Cleaning Carburetor

● CAUTION ● Do not use any harsh carburetor cleaning fluids when cleaning the carburetor. Deterioration of non-metallic parts will result.

1-34 Using a soft brush, wash all parts carefully and place on a clean piece of cardboard. Do not use a rag for this purpose, as lint from the rag can transfer to the clean parts.

2-34 Dry all component with compressed air. Make sure all passageways are unobstructed.

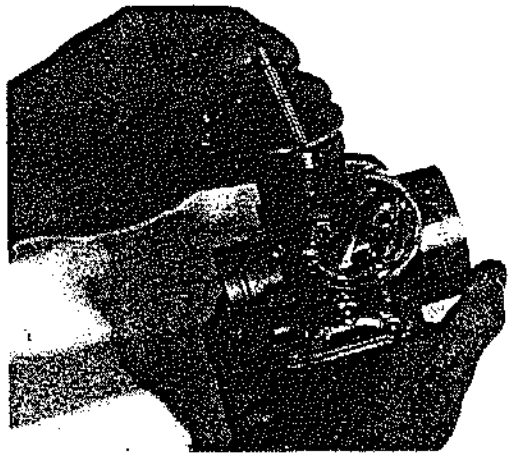
▲ WARNING ▲ When drying components with compressed air, be sure to protect eyes from the cleaning solvent.

● CAUTION ● Do not use wire or small drill bits to clean carburetor orifices, holes or channels. Distortion of any of these will ruin the carburetor.

Assembling the Carburetor

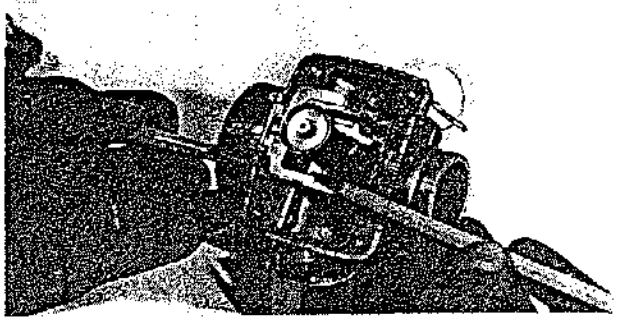
1-35 Install the inlet needle seat. Install with gasket washer, splash plate and gasket washer in position. Torque down to 35 in. lbs. Install the needle and keeper spring.

2-35 Insert the needle jet down through the top of the throttle slide bore and into position. Align the slot on the side of the needle jet with the pin down inside the needle jet bore and gently push into position.

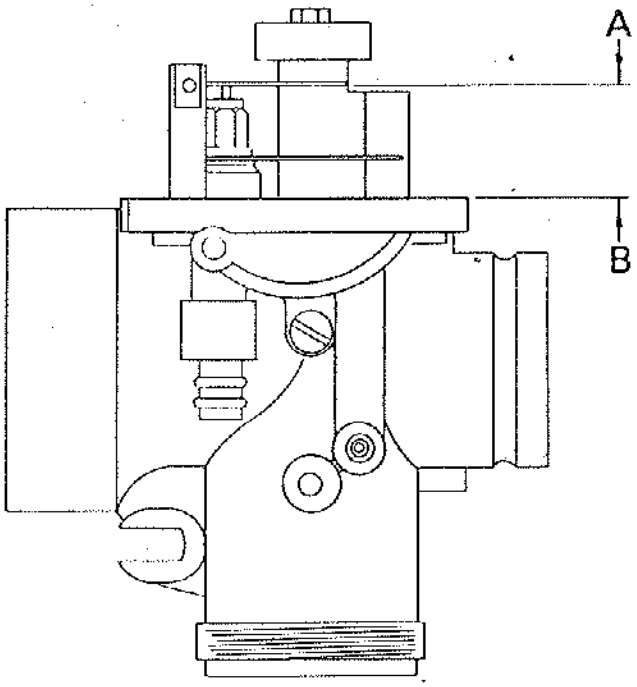


3-35 Install the main jet cup and main jet.

4-35 Install the float arm with the thinner of the two arms, positioned on the same side as the hole in the splash plate below. Secure the arm assembly with the float arm pin. The larger end of the pin must be located in the larger tower bore.



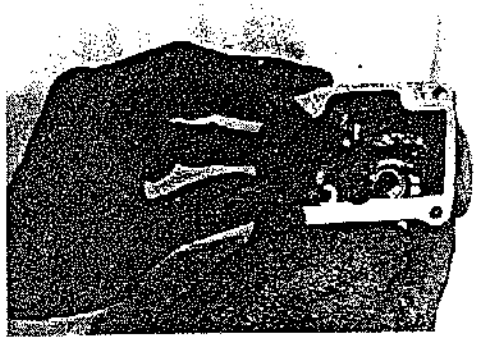
5-35 With the carburetor in an inverted position, float arm (A) should be parallel with the body (B), as indicated.



■ NOTE: To adjust the float arm never bend the arm itself, always bend the tab which contacts the inlet needle.

6-35 Install the pilot jet and tighten securely.

7-35 If removed, slide each float down onto the float pin located in the float bowl. The float must be positioned with its pin down towards the bottom of the bowl.



8-35 Install a new float bowl gasket.

9-35 Install the float bowl. Be careful not to allow the floats to slide off of the pins in the float bowl. Secure with the four philip screws. Attach overflow hose brackets to two of these screws.

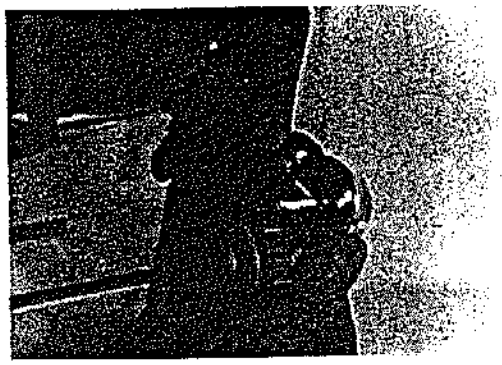
10-35 Install the starter plunger assembly with lever into the carburetor and tighten. Be sure to position the lever friction stop plate, squarely under lever, before tightening the starter plunger nut.

11-35 Position the throttle return spring over the throttle cable and compress, so the cable can be attached to the slide.

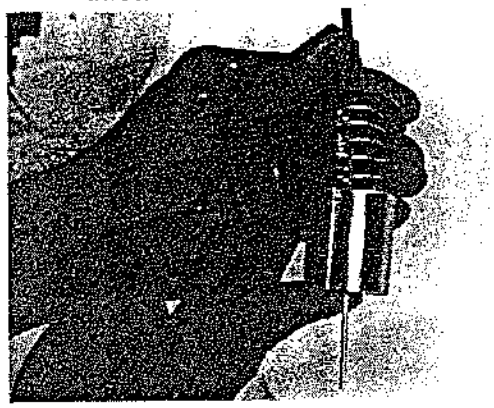
12-35 If the E-clip was removed from the jet needle, re-install the clip in the same groove as it was found.

13-35 Insert the jet needle through the center hole of the slide.

14-35 Place the locking plate over the jet needle and position its bent tab into the cable slot, to lock the cable into position.



15-35 Release the spring, and position it into the throttle valve.



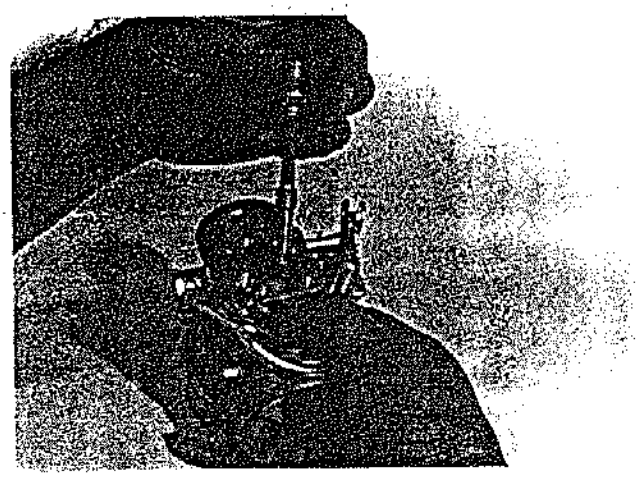
16-35 Insert the throttle slide into carburetor, being careful to position the slide cut-away towards the front of the venturi or away from the engine.

Disassembling Butterfly Mikuni

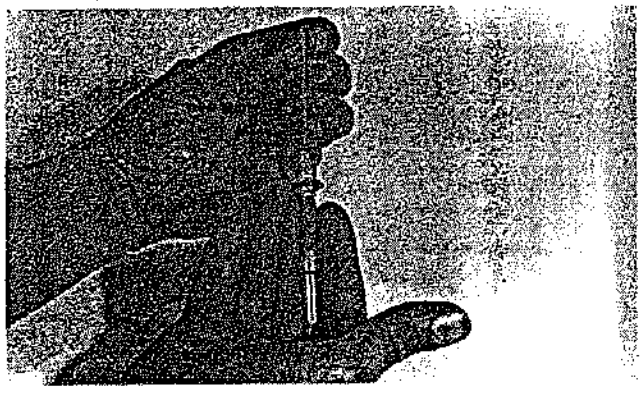
NOTE: The vent hoses may be removed to aid in disassembling the carburetor.

1-36 Remove the four screws securing the throttle-cable bracket, then remove bracket and gasket from top of carburetor.

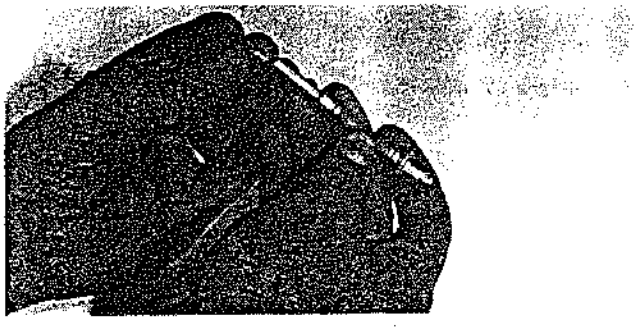
2-36 Lift the main nozzle assembly free of the carburetor body.



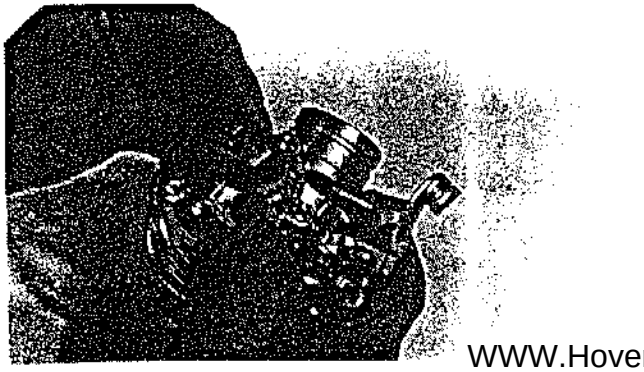
3-36 Remove the air jet and pipe assembly from the top of the nozzle, using a small screwdriver.



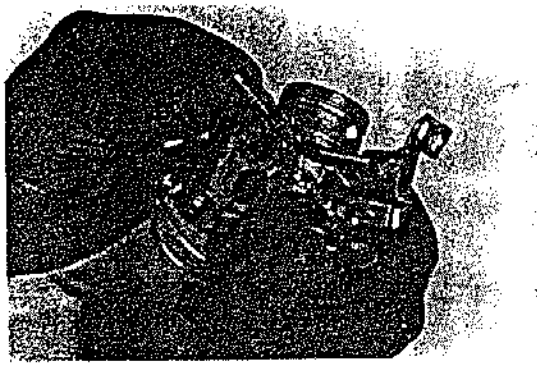
4-36 Remove the main jet from the jet holder (at the bottom of the nozzle).



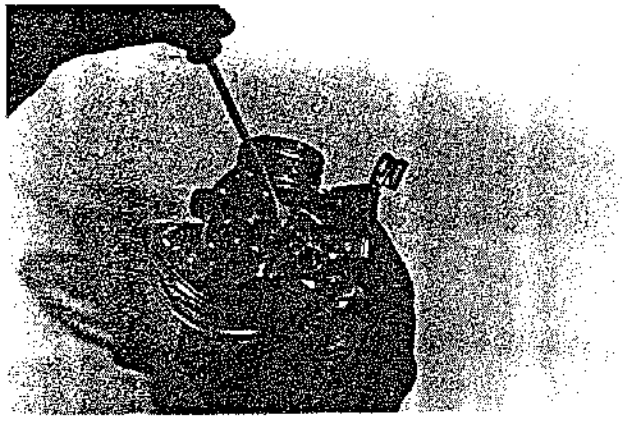
5-36 Remove the bypass block from the top of the carburetor. Account for the o-ring on the bypass block.



6-36 Remove the pilot fuel screw from the carburetor.

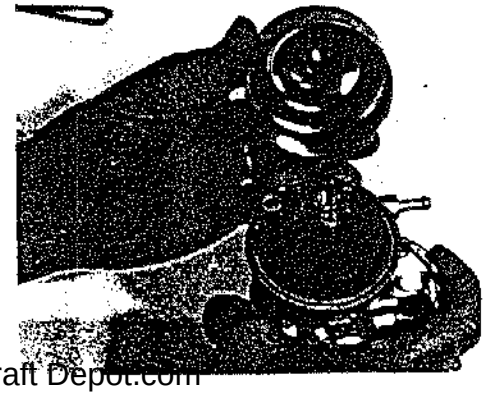


7-36 Remove the pilot jet.

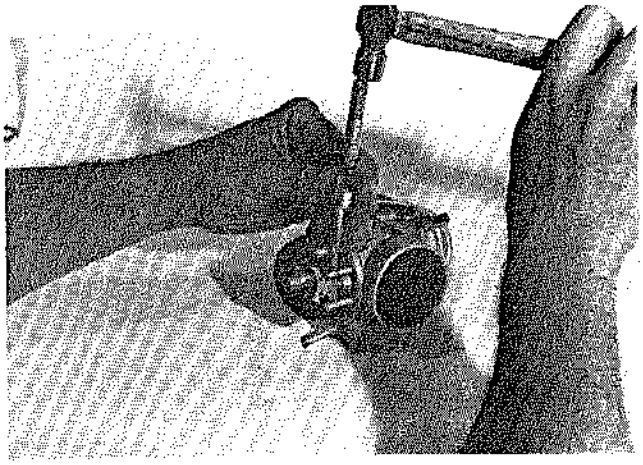


8-36 Remove the pilot air jet.

9-36 Remove the bolt and sealing washer, which secure the float bowl, then remove float bowl and account for the rubber gasket.

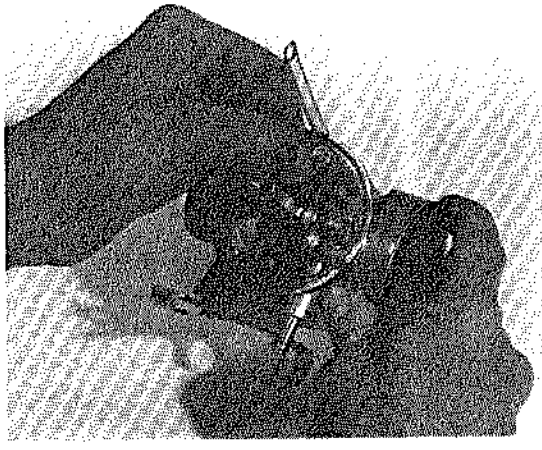


10-36 Remove the float pin, then remove the float.

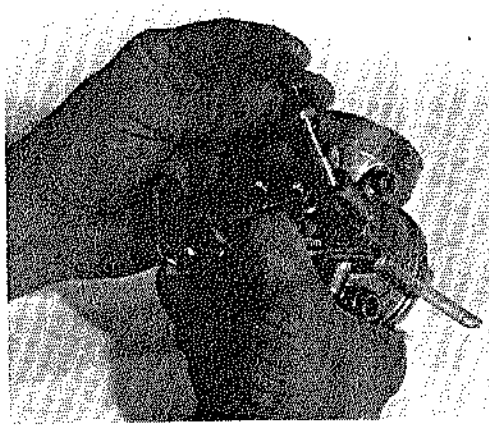


NOTE: One end has two flat portions, which indicate a larger pin diameter. Because of the larger diameter, the pin can only be removed one way.

11-36 Remove the inlet valve from the inlet seat. The seat cannot be removed as it is pressed into the carburetor body.



12-36 Remove the starter plunger.



Clean Carburetor (Butterfly Type Mikuni)

CAUTION Do not place any non-metallic parts in any harsh carburetor cleaning fluids. Deterioration to soft rubber gaskets, o-rings and seals will result.

1-37 Place all parts in a wire basket and wash in parts washing solvent.

2-37 Wash parts using a soft brush and blow dry using compressed air.

3-37 Lay parts on a clean surface.

WARNING When drying parts with compressed air, always wear safety glasses.

Inspecting Carburetor

1-38 Inspect the carburetor body for cracks, nicks, stripped threads and worn throttle shaft housing.

2-38 Inspect the condition of the throttle return spring.

3-38 Inspect float bracket and pin for wear.

4-38 Inspect o-rings, float bowl packing and throttle seals for distortion or noticeable damage.

5-38 Inspect pilot fuel needle tip for wear, damage or distortion.

6-38 Inspect starter plunger and seat for wear or damage.

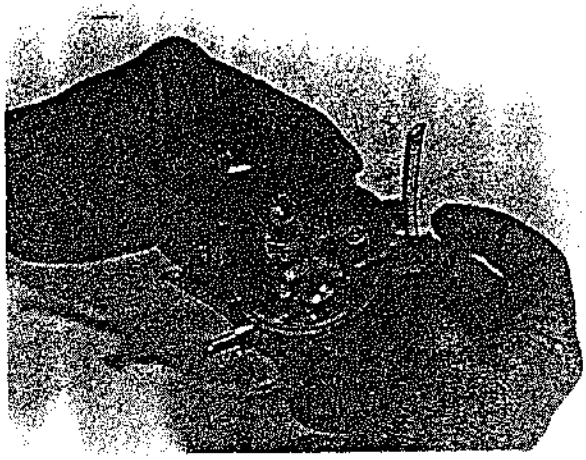
7-38 Inspect the carburetor mounting flange for cracks.

CAUTION An air leak between the carburetor and engine will cause engine overheating.

Assembling Carburetor

1-39 Install the inlet needle into the inlet needle valve seat.

2-39 Move the float into position and secure with the float pin.



CAUTION **The float pin can be installed only one way. Be careful not to damage pin or carburetor body. There are no float adjustments to be made on this carburetor. Trying to change adjustments will cause damage to float.**

3-39 Make sure float bowl packing gasket is properly positioned. Place float bowl onto the carburetor base, then secure bowl with the sealing washer and bolt. Tighten securely.

4-39 Install the pilot air jet and tighten.

5-39 Install the pilot jet and tighten.

6-39 Install the pilot fuel screw. Turn the fuel screw clockwise until it seats, then rotate the fuel screw counterclockwise, one turn open.

CAUTION **Do not force the pilot fuel screw after it seats. Forcing the screw will result in damage to the carburetor body and fuel screw tip. Use only a very small screwdriver.**

7-39 Install the bypass block into the carburetor body. Be sure its o-ring is in place.

8-39 Assemble the nozzle by threading the air jet tube down into the nozzle from the top and tighten. Install the main jet into the jet holder and tighten. Install lower and upper o-rings.

9-39 Place the nozzle assembly into the carburetor.

NOTE: The nozzle assembly can be installed only one way. The flat portion of the mounting flange correctly positions the assembly.

10-35 Place the gasket and throttle cable bracket onto the top of the carburetor and secure with four mounting screws.

Carburetor Problem Diagnosis

When the fuel air mixture is diagnosed as improper due to spark plug readings, possible correction may result if the carburetor is cleaned and its passages blown clear with compressed air.

When the problem still exists, further determine whether the mixture is too lean, again using the spark plug firing end condition as a guide.

When troubleshooting a carburetor problem, always determine at what point the problem exists. The throttle lever location should then be noted, and after turning off the engine, placed in the problem area. Remove the air cleaner and check slide position. Never assume because the throttle lever is at half, that the carburetor slide is also at the half position. After determining the actual throttle position, you can then determine which circuit and components to adjust or change.

MIXTURE TOO RICH
Black Spark Plug Tip Heavy Exhaust Smoke Engine Runs Worse After Warm-up Runs Better Without Air Silencer Heavy Carbon Deposits in Combustion Chamber

MIXTURE TOO LEAN
Spark Plug Electrodes White or Gray Fluctuation in Engine Speed Power Loss Engine Overheats Back Firing - Detonation Cylinder Scoring

1-40 0 - ¼ Throttle
Pilot air screw misadjusted
Pilot jet wrong size
Obstruction pilot jet, bypass or outlet
Pilot jet loose
Choke plunger not seating or damaged (rich)
Carburetor, rubber flange or intake air leak (lean)

2-40 ¼ - 3/8 Throttle
Obstruction in mainjet or needle jet (lean)
Jet needle out of adjustment or wrong size
Pilot system malfunction

3-40 ¼ - ¾ Throttle
Main jet incorrect size or clogged
Needle jet clogged or wrong size
Jet needle out of adjustment or wrong size

4-40 ¾ - Full Throttle
Main jet incorrect or obstructed (lean - rich)
Fuel filter blocked (lean)

Carburetor Tuning and Adjustment

1-41 **Idle Adjustment Screw**
It is best to set engine idle between 1400 to 1700 RPM if the engine application permits. If you try to idle the engine too slowly, it will tend to load up with fuel and throttle response will be very sluggish. Always make final throttle adjustment on a warm engine.

2-41 **Pilot Jet and Pilot Air Screw**
Start the engine and allow it to run several minutes until it is warm. Pre-set the pilot air screw to one turn open. Open the throttle slowly and see if the engine revolutions increase smoothly. If the pilot jet is too small, increase in the engine speed will be slow and irregular. Too large a pilot, on the other hand, would create heavy exhaust smoke as well as a dull exhaust noise. If you cannot maintain the engine speed at ¼ throttle with the throttle held constant, the pilot jet is too small.

The pilot air screw should be adjusted to where the engine idles smoothly and you have good low speed throttle response. If you find you need to have the air screw set below one turn open, the pilot jet is too small. If the air screw needs to be set over 2½ turns open for smooth idle, the pilot jet is too large.

Selection of Needle Jet

3-41 The needle jet and jet needle must provide a proper air/fuel mixture ratio during the so-called medium throttle valve opening (¼ - ¾ opening). Whether or not the right size of these parts is used will greatly effect the mid-range engine performance and engine operating temperature.

The air/fuel mixture ratio is controlled by the height of the E-clip that is inserted into one of the five slots provided on the head of the jet needle. The first slot is the leanest position with the bottom slot being the richest position.

To check for correct jet needle adjustment, run the engine at ½ throttle with the ultralight secured, for three to four minutes. Do not change throttle setting, but instead, turn the ignition switch off before returning the throttle control to the idle position. Remove the spark plugs and check tip color. Tip color should be dark to light brown in color.

If the spark plug tips appear to be black, the E-clip should be moved one position at a time, towards the top of the needle. Re-run test between each adjustment. Continue this procedure until the tip color changes to a dark brown.

If you are monitoring cylinder head temperature, the maximum temperature is 400°, taken at the number one cylinder (P.T.O. side).

If you are monitoring E.G.T.'s maximum temperature is 1275°. If either of these reach the maximum during the test run, the E-clip position must be changed and made richer.

Selection of Main Jet

To select main jet size, perform the same test as explained for selecting the proper needle jet. Again with the ultralight secured, run the engine at full throttle for several minutes. Do not drop the throttle, but instead, turn off the ignition switch. Remove the spark plugs and check tip color. Spark plug tip color should appear dark brown. If the spark plugs appear to be black in color, select a main jet of one size smaller and re-run test.

● CAUTION ● There are three different types of main jets used by Mikuni. They are the round jet, short hex and long hex jets. All flow different amounts of fuel and you must use (long hex main jet) the same type as removed.

If you are monitoring cylinder head temperature (C.H.T.), the sensor must be placed under the number one cylinder spark plug. Maximum temperature should not exceed 400°. Never use the spark plug gasket with the sensor ring installed.

If you are monitoring exhaust gas temperature (E.G.T.), install the probe in the number one cylinder exhaust stack, 1½ to 2 inches from the exhaust gasket surface. Maximum E.G.T. must not exceed 1275 degrees.

Basic Carburetor Jetting Guide

NOTE: Listed below are the different jetting components to be used in the Mikuni VM 32mm carburetor, when having other manufacturers exhaust systems installed. Remember that these are only basic guidelines, and engine cylinder head temperature, exhaust gas temperature and spark plug tip color will determine actual jet selection.

ENGINE - Cuyuna UL11-02

Jet Selection	Cuyuna Exhaust	Fisher Exhaust	Protopipe Muffler
Main Jet	300 *	300 *	320 *
Needle Jet	0-8	0-8	P-2
Jet Needle	6FL14-2	6FL14-2	6DH7-3
Pilot Jet	35	35	25
Cutaway (slide)	2.5	2.5	2.5

ENGINE - Cuyuna 430 Model

Jet Selection	Cuyuna Exhaust	Fisher Exhaust	Protopipe Muffler
Main Jet	270 *	250 *	280 or 290 *
Needle Jet	159-P6	P-2	P-2
Jet Needle	6DH3-3	6F4-4	6DH2-3
Pilot Jet	25	25	25
Cutaway (slide)	2.5	2.5	2.5

* Main jet size based on 60-80 degree temperature at sea level.

Main Jet Selection Chart

Altitude Feet	ENGINE: 430 R/D		EXHAUST: Cuyuna	CARBURETOR: VM32	
8000	230	220	210	200	190
6000	250	240	230	220	210
4000	270	260	250	240	230
2000	290	280	270	260	250
Sea Level	310	300	290	280	270
Temp. °F	0° - 20°	20° - 40°	40° - 60°	60° - 80°	80° - 100°
Altitude Feet	ENGINE: 430 R/D		EXHAUST: Cuyuna	CARBURETOR: VM28	
8000	200	190	180	170	160
6000	210	200	190	180	170
4000	220	210	200	190	180
2000	230	220	210	200	190
Sea Level	240	230	220	210	200
Temp. °F	0° - 20°	20° - 40°	40° - 60°	60° - 80°	80° - 100°
Altitude feet	ENGINE: HI-Performance		EXHAUST: Cuyuna	CARBURETOR: B34-32	
8000	170	160	150	140	130
6000	180	170	160	150	140
4000	190	180	170	160	150
2000	200	190	180	170	160
Sea Level	210	200	190	180	170
Temp. °F	0° - 20°	20° - 40°	40° - 60°	60° - 80°	80° - 100°
Altitude Feet	ENGINE: 215 R/D		EXHAUST: Cuyuna	CARBURETOR: VM32 or B34-32	
8000	150	140	130	120	110
6000	160	150	140	130	120
4000	170	160	150	140	130
2000	180	170	160	150	140
Sea Level	190	180	170	160	150
Temp. °F	0° - 20°	20° - 40°	40° - 60°	60° - 80°	80° - 100°
Altitude Feet	ENGINE: ULII-02		EXHAUST: Cuyuna	CARBURETOR: VM32	
8000	250	240	230	220	210
6000	270	260	250	240	230
4000	290	280	270	260	250
2000	310	300	290	280	270
Sea Level	330	320	310	300	290
Temp. °F	0° - 20°	20° - 40°	40° - 60°	60° - 80°	80° - 100°

* NOTE: Suggested main jet calibration is based on the use of the Cuyuna exhaust system, "Unifilter" foam air filter and a Cuyuna fuel pump. Changes of the above components will effect the fuel demands of the engine and therefore affect the carburetor calibration.

* NOTE: Main jet selection charts are to be used only as a guideline. Cylinder head temperatures and firing end condition of the spark plugs will determine actual main jet selection.

Carburetor Troubleshooting Chart

PROBLEM:	CONDITION	REMEDY
A. Hard Starting	1. Throttle open	1. Return to idle position.
	2. Incorrect air-fuel mixture adjustment.	2. Set mixture adjustment screw in accordance with owner's manual or shop manual instructions.
	3. Clogged fuel filter.	3. Clean filter.
	4. Clogged low speed fuel jets.	4. Disassemble carburetor and chemically clean.
	5. Clogged vent in fuel tank cap.	5. Unclog vent or replace cap.
	6. Float stuck.	6. Remove float bowl, check float operation and correct or replace.
	7. Float damaged or leaking.	7. Replace float.
	8. Incorrect float level.	8. Set float height in accordance with shop manual specifications.
	9. Intake air leak.	9. Check carburetor mounting flanges for air leaks.
	10. Ignition problem.	10. Repair, replace or adjust as necessary.
	11. Low cylinder compression.	11. Repair, replace or adjust as necessary.
B. Poor idle or stalling.	1. Idle speed adjustment(s) set too low.	1. Adjust idle RPM in accordance with specifications in owner's manual or shop manual, 1400 to 1700 RPM.
	2. Idle speed adjustments are unequal (twin carburetor models with multicarburetors, using individual throttle stop and adjustments).	2. Equalize throttle stop settings.
	3. Clogged idle and low speed air bleed.	3. Disassemble carburetor and chemically clean.
	4. All causes, listed under "Hard Starting".	

C. Idle Mixture Adjustment is Ineffective. Carburetor does not respond to movement of the idle mixture screw.	1. Idle speed set too high.	1. Adjust idle speed in accordance with specifications in owner's manual or shop manual.
	2. Clogged low speed air-bleeds.	2. Disassemble carburetor and chemically clean.
	3. Damaged mixture adjustment needle.	3. Replace mixture adjustment needle.
	4. Mixture adjustment needle "O" ring is not sealing (models using "O" ring).	4. Replace "O" ring.
	5. Damaged mixture adjustment needle seat.	5. Replace carburetor.
	6. All carburetor problems listed under "Hard Starting".	
D. Slow Return to Idle.	1. Idle speed set too high.	1. Adjust idle speed in accordance with specifications in owner's manual or shop manual.
	2. Idle speed adjustments are unequal (twin carburetor models using individual throttle stop adjustments).	2. Equalize throttle stop settings.
	3. Throttle valve sticking.	3. Clean and inspect throttle valve and return spring. Replace if necessary.
	4. Throttle linkage sticking.	4. Clean and inspect throttle linkage and return spring. Lubricate, repair or replace as necessary.
	5. Throttle cable binding.	5. Correct routing or replace cable as necessary.
E. Engine Surges When Cruising at a Constant Speed.	1. Incorrect air-fuel mixture adjustment.	1. Low speed - Low speed jet size change. Intermediate Jet needle height adjustment or primary main jet change.

F. Engine Does Not Develop Full Power or Misses on Acceleration.	1. Incorrect use of choke.	1. Correct use of choke.
	2. Clogged air cleaner.	2. Clean or replace.
	3. Incorrect air-fuel mixture adjustment.	3. Low speed - Low speed jet size change. Intermediate Jet needle height adjustment. High speed - Main Jet size change.
	4. Throttle valve not synchronized (models with two or more carburetors).	4. Adjust throttle valve synchronization.
	5. Clogged air filter.	5. Clean filter.
	6. Clogged fuel air jets.	6. Disassemble carburetor and chemically clean.
	7. Clogged air bleeds.	7. Disassemble carburetor and chemically clean.
	8. Fuel jets loose.	8. Tighten fuel jets.
	9. Fuel jet "0" ring leaking (models using "0" rings).	9. Replace "0" rings.
	10. Float stuck.	10. Remove float bowl, check float operation and correct or replace.
	11. Float damaged or leaking.	11. Replace float.
	12. Incorrect float level.	12. Set float height in accordance with shop manual specifications.
	13. Vacuum piston sticking (if used).	13. Clean and inspect vacuum piston and return spring. Replace if necessary.
	14. Ignition problem.	14. Repair, replace or adjust as necessary.
	15. Low cylinder compression.	15. Repair, replace or adjust as necessary.

Cuyuna Service Manual

Electric Start Section

ELECTRICAL

General - Magneto Ignition

The Cuyuna two-cycle engine electrical system consists of two, somewhat separate, systems; the ignition system and the magneto alternator system. Electrical current for both systems is produced by the flywheel magneto generator assembly.

The flywheel magneto generator assembly, consists of the components listed below:

1. Flywheel w/magnets
2. Base plate
3. Lighting coil
4. Generator coil
5. Breaker points
6. Condenser
7. Felt lubricator
8. External coil
9. Spark plug

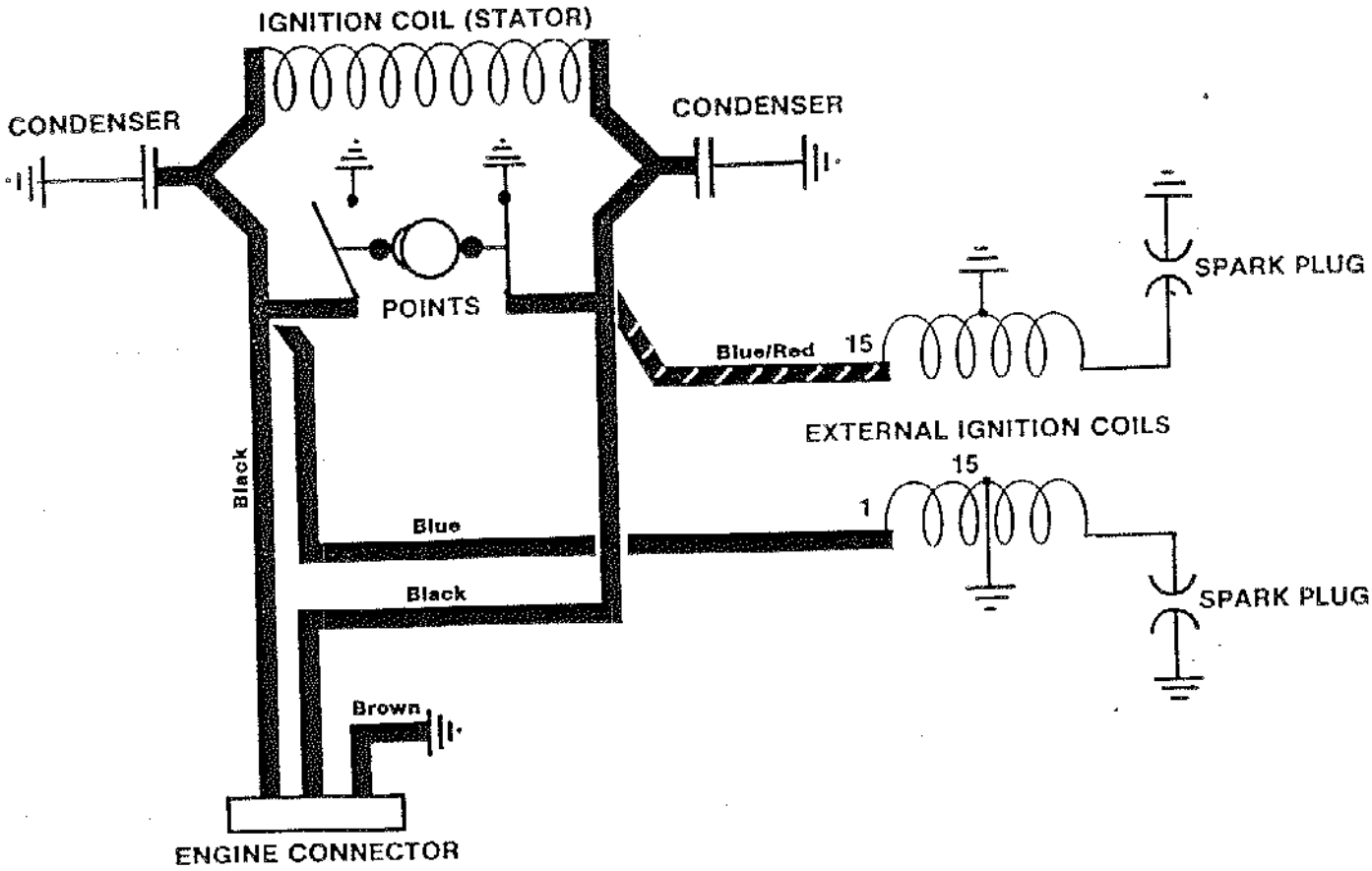
Another compenent that functions in the ignition system is the ignition switch.

Magneto Alternator System - Ignition

The magneto alternator system produces current that provides the spark necessary to ignite the fuel/air mixture in the combustion chamber, and also, current which allows for operation of the lights and electrical accessories. To produce and control the necessary voltage required for ignition, a number of electrical components are used in conjunction with each other.

FLYWHEEL-MOUNTED PERMANENT MAGNETS

Provide a moving magnetic field when the flywheel is rotating around the generating coil and lighting coils.



IGNITION SCHEMATIC

GENERATOR COIL

Mounted on the base plate, just under the 30 watt lighting coil. Each lead of the generator coil is connected to a condenser with a parallel connection with the breaker points and the external ignition coil primary. On a single cylinder engine, one lead of the generating coil is grounded to the base plate.

As stated previously, high voltage is required to bridge the spark plug air gap to ignite the fuel/air mixture in the combustion chamber. To accomplish this, the magnets contained within the flywheel, swing into position next to the generating coil and their magnetic field sweeps through the coil windings, which induces a strong current. This current is, in effect, short-circuited through the points, so that the wire in the coil passes the electricity around in a continuous loop, making the coil into an electromagnet with a field polarity opposite of the flywheel magnets. With the two magnetic fields pushing against each other, the points open and the current flow in the generating coil is interrupted, its magnetic field collapses, which permits the flywheel's magnetic field to snap through the generating coil. This creates an extremely rapid flux change, which induces a very strong voltage surge in the generating coil, which is passed along to the primary side of the external coil.

The external coil is made up of two separate windings. These are the primary and secondary windings. The primary winding is made up of several hundreds of turns of large diameter copper wire. The secondary winding is a much larger number of turns of small diameter wire and is connected at one end to the spark plug lead. As the surge of voltage enters the primary from the generating coil, a magnetic field is created. The field then collapses and voltage is induced in the secondary winding. The voltage builds in the secondary until it can jump the gap at the spark plug tip.

The condenser is connected in parallel with the breaker points and generating coil. It acts much like a storage tank, as it absorbs the current which would otherwise arc across the opening points. The stored up voltage is then discharged into the primary upon the next firing phase. Without the condenser in the system, the breaker points would burn in a very short time.

Capacitor Discharge Ignition

The flywheel magneto generator assembly, consists of the components listed below:

1. Flywheel w/magnets
2. Base plate
3. Lighting coil
4. Ignition pulser coil
5. Ignition exciter coil
6. CDI unit
7. External coil (mounted externally on engine)
8. Spark plug

The remaining component that functions in the ignition system is the ignition switch.

Charging System

The magneto alternator system supplies 12 (regulated) volts, and 150 watts of AC current. Unregulated current can reach as high as 32 volts at wide open throttle. It is this current that allows for operation of the lights and electrical accessories. Current is produced by rotation of four magnets around and past a large lighting coil. Since the magnets are alternately mounted and also alternately pass the lighting coil, the magnetic forces change direction of travel through the coil. The direction of change occurs every 90 degrees of flywheel rotation. Therefore, the electricity induced in the lighting coil windings will also alternate in direction of flow. The term for this type of flow is "alternating current".

All of the Cuyuna engines are equipped with a charging system. The point ignition system uses two individual coils, which produce 150 watts of AC current. To charge a battery with either system, you must convert AC current to DC current. This is done by using a rectifier. The Cuyuna rectifier/regulator converts AC current to DC current and regulates it to 13.5 DC volts.

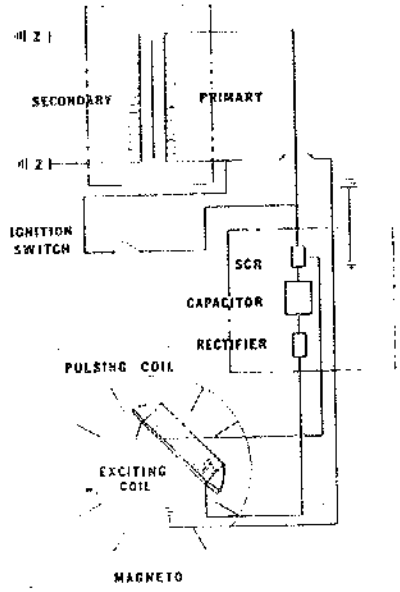
Capacitor Discharge Ignition Principles

To produce and control the necessary voltage required for ignition, a number of electrical components are used in conjunction with each other. These five components are:

1. **Flywheel-Mounted Permanent Magnets:**
   The flywheel-mounted magnets provide a moving magnetic field when the flywheel is rotating around the coils.
2. **Exciting Coil:**
   Mounted on the base plate, just below the pulser coil, is the exciting coil. One lead of the exciting coil is grounded to the engine through the coil attaching screws; the other lead is connected to the CDI unit.
3. **Pulser Coil:**
   Mounted on the base plate just above the exciting coil is the pulser. One lead of the pulser coil is attached to the same red lead as the exciter coil. The other lead is connected to the CDI unit.
4. **CDI Unit:**
   A CDI unit, mounted on the fan housing, contains a rectifier, capacitor and a solid state switch.
5. **Ignition Coil:**
   An ignition coil is mounted on the fan housing with a high tension lead going to each spark plug.

The CD ignition system cannot utilize alternating current, so current from the exciter coil is routed through a rectifier to eliminate the negative flow. The positive flow passes through the rectifier and is stored in the capacitor in the CDI unit. The capacitor is connected to the primary winding of the ignition coil through an SCR. The SCR acts as a switch for the exciter current. With the SCR switch open, the exciter current builds up a charge in the capacitor. To fire the spark plug,

the SCR switch is closed or triggered by a pulse from the pulser coil. The position of this pulser coil, in relation to the magnets and the piston, triggers the SCR at the precise moment to ensure the most efficient combustion. When the SCR switch closes, a circuit is completed from the capacitor to the ignition coil primary. As a result, current flows through the external ignition coil primary.



As previously stated, the external ignition coil is made of two separate windings; a low voltage "primary" and high voltage "secondary". As current flows through the "primary" the magnetic field builds up, resulting in the induction of the "secondary". Because of the required high voltage current that is needed to jump the air gap between the center and side electrodes of the spark plug, a considerable increase in voltage must take place.

But how is this increase in voltage generated? The wire turn ratio of the secondary is considerably more than that of the primary, which accounts for the increased secondary output. Because the secondary has a high voltage output, it is wound above the primary, which prevents a short circuit of the coil. Because the secondary is wound above the primary, the magnetic force lines of the primary are broken, resulting in the induction of an eletromotive force (EMF) in the secondary.

Therefore, the secondary allows high voltage current to flow to the spark plug and jump the air gap between the center and side electrode. At the moment of spark, the compressed fuel/air mixture in the combustion chamber is ignitied, causing expansion and a single power pulse.

The timing of the ignition spark, as previously stated, is accomplished by a trigger impulse to the CDI unit and SCR switch. The trigger impulse is induced in the pulser coil by the flywheel magnets. The SCR requires a certain voltage to actuate it. At cranking speeds and low RPM there is enough voltage to actuate the SCR when the piston is a few degrees before top dead center (BTDC). Advancing the timing by electronic means insures easy starting and maximum efficiency at high RPM. The most important advantages of CDI are: stronger ignition at cranking speeds, no maintenance requirements of breaker points, and simpler adjustment of timing. These result in easier starting, peak performance and low maintenance.

Other components that function in the ignition system, but are not mounted on the engine, include: the ignition switch. The ignition is called a "closed circuit" CDI system. This means the circuit must be complete between the yellow/black ignition wire and ground, using a switch, before the igntion will function.

Point Ignition - Specifications

Description	Part Number	Resistance Test	Test Connections
Ignition Coil-Primary	000-43-056-060	1.9 ohms ± 10%	(+) Blue term. (−) Ground
Ignition Coil-Secondary	000-43-056-060	5100 ohms ± 15%	(+) High Ten Lead (−) Ground
Generating Coil	000-43-211-000	3.7 ohms ± 7%	(+) Black (−) Black
Lighting Coil-30 watt	000-43-207-000	2.2 ohms ± 10%	(+) Green (−) Green/Black
Lighting Coil-120 watt	000-43-206-000	1.5 ohms ± 10%	(+) Yellow (−) Yellow/Black
Points	000-43-062-240	1 ohm	(+) Blue-Blue/Red (−) Ground
Condenser	000-43-065-160	Open	(+) Terminal (−) Case
Spark Plug Cap	002-44-224-200	1000 ohms ± 10%	(+) Plug Term. End (−) Wire End
Ignition Timing	18° BTDC, .070"-.078" BTDC, 1.8mm-2.0mm (Full Advance)		

C.D.I. Ignition - Specifications

Description	Part Number	Resistance Test	Test Connections
Ignition Coil-Primary	000-43-209-000	.33 ohm ± 15%	(+) Blue/White (−) Black
Ignition Coil-Secondary	000-43-209-000	3900 ohms ± 20%	Between High Tension Leads with caps removed
Charge Coil	000-43-205-000ASM	180 ohms ± 10%	(+) Red/Black (−) Black/Red
Trigger Coil	000-43-205-000ASM	2.2 ohms ± 10%	(+) Black/White (−) Black/Red
Lighting Coil	000-43-205-000ASM	.18 ohms ± 10%	(+) Yellow (−) Yellow
Spark Plug Cap	002-44-443-000	5000 ohms ± 10%	(+) Plug. Term. End (−) Wire End
Ignition Timing	28° or .174 at 1800 RPM - 18° or .078 at 6000 RPM		

Testing Point Ignition Components

Before any disassembly of the ignition components is started, a few simple test procedures should be carried out to determine if the ignition system is truely the problem. Many times, time and money are both wasted in replacement of ignition components, when the problem is elsewhere.

Below is a test procedure that has proven to cut time in troubleshooting ignition problems. It will first assist you in pinpointing the problem area and then if electrical, finding the problem.

ENGINE FAILS TO START

1-42 Remove the spark plug (plugs) from the engine and inspect them to determine if they are fouled.

2-42 Place new spark plugs into the spark plug caps and ground the spark plugs to the cylinder. Be sure the plugs are properly gapped.

3-42 Grasp the recoil handle and crank the engine over briskly. Observe the spark plug firing tip for spark. Be sure the ignition switch is in the "ON" position.

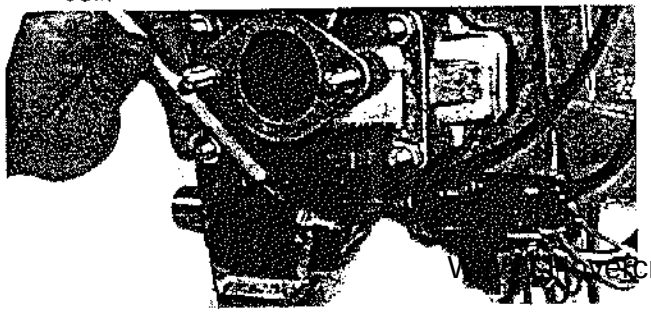
4-42 If no spark is seen, inspect the two black leads to make sure they are in good condition. Inspect the outer rubber coating of these wires, from the engine to the ignition switch to make sure the insulation isn't rubbed through anywhere, causing a short circuit.

5-42 If the ignition switch leads are in good condition, disconnect them from the ignition switch and isolate the wire ends to prevent them from grounding. Grasp the recoil handle and once again crank the engine over while observing the spark plugs for spark. If spark is now present, the ignition switch is faulty. If there isn't any spark noted, the problem is with one of the ignition components. Follow the procedure below, using an ohmmeter.

Ignition Coil Resistance Test (External)

PRIMARY WINDING

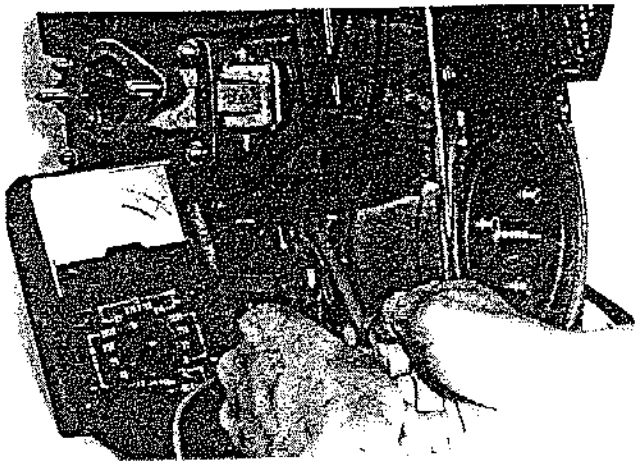
1-43 Disconnect both the ground lead (brown wire) and the blue or blue/red lead from the ignition coil.



2-43 Set the ohmmeter scale selector knob to the X1 scale.

3-43 Touch the meter leads together and zero the needle.

4-43 Touch the ohmmeter leads to each of the spade connectors of the ignition coil. If the primary winding is in good condition the meter should read 1.9 ohms ± 10%.



SECONDARY WINDING

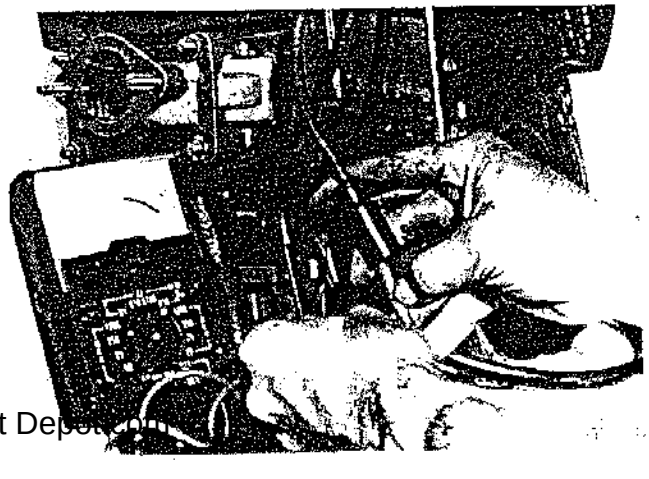
1-44 Remove the spark plug cap from the spark plug wire by rotating the cap counter-clockwise.

2-44 Disconnect both the blue and brown ground leads from the ignition coil.

3-44 Set the ohmmeter selector knob on the X1K scale.

4-44 Touch the ohmmeter leads together and zero the meter needle.

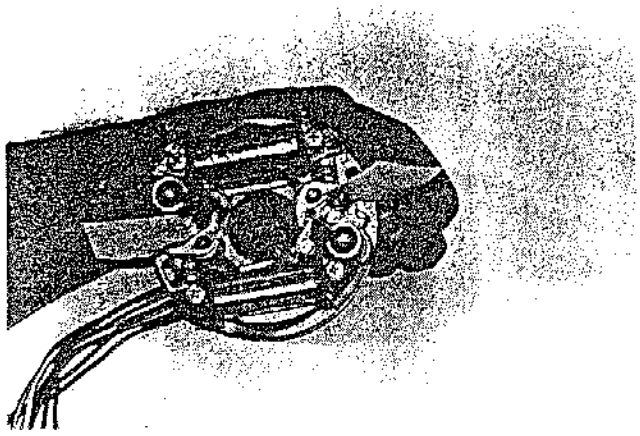
5-44 Connect the red ohmmeter lead to the spark wire. Touch the remaining black ohmmeter lead to either of the spade connectors of the ignition coil. The ohmmeter should read 5100 ohms ± 15%.



Ignition Generator Coil Resistance Test

1-45 Remove the recoil starter. Remove the starter cup and belt pulleys from the flywheel.

2-45 Insert a small piece of cardboard between the points to prevent them from making contact. Do this on both sets if you are working on a twin-cylinder model.



3-45 Remove the blue lead from each ignition coil and make sure they are isolated from the engine. Note their location so they can be re-installed correctly. Also remove the two black leads from the ignition switch and isolate them, make sure they do not touch the air frame or engine.

4-45 Set the ohmmeter selector knob on the X1 position. Touch the tester leads together and zero the meter needle.

5-45 Touch the ohmmeter lead to each of the black ignition leads. The ohm reading should be 3.7 ohms ± 10%.

Condenser Test

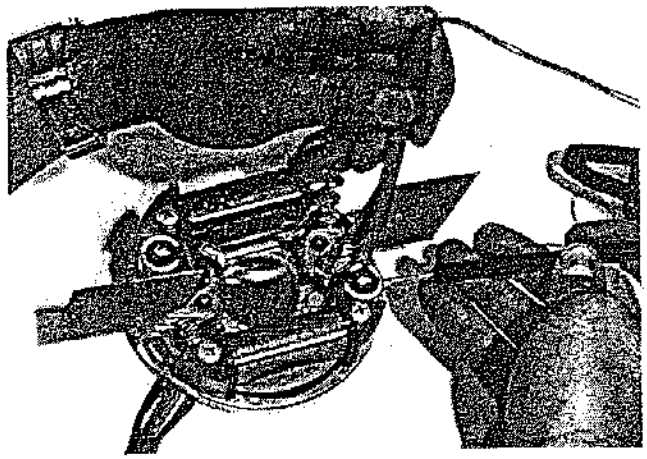
1-46 Disconnect the blue lead from each ignition coil and isolate them so they do not touch the engine.

2-46 Remove the recoil, starter cup and belt pulleys. Using a couple of small cardboard pieces, block both sets of points open.

NOTE: On the 215 single cylinder model, you must block the points open and remove the screw securing the remaining generating coil lead to the stator plate. Make sure this ground lead doesn't touch any part of the engine during the test procedure.

3-46 Touch the red lead of the ohmmeter (set on X1) to the center post of the condenser and ground the black ohmmeter lead to the condenser case. The ohmmeter must read open. If the ohmmeter shows continuity, the condenser must be replaced.

4-46 Set the ohmmeter on X1K and repeat test. With the meter set on X1K, you should note a slight jump in the needle as the condenser takes on a small charge from the ohmmeter. Reverse the tester leads and you will again observe a slight needle movement. This indicates the condenser is good.

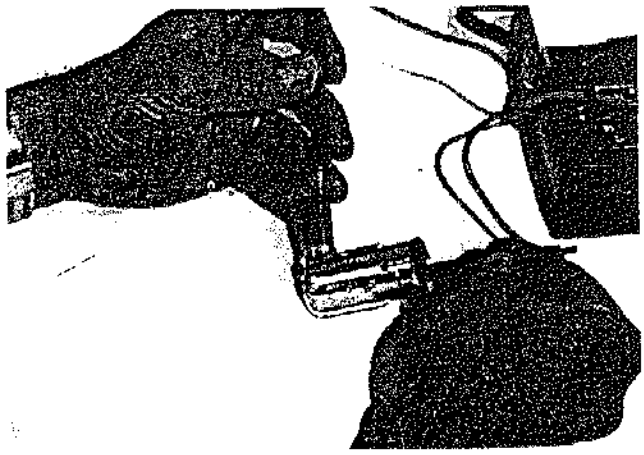


Spark Plug Cap

1-47 The Bosch spark plug cap is a 1000 ohm resistor type cap. To test this component, first remove it from the spark plug wire by turning it counter-clockwise. Continue this rotation until the cap is free of the spark plug wire.

2-47 Set the ohmmeter selector knob on X1K scale and zero the needle.

3-47 Touch the two ohmmeter leads to either end of the spark plug cap, making a good connection at each end. The ohmmeter should register 1000 ohms ± 10%.

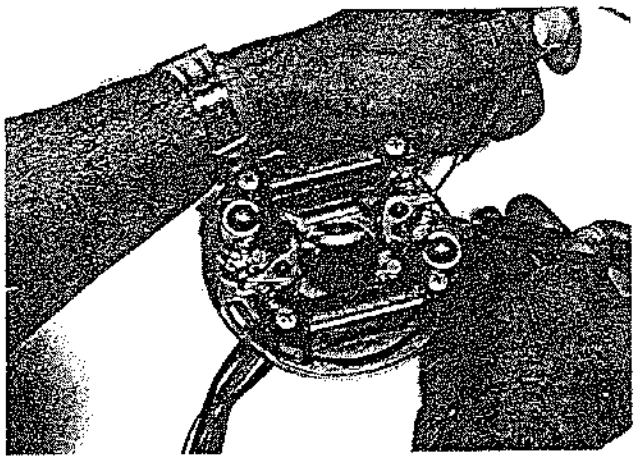


Ignition Points

1-48 The ignition points can also be tested using the ohmmeter to determine their condition. If the points have been blocked open with cardboard during previous test, remove the cardboard allowing the points to make good contact. If the points appear to be dirty pass the cardboard between the contacts several times to remove any oil or any traces of dirt.

2-48 Set the ohmmeter selector knob on the X1 scale and zero the needle.

3-48 Touch the two ohmmeter leads to either side of the contact points. If more than 1 ohm resistance is registered, the points should be replaced. Do not try filing the point contacts to restore them. Always install new points if the present set doesn't meet the above specification or if they are burnt or pitted.



Charge Coils Resistance Test

● CAUTION ● If the charging system is being used to charge a battery, disconnect the battery to prevent damage to the ohmmeter.

1-49 Disconnect the four charge coil wires from the electrical system. These would be the two (2) green and two (2) yellow wires. The two (2) green wires are from the small 30 watt coil and the two (2) yellow leads are from the 120 watt coil.

2-49 Set the ohmmeter scale selector on the X1 position. Touch the tester leads together and zero the meter.

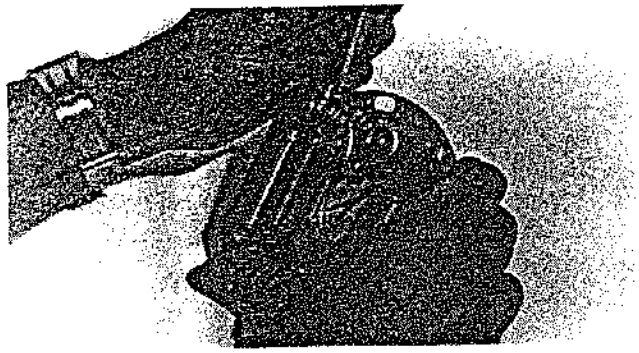
3-49 Touch the red ohmmeter lead to the green wire and the black ohmmeter lead to the green/black wire. Your tester should read 2.2 ohms ± 10%.

4-49 Next, locate the solid yellow and yellow/black wires. Touch the red tester lead to the solid yellow wire and the black tester lead to the yellow/black wire. The resistance should be 1.5 ohms ± 10%.

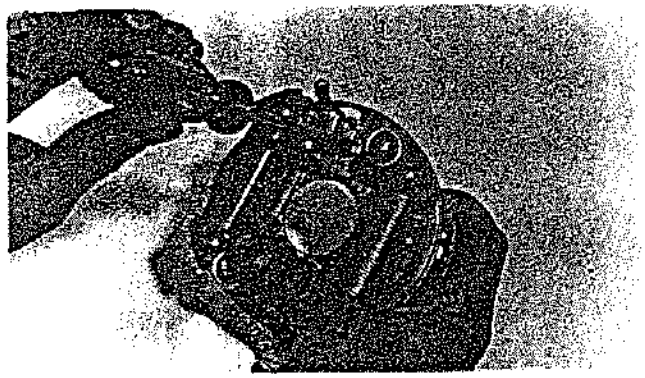
Ignition Points Replacement

1-50 Remove the recoil starter cup, belt pulley and flywheel from the engine. Refer to the engine disassembly section of this manual for instructions covering removal of these components. To aid in taking better photographs, the stator plate has been removed from the engine. However, during ignition point replacement, it can be left in place.

2-50 Using a small ignition wrench, remove the nut and lockwasher securing the blue and black leads to the point set. Remove the wires.



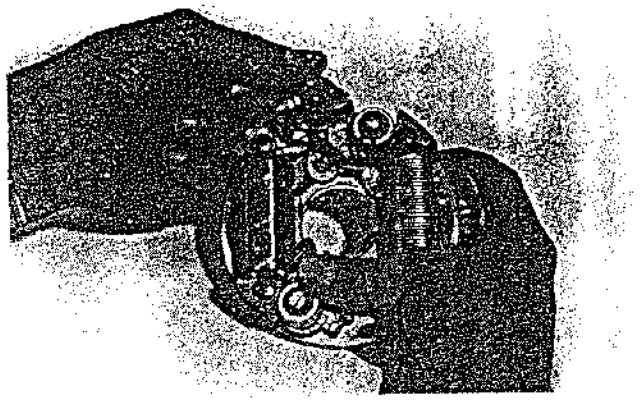
3-50 Remove the single screw securing the point set to the stator plate. Lift the point set free of the stator plate.



4-50 Remove the new point set from its package and account for the small tube of grease sent with each set.

5-50 Apply the grease behind the point set rubbing block as shown. Only a small amount is required.

6-50 Set the points into position on the stator plate and secure with the single attaching screw. Be sure the wires are routed properly under the point plate before tightening the attaching screw. If any of these wires are pinched, a short circuit of the ignition system will result.



7-50 Position the blue and black wires onto the small securing screw, next to the white nylon insulating washer. Secure with nut and lockwasher. Be sure that neither of the wire brass eyelets touch any metal surfaces or the ignition will be grounded. Hold the brass eyelets with a needle nose pliers as the securing nut is tightened to prevent them from turning or twisting.

8-50 After installing new points, pre-set the point gap to .015. This can be done easiest by removing the cam from the flywheel and installing it on the crankshaft. Rotate the cam until its lobe comes in contact with the point rubbing block. Continue to rotate the cam until the points open to their widest gap. At this point, adjust the gap to .015. Final point gap adjustment will be done during engine timing.

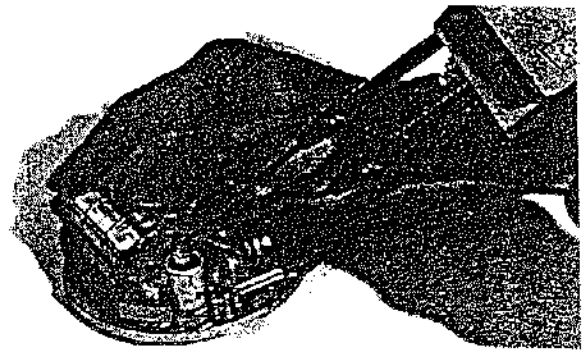
Condenser Replacement

1-51 Remove the recoil, starter cup, belt pulley, flywheel and fan housing from the engine. Refer to the engine disassembly section of this manual for instructions covering removal of these components.

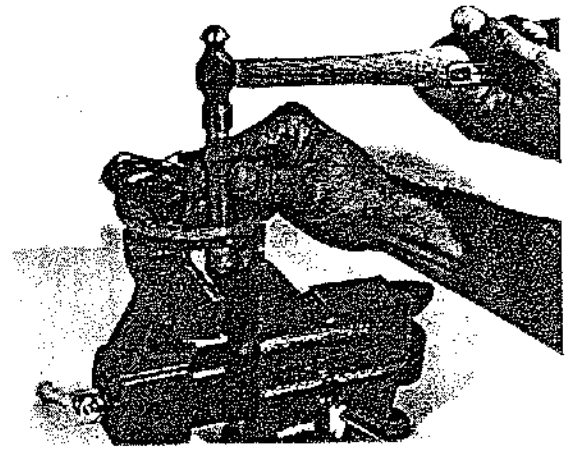
2-51 Scribe a reference line on the stator plate and fan housing for assembly purposes.

3-51 Remove the two screws that secure the stator plate to the fan housing and remove the stator plate.

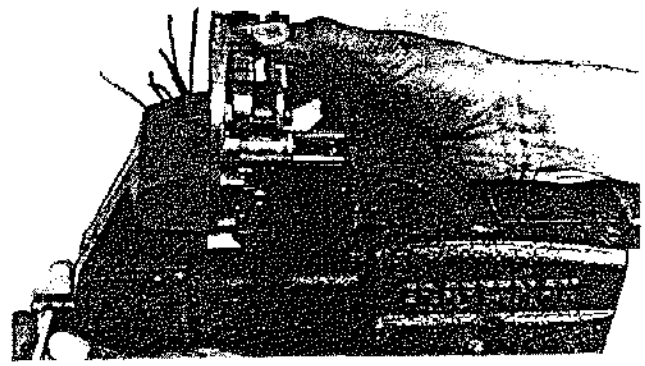
4-51 Using a soldering gun, remove the black wires from the top of the defective condenser.



5-51 From the backside of the stator plate, drive the condenser free of its mounting position.



6-51 Using a socket that is the same diameter as the condenser, position socket, condenser and stator plate between the jaws of a small vise. Using the vise as a press, slowly close the vise jaws, pressing the condenser into place.



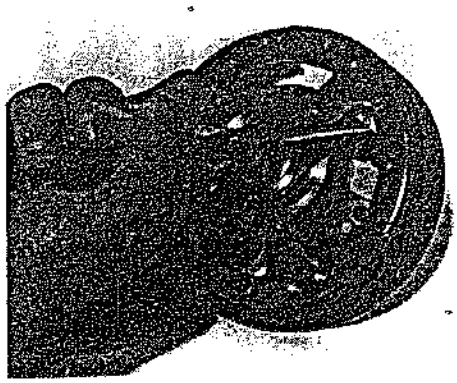
7-51 Only press the condenser into the stator plate until its flat bottom surface is flush with the bottom edge of the mounting bore. Be careful not to kink or bulge the sides of the condenser case.

8-51 Using resin core solder, re-solder the two black leads to the top of the new condenser. Make certain that these wires do not come in contact with the condenser case or the ignition will be shorted.

9-51 Install the stator back into the fan housing, making sure none of the wires are pinched on the backside. Align the two scribe marks and secure with the two screws and lockwashers. Engine timing must be checked when engine is re-assembled.

Ignition Timing Procedure (Points)

1-52 Remove the recoil, starter cup, belt pulleys and spark plugs from the engine.



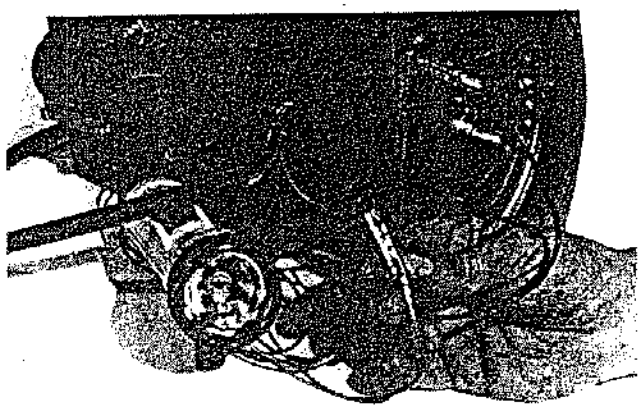
NOTE: Inspect the flywheel to determine if the advance arm spring has been removed. If it hasn't, remove it using a needle nose pliers, working through the opening in the flywheel face. Grasp the spring at either end and carefully stretch it out through the opening until it unhooks from the advance arm and the stationary mounting post and discard it. In using this method, there is no need to remove the flywheel. Inspect the spring once removed to be sure it hasn't broken off, leaving part of the spring inside the flywheel. The spring isn't used with the new timing specification.

2-52 Locate the two screws securing the stator plate to the fan housing. Loosen these screws and rotate the stator plate full clockwise (full retarded) and re-tighten screws, securing the stator plate in the full retarded position.

NOTE: When adjusting the timing to the new specifications (.070 - .078 or 1.8 - 2.0mm), timing on both cylinders is set by adjusting the point gap on each set of points. As pointed out above, the advance spring must be removed to assure easier starting. If the spring isn't removed, starting becomes very difficult.

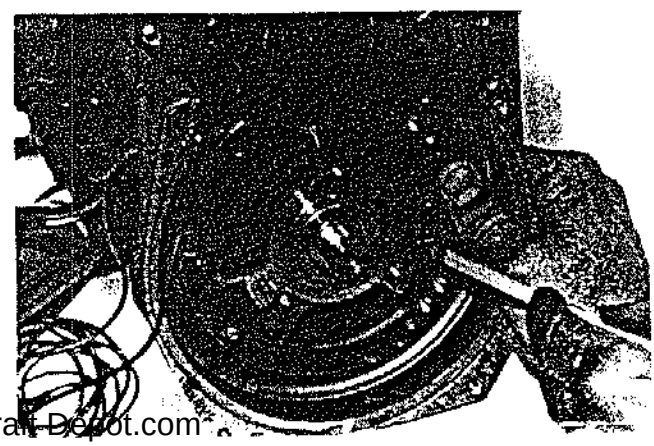
3-52 Install a dial indicator assembly into the spark plug hole of the Number two (2) cylinder (fan side).

4-52 Attach a continuity light or ohmmeter with one lead to ground, the other lead to the blue/red coil wire. Disconnect the wire from the coil.



5-52 Rotate the flywheel clockwise and observe the dial indicator needle movement. Continue to rotate the flywheel clockwise until the indicator needle changes direction. Rotate the indicators outer face until the zero on the dial, coincides exactly at the point of direction change. Where the indicator changes direction is known as (T.D.C.) top dead center.

6-52 Rotate the flywheel counter-clockwise from (T.D.C.) top dead center, until the indicator needle indicates .070 to .078, or 1.8 to 2.0mm. At this point, make sure the advance arm is pushed fully open or out against its stop.

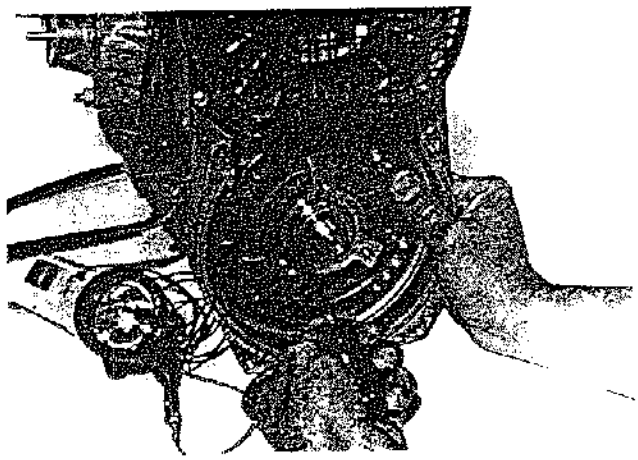


7-52 With the advance arm in the full advance position, the continuity light should dim in the range of-070 to .078 or 1.8 to 2.0mm. If you are using a ohmmeter, you should observe a needle deflection if timing is correct. If neither of these are observed, you must adjust the point gap to correct timing.

8-52 Position the flywheel, so that the indicator needle indicates .078 or 2.0mm. While holding the flywheel in this position with one hand, insert a screwdriver blade into the adjustment notch of the point plate and between the two aluminum post of the stator plate.

NOTE: There is no need to loosen the screw securing the point set to the stator plate. Leave it tight during this procedure and you will save considerable time.

9-52 While holding the flywheel at .078 or 2.0 mm, twist the screwdriver left or right while observing the continuity light or ohmmeter. As soon as you note a light intensity change or needle deflection, remove the screwdriver and recheck timing. Rotate the flywheel counter-clockwise until the needle indicates .100 (B.T.D.C.) before top dead center. Next, rotate the flywheel clockwise until you see the light change intensity, or the ohmmeter needle deflect. Stop at that exact point and note the indicator reading. It must be between .070 to.078 or 1.8 to 2.0 mm. If the indicator needle is out of these specification, again repeat all of step 8-52 &9-52.



After you have the timing set on the #2 cylinder, install the dial indicator into the #1 cylinder spark plug hole (P.T.O. side) and repeat the same procedure. Both cylinders must be timed within .002 or .05 mm of each other.

11-52 When timing the number one cylinder, attach the continuity tester lead to the solid blue wire. It is found attached to the ignition coil nearest the P.T.O. side or number one cylinder. Reinstall the blue/red wire on the number two ignition coil.

NOTE: After the timing procedure is completed, rotate the flywheel counter-clockwise until the points are on the high side of the cam or at their maximum open position, observed through the largest opening in the flywheel. Check gap using a feeler gauge. Point gap must be between .012 to .016 or 0.71 to 0.81 mm.

Correct ignition timing will ignite the compressed fuel/air mixture in the combustion chamber, just before the piston reaches the top of its stroke. Timing is measured in distance from top dead center or in degrees of crankshaft rotation.

Correct timing greatly influences performance. Improper timing causes a decrease in horsepower, overheating and increased fuel consumption, and can also shorten engine life.

In the point ignition system, the breaker points on the magneto stator plate work as a switch that interrupts current flow from the generating coil to the primary winding of the external ignition coil. If the point gap is too small, current flow cannot be interrupted totally because a small amount will jump the close gap. If the gap is too large, the quantity of current decreases because the breaker points will interrupt the flow to the primary, before the winding of the generating coil are fully saturated. In either case, performance is influenced because high voltage cannot be produced consistently.

Troubleshooting CD Ignition

The troubleshooting procedure for the close circuit ignition system, is much different than what is used for the standard open circuit type systems. In the standard open circuit ignitions, the ignition depends on an open ignition switch to operate. In the "closed" circuit ignition system, the ignition lead must be grounded before the ignition will operate. To troubleshoot the "closed " ignition system, use the following procedure:

1-53 Remove the spark plugs and visually check electrod condition. Replace any fouled plug. Attach the spark plugs to the high tension leads and ground them on the cylinder heads.

NOTE: Make sure the ignition switch is in the "ON" position, and both spark plugs are grounded to the cylinder head.

2-53 Crank the engine over quickly and check for spark. If no spark is seen, check to make sure the ignition switch is "ON", and that the there is a good connection from the yellow/black ignition wire to the switch and a good ground from the switch to the engine. After making these checks, again crank the engine over. If no spark is present, proceed to step 3.

● CAUTION ● Spark plugs must be installed and grounded to engine. Never crank the engine over without having the spark plugs attached to the high tension leads and grounded, as damage to the C.D.I. unit may result.

3-53 Disconnect the yellow/black lead from the ignition switch, then using a short piece of wire, ground the yellow/black wire to the engine (any clean, unpainted metal surface). Crank the engine over. If spark is now present, the problem is either one or more of the following: A. Defective ignition switch. B. Corroded or loose wire connection at the ignition switch connector. C. Poor ground connection.

To check these possible causes, proceed to "Ignition Switch Test."

Ignition Switch Test

1-54 Remove both the ground and ignition leads from the ignition switch.

2-54 Using an ohmmeter or continuity light, attach the two tester leads to either wire terminal of the switch.

3-54 With the switch in the closed position, your tester must show full continuity. If the tester shows an open circuit, double check your test connections. If the connections are correct, replace the switch.

Ignition Ground

1-55 As stated before, this ignition system will not function unless it is first properly grounded. To test for this, attach a short jumper lead to the single yellow and black ignition wire. Ground the jumper lead to any clean unpainted surface on the engine.

2-55 With the spark plugs grounded to the cylinder heads, grasp the recoil rope and crank the engine over sharply. If spark is present at the spark plug electrods, check the wiring harness to and from the ignition switch for both a good ground and tightness.

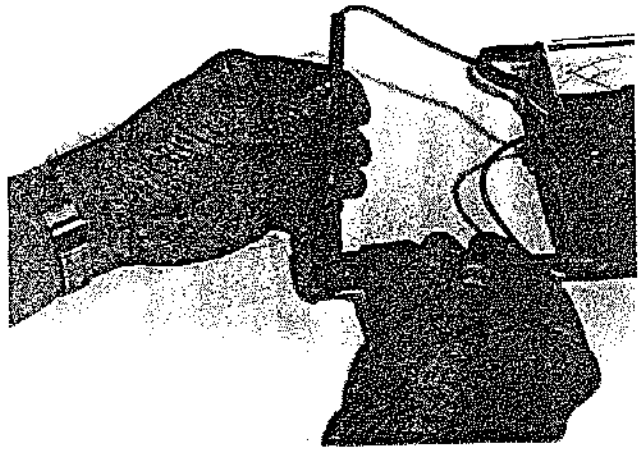
If no spark is present, proceed to checking the electrical system components, using an ohmmeter. When testing the electrical system, always start by testing the easier components first. When testing the different electrical components, there is one that cannot be tested accurately. It is the C.D.I. box or amplifier. If all the other components test "good", the C.D.I. unit can then be assumed to be the problem. All resistance specifications and test connections are given in an easy-to-follow test procedure.

Spark Plug Cap Resistance Test

1-56 Remove the spark plug caps from the high tension leads by turning them counter-clockwise.

2-56 Set the ohmmeter selector on the X1K position, then touch the leads together and zero the meter.

3-56 In turn, on each cap, connect one meter lead to one end of the cap, connect the other meter lead to the other end of the cap.

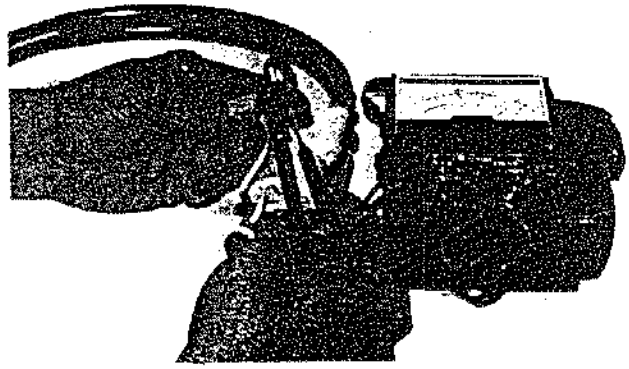


4-56 Spark plug cap resistance must be 5000 ohms ± 10%.

External Coil (Primary Winding Resistance)

1-57 Set the ohmmeter scale selector on the X1K scale and zero the meter.

2-57 Test between the white/blue and black leads in the double plug connector.

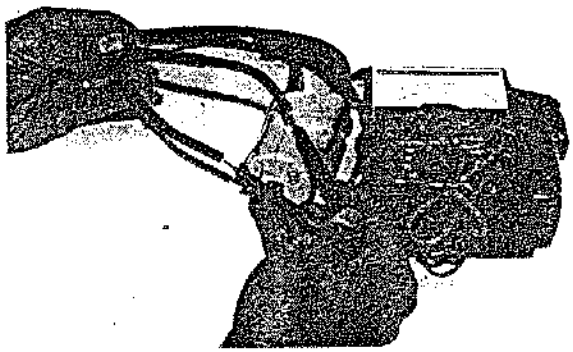


3-57 The resistance must be .33 ohms ± 15%.

External Coil (Secondary Winding Resistance)

1-58 Set the ohmmeter scale selector on the X1K position and zero the meter.

2-58 Remove the spark plug caps and perform the test between the two high tension leads.

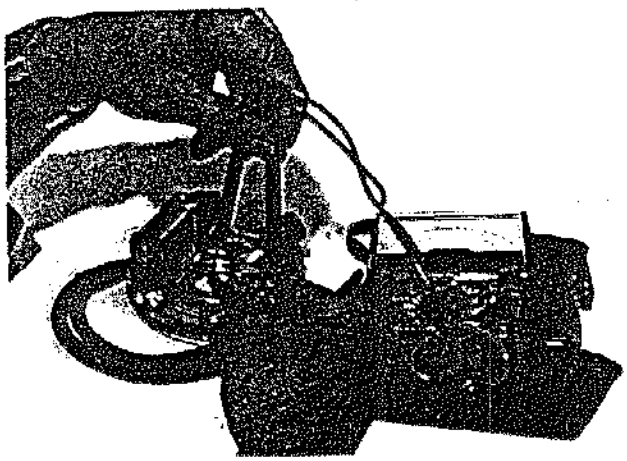


3-58 The resistance must be 3900 ohms ± 20%.

Charge Coil Resistance Test

1-59 Set the ohmmeter scale selector on the X100 scale.

2-59 Disconnect the triple and the double plug connectors from the engine magneto to the C.D.I. unit. Test between the black/red lead in the triple plug and the red/black lead in the double plug connectors from the engine wiring harness.



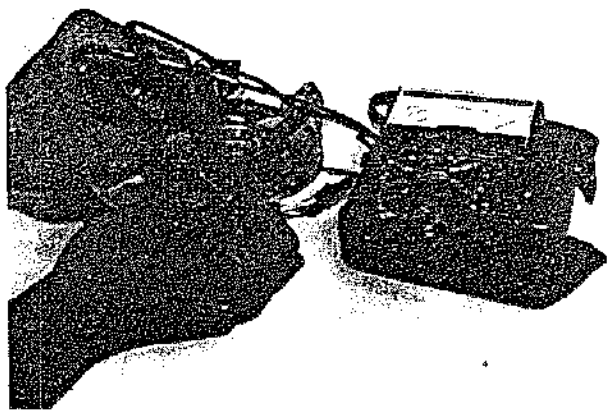
3-59 The resistance must read 180 ohms ± 10%.

Trigger Coil Resistance Test

1-60 Set the ohmmeter scale selector on the X1 position and zero the meter.

2-60 Disconnect the triple and double plug connectors from the C.D.I. unit. Perform test on wires leading into the engine magneto.

3-60 Test between the black/white and black/red leads in the triple plug.



4-60 The resistance must be 2.2 ohms ± 10%.

Lighting Coil Resistance Test

1-61 Set the ohmmeter scale selector on the X1 position and zero the meter.

2-61 Test between the two solid yellow leads found in the double plug connector from the engine magneto.

3-61 The resistance must be .18 ohms ± 10%.

Checking Ignition Timing

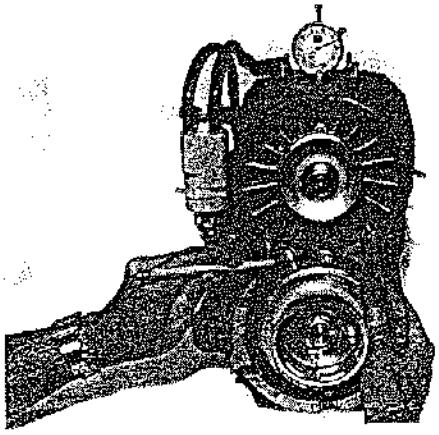
C.D.I. ignition timing must be checked with the engine running, using a good automotive timing light.

The closed circuit C.D.I. ignition used on the Cuyuna engine has a retarding timing curve. As the engine RPM increases, you will note that timing actually retards instead of advancing as is so commonly seen. With this type of retarding curve, the engine has improved torque at lower engine speeds. To check engine timing, follow the procedure below.

NOTE: With the C.D.I. ignition, each spark plug fires twice per revolution and the ignition advance mechanism is controlled electrically. Because both spark plugs fire at the same time, it is only necessary to time one of the two cylinders as the other will also be correct. Engine timing must be checked at the specified RPM, called out in the instructions.

1-62 Remove the spark plugs from the engine.

2-62 Install a dial indicator into the number two cylinder (magneto side). Locate top dead center (T.D.C.) and rotate the flywheel counter-clockwise from top dead center .174 or 4.4mm before top dead center (B.T.D.C.). While holding the flywheel at .174 or 4.4mm, place a mark on the flywheel that aligns with the long stationary "run" indicator line of the fan housing.



3-62 Remove the dial indicator and install spark plugs, torquing them to 20 ft. lbs. Secure spark plug wires to the spark plugs.

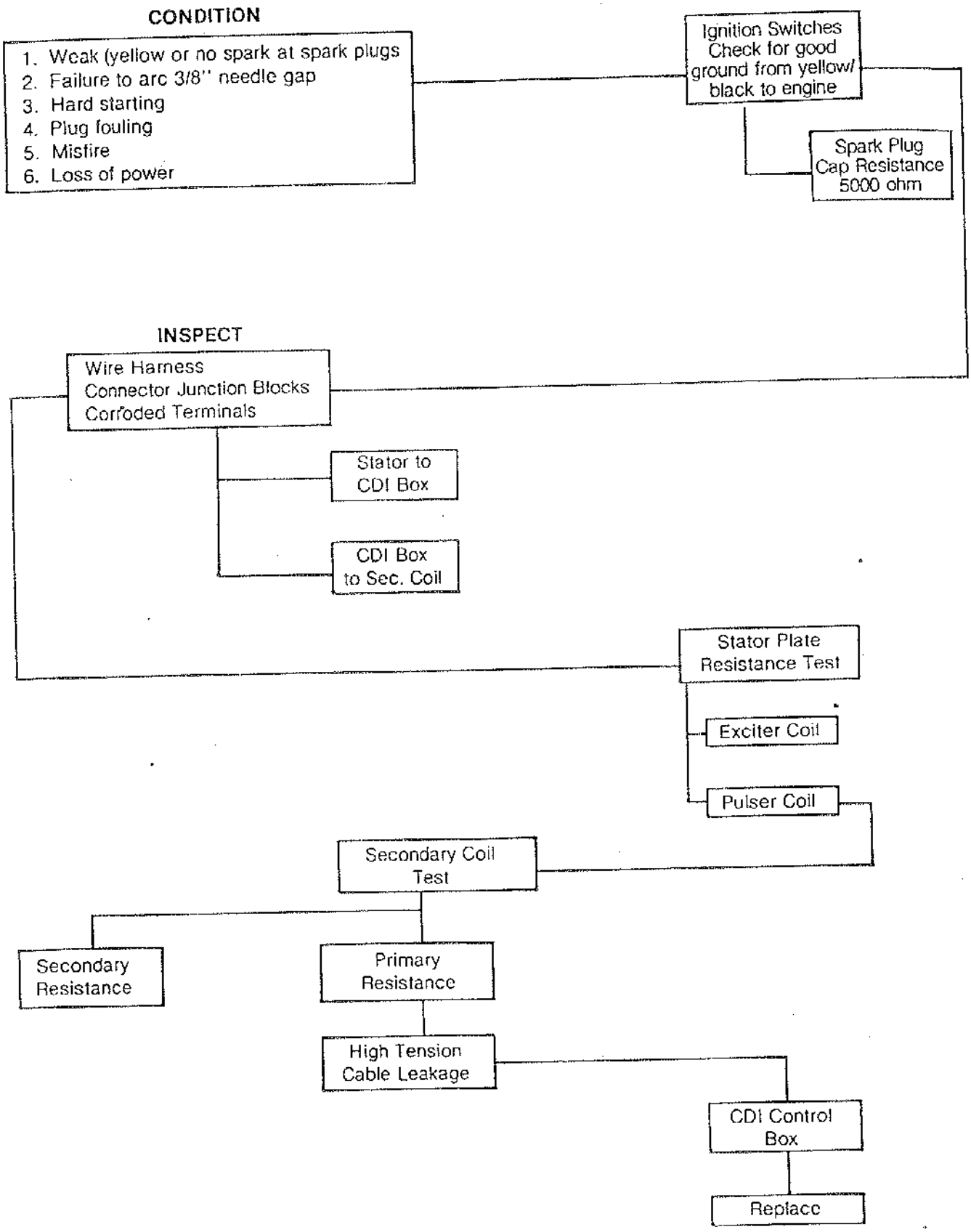
WARNING To avoid injury, stake aircraft stationary while checking engine timing. Be extremely careful around the propeller area.

4-62 Connect positive and negative leads from timing light to power source and clamp the remaining lead to either spark plug wire. Start engine and run at 1800 RPM. Direct the timing light towards the timing mark on the fan housing. At 1800 RPM, the scribed mark on the flywheel must align with the stationary mark on the fan housing.

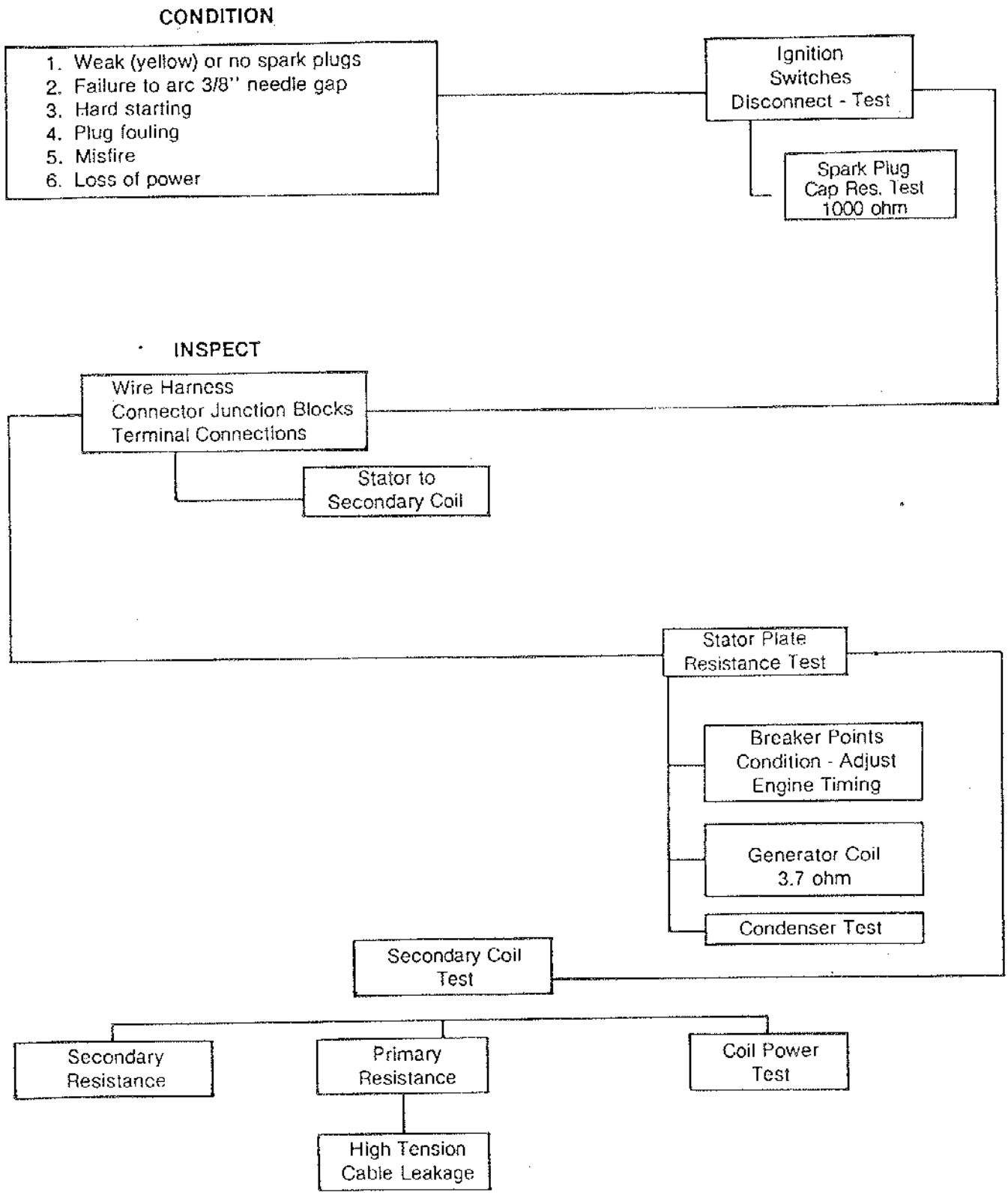
5-62 If timing needs to be adjusted, remove the recoil starter, starter cup and belt pulleys.

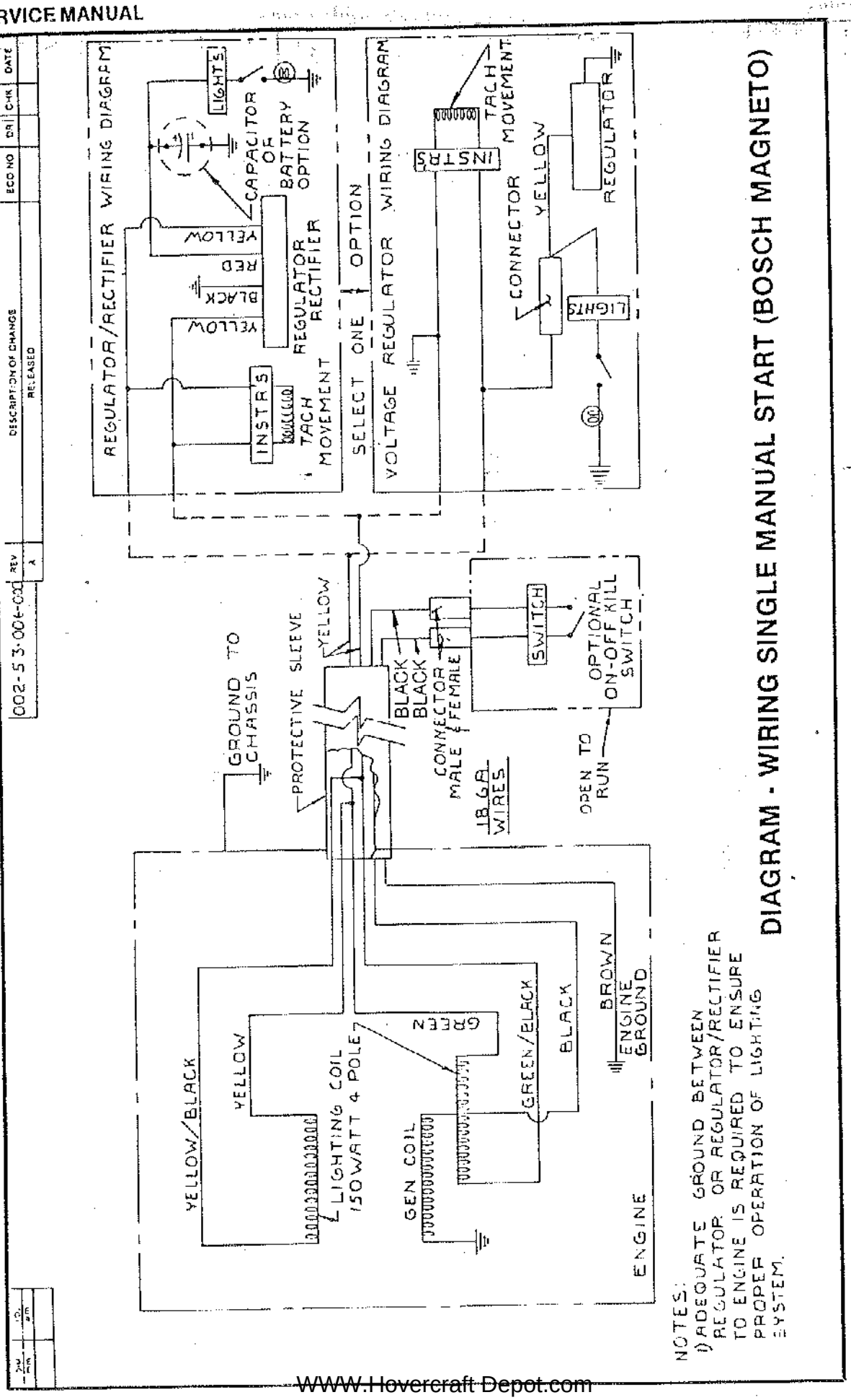
6-62 Working through the openings provided in the flywheel face, loosen the two stator plate fastening screws. Rotate the stator plate clockwise to retard the timing and counter-clockwise to advance timing. Re-tighten the two stator plate screws and assemble starter assembly to engine. Run the engine and re-check timing.

CDI Diagnostic Test Sequence

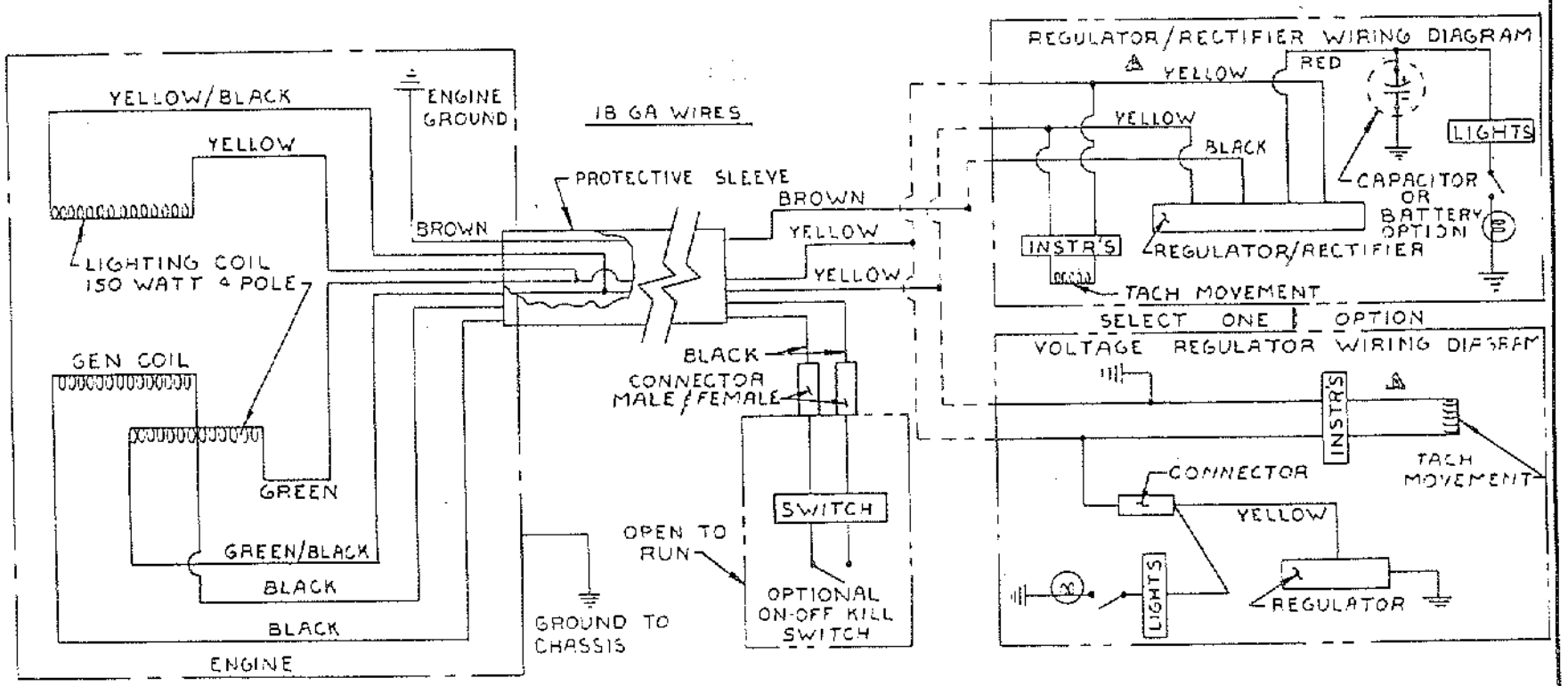


Magneto Point Ignition
Diagnostic Test Sequence



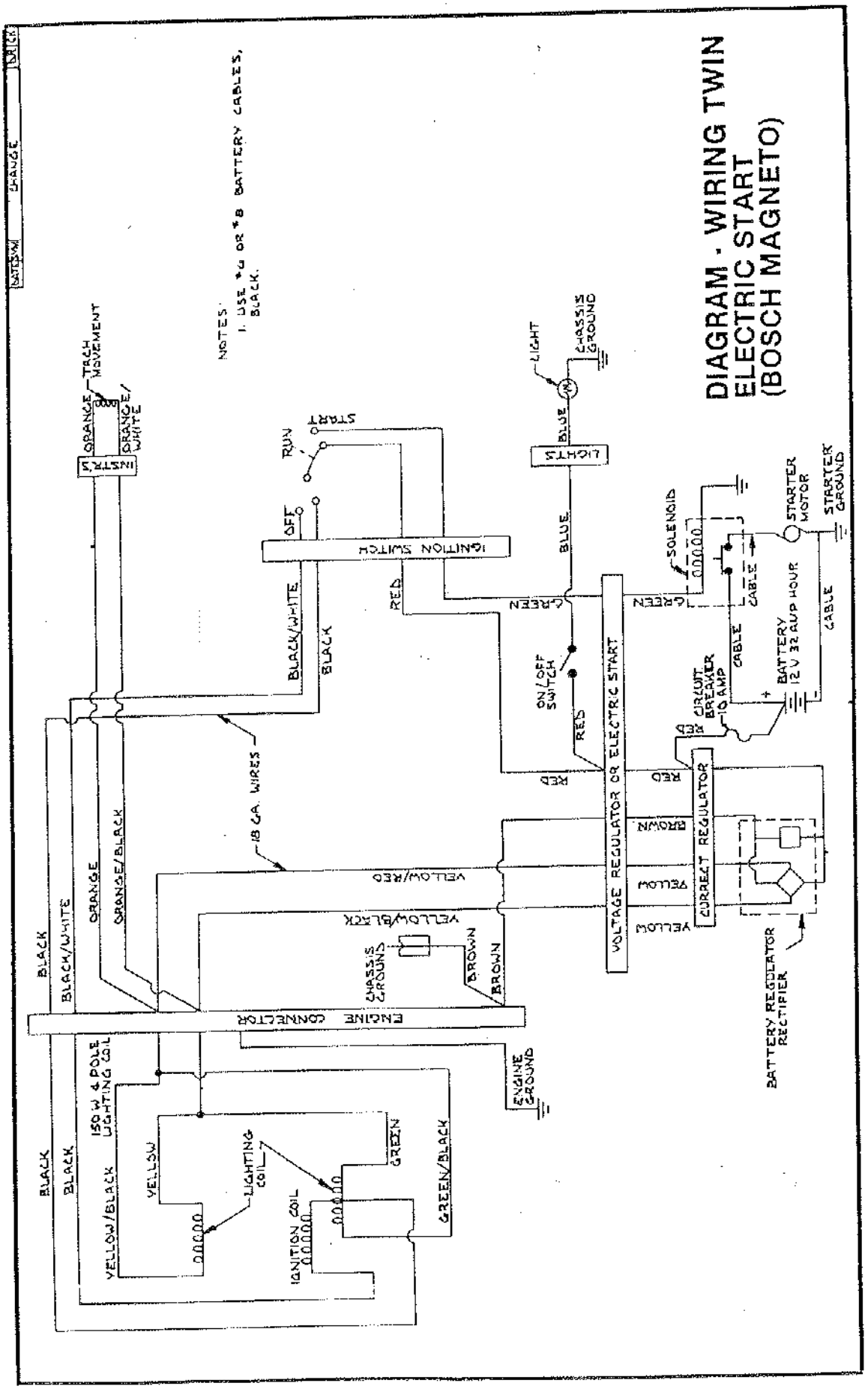


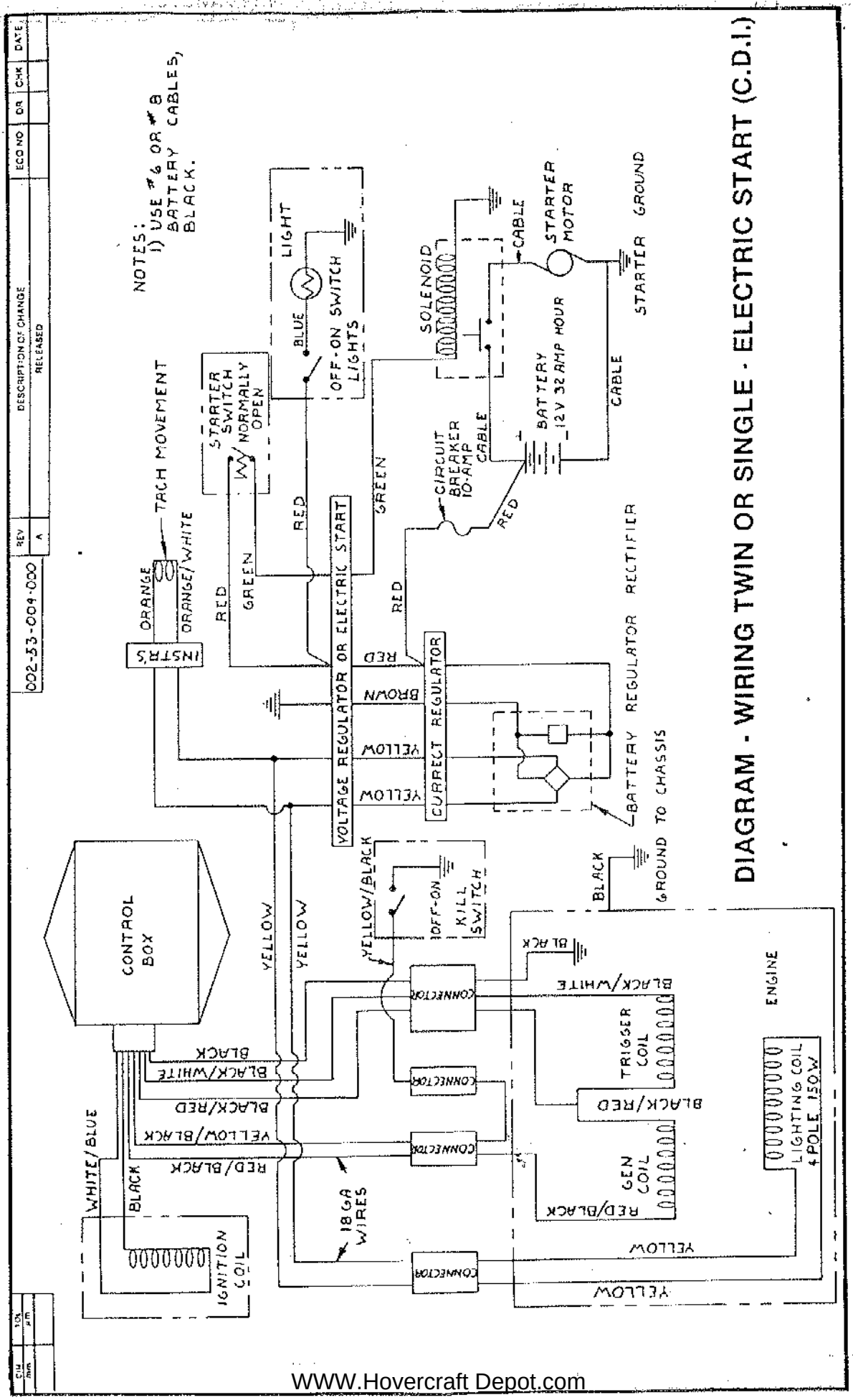
002-53-002-000	REV	DESCRIPTION OF CHANGE	ECO NO	DR	CHK	DATE
	A	RELEASED				
	B	REVISED & REDRAWN	1083	JE	Jww	7-29-82

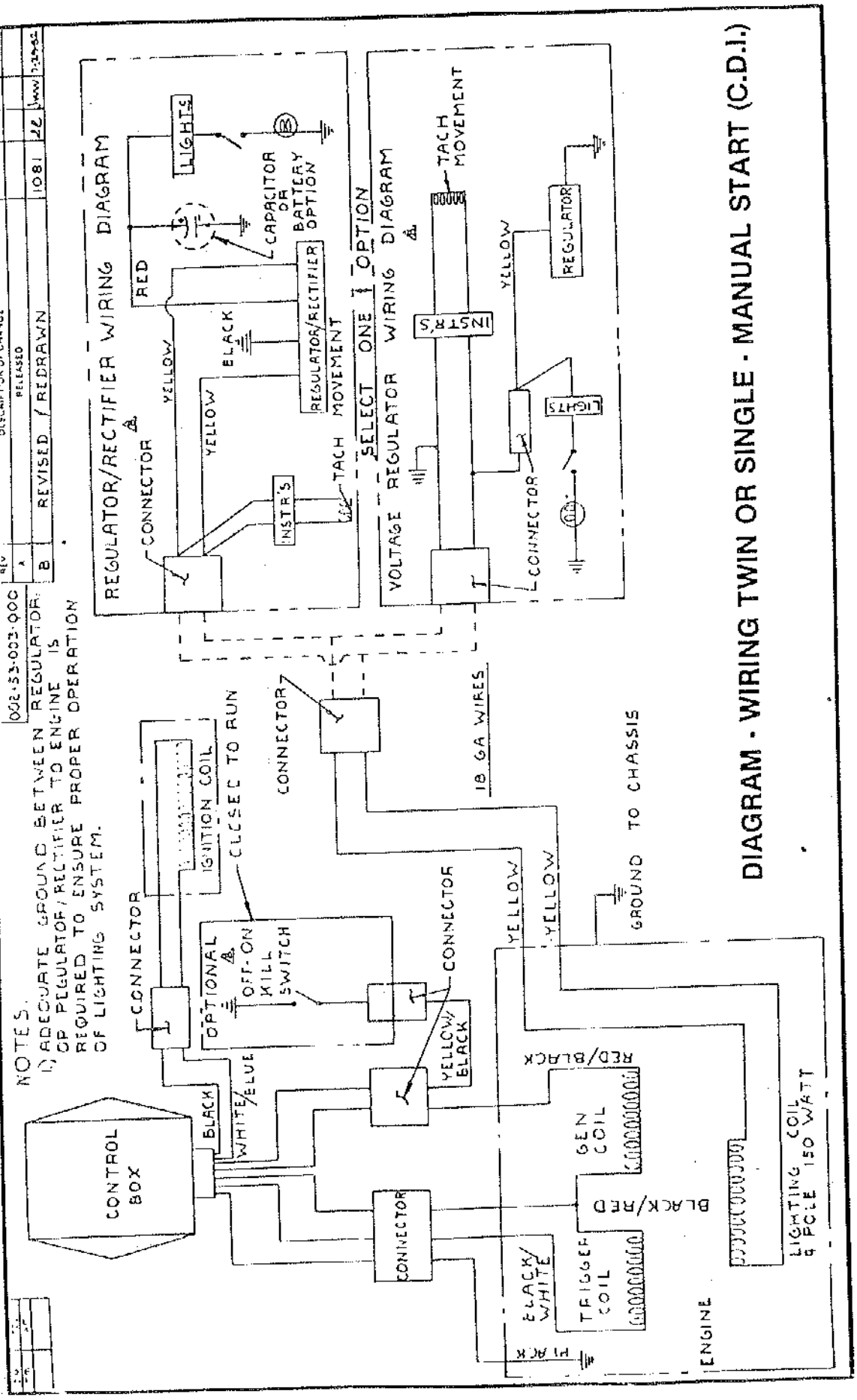


NOTES:
1) ADEQUATE GROUND BETWEEN REGULATOR OR REGULATOR/RECTIFIER TO ENGINE IS REQUIRED TO ENSURE PROPER OPERATION OF LIGHTING SYSTEM.

DIAGRAM - WIRING TWIN MANUAL START (BOSCH MAGNETO)







Troubleshooting

(ELECTRICAL)

TROUBLE	PROBABLE CAUSE	REMEDY
No lights.	1. Open Circuit: Faulty Switch Separated Connector Cut Wiring.	1. Repair or replace faulty or damaged element.
	2. Wiring shorted to ground: Damaged Insulation.	2. Repair or replace damaged or faulty element.
	3. Faulty Regulator (Shorted SCR).	3. Replace regulator.
Dim lights.	1. Shorted lighting coil.	1. Replace armature plate or coil.
	2. Faulty regulator - Incorrect regulator set point (too low).	2. Replace regulator.
Burned out lights (all).	1. Faulty regulator - Incorrect set point (too high).	1. Replace regulator and failed bulbs.
Burned out lights (individual).	2. Failed bulb	2. Replace bulb.
Burned out lights.	3. Intermittent short in wire harness.	3. Repair or replace wire harness.
Engine won't run.	1. Open or shorted windings in ignition coils (stator).	1. Replace armature plate.
Weak or no spark.	2. Open or shorted windings in external ignition coil	2. Replace external coil.
	3. Shorted condenser - dirty or worn	3. Replace condenser.
	4. Damaged (burned) points.	4. Replace points.
Engine won't run - Adequate spark.	1. Burned or fouled plugs.	1. Replace plugs. Determine that correct plugs are being used. CHECK ENGINE TROUBLESHOOTING
	2. See Engine Trouble-shooting Section.	
Unacceptable Engine Performance.	3. See Engine Trouble-shooting Section.	

GENUINE REPLACEMENT PARTS

When replacement of parts is necessary, use only genuine Cuyuna parts. They are precision made to insure high quality and correct fit. Refer to the Cuyuna illustrated parts book for the correct part number, quantity and description.

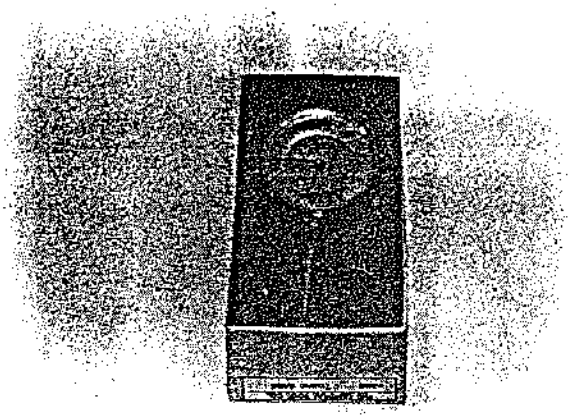
Service parts should be purchased through the dealer from which you purchased the product containing the Cuyuna engine. Provide your dealer with full details of your engine, including the serial number and model number and the product in which your engine is installed.

CUYUNA ACCESSORIES AND PUBLICATIONS

	Part Number
Cuyuna Oil Sold in case lots (24-16 oz. cans)	000-44-001-000
Light Regulator Regulate alternator output to 12 volts AC	002-53-027-000
Regulator/Rectifier Regulates alternator output to 12 volts DC	002-53-024-000
Electric Starter (R model-twin) 10 lbs., ring gear mounts on PTO shaft	291-31-910-000
Hi-Performance Kit (430 only) Rated 43 h.p. at 6800 RPM	430-31-366-000 (STD)
Dual Carburetor Kit (430 only) Must be used with Cuyuna engine exhaust system for 43 h.p. at 6800 RPM	430-31-367-000
"Flow-Thru" Cylinder Head Improves airflow and better balance of cylinder temperature	438-07-016-000
Carburetion and Exhaust Systems Mikuni VM series carburetor and Cuyuna exhaust.	Specify application when ordering
Cuyuna Engine Service Manual (NEW 1983) A revised comprehensive manual covering engine and carburetor -disassembly, inspection, reassembly and operating procedures.	
Cuyuna Illustrated Parts Manual Exploded view of engine parts and their respective numbers.	
Cuyuna Engine Theory Manual Detailed examination of the design, function and operation of engines manufactured by Cuyuna.	
Cuyuna Fuel System Theory Manual Detailed examination of the design, function and operation of carburetors used on the Cuyuna engine.	
Cuyuna Electrical Systems Theory Manual Detailed examination of the design, function and operation of the electrical systems used on Cuyuna engines.	

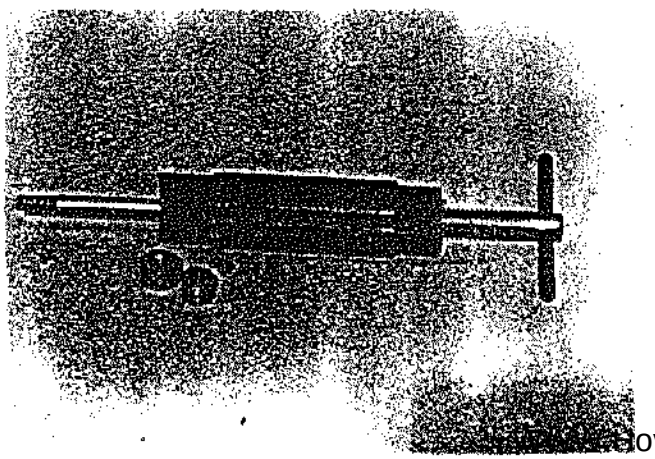
Cuyuna Special Tools

1. **Dial Indicator**
   Used in engine timing to locate exact number of thousandths before top dead center. Part number 444-31-804-000.

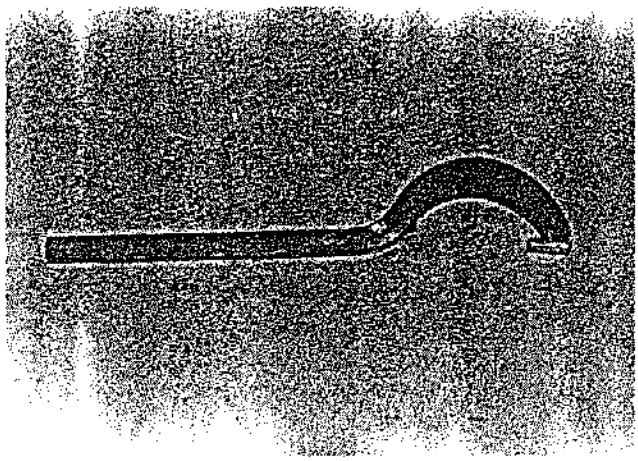


2. **Flywheel Puller**
   Used to remove engine flywheel. Part number 444-31-843-200.

3. **Wrist Pin Puller**
   Used to remove piston wrist pin. Part number 444-31-805-000.



4. **Spanner Wrench**
   Used to hold crankshaft stationary while loosening or tightening the flywheel nut. Part number 444-31-806-000.



5. **Ring Gear Tool**
   Used to install the electric start ring gear. Part number 444-31-886-000.