John Deere
Service Manual
110 Lawn and Garden Tractor
(Serial No. 250,001 -)
SM-2101-(Jan-74)

John Deere Horicon Works
SM2101 (Jan-74)
LITHO IN U.S.A.
ENGLISH

110 LAWN AND GARDEN TRACTOR
(Serial No. 250,001-)
Service Manual
SM-2101-(Jan-74)

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

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INTRODUCTION

This service manual contains service and maintenance information for the John Deere 110 Lawn and Garden Tractor (Serial No. 250,001-).

The manual is divided into sections. Each section pertains to a certain component or operational system of the tractor. The information is divided into groups within each section.

Emphasis is placed on diagnosing malfunctions, analysis and testing. Diagnosing malfunctions includes possible troubles, their causes and how to correct them. Under specific components these troubles are analyzed to help you understand what is causing the problem. In this way, you can eliminate the cause rather than just replace parts and have the same problem keep recurring.

Specifications and special tools are found in the last group of each section.

This manual can be kept in its own cover or it can be filed in your service manual rack or in your Consumer Products Service Information Binder.

Whenever new or revised pages are provided, insert them into your manual as soon as you receive them. Your service manual will always be up-to-date and be a valuable asset in your service department.

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

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Section 10
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SERIAL NUMBERS

Tractor

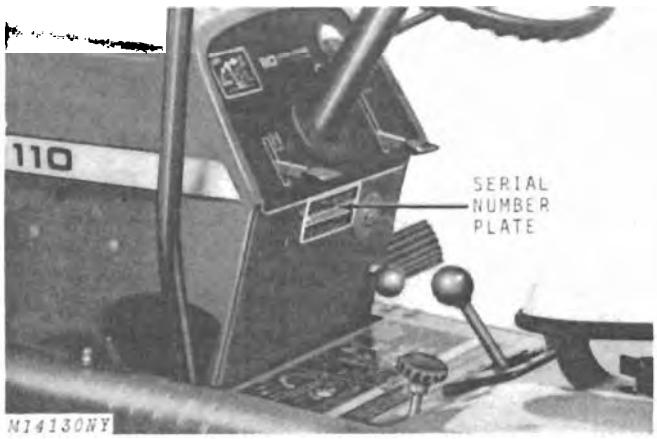

Fig. 1-Tractor Serial Number Plate

The tractor serial number, Fig. 1, is located on the pedestal below the steering wheel.

Engine

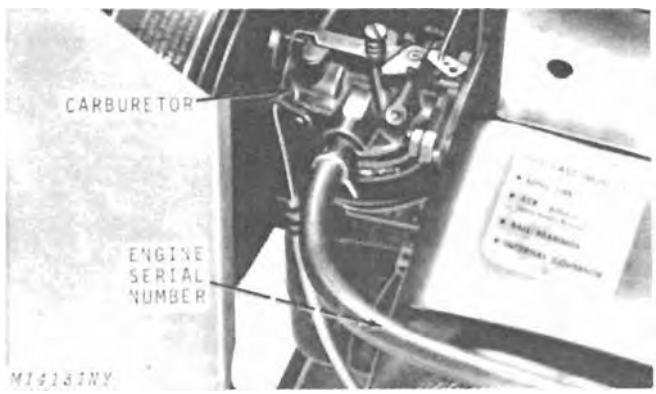

Fig. 2-Engine Serial Number Plate

The engine serial number, Fig. 2, is located on the front of the engine shroud.

VINTAGE INFORMATION

Year Manufactured	110 Tractor (8 hp) Tractor Serial No.	110 Tractor (10 hp) Tractor Serial No.
1972	(250,001-260,000)	(260,001-272,000)
1973	(272,001-285,000)	(285,001-310,000)
1974	(310,001-320,000)	(320,001-)

IDENTIFICATION CODES

Tire Codes

John Deere 110 Tractors are available with three different combinations of tires as follows:

Tire Code	Size Front	Size Rear	Tread
GT-3	16x6.50-8	23x8.50-12	High-Flotation
GT-4	4.80/4.00-8	------	Studded
	------	23x8.50-12	Traction
GT-5	16x6.50-8	23x10.50-12	High-Flotation
GT-8 Bar Tread	16x6.50-8 or 4.80/4.00-8	------	High-Flotation
	------	23x10.50-12	Traction

Tractor Codes

Four identification codes are used for 110 Lawn and Garden Tractors Serial Number 250,001 and above. See the chart below for the codes, type of lift and serial numbers for each group of tractors.

Tractor	Serial No.	Manual Lift	Hydraulic Lift	Electric Lift
8 hp	250,001-260,000	0643M		
8 hp	272,001-285,000	0643M		
8 hp	310,001-320,000	0643M		
10 hp	260,001-272,000	0631M	0632M	
10 hp	285,001-310,000	0631M		0633M
10 hp	320,001-	0631M		0633M

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Group 10
SPECIFICATIONS

TRACTOR SPECIFICATIONS

Item	8 hp	10 hp
CAPACITIES		
Fuel Tank	1.75 U.S. Gallons	1.75 U.S. Gallons
Crankcase	2-1/2 U.S. Pints	3 U.S. Pints
Transaxle	3-1/2 U.S. Pints	3-1/2 U.S. Pints
Hydraulic System	. . . . .	2 U.S. Pints
TRANSMISSION		
Type	Transaxle	Transaxle
Gear Selections	4 forward - 1 reverse	4 forward - 1 reverse
TRAVEL SPEEDS - @3600 rpm		
1st Gear (Variable)	.4 to 1.0 mph	.4 to 1.0 mph
2nd Gear (Variable)	1.3 to 2.9 mph	1.3 to 2.9 mph
3rd Gear (Variable)	2.4 to 5.0 mph	2.4 to 5.0 mph
4th Gear (Variable)	3.4 to 7.4 mph	3.4 to 7.4 mph
Reverse (Variable)	1.8 to 3.3 mph	1.8 to 3.3 mph
DIMENSIONS		
Wheelbase	46 in.	46 in.
Overall Length	66-3/4 in.	66-3/4 in.
Overall Height	41 in.	41 in.
Overall Width (maximum)	41-1/2 in.	41-1/2 in.
WHEEL TREAD		
Front	31 in.	31 in.
Rear (GT-3 Tires)	27 in. or 33 in.	27 in. or 33 in.
(GT-5 Tires)	28-1/2 in. or 31 in.	28-1/2 in. or 31 in.
BRAKES		
Type	Band, pedal-operated	Band, pedal-operated
Parking	Hand lock foot brake	Hand lock foot brake
CLUTCH	V-belt system	V-belt system
PTO CLUTCH	Manual	Manual
STEERING	Enclosed gear	Enclosed gear
LIFT	Manual	Manual, Electric, Hydraulic
SHIPPING WEIGHT (GT-3 TIRES)	691 lbs.	759 lbs. - Manual lift 774 lbs. - Electric lift 770 lbs. - Hydraulic lift

ENGINE SPECIFICATIONS

Item	8 hp	10 hp
Engine Model No.	K181S	K241AS
Manufacturer	Kohler	Kohler
Cylinders	One	One
Stroke/Cycle	Four	Four
Bore	2.94 in.	3.25 in.
Stroke	2.75 in.	2.875 in.
Displacement	18.63 cu. in.	23.9 cu. in.
Speeds (fast) No-Load	3600 to 3900 rpm	3600 to 3900 rpm
Speeds (idle)	1650 to 1950 rpm	1650 to 1950 rpm
Horsepower*	8 @3600 rpm	10 @ 3600 rpm
Normal Compression	110 to 120 psi	110 to 120 psi
Valve Clearance		
Intake (Cold)	0.007 in.	0.010 in.
Exhaust (Cold)	0.016 in.	0.020 in.
Ignition**	Magneto	Battery
Spark Plug	J-8-Champion 45-M-AC 14-7 Prestolite	H-10-Champion 45-L-AC 14-L7B-Prestolite
Spark Plug Gap	0.020 in.	0.020 in.
Breaker Point Gap	0.020 in.	0.020 in.
Charging System***	Alternator	Alternator
Starter	12-Volt	12-Volt
Air Filter	Dry-type	Dry-type

**The horsepower rating shown is established by the engine manufacturer in accordance with Standard Internal Combustion Engine Institute procedure. It is corrected at 60°F. and 29.22 in. Hg. Barometer and is developed from laboratory test engines equipped with standard air cleaner and muffler.*

***Magneto ignition is used on 8 hp tractors through Serial No. 252,832. Battery ignition is used on 8 hp and 10 hp tractors beginning with Serial No. 252,833.*

****See page 40-5-3 for a listing of tractors with 10 amp or 15 amp alternators.*

TIRE SPECIFICATIONS

Tire Code	Location	Size	Tubeless	Ply-Rating	Tread	Tire Inflation Pressure (PSI)
GT-3	Front Rear	16x6.50-8 23x8.50-12	Yes* Yes*	2 2	High- Flotation	6 to 16 5 to 10
GT-4	Front Rear	4.80/4.00-8 23x8.50-12	No Yes*	4 2	Studded Traction	12 to 40 5 to 10
GT-5	Front Rear	16x6.50-8 23x10.50-12	Yes* Yes*	2 2	High- Flotation	6 to 16 5 to 10
GT-8 Bar Tread	Front** Rear	16x6.50-8 23x10.5-12	Yes* Yes*	2 2	High- Flotation Traction	6 to 16 5 to 10

*Tubes available for service. See your parts catalog.
**Use 4.80/4.00-8 front tires with front-end loaders.

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BATTERY SPECIFICATIONS

Tractor	Battery
8 hp	John Deere, 12 Volt, (AM30094), BCI Group U1, 135 cold cranking amps at 0°F., 30-minute reserve capacity.
10 hp	John Deere, 12 Volt, (AM31186), BCI Group 22F, 255 cold cranking amps at 0°F., 55-minute reserve capacity

REAR WHEEL WEIGHT BOLT SIZE CHART

Tire/Wheel Option	Wheel Position	No. of Weights	Bolt Size
GT-3 or GT-4	Narrow	1	1/2x5-1/2
GT-3 or GT-4	Narrow	2	1/2x7-1/2
GT-3 or GT-4	Wide	1	1/2x5-1/2
GT-3 or GT-4	Wide	2	1/2x7-1/2
GT-5	Narrow	1	1/2x5-1/2
GT-5	Narrow	2	1/2x8
GT-5	Wide	1	1/2x5-1/2
GT-5 or GT-8	Wide	2	1/2x7-1/2
Adjustable	Not Reversible	1	1/2x2-1/2
Adjustable	Not Reversible	2	1/2x4-3/4

BOLT TORQUE CHART

Grade of Bolt		SAE-2	SAE-5	SAE-8		
Min. Tensile Strength		64,000 PSI	105,000 PSI	150,000 PSI		
Grade Marking on Bolt					Socket or Wrench Size	
U.S. Standard		TORQUE IN FOOT POUNDS			U.S. Regular	
Bolt Dia.	U.S. Dec. Equiv.				Bolt Head	Nut
1/4	.250	6	10	14	7/16	7/16
5/16	.3125	13	20	30	1/2	1/2
3/8	.375	23	35	50	9/16	9/16
7/16	.4375	35	55	80	5/8	11/16
1/2	.500	55	85	120	3/4	3/4
9/16	.5625	75	130	175	13/16	7/8
5/8	.625	105	170	240	15/16	15/16
3/4	.750	185	300	425	1-1/8	1-1/8
7/8	.875	*160	445	685	1-5/16	1-5/16
1	1.000	250	670	1030	1-1/2	1-1/2

Multiply Readings by 12 for inch pound values.

** "B" Grade bolts larger than 3/4-inch are sometimes formed hot rather than cold which accounts for the lower recommended torque.*

NOTE: Allow a tolerance of plus or minus 10% on all torques given in this chart.

SET SCREW SEATING TORQUE CHART

Screw Size	Cup Point	Square Head
	Torque In Inch Pounds	
#5	9	—
#6	9	—
#8	20	—
#10	33	
1/4	87	212
5/16	165	420
3/8	290	830
7/16	430	—
1/2	620	2100
9/16	620	—
5/8	1225	4250
3/4	2125	7700

Divide Readings by 12 for foot pound values
NOTE: Allow a tolerance of plus or minus 10% on all torques given in this chart.

Group 15
TUNE-UP AND ADJUSTMENT

PRELIMINARY ENGINE TESTING

Operation	Specification	Reference
Cylinder compression	110 to 120 psi (reverse rotation)	Section 20, Group 5
Crankcase vacuum	Idle speeds: 10 to 15 inches of water column Full speed: Approx. 5 inches of water column	Section 20, Group 5

MINOR TUNE-UP GUIDE

Operation	Specification	Reference
Change oil	Summer above 32°F. SAE 30 Winter below 32°F. SAE 5W-20	Section 10, Group 20
Clean and regap spark plug	Clean electrodes and insulator. Set gap at 0.020 in. (8 hp) and 0.020 in. (10 hp).	Section 40, Group 15 or 20
Remove air cleaner and clean by tapping lightly against flat surface.	Check air cleaner condition Replace if necessary	Section 30, Group 15
Adjust carburetor	High-speed mixture needle Idle mixture needle Idle stop screw Speed (idle) - 1650 to 1950 rpm	Section 30, Group 10
Adjust governor speed	Speed (fast - no load) 3600 to 3900 rpm	Section 20, Group 10
Check and clean fuel tank and fuel shut off strainer.	Regular non-leaded gasoline with an octane rating of 90 or higher.	Section 30, Group 20
Battery hydrometer test	1.260 to 1.280 specific gravity 100% charged at 80°F.	Section 40, Group 10

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MAJOR TUNE-UP GUIDE

IMPORTANT: Major tune-up should include all items listed for "Minor Tune-Up" on page 10-15-1 in addition to the following:

Operation	Specification	Reference
Recondition carburetor	Install carburetor repair kit	Section 30, Group 10
Inspect and clean breather assembly	Replace parts as necessary. Install new gaskets. Check crankcase vacuum after assembly.	Section 20, Group 10
Remove shrouding, clean cylinder and cylinder head fins	.....	Section 20, Group 10
Test condenser	.....	Section 40, Group 15 or 20
Test coil	.....	Section 40, Group 15 or 20
Replace breaker points	Point gap 0.020 ± 0.002 in.	Section 40, Group 15 or 20
Retime ignition	"S" mark on flywheel at 1200 to 1800 rpm	Section 40, Group 15 or 20

COMMON ADJUSTMENTS

NOTE: The following common adjustments are recommended after engine tune-up is completed.

Adjustment	Specification	Reference
Variator	.....	Section 50, Group 10
Steering linkage	.....	Section 70, Group 5
Brakes	.....	Section 50, Group 10

Group 20
FUEL AND LUBRICANTS

FUEL

Always use fresh, clean "regular" grade gasoline having an octane rating of 90 or higher. We recommend non-leaded gasoline because it reduces cylinder head deposits. Low-lead or leaded "regular" grades are acceptable if the octane rating is 90 or higher.

DO NOT use premium, ethyl or white gasoline or regular gasoline having an octane rating below 90. Never use special additives such as carburetor cleaners, de-icers, or moisture-removing liquids in your gasoline.

IMPORTANT: Do not mix oil with gasoline.

Avoid using stale gasoline or gasoline that has been stored a long time. Stale gasoline does not vaporize properly and causes hard starting.

IMPORTANT: Do not permit dirt or other foreign matter to enter the fuel system which may cause hard starting, poor performance and engine damage. Always use clean gasoline storage cans and funnels.

LUBRICANTS

Effective use of lubricating oils and greases is perhaps the most important step toward low up-keep cost, long tractor life, and satisfactory service. The charts on this page indicate capacity, type of lubricant, and service intervals.

John Deere Torq-Gard Supreme Engine Oil is recommended because of its superior lubricating qualities. If oil other than Torq-Gard Supreme is used, it must conform to one of the following specifications:

SINGLE-VISCOSITY OILS

API Service CD/SE, CD/SD, CC/SD or SD
MIL-L-46152 or MIL-L2104C*

MULTI-VISCOSITY OILS

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

**As further assurance of quality, the oil should be identified as suitable for API Service Designation SD.*

IMPORTANT: Never put additives in the crankcase. Additives could reduce rather than help oil's lubricating ability.

CAPACITIES

Fuel Tank ..... 1-3/4 U.S. gallons
Crankcase
8 hp ..... 2-1/2 U.S. pints
10 hp ..... 3 U.S. pints
Transaxle ..... 3-1/2 U.S. pints
Hydraulic System (optional equip.) ..... 2 U.S. pints

TYPE OF LUBRICANT

Crankcase

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

Air Temperature	John Deere Torq-Gard Supreme Oil	Other Oils	
		Single Viscosity Oil	Multi-Viscosity Oil
Above 32°F.	SAE 30	SAE 30	Not recommended
−10°F. to 32°F.*	SAE 10W-20	SAE 10W	SAE 10W-30
Below −10°F.	SAE 5W-20	SAE 5W	SAE 5W-20

**SAE 5W-20 oil may also be used to insure optimum lubrication at starting, particularly when engine is subjected to −10°F. or lower temperatures for several hours.*

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

Transaxle ..... John Deere AM30200 Transmission Lubricant or SAE 90 Gear Lubricant. Also an equivalent SCL Multipurpose-Type Gear Oil

Tractor Grease Fittings ..... John Deere Multipurpose Lubricant SAE (Seasonal grade) or equivalent Multipurpose-Type Grease

Hydraulic System (Optional Equipment) ..... John Deere All-Weather Hydrostatic Fluid or an equivalent Type A or F Automotive Automatic Transmission Fluid.

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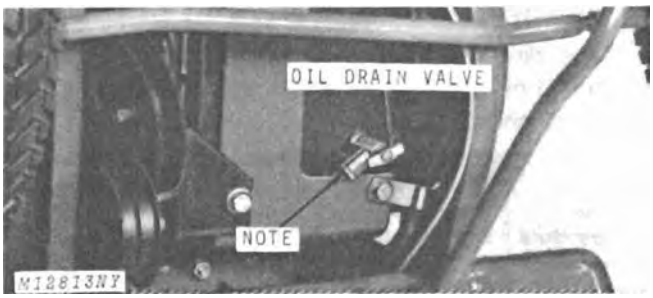
SERVICE INTERVALS

Crankcase (Oil Change)
- Break-in ..... First 2 hours
- Regular ..... Every 25 hours
- Dusty Conditions ..... Every 8 hours

Transaxle (Oil Change) .....200 hours or 2 years
Tractor Grease Fittings
(See page 10-20-3 and 10-20-4 for locations)
Spring and Fall Season
Hydraulic System (Optional Equip) ..... Every 25 hours check level

CHANGING CRANKCASE OIL



10 hp Tractor Illustrated

Fig. 1-Draining Oil

8 hp Tractor *10 hp Tractor*

Fig. 2-Dipstick and Oil Fill Tube

Drain crankcase when oil is hot and all dirt and foreign material is in suspension.

NOTE: For convenience, a suitable length of 5/8-inch garden hose or plastic tubing may be installed on the drain valve to allow oil to drain into a container away from the tractor. See Figure 1.

Remove drain plug or open oil drain valve, Fig. 1, and allow oil to drain into a container.

Install plug or close valve. Fill crankcase with oil, Fig. 2, of the proper viscosity (page 10-20-1) to "F" mark on dipstick. Crankcase capacity is approximately 3 U.S. pints.

IMPORTANT: Check dipstick reading before pouring in the last 1/2 pint. Fill only to "F" mark. Overfilling can cause engine overheating resulting in permanent damage to the engine.

NOTE: Change oil every eight hours when working in extremely dusty conditions.

CHANGING TRANSAXLE OIL

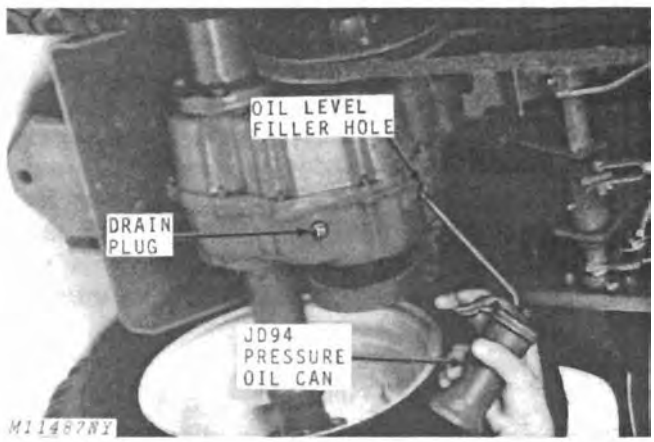


Fig. 3-Adding Oil to Transaxle

Every 2 years or 200 hours of operation, remove the transaxle drain plug and drain all oil into a shallow container. Wipe the drain plug clean and replace it in the transaxle.

Add seven 1/2-pint cans of John Deere AM30200 Transmission Oil or its equivalent through the filler hole, Fig. 3. The transaxle holds 3-1/2 U.S. pints of oil.

CHECKING HYDRAULIC LIFT SYSTEM FLUID LEVEL (Optional Equipment)

Every 25 hours of operation check to see that the fluid level is from 1-1/2 to 2 inches from the top of the reservoir.

When required, add John Deere All-Weather Hydrostatic Fluid or an equivalent Type A or F Automotive Automatic Transmission Fluid. Add only enough to keep the reservoir filled to the proper level.

IMPORTANT: Do not allow dirt or foreign material to enter the reservoir. Do not overfill.

LUBRICATING GREASE FITTINGS
110 Tractors (Serial No. -272,000)

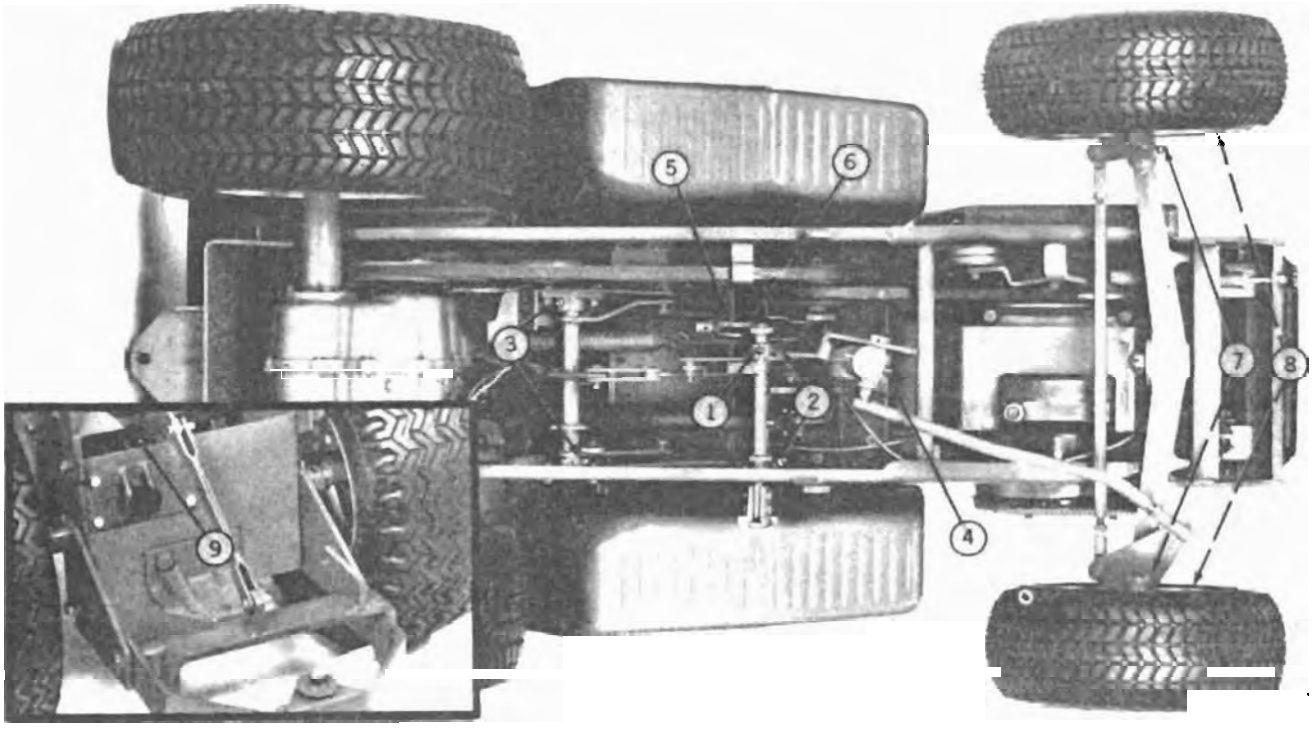


Fig. 4-Grease Fitting Locations on 110 Tractor (Serial No. -272,000)

Each spring and fall lubricate the following 13 grease fittings, (14 with extra equipment integral hitch shown in inset) Fig. 4, with John Deere Multi-Purpose Lubricant or an equivalent SAE multipurpose-type grease:

1. Clutch-brake shaft (two fittings).
2. Primary lift shaft (two fittings).
3. Secondary lift shaft (two fittings).
4. Steering gear
5. Clutch over-ride.
6. Variator pivot.
7. Front wheel spindles (two fittings).
8. Front wheel bearings (two fittings).
9. Integral hitch (extra equipment).

NOTE: Do not overlubricate steering gear fitting. Only 3 to 4 strokes with a hand grease gun or John Deere Pisto-Luber are necessary. Do not use a high-pressure grease gun on this fitting (4).

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LUBRICATING GREASE FITTINGS—Continued
110 Tractors (Serial No. 272,001-)

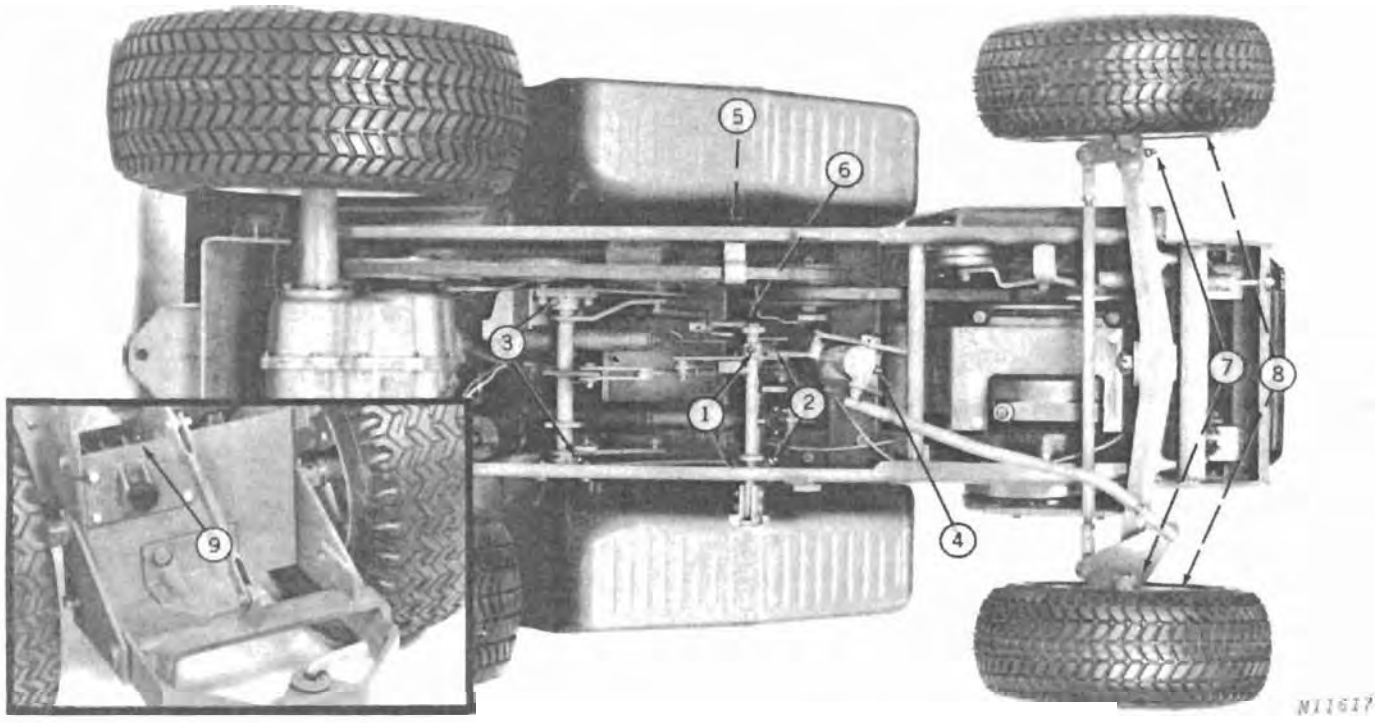

Fig. 5-Grease Fitting Locations on 110 Tractor (Serial No. 272,001-)

Each spring and fall lubricate the 13 grease fittings (14 with extra equipment integral hitch shown in inset) Fig. 5, with John Deere Multi-Purpose Lubricant or an equivalent SAE multipurpose-type grease.

1. Clutch pedal shaft (two fittings).
2. Primary lift shaft (two fittings).
3. Secondary lift shaft (two fittings).
4. Steering gear.
5. Brake pedal shaft.
6. Variator pivot.
7. Front wheel spindles (two fittings).
8. Front wheel bearings (two fittings).
9. Integral hitch (extra equipment).

NOTE: Do not overlubricate steering gear fitting. Only 3 to 4 strokes with a hand grease gun or John Deere Pisto-Luber are necessary. Do not use a high-pressure grease gun on this fitting (4).

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Section 20
ENGINE

Group 5
GENERAL INFORMATION

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DESCRIPTION

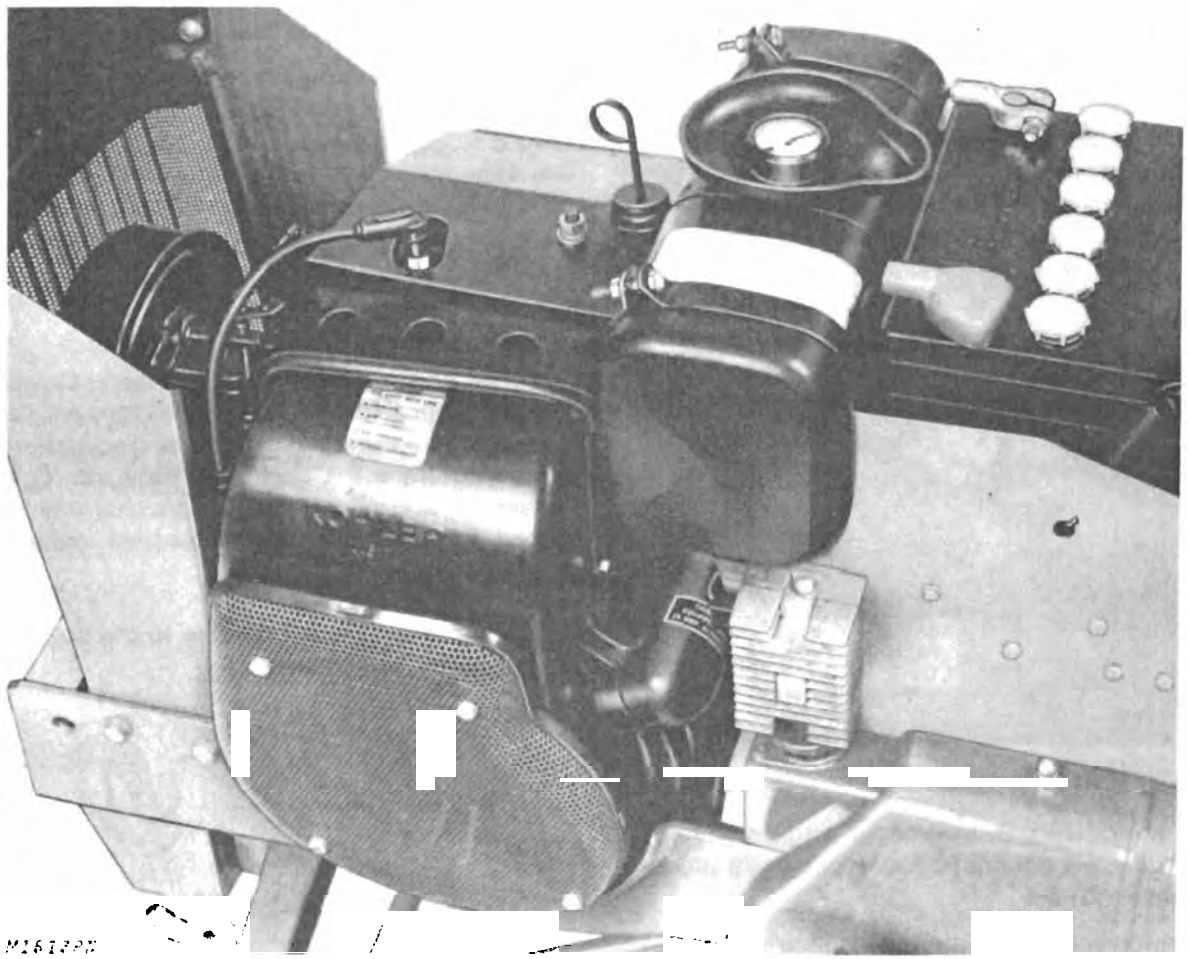


Fig. 1-Kohler K241AS Engine

The 8 hp tractor is equipped with a Kohler K181S engine and the 10 hp tractor is equipped with a Kohler K241AS engine, Fig. 1.

The K181S and K241AS are both four-cycle, L-head, single-cylinder, internal-combustion engines. Each engine has a cast-iron block with a large bore and short stroke.

The engines are air-cooled, with anti-friction ball bearings, oil bath lubrication and internal flyweight governor.

Other features are an alternator charging system and battery-coil ignition.

NOTE: 8 hp tractors (Serial No. 250,001-252,832) are equipped with magneto-alternator ignition systems. Beginning with Serial No. 252,833 8 hp tractors have battery-ignition systems.

ENGINE ANALYSIS

PRELIMINARY ENGINE CHECKS

A complete diagnosis guide of engine malfunctions begins on page 20-5-6. However, the majority of engine trouble reports are of a minor non-chronic nature and are usually due to electrical or fuel system difficulties. First make the checks listed below to isolate the majority of engine problems.

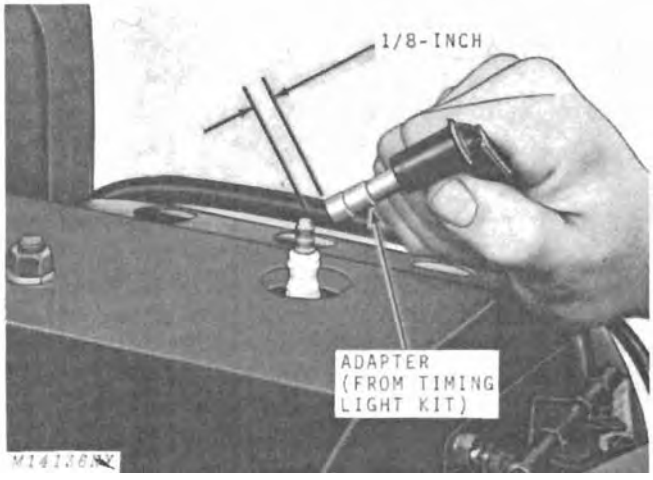


Fig. 2-Checking Spark At Plug

Check spark, Fig. 2, whenever engine will not start. If engine will not crank, follow diagnosis procedure on page 20-5-6.

Remove ignition cable from spark plug and install adaptor or ordinary paper clip. Hold approximately 1/8 inch away from spark plug terminal while cranking the engine.

If there is good spark between the adaptor and the spark plug terminal, the problem is in the fuel-air system. If gas tank is full, check shut-off valve under gas tank and gas lines to carburetor to be certain gas is getting to carburetor. Connect high tension wire to spark plug and crank engine. Choke as necessary. If engine still does not start, refer to "Diagnosing Malfunctions" to check for internal difficulties.

If there is no spark at the adaptor or a weak spark, the trouble is in the electrical system. If the battery and spark plug are good and all electrical connections are tight, the trouble most likely is in the breaker points or condenser. Clean or replace points and adjust gap. If breaker points are burned, replace the condenser also.

If the engine still does not start, or starts but does not run properly, make the compression test on this page and the vacuum test on page 20-5-5.

PRELIMINARY ENGINE TESTS

The following preliminary engine tests are recommended to detect and isolate possible malfunctions before proceeding with further diagnosis. These tests are especially important when the engine is burning oil, losing power or running erratically and when carburetion and ignition adjustments do not correct the condition.

Compression Test

Kohler engines have ACR (Automatic Compression Release Camshaft). Because ACR relieves compression pressure during lower cranking speeds, it is important to crank the engine at 1000 rpm or more to obtain an accurate test. ACR mechanism is disengaged when engine speed reaches approximately 650 rpm.

When the engine is operable in the tractor, check compression as follows.

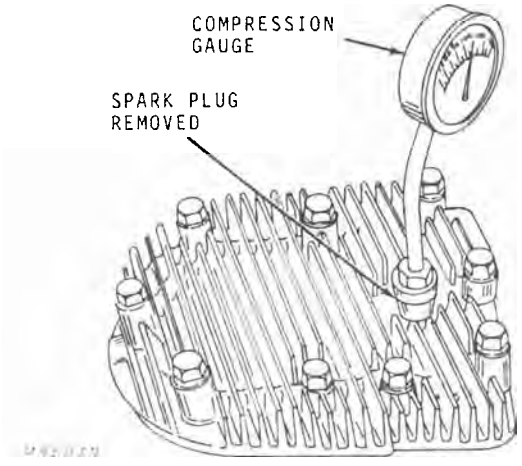


Fig. 3-Testing Engine Compression

Depress clutch-brake pedal or brake pedal and set parking brake. Be sure oil in crankcase is at proper level and battery is properly charged.

NOTE: Be sure tractor drives are all disengaged. Run engine until warm, then stop the engine.

Remove spark plug. Also remove air filter for most accurate test.

Set throttle and choke valve in wide open position by raising throttle lever, and lowering choke lever.

Hold compression gauge firmly in spark plug opening, Fig. 3. Crank engine at 1000 rpm and observe reading. Repeat test to verify readings.

A starter rope can be used if 650 rpm or more cannot be reached by using the electric starter.

To use starter rope procedure, wind a number of turns of 1/4-inch rope around PTO sheave opposite the direction of engine rotation. Pull rope firmly and observe reading. Repeat test until readings are consistent.

Test Conclusions

An engine in top operating condition will read 110 to 120 psi when engine is cranked approximately 1000 rpm.

A compression test above 120 psi, indicates excessive carbon deposits in the combustion chamber or on the piston.

A reading lower than 100 psi indicates leakage at the cylinder head gasket, piston rings or valves. *The engine should be reconditioned if compression falls below 90 psi.*

To determine whether the rings or the valves are at fault, pour about one tablespoonful of heavy oil into the spark plug hole. Crank the engine several revolutions to spread the oil and repeat the compression test.

The oil will temporarily seal leakage around the piston rings. If the same approximate compression reading is obtained, the rings are satisfactory, but the valves are leaking or the piston is damaged. If the compression has increased considerably over the original readings, there is leakage past the rings.

Crankcase Vacuum Test

The crankcase breather maintains a partial vacuum in the crankcase when the engine is operating properly.

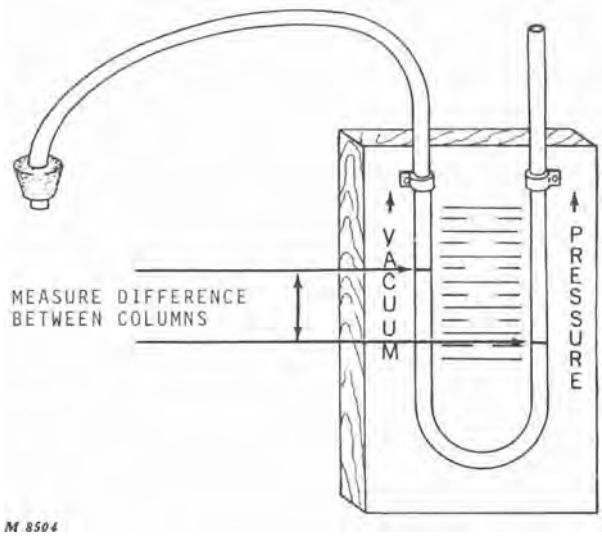


Fig. 4-Checking Crankcase Vacuum

Connect a water U-tube manometer, Fig. 4, to cylinder block oil filler tube. Tester must hang vertically. Start and run engine at 1200 to 1700 rpm. Allow engine to warm up and observe reading on scale. Follow manufacturer's recommendations for installation, testing and compensation for the effect of altitude on the gauge reading.

Test Conclusions

Proper crankcase vacuum for the K181S and K241AS engines is a 5 to 10-inch water column on the manometer gauge.

A crankcase vacuum reading lower than specified is most likely due to a leaking breather valve or improperly assembled breather. See page 20-10-9 and carefully reassemble all breather parts. A low vacuum reading may also be caused by leaky valves, engine blow-by or worn crankshaft oil seals.

If the crankcase is found to be pressurized rather than have a vacuum, chances are that the breather plate has been assembled backwards or the breather filter is plugged.

Engines with zero vacuum or a pressurized crankcase will likely be pumping oil into the combustion chamber or out the breather or oil seals. This can be detected by watching for excessive exhaust smoke, engine overheating or oil leakage outside the engine.

DIAGNOSING MALFUNCTIONS

Engine Will Not Crank

Transaxle not in neutral.

Battery discharged or defective.

Neutral-start switch and bracket loose or not properly adjusted.

PTO drive engaged.

Defective safety switch(es).

Defective starter.

Defective solenoid.

Loose electrical connections.

Defective key switch.

Engine seized.

Engine Starts Hard

Spark plug pitted or fouled.

Breaker points worn, pitted or out of adjustment.

High tension wire shorted.

High tension wire loose at spark plug or coil.

Loose electrical connections.

Restricted gas tank vent.

Clogged fuel line or air lock.

Broken choke cable.

Throttle cable not properly adjusted.

Dirt or water in fuel system.

High speed and idle mixture needles not properly adjusted.

Wrong valve clearance.

Leaking head gasket.

Restricted exhaust system.

Low compression.

Engine Starts But Fails To Keep Running

Restricted gas tank vent.

High speed and idle mixture needles not properly adjusted.

Broken choke cable.

Dirt or water in fuel system.

Carburetor float not properly adjusted or float valve leaking.

High tension wire loose at spark plug or coil.

High tension wire shorted.

Breaker points not properly adjusted.

Loose electrical connections.

Faulty condenser.

Excessive engine load.

Engine Cranks But Will Not Start

Empty gas tank.

Restricted gas tank vent.

Fuel shut-off valve closed (valve below gas tank).

Clogged, restricted or air-locked fuel line.

Breaker points worn or pitted.

Spark plug fouled or pitted.

Incorrect spark plug.

Battery not fully charged.

Loose electrical connections.

High speed and idle mixture needles not porperly adjusted.

Faulty condenser.

Defective ignition coil.

Dirt in fuel system.

Frayed electrical wire(s) causing ground(s).

Engine Runs But Misses

High tension wire loose from spark plug or coil.

Breaker points out of adjustment or worn and pitted.

Spark plug fouled, pitted or gap incorrect.

Incorrect spark plug.

Loose electrical connections.

Carburetor float not properly adjusted or float valve leaking.

Dirt or water in fuel system.

Wrong valve clearance.

Faulty coil.

Engine Misses Under Load

Spark plug fouled, pitted or gap incorrect.

High speed and idle mixture needles not properly adjusted.

Incorrect spark plug.

Breaker points out of adjustment or worn and pitted.

Ignition out of time.

Dirt or water in fuel system.

Stale fuel.

Engine Will Not Idle

Idle speed too low.

High speed and idle mixture needles not properly adjusted.

Dirt or water in fuel system.

Restricted gas tank vent.

Spark plug fouled, pitted or gap incorrect.

Wrong valve clearance.

Low engine compression.

Engine Misses When Advancing Throttle

Cold engine.

High speed and idle mixture needles not properly adjusted.

Spark plug fouled, pitted or gap incorrect.

Linkage misaligned (throttle arm-to-governor).

Engine Loses Power

Crankcase low on oil.

Engine shrouding plugged.

Excessive engine load.

Restricted air filter.

Dirt or water in fuel system.

High speed and idle mixture needle not properly adjusted.

Spark plug fouled, pitted, or gap incorrect.

Too much oil in crankcase.

Low engine compression.

Worn cylinder bore.

Engine Overheats

Dirty or plugged shrouding and engine fins.

High speed and idle mixture needles not properly adjusted.

Too much oil in crankcase.

Worn valve stem and/or guides.

Crankcase low on oil.

Excessive engine load.

Faulty breather causing low crankcase vacuum.

Engine Knocks

Engine out of time.

Stale fuel.

Excessive engine load.

Crankcase low on oil.

Engine Backfires

High speed and idle mixture needles not properly adjusted (lean mixture).

Loose cylinder head or blown head gasket.

Intake valve sticking in guide.

Ignition out of time.

Engine Low On Power At Full Throttle

Restricted air filter.

Spark plug fouled, pitted or gap incorrect.

Incorrect spark plug.

Restricted exhaust.

Breaker points out of adjustment, worn and pitted.

Clogged fuel line or air lock.

Broken choke cable.

Clogged breather assembly.

Defective ignition coil.

Governor malfunctioning.

Engine Does Not Maintain Constant Speed (Surges)

High speed and idle mixture needles not properly adjusted.

Spark plug gap incorrect.

Throttle-to-governor linkage not properly assembled.

Breaker points out of adjustment, worn or pitted.

Dirt of water in fuel system.

Sensitive governor.

Engine Uses Excessive Amount Of Oil

Clogged breather assembly.

Breather not assembled properly.

Worn or broken piston rings.

Worn cylinder bore.

Clogged oil holes in piston.

Wrong size piston rings.

Worn valve stems and/or valve guides.

Incorrect oil viscosity.

Faulty breather causing low crankcase vacuum.

Engine Runs Erratically

Dirt or water in fuel system.

High speed and idle mixture needles not properly adjusted.

Idle speed too low.

Spark plug fouled, pitted, or gap incorrect.

Poor compression.

Faulty breather causing low crankcase vacuum.

Carburetor leaking at gaskets or at fuel connections.

Restricted gas tank vent.

Throttle-to-governor linkage incorrectly assembled.

Sensitive governor.

Gasoline In Crankcase

Carburetor float not properly adjusted or leaking.

Worn float valve and/or seat.

Group 10
CYLINDER HEAD, VALVES AND BREATHER

GENERAL INFORMATION

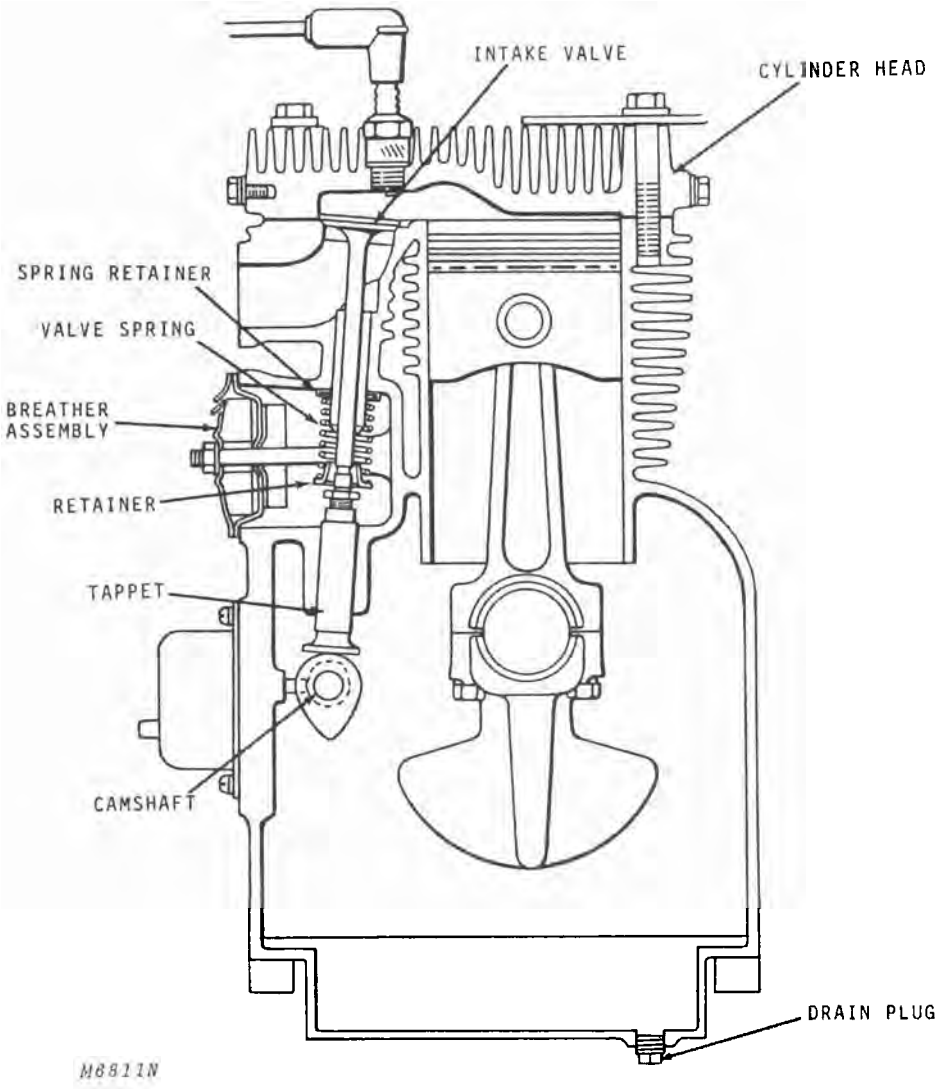


Fig. 1-Schematic View of Valves and Tappets

It is not necessary to remove the engine from the tractor to grind valves and valve seats or to service the breather assembly.

The exhaust valve insert is press fitted into the block and can be replaced. The intake valve seat is machined into the block.

Valve guides can be replaced when wear tolerances are exceeded.

The breather assembly, Fig. 1, is mounted in front of the valve spring chamber below the carburetor.

VALVE ANALYSIS

Fig. 2-Lead Deposits on Leaky Intake Valve

Lead deposits on the intake valve, Fig. 2, consist mostly of lead and some metal which comes from the lubricating oil. It is caused by a small amount of exhaust gas leakage into the intake port area. This indicates that the valve is not sealing properly. Grind the valve and reface the seat to correct this condition.

NOTE: Be sure to correct valve-to-tappet clearance after grinding valves. See page 20-10-8.

Fig. 3-Valve Stem Corrosion

Valve stem corrosion, Fig. 3, is caused by moisture finding its way into the engine. Moisture in the fuel-air mixture can condense inside the engine when the engine is stopped prior to warm up.

Valve corrosion can also occur during storage when the engine has been idle for some time. Fogging or pouring oil in the combustion chamber before storing will prevent valve corrosion.

Corroded and pitted valves tend to collect deposits which in turn cause valve sticking. Always replace badly corroded or pitted valves with new valves.

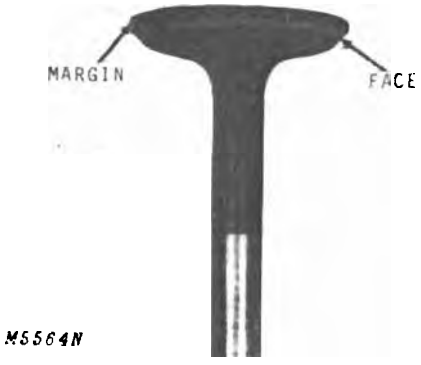


Fig. 4-Exhaust Valve Running Too Hot

Exhaust valves are designed to function in temperatures exceeding 5000° F. However, when operating at this temperature for long periods of time, valve burning occurs, Fig. 4. Tell-tale signs of valves running too hot is the dark discoloration of the valve stem down into the area protected by the valve guide. Another indication is distortion of the valve margin and valve face. Valve inserts may also begin to burn away.

The most common cause of an overheated engine and valves is poor cooling due to dirt or obstructions inside the intake shrouding. Remove and clean shrouding and all cooling fins on the engine if this condition is noticed.

NOTE: Never run engine with shrouding removed.

Also check for improper valve timing by checking and correcting valve clearance.

Worn valve guides or valve springs can also cause overheated valves.

Valves running hot also can be caused by an improper spark plug, a lean fuel mixture, or overheated spark plug, which causes pre-ignition.

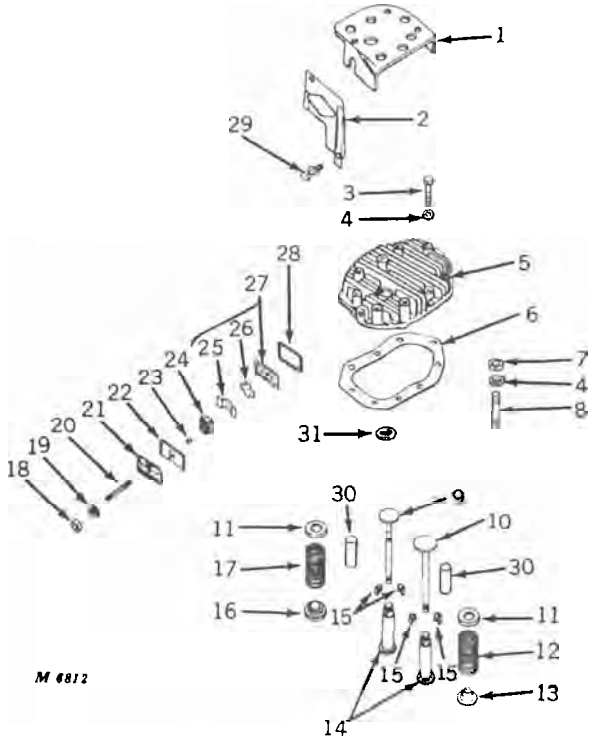
Fig. 5-Gummy Valve Causing Valve to Stick

Using gasoline which has been left in the tank a long time is a common cause of sticking valves, Fig. 5.

Sometimes this gummy substance can be seen on the valve. When this condition is found, it is also likely that the carburetor also contains gum deposits and will require a complete cleaning.

Advise customer always to use fresh gasoline and always to drain gas from all fuel lines and carburetor before storing tractor.

REPAIR



1—Head Baffle
2—Side Baffle
3—Cap Screw (7 used)
4—Washer (10 used)
5—Cylinder Head
6—Head Gasket
7—Hex. Nut (2 used)
8—Stud (2 used)
9—Exhaust Valve
10—Intake Valve
11—Upper Spring Retainer
12—Intake Valve Spring
13—Lower Spring Retainer
14—Tappet (2 used)
15—Spring Keeper (4 used)
16—Exhaust Valve Rotator (K241AS)
17—Exhaust Valve Spring
18—Hex. Nut
19—Lock Washer
20—Stud
21—Cover
22—Outer Gasket
23—Seal
24—Filter
25—Baffle
26—Reed
27—Breather Plate Assembly
28—Inner Gasket
29—Cap Screw (4 used)
30—Valve Guides (2 used)
31—Exhaust Valve Insert

Fig. 6-Exploded View of Cylinder Head, Valves and Breather

REPAIR—Continued

It is not necessary to remove the engine from the tractor when servicing the cylinder head, head gasket, muffler, breather assembly, valves and valve seats.

IMPORTANT: On tractors equipped with hydraulic lift, do not disconnect the hydraulic lines. Remove the pump, valve and reservoir unit from the top of the engine and lower it to the ground with the hydraulic lines still attached. This procedure avoids the possibility of dirt entering the system.

Disconnect choke conduit and cable at carburetor. Remove carburetor, breather assembly, head baffle, cylinder head and head gasket.

Removing Valves

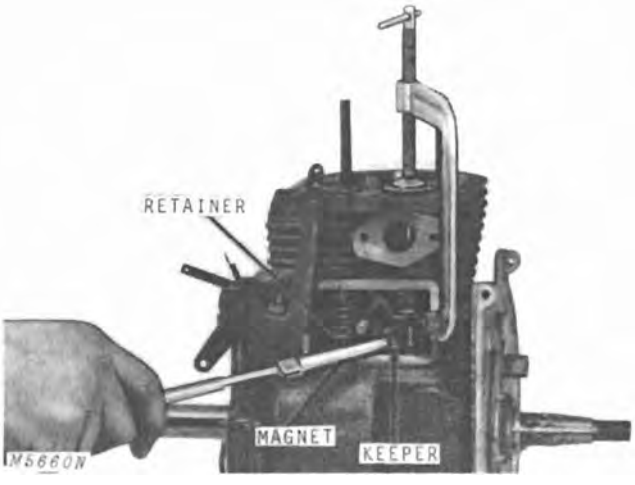


Fig. 7-Removing Valves

Use a valve spring compressor to compress valve springs, Fig. 7. Remove keepers from valve stem and lift valves from engine block.

Remove valve spring retainers and valve springs from valve chamber.

Inspecting Cylinder Head

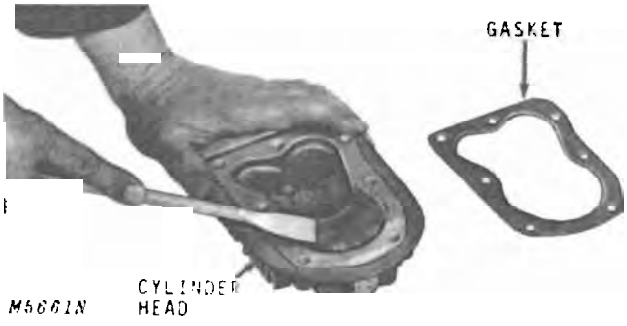


Fig. 8-Cleaning Cylinder Head

Remove all deposits from combustion chamber and gasket surface of head with a scraper, Fig. 8, and a wire brush.

Be careful not to damage the cylinder head gasket surface. Use a safe cleaning solvent to remove dirt, grease and other deposits.

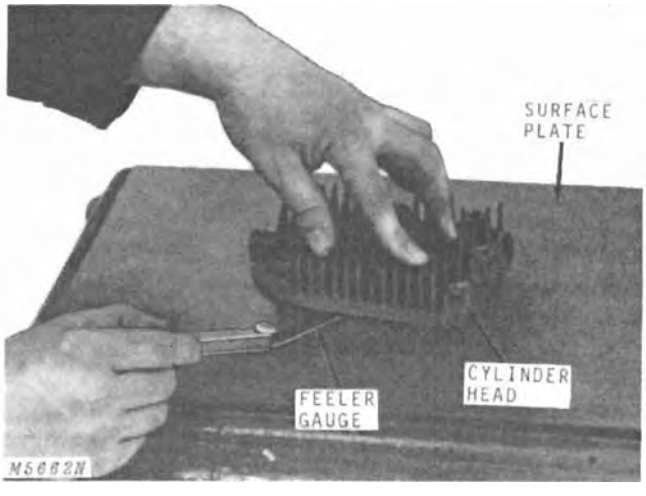


Fig. 9-Checking Surface of Cylinder Head

Check the cylinder head for cracks or broken cooling fins and inspect the gasket surface for burrs and nicks. Replace the head if any of these conditions are found.

When replacing a head gasket, always check the cylinder head for warpage. Use a surface plate and a 0.0015-inch ribbon feeler gauge in the manner shown in Fig. 9. The feeler gauge should drag at all points when drawn from between the head and surface plate.

NOTE: Whenever the cylinder head is removed, discard the head gasket. Always use a new head gasket when installing the cylinder head.

Inspecting Breather

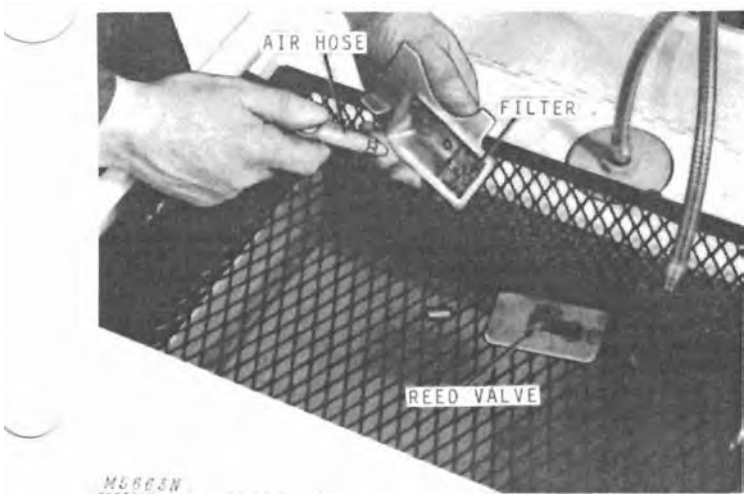


Fig. 10-Cleaning Breather Filter

Clean all breather parts in solvent, Fig. 10. Blow out filter contamination with compressed air or replace with new filter as necessary.

Inspect reed valve on breather to be certain it covers all of breather hole. When depressed in the center, the valve should close over the hole with a snap. Replace valve plate having weak tension.

Be sure small drain hole in breather plate is not clogged.

Testing Valve Springs

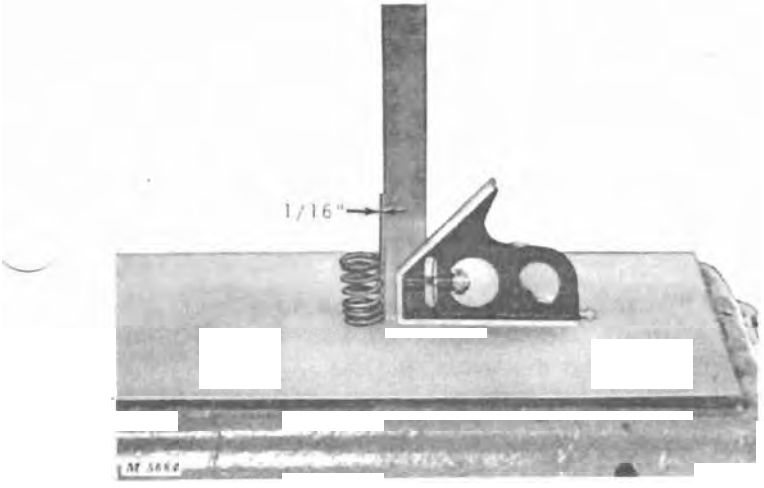


Fig. 11-Valve Spring Squareness

Check valve spring for squareness, using a steel square and a surface plate, Fig. 11. Stand the spring and square on end on the surface plate. Slide the spring up to the square. Revolve the spring slowly and observe the space between the top coil of the spring and the square. See Specifications, page 20-25-2, for out-of-square limits.

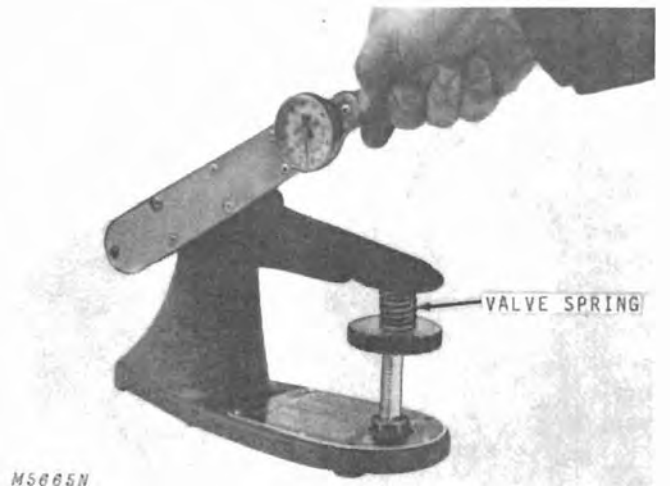


Fig. 12-Valve Spring Tension

Check valve spring for proper pressure, Fig. 12. Refer to Specifications, page 20-25-2, for free length of the spring and the pressure in pounds that the spring should exert when it is compressed to a measured length.

Inspecting Valves

Remove carbon from valve head, face, and stem with a power-operated wire brush. Be sure carbon is removed and not merely burnished. Any carbon left on the stem will affect accurate alignment in the valve refacer collet.

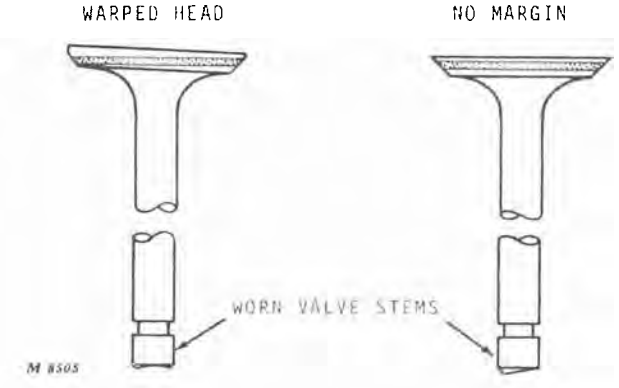


Fig. 13-Faulty Valves

Inspect valve faces, heads and stems for distortion, pitting, and burning, Fig. 13. Recondition valves that appear acceptable. Distorted valves will be evident when refacing operation is performed. Replace all valves with less than 1/32-inch margin or those having a questionable appearance.

Grind valve stems square prior to installation and resetting of valve tappet clearance.

Litho in U.S.A.