OPERATORS MANUAL AND PARTS CATALOG

FOR

MODEL

25EK-23R/5178A

CONTRACT 4303 (2690)-66P

ONAN ENGINE/GENERATOR DIVISION Studebaker CORPORATION

2515 UNIVERSITY AVE. S.E. MINNEAPOLIS, MINN. 55414

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OPERATORS MANUAL AND PARTS CATALOG

MODEL
25EK-23R/5178A

120-240 Volt Single-Phase
3-Wire 50-60 Cycle
0.8 Power Factor 1500-1800 RPM

CONTRACT NUMBER 4303 (2960) - 66P

TABLE OF CONTENTS

DESCRIPTION

Instructions in this manual refer to Model 25EK-23R/5178A generating plant. Refer to Ford Engine Manual for major repair and overhaul instructions for the engine only. Plant installation, operation, maintenance, and generator-control repair and maintenance are covered in this manual.

MODEL AND SPEC. NO.

25EK - 23R/5178A
1 2 3 4

1. Factory Code: general identification
2. Specific Type: R-remote starting. Can be started either at the plant or from remote control station.
3. Factory Code: special equipment supplied per customer order.
4. Specification Letter: advances with factory production modification.

SPECIAL FEATURES

Sheet Metal Housing.
Self-contained 20 gal. Fuel Tank.
Shielded Ignition System.
Suppressed Electrical System.
50 or 60 Cycle Generator.
120 or 240 Volt, 2 or 3-Wire Reconnectable Generator.
Remote Control Panel.
Automatic Battery Charger.
High Water Temperature, Low Oil Pressure, Overspeed Cut-out Protection.

MANUFACTURER'S WARRANTY

The Manufacturer warrants, to the original user, that each product of its manufacture is free from defects in material and factory workmanship if properly installed, serviced and operated under normal conditions according to the Manufacturer's instructions.

Manufacturer's obligation under this warranty is limited to correcting without charge at its factory any part or parts thereof which shall be returned to its factory or one of its Authorized Service Stations, transportation charges prepaid, within one year after being put into service by the original user, and which upon examination shall disclose to the Manufacturer's satisfaction to have been originally defective. Correction of such defects by repair to, or supplying of replacements for defective parts, shall constitute fulfillment of all obligations to original user.

This warranty shall not apply to any of the Manufacturer's products which must be replaced because of normal wear, which have been subject to misuse, negligence or accident or which shall have been repaired or altered outside of the Manufacturer's factory unless authorized by the Manufacturer.

Manufacturer shall not be liable for loss, damage or expense directly or indirectly from the use of its product or from any cause.

The above warranty supersedes and is in lieu of all other warranties, expressed or implied, and of all other liabilities or obligations on part of Manufacturer. No person, agent or dealer is authorized to give any warranties on behalf of the Manufacturer nor to assume for the Manufacturer any other liability in connection with any of its products unless made in writing and signed by an officer of the Manufacturer.

DATED AUGUST 1, 1963

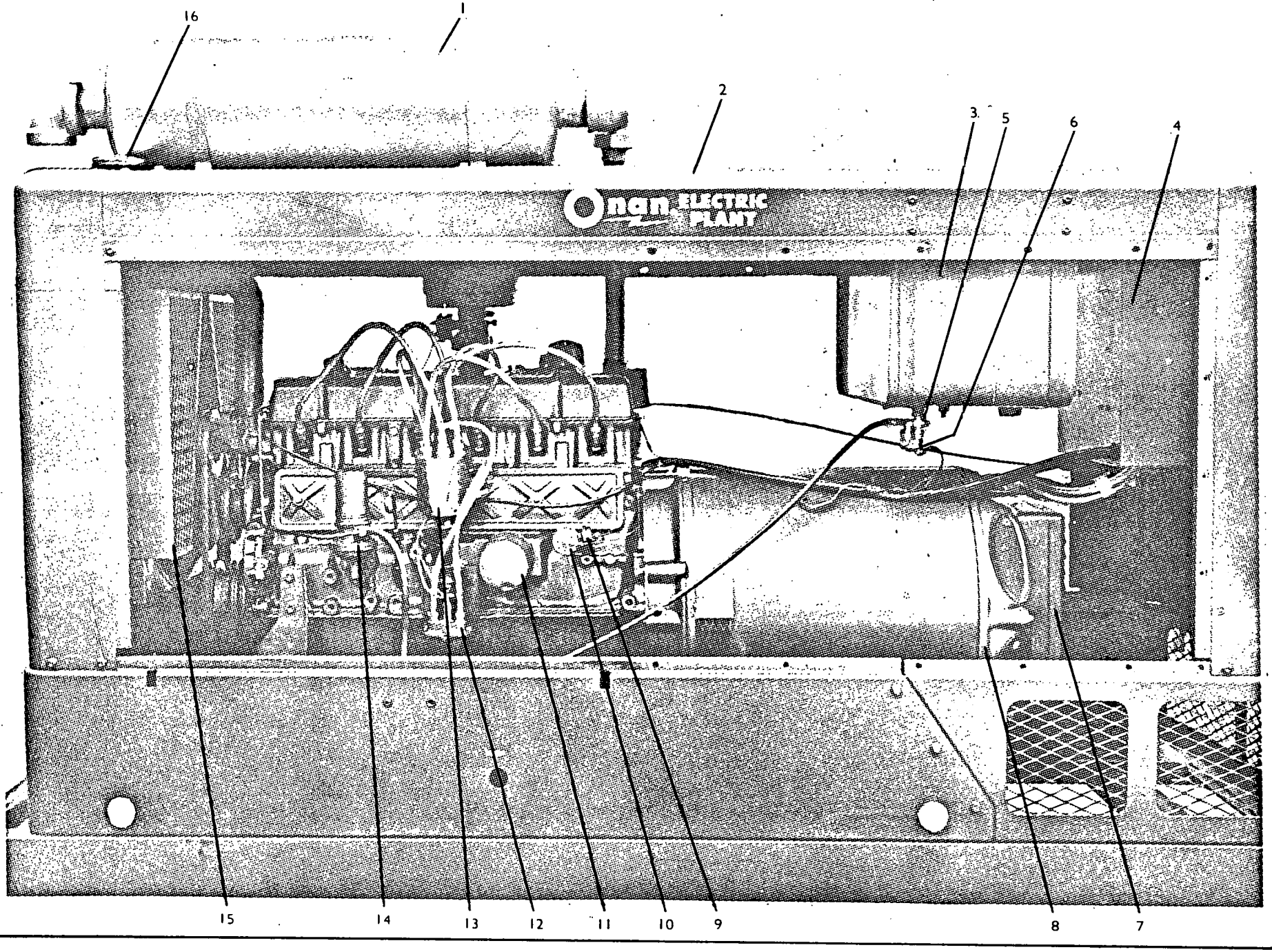


FIG. 1-1. RIGHT SIDE VIEW OF PLANT

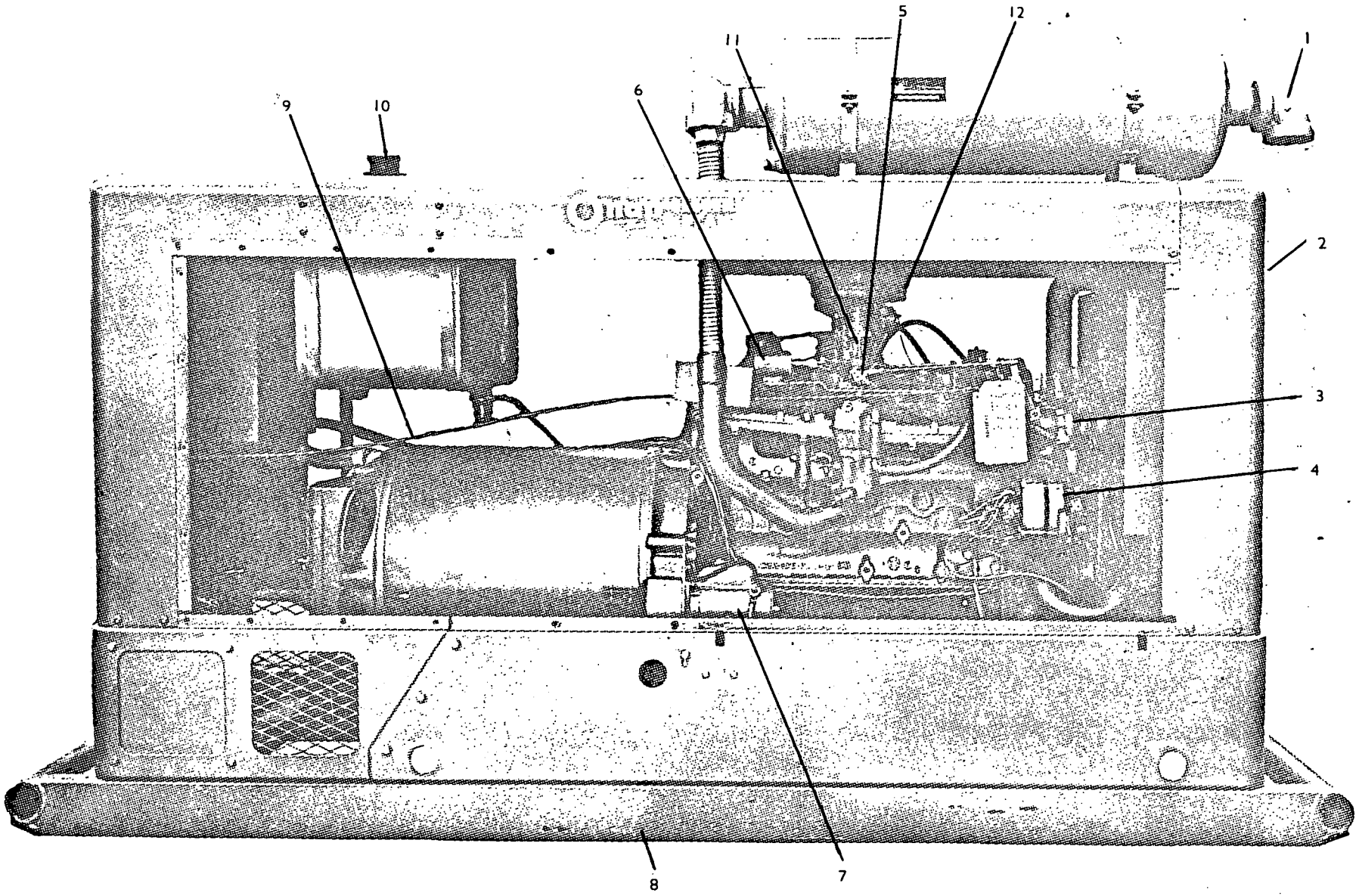


FIG. 1-2. LEFT SIDE VIEW OF PLANT

KEY TO FIG. 1-1

1. Muffler . . . . . Fig. 7-14
2. Housing . . . . . Fig. 7-15
3. Fuel Tank (20 U.S. Gallon) . . . . . Fig. 7-19
4. Control . . . . . Fig. 7-18
5. Fuel Tank Drain . . . . Fig. 7-19
6. Fuel Solenoid Shut-off Valve . . . . . Fig. 7-19
7. Static Exciter . . . . . Fig. 7-17
8. Revolving Field Generator . . . . . Fig. 7-16
9. Oil Pressure Sending Unit . Fig. 7-14
10. Low Oil Pressure Cut-off Switch . . . . . Fig. 7-14
11. Oil Filter . . . . . Fig. 7-1
12. Ignition Coil (Shielded) . . Fig. 7-13
13. Distributor (Shielded). . . Fig. 7-13
14. Fuel Pump & Filter. . . . Fig. 7-10
15. Fan Guard . . . . . Fig. 7-14
16. Radiator Fill . . . . . Fig. 7-14

Note: Figure No.'s refer to Parts Catalog with complete item description.

KEY TO FIG. 1-2

1. Exhaust Outlet . . . . . Fig. 7-14
2. Cooling Air Outlet . . . . Fig. 7-4
3. Governor. . . . . Fig. 7-13
4. Alternator (Battery Charging). . . . . Fig. 7-13
5. Throttle Linkage . . . . Fig. 7-13
6. Anti-Diesel Solenoid . . . . . Fig. 7-12
7. Cranking Motor . . . . . Fig. 7-11
8. Mounting Skid Base . . . . Fig. 7-15
9. Vernier Governor Control Cable (Manual Engine Speed Control). . . . . Fig. 7-13
10. Fuel Tank Fill . . . . . Fig. 7-19
11. Carburetor . . . . . Fig. 7-12
12. Air Cleaner . . . . . Fig. 7-12

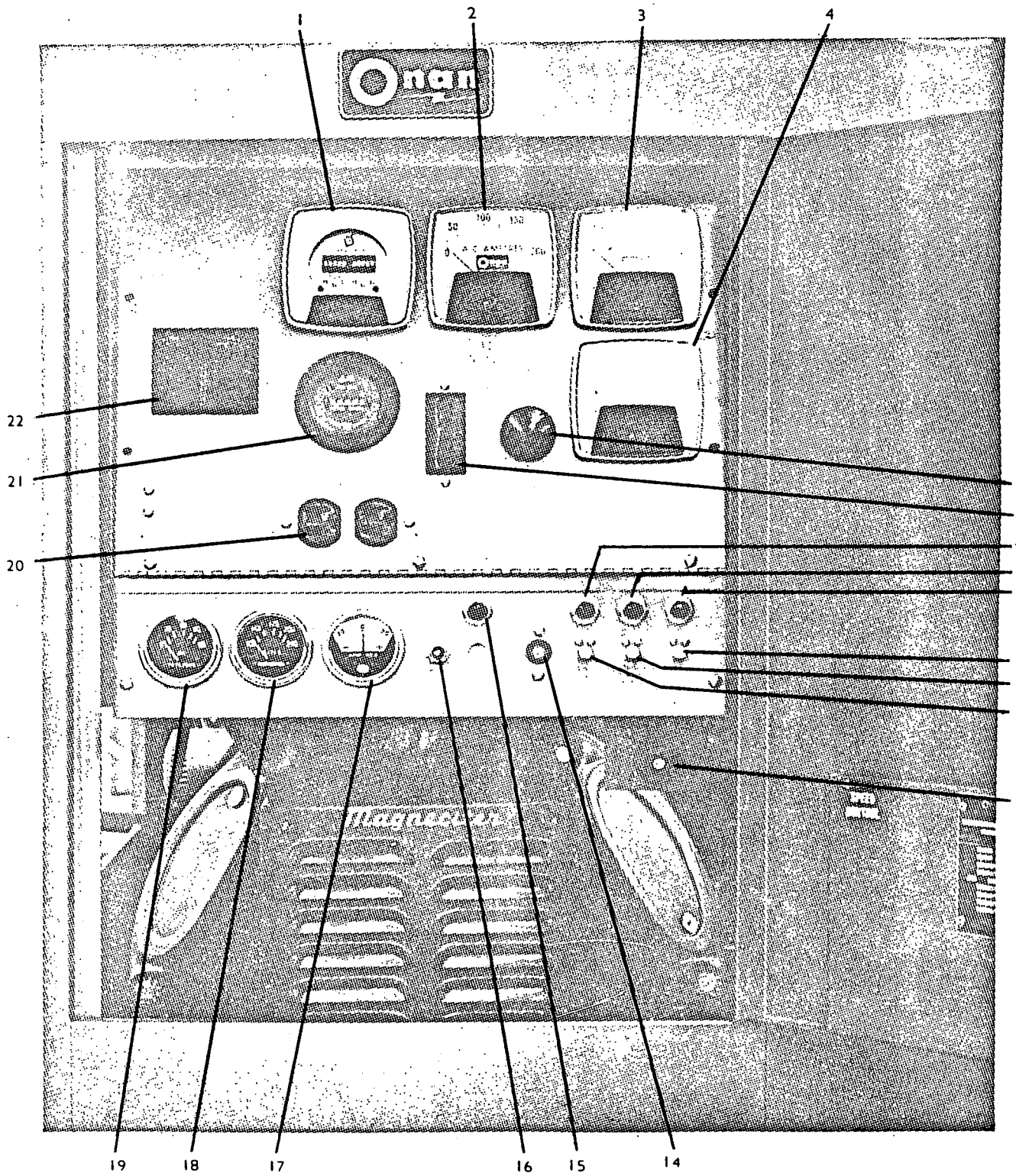


FIG. 1-3. CONTROL PANEL

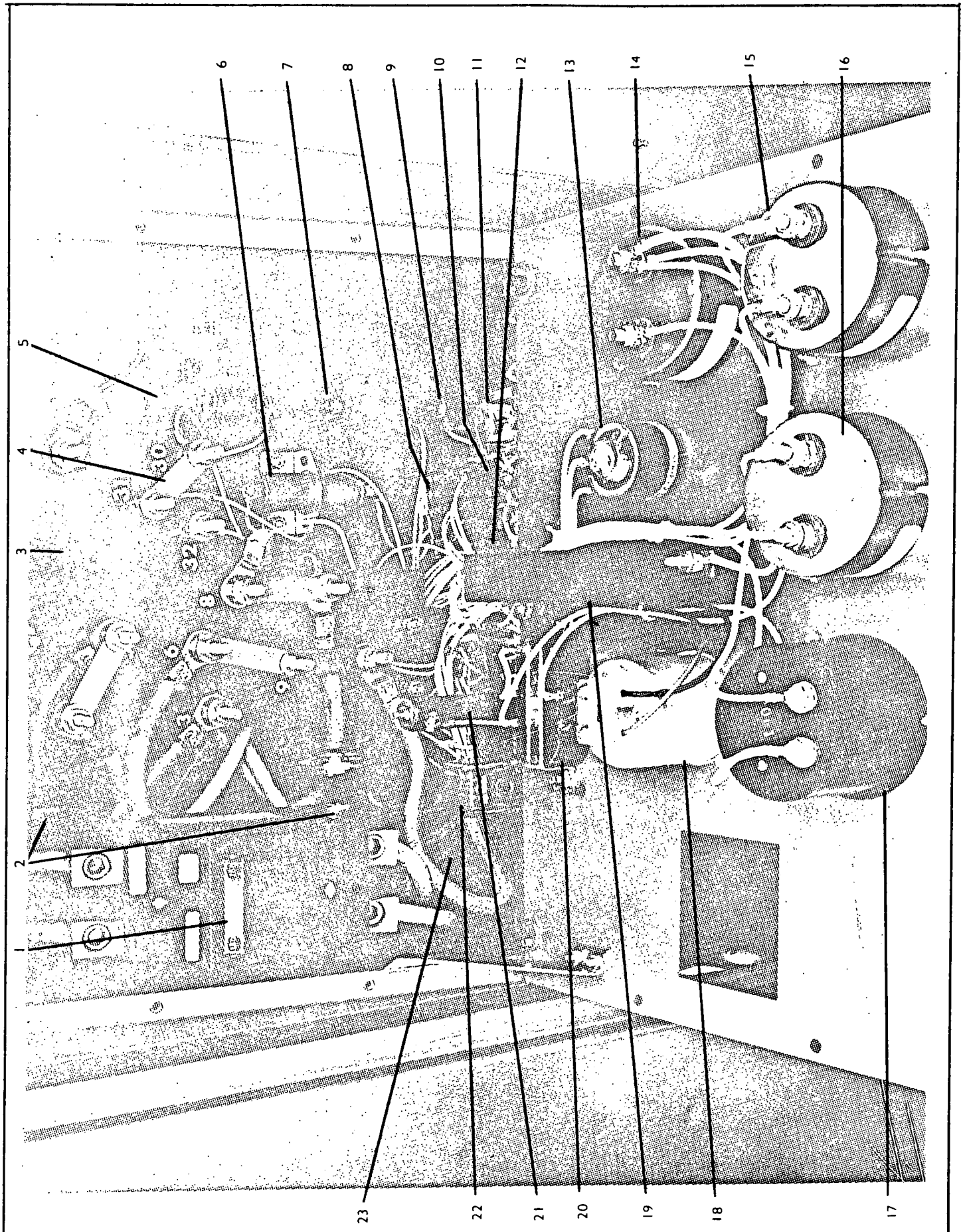


FIG. 1-4. CONTROL PANEL (Interior)

KEY TO FIG. 1-3*

1. Frequency Meter
2. AC Ammeter
3. AC Ammeter
4. AC Voltmeter
5. Voltage Regulator Rheostat
6. Field Circuit Breaker
7. Signal Light (Low Oil Pressure)
8. Signal Light (High Water Temperature)
9. Signal Light (Overspeed)
10. Latch Relay (Overspeed)
11. Latch Relay (High Water Temperature)
12. Latch Relay (Low Oil Pressure)
13. Vernier Governor Control (Manual Engine Speed Control)
14. Cranking Limiter
15. Signal Light (Plant Failed to Start)
16. Toggle Switch (Run, Stop, Remote)
17. DC Ammeter (Battery Charge Rate)
18. Gage (Water Temperature)
19. Gage (Oil Pressure)
20. Receptacle (120-volts, 1-Phase)
21. Running Time Meter
22. Lead Circuit Breaker

*Refer to Parts Catalog Fig. 7-18 for Complete Item Description.

KEY TO FIG. 1-4*

1. Load Circuit Breaker
2. Current Transformers
3. Terminal Board
4. Jumper (Used for Terminal Board Connections)
5. Capacitor (0.25 mfd)
6. Capacitor, Feed Thru (2 mfd)
7. Resistor, Fixed (425-ohm, 50-W)
8. Terminal Block
9. Resistor, Fixed (3-ohm, 10-W)
10. Terminal Block
11. Relay - Time Delay
12. Relay - Ignition
13. Rheostat , Voltage Regulator
14. AC Voltmeter
15. AC Ammeter
16. AC Ammeter
17. Frequency Meter
18. Running Time Meter
19. Field Circuit Breaker
20. Receptacle
21. Resistor, Fixed (4-ohm, 50-W)
22. Relay - Start Disconnect
23. Terminal Block

*Refer to Parts Catalog Fig. 7-18 for complete Item Description.

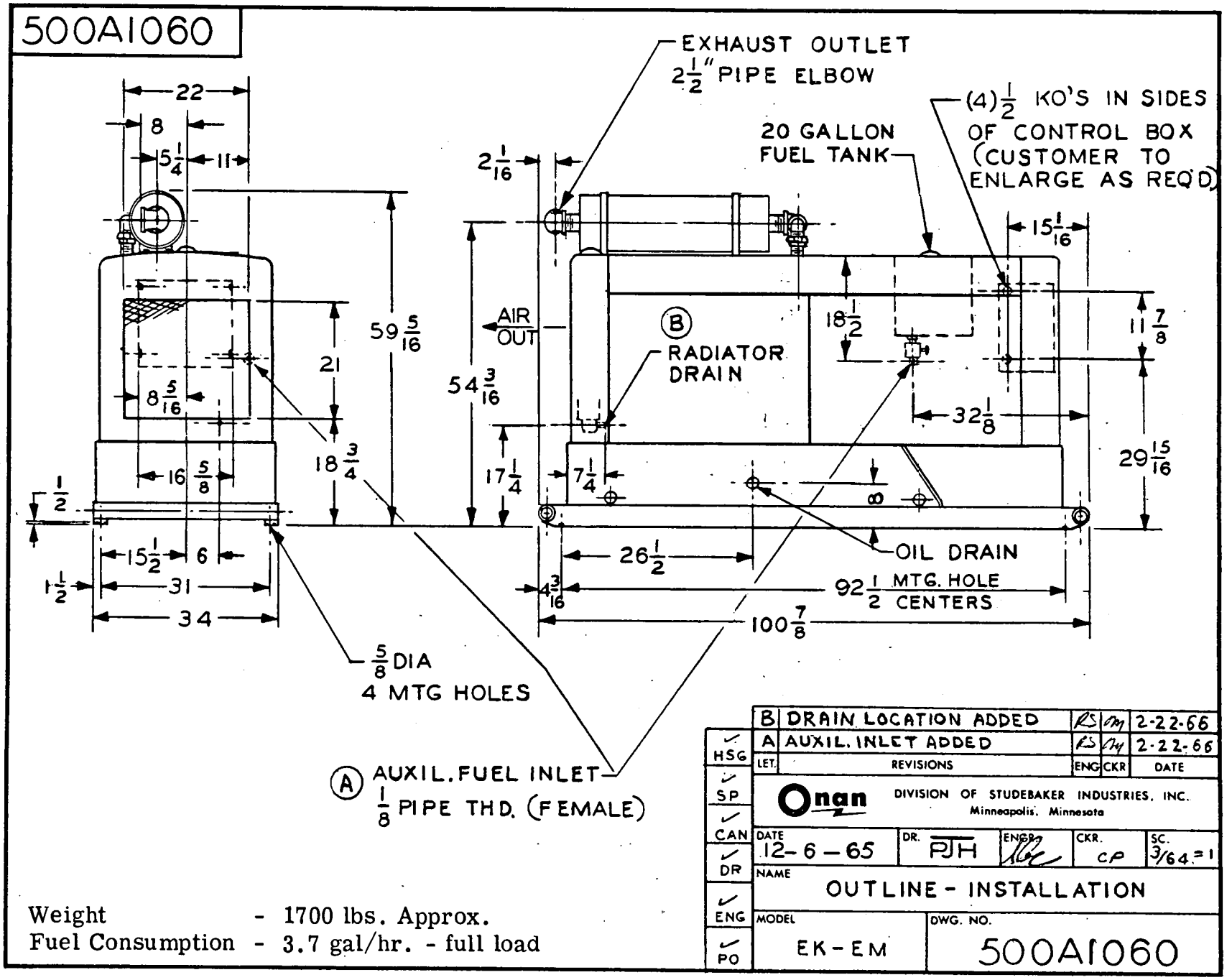


Fig. 1-5 Outline View

PERTINENT DATA

ENGINE

Manufacture	Ford
Model	C5PF-6005A
H.P. RPM	69 hp - 1800 rpm
Displacement	240 cu. in.
Bore	4.00 in.
Stroke	3.18 in.
Firing Order	1-5-3-6-2.4
Compression Ratio	8.75 to 1
Valve Setting	0.0 in (hydraulic lifters)
Oil Capacity	6 qts.
Low Oil Pressure Cut-off	9 lbs.
High Water Temperature Cut-off	205°F.
Over-Speed Cut-off	2100 rpm
Cooling System Capacity	5 gal.

GENERATOR

Manufacture	ONAN
Model	25EK/334
Rated Voltage - KVA	31.25
Rated Voltage	120/240
Phase	1
Rated Amp.	130
Cycles	50 or 60
RPM	1500 or 1800
Frequency Regulation	5%
Voltage Regulation	±2%*

*±5% Voltage adjustment with Voltage Regulator Rheostat.

GENERAL DESCRIPTION

The 25EK-23R/5178A Generating Plant is a complete, self-contained, unit which produces 25, 000 watts, 120 or 240-volts, at 50 or 60 cycles. The plant consists of three major subassemblies: Engine, Generator, and Control.

Engine: The engine is a six-cylinder, in-line, overhead valve, water cooled, 4-cycle, type. The engine burns gasoline, has a displacement of 240 cubic inches, and is rated at approximately 69 h.p. at 1800 rpm. A belt-driven mechanical governor controls engine speed which can be varied by the control panel mounted vernier governor control. The cast iron cylinder block-crankcase contains a cast-alloy iron crankshaft which is supported by 7-main bearings and a gear-driven camshaft which is supported by 4 bearings. The aluminum alloy pistons are cam ground and use 3-piston rings. Forged steel connecting rods, with replaceable bearings, connect the pistons to the crankshaft which drives the flywheel. The fuel system is self-contained with a 20-gallon tank mounted in the top of the housing. A flexible fuel line connects the tank to the diaphram-type, engine-driven, fuel pump. A replaceable fuel filter is mounted directly on the fuel pump. The adjustable, float-type, carburetor is mounted directly on the intake manifold. An oil-bath air cleaner mounts to the carburetor for cleaning combustion air. The ignition system is completely shielded and suppressed to remove radio frequency interference. The cooling system requires only a supply of cool air to operate. Approximately 5700 cubic feet per minute is required for cooling the unit. Air is drawn in and over the engine and expelled out through the radiator front side.

Generator: The generator consists of a 4-pole, revolving-field, type alternator and a "static" type exciter with magnetic amplifier regulation. The alternating current output is generated in the stator winding which is directly mounted to the rear of the engine. The rotating field is attached to a flexible coupling which is mounted to the engine flywheel. The rotor turns a engine speed which determines frequency. During 60-cycle output the engine speed is 1800 rpm, for 50-cycle output the engine speed is 1500 rpm. Various taps in the windings provide either 120 or 120-240 volt outputs. The static exciter has no moving parts and is mounted on the generator end bell. Voltage regulation is $\pm 2\%$ from no-load to continuous rated load. Generator output is applied to a magnetic amplifier in its exciter which monitors any increase or decrease in voltage and provides a corresponding decrease or increase in field excitation voltage. A rheostat in the control provides a $\pm 5\%$ output voltage adjustment.

Control: The engine controls include 12-volt starting and battery charging circuits with connections for the remote plant control panel. Gages indicate engine oil pressure, water temperature, and battery charge rate. Three latching relays, manual reset type, and three signal lights indicate and stop the plant if oil pressure fails, water temperature exceeds $205^{o}F$, or the engine speed exceeds 2100-rpm. The cranking limiter, thermal operated manual reset type, prevents excessive engine cranking while starting the plant, An additional signal light indicates that the plant has failed to start. The AC control section of the panel contains ammeters to indicate current flow in the generator output. A voltmeter and fre-

quency meter indicate the output voltage and frequency. The running time meter provides an accurate record of the actual unit operating time. A field circuit breaker (15 amp) provides protection of the exciter against extreme overloads. The voltage regulator rheostat provides ±5% output voltage variation. Load circuit breakers protect the generator output windings against severe and unexpected overloads. A large terminal board and heavy copper jumpers provide a simple method of changing the output voltage (120-volts or 120-240 volts). By changing the jumper position on the terminal board studs the output voltage is changed. The entire control section mounts on the inside of housing and is protected by the housing door. Knockouts are provided in the control enclosure for attachment of wiring conduit.

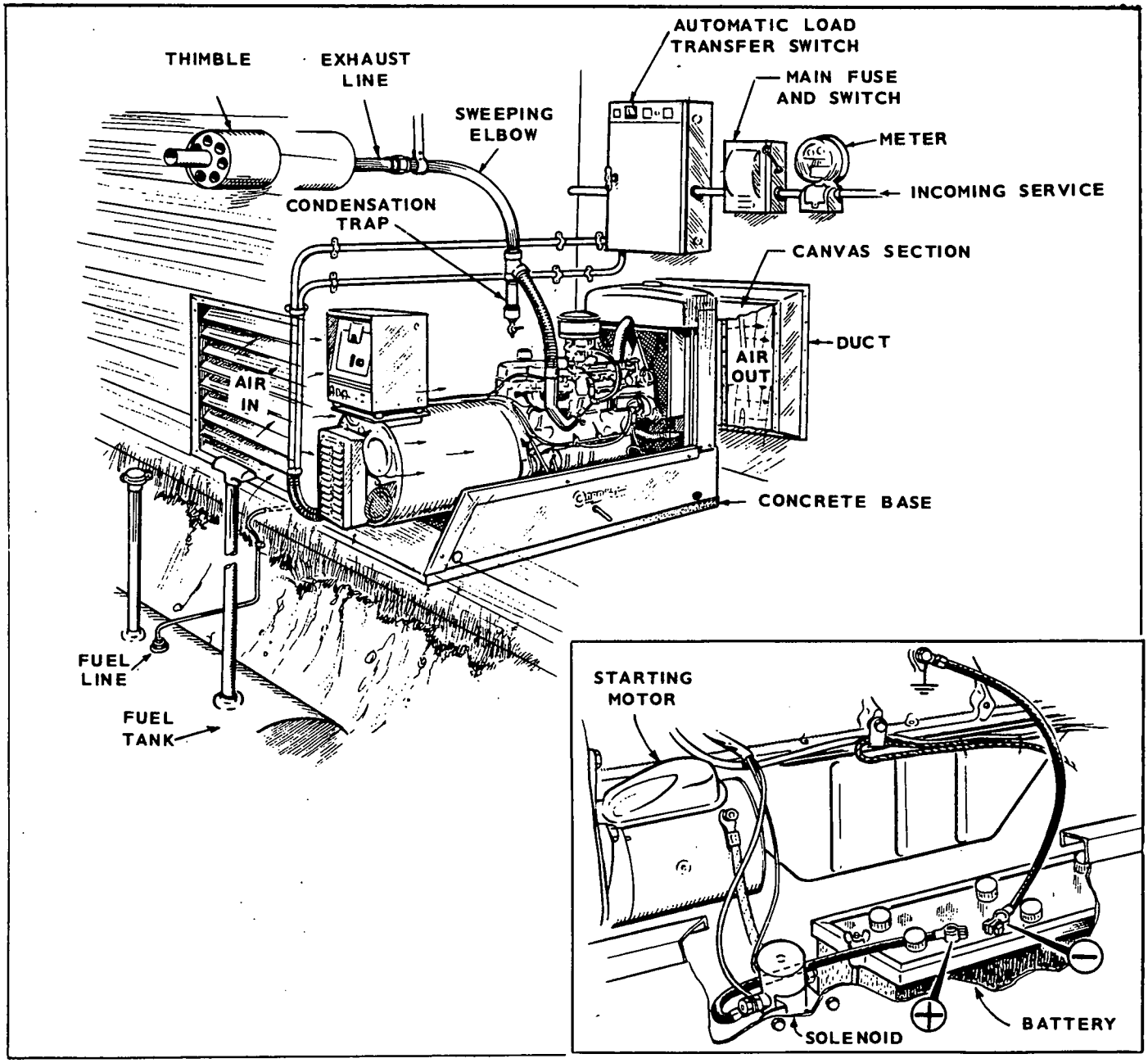


FIG. 3-1. TYPICAL INSTAL LATION

INSTALLATION

Each installation must be considered individually - use these instructions as a general guide. Follow the principles outlined and refer to the installation outline drawing. Local regulations (building code, fire ordinance, etc.) may affect some details, and any such regulations should be fully observed.

LOCATION

The selected site should be dry, well ventilated, and reasonably dust free. Provide sufficient clearance (at least 24 in. recommended) on all sides for servicing. Local regulations sometimes require that for emergency standby service the ambient temperature must not fall below a specified minimum.

MOUNTING

The plant is mounted to a rigid base that provides proper support and adequate vibration damping. However, for convenience in draining oil, general servicing, etc., the plant can be mounted on raised pedestals or rails at least 6 in. high. If mounting in a trailer, or for other mobile application, bolt securely in place.

VENTILATION

The engine generates heat that must be dissipated. For a radiator cooled unit, proper ventilation is of vital importance. Under average operating conditions, approximately 5700 cubic feet of air per minute provides sufficient cooling. If installed in a small room, an auxiliary fan of sufficient size to assure proper volume of air may be necessary. The auxiliary fan can be connected to operate only when the plant is running.

The pusher type fan forces the cooling air out through the front of the radiator. For room or compartment installations the usual method of exhausting the heated air is to construct a duct from the front of the radiator to an opening in an outside wall. Inlet and outlet ducts and wall opening areas should be at least as large as the plant radiator.

Provide inlet and outlet openings with suitable shutters to prevent back flow of cold outside air during shut down. Proper consideration must be given to any other draft-creating equipment installed in the same room. If unattended automatic starting is planned, (as for emergency standby with automatic load transfer switch) the shutters should be automatically controlled.

EXHAUST

Pipe the exhaust gases outside any enclosure. Use pipe at least as large as the 1-1/2 in. pipe size outlet of the engine. Increase the pipe diameter one pipe size for each additional 12-ft. in length. Use a flexible connection at the engine exhaust manifold. Provide adequate support for the piping. Pipe fittings cause a resistance to the flow of exhaust gases and can result in a loss of engine power. Use sweeping type elbows in preference to standard pipe elbows, and keep the number of necessary turns to the minimum. If the exhaust line runs upward at any point, install a vapor trap at the low point, with provision for periodic draining. Shield or insulate the line if there is danger of personnel contact. If the line passes close to a combustible wall or partition, allow at least 4" clearance. Install a suitable muffler.

FUEL CONNECTION

Gasoline Fuel: Use 3/8 in. size tubing to connect the engine fuel pump inlet to an approved fuel tank installation. Be sure to comply with local regulations when installing any gasoline supply tank. An underground tank usually has the fuel outlet at the top, requiring a drop or suction tube extending down to within an inch or two of the tank bottom. All supply connections must be air tight, to assure that the pump will lift the fuel from the tank. The lift of fuel from the supply tank to the fuel pump should not exceed 6 ft., and horizontal distance not more than 50 ft. Use 3/8 in. tube size for up to 25 ft., 1/2 in. tube size up to 50 ft. Use a suitable adapter fitting to fit the 1/8 in. pipe thread inlet opening of the fuel pump.

BATTERY

One 12-volt battery is used. Each battery cable terminal clamp is stamped "P" (positive) or "N" (negative) for connection to the proper battery terminal post. Connect positive to the "P" terminal of the start solenoid. Connect negative to a convenient ground point on the engine. Service the batteries as necessary.

REMOTE CONTROL PANEL

Starting and stopping is provided through a 12-volt, 2-wire electrical system. Terminal blocks in the plant control box and on the back of the remote control panel provide wiring connection points (Fig. 3-2). Connect REMOTE, B+, GND, 12, terminals on the remote panel to the corresponding terminals on the plant remote control terminal block. Use No. 18 AWG wire for connections up to 900 ft. Terminals N and 10 connect to the 120 volts AC terminals in the plant control box terminal board. Terminal 42 and 43 on the remote panel connect to the commercial 120 volt AC line power source which is used to supply power to load when the plant is not operating. Signal lights in the remote panel indicate ENGINE RUNNING, ENGINE LOCK-OUT (plant shut-down), COMMERCIAL POWER ON, ALARM SILENCED. The audible alarm in the remote panel indicates that one of the plant protection devices has operated and has shut down the plant. The ALARM DISCONNECT switch is used to silence the alarm. The ALARM SILENCED signal light will glow to indicate that the alarm switch is at the SILENCED position. The RUN-STOP switch is used to start and stop the plant. Refer to the Wiring Diagrams for connection points and remote panel wiring.

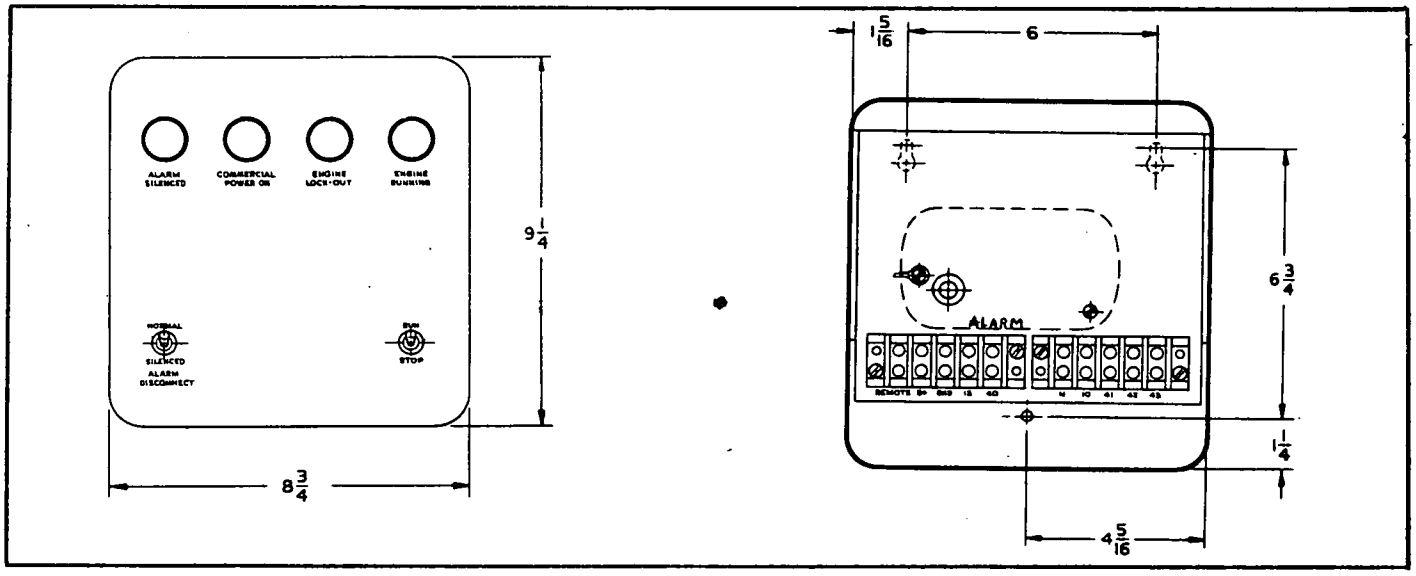
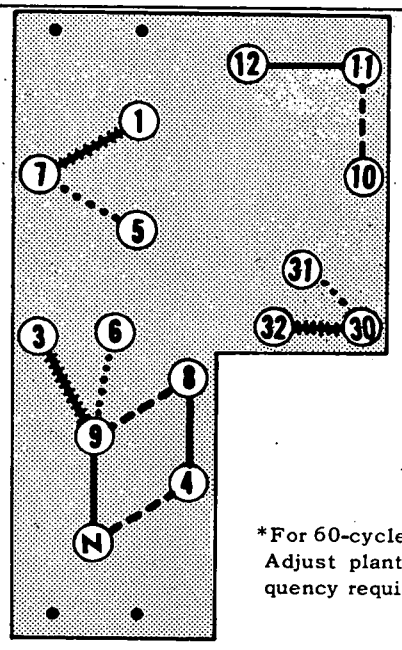


FIG. 3-2. REMOTE CONTROL PANEL

LOAD WIRE CONNECTION

The plant AC output terminals are studs located on the large terminal board inside the control box. Terminals 10, 11, N (Neutral) are the load connection points (Fig. 3-3).

Load wire connections change according to the voltage and frequency output selection (120-volt, single-phase, two-wire, or 120/240-volt, single-phase, three-wire; with a frequency of 50 or 60-cps). Desired voltage and frequency is obtained by changing the load wire connections (and jumpers) on the output terminal block located behind the control panel. Connect wires and jumpers according to the following diagram and table. For further information see wiring diagrams 612D2610 and 612C2611 following the parts listed. For 240V-single phase - separate ground - see 612D2610.



CONNECT LOAD-TO-LOAD TERMINALS WITH JUMPER BETWEEN TERMINAL POINTS SHOWN

CODE		JUMPER TERMINALS	LOAD TERMINALS
———	120 - 240V	4-8, 9-N, 11-12	10, 11, N
- - - -	120V	8-9, 4-N, 10-11	10, N
•••••••	60 CPS *	5-7, 6-9, 30-31	
~~	50 CPS *	1-7, 3-9, 30-32	

*For 60-cycle output - plant rpm is 1800. For 50-cycle output - plant rpm is 1500. Adjust plant rpm with vernier governor control according to voltage and frequency requirements as indicated on Frequency Meter and AC Voltmeter.

FIG. 3-3. LOAD WIRE CONNECTION

120-VOLT: Connect load wires to terminals 10 and N (neutral).
120-240-VOLT: Connect load wires to terminals 10, 11, and N (neutral). Two 120-volt circuits are available from terminals 10-N and 11-N. Each circuit load must not exceed 1/2 the rated plant capacity (12.5KW-60-cps-per circuit). One 240-volt circuit is available from terminals 10-11. If both 120-volt and 240-volt current is used at the same time, use care not to overload any one circuit.

IMPORTANT: When using the two 120-volt circuits simultaneously, balance the load between each circuit as much as possible by observing current flow on the AC Ammeters in the control panel.

GENERAL OPERATING INSTRUCTIONS (Fig. 3-4).

STARTING

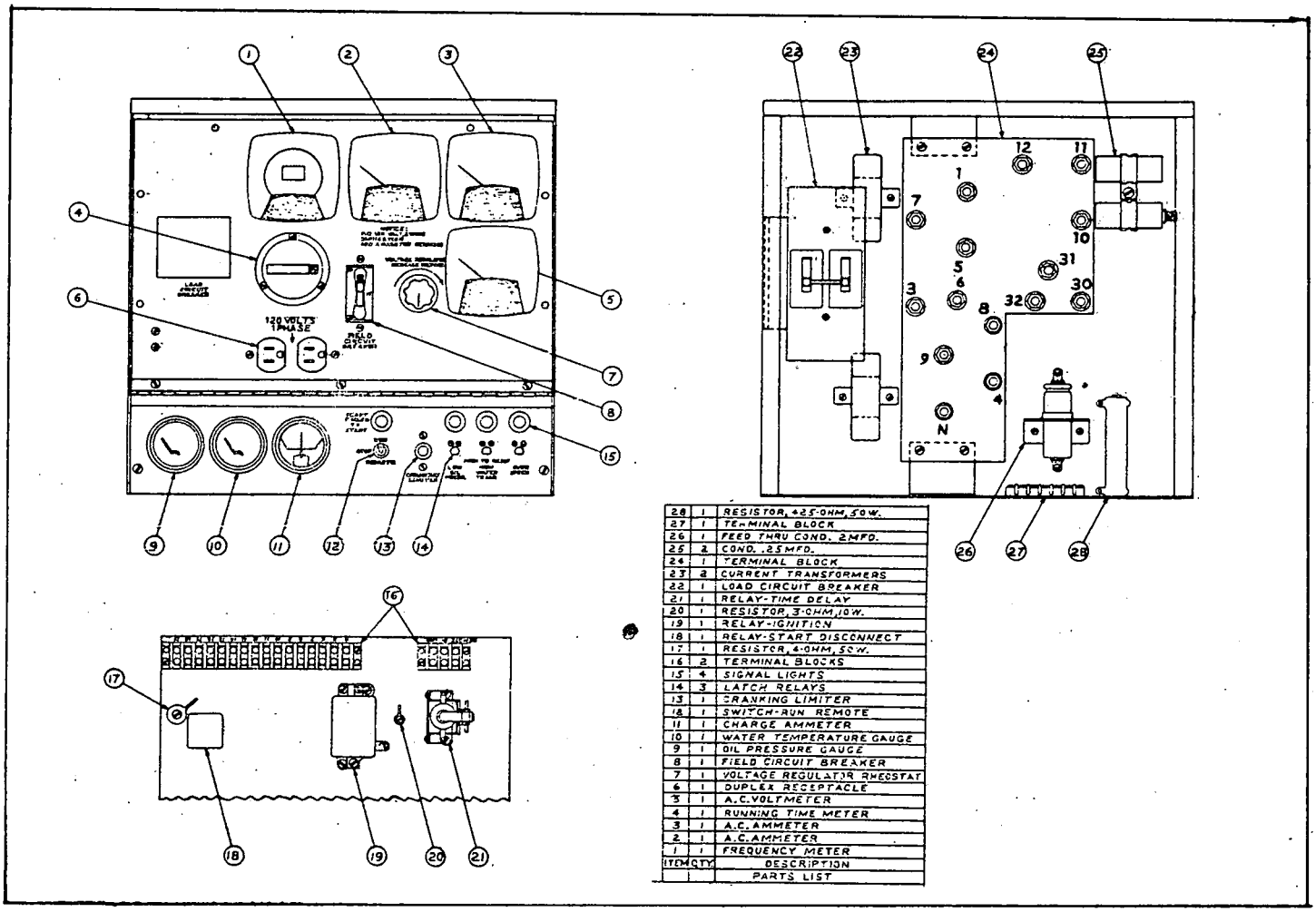
During the initial run have the field circuit breaker OFF so the unit can run at no load. To start the unit, move the run-stop switch to the RUN position. The plant should start within a few seconds of cranking. The cranking motor will be disconnected by the start disconnect relay when the engine comes up to speed. If the unit fails to start within about 30-seconds, the cranking limiter will open to stop cranking.

CHECKING OPERATION

As soon as the engine starts, check the oil pressure gage and the battery charge ammeter. As the engine warms up, check the water temperature gage. When the engine reaches operating temperature, as indicated by the oil pressure and water temperature gages, energize the generator by moving the field circuit breaker to ON. Then check the voltmeter for the correct output voltage. A voltage adjustment of 5% can be made with the rheostat on the control panel. If a voltage adjustment is necessary, wait until the voltage remains at a stable level.

STOPPING

If operating conditions permit, disconnect the electrical load and allow the plant to run at no load to prevent an excessive temperature rise. To stop the plant, move the run-stop switch to the STOP position.



ITEM	QTY	DESCRIPTION
		PARTS LIST
1	1	FREQUENCY METER
2	1	A.C. AMMETER
3	1	A.C. AMMETER
4	1	RUNNING TIME METER
5	1	A.C. VOLTMETER
6	1	DUPLEX RECEPTACLE
7	1	VOLTAGE REGULATOR RHEOSTAT
8	1	FIELD CIRCUIT BREAKER
9	1	OIL PRESSURE GAUGE
10	1	WATER TEMPERATURE GAUGE
11	1	CHARGE AMMETER
12	1	SWITCH-RUN REMOTE
13	1	CRANKING LIMITER
14	3	LATCH RELAYS
15	4	SIGNAL LIGHTS
16	2	TERMINAL BLOCKS
17	1	RESISTOR, 4-OHM, 50 W.
18	1	RELAY-START DISCONNECT
19	1	RELAY-IGNITION
20	1	RESISTOR, 3-OHM, 10 W.
21	1	RELAY-TIME DELAY
22	1	LOAD CIRCUIT BREAKER
23	2	CURRENT TRANSFORMERS
24	1	TERMINAL BLOCK
25	2	COND. .25 MFD.
26	1	FEED THRU COND. 2 MFD.
27	1	TERMINAL BLOCK
28	1	RESISTOR, 4.25 OHM, 50 W.

FIG. 3-4. CONTROL PANEL

NORMAL OPERATING FUNCTIONS

Safety Stopping Devices: In addition to the ac circuit breaker (which does not stop the plant), the plant is equipped with several safety devices that stop the engine under conditions that could cause severe damage.

NOTE: If one of the safety stopping devices operates to stop the plant the Emergency Latch Relay PUSH TO RESET button must be reset before the plant can be restarted.

1. Low oil pressure cut-off: A pressure operated switch mounted on the engine stops the plant if the engine oil pressure drops below about 9-lbs. The switch is not adjustable.

2. Over speed cut-off: A centrifugal weight type switch is attached to the outer end of the generator shaft and is not adjustable. The switch operates to stop the plant if the engine speed should accidentally rise to a dangerous point. Under no circumstances should the plant be operated if the switch is disconnected or otherwise made inoperative. Excessive speed could cause extensive generator damage.

   WARNING: An overspeed protective switch is built into the outer end of the generator rotor shaft. This overspeed device automatically shuts off the engine if the speed reaches 2100 rpm. Under no circumstances should the overspeed switch be by-passed or disconnected when the plant is operated. Extensive generator damage can result from overspeed operation.

   If the switch stops the plant, check the governor system to make sure it is adjusted correctly and operating freely. If the governor is correctly adjusted and engine is otherwise functioning properly, the plant still shuts down, the switch may not be operating properly. Do not attempt to adjust the switch, replace with a new one.

3. High water temperature cut-off: A thermostatic switch is mounted on the engine. If the water temperature rises to about 205^{o}F., the switch acts to stop the plant. The coolant temperature must drop about 10^{o} before the engine can be restarted.

Oil Pressure: The oil pressure gage indicates the engine oil pressure while the engine is running. Normal oil pressure at operating temperature is within a range of 30 - 75 psi. Pressure will be high until the engine warms up.

Water Temperature: The panel water temperature gage indicates the coolant temperature during operation. Normal operating temperature is 165^{o}F. to 185^{o}F.

Charge Ammeter: The small dc ammeter indicates the battery charge rate. An automatic regulator controls the charge rate, which varies according to the charge condition of the battery. The charge rate will be comparatively high when the plant first starts, but should fall to almost zero as the battery becomes fully charged.

Emergency Latch Relays: Emergency latch relays are energized by battery voltage when a ground is provided by one of the engine safety devices. A red signal light comes on and a button protrudes from the control panel to indicate a latched relay.

Run-Stop Switch: A SPDT, center off switch, it functions as a manual control for starting and stopping and as a selector when a switch is installed for remote control.

Voltage Regulator Rheostat: On plants equipped with the voltage regulator rheostat, the rheostat provides for approximately 5% plus or minus adjustment of the output voltage. Turn clockwise to increase the voltage, counterclockwise to decrease the voltage.

Battery, Hot Location: Batteries will self discharge very quickly when the ambient temperature is consistently above 90°F., such as in a boiler room. To lengthen battery life, dilute the electrolyte from its normal 1.275 specific gravity reading a full charge to a 1.225 reading. The cranking power of the battery will be reduced slightly when the electrolyte is so reduced, but if the temperature is above 90°F. this should not be noticed, and the lengthened battery life will be a distinct advantage.

Cranking Limiter: The cranking limiter is a safety device which prevents excessive engine cranking. The electrically operated thermal relay will automatically open the engine cranking circuit after approximately one-minute cranking time. The limiter must be manually reset after opening. A red signal glows if engine fails to start and the limiter opens. Allow at least one minute before attempting to reset the limiter. Investigate any failure in starting.

Exercise Period: If the plant is used infrequently, such as in standby service, start and operate for 30 to 45-minutes at least once a week. This exercise period keeps oil distributed on engine parts, fuel system full, etc., and promotes easier starting.

No Load Operation: Period of no load operation should be held to a minimum. If it is necessary to keep the engine running for long periods of time when no electrical output is required, best engine performance will be obtained by connecting a "dummy" electrical load. Such a load could consist of heater elements, etc.

AC Ammeter: The ac ammeter indicates the amount of load connected to the generator circuit. On three phase models, the current shown will be for one phase only, according to the position of the selector switch.

AC Voltmeter: The ac voltmeter indicates the voltage of the ac output. On three phase models, the voltage shown will be for the same phase as the amperage shown, according to the position of the selector switch. On a single phase (no selector switch) or four wire, three phase model, the voltage shown will be the higher nameplate voltage.

Running Time Meter: The running time meter registers the total number of hours, to 1/10th, that the plant has run. Use it to keep a record of periodic servicing.

Frequency Meter: The frequency meter indicates the frequency of the output current in cycles per second. It can be used to check engine speed (each cycle per second equals 30 rpm engine speed).

Circuit Breakers: The circuit breaker is a safety device to protect the generator against damage from an overload. If an overload should occur, the circuit breaker will automatically trip, disconnecting the generator output from the load terminals. After correcting the overload condition, it is necessary to manually reset the breaker to the ON position.

Field Circuit Breaker: This breaker is a safety device to protect the static exciter from overload. If an overload should occur, the breaker will automatically open the circuit between the exciter and the generator field coils. Manually reset the breaker after correcting the overload condition.

THEORY OF OPERATION

ENGINE: The engine uses a conventional battery, coil and distributor ignition system. When the breaker points are closed, battery voltage (12-volts) flows through the coil primary windings and to ground through the breaker points. As the breaker points open, the magnetic field in the coil primary passes through the coil secondary windings producing a very high voltage output. High voltage output is produced every time the breaker points open. The 12-volt battery-charging alternator is a revolving field unit which produces a rectified DC voltage output. A transistorized voltage regulator senses the voltage at the alternator auxiliary terminal and allows the required field current to flow to the alternator to maintain system voltage at the output terminals. The starter motor is energized by the closing of the starter solenoid which allows battery current to flow to the starter windings. The starter engages the engine flywheel before starting to crank to eliminate gear mis-matching. The anti-dieseling solenoid is energized when the plant is operating. When the plant is shut-down, the solenoid de-energizes allowing the plunger to be pulled out by spring tension forcing the throttle open to prevent engine dieseling (after-firing). The electric fuel solenoid valve is energized only when the plant is operating and de-energized when the plant is shut-down preventing fuel siphon action.

GENERATOR: The generator is a four-pole, revolving field, externally-excited (generator mounted static exciter) type. The rotating field is coupled to the engine and rotates at engine speed. Field excitation voltage (DC) is supplied and regulated by the static exciter through slip rings and brushes to the field coils (Fig. 4-1). The alternating current output is tapped from the stator windings with the output leadwires terminated at the large terminal board in the control box. By changing the wiring connections, either 50- or 60-cycle output (engine speed must also be changed 1500-to 1600-rpm) may be obtained with 120-volt, 2-wire or 120/240-volt, 3-wire voltage rating.

The static exciter (Magneciter) functions as a power supply for the revolving field and a voltage regulator. By regulating the amount of current to the field, it controls the ac output of the generator. The circuit shown in Fig. 4-2 is the power supply. It's a full wave rectifier made up of 2 half wave rectifiers and supplies direct current to the field. Two gate reactors regulate the generator output voltage, by controlling the current flowing in the field (Fig. 4-3).

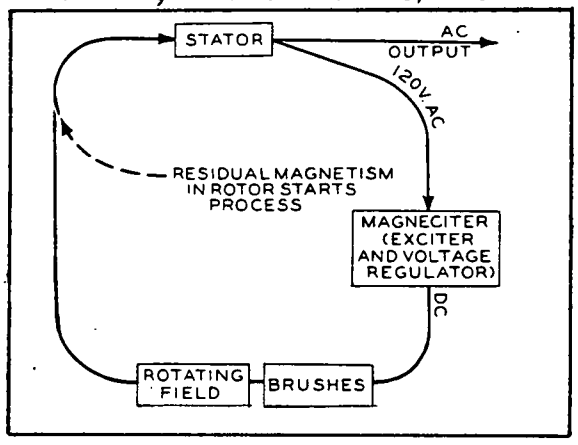


FIG. 4-1. SCHEMATIC ALTERNATOR AND EXCITER

Each gate reactor is a metal doughnut shaped core with 2 windings, an output or gate winding and a control winding. The amount of current the reactor allows to flow in the gate winding is dependent on the amount of magnetism in the core. As current flow increases, the gate opens, when there is more magnetism in the core, until finally when the core is saturated, the gate is all the way open, the reactor then does not oppose current flow. Since the rectifiers allow current in the gate winding to flow in only 1 direction, it can act only to magnetize the core. If the magnetism in the core were decreased this would reduce the current flow through the gate winding.

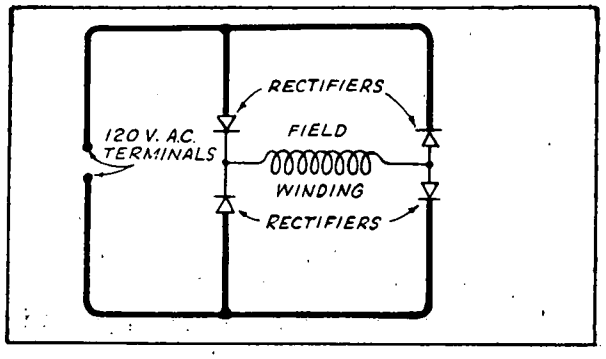


FIG. 4-2. POWER SUPPLY

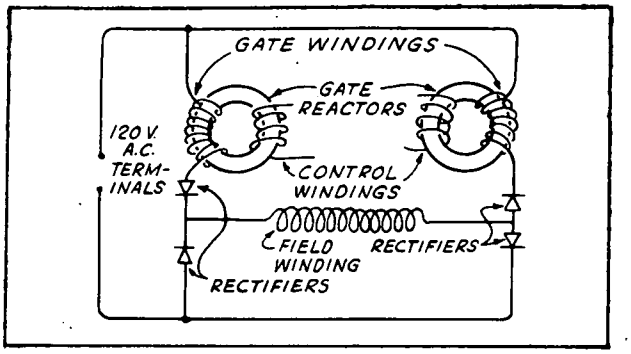


FIG. 4-3. POWER SUPPLY WITH GATE REACTORS

When current flows in the control windings, it decreases the magnetism in the core, reducing the current flow in the gate winding. The control regulates the current in the generators' field, which controls generator output. More de-magnetizing current in the control winding allows less current in the gate winding and generator field and a lower output voltage.

The regulator must allow little or no current flow up to a certain output voltage and a large flow above that voltage so the current in the control windings will depend on the voltage output of the generator (Fig. 4-4). The control circuit uses rectifiers to allow the current to flow in only one direction and a control reactor. The control reactor is the voltage sensitive control of the regulator. Its characteristics are shown in Fig 4.-5. Below the proper voltage, little current flows through the re-

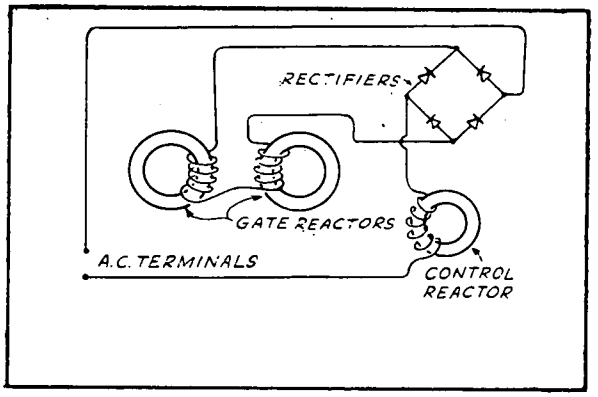


FIG. 4-4. CONTROL CIRCUIT

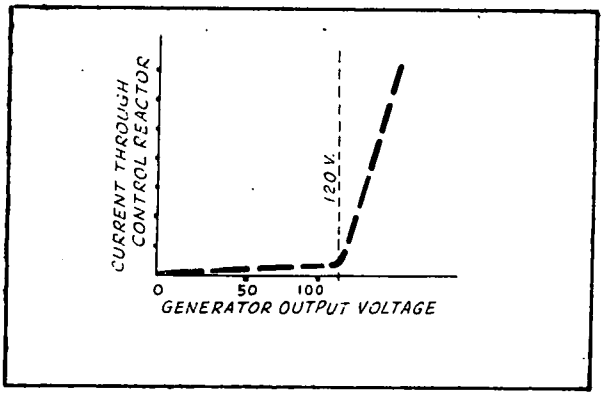


FIG. 4-5. CONTROL REACTOR CHARACTERISTICS

actor, so little current flows in the control windings. This allows full current to the field windings. When the reactor saturates magnetically, it suddenly allows a lot of current to flow through the control windings, reducing the current to the field windings. This reduces the generators' output voltage, which, in turn reduces the current through the control reactor and control windings back to the set requirements. The regulator holds voltage at the pre-set level determined by the control reactor.

Compounding windings on each large reactor, help to retain voltage control through changes in load and an output voltage control resistor allows adjustment of the output voltage by changing the voltage across the control reactor.

CONTROL: The control section is mounted at the rear of the unit and is accessible through the rear door. The control is divided into two sections: AC control panel, and engine control panel. The AC control panel swings down for access to the rear of both panels and internal wiring. The ac control panel contains all connections, meters, and controls to monitor and adjust generator output. A 150-amp load circuit breaker is wired in series with the output terminals of the load-connection terminal board. The load breaker will open in case of an overload in the load circuit and protects the generator output windings. A 15-amp field circuit breaker is connected in series with the static exciter input. The breaker will open in case of a generator overload and protect the static exciter from damage. A voltage regulator rheostat in series with the voltage regulator portion of the exciter allows a ±5% change in voltage output. Turn clockwise to increase voltage or counterclockwise to decrease voltage. The two AC ammeters and their current transformers monitor voltage output from the two generator output legs. When connected for 120-volt, 2-wire output the ammeter readings must be added together for total current flow. When connected for 3-wire output, each ammeter indicates current flow in one output leg.

The engine control panel contains signal lights, latching relays, gages, and switches to monitor and control engine operation. The oil pressure gage and water temperature gage are series wired into resistance element type sending units mounted on the engine. The charge ammeter indicates current flow in the engine electrical system. It is wired in series with the battery charging 12-volt alternator and the remaining engine circuits. The RUN-STOP-REMOTE switch controls plant starting and stopping from the engine control panel. When set at RUN, battery voltage is applied to the normally closed contacts of the cranking limiter, three latching relays, starter solenoid (the starter engages and begins to crank the engine), and the electric choke. Battery voltage also energizes the Ignition Relay which closes the circuit to the ignition coil allowing the ignition system to operate and the engine to start. As the engine starts to crank, a heating element in the Cranking Limiter starts to heat and continues to heat until cranking stops or its thermal device operates to de-energize (open) the limiter. The limiter allows approximately one minute of engine cranking before opening. When the limiter opens, its contacts close to energize the Plant Failed to Start signal light and a button protrudes from the limiter. Limiter contacts open to remove battery voltage from the ignition system and open the circuit to the Starter Solenoid to stop engine cranking. The limiter must be manually re-set before engine cranking can again be attempted. As the engine starts and builds up speed the battery-charging alternator begins to produce voltage. A connection to the AUX terminal on the alternator to the coil of the Start-Disconnect relay allows alternator voltage to energize the Start-Disconnect relay and open the circuit to the starter solenoid to stop engine cranking. Contact 3 on the Start-Disconnect relay closes as the relay energizes which allows the Time Delay relay in the low oil pressure circuit to energize. The time Delay relay energizes, contacts open, for approximately 15-seconds to allow oil pressure build-up while starting. After the 15-second delay, the contacts close to complete the low-oil pressure circuit to the pressure switch. If the oil pressure drops below 9-psi, the pressure actuates allowing the Low Oil Pressure Latching Relay to open, stopping the plant, and lighting the Low Oil Pressure Signal light. The latching relay must be manually re-set before resuming operation. The low oil pressure condition must be repaired before the plant will operate. The High Water Temperature Latching Relay is energized by the closing of the High Water Temperature

switch when the coolant temperature exceeds 205°F. When the latching relay energizes, the plant will shut down, and the High Water Temperature signal light will glow. The latching relay must be manually re-set before resuming operation and the high temperature condition must be repaired before the plant will operate. The Overspeed Latching Relay is energized by the closing of the Overspeed switch. The overspeed switch is a centrifugal type mounted on the end of the generator shaft behind the static exciter. The latching relay will energize to shut-down the plant and energize the Overspeed Signal Light. The latching relay must be manually re-set before assuming normal operation. If the overspeed condition continues, adjust the governor, governor linkage, or carburetor.

Setting the RUN-STOP-REMOTE switch at STOP de-energizes the control electrical system allowing to anti-dieseling solenoid to release, shutting down the plant. Setting the switch at REMOTE closes the circuit to the Remote Terminal block allowing plant operation from the Remote Control unit.

Follow a definite schedule of inspection and servicing. Use the running time meter to keep a record of service operations. Service periods outlined below are for normal service and operating conditions. For continuous heavy duty, extreme temperatures, etc., service more frequently. Refer to Fig. 5-1 for specific lubrication points and Fig. 5-2 for recommended lubricant.

DAILY SERVICE, NORMAL 8-HOURS OPERATION

1. Gasoline: Check, replenish as necessary.
2. Crankcase Oil: Check, add as necessary.
3. Air Cleaners: Check, clean as frequently as necessary.
4. Radiator: Check level, add as necessary.
5. Cleaning: Wipe clean of dust, spilled oil, etc.
6. Inspection: Inspect for loose parts, leaks, etc.

WEEKLY SERVICE, NORMAL 50-HOURS OPERATION

1. Governor Linkage: Lubricate sparingly. Keep dust free.
2. Crankcase Breather: Clean breather caps.

MONTHLY SERVICE, 200-250 HOURS OPERATION

1. Spark Plugs: Clean, re-set, test.
2. Ignition Points: Check, re-set, replace if necessary.
3. Ignition Timing: Check.
4. Valves; Check tappet clearances.
5. Breathers: Clean.
6. Fuel Sediment Bowl: Clean (Fig. 1-1).
7. Charge Alternator: Clean and inspect for loose connections, etc.
8. Alternator Brushes: Check, replace if worn to 1/2-inch or if damaged. DO NOT LUBRICATE.
9. Crankcase Oil: Drain and refill unless experience indicates oil can be used for longer period. Maximum 100-hours operation.
10. Oil Filter: Replace element at oil change (Fig. 1-1).

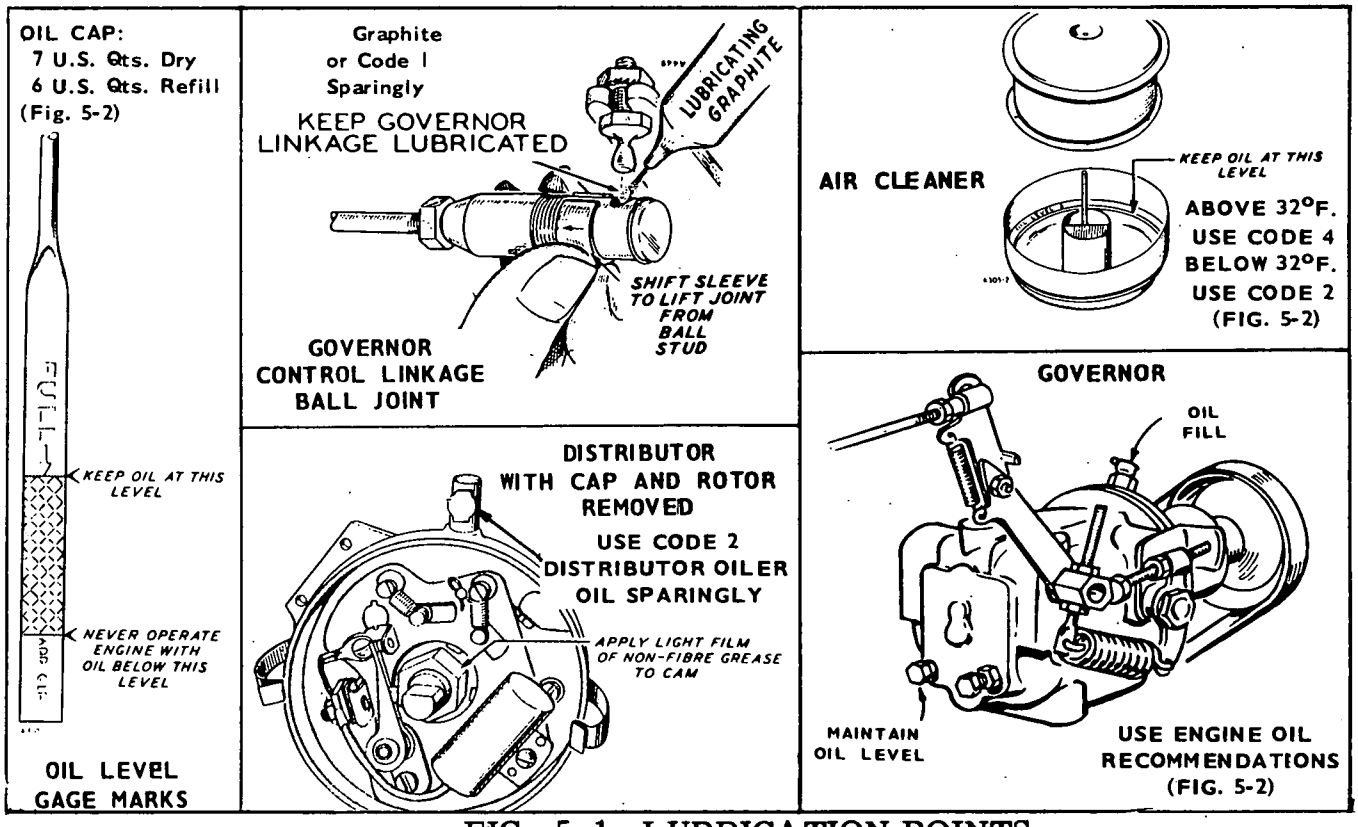


FIG. 5-1. LUBRICATION POINTS

ENGINE OIL RECOMMENDATIONS		LUBRICATION CODE	
Viscosity*	Temperature	Viscosity	Code
SAE 40 or 20W-40	Above +100°F.	SAE5W	1
SAE 30 or 10W-30	+32°F. to +100°F.	SAE10W	2
SAE 20 or 10W-30	+10°F. to + 32°F.	SAE 20	3
SAE 10W	+10°F. to - 10°F.	SAE30	4
SAE 5W or 5W-20	Below - 10°F.		

MILITARY SPECIFICATION	TEMP.
MIL-L-2104B #30	Above 0°F.
MIL-L-2104B #10	0°F to 30°F.
MIL-L-10295A	Below 0°F.

FIG. 5-2. LUBRICANT CHART

*Engine lubricating Oil must meet commercial type MS specifications.

MAINTENANCE

Maintenance consists of the periodic servicing, checking, and adjustment of the generating plant. Also, occasional adjustment or repair may be necessary correct malfunctions. This section includes engine maintenance and minor repair, complete generator maintenance, repair and overhaul, and plant trouble shooting. Plant accessories are covered in the applicable service bulletins included with this manual.

Engine Speed: Frequency of the generator output current is in direct ratio to the engine speed. Engine speed is controlled by the belt-drive mechanical governor. Original factory setting of the governor should not be disturbed. However, in case of repair or adjustment, the governor is easily reset.

1. Governor oil level should be even with the bottom of the oil level plug. When adding oil to the governor, the oil should just start to flow out of the oil level plug hole. Do not over-fill.

2. Adjust the vernier governor control or change length of the throttle link to give an engine speed of approximately 1800-rpm for a 60-cycle plant (1500-rpm for a 50-cycle plant). Lengthen the link to decrease the rpm or shorten the link to increase the rpm. Use the frequency meter to determine engine speed. Multiply frequency by 30 to obtain engine speed.

   EXAMPLE: 30 x 61 (cycles) equals 1830 rpm.

   Check generator voltage using the AC voltmeter. It may be necessary to make a slight re-adjustment of the speed setting to obtain the preferred voltage at average load. A range of 1830 to 1890 rpm (61 to 63-cycles) should give the desired voltage. Engine speed irregularities may be caused by either carburetor or governor adjustments.

Carburetor: Carburetors have main and idle adjusting needle valves. The main adjusting needle, at the bottom of the carburetor, affects the operation at the heavier load conditions. The idle adjusting needle, at the side of the carburetor, affects the operation at the light and no load conditions.

Under normal circumstances, the factory carburetor adjustments should not be distrubed. If the adjustments have been changed, an approximate setting of 1-1/2 turn open for the idle needle and one turn open for the main needle will permit starting. Adjust temporarily for smoothest running. Allow the engine to thoroughly warm up before making final adjustment. Use the frequency meter to monitor engine speed during adjustment. As an alternate method, the manual field rheostat may be set temporarily and the speed change can be observed on the voltmeter while adjusting the carburetor.

To adjust the "idle" (no load) needle, apply no load to the generator. Slowly turn the idle adjusting needle out until the engine speed drops slightly. Turn the needle in just to the point where the speed returns to normal.

To adjust the main needle, apply a full electrical load. Turn the main needle in until the engine speed begins to drop. Slowly turn the needle out until the speed no longer rises. Try various electrical loads. If the engine speed fluctuates at

any load, turn the main adjusting needle out slightly. Do not turn out more than 1/2 turn beyond the original full load setting. If stable speed cannot be obtained by such carburetor adjustment, a change in the governor sensitivity adjustment may be required.

Electric Choke: A 12-volt electric choke with vacuum booster is used. The adjustable choke cover is held in place by the three outer screws. The perimeter of the cover is divided into sections by small raised marks. One of the marks is zero and the twelfth mark from the zero mark is an asterisk (*). The asterisk indicates the normal adjustment setting. A long raised line on the top of the choke housing is the reference mark. Normal setting for the choke is when the asterisk mark lines up with the reference line.

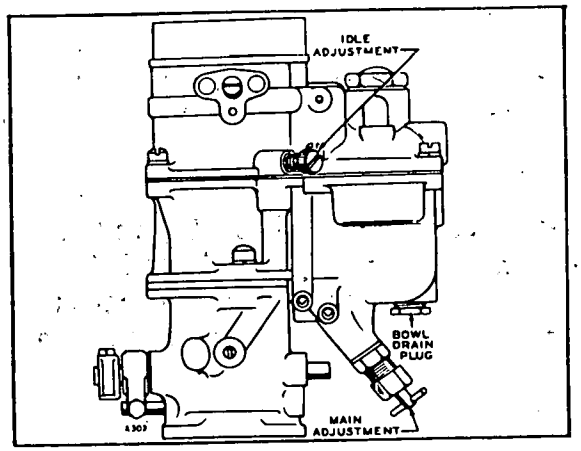


FIG. 6-1. CARBURETOR ADJUSTMENT

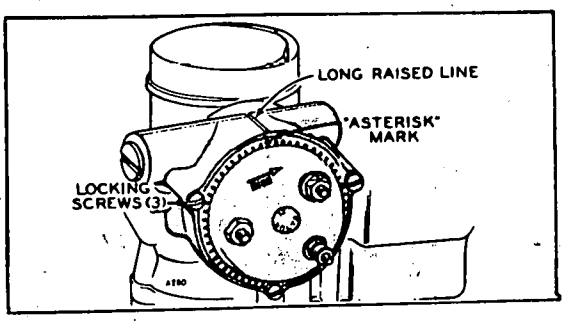


FIG. 6-2. CHOKE ADJUSTMENT

If over-choking occurs, loosen the three locking screws and turn the choke cover slightly to the left (counterclockwise). Do not turn very far. One or two notches is usually sufficient. To increase the choking action, turn the choke cover slightly to the right (clockwise). Tighten the three locking screws.

Anti-Dieseling Holding Switch: The micro switch, at the anti-dieseling solenoid, shorts across the resistor in the solenoid circuit, giving full battery voltage momentarily to pull in the plunger for engine starting and running.

The micro switch must be mounted at the proper distance from the solenoid plunger cam. Inspect by working the plunger by hand. Listen for the "click" as the switch is opened and held by the plunger. If the switch does not open, high voltage will burn out the anti-dieseling solenoid. If the switch opens too soon the plunger will not continue to hold fully in -- chattering will occur.

To adjust the switch position move its bracket slightly at the screws which mount the bracket and solenoid.

Anti-Dieseling Control: Normally the factory set adjustment should not be changed. Adjustment procedure is included with governor adjustment.

The anti-dieseling control (sometimes called governor over-ride) is a device to hold the throttle closed during stopping of the plant. This insures prompt stopping and prevents back firing. A spring and linkage hold the throttle closed during stopping and shut down. A solenoid is energized to overcome the spring tension and permits the governor to open the throttle during starting and running. The anti-

dieseling control spring tension must be adjusted so that it is slightly stronger than the spring in the governors jointed lever and weaker than the pull of the solenoid (Fig. 6-3).

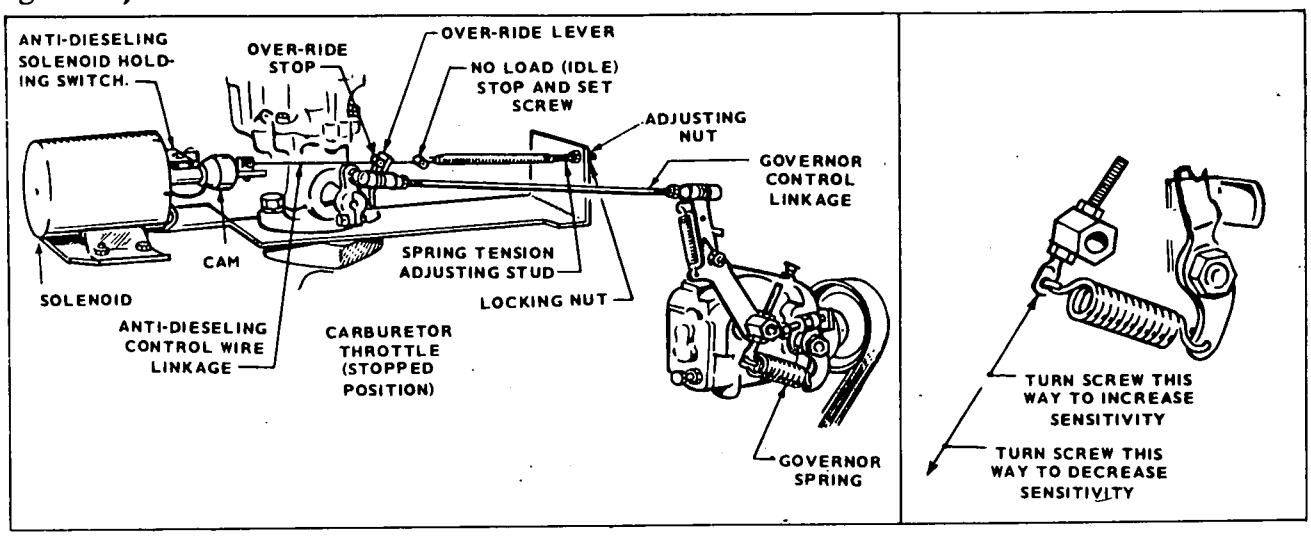


FIG. 6-3. GOVERNOR LINKAGE

Governor (Includes Anti-dieseling Control): The governor controls the speed of the engine, and therefore the frequency of the current. Plant speed affects ac output voltage. Use the frequency meter to check engine speed for proper governor adjustment.

1. Governor linkage - With engine stopped, throttle held wide open, and tension on governor spring, adjust the governor linkage length by rotating the ball joint on the link so that the carburetor stop lever clears the stop pin by not less than 1/32-inch.

2. Anti-diesel control - Move stops (set screws on wire link) away from carburetor so that they have no purpose until completing speed adjustments.

3. Warm up - Start the plant and allow it to reach operating temperature.

4. Speed - Adjust the speed. With no electrical load connected, adjust the governor control to attain the proper no load (n.l.) speed as shown in the speed chart (Fig. 6-4). Apply a full rated load at 0.8 power factor and again check the speed. Be sure the voltage is safe for the load applied. An incorrect speed drop from no load to full load necessitates a sensitivity adjustment.

   Although the plant is rated at 80% power factor load, the speed and voltage regulation at full load may be made by connecting the type of load that corresponds with the application. At unity (0.0) power factor, the KW rating is equal to 25 kilowatts.

5. Sensitivity - If the plant tends to hunt (alternately increase and decrease speed) under load conditions, increase very slightly the distance between the governor main shaft and the sensitivity screw on which the spring link pivots. For best regulation, keep the sensitivity screw up as closely as possible without causing hunting.

		SPEED RANGE LIMITS		SPEED SPREAD PREFERRED		(WITHIN RANGE) LIMITS	
		MAX.	MIN.	F.L. *	N.L.	MAX.	MIN.
FOR 60-CYCLE OPERATION	CYCLE	63	59	59 - 61		3	1.5
	RPM	1890	1770	1770 - 1830		90	45
FOR 50-CYCLE OPERATION	CYCLE	53	49	49 - 51		3	1.5
	RPM	1590	1470	1470 - 1530		90	45

*Speed Regulation for Full Rated Load is at 0.8 Power Factor.

FIG. 6-4. SPEED CHART - GOVERNOR REGULATION

6. General - Be sure that all lock nuts are tightened as adjustments are completed. The governor cannot operate properly if there is any binding, sticking, or excessive looseness in the connecting linkage or carburetor throttle assembly. A lean fuel mixture, or a cold engine may cause hunting. If a voltage drop is excessive during full load application, and adjustments are correct, the engine may be operating improperly and should be repaired as necessary.

7. Output - Check the ac output voltage with the voltmeter and frequency meter.

8. Throttle Stop - With the plant stopped, see that the throttle stop lever screw (attaching the over-ride lever) engages the carburetor throttle stop pin by 1/4 to 1/2 turn. This can be done by backing off the screw until it just clears the stop pin, then turning in 1/4 to 1/2 turn. This provides a "cracked open" throttle for good starting characteristics. Do not adjust the screw so far as to cause the plant to "diesel" and refuse to stop, thus defeating the purpose of the anti-dieseling control.

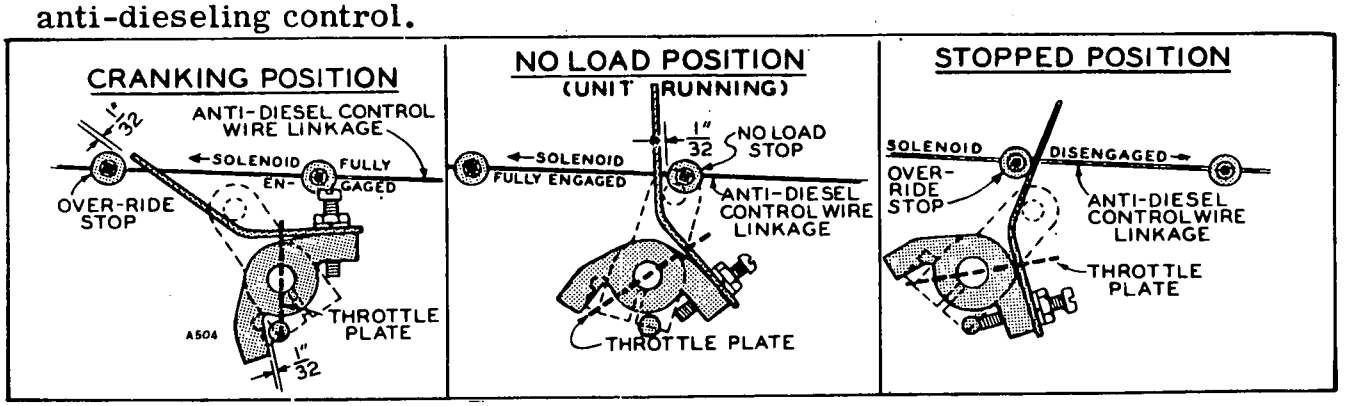


FIG. 6-5. ANTI-DIESEL CONTROL ADJUSTMENT

9. Anti-diesel control - (a) See that the wire linkage is securely attached to the solenoid plunger. Do not shorten or lengthen this connection unless the spring tension at the opposite end cannot be fully adjusted by its stud. (b) Set the stop (over-ride set screw, located nearer the solenoid) on the wire linkage to about 1/32 in. (Fig. 6-5) from the slotted over-ride lever on the carburetor so that it does not interfere with wide open throttle when the solenoid is fully engaged (plunger in, as when plant is running). (c) See that the anti-dieseling control spring tension is just enough to positively bend the governors' jointed lever and

hold the throttle closed during stopping. The spring tension adjusting stud serves also to rotate the spring as necessary to hold the linkage stops horizontally to engage flat against the over-ride lever. (d) Set the no load stop (set screw, located nearer the spring) on the wire linkage 1/32 in. away from over-ride lever while the plant is running at rated speed with electrical load removed (no load). Start and stop the plant to check the adjustment. Secure all lock nuts as adjustments are completed.

Ignition System: The ignition system is completely shielded for interference suppression. Use caution when removing shielded components to prevent damage to the shielding. Refer to Figure 6-6 for leadwire connections.

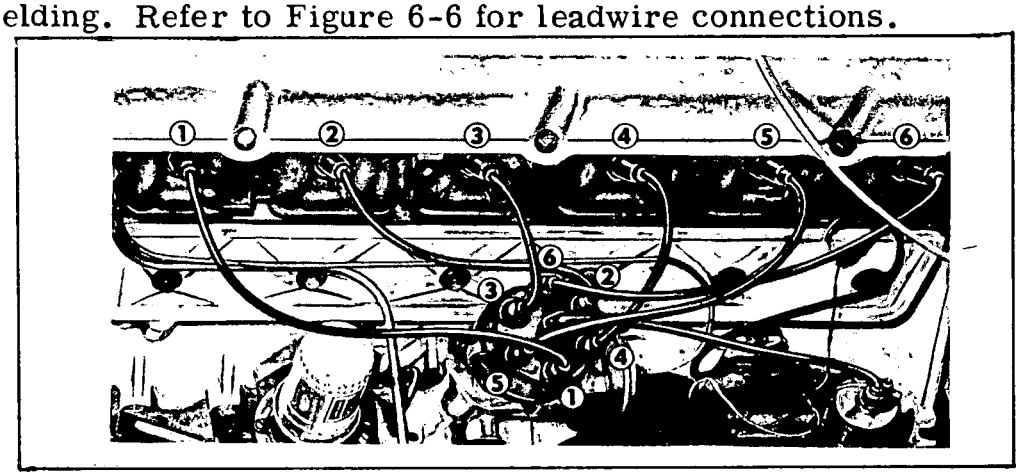


FIG. 6-6. IGNITION WIRING (TYPICAL)

The distributor is a conventional vacuum advance type with shielded added. Rotation is clockwise when viewed from the top (Fig. 6-7).

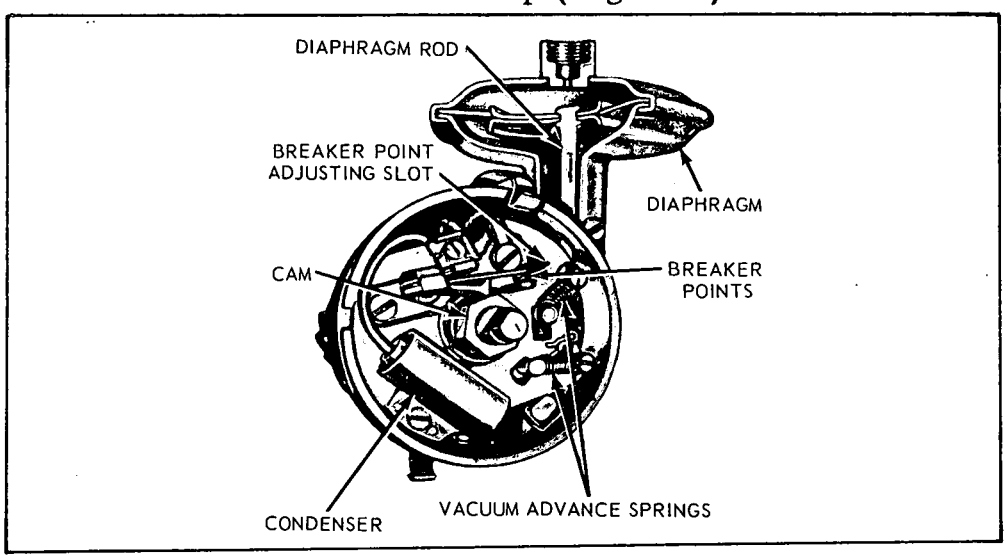


FIG. 6-7. DISTRIBUTOR (CAP REMOVED).

Breaker Point Check and Adjustment: At service intervals, check, clean, and adjust breaker points. Open the points and clean them with a stiff bristle brush and a suitable solvent, such as carbon tetrachloride. Inspect points for excessive metal transfer, pitting, or badly burned condition. Metal transfer is considered excessive when it exceeds the point setting of 0.024-0.026 inch. Inspect the rubbing block for a loose, chipped or broken condition. Replace defective points.

NOTE: Do not use a file, sandpaper, or emery clotch to clean or remove pits from distributor points. Any abrasion of the point surfaces only causes them to burn faster.

It is not advisable to use a feeler gauge to adjust or check the gap of used breaker points. The normal roughness makes an accurate gap check or setting impossible. Check the dwell angle with a dwell meter and adjust to 35° - 38° (36° preferred). Follow normal instructions as supplied with dwell meter or test instruments.

Breaker Point Replacement: At the recommended intervals, or as inspection indicates, the distributor points should be replaced. The breaker points can be replaced without removing the distributor from the engine as follows:

1. Disconnect the condenser and primary leads from the points. Remove the screws that secure the breaker point assembly to the breaker plate, then remove the breaker point assembly.

2. To install, place the breaker point assembly in position and install retaining screws. Be sure that the ground wire is under the breaker point screw near the pivot. Attach primary and condenser wires to points. Apply a light film of distributor cam lubricant to the cam — do not use engine oil (Fig. 5-1).

3. The vented-type breaker points must be accurately aligned and close squarely to insure normal breaker point life. Turn the distributor cam (energize starter if distributor is in engine) so breaker points close. Check the alignment of the points (Fig. 6-8) with a magnifying glass. Align the points to make full face contact by bending the stationary point bracket. Do not bend the movable arm.

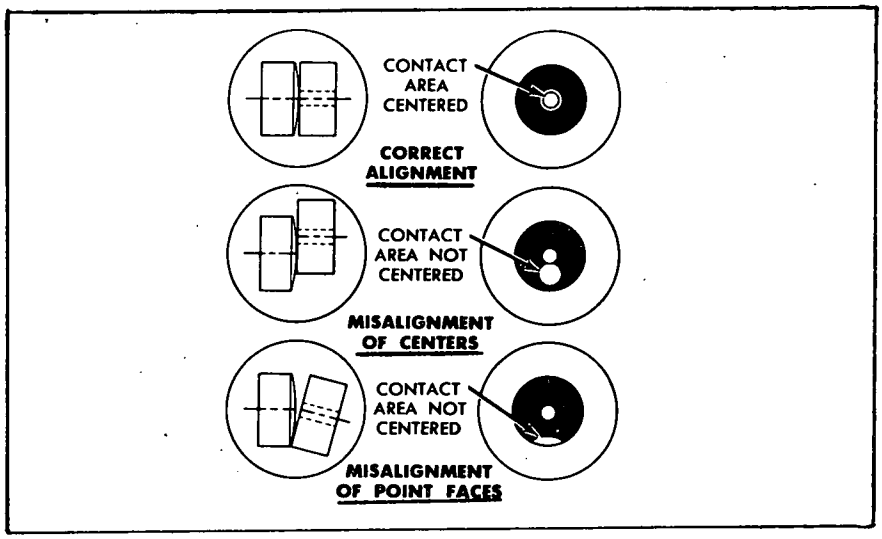


FIG. 6-8. BREAKER POINT ALIGNMENT.

4. After aligning breaker points, adjust to the correct gap using a feeler gauge or dwell meter. To adjust the points with a feeler gauge, turn the distributor shaft until the rubbing block rests on the peak of a cam lobe. Insert the correct blade of a clean feeler gauge between the points. The gap should be set to the larger opening (0.026 inch) because the rubbing block will wear down slightly while seating to the cam. When setting the points with a dwell meter, adjust the dwell angle to the low setting (35°) to compensate for rubbing block wear.

Ignition Timing: When distributor points are replaced or adjusted, check the ignition timing. The timing gear cover has timing marks covering the range from T.D.C. to 14° B.T.D.C. (Fig. 6-9). These marks are labeled 14°, 10°, 6°, 4°, and represent

degrees B.T.D.C. These marks, and a mark on the crankshaft damper, are used to time the engine. The recommended timing setting is 6° B.T.D.C. Adjust the ignition timing as follows:

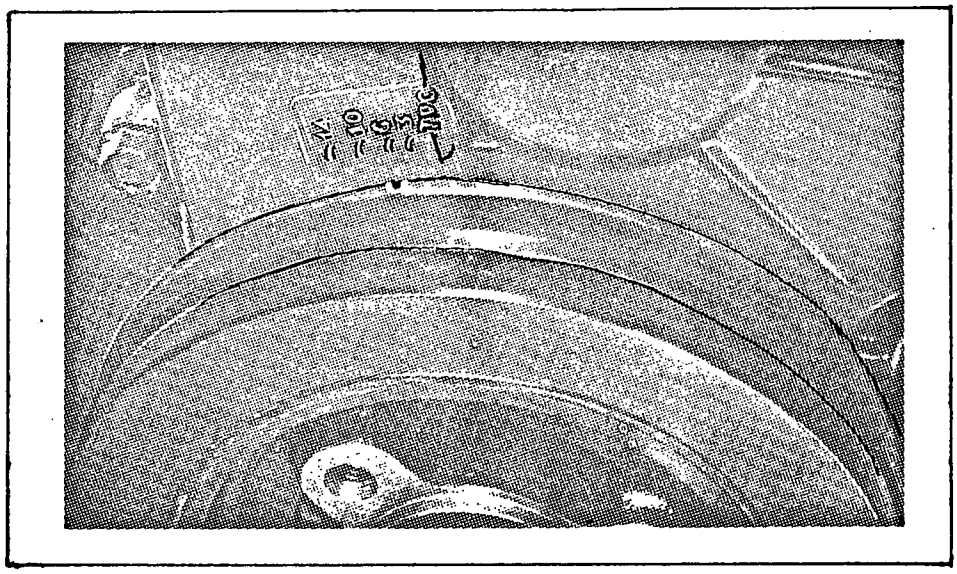


FIG. 6-9. TIMING MARKS.

1. Disconnect the distributor vacuum line. Connect the timing light high tension lead to the No. 1 spark plug (front cylinder), and the other two leads to the proper battery terminals. Clean the timing marks, and color the marks to improve legibility.

2. Operate the engine at a maximum of 550 rpm, and direct the timing light at the pointer, keeping the timing marks in line with the center of the pulley and the light. The light should flash just as the 6° mark on the timing gear cover lines up with the mark on the damper.

3. If the 6° mark and the mark on the damper do not line up, loosen the distributor body clamp, and rotate the distributor body until the mark and pointer are in line.
   NOTE: Ignition timing is advanced by counterclockwise rotation of the distributor body, while clockwise rotation retards timing.

4. For altitude operation, and/or to obtain optimum engine performance and fuel economy, the initial ignition timing may be advanced 5° over the "normal" setting. Do not advance beyond this point. Advance the timing progressively until engine detonation (spark knock) is evident under actual load acceleration, Retard the timing until the detonation (spark knock) is eliminated. If individual requirements and/or the use of sub-standard fuelds dictate, the initial timing may have to be retarded from the recommended setting to eliminate detonation (spark knock). If retiming is necessary, it should be done progressively and not to exceed 2° B.T.D.C.

5. Tighten the distributor body clamp and connect the distributor vacuum line, then accelerate the engine while watching the timing mark with the timing light to determine if the advance mechanism is functioning. The pointer should advance as engine rpm increases to indicate the advance mechanism is functioning.

Drive Belt Adjustment: Separate belts are used to drive the fan, governor, and alternator. Correct adjustment of these belts must be maintained to provide proper engine cooling and alternator output. Belts should be checked for cracks and wear occasionally and replaced when necessary.

To adjust the fan belt, loosen the fan bracket screws, then move the bracket up or down until a deflection of 1/2-in. is obtained between the crankshaft pulley and the fan pulley, with light thumb pressure on the belt (Fig. 6-10).

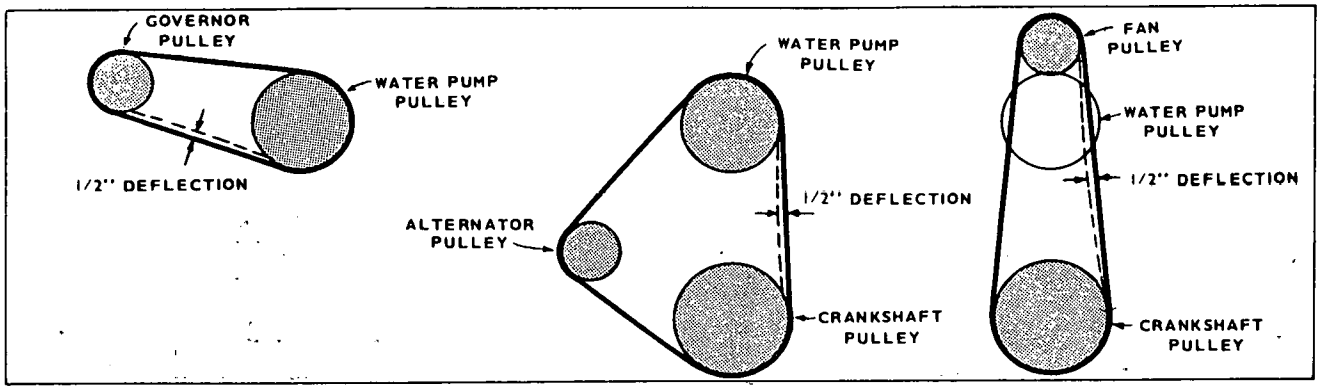


FIG. 6-10. BELT TENSION

To adjust the alternator or governor belt, loosen the link clamp screw and the mounting bolts. Move the alternator or governor toward or away from the engine until a deflection of 1/2-in. is obtained between the pulleys, with light thumb pressure on the belt.

GENERATOR MAINTENANCE

Generators normally require little servicing. Periodic inspection, to coincide with engine oil changes, will assure continued good performance.

Brushes: To examine the brushes, brush springs, and slip rings, remove the inspection and ventilating covers from the end bell openings. Keep the end bell, brush rig, etc., free of dust and dirt.

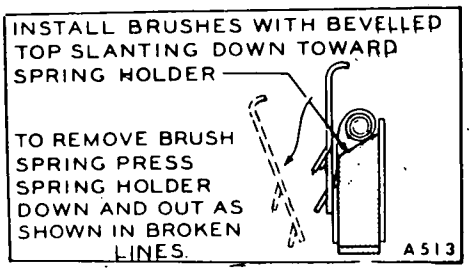


FIG. 6-11. BRUSH HOLDER

Brushes should be replaced when worn to approximately 1/2-in., or so that the lead end of the brush is below a point midway between the outer and inner end of its guide. Do not attempt to remove the brush without first removing its spring and bracket (Fig. 6-11). Never bend a spring back over its bracket - doing so will put a kink in it and require its replacement. Do not use a substitute brush that may look identical but may have entirely different electrical characteristics. Be sure the brush is installed so that the short side of its taper is toward the spring and its bracket.

Generator Bearing: The generator bearing is prelubricated for its life and sealed. It requires no servicing.

Exciter: The exciter contains no moving parts. Occasionally blow out any dust, etc. Check thoroughly to assure that all components are mechanically secure, and that all electrical connections are tight.

Generator tests - If the generator does not function properly, a few simple tests with the plant off may isolate the cause.

1. Temporarily disconnect the leads from exciter terminals E1, E2, AF1 and AF2. Check the exciter wiring diagram for input voltage to the exciter, and temporarily connect an alternate source (such as commercial line) of ac power with the same voltage rating to exciter terminals E1 and E2.

   Check the voltage across terminals AF1 (+) and AF2 (—). If there is no dc voltage, the exciter is not functioning.

2. If dc voltage at terminals AF1 and AF2 is 25-volts or higher, check the alternator for a grounded or open circuits as follows:

   Rotor Continuity Tests: Remove the brushes so none touches the collector rings.

   a. Using an ohmmeter, test for grounding between each slip ring and the rotor shaft.

   b. Test for short or open circuit in rotor winding, by measuring resistance of winding. It should measure approximately 3.27 ohms (at 70°F). If an accurate ohmmeter isn't available, check the rotor for open circuit or grounding with a dc test lamp (Fig. 6-12).

   Replace the rotor if it is grounded, or has an open circuit or short.

   Stator Continuity Tests: Disconnect the generator output leads in the control box. Refer to wiring diagrams to determine the output lead coding.

   a. Using either the test lamp or an ohmmeter, check each winding of the stator for grounding to the laminations or frame.

      NOTE: Some generators have ground connections to the frame. Check wiring diagrams.

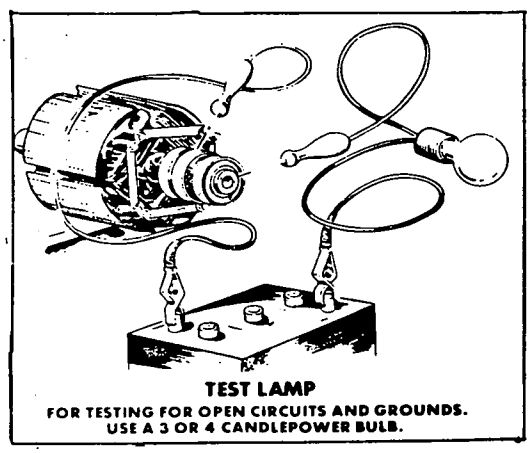


FIG. 6-12. CONTINUITY TEST LAMP

b. Using an accurate ohmmeter, test the resistance of each stator winding. Compare the resistances obtained. All windings of equal output voltage should indicate about the same resistance. An usually low reading indicates a short; a high reading an open circuit.

If the ohmmeter required for this test isn't available, check for open circuits with the test lamp.

If any windings are shorted, open-circuited or grounded, replace the stator assembly. Before replacement, check the leads for broken wires or insulation and replace any defective lead. If this does not correct the fault, replace the assembly.

3. No terminal of the exciter should show a grounded circuit.

4. Checking static exciter - Troubles are listed in advancing order, from no output voltage to a rated but fluctuating output voltage. The relationship between trouble and cause is not always consistent from model to model, so the following information must be used as a guide, not an absolute rule. The column entitled "step" indicates the step for testing a standard component. When the word "None" appears in that column, all the information needed to complete the check is given in the column headed "Corrective Action". Use a multimeter to check continuity, voltage, and resistance as indicated in the tests.

Note: It is imperative that the testing procedures are completely understood by the serviceman before attempting to perform corrective maintenance. Use caution when working on an operating plant.

NATURE OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION	STEP
Generator will not build up voltage.	Circuit breaker in "off" or "tripped" position	Reset and close breaker	None
	Open in circuit breaker	Stop plant and check breaker continuity	
	No ac power to Magneciter	Check ac voltage at E1-E2 with the plant operating. Voltage should be five percent of the rated voltage. If not, check continuity from E1-E2 back to the generator	None
	Partial loss of residual in rotor	With plant operating jumper from E2 to heat sink of field rectifier Z until voltage begins to build-up. Then remove.	None
	Pair of Field Rectifiers (either Z & W or Y & X) open.	Test rectifiers and replace if defective.	

NATURE OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION	STEP
Generator will not build up voltage (Cont.)	Both field rectifiers Y and X shorted.	Test rectifiers and replace if defective.	5
Output voltage slow to build up. Circuit breaker opens in about five seconds.	Either field rectifier Y or X shorted.	Test rectifiers and replace if defective.	5
Output voltage slow to build up and five percent below rated voltage after build up. Voltage regulation poor.	Either field rectifier Z or W shorted.	Test rectifier and replace if defective.	5
Output voltage slow to build up and higher than rated voltage after build up.	Open circuit in one or more control rectifier.	Test rectifier and replace if defective. Check soldered connections to rectifiers.	5
Output voltage slow to build up and ten to twenty percent above rated voltage after build up.	Open in one field rectifier.	Test rectifiers and replace if defective.	5
	Open circuit in gate winding G1-G2 of reactor A or B.	If field rectifiers Z and Y check okay, check continuities of gate windings G1-G2.	6
Output voltage builds up normally but less than rated voltage after build up.	Shorted winding in control reactor.	Test control reactor and replace if defective.	7
Output voltage builds up normally with slightly less than rated voltage at no load and low voltage at full load.	Compound winding S1-S2 installed backward or has open circuit.	Check wiring diagram for polarity of compound windings through reactors A and B and test for continuity.	None
Output voltage builds up normally but 20 percent above rated voltage after build up. Voltage regulation poor.	Compound winding S1-S2 installed backward through one reactor (A or B).	Check wiring diagram for polarity of compound winding through reactor A or B.	None
Output voltage builds up normally but is twenty five percent above rated voltage after build up.	Open circuit in control rectifier bridge.	Check continuity from the junction of control rectifiers Z and Y to the junction of control rectifiers X and W.	None
Output voltage builds up normally but 125 to 150 percent above rated voltage after build up.	Shorted turn in gate winding G1-G2 of reactor A or B.	Test reactors A and B for shorted turns and replace if defective.	6
Output voltage builds up normally but 150 to 200 percent above rated voltage after build up. No regulation possible.	Control winding C1-C2 of reactor A or B polarized incorrectly.	Check circuit connections of both reactors A and B.	None
	Shorted turn in control winding C1-C2 of reactor A or B.	Test reactors A and B for shorted turn and replace if defective.	6
	Open in control circuit.	Check continuity from E1 to E2 through control circuit.	None

NATURE OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION	STEP
Generator voltage fluctuating while engine running at constant speed.	Incorrect setting on the stabilizing resistor.	Check resistance and reset.	8

5. Checking Rectifiers: Disconnect one lead from, or remove, each rectifier for its individual test.

   Caution: Note carefully the DIRECTION OF MOUNTING of any rectifier removed. It must be remounted in its original direction.

   a. Connect the ohmmeter across the rectifier contacts and observe the meter reading.
   b. Reverse the connections and compare the new reading with the first reading.
   c. If one reading is considerably higher than the other reading, the rectifier can be considered satisfactory. However, if both readings are low, or if both indicate an "open" circuit, replace the rectifier with a new identical part.

6. Checking reactors "A" and "B":
   Caution: The extent to which the resistance values obtained when troubleshooting with an ohmmeter are reliable and useful is governed by the accuracy of that ohmmeter. Resistance readings of the range of values found between G_1 and G_2 cannot be read with accuracy on a multimeter.
   a. Set the resistance range selector on the meter to the resistance range.
   b. Isolate one gate winding by disconnecting either end of gate winding G1-G2 from its point of connection; for example, disconnect G1 at E2. Measure the resistance in the gate winding across G1-G2. Should be **0.30** .
   c. Isolate one control winding by disconnecting either lead C1 or C2 from the terminal block. Measure the resistance in the control winding across C1-C2. Should be **8.5** .

   d. Connect one meter lead to the disconnected gate winding lead and the other meter lead to the disconnected control winding lead and check for continuity.

   Results:
   1. REACTOR IS SERVICEABLE if resistance is within 20 percent either way of the value listed and there is no continuity between the control and gate windings.
   2. REACTOR IS DEFECTIVE if there is an open circuit in either the gate or the control windings. Continuity between the gate and the control windings is also an indication of a defective reactor. In either case, the reactor should be replaced.

7. Checking Control Reactor: Isolate the control reactor by disconnecting common lead "C" from its point of connection and carefully measure the resistance from this lead to the numbered lead on the control reactor. Should be **18.0**.

   Results:
   a. CONTROL REACTOR IS SERVICEABLE if resistance is within 10 percent of the value specified.
   b. CONTROL REACTOR IS DEFECTIVE if no continuity is indicated between the common lead "C" and the numbered lead, indicating the presence of an open circuit.

8. Checking resistors: The resistors must be checked with a multimeter adjusted to the appropriate range of resistances. See wiring diagram for correct values.

   Isolate the Resistor by disconnecting one end from its point of connection and carefully measure the resistance.

   Results:
   a. RESISTOR IS SERVICEABLE if the measured resistance falls within 20 percent of the value specified in the wiring diagram.
   b. RESISTOR IS DEFECTIVE if there is no indication of continuity through the resistor. If the measured resistance exceeds the percent limits either way, the stabilizing resistor can be adjusted to bring the resistance within the required limits.

Generator Disassembly: If generator tests determine generator repair is required, remove and disassemble the generator according to Figures 6-13, 6-14 and the following instructions. Index numbers refer to Figure 6-13 except where noted.

1. Disconnect generator and control leadwires from the terminal blocks in the control box. Check leadwire markings for legibility to ease assembly. Arrange leads so they can be withdrawn from the control box easily.

2. Remove the control box mounting screws (4) which secure the control mount to the generator frame. Remove the control box. In some cases it may be necessary to remove the control box from its shock mountings and base to facilitate leadwire removal.

3. Remove the cap nuts (4) which attach the exciter cover and remove the cover. Disconnect the leadwires which come from the generator to the exciter (check leadwire markings for legibility). Remove the capscrews (6) which secure the exciter to the generator end bell and remove the entire exciter assembly (Fig. 6-14).

4. Remove the centrifugal switch (item 8) from the end bell (13) and rotor shaft. Remove the end bell covers (items 9, 9A). Slip the brushes (item 7) and springs (item 6) from brush rig (item 5) - it is not necessary to disconnect the brush leads unless brush replacement is required.

5. Block the rear of the engine in place by supporting the flywheel housing. Remove the narrow generator band (item 14). Remove the large capscrews which secure the generator mounting pad (item 19) to the skid base. Remove the capscrews which secure the stator assembly (item 4) to the engine flywheel housing.

6. Using an overhead hoist and sling, slide the stator assembly (item 4) off the rotor assembly (item 1). CAUTION: Do not damage the brush rig (item 5) while removing the stator.

7. Remove the brush rig (item 5), large generator band (item 15), and the end bell (item 13) from the stator assembly (item 4) if required.

8. Attach the hoist and sling to the rotor assembly (item 1) and apply a slight lift to support the rotor. Remove the bolts which secure the flexible drive coupling to the engine flywheel and pull the rotor from the engine.

9. Pull the bearing (item 3) from the rotor shaft if required with a wheel or gear puller. If required, remove the blower (item 2) from the rotor and the air scroll (item 11). Refer to the Parts Catalog for replaceable parts and assemblies.

Generator assembly is the reverse of disassembly procedures.

Static exciter service and repair does not complete disassembly. Individual components are easily accessible for servicing. All components are easily removable after disconnecting the attached leadwires. Refer to the Parts List for the exploded view and part numbers . See its Wiring Diagrams for leadwire connections.

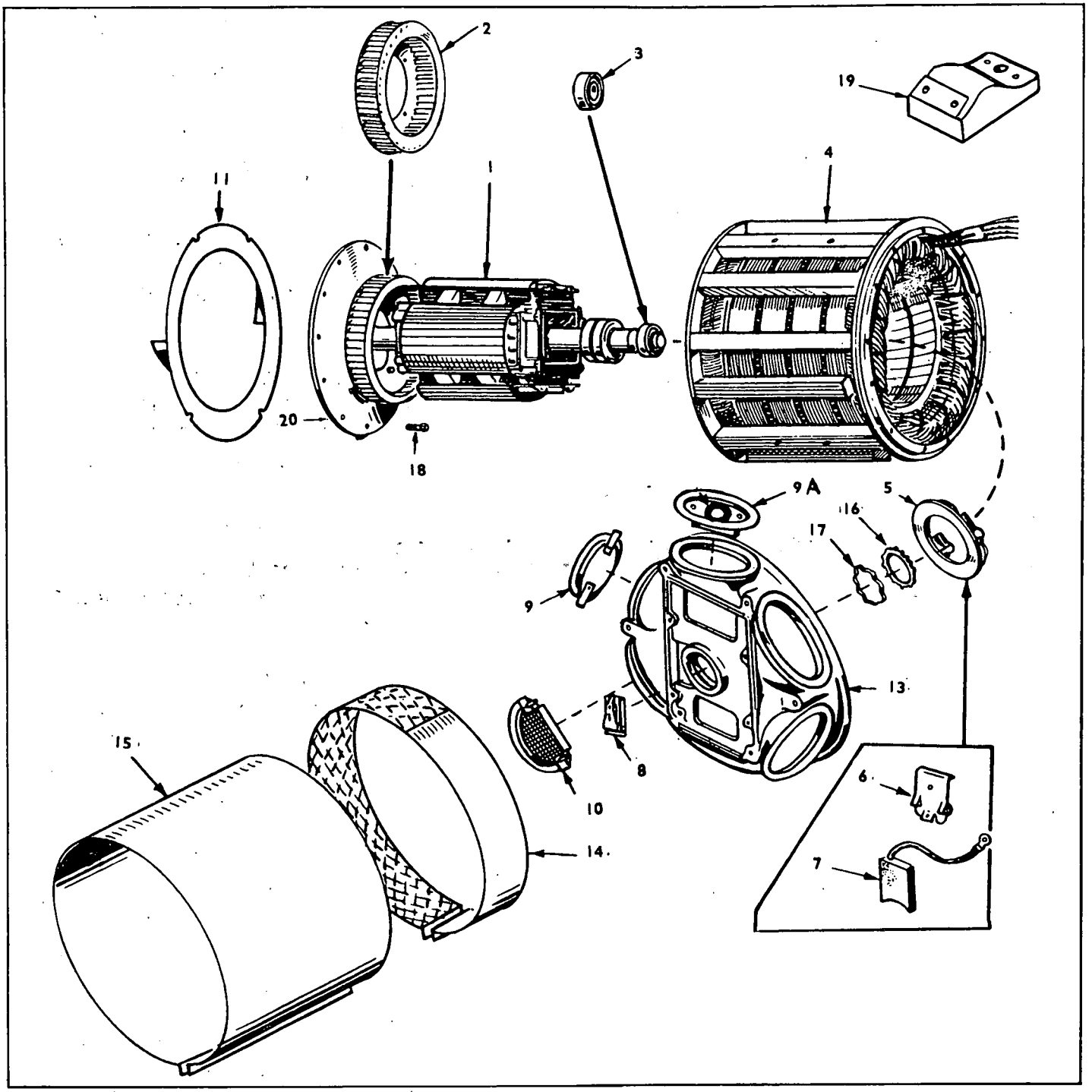


FIG. 6-13. GENERATOR ASSEMBLY

REF. NO.	QTY. USED	PART DESCRIPTIONS
1	1	Rotor Assy., Wound - Includes Brg., Blower & Drive Assy.
2	1	Blower
3	1	Bearing
4	1	Stator Assy., Wound
5	1	Rig Assy., Brush
6	4	Spring, Brush
7	4	Brush
8	1	Switch Assy., Overspeed
9	2	Cover, End Bell, Open. (Plain)
9A	1	COVER, END BELL OPENINGS (W/Lead Hole) - INCLUDES GROMMET
10	2	Cover, End Bell Openings (Screened)
11	1	Scroll, Air
13	1	Bell, End
14	1	Band, Gen. - Front (Narrow)
15	1	BAND, GENERATOR - REAR (Wide)
16	1	Holder, Brg. (Anti-Rotation)
17	1	Spring, Brg. Holder
18	6	Bolt, Shoulder (5/16-18")
19	2	Pad, Generator Mtg.
20	1	Disc. Drive

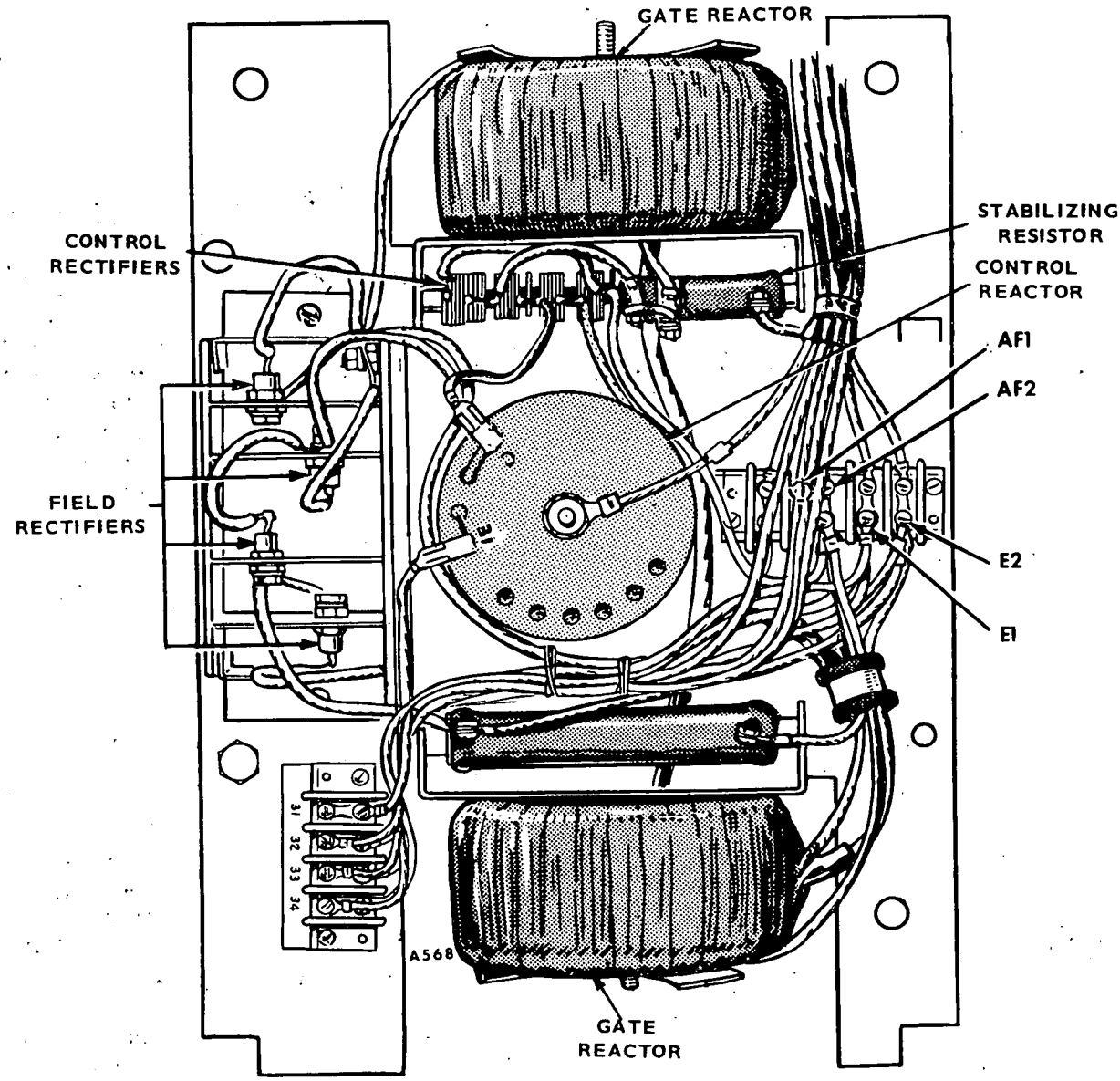


FIG. 6-14. STATIC EXCITER ASSEMBLY (COVER REMOVED).

TROUBLE-SHOOTING CHART

POSSIBLE CAUSE	REMEDY
ENGINE CRANKS TOO STIFFLY	
Too heavy oil in crankcase.	Drain. Refill with lighter oil.
Engine seized.	Disassemble and repair.
ENGINE CRANKS TOO SLOWLY WHEN CRANKED ELECTRICALLY	
Discharged or defective battery.	Recharge or replace.
Loose connections.	Tighten loose connections.
Corroded battery terminals.	Clean corroded terminals. Replace cable if necessary.
Brushes worn excessively or making poor contact.	Replace brushes or clean commutator.
Short circuit in generator or load circuit.	Repair or replace parts necessary. Disconnect load.
Dirty or corroded points in start solenoid switch.	Replace switch.
ENGINE WILL NOT START WHEN CRANKED	
Faulty ignition.	Clean, adjust, or replace breaker points, spark plugs, condenser, etc., or retime ignition.
Lack of fuel or faulty carburetion.	Refill the tank. Check the fuel system. Clean, adjust or replace parts necessary.
Clogged fuel filter.	Clean.
Cylinders flooded.	Ground spark plug cables. Crank engine with spark plugs removed.
Poor fuel.	Drain. Refill with good fuel.
Poor compression.	Tighten cylinder heads and spark plugs. If still not corrected, grind the valves. Replace the piston rings if necessary.
Wrong ignition timing.	Reset breaker points or retime ignition.

POSSIBLE CAUSE	REMEDY
ENGINE RUNS BUT VOLTAGE DOES NOT BUILD UP	
Poor brush contact.	See that brushes seat well on slip rings, are free in holders, are not worn too short, and have good spring tension. Refer to the *Generator Maintenance and Repair* section.
Open circuit, short circuit, or ground in generator	
VOLTAGE UNSTEADY BUT ENGINE NOT MISFIRING	
Speed too low.	Adjust governor to correct speed.
Poor brush contact.	Refinish slip rings if necessary. See that brushes seat well on slip rings, are free in holders, are not worn too short, and have good spring tension.
Loose connections.	Tighten connections.
Fluctuating load.	Correct any abnormal load condition causing trouble.
GENERATOR OVERHEATING	
Short in load circuit.	Correct short circuit.
Generator overloaded.	Reduce the load.
ENGINE OVERHEATING	
Improper lubrication.	Change to proper oil.
Poor ventilation.	Provide ample ventilation at all times.
Dirty or oily cooling surfaces.	Keep the engine clean.
Retarded ignition timing.	Retime ignition.
Generator overloaded.	Reduce load.

POSSIBLE CAUSE	REMEDY
VOLTAGE DROPS UNDER HEAVY LOAD	
Engine lacks power.	See remedies under *Engine Misfires at Heavy Load*
Poor compression.	Tighten cylinder heads and spark plugs. If still not corrected, grind the valves. Replace piston rings if necessary.
Faulty carburetion.	Check the fuel system. Clean, adjust or repair as needed.
Dirty carburetor air cleaner.	Clean.
Choke partially closed.	Choke plate must be wide open at operating temperature.
Carbon in cylinders or in carburetor venturi.	Remove carbon.
Restricted exhaust line.	Clean or increase the size.
ENGINE MISFIRES AT LIGHT LOAD	
Carburetor idle jet clogged or improperly adjusted.	Clean.
Spark plug gaps too narrow.	Adjust to correct gap.
Intake air leak.	Tighten. Replace gaskets if necessary.
Faulty ignition.	Clean, adjust, or replace breaker points, spark plugs, condenser, etc., or retime ignition.
ENGINE MISFIRES AT HEAVY LOAD	
Defective spark plug.	Replace.
Faulty ignition.	Clean, adjust, or replace breaker points, spark plugs, condenser, etc., or retime ignition.
Clogged carburetor.	Clean carburetor.
Clogged fuel screen.	Clean.
Defective spark plug cable.	Replace.
ENGINE MISFIRES AT ALL LOADS	
Fouled spark plug.	Clean and adjust.
Defective or wrong spark plug.	Replace.
Leaking valves.	Grind valves.
Broken valve spring.	Replace.
Defective or improperly adjusted breaker points.	Adjust or replace breaker points.
LOW OIL PRESSURE	
Oil too light or diluted from leaking fuel pump diaphragm.	Drain, refill with proper oil. Repair or replace fuel pump.
Oil too low.	Add oil.
Oil relief valve not seating.	Remove and clean, or replace.
Badly worn bearings.	Replace.
Sludge on oil screen.	Remove and clean.
Badly worn oil pump.	Replace.
Defective oil pressure gage.	Replace.
HIGH OIL PRESSURE	
Oil too heavy.	Drain, refill with proper oil.
Clogged oil passage.	Clean all lines & passages.
Oil relief valve stuck.	Remove and clean.
Defective oil pressure gage.	Replace.
ENGINE BACKFIRES AT CARBURETOR	
Lean fuel mixture.	Clean carburetor. Adjust jets.
Clogged fuel filter.	Clean.
Air leak at intake manifold or carburetor flange.	Tighten mounting screws. Replace gaskets as necessary.
Poor fuel.	Refill with good, fresh fuel.
Spark advanced too far.	Reset breaker points or retime ignition.
Intake valve leaking.	Reseat or replace.
EXCESSIVE OIL CONSUMPTION	
LIGHT BLUE EXHAUST	
Poor compression. Usually due to worn pistons, rings, or cylinders.	Refinish cylinders. Install oversize pistons and rings.
Oil leaks from oil base or connections. This does not cause smoky exhaust.	Replace gaskets. Tighten screws and connections. Check breather valve.
Oil too light or diluted.	Drain. Refill with proper oil.
Too large bearing clearance.	Replace bearings necessary.

POSSIBLE CAUSE	REMEDY
Engine misfires.	Refer to *Engine Misfires at All Speeds.*
Faulty ignition.	Clean, adjust, or replace breaker points, spark plugs, condenser, etc., or retime the ignition.
Too much oil.	Drain excess oil.

BLACK, SMOKY EXHAUST, EXCESSIVE FUEL CONSUMPTION, FOULING OF SPARK PLUG WITH BLACK SOOT, POSSIBLE LACK OF POWER UNDER HEAVY LOAD

Fuel mixture too rich.	See that choke opens properly. Adjust jets properly. Adjust the float level.
Choke not fully open.	See that choke opens properly.
Dirty air cleaner.	Clean. Refill with proper oil.
Excessive crankcase pressure, causing excessive fuel pump pressure.	Clean breather valve.

LIGHT POUNDING KNOCK

Loose connecting rod.	Replace bearings.
Low oil supply.	Add oil. Change if necessary.
Oil badly diluted.	Drain. Refill with proper oil. Check for cause.
Low oil pressure.	See *Low Oil Pressure* for remedies.

ENGINE STOPS UNEXPECTEDLY

Latching relay open.	Correct cause of shut-down, reset relay.
Defective ignition system.	Check the ignition system. Repair or replace as needed.

DULL METALLIC THUD. IF NOT BAD, MAY DISAPPEAR AFTER FEW MINUTES OPERATION. IF BAD, INCREASES WITH LOAD.

Loose crankshaft bearing.	Replace unless one of the next two remedies permanently corrects the trouble.

SHARP METALLIC THUD, ESPECIALLY WHEN COLD ENGINE FIRST STARTED

Low oil supply.	Add oil.
Oil badly diluted.	Change oil. Check for cause.

PINGING SOUND WHEN ENGINE IS SUDDENLY OR HEAVILY LOADED

Carbon in cylinders.	Remove the carbon.

POSSIBLE CAUSE	REMEDIES
Spark advanced too far.	Reset breaker points or retime ignition.
Wrong spark plugs.	Install correct spark plugs.
Spark plug burned or carboned.	Clean. Install new plug if necessary.
Valves hot.	Adjust tappet clearance.
Fuel stale or low octane.	Use good, fresh fuel.
Lean fuel mixture.	Clean fuel system. Adjust carburetor jets properly.
Engine hot.	Check air circulation.

TAPPING SOUND

Valve clearance too great.	Adjust to proper clearance.
Defective Hydraulic Lifter.	Clean or Replace.
Broken valve spring.	Install new spring.

HOLLOW CLICKING SOUND WITH COOL ENGINE UNDER LOAD

Loose piston.	If noise is only slight and disappears when engine warms up, no immediate attention needed. Otherwise replace parts necessary.

VOLTAGE LOW AT FAR END OF LINE BUT NORMAL NEAR PLANT

Too small line wire used for load and distance.	Install larger or extra wires or reduce load.

MOTORS RUN TOO SLOWLY AND OVERHEAT AT FAR END OF LINE BUT OK NEAR THE PLANT

Too small line wire used for load and distance.	Install larger or extra wires or reduce load.

NOISY BRUSHES

Rough slip rings.	Resurface. Undercut mica.

EXCESSIVE ARCING OF BRUSHES

Rough slip rings.	Turn down.
Dirty slip rings.	Clean.
Brushes not seating properly.	Sand to a good seat or reduce load until worn in.

DIMENSIONS AND TOLERANCES

All Measurements Are Inches Unless Otherwise Noted.

GENERAL

Maximum Gross Horsepower at rpm	
240	124 at 2800
Maximum Gross Torque—Foot-Pounds at rpm	
240	235 at 2400
Taxable Horsepower	
240	38.4
Bore and Stroke	
240	4.00 x 3.18
Displacement (cubic inches)	
240	240
Compression Pressure at Cranking Speed (psi)	150-200
Compression Ratio – 240	8.75 to 1
Firing Order	1-5-3-6-2-4
Idle Speed (rpm)	500-550
Manifold Vacuum at Idle-Minimum (Inches Mercury)	17
Initial Ignition Timing—B.T.D.C.	6°
Oil Capacity (qts.)*	6
Oil Pressure—Hot at 2000 rpm	35-60

* Add 1 quart when changing filter.

CYLINDER HEAD

Gasket Surface Flatness	.003 inch in any 6 inches or .007 inch overall
Valve Guide Bore Diameter	0.3433-0.3443
Valve Seat Width—Intake	0.060-0.080
Valve Seat Width—Exhaust	0.070-0.090
Valve Seat Angle	45°
Valve Seat Runout—Maximum	0.0015

VALVE MECHANISM

Valve Lash—Hot and Cold	Zero
Intake Valve Stem Diameter—Standard	0.3416-0.3423
Exhaust Valve Stem Diameter—Standard	0.3416-0.3423
Intake Valve Stem Diameter—0.003 Oversize	0.3446-0.3453
Exhaust Valve Stem Diameter—0.003 Oversize	0.3446-0.3453
Intake Valve Stem Diameter—0.015 Oversize	0.3566-0.3573

VALVE MECHANISM (Continued)

Exhaust Valve Stem Diameter—0.015 Oversize	0.3566-0.3573
Intake Valve Stem Diameter—0.030 Oversize	0.3716-0.3723
Exhaust Valve Stem Diameter—0.030 Oversize	0.3716-0.3723
Valve Face Angle	44°
Intake Valve Stem	
to Valve Guide Clearance	0.0010-0.0027—Wear Limit 0.0047
Exhaust Valve Stem	
to Valve Guide Clearance	0.0010-0.0027—Wear Limit 0.0047
Intake Valve Head Diameter	1.772-1.787
Exhaust Valve Head Diameter	1.552-1.567
Valve Face Runout	0.0015—Wear Limit 0.0025
Valve Spring Free Length—Approximate	1.99
Valve Spring Out of Square—Maximum	0.072
Valve Spring Pressure—Lbs. at Specified Length	76-84 at 1.70
	Wear Limit 68 at 1.70
Intake	180.5-199.5 at 1.325
Intake	Wear Limit 168 at 1.325
Exhaust	187.0-207.0 at 1.300
Exhaust	Wear Limit 162.0 at 1.300
Valve Spring Assembled Height—Pad to Retainer	1-43/64—1-47/64
Hydraulic Valve Lifter Leak Down Rate—Seconds	10-100
Valve Push Rod Runout—Maximum	0.025
Valve Tapper Diameter—Standard	0.8740-0.8745
Valve Tappet to Tappet Bore Clearance	0.0005-0.0020—Wear Limit 0.0050

CAMSHAFT AND TIMING GEARS

Camshaft Journal Diameter—Standard	2.017-2.018
Camshaft Journal Runout	0.005
Camshaft Journal to Bearing Clearance	0.001-0.003—Wear Limit 0.006
Camshaft Journal Out-of-Round	.0.0010
Camshaft End Play	0.003-0.007—Wear Limit 0.012
Camshaft Gear to Crankshaft Gear Backlash	0.002-0.004
Camshaft Lobe Lift	
Intake	0.233
Exhaust	0.249
Maximum Allowable Lobe Lift Loss	0.005
Assembled Gear Face Runout—Maximum	0.006

CAMSHAFT BEARINGS

Inside Diameter	2.0190-2.0200
Location in Relation to Front Face of Block Cam Bearing Bore Face—No. 1 Bearing Only—Below	0.020-0.035

FLYWHEEL

Flywheel Clutch Face Runout—Maximum	0.010
Assembled Flywheel O.D. Runout	0.007

CRANKSHAFT

Main Bearing Journal Diameter—Coded Blue	2.3982-2.3986
Main Bearing Journal Diameter—Coded Red	2.3986-2.3990
Main Bearing Journal Runout	0.002—Wear Limit 0.003
Connecting Rod and Main Bearing Journals Out-of-Round—Maximum	0.0004
Connecting Rod and Main Bearing Journals Taper—Maximum	0.0003/inch
Thrust Bearing Journal Length	1.199-1.201
Main Bearing Journal Thrust Face Runout	0.001
Connecting Rod Journal Diameter—Coded Blue	2.1228-2.1232
Connecting Rod Journal Diameter—Coded Red	2.1232-2.1236
Crankshaft Free End Play	0.004-0.008—Wear Limit 0.012
Assembled Gear Face Runout	0.006

MAIN BEARINGS

Journal Clearance—240	0.0006-0.0024
Wall Thickness—Coded Red	0.0950-0.0953
Wall Thickness—Coded Blue	0.0954-0.0957
Wall Thickness—0.002 Undersize	0.0963-0.0968

CONNECTING ROD

Piston Pin Bushing I.D.—Standard	0.9104-0.9112
Bearing Bore Diameter—Coded Red	2.2750-2.2754
Bearing Bore Diameter—Coded Blue	2.2754-2.2758
Bearing Bore Out-of-Round and Taper	0.0004
Connecting Rod Length—Center to Center 240	6.7932-6.7962
Twist Total Difference—Maximum*	0.012
Bend Total Difference—Maximum*	0.004
Connecting Rod Assembly—Assembled to Crankshaft Side Clearance	0.006-0.014—Wear Limit 0.017

* Pin bushing and crankshaft bearing bore must be parallel and in the same vertical plane within the specified total difference at ends of 8 inches long bar measured 4 inches on each side of rod.

CONNECTING ROD BEARINGS

Bearing to Crankshaft Clearance	0.0006-0.0022
Wall Thickness—Coded Red	0.0752-0.0755
Wall Thickness—Coded Blue	0.0756-0.0759
Wall Thickness—0.002 Undersize	0.0762-0.0767

PISTON

Piston Diameter—Coded Red	3.9984-3.9990
Piston Diameter—Coded Blue	3.9996-4.0002
Piston Diameter—0.003 Oversize	4.0008-4.0014
Piston to Bore Clearance*	0.0014-0.0022

* Measured 90° to pin centerline and at pin centerline height.

PISTON PIN

Piston Pin Diameter—Standard	0.9119-0.9124
Piston Pin Length	3.010-3.040
Piston Pin to Piston Clearance	0.0003-0.0005—Wear Limit 0.0008

PISTON RINGS

Top Compression Ring Width	0.0774-0.0781
Bottom Compression Ring Width	0.0770-0.0780
Oil Ring Width	0.080-0.081
Top Compression Ring Side Clearance	0.0019-0.0036
Bottom Compression Ring Side Clearance	0.0020-0.0040
Compression Ring Side Clearance—Wear Limit	0.0060
Oil Ring Side Clearance	Snug
Oil Ring Side Clearance—Wear Limit	0.0070
Top Compression Ring—Standard Bore—Ring Gap Width	0.010-0.020
Bottom Compression Ring—Standard Bore—Ring Gap Width	0.010-0.020
Oil Ring—Standard Bore—Ring Gap Width	0.015-0.055

CYLINDER BLOCK

Cylinder Bore Diameter 240-300	4.0000-4.0024
Cylinder Bore Out-of-Round—Maximum	0.0010—Wear Limit 0.0050
Cylinder Bore Taper	0.001—Wear Limit 0.010
Head Gasket Surface Flatness	0.003 inch in any 6 inches or 0.007 inch overall
Main Bearing Bore Diameter—Coded Red	2.5902-2.5906
Main Bearing Bore Diameter—Coded Blue	2.5906-2.5910

OIL PUMP

Relief Valve Spring Tension—Lbs. at Specified Length	20.6-22.6 at 2.490
Relief Valve Clearance	0.0015-0.0029
Drive Shaft to Housing Bearing Clearance	0.0015-0.0029
Rotor Assembly End Clearance—Pump Assembled	0.0011-0.0041
Outer Race to Housing—Radial Clearance	0.006-0.012

IGNITION SYSTEM

Ignition Timing—B.T.D.C.—Recommended	6°
Breaker Arm Spring Tension (Ounces)	17-21
Contact Spacing	0.024-0.026
Contact Dwell at Idle Speed	35°-38°
Shaft End Play Clearance	0.003-0.010

Spark Plugs

Type	Autolite BTF 42
Size	18mm
Gap (Inches)	0.032-0.036
Torque (ft-lbs.)	15-20

DISTRIBUTOR ADVANCE CHARACTERISTICS

VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.

rpm (Distributor)	Advance (Degrees)	Vacuum (Inches of Mercury)
600	1 – 2	0.70
800	4-1/2 – 5-1/2	1.20
1200	8-1/4 – 9-1/2	2.10
1600	11 – 12-1/4	3.70
2000	11-3/4 – 13-1/4	4.90

Maximum Advance Limit . . . . . 15-1/4°

THERMOSTAT

Begins to Open (°F.)	157-162
Fully Open (°F.)	182

TORQUE LIMITS – FOOT-POUNDS

Main Bearing Cap Bolts – Oiled Threads	60-70
Cylinder Head Bolts – Oiled Threads	70-75
Oil Pan to Cylinder Block	10-12
Manifold to Cylinder Head	20-25
Exhaust Pipe to Manifold	25-35
Flywheel to Crankshaft	75-85
Oil Pump to Cylinder Block	12-15
Oil Pump to Cover Plate	6-9
Oil Filter Adapter to Cylinder Block	15-20
Oil Filter	20-25
Cylinder Front Cover	12-15
Water Outlet Housing	12-15
Valve Rocker Arm Cover	4-7
Damper or Pulley to Crankshaft	130-145
Connecting Rod Nuts	40-45
Camshaft Thrust Plate to Block	19-21
Valve Rocker Arm Stud Adjusting Nut*	4.5-15

*With tappet on camshaft base circle, turn adjusting nut counterclockwise.

Valve Push Rod Chamber Cover	1.0-1.5
Water Pump to Cylinder Block	12-15
Oil Pick-up Tube to Oil Pump	12-15
Engine Governor to Cylinder Block	23-28

TORQUE LIMITS FOR VARIOUS SIZE BOLTS

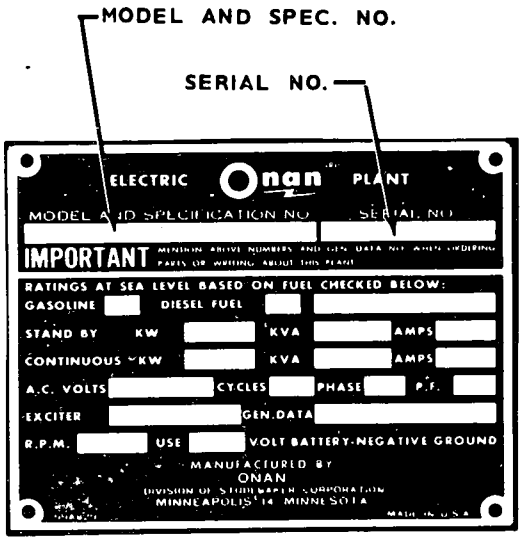
CAUTION: In the event that any of the limits below are in disagreement with any of those listed above, the above limits prevail.

Size (Inches)	1/4-20	1/4-28	5/16-18	5/16-24	3/8-16	3/8-24
Torque (Foot-Pounds)	6-9	6-9	12-15	15-18	23-28	30-35
Size (Inches)	7/16-14	7/16-20	1/2-13	1/2-20	9/16-18	5/8-18
Torque (Foot-Pounds)	45-50	50-60	60-70	70-80	85-95	130-145

INSTRUCTIONS FOR ORDERING REPAIR PARTS

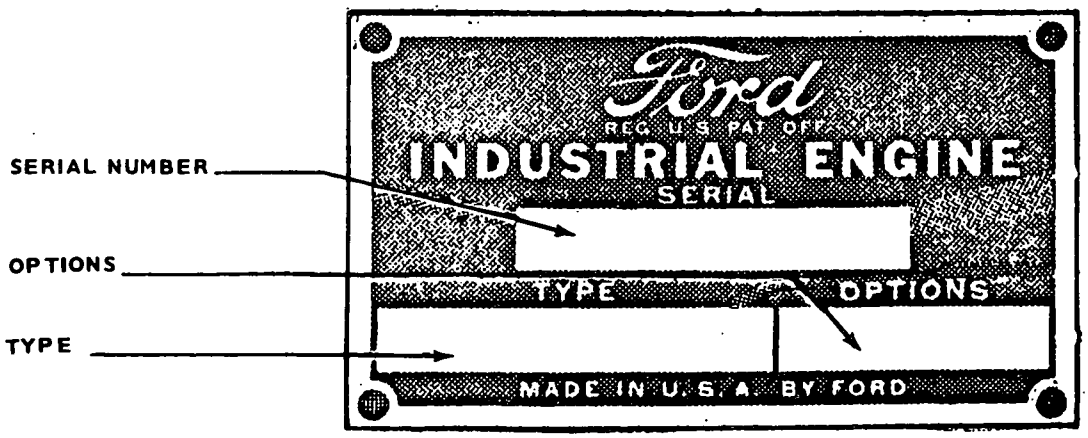
ONAN PARTS

All parts in this list are *Onan* parts. For *Onan* parts or service, contact the dealer from whom you purchased this equipment or your nearest authorized service station. To avoid errors or delay in filling your order, please refer to the *Onan nameplate* located on the upper right side of the flywheel housing and give the complete:



FORD PARTS

All Ford parts must be ordered from the Ford Motor Company of Dearborn, Michigan, or their nearest authorized distributor. Refer to the Engine nameplate located on side of the crankcase. When ordering parts, always supply Ford with the following nameplate information:

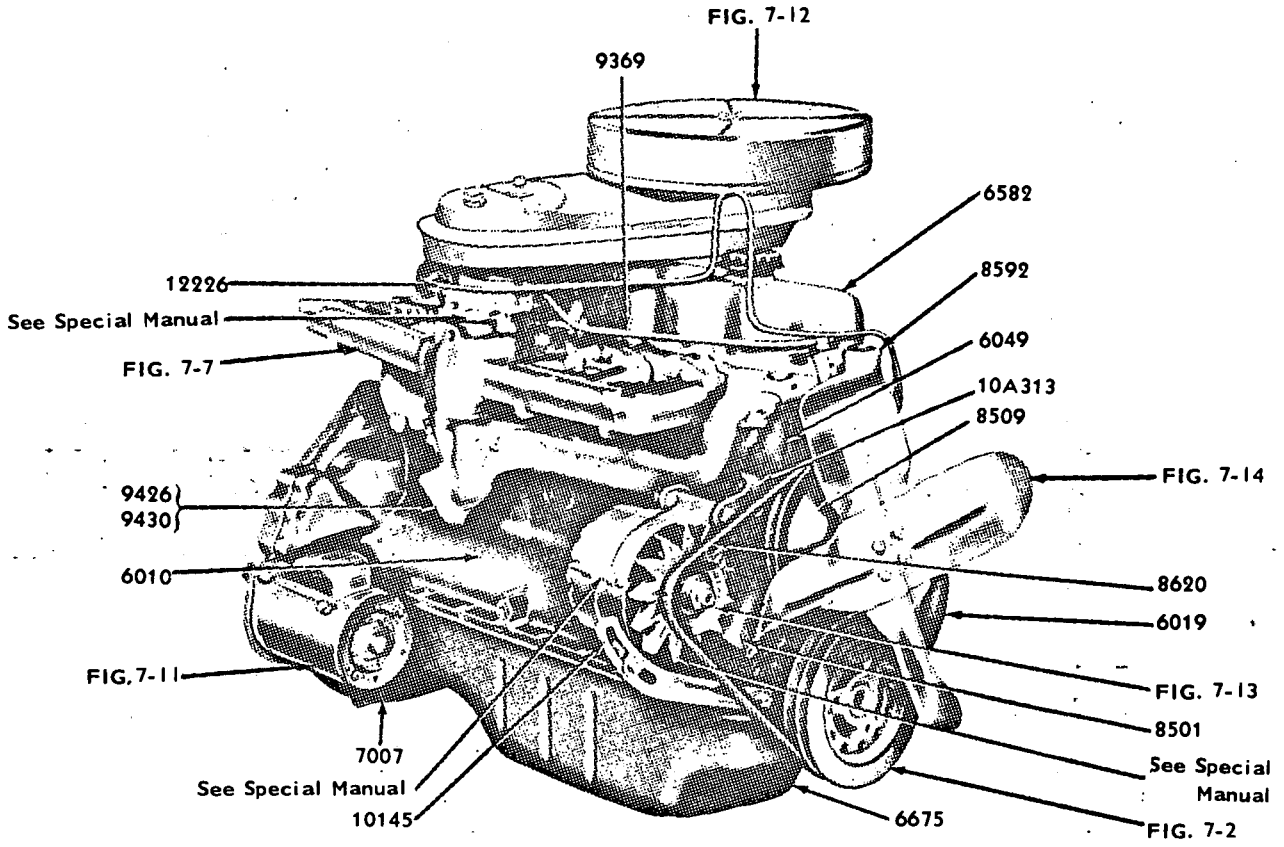


PARTS CATALOG

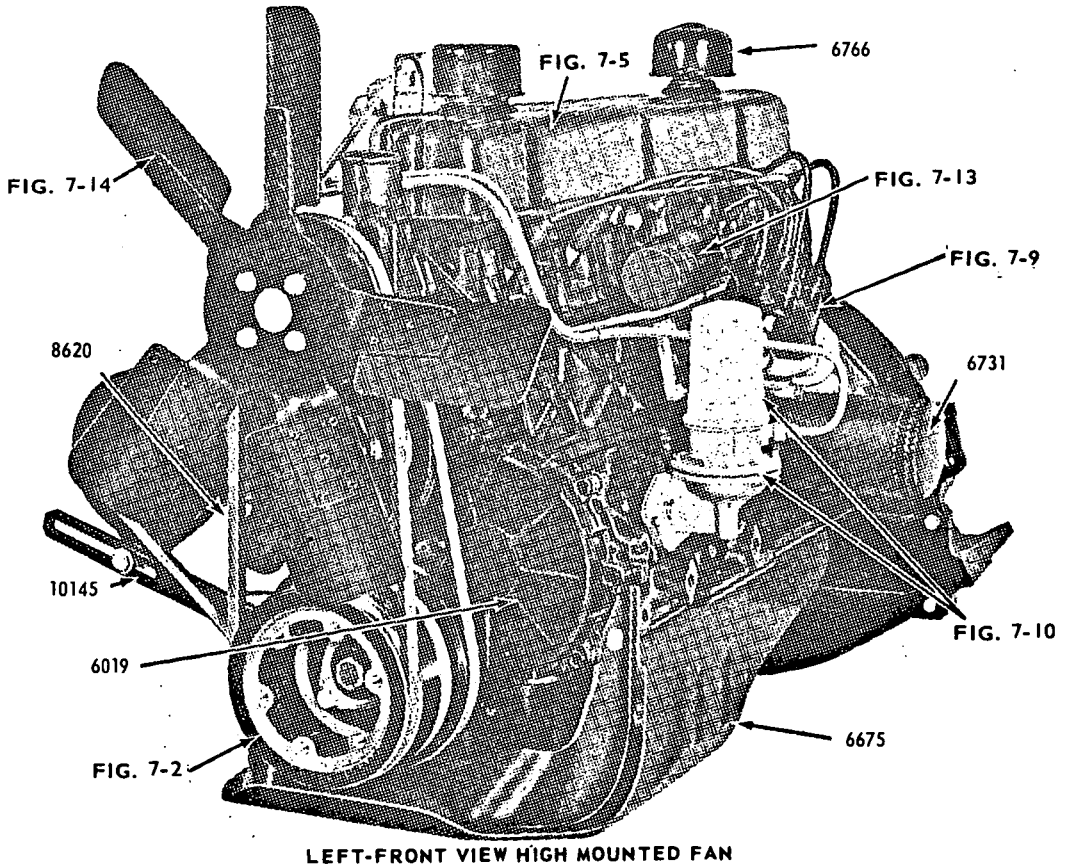
This catalog applies to Model 25EK-23R/5178A. The EK is powered by a Ford C5PF-6005-A engine. Engine parts modified or added by *Onan* will be in this list and have *Onan* part numbers. *Onan* parts are arranged in groups of related items and are identified by a reference. All parts illustrations are typical. Ford parts are identified by part number from the illustrations. Ford parts are listed in numerical sequence except for particular assemblies which have parts listed within the assembly. Using the Model and Spec No. from the *Onan* plant nameplate.

PLANT DATA TABLE

MODEL AND SPEC NO.	ELECTRICAL DATA					
	WATTS	VOLTS	CYCLES	PHASE	WIRE	
25EK-23R/	25,000	120/240	50 or 60	1	3	



RIGHT-FRONT VIEW LOW MOUNTED FAN



LEFT-FRONT VIEW HIGH MOUNTED FAN

FIG. 7-1 ENGINE, (TYPICAL 6 CYLINDER).

PART NO.	QTY. USED	PART DESCRIPTIONS
C20Z 6A008-A	AR	Dowel, Cyl. Head to Block 43/64" o.d. x 7/16" Long - Split
C5JE 6009-A	1	Cylinder Assy. incl. timing chain, cam and gears
C5UZ 6010-A	1	Block Assy., Cylinder
C5AZ 6019-A	1	Cover Assy., Timing Gear, Front
C5AZ 6020-A	1	Gasket, Timing Gear Front Cover
C5TZ-6028-B2	1	Support, Engine Front
43039-S8	4	Bolt 7/16-14 x 7/8" (front support to engine)
C5AZ 6026-A	5	Plug, Cylinder Block, Cup Type 1.64" o.d.
C5AZ 6049-A	1	Head, Cylinder, includes C5AZ 6051-B gasket
C5AZ 6051-B	1	Gasket, Cylinder Head
C20Z 6065-B	14	Bolt, Cylinder Head, 7/16"-14 x 3.94"
C3JZ 6404-D	1	Decal, Rocker Arm Cover
B5P 6404-A	1	Plate, Engine Name
92032-52	4	Screw, Drive
C5TZ 6675-A	1	Pan Assy., Engine Oil
C3AZ 6730-A	1	Plug, Engine Oil Pan Drain
C1AZ 6731-A	1	Element Assy., Oil Filter (w/gaskets)
C20Z 6734-A	1	Gasket, Oil Drain Plug
EAA 6749-A	1	Gasket, Oil Filter Center Bolt to Cover
C5TZ 6750-C	1	Indicator Oil Level
C5AZ 6754-B	1	Tube Assy., Oil Level Indicator
C5JZ 6763-A	1	Pipe Assy., Oil Filter
377393-S	1	Grommet
C1TZ 6766-A	1	Cup Assy., Breather
C5TZ 6881-A	1	Adapter, Oil Filter
C5JZ 7007-A	1	Plate, Engine Rear
43040-S8	4	Bolt 7/16-14 x 1"
C5AZ 8509-A	1	Pulley, Water Pump
B7T 8538-A	1	Clamping Ring, Pulley
42908-S8	4	Screw and Washer 5/16-24 x 5/8"
B8TZ 8620-D	1	Fan Belt
C5JZ 8592-B	1	Connection Assy., Water Outlet
C5JZ 8255-A	1	Gasket, Water Outlet
C2UZ 8575-B	1	Thermostat (160°F)
C5AE 9C322-A	1	Bracket, Tube carb. to Fuel Pump
376255-S	2	Bolt 5/16-18 x .88"
42998-S8	2	Bolt 3/8-16 x 1.0"
C5JZ 8625-C	1	Bracket and Pulley Assy.
C5JZ 8633-A	1	Guide, Fan Bracket
88423-S8	2	Stud 7/16-14-20 x 1-3/4"
351428-S8	2	Washer, Flat 7/16"
34397-S8	2	Nut 7/16-14
C2AA 9324-A	1	Hose, Fuel Tube Connector
87972-S	1	Connector, 1/8-27 NPT x 1/2 - 20
376545-S8	2	Clamp, Hose
C5AE 9369-B	1	Tube Assy., Fuel Pump to Carb.
372795-S	1	Clip, Fuel and Vacuum Line
C5JZ 12226-A	1	Distributor Vacuum Tube
351112-S	2	Screw 3/8-24 x .55"
C5AZ 10A313-C1	1	Bracket, Alternator Mounting
42996-S8	3	Bolt 3/8-16 x 3/4"
C5TZ 10145-F1	1	Arm, Alternator Adjusting
20512-S8	1	Bolt 5/16-18 x 1-7/8"
351415-S8	1	Washer, Flat
34806-S8	1	Washer, Lock 5/16"

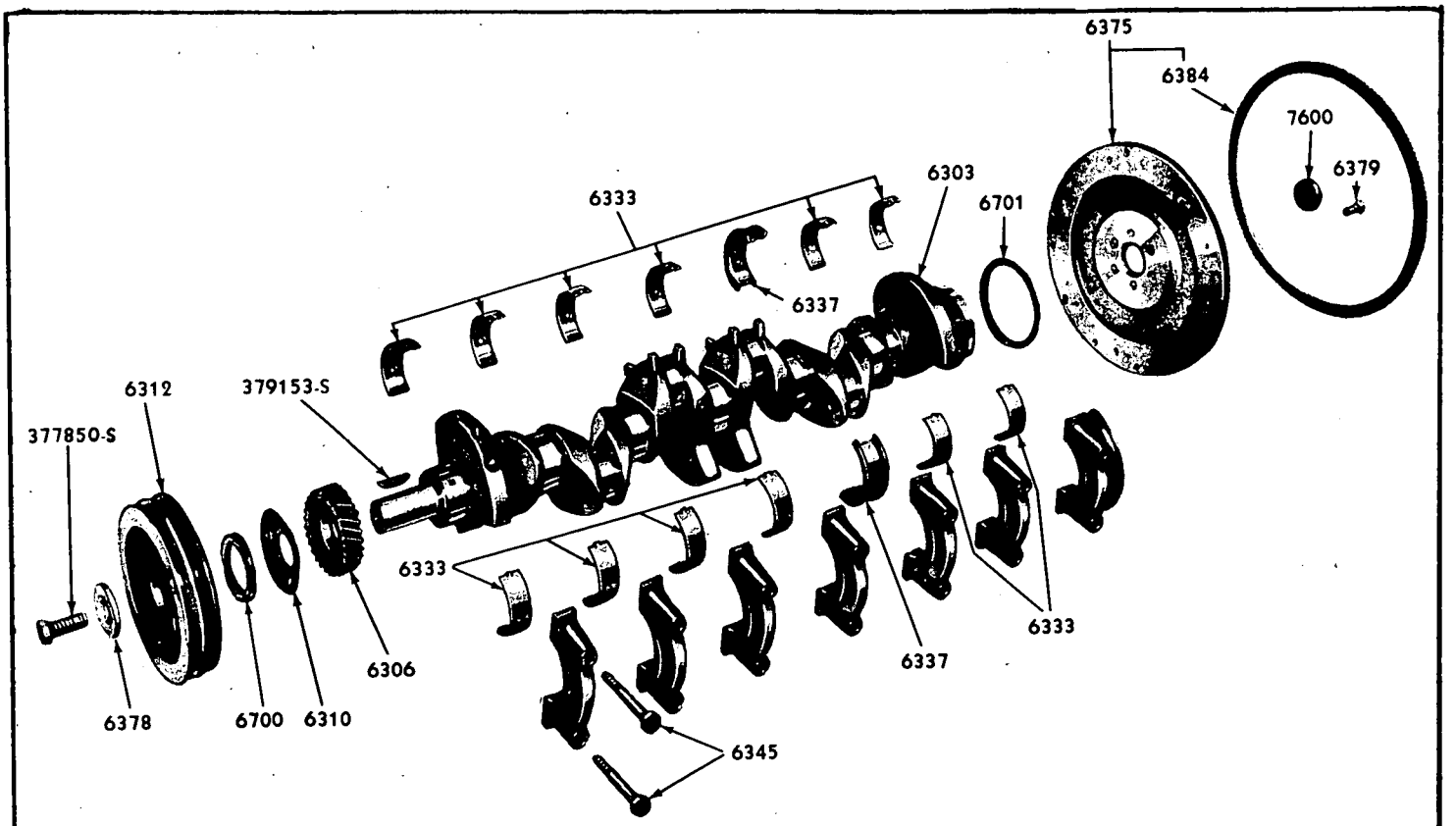
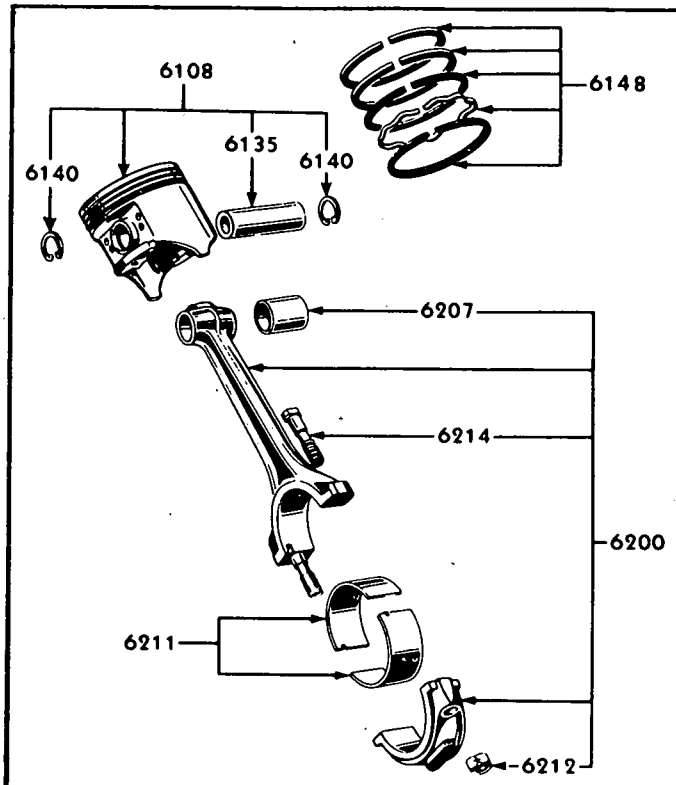


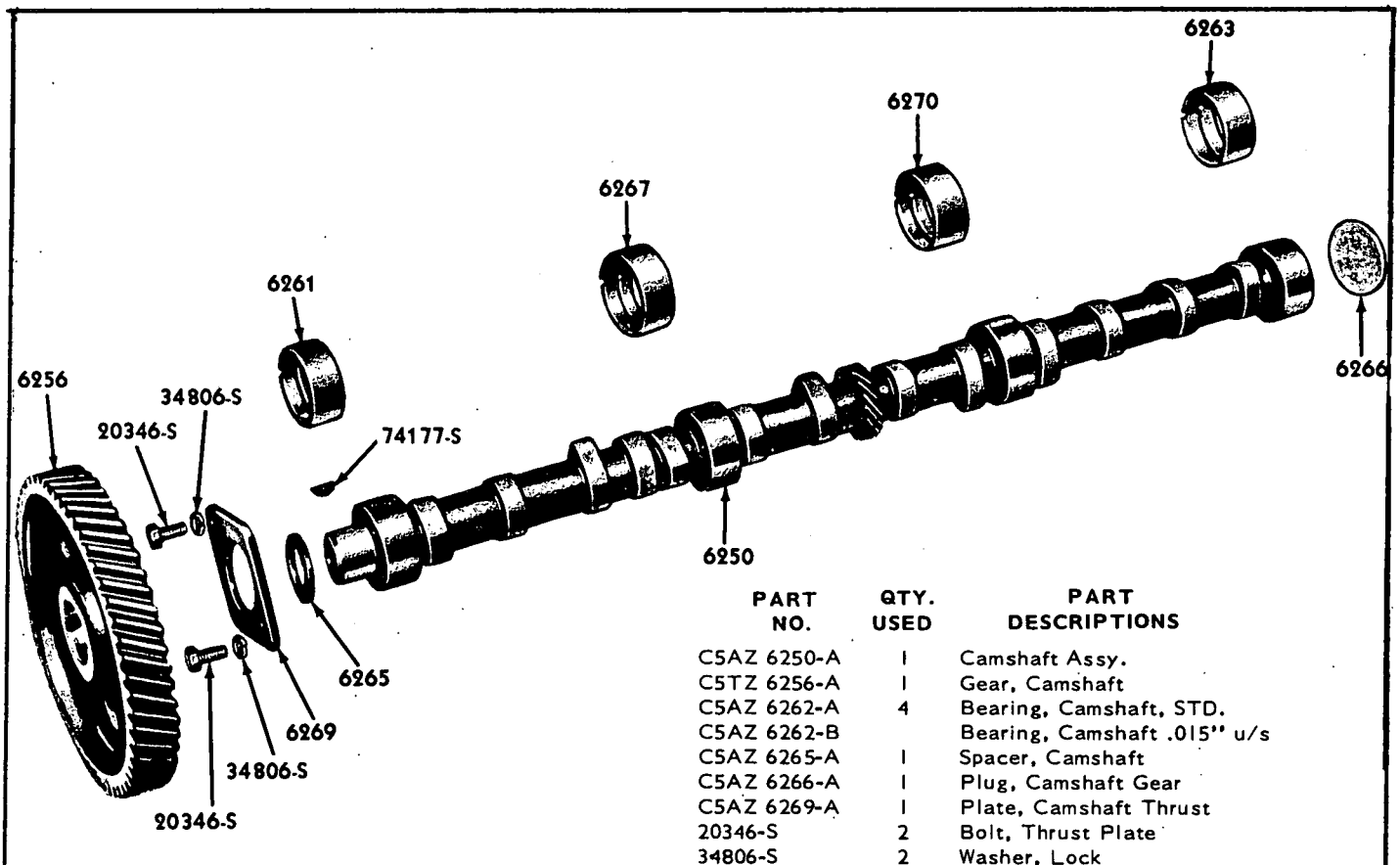
FIG. 7-2. CRANKSHAFT, FLYWHEEL AND RELATED PARTS (TYPICAL).

PART NO.	QTY. USED	PART DESCRIPTIONS
C5AZ 6303-A	1	Crankshaft
C5TZ 6306-A	1	Gear, Crankshaft
379153-S	1	Key, Gear to Crankshaft
C5AZ 6310-A	1	Slinger, Crankshaft Oil
C5TZ 6312-B	1	Pulley, Crankshaft
377850-S	1	Bolt, 5/8-18 x 2"
C30Z 6378-A	1	Washer, Plain 1-3/4" o.d. x 21/32" x 1/8" Thick
C5JZ 6A312-A	1	Pulley, Crankshaft, Outer
42999-S8	3	Bolt 3/8"-16 x 1.12"
C5TZ 6333-A	6	Bearing, Main - Upper - Front, Front Intermediate, Center, Rear Intermediate, Rear, STD(R)
C5TZ 6333-B		Bearing, Main, Upper, STD(B)
C5TZ 6333-C		Bearing, Main, Upper, .002"
C5TZ 6333-D		Bearing, Main, Upper, .010"
C5TZ 6333-E		Bearing, Main, Upper, .020"
C5TZ 6333-F		Bearing, Main, Upper, .030"
C5TZ 6333G	6	Bearing, Main, Lower - Front, Front Intermediate, Center, Rear Intermediate, Rear, STD(R)
C5TZ 6333-H		Bearing, Main, Lower STD(B)
C5TZ 6333-J		Bearing, Main, Lower, .002"
C5TZ 6333-K		Bearing, Main, Lower, .010"
C5TZ 6333-L		Bearing, Main, Lower, .020"
C5TZ 6333-M		Bearing, Main, Lower, .030"
C5TZ 6337-A	1	Bearing, Main, Upper - Rear Intermediate STD(R)
C5TZ 6337-B	1	Bearing, Main, Upper STD (B)
C5TZ 6337-C	1	Bearing, Main, Upper .002"
C5TZ 6337-D	1	Bearing, Main, Upper .010"
C5TZ 6337-E	1	Bearing, Main, Upper .020"
C5TZ 6337-F	1	Bearing, Main, Upper .030"
C5TZ 6337-G	1	Bearing, Main, Lower, Rear Intermediate STD(R)
C5TZ 6337-H	1	Bearing, Main, Lower STD (B)
C5TZ 6337-J	1	Bearing, Main, Lower .002"
C5TZ 6337-K	1	Bearing, Main, Lower .010"
C5TZ 6337-L	1	Bearing, Main, Lower .020"
C5TZ 6337-M	1	Bearing, Main, Lower .030"
C20Z 6345-A	14	Bolt, Crankshaft Main Bearing Cap
C20Z 6A366-A	1	Plate, Flywheel Reinforcing
C5TZ 6375-E	1	Flywheel & Ring Gear Assy.
378223-S	6	Bolt 7/16-20 x 1.62"
C5AZ 6384-A	1	Ring Gear, 184 teeth
C3AZ 6700-A	1	Oil Seal, Cylinder Front Cover
C5AZ 6701-A	1	Packing, Crankshaft, Rear
MK 7600-A	1	Bearing, Clutch Pilot



PART NO.	QTY. USED	PART DESCRIPTIONS
C3AZ 6108-P	6	Piston Assy., Includes pin (ident. mark RED) STD.
C3AZ 6108-H		Piston Assy., Includes pin .020"
C3AZ 6108-J		Piston Assy., Includes pin .030"
C3AZ 6108-K		Piston Assy., Includes pin .040"
B2AZ 6135-A	6	Pin, Piston STD
C3AZ 6148-A	3	Ring Set, Piston (part to re-ring 2 pistons, 3 required for 6-cyl) STD
C3AZ 6148-C		Ring Set, Piston .020" o/s
C3AZ 6148-D		Ring Set, Piston .030" o/s
C3AZ 6148-E		Ring Set, Piston .040" o/s
C5AZ 6200-A	6	Rod Assy., Connecting
C5AZ 6211-A(R) C5AZ 6211-A(B)	12	Bearing, Connecting Rod STD (standard size includes Red (R) & Blue (B) for selective fit)
C5AZ 6211-C		Bearing, Connecting Rod .002" u/s
C5AZ 6211-D		Bearing, Connecting Rod .010" u/s
C5AZ 6211-E		Bearing, Connecting Rod .020" u/s
C5AZ 6211-F		Bearing, Connecting Rod .030" u/s
C1TE 6212-A		Nut, Connecting Rod 3/8"-24
C40Z 6214-B		Bolt, Connecting Rod

FIG. 7-3. PISTON AND CONNECTING ROD (TYPICAL).



PART NO.	QTY. USED	PART DESCRIPTIONS
C5AZ 6250-A	1	Camshaft Assy.
C5TZ 6256-A	1	Gear, Camshaft
C5AZ 6262-A	4	Bearing, Camshaft, STD.
C5AZ 6262-B		Bearing, Camshaft .015" u/s
C5AZ 6265-A	1	Spacer, Camshaft
C5AZ 6266-A	1	Plug, Camshaft Gear
C5AZ 6269-A	1	Plate, Camshaft Thrust
20346-S	2	Bolt, Thrust Plate
34806-S	2	Washer, Lock
74177-S	1	Key, Camshaft to Gear
C3AZ 6278-A	1	Washer, Camshaft Sprocket 1.26" o.d. x .46" ID x .25" thick

FIG. 7-4. CAMSHAFT, GEAR, BEARINGS (TYPICAL).

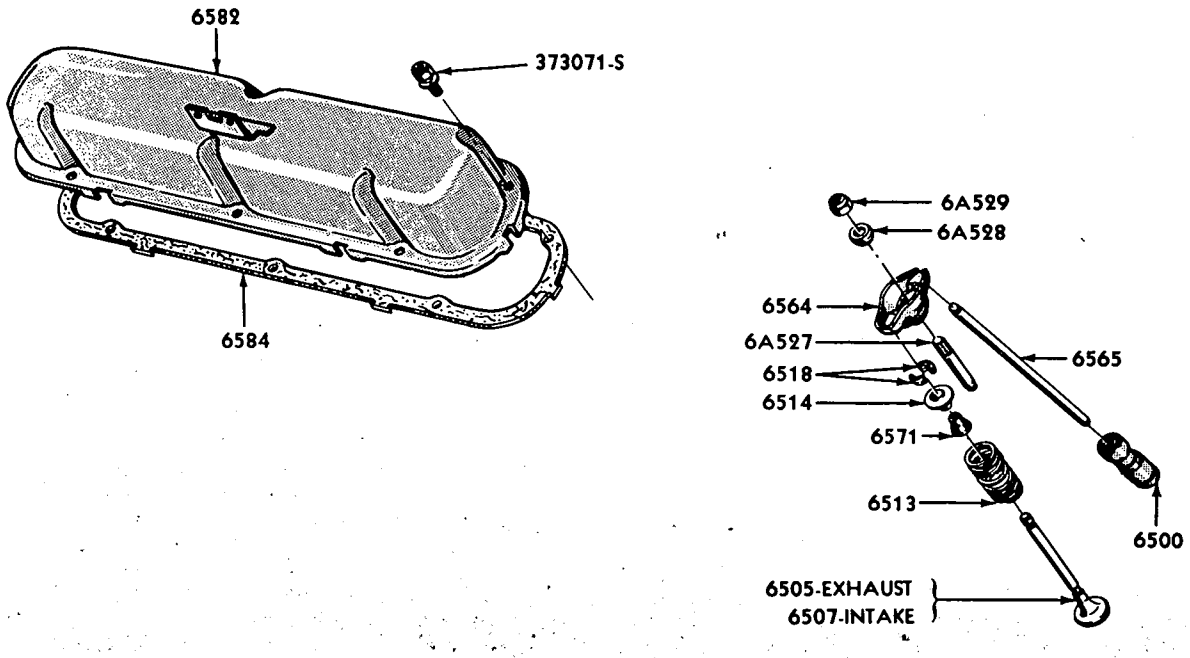


FIG. 7-5. VALVES, PUSH RODS, ROCKER ARM COVER AND RELATED PARTS (TYPICAL).

PART NO.	QTY. USED	PART DESCRIPTIONS
C20Z 6500-B	12	Tappet Assy., Valve, Hydraulic
C5AZ 6505-A	6	Valve, Exhaust, STD
C5AZ 6505-B		Valve, Exhaust .003" o/s stem
C5AZ 6505-C		Valve, Exhaust, .015" o/s stem
C5AZ 6505-D		Valve, Exhaust, .030" o/s stem
C5AZ 6507-A	6	Valve, Intake, STD
C5AZ 6507-B		Valve, Intake, .003" o/s stem
C5AZ 6507-C		Valve, Intake, .015" o/s stem
C5AZ 6507-D		Valve, Intake .030" o/s stem
C5AZ 6513-A	6	Spring, Valve, Intake
C5TZ 6513-A	6	Spring, Valve, Exhaust
C3AZ 6514-B	12	Retainer, Valve Spring
7HA 6518-A	24	Lock Key, Valve Spring Retainer
C5AZ 6519-A	1	Cover, Valve Push Rod
C5AZ 6521-A	1	Gasket, Push Rod Cover
C5AZ 6A527-A	12	Stud, Rocker Arm Support, Std.
C5AZ 6A527-B		Stud, Rocker Arm Support, .006" o/s
C5AZ 6A527-C		Stud, Rocker Arm Support, .015" o/s
C20Z 6A528-A	12	Seal, Rocker Arm Fulcrum
C2DZ 6A529-B	12	Nut, Rocker Arm Stud
C5AZ 6A545-A	1	Seal, Rocker Arm Cover Baffle
C5AZ 6564-A	12	Arm, Valve Rocker
C5AZ 6564-A	12	Arm & Screw Assy., Valve Rocker
C5AZ 6565-A	12	Rod, Valve Push
C5AZ 6571-A	12	Seal, Valve Stem
C5AZ 6582-A	1	Cover Assy., Valve Rocker Assy.
373071-S	8	Screw
C5AZ 6584-A	1	Gasket, Valve Rocker Arm Cover

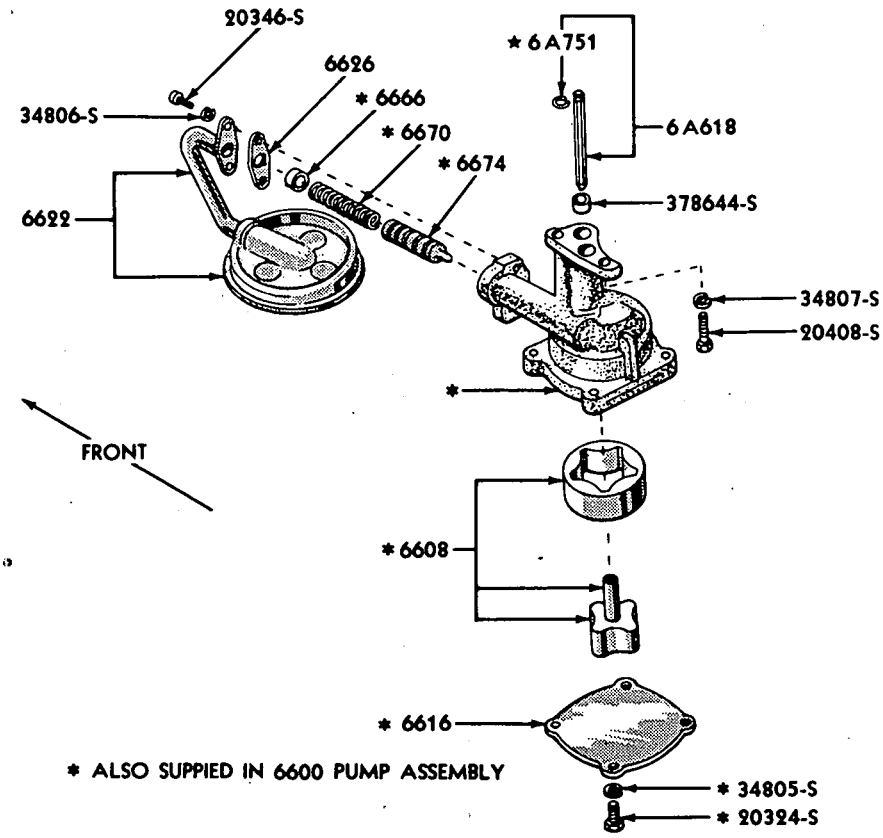


FIG. 7-6. OIL PUMP (TYPICAL).

PART NO.	QTY. USED	PART DESCRIPTIONS
C5AZ 6600-A	1	Pump Assy., Engine Oil
20408-S	2	Screw
34807-S	2	Washer, Lock
C4TZ 6608-A	1	Rotor and Shaft Assy., Oil Pump Drive
B8A 6616-C	1	Plate Assy., Oil Pump Body
20324-S	4	Screw
34805-S	4	Washer, Lock
C5AZ 6A616-A	1	Shaft Assy., Oil Pump Intermediate
C5AZ 6A618-A	1	Shaft Assy.
C5TZ 6622-B	1	Screen, Tube and Cover Assy.
20346-S	2	Screw
34806-S	2	Washer, Lock
C5AZ 6626-A	1	Gasket, Inlet Tube Fitting
C4AZ 6629-A	1	Ring, Intermediate Shaft Retainer
C5AZ 6666-A	1	Plug, Oil Relief Valve
C5AZ 6670-A	1	Spring, Relief Valve
C5AZ 6674-A	1	Plunger, Relief Valve

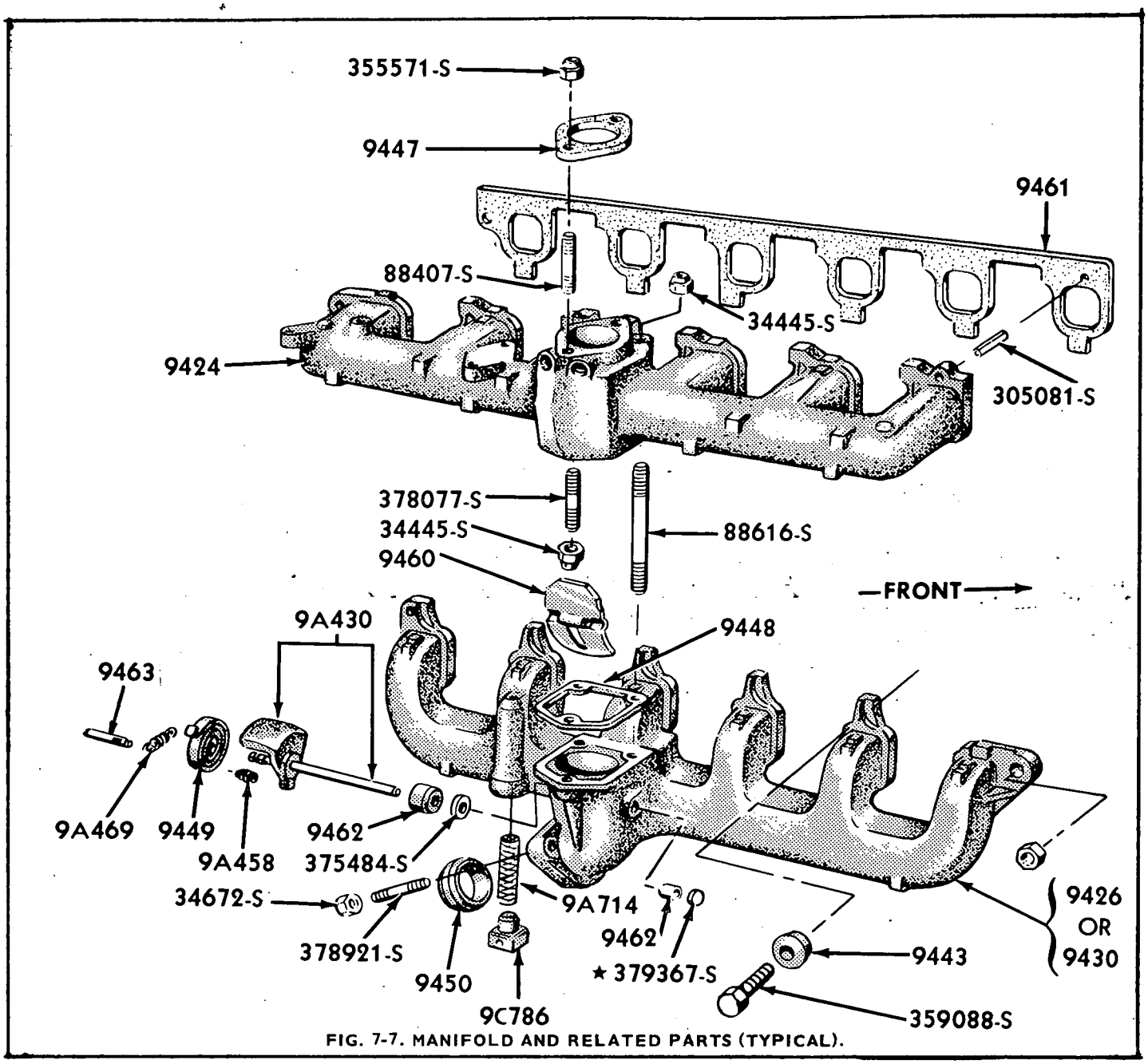


FIG. 7-7. MANIFOLD AND RELATED PARTS (TYPICAL).

PART NO.	QTY. USED	PART DESCRIPTIONS
C5TZ 9425-A	1	Manifold Assy., Exhaust
359088-S	5	Bolt
9443	5	Washer
C5AZ 9A430-A	1	Shaft, c/weight Assy. Control Valve
C5TE 9A433-F	1	Manifold Assy., Intake & Exhaust
374259-S8	1	Plug, Pipe, Intake Manifold
C5AZ 9448-B	1	Gasket, Intake & Exhaust
C5AZ 9449-A	1	Spring, Exhaust Control Valve
C5JZ 9450-A	1	Gasket, Exhaust Pipe
C5AZ 9A458-A	1	Spring, Ex. Control Valve Stop
C5AZ 9460-A	1	Valve, Ex. Control
C5AZ 9461-A	1	Gasket, Intake Manifold
C5AZ 9462-A	1	Bushing, Ex. Control Valve
C5AZ 9462-B	1	Bushing, Ex. Control Valve
C5AZ 9463-A	1	Pin, Ex. Control Valve
C5AZ 9A469-A	1	Spring, Ex. Control Valve Ext.

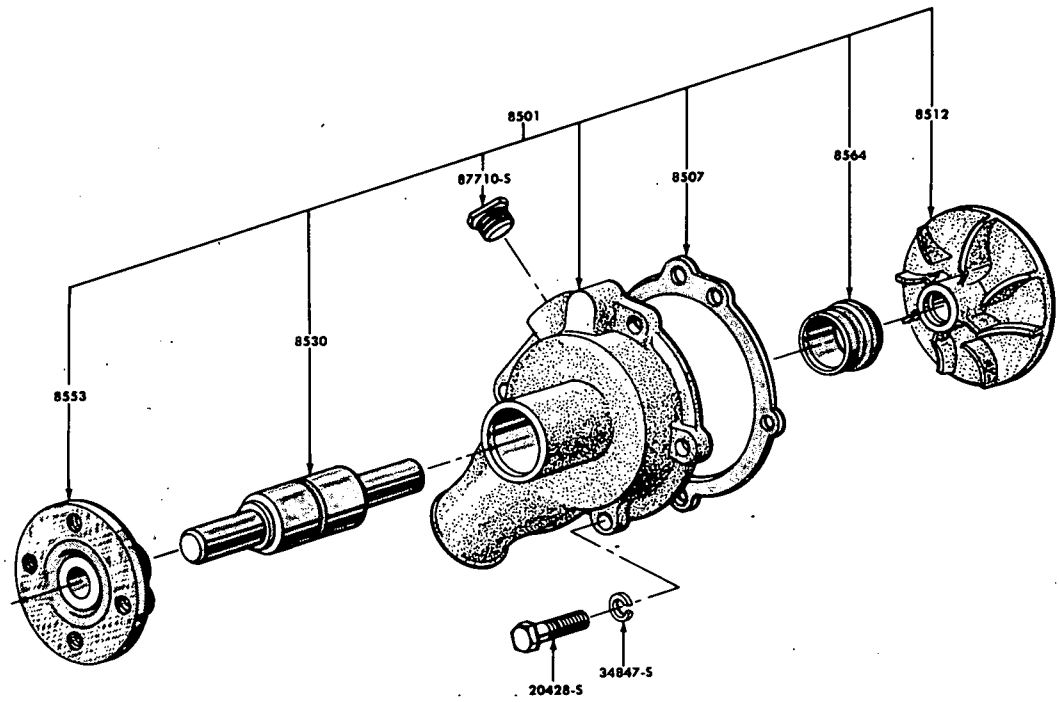


FIG. 7-8. WATER PUMP

PART NO.	QTY. USED	PART DESCRIPTIONS
C5AZ 8501-A	1	Pump Assy., Water
C5AZ 8507-A	1	Gasket, Water Pump
C5AZ 8512-A	1	Impeller, Water Pump
C5AZ 8530-A	1	Shaft and Bearing Assy., Water Pump
C5TZ 8546-B	1	Spacer, Pulley to Fan
B4A 8553-A	1	Hub, Water Pump Pulley
B2AZ 8564-A	1	Seal, Water Pump

PART NO.	QTY. USED	PART DESCRIPTIONS
C5TZ 12127-N	1	Distributor Assy., Less terminal housing (cap) and rotor
7HA 12106	1	Housing assy. - distributor terminal
C5AZ 12120-A	1	Bushing - distributor housing
FAA 12143-A	1	Gasket - distributor base
7RA 12144	2	Clamp - terminal housing hold down
C5TZ 12151-A	1	Plate assy. - distributor breaker - upper
C5TZ 12151-B	1	Plate assy. - distributor breaker - lower
C3DZ 12171-A	1	Point set assy. - breaker arm and contact
C5TZ 12175-A	1	Shaft and cam assy.
B7A 12177-A	1	Retainer - distributor cam
B7A 12179-A	1	Washer - distributor driven gear thrust
C5AZ 12188-A	2	Weight assy.
C0TZ 12192-A	1	Distributor diaphragm spring - 9 coils
C5AZ 12192-F	1	Distributor primary spring - 5-1/2 coils
C5VY 12192-A	1	Distributor secondary spring - 5 coils
FAA 12200-B	1	Rotor
C0TZ 12202-A	1	Stop - vacuum advance
C5TZ 12210-A	1	Cam assy.
C5AE 12226-B	1	Tube - vacuum
B9AF 12264-A	1	Wire assy. - distributor breaker ground
31037-S7	1	Screw - ground wire to housing
C5TZ 12300-A	1	Condenser
C5TZ 12370-A	1	Diaphragm assy.
C5TZ 12390-A	1	Gear - distributor driven

*Supplied only in 12127 Distributor Assembly.

See Fig. 7-13 for additional distributor and shielded ignition system parts.

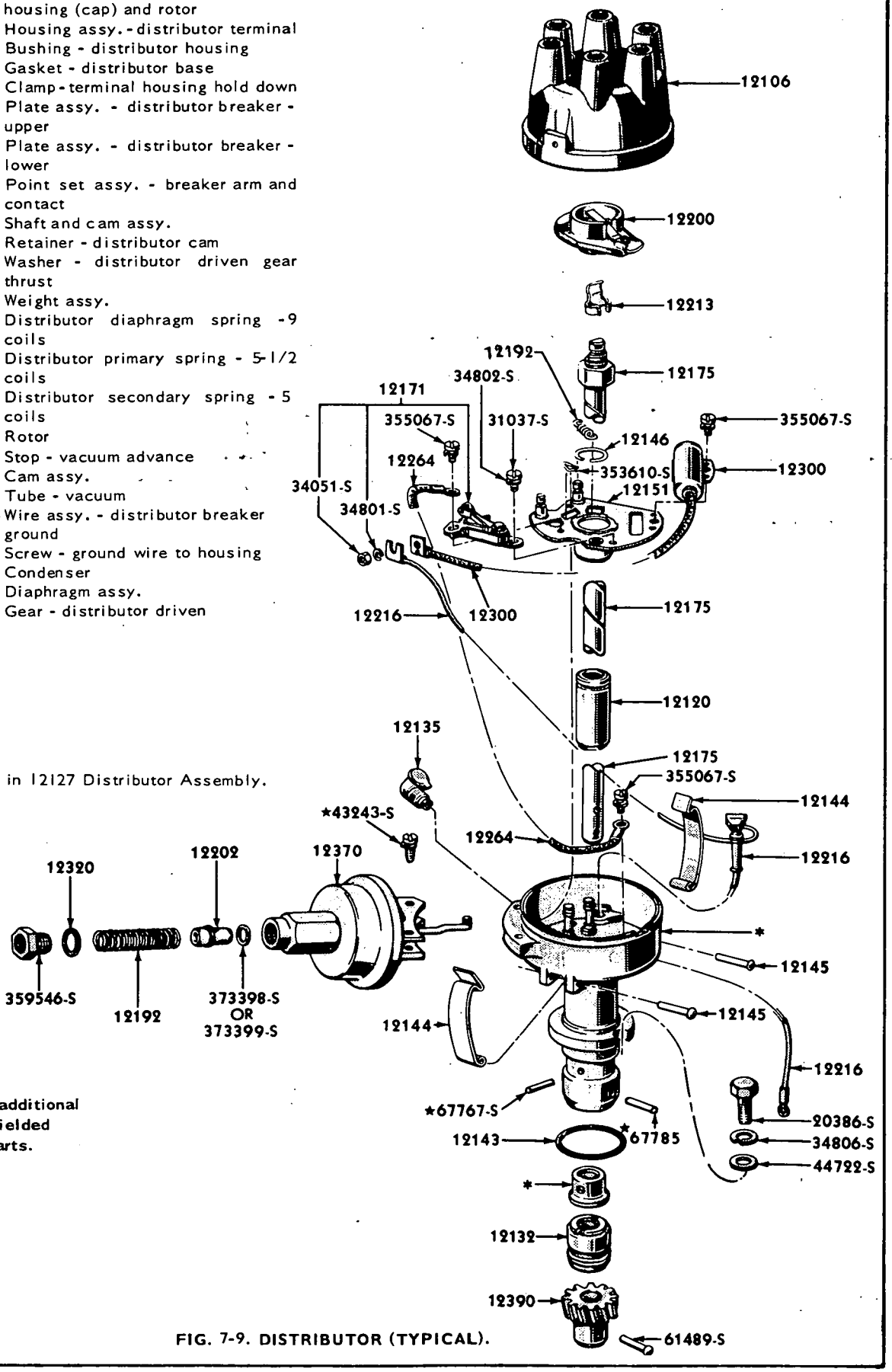


FIG. 7-9. DISTRIBUTOR (TYPICAL).

PART NO.	QTY. USED	PART DESCRIPTIONS
C3AZ 9350-T	1	Pump Assy., Fuel
C3AZ 9417-B	1	Gasket, Fuel Pump
C0DE 9352-A*	2	Valve Assy.
C4AZ 9365-A	1	Strainer Assy.
C5TE 9369-F	1	Tube Assy.
C3AZ 9376-B	1	Arm Assy., Rocker
C3AZ 9380-A*	1	Spring, Rocker Arm Return
8EL 9381*	1	Link, Rocker Arm
B5AZ 9389-A*	1	Bushing, Rocker Arm
B5AZ 9A392-A*	1	Retainer, Oil Seal
C0AZ 9A393-A*	1	Seal, Fuel Pump
C5AZ 9396-A*	1	Spring, Diaphragm
C3AZ 9398-D*	1	Diaphragm Assy.
49B 9408*	2	Gasket
C3AZ 9417-A*	1	Gasket
49B 9418*	1	Washer

*Items included in Fuel Pump Repair Kit C3AZ 9349-F.

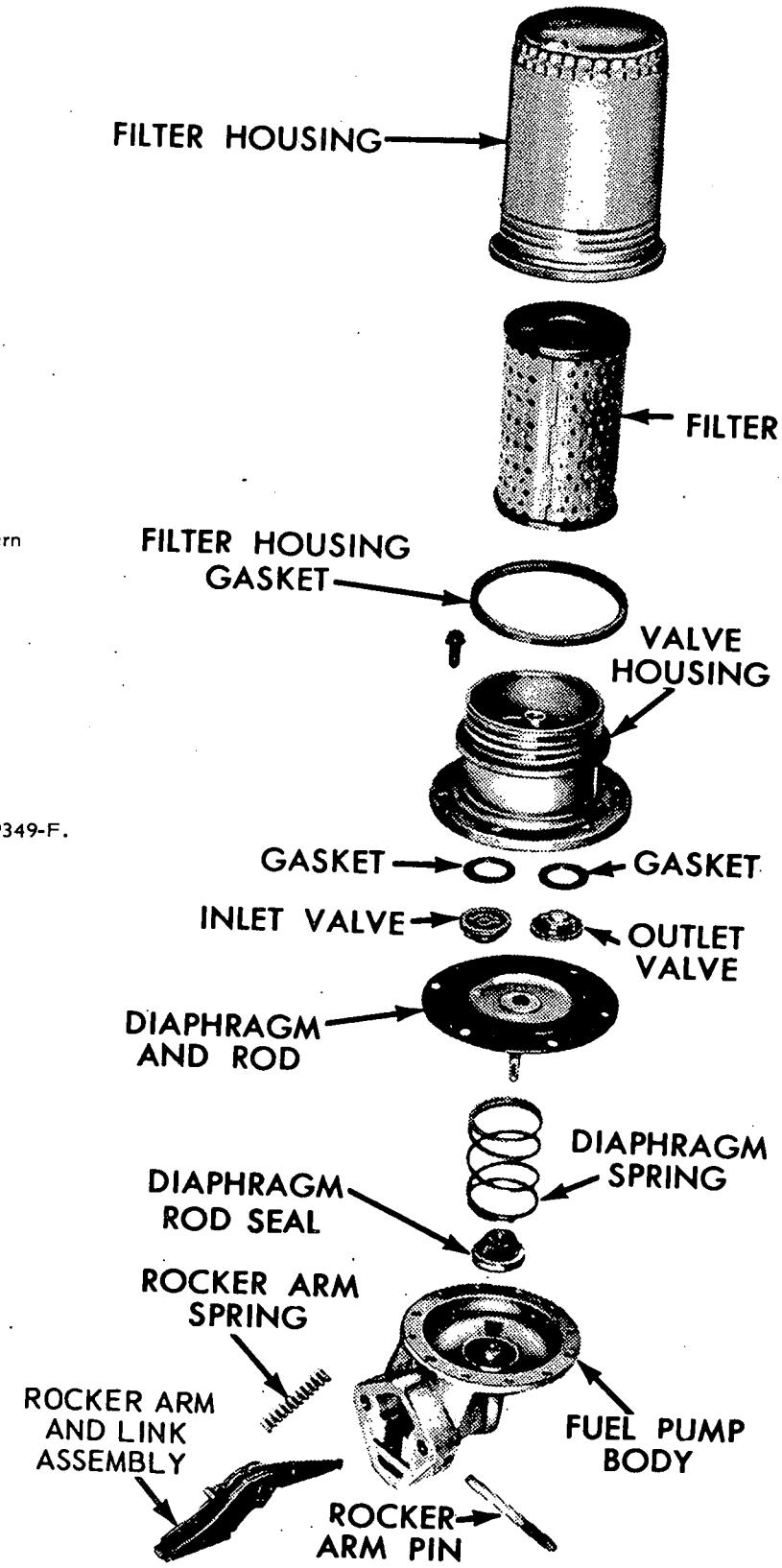


FIG. 7-10. FUEL PUMP AND FILTER.

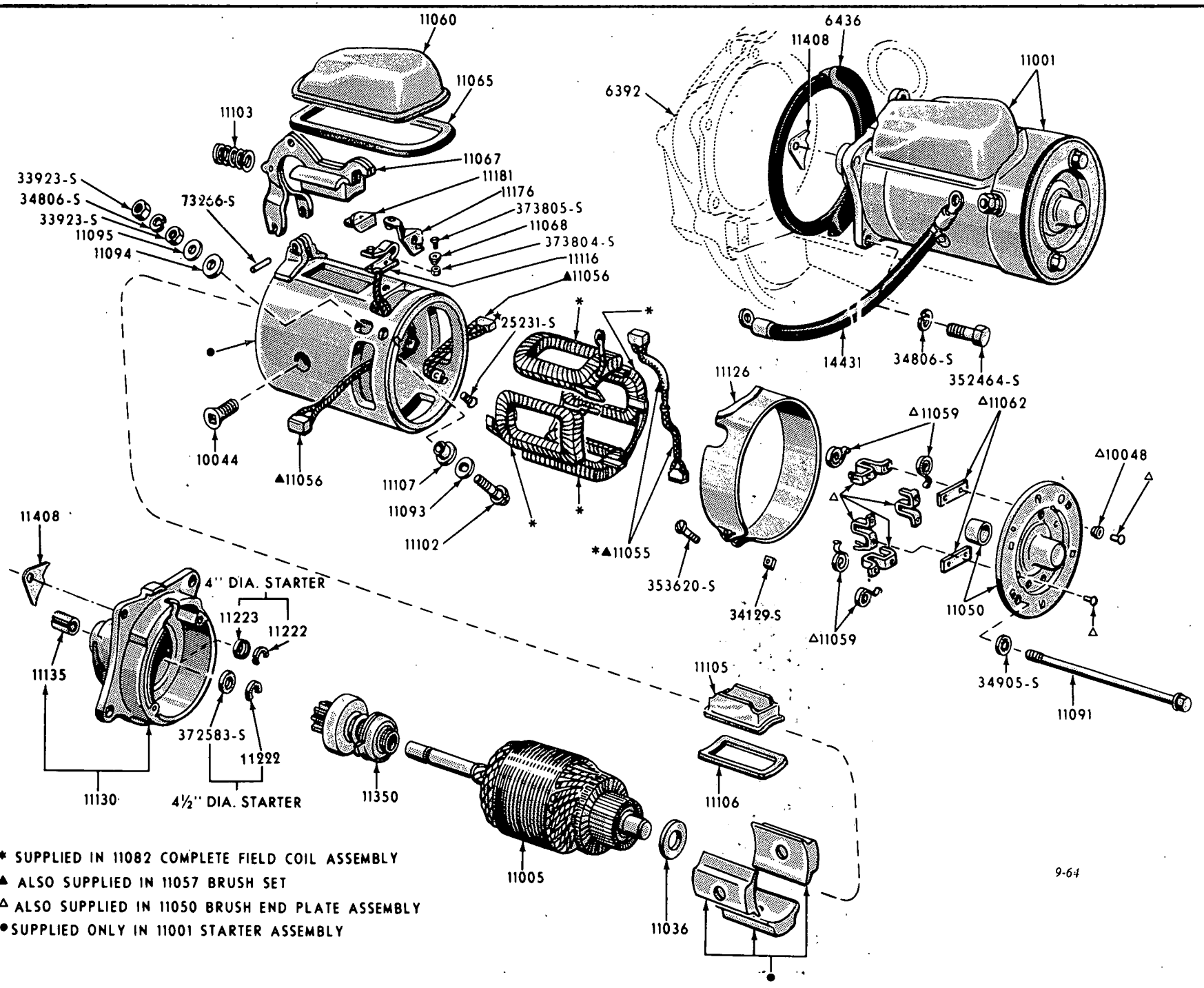


FIG. 7-11. TYPICAL STARTER AND DRIVE.

PART NO.	QTY. USED	PART DESCRIPTIONS
C20Z 11002-A	1	Starting Motor Assembly
376587-S8	2	Bolt 3/8"-16 x 1.12 hex washer hd.
34782-S8	2	Lockwasher 3/8"
33825-S8	2	(Attach starting motor) Nut, Hex, 3/8-16
C40Z 11005-A	1	Armature assy.
C0DZ 11036-A	1	Washer - starter motor armature thrust
18 11052	1	Bushing - starter motor front end plate
18 11056	1	Brush assy.
C0DZ 11057-B	1	Brush set
374993	2	Screw - Pan head for brush set
34803-S7	2	Lockwasher - spring No. 10 for brush set
B 11059	4	Spring - starter motor brush
C0DZ 11060-C	1	Cover - starter motor plunger
C0DF 11065-A	1	Gasket - starter motor plunger cover
C0DF 11067-B	1	Lever Assy. - starter motor drive
C0DF 11068-A	1	Insulator - starter motor switch
C0DF 11083-A	1	Field coil - lower
C0DF 11085-A	1	Field coil - R.H.
C0DF 11084-A	1	Field coil - L.H.
C20Z 11082-B	1	Field coil - complete
C3AZ 10120-A	2	Bolt - thru
34847-S8	2	Lockwasher 3/8"
34906-S8		Lockwasher 5/16"
B5A 11093-A	1	Washer - starter motor field terminal
18 11094-B	1	Washer - starter motor field terminal insulating
B5A 11095-A	1	Washer - starter motor field terminal screw
C0DF 11102-A	1	Terminal - starter motor field
C1VF 11103-A	1	Spring - plunger return
C0DF 11105-A	1	Sleeve - coil retaining
C0DF 11106-A	1	Flange coil retaining
18 11107-B	1	Insulator field terminal
C20Z 11126-A	1	Band assy. - starter motor cover
C20Z 11130-A	1	Housing kit - rear end
C20Z 11134-A	1	Point kit - starter motor contact
C2DZ 11135-A	1	Bushing - starter motor rear end plate
C20Z 11176-A	1	Post assy. - contact
C20Z 11181-A	1	Insulator - switch spring
C2DZ 11222-A	1	Ring - drive stop
C2DZ 11223-A	1	Retainer - drive ring
C40Z 11350-B	1	Drive assy. starter motor

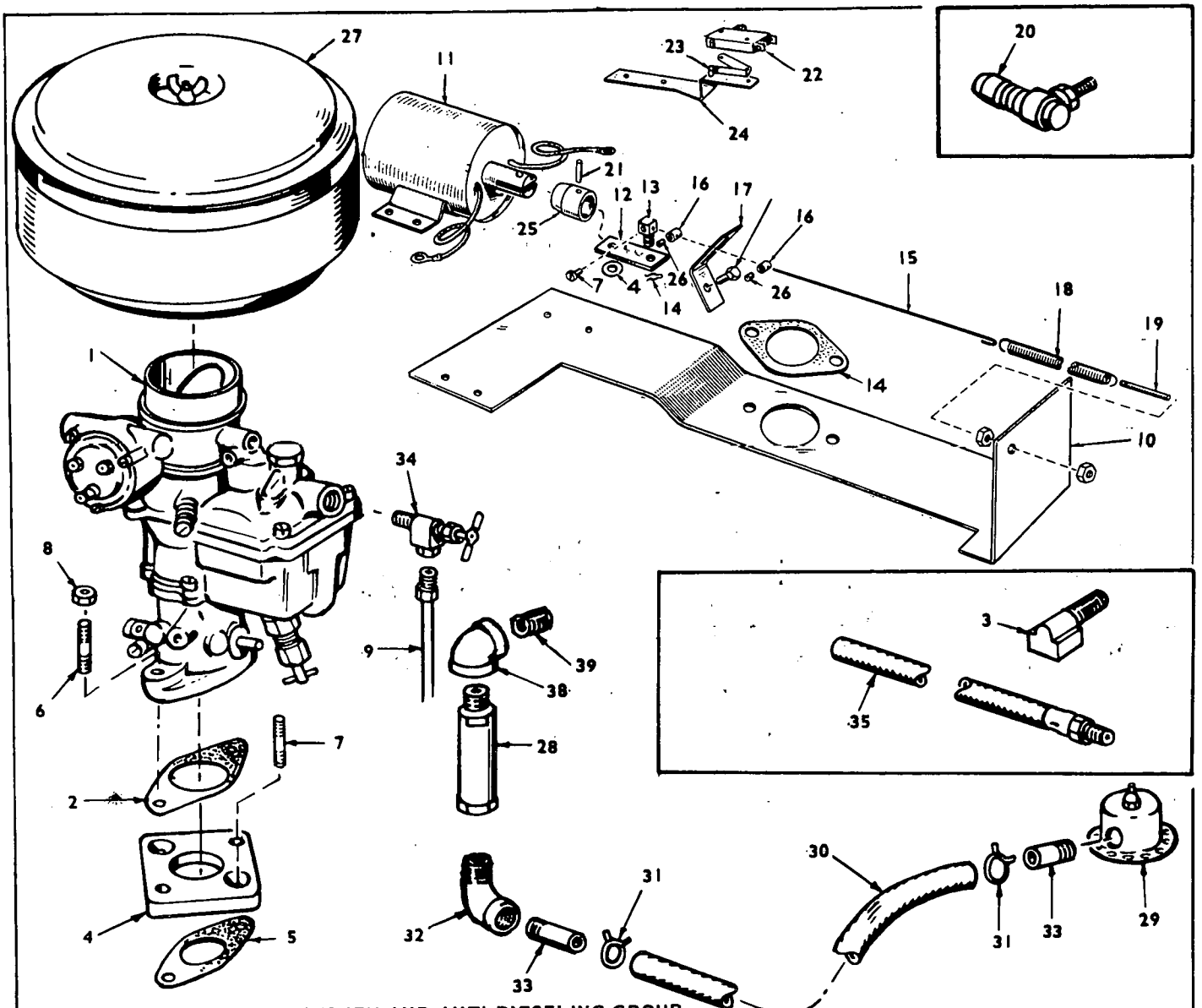


FIG. 7-12. GASOLINE FUEL SYSTEM AND ANTI-DIESELING GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
1	*CARBURETOR		
	141C575	1	Key 1
2	145A120	1	Gasket, Carb. Mtg.
3	502-2	1	Elbow, Fuel Pump Outlet
4	148B593	1	Adapter, Carburetor
5	154A133	2	Gasket, Carb. Adapter
6	520A237	2	Stud, Carb. Mounting
7	520A434	2	Stud, Carb. Adapter Mtg.
8	104A91	2	Nut, Carb. Mounting
9	149C1052	1	Line, Fuel Pump to Carb.
10	145C182	1	Bracket, Anti-Dieseling Cont.
11	307B259	1	Solenoid, Anti-Dieseling
12	145A164	1	Extension, Solenoid Arm
13	142-113	1	Swivel, Choke Lever
14	516-59	1	Pin, Cotter
15	145A166	1	Link, Throttle
16	145A165	2	Stop, Throttle
17	145A163	1	Arm, Override
18	145A158	1	Spring, Throttle
19	150A96	1	Stud, Gov. Adjusting
20	150A638	1	Joint, Ball
21	516-86	1	Pin, Roll
22	309A155	1	Micro Switch
23	309P133	1	Actuator
24	309A131	1	Bracket, Micro Switch
25	309A132	1	Cam, Micro Switch
26	803-2	2	Screw, Socket Head
27	140C261	1	Cleaner, Air
28	123A910	1	Valve, Breather
29	123P911	1	Adapter, Breather
30	503-119	1	Hose, Breather
31	503-131	2	Clamp, Hose
32	505A11	2	Elbow, Street
33	505A10	2	Nipple, Half
34	504-7	1	Valve, Shut-off - Carb. Inlet
35	501P130	1	Line, Fuel to pump (48")
36			
38	505-38	1	Elbow, 90° (Breather)
39	505-71	1	Nipple (Breather)

*Order carburetor component parts by description. Be sure to include Model, Spec and Serial Number from ONAN nameplate.

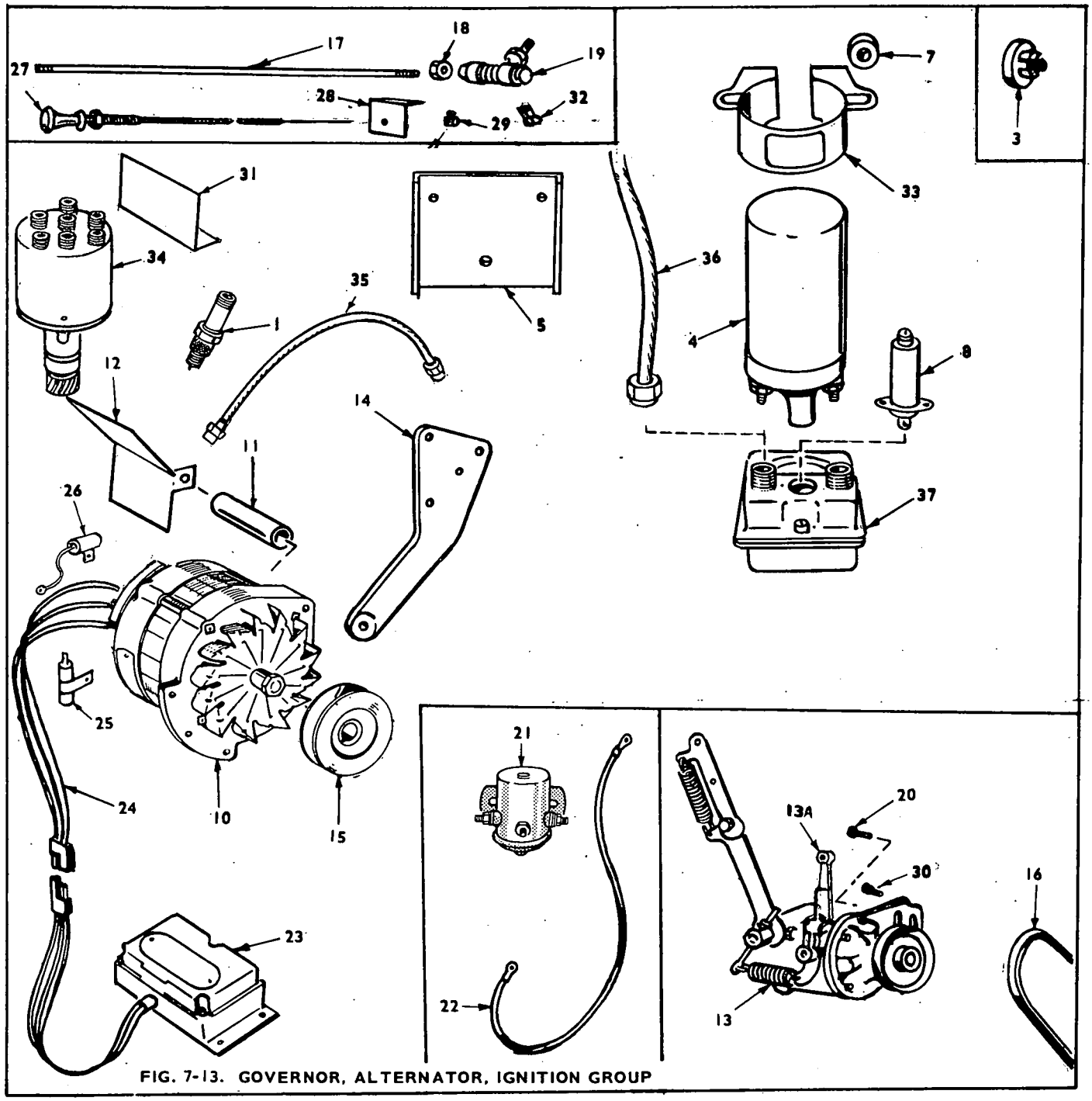


FIG. 7-13. GOVERNOR, ALTERNATOR, IGNITION GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
1	EF-14Y	1	Spark plug - shielded
2	TSF206101	1	Lead, High Tension, Shielded
3	517-43	1	Plug, Dist. Vac. Advance
4	166B278	1	Coil, Ignition
5	160B998	1	Bracket, Coil
7	301A663	1	Spacer
8	312A58	2	Condenser, (1) Coil, (1) Alter.
10	191P543	1	Alternator, Charge
11	191A571	1	Spacer, Alternator Mtg.
12	191B578	1	Heat Shield, Alternator
13	151P315	1	*Governor (See Special Manual)
13A	151-326	1	Lever, Governor Speed
14	151P311	1	Bracket, Gov. & Alternator
15	191-623	1	Pulley, Alternator
16	511-77	1	Belt, V
17	520A214	1	Stud, Linkage
18	115-25	1	Nut, Linkage Stud
19	150A638	1	Joint, Ball
20	801-50	1	Screw, Hex - Gov. Mtg. (3/8-24 x 1")
21	307B514	1	Solenoid, Start
22	336A1199	1	Lead, Sol. to Starter
23	191-542	1	Regulator, Charge
24	336A723	1	Cable Alternator
25	191-545	1	Resistor, Alternator
26	312A153	1	Condenser, Alternator
27	152P120	1	Cable, Vernier Control
28	151A230	1	Bracket, Cable

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
29	151A158	1	Swivel, Cable
30	151-327	1	Screw, Shoulder
31	155A943	1	Shield, Heat, Vernier Cable
32	141A496	2	Clamp, Cable
33	166B279	1	Bracket, Coil
34	TSFD-206	1	Distributor, Shielded**
35	CABLE, HI-TENSION - SHIELDED**		
	206104	1	#5 Cylinder
	206104	1	#2 Cylinder
	206105	1	#3 Cylinder
	206103	1	#6 Cylinder
	206106	1	#4 Cylinder
	206103	1	#1 Cylinder
36	206102	1	Lead, Low Tension**
37	106	1	Shield, Coil**

*Check Governor nameplate and order components from your nearest Pierce Govemor Co. dealer.

**Thale Engineering Corp.
254 West Colorado Blvd.
Pasadena 8, California

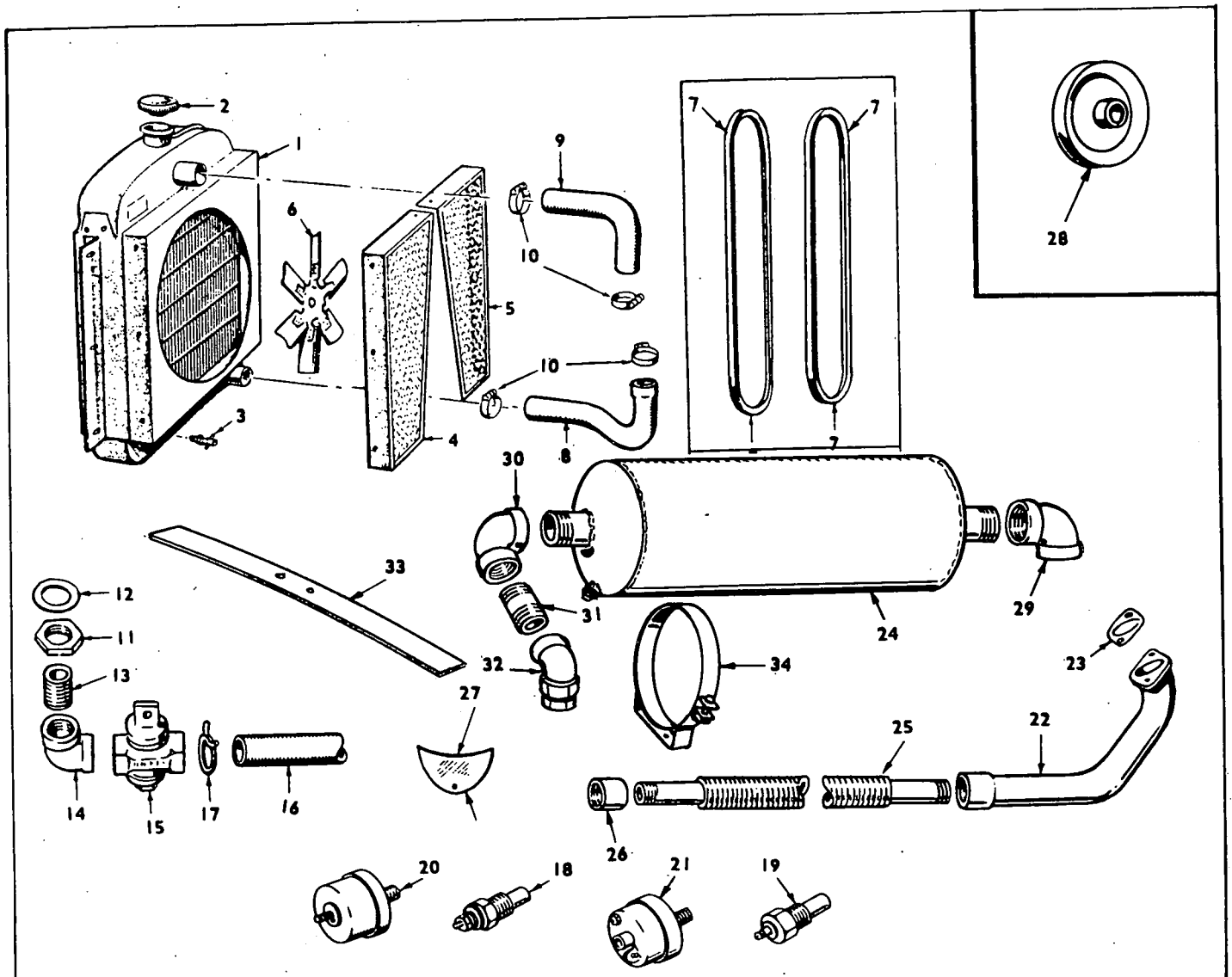


FIG. 7-14. COOLING, OIL DRAIN, AND EXHAUST GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
1	RADIATOR 130D660	1	
2	130B449	1	Cap, Radiator
3	504-28	1	Valve, Rad. Drain
4	130C352	1	Guard, Fan (R.H.)
5	130C351	1	Guard, Fan (L.H.)
6	130C355	1	Blade, Fan
7	BELT		
	511P75	1	Fan
	511P74	1	Water Pump
8	503P490	1	Hose, Lower - Rad.
9	503P491	1	Hose, Upper - Rad.
10	503-365	4	Clamp, Hose
11	145A67	1	Nut, Lock - Oil Drain
12	526A164	1	Washer, Flat - Oil Drain
13	505-101	3	Nipple, Pipe - Oil Drain
14	505-39	1	Elbow, Oil Drain
15	504-30	1	Valve, Oil Drain
16	503-484	1	Hose, Oil Drain
17	503-131	1	Clamp, Hose - Oil Drain

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
18	193A104	1	Element, Water Temp.
19	309A178	1	Switch, Water Hi-Temp.
20	193A108	1	Element, Oil Pressure
21	309B64	1	Switch, Low Oil Pressure
22	155B921	1	Tube, Exhaust
23	155A923	1	Gasket, Exhaust Tube
24	155A189	1	Muffler
25	155A942	1	Tube, Exh. Flexible
26	505-32	1	Coupling, Exh. Tube
27	191A581	1	Cover, Starter Hole
28	512A51	1	Pulley, Water Pump
29	505-44	1	Elbow (2-1/2" x 90°)
30	505-260	1	Elbow, Reducing (2-1/2" to 1-1/2")
31	505-220	1	Nipple (1-1/2" x 1-3/4")
32	505-643	1	Elbow, Union (1-1/2")
33	155B789	2	Support, Muffler
34	140B649	2	Band, Mounting

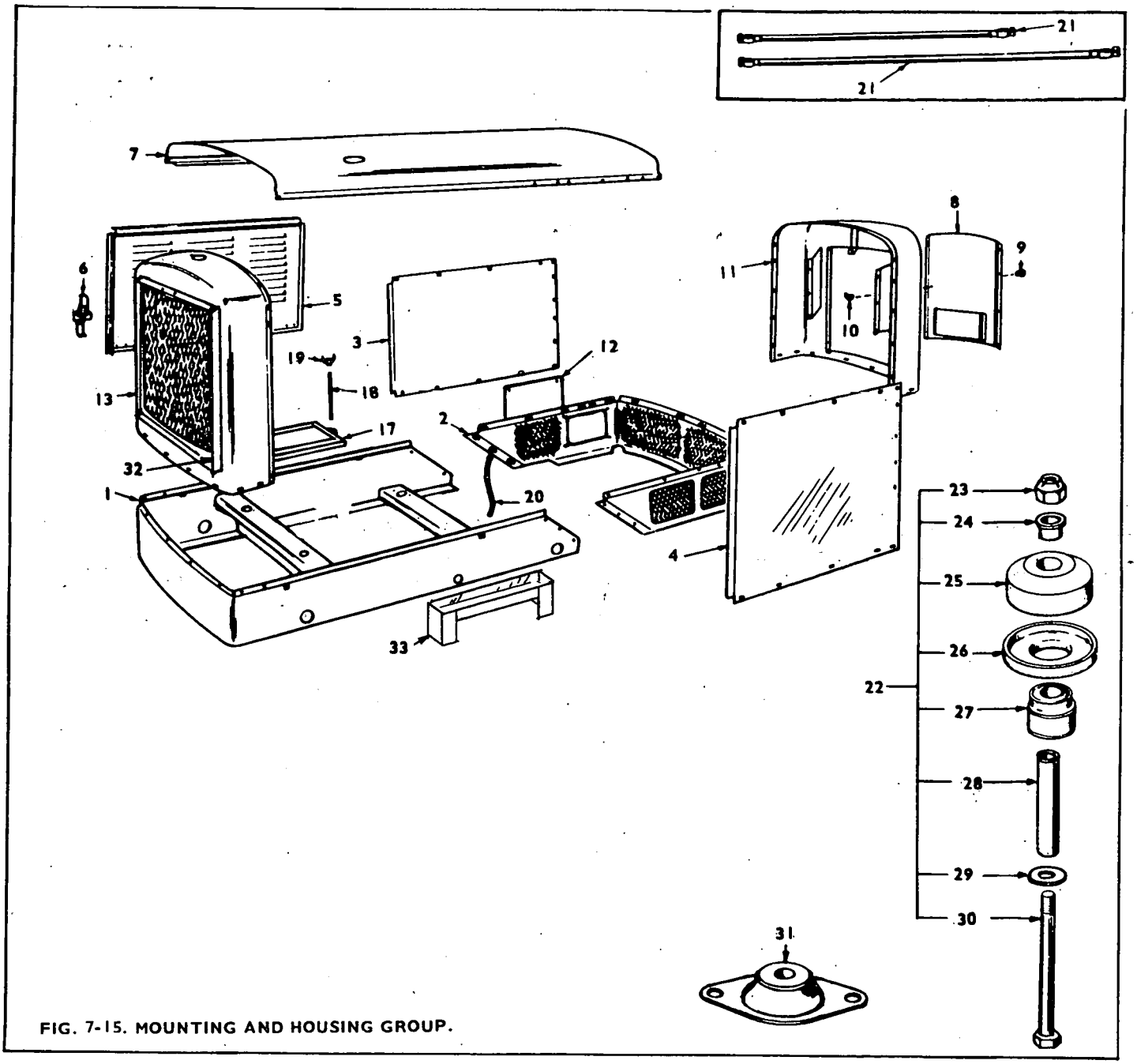


FIG. 7-15. MOUNTING AND HOUSING GROUP.

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
1	403D749	1	Chassis, Front
2	403D697	1	Chassis, Rear (Housed)
3	405C1378	1	Panel, Left Side (Housed)
4	405C1379	1	Panel, Right Side (Housed)
5	405C1383	2	Panel, Door Side (Housed)
6	406A105	4	Clamp, Door (Housed)
7	405D1380	1	Panel, Top (Housed)
8	405B932	1	Panel, Rear Door (Housed)
9	406-2	1	Knob, Door (Housed)
10	406A88	1	Catch, Door (Housed)
11	405D1381	1	Panel, Rear (Housed)
12	403A373	1	Panel, Chassis (Housed)
13	405D1382	1	Panel, Front
14	403C774	1	Skid (not illustrated)
15	403C775	1	Bracket, Battery Charger (Not illustrated)
17	416B338	1	Frame, Battery Hold-down
18	520A663	2	Stud, Battery Hold-down
19	865-7	2	Wing Nut, Battery Hold-down
20	336A476	1	Cable, Ground
21	CABLE, BATTERY		
	416A49	1	14" Long
	416A18	1	17" Long
22	402A338	1	Mounting Assembly, Engine End - Includes Parts Marked*
23	870-68	2	*Nut, Huglock (7/16-20)
24	402A337	2	*Spacer, Engine Mount
25	402A10	2	*Mount, Rubber (Upper)
26	402A12	2	*Cup, Metal
27	402A11	2	*Mount, Rubber (Lower)
28	403A633	2	*Spacer, Mount
29	526-141	2	*Washer, Flat
30	801-81	2	*Cap Screw, Hex
31	402A209	2	Mount, Vibration, Gen. End
32	405B1054	1	Flange, Air Duct
33	416B551	1	Box, Battery

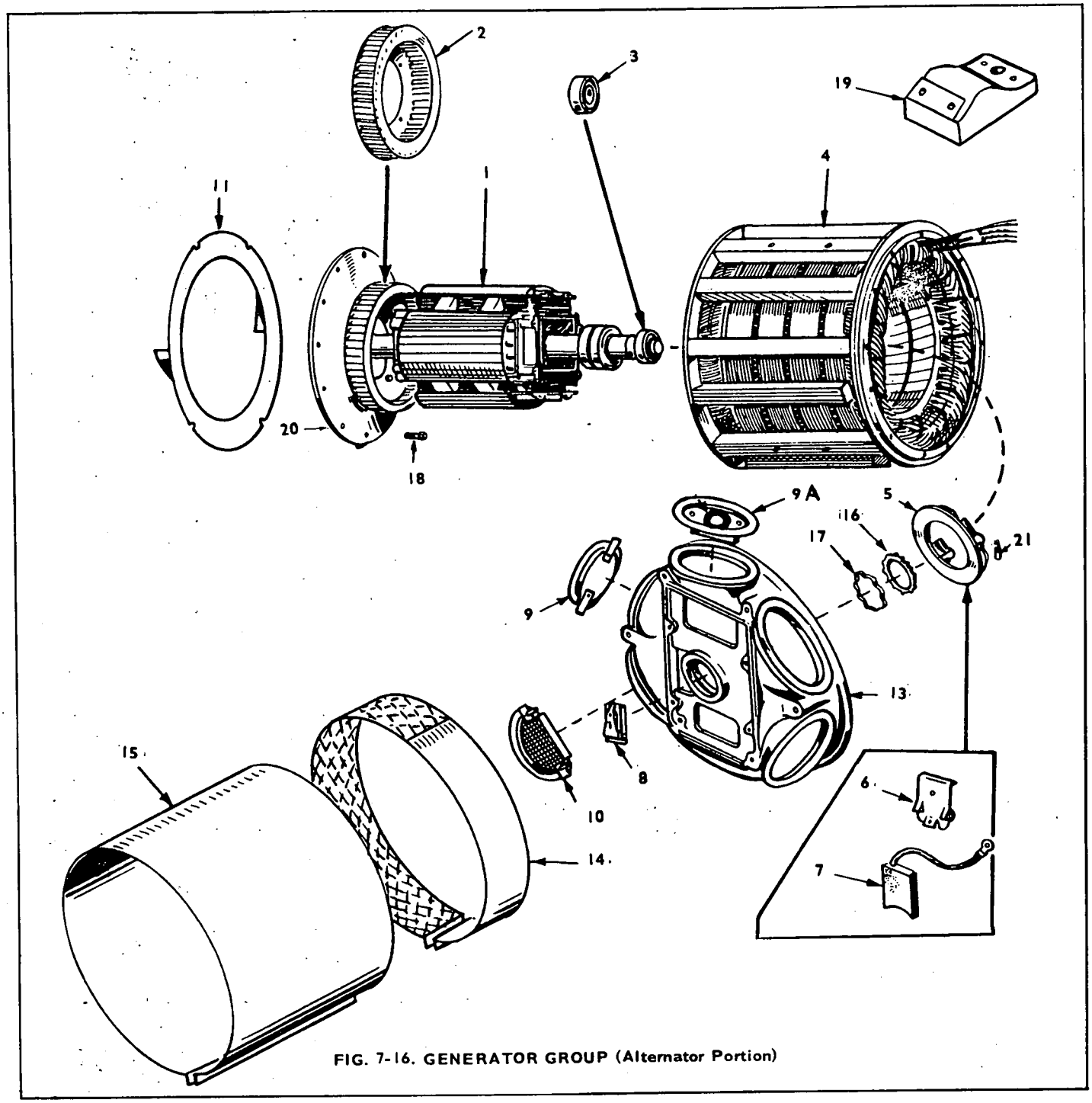


FIG. 7-16. GENERATOR GROUP (Alternator Portion)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
1	201A1364	1	Rotor Assy., Wound - Includes Brg., Blower & Drive Assy.
2	205B68	1	Blower
3	510P63	1	Bearing
4	220-946	1	Stator Assy., Wound
5	212C248	1	Rig Assy., Brush
6	212B1105	4	Spring, Brush
7	214A56	4	Brush
8	150A717	1	Switch Assy., Overspeed
9	232B1254	2	Cover, End Bell, Open. (Plain)
9A	COVER, END BELL OPENINGS (W/Lead Hole) - INCLUDES GROMMET		
	234C226	1	1-Phase Plants
10	232B1253	2	Cover, End Bell Openings (Screened)
11	234C175	1	Scroll, Air
13	211E131	1	Bell, End
14	234C174	1	Band, Gen. - Front (Narrow)
15	BAND, GENERATOR - REAR (Wide)		
	234C178	1	3-Phase Plants, Key 2
16	232A1186	1	Holder, Brg. (Anti-Rotation)
17	232A1187	1	Spring, Brg. Holder
18	815A292	6	Bolt, Shoulder (5/16-18")
19	232C1556	2	Pad, Generator Mtg.
20	232B1820	1	Disc. Drive
21	312A153	1	Condenser, suppression 0.5 MFD

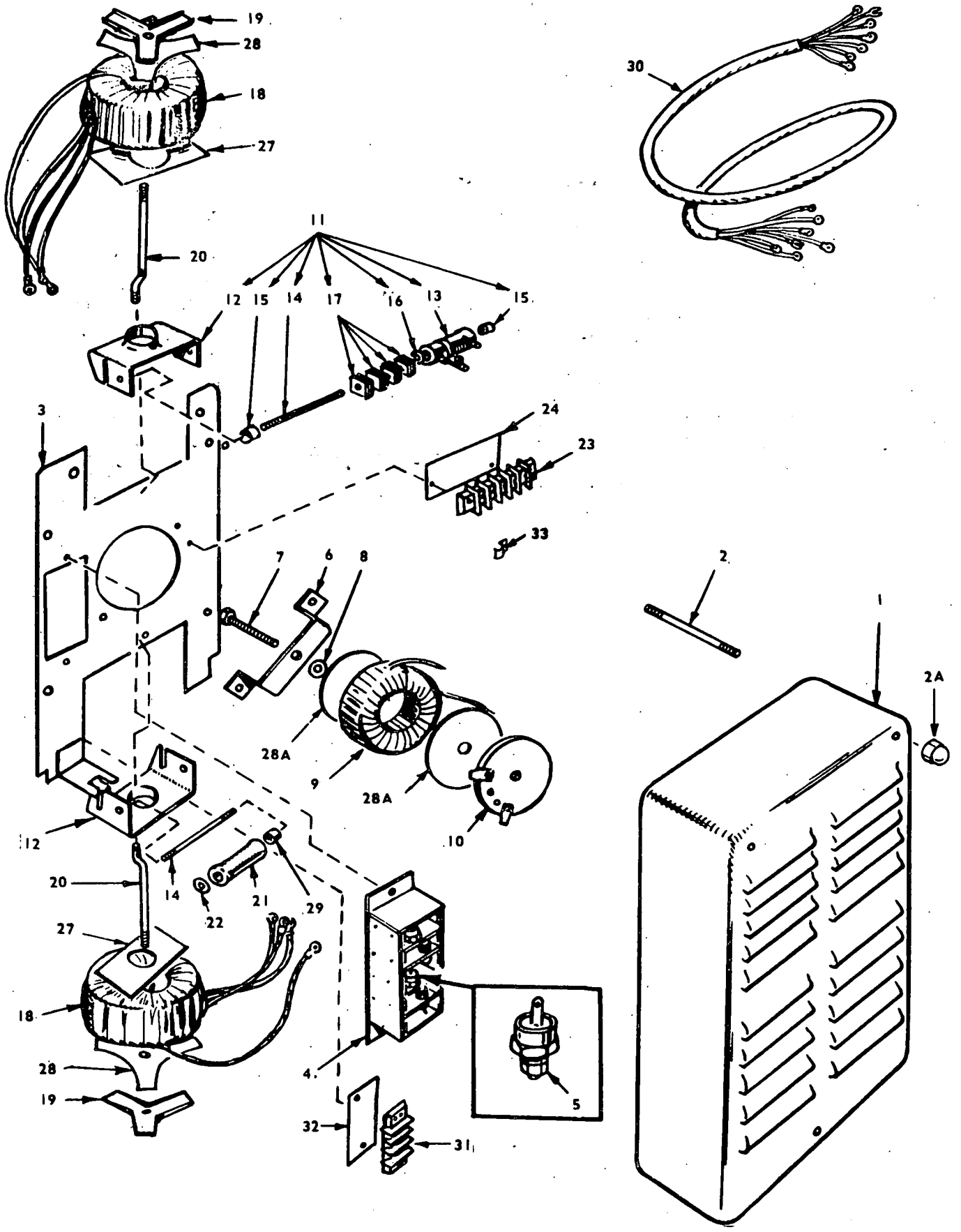


FIG. 7-17. GENERATOR GROUP (Exciter Portion).

REF. NO.	QTY. USED	PART DESCRIPTIONS	PART NUMBER 102SX144 B
	1	Exciter Complete (Less Cover)	209-57
1	1	Cover, Exciter	234D106
2	3	Stud, Exciter Cover Mtg.	520A575
2A	3	Nut, Exciter Cover Mtg.	866-1
3	1	Panel Only, Exciter	234D105
4	1	Rectifier Assy., Power	305B212
5	4	Rectifier Only, Power (Field)	305P244
6	1	Bracket Only, Overspeed Switch	150B733
7	1	Stud & Contact Point Assy., Voltage Control Reactor Mtg.	150A772
8	2	Fibre Washer (1/4 x 3/4 x 1/16")	508-18
8	1	Fibre Washer (1/4 x 3/8 x 1/32")	508-29
9	1	Reactor, Voltage Control	315A182
10	1	Block, Terminal – Volt. Cont. Reactor	332A687
11	1	Rectifier Assy., Includes Parts Marked*	305B202
12	2	Bracket, Gate Reactor Mtg. (1 Only in 305B202)	234B60
13	1	Resistor, Control, Adj. (150-Ohm, 25-Watt)	304A5
14	2	Stud, Res. & Rect. Mtg. (1 Only in 305B202)	520A579
15	2	Spacer, Res. & Rect. to Stud	232A1473
16	2	Washer, Adj. Resistor Centering	304A14
17	4	Rectifier, Reg. Control	305P208
18	2	Reactor, Gate	315A63
19	2	Retainer, Gate Reactor	234B62
20	2	Stud, Gate Reactor Mtg.	232A1361
21	1	Resistor, Fixed (200-Ohm, 50-Watt)	304A21
22	2	Washer, Fixed Res. Centering	304A15
23	1	Block, Term. (5-Place)	332A604
24	1	Strip, Blk. Marker (5-Place)	332A678
27	2	Insulation, Gate Reactor to Mtg. Bracket	232A1547
28	2	Insulation, Gate Reactor to Retainer	232A1546
28A	2	Insulation, Volt. Cont. Reactor Mtg.	232A1548
29	2	Spacer, Fixed Resistor to Stud	232A1474
30	1	Wiring Harness	338B237
31	1	Block, Term. (4-Place)	332A537
32	1	Strip, Marker	332A686
33	1	Bracket, feed-thru Cond. Mtg.	301A1935

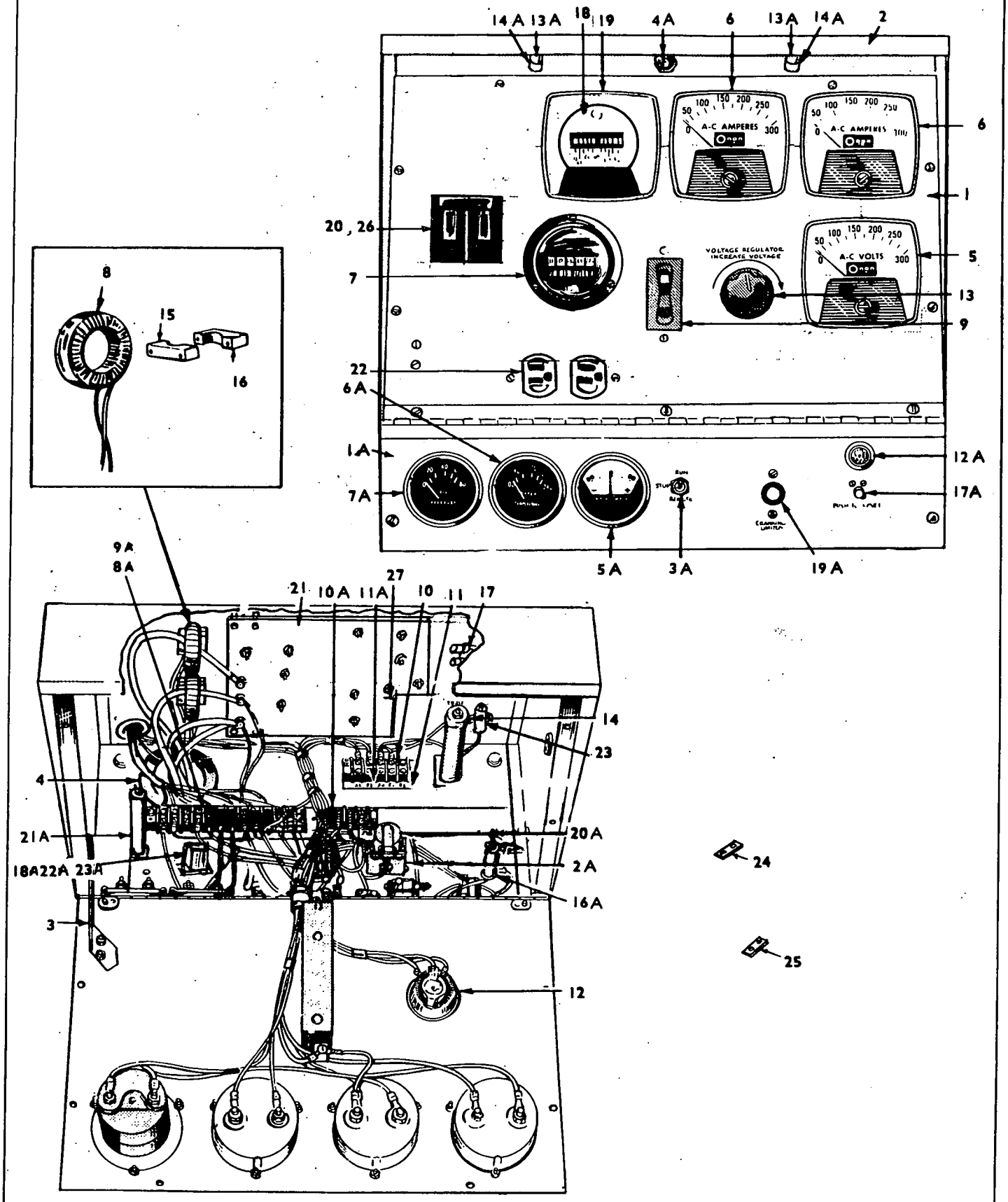


FIG. 7-18. ENGINE, AC OUTPUT, CONTROL GROUP

CONTROL GROUP (AC Output Portion)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
1	PANEL ONLY - UPPER CONTROL		
	301C2447	1	1-Phase - Housed Plants
2	301B2471	1	Box Only, Control
3	301A1914	1	Bracket, Panel Stop
4	508-63	1	Grommet (For 2-3/4" Hole)
5	VOLTMETER, AC		
	302P421	1	Voltmeter Scale 0-300
6	AMMETER, AC		
	302P411	2	Ammeter Scale 0-200
7	METER, RUNNING TIME		
			60-Cycle Plants
	302P189	1	120, 1-Ph., 120/240 V, 1-Ph.
8	TRANSFORMER, CURRENT, HOUSED PLANTS, (Check Transformer Nameplate, Select According to Rating)		
	302B106	2	Nameplate Ratio 200/5 (Use with 0-200 AC Ammeter)
9	BREAKER, CIRCUIT		
	320B2	1	15-Amp
10	332A604	1	Block, Term. (5-Place)
11	STRIP, TERMINAL BLOCK MARKER		
	332A689	1	Marked 32, 33, 34, E1, E2
12	303-97	1	Rheostat, Volt. Reg.
13	303-32	1	Knob, Rheostat
14	304A479	1	Resistor, Volt. Reg.
15	302A235	2	Clamp, Current Trans. Mtg., Inside Half
16	302A236	2	Clamp, Current Trans. Mtg., Outside Half
17	CONDENSER, OUTPUT TERMINAL SUPPRESSION		
	312A147	2	.25 mfd. 500 vac.
18	302P560	1	Meter, Frequency
19	302B448	1	Plate, Freq. Meter Face
20	320P239	1	Breaker, Circuit (2 pd.)
21	332C882	1	Block, Terminal
22	323P184	1	Receptacle, Duplex
23	312P95	1	Condenser, 1.9 MFD, 130 VAC (E1 term.)
24	332A883	5	Jumper, Copper (2-7/8" Long)
25	332A884	1	Jumper, Copper (2-3/8" Long)
26	301B2470	1	Bracket, Breaker Mounting
27	301A648	1	Plate, Ground

CONTROL GROUP (Engine Instruments Portion)

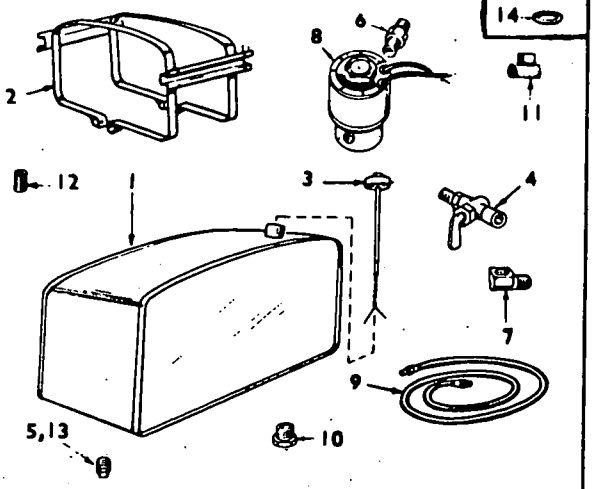
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
1A	301C2124	1	Panel Only, Lower Cont.
2A	301A1685	1	Bracket, Time Delay Relay Mounting
3A	308P138	1	Switch (Run-Stop-Remote)
4A	308-2	1	Switch, Panel Light
5A	302A61	1	Ammeter, Charge (30-0-30)
6A	193B106	1	Gage, Water Temp.
7A	193B107	1	Gage, Oil Pressure
8A	332A795	1	Block, Term. (16-Place)
9A	332A862	1	Strip, Marker (4 through 19)
10A	332A611	1	Block, Term. (3-Place)
11A	332A762	1	Strip, Marker (Remote, B+, Ground)
12A	322P69	4	Receptacle Assy., Pilot Light
13A	322P72	2	Receptacle, Panel Light
14A	322-4	6	Bulb, (2) Panel (4) Pilot
16A	304A192	1	Resistor, Fixed (3-Ohm, 10-W)
17A	307A655	3	Relay, Emergency Latch
18A	307P819	1	Relay, Start-Disconnect
19A	320A259	1	Limiter, Cranking
20A	307A388	1	Relay, Time Delay, Low Oil Pressure Switch
21A	304A45	1	Resistor, Fixed (4-Ohm, 50-W)
22A	307P778	1	Spring, Relay Hold-down
23A	323P52	1	Socket, Relay

SPECIAL GROUP (Not Illustrated)

1	310C79	1	Remote Control
2	305P412	1	Charger, Battery

FIG. 7-19. MOUNTED FUEL TANK GROUP.

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
1	159D490	1	Tank, Fuel
2	159D489	1	Strap, Fuel Tank
3	159B512	1	Cap and Indicator
4	504-4	1	Valve, Shut-off
5	505-57	1	Plug, pipe 1/8"
6	502-82	1	Nipple, Hex
7	502-2	1	Elbow, Inv. Male
8	307P565	1	Valve, Solenoid-Fuel
9	501B10	1	Line, Flex Fuel (42")
10	502-3	1	Connector, Inv. Male
11	505-59	1	Tee, 1/8"
12	505-98	1	Nipple, 1/8 x 3/4"
13	505-274	1	Plug, 1/8"
14	159P751	1	Gasket, Cap & Indicator



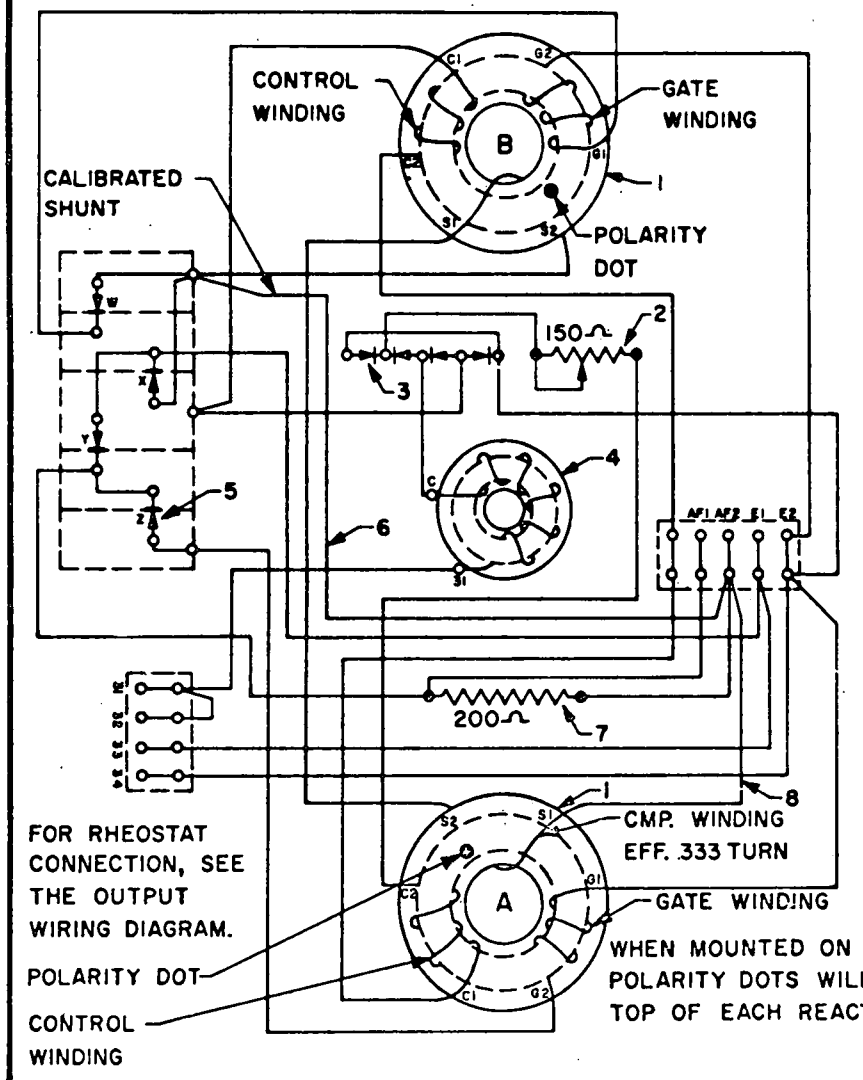
TYPICAL WIRING DIAGRAMS

The wiring diagrams shown on the following pages are typical for standard engines only. They apply only to models with Onan factory mounted controls.

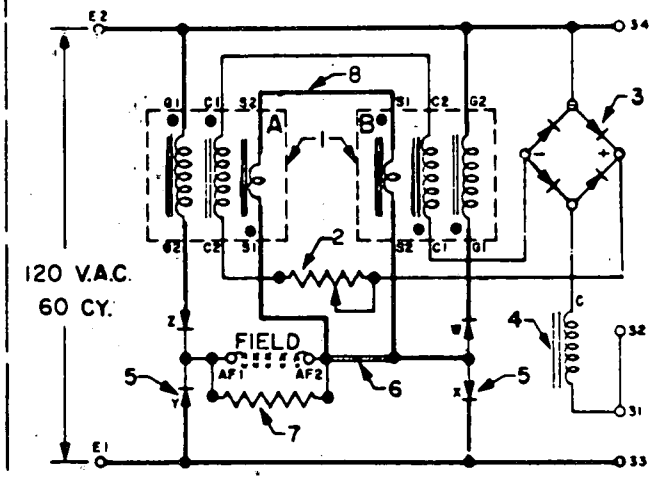
If you need a wiring diagram for a special engine with fabricator's controls and the diagrams shown here are not sufficient, request a wiring diagram from the equipment manufacturer.

625A257

PICTORIAL



SCHEMATIC



ITEM	QTY	DESCRIPTION
8	1	NO. 14 WIRE, 27" LG.
7	1	RESISTOR-DAMPING
6	1	NO. 14 WIRE, 13½" LG.
5	4	RECTIFIER-FIELD
4	1	REACTOR-CONTROL
3	4	RECTIFIER-CONTROL
2	1	RESISTOR-STABILIZING
1	2	REACTOR-GATE

PARTS LIST

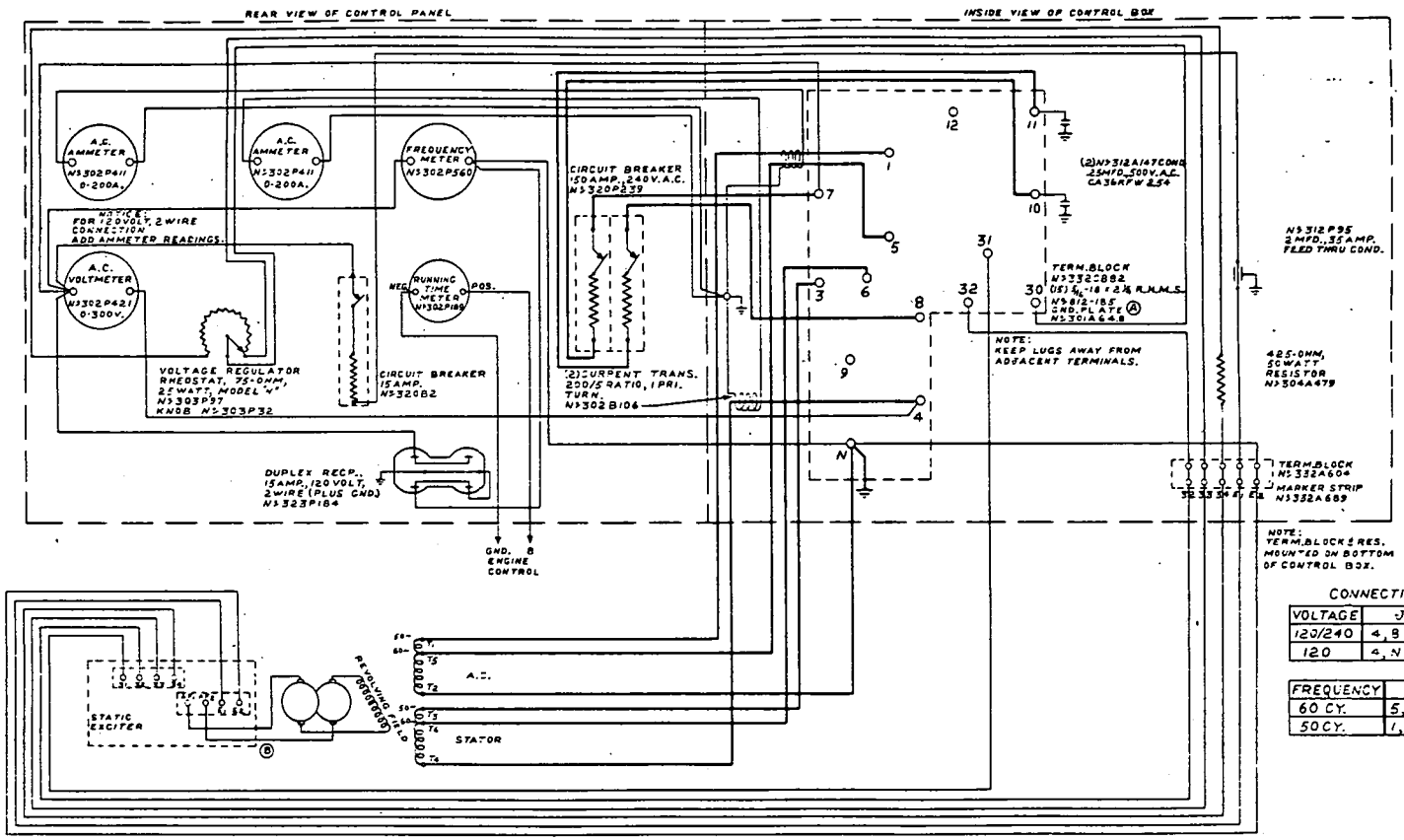
NAME: STATIC EXCITER WIRING DIAGRAM 120 V.A.C. 60 CY.

MODEL: 102SXINIB

DWG. NO.: 625A257

612D2610

25 EK-23R/5178A



Note: 24V
1–Phase:
Remove ground plate from behind "N" stud on terminal block.

Disconnect circuit to duplex receptacle.

Ground one side of 240V. circuit.

CONNECTION TABLES

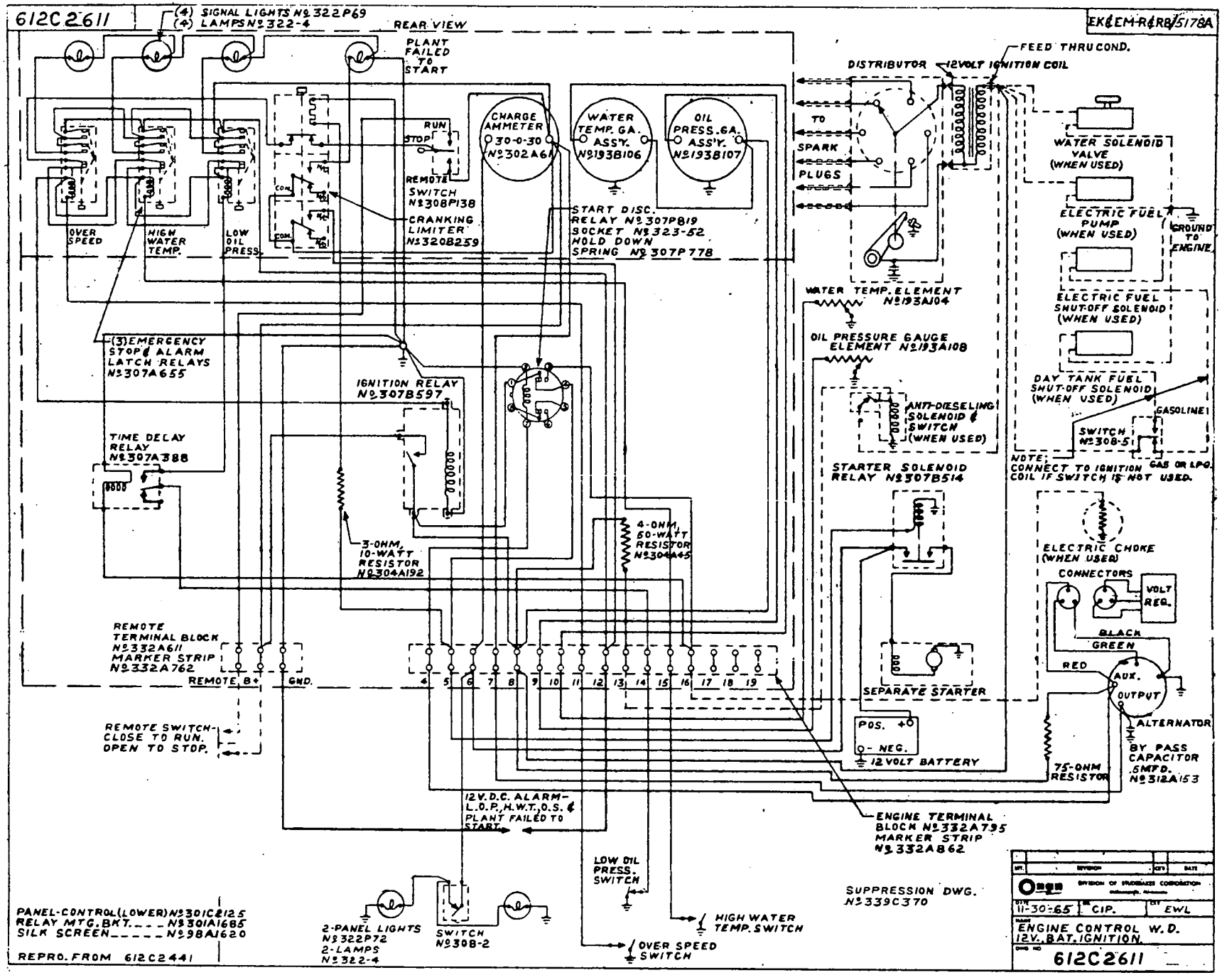
VOLTAGE	JUMPER			LOAD
120/240	4, 8	9, N	11, 12	10, 11, N
120	4, N	8, 9	10, 11	10, N.

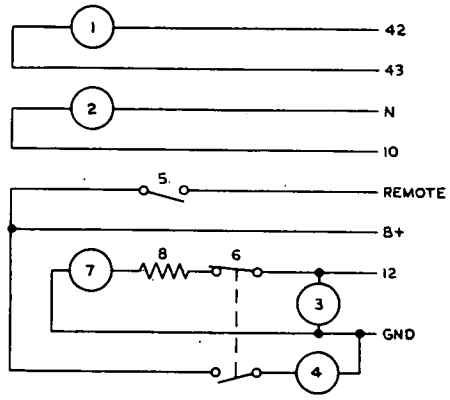
FREQUENCY	JUMPER		
60 CY.	5, 7	6, 9	30, 31
50 CY.	1, 7	3, 9	30, 32

MATL. NOTE;
PANEL-CONTROL (UPPER) N3 301C 2447
BOX-CONTROL N3 301B 8471 (MODIFY AS REQUIRED)
(2) CUR. TRANS. CLAMPS N3 302A 235
(2) CUR. TRANS. CLAMPS N3 302A 236
GROMMET N3 508 P63
BRACKET (PANEL STOP) N3 301A 914
METER FACE PLATE N3 302 B448
(5) JUMPERS (A.C.) N3 332A 883
(1) JUMPER (EX.) N3 332A 884
BKT.-CIRCUIT BREAKER MTG. N3 301B 2470
SILK SCREEN N3 98C 1856 (A.C. PANEL)
SILK SCREEN N3 98B 1739 (CONN. TAB. LES, INSIDE CONTROL BOX)
SILK SCREEN N3 98B 1740 (TERMINAL BLOCK NO'S.)
SUPPRESSION ILLUSTRATION, N3 339C 370
NOTE:
USE WITH ENGINE CONTROL W.D.

612D2610

B REV. (2) N3 312 A 83
A ADDED N3 332 A 883
Onan
11-30-61 C. O.
23R: 120/240 V.
612D2610


612C2611
(4) SIGNAL LIGHTS Nº 322P69
(4) LAMPS Nº 322-4
REAR VIEW
EK&EM-R&RB/5178A
PLANT FAILED TO START
RUN
STOP
REMOTE SWITCH Nº 308P138
CRANKING LIMITER Nº 3208259
CHARGE AMMETER 30-0-30 Nº 302A6
WATER TEMP. GA. ASSY. Nº 1938106
OIL PRESS. GA. ASS'Y. Nº 1938107
START DISC. RELAY Nº 307P819
SOCKET Nº 323-52
HOLD DOWN SPRING Nº 307P778
OVER SPEED
HIGH WATER TEMP.
LOW OIL PRESS.
DISTRIBUTOR
12VOLT IGNITION COIL
FEED THRU COND.
TO SPARK PLUGS
WATER SOLENOID VALVE (WHEN USED)
ELECTRIC FUEL PUMP (WHEN USED)
GROUND TO ENGINE
ELECTRIC FUEL SHUT-OFF SOLENOID (WHEN USED)
WATER TEMP. ELEMENT Nº 193A104
OIL PRESSURE GAUGE ELEMENT Nº 193A108
(3) EMERGENCY STOP & ALARM LATCH RELAYS Nº 307A655
IGNITION RELAY Nº 307B597
DAY TANK FUEL SHUT-OFF SOLENOID (WHEN USED)
ANTI-DIESELING SOLENOID & SWITCH (WHEN USED)
GASOLINE
SWITCH Nº 308-5
GAS OR LPG
NOTE: CONNECT TO IGNITION COIL IF SWITCH IS NOT USED.
TIME DELAY RELAY Nº 307A388
STARTER SOLENOID RELAY Nº 307B514
3-OHM, 10-WATT RESISTOR Nº 304A192
4-OHM, 50-WATT RESISTOR Nº 304A45
ELECTRIC CHOKE (WHEN USED)
CONNECTORS
VOLT REG.
BLACK
GREEN
RED
AUX. OUTPUT
ALTERNATOR
REMOTE TERMINAL BLOCK Nº 332A611
MARKER STRIP Nº 332A762
REMOTE B+
GND.
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
SEPARATE STARTER
POS. +
NEG. -
12 VOLT BATTERY
75-OHM RESISTOR
BY PASS CAPACITOR .5MFD. Nº 312A153
REMOTE SWITCH-CLOSE TO RUN. OPEN TO STOP.
12V. D.C. ALARM-L.O.P., H.W.T., O.S. & PLANT FAILED TO START
ENGINE TERMINAL BLOCK Nº 332A795
MARKER STRIP Nº 332A862
LOW OIL PRESS. SWITCH
SUPPRESSION DWG. Nº 3339C370
2-PANEL LIGHTS Nº 322P72
2-LAMPS Nº 322-4
SWITCH Nº 308-2
HIGH WATER TEMP. SWITCH
OVER SPEED SWITCH
PANEL-CONTROL (LOWER) Nº 301C2125
RELAY MTG. BKT. ---- Nº 301A1685
SILK SCREEN ---- Nº 98A1620
REPRO. FROM 612C2441
DIVISION OF STUDEBAKER CORPORATION
11-30-65
CIP.
EWL
ENGINE CONTROL W.D.
12V. BAT. IGNITION.
612C2611



ITEM	QTY	DESCRIPTION
9	2	TERMINAL BLOCKS
8	1	RESISTOR, 7.5 OHM, 10W.
7	1	ALARM BELL
6	1	SWITCH - ALARM DISCONNECT
5	1	SWITCH - RUN STOP
4	1	LAMP
3	1	LAMP
2	1	LAMP
1	1	LAMP

PARTS LIST

Onan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota

DATE	DR	ENGR	CKD	SC
3-9-66	PWH	EZ		1/2

NAME: REMOTE CONTROL

MODEL 25EK-23R
SPEC. 5178A
300-414

ITEM NO.

DWG NO. 310C79