

**OWNER'S MANUAL  
AND PARTS LIST**



REG. TRADE-MARK

**180 AMP., AC WELDER  
AND  
5000 WATT AC POWER PLANT**

**MODEL NUMBERS**

20191 MANUAL START —  
20192 MANUAL START —  
20193 ELECTRIC START

**SPECIFICATION NUMBERS**

5.ONB- 341P/5277 (Manual Start) —  
5.ONB- 343P/5277 (Manual Start) —  
5.ONB- 343E/5277 (Electric Start)

*Master Copy!*  
**SEARS, ROEBUCK AND CO. - U.S.A.**

940-1007

*Do Not Remove*

## HOW TO ORDER REPLACEMENT PARTS

FOR PARTS OR SERVICE, CONTACT YOUR NEAREST SEARS STORE OR REFER TO YOUR NEAREST AUTHORIZED ONAN SERVICE STATION.

TO AVOID ERRORS OR DELAY IN FILLING YOUR PARTS ORDER, PLEASE FURNISH ALL INFORMATION REQUESTED.

**ONAN**  
**ELECTRIC PLANT**  
MODEL AND SPEC NO. \_\_\_\_\_  
SERIAL NO. \_\_\_\_\_  
ALWAYS GIVE THE MODEL AND SERIAL NO. WHEN ORDERING PARTS  
AC WELDER RATING  
100 AMPS @ 80 VOLTS  
WELDING SERVICE RANGE  
55-100 AMPS 3600 RPM  
AC RATING  
\_\_\_\_ VOLT, 30 AMPERE  
5.0 KW \_\_\_\_\_ AMPS  
40 CYCLE @ 3600 RPM  
USE \_\_\_\_\_ VOLT BATTERY  
MANUFACTURED BY  
**ONAN**  
DIV. OF STURMARE CORPORATION  
MILWAUKEE, WISCONSIN  
3041100 14441110

1. Always give complete:

MODEL AND SPECIFICATION NO.

SERIAL NO.

2. Give the part number, description and quantity of each item. Do not order by reference number or group number. If an old part cannot be identified, return the part to your SEARS STORE or nearest AUTHORIZED ONAN SERVICE STATION. Print your name and address plainly on the package. Write a letter to the same address stating the reason for returning the part.

Any claim for loss or damage to your unit in transit should be filed promptly against the transportation company making the delivery. Shipments are complete unless the packing list indicates items are back ordered.

Prices are purposely omitted from the Parts List due to confusion resulting from fluctuating costs, import duties, sales taxes, exchange rates, etc. For current parts prices, contact your nearest SEARS STORE or ONAN Service Center.

# **AC WELDER**

**180 AMP.**

**SERIES  
NB**

9AB72

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THIS MANUAL PROVIDES INFORMATION FOR PROPER OPERATION, MAINTENANCE AND SERVICE PROCEDURES: ALSO PARTS CATALOG.

WE SUGGEST THIS BOOK BE KEPT HANDY FOR READY REFERENCE WHEN NECESSARY, EITHER FOR ORDERING PARTS OR MAKING ADJUSTMENTS.

**IMPORTANT...RETURN WARRANTY  
CARD TO MANUFACTURER.**

# GENERAL INFORMATION

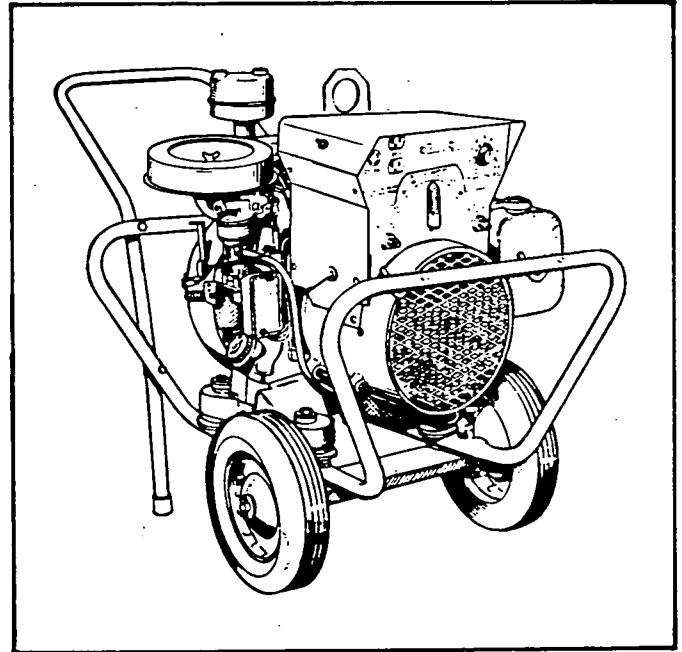
## INTRODUCTION

The welder is a complete engine-driven, alternating current arc welding machine. It consists of a gasoline engine directly connected to an electric generator. They are mounted to a sturdy carrying frame. A two-wheeled dolly is available as an option if the unit must be moved frequently.

The welder is rated 180 amperes, 25 volts, alternating current at 50% duty cycle. Auxiliary alternating current is available and output is 120 volts, rated 5000 watts, 60 hertz at 100% duty cycle. AC output is available at any time although at reduced output when the welding current is being used. This AC output is convenient for emergency lighting, running power tools, etc., when working at locations away from AC power line sources.

All 1/16-inch through 5/32-inch electrodes may be used. Electrodes of 3/16-inch which do not exceed the welder capacity may be used.

When instructions in this manual refer to a specific model of welder, identify the model by referring to the MODEL AND SPECIFICATION NO. as shown on the unit nameplate.



How to interpret MODEL and SPEC NO.

5.0NB - 341 E / 1 A

1                      2                      3 4

ENGINE MODEL REFERENCE		
MODEL NO.	TYPE	AC VOLTAGE
5.0NB-341P/1	Manual Start	120 V
5.0NB-343P/1	Manual Start	120/240 V
5.0NB-341E/1	Electric Start	120 V
5.0NB-343E/1	Electric Start	120/240 V

1. Factory code for general identification purposes.
2. Specific Type:  
P - PORTABLE, manual starting.  
E - ELECTRIC starting, at welder only.
3. Factory code for optional equipment supplied.
4. Specification (Spec Letter) advances with factory production modification.

# SPECIFICATIONS

## Nominal Dimensions

Height . . . . .	24 "
Weight . . . . .	23 "
Length . . . . .	30-3/4 "
Weight in Pounds (approx.)	
Skid mounted, manual . . . . .	280
Skid mounted, electric . . . . .	300
Dolly mounted, manual . . . . .	300
Dolly mounted, electric . . . . .	320
Fuel Type . . . . .	* Gasoline
Number of Cylinders . . . . .	2
Cylinder Bore . . . . .	3-9/16 "
Cylinder stroke . . . . .	3 "
Displacement (cu. in.) . . . . .	30
Maximum BHP (at 3600 rpm) . . . . .	12
Governor Type . . . . .	Adjustable, mechanical flyball
Fuel Pump Type . . . . .	Diaphragm
Ignition Type	
Electric Start . . . . .	Battery
Manual Start . . . . .	Magneto
Mounted Fuel Tank Capacity (U.S. gallons) . . . . .	1.5
Oil Capacity (U.S. quarts) . . . . .	2
Generator	
Welder Output - Maximum Amperes (50% duty cycle) . . . . .	180
AC Auxiliary Watts Output (120 or 240 volts, single-phase, 100% duty cycle) . . . . .	5000
Battery Size (electric start only)	
Nominal Battery Voltage . . . . .	12
Number Used . . . . .	One
Ampere/Hour SAE 20 Hr. Minimum . . . . .	32
Approx. Battery Dimensions for Battery Rack . . . . .	7-3/4 " L x 5-1/8 " W x 7-3/8 " H

\* - Non-leaded or regular grade. See OPERATION section for special instructions.

# DIMENSIONS AND CLEARANCES

All clearances given at room temperature of 70°F.  
All dimensions in inches unless otherwise specified.

	Minimum	Maximum
Valve Tappet Clearance		
Intake . . . . .	.009	.010
Exhaust . . . . .	.013	.014
Valve Stem in Guide – Intake . . . . .	0.001	0.0035
Valve Stem in Guide – Exhaust . . . . .	0.0025	0.0040
Valve Spring Length		
Free Length . . . . .	1.662	
Compressed Length . . . . .	1.375	
Valve Spring Tension (lb)		
Open . . . . .	71	79
Closed . . . . .	38	42
Valve Seat Bore Diameter, Exhaust . . . . .	1.2510	1.2520
Valve Seat Diameter, Exhaust . . . . .	1.254	1.255
Valve Stem Diameter		
Intake . . . . .	0.3425	0.3430
Exhaust . . . . .	0.3410	0.3415
Valve Guide Diameter (I.D.) . . . . .	0.344	0.346
Valve Lifter Diameter . . . . .	0.7475	0.7480
Valve Lifter Bore . . . . .	0.7505	0.7515
Valve Seat Interference Width . . . . .	1/32	3/64
Valve Face Angle . . . . .	44°	
Valve Seat Angle . . . . .	45°	
Valve Interference Angle . . . . .	1°	
Crankshaft Main Bearing . . . . .	0.0025	0.0038
Crankshaft End Play . . . . .	0.006	0.012
Camshaft Bearing . . . . .	0.0015	0.003
Camshaft Lift . . . . .	0.300	
Camshaft Bearing Diameter . . . . .	1.3760	1.3770
Camshaft Journal Diameter . . . . .	1.3740	1.3745
Rod Bearing . . . . .	0.0020	0.0033
Connecting Rod End Play . . . . .	0.002	0.016
Timing Gear Backlash . . . . .	0.002	0.003
Oil Pump Gear Backlash . . . . .	0.002	0.005
Piston to Cylinder, Strut Type (Measured below oil-controlling ring – 90° from pin) Clearance. . . . .	0.0025	0.0045
Piston Pin Diameter . . . . .	0.7500	0.7502
Piston Pin in Piston . . . . .	0.0001	0.0005
Piston Pin in Rod . . . . .	0.0002	0.0007
Piston Ring Groove Width		
Top 1 . . . . .	0.0955	0.0965
Top 2 . . . . .	0.0955	0.0965
Top 3 . . . . .	0.1880	0.1890
Piston Ring Gap in Cylinder . . . . .	0.013	0.023
Piston Ring Side Clearance (Top compression ring only) . . . . .	0.002	0.008
Breaker Point Gas (Full Separation) . . . . .	0.020	
Spark Plug Gap . . . . .	0.025	
Crankshaft Main Bearing Journal – Standard Size . . . . .	1.9992	2.000
Main Bearing Diameter . . . . .	2.0020	2.0030

Crankshaft Rod Bearing Journal – Standard Size . . . . .	1.6252	1.6260
Cylinder Bore – Standard Size . . . . .	3.5635	3.5645
Ignition Timing (Fixed) . . . . .	22 °BTC	
Magneto Pole Shoe Air Gap . . . . .	0.010	0.015
** Compression (PSI at Sea Level) . . . . .	105 to 115	

\*\* - When checking compression on unit the compression release must be deactivated. Adjust exhaust valves to .020 when checking compression.  
Remember to readjust exhaust valves after compression check.

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# ASSEMBLY TORQUES AND SPECIAL TOOLS

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## TORQUES

Assembly torques as given here require the use of a torque wrench. These assembly torques will assure proper tightness without danger of stripping the threads. If a torque wrench is not available, you will have to estimate the degree of tightness necessary for the stud, nut or screw being installed and tighten accordingly. Be careful not to strip the threads. Check all studs, nuts and screws often with the engine cold. Tighten as needed to prevent them from working loose.

### TORQUE SPECIFICATIONS

### FT. - LB.

Cylinder Head Nuts . . . . .	29-31
Rear Bearing Plate . . . . .	30-35
Connecting Rod Bolt . . . . .	24-26
Flywheel Capscrew . . . . .	30-35
Starter Mounting Bracket to Block . . . . .	25-30
Oil Base Mounting Screws . . . . .	38-43
Gear Case Cover . . . . .	14-18
Other 5/16-Inch Cylinder Block Nuts . . . . .	10-12
Spark Plug . . . . .	15-20
Magneto Stator Screws . . . . .	8-10
Generator Armature Through Stud . . . . .	50-55

## SPECIAL TOOLS

These tools are available to aid service and repair work.

Crankshaft Gear Pulling Ring . . . . .	420A248
Flywheel Puller . . . . .	420A100
Combination Bearing Remover, Main and Cam . . . . .	420A325
Combination Bearing Driver, Main and Cam . . . . .	420B324
Valve Guide Driver . . . . .	420A300
Valve Seat Driver . . . . .	420A308
Valve Seat Staker, Exhaust . . . . .	420A310
Valve Seat Cutter . . . . .	420A311
Oil Seal Guide and Driver Bearing Plate . . . . .	420B181
Gear Cover . . . . .	420B313
Timing Advance Mech. Cover Driver . . . . .	420A296



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# INSTALLATION

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For normal service, the NB welder is not permanently mounted and no installation instructions are needed. If the welder is used in a permanent location or mounted in a vehicle, use the following recommendations as a guide.

## VENTILATION

Welders generate considerable heat during operation. Provide unobstructed separate air inlet and outlet openings (minimum area of 3-1/2 sq. ft. each) in any small enclosure. Locate the inlet opening as close to the front of the engine blower intake as possible and the outlet opening toward the generator end and somewhat higher than the inlet opening. Position air inlet and outlet opening to prevent recirculation of heated air.

## EXHAUST

When an extension exhaust pipe is attached to the engine, use a piece of flexible tubing between this pipe and the engine. The muffler should be fitted to the outer end of the exhaust pipe.

## WARNING

*Gasoline engine exhaust gases are deadly. Never operate welder inside a building or confined area without piping exhaust gases outside the enclosure.*

## MOBILE MOUNTING

Mount the welder securely in place, as considerable strain is present on rough roads or in turning sharp corners, etc. Extra vehicle floor support may be necessary to keep the welder mounting bolts from tearing loose. Use pipe clamps or U-bolts to secure the welder frame to the floor. Maximum operation angle is 15° sideways, 30° front-to-rear tilt.

For convenience in servicing, especially draining oil, it may be desirable to elevate the welder above the vehicle floor.

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# OPERATION

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## PRESTART INFORMATION

When the unit is to be used for welding, always connect the welding cables to the power terminals on the panel before starting. It is not necessary to observe polarity in making ground connections between welder and the work. Welding current selection may be made with the unit running but not under load.

**WARNING** *Do not, under any circumstances, touch the terminals of the welder while it is operating! Although the voltage is not high, it can cause severe shock with possible serious consequences! Stop the unit before making connections.*

## INITIAL START

Check the engine to make sure it has been filled with oil and fuel. See the recommendations below.

### Crankcase Oil:

Be sure the crankcase has been filled to the FULL mark with an American Petroleum Institute (API) designation SE oil of the viscosity recommended on the nameplate. If the SE oil is not available, an SD or SD/CC oil may be used. See PERIODIC MAINTENANCE section for complete lubrication recommendations.

**NOTE:** *If oils with these designations are not yet available, use an oil with the API designation MS, MS/DG or MS/DM which has passed all the Automotive Manufacturer's Sequence Tests and the MIL-L-2104B Tests. Don't use an oil with the API designation DS.*

**Recommended Fuel:** Use a good grade of unleaded or regular gasoline. If the engine has previously used regular or leaded gasoline, it's necessary to remove the head and clean out deposits before switching to a unleaded gasoline. If not performed, preignition could occur and cause engine damage.

**WARNING** *Never add fuel to welder while it is running.*

**NOTE:** *On cold starts, set the idle lever in the idle position (down) to start. The idle lever is located adjacent to the governor yoke control shaft. Set manual choke as necessary for weather conditions.*

## STARTING

**Manual:** With the optional Rendi-Pull starter, the starter rope is in the starting position and will automatically rewind to this position after the rope is pulled and released. If the welder does not have the automatic rewind starter, wind starting rope on flywheel rope

sheave in a clockwise direction to within approximately 6 inches of the starting rope handle.

Crank unit with a rapid, smooth pull on the starting rope. If unit does not start readily, change choke setting. Avoid overchoking as this can cause oil dilution which can result in excessive wear of internal engine parts. As soon as unit starts, adjust choke to best running position, gradually adjusting choke control as unit warms up.

If the engine fails to start within two or three rope pulls, rust inhibitor oil injected into the cylinder at the factory may have fouled the spark plug. Remove the plug and clean in nonflammable solvent. Dry thoroughly and reinstall. Engine should now start without difficulty. Heavy exhaust smoke may be noticed when engine is first started. This is normal and is caused by the inhibitor oil burning off.

### Electric:

1. Adjust choke according to temperature conditions. Adjust as explained for manual start models.
2. Move ignition switch to ON.
3. Push START switch, located on rear side of control box, firmly. If unit does not start within a few seconds, release the START switch and wait a few seconds before reattempting to start. If unit does not start after two attempts, open the choke and repeat starting sequence.

**NOTE:** *A distinct metallic clicking noise will be heard just as unit starts and again just as it stops. This is the decompression release...and is a normal noise to be expected.*

4. After unit starts, adjust choke to best running position. Gradually adjust choke control as unit warms up.

Should the charge condition of the battery become so low that it cannot furnish enough power for cranking, the engine can be started by manually cranking with the starting rope.

**NOTE:** *The battery charge voltage is regulated to supply a nominal 1.5 amp charge rate at full rpm. Manual start models are not equipped with a battery charge circuit.*

## APPLYING LOAD

Allow the engine to warm up thoroughly at idle speed before applying a heavy welding load. Set the idle lever

at high speed position before applying a load. The welder is thermally protected and self-regulating. Although the welder can be loaded to full nameplate rating for initial operation, it is recommended they be loaded only 80% of rated capacity the first few hours.

Controlled break-in with proper oil and a conscientiously applied maintenance program will help assure satisfactory service for hundreds of hours from your electric welder.

**NOTE:** Drain the initial oil after 50 hours of operation while the engine is still hot.

### STOPPING

**Manual Start Welders:** Depress stop button located on upper rear side of blower housing. Hold button down until engine is completely stopped.

**Electric Start Welders:** Move ignition switch to STOP or OFF position. If ignition switch is left in ON position when unit is not running, battery will be discharged.

### WELDING CURRENT CONTROL

The control panel contains a current selector handle which can be turned to any one of the dial positions to obtain the required welding amperage. Make sure the handle snaps firmly into place when making the desired amperage selection.

**CAUTION** Considerable heat is generated by the reactor assembly inside the welder control box. Always keep the engine and control cover installed on the unit, to direct cooling air properly to the control box. **NEVER WELD WITH THE ENGINE AND CONTROL COVER REMOVED.**

### WELDING CABLE SIZE

Keep the welding cables as short as possible and check all connections for tightness. Consult Table 1 for correct cable size for current draw and cable length.

TABLE 1. RECOMMENDED WELDING CABLE SIZE

AC POWER AMPERES	TOTAL CIRCUIT LENGTH IN FEET					
	100	150	200	250	300	400
75	6	4	3	3	2	1
100	4	3	3	2	1	1/0
150	3	2	1	1/0	2/0	3/0
200	2	1	1/0	2/0	3/0	4/0

When welding with long cables, avoid allowing the cables to form coils. A coil of cable will produce a magnetic field that can lower the generator output. If you have excess cable on the floor, tape the cables together at short intervals and arrange them in "snake" fashion to take up the slack.

**CAUTION** Do not change the amperage tap (control handle) while the power is being used for welding or pipe thawing. The sudden

connection break can produce an arc within the control box and cause serious damage to the switching members or other components in the control circuit. Disconnect one electrode clamp from the work when changing amperage selection.

### AUXILIARY AC POWER

The welders are available with either 120-volt AC, 5 KW auxiliary power or 120/240-volt AC, 5 KW auxiliary power. The 120-volt model is equipped with two 120-volt duplex receptacles with each outlet (4) rated at 15 amps. Although a total of 42 amps is available, no more than 15 amps may be drawn from any individual outlet. The three outlets of the 120/240-volt model are rated at 20 amperes each. No more than 20 amps draw from any individual outlet.

Use of auxiliary power is not recommended while welding current is being used. If necessary, however, a low wattage trouble light may be connected without undue loss of welding power. The governor control lever must be in the WELD position for both weld and auxiliary power.

**NOTE:** Using AC auxiliary power during welding operation causes a voltage drop when the arc is struck and during actual welding.

### OUT-OF-SERVICE PROTECTION

Protect an engine that is to be out-of-service for more than 30 days as follows:

1. Run engine until thoroughly warm.
2. Turn off fuel supply and run until engine stops.
3. Drain oil from oil base while still warm. Refill and attach a warning tag stating oil viscosity used.
4. Remove spark plug. Pour 1 ounce (two tablespoons) of rust inhibitor (or SAE 50 oil) into the cylinder. Crank engine over a few times. Install spark plug.
5. Service air cleaner.
6. Clean governor linkage and protect by wrapping with a clean cloth.
7. Plug exhaust outlet to prevent entrance of moisture, dirt, bugs, etc.
8. Wipe entire unit. Coat rustable parts with a light film of grease or oil.
9. Provide a suitable cover for the entire unit.
10. If battery is used, disconnect and follow standard battery storage procedure.

### HIGH AMBIENT TEMPERATURES

1. See that nothing obstructs air flow to and from the plant.
2. Keep cooling fins clean. Air housing should be properly installed and undamaged.

### LOW AMBIENT TEMPERATURES

1. Use correct SAE oil for temperature conditions. Change oil only when engine is warm. If an unexpected temperature drop causes an emergency, move the unit to a warm location or apply heat externally until oil flows freely.
2. Use fresh fuel. Protect against moisture condensation.

3. Keep fuel system clean and batteries in a well charged condition.

#### **EXTREMELY DIRTY OPERATING CONDITIONS**

1. Keep unit clean. Keep cooling system clean.
2. Service air cleaner as frequently as necessary.
3. Change crankcase oil every 40 operating hours.
4. Keep oil and gasoline in dust-tight containers.
5. Keep governor linkage clean.

#### **HIGH ALTITUDE**

For operation at altitudes over 2500 feet above sea level, close carburetor main jet adjustment slightly to maintain proper air-to-fuel ratio (refer to FUEL SYSTEM section). Maximum power will be reduced approximately 4% for each 1000 feet above sea level, after the first 1000 feet.

# ENGINE TROUBLESHOOTING

TROUBLE																				GASOLINE ENGINE TROUBLESHOOTING GUIDE																				CAUSE
Backfire at Carburetor	Bearing Wear	Black Exhaust	Blue Exhaust	Burned Valves	Connecting Rod Wear	Crankshaft Slowly	Cylinder Wear	Engine Stops	Failure to Start	Governor Hunting	High Oil Pressure	Loss of Coolant (Water Cooled)	Mechanical Knocks	Misfiring	Overheating (Air Cooled)	Piston Wear (Water Cooled)	Poor Compression	Ring Wear	Sticking Valves																					
																				STARTING SYSTEM																				
																				Loose or Corroded Battery Connection																				
																				Low or Discharged Battery																				
																				Faulty Starter																				
																				Faulty Start Solenoid																				
																				IGNITION SYSTEM																				
																				Ignition Timing Wrong																				
																				Wrong Spark Plug Gap																				
																				Worn Points or Improper Gap Setting																				
																				Bad Ignition Coil or Condenser																				
																				Faulty Spark Plug Wires																				
																				FUEL SYSTEM																				
																				Out of Fuel - Check																				
																				Lean Fuel Mixture - Readjust																				
																				Rich Fuel Mixture or Choke Stuck																				
																				Engine Flooded																				
																				Poor Quality Fuel																				
																				Dirty Carburetor																				
																				Dirty Air Cleaner																				
																				Dirty Fuel Filter																				
																				Defective Fuel Pump																				
																				INTERNAL ENGINE																				
																				Wrong Valve Clearance																				
																				Broken Valve Spring																				
																				Valve or Valve Seal Leaking																				
																				Piston Rings Worn or Broken																				
																				Wrong Bearing Clearance																				
																				COOLING SYSTEM (AIR COOLED)																				
																				Poor Air Circulation																				
																				Dirty or Oily Cooling Fans																				
																				Blown Head Gasket																				
																				COOLING SYSTEM (WATER COOLED)																				
																				Insufficient Coolant																				
																				Faulty Thermostat																				
																				Worn Water Pump or Pump Seal																				
																				Water Passages Restricted																				
																				Defective Gaskets																				
																				Blown Head Gasket																				
																				LUBRICATION SYSTEM																				
																				Defective Oil Gauge																				
																				Relief Valve Stuck																				
																				Faulty Oil Pump																				
																				Dirty Oil or Filter																				
																				Oil Too Light or Diluted																				
																				Oil Level Low																				
																				Oil Too Heavy																				
																				Dirty Crankcase Breather Valve																				
																				THROTTLE AND GOVERNOR																				
																				Linkage Out of Adjustment																				
																				Linkage Worn or Disconnected																				
																				Governor Spring Sensitivity Too Great																				
																				Linkage Binding																				

# PERIODIC MAINTENANCE

## AIR FILTER

The NB series engine is equipped with a paper cartridge, automotive type air filter (Figure 1). Under normal usage the filter should be changed every 200 hours. Extremely dusty conditions may require a change every 50 hours. The filter should be inspected more frequently, especially if the engine appears to be losing power or idles roughly. If the filter element is dirty, it may be cleaned by tapping gently on a flat surface. When cleaning, do not dent the plastic sealing surfaces. Wipe the sealing surfaces and the air cleaner pan and cover clean before reassembling. When replacing the wing nut don't forget the copper washer. Tighten the wing nut finger tight only.

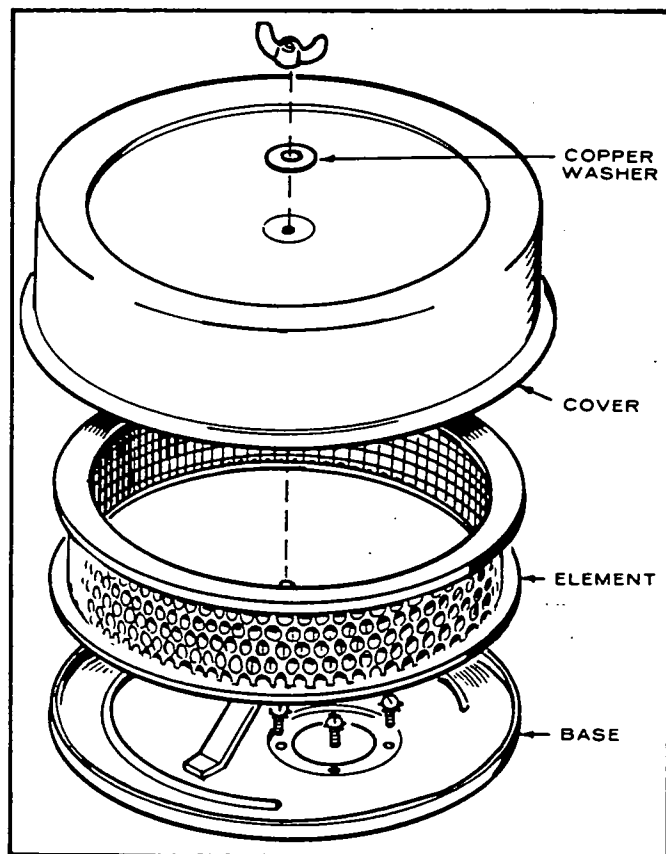


FIGURE 1. AIR FILTER ASSEMBLY

## BREATHER VALVE

Remove the hose from the breather valve at the valve compartment cover (Figure 2). Wash the valve and filter in suitable solvent. Dry and replace. The valve must work free and the hose must not be restricted to prevent expelled air from re-entering the crankcase. Install parts removed with new gaskets.

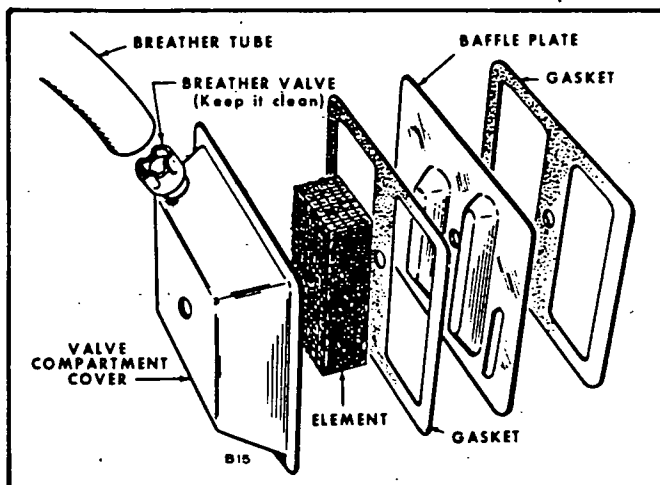


FIGURE 2. BREATHER VALVE AND FILTER MAINTENANCE

## CRANKCASE OIL

Oil capacity is 2 U.S. quarts. Fill to the *full* mark on oil indicator. Use a good quality detergent oil with the API (American Petroleum Institute) designation SE and of the viscosity recommended on nameplate or as shown in Figure 3. If SE oil is not available, use SD or SD/CC.

**NOTE:** If oils with these designations are not yet available, use an oil with the designation MS, MS/DG or MS/DM which has passed the Automotive Manufacturer's Sequence Tests and the MIL-L-2104B Tests. Don't use an oil with a DS designation.

When adding oil between changes, use identical oil as in the crankcase. Different brand oils might not be compatible when mixed.

Change crankcase oil every 100 hours under normal operating conditions. For extremely dusty or dirty operating conditions, change oil every 50 hours.

## MAINTENANCE SCHEDULE

Use this factory recommended maintenance schedule (based on favorable operating conditions) to serve as a guide to get long and efficient welder life. Neglecting routine maintenance can result in failure or permanent damage to the welder. Maintenance is divided into two categories: (1) *operator maintenance* – performed by the operator and (2) *critical maintenance* – performed by qualified service personnel.

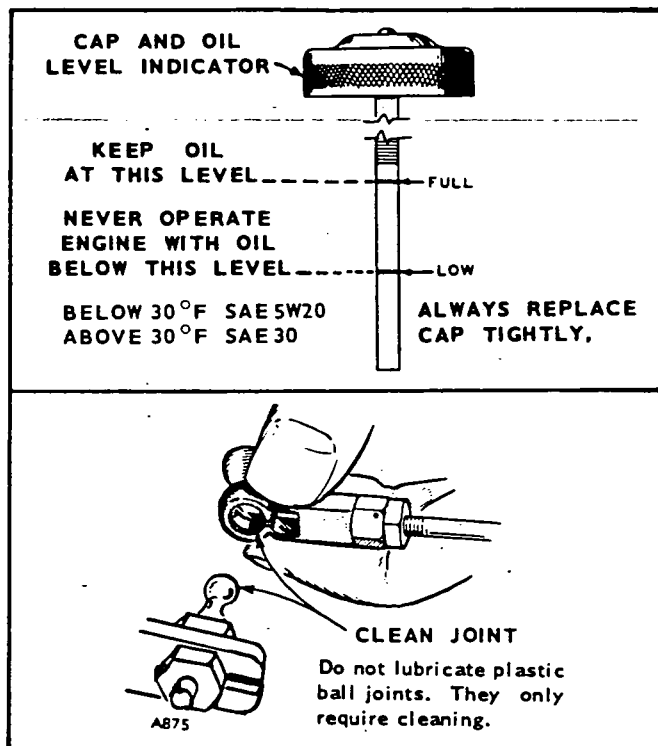


FIGURE 3. MAINTENANCE PROCEDURES

#### OPERATOR MAINTENANCE SCHEDULE

MAINTENANCE ITEMS	OPERATIONAL HOURS			
	8	50	100	200
Inspect Welder	x			
Check Breaker Points			x	
Check Oil Level	x			
Clean Air Cleaner		x1		
Clean Governor Linkage		x1		
Check Spark Plugs			x	
Change Crankcase Oil			x1	
Clean Crankcase Breather				x
Clean Fuel System				x
Check Battery			x	

x1 - Perform more often in extremely dusty conditions.

#### CRITICAL MAINTENANCE SCHEDULE

MAINTENANCE ITEMS	OPERATIONAL HOURS		
	200	500	1000
Check Collector Rings		x1	
Check Brushes		x2	
Remove Carbon & Lead	x3		
Check Valve Clearance	x		
Clean Carburetor		x	
Clean Generator		x	
Grind Valves (if required)		x	
General Overhaul (if required)			x

x1 - Perform more often in extremely dusty conditions.

x2 - Replace brushes when worn to 5/16" or less.

x3 - The frequency of carbon or lead deposit removal will vary with operating conditions. Frequent short operating periods, consistently cool operation, use of highly leaded gasoline, etc. are some causes of more rapid formations of combustion deposits. Remove deposits as experience indicates the necessity. Always install new gaskets.

For any abnormalities in operation, unusual noises from engine or generator, loss of power, overheating, etc., contact your dealer.

# ADJUSTMENTS

## CARBURETOR

The carburetor (Figure 4) has a main fuel (high speed) adjustment (needle A) and a fuel idle adjustment (needle B). The main adjustment (needle A) affects operation under heavy load conditions. Idle adjustment affects operation at light or no load. Under normal circumstances, factory carburetor adjustments should not be disturbed. If the adjustments have been disturbed, turn needles off their seats 1 to 1-1/2 turns to permit starting, then readjust them for smooth operation.

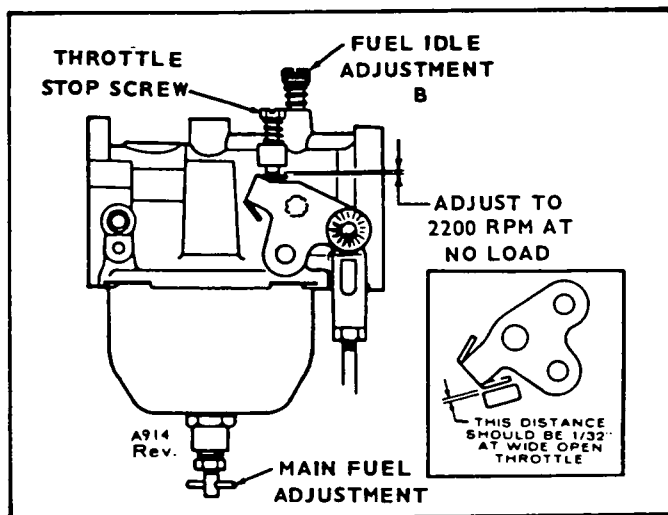


FIGURE 4. CARBURETOR ADJUSTMENTS

**CAUTION** Forcing the needle against its seat will damage it. The needle does not completely shut off fuel when seated.

If the engine runs unevenly at half or full load due to faulty carburetion, the main adjusting needle needs adjusting. Make the adjustment while the engine is running at normal operating temperature and with almost a full load connected to the engine.

Turn the main adjusting needle out about two full turns. Then turn it slowly in until the engine begins to lose power and speed. Then turn it out very slowly until the engine runs smoothly at full power and speed.

When adjusting the idle jet needle, the engine should be running at normal operating temperature and without a load connected. Turn the idle adjusting needle in until the engine loses considerable speed. Then turn it out until the engine runs smoothly.

Set the throttle stop screw (located on carburetor throttle lever) with no load connected and while running at a

2200 RPM setting (Figure 4).

If the engine develops a "hunting" condition (alternate increase and decrease of engine speed) try correcting by opening the main adjusting needle a little more. Do not open more than 1/2 turn beyond the maximum point of power. If this does not correct the condition, follow the instructions for regulating the sensitivity of the governor under GOVERNOR ADJUSTMENT.

## CHECK BREAKER POINTS

Replace burned or faulty points. If only slightly burned, dress smooth with file or fine stone. Measure gap with thickness gauge; gap points at .020".

Ignition breaker points (Figure 5), must be correctly gapped. Crank engine to fully open breaker points (1/4 turn after top center). To adjust point gap loosen screws labeled A and adjust cam marked B. Tighten screws and check point gap.

Ignition points should break contact just when the 22° timing mark aligns with the flywheel timing mark. Final timing is corrected by properly shifting the breaker point box on its mounting and using a timing light. If specified timing cannot be obtained by moving the breaker box, check to be sure timing marks on gears are aligned. Timing procedures appear in the IGNITION SYSTEM section.

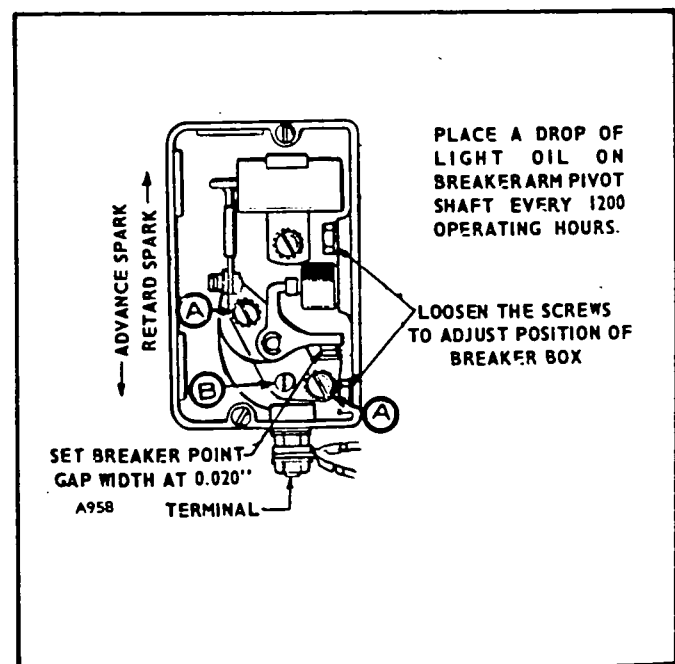


FIGURE 5. IGNITION ADJUSTMENTS



## GOVERNOR ADJUSTMENT

Engine speed is governor-controlled, and preset at the factory. Proper governor adjustment is one of the most important factors in maintaining the power and speed desired from the engine.

These engines are adapted for use where a double range of speed settings is desired. Engine speed is controlled at idle (approximately 2200 to 2300 RPM) and maximum (approximately 3600 RPM) by simply shifting the governor control lever up for high speed and down for idle. See Figure 6.

The design of the governor gives an automatic decrease in sensitivity when the speed is increased and the result is good stability at both speeds.

Before making governor adjustment, run the engine about 15 minutes to reach normal operating temperature. If the engine is being run with the throttle wide open, either the governor is not properly adjusted or the engine is overloaded. It is difficult to determine if after long usage the governor spring has become fatigued. If, after properly making all other adjustments, the regulation is still erratic, install a new spring (Figure 6).

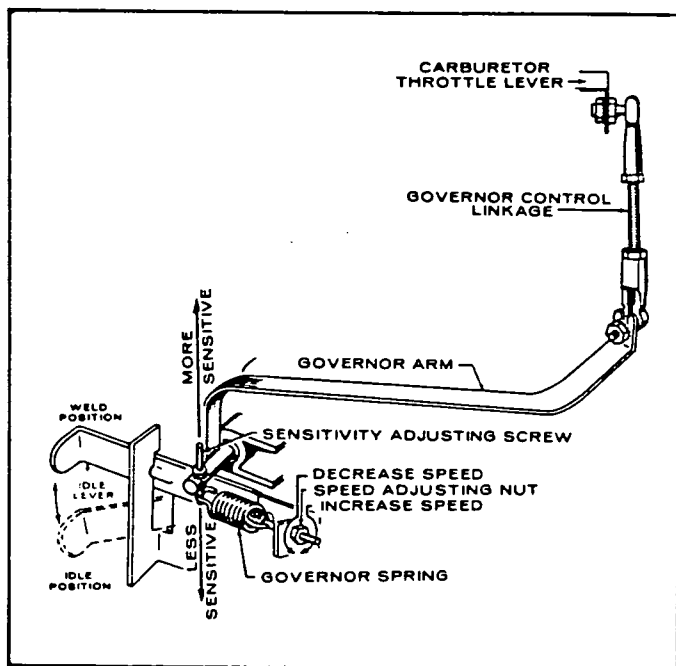


FIGURE 6. GOVERNOR ADJUSTMENTS

A reliable instrument for checking engine speed is required for accurate governor adjustment. Engine speed can be checked with a tachometer.

Check the governor arm, linkage, throttle shaft, and lever for binding condition or excessive slack and wear at connecting points. A binding condition at any point will cause the governor to act slowly and regulation will be poor. Excessive looseness will cause a hunting condition and regulation will be erratic. Work the arm back and forth several times by hand while the engine is idle. If either of these conditions exist, find out where the trouble lies and adjust or replace parts as needed.

**Linkage:** The engine starts at wide open throttle. The length of the linkage connecting the governor arm to the throttle arm is adjusted by rotating the ball joint. Adjust length so that with the engine stopped and tension on the governor spring, the lower stop on the carburetor throttle lever is  $1/32''$  from stop pin. (Figure 4). This setting allows immediate control by the governor after starting and synchronizes travel of the governor arm and the throttle shaft.

**Procedure:** This gives the procedure only briefly. Refer to the details on each subject herein.

1. Adjust the carburetor main jet for the best fuel mixture at full load operation.
2. Adjust the carburetor idle needle with no load connected.
3. Adjust the length of the governor linkage.
4. Check the governor linkage and throttle shaft for binding or excessive looseness.
5. Adjust the governor spring tension for nominal engine speed at no-load operation.
6. Check the rpm drop between no-load and full-load operation and adjust the governor sensitivity as needed.
7. Recheck the speed adjustment.
8. Set the carburetor throttle stop screw.

Approximately 3600rpm is the recommended maximum full load speed for continuous operation. The speed must agree with the load requirements.

**Speed Adjustment:** The speed at which the engine operates is determined by the tension applied to the governor spring. Increasing spring tension increases engine speed. Decreasing spring tension decreases engine speed. The no-load speed of the engine should be slightly higher than the speed requirements of the connected load.

If a speed adjustment is needed, turn the speed adjusting nut in to increase the speed or out to decrease the speed (Figure 6).

The sensitivity of the governor depends upon the position of the arm end of the governor spring. A threaded stud on the governor arm provides for adjustment. To increase sensitivity move the governor spring toward the governor shaft by turning the screw in. To decrease sensitivity, move the governor spring away from the governor shaft by turning the screw out.

# IGNITION SYSTEM

In order to receive satisfactory performance of the ignition system all components must be in good condition and the spark must be properly timed. Hard starting, low power and erratic operation can often be caused by faulty ignition. If poor ignition is suspected, the first thing to do is to determine if the ignition system is actually at fault. A simple operational test will determine this.

**NOTE:** Manual start models are equipped with magneto ignition. Electric start models have automotive type battery ignition.

Remove the high tension lead from the spark plug and hold the end terminal approximately 3/16" from a clean

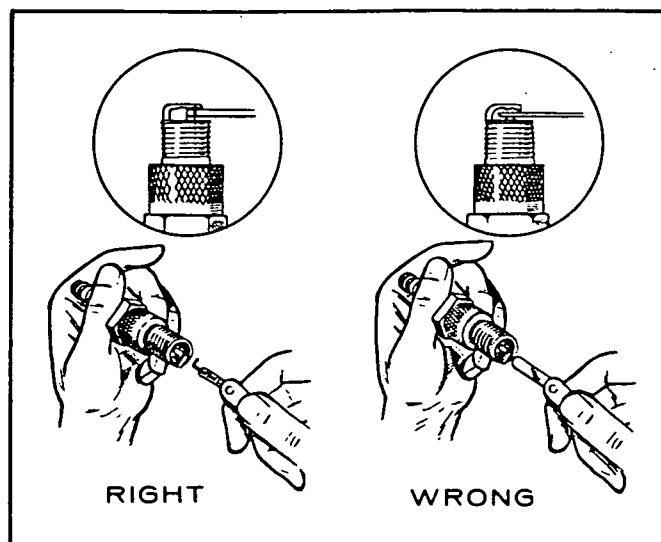


FIGURE 8. SETTING SPARK PLUG GAPS

metal part of the engine. Crank the engine fast enough to produce a spark. If a sharp, snappy spark occurs, the trouble apparently is not in the coil, condenser, or breaker points although it could be in the spark plug. If there is no spark or one that is weak or yellowish in color, ignition trouble is indicated.

**High Tension Lead:** Inspect Ignition lead for cracks or breaks in the insulation that may weaken the current before it reaches a plug. A high tension wire touching metal at some point may make operation unsatisfactory.

**Spark Plug:** Engine misfire or generally poor operation is often caused by a spark plug in poor condition or with the wrong gap setting. Remove the spark plug and carefully check for the following conditions:

- Porcelain insulator cracked or coated with oil.
- Electrodes burned or worn away.
- Wrong gap setting (Figure 8).

If the porcelain insulator is cracked or broken or if the electrodes are badly worn or burned replace the spark plug with a new one.

If not, it can probably be restored to good operating condition by the following steps:

1. Degrease wet or oily plug and dry thoroughly.
2. File center electrode to a flat surface.
3. Adjust gap to .025". Use a round wire gauge for more accurate measurement.
4. Install plug. Tighten to torque value of 15-20 ft. pounds.

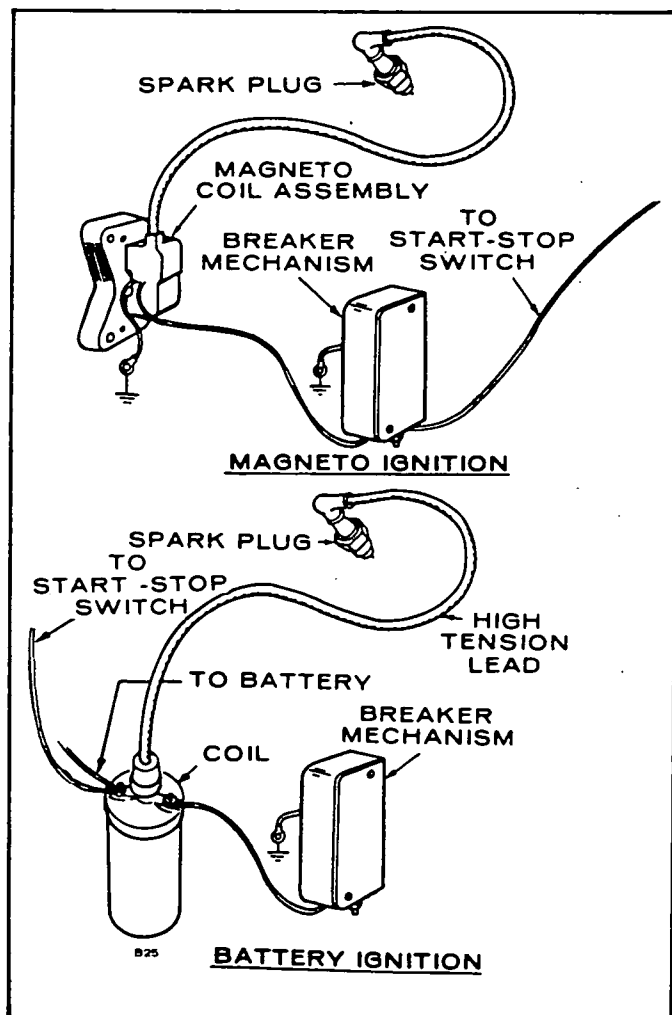


FIGURE 7. NB IGNITION SYSTEMS

**Breaker Points:** The condition and adjustment of the breaker points greatly affect the performance of the engine. If points are burned or badly oxidized, little or no current will pass. As a result, the engine may not operate at all or, if it does run, it is likely to miss, particularly at full throttle.

Always replace badly burned or pitted breaker points. If only slightly pitted or burned, the points can be dressed down with a file or fine stone. This will help temporarily but points should be replaced at first opportunity. If points are oxidized, rub a piece of coarse cloth across the surface. Dirty or oily points can be cleaned with a cloth but be sure no particles of lint are left between surfaces.

Measure the gap with a thickness gauge and set at .020". To set the gap, crank the engine to fully open the breaker points (1/4 turn after top center). Loosen and move stationary contact to correct the gap at full separation. The mating surfaces of breaker points must make contact evenly. Point alignment is extremely important to proper engine operation and point life.

Adjustment of the breaker points affects the time that contacts are opened and closed. Timing of the spark plug firing, which occurs when the breaker points separate, is critical to best engine performance. The spark must fire the fuel mixture at the proper split second when the piston is at the proper location in the cylinder to get the most power from the fuel charge. Set the ignition timing as follows:

1. Adjust the ignition breaker point gap width to .020 inch at full separation.
2. Remove breaker box cover.
3. Crank the engine over slowly by hand in the direction of crankshaft rotation until the T/C mark on the flywheel and the 22° mark on the gear cover are exactly in line ON THE COMPRESSION STROKE (Figure 9).
4. Turn the flywheel to the left, against crankshaft rotation, until the mark is about two inches past the 25° mark on the gear cover.
5. Turn the flywheel slowly to the right and note whether the ignition points just separate when the

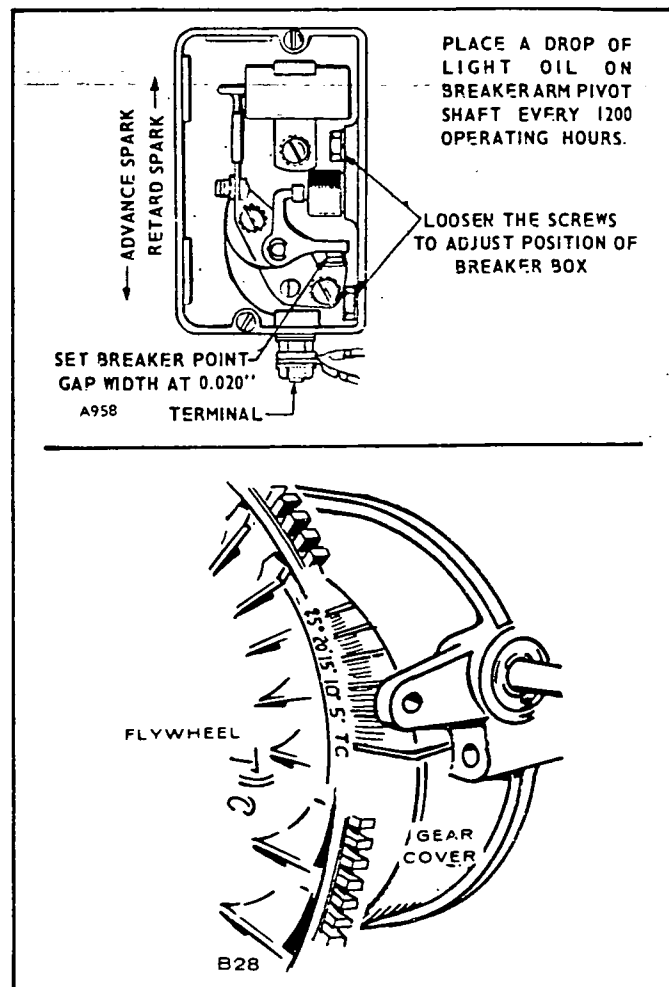


FIGURE 9. IGNITION TIMING

mark on the flywheel aligns with the 22° mark on the gear cover (engine must be on the compression stroke). If marks align as the points break, timing is correct. If not, loosen the breaker box mounting screws and shift the whole breaker box assembly slightly upward to retard the timing (points breaking too soon), or slightly downward to advance the timing (points not breaking soon enough). Tighten the breaker box mounting screws securely after making an adjustment.

# FUEL SYSTEM

## CARBURETOR

Carburetor maintenance should consist of regular cleaning. Some types of gasoline have a tendency toward formation of gum deposits inside the carburetor. This gum formation can usually be removed by soaking in alcohol or acetone. A fine, soft wire may be used to clean jets.

**Gasoline:** Adjusting the carburetor means obtaining the correct fuel-to-air mixture for smooth, efficient operation. The carburetor should be adjusted in two steps – first the idle adjustment and then the load adjustment (Figure 10).

**Important:** If the carburetor is completely out-of-adjustment so the engine will not run, open both needle valves 1 to 1-1/2 turns off their seats to permit starting. Do not force the needle valves against their seats. This will bend the needle.

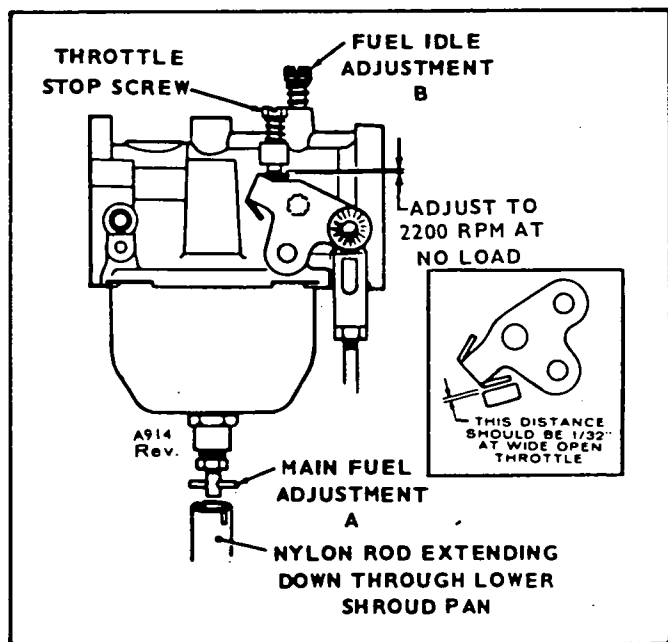


FIGURE 10. CARBURETOR

Before adjusting the carburetor, be sure the ignition system is working properly and the governor is adjusted. Then allow the engine to warm up.

1. With no load, turn the idle adjustment out until the engine speed drops slightly below normal. Then turn the needle in until speed returns to normal.
2. Apply a full load to the engine.
3. Carefully turn the main adjustment in until speed drops slightly below normal. Then turn the needle out until speed returns to normal.

*Alternate Method, Use When There is No Load Adjustment Possible.*

1. Start the engine and allow it to warm up.
2. Push in on the governor mechanism to slow the unit down to about 900-1000 RPM (trying to slow engine below 900 RPM engages decompression release and stops engine).
3. Set the idle adjustment screw for even operation (so the engine is running smoothly).
4. Release the governor mechanism to allow the engine to accelerate. If the engine accelerates evenly and without a lag, the main adjustment is correct. If not, adjust the needle outward about 1/2 turn and again slow down the engine and release the mechanism. Continue until the engine accelerates evenly and without a time lag after releasing the governor.

With the carburetor and governor adjusted, set the throttle stop screw, Figure 10, to allow 2200rpm with the engine operating at no load. This prevents excessive hunting when a large load is suddenly removed.

## Removal and Disassembly:

1. Remove the fuel line and governor linkage.
2. Remove the two carburetor mounting nuts and pull off the carburetor.
3. Remove the air cleaner from the carburetor.
4. Remove the float bowl nut and bowl.
5. Remove the float pin and float. Figure 11.
6. Lift out the float valve and unscrew its seat.
7. Remove the no-load adjusting needle.
8. Remove the load adjusting needle and spring.
9. Remove the throttle plant screws and the plate and pull out the throttle shaft.
10. Remove the choke plate screws, plate, and pull out the choke shaft.

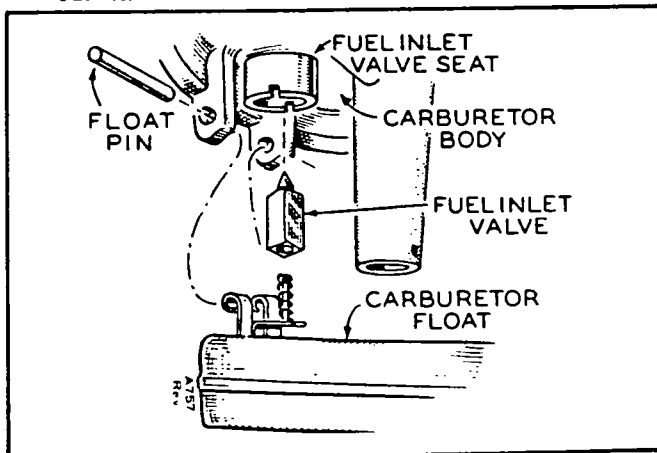


FIGURE 11. CARBURETOR DISASSEMBLY

**Cleaning and Repair:** To clean the carburetor, soak all components thoroughly in a good carburetor cleaner, following the cleaner manufacturer's instructions. Be sure all carbon is cleaned from the carburetor bore, especially in the area of the throttle valve. Blow out the passages with compressed air. If possible, avoid using wire to clean out the passages.

Check the adjusting needles and nozzle for damage. If float is loaded with fuel or damaged, replace it. The float should fit freely on its pin without binding. Invert the carburetor body and measure the float level, Fig. 12.

If necessary, bend the small lip that the intake valve rides on to adjust float level.

Check the choke and throttle shafts for excessive side play and replace if necessary. Do not remove the coating on the throttle shaft. This is teflon, used to reduce wear and friction between the shaft and carburetor body.

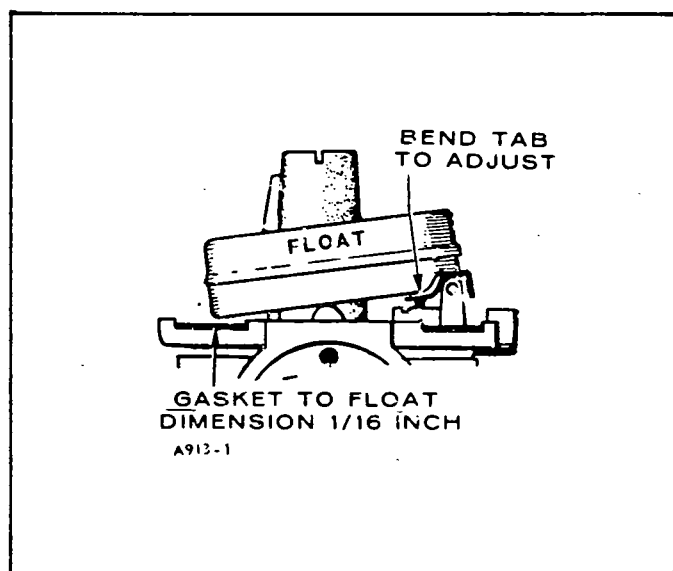


FIGURE 12. FLOAT LEVEL ADJUSTMENT

#### Assembly and Installation:

1. Install the throttle shaft and valve, using new screws and lock washers. Install the bevel mated to the carburetor body. To center the valve, back off the stop screw, close the throttle lever, and seat the valve by tapping it with a small screwdriver; then tighten the two screws.
2. Install choke shaft and valve. Center the valve in the same manner as the throttle valve (step 1). Use new screws and lock washers.
3. Install the main nozzle, making sure it seats in the body casting.
4. Install the intake valve seat and valve.
5. Install the float and float pin. Center the pin so the float bowl does not ride against it.
6. Check the float level with the carburetor casting inverted. See Figure 12.
7. Install the bowl ring gasket, bowl and bowl nut. Make sure that the bowl is centered in the gasket, and tighten the nut securely.
8. Install the load adjusting needle with its spring. Turn in until it seats and back out 1 to 1-1/2 turns.
9. Install the idle adjusting screw finger tight. Then back out 1 to 1-1/2 turns.
10. Install the choke and adjust.
11. Install the carburetor on the engine and connect the gasoline inlet, governor mechanism, breather hose, and choke.
12. Install the air cleaner.

To check float level, remove the entire main fuel adjustment assembly from the float bowl (unscrew large nut from float bowl - Figure 12). Invert the carburetor cover and float. With the float parallel to the cover gasket. The float tab should just touch the fuel inlet valve spring. With the float then hanging, its weight should compress the spring and the top of the float should be 1/16 - 1/8 from the cover gasket. The proper level from the float to the gasket should be 1/16" with the valve spring compressed. The float tab should just touch the fuel inlet valve and not compress the inlet valve spring. Adjust by bending the tab on the float.

**NOTE:** Do not apply excessive pressure to float valve.

# VALVE SYSTEM

Properly seated valves are essential to good engine performance. The aluminum cylinder head is removable for valve servicing. Do not pry to loosen the cylinder head, rap sharply on the edge with a soft faced hammer, taking care not to break any cooling fins. A conventional type valve spring lifter may be used when removing the valve spring locks, which are of the split type. Clean all carbon deposits from the cylinder head, piston top, valves, guides, etc. If a valve face is burned or warped, or the stem worn, install a new valve.

Worn valve stem guides may be replaced from inside the valve chamber. Valve locks are split, tapered type, the smaller diameter of which must face toward the valve head. Tappets are also replaceable from the valve chamber, after first removing the valve assemblies.

The valve face angle is  $44^\circ$ . The valve seat angle is  $45^\circ$ . This  $1^\circ$  interference angle results in a sharp seating surface between the valve and the top of the valve seat. The interference angle method of grinding valves minimizes face deposits and lengthens valve life (Figure 13).

The valves should not be hand lapped, if at all avoidable, since the sharp contact may be destroyed. Valve faces should be finished in a machine to  $44^\circ$ . Valve seats should be ground with a  $45^\circ$  stone, and the width of the seat band should be  $1/32$  to  $3/64$  of an inch wide. Grind only enough to assure proper seating.

Remove all grinding compound from engine parts and place each valve in its proper location. Check each

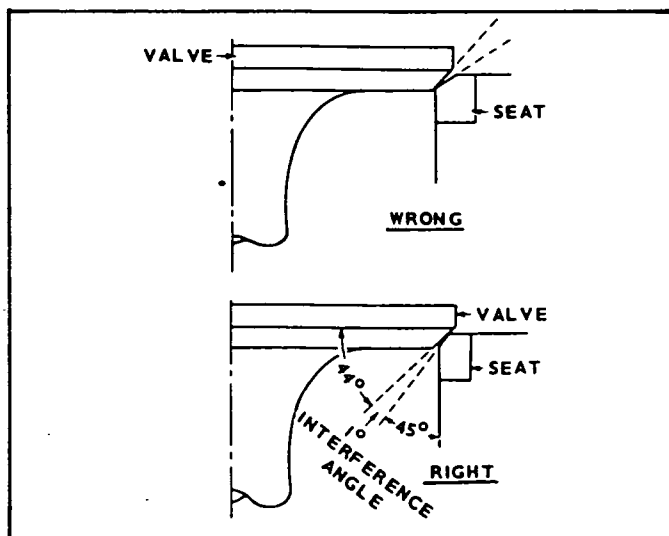


FIGURE 13. VALVE GRINDING

valve for a tight seat, using an air-pressure-type testing tool. If such a tool is not available, make pencil marks at intervals across the valve face and observe if the marks rub off uniformly when the valve is rotated part of a turn against the seat.

Lightly oil the valve stems and reassemble all parts removed. Adjust the valve clearance.

## TAPPET ADJUSTMENT

The engine is equipped with adjustable tappets. To make a tappet adjustment, remove the blower housing, valve

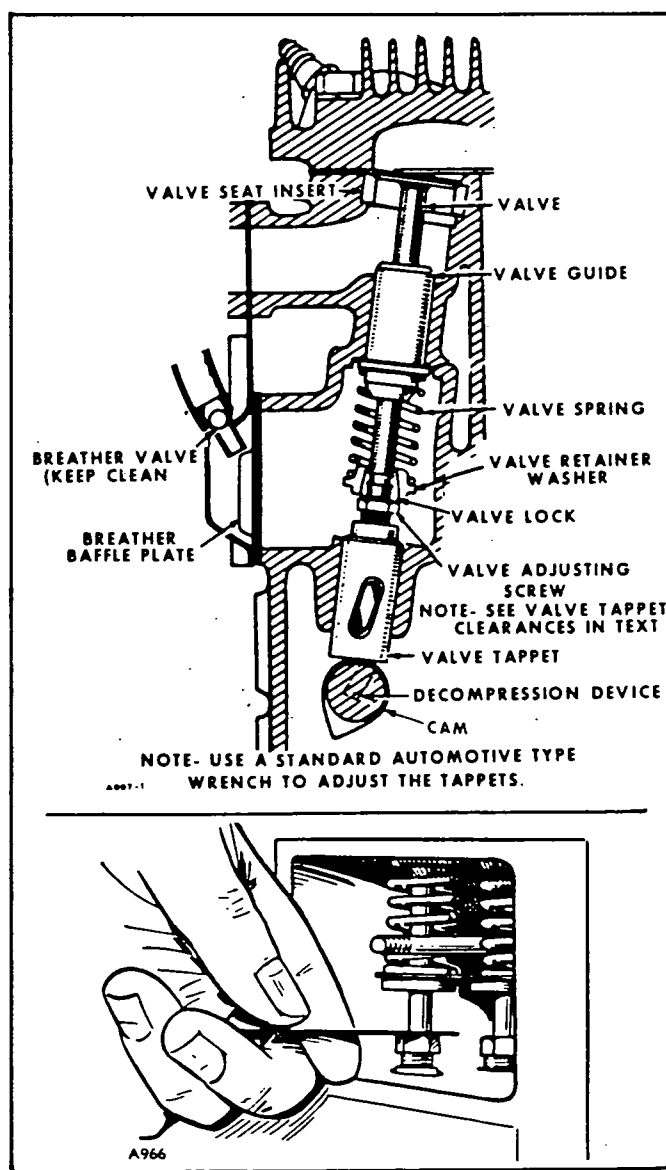


FIGURE 14. TAPPET ADJUSTMENT

cover and the spark plug. Turn the flywheel by hand to the end of the compression stroke until the T/C mark on the flywheel aligns with the 0° (degree) mark on the gear case cover. Continue to rotate the flywheel until the piston is approximately 1/4" down from the top of the cylinder. At this point the valves are closed and the valve stems and tappets should separate sufficiently to insert a feeler gauge (Figure 14). Starting with the thickest gauge that will enter the gap, turn the adjusting screw until the clearances specified in the Table of Clearances are obtained.

For example, if the largest gauge that will enter is .014 on the intake valve, this means that the adjusting screw

must be turned out. When at proper setting, the .010 feeler gauge will enter but the .011 gauge will not.

**NOTE:** *Make sure to exert downward pressure on the tappet so that contact with the cam lobe is maintained when measurements are taken. If this is not done, a false measurement may result.*

If more clearance is required, reverse the above procedure, but starting with the smallest feeler gauge and turning the adjusting screw in.

# STARTING SYSTEM

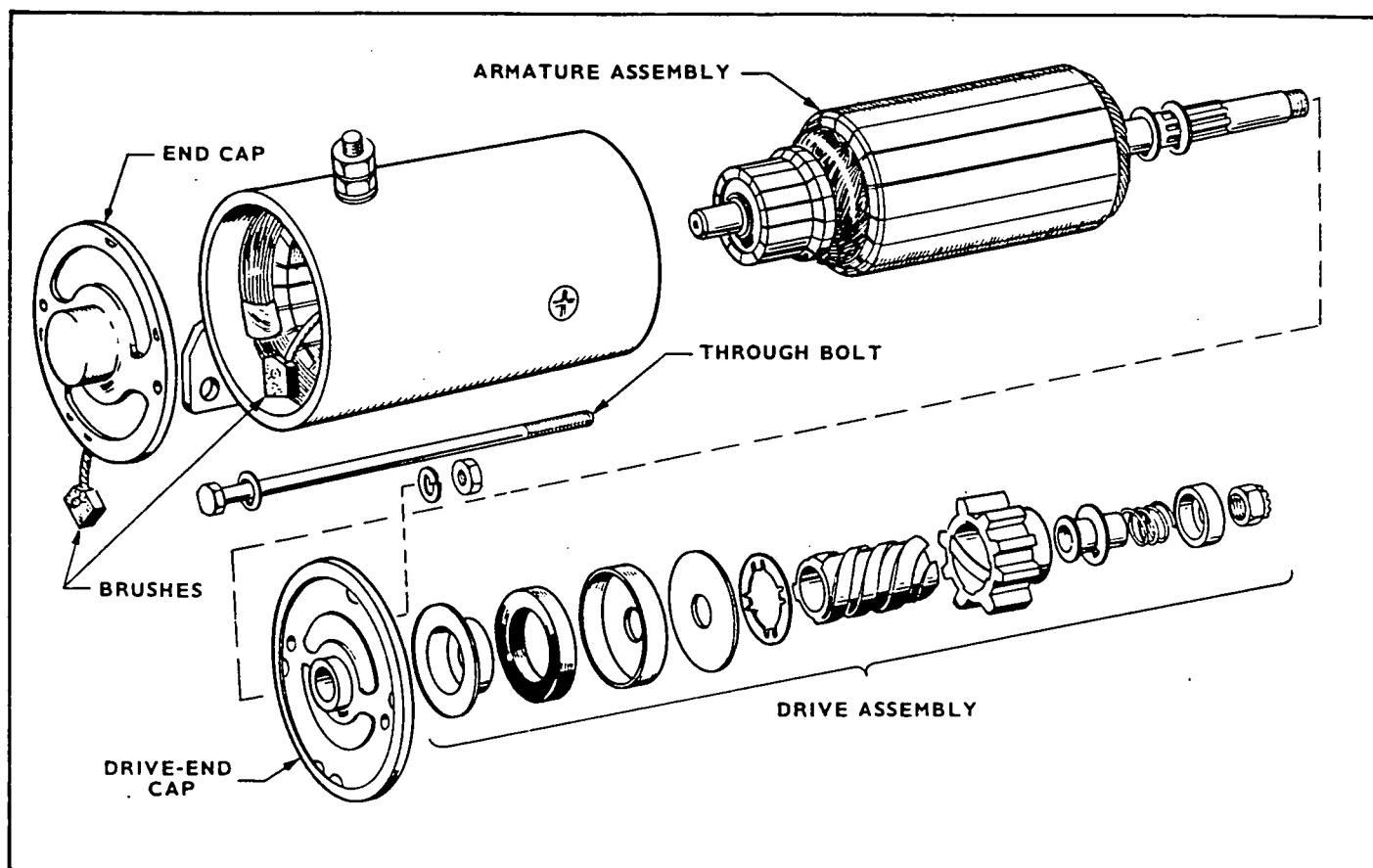


FIGURE 15. ELECTRIC STARTER ASSEMBLY

## ELECTRIC STARTER

Over a period of time, depending upon operating conditions, the electric starter may require minor maintenance such as brush replacement. Complete overhaul may be needed if the starter has been damaged through misuse or accident. The following instructions detail disassembly, reassembly, repair, testing, and maintenance.

## DISASSEMBLY

Figure 15 is the exploded view of the cranking motor. The disassembly is performed in the following sequence.

1. Remove the through-bolts.
2. The armature, drive and cap assembly and drive assembly are removed as a unit from the drive end. The end cap assembly may be taken off by removing the brushes from the brush holders.
3. If necessary, the drive assembly may be disassembled further by removing the self-locking nut.
4. Remove the terminal, if required.

## CLEANING

1. Such parts as the field coil, armature, and brushes are wiped with a clean dry cloth. If compressed air is available this may be used.
2. Bearing equipped parts should not be soaked in a non-petroleum base solvent. These parts are soaked in mineral spirits and cleaned by brushing.
3. The rubber cushion should be cleaned in non-flammable solvent, but never in mineral spirits.
4. All parts that have been washed in solvent should be well dried before use.

## REASSEMBLY

Reassembly is the reverse of disassembly. The following precautions should be taken.

1. Apply a film of medium engine oil to the bearing portions before reassembly. Also to the exterior and interior of the shaft screw a small quantity of a very light grade oil should be applied; medium or



heavy oil and grease may cause to the drive assembly to stick in cold weather.

2. Spline threads are provided up to the mid portion of the interior of screw sleeve and when assembling the drive assembly the spline thread portion should be on the armature aide.
3. After the drive assembly is assembled on the shaft the self locking nut is tightened by a torque of 170-220 in-lbs.
4. The armature should be adjusted by spacing washers to give end play of .005" - .015".
5. The thru-bolts are tightened by a torque of 35 - 44 in-lbs.

## PERFORMANCE TEST

1. No load test:

The cranking motor is wired up as shown in Figure 16 and run. The values of meter readings should be as follows:

Battery Voltage	11.8 V
Minimum RPM	8,000
Maximum Current Draw	25 Amperes

If the above meter readings are obtained, operation is considered satisfactory.

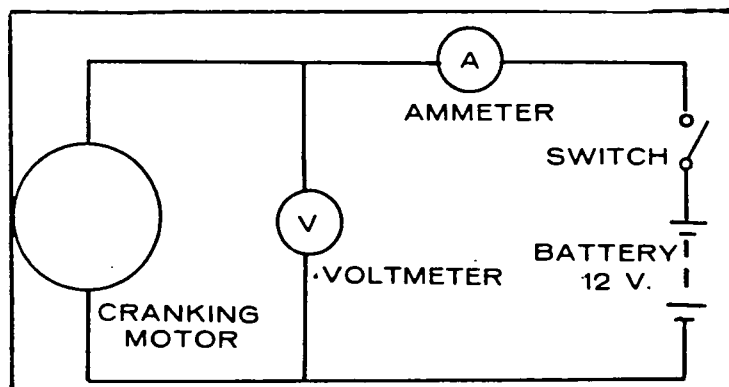


FIGURE 16. CRANKING MOTOR TEST CIRCUIT

**NOTE:** The conductor for the testing should be at least #14AWG and as short as possible for no-load testing.

2. Inspection of Drive Assembly:

The operation of the drive assembly is inspected by instantaneously applying rated voltage to the connection circuit in Figure 16.

3. If in either 1 or 2 above an abnormal condition is found, the following inspections are to be made:

- Annealed brush springs
- Improperly seated brushes
- Insufficient armature end play
- Shorted or open armature
- Shorted or grounded armature

- Shorted or grounded field
- Poor electrical connection
- Dirty commutator

## INSPECTION

1. Inspection for Grounded Armature:

Grounds in the armature can be detected by the use of a test lamp and test points. If the lamp lights when one test point is placed on the commutator with other point on the core or shaft, the armature is grounded.

2. Inspection for Shorted Armature:

Short circuits in the armature are located by use of a growler. When the armature is revolved in the growler with a steel strip such as a hack-saw blade held above it, the blade will vibrate above the area of the armature core in which the short circuit is located.

3. Inspection for Open in the Armature:

The most likely place for an open to occur is at the commutator riser bars. Inspect the points where the conductors are joined to the commutator bars for loose connections.

4. Inspection for Open in the Field Coil:

Connect test lamp leads to ends of field coils. If lamp does not light, the field coils are open.

5. Inspection for Grounded Field Coil:

Connect one lead of the test lamp to the yoke and the other lead to the field connector. If the lamp lights, field coil is grounded.

6. Brush Inspection:

When brushes are worn more than 5/16 inch they are to be replaced. Figure 17 shows the limit for wear. See that the brushes move smoothly in the brush holder.

7. Inspection for Brush Spring Pressure:

If the pressure on the tension testing measures 17-25 ounces the pressure on the brush will be sufficient.

8. Drive Assembly Inspection:

Fully compress the drive spring and make certain that the gear assembly freely returns to its original position.

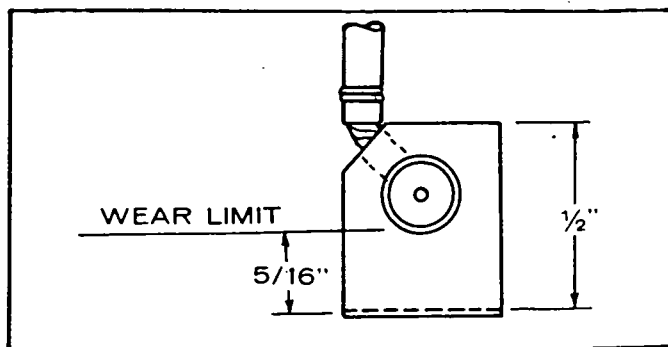


FIGURE 17. BRUSH INSPECTION FOR WEAR

### Precautions To Be Taken After Service:

1. The shaft of the cranking motor and the central axis of the engine must be parallel and the mounting bolts should be tightened so that cranking motor does not shift when starting. When tightening is incomplete or any foreign material exists at the mating surface, damage such as cracking the housing may occur.
2. When cranking motor is used the following cranking time should be observed.
  - a. Do not put the cranking motor in continuous operation for more than 20 seconds.
  - b. Between 20 seconds of cranking time give 30 seconds of rest time between each cranking cycle.
  - c. Do not repeat the above (a) step more than 5 times. If the engine does not start, there may be some other cause for non-start and this must be inspected.
3. If the engine does not crank do not leave the starter in a stall (locked rotor) condition longer than 10 seconds.
4. This cranking motor requires no oiling but when it is dismantled, lubrication should be done as instructed in Disassembly Section.

### READI-PULL STARTER (Optional)

Refer to Figure 18 showing the Read-Pull manual starter disassembled.

#### **WARNING**

*The recoil spring may unwind and cause injury if let fly wildly when starter is disassembled or reassembled.*

The sheave hub bearing (16) has a recess which was packed full of grease at the factory. Normally, no

additional lubrication is required. However, if the starter is disassembled for some other reason, add grease to the bearing and to the spring pawls (11) where they contact the ratchet arm (13).

To install a new rope or internal parts, remove the starter from its mounting ring by removing the four clamping screws.

To install a new rope, rotate the sheave (10) with crankshaft rotation direction to fully tighten the spring (8), back up only as necessary to align the hole in the sheave with the slot in the cover (5), clamp the rope to the sheave, then when released, the rope will wind on the sheave.

To install a new recoil spring, remove the sheave from the cover. Wind the spring, with its rivet heads outward, forming a coil small enough to be inserted in the recess of the starter cover. It may be necessary to tie the spring with a piece of wire to prevent its unwinding during installation unless other help is available. Place the spring in the cover recess in crankshaft rotation direction. Remove the tying wire if used. While holding the spring to prevent its unwinding, install the inside end of the spring on the roll pin (7) in the cover. With the pull rope removed, install the sheave assembly in the cover so that the tab on the sheave enters the outside end loop of the recoil spring. Be sure the thrust washer (9) is in place. Then install the pull rope.

Spring breakage is much less common than spring fatigue due to long usage. In either case, the spring should be replaced. Cleaning and lubricating the pawls and ratchet arms in the rope sheave will improve a sluggish acting recoil. To temporarily extend the life of a fatigued spring, try rewinding it *inside out* (rivet heads inward).

To install a ratchet arm (13) in the sheave, the pawl

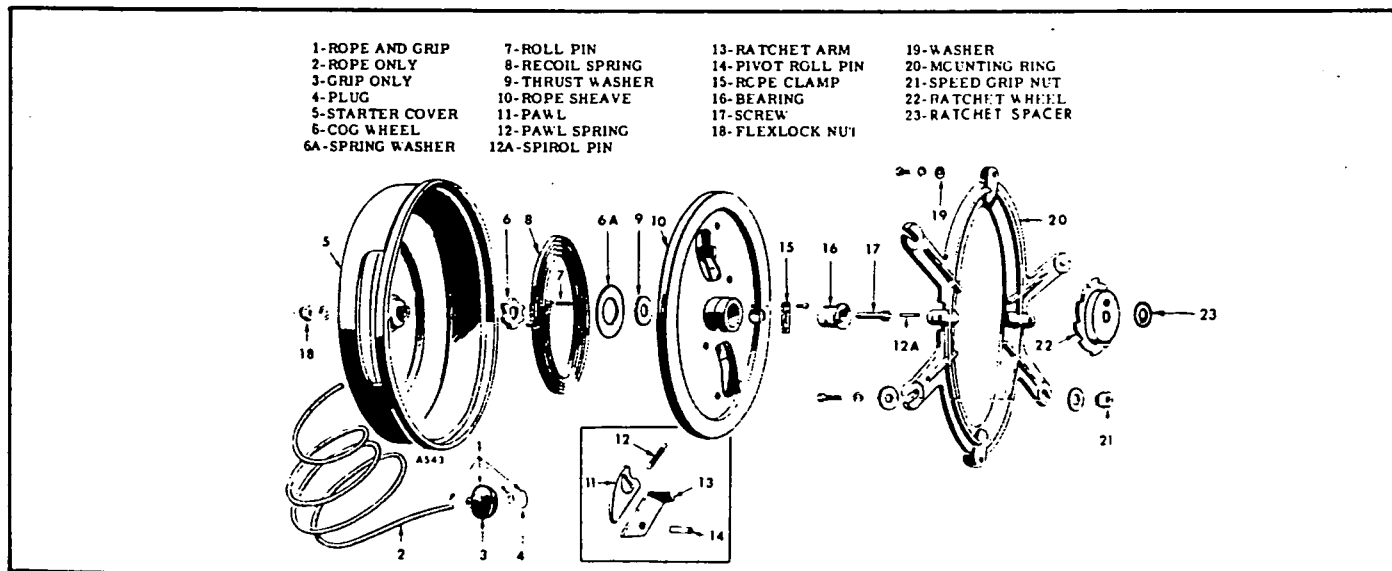


FIGURE 18. READI-PULL STARTER ASSEMBLY

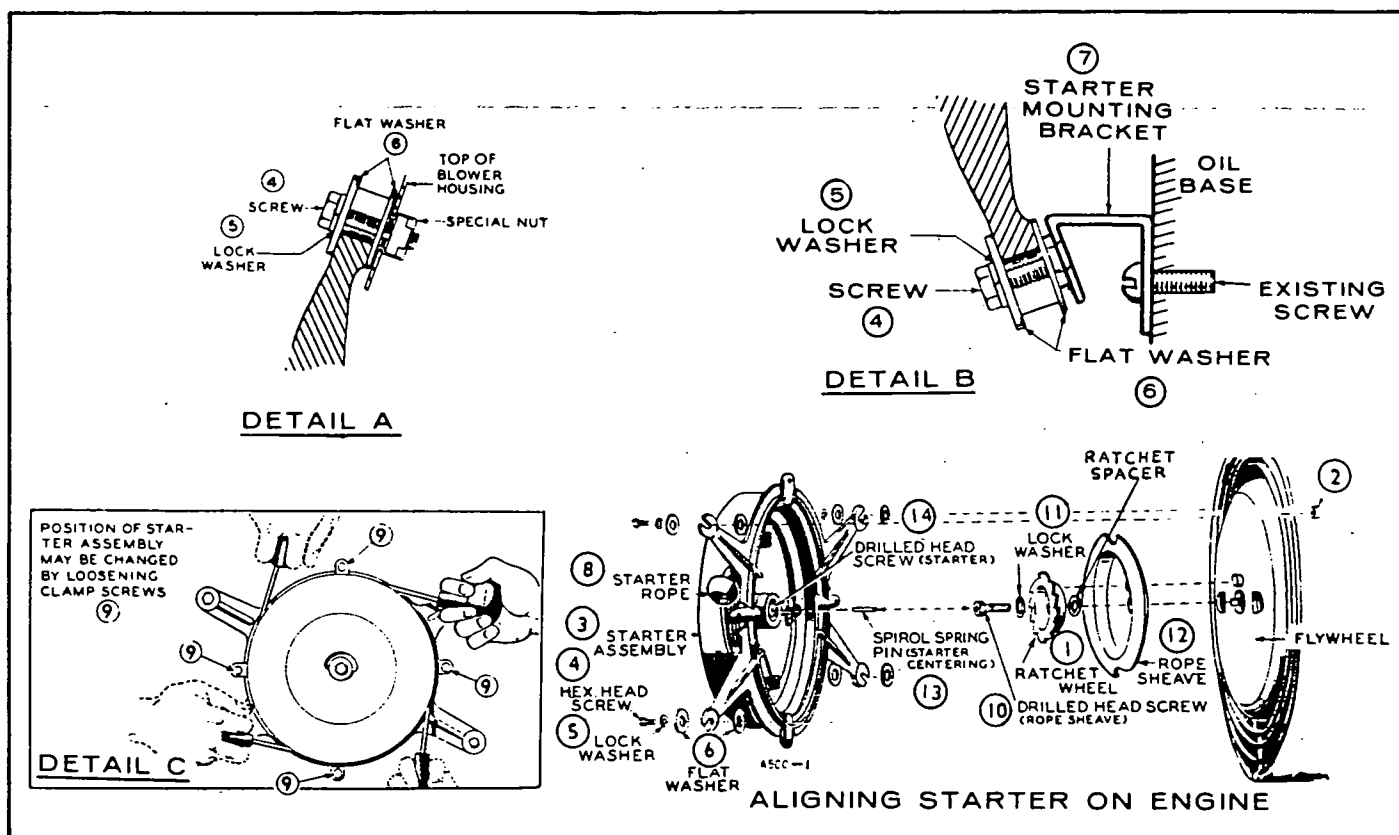


FIGURE 19. INSTALLATION OF READI-PULL STARTER

(11) must first be removed. The ratchet arm will fit in only the correct position. The spring pawl must be installed with its flat edge against the ratchet arm.

The anti-backlash cogwheel (6) is an easy press fit on the starter cover.

### INSTALLING THE READI-PULL STARTER

See that the engine blower housing is in good condition. If the mounting holes are worn or if the blower housing is otherwise damaged, replace it with a new one. Refer to Figure 19.

1. Install the new ratchet wheel (1) against rope sheave (12) using lock washer (11) and flywheel mounting screw (10). Discard the large flat washer from engines so equipped. Engage drive hole with flywheel boss.
2. Special nuts (2) are supplied for mounting the starter to the blower housing. If the blower housing is not already fitted with similar nuts, remove the blower housing and install the nuts as shown in detail A. Reinstall the blower housing, tightening securely in place.
3. Use the two bottom screws which hold the blower

housing to the oil base to install the left- and right- hand starter mounting brackets (7 in detail B). Do not tighten at this time.

4. Install centering pin (13) in starter center screw (14) allowing  $3/8"$  to protrude so it will engage with pilot hole in the flywheel mounting screw (10).
5. Center the starter assembly over the ratchet wheel with the centering pin (13) engaged. While holding in position, mount the starter using a hex head screw (4), lock washer (5) and two flat washers (6) at each mounting arm as shown in details. Note a thin flat washer is used under each arm and a thick washer outside the arm. Tighten the mounting screws securely.
6. Tighten the two lower screws removed earlier on the oil base
7. The direction of pull on the starter rope is adjustable to fit the individual installation. See detail C. To change the direction of pull, loosen the four clamp screws (9) and turn the starter in its mounting ring to the desired position. Tighten the four clamp screws securely. Try the starter several times, making sure that the pull rope will not rub against one of clamping screws.

# ENGINE DISASSEMBLY

## GEAR COVER

After removing the mounting screws, tap the gear cover gently with a soft-faced hammer to loosen it.

When installing the gear cover, make sure that the pin in the gear cover engages the metal-lined (smooth) hole in the governor cup. Turn the governor cup so that the metal-lined hole is at the three o'clock position. The smooth side of the governor yoke must ride against the governor cup. Turn the governor arm and shaft clockwise as far as possible and hold in this position until the gear cover is installed flush against the crankcase. Be careful not to damage the gear cover oil seal. Adjust the roll (stop) pin to protrude to a point  $3/4$ " from the cover mounting surface.

## GOVERNOR CUP

With the gear cover removed, the governor cup can be taken off after removing the snap ring from the camshaft center pin. Catch the flyballs while sliding the cup off. See Figure 20.

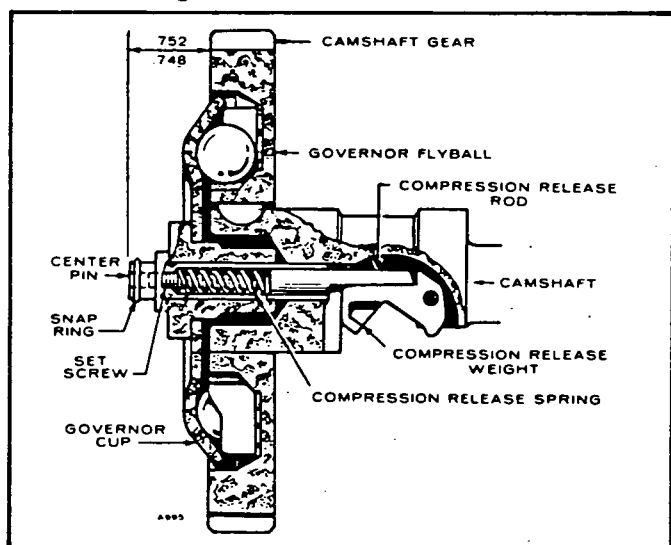


FIGURE 20. GOVERNOR CUP DETAILS

In order to facilitate easier cranking, a compression release has been built into the camshaft gear and governor assembly. See Figure 20. This device holds the exhaust valve open approximately  $.020$ " on the compression stroke when starting. After the engine starts, the compression release weight extends due to centrifugal force and the exhaust valve functions normally. No adjustment of this assembly is required nor possible.

When starting or stopping, there will be a sharp, metallic click caused by the decompression release.

If for any reason the governor cup is disassembled and then reassembled, initial adjustment of the set screw shown in figure 20 is critical. Position the set screw

at the governor cup assembly so that the nose of the compression release weight is even with the cam base circle, when the weight nose is at the "in" position. The weight nose should be  $.001$ " maximum outside the base circle to  $.004$ " maximum inside the base circle.

**NOTE:** Set screw is adjusted at the factory and secured in position with Locktite. If the set screw is removed ALWAYS use Locktite or equivalent thread sealant to lock screw in position.

Replace with a new part, any flyball which is grooved or has a flat spot, the ball spacer if its arms are worn or otherwise damaged, and the governor cup if the race surface is grooved or rough. The governor cup must be a free spinning fit on the camshaft center pin, but without excessive looseness or wobble.

When installing the governor cup, tilt the engine so the gear is up, put the flyballs in place (equally spaced) and install the cup and snap ring on the center pin. See Figure 21.

The camshaft center pin extends out  $3/4$ " from the end of the camshaft. This distance provides an in and out travel distance of  $7/32$ " for the governor cup, as illustrated. Hold the cup against the flyballs when measuring. If the distance is less (the engine may race, especially at no load), remove the center pin and press a new pin in only the required amount. Otherwise, grind off the hub of the cup as required. The camshaft center pin cannot be pulled outward nor removed without damage. If the center pin extends out too far, the cup will not hold the flyballs properly.

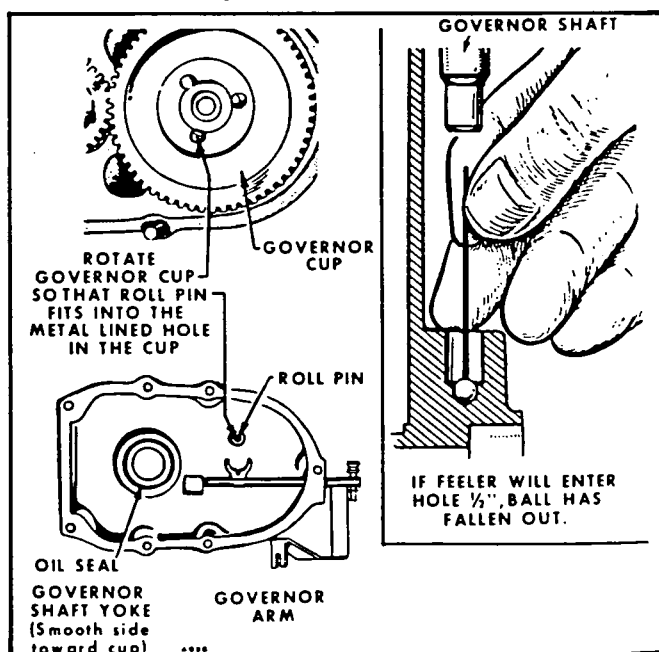


FIGURE 21. GEAR COVER ASSEMBLY

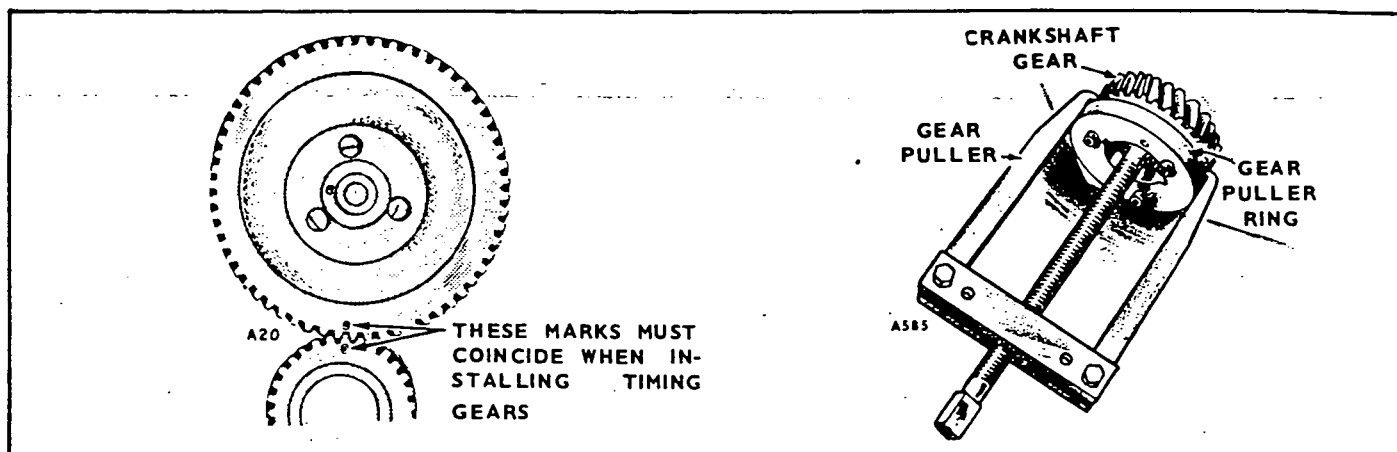


FIGURE 22. TIMING GEAR REMOVAL AND INSTALLATION

### TIMING GEARS

If replacement of either the crankshaft gear or the camshaft gear becomes necessary, install both gears new, never one only. To remove the crankshaft gear, first remove the snap ring, then use crankshaft gear puller to remove gear as shown in Figure 22.

The camshaft gear is pressed on and keyed to the camshaft. The camshaft and gear must be removed as an assembly, after first removing the crankshaft gear lock ring and washer. Before removing the camshaft and gear assembly, remove the cylinder head and valve assemblies. Remove the fuel pump and tappets. After removing the governor cup assembly from the gear, the camshaft may be pressed out of the gear by use of a hollow tool or pipe which will fit over the camshaft center pin. Do not press on the center pin or damage it in any way. The governor ball spacer is a press fit to the camshaft gear.

When pressing a camshaft gear onto the camshaft, be sure the gear is started straight and that the key is properly in place. Install the governor cup assembly before installing the camshaft and gear in the engine.

Each timing gear is stamped with O mark near the edge. The gear teeth must mesh so that these marks exactly coincide when the gears are installed in the engine. Be sure, when installing the camshaft gear and shaft assembly, that the thrust washer is properly in place behind the camshaft gear. Replace the retaining washer and lock ring to the crankshaft.

### PISTONS AND RINGS

The piston and connecting rod assembly is removed outward from the cylinder. The pistons are fitted with two compression rings and one oil control ring with an expander. Inspect each piston. The piston ring grooves should be cleaned of any carbon deposits and the oil return slots in the lower groove must be open.

If the pistons are badly scored, very loose in the cylinder, have badly-worn ring grooves, or otherwise are not in good condition, install new pistons. Install new pistons if the old ones are loose on the piston pins and 0.002" oversize piston pins will not correct it. Handle pistons carefully to avoid nicking the walls. Any raised surface of this type must be dressed down carefully.

Inspect the rings carefully for fit in grooves, for tension and for seating on cylinder walls. Install new rings where there is any doubt about the condition of the old rings.

For following, refer to Figure 23. Before installing new rings on the piston, check the ring gap by placing each ring squarely in its cylinder at a position corresponding to the bottom of its travel. The gap between the ends of the ring is given in the Table of Dimensions and Clearances. Rings which are slightly oversize may be filed as necessary to obtain the correct gap, but do not use rings which require too much filing. Standard size rings may be used on .005" oversize pistons. Use .010", .020", .030" and .040" oversize rings

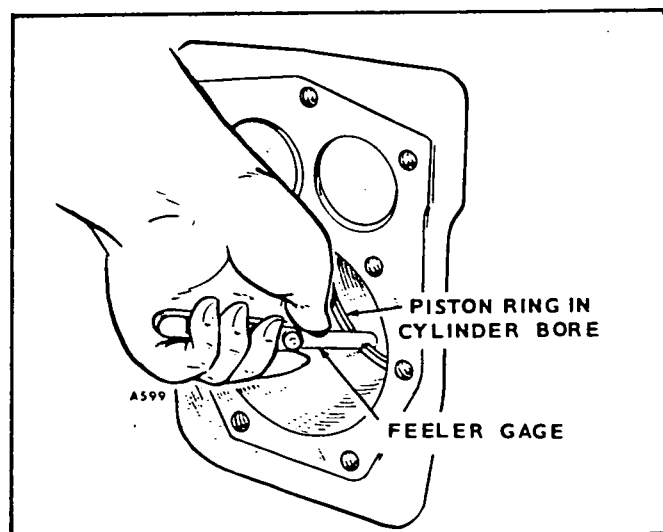


FIGURE 23. FITTING PISTON RINGS TO CYLINDER

on corresponding oversize pistons. Rings of the tapered type are usually marked *top* on one side, or identified in some other manner and the ring must be installed with this mark toward the closed end of the piston.

Space each ring gap one third of the way around the piston from the preceding one, with no gap directly in line with the piston pin. The bottom piston ring groove should be fitted with an expander and an oil control ring and the two upper grooves fitted with compression rings. The chrome-faced ring should be fitted in the top groove. The oil control ring is selected for best performance in regard to the correct unit pressure characteristics.

The piston is fitted with a full floating-type piston pin. The pin is kept in place by two lock rings in the piston, one at each side. Be sure these lock rings are properly in place before installing the piston and connecting rod in the engine. Refer to Table of Dimensions and Clearances for the correct piston-to-cylinder clearance.

### CONNECTING RODS

The connecting rod should be serviced at the same time the piston or piston rings are serviced. Rod must be removed with the piston. Rods are available in standard or .010", .020" or .030" undersize.

Install the connecting rod and cap as shown in Figure 24. Coat the crankshaft journal bearing surfaces with oil before installing the rod. Crank the engine by hand to see that the rod is free. If necessary, rap the connecting rod cap screws sharply with a soft faced hammer to set the rod square on the journal.

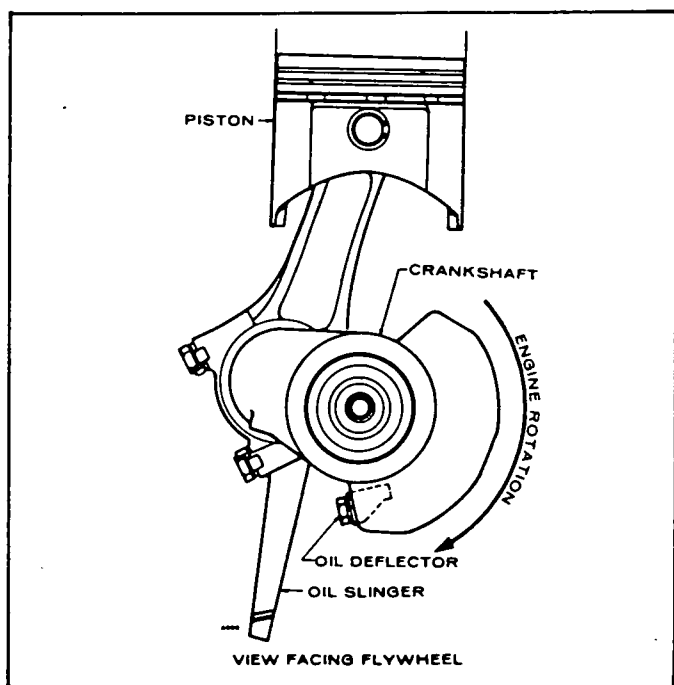


FIGURE 24. CONNECTING ROD INSTALLATION

### CRANKSHAFT

Inspect the bearing journals. If they are scored and cannot be smoothed out by dressing down, the bearing journals should be refinished to use nearest available undersize bearings or a new crankshaft should be installed. If a worn main bearing journal cannot be fitted with an available precision type undersize bearing, then refinish it to the next undersize.

### BEARINGS

Removal of the camshaft or crankshaft bearings requires complete disassembly of the engine. Use a press or a suitable drive plug to remove the bearings. Support the casting to avoid distortion and avoid damaging the bearing bore during removal and installation. Use oil on the bearings to reduce friction when installing and again lubricate with oil after installing. See Figure 26.

New crankshaft main bearings are precision type which *do not* require line reaming or line boring after installation. They are available in standard size .002", .010", .020" or .030" undersize. Expand the bearing bore by placing the casting in hot water or in an oven heated to 200°F.

**CAUTION** If a torch is used, apply only a little heat.

If practical, cool the precision bearing to shrink it. Align the oil hole(s) in the bearing with the oil hole(s) in the bearing bore. The oil passage must be at least 1/2 open. The cold oiled precision bearing should require only light taps to position it. Install the bearing flush with the inside end of the bore. If head of lock pin is damaged, use side cutters or Easy

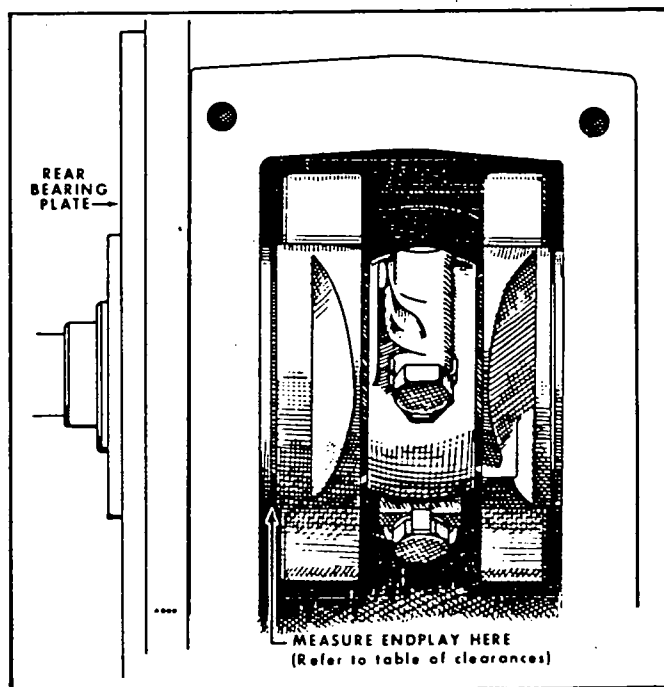


FIGURE 25. CRANKSHAFT ENDPLAY

Out tool to remove and install new pin. Apply oil to thrust washer to hold it in place while installing the crankshaft. Oil grooves in thrust washers must face the crankshaft, washers must be flat (not bent) and washers two notches must fit over two lock pins to prevent riding on crankshaft.

New camshaft bearings are precision type which *do not* require line reaming or line boring after installation. Coat the bearing with lubricating oil to reduce friction. Place the bearing on the crankcase over the bearing bore with the elongated hole in proper position and narrow section facing out (except bores without oil holes install with bearing groove at the top). Be sure to start the bearing straight. Press the front bearing in flush with the outside end of the bearing bore. Press the rear bearing in flush with the bottom of counterbore which receives the expansion plug.

### OIL SEALS

The bearing plate must be removed to replace its oil seal. Drive the oil seal out from the inside.

Before installing the seals, fill the space between seals with a fibrous grease or stiff cup grease. This will improve sealing. See Figure 27.

When installing the gear cover oil seal, tap the seal inward until it is  $\frac{31}{32}$  of an inch from the mounting face of the cover. Install new style, thin open-face seal  $1\frac{7}{64}$ " from the mounting face of cover.

When installing the bearing plate oil seal, tap the seal into the bearing plate bore to bottom against the shoulder in the plate bore. Use a seal expander, or place a piece of shim stock around the end of the crankshaft, when replacing the bearing plate to avoid damaging the seal. Remove the shim stock as soon as the plate is in place.

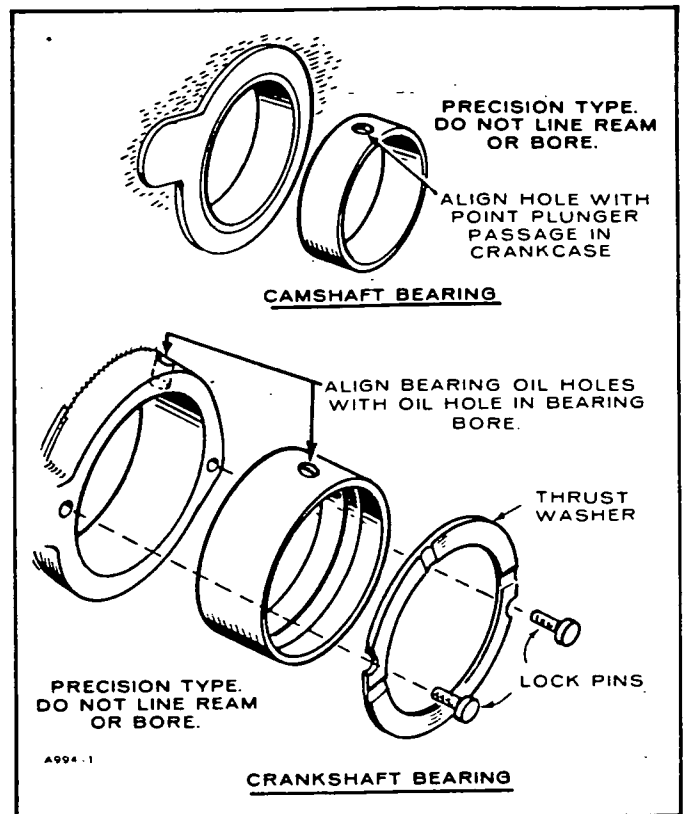


FIGURE 26. CAMSHAFT AND CRANKSHAFT BEARINGS

### CYLINDER

The cylinder wears very little in normal service. If, through improper lubrication or accident, the cylinder wall should become scored or worn badly, the cylinder may be rebored and honed to accommodate a new piston and ring set of the available oversizes. Pistons are available in .010", .020", .030" and .040" oversize. Piston rings are available in .010", .020", .030" and .040" oversize. If the cylinder is not being recondi-

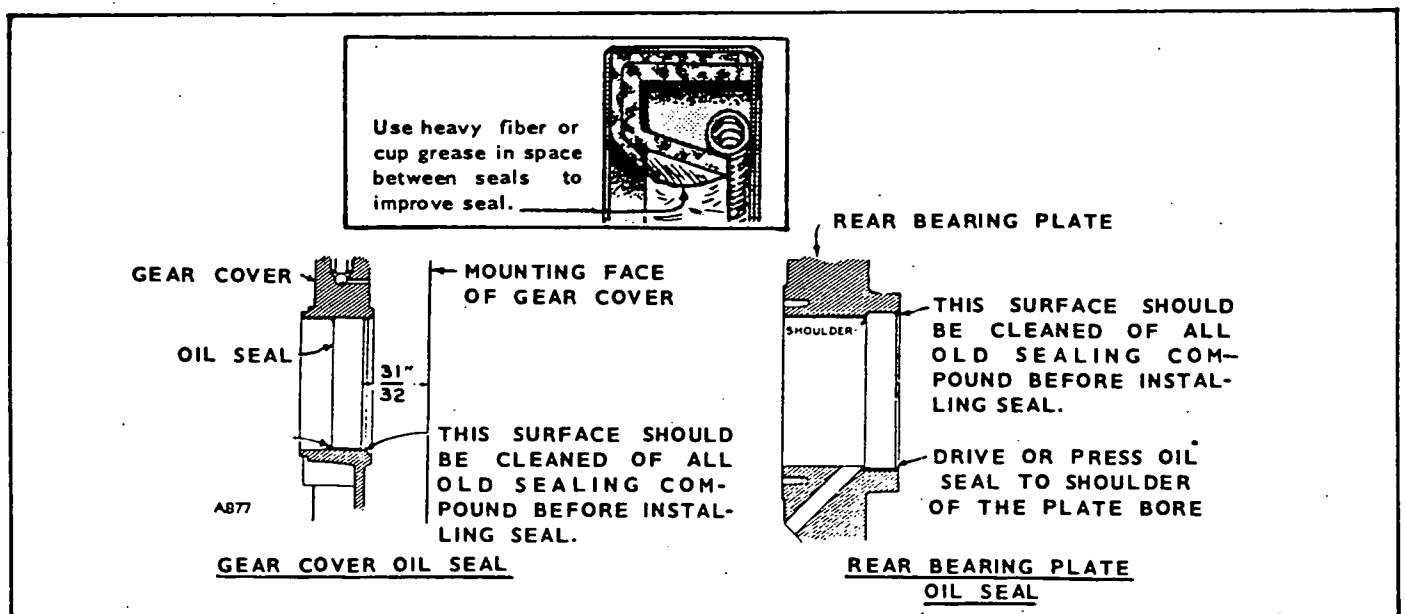


FIGURE 27. GEAR COVER AND REAR BEARING PLATE OIL SEALS

tioned, but new piston rings are being installed, remove any ridge which may have become formed at the top of piston ring travel in the cylinder bore. Engine might be fitted at the factory with a .005" oversize piston and are so indicated by a letter E following the engine serial number stamped on the cylinder block and on the unit nameplate. The standard bore size appears in Table of Dimensions and Clearances.

### CYLINDER HEAD

The cylinder head bolts should be tightened in the order designated in Figure 28 and to the torque specified at the time the engine is assembled or the cylinder head replaced. This should be at room temperature. At some later time, after the engine has been operated so it reached normal hot temperature and allowed to cool to room temperature, the cylinder head bolts should be retorqued to the original specified torque. This retightening should be done before the engine has been run a total of fifty operating hours.

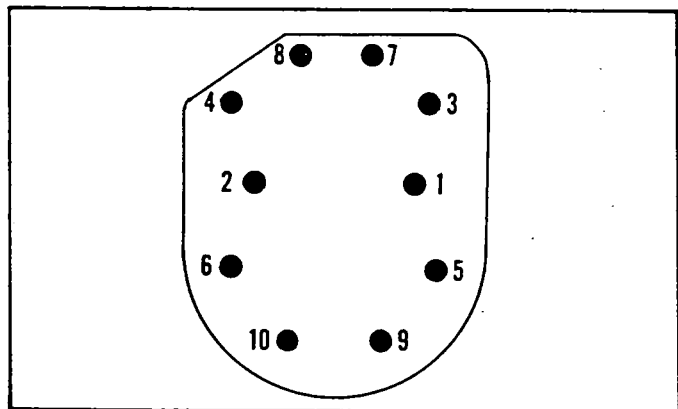


FIGURE 28. HEAD BOLT TIGHTENING DIAGRAM

### FLYWHEEL

Removing an aluminum flywheel is a relatively simple process, but the following procedure must be followed to avoid damage to the gear case and possible injury to the operator.

1. Turn the flywheel mounting screw outward about two turns.

#### **WARNING**

*Do not remove the screw completely since it acts as a restrainer when the flywheel snaps loose. If the flywheel is not held by the screw, the spring action in the wheel will cause it to fly off with great force which can cause injury to the operator.*

2. Install a puller bar (Part No. 420A100) on the flywheel as shown in Figure 29.
3. Turn the puller bar bolts in, alternately, until the wheel snaps loose on the shaft.

To remove a die cast wheel with puller slots in the face, use a suitable claw type puller.

#### **CAUTION**

*Do not use a screwdriver or similar tool to pry behind the flywheel against the gear case. The gear case cover is die-cast material and will break if undue pressure is applied in this manner.*

4. Unscrew the puller from the flywheel, remove the flywheel mounting screw and washer and pull the flywheel off the shaft. Take care not to drop the wheel. A bent or broken fin will destroy the balance. Always use a steel key for mounting the flywheel.

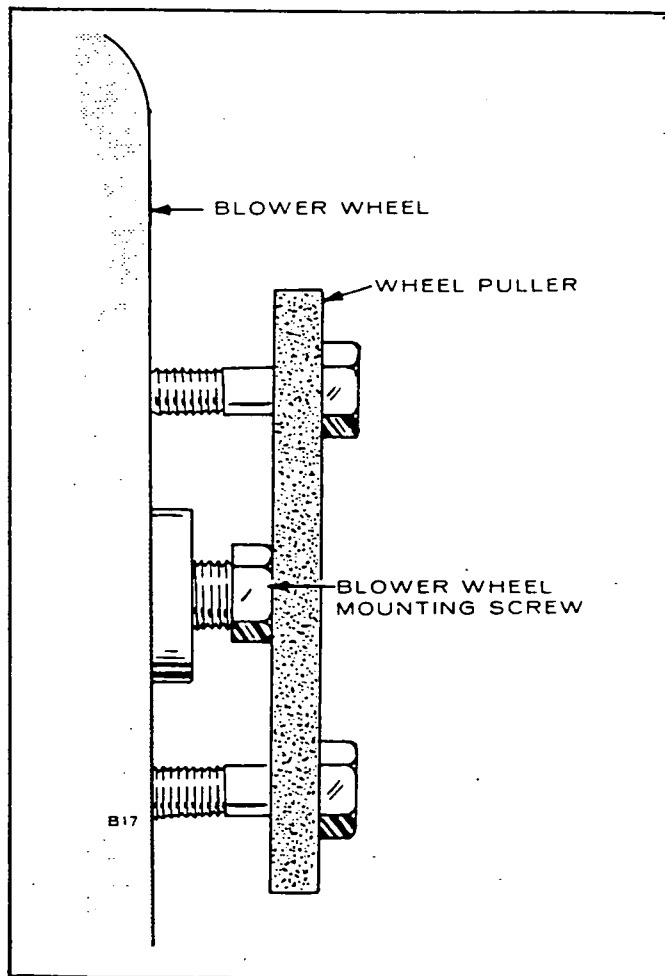


FIGURE 29. BLOWER WHEEL PULLER



# GENERATOR MAINTENANCE

## GENERATOR REVOLVING FIELD

The generator uses a 2 pole revolving field with an exciter winding to excite the field and regulate the AC output (Figure 30).

The generators' AC welding output comes from the stator windings which also supply 120 volts, or 120/240 volts, AC, depending on model. An additional winding supplies power for battery charging system (electric start models only).

To aid servicing and repair, all output leads from the generator are marked. The lead and terminal markings are shown on the welder wiring diagram.

## MAINTENANCE

The generator normally requires little care other than periodic inspection of the bearing, collector rings and brushes every 500 hours.

## BRUSHES

After approximately 500 hours of operation, remove the generator brushes and inspect for wear, scoring and general conditions.

To remove the brushes, remove the generator fan guard and the fan. The brush guide is now accessible and can be detached by removing the attaching screws in the end bell. Before removing the brushes from the guide, tag the leads 5 and 6 as shown by the markings on the side of the brush holder. See Figure 31. Unscrew the brush retaining screws and pull the brushes from the guide.

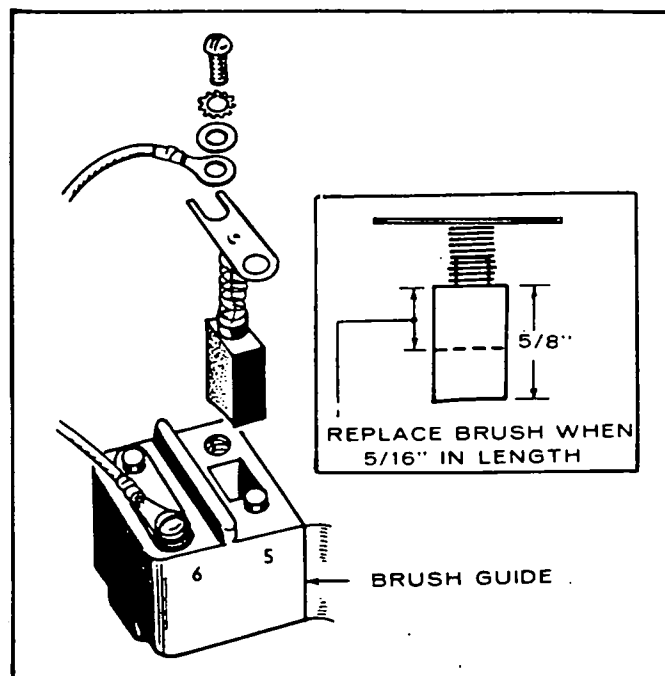


FIGURE 31. GENERATOR BRUSH REMOVAL

The brush faces should have a smooth, coppery cast to them, with no deep grooves present. If serious grooves are noted, the slip rings should be inspected to determine the cause for corrective purposes. If slip ring dressing is required, your nearest qualified electric motor or generator service shop is best equipped to handle this job.

If brushes appear to be in satisfactory condition, and are at least 5/16" in length, replace them in the guide

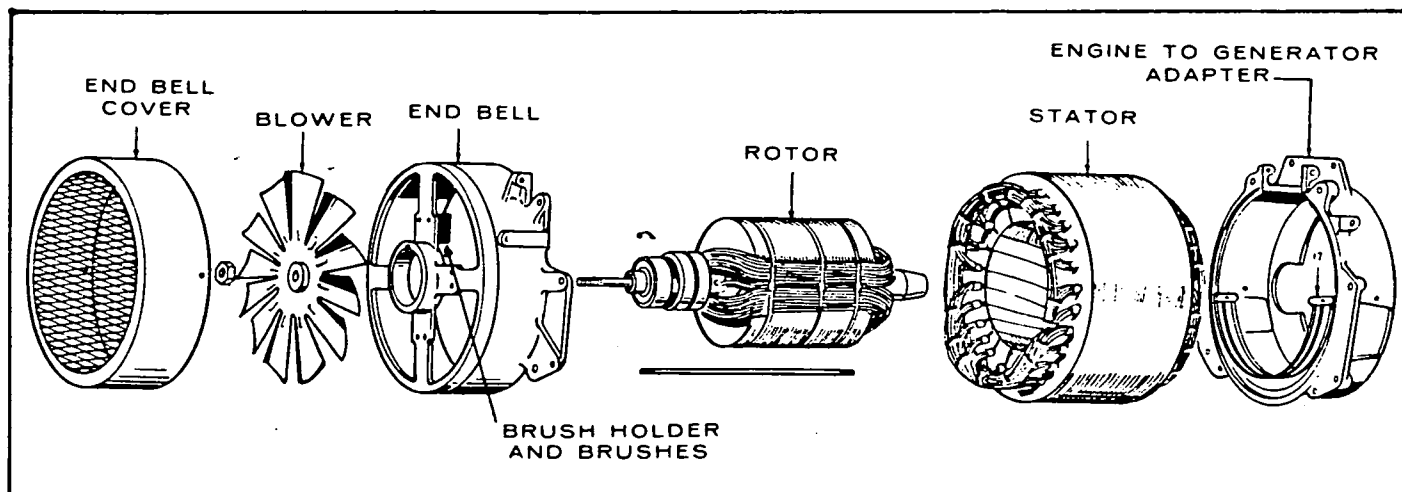


FIGURE 30. NB GENERATOR ASSEMBLY

from which they were removed. Work the brushes up and down in the guide to be sure there is no sticking or binding. If they bind, clean out the guide with air pressure or a small bristle brush until the brushes slide freely in the guide. Replace the brush retainer screws.

If brushes are worn to less than 5/16" length, replace with new brushes. See Figure 31 for comparison scale.

When replacing brushes, don't use a substitute brush that may look identical. It may have entirely different electrical characteristics.

### GENERATOR BEARING

This bearing is prelubricated and double-sealed. For maximum reliability, replace during a general overhaul.

### COLLECTOR RINGS

Slip (collector) rings may have a dark brown appearance. This is normal and consists of a thin lubricating film which aids in the life of brushes and slip rings. Do not remove the film.

The collector rings must be clean and free of scratches, burrs and marks. If cleaning is necessary, use No. 00 sandpaper to clean the surface. Never use emery cloth or other conducting abrasives.

### TROUBLESHOOTING

Unsatisfactory or erratic operation of the generator can, in most cases, be isolated quite simply. Under or over-voltages can usually be traced to improper governor operation causing over, under, and fluctuating engine speeds. If a fault condition persists, checking the entire electrical system with a continuity tester, or ohmmeter, may be required. The tests that follow can be performed without disassembly of the generator.

#### **WARNING**

*Don't perform troubleshooting tests with the generator running. Serious injury to the operator and damage to the test instruments can result.*

### LOSS OF WELDING POWER

1. Remove control box cover screws (at base of cover) and lift off cover.
2. Visually check the rotary switch wiper blade and contact points for burned areas. If questionable contacts are observed, attach one lead of ohmmeter to left hand welding terminal stud; turn switch handle to contact to be tested. Touch the other ohmmeter lead to the reactor lead where it is clamped to the switch terminal. A low (less than 2 ohms) resistance reading should be obtained on the meter if there is a good contact in the switching members. A high resistance indicates poor contact. If cleaning the contact and wiper blade does not restore

the contact, switch replacement may be necessary. See Control Box Section.

3. If switch checks out satisfactorily, examine all leads, terminals, and screw connections visually for opens or shorts. A point-to-point check with the ohmmeter will indicate any open circuit.
4. If connections appear all good, isolate the diode (see Control Box Section) attached to the small circuit board back of the control panel. Check the diode with the ohmmeter by alternately reversing the leads. If the diode passes current in one direction and not the other, the diode is probably good.

**NOTE:** *A bad diode will cause the ignition to short and stop the engine. A marginal diode may operate sufficiently well to enable the engine to run but will not deliver enough current to excite the generator (flash the field). If there is any doubt as to the condition of the diode, replace it without question. Make sure, when replacing, that the arrow on the new diode points in the same direction as the one removed.*

5. Isolate the small resistor from the diode and test with the ohmmeter. Resistance should measure  $2.7 \text{ ohms} \pm 5\%$ .
6. Remove the end bell cover and cooling fan. Check the brushes in accordance with the procedure in the Maintenance Section. Check all connections for shorts or opens with the ohmmeter.
7. Isolate the two diodes from the end bell frame by removing the attaching nuts. Test as in Step 3. Replace if marginal.
8. If loss of welding power is noticed only in the upper ampere ranges, it is very possible that the electrolytic capacitors are at fault. An ohmmeter will tell you if the capacitor is shorted but will not tell you if the capacitor is open or has changed value. Unless a special capacitor tester is available, substitution of capacitors known to be good is the quickest way of determining the condition of the suspect capacitors. Observe polarity closely when replacement is made.
9. Further tests of excitation and load windings are possible only after dismantling the generator. It is suggested that this be performed only by a qualified electric motor and generator service shop.

### LOSS OF AUXILIARY POWER

1. Start the check-out procedure by pressing the reset button(s) on the circuit breaker(s). If the button appears to reset, start the engine to determine whether or not auxiliary power is now available. If circuit breaker again opens, the circuit is either overloaded or a short circuit is causing the breaker to trip. Measure the load being drawn. Total load should not exceed 5KW. Check appliance, tool, or cord plugs for shorts.
2. If no evidence of fault is found with the circuit

breaker, proceed with applicable steps 1 thru 9, preceding.

### CONTROL BOX

The rear side of the control panel contains the switching members and connections to the reactor transformer. Also, a small panel on the lower part of the control panel mounts a diode and resistor which provide a DC pulse for generator excitation buildup.

If troubleshooting an inoperative generator indicates replacement of the diode and/or resistor is necessary, certain precautions should be taken to avoid heat damage to the new diode. After unsoldering the lower lead of the diode to be removed, clean any excess solder off the terminal board post. Make a loop in the diode lead and fit it to the solder terminal. Allow enough room between the solder joint and the diode body to allow a small nose pliers to grasp the lead. The pliers will act as a heat sink to absorb the heat applied by the soldering iron. Make the solder joint quickly to avoid overheating the solder joint. Secure opposite lead to the threaded stud along with the resistor lead. When replacing the resistor, the use of reasonable care in soldering will suffice.

If, through accident or misuse, the selector switch becomes damaged or burned, and replacement is necessary, the following procedure should be followed for switch replacement.

1. Disconnect and tag all leads from the control box to the generator.
2. Remove all bolts and screws that attach the control box to the generator frame and lift the assembly off the generator.
3. Use a small pin punch to drive the roll pin from the selector handle and pull the handle off the shaft.
4. With the aid of a snap-ring pliers (Part No. 420P107) remove the snap ring from the selector shaft.
5. Remove the receptacle and circuit breaker mounting screws from panel front. Unscrew the nuts and washers from the terminal studs on the front of the terminal studs on the front of the control panel.
6. Remove the 1/4-20 machine bolt from the top-center of the control panel and pull the panel off.
7. The wiper blade, tension spring, and operating shaft may now be slid out of the switch assembly as a unit. This will release the copper connector bar and terminal stud which should also be removed.
8. The squeeze-type connectors that secure reactor leads x1 through x7 to the selector terminals must be removed with a hack-saw, bolt cutters or other suitable means. If it is determined that this is impossible, the stranded leads may be severed next to the connector. This method is not recommended unless absolutely necessary, since shortening the lead will make handling more difficult.
9. Clean the leads with sandpaper and tape any frayed or broken insulation or slide a new glass fiber sleeve over the lead if the insulation is beyond repair. Replace the identifying marker (x1, x2, etc.) on the sleeve.
10. The leads are reassembled to the new selector panel with screw type connectors. See Parts List. Before reassembly, tin or flux any bare copper wires. Insert wire and terminal pin and tighten securely. Flow solder into the connector and wires with either a low flame torch or large soldering copper. This will assure a good, permanent electrical bond.
11. Replace any other parts as necessary and reassemble the new switch in the reverse order of disassembly. When replacing the switch handle, do not overlook replacing the spacer washer under the snap ring.

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# WIRING DIAGRAMS

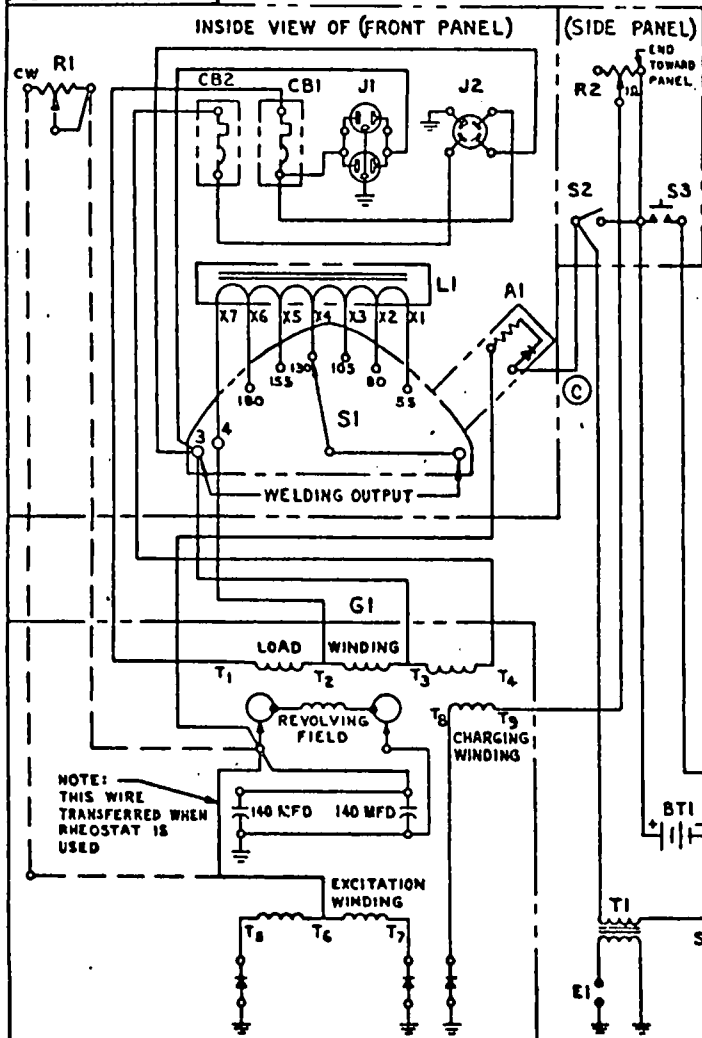
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MODEL	PAGE
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5.0 NB - 341P/10154A	
5.0 NB - 343P/1B	36
5.0 NB - 343P/10154A	
5 NB - 343/1A	37
5.0 NB - 341E/1B	38
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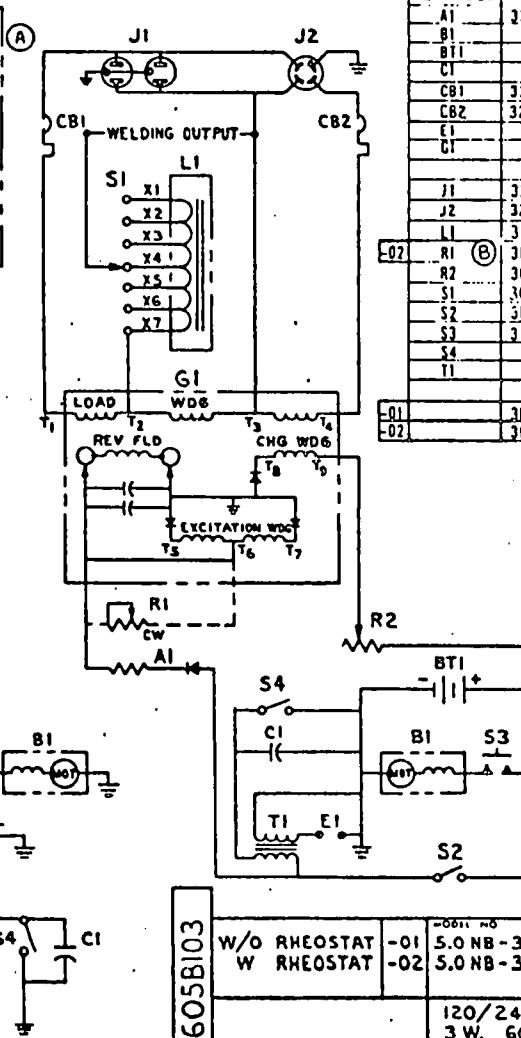


605B103

## WIRING DIAGRAM



## SCHEMATIC



REF	DES	PART NO.	QTY	PARTS LIST	DESCRIPTION
A1		322A1208(REF)	1	CIRCUIT BOARD ASSY (BUILD-UP)	
B1			1	STARTER	
BT1			1	BATTERY 12 V	
C1			1	CAPACITOR-IGN	3 MFD, 300VDC
CB1		320P361(REF)	1	CIRCUIT BREAKER-THRM	40 AMP
CB2		320P360(REF)	1	CIRCUIT BREAKER-THRM	25 AMP
E1			1	SPARK PLUG	
G1			1	ALTERNATOR ASSY	
J1		323P707(REF)	1	RECEPTACLE-DUPLEX	
J2		323P91(REF)	1	RECEPTACLE-TWISTLOCK	
L1		315D328(REF)	1	REACTOR	
R1	(B)	303P103(REF)	1	RHEOSTAT	
R2		304A57(REF)	1	RESISTOR	1 50 50 W (40 TO 10)
S1		308C76A(REF)	1	SWITCH ROTARY TAP	
S2		308P299(REF)	1	SWITCH-IGN	
S3		313A32(REF)	1	SWITCH-START	
S4			1	POINTS-IGN	
T1			1	COIL-IGN	
-01		3000175	1	CONTROL-GEN ASSY	
-02		3000703	1	CONTROL-GEN ASSY	

C	WIRE WAS FROM A1 TO S4	5-2-72
A	WIRE WAS FROM A1 TO S4	11-2-72
REV	REVISION	DATE
001		
002		
003		
004		
005		
006		
007		
008		
009		
010		
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605B103

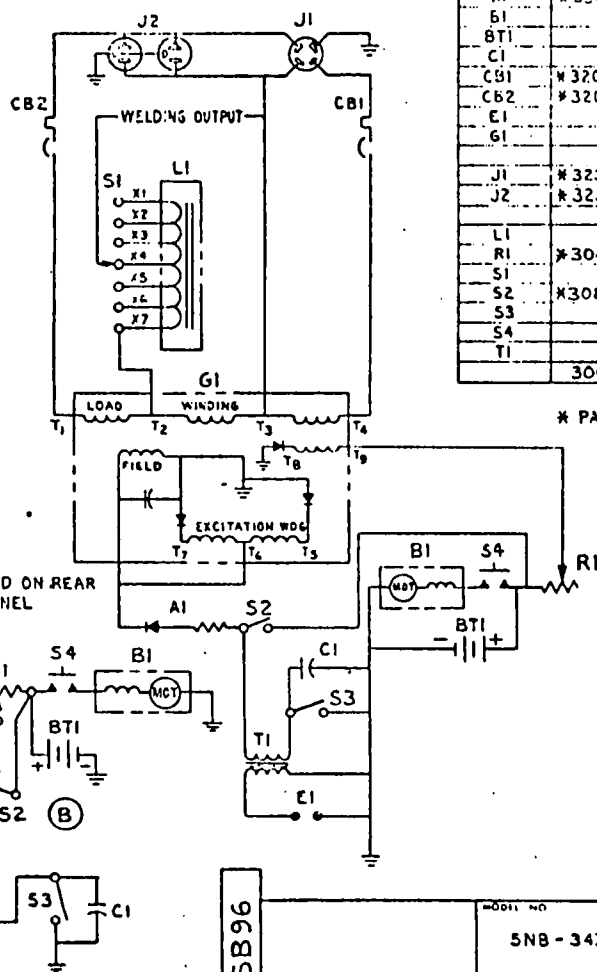
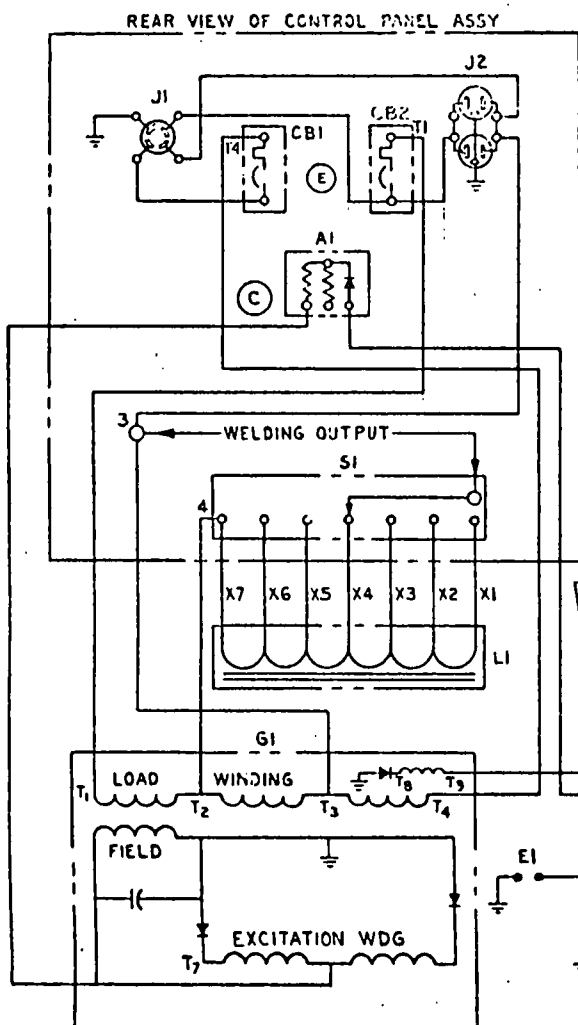
W/O RHEOSTAT	-01	5.0 NB-343E/1B
W RHEOSTAT	-02	5.0 NB-343E/10154A
		120/240 V, 1 PH, 3 W, 60 CY

CONTROL-GEN SET  
(WIRING DIAGRAM)

605B103

### WIRING DIAGRAM

SCHEMATIC



REF	DES	PART NO	QTY	DESCRIPTION
AI		*322A120B	1	CIRCUIT BREAKER - 15 AMP
BI			1	STOPPER
BTI			1	BATTERY 12V
CI			1	CAPACITOR - 10M, 3MFD, 300VDC
CB1		*320P360	1	CIRCUIT BREAKER - 15AMP, 25 AMP
CB2		*320P361	1	CIRCUIT BREAKER - 15AMP, 40 AMP
EI			1	SPARK PLUG
GI			1	ALTERNATOR ASSY
J1		*323P91	1	RECEPTACLE - TWISTLOCK
J2		*323P707	1	RECEPTACLE - DUPLEX
LI			1	REACTOR
RI		*304A57	1	RESISTOR, 1.5Ω, 50W
S1			1	SWITCH - ROTARY TAP
S2		*308P69	1	SWITCH - 10N
S3			1	POINTS - 1GN
S4			1	SWITCH - START
TI			1	COIL - 1GN
		300C712	1	CONTROL-GEN ASSY

\* PART NUMBERS GIVEN ARE REFERENCE

E	REVISED CPT CH2 TIL POINTS	7-10-70
D	UPDATED WIRING TIE POINTS	7-10-70
C	REVISED 21 HOOK UP	7-9-70
B	REVISED 11 HOOK UP	7-9-70
A	REVISED 5 HOOK UP	7-9-70

(A)

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**Open**

DIVISION OF INVESTIGATIONS

10-1-6

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466
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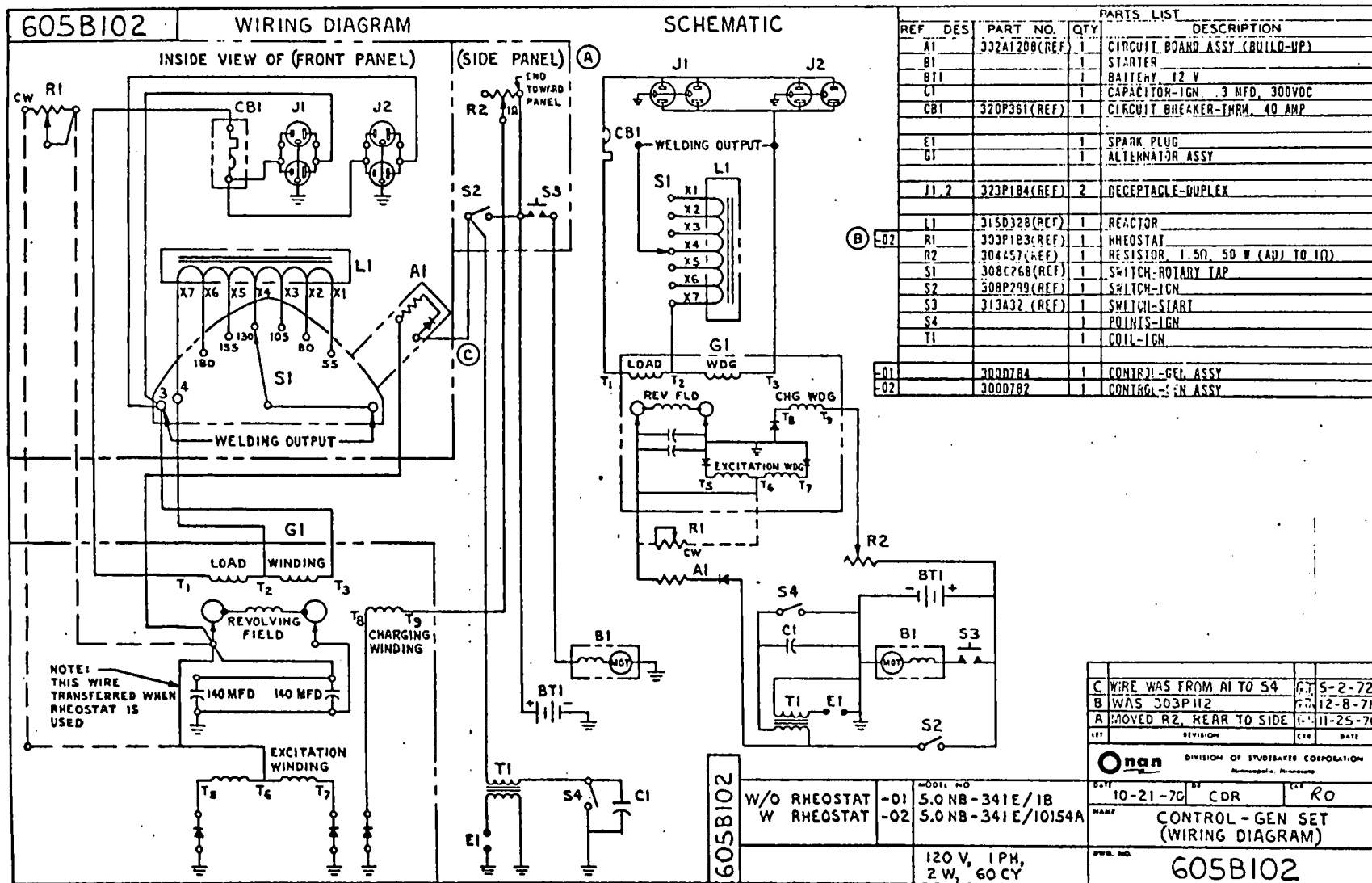
name	WIRING DIAGRAM CONTROL-GEN SET
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605B96

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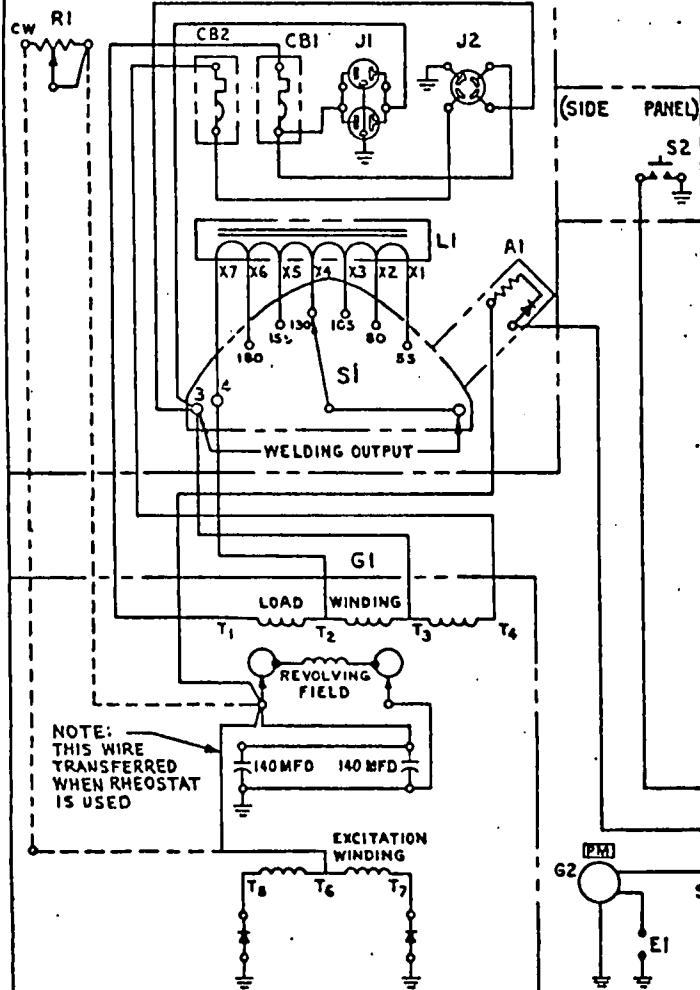
120/240 V., 1 PH.,  
3 W., 60 CY.



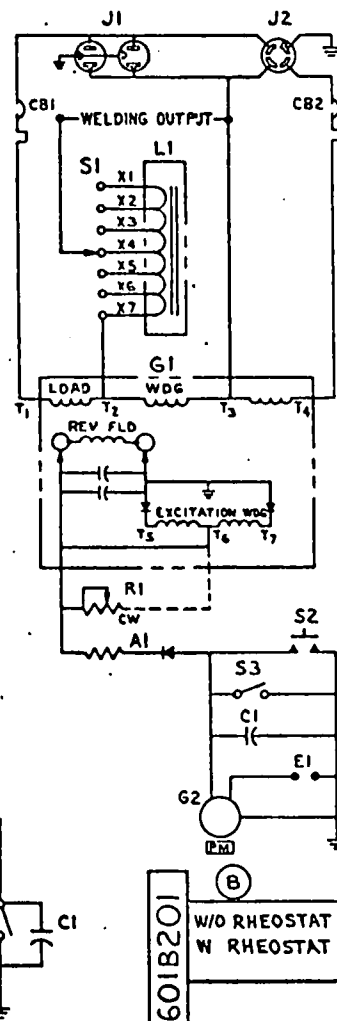


### WIRING DIAGRAM

INSIDE VIEW OF (FRONT PANEL)



SCHEMATIC



	PARTS LIST			
	REF DES	PART NO.	QTY	DESCRIPTION
	A1	332A194(REF)	1	CIRCUIT BOARD ASSY (BUILD-UP)
	C1		1	CAPACITOR-IGN .3 WFD 300VDC
	C81	320P3G1(REF)	1	CIRCUIT BREAKER-THERM .40 AMP
	C82	320P3G0(REF)	1	CIRCUIT BREAKER-THERM 25 AMP
	E1		1	SPARK PLUG
(E)	G1		1	ALTERNATOR ASSY
	G2		1	MAGNETO
	J1	327P707(REF)	1	RECEPTACLE-DUPLEX
	J2	327P416(REF)	1	RECEPTACLE-TWISTLOCK
(C)	L1	3150335(REF)	1	REACTOR
	R1	303P122(REF)	1	THERMISTAT
	S1	306F768(REF)	1	SWITCH-ROTARY TAP
	S2	313PIN (REF)	1	SWITCH-STOP
	S3		1	POINTS-IGN
(D)				
-01		320C787	1	CONT 1 - WELDER
-02		300D854	1	CONT 3 - WELDER

E	ADDED G2	6-5-72
D	REM T1; COIL MAGNETO	6-5-72
C	WAS - - - - -	
B	ADDED MODEL W/O RECSTAT	0-21-71
A	ADDED /1B MODEL NO.	0-6-71
REV	REVISION	DATE

**Onan** DIVISION OF STUDEBAKER CORPORATION  
 Motor Vehicle Group

DATE 10-22-70 BY CDR TEL 10

NAME CONTROL - GEN SET  
 (WIRING DIAGRAM)

PART NO 601B201

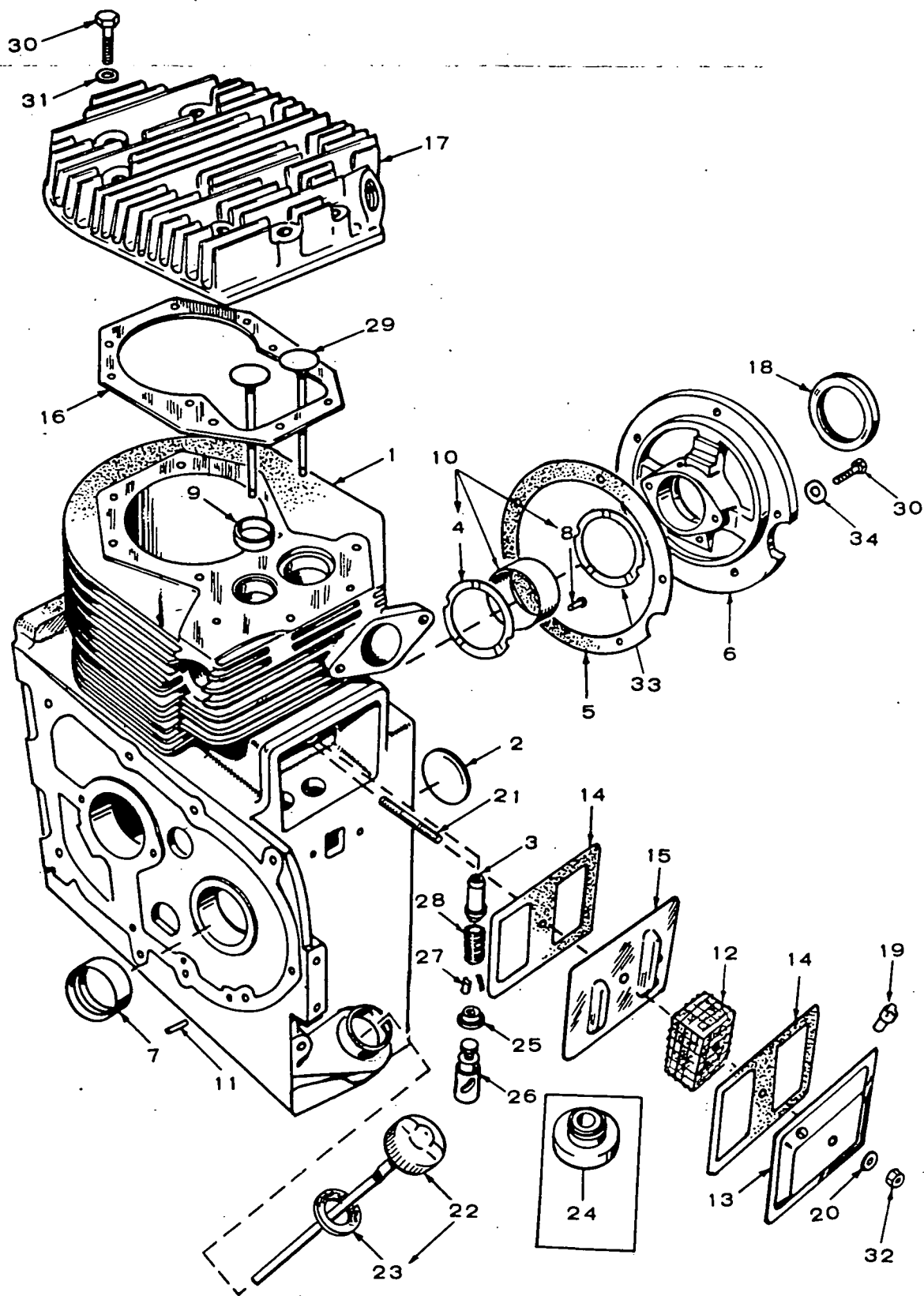
# PARTS CATALOG

This catalog applies to the standard 180 ampere welder as listed in the Plant Data Table below. Each illustrated part is identified by a reference number corresponding to the same reference number in the Parts List for the group. Parts illustrations are typical. Using the MODEL or SPEC NO. from the plant nameplate, select the parts Key No. (1, 2, etc. in the last column) that applies to your plant Model and Spec No. This Parts Key No. represents parts that differ between models. Unless otherwise mentioned in the description, parts are interchangeable between models. Right and left plant sides are determined by FACING the engine end (front) of the plant.

PLANT DATA TABLE

MODEL or SPEC	ELECTRICAL DATA							TYPE OF STARTING	USE PARTS KEY NO.
	OUTPUT (For Welding)			OUTPUT, 1 Phase (Available continuously when not welding)					
	Amps	Volts	Duty Cycle	Watts	Volts	Cycle	Phase		
5.0NB-341P/1*	180	25	50%	5000	120	60	1	Manual	1
5.0NB-343P/1*	180	25	50%	5000	120/240	60	1	Manual	1
5.0NB-341E/1*	180	25	50%	5000	120	60	1	Electric	2
5.0NB-343E/1*	180	25	50%	5000	120/240	60	1	Electric	2

- \* - The Specification Letter which completes the specification on the nameplate (Example: 5.0NB-341P/1A) advances (A to B, B to C, etc.) with manufacturing changes.



CYLINDER BLOCK GROUP

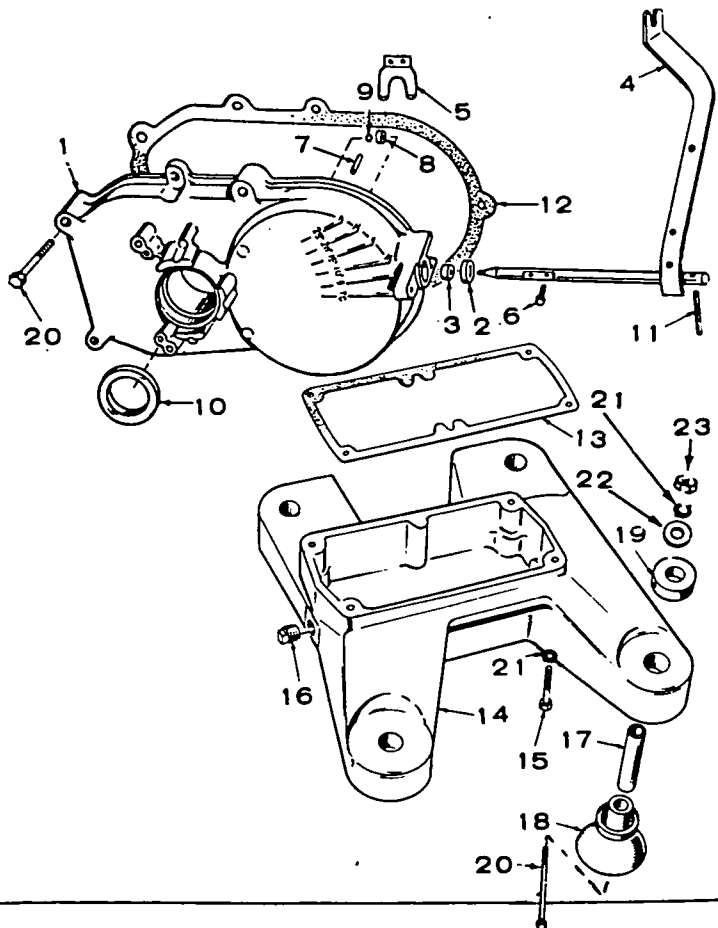
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	110A1823	1	Block Assy., Cylinder (Includes Parts Marked *)
2	517-48	1	* Plug, Camshaft Expansion
3	GUIDE, VALVE		
	110A1762	1	* Intake
	110A1763	1	* Exhaust
4	104A575	2	* Washer, Crankshaft Bearing Thrust
5	101K415	1	* Gasket, Bearing Plate
6	101D409	1	* Plate, Rear Bearing (Excludes Bearing)
7	101A367	2	* Bearing, Camshaft Front and Rear (Precision)
8	516A72	4	* Pin, Main Bearing Stop
9	* INSERT, EXHAUST VALVE SEAT (STELLITE)		
	110A1751	1	Standard
	110A1751-02	1	.002" Oversize
	110A1751-05	1	.005" Oversize
	110A1751-10	1	.010" Oversize
	110A1751-25	1	.025" Oversize
10	* BEARING, CRANKSHAFT		
	101K427	2	Standard
	101K427-02	2	.002" Undersize
	101K427-10	2	.010" Undersize
	101K427-20	2	.020" Undersize
	101K427-30	2	.030" Undersize
11	516A11	2	* Pin, Gear Cover Locating
12	123A996	1	Filter, Valve Compartment
13	110A1782	1	Cover, Valve Compartment
14	110A1791	2	Gasket, Valve Compartment
15	110A1783	1	Baffle, Valve Compartment
16	110A1731	1	Gasket, Cylinder Head

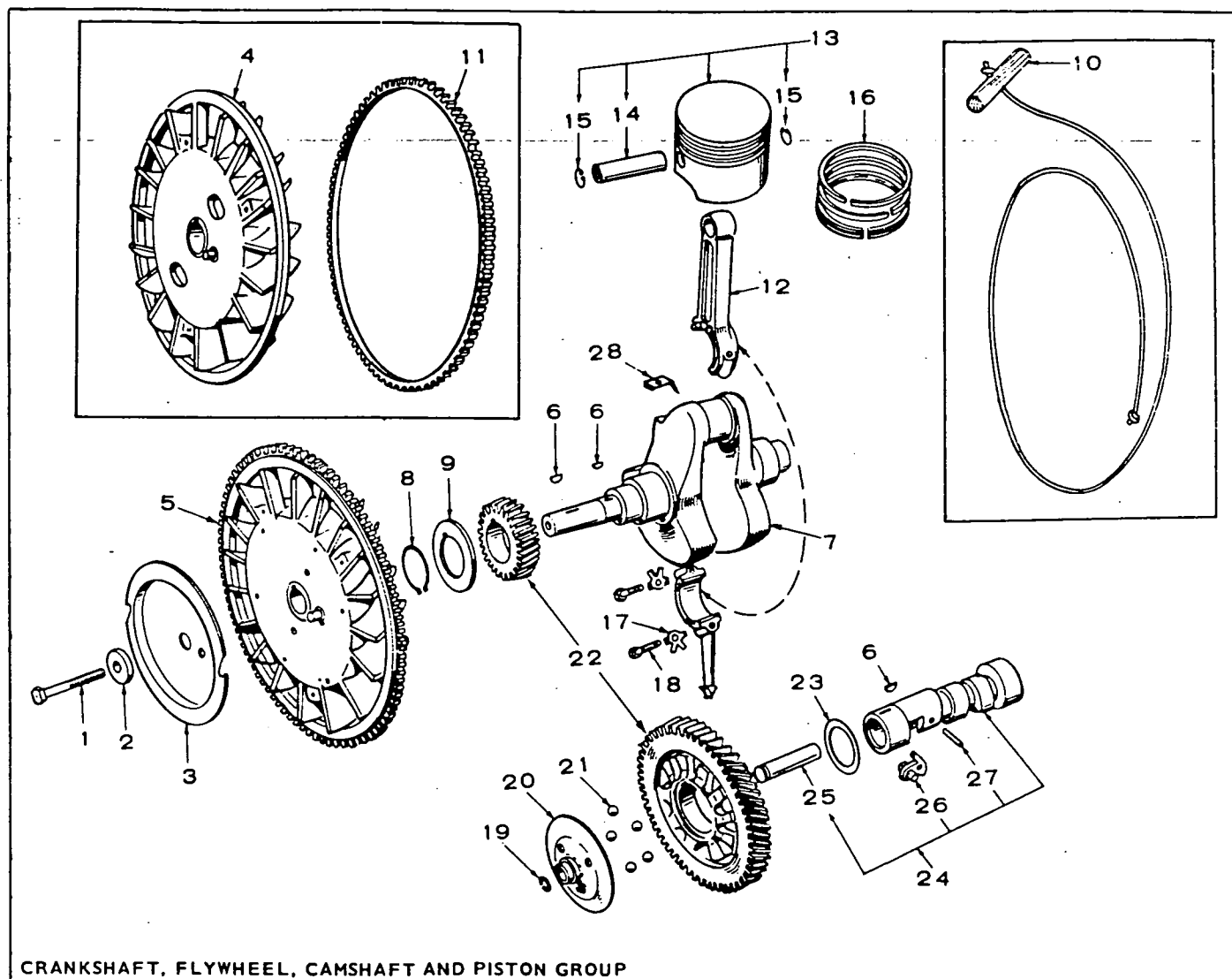
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
17	110D1733	1	Head, Cylinder
18	509A41	1	Seal, Bearing Plate
19	123A486	1	Valve, Breather
20	526-63	1	Washer (Copper), Valve Compartment Cover
21	520A634	1	Stud, Valve Box Cover
22	123A1134	1	Cap and Indicator, Oil Fill
23	123A191	1	Gasket, Oil Fill Cap
24	110A904	1	Rotocap, Valve, Exhaust
25	110A893	1	Washer, Valve Spring Retainer - Intake
26	TAPPET, VALVE		
	115A6	2	Standard
	115A6-05	2	.005" Oversize
27	110A639	4	Lock, Valve and Springs Retainer
28	110A539	2	Spring, Valve
29	VALVE		
	110B1718	1	Intake
	110B1719	1	Exhaust (Stellite)
30	SCREW, HEX HEAD CAP		
	102A455	4	Cylinder Head (3/8-16 x 1-1/4")
	800-515	4	Cylinder Head (3/8-16 x 1-3/4")
	800-516	2	Cylinder Head (3/8-16 x 2")
	800-517	5	Bearing Plate (3/8-16 x 1")
31	526A174	10	Washer, Flat - Cylinder Head
32	862-1	1	Nut, Hex - Valve Cover
33	104A776	As Req.	Shim, Crankshaft Endplay
34	526-251	5	Washer, Flat - Bearing Plate

\* Parts Contained in Cylinder Block Assembly.

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	103B361	1	Cover Assy., Gear - Includes Parts Marked *
2	509P8	1	* Seal, Oil - Governor Shaft
3	510P13	1	* Bearing, Governor Shaft (Upper)
4	150B1258	1	* Shaft and Arm, Governor
5	150B1187	1	* Yoke, Governor Shaft
6	815-46	2	* Screw, Yoke Retaining
7	516-130	1	* Pin, Governor Cup Stop (In Gear Cover)
8	510A8	1	* Bearing, Governor Shaft (Lower)
9	510P14	1	* Ball, Bearing - Governor Shaft
10	509A40	1	* Seal, Gear Cover
11	150A96	1	* Stud, Governor Sensitivity
12	103B11	1	Gasket, Gear Cover
13	102B107	1	Gasket, Oil Base Mounting
14	102D625	1	Base, Oil
15	800-56	4	Screw, Cap - Oil Base to Block
16	505-110	1	Plug, Oil Drain
17	402A290	4	Bushing, Mounting Cushions
18	402A283	4	Cushion, Mounting
19	402A282	4	Snubber, Cushion
20	SCREW, HEX CAP		
	114A22	4	Gearcover Mounting (5/16-18 x 1-3/4")
	800-34	1	Gearcover Mounting (5/16-18 x 2-1/4")
	800-83	4	Plant Mounting
21	WASHER, LOCK		
	850-55	4	Plant Mounting
	850-55	4	Oil Base Mounting
22	526-14	4	Washer, Flat - Plant Mtg.
23	862-4	4	Nut, Hex - Plant Mounting

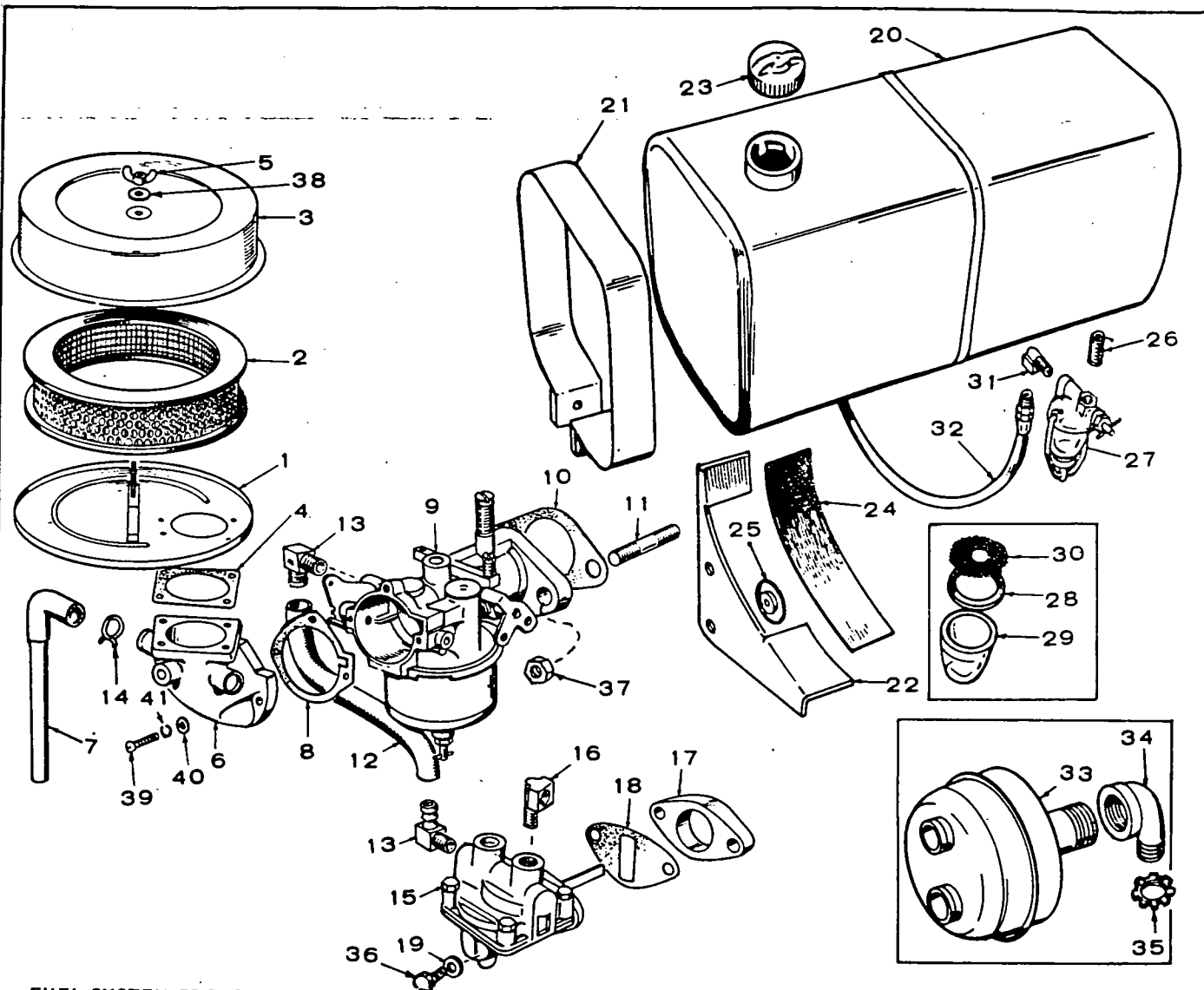
\* - Included in Gear Cover Assembly.





CRANKSHAFT, FLYWHEEL, CAMSHAFT AND PISTON GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION	REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	104A170	1	Screw, Flywheel Mounting	14	PIN, PISTON		
2	526A17	1	Washer, Wheel Mounting	112A112		1	Standard
3	192B308	1	Sheave, Starter Rope	112A112-02		1	.002" Oversize
4	160E1080	1	Flywheel, Key 1	15	518A294	2	Ring, Piston Pin Retaining
5	134B1895	1	Flywheel, Key 2 (Includes Ring Gear)	16	RING SET, PISTON		
6	KEY, WOODRUFF			113A142		1	Standard
515-2		1	Flywheel Mounting	113A142-10		1	.010" Oversize
515-1		1	Crankshaft Gear Mounting	113A142-20		1	.020" Oversize
515-1		1	Camshaft Gear Mounting	113A142-30		1	.030" Oversize
7	104D703	1	Crankshaft	113A142-40		1	.040" Oversize
8	518-14	1	Lock, Crankshaft Gear Washer	17	114A59	2	Lock, Connecting Rod Screw
9	104A43	1	Washer, Crankshaft Gear Retaining	18	114A171	2	Screw, Hex - Connecting Rod Cap
10	192A83	1	Rope, Manual Starting	19	150A78	1	Ring, Camshaft Center Pin
11	134C673	1	Gear, Ring - Key 2	20	150B1116	1	Cup, Governor
12	ROD, CONNECTING (Includes Bolts)			21	510-15	5	Ball, Fly - Governor
114C204		1	Standard	22	105A353	1	Gear Set, Timing (Includes 1 ea. Crankshaft & Camshaft Gears)
114C204-10		1	.010" Undersize	23	105A4	1	Washer, Camshaft Gear Thrust
114C204-20		1	.020" Undersize	24	105C338	1	Camshaft (Includes Center Pin Assy. & Compression Release)
114C204-30		1	.030" Undersize	25	150A1296	1	Pin Assy., Center - Governor
13	PISTON AND PIN (Includes Retaining Rings)			26	105D289	1	Weight, Compression Release
112-111		1	Standard	27	516-181	1	Pin, Compression Release Weight
112-111-10		1	.010" Oversize	28	104A750	1	Deflector, Crankshaft Oil
112-111-20		1	.020" Oversize				
112-111-30		1	.030" Oversize				
112-111-40		1	.040" Oversize				



FUEL SYSTEM GROUP

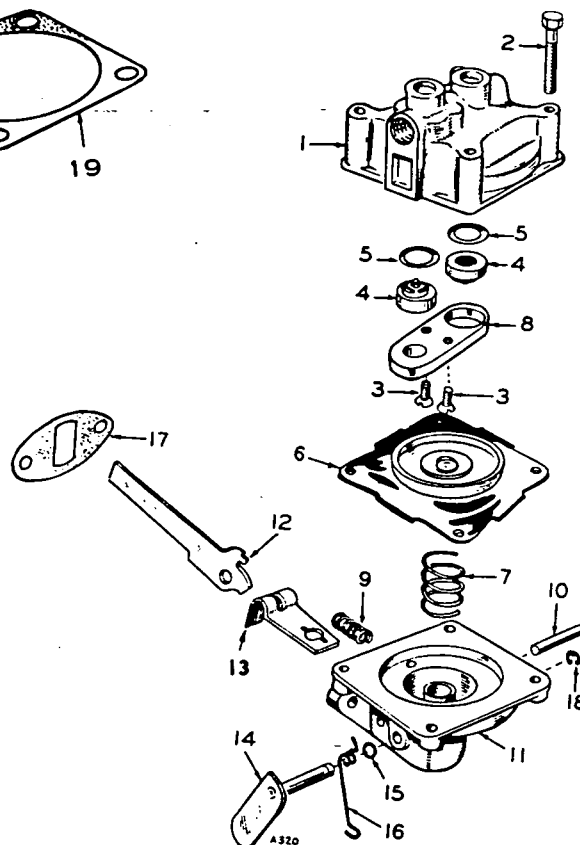
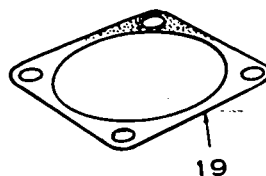
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	140A1048	1	Base, Air Cleaner
2	140P1055	1	Element, Air Cleaner
3	140C1053	1	Cover, Air Cleaner
4	140A1069	1	Gasket, Air Cleaner
5	865P22	1	Nut, Wing - Air Cleaner
6	140A1063	1	Adapter, Air Cleaner
7	503A516	1	Hose, Breather
8	140A1087	1	Gasket, Adapter to Carburetor
9	141D772	1	Carburetor, Gasoline (NOTE: See Separate Group for Components)
10	154A733	2	Gasket, Carburetor Mounting
11	520A114	2	Stud, Carburetor Mounting
12	503A588	1	Line, Fuel Pump to Carburetor
13	502-313	2	Elbow, (1) Carburetor Inlet (1) Fuel Pump Outlet
14	503P301	1	Clamp, Breather Hose
15	149D1213	1	Pump, Fuel
16	502-20	1	Elbow, Fuel Pump Inlet
17	149A45	1	Spacer, Fuel Pump Mounting
18	149A3	2	Gasket, Fuel Pump Mounting
19	526-63	2	Washer (Copper), Fuel Pump Mounting - Early Models
20	159C948	1	Tank, Fuel (Mounted)
21	159A892	2	Strap, Mounted Fuel Tank

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
22	159C954	1	Bracket, Fuel Tank Mounting
23	159A7	1	Cap, Fuel Tank
24	159A893	4	Insulation, Fuel Tank Mounting
25	159A955	8	Spacer, Fuel Tank Mounting
26	502-46	1	Nipple, Fuel Filter to Tank
27	149B79	1	Filter, Fuel
28	149-149	1	Gasket, Filter Bowl
29	149-150	1	Bowl, Fuel Filter
30	149-202	1	Screen, Fuel Filter
31	502-2	1	Elbow, Fuel Filter Outlet
32	501A7	1	Line, Flex-Fuel Filter to Pump
33	155B1018	1	Muffler, Exhaust
34	505-3	1	Elbow, Exhaust (1" x 90°)
35	331-53	1	Locknut, Exhaust Elbow
36	806-9	2	Screw, Fuel Pump Mounting
37	868-2	2	Nut, Carburetor Mounting
38	526A8	1	Washer, Air Cleaner
39	SCREW, AIR CLEANER ADAPTER MOUNTING		
	813-112	1	10-32 x 2-1/2" (Top)
	813-103	2	10-32 x 3/4"
40	526-71	3	Washer (Copper) - Air Cleaner Adapter Mounting
41	850-30	2	Washer, Lock - Air Cleaner Adapter Mounting

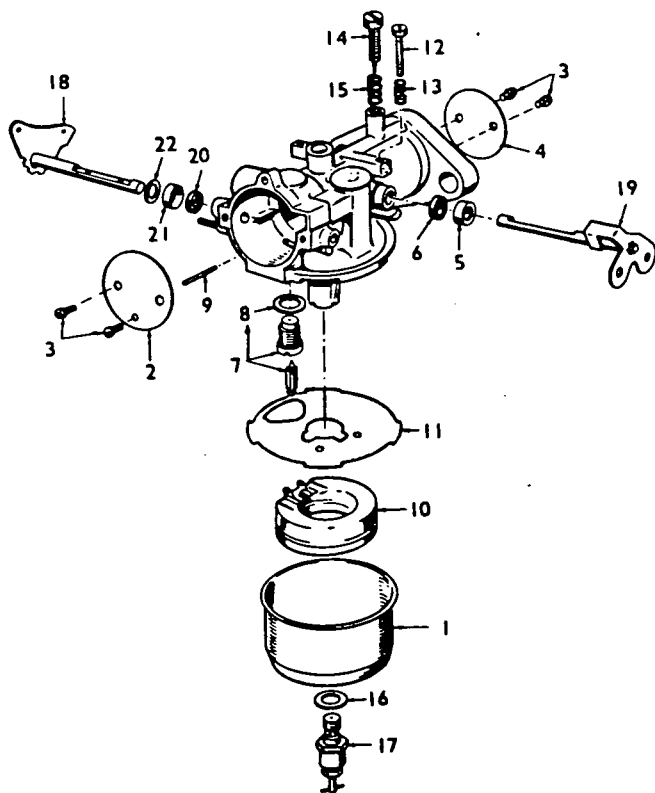
# **FUEL PUMP PARTS GROUP**

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	149D1213	1	Pump, Fuel
	149K526	1	Kit, Fuel Pump Repair - (Includes Parts Marked *)
1		1	Body, Upper (Not Sold Separately)
2	815-148	4	Screw, H. H. (#3-32 x 7/8")
3	815-147	2	Screw, Phillips Flat Head (#8-32 x 5/8")
4	149-96	2	*Valve and Cage
5	149A95	2	*Gasket, Valve
6	149A582	1	*Diaphragm Assembly
7	149A672	1	Spring, Diaphragm
8	149A539	1	Retainer, Valve Cage
9	149A675	1	*Spring, Rocker Arm
10	516A113	1	Pin, Rocker Arm
11		1	Body, Lower (Not Sold Separately)
12	149B1148	1	Arm, Rocker
13	149A670	1	Link, Rocker
14	149A1042	1	Lever, Hand Primer
15	509-65	2	Seal "O" Ring
16	149A1044	1	Spring, Priming Lever
17	149A3	1	*Gasket, Fuel Pump Mounting
18	518-129	1	Ring, Retainer - Primer Lever
19	149A858	1	*Gasket, Diaphragm

\* - Parts Contained in 149K526 Fuel Pump Repair Kit.



# **CARBURETOR PARTS GROUP**

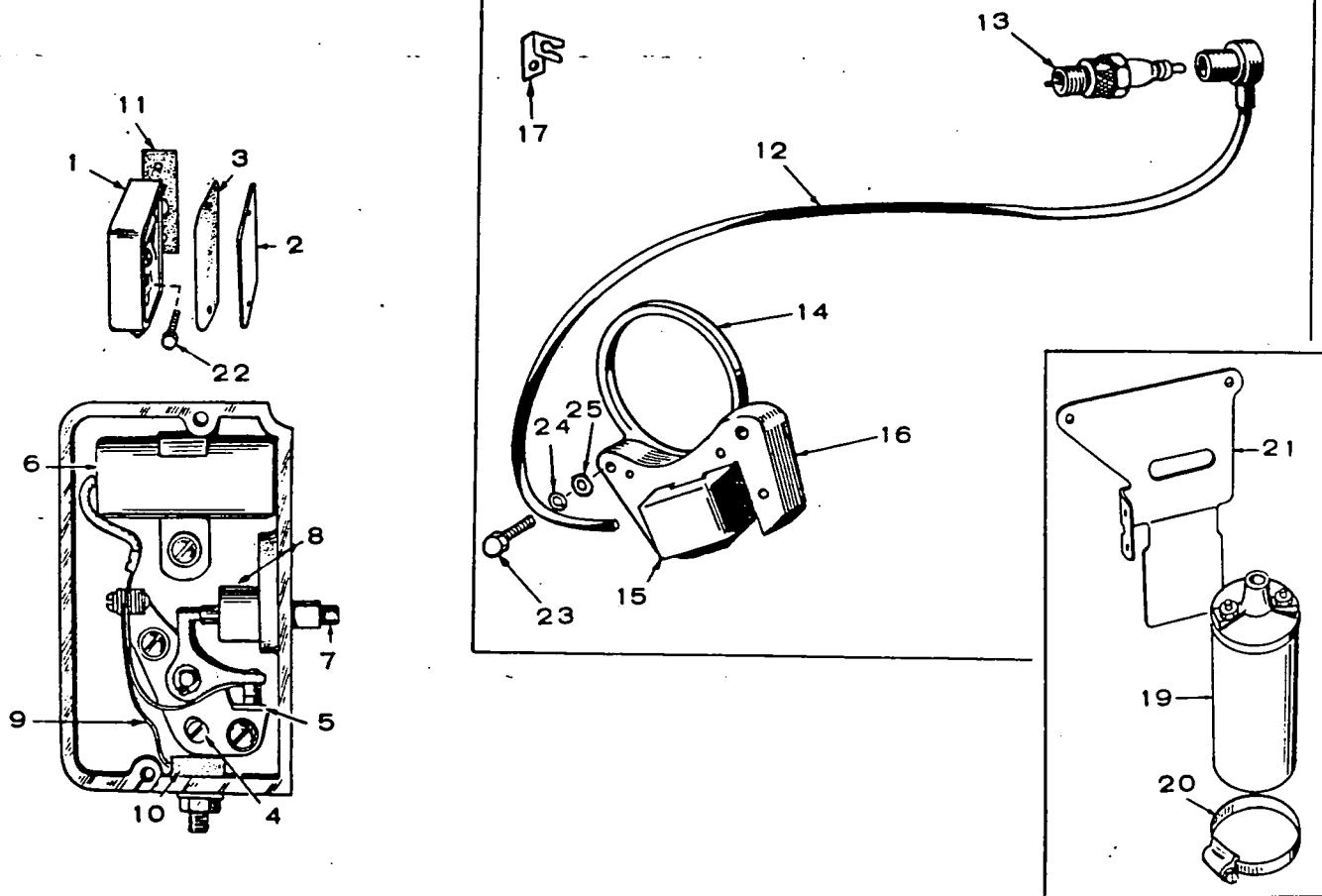


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	141D772	1	Carburetor, Gasoline
	141K785	1	Repair Kit (Includes Parts Marked *)
	141K748	1	* Gasket Kit (Includes Parts Marked £)
	154A733	2	*£Gasket, Carburetor Flange
1	141P708	1	Bowl, Fuel
2	141P771	1	Plate, Choke
3	141P698	4	Screw & Washer, Choke & Throttle Plate Mounting
4	141P706	1	Plate, Throttle
5	141P705	1	*Retainer, Seal
6	141-661	1	*£Seal, Rubber
7	141P704	1	*Valve Seat Assembly, Fuel
8	141P696	1	*£Washer, Fuel Valve Seat
9	141P703	1	*Shaft, Float
10	141P702	1	Float Assembly
11	141P701	1	*£Gasket, Bowl to Body
12	141P700	1	Screw, Throttle Stop
13	141P711	1	Spring, Throttle Stop
14	141P786	1	Needle, Idle Adjusting
15	141P710	1	Spring, Idle Needle
16	141A77	1	*£Washer, Main Jet Assembly
17	141-712	1	Jet Assembly, Main (Adjustable)
18	141P742	1	Shaft, Choke
19	141P775	1	Shaft & Lever, Throttle
20	141P697	1	Seal, Felt
21	141P203	1	Retainer, Felt Seal
22	141P699	1	Washer

\* Parts contained in Repair Kit.

£ Parts contained in Gasket Kit.

# IGNITION GROUP

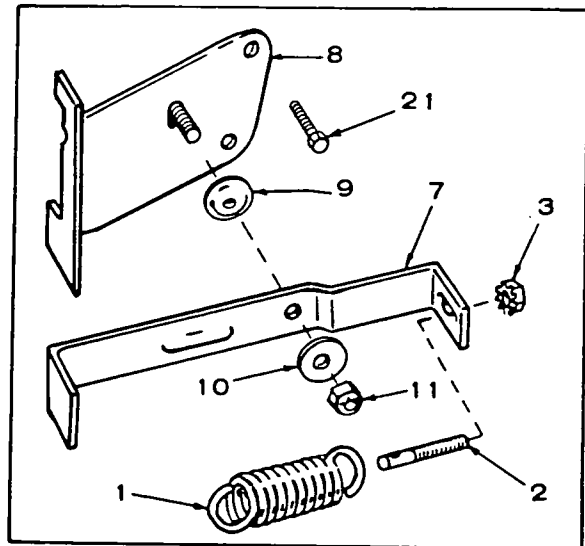
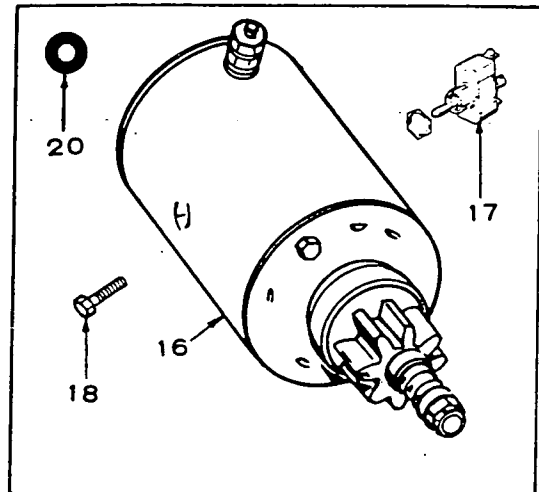
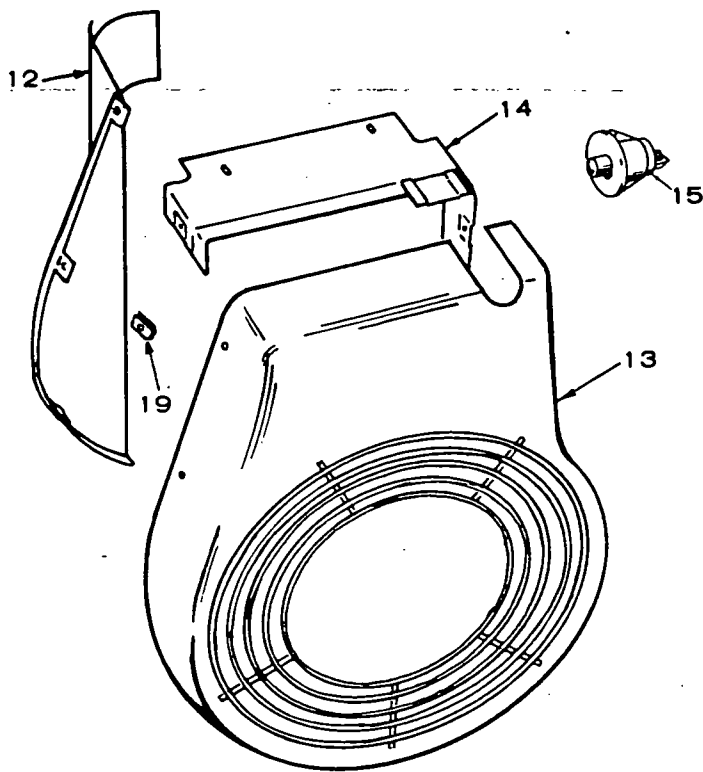


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	160A257	1	Box Assembly, Breaker (Includes Parts Marked *)
2	160A930	1	*Cover, Breaker Box
3	160A150	1	*Gasket, Breaker Box Cover
4	160A75	1	*Cam, Point Gap Adjusting
5	160A2	1	*Point Set, Breaker
6	312A69	1	*Condenser
7	160A262	1	*Plunger Assembly (Includes Diaphragm and Guide)
8	160A263	1	*Diaphragm Only, Breaker Plunger
9	160A428	1	*Strap, Point Set to Terminal Block
10	160A349	1	*Block and Screw Assembly, Terminal
11	160A43	1	Gasket, Breaker Box Mtg.
12	CABLE, SPARK PLUG		
	167A1547	1	Key 1
	167A1524	1	Key 2
13	167-241	1	Plug, Spark

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
14	160B1120	1	Backplate Assy., Magneto- (Includes Parts Marked £)- Key 1
15	160B1002	1	£Coil, Magneto Stator - Key 1
16	160B1119	1	£Pole Shoe, Magneto Stator - Key 1
17	167A188	1	Clip, Spark Plug Cable - Key 1
19	166B278	1	Coil, Ignition - Key 2
20	503P514	1	Clamp, Coil - Key 2
21	166C537	1	Bracket, Coil Mounting - Key 2
22	815P353	1	Screw, Breaker Box Mounting
23	815-259	2	Screw, Magneto Backplate Mounting
24	850-40	2	Washer, Lock - Magneto Backplate Mounting
25	526-15	2	Washer, Flat - Magneto Backplate Mounting

\* Parts Contained in 160A257 Breaker Box Assembly.  
£ Parts Contained in 160B1120 Backplate Assembly.



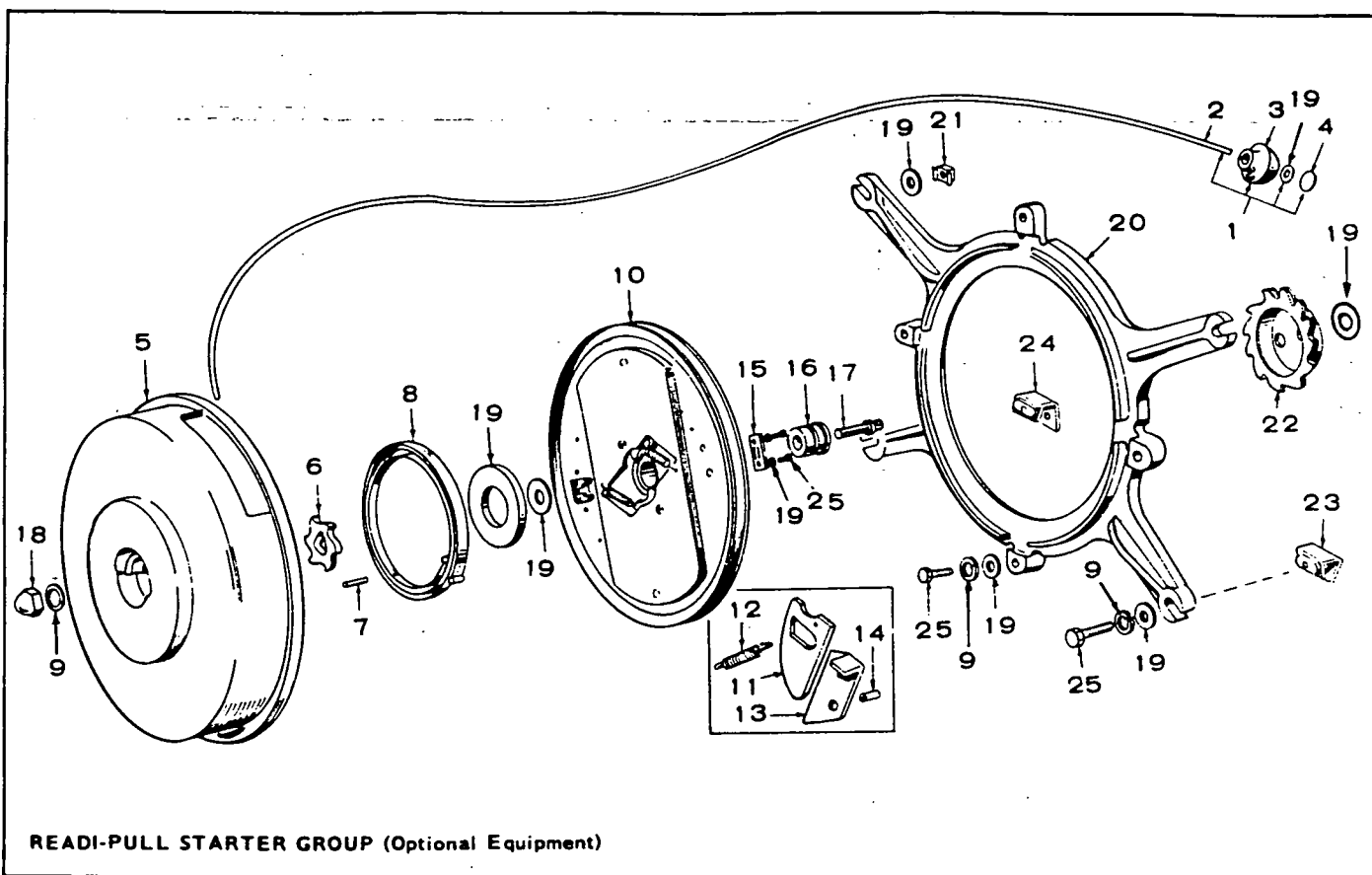


THROTTLE CONTROL, STARTER MOTOR AND HOUSING GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	150A98	1	Spring, Governor
2	150A96	1	Stud, Speed Adjusting
3	870-131	3	Nut, Locking
4	150A1081	2	Joint, Ball
5	150A883	1	Link, Throttle
6	870P188	2	Palnut, Locking
7	150B1238	1	Lever, Throttle Control
8	150B1239	1	Bracket, Throttle Control Lever
9	152A41	1	Washer, Tension
10	526-15	1	Washer, Flat
11	870-65	1	Nut, Huglock
12	HOUSING, CYLINDER AIR		
	134C2059	1	Key 1
	134C2058	1	Key 2

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
13	134C1956	1	Housing, Blower
14	134C2055	1	Cover, Cylinder Air
15	313-18	1	Switch, Stop - Key 1
16	191D767	1	*Motor, Starting - Key 2
17	308-69	1	Switch, Stop - Key 2
18	800-50	2	Screw, Machine, Starter Mtg.
19	870-107	3	Nut, Cyl. Air Housing Mtg.
20	508-155	1	Grommet, Cyl. Air Housing - Key 2
21	812-150	2	Screw, Machine - Control Bracket Mounting

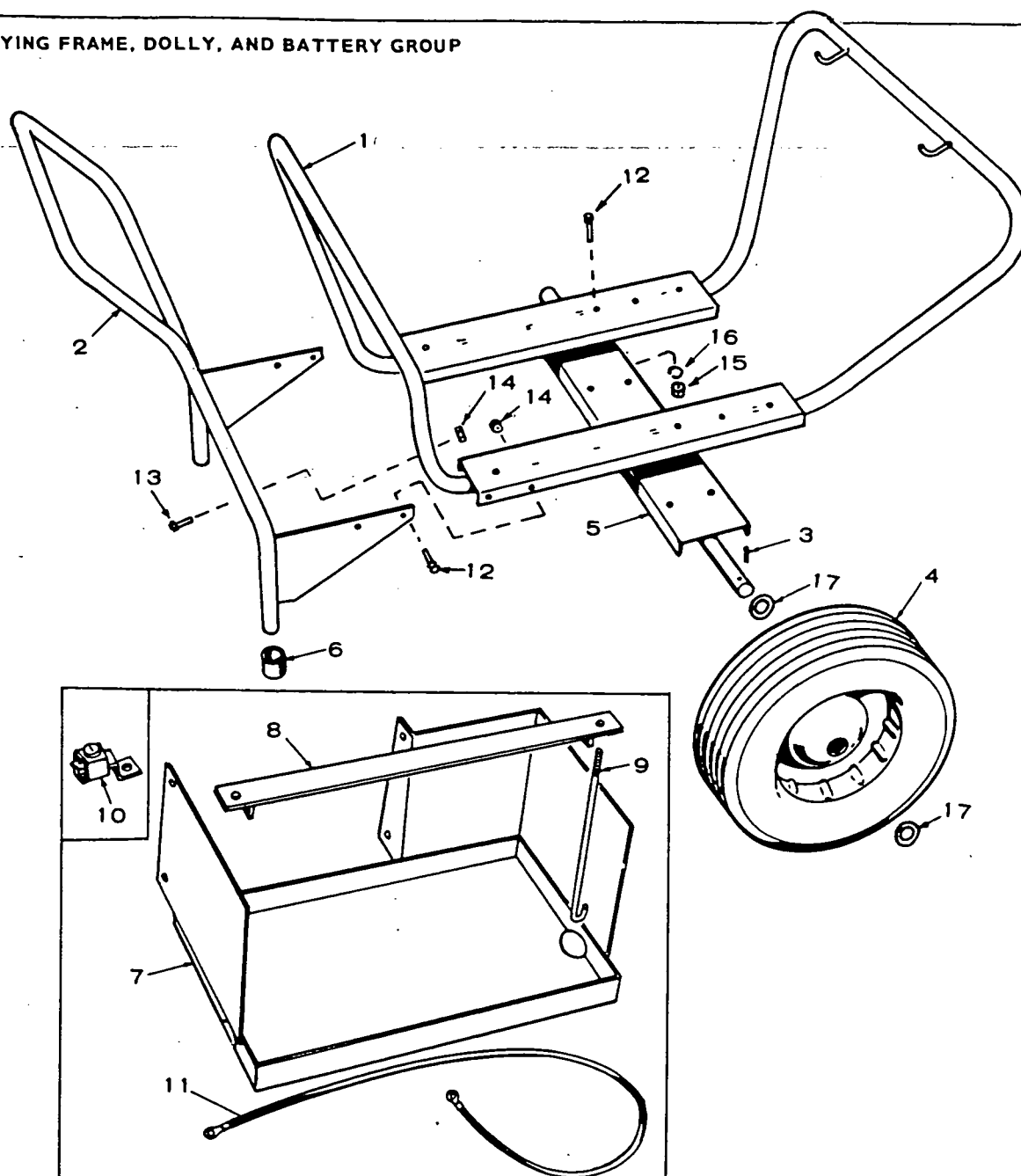
\* - For breakdown, see "STARTING MOTOR PARTS GROUP".



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	192K385	1	Starter Kit, Complete - Includes Mtg. Ring & Ratchet Wheel
1	192A45	1	Rope & Grip Assembly
2	192-43	1	Rope, Starter, Less Grip, 83" Long
3	192A44	1	Grip, Starter Rope - Rubber
4	517A25	1	Plug, Starter Rope Grip
5	192C152	1	Cover, Starter
6	192A153	1	Wheel, Cog - Anti-Backlash
7	516-138	1	Pin, Roll (3/16 x 9/16") Recoil Spring
8	192A39	1	Spring, Recoil
9	WASHER, LOCK 850-50	1	Bushing to Cover Screw
	850-40	4	Starter to Starter Ring
	850-40	4	Starter Mounting
10	192B180	1	Sheave Assembly, Rope (Includes Parts Marked *)
11	192A172	2	*Pawl
12	192A165	2	*Spring, Pawl
13	192A168	2	*Arm, Ratchet
14	516-110	4	*Pin, Roll (5/16 x 1/2"), (2) Ratchet Arm, (2) Pawl
15	192A167	1	*Clamp, Rope

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
16	192A163	1	Bearing, Sheave Hub (Bronze)
17	192A323	1	Capscrew, Socket Head (3/8-16 x 1-1/2")
18	870-138	1	Nut, Bushing to Cover Screw
19	526-180	4	Washer, Flat
	526-158	4	Starter to Mounting Ring
	526-130	2	Starter Mounting (1/8" thick)
	526-14	1	Starter Mounting - top (1/16" thick)
	526-169	1	Ratchet Wheel Mounting
	526-15	1	Rope Grip
	526A168	2	Rope Clamp Mounting
	526A123	1	Spring Retainer
20	192C186	1	Thrust, Sheave
21	870-110	2	Ring, Mounting, Starter to Blower Housing
22	192B309	1	Nut, Speed Grip, Starter Ring to Blower Housing - Top
23	192A294	1	Wheel, Ratchet
24	192A295	1	Bracket, Starter Mounting - R.H.
25	192A295	1	Bracket, Starter Mounting - L.H.
	SCREW, HEX CAP 815-137	4	Starter to Mounting Ring
	800-7	4	Starter Mounting
	815-137	2	Rope Clamp Mounting

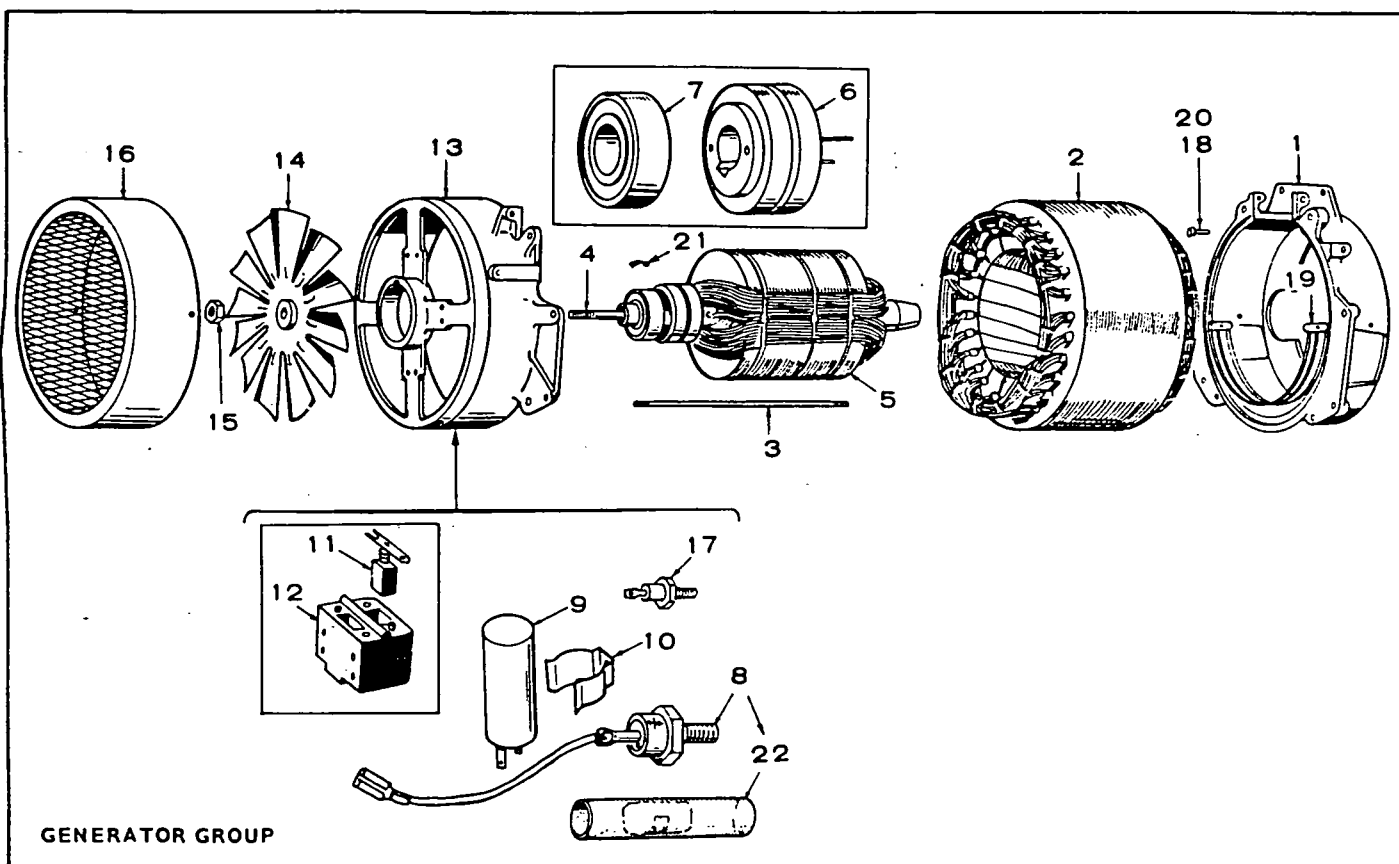
# CARRYING FRAME, DOLLY, AND BATTERY GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	410K311	1	Dolly Kit (Includes Parts Marked * Plus Hardware) - Optional Equipment
1	403C876	1	Frame, Carrying
2	410B307	1	*Handle, Dolly - Optional Equipment
3	516-42	2	*Pin, Cotter - Optional Equipment
4	410P223	2	*Wheel and Tire - Optional Equipment
5	410B308	1	*Axle Assy. - Optional Equipment
6	403P588	2	*Tip, Dolly Handle - Optional Equipment
7	416D609	1	Rack, Battery - Key 2
8	416A453	1	Strap, Battery Hold-down - Key 2
9	416A620	2	Stud, Battery Hold-down - Key 2

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
10	332-142	1	Terminal Ground
11	LEAD, BATTERY - Key 2		
	336A1907	1	10-1/2" (Negative)
	336A1905	1	24" (Positive) - Spec A only
	336A2049	1	21" (Positive) - Begin Spec B
12	SCREW, HEX CAP		
	800-74	4	Axle Plate to Carrying Frame
	800-5	4	Dolly Handle Plate Mounting
13	812-160	4	Screw, Round Head Dolly Handle
14	870-65	8	Nut, Hug Lock - Dolly Handle
15	862-4	4	Nut, Hex - Axle Plate Mounting
16	850-55	4	Washer, Lock - Axle Plate Mounting
17	526-112	4	Washer, Flat - Wheel Mounting

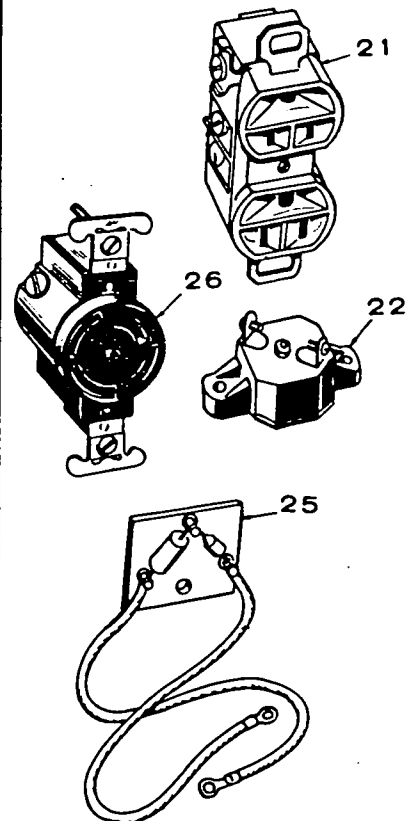
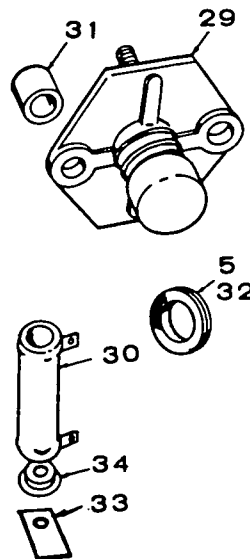
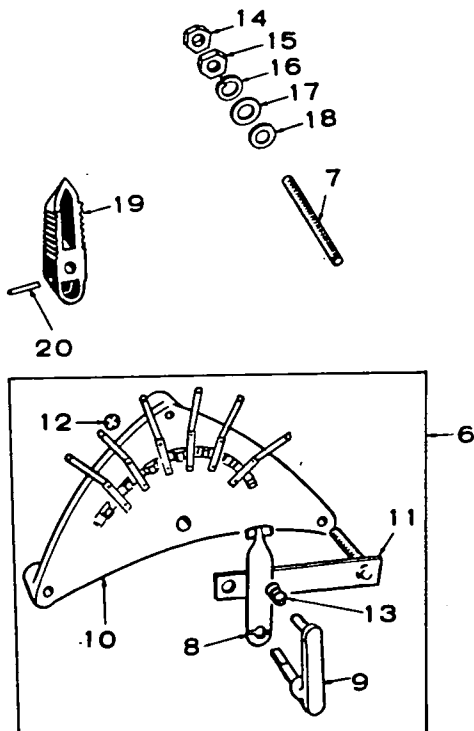
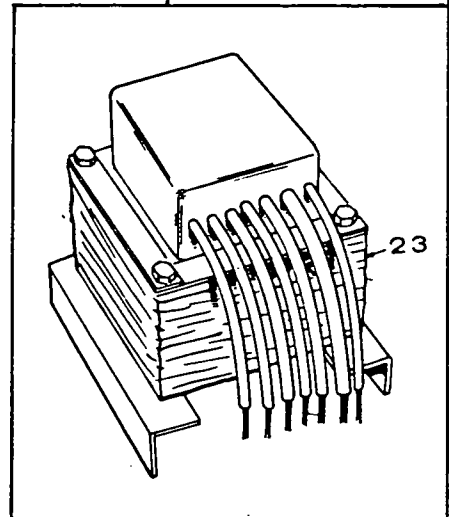
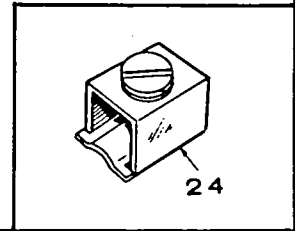
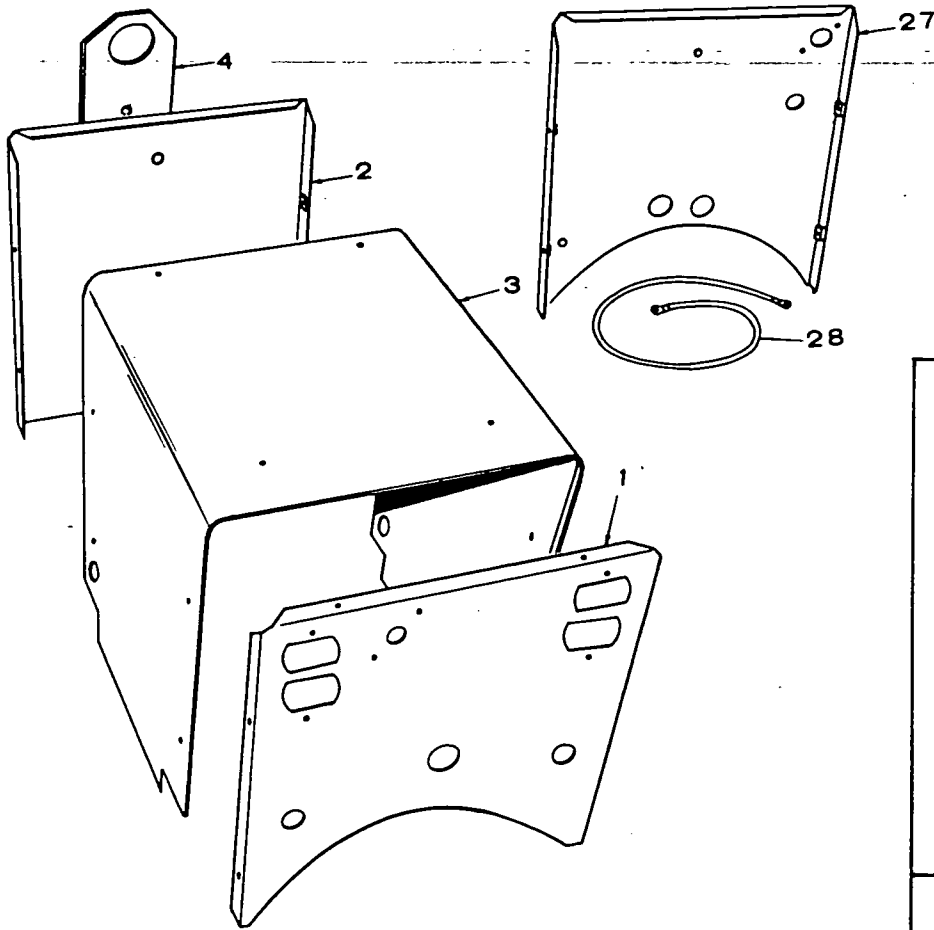
\* - Parts Contained in 410K311 Dolly Kit.



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	231D143	1	Adapter, Generator to Engine
2	STATOR, WOUND		
	220D1340	1	Key 1 with 120/240 Volt AC
	220D1433	1	Key 1 with 120 Volt AC
	220D1500	1	Key 2 with 120 Volt AC
	220D1501	1	Key 2 with 120/240 Volt AC
3	520A706	4	Stud, Generator Through
4	520A705	1	Stud, Rotor Through
5	201D1625	1	Rotor, Wound
6	204A61	1	Ring, Collector
7	510A47	1	Bearing, Rotor (Double Sealed and Pre-lubricated)
8	RECTIFIER ASSEMBLY (Includes Connector)		
	305A492	2	Key 1
	305A492	3	Key 2
9	356B35	2	Capacitor
10	518P271	2	Clip, Capacitor Mounting

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
11	214A59	2	Brush, Generator
12	212A1064	1	Holder, Brush
13	211D182	1	Bell, End
14	205C83	1	Blower, Generator
15	870P203	1	Nut, Rotor Through Stud
16	234C305	1	Cover, End Bell
17	305A235	1	Rectifier, Key 2
18	800-50	4	Screw (3/8-16 x 1") - Adapter Mounting
19	232C2131	1	Guard, Generator Adapter
20	800-3	2	Screw (1/4-20 x 1/2") - Guard Mounting
21	232A596	1	Clip, Bearing Stop
22	CONNECTOR		
	332-556	2	Key 1
	332-556	3	Key 2
	334-26	1	Wire, #16 (10 ft.)

CONTROL GROUP - SPEC A

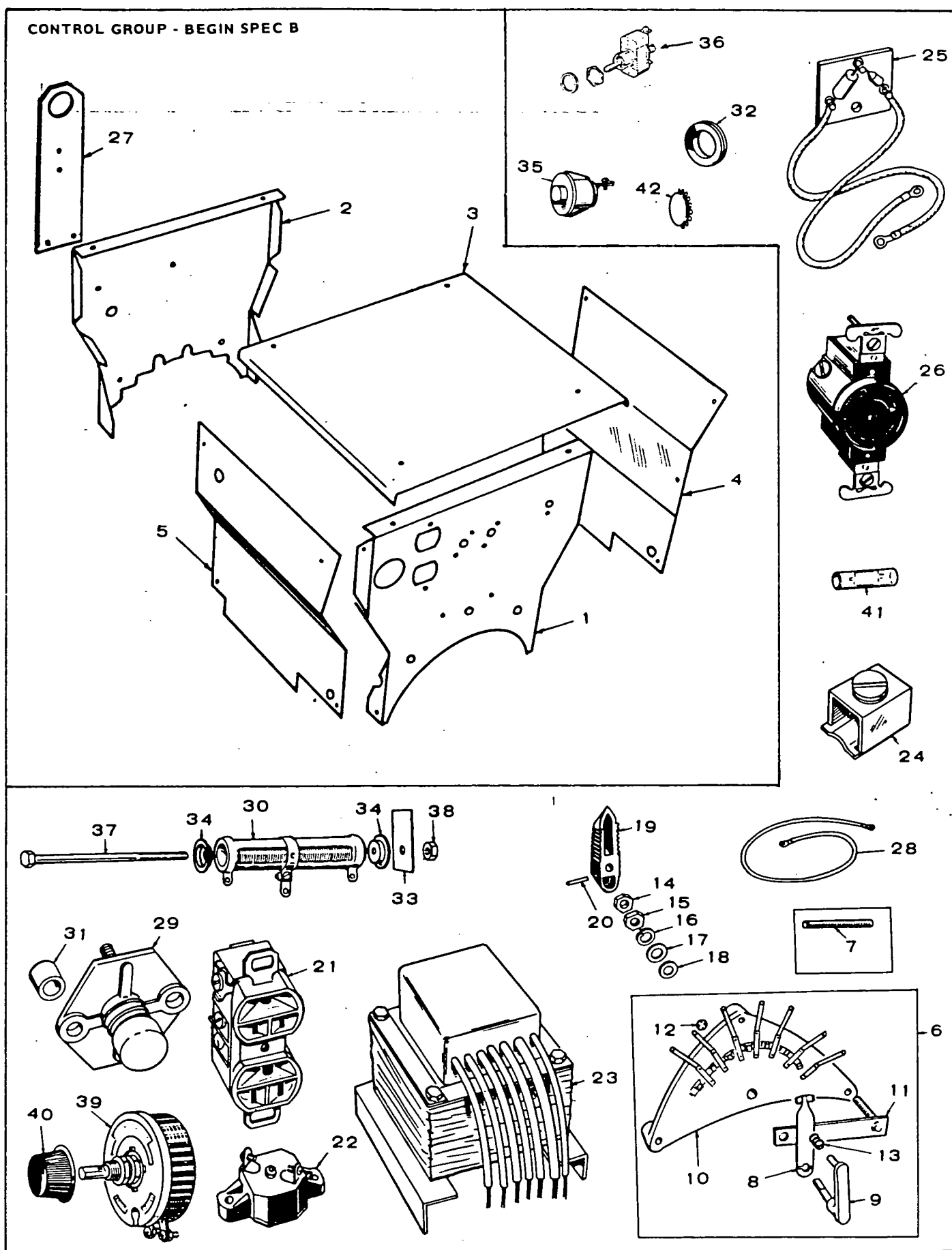


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	PANEL, CONTROL BOX - FRONT		
	301C3075	1	For Units with 120 Volt AC
	301C3117	1	For Units with 120/240 Volt AC
2	301C3074	1	Panel, Control Box (Rear) - Key 1
3	301C3231	1	Wrapper, Control Box
4	403B875	1	Bracket, Lifting
5	508-27	1	Grommet, for 7/16" Hole
6	308C268	1	Switch, Rotary Tap (Includes Parts Marked *)
7	308A283	1	Stud, Ground
8	308A265	1	* Blade, Rotary Tap Switch
9	308B261	1	* Arm, Rotary Tap Switch
10	308C287	1	* Plate, Rotary Tap Switch
11	308A267	1	* Jumper, Rotary Tap Switch
12	518P283	1	* Ring, Grip - Rotary Tap Switch
13	308A271	1	* Spring, Rotary Tap Switch
14	871-28	2	Nut, Hex Brass - Jam (3/8-16)
15	871-29	4	Nut, Hex Brass - Full (3/8-16)
16	850-50	2	Washer, Lock (3/8")
17	526-59	4	Washer, Flat - Brass
18	508A150	2	Washer, Insulating
19	303B165	1	Knob, Rotary Tap Switch
20	516P178	1	Pin, Rotary Tap Switch Knob
21	RECEPTACLE, DUPLEX		
	323P707	1	For Units with 120/240 Volt AC
	323P184	2	For Units with 120 Volt AC
22	BREAKER, CIRCUIT		
	320P361	1	40 Ampere
	320P360	1	25 Ampere - For Units with 120/240 Volt AC

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
23	315D328	1	Reactor Assembly
24	332P1319	6	Connector, Wire
25	332A1208	1	Board Assembly, Circuit
26	323P91	1	Receptacle, Twistlock - For Units with 120/240 Volt AC
27	301C3232	1	Panel, Control Box (Rear) - Key 2
28	LEAD, REAR CONTROL BOX PANEL - Key 2		
	336A1904	1	8" - Start Switch to Starter
	336A1903	1	4" - Start Switch to Resistor
29	313A32	1	Switch, Start - Key 2
30	304A168	1	Resistor, 1.5-Ohm - 25 Watt - Key 2
31	301A2404	2	Spacer, Switch Mounting - Key 2
32	GROMMET, CONTROL BOX PANEL - Key 2 Key 2		
	508P95	1	For 17/32" Hole
	508-8	1	For 13/16" Hole
33	304A292	1	Insulator, Resistor Mounting - Key 2
34	304A14	2	Washer, Centering - Resistor - Key 2

\* - Parts Contained in 308C268 Rotary Tap Switch Assembly.

CONTROL GROUP - BEGIN SPEC B



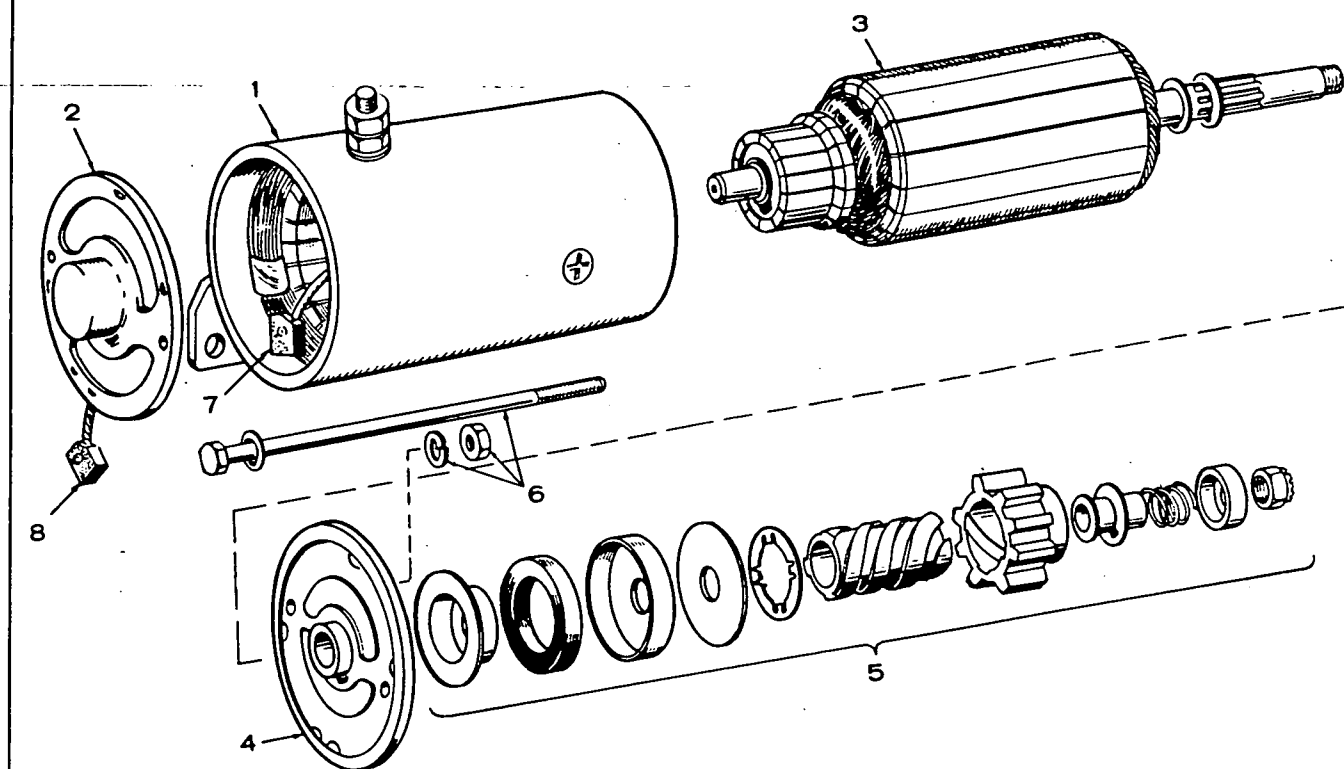
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	PANEL, CONTROL BOX - FRONT		
	301C3367	1	Units with 120 Volt AC, Without Rheostat
	301C3365	1	Units with 120 Volt AC, With Optional Rheostat
	301C3366	1	Units with 120/240 Volt AC, Without Rheostat
	301C3363	1	Units with 120/240 Volt AC, With Optional Rheostat
2	301C3356	1	Panel, Control Box - Rear
3	301B3361	1	Panel, Control Box - Top
4	301C3358	1	Panel, Control Box - Left Side
5	PANEL, CONTROL BOX - RIGHT SIDE		
	301C3364	1	Key 1
	301C3360	1	Key 2
6	308C268	1	Switch, Rotary Tap (Includes Parts Marked *)
7	308A283	1	Stud, Ground
8	308A265	1	* Blade, Rotary Tap Switch
9	308A261	1	* Arm, Rotary Tap Switch
10	308A287	1	* Plate, Rotary Tap Switch
11	308A267	1	* Jumper, Rotary Tap Switch
12	518P283	1	* Ring, Grip - Rotary Tap Switch
13	308A271	1	* Spring, Rotary Tap Switch
14	871-28	2	Nut, Hex Brass - Jam (3/8-16) - Grounding Stud
15	871-29	4	Nut, Hex Brass - Full (3/8-16) - Grounding Stud
16	850-50	2	Washer, Lock (3/8) - Grounding Stud
17	526-59	4	Washer, Flat - Brass - Grounding Stud
18	508A150	2	Washer, Insulating - Grounding Stud
19	303B165	1	Knob, Rotary Tap Switch
20	516P178	1	Pin, Rotary Tap Switch Knob
21	RECEPTACLE, DUPLEX		
	323P184	2	Units with 120 Volt AC
	323P707	1	Units with 120/240 Volt AC

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
22	BREAKER, CIRCUIT		
	320P361	1	40 Ampere
	320P360	1	25 Ampere - Units with 120/240 Volt AC
23	315D328	1	Reactor Assembly
24	332P1319	6	Connector, Wire
25	BOARD ASSEMBLY, CIRCUIT		
	332A1394	1	Key 1
	332A1208	1	Key 2
26	323P91	1	Receptacle, Twistlock - Units With 120/240 Volt AC
27	403A971	1	Bracket, Lifting
28	336A2048	1	Lead, Start Switch to Starter - Key 2
29	313A32	1	Switch, Start - Key 2
30	304A51	1	Resistor, Adjustable - Key 2
31	301A2404	2	Spacer, Start Switch Mounting - Key 2
32	GROMMET, CONTROL BOX PANEL		
	508P2	1	For 1/2" Hole
	508-8	1	For 13/16" Hole - Key 2
33	304A292	1	Insulator, Resistor Mounting - Key 2
34	303A427	2	Washer, Centering - Resistor Mounting - Key 2
	SWITCH, STOP		
35	313P18	1	Key 1
36	308P299	1	Key 2
37	800-21	1	Screw, Resistor Mounting - Key 2
38	870-232	1	Nut, Hex - Resistor Mounting - Key 2
39	303P183	1	Rheostat (Optional)
40	303P32	1	Knob, Rheostat (Optional)
41	332-556	1	Connector, Lead
42	PLUG, DOT BUTTON (Units Without Rheostat)		
	517-21	1	For 7/8" Hole
	517P45	1	For 9/32" Hole

\* - Parts included in the 308C268 Rotary Tap Switch.



# STARTING MOTOR PARTS GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	191 D767	1	Motor, Starting
1	191-804	1	Housing Assembly
2	191-795	1	Cap Assembly, End
3	191-796	1	Armature Assembly
4	191-797	1	Cap Assembly, Drive End
5	191-805	1	Drive Assembly, Complete
6	191-799	2	Bolt Assembly - Through
7	191-800	1	Brush, Positive
8	191-801	1	Brush, Negative

## SERVICE KITS AND MISCELLANEOUS

NOTE: For other kits, refer to the group for the part in question.

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	98C2028	1	Decal Kit
	160K836	1	Kit, Ignition Tune-up
	168K110	1	Gasket Kit, Complete Engine
	522K251	1	Kit, Overhaul
	316K32	1	Welder Accessory Kit (Cables and Helmet)

# **CUSTOMER SERVICES**

**OWNER'S WARRANTY SERVICE -  
ENGINE DRIVEN ELECTRIC GENERATOR SETS,  
SEPARATE GENERATORS, INDUSTRIAL ENGINES**

## **QUALITY OF PRODUCT**

Onan products are engineered and designed to perform as stated on product nameplate and published specification. Only quality material and workmanship are used in the manufacture of this product. With proper installation, regular maintenance and periodic repair service, the equipment will provide many enjoyable hours of service.

## **GENERAL WARRANTY PRACTICES**

All Onan-manufactured engine-driven electric generator sets, separate generators, and industrial engines are sold with a full one-year warranty. This warranty is issued only to the original user and promises that these products are free from defects in material or factory workmanship when properly installed, serviced, and operated under normal conditions, according to the manufacturer's instructions. The text of the Onan published warranty appears in the Onan Operator's Manual sent with the product.

**Warranty Registration:** A Warranty Registration card accompanies each Onan Product. This card must be properly filled out and returned to the Onan Factory in order to qualify for warranty consideration as covered in this bulletin. When requesting warranty repair work you must provide the purchase date, Onan model and serial number of the equipment.

**Warranty Authorization:** Warranty service must be performed by Onan Factory or Onan Authorized Distributors or their Approved and Registered Service Dealers. A complete listing of these Onan Authorized Parts and Service Centers is provided in our brochure F-115, a copy of which is supplied with each Onan Product. These Onan Authorized Service Centers have trained service personnel, parts stock, and the necessary facilities and tools for the service and repair of Onan equipment.

**Material Allowances:** Onan will allow credit or furnish free of charge to the Onan Authorized Service Station or his Approved Service Dealer, all genuine Onan parts used in a warranty repair of these products which fail because of defective material or workmanship.

**Labor Allowance:** Onan will allow warranty repair credit to the Onan Authorized Parts and Service Center and his Approved Dealer at straight time labor when the cause of failure is determined to be defective material or factory workmanship. This labor allowance will be based on the factory's standard time schedule of published flat rate labor allowances, or, otherwise a time judged reasonable by the factory. Repair work other than warranty will be charged to the owner. The Onan Division's Warranty practice does not provide for allowance of expenses such as start-up charges, communication charges, transportation charges, travel time and/or mileage, unit removal or installation expense, cost of fuel, oil, normal maintenance adjustments, tune-up adjustments or parts maintenance items.

**Administration:** Warranty of Onan Products is administered through Onan Authorized Distributors in whose territory the equipment is located. These Distributors and their Approved or Registered Onan Service Dealers are authorized to make settlement of all customer warranty claims within the limits of the manufacturer's warranty policy as described herein.

Onan reserves the right to change warranty practices without prior notice.

## MAINTENANCE

A Planned Preventive Maintenance Program is extremely important if you are to receive efficient operation and long service life from your Onan unit. Neglecting routine maintenance can result in premature failure or permanent damage to your equipment. The Onan Operator's Manual sent with the product contains recommended maintenance schedules and procedures.

Maintenance is divided into two categories:

1. Operator Maintenance . . . . . performed by the operator.
2. Critical Maintenance . . . . . performed only by qualified service personnel.

Regular maintenance will help you avoid sudden and costly repairs in the future. Adequate evidence of this scheduled maintenance must be offered when applying for a warranty claim.

## INSTALLATION

Installation is extremely important and all Onan Products should be installed in accordance with the manufacturer's recommendations. If the owner experiences any difficulty with such items as mounting, ventilation, exhaust location, fuel lines, wiring, etc., he should immediately contact the company from whom he purchased the equipment so that corrective action can be taken. Although the Onan Authorized Distributor and his Approved or Registered Service Dealers may be able to remedy certain installation difficulties, such repair work is not considered Onan warranty and there will be a charge for this service.

Onan

Minneapolis, Minnesota 55432

MSS-22A  
Replaces 23B054  
Rev. 11-1-71

# The Story of



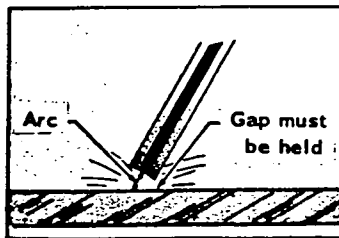
REG. TRADE-MARK

## Contact Rod

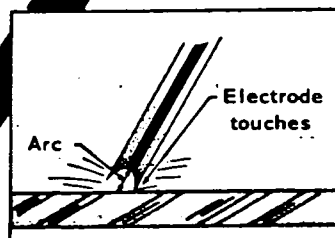
Contact rod enables anyone to weld because the operator does not have to maintain an arc as with conventional rod. Welding is done while the electrode coating is in contact with the work.

Simply rest the electrode on the work. Maintaining constant arc length is effortless as the cone depth automatically provides the correct spacing between electrode and work for proper arc length and also prevents electrode freezing. Drag the electrode at the appropriate speed for the weld desired.

### THE OLD



### THE EASY



Special coating of powdered iron forms a shell around wire core. Core burns back from outside coating to keep proper gap. Easiest arc welding method known.

**Craftsman Contact Rod is self starting —  
plus automatic restarting . . .**

The electrode starts on contact. Glazing over has been eliminated so the rod can be instantly restarted each time the arc is broken.

**Craftsman Contact Rod is self cleaning . . .**

Under normal conditions the slag removes itself as the weld cools. Spatter is almost non-existent.

**Craftsman Contact Rod has no smoke or fumes . . .**

Contact rod, because of the complete lack of choking smoke or fumes, is a pleasure to use.

**Craftsman Contact Rod has an exceptionally  
good appearance . . .**

With fine ripple, unusually clean, smooth appearance, and no slag inclusions.

**Craftsman Contact Rod deposits more metal faster . . .**  
Because the powdered iron in the flux goes into the weld.

*Make Sears*

*Your WELDING HEADQUARTERS*