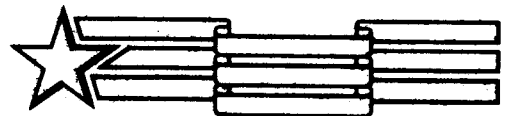


Ingersoll

**ELECTRICAL SYSTEM
WITH STARTER GENERATORS
MODEL 210, 220, 222, 224,
442, 444, 644
Service Manual No. 9-99773**



QUALITY IN THE AMERICAN TRADITION

Ingersoll Equipment Co., Inc.

Winneconne, Wisconsin 54986-9576

casecoltingersoll.com

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SAFETY MESSAGES



This safety alert symbol indicates Important Safety Messages in this manual. When you see this symbol carefully read the message that follows and be alert to the possibility of personal injury or death.



POISON: Batteries contain sulfuric acid which can cause severe burns. Avoid contact with skin, eyes or clothing. Antidote - external flush with water - internal drink large quantities of water or milk. Follow with Milk of Magnesia, beaten egg or vegetable oil. Call physician immediately. Eyes flush with water for 15 minutes and get prompt medical attention. Keep out of reach of children.



CAUTION: When removing a battery always disconnect the negative (ground) cable first. When installing the battery always connect the negative (ground) cable last. This will prevent accidental grounding of wrench when disconnecting or connecting the positive cable. Place all electrical switches in the 'off' position.



CAUTION: Think out your circuit before you make or break a connection. A wrong connection can be painful and expensive.



DANGER: Charging batteries produce explosive hydrogen gas. Keep sparks, flames and cigarettes away. Ventilate when charging or using in enclosed space. Always shield eyes when working near batteries. Explosion of hydrogen gas can cause serious injury.



CAUTION: When working around storage batteries remember that all exposed metal parts are "live". Never lay a metal object across the terminals as a spark or short circuit may result.



CAUTION: Put transmission and attachment drive controls in neutral before attempting to troubleshoot the electrical system. Unexpected machine movement can cause injury.



CAUTION: Storage areas for batteries must be well ventilated to prevent accumulation of hydrogen gas from newly recharged batteries.



WARNING: To jump start this machine, connect positive jumper cable to battery terminal on starter solenoid and connect negative jumper cable to good engine ground. Start engine only when seated in operator's seat. Stop engine before leaving machine. Disconnect jumper cables. Any other method could result in uncontrolled machine movement.



CAUTION: Never wear rings or metal watch bands that may ground a live circuit. Severe burns may result.

TEST EQUIPMENT

The following listing is the minimum suggested test equipment needed to perform the troubleshooting steps outlined in this service manual section.

1. VOM Meter

A Volt-Ohm-Milliamp Meter with the following ranges:

Volts - DC - 0 to 1 -	Used for measuring voltage drops in circuitry.
Volts - DC - 0 to 20 -	Used for measuring battery charging voltage.
mA - DC - 0 to 3 -	Used for measuring current leakage.
Ohms - Rxl -	Used for measuring low resistance values such as the primary ignition coil winding.
Ohms - RX1000-	Used for measuring higher resistance values such as in ignition coil secondary windings.

Several suitable meters are:

Radio Shack Model 22-202 and Model 22-203
LaFayette Model 99R50734 and Model 99R50841

2. An automotive type ampmeter such as, Case Part Number C18389, with leads and alligator clips.
3. Spark Tester, such as, Briggs and Stratton Part Number 19051.
4. Clip on ampmeter
5. Jumper leads 24" long, 14 gauge wire with alligator clips.
6. 12 Volt test light
7. Battery Hydrometer
8. DC Power Timing Light

SPECIFICATIONS

STARTER GENERATOR

BELT TENSION 1/4" (6 mm) deflection when finger pressure is applied halfway between the pulleys. Do not over-tighten.

BRUSH TENSION.....24-32 in. lb. (2.8-3.6 Nm)

NO LOAD

STARTER TEST..... 11 volts - controlled
Max. RPM--2900
Min. RPM--2500
Max. Amps--18
Normal Amps--Approximately 12

GENERATOR OUTPUT

at 80°F. (25°C).....1.5 Amps Field Current
Draw-Controlled
4950 RPM-controlled
Output - 12 Amps 14 Volts

VOLTAGE REGULATOR

VOLTAGE CONTROL RELAY

Air Gap......075" (1.91 mm)
Voltage Range..... 13.6-14.5 Volts
Adjust to.....14.0 volts

CUTOUT RELAY

Air Gap......020" (0.51 mm)
Point Opening..... .020" (0.51 mm)
Closing Voltage..... 11.8-14.0 Volts

IGNITION COIL

PRIMARY RESISTANCE

Delco Coil 3.5 to 4.5 ohms
Other 2.8 to 3.4 ohms

SECONDARY RESISTANCE

Delco Coil 7,000 to 9,000 ohms
Other 11,200 to 15,500 ohms

SPARK PLUG

TYPE..... Champion H-10 or RH-10 or equivalent

THREAD SIZE..... 14 mm

GAP SETTING......035" (0.89 mm) for std.
.025" (0.64 mm) for resistor

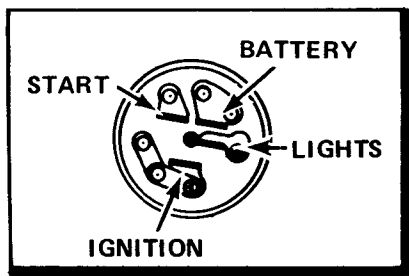
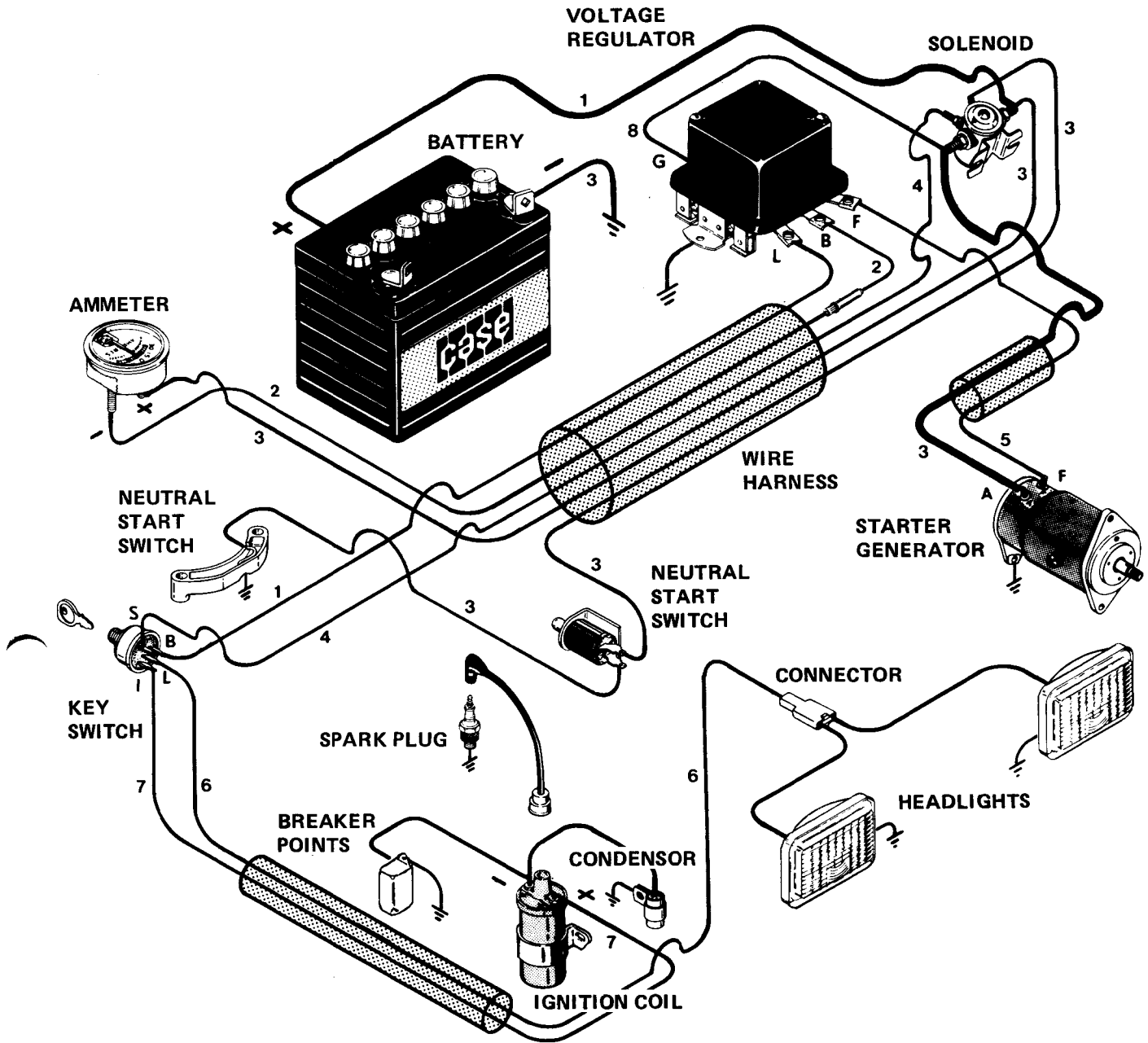
INSTALLATION

TORQUE..... 18-22 lb. ft. (25-29 Nm)
HEX SIZE.....13/16"

BREAKER POINT GAP.. .017" to .024"
(0.43 to 0.6 mm)

IGNITION TIMING.....20° BTC

WIRING DIAGRAM WITH AMMETER

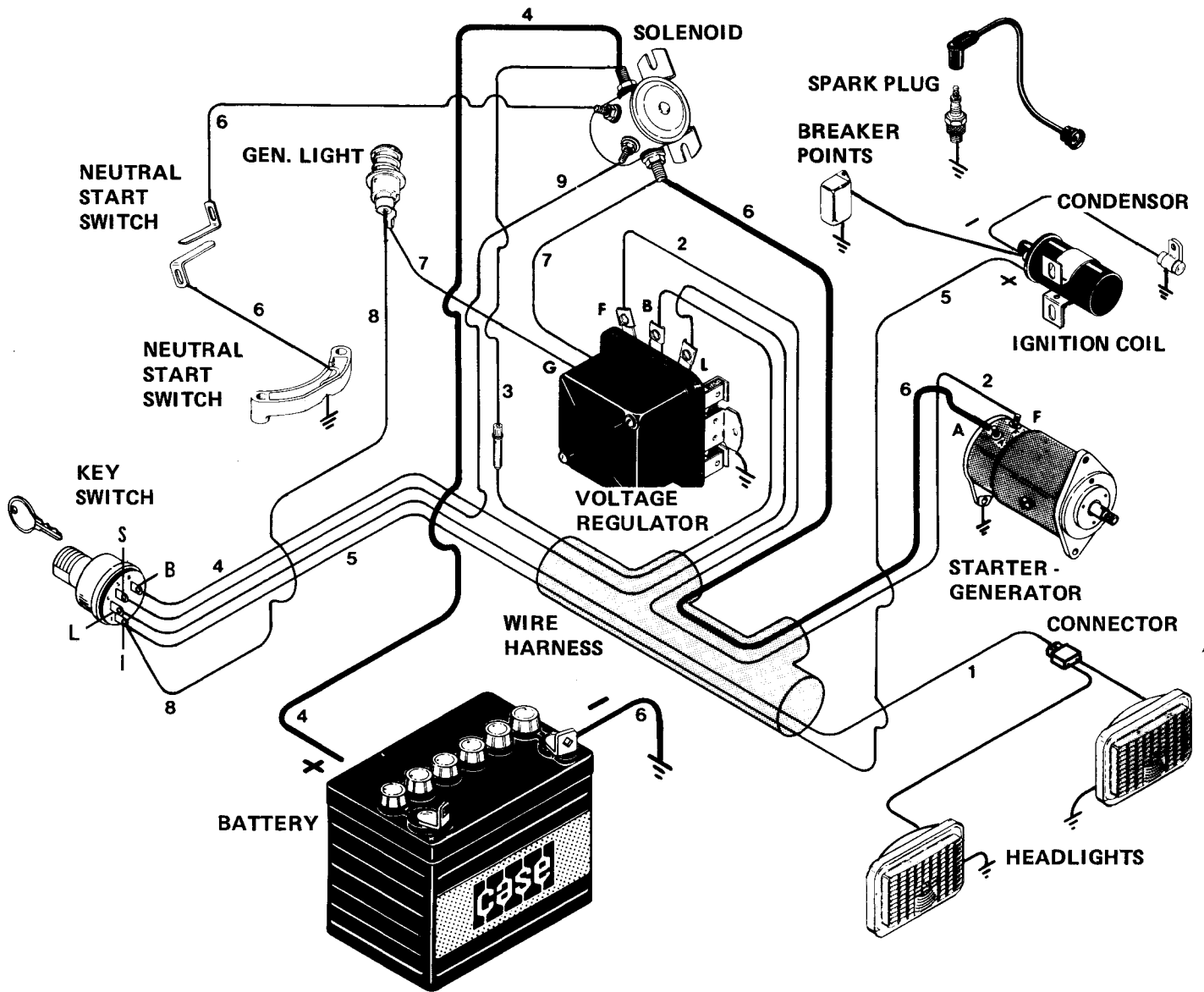


IGNITION SWITCH TERMINALS

- COLOR CODE**
- 1. Red
 - 2. Orange
 - 3. Black
 - 4. Yellow
 - 5. Lt. Green
 - 6. Pink
 - 7. Black/White
 - 8. White

FIGURE 1

WIRING DIAGRAM WITH GENERATOR LIGHT



COLOR CODE

- 1. Pink
- 2. Green
- 3. Orange
- 4. Red
- 5. Black/White
- 6. Black
- 7. White
- 8. Purple
- 9. Yellow

FIGURE 2

TROUBLESHOOTING CHART



CAUTION Put transmission and attachment drive controls in neutral before attempting to troubleshoot the electrical system. Unexpected machine movement can cause injury.

I. ENGINE WILL NOT CRANK

SYMPTOM	POSSIBLE CAUSE	TEST	SOLUTION
A. Solenoid doesn't click or clicks repeatedly (See "B" below)	1. Dead or weak battery	Hydrometer test. Voltmeter reading 9.5 minimum at battery terminals when cranking	Charge or replace battery
	2. Poor or open connection at solenoid, ampmeter, fuse, key switch, or neutral start switches	Visually inspect	Clean and tighten loose or corroded connections
B. Solenoid doesn't click	1. One or both neutral start switches open	Connect jumper wire from solenoid post (small post ground side) to ground	Disengage PTO clutch and put travel lever in N. Repair or replace one or both N start switches if defective
	2. Fuse blown	Check continuity	Replace fuse
	3. Open ampmeter	Check continuity	Replace ampmeter
	4. Open solenoid	Check continuity	Replace solenoid
	5. Open ignition switch	Connect jumper from battery positive to solenoid "+" small terminal or from B to S terminal on switch	Replace ignition switch
C. Solenoid click but engine won't crank (See A above)	1. Engine tight or ACR malfunction	Attempt to turn engine manually to check for free rotation	Repair engine if found to be tight
	2. Defective solenoid switch	Connect jumper wire across large solenoid posts. Engine should crank.	Replace solenoid
	3. Defective or worn starter		Repair or replace. See starter motor section of this manual.

II. ENGINE CRANKS, BUT WON'T START

SYMPTOM	POSSIBLE CAUSE	TEST	SOLUTION
A. Engine cranks slowly and won't start (Electrical problems only)	See A. & C. above		
B. Engine cranks but won't start (No spark)	1. Points not opening and closing	Check gap	Clean and set gap to .017" to .024". Time engine.
	2. No current to coil	Check for battery voltage at coil + with voltmeter or testing light. Hold switch in "start" position. Check wire connections and ignition switch continuity from "B" to "I" in both start and run positions	Replace switch or wires as required
	3. Spark plug	Inspect for grounded high tension lead or cracked insulator or fouled spark plug	Repair or replace lead or plug as required
	4. Defective ignition coil	Use coil tester	Replace
	5. Shorted to ground condenser	Unhook condenser lead. Crank engine. If weak spark is now seen, condenser was shorted.	Replace condenser

III. ENGINE RUNS ERRATICALLY

A. Engine runs at idle and erratically (electrical problems only). Flashing blue arc at points. Points burned.	Faulty condenser or condenser connected to coil "+" (points and condenser should be connected to coil "-")	Condenser test. Inspect connection.	Replace or connect condenser to coil "-".
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IV. ENGINE CRANKS IN GEAR

A. Engine cranks with travel lever in drive (210 - clutch pedal up; 644 - travel pedal depressed)	Grounded N start switch (travel or PTO) or wire lead	Visual inspection. Disconnect wire from small solenoid post to PTO N-Start switch.	Repair or replace wire lead or N - Start switch (travel or PTO).
B. Engine cranks with PTO clutch in gear or both travel and PTO in gear.	Grounded PTO N - Start switch or wire lead or grounded starter solenoid	Visual inspection. Disconnect wire from small solenoid posts N - Start switch. Attempt to crank engine.	Repair or replace lead or N - Start switch. If unit cranks with wire disconnected - R & R solenoid.

V. FUSE BLOWS REPEATEDLY

A. Fuse blows when key is turned to lights or run position.	Bare spot in headlight wire or coil wire.	Inspect wires for cuts or bare spots	Repair with approved electrical tape or replace wires.
B. Fuse blows when engine is running.	1. See A. above 2. Charging voltage too high.	1. See A. above 2. Test generator/regulator output. See Section VII.	1. See A. above 2. Adjust or repair generator or regulator as necessary
C. Fuse blows when key is turned to "OFF" position.	Voltage regulator cut-out relay sticking closed	Remove regulator cover and inspect cutout relay points.	Replace voltage regulator.

VI. BATTERY UNDER CHARGING (OR NO CHARGE)

SYMPTOM	POSSIBLE CAUSE	TEST	SOLUTION
A. Battery goes dead with normal usage	1. Defective battery	Recharge and perform battery test	Replace if necessary
	2. Cold weather, short running periods	Recharge and perform battery test	Use battery heater and trickle charger
	3. Stop start operation	Recharge and perform battery test	Keep engine speed high enough to charge
	4. Dirty or corroded terminals or wires	Visual inspection	Clean
	5. Excessive electrical loads	Total individual loads	Reduce total load
	6. Auxiliary electrical loads connected to battery positive terminal or "B" terminal on voltage regulator	Visual inspection	Connect auxiliary electrical loads to "L" regulator terminal only.
B. No charge to battery (ampmeter at 0 or indicator light stays lit).* NOTE: If unit is not equipped with an ammeter, connect one, in series at the fuse holder. Make sure to include a fuse in the lead to the ammeter.	1. Battery fully charged (Ammeter at '0')	Turn head lights on for 5 minutes with engine shut off. Start tractor.	Ammeter shows charge. Indicates charging system functioning properly.
	2. Defective voltage control relay	1. Connect voltmeter to battery terminals 2. Run engine at 3/4 throttle 3. Momentarily ground field terminal of voltage regulator.	If output shows no increase, regulator at fault. (a) Make sure regulator is grounded to tractor frame and (b) Adjust regulator relay or (c) Replace voltage regulator.
	3. Defective cut out relay	1. Connect voltmeter to battery terminals 2. Run engine at 3/4 throttle 3. Momentarily jump between the "G" and "B" terminals of voltage regulator. Make sure regulator is grounded to tractor frame.	If output increases, cut out relay is at fault. (a) Adjust cut-out relay or (b) Replace voltage regulator.
	4. Defective generator	If output does not increase in 2 or 3 above, the generator is faulty.	Repair or replace the generator.

***NOTE:** Be sure to check all connections for continuity before replacing major components. Be sure voltage regulator is grounded to tractor frame.

VII. BATTERY CONTINUOUSLY CHARGES AT HIGH RATE

A. Ammeter continuously shows high value. Water consumption exceeds 1 oz each 25 hours.	1. Grounded field in volt regulator	Remove wire from volt reg. "F" terminal. If output drops, field grounded in reg.	Repair or replace
	2. Grounded field in generator	If output does not drop in (1) above, field is grounded in generator	Repair or replace

BATTERY CARE AND MAINTENANCE

ACTIVATING THE DRY-CHARGED BATTERY

The activation procedure described below must be followed to insure satisfactory battery performance.

1. Remove battery from tractor. This must be done to prevent accidental spillage of battery acid on metal tractor parts.
2. Remove battery caps and fill to a point slightly **BELOW** the vent well. Small battery size may cause electrolyte to bubble over when charging if filled to vent well at first.
3. Charge at 3 amp rate until fully charged (1.260 specific gravity). Higher charging rates may damage battery. See the Battery Maintenance section of this manual.
4. Disconnect charger. Unplug charger from wall before disconnecting at battery to prevent spark at battery post.
5. Top off each cell with electrolyte to the vent well if required. Install battery caps.
6. Wash battery with baking soda solution if moist from electrolyte. Be careful not to get baking soda solution in cells.
7. Install battery in tractor. Connect positive cable first and negative cable last. Coat terminals with cup grease to prevent corrosion.



CAUTION: When removing a battery always disconnect the negative (ground) cable first. When installing the battery always connect the negative (ground) cable last. This will prevent accidental grounding of wrench when disconnecting or connecting the positive cable. Place all electrical switches in the 'off' position.

8. Maintain battery as described in the Battery Maintenance section of this manual.

REMOVAL AND INSTALLATION

Proper removal and installation procedures are required to prevent personal injury and damage to battery or equipment.

1. Place all electrical switches in the "off" position.
2. To remove battery: **DISCONNECT NEGATIVE ("-")** cable first and **POSITIVE ("+")** cable last.
3. To install battery: **CONNECT POSITIVE ("+")** cable first and **NEGATIVE ("-")** cable last.
4. Be sure to install insulating boot when provided, on **POSITIVE ("+")** terminal.
5. Use care when tightening or loosening cables at battery terminals. Excessive force or hammering will cause damage to battery.
6. Coat battery terminals with light cup grease to prevent corrosion.
7. Tighten battery hold down securely. Avoid overtightening which could cause damage to battery case or cells.

BATTERY MAINTENANCE

1. **BATTERY TOP:** The battery top must be kept clean and dry. Dirt or moisture will cause the battery to self-discharge. The battery top can be cleaned with baking soda solution. Do not allow baking soda solution to enter the cells.
2. **TERMINAL CONNECTIONS:** The battery terminal connections must be kept clean and tight. Loose or corroded connections offer resistance to current flow resulting in poor battery performance.

Use a wire brush to clean terminals and coat with cup grease to prevent corrosion.



CAUTION: When working around storage batteries remember that all exposed metal parts are "live". Never lay a metal object across the terminals as a spark or short circuit may result.

3. **ELECTROLYTE LEVEL:** The electrolyte level must be maintained above the cell plates at all times to avoid permanent battery damage. The battery must be kept filled to the vent well with water free of scale forming minerals.

Water consumption in excess of 1 ounce (29 ml) every 25 hours of operation indicates an over-charging problem. See the testing section of this manual.

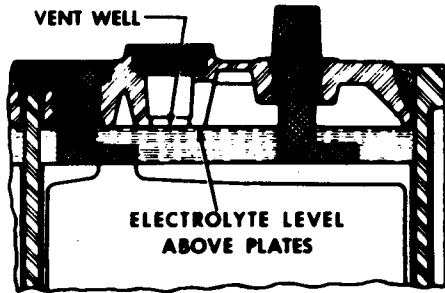


FIGURE 3

4. **STATE OF CHARGE:** The battery must be maintained in a full state of charge as indicated by hydrometer readings. A battery that is allowed to stand in a discharged condition will become permanently damaged.

An idle battery will self discharge. For this reason, idle batteries should be checked periodically and charged as necessary.

Discharged batteries will freeze in cold weather. For example, a battery with specific gravity of 1.175 will freeze at 0°F (-18°C).

5. **CHARGING PROCEDURE:**

- A. Charging at a rate not to exceed 3 amps is recommended.
- B. Charging at higher rates up to 15 amps is permissible as long as:
- Violent gasing does not occur
 - Electrolyte is not spewed from vents
 - Electrolyte temperature does not exceed 125°F (51°C)

DO NOT exceed 15 amps charge rate.

- C. A battery is fully charged when, after two, two hour intervals at a low charge rate (3 amps), all cells are gasing freely and no change in specific gravity occurs.

- D. Always turn charger off or unplug from wall before removing clips from battery terminals. This prevents arcing at battery which can cause explosion of hydrogen gas created while charging.

BATTERY TESTING

SPECIFIC GRAVITY TEST (HYDROMETER TEST): The hydrometer is used to measure the specific gravity of battery electrolyte (weight of electrolyte as compared to water). This indicates the state of charge of the battery.

Mix newly added water with electrolyte before taking hydrometer readings by:

- charging for 15 minutes at 3 amps and
- applying a 75 amp load for 15 seconds (about equal to cranking engine for 15 seconds).

The hydrometer reading is only correct when electrolyte temperature is 80°F (25°C). Correct readings for temperature variation in accordance with the following guidelines:

Electrolyte temperature correction - Fahrenheit scale

For every 10°F below 80°F SUBTRACT .004 from the observed hydrometer reading.

For every 10°F above 80°F ADD .004 to the observed hydrometer reading.

Electrolyte temperature correction - Celsius scale

For every 10°C below 25°C SUBTRACT .007 from the observed hydrometer reading.

For every 10°C above 25°C ADD .007 to the observed hydrometer reading.

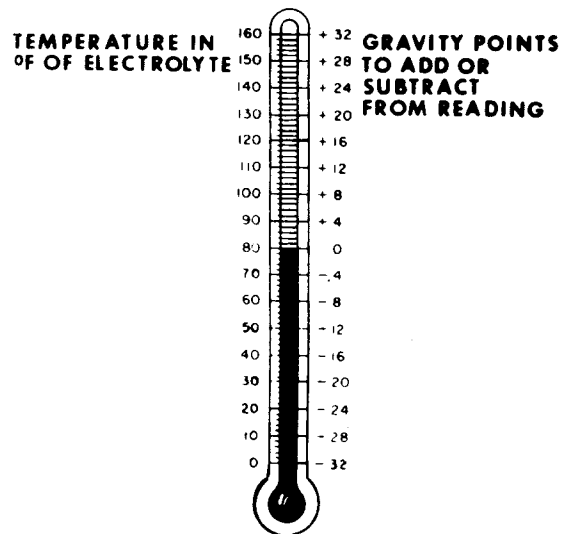


FIGURE 4

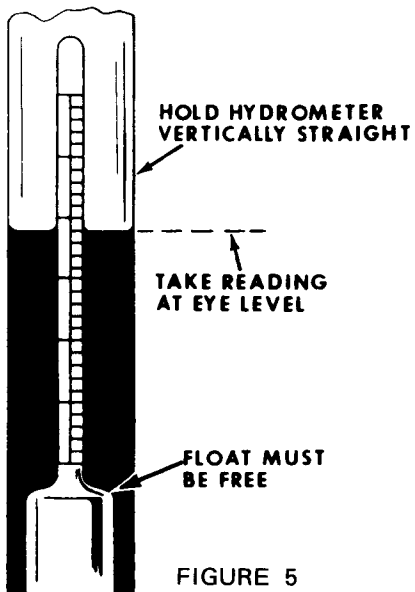


FIGURE 5

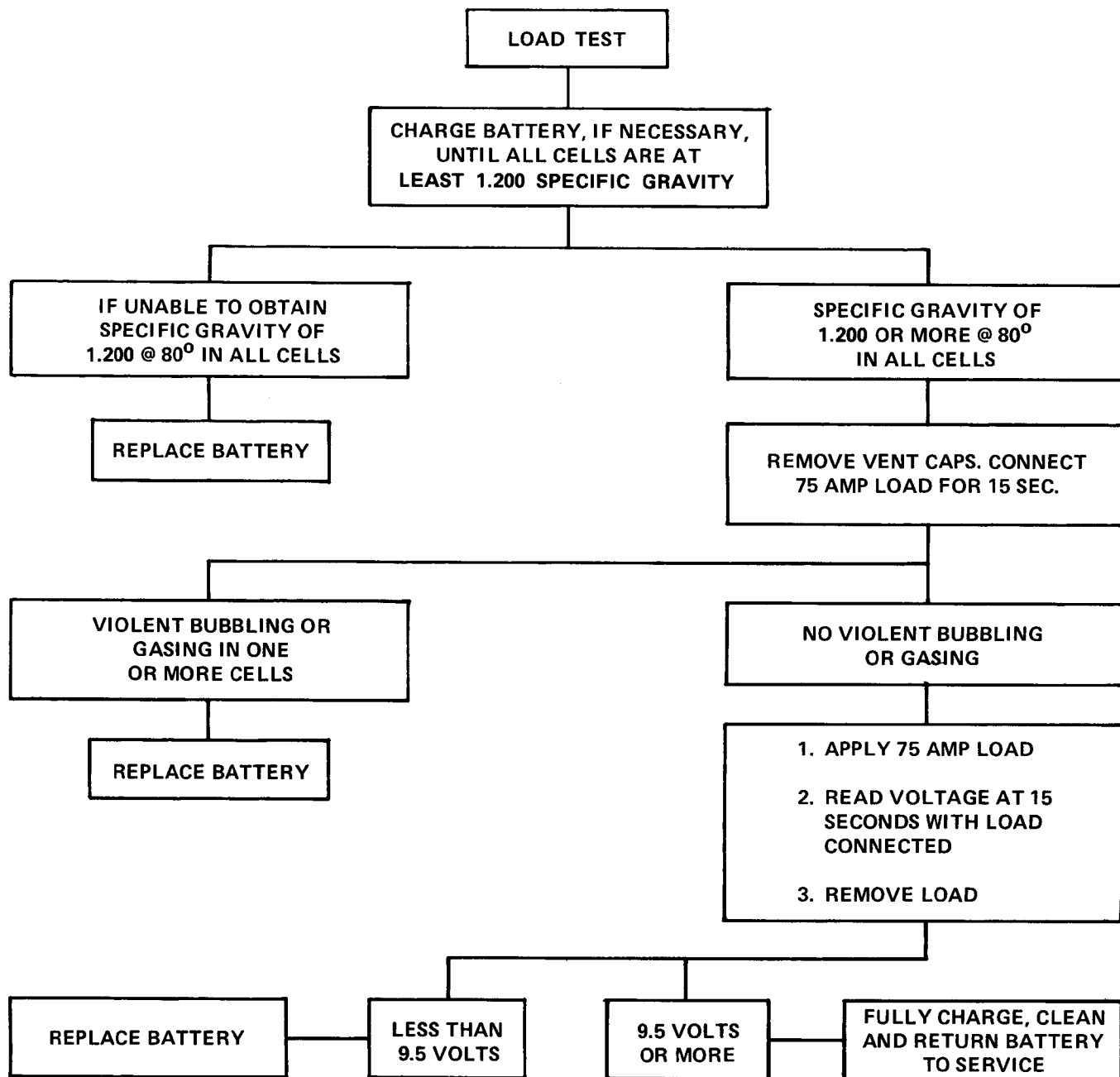
Fill hydrometer with enough electrolyte to allow float to float freely. Hold hydrometer vertically and at eye level when taking a reading. Record reading for each cell, and correct for temperature as described above. Refer to battery check sheet.

LOAD TEST: Perform the battery load test by loading the battery to 3 times its amp-hour rating for 15 seconds.

Examples: 3 x 24 amp-hour = 72 amp load
3 x 32 amp-hour = 96 amp load

This load can be created with a battery load tester or by cranking the engine (cranking load of room temperature engine is approximately 80 amps).

Follow the step-chart and enter results on the battery check sheet.



BATTERY CHECK SHEET

TEST Result	Summary	Indication	Remedy
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VISUAL INSPECTION

1. Dirty battery top _____		Battery OK	Clean
2. Clogged vents _____		Battery OK	Clean
3. Corrosion _____		If severe, possible battery defect.	Clean and continue testing.
4. Low water level _____	Excess water use - Test for overcharging.	Battery OK	Add water
5. Cracked case _____		Defective battery	Replace

SPECIFIC GRAVITY CHECK

Cell No. 1 _____	1. More than 30 gravity points variation between cells.	1. Defective, discharged or worn out battery.	1. Recharge battery. Repeat test. If cell readings still vary more than 30 points, replace battery.
Cell No. 2 _____			
Cell No. 3 _____			
Cell No. 4 _____	2. Most cells below 1.230 and within 30 points.	2. Discharged	2. Recharge and make Load Test.
Cell No. 5 _____	3. Most cells at or near full charge (1.260) and within 30 points.	3. Charged	3. Make Load Test.
Cell No. 6 _____	4. Most cells above full charge (1.260)	4. Overcharged	4. Check regulator.

NOTE: Specific gravity readings apply to original equipment or Case supplied replacement batteries only. Other makes may vary.

LOAD TEST

Battery must have 1.200 specific gravity. Load equals 20-hour amp rating x 3 for 15 seconds			
12 volt battery _____	Over 9.5 volts	Battery OK	Recharge if necessary
	Under 9.5 volts	Defective	Replace

IGNITION SYSTEM REPAIR

COMMON CAUSES - - POOR OR NO IGNITION

NO IGNITION SPARK

1. Switch turned off
2. Leads disconnected or broken
3. Bad plug
4. Ignition switch faulty
5. Breaker points oxidized
6. Breaker points stuck
7. Condenser faulty
8. Ignition coil faulty

POOR IGNITION

1. Plug wet
2. Plug gap incorrect
3. Plug carbon fouled
4. Wrong plug
5. Breaker points dirty or bad condition
6. Point gap wrong
7. Condenser weak
8. Push rod sticking or worn
9. Cam lobe worn

See Troubleshooting section of this manual for more complete troubleshooting information.

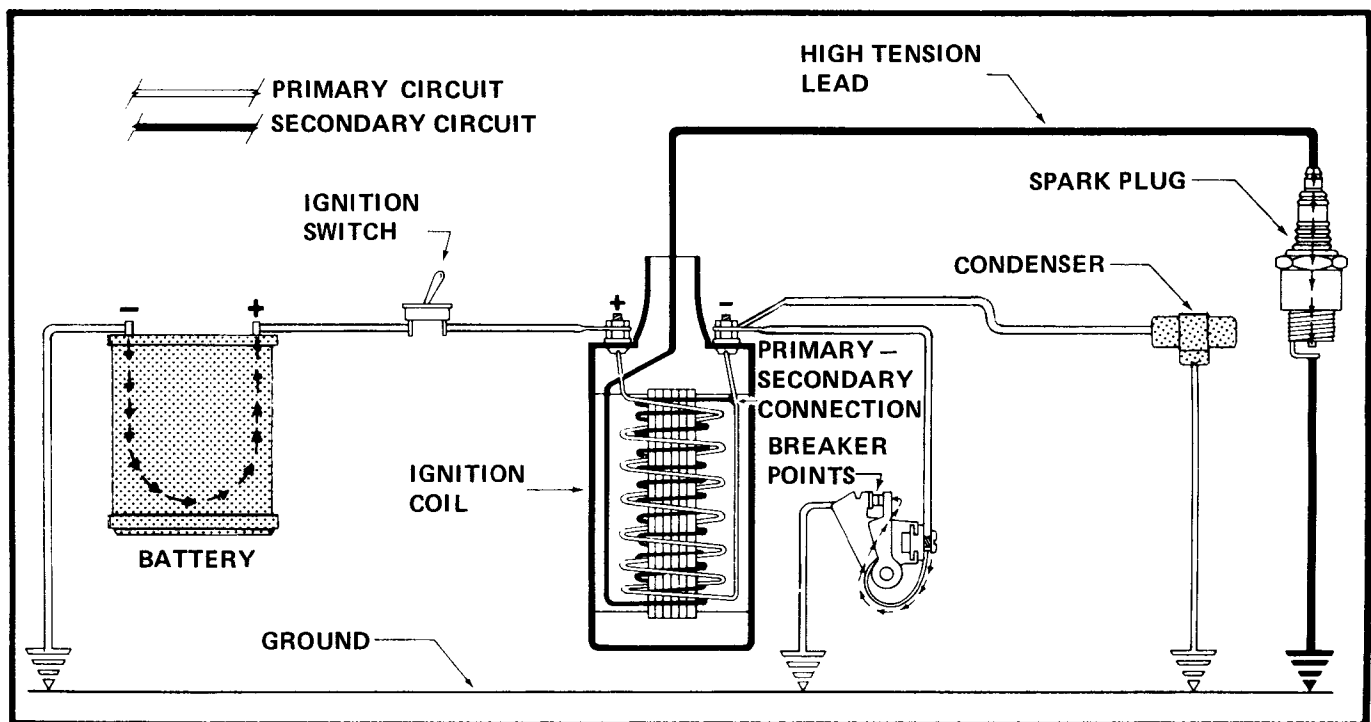


FIGURE 6 Schematic of a typical battery ignition system.

BREAKER POINT SERVICE: Engine operation is greatly affected by breaker point condition and adjustment of the gap. If points are burned or badly oxidized, little or no current will pass and as a result the engine may not operate at all, or if it does run it is likely to misfire, particularly at full throttle.

The breaker point gap affects the time that the contacts are opened and closed. If the points are adjusted to a wider gap, they will open earlier and close later. A definite time is required for the magnetic field within the ignition coil to build up to sufficient value. If the contact points are closed for too short a time, a weak spark will be produced by the coil. If points are set too wide, they will open before the primary current reaches the maximum value and on the other hand if set too close, they will open after the primary current has passed its maximum value.

Breaker Point Replacement: Rotate engine flywheel until "T" mark (top dead center) is in center of timing sight hole with piston on compression stroke.

Replace breaker point assembly. Set gap at .020" (.50 mm).

This will allow engine to start and run so ignition timing may be checked and adjusted.

Ignition Timing: Connect timing light to tractor battery and spark plug in accordance with directions provided with your timing light.

Start and run engine at a medium speed (about 1800 RPM).

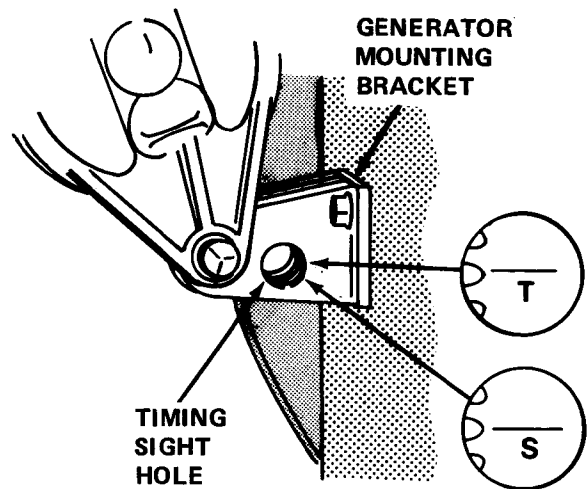


FIGURE 7 Ignition Timing

Aim timing light into timing sight hole. "S" mark should be centered. Adjust point gap as required to center "S" mark in timing sight hole.

NOTE: The timing mark may be easier to see if after aligning "S" mark in sight hole a chalk mark is made between the blower housing and rotating air screen.

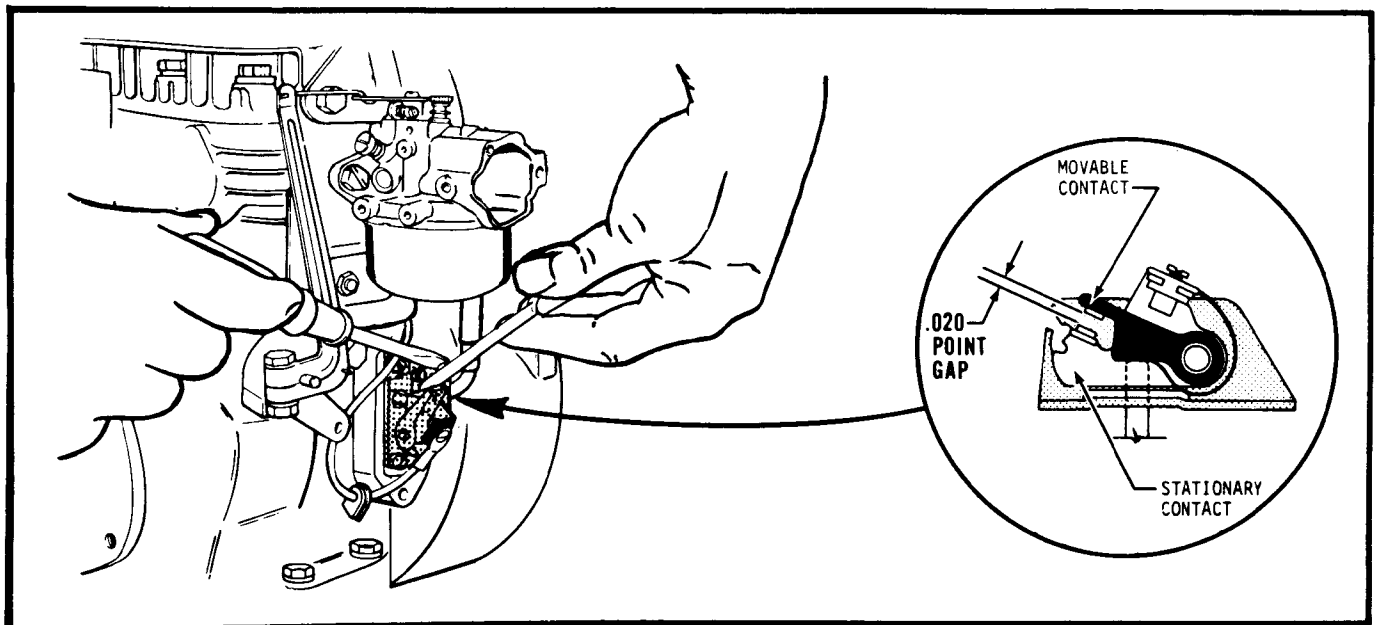


FIGURE 8
Breaker point gap adjustment

COIL SERVICE: Inspection: The ignition coil should be kept clean and dry and connections must be kept tight. The rubber boot on the high tension terminal must be in good condition to prevent leakage of current across exposed surfaces.

Installation: The coil must be installed with the primary positive "+" terminal connected to battery positive "+" (from key switch). The coil negative "-" must be connected to the breaker points and condenser. See Figure 6.

Testing: Ohmmeter test for coil primary winding

1. Select RX 1 scale on ohmmeter.
2. Zero ohmmeter needle.
3. Connect one ohmmeter lead to coil "+" terminal, the other to coil "-" terminal.
4. Resistance should be as listed in the specification section of this manual.

Infinite resistance indicates open primary circuit. Less than specified resistance indicates a shorted primary circuit.

Ohmmeter test for coil secondary winding

1. Select RX 1,000 scale on ohmmeter.
2. Zero ohmmeter needle.
3. Connect one ohmmeter lead to coil spark plug terminal, the other to coil "-" terminal.
4. Resistance should be as listed in the specification section of this manual.

Infinite resistance indicates an open secondary circuit. Substantially less than specified resistance indicates a shorted secondary circuit.

Ohmmeter test for grounded windings

1. Select RX 1,000 scale on ohmmeter.
2. Zero ohmmeter needle.
3. Connect one ohmmeter lead to coil "-" terminal, the other to metal case of coil.
4. Infinite resistance indicates a good coil. Continuity indicates a grounded coil.

NOTE: Do not touch ohmmeter leads with fingers when performing this test.

A coil testing "good" with the ohmmeter test is not conclusive. Coils may fail intermittantly when subjected to load, heat, and vibration of a running engine.

The use of a spark tester or coil tester will complete the testing of coil output.

Coil Tester Test

Follow the instructions provided with the coil tester. If a coil tester is not available, the spark tester check can be used.

Spark Tester Test

1. Connect spark tester ground clip to engine ground.
2. Connect spark plug wire to test terminal of spark tester.
3. Crank engine.
4. A sharp blue spark should be visible.
5. Connect spark tester ground clip to spark plug. (Now spark tester is in series with engine spark plug.)
6. Start and operate engine under load. Presence of spark (coil output) can be monitored during operation.

CONDENSER SERVICE

Symptoms

Condenser shorted to ground will prevent coil from producing secondary voltage.

Condenser with open circuit or decreased capacitance reduces coil output voltage and will cause points to burn excessively.

Condenser with too little capacitance will cause metal to build up on the moveable contact.

Condenser with too much capacitance will cause metal to build up on the stationary contact.

Replace condenser with proper one as indicated in parts listing.

Testing: Ohmmeter test

1. Remove condenser.
2. Select RX 10K scale on ohmmeter. Zero the meter.
3. Touch one ohmmeter lead to the condenser case and the other ohmmeter lead to the condenser lead.

NOTE: Do not touch ohmmeter prods or condenser case or lead while performing this test.

4. Reverse the ohmmeter leads on the condenser. A properly operating condenser will cause the ohm needle to move slightly each time the leads are reversed and touched to the condenser.

5. If the needle does not move or if a constant low resistance reading occurs, the condenser is defective.

IMPORTANT: Be sure to connect condenser to the breaker point side of the coil. That is the negative "-" side on the negative ground system.

SPARK PLUG SERVICE

Symptoms: Spark plugs in poor condition or gapped improperly can cause engine misfire and poor operation.

Refer to Figures 9, 10 and 11 for examples of failed spark plugs. Correct the cause of the failure before returning the engine to service.

Removal:

Every 100 hours remove plug, check condition and reset gap.

CLEAN AREA around plug before removal.

DO NOT sandblast, wire brush, scrape or otherwise service plug in poor condition--best results are obtained with new plug.

Set spark gap at .035" (.89 mm) for standard plugs and .025" (.64 mm) for resistor plugs. Tighten plug to 18 to 22 lbs. ft. (25 to 29 Nm) with a torque wrench.



FIGURE 10 Overheated Spark Plug

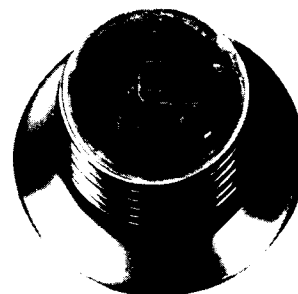


FIGURE 11 Fuel Fouled Spark Plug

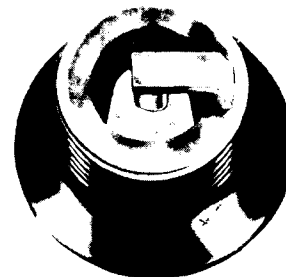


FIGURE 12 Spark Plug With Normal Wear

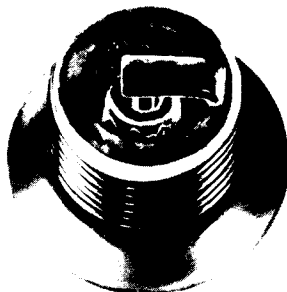
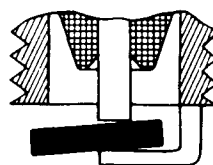
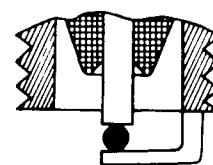


FIGURE 9 Oil Fouled Spark Plug



FLAT FEELER GAUGE CAN GIVE FALSE READING



ROUND FEELER GAUGE WILL GIVE A MORE ACCURATE READING

FIGURE 13 Spark Plug Gap

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