

John Deere 2000 Series Tractors



JOHN DEERE

SERVICE MANUAL John Deere 2000 Series Tractors

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**SERVICE MANUAL FOR
JOHN DEERE DEALERS**

**2000
SERIES**

TRACTORS

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TO THE JOHN DEERE SERVICEMAN

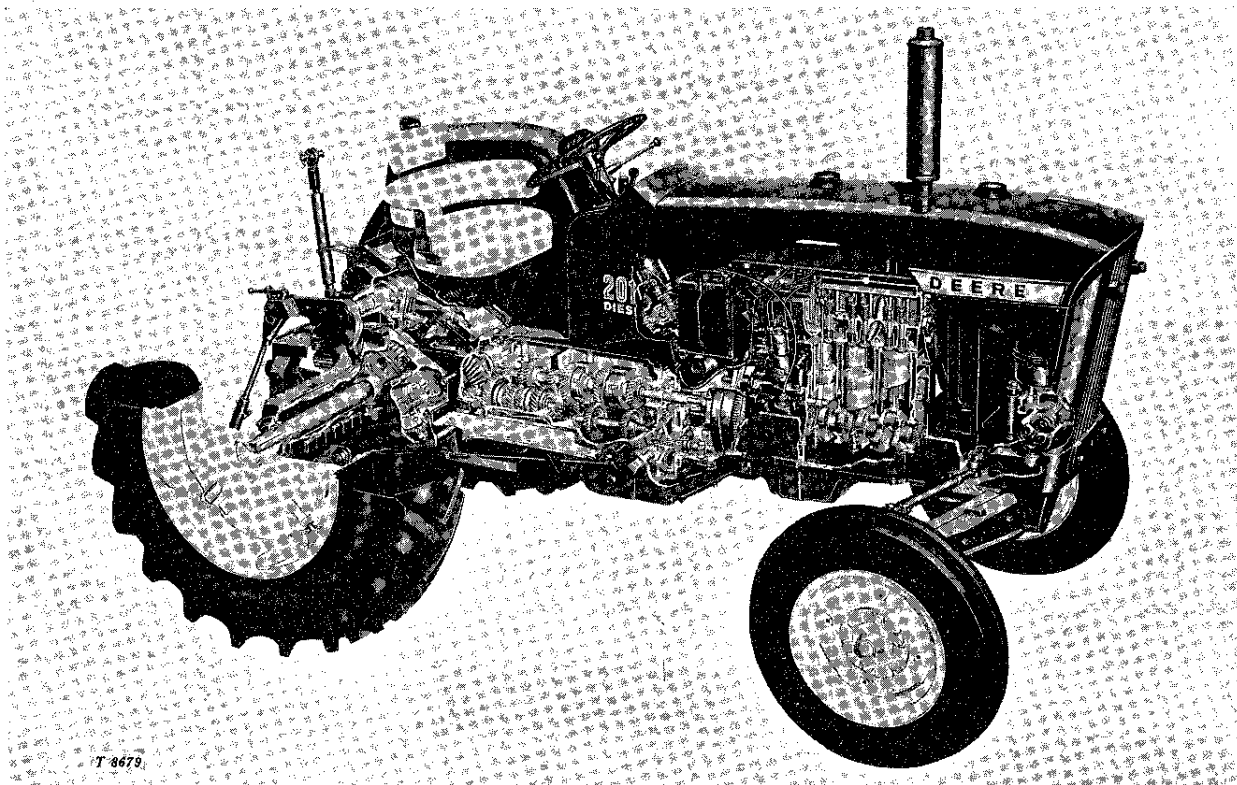
This service manual contains maintenance instructions for John Deere 2000 Series tractors. Included are complete instructions for removal, disassembly, inspection, repair, assembly and installation of the major parts and assemblies of the tractor.

In addition, the manual contains brief descriptions of the more complicated systems of the tractor, and tells how they operate. Dimensions of many new wearing parts are given as an aid in determining when parts replacement is necessary. Tests and adjustments, required to keep the tractor operating efficiently, are explained in detail.

A section on "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.



Cutaway View of John Deere 2010 Row-Crop Utility Tractor

Section 10

DESCRIPTION, OPERATION AND SPECIFICATIONS

Group 5

DESCRIPTION

DESCRIPTION

The 2010 Row-Crop is a general-purpose tractor which can be equipped with Roli-O-Matic, dual front wheels, single front wheel, or adjustable front axles. It is especially useful for planting and cultivating two, four, or six rows, mowing, seedbed preparation, and similar jobs.

The 2010 Row-Crop Utility Tractor is, as the name implies, an all-around agricultural row-crop type tractor. Its low center of gravity provides excellent stability and maneuverability even when working under adverse conditions. Its groundhugging features make it ideally suited for general purpose farming.

The 2010 Hi-Crop Tractor provides 34-inch crop clearance under the front axle and 31-inch clearance under the transmission, making late cultivating possible without damage to tall, bushy, or high-bedded crops. The flexibility of this tractor makes it ideal for bedding, planting, side-dressing, cultivating, and harvesting.

These tractors have ample power to pull two or three plow bottoms, or the equivalent, in most soils.

The tractors in the 2010 Series line are identical in many respects. Features which are common to both types are described briefly in the paragraphs which follow. The distinctive features of each are also mentioned briefly.

COMMON FEATURES

GASOLINE AND LP-GAS ENGINES

The 2010 Series has a vertical, four-cylinder, valve-in-head, four-stroke cycle, internal com-

bustion engine. A bore of 3-5/8 inches and a stroke of 3-1/2 inches gives a piston displacement of approximately 145 cubic inches.

The 2010 Series is available with either gasoline-burning equipment or LP-Gas-burning equipment. The compression ratio of the gasoline-burning engine is 7.9 to 1 as opposed to 8.9 to 1 in the LP-Gas engine. (Pistons are available for high altitude operation of gasoline engines which provide a 9.0 to 1 compression ratio.)

A replaceable "sleeve and deck" assembly is used in the cylinders of both gasoline and LP-Gas models. This feature provides lower costs at time of engine overhaul.

Crankshaft rotation is clockwise when viewed from the front.

The engine has replaceable precision-type main and connecting rod bearing inserts. All bearings and other parts of the engine are lubricated by a force-feed and splash-type system with a replaceable-type oil filter. The crankcase is ventilated by means of a ventilator outlet tube attached to the rocker arm cover. This tube discharges below the crankcase flange. Engine speeds are controlled by a flyweight-type governor, gear-driven from the camshaft gear.

DIESEL ENGINES

The 2010 Series has a vertical, 4-cylinder, valve-in-head, fuel injection, four-stroke cycle, internal combustion engine. A bore of 3-7/8 inches and a stroke of 3-1/2 inches gives a piston displacement of approximately 165 cubic inches.

The compression ratio of the Diesel engine is 19 to 1.

The engine has replaceable precision-type main and connecting rod bearing inserts. All bearings and other parts of the engine are lubricated by a force-feed and splash-type system with a replaceable-type oil filter. The crankcase is ventilated by means of a ventilator outlet tube attached to the rocker arm cover and discharging below the crankcase flange. Engine speeds and injection timing are controlled by the fuel injection pump.

A replaceable "sleeve and deck" assembly is used in the cylinders of the Diesel engine.

Crankshaft rotation is clockwise when viewed from the front.

FUEL SYSTEM

The 2010 Series gasoline fuel system is equipped with a 16 U.S. gallon fuel tank. The carburetor is a single-throat, updraft, adjustable idle jet type.

The 2010 Series Diesel uses a distributor-type fuel injection pump. The fuel system consists of a 16 U.S. gallon fuel tank, fuel filters, fuel strainer, fuel injection pump, fuel injection nozzles, and turbulence chambers. The fuel injection pump is an opposed plunger, inlet metering, distributor-type. Pintle-type injector nozzles are located in turbulence chambers mounted at the top of each cylinder.

The LP-Gas fuel system has a cylindrical, heavy welded tank and is equipped with several pressure valves and gauges designed as safety features. The tank has a capacity of 22.6 U.S. gallons at 80% fill. A direct reading, magnetic-type fuel gauge is mounted on the rear of the tank. A coolant-heated converter is used to turn pressurized LP-Gas fuel into a gas and reduce pressure. The carburetor is a converter-fed, single-throat, updraft model.

CAUTION: Before operating the LP-Gas-fuel system, read carefully the information in Section 92, Group 10, regarding the nature of LP-Gas and the rules for handling it safely.

IGNITION

Gasoline and LP-Gas models have a battery-distributor type ignition system with automatic spark advance. A 12-volt battery, generator, and starter are standard equipment.

The Diesel engines are equipped with an electrical pre-heating system called "glow plugs" which are electrical heating elements located above the fuel injectors on the cylinder head and extending into the turbulence chambers. There are four glow plugs on the 2010 Series Diesel Tractors. They are used when starting a cold engine and need not be used when starting a warm engine. A 12-volt battery, generator, and starter are standard equipment.

LIGHTING SYSTEM

All lighting equipment is optional and includes hood-mounted headlights, dual or single fender-mounted headlights, a dash light, a tail light, a combination white and red rear warning light, a rear warning light, a rear work light, and auxiliary plug-in light socket.

COOLING SYSTEM

The engines are liquid cooled; the coolant flows by pressure through passages around the cylinders in the block, and around valves in the cylinder head. Coolant is circulated evenly in all passages in the block, head, (converter in LP-Gas models) and through the radiator by a centrifugal water pump located on the cylinder block, and operated by the fan belt. A thermostat and fixed by-pass insure a quick and thorough engine warm-up.

LUBRICATION

The engine lubrication systems are forced by a positive displacement, gear driven oil pump. The oil pump on Diesel models is located under the fuel injection pump (distributor on Gasoline and LP-Gas) and extends into the bottom of the crankcase. Oil is fed under pressure onto governor bearings, crankshaft main bearings, and connecting rods, and splashed onto piston pins, and valve tappet assembly. These lubrication systems employ an oil filter with a replaceable filter element.

CLUTCH

The engine clutch used on the 2010 Series Tractors is a spring-loaded, single dry-disk, foot-operated clutch, located in front of the transmission. Adjustment for free clutch pedal travel can be made externally.

TRANSMISSION

The Syncro Range Transmission (Section 120) has a high range, low range, and reverse. It is a synchronized shift in series with four speed gear ratios to provide eight forward speeds and three reverse speeds.

A conventional ring-gear and bevel-pinion type differential is enclosed in the rear of the transmission case. Bevel pinion and gear backlash adjustment is made by shims between the ring gear carrier and the bearings.

POWER TAKE-OFF

The power take-off is the continuous-running type, governed by its own separate clutch, and is available with dual speeds of 540 rpm or 1000 rpm. It is an engine-driven type and is completely independent of tractor ground travel. It fully meets all ASAE-SAE standards.

BELT PULLEY

A belt pulley is available as an attachment. The pulley assembly slips over the power take-off shaft and is attached to the power take-off housing. The belt pulley is driven by the power take-off shaft. The belt speed is 3100 feet per minute at 1900 engine rpm.

BRAKES

Two individually or simultaneously operated, self-energizing double-disk brakes are provided, Fig. 10-5-1. Braking is applied by foot pedals through rod and lever linkage.

The 2010 Row-Crop and Row-Crop Utility brakes are mounted on the outside of the final drive housings. The 2010 Hi-Crop brakes are located inside the final drive housings. Brake adjustments are made externally on all tractors.

STEERING MECHANISM

The 2010 Series Tractors are steered by a steering gear and drag link which connects to a spindle mechanism over the front wheels. Power steering is optional.

REAR WHEELS

Row-Crop tractors can be equipped with sliding hub, rack and pinion, or power adjusted

rear wheels. Row-Crop Utility Tractors can be equipped with demountable rim, fixed hub, sliding hub, rack and pinion, or power-adjusted rear wheels. Hi-Crop Tractors have either a steel disk wheel on a reversible hub or a cast disk wheel with demountable rim on a reversible hub.

FRONT AXLES

The Row-Crop Utility tractor is equipped with adjustable front axles of either the straight or swept-back type. Both types of axle have an adjustable tread of 50 to 74 inches in 2-inch steps, which can be increased to 79-1/8 inches by reversing the wheels. Swept-back axles give a shorter turning radius for sharper turns in the field or in close-quarters work. An optional straight front axle can be adjusted from 62 to 88 inches (93-1/8 inches with wheels reversed).

The Row-Crop Tractor may be equipped with a front axle of the spindle and knuckle type (dual), adjustable front axle of the straight type, Roll-O-Matic type, or single front wheel type. The adjustable front axle provides a tread range of 50 to 74 inches in 2-inch steps, which can be increased to 79-1/8 inches by reversing the wheels. An optional adjustable front axle can be adjusted from 62 to 88 inches (93-1/8 inches with wheels reversed).

The Hi-Crop Tractor is equipped with a front axle which provides wheel treads of 54 to 84 inches in 6-inch steps (89-1/8 inches with wheels reversed). Radius rods are available to provide increased strength under unfavorable working conditions.

HYDRAULIC SYSTEM, 3-POINT HITCH, AND LOAD-AND-DEPTH CONTROL

As optional equipment, the 2010 Series Tractors may be equipped with a single or dual hydraulic system, a single or dual remote control system, and a 3-point hitch.

Depending on individual needs, the tractors can be equipped with either a single hydraulic system to raise, lower, or set integral implements to desired depth, or a dual hydraulic system which will raise, lower, or set at desired depth, part of an integral implement independently (such as one side of a two-row cultivator) or all of the implement simultaneously. By simple adjustments, both cylinders

may be made to act together, approximately doubling the lifting capacity.

The load-and-depth control system regulates implement working depth over uneven ground, compensating for the effect of ridges and depressions.

The desired implement working depth is set by the hydraulic system control levers. When the tractor front wheels pass over a ridge, the implement mounted at the rear of the tractor is forced downward. This pushes the center link of the 3-point hitch forward, actuating the load control yoke and linkage causing the system to raise the implement until the system is again in balance and the implement is working at the correct depth.

When tractor front wheels drop into a depression, the implement tends to rise in relation to the ground level. The resulting pull on the center link causes the load-and-depth control to lower the implement to the proper working depth. In addition, when soil conditions change so that the implement is working in abnormally hard soil, the implement is forced backward, causing the center link to push forward. The system then raises the implement sufficiently to reduce draft and minimize strain on the tractor and implement.

When once more operating in normal soil, the load-and-depth control again returns the implement to the operating depth determined by the position of the control lever.

A positive-displacement, gear-type hydraulic pump is mounted on the transmission front cover. The pump is driven by a coupling on the front end of the driveshaft. All 2010 Series Tractors

use the same pump (with varying gear sizes and capacities) in their hydraulic systems. Refer to Section 190, Group 5 of this Manual.

The tractor may be equipped to operate single-acting or double-acting remote hydraulic cylinders. A single remote cylinder is connected by hoses to a breakaway coupler mounted at the rear of the tractor. If a second cylinder is used, it is connected by short hoses to the control valve. Pressure oil from the hydraulic pump is directed by the selective control valve to the cylinder or cylinders.

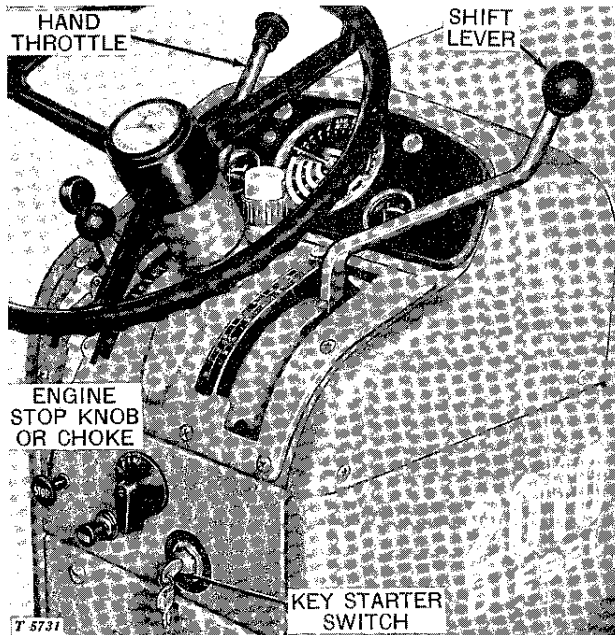
If the tractor is equipped with one remote cylinder, the cylinder can be used to control a drawn implement or to control front-mounted tools. Two remote cylinders (with dual system) permit selective control of front-mounted units and dual hookups on drawn machines. The two remote cylinders may be operated individually or simultaneously.

The 3-point hitch on all tractors provides an efficient, versatile means of attaching integral implements to the tractor.

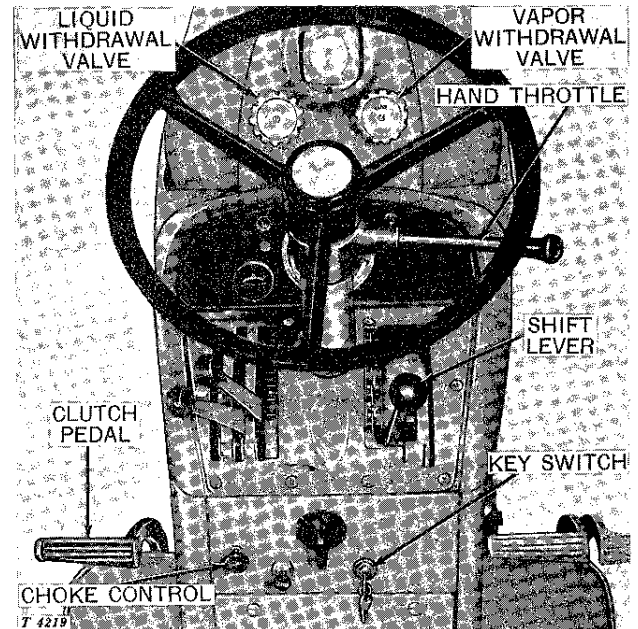
FRONT-MOUNTED ROCKSHAFT

Tractors may be equipped with a front rockshaft to control the front rigs of cultivators and other front-mounted tools. The front rockshaft can be powered by the rear rockshaft lift arms (H, R, RU) or by one or two remote cylinders (R only). When powered by the rear rockshaft, rigs on the front rockshaft can be operated together with rigs at the rear or as separate units (with dual rear rockshafts only). Remote cylinder powered front rockshafts are available in single or dual systems, which provide both up and down pressure.

Group 10 OPERATION



Gasoline and Diesel



L.P-Gas

Fig. 10-10-1—Engine Starting Controls

PRE-STARTING INSPECTION

1. Check engine crankcase oil level.
2. Check radiator coolant level.
3. Check radiator hoses and connections for leaks.

4. Make sure the fuel shut-off valve under the fuel tank is open (gasoline and diesel).

STARTING CONTROLS

Fig. 10-10-1 shows starting controls for gasoline, diesel, and LP-Gas engines.

STARTING THE ENGINE

Gasoline	Diesel	LP-Gas	Procedure
X	X	X	Place shift lever in "PARK" and depress clutch pedal to decrease drag on engine.
X	X		Advance hand throttle to half-way open position.
		X	Advance hand throttle to provide a speed slightly faster than slow idle.
X		X	Pull out choke (if engine is cold).
	X		Turn key starter switch left to "GLOW PLUGS" and preheat engine. (See time chart below.)*
		X	Open the VAPOR withdrawal valve <u>slowly</u> .
X	X	X	Turn key starter switch all the way to right to start engine. <u>Do not hold switch in start position for more than 30 seconds. To do so may overheat starter.</u>
X		X	As soon as engine starts, push in choke. (During cold weather leave choke partially out a few minutes if necessary.)
X	X	X	As engine begins to run, check to see that generator and oil pressure tel-lights go out. If not, stop engine and troubleshoot.
		X	Operate engine until warm; then slowly open LIQUID withdrawal valve and close VAPOR withdrawal valve.
X	X	X	Allow engine to warm up for five minutes before placing under load. Do not idle engine during this period.

*Preheat time for diesel glow plugs at various temperatures:

Above 40° F. . . . 1 minute	10° F. to - 10° F. . . . 2 to 3 minutes
40° F. to 10° F. . . . 1-1/2 to 2 minutes	-10° F. to - 20° F. . . . 3 to 4 minutes

AFTER STARTING INSPECTION

- | | |
|---|---|
| <p>1. Check the generator and oil pressure tel-lights on dash to make sure they go out.</p> | <p>2. Check water temperature gauge. Do not operate engine under load until gauge moves to "N" (normal) range.</p> <p>3. Check for water, oil, and hydraulic leaks.</p> |
|---|---|

COLD WEATHER STARTING

Use only recommended types of fuel and crankcase oil for cold weather operation (see Section 30). (Also use same type of oil in air cleaner.)

Make sure battery is fully charged to develop maximum cranking speed.

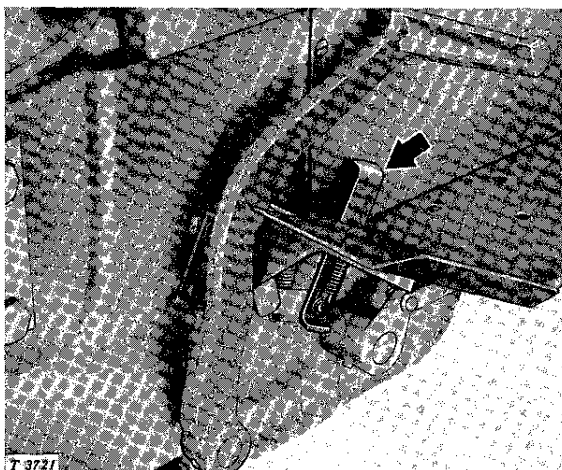


Fig. 10-10-2—Hydraulic Pump Lever

The tractor will start easier in extreme cold weather if hand throttle is placed in one-half speed position, and clutch and hydraulic pump are disengaged (Fig. 10-10-2). On diesel tractors, glow plugs should be heated for longer periods.

On diesel tractors, in extreme cold weather, it may be necessary to connect a booster battery in parallel with battery on tractor. CAUTION: Ether is NOT recommended as a diesel starting aid. It may damage engine or starter.

STOPPING THE ENGINE**ALL ENGINES**

Place shift lever in "PARK" position.

Idle engine at least one or two minutes before stopping. This will allow engine to cool off, preventing extreme contraction of parts, possible

back-firing, and coking of lubricating oil on piston rings, valve guides, etc.

GASOLINE ENGINE

Turn key starter switch to vertical "OFF" position.

NOTE: If tractor is not to be used for several days, drain fuel from carburetor at plug on bottom.

DIESEL ENGINE

Turn key starter switch to vertical "OFF" position while pulling out on engine stop knob to cut off fuel. CAUTION: Do not attempt to stop by turning off fuel supply at shut-off valves. Doing so will cause injection pump to run dry and damage internal parts.

LP-GAS ENGINES

Close the LIQUID withdrawal valve and slowly open the VAPOR withdrawal valve. Idle the engine for a minute or two to use up the liquid fuel in the lines.

Close the VAPOR withdrawal valve and let the engine idle until fuel is exhausted and the engine stops. TURN THE KEY SWITCH OFF.

BREAKING IN THE ENGINE

Before tractor was shipped from factory, all bearings and friction surfaces were correctly fitted, and the crankcase was filled with a "breaking-in" oil.

During the first 20 hours of service, tractor engine should be operated at rated speed, and under normal load. Avoid light loads and excessive engine idling. Check crankcase oil level periodically. If it becomes necessary to add oil during the "breaking-in" period, either SAE 10W or SAE 5W-20 may be used.

After this 20-hour period, drain the crankcase oil, replace the crankcase oil filter, and fill the crankcase with oil of the proper viscosity and quality (see Section 30).

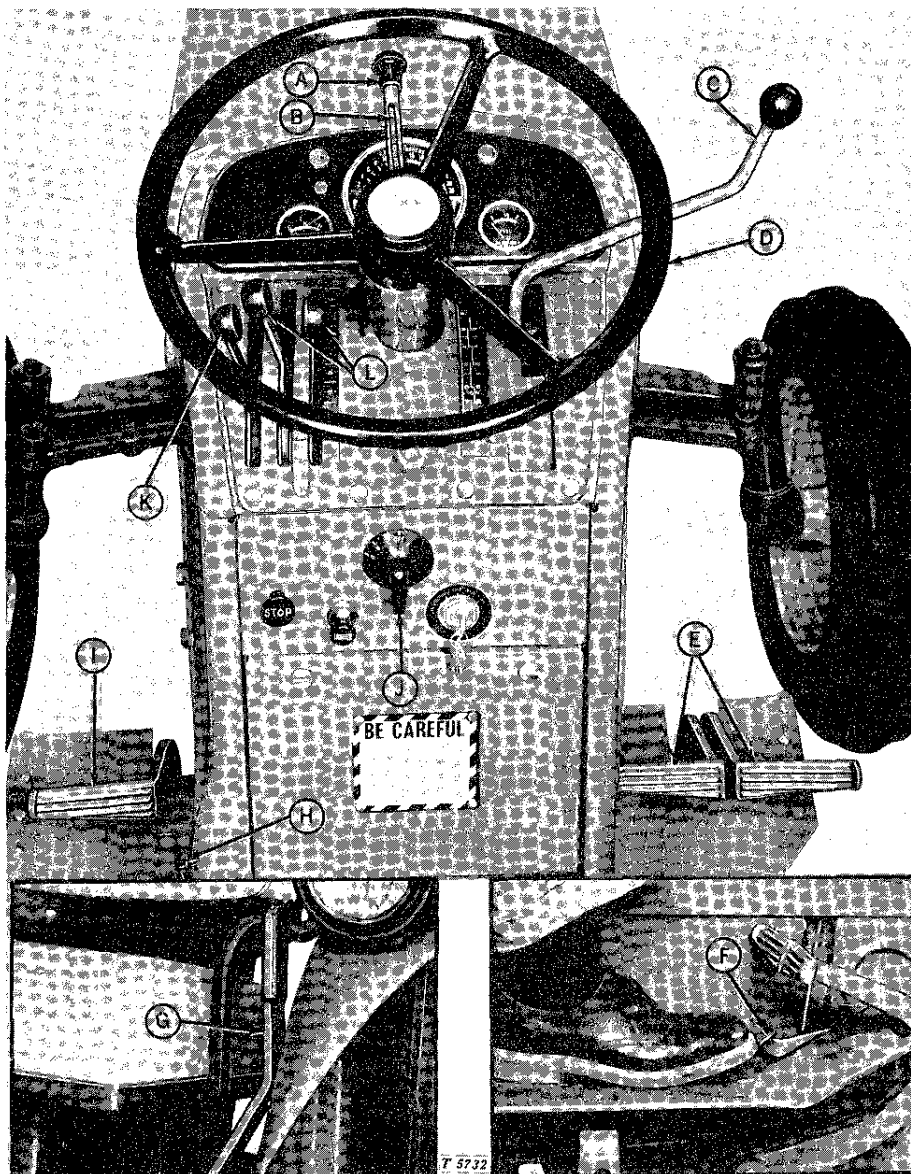
OPERATING CONTROLS

The operating controls on all tractors are identical (Fig. 10-10-3). The clutch pedal, brake pedals, shift lever, PTO clutch lever, rockshaft control levers, remote hydraulic cylinder control levers, hand throttle, and foot throttle are located in the same position on all tractors.

OPERATING THE TRACTOR

TRACTOR WARM-UP

Before putting tractor under full load or into high gear, be sure it is warmed up sufficiently. Oil will then circulate freely, preventing undue wear on engine or transmission parts.



- | | |
|------------------------|--|
| A - Hand Throttle Knob | G - Powershaft and Belt Pulley Control Lever |
| B - Hand Throttle | H - Hydraulic Pump Disengaging Lever |
| C - Shift Lever | I - Clutch Pedal |
| D - Steering Wheel | J - Light Switch |
| E - Brake Pedals | K - Remote Hydraulic Cylinder Control Lever |
| F - Foot Throttle | L - Rockshaft Control Levers |

Fig. 10-10-3—Operating Controls

ENGINE SPEEDS

The tractor is designed to operate at speeds ranging from 1500 to 2500 rpm. These are variable governed speeds, and the engine can be operated at any speed between the two extremes to meet various working conditions.

Full load SAE standard PTO speed is 1900 rpm. Use this speed when operating the power take off or belt pulley. Slow-idle is 600 rpm (gasoline and LP-Gas) or 750 rpm (diesel).

In addition, an engine speed of 2500 rpm is provided to save time when traveling on highways or on smooth-surfaced roads.

Using Hand Throttle

Use the hand throttle to select slow-idle or any of the variable governed speeds. Move the lever clockwise to accelerate; move the lever counter-clockwise to decelerate.

Move the throttle counter-clockwise as far as it will go to obtain slow-idle. To obtain the 1900 rpm engine speed, pull throttle clockwise to the first stop. Placing the throttle halfway between slow-idle and 1900 rpm gives the 1500 rpm speed.

To obtain working speeds above 1900 rpm, pull out on the throttle knob and move throttle clockwise as far as it will go. This is the 2500 rpm position.

Using Foot Throttle

The foot throttle operates in conjunction with the hand throttle. It provides foot control of engine speed and is a convenient means of accelerating or decelerating, especially during transport operation. When pedal is released, engine will decelerate to hand throttle setting.

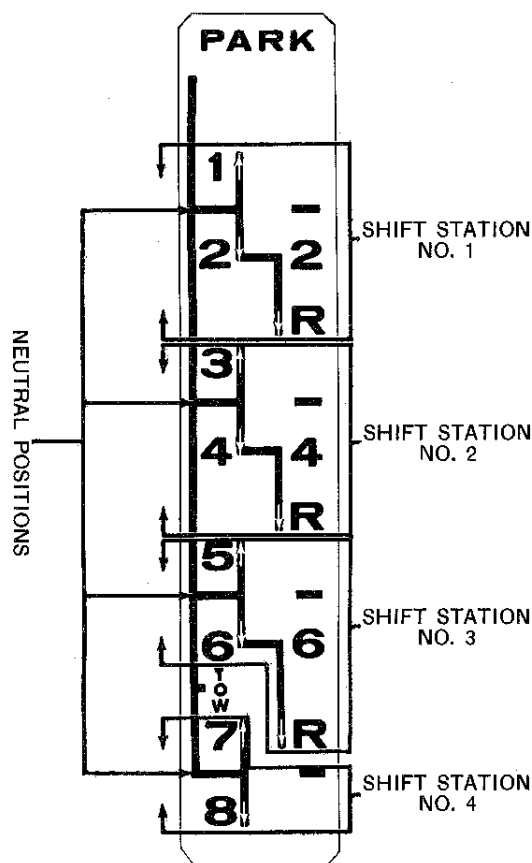
NOTE: The foot throttle is not intended as a means of "revving up" engine beyond normal working speeds.

SELECTING GROUND SPEED

The tractor has eight forward gears and three reverse gears. These gears, together with the engine speeds that may be selected, enable the

operator to balance load and speed for maximum economy and allow him flexibility to meet varying working conditions. For example, to obtain a given ground speed the operator may choose to work in a low gear at high engine speed for maximum reserve power or in a higher gear at a lower engine speed for maximum fuel economy.

Examples of the ground speeds at which the tractor will travel are shown in Group 15 of this Section. Engine working speeds may be varied between 1500 and 2500 rpm.



T 1053

Fig. 10-10-4—Gear Shifting Pattern

SHIFTING GEARS

The gear shifting pattern is shown in the decal diagram in Fig. 10-10-4. Note that the eight forward gears are paired in four shifting stations, and that three of the stations have reverse gears. Also notice that lines between each part of forward gears indicate neutral positions.

SHIFTING FROM NEUTRAL

Having determined the proper gear, depress the clutch pedal to disengage the clutch, and move the shift lever from neutral to the slot for the gear desired.

Gradually release the clutch pedal to take up the load smoothly.

SHIFTING FROM ONE GEAR TO ANOTHER

The transmission can be shifted from one forward gear to another forward gear of the same shift station while the tractor is in motion. For instance, you can shift between 1st and 2nd gear without stopping the tractor. This is a speed shift: merely declutch momentarily while shifting. You can also shift from a forward gear to a reverse gear of the same shift station while the tractor is in motion. This is especially useful in "shuttling" the tractor back and forth when a traction stall has occurred or for loader operation.

To shift to a new gear not in the same shift station, stop the tractor, depress the clutch pedal, and move the shift lever to neutral. You can then shift from neutral to the new gear in the usual manner and gradually release the clutch pedal to engage the clutch.

PARKING THE TRACTOR

When the tractor is stopped for parking, for holding it on an incline, or for holding it during PTO or belt work, move the shift lever as far as it will go upward from neutral to the "PARK" position.

This automatically holds the tractor stationary. Shifting from "PARK" to neutral or to an operating gear releases the braking action.

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

TOWING THE TRACTOR

The shift quadrant on your tractor also has a "TOW" position. Whenever the tractor is to be towed, move the shift lever to this position. This will eliminate unnecessary wear of transmission parts when the tractor is being towed by another vehicle.

CAUTION: The tractor should never be towed at a speed greater than 20 miles per hour. Always attach a tow bar or chain to the tractor frame.

Group 15 SPECIFICATIONS

PERFORMANCE (Observed at Nebraska Tests 799 and 800)

	Gasoline	Diesel
Maximum drawbar horsepower	40.82	41.40
Maximum power take-off horsepower	46.86	46.67
Maximum drawbar pull (pounds)	4596	4553

CAPACITIES (U.S. Standard Measures)

Fuel tank . . . Gasoline and Diesel, 16 gals.; LP-Gas @80% full, 22.6 gals.
Cooling system 3 gals.
Engine lubrication (including filter) 5 qts.
Transmission case 8 gals.
Final drive cases (each) 1 gal.

ENGINE

Number of cylinders 4
Bore and stroke, inches . . Gasoline and LP-Gas, 3-5/8 x 3-1/2; Diesel, 3-7/8 x 3-1/2
Displacement in cubic inches Gasoline and LP-Gas, 145; Diesel, 165
Compression ratio . . . Gasoline, 7.9 to 1; Gasoline high altitude engine, 9.0 to 1; LP-Gas, 8.9 to 1; Diesel, 19 to 1

ENGINE SPEEDS

SAE standard PTO engine speed. . . 1900 rpm
Fast-idle for PTO 2100 rpm
Slow-idle 800 rpm (Diesel) 600 rpm (Gasoline and LP)
Fast-idle for full engine power 2700 rpm (Gasoline and LP) 2650 rpm (Diesel)
Full engine power 2500 rpm

IGNITION SYSTEM (Gasoline and LP-Gas)

Type Battery - distributor
Distributor point gap022-inch
Spark plugs
Size 14 mm
Gap025-inch (Gasoline) .015-inch (LP-Gas)

TRANSMISSION SPEEDS, MPH (NO SLIP)

Hi-Crop Tractor (13.6 x 38 rear tires).

Gear	(-29000)		(29001-Up)	
	Engine rpm		Engine rpm	
	1500	2500	1500	2500
1st	1.57	2.61	1.37	2.29
2nd	2.22	3.70	1.94	3.24
3rd	2.72	4.54	2.38	3.97
4th	3.86	6.43	3.38	5.63
5th	4.79	7.98	4.19	6.99
6th	6.79	11.31	5.94	9.90
7th	8.00	13.33	7.00	11.67
8th	11.30	18.89	9.92	16.53
Rev. 1	1.74	2.89	1.52	2.53
Rev. 2	3.02	5.03	2.64	4.40
Rev. 3	5.31	8.84	4.64	7.74

Row-Crop Tractor (12.4 x 36 or 13.9 x 36 rear tires)

Gear	(-29000)		(29001-Up)	
	Engine rpm		Engine rpm	
	1500	2500	1500	2500
1st	1.59	2.65	1.27	2.12
2nd	2.25	3.75	1.80	3.01
3rd	2.76	4.60	2.21	3.69
4th	3.91	6.52	3.13	5.22
5th	4.86	8.10	3.89	6.49
6th	6.88	11.47	5.51	9.19
7th	8.11	13.52	6.50	10.83
8th	11.49	19.16	9.20	15.34
Rev. 1	1.76	2.93	1.41	2.35
Rev. 2	3.06	5.10	2.45	4.08
Rev. 3	5.38	8.97	4.31	7.18

Row-Crop Utility (13.6 x 28 rear tires)

Gear	(-29000)		(29001-Up)	
	Engine rpm		Engine rpm	
	1500	2500	1500	2500
1st	1.60	2.67	1.12	1.86
2nd	2.27	3.78	1.58	2.64
3rd	2.78	4.64	1.94	3.23
4th	3.94	6.57	2.75	4.58
5th	4.90	8.16	3.41	5.69
6th	6.94	11.56	4.83	8.06
7th	8.18	13.63	5.70	9.50
8th	11.58	19.31	8.07	13.45
Rev. 1	1.77	2.96	1.24	2.06
Rev. 2	3.08	5.14	2.15	3.58
Rev. 3	5.42	9.04	3.78	6.30

APPROVED TIRE OPTIONS

Front Tires

Size	Ply	Hi-Crop	Row-Crop	Row-Crop Utility
6.00 x 14	4		X	
6.00 x 14	6		X	
6.00 x 16	4	X		X
6.00 x 16	6			X
6.50 x 16	6	X		X
6.50 x 16	8		X	
7.50 x 15	6			X
7.50 x 16	4	X		X
9.00 x 10	8		X	

Rear Tires

Size	Ply	Hi-Crop	Row-Crop	Row-Crop Utility
16.9 x 26	6			X
12.4 x 28	4			X
13.6 x 28	4			X
14.9 x 28	6			X
16.9 x 28	6			X (RUS)
16.9 x 30	6			X
11.2 x 36	4		X	X
12.4 x 36	4		X	X
13.9 x 36	4		X	X
13.9 x 36	6		X	X
11.2 x 38	4	X		
12.4 x 38	4	X		
13.6 x 38	6	X		

GEAR REDUCTION RATIO (ENGINE TO AXLE)

Gear reduction ratio in first gear

Hi-Crop (-29000)	163 to 1
Hi-Crop (29001-Up)	186 to 1
Row-Crop (-29000)	151 to 1
Row-Crop (29001-Up)	188 to 1
Row-Crop Utility (-29000)	127 to 1
Row-Crop Utility (29001-Up)	188 to 1

Gear reduction ratio in eighth gear

Hi-Crop (-29000)	22.5 to 1
Hi-Crop (29001-Up)	25.7 to 1
Row-Crop (-29000)	20.8 to 1
Row-Crop (29001-Up)	26 to 1
Row-Crop Utility (-29000)	17.6 to 1
Row-Crop Utility (29001-Up)	26 to 1

DIMENSIONS (INCHES)

Point of Measurement	Hi-Crop	Row-Crop	Row-Crop Utility
Height to top of hood (Gas & Diesel)	72-5/8	60-1/16	55-5/8
(LP-Gas)	81-1/2	68-5/16	64-1/2
Over-all height	93-1/4	85-3/4	76-1/4
Over-all width, minimum	75-3/8	86	71
Over-all length (straight axle)	134-3/4	132	127-1/4
(swept-back axle)			121-3/4
(with 3-point hitch)	142-7/8	142	139-3/4
Wheel base (straight axle)	89-3/8	90	86-7/8
(swept-back axle)			81-1/2
Clearance, front axle	34-1/2	23-3/4	19-5/8

APPROXIMATE SHIPPING WEIGHT (LBS.)

	Hi-Crop	Row-Crop	Row-Crop Utility
(Gas)	5301	4671	4799
(LP-Gas)	5474	4844	4972
(Diesel)	5406	4776	4904

WHEEL TREADS

Type	Tractor	Range in Inches
Front:		
Straight adjustable axle	H R, RU	54 to 84* 50 to 74* or 62 to 88*
Swept-back adjustable axle	RU	50 to 74* or 48 to 68*
Rear:		
Steel disk	H	54 to 90
Steel disk	RU	64 to 84**
Cast disk	H	60 to 90
Sliding hub	R RU	56 to 93 or 56 to 104 53 to 96 or 53 to 106
Power adjusted	R RU	56 to 80 or 64 to 88 56 to 80
Rack and pinion	R, RU H	54 to 96*** 58 to 90
Demountable rim	RU	56 to 80

*Add 5-1/8 inches with wheels reversed

**58 or 74 with 16.9 x 26 tires

***62 to 88 with 16.9 x 30 tires (RU only)

Section 30

PERIODIC LUBRICATION

Group 5

LUBRICATION TIMETABLE

Effective use of lubricating oils and greases is perhaps the most important step towards low upkeep cost, long tractor life, and satisfactory service. Use only those lubricants specified in this section; apply them at the intervals and according to the instructions in the lubrication section.

ENGINE LUBRICATING OILS

When selecting proper oil for the engine crankcase, three factors should be considered: the reliability of the oil supplier and manufacturer, the viscosity for the fill period, and the type of service under which the engine will be operated. Let's consider each of these.

RELIABILITY OF OIL SUPPLIER AND MANUFACTURER

There is no universal label indicating the quality of an oil, nor is there an independent reviewing organization to insure that claims made on oil labels are true. Therefore it is important that you select only recognized brands of oils furnished by a reliable manufacturer and supplier.

VISCOSITY

Either single viscosity oil or multi-viscosity oil may be used. Single viscosity oil provides satisfactory lubrication when smaller or more limited temperature fluctuations are encountered. Multi-viscosity oil provides satisfactory lubrication whenever a wider range of temperature is encountered and makes starting easier at low temperature.

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

Air Temperature	Single Viscosity Oil	Multi-Viscosity Oil
Above 90°F.	SAE 30	SAE 20W-40
32°F. to 90°F.	SAE 20W	SAE 10W-30
-10°F. to 32°F.	SAE 10W	SAE 10W-30
Below -10°F.	SAE 5W*	SAE 5W-20*

**Use of SAE 5W or 5W-20 may cause some increase in oil consumption. Check level more often when using these oils.*

TYPE OF SERVICE

The oil manufacturer identifies, on the oil container, the type of service for which an oil is classified. The identification is an American Petroleum Institute (API) service designation. The manufacturer may also indicate on the container that the oil meets an Ordnance Department Military specification or other engine manufacturer's requirements.

API service classifications are not specifications and do not necessarily guarantee quality. These classifications only establish terminology for type of service so that the oil manufacturer may make his best recommendations. Military designations are used to identify oils which have qualified under military performance specifications.

For diesel engines, the type of service under which your tractor is operated is determined by the amount of sulfur in the fuel being used. When fuel contains less than 0.5% sulfur, use oil having an API service classification DM. Oils that are designated as Mil-L-2104B or Supplement 1 may also be used. When fuel contains more than 0.5% sulfur, use oil having an API service classification DS or Military specification Mil-45199A (Series 3).

For spark ignition engines, use oil having an API service classification MS or Military specification Mil-L-2104A. Oils having an API designation DM or Supplement 1 may also be used.

As further insurance of quality for either diesel or spark-ignition engines, use only those oils bearing the following statement on the container, or words to the effect, "Passes Manufacturer's Sequence Tests."

GREASES

SAE multipurpose type grease is recommended for all grease fittings and hand packing points on your tractor and its optional equipment.

SAE multipurpose type grease, made from lithium soap for extreme resistance to both heat and water washing, has a broad range of uses.

Single applications of these greases provide lubrication for a relatively long period and serve the important function of helping to keep contamination out of bearings.

STORING LUBRICANTS

Use clean containers to store and handle all lubricants. The tractor can operate at top efficiency only if clean lubricants are used.

The tractor is equipped with safeguards, such as the air cleaner and oil filter, which are designed to keep dust, dirt, and other abrasives from reaching operating parts. Clean lubricants will help these safeguards do their jobs properly.

LUBRICATION AND SERVICE INTERVALS

The lubrication and service periods for the tractor are daily or every 10 hours, every 200 hours, every 600 hours, every 1200 hours and every spring and fall season. These intervals are based on operation under normal conditions. When the tractor is operated under unusual conditions, such as excessive heat, cold or dust, the tractor should be checked and serviced at more frequent intervals.

The chart on the following pages is a condensed list of the tractor components to be serviced at each interval and the service to be performed.

LUBRICATION TIMETABLE

EVERY 10 HOURS

Component	Description of Service	Unit Capacity	Description of Lubricant
Engine Crankcase	Check oil level with oil filler gauge	To "FULL" mark	Oil type: DM or DS (diesel); MS (gasoline) Above 90° F: SAE 30 or 20W-40 32° F to 90° F: SAE 20W or 10W-30 -10° F to 32° F: SAE 10W or 10W-30 Below -10° F: SAE 5W or 5W-20
Air Cleaner	Check dirt and oil level in cup	To "OIL LEVEL" Line	Same as crankcase
Steering Drag Link (-42000)	Lubricate fitting	Several strokes of grease gun	SAE multipurpose grease
Brake Linkage	Lubricate 2 fittings	Several strokes of grease gun	SAE multipurpose grease
Front Rockshaft	Lubricate fittings	Two strokes of grease gun	SAE multipurpose grease
Roll-O-Matic	Lubricate 2 fittings	Several strokes of grease gun	SAE multipurpose grease
Fuel Sediment Bowls (diesel) (42001-Up)	Drain any water or dirt deposits	.....	.....
Radiator	Check coolant level	To midway between core and filler neck	See Section 80

EVERY 200 HOURS

Component	Description of Service	Unit Capacity	Description of Lubricant
PTO Housing	Check oil level	One-inch below top of filler hole	John Deere type 303 special oil (or its equivalent)
3-Point Hitch	Lubricate grease fittings	Several strokes of grease gun	SAE multipurpose grease
Generator	Fill oil cups	.....	SAE 10W or 5W-20 oil
Wide Front Axle	Lubricate 4 fittings	Several strokes of grease gun	SAE multipurpose grease
PTO Stub Shaft	Lubricate splines	.....	High-temperature grease
Distributor			
Cam	Lubricate cam	Trace	High-temperature grease
Wick (-42000) (Delco-Remy only)	Apply oil to wick	2 or 3 drops	Engine oil
Shaft (-42000) (Delco-Remy only)	Fill reservoir	To filler hole	Engine oil
Engine Clutch Throw-Out Bearing	Lubricate grease fitting	Two strokes of grease gun	SAE multipurpose grease
Single Front Wheel	Lubricate grease fitting	Several strokes of grease gun	SAE multipurpose grease
Engine Crankcase	Drain and refill	5 U.S. Quarts including filter	See "Every 10 Hours," first item
Oil Filter Element	Change element	.....	.....
Battery	Check level of electrolyte	Fill each cell to level above plates	Distilled water
Air Cleaner	Drain, clean, and refill to mark on cup	To "OIL LEVEL" Line	Same as crankcase
Transmission- Hydraulic System	Check oil level at transmission filler hole	To level of filler hole	John Deere type 303 special purpose oil (or its equivalent)
Final Drives	Check oil level at filler holes	To level of filler hole	SAE 80 multipurpose lubricant or John Deere type 303 special purpose oil (or its equivalent)
Belt Pulley	Check oil level at filler holes	1-1/4 U.S. Quarts	SAE 80 multipurpose lubricant*

*If prevailing temperature is above 80°F, use SAE 90 multipurpose lubricant.

EVERY 600 HOURS

Diesel Fuel Filter	Change element (1st sta. only -42000). Clean bowl and screen	.....	.....
Crankcase Vent Tube	Swab out tube	.....	.....
Transmission-Hydraulic System	Clean filter	.....	.....
Steering Gear Housing	Check grease level at filler hole	To level of filler hole	SAE multipurpose grease
Steering Spindle Housing (Manual)	Check oil level at filler hole	To level of filler hole	SAE 80 multipurpose lubricant*
Belt Pulley	Drain and refill	1-1/4 U.S. Quarts	SAE 80 multipurpose lubricant*

EVERY 1200 HOURS

Front Wheel Bearings	Repack bearings	.....	SAE multipurpose grease
Transmission-Hydraulic System	Drain and refill transmission	8 U.S. Gallons	John Deere type 303 special purpose oil (or its equivalent)
Final Drives	Drain and refill to level of filler hole	1 U.S. Gallon (each)	SAE 80 multipurpose lubricant or John Deere type 303 special purpose oil (or its equivalent)
PTO Housing	Drain and refill to level of filler hole	2 U.S. Quarts	John Deere type 303 special purpose oil (or its equivalent)
Starter (Diesel) (Delco-Remy)	Lubricate	Saturate wicks	SAE 10W or 5W-20 oil

EVERY SPRING AND FALL

Cooling System	Drain, flush and fill	3 U.S. Gallons	See Section 80
Engine Crankcase	Drain and fill	5 U.S. quarts (including filter)	Same as Crankcase (10 hours)
	Replace filter	.....

**If prevailing temperature is above 80° F, use SAE 90 multipurpose lubricant.*

Section 40

ENGINE TUNE-UP AND TRACTOR ADJUSTMENT

Group 5

PURPOSE OF TUNE-UP AND ADJUSTMENT

Tune-up means making minor adjustments and repairs in an orderly sequence to improve the operation of the tractor. The procedure given here has proved most successful, and should be used step-by-step to put the customer's tractor in top-notch running condition.

Generally, the customer's complaint will decide which system or part of the tractor is checked first, but within each area, the prescribed order of checks and adjustments should be followed.

Unless otherwise noted, the tune-up procedures given apply to all 2010 Series Tractors.

VISUAL INSPECTION

First, even before starting the tractor, a visual inspection can give definite clues to condition of tractor. These clues may suggest checks and adjustments, which are given in Groups 10 and 15 of this Section.

OIL AND WATER LEAKAGE

Make a general check of all external areas of tractor and engine, including lines, hoses and connections. Look for evidence of oil or water leakage.

ELECTRICAL AND IGNITION SYSTEM

Note general condition of wiring, ground strap, and cable. Check for oil-soaked, frayed or damaged insulation and excessive corrosion.

Check distributor for cracked cap, excessive dirt or grease (Gasoline and LP-Gas). Inspect spark plug connections for corrosion or excess dirt or moisture which might cause shorting.

Check battery for excessive corrosion, cracked case, correct caps, amount of electrolyte, proper mounting and cable connections.

Inspect starter and generator for excessive dirt and grease, loose cables and worn wiring. Check condition of generator belt.

FUEL SYSTEM

Gasoline and LP-Gas

Inspect the fuel system by beginning at the air cleaner. Note whether air intake hole is partially clogged. Inspect condition of air cleaner parts and connections. If the proper amount of thoroughly cleaned air does not reach the carburetor, performance of the engine is greatly affected.

Check fuel tank, lines, and connections for restriction or leakage.

Inspect fuel sediment bowl for dirt and leakage between gasket and body.

Inspect carburetor for evidence of gas leakage or flooding and check condition of choke and throttle lever shafts.

Check throttle and choke control linkage for excessive wear or binding.

Inspect for evidence of manifold leaks due to cracks or blown gaskets.

On LP-Gas models, check for leakage around gauges at tank, and for rotting of hoses and leakage at converter connections.

Diesel

Inspect air cleaner intake tube for clogging. Inspect condition of air cleaner parts and connections for visible air leaks.

Check fuel tank, lines, and connections for restriction or leakage.

Inspect sediment bowl for leakage between gasket and body.

Check filters for evidence of leakage or looseness.

Check for looseness or leakage at injector nozzles and line connectors.

Check shut-off and throttle linkage at fuel injection pump for binding or wear.

Inspect exterior of fuel injection pump for evidence of fuel leakage or loose connections.

Inspect for evidence of manifold leaks due to cracks or blown gaskets.

COOLING SYSTEM

Inspect radiator grille for clogging or damage.

Check radiator carefully for evidence of leakage, clogging of air spaces between fins, and condition of fins.

Inspect radiator hoses of "mushy" condition.

Check cylinder head gasket and water inlet connections for evidence of leakage.

Inspect cooling fan for bent blades, looseness, and rubbing.

TIRES

Inspect tires for cuts, breaks, or rotting condition. Check for proper inflation.

STEERING MECHANISM

Inspect steering spindle or motor for evidence of oil leakage at gaskets and line connections.

Check steering gear assembly for signs of grease leakage. On power gears, check valve housing for oil leaks at connectors and seals.

3-POINT HITCH

Check 3-point hitch for wear and excessive looseness of lift links and pins.

Group 10

ENGINE TUNE-UP

Fundamentally, a badly worn engine cannot be tuned up; therefore, certain inspections and tests must be made to determine whether a major overhaul is necessary or whether a tune-up will bring the engine to peak efficiency of operation.

Three important conditions are necessary for efficient and economical engine performance: sufficient compression, proper timing, and correct fuel-air mixture or injection delivered to each combustion chamber.

COMPRESSION TEST

If engine parts are excessively worn, sufficient compression can only be obtained by a major overhaul.

To make the compression test, proceed as follows:

1. Start the engine and allow it to warm up to normal operating temperature.
2. Check oil pressure at starting and later at operating speed of 1900 rpm.
3. When engine reaches its normal operating temperature, shut off engine.
4. Advance hand throttle to its maximum open or clockwise position (gasoline or LP-Gas). On diesel tractors, pull out the fuel shut-off knob (-29000) or hand throttle (29001-Up) to place the engine in the "no fuel" position.
5. Remove spark plugs or injector nozzles.
6. Hold compression gauge firmly in place in No. 1 (front) cylinder spark plug or nozzle hole, and crank engine for several seconds with starter.

NOTE: Make sure battery is fully charged in order to develop full cranking speed for this test.

7. Note pressure gauge reading.

The minimum compression reading of an engine (with rings seated) should be as follows: Gasoline—125 psi at 200 rpm cranking speed; Diesel—300 to 350 psi at 150 rpm or 350 to 400 psi at 250 rpm; LP-Gas—160 to 180 psi at 200 rpm.

Repeat this test on No. 3 cylinder; then No. 4 cylinder; then on No. 2 cylinder.

In general an engine with excessively low compression must be reconditioned before a tune-up can be effective.

By cranking the engine, much can be learned of its condition. The engine will rotate with practically no resistance if compression pressure is low in all cylinders. With pressure low in one cylinder it can be felt by resistance when a good piston is coming upward on compression stroke. If the intake or exhaust valves are leaking, this can be heard while cranking.

If the pressure was found to be good in all cylinders, tune up the engine by the following procedure:

IGNITION AND ELECTRICAL SYSTEMS

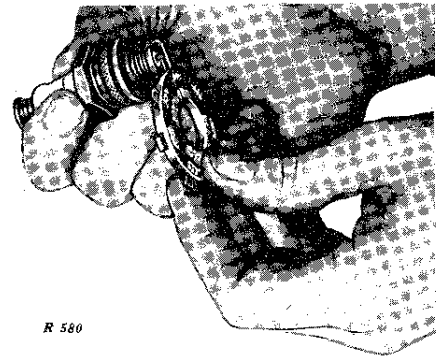


Fig. 40-10-1--Checking Spark Plug Point Gap

SPARK PLUGS

On Gasoline and LP-Gas engines, check, clean, and re-gap spark plugs according to instructions in Section 100, Group 10 of this manual. Clean up electrodes with a point file. Electrode gap of spark plugs should be .025-inch (Gasoline) or .015-inch (LP-Gas). Install spark plugs, using new gaskets, and tighten to 35 foot-pounds.

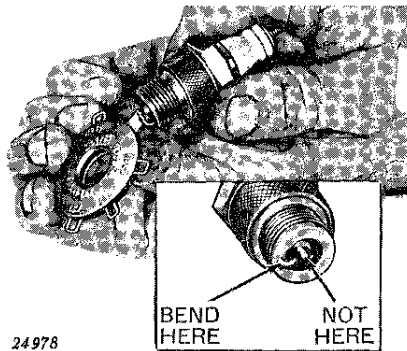


Fig. 40-10-2--Adjusting Spark Plug Point Gap

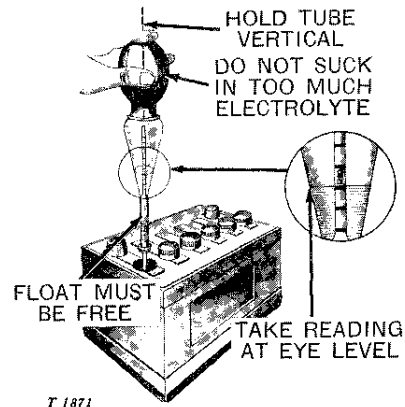


Fig. 40-10-4--Checking Specific Gravity of Battery

GENERATOR BELT

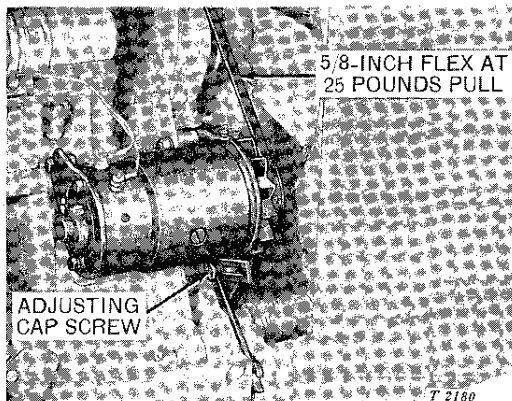


Fig. 40-10-3--Adjusting Generator Belt Tension

Adjust generator belt tension. With the generator bracket and adjusting cap screws loose, force the generator away from the engine until there is a 5/8-inch flex at 25 pounds pull on one side of the belt (Fig. 40-10-3). Retighten cap screws.

IGNITION AND ELECTRICAL CIRCUITS

Test ignition and electrical circuits by referring to Section 100, Group 5 of this manual.

BATTERY

Inspect battery and cables according to instructions given in Section 100, Group 10 of this manual.

Check level of electrolyte solution in battery. Fill battery cells, if necessary, to level of filler neck. Use distilled water if possible, or clean water with a low mineral content.

STARTER, GENERATOR AND DISTRIBUTOR

Test and adjust or repair starter, generator, and distributor (Gasoline and LP-Gas), following instructions given in Service Manual SM-2029, "John Deere Electrical Systems."

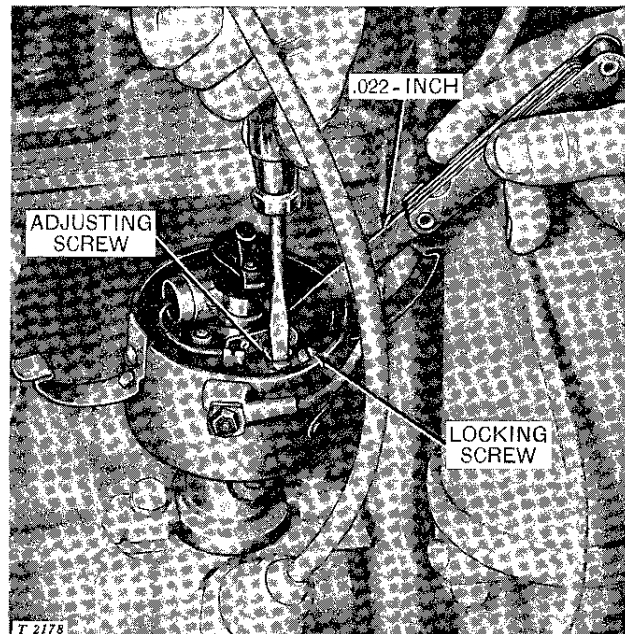


Fig. 40-10-5--Setting Distributor Point Gap
(Delco-Remy Illustrated)

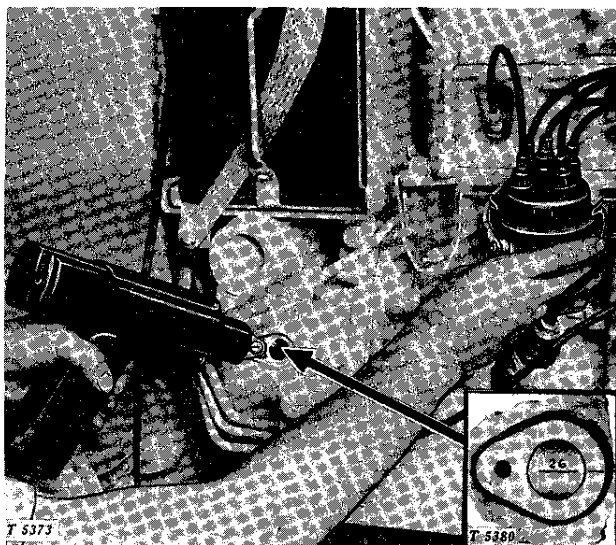


Fig. 40-10-6 -- Timing Distributor with Timing Light

The distributor rotates counterclockwise, viewed from the top. The automatic spark advance is 26 degrees of engine rotation. Clean points to remove corrosion and set point gap to .022 inch (Fig. 40-10-5). Pitted or corroded points cannot be accurately set with a feeler gauge. (For details, see Section 100, Group 10 of this Manual.)

Timing Distributor with Power Timing Light

Although the distributor can be timed either by use of a power timing light or by the manual method, it is highly recommended that the power timing light method be used.

Instructions for using power timing lights are provided by the timing light manufacturer. However, the following steps must be taken to prepare the engine for timing by this method.

1. Start engine and allow it to run until normal operating temperature is reached.
2. Uncover timing hole (Figure 40-10-6).
3. Stop engine and follow manufacturer's instructions for attaching timing light leads to battery and to No. 1 (front) spark plug. (Positive side of battery is grounded in 2000 Series Tractors).

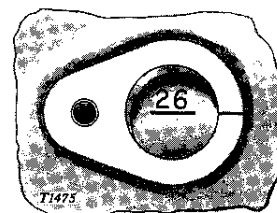


Fig. 40-10-7 -- Flywheel Timing Mark

4. Start engine and bring it up to 2500 rpm, plus or minus 25 rpm.
5. Loosen distributor attaching cap screws.
6. Direct timing light toward timing hole in center frame (Fig. 40-10-6) and rotate distributor body until "26" mark on flywheel lines up with mark on timing hole.
7. Hold distributor in this timed position and tighten attaching cap screws.
8. Recheck position of "26" mark. When engine is properly timed, remove timing light leads in order outlined in manufacturer's instructions.
9. Slide cover over timing hole and tighten screw securely.

Timing Distributor by Manual Method

The 2000 Series Tractors may be equipped with either Delco-Remy, Autolite, or Wico distributors. The automatic advance mechanism differs slightly in the three distributors. On the Delco-Remy and Autolite models, both the rotor and the cam advance in operation. On the Wico Model, only the cam advances. Due to these differences, the procedures for manual timing differ slightly (as shown below in Step 4).

NOTE: Use of a timing light is recommended for more accurate timing. When using a timing light, the procedure for all distributor equipment is the same.

1. Uncover timing hole located on distributor side of clutch housing (Fig. 40-10-7).

2. Remove all spark plugs.

3. Turn engine very slowly. Place thumb in spark plug port of No. 1 (front) cylinder. Turn engine until considerable air pressure is felt against thumb; then continue turning until "26" mark on flywheel lines up with marks on side of timing hole (Fig. 40-10-7). Do not reverse rotation of engine if "26" mark goes past hole; instead, repeat procedure.

4. On Delco-Remy or Autolite distributors, remove distributor cap and dust cover. Install distributor rotor and turn it counterclockwise as far as possible. While holding rotor in this position, rotate distributor body slowly until points are just beginning to open (Fig. 40-10-8).

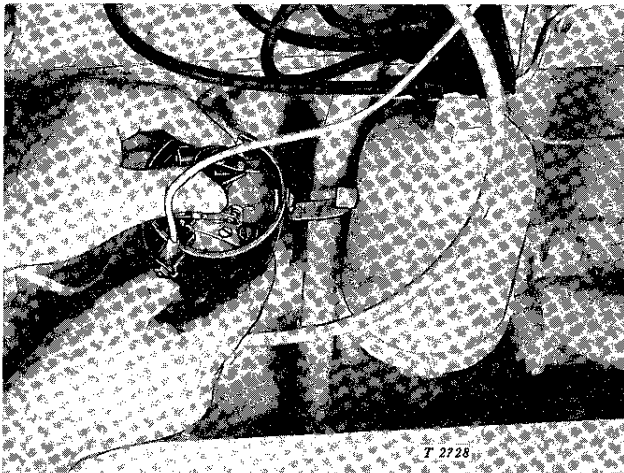


Fig. 40-10-8 -- Timing Delco-Remy Distributor

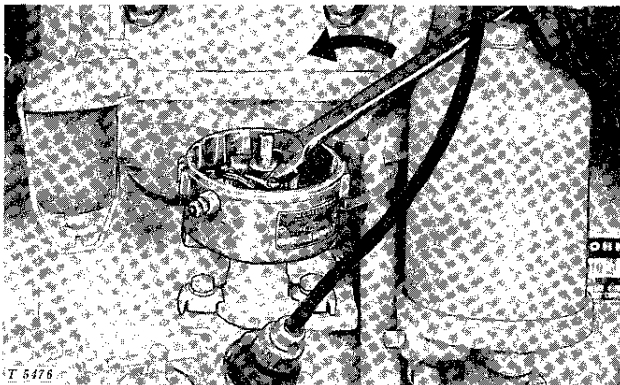


Fig. 40-10-9 -- Timing Wico Distributor

On Wico distributors, remove distributor cap, dust cover, and rotor. Using an open end wrench, turn cam counterclockwise as far as possible. While holding cam in this position, rotate distributor body slowly until points are just beginning to open (Fig. 40-10-9).

TIMING INJECTION PUMP (DIESEL)

The engine and the fuel injection pump must be timed to each other. To check the timing, do the following:

1. Uncover timing hole on clutch housing (Fig. 40-10-10).

2. Turn engine in direction of rotation (counterclockwise when viewed from flywheel end) until No. 1 piston is on a compression stroke and the "DC" mark on the flywheel rim aligns with timing mark on the clutch housing (Fig. 40-10-10).

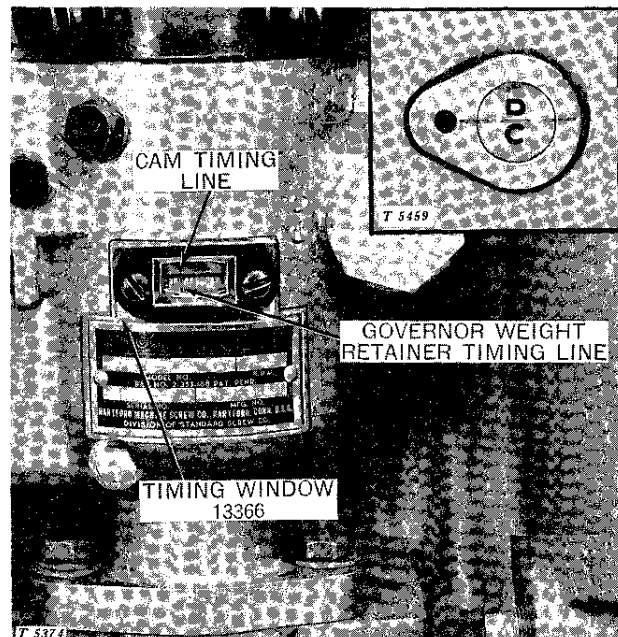


Fig. 40-10-10 -- Timing Lines

3. Remove timing hole cover on injection pump housing and check to see if the timing line on the weight retainer hub aligns with the mark on the cam rim as shown in Fig. 40-10-10). If adjustment is required, loosen pump mounting bolts and turn injection pump assembly by hand so that the timing marks line up, and retighten mounting bolts.

4. Turn engine over two revolutions in direction of engine rotation and recheck pump timing.

NOTE: When rotating crankshaft, care must be taken so that the crankshaft is not rotated beyond the specified timing mark. If the timing mark has been passed, it will be necessary to turn the engine backward at least 1/4 turn and again rotate the crankshaft counterclockwise, thus removing all gear train backlash.

5. Replace timing hole cover on clutch housing and on fuel injection pump. Bleed fuel system as described under "Fuel System" in this group.

CHECKING INJECTION PUMP ADVANCE

See Section 91, Group 20 for correct procedure.

ADJUSTING VALVE CLEARANCE

To adjust valve clearance properly, each piston must be at top dead center at end of its compression stroke at time adjustment is made.

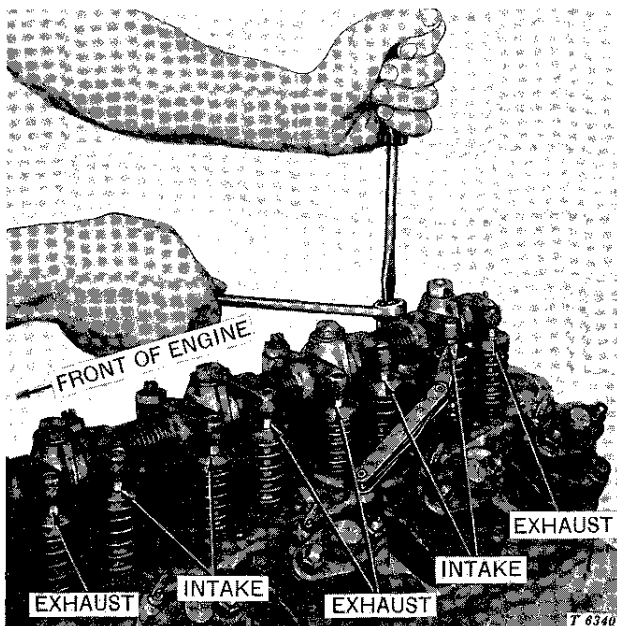


Fig. 40-10-11--Adjusting Valve Tappet Clearance

To determine correct position, turn engine until No. 1 (front) piston is at top dead center on compression stroke (both valves closed). The "DC" mark on flywheel will now be lined up with the marks on timing hole (see Fig. 40-10-7).

Adjust valve clearance on both valves of No. 1 cylinder (Fig. 40-10-11). Intake valves are set at .012-inch and exhaust valves are set at .018-inch when engine is cold. Turn engine 1/2 revolution of crankshaft and set No. 3 valves. Turn engine 1/2 revolution of crankshaft and set No. 4 valves; turn engine 1/2 revolution of crankshaft and set No. 2 valves.

CYLINDER HEAD GASKET AND BOLTS

NOTE: Refer to Sections 50 and 51 for servicing details.

While rocker arm cover is removed, re-torque cylinder head bolts. First check cylinder head gasket for possible leaks. (Any compression leaks would have been indicated during the compression test which preceded this.) Replace gasket if any air, water, or oil leaks are evident. Re-torque cylinder head bolts to 150 foot-pounds in the sequences shown in Figures 50-15-14 (Gasoline and LP-Gas) or 51-15-13 (Diesel).

COOLING SYSTEM

RADIATOR

Run the engine sufficiently to stir up any rust or sediment. Stop the engine and drain the cooling system completely before sediment settles again. Close drain cocks and fill radiator with a solution composed of one pound of washing soda per gallon of water. (Cooling system capacity is 3 U.S. gallons.) Install the filler cap and run the engine for one hour.

Drain out the solution, add fresh water, and run the engine for a few minutes. Stop the engine and drain out this flushing water.

Fill system with fresh water.

CAUTION: Do not pour hot water in a cold engine or cold water in a hot engine at any time. Do not operate the tractor without water even for a few minutes.

If radiator still shows signs of being clogged, it may require more drastic cleaning such as use of commercial cleaners and back flushing (Section 80, Group 5).

HOSES

Inspect radiator hoses for "mushy" interior. Hoses may look good outwardly but be partially deteriorated inside, requiring new hoses. Whenever in doubt, install new hoses, making sure all connections are tight.

GRILLE AND RADIATOR CORE

Remove hood and grille. Blow out all traces of dirt and chaff from grille and radiator core with compressed air. Straighten all bent fins.

AIR CLEANER

Remove air cleaner access panel. Loosen clamp and remove air cleaner cup (Fig. 40-10-12). Clean cup out thoroughly.

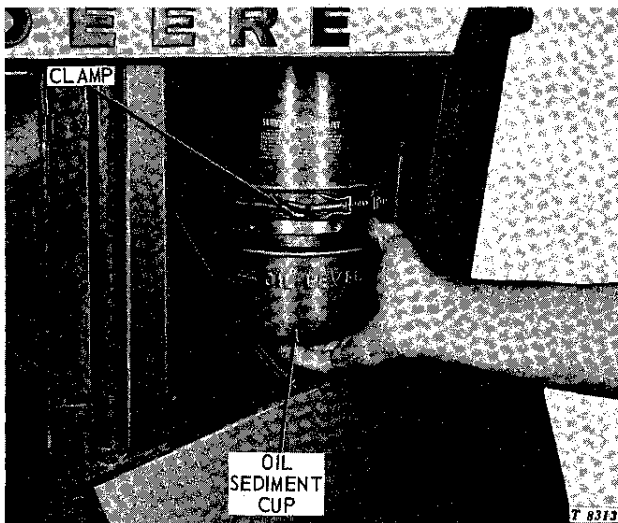


Fig. 40-10-12--Air Cleaner Cup

Disconnect air-cleaner hose. Remove air cleaner.

Check condition of air hole, stack, body, and filter element. Wash all parts in solvent.

CAUTION: Do not dry the filter element with compressed air. To do so may damage the element. Do not steam-clean the element. The steam tends to form tiny mud balls which cannot be removed.

Replace air cleaner. Make sure all hose connections are tight. Fill air cleaner cup up to indicated level with same weight of oil as is used in crankcase. Replace cup. Install access panel.

When installing air cleaner cup make sure it is properly seated against upper body and that the mounting band is properly fitting all the way around cup and upper body. Tighten thumb screw on band only finger-tight. Do not use any tool to tighten the thumb screw.

FUEL SYSTEM

GASOLINE AND LP-GAS

Fuel Tank and Lines

Check fuel tank and lines for dirt or foreign matter and remove to clean if necessary.

Fuel Filter

Clean sediment bowl and filter screen thoroughly (Fig. 40-10-13).

Install filter screen, gasket, and bowl.

NOTE: Use new gasket, making sure gasket and screen are properly seated before tightening jam nut.

DIESEL

Fuel Tank and Lines

Inspect fuel tank and lines for dirt or foreign matter and remove to clean if necessary.

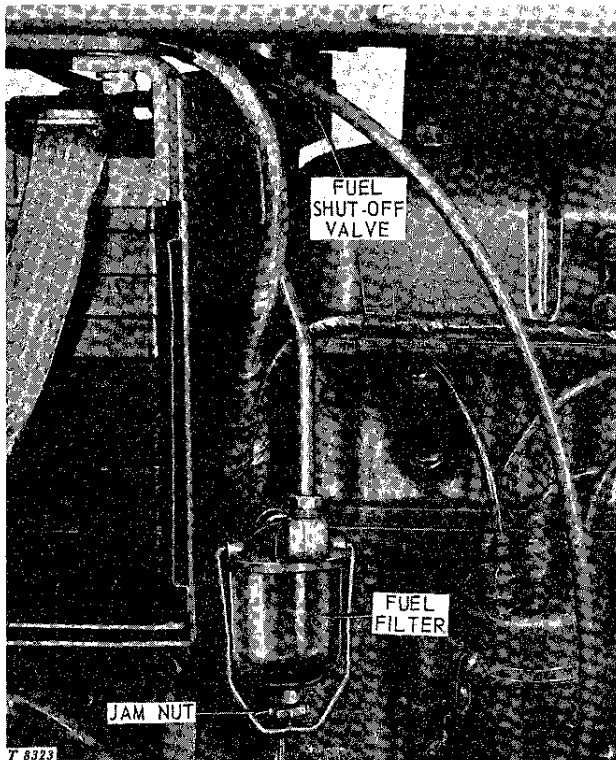


Fig. 40-10-13--Fuel Filter (Gasoline)

Fuel Strainer and Fuel Filters

Remove and clean fuel sediment bowl (Fig. 40-10-14 or 40-10-15). On tractors (-42000), reinstall filter screen, gasket, and bowl. Use new gasket and be sure gasket and screen are properly seated before tightening jam nut. On tractors (42001-up), reinstall bowl and tighten large stud screw until finger tight. Be sure gasket is in place on shoulder of filter element before tightening stud.

Tractors (-42000). Check first stage fuel filter element for dirt or water-soaking (Fig. 40-10-14). Loosen bolts holding filter clamp and remove case marked "1ST STA" from filter head. Make sure that metal ferrule on top of element is removed with case. Install new felt washer on filter sleeve; then grease sleeve and install new O-ring. Replace the element if it is dirty or water-soaked. Unless first-stage filter is extremely dirty or water-soaked, do not replace second-stage filter except at major overhaul. Install filter case under filter head. Adjust clamp and tighten clamp bolts. Bleed fuel system (see following).

Tractors (42001-Up). Check the one-stage filter element for dirt or water-soaking (Fig. 40-10-15). Back off large stud screw under filter sediment bowl and remove screw and bowl. Remove filter element. Replace element and gaskets if element is dirty or water-soaked. Place gaskets on shoulders of element and slip element under filter head. Reinstall screw and bowl under filter element. Be sure gaskets are not crimped, then tighten stud screw until snug. Bleed fuel system (see following).

Bleeding Diesel Fuel System (-42000)

Any time the Diesel fuel system is opened or has run dry, it is necessary to bleed the entire fuel system to remove air bubbles. Do this as follows:

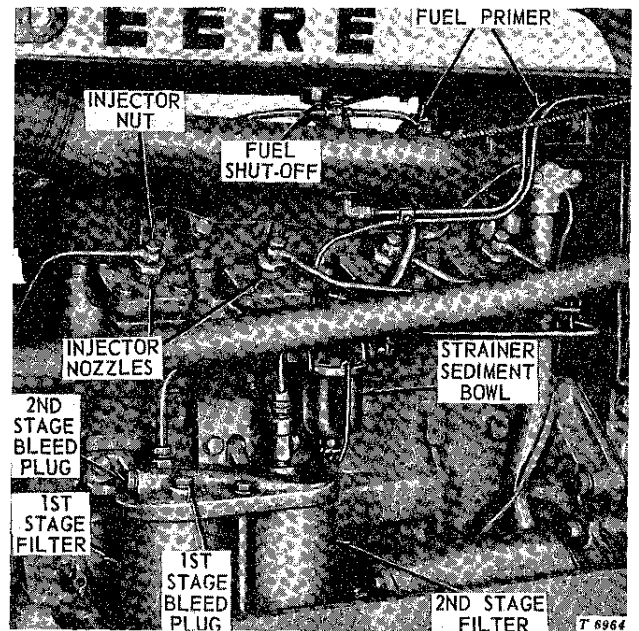


Fig. 40-10-14--Diesel Fuel System Components (-42000)

Fill fuel tank with No. 1-D or No. 2-D Diesel fuel (see chart, page 91-5-1).

Drain the sediment bowl to remove moisture condensation or air lock. Loosen jam nut under sediment bowl and gradually loosen bowl until fuel flows freely.

Loosen bleed plug on top of first stage filter and let fuel flow until it is free of air bubbles (Fig. 40-10-14). Re-tighten bleed plug.

Loosen bleed plug for second stage filter and let fuel flow until it is free of air bubbles. Re-tighten bleed plug.

Loosen the fuel injector nozzle nuts on each injector nozzle (Fig. 40-10-14). Turn ignition switch on and crank engine with starter until fuel begins to slowly flow around loosened injector nozzle nuts. Re-tighten all injector nozzle nuts as follows: On tractors (-29000), torque nuts to 15 ft-lbs. On tractors (29000-42000), torque nuts to 35 ft-lbs.

CAUTION: Loosen the injector nozzle nuts only one turn to avoid excessive fuel spray.

NOTE: If engine is running, loosen only one injector nozzle nut at a time. Retighten nut before going on to the next nozzle nut.

Bleeding Diesel Fuel System (42001-Up)

If the engine has been idle for a long period or if the fuel system has been opened or has run dry, you must bleed the entire fuel system before operation to remove air. Do this as follows:

1. Fill tank with No. 1-D or No. 2-D diesel fuel (see chart, page 91-5-1).
2. Open fuel shut-off valve at outlet under tank.

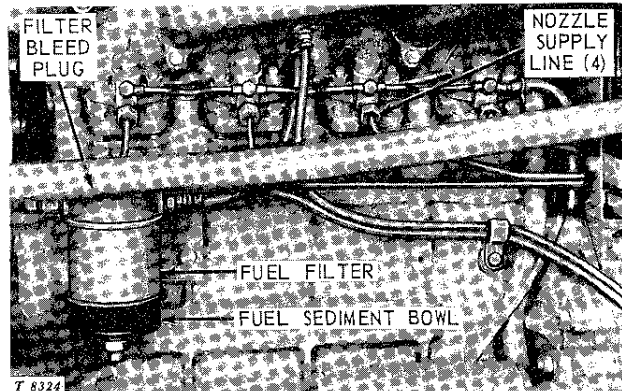


Fig. 40-10-15—Diesel Fuel System Components (42001-Up)

3. Loosen bleed plug on top of fuel filter (Fig. 40-10-15). Let fuel flow until free of air bubbles. Tighten plug.

4. Loosen fuel supply line at each injector nozzle. Crank engine until fuel begins to slowly flow around connections and then re-tighten to 15 to 20 foot-pounds.

CAUTION: Loosen injector lines only one turn to avoid excessive spray.

NOTE: If engine is running, loosen only one injector line at a time. Retighten to 15 to 20 foot-pounds before going on to the next one.

DIESEL ENGINE SPEED ADJUSTMENTS (-29000)

Start engine and operate hand and foot throttles. If engine idles too fast or too slow, or if linkage binds or is loose, make speed control adjustments as given below. Use a hand tachometer for more accurate rpm readings. Allow a range of plus or minus 20 rpm for speed settings. (All speeds are for tractor with no load.)

FAST-IDLE ADJUSTMENT

Move hand throttle full clockwise, without pulling knob. Adjust for 2100 rpm at rear control rod under dash (Fig. 40-10-16).

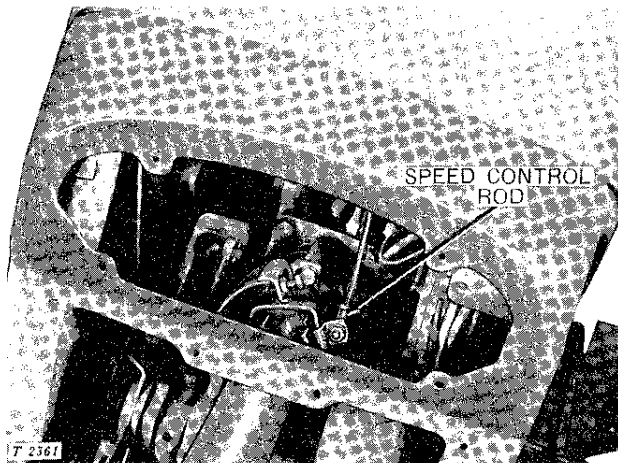


Fig. 40-10-16--Rear Speed Control Rod

NOTE: Do not force hand throttle in order to reach slow-idle or overtravel positions (below). Forcing may damage stops on fuel injection pump. Also screw out on stop screws (Fig. 40-10-17) to obtain freedom in positioning throttle lever. Then screw in on stop screws to set lever stops.

SLOW-IDLE ADJUSTMENT

Move hand throttle lever counterclockwise until 800-850 rpm slow-idle speed is obtained. Then turn in on slow-idle stop screw (Fig. 40-10-20) until it is snug against speed control arm. Do not adjust so as to preload throttle lever on pump.

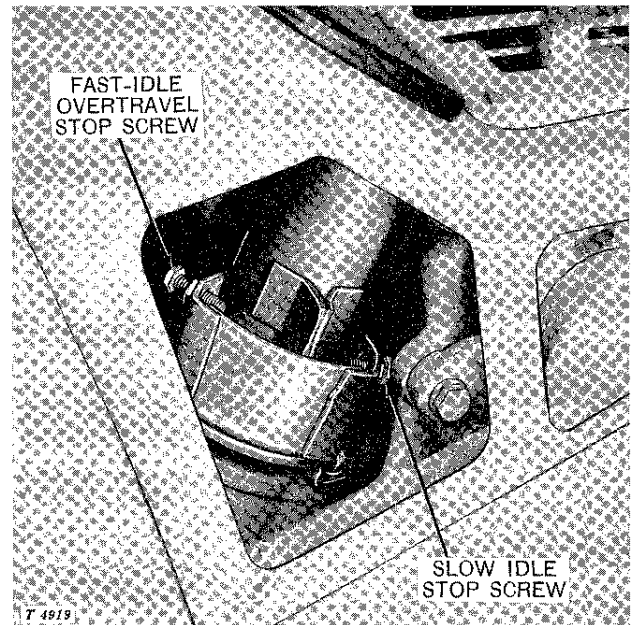


Fig. 40-10-17--Speed Control Stop Screws (-29000)

FAST-IDLE OVERTRAVEL ADJUSTMENT

Move hand throttle lever in clockwise direction, passing stop by pulling out on knob, and continue moving until 2650 rpm fast-idle speed is obtained. Then turn in on fast-idle stop screw (Fig. 40-10-17) until it is snug against speed control arm. Do not adjust so as to preload throttle arm on pump.

Adjust foot throttle (if used). Leave hand throttle in fast-idle overtravel position and adjust foot throttle so that pedal just touches footrest. Do this by disconnecting foot-operating rod yoke from bellcrank (by reaching through cowl rear opening); then loosen lock nut and screw yoke in or out until rod will allow foot pedal to just touch footrest. Tighten lock nut and attach yoke to bellcrank.

DIESEL ENGINE SPEED ADJUSTMENTS (29001-Up)

Start engine and operate hand and foot throttles, noting way in which engine accelerates and idles. If engine idles too fast or too slow, or if linkage binds or is loose, make speed control adjustments as given below. Use a hand tachometer for more accurate rpm readings. Allow a range of plus or minus 20 rpm for idle speeds. (All speeds are for tractor with no load.)

SLOW-IDLE ADJUSTMENT

1. Disconnect vertical control rod from injection pump (Fig. 40-10-18).
2. Run engine and lightly rotate injection pump throttle arm down to slow idle. Let arm "settle" in this position.
3. Engine speed should now be 800 rpm. If not, adjust slow-idle screw on rear of pump body until speed is correct.

INTERMEDIATE IDLE ADJUSTMENT

1. Move throttle lever full clockwise (without pulling knob).
2. Position upper end of pump control rod in center of lever slot and secure.
3. Adjust lower end of rod to just match pump throttle arm when engine is running at 2100 rpm. Connect rod.

RECHECK AND ADJUSTMENT OF SPEEDS

1. Move hand throttle full counter-clockwise with knob in (until it strikes solid stop on steering column under dash).
2. Check engine speed at this stop. If speed is over 800 rpm, move pump control rod "out" in upper lever slot. If engine speed checks out at 800 rpm, make this extra check: Move hand throttle clockwise approximately one inch at the knob. If engine speed fails to increase, move pump control rod "in" in upper lever slot.
3. Move hand throttle to intermediate stop again and check speed for 2100 rpm. Readjust length of pump control rod, if necessary, to get this speed.

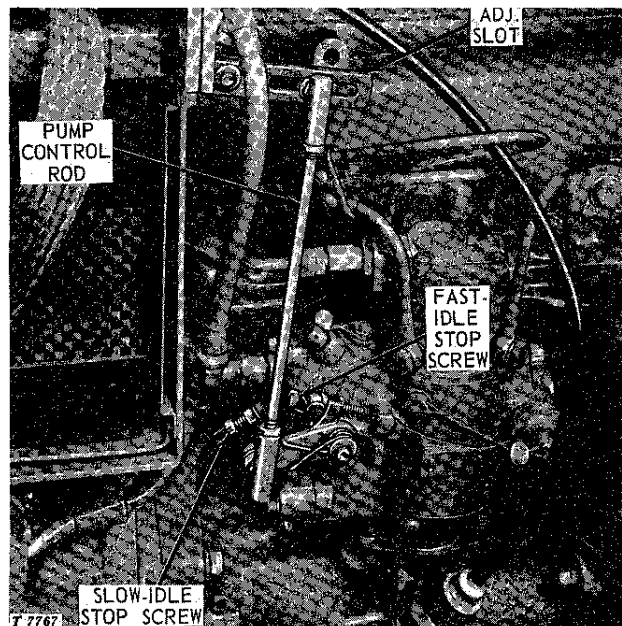


Fig. 40-10-18--Engine Speed Adjustments (Tractors Ser. No. 29001-Up)

FAST-IDLE ADJUSTMENT

1. Move hand throttle full clockwise, pulling out on knob to get full travel. Keep moving lever until it strikes solid stop on steering column.
2. Fast idle engine speed should now be 2670 rpm. Adjust if necessary at fast-idle stop screw on injection pump arm.

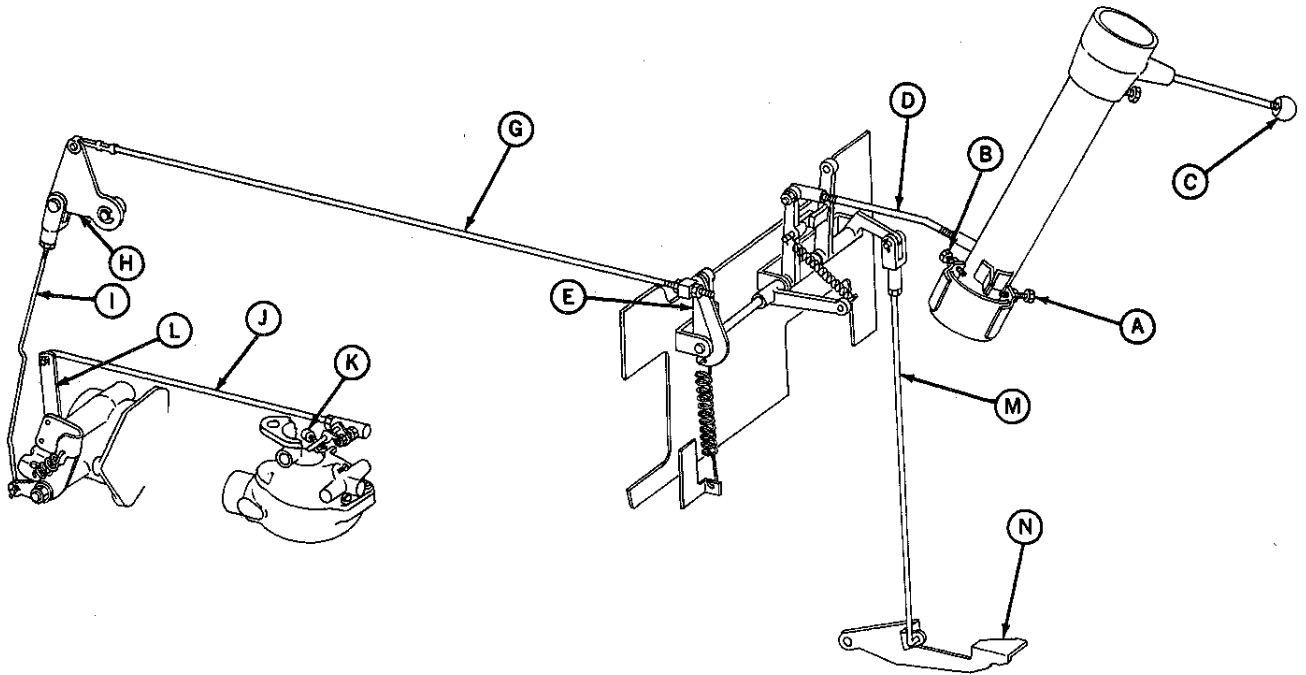
ENGINE STOP CHECK

Move hand throttle full counterclockwise, pulling out on knob. Engine should stop. (If not, linkage adjustments will have to be made. If so, readjust idle speeds as given above.)

FOOT THROTTLE ADJUSTMENT

1. Disconnect vertical foot operating rod from bellcrank under cowl.
2. Move hand throttle full clockwise with knob pulled out (2670 rpm stop).
3. With pedal resting on footrest, align holes in foot operating rod yoke and bellcrank. Then shorten one turn of yoke. Tighten lock nut on yoke and re-connect.

ENGINE SPEED ADJUSTMENTS (Gasoline and LP-Gas)



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Fig. 40-10-19--Engine Speed Adjustments

Check engine for proper idling and accelerating. If necessary, adjust as follows:

Back out idle stop screws (A and B) on steering column. (Remove cowl panels for access).

Move throttle lever (C) full counterclockwise.

Adjust rear control rod (D) until governor control lever (E) contacts firewall. Tighten nuts on ball joint ends.

Tractors 29001-Up: Adjust front control rod (G) until lower edge of bellcrank (H) is horizontal. Lock nuts on both sides of control rod swivel.

Start engine and move throttle lever (C) full clockwise (without pulling out on knob).

Adjust governor control rod (I) until engine runs at 2100 rpm. Tighten nut on yoke.

Move throttle lever (C) full counterclockwise.

Adjust carburetor stop screw (J) until warm engine idles at 600 rpm. (If this stop is changed, readjust carburetor for best idling. See Section 90, Group 5.)

Disconnect throttle rod (K) from governor. Rotate governor lever (L) and throttle rod fully forward. Adjust throttle rod until it just matches hole in lever. Then shorten rod one turn (Pierce governors) or three turns (John Deere governors). Secure rod yoke with nut.

With Foot Throttle Option: Adjust slow idle stop screw (A) against stop bracket until hand operating lever contacts foot operating bellcrank. Then back off stop screw one turn. Lock with jam nut.

With Hand Throttle Only: Adjust slow idle stop screw (A) until it touches stop bracket. Then back off screw one turn. Lock with jam nut.

Move throttle lever full clockwise, passing stop by pulling out on knob. Keep on moving lever until engine runs at 2700 rpm. Turn fast idle stop screw (B) tight against stop bracket and lock with nut.

With Foot Throttle Option: Keep throttle lever at fast idle. Detach foot operating rod yoke (M) from bellcrank. With foot throttle pedal (N) resting on footrest, adjust rod until yoke matches bellcrank and pin can be inserted. Then shorten rod one turn and connect. Secure yoke with lock nut.

CARBURETOR ADJUSTMENTS (Gasoline and LP-Gas)

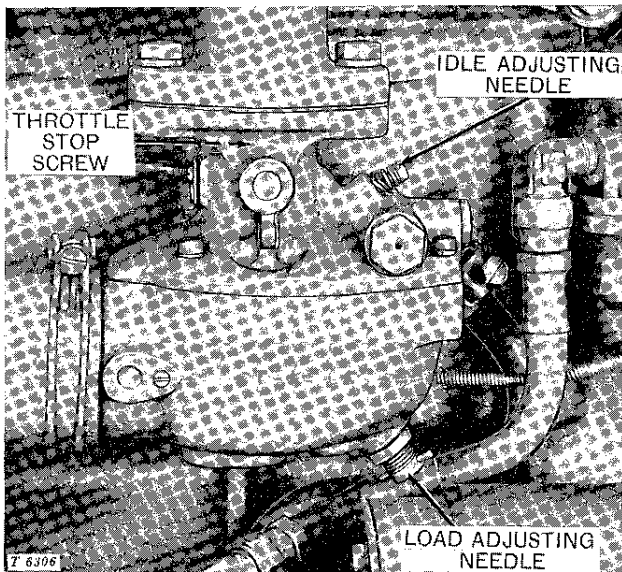


Fig. 40-10-20--Carburetor Adjustments

With engine warmed up, note how it idles at both slow- and fast-idle.

If engine does not run smoothly at slow-idle, turn idle adjusting screw (Fig. 40-10-20) until engine runs smoothest. Then readjust slow-idle for 600 rpm.

Speed engine up to fast-idle. Screw load adjusting needle (Fig. 40-10-20) in until engine begins to falter or lose power. Screw needle out until engine begins to run smoothly. Then screw out one more turn.

NOTE: On LP-Gas tractors, engine may run better in very hot weather or at high altitudes if load needle is closed. In very cold weather, engine may run better if load needle is opened an extra amount.

Put tractor under load to try out carburetor adjustments. Readjust load needle if necessary.

If engine backfires as clutch is engaged, open load needle slightly--normally less than one-eighth turn. If black smoke comes out of muffler, close load needle slightly.

If carburetor cannot be adjusted for good performance, refer to Section 90, Group 5 of this Manual for carburetor cleaning and overhaul.

CHOKE

Remove air cleaner-to-carburetor hose and check choke disk. Make sure that the disk centers in the bore and that it entirely closes the air passage when in choke position. Make sure that it is parallel with the center line of the bore when it is in the operating position. Check relief valve plate for sufficient spring tension.

SPEED CONTROL FRICTION ADJUSTMENT

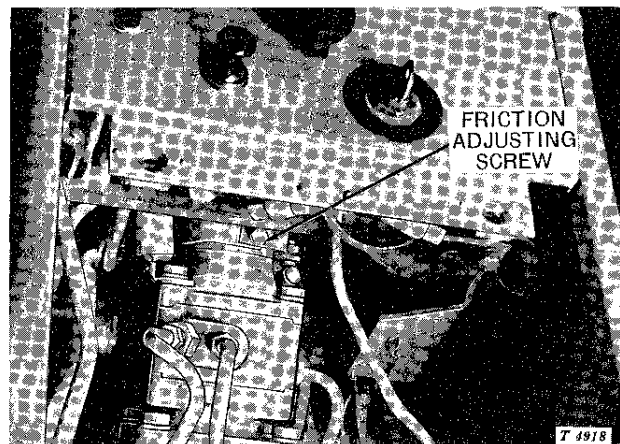





Fig. 40-10-21--Speed Control Friction Adjustment

If speed control lever "creeps" or is hard to operate, adjust at friction screw on steering column tube (Fig. 40-10-21). This screw puts pressure on friction facing inside tube. Adjust screw so that speed control lever will hold in any setting, while only a moderate drag is felt in moving the lever.

Group 15 TRACTOR ADJUSTMENT

The tractor adjustments given here will make the tractor safer to operate and easier to handle. While making these adjustments, check all bolts and cap screws on the tractor for proper tightness. The table below explains how various bolts and cap screws should be torqued.

TORQUE CHART

RECOMMENDED TORQUE IN FOOT-POUNDS COARSE AND FINE THREADS			
			
Bolt Diameter	Plain Head*	Three Radial Dashes*	Six Radial Dashes*
1/4	6	10	14
5/16	13	20	30
3/8	23	35	50
7/16	35	55	80
1/2	55	85	130
9/16	75	130	185
5/8	105	170	250
3/4	185	300	420
7/8	160**	445	670
1	250	670	1000

*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.

BRAKE ADJUSTMENT

The only brake adjustment is for correct free travel in the pedals.

Disconnect brake rods from brake levers. Tighten adjusting nut (Fig. 40-15-1) until brake lever is flush against brake housing. Place brake pedals tight against bottom of footrest and connect brake rods to brake levers.

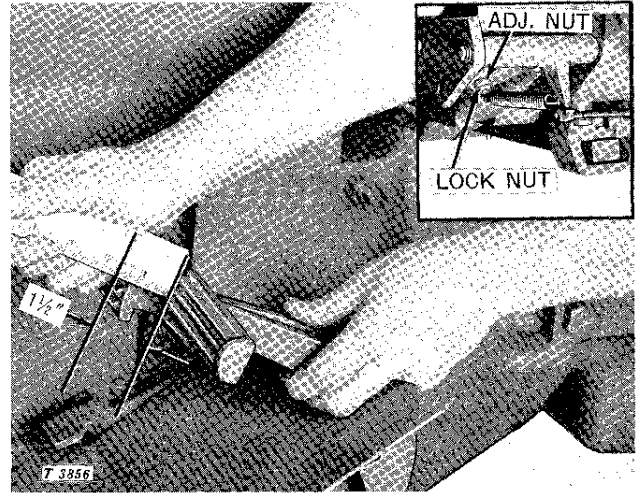


Fig. 40-15-1—Adjusting Brakes

To make adjustment, loosen adjusting nut on brake lever until 1-1/2-inch free travel is obtained at pedal pad (Fig. 40-15-1). If pedal pads are not in alignment when brakes are applied, equalize them by increasing the free travel of the one having the least free travel.

ENGINE CLUTCH ADJUSTMENT

The engine clutch should be adjusted to have approximately 1-inch free travel at pedal pad.

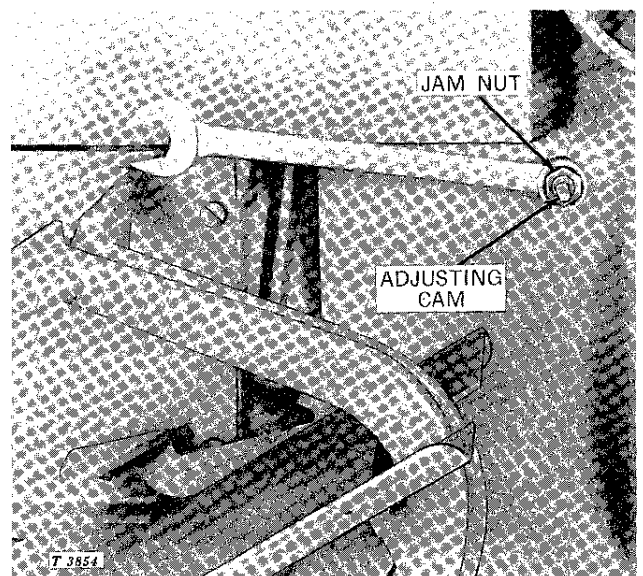


Fig. 40-15-2—Engine Clutch Adjusting Cam

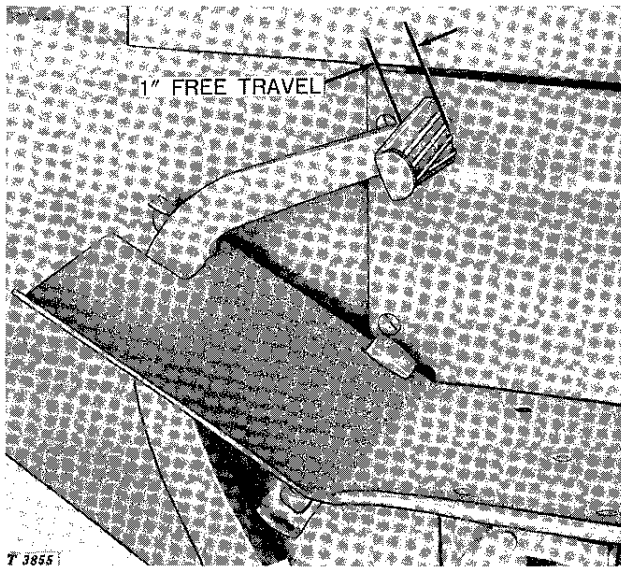


Fig. 40-15-3--Measuring Clutch Pedal Free Travel

To adjust clutch, loosen jam nut on adjusting cam (Fig. 40-15-2). Turn adjusting cam counter-clockwise to decrease pedal free travel, and clockwise to increase pedal free travel. When the 1-inch free travel has been obtained (Fig. 40-15-3), hold adjusting cam in position and tighten jam nut securely. Recheck free travel to be sure the adjustment has been made correctly.

PTO CLUTCH ADJUSTMENT

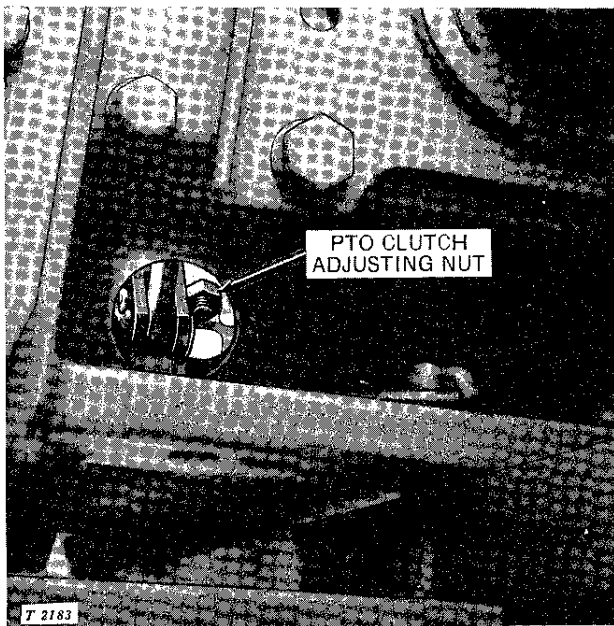


Fig. 40-15-4--PTO Clutch Adjustment

The PTO clutch lever should have 1-inch free travel at its extremes of travel, that is, beyond the engaged and disengaged positions.

To make adjustment, remove hole plug at lower left of PTO housing (Fig. 40-15-4). Use a socket wrench to reach in and turn clutch adjusting nut. Adjust the nut until 1-inch free travel of PTO clutch lever is obtained at both extremes. If free travel is unequal at extremes of lever travel, average out free travel.

NOTE: If no PTO clutch lever free travel can be obtained at either or both extremes, the internal PTO shifter linkage will require adjustment. See Section 140 of this manual for detailed service instructions.

FRONT WHEEL BEARING ADJUSTMENT

DUAL FRONT WHEEL, ROLL-O-MATIC, AND ADJUSTABLE AXLE TYPES

Lift the front wheels off the floor and check for end play. If end play is noticeable, the bearings need adjustment.

Remove hub cap and cotter pin. Using a torque wrench, tighten adjusting nut to a tension of 35 to 40 foot-pounds (Fig. 40-15-5). Then back off the adjusting nut to the nearest castellation and insert cotter pin.

NOTE: If castellation just lines up with cotter pin hole, after application of 35 to 40 foot-pounds, nut must be backed off one full castellation.

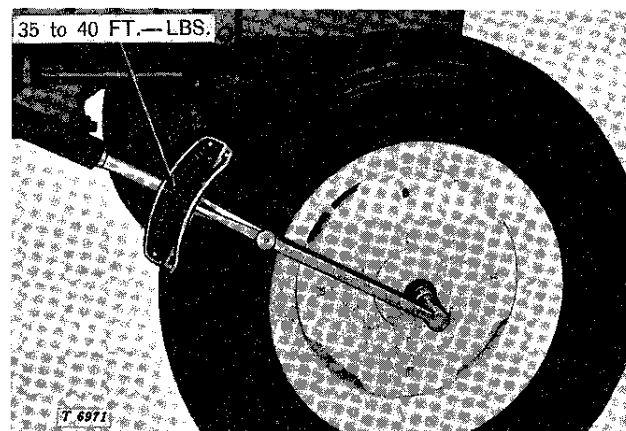


Fig. 40-15-5--Adjusting Front Wheel Bearings

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