Electrical System
108-118 Tractors

Service Manual No. 9-50221

J I Case
A Tenneco Company

TABLE OF CONTENTS

INTRODUCTION

DO NOT ATTEMPT EVEN MINOR ELECTRICAL ADJUSTMENTS WITHOUT THE AID OF PROPER TEST EQUIPMENT.

SAFETY

IMPORTANT SAFETY PRECAUTIONS THAT MUST ALWAYS BE OBSERVED WHEN WORKING AROUND ELECTRICAL SYSTEMS:

ALWAYS - UNHOOK THE BATTERY GROUND CABLE FIRST - AND HOOK IT UP LAST.

NEVER - CAUSE SPARKS TO OCCUR OR SMOKE NEAR BATTERIES THAT ARE CHARGING OR HAVE BEEN RECENTLY CHARGED.

NEVER - WEAR RINGS OR METAL WATCH BANDS THAT MAY GROUND A LIVE CIRCUIT.

THINK - OUT YOUR CIRCUIT BEFORE YOU MAKE OR BREAK A CONNECTION. A WRONG CONNECTION CAN BE PAINFUL AND EXPENSIVE.

BATTERY SERVICE AND INSPECTION

IMPORTANT! Working with storage batteries, all exposed metal surfaces are "live". Never lay a metal object on top of a battery as a short circuit may result. Sparks or open flame must be kept away from batteries due to the presence of explosive gas in and around the batteries while they are being charged or in use.

The sulfuric acid or electrolyte present in a battery is very harmful to your eyes, skin and clothing. If contact is made with it, wash it with a weak solution of baking soda and water. This will neutralize the acid.

VISUAL INSPECTION

Check the battery terminals and cables for dirty or corroded conditions which will cause high resistance, resulting in undercharged batteries and very poor cranking speed.

The battery tray, hold-down terminals and cable ends must be cleaned when contaminated, use baking soda and water. This will help to prevent self discharge of batteries. After cleaning and drying, a thin coating of Vaseline or light cup grease on terminals will help prevent contamination.

A cracked or leaking battery case will let the electrolyte leak out and cause damage to the equipment. A battery in this condition should be replaced. When just the top sealing compound is leaking, the battery can be resealed.

Vent holes in the filler caps should always be kept open to let the battery gases escape. Never remove battery caps except to add water.

The electrolyte level should be checked each week. Never let the level drop to a point where the plates are exposed. Odorless, clear water should only be added when the electrolyte level is low. DO NOT OVERFILL, refer to Figure 1.

Normal water consumption would be approximately 1 oz. every 25 hours or weekly. If it is greater, either the case is leaking or regulator is overcharging and must be adjusted.

SPECIFIC GRAVITY CHECK

The most reliable way to determine the concentration of sulfuric acid in the electrolyte is to measure the relative weight or specific gravity of the solution. A hydrometer is used for this, and only enough solution is removed from a battery cell so the float is suspended freely and not touching the top, bottom or sides of the glass tube, Figure 2. Always hold the hydrometer at eye level and in vertical position when taking a reading. A hydrometer reading is only correct when the temperature of the solution is 80° F.

NOTE

Most hydrometers have a calibrated thermometer to correct this.

When it is above or below this reading, it has to be corrected either by adding .004 gravity points for every 10° above 80° F., or subtracting .004 gravity points for every 10° below 80° F., Figure 3.

When the specific gravity readings between the cells show a variation of .025, the battery should be replaced.

The battery should never be allowed to drop below 75% charge while not in use.

State of Charge	Specific Gravity Range
100%	1.260
75%	1.230
50%	1.200
Discharged	1.110

When a battery is to be charged, it may be charged at a rate of 3 amps. The battery temperature should never exceed 110° F., while charging. If it does, reduce charging rate.

The charger should be left on until the specific gravity readings stay the same after three checks of an hour apart.

CAUTION: DO NOT USE FAST CHARGER!

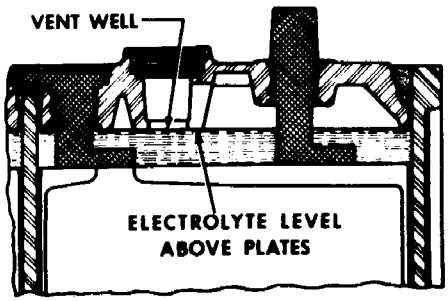


Figure 1

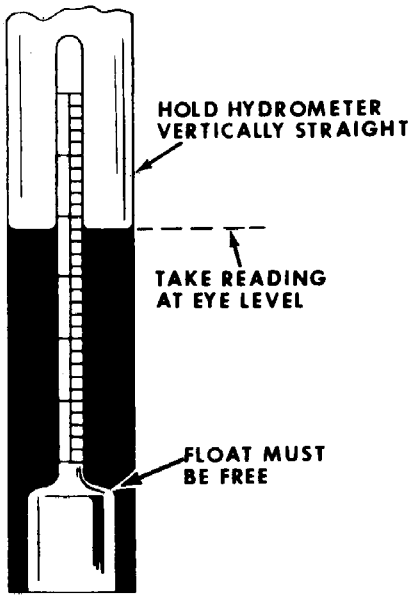


Figure 2

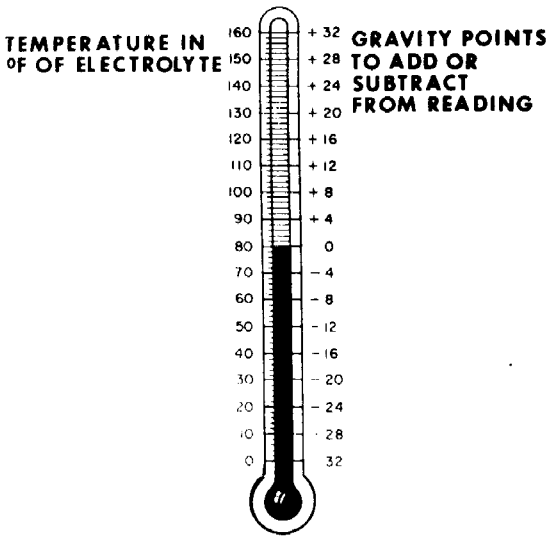


Figure 3

12 VOLT STARTER MOTORS

Cranking Motor Operation Time Limits

USING THE STARTER, Due to size requirements, these starters have certain cold weather limitations. Below 32° F., use clean 10W oil in engine.

NOTE:

BE SURE unit is in neutral and all blades, belts and clutches are disengaged to relieve engine load.

1. NEVER RUN STARTER OVER 30 SECONDS CONTINUOUSLY.
2. Allow 3 FULL MINUTES between each 30 second cranking period.
3. DO NOT repeat steps 1 and 2 more than 6 times. If engine does not start during intervals outlined above, there is a mechanical reason. Check and correct.
4. Allow 30 MINUTES before beginning cycle outlined again.

108 - 118 TRACTORS

Failure to observe above time limits will overheat electric motor causing permanent and expensive damage.

STARTER DIAGNOSIS

These starter motors use a gear type engagement method, similar to an automobile starter. When the starter motor is activated, the helix on the starter motor shaft drives a pinion gear into engagement with a ring gear attached to the engine flywheel, and cranks the engine.

If a starting problem is encountered, check the engine thoroughly to be sure it is not the cause of starting difficulty. It is a good practice to remove the spark plug and rotate the crankshaft by hand, to be sure it rotates freely. Any belt, clutch, or other parasitic load will affect cranking performance.

1. Cranks Engine Slowly -
   - A. Battery discharged
   - B. Faulty electrical connection
   - C. Additional load affectng performance
   - D. Dirty or worn starter motor commutator, bearing, etc.
   - E. Worn brushes or weak brush spring
   - F. #30 engine oil below 40°
2. Engine Will Not Crank -
   - A. Discharged or defective battery
   - B. Faulty electrical connection
   - C. Faulty starter motor switch (open circuit)
   - D. Brushes sticking, etc.
3. Starter Motor Spins, But Des Not Crank Engine -
   - A. Sticking pinion gear due to dirt
   - B. Damaged pinion or ring gear
   - C. Incorrect rotation due to reversed motor polarity - all motors rotate counter-clockwise.

BATTERY CRANKING VOLTAGE AND STARTER CIRCUIT TESTS

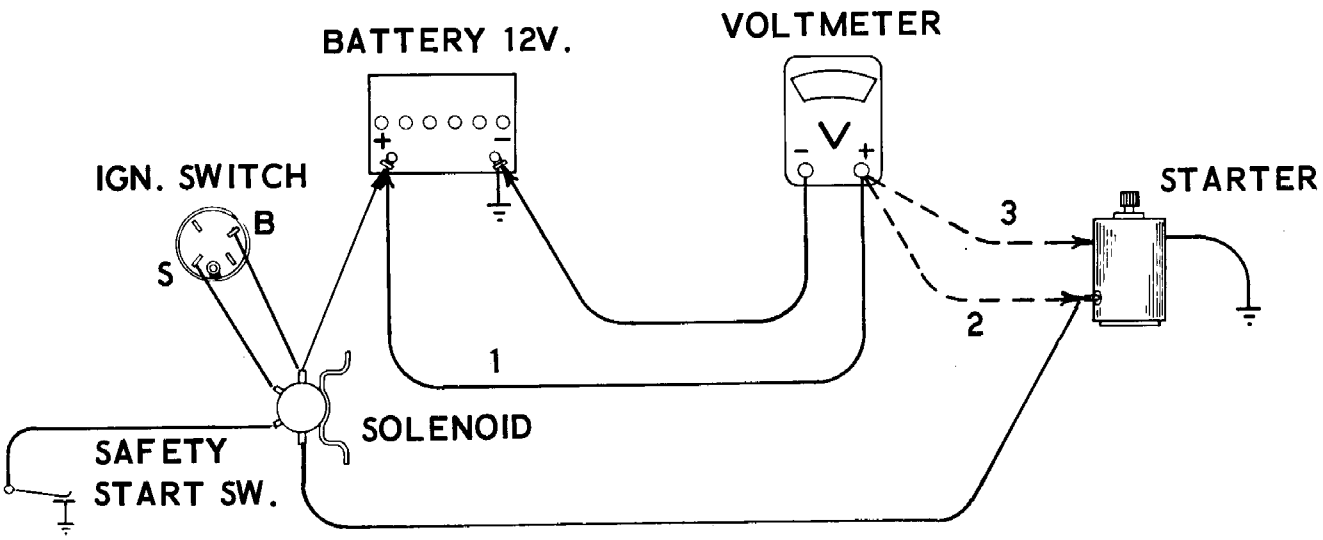


Figure 4

NOTE:
Before testing, disconnect spark plug lead and ground to prevent engine from starting and prevent coil damage. Press clutch - brake pedal fully, and be sure P.T.O. is disengaged to activate safety start switches.

ELECTROLYTE: Temperature: 60° F. to 80° F.

Battery specific gravity must be 1.225 or above and even within .025 points between highest and lowest cells.

NOTE:

Complete the following checks in sequence listed before troubleshooting individual circuits.

1. AVAILABLE VOLTAGE - BATTERY CONDITION: Connect a voltmeter between the positive and negative terminals of the battery. #1 - Figure 4: Crank the engine for 30 seconds and record the voltage. Should be 9.5 volts minimum (if less, recharge or replace battery).

2. INSULATED CIRCUIT RESISTANCE TEST: Move red voltmeter clip to starter Terminal #2 - Figure 4. Crank engine and record voltage. If more than .5 volt less than in Step #1 above, check cables, connections or solenoid.

3. GROUND CIRCUIT RESISTANCE TEST: Move red voltmeter clip to ground on starter housing, #3 - Figure 4. Crank engine, if more than .2 volt appears on meter, check starter frame mounting at starter and at engine block, negative cable and connections at engine and battery negative terminal.

CIRCUIT PROBLEM ISOLATION

1. LOCATING INSULATED CIRCUIT PROBLEMS - Move red voltmeter clip backwards one terminal step at a time toward battery positive while cranking the engine. A sudden change in voltage drop indicates you have located problem area.

2. LOCATING GROUND CIRCUIT PROBLEMS - Move the red clip one step at a time - starter to bracket, to engine, to ground cable, ground cable terminal to battery negative.

VOLTAGE DROPS ALLOWED - STARTER CIRCUIT

Battery to Starter	.5V	Max.
Each Cable	.1V	Max.
Solenoid	.1V	Max.
Each Connection	.0V	Max.
Ground Circuit	.2V	Max.

SERVICE PROCEDURES - 12 VOLT DC ELECTRIC STARTER.

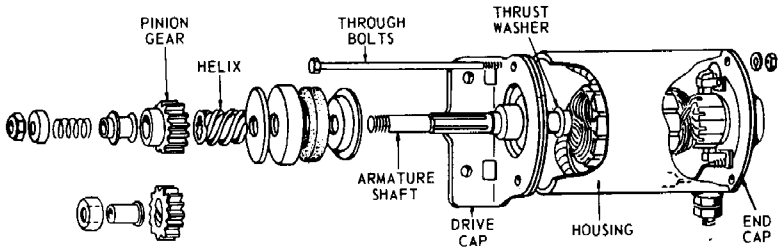


Figure 5

CHECKING STARTER MOTOR DRIVE

When the starter motor is activated, the pinion gear should rise, engaging the flywheel ring gear, and crank the engine. This action can be observed by removing the starter shield. If the starter motor drive does not react properly, inspect the helix and pinion gear for freeness of operation. If any sticking occurs, this must be corrected. Proper operation of the starter is dependent on the pinion freely moving on the helix. See Fig. 6.

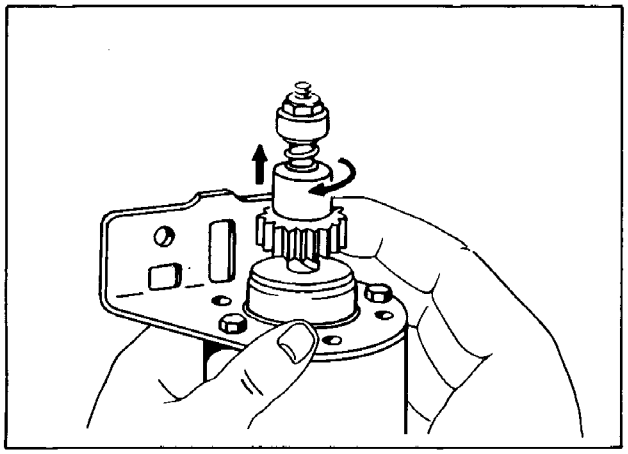


Figure 6

DISASSEMBLING STARTER MOTOR DRIVE

To remove the drive assembly for cleaning or replacement, clamp the pinion gear in a vise having brass jaws, to prevent damage to the gear teeth. The lock nut may be to the gear teeth. The lock nut may then be removed and the starter drive disassembled for cleaning or replacement.

The pinion gear should be inspected for damaged teeth. If a sticking condition exists between the pinion gear and the helix, the parts may be washed in a solvent such as Stanasol or Varsol. If the sticking condition is not corrected by cleaning, the complete drive assembly must be replaced. Individual parts of the drive assembly are not available.

ASSEMBLING STARTER MOTOR DRIVE

Reverse disassembly procedure for assembling. The interior of the shaft screw has a spline machined to the center; when assembling, the spline must face the end of the armature shaft. See Fig. 7. Torque the lock nut to 170 inch pounds. This torque has an affect on pinion travel, so proper torque should be maintained. NOTE: Do not lubricate Drive Assembly.

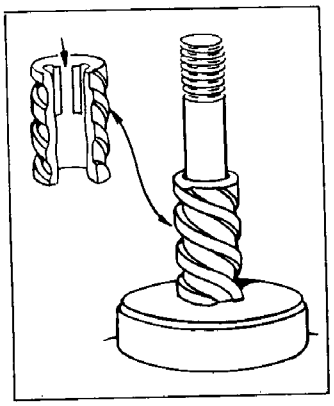


Figure 7

DISASSEMBLY OF STARTER MOTORS

Remove the lockwasher, nuts and thru bolts. See Fig. 8. The armature, drive cap and gear drive can now be removed as an assembly.

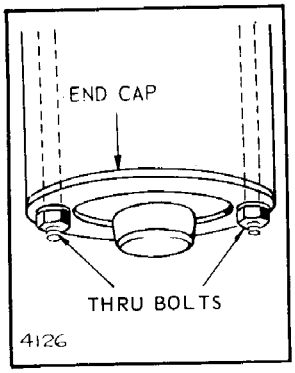


Figure 8

NOTE: THRU BOLTS AND NUTS MUST BE PLACED IN THE SAME POSITION AS WHEN REMOVED, OR INTERFERENCE MAY RESULT.

(See checking starter motor drive if repair, cleaning or replacement of drive assembly is necessary).

CAUTION: Do not clamp the motor in a vise or strike the motor with a hammer. Some motors include two powerful ceramic magnets which can be broken or cracked if the motor housing is deformed or dented.

To remove the end cap, lift the brush springs and slide brushes out of the brush holders.

Clean all dirt or corrosion accumulations from the armature, end cap, motor support, etc. The bearings, housing and armature should not be soaked in a cleaning solution. The armature commutator may be cleaned with a fine sand paper. Do not use emery cloth, as emery will embed in the commutator and cause rapid brush wear. If it is suspected that the armature or field coil is defective, a new armature or field coil should be tried in the motor. If proper testing equipment is available, check the suspected armature or field coil to determine if it is defective. The brushes should be checked for poor seating, weak brush springs, dirt, oil or corrosion. Brush spring pressure should measure from 17 to 25 ounces. Also check to be sure brushes are not sticking in their respective brush holders. See Fig. 9.

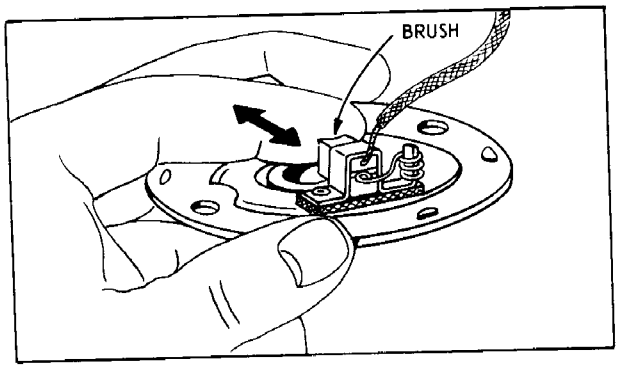


Figure 9

ASSEMBLY OF STARTER MOTORS

When all parts have been thoroughly inspected, lightly lubricate the end cap bearings with #20 oil, and reassemble in the following manner.

Insert the brushes in their respective holders. NOTE: A tool such as shown in Fig. 10 should be used to hold the brushes clear of the armature commutator when assembling the end cap to the housing.

Slide the armature into the housing, being sure to match the drive cap keyway to the stamped key in housing. Assemble end cap, again matching the keyway to key in housing. Care should be used to prevent damaging ceramic magnets where used.

Assemble thru bolts, lockwashers and nuts. NOTE: THRU BOLTS AND NUTS MUST BE PLACED IN THE SAME POSITION AS WHEN REMOVED OR INTERFERENCE MAY RESULT.

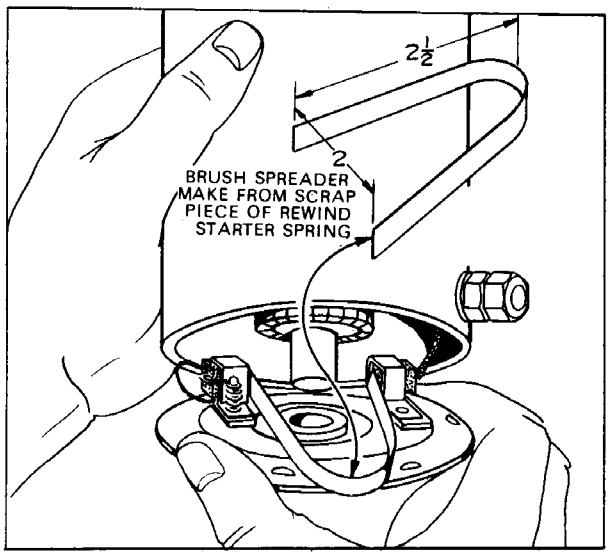


Figure 10

The starter motor is now ready for installation to the engine.

PERFORMANCE NO-LOAD TEST

A performance test of the 12 volt starter motor may be made in the following manner.

Equipment Needed -

1. A tachometer capable of reading 10,000 R.P.M.
2. A 6 volt battery ± 0.3 volts
3. An ammeter capable of reading 50 amperes

Connect the starter motor, battery and ammeter as shown on the accompanying illustration. See Fig. 11.

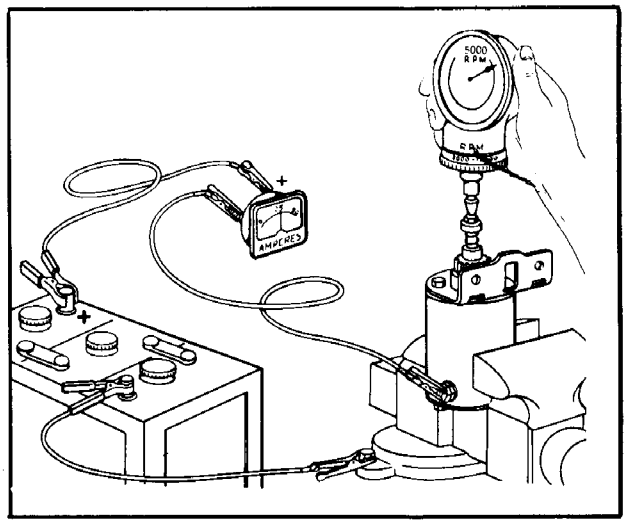


Figure 11

Insert the tachometer in the end of the starter motor and activate the starter motor. A starter motor in good condition will be within the following specifications.

1. Starter motor R.P.M. - 5,000 minimum.
2. Current draw (amperes) - 25 maximum. (Disregard surge current)

If the starter motor does not perform satisfactorily, the following should be checked, and corrected if necessary.

1. A binding or seizing condition in the starter motor bearings
2. Starter motor brushes sticking in brush holders
3. A dirty or worn armature commutator or brushes
4. A shorted, open, or grounded armature or field coil
5. A defective starter motor switch

SOLENOID ENERGIZING CIRCUIT TEST

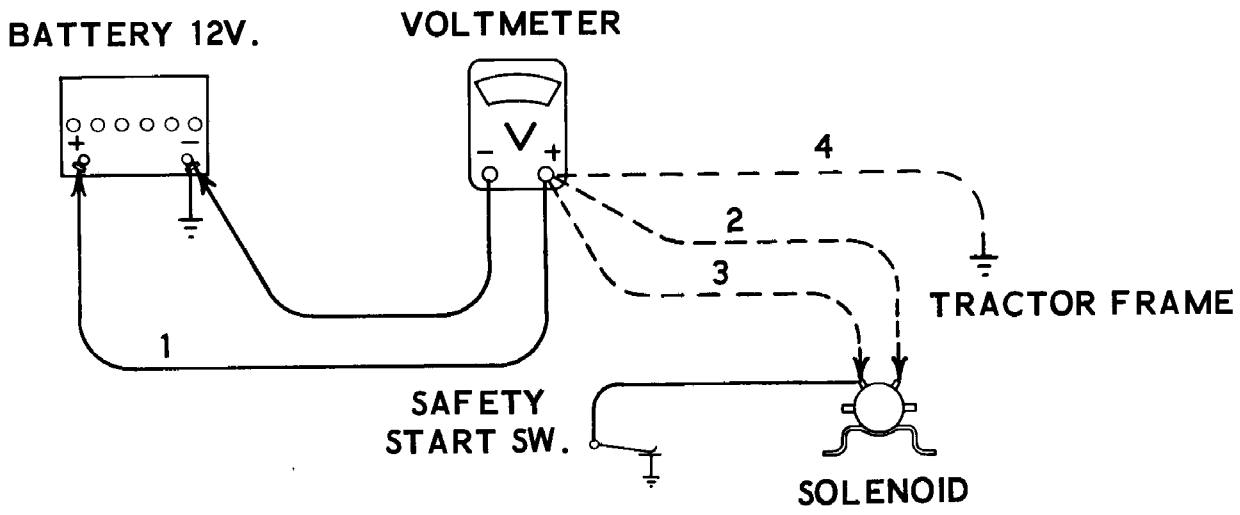


Figure 12

Disconnect spark plug lead and ground to engine, to prevent engine starting and possible coil damage.

1. Connect red voltmeter lead to battery positive terminal, black to battery negative #1. Crank engine and record voltage. See Figure 12.

2. Move red clip to solenoid energizing terminal #2. Crank engine. Voltage should be within .3 volt of voltage recorded in Step 1 above.

3. Move red clip to solenoid grounding terminal #3. Crank engine. Voltage should not exceed .2 volt.

4. If test 3 above is in excess of 0.2 volt, move red clip to ground on frame #4. Reading should be 0 - .1 volt. This indicates trouble in safety start switch.

INTERPRETATION OF ABOVE

From Step 2:

a. No Voltage Drop Step #2 - Open solenoid winding, loose or dirty connections or broken wire between solenoid ground terminal and safety start switch. Safety start switch dirty, not making contact with travel or clutch lever. Travel lever or clutch to frame ground faulty or open.

b. Voltage Drop Greater Than Step #2 - Loose or dirty connections or frayed wire between battery and ignition switch, faulty switch, or loose or dirty connections or frayed wires from switch to solenoid.

From Step 3:

a. No Voltage Drop Step #3 - Loose or broken wire between solenoid ground terminal and safety start switch, safety start switch dirty, not making contact with travel lever or clutch lever, travel lever or clutch to frame ground faulty or open.

b. Voltage Drop Greater Than Step #3 - Loose or dirty connections or frayed wires between solenoid ground terminal and safety start switch, poor connection between travel lever or clutch lever and frame of tractor.

CODED WIRING DIAGRAM 108 - 118

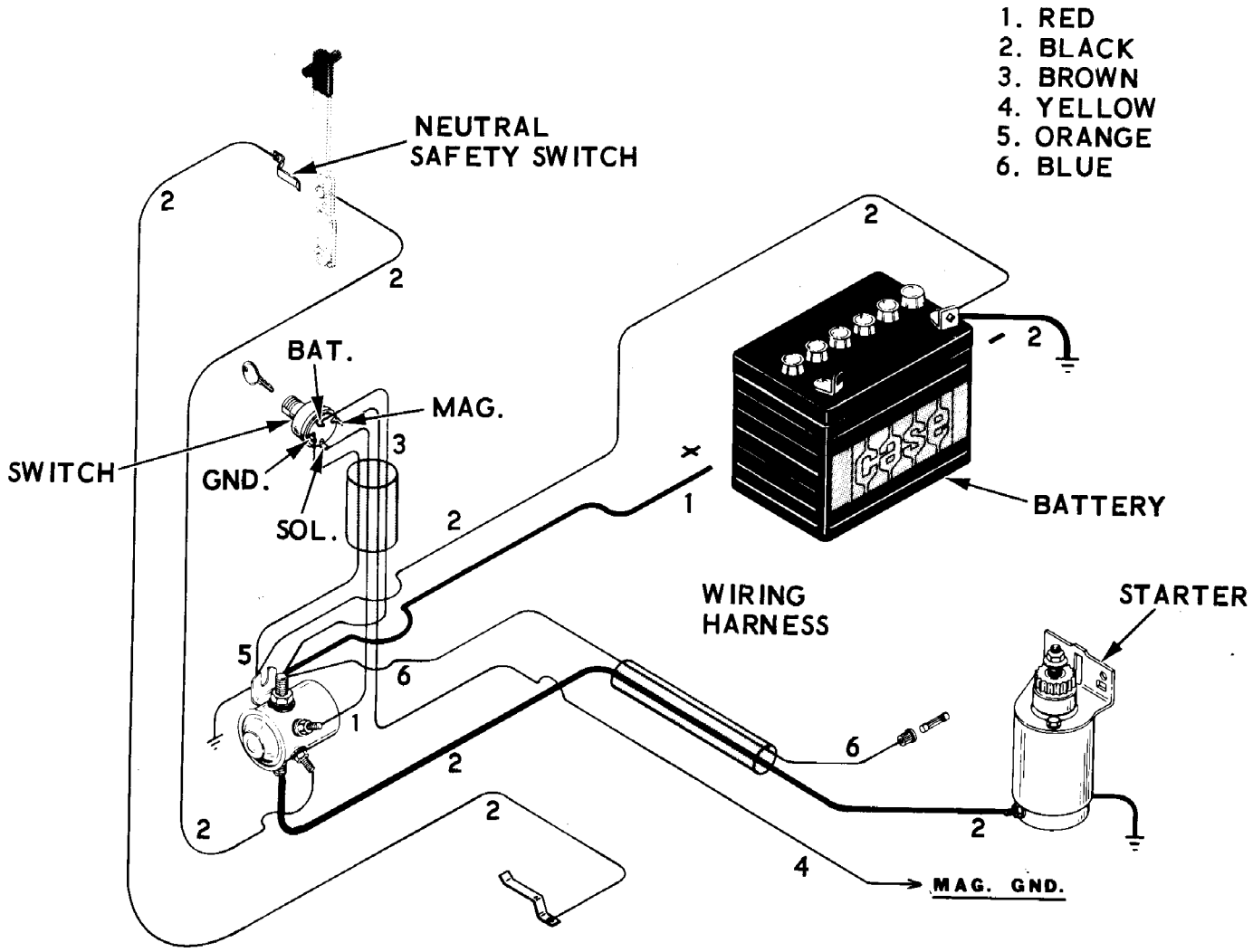


Figure 13

CHARGING CIRCUIT

This efficient gear drive, 12 volt battery powered starter system is compact and powerful. Recommended battery sizes range from 20 ampere hour for warm temperature service to 40 ampere hour in coldest service.

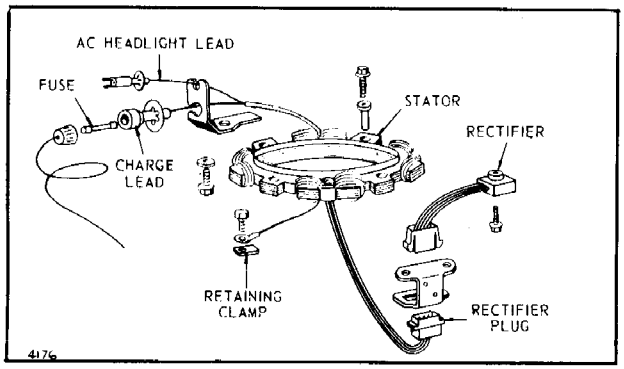


Figure 14

THE DUAL CIRCUIT ALTERNATOR

The Dual Circuit Alternator is actually two separate alternators. A single ring of magnets inside the flywheel supplies the magnetic field for both of them. One alternator uses a solid state rectifier and provides battery charging current. The other alternator feeds alternating current directly to the lights. Since the two are electrically independent, use of the lights does not reduce the charge going into the battery. The battery is not used for the lights, so lights are available even if the battery is disconnected or removed.

Current for the lights is available as long as the engine is running. The output depends upon engine speed. Twelve-volt lights with a total rating of 60 to 100 watts may be used. With lights rated at 70 watts, the voltage rises from 8 V at 2400 RPM to 12 V at 3600 RPM, so the brightness of the light changes with the engine speed. The 5 amp. lighting alternator uses less than .2 of a horsepower at full output.

The current from the battery charging alternator is unregulated and is rated at 3 amperes. The output rises from 2 amperes at 2400 RPM to 3 amperes at 3600 RPM, and uses less than .2 of a horsepower.

There are two external connections. The battery charging current connection is made through a 7.5 ampere fuse mounted in a fuse holder beside the starting motor. Current for the lights is available at a plastic connector located below the fuseholder. The two connections are different so they cannot be accidentally interchanged. The fuse protects the 3 amp. charging alternator and rectifier from burnout due to improper (reverse polarity) battery connections. The 5 amp. lighting alternator does not require a fuse as a short circuit in its output will not damage it. The return circuit for both alternators is through ground to the engine block.

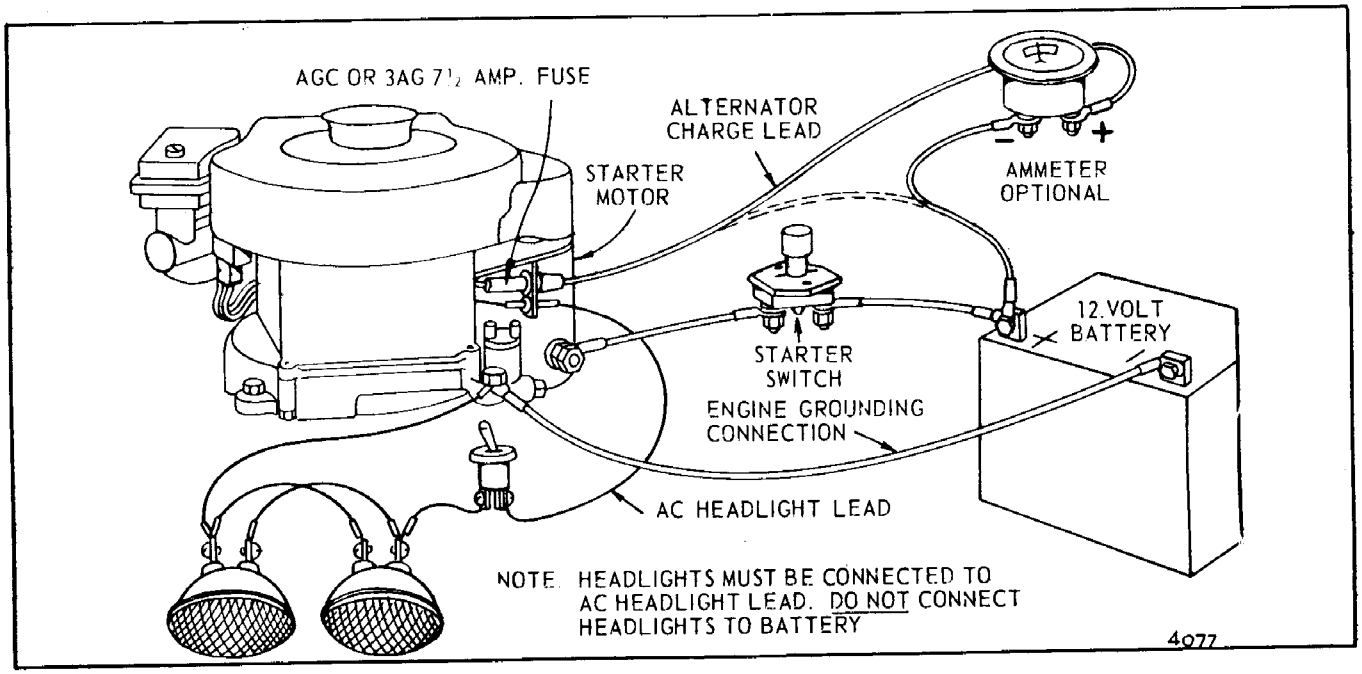


Figure 15

EQUIPMENT REQUIRED TO TEST ALTERNATORS

1. Ammeter

Range 20-0-20; available from automotive parts supplier or use Briggs & Stratton No. 295158. Attach leads and alligator clips as shown in Figure 16. NOTE: Ammeter from multimeter may be used if 15 amp. range available.

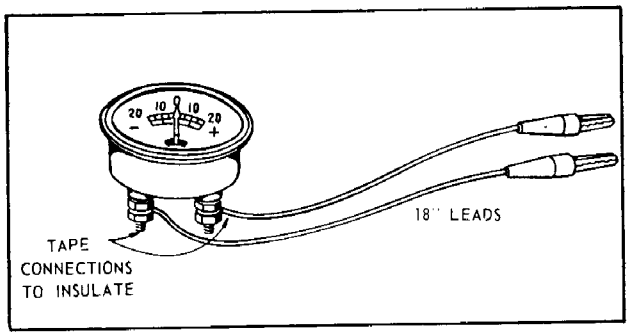


Figure 16

2. Test Lamp

12-volt bulb and bulb holder; available from automotive parts supplier, or use Briggs & Stratton No. 67245 bulb and No. 298586 bulb holder. Attach leads and alligator clips as shown in Figure 17.

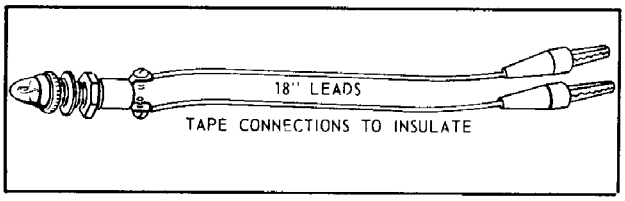


Figure 17

3. Fuse Cap Test Lead

No. 390313 fuse cap. Attach alligator clip as shown in Figure 18.

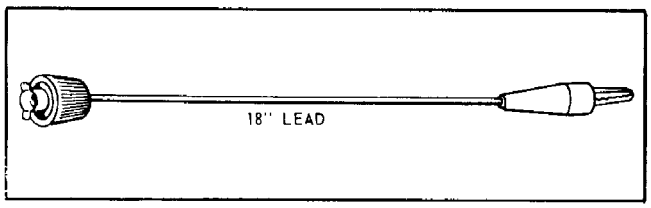


Figure 18

4. Load Lamp

G.E. No. 4001 sealed beam headlight or equivalent. Available from automotive parts supplier. Attach leads and clips as shown in Figure 19.

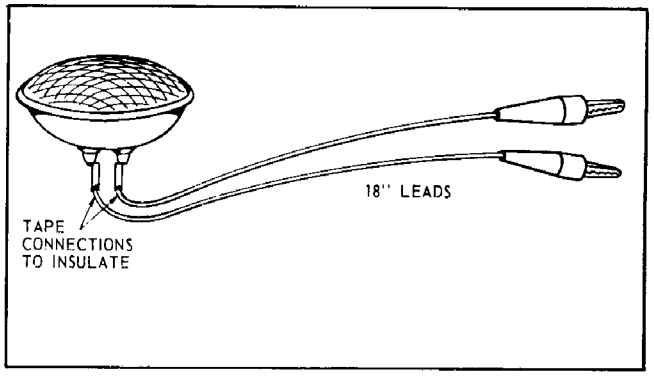


Figure 19

5. Fuses

AGC or 3AG, 7-1/2 ampere fuse, Available from automotive parts supplier, or Briggs & Stratton No. 67125 (7-1/2 amp.)

6. Multimeter

Eico Tester No. 540 or equivalent; available from radio or electronic parts supplier.

CHECKING DUAL CIRCUIT ALTERNATOR

Fuse Blown

Check if battery polarity is correct: Negative (-) side of battery should be grounded to engine or frame; positive (+) side of battery to (fused) alternator output lead. Figure 20. If reversed, correct and put in new fuse.

WHEN CHECKING ALTERNATOR COMPONENTS, MAKE THE TESTS IN THE FOLLOWING SEQUENCE:

BATTERY RUNS DOWN

Testing Alternator Charging Output

Install ammeter in series with charging lead, as in Figure 20. Start engine. Ammeter should indicate charge. The charge rate is dependent upon the condition of the battery.

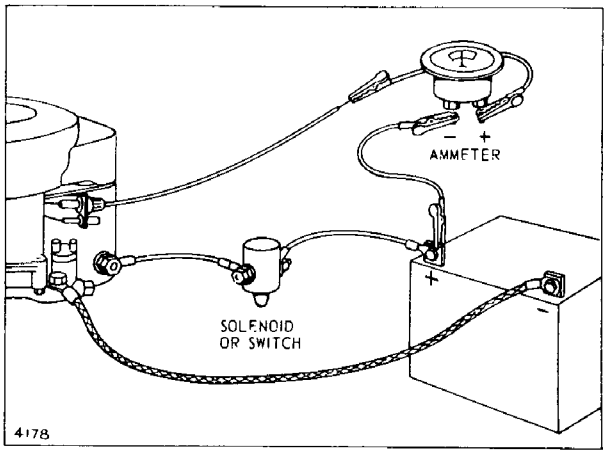


Figure 20

If ammeter shows no charge, test stator and rectifier.

Testing for Short in Stator or in Rectifier

Disconnect charging lead from battery, and connect small test lamp in series between battery positive terminal and fuse cap as shown in Figure 21. DO NOT START ENGINE. Test lamp should not light. If it does light, stator's charging lead is grounded or rectifier is defective. Unplug rectifier plug under blower housing. See Figure 22. If test light does not go out, stator charging lead is grounded.

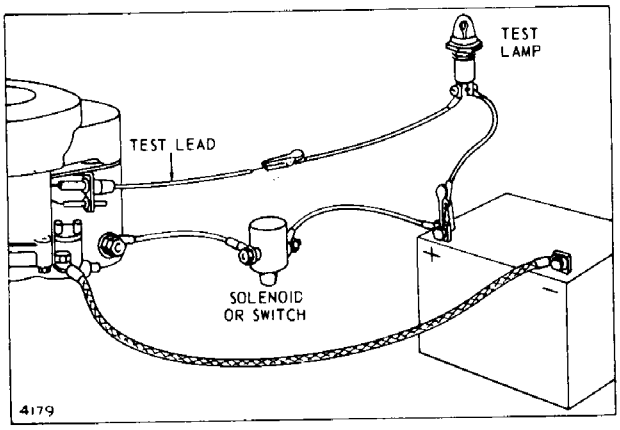


Figure 21

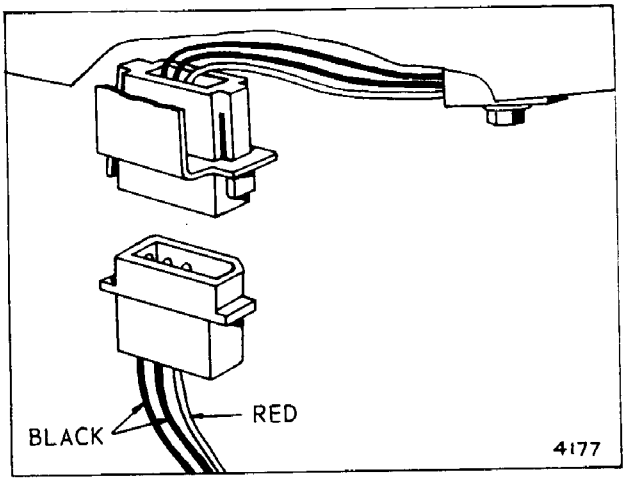


Figure 22

Testing Stator Charging Coils

If "short" test indicates stator charging lead is grounded, remove blower housing, flywheel, starter motor and retaining clamp (See Figure 23) and examine length of red lead for damaged insulation or obvious shorts on lead. If bare spots are

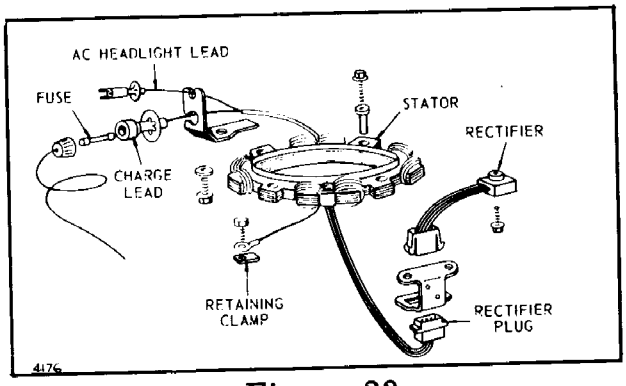


Figure 23

found, repair with electrical tape and shellac. If short cannot be repaired, replace stator. Charging lead should also be checked for continuity as follows: Use multimeter set on resistance scale. Touch one test prod to lead at fuse holder. Touch other test prod to red lead pin in plastic connector: See Figure 24. Unless the meter shows continuity, the charging lead is open and the stator must be replaced.

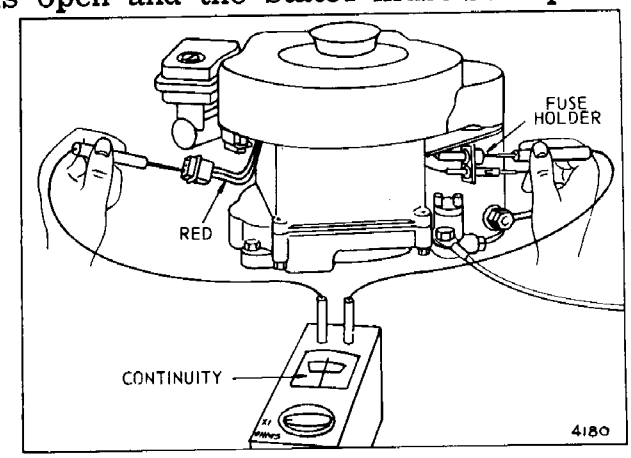


Figure 24

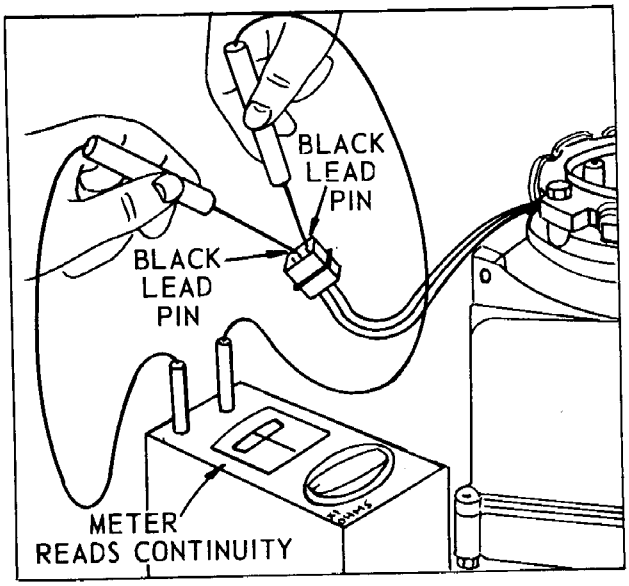


Figure 25

The charging coils should be checked for continuity as follows: Using the multimeter, touch one test prod on each of the black lead pins as shown in Figure 25. If meter does not show continuity, charging coils are defective and stator must be replaced. Test for grounded charging coils by touching one test prod to a clean "ground" surface on the engine and touching the other test prod on each of the black lead pins as shown in Figure 26. If the meter shows continuity, the charging coils are grounded and stator must be replaced.

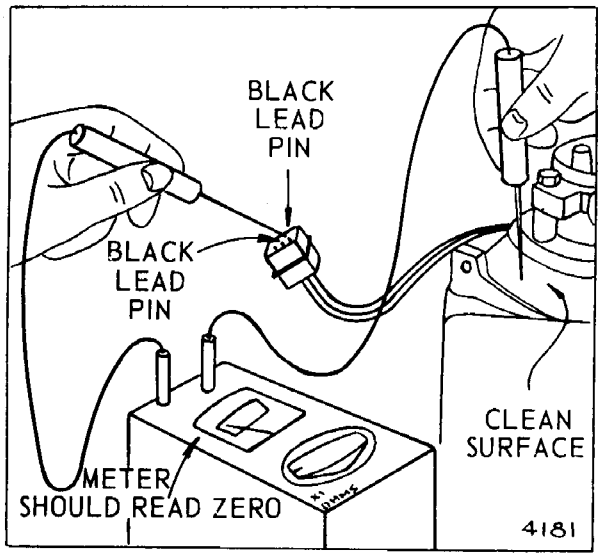


Figure 26

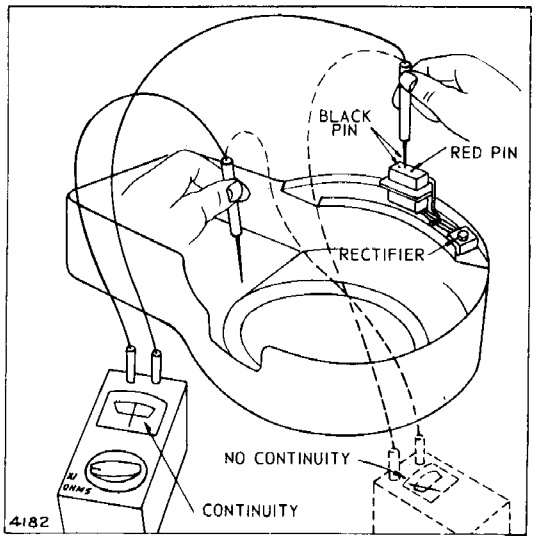


Figure 27

Testing Rectifier

Attached to the blower housing baffle is a small black rectifier assembly.

The rectifier is tested with a multimeter as follows: Three leads from the rectifier connect to pins in the detachable plug. See Figure 27. Leave rectifier installed on blower housing. Test rectifier with multimeter (using resistance scale) to check resistance from the red lead pin to blower housing (in an unpainted clean area). See Figure 27.

After checking pin, reverse meter leads and recheck. The meter should show a reading in one direction only. If the rectifier pin shows a meter reading both ways, the rectifier is defective. If the pin shows no reading either way, the rectifier is again defective.

Leaving one probe on blower housing, repeat with each black lead pin. Again meter should show continuity on one direction only, otherwise rectifier is defective. Now try between red lead pin and each black lead pin. Again, when probes are interchanged, meter should show continuity in one direction only.

Testing Alternator AC Circuit (Lighting)

Connect load lamp to AC output plug and ground as shown in Figure 28. Load lamp should light to full brilliance at medium engine speed. If lamp does not light, or is very dim at medium speeds, remove blower housing and flywheel. Disconnect ground end of AC coil, which is attached to the retaining clamp screw as shown in Figure 29.

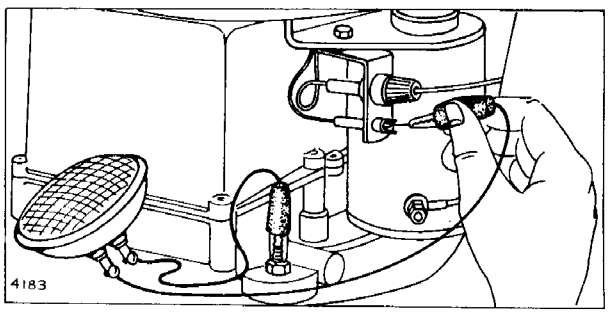


Figure 28

With multimeter, check continuity between ground lead of AC coil and AC output terminal as shown in Figure 29. Meter should show continuity.

Next, be sure ground lead terminal is not touching a grounded surface, and check continuity from terminal to ground.

Meter should not show continuity. If meter indicates continuity, coils are grounded and defective. Examine both (white) leads to be sure the insulation is not worn or cut. Repair with tape and shellac if a bad spot is found. If ground still exists, or if AC coils do not show continuity, stator must be replaced.

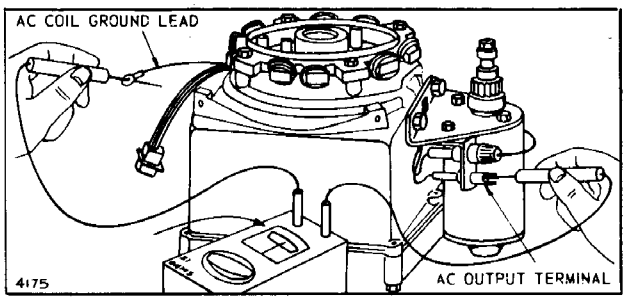


Figure 29

IGNITION

This engine has a flywheel type, internal breaker, ignition system.

Check Ignition

Remove the spark plug. Spin the flywheel rapidly with one end of the ignition cable clipped to the #19051 tester and with the other end of the tester grounded on the cylinder head. If spark jumps the .166" tester gap, you may assume the ignition system is functioning satisfactorily. Fig. 30.

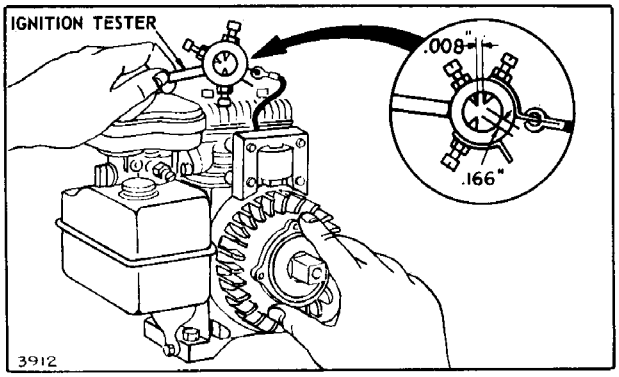


Figure 30

NOTE: If engine runs but misses during operation, a quick check to determine if ignition is or is not at fault can be made by inserting the #19051 tester between the ignition cable and the spark plug. A spark miss will be readily apparent.

SPARK PLUG

The plug recommended for Briggs & Stratton 8 H.P. engine is the prestolite 14-7N or equivalent.

Spark Plug Cleaning

Clean spark plug with a pen knife or wire brush and solvent and set gap at .030". If electrodes are burned away, or the porcelain is cracked, replace with a new plug. DO NOT USE ABRASIVE CLEANING MACHINES. Fig. 31.

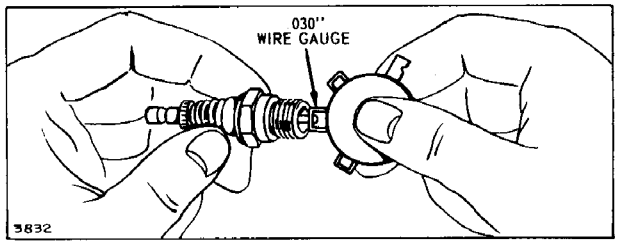


Figure 31

SPECIFICATIONS

1. Spark plug gap: .030
2. Condenser capacity: .18 to .24 M.F.D.
3. Contact point gap: .020
4. Armature air gap .010 - .014
5. Flywheel nut torque: 67 ft. lb.

Coil and Condenser Testing

Use an approved tester to test coils and condensers. Specifications are supplied by the tester manufacturer.

IGNITION

Flywheel Type - Internal Breaker

The flywheel is located on the crankshaft with a soft metal key. It is held in place by a nut. The flywheel key must be in good condition to insure proper location of the flywheel for ignition timing. DO NOT use a steel key under any circumstances. Use only the soft metal key, as originally supplied.

The keyway in both flywheel and crankshaft should not be distorted.

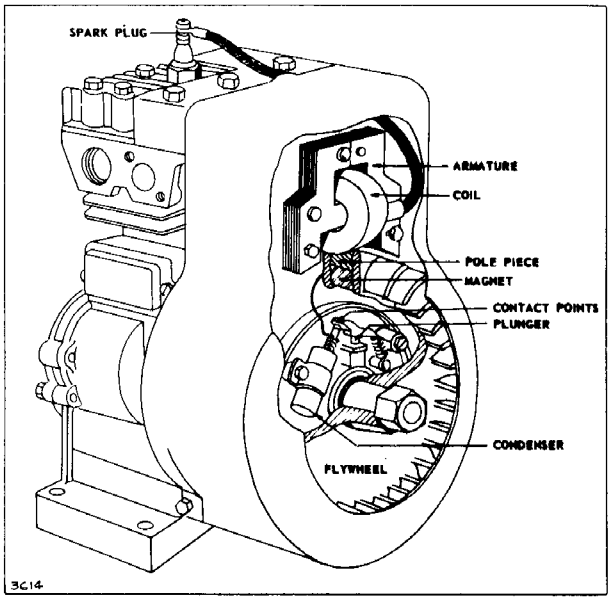


Figure 32

Place a block of wood under flywheel fin to prevent flywheel turning while loosening nut. Fig. 33.

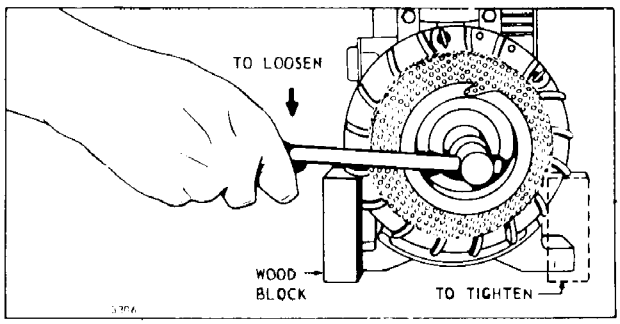


Figure 33

Remove Flywheel

The flywheel has two holes provided for use of a flywheel puller. Use Briggs & Stratton #19165 or equivalent. Leave nut on crankshaft for puller to bear against. Fig. 34.

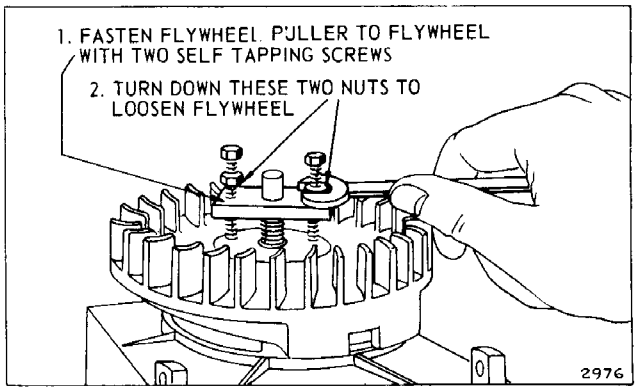


Figure 34

Removing Breaker Cover

Care should be taken when removing breaker cover, to avoid damaging cover. If cover is bent or damaged it should be replaced to insure a proper dust seal.

Breaker Points

Breaker point gap is .020". Breaker points should be checked for contact and for signs of burning or pitting. Points set too wide will advance spark timing and may cause kick back when starting. Points gapped too close retard spark timing and decrease engine power.

Breaker point assembly is removed by loosening the screw holding the post. The condenser on these models also includes the breaker point. The condenser is removed by loosening the screw holding the condenser clamp.

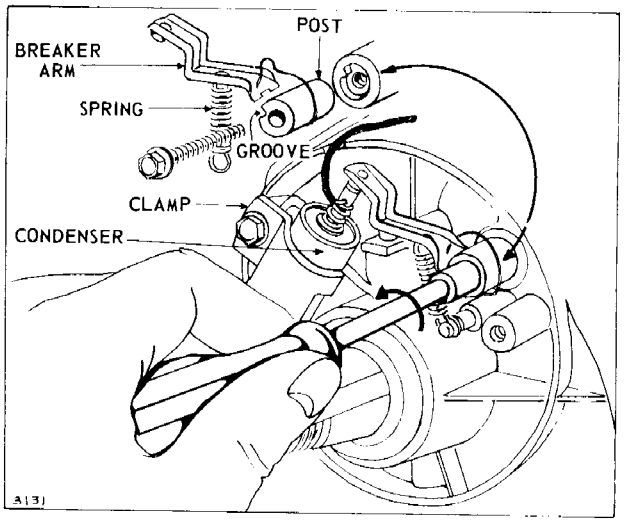


Figure 35

If the breaker point plunger hole becomes worn excessively, oil will leak past the plunger and may get on the points, causing burning. To check, loosen breaker point mounting screw and move breaker points out of the way. Remove plunger. If the flat end of the #19055 plug gauge will enter the plunger hold for a distance of 1/4" or more, the hole should be rebushed. Fig. 36.

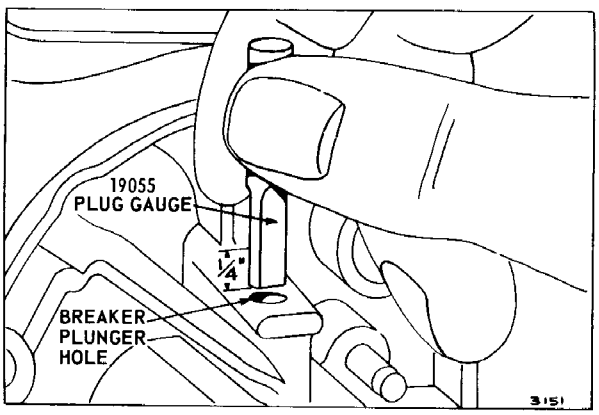


Figure 36

Install Breaker Point Plunger Bushing

To install the bushing, it is necessary that the breaker points, armature, and crankshaft be removed. Use a reamer #19056, to ream out the old plunger hole. See Fig. 37. This should be done by hand. The reamer should be in alignment with the plunger hole. Drive the bushing, #23513, with driver #19057 until the upper end of the bushing is flush with the top of the boss. Fig. 37. Finish reaming the bushing with reamer #19058. All reaming chips or dirt must be removed.

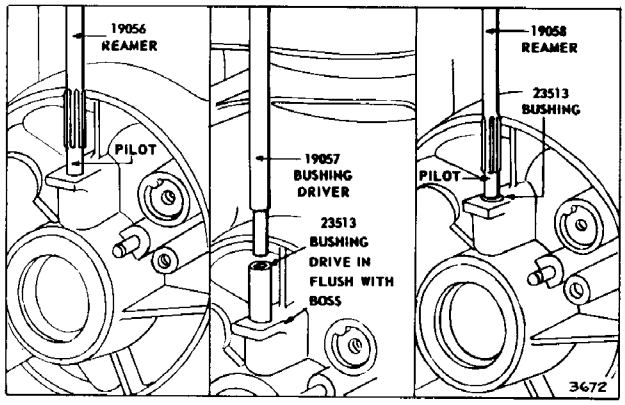


Figure 37

Breaker Point Plunger

If the breaker point plunger is worn to a length of .870" or less, it should be replaced. Plungers must be inserted with groove at the top when installed or oil will enter breaker box. See Fig. 38.

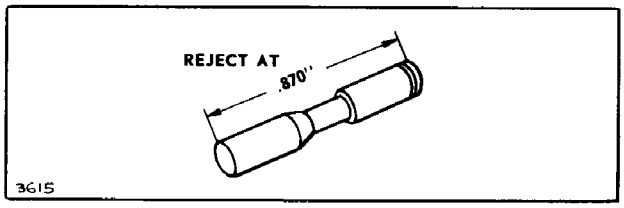


Figure 38

Install Breaker Points

Insert breaker plunger into the plunger hole in cylinder. Breaker points are installed by placing the mounting post of the breaker arm into the recess in the cylinder so that the groove in the post fits the notch in the recess. Tighten the mounting screw securely. Use a 1/4" spinner wrench if available. Slip the open loop of the breaker arm spring through the two holes in the arm, then hook closed loop of spring over the small post protruding from the cylinder. Push flat end of the breaker arm into the groove in the mount-

ing post. This places tension on the spring and pulls arm against the plunger. Primary wire is fastened to condenser with spring fastener. Compress spring, Fig. 39, and slip primary wire and ground wire into hole in condenser post. Release spring. Lay the condenser in place and tighten the condenser clamp securely. Install spring in breaker arm as shown in Fig. 40.

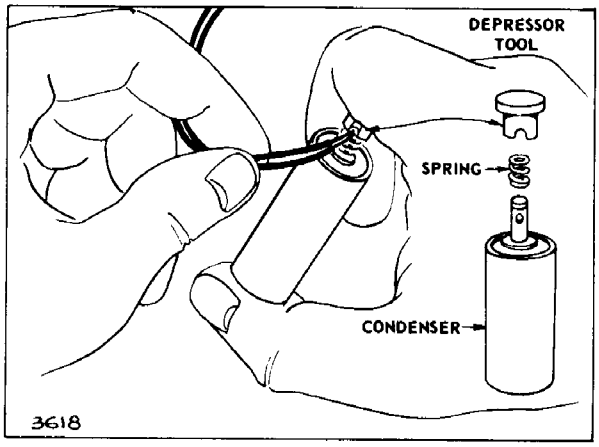


Figure 39

Adjusting Breaker Point Gap

Turn crankshaft until points open to widest gap. When adjusting breaker point assembly as shown in Fig. 40, move condenser forward or backward with a screw driver until a gap of .020" is obtained.

NOTE: Always clean breaker points after adjustment. Open the points and insert a piece of lintless paper. Draw the paper through the points. Open points when removing paper so it will not tear, leaving paper between the points.

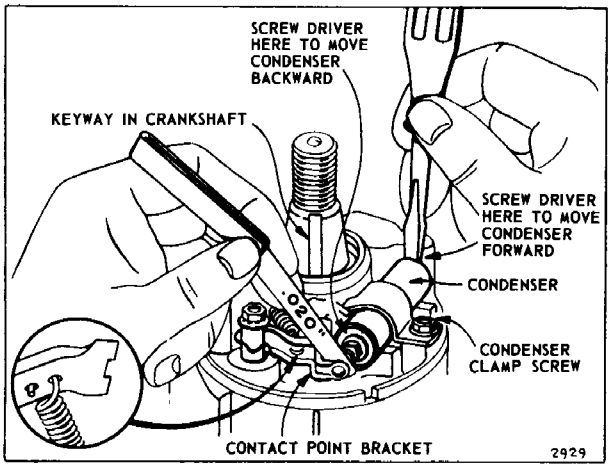


Figure 40

Breaker Point Cover

The breaker point cover, Fig. 41, protects the points from dirt. The opening for the primary and/or ground wire should be sealed with No. 2 Permatex or similar sealer to prevent dirt from entering the breaker box. Cover should not be distorted so as to lose its seal around the outer edge. Replace if damaged.

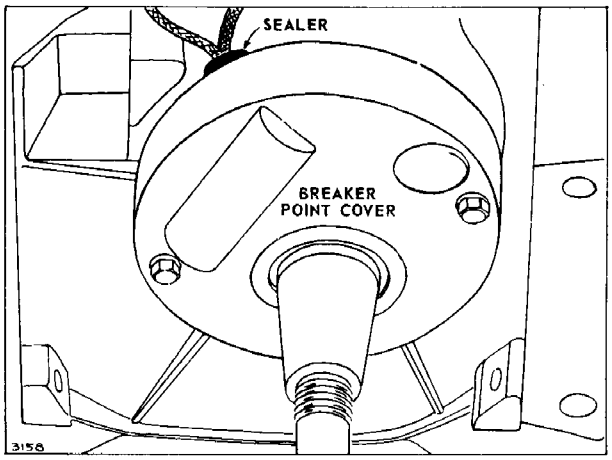


Figure 41

Install Armature

Install governor blade and armature. Fig. 42. The mounting holes in the armature laminations are slotted. Push armature up as far as possible and tighten one mounting screw to hold armature in place.

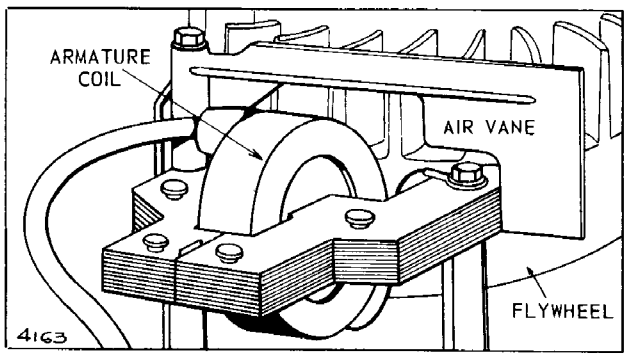


Figure 42

Adjust Armature Air Gap

Set air gap between the flywheel and armature between .010 and .014. With armature up as far as possible, and one screw tightened, slip the proper gauge between armature and flywheel. Fig. 43. Turn flywheel until magnets are directly below the armature. Loosen the one mounting screw and the magnets should pull the armature down firmly against the thickness gauge. Then tighten the mounting screws.

Install Flywheel

Remove all oil or grease, clean flywheel hole and tapered end of crankshaft before assembling flywheel to shaft. Insert zinc key into keyway. Slip spring washer over crankshaft with hollow side toward flywheel. To tighten flywheel nut, reverse removal operation. See "Remove Flywheel Nut". Torque to 67 ft. lb.

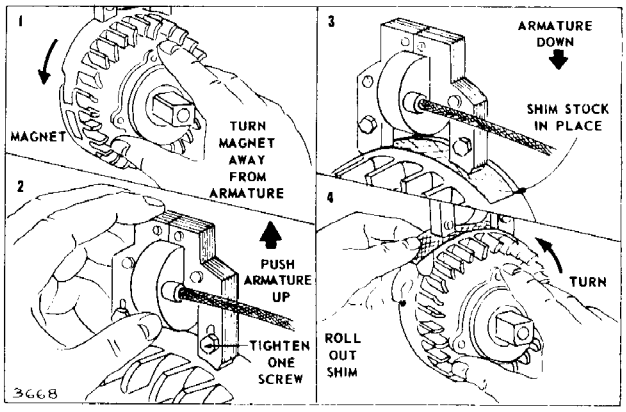


Figure 43

IGNITION SWITCH TEST

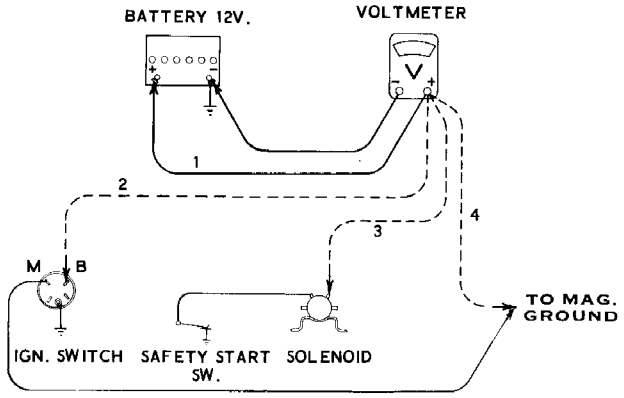


Figure 44

NOTE:

Disconnect solenoid to starter cable at starter and tape. Engage safety start switch. Depress clutch-brake pedal fully and place attachment drive lever in neutral position.

1. Attach red voltmeter lead to battery positive, black lead to battery negative #1. Turn switch to start position and record voltage.

2. Move red clip to ignition switch battery terminal #2. Turn switch to start position. Voltage should be within .1 volt of voltage recorded in Step 1.

3. Move red clip to solenoid start terminal #3. Turn switch to start position. Voltage should be within .3 volt of voltage recorded in Step 1.

4. Hook red voltmeter lead as in Step 1 above. With ignition switch "off", move black voltmeter lead to end of disconnected magneto ground to ignition switch wire. Battery voltage should appear on meter. If "0" volts, switch is defective or not grounded.

INTERPRETATION

From Step 2:

a. No Voltage Drop Step 2 - Damaged start contacts on igniton switch, broken or loose wire between terminal and solenoid, solenoid winding open, broken or loose wire between solenoid and safety start switch or open safety start switch.

b. Voltage Drop Greater Than Step 2 - Shorted solenoid winding.

From Step 3:

a. No Voltage Drop Step 3 - Solenoid winding open, loose or broken wire between solenoid and safety start switch or open safety start switch.

b. Voltage Drop Greater Than Step 3 - Shorted solenoid winding.

From Step 4:

a. If battery voltage appears in this test damage to ignition points and coil will occur (replace switch immediately and check for damaged magneto points or coil.)

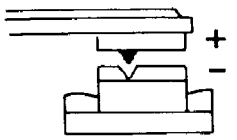
From Step 5:

"O" volts indicates faulty switch or ground lead not attached at switch or ground at solenoid mounting screw.

CONTACT SURFACE WEAR - Wear patterns that can exist and their causes.

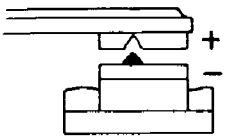
REPLACE CONTACT SET WHEN TRANSFER EXCEEDS .010"

Ideal contact point wear pattern.



TRANSFER OF MATERIALS FROM – POINT TO + POINT

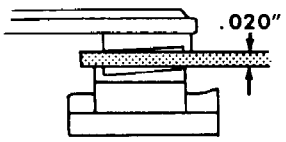
Contact point wear pattern such as this indicates condenser capacity may be too low - this is a normal wear pattern, but indicates why the condenser should always be replaced at the same time points are replaced.



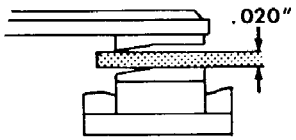
TRANSFER OF MATERIALS FROM + POINT TO – POINT

Contact point wear pattern such as this indicates condenser capacity may be too high - use only genuine case contact points and condenser replacement sets to insure the correct condenser capacity and condenser lead wire length.

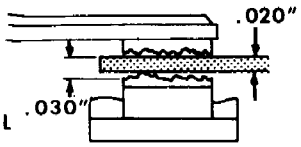
Some of the difficulties that can be encountered when trying to measure point gap with a feeler gauge.



MISALIGNED CONTACT POINTS WOULD GIVE FALSE READING

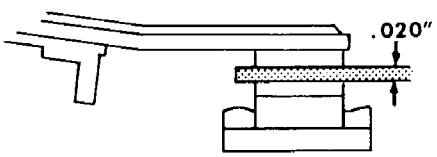


UNEVENLY WORN CONTACT POINTS WOULD GIVE FALSE READING



ACTUAL POINT OPENING

PITTED CONTACT POINTS



CONTACT POINTS THAT ARE PROPERLY ALIGNED WOULD GIVE TRUE GAP SETTING

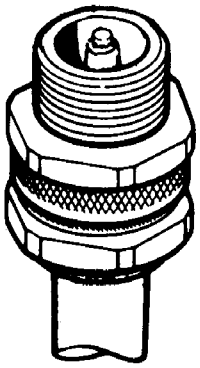


Figure 45

Grind the side electrode off of a new 18 MM spark plug. Attach coil wire to this spark plug and lay on engine block while cranking engine with the starter and regular plug in cylinder head. A blue spark should jump this gap. If spark is not blue or no spark occurs, replace points, condenser, or coil as required.

If problem still exists check flywheel magnets as shown in Figure 46. Screw driver held loosely and parallel from magnets should be drawn in contact with magnets.

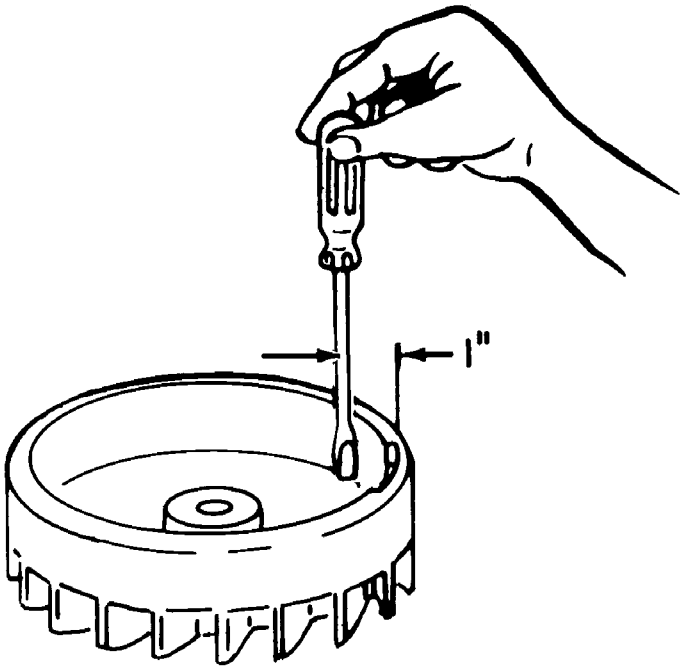


Figure 46

COIL POLARITY

In a negative grounded system, the negative or primary terminal marked with a (-) should be connected to the breaker terminal. Coil polarity refers to the direction of high tension current flow and should always be negative at the spark plug. Reversed coil polarity is almost always traced to reversed leads at the coil. A simple way to check coil polarity is to remove spark plug wire at the plug and hold it about 1/4 of an inch away from the spark plug while the engine is idling. Insert the point of a wood lead pencil between the wire end and spark plug, Figure 47 and 48.

If the spark flares or feathers and has a slight orange color on the plug side of the pencil, coil polarity is correct. If this occurs on the wire side of the pencil, coil polarity is reversed. Reverse wires at the coil.

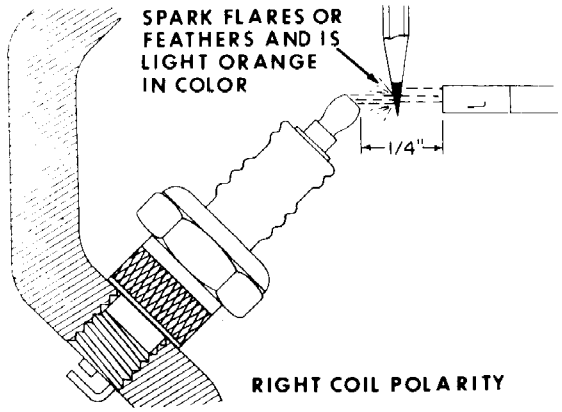


Figure 47

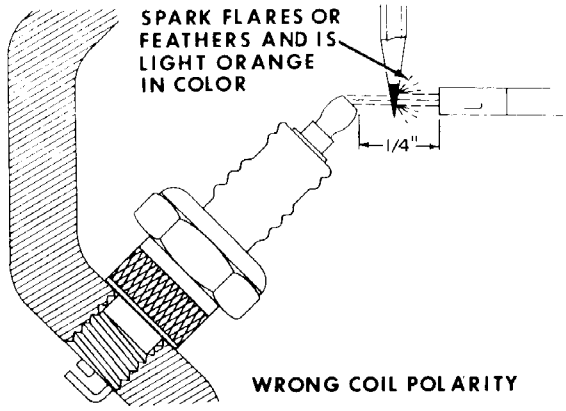


Figure 48

SPARK PLUGS

SPECIFICATIONS

Type -----Prestolite 14 7N or Equivalent
Thread Size ----------14 MM
Gap Setting ----------.030 Inch
Installation Torque -----27 Foot Pounds
Socket Wrench Size ----------3/4 Inch

The purpose of the spark plug is to fire or ignite the proper fuel mixture in the combustion chamber of the engine at a preset time. This is controlled by the breaker cam and points. A spark plug which does not function properly will increase fuel consumption, cause crankcase oil dilution, excessive deposit in the combustion chamber and greatly reduce the efficiency of the engine.

A close examination of the spark plug will give the service man an indication in general of the engine conditions. A fouled or burnt spark plug can be used as good visible evidence to show the customer when soliciting a valve or overhaul job.

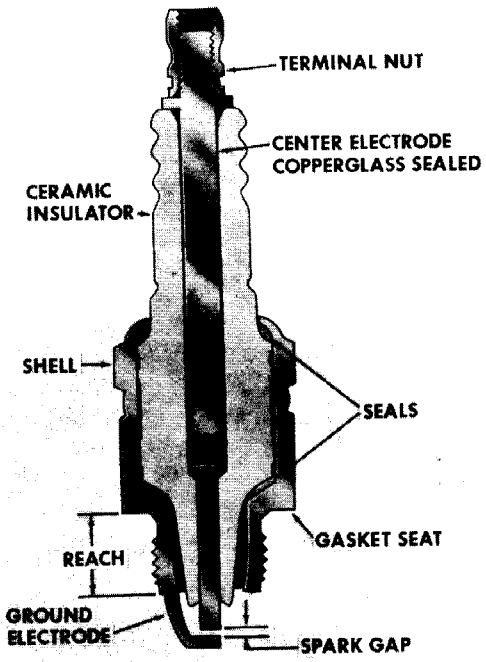


Figure 49

REMOVAL AND INSPECTION

Remove the wire from the spark plug and use a thin wall deep socket spark plug type wrench of correct size 3/4" to remove the spark plug.

The wrong size or type socket wrench can cause distortion or insulator breakage.

SPARK PLUG GASKET

The first thing to inspect after removal of a plug is the copper gasket. This will tell you if the spark plug was installed correctly.

A spark plug that has been properly torqued in place to 27 foot pounds will have the copper gasket compressed to 1/2 of its original thickness.

A spark plug gasket that was not compressed enough when the plug was installed can cause compression leakage. The plug will run hotter than it should as the heat will not be transferred from the plug to the cylinder head as fast.

A spark plug gasket that is compressed too much when the plug is installed will cause the plug to run colder than it should and thus will foul a lot faster. It is also possible that when the plug is installed too tight, it will cause distortion of the electrodes. Thus the plug gap would be increased beyond its original setting.

SPARK PLUG INSULATORS

Always inspect the spark plug for a broken or cracked insulator. If a crack of any severity is found, the spark plug must be discarded, Figure 50 and 51.

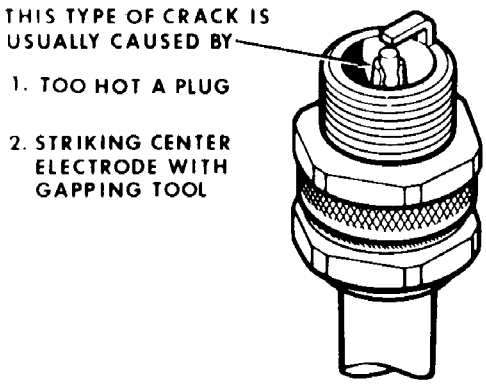


Figure 50

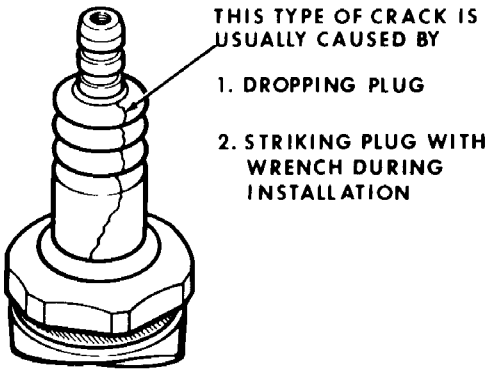


Figure 51

SPARK PLUG HEAT RANGE

The term "Heat Range" classifies a spark plug according to its ability to transfer heat from the gap end of the plug to the cylinder head. The ability of a plug to transfer heat is determined by the length of the insulator nose, Figure 52.

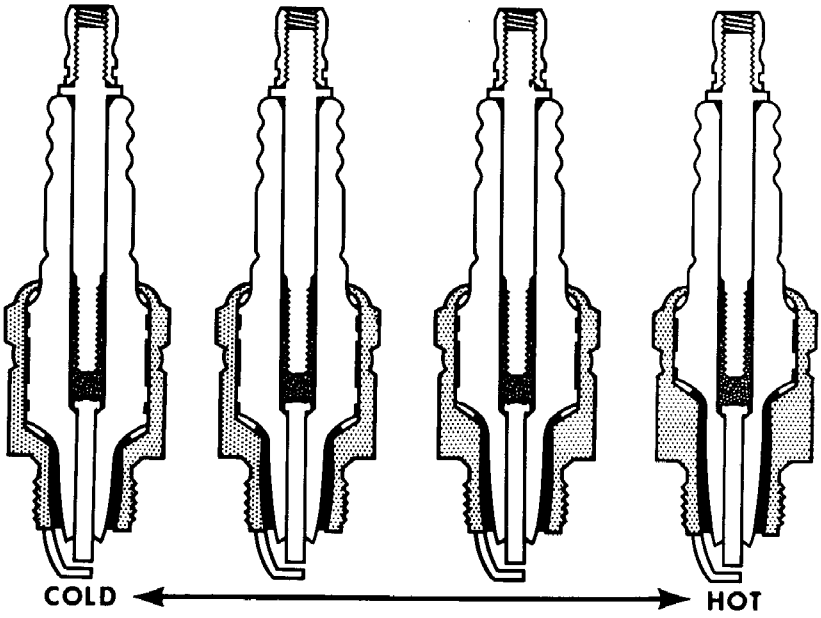


Figure 52

COLD SPARK PLUGS

A cold plug has a short insulator nose which cools quickly. A cold plug is used where combustion chamber temperatures are higher than normal. This condition will exist when the engine is under continual heavy loads and in hot weather operation.

HOT SPARK PLUGS

A hot plug has a long insulator nose which cools much slower and is used when engine combustion chamber temperatures are relatively low. This condition will exist in cold weather operation, prolonged idling and light loads.

MEDIUM OR NORMAL HEAT RANGE SPARK PLUGS

The medium length insulator nose cools normally and is not subjected to constant high or low temperatures or constant light or heavy loads. This medium range plug represented a compromise to cover the widest range of operating conditions.

If a hot plug is installed in an engine for light loads or cold weather operation, it is very important that it be replaced by a colder plug when engine is operated at sustained heavy loads in hot weather. Using too hot a plug for sustained heavy load operation may result in the spark plug becoming overheated, causing pre-ignition, cracking of the plug insulator and serious engine damage.

ELECTRODES

Examine the spark plug electrodes to determine if the plug is the proper heat range. Deposits on the electrodes will give some indication of the condition of the engine.

OIL FOULED SPARK PLUGS

An oil fouled spark plug will have wet oily deposits on the electrode and the bottom of the shell.

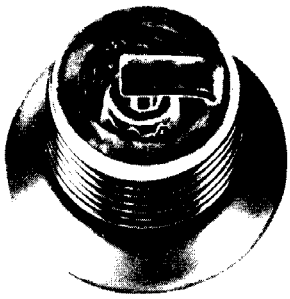


Figure 53

Oil fouling indicates an excess amount of crankcase oil is getting into the compression chanber as a result of worn piston rings, cylinder bore or valve guides.

A hotter spark plug will temporarily relieve oil fouling of the plug, but the permanent cure is to eliminate the cause of the oil getting into the compression chamber.

BURNED OR OVERHEATED SPARK PLUGS

A burned or overheated spark plug will have a dry shiny white, glazed or badly cracked insulator nose. This can be caused by anyone of the following:

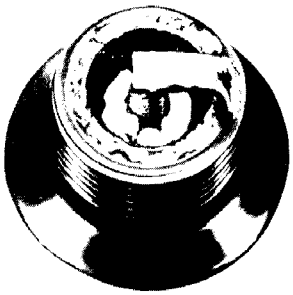


Figure 54

1. Too lean a fuel air mixture.
2. Improper ignition timing.
3. Too hot a spark plug for the type of engine service.
4. Burned or sticking valves.
5. Engine cooling system not operating properly.

FUEL FOULED SPARK PLUGS

A fuel fouled spark plug has a dry black deposit on the electrode and bottom of the shell. It can be caused by any of the following:

1. Excessive use of the choke by the operator.
2. Too rich an air fuel mixture.
3. Prolonged engine idling.
4. The use of too cold a spark plug for the type of engine service.
5. Clogged air cleaner.
6. Poor ignition output.
7. Normally worn out spark plug.

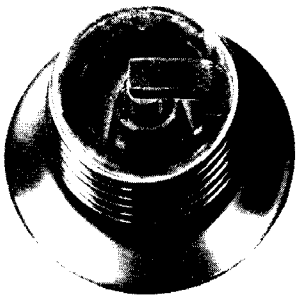


Figure 55

SPARK PLUG

A spark plug that has been worn out by normal service can be identified by a light brown to grayish tan dry deposit. It indicates a balanced ignition and combustion system and the plug was of the proper heat range.

NOTE

If a highly leaded fuel is used, a white powdery or yellow glazed deposit will appear. These deposits should be cleaned off regularly.

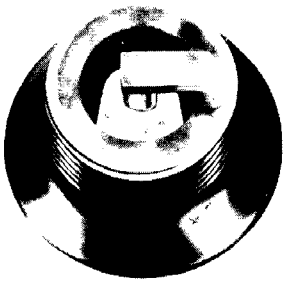


Figure 56

CLEANING AND GAPPING SPARK PLUG

Clean spark plug with pen knife or wire brush and solvent. File the electrode sparking areas to obtain bright flat parallel surfaces and reset the gap between the electrodes to .030 inch.

Use a round type feeler gauge to measure the gap as a flat type feeler gauge will give a false reading, Figure 57.

Set the gap by bending the ground or outside electrode. Never try to bend the center electrode as the insulator will crack.

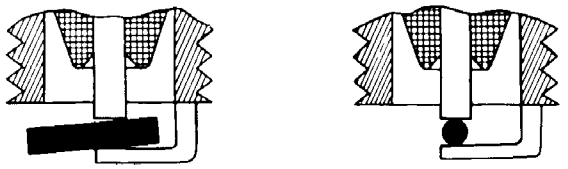
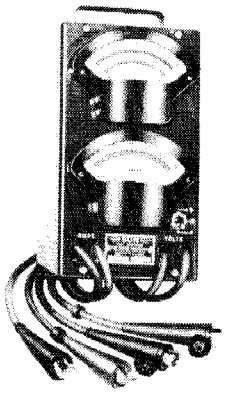


Figure 57

INSTALLING THE SPARK PLUG

Make sure the cylinder head threads and the gasket seat is clean. Always install a new gasket whenever a spark plug has been removed and reinstalled. Use a thin wall deep socket type spark plug wrench (3/4") and torque to 27 foot pounds. If a torque wrench is not used, tighten the plug until the plug, gasket and head make contact and then give it 3/4 of a turn which will compress the gasket properly. Install spark plug wire.

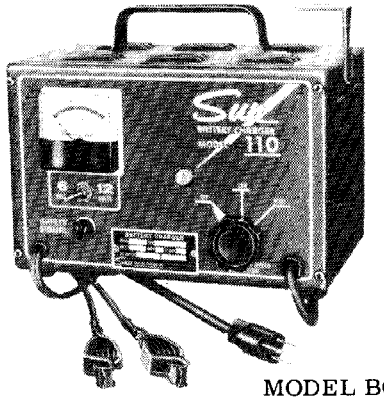
PURCHASE TOOLS OF EQUAL OR BETTER QUALITY FOR USE IN TESTING ELECTRICAL SYSTEMS



VOLT-AMPERE TESTER
MODEL VAT-60

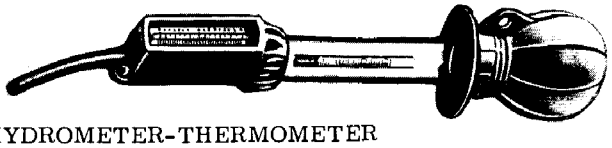
The VAT-60 has 2% accuracy meters. The voltmeter scale ranges are 0-4, 0-8, and 0-16 volts in .1 volt steps. The ammeter scale range is 10-0-75 amperes in 2 ampere steps.

NOTE: TESTER AND CHARGER AVAILABLE FROM: SUN ELECTRIC CORP., Harlem & Avondale, Chicago, Illinois 60631



MODEL BC-110

The Model BC-110 features the superior quality engineering, workmanship and materials as the larger models. This lower output charger is ideal for small shop operator or for home use. On a continuous duty basis, it will charge 6 volt or 12 volt batteries at 10 amperes. Its Charge Rate Selector permits the operator to tailor the charge rate to meet slow charge requirements of various size batteries.



HYDROMETER-THERMOMETER

Hydrometer-Thermometer. Has float gauge printed in three colors with "Recharge," "Fair" and "Good" markings to indicate exact battery condition. Range of 1,060 to 1,320 covers all test conditions. Recessed thermometer with range of 0 to 160 degrees shows temperature and Specific Gravity corrections. Six ounce capacity red rubber filler bulb has straight stem and is 10-1/2" overall.

NOTE

The J I Case Company reserves the right to make improvements in design or changes in specifications at any time without incurring any obligations to install them on units previously sold.

Printed In U.S.A.