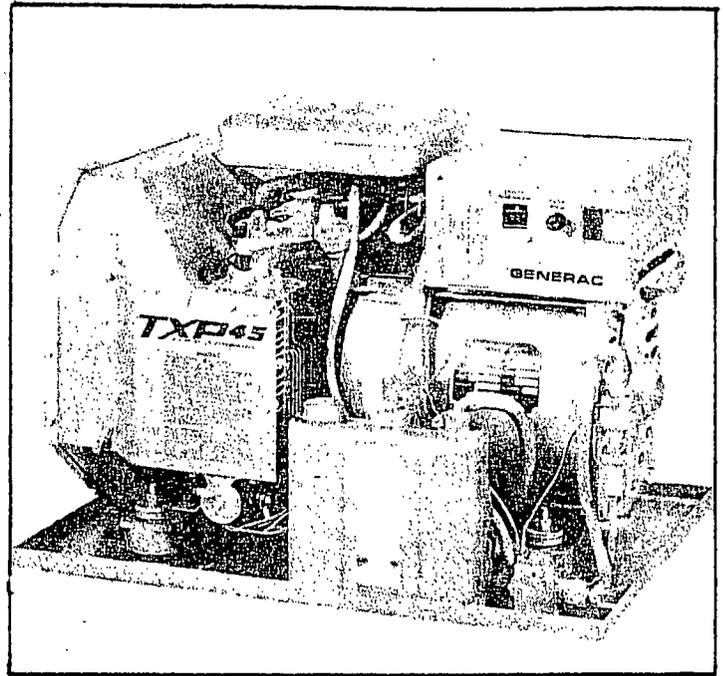


# **TXP ALTERNATOR**



## **DIAGNOSTIC REPAIR MANUAL**

**GENERAC**

P.O. Box 8, Waukesha, Wisconsin 53186

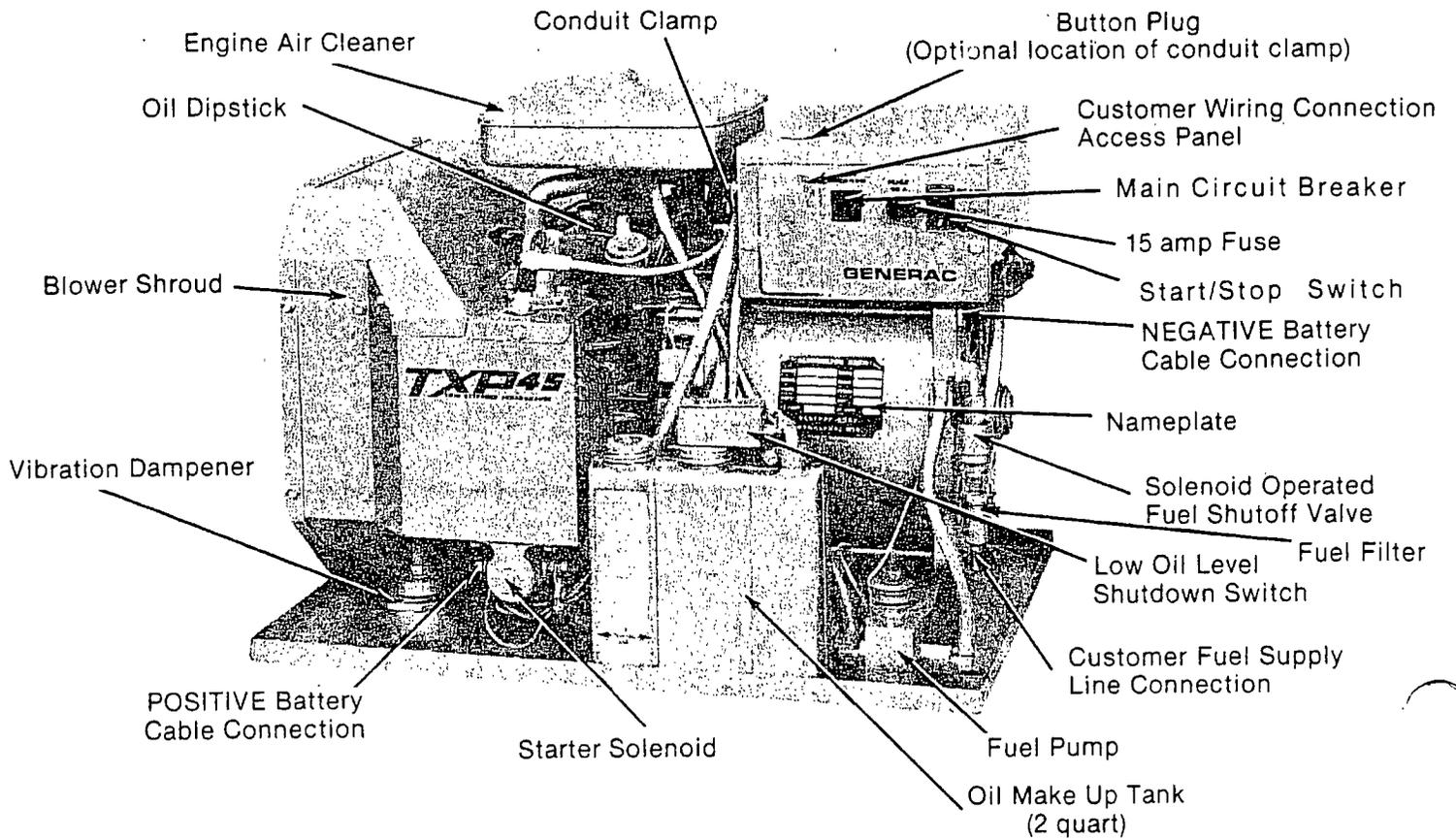


Figure 1. NOMENCLATURE

# PART I GENERAL

Section	Title	Page
1	Specifications .....	1.1
	Difference Data .....	1.1
	Engine Lubrication .....	1.2
	Electrical Test Specifications .....	1.2
	Torque Values .....	1.3
	Engine Specifications .....	1.4
2	Wiring Diagram (Model 6931-0) .....	2.1
	Wiring Diagram .....	2.2
	Factory Equipped Customer Wiring Connections .....	2.3
	TXP Reconnected for 120/240 Volt Output .....	2.3

## SPECIFICATIONS

Model No.	6931-0	6931-1	6931-2
Wattage Capacity	4500		
Voltage Output	120/240*		
Amperes	37.5 at 120 Volts - 18.75 at 240 Volts		
Frequency	60 Hz		
Phase(s)	1-Phase		
Voltage Regulation	120 Volts (+2%) AC at 60 Hertz		
Driven Speed	1800 rpm		
Battery Charging Amperes	0 - 10 Amperes at 12 Volts DC		
Gross weight (wet)	215 Pounds		
Engine Type	2-Cylinder, 4-Cycle, Aluminum		
Engine Horsepower	Approximately 10 at 1800 rpm		
Bore	3.44 Inches (87.3 mm)		
Stroke	2.16 Inches (54.7 mm)		
Displacement	40 Cu. In. (656 cc)		
Valves	Stellite exhaust valves - Valve rotators on exhaust valves		
Governed Speed	1800 rpm		
Air Cleaner	Dry paper element, oil foam pre-cleaner		
Crankcase Oil Capacity	56 Ounces (3½ Pints)		
Oil Make-up System	Maintains crankcase oil level at about 48 Ounces (3 Pints)		
Ignition System	Solid state capacitor discharge type		
Starting System	12 Volt DC electric (Ring Gear)		
Cranking Current	Approximately 90 amperes nominal		

\*As shipped, alternator provides 120 volts AC only. Unit is reconnectable to supply 120 and 240 volts AC. See Page 2.3.

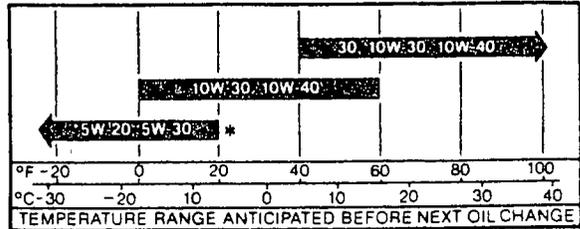
## DIFFERENCE DATA

Model 6931-0 - Rigid coupling between engine drive shaft and rotor
Model 6931-1 - Added a flexible coupling between engine drive shaft and rotor
Model 6931-2 - New rotor with improved 4-pole laminations. New improved blower housing with heavier sheet metal. New improved inertia ring with increased mass.

## ENGINE LUBRICATION

Use any high quality detergent oil having a classification which includes "Service MS, SC, SD or SE". No special additives should be used.

### RECOMMENDED SAE VISCOSITY GRADES



## ELECTRICAL TEST SPECIFICATIONS

COMPONENT	TEST POINTS	TEST VALUE
Stator Windings		
AC Power Windings	Wire #11 - Wire #22	0.42 Ohms
AC Power Windings	Wire #33 - Wire #44	0.42 Ohms
Excitation Windings	White receptacle Pin #2 - Pin #6	2.30 Ohms
Battery Charge Windings	Wire #55 - Ground	0.20 Ohms
Wire #77 - Ground	Wire #77 - Ground	0.20 Ohms
Rotor	Brush terminals or Slip Rings	13.00 Ohms
Ignition Stator Charge Coil	Ignition Module Receptacle Pin #2 - Ground	225.00 Ohms
Trigger Coil	Ignition Module Receptacle Pin #3 - Ground	6.00 Ohms
Ignition Stator Voltage Input to Printed Circuit Board	PCB Pin #4 - Ground	0.5-1.5 Volts
Fuel Pump DC Resistance	Fuel Pump terminal to ground	50.00 Ohms
Spark Timing	-----	26 BTDC
Choke Heater	Wire #77 - Ground	30.00 Ohms
Sensing Transformer		
Secondary Winding	Wire #11 - Wire #22	See NOTE
Primary Winding	White receptacle Pin #3 - #5	See NOTE
Field Boost Voltage (While Cranking)	White receptacle Pin #4 - Ground	9 - 12 VDC

NOTE:-Either of two transformer makes may be used. The Wescoil transformer has a primary winding resistance of 745-825 Ohms and a secondary winding resistance of 1603-2169 Ohms. The CoilTran transformer has a primary resistance of 824-1114 Ohms and a secondary resistance of 1222-1654 Ohms.

## TORQUE VALUES

STANDARD TORQUE VALUES			All Values in FOOT-POUNDS TORQUE VALUES + 5 PER CENT					
BOLT SIZE	Grade 2		Grade 5		Grade 7		Grade 8	
	DRY	LUB	DRY	LUB	DRY	LUB	DRY	LUB
1/4-20	5	4	8	6	10	8	12	9
1/4-28	6	5	10	7	12	9	14	11
5/16-18	11	8	17	13	21	16	24	18
5/16-24	13	10	19	15	24	18	27	21
3/8-16	20	15	31	24	38	29	44	34
3/8-24	23	17	35	27	43	33	49	38
7/16-14	32	25	49	38	61	47	70	54
7/16-20	36	27	55	42	68	52	78	60
1/2-13	49	38	75	58	93	72	105	82
1/2-20	55	42	85	65	105	80	120	90
9/16-12	70	54	110	84	135	105	155	120
9/16-18	78	60	120	93	150	115	170	132
5/8-11	92	71	150	115	185	145	210	165
5/8-18	105	81	170	130	210	160	240	185
3/4-10	165	125	270	205	330	250	375	290
3/4-16	180	140	295	230	365	280	420	320
7/8-9	200	155	395	305	530	405	605	455
7/8-14	225	170	435	335	585	450	670	515
1 - 8	300	230	590	455	795	610	905	695
1 - 14	340	260	680	510				

GRADE	2	5	8
BOLT HEAD SYMBOL			

### SPECIAL TORQUES

Connecting Rod.....	190	In.-Lbs.
Cylinder Head (Torque in staggered sequence).....	160	In.-Lbs.
Spark Plug.....	200	In.-Lbs.
Starter Motor Mounting Bolts.....	160	In.-Lbs.
Engine Base.....	300	In.-Lbs.
Sump (7 bolts).....	160	In.-Lbs.
Crankcase Cover (7 bolts).....	140	In.-Lbs.
Governor Lever Lock Nut.....	100	In.-Lbs.
Fan to Engine Shaft Capscrew (Grade 5)-(Apply Loc-Tite 601 to capscrew threads).....	19	Ft.-Lbs.
Flex Coupling to Rotor Hub Capscrews (Model 6931-2) - (Apply LocTite 601 to capscrew threads).....	19	Ft.-Lbs.
Flex Coupling to Fan Capscrews (Model 6931-2) - (Apply LocTite 601 to capscrew threads).....	19	Ft.-Lbs.

## ENGINE SPECIFICATIONS

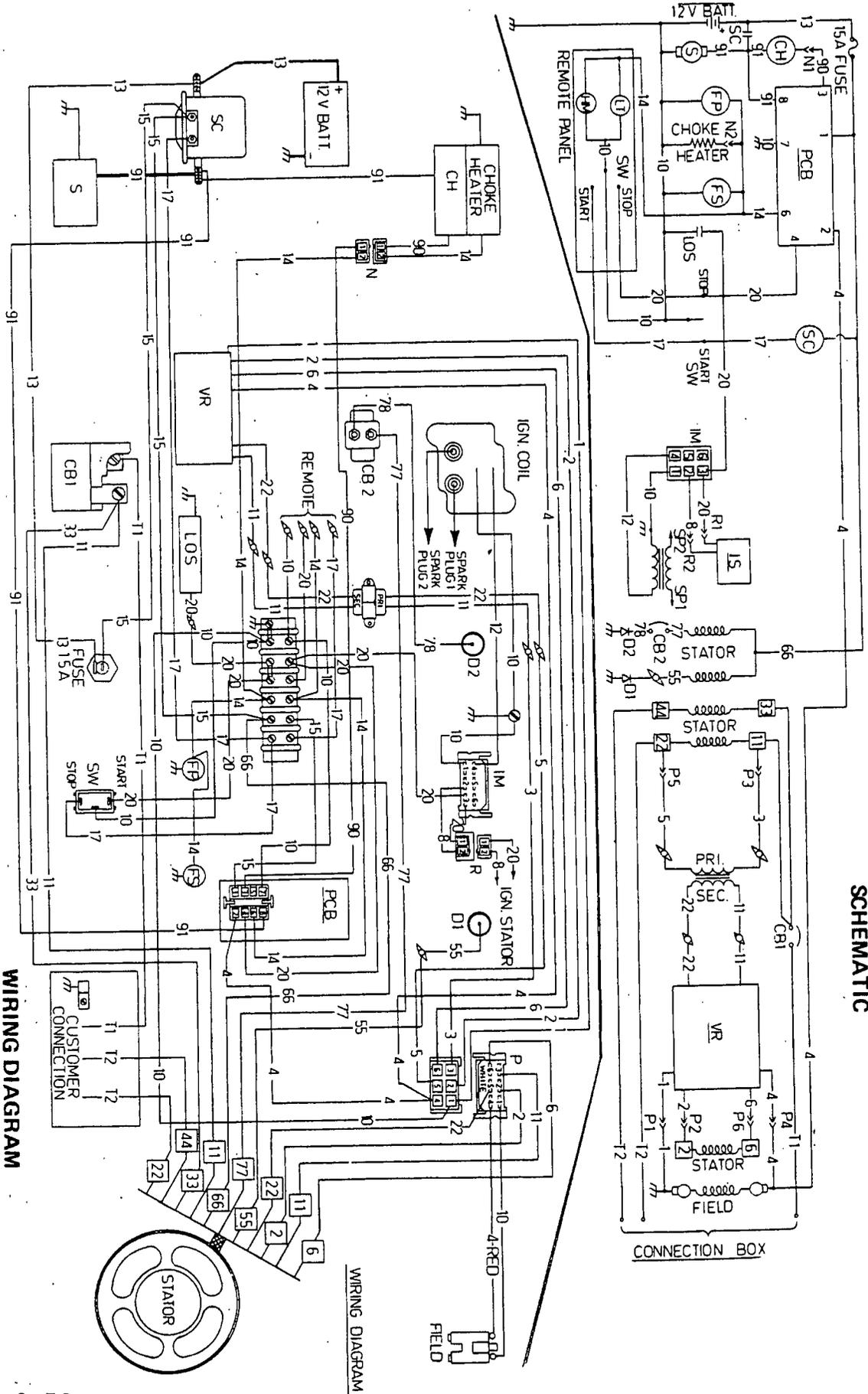
Spark Plug Gap.....	0.030"
Crankshaft End Play.....	0.002"-0.008"
Governed Idle Speed Adjustment.....	1400 rpm*
Valve Clearance (with springs installed).....	Intake .005"- .007" Exhaust .007"- .009"
Valve Seat Angle.....	Intake - 30 Exhaust - 45
Valve Seat Width.....	3/64"- 1/16"
Valve Seat Margin.....	Not less than 1/64"
Valve Clearance (springs not installed).....	Intake .007"- .009" Exhaust .009"- .011"
Crankshaft Reject Sizes.....	PTO Journal 1.376" Crankpins 1.622"
Cylinder Bore Standard Diameter.....	3.4375**
Ring Gap Reject Sizes (Top and center compression).....	0.035"
(Oil Ring).....	0.045"
Ring to Ring Groove Maximum Clearance.....	0.007"
Maximum Piston Pin Out-of-Roundness.....	0.0005"
Crankpin Bearing Hole Rejection Size.....	1.252"
Piston Pin Bearing Hole Rejection Size.....	0.802"
Camshaft Rejection Sizes (Gear and Shaft Journals).....	0.623"
(Cam Lobes).....	1.124"
Cylinder Bore Maximum Out-of-Roundness.....	0.0025"
	0.010" above standard
Cylinder Bore Oversizes when honing.....	0.020" above standard 0.030" above standard

\*Adjust carburetor idle screw to 900 rpm  
 \*\*Resize if worn 0.003" or more

# WIRING DIAGRAMS

MODEL 6931-0

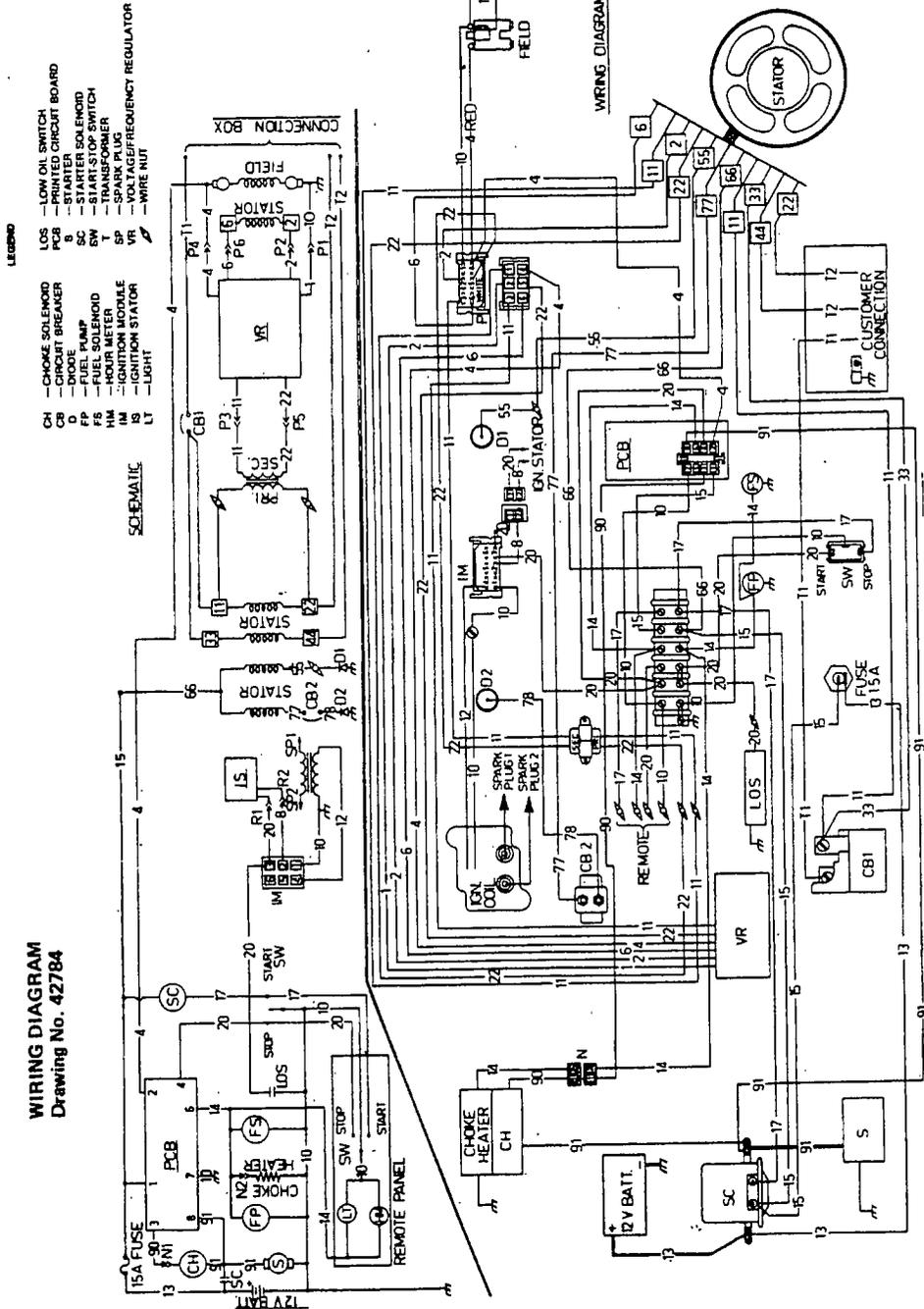
- LEGEND**
- CH— Choke Solenoid
  - CB— Circuit Breaker
  - D— Diode
  - FP— Fuel Pump
  - FS— Fuel Solenoid
  - HM— Hour Meter
  - IM— Ignition Module
  - IS— Ignition Stator
  - LT— Light
  - LOS— Low Oil Switch
  - PCB— Printed Circuit Board
  - SC— Starter Solenoid
  - SW— Start-Stop Switch
  - T— Transformer
  - SP— Spark Plug
  - VR— Voltage/Frequency Regulator
  - W— Wire Nut



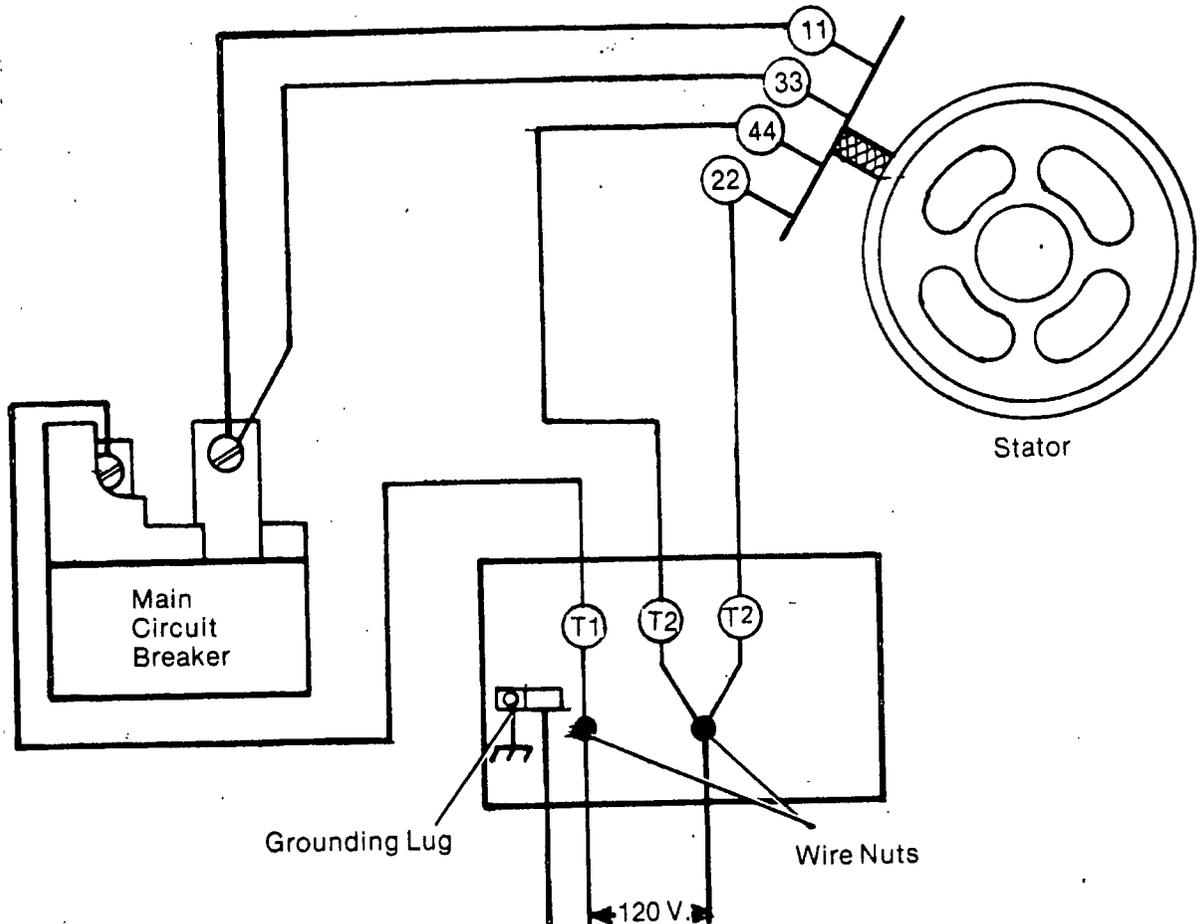
SCHEMATIC

WIRING DIAGRAM

WIRING DIAGRAM  
Drawing No. 42784



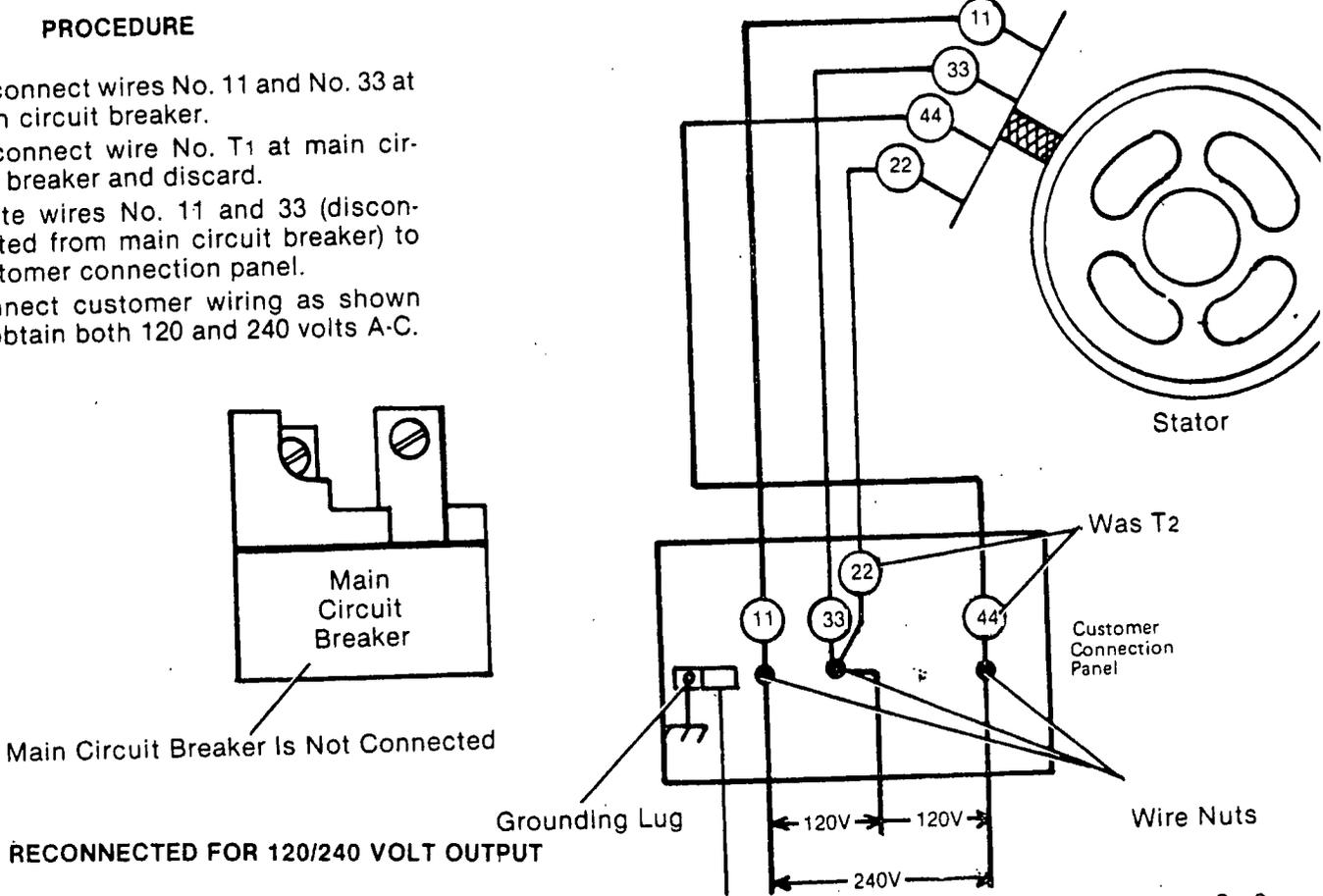
MODEL 6931-1  
6931-2



**Factory Equipped Customer Wiring Connections  
120 Volts Only**

**PROCEDURE**

1. Disconnect wires No. 11 and No. 33 at main circuit breaker.
2. Disconnect wire No. T1 at main circuit breaker and discard.
3. Route wires No. 11 and 33 (disconnected from main circuit breaker) to customer connection panel.
4. Connect customer wiring as shown to obtain both 120 and 240 volts A-C.



**TXP RECONNECTED FOR 120/240 VOLT OUTPUT**

# PART II

## TROUBLE DIAGNOSIS

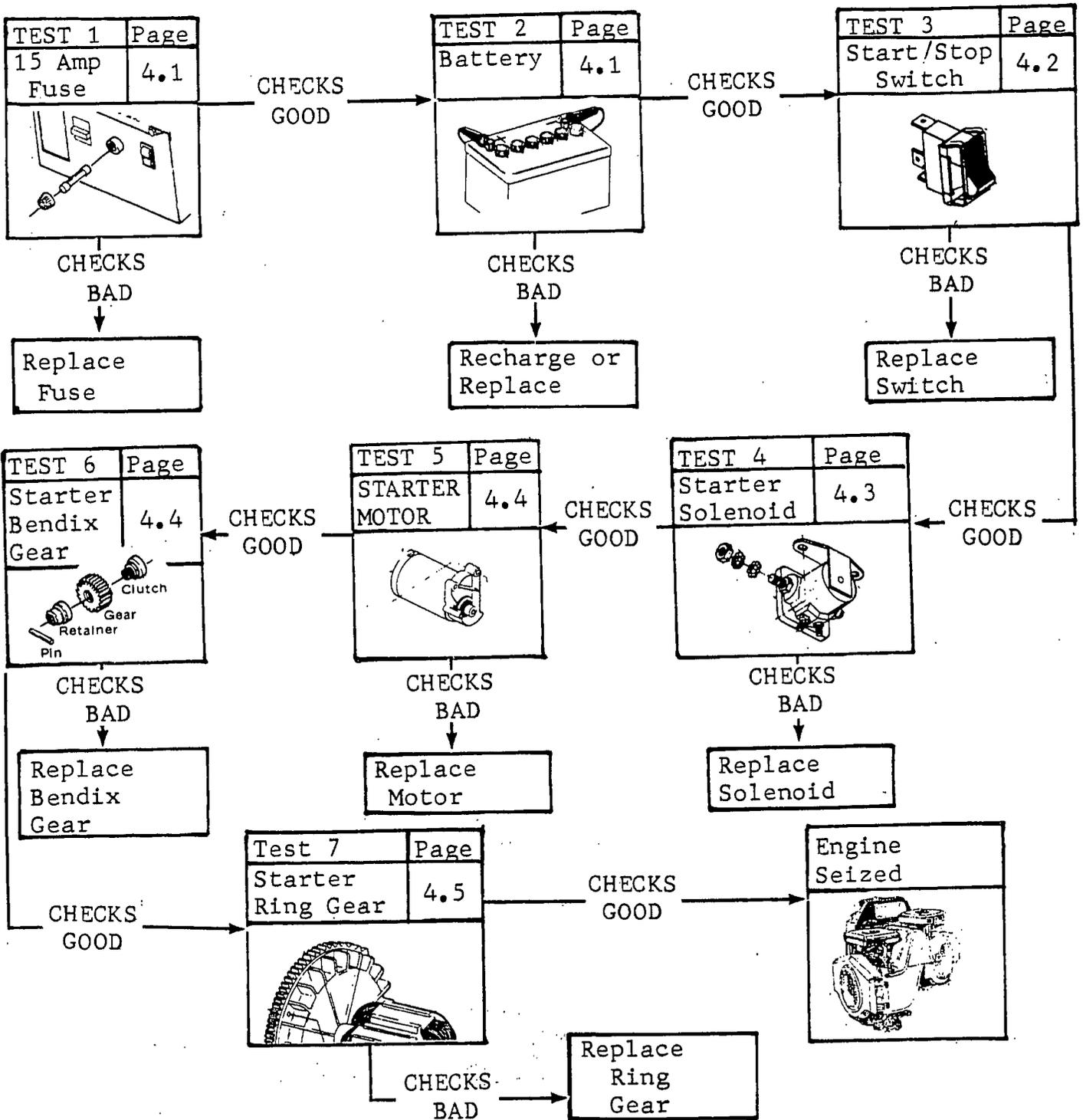
Section	Title	Page
3	DIAGNOSTIC FLOW CHARTS	
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	Engine Cranks, Won't Start .....	3.2
	Engine Starts Hard, Runs Rough .....	3.5
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	A-C Power Low .....	3.9
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4	DIAGNOSTIC TESTS	
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	Test 17 - 4 Amp Fuse .....	4.10
	Test 18 - Printed Circuit Board .....	4.11
	Test 19 - Fuel Filter .....	4.11
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	Test 22 - Check Installation .....	4.13
	Test 23 - Carburetor .....	4.14
	Test 24 - Compression .....	4.15
	Test 25 - Head Gasket .....	4.15
	Test 26 - Valves .....	4.15
	Test 27 - Rings .....	4.15
	Test 28 - Cylinder .....	4.15
	Test 30 - Choke .....	4.16
	Test 31 - Pre-Choke .....	4.17
	Test 32 - Governor .....	4.17
	Test 33 - Frequency .....	4.18
	Test 34 - Excitation Windings .....	4.19
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	Test 36 - Output Voltage .....	4.19
	Test 37 - Sensing Transformer .....	4.20
	Test 38 - Main Circuit Breaker .....	4.21
	Test 39 - Rotor .....	4.21
	Test 40 - Field Boost .....	4.22
	Test 41 - Stator .....	4.23
	Test 42 - Charging Output .....	4.23
	Test 43 - Circuit Breaker .....	4.24
	Test 44 - Diodes D1 and D2 .....	4.24
	Test 45 - Stator Battery Charge Windings .....	4.25

# DIAGNOSTIC FLOW CHARTS

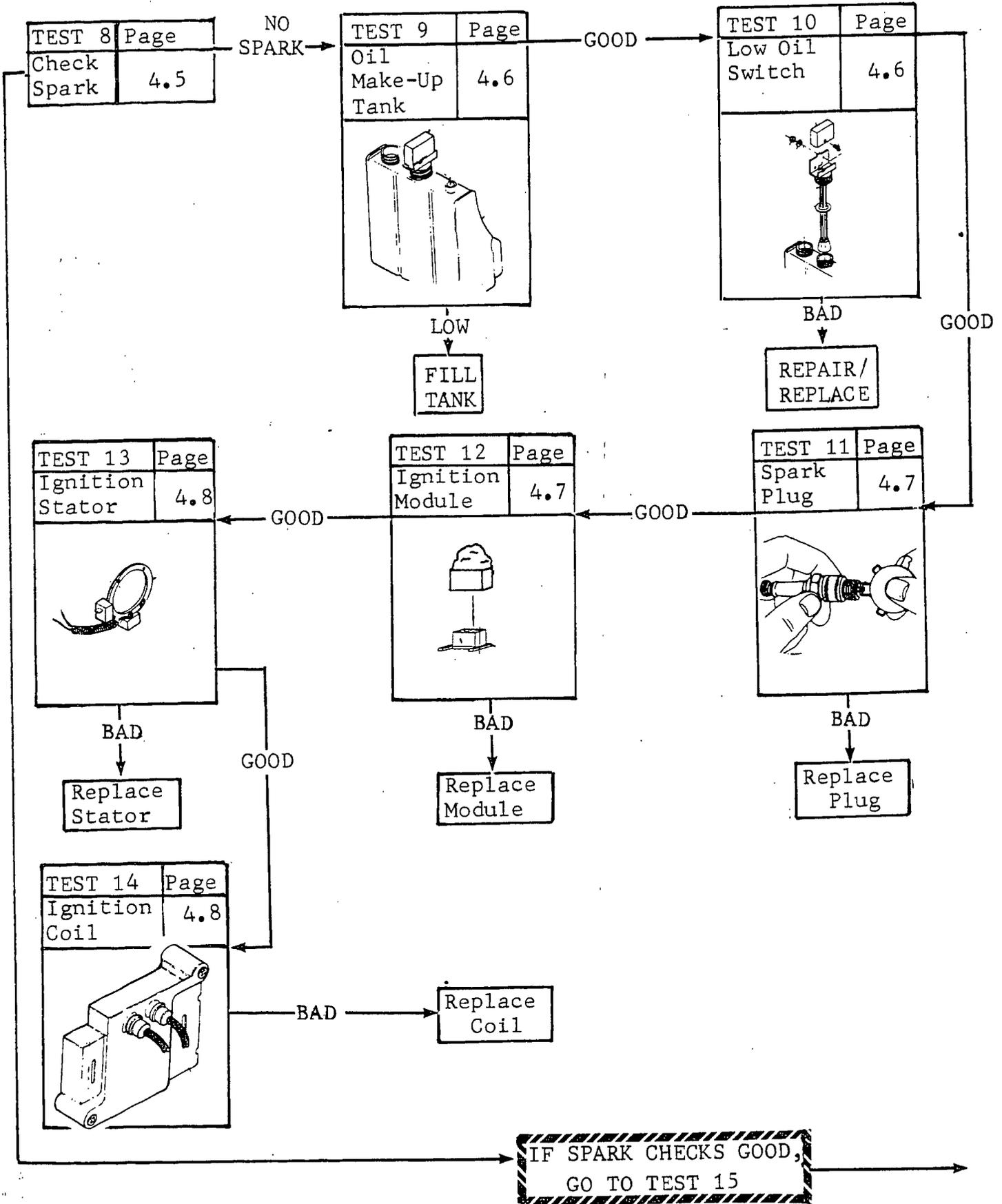
## INTRODUCTION

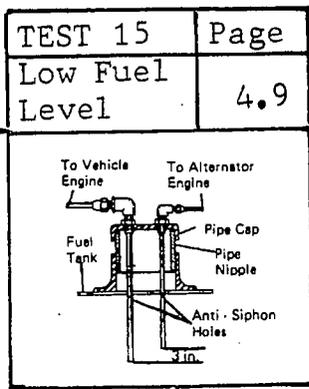
Use these FLOW CHARTS in conjunction with the detailed instructions for each test in Section 4. Test numbers assigned in the FLOW CHART are identical to the test numbers assigned to specific tests in Section 4.

## ENGINE WON'T CRANK

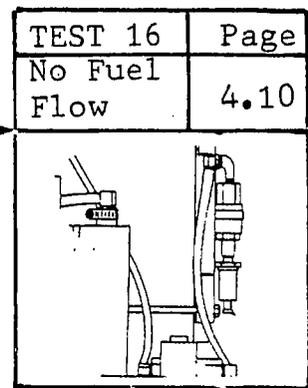


# ENGINE CRANKS, WON'T START

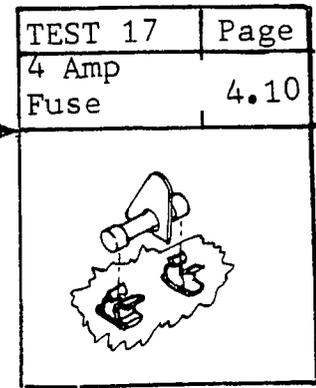




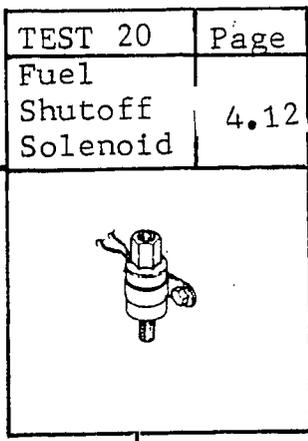
LOW  
FILL TANK



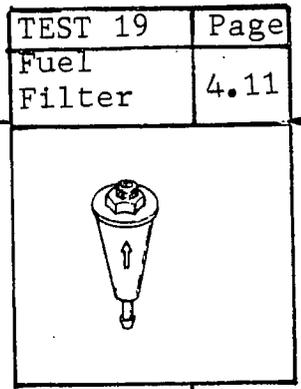
GOOD  
GO TO TEST 23



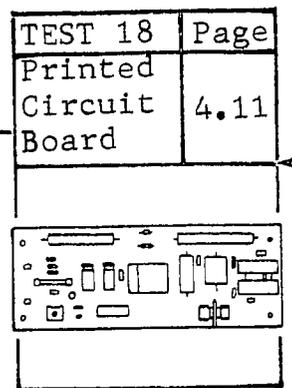
BAD  
REPLACE FUSE



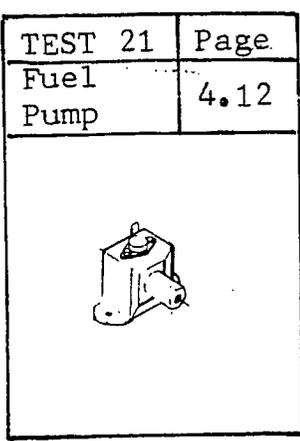
BAD  
REPLACE SOLENOID



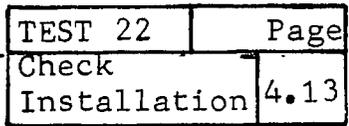
BAD  
REPLACE FILTER



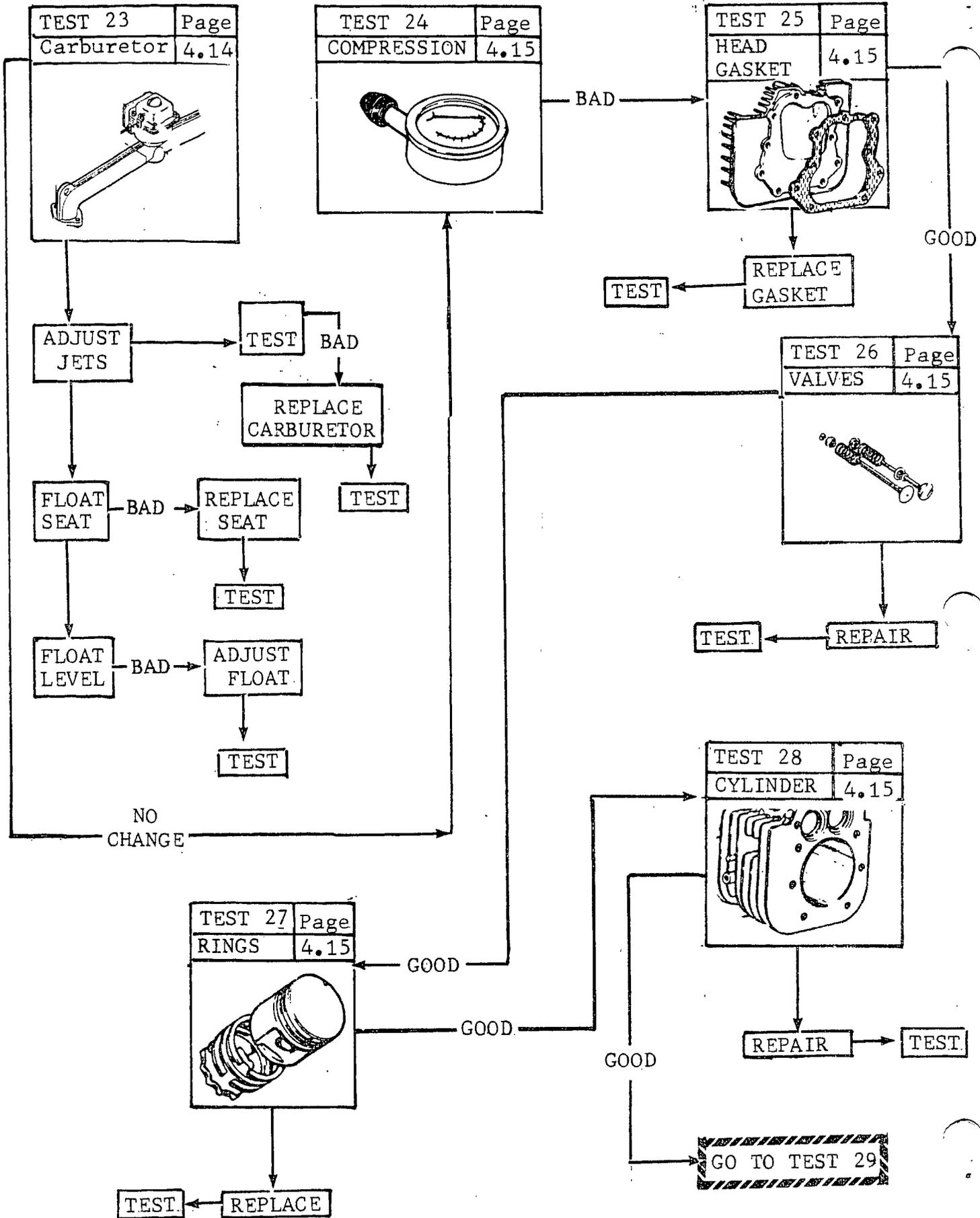
BAD  
REPLACE BOARD



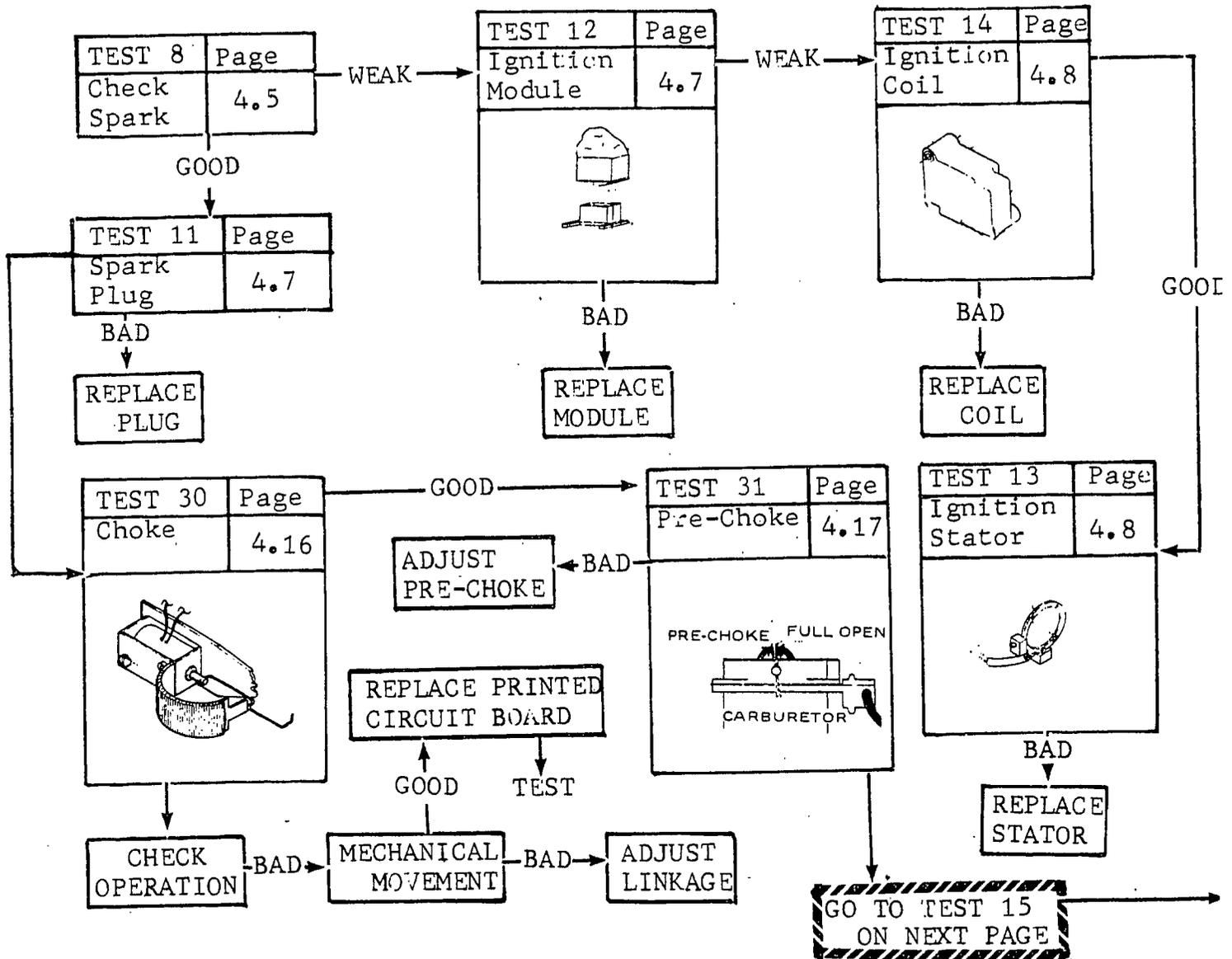
BAD  
REPLACE PUMP

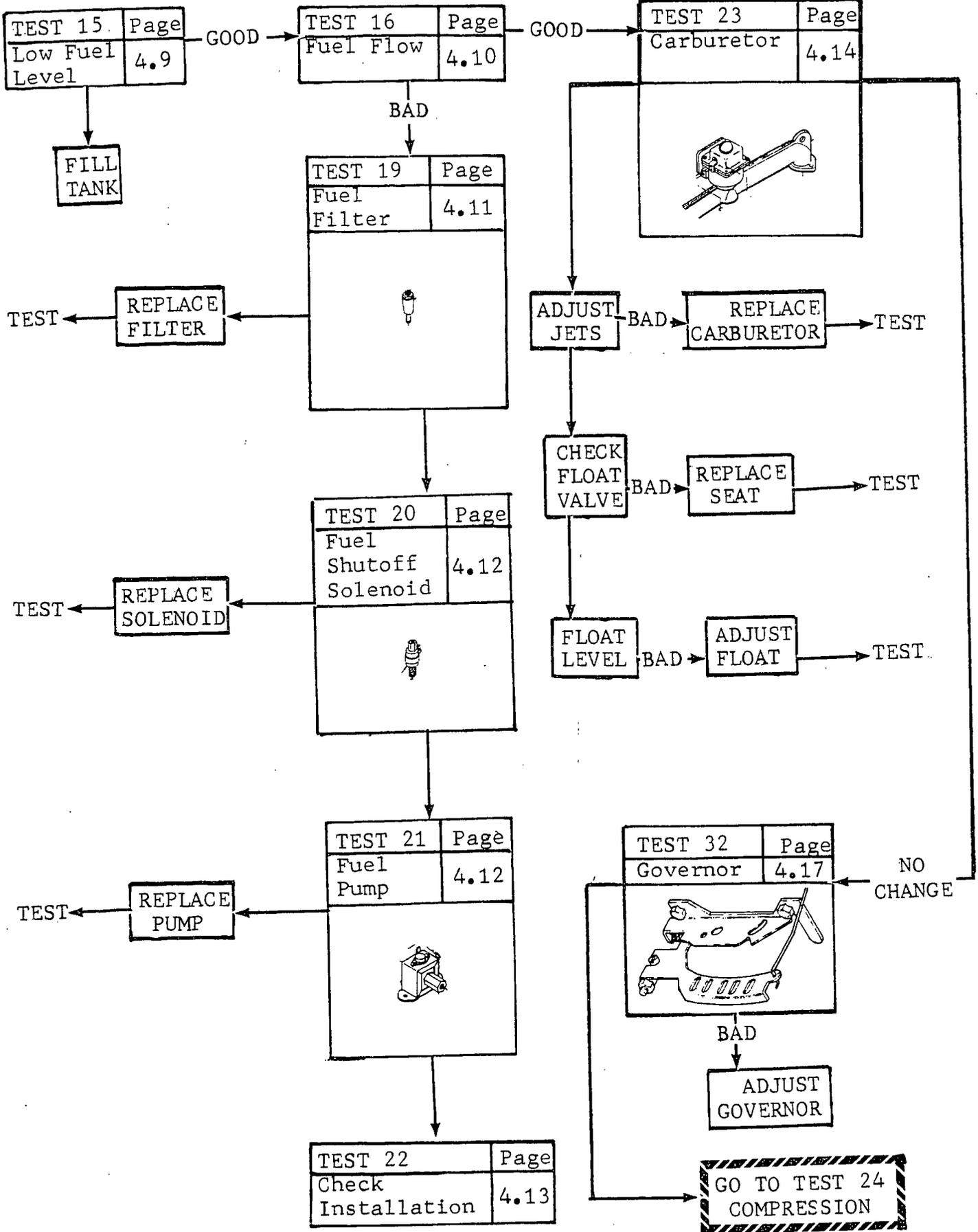


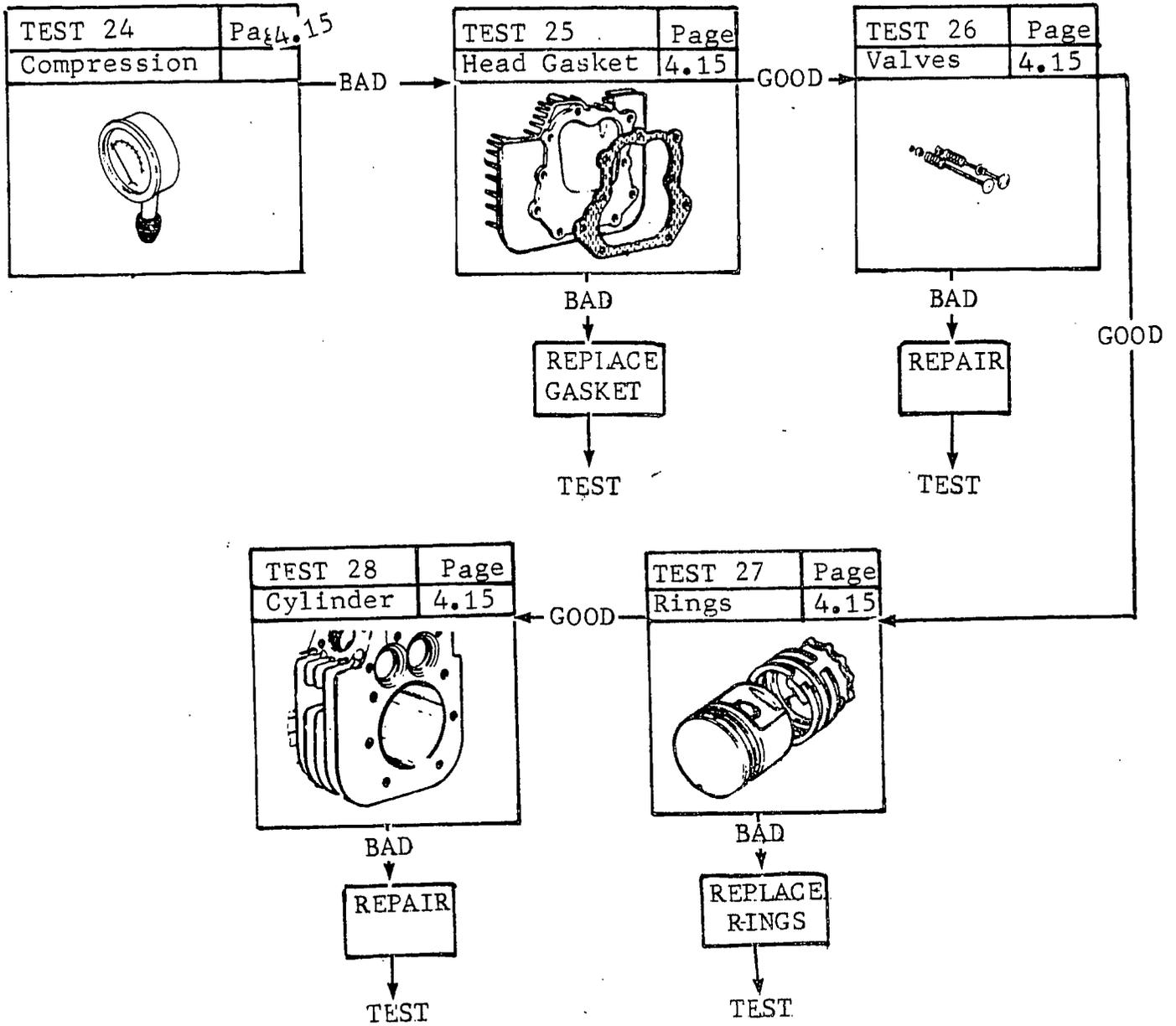
IF TEST 16 IS GOOD,  
GO TO TEST 23



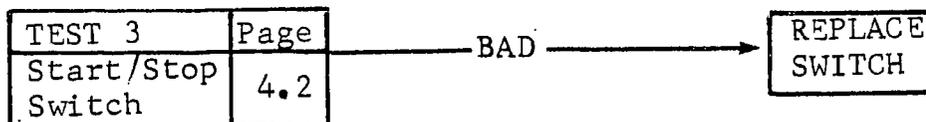
## ENGINE STARTS HARD - RUNS ROUGH



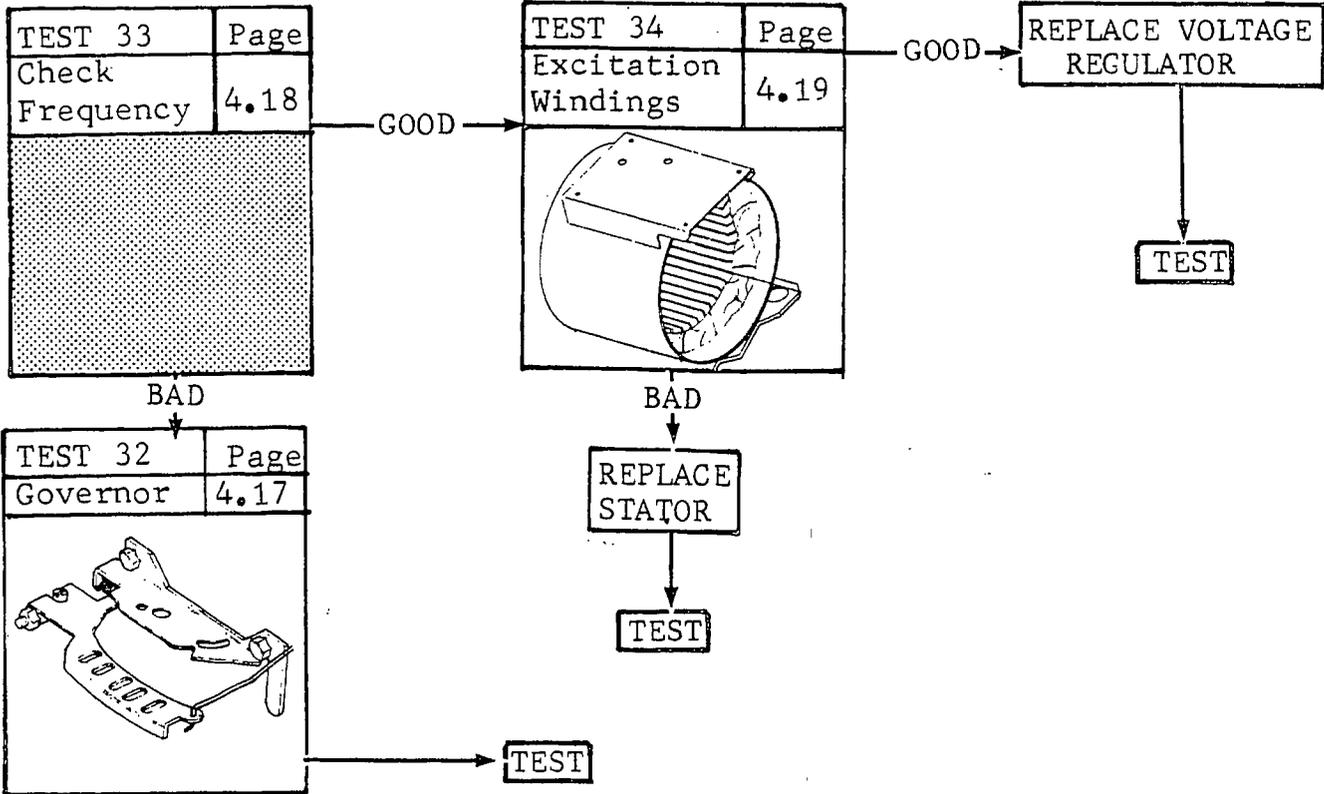




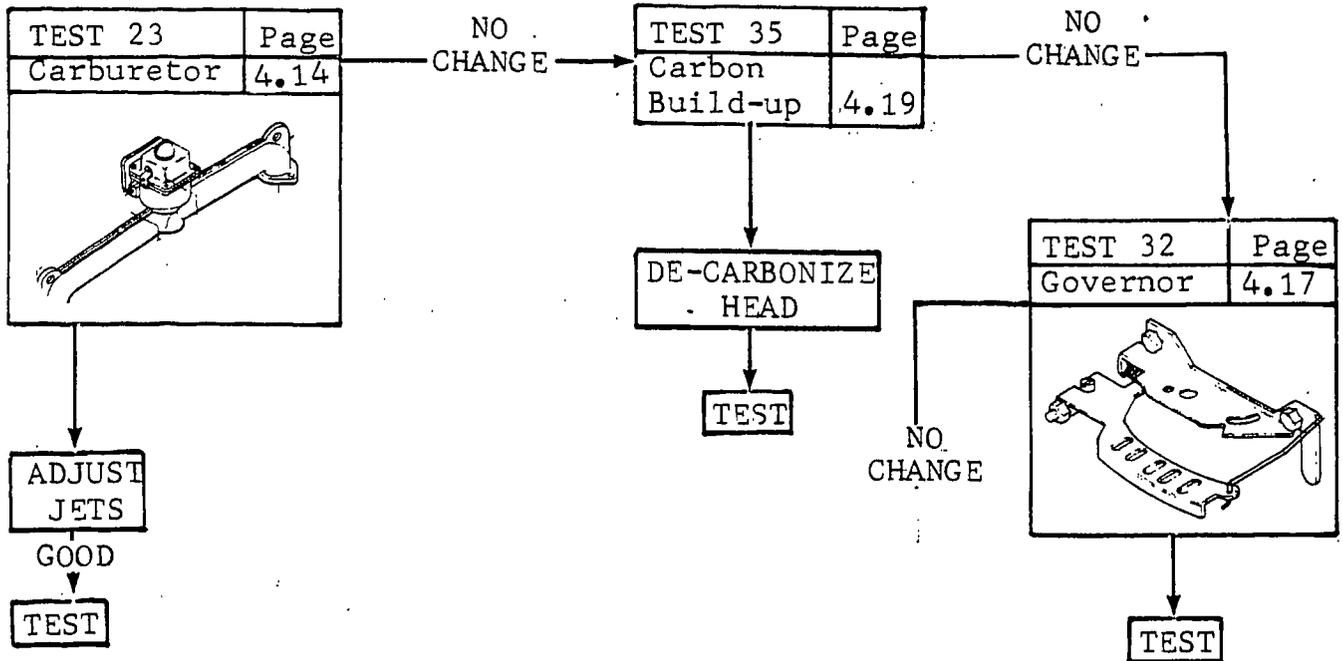
**SWITCH SET TO STOP - ENGINE KEEPS RUNNING**



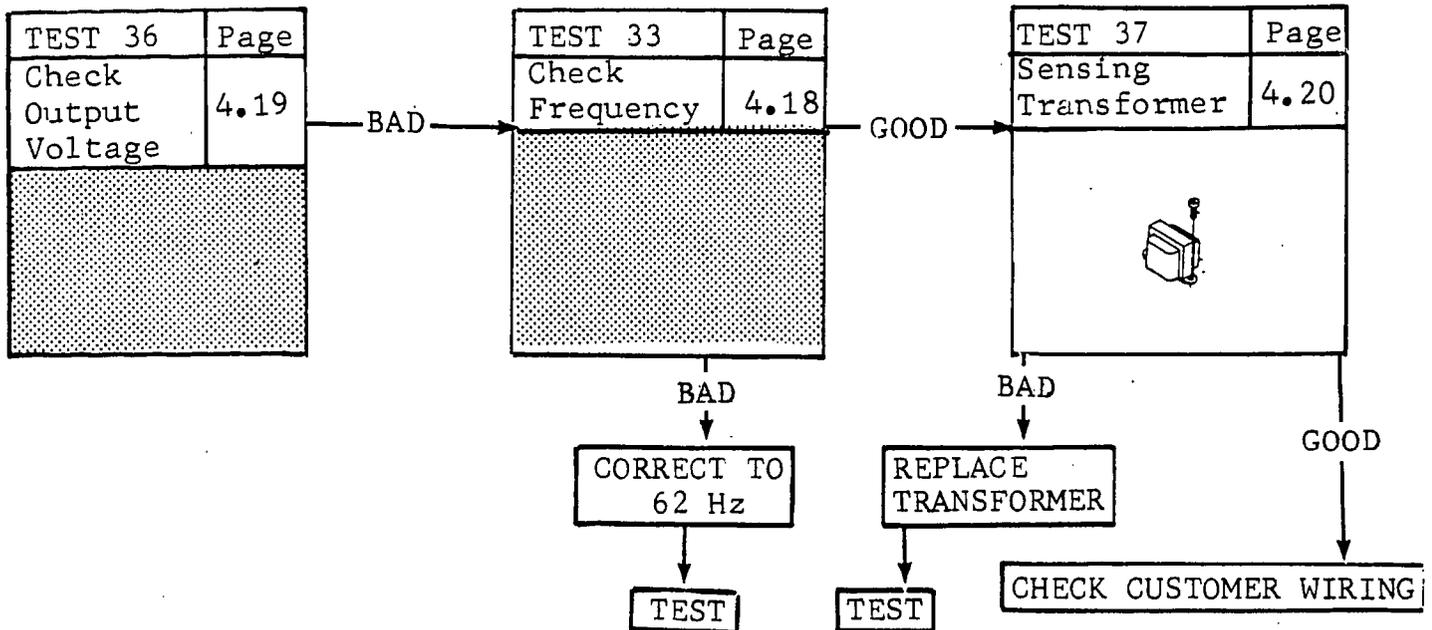
# A-C VOLTAGE LOW



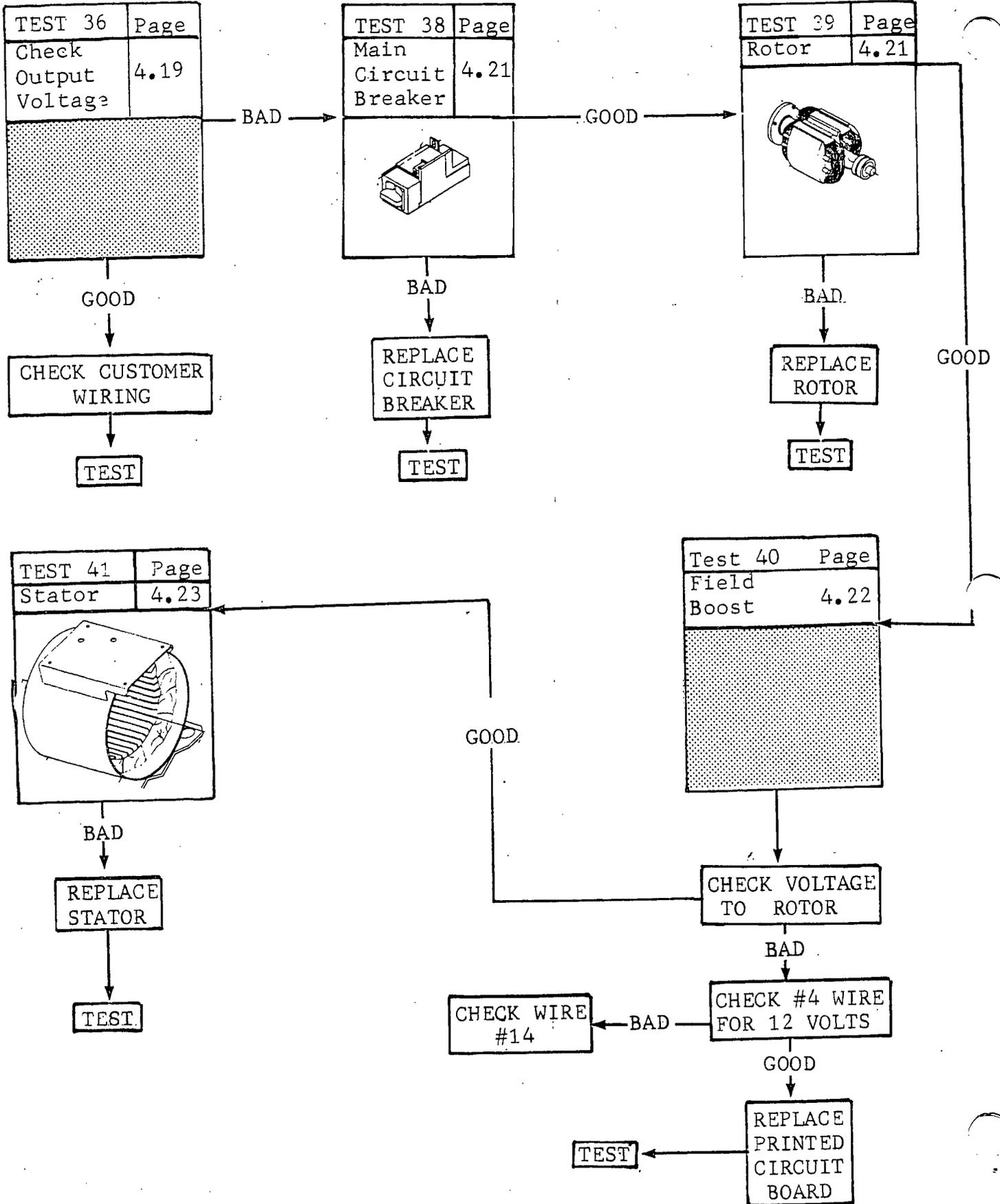
## A-C POWER LOW



## A-C VOLTAGE HIGH



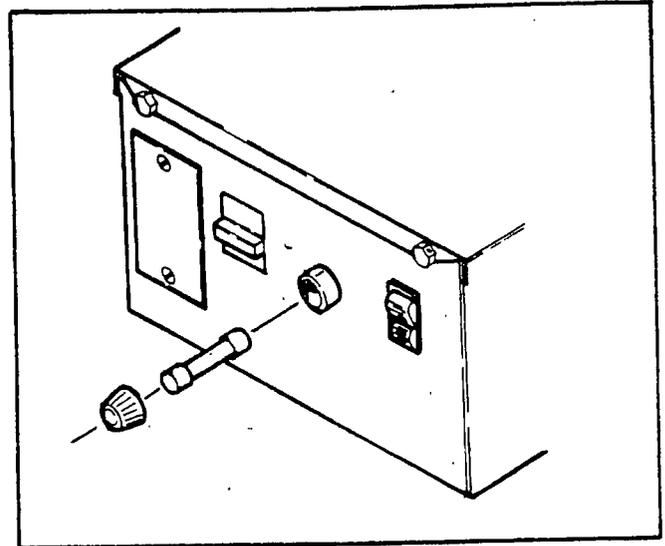
# NO A-C VOLTAGE



## TEST 1 - 15 AMP FUSE

Remove and visually inspect the 15 amp fuse. A more thorough check may be made with a Volt-Ohm-Milliammeter, as follows:

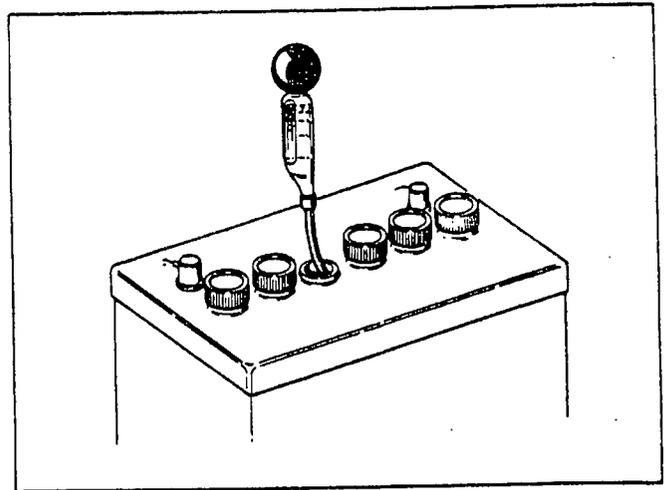
1. Set VOM to "+DC" and to "Rx1" scale.
2. Connect test probes together and "Zero" the meter.
3. Touch test probes to the fuse ends - meter needle should swing up-scale and indicate "Zero" ohms. If needle does not move upscale, replace the fuse.



- RESULTS: 1.) Fuse tests bad.....Install new 15 Amp Fuse  
2.) Fuse tests good.....Continue tests in "Diagnostic Flow Charts", Section 3

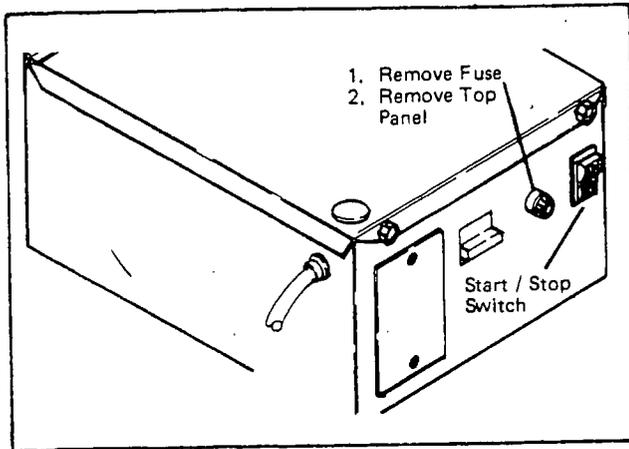
## TEST 2 - BATTERY

Check battery condition, as well as the condition, cleanliness and security of battery cables and connections.

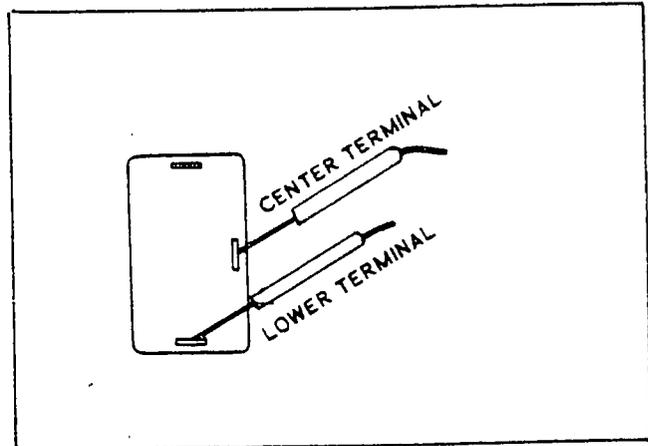


- RESULTS: 1.) Battery, cables or connections test bad.....Replace or repair the defective component  
2.) Battery, cables and connections test good.....Continue tests in "Diagnostic Flow Charts", Section 3

## TEST 3 - START - STOP SWITCH



Remove the 15 amp Fuse to disconnect the starting circuit. Then remove 2 screws that retain the top panel. Finally, remove the top panel.



Set the switches of a Volt-Ohm-Milliammeter to "+DC" and to "Rx1" scale. Connect meter test probes together and "Zero" the meter. Connect the meter test probes to the switch center and lower terminals, as shown above. Meter needle should not move. Hold Switch at START position - meter needle should move upscale to "zero". Hold switch at STOP - meter needle should drop all the way downscale to "Infinity".

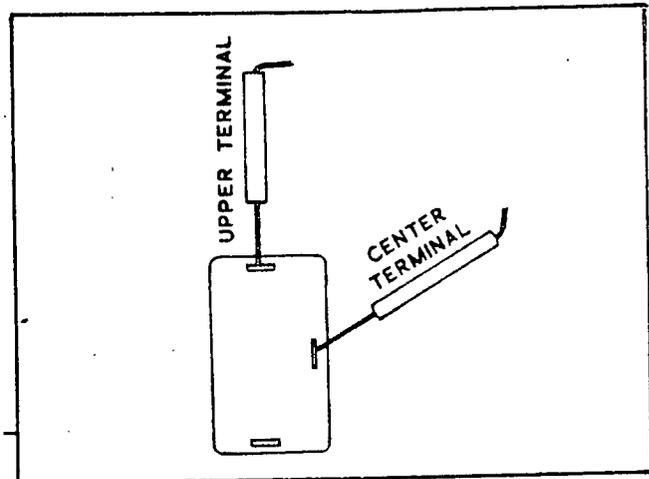
RESULTS: 1.) Switch tests Bad.....Install a new switch  
2.) Switch tests Good.....Continue tests

Connect the VOM test probes to the Switch terminals as shown at right.

Hold Start/Stop Switch at START - meter needle should not move.

Release the Switch to NEUTRAL position - the meter needle should not move.

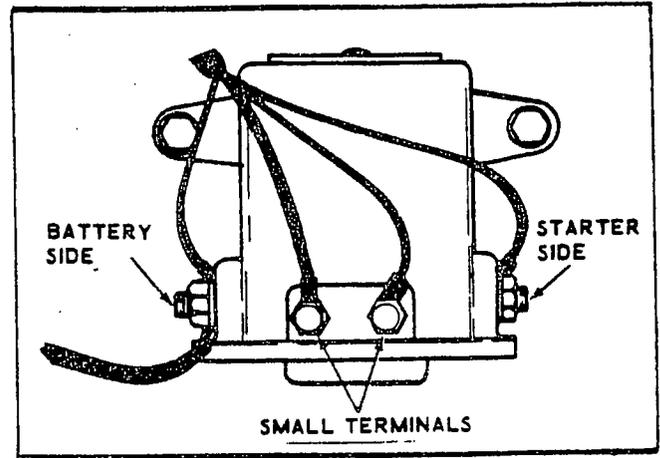
Hold the Switch at STOP - the meter needle should swing upscale and indicate "zero" ohms.



RESULTS: 1.) Switch tests Bad.....Install a new Start/Stop Switch  
2.) Switch tests Good.....Reconnect wires to Switch  
Install top panel  
Install 15 Amp Fuse  
Continue Tests

## TEST 4 - STARTER SOLENOID

A.) Set the Start/Stop Switch to START position and back to NEUTRAL several times. An audible "click" should be heard as the solenoid actuates.



RESULTS: 1.) Solenoid actuates but engine does not crank.....Continue test (Paragraph "B")  
2.) Solenoid does not actuate...Continue test (Paragraph "D")

B.) Set VOM to "+DC" and to a scale greater than 12 Volts DC. Connect the NEGATIVE (or COMMON) test probe to ground. Connect the POSITIVE (+) test probe to the battery cable connection on the starter solenoid. The meter needle should indicate 12 volts DC.

RESULTS: 1.) Meter reads 12 Volts.....Continue test (Paragraph "C")  
2.) Meter indicates less than 12 Volts.....Check for open or shorted wire or loose connections between battery and starter solenoid

C.) Connect POSITIVE (+) meter probe to starter cable connection on starter solenoid. Connect NEGATIVE (or COMMON) test probe to ground. Hold Start/Stop Switch at START - meter should indicate 12 volts DC.

RESULTS: 1.) Meter does not indicate 12 Volts.....Install new starter solenoid  
2.) Meter reads 12 Volts and solenoid checks good.....Continue tests in "Diagnostic Flow Charts", Section 3

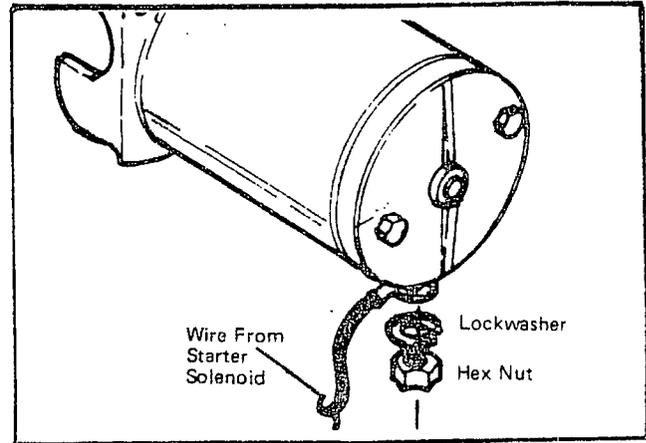
D.) Set VOM to "+DC" so that 12 Volts can be read. Connect meter POSITIVE (+) probe to one of the small terminals on the starter solenoid. Connect the remaining test probe to ground. Meter should read 12 Volts. With NEGATIVE (or COMMON) test probe still connected to ground, connect POSITIVE (+) test probe to the other small terminal. Meter should indicate 12 volts DC.

RESULTS: 1.) Meter indicates 12 Volts from BOTH small terminals to ground.....Continue tests in "Diagnostic Flow Charts", Section 3

2.) Meter does NOT read 12 Volts.....Retest battery, 15 Amp Fuse and Start/Stop Switch. When sure that these components are good, and 12 volts is not obtained from both small terminals, replace solenoid.

## TEST 5 - STARTER MOTOR

A.) Set VOM to "+DC" and to a high enough DC volts scale to permit reading 12 volts. Connect the POSITIVE test probe to starter cable connection at the starter. Connect the NEGATIVE (or COMMON) test lead to ground, then hold Start/Stop Switch at START. Starter should run and meter should read 12 Volts.

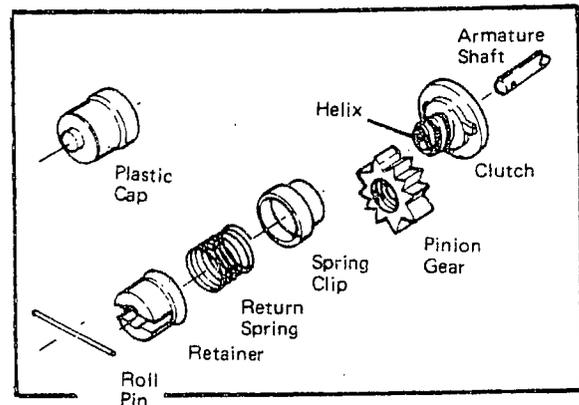


RESULTS: 1.) Meter indicates 12 Volts, but starter does not run.....Replace starter  
2.) Starter runs.....Continue tests in "Diagnostic Flow Charts", Section 3

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## TEST 6 - STARTER BENDIX GEAR

A.) Hold Start/Stop Switch at START and listen for sound of starter.



RESULTS: 1.) Starter motor can be heard running without load.....Continue checks in Paragraph "B"  
2.) Starter runs and cranks the engine.....Continue tests in "Diagnostic Flow Charts", Section 3

B.) Remove starter. Inspect pinion gear for damage or excessive wear.

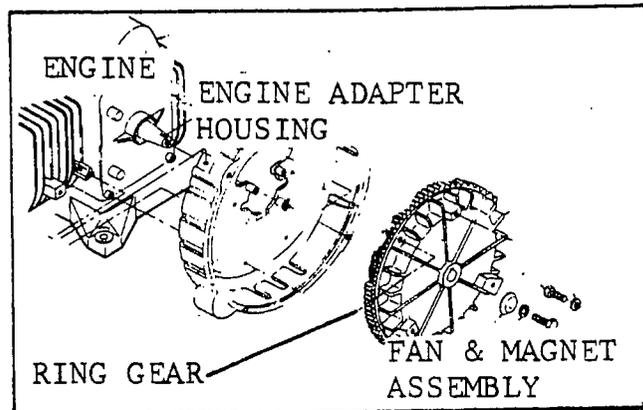
RESULTS: 1.) Starter pinion gear damaged.....Replace  
2.) Starter Pinion gear is good.....Continue test (Paragraph C)

C.) Without installing starter, connect starter cable from starter solenoid to starter terminal post. Hold Start/Stop Switch at START. The starter pinion gear should move outward on the clutch.

- RESULTS: 1.) Starter Pinion Gear does not move outward.....Inspect helix on clutch for freedom of operation. If sticking due to dirt, clean entire starter drive. If any parts are damaged or worn, replace.
- 2.) Pinion Gear does move outward.....Continue tests in "Diagnostic Flow Charts", Section 3

**TEST 7 - STARTER RING GEAR**

A.) Inspect Starter Ring Gear for damaged teeth.



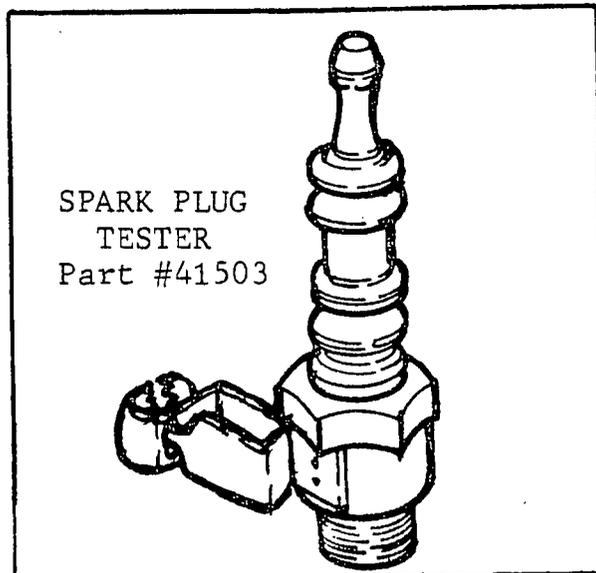
- RESULT: 1.) Ring Gear damaged.....Replace
- 2.) Ring Gear Good.....Continue tests in "Diagnostic Flow Chart", Section 3

**TEST 8 - CHECK SPARK**

A.) Remove lead from one spark plug. Connect the lead to Spark Plug tester, Part No. 41503. Attach the spark plug tester clamp to a clean, paint-free ground. Crank the engine - a sharp, "snappy" spark should be seen. Repeat the test for the remaining spark plug.

 **CAUTION**

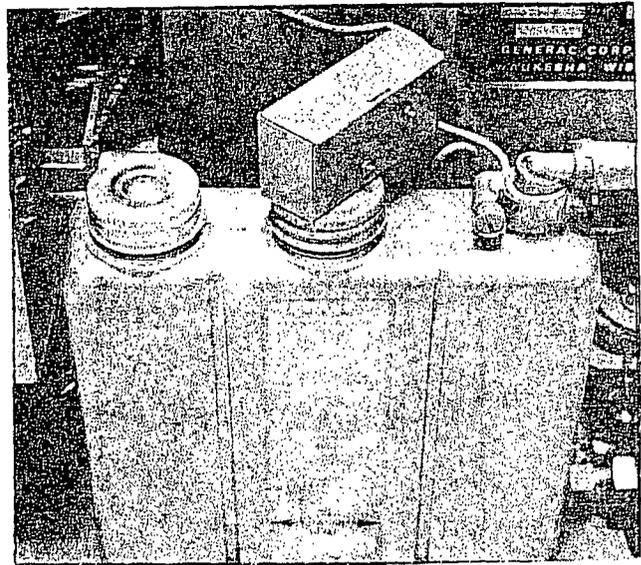
NEVER crank the engine with a spark plug or spark plug lead removed, unless the spark plug or lead is connected to a clean ground. Failure to ground the plug or lead can damage the ignition coil.



- RESULT: 1.) A sharp, snappy spark is NOT observed.....Continue tests in "Diagnostic Flow Charts", Section 3
- 2.) A sharp, snappy spark is observed.....Continue tests in "Diagnostic Flow Charts", Section 3, 4.5

## TEST 9 - OIL MAKE-UP TANK

A.) Check Oil level in Oil Make-up Tank. If oil level is near OIL CHANGE LEVEL arrows, refill tank with same type and grade of oil used in engine crankcase.



RESULTS: 1.) Oil level LOW.....Refill tank  
2.) Oil level GOOD.....Continue tests in "Diagnostic Flow Charts", Section 3

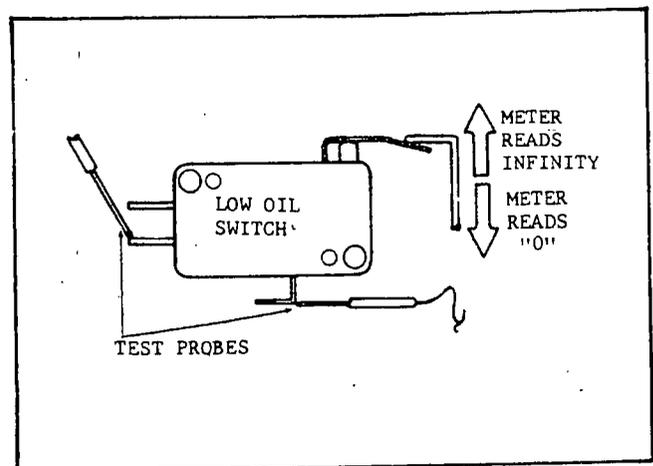
## TEST 10 - LOW OIL SWITCH

A.) Remove one screw that retains the Low Oil Switch Cover. Move Cover out of the way.

Set VOM to "+DC" and to "Rx1" scale. Connect meter test probes and zero the meter. Connect one meter test probe to lower left switch terminal and remaining probe to ground terminal (bottom of switch). With switch actuating lever DOWN (low oil condition), meter needle should swing upscale to "Zero". If meter

A.) Remove one screw that retains the Low Oil Switch Cover. Move Cover out of the way to expose switch terminals.

Set VOM to "+DC" and to "Rx1" scale. Connect meter test probes and "zero" the meter. Connect one test probe to lower left switch terminal. Connect remaining test probe to ground. With switch actuating lever DOWN (low oil level), meter needle should swing upscale to "zero". With switch actuating lever UP (normal oil level), meter needle should drop all the way downscale to "infinity". MAKE SURE GROUND WIRE BETWEEN SWITCH BOTTOM TERMINAL AND OIL FILLER NECK BRACKET SCREW IS TIGHT.



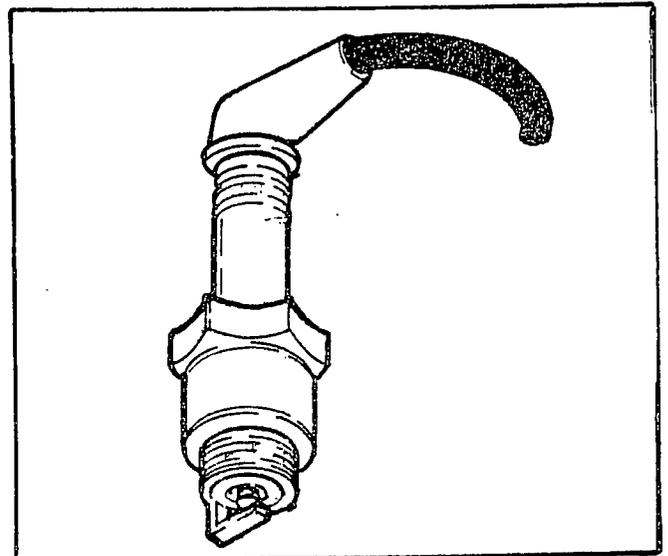
 CAUTION

Before installing Low Oil Switch Cover, make sure the float arm is riding on top of the switch actuating lever. If float arm has dropped off of switch actuating lever, engine will not shut down when oil level in tank is low.

- RESULTS: 1.) Switch tests Bad.....Replace Switch  
2.) Switch tests Good.....Continue tests in "Diagnostic Flow Charts", Section 3

**TEST 11 - SPARK PLUG**

A.) Remove one spark plug. Connect spark plug wire to plug. Ground spark plug against engine. Hold Start/Stop Switch at START and observe spark plug. A sharp, snappy spark should be seen. Repeat test for second spark plug.



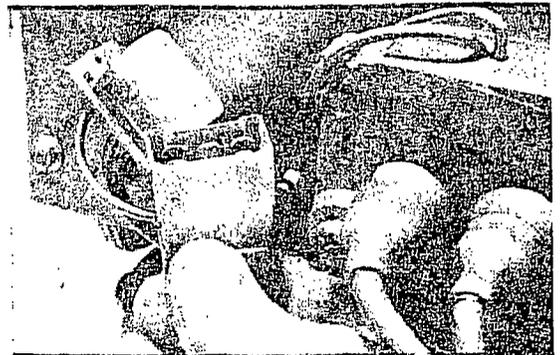
 CAUTION

NEVER crank engine with a spark plug or spark plug wire removed, unless the spark plug or wire is connected to a clean ground. Failure to ground the plug or lead can damage the ignition coil.

- RESULTS: 1.) Sharp, snappy spark is NOT observed.....Replace spark plug  
2.) Sharp, snappy spark IS observed.....Continue tests in "Diagnostic Flow Charts", Section 3

**Test 12 - IGNITION MODULE**

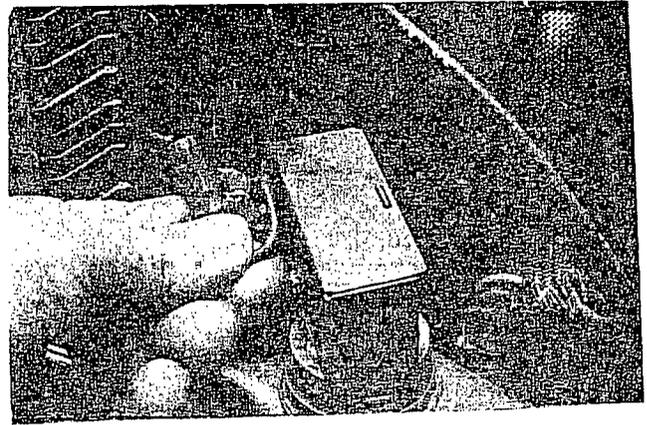
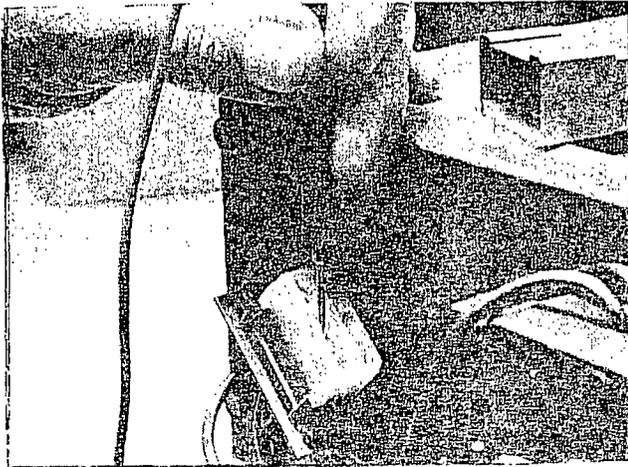
A.) Unplug the Ignition Module from its receptacle. Inspect the connector pins in the module and module receptacle - make sure the pins are not bent or pushed in. Install a new (or "shop") ignition module and check for normal spark.



- RESULTS: 1.) Normal "hot" sparking.....Install a new Ignition Module, continue tests  
2.) Normal sparking NOT observed....Continue tests in "Diagnostic Flow Charts", Section 3

## TEST 13 - IGNITION STATOR

A.) Remove the wire nut from Wire No. 20 at the Low Oil Switch. Disconnect the wire, to prevent interaction. Then proceed as follows:



a. Set VOM to "Rx100" and to "+DC". Zero the meter. Connect one meter test probe to Pin No. 2 of the Ignition Module receptacle. Connect the second test probe to ground. Meter needle should swing upscale and read approximately 225 Ohms (+10%). This is the Ignition Stator Charge Coil resistance.

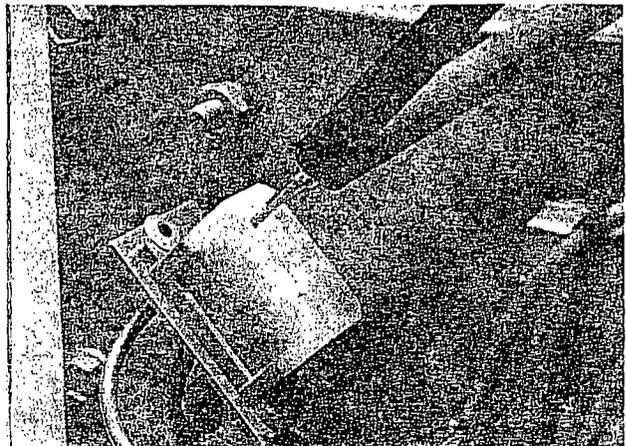
b. Set the VOM to "+DC" and to "Rx1" scale. Again zero the meter. Connect one meter test probe to Ignition Module receptacle Pin No. 3, and the second probe to ground. Meter needle should swing upscale and read approximately 6 Ohms. This is the Ignition Stator Trigger Coil resistance.

RESULTS: 1.) Tests Bad.....Install new Ignition Stator  
 2.) Tests Good.....Continue tests in "Diagnostic Flow Chart", section 3

Reconnect Wire No. 20 at the Low Oil Switch and retain with wire nut before proceeding to next test. Also install Ignition Module.

## TEST 14 - IGNITION COIL

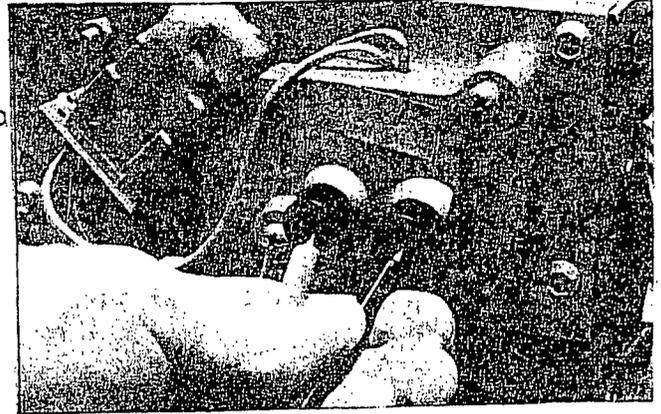
A.) Set VOM to "Rx1" scale and to "+DC", then zero the meter. Connect one meter test probe to Pin 4 of the Ignition Module receptacle. Connect the remaining test probe to Ignition Module receptacle Pin 1. Meter needle should swing upscale and indicate the Ignition Coil primary winding resistance (about 0.5 Ohms).



*PIN #2 CHARGE COIL  
 PIN #3 TRIGGER COIL*

- RESULTS: 1.) Checks BAD.....Replace Ignition Coil  
 2.) Checks Good.....Continue with Paragraph "B"

B.) Set VOM to "Rx100" scale and zero the meter. Unplug both spark plug wires from Ignition Coil, and insert the two meter test probes as shown. Meter needle should indicate secondary winding resistance, about 6500 ohms.



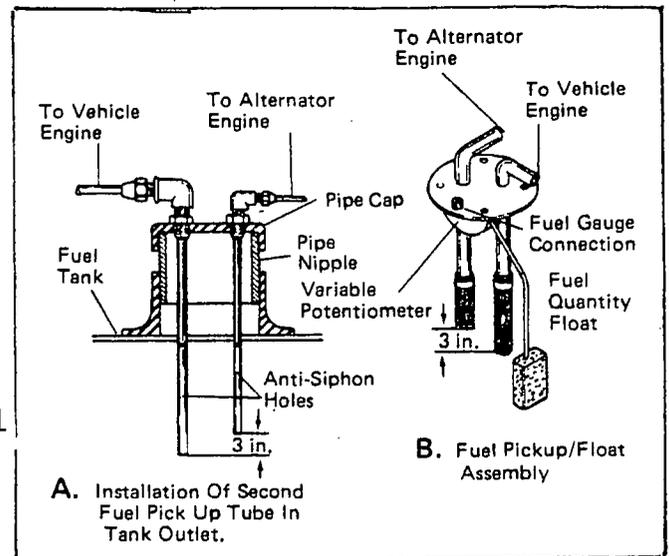
- RESULTS: 1.) Checks Bad.....Replace Ignition Coil  
 2.) Checks Good.....Continue with Paragraph "C"

C.) Set VOM to "Rx10,000" scale and zero the meter. Connect one meter test probe to Ignition Coil as in Paragraph "B", but connect the second probe to ground. Meter needle should not swing upscale (infinity).

- RESULTS: 1.) Meter swings upscale....Replace Ignition Coil  
 2.) Meter does not move.....Continue with tests in "Diagnostic Flow Charts", Section 3

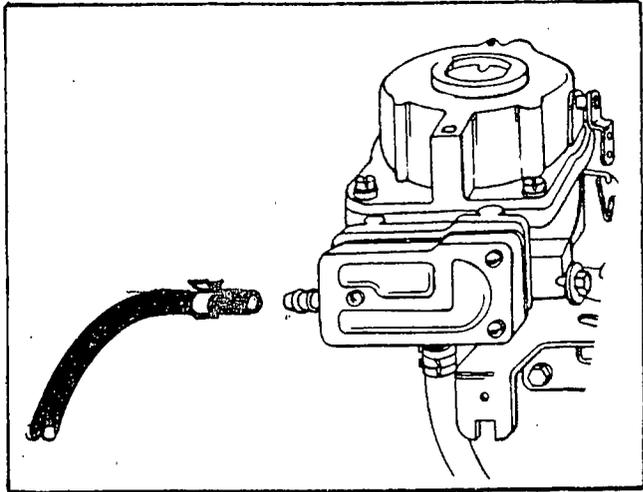
### TEST 15 - LOW FUEL LEVEL

A.) Check fuel level in gas tank. The vehicle engine fuel pickup tube in the tank, is usually several inches longer than the alternator pickup tube. This means that, even if adequate fuel is available for vehicle engine operation, the fuel may be below the alternator fuel pickup tube.



## TEST 16 - NO FUEL FLOW

At carburetor inlet, spread clamp and slide it down the fuel inlet hose. Disconnect the hose from inlet fitting - BE CAREFUL NOT TO BREAK THE FITTING. Hold open end of fuel hose over a suitable container. Hold Start/Stop Switch at START to crank engine. Check for fuel flow from fuel inlet hose.

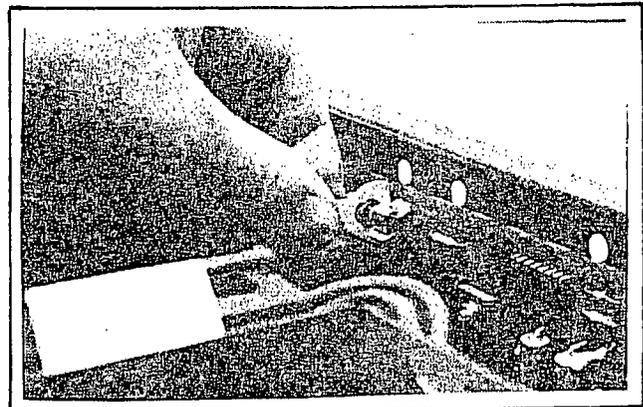
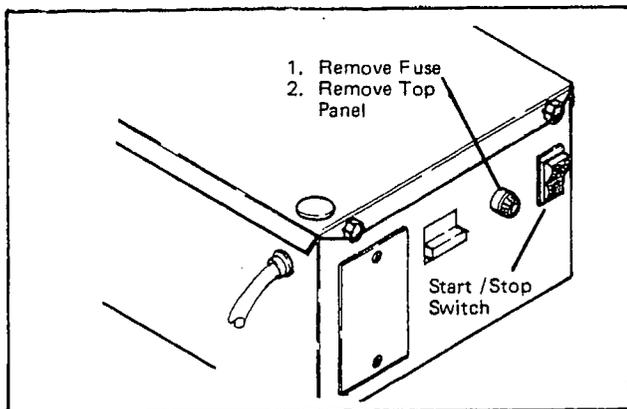


**DANGER**

Gasoline vapors are highly flammable and explosive. Do not permit smoking, open flame or sparks in the vicinity while checking for fuel flow.

- RESULTS: 1.) Fuel Flow Bad.....Continue tests in "Diagnostic Flow Charts", Section 3  
2.) Fuel Flow Good.....Continue tests in "Diagnostic Flow Charts", Section 3

## TEST 17 - 4 AMP FUSE



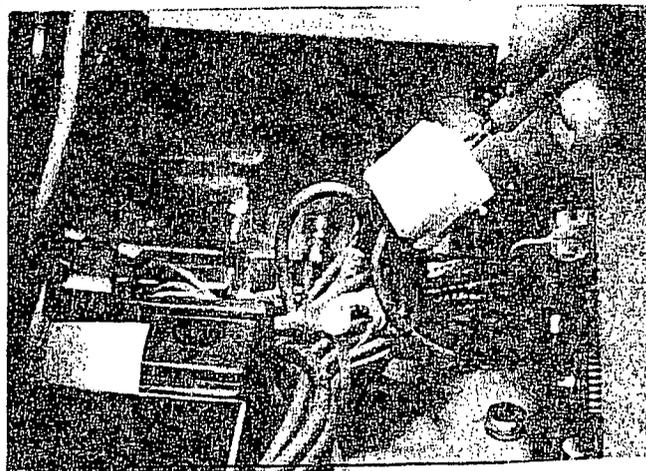
A.) Remove 15 Amp fuse to disconnect starting circuit. Remove the 2 screws that retain the top panel. Remove the top panel.

B.) Remove the 4 Amp Fuse from the Printed Circuit Board. Check visually for an open fuse element. Set VOM to "+DC" and to "Rx1" scale. Zero the meter. Connect meter test probes to both ends of fuse. Meter needle should swing upscale and indicate "zero".

- RESULTS: 1.) Fuse checks Good.....Continue tests in "Diagnostic Flow Charts" Section 3  
2.) Fuse checks Bad.....Replace Fuse

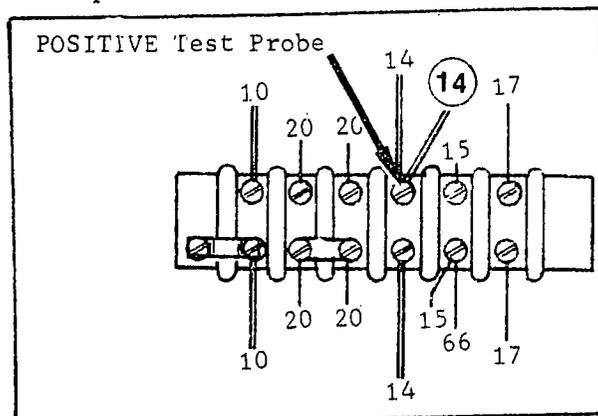
## TEST 18 - PRINTED CIRCUIT BOARD

A.) Depress locking tangs of Printed Circuit Board connector plug and disconnect plug from its receptacle. On the connector plug, locate Pin # 4 to which Wire #20 attaches. Set the VOM switches to "AC" and to 2.5 Volts. Connect one VOM test probe to Connector plug Pin #4 and the other test probe to ground. Crank the engine - meter needle should swing up-scale and indicate approximately 0.5 volts AC (pulsing voltage).



RESULTS: 1.) Meter indicates 0.5 Volts.....Go to Paragraph "B"  
2.) Meter does not indicate.....Check Wire #20 between Printed Circuit Board and Terminal Strip, and between Terminal Strip and Ignition Module for open or shorted condition.  
0.5 volts

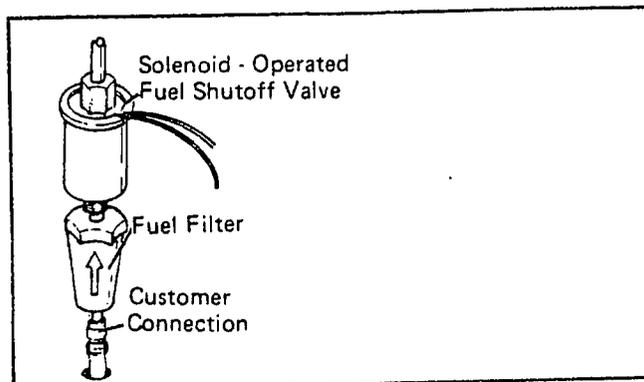
B.) Plug printed circuit board connector plug in. Locate Wire #14 connection at terminal strip. Set VOM to "+DC" and to "50V" scale. Connect POSITIVE (+) meter test probe to terminal strip wire #14 connection and other test probe to ground. Crank the engine. Meter should indicate battery voltage (9-12 volts DC).



RESULTS: 1.) Meter indicated 12 volts.....Continue tests in "Diagnostic Flow Charts", Section 3  
2.) Meter did NOT indicate..... Check Wire #14 between Terminal Strip and Printed Circuit Board for open or shorted condition. If not open or shorted, replace Printed Circuit Board.

## TEST 19 - FUEL FILTER

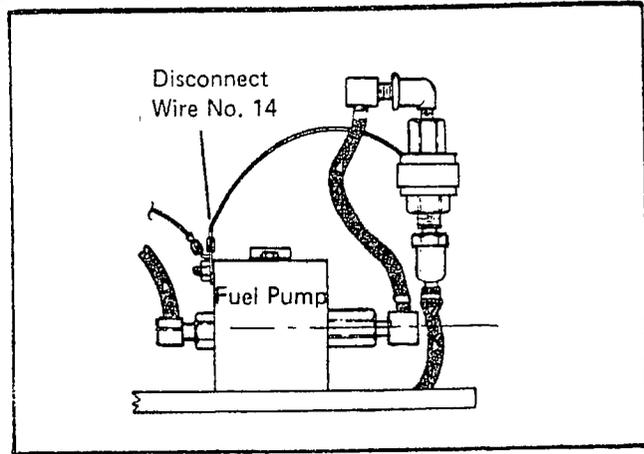
Remove and replace the In-Line Fuel Filter. Make sure arrow on Fuel Filter points towards the solenoid-operated Fuel Shutoff Valve. Repeat TEST 16 on Page 4.10 (No Fuel Flow).



- RESULTS: 1.) Fuel Flow Good,  
engine still won't start.....Go to TEST 23  
2.) Fuel Flow Bad.....Go to TEST 20  
3.) Fuel Flow Good and engine  
starts.....Repair completed, dis-  
continue tests

**TEST 20 - FUEL SHUTOFF SOLENOID**

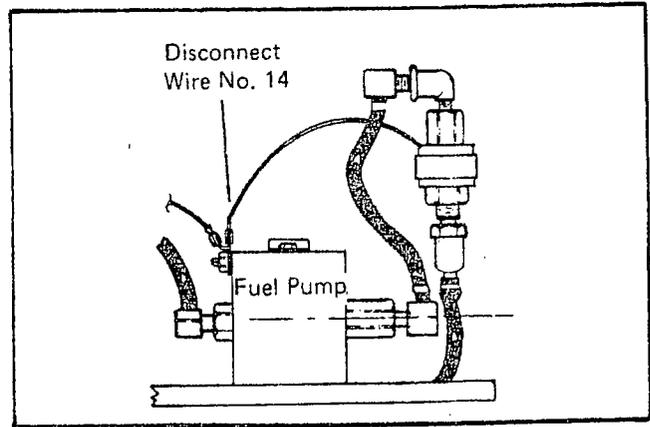
A.) Disconnect Fuel Shutoff Solenoid Wire #14 at the Fuel Pump terminal. Crank the engine for 2 or 3 seconds, then touch the terminal end of Wire #14 to the Fuel Pump terminal. Fuel Shutoff Solenoid should actuate and sound of Fuel Pump should change noticeably.



- RESULTS: 1.) Fuel Shutoff Solenoid did not actuate.....Replace Fuel Shutoff Solenoid  
2.) Fuel Shutoff Solenoid actuated.....Continue tests in "Diagnostic Flow Charts", Section 3

**TEST 21 - FUEL PUMP**

A.) Disconnect BOTH Wires #14 at the Fuel Pump terminal. Set VOM to "+DC" and to "Rx1" scale. Zero the meter. Connect one meter test probe to the Fuel Pump connection terminal and the remaining test probe to ground. Meter needle should swing upscale and read approximately 50 Ohms.

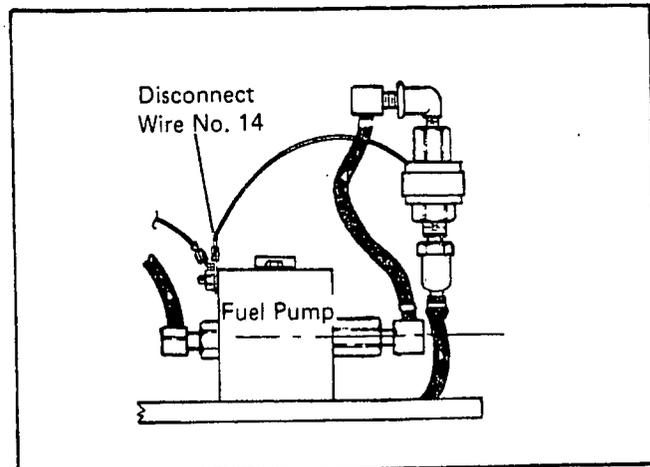


- RESULTS: 1.) Pump tests Good.....Go to Paragraph "B"  
2.) Pump tests Bad.....Replace Fuel Pump

B.) Reconnect both Wires #14 to Fuel Pump connection terminal. Crank the engine and listen for sound of fuel pump.

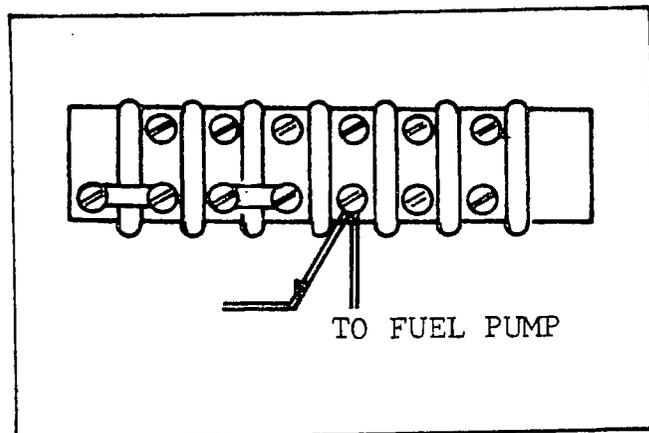
- RESULTS: 1.) Pump does not pulse.....Go to Paragraph "C"  
2.) Pump pulses normally.....Continue tests in "Diagnostic Flow Charts", Section 3

C.) Disconnect Wire #14 at Fuel Pump terminal. Set VOM to "+DC" and to 50 Volt scale. Connect the POSITIVE (+) meter test probe to the terminal end of Wire #14. Connect the COMMON test probe to ground. Crank the engine - meter needle should deflect upscale and indicate battery voltage (about 12 volts DC).



- RESULTS: 1.) Meter does NOT read 12 volts.....Go to Paragraph "D"  
 2.) Meter indicates 12 volts, but pump does not pulse when Wire #14 is connected to its terminal.....Replace Fuel Pump

D.) Check Wire #14, between the Fuel Pump and terminal strip in control panel, for open or shorted condition.



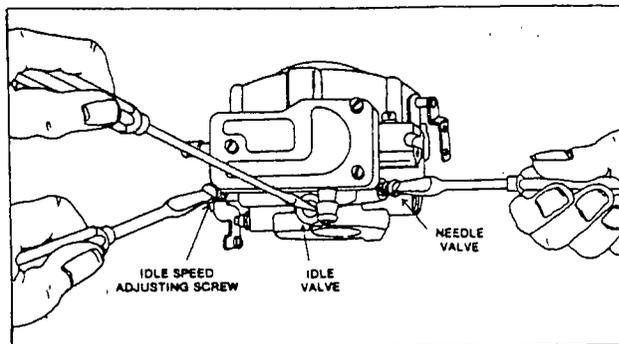
- RESULTS: 1.) Wire #14 checks Good.....Continue tests in "Diagnostic Flow Charts", Section 3  
 2.) Wire #14 checks Bad.....Repair/Replace Wire #14

## TEST 22 - CHECK INSTALLATION

Does the installation include a second in-line fuel filter? If so, check the filter for clogging. If a shutoff valve is installed in the fuel supply line, make sure the valve is open. Finally, make sure the air inlet opening in the door is large enough. An insufficient supply of cooling air will result in high compartment temperatures and possible fuel line vapor lock. Refer to INSTALLATION MANUAL, RECREATIONAL VEHICLE ALTERNATORS (Part No. 49204).

## TEST 23 - CARBURETOR

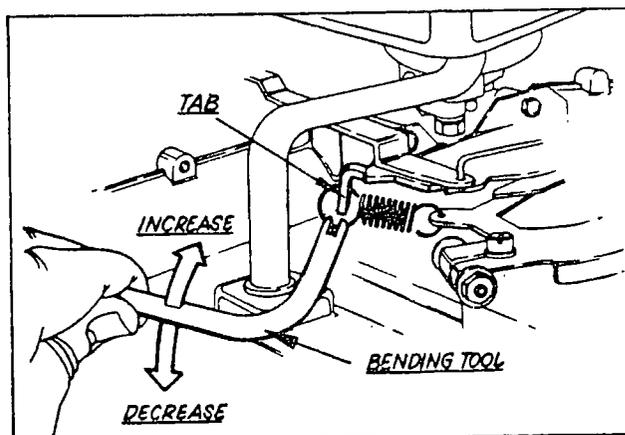
Adjust Jets: Turn Needle Valve clockwise until it just closes - DO NOT TURN IN TOO FAR, OR JET MAY BE DAMAGED. Then open needle valve  $1\frac{1}{2}$  turns (counterclockwise). Close Idle Valve in same manner, then open  $1\frac{1}{2}$  turns. This initial adjustment will permit the engine to be started and warmed up.



With engine running, hold the throttle lever against the Idle Stop. Set the Idle Speed Adjusting Screw to obtain 1400 rpm. Turn Idle Valve SLOWLY clockwise to obtain 1400 rpm, 93 volts AC, or 46 Hz. Then turn Idle Valve SLOWLY clockwise (lean mixture) until engine misses or engine speed slows. Finally, turn Idle Valve one-half turn counterclockwise. Hold throttle lever against idle stop and turn Idle Speed Adjusting Screw to obtain 900 rpm (30 Hertz or 60 Volts a-c). Then bend Governed Idle Tab (see illustration at right) to obtain 1400 rpm (93 Volts a-c or 46 Hertz).

### NOTE

Governed idle must be adjusted for proper operation. The smaller spring keeps the engine on governor, even at idle speed. Idle speed should not be lower than 1100 rpm, 73 volts or 37 Hz.



Release throttle lever and let engine accelerate to governed speed. Apply a load to the alternator, between 3000 and 4500 watts. Turn Needle valve SLOWLY clockwise (lean mixture) until voltage reading starts to drop off. Then turn Needle Valve counterclockwise until the highest voltage reading is obtained. When the highest voltage is obtained, turn the Needle Valve counterclockwise an additional  $\frac{1}{8}$  of a turn.

Check Float Valve and Seat: Refer to engine section of this Manual for procedures. Inspect float valve and its seat for damage, dirt or wear.

Check Float Level: Refer to engine section of this Manual for procedures.

## TEST 24 - COMPRESSION

A.) Use a standard compression gauge. Insert end of gauge into spark plug hole. Open throttle wide open and crank the engine. Repeat compression check for second cylinder. There should be no more than a 25 per cent difference in compression between the two cylinders. A greater pressure difference indicates loss of compression.

RESULTS: 1.) Compression Low.....Go to Paragraph "B"  
2.) Compression Good....Go to Test 29

B.) Squirt a few drops of oil into the spark plug opening of one cylinder. Repeat compression Test of Paragraph "A" above. If compression is higher than was obtained in "A", RING or CYLINDER wear is indicated. If little or no difference in compression is noted, compression loss is due to a leaking HEAD GASKET, FAULTY VALVES, etc.

Repeat Paragraph "B" for second cylinder.

RESULTS: 1.) Compression Increased..Go to Test 27 and 28  
2.) No increase.....Go to Tests 25 and 26

## TEST 25 HEAD GASKET

Refer to ENGINE REPAIR section of this Manual.

## TEST 26 VALVES

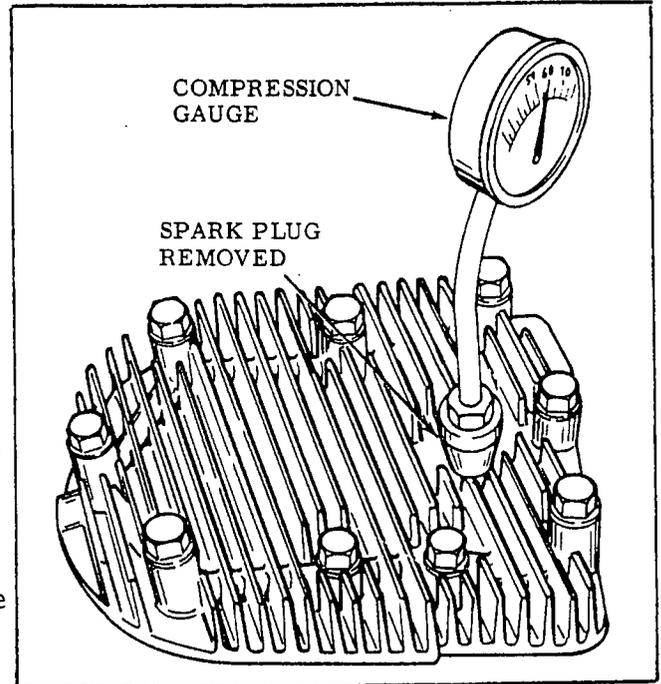
Refer to ENGINE REPAIR section of this Manual.

## TEST 27 RINGS

Refer to ENGINE REPAIR section of this Manual.

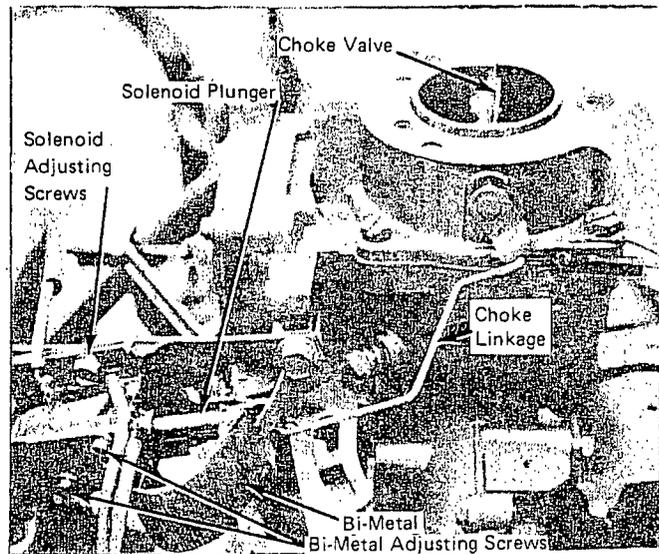
## TEST 28 CYLINDER

Refer to ENGINE REPAIR section of this Manual.



## TEST 30 CHOKE

A.) Hold the Start/Stop Switch at START position and crank engine. While the engine is cranking, the Choke Solenoid should pulse the choke from a "No-Choke" to a "Choke" position, at a rate dependent on ambient temperature.



RESULTS: 1.) Choke Movement Good.....Go to Test 31  
2.) Choke does not move.....Go to Paragraph "B"

B.) Inspect the Choke Assembly and Linkage for binding caused by improper choke support alignment, dirt, etc. Push the Choke back and forth with your finger - no mechanical binding or sticking should be observed.

RESULTS: 1.) Choke is Binding.....Adjust or clean choke linkage  
2.) Choke moves freely.....Go to Paragraph "C"

C.) Loosen the two solenoid adjusting screws. Adjust solenoid axial movement so that, with the carburetor choke valve closed, the choke solenoid plunger is bottomed. Tighten the two adjusting screws, and check again for correct choke action.

RESULTS: 1.) Solenoid pulls in normally.....Go to Test 31  
2.) Solenoid does not operate normally...Go to Paragraph "D"

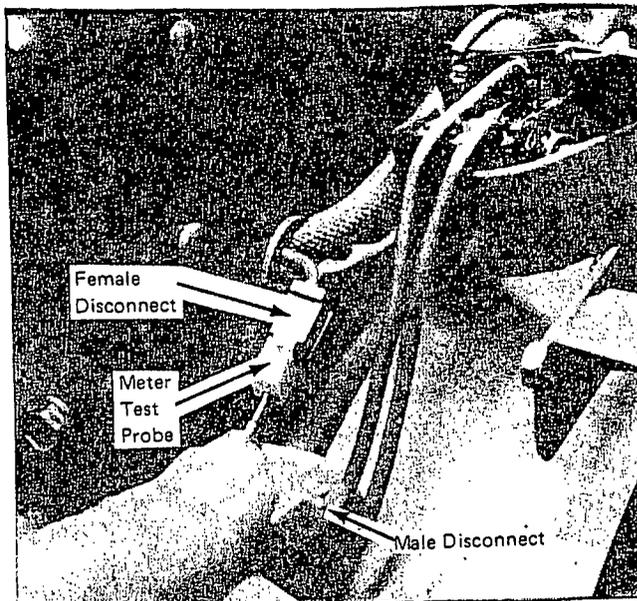
D.) A small 2-wire disconnect is located adjacent to the Choke assembly. Wire #90, from the Printed Circuit Board to the Choke Solenoid, and Wire #14, from the Printed Circuit Board to the Choke Bi-Metal, can be disconnected here. The following test is a check of the Printed Circuit Board, which governs Choke pulsing action.



### CAUTION

The VOM positive (+) test probe MUST be connected to the Wire #90 pin on the FEMALE half of the disconnect. This is wire #90 from the Printed Circuit Board. DO NOT connect the test probe to the male half of the disconnect (wire #90 from the Choke Solenoid). Wire #90, from the Choke Solenoid to the male half of the disconnect, is HOT while the engine is being cranked. Connection of the VOM to the Wire #90 MALE disconnect pin will seriously damage the meter as soon as the engine is cranked.

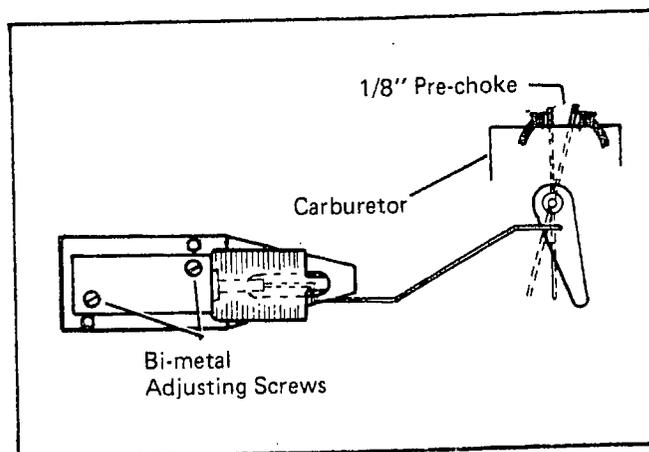
Unplug the mating halves of the small disconnect. Locate the male and female pins that connect Wire #90 from the Choke SOLENOID (NOT from the Choke Bi-Metal). Set the VOM to "+DC" and to "Rx1" scale, then zero the meter. Connect the POSITIVE (+) meter test probe to the FEMALE Wire #90 pin, NOT TO THE MALE WIRE #90 PIN. Connect the common (-) test probe to ground. Crank the engine. Meter needle should swing upscale, then drop downscale in a pulsing cycle.



- RESULTS: 1.) Meter needle does NOT move.....Replace Printed Circuit Board  
 2.) Check is Good, but on subsequent tests Choke does not operate normally.....Replace Choke Assembly

### TEST 31 PRE-CHOKE

A.) With the Choke Bi-Metal cold (ambient temperature), the carburetor Choke Valve should be approximately 1/8 inch away from its vertical position, and towards a CHOKE position. If necessary, loosen the Bi-Metal adjusting screws and move the Bi-Metal to obtain this setting. This is the "Pre-Choke" position.

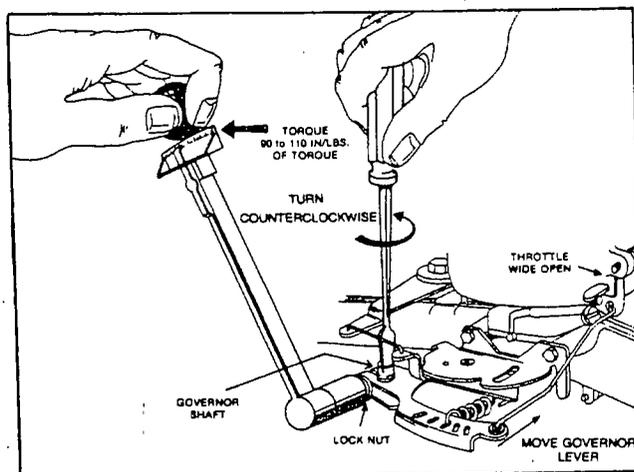


### TEST 32 GOVERNOR

A.) Adjust Carburetor jets and Governed Idle as outlined in Test 23, CARBURETOR. These adjustments must be completed before attempting to adjust the Governor.

- RESULTS: 1.) Problem is corrected.....Test Completed  
 2.) Engine "hunts" and/or AC Voltage or Frequency is incorrect.....Go to Paragraph "B"

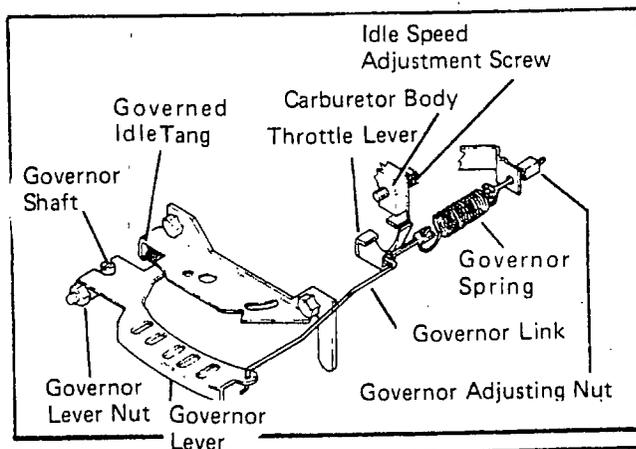
B.) Loosen Governor Lever Nut. Push Governor Lever all the way counterclockwise to open throttle wide open. Hold the Governor Lever in this position, then rotate the Governor shaft all the way counterclockwise, as far as it will go. Tighten the Governor Lever Nut to 100 inch-pounds.



RESULTS: 1.) Engine runs normal, provides 62 Hz at "No-Load".....Test Completed  
 2.) Engine "hunts" and/or AC Voltage or Frequency is incorrect.....Go to Paragraph "C"

C.) With engine running, turn Governor Adjusting Nut to obtain 62 Hz at "No-Load".

Governor tab should be bent to apply slight tension to governed idle spring at 1860 rpm (62 Hz or 124 volts), with no electrical loads applied. Spring should be loose when loads are applied.



**NOTE**

The Governed Idle spring prevents engine speed surging and "hunting" during "No-Load" conditions. When an electrical load is applied, the spring will normally become loose and ineffective.

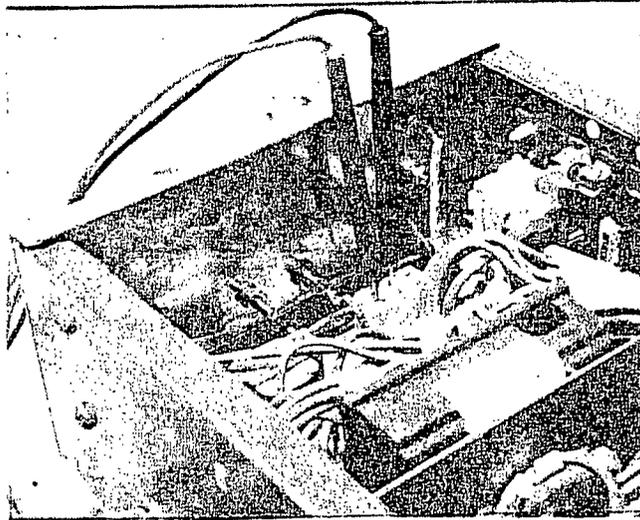
**TEST 33 FREQUENCY**

A.) Use an accurate Frequency Meter to check alternator output frequency. The Model 5515 Load Bank is equipped with a frequency meter, as well as provisions for reading voltage and amperage. Frequency should be 63 Hz (63 cps) at "no-load". With an electrical load applied, frequency should be 59-63 Hz and stable. (All mechanical governors have a normal "offspeed" fluctuation, which is the reaction time of the governor.)

RESULTS: 1.) Frequency checks Bad.....Continue tests in "Diagnostic Flow Charts", Section 3  
 2.) Frequency Checks Good.....Continue tests in "Diagnostic Flow Charts", Section 3

## TEST 34 - EXCITATION WINDINGS

A.) Remove Control Panel top cover. Locate the white connector plug at the rear of the panel. Unplug the connector from its receptacle. Set VOM to "+DC" and to "Rx1" scale, then zero the meter. Connect one meter test probe to receptacle pin #2. Connect the second test probe to receptacle pin #6. Meter needle should swing upscale and indicate about 1.8 to 2.5 ohms. This is the resistance of the stator excitation winding.



RESULTS: 1.) Windings check Bad.....Replace Stator  
2.) Windings check Good.....Continue tests in  
"Diagnostic Flow Charts", Section 3

B.) Set the meter switches to "+DC" and to "Rx10,000" scale. Zero the meter. Connect one test probe to white receptacle pin #2, and the other test probe to ground. Meter needle should not move.

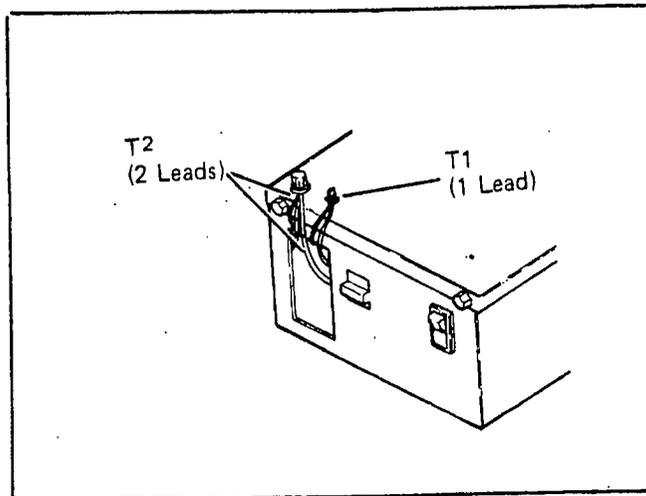
RESULTS: 1.) Meter needle swings upscale.....Replace stator  
2.) Meter needle does not move.....Continue tests in  
"Diagnostic Flow Charts", Section 3

## TEST 35 - CARBON BUILDUP

A.) Excessive carbon buildup in the engine combustion chamber can seriously affect engine power. Carbon deposits should be removed every 500 hours of operation, or whenever the cylinder heads are removed. If engines are run at a steady load, it may be necessary to remove carbon more often. Refer to ENGINE REPAIR section of this Manual for cylinder head removal and installation procedures. When reinstalling cylinder heads, bolts must be installed in the proper location on the head and the cylinder head must be properly torqued.

## TEST 36 - OUTPUT VOLTAGE

A.) Use an accurate voltmeter or the Model 5515 Load Bank to check output voltage. When using a voltmeter, connect one meter test probe to alternator output lead T1 and the remaining test probe to 2 output leads T2. Voltage should be approximately 125 volts at "no-load", and 115 - 125 volts AC under load. If voltage checks good, check frequency.

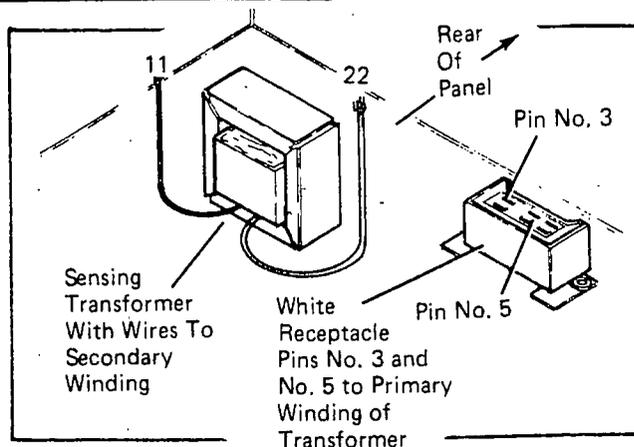


## TEST 37 - SENSING TRANSFORMER

Either of 2 Sensing Transformers may be used. When checking Transformer windings for an open condition, resistance readings obtained should be as shown in the following CHART:

TRANSFORMER MAKE	RESISTANCE (In OHMS)	
	Primary	Secondary
WesCoil	745-825	1603 - 2169
CoilTran	824-1114	1222 - 1654

A.) Remove wire nuts that retain wires #11 and #22, between the Transformer and Voltage Regulator Disconnect the wires. Set VOM to "+DC" and to "Rx100" scale. Zero the meter. Connect one meter test probe to Wire #11, and the second test probe to Wire #22. Meter needle should swing upscale and indicate resistance for SECONDARY winding.



RESULTS: 1.) Checks Good.....Continue tests in "Diagnostic Flow Charts", Section 3  
 2.) Checks Bad.....Replace Sensing Transformer

B.) Set VOM to "+DC" and to "Rx10,000" scale. Zero the meter. Connect one meter test probe to Wire #11. Connect the second test probe to Ground. Meter needle should NOT move. Any needle movement indicates a shorted condition.

RESULTS: 1.) Tests Good.....Continue tests in "Diagnostic Flow Charts"  
 2.) Tests Bad.....Replace Transformer

C.) Unplug the white connector plug from its receptacle. Set the VOM to "+DC" and to "Rx100" scale. Zero the meter. Connect one meter test probe to White receptacle Pin #3. Connect the second test probe to white receptacle Pin #5. Meter needle should swing upscale and indicate resistance shown in CHART for PRIMARY winding.

RESULTS: 1.) Tests Good.....Continue tests in "Diagnostic Flow Charts", Section 3  
 2.) Tests Bad.....Replace Transformer

D.) Set VOM to "+DC" and to "Rx10,000" scale. Zero the meter. Connect one meter test probe to white receptacle Pin #3. Connect the remaining test probe to Ground. Meter needle should not move. Any movement of the needle indicates a shorted condition.

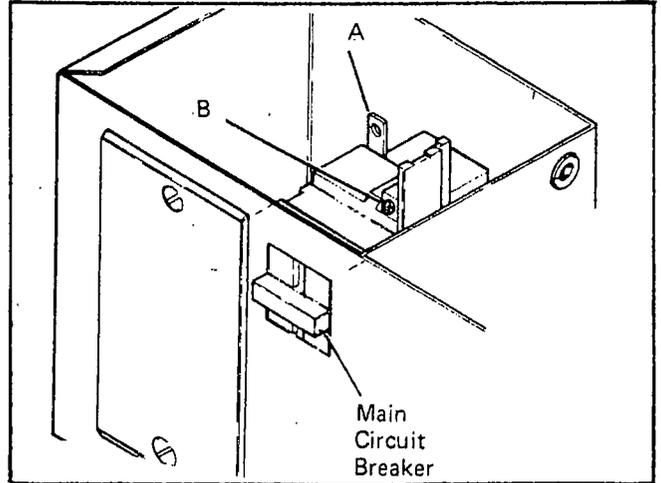
RESULTS. 1.) Tests Good.....Continue tests in "Diagnostic Flow Charts", Section 3  
 2.) Tests Bad.....Replace Transformer

## TEST 38 - MAIN CIRCUIT BREAKER

### NOTE

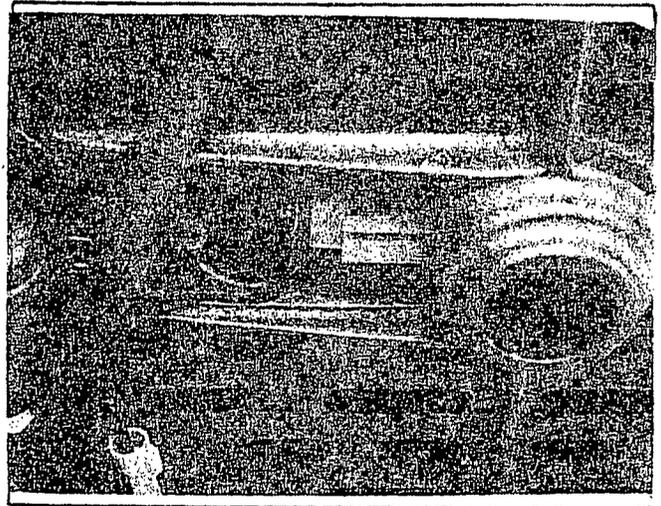
If the alternator has been reconnected to provide a dual voltage of 120 and 240 volts, the Main Circuit Breaker will be disconnected from the circuit. See WIRING DIAGRAMS, Section 2.

A.) Disconnect wires from Main Circuit Breaker terminals "A" and "B", to prevent interaction. Set VOM to "+DC" and to "Rx1" scale. Zero the meter. Connect one meter test probe to Terminal "A" and one probe to Terminal "B". With the Circuit Breaker ON, meter needle should swing upscale and indicate ZERO ohms. With Breaker OFF, meter needle should drop all the way downscale to "Infinity".



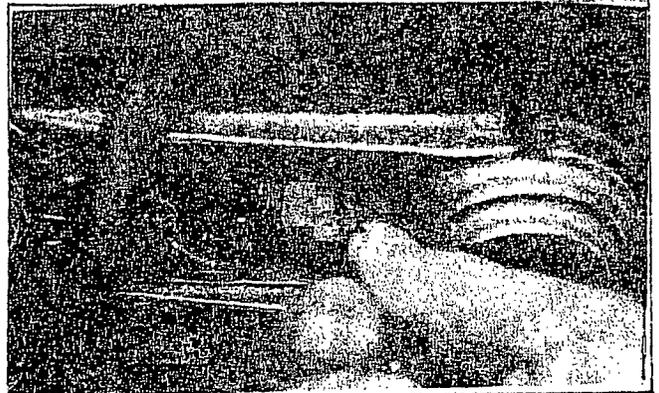
## TEST 39 - ROTOR

A.) Use a  $\frac{1}{2}$  inch nut driver to remove the No. 8-32 screw that retains the Brush Inspection Cover to the Rear Bearing Carrier. Remove the Brush Inspection Cover. Set a VOM to "Rx1" scale and to "+DC". Zero the meter. Connect one meter test probe to the brush terminal furthest from the Brush Inspection Cover opening. Connect the second test probe to Ground. Meter needle should swing upscale and indicate approximately 13 Ohms ( $\pm 10\%$ ).



RESULTS: 1.) Tests Good.....Continue tests in "Diagnostic Flow Charts", Section 3  
2.) Tests Bad.....Go to Paragraph "B"

B.) Use a  $\frac{1}{2}$  inch nut driver to remove the Brush terminal screws, as well as the Brush Holder retaining screws. With VOM set to "+DC" and to "Rx1" scale, repeat the test of Paragraph "A" directly on the Rotor Slip Rings. Meter needle should swing upscale and indicate approximately 13 Ohms ( $\pm 10\%$ ).



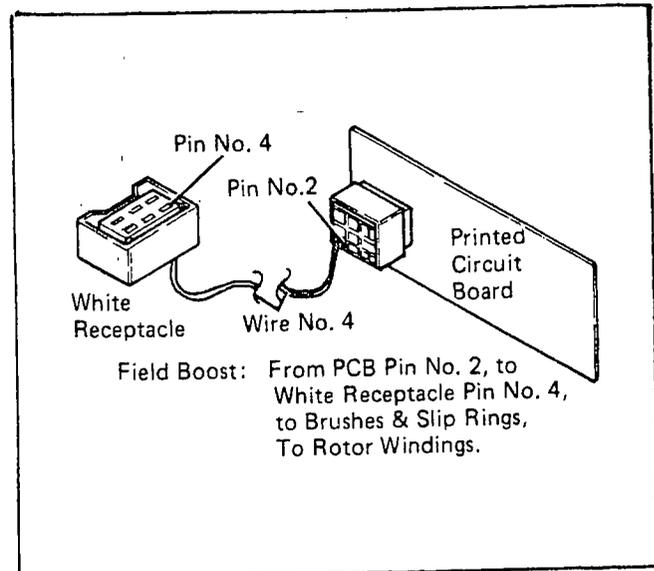
- RESULTS: 1.) Tests Good.....Go to Paragraph "C"  
 2.) Tests Bad.....Replace Rotor

C.) Inspect Brushes and Slip Rings. Replace Brushes if cracked, broken or less than 5/16 inch long. If Slip Rings are dirty or tarnished, clean with fine sandpaper. DO NOT USE EMERY CLOTH. Then repeat Test "A".

- RESULTS: 1.) Tests Good.....Continue Tests in "Diagnostic Flow Chart", Section 3  
 2.) Tests Bad.....Replace Rotor Assembly

### TEST 40 - FIELD BOOST

A.) Unplug the Ignition Module from its receptacle to prevent the engine from starting. At the rear of the control panel (on the panel floor), disconnect the white connector plug from its receptacle. Set the VOM to "+DC" and to a scale that will permit 12 volts to be read. Connect the Positive (+) test probe to white receptacle Pin #4 and the COMMON test probe to Ground. Crank the engine. Meter should indicate about 9 - 12 volts DC. Reconnect the white connector plug before proceeding.



- RESULTS: 1.) Checks Good.....Continue with "Diagnostic Flow Charts", Section 3  
 2.) Checks Bad.....Go to Paragraph "B"

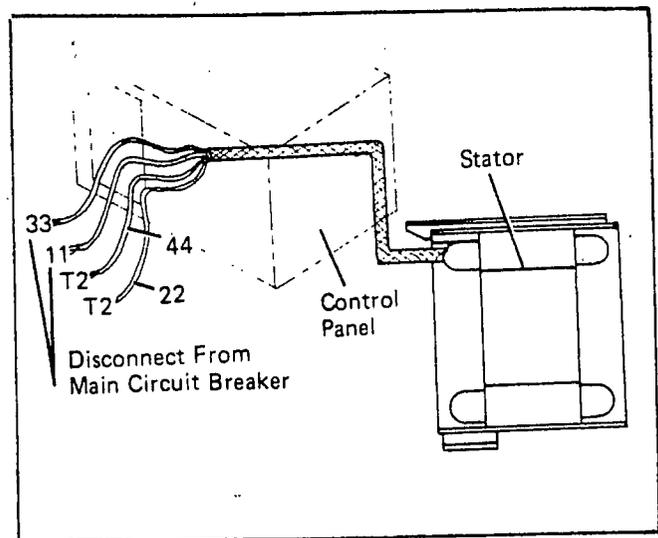
B.) Unplug the connector plug from the Printed Circuit Board and from the white receptacle. Set VOM to "+DC" and to "Rx1" scale. Zero the meter. Connect one meter test probe to printed circuit board connector plug (Pin #2). Connect the second test probe to white receptacle connector plug (Pin #4). Meter needle should swing all the way upscale to "zero".

- RESULTS: 1.) Wire #4 checks good.....Replace Printed Circuit Board  
 2.) Wire #4 checks Bad.....Repair/replace Wire #4

- RESULTS: 1.) Checks Good, but checked Bad in Paragraph "A".....Check Wire #4, between the Printed Circuit Board and white receptacle  
 2.) Checks Bad.....Replace Printed Circuit Board

## TEST 41 - STATOR

A.) Disconnect Wires #11 and #33 from the Main Circuit Breaker. Disconnect two Wires #T2 from customer wiring. The two wires #T2 are also labelled #22 and #44. Set VOM to "+DC" and to "Rx1" scale. Zero the meter. Connect meter test probes to Wires #11 and #22, and observe the reading. Then connect test probes to Wires #33 and #44 and observe the reading. In each case, the meter needle should swing upscale to approximately 0.42 Ohms.



RESULTS: 1.) Tests indicate open.....Disassemble alternator. Test stator with VOM and with an Insulation Breakdown Tester. Replace, if defective.  
2.) Tests Good.....Go to Paragraph "B"

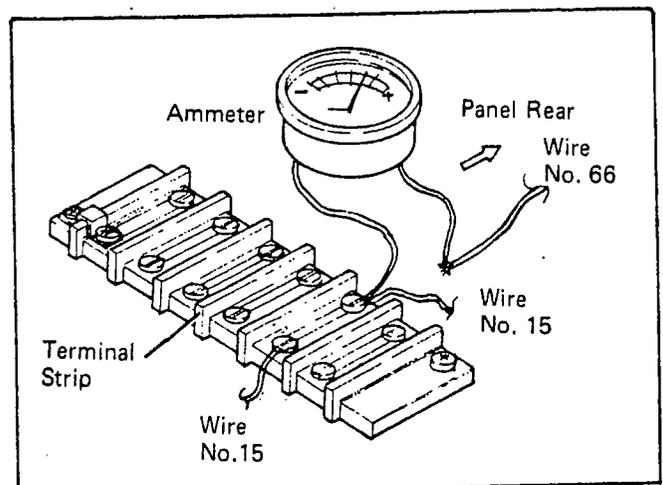
B.) Set VOM to "+DC" and to "Rx10,000" scale. Zero the meter. Connect one meter test probe to Wire #11. Connect the second test probe to Ground. Observe meter. Then connect one test probe to Wire #33 and the other test probe to Ground. In each case, the meter needle must not move (Infinity). Any movement of the meter needle indicates a "shorted" condition.

RESULTS: 1.) Tests indicate "short".....Disassemble alternator. Test stator with VOM and with an Insulation Breakdown Tester. Replace if defective.  
2.) Tests Good.....Continue tests in "Diagnostic Flow Charts", Section 3

## Battery Charge Tests

### TEST 42 - CHARGING OUTPUT

A.) Disconnect Wire #66 at the control panel Terminal Strip. Then connect an Ammeter in series with the disconnected Wire #66 and the Terminal Strip connection. Start the alternator. The Ammeter should indicate an output, dependent upon battery condition.

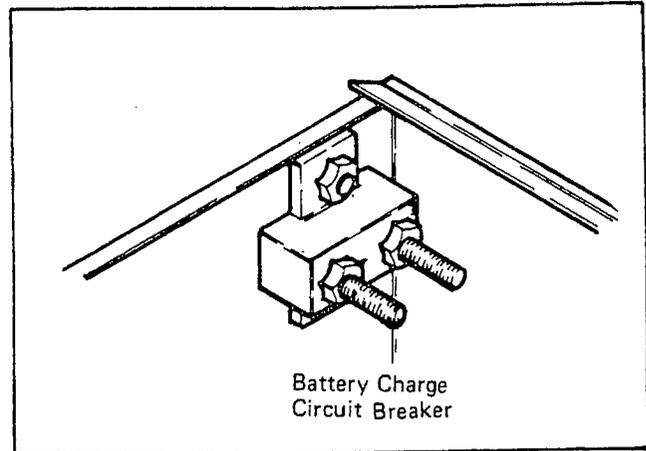


- RESULTS: 1.) Ammeter indicates discharge or no output.....Go to Test 43  
 2.) Ammeter indicates a charge.....Discontinue tests

Disconnect Ammeter from circuit and reconnect Wire #66 to Terminal Strip before proceeding.

**TEST 43 - CIRCUIT BREAKER**

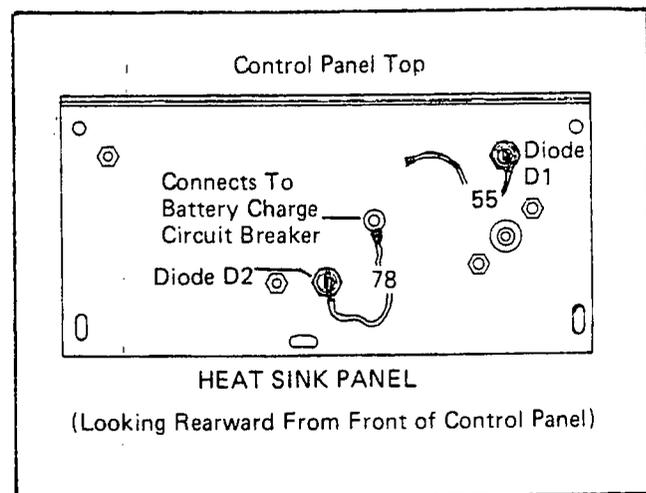
A.) Disconnect Wires #77 and #78 from the Circuit Breaker. Set VOM to "+DC" and to "Rx1" scale, and zero the meter. Connect meter test probes to Circuit Breaker terminal studs. Meter needle should swing upscale to "zero".



- RESULTS: 1.) Checks Good.....Go to Test 44  
 2.) Checks Bad.....Replace Circuit Breaker

**TEST 44 - DIODES D1 & D2**

A.) Disconnect Wire #78 at the battery charge circuit breaker. Set VOM to "+DC" and to "Rx1" scale, then zero the meter. Connect the Positive (+) test probe to Wire #78 from Diode D2. Connect the COMMON (-) test probe to Ground. Meter needle should not move. Set meter to "-DC" (or reverse the test probes). Meter needle should swing upscale to some mid-scale reading (approximately 7 - 12 Ohms).



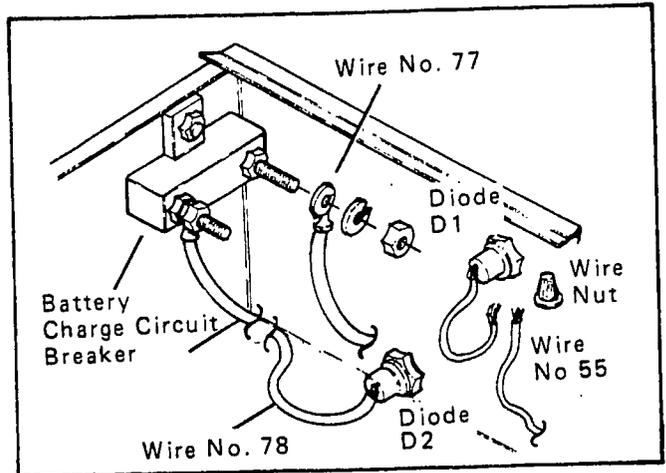
- RESULTS: 1.) Tests Good.....Reconnect Wire #78 to circuit Breaker, go to Paragraph "B"  
 2.) Tests Bad.....Replace Diode D2

B.) Remove wire nut and disconnect Wire #55, near Diode D1. Set VOM to "+DC" and to "Rx1" scale. Zero the meter. Connect the Positive (+) test probe to Wire #55 from Diode D1. Connect the COMMON (-) test probe to Ground. Meter needle should not move. Set VOM to "-DC" (or reverse the test probes). Meter needle should swing upscale to some mid-scale reading (approximately 7 - 12 Ohms).

- RESULTS: 1.) Tests Good.....Reconnect Wire #55, retain with wire nut. Go to Test 45  
 2.) Tests Bad.....Replace Diode D1

TEST 45 - **STATOR BATTERY CHARGE WINDINGS**

A.) Remove the 15 Amp Fuse. Disconnect Wire #77 from Battery Charge Circuit Breaker. Remove wire nut from the Wire #55 connection, near Diode D1, then disconnect the wires. Set VOM to "+DC" and to "Rx1" scale. Zero the meter. Connect one meter test probe to Wire #55. Connect the other test probe to Wire #77. Meter needle should swing upscale and indicate approximately 0.20 Ohms.



- RESULTS: 1.) Tests Good.....Go to Paragraph "B"  
 2.) Tests Bad.....Replace Stator

B.) With 15 Amp Fuse still removed, set VOM to "+DC" and to "Rx10,000" scale. Zero the meter. Connect one meter test probe to Wire #55, and the other test probe to Ground. Meter needle should not move (infinity).

- RESULTS: 1.) Meter needle moved upscale.....Shorted condition indicated, replace Stator  
 2.) Meter needle did not move.....Checks Good

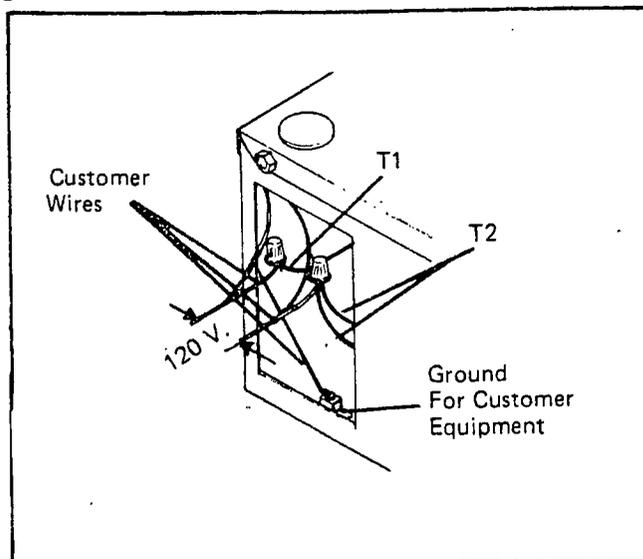
# PART III

## ALTERNATOR REPAIR

Section	Title	Page
5	CONTROL PANEL	
	Customer Wiring Connections .....	5.1
	Voltage Regulator .....	5.1
	Printed Circuit Board .....	5.3
	Diodes D1 and D2 .....	5.4
	Other Components .....	5.4
	Panel removal .....	5.4
6	ALTERNATOR	
	Rear Bearing Carrier .....	6.1
	Stator .....	6.2
	Rotor .....	6.3
	Flexible Coupling .....	6.4
	Fan .....	6.5
	Engine Adapter/Ignition Stator .....	6.6
7	REASSEMBLY	
	Engine Adapter/Ignition Stator .....	7.1
	Fan .....	7.1
	Flex Coupling/Rotor .....	7.1
	Stator .....	7.2
	Rear Bearing Carrier .....	7.2
	Control Panel .....	7.3

## CUSTOMER WIRING CONNECTIONS

Customer wiring connections for 120 volts only are shown at right. A 3-wire cable should be used. Connect two alternator T2 wires to one cable wire. Connect one alternator T1 wire to a second cable wire. The third cable wire should be connected to the grounding lug, as shown at right.



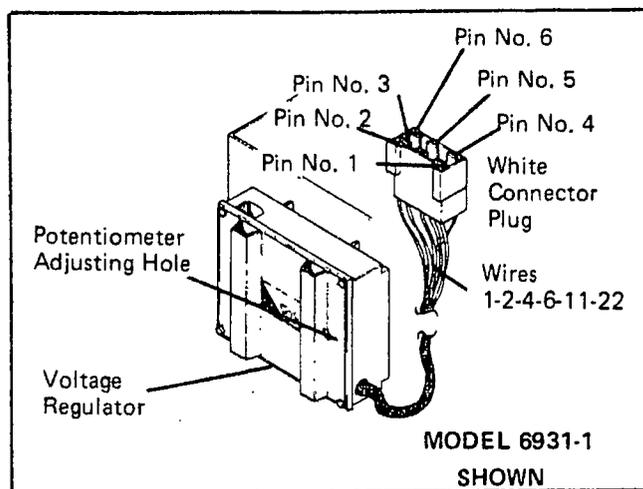
### NOTE

Panel output wiring can be reconnected to supply a dual voltage of 120/240 volts. See Section 2. A 4-wire cable is required when supplying dual voltage.

## VOLTAGE REGULATOR

The Voltage Regulator used on the TXP provides a constant voltage to frequency ratio of 2 to 1. That is, when alternator frequency is 60 Hz, voltage output will be 120 volts a-c (+2%). If frequency should drop to 55 Hz, output voltage would also drop, to about 110 volts a-c.

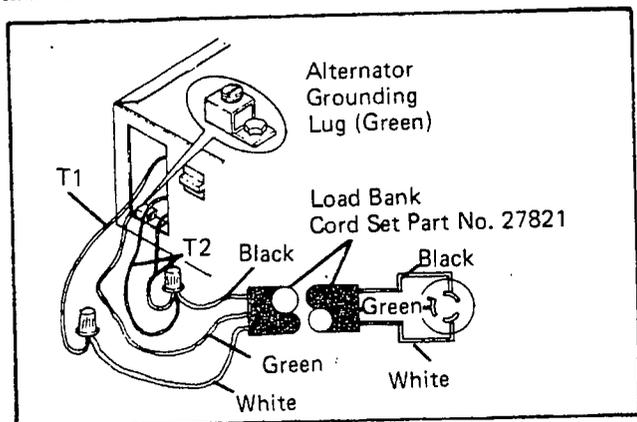
The Voltage Regulator Assembly for the Model 6931-1 TXP is shown at right. Be sure to check the wiring diagram for the specific model involved. The following CHART lists Regulator wires and their function.



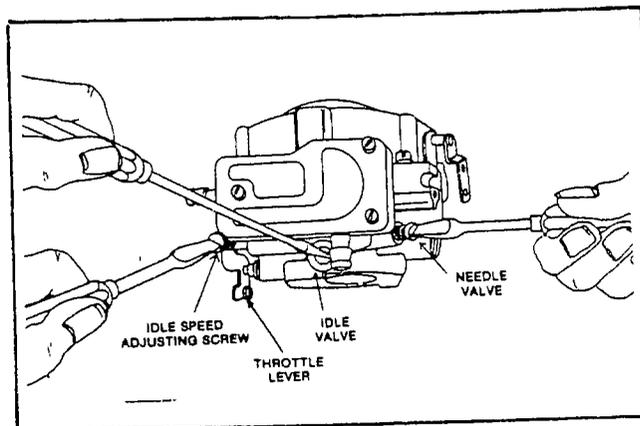
Wire #	To Connector Pin	Function
1	#1	DC Current from (-) brush and slip ring
2	#2	AC Current from excitation windings
4	#4	DC Current to (+) brush and slip ring
6	#6	AC Current from excitation windings
11	#3	120 volt sensing from Sensing Transformer
22	#5	120 volt sensing from sensing Transformer

## VOLTAGE REGULATOR ADJUSTMENT

The Voltage Regulator is adjusted at the factory and normally requires no additional adjustment. If the engine is running at 62 Hz "No-Load" and voltage readings are incorrect, the Regulator may be adjusted. An accurate Frequency Meter and Voltmeter are required to adjust the Regulator. The Model 5515 Load Bank provides both these instruments. The following procedure covers use of the Load Bank for Regulator adjustment.



1. Connect 3-wire cord set (Part No. 27821) to alternator output wires as shown above. Plug the connector plug into the 120 volt, 3-prong connector plug on the Load Bank. Set ALL Load Bank Heater element switches to OFF. Set Ammeter Hi-Lo Range Selector Switch to 0-50 AMPS. MAKE SURE THE LOAD BANK HEATER ELEMENT COVER IS OPEN.



2. Adjust carburetor jets and governed idle as outlined in Test 23, Page 4.14.

3. Adjust Governor as outlined in Test 32, Page 4.18 and 4.19.

4. With engine running at 62 Hz and no electrical loads applied, use a very small screwdriver to adjust the regulator potentiometer (CW to Increase, CCW to Decrease voltage). Set potentiometer to obtain 124 volts at 62 Hz (No-Load).



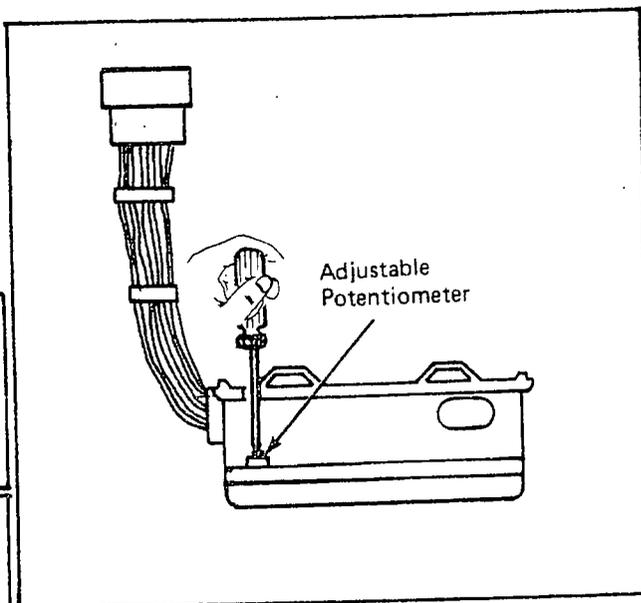
**DANGER**

Use extreme caution when working in the control panel. Live voltages are present when unit is running.



**CAUTION**

Do not force the potentiometer past its stops, or damage to the potentiometer will result.



## PRINTED CIRCUIT BOARD

The Printed Circuit Board provides the necessary components for:

1. Control of those functions required for engine starting, running, and stopping. These functions include:

- a. Energizing the Fuel Shutoff Solenoid open and closed, as needed
- b. Turning the electric fuel pump ON and OFF
- c. Energizing the Choke Heater
- d. Controlling Choke Solenoid action

2. Controlling current flow to the Field Boost circuit during a start. This current is delivered across the brushes and slip rings, to ensure the presence of a magnetic field around the Rotor during a start. Thus, it is never necessary to energize the field, since it is energized during every start.

The illustration at right shows the Printed Circuit Board components that can be tested, adjusted, or replaced. Maintenance is limited to (a) replacement of the 4 Amp Fuse, (b) adjustment of the Choke Adjustment potentiometer, or (c) replacement of the entire Printed Circuit Board.

The Printed Circuit Board receptacle and its mating connector are shown at right. Notice the functions of each pin in the connector and receptacle.

Pin No.	Wire No.	Nominal Value	Function
1	15	12 VDC	Battery Voltage to PCB
2	4	6-12 VDC	Field Boost current to Rotor
3	90	0 OR 12 VDC (Pulsing)	Choke Solenoid
4	20	0 - 3 VAC	Ignition Stator output (Turns PCB on during start)
5	—	—	Not Used
6	14	12 VDC	To Fuel Pump, Fuel Shutoff Solenoid, and Choke Heater
7	10	0-	PCB Ground
8	91	0 OR 12 VDC (Pulsing)	Choke Solenoid

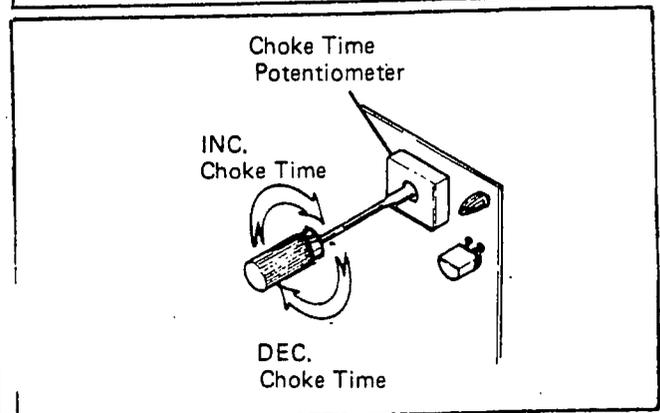
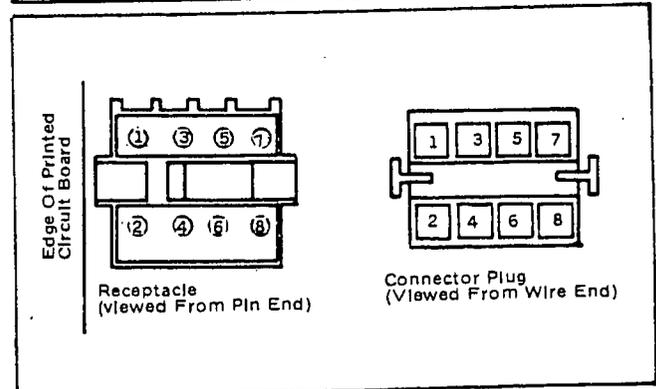
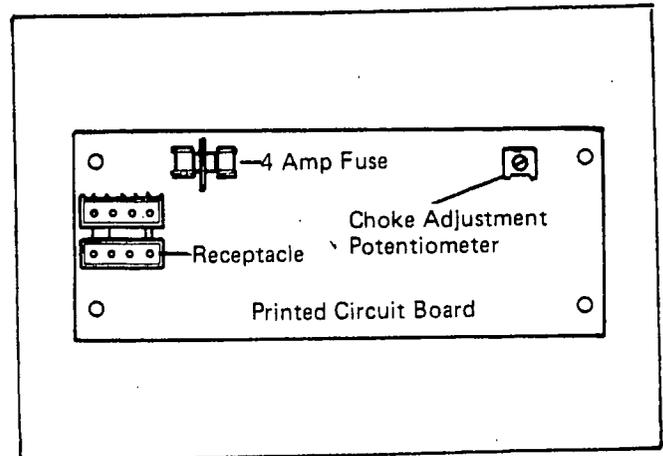
The Choke Adjustment Potentiometer can be used to increase or decrease choke time. To INCREASE choke time, turn the adjustment screw clockwise. To decrease choke time (or increase "no-choke" time"), turn the slotted adjustment counterclockwise.



**CAUTION**

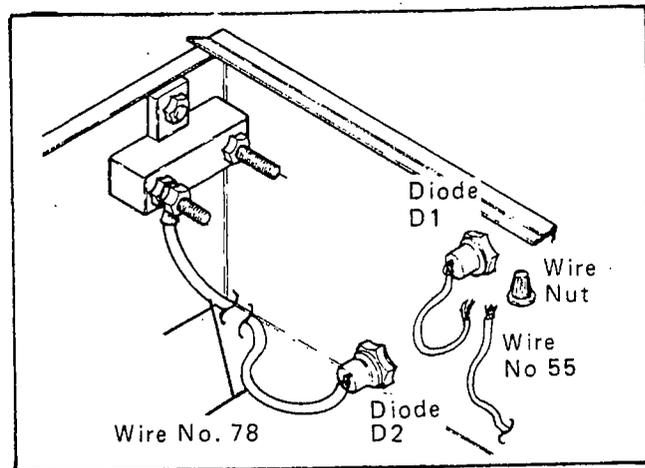
Be careful not to force the slotted adjustment past its stops.

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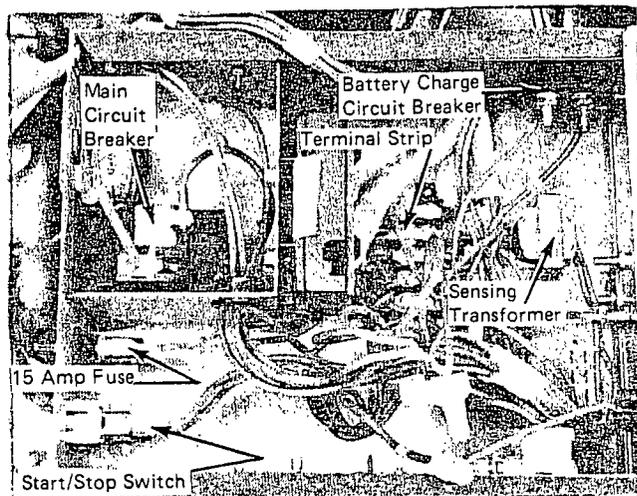
## DIODES D1 & D2

Diodes D1 and D2 are a part of the battery charging circuit. They function to convert the a-c output of the battery charge windings to direct current (d-c). Battery charge circuit checks are outlined in Tests 42 through 45, Pages 4.24 through 4.26. When replacing a defective diode, bleed off excessive heat by means of a heat sink - diodes are extremely sensitive to heat.



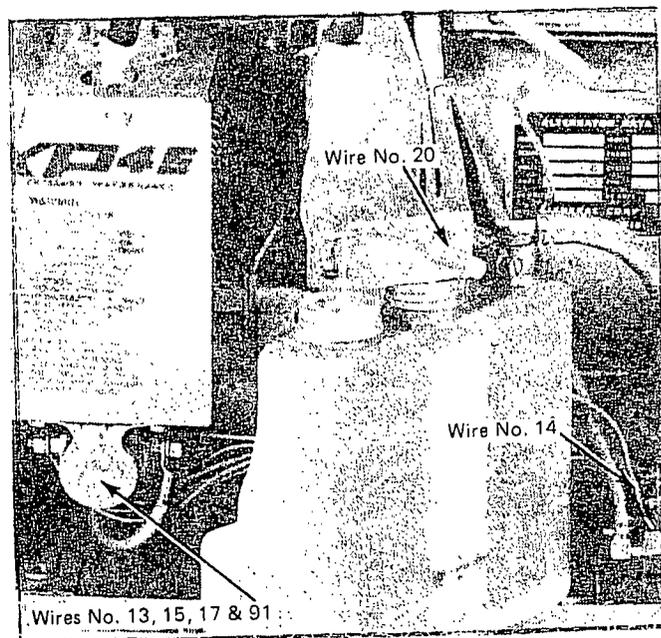
## OTHER COMPONENTS

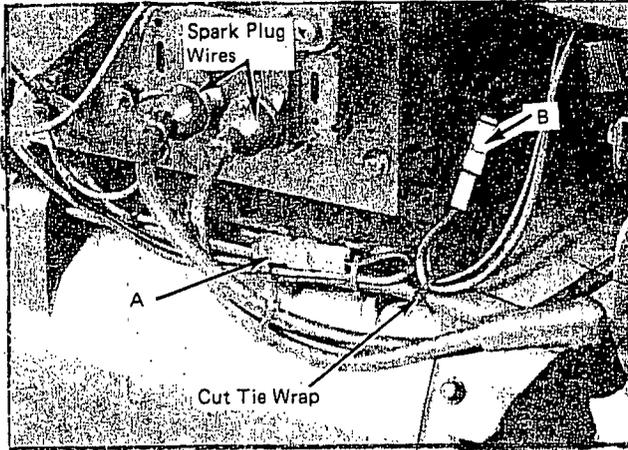
Other Control Panel components are shown at right. These include (1) a 40 Amp Main Circuit Breaker, (2) a 15 Amp Fuse, (3) a Start/Stop Switch, (4) battery Charge Circuit Breaker, (5) Sensing Transformer, and (6) Terminal Strip. Refer to Sections 2 and 3 for troubleshooting and testing of these components. Refer to the Wiring Diagram for each specific alternator model when reconnecting components.



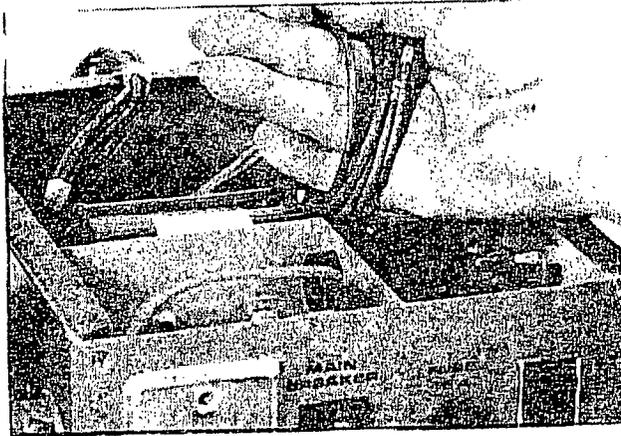
## PANEL REMOVAL

1. At front of alternator, locate the large wire bundle from control panel. Disconnect all wires from this wire bundle, as follows:
  - (a) Wire #14 at fuel pump
  - (b) Wire #20 to Low Oil Switch
  - (c) Two Wires #15 at Starter Solenoid
  - (d) Wire #13 at Starter Solenoid
  - (e) Wire #17 at Starter Solenoid
  - (f) Wire #91 at Starter Solenoid

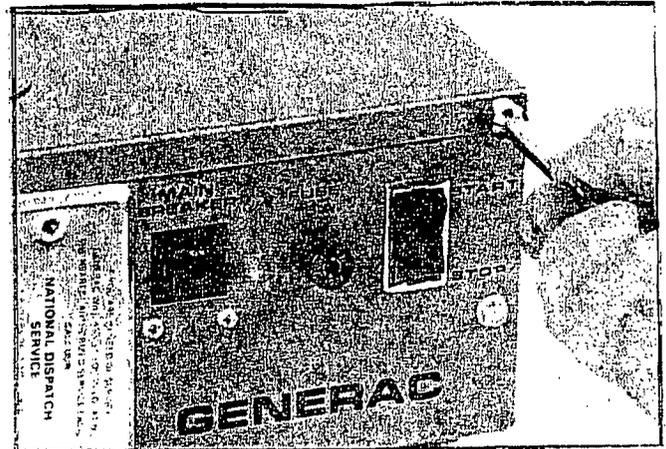




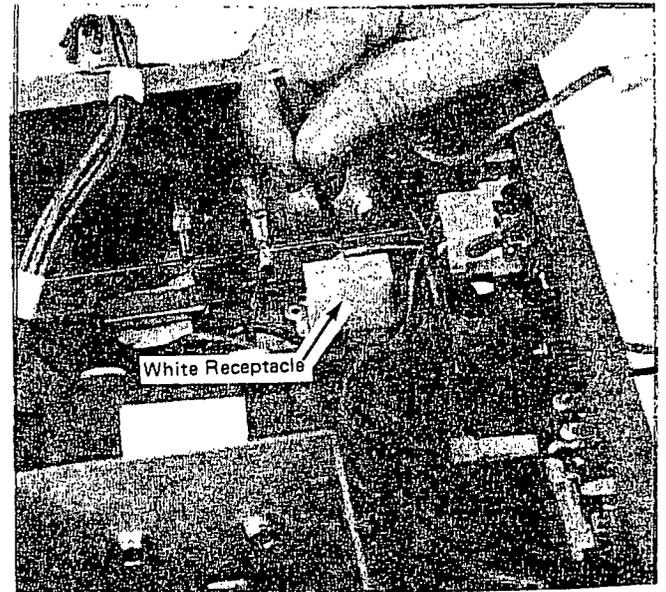
2. At rear of Panel, (a) disconnect spark plug wires from Ignition Coil, (b) disconnect the wire connectors A and B, and (c) cut the tie wrap that holds Wires #2 and #6 to the stator bolt.



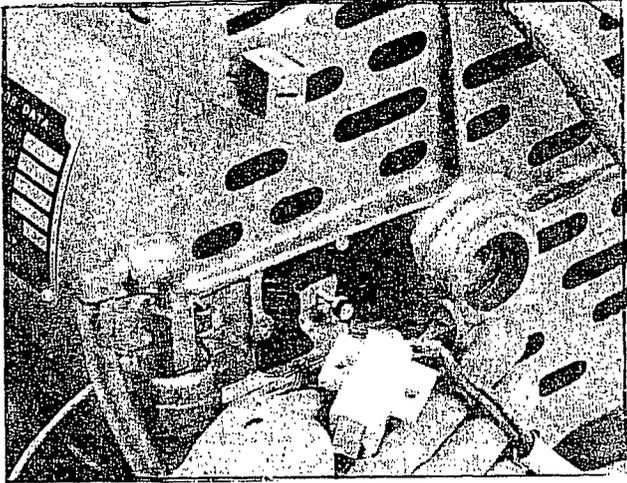
4. Remove wire nuts and disconnect wires #11 and #22 to Sensing Transformer, as well as Wire #55 to Diode D1. Disconnect wire #66 at terminal strip. Disconnect wire #77 at battery charge circuit breaker. Disconnect wires #11 and #33 from main circuit breaker and pull through the snap bushing. Remove wire nuts from two wires #T2 and pull through snap bushing. Pull all wires through snap bushing at rear floor of panel.



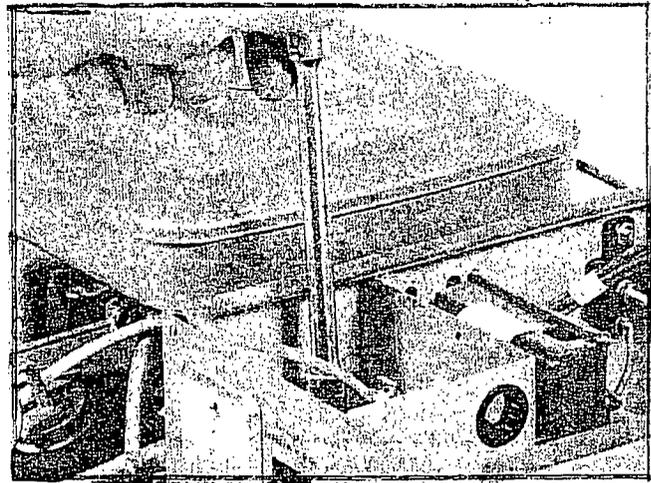
3. Remove the Panel top cover.



5. At the rear exterior floor of the control panel, locate wires #1, #2, #4 and #6 that connect into the white receptacle. Use a small screwdriver or pen knife to "unlock" each female pin from its receptacle slot, while carefully pulling down on each wire. Remove all four wires from the white receptacle.



6. Use a  $\frac{1}{4}$  inch nut driver to remove brush inspection cover screw. Remove brush inspection cover. Use a  $\frac{1}{4}$  inch nut driver to remove the 2 screws that retain the brush holder. Cut the tie wrap that retains the brush wires to the rear bearing carrier.

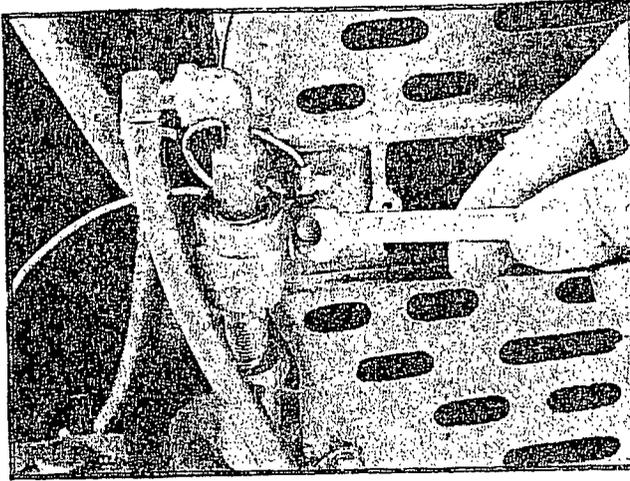


7. Use a  $\frac{7}{16}$  inch socket to remove the 4 bolts that retain the control panel to the stator can. Lift straight up and remove the entire control panel.

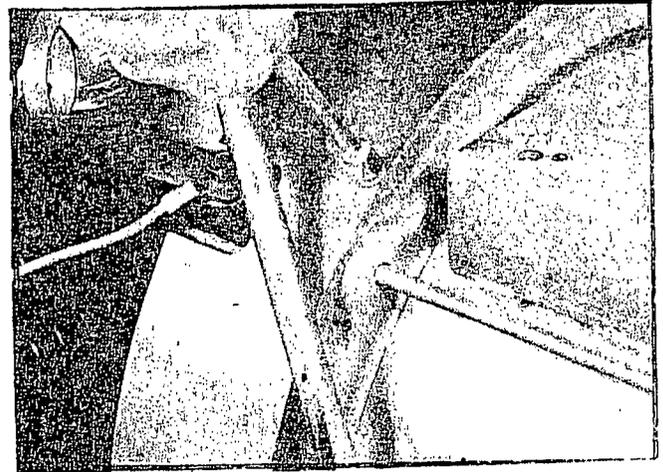
## REAR BEARING CARRIER

### REMOVAL

1. Remove Control Panel as outlined in Section 5.

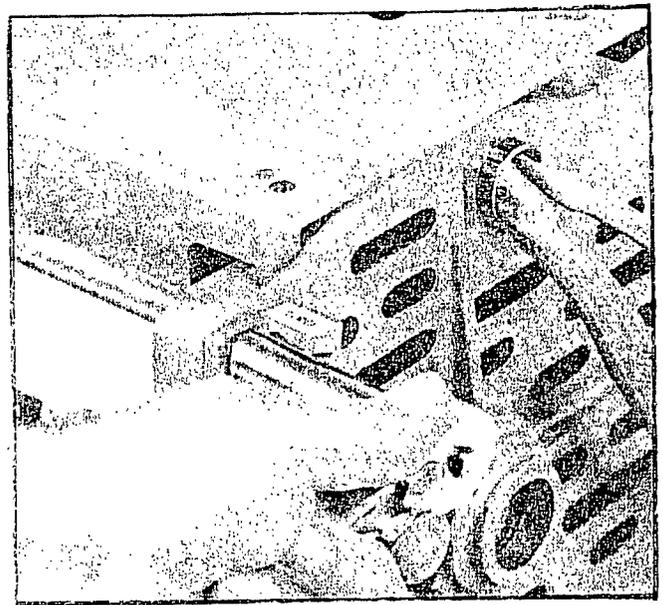


2. Remove the Fuel Shutoff Solenoid Clamp screw. Tape or cover the open end of the Fuel Filter to prevent entry of dirt. Lay the Filter, Solenoid and hoses out of the way.



3. Use a 1/4 inch nut driver to remove the 3 screws that retain the Fan Guard. Remove the Fan Guard.

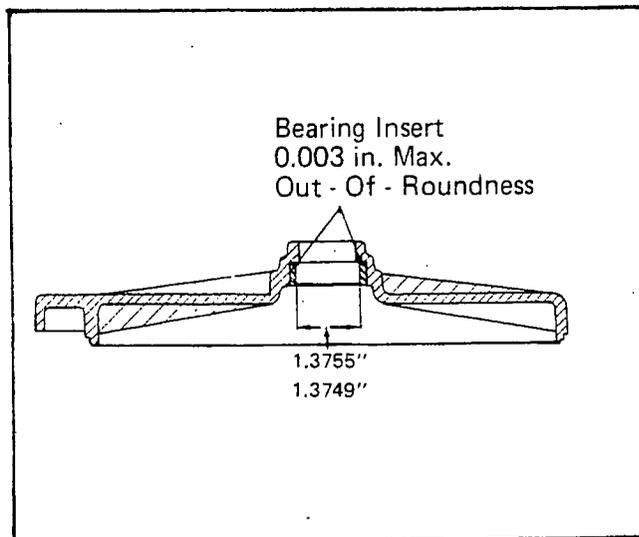
4. Use a 7/16 inch socket to remove the 4 stator bolts. Use a wood or fiber mallet to tap each projecting corner of the Rear Bearing Carrier. When Rear Bearing Carrier is free of the Rotor bearing, slide the wire bundle through the snap bushing and remove the Rear Bearing Carrier.



### INSPECTION

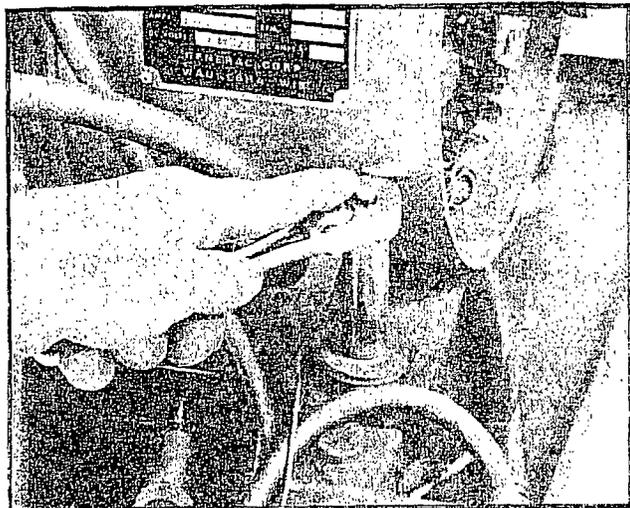
1. Check closely for cracks, or other damage.
2. Check condition of snap bushing. Replace, if damaged.
3. Inspect threaded holes for condition of threads, damage, etc. Repair or retap, as required.

4. Inspect rotor bearing mating surface on Rear Bearing Carrier. Replace Rear Bearing Carrier if damaged, or worn excessively. Use an inside micrometer to measure bearing insert inside diameter. Inside diameter of insert must be 1.3749 - 1.3755 inches. Maximum out-of-roundness must not exceed 0.003 inch. Replace Rear Bearing Carrier if these limits are exceeded.

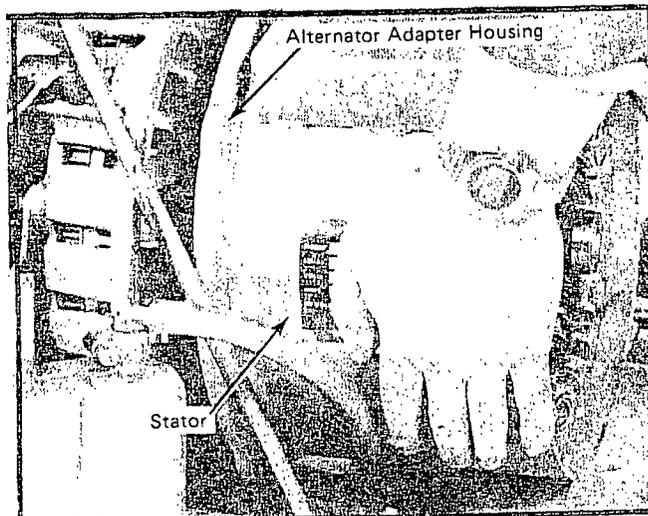


## STATOR

### REMOVAL



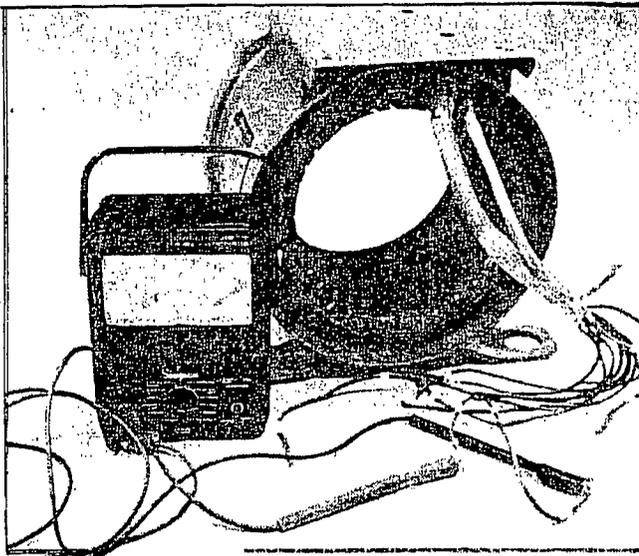
1. Remove the stator-to-vibration dampener bolts, hex nuts, and lock-washers, using a 9/16 inch socket. Bolt heads are below the slide pan. Rest the engine adapter housing on a block of wood, then completely remove all vibration dampener components.



2. Tap stator can free of engine adapter. Carefully remove the stator can, along with the Alternator Adapter Housing. If necessary to remove the Alternator Adapter Housing from the Stator can, place re-assembly alignment marks on Housing and Stator can, then tap Housing free of Stator can.

### INSPECTION

1. Inspect Stator can, Alternator Adapter Housing, and Stator windings for obvious damage. Replace any component that appears to be damaged. If required, Alternator Adapter Housing can be replaced. Replace the entire stator can as an assembly.
2. Carefully inspect stator wiring for damage. Repair or replace defective wiring, as required.

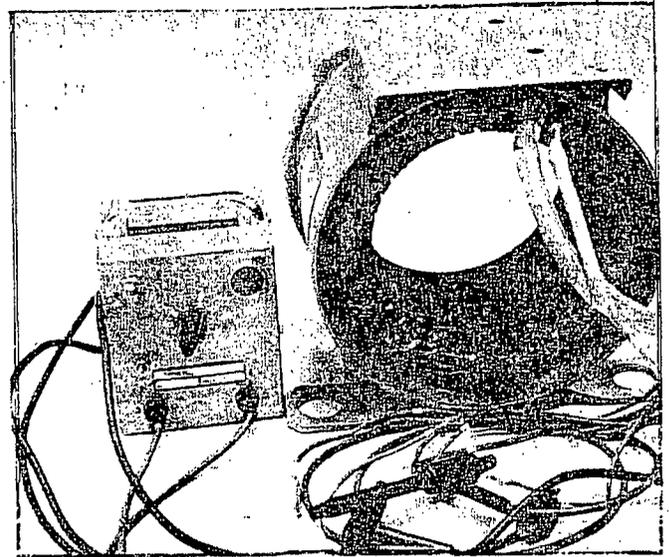


3. Set VOM to "+DC" and to "Rx1" scale. Zero the meter. Connect the meter test probes to stator wires listed in CHART below. Meter needle should swing upscale and indicate resistances as listed in CHART. If meter needle does not swing upscale, the winding being tested is "open", and stator should be replaced.

NAME OF WINDING	WIRE NO.	READING
Power	11 to 22	0.42
Power	33 to 44	0.42
Excitation	2 to 6	2.30
Battery Charge	55 to 77	0.20

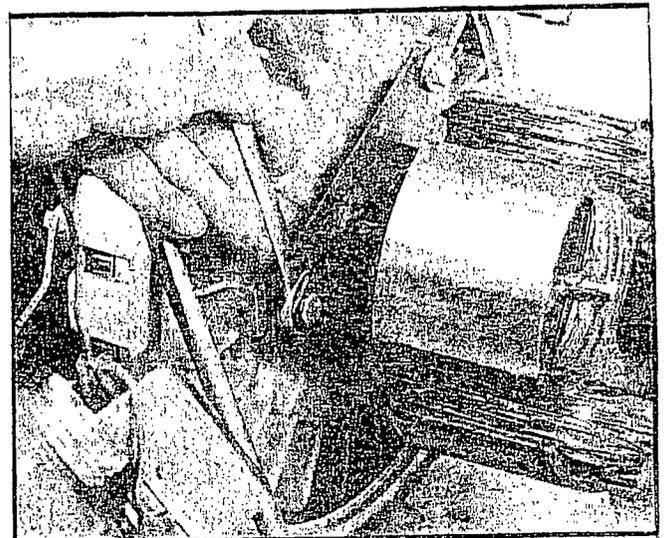
## ROTOR

1. Insert a screwdriver through engine adapter housing cooling air slots and between fan blades to stop rotor from turning. Remove 3 bolts that retain the flexible coupling to the fan. (LOC-TITE was applied to threads of these bolts during assembly.) Remove the Rotor and Flexible Coupling.



4. Use an INSULATION BREAKDOWN tester to test stator windings for defective insulation. Follow the tester manufacturer's instructions carefully. Test each winding at 2000 volts, from the winding to ground, and at 1500 volts between isolated windings.

## REMOVAL

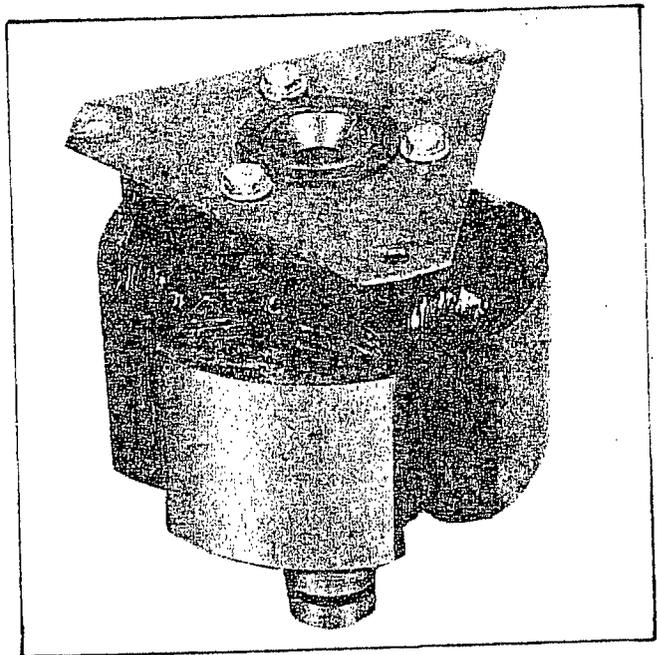


## INSPECTION

1. Brush Holder & Brushes - The Brush Holder was removed along with the Control Panel, and left attached to Control Panel wiring. Inspect Brush Holder for obvious damage, cracks, etc. Replace, if damaged. Inspect brushes carefully. Replace if cracked, damaged or less than 5/16 inch long.
2. Rotor Bearing - Check bearing for freedom of rotation. Bearing must spin freely on shaft. If bearing must be replaced, use a bearing puller to remove, then press a new bearing over shaft.
3. Slip Rings - Inspect Slip Rings. If dirty, dull or tarnished, clean until shiny with fine sandpaper. DO NOT USE EMERY CLOTH.
4. Rotor Windings - Inspect entire rotor for obvious damage. Set VOM to "+DC" and to "Rx1" scale, then zero the meter. Hold the Positive (+) meter test probe into contact with slip ring ring nearest the rotor bearing. Hold the second test probe against the other slip ring. Meter needle should swing upscale and indicate approximately 13 Ohms. If the meter does not swing upscale, rotor windings are "open". An INSULATION BREAKDOWN TESTER may be used to test the rotor windings. BE SURE TO FOLLOW THE TESTER MANUFACTURER'S INSTRUCTIONS. DO NOT CONNECT TESTER PROBES ACROSS THE SLIP RINGS. DO NOT EXCEED TESTER SETTING OF 500 VOLTS.

## **FLEXIBLE COUPLING**

1. The Flexible Coupling is retained to the Rotor with 3 bolts and flatwashers. If necessary to remove the Flexible Coupling, remove the 3 bolts and washers. (LOCTITE was applied to threads of the bolts during assembly.)

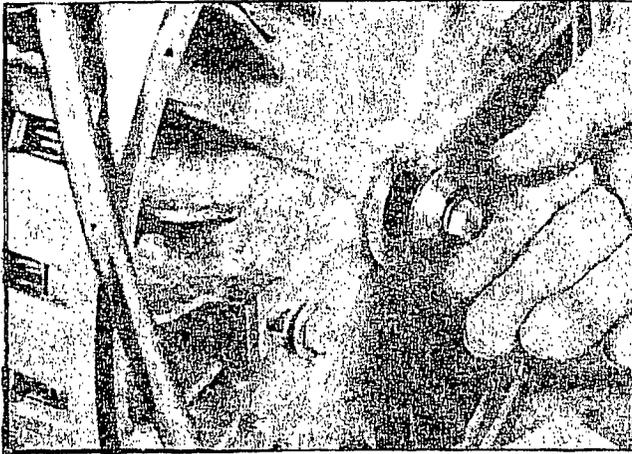


## INSPECTION

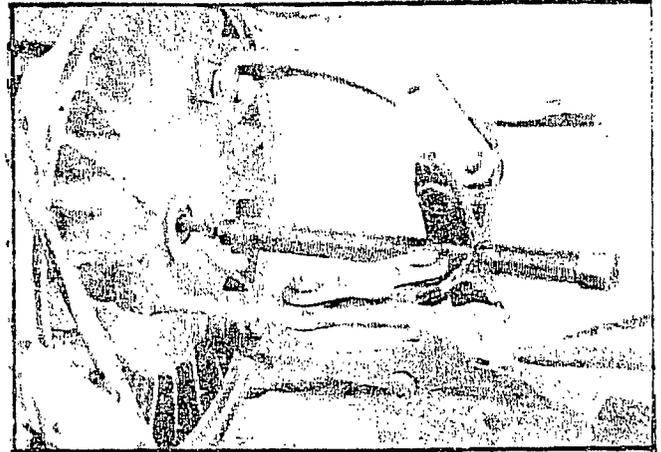
The Flexible Coupling should be rejected if bent, cut, gouged, or otherwise damaged. Any scratch, other than a surface scratch, should be cause for rejection. The coupling must be perfectly flat. Especially note the condition of coupling mounting holes. Any damage caused by improper installation of washers is cause for rejection. Any wear or out-of-roundness of mounting holes is also cause for rejection. FOLLOW INSTRUCTIONS IN THIS MANUAL CAREFULLY FOR INSTALLATION OF THE FLEXIBLE COUPLING.

# FAN

## REMOVAL

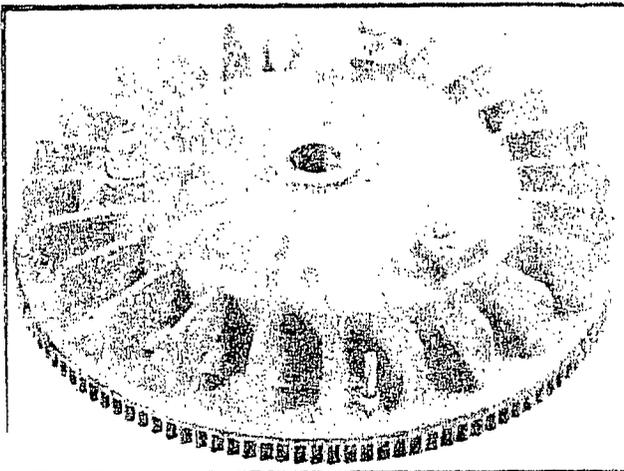


1. Prevent the Fan from turning.
2. Use a  $\frac{1}{2}$  inch socket with breaker bar to remove Fan Bolt. Remove Fan Bolt, washer and Belleville washer.

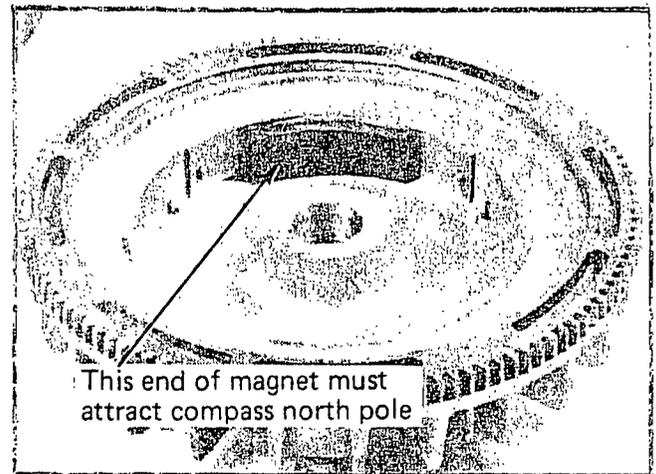


2. Install a bolt into threaded center of engine shaft. Install 3 bolts into flexible coupling mounting holes on Fan. Install a puller as shown. Tighten puller, then strike with mallet sharply. Alternately tighten puller and strike puller end, until Fan is free of tapered engine shaft.

## INSPECTION



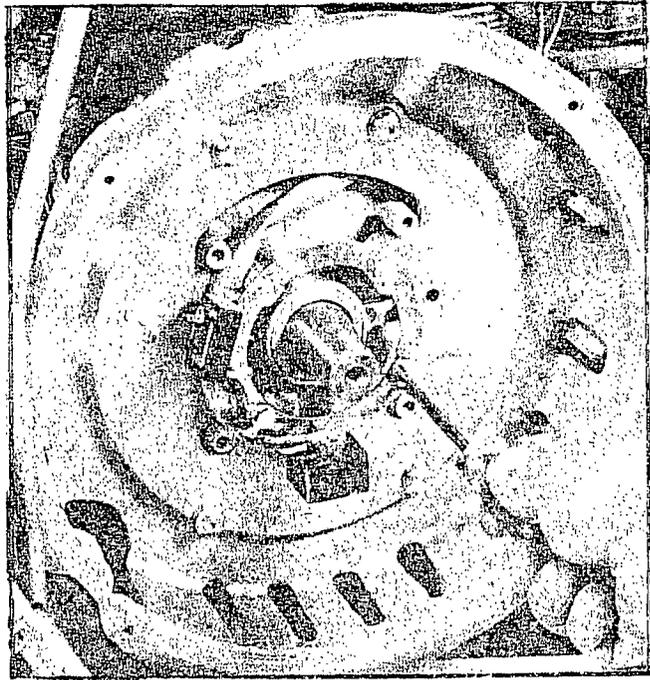
1. Thoroughly de-grease and clean Fan and Ring Gear. Inspect closely for cracks, or other damage.
2. Check condition of all threaded holes.
3. Check fan special key and keyway, as well as keyway on tapered engine shaft. Replace key if worn or damaged. Replace any part with a worn keyway.



4. Check Ring Gear. To replace, remove 3 screws and elastic stop nuts. Clean Ring Gear to Fan mating surfaces thoroughly before installing new Ring Gear. New screws and locknuts are shipped with Ring Gear.
5. Magnet is located opposite the counterweight. Replace Fan if it has shifted, or is damaged. North pole of a magnetic compass must attract pole of magnet indicated above.

## ENGINE ADAPTER IGNITION STATOR

1. The Engine Adapter Housing is retained to the engine by four 5/8-16 x 1 inch long button head screws. To remove Engine Adapter Housing, remove these screws.
2. Use a 5/16 inch nut driver to remove four screws that retain the Ignition Stator to the Engine Adapter Housing. Remove the Ignition Stator.



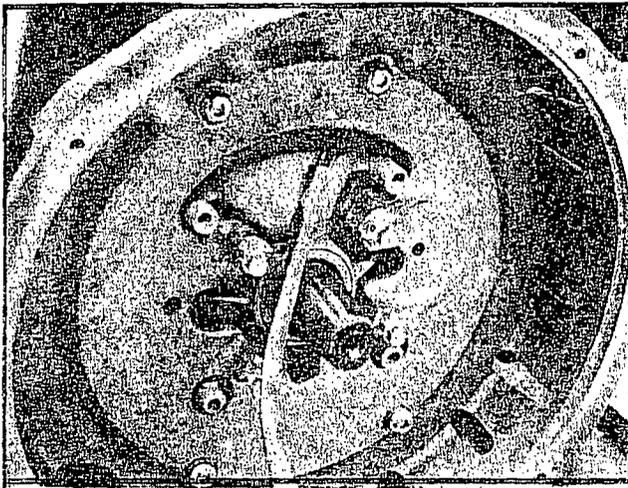
### INSPECTION

1. Check Engine Adapter Housing for cracks, or other damage. Replace, if damaged.
2. Inspect Ignition Stator locating dowel pin for damage.
3. Set VOM to "+DC" and to "Rx1" scale. Zero the meter. Connect one meter probe to the Wire #20 connection at the wiring disconnect, and the other test probe to the metal ring of the Ignition Stator. Meter needle should swing upscale and read approximately 6 Ohms. If needle does NOT swing upscale, Ignition Stator Trigger Coil is "open".
4. Set VOM to "+DC" and to "Rx100" scale. Zero the meter. Connect one test probe to the Wire #8 connection at the wiring disconnect and the other probe to the Stator metal ring. Meter needle should swing upscale to approximately 225 Ohms. If needle does not swing upscale, the Stator Charge Coil is "open".

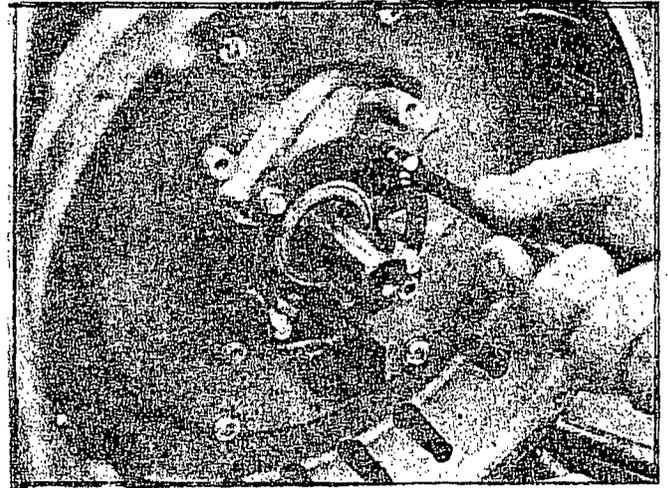
# REASSEMBLY

7

## ENGINE ADAPTER IGNITION STATOR



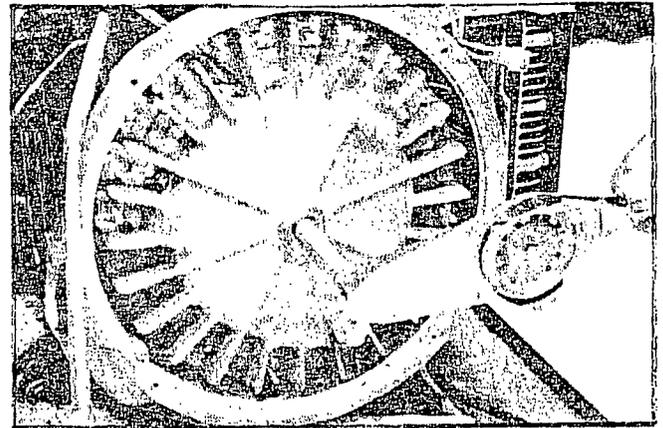
1. Route the Ignition Stator wires behind the Engine Adapter. Then mount the Engine Adapter and retain with four 5/16-18 x 1 inch long buttonhead screws. Tighten screws to 11 foot-pounds.



2. Offset holes ensure correct installation of the Ignition Stator. Align holes, then retain Ignition Stator with four No. 10-32 screws, 3/8 inch long.

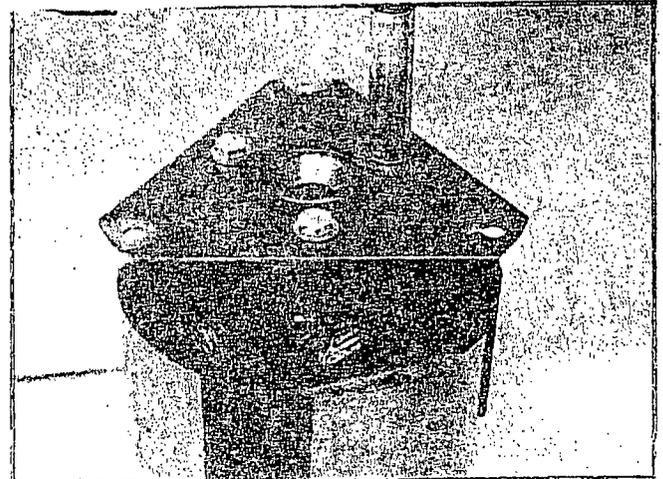
## FAN

1. Carefully align Fan hub keyway with engine shaft keyway, then install Fan onto engine shaft. Install the special square drive key into the aligned keyways, so that the installed key is flush with surface of Fan hub. Key must not be permitted to ride inward against curved radius of engine shaft keyway. Slide retainer washer and Belleville washer onto 5/16-24 x 1½ inch long capscrew (use Grade 5 only). Apply LOC-TITE 601 to capscrew threads. Install capscrew, torque to 19 Foot-Pounds.

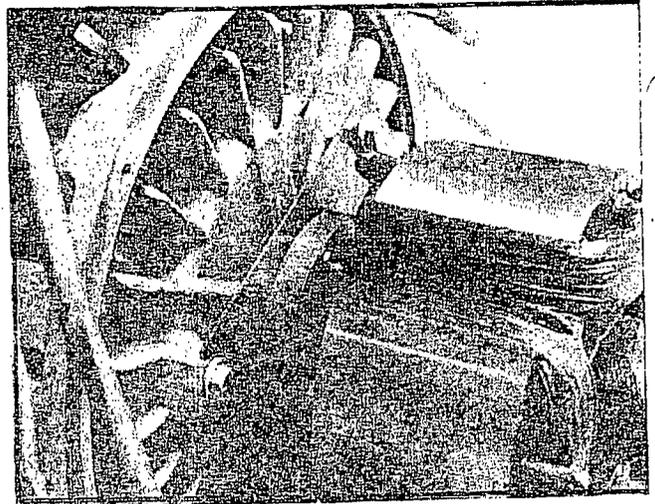


## FLEX COUPLING ROTOR

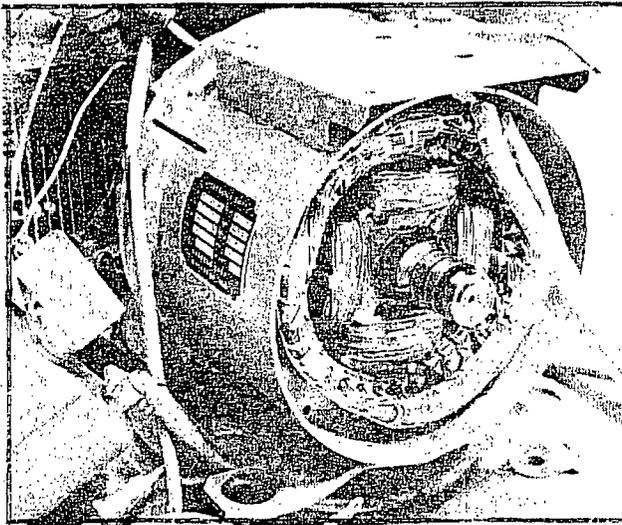
1. Install Flex Coupling onto Rotor hub. Slide one washer over each 5/16-18 x 3/4 inch long capscrew - RADIUS OR CHAMFERED SIDE OF WASHER MUST BE AGAINST THE FLEX COUPLING. Apply LOC-TITE 601 to capscrew threads. Install all three capscrews and torque to 19 Foot-Pounds.



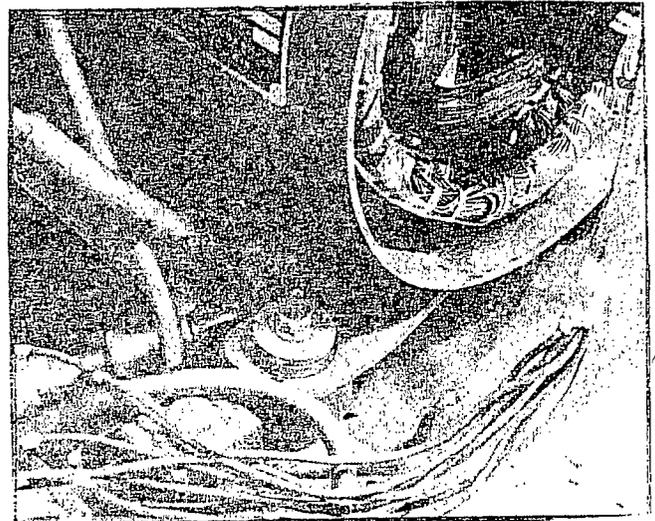
2. Mount Rotor to Fan bosses. Use two flat washers under each 5/16-18 x 3/4 inch long capscrew - RADIUS OR CHAMFERED SIDE OF WASHER MUST BE AGAINST FLEX COUPLING. Apply LOC-TITE 601 to capscrew threads. Install capscrews and torque to 19 Foot-Pounds.



## STATOR



1. If previously removed, align alternator adapter with stator can and install. Slide alternator adapter and stator can carefully over the rotor, with stator bolt holes in engine adapter and alternator adapter aligned. Seat the mating flanges of engine and alternator adapter against each other.

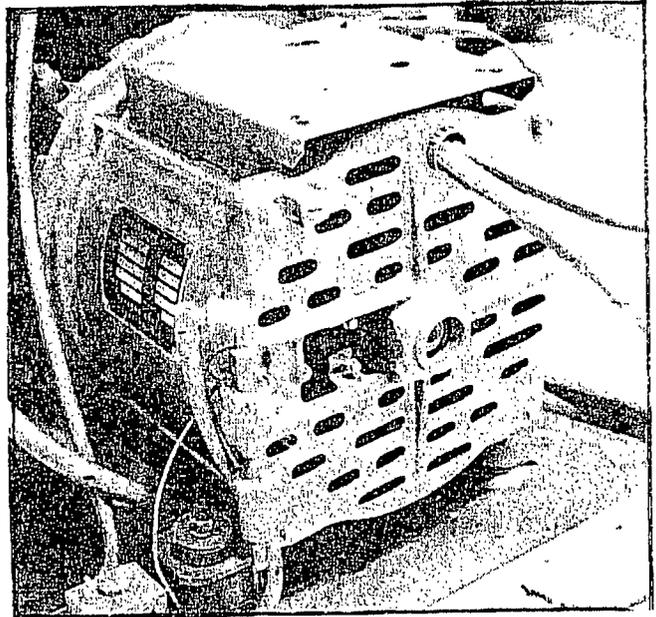


2. Slide a rubber vibration dampener into place over slide pan hole. Install bolt, with bolt head at bottom of slide pan. Install metal spacer, rubber washer, metal washer, lockwasher and hex nut. Repeat for second vibration dampener. Tighten both hex nuts.

## REAR BEARING CARRIER

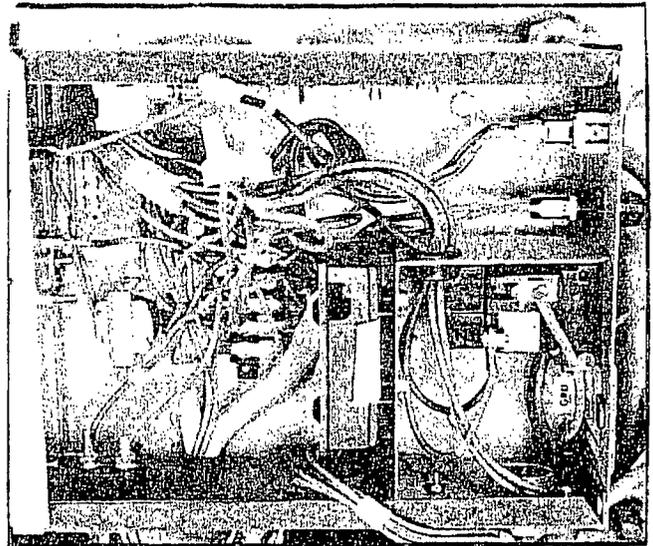
1. Pull wire bundles through snap bushing in Rear Bearing Carrier. Then align Carrier with rotor bearing and with threaded holes in engine adapter. Lightly tap Carrier over rotor bearing. Install four stator bolts, with lockwashers. Grounding lug goes under upper left hand bolt, fuel pump ground wire under lower left bolt. Retain fuel shutoff solenoid clamp next to brush inspection window.

2. Make sure all four stator bolts are tightened down evenly. Engine adapter to alternator adapter mating flanges must be flush, as well as stator can to Rear Bearing Carrier mating flanges.



## CONTROL PANEL

Refer to CONTROL PANEL REMOVAL on Pages 5.4 through 5.6. Retain the Control Panel to stator can using four capscrews and lockwashers. Connect all wiring previously disconnected. Refer to a wiring diagram for the specific unit for correct wiring connections. Use tie wrap for neater wire bundles and for wiring support where necessary. When installing brushes and brush holder, the red (No. 4) wire goes next to the rotor bearing. Brush ground wire extends from the other brush - retain the ground wire with one of the brush holder retaining screws.



# PART IV ENGINE REPAIR

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	Checking Compression .....	8.1		Installing Breathers .....	12.2
	Remove/Install Cylinder Heads .....	8.1		Oil Seal .....	12.2
	Remove Valves .....	8.2		Oil Make-up System .....	12.3
	Reface Valves and Seats .....	8.3	13	<b>IGNITION</b>	
	Check/Adjust Tappet Clearance .....	8.3		General .....	13.1
	Install Valves .....	8.3		Operation .....	13.1
	Install Intake Valve and Stem Seal .....	8.4		Spark Plugs .....	13.1
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9	<b>CRANKSHAFT &amp; CAMGEAR</b>			Check Starter Motor drive .....	14.1
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	Crankshaft End Play .....	9.2	15	<b>CARBURETION</b>	
10	<b>PISTONS, PINS &amp; RODS</b>			General .....	15.1
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	Remove Connecting Rod .....	10.1		Carburetor Removal .....	15.2
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11	<b>CYLINDERS</b>			General .....	16.1
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	Honing .....	11.1		Governor Gear Installation .....	16.2
	Cylinder Finish and Cleaner .....	11.2		Crankcase Cover Installation .....	16.3
12	<b>LUBRICATION</b>			Governor Shaft Adjustment .....	16.3
	General .....	12.1		Adjusting Governed Idle .....	16.3
	Oil Recommendations .....	12.1		Top Governed Speed Adjustment .....	16.3
	Oil Fill and Dipstick .....	12.1			
	Crankcase Breathers .....	12.1			

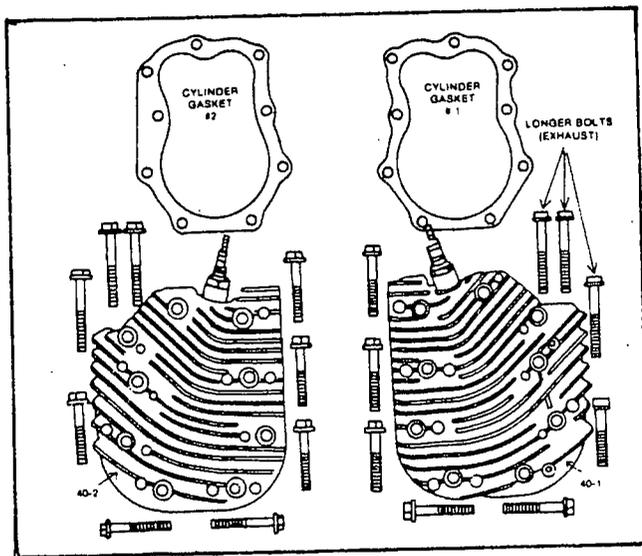
## CHECKING COMPRESSION

Remove both spark plugs. Insert a compression gauge into one of the spark plug openings. Crank the engine, using the electric starter. Repeat test for second cylinder. Maximum pressure differential between the two cylinders should not exceed 25 per cent. A greater pressure differential indicates loss of compression.

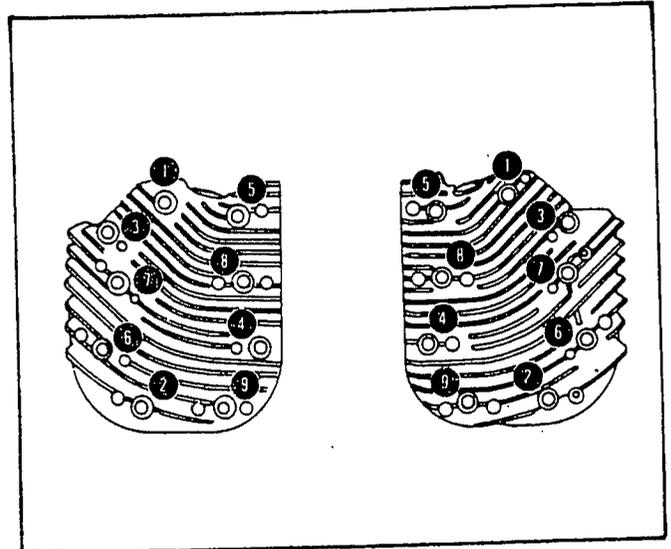
Loss of compression is generally caused by any of the following:

1. Defective/leaking cylinder head gasket
2. Sticking/improperly seated valves
3. Worn/broken piston rings or cylinder

## REMOVE/INSTALL CYLINDER HEADS



Remove sheet metal cylinder head covers and air ducting around the engine cylinder heads. Note positions of cylinder head bolts, to ensure correct reassembly. Longer bolts are used around the exhaust valve areas.

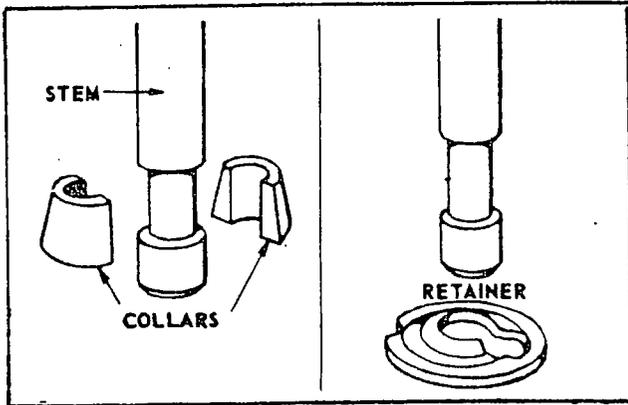


To install cylinder heads, first install the correct head gasket. DO NOT USE ANY KIND OF SEALANT ON HEAD GASKET. Install cylinder head with bolts in their proper position. Tighten all head bolts down evenly by hand. Then tighten bolts to 160 Inch-Pounds, in the proper sequence.

### IMPORTANT

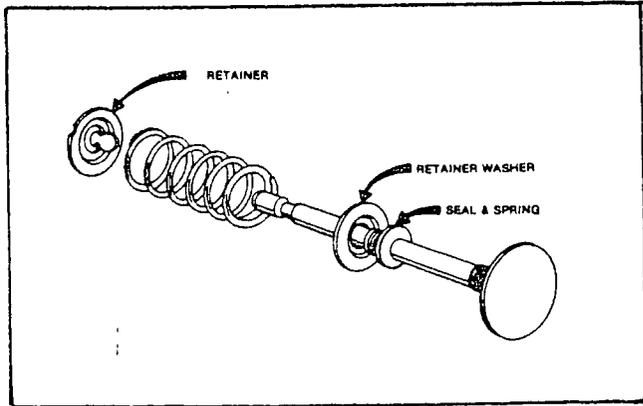
When removing and installing valves and valve parts, keep all parts together as a set. Valves, valve springs and tappets are not interchangeable between valve ports.

# REMOVE VALVES

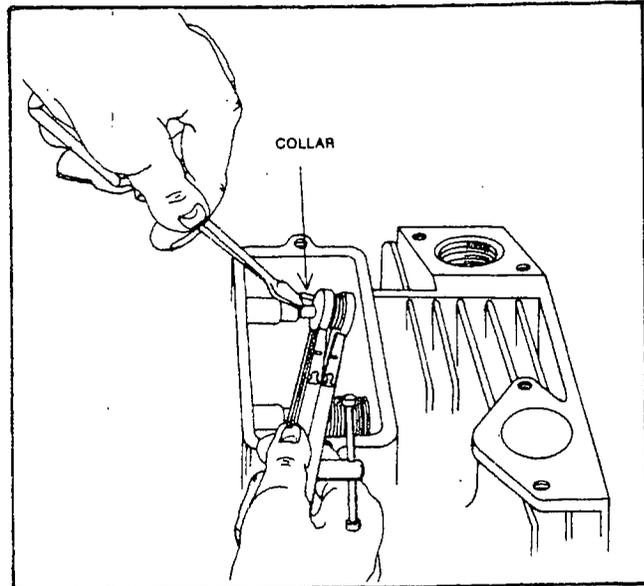


Valve springs are retained by COLLARS and RETAINERS, as shown above.

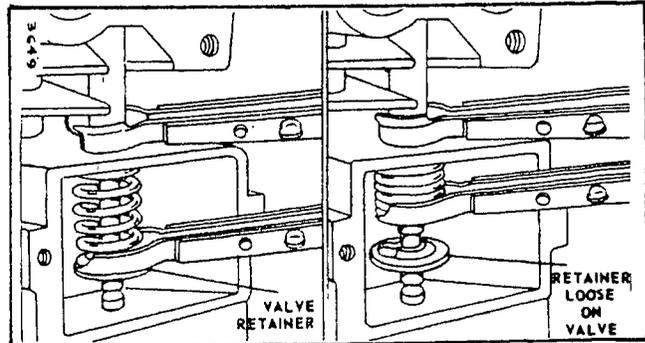
To remove exhaust valve, insert valve spring compressor upper jaw between the valve spring and the valve chamber. Insert lower spring compressor jaw below the retainer. Compress the spring, remove collars from stem, release the spring, and finally remove the spring.



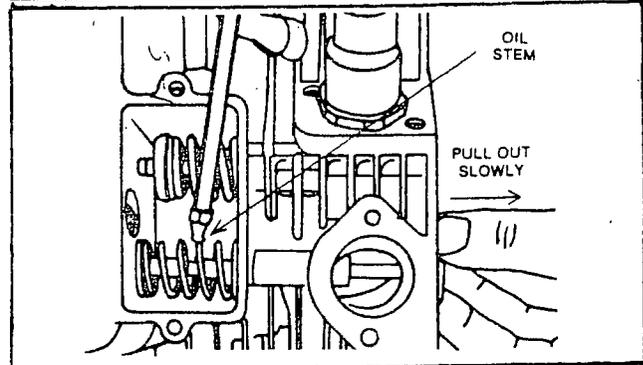
Intake valves have a stem seal, retained by the valve spring.



To remove Intake Valve, slip upper jaw of valve spring compressor over the top of the valve chamber. Place the lower jaw of the spring compressor between spring and retainer. Compress the valve spring, then remove retainer.

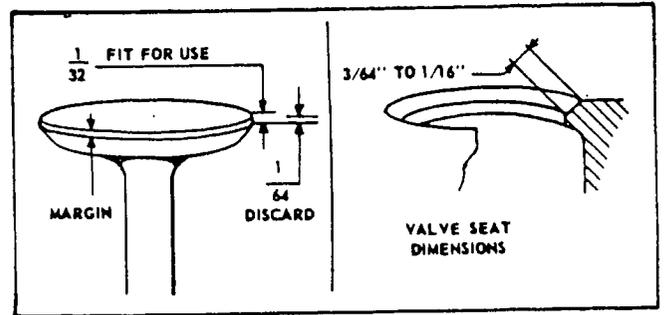


Lubricate the valve stem and pull Intake Valve out slowly, to avoid damage to the Valve stem seal.



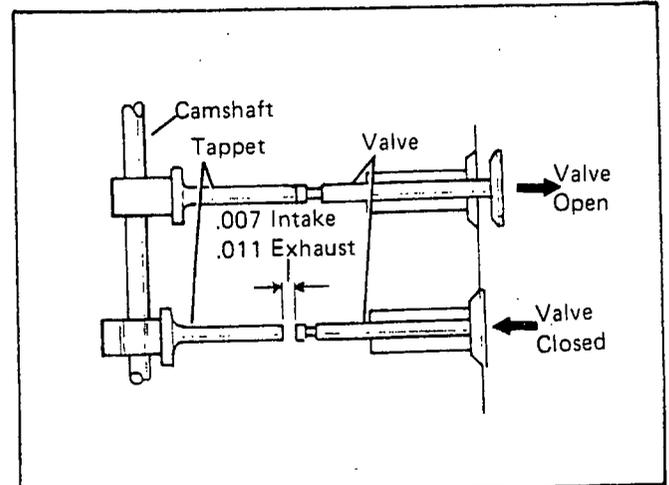
## REFACE VALVES AND SEATS

Valves and valve seats may be lapped or ground, using a fine lapping compound. Clean away all lapping compound after lapping. Exhaust valve faces have an angle of  $45^\circ$ , while Intake valves have an angle of  $30^\circ$ . Valve seat WIDTH should be between  $3/64$  to  $1/16$  inch - if seat is wider, use a narrowing stone or a cutter to decrease the seat width. Replace valve if its margin is  $1/64$  inch (or less) after refacing. Badly burned valves or valve seats should be replaced.



## CHECK/ADJUST TAPPET CLEARANCE

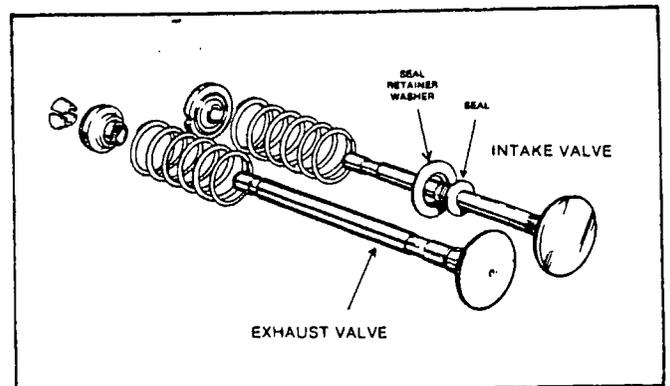
Install valves in their correct position in cylinder. DO NOT INSTALL INTAKE VALVE STEM SEAL. Turn crankshaft until exhaust valve is at its highest position. Then check Intake Valve stem to tappet clearance with a feeler gauge. Grind off end of Intake Valve stem to obtain proper clearance as shown in CHART below. Turn crankshaft to bring Intake Valve to its highest position, then check exhaust valve stem to tappet clearance in the same manner. Grind end of valve stem to obtain proper clearance.



VALVE TAPPET CLEARANCE		
WITH SPRINGS INSTALLED	INTAKE	.007" - .009"
	EXHAUST	.009" - .011"
SPRINGS NOT INSTALLED	INTAKE	.005" - .007"
	EXHAUST	.007" - .009"

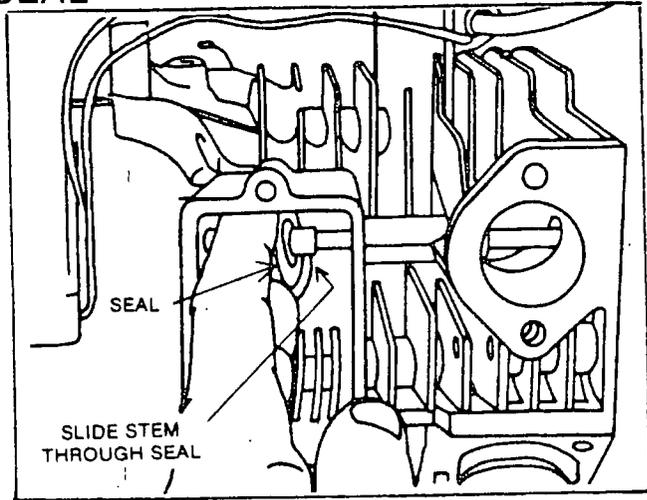
## INSTALL VALVES

Exhaust and Intake Valve components are shown at right. A new stem seal should be installed on the Intake Valve, if required. Heavier springs are used on the Exhaust Valves. Apply a light film of oil on valve stems before installing valves in valve guides.

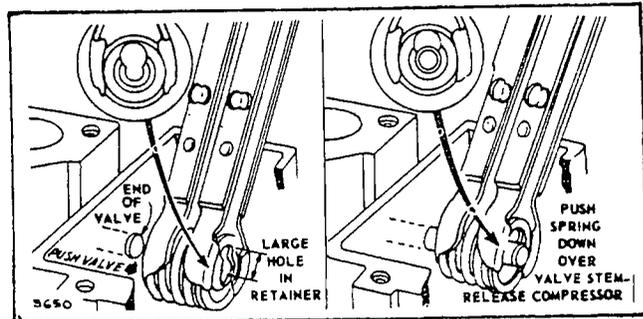


## INSTALL INTAKE VALVE AND STEM SEAL

Place seal and seal retainer washer in valve chamber. Lightly oil Intake Valve stem and guide, then install valve stem through guide. Insert end of valve stem through the stem seal and seal retainer washer. As you slowly push the valve stem through the seal, rotate the valve to prevent damage to seal.

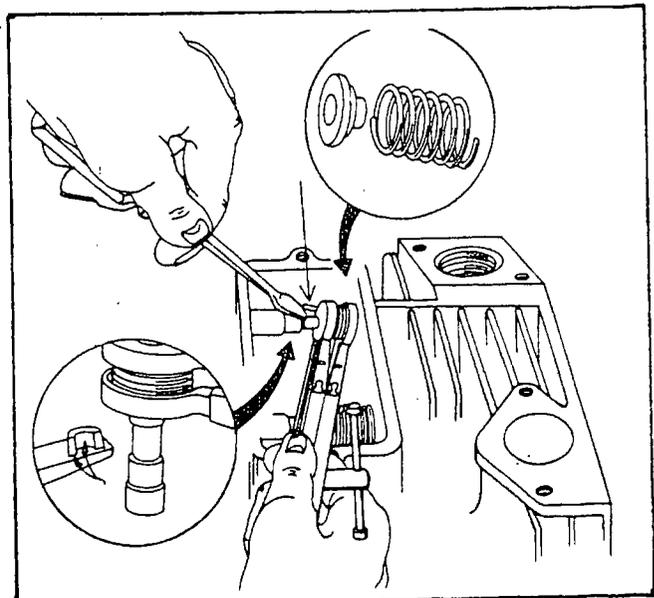


Place the valve spring and retainer into valve spring compressor. Compress spring until solid. (Make sure large diameter of spring retainer is away from valve chamber front.) Insert the compressed spring and retainer into valve chamber, then open spring compressor about 3/8 to 1/2 inch. Push valve in and press seal and retainer further onto valve stem at same time. Drop the valve stem through the larger area of the retainer slot. Move compressor to center the small area of valve retainer slot onto the valve spring shoulder. Release the spring tension and remove the compressor.



## INSTALL EXHAUST VALVE AND RETAINER

Install Valve spring and retainer into valve spring compressor and compress spring all the way. Then insert the compressed spring and retainer into valve chamber. Push valve into place and slide stem through retainer. Hold the spring toward the cylinder head and position valve so it is fully seated. Insert collars into valve stem groove (grease may be used). Lower the spring until the retainer is around collars, then remove valve spring compressor. **MAKE SURE BOTH COLLAR HALVES ARE IN PLACE.**



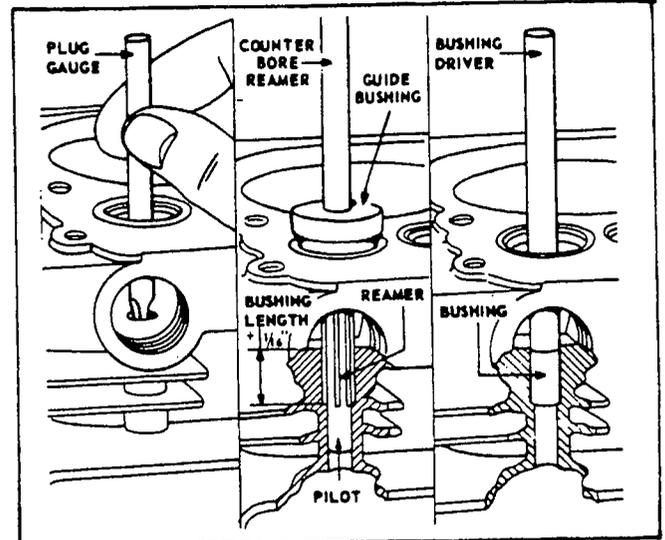
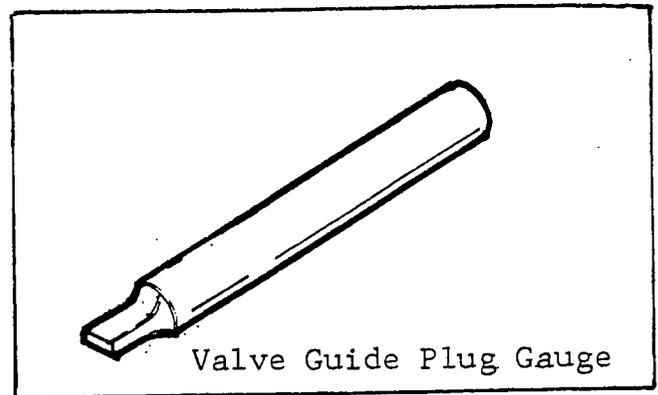
## VALVE GUIDES

Valve Guides (Part No. 49271) are replaceable, providing the following tools are available:

1. Valve Guide Plug Gauge
2. Reamer
3. Reamer Guide Bushing

Sources for these tools will be furnished on request.

If the flat end of the Valve Guide Plug Gauge can be installed into the Part No. 49271 valve guide more than 5/16 inch, the guide is worn and should be replaced. Use a Reamer and Reamer Guide Bushing to ream out the worn Valve guide. Lubricate Reamer with kerosene. Ream 1/16 inch deeper than valve guide bushing 49271 - DO NOT REAM THROUGH THE GUIDE. Use a brass driver and press valve guide bushing 49271 into place until top of bushing is flush with top of valve guide. The bushing requires no further reaming and a standard valve can be used.

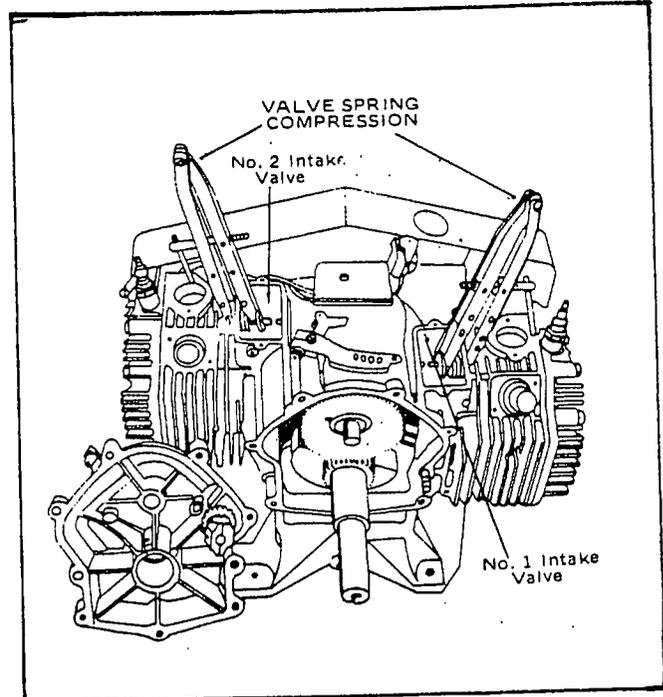


# CRANKSHAFT & CAMGEAR

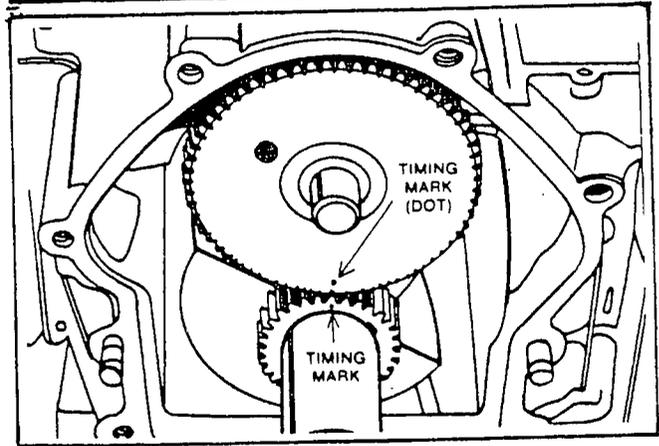
9

## CRANK SHAFT REMOVAL

Remove rust and burrs from power take-off end of crankshaft. Remove crankcase sump cover. If valves are installed, use valve spring compressor to compress Intake Valve springs.



Note timing mark on Camgear and Crankshaft Gear. Carefully remove Camgear - tappets must be clear of cam lobes before camgear can be removed.

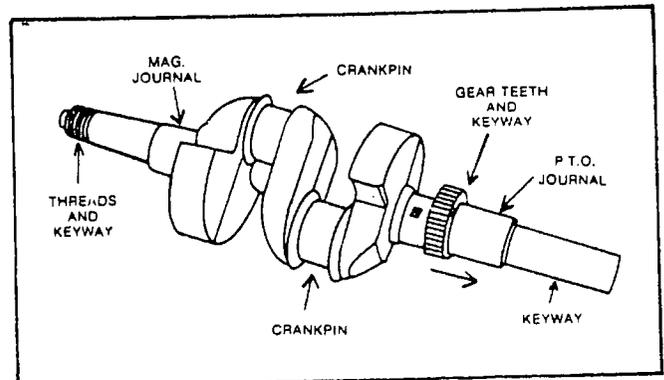


Remove spark plugs. Remove both connecting rod caps (see Section 10). Rotate crankshaft until connecting rods are free of crankshaft throws. Remove crankshaft.

## CHECKING THE CRANKSHAFT

The CHART below shows rejection sizes of crankshaft wear points - replace crankshaft if any points are worn smaller than the size indicated.

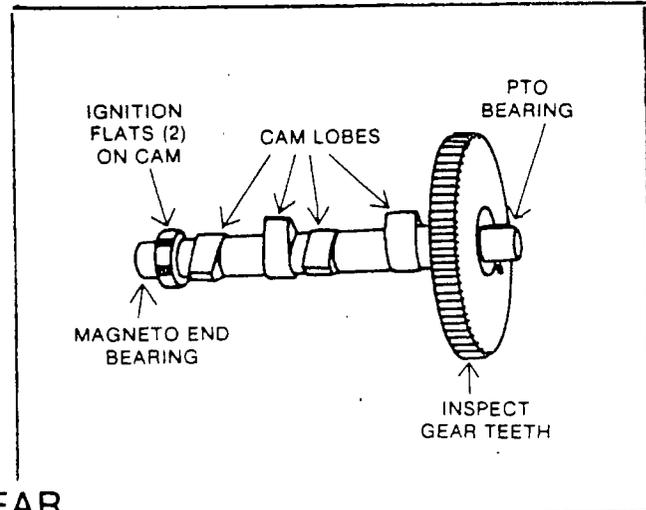
PTO JOURNAL	MAG JOURNAL	CRANKPINS
1.376	1.376	1.622



## CHECKING THE CAMGEAR

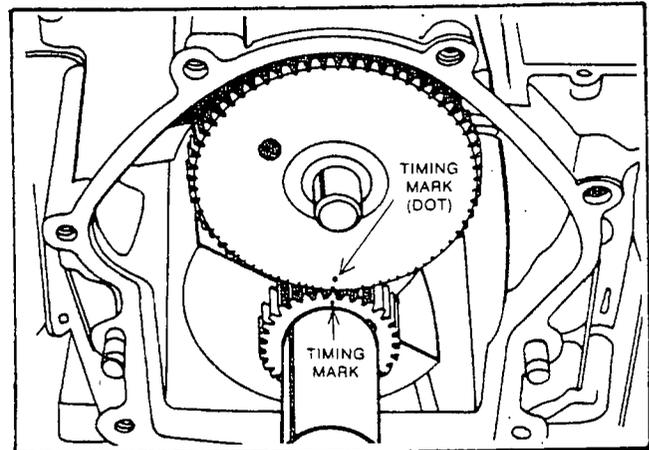
Inspect Camgear teeth for wear, nicks or damage. Camgear, Camgear journals, and cam lobe rejection sizes are listed in the CHART below.

CAMGEAR OR SHAFT JOURNALS	CAM LOBES
0.623	1.124



## INSTALL CRANKSHAFT AND CAMGEAR

Install crankshaft. Then install tappets. Finally, install Camgear. Make sure timing marks are aligned as shown at right. Install connecting rods and caps as outlined in Section 10.



## CRANKCASE COVER

Protect oil seal when installing the crankcase cover. Use oil or grease on sealing edge of the seal. Seal must slip easily over crankshaft. If sharp edge of seal is cut or bent under, the seal will leak. Lubricate cover bolts with oil before installing. Tighten bolts down evenly to 10 Foot-Pounds.

## CRANKSHAFT END PLAY

Crankshaft end play should be between 0.002 and 0.008 inch. To obtain correct end play, new gasket sets include 3 gasket thicknesses - 0.005, 0.009, 0.015 inch. Check end play with one 0.015 inch gasket installed. If end play is less than 0.002 inch, add additional gaskets in various combinations to obtain correct end play.

# PISTONS, RINGS & RODS

10

## REMOVE PISTON & CONNECTING ROD

Remove Cylinder Head (Section 8). Remove crankcase sump cover and cam-gear (Section 9). Remove Connecting Rod cap. Remove any carbon or ridge from cylinder wall. Push piston and rod out through top of cylinder.

### IMPORTANT

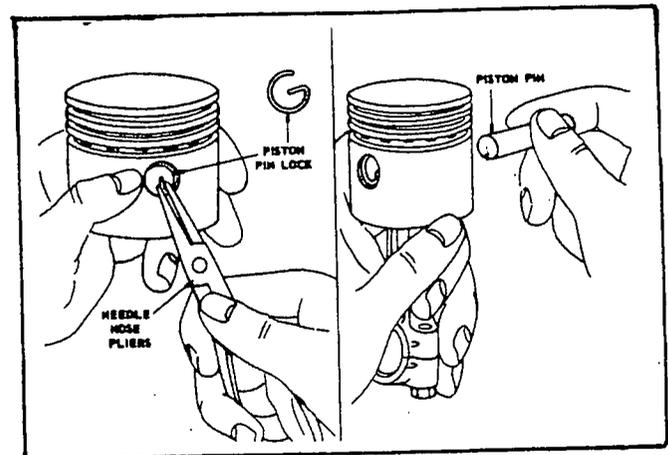
Keep each piston, connecting rod and cap together as a set. All parts must be installed in the same cylinder from which they were removed. Parts are not interchangeable between sets.

### NOTE

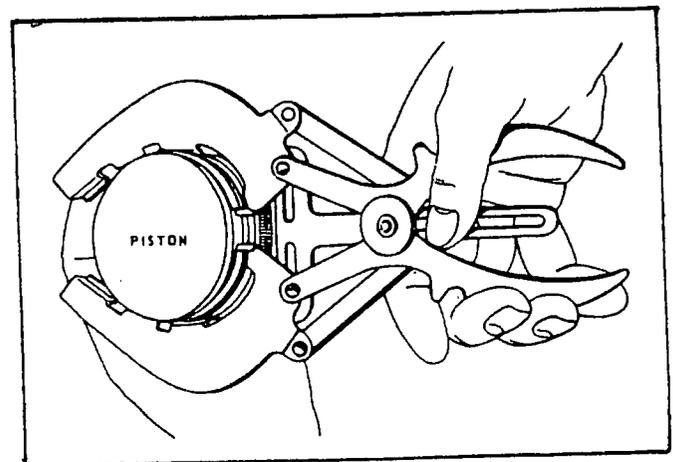
Connecting rod bolt locks are not used. Special hardened washers are installed under connecting rod cap bolts.

## REMOVE CONNECTING ROD

Use needle nose pliers to remove piston pin lock. Then slide piston pin from piston and remove connecting rod.

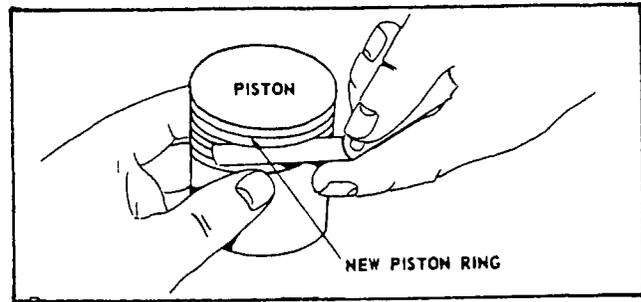


Using a ring expander, remove rings one at a time.



## CHECK PISTON

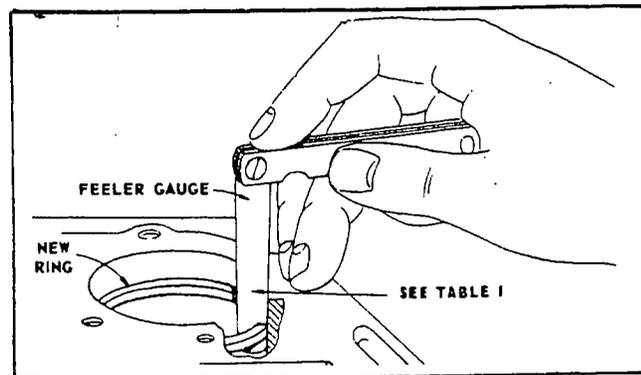
If the piston is not to be replaced or cylinder is not to be re-sized, piston should be checked. Clean carbon from top ring groove. Install a NEW ring in the groove. If a 0.007 inch (or larger) feeler gauge can be inserted in the space above the ring, piston is worn and should be replaced.



## CHECK RINGS

Clean all carbon from rings and from cylinder bore. Install old rings down into the cylinder bore, one at a time, one inch into the bore. Check ring gap with feeler gauge. If gap is greater than shown in CHART below, replace the ring.

COMPRESSION RING	OIL RING
0.035	0.045



## CHECK CONNECTING ROD

Replace rod if crankpin bearing is scored or worn. DO NOT ATTEMPT TO FILE OR FIT THE ROD. The following CHART shows rejection sizes of crankpin bearing and piston bearing holes.

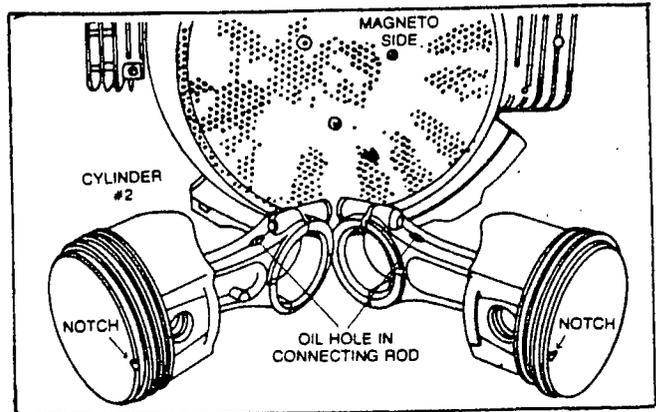
CRANKPIN BEARING	PISTON PIN BEARING
1.252	0.802

## CHECK PISTON PIN

Replace the piston pin if it is more than 0.0005 inch out-of-round.

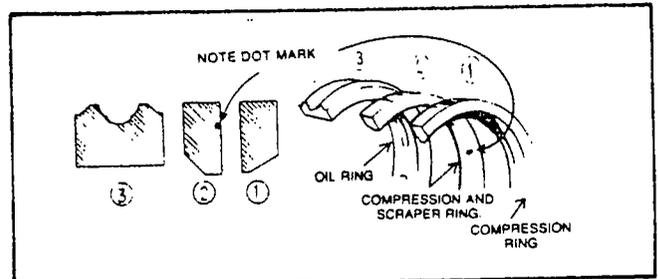
## ASSEMBLE PISTON AND CONNECTING ROD

Place a piston pin lock into the groove at one side of piston. Insert piston pin from opposite side of piston, through rod, until it is stopped by the pin lock. Install second piston pin lock. Make sure locks are firmly set into grooves. Oil holes in connecting rods must face as shown at right.



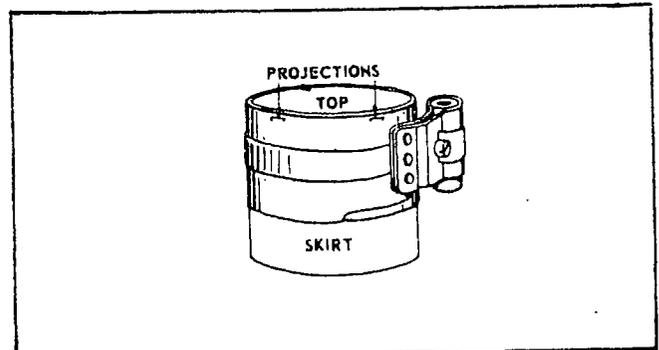
## ASSEMBLE RINGS TO PISTON

Correct piston ring positioning is shown at right. An expander goes under the oil ring. The dot on the second compression ring must face direction shown.

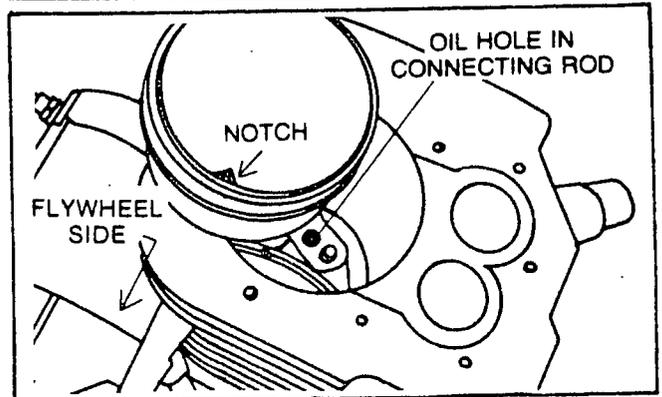


## INSTALL PISTON AND CONNECTING ROD

Oil the rings and the piston skirt. Use ring compressor to compress the rings as shown at right.

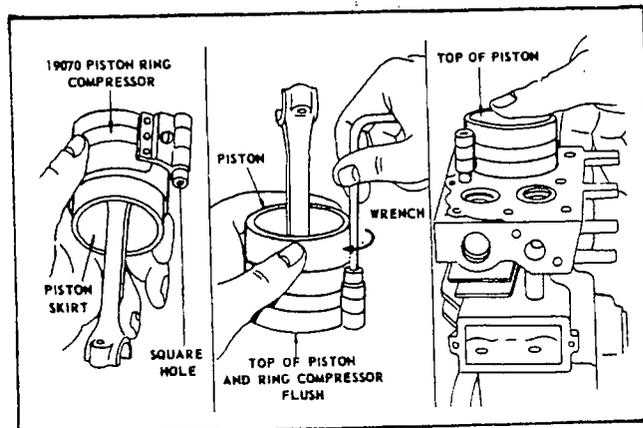


Turn the piston and ring compressor upside down on a clean, flat bench. Push piston downward until compressor is flush with piston head. Draw compressor tight, then loosen slightly. Notch on piston must face the flywheel side of cylinder when installed, as shown at right.



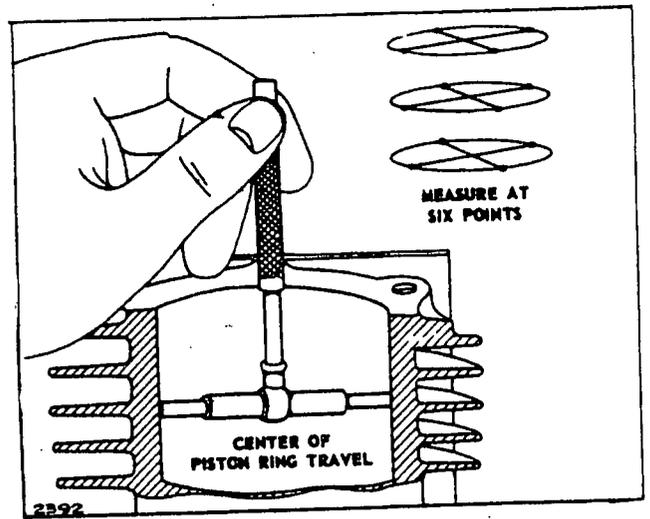
Rotate crankshaft so that the journal is all the way down. Clean and oil cylinder bore. Carefully push the piston into cylinder bore. When all rings are captured by the cylinder bore, remove ring compressor.

Oil the crankshaft crankpin. Pull connecting rod against crankpin and install end caps so that their assembly marks are aligned. Install oil dipper. Install special hardened washers under bolt heads. Install bolts and tighten to 190 Inch-Pounds. Rod must be able to move sideways on the crankpin after torquing.



## INSPECTION

Inspect cylinders for cracks, broken fins, stripped bolt holes, and scoring of cylinder walls. Use an inside micrometer or telescoping gauge to determine size of cylinder bore. Measure at right angles as shown at right. If bore is more than 0.003" oversize, or more than 0.0025" out-of-round, it must be resized. The following CHART lists STANDARD cylinder bore diameters.



STANDARD CYLINDER BORE DIAMETERS	MAX.	MIN.
	3.4375	3.4365

## RESIZING

ALWAYS RESIZE TO EXACTLY 0.010", 0.020", or 0.030" OVER STANDARD SIZE, AS SHOWN IN THE PRECEDING CHART. If resizing is done accurately, standard oversize pistons and rings will fit perfectly and proper clearances will be maintained. Cylinders can be resized with a hone. Use the stones and lubricants recommended by the hone manufacturer to produce the correct cylinder wall finish. (NOTE:- An acceptable honing oil can be made by mixing 4 parts SAE 30 oil with 1 part kerosene.) If a boring bar is used, a hone must be used after the boring operation to produce the proper cylinder wall finish.



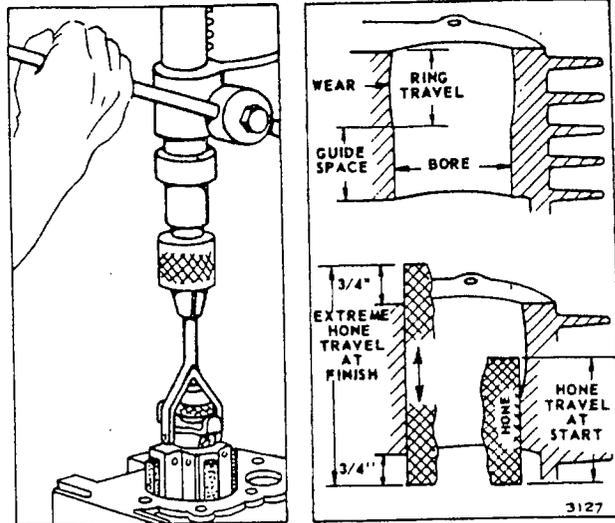
### CAUTION

If cylinders are to be resized at a "Job Shop", do not take pistons with the cylinders. If pistons and cylinders are sized to match, seizure will occur. Oversizing must be done to exact oversizes specified in CHART.

## HONING

Honing can be done with a portable electric drill. However, it is easier to hone with a drill press. Before starting the honing operation, clean cylinder walls thoroughly.

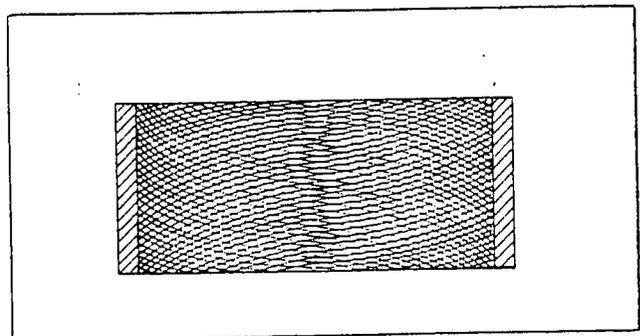
Fasten cylinder to honing plate. Use a level to align drill press spindle with bore. Oil surface of drill press table liberally. Set plate and cylinder on drill press table. DO NOT ANCHOR TO TABLE. If using portable drill, set plate and cylinder on floor. Install hone drive shaft into chuck of drill press or portable drill. Insert hone into cylinder. Connect drive shaft to hone and set stop on drill press so that hone can extend only 3/4 inch to 1 inch from top or bottom of cylinder. If using a portable drill, set a wood block inside cylinder as a stop for the hone.



With hone in center of cylinder bore, tighten adjusting knob until stone fits snugly against cylinder wall. DO NOT FORCE. Hone should run at 300 to 700 rpm. Lubricate hone as previously recommended. Be sure that cylinder and hone are centered and aligned with drive shaft and drill spindle. Start the drill. As the hone spins, move it up and down at lower end of cylinder. (Cylinder is probably not worn at bottom, but will guide the hone to straighten the bore.) As bottom of cylinder enlarges, gradually increase stroke lengths until hone travels full length of cylinder bore. DO NOT EXTEND HONE MORE THAN 3/4 to 1 INCH AT EITHER END OF CYLINDER BORE. As cutting tension decreases, stop hone and tighten adjusting knob. Check the cylinder bore diameter frequently with an accurate micrometer. Hone about 0.0005 inch larger than required to allow for shrinkage when cylinder cools. When within 0.0015 inch of desired size, change from rough stone to finishing stone.

## CYLINDER FINISH AND CLEANER

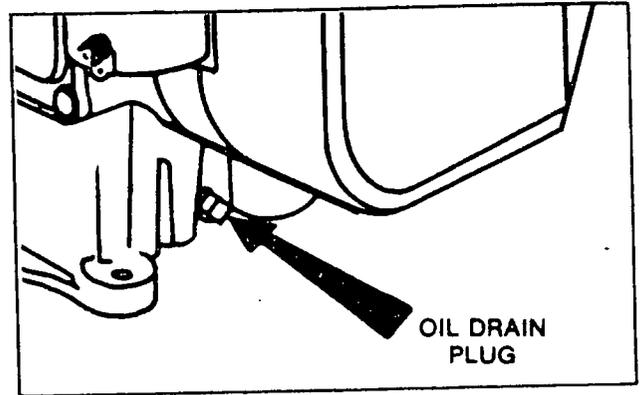
The finished cylinder wall should have a crosshatch appearance, as illustrated at right. This will permit proper lubrication and ring break-in.



After honing, clean entire cylinder thoroughly with a brush, soap and hot water. Do NOT use kerosene or gasoline - solvents of this type will not remove all of the honing grit.

## GENERAL

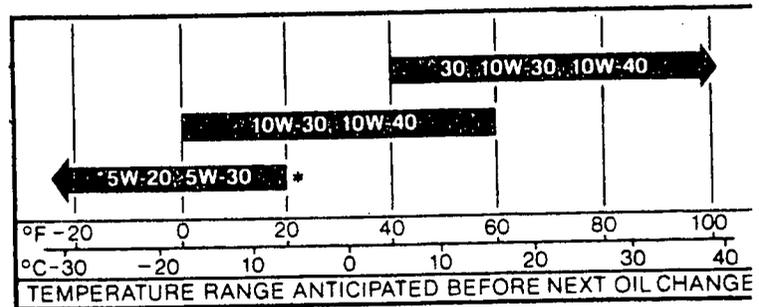
Change oil after the first 5 operating hours, every 25 hours of operation thereafter. Remove oil drain plug and drain oil while engine is warm. Reinstall drain plug. Remove dipstick and fill engine crankcase with new oil of proper grade. Use same grade of oil in OIL MAKE-UP TANK as was used in crankcase. Crankcase oil capacity is approximately 3.5 pints (1.65 liters).



## OIL RECOMMENDATIONS

Use any high quality detergent oil having a classification that includes SC, SD or SE, as recommended in CHART at right. No special additives should be used.

### RECOMMENDED SAE VISCOSITY GRADES



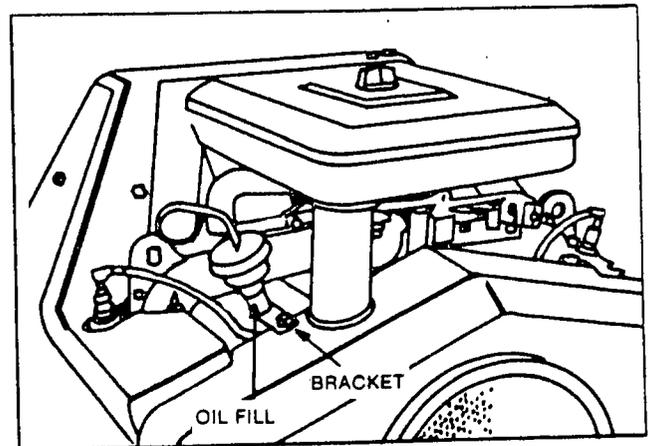
\*If not available, a synthetic oil may be used having -5W-20, 5W-30 or 5W-40 viscosity.

## OIL FILL AND DIPSTICK

A plastic oil fill tube is used, with the bottom of the tube pressed into a rubber grommet and sealed. A leak at the base of the tube or in the dipstick seal can cause loss of crankcase vacuum. This, in turn, will result in smoke discharge from the exhaust and failure of the oil make-up system to function.

## CRANKCASE BREATHERS

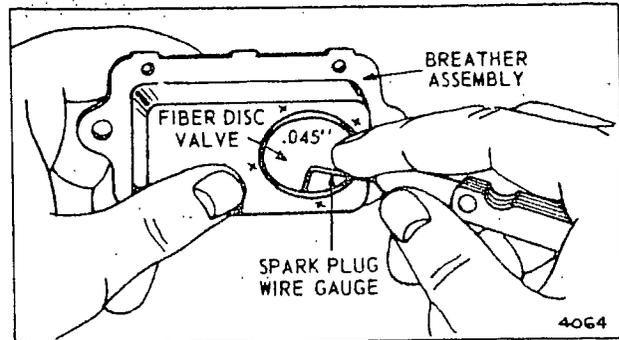
The crankcase breathers act to maintain a partial vacuum in the crankcase. This vacuum prevents oil from being forced out at the rings, oil seals, and gaskets.



## CHECKING BREATHERS

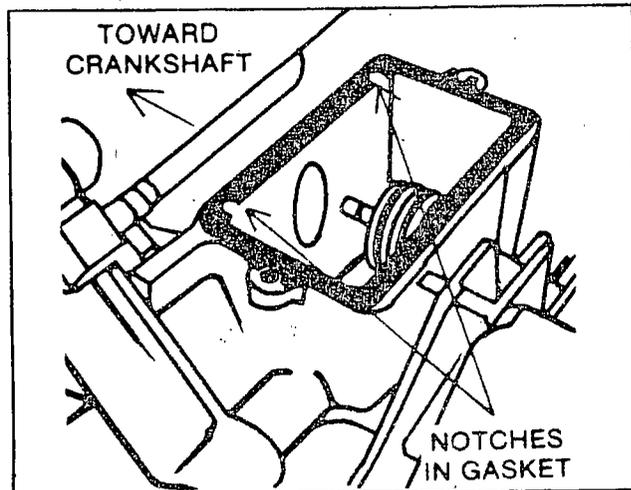
To remove breather assemblies, remove carburetor air cleaner and intake manifold. Remove the dipstick tube. Then remove air guide. Finally, remove breathers.

If a 0.045" wire gauge can be inserted between the breather fiber disc valve and body, fiber disc valve is defective. A spark plug wire gauge may be used. DO NOT USE FORCE WHEN CHECKING THIS CLEARANCE.

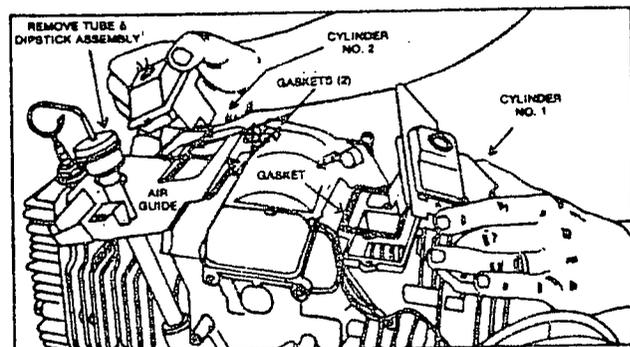


## INSTALLING BREATHERS

Install a new gasket each time the breather assemblies are removed and reinstalled. Make sure breather gaskets are properly located. Locate gasket notches as shown at right. Make sure retaining screws are tight to prevent leakage.

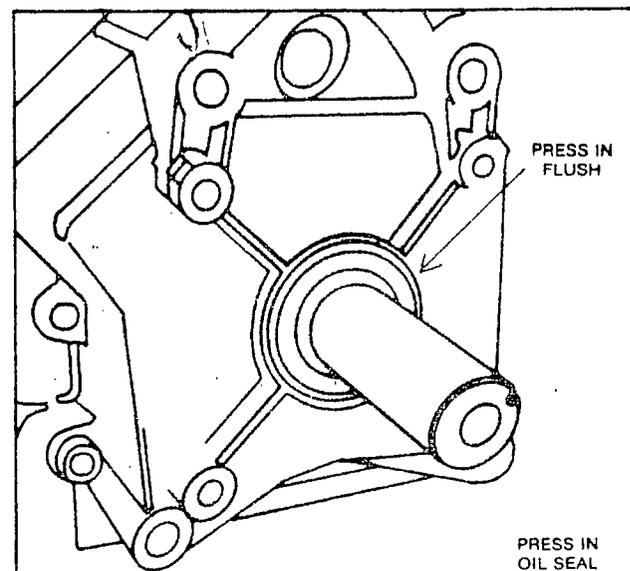


Make sure breather tubes are not hardened or damaged, and that the tubes seal properly.

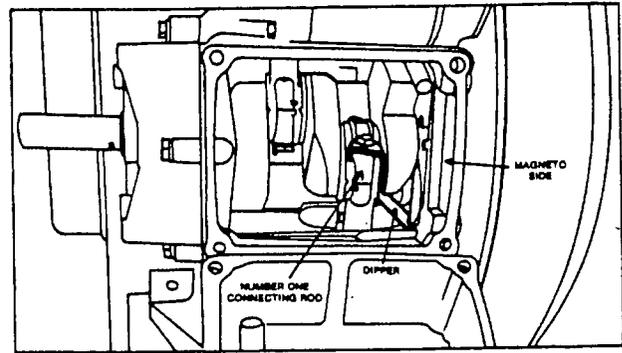


## OIL SEAL

Always install the oil seal with sharp edge of rubber toward engine interior. Lubricate oil seal inside diameters with Lubriplate (or equivalent), before assembling engines. Press replacement seals in, flush with engine.

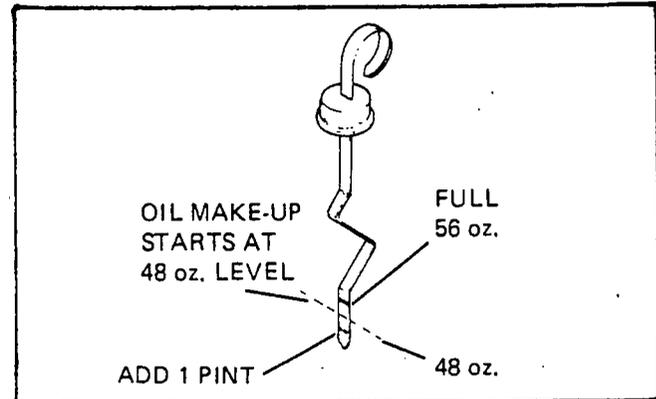
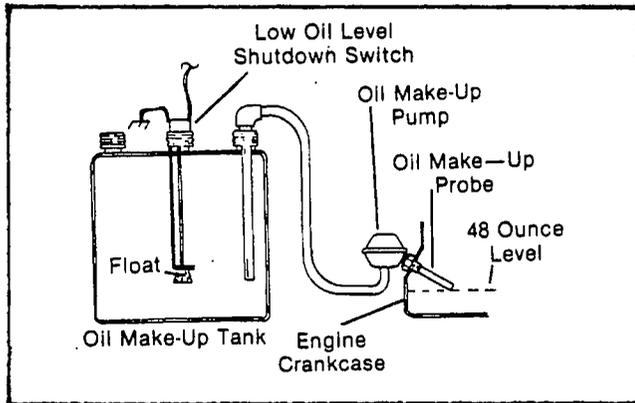


The oil dipper must be properly installed on the number 1 connecting rod, as shown at right. A special washer is installed between dipper and bolt head.



## OIL MAKE - UP SYSTEM

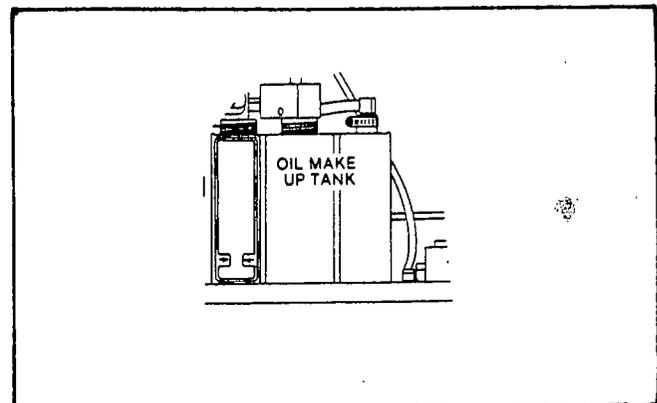
The Oil Make-up System functions to prevent dangerously low engine crankcase oil levels during operation. The system consists of (1) an Oil Make-up TANK with low oil level shutdown switch, (2) an Oil Make-up PUMP, (3) an Oil Make-up PROBE, and (4) interconnecting lines.

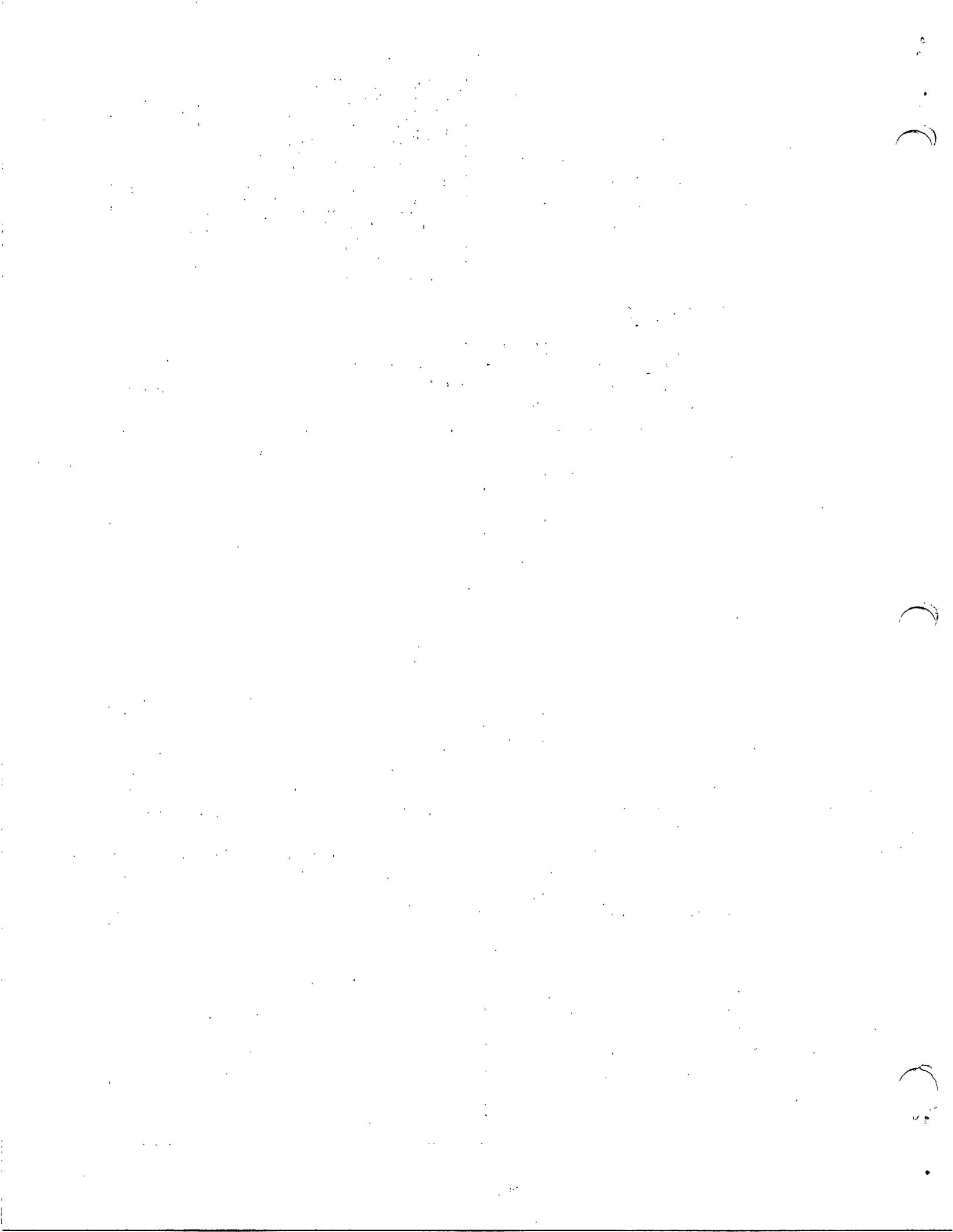


The Oil Make-up Pump will not act while the tip of the Oil Make-up Probe is submerged in oil. If oil level in the crankcase should drop to about the 48 ounce level, the tip of the Probe will be exposed to crankcase vacuum/pressure pulses. These pulses actuate the Oil Make-up Pump diaphragm and the pump action then draws oil from the Tank. When the Probe tip is again submerged in oil, pumping action stops.

During initial filling of the engine crankcase, approximately 56 ounces ( $3\frac{1}{2}$  pints) of oil is added. This amount of oil brings the oil level up to the oil dipstick FULL mark. The Oil Make-up System will not start to pump oil into the crankcase until oil level has reached the 48 ounce point, about halfway between the dipstick FULL mark and ADD 1 PINT mark.

If Oil Make-up Tank oil level should drop below the OIL CHANGE LEVEL arrows on the tank side, the float-operated Low Oil Level Shutdown Switch will ground the engine ignition system and the engine will automatically shut down.





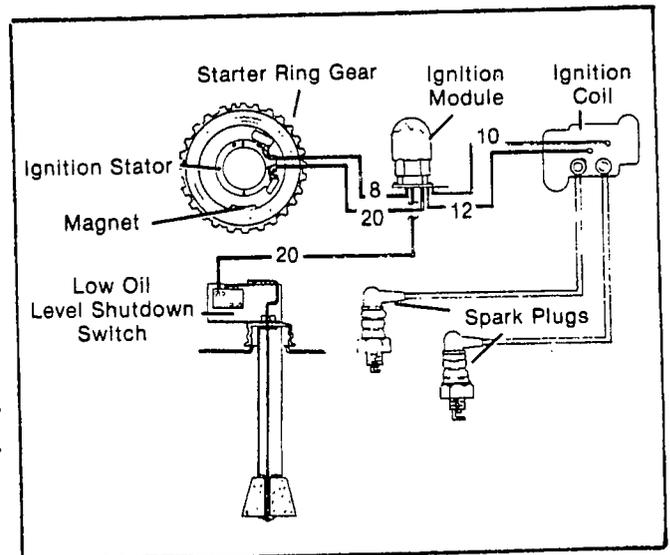
## GENERAL

The engine Ignition System is a solid state capacitor discharge type, often called a "breakerless" system due to the absence of breaker points. The system consists of the following components:

1. Engine flywheel magnet
2. Ignition stator
3. Ignition Module
4. Ignition Coil
5. Spark Plugs
6. Interconnecting wiring

## OPERATION

Engine rotation causes the starter ring gear to turn. A magnet rotates with the ring gear to induce current flow into the charge and trigger coils of the Ignition Stator. Current flow from the Charge coil passes through Wire #8 and charges a capacitor in the Ignition Module. At 26° BTDC of the engine piston stroke, current flow from the Ignition Stator trigger coil is delivered through Wire #20 to the base of a transistor in the Ignition Module, causing the Ignition Module capacitor to discharge. The capacitor discharges through Wire #12, through the Ignition coil primary windings, and through Wire #10 to ground. Current flow through the coil primary windings induces a high voltage into the ignition coil secondary windings to fire the spark plug gaps.



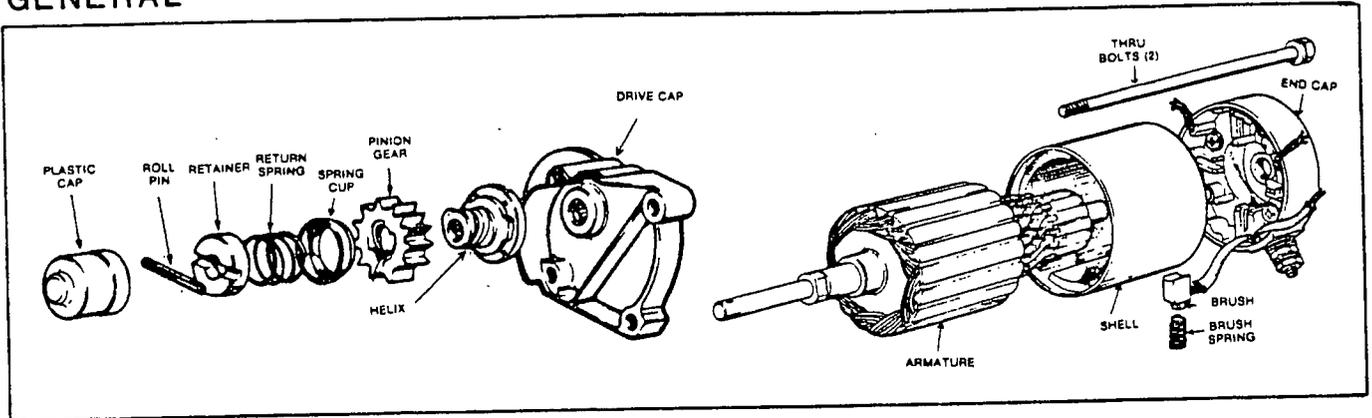
## SPARK PLUGS

Use a Champion J-8, Auto-Lite A-71, or AC No. GC-46 spark plug. Set plug gap to 0.030 inch. Clean spark plugs with pen knife or with wire brush and solvent. DO NOT GRIT BLAST. Replace plug if electrodes are burned away or if porcelain is cracked.

# STARTER MOTOR

14

## GENERAL

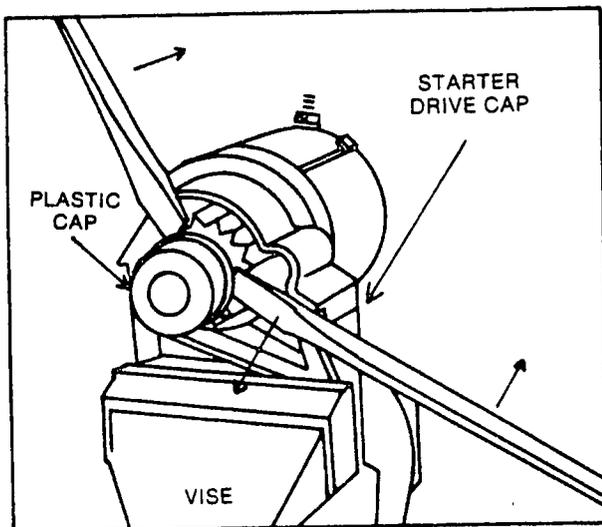


An exploded view of the starter is shown above. The starter uses a gear type engagement, similar to an automobile. Energizing the starter motor causes the helix on the starter to drive a pinion gear into engagement with a ring gear. The pinion gear then cranks the engine.

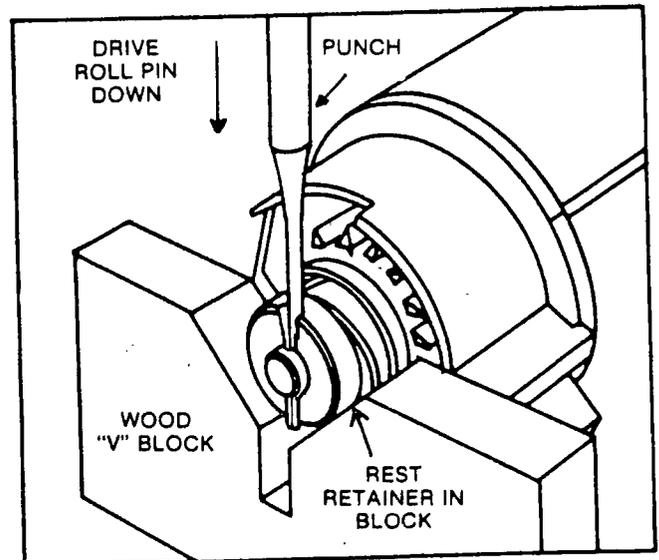
## CHECK STARTER MOTOR DRIVE

When the starter motor is energized, the pinion gear should move out on its helix to engage the ring gear. If the motor drive does not react properly, inspect helix and pinion gear for freedom of movement. If sticking or binding occur, the condition must be corrected. Pinion must move freely on its helix. **DO NOT LUBRICATE DRIVE ASSEMBLY.**

## DISASSEMBLE STARTER MOTOR DRIVE



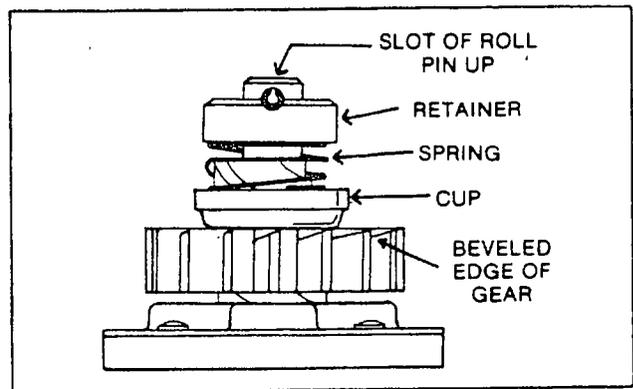
Clamp starter drive cap in a vise. **DO NOT CLAMP MOTOR SHELL IN VISE.** Use two screwdrivers to remove the plastic cap, as shown. If cap becomes damaged, it must be replaced.



Use a 1/8 inch diameter punch and a hammer to drive the roll pin out. Rest retainer in a wood V-block, as shown.

## ASSEMBLE STARTER MOTOR DRIVE

Install pinion gear with beveled edge away from starter. Install clutch and gear onto shaft, followed by cup, spring and retainer. Press or drive roll pin through the slot on retainer and through hole in armature shaft. Position slot of roll pin up as shown. Roll pin must be centered within 1/32 inch. Press plastic cap into position until it locks into place.

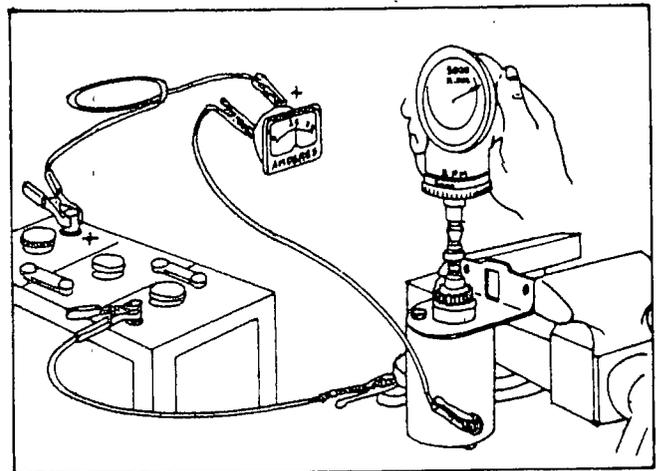


## TESTING THE STARTER MOTOR

To check the starter motor, the following equipment is needed:

1. Tachometer capable of reading 10,000 rpm
2. A 12 volt battery
3. Ammeter capable of reading 50 Amperes

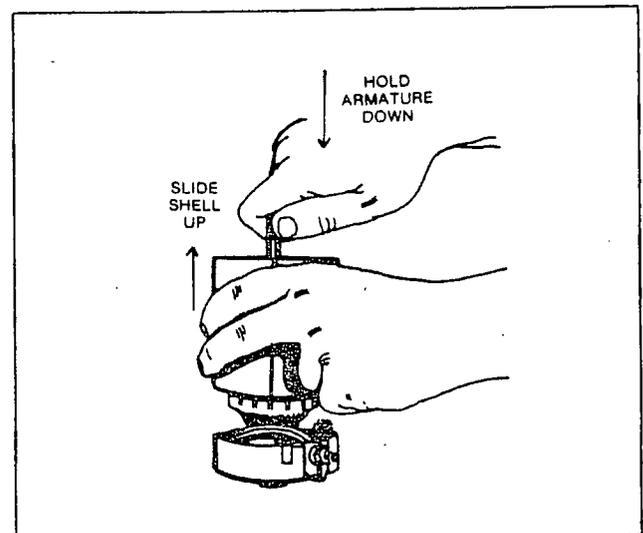
Connect starter motor, battery and ammeter as shown at right. Insert tachometer into starter motor and energize motor. Motor should run at 6200 rpm (minimum) and current draw should not exceed 16 amperes (maximum). DISREGARD SURGE CURRENT.



## STARTER MOTOR DISASSEMBLY

To disassemble the starter motor, first remove the starter drive as outlined previously. Then remove the mounting bracket from the starter motor shell by removing the two through bolts.

Push down on armature shaft and slide the shell up and off. Remove armature from end cap.





## CAUTION

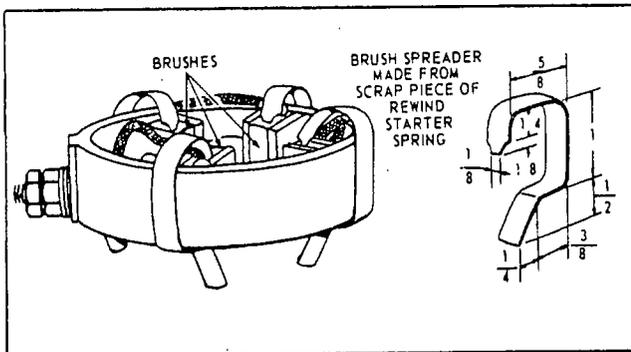
Never clamp starter motor in a vise or strike motor with a hammer. Motors contain two ceramic magnets. These magnets can be broken or cracked if housing is deformed or dented.

Inspect starter motor parts. Clean all dirt from armature, end cap, motor support, etc. DO NOT SOAK BEARINGS, HOUSING OR ARMATURE IN A CLEANING SOLUTION. Clean commutator with fine sandpaper - NOT WITH EMERY CLOTH. Check brushes for poor seating, weak springs, dirt, oil or corrosion. Brush spring tension should measure 17 - 25 ounces. When worn to 1/8 inch or less, replace brushes. See illustrations below.

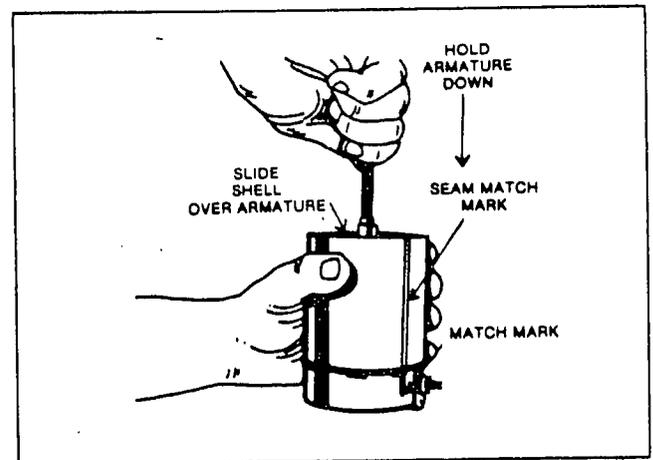
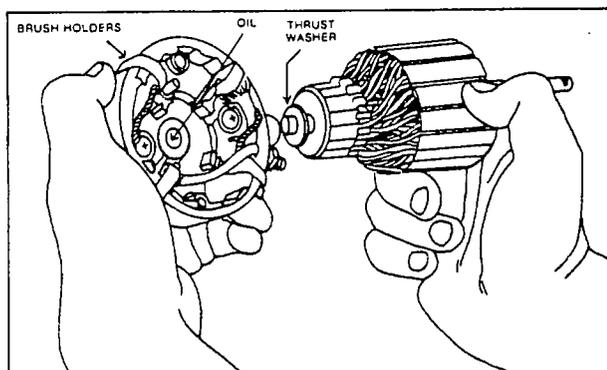
## STARTER MOTOR REASSEMBLY

Make sure all parts have been thoroughly inspected. Lightly lubricate end cap bearing with No. 20 oil, then reassemble as follows:

1. Insert brushes into their respective holders. A locally fabricated tool, as shown at right, should be used to hold brushes clear of commutator.



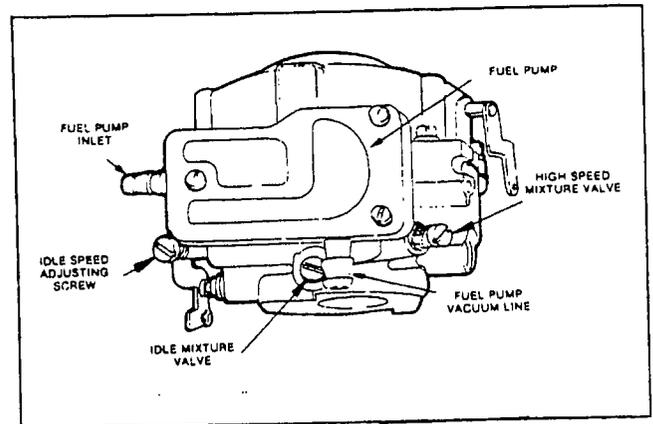
2. Install armature into end cap.



3. Slide motor shell over armature with notch toward end cap. Line up marks on end cap and shell. Slide drive cap over end of armature and install through-bolts and lock washers. Tighten through-bolts to 45-55 inch-pounds. Make sure armature turns freely, then install starter drive components as outlined previously.

## GENERAL

The engine uses a 2-piece, down-draft carburetor, with separate high speed and idle speed fuel circuits. The carburetor includes an integral pulse-type fuel pump, capable of priming at an 18 inch maximum lift. Carburetor adjustment procedures differ from those of single cylinder engines. Adjustment procedures outlined in this manual must be carefully followed.

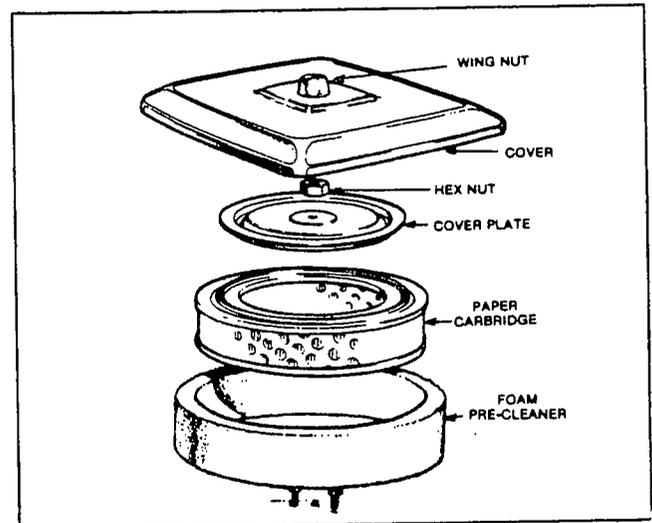


## AIR CLEANER SERVICING

Worn or damaged air cleaner gaskets must be replaced. Bent mounting studs must be straightened or replaced.

Clean and re-oil Foam Pre-cleaner every 25 operating hours or every 3 months, whichever comes first.

1. Remove wing nut and cover.
2. Slide Foam Pre-Cleaner off paper cartridge.
3. A-Wash Foam Pre-Cleaner in liquid detergent and water.  
 B-Squeeze dry  
 C-Oil with 1 ounce engine oil.  
 Squeeze to distribute oil.
4. Assemble Pre-Cleaner to paper cartridge. Install cover and tighten wing nut down.



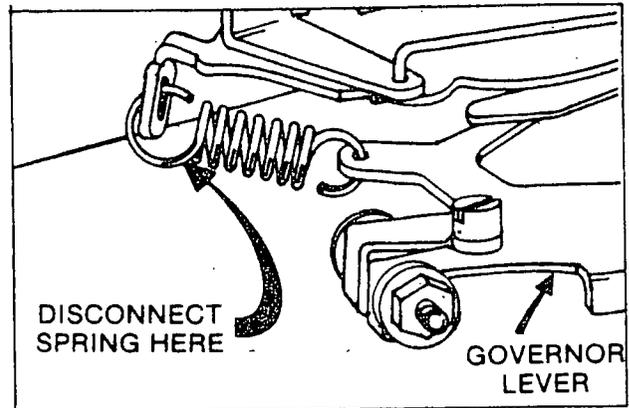
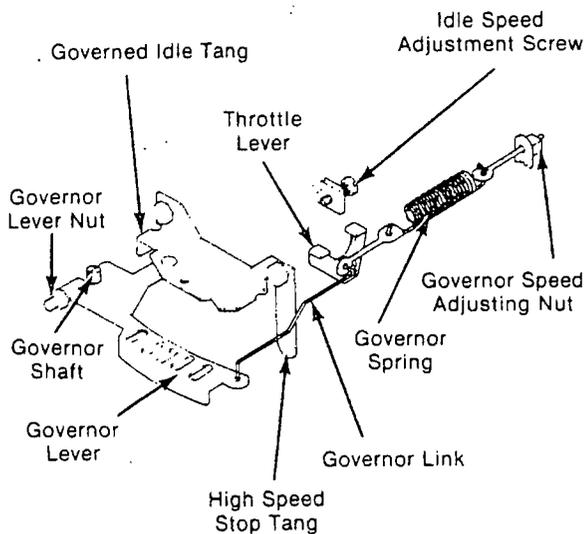
Each 100 hours of operation or every year, whichever occurs first, remove paper cartridge. Clean by tapping gently on a flat surface. Replace if damaged or extremely dirty.

### IMPORTANT

The paper cartridge used on the TXP alternator engines is a special FLAME RETARDANT element. DO NOT SUBSTITUTE ANY OTHER ELEMENT. ONLY A FLAME RETARDANT ELEMENT MAY BE USED.

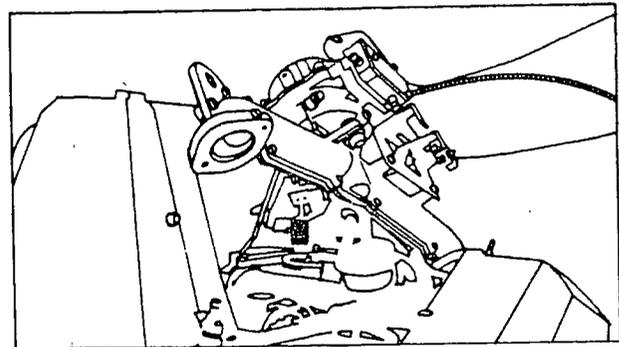
## CARBURETOR REMOVAL

The carburetor and intake manifold are removed as an assembly. Disconnect fuel line from integral fuel pump. DO NOT BREAK PLASTIC NIPPLE ON FUEL PUMP. Remove screws that retain intake manifold to engine.



Disconnect governed idle spring.

Disconnect governor link from governor lever.



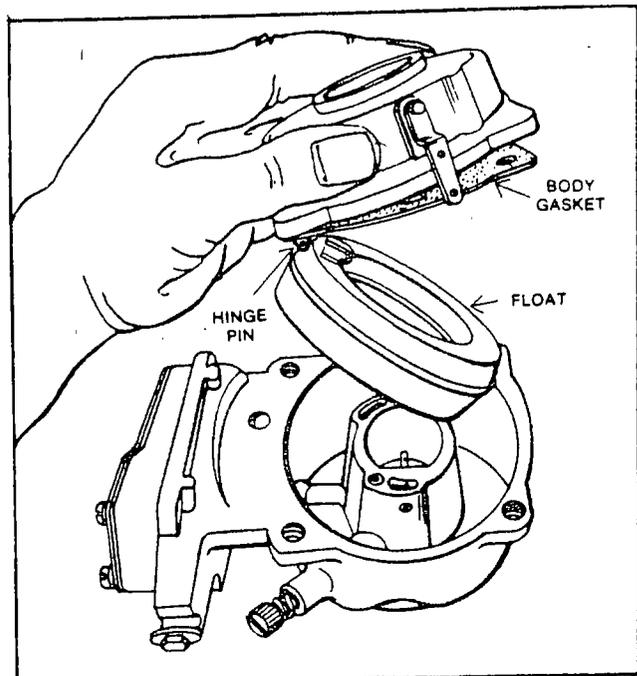
Disconnect vacuum line from its fitting at fuel pump. Remove carburetor and intake manifold.

## CARBURETOR DISASSEMBLY

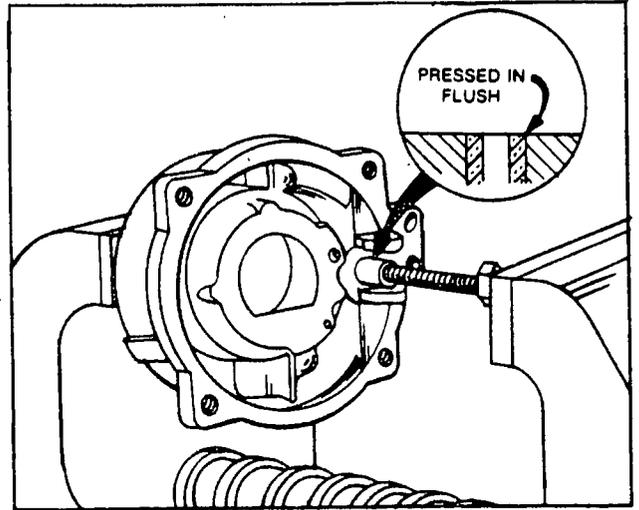
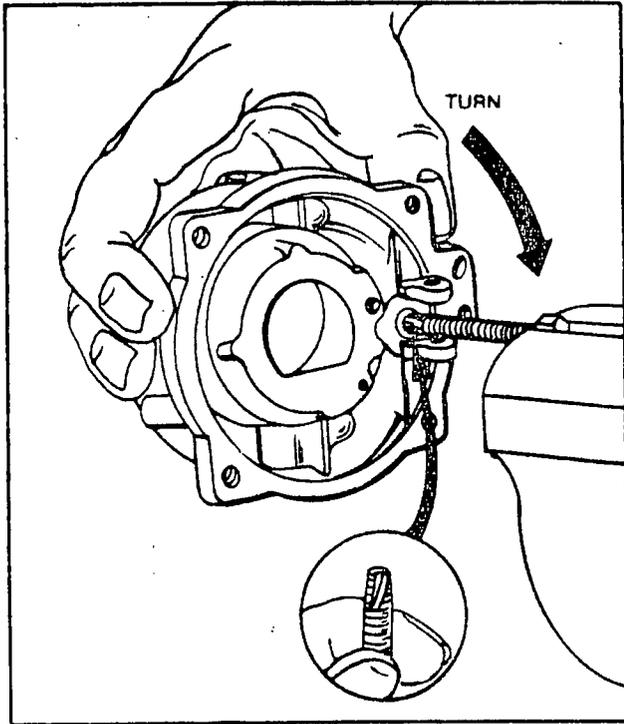
Remove idle and needle valves. Replace if damaged. Remove fuel pump body. Remove upper carburetor body, float and float valve. Check float for leakage, replace if damaged. Check float valve and seat, replace if damaged or worn. DO NOT CLEAN CARBURETOR IN ANY SOLVENT UNLESS ALL RUBBER SEALS AND NYLON PARTS HAVE BEEN REMOVED.

## CARBURETOR REPAIR

When reassembling carburetor, use new parts where necessary. Always use NEW GASKETS. Carburetor repair kits are available. The float valve has a Viton tip. Float valve seat is pressed into the carburetor body.



## FLOAT VALVE SEAT REPLACEMENT

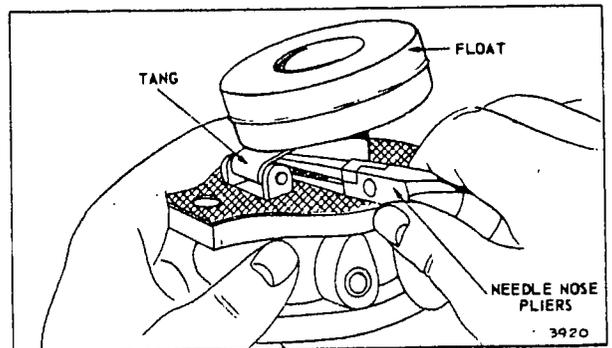
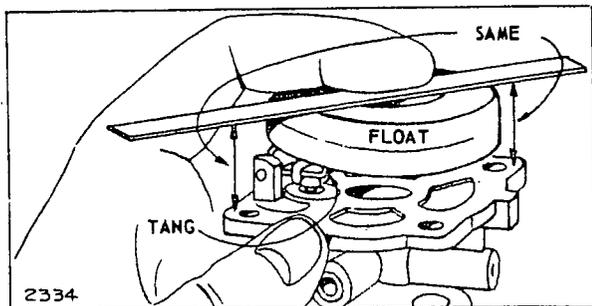
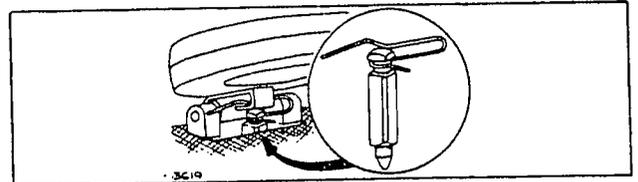


Press new seat flush with body, using old seat and screw as a driver. DO NOT PRESS SEAT BELOW SURFACE OF BODY.

Clamp the head of a self-threading screw in a vise. Then turn carburetor body to thread screw into seat. Continue turning carburetor to draw the seat out. Install a new seat into carburetor body. New seat has a starting lead.

Install float valve.

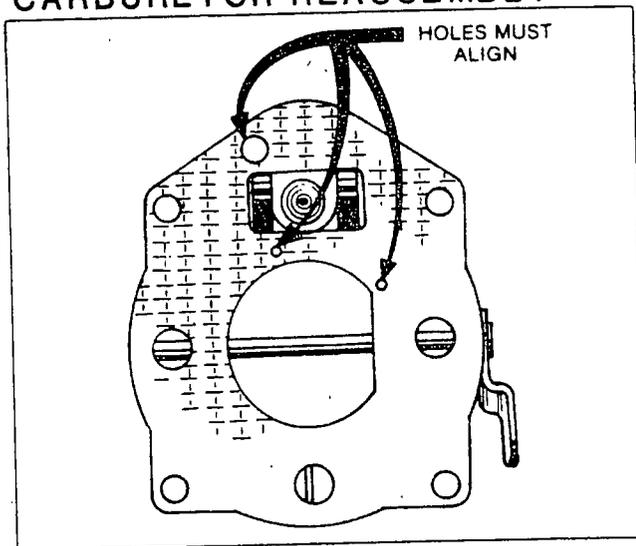
### CHECKING FLOAT LEVEL



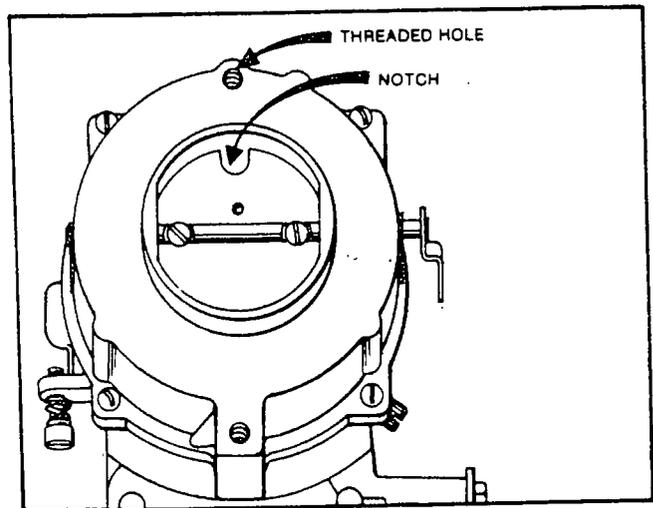
With body gasket, float valve and float installed on upper body, the float should be parallel to the body mounting surface.

If not parallel, bend tang on float until just parallel. DO NOT PRESS ON FLOAT TO ADJUST.

## CARBURETOR REASSEMBLY



Make sure holes in body gasket are properly aligned with body as shown above. Fasten upper and lower bodies together with mounting screws.

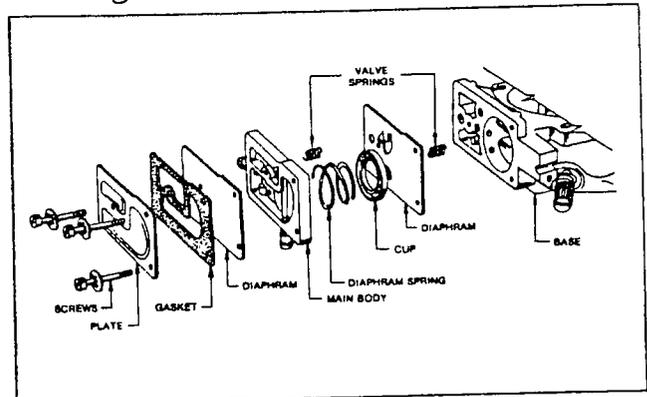


If choke shaft and plate were removed, choke plate must be reinstalled as shown above. Tighten two choke plate screw - DO NOT OVERTIGHTEN.

Screw in needle and idle valves until they just seat. Then back off on both valves  $1\frac{1}{2}$  turns. These settings are approximately correct. Final adjustment will be made with engine running.

## INTEGRAL FUEL PUMP

The integral fuel pump is operated by crankcase vacuum/pressure pulses. See exploded view at right.



Remove three screws that attach pump to carburetor. Lift pump body off carefully to prevent damage to diaphragm. Inspect diaphragm for punctures, wrinkles and wear. Replace, if damaged. Make sure diaphragm mounting surfaces are free of nicks, burrs, debris. Inspect pulse chamber spring and flapper valve springs for distortion or deterioration. Replace, if necessary. Inspect outer pulse chamber diaphragm and cover plate gasket for cracks and punctures. When assembling fuel pump, tighten screws in a staggered sequence to avoid distortion of diaphragm.

## CARBURETOR ADJUSTMENT

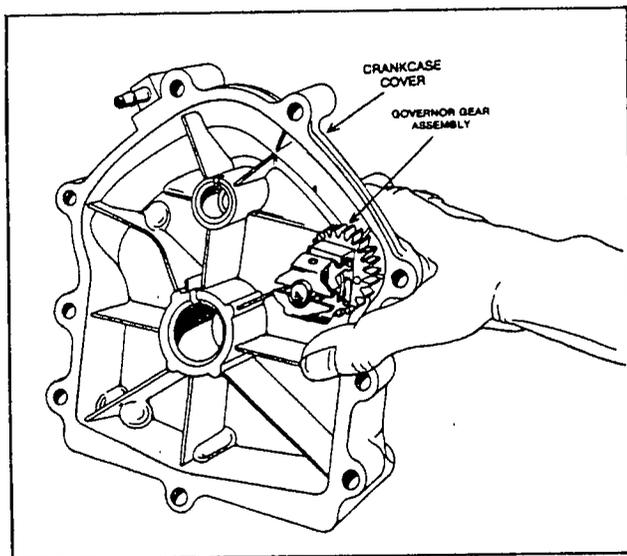
Carburetor adjustment procedures are outlined on Page 4.14, Test 23.

## GENERAL

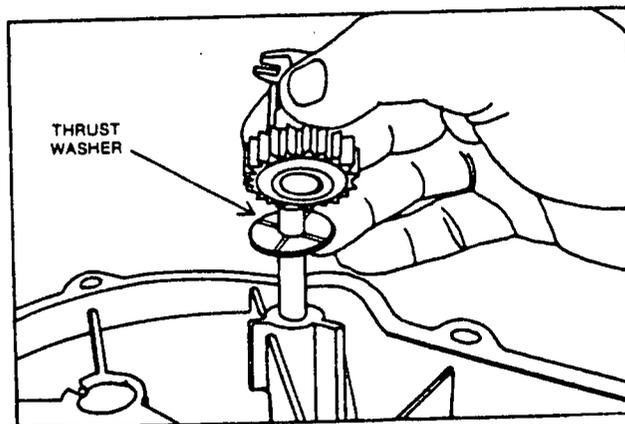
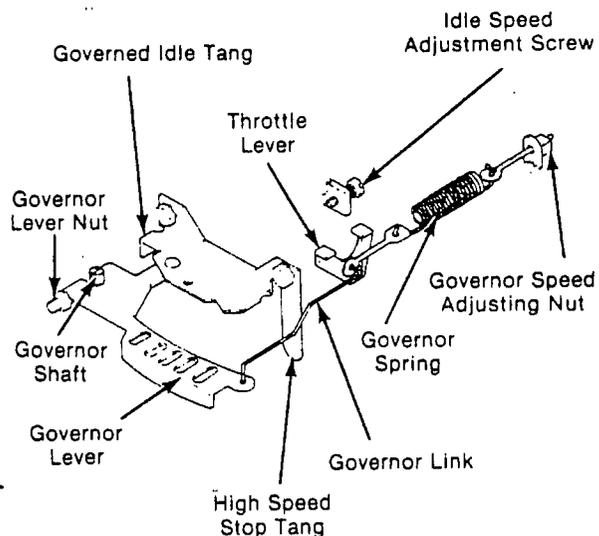
The governor functions to maintain engine speed at 1800 rpm, even though the load may vary. The governor spring tends to move the throttle open. Counterweight force tends to close the throttle. Engine speed at which spring and counterweight forces balance is called the governed speed. Governed speed can be changed by varying spring tension.

## GOVERNOR LEVER & SHAFT REMOVAL

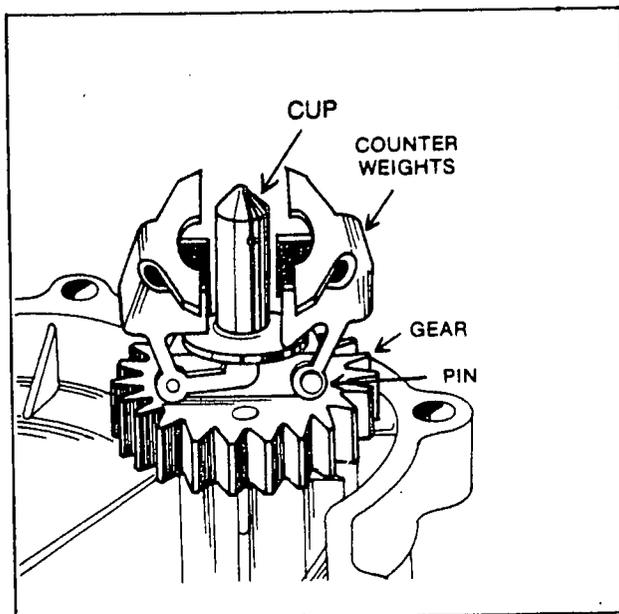
Drain crankcase oil. Rotate crankshaft until intake valve on No. 1 cylinder is wide open to relieve side pressure on cam shaft bearing. Remove crankcase cover.



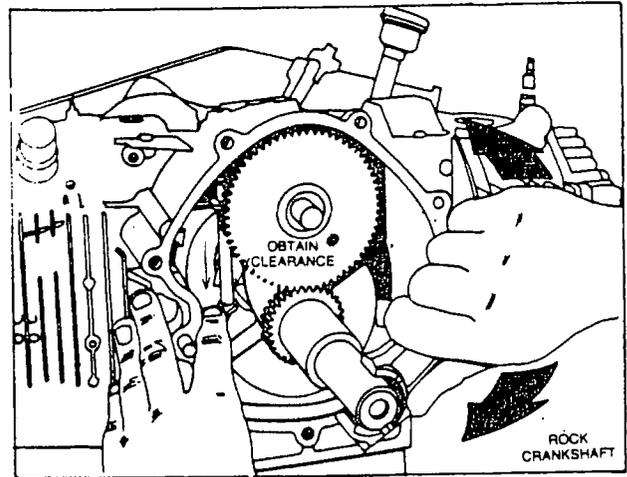
Inspect governor for wear on gear teeth, pivot pins, and counterweights. Inspect governor cup. Replace governor, if necessary.



Note location of thrust washer when removing governor from crankcase cover

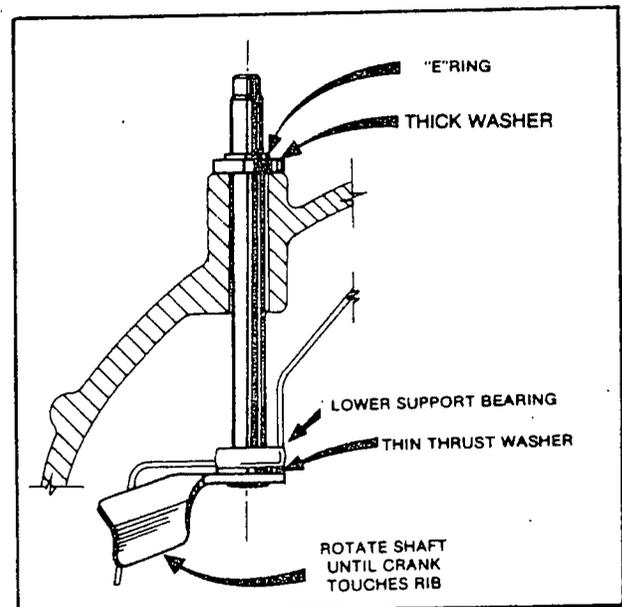


Loosen nut and remove governor lever. Rotate crankshaft to place crankshaft gear timing mark at about the 10 o'clock position. Remove E-ring and thick washer at outer end of governor shaft. Governor shaft will slide down into gear case. Rotate crankshaft back and forth slightly until shaft can easily be removed.



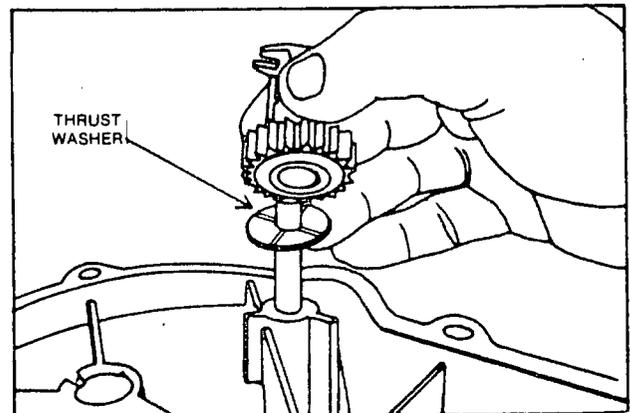
## GOVERNOR SHAFT INSTALLATION

Install thin thrust washer onto governor shaft before installing shaft into crankcase. Slide the shaft up into position, rotating crankshaft to obtain clearance. Install thick washer, then retain shaft with E-ring. Install governor lever onto shaft and tighten nut lightly. Rotate shaft until crank touches rib, as shown at right. IF GOVERNOR SHAFT IS NOT IN PROPER POSITION BEFORE ASSEMBLING CRANKCASE COVER, CORRECT GOVERNOR ADJUSTMENT WILL NOT BE OBTAINED.



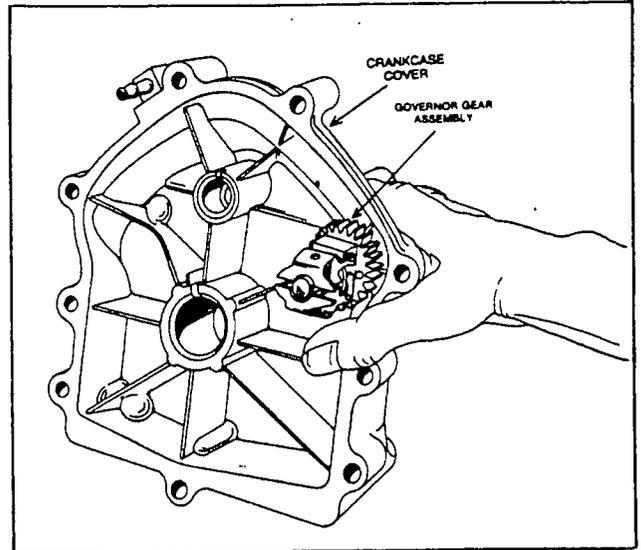
## GOVERNOR GEAR INSTALLATION

Install governor gear and thrust washer onto shaft in crankcase cover as shown at right. Make sure the gear rotates freely. Be sure weights and cup move freely with no evidence of binding.



## CRANKCASE COVER INSTALLATION

Position engine with crankshaft in a vertical position. Rotate crankshaft to place timing mark on can gear at 12 o'clock. Install gasket and install cover. MAKE SURE GOVERNOR GEAR TEETH ARE IN MESH - use long thin screwdriver to rotate governor gear, if necessary.



## GOVERNOR SHAFT ADJUSTMENT

Adjust governor lever as outlined in Test 32, Page 4.18.

## ADJUSTING GOVERNED IDLE

Adjust governed idle as outlined in Test 23, Page 4.14.

## TOP GOVERNED SPEED ADJUSTMENT

Adjust governor as outlined in Test 32, Page 4.18.