Electrical System
107-117 Tractors

Service Manual No. 9-99762

J I Case
A Tenneco Company

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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.

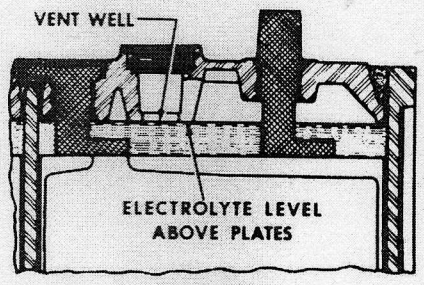


Figure 1

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.

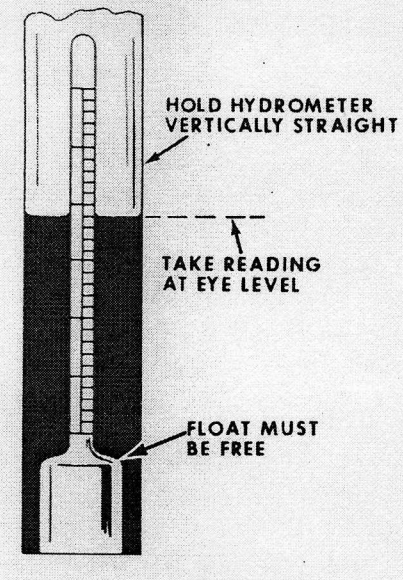


Figure 2

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!

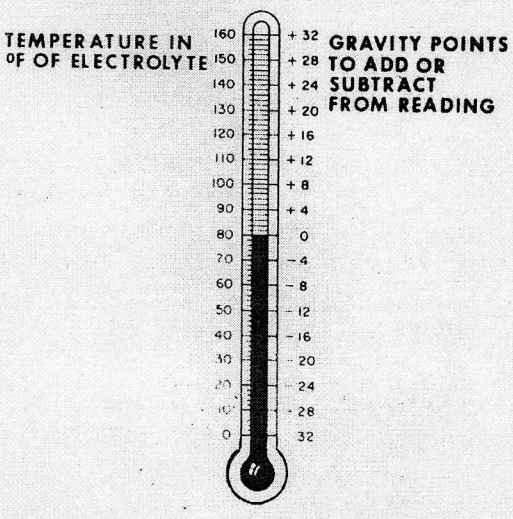


Figure 3

12 VOLT STARTER MOTORS

Cranking Motor Operation Time Limits

USING THE STARTER, Due to size requirements, these starters have certain cold weather limitations. Under 20° it may be necessary to use rewind starter to start engine. 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.

107 - 117 TRACTORS

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

BATTERY CRANKING VOLTAGE AND STARTER CIRCUIT TESTS

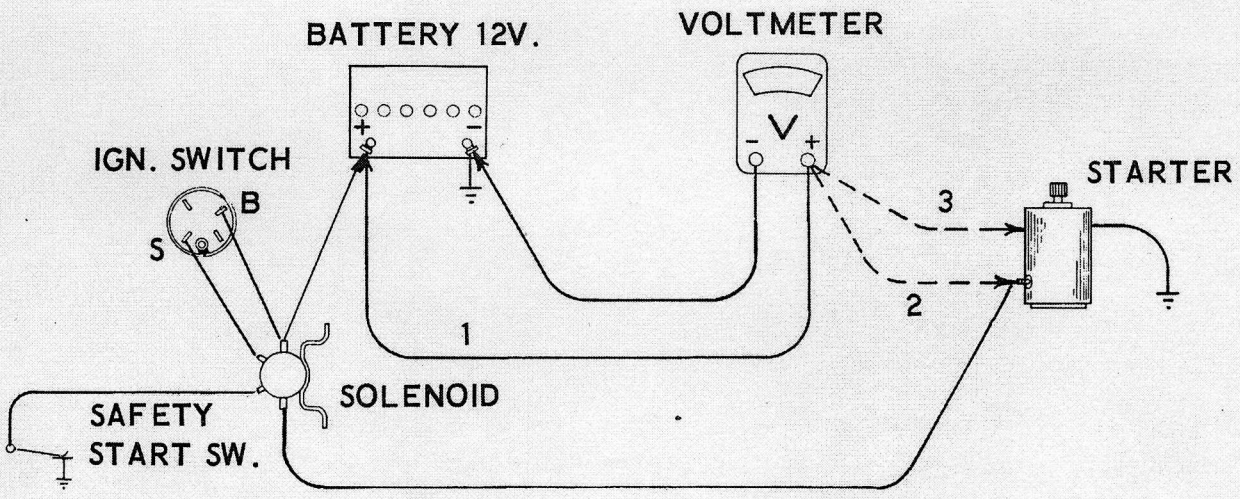


Figure 4

NOTE:

Before testing, disconnect spark plug lead and ground to prevent engine from starting and prevent coil damage. Engage safety start switch - Model 107 depress clutch - brake pedal fully - Model 117 place travel lever in the neutral position and lock brake.

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.

TROUBLESHOOTING

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.

NOTE:

Remove armature, drive end cap and drive as an assembly.

1. Hold the Pinion Gear firmly in a brass jawed vise when removing or tightening the castellated nut. The nut must be torqued to a minimum of 100 in. lbs. If necessary, continue tightening the nut until the cotter pin can be assembled to the hole in the shaft and the slot in the nut.

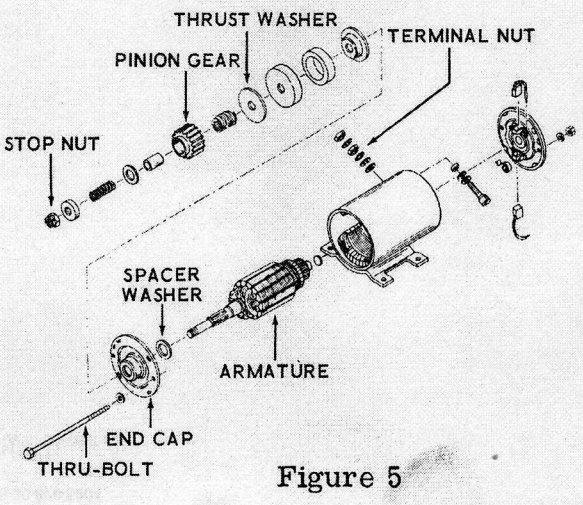


Figure 5

2. Use the spacing washers as required, to obtain an armature end play of .005" - .015".

3. Apply a film of SAE #10 oil to the bearing portions and spines of the armature shaft before assembly.

4. Tighten the input terminal nut next to the housing to a torque of 50 in. lbs.

5. The brush shunt is approximately 3/4" longer than is necessary for the grounded brush; remove any excess shunt remaining after soldering to the grounded brush terminal.

6. Assemble the thrust spacer to the commutator end cap bearing bore with the convex surface facing the open end of the bore.

7. Tighten the thru-bolts to a torque of 30 - 35 in. lbs.

PERFORMANCE NO-LOAD TEST

NOTE:

This motor should NOT be operated continuously for more than 15 seconds when testing.

Starter Part No.	C15989
Applied Voltage	6.0
Minimum RPM	6000
Maximum Current Draw	20 amps.

1. Use a fully charged 6 volt battery and connect it to the input terminal of the starting motor through a switch. Use test leads of No. 10 cable or larger which should not be over 6 feet in length. Check the operation of the drive assembly by applying rated voltage momentarily.

2. If the unit does not meet the foregoing test, check for the following.

Binding armature

Annealed brush springs

Improperly seated brushes

Insufficient armature end play

Shorted or open armature

Shorted or grounded field

Poor electrical connections

SOLENOID ENERGIZING CIRCUIT TEST

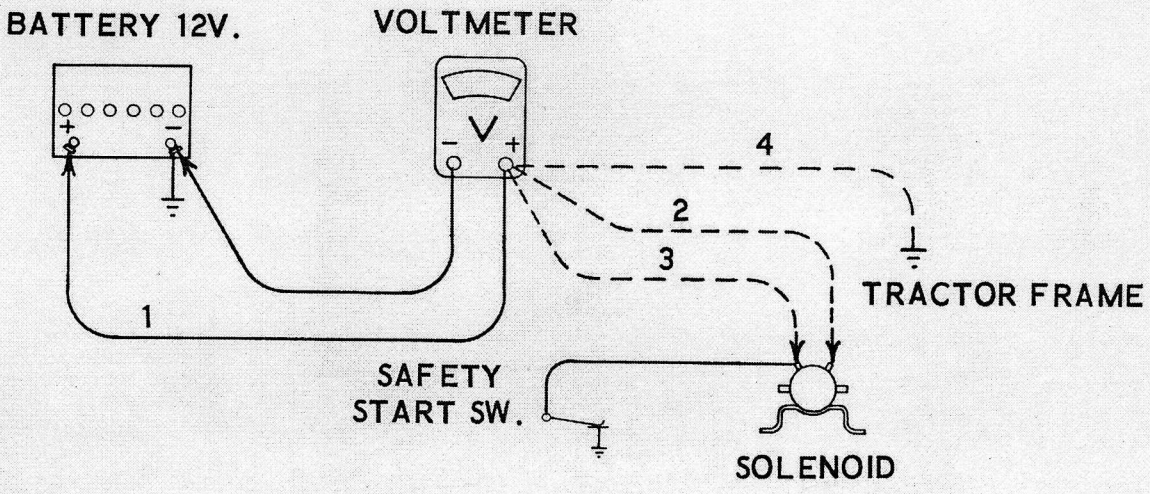


Figure 6

NOTE:

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 6.

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.

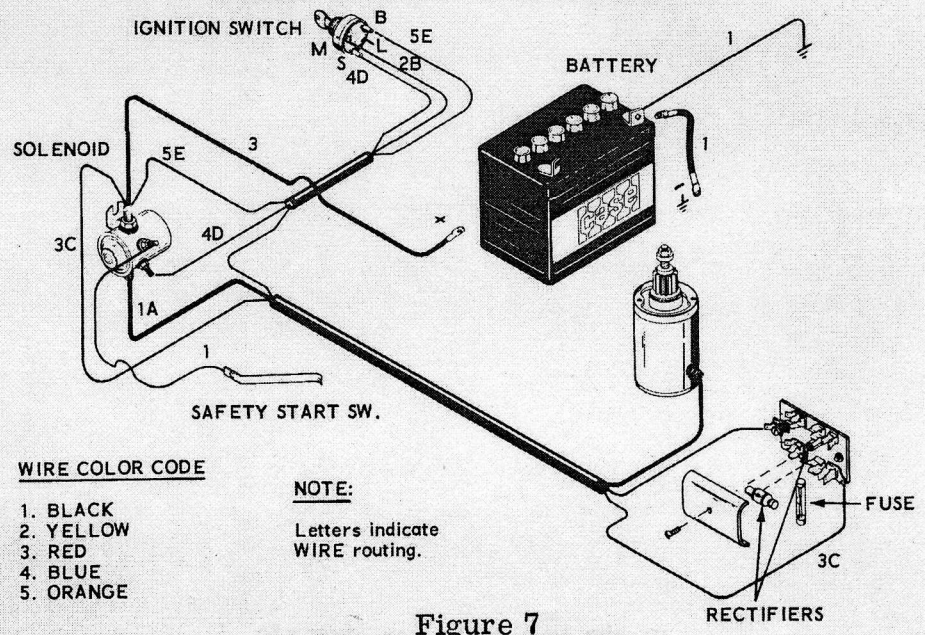
b. Voltage Drop Greater Than Step #2 - Loose or dirty connections or frayed wire between battery and ignition switch, faulty switch, or loose or dirty connections or frayed wires from switch to solenoid.

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 107-117



WIRE COLOR CODE

1. BLACK
2. YELLOW
3. RED
4. BLUE
5. ORANGE

NOTE:

Letters indicate WIRE routing.

Figure 7

WIRING SCHEMATIC 107-117

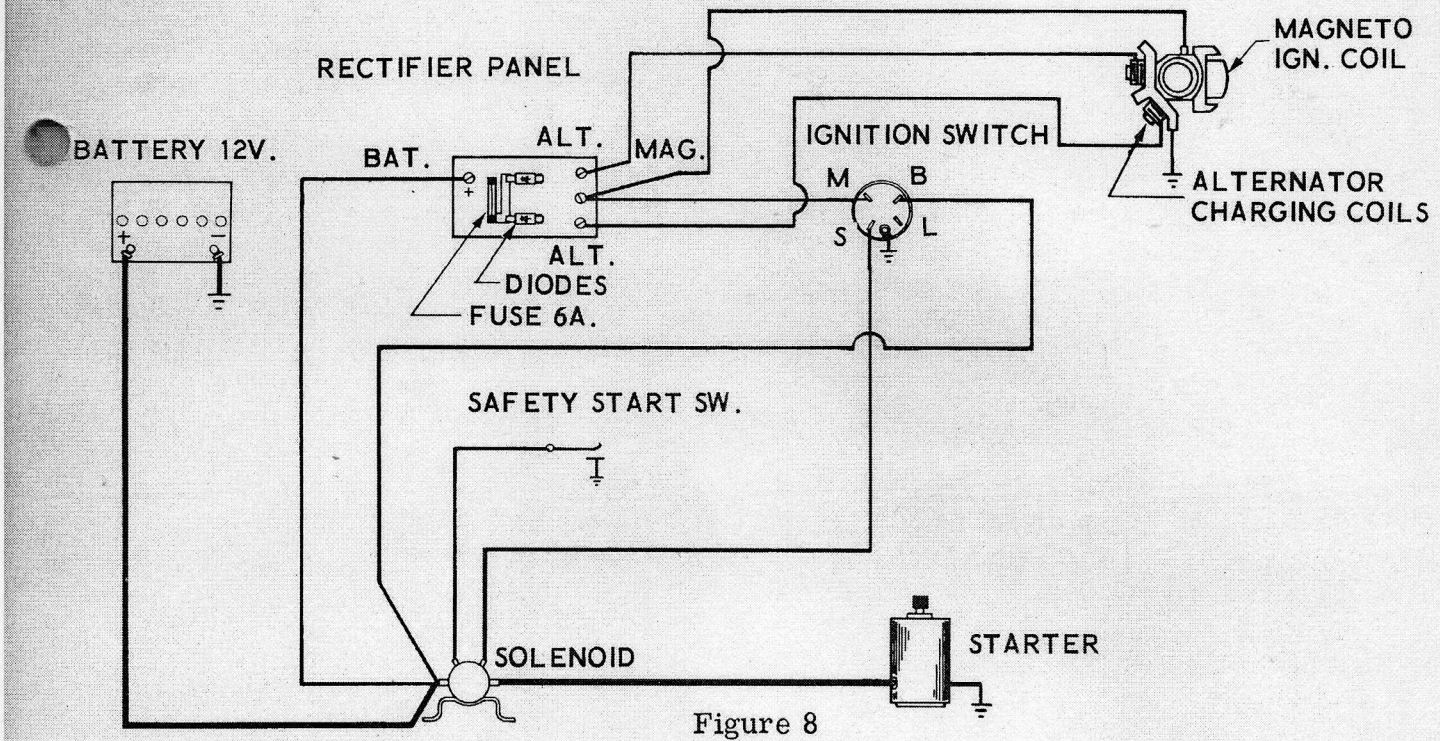


Figure 8

ALTERNATORS

GENERAL INFORMATION

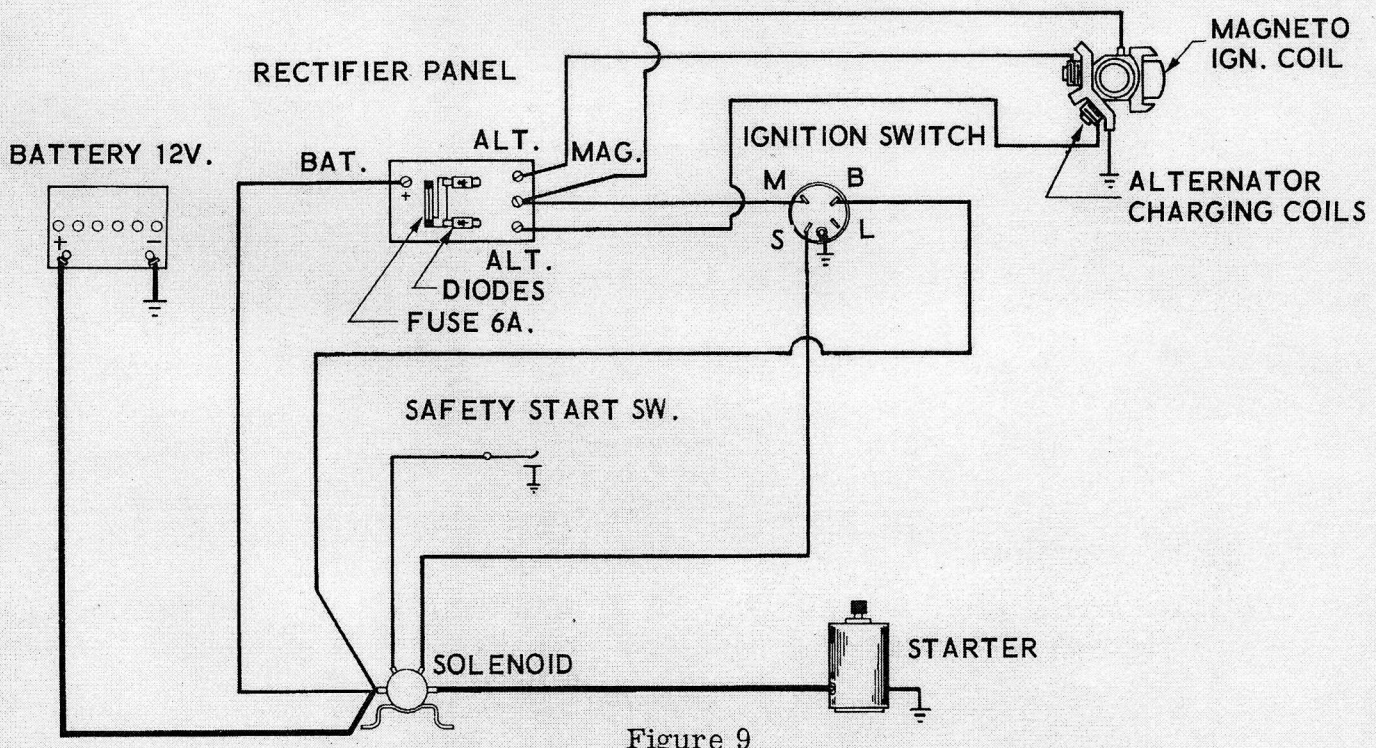


Figure 9

1. Three amp alternator charging circuits. The maximum output is about 3 amps. These units merely rectify A.C. to D.C. No regulator is used in these circuits.

2. The charging circuits in Figure 9 are non regulated low output units. The rectifier panel converts A.C. to D.C. to charge the battery.

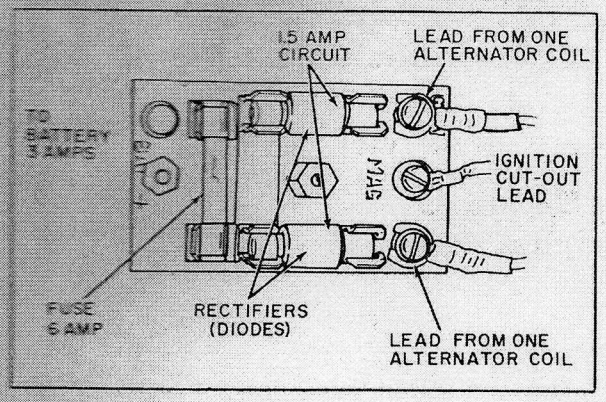


Figure 10

3. All systems must convert generated alternating current to direct current to effectively charge a storage battery.

4. The 3 amp rectifier system is readily identifiable by the rectifier panel in the circuit, Figure 10. The panel includes two diodes (rectifiers) and a fuse for overload protection. If an overcharge condition exists, one diode (rectifier) can be removed to cut charge rate in half.

INSTRUCTIONS FOR ENGINES EQUIPPED WITH 12-VOLT D.C. ELECTRIC STARTER AND 3 AMP ALTERNATOR FOR CHARGING THE BATTERY

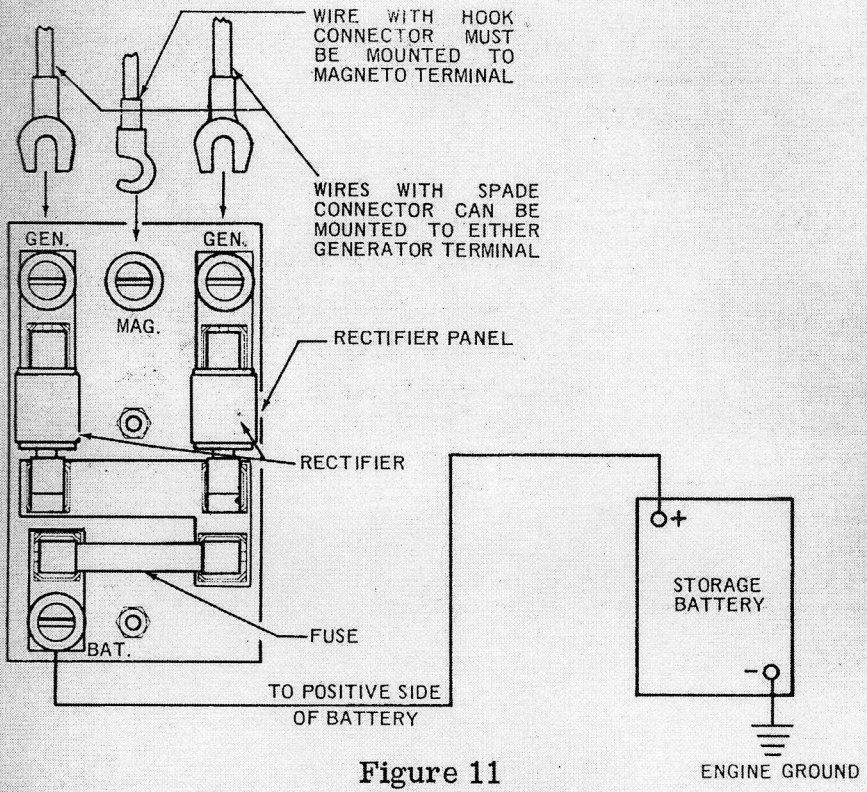


Figure 11

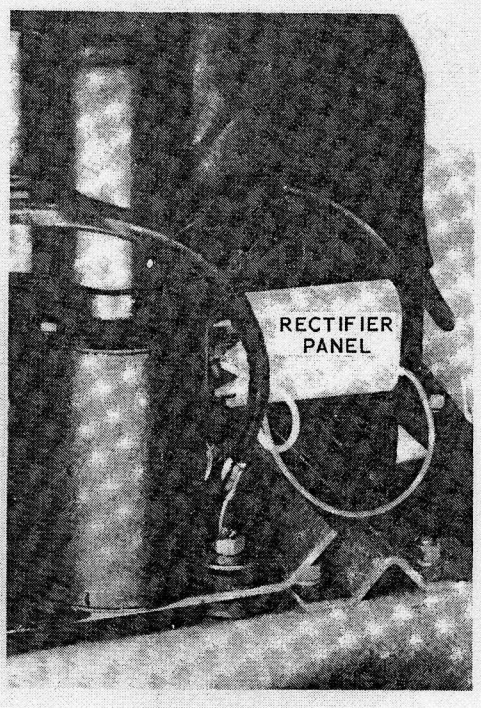


Figure 12

1. Install and service battery according to instructions supplied with battery.

2. Connect battery positive lead to terminal on rectifier panel and ground negative lead to engine as shown in Figure 11.

3. WARNING! Do not operate engine with rectifiers in circuit when one or both battery leads are disconnected------ Remove both rectifiers or alternator leads if for any reason engine must be operated without battery. NOTE:-- Position of rectifiers in Figure 11, grooved end of rectifier must fit in retaining clip toward battery terminal --- also look at end of rectifier before removing to observe correct position.

4. CAUTION -- To prevent overcharging of battery when engine is operating for longer periods than 4 hours, remove one rectifier, or one alternator lead. For all operation of less than 4 hours, and all intermittent operation, both rectifiers must be in place. Removal of one rectifier reduces charging rate by approximately one-half.

5. When servicing the rectifier panel or removing and replacing rectifiers, be sure to replace properly.

7. Boost starting - When using booster 12 volt battery as a source hook positive jumper to positive battery terminal, negative to negative terminal. Between tractor battery and jumper battery.

6. If lead wires are incorrectly attached to battery, the fuse on the rectifier will burn out. Correct by attaching lead wires properly, and install new 6 amp fuse. See Figure 11.

VOLTAGE TEST FOR ALTERNATOR

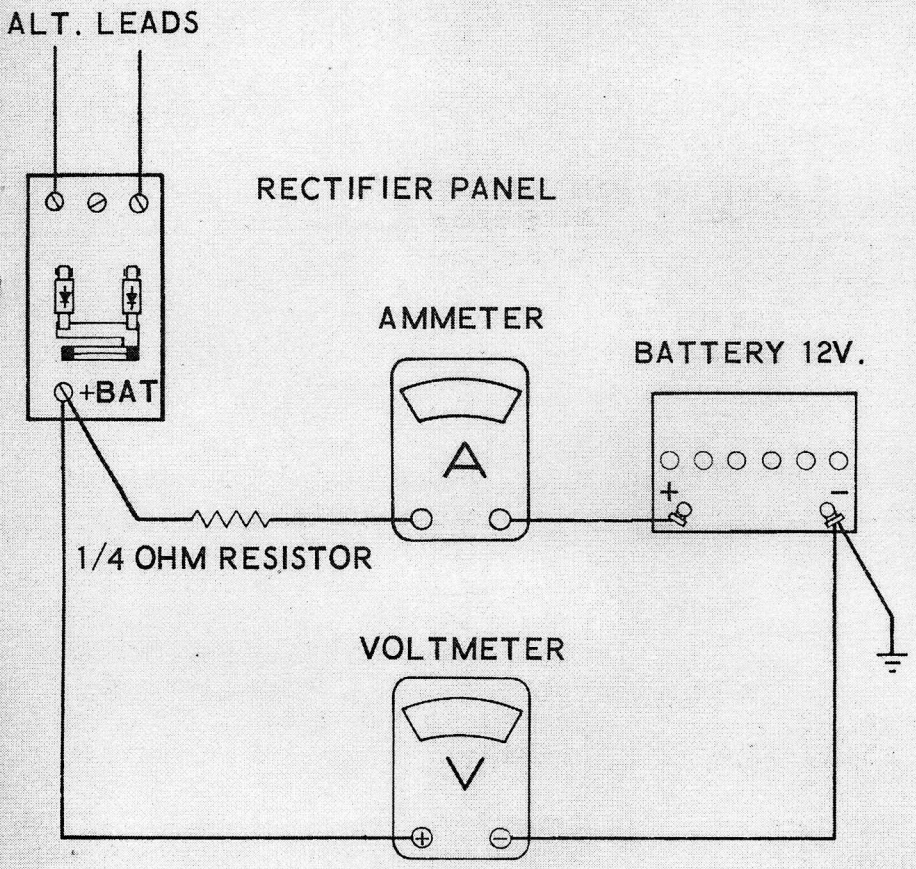


Figure 13

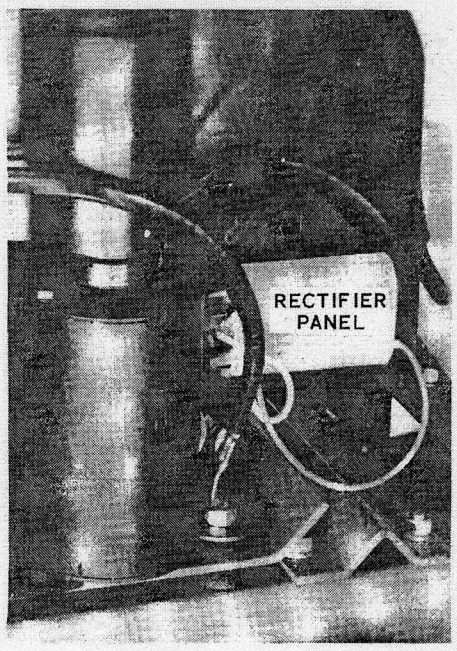


Figure 14

1. Remove red lead from battery terminal of rectifier panel - Figure 13.

2. Clip red ammeter lead to this terminal and the black ammeter lead to the red wire that was removed.

3. Insert 1/4 OHM Resistor in series with ammeter.

4. Attach red voltmeter clip to rectifier panel battery terminal, black to battery neg terminal.

5. Start engine, run at high idle, voltage should be 13.5 to 14.2 volts.

6. If "0" volts is indicated, check and replace fuse or diode rectifiers, as required.

7. If still "0" volts at high idle, check for loose, broken or grounded stator leads or shorted stator windings. Replace or repair as necessary.

NOTE: Test fuse and diodes with flashlight tester.

* Light	One Direction Only	OK
* Light	Two Directions	Replace
* No Light	Either Direction	Replace
Fuse	Light Must Light	OK
* Diodes		

AMPERAGE TESTS FOR ALTERNATOR

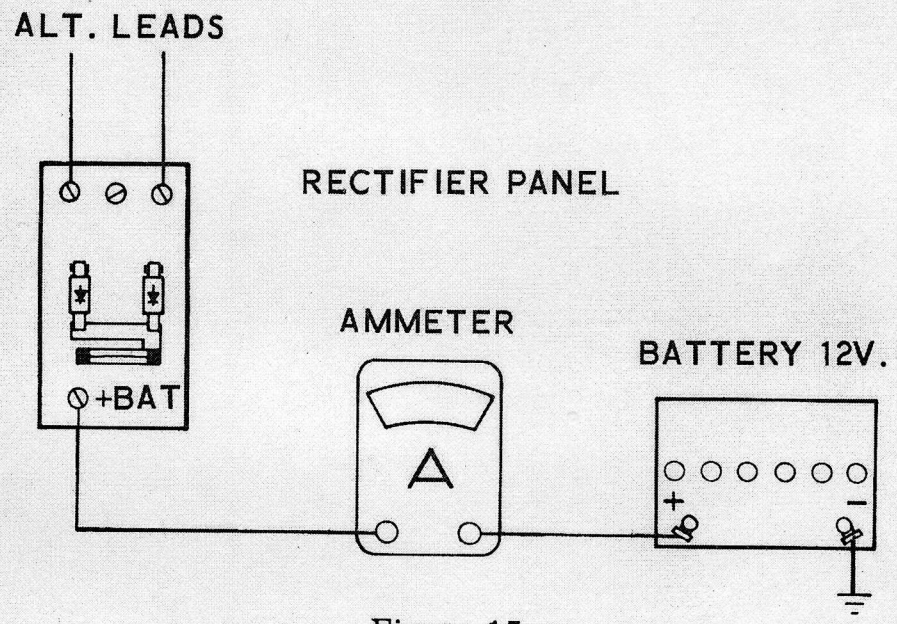


Figure 15

1. Remove red lead from battery terminal of rectifier panel - Figure 15.

2. Clip red ammeter lead to this terminal, black to red wire removed from this location.

3. Start engine and run at high idle, amperage should be minimum 3 amps.

4. If less than 3 amps., shut off engine and turn on lights for 30 seconds or remove plug wire and crank engine for several seconds to drop battery state of charge.

5. Restart engine, minimum of 3 amps. should now appear - if still low - approximately 1-1/2 to 2 amps:

   a. Test for open diode rectifier, loose connections or one defective stator winding.

   b. If "0" amps, check fuse, two diode rectifiers, broken leads or both stator windings.

1. MAGNETO IGNITION COMPONENTS - Tecumseh's magneto ignition consists of a stator assembly mounted to the engine, Figure 16, and a magnet cast into the rotating flywheel.

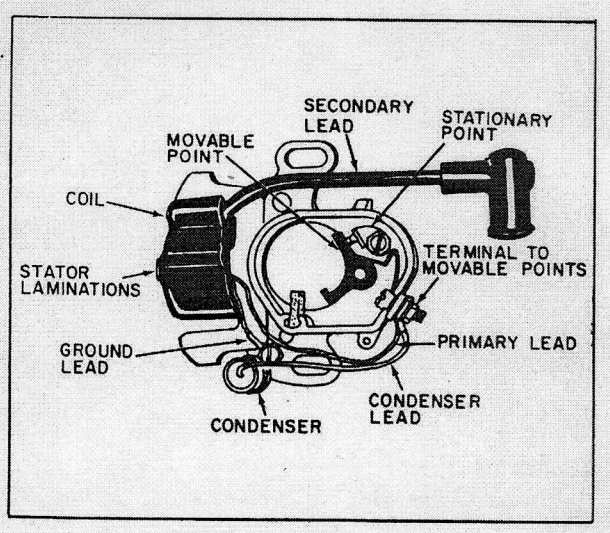


Figure 16

2. The stator assembly consists of stator plate, laminations, ignition coil, contact points and condenser.

3. Stator laminations merely assist in concentrating the magnetic lines of force for the primary circuit.

4. Contact points consist of an insulated movable point that connects to the coil primary lead and a stationary point that is grounded to the stator body and provides the return path for the primary circuit.

5. The condenser acts as an electrical shock absorber to prevent arcing between the contact points as they open. Arcing would lower voltage output at the spark plug as well as burn and pit contact points, shortening point life.

THE IGNITION COIL - The coil consists of two coil windings that are hermetrically sealed within a plastic like casing. See Figure 17.

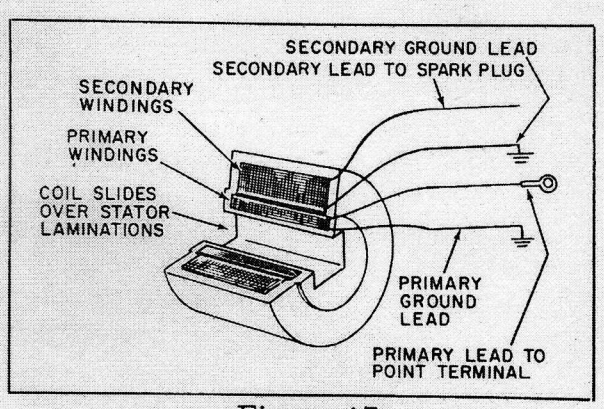


Figure 17

1. The primary winding consists of a few turns (about 150) of a comparatively heavy gauge wire wrapped around the center receptacle hole for the stator laminations. One lead is connected to the insulated movable contact point terminal and the other lead is grounded to the stator body.

2. The primary circuit is the low voltage (300 - 400 volts) circuit that is used as a transformer to increase the voltage in the secondary or high voltage circuit (10 - 20 thousand volts).

3. The secondary winding, Figure 18, is of extremely fine wire with many turns (about 10,000) wrapped over the primary windings. One lead connects to the spark plug and the other is grounded to the stator body.

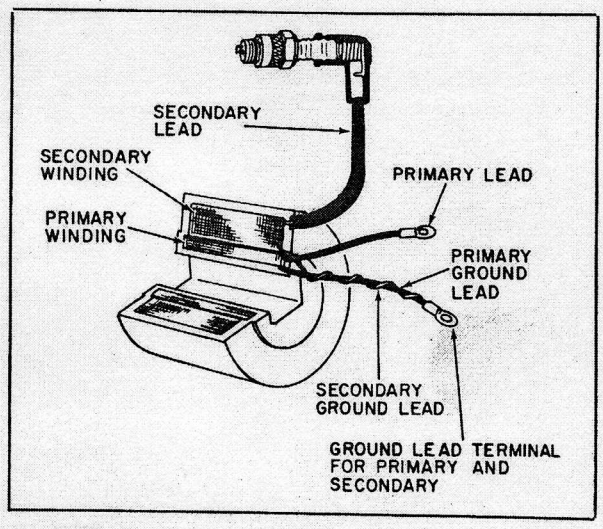


Figure 18

4. The ground (also known as the common) provides the return path to complete each circuit.

HOW TECUMSEH MAGNETO IGNITION WORKS

1. See Figure 19 - As the magnet and flywheel rotates the magnetic field of force around the magnet is cut by the coil windings. This cutting action induces a current flow (movement of electrons) within the primary windings.

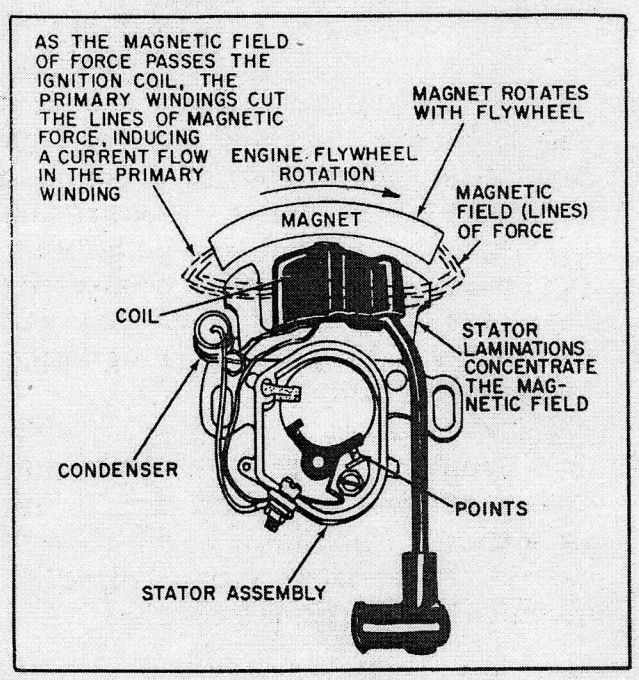


Figure 19

2. See Figure 20 - Current movement within a conductor (primary windings) produces a magnetic field around that conductor.

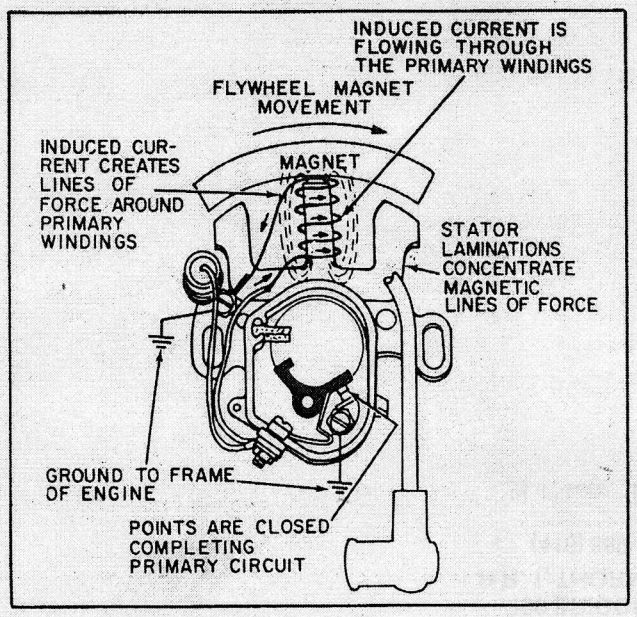


Figure 20

3. See Figure 21 - The magnetic field around the primary windings encompasses the secondary windings also.

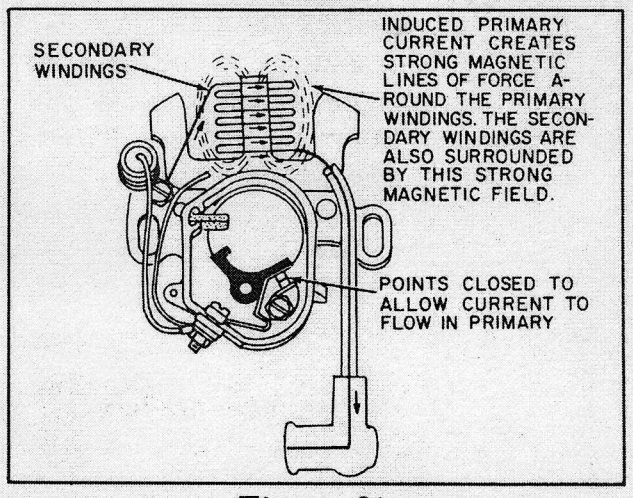


Figure 21

4. Points remain closed to complete the primary circuit and maintain the current flow and field of force.

5. See Figure 22 - At the point of maximum magnetic strength within the primary circuit, the points OPEN, rapidly collapsing the magnetic field.

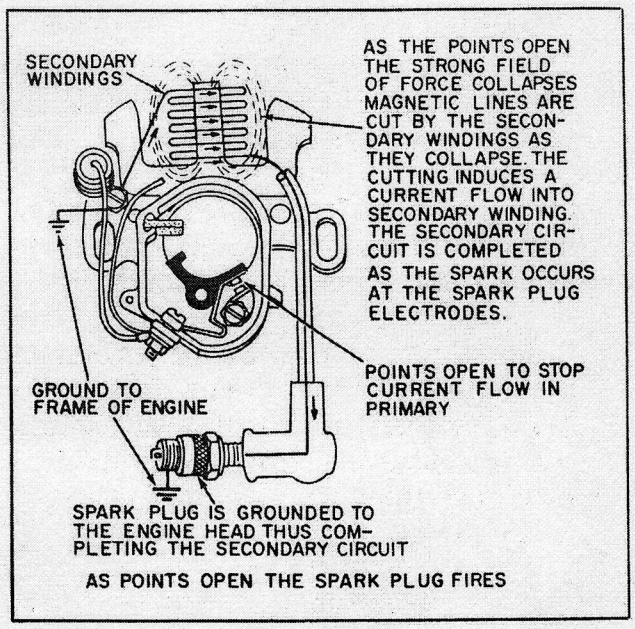


Figure 22

6. As the field of force collapsed, the magnetic lines are cut by the secondary windings. This induces rapid current movement within the secondary circuit, thus firing the spark plug to complete the secondary circuit.

7. The points then reclose to repeat the cycle sequence.

IGNITION SWITCH TEST

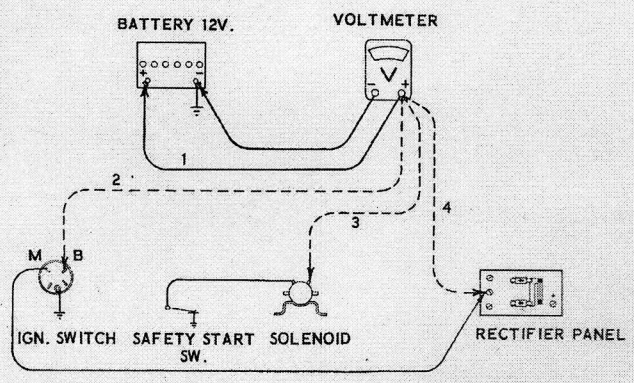


Figure 23

NOTE:

Disconnect solenoid to starter cable at starter and tape. Engage safety start switch. Model 107 - depress clutch-brake pedal fully and Model 117 - place travel 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. Remove magneto to ignition switch wire from rectifier panel and attach red voltmeter lead to this wire. Turn ignition switch back and forth from light to off position at least 12 times. No voltage should be recorded with this hook-up. NOTE - If battery voltage appears, replace switch at once.

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

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.

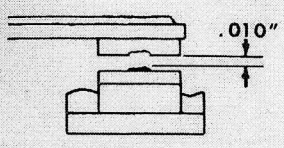
From Step 4:

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:

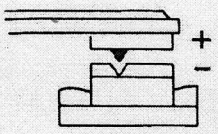
If "0" Volts Appears In Step 5 - Remove ignition switch retaining nut, clean rust or paint from panel. Reinstall ignition switch and test again. If still "0" volts, replace ignition switch. If equipped with switch kit (C17809), "0" volts indicates faulty switch or ground lead not attached at switch or ground at solenoid mounting screw.

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



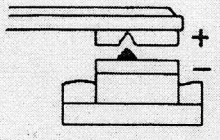
REPLACE CONTACT SET WHEN TRANSFER EXCEEDS .010"

Ideal contact point wear pattern.



TRANSFER OF MATERIALS FROM − POINT TO + POINT

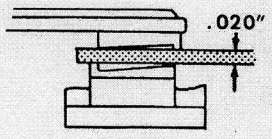
Contact point wear pattern such as this indicates condenser capacity may be too low - this is a normal wear pattern, but indicates why the condenser should always be replaced at the same time points are replaced.



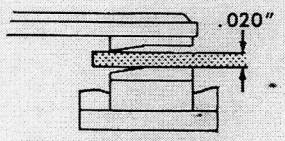
TRANSFER OF MATERIALS FROM + POINT TO − POINT

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.

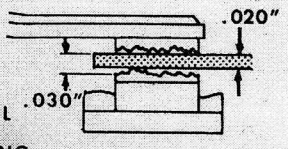
Some of the difficulties that can be encountered when trying to measure point gap with a feeler gauge.



MISALIGNED CONTACT POINTS WOULD GIVE FALSE READING

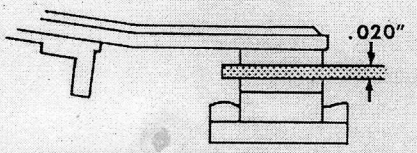


UNEVENLY WORN CONTACT POINTS WOULD GIVE FALSE READING



ACTUAL POINT OPENING

PITTED CONTACT POINTS



CONTACT POINTS THAT ARE PROPERLY ALIGNED WOULD GIVE TRUE GAP SETTING

Figure 20

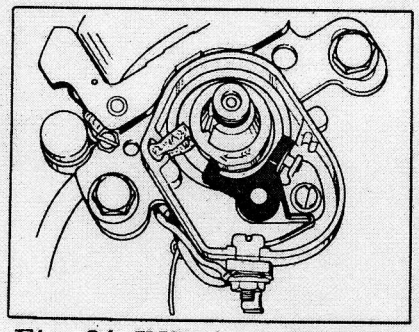


Fig. 24 INSTALL POINTS

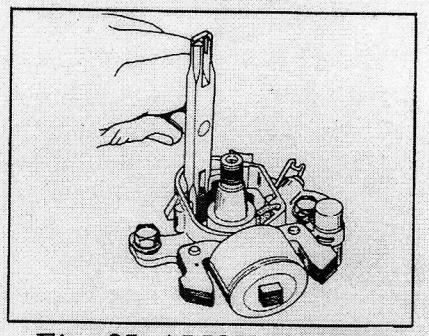


Fig. 25 ALIGN POINTS

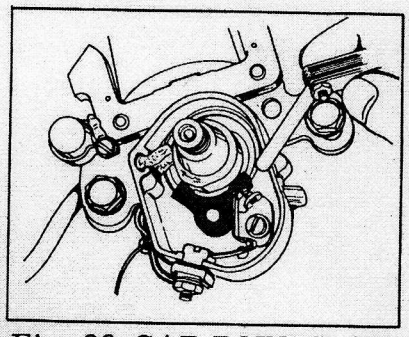


Fig. 26 GAP POINTS .020

1. Remove engine shroud, head, and flywheel.

2. Turn crankshaft until highest part of cam lobe is under breaker arm, adjust point gap to .020 or replace, align, and gap points as shown above.

3. Check the height of piston in relation to top of cylinder block with a pocket scale, caliper or micrometer depth gauge for T.D.C. Fig. 28.

4. Calibrate one of above tools to contact piston head .080 to .090 before T.D.C. Turn crankshaft backward to lower piston far enough to insert tool and bring piston head in contact with tip of tool in direction that engine runs. Figure 29.

5. With piston in this position, adjust stator position as indicated, in Figure 29 and 30 below.

6. Torque stator bolts 60-84 in. lbs. Install leads, cover, flywheel, cylinder head and shrouding. Torque cylinder head bolts to 140-200 in. pounds.

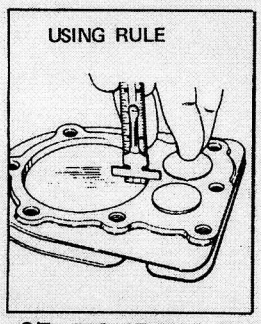


Fig. 27 TO FIND T.D.C.

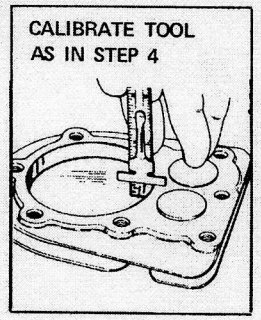


Fig. 28 BEFORE T.D.C.

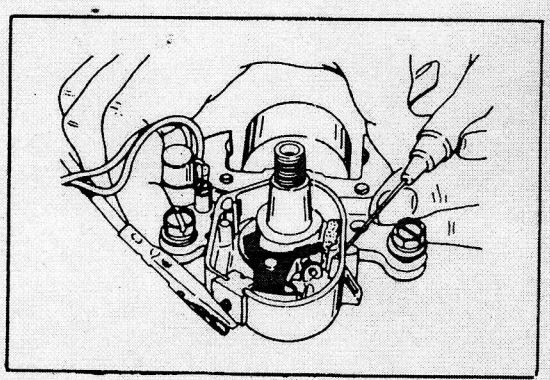


Fig. 29 INSTALL TEST LIGHT WITH COIL LEADS DISCONNECTED FROM POINT TERM.

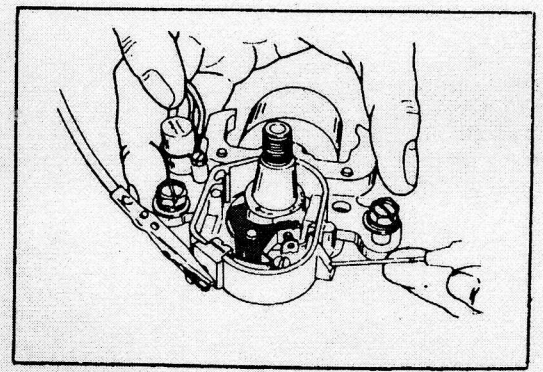


Fig. 30 ROTATE STATOR UNTIL POINTS JUST OPEN (LIGHT GOES OUT).

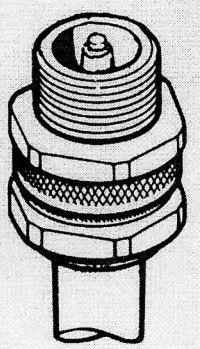


Figure 31

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 32. Screw driver held loosely and parallel from magnets should be drawn in contact with magnets.

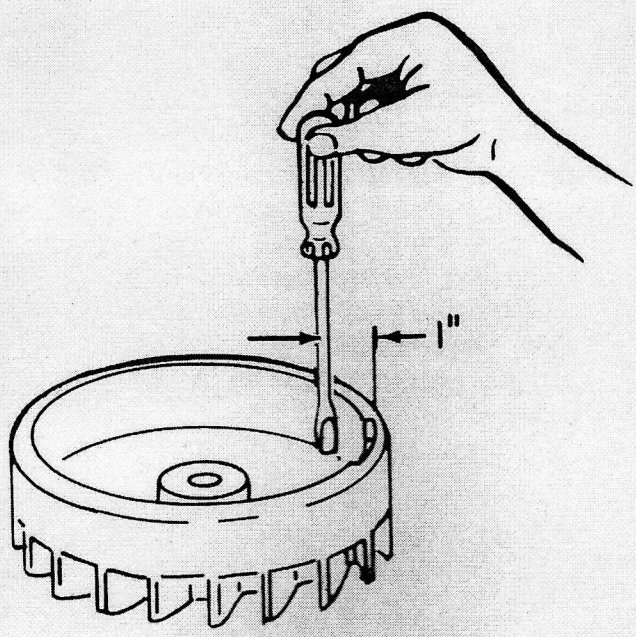


Figure 32

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 33 and 34.

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.

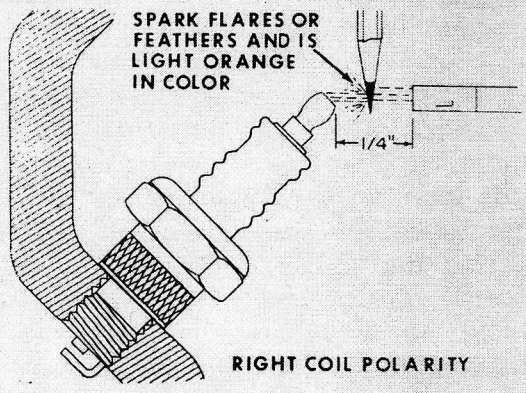


Figure 33

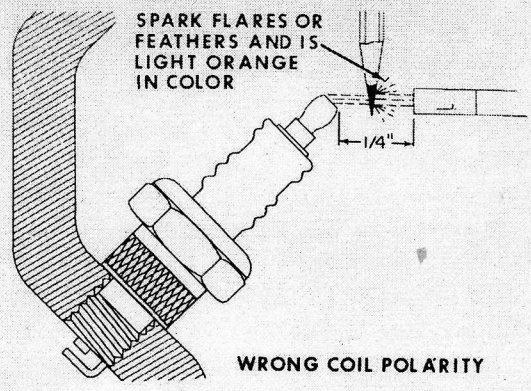


Figure 34

SPARK PLUGS

SPECIFICATIONS

Type -----Prestolite 14 L7 or Equivalent
Thread Size ----------14 MM
Shank Length ----------7/16 Inch
Gap Setting ----------.025 Inch
Installation Torque -----27 Foot Pounds
Socket Wrench Size ---------13/16 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.

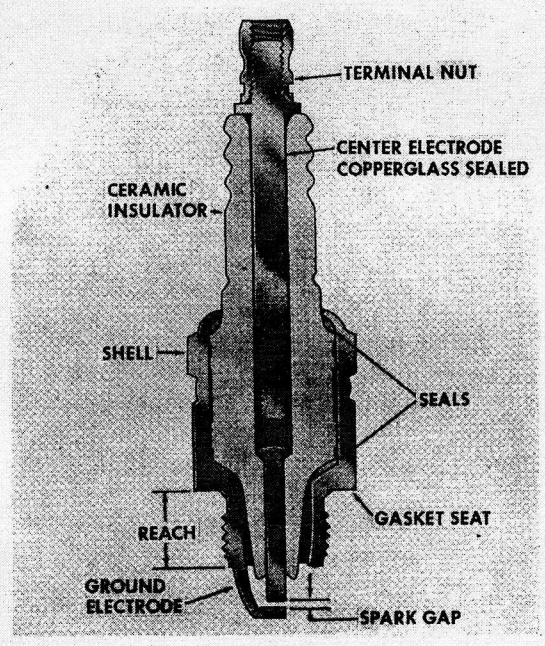


Figure 35

REMOVAL AND INSPECTION

Remove the wire from the spark plug and use a thin wall deep socket spark plug type wrench of correct size 13/16" 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 20 and 21.

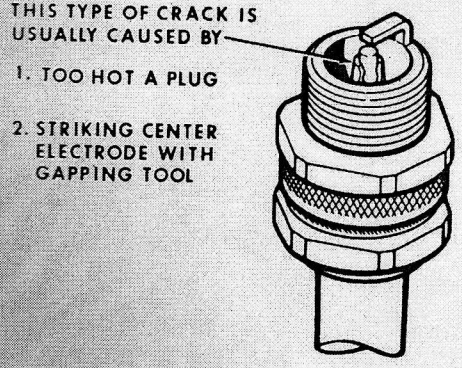


Figure 36

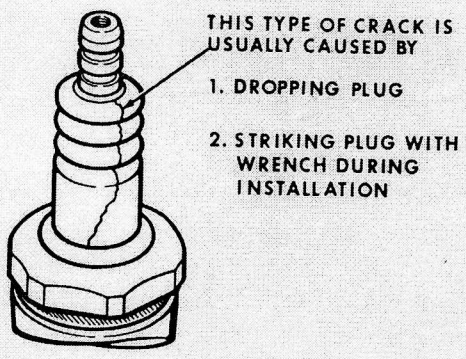


Figure 37

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 38.

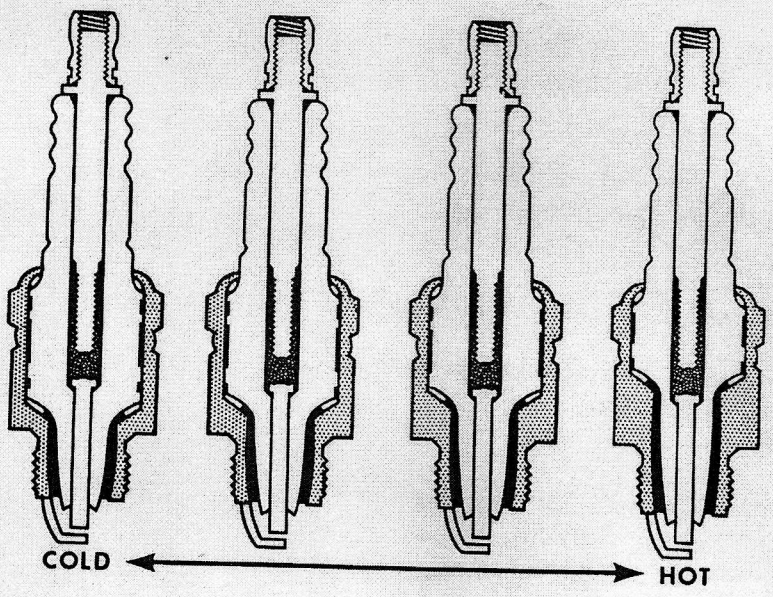


Figure 38

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.

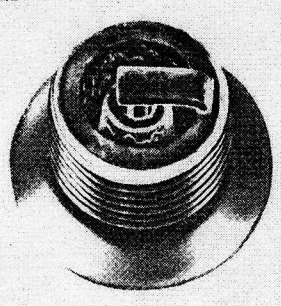


Figure 39

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:

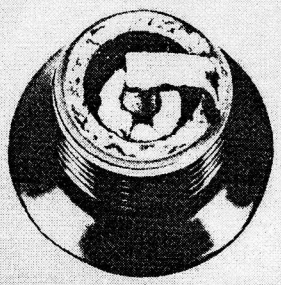


Figure 40

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.

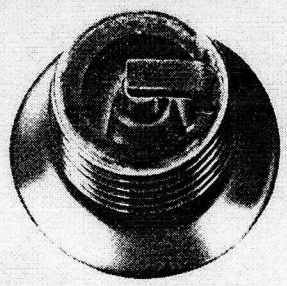


Figure 41

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.

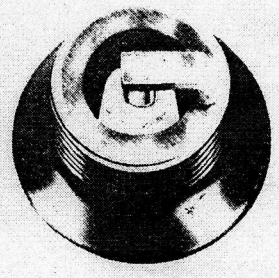


Figure 42

NOTE

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

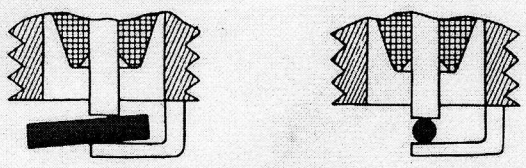
CLEANING AND GAPPING SPARK PLUG

Use an abrasive type cleaning machine (if available) to remove the deposits on the plug. After this has been done, wire brush the threads.

File the electrode sparking areas to obtain bright flat parallel surfaces. The plug should be washed in a good cleaning solvent and blown dry with air pressure. Reset the gap between the electrodes to .025 inch.

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

Use a round type feeler gauge to measure the gap as a flat type feeler gauge will give a false reading, Figure 43.



FLAT FEELER GAUGE CAN GIVE FALSE READING

ROUND FEELER GAUGE WILL GIVE A MORE ACCURATE READING

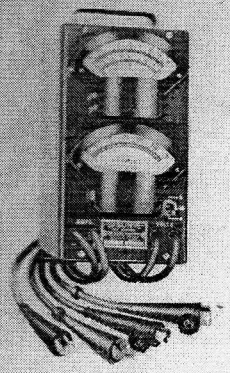
Figure 43

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 (13/16") 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.

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.

PURCHASE TOOLS OF EQUAL OR BETTER QUALITY FOR USE IN TESTING ELECTRICAL SYSTEMS AND ENGINE R.P.M.
MODELS 107 - 117



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

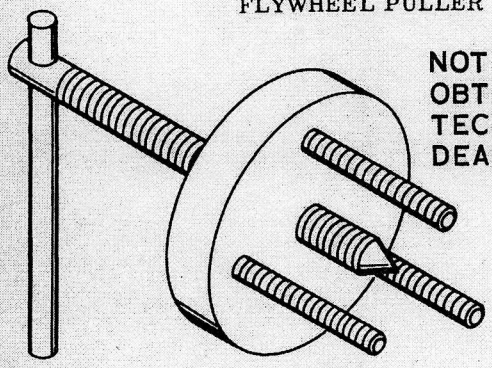
The Model BC-110 features the superior quality engineering, workmanship and materials as the larger models. This lower output charger is ideal for small shop operator or for home use. On a continuous duty basis, it will charge 6 volt or 12 volt batteries at 10 amperes. Its Charge Rate Selector permits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

THE FOLLOWING TOOLS AVAILABLE FROM TECUMSEH PRODUCTS.

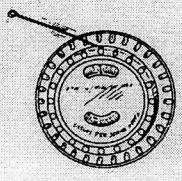
FLYWHEEL PULLER



670218 Flywheel Puller. Used on Lauson vertical and horizontal with flywheels that have drilled and tapped holes.

NOTE: THESE TOOLS CAN BE OBTAINED FROM THE LOCAL TECUMSEH DISTRIBUTOR OR DEALER.

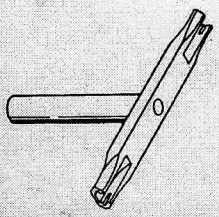
VIBRATION TACHOMETER



NO. 670156 - Tachometer.

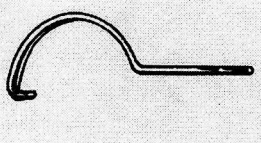
To be used to determine high and low idle speeds, also to determine specific R.P.M. for electrical test procedures.

POINT ALIGNING TOOL



NO. 670192 - Breaker point aligning tool.

FLYWHEEL TOOL



670217 Flywheel Tool. Used on vertical and horizontal engines.

GHRBO

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