

# **ELECTRIC MOTOR SERVICE AND REPAIR MANUAL**



**BRIGGS & STRATTON CORPORATION, Milwaukee, Wisconsin 53201, U.S.A.**

# FORWARD

Before attempting electric motor repair, it is necessary that your shop be equipped with proper tools, equipment, and mechanics who are thoroughly familiar with Briggs & Stratton electric motor design and construction. With your shop thus equipped, this manual will serve as a guide to performing the various steps necessary to do a complete and satisfactory job.

In order to keep tables as simple as possible, only the basic motor models are listed, unless there is a difference between them and special models.

To make inspection of electrical parts simple and accurate, only the resistance or voltage and time values are given. Replace parts that do not test within values given.

The terms "inspect," "check," and "replace" are used as follows:

- INSPECT** – Visual inspections, look for signs of wear, brinnelling, cracks, stripped threads, etc.
- CHECK** – Measure by means of meter, micrometer, scale, etc.
- REPLACE** – This usually means to take off the old part and reassemble it or replace with a new one.

Illustrations do not necessarily designate a particular model, and should only be used to identify repair procedures.

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 **WARNING: 120 VOLT ELECTRIC MOTORS MUST BE HI-POT TESTED AFTER REPAIRS ARE COMPLETED AND BEFORE INSTALLING EQUIPMENT.**

**IF A HI-POT TESTER IS NOT AVAILABLE, HAVE MOTOR TESTED BY AN ELECTRIC MOTOR REPAIR SHOP BEFORE RETURNING MOTOR TO SERVICE.**

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## Electric Motor Manual

# Section 1 GENERAL INFORMATION

### GENERAL INFORMATION

The Briggs & Stratton Model Series 101120, 748000 is a 120-volt 4-pole permanent magnet motor with double insulation. The motor armature is supported by a PTO ball bearing and a replaceable needle bearing on the commutator end.

The four pin connector supplies 120 volts AC to a full wave bridge rectifier. This rectifier supplies 120 volts DC to the motor armature. The four pin connector also provides for dynamic braking to stop the armature in less than three seconds, when used on rotary lawn mowers, Fig. 1.

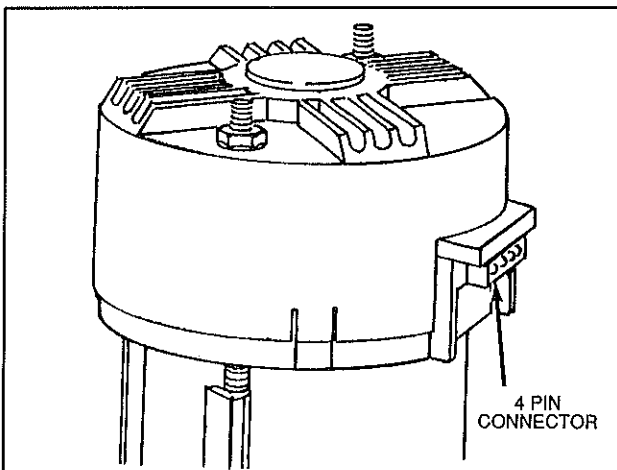


Fig. 1

### HOW MOTOR OPERATES

The motor housing assembly contains two ceramic magnets with each having a north and south magnetic pole. This provides a four pole magnetic field, Fig. 2. The armature contains twenty four coils connected to twenty four commutator bars within the four pole magnetic field of the motor housing.

For simplicity, only one coil is shown in Fig. 3. When current flows through the coil, as shown by arrows "A," Fig. 3, a magnetic field, arrows "B," is produced. On one side of the coil the magnetic field is in the same direction as the field produced by magnetic field of the motor housing and opposite the magnetic field

produced on the other half of the coil. This results in magnetic force pulling up on the coil when the magnetic fields are in the same direction and pulling down on the coil when the magnetic fields are in opposite directions, Fig. 3.

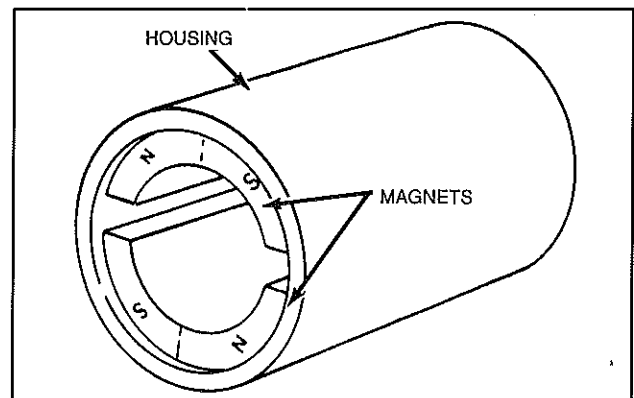


Fig. 2

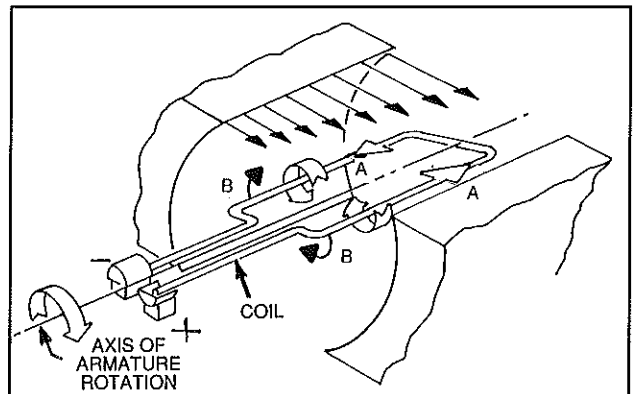


Fig. 3

### DYNAMIC BRAKING

Dynamic braking is a function of the electrical circuitry in the handle switch, wiring harness, and within the motor. When the handle switch is released to the "OFF" position, the dynamic brake feature is activated by completing a separate circuit designed to reverse the magnetic forces in the armature. It is this rapid reversal of magnetic forces within the armature which causes the dynamic brake action.

# GENERAL INFORMATION

## MAINTENANCE

Grass, chaff, or dirt may clog the air cooling system, especially after prolonged service cutting dry grasses. Yearly or every fifty hours, whichever comes first, remove the motor cover, clean filter with soap and water, and areas shown to avoid overheating and motor damage. Clean more often, if necessary. Remove grass, chaff, and dirt with a brush or cloth, Fig. 4.

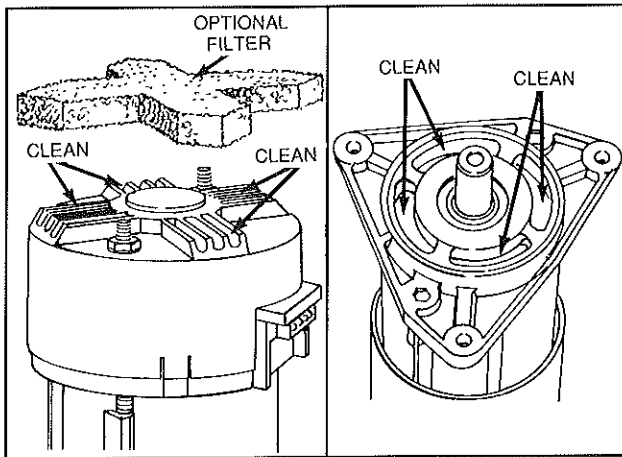


Fig. 4

## LUBRICATION

Model Series 101120, 748000 electric motor bearings are lubricated at the factory and no further lubrication is required over the life of the motor.

## POWER SUPPLY AND EXTENSION CORDS

The motor should be operated at 120 volts, AC only, on a 15 ampere (minimum) circuit. Use only UL type SJTW-A (in Canada use CSA approved type SJTW). A two conductor cord is adequate for the double insulated motor. Grounding is not required. The use of any extension cord consumes some power. To keep power loss to a minimum, use table to determine minimum extension cord size to use.

### EXTENSION CORD WIRE SIZE A.W.G, LENGTH

50 to 100 feet.....	16 AWG minimum
100 to 150 feet.....	14 AWG minimum
150 to 200 feet.....	12 AWG minimum

## SAFETY



**WARNING:** An electrical shock, possible severe or fatal, may occur if the following instructions are not followed.

DO NOT run motor in damp, wet grass, or in the rain.

DO NOT pour or spray water on the motor while running or cleaning.

DO NOT use extension cords with frayed, cut, or damaged insulation.

DO NOT attempt to repair or make any adjustments on the motor or equipment while the unit is plugged into a wall receptacle.



**CAUTION:** A.N.S.I. Standard Specifications for rotary power lawn mowers specify a maximum blade tip speed of 19,000 feet per minute (5,791 meters per minute), primarily to reduce the danger from thrown objects.

When replacing mower blades, use **ONLY BLADES** with the diameter and lift specified by the mower manufacturer.

Keep the motor clean of grass, chaff, and dirt. An accumulation of combustible material around or on the motor will prevent cooling and may result in a fire and personal injury.

**ALWAYS KEEP HANDS AND FEET CLEAR OF MOVING OR ROTATING PARTS.**

## GENERAL MOTOR SPECIFICATIONS

### MODEL SERIES 101120, 748000

Horsepower Maximum.....	1.2
Speed @ Max. Horsepower.....	2000 RPM
Stall Torque.....	1100 in. ozs. (5.7 ft. lbs.)
Speed, Free*.....	4800 RPM

### MODEL SERIES 748200

Horsepower Maximum.....	1.1
Speed @ Max. Horsepower.....	2600 RPM
Stall Torque.....	800 in. ozs. (4.2 ft. lbs.)
Speed, Free*.....	6400 RPM

\*Free: without mower blade or accessories.

## Electric Motor Manual

# Section 2 MOTOR DISASSEMBLY



**WARNING:** TO PREVENT ACCIDENTAL RUNNING OR AN ELECTRICAL SHOCK, always disconnect extension cord at the controller when servicing motor or equipment.

When removing motor from equipment, remove rust, dirt, or burrs from PTO shaft before removing fan, bearing housing assembly, accessories, or driven parts, Fig. 4.

### REMOVE MOTOR COVER (optional) (when equipped)

Remove two cover nuts, washers, and motor cover, Fig. 1.

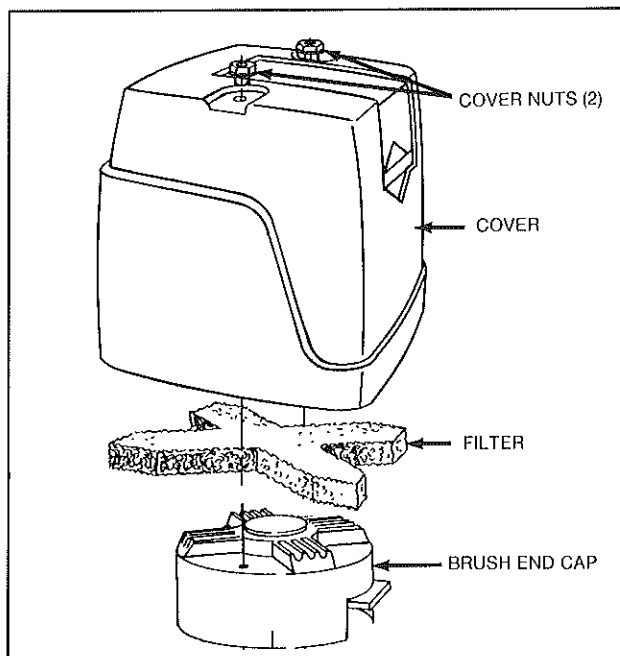


Fig. 1 – Removing Motor Cover

NOTE: For procedure to remove motor cover supplied by original equipment manufacturer, see their service instructions.

Briggs & Stratton 1000 watt electric motors have been built with two styles of brush boxes. The current style is used on Type #'s above 0200.

The early style was used on Type #'s below 0200. The early style, first version, used the brush box to hold brush holders before Date Code 8512171.

Early style, second version, used brush retainers on outer end of brush holders after Date Code 8512161.

### REMOVE BRUSH BOX, TYPE #'s 0200 and ABOVE

Remove brush end cap by prying up on three retaining tabs, Fig. 2.

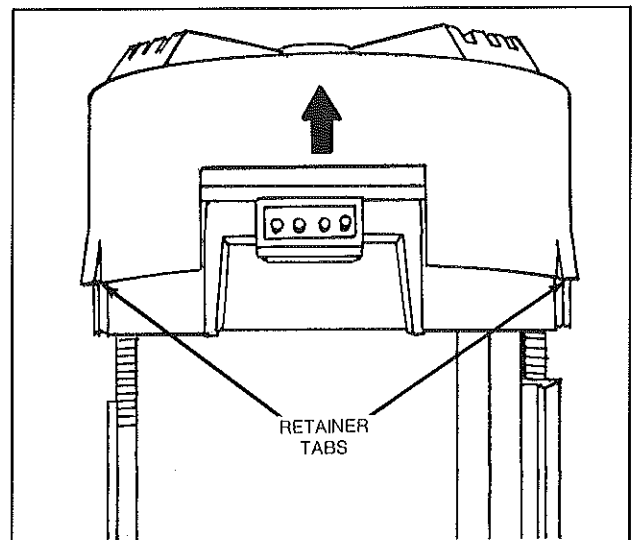


Fig. 2 – Removing Brush End Cap

Remove two nuts holding brush box. Lift off brush box. Brushes and springs will be removed with brush box, Fig. 3.

# MOTOR DISASSEMBLY

## Brush Box

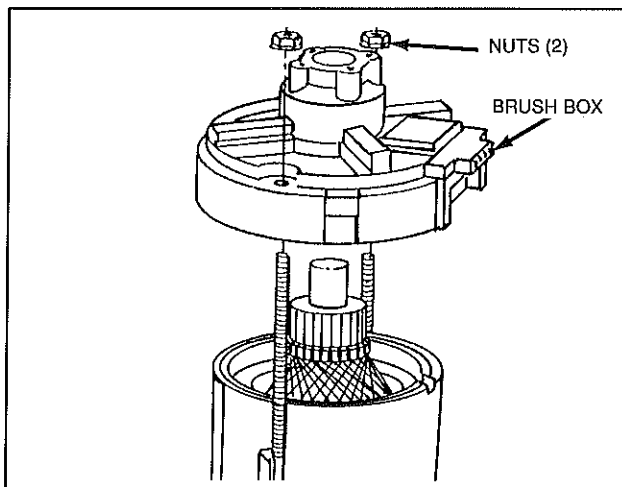


Fig. 3 – Removing Brush Box

### REMOVE BRUSH BOX, TYPE #'s Below 0200

Remove two nuts and washers holding brush end cap and lift off brush end cap, Fig. 4.

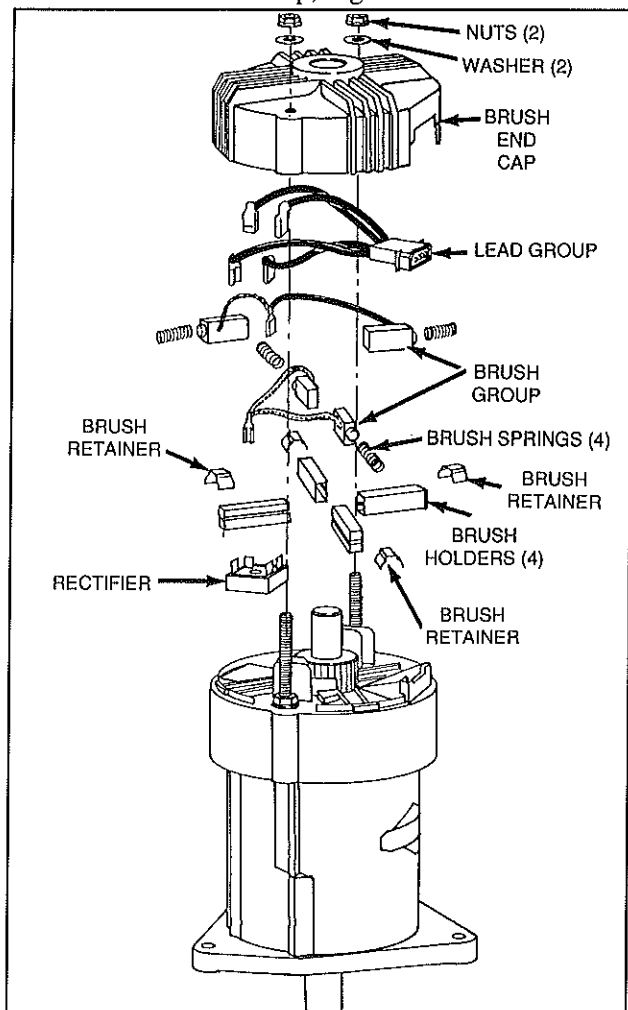


Fig. 4 – Parts Identification

On brush caps after Date Code 8512161, squeeze on side of outer brush retainer and tip retainer out, Fig. 4.

Push in on brush holder and lift up slowly to release spring tension. Repeat for other three brush holders, Fig. 5.

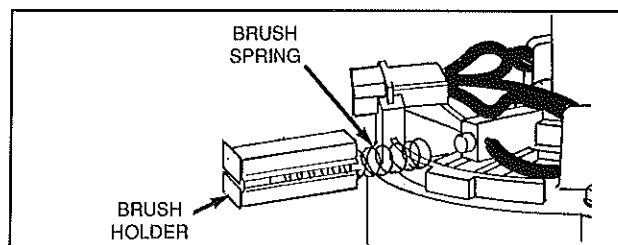


Fig. 5 – Removing Brush Holder and Spring

Lift out motor lead group, brushes, and rectifier as an assembly, Fig. 6.

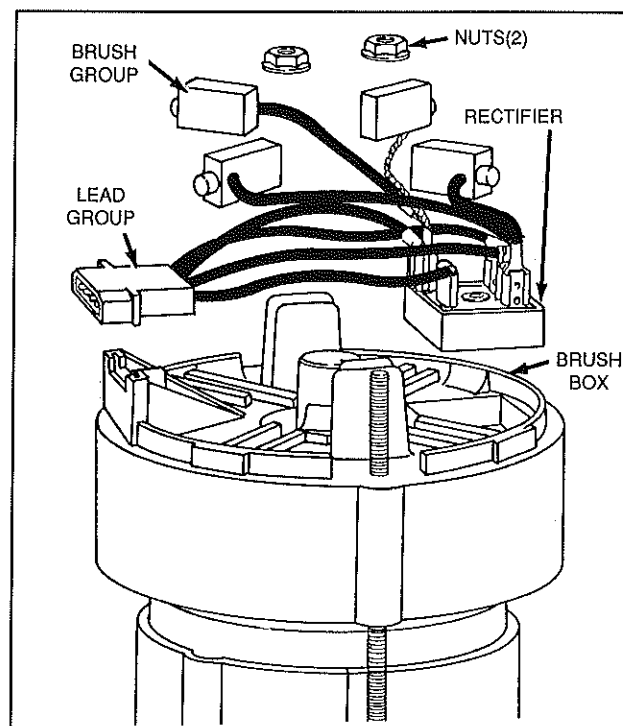
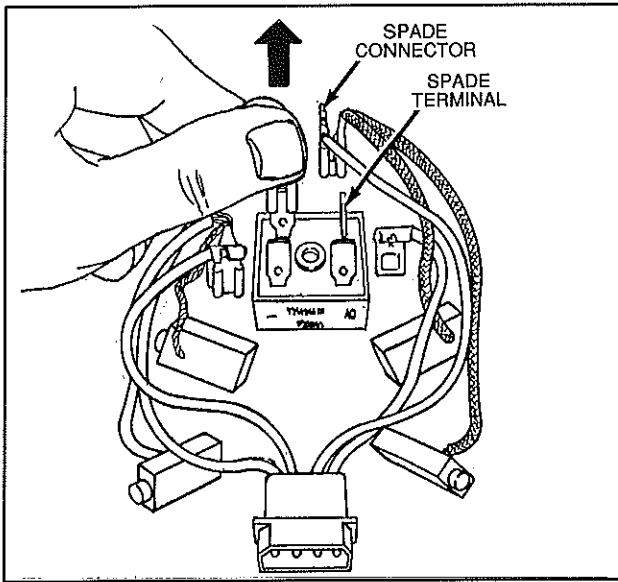


Fig. 6 – Removing Motor Leads,  
Brushes, and Rectifier

Disconnect lead group wires and brush lead wires from rectifier, pulling spade connectors straight out from spade terminals, Fig. 7.



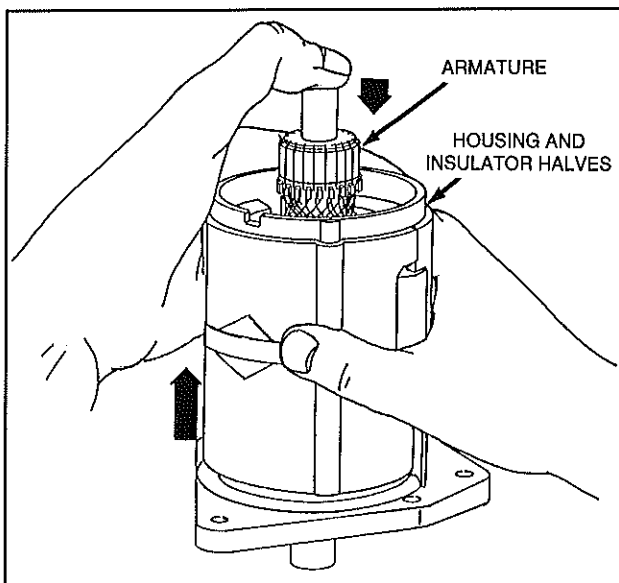
# MOTOR DISASSEMBLY



**Fig. 7 – Removing Spade Terminals**

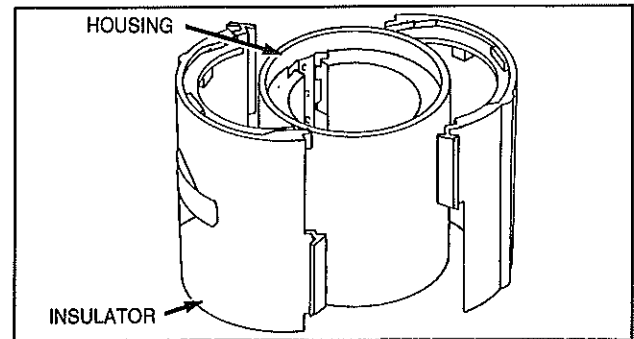
## DISASSEMBLE MOTOR, MODEL SERIES 748001, 748003, 748203

While pushing down on armature shaft, lift off housing and insulator assembly, Fig. 8.



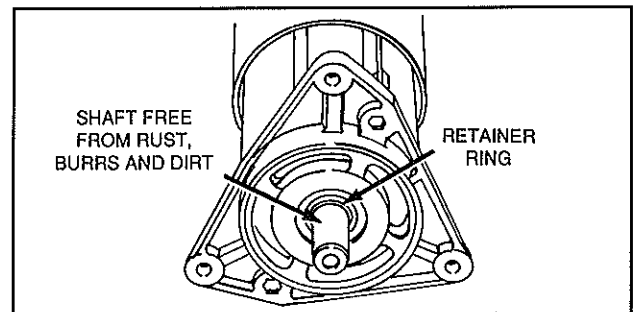
**Fig. 8 – Removing Housing and Insulator Halves (typical)**

Turn housing over and slide insulator halves off, Fig. 9.



**Fig. 9 – Removing Insulator Halves**

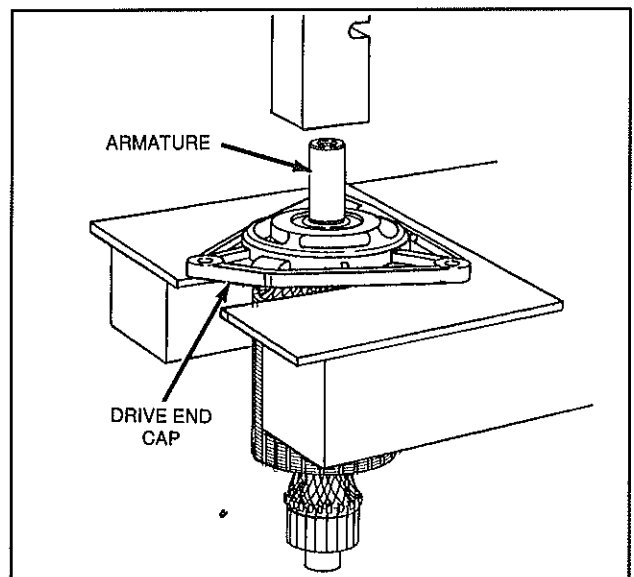
Remove retaining ring from bottom of armature shaft, Fig. 10.



**Fig. 10 – Removing Retainer Ring (typical)**

Support drive end cap in arbor press and press out armature, Fig. 11.

NOTE: Press out armature, only if required, after inspection as outlined in Section 3. Support drive end cap as shown, Fig. 11.



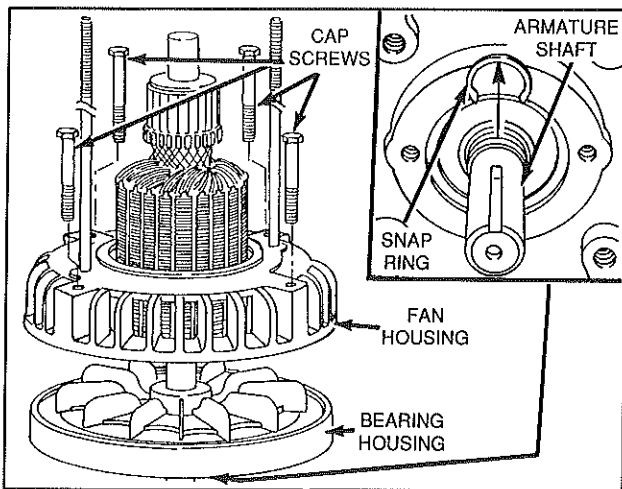
**Fig. 11 – Pressing Out Armature**

# MOTOR DISASSEMBLY

## DISASSEMBLE MOTOR, MODEL SERIES 748002, 748004, 748005

NOTE: For removal of accessories, see Section 5 or original equipment manufacturers service manual.

Remove external snap ring or retaining ring from armature shaft. Remove four cap screws from fan housing. Slide off bearing housing assembly, Fig. 12.



**Fig. 12 – Removing Bearing Housing**

Remove brush box as described in this section, pages 1 and 2

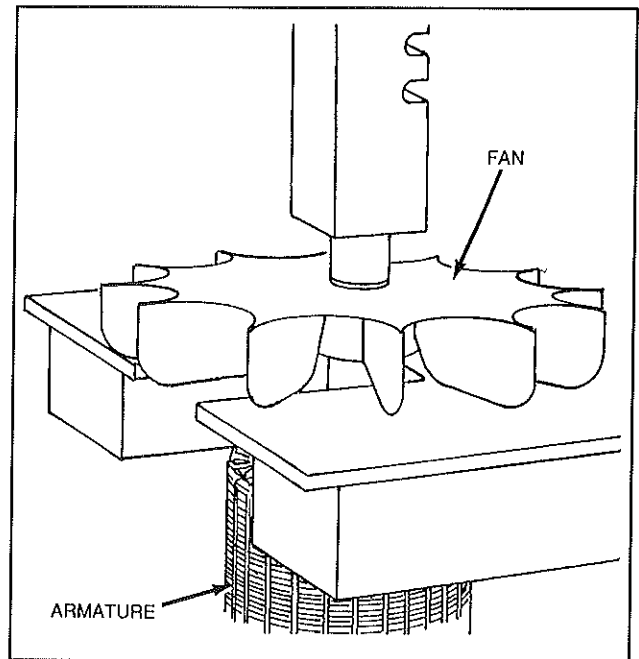
NOTE: When removing brush boxes on motors, Type #'s below 0200, with fan housing before Date Code 850725011, it may be required to hold head of thru bolts. On fan housing after Date Code 850724011, the head of the thru bolt is held from turning by a recessed pocket.

While pushing down on armature shaft, lift off housing and insulator assembly, Fig. 8.

Turn housing over and slide insulator halves off, Fig. 9.

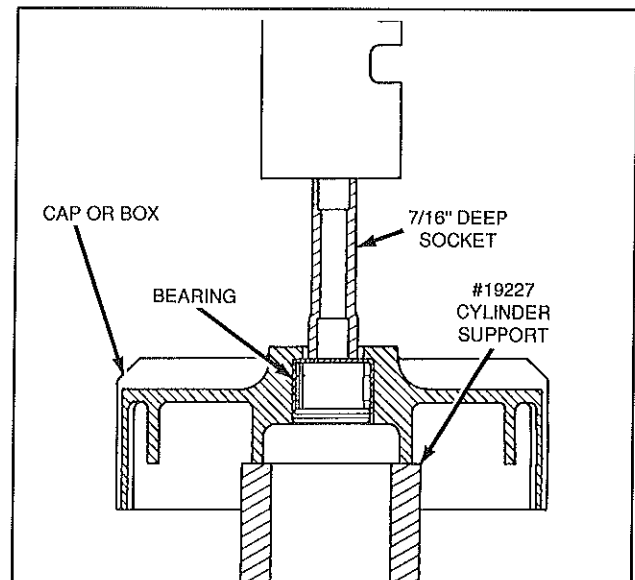
Lift fan housing off armature.

Remove external snap ring, Fig. 12 from armature holding fan on armature. Press fan off armature, Fig. 13.



**Fig. 13 – Removing Fan from Armature**

Remove needle bearing from brush end cap or brush box, supporting cap or box with Tool #19227, Cylinder Support, and press bearing out on arbor press using a 7/16" deep socket, Fig. 14.



**Fig. 14 – Pressing Out Needle Bearing**

Remove lead group wires and brush lead wires from rectifier, pulling spade connectors straight out from spade terminals, Fig. 7.

## Electric Motor Manual

### Section 3 TESTING AND INSPECTION

#### TEST EQUIPMENT

The following equipment is recommended to check and evaluate repair of 120 volt electric motors.

#### VOLT/OHM/AMPERE (VOA) METER

Digital Multimeter (or equivalent), Tool #19357, is the suggested meter and can be ordered from your Briggs & Stratton source of supply. The meter can be used to measure volts, ohms, amperes, or test diodes, when correct leads are used, Fig. 1.

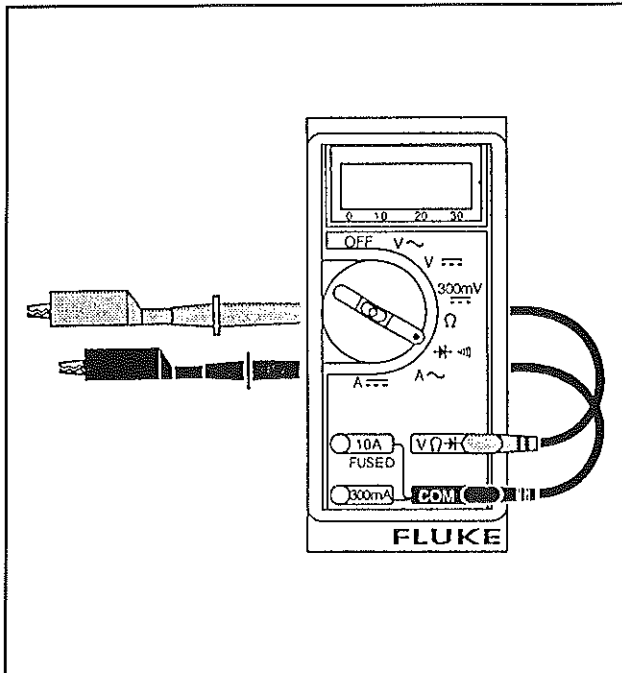


Fig. 1 – Digital Multimeter

#### HI-POT TESTER

A Hi-Pot tester is recommended. This tester is used to detect insulation breakdown which may produce an electrical shock, which may be severe or even fatal, Fig. 2.

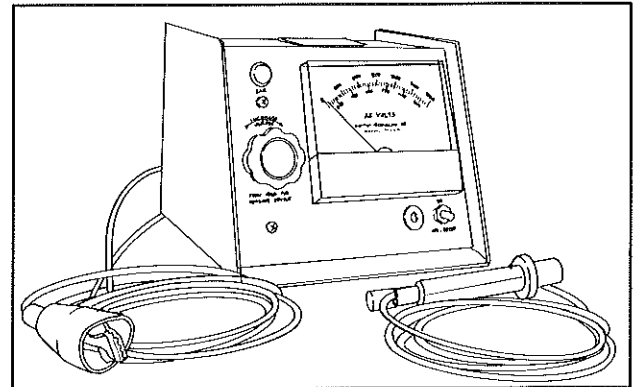


Fig. 2 – Hi-Pot Tester

#### TACHOMETER

Tool #19200 (or equivalent) is the recommended tachometer and can be ordered from your Briggs & Stratton source of supply. The tachometer (Trysit Sirometer) measures from 800 to 25,000 revolutions per minute (RPM), Fig. 3.

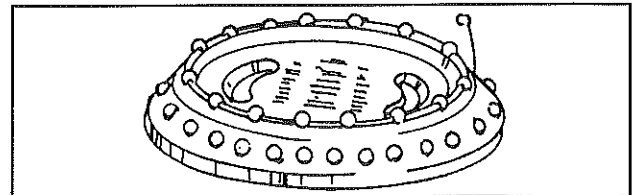
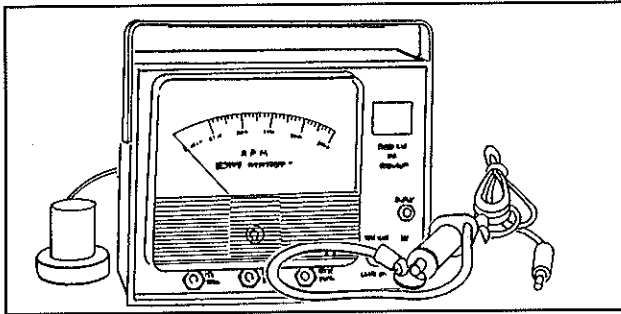


Fig. 3 – Tachometer (Trysit Sirometer)

#### BLADE MONITOR®

Tool #19255 is the recommended tester and can be ordered from your Briggs & Stratton source of supply. The Blade Monitor® measures blade stopping time, blade tip speed, and Top No Load RPM of the mower motor, Fig. 4.

# TESTING AND INSPECTION



**Fig. 4 – Blade Monitor®**

## TROUBLESHOOTING MODEL SERIES 101120, 748000 ELECTRIC MOTORS

The following is a list of possible problems and possible causes to aid in diagnosing problems with the 120 volt motor.

1. Motor will not run:
  - A. Wall outlet (no power, blown fuses, circuit breaker tripped, ground fault interrupter tripped).
  - B. Extension cord (broken wire, motor connector loose or damaged).
  - C. Rectifier (open).
  - D. Controller (switch open, circuit breaker tripped or inadequate lever travel).
  - E. Armature (open).
  - F. Brushes (worn or sticking).
2. Motor runs but appears under powered:
  - A. Additional load affecting performance (see note below.)
  - B. Electrical connections (dirty, corroded, or loose).
  - C. Commutator (dirty or worn).
  - D. Brushes (worn, sticking, or dirty).
  - E. Extension cord (undersize wire, cord too long.) Refer to Wire Length and A.W.G. Wire Size Chart, Section 1.
  - F. Rectifier (one diode open).
  - G. Armature (one or more pairs of windings open).
  - H. Low line voltage.

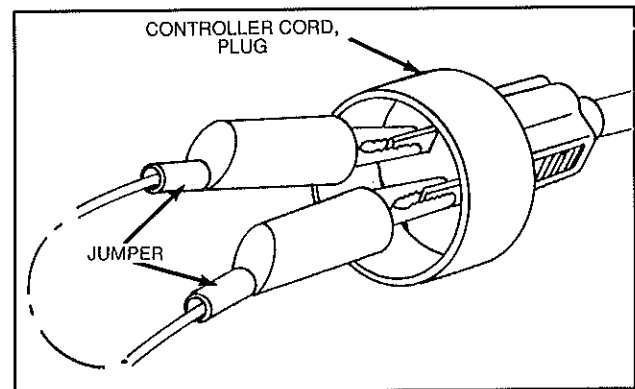
**NOTE:** A performance problem could be either equipment or motor related. Wet or heavy grass can reduce motor performance. Excessive grass deposits under mower deck or a dull mower blade will also affect operation. With all equipment load removed and power supply disconnected, turn motor over slowly to detect tight motor bearings.

3. Motor trips circuit breakers (runs hot, produces smoke or odors).
  - A. Motor switch (shorted).
  - B. Rectifier (shorted).
  - C. Armature (shorted).
  - D. Extension cord (shorted).
  - E. Circuit overloaded (by other appliances).
4. Motor runs normal, does not stop within CPSC mandated three seconds.
  - A. Brushes (one brush sticking or worn).
  - B. Armature (open or shorted).
  - C. Break in internal circuitry.
  - D. Motor switch (dirty or corroded).
  - E. Controller wiring (open).

## ELECTRICAL TESTS

### Check Controller (except 3-Speed)

1. Connect controller cord plug blades together with a jumper, Fig. 5.



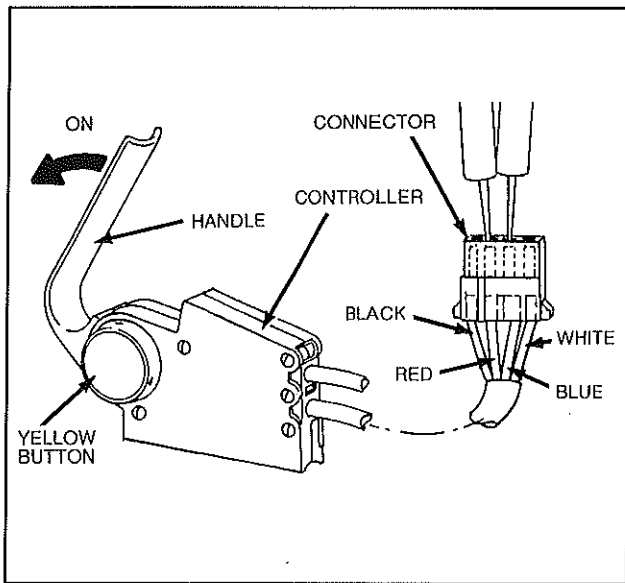
**Fig. 5 – Connecting Jumper**

2. Turn switch on Digital Multimeter, Tool # 19357 to  $\Omega$  or;

On V.O.A. Meter, Tool #19236, to R X 1 on range switch and function switch to "OHMS" position. Zero the meter.

Connect test leads to two center terminals (red and blue wires) of controller motor connector. There should be continuity, Fig. 6. If no continuity, replace controller. Push down on YELLOW button on controller and operate controller handle. There should not be continuity. If there is, replace controller.

## TESTING AND INSPECTION



**Fig. 6 – Checking Controller**

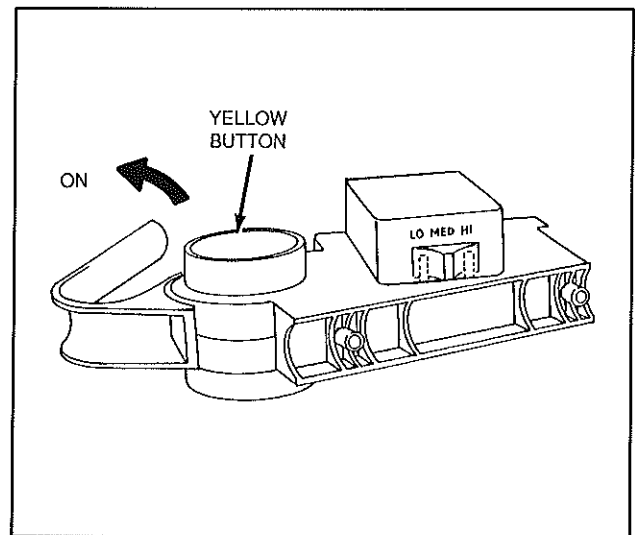
3. With meter set the same as step 2, connect test leads to two outer terminals (black and white wires). Push down on YELLOW button on controller and place controller handle in "ON" position. The meter should show continuity. If not, replace controller. Release handle. There should be no continuity. If there is, replace controller.

### Check 3 Speed Controller

1. Connect controller cord plug blades together with a jumper, Fig. 5.
2. Turn switch on Digital Multimeter, Tool # 19357 to  $\Omega$  or;

On V.O.A. Meter, Tool #19236, set to R X 1 on range switch and function switch to "OHMS" position and zero meter.

With controller in the normally "OFF" position, connect the "OHMS" test leads to the outer terminals of the controller motor connector. Push down on YELLOW button of controller and place controller handle in "ON" position. The meter needle should show a slight movement or change in digital reading. Repeat in each of the three speed controller switch positions. If there is no needle deflection, replace the controller, Fig. 7.



**Fig. 7 – Checking 3-Speed Controller**

### Inspect Drive End Cap or Bearing Housing Assembly Ball Bearing

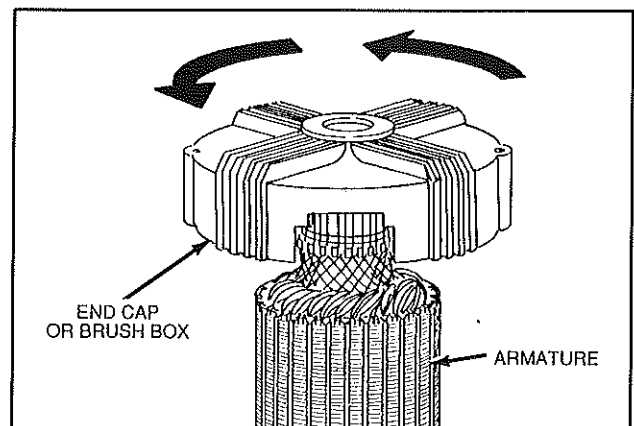
Install armature in drive end cap or bearing housing. Assemble ball bearing snap rings, when used.

Rotate armature to feel if bearing is rough or tight. Inspect bearing seals for lubrication leakage.

Replace drive end cap or bearing housing assembly if bearing is rough, tight, or leaking lubricant.

### Inspect Brush End Cap or Brush Box Needle Bearing

Place armature commutator journal in bearing of brush end cap or brush box and rotate armature feeling for rough spots or tightness, Fig. 8. If bearing is rough, tight, or dry of lubricant, replace. If bearing is loose in brush end cap or brush box, replace cap or box.

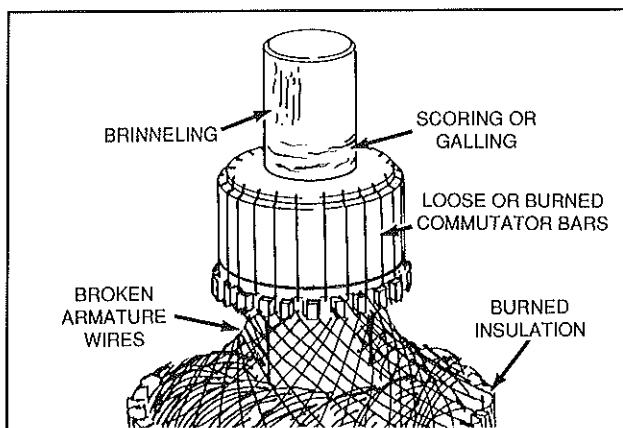


**Fig. 8 – Inspecting Needle Bearing (typical)**

# TESTING AND INSPECTION

## Inspect Armature

Inspect commutator journal for brinelling, galling, or roughness. Inspect commutator bars for burning or pitting, Fig. 9. Inspect armature windings for broken wires, burned insulation, or loose commutator bars. Replace armature if damaged.

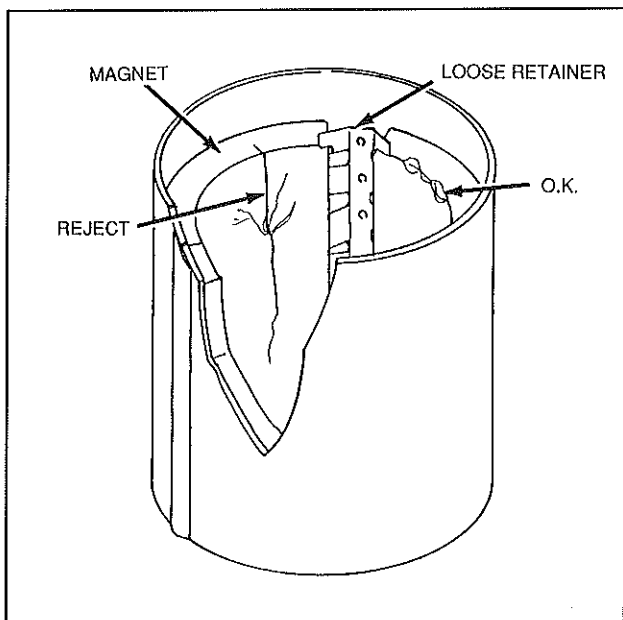


**Fig. 9 – Inspecting Armature, All**

## Inspect Housing Assembly

Inspect magnets for cracks, debonding (loose) from housing, or loose magnet retainers. Replace housing if damaged, Fig. 10.

NOTE: Small chips in magnets will not affect motor performance unless loose.



**Fig. 10 – Inspecting Housing, All**

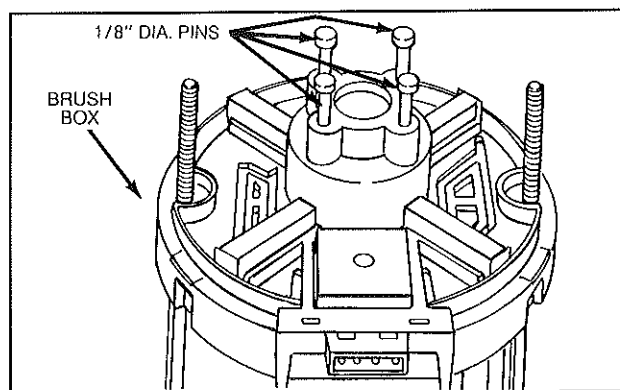
## General Inspection

Inspect all parts for breakage, wear, distortion or cracks. Replace all damaged parts.

## Inspection – Electrical

### Check Motor Connector on Brush Box, Type #'s 0200 and Above

NOTE: Before making following check, brush box must be removed from motor and brushes held by 1/8" diameter pins or brushes must be removed, Fig. 11.



**Fig. 11 – Brush Retainers (1/8" Dia. Pins)**

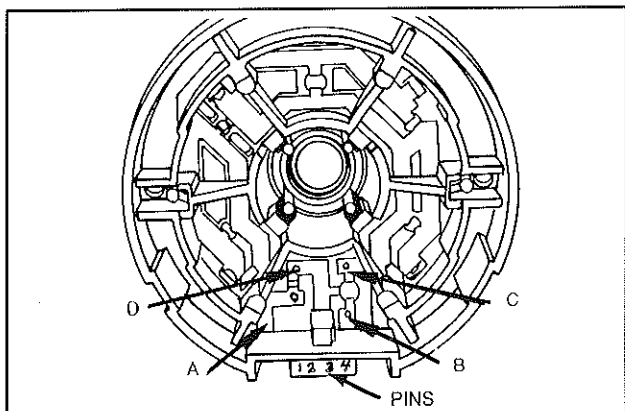
1. Turn switch on Digital Multimeter, Tool # 19357 to  $\Omega$  or;

On V.O.A. Meter, Tool #19236, set to R X 1 on range switch and function switch to "OHMS" position and zero meter.

Connect either test lead from meter to Pin 1 of brush box. Connect other test lead to Terminal "D" of brush box, Fig. 12. There should be continuity.

2. Repeat Step 1 on Pin 4 and Terminal "B." Test results should be the same as Step 1, Fig. 12.

## TESTING AND INSPECTION



**Fig. 12 – Checking Connector and Rectifier**

3. If either or both Steps 1 and 2 do not have continuity, replace brush box.

### Check Rectifier, Type #'s 0200 and Above

1. Turn switch on Digital Multimeter, Tool # 19357 to  $\nabla$  (Diode Test) or set V.O.A. meter, Tool #190236, function switch to "DIODE TEST" and range switch to "DIODE TEST." Zero meter. Place "DIODE TEST" leads into "DIODE TEST" socket on meter.
2. Place positive test lead (+) and negative lead (-) on rectifier terminals in sequence shown in Table 1 and Fig. 12.

**Table 1**

RED TEST LEAD (+) POSITIVE	BLACK TEST LEAD (-) NEGATIVE	METER READING (CONTINUITY)
A	B	NO
B	A	YES
B	C	NO
C	B	YES
C	D	YES
D	C	NO
D	A	YES
A	D	NO

3. If test do not show readings indicated in table above, replace brush box.

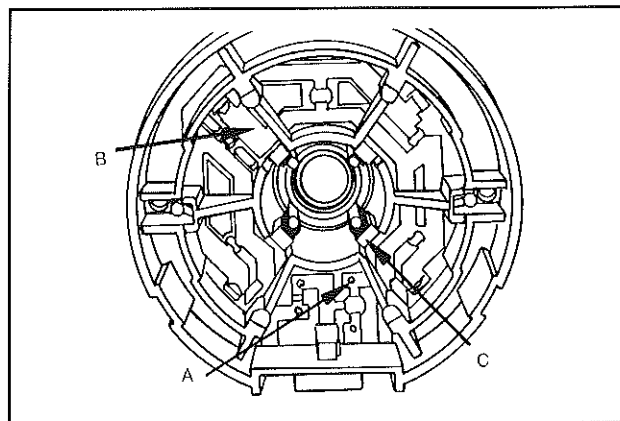
### Check Rectifier to Brush Holder Connections, Type #'s 0200 and Above

1. Turn switch on Digital Multimeter, Tool # 19357 to  $\Omega$  or;

On V.O.A. meter, Tool #19236, set range switch to R X 1 and function switch to "OHMS."

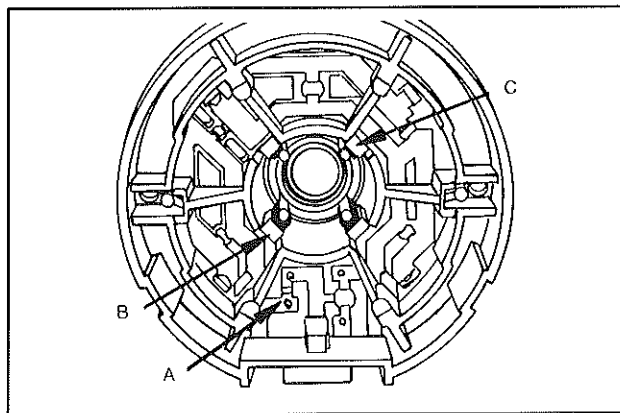
Place "OHMS" test leads in "OHMS" connector and zero meter.

2. Place either test lead on rectifier Terminal "A." Place other test lead on end of brush holders "B" and then "C." There should be continuity, Fig. 13.



**Fig. 13 – Checking Rectifier to Brush Holder**

3. Repeat Step 2, Fig. 14. There should be continuity.



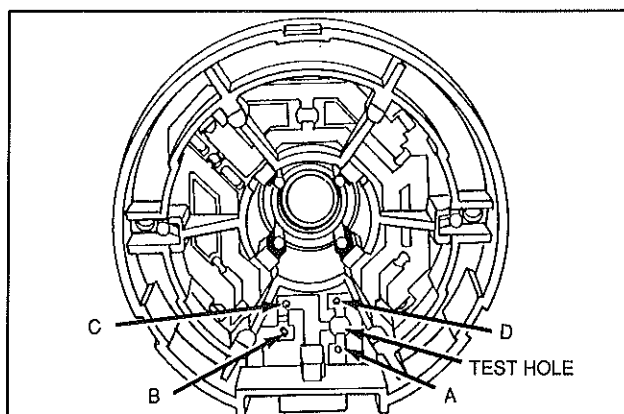
**Fig. 14 – Checking Rectifier to Brush Holder**

4. If no continuity is found in Steps 2 and 3, replace brush box.

# TESTING AND INSPECTION

## Test Rectifier for Grounds, Type #'s 0200 and Above

1. With meter set the same as "Test Rectifier," place one test lead thru hole in brush box on metal case of rectifier. Touch other lead to points "A," "B," "C," and "D." There should not be continuity, Fig. 15 .

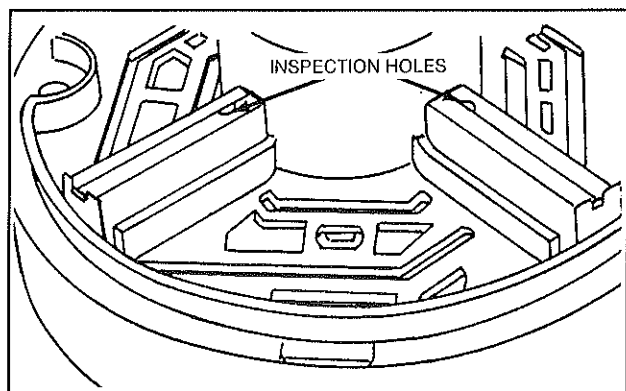


**Fig. 15 – Checking Rectifier for Grounds**

2. Reverse test leads and repeat Step 1. There should not be continuity. Replace brush box if there was continuity in Steps 1 or 2.

## Inspect Brushes, Type #'s 0200 and Above

Replace brushes when ends of brushes can be seen thru brush holder inspection holes, Fig. 16.



**Fig. 16 – Inspecting Brushes**

## Check Rectifier, Type #'s Below 0200

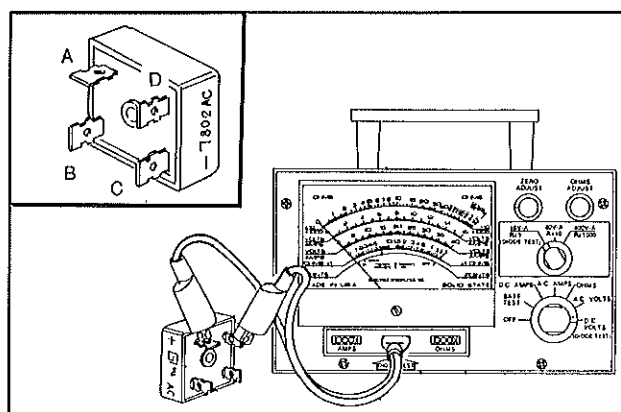
Remove all leads from rectifier before testing. Turn switch on Digital Multimeter, Tool # 19357 to  $\rightarrow$  (Diode Test) or;

On Tool #19236, V.O.A. Meter, "DIODE TEST," Zero meter. Plug "DIODE TEST" leads into "DIODE TEST" socket on meter.

Place positive (+) Red test lead and negative (–) Black test lead on rectifier terminals in sequence shown in Table 2, and Fig. 17.

**Table 2**

RED TEST LEAD (+) POSITIVE	BLACK TEST LEAD (–) NEGATIVE	METER READING (CONTINUITY)
A	B	NO
B	A	YES
B	C	NO
C	B	YES
C	D	YES
D	C	NO
D	A	YES
A	D	NO



**Fig. 17 – Checking Rectifier**

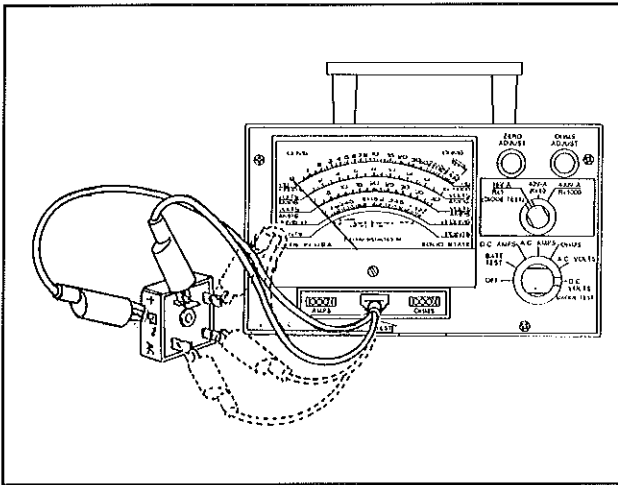
If meter does not show readings indicated in Table 2, rectifier is defective and must be replaced.

## Check Rectifier (grounds), Type #'s Below 0200

With meter set same as in previous test, touch one lead to metal case of rectifier and other lead to each rectifier terminal. Reverse leads and repeat test, Fig. 18. If there is continuity from any terminal to case, replace rectifier.



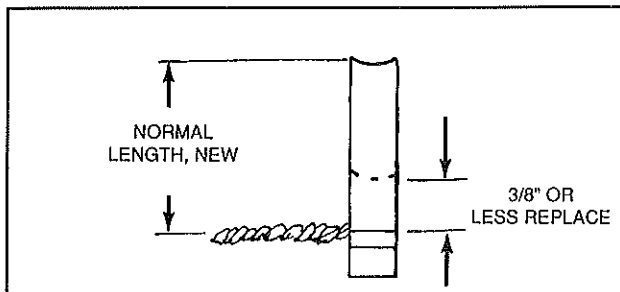
## TESTING AND INSPECTION



**Fig. 18 – Checking for Grounds**

### Inspect Brushes, Type #'s 0200 and above

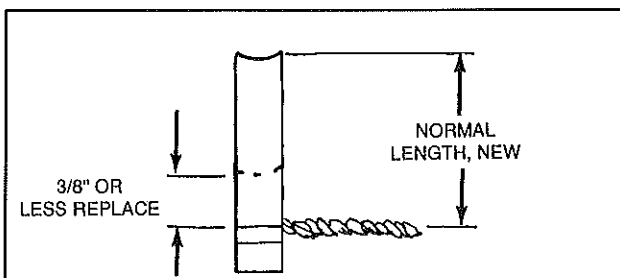
Replace brushes when ends of brushes can be seen thru inspection holes in brush holders, Fig. 16.



**Fig. 19 – Checking Brushes**

### Inspect Brushes, Type #'s Below 0200

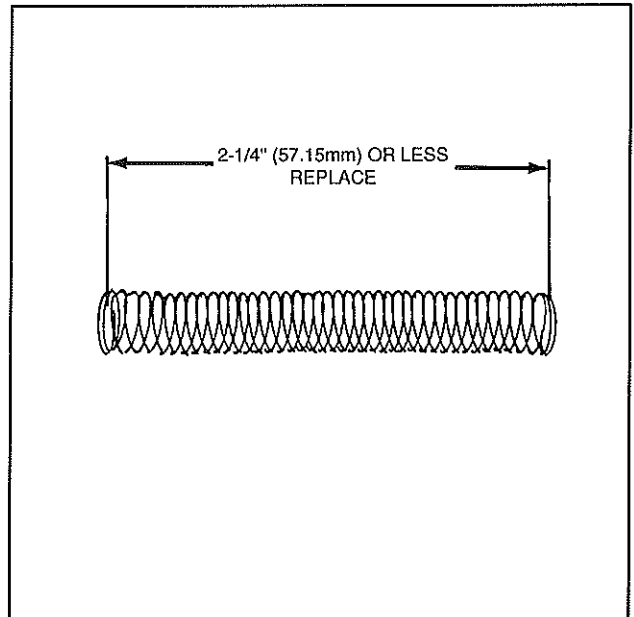
Inspect brushes for loose leads, cracks, or wear. Replace brushes worn to 3/8" or less, Fig. 20.



**Fig. 20 – Checking Brushes**

### Check Brush Springs, Type #'s Below 0200

Replace brush springs if distorted, stretched, or free length is less than 2-1/4", Fig. 21.



**Fig. 21 – Checking Brush Springs**

NOTE: Brush spring are part of brush holders and can not be checked or replaced except as an assembly.

### Check Armature, All Type #'s

Armature can best be tested on a 120 volt Sensitive Automotive Growler or Armature Tester. Follow instructions supplied with tester for proper test procedures.

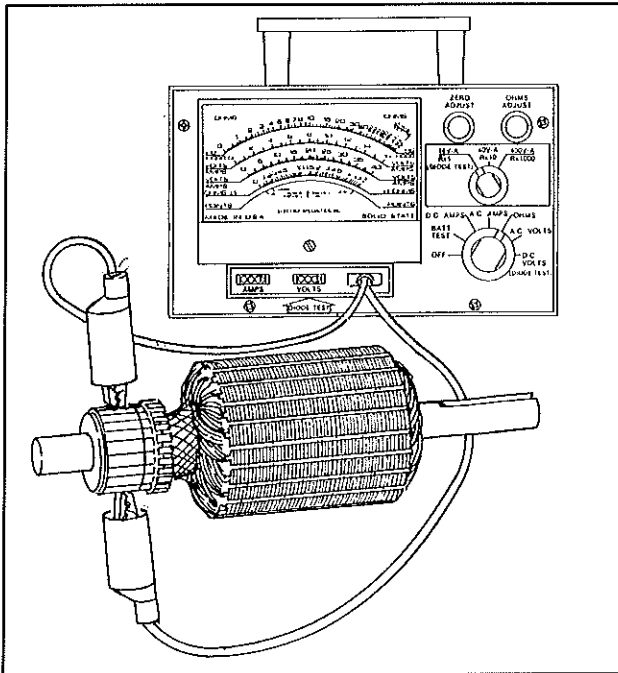
If an armature tester is not available, Tool #19236, V.O.A. Meter, can be used as follows:

Turn switch on Digital Multimeter, Tool # 19357 to  $\Omega$  or;

On V.O.A. meter, Tool #19236, set range switch to R X 1 and function switch to "OHMS" and zero meter.

Place one lead on a commutator bar and other lead on commutator bar 180° apart, Fig. 22. Note reading (3 to 5 ohms). Repeat for each pair of bars. All readings should be uniform. If one or more pairs are very high or very low, those pairs are shorted or open. Replace armature.

## TESTING AND INSPECTION



**Fig. 22 – Checking Armature**

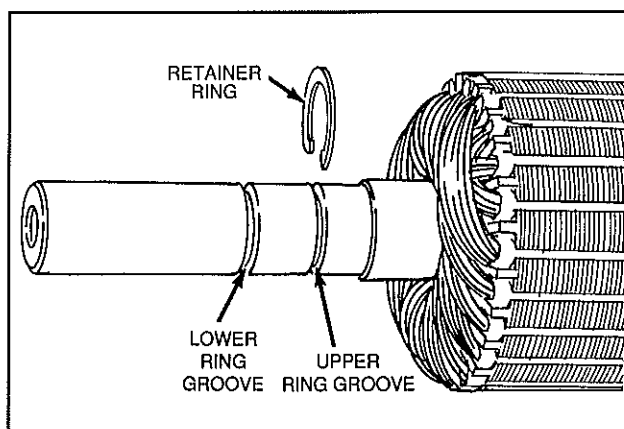
NOTE: Commutator bars must be clean to perform an accurate test. Use commutator paper or flint paper to clean. DO NOT USE aluminum oxide or emery cloth to clean commutator bars.

## Electric Motor Manual

### Section 4 ASSEMBLY

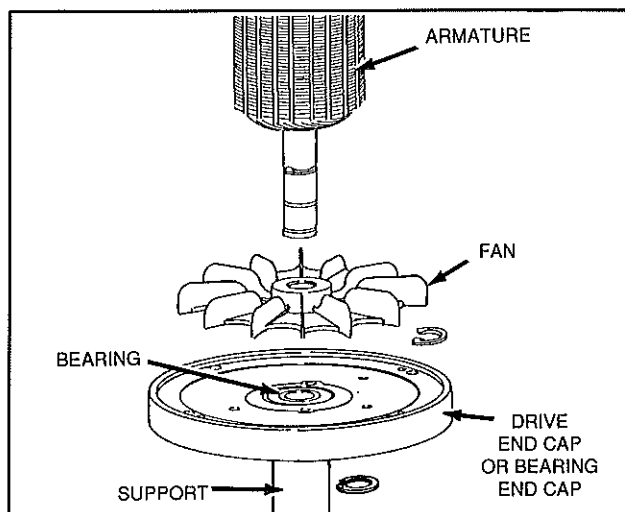
#### INSTALL ARMATURE

Place one retainer ring in upper retainer ring groove, Fig. 1.



**Fig. 1 – Installing Retainer Rings**

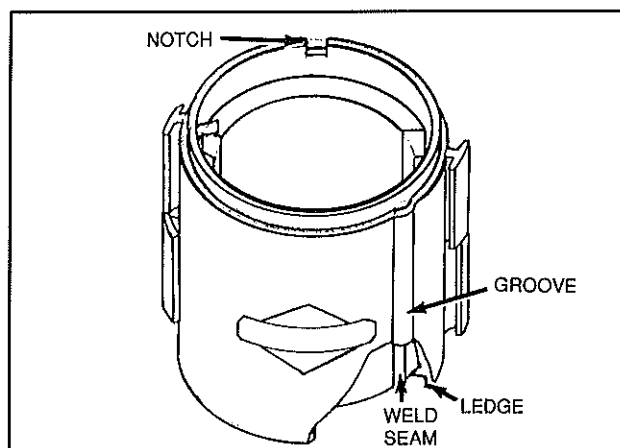
While supporting inner bearing race, press armature into drive end cap or bearing end cap bearing until inner race of bearing is in contact with retainer ring, Fig. 2 Install fan and second retainer ring in lower retainer groove.



**Fig. 2**

#### Assemble Housing and Insulator Halves

Place two halves of insulators on bench with ledges down, Fig. 3. Slide magnet housing down into insulator halves with notch up, Fig. 3, and weld seam centered in slot of one of the insulator halves.



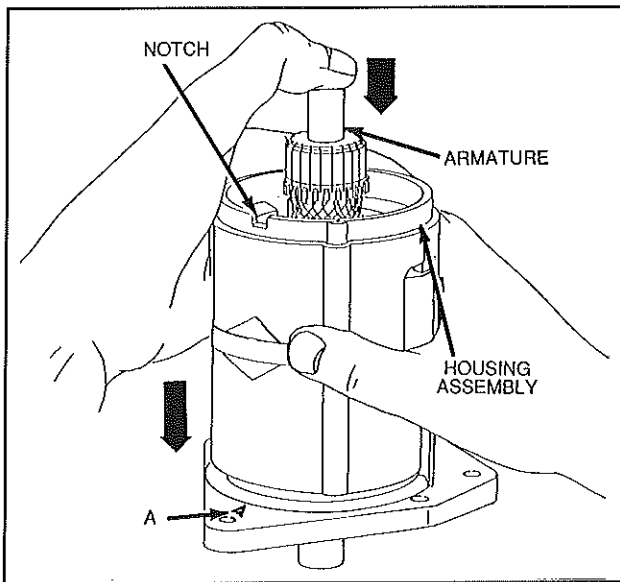
**Fig. 3 – Assembling Housing and Insulators**

#### Assemble Housing and Armature Model Series 748001, 748003, 748203

Slide housing assembly down over armature assembly, while holding armature firmly down on work surface. Keep fingers out from lower edge of housing assembly, Fig. 4.

NOTE: On Model Series 748001, notch on housing should face toward mounting hole "A."

# ASSEMBLY

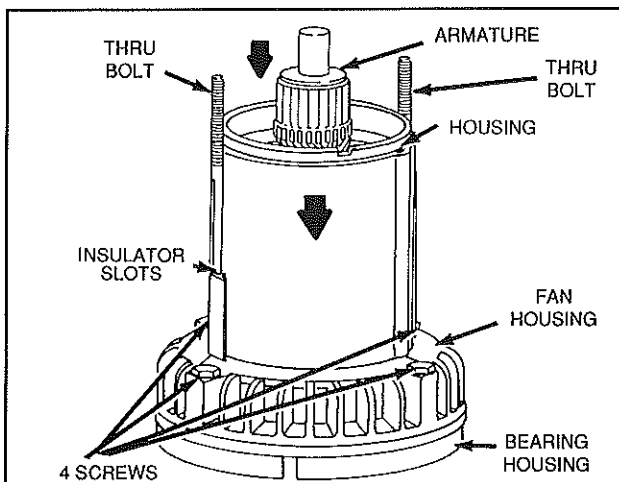


**Fig. 4 – Installing Housing and Insulator Halves**

## Assemble Housing and Armature Model Series 748002, 748004, 748005

Install thru bolts into fan housing and install fan housing on bearing housing assembly, Fig. 5. Torque four screws to 85 in. lbs.

Place fan housing and armature assembly on work surface. While holding armature down firmly, lower housing over armature with thru bolts in insulator slots. Keep fingers out from under lower edge of housing, Fig. 5.



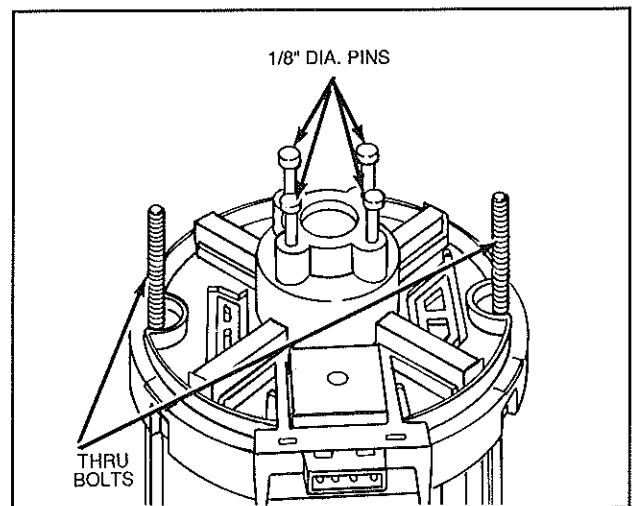
**Fig. 5 – Assembling Housing and Insulator Halves**

## Install Brush Box, Type #0200 and Above

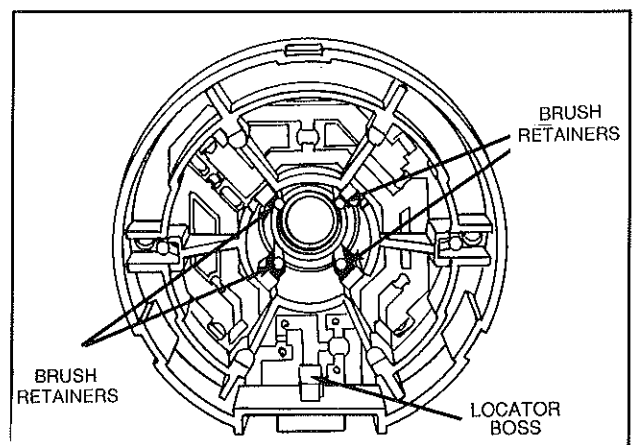
Before installing brush box, push brushes into brush holders and hold brushes with 1/8" non-conducting pins supplied with replacement brushes or brush retainers, Fig. 6.

Install thru bolts in drive end cap and insulator slots, if not already installed.

The brush box has a locator boss, Fig. 7. This boss indexes with locator notch in motor housing and insulator halves, Fig. 8. Push brush box down over thru bolts until box is seated and boss is in locator notch, Fig. 9.

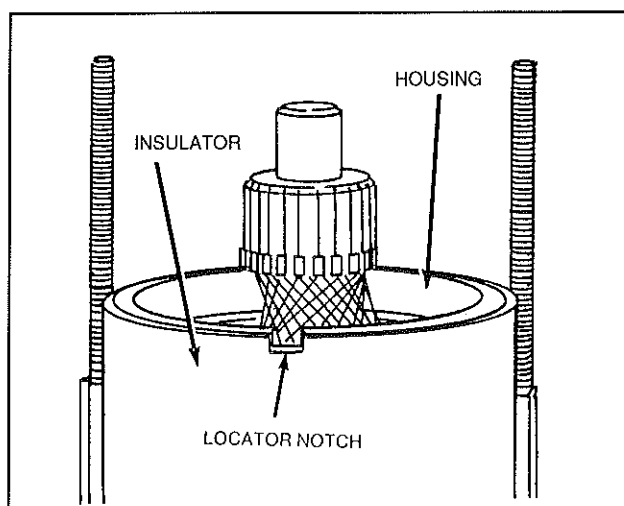


**Fig. 6 – Installing Brush Retainer Pins**



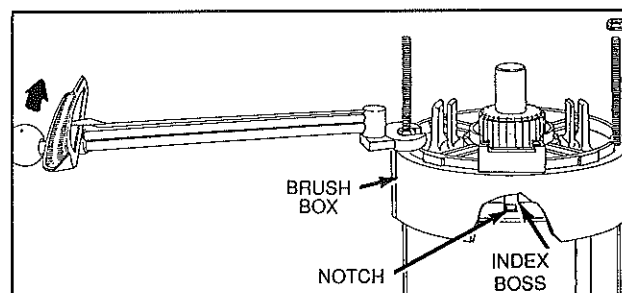
**Fig. 7 – Locator Boss**

# ASSEMBLY

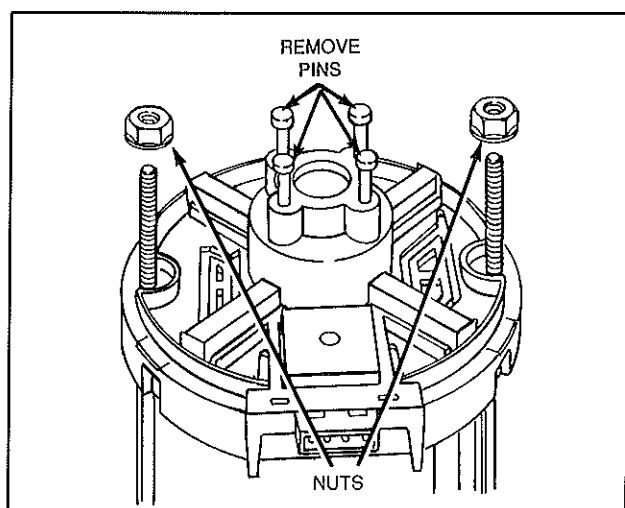


**Fig. 8 – Locator Notch**

Slide brush box down onto armature and housing assembly, Fig. 10. Index boss in brush box with notch in housing assembly, Fig. 10. Install two nuts and torque to 20 to 25 in. lbs.



**Fig. 10 – Installing Brush Box**



**Fig. 9 – Installing Brush Box**

Install two nuts on thru bolts and torque nuts to 15 to 20 in. lbs.

## Install Brush End Cap

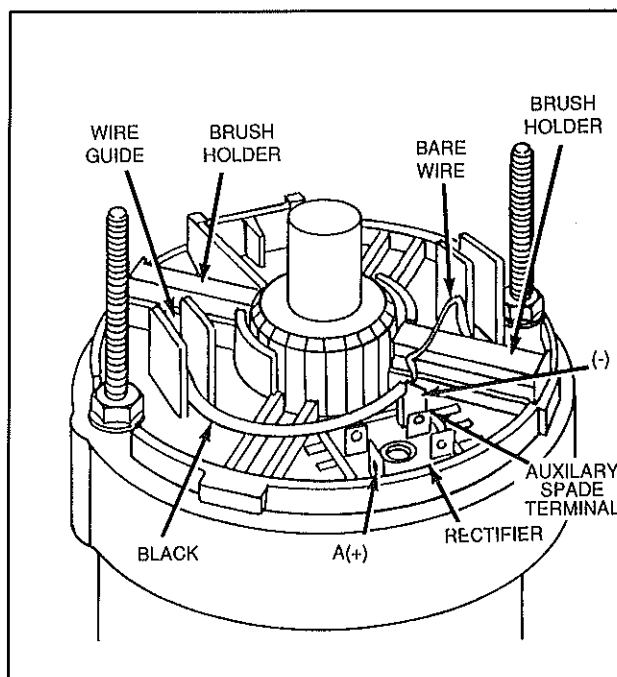
Install brush end cap over thru bolts and push cap down until it snaps into place, Fig. 2, Section 2

## Install Brush Box, Type #'s Below 0200

Install thru bolts thru bottom of drive end cap, if not already installed.

## Assemble Rectifier, Brushes, Brush Holders, and Lead Groups

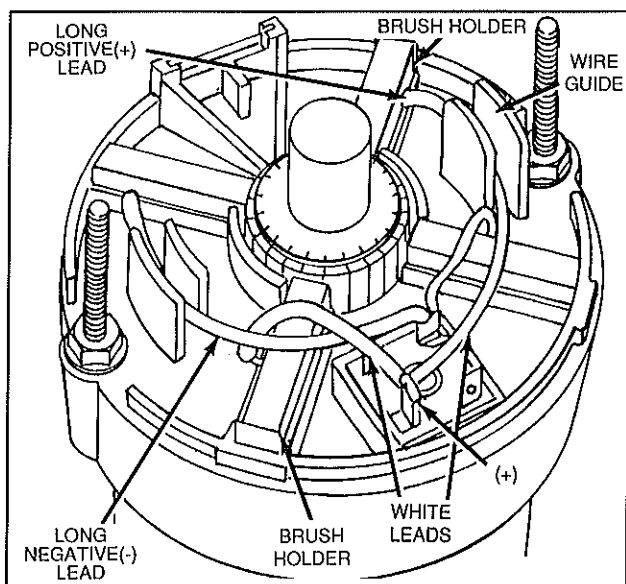
Place rectifier in recess with positive terminal at "A," Fig. 11. Place brush group with one bare wire and one black wire on negative (-) terminal of rectifier. Note position of auxiliary spade terminal, Fig. 11. Place black wire in wire guide.



**Fig. 11 – Installing Negative Brush Leads**

Place brush group with two WHITE wire leads on positive (+) terminal, Fig. 12.

# ASSEMBLY

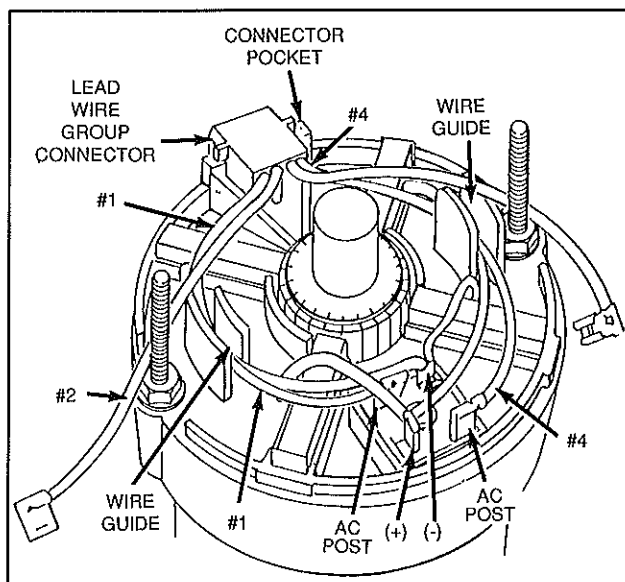


**Fig. 12 – Installing Positive Brush Leads**

Install brush holders and springs, Fig. 11 and Fig. 12. Note position of slack on long negative (-) lead and long positive (+) lead in wire guides. Move armature back and forth to check freedom of movement of brushes and brush leads in brush holders.

NOTE: Install outer brush retainers, when used, Fig. 14.

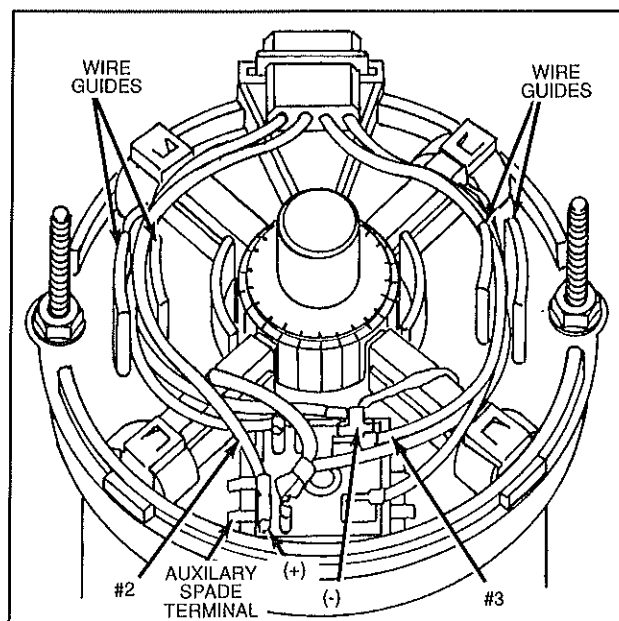
Place lead wire group connector in connector pocket with numbers down, Fig. 13. Place leads #1 and #4 in wire guides and route lead #1 under short WHITE brush lead to AC post, Fig. 13.



**Fig. 13 – Routing AC Leads**

Install lead #4 to other AC post, Fig. 13.

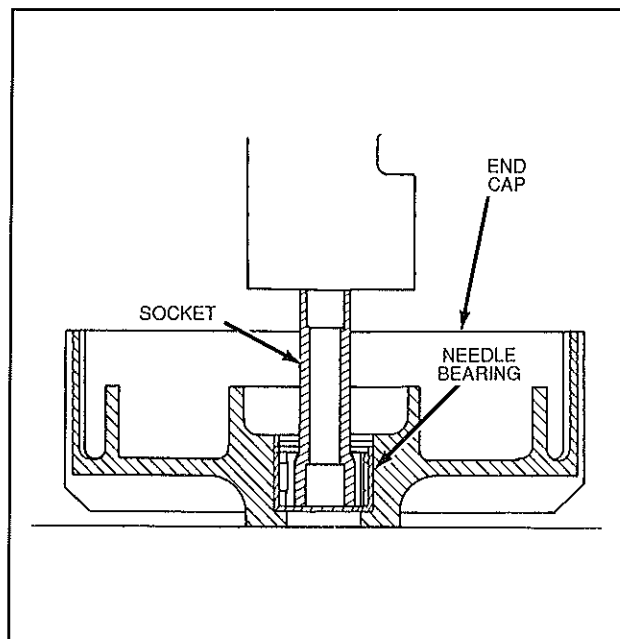
Place leads #2 and #3 in wire guides. Lead #2 goes to auxiliary positive spade terminal, (part of WHITE brush lead connector on positive terminal). Lead #3 goes to auxiliary negative (-) spade terminal, (part of BLACK and bare lead connector), Fig. 14.



**Fig. 14 – Routing Leads #2 and #3**

## Install Needle Bearing

Press needle bearing into brush end cap until seated, Fig. 15. Check to see that bearing is not loose. Replace brush end cap if bearing is loose.



**Fig. 15 – Installing Needle Bearing**

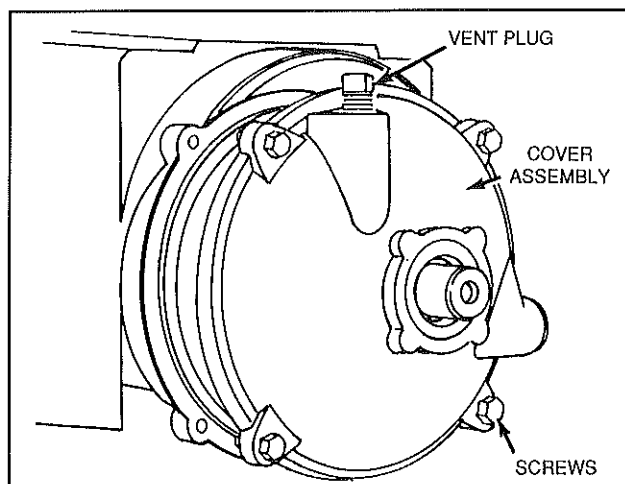
**Electric Motor Manual**

**Section 5  
ACCESSORIES**

**GEAR REDUCTION ACCESSORY**

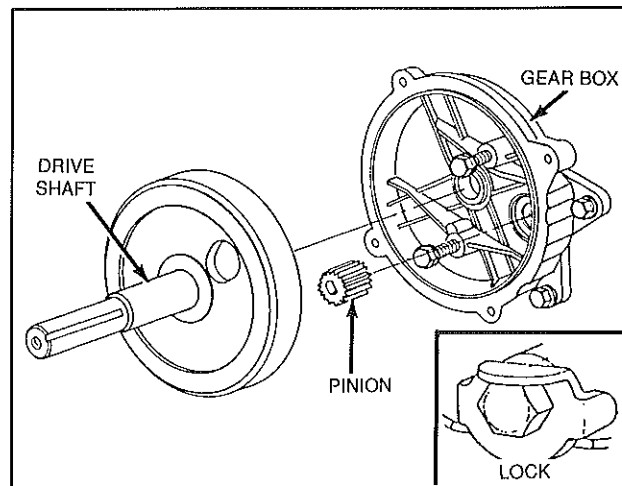
**Drain and Disassemble Gear Reduction**

Remove oil vent plug. Loosen four cap screws holding gear case cover assembly. Pull cover away from gear case assembly to drain gear box. After gear box is drained, remove screws and cover, Fig. 1.



**Fig. 1 – Draining Gear Reduction  
and Removing Cover**

Remove drive shaft assembly and pinion from gear box. Bend down two screw locks (optional) and remove four cap screws. Slide gear box off motor shaft and bearing housing assembly, Fig. 2.



**Fig. 2 – Removing Drive Gear, Pinion,  
and Gear Box**

**Inspect Gear Box**

Inspect oil seals for cracks, tears, or hardening. Replace seals if damaged or hard.

Inspect pinion and drive gear for worn, cracked, or chipped teeth. Replace if damaged, worn, or chipped.

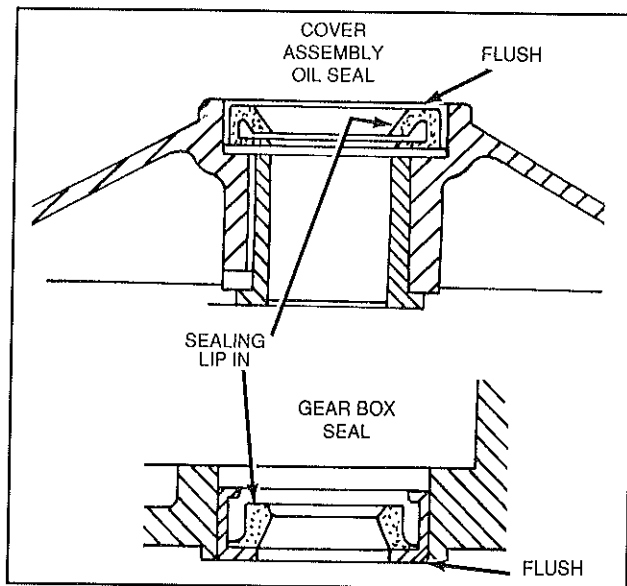
Inspect gear case and cover for cracks, damaged mounting or gasket surfaces. Replace if damaged.

**ASSEMBLE GEAR REDUCTION**

**Install Oil Seals**

Install oil seals with sealing lip towards inside of gear case or cover until metal case of seal is flush with outside of case or cover, Fig. 3.

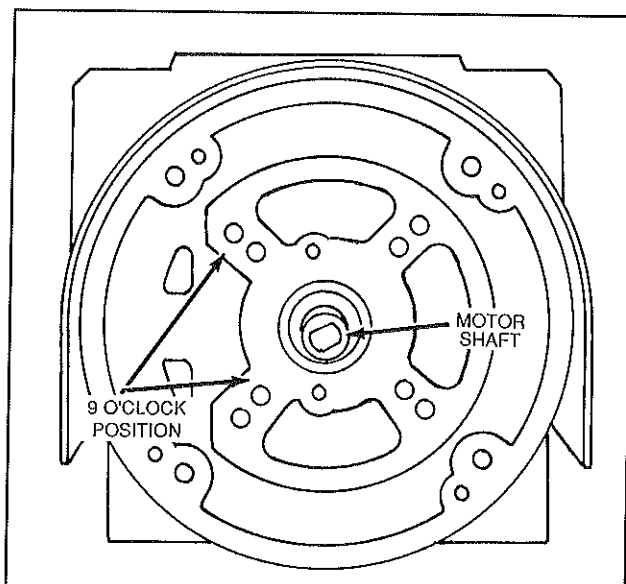
## ACCESSORIES GEAR REDUCTION



**Fig. 3 – Installing Seals**

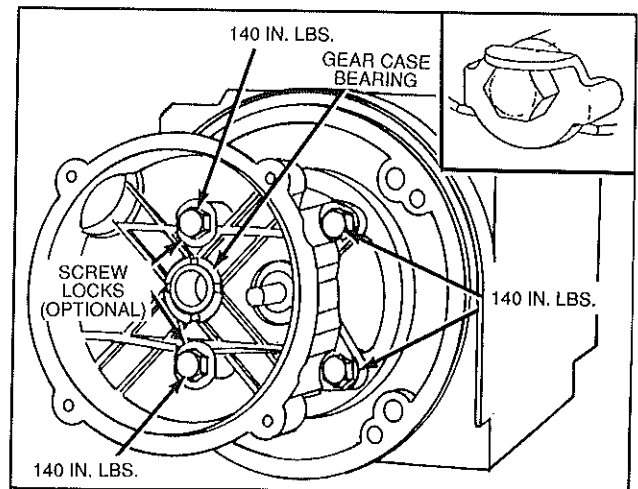
### Install Gear Case Assembly

**NOTE:** Because gear case can be installed in four different positions, the bearing housing must be installed in original position. The standard 9 o'clock position is shown in Fig. 4.



**Fig. 4 – Positioning Bearing Housing Assembly**

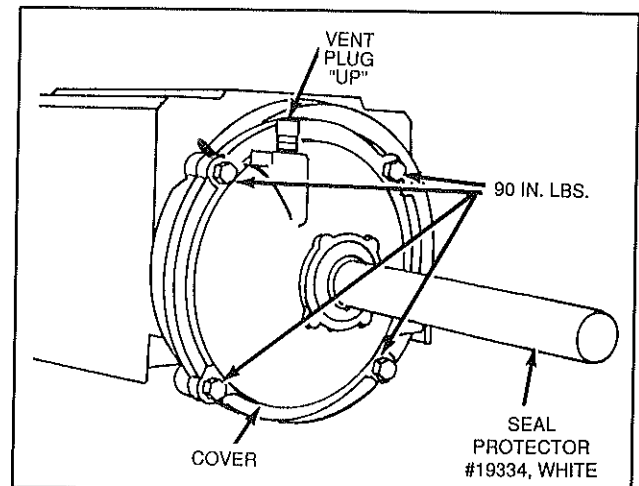
Slide gear case assembly onto motor shaft and bearing housing assembly. Install two short screws and lockwashers. Install two long screws and screw locks with tabs down and next to gear case ribs of gear case. Torque four screws to 140 in. lbs. Bend locks (when used) up against flats on head of cap screws, Fig. 5.



**Fig. 5 – Installing Gear Case**

Slide pinion onto motor shaft. Then slide drive shaft assembly into gear case bearing and engage pinion gear.

Insert Tool #19334, WHITE Seal Protector, into seal of gear case cover. Slide cover unto gear case until cover is seated on new gasket. Torque four screws to 90 in. lbs., Fig. 6. Remove seal protector.



**Fig. 6 – Installing Gear Case Cover**



## ACCESSORIES GEAR REDUCTION HYDRAULIC PUMP

### Fill Gear Case with Lubricant

To fill gear case, remove plugs with wrench. Fill gear case with SAE 30 weight oil for temperatures above 40° F. Use 10W30 weight oil between 40° and 0° F. Use 5W20 or 5W30 weight oil below 0° F. Fill gear case just to the point of overflowing at the lower hole. Install plug in lower hole and torque to 90 in. lbs. Install vent plug in top hole and torque to 40 in. lbs., Fig. 7.

NOTE: Vent plug has a hole in head of plug.

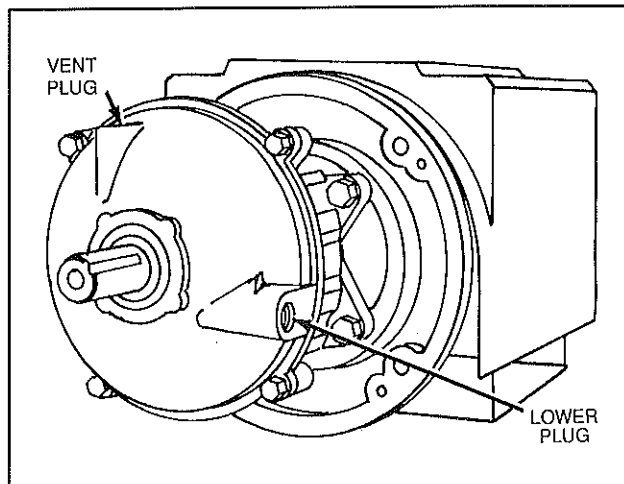


Fig. 7 – Filling Gear Case

### HYDRAULIC PUMP ACCESSORIES

Three general types of pumps have been supplied with Briggs & Stratton 1000 watt electric motors, two types by MTE (Mechanical Tool & Engineering Co.) and one by John F. Barnes Corp, both located in Rockford, IL.

### Remove Aluminum MTE Pump

Remove two allen head screws holding pump to bearing housing. Pump is located on bearing housing with a pilot ring. DO NOT LOSE pilot ring, Fig. 8.

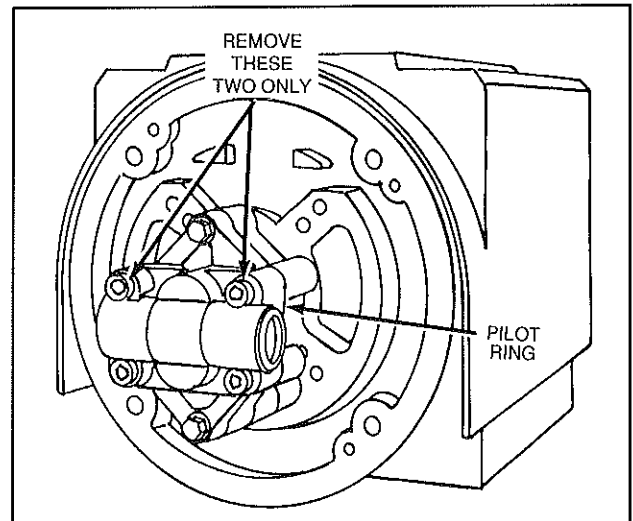


Fig. 8 – Aluminum Removing Pump

### Remove Cast Iron MTE Pump

Remove two screws holding pump on bearing housing, Fig. 9.

NOTE: Contact MTE for pump repair procedures or replacement.

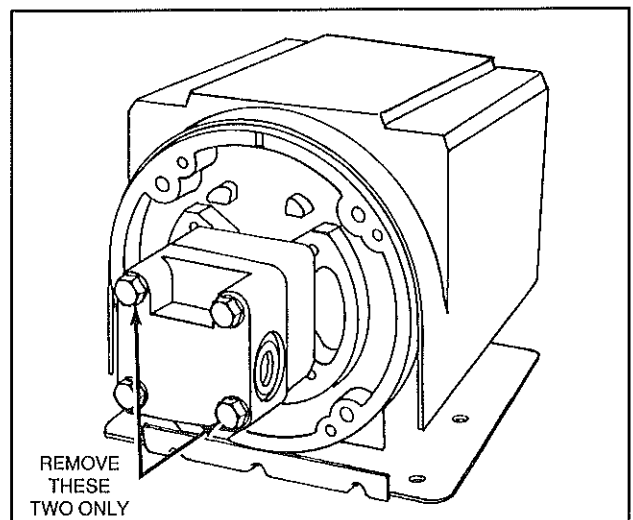


Fig. 9 – Removing Cast Iron Pump

## ACCESSORIES HYDRAULIC PUMP

### Remove John F. Barnes Pump

Remove four screws holding pump mounting flange to bearing housing, Fig. 10.

NOTE: Contact John f. Barnes Corp. for pump repair procedures or replacement.

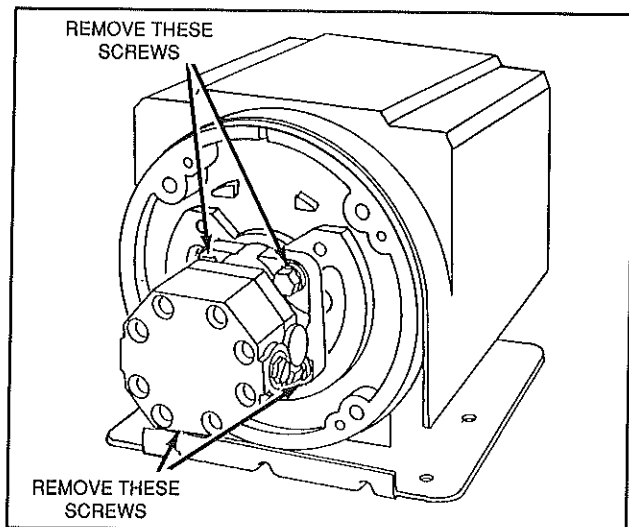


Fig. 10 – Removing Pump

### Install Aluminum MTE Pump

Place pilot ring in counterbore of bearing housing. Lubricate armature shaft slot with Lubriplate® or high pressure lubricant. Place pump bearing housing aligning driven tang with slot in armature shaft and pump pilot in hole of pilot ring. Rotate pump until mounting holes align and torque screws to 85 in. lbs., Fig. 12.

### Install Cast Iron MTE Pump

Place lubricant in slot of armature shaft such as Lubriplate® or high pressure lubricant. Align driven tang of pump with slot in armature shaft and mount pump on bearing housing. Rotate pump until two mounting holes align and install mounting screws with lockwashers and torque screws to 180 in. lbs., Fig. 11.

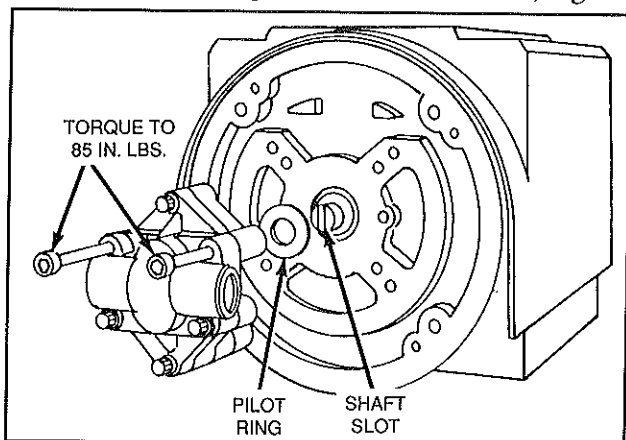


Fig. 11 – Installing Cast Iron MTE Pump

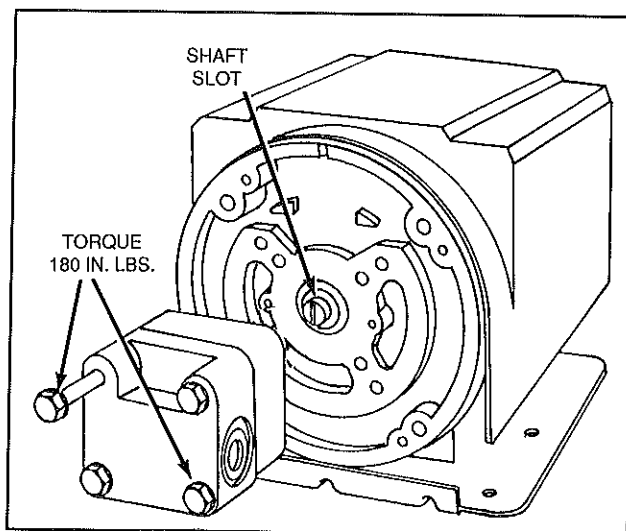


Fig. 12 – Installing Pump

### Install John F. Barnes Pump

Place lubricant in slot of armature shaft such as Lubriplate® or high pressure lubricant. Align driven tang of pump with slot in armature and mount pump on bearing housing. Rotate pump until four mounting holes align and install four mounting screws and lockwashers. Torque screws to 120 in. lbs., Fig. 13.

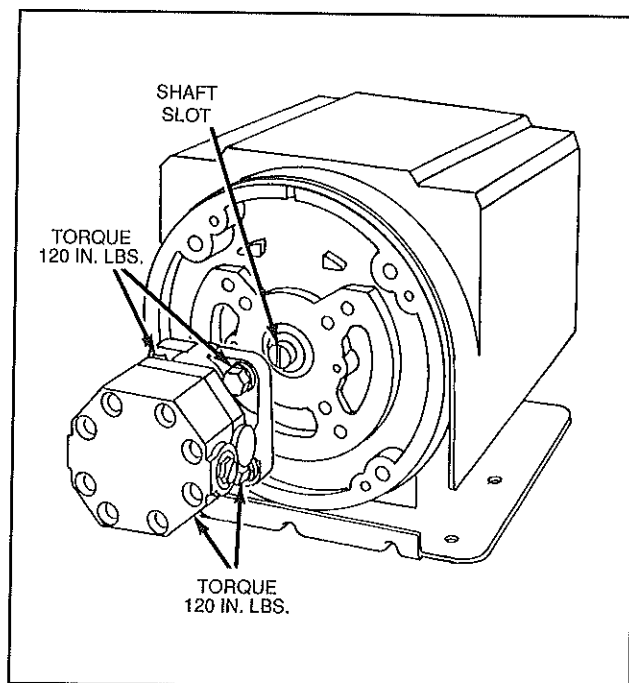


Fig. 13 – Installing Pump

## Install Brush End Cap

Two versions of brush end caps have been used. The first version had four bosses to hold down the outer end of the brush holders and a circular inner boss to hold down the inner ends of the brush holders, Fig. 16.

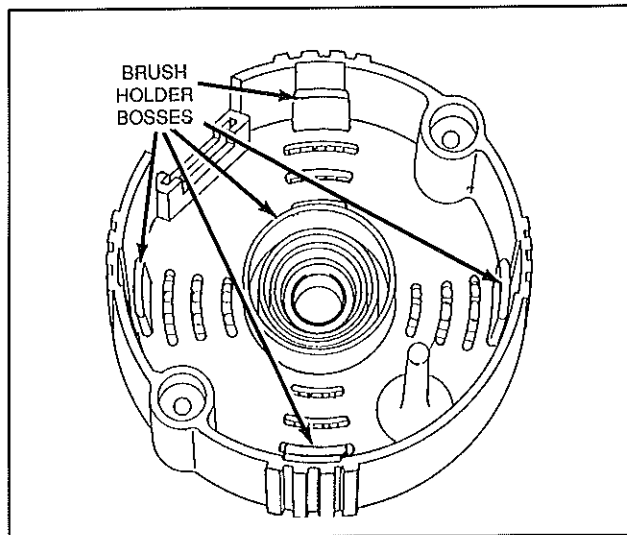


Fig. 16 – First Version

The current version used the inner circular boss only to hold down the inner ends of the brush holders. The outer ends were held with clips, Fig. 17.

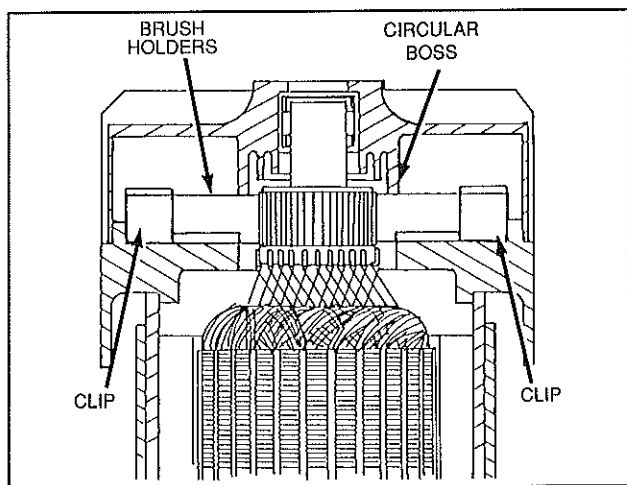


Fig. 17 – Second Version

Install brush box, either version, being sure wires are clear of bosses, Fig. 18. Install two flat washers and two nuts. Torque nuts to 20 to 25 in. lbs.

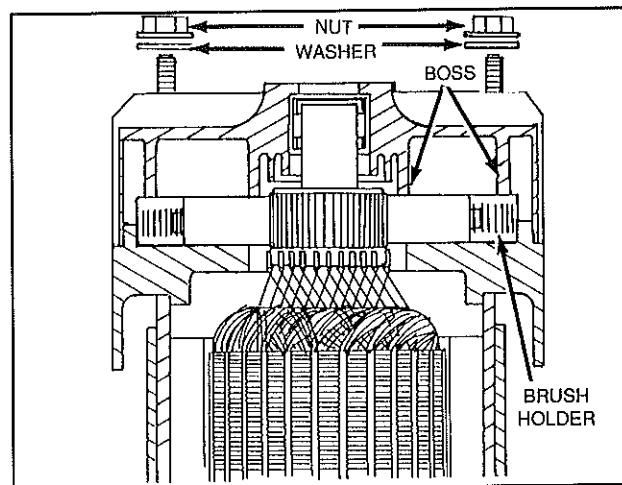


Fig. 18 – Installing Brush End Cap



**WARNING:** Before installing motor on equipment, test motor with a Hi-Pot tester.

## HI-POT TEST

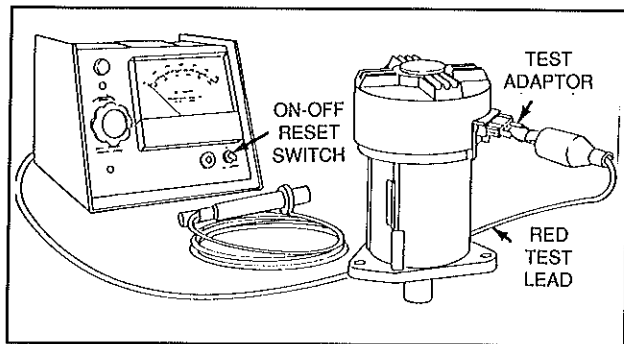
The function of Hi-Pot testing is to assure that the electric motor is safe to use by placing a high voltage across the motor to test internal insulation. An ohmmeter, voltmeter, or ammeter cannot do this.

**IF A HI-POT TESTER IS NOT AVAILABLE, HAVE MOTOR TESTED BY AN ELECTRIC MOTOR REPAIR SHOP BEFORE RETURNING MOTOR TO SERVICE.**

## TYPICAL HI-POT TESTER PROCEDURE

1. Turn Hi-Pot Tester "ON-OFF RESET" switch in "OFF" position.
2. Plug tester in AC grounded outlet.
3. Install test adapter, Tool #19278, into motor connector, Fig. 19.
4. Connect testers RED TEST LEAD to test adapter, Fig. 19.

# ASSEMBLY

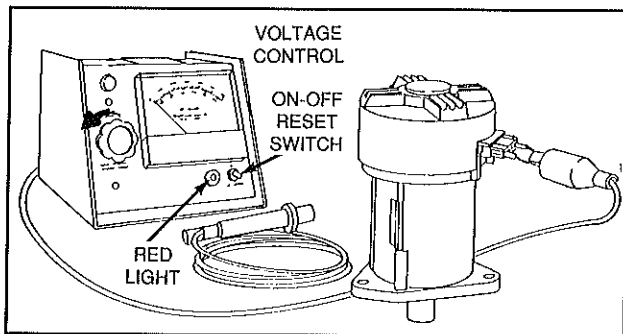


**Fig. 19 – Connecting Hi-Pot Tester**

5. Turn large voltage control knob counterclockwise (left) until knob stops, Fig. 19.
6. Turn “ON-OFF RESET” switch “ON.” RED light next to “ON-OFF RESET” switch will come on, Fig. 20.

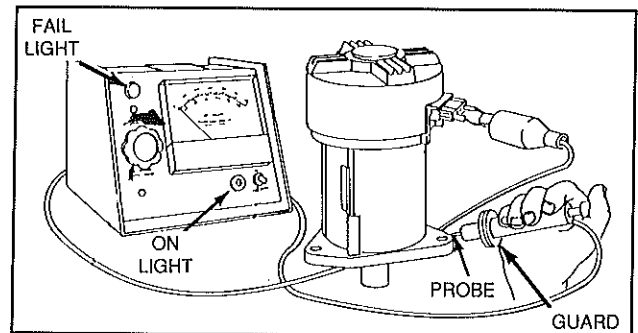
NOTE: Motor **MUST** be placed on an insulated surface. **DO NOT** come in contact with any part of motor during test.

7. With one hand, depress top of test probe with thumb and hand above guard and place probe firmly on motor base, Fig. 21.



**Fig. 20 – Testing for Hi-Potential Leakage**

8. With other hand, push in on voltage control knob and turn knob slowly clockwise (right) until meter reads 1500 volts and hold for ONE SECOND. Release knob.



**Fig. 21 –Testing for Leakage**



**WARNING: DO NOT REMOVE OR MOVE PROBE DURING TEST.** Turn tester off.

## TEST BLADE STOPPING TIME

Testing blade stopping time is only required for motors that will be used on rotary lawn mowers.

Install motor with cutter blade on mower deck before testing stopping time.

To test blade stopping time, follow instructions packed with Blade Monitor®, Tool #19255. Stopping time must be three seconds or less. If stopping time is more than three seconds, refer to “Troubleshooting, Section 3.”

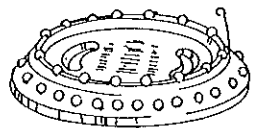
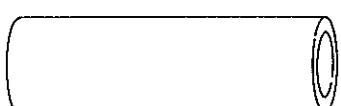
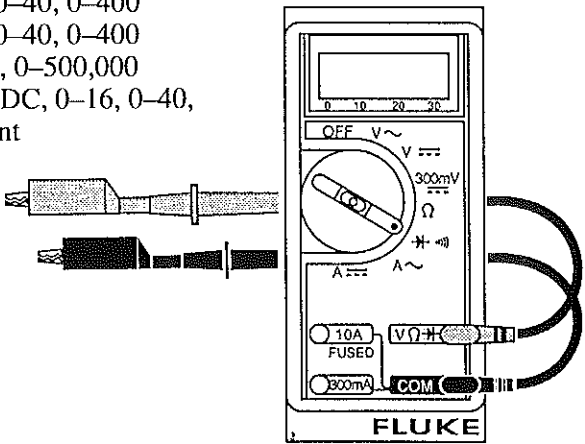
# Electric Motor Manual

## Section 6 TOOLS

### Electric Motor Service Manual

It is assumed that Authorized Briggs & Stratton Service Centers have common hand tools to repair electric motors.

The following tools or their equivalents are required to service Briggs & Stratton Model Series 101120, 748000 Electric Motors.

Tool No.	Description	Use
19200	Tachometer	Check Top No Load RPM 
19227	Cylinder Support	Support Brush End Cap When Removing Needle Bearing 
19357	Digital Multi-Meter	Check AC & DC Voltages Measures Resistance Measure AC & DC Amperes  Ranges: Volts, AC, 0-16, 0-40, 0-400 Volts, DC, 0-16, 0-40, 0-400 Ohms (resistance), 0-500,000 Amps, AC, 0-16, DC, 0-16, 0-40, & 0-400 with shunt 

# TOOLS

## BRIGGS & STRATTON REPAIR TOOLS (Cont'd.)

Tool No.	Description	Use
No Longer Available	Hi-Pot Tester	Checks for potential leaks or grounded conditions
19278	Hi-Pot Adapter	Output Voltage Variable – 0–3000 Volts AC. Leakage Detection – Approximately 3 Milliamps
19255	Blade Monitor	Test Motors for Blade stopping Time and Blade Tip Speed
19259 19260	Magnetic Pickup Trip Cord and Socket	
19334	Seal Protector Kit	Protect Seals When Installing Gear Case Covers

