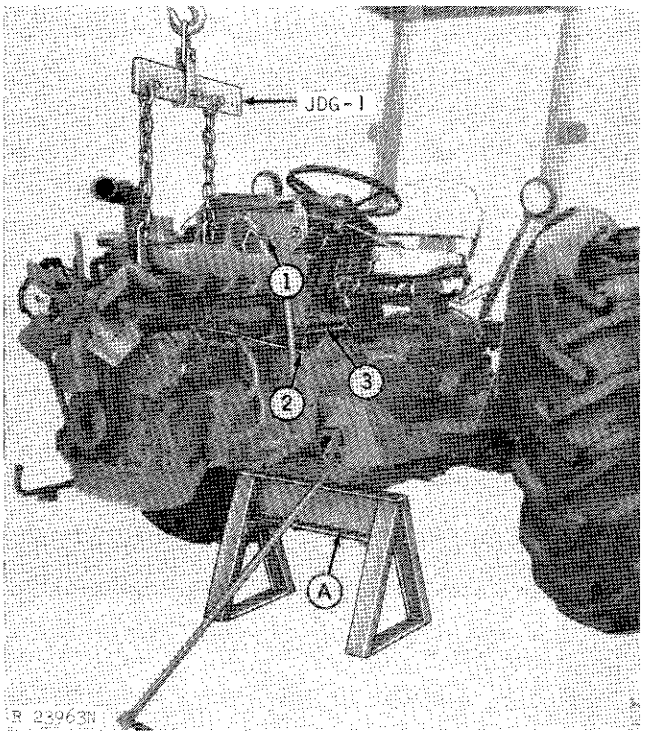
Reverse the numbered removal steps. Use new gaskets on oil filler spout (step 10) and fuel pump (step 7).

Install battery, side grille screens, hood, muffler, and front ballast (if used). Fill cooling system.

Start engine and check operation.

REMOVING ENGINE

Remove the front end from tractor as explained in SEPARATING TRACTOR FRONT END FROM ENGINE.



A—Support Stand

Fig. 4-Left-Hand Removal Procedure

1. Disconnect temperature gauge sensing bulb from engine.

2. Disconnect speed control rod.

3. Disconnect and remove fuel shut-off rod.

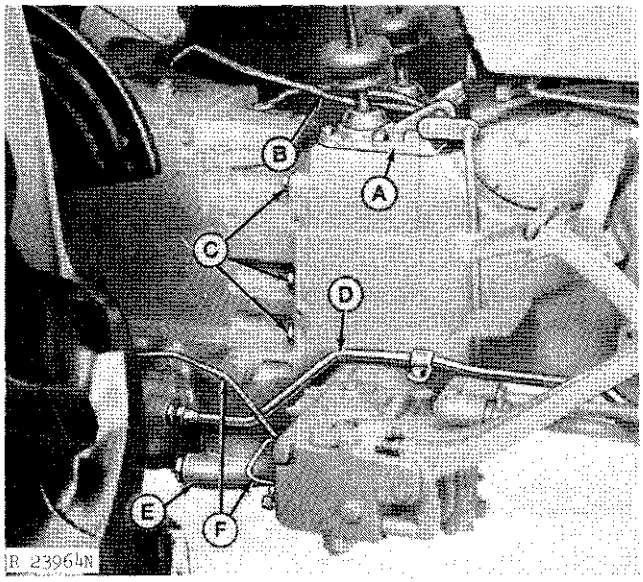


Fig. 5-Right-Hand Removal Procedure

4. Disconnect wiring harness from oil pressure sensing unit, the fuel indicator connector, the two terminals on the starter solenoid, and three terminals on rear of alternator. Pull harness rearward until it is free from engine block and fuel filter.

5. Disconnect speed-hour meter drive from flywheel housing.

6. Remove hydraulic reservoir vent hose from support clamp and pull rearward until it is free from the engine.

7. Remove cowl-to-flywheel housing cap screws.

Place a hydraulic floor jack or a support stand under the clutch housing or transmission case. Remove the engine-to-clutch housing cap screws. Separate engine from clutch housing.

ASSEMBLY

Join engine to clutch housing. Reverse removal procedure.

Tighten cap screws to specified torque (Section 10, page 30-1). To complete installation, refer to instructions for assembly given under SEPARATING TRACTOR FRONT END FROM ENGINE.

SEPARATING ENGINE FROM CLUTCH HOUSING

Remove battery door on top of cowling. Disconnect battery ground cable(s) at terminals. Remove right-hand cowl from tractor. Remove muffler, hood, grille screens, and front ballast (if used). Remove both batteries. Drain cooling system.

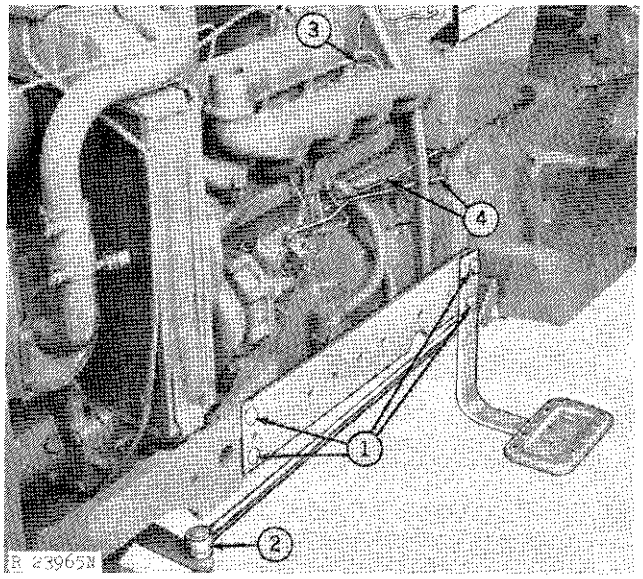


Fig. 6-Left-Hand Removal Procedure

1. Remove tool box from right side frame (if so equipped) and remove both right-hand and left-hand side frames.

2. Disconnect drag link at front from steering mechanism.

3. Disconnect temperature gauge sensing bulb from engine.

4. Disconnect speed control rod at rear. Disconnect and remove fuel shut-off rod.

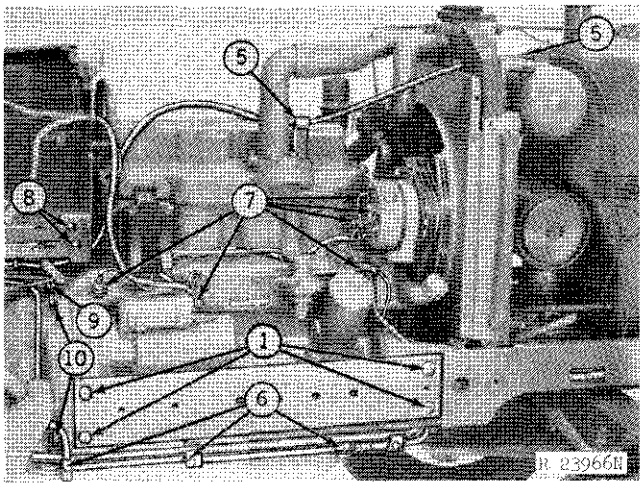


Fig. 7-Right-Hand Removal Procedure

5. Disconnect hydraulic oil reservoir vent hose from top of reservoir. Remove vent hose from support clamp and pull hose rearward until it can be positioned so it is free from engine.

6. Disconnect hydraulic pump pressure oil pipe at connector. Remove retaining clamp from pump inlet and reservoir return pipes. Disconnect power steering pressure line.

7. Disconnect wiring harness at oil pressure sensing switch, starter solenoid, rear of alternator, and fuel tank indicator wire. Pull the wiring harness rearward until it can be freed from engine and fuel filter housing.

8. Remove the two cowl-to-flywheel housing cap screws.

9. Disconnect tachometer at clutch housing and at tachometer and pull cable from clutch housing.

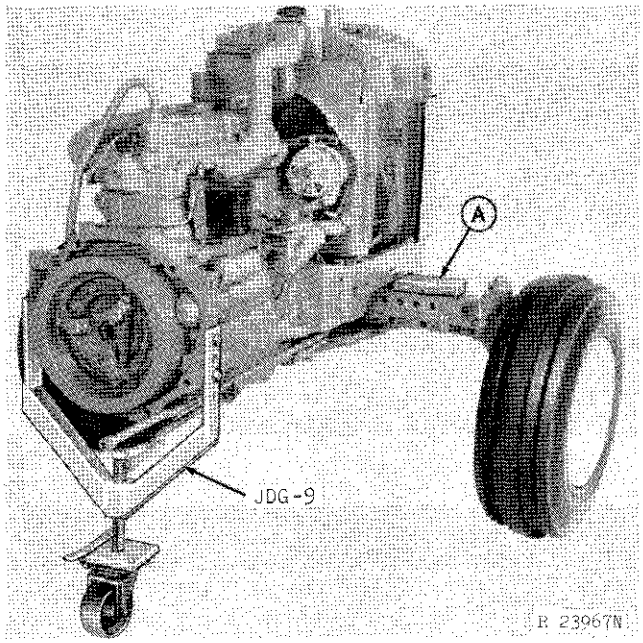
⚠ CAUTION: Install a wood block between front axle and engine front support on both sides of tractor to prevent assembly from tipping (A, Fig. 8).

If not already done so, install the JDG-9 Support Stand in rear engine flange side frame holes. Adjust wheel of support stand tightly against floor.

Place a container under the rear portion of clutch housing to catch the hydraulic oil from the pump inlet pipe and the cooler return pipe, when the tractor is separated.

IMPORTANT: Do not lose check valve assembly (tractors without Hi-Lo or reverser) in end of hydraulic pump inlet pipe when separation is made. Install caplugs on hydraulic pipes and fittings to prevent entry of foreign material.

10. Remove clutch housing-to-engine flange cap screws.



A—Block of Wood

Fig. 8-Front End After Separation (Tractor with Reverser)

Roll front section of tractor away from clutch housing (Fig. 8).

ASSEMBLY

Remove caplugs and join engine and clutch housing. Reverse the numbered removal steps. Remove JDG-9 Support Stand and floor jack. Tighten cap screws to 170 ft-lbs (230 Nm) torque.

Install battery, side grille screens, hood, muffler, and cowl. Start engine, inspect for leaks, and check operation.

SEPARATING CLUTCH HOUSING FROM TRANSMISSION CASE

Drain the transmission (remove both drain plugs). Remove the hydraulic oil filter cover and element.

Remove the drawbar from tractor.

Disconnect the clutch return spring. Remove the left-hand and right-hand footrests. Remove the transmission shield.

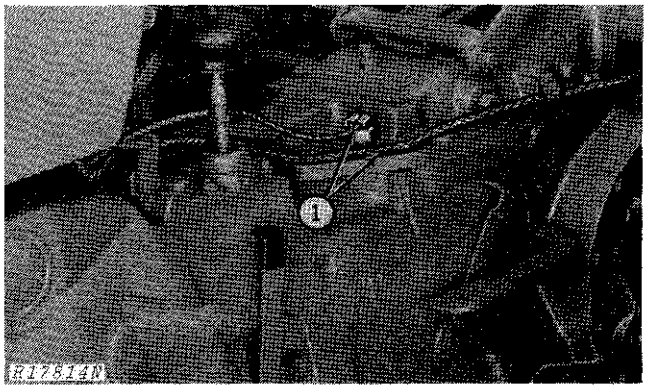


Fig. 9-Left-Hand Separation Procedures

1. Disconnect wiring harness from neutral start switch and light switch (Fig. 4).

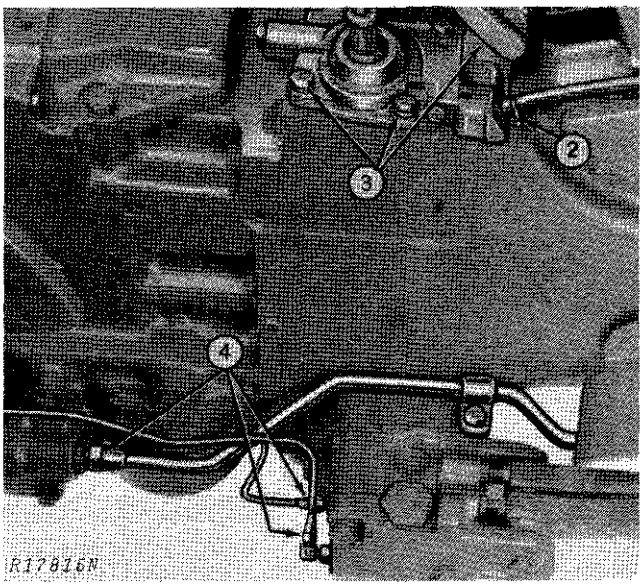


Fig. 10-Right-Hand Separation Procedures

2. Disconnect hydraulic oil reservoir vent hose (Fig. 5). Disconnect mid couplers (if equipped).

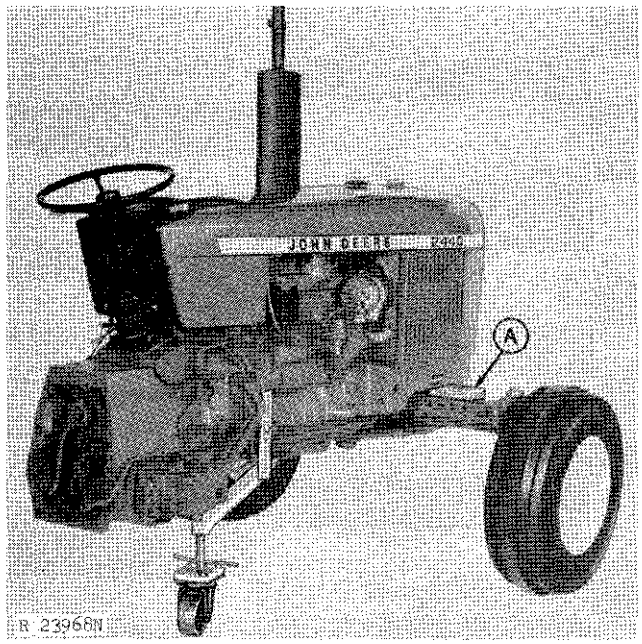
3. Remove control valve cover, and remove shift cover cap screws (tractors with Hi-Lo shift). Remove shift cover from clutch housing. Inside the clutch housing, remove the two clutch housing-to-transmission case cap screws, and the gear shifter lever guide spring.

4. Disconnect brake pipes from brake valve housing, and disconnect pressure pipe at pressure control valve.

Install JDG-9 Support Stand on flywheel housing.

⚠ CAUTION: Install a wood block between front axle and front support on both sides of tractor to prevent assembly from tipping (A, Fig. 11).

Place floor jack under transmission case.



A—Block of Wood

Fig. 11-Front End After Separation

Remove the clutch housing-to-transmission case cap screws, and roll front end away from transmission case (Fig. 11). Install caplugs.

ASSEMBLY

Install a new clutch housing-to-transmission case gasket and new rubber packings. Remove caplugs.

IMPORTANT: If tractor has a mid-PTO, be sure spring and ball are inserted in PTO drive shaft before joining units.

Litho in U.S.A.

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ASSEMBLY—Continued

Join front and rear units. Reverse the numbered separation steps. Tighten cap screws to specified torque (Section 10, Group 30).

Install the transmission shield, footrests, clutch return spring, and drawbar.

Install hydraulic oil filter element and cover. Fill transmission to proper level.

Remove JDG-9 Support Stand, floor jack, and wood blocks.

REMOVING FINAL DRIVE ASSEMBLY

Drain the transmission case at both plugs. Disconnect battery ground straps at negative terminals of the batteries.

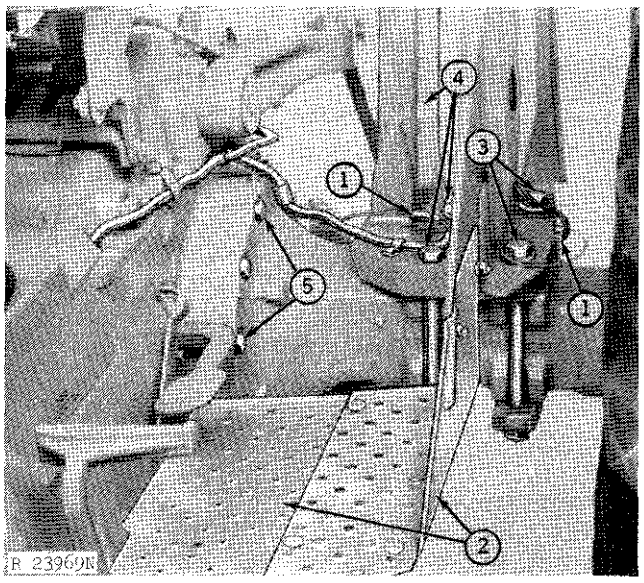


Fig. 12-Final Drive Removal Procedure

When right-hand axle housing is to be removed, first remove the selective control valve.

1. Disconnect wiring harness from lights, fender, and axle housing. Pull harness free of axle housing.

2. Remove footrest and extension. Release tension on clutch pedal spring before removing footrest completely. Disconnect hydraulic brake line.

3. Remove outside long bolts so that fender may be removed. (It will be more convenient to remove tractor tire before removing fender, or position tire at widest position.)

4. Remove inside bolts attaching Roll-Gard to axle housing and remove Roll-Gard.

5. Place floor jack or support stand under transmission case. Remove tire (if not already done). Remove cap screws securing axle housing. Wrap chain around axle housing toward inner end. Remove axle housing from transmission case.

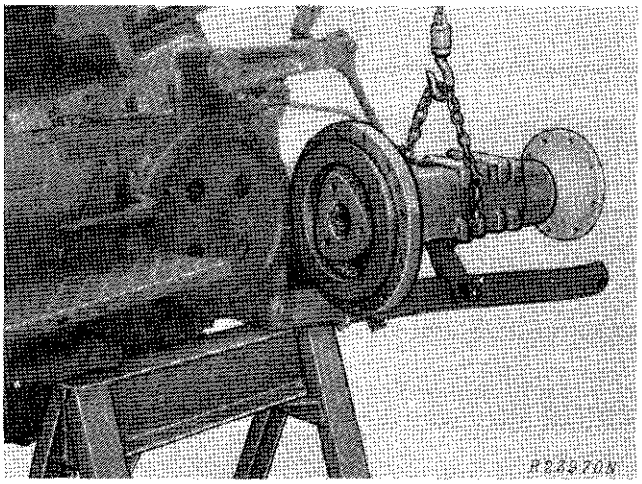


Fig. 13-Final Drive Housing Removed

ASSEMBLY

Install a new gasket on transmission case. Be sure brake disk is properly positioned on final drive shaft.

Join axle housing to transmission case. Tighten cap screws to specified torque. Remove caplugs.

Reverse the removal steps. Fill transmission with oil to the proper level.

Start engine and check operation.

10

Group 27
SEPARATION (2640)

SEPARATING TRACTOR FRONT END FROM ENGINE

Remove battery door from cowling. Remove right-hand or left-hand cowl. Disconnect negative battery cable from both batteries.

Remove side grille screen, muffler, hood, and front ballast (if so equipped).

Drain cooling system. Shut off fuel at fuel cock underneath fuel tank.

Wedge a block on each side between the front support and the axle.

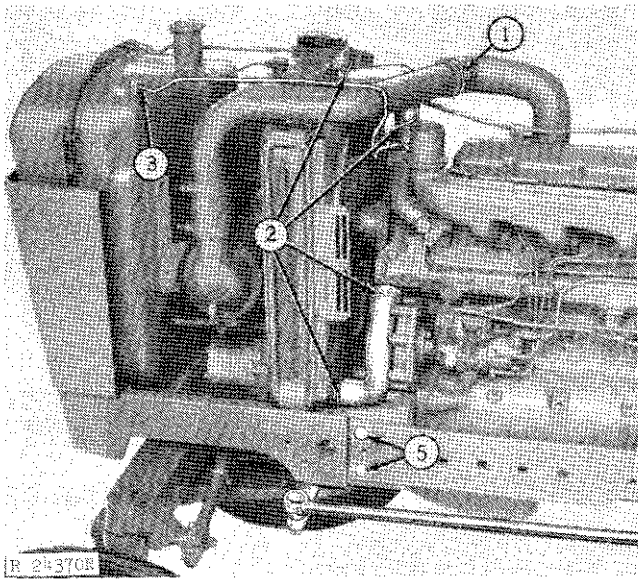


Fig. 1-Left-Hand Removal Procedures

Refer to Fig. 1 for left-hand removal procedure.

1. Remove air intake hose from air intake pipe.

2. Remove upper and lower radiator hoses.

3. Disconnect the fuel leak-off pipe.

4. Disconnect front end of drag link from steering mechanism.

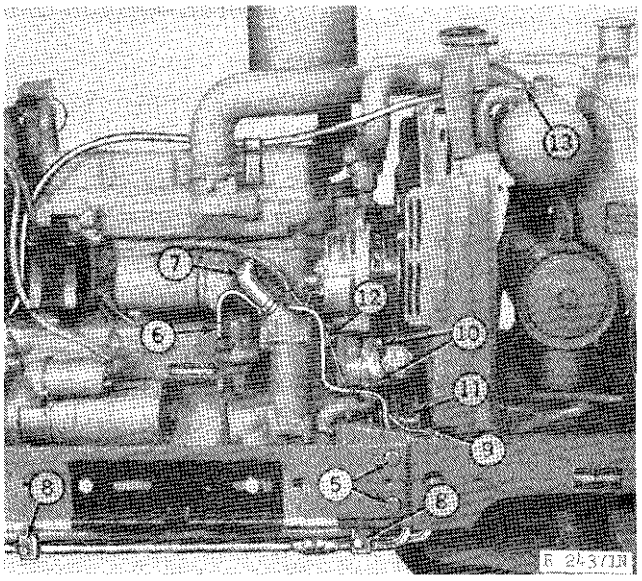


Fig. 2-Right-Hand Removal Procedures

Refer to Fig. 2 for right-hand removal procedures.

5. Remove toolbox (if so equipped). Remove side frames from tractor.

6. Remove fuel inlet line from fuel pump.

7. Remove top engine oil cooler hose.

8. Remove hydraulic oil pipe clamps from pipes.

9. Disconnect hydraulic oil lines underneath and directly behind the radiator. Disconnect hydraulic pump pressure pipe at connector.

10. Remove oil filler spout from front of engine block.

11. Disconnect and remove hydraulic pump drive coupling.

12. Disconnect fuel tank indicator wire.

13. Disconnect hydraulic reservoir vent hose and remove it from underneath the foam insulation piece.

Install JDG-9 Support Stand in side frame holes of front support (Fig. 3). Adjust stand to be tight against floor.

10

SEPARATING TRACTOR FRONT END FROM ENGINE—Continued

NOTE: A hydraulic pump check valve is located in clutch housing pump inlet pipe bore on units without Hi-Lo. Do not lose these parts.

⚠ CAUTION: Place a hydraulic floor jack or floor support under clutch housing or transmission case. Be sure wooden blocks are positioned between front support and front axle before separation is made. Tractor will roll sideways without blocks.

Install JD-244 Lifting Eyes on engine. Using an overhead hoist, attach JDG-1 Engine Lift Sling to JD-244 Lifting Eyes to support engine (Fig. 12).

Remove the six engine-to-front support cap screws.

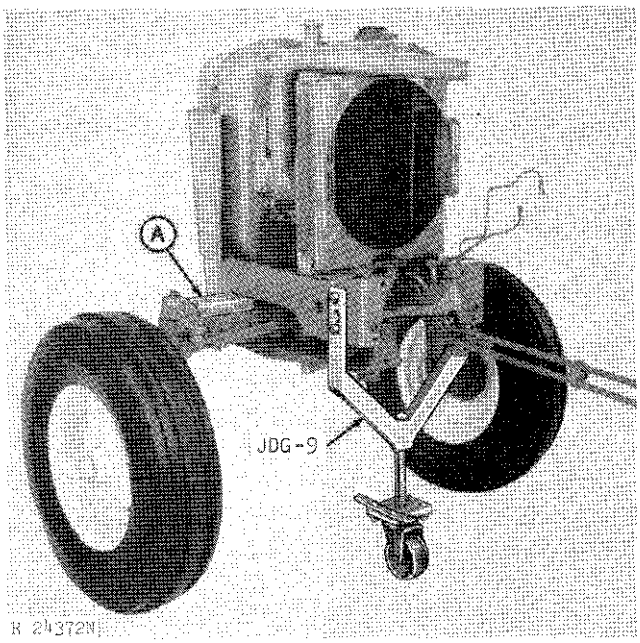


Fig. 3-Tractor Front End Separated from Engine

Carefully separate the tractor front end from the engine by rolling the front end forward (Fig. 3).

ASSEMBLY

IMPORTANT: Be sure hydraulic pump check valve (tractors without Hi-Lo or reverser) is installed in the pump inlet pipe before joining sections. Remove caplugs.

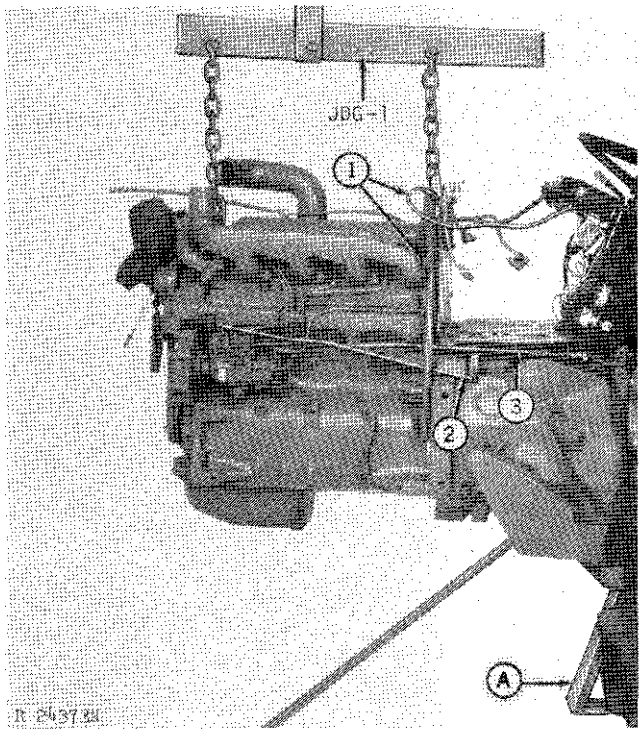
Join sections. Tighten bolts and cap screws to specified torque (Section 10, Group 30). Remove lift sling and lifting eyes. Remove support stands.

After reversing the removal steps, install muffler, hood, side grille screens, batteries, cowls, and front ballast (if used).

Fill the cooling system, start engine, and check operation.

REMOVING ENGINE

Remove the front end from tractor as explained in SEPARATING TRACTOR FRONT END FROM ENGINE.



A—Support Stand

Fig. 4-Left-Hand Removal Procedure

1. Disconnect temperature gauge sensing bulb from engine.

2. Disconnect speed control rod.

3. Disconnect and remove fuel shut-off rod.

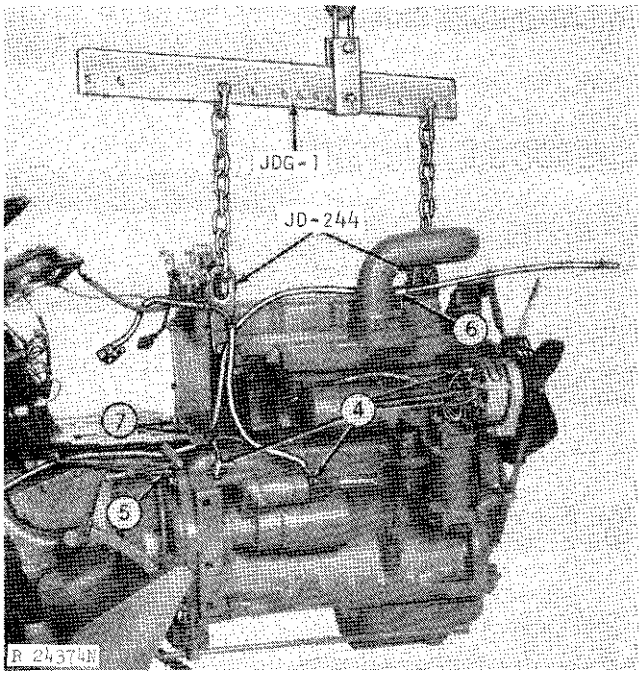


Fig. 5-Right-Hand Removal Procedure

4. Disconnect wiring harness from oil pressure sensing unit, the fuel indicator connector, the two terminals on the starter solenoid, and three terminals on rear of alternator. Pull harness rearward until it is free from engine block and fuel filter.

5. Disconnect speed-hour meter drive from flywheel housing.

6. Remove hydraulic reservoir vent hose from support clamp and pull rearward until it is free from the engine.

7. Remove cowl-to-flywheel housing cap screws.

Place a hydraulic floor jack or a support stand under the clutch housing or transmission case. Remove the engine-to-clutch housing cap screws. Separate engine from clutch housing.

ASSEMBLY

Join engine to clutch housing. Reverse removal procedure.

Tighten cap screws to specified torque (Section 10, Group 30). To complete installation, refer to instructions for assembly given under SEPARATING TRACTOR FRONT END FROM ENGINE.

SEPARATING ENGINE FROM CLUTCH HOUSING

Remove battery door on top of cowling. Disconnect battery ground cable(s) at terminals. Remove right-hand cowl from tractor. Remove muffler, hood, grille screens, and front ballast (if used). Remove both batteries. Drain cooling system.

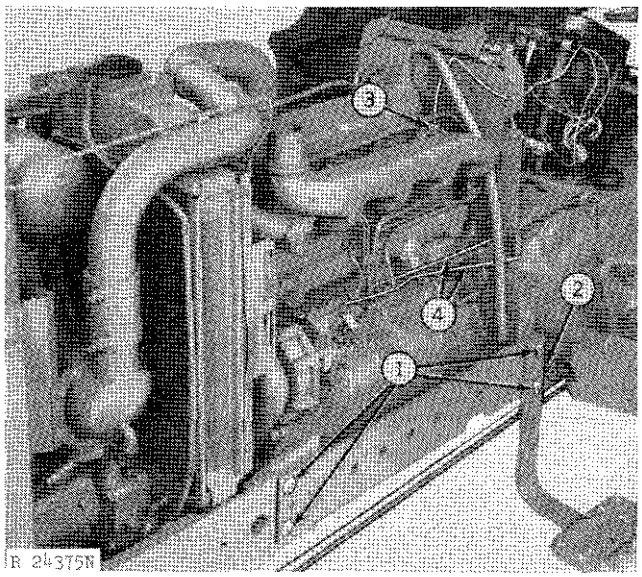


Fig. 6-Left-Hand Separation Procedures

1. Remove toolbox from right side frame (if so equipped) and remove both right-hand and left-hand side frames.

2. Disconnect drag link at front from steering mechanism.

3. Disconnect temperature gauge sensing bulb from engine.

4. Disconnect speed control rod at rear. Disconnect and remove fuel shut-off rod.

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SEPARATING ENGINE FROM CLUTCH HOUSING—Continued

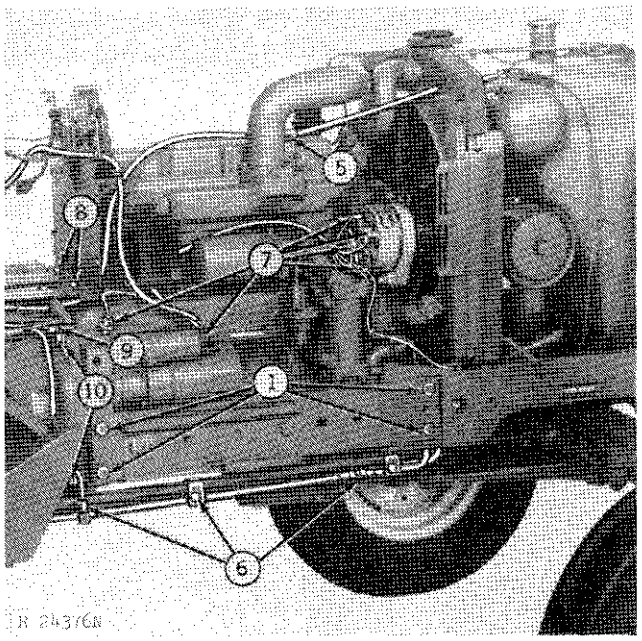


Fig. 7-Right-Hand Separation Procedures

5. Disconnect hydraulic oil reservoir vent hose from top of reservoir. Remove vent hose from support clamp and pull hose rearward until it can be positioned so it is free from engine.

6. Disconnect hydraulic pump pressure oil pipe at connector. Remove retaining clamp from pump inlet and reservoir return pipes. Disconnect power steering pressure line.

7. Disconnect wiring harness at oil pressure sensing switch, starter solenoid, rear of alternator, and fuel tank indicator wire. Pull the wiring harness rearward until it can be freed from engine and fuel filter housing.

8. Remove the two cowl-to-flywheel housing cap screws.

9. Disconnect tachometer at clutch housing and at tachometer and pull cable from clutch housing.

⚠ CAUTION: Install a wooden block between front axle and engine front support on both sides of tractor (Arrow, Fig. 8).

If not already done so, install the JDG-9 Support Stand in rear engine flange side frame holes. Adjust wheel of support stand tightly against floor.

Place a container under the rear portion of clutch housing to catch the hydraulic oil from the pump inlet pipe and the cooler return pipe, when the tractor is separated.

IMPORTANT: Do not lose check valve assembly (tractors without Hi-Lo or reverser) in end of hydraulic pump inlet pipe when separation is made. Install caplugs on hydraulic pipes and fittings to prevent entry of foreign material.

10. Remove clutch housing-to-engine flange cap screws.

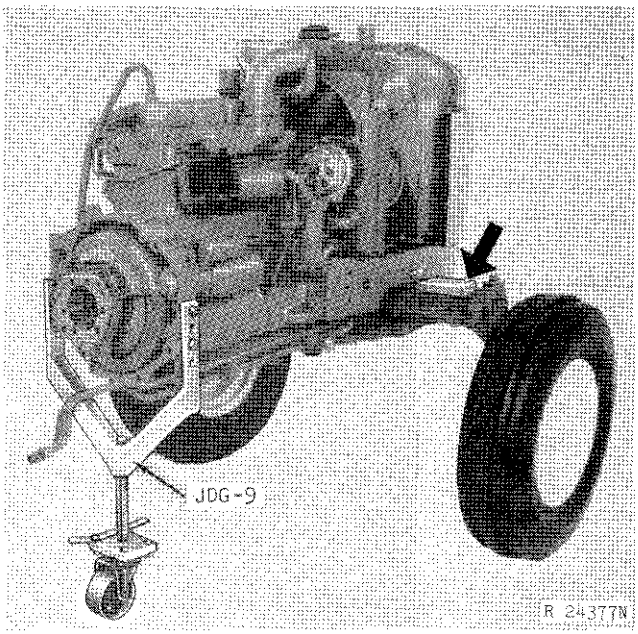


Fig. 8-Engine Separated from Clutch Housing

Roll front section of tractor away from clutch housing (Fig. 8).

ASSEMBLY

Remove caplugs and join engine and clutch housing. Reverse the numbered removal steps given under SEPARATION. Remove JDG-9 Support Stand and floor jack. Tighten cap screws to specified torque. (See Group 30 of this Section.)

Install battery, side grille screens, hood, muffler, and right-hand cowl. Start engine, inspect for leaks, and check operation.

SEPARATING CLUTCH HOUSING FROM TRANSMISSION CASE

Drain the transmission (remove both drain plugs). Remove the hydraulic oil filter cover and element.

Disconnect the clutch return spring. Remove the left-hand and right-hand footrests. Remove the transmission shield.

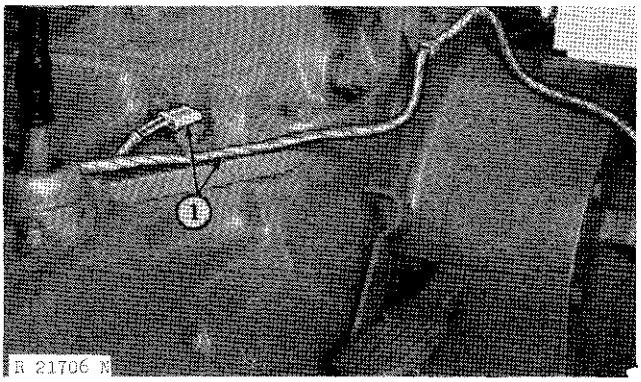


Fig. 9-Left-Hand Separation Procedures

1. Disconnect wiring harness from neutral-start switch and light switch (Fig. 9).

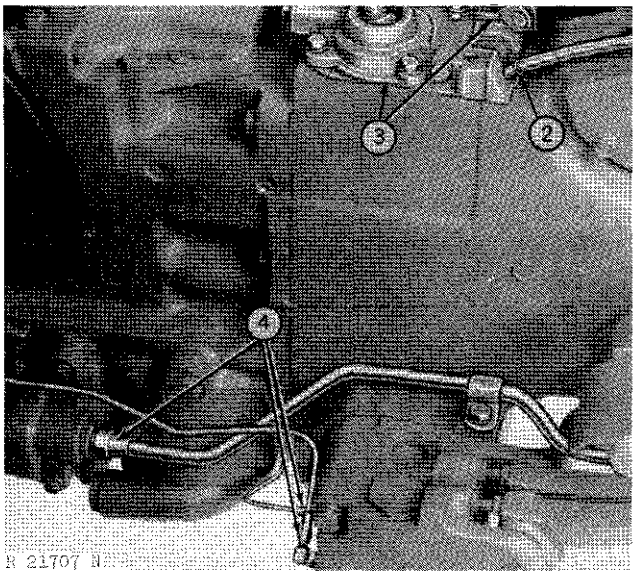


Fig. 10-Right-Hand Separation Procedures

2. Disconnect hydraulic oil reservoir vent hose (Fig. 10). Disconnect mid couplers (if equipped).

3. Remove control valve cover, and remove shift cover cap screws (tractors with Hi-Lo shift). Remove shift cover from clutch housing. Inside the clutch housing, remove the two clutch housing-to-transmission case cap screws, and the gear shifter lever guide spring.

4. Disconnect brake pipes from brake valve housing, and disconnect pressure pipe at pressure control valve.

Install JDG-9 Support Stand on flywheel housing.

⚠ CAUTION: Install a wooden block between front axle and front support on both sides of tractor to prevent assembly from tipping (Arrow, Fig. 11).

Place floor jack under transmission case.

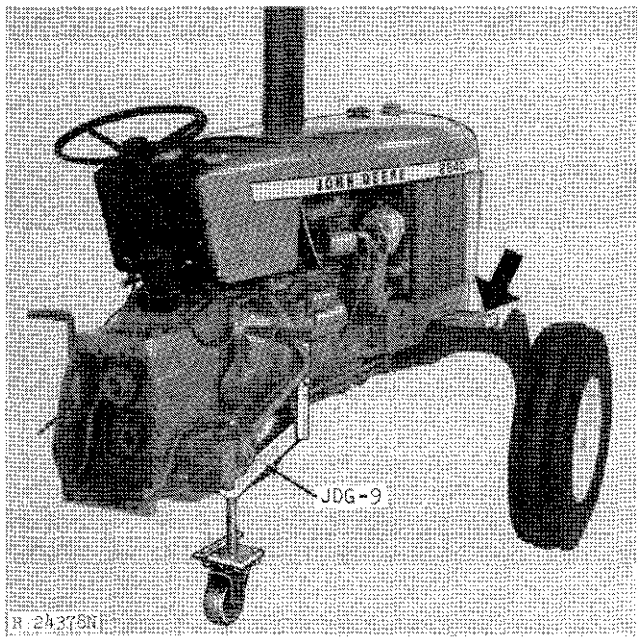


Fig. 11-Clutch Housing Separated from Transmission

Remove the clutch housing-to-transmission case cap screws, and separate units (Fig. 11). Install caplugs.

ASSEMBLY

Install a new clutch housing-to-transmission case gasket and new rubber packings. Remove caplugs.

10

SEPARATING CLUTCH HOUSING FROM TRANSMISSION CASE—Continued

Join front and rear units. Reverse the numbered separation steps. Tighten cap screws to specified torque (Section 10, Group 30).

Install the transmission shield, footrests, clutch return spring, and drawbar.

Install hydraulic oil filter element and cover. Fill transmission to proper level.

Remove JDG-9 Support Stand, floor jack, and wooden blocks.

REMOVING FINAL DRIVE ASSEMBLY

Drain the transmission case at both plugs. Disconnect battery ground straps at negative terminals of the batteries.

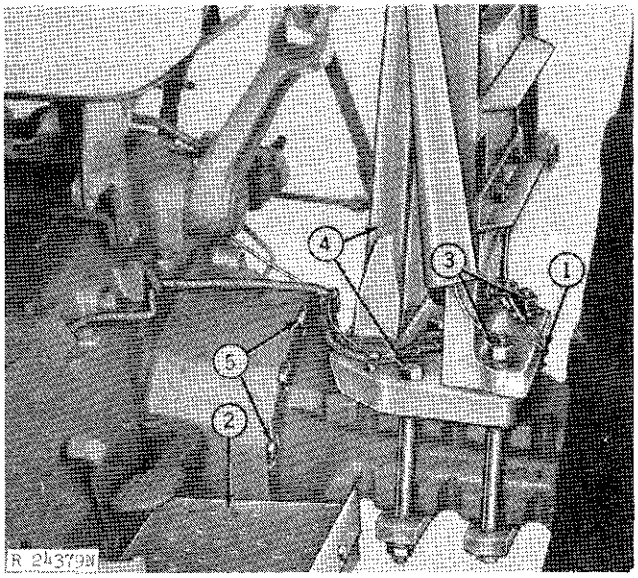


Fig. 12-Final Drive Assembly Removal Procedures

When right-hand axle housing is to be removed, first remove the selective control valve.

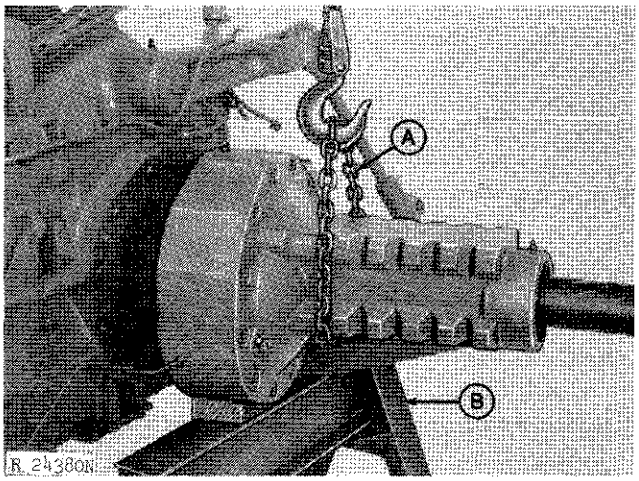
1. Disconnect wiring harness from lights, fender, and axle housing. Pull harness free of axle housing.

2. Remove footrest and extension. Release tension on clutch pedal spring before removing left-hand footrest completely. Disconnect hydraulic brake line.

3. Remove outside long bolts so that fender may be removed. (It will be more convenient to remove tractor tire before removing fender, or position tire at widest position.)

4. Remove inside bolts attaching Roll-Gard to axle housing and remove Roll-Gard.

5. Place floor jack or support stand (B, Fig. 13) under transmission case. Remove tire (if not already done). Remove cap screws securing axle housing. Wrap chain (A) around axle housing toward inner end. Remove axle housing from transmission case.



A—Chain on Housing *B—Support Stand*

Fig. 13-Assembly Removed from Transmission Case

ASSEMBLY

Install a new gasket on transmission case. Be sure brake disk is properly positioned on final drive shaft.

Join axle housing to transmission case. Tighten cap screws to specified torque (Section 10, Group 30). Remove caplugs.

Reverse the removal steps. Fill transmission with oil to the proper level.

Start engine and check operation.

10

Group 30
SPECIFICATIONS AND SPECIAL TOOLS

SPECIFICATIONS

Item	Specification
Fan belt adjustment	3/4 inch (2.54 cm) deflection, 20 lb. (104 N) force

Item	Torque (ft-lbs [Nm])
Engine-to-clutch housing	170 (230)
Drag link nuts	55 (75)
Clutch housing-to-transmission case	85 (115)
Front end support-to-engine block	
5/8 inch	170 (230)
9/16 inch	130 (176)
Hydraulic pump drive coupling nuts	25 (34)
Axle housing-to-transmission case	85 (115)
Roll-Gard-to-axle housing	300 (407)
Rear wheel-to-hub bolts	
(rack and pinion axle)	300 (407)
Rim-to-wheel disk nuts	170 (230)
Rear wheel-to-flanged axle cap screws	
Cast wheel (regular and power adj.)	130 (176)
Steel wheel	100 (135)
Demountable rim wheel	100 (135)
Front wheel bearing	35 (47)
Front wheel hub bolts	100 (135)

SPECIAL TOOLS

No.	Name	Use
JD-244*	Engine Lifting Eyes	Engine removal
JDG-1*	Engine Sling	Removing engine
JDG-9*	Support Stand	Tractor separation

**Order from: Service Tools, P.O. Box 314, Owatonna, Minnesota 55060*

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10

TORQUE CHART



Bolt Diameter	Plain Head*	Three Radial Dashes*	Six Radial Dashes*
1/4 in. (6.35 mm)	6 ft-lbs (8 Nm)	10 ft-lbs (14 Nm)	14 ft-lbs (19 Nm)
5/16 in. (7.93 mm)	13 ft-lbs (18 Nm)	20 ft-lbs (27 Nm)	30 ft-lbs (41 Nm)
3/8 in. (9.53 mm)	23 ft-lbs (31 Nm)	35 ft-lbs (47 Nm)	50 ft-lbs (68 Nm)
7/16 in. (11.11 mm)	35 ft-lbs (47 Nm)	55 ft-lbs (75 Nm)	80 ft-lbs (108 Nm)
1/2 in. (12.70 mm)	55 ft-lbs (75 Nm)	85 ft-lbs (115 Nm)	120 ft-lbs (163 Nm)
9/16 in. (14.29 mm)	75 ft-lbs (102 Nm)	130 ft-lbs (176 Nm)	175 ft-lbs (237 Nm)
5/8 in. (15.88 mm)	105 ft-lbs (142 Nm)	170 ft-lbs (230 Nm)	240 ft-lbs (325 Nm)
3/4 in. (19.05 mm)	185 ft-lbs (251 Nm)	300 ft-lbs (407 Nm)	425 ft-lbs (576 Nm)
7/8 in. (22.23 mm)	160 ft-lbs (217 Nm)**	445 ft-lbs (603 Nm)	685 ft-lbs (929 Nm)
1 in. (25.40 mm)	250 ft-lbs (339 Nm)**	670 ft-lbs (908 Nm)	1030 ft-lbs (1396 Nm)

**The types of bolts and cap screws are identified by head markings as follows:*

Plain Head: regular machine bolts and cap screws.

3-Dash Head: tempered steel high-strength bolts and cap screws.

6-Dash Head: tempered steel extra high-strength bolts and cap screws.

***Machine bolts and cap screws 7/8 inch and larger are sometimes formed hot rather than cold, which accounts for the lower torque.*

Section 20
ENGINE

CONTENTS OF THIS SECTION

Litho in U.S.A.

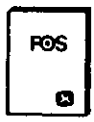
CONTENTS OF THIS SECTION—Continued

Litho in U.S.A.

Group 5
GENERAL INFORMATION AND DIAGNOSIS

GENERAL INFORMATION

The engine is a 4-cylinder valve-in-head, vertical in-line four cycle engine.



For basic theory of engine operation see the FOS Manual 30—ENGINES.

DIAGNOSING MALFUNCTIONS

Will not Start

Fuel System Malfunction—See Section 30
- Foreign matter in fuel
- Improper fuel
- Faulty fuel pump
- Fuel shut off at tank
- Restricted air intake system
- Faulty injection nozzles
- Plugged fuel filter

Electrical System Malfunction—See Section 40
- Corroded or loose battery connections
- Faulty or loose wiring
- Weak battery
- Faulty key switch
- Faulty neutral start switches

Uneven Running or Frequent Stalling

Basic Engine Problem—See This Section
- Improper valve clearance
- Cylinder head gasket leaking
- Valves sticking or burned
- Worn or broken compression rings
- Low compression
- Incorrect timing
- Coolant temperature below normal
- Engine overheating

Fuel System Malfunction—See Section 30
- Low fuel supply
- Restricted fuel lines or filters
- Faulty fuel pump
- Faulty injection pump
- Faulty injection nozzles
- Exhaust system restricted

Engine Misses

Basic Engine Problem—See This Section
- Worn camshaft lobes
- Weak valve springs
- Incorrect valve clearance
- Burned, warped, pitted or sticking valves
- Low compression
- Incorrect timing
- Engine overheating

Fuel System Malfunction—See Section 30
- Air in fuel
- Faulty injection nozzles
- Faulty injection pump
- Water in fuel
- Mixture of gasoline and diesel fuels
- Faulty fuel pump

Lack of Power

Basic Engine Problem—See This Section
- Blown cylinder head gasket
- Worn camshaft lobes
- Incorrect valve clearance
- Burned, warped, pitted or sticking valves
- Weak valve springs
- Incorrect timing
- Low compression
- Wrong oil viscosity
- Coolant temperature above or below normal
- Engine overheating

Fuel System Malfunction—See Section 30
- Plugged fuel filters
- Improper fuel
- Faulty injection pump
- Faulty injection nozzles
- Faulty fuel pump
- Restricted air cleaner
- Restricted exhaust system
- Low intake manifold pressure
- Obstructed fuel line

Power Train Malfunction—See Section 50
- Clutch slipping

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Engine Overheats

Basic Engine Problem—See This Section
- Defective head gasket
- Incorrect timing
- Crankcase oil level low
- Low coolant level
- Radiator or side grille screen dirty
- Loose or broken fan belt
- Faulty thermostat
- Cooling system limed up
- Defective radiator pressure cap
- Faulty water pump

Service Problem—See Section 10
- Engine overloaded
- Crankcase oil level low
- Improper fuel

Fuel System Malfunction—See Section 30
- Excessive fuel delivery

Excessive Oil Consumption

Basic Engine Problem—See This Section
- Restricted oil passage from valve cover
- Worn valve guides or valve stems
- Oil control rings worn or broken
- Scored liners or pistons
- Excessive ring groove wear in piston
- Rings sticking in grooves of piston
- Oil return slots in piston clogged
- Insufficient piston ring tension
- Piston ring gaps not staggered
- Worn crankshaft thrust bearing (misaligned piston and rod)
- Excessive main or connecting rod bearing clearance
- Front or rear crankshaft oil seal faulty
- Crankcase oil too thin
- Oil pressure too high
- Oil level too high

Service Problem—See Section 10
- Crankcase oil too thin
- Oil level too high

Fuel System Malfunction—See Section 30
- Restricted air intake

Excessive Fuel Consumption

Basic Engine Problem—See This Section
- Low compression
- Incorrect timing

Service Problem—See Section 10
- Engine overloaded

Fuel System Malfunction—See Section 30
- Leaks in fuel system
- Restricted air cleaner
- Faulty injection nozzles
- Faulty injection pump

Black or Gray Exhaust Smoke

Basic Engine Malfunction—See This Section
- Incorrect engine timing

Service Problem—See Section 10
- Improper grade of fuel
- Engine overloaded

Fuel System Malfunction—See Section 30
- Excessive fuel delivery
- Restricted air cleaner
- Defective muffler
- Faulty injection nozzles

White Exhaust Smoke

Basic Engine Problem—See This Section
- Low compression
- Incorrect timing

Fuel System Malfunction—See Section 30
- Faulty injection nozzles
- Improper fuel

Slow Acceleration

Fuel System Malfunction—See Section 30
- Faulty injection pump
- Faulty injection nozzles

Engine Noises—General

Regular Clicking Noise
- Incorrect valve clearance

Light Knock or Pound
- Worn bearings
- Misaligned connecting rod
- Lack of oil

Light Double Knock at Idle
- Worn or loose piston pin or bushing
- Lack of oil

DIAGNOSING MALFUNCTIONS—Continued

Chattering or Rattling during Acceleration
- Worn or broken piston rings
- Worn cylinder liners
- Low oil pressure
- Worn main bearings

Hollow, Muffled Bell-Sound—Cold Engine
- Worn pistons
- Worn liners
- Lack of oil
- Misaligned connecting rods

Dull, Heavy Knock Under Load
- Steady noise—worn main bearings
- Irregular noise—worn thrust bearing

Miscellaneous Engine Noises
- Excessive valve clearance
- Worn cam followers
- Bent push rods
- Worn rocker arm shafts
- Worn main or connecting rod bearings
- Foreign material in combustion chamber
- Worn piston pins and pin bushings
- Scored piston
- Incorrect timing
- Excessive crankshaft end play
- Loose main bearing caps
- Worn gears
- Broken oil pump shaft
- Low engine oil level or pressure

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Litho in U.S.A.

Group 10
CYLINDER HEAD, VALVES, CAMSHAFT AND TIMING GEAR TRAIN (2440)

GENERAL INFORMATION

The cylinder head holds the rocker arm assembly, valve springs and valves. Valve guides and seats are integral with the head.

Valves are equipped with springs, spring retainers, retainer locks and replaceable wear caps.

The camshaft is driven at 1/2 engine speed by the crankshaft through the top idler gear. The camshaft has an eccentric lobe to actuate the fuel pump.

The timing gear train consists of upper and lower idler gear assemblies and balance shafts. The idler gears receive power from the crankshaft gear and, in turn, power the camshaft, injection pump, engine oil pump, and right-hand balancer shaft gears. The left-hand balancer shaft gear is driven by the engine oil pump gear.

DIAGNOSING MALFUNCTIONS

Sticking Valves

Carbon deposits on valve stems
Worn valve guides
Warped valve stem
Cocked or broken valve springs
Worn or distorted valve seats
Insufficient lubrication

Burned, Pitted, Worn, or Broken Valves

Worn or distorted valve seats
Worn valve guides
Insufficient cooling
Insufficient lubrication
Cocked or broken springs
Pre-ignition
Detonation
Improper engine operation
Improper valve clearance
Improper valve gear train timing
Warped or distorted valve stems
"Stretched" valves due to excessive spring tension
Distorted cylinder head
Bent push rods
Carbon build-up on valve seats
Rocker arm failure

Worn, Warped, or Distorted Valve Guides

Lack of lubrication
Cylinder head distortion
Excessive heat
Unevenly tightened cylinder head bolts

Distorted Cylinder Head and Cylinder Head Gasket Leakage

Improper cylinder head torque
Improper gasket installation
Excessive oil pressure
Improper cylinder liner height above block

Worn or Broken Valve Seats

Misaligned valves

Distorted Cylinder Head

Carbon Deposits on Seats Due to Incomplete Combustion

Valve spring tension too weak
Excessive heat
Improper valve timing
Improper valve clearance

Camshaft Failures

Scored camshaft lobes due to inadequate lubrication
Excessive end play due to thrust plate wear
Broken or warped camshaft due to improper timing

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PRELIMINARY VALVE TRAIN CHECKS

Check condition of visible valve train parts for indication of malfunctions.

Prior to cylinder head removal, inspect and check engine operation.

Checking Valve Clearance

Intake valve clearance is 0.014 inch (0.35 mm). Exhaust valve clearance is 0.018 inch (0.46 mm).

Checking Valve Lift

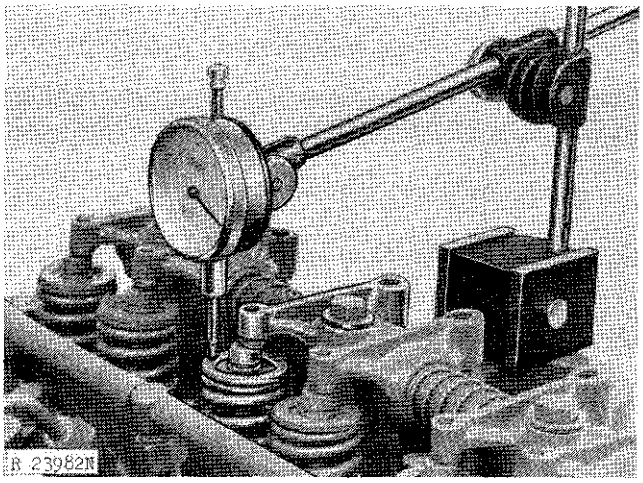


Fig. 1-Checking Valve Lift

Before removing cylinder head, check valve lift. Measuring valve lift can give an indication of wear to cam lobes, cam followers, and push rods. Valves should be adjusted to proper clearance.

Place dial indicator on valve spring cap. Manually rotate engine in running direction with JD-281 Engine Rotation Tool. When rocker arm contacts valve stem, check dial indicator travel as rocker arm moves valve to full open. Indicator should read 0.460 to 0.480 inch (1.168 to 1.220 cm) on intake valves and 0.456 to 0.482 inch (1.158 to 1.224 cm) on exhaust valves. If lift is less than 0.430 inch (1.092 cm) on intake valves and 0.426 inch (1.082 cm) on exhaust valves, camshaft should be replaced.

CYLINDER HEAD AND VALVES

Removal

Remove battery ground cable.

The engine need not be removed to service the cylinder head and its related parts.

Drain cooling system and remove all parts that are connected to the cylinder head.

Disconnect fuel injection lines and identify. Remove injection nozzles as directed in Section 30. Plug all fuel lines to prevent fuel system contamination.

Identify all parts during removal for reassembly.

NOTE: Do not rotate crankshaft with cylinder head removed unless all cylinder liners are secured with cap screws and washers.

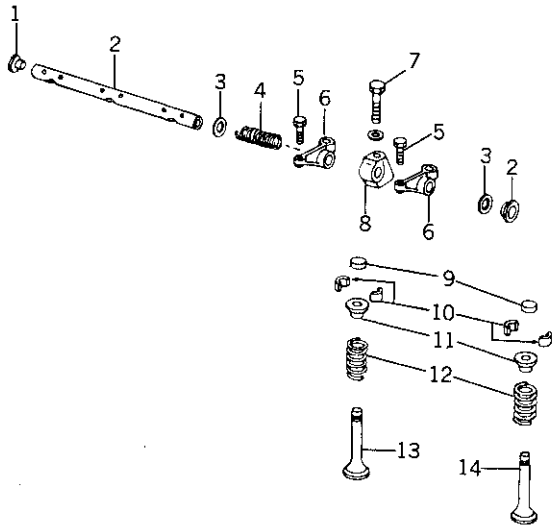
Remove spring washers (3, Fig. 2) and plugs (1) from rocker arm shaft. Slide parts from shaft and identify for reassembly.

Remove wear caps (9), spring retainers (10), retainer locks (11), springs (12), and valves (13 and 14). Identify each valve for reassembly.

Repair

Valve Springs

Inspect valve springs (12) for alignment, wear and damage. Place springs on a flat surface to see that they are square and parallel. Do not use springs that are cocked, crooked or contain broken or rusty coils.



1—Plug (2 used)
2—Rocker Arm Shaft
3—Washer (2 used)
4—Spring (3 used)
5—Adjusting Screw (8 used)
6—Rocker Arm (8 used)
7—Cap Screw (4 used)
8—Clamp (4 used)
9—Wear Cap (8 used)
10—Retainer Lock (16 used)
11—Retainer (8 used)
12—Valve Spring (8 used)
13—Intake Valve (4 used)
14—Exhaust Valve (4 used)

Fig. 2-Valves and Rocker Arm Assembly