5020
Tractor

JOHN DEERE

TECHNICAL MANUAL

5020
Tractor

TM1022 (01JAN73) English

John Deere Tractor
TM1022 (01JAN73)

LITHO IN U.S.A.
ENGLISH

5020 TRACTOR
TECHNICAL MANUAL
TM-1022 (JAN-73)

CONTENTS

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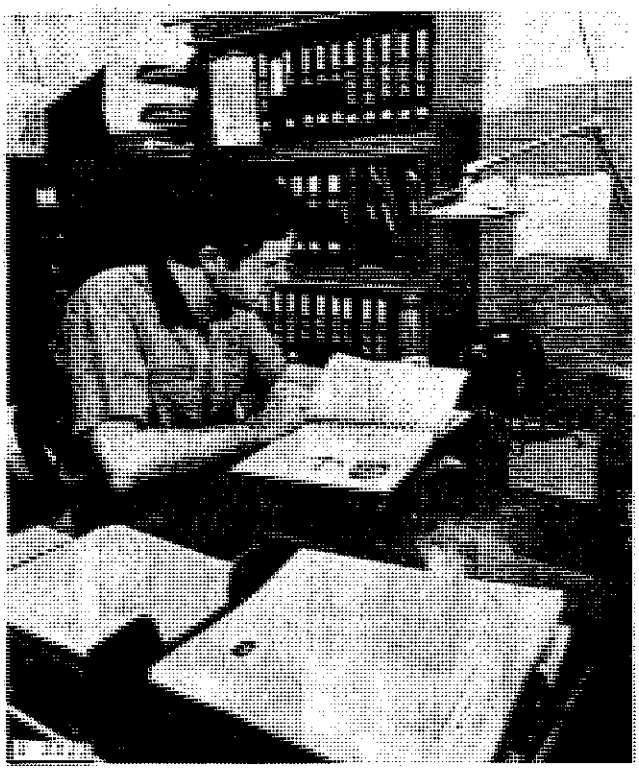
INTRODUCTION



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 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.

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—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.

⚠ 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

PTO HORSEPOWER (Official Test): 141.34 hp.

ENGINE:
- Type . . . 6-cylinder, in-line, valve-in-head
- Bore and stroke . . . . . 4-3/4 in. x 5 in.
- Displacement . . . . . 531 cu. in.
- Compression ratio . . . . . 16.5 to 1
- Firing order 1-5-3-6-2-4
- Valve clearance . . . . . Intake-0.018 in. Exhaust-0.028 in.
- Injection pump timing . . . . . TDC
- Engine Speeds:
  - Slow idle . . . . . 800 rpm
  - Working range . . . . . 1500 to 2200 rpm
  - Maximum transport speed . . . 2500 rpm

LUBRICATION SYSTEM: . . Full pressurized with full-flow micronic oil filter, water cooled oil cooler, and bypass valves for filter and cooler

FUEL SYSTEM:
- Type . . . . . Direct injection
- Filters . . . . . Two-stage with replaceable impregnated paper elements
- Injection pump type . . . . . Inlet metering, distributing type
- Air cleaner . . . . . Dry type

COOLING SYSTEM:
- Type . . Pressurized with centrifugal pump, engine temperature control, two heavy-duty thermostats

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CAPACITIES:
- Fuel tank . . . . . 68 U.S. gals.
- Crankcase (with filter change) . 20 U.S. qts.
- Transmission-hydraulic system 16 U.S. gals.
- Cooling system (add 2 qts. for cab heater) . . . . . 33 U.S. qts.

TRANSMISSION:
- Type . . . . . Syncro-Range, constant mesh
- Clutch . . . . . Heavy-duty, two 12 in. plate, foot operated
- Gear selections . . 8 forward and 2 reverse
- Shifting . . . . . 4 stations, synchronized shifting within stations

POWER TAKE-OFF:
- Type . . . . . Independent, rear
- Clutch. . . . Wet disk, hydraulically actuated
- Speed (1900 engine rpm) . . . . . 1010 rpm
- PTO ahead of drawbar hitch point . . 16 in.

HYDRAULIC SYSTEM:
- Type . . . Closed center, constant pressure. Includes power steering, power brakes and implement control
- Standby pressure . . . . . 2250 psi

BRAKES . . . . . Hydraulically power actuated, disk-type operating in oil. Provision for manual operation with brake accumulator to supply oil

STEERING . . . . Full power, hydrostatic type. Provision for manual operation

ELECTRICAL SYSTEM:
- Type . . . . . 12-volt, negative ground
- Batteries . . . . . Two 6-volt, 87-plate, 204 ampere-hour group 6T3A, tractor-type, connected in series
- Alternator . . . . . 12-volt, 55-amp, with integral transistorized regulator . . . . . Tractors with air conditioned cabs, 12-volt, 72-amp, with integral or separate regulator (depending on serial number)

FRONT TIRES:*
- Standard 11.00-16, 8-ply
- Row-Crop 9.50-20, 8-ply

REAR TIRES:*
- Standard 24.5-32, 10-ply
- Row-Crop 18.4-38, 12-ply

FRONT WHEEL TREAD:
- Fixed tread . . . . . 69 or 71 in.
- Adjustable tread (11.00-16 tires). 68 to 80 in.

REAR WHEEL TREAD:
- Standard:
  - 24.5-32 tire . . . . . 70 to 82 in.
  - 18.4-34 tire (dual) . . . . . 68 and 112 in.
  - 18.4-38 tire (dual) . . . . . 65 to 120 in.
- Row-Crop:
  - 18.4-38 tire . . . . . 60 to 120 in.
  - 24.5-32 tire . . . . . 70 to 112 in.

GROUND SPEEDS IN MILES PER HOUR (1900 engine rpm with 24.5-32 tires)
- 1st 1.7
- 2nd 2.6
- 3rd 3.5
- 4th 4.5
- 5th 5.6
- 6th 7.3
- 7th 9.4
- 8th 15.4
- 1st reverse 3.4
- 2nd reverse 5.4

DIMENSIONS:
- Standard (Fixed tread front axle):
  - Wheel base . . . . . 104 in.
  - Over-all length . . . . . 172.3 in.
  - **Over-all height . . . . . 98.3 in.
  - Height to steering wheel . . . . . 82.4 in.
  - Width . . . . . Regular wheel, 95.8 in.
  - Drawbar clearance . . . . . 16 in.
  - Turning radius . . . . . 12 ft. 6 in.
- Row-Crop (81.5-inch tread front axle):
  - Wheel base . . . . . 102 to 106 in.
  - Over-all length . . . . . 172.3 in.
  - **Over-all height . . . . . 98.3 in.
  - Height to steering wheel . . . . . 82.4 in.
  - Over-all width . . . . . 108.4 in.
  - Turning radius . . . . . 13 ft.

SHIPPING WEIGHT (With equipment for average field service, less fuel and ballast). Add 575 lbs. if equipped with Roll-Gard.
- Standard . . . . . 15,600 lbs.
- Row-Crop . . . . . 14,480 lbs.

Additional tire sizes available.

***Tractors with Air Conditioned Cab and 20.8-38 tires . . . . . 119.6 in.*

Tractors with Cab and without Air Conditioning (20.8-38 tires) . . 117.6 in.

(Specifications and design subject to change without notice.)

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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.

Tractors shipped from the factory with the alternator completely disconnected require an AR47860 Auxiliary Ignition Battery Kit to supply power for the fuel shutoff solenoid. The adapter on the battery harness kit plugs into the cigar lighter. Be sure to read the instructions attached to the tractor before starting the engine.

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	Specifications	Reference
Check radiator for coolant loss and antifreeze protection.	1-1/2 inches above baffle.	. . . . .
Reduce shipping pressure of tires. . .	. . . . .	Operator's manual
Cover tractor and tires for protection and cleanliness.	. . . . .	. . . . .

BEFORE DELIVERING TRACTOR

Electrical System		
Install electrolyte and charge batteries.	. . . . .	FOS-20
Punch date code on battery tag.	. . . . .	. . . . .
Connect alternator. Do not attempt to polarize.	. . . . .	Section 40, Group 10
Install light switch knob.	. . . . .	. . . . .
Clean terminals and connect battery cables.	. . . . .	Section 40, Group 5
Check alternator belt adjustment. . .	1-inch deflection, 20 lb. force. .	Operator's manual

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BEFORE DELIVERING TRACTOR—Continued

Service	Specifications	Reference
Cooling System		
Inspect radiator for coolant loss. . . .	1-1/2 inches above baffle.	. . . . .
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 retainer cap screws for tightness.	Front hub bolts - 100 ft-lbs Rear hub bolts - 300 ft-lbs Rim clamp nuts - 170 ft-lbs	. . . . .
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. Type 303 Special-Purpose Oil.	Operator's manual
Lubricate grease fittings.	SAE multipurpose-type grease.	Operator's manual
Engine		
Check air cleaner.	. . . . .	Operator's manual
Fill fuel tank and start engine.	Capacity - 68 U.S. gallons . . .	Operator's manual
Check operation of gauges and indicator lamps.	. . . . .	Operator's manual
Check speed control linkage for free operation.	. . . . .	Section 30, Group 10
Check engine idle speeds.	. . . . .	Section 30, Group 10
Operation		
Shift transmission through all speeds.	. . . . .	Operator's manual
Check transmission clutch operation.	Clutch pedal free travel should be 1-1/2 inches.	Operator's manual
Check power take-off operation.	. . . . .	Operator's manual
Check differential lock operation. . .	. . . . .	Operator's manual
Check hydraulic system operation: Rockshaft, steering, remote cylinder, and brakes.	. . . . .	Operator's manual

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BEFORE DELIVERING TRACTOR—Continued

Service	Specifications	Reference
Check 3-point hitch operation.	. . . . .	Operator's manual
Check seat operation	. . . . .	Operator's manual
Check cab pressurizer and windshield wiper operation, air conditioner and heater system operation (if equipped)	. . . . .	Operator's manual
Adjust headlights and check operation.	. . . . .	Operator's manual
General		
Adjust air conditioner drive belt tension.	1-inch deflection, 25 lb. force. .	Operator's manual
Tighten accessible nuts and cap screws.	. . . . .	. . . . .
Clean tractor and touch up paint. . . .	. . . . .	. . . . .

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.

Many complaints have arisen simply because the owner was not shown how to operate and service his new tractor properly. Enough time should be devoted, at the customer's convenience, to introducing the owner to his new tractor and explaining to him how to operate and service it.

The following procedure is recommended before the serviceman 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.
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 him the operator's manual.

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AFTER-SALE INSPECTION

The purchaser of a new John Deere tractor is entitled to a free inspection at some mutually agreeable time 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 customer's John Deere Delivery Receipt.

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.

If the recommended after-sale service inspection is followed, the dealer can eliminate needless 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 sale of other new equipment.

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

INSPECTION PROCEDURE

Service	Specifications	Reference
Cooling System		
Check radiator coolant level.	1-1/2 inches above baffle. . . .	. . . . .
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 clean it if necessary.	. . . . .	Operator's manual
Electrical System		
Check specific gravity and electrolyte level of batteries.	Full charge - 1.260 at 80° F.	Operator's manual
Check belt tension.	1-inch deflection with a 20-pound force.	Operator's manual
Start engine and check operation of starter, lights, and indicator lamps . .	. . . . .	Operator's manual

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INSPECTION PROCEDURE—Continued

Service	Specifications	Reference
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 Type 303 Special-Purpose Oil.	Operator's manual
Engine		
Check valve clearance.	Intake - 0.018 inch. Exhaust - 0.028 inch.	Operator's manual
Check engine speed under load, fuel consumption, and horsepower. . . .	Specification.	Group 15 of this Section
Clutches and Differential Lock		
Check transmission clutch free travel	Approximately 1-1/2-inch free travel.	Operator's manual
Check PTO clutch and brake operation.	. . . . .	Section 50, Groups 35 and 40
Check differential lock operation. . .	. . . . .	Operator's manual
Hydraulic System		
Check rockshaft and remote cylinder operation.	. . . . .	Operator's manual
Check power steering.	Smooth, easy operation. . . .	Section 70, Group 20
Check power brakes and accumulator.	The accumulator should supply oil to each brake for at least 20 applications at 5 second intervals after the engine has been stopped for 15 minutes, when applied individually.	Operator's manual
Cab		
Check operation of cab controls.	. . . . .	Operator's manual
Check air conditioning compressor drive belt tension.	1-inch deflection, 25-lb force. .	Operator's manual
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 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 - 2200 engine rpm or 1170 PTO rpm	Compare with previous recorded output record and compare with output after tune-up	FOS 30 Manual, Chapter 12
Compression Test	375 - 400 psi at cranking speed	FOS 30 Manual, Chapter 12
Vapor Flow Test (average engine condition)— Conduct compression test if blowby is excessive.	Normal Blowby - 100 to 170 cu. ft./hr. Excessive Blowby - 300 cu. ft./hr.	FOS 30 Manual, Chapter 12
Engine Coolant Check Test	No air bubbles or oil film in radiator	FOS 30 Manual, Chapter 12

ENGINE TUNE-UP

Air Intake System		
Service air cleaner and check system for leaks	. . . . .	FOS 30 Manual, Chapter 12
Check system for restrictions using water manometer (inches of water)	. . . . .	FOS 30 Manual, Chapter 12
Normal reading (with clean filter elements)	12-14 in. at 2200 rpm	. . . . .
Maximum permitted reading	25 in. at 2200 rpm	. . . . .
Check restriction indicator light operation	24-26 in. at 2200 rpm	. . . . .
Exhaust System		
Check system for leaks	. . . . .	FOS 30 Manual, Chapter 12
Check for restricted muffler or exhaust pipe	. . . . .	FOS 30 Manual, Chapter 12
Crankcase Ventilating System		
Check system for restrictions	. . . . .	FOS 30 Manual, Chapter 12
Cooling System		
Clean grille screen, radiator core, and oil cooler core	. . . . .	20-30
Clean and flush system, check thermostat	. . . . .	20-30
Check pressure cap	6.25 to 7.50 psi release pressure	20-30

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ENGINE TUNE-UP—Continued

Operation	Specification	Section-Group Reference
Cylinder Head and Valves		
Torque cap screws	180 ft-lbs in sequence	20-10
Set valve clearance	Intake, 0.018 in. Exhaust, 0.028 in.	20-10
Diesel Fuel System:		
Check fuel tank for water		30-10
Check fuel pump pressure	3-1/2 to 4-1/2 psi	30-10
Clean sediment bowls and change filter		30-10
Service injection nozzles		30-10
Injection Pump (AR46386):		
Service and check timing	TDC 2° advance at 1300 rpm (no load); 5°± 1/2° advance at 2500 rpm (no load); 4° advance at 1900 rpm (full load); 5°± 1/2° advance by 2500 rpm (full load)	30-10 30-10
Adjust throttle linkage (PTO shaft speeds given in parentheses)	Hand - 2150 (1144) rpm idle speed, 1900 load speed Hand - 800 (426) rpm slow idle speed Hand - 2400 (1277) rpm idle speed, 2200 load speed Foot - 2650 (1410) rpm idle speed, 2500 load speed	30-10
Check engine oil pressure	25 - 35 psi (1900 rpm)	20-25
Charging System:		
Check battery specific gravity	1.240 - 1.260	40-10
Check battery water consumption and electrolyte level		40-10
Clean battery, cables, and box		40-10
Check alternator belt tension	20 lbs. at 1 in. belt deflection	40-10
Check alternator output	55 amp alternator - 45 amps at 1440 engine rpm and 13 to 15 volts 72 amp alternator - 65 amps at 1400 engine rpm and 13 to 15 volts	40-10
Check alternator regulated voltage	14.2 - 1[illegible]6 volts (operating)	40-10
Starting System:		
Check start-safety switch operation		40-15
Check starter current draw	Approximately 525 amps	40-15
Check battery voltage when starting	Min. 9 volts (cranking)	40-15
Check operation of alternator, oil pressure and indicator lights		40-20

FINAL ENGINE TESTING

Dynamometer	Compare with previous recorded output and file for future reference.	20-5

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TRACTOR TUNE-UP

Operation	Specification	Section-Group Reference
Adjust transmission clutch free travel . . .	1-1/2 in.	50-5
Transmission:		
Check shifting	. . . . .	50-10 & 20
Check for proper operation without excessive noise	. . . . .	50-10 & 20
Power Take-Off:		
Check engagement feel.	. . . . .	50-25
Check for excessive noise	. . . . .	50-25
Check differential lock operation	420 - 525 psi	50-15
Check brake pedal travel and even position.	3 inches maximum pedal travel for 20 applications (each brake pedal) at 5 second intervals, when applied individually	70-25
Check front wheel bearing adjustment and lubrication	35 ft-lbs, loosen to hole	. . . .
Check front wheel toe-in	1/8 - 3/8 in.	. . . .
Check tire inflation	. . . . .	. . . .
Hydraulic system pressures, flow rates, or cycle times are for conditions specified in Section 70 (tractor at operating temperature, transmission-hydraulic oil at 140°F. to 160°F., proper test equipment, correct test sequence, etc.).		
Transmission pump	5 gpm minimum at 1900 engine rpm	70-5
Main hydraulic pump	2200 - 2300 psi (standby) 22 gpm at 2000 psi and 1900 rpm	70-5
Pressure control valve	1650 - 1700 psi at 800 rpm (approximately 10 gpm flow)	70-5
Rockshaft:		
Lift cycle time (75 degrees rotation) . . .	2.7 - 3.0 seconds at 1900 rpm	70-30
Lever position (depth control)	Full raise (lever leading edge at 0 on quadrant)	70-30
Lever position (load control)	Complete raise (control lever leading edge at 1-1/2 on quadrant)	70-30
	Complete lower (control lever leading edge at 2-1/2 on quadrant)	70-30
Selective control valve	3 to 18 gpm at 1200 psi and 1900 rpm	70-35

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Group 20
LUBRICATION

GENERAL INFORMATION

Carefully written and illustrated instructions are included in the tractor operator's manual. Remind your customer to follow the recommendations in these instructions.

For your convenience, the following chart showing capacities and type of lubricant for the various components has been included. Additional lubrication information is on page 20-2.

Component	Capacity	Type of Lubricant	Interval of Service
Engine Crankcase	20 U.S. quarts (includes filter)	See "Engine Lubricating Oil" on page 20-2	10 Hours - Check level 100 Hours - Change oil 200 Hours - Replace filter
Transmission and Hydraulic System	16 U.S. gallons	John Deere Type 303 Special-Purpose Oil	200 Hours - Check level 600 Hours - Replace filter 1200 Hours - Change oil
Front Wheel Bearings	. . . . .	Wheel Bearing Grease	1200 Hours - Repack bearings
Grease Fittings	. . . . .	John Deere Multi-Purpose Lubricant or its equivalent	See Operator's Manual

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LUBRICANTS

ENGINE LUBRICATING OILS

X3377

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

If Torq-Gard or 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-L2104C
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.

Air Temperature	John Deere Torq-Gard Oil	Other Oils: Single Viscosity Oil	Other Oils: Multi-Viscosity Oil
Above 32° F.	SAE 30	SAE 30	Not recommended
-10° F. to 32° F.**	SAE 10W-20	SAE 10W	SAE 10W-30
Below -10° F.	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. or lower for several hours.*

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

TRANSMISSION HYDRAULIC OILS

Use only John Deere Type 303 Special-Purpose 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 may be used in all weather conditions.

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.

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Group 25
SEPARATION

REMOVING ROLL-GARD CAB

GENERAL INFORMATION

When the tractor is equipped with a Roll-Gard cab, it may be necessary to remove the cab in order to service tractor. Individual service requirements will dictate whether the serviceman will remove cab panels or remove the complete cab. For example, to remove the rockshaft housing, it is necessary only to remove the covers over the housing. However, service of the differential or final drives will require complete cab removal.

TRACTORS WITH HINSON CAB

Disconnect battery ground cable. Disconnect cab wiring at connectors on dimmer switch harness, and from circuit breakers located on control support rear panel. Disconnect wiring from headlight dimmer switch.

Remove cab floor mat, platform, floor panels, side shields, operator shields, and front panels.

Remove perforated foam insulation from cab panels over rockshaft housing inside cab. Remove rear panels (Fig. 2).

On tractors with air conditioning, loosen the compressor drive belt, and remove the compressor (Fig. 4) with refrigerant hoses connected to the compressor. Bend hoses so that the unit can be placed inside the cab or fastened to the cab. Do not disconnect the refrigerant hoses unless absolutely necessary.

⚠ CAUTION: Whenever the refrigerant hoses are to be disconnected, first discharge the compressor or the complete system as explained in SM-2089 (Tractor Air Conditioning and Heating Systems) under DISCHARGING THE SYSTEM. Follow all safety precautions listed in the manual to avoid personal injury.

On tractors with a heater, drain a sufficient amount of coolant from the cooling system, and disconnect the heater hoses from the engine.

Attach cab lifting bracket (Fig. 15) to cab.

If lifting bracket is not available, use two chains, fastening one chain to front and rear lifting straps on the left-hand side of cab, and the other chain to the front and rear lifting straps on the right-hand side. Connect both chains to JDG-1 engine lift sling.

IMPORTANT: Chains should be at least 5-ft. long to permit as vertical a pull as possible from each lifting strap.

Remove the cab front and rear mounting bolts (Figs. 1 and 2). Lift cab from tractor.

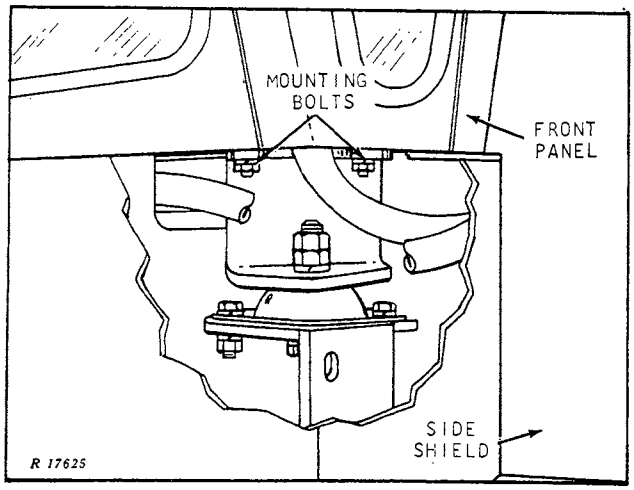

Fig. 1–Front Mounting Bolts and Panels

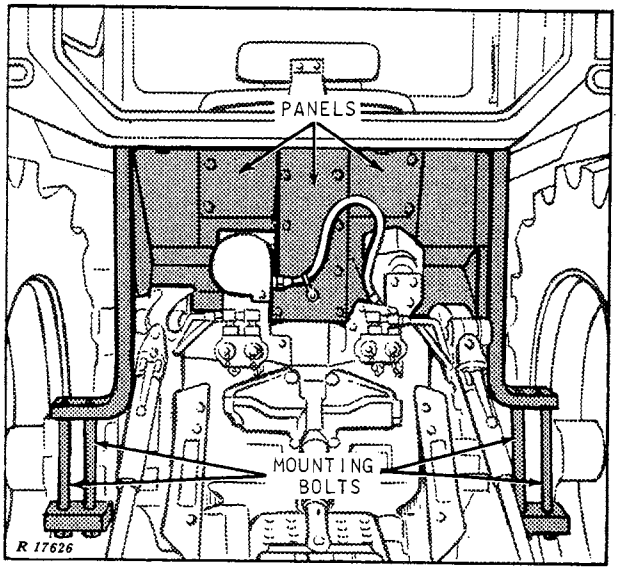

Fig. 2–Rear Mounting Bolts and Panels

TRACTORS WITH STOLPER CAB

Remove floor mats and pads, cab floor panels, front cowl panel, and rockshaft covers (Fig. 3).

Disconnect the battery ground cable.

Disconnect cab wiring harness (refer to WIRING DIAGRAMS, Sect. 40), under right-hand side of cab.

On cabs equipped with a heater, drain the cooling system and disconnect heater hoses from connections on right-hand side panel inside cab.

Air conditioned cabs will require removal of air conditioning compressor. Loosen drive belt and remove from compressor pulley. Remove

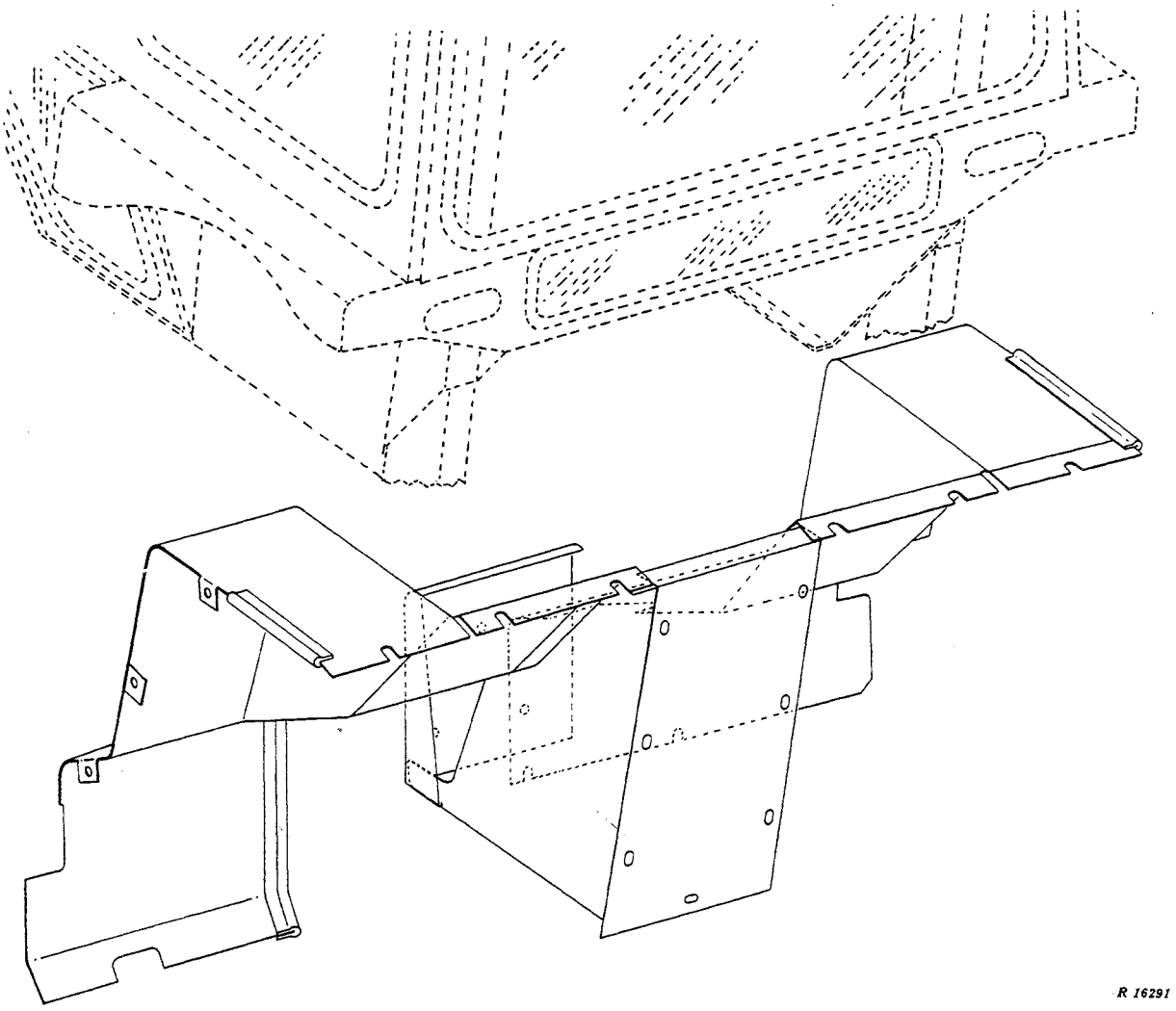

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Fig. 3–Roll-Gard Cab Cover Panels

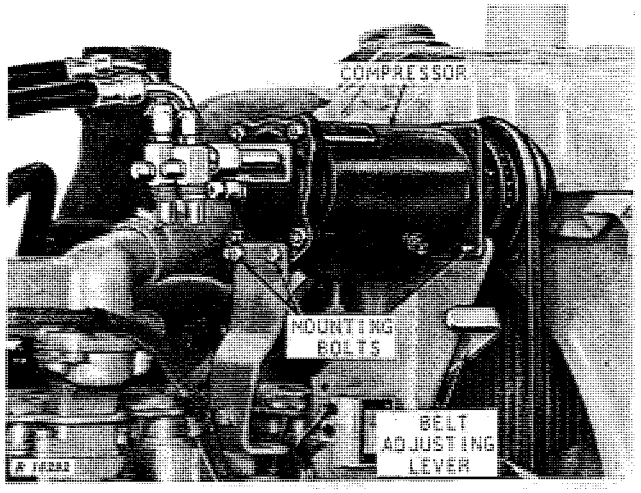

Fig. 4–Compressor Mounting

compressor (with refrigerant hoses attached) from engine and bend hoses so that the unit can be placed inside the cab or fastened to the cab. Do not disconnect the refrigerant hoses unless absolutely necessary.

CAUTION: Whenever the refrigerant hoses are to be disconnected, first discharge the compressor or the complete system as explained in SM-2089 (Air Conditioning and Heating Systems) under DISCHARGING THE SYSTEM. Follow all safety precautions listed in the manual to avoid personal injury.

Remove the bolts attaching the Roll-Gard frame to the rear axle housings.

Lift cab from tractor (Fig. 14).

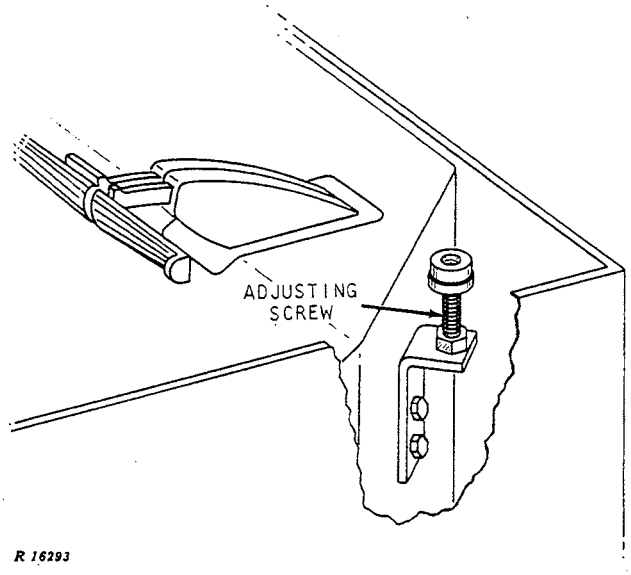

Fig. 5–Front Adjusting Screw and Bracket

INSTALLING ROLL-GARD CAB

When installing Stolper cab on tractor, be sure to properly align cab with cowl by using the front adjusting screws (Fig. 5) before tightening Roll-Gard frame to rear axle. Use of shims may be required to secure a satisfactory installation.

Reverse the removal steps. Tighten the Roll-Gard-to-axle housing bolts and the compressor drive belt (on air conditioned cabs) to specifications.

After the cab panels and extensions are in place, seal all holes and openings with tape, foam material, or sealant before installing floor pads and mats. Careful sealing of holes must be done for the pressurizer to be effective in keeping out dust and dirt.

Install floor pads and mats.

SEPARATING ENGINE FROM TRACTOR FRONT END

Close the fuel shut-off valve, and drain engine cooling system. Remove side shields, grille screens, left-hand operator's shield, prescreener, muffler, cowl, and hood.

Disconnect batteries (system is negative ground).

Remove tractor steps and disconnect hydraulic pump oil seal drain tube.

1. Refer to Fig. 6 and disconnect right-hand steering cylinder pipe and hydraulic pressure pipe at fittings before the engine oil cooler.

2. Disconnect fuel inlet pipe at fuel pump.

3. Disconnect right-hand steering cylinder from frame bracket.

4. Remove hydraulic pump drive coupler and loosen pump support from engine.

5. Disconnect fuel gauge sender and remove fuel leak-off pipe.

6. Remove upper water hose.

7. Remove radiator brace.

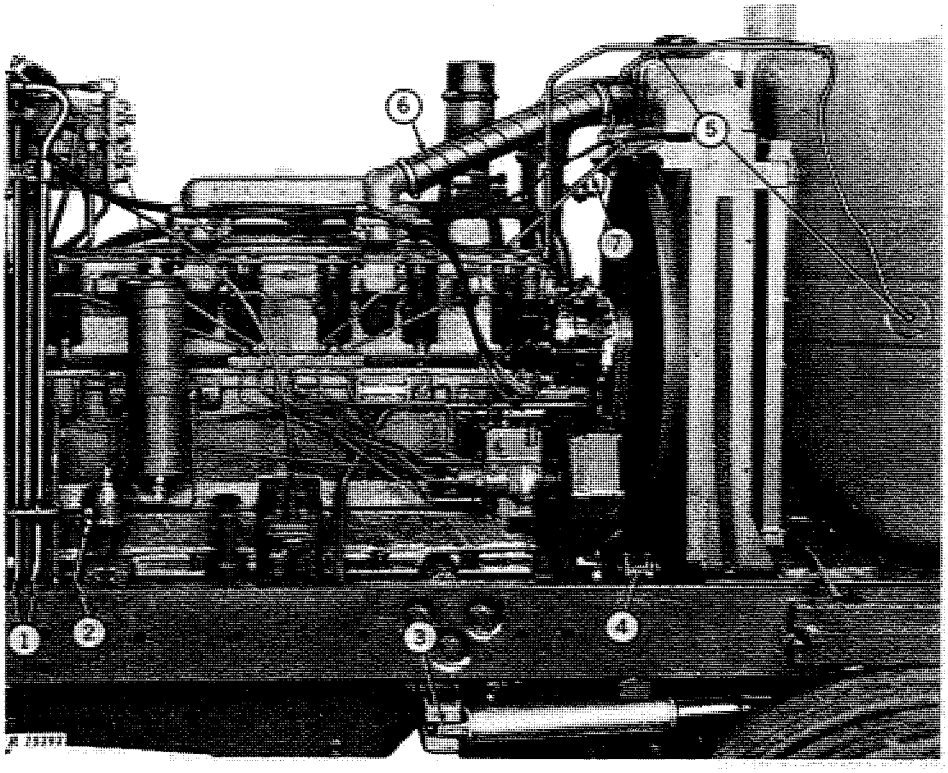

Fig. 6–Separation Procedures on Right-Hand Side

8. Disconnect air indicator switch and remove harness from clip on radiator (Fig. 7).

9. Remove air intake pipe.

10. Remove lower water hose.

11. Loosen hose clamp on hydraulic return pipe and remove clamp. Remove cap screw securing battery compartment to frame.

12. Disconnect left-hand steering cylinder from frame bracket.

13. Remove center section of left-hand steering pipe.

14. Disconnect hydraulic pump inlet pipe and remove clamps.

Install JDG-2C front support stand. If tractor has front weights, place blocking under weights to prevent tipping or install JDG-7 lift bracket and place blocking under bracket. Install wedges between front end and side frames for added stability.

Install engine lift sling with portable hoist.

Remove cap screws securing side-frame-to-steering cylinder brackets and side-frame-to-clutch housing. Move engine and rear of tractor away from front end.

ASSEMBLING ENGINE AND TRACTOR

Move tractor together. Do not use excessive force or bend hydraulic piping.

Tighten side-frame-to-steering cylinder brackets, side-frame-to-clutch housing, hydraulic pump support, and hydraulic pump drive coupler cap screws to specified torque.

Remove front support stand, lift sling, blockings, and wedges. Connect oil seal drain tube.

Reverse the numbered separation procedures.

Fill the engine cooling system and open fuel shut-off valve. Connect batteries.

Check engine and transmission oil levels.

Start the engine, check for leaks, and bleed the steering system.

Install sheet metal, muffler, pre-screener, and steps.

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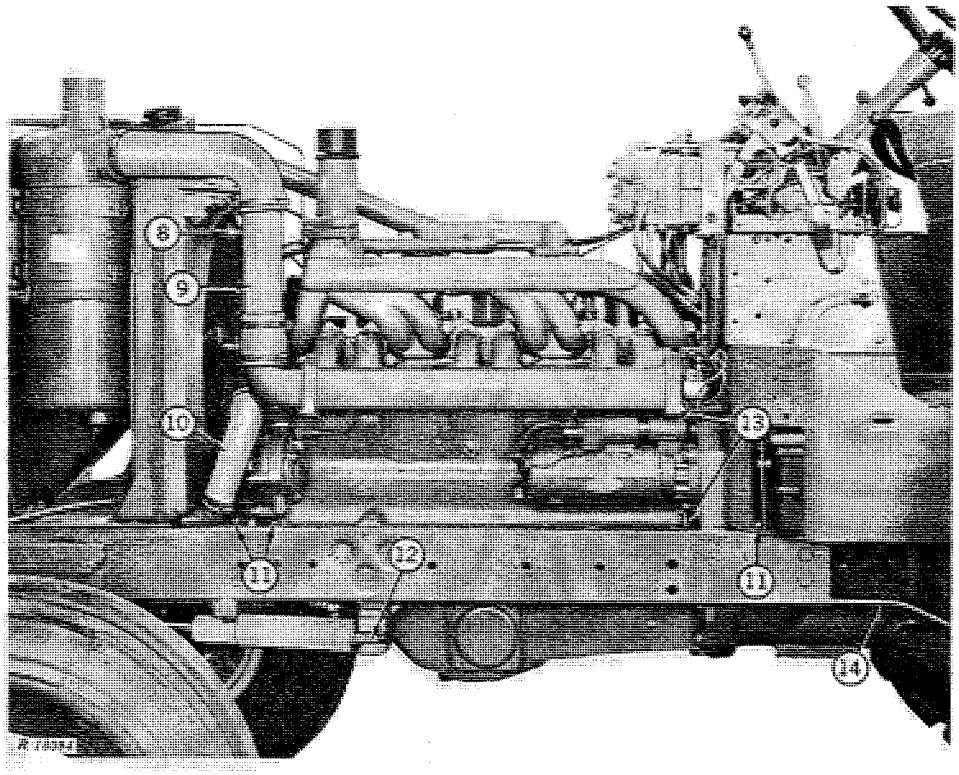

Fig. 7–Separation Procedures on Left-Hand Side

REMOVING ENGINE

Separate engine from tractor front end as previously instructed.

1. Disconnect and remove starter.

2. Remove starter circuit relay and circuit breaker support from intake manifold.

3. Disconnect ether aid pipe.

4. Remove engine temperature bulb from engine.

5. Disconnect tachometer cable.

6. Disconnect wire from oil pressure switch.

7. Disconnect alternator harness from main harness at the control support.

8. Disconnect speed control rod from arm.

9. Place blocking under clutch housing and rear half of tractor.

10. Remove cap screws securing engine-to-clutch housing and remove engine.

INSTALLING ENGINE

Install the engine to the clutch housing (never use excessive force). Tighten cap screws to specified torque.

Reverse the separation procedures as outlined under REMOVING ENGINE and SEPARATING ENGINE FROM TRACTOR FRONT END.

Fill the engine cooling system and open fuel shut-off valve. Connect batteries.

Check engine and transmission oil levels.

Start the engine, check for leaks, and bleed the steering system.

Install sheet metal, muffler, and pre-screener.

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SEPARATING ENGINE FROM CLUTCH HOUSING

Drain engine cooling system.

Remove side shields, grille screens, left-hand operator's shield, muffler, pre-screener, cowl, and hood.

Disconnect batteries (system is negative ground).

Remove tractor steps.

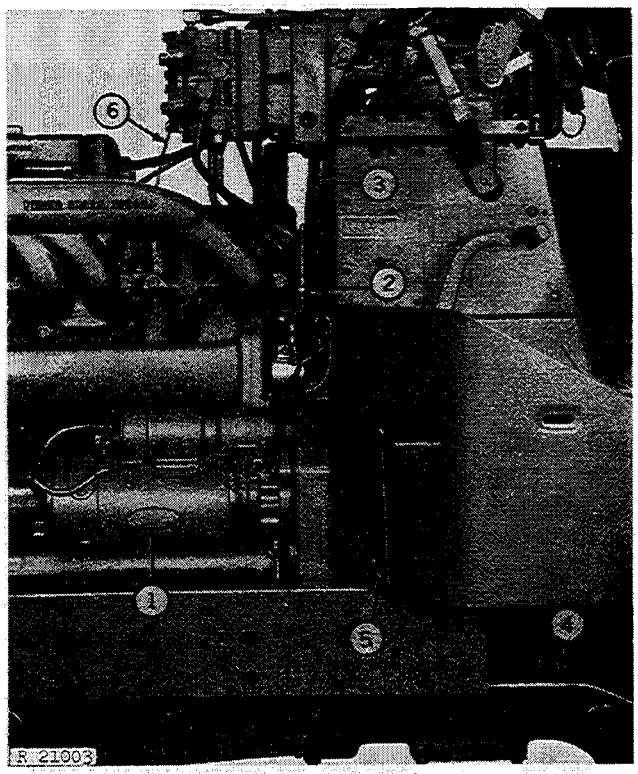

Fig. 8–Separation Procedures on Left-Hand Side

1. Disconnect and remove starter (Fig. 8).

2. Disconnect center section of left-hand steering pipe.

3. Disconnect ether aid pipe.

4. Disconnect main hydraulic pump inlet pipe at the oil filter relief valve housing. Allow oil to drain back from the oil cooler.

5. Remove cap screw securing battery compartment to frame.

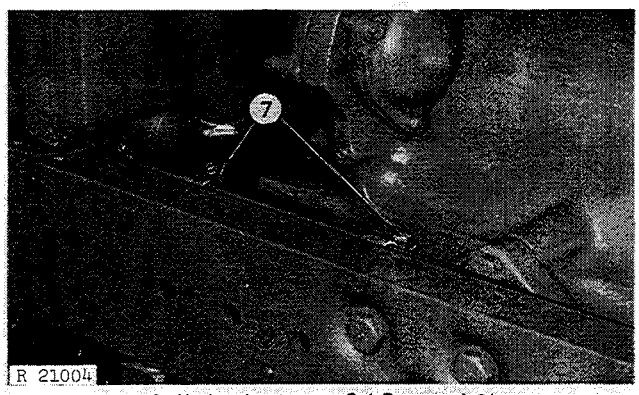

Fig. 9–Hydraulic Return Oil Pipe and Clamp

6. Remove engine temperature bulb from engine.

7. Disconnect hydraulic system return oil pipe and clamps (Fig. 9).

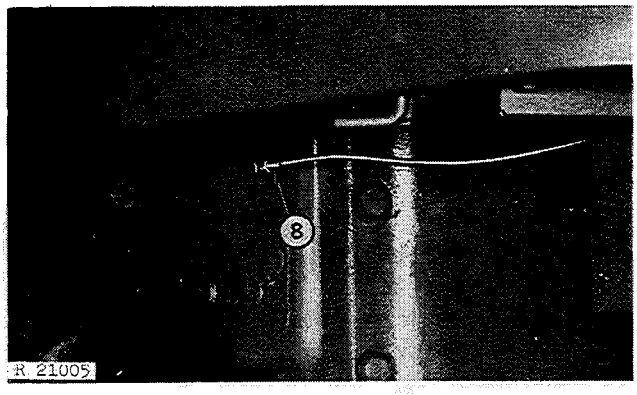

Fig. 10–Hydraulic Pump Oil Seal Drain Tube

8. Disconnect hydraulic pump oil seal drain tube (Fig. 10).

9. Disconnect tachometer cable (Fig. 11).

10. Disconnect speed control rod from arm.

11. Disconnect hydraulic pressure pipe, and remove crankcase breather pipe.

12. Disconnect alternator harness from main harness at the control support.

13. Disconnect right-hand steering pipe from steering valve. Remove clamp and disconnect right-hand steering pipe at coupling below engine oil cooler. Remove upper section of right-hand steering pipe.

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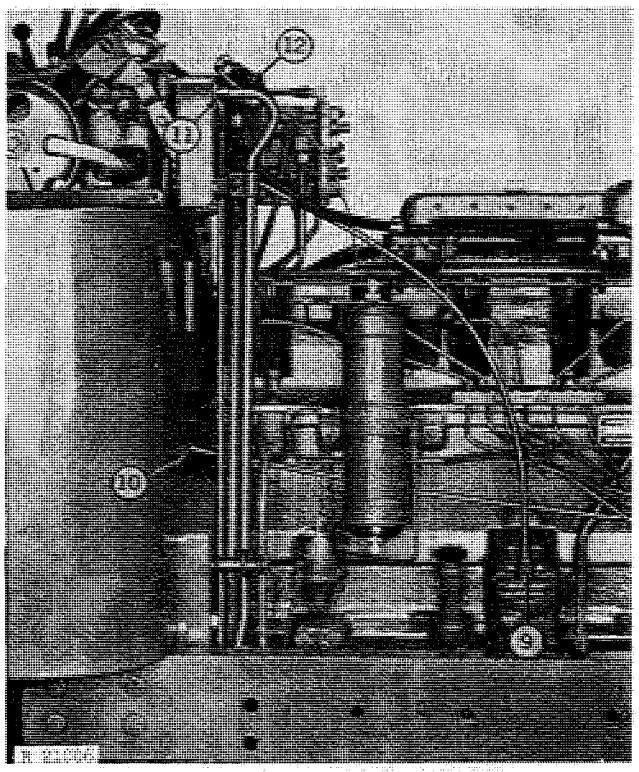

Fig. 11–Separation Procedures on Right-Hand Side

14. Install lift sling (JDG-1) and brackets (JDG-1-9) to the engine. Use portable hoist to support engine and front of tractor.

15. Remove drawbar support and install JDG-2M support stand.

16. Remove cap screws securing side-frames-to-clutch housing and engine-to-clutch housing and roll front half of tractor away.

ASSEMBLING ENGINE AND CLUTCH HOUSING

Move both halves of tractor together. Never use excessive force.

Tighten clutch housing-to-engine cap screws and side-frame-to-clutch housing cap screws to specified torque. Remove lift sling, brackets and stand.

Reverse the numbered separation procedures.

Fill the engine cooling system. Connect battery.

Check engine and transmission oil levels.

Start the engine, check for leaks, and bleed the steering system.

Install sheet metal, pre-screener, steps, and muffler.

SEPARATING CLUTCH HOUSING FROM TRANSMISSION CASE

Bleed brake accumulator (open brake bleed screws and depress both brake pedals).

Drain transmission case.

Remove control support cover, battery covers, tool box door, and operator shields.

Disconnect battery cables and remove batteries (rear battery first).

Disconnect PTO control valve cable from battery compartment and remove compartment (do not separate supports from compartment).

1. Remove rockshaft cover and quik-coupler.

2. Remove front right-hand platform extension and platform.

3. Remove accumulator pipe shield and pipe.

4. Loosen selective control valve pipe clamp and remove upper rear tool box retaining cap screw and hydraulic pipe clamp.

5. Remove clamp securing rockshaft and right-hand brake pressure pipes.

6. Loosen differential lock valve and pry valve outward. Push tool box downward (accumulator is removed with tool box).

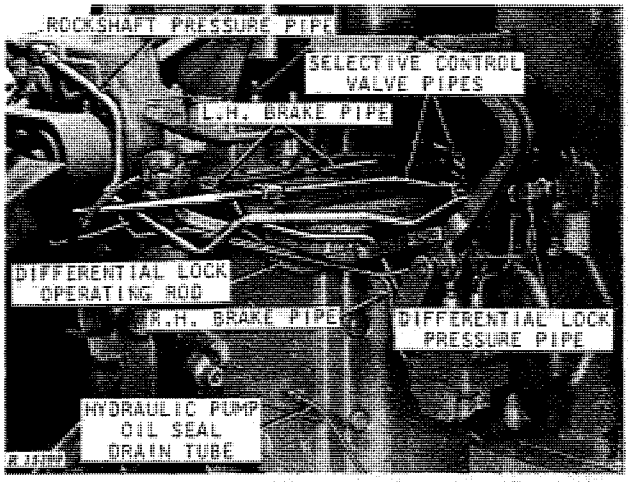

Fig. 12–Hydraulic Pipes

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7. Disconnect differential lock operating rod, right- and left-hand brake pipes, rockshaft pressure pipe, and differential lock pressure pipe (Fig. 12).

8. Disconnect hydraulic pump oil seal drain tube.

9. Disconnect selective control valve pipes at control support.

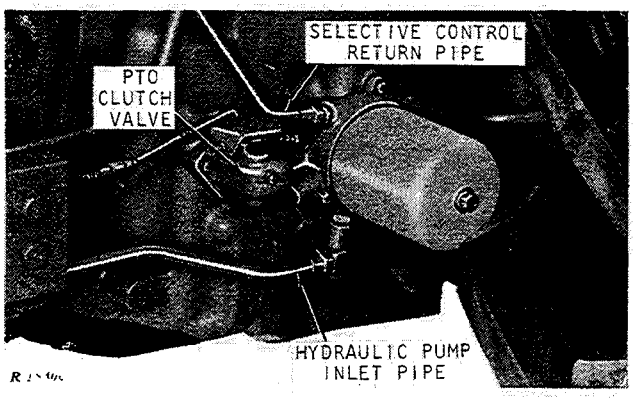

Fig. 13–PTO Clutch Valve and Hydraulic Pipes

10. Disconnect selective control valve return oil pipe and hydraulic pump inlet pipe from oil filter relief valve housing (Fig. 13).

11. Remove PTO clutch valve.

12. Remove transmission case cover.

13. Remove cap screws (inside transmission case) securing transmission case to clutch housing.

14. Disconnect speed range and speed change shifter cam rods from cams.

15. Place blocks between front axle and frame to prevent tipping. Install a stand under rear of engine oil pan. Raise tractor so stand supports part of tractor weight. Use rear support stand (JDG-2M), to support transmission weight.

16. Remove clutch housing-to-transmission case cap screws and separate transmission case from clutch housing (use care not to bend differential lock pressure pipe).

ASSEMBLING CLUTCH HOUSING AND TRANSMISSION CASE

With new gasket in place, move transmission case to clutch housing. Insert shifter cam rods through proper holes in transmission case.

Align notches in transmission oil pump drive shaft with dowel pins in the transmission oil pump.

Be sure PTO clutch shaft properly enters bushings in transmission case, PTO shaft mates with splines in coupling, and transmission drive shaft aligns with splines in clutch shaft.

Tighten clutch housing-to-transmission case cap screws to specified torque.

Connect shifter cam rods.

Pour oil in transmission case and replace transmission cover.

Reverse the numbered separation procedures.

Install battery compartment and attach PTO valve cable. Install batteries and connect cables. Install covers, tool box door, and operator shields.

Start the engine, check for leaks, and bleed the brakes. Check PTO clutch valve adjustment.

REMOVING FINAL DRIVE ASSEMBLY

Drain the transmission case.

Disconnect fender wiring harness and remove fender.

Raise rear end of tractor (jack or hoist) and block adequately to prevent tipping.

Remove wheel.

If removing right-hand housing on a tractor with a differential lock, remove the pressure oil pipe to differential case.

Use a hoist and chain to support final drive housing.

To prevent damage from falling, remove sun pinion, brake backing plate, and brake disk.

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ASSEMBLY

Reverse the separation procedure.

IMPORTANT: To prevent serious damage when installing the final drive housing, be sure that the sun pinion does not work outward far enough to allow the brake disk to drop inside the sun pinion teeth.

Install wheel, fender and wiring. Fill the transmission case.

SPECIFICATIONS

Air Conditioning Compressor Drive Belt deflection (at 25 lb. pull)	1 in.

TORQUES FOR HARDWARE

Item	Torque (ft-lbs)
Hydraulic pump drive coupling	30
Hydraulic pump support to engine	85
Side frames to clutch housing	300
Side frames to steering cylinder brackets	300
Steering cylinder brackets to engine	300
Clutch housing to engine	300
Oil pan to clutch housing	300
Clutch housing to transmission case:	
(3/4-inch)	300
(7/8-inch)	445
Final drive housing to case	170
Fender bracket to rear axle housing U-bolt nuts	125
Axle housing-to-Roll-Gard frame (or Roll-Gard cab frame)	445
Nylon hydraulic bleed line	Finger tight, then 1/6-1/3 turn more

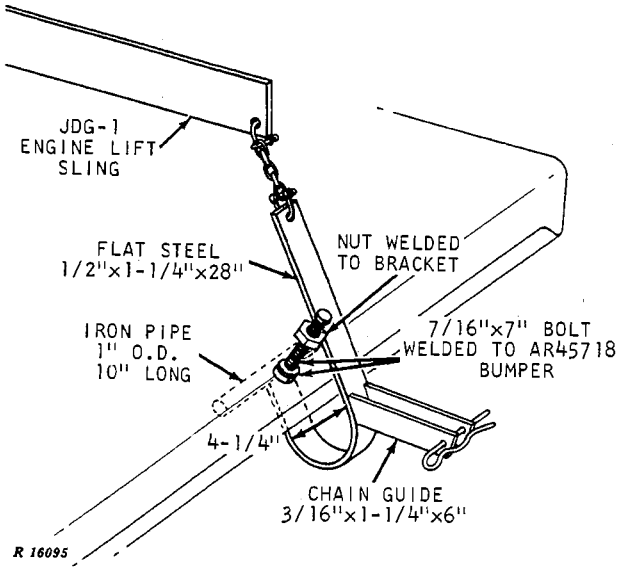

Fig. 14–Cab Lifting Brackets (Stolper)

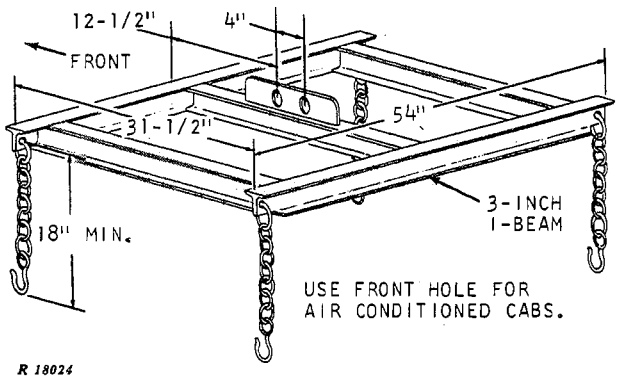

Fig. 15–Cab Lifting Brackets (Hinson)

SPECIAL TOOLS

No.	Name	Use
JDG-1*	Engine sling	Engine removal
JDG-1-9*	Engine lift brackets	Engine removal
JDG-2C*	Front support stand	Tractor separation
JDG-2M*	Rear support stand	Tractor separation
JDG-7*	Lift bracket	Tractor separation
. . . . .	Cab lifting brackets	Cab removal and installation

**Order from:*

Service Tools, Inc.
1901 Indiana Ave.
Chicago, Illinois 60616

Section 20
ENGINE

CONTENTS OF THIS SECTION

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Group 5
GENERAL INFORMATION AND DIAGNOSIS

GENERAL INFORMATION

The engine is a liquid cooled, 6-cylinder, diesel fueled, valve-in-head, vertical in-line four-cycle engine.

For basic theory of engine operation see FOS-30 "Engines" manual.

DIAGNOSING ENGINE 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
- Weak battery
- Faulty injection pump solenoid

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

Service Problem--See Section 10
- Low fuel supply

Fuel System Malfunction--See Section 30
- 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
- Weak valve springs
- Incorrect valve clearance
- Burned, warped, pitted, or sticking valves
- Low compression
- Worn camshaft lobes (could be caused by faulty damper)
- Incorrect timing
- Engine overheating

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

LACK OF POWER

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

Service Problem--See Section 10
- Dirty or obstructed air cleaners
- Improper fuel
- Wrong oil viscosity

Fuel System Malfunction--See Section 30
- Plugged fuel filters
- Faulty injection pump
- Faulty injection nozzles
- Faulty fuel pump
- Restricted exhaust system
- Low intake manifold pressure
- Incorrect throttle linkage

Power Train Malfunction--See Section 50
- Clutch slipping

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