

# 200, 208, 210, 212, 214 and 216 Lawn and Garden Tractors



JOHN DEERE

## SERVICE MANUAL

200, 208, 210, 212, 214 and 216 Lawn  
and Garden Tractors

SM2105 (01OCT81) English

John Deere  
Lawn & Grounds Care Division  
SM2105 (01OCT81)

LITHO IN U.S.A.  
ENGLISH



# JOHN DEERE 200, 208, 210, 212, 214 AND 216 LAWN AND GARDEN TRACTORS

Service Manual  
SM-2105 (June-81)

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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 200, 208, 210, 212, 214 and 216 Lawn and Garden Tractors and attachments through 1982 model (SN 195,001-).


The manual is divided into sections. Each section pertains to a certain component or operational system of the tractor or attachment. 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 the part.

Metric equivalents have been included, where applicable, throughout this service manual.

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

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.**

### FOR YOUR CONVENIENCE

Vertical lines appear in the margins of many of the pages. These lines identify new material and revised information that affects specifications, procedures, and other important instructions.

# Section 10 GENERAL Group 5 TRACTOR IDENTIFICATION

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## SERIAL NUMBERS

### Tractor

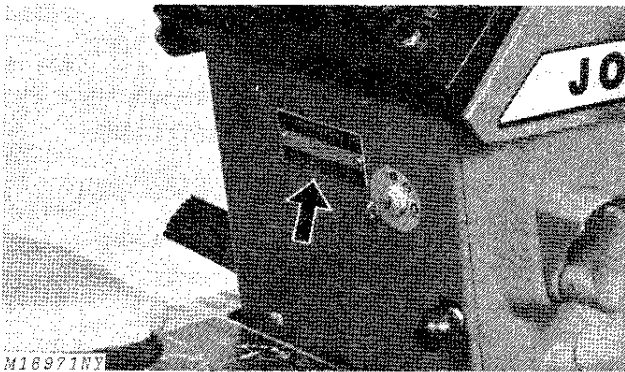
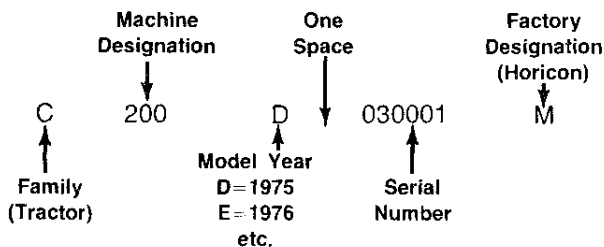


Fig. 1-Tractor Serial Number

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

The first letter indicates the "family of machine"; the next three numbers or letters, the "model or machine designation"; the letter in the fifth position indicates the "model year". This is followed by a space (for computer purposes), and a six-digit serial number and the letter "M" denoting Horicon as the factory of manufacture.



When ordering parts, use only the six-digit serial number. When writing about or filling out warranty claims, use all thirteen numbers, letters and spaces shown on the machine serial number plate.

### Engine

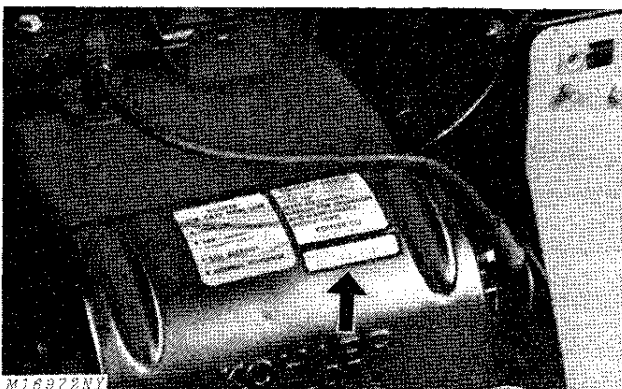


Fig. 2-Engine Serial Number

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

### Transaxle

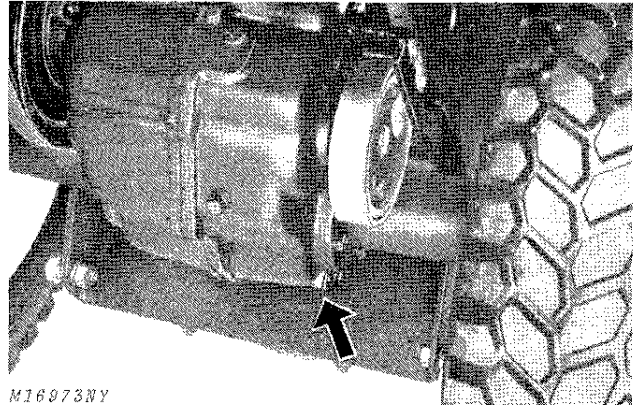


Fig. 3-Transaxle Serial Number

The transaxle serial number, Fig. 3, is located on the transaxle case next to the L.H. axle housing.

## IDENTIFICATION CODES

### Tire Codes

John Deere 200, 210, 212, 214 and 216 Tractors can be equipped with four 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 -----	----- 23x8.50-12	Studded Traction
GT-5	16x6.50-8	23x10.50-12	High-Flotation
GT-8 Bar Tread	16x6.50-8 or 4.80/4.00-8 -----	----- 23x10.50-12	High-Flotation Traction

**NOTE:** The 200 Tractor is equipped with GT-3 tires as standard equipment. The 208 Tractor is equipped with 4.80 x 4.00-8 (2-ply) front tires and 23 x 8.50-12 rear tires as standard equipment. The 208 Tractor can be equipped with GT-3, GT-4, GT-5, or GT-8 tires listed above if desired. The 210, 212, 214 and 216 Tractors are equipped with GT-5 tires as standard equipment.

## Group 10 SPECIFICATIONS

### ENGINE SPECIFICATIONS

Item	200	208	210
Engine Model No. ....	K181QS	K181S	K241AQS
Manufacturer .....	Kohler	Kohler	Kohler
Cylinders .....	One	One	One
Stroke/Cycle .....	Four	Four	Four
Bore .....	2.94 in. (74.6 mm)	2.94 in. (74.6 mm)	3.25 in. (82.5 mm)
Stroke .....	2.75 in. (69.8 mm)	2.75 in. (69.8 mm)	2.88 in. (73.1 mm)
Displacement .....	18.6 cu. in.	18.6 cu. in.	23.9 cu. in.
Speeds (Fast) No Load ..	3400 to 3500 rpm	3400 to 3500 rpm	3400 to 3500 rpm
Speeds (Idle) .....	1700 to 1900 rpm	1700 to 1900 rpm	1700 to 1900 rpm
Horsepower* .....	8	8	10
Normal Compression .....	110 to 120 psi	110 to 120 psi	110 to 120 psi
Valve Clearance			
Intake (Cold) .....	0.007 in. (0.178 mm)	0.007 in. (0.178 mm)	0.010 in. (0.254 mm)
Exhaust (Cold) .....	0.016 in. (0.406 mm)	0.016 in. (0.406 mm)	0.020 in. (0.508 mm)
Ignition .....	Battery	Battery	Battery
Spark Plug** .....	Champion-J-8 or XJ8 AC-45-M or R-46 Prestolite-14-7 or 14-R8	Champion-RJ8	Champion-H-10 AC-45L Prestolite-14-L7B
Spark Plug Gap .....	0.025 in. (0.635 mm)	0.025 in. (0.635 mm)	0.035 in. (0.889 mm)
Breaker Point Gap .....	0.020 in. (0.508 mm)	0.020 in. (0.508 mm)	0.020 in. (0.508 mm)
Charging System .....	Alternator	Alternator	Alternator
Starter .....	12-Volt	12-Volt	12-Volt
Air Filter .....	Dry-type	Dry-type	Dry-type

Item	212	214	216
Engine Model No. ....	K301AQS	K321AQS	K341AQS
Manufacturer .....	Kohler	Kohler	Kohler
Cylinders .....	One	One	One
Stroke/Cycle .....	Four	Four	Four
Bore .....	3.38 in. (85.8 mm)	3.50 in. (88.9 mm)	3.75 in. (95.2 mm)
Stroke .....	3.25 in. (82.5 mm)	3.25 in. (82.5 mm)	3.25 in. (82.5 mm)
Displacement .....	29.1 cu. in.	31.3 cu. in.	35.9 cu. in.
Speeds (Fast) No Load ..	3400 to 3500 rpm	3400 to 3500 rpm	3400 to 3500 rpm
Speeds (Idle) .....	1700 to 1900 rpm	1700 to 1900 rpm	1700 to 1900 rpm
Horsepower* .....	12	14	16
Normal Compression .....	110 to 120 psi	110 to 120 psi	110 to 120 psi
Valve Clearance			
Intake (Cold) .....	0.010 in. (0.254 mm)	0.010 in. (0.254 mm)	0.010 in. (0.254 mm)
Exhaust (Cold) .....	0.020 in. (0.508 mm)	0.020 in. (0.508 mm)	0.020 in. (0.508 mm)
Ignition .....	Battery	Battery	Battery
Spark Plug** .....	Champion-H-10 AC-45L Prestolite-14-L7B	Champion-H-10 AC-45L Prestolite-14-L7B	Champion-H-10 AC-45L Prestolite-14-L7B
Spark Plug Gap .....	0.035 in. (0.889 mm)	0.035 in. (0.889 mm)	0.035 in. (0.889 mm)
Breaker Point Gap .....	0.020 in. (0.508 mm)	0.020 in. (0.508 mm)	0.020 in. (0.508 mm)
Charging System .....	Alternator	Alternator	Alternator
Starter .....	12-Volt	12-Volt	12-Volt
Air Filter .....	Dry-type	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.

\*\*In Canada, compliance with radio interference regulations certified. Replace spark plug with resistor-type spark plug only. Use Champion RJ8 for 200 and 208 Tractors. Use Champion RH10 for 210, 212, 214 and 216 Tractors.

### BATTERY SPECIFICATIONS

Tractor	Battery
200, 208	John Deere, 12 Volt, (AM30094), BCI Group U1, 135 cold cranking amps at 0°F (-17°C), 30-minute reserve capacity.
210, 212, 214, 216	John Deere, 12 Volt, (AM31186), BCI Group 22F, 255 cold cranking amps at 0°F (-17°C), 55-minute reserve capacity.

### TRACTOR SPECIFICATIONS

Item	200, 208	210, 212, 214, 216
<b>CAPACITIES</b>		
Fuel Tank .....	3-1/2 U.S. Gallons (13.25 L)	3-1/2 U.S. Gallons (13.25 L)
Crankcase .....	2-1/2 U.S. Pints (1.18 L)	** (S.N. 30001-95261) 3 U.S. Pts. (1.42 L)
		*** (S.N. 95262 and up) 4 U.S. Pints (1.89 L)
Transaxle .....	3-1/2 U.S. Pints (1.65 L)	3-1/2 U.S. Pints (1.65 L)
Hydraulic System (optional) .....		2 U.S. Pints (0.94 L)
<b>TRANSMISSION</b>		
Type .....	Transaxle	Transaxle
Gear Selections .....	4 forward - 1 reverse	4 forward - 1 reverse
<b>TRAVEL SPEEDS - (at 3400 rpm)</b>		
1st Gear (Variable) .....	0.3 to 0.9 mph (.6 to 1.6 kms/hr)	0.3 to 0.9 mph (.6 to 1.6 kms/hr)
2nd Gear (Variable) .....	1.0 to 2.7 mph (2.1 to 4.6 kms/hr)	1.0 to 2.7 mph (2.1 to 4.6 kms/hr)
3rd Gear (Variable) .....	1.8 to 4.7 mph (3.8 to 8.0 kms/hr)	1.8 to 4.7 mph (3.8 to 8.0 kms/hr)
4th Gear (Variable) .....	2.6 to 7.0 mph (5.5 to 11.9 kms/hr)	2.6 to 7.0 mph (5.5 to 11.9 kms/hr)
Reverse (Variable) .....	1.4 to 3.7 mph (2.4 to 5.3 kms/hr)	1.4 to 3.7 mph (2.4 to 5.3 kms/hr)
<b>DIMENSIONS</b>		
Wheelbase .....	46 in. (1.168 m)	46 in. (1.168 m)
Overall Length .....	67-1/2 in. (1.715 m)	67-1/2 in. (1.715 m)
Overall Height .....	42 in. (1.067 m)	42 in. (1.067 m)
Overall Width (maximum) .....	41-1/2 in. (1.054 m)	41-1/2 in. (1.054 m)
<b>WHEEL TREAD</b>		
Front .....	31 in. (78.74 cm)	31 in. (78.74 cm)
Rear (GT-3 Tires) .....	27 in. or 33 in. (68.58 cm or 83.82 cm)	27 in. or 33 in. (68.58 cm or 83.82 cm)
(GT-5 Tires) .....	28-1/2 in. or 31 in. (72.39 cm or 78.74 cm)	28-1/2 in. or 31 in. (72.39 cm or 78.74 cm)
<b>BRAKES</b>		
Type .....	Band, pedal-operated	Band, pedal-operated
Parking .....	Hand-lock foot brake	Hand-lock foot brake
<b>CLUTCH</b>		
PTO CLUTCH .....	V-belt system	V-belt system
<b>STEERING</b>		
STEERING .....	Manual	Manual
LIFT* .....	Enclosed gear	Enclosed gear
SHIPPING WEIGHT .....	Manual, Electric	Manual, Electric, Hydraulic
	200 Tractor - 691 lbs. (313 kg)	759 lbs. (344 kg)
	208 Tractor - 673 lbs. (305 kg)	

\*Electric and Hydraulic Lifts are dealer installed options.

\*\*Aluminum Pan

\*\*\*Steel Pan

### TIRE SPECIFICATIONS

Tire Code	Location	Size	Tubeless	Ply-Rating	Tread	Tire Inflation Pressure
***	Front	4.80x4.00-8	Yes	2	Studded High- Flotation	10 to 12 psi (69 to 82 kPa)
	Rear	23x8.50-12	Yes	2		5 to 10 psi (34 to 69 kPa)
GT-3	Front	16x6.50-8	Yes*	2	High- Flotation	6 to 16 psi (41 to 110 kPa)
	Rear	23x8.50-12	Yes*	2		5 to 10 psi (34 to 69 kPa)
GT-4	Front	4.80/4.00-8	No	4	Studded Traction	12 to 40 psi (82 to 276 kPa)
	Rear	23x8.50-12	Yes*	2		5 to 10 psi (34 to 69 kPa)
GT-5****	Front	16x6.50-8	Yes*	2	High- Flotation	6 to 16 psi (41 to 110 kPa)
	Rear	23x10.50-12	Yes*	2		5 to 10 psi (34 to 69 kPa)
GT-8 Bar Tread	Front**	16x6.50-8	Yes*	2	High- Flotation Traction	6 to 16 psi (41 to 110 kPa)
	Rear	23x10.5-12	Yes*	2		5 to 10 psi (34 to 69 kPa)

\*Tubes Available for service. See your parts catalog.

\*\*Use 4.80/4.00-8 (4-ply) front tires with front-end loaders.

\*\*\*Regular equipment tires on 208 Tractor.

\*\*\*\*Regular equipment tires on 210, 212, 214 and 216 Tractors.

### REAR WHEEL WEIGHT BOLT SIZE CHART

Tire/Wheel Option	Wheel Position	No. of Weights	Bolt Size
GT-3 or GT-4	Narrow	1	1/2 x 5-1/2
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



### BOLT TORQUE CHART

AVERAGE TIGHTENING TORQUE FOR BOLTS  
(BASED ON 85% OF YIELD)

Bolt Size	A17B			A17D			A17F		
	in-lb	ft-lb	Nm	in-lb	ft-lb	Nm	in-lb	ft-lb	Nm
1/4	72	6	8	120	10	13.5	168	14	19
5/16	156	13	17.6	240	20	27	360	30	40.7
3/8	276	23	31.2	420	35	47.5	600	50	67.8
7/16	420	35	47.5	660	55	74.6	960	80	108.5
1/2	660	55	74.6	1020	85	115.2	1440	120	162.7
9/16	900	75	101.7	1560	130	176.3	2100	175	237.3
5/8	1260	105	142.4	2040	170	230.5	2880	240	325.4
3/4	2220	185	250.8	3600	300	406.7	5100	425	576.2
7/8	1920	160	216.9	5340	445	603.3	8220	685	928.7
1	3000	250	339	8040	670	908.4	12360	1030	1396.5
1-1/8	3960	330	447.4	10920	910	1233.8	17520	1460	1979.5
1-1/4	5760	480	650.8	15000	1250	1694.8	24720	2060	2793

B-grade bolts larger than 3/4-inch are sometimes formed hot rather than cold, which accounts for the lower mean tightening torque.

### SET SCREW SEATING TORQUE CHART

Screw Size	Seating Torque	
	in-lb	Nm
#5	9	1.0
#6	9	1.0
#8	20	2.3
#10	33	3.7
1/4	87	9.8
5/16	165	18.6
3/8	290	32.8
7/16	430	48.6
1/2	620	70.1
9/16	620	70.1
5/8	1225	138.4
3/4	2125	240.1

## Group 15 FUEL AND LUBRICANTS

### FUEL

Always use fresh, clean "regular grade or non-leaded" gasoline having an octane rating of 87 or higher. We recommend non-leaded gasoline because it reduces cylinder head deposits.

The use of GASOHOL is not recommended.

Do not use gasohol, premium, ethyl or white gasoline. Never use special additives such as carburetor cleaners, de-icers, or moisture-removing liquids in your gasoline.

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

### LUBRICANTS

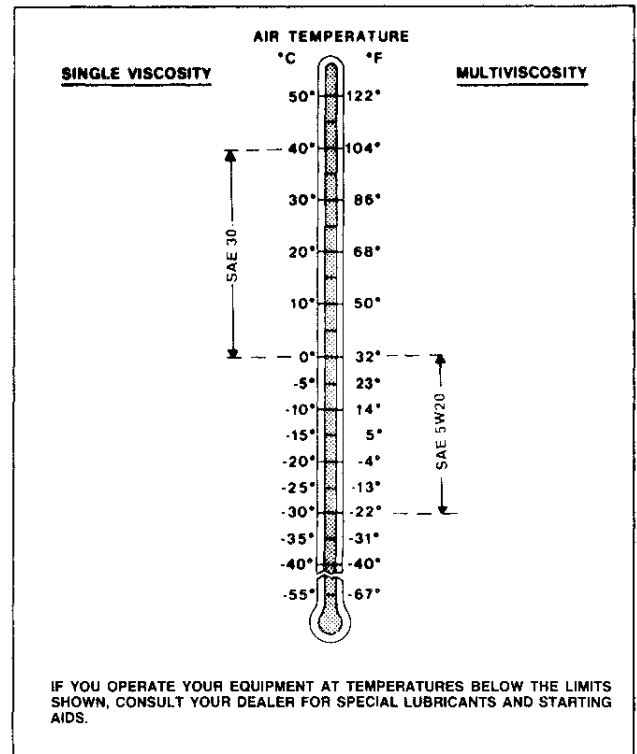
#### Engine Crankcase

**IMPORTANT: During the first 5 hours of break-in operation on a new engine or whenever the engine is overhauled or rebuilt with a new short block, use a good quality single viscosity oil with a service designation no higher than "SB" or "SC". DO NOT use "SD" or "SE" service designation oils during break-in operation. If "SB" or "SC" oils are not available, any single viscosity oil may be used. After the first 5 hours of break-in operation, drain the engine crankcase and refill with fresh oil with a service designation shown below.**

John Deere TORQ-GARD SUPREME™ engine oil is recommended. If other oils are used, they must be premium quality engine oils meeting performance requirements of:

- API Service Classification  
CD/SD
- Military Specification  
MIL-L-2104C

For low temperature operation, where oils meeting the above requirements may not be available in appropriate viscosity grade, oils meeting the performance requirements of API Service Classification CS/SC or Military Specification MIL-L46152 may be used, but at a shorter drain interval.



M27560

Quality engine oils are blended, so additives are neither required nor recommended.

### CAPACITIES

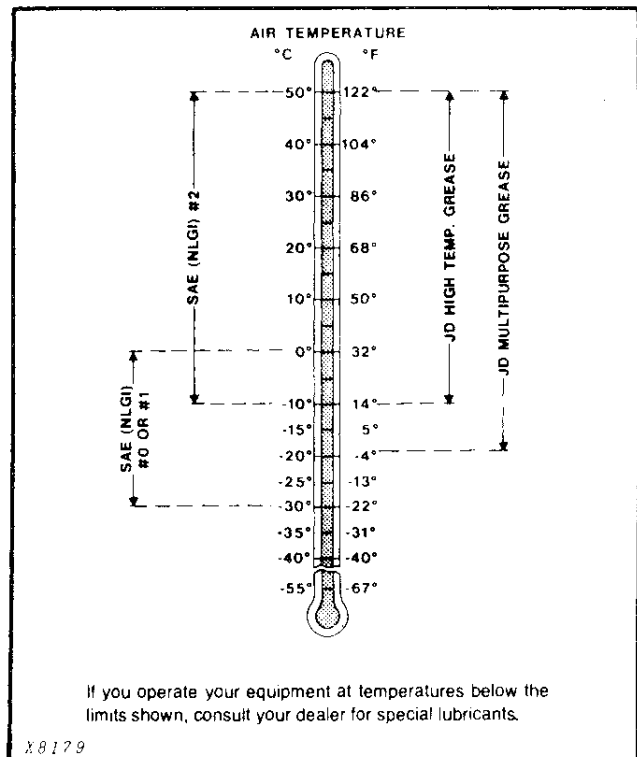
Fuel Tank	3-1/2 U.S. gallons (13.5 L)
Crankcase:	
200, 208	2 U.S. pints (0.946 L)
210, 212, 214 and 216	Aluminum Pan Engine 3 U.S. pints (1.42 L) Steel Pan Engine 4 U.S. pints (1.89 L)
Transaxle	3-1/2 U.S. pints (1.65 L)
Hydraulic System (optional equip.)	2 U.S. pints (0.94 L)

### Grease Fittings

John Deere High Temperature/Extreme Pressure Grease is recommended for axle bearings and front axle pivots. If other greases are used, use SAE Multipurpose High Temperature Grease with Extreme Pressure (EP) performance capable of operating at compartment temperatures above 150°C.

John Deere Multipurpose Grease is recommended for all grease fittings. If other greases are used, use:

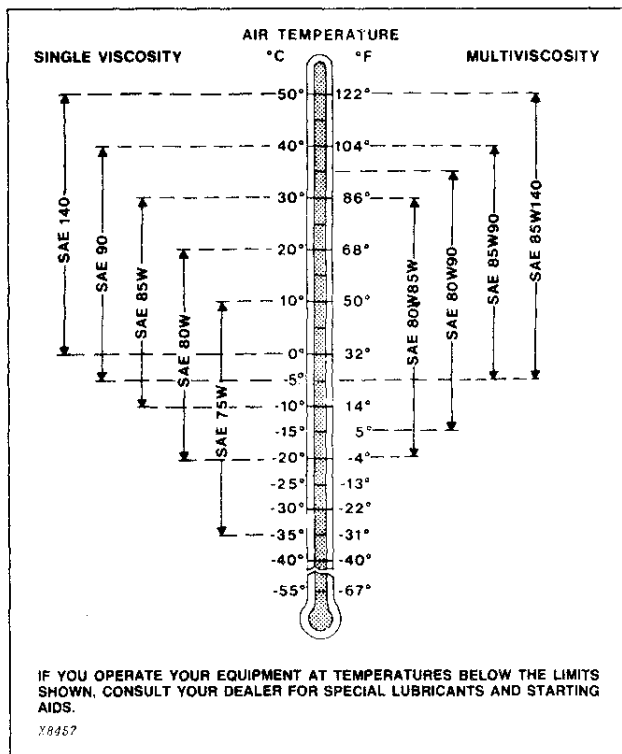
- SAE Multipurpose Grease
- SAE Multipurpose Grease containing 3 to 5 percent molybdenum disulfide.



### Alternative Lubricants

Conditions in certain geographical areas outside the United States and Canada may require different lubricant recommendations than those printed in the operator's manual. Consult your John Deere dealer to obtain alternative lubricant recommendations.

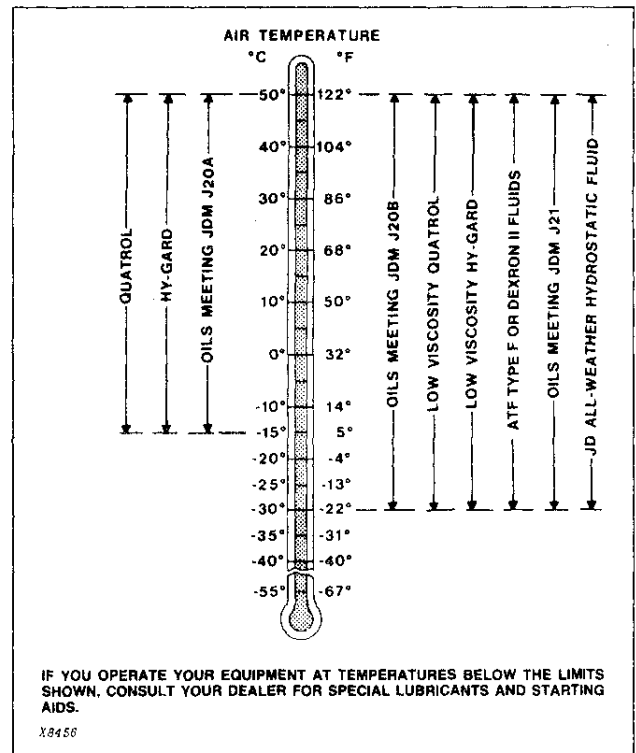
### Transaxle



Use John Deere SCL Gear Oil or oils meeting performance requirements of API Service Classification GL-4 and containing sulfur, chlorine and lead additives.

Depending on air temperature range during the fill period, use oil viscosity as shown.

### Hydraulic Lift System (Extra Equipment)



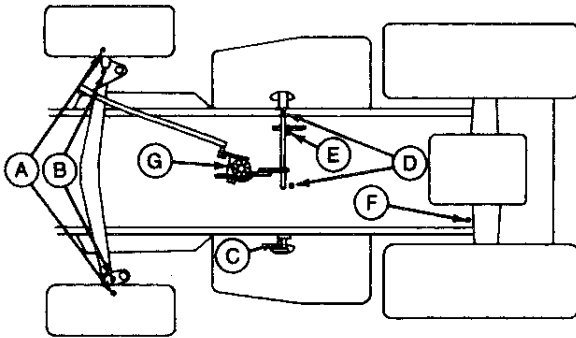
Use John Deere All-Weather Hydrostatic Fluid, John Deere Hy-Gard® Transmission and Hydraulic Oil or one of the following oils meeting John Deere Standard JDM21.

- Type F or Dexron II Automatic Transmission and Hydraulic Oil
- Quatrol® Oils
- Oils meeting the requirements of John Deere Standard JDM J20

### SERVICE INTERVALS

#### Lubricating Grease Fittings

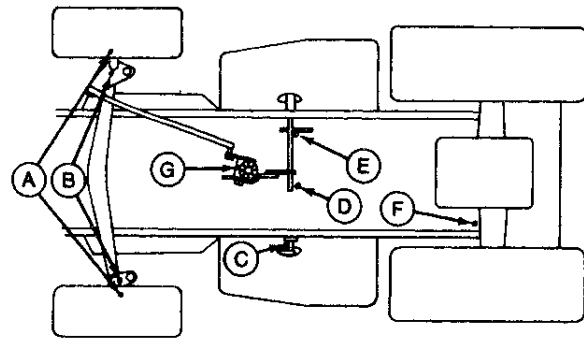
Grease tractor grease fittings in Spring and Fall Season. Tractor grease fitting locations are as follows:



M14459N

- A—Front Wheel Hubs
- B—Front Axle Spindles
- C—Brake Pedal Shaft
- D—Clutch Pedal Shaft
- E—Primary Lift Shaft
- F—Rear Brake Shaft
- G—Steering Gear\*

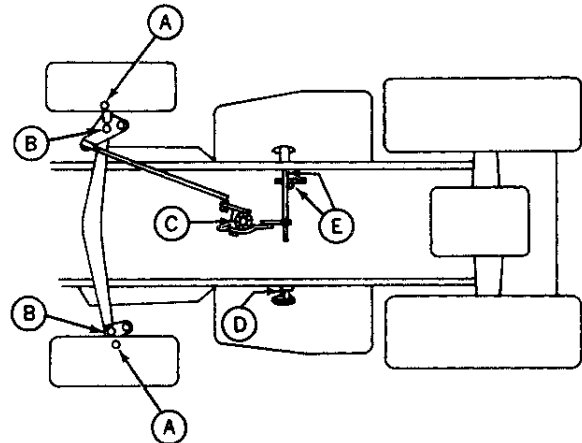
Fig. 1-Grease Fitting Locations (Serial No. 30,001-55,000)



M14460N

- A—Front Wheel Hubs
- B—Front Axle Spindles
- C—Brake Pedal Shaft
- D—Clutch Pedal Shaft
- E—Primary Lift Shaft
- F—Rear Brake Shaft
- G—Steering Gear\*

Fig. 2-Grease Fitting Locations (Serial No. 55,001-95,001)



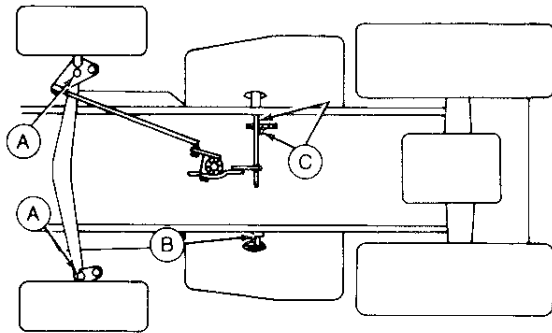
M23340

- A—Front Wheel Hubs
- B—Front Axle Spindles
- C—Steering Gear (See "IMPORTANT" below)
- D—Brake Pedal Shaft
- E—Primary Lift Shaft

Fig. 3-Grease Fitting Locations (Serial No. 95,001- )

**IMPORTANT:** Do not overlubricate steering column fitting. Only 3 to 4 strokes with a hand grease gun are necessary. Do not use a high-pressure grease gun on this fitting.

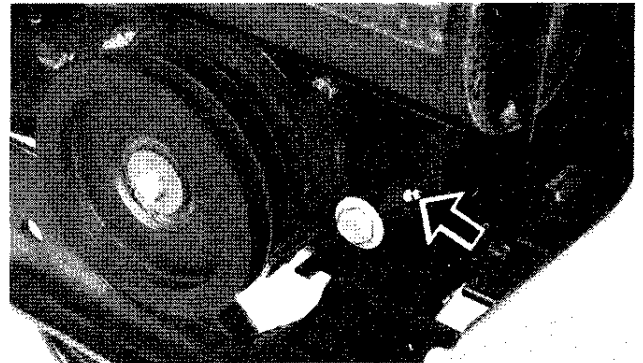
### LUBRICATING GREASE FITTINGS—Continued



**A—Front Axle Spindles**      **C—Primary Lift Shaft**  
**B—Brake Pedal Shaft**

M28401

Fig. 4-Grease Fitting Locations  
(Serial No. 109,001- )



M28544

Fig. 5-Hanger Spacer Fitting on 200 Series  
Tractors (Serial No. 190,001- )

## Group 20 TUNE-UP AND ADJUSTMENTS

### PURPOSE OF TUNE-UP AND ADJUSTMENTS

Generally, the customer complaint will reveal which system or component requires checking. However, when dealing with the entire tractor, it is recommended that the step-by-step procedures outlined on the following pages be used.

### VISUAL INSPECTION

Much can be learned about the general condition of the tractor by a thorough visual inspection. For convenience, remove the side panels and hood.

Check the engine, transaxle and hydraulic system (if so equipped) for evidence of oil leakage.

Inspect battery for excessive corrosion, cracked case, proper installation and cable connections. Note general condition of wiring harness. Be sure the harness is not oil-soaked and that it is not frayed or damaged.

### ENGINE TUNE-UP

Engine tune-up is making minor repairs and adjustments in an orderly sequence to improve the overall efficiency and operation of the engine.

Tune-up includes checking, adjusting and servicing the electrical, ignition, air intake, fuel and lubrication systems.

### TRACTOR ADJUSTMENTS

Adjusting tractor components insures that engine horsepower will be utilized in the most efficient manner.

Adjustments to be made on the tractor include: Checking or changing transaxle lubricant, lubricating grease fittings, checking PTO clutch and brake, tractor brakes, belts and equipment.

### TUNE-UP GUIDE

The following guide offers an orderly sequence for servicing a tractor that has been running well.

Also use this guide to explain to your customers what a tune-up includes. Be sure to obtain customer permission before performing these services.

1. Clean Engine Shrouds and Cooling Fins
2. Clean or Replace Air Filter Element
3. Clean Fuel Strainer
4. Check and Clean Engine Crankcase Breather
5. Check Spark Plug Gap
6. Check Ignition Breaker Points and Engine Timing
7. Adjust Carburetor
8. Check Engine Speed
9. Change Engine Crankcase Oil
10. Check or Change Transaxle Lubricant
11. Lubricate Grease Fittings
12. Repack PTO Clutch Bearing
13. Service Battery
14. Check Tire Pressure
15. Check Operation and Condition of:
  - (A) Lights
  - (B) Lift System
  - (C) Steering
  - (D) Brakes (PTO Clutch and Tractor)
  - (E) Belts and Equipment

## TUNE-UP AND ADJUSTMENTS

### 1. Clean Engine Shrouds and Cooling Fins

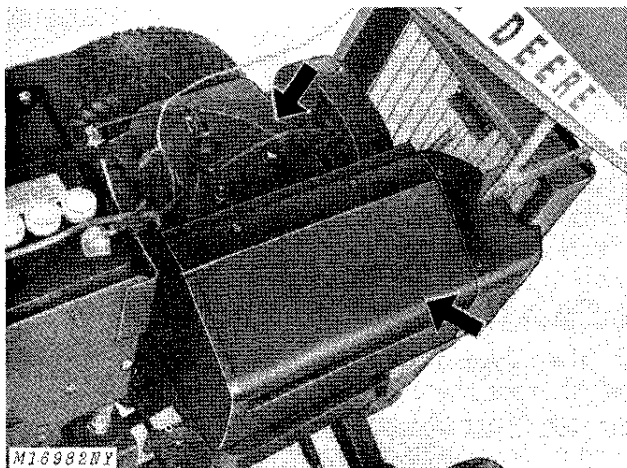


Fig. 1-Engine Shrouds  
(210 Tractor Illustrated)

Remove engine shrouds, Fig. 1. Blow out cooling fins with compressed air. Be sure all dirt and debris are removed from the engine.

### 2. Clean or Replace Air Filter Element

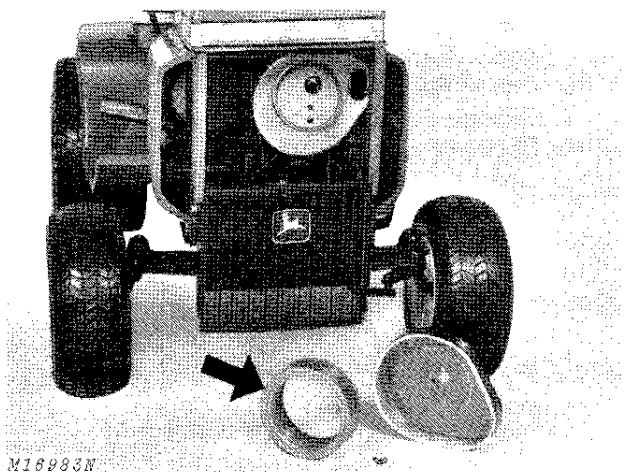


Fig. 2-Air Filter Element  
(210 Tractor Illustrated)

Remove the air filter element, Fig. 2. Tap the filter lightly against a flat surface and brush out dust. Do not clean filter with a liquid cleaner or compressed air.

Replace filter if it is bent, crushed, damaged or extremely dirty.

### 3. Clean Fuel Strainer

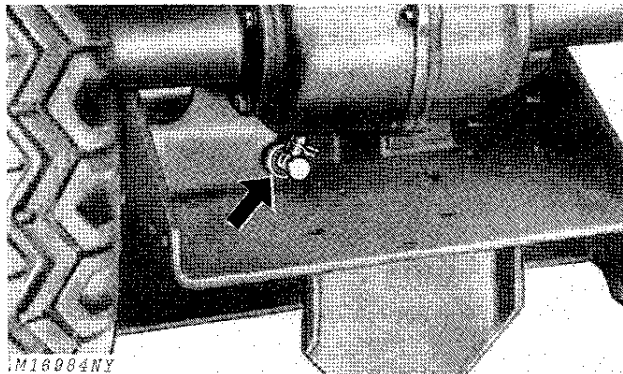


Fig. 3-Fuel Shut-Off Valve

Close the fuel shut-off valve, under fuel tank, Fig. 3. Disconnect hose from valve. Attach a 12-inch length of 1/4-inch hose and drain fuel tank into a clean container.

Remove hose from valve. Unscrew shut-off valve with strainer from fuel tank. Thoroughly clean all particles from strainer.

Install shut-off valve and strainer assembly. Close the valve, connect the hose, and fill fuel tank.

### 4. Check and Clean Engine Crankcase Breather

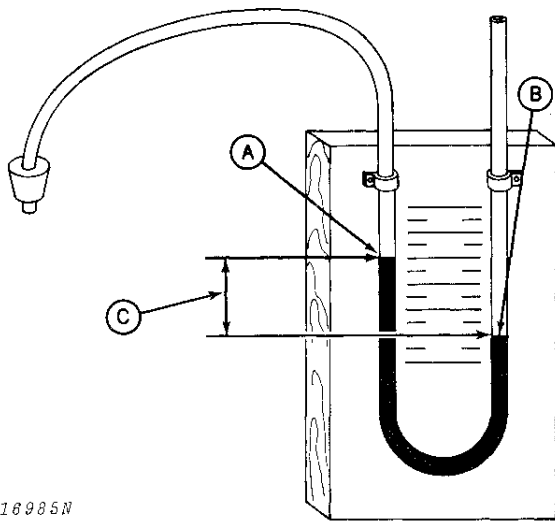
A clogged crankcase breather can cause positive pressure to build up in the crankcase.

Check crankcase vacuum with a U-tube water manometer.

An engine in good condition and operating at normal temperatures will show a 5 to 10-inch water column on the manometer.

An engine in good condition and operating at normal engine temperatures will show a 5 to 10-inch water column of vacuum or negative pressure on the manometer, (see Fig. 4).





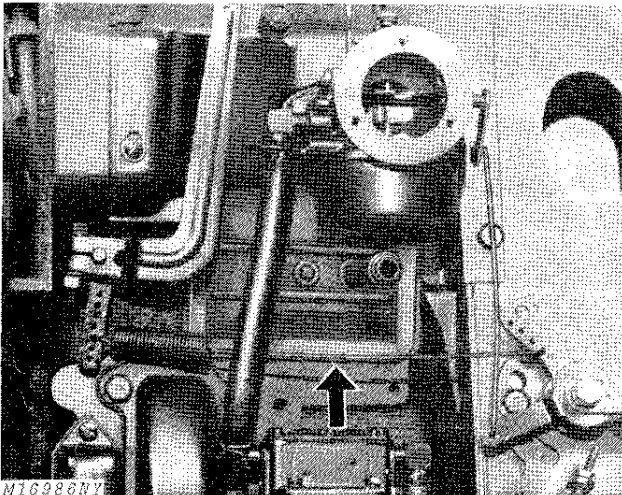
M16985N

A—Negative Pressure                      B—Positive Pressure  
C—Difference Between Columns

Fig. 4-U-Tube Water Manometer

When using manometer, Fig. 4, place stopper into oil fill hole (other end open to atmosphere) and measure difference between columns (C).

If water column is higher in tube connected to engine, vacuum or negative pressure (A) is indicated. If the higher column is on the atmospheric side of manometer, positive pressure (B) is present.



M16986NY

Fig. 5-Engine Crankcase Breather  
(210 Tractor Illustrated)

Disassemble breather assembly, Fig. 5, and clean it thoroughly. Reinstall breather assembly and recheck pressure.

## 5. Check Spark Plug Gap

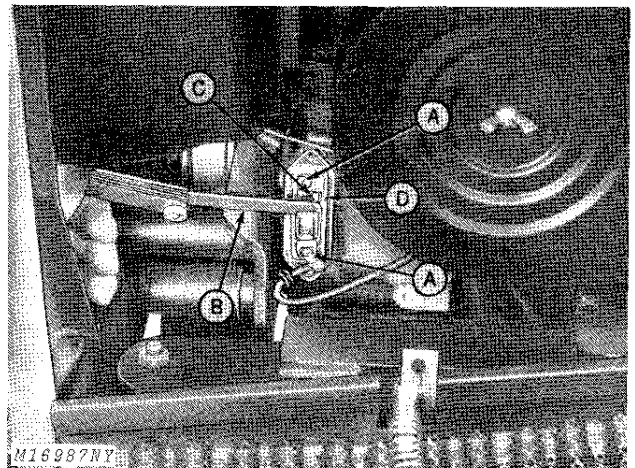
Remove spark plug, check condition and reset gap, page 10-10-1.

Good operating conditions are indicated if plug has light gray or tan appearance. A dead white appearance could indicate overheating. A black (carbon) appearance may indicate an "over-rich" fuel mixture, clogged air cleaner or improper carburetor adjustment.

Do not service a plug in poor condition. Install a new plug and torque it to 18 to 22 ft-lbs (24 to 30 Nm). See page 10-10-1.

## 6. Check Ignition Breaker Points and Engine Timing

Replace badly burned or pitted breaker points. If points are oxidized, rub a piece of coarse cloth across the surfaces. Clean dirty or oily points with a cloth, but make sure no particles of lint are left between the surfaces.



M16987NY

A—Retaining Screws                      C—Locking Screw  
B—Feeler Gauge                          D—V-Slot

Fig. 6-Replacing and Adjusting Points

To replace points, remove retaining screws (A), Fig. 6. Be sure lock washers are in place when installing new points.

To adjust breaker points, rotate engine until "T" mark on flywheel lines up with indicator, Fig. 8. Use feeler gauge (B, Fig. 6) to measure gap for 0.020-inch (0.508 mm) clearance when points are fully open.

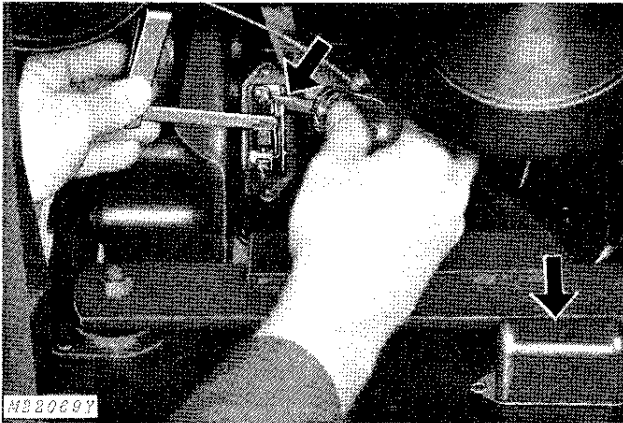
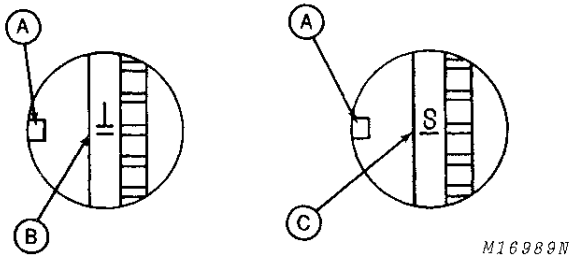


Fig. 7-Adjusting Points

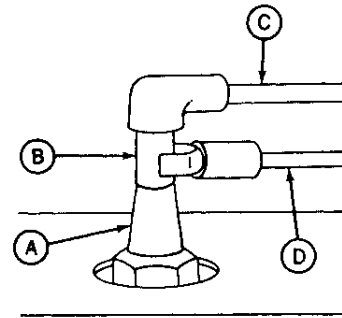
If necessary, loosen locking screw (C, Fig. 6) and move screwdriver in V-slot, Fig. 7, until gap is 0.020-inch (0.508 mm). Gap setting can vary from 0.018 to 0.022-inch (0.457 to 0.588 mm) to achieve smoothest running. Tighten locking screw securely after adjusting gap.



A—Indicator      B—"T" Mark      C—"S" Mark

Fig. 8-Timing Sight Hole

The timing sight hole is in the engine blower housing. Two timing marks are stamped on the flywheel. The "T" mark (B) indicates top dead center (TDC) and the "S" mark (C) indicates the spark point. Line under the timing marks should line up with the indicator (A), Fig. 8.



M16990N

A—Spark Plug      C—High Tension Lead  
B—Adapter      D—Timing Light Lead

Fig. 9-Adapter and Timing Light Lead

Remove high tension lead (C) at spark plug (A). Install a spark plug adapter (B) and re-connect high tension lead (C). Connect one timing light lead (D) to the spark plug adapter, Fig. 9.

Connect second timing light lead to the positive battery terminal. See timing light instructions for battery size, wiring, etc.

Connect third timing light lead to ground.

Rotate engine by hand until "S" mark is visible through timing sight hole. Chalk "S" line for easy reading.

Start and run engine at 1700 to 1900 rpm idle speed. The timing light should flash as "S" mark lines up with indicator in timing sight hole.

If timing is off, loosen locking screw and adjust points as shown in Fig. 7 until the "S" mark lines up with indicator in timing sight hole.

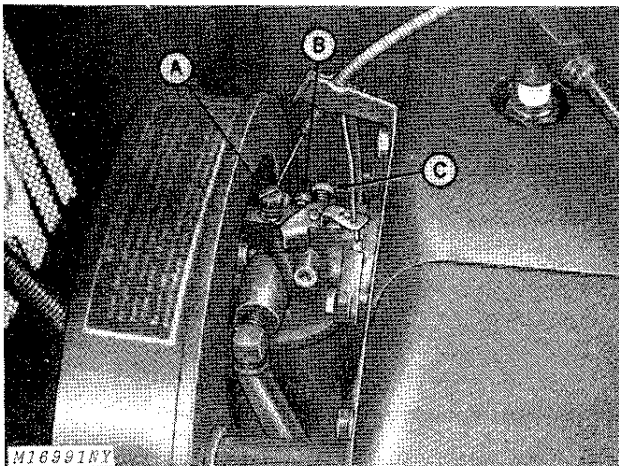
Retighten locking screw before replacing breaker point cover.

## 7. Adjust Carburetor

**⚠ CAUTION:** Prevent burns. Do not touch engine shrouds or muffler shield if engine has been running.

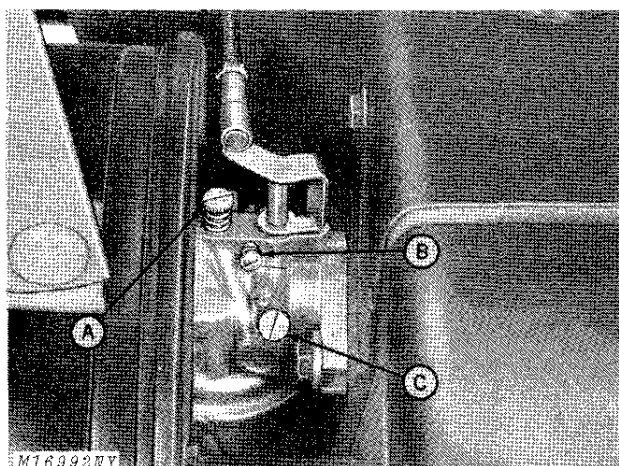
Idle adjustment and high-speed adjustment must be made at the same time as each affects the other.

Adjust carburetor as follows:



A—High-Speed Mixture Needle  
B—Idle Speed Screw  
C—Idle Mixture Needle

Fig. 10-200 and 208 Tractor Carburetor



A—High-Speed Mixture Needle  
B—Idle Speed Screw  
C—Idle Mixture Needle

Fig. 11-210, 212, 214 and 216 Tractor Carburetor

1. Turn high-speed mixture needle (A), Figs. 10 or 11, clockwise until lightly seated. Close finger-tight only. Then open 1-1/2 turns.

2. Turn idle mixture needle (C) clockwise until lightly seated. Close finger-tight only. Then open 2 complete turns.

3. Start engine and raise throttle lever on dash panel to "FAST" position. Allow engine to warm up.

4. Turn high-speed mixture needle (A) 1/8 turn each time, clockwise or counterclockwise, until engine runs smoothly at full throttle (3400 to 3500 rpm).

5. Move throttle lever to "SLOW" position and turn idle mixture needle (C) 1/8 turn each time, clockwise or counterclockwise, until engine runs smoothly (1700 to 1900 rpm).

6. Advance throttle lever quickly to check for uniform acceleration. If engine misses, fuel-air mixture is too lean. Turn high-speed mixture needle (A) counterclockwise until positive acceleration can be obtained.

7. If excessive exhaust smoke is noticed, mixture is too rich. Readjust idle mixture needle (C), until engine idles smoothly at 1700 to 1900 rpm.

## 8. Check Engine Speed



Fig. 12-Checking Engine Speed With Vibration Tachometer

A vibration tachometer, Fig. 12, can be used to check engine for a slow idle speed of 1700 to 1900 rpm and a full throttle speed of 3400 to 3500 rpm.

If carburetor adjustments do not give correct engine speed, adjust governor linkage. See Section 30, Group 10.

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### 9. Change Engine Crankcase Oil

Refer to page 10-15-3.

### 10. Check or Change Transaxle Lubricant

Refer to page 10-15-3. Lubricant level should be level with the filler hole.

### 11. Lubricate Grease Fittings

Refer to page 10-15-2.

### 12. Service Battery

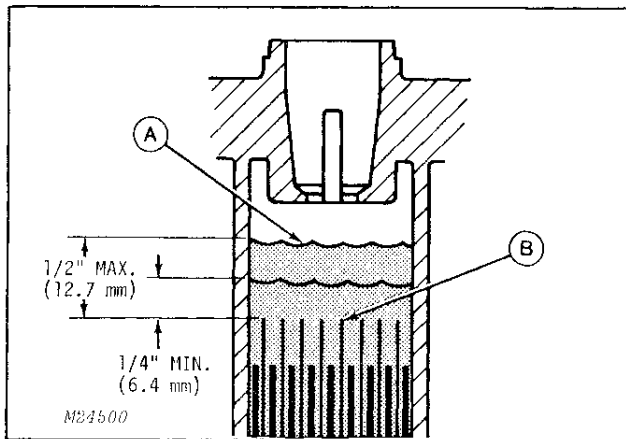


Fig. 13-Battery Electrolyte Level

Check electrolyte every 25 hours of operation.

**CAUTION:** Battery electrolyte is poisonous and corrosive. It can injure eyes, skin, and clothing. Handle it carefully. If electrolyte is spilled, flush immediately with a solution of one part baking soda to four parts water.

Keep shield on positive (+) terminal closed.

1. Remove caps.
2. If necessary, add distilled water until level (A) is 1/4 to 1/2 inch (6.4 to 12.7 mm) above plates (B).

*NOTE: DO NOT fill to bottom ledge of filler tube.*

3. During freezing weather, run engine at least 1 hour to mix water and electrolyte thoroughly.
4. Install caps.

### 13. Check Tire Pressure

Inflate tires as shown in chart below.

Use high readings for heavy front loads such as loaders; mid-range readings for blades and snow throwers and low readings for normal lawn use.

TIRE INFLATION PRESSURES		
Tire	Front	Rear
Regular Equipment Tires on 208 Tractor	4.80 x 4.00-8 (2-ply) 10 to 12 psi (4.13 to 5.65 bar) 4.20 to 5.74 kg/cm <sup>2</sup>	23 x 8.50-12 5 to 10 psi (2.34 to 4.75 bar) (2.38 to 4.83 kg/cm <sup>2</sup> )
High-Flotation Tires (GT-3 Tractor)	16 x 6.50-8 6 to 16 psi (2.82 to 7.58 bar) (2.87 to 7.70 kg/cm <sup>2</sup> )	23 x 8.50-12 5 to 10 psi (2.34 to 4.75 bar) (2.38 to 4.83 kg/cm <sup>2</sup> )
Traction Tires (GT-4 Tractor)	4.80 x 4.00-8 12 to 40 psi (5.65 to 19 bar) (5.74 to 19 kg/cm <sup>2</sup> )	23 x 8.50-12 5 to 10 psi (2.34 to 4.75 bar) (2.38 to 4.83 kg/cm <sup>2</sup> )
High-Flotation Tires (GT-5 Tractor)	16 x 6.50-8 6 to 16 psi (2.82 to 7.58 bar) (2.87 to 7.70 kg/cm <sup>2</sup> )	23 x 10.50-12 5 to 10 psi (2.34 to 4.75 bar) (2.38 to 4.83 kg/cm <sup>2</sup> )
Traction Tires (GT-8 Tractor)	4.80 x 4.00-8 (4-Ply) 12 to 40 psi (5.65 to 19 bar) (5.74 to 19 kg/cm <sup>2</sup> )	23 x 10.50-12 5 to 10 psi (2.34 to 4.75 bar) (2.38 to 4.83 kg/cm <sup>2</sup> )

### 14. Check Operation and Condition of:

**A. Lights** - Replace bulbs or wiring as necessary.

**B. Lift System** - Check manual, electric or hydraulic lift for proper function. Once a week or every 50 hours of operation check hydraulic fluid level. Hydraulic fluid level should be within 1 inch (25.4 mm) from top of reservoir. Use John Deere All Weather Hydrostatic Fluid or an equivalent Type "F" Automatic Transmission Fluid.

**C. Steering** - Refer to Section 70 for steering gear adjustment if required.

**D. Brakes** - See Section 50 for brake adjustment.

**E. Belts and Equipment** - Clean belts by wiping them with a clean cloth. Do not use solvents. Solvents will soften the material and cause belts to grab.

# Section 20 ENGINE

## Group 5

### GENERAL INFORMATION AND DIAGNOSIS

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## DESCRIPTION

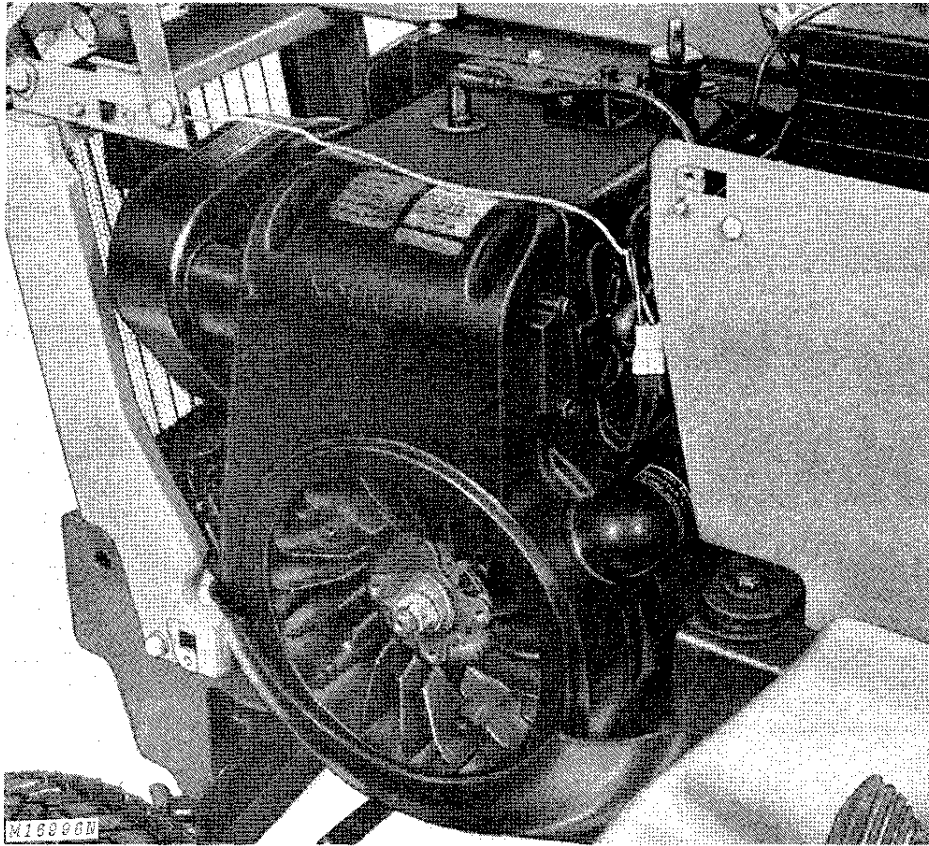


Fig. 1-Kohler Engine

Kohler engines, Fig. 1, are used in the 200 Series Tractors. The tractors with their respective engines are as follows:

200 Tractor	- K181QS	- 8hp
208 Tractor	- K181S	- 8hp
210 Tractor	- K241AQS	- 10hp
212 Tractor	- K301AQS	- 12hp
214 Tractor	- K321AQS	- 14hp
216 Tractor	- K341AQS	- 16hp

Each of the four-cycle, L-head, single-cylinder, internal combustion engines has a cast-iron block with a large bore and short stroke.

These air-cooled engines feature anti-friction ball bearings, oil bath lubrication, internal flyweight governors, an alternator charging system and battery-coil ignition.