OPERATORS MANUAL AND PARTS CATALOG

FOR

Onan®

ELECTRIC GENERATING PLANTS

Ch 1 Pages 1-29

WE

SERIES

ONAN
2515 UNIVERSITY AVE. S. E. · MINNEAPOLIS, MINNESOTA 55414
A DIVISION OF STUDEBAKER CORPORATION
IN CANADA: ONAN GENERATORS CANADA LTD., 233 CAMPBELL ROAD, GUELPH, ONTARIO
INTERNATIONAL DISTRICT OFFICE: EMPIRE STATE BLDG., 350-5TH AVE., RM. 2204, NEW YORK 10001

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We mean it.....

.....and this certificate with the Onan electric plant you purchased proves we mean it! When this plant left our factory in Minneapolis it took with it our sincere assurance that it will produce exactly as stated on its name-plate.

The name of ONAN is synonymous with satisfactory performance, certified performance.

GENERAL INFORMATION

This instruction book contains information for the proper installation, operation, and maintenance of your equipment. We suggest that this book be kept handy so that it can be referred to when necessary.

This equipment is the result of proven engineering design, highest quality materials, and expert workmanship. Thorough inspection and testing assures you that this equipment will perform as expected.

If you wish to contact your dealer or the factory regarding this equipment, be sure to supply the complete MODEL and SPEC. NO., and the full serial number of the equipment as shown on the nameplate. This information is necessary to identify the equipment among the many basic and special optional types manufactured.

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 other 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

IMPORTANT

RETURN WARRANTY CARD ATTACHED TO UNIT

TABLE OF CONTENTS

The Onan generating plant of the WE series consists of a Roiline (division of Waukesha) model H884 engine that supplies the motive power, a revolving field alternating current generator with a "static" exciter, and engine and electrical controls and instruments according to the individual model. The entire unit is mounted on a single skid base.

The electrical output characteristics of the plant vary according to the particular model, and are noted on the Onan nameplate attached to the unit. Standby service is understood to be of an intermittent nature, not exceeding a few hundred hours per year. The voltage and frequency regulation is within plus or minus 3%, between no load and full load conditions.

Each generating plant is given a complete running test under various load conditions and is carefully checked before leaving the factory. Inspect the plant closely for any damage which may have occurred in shipment. Any such damage must be corrected before putting the plant in operation. If it ever becomes necessary to contact a dealer or the factory regarding the generating plant, always refer to the complete Model and Spec. No. and the Serial number as given on the Onan nameplate. Refer to the engine nameplate when requesting basic engine information from its manufacturer.

ENGINE

The engine is a Roiline model H884 which is described in the Roiline operator's manual. The specific engine used may have variations due to the type of fuel used (gasoline, natural gas, etc.) type of cooling, or for other requirements specified by the plant purchaser. Basically, the engine is an 8-cylinder water cooled, spark ignition type. The cylinder bore is 5-3/8-inch, piston stroke 4-7/8-inches, 884-cubic inches displacement and compression ratio is 7.6 to 1. The engine is rated 235-horsepower at 1800 rpm operating on gasoline fuel. The standard oil capacity is 20 U.S. quarts (26 quarts including filters and lines). The standard radiator cooled capacity is 20 U.S. gallons. A 12-volt battery ignition system is used. Accessories installed on the engine, safety devices, engine indicating gauges, etc. vary according to purchaser options.

GENERATOR

The generator consists of a 4-pole revolving field type alternator, and a "static" type exciter. The alternating current is generated in the alternator stator, which is attached directly to the rear end of the engine. The alternator rotating field is attached to the engine flywheel, and so turns at engine speed. Thus the 60-cycle plant must operate at approximately 1800 rpm, and the 50-cycle plant at approximately 1500 rpm. The rotor is supported at the engine by the engine flywheel, and at the outer end by a large ball bearing fitted into the end frame.

GENERATOR (Cont.)

The exciter components are mounted inside a sheet metal enclosure attached to the end frame of the alternator. The exciter supplies direct current to the field of the alternator. The design of the exciter provides for almost constant ac output over a wide range of load conditions, and provides for maintaining voltage when the generator is called upon to start large electric motors. The static exciter is considerably smaller and lighter than a conventional dc generator type, and eliminates the necessity of an external voltage regulator through the use of a magnetic amplifier.

CONTROLS

The plant control box is mounted on the generator. It contains components for starting, controlling, and stopping the plant. Instruments to indicate engine and generator performance are flush mounted on the operator's panel of the control.

The engine is started through a run-stop switch, a fuel solenoid relay, 2-cycle cranking relays, a pilot relay, a series-parallel solenoid, and a starter motor. Cranking alternates in 10-second cranking cycle and 5-second rest cycle until the engine starts or the cranking limiter opens. A start disconnect relay stops the cranking when the engine starts.

Engine performance is indicated by a water temperature gauge, a low oil pressure gauge, and a battery charge ammeter. The engine is protected from high water temperature, low oil pressure, and overspeed, all operating through an emergency latch relay. A latched relay is indicated by a red light on the control panel and by a protruding button which has to be manually reset. There is a terminal block in the control for connecting wires to a remote control switch. Other controls are used in conjunction with accessories specified by the purchaser.

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. EXTENSIVE GENERATOR DAMAGE WILL RESULT FROM OVERSPEED.

Installation of the generating plant involves its location, connection of fuel source, connection of exhaust line, starting battery installation, connection to load wiring, and (some models) connection to source of cooling water. Each installation presents its individual problems - use these instructions as a general guide. Typical installations are shown.

LOCATION. - In the average installation, the location has been pre-selected, but local codes or other regulations may determine some details. For standby service a minimum ambient temperature is usually required. The location should be dry, well ventilated, and reasonably dust free. Normally, the plant should be located near the main line switch. Provide sufficient clearance (24 inches recommended) on all sides for convenience in servicing the plant.

MOUNTING. - Refer to the separate installation outline drawing. The plant is mounted on a rigid skid base which provides sufficient support. If desired, the entire plant and base can be mounted on raised concrete or heavy timber pedestals to provide clearance for future oil pan removal. Tie down bolts can be used as desired. If additional freedom from vibration is required, optional vibration dampers are available.

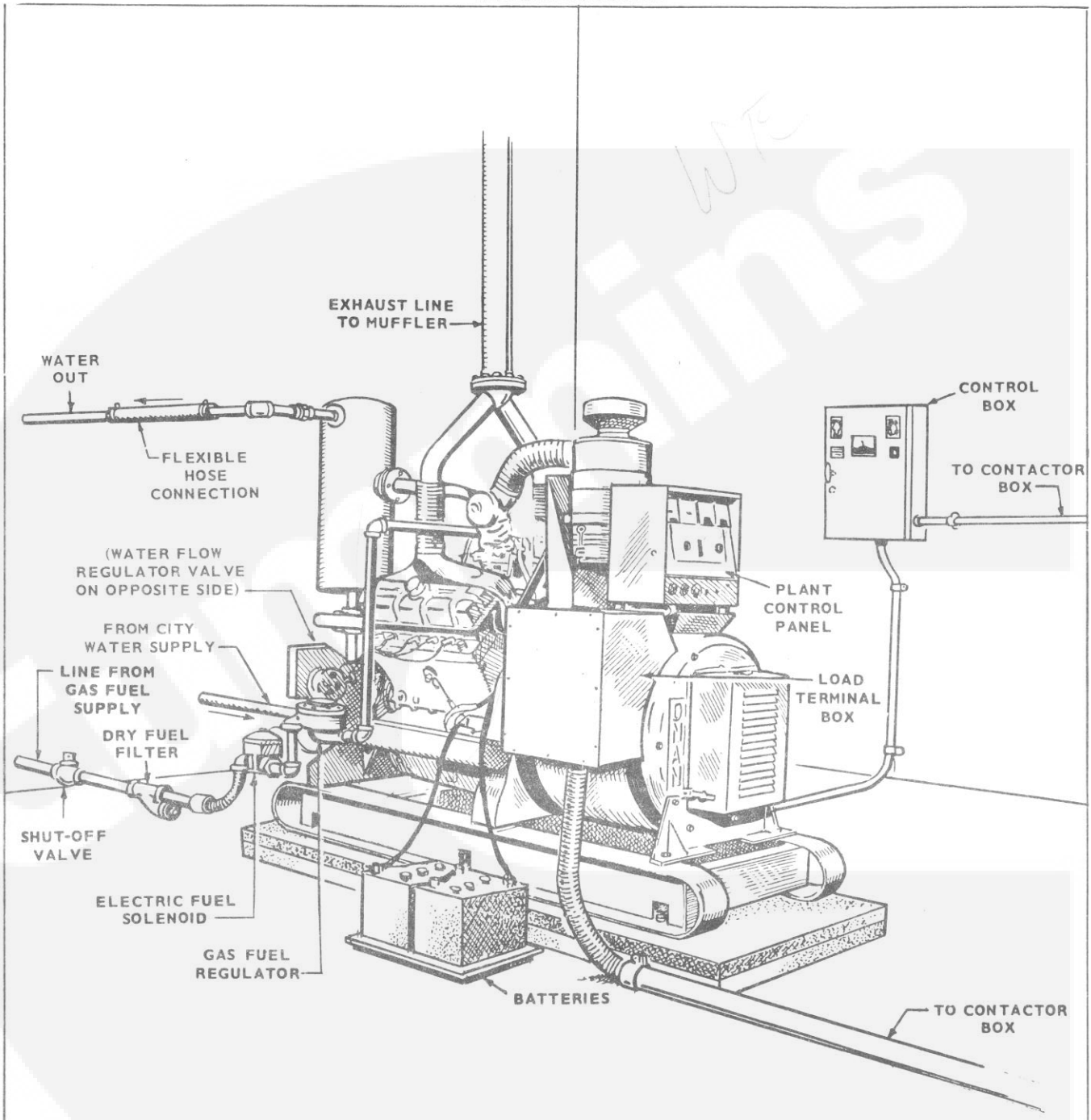
VENTILATION AND COOLING. - For radiator cooled units, proper ventilation is of vital importance. An air volume of approximately 14, 000-cubic feet of air per minute is needed. If the installation is made in a small room or special compartment, it may be necessary to construct a duct for exhausting heated air from the front of the radiator to an outside wall opening. The pusher type fan forces the heated air out through the front of the radiator. Provide a separate opening, at least equal in size to the radiator area, for entry of fresh cooling air.

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

"CITY WATER" COOLING. - Units designed for "city water" cooling use a changing flow of cooling water. Two basic variations are optional. Refer to the installation drawing supplied for inlet and outlet locations, pipe size, etc.

1. STAND PIPE. - The standpipe system uses a mixing or tempering tank. The cooling water that circulates through the engine mixes with a source of cool "raw" water. The water supply must be free of scale-forming lime or similar impurities.

An electric solenoid valve is connected to open the water flow as the plant starts,



TYPICAL INSTALLATION
CITY WATER COOLING----NATURAL GAS FUEL

and shuts it off as the plant stops. However, a rate-of-flow hand valve is optional for installation in the water supply line. Use a length of flexible hose to connect the supply line to the plant water inlet. Pipe the water outlet flow to a convenient drain point.

If the rate of water flow is not automatically controlled, the hand valve installed in the inlet pipe should be adjusted, during the initial run, for proper cooling without excessive water usage. Refer to the table for the approximate minimum water flow required at the water temperatures and loads listed.

MINIMUM WATER FLOW, STAND PIPE COOLING

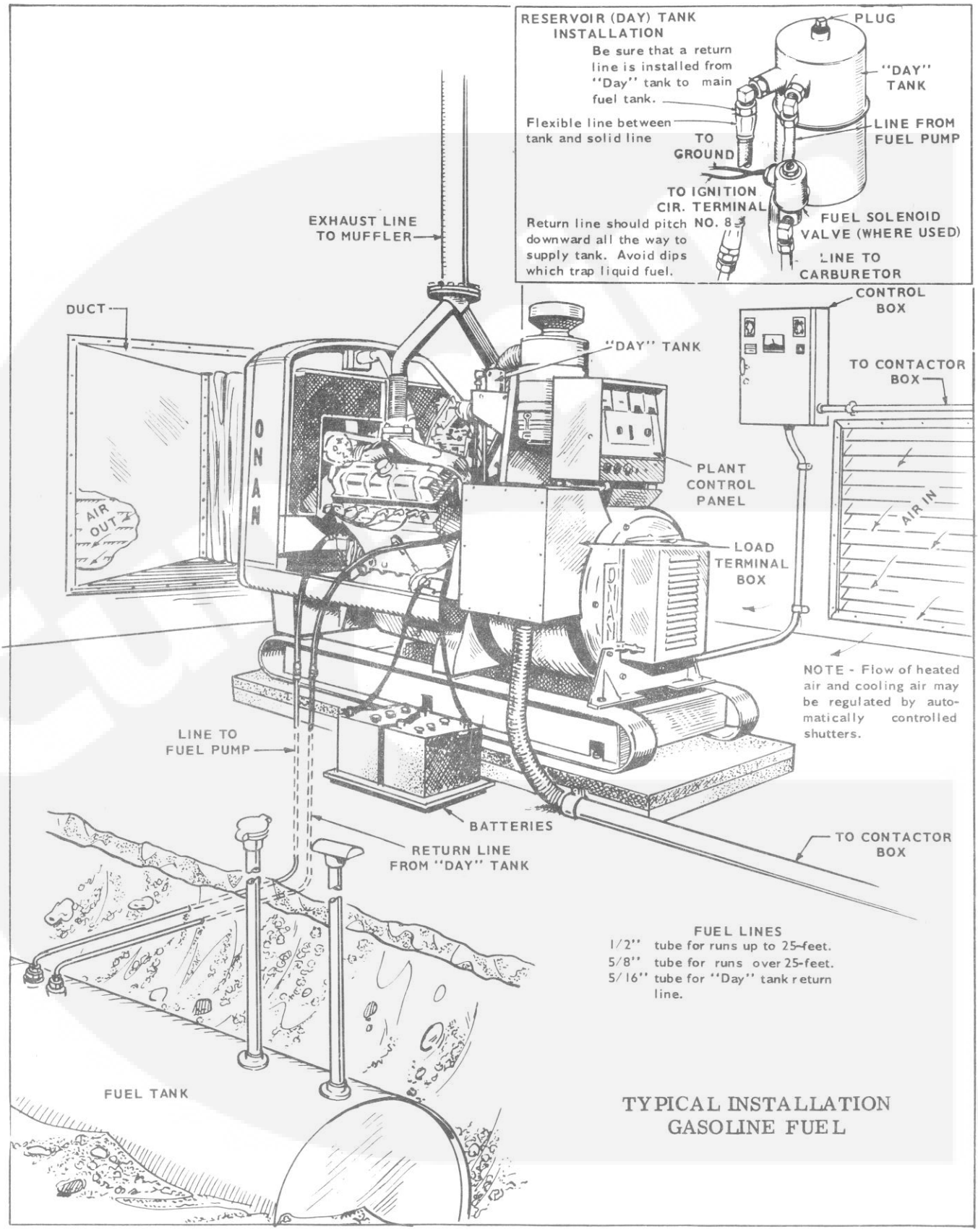
ELECT. LOAD	WATER TEMP (^{O}F.)	MIN. FLOW-GAL/MIN.
140 and 150 KW	40	9
	60	10
	80	13

2. HEAT EXCHANGER. - The heat exchanger installation provides for a "closed" engine cooling system. The engine coolant circulates through a tubed chamber, keeping it separate from the cool "raw" water. The coolant chamber must be filled for operation, as for a radiator cooled plant. An electric solenoid valve is connected in the "raw" water line to open the water flow as the plant starts, and to shut it off as the plant stops. A rate-of-flow hand valve is usually provided for installation in the supply line. Use a length of flexible hose to connect the supply line to the plant water inlet. Pipe the water outlet flow to a convenient drain point. The hand valve is adjusted during the initial run for proper rate-of-flow to assure proper cooling without excessive water usage. The table shows the approximate water flow necessary for proper cooling at the loads and water temperatures listed. Service the same as a radiator.

MINIMUM WATER FLOW, HEAT EXCHANGER COOLING

ELECT. LOAD	WATER TEMP (^{O}F.)	MIN. FLOW-GAL/MIN.
140 and 150 KW	40	30
	60	43
	80	136*

* For application at 80^{O} water for heat exchanger, consult factor for proper selection of heat exchanger.



TYPICAL INSTALLATION
GASOLINE FUEL

FUEL CONNECTION. - The plant may be equipped to operate on gasoline only, natural gas only, or both. Special heat exchanger equipment is provided on LPG burning models.

Natural Gas. - The gas flow regulator mounted on the plant is designed for a line pressure of 7 to 10-inch water column (max. 6-oz. per sq. in.). If the line pressure is excessive, install a suitable pressure reducing regulator. Be sure all local regulations are complied with: electric solenoid shut-off valve (usually installed at the factory), hand shut-off valve at the fuel source, supply line filter, etc. Use a short length of approved flexible connection between the supply pipe and the plant regulator inlet.

Gasoline Fuel. - Use 1/2-inch size tubing to connect the engine fuel pump inlet to an approved fuel tank installation. If the plant is equipped with the 1-quart "DAY" reservoir tank above the carburetor, a fuel return line (5/16-inch tube size) must be installed to return excess fuel to the supply tank. Be sure this line has a continuous drop to the supply tank, avoiding "traps".

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-feet, and horizontal distance not more than 50-feet. Use 1/2-inch tube size for up to 25-feet, 5/8-inch tube size up to 50-feet. Use a suitable adapter fitting to fit the 1/4-inch pipe thread inlet opening of the fuel pump.

Combination Gas-Gasoline. - The combination gas-gasoline plant is designed for normal operation on gas fuel, with provision for emergency operation on gasoline fuel. Follow the procedure as given for gas fuel connections. A reservoir tank is sometimes provided, so a fuel return line may be necessary as described for gasoline fuel.

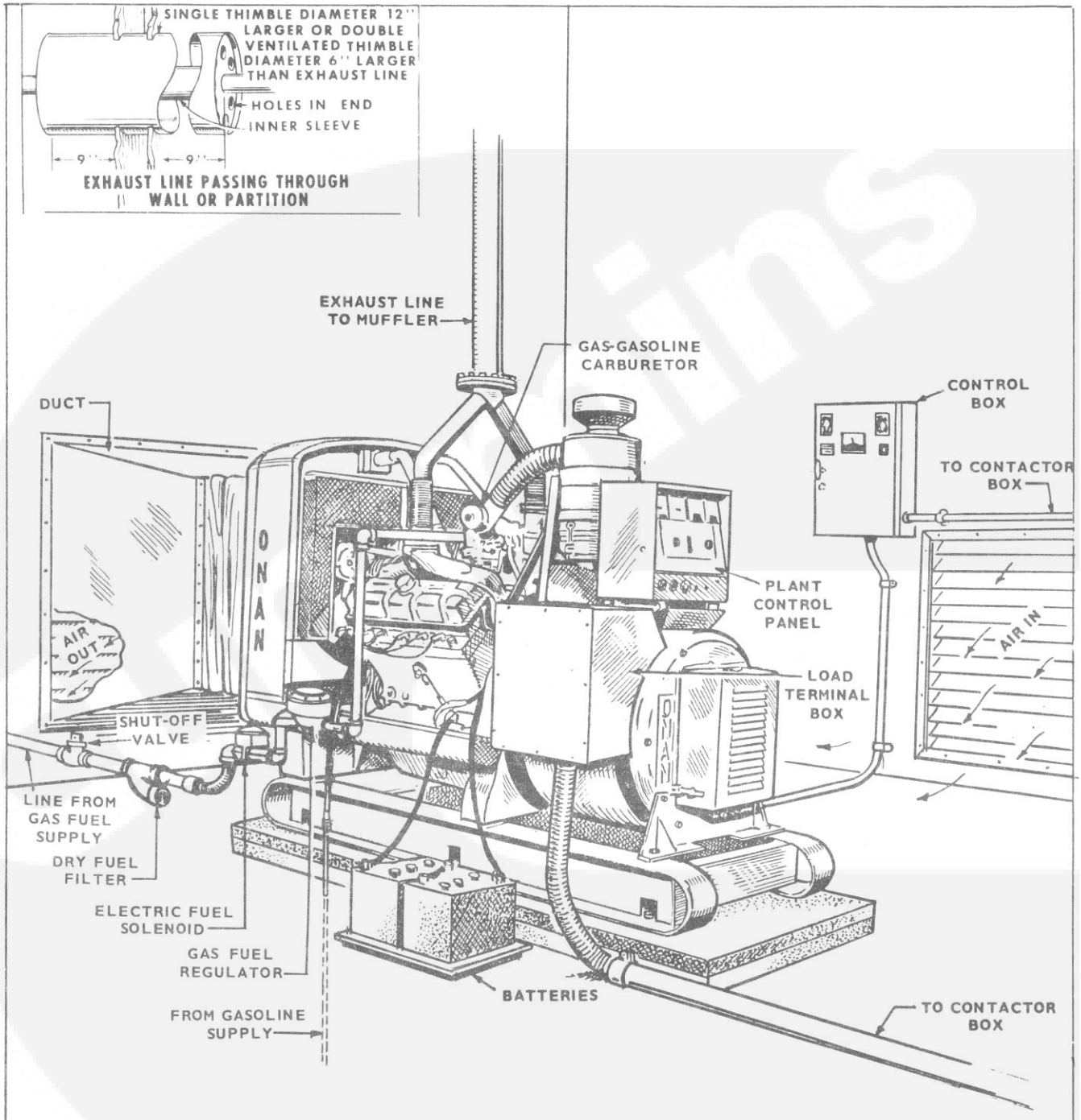
EXHAUST. - Exhaust gases from the engine are deadly poisonous and must be piped outside. Exhaust manifolds and connections vary according to the purchaser's option. The exhaust flange is for 5-inch pipe - never use smaller fittings. Use a flexible connection to the exhaust manifold.

The installation of the exhaust line will vary according to the individual requirements. However, a few basic rules must be observed.

1. Avoid sharp elbow turns. Sweeping elbows are recommended. Hold back pressure to a minimum -- not to exceed 1/2-psi.

   For lengthy lines, it may be necessary to increase the size in order to keep back pressure within the recommended limit.

2. If the exhaust line runs upward at any point, install a vapor trap at the low point, with provision for periodic draining.



TYPICAL INSTALLATION
GAS-GASOLINE FUEL

3. Walls and partitions through which exhaust pipes pass must be protected by a metal thimble having the dimensions shown in the typical installation illustration.

4. Install a suitable muffler. Various types are optional.

STARTING BATTERY. - Two 6-volt batteries, type 5D, are recommended. Connect the batteries in series (positive post of one battery to the negative post of the second battery) for 12-volt starting current. Connect the cable from the starter solenoid to the remaining battery positive post, and the grounded (negative) cable to the battery negative post.

NOTE

DO NOT USE POSITIVE GROUND IF SHOWN IN THE ENGINE INSTRUCTION MANUAL. REFER TO THE PLANT WIRING DIAGRAM FURNISHED.

For a standby installation, a trickle charger for keeping the starting batteries charged is recommended. Infrequent use of the plant in standby service may allow a battery to self discharge to the point where it may not be able to start the plant in an emergency. If an automatic load transfer switch assembly is used which does not include a trickle charge circuit, a separate charger should be used.

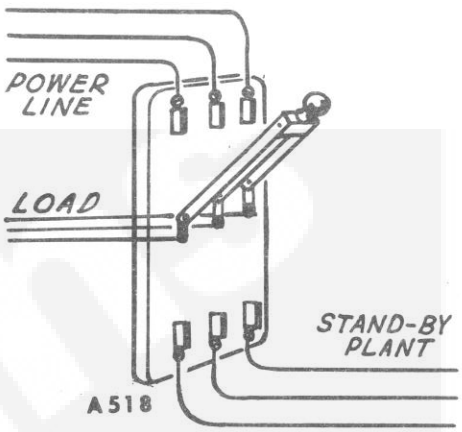
CONTROL CONNECTIONS. - Load transfer and automatic demand controls operate through the plant control to start, control, and stop the plant as demanded by the application. Wiring instructions are in the manuals supplied with these automatic controls. Connections at the remote control terminal block are shown on the plant control wiring diagram. The GND terminal is for a customer-supplied alarm at a remote location to warn of high water temperature, low oil pressure, and overspeed.

OPTIONAL SIGNALS. - Refer to the engine control wiring diagram furnished. Terminals are provided for connection of a signal light or alarm to indicate an emergency stop, or for failure to start automatically. Such signals, etc. must be rated for 12-volt dc service.

LOAD CONNECTIONS. - Be sure wiring meets requirements of electrical codes in effect at the installation site. Many local regulations require that wiring connections to the plant be made by a licensed electrician, and that the installation be inspected and approved before operation.

If the plant is installed for standby service, a double throw line switch of the proper capacity rating must always be used. This switch (either manual or automatic

type) must be connected so that there is no possibility for the generator current to be fed into the normal source, nor for the normal source and generator current to be connected at the same time.



Instructions for connecting an automatic switch (line transfer control) are supplied with such equipment. It is assumed that personnel connecting the generator and any auxiliary equipment are fully qualified.

Make load wire connections according to the plant facilities provided. Some plants have large studs to which the load wires can be directly connected. Other plants are designed to be "reconnectible" for different output voltage (see CAUTION) and have groups of loose, unterminated leads. Each individual lead is labeled, T1 through T12. Leads are formed into groups, and some are further identified for load wire connections as indicated on the output control wiring diagram.

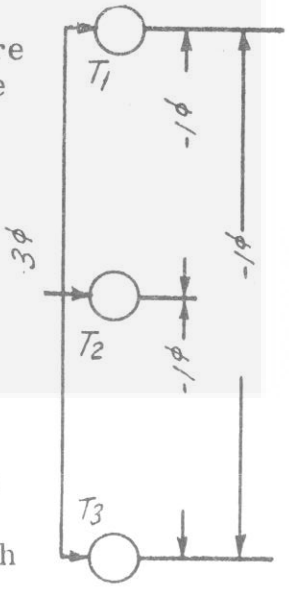
CAUTION

Reconnection, for different output voltage than shown on the plant nameplate, involves also control panel changes - sometimes of a very extensive nature. For specific information, contact the factory. Give the COMPLETE information shown on the ONAN nameplate, and indicate the NEW voltage desired.

1. Use commercially available cable connectors to make connections.

2. Connect the load wires to the appropriate generator wire group (or terminal post) according to the proper connection diagram.

3. Tape or otherwise insulate each connection where loose leads are used. Such insulation must be at least equal to the original wire insulation.



3-PHASE, 3-WIRE PLANT

No terminal is grounded. For three phase current, connect separate load wires to each plant terminal "T1", "T2" and "T3", one wire to each terminal. Reversing the connections between any two terminals will reverse the direction of rotation of 3-phase motors. If phase sequence before connections are completed.

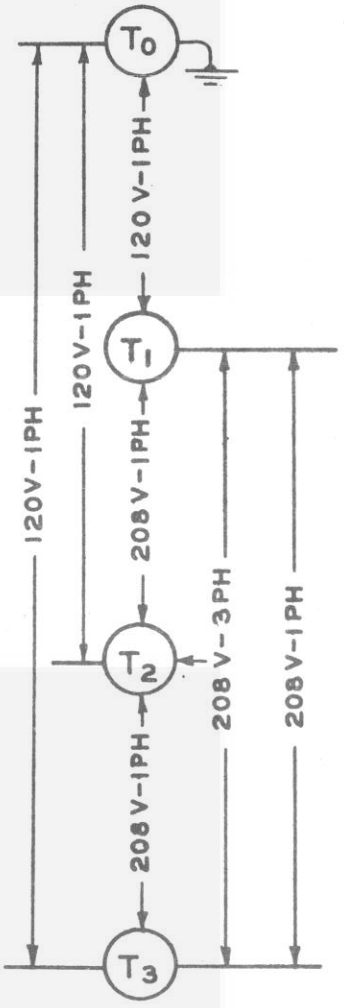
To obtain single phase current, connect separate load wires to each of any two plant terminals. Three single phase circuits are thus available, with not more than 1/3 of the plant rated capacity for each

circuit. Balance the load as closely as possible among the circuits.

If both single phase and three phase current is to be used at the same time, use care not to overload any one circuit. Subtract the amount of the 3-phase load from the rated capacity of the plant. Divide the remainder by 3, and this is the maximum load that can be taken from any one circuit for single phase current use.

3-PHASE, 4-WIRE, WYE-CONNECTED PLANT
(120/208-volt example shown)

The terminal marked "T0" is grounded. For single phase current, connect the "neutral" (white) load wire to the "T0" terminal. Connect the "hot" (black) load wire to any one of the other three terminals, "T1", "T2", "T3". Three separate single phase circuits are thus available. Do not attempt to take more than 1/3 the rated capacity of the plant from any one circuit. Balance the load as closely as possible between the three circuits.



For three phase current, connect a separate load wire to each of the plant terminals "T1", "T2", and "T3", leaving the "T0" terminal unused. Reversing the connections between any two terminals will reverse the direction of rotation of 3-phase motors. If phase sequence is important, check the phase sequence before making final connections.

For single phase current of the 3-phase voltage, connect separate load wires to each of any two terminals, T1, T2, or T3. Do not use the T0 terminal. Three separate 1 phase circuits are available: "T1" and "T2", "T1" and "T3", "T2" and "T3". Do not attempt to take more than 1/3 the rated capacity of the plant from any one circuit. Balance the load as closely as possible between the three circuits.

If both single and three phase current is used at the same time, follow the principles of load distribution as given for the 3-phase, 3-wire plant.

3-PHASE, 4-WIRE, DELTA-CONNECTED PLANT
(120/240-volt example shown)

This type of generating plant is specially designed so that two types of loading can be applied to the generator; regular, 3-phase, 3-wire operation; or, combination, 3-phase, 3-wire and 1-phase, 3-wire operation.

The load terminals are marked T1, T2, T3 and T0. The T0 terminal is the generator center tap between T1 and T2. The T0 terminal of the generator is not grounded.

INSTALLATION

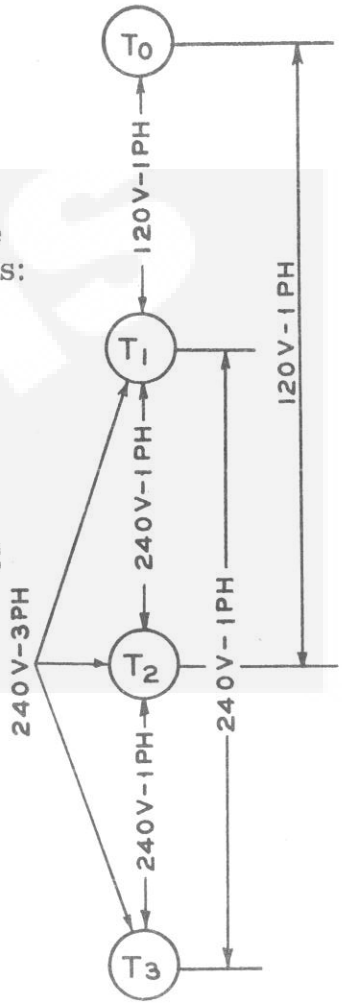
For 3-phase 3-wire operation connect the three load wires to the three terminals T1, T2, T3, one wire to each terminal post. For 3-phase, 3-wire operation the T0 terminal is not used and is normally not grounded.

If it is desired to use combination single phase and three phase loads simultaneously connect such single phase loads as follows:

For 1-phase, 3-wire operation, terminals T1 and T2 are the "hot" terminals; the T0 terminal is the neutral (which can be grounded if desired).

Any combination of single phase and three phase loading can be applied to the generator simultaneously as specified above as long as no terminal current exceeds the rated NAMEPLATE current of the generator.

Combination single phase and three phase loads applied to a three phase generator are unbalanced loads which cause the phase voltages to be unequal. These unbalanced loads will not create voltage unbalance of the phase voltages of greater than 5-per cent so long as no terminal current exceeds the rated current of the generator.

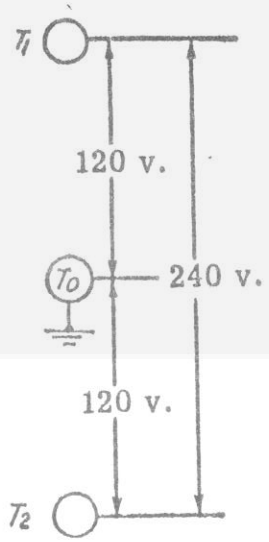


120/240-VOLT, SINGLE PHASE, 3-WIRE PLANT

The terminal marked "T0" is grounded. For 120-volt current, connect the "neutral" (white) load wire to the T0 terminal. Connect the "hot" (black) load wires to the T1 and T2 terminals. Two 120-volt circuits are thus available, with not more than one half the rated capacity of the plant available on each circuit. Balance the load as closely as possible between the two circuits.

For 240-volt current, connect one load wire to terminal T1 and the other load wire to terminal T2, leaving terminal T0 unused.

If both 120 and 240-volt current are used at the same time, use care not to overload either side of the circuit.



CRANKCASE OIL. - Refer to the SERVICE section of the Roiline engine manual. Fill the engine crankcase with oil as recommended, according to the temperature conditions. The capacity of the standard oil pan is 20 U.S. quarts (not including filters, lines or other accessories). Check the level after 10 to 15 minutes of the initial run.

For average operating conditions, oil designated as meeting requirements for military specification MIL-L-2104A, type A, is recommended. Many oils designated for MS or DG service meet these requirements. Check with the oil supplier.

AIR CLEANERS. - Service the air cleaners with oil as instructed on the air cleaners. Be sure to properly install and tighten the air cleaner cup after servicing.

RADIATOR. - On units which use a coolant radiator, fill the radiator with clean, soft water. Use a good rust and scale inhibitor. If there is any possibility of exposure to freezing temperatures, use antifreeze solution in the proper proportion. The standard radiator and block capacity is 20 U.S. gallons. On the initial run, check the coolant level several times and add liquid as necessary to compensate for any air pockets which may have been present at the original filling.

HEAT EXCHANGER. - If the plant is equipped for "city water" cooling, using the closed heat exchanger cooling system, fill the heat exchanger chamber with clean soft water. As with a radiator, use a good rust and scale inhibitor, and check for proper coolant level.

GASOLINE. - Use fresh, automotive "regular" grade of gasoline. Do not use a highly leaded "premium" grade. The engine operates at best efficiency and economy when using the regular grade. More frequent lead removal, valve, and spark plug servicing will be required if highly leaded gasoline is used.

Operate the fuel pump primer lever (plants equipped with diaphragm pump) to "prime" the fuel system and to assure that the carburetor is properly filled with gasoline. If the plant is equipped with the "DAY" reservoir tank, fill the tank at the plugged top opening.

COMBINATION GAS-GASOLINE FUELED PLANT. - A plant designed for operation on gas fuel, with provision for emergency operation on gasoline fuel, is equipped with a GAS-GASOLINE toggle switch. Throw the switch to the position indicated, according to the type of fuel in use.

The combination fuel carburetor is fitted with a gasoline shut-off and float lock at the gasoline inlet. For gas operation the lock screw should be turned up to its limit - for gasoline operation turned out until it back seats. Refer to the adjustments section for details.

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 and leave it there. The unit will run as long as the switch is at that position. 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 10 seconds the cycle cranking relay will interrupt cranking for about 10 seconds, and then the unit will automatically crank again.

The standard engine is designed for normal starting in temperatures of 50°F. or higher. Optional equipment is available if operation in lower temperatures is required.

CHECKING OPERATION. - As soon as the engine starts, check the oil pressure gauge and the battery charge ammeter. As the engine warms up, check the water temperature gauge. When the engine reaches operating temperature, as indicated by the oil pressure and water temperature gauges, 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. Should the voltage tend to wander from the stable point, a governor sensitivity adjustment may be required. Operating instructions for a load transfer or an automatic demand control are in separate manuals.

WATER FLOW. - If the plant is city water (pressure) cooled, but without optional flow regulator, check the rate of water flow. At installation, an

adjustable valve was connected in the water supply line. With the key provided, adjust the valve to provide a flow of water sufficient to keep the water temperature gauge reading within the range of 165°F. to 185°F. Excessive water flow is wasteful and expensive - too little flow will cause a rise in coolant temperature and automatic shut down by the high temperature safety switch. To avoid unauthorized tampering after proper adjustment, remove and store the adjusting key.

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

AC VOLTMETER. - The voltmeter indicates the ac current voltage. On three phase models, the voltage of one phase only will be shown according to the selector switch position. On the four wire, three phase model the voltage shown will always be the three phase (higher) voltage.

On the single phase model, only the higher voltage will be shown.

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.

SAFETY STOPPING DEVICES. - In addition to the ac circuit breaker (which does not stop the plant) the plant is equipped with three safety devices which stop the engine under circumstances which could cause severe damage.

1. High Water Temperature Cut-Off. - A non-adjustable thermostatic cut-off switch causes the engine to stop in a high water temperature condition. Water temperature must drop 10°F. before the engine can be restarted.

2. Low Oil Pressure Cut-Off. - A non-adjustable pressure operated switch mounted on the engine stops the plant if the engine oil pressure drops dangerously low.

3. Over Speed Cut-Off. - A non-adjustable weight type switch is attached to the outer end of the generator shaft. The switch stops 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 other wise made inoperative. Excessive speed could cause extensive generator damage.

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.

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.

NORMAL CONTROL FUNCTIONS

OIL PRESSURE. - The oil pressure gauge indicates the engine oil pressure while the engine is running. Normal oil pressure at operating temperature is approximately 40-psi. Pressure will be higher until the engine warms up.

WATER TEMPERATURE. - The water temperature gauge indicates the coolant temperature during operation. Normal operating temperature is approximately 160 to 185 degrees F.

CHARGE AMMETER. - The small dc ammeter indicates the battery charging current. An automatic regulator controls the charge rate which will vary according to the charge condition of the batteries. The charge rate will be comparatively high when the plant first starts, but should fall almost to zero as the batteries become fully charged.

EMERGENCY LATCH RELAY. - The emergency latch relay is energized by battery voltage when a ground is provided by one of the engine safety devices. A red light comes on and a button protrudes from the control panel to indicate a latched relay.

RUN-STOP SWITCH. - A SPDT, center off switch functions as a manual control for starting and stopping and as a selector when a switch is installed for remote control.

METER SELECTOR SWITCH. - The selector switch is provided on the three phase models. The position of its handle indicates which phase of the generator output is indicated on the ac ammeter and voltmeter.

CIRCUIT BREAKER. - The circuit breaker protects the plant against damage from an extreme over load. If the breaker trips, it must be reset manually.

FREQUENCY METER. - The vibrating reed frequency meter indicates the exact frequency of the output current in cycles per second.

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 service.

OPTIONAL SIGNALS OR ALARMS. - Provision is made for connecting a signal light or alarm to indicate an emergency stop, and to indicate a failure to start. Investigate immediately and correct the cause of any improper operation.

VOLTAGE ADJUSTMENT RHEOSTAT

The voltage regulator rheostat provides for adjusting the ac output voltage for normal operating conditions. It provides an adjustment range of approximately 5-percent plus or minus if the engine governor is properly adjusted for correct frequency. Turn clockwise to increase the voltage, counterclockwise to lower the voltage. In normal operation the regulator should keep the output voltage within 3-percent plus or minus, between no load and full load conditions. It should not be necessary to change the rheostat setting, once set, under normal operating conditions.

BATTERY, HOT LOCATION. - Batteries will self discharge very quickly when installed where the ambient temperature is consistently above 90-degrees F., such as in a boiler room. To lengthen battery life dilute the electrolyte from its normal 1.275 specific gravity reading at full charge to a 1.225 reading. The cranking power is reduced slightly when the electrolyte is so diluted, but if the temperature is above 90-degrees F. this should not be noticed, and the lengthened battery life will be a distinct advantage.

1. Fully charge the battery.
2. With the battery still on charge, draw off all the electrolyte above the plates in each cell. DO NOT ATTEMPT TO POUR OFF! Use a hydrometer or filler bulb. Avoid skin or clothing contact with the electrolyte and dispose of it in a safe manner.
3. Refill each cell with approved water, to the recommended level.

4. Continue charging for 1-hour at a 4 to 6-ampere rate.
5. Test each cell. If the specific gravity is still above 1.225, repeat steps 2, 3, and 4 until the reading is reduced to 1.225. Usually repeating steps 2, 3, and 4 two times is sufficient.

EXERCISE PERIOD. - If the plant is used infrequently, as in standby service, start and operate for 15 to 30 minutes at least once a week. This keeps oil distributed on engine parts, fuel system full, etc., and promotes easier starting.

PERIODIC SERVICE

GENERAL. - 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. For periods of little use, service periods can be lengthened accordingly. Refer to the engine manual for details of service operations.

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. WATER PUMP. - Turn grease cup.
6. CLEANING. - Wipe clean of dust, spilled oil, etc.
7. INSPECTION. - Inspect for loose parts, leaks, etc.

WEEKLY SERVICE, NORMAL 50 HOURS OPERATION.

1. CRANKCASE OIL. - Drain and refill unless experience indicates oil can be used for longer period. Maximum 100 hours operation.
2. GOVERNOR LINKAGE. - Lubricate sparingly. Keep dust free.
3. OIL FILTER. - Replace element at oil change.

MONTHLY SERVICE, 200-250 HOURS OPERATION.

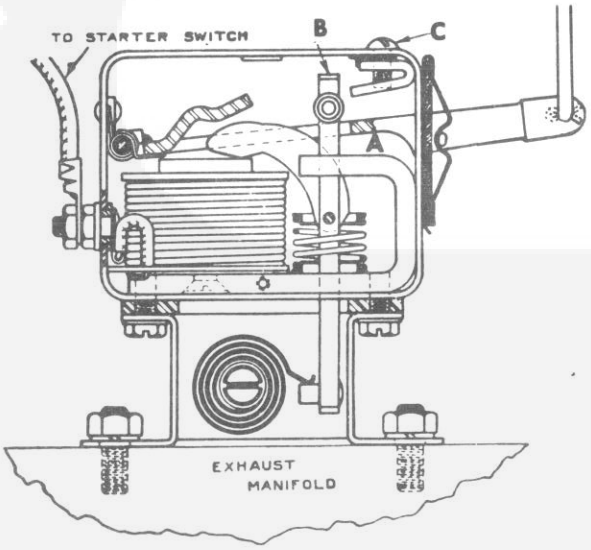
1. SPARK PLUGS. - Clean, re-set, test.
2. IGNITION POINTS. - Check, re-set.
3. IGNITION TIMING. - Check.
4. VALVES. - Check tappet clearances.
5. BREATHERS. - Clean.
6. FUEL SEDIMENT BOWL. - Clean.
7. ALTERNATOR BRUSHES. - Check, replace if worn to 1/2-inch or if damaged. DO NOT LUBRICATE.

ENGINE. - Basic engine adjustment procedures are given in the engine manual. Proper carburetor and governor adjustments are essential to provide correct generator current characteristics.

GOVERNOR. - The governor function is to keep the engine speed nearly constant regardless of load conditions imposed by the generator. Generator output, voltage and frequency, are dependent upon engine speed.

Basic principles of governor adjustment are given in the engine manual. The governor should control the speed so that the frequency at full load is within 2 to 3 cycles of the frequency at no load. A momentary surge beyond the 3-cycle limit is normal when the load is changed, but the frequency should stabilize within a few seconds. Normal frequency at no load is approximately 61 cycles for a 60-cycle plant, but may be as high as 63 cycles if necessary to obtain the desired voltage. The frequency at full load should not drop below 59 cycles.

GASOLINE (only) CARBURETOR CHOKE. - When units are to be operated on gasoline only, they are equipped with an electrically and thermostatically controlled choke. Should adjustment become necessary, the adjusting procedure is described as follows:



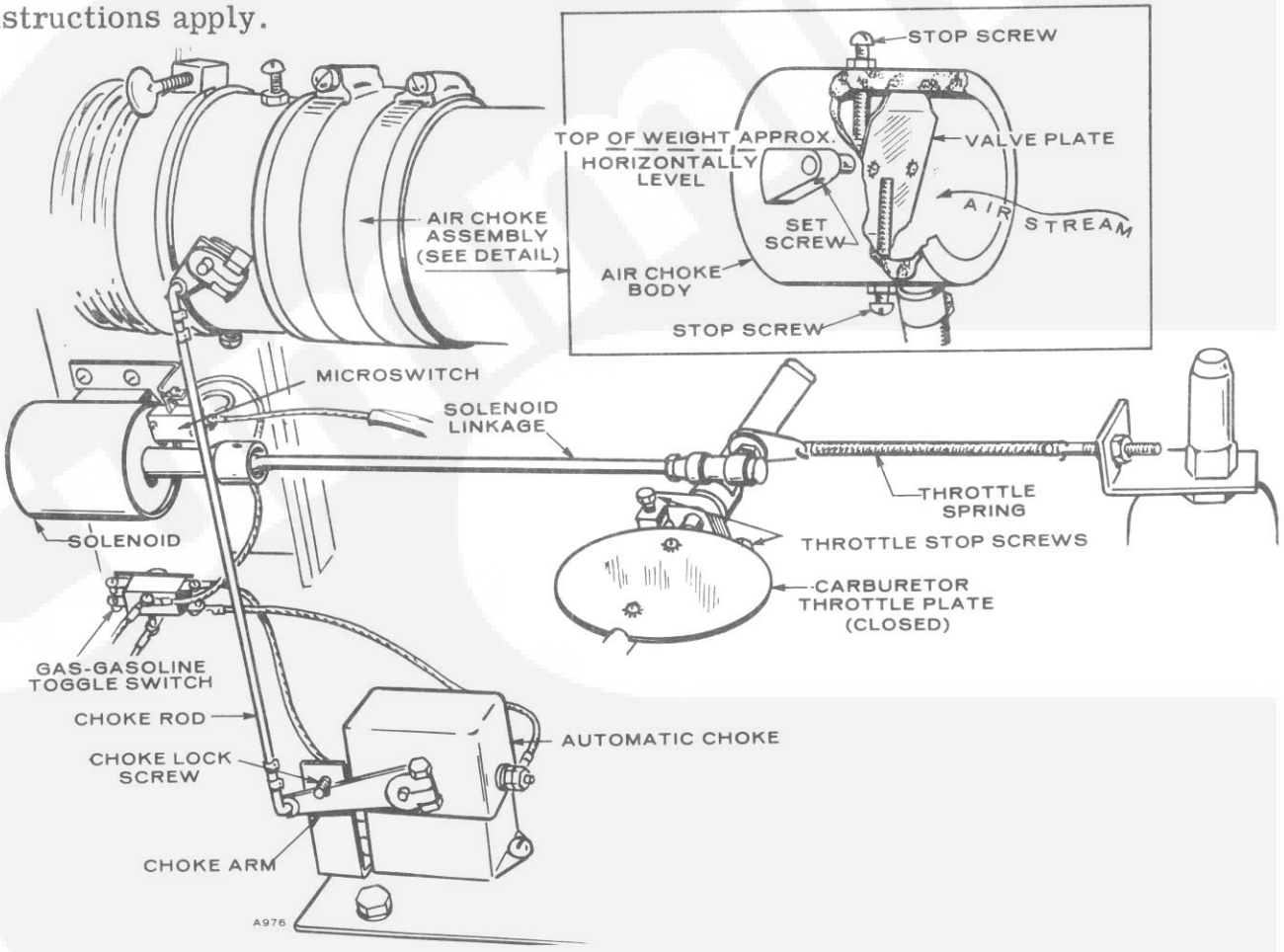
1. Adjust the lever so that when carburetor choke valve is closed tight there will be .015" to .020" clearance between the lever of the automatic choke and the field pole that serves as a stop. This measurement is taken at (A) and must be made with the thermostatic control (B) pushed down as far as it will go.

2. With automatic choke and carburetor choke valve adjusted for closed position, next open the valve to widest position and adjust magnetic lock (C) in top of choke so that the armature lever will rest against the angle piece that forms the magnetic lock. This adjustment, when properly made, keeps the choke from operating when the engine is hot.

3. Test by closing starter switch and watch closely to see if carburetor choke valve snaps all the way shut WITH ENGINE COLD. Then operate engine until it thoroughly warm and see that the choke lever rests against the magnetic lock when the choke valve is wide open.

CAUTION! Do not oil the automatic choke under any circumstance.

GAS-GASOLINE AUTOMATIC CHOKE. - Most gas-gasoline plants are equipped with a Sisson automatic choke for efficient starting with either fuel. For operation in either mode, the following instructions apply.



1. Gas Operation. - The arm of the electric choke must be locked in the open position. Pull the arm down, engage the lock by turning the machine screw in as shown. See that the off-set weight is properly positioned for full (closed position) choking for starting. The choke must be free to blow open with the incoming air stream, its extent of opening determined by the load conditions.

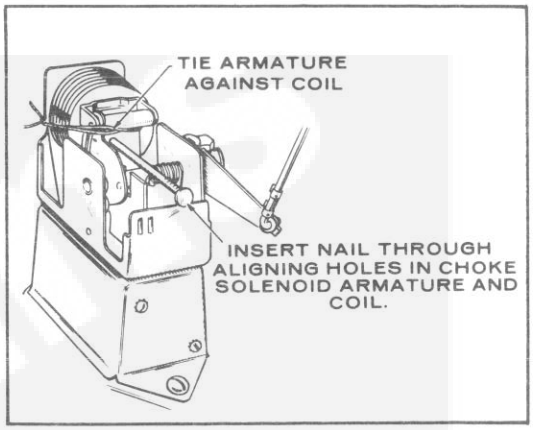
2. Gasoline Operation. - The mechanical lock must be released to allow proper choke action. The choke linkage over-rides the off-set weight action, providing full choking action for cranking, and gradual opening during warmup by means of a heating element under the choke base. Be sure the heating element works properly

NOTE

Be sure the GAS-GASOLINE toggle switch is in the correct position.

ADJUSTMENTS

3. Adjustment. - Extremes in ambient operating temperatures should not require any readjustment of the choke. However, if the original factory settings have been disturbed, the proper settings must be restored.



a. Remove the induction air hose at the carburetor air inlet to observe the action of the choke valve plate.

b. Be sure the choke body is mounted to allow horizontal positioning of the choke valve plate shaft.

c. See that the over-ride lever assembly is properly positioned so that the valve plate is free to move from the fully closed to wide open position while the choke arm is held down.

d. Position the offset weight on the shaft so, that with the choke plate closed, the top of the weight is horizontally level.

e. Slip the choke assembly snap-on cover upward to remove it.

f. Insert an 8 penny nail, or similar diameter rod, through the aligning holes of the solenoid armature and core as shown.

g. Tie the armature firmly against the core. This simulates the choke position while the engine is cranking. Loosen the choke arm on its shaft.

h. Raise the choke arm to fully close the choke valve plate and tighten the choke arm on the shaft.

i. Remove the alignment nail and untie the armature. With the choke arm locked for gas operation, check to see that the choke valve plate closes fully from the action of the counterweight but is free to open from air stream force. Replace the cover.

CARBURETOR FUEL ADJUSTMENT. - Proper carburetor adjustment is essential to proper governor action. Too lean a carburetor adjustment is likely to cause erratic governor action, or surging. Too rich a mixture will cause low power and excessive fuel consumption.

THROTTLE STOP. - With the plant stopped, see that the throttle stop lever screw 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.

ADJUSTMENTS

ANTI-DIESELING CONTROL. - The anti-dieseling control is a device to hold the throttle closed during stopping of the plant. This insures prompt stopping and prevents dieseling. Normally, the factory-set adjustment should not be changed. However, if through accident the setting is disturbed, the linkage may be reset as follows: Adjust the solenoid link so that the solenoid plunger bottoms in the solenoid. 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 and chattering will occur.

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

Check the throttle arm position on the carburetor; the throttle plate should be completely open when the solenoid is energized and the engine not running. When the power is off to the solenoid, the throttle plate should be fully closed.

The throttle spring should have sufficient tension to pull the throttle plate completely closed upon shutdown of the engine but should not be so tight as to overcome the pull of the solenoid while the engine is running.

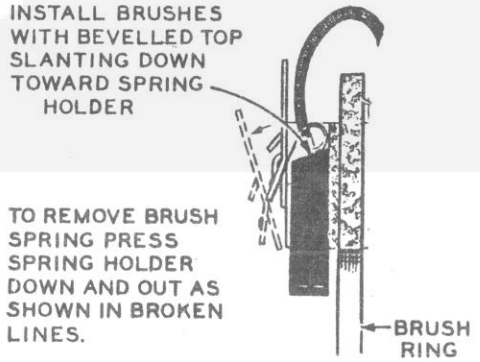
MAINTENANCE

ENGINE. - Basic engine maintenance is covered in the Roiline engine manual.

GENERATOR. - The ac generator normally requires very little servicing. Periodic inspection, to coincide with engine oil changes, will assure continued good performance.

To examine the brushes, brush springs, and slip rings, remove the exciter cover. Note that the exciter assembly mounts on a hinged plate. Remove the screws from the left side of the exciter plate and swing the assembly outward. Openings in the alternator end bell permit access to the brush rig.

Brushes should be replaced when worn to approximately 1/2-inch long, or so that the top of the brush is below a point midway between the outer and inner end of its guide. 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. Do not attempt to remove the brush without first removing its spring and bracket as shown. Never bend a spring back over its bracket - doing so will put a kink in it and require replacement.



BRUSH SPRING REMOVAL

The generator bearing is prelubricated and sealed. It requires no servicing.

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.

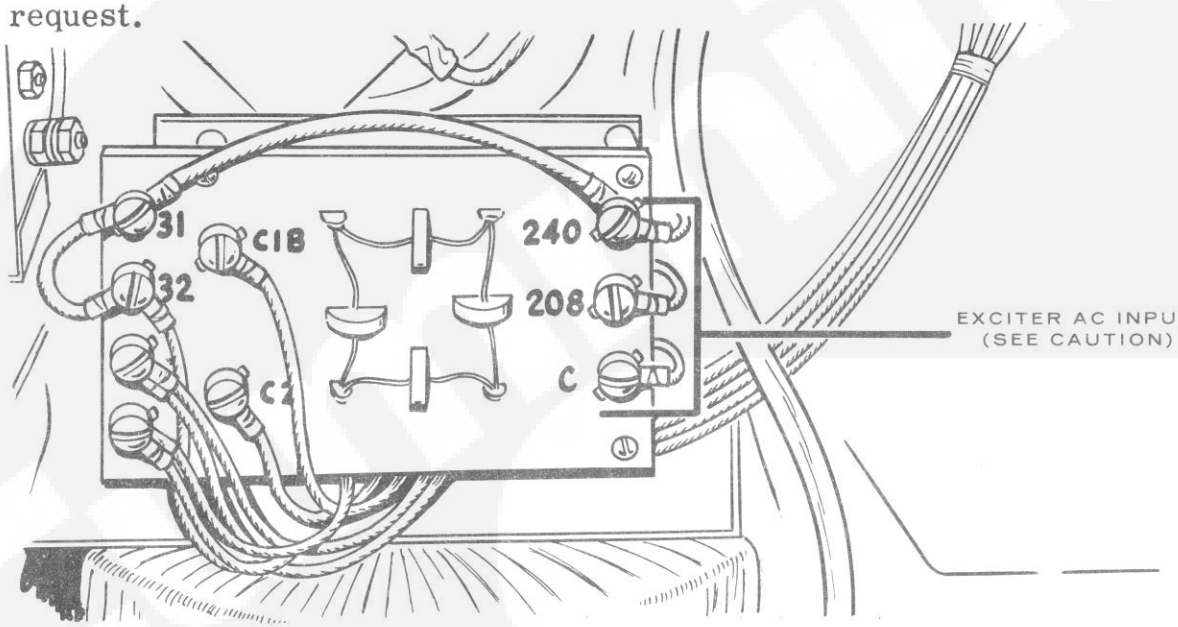
If the generator fails to produce current, a few tests may isolate the cause.

1. Temporarily disconnect leads E1, E2, AF1, and AF2 from the terminal block. Connect a substitute ac power source, such as the normal line voltage. Be sure the substitute power source is the correct voltage, as indicated on the exciter wiring diagram. For example, do not connect 480-volt current directly to the E1 and E2 exciter terminals. CAUTION - Limit test voltage application to one minute or less.

   If there is no dc voltage at terminals AF1 and AF2 with an independent power source connected to exciter terminals E1 and E2, the exciter is not functioning.

CAUTION

The exciter is operable on either 208 or 240-volt ac input, and is factory connected for the correct voltage. This exciter input voltage has no direct relationship to the generator OUTPUT voltage. DO NOT CHANGE THE ORIGINAL FACTORY EXCITER JUMPER CONNECTION UNLESS THE SPECIAL INSTRUCTIONS FOR RECONNECTING FOR DIFFERENT AC OUTPUT ARE BEING FOLLOWED. These special instructions are supplied on request.



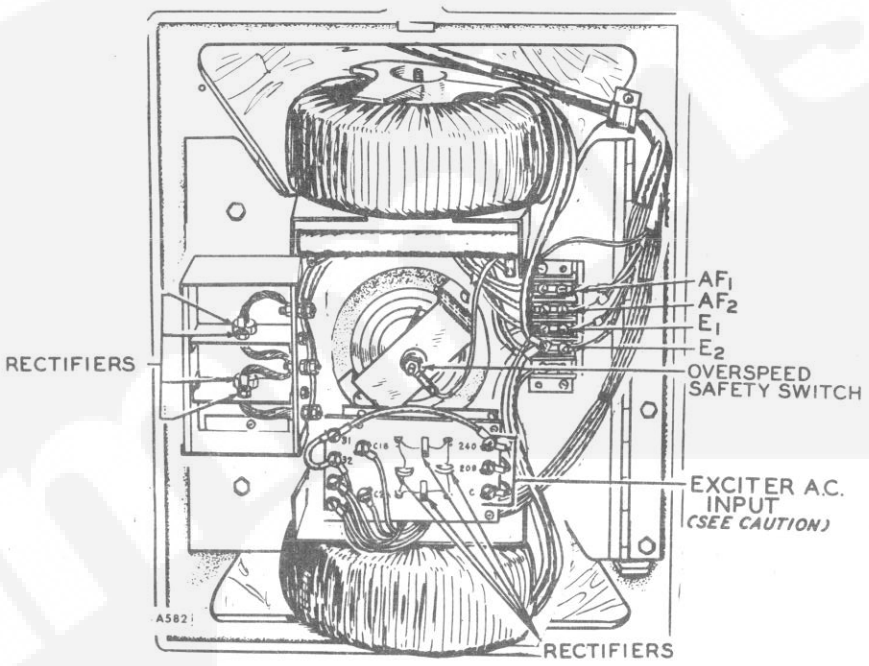
2. No component or terminal of the exciter should show a grounded circuit.
3. If dc voltage is present at terminals AF1 and AF2 in step 1 above, check the alternator for grounds, opens, etc.
4. Connect exciter leads. If ac voltage drops under load conditions, check the exciter rectifiers. Use a low voltage battery powered "Multimeter" type ohmmeter. Disconnect one lead from, or remove, each rectifier for the test.

NOTE

Note carefully DIRECTION OF MOUNTING of any rectifier removed. It must be remounted in its original direction. Use extreme care not to overheat a rectifier if working on a soldered connection.

a. Connect the ohmmeter across the rectifier contacts and obtain the meter reading.
b. Reverse the ohmmeter 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. If both readings are low, or if both indicate an "open" circuit, replace the rectifier with a new identical part.

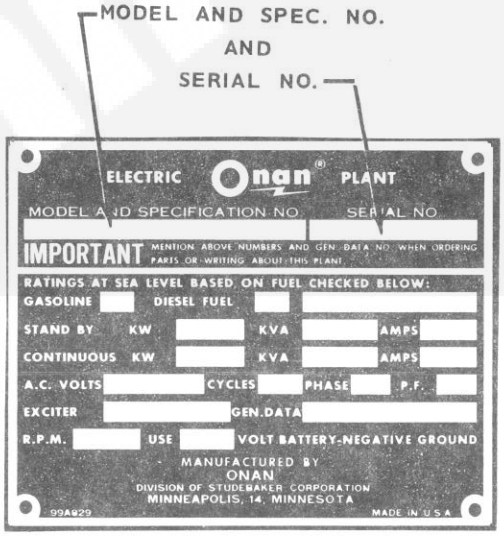


STATIC EXCITER

INSTRUCTIONS FOR ORDERING REPAIR PARTS

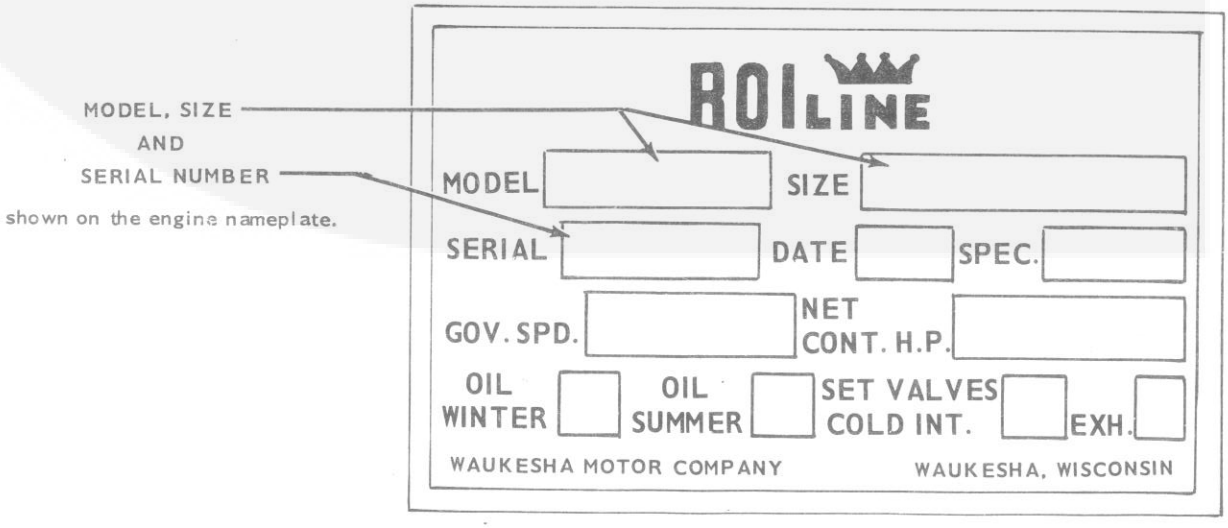
ONAN PARTS

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:



WAUKESHA PARTS

All Waukesha parts must be ordered from the Waukesha Motor Company of Waukesha, Wisconsin, or their nearest authorized distributor. Refer to the Waukesha Engine flywheel housing. When ordering parts, always supply Waukesha with the following nameplate information:



PARTS CATALOG

This catalog applies to the standard WE plants as listed below. Powered by a Waukesha H-884-Roiline engine (see Waukesha Manual). Engine parts modified or added by *Onan* will be in this list and have *Onan* part numbers. These supersede similar parts listed in the Waukesha manual. *Onan* parts are arranged in groups of related items and are identified by a reference. All parts illustrations are typical. Using the Model and Spec. No. from the *Onan* plant nameplate, select parts from this catalog that apply to your plant. Unless otherwise mentioned, parts are interchangeable. Right and left plant sides are determined by facing the front end of the engine.

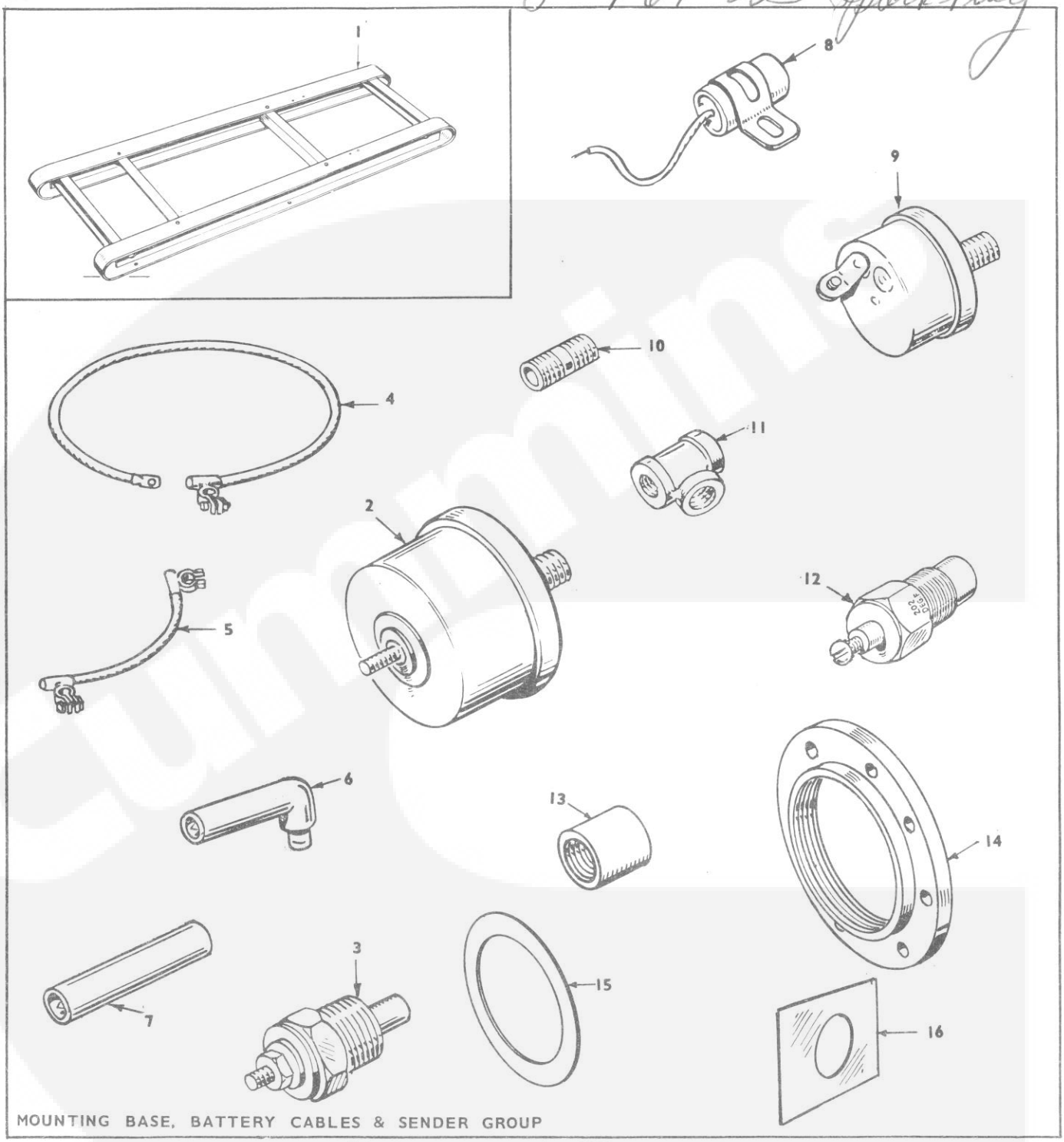
PLANT DATA TABLE

MODEL AND SPEC. NUMBER *	ELECTRICAL DATA				
	WATTS**	VOLTS	CYCLES	PHASE	WIRE
125WE-53R8/	125,000	120/240	50	1	3
130WE-54R8/	130,000	120/208	50	3	4
130WE-54XR8/	130,000	277/480	50	3	4
130WE-55DR8/	130,000	120/240	50	3	4
130WE-57R8/	130,000	220/380	50	3	4
130WE-59R8/	130,000	600	50	3	3
130WE-59XR8/	130,000	120/240	50	3	4
140WE-4R8/	140,000	120/208	60	3	4
140WE-4XR8/	140,000	277/480	60	3	4
140WE-5DR8/	140,000	120/240	60	3	4
140WE-9R8/	140,000	600	60	3	3
150WE-3R8/	150,000	120/240	60	1	3
150WE-4R8/	150,000	120/208	60	3	4
150WE-4XR8/	150,000	277/480	60	3	4
150WE-5DR8/	150,000	120/240	60	3	4
150WE-9XR8/	150,000	347/600	60	3	4
160WE-4R8/	160,000	120/208	60	3	4
160WE-4XR8/	160,000	277/480	60	3	4
160WE-5DR8/	160,000	120/240	60	3	4
160WE-9R8/	160,000	600	60	3	4

* - The Specification Letter advances (A to B, B to C, etc.) with manufacturing changes

** –Maximum Standby rating, continuous rating is also shown on Onan nameplate.

8-167-223 Spark Plug



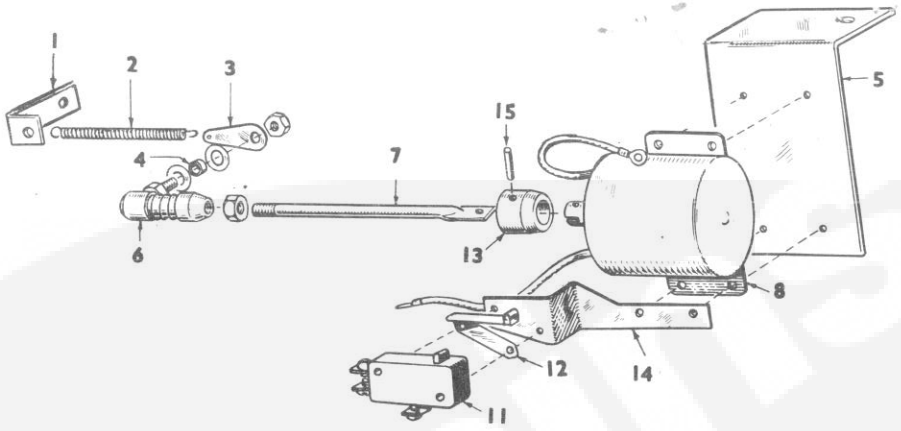
MOUNTING BASE, BATTERY CABLES & SENDER GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
1	403C746	1	Base, Mounting
2	193A108	1	Sender, Oil Press. (Eng. Unit Only)
3	193A104	1	Sender, Water Temp. (Eng. Unit Only)
4	CABLE, BATTERY		
	416A445	1	Negative
	416A444	1	Positive
5	416A446	1	Cable, Batt. Jpr.
6	314-156	8	Suppressor, Spark Plug
7	314P6	1	Suppressor, Coil
8	312A58	2	Condenser, 0.1-Mfd. (1) Charge Reg. (1) Ign. Coil
9	309B10	1	Switch, Oil Press. Cut-Off

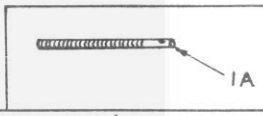
REF. NO.	PARTS NO.	QTY. USED	PARTS DESCRIPTION
10	505-104	2	Nipple, Close (1/8 x 1-1/2) Oil Press. Tee to Crnks.
11	505-59	1	Tee, Pipe (1/8) Oil Press. Switch & Sender
12	309A178	1	Switch, High Water Temp. Cut-off
13	505-26	1	Coupling, Oil Press. Tee to Crnks.
14	155P658	1	Flange, Muffler Mtg.
15	155P675	1	Gasket, Muffler Mtg.
16	SHIM, GEN. TO MTG. BASE		
	232A1817	As Req.	.062"
	232A1489		.0598"
	232A1490		.0354"

ENGINE REPLACEMENT: Furnish complete Model, Spec., and Serial Number from ONAN nameplate.

Sisson Choke used on some models.
Waukesha Part # 810396B



ANTI-DIESELING CONTROL GROUP



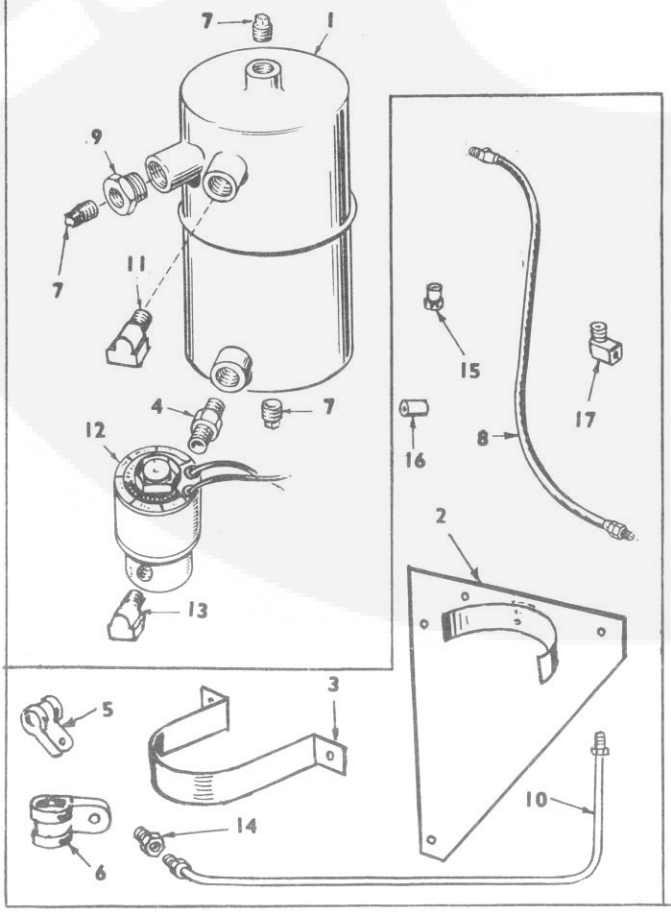
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
1	145A370	1	Bracket, Spring Adj.
1A	150A96	1	Stud, Adjusting
2	145A158	1	Spring, Throttle
3	145A118	1	Link, Throttle Spring
4	150A302	1	Spacer, Linkage
5	145C369	1	Bracket, Sol. Mtg.
6	150A638	1	Joint, Ball

REF. NO.	PARTS NO.	QTY. USED	PARTS DESCRIPTION
7	145A371	1	Link, Sol. to Ball Joint
8	307B259	1	£ Solenoid & Lead Assy.
11	309A155	1	Switch, Micro
12	309P133	1	Actuator, Micro Switch
13	309A132	1	Cam, Micro Switch
14	309A131	1	Bracket, Micro Switch
15	516-86	1	Pin, Roll, Cam

NOTE: This group not used for gas operated plants.

£ Replace with 145K491

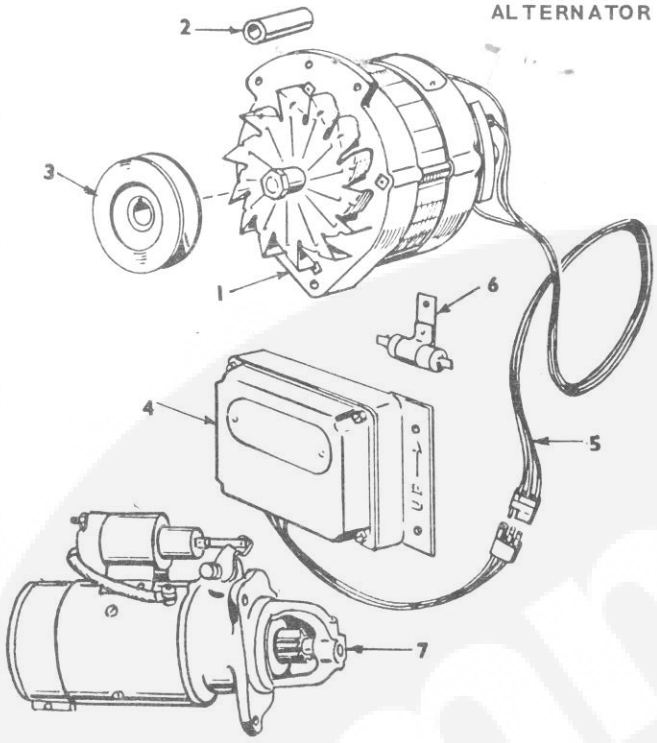
RESERVOIR TANK GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
1	159B294	1	Tank, Reservoir
2	159A870	1	Bracket, Tank Mtg.
3	159A871	1	Band, Tank
4	502-82	1	Nipple, Hex
5	332-51	2	Clip
6	332B854	1	Clamp, Fuel Line
7	505-57	3	Plug, Pipe, Sq. Hd. (1/8)
8	501A89	1	Line, Fuel, Flex., Tank Pump
9	159A705	1	Bushing, Red., Restricted
10	159A873	1	Line, Fuel Tank to Carb.
11	502-2	1	Elbow, Inv. Male, Flex. Line to Tank
12	307P565	1	Valve, Solenoid
13	502-4	1	Elbow, Inv. Male, Sol. Valve
14	502-35	1	Connector (5/16") Fuel Line
15	502-17	1	Connector (1/4") Fuel Line
16	505-26	1	Coupling (1/8") Fuel Line
17	502-41	1	Elbow (5/16")

NOTE: This group not used for gas operated plants.

ALTERNATOR AND STARTER MOTOR GROUP

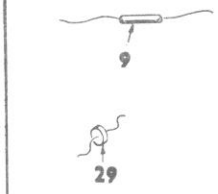


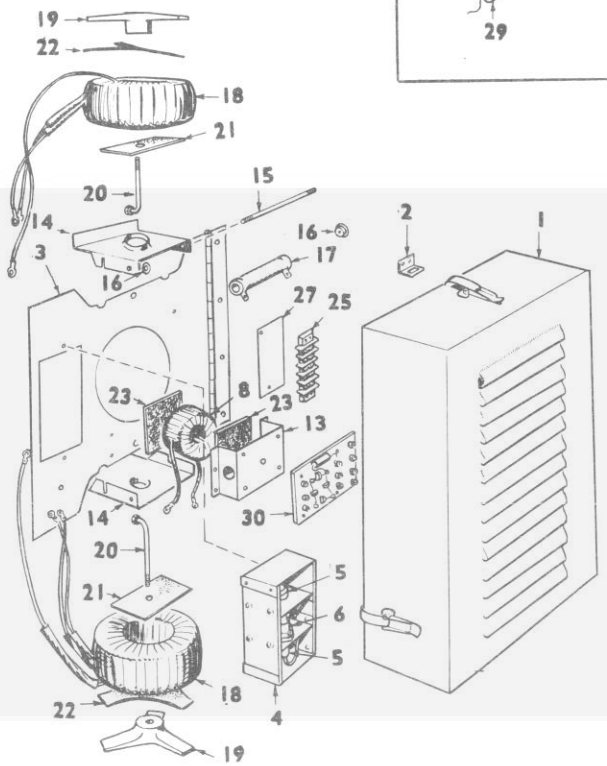
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
1	191P543	1	Alternator, Charge
2	232A1813	1	Spacer, Alternator Mtg.
3	191-623	1	Pulley, Alternator
4	191-542	1	Regulator, Charge
5	191-544	1	Cable Alternator
6	191-545	1	Resistor, Alternator
7	191P568	1	*Motor, Starter DELCO 1113376

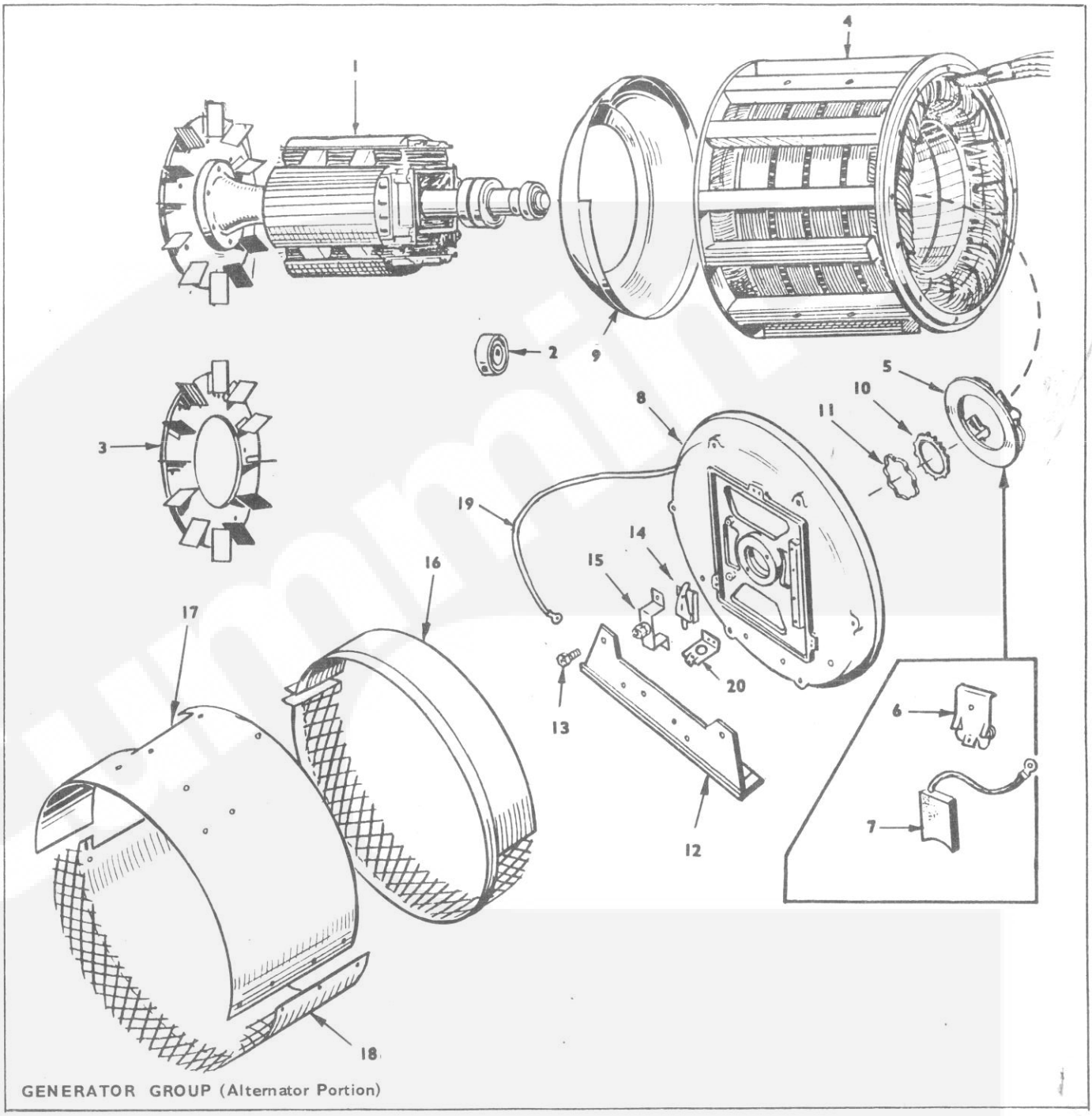
* - Check starter nameplate and order components from your nearest dealer.

GENERATOR GROUP (Exciter Portion)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
	207D12	1	Magneciter Assy., Complete
1	234D116	1	Cover, Exciter
2	232A1376	3	Bracket, Fastening, Cover to Alt. End Bell
3	234D74	1	Panel Only, Exciter
4	305B228	1	Rectifier Assy., Power Complete (Incl. two #305P233 & two #305P234 Rect. plus wire and hardware)
5	RECTIFIER ONLY, POWER (Field)		
	305P233	2	Lower Two, Neg. (Incl. in Rect. Assy. #305B228)
6	305P234	2	Upper Two, Pos. (Incl. in Rect. Assy. #305B228)
8	315A78	1	Reactor, Voltage Control
9	304P476	1	Resistor, Voltage Control Reactor (Incl. in Rect. & Resistor Assy. #305B227)
13	234B115	1	Bracket, Mtg., Volt. Cont. Reactor
14	234B75	2	Bracket, Gate Reactor Mtg.
15	520A190	1	Stud, Resistor Mtg.
16	304A15	2	Washer, Resistor Ctrg.
17	304-442	1	Resistor, Fixed, Mts. to Gate Reactor Bracket
18	315A51	2	Reactor, Gate
19	232A1389	2	Retainer, Gate Reactor
20	232A1403	2	Stud, Gate Reactor Mtg.
21	232B1388	4	Gasket, Gate Reactor Mtg.
22	232B1387	4	Gasket, Gate Reactor to Ret.
23	232A1548	2	Gasket, Cont. React. Coil Mtg.
25	332A532	1	Block, Terminal (5-Place)
27	332A693	1	Strip, Term. Blk. Marker (5-Place)
29	305P240	4	Rectifier, Volt. Control Reactor (Incl. in Rect. & Resistor Assy. #305B227)
30	305B227	1	Resistor Assy., Rect. (Incl. 304P476 Resistor & (4) Rect. 305P218)







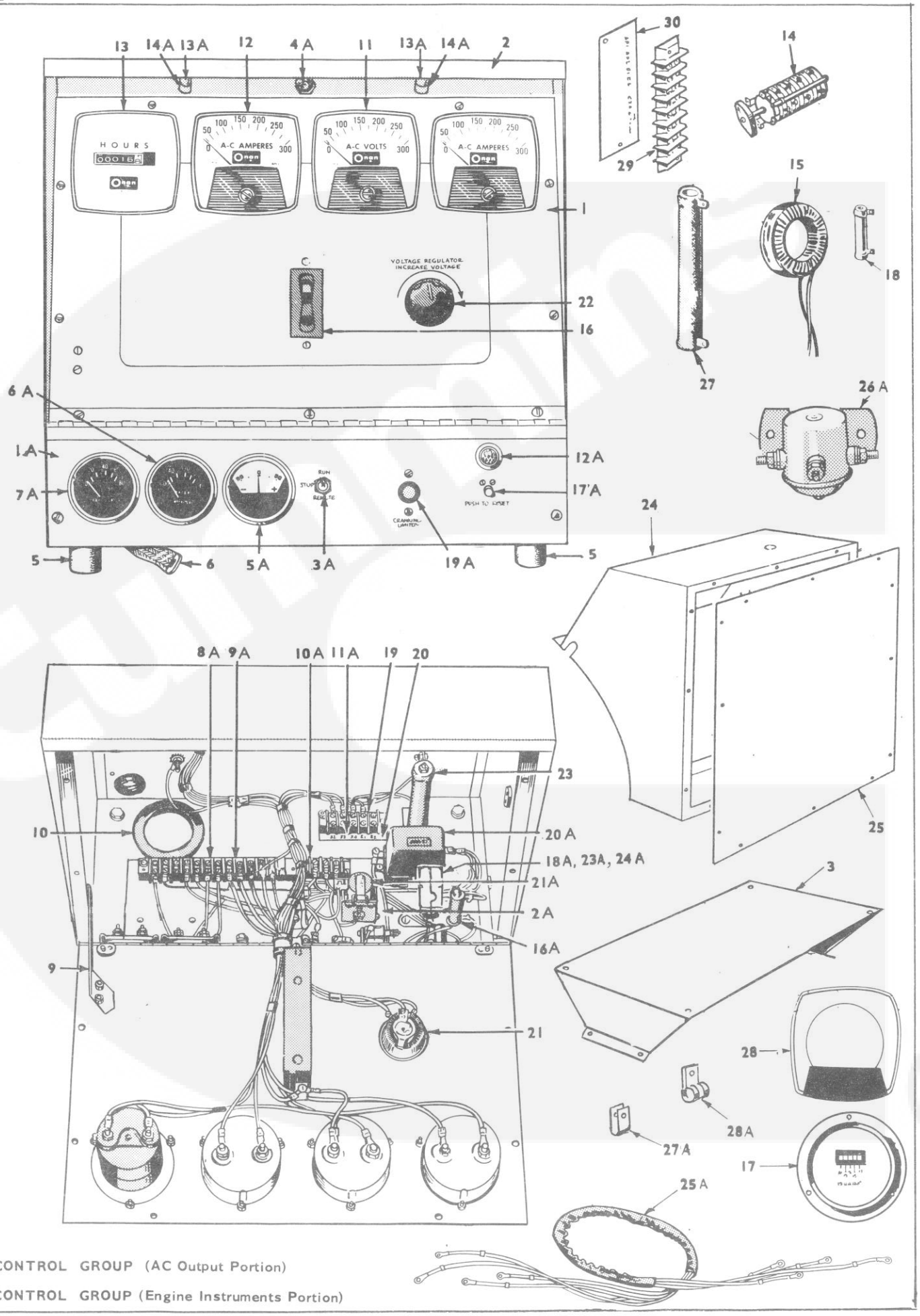
GENERATOR GROUP (Alternator Portion)

NOTE: Output Terminal Box, Cover & Internal Parts listed in the AC Output Control Group (Mounts on Side of Gen.).

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
1	*	1	Rotor Assy., Wound, Incl. Brg., Blower & Drive Assy.
2	510P88	1	Bearing
3	205C61	1	Blower
4	*	1	Stator Assy., Wound
5	212C248	1	Rig Assy., Brush, Incl. Brushes & Springs
6	212B1105	4	Spring, Brush
7	214A56	4	Brush
8	211D153	1	Bell, End, Alt. to Exciter
9	234D69	1	Baffle, Air
10	232A1807	1	Holder, Brg.
11	232A1808	1	Spring, Brg. Holder

REF. NO.	PARTS NO.	QTY. USED	PARTS DESCRIPTION
12	232D1396	1	Support, Gen. Mtg.
13	805-35	4	Bolt, Place, Gen. Mtg.
14	150A717	1	Switch Assy., Overspeed
15	150A713	1	Bracket, Overspeed Switch, Incl. Contact Point
16	234D70	1	Band, Gen., Frt. Port. (Narrow)
17	*	1	Band, Gen., Rr. Port., Upper Half (Wide)
18	*	1	Band, Gen., Rr. Port., Lower Half (Wide)
19	336A1213	1	Lead Assy., Overspeed Switch
20	234A107	1	Bracket, Conduit Connector

* - Order by description, giving complete Model, Spec. & Serial Number (ONAN Nameplate).



CONTROL GROUP (AC Output Portion)

CONTROL GROUP (Engine Instruments Portion)

NOTE: Unhoused plants with optional Meter Panel, use parts marked (£) as listed for Housed Plants.

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
1	*	1	Panel Only, Upper Cont.
2	301D2115	1	Box Only, Control
3	301C1830	1	Bracket, Cont. Box Mtg.
5	402-78	4	Mount, Rubber, Cont. Box Mtg.
6	337A44	1	Strap, Grd.
9	301A1914	1	Bracket, Panel Stop
10	508-63	1	Grommet (2-3/4" Hole)
11	VOLTMETER, AC (Check Scale & Select According to Rating)		
	302P421	1	Voltmeter Scale 0-300
	302P422	1	Voltmeter Scale 0-600
	302P423	1	Voltmeter Scale 0-750
12	AMMETER, AC (Check Scale and Select According to Rating) NOTE: 1-Phase use 2.		
	302P411	1	Ammeter Scale 0-200
	302P412	1	Ammeter Scale 0-250
	302P414	1	Ammeter Scale 0-500
	302P415	1	Ammeter Scale 0-750
	302P416	1	Ammeter Scale 0-1000
13	£METER, RUNNING TIME		
			60-Cycle Plants
	302P465	1	120/240-V, 1-Ph., 120/208-V, 3-Ph., 120/240-V, 3-Ph. & 600-V, 3-Ph.
	302P467	1	277/480-V, 3-Ph.
			50-Cycle Plants
	302P468	1	120/240-V, 1-Ph., 120/208-V 3-Ph., 120/240-V, 3-Ph. & 600-V, 3-Ph.
	302P469	1	220/380-V, 3-Ph.
	302P470	1	277/480-V, 3-Ph.
14	308-22	1	Switch, Volt. & Current Sel.
15	£TRANSFORMER, CURRENT (Check Transformer Nameplate, Select According to Rating)		
	302B106	3	Nameplate Ratio 200/5 (Use with 0-200 AC Ammeter) 2 Only for 1-Ph.
	302B209	3	Nameplate Ratio 250/5 (Use with 0-250 AC Ammeter
	302B372	3	Nameplate Ratio 500/5 (Use with 0-500 AC Ammeter)
	302B385	3	Nameplate Ratio 750/5 (Use with 0-750 AC Ammeter)
	302B394	2	Nameplate Ratio 1000/5 (Use with 0-1000 AC Ammeter
16	BREAKER, CIRCUIT		
	320B18	1	1-Ph. Plants (20-Amp)
	320B170	1	3-Ph. Plants (18-Amp)
	320B2	1	3-Ph. Plants (15-Amp)
17	METER, FREQUENCY		
	302-213	1	60-Cycle Plants
	302-234	1	50-Cycle Plants
18	RESISTOR FREQUENCY METER		
	304A305	1	For 277/480-V, 3-Ph. Plants (45,000-Ohm, 10-W)
	304A125	1	For 220/380-V, 3-Ph. Plants (15,000-Ohm, 25-W)
	304A402	1	For 600-V, 3-Ph. Plants (60,000-Ohm, 10-W)
19	332A604	1	Block, Term. (5-Place)
20	332A690	1	Strip, Block Marker (5-Place)
21	303-111	1	Rheostat, Volt. Reg.
22	303-32	1	Knob, Rheostat
23	304A484	1	Resistor, Volt. Reg.
24	*	1	Box, Output Term (Side of Gen.)
25	*	1	Cover, Output Term. Box
27	304A536	1	£Resistor, Fixed (9000-Ohm, 50-Watt) Off Running Time Meter, 600-V 3-Ph., Hsd. Plts.
28	302B448	As Req.	Plate, Meter Face
29	332A503	1	Block, Term. (8-Place)
30	332A601	1	Strip, Blk. Marker (15 through 22)

* - Order by description, giving complete Model, Spec., and Serial Number (ONAN Nameplate)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTIONS
1A	301D2115	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	332A607	1	Block, Term. (12-Place)
9A	332A608	1	Strip, Marker (4 through 15)
10A	332A604	1	Block, Term. (5-Place)
11A	332A762	1	Strip, Marker (Remote, B+, Ground)
12A	322P69	1	Receptacle Assy., Pilot Light
13A	322P72	2	Receptacle, Panel Light
14A	322-4	3	Bulb, (2) Panel (1) Pilot
16A	304A192	1	Resistor, Fixed (3-Ohm, 10-W)
17A	307A655	1	Relay, Emergency Latch
18A	307P819	1	Relay, Start-Disconnect
19A	320A104	1	Limiter, Cranking
20A	307B597	1	Relay, Fuel Solenoid
21A	307A388	1	Relay, Time Delay, Low Oil Pressure Switch
23A	307P778	1	Spring, Relay Hold-down
24A	323P52	1	Socket, Relay
25A	*	1	Harness Assy., Eng. to Cont.
26A	307B514	1	Relay, Pilot
27A	416A96	1	Clip, Harness (Metal)
28A	332-49	1	Clip, Harness (Rubber Insul.)

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