

# John Deere 5010-I Tractor



JOHN DEERE

## SERVICE MANUAL John Deere 5010-I Tractor

SM2051 (01AUG64) English

**SM2051 (01AUG64)**

LITHO IN U.S.A. (REVISED)  
ENGLISH





# JOHN DEERE 5010-I TRACTOR

## CONTENTS

	Section
Description, Operation, and Specifications . . . . .	10
Specifications . . . . .	20
Periodic Services . . . . .	30
Engine Tune-Up and Tractor Adjustments . . . . .	40
Preliminary Procedure for Major Service . . . . .	50
Basic Engine . . . . .	60
Engine Lubrication System . . . . .	70
Cooling System . . . . .	80
Fuel System . . . . .	90
Transmission Clutch . . . . .	100
Syncro-Range Transmission . . . . .	110
Differential . . . . .	120
Final Drive . . . . .	130
Power Take-Off (PTO) . . . . .	140
Electrical System . . . . .	150
Seat . . . . .	160
Front Axle . . . . .	170
Wheels, Tires, and Weights . . . . .	180
Hydraulic System . . . . .	190
Hydraulic Pumps . . . . .	200
Power Steering . . . . .	210
Power Brakes . . . . .	220
Selective Control Valves . . . . .	230
Drawbar Assembly . . . . .	240
Trouble Shooting . . . . .	250
Special Service Tools . . . . .	260

## TO THE JOHN DEERE SERVICEMAN

This service manual contains maintenance instructions for John Deere 5010-I Tractors. Included are complete instructions for removal, disassembly, inspection, repair, assembly and installation of the major parts and assemblies of the tractor.

In addition, the manual contains brief descriptions of the more complicated systems of the tractor, and tells how they operate.

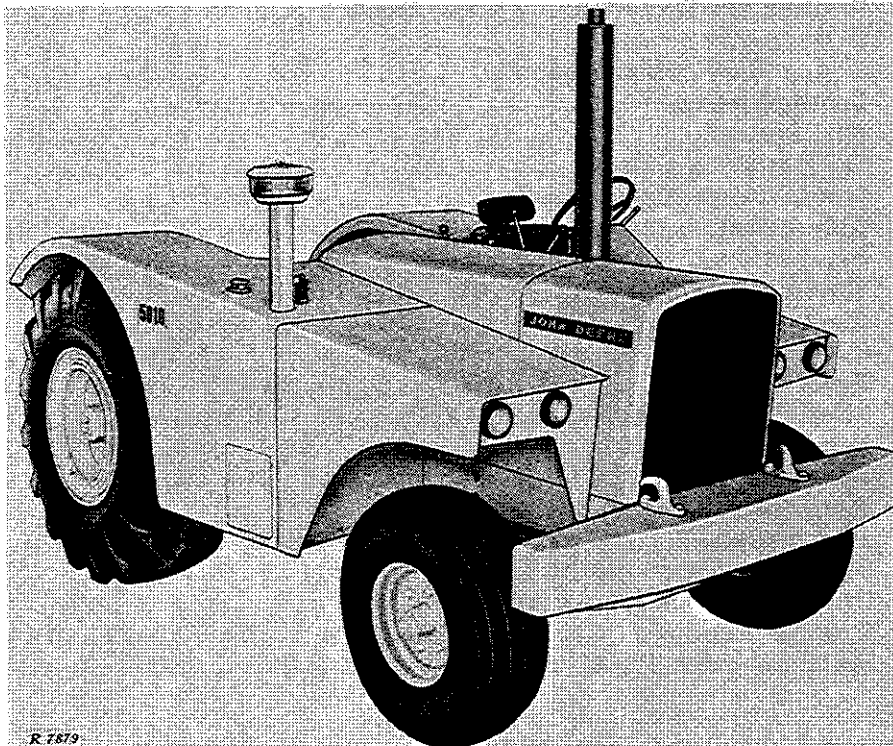
In Section 20, "Specifications," dimensions of many new wearing parts are given as an aid in determining when parts replacement is necessary. Section 260, "Special Service Tools," describes the tools necessary for proper servicing of 5010-I Tractors.

Section 40, "Tune-Up and Adjustment," contains instructions for performing the services necessary to help the tractor perform efficiently

and economically after it has been in the field for some time.

This manual was planned and written for the Service Department; its place is in the shop. Use the manual whenever in doubt about correct maintenance procedures. Use it as a text book for training new Service Department personnel who are unfamiliar with John Deere Tractors.

Daily use of the service manual as a guide for any and all service problems will reduce error and costly delay to a minimum and assure you the best in finished service work. In many instances your customer's confidence in your work will be improved when he sees you using the service manual. He knows you are following approved maintenance procedures and making proper adjustments. There is no guesswork when you use the manual.



John Deere 5010-I Tractor



# DESCRIPTION, OPERATION, AND SPECIFICATIONS

## Group 5 DESCRIPTION

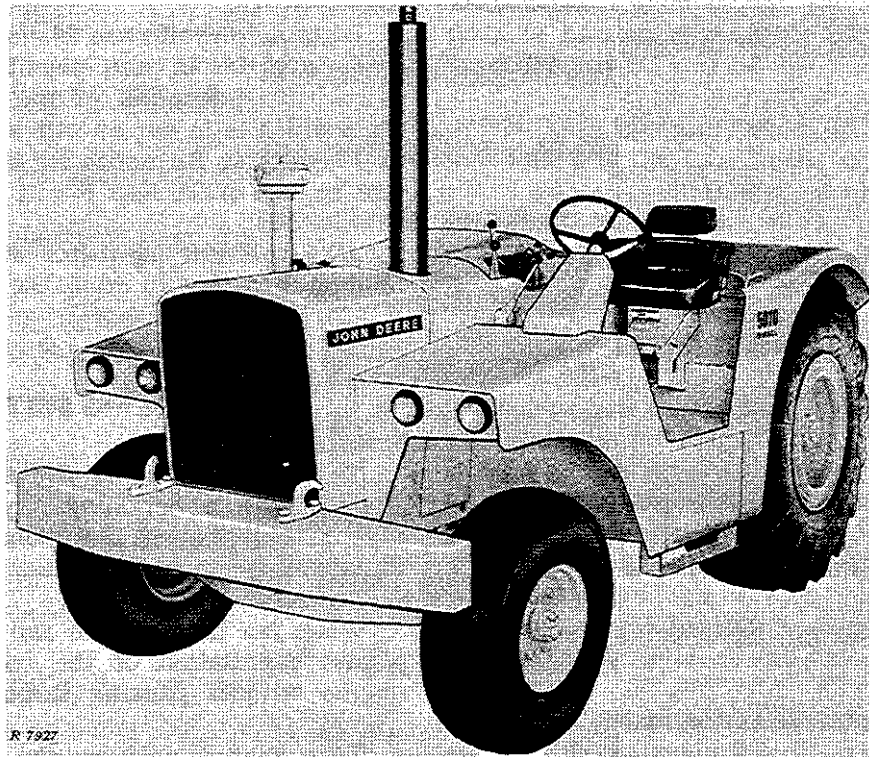


Fig. 10-5-1—John Deere 5010-I Tractor

### INTRODUCTION

The John Deere 5010-I Tractor is designed to operate heavy industrial equipment.

The tractor is the prime mover for the John Deere 5010 Scraper, a rugged, compact, efficient dirt moving unit.

The operator's station is at the side of the tractor, a convenient position for better observation of the work being performed.

The tractor is equipped with a powerful John Deere engine developing more than 100 drawbar horsepower.

The features of the tractor are described briefly in the paragraphs which follow. Full descriptions of each of the components are given in the various sections throughout this manual.

### SERIAL NUMBERS

Each engine bears a serial number located on the fuel filter bracket mounting pad on the cylinder block.

The tractor serial number is located at the center of the rear of the transmission case.

## MODEL NUMBERS

The fuel injection pump, main hydraulic pump, selective control valve housings, and alternator each bear a model number.

## ENGINE

The full diesel engine has six, in-line cylinders and develops approximately 121 horsepower at the PTO (factory calculated at 2200 rpm engine speed). See Section 60 for additional information.

## CRANKCASE VENTILATING SYSTEM

Forced crankcase ventilation is accomplished by a liquid-seal, impeller-type pump. See Section 60.

## CLUTCH ASSEMBLIES

The heavy-duty, two-plate, spring-loaded, transmission clutch is located in a recess at rear of the engine flywheel. It is operated by a pedal (hydraulically assisted) located to the left of the operator's platform. The clutch-operating cylinder is connected to an accumulator which supplies energy to operate the clutch, should the engine be stopped or hydraulic pressure fail. The clutch assembly is described in Section 100.

The PTO clutch is of the multiple wet-disk type and is hydraulically actuated. It is operated by a lever to right of operator. This clutch is described in detail in Section 140.

## FUEL SYSTEM

The 49 U.S. gallon fuel tank is located in a housing at right side of tractor, just ahead of the rear wheel.

A fuel pump, driven from the camshaft, and provided with a sediment bowl and screen, assures a constant supply of clean fuel to the diesel injection pump.

A large-capacity fuel filter, connected between the fuel pump and injection pump, filters the diesel fuel before it enters the injection pump. The filter contains two replaceable micron filtering elements.

See Section 90 for details.

## ELECTRICAL SYSTEM

The tractor is equipped with a 24-volt alternator with regulator to furnish current for the electrical load and to maintain charges in four 6-volt batteries, connected in series.

This system is of the conventional grounded type, using negative grounded circuits.

Lighting circuits are 24-volt with two 12-volt loads in series in each circuit. All lamps are in pairs with exception of the tractor red tail lamp which is in series with a resistor. Current at 12 volts is furnished for the accessory circuit by two of the four 6-volt tractor batteries.

A 24-volt starting motor with enclosed solenoid shift is used to crank the engine.

See Section 150 for additional information.

## COOLING SYSTEM

The tractor has a pressure-type cooling system with a centrifugal-type pump to provide circulation of the coolant. Two thermostats maintain constant coolant temperature.

When the thermostats are closed, a bypass allows circulation of the coolant through the engine without passing through the radiator.

This feature allows the engine to reach operating temperature in a shorter length of time. When coolant reaches operating temperature, the thermostats open allowing circulation of coolant through the radiator to maintain a constant operating temperature.

Section 80 contains detailed information.

## TRANSMISSION

The Syncro-Range transmission, which contains constant mesh, helical cut gears, has four shift ranges. Three of the ranges have low, high, and reverse gears. The fourth range has low and high gears only. Thus, eight forward gears and three reverse gears are provided. Shifting is accomplished by means of two levers located to the left and forward of the instrument panel. The left-hand lever is used to select the desired range. The right-hand lever is used to select high, low, or reverse gear within the range.

Shifting is accomplished with two levers located to the right and forward of the operator.

The high, low, and reverse gear shifting is synchronized and can be accomplished while the tractor is moving.

While the shift between ranges is of the collar shift type and is normally accomplished with the tractor stopped, it can be accomplished while the tractor is on the move by proper use of the "double clutching" technique.

An oil cooler is provided to maintain transmission oil temperature at a satisfactory level.

See Section 110 for transmission details.

#### DIFFERENTIAL AND FINAL DRIVE

A conventional spiral bevel ring gear and pinion drive is used in the tractor. A planetary gear assembly provides the final gear reduction in the drive gear train. This design reduces strain on the transmission gear train. See Sections 120 and 130 of this manual.

A lock (optional in tractors Serial No. 8000 and after) located in the differential assembly, enables the operator to lock the differential. This causes both rear wheels to turn at the same speed, moving the tractor under conditions where one drive wheel has lost its traction.

#### POWER TAKE-OFF (PTO)

The tractor can be furnished with a right-angle, vertical PTO for use with the elevating scraper. It operates at 974 rpm (1900 rpm engine speed).

The tractor can be obtained with a horizontal PTO which operates at 1010 rpm (1900 rpm engine speed).

See Section 140 of this manual for details.

#### DRAWBAR

The tractor is equipped with a heavy-duty, fixed drawbar for attaching towed equipment.

See Section 240 for details.

#### FRONT AXLE

The tractor is equipped with a heavy-duty, non-adjustable front axle. For details see Sections 170 and 180 of this manual.

#### REAR WHEELS

Heavy-duty rear wheels are attached to the rear axles with no provision for tread width adjustment.

Rear wheel tread is 72 inches.

For detailed information, see Section 180 of this manual.

#### SEAT

The tractor is regularly equipped with a deluxe suspension seat. This seat contains a steel compression spring and a shock absorber to provide "Float Ride" suspension.

The seat has a flexibly-mounted, padded back rest and semi-circular foam padding which surrounds the back of the operator.

Refer to Section 160 for additional information.

#### HYDRAULIC SYSTEM

The tractor hydraulic system is pressurized by a constant-running, variable displacement, hydraulic pump. The pump is mounted below and ahead of the radiator. It is driven at engine speed by the engine crankshaft. The hydraulic

pump supplies oil under pressure to operate the power steering, power brakes, transmission clutch, power take-off clutch, two remote hydraulic cylinders (if so equipped) or, on scraper units, scraper brakes and operating cylinders.

The hydraulic system is constant pressure, closed center, and "live"; that is, it operates when the engine is running, whether the tractor is moving or not.

See Sections 190 through 230 for additional information.

### STEERING

Hydraulic power steering is regular equipment on the tractor. Movement of the steering wheel actuates a steering valve which directs a flow of pressure oil to two steering cylinders which turn the front wheels. In case of pressure oil failure, the tractor can be steered manually. Complete information is given in Section 210.

### POWER BRAKES

The power brakes are operated by pedals located at the right side of the operator's platform. The brakes can be applied independently or simultaneously. The brake pedals can

be locked together for simultaneous operation if desired. The hydraulically actuated, disk type brakes operate in oil.

*NOTE: The tractor brake pedals should always be locked together when operating the scraper unit except when it is necessary to use individual braking to make extremely short turns.*

On scraper units, the scraper power brakes are operated by a lever located at the left of the steering column, just under the steering wheel.

**CAUTION:** Always apply the scraper brakes first when stopping the unit. Then, if necessary, use tractor brakes to assist. Using tractor brakes alone can be dangerous due to possible jackknifing of the scraper unit.

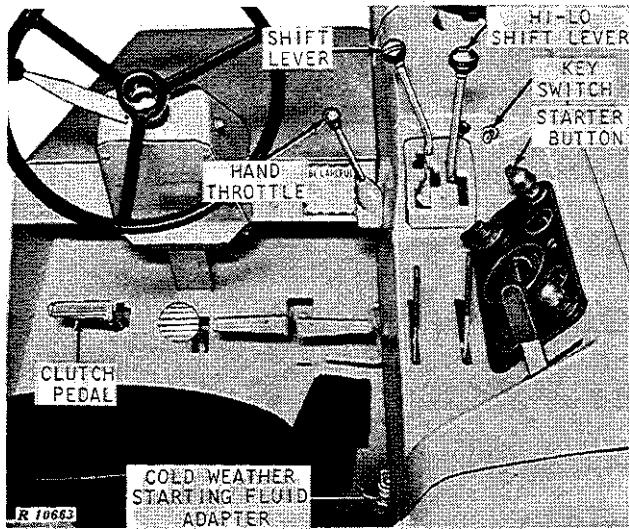
An accumulator, charged with dry nitrogen at 500 psi pressure, is connected to the tractor brake system and transmission clutch operating cylinder.

On scraper units, the accumulator is connected to the scraper brake system.

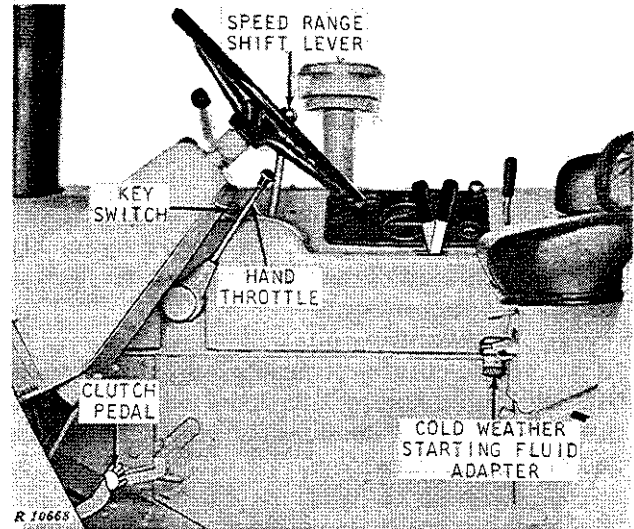
The accumulator stores energy for operation of brakes and clutch for several applications after the engine is stopped or if the main hydraulic pump should fail.

## Group 10

# OPERATION



Serial No. 8000 and After



Prior to Serial No. 8000

Fig. 10-10-1—Engine Starting Controls

### STARTING CONTROLS

Figure 10-10-1 illustrates the starting controls for the engine.

#### PRE-STARTING INSPECTION

1. Check the engine crankcase oil level.
2. Check the radiator coolant level.
3. Check radiator hose and connections for leaks.
4. Make sure the fuel shut-off valve on the bottom of the fuel tank is open.
5. Visually inspect tractor and tires for any irregularities which might affect operation.

### STARTING THE ENGINE

1. Place the Hi-Lo (right-hand) gearshift lever in neutral (N) position.
2. Move hand throttle lever to a position midway between the slow idle and 1900 rpm positions.
3. Turn the key switch to the first position. The oil pressure indicator lamp should light. If it does not, turn the key switch off and determine the cause. See Section 150.
4. At temperatures below 32° F. use the cold-weather starting fluid adapter (page 10-10-2) and other cold weather starting aids as required.



5. Tractors, Serial No. 8000 and after: Press the starter button to crank the engine.

Tractors prior to Serial No. 8000: Turn the key switch all the way to the right to crank the engine.

*NOTE: Do not hold switch in "crank" position for more than 30 seconds at a time. To do so may overheat the starter.*

If the engine does not start the first time, wait a minute or two before trying again. If it does not start after four attempts, refer to Section 250 of this manual.

6. As the engine begins to run, check to see that the oil pressure light goes out. If not, stop the engine and determine the cause. See Section 150 of this manual.

Check ammeter for alternator charging rate. If no charge is shown, refer to Section 150 of this manual.

#### AFTER-STARTING INSPECTION

1. Make sure that oil pressure light goes out.
2. Be sure ammeter shows charge.
3. Check for water, oil, or hydraulic leaks.

#### COLD WEATHER STARTING

##### COLD WEATHER STARTING FLUID ADAPTER

The tractor is equipped with an adapter (Fig. 10-10-1) to inject atomized starting fluid into the engine air intake system. The starting fluid, which aids fuel combustion, is furnished in pressurized cans.

To install a can of starting fluid, remove cap from the adapter, position outlet tube of can on adapter pilot, and push up gently on bottom of can until it snaps into place.

To inject starting fluid, push the can up 1/16 inch farther while turning the engine with the starter. Relax pressure on can between "shots" of starting fluid. Stop injecting fluid after the engine starts. If engine starts to die during the first few moments of operation, inject starting

fluid to smooth out engine operation. Remove can from the adapter when the engine is operating satisfactorily.

*NOTE: Install cap on adapter when not in use. This prevents dust being drawn into engine air intake system.*

#### ADDITIONAL BATTERIES

Starting the engine in cold weather can be facilitated by connecting an additional 24 volts of booster batteries in parallel with the tractor batteries.

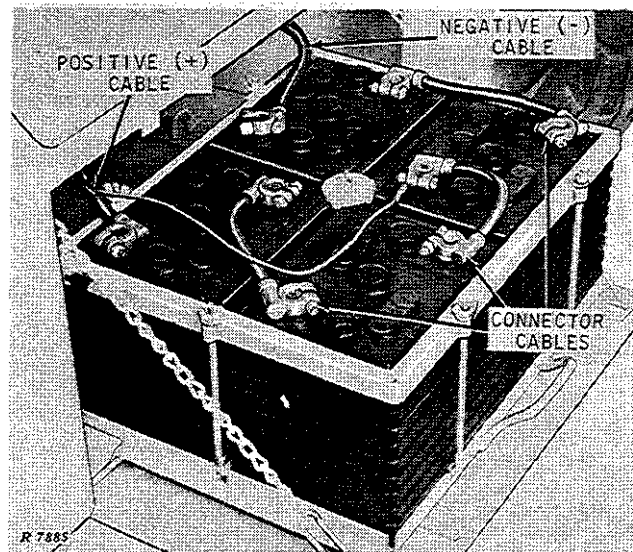


Fig. 10-10-2—Battery Connections

Use jumper cables to connect the positive (+) terminal of the booster battery assembly to the positive terminal of the tractor battery assembly (Fig. 10-10-2) and the negative (-) terminal of the booster battery to the negative terminal of the tractor battery assembly.

**CAUTION: Use care, when connecting auxiliary batteries, to avoid generating a spark which could cause an explosion.**

#### CRANKCASE OIL HEATER

The tractor is designed to permit use of a 240-watt electrical crankcase oil heater. The heater warms the oil in the crankcase to facilitate engine starting.

To install the crankcase oil heater, drain crankcase oil and remove plug (Fig. 10-10-3)

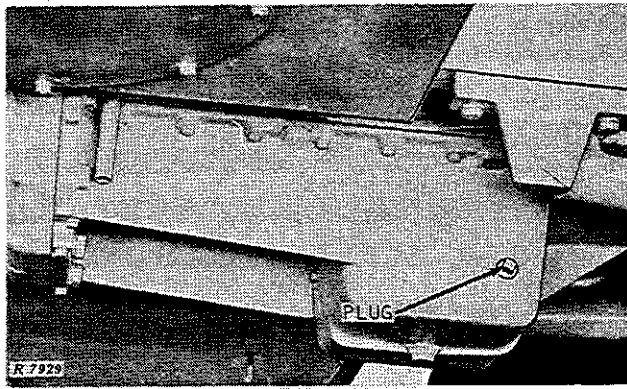


Fig. 10-10-3—Plug for Crankcase Oil Heater Installation

from right front side of case. Apply thread paste to threads of heater, install heater and refill crankcase. When heater is to be put to use, remove protective cap, attach cord, and plug into any convenient 115-volt electrical source with suitable ground.

The connector at the heater has a release lever to lock the connector to the heater. Press the lever when connecting or disconnecting the cord.

#### HYDRAULIC PUMP

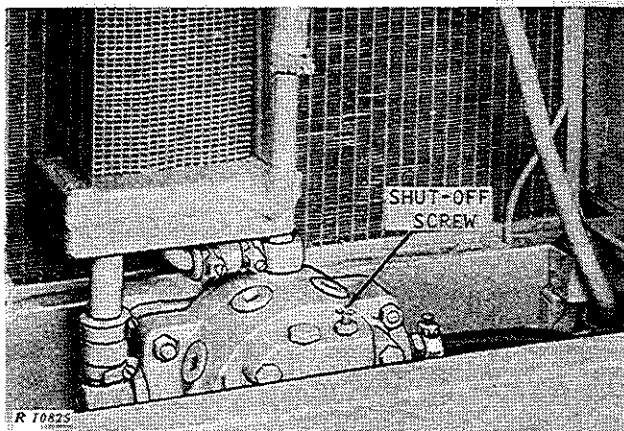


Fig. 10-10-4—Hydraulic Pump Shut-Off Screw

On tractors prior to Serial No. 4500 the hydraulic pump can be taken "out-of-stroke" (shut off) as an aid to cold weather starting.

Tractors, Serial No. 4500 and after do not have this feature unless it has been installed as a field installation.

To shut off the pump, remove tractor radiator grille and turn shut-off screw (Fig. 10-10-4) in (clockwise) one turn with a screwdriver. Then

turn screw in by hand until resistance is felt, then one more turn. The hydraulic pump is now out-of-stroke (shut off). After the engine has started, use a screwdriver to back the shut-off screw (counter-clockwise) all the way out. The pump will now build up pressure.

*NOTE: Oil will leak past the shut-off screw if it is not backed all the way out against the internal stop.*

#### POWER SHAFT CLUTCH DRIVE

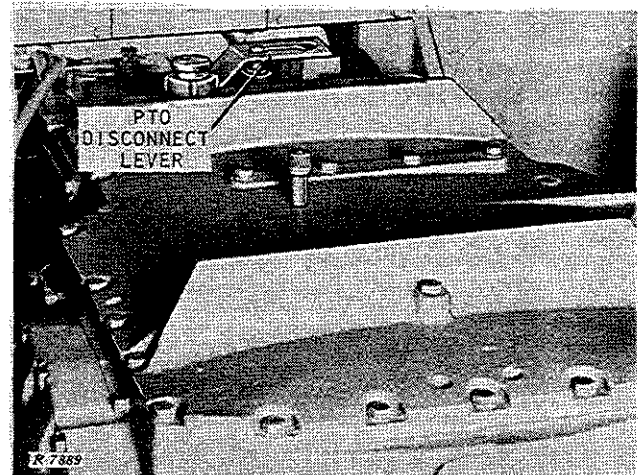


Fig. 10-10-5—PTO Drive Disconnect Lever

An additional method of removing drag from the engine to assist in cold weather starting is to disconnect the power shaft clutch drive. The drive is disconnected when the straight edge of the disconnect lever (Fig. 10-10-5) is up. Drive is disconnected by lifting up lever and rotating it 180 degrees, then returning it to the slot.

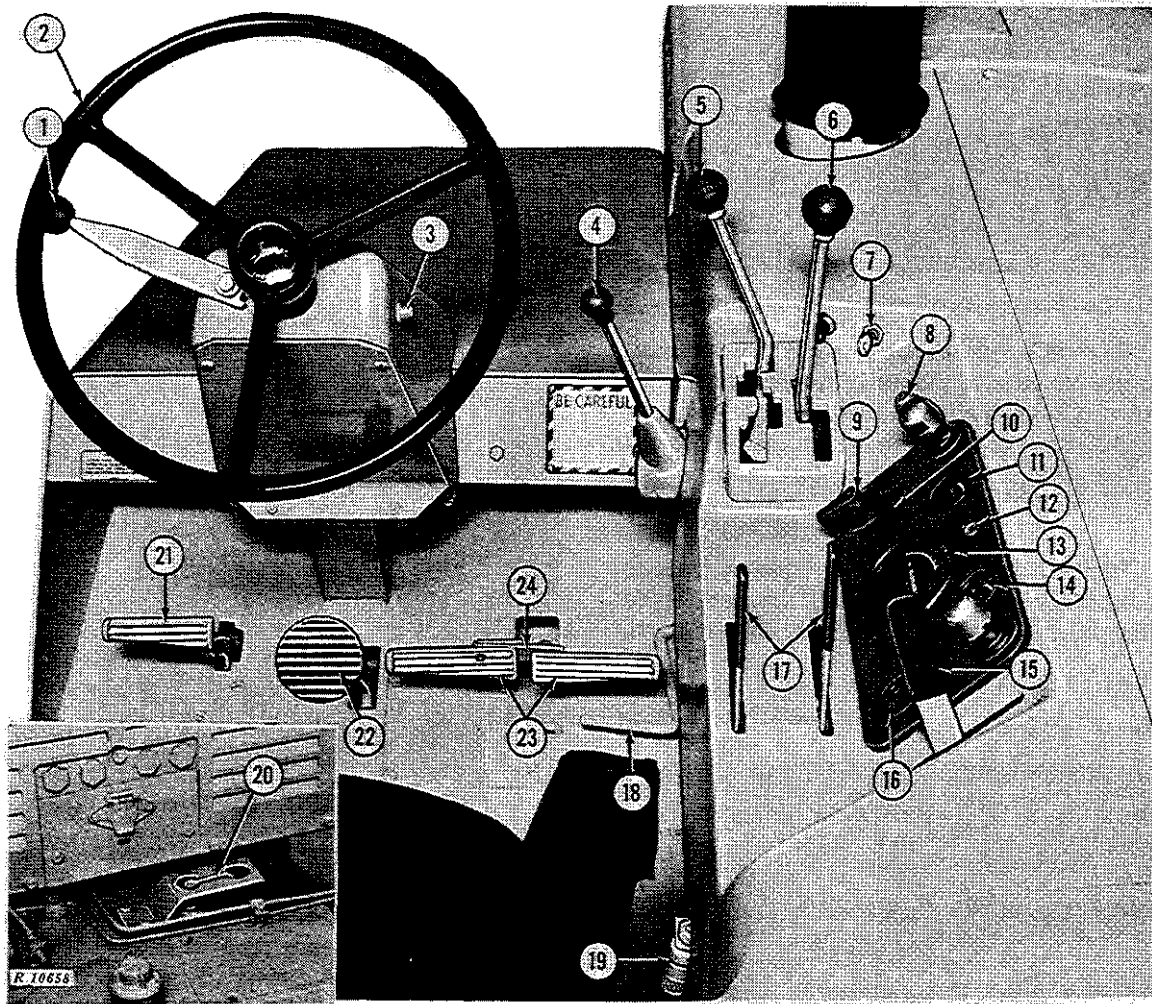
#### STOPPING THE ENGINE

After operating the engine under load, run the engine at slow idle (600 rpm) for at least one or two minutes before stopping. This will allow the engine to cool gradually, preventing uneven contraction of parts and coking of lubricating oil on piston rings, valve guide, etc.

Turn the key switch off. After a few revolutions the engine will stop.

*NOTE: Never drain coolant immediately after the engine is stopped.*

## OPERATING CONTROLS



- |                                   |  |
|-----------------------------------|--|
| 1 - Scraper Brake Operating Lever | 13 - Speed Meter                         |
| 2 - Steering Wheel                | 14 - Ammeter                             |
| 3 - Horn Button                   | 15 - PTO Clutch Operating Lever          |
| 4 - Hand Throttle Lever           | 16 - Fuel Gauge                          |
| 5 - Range Selector Lever          | 17 - Selective Control Operating Levers  |
| 6 - Hi-Lo Shift Lever             | 18 - Foot Throttle Lever                 |
| 7 - Key Switch                    | 19 - Cold Weather Starting Fluid Adapter |
| 8 - Starter Button                | 20 - PTO Drive Disconnect Lever          |
| 9 - Light Switch                  | 21 - Clutch Operating Pedal              |
| 10 - Speed Meter Knob             | 22 - Differential Lock Operating Pedal   |
| 11 - Water Temperature Gauge      | 23 - Brake Operating Pedals              |
| 12 - Oil Pressure Indicator Lamp  | 24 - Brake Pedal Bar                     |

Fig. 10-10-6—Operating Controls  
(Serial No. 8000 and After)

## OPERATING THE TRACTOR

Operating controls are illustrated in Figure 10-10-6.

### ENGINE WARM-UP

Always be sure that the engine is at operating temperature before subjecting it to a full load.

A practical way to do this is to idle the engine at about 1500 rpm a few minutes, then operate at a very light load (such as driving to the job) for the next five or ten minutes.

It is good practice, when the tractor is first put to work, to operate in the next lower speed than normally used for the load, for about 30 minutes. This gives the oil a chance to circulate freely and prevents undue wear on engine or transmission parts.

### ENGINE BREAK-IN

With the following exceptions, the diesel engine is ready for normal operation. To facilitate break-in, avoid prolonged periods of engine idling, particularly for the first 100 hours of service.

When the sulphur content of the diesel fuel used does not exceed 0.5%, drain the oil from the crankcase after the first 100 hours of service and replace the engine oil filter. Fill the crankcase with the proper oil.

*NOTE: When the sulphur content of the diesel fuel exceeds 0.5%, change the engine oil and oil filter after the first 20 hours of operation.*

*NOTE: Observe engine coolant carefully during break-in period. If temperature rises above normal operating range, shift to a lower gear to reduce load on the engine.*

### ENGINE SPEEDS

The engine is designed to operate at working speeds ranging from 1500 to 2200 rpm. These are variable governed speeds, and the engine

can be operated at any speed between the two extremes to meet various working conditions.

Slow idle speed of the engine is 600 rpm.

### Foot Throttle

Since engine speed most used when operating industrial tractors is 2200 rpm, and since engine speed must be varied quickly when shifting the transmission up or down, the foot throttle (Fig. 10-10-7) is usually used to control engine speed.

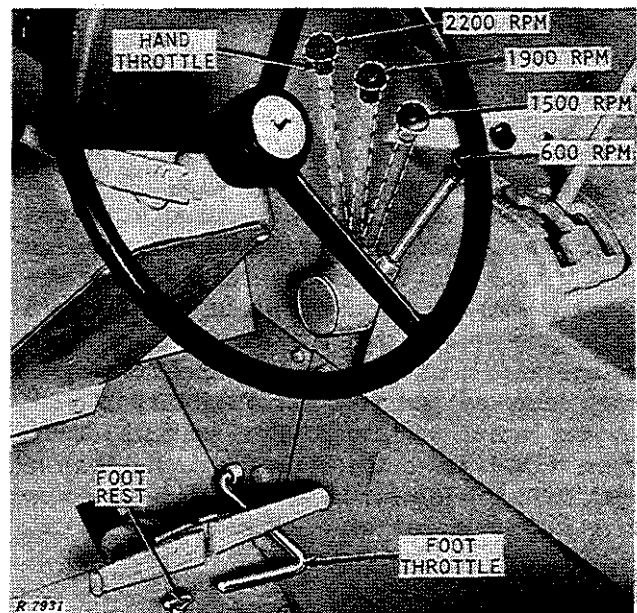


Fig. 10-10-7--Range of Hand Throttle Positions

The foot throttle can be used to obtain any engine speed between 600 and 2200 rpm. However, it cannot be used to obtain any speed below that established by the hand throttle.

### Hand Throttle

The hand throttle (Fig. 10-10-7) is normally used to control engine speeds when the tractor is operated without the scraper.

Move hand throttle (knob in) all the way to the rear to obtain slow idle (600 rpm) speed.

To obtain 1900 rpm speed (for PTO operation at rated speed) move lever forward to first stop. Placing lever midway between slow idle and 1900 positions gives 1500 rpm engine speed. Engine

speeds between 1500 and 1900 rpm can be obtained by moving lever between these two positions.

To obtain working speeds above 1900 rpm, pull up on knob at end of the hand throttle lever and move lever all the way forward. This is the 2200 rpm position. Engine speeds between 1900 and 2200 rpm can be selected by moving the lever between these two positions.

*NOTE: Avoid overloading tractor engine. Overloading causes undue strain on parts, eventually resulting in poor operation and unnecessary repair expense.*

**SELECTING GROUND SPEEDS**

The transmission has four speed ranges, grouped in four shift stations (Fig. 10-10-9). Three of the ranges have low, high and reverse gears. The fourth range has low and high speeds only. Thus, eight forward speeds and three reverse speeds are provided, which, together with the engine speeds that may be selected, allow the operator to balance, load and speed for maximum economy and give him flexibility to meet varying work conditions. For example, for a given travel speed the operator may choose to work in a low speed at a high engine speed or in a higher speed at a lower engine speed.

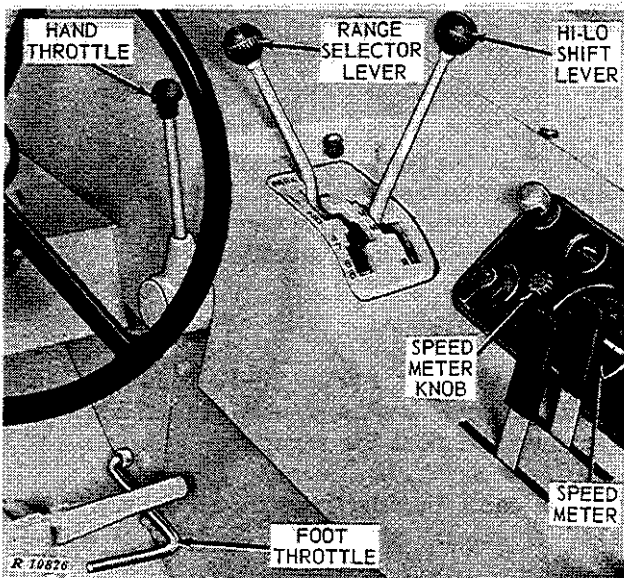


Fig. 10-10-8—Shift Levers and Quadrant

Shifting is accomplished by means of two levers located to the left and forward of the

instrument panel (Fig. 10-10-8). The range selector lever is used to shift between stations. By moving the lever from one station to another, a new range of speeds is available. Normally, this shift is made when the tractor is stopped, but by using the proper "double-clutching" technique it may be made while the tractor is moving. This technique is explained on page 10-10-7. The desired speed within a range is selected by means of the Hi-Lo shift lever, located at the right of the range selector lever. The Hi-Lo shift lever has four positions: "L" (Low), "N" (Neutral), "H" (High), and "R" (Reverse). When the Hi-Lo shift lever is in the "L" position the transmission is in the lower speed of the range. When the lever is in the "H" position, the transmission is in the higher speed of the range. When the lever is in the "R" position, the transmission is in reverse.

Examples of ground speeds at which the tractor will travel are given in Group 15 of this Section. Engine working speeds can be varied between 1500 and 2200 rpm.

*Gear Shifting*

Figure 10-10-9 illustrates details of the gear-shift quadrant.

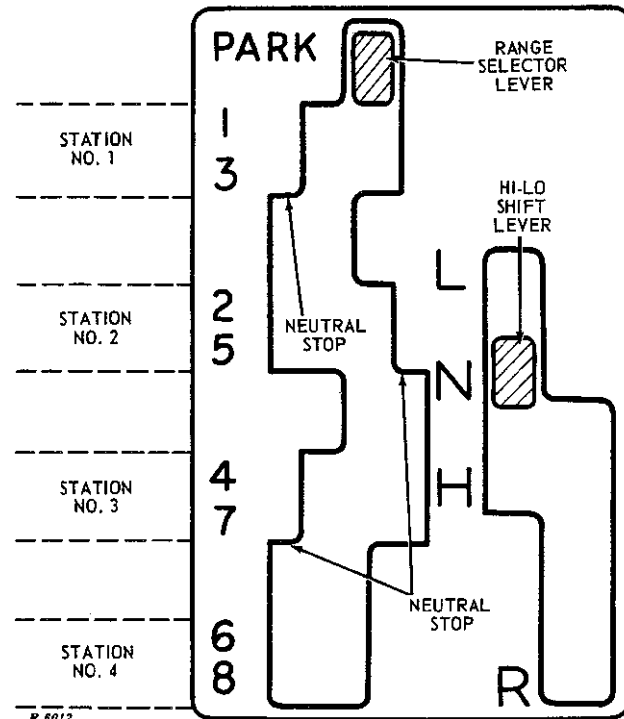


Fig. 10-10-9—Details of Shift Quadrant

Depress the clutch pedal and move the range selector lever into the desired station (Fig. 10-10-9). Move the Hi-Lo shift lever from neutral to "H," "L," or "R" to obtain the desired speed within the range. Gradually release the clutch to take up the load smoothly. With the clutch pedal depressed, the Hi-Lo shift lever can be shifted from the low to the high or the high to the low range of speeds in any station while the tractor is moving. The lever can also be shifted from forward to reverse (except in Station No. 4) without stopping the tractor. To avoid injury or damage, reverse direction only at very slow speeds.

Although shifting between stations usually is done with the tractor stopped, this shift can be made while the tractor is in motion by "double clutching." Basically this is a matter of engaging the clutch momentarily while the range selector lever is in neutral, and bringing the engine speed up or down to match the speed of the next desired station.

For example: Suppose the transmission is in 5th speed while the engine is operating at 2200 rpm. For higher ground speed it is desired to shift into 7th speed. Leave the Hi-Lo shift lever in "H," depress the clutch pedal, release the foot throttle, and move the range selector lever to neutral. (This lever is in neutral when it is located in any space in the quadrant between stations.)

Momentarily engage the clutch until engine speed has decreased to about 1100-1200 rpm. Disengage the clutch, move the range selector lever to 7th speed, and engage the clutch. This shift requires a little time (2 to 5 seconds) and cannot be rushed or clash will result. Note that engine speed is reduced about 50 percent.

Down shifting must be done rapidly. To down shift from 7th to 5th speed, for example, reduce engine speed to 1300-1500 rpm, disengage the clutch (but do not let up on the foot throttle), and move the range selector lever against the upper neutral stop illustrated in Figure 10-10-9. (The three neutral stops are provided for down shifting.) Rapidly engage and disengage the clutch, move the selector lever to 5th speed, and engage the clutch. The entire shift requires only 1 to 2 seconds.

**CAUTION:** Do not down shift from high to low speed without reducing engine speed. If engine speed is not reduced it may become excessive when the clutch is engaged, causing damage to engine.

The above procedures with minor variations to meet operating conditions, will result in "no clash" shifts between range stations but require practice. Avoid forcing the shift lever when a mismatch occurs due to improper timing during the shifting process. Unnecessary clash may cause damage. In general, double clutching is necessary for any shift of the range selector lever while the tractor is in motion.

#### DIFFERENTIAL LOCK

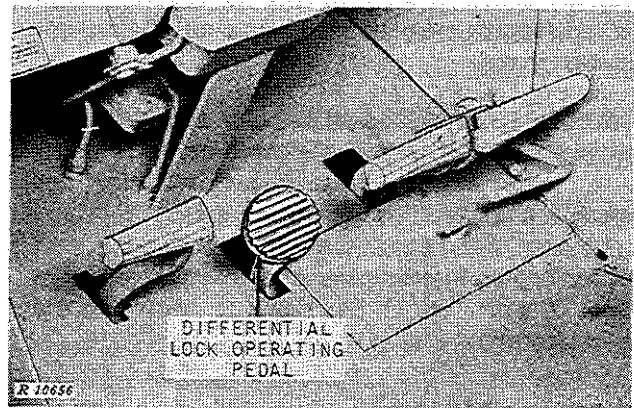


Fig. 10-10-10—Differential Lock Operating Pedal

When conditions are encountered where one drive wheel has lost traction, tractor movement can often be maintained by using the differential lock.

To engage the lock, depress the operating pedal (Fig. 10-10-10) and hold until conditions improve. Releasing the pedal pressure disengages the lock.

*NOTE:* So long as the differential lock is applied any attempt to turn the tractor will be resisted by the action of the locked differential. Under some conditions it may be necessary to engage the lock intermittently to maintain tractor motion in the direction desired.



## PARKING THE TRACTOR

When the tractor is stopped for parking, move the Hi-Lo shift lever to the "N" (neutral) position and move the range selector lever as far as it will go forward into the "PARK" position. The lever, once in "PARK," must be moved from this position before the Hi-Lo shift lever can be moved from neutral.

**CAUTION:** Be sure tractor is stopped before placing shift lever in "PARK" position.

## TOWING THE TRACTOR

Place the range selector lever in any neutral position and the Hi-Lo shift lever in the "N" (neutral) position when towing the tractor. This will eliminate unnecessary wear of the transmission parts.

*NOTE: If at all possible, the engine should be run at idle speed while the tractor is being towed. This will provide power steering and brakes.*

**CAUTION:** Never tow the tractor at high speed. Always attach tow bars or chains to the tow hooks provided.

## HYDRAULIC SYSTEM

The hydraulic system is a constant pressure, closed center, variable displacement type that provides a quick, easy means of supplying oil under pressure to operate power steering, power brakes, power take-off clutch, transmission clutch, two remote hydraulic cylinders (if so equipped) or, on scraper units, scraper brakes and scraper cylinders.

Pressure and flow of the oil are maintained by a variable displacement, constant pressure pump driven by the engine crankshaft. The reservoir for the system is the transmission case, and oil is carried through external pipes and hoses to each hydraulic function. All oil in the system is filtered through full-flow filters.

## POWER BRAKES

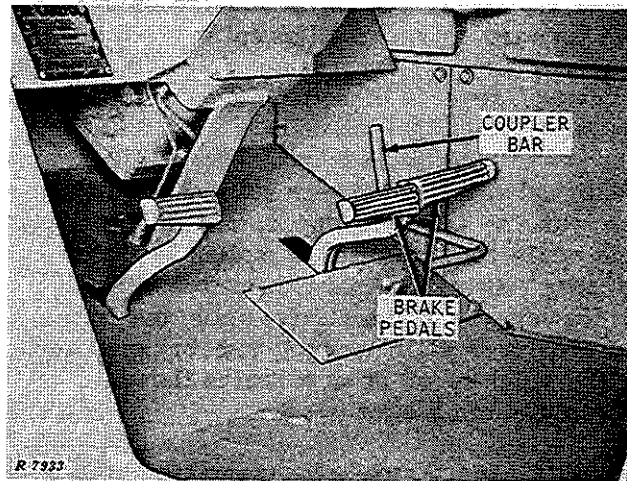


Fig. 10-10-11—Brake Pedals and Coupler Bar

The tractor is equipped with hydraulically actuated power brakes. Each brake pedal (Fig. 10-10-11) can be applied individually to assist in making short turns or simultaneously for slowing or stopping the tractor. The pedals can be locked together for simultaneous operation.

On scraper units, power brakes are operated by a lever located under the left side of the steering wheel. Pulling down on the lever applies the brakes.

**CAUTION:** Always apply the scraper brakes first when stopping the scraper unit. Then, if necessary, use the tractor brakes to assist.

An accumulator provides energy for several brake applications after the engine is stopped or should the hydraulic pressure fail.

#### POWER STEERING

The tractor is equipped with fully hydraulic power steering and, like the power brakes, uses the same oil as the transmission and hydraulic system.

The power steering system consists of a valve, cylinders, and hydraulic pipes. The valve directs the flow of oil to and from the cylinders for either a right- or left-hand turn.

#### EQUIPMENT CONTROL SYSTEM

Figure 10-10-12 illustrates equipment operating controls.

The power take-off shaft is used to operate powershaft-driven equipment such as the elevator on the scraper. Moving the operating lever away from the operator engages the clutch; moving the lever toward the operator disengages the clutch and applies a brake to the PTO shaft.

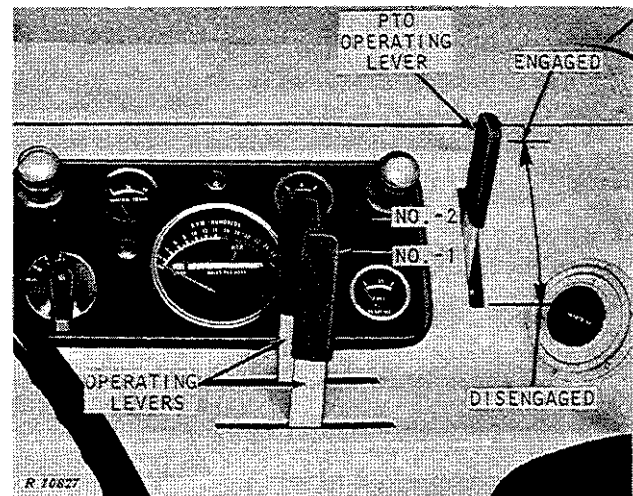


Fig. 10-10-12—PTO and Selective Control Operating Levers

**NOTE:** The brake is designed to stop only the PTO shaft, not the driven machine.

Selective control levers (No. 1 and No. 2; Fig. 10-10-12) can be used to operate remote hydraulic cylinders, either single or double acting.

On scraper units, these levers are used to operate the scraper bowl.



## Group 15 SPECIFICATIONS

(Subject to change without notice.)

**\*HORSEPOWER**

Flywheel (2200 engine rpm) . . . . .	*133.0
PTO (2200 engine rpm) . . . . .	121.12
PTO (1900 engine rpm) . . . . .	108.67
Drawbar (2200 engine rpm) . . . . .	108.91

**ENGINE**

Type . . . . Full diesel, 6-cylinder, in-line, valve-in-head

**Engine speeds:**

Slow idle . . . . .	600 rpm
Working speeds . . . . .	1500 to 2200 rpm
Transport speeds . . . . .	Up to 2200 rpm

**Engine specifications:**

Bore and stroke . . . . .	4-3/4 x 5 in.
Displacement . . . . .	531 cu. in.
Compression ratio . . . . .	16.1 to 1
Firing order . . . . .	1-5-3-6-2-4
Valve clearance:	

Intake . . . . . 0.015 in.

Exhaust . . . . . 0.022 in.

Injection pump timing . . . . . TDC

**GROUND SPEEDS**

Tractors equipped with  
18.00-25 or 23.5-25 Earthmover tires

Gear	Hand Throttle Operating Range		
	1500 Rpm	1900 Rpm	2200 Rpm
1st	1.7 mph	2.2 mph	2.5 mph
2nd	2.8 mph	3.5 mph	4.1 mph
3rd	3.7 mph	4.6 mph	5.4 mph
4th	4.7 mph	6.0 mph	6.9 mph
5th	5.9 mph	7.4 mph	8.6 mph
6th	7.7 mph	9.7 mph	11.3 mph
7th	10.0 mph	12.6 mph	14.6 mph
8th	16.2 mph	20.6 mph	23.8 mph
3rd reverse	3.6 mph	4.5 mph	5.2 mph
5th reverse	5.7 mph	7.2 mph	8.4 mph
7th reverse	9.7 mph	12.3 mph	14.2 mph
8th at 2400 rpm (fast idle no-load engine speed)			26.1 mph

*\*Factory observed, corrected to standard sea level conditions (29.92 in. Hg. and 60° F.).*

**CAPACITIES (Dry Measurements)**

Fuel tank . . . . .	49 U.S. gals.
Engine crankcase . . . . .	13-1/2 U.S. qts.
Transmission-hydraulic system . . . . .	17 U.S. gals.
Cooling system . . . . .	40 U.S. qts.

**LUBRICATION SYSTEM** . . Force-feed, pressurized-type, with full flow oil filter

**FUEL SYSTEM**

Type . . . . . Direct injection  
Injection pump . . . . . Inlet metering, distributing-type

Air cleaner . . . . . Dry-type

**COOLING SYSTEM**

Type . . . . . Pressurized with centrifugal pump

Engine temperature control . . Two heavy-duty thermostats

**ELECTRICAL SYSTEM**

Type . . . . . 24-volt  
Starter . . . . . 24-volt

Alternator . . . . . 24-volt

Lights, head  
and flood . . . . . 24-volt, grounded, using 12-volt bulbs, two lamps connected in series in 24-volt circuits

Lights, red tail:  
Tractor . . . . . 24-volt, grounded, using 12-volt bulbs, connected in series with a resistor in 24-volt circuit.

Scraper . . . . . 24-volt, grounded, using 12-volt bulbs, connected in series in 24-volt circuit

Accessories . . . . . 12-volt, grounded

Batteries . . . . . Four, 115 ampere-hour, 6-volt batteries, connected in series



**Thank you very much for  
your reading. Please Click  
Here. Then Get COMPLETE  
MANUAL. NO WAITING**



**NOTE:**

**If there is no response to  
click on the link above,  
please download the PDF  
document first and then  
click on it.**



## Section 20

# SPECIFICATIONS

### Group 5

#### PURPOSE

This section contains detailed specifications for various parts in the tractor. If desired, a tab or marker can be added to aid future reference to this section.

The dimensions given for new parts are intended to aid the service man in determining when a new part is necessary. This new part information should never be used as the only reason for part replacement. Satisfactory performance during the future service life of the tractor should be the main consideration. However, worn parts usually require more attention than new parts.

#### INDEX

Clutch . . . . .	20-5-4
Differential . . . . .	20-5-6
Differential Lock . . . . .	20-5-6
Electrical System . . . . .	20-5-9
Engine . . . . .	20-5-1
Final Drive . . . . .	20-5-8
Front Axle . . . . .	20-5-10
Fuel System . . . . .	20-5-4
Hydraulic System . . . . .	20-5-11
Power Take-Off (PTO) . . . . .	20-5-8
Rear Wheels . . . . .	20-5-11
Seat . . . . .	20-5-10
Transmission . . . . .	20-5-5

### ENGINE

#### General Specifications

<i>Item</i>	<i>Specifications</i>
Crankcase oil capacity when crankcase is dry . . . . .	13-1/2 U.S. quarts
Cooling system capacity . . . . .	40 U.S. quarts
Timing of injection pump . . . . .	TDC
Slow idle speed . . . . .	600 rpm
No load speed (1900 rpm position) . . . . .	2150 rpm
No load speed (2200 rpm position) . . . . .	2400 rpm
No load speed speed for fully depressed foot throttle . . . . .	2400 rpm

#### Cylinder Liners

I.D. of cylinder liner . . . . .	4.7493 to 4.7507 in.
Maximum wear or taper . . . . .	0.005 in.
Thickness of cylinder liner shim . . . . .	0.030 in.

#### Pistons

O.D. at top of skirt, parallel to piston pin . . . . .	4.7282 to 4.7288 in.
O.D. at top of skirt, right angle to piston pin . . . . .	4.7422 to 4.7428 in.
O.D. at bottom of skirt, parallel to piston pin . . . . .	4.7300 to 4.7310 in.
O.D. at bottom of skirt, right angle to piston pin . . . . .	4.7440 to 4.7450 in.
Clearance at top of skirt, parallel to piston pin . . . . .	0.0218 to 0.0242 in.
Clearance at top of skirt, right angle to piston pin . . . . .	0.0078 to 0.0102 in.

## Pistons (Continued)

<i>Item</i>	<i>Specification</i>
Clearance at bottom of skirt, parallel to piston pin . . . . .	0.0183 to 0.0207 in.
Clearance at bottom of skirt, right angle to piston pin . . . . .	0.0048 to 0.0072 in.
Piston pin bore in piston . . . . .	1.7506 to 1.7512 in.
Piston pin to piston clearance . . . . .	0.0003 to 0.0015 in.
Piston ring side clearance 1st, 2nd and 3rd grooves . . . . .	0.0045 to 0.0060 in.
4th groove . . . . .	0.0025 to 0.0030 in.
Maximum clearance before replacement 1st, 2nd, and 3rd grooves . . . . .	0.008 in.
4th groove . . . . .	0.007 in.

## Piston Pins

O.D. piston pins . . . . .	1.7497 to 1.7503 in.
Piston pin to connecting rod clearance . . . . .	0.0007 to 0.0023 in.

## Valves

O.D. of valve stems (intake and exhaust) . . . . .	0.4335 to 0.4345 in.
Angle of valve face . . . . .	44-1/2°
Intake valve clearance . . . . .	0.015 in.
Exhaust valve clearance . . . . .	0.022 in.

## Valve Springs

Load to compress spring to 2-7/16 inches . . . . .	61 to 75 lbs.
Load to compress spring to 1-29/32 inches . . . . .	190 to 232 lbs.

## Valve Seats

Angle of valve seat . . . . .	45°
Width of valve seat . . . . .	3/32 in.
Concentricity of valve seat width guide (indicated runout) . . . . .	0.002 in.

## Valve Guides

Depth to valve guide from bottom of cylinder head . . . . .	1-7/8 in.
I.D. of valve guide . . . . .	0.4374 to 0.4390 in.
Clearance between valve stem and guide . . . . .	0.0029 to 0.0055 in.

## Rocker Arms and Shaft

O.D. of rocker arm shaft . . . . .	0.9990 to 1.0000 in.
I.D. of rocker arm . . . . .	1.0030 to 1.0050 in.
Clearance between arm and shaft . . . . .	0.0030 to 0.0060 in.

## Camshaft and Bearings

I.D. of camshaft bearing bore in cylinder block . . . . .	2.4995 to 2.5005 in.
O.D. of camshaft journals . . . . .	2.3745 to 2.3775 in.
I.D. of camshaft bushings (installed) . . . . .	2.3775 to 2.3795 in.
Clearance between journal and bushing . . . . .	0.002 to 0.005 in.
Thrust plate thickness . . . . .	0.1185 to 0.1215 in.
End play of camshaft . . . . .	0.0025 to 0.0085 in.

Connecting Rods and Bearings

<i>Item</i>	<i>Specification</i>
O.D. of connecting rod crankshaft journal . . . . .	3.4980 to 3.4990 in.
I.D. of connecting rod bearing (assembled) . . . . .	3.5005 to 3.5025 in.
Connecting rod bearing oil clearance . . . . .	0.0015 to 0.0045 in.
I.D. of piston pin bushing . . . . .	1.7510 to 1.7520 in.

Crankshaft and Main Bearings

O.D. of crankshaft main bearing journals . . . . .	3.7480 to 3.7490 in.
I.D. of main bearings (assembled) . . . . .	3.7421 to 3.7441 in.
Main bearing oil clearance . . . . .	0.0031 to 0.0061 in.
Crankshaft end play . . . . .	0.0025 to 0.0085 in.
Rear oil slinger installed from rear edge of crankshaft flange . . . . .	3/64 in.

Oil Pump

O.D. of drive gear . . . . .	2.3120 to 2.3160 in.
O.D. of driven and idler gears . . . . .	2.2680 to 2.2690 in.
O.D. of drive shaft . . . . .	0.6240 to 0.6250 in.
O.D. of idler gear shaft . . . . .	0.6284 to 0.6290 in.
I.D. of gear bores in housing . . . . .	2.2720 to 2.2740 in.
Clearance between pump gear teeth and pump housing . . . . .	0.0010 to 0.0014 in.
Gear thickness . . . . .	1.500 to 1.502 in.
Depth of bore in housing . . . . .	1.503 to 1.505 in.
End clearance of pump gears . . . . .	0.001 to 1.005 in.
Oil pressure at 1900 rpm . . . . .	25 to 35 psi

Ventilator Pump

O.D. of pump shaft . . . . .	0.7495 to 0.7505 in.
I.D. of pump shaft bushings in housing . . . . .	0.752 to 0.754 in.
I.D. of impeller bore . . . . .	0.7505 to 0.7525 in.
End play of pump shaft . . . . .	0.006 to 0.012 in.
O.D. of idler gear shaft . . . . .	1.499 to 1.500 in.
I.D. of bushing in idler gear . . . . .	1.501 to 1.502 in.

Water Pump

Clearance between impeller and housing . . . . .	0.070 to 0.090 in.
O.D. of pump shaft at impeller end . . . . .	0.6262 to 0.6272 in.
I.D. of bore in impeller . . . . .	0.6242 to 0.6252 in.

Cooling System

Filler cap release pressure . . . . .	7 psi
Thermostat opening temperature . . . . .	160° or 180°
Water pump impeller blade to housing clearance . . . . .	0.70 to 0.90 in.
Fan belt tension to allow 1-inch deflection . . . . .	20 lbs.