

KS-5667-01 AUTOMATIC GASOLINE ENGINE-ALTERNATOR

5 KW (J86618)

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1. GENERAL

1.1 Scope

1.11 This section covers installation of single-phase KS-5667-01 gasoline engine-alternators made by the Kohler Company. These sets are rated at 5 KW, 6.25 KVA, 230/115 Volts.

1.12 Tests in this section are based on the following circuit diagrams:

SD-81100-01 Alarms - Unattended Office  
SD-81223-01 Alarms - Attended Office  
SD-81348-01 5 KW, 1-Phase Engine-Alternator  
SD-81349-01 5 KW, 1-Phase Power Plant

1.13 Requirements in the job specification supersede those in this section. However, information in this section or associated sections takes precedence over information in supplier's manuals where differences occur. An example of this is in the matter of cleaning fluids, some of which are prohibited in telephone offices.

1.2 Apparatus Adjustments

1.21 For detailed information regarding adjustment of relays, meters and apparatus, refer to the Table of Contents in this handbook. Adjust all apparatus in accordance with that information or with Circuit Requirement Tables before starting the tests in this section.

1.3 Precautions

1.31 Observe the general precautions in Handbook 0 and in Section 131 of this handbook.

1.32 Before doing any work on either the engine or the control of these sets (which can start automatically) do the following: (1) Operate BP Switch to BYPASS position. (2) Operate ENGINE CONTROL Switch to CONT DISC position. (3) Disconnect the positive lead at the starting battery. (4) Remove the 1-1/3 ampere fuse supplying battery to the AC & ENG ALM circuit.

1.33 Avoid contact with terminals of the BP Switch because commercial power is always present on the switch when the plant is in service.

1.34 A fuse in the wall-mounted cabinet protects the water jacket heater. This is the fuse in the line to H1 terminal. DO NOT INSTALL THIS FUSE UNTIL THE COOLING SYSTEM IS FILLED. Also, be sure to remove this fuse before draining the radiator and reinstall only after the radiator is refilled.

1.35 Do not start the engine with the Battery Charger HI-LO Switch in HI, as this may blow the charger fuse. Operate switch to LO, start the engine and then restore switch to HI, if the high charging rate is still required.

1.4 Description

1.41 Figure 1 illustrates the List 6 engine set for indoor installation. The List 7 set is a housed unit for outdoor installation.

1.42 Figure 2 illustrates the wall-mounted control cabinet. Voltmeter and ammeter are furnished on this cabinet and there are no meters on the engine-alternator. The cabinet includes all relays and controls and a charger for the starting batteries.

1.43 Approximate dimensions and weight of the engine-alternator alone are as follows: 4'-1" Long, 1'-10" Wide and 2'-5" High. The List 6 set weighs about 575 pounds and List 7 weighs about 765 pounds. The wall-mounted control cabinet weighs about 225 pounds.

2. RECORDS

2.1 Record test, maintenance, and battery charge information on the following forms:

|           |                        |
|-----------|------------------------|
| ID-1275   | Lubrication Record     |
| ID-1285   | Storage Battery Report |
| SD-4-1313 | Test Trouble Record    |
| SD-4-1315 | Summary of Tests       |
| ID-946    | Engine-Alternator Test |

### 3. TOOLS AND TEST EQUIPMENT

| Note | Quan. | Code   | Description               |
|------|-------|--------|---------------------------|
|      | 1     | R-2705 | Tachometer                |
|      | 1     | R-3076 | Manometer, Water          |
|      | 1     | R-2722 | Detector, Carbon Monoxide |
| 1    | -     | -      | Casite, 1 quart           |
|      | 1     | R-2759 | Water Rheostat, 6 KW      |

NOTE 1: Purchase locally as required.

### 4. INSTALLATION

4.01 Before the set is received check slope of the pier or floor mounting area for the set. Lay out isolator support areas from Drawing H-269-352.

4.02 The mounting area for the set shall slope not more than 1/4 inch in 10 feet. Refer to Section 129 in this handbook for method of checking slope. If the mounting area slopes more than this amount the telephone company should be requested to correct the condition.

4.03 Tile or linoleum under the support areas shall be cut out so that the base of the isolators rest on the concrete.

4.04 When the set is received have the riggers move it into position and install the vibration isolators under the set. No final leveling is required.

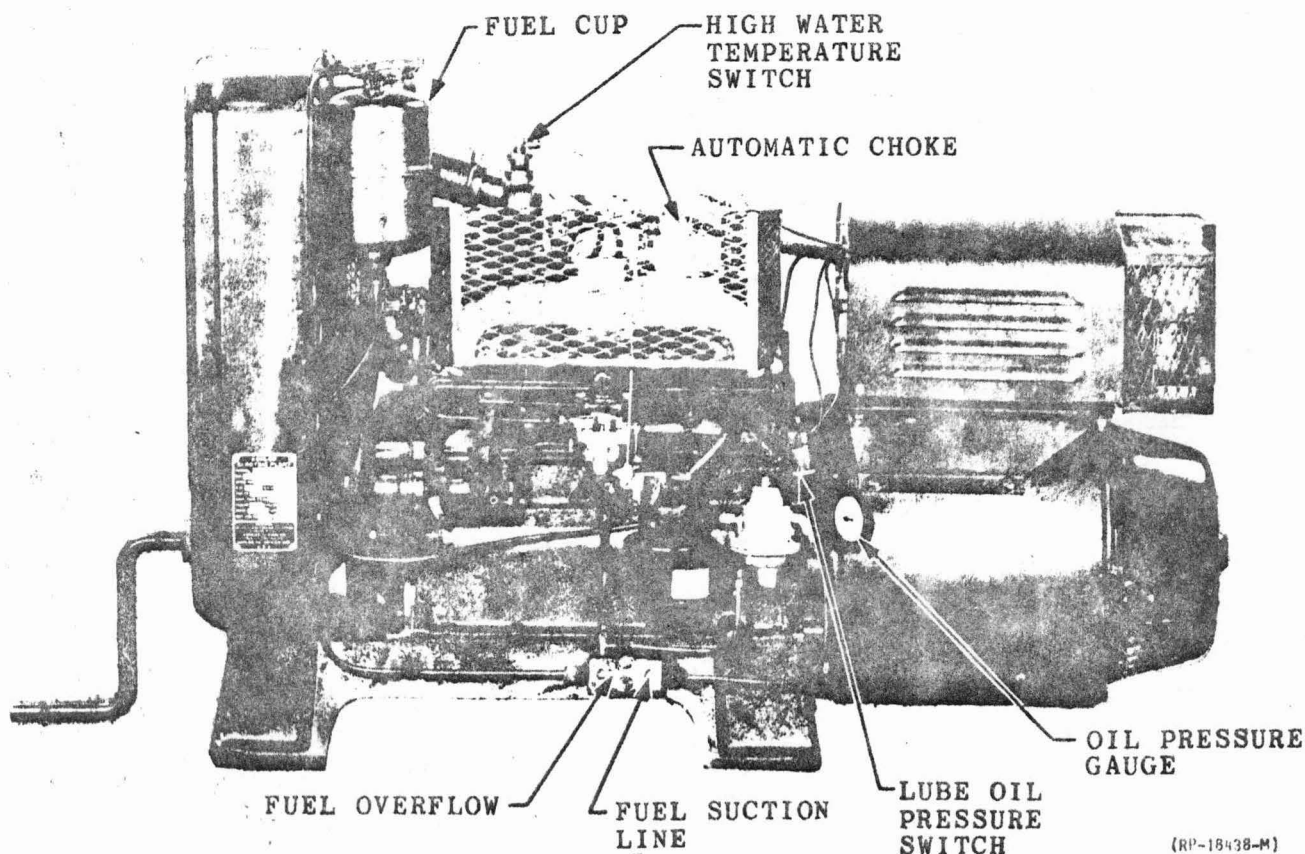
4.05 Inspect each set for damage, correct rating, accessories, tools, and loose parts. Remove any blocking from relays, etc.

4.06 Connect all piping. Before assembling the exhaust line drill and tap the hole for a 1/8 inch manometer connection one foot from the exhaust manifold. A drill, tap, and tap wrench will be found in the R-3076 Manometer box.

4.07 In order to protect the immersion heater until water is put in the cooling system, remove the fuse to the H1 terminal in the wall-mounted cabinet.

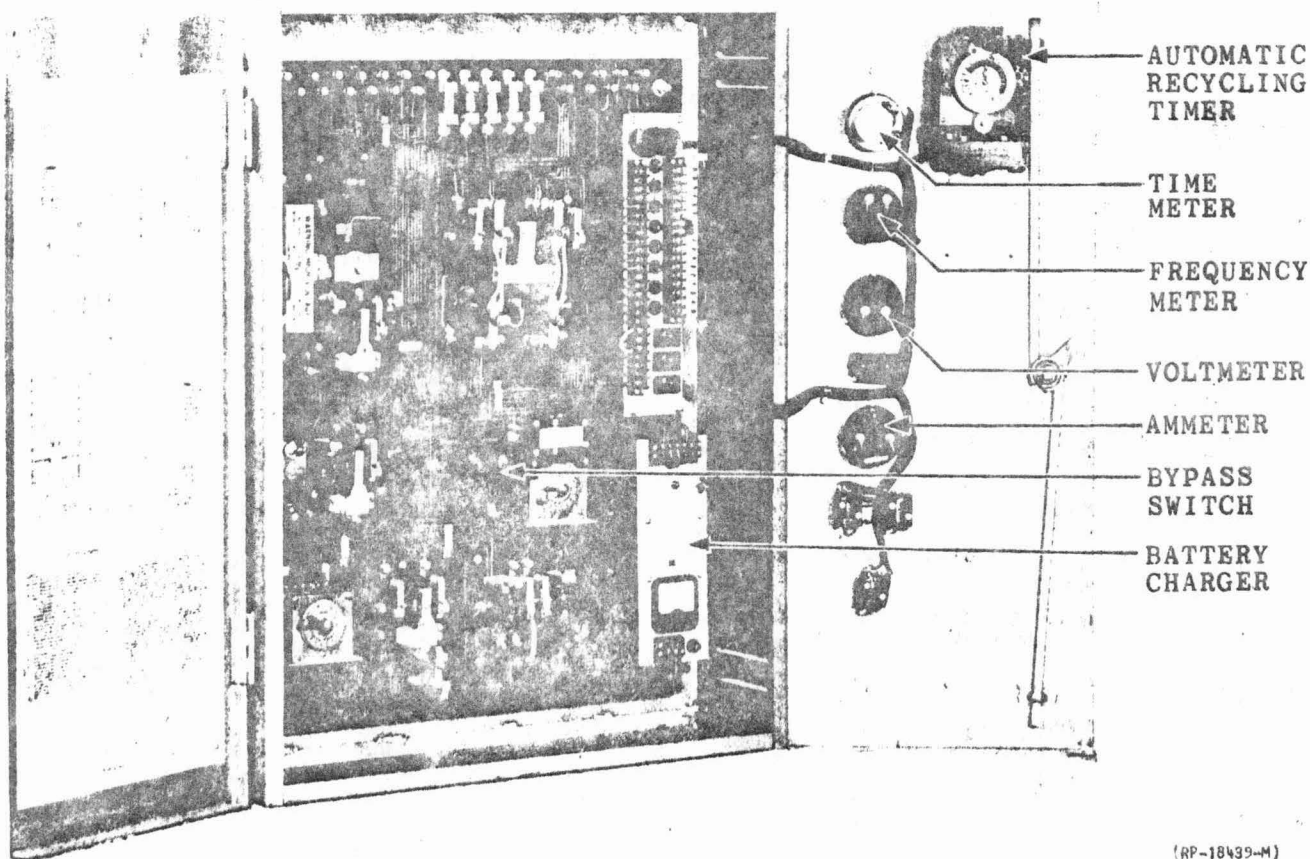
4.08 Put water in the cooling system. Observe water, antifreeze, and rust inhibitor information in Section 133. Use only soft water. Capacity of the cooling system is 7 quarts.

NOTE: Do not use alcohol as antifreeze. When filling the system open the ventcock on the water heater housing to bleed the air from the system.



(RP-18438-M)

FIG. 1 5 KW ENGINE-ALTERNATOR - FUEL SIDE  
(PAR. 1.41)



(RP-18499-M)

FIG. 2 WALL-MOUNTED CONTROL CABINET - 5 KW  
(PAR. 1.42)

4.09 Charge the starting battery in accordance with the section on engine starting batteries in Handbook 18.

4.091 There are terminals provided on the control cabinet so that a 230 volt ac source may be connected directly to the Battery Charger. Remove fuses F7 and F8 and connect a 230 volt ac source to terminals R1 and R2 of the cabinet. The 230 volt leads must be protected with 5 ampere fuses in the ac service cabinet.

4.092 Operate HI-LO Switch to HI. Adjust rheostat for desired charging rate as indicated on the charger ammeter.

4.093 After the initial charge operate HI-LO switch to LO and adjust the charger to float the battery in the voltage range below:

Lead Acid: 26.0-26.4 Volts  
Nickel-Cadmium: 28.0-29.0 Volts

4.094 Remove the ac from terminals R1 and R2 feeding the Battery Charger in the cabinet. Install fuses F7 and F8 removed earlier.

4.10 Open crankcase drain to remove any oil or residue. Close the drain and fill crankcase with specified oil to top line on dipstick. Capacity of crankcase is about 6 quarts. Also put oil in air cleaner. See Lubrication Chart on Operating Instructions. Observe requirements for the use of Casite.

4.11 Place Operating Instructions as directed by the telephone company.

4.12 Clean the set.

4.13 Turn the engine over with the hand crank to be sure it is free to rotate.

4.14 Check that the pointers on all meters indicate zero. Adjust pointers to zero as required by means of the zero-adjusting screws on the front of the meters.

## 5. PRELIMINARY PERFORMANCE TESTS

### 5.1 Initial Start

NOTE: How some of the controls are set will depend on whether or not office load is connected to the control cabinet. If office load is connected the BP Switch has been operated to BYPASS position.

5.101 Set controls on the cabinet as follows:

ENGINE TEST Switch to ON  
TRANSFER TEST Switch to NORMAL  
ENGINE CONTROL Switch to CONT DISC  
BP Switch to AUTOMATIC or BYPASS  
Battery Charger to LO

5.102 Open the fuel valve in the suction line to the engine. If the set is being started for the first time, or if the fuel system is empty, operate the hand lever on the fuel pump until the glass fuel cup is filled.

5.103 Depress ITS Thermal Switch reset button on engine.

5.104 Operate REMOTE EMERGENCY STOP Switch to NORMAL position.

5.105 Start engine as follows:

5.1051 BP Switch at BYPASS: Put a jumper across 4-5 contacts (auxiliary G contact of the BP Switch). Operate ENGINE CONTROL Switch to AUTO START.

5.1052 BP Switch at AUTOMATIC: Operate ENGINE CONTROL Switch to AUTO START.

5.106 Check engine-alternator speed with R-2705 Tachometer. This should be within the range 1770-1860 rpm.

5.107 Check alternator voltage by turning VOLTS ADJUST control throughout its range. Voltage should be within the range 220-245 volts. Adjust voltage to match outside line voltage.

5.108 Run for about 15 minutes. Check oil pressure and water temperature. Check for exhaust, fuel, oil and water leaks.

NOTE: Check for exhaust system leaks with R-2722 Carbon-Monoxide Detector. (See Section 131 in this handbook).

5.109 Stop the set by operating ENGINE CONTROL Switch to CONT DISC.

5.110 Correct any leaks that may have been observed.

### 5.2 Full-Load Test

5.21 Connect the R-2759 Water Rheostat as follows:

5.211 If office load is not connected, connect the artificial load to load terminals 2L1 and 2L3.

5.212 If office load is connected and being carried by commercial power through the BP Switch, connect the load to the 2L1 and 2L3 terminals of the TS relay (Transfer Relay).

5.22 Remove the 1/8 inch pipe plug in the exhaust pipe and connect the R-3076 Manometer.

5.23 Start the set by operating ENGINE CONTROL Switch to AUTO START position. After the unit is up to speed record no-load volts, speed, lube oil pressure, water temperature and time meter reading.

5.24 Make a one-hour Preliminary Load Test by applying 2.5 KW and 5 KW load for 30 minutes each. Record volts, amperes, speed, lube oil pressure, water temperature and time meter at the beginning and end of each 30-minute period. Calculate and record KW for each reading, as follows:

$$KW = \frac{LINE VOLTS \times LINE AMPERES}{1000}$$

NOTE: The KW load that the engine-alternator will carry decreases as altitude above sea level increases. It must be capable of carrying at least the following load:

|             |         |
|-------------|---------|
| Up to 3000' | 5 KW    |
| 4000'       | 4.75 KW |
| 5000'       | 4.5 KW  |
| 6000'       | 4.25 KW |
| 7000'       | 4.0 KW  |

5.25 At full-load determine exhaust system back pressure with the R-3076 Manometer in accordance with Section 131 in this handbook. Record this value on the test sheet.

5.26 Throughout the test run check meters for any signs of lack of freedom of movement or internal damage.

5.27 The set shall meet the requirements shown in Paragraph 5.3 during this test.

5.28 The customer may wish to continue with the Acceptance Test, Paragraph 6. In that case continue with the 1-1/2 hour run shown in Paragraph 6.

5.29 If the Acceptance Test will be delayed, reduce artificial load to minimum and shut the set down by operating ENGINE CONTROL Switch to CONT DISC. After exhaust system has cooled sufficiently, remove manometer connection, replace the 1/8 inch pipe plug and then tighten all exhaust system bolts.

### 5.3 Test Requirements

5.31 Speed shall stay within the range 1770-1860 rpm.

5.32 Voltage shall stay within  $\pm 5\%$  of original setting at no-load. (Multiply no-load cold voltage by 0.05 to calculate allowed variation).

5.33 Lube oil pressure shall not drop below 15 psi.

5.34 Water temperature shall not exceed 190° F.

5.35 Exhaust back pressure at full-load shall not exceed 13.6 inches of water (1 inch of mercury).

## 6. ACCEPTANCE TEST

TIME: This test is 1-1/2 hours in length, one hour at full load and 1/2 hour at office load or a load value equal to office load.

LOAD: It is preferable to make the official Acceptance Test using office load supplemented by artificial load.

6.1 If this is a continuation of the Preliminary Test start with Paragraph 6.4.

6.2 If this is a separate test with office load connected operate cabinet controls as follows:

ENGINE TEST Switch to ON.  
TRANSFER TEST Switch to NORMAL.  
ENGINE CONTROL Switch to CONT DISC.  
BP Switch to BYPASS  
Battery Charger to LO

6.3 Start the set by operating ENGINE CONTROL Switch to AUTO START. With artificial load at minimum transfer office load to the set by operating BP Switch to AUTOMATIC. Increase artificial load so that the set is carrying full load.

6.4 With the set operating at full load record volts, amperes, speed, lube oil pressure, water temperature and time meter every 30 minutes for a period of one hour. The set shall meet requirements shown in Paragraph 5.3.

NOTE: With office load connected it will not be possible to determine KW. Do not exceed 6.25 KVA.

$$KVA = \frac{\text{Line Voltage} \times \text{Sum of Line Currents}}{1000}$$

6.5 After one hour at full load reduce artificial load so that the set carries a value of load approximately equal to the normal office load. If office load is being carried then reduce artificial load to zero.

6.6 With the set carrying office load or a load equal to office load the governor may be adjusted so that speed is approximately 1800 rpm. Refer to Paragraph 9.1 for the adjustment.

6.7 Run the set thirty minutes at office load value and take two sets of readings, at the beginning and end of the period.

6.8 At the end of the test transfer office load back to commercial power by operating BP Switch to BYPASS. If artificial load was used reduce the load to zero. Allow the set to run at no-load for about 2 minutes and then shut it down by operating ENGINE CONTROL Switch to CONT DISC.

6.9 After exhaust system has cooled sufficiently, tighten all exhaust system bolts, remove manometer connection, and replace 1/8 inch pipe plug in the exhaust line, if this has not been done earlier.

## 7. ENGINE TROUBLE CONTROLS

NOTE: Switches in Paragraphs 7.2 and 7.3 are not adjustable. These have been checked for operation in the required range at the factory. If the switch appears to be damaged or otherwise defective replace it.

### 7.1 Preliminary

7.11 Operate controls as follows:

ENG TEST Switch to ON  
ENGINE CONTROL Switch to CONT DISC  
TRANS TEST Switch to NORMAL  
BP Switch at AUTOMATIC or BYPASS  
Battery Charger to LO

7.12 Disconnect the artificial load.

7.13 Start the engine by operating ENGINE CONTROL Switch to AUTO START.

### 7.2 High Water Temperature Switch (WS)

7.21 This switch closes to ground the ignition and stop the engine if engine water reaches 203-212°F up to 3000 ft. altitude or 195-205°F for altitudes above 3000 feet.

7.22 Simulate closure of the WS switch by shorting the terminals until the engine shuts down, which occurs when LTS timer operates in 30-60 seconds. The LTS timer provides an Engine Failure Alarm (EF lead). Remove the short on the switch when the engine shuts down.

7.23 About 2 minutes after shutdown EF lamps of AC & ENG ALM and office alarm light and ground is applied over lead ATA to distant point.

7.24 With the engine shut down the LO relay releases and EFT Timer starts. After EFT Timer times out (1-1/2 to 2-1/2 minutes) MH relay operates. MH also provides ground on EF lead.

7.25 Operate ENGINE CONTROL Switch to CONT DISC position.

7.26 Depress RESET button on the cabinet and on LTS relay to reset MH relay and remove the EF lead indication.

### 7.3 Low Oil Pressure Switch (LOP)

7.31 This switch closes when lube oil pressure drops to about 6 psi.

7.32 The switch is not adjustable. A simulated closure test may be made by shorting the terminals of the switch. Sequence of operations will be as shown in Paragraphs 7.22 through 7.26.

#### 7.4 Overtime Cranking (ITS Switch)

7.41 This switch opens to drop out the cranking relay if the engine cranks continuously for 40-120 seconds without starting. A contact on this switch also brings in an Engine Failure alarm. The switch requires manual resetting.

7.42 It will not be necessary to check this feature provided the timing and operation in Paragraph 7.22 is satisfactory.

#### 7.5 Low Fuel (If Provided)

7.51 Clip a grounded lead to LG terminal in Main Control Cabinet. Lamp LG on low fuel alarm lights, minor alarm sounds, and ground is applied over lead ATD to distant point.

7.52 Operate ACO key on Low Fuel Alarm to silence alarm.

7.53 Remove ground from LG terminal. LG lamp goes out and ground is removed from ATD lead.

### 8. EMERGENCY STOPS

8.1 If a remote electrical stop switch is provided to allow emergency shut-down from a remote location, start the engine and verify that operating the REMOTE STOP SWITCH to STOP will shut down the engine.

8.2 Operate this switch to NORMAL and engine will start.

### 9. ENGINE ACCESSORY TESTS AND ADJUSTMENTS

#### 9.1 Governor

9.11 Adjust speed as follows. Loosen the locknut on the bumper screw on the rear of the governor and turn this out several turns CCW. Loosen the locknut on the Speed Adjusting Screw (top left) and turn the screw in to raise speed or out to lower speed. Later with the set running at no load turn the bumper screw in to eliminate surging, but not far enough in to increase speed.

9.12 If the governor surges under load, or at the desired load point, turn the Auxiliary Adjusting Screw (rear end of spring) out a few turns at a time until surging stops. For close speed regulation, keep this screw in as close as possible without making the governor surge.

9.13 Tighten all locknuts securely after making any adjustments.

#### 9.2 Carburetor

9.21 Close the main jet needle valve by turning it slowly CW. Be careful to not turn it after it reaches bottom. After it has seated turn it out (CCW) three full turns.

9.22 Start the engine and let it warm up thoroughly. With the engine running at normal speed slowly close the main jet by turning it CW until engine speed

decreases or until the engine does not run smoothly. Then open the jet about 1/4 to 1/2 turn from this point. Turning the needle valve in provides a richer mixture while turning it out provides a leaner mixture.

#### 9.3 Automatic Choke

9.31 Check that at starting (cold engine) the carburetor choke valve, located in the air intake, snaps shut all the way.

9.32 Observe that when the engine warms up about 5 to 6 minutes the choke lever has operated its full swing to insure that the choke valve is wide open.

#### 9.4 Water Jacket Heater and Switch

9.41 This test can be made at any time after water has been put in the radiator. Commercial power must be available on the cabinet and the engine must be cold.

9.42 Install F13 fuse (fuse in circuit to H1 terminal) and operate BP Switch to AUTOMATIC.

9.43 The water heater should bring the water in the engine block to 70-80°F and hold it there. Observe water temperature gauge on the set.

9.44 If necessary to make an adjustment on the heater switch turn the adjusting knob so that the pointer indicates a higher or lower setting as desired.

### 10. AUTOMATIC OPERATION TESTS

**NOTE:** In these tests the engine-alternator will carry the office load. Previous tests assure that it is ready to do so. It will be necessary to ask the telephone company representative for permission to make the tests.

#### 10.1 Preliminary

10.11 The following switch positions are normal for the set with commercial ac carrying the office load.

ENG TEST Switch at OFF  
ENGINE CONTROL Switch at AUTO  
START  
TRANS TEST Switch at NORMAL  
BP Switch at AUTOMATIC  
Remote EMERGENCY STOP at NORMAL  
Battery Charger to LO

10.12 Remove the jumper across 4-5 contacts of the BP switch (if this was put in).

#### 10.2 ENG TEST Switch

10.21 Operate ENG TEST Switch to ON. Engine starts immediately and runs at no load.

10.22 Operate ENG TEST Switch to OFF. The engine stops.

#### 10.3 TRANS TEST Switch

10.31 Operate TRANS TEST Switch to TEST. The engine starts after a delay of 3-5 seconds, accelerates and comes up to speed.

10.32 The PF lamp of AC & ENG ALM and of the office alarm lig Ground is applied over lead ATB to the distant point 1-1/2 to 3-1/2 minutes after the test switch is operated. Momentarily operate ACO Key of AC & ENG ALM to silence the minor alarm.

10.33 After a 10 second warm-up Time (EST Timer) the TS (Transfer Relay) operates to transfer the load to the engine-alternator. When the transfer occurs PO lamps of AC & ENG ALM and office alarm light, minor alarm sounds and ground is applied over lead ATC to the distant station. Again operate ACO Key to silence the minor alarm.

10.34 Allow the set to carry the load for a few minutes. Then operate TRANS TEST Switch to NORMAL. PF lamps are extinguished and ground is removed from ATB lead. Where stations have a B1 alarm receiving-director circuit, ground is applied on ATE lead to the distant point.

10.35 The engine-alternator continues to carry the load for the Hold-Over Time after the TRANS TEST Switch is operated. The time may vary from 2-13 minutes, depending on the desired setting of TD Timer. At the end of the Hold-Over Time the TS relay releases to transfer the load to commercial power.

10.36 PO lamps are extinguished and ground is removed from ATC lead when the load transfer occurs. The engine continues to run for about two minutes after the transfer and then shuts down.

NOTE: The TD timer has three timing functions:

- (1) Fixed 3-5 second start delay.
- (2) Fixed 2 minute delay on stopping.
- (3) Adjustable Hold-Over time (2-13 minutes)

10.37 Remove indication on lead ATE, where provided, by grounding terminal RD- in AC & ENG ALM.

#### 10.4 Power Failure Test

10.41 Open the outside power service switch. The sequence of events is the same as in Paragraphs 10.31 through 10.33.

10.42 Momentarily operate ACO key of AC & ENG ALM to silence minor alarms.

10.43 Allow the engine-alternator to carry the load for a few minutes. Close the outside power switch. The sequence of events is the same as in Paragraphs 10.34 through 10.36.

10.44 Remove indication on lead ATE, where provided, by grounding terminal RD- in AC & ENG ALM.

#### 10.5 Remote Start Test

10.51 Momentarily touch a grounded lead to RS terminal on the cabinet. Engine starts and sequence of events is the same as in Paragraphs 10.31 through 10.33.

10.52 Operate ACO key of AC & ENG ALM to silence the minor alarm.

10.53 The engine-alternator carries the load for about 30 minutes (RST Timer) and then goes into the Hold-Over Time. After RST times out the sequence of events is the same as shown in Paragraphs 10.34 and 10.35.

10.54 Remove indication from ATE lead, where provided, by grounding terminal RD- in AC & ENG ALM.

#### 11. MAINTENANCE DURING INSTALLATION

11.1 Before each run check crankcase oil level. If level has fallen more than half the distance from the top line (H) to the low line (L) on the dipstick add sufficient oil to bring the level up to the H mark.

11.2 Periodically check the battery charging current and the voltage of the starting battery.

#### 12. GENERAL TROUBLES AND CAUSES

##### 12.01 Low Lubricating Oil Pressure

Insufficient oil or oil too light  
Worn bearings

##### 12.02 No Fuel or Insufficient Fuel

Low fuel supply  
Suction line valve not open  
Obstruction in fuel lines  
Suction lift too great  
Loose fuel lines or cracked connections  
Suction lines too small  
Fuel cup leaks  
Faulty fuel pump  
Dirty strainers

##### 12.03 Difficult Starting

Insufficient fuel (see 12.02)  
Throttle closed too much  
Cold engine  
Incorrect gasoline and air mixture - too lean or too rich  
Fouled or damaged spark plugs  
Incorrect timing  
Weak battery  
Spark plug leads incorrectly connected  
Fuel tank not properly vented  
Incorrect Firing Order (Par. 12.14)

##### 12.04 Smoky Exhaust

Black or gray: Mixture too rich  
Incorrect timing  
Blue: Too much oil due to worn piston rings or cylinders.

12.05 Backfiring

Cold engine  
Mixture too lean  
Poor grade of gasoline  
Air leak between carburetor and block

12.06 Engine Stalls

Idling speed too low  
Incorrect mixture, too lean or too rich, or insufficient fuel  
Sticky governor linkage  
Cold engine

12.07 Pounding or Knocking

Poor grade of fuel  
Incorrect timing  
Excessive carbon deposits on pistons or cylinder head  
Loose or worn engine parts  
Obstruction in exhaust line

12.08 Lack of Power

Mixture too rich or too lean  
Cold engine  
Obstruction in exhaust line  
Lack of Lubrication  
Throttle not properly set  
Speed too low  
Engine overloaded

12.09 High Water Temperature

Low water level  
Insufficient lube oil or insufficient lube oil pressure  
Engine overloaded  
Incorrect timing  
Excessive exhaust back pressure  
Thermostat stuck in closed position

12.10 Alternator Fails to Generate Voltage

Loose or open connections  
Loss of magnetism by exciter field (Par. 12.13)

12.11 Erratic Voltage

Poor commutation due to worn brushes, rough commutator or slip rings, dirty commutator

Loose or poor connections  
Sticky governor control arm  
Reversed Exciter Field Polarity (Par. 12.13)

12.12 Regulator Hunts

Incorrect adjustment of dashpot

12.13 Reversed Exciter Field Polarity and Loss of Magnetism

12.131 Check for reversed polarity by connecting a 150 volt dc voltmeter to the exciter terminals with the set running. Connect voltmeter + and - terminals to exciter field + and - terminals, respectively. If the voltmeter does not read up-scale the field is reversed.

12.132 To correct reversed polarity, stop the set, remove all exciter brushes, and connect approximately 45 volts dc, if available, or the starting battery across the exciter field. The dc positive lead should be connected to the positive field terminal and the negative to the negative field terminal. Slowly open and close this circuit two or three times. Disconnect the dc source, and replace the exciter brushes.

12.133 Failure of the alternator to produce a voltage may be due to loss of magnetism by the exciter. Proceed to flash the field as in Paragraph 12.132 to correct this condition.

12.14 Firing Order

12.141 The firing order for the cylinders is indicated on the engine, usually on the engine nameplate. The plugs must be connected for correct firing order. The firing sequence of the distributor cables is opposite to the direction the magneto is driven. When facing the distributor cable outlets, No. 1 is located in the upper right-hand corner. This goes to cylinder No. 1, the cylinder nearest the radiator. The next distributor cable goes to the second cylinder fired, etc.

➔ No arrows are shown due to extensive changes.

Vertical line at side of paragraphs indicates requirements.

Manager, Product Engineering

## Reason for Reissue:

- (1) To eliminate information on all units except the 5KW K3-5667-01 Lists 6 and 7.
- (2) To make general revisions.

Replaces Section 142 dated 5-18-58.