

TM-11-919A.

H5-095A

INSTRUCTION BOOK

FOR

GASOLINE ENGINE GENERATOR SET PU-107A/U

PREPARED FOR  
THE SIGNAL CORPS

ON ORDER No. 29E-7955-29

25 FEBRUARY 1955

FORWARD COMMENTS ON THIS PUBLICATION DIRECTLY TO:

Commanding Officer  
The Signal Corps Publications Agency  
Fort Monmouth, New Jersey  
ATTN: Standards Division

## WARNING

Dangerous voltages are generated by this equipment. Do not attempt to change output connections or the setting of the Wye-Delta change board while the equipment is in operation.

Provide proper and adequate ventilation if the equipment is operated in a confined space. Exhaust gases, produced by a gasoline engine, are poisonous. Excessive inhalation may cause serious sickness or death.

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**INSTRUCTION BOOK**

**FOR**

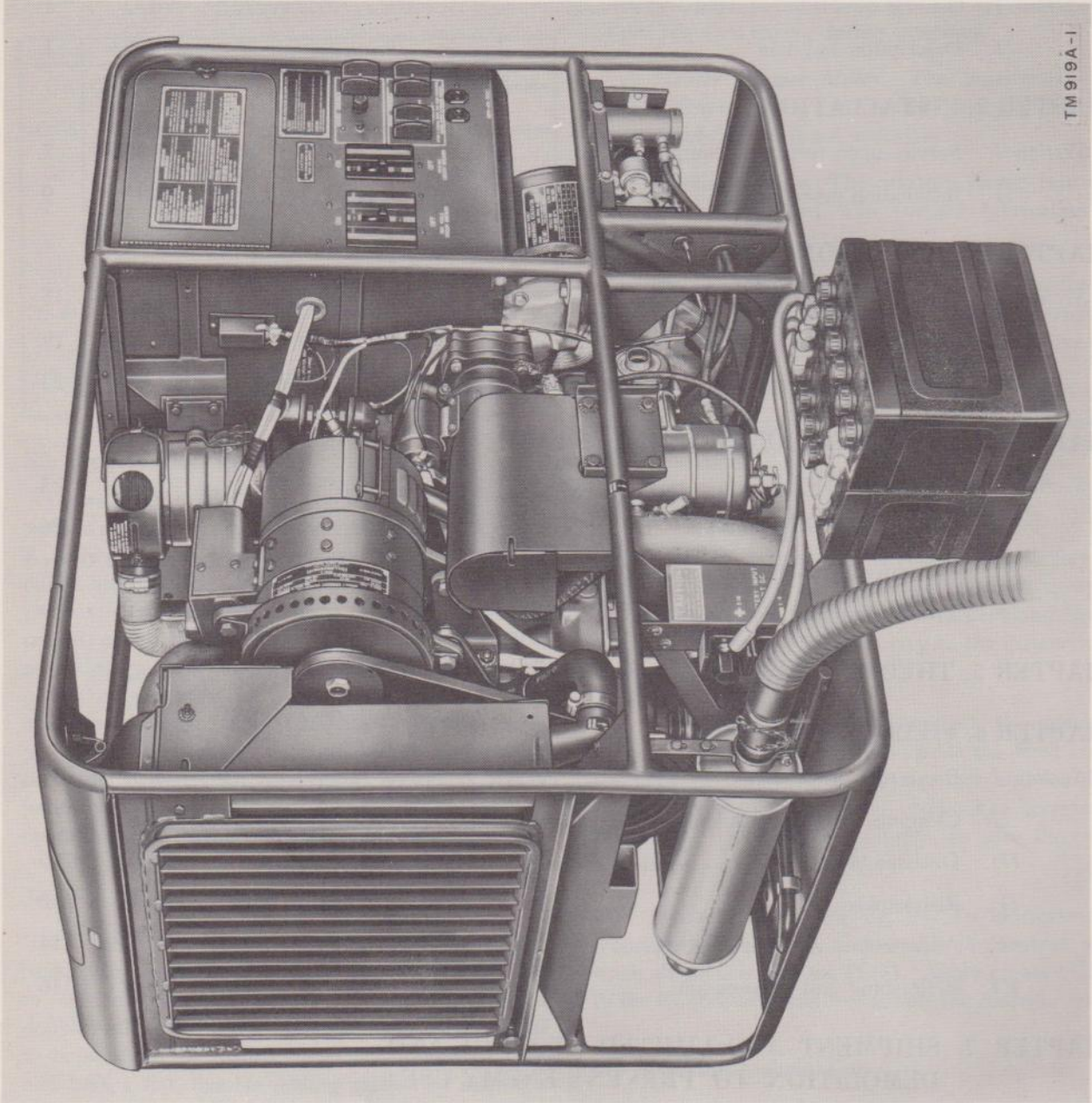
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Figure 1. Gasoline Engine Generator Set PU-107A/U.

## CHAPTER 1

### INTRODUCTION

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#### Section I. GENERAL

##### 1. Scope

These instructions are published for the information of all concerned. They include complete information for operating, servicing, maintaining, and overhauling Gasoline Engine Generator Set PU-107A/U. Also included are a detailed description of all major parts and a discussion of the theory of operation.

##### 2. Forms and Records

a. The following forms will be used for reporting unsatisfactory conditions of Army materiel and equipment and in performing preventive maintenance.

- (1) DD Form 6, Report of Damaged or Improper Shipment, will be filled out and forwarded as prescribed in SR 745-45-5 (Army); Navy Shipping Guide, Article 1850-4 (Navy); and AFR 71-4 (Air Force).
- (2) DA Form 468, Unsatisfactory Equipment Report, will be filled out and forwarded to the Office of the Chief Signal Officer, as prescribed in SR 700-45-5.
- (3) DD Form 535 Unsatisfactory Report, will be filled out and forwarded to Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio, as prescribed in SR 700-45-5 and AF TO 00-35D-54.
- (4) DA Form 11-260, Operator First Echelon

Maintenance Check List for Signal Corps Equipment (Power Units, Reel Units (Engine-Driven)), will be used in accordance with instructions appearing on the form.

- (5) DA Form 11-261, Second and Third Echelon Maintenance Check List for Signal Corps Equipment (Power Units, Reel Units (Engine-Driven)), will be used in accordance with instructions appearing on the form.
- (6) WD Form 460 (Preventive Maintenance Roster) will be used in accordance with current practices.

b. Use other forms and records as authorized.

##### 3. Purpose and Use

a. Gasoline Engine Generator Set PU-107A/U is intended as a source of power for Electronic Search Central AN/GSS-1. It also may be used as a source of power for transportable or mobile radar and similar Signal Corps equipment.

b. The 28-volt direct-current (dc) generator can be used to charge groups of wet cell storage batteries in either series or parallel circuits. Using a 20-ampere charging rate with a series circuit, it is possible to charge four 6-volt batteries, or one 24-volt battery. Using a 20-ampere charging rate with a parallel circuit, it is possible to charge five groups of four 6-volt batteries, five groups of two 12-volt batteries, or five 24-volt batteries.

#### Section II. DESCRIPTION AND DATA

*Note.* All left and right designations are assumed as viewed from the rear, or generator end, facing the set.

##### 4. Description

Gasoline Engine Generator Set PU-107A/U is a portable electric generating set that consists of the

following major assemblies: a single bearing, permanent magnet, 400-cycle alternator; a 28-volt dc generator; a four-cylinder, four-stroke cycle, liquid cooled, gasoline engine; a winterization system to aid starting in low temperatures; and necessary controls and instruments for the operation and regulation of the equipment. The 400-cycle alternator is directly coupled to the engine flywheel and the 28-volt dc generator is belt driven from the engine crankshaft. All necessary controls and instruments are mounted on panels on the left-hand side at the generator end of the unit. Power output and remote control connections are provided on the right-hand side of the unit. The entire equipment is mounted within a tubular steel frame and a canvas cover is provided to protect the equipment when it is not in operation.

## 5. Major Systems and Assemblies

*a. Engine.* The generator is driven by a conventional, L-head, four-stroke cycle, four-cylinder, liquid cooled, gasoline engine. Ignition is provided by a high-tension magneto (11, fig. 3) and self shielded spark plugs (3, fig. 3). A 15-quart, tubular-cell radiator (27, fig. 2), belt driven fan and water pump comprise the major elements of the cooling system. The engine is lubricated by a gear-type oil pump that delivers oil under pressure to the main bearings and connecting rod bearings. The fuel system consists of an up-draft carburetor (14, fig. 3), a diaphragm-type fuel pump (16, fig. 3), and a remote fuel line and fuel drum adapter. There is no fuel tank on the unit. The engine may be started by means of a hand crank or by a 24-volt electric starting system. Two 12-volt storage batteries, connected in series, are provided to supply power for the electric starting motor. A belt-driven, 24-volt dc generator (5, fig. 3) maintains the batteries in a charged condition.

*b. Winterization system.* A winterization system is provided to aid in starting the engine in low temperatures. The winterization unit consists of a fuel pump (15, fig. 2), fuel control valve (16, fig. 2), blower (17, fig. 2), heat exchanger pan (18, fig. 2), and shield (21, fig. 2). A switch, circuit breaker, and indicator lamp for control of the winterization system are mounted on the unit control panel.

*c. Alternator.* (9, fig. 4). The alternator is of the permanent magnet-type with 28 poles. It is directly coupled to the engine and, when operated at 1,714

revolutions per minute (rpm), develops 12.5 kilowatts (kw), 120 or 208 volt, three-phase, four-wire output at .8 power factor. A compensator assembly, consisting of a transformer (1, fig. 4) and a capacitor assembly (4, fig. 4), is provided to maintain voltage stability.

*d. Dc power generator.* A separate, 28-volt dc generator (1, fig. 2) is mounted to one side of the engine and driven by a V-belt from the engine crankshaft. This generator, when operated at 4,500 rpm, will deliver 2.5 kw, 28 volts dc.

*e. Radio-frequency Suppression Equipment.* Radio frequencies produced by the operation of the set are suppressed by shielding, ground straps, grounded capacitors, resistor-suppressors, and bonds formed by external-internal-toothed lock washers. A complete description of suppression equipment is contained in paragraph 67.

*f. Frame.* The frame structure (12, fig. 3) supports the entire generator set assembly and is comprised of two parts. The lower frame acts as a skid and also shock-mounts the engine and alternator. The upper frame mounts the instrument and control panels, the wye-delta change board, and terminal panel.

## 6. Performance Characteristics

*a. Output combinations.* The generator set is rated at the following output combinations:

- (1) Ten kilowatts (kw) at .8 power factor, 120 volts alternating-current (ac), single-phase, 400 cycles, 2.5 kw at 28 volts dc.
- (2) Ten kw at .8 power factor, 120/208 volts ac, three-phase, four-wire, 400 cycles, 2.5 kw at 28 volts dc.
- (3) Twelve and one-half kw at .8 power factor, 120/208 volts ac, three-phase, four-wire, 400 cycles.

*b. Alternating Current.*

- (1) Single-phase, 120-volt, .8 power factor.

Approx. load	Amperes	Volts	Kilowatts	Cycles
0	0	124	0	400-415
¼	25.5	122-124	2.5	400-415
½	52.0	120-122	5.0	400-415
¾	78.0	120-122	7.5	400-415
Full	104.0	118-120	10.0	400-415

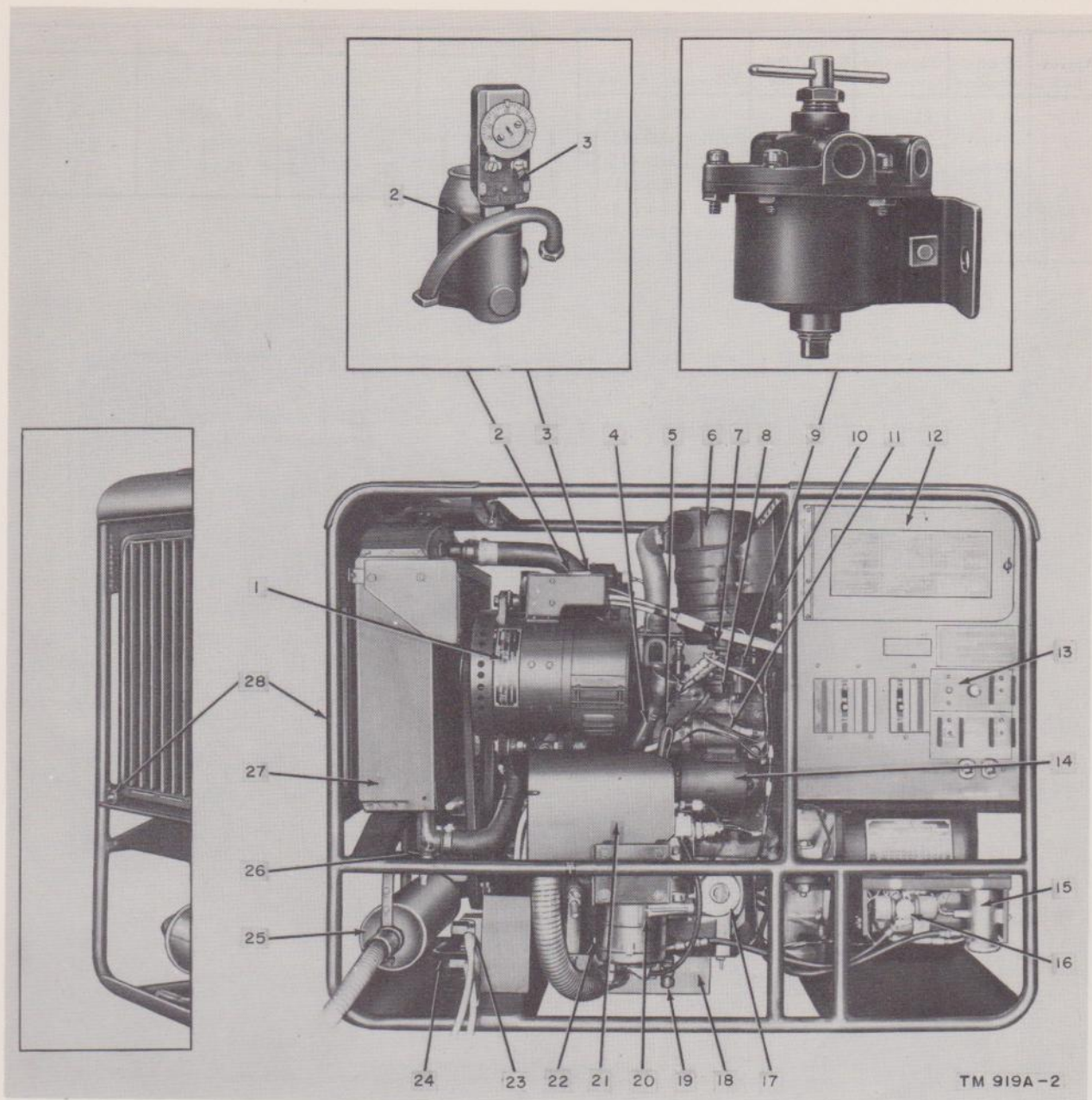


Figure 2. Gasoline Engine Generator Set PU-107A/U, left side.

- |   |                                       |  |
|---|---------------------------------------|--|
| 1. 28-v, 2.5-kw generator (G3).           | 10. Ten-conductor socket (P1 and J2). | 20. Heater (HR2).                              |
| 2. Coolant outlet neck (A 1).             | 11. Starting motor solenoid (L2).     | 21. Heater shield (MP550).                     |
| 3. Coolant temperature cutoff switch (S3) | 12. Instrument panel door (A 136).    | 22. Crankcase.                                 |
| 4. Oil filler tube (MP3).                 | 13. Control panel (MP530).            | 23. Battery input terminals (H1953 and H1954). |
| 5. Bayonet gage (M21).                    | 14. Starting motor (B1).              | 24. Hand crank (MP557).                        |
| 6. Air cleaner.                           | 15. Heater fuel pump (L5).            | 25. Muffler (MP201).                           |
| 7. Low-oil-pressure cutoff switch (S2).   | 16. Heater fuel control valve (L4).   | 26. Radiator drain (MP207).                    |
| 8. Oil-pressure transmitter (E8).         | 17. Heater blower (B2).               | 27. Radiator (A 41).                           |
| 9. Oil filter (FL1).                      | 18. Heater heat exchanger pan (HR1).  | 28. Manual choke (MP534).                      |
|   | 19. Crankcase drain (H535).           |  |



(2) Three-phase, 208-volt, .8 power factor.

c. Direct current.

Approx. load	Output Amperes	Phase-to-Phase Output Volts	Phase-to-Neutral Output Volts	Kilowatts	Cycles
0	0	215-218	124	0	400-415
1/4	10.0	213-215	123	3.0	400-415
1/2	21.5	210-212	121	6.25	400-415
3/4	32.5	210-212	121	9.5	400-415
Full	43.5	208-211	120	12.5	400-415
5/4	54.0	206-208	119	15.5	400-415

Approx. load	Output Amperes	Output Volts	Kilowatts
0	0	27-30	0
1/4	22	27-30	.625
1/2	45	27-30	1.25
3/4	71	27-30	2.0
Full	90	27-30	2.5

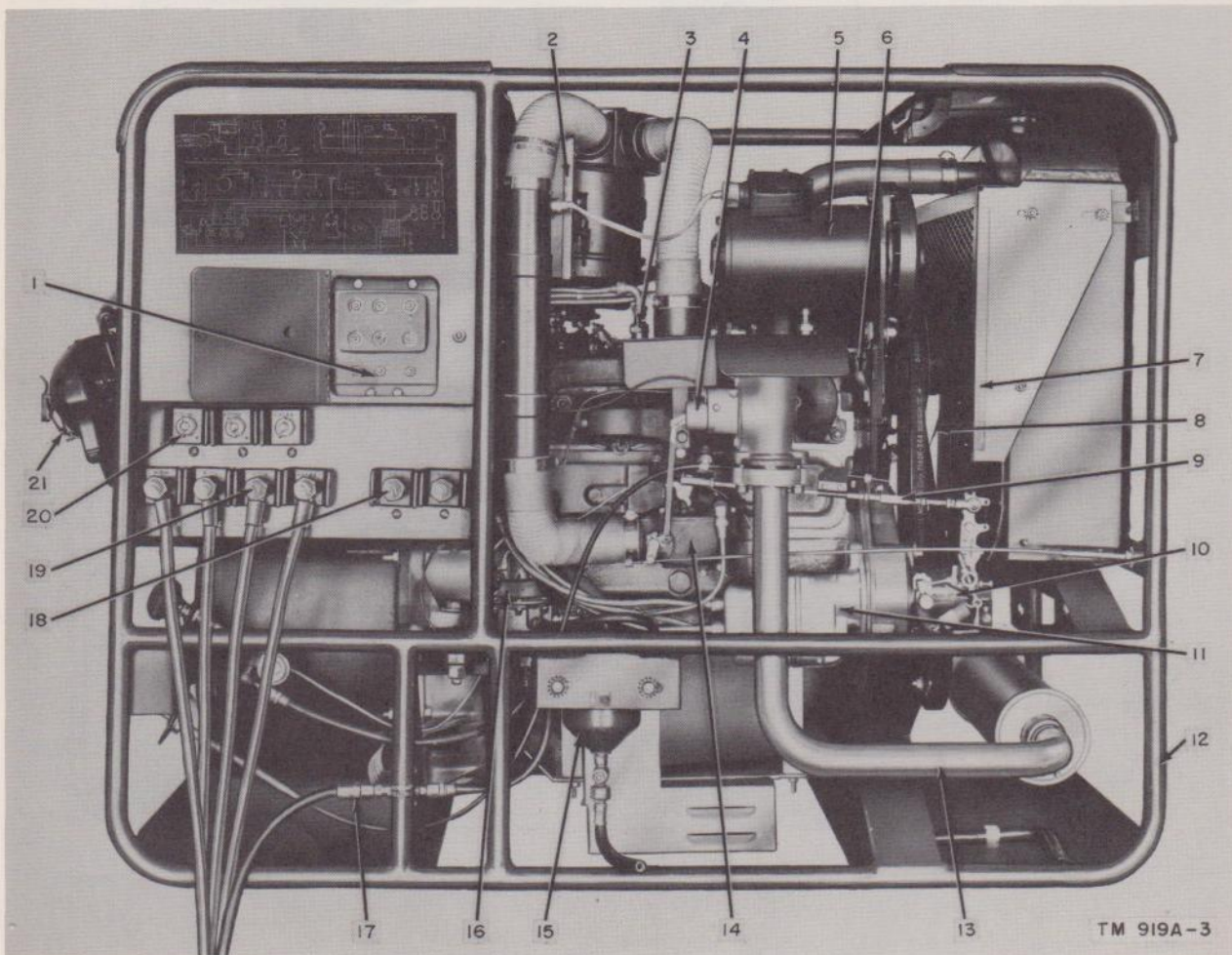
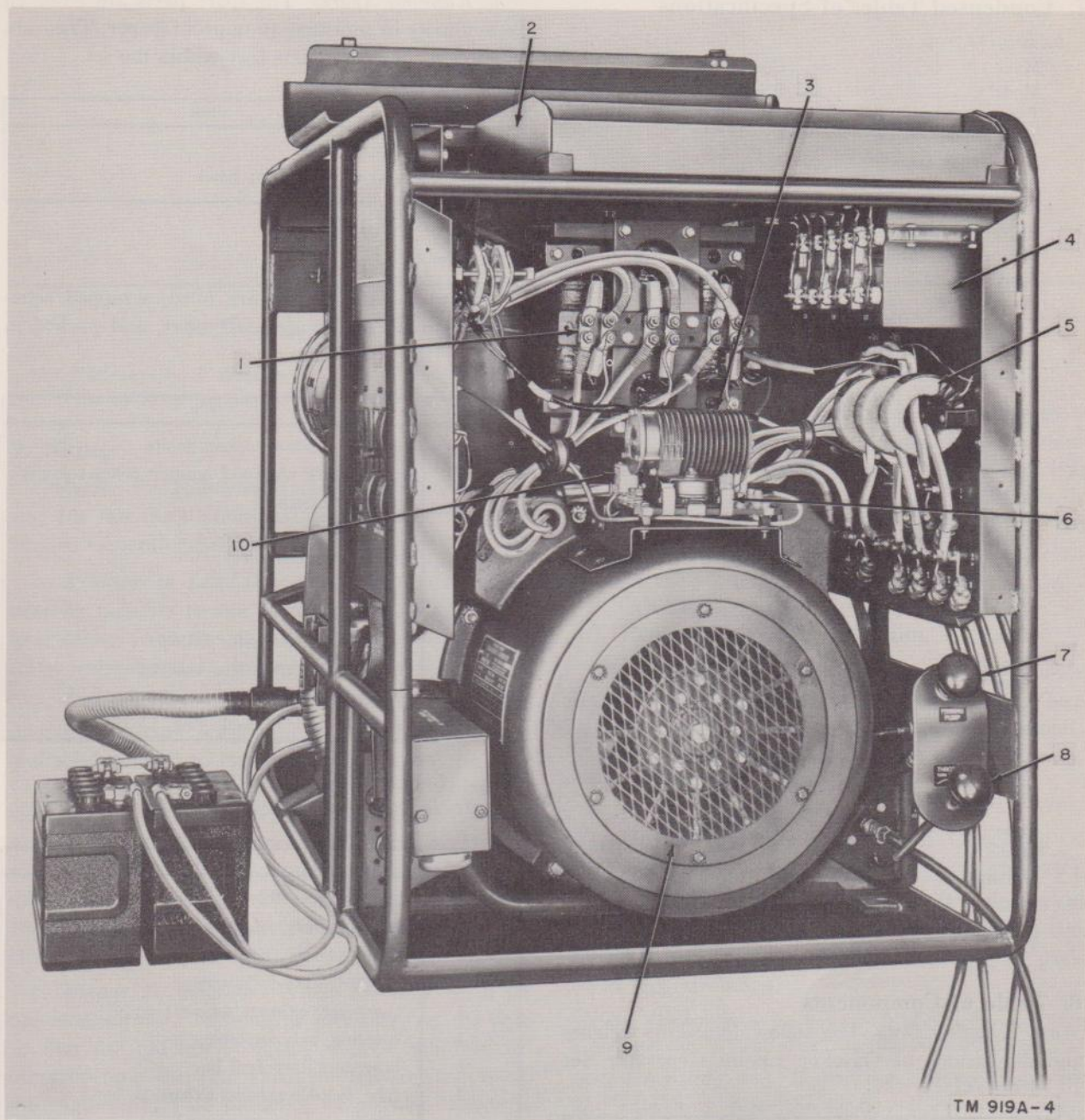


Figure 3. Gasoline Engine Generator Set, PU-107A/U, right view.

- |   |                                    |  |
|---|------------------------------------|--|
| 1. Wye-delta change board.                  | 8. Fan (B26).                      | 16. Fuel pump (MP272).                         |
| 2. Suppression box (VR5).                   | 9. Carburetor-to-governor linkage. | 17. Auxiliary fuel line adapter (MP558).       |
| 3. Spark plugs (E195 and E198).             | 10. Governor (MP535).              | 18. Dc voltage output terminals (E18 and E19). |
| 4. Electric choke (L3).                     | 11. Magneto (E13).                 | 19. Ac voltage output terminal.                |
| 5. 24-volt battery-charging generator (G3). | 12. Frames (A 178 and A 179).      | 20. Remote control terminal.                   |
| 6. Water pump.                              | 13. Exhaust system.                | 21. Fire extinguisher (MP556).                 |
| 7. Fan guards (A 44 and A 45).              | 14. Carburetor (MP292).            |  |
|   | 15. Fuel filter (FL12).            |  |



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Figure 4. Gasoline Engine Generator Set PU-107A/U, rear view.

- |  |                             |
|--|-----------------------------|
| 1. Compensator transformer (T2).             | 6. Stop relay (K3).         |
| 2. Tool tray (MP546)                         | 7. Primer pump (MP431).     |
| 3. Dc voltage regulator (E14)                | 8. Manual throttle (MP531). |
| 4. Compensator capacitor assembly (C26)      | 9. Alternator (G2).         |
| 5. Ammeter current transformers (T4 and T6). | 10. Start relay (K1).       |

## 7. Condensed Tables of Specifications

### a. Engine.

Make	Continental.
Model	FS-162-6011.
Type	4-stroke cycle.
Type cylinder head	L.
Number of cylinders	4.
Bore	3-7/16.
Stroke	4-3/8.
Piston displacement	162 cu in.
Compression ratio	6.3 to 1.
Speed	1,714 rpm.
Horsepower	41.
Type cooling	Liquid.
Cooling system capacity	15 qt.
Type lubrication	Pressure and splash system
Lube oil capacity	4½ qt.
Fuel consumption (gal per hr.)	2.5.
Air cleaner	Oil bath.
Spark plugs	XE-8 Coml (Champion).
Ignition system	Magneto.
Batteries (2)	12-v each.

### b. Alternator.

Make	Hollingsworth.
Model	APG-H-11636.
Voltage	120/208.
Phase	Single or three.
Cycle	400.
Power factor	0.8
Speed	1,714 rpm.
Drive	Direct.

### c. Dc Generator.

Make	Hollingsworth.
Model	DG.
Voltage	28.
Ampere rating	90.
Speed	4,500 rpm.
Drive	Pulley and belt.

## 8. Table of Components

a. *Packaging Data.* The following are the weights and dimensions of Gasoline Engine Generator Set PU-107A/U.

Quantity	Item	Width (in.)	Length (in.)	Height (in.)	Volume (cu ft)	Weight (lb)
1	Gasoline Engine Generator Set PU-107A/U	28	48	37	28.8	1,150
1	Engine	22	24	22	7.77	335
1	Alternator	18.5	11.06	18.88	1.79	245
2	Battery (crated)	9	14	12	0.087	35

b. *Running Spares.* The spare parts are wrapped individually in moisture-fungiproof paper. They are packed in the spare parts tray within the set.

Quantity	Item
4	spark plugs
4	gaskets, fuel pump bowl

### c. Tools.

The tools listed below are oiled, wrapped separately in moisture-fungiproof paper, and packed in the tool tray within the set.

Quantity	Item
1	dresser, ignition contact points
1	gage, spark plug and ignition contact points
1	handle, wrench
1	oiler, hand
1	pliers, combination
2	sandpaper, flint
1	screw driver
1	screw, eye, alternator lifting
1	bolt, puller, alternator bearing
1	wrench, adjustable
1	wrench, socket, spark plug, 13/16 in.

### d. Installation Equipment.

Quantity	Item
1	adapter, fuel drum
1	cable, battery, negative
1	cable, battery, positive
1	cable, battery-to-battery
1	connector, exhaust tubing pipe
1	coupling, exhaust tubing lock
1	hose, auxiliary fuel line
1	tube, flexible exhaust extension

### e. Miscellaneous Equipment.

Quantity	Item
2	battery, 12-volt storage (separately packaged)
1	cover, canvas
1	crank, hand
1	fire extinguisher

# CHAPTER 2

## INSTALLATION

---

### Section I. SERVICE UPON RECEIPT OF EQUIPMENT

*Note.* Paragraphs 9 through 17 cover service for new, old, or reconditioned equipment.

#### 9. Siting

Consider the following factors when selecting a site for the installation and operation of Gasoline Engine Generator Set PU-107A/U.

*a. Relation to Load.* Locate the generator set as near as possible to the electrical load. Excessively long cables from the unit to the load increase line resistance and cause a definite voltage drop.

*b. Outdoor Installation.* When the unit is to be operated outdoors, select a site that is reasonably dry and solid enough to support the weight of the unit (1,250 pounds). No special foundation is necessary; however, the unit should be operated in as near a level position as possible. If the terrain is soft or muddy, make a foundation out of planks or other similar material. If possible, provide some form of shelter to protect the equipment from the elements.

*c. Indoor Installation.* When the unit is to be operated within a building or inclosure, set the unit so that the radiator is facing a door, window, or other opening through which the hot-air blast from the engine may pass outdoors. If possible, attach a canvas duct to the radiator grill and attach the other end of the duct to the building opening. Connect the flexible exhaust tubing to the muffler outlet and extend the free end of the exhaust tubing to the outside of the building or shelter. Be sure that all exhaust connections are gastight. *Carbon monoxide fumes from a gasoline engine are extremely dangerous and, when inhaled, may cause serious illness or death.* Provide not less than 2 feet of space on all sides of the unit to facilitate working on and

operating the equipment.

*d. Location of Fuel Supply.* If the unit is to be operated indoors, locate the fuel supply tank outside the inclosure within easy range of the 20-foot long fuel line furnished with the equipment. Locate the fuel supply drum so that the bottom of the fuel drum adapter is not more than 6 feet below the level of the engine fuel pump.

#### 10. Preparation of Foundation

No special foundation is necessary; however, the generator set should be placed on a firm, level surface capable of supporting at least 1,250 pounds. The base of the packing crate will serve as a temporary foundation in mud or snow.

#### 11. Uncrating, Unpacking, and Checking

Gasoline Engine Generator Set PU-107A/U is shipped in three packages. The set, including all spare parts, tools, and installation equipment, is contained in one large crate. The two batteries are packed in separate boxes.

*Note.* The bottom of the large crate is constructed to form a skid and can be used for sliding the set short distances.

*a. Uncrating and Unpacking.* Before uncrating and unpacking, place the set near the location where it will be operated. Uncrate the set carefully to avoid damage. Use a nail puller and other appropriate tools. Be sure to remove all packages and parts within the crate or they may be accidentally discarded with the packing material. The set is inclosed in waterproof paper and a vaporproof barrier only when prepared for overseas shipment. When prepared for domestic shipment, the vaporproof barrier is not used. Refer to figure 5 and uncrate and unpack the equipment as follows:

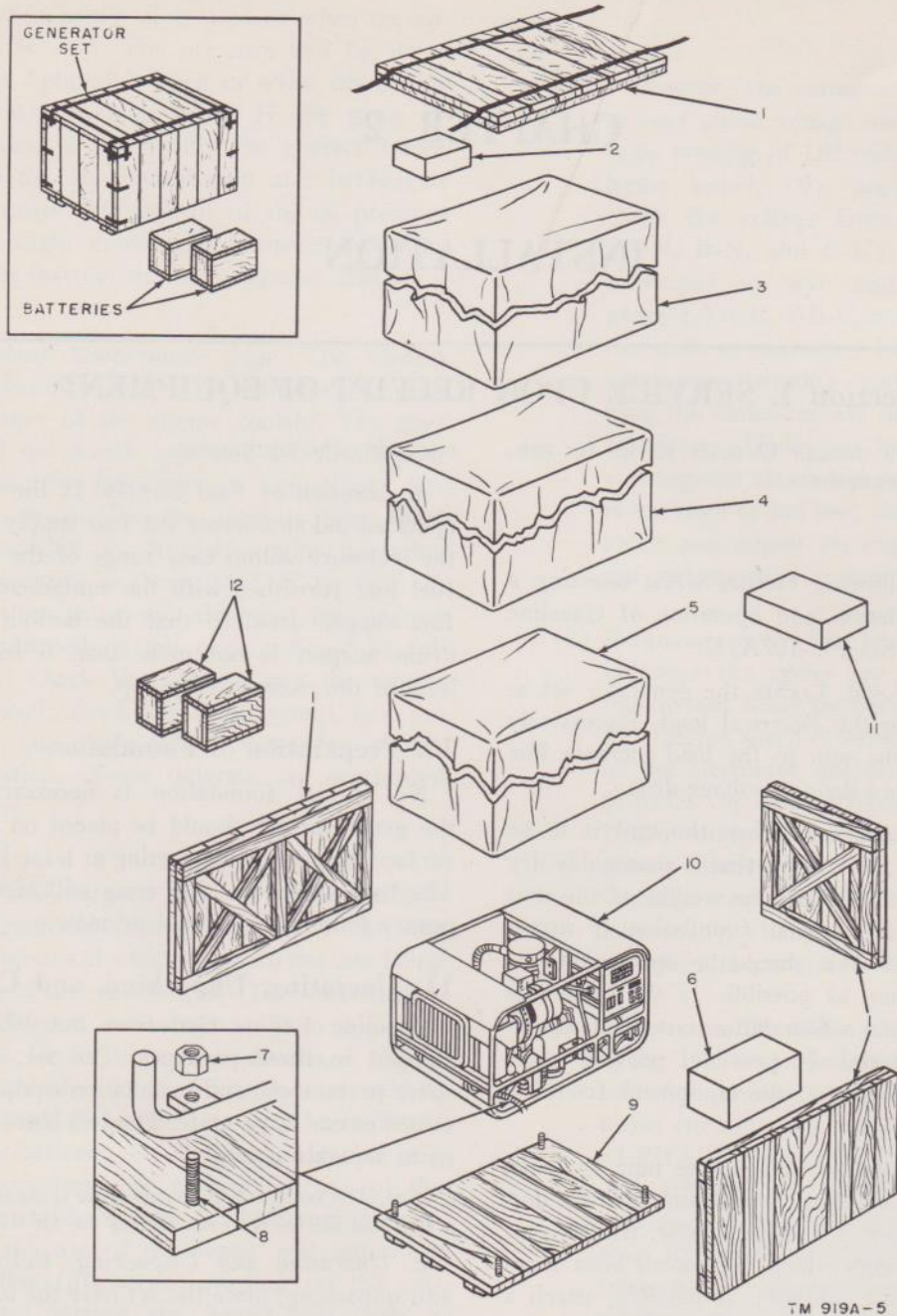


Figure 5. Generator set, packaging.

- |                            |                              |
|----------------------------|------------------------------|
| 1. Top and sides.          | 7. Nuts.                     |
| 2. Manuals.                | 8. Bolts.                    |
| 3. Waterproof paper.       | 9. Base.                     |
| 4. Vaporproof barrier.     | 10. Generator set.           |
| 5. Canvas cover (H2368).   | 11. Spare parts.             |
| 6. Installation equipment. | 12. Batteries (BT1 and BT2). |

- (1) Remove the top and sides (1) of the large crate.
- (2) Remove the manuals (2), located on top of the set.
- (3) Remove the waterproof paper (3) and the vaporproof barrier (4).
- (4) Remove the canvas cover (5), inclosing the entire set.
- (5) Remove all the packaged installation equipment (6) located in the bottom of the lower frame.
- (6) Remove the nuts (7) from the four bolts (8) fastening the set to the crate base (9). The generator set (10) can now be removed.
- (7) Unpack the spare parts (11). The tools are wrapped individually in the tool tray in the top rear of the unit. Unwrap these only as required.
- (8) Do not uncrate the batteries (12) until the equipment has been set up for operation.

## Section II. INSTALLATION PROCEDURE

### 12. Setting Up Equipment

After a suitable location has been chosen (par. 9) and the equipment has been checked (par. 11b), set up the equipment as follows:

*a. Mounting on Foundation.* Determine whether the equipment is to be installed indoors or outdoors, and follow the instructions in subparagraphs (1) or (2) below, as applicable.

- (1) For permanent indoor installation, fasten the set to the floor or foundation. Four holes are located in the mounting pads on the bottom four corners of the lower frame. Fasten the set to the floor with  $\frac{1}{2}$ -inch bolts or lag screws of proper length.
- (2) For outdoor installation, locate the set on level ground. If this is impossible, the alternator end of the set must be the lower end.

**Warning:** Never operate the generator set in a position more than  $10^\circ$  off level, longitudinally or laterally.

*b. Connecting Exhaust Tube.* For indoor operation, connect the exhaust extension tube to the muffler (fig. 6). Extend the tube to an exterior wall by the most direct route with as few turns as possible. Pitch the tube downward so all condensate will

*b. Checking.* A list of all spare parts and tools packed with the equipment is mounted on the underside of the tool tray cover. Check to be sure the equipment is complete and has not been damaged in shipment and handling.

- (1) Check the tools, spare parts, installation equipment, and all major components with the packing lists.
- (2) Inspect the over-all unit carefully for damage. Give particular attention to the following: Examine the carburetor, magneto, air cleaner, and fuel pump for dents and breakage. Check the fuel line from the fuel pump to the carburetor for loose connections and kinks. Examine the instruments and controls for damage. Check all wiring for torn insulation and broken wires. If any damage is noted or if the equipment does not check with the packing lists, fill out and forward DD Form 6 in accordance with the instructions in paragraph 2.

drain out. If the tubing passes through an inflammable wall, install appropriate fireproof insulation.

**Warning:** Be sure that all connections are gas-tight. Carbon monoxide is deadly poisonous. Inhaling exhaust gases may be fatal.

*c. Installing Fuel Hose.* Connect the 20-foot

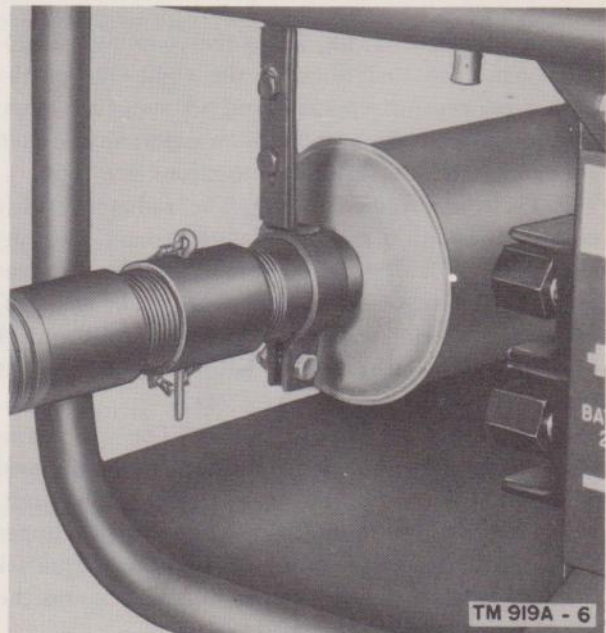


Figure 6. Exhaust tube connection to muffler.

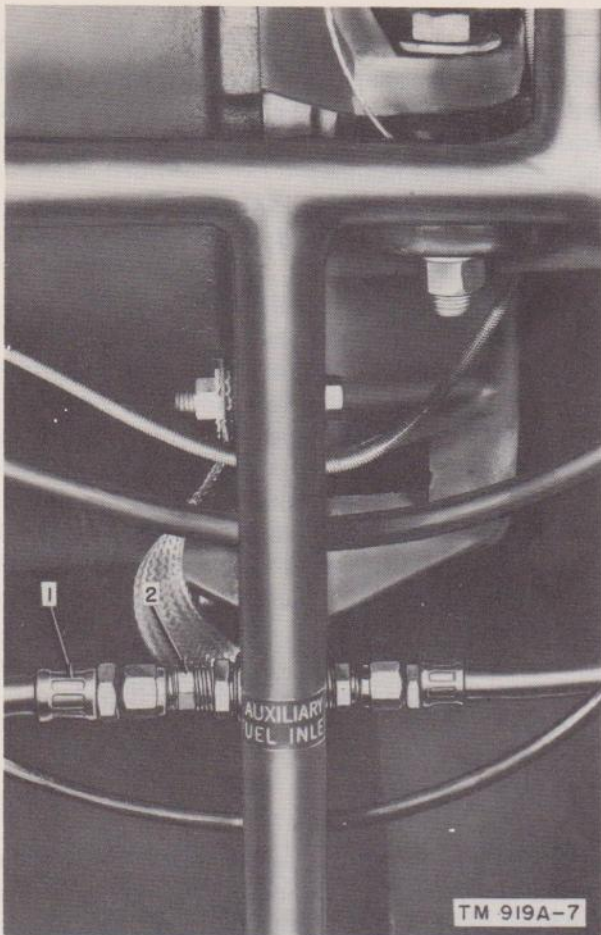


Figure 7. Fuel supply hose connection.

1. Remote fuel line. 2. Remote fuel line adapter.

remote fuel line (1, fig. 7) to the coupling (2) located near the fuel filter on the right side of the unit. Connect the opposite end to the fuel drum adapter. Mount the adapter in an externally located fuel container. Be sure all connections are tight.

*d. Installing Radiator Duct.* The radiator grill is constructed with a channel flange around the outside edge. For indoor operation, attach a canvas duct to the flange. Use a window or make an opening in an exterior wall and attach the outlet end of the duct. This opening must be at least as large as the radiator grill flange.

*e. Installing Fire Extinguisher.* The fire extinguisher, mounting bracket, and hardware are shipped with the equipment but detached from the unit. Mounting holes have been drilled in the rear upper frame panel for mounting the fire-extinguisher bracket. Bolt the bracket to the unit and mount the fire extinguisher in the bracket.

### 13. Removal of Corrosion Preventives

Corrosion preventives are for permanent protection and must not be removed. There are no protective seals installed on the unit.

### 14. Connections and Interconnections

All internal connections for the operation of the generator set are made at the factory and no additional connections within the unit are needed. Make ac output connections, dc output connections, remote start connections, and battery connections as follows:

*a. Ac Output Connections.* The wye-delta change board and the output terminals are located on the right side of the unit. Open the change board door to check the ac output rating in which the generator set is connected. The symbol of the rated load will be either Y (wye) or  $\Delta$  (delta). To change the voltage connections, remove the six nuts and washers that secure the jumper board to the terminal board. For 120-volt, single-phase, 10-kw operation, connect the jumper board in the delta position (fig. 8). Connect cables from the load to output terminals marked PHASE A (1, fig. 8) and PHASE C (2). Use #0 AWG (American Wire Gauge) cable. For 120/208-volt, three-phase, 12.5-kw operation, connect the jumper board in the wye position (fig. 9). Connect cables from the load to output terminals marked PHASE A (1, fig. 9), PHASE B (2), PHASE C (3), and NEUTRAL (if required). Use #4 AWG cable. Figures 8 and 9 show the proper delta and wye connections.

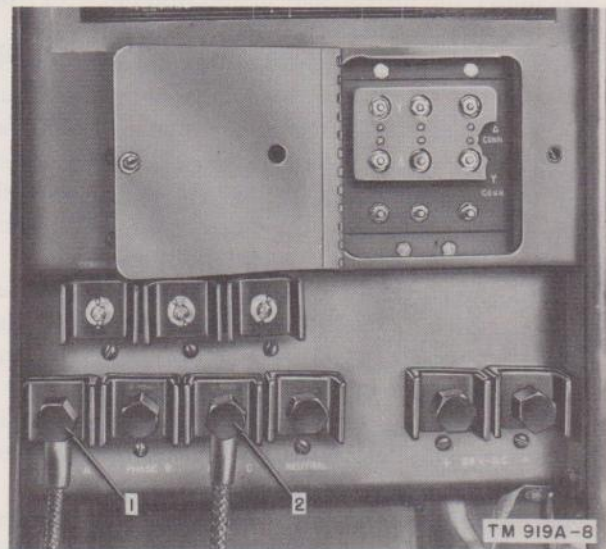


Figure 8. Single phase, 120 volt connections (Delta).  
1. PHASE A terminal. 2. PHASE B terminal.