# John Deere

## Service Manual

## 110 and 112 Lawn and Garden Tractors

## (Serial No. -100,000)

## SM-2059-(Apr-67)

**John Deere Horicon Works**
**SM2059 (Apr-67)**
LITHO IN U.S.A.
**ENGLISH**

Service Manual

# 110 AND 112 LAWN AND GARDEN TRACTORS

**(Serial No. -100,000)**

## CONTENTS

# INTRODUCTION

This service manual contains service and maintenance information for John Deere 110 and 112 Lawn and Garden Tractors (Serial No. -100,000).

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.

All sections of this service manual should be carefully studied by the serviceman. Much basic information such as the principles of 4-cycle engine operation, carburetion and ignition have been omitted. Such information can be found in any good library and is recommended reading for the new serviceman before consulting this manual for service procedures.

Emphasis is placed on diagnosing malfunctions, analysis and testing. Diagnosing malfunctions lists possible troubles, their causes and how to correct them. Under specific components these troubles are analyzed to help the serviceman understand what is causing the problem so he can correct it rather than just replace parts and have the same problem keep recurring.

Specifications and special tools are found at the end of the Groups for easy reference.

This manual can be kept in its own cover, or it can be removed and filed in your service manual rack or behind the service manual tab in your Lawn and Garden Parts and Service Binder.

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

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# Section 10
# GENERAL

## Group 5
## TRACTOR IDENTIFICATION

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## SERIAL NUMBERS

Each lawn and garden tractor is assigned an individual serial number. Serial numbers are written in parentheses throughout this manual for the reasons shown below. Only the last four digits of the serial number are shown for earlier tractors and the last six digits for later tractors. All serial number references are tractor serial numbers and not engine specification numbers.

( 3551- ) When a serial number appears before the dash, the design change was introduced beginning with that serial number and is still current.

( -40000) When a serial number appears after the dash, the design change was effective up to and including that serial number and is no longer effective.

(40001-65000) When a serial number appears both before and after the dash, the design change was effective with the first serial number, but is no longer effective after the second serial number.

## VINTAGE INFORMATION

| | *110 Tractor* | | | | | *112 Tractor* |
|---|---|---|---|---|---|---|
| | *( -3550)* | *( 3551-15000)* | *(15001-40000)* | *(40001-65000)* | *(65001-100,000)* | *( -100,000)* |
| Year Manufactured | 1963 | 1964 | 1965 | 1966 | 1967 | 1966-1967 |
| Model - Manual Lift | 110 | 110 | 110 | 110 | 110 | 112 |
| Model - Hydraulic Lift | --- | --- | --- | 110H | 110H | 112H |
| Engine Model Number | Kohler K161S | Kohler K181S | Kohler K181S | Kohler K181S | Kohler K181S | Tecumseh HH100 |
| Engine Horsepower | 7 | 8 | 8 | 8 | 8 | 10 |
| Transaxle Speeds (Forward) | 3 | 3 | 4 | 4 | 4 | 4 |
| Transaxle Speeds (Reverse) | 1 | 1 | 1 | 1 | 1 | 1 |

## SERIAL NUMBER PLATES

SERIAL NO. ( -15000)

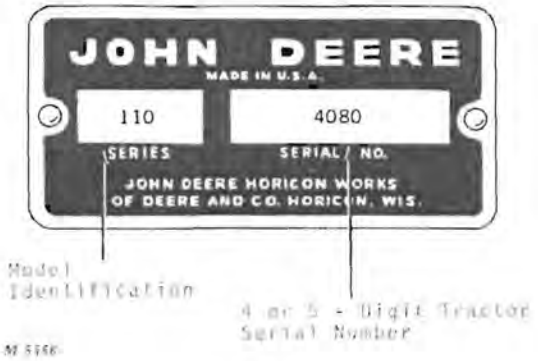


Fig. 1

SERIAL NO. (15001-40000)

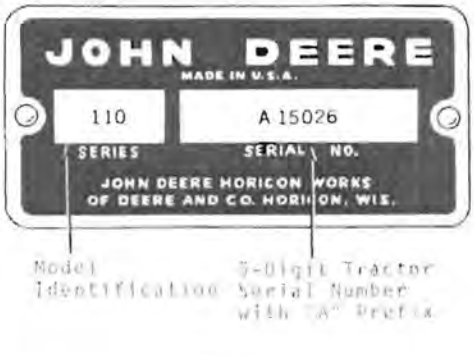


Fig. 3

SERIAL NO. (40001-65000)

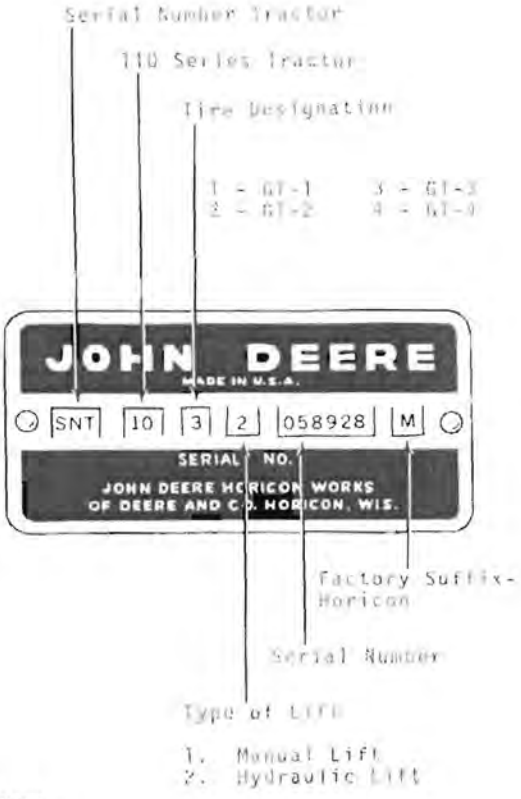


Fig. 2

SERIAL NO. (65001-100,000)

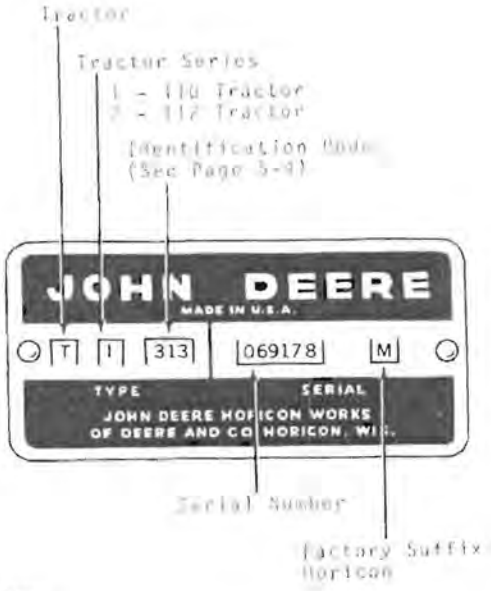


Fig. 4

## IDENTIFICATION CODES

### TRACTOR CODES

The tractor identification code is indicated on tractor serial number plates beginning with tractor Serial No. 65001. See the chart below for tractor identification codes.

| Tire | 110 Manual Lift | | 110 Hydraulic Lift | | 112 Manual Lift | 112 Hydraulic Lift |
|---|---|---|---|---|---|---|
| | Without Mower Drive | With Mower Drive | Without Mower Drive | With Mower Drive | Without Mower Drive | Without Mower Drive |
| GT-1 | 300 | 304 | 307 | 311 | --- | --- |
| GT-2 | 301 | 305 | 308 | 312 | --- | --- |
| GT-3 | 302 | 306 | 309 | 313* | 314 | 316 |
| GT-4 | 303 | --- | 310 | --- | 315 | 317 |

**Example: Code 313 is a 110 Tractor with hydraulic lift, factory installed mower drive and GT-3 high-flotation tires.*

### TIRE CODES

Tires for Lawn and Garden Tractors are referred to in abbreviated form as GT-1, GT-2, GT-3 or GT-4. The description of each is as follows:

| Tire | Size, Front | Size, Rear | Tubeless | Ply | Tread |
|---|---|---|---|---|---|
| GT-1 | 4.80/4.00-8 | 6-12 | No | 2 | All Purpose |
| GT-2 | 4.80/4.00-8 | 6-12 | No | 2 | Traction |
| GT-3 | 16x6.50-8 | 23x8.50-12 | Yes | 2 | High-Flotation |
| GT-4 | 4.80/4.00-8 | --- | No | 4 | Studded |
| GT-4 | --- | 23x8.50-12 | Yes | 2 | Traction |

### TIRE INTERCHANGEABILITY

Tractor tires may be interchanged depending on Serial Numbers as follows:

| Tractor Serial No. | 110 Tractors | | | |
|---|---|---|---|---|
| | GT-1 | GT-2 | GT-3 | GT-4 |
| ( - 4048) | X | X | -- | -- |
| ( 4049-15000) | X | X | X | -- |
| (15001-40000) | X | X | X | -- |
| (40001-65000) | X | X | X | X |
| (65001-100,000) | X | X | X | X |
| | 112 Tractors | | | |
| ( - 3550) | -- | -- | X | X |
| ( 3551- ) | -- | -- | X | X |

*Note that GT-3 and GT-4 front tires should not be used on 110 Tractors Serial No. ( - 4048). Steering gear ratios below this serial number are not adequate for these tires.*

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# Group 10
# SPECIFICATIONS

## ENGINE SPECIFICATIONS

| Engines | 110 Tractors | | 112 Tractors |
|---|---|---|---|
| | ( -3550) | (3551- ) | ( -100 000) |
| Engine Model No. | K161S | K181S | HH100 |
| Manufacturer | Kohler | Kohler | Tecumseh |
| Cylinders | One | One | One |
| Cycle | Four | Four | Four |
| Bore & Stroke | 2.875 x 2.50 in. | 2.94 x 2.75 in. | 3.31 x 2.75 in. |
| Displacement | 16.22 cu. in. | 18.63 cu. in. | 23.70 cu. in. |
| Speeds (fast) No Load | 1800-3800 rpm | 1800-3800 rpm | 1800-3800 rpm |
| Speeds (idle) | 1200-1700 rpm | 1200-1700 rpm | 1200-1700 rpm |
| Horsepower (Engine Manufacturers Rating)* | 7 @ 3600 rpm* | 8 @ 3600 rpm* | 10 @ 3600 rpm* |
| Normal Compression | 110-120 psi | 110-120 psi | 110-120 psi |
| Valve Clearance | --- | --- | --- |
| (Intake) Cold | 0.007 in. | 0.007 in. | 0.010 in. |
| Valve Clearance | --- | --- | --- |
| (Exhaust) Cold | 0.016 in. | 0.016 in. | 0.010 in. |

**The horsepower ratings shown are established by the engine manufacturer in accordance with Standard Internal Combustion Engine Institute procedure. They are corrected to 60°F. and 29.92 in. Hg. Barometer and are developed from laboratory test engines equipped with standard air cleaner and muffler less motor-generator equipment.*

## CAPACITIES

| Cavities | 110 Tractors | | | 112 Tractors |
|---|---|---|---|---|
| | ( -15000) | (15001-40000) | (40001-100,000) | ( -100,000) |
| Fuel Tank - U.S. Gallons | 1.9 | 1.9 | 1.9 | 1.9 |
| Crankcase - U.S. Pints | 2.5 | 2.5 | 2.5 | 2.5 |
| Transaxle - U.S. Pints | 2.0 | 3.0 | 3.0 | 3.0 |
| Hydraulic Lift System - U.S. Pints | -- | -- | 2.5 | 2.5 |

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## VARIABLE GROUND SPEEDS - MILES PER HOUR
(at 3600 rpm engine speed)

| | 110 Tractor | | | | 112 Tractor |
|---|---|---|---|---|---|
| | ( -3550) | ( 3551-15000) | (15001-65000) | (65001-100,000) | ( -100,000) |
| 1st Gear | .9 to 2.5 | 1.1 to 2.5 | .37 to .84 | .4 to .8 | .4 to 1.0 |
| 2nd Gear | 1.6 to 4.5 | 2.1 to 4.4 | 1.1 to 2.5 | 1.1 to 2.5 | 1.3 to 2.9 |
| 3rd Gear | 2.4 to 6.5 | 3.0 to 6.5 | 2.1 to 4.4 | 2.1 to 4.4 | 2.4 to 5.0 |
| 4th Gear | --- | --- | 3.0 to 6.5 | 3.0 to 6.5 | 3.4 to 7.4 |
| Reverse | 1.2 to 3.4 | 1.5 to 3.4 | 1.6 to 2.9 | 1.6 to 2.9 | 1.8 to 3.3 |

## CURB WEIGHTS

| Tire Groups | 110 Tractor | | | | 112 Tractor |
|---|---|---|---|---|---|
| | ( -3550) | ( 3551-15000) | (15001-40000) | (40001-100,000) | ( -100,000) |
| GT-1 Manual Lift | 500 lbs. | 513 lbs. | 531 lbs. | 545 lbs. | --- |
| GT-2 Manual Lift | 500 lbs. | 513 lbs. | 531 lbs. | 545 lbs. | --- |
| GT-3 Manual Lift | --- | *535 lbs. | 550 lbs. | 568 lbs. | 579 lbs. |
| GT-4 Manual Lift | --- | --- | --- | 570 lbs. | 581 lbs. |
| GT-1 Hydraulic Lift | --- | --- | --- | 566 lbs. | --- |
| GT-2 Hydraulic Lift | --- | --- | --- | 566 lbs. | --- |
| GT-3 Hydraulic Lift | --- | --- | --- | 583 lbs. | 591 lbs. |
| GT-4 Hydraulic Lift | --- | --- | --- | 586 lbs. | 594 lbs. |

**Weight becomes effective with Serial No. 4049.*

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## TRACTOR SPECIFICATIONS

| | 110 Tractor Only | 110 and 112 Tractors | |
|---|---|---|---|
| | All Purpose and Traction Tires (GT-1 & 2) | High-Flotation Tires (GT-3) | High-Flotation Traction Tires (GT-4) |
| WHEEL TREAD | | | |
| Front | 29 in. | 30 in. | 30 in. |
| Rear | 27 or 33 in. | 27 or 33 in. | 27 or 33 in. |
| TIRE SIZES (Also see Group 5) | | | |
| Front | 4.80/4.00-8 2 ply | 16 x 6.50-8 2 ply | 4.80/4.00-8 4 ply |
| Rear | 6-12 2 ply | 23 x 8.50-12 2 ply | 23 x 8.50-12 2 ply |
| TIRE INFLATION | | | |
| Front | 12 psi | 8 psi | 40 psi |
| Rear | 6 psi | 5 psi | 5 psi |
| DIMENSIONS | | | |
| Wheel Base | 44 in. | 44 in. | 44 in. |
| Over-all Length | 63 in. | 63 in. | 63 in. |
| Over-all Height | 38-3/4 in. | 38-3/4 in. | 38-3/4 in. |
| Over-all Width: | | | |
| (min.) | 34-1/2 in. | 37 in. | 37 in. |
| (max.) | 39 in. | 41-1/2 in. | 41-1/2 in. |
| Turns Outside | 30-1/2 in. radius | 28-1/2 in. radius | 28-1/2 in. |

TRANSAXLE - See Section 50 for detailed specifications.

ELECTRICAL SYSTEM - See Section 40 for detailed specifications.

FUEL SYSTEM - See Section 30 for detailed specifications.

CLUTCH, BRAKE AND VARIATOR - See Section 50 for detailed specifications.

STEERING AND WHEEL BEARINGS - See Section 70 for detailed specifications.

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## 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 | | | | | U.S. Regular | |
| Bolt Dia. | U.S. Dec. Equiv. | TORQUE IN FOOT POUNDS | | | 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.*

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## TRACTOR SPECIFICATIONS

| | 110 Tractor Only | 110 and 112 Tractors | |
|---|---|---|---|
| | All Purpose and Traction Tires (GT-1 & 2) | High-Flotation Tires (GT-3) | High-Flotation Traction Tires (GT-4) |
| WHEEL TREAD | | | |
| Front | 29 in. | 30 in. | 30 in. |
| Rear | 27 or 33 in. | 27 or 33 in. | 27 or 33 in. |
| TIRE SIZES (Also see Group 5) | | | |
| Front | 4.80/4.00-8 2 ply | 16 x 6.50-8 2 ply | 4.80/4.00-8 4 ply |
| Rear | 6-12 2 ply | 23 x 8.50-12 2 ply | 23 x 8.50-12 2 ply |
| TIRE INFLATION | | | |
| Front | 12 psi | 8 psi | 40 psi |
| Rear | 6 psi | 5 psi | 5 psi |
| DIMENSIONS | | | |
| Wheel Base | 44 in. | 44 in. | 44 in. |
| Over-all Length | 63 in. | 63 in. | 63 in. |
| Over-all Height | 38-3/4 in. | 38-3/4 in. | 38-3/4 in. |
| Over-all Width: | | | |
| (min.) | 34-1/2 in. | 37 in. | 37 in. |
| (max.) | 39 in. | 41-1/2 in. | 41-1/2 in. |
| Turns Outside | 30-1/2 in. radius | 28-1/2 in. radius | 28-1/2 in. |

TRANSAXLE - See Section 50 for detailed specifications.

ELECTRICAL SYSTEM - See Section 40 for detailed specifications.

FUEL SYSTEM - See Section 30 for detailed specifications.

CLUTCH, BRAKE AND VARIATOR - See Section 50 for detailed specifications.

STEERING AND WHEEL BEARINGS - See Section 70 for detailed specifications.

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## 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.*

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# Group 15
# TUNE-UP AND ADJUSTMENT

*IMPORTANT: Before attempting to tune-up the 110 or 112 Tractor engine, first determine if performance can be restored by tune-up. Do this by making the preliminary engine tests below.*

## PRELIMINARY ENGINE TESTING

| Operation | Specification | Reference |
|---|---|---|
| Cylinder compression | 110-120 psi (1000 rpm) | Section 20, Group 5 or 25 |
| Crankcase vacuum | 5-10 inches of water column | Section 20, Group 5 or 25 |
| Battery hydrometer test | 1.260-1.280 sp. gr. 100% charged at 80° F. | Section 40, Group 10 |

## MINOR TUNE-UP GUIDE

| Operation | Specification | Reference |
|---|---|---|
| Change oil | Summer above 32° F.—<br>SAE 30 (AM 30730)<br>Winter below 32° F.—<br>SAE 5W-20 (AM 30710) | Section 10, Group 20 |
| Clean and regap spark plug | Clean electrodes<br>Clean insulation<br>Replace gasket<br>Set gap at 0.025 in. | Section 40, Group 10 |
| Remove air cleaner and clean by tapping lightly against flat surface | Check air cleaner condition<br>Replace if necessary | Section 30, Group 15 |
| Adjust carburetor | High speed mixture needle<br>Idle mixture needle | Section 30, Group 10 |
| Adjust governor speed | Speed (fast)—<br>3800 rpm no load;<br>Speed (idle)—<br>1200-1700 rpm | Section 20, Group 20 or 40 |
| Check and clean fuel tank, sediment bowl and strainer | Regular gasoline only | Section 30, Group 20 |

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## MAJOR TUNE-UP GUIDE

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

| Operation | Specification | Reference |
|---|---|---|
| Recondition carburetor | Install carburetor 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 or 30 |
| Remove shrouding, clean engine and cylinder head fins | . . . . . | Section 20, Group 10 or 30 |
| Test condenser | Capacity .18-.23 Microfarads Delco No. 1965489 | Section 40, Group 10 |
| Test coil | Operating amp. 2.25 max. Secondary continuity Min. 3.9 OHMS, Max. 4.08 OHMS, Delco No. 1115043 | Section 40, Group 10 |
| Replace breaker points | Point gap 0.020 in. | Section 40, Group 10 |
| Retime ignition | "SP" or "S" mark on flywheel at 1200-1800 rpm | Section 40, Group 10 |

## COMMON ADJUSTMENTS

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

| Adjustment | Specification | Reference |
|---|---|---|
| Clutch, brake and variable speed | . . . . . | Section 50, Group 10 |
| Steering linkage | . . . . . | Section 70, Group 5 |
| Belt tension: | | |
| Motor-Generator | . . . . . | Section 40, Group 15 |
| Hydraulic Pump | . . . . . | Section 60, Group 15 |
| Primary | . . . . . | Section 50, Group 10 |
| Secondary | . . . . . | Section 50, Group 10 |

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# Group 20
# FUEL AND LUBRICANTS

## FUEL

Use regular grade gasoline only of recognized brand. It should be fresh and from a supply blended for the area in which it is to be used. Summer blends held over for winter use will not vaporize properly at lower temperatures and may be the real reason for slow starts. White gas may be used only if octane rating is at least 75.

Do not mix oil with gasoline.

Never use premium grade gasoline (ethyl) in small tractor engines. The compression ratio (6.5 to 1) is not high enough to require the premium grade and it can cause a severe buildup of lead deposits in the engine. The deposits will rob power and may shorten the life of the engine.

## LUBRICANTS

Carefully written and illustrated instructions have been included in the operator's manual furnished with your customer's machine. Remind your customer to follow the recommendations in those instructions.

Oil used in the engine crankcase should have an American Petroleum Institute (API)/SAE classification of Service MS. Never fill engine crankcase above full (F) mark on dipstick.

The chart below and on page 20-2 indicates type of lubricant, capacities and service intervals recommended for both 110 and 112 tractors.

## CAPACITIES

| *Cavities* | *110 Tractor* | *112 Tractor* |
|---|---|---|
| Fuel Tank - U.S. Gallons | 1.9 | 1.9 |
| Crankcase - U.S. Pints | *2.5 | *2.5 |
| Transaxle - U.S. Pints | 2.0 ( -15000) | 3.0 |
| Transaxle - U.S. Pints | 3.0 (15001- ) | 3.0 |
| Hydraulic Lift System - U.S. Pints | 2.5 (1 to 1-1/2 inches below top of reservoir) | 2.5 (1 to 1-1/2 inches below top of reservoir) |

**Initial fill for new engine or after engine has been disassembled for service. Thereafter 2 pints only (such as periodic oil changes).*

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## TYPE OF LUBRICANT
(110 and 112 Tractors)

| | |
|---|---|
| Crankcase - (API)/SAE Service MS Detergent type | |
| Summer - Above 32° F | SAE 30 - John Deere AM30730 |
| Winter - Below 32° F | SAE 5W-20 John Deere AM30710 |
| Transaxle | John Deere AM30200M |
| Hydraulic Lift | Automatic Transmission Fluid Type A |
| Tractor Grease Fittings and Front Wheel Bearings | SAE (Seasonal grade) Multi-Purpose Type Grease |

## SERVICE INTERVALS
(110 and 112 Tractors)

| | |
|---|---|
| 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 |
| Hydraulic Lift System | 200 hours or 2 years |
| Tractor Grease Fittings (See page 20-4 for locations) | Spring and fall season |
| Front Wheel Bearings (repack) | Each time wheel is removed |

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## CHANGING CRANKCASE OIL

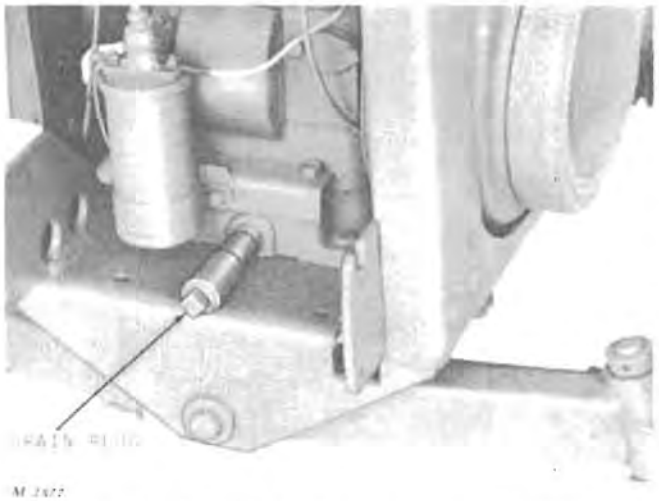

Fig. 1 – Oil Drain on 110 Tractors ( -15000)

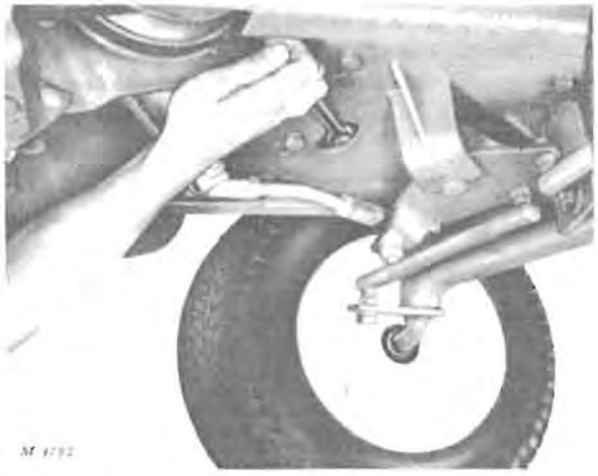

Fig. 2 – Oil Drain on 110 Tractors (15001-100,000) and 112 Tractors ( -100,000)

Before draining oil, allow engine to warm up. Dirt and foreign material is in suspension when oil is hot.

## CHANGING TRANSAXLE OIL

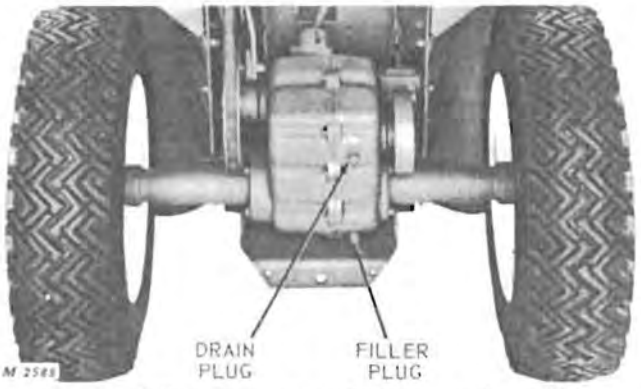


Fig. 3 – Filling Transaxle on 110 Tractors ( -3550)

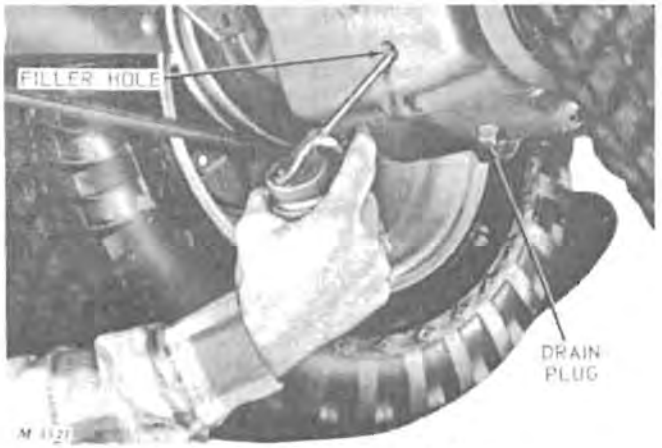


Fig. 4 – Filling Transaxle on 110 Tractors ( 3551-100,000) and 112 Tractors ( -100,000)

Use JD93 pressure oil can or equivalent to fill transaxle as shown above.

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## GREASE FITTING LOCATION

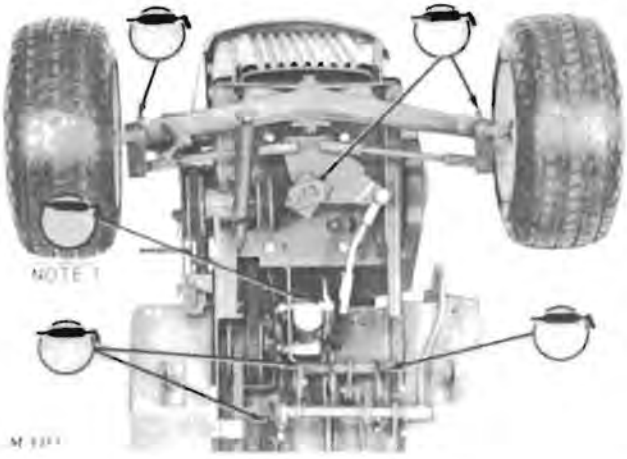


Fig. 5 – Tractor Grease Fittings

110 Tractors Serial No. 40001 and higher and 112 Tractors have grease fittings as indicated above. 110 Tractors Serial No. 40000 and below do not have all grease fittings indicated above.

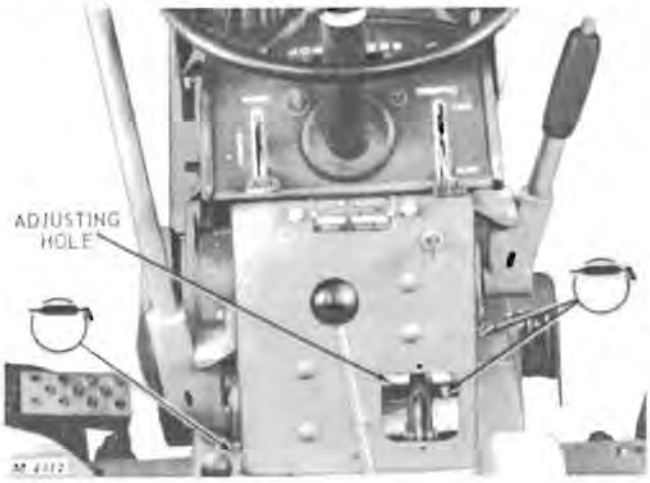


Fig. 6 – Inspection Plate Removed to Expose Grease Fitting

*NOTE: Do not overlubricate steering column fitting. Only 3 or 4 strokes with hand grease gun or 15 to 20 strokes with JD5804 Lubrigun are necessary. Do not use high pressure grease guns on this fitting.*

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# Section 20
# ENGINE

## Group 5
## GENERAL INFORMATION

## KOHLER ENGINE FOR 110 TRACTOR

### TABLE OF CONTENTS

110 TRACTOR



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## TABLE OF CONTENTS—CONTINUED



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## DESCRIPTION

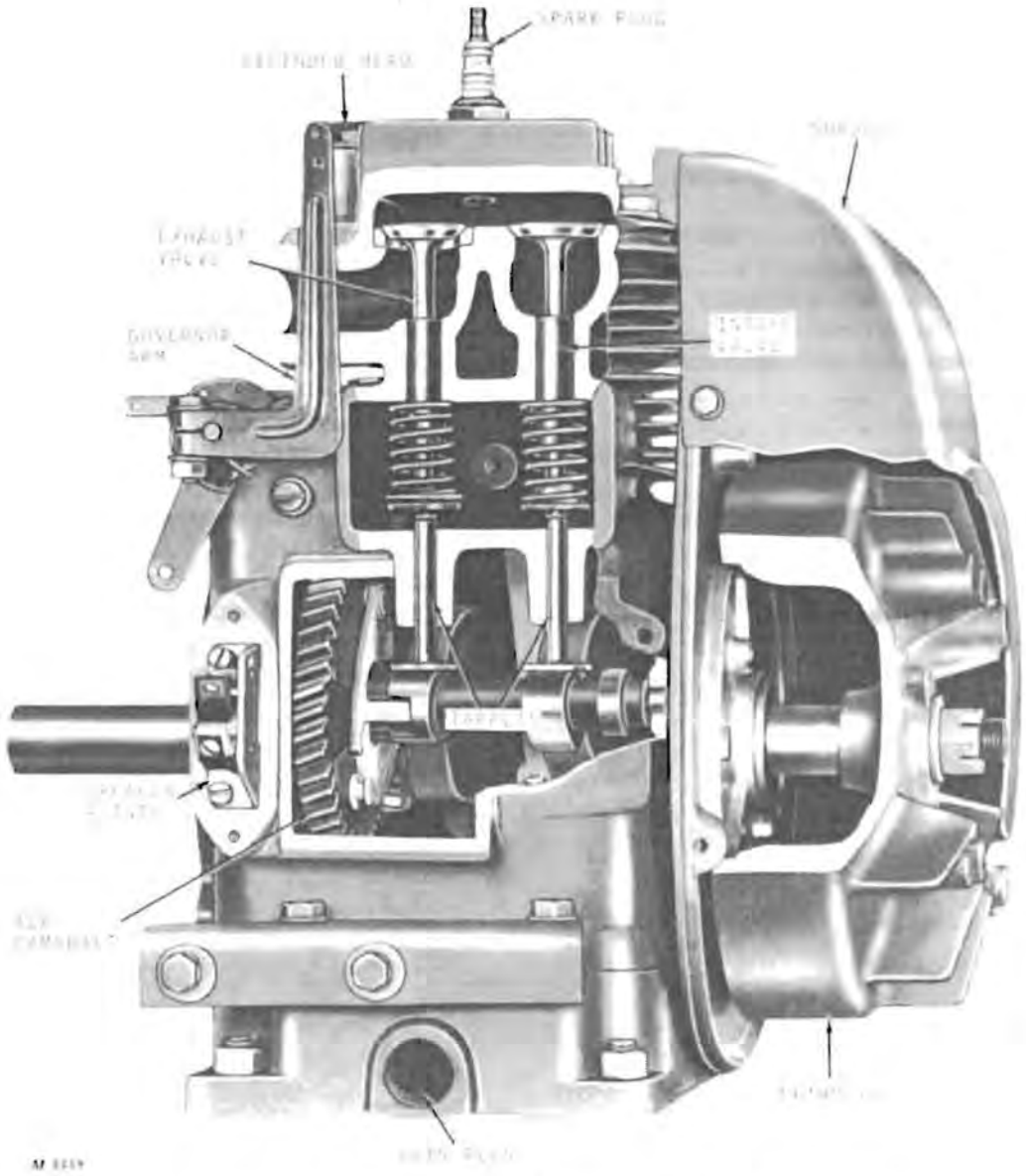

*Fig. 1–Cutaway View of Kohler K181S Engine Showing Valves and Tappets*

Both K161S and K181S engines used in 110 Tractors are Kohler four cycle, internal combustion engines. They have cast iron blocks, and are L-head, single cylinder with large bore - short stroke design.

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

Detailed specifications for each engine are covered in Section 10, "General", and at the end of each group in this section.

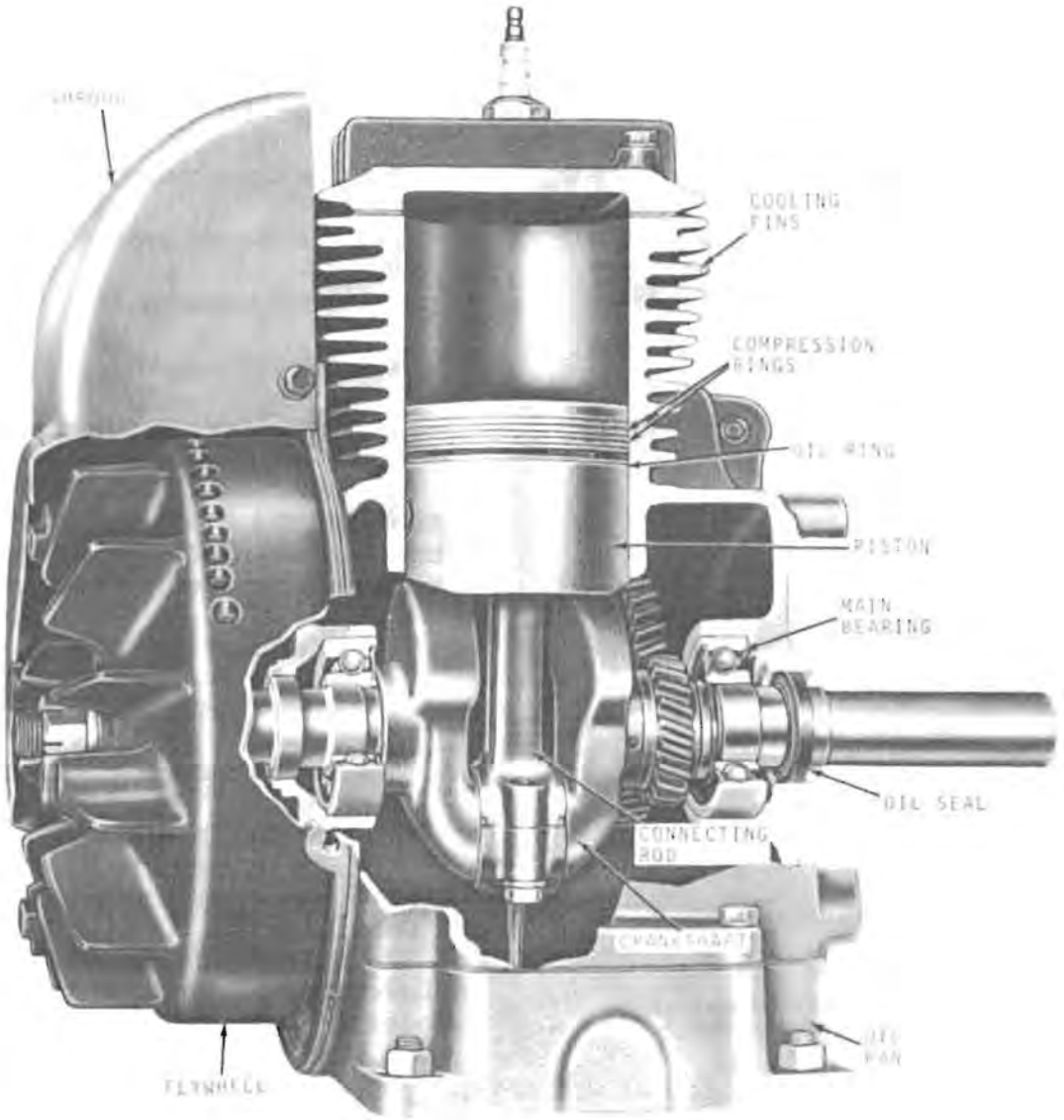


*Fig. 2–Cutaway View of Kohler K181S Engine Showing Piston, Crankshaft and Bearings*

The maximum brake horsepower curve shows the performance of laboratory engines equipped with standard air cleaner, muffler and flywheel corrected to sea level barometer and with free air temperature of 60° F. Horsepower decreases 3-1/2% for each 1000 feet above sea level, and 1% for each 10° F. above 60° F.

Horsepower ratings are established in accordance with Society of Automotive Engineers - Small Engine Test Code - J 607.

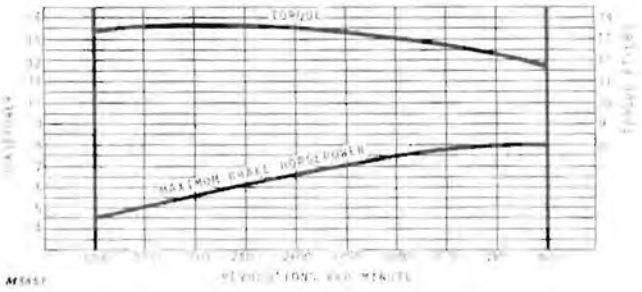


*Fig. 3–Torque-Horsepower Chart*

## DESCRIPTION—Continued

*Fig. 4–Kohler K161S 7 Horsepower Engine Serial No. ( -3550)*

*Fig. 5–Kohler K181S 8 Horsepower Engine Serial No. (3551-15000)*

*Fig. 6–Kohler K181S 8 Horsepower Engine Serial No. (15001-100000)*

110 Tractors, Serial No. ( -3550), are equipped with Kohler K161S 7 Horsepower engines. Visible differences between this and later engines are:

1 - Air cleaner location.

2 - Screw-type dipstick.

3 - Blower housing.

4 - Muffler design.

5 - Engine identification markings.

Tractors, Serial No. (3551-15000), used Kohler K181S 8 Horsepower engines. In addition to mechanical changes necessary to obtain the extra horsepower, visible changes are:

1 - Air cleaner position.

2 - Push-type dipstick.

3 - Extra screen in blower housing.

4 - Improved muffler.

5 - Engine identification markings.

Tractors, Serial No. (15001-100000) use the Kohler K181S 8 Horsepower engine which has the following visible external changes:

1 - Crankcase drain on bottom of pan.

2 - Coil relocated for easier point access.

Internal changes on engines for tractors, Serial No. (40001-100000), include:

1 - Automatic compression release camshaft (ACR).

2 - Exhaust valve rotators for tractors equipped with hydraulic lift.

3 - Studs are provided in the engine head to carry the hydraulic pump and valve on 110H Tractors.

# ENGINE ANALYSIS

## PRELIMINARY ENGINE CHECKS

A complete diagnosis guide of engine malfunctions appears on page 5-9. 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. 7–Checking Spark at Plug*

Check spark. Figure 7, whenever engine will not start. If engine will not crank, follow diagnosis procedure on page 5-9.

Remove ignition cable from spark plug and install adaptor or ordinary paper clip. Hold approximately 1/4 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 on sediment bowl 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" guide to check for internal difficulties.

If there is not 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 and 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 5-8.

## 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

110 Tractors ( -40001) have engines with a regular camshaft. Tractors (40001-100,000) have engines with 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. 8–Testing Engine Compression*

Depress clutch-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.

COMPRESSTION TEST - Continued

Set throttle and choke valve in wide open position by raising throttle lever all the way and lowering choke lever.

Install compression gauge in cylinder, Figure 8. Follow manufacturer's recommendations for installing and reading compression tester.

*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 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 100 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 crankshaft breather maintains a partial vacuum in the crankcase when engine is operating properly.

Connect water U-tube manometer to oil filter hole in cylinder block, Figure 9. Tester must hang vertical as shown. Start and run engine at 1200-1700 rpm. Allow engine to warm up and observe reading on scale. Follow manufacturers recommendations for installation, testing and compensation for the effect of altitude on the gauge reading.

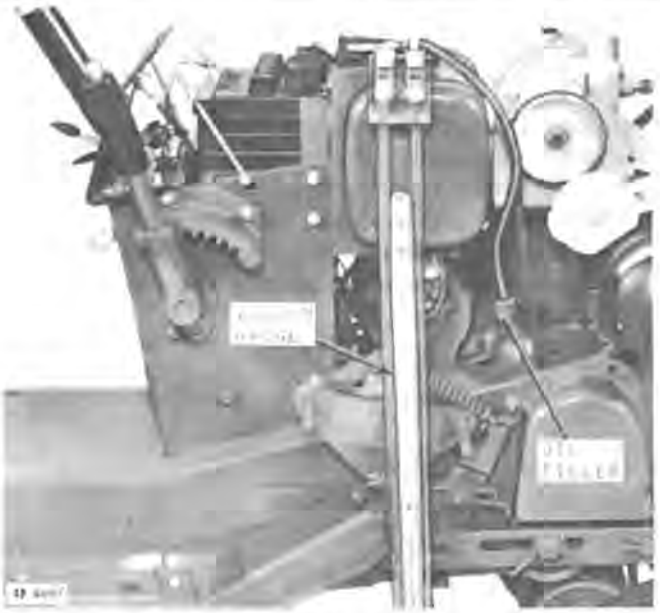

*Fig. 9–Checking Crankcase Vacuum*

*Test Conclusions*

Proper crankcase vacuum for both the K161 and K181 engines is 5-inches to 10-inches water column.

A crankcase vacuum reading lower than indicated above is most likely due to a leaking breather valve or improperly assembled breather. See Group 10 and carefully reassemble all breather parts. A low vacuum reading may also be caused by leaky valves, engine blow-by or worn 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 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

*Engine Will Not Crank*

Transaxle not in neutral.
Place shift lever in neutral position.

Battery discharged or defective.
Check battery condition.
Replace battery if necessary.

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

PTO drive engaged.
Disengage clutch.

Defective safety switch(es).
Replace switch(es).

Loose motor-generator belt.
Adjust belt tension.

Broken motor-generator sheave.
Replace motor-generator sheave.

Defective solenoid.
Replace solenoid.

Loose electrical connections.
Tighten connections firmly.

Motor-generator malfunction.
Check condition of motor-generator.
Repair or replace if necessary.

Engine seized.
Check engine condition.

*Engine Cranks But Will Not Start*

Empty fuel tank.
Fill fuel tank.

Restricted fuel tank vent.
Replace cap or cap gauge assembly.

Fuel shut-off valve closed (valve below fuel tank).
Open shut-off.

Clogged, restricted or air lock in fuel line.
Clean and bleed line.
Replace line if necessary.

Breaker points worn or pitted.
Check condition.
Replace if necessary.

Spark plug fouled or pitted.
Check condition of plug.
Clean and regap.
Replace if necessary.

Incorrect spark plug.
Install proper spark plug.

Battery not fully charged.
Charge battery and check condition.
Replace battery if necessary.

Loose electrical connections.
Tighten connections firmly.

Wire leads not properly connected.
Connect wire leads to their respective terminal.

High speed and idle mixture needles not properly adjusted.
Adjust carburetor.

Faulty condenser.
Replace condenser.

Defective ignition coil.
Replace coil.

Dirt in fuel system.
Remove fuel system and clean dirt and water from system.
Install new gaskets.
Install carburetor kit if necessary.

Frayed wire(s) causing ground(s).
Repair wire(s), replace if necessary.

*Engine Starts Hard*

Spark plug pitted or fouled.
Check condition of plug.
Clean and regap.
Replace if necessary.

Breaker points worn, pitted or out of adjustment.
Check breaker point condition.
Clean and regap.
Replace breaker points if necessary.

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## DIAGNOSING MALFUNCTIONS—Continued

*Engine Starts Hard—Continued*

High tension wire shorted.
Replace wire.

High tension wire loose at spark plug or coil.
Check spark plug connection and install wire properly in coil.

Loose electrical connections.
Check connections and tighten leads firmly.

Restricted fuel tank vent.
Replace filler cap or cap gauge assembly.

Clogged fuel line or air lock.
Clean and bleed line.
Replace line if necessary.

Broken choke cable.
Replace and adjust cable properly.

Throttle cable not properly adjusted.
Check cable at control and governor assembly and adjust properly.

Dirt or water in fuel system.
Remove fuel system and clean dirt and water from system.
Install new gaskets.
Install carburetor kit if necessary.

High speed and idle mixture needles not properly adjusted.
Adjust needles properly.

Wrong valve clearance.
Check and adjust valve clearance.

Bad head gasket.
Replace gasket and torque cylinder head properly.

Restricted exhaust system.
Check exhaust system condition.
Replace muffler if necessary.

Low compression.
Check compression and service engine accordingly.

*Engine Starts But Fails to Keep Running*

Restricted fuel tank vent.
Replace fuel cap or cap gauge assembly.

High speed and idle mixture needles not properly adjusted.
Adjust needles properly.

Broken choke cable.
Replace and adjust cable properly.

Dirt or water in fuel system.
Remove fuel system and clean dirt and water from system.
Install new gaskets.
Install carubretor kit if necessary.

Carburetor float not properly adjusted or leaky float.
Check float condition, adjust float.
Install new float and adjust if necessary.

High tension wire loose at spark plug or coil.
Check spark plug connection and install wire properly in coil.

High tension wire shorted.
Replace wire.

Breaker points not properly adjusted.
Clean and regap.
Replace breaker points if necessary.

Loose connections.
Check and tighten wires properly.

Defective head gasket.
Replace head gasket and torque cylinder head properly.

Faulty condenser.
Check condenser.
Replace if necessary.

Excessive engine load (lugging engine).
Reduce engine load.

*Engine Runs But Misses*

High tension wire loose from spark plug or coil.
Check spark plug connection and install wire properly in coil.

Breaker points out of adjustment or worn and pitted.
Clean and adjust.
Replace points if necessary.

Spark plug fouled or pitted, incorrect gap.
Clean and regap plug.
Replace plug if necessary.

Incorrect spark plug.
Install proper plug.

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Tighten connections.

Carburetor float not properly adjusted or hole in float.
Check condition of float.
Adjust float to proper position.
Replace leaky float.

Dirt or water in fuel system.
Remove fuel system and clean dirt and water from system.
Install new gaskets.
Install carburetor kit if necessary.

Wrong valve clearance.
Check valve clearance and valve condition.
Repair valve as necessary.

Faulty coil.
Check coil condition.
Replace coil if necessary.

*Engine Misses Under Load*

Spark plug fouled or pitted, incorrect gap
Clean and regap plug.
Replace spark plug if necessary.

High speed and idle mixture needles not properly adjusted.
Adjust needles.

Spark plug fouled or pitted, incorrect gap.
Check spark plug condition.
Clean and regap.
Replace spark plug if necessary.

Incorrect spark plug.
Install proper spark plug.

Breaker points out of adjustment or worn and pitted.
Clean and adjust.
Replace points if necessary.

Ignition out of time.
Set engine timing.

Dirt or water in fuel system.
Remove fuel system and clean dirt and water from system.
Install new gaskets.
Install carburetor kit if necessary.

Old fuel.
Drain system and fill fuel tank with fresh fuel.

Linkage misaligned (throttle arm to governor arm).
Straighten linkage to prevent binding.

*Engine Will Not Idle*

Idle speed too low.
Adjust idle screw.

High speed and idle mixture needles not properly adjusted.
Adjust needles properly.

Dirt or water in fuel system.
Remove fuel system and clean dirt and water from system.
Install new gaskets.
Install carburetor kit if necessary.

Restricted fuel tank.
Replace filler cap or cap gauge assembly.

Spark plug fouled or pitted, incorrect gap.
Check spark plug condition.
Clean and regap.
Replace spark plug if necessary.

Wrong valve clearance.
Check valve clearance and valve condition.
Service valve(s) as necessary.

Low engine compression.
Check compression.

*Engine Misses When Advancing Throttle*

Cold engine.
Choke engine before advancing throttle.

High speed and idle mixture needles not properly adjusted.
Adjust needles.

Spark plug fouled or pitted, incorrect gap.
Check spark plug condition.
Clean and regap.
Replace spark plug if necessary.

Linkage misaligned (throttle arm to governor).
Straighten linkage to prevent binding.



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