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# TM 11-943

TO 16-35 PU 181-5

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

# ENGINE GENERATOR PU-181/PGC-1

*DEPARTMENT OF THE ARMY • APRIL 1951*

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# ENGINE GENERATOR PU-181/PGC-1


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For explanation of distribution formula, see SR 310–90–1.

# CONTENTS

# SAFETY NOTICE

1. Sufficient and proper ventilation must be provided if the power unit is operated in a confined space. Exhaust gases produced are poisonous, and excessive inhalations may result in sickness or death.

2. Do not service the unit with gasoline while it is running or if a radio transmitter is operating near the engine generator. Avoid spilling fuel on a hot engine.

3. The operator must observe every standard safety regulation while operating this engine generator.

4. This equipment generates high voltage which is dangerous to life. Keep clear of all live parts. Never make or change electrical connections while the equipment is running. Severe and possibly fatal shocks may be experienced. Keep tools, oilcans, loose parts, and moisture away from the engine generator and keep the surrounding area dry.

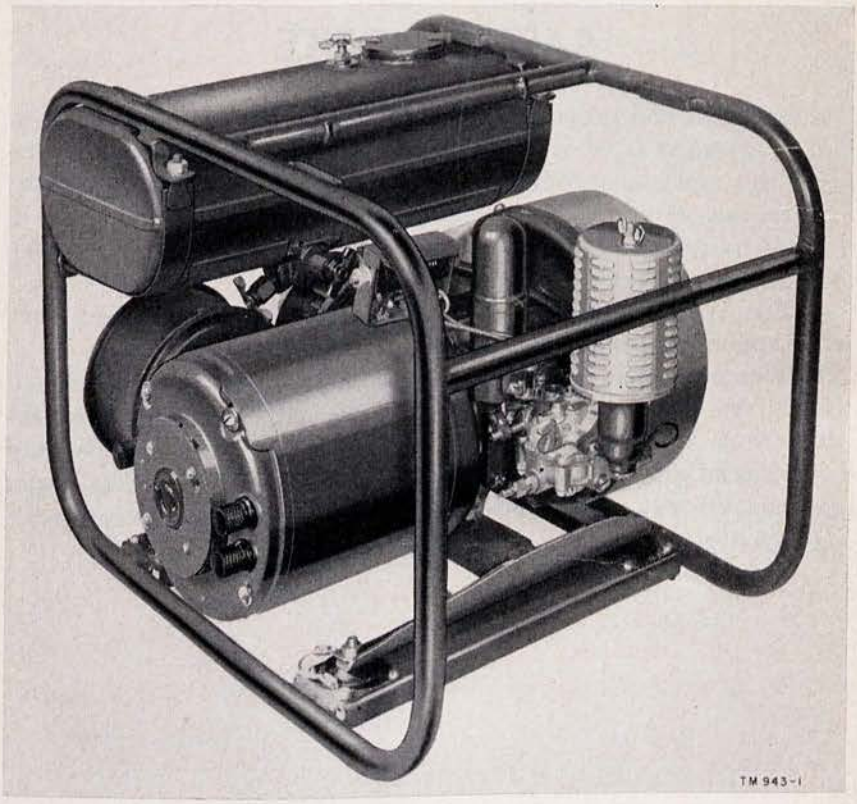



*Figure 1. Engine Generator PU–181/PGC–1.*

# CHAPTER I

# INTRODUCTION

## Section I. GENERAL

### 1. Scope

*a.* These instructions are published for the information and guidance of the personnel to whom this equipment is issued. They contain information on the operation and on the organizational and field maintenance of the equipment as well as a discussion of the theory of operation. They apply only to Engine Generator PU–181/PGC–1.

*b.* Appendix I contains a list of available publications applicable to the equipment. Appendix II contains a table of all standard nuts, bolts, screws, and washers used in the equipment that are not special items, but are a type readily obtainable from commercial sources.

### 2. Forms and Records

The following standard forms will be used for reporting unsatisfactory conditions of equipment, or improper preservation, packaging, packing, marking, loading, stowage, or handling thereof.

*a.* DD Form 6, Report of Damaged or Improper Shipment, will be filled out and forwarded as prescribed in SR 745–45–5.

*b.* DA AGO 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.

*c.* AF Form 54, Unsatisfactory Report, will be filled out and forwarded to Commanding General, Air Matériel Command, Wright-Patterson Air Force Base, Dayton, Ohio, as prescribed in SR 700–45–5 and AFR 65–26.

*d.* The following forms, explained in TM 37–2810, are necessary in connection with the operation and maintenance of Signal Corps internal-combustion-engine-driven equipment.

(1) DD Form 110, Vehicle and Equipment Operational Record.
(2) WD AGO Form 460, Preventive Maintenance Roster.
(3) DA AGO Form 464, Preventive Maintenance and Technical Inspection Work Sheet for Engineer Equipment.

*e.* Use other forms and records as authorized.

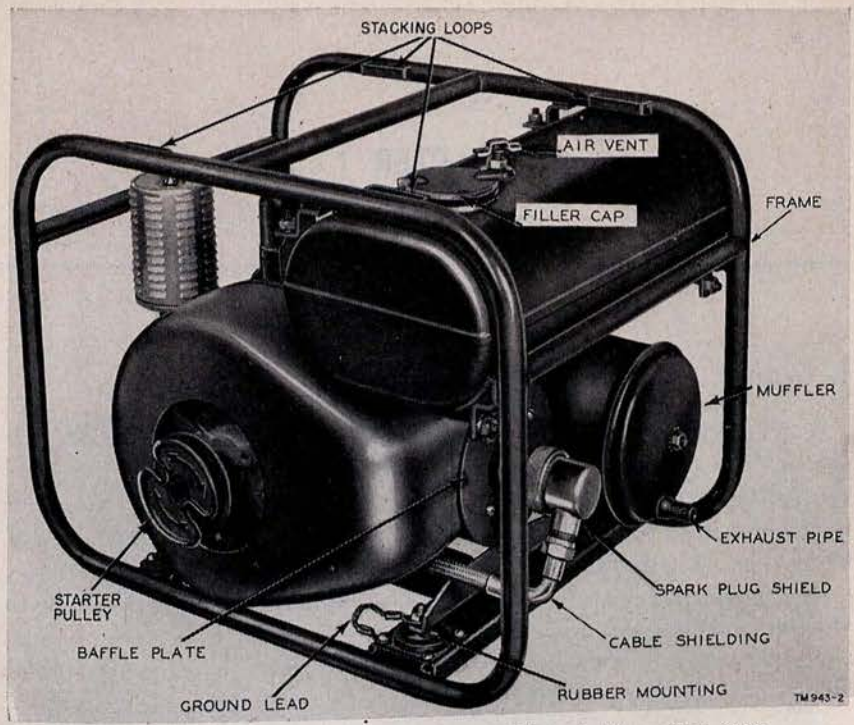



*Figure 2. Engine Generator PU–181/PGC–1, right quarter view.*

## Section II. DESCRIPTION AND DATA

### 3. General Description

*a.* Engine Generator PU–181/PGC–1 is a compact, lightweight, electric generating set which consists of gasoline Engine GE–12–F and a-c (alternating-current) Generator GN–51–C. It is designed to deliver 300 watts ac at 120 or 240 volts, operating at 3,600 rpm (revolutions per minute).

*b.* Engine GE–12–F is a single-cylinder, air-colled, two-cycle gasoline engine which develops 1.25 horsepower at 3,600 rpm.

*c.* Generator GN–51–C is a single-phase, 60-cycle unit of the revolving-field type. It is coupled to the engine crankshaft by means of a splined, flexible coupling and fan assembly.

*d.* The complete engine generator is mounted on four rubber shock mountings in an open tubular frame. The rubber shock mountings serve to absorb vibration when the unit is in operation.

*e.* Case CY–739/PGC–1 is provided as a protective housing for the engine generator unit when it is not operating. This case is constructed of plywood and reinforced at the corners by metal corner pieces. The upper part of the case fits over the engine generator unit

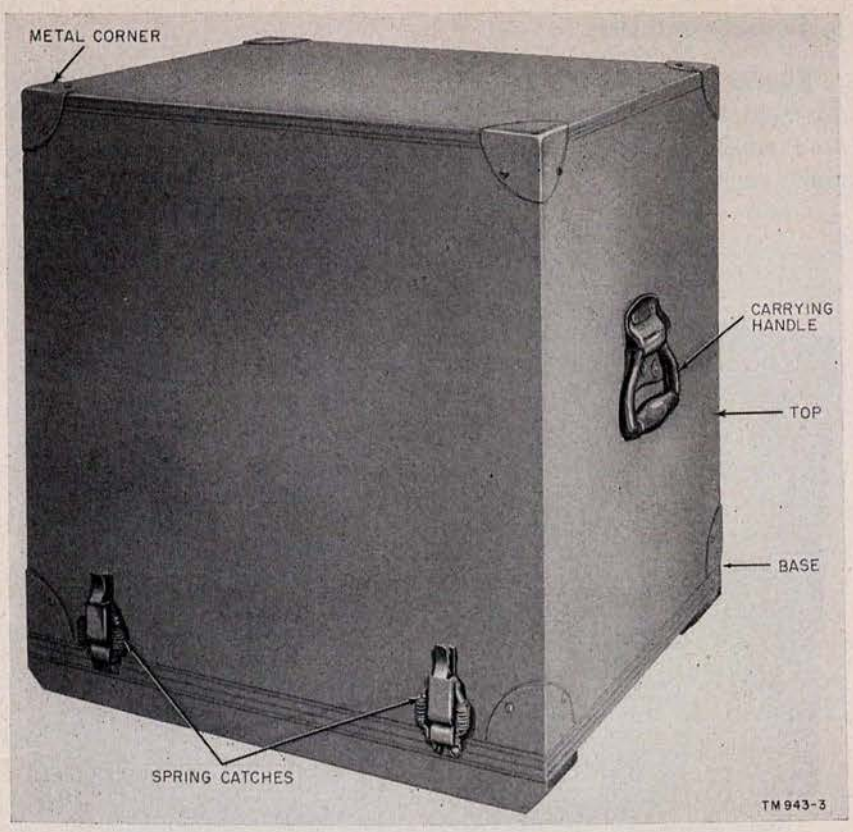



*Figure 3. Case CY–739/PGC–1.*

and is fastened to a wooden platform base with four spring latches. There are metal carrying handles on opposite ends of the case to facilitate handling. A compartment for tools and spare parts is provided in the top of the case. This compartment has a wooden door with a sliding catch which gives access to the tools and spare parts.

*f.* Bag CW–191/PGC–1 is provided to protect the engine generator unit when it is not operating and when it is not housed in Case CY–739/PGC–1. This bag is of waterproof material and completely covers the equipment. When not in use, Bag CW–191/PGC–1 is stowed inside of Case CY–739/PGC–1, directly above the door to the tool and space parts compartment. Bag CW–191/PGC–1 must be removed from the equipment before the engine generator unit is placed in Case CY–739/PGC–1. Carrying handles are placed on opposite ends of the bag and there are also two rows of metal rings, on opposite sides, to facilitate handling.

*g.* The complete weight of Engine Generator PU–181/PGC–1, Case CY–739/PGC–1, and Bag CW–191/PGC–1, with the fuel tank empty, is approximately 98 pounds.

## 4. Purpose and Use

Engine Generator PU–181/PGC–1 is intended as a source of power for Signal Corps Teletypewriter Set AN/PGC–1. It may also be used to furnish power for other equipment requiring power within its rated capacity.


*Figure 4. Bag CW–191/PGC–1.*

## 5. Major Parts and Assemblies (figs. 5 to 9)

*a.* Engine. Engine GE–12–F is a single-cylinder, two-cycle, air-cooled unit with a 2-inch bore, a 1½-inch stroke and a piston displacement of 4.72 cubic inches. It is designed to operate satisfactorily on gasolines with an octane rating as low as 72 and will run approximately 7½ hours at full-load on a single filling of the fuel tank. The fuel tank capacity is 1 gallon.

*b.* Generator. Generator GN–51–C has a two-winding stator (stationary member) and is designed to generate 60-cycle single-phase, ac,

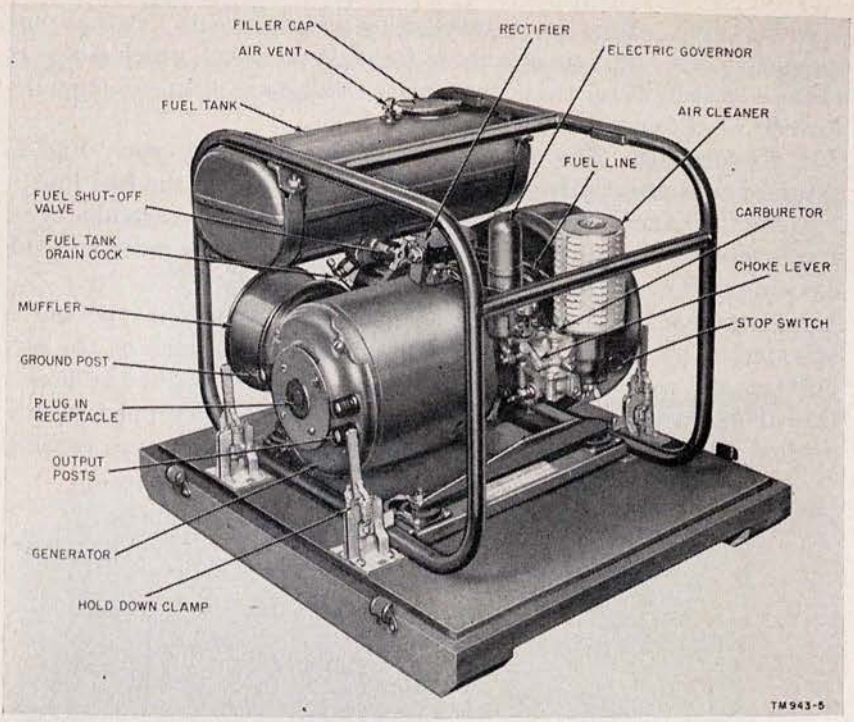



*Figure 5. Engine Generator PU–181/PGC–1, mounted on wooden platform base.*

120 or 240 volts, at 3,600 rpm. Within the stator is the rotating field which consists of a cylindrical permanent magnet mounted on the generator shaft. No brushes or slip rings are used.

(1) The generator output is 300 watts at 100 percent power factor. When connected for 120 volts, the voltage output without load is approximately 128 volts, while at full-load of 300 watts, the voltage output is approximately 112 volts. The electric governor on the engine causes the engine speed to increase with increasing generator load, so that from no-load to full-load the voltage output is held between these two values.

(2) When connected for 240 volts, the voltage output will vary approximately between 256 and 224 volts from no-load to full-load.

(3) A single, 20-ampere, twist-lock receptacle and three binding posts are located in the outer end casting of the generator. Two of these posts are for output, while the other, which is marked *G*, is for a ground connection. (Do not use pliers on these posts.)

*Note.* Do not use output posts except in cases of emergency where no connecting plug is available.

*c.* MAGNETO. Ignition is supplied by a high-tension flywheel-type magneto. This consists of a rotor (moving member) which is a part of the engine flywheel and a stator plate (stationary member) mounted directly on the engine crankcase.

*d.* CARBURETOR. The carburetor is of the float feed type. Fuel is supplied to it directly from the gasoline tank through the fuel line.

*e.* AIR CLEANER. The air cleaner is of the replaceable cartridge type. Its function is to prevent the air which enters the carburetor from drawing dust and dirt into the engine.

*f.* GOVERNOR. The governor is of the electric solenoid type and is actuated by generator voltage. The solenoid is mounted on the carburetor, and the plunger or armature is connected to the carburetor throttle shaft by a link and lever arrangement. Ac tapped from a portion of the generator windings passes through a dry-type rectifier

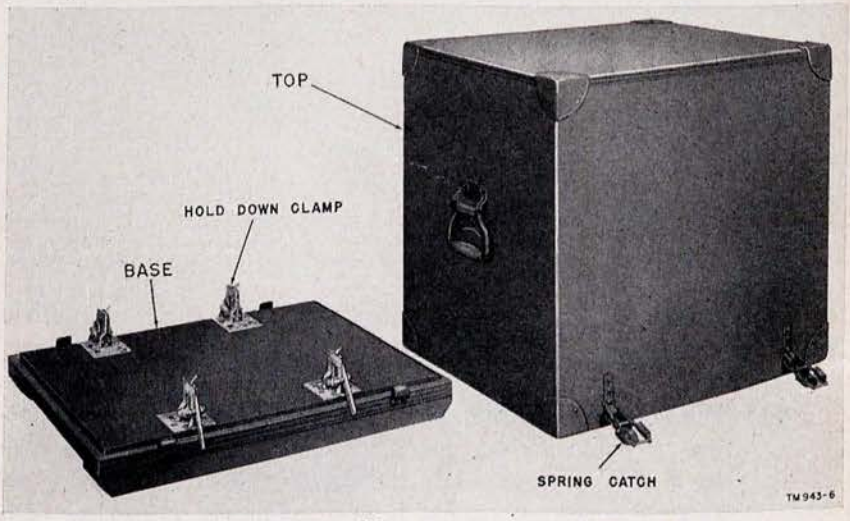



*Figure 6. Case Cr–739/PGC–1, top section removed from base.*

where it is converted into dc (direct current) and supplied to the solenoid. This current produces a magnetic pull on the plunger, moving it against the action of a small spring, and thus controls the throttle valve movement which in turn varies the engine speed to obtain substantially constant voltage under generator load variations.

*g.* WOODEN CASE. The wooden case (Case CY–739/PGC–1) is for storage and moving of the unit. It is of plywood reinforced with metal corners. The top is held to the base by four spring catches. The wooden base has four clamps to hold the power unit securely. The base may be used for an operating platform for the power unit when conditions warrant.

*h.* WATERPROOF BAG. A rubberized waterproof bag is packed in the upper inside of the wooden case over the tool and spare parts com-

partment door. Unpack the bag with the open end of the case up. Set the unit in the bag on the padded base and close the edge by folding over and over on creased lines. Seal and strap the bag tightly for waterproof protection.

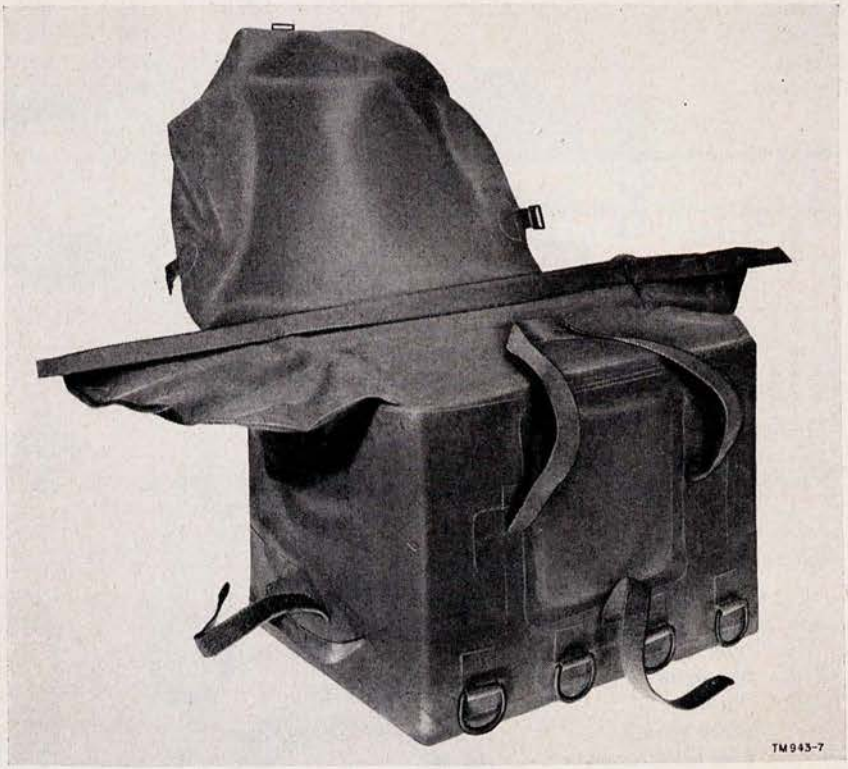



*Figure 7. Bag CW–191/PGC–v, partially open.*

## 6. Tabular Data

*a.* Weights and Dimensions.

| Item | Height (in.) | Width (in.) | Length (in.) | Weight (lb.) |
|---|---|---|---|---|
| Engine Generator PU–181/PGC–1 consisting of: | 12 13/16 | 14 1/8 | 17 1/8 | |
| 1 Engine GE–12–F (complete) | 12 13/16 | 13 1/8 | 17 1/8 | 37 |
| 1 Generator GN–51–C | 7 1/2 | 6 | 6 | 19 |
| 1 basic engine | 4 7/16 | 7 3/16 | 7 5/8 | 8 3/4 |
| 1 Bag CW–191/PGC–1 | 13 | 14 1/2 | 18 | 5 1/2 |
| 1 wooden Case CY–739/PGC–1 | 19 3/14 | 16 5/8 | 19 3/4 | 28 |
| 1 set tools and materials. | | | | |
| 1 set running spare parts. | | | | |

*b.* Performance Characteristics.

| Approx. load | Amperes | Volts | Watts | Cycles |
|---|---|---|---|---|
| ¼ load | 0. 6 | 120. 5 | 75 | 59 |
| ½ load | 1. 26 | 119. 5 | 150 | 60. 5 |
| ¾ load | 1. 92 | 117. 5 | 225 | 61. 0 |
| Full load | 2. 63 | 114. 0 | 300 | 62. 0 |

*Note.* The above characteristics are approximate with generator connected for 120-volt output.

*c.* Condensed Table of Specifications.

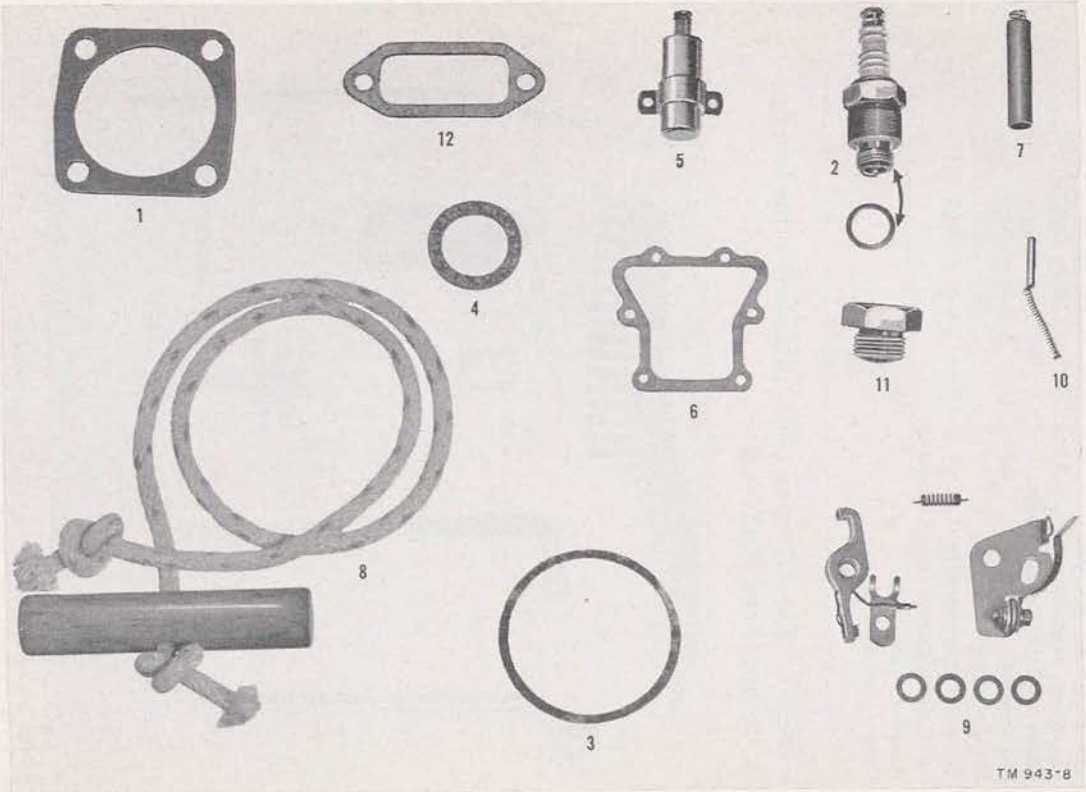
(1) *Engine.*

| | |
|---|---|
| Make | Jacobsen Manufacturing Co. |
| Model | J100. |
| Type | Two-cycle. |
| Number of cylinders | One. |
| Bore | 2-in. |
| Stroke | 1½-in. |
| Piston displacement | 4.72 cu. in. |
| Compression ratio | 5.5 to 1. |
| Engine speed | 3,600 rpm. |
| Cooling | Air-cooled. |
| Horsepower | 1.25 at 3,600 rpm. |
| Piston | Vanasil. |
| Piston rings | Three (compression type). |
| Piston pin | Stationary in piston. |
| Lubrication system | Oil mixed with fuel. |
| Air cleaner | Dry type. |
| Oil filter | None. |
| Spark plug | Champion J–11, 14 mm. |
| Fuel tank capacity | 1 gal. |
| Governor | Electric solenoid type. |
| Main bearings | Ball bearing. |
| Carburetor | Tillotson MD49A. |

(2) *Generator.*

| | |
|---|---|
| Make | Electric Motors & Specialty Co. |
| Model | GN–51–C. |
| Voltage | 120 or 240 v. |
| Phase | Single-phase. |
| Cycle | 60-cycle. |
| Power factor | 100%. |
| Rating | 300 w, 2.5 amp. |
| Speed (rpm) | 3,600. |
| Drive | Direct. |

*d.* Spare Parts (fig. 8). The following running spare parts are packed in the tool compartment in the upper end of Case CY–739/PGC–1. This compartment has a small door with a latch on the inside of the case.

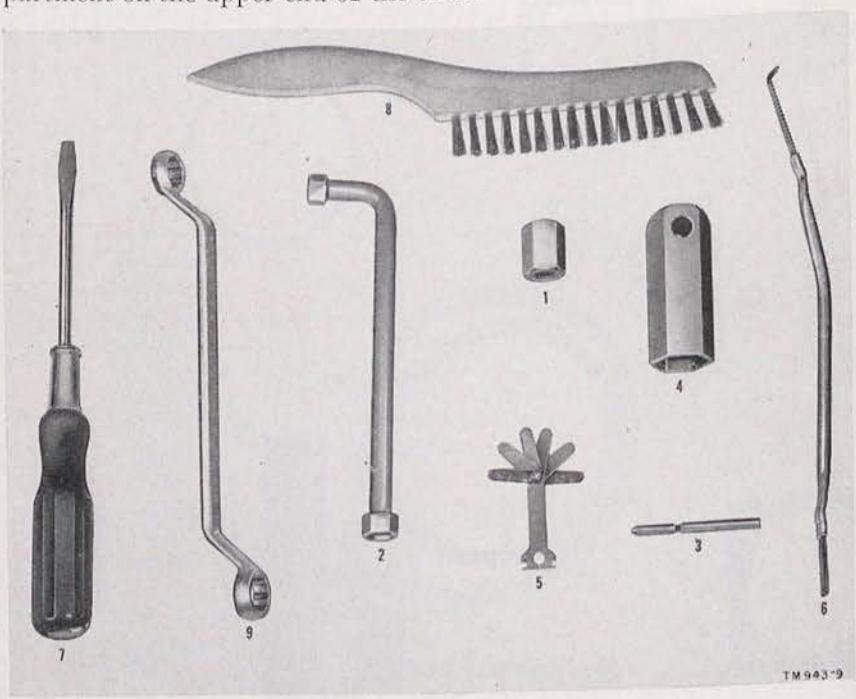



1. Cylinder head gasket.
2. Spark plug and gasket.
3. Muffler head gasket.
4. Air cleaner mounting gasket.
5. Magneto capacitor.
6. Intake passage cover gasket.
7. Suppression resistor.
8. Starting rope.
9. Breaker point assembly.
10. Governor plunger return spring and pin.
11. Spark plug adapter.

*Figure 8. Engine Generator PU–181/PGC–1, spare parts.*

| Quantity | Item |
|---|---|
| 10 | Gasket, cylinder head mtg. |
| 10 | Plug, spark. |
| 1 | Gasket, muffler body mtg. |
| 1 | Gasket, air cleaner mtg. |
| 3 | Capacitor, magneto. |
| 10 | Gasket, intake passage cover. |
| 1 | Suppressor. |
| 1 | Rope, starter. |
| 2 | Points, contact breaker. |
| 1 | Cam, radio ground brush assembly. |
| 1 | Adapter, spark plug. |
| 10 | Gasket, exhaust flange. |

*e.* Tools (fig. 9). The following tools are packed in the tool compartment on the upper end of the case:




1. Flywheel puller.
2. Socket wrench (½" x 9/16").
3. Ignition timing gage.
4. Spark plug wrench.
5. Spark plug gage and adjusting tool.
6. Carbon scraper.
7. Screw driver.
8. Wire brush.
9. Offset box wrench (5/16" x 7/16").

*Figure 9. Engine Generator PU–181/PGC–1, tool equipment.*

| Quantity | Item |
|---|---|
| 1 | Puller, flywheel. |
| 1 | Wrench, double-end box, 5/16–7/16. |
| 1 | Gage, spark timing. |
| 1 | Wrench, spark plug. |
| 1 | Gage, spark plug and ignition point. |
| 1 | Scraper, carbon. |
| 1 | Screw driver, 9″ lg 4″ blade. |
| 1 | Brush, cleaning. |
| 1 | Wrench, double-end box, ½–9/16. |

# CHAPTER 2

# OPERATING INSTRUCTIONS

## Section I. SERVICE UPON RECEIPT OF EQUIPMENT

### 7. Service Necessary for New Equipment

*a.* Siting Indoors. If the unit is installed indoors, be sure that all exhaust connections are gastight and that the room is well ventilated. Place the unit near a door or window and connect one end of a suitable length of flexible exhaust tubing to the exhaust outlet and run it to the outside of the building. Avoid bending if possible. Use a piece of 1-inch tubing (internal diameter) when the distance from the engine generator to the outside of the building is less than 10 feet. For distances over 10 feet, use 1½-inch tubing (internal diameter).

*b.* Siting Outdoors. Install the power unit on a dry, level location. Place it in such a position that free air circulation is obtained and make sure that exhaust fumes are carried away from operating personnel.

***Caution:*** Carbon monoxide, contained in exhaust gases, is tasteless, odorless, and is a deadly POISON.

### 8. Uncrating and Unpacking

Engine Generator PU–181/PGC–1 is shipped in Case CY–739/PGC–1. The complete equipment, including Case CY–739/PGC–1, is placed in a wooden shipping case which is lined with corrugated fiberboard. The wooden packing case is bound with metal strapping. To unpack, carefully remove the metal straps and remove the top and sides of the shipping case. Lift off the top section of Case CY–739/PGC–1 and check the contents against the packing list. Inspect the equipment for evidence of damage or improper shipment and if any unsatisfactory condition is noted, fill out and forward DD Form 6 in accordance with SR 745–45–5.

### 9. Setting Up Equipment

As soon as the equipment has been removed from its shipping case, inspect all parts for damage that might have occurred during shipment. Pay particular attention to the fuel tank, magneto flywheel housing, air cleaner, and carburetor to be sure that these parts have not been dented or broken. Check the fuel line to be sure that it is tight and not bent or damaged. Compare number and identity of

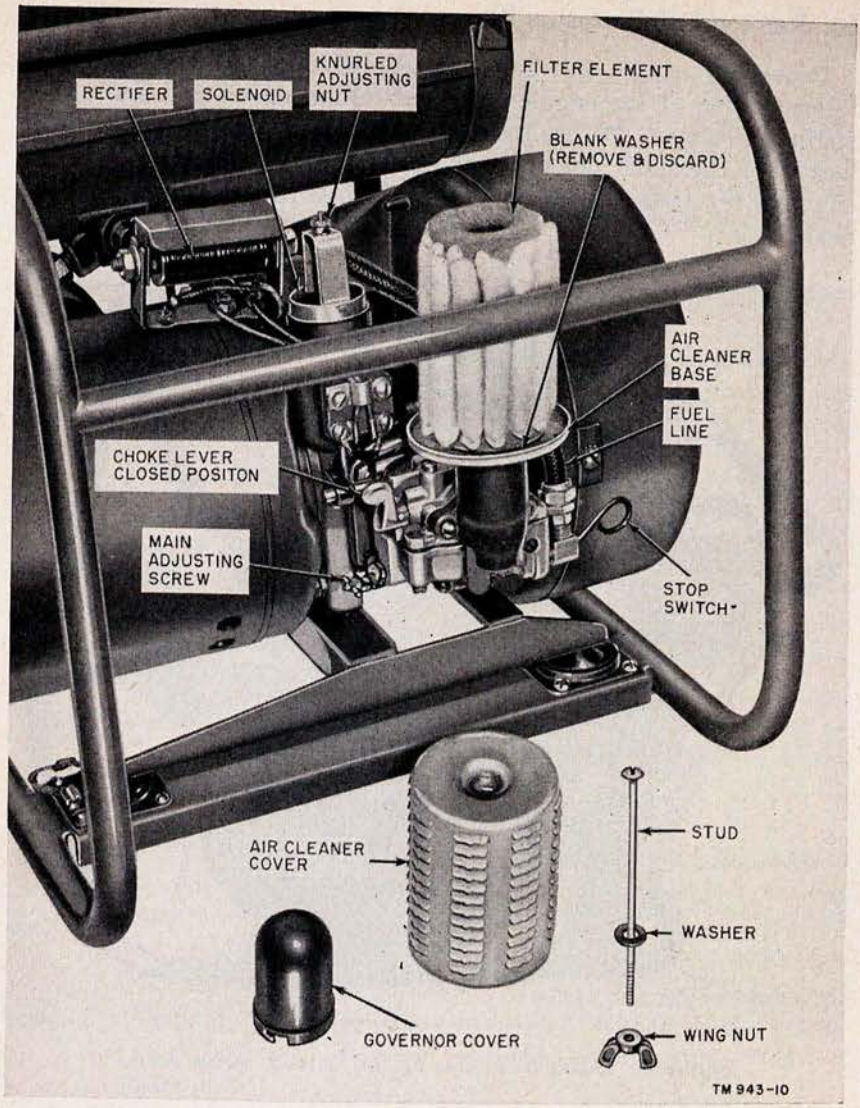



*Figure 10. Air cleaner and governor, covers removed.*

tools in the tool kit with the tool kit list. Running spares have been processed against damage by moisture and packed in envelopes marked to show parts inclosed. Do not open these packages until the parts are to be used. Before setting up the equipment for operation, carefully note the instructions contained on each tag attached to the unit and proceed as follows:

*a.* Disassemble air cleaner and remove blank washer from the element (fig. 10).

*b.* Remove pipe cap from exhaust outlet on muffler.

## 10. Removal of Corrosion Preventives

Processing of the unit for shipment includes treating the entire internal area of the engine with rust-inhibiting oil and sealing all engine openings. Before setting up the unit, open the drain cock located on the under side of the engine crankcase (fig. 11). Crank the engine a few times to clean out the crankcase thoroughly. Close the drain cock.

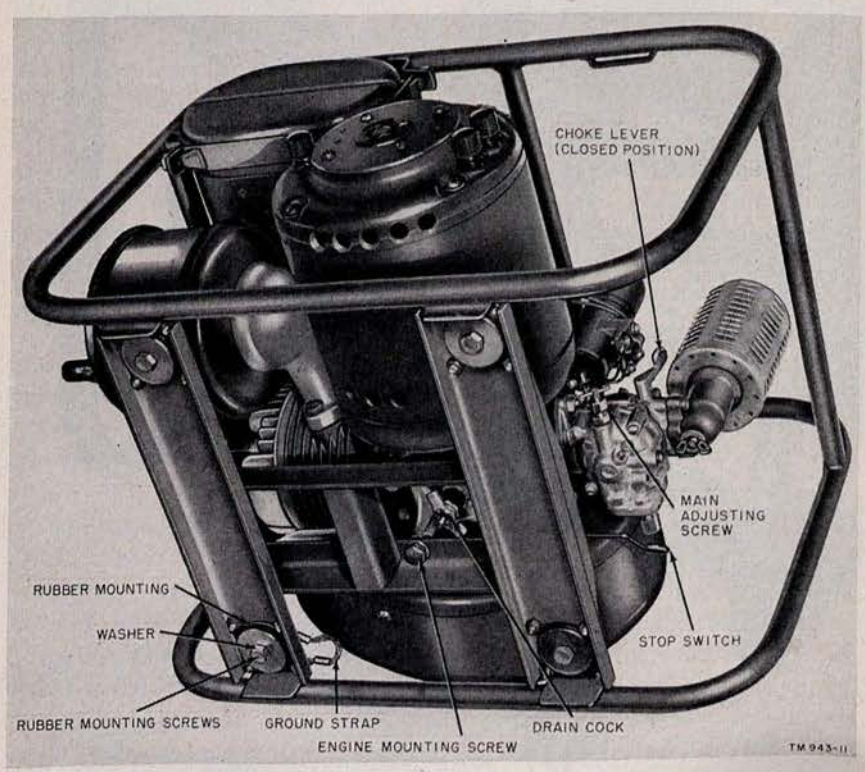



*Figure 11. Engine Generator PU–181/PGC–1, bottom view.*

## 11. Special Installation Procedure

When operating in swampy or wet terrain, clamp the engine generator on the base from the wooden case; then place it on a dry platform, constructed of planks, boxes, or other suitable material. When operating in a closely confined area, be sure that exhaust fumes are carried away from the operating personnel. When operating in rain, protect the unit with a shelter that will keep the ignition cable, fuel tank, carburetor, air cleaner, and generator dry. Make sure that the cooling air intake is not obstructed and that there is ample circulation of air for cooling.

## 12. Electrical Connections

A single 20-ampere, twist-lock receptacle and three binding posts are located in the outer end casting of the generator. Two of these posts are for output, while the other, which is marked G, is for a ground connection. (Do not use pliers on these posts.) Do not use output posts except in cases of emergency where no connecting plug is available.

**Caution:** Be sure generator is connected for desired voltage before operating.

*a.* The windings of the generator are so arranged that by reconnection either 120 or 240 volts may be obtained. Be sure that connections in the outlet box are properly made for the desired voltage, according to the diagram (fig. 12).

*b.* To change the voltage, first remove the outlet cover (4) on the end of the generator by loosening the two fastening screws. Then proceed as follows:

(1) If the generator is connected for 120 volts and 240 volts is desired, loosen the two screws (1 and 2) on the outlet on the back of the cover, and remove the RED and YELLOW leads. (These are the only leads which have open-type terminals and can be removed without removing terminal screws.) Place both RED and YELLOW leads under the head of the extra terminal screw (3) beside the outlet and tighten all three screws.

(2) If the generator is connected for 240 volts and 120 volts is desired, remove the RED and YELLOW leads from the extra terminal screw (3) beside the outlet. Fasten the RED lead under the head of the screw on the outlet to which the GREEN lead (2) is fastened. Fasten the YELLOW lead under the screwhead on the outlet to which the BLACK lead (1) is fastened. Tighten all three screws before replacing outlet plate.

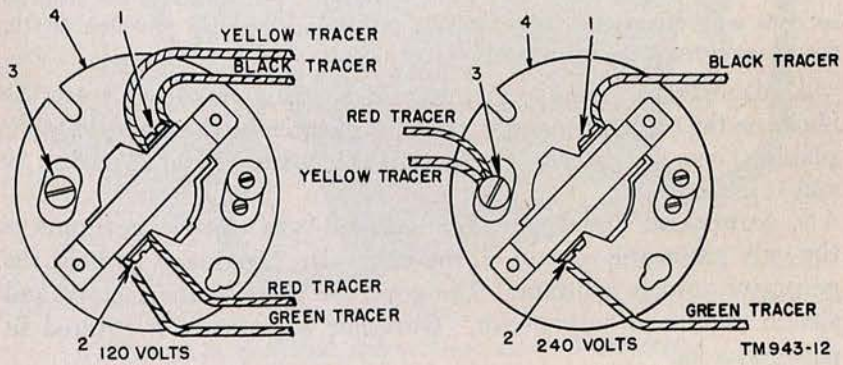



*Figure 12. Generator GN–51–C, voltage connection diagram.*

## 13. Initial Lubrication

Engine Generator PU–181/PGC–1 requires no initial lubrication other than the oil mixed with gasoline for the engine. The magneto cam is lubricated at the factory and requires relubrication only when the engine is disassembled. Generator GN 51–C has two presealed lubricated bearings which require no field lubrication.

## 14. Preparation of Fuel System

Prepare a mixture of lubricating oil and gasoline as follows: Place 1 gallon of gasoline in a separate, clean container and add to the gasoline 2 measuring cupfuls (fuel tank cap) of lubricating oil. Shake the container or stir the fuel and oil until thoroughly mixed. Then pour the mixture into the fuel tank. To avoid loss of oil from the measuring cup, hold a finger over the vent hole in the side of the tube. Never plug this hole.

***Caution:*** Never run Engine Generator PU–181/PGC–1 on gasoline to which oil has not been added. Never attempt to fill fuel tank while the unit is operating.

*a.* Before pouring the fuel mixture into the tank, ground the fuel container momentarily to an unpainted surface on the unit that is away from the tank. Always keep the fuel container in contact with the tank during filling operations. This reduces the danger of fire from a static discharge (spark).

*b.* Replace the fuel tank cap securely.

*c.* Open the fuel shut-off valve and the air vent in the top of the fuel tank. Wipe off any fuel which may have been spilled while the tank was being filled.

*d.* Check the fuel shut-off valve, fuel tank drain valve, fuel line and connection, and carburetor float bowl for leaks (fig. 5).

# Section II. CONTROLS

## 15. Controls

*Note.* This section describes, locates, illustrates, and furnishes the operator or crew with information pertaining to the various controls provided for the proper operation of the equipment.

*a.* Manual Controls. The manual controls on the unit are the choke on the carburetor and the stopping switch on the magneto backplate. These are described in section III (pars. 17 and 21) (figs. 10 and 11).

*b.* Automatic Controls. The solenoid-type electric governor is the only automatic control on the unit. Its function is to hold the generator voltage constant. The governor is set at the factory and should require no adjustment. Governor adjustment is covered in paragraph 95.

## Section III. OPERATION UNDER USUAL CONDITIONS

*Note.* Operators and/or crews charged with the operation of the equipment covered in this manual will provide themselves with DD Form 110 and make appropriate entries thereon.

### 16. Preliminary Procedure

*a.* Check beneath the unit for indications of leakage and see whether fuel is leaking from the crankcase, fuel tank, fuel line, or carburetor float chamber. Correct all leaks before proceeding.

*b.* Open the air vent and fuel line shut-off (fig. 13).

*c.* Check to see that the fuel tank is full.

*d.* Check that all fastenings and connections are secure.

### 17. Starting

*a.* The fuel-mixture adjustments have been factory set and unless changed do not need readjustment each time the engine is started. For complete setting of carburetor adjustments see paragraph 94.

*b.* Move the choke lever to the closed position (figs. 10 and 11). The lever pulls back toward the air cleaner in closed position.

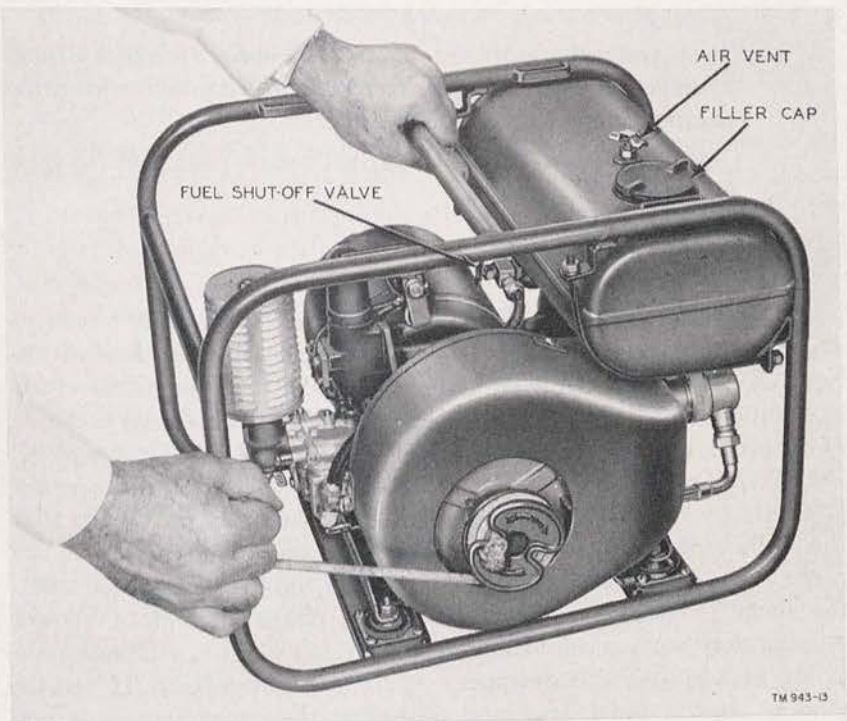



*Figure 13. Cranking Engine Generator PU–181/PGC–1.*

*c.* Slip the knotted end of the starter rope into the notch of the starter pulley and wind it around the pulley clockwise. Pull the rope up sharply, while holding the frame of the unit with the other hand. Repeat until the engine starts. If the engine does not start on the fourth or fifth cranking, refer to paragraph 20.

*d.* When the engine starts, move the choke lever to the running position. The running position is toward the engine.

**Caution:** Except in an extreme emergency, always operate the unit for a 5-minute warm-up period before applying load. This is extremely important in low temperatures.

*e.* Overchoking the engine when starting will flood it. This is particularly true when starting a warm engine. When this occurs, proceed as follows:

(1) Close the range (high-speed) mixture adjustment screw (fig. 11), taking note of the number of turns so that it can be reopened later to its previous position.
(2) Open the crankcase drain cock and crank the engine a few times with this cock open (fig. 11).
(3) Close the drain cock securely.
(4) Remove, dry, and reinstall the spark plug.
(5) Repeat the starting operations with the choke in the running position.
(6) Reset the carburetor load range (high-speed) mixture adjustment screw (fig. 11) to previous operating position after the engine has started.

*Note.* Whenever the spark plug is removed, check that the spark plug adapter is not fouled.

## 18. Precautions after Starting

*a.* Insufficient Fuel. Failure to run more than a few seconds after starting or when load is applied usually indicates, a lean carburetor adjustment. If this occurs immediately after the motor starts and while it is still cold, move the choke lever to partly closed position. If operation without partial choking is not possible, see paragraph 94.

*b.* Too Much Fuel. When the engine appears to misfire every alternate revolution and lacks power, it is usually an indication that the carburetor is set too rich or the choke is partly on. See that the choke lever is in running position. If the indications persist when the choke is open, see paragraph 94. A slight amount of erratic missing may occur when idling at no load, but this is a characteristic of the engine and will disappear when load is applied. If erratic missing occurs under load and adjusting the carburetor does not correct it, the trouble is usually caused by a fouled spark plug. The

remedy—Clean or replace the spark plug. Engine GE–12–F is fitted with an adapter (screen) which is screwed into the cylinder head and into which the spark plug is screwed. It is the purpose of this adapter to reduce spark plug fouling. Always check this adapter to see that it is clean when checking, cleaning, or replacing spark plugs.

## 19. Applying Load

After an initial warm-up period of 5 minutes, plug the cord from the equipment to be operated into the receptacle in the end of the generator. Be sure that the generator is not overloaded or short-circuited for long periods of time. The generator will stand short periods of overload and may even be loaded continuously to 350 watts without damage, but greater overloads of short-circuiting for long periods of time will overheat and destroy the windings. A short-circuited generator will cause the throttle to open wide and the engine to overspeed. Never accelerate the engine beyond its governed speed as this will raise the voltage output which may damage the insulation of the generator.

## 20. Operating Procedure

If, at any time, the engine fails to start, check the following possibilities:

*a.* Make sure there is at least 1 inch of gasoline in the fuel tank.

*b.* Make sure the air vent on the fuel tank is open.

*c.* Remove the spark plug. Lay it on the tubular frame with the high-tension wire connected and spin the engine to check the spark. If no spark occurs at the points, clean out the plug and spark plug adapter or replace it with a new one. The spark plug points should have a gap of .035 inch. When making this test, be sure that only the body of the plug touches the tubular frame (fig. 14). Also, check the spark plug adapter to see that it is clear.

*d.* A weak spark plug may be the trouble; this is generally due to improper point adjustment. Check point opening adjustment as outlined in paragraph 92.

*e.* Make certain the fuel line packing nuts are drawn up tight, as an air leak will prevent a full charge of gasoline from entering the engine and will affect carburetion. Check all connections, including the fuel line shut-off (fig. 13). Periodically tighten all connections.

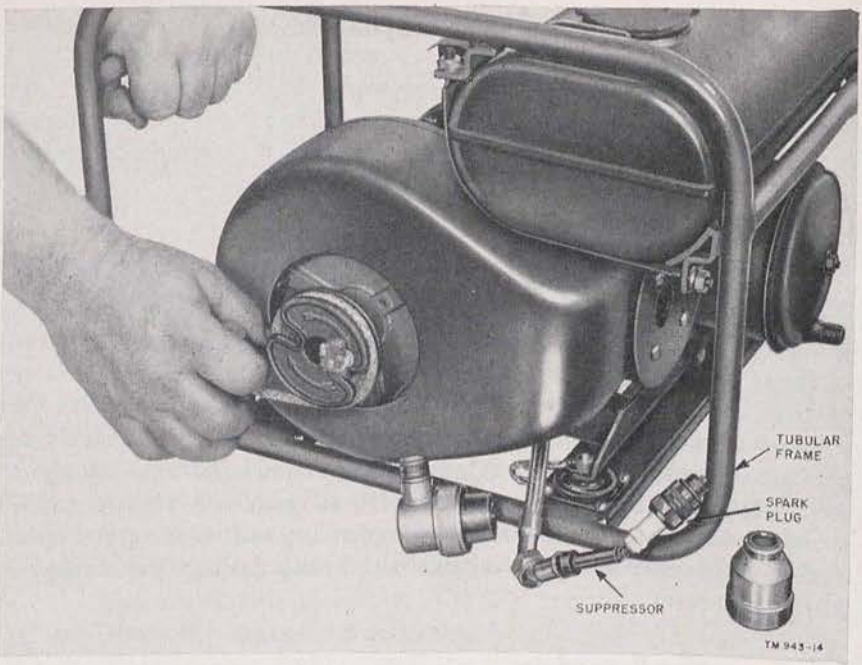



*Figure 14. Testing spark plug.*

## 21. Stopping

To stop the engine, press the wire level extending from the magneto backplate (fig. 10) down until the engine comes to a complete stop. Always close the fuel shut-off valve and fuel tank air vent when the unit is not in operation.

# Section IV. OPERATION UNDER UNUSUAL CONDITIONS

## 22. Operation in Arctic Climates

*a.* General. Special precautions are necessary to prevent poor performance or total operational failure of equipment in subzero temperatures. Most Signal Corps equipment can be used in winter if difficulties common in low temperatures are anticipated and precautions taken to prevent them. For operation purposes, place equipment in heated rooms whenever possible. Wrap it in blankets, when on the march, to protect it from winds and freezing temperature. The following problems may be encountered:

(1) Steel shrinks and becomes brittle in subzero temperatures.
(2) Natural rubber resists cold weather well, but certain types of synthetic rubber are unreliable and become brittle.
(3) Canvas freezes and loses its pliability in cold weather.

(4) Lubricants become stiff causing drag and also causing moving parts to stick.

*b.* Cold Weather Treatment and Instructions.

(1) *Cleanliness.* Gummy and dirty parts, oil, and grease solidify more readily in extremely cold weather. Clean all parts thoroughly to maintain sluggish-free action.

(2) *Lubricants.* Store fuel and lubricants in tightly closed containers at all times. Always fill container to avoid air spaces. Condensation forms in air spaces and water is deposited at the bottom of the fuel or oilcan. Prevent snow and water from getting into the lubricants and lubrication equipment.

(3) *Lubrication.* Service all lubrication points more frequently. Keep snow, water, and ice from collecting on the lubrication points.

(4) *Shelter.* Cold wind must be kept from blowing directly on the equipment during transportation. A shelter, preferably heated, should be provided to house the power unit whenever practicable. Store fuel, lubricant, and power unit accessories in shelters or windbreaks. Keep snow and ice from covering equipment. Do not attempt to operate frozen equipment. Move it to a warm location and wait until the stiff lubricants become sufficiently fluid to lubricate the vital parts properly. Consult TB 11–2525–1 for information covering the method of warming up Engine Generator PU–181/PGC–1 for cold weather. Follow applicable instructions in TB SIG 66.

## 23. Operation in Desert Climates

*a.* General. Signal Corps equipment operated in desert localities is affected by the extremely high temperatures and the amount of dirt, dust, sand, and other foreign matter in the air. Be careful to prevent such elements from filtering into lubricated parts. Cover the equipment when it is not in use. Thorough cleanliness is imperative. Instead of merely adding new lubricants at regular intervals, whenever practicable clean and lubricate all moving parts. If possible, inspect and clean the equipment daily. In any case, inspect the air filters and similar protective devices every day and clean them wherever necessary. For detailed information, refer to TB SIG 75. Some of the problems encountered are as follows:

(1) Lubricants become thin and drain from moving metal and fiber parts rapidly. Refer to paragraph 31 for detailed lubrication instructions.

(2) Foreign matter, such as dirt, dust, or sand, acts as an abrasive causing excessive wear, clogging air cleaners, and impeding the flow of air.

(3) Unprotected and exposed equipment will be affected by the high ambient temperatures existing during the day and by condensation at night. Midday temperatures in desert areas become abnormally high, and unshaded equipment quickly absorbs the heat generated by the rays of the sun. Operation of the equipment under such conditions quickly raises its temperature to unsafe heights.

*b.* Precautions.

(1) *Lubrication.* Never add fresh lubricant to old dirt-bearing grease or oil.

(2) *Air cleaner.* Remove and clean daily or more often is necessary. Replace clogged or damaged element. Never operate the power unit without an air cleaner.

(3) *Shelter.* Engine Generator PU–181/PGC–1 must be protected against wind-blown dust and sand. A roof must be placed over the equipment shelter that will effectively keep out the rays of the sun as well as sand. The unit is air-cooled and depends on air circulating around the generator-armature and field coils and around the cylinder-cooling fins for cooling heated parts to safe operating temperatures. Provide the shelter with adequate ventilation louvers and an outlet for the exhaust. Also place the power unit in the wooden case during idle periods (after the unit has cooled sufficiently). Store fuels, lubricants, and other supplies in a suitable shelter to avoid the entrance of sand into the containers. Always strain fuel and oil if the sand and dirt content is doubtful.

## 24. Operation in Tropical Climates

When the unit is being operated under conditions of extreme heat and high humidity, take special precautions to see that the flow of air around the unit is unobstructed. Keep all air passages clean, and protect the unit as much as possible from the direct rays of the sun. Follow pertinent instructions in TB SIG 72.

# CHAPTER 3

# MAINTENANCE INSTRUCTIONS

## Section I. ORGANIZATIONAL TOOLS

### 25. Catalog Reference

All tools, parts, and equipment supplied with Engine Generator PU–181/PGC–1 are listed in paragraph 6 of this manual.

### 26. Use and Care of Tools

*a.* Use of Tools.

(1) *General.* The proper use of tools is very important as improper use will damage the tools, damage the equipment, and and may result in personal injury.

(2) *Wrenches.* When tightening a nut, bolt, or cap screw, be sure to use the proper wrench for the job. Do not use a wrench that is slightly worn or one that is oversized as this will result in rounding the nut, bolt head, or screwhead and may cause damage to the equipment and personal injury if the wrench should slip. Never use pliers for tightening or loosening nuts, bolts, or cap screws. If possible, always use the correct sized open-end wrench, box wrench, or socket wrench. When tightening cylinder head bolts or cap screws, use a torsion wrench, if one is available. Never use a pipe or other means to increase the leverage as this will bend or break the wrench and may possibly strip the threads of the fastening.

(3) *Screw drivers.* When loosening or tightening a fastening which has a slotted head, use a screw driver with a blade that fits the slot in the head of the fastening. Do not use a wrench or pliers on the shank of the screw driver to increase leverage. Be sure to keep the blade of the screw driver square in the slot of the fastening. Never use a screw driver as a pry bar or chisel.

(4) *Other tools.* Specific tools are made for specific purposes. Make sure to use the right tool for the job and that it is of the correct size for the work to be done.

*b.* Care of Tools. The condition in which a mechanic keeps his tool equipment is a good indication of his ability. Do not abuse tools by using them for work for which they were never intended. Keep tool equipment properly stowed and protected from dirt and dampness at all times when not in use. After using a tool, clean it thoroughly and replace it in its proper place in the tool box. Keep all tools free from rust and keep adjustable tools, such as pliers and adjustable wrenches, lubricated. Keep the toolbox clean and free from all foreign matter and debris. After cleaning tools and before putting them away, wipe them with a clean cloth moistened with oil to protect them against rust. For more complete details on the care and use of tools, refer to TM 11–453.

## 27. Special Tools for Engine Generator PU–181/PGC–1

Special tools provided for the unit are illustrated in figure 9. The use of the spark timing gage and ignition point gage are described in paragraphs 92 and 93. The flywheel puller is described in paragraph 59*d*.

# Section II. LUBRICATION AND PRESERVATION

## 28. Lubricating Periods

Lubrication instructions frequently are given in periods of days, weeks, months, half years, and years. A daily period of operation consists of any consecutive 8-hour period or any number of periods of operation that total 8 hours. A weekly period of operation is any number of operating periods that total 64 hours. A monthly period of operation is any number of operating periods that total 256 hours. A half-yearly period of operation is any number of operating periods that total 1,024 hours. A yearly period of operation is any number of operating periods that total 2,048 hours.

## 29. Factory Lubricated Parts

*a.* Magneto Cam. The magneto cam lubricating wick (cam wiper) is saturated with grease at the factory and should not require any lubrication for long periods. However, if it becomes necessary to remove the flywheel, clean off all the old lubricant and dirt from the cam surface, and apply one or two drops of Oil, engine (OE 10) to the felt wick. Avoid excessive lubrication of the wick.

*b.* Breaker Arm. The magneto breaker-arm pivot bearing is lubricated at the time of assembly and should not require additional lubrication. When replacing breaker points (par. 65*a*), clean off all the

old lubricant with solvent (SD) and allow them to dry thoroughly. Apply a thin coat of grease (GL) to the magneto breaker-arm pivot-bearing surface.

***Caution:*** Avoid placing lubricant on the breaker points. Wipe off excess lubricant.

*c.* Parts Not To Be Lubricated.

(1) *Generator.* The generator is equipped with two sealed type ball bearings. The sealed feature is to prevent the entrance of dirt and escape of lubricant. These bearings are packed during manufacture with the correct amount and grade of grease to last the life of the bearings at normal operating temperature. If the lubricant runs out of a bearing, the bearing will have to be replaced with a new bearing. Do not apply oil or solvent to the bearings for the purpose of supplementing, softening, or otherwise modifying the special lubricant originally placed therein.

(2) *Air cleaner.* The air cleaner operates dry and does not require lubrication. To clean, refer to paragraph 72.

## 30. Lubrication Requiring Disassembly

There are no lubrication operations that require disassembly of parts or assemblies in the operation of the unit.

## 31. Routine Lubrication

*a.* Lubrication Orders. Lubrication orders are illustrated, numbered, and dated cards or decalcomania labels which prescribe approved lubrication instructions for mechanical equipment which requires lubrication by using organizations. Current lubrication orders should be requisitioned in conformance with instructions and lists in SR 310–20–3. Instructions contained in lubrication orders are mandatory and supersede all conflicting lubrication instructions of an earlier date.

*b.* Approved Lubricants and Cleaner.

| Symbols | Nomenclature |
|---|---|
| OE 10 | Oil, engine, SAE–10. |
| OE–A | Oil, engine, arctic (use for all below zero operation). |
| GL | Grease, Instrument, or AN–G–25. |
| SD | Solvent, dry-cleaning, Federal P–661a. |
| DA | Oil, fuel, Diesel. |

*c.* Records and Reports.

(1) *Records.* A complete record of lubrication must be kept for each power unit. For this purpose WD AGO Form 460 must be used.

(2) *Reports:* If lubrication instructions are followed and proper lubricants are used and if satisfactory results are not obtained, make a report to the officer responsible for maintenance of the unit.

## 32. Weatherproofing

*a.* General. Signal Corps equipment, when operated under severe climatic conditions, requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials.

*b.* Tropical Maintenance. A special moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. This treatment is fully explained in TB SIG 13 and TB SIG 72.

*c.* Lubrication. The effects of extreme cold and heat on materials and lubricants are explained in TB SIG 69. Observe all precautions outlined in TB SIG 69 and pay strict attention to all lubrication orders when operating equipment under conditions of extreme cold or heat.

## 33. Rustproofing

Whenever the equipment is to be placed in storage or is to be out of service for a period of 30 days or more, precautions must be taken to guard against rust. Process the equipment as follows:

*a.* Drain the entire fuel system, including the crankcase.

*b.* Turn the power unit upside down.

*c.* Remove the spark plug and spark plug adapter and the crankcase drain cock.

*d.* While the unit is being cranked by hand, spray OIL, lubricating preservative special (PL-special) through the spark plug hole and the drain cock hole to coat the interior surfaces of the engine. Use an air atomizing type of spray gun and dry air.

*e.* After the engine has cooled, remove grease and dirt from the exterior.

*f.* Seal the exhaust outlet, and cover the air cleaner with tape, adhesive, waterproof cloth (Signal Corps stock No. 6Z8624–1).

*g.* Be sure all surfaces are dry, then spray all unpainted exterior surfaces, including wiring, with Compound, Insulation, Ignition (Ordnance Spec. No. AXS–858).

## 34. Gum Prevention

*a.* When exposed to air, gasoline tends to oxidize and form a gummy compound. This gummy substance eventually settles in the fuel line, fuel tank, carburetor, and other parts of the fuel system. The addition of an oxidation inhibitor and metal deactivator to gasoline, which has not begun to deteriorate, reduces the formation of gum during storage periods up to 6 months.

*b.* When the unit is to be placed in storage or remain idle for 30 days or longer, treat the fuel system with gum preventive compound (Federal stock No. 51–C–1587–225). This compound is issued in 4-ounce containers. Use it as follows:

(1) Make sure that the fuel system is free from accumulated gum. Unless the unit is entering its first storage period, inspect and clean the entire fuel system from the fuel tank to the reed valve of the carburetor.

(2) It may be necessary to remove dried gum by scraping, brushing, or other mechanical means. Parts which cannot be thoroughly cleaned and freed from gum deposits without damage should be replaced. The following solvents may be used:

(*a*) Benzine may be obtained in 1-quart containers (Signal Corps stock No. 6G100).

(*b*) Acetone, grade B, may be obtained in 1-gallon containers (Signal Corps stock No. 6G4.1).

(*c*) Alcohol, denatured, grade 2, may be obtained in 1-quart containers (Signal Corps stock No. 6G16.1).

*c.* After thoroughly cleaning and reassembling the equipment, half-fill the fuel tank with fresh gasoline mixed with the proper proportion of engine oil. Add gum preventive compound in the proportion of 1 ounce of compound to 5 gallons of fuel.

*d.* Add enough untreated, fresh gasoline and oil mixture to fill the fuel tank and operate the engine for at least 5 minutes.

*e.* After running the engine for 5 or more minutes, drain the entire fuel system, including the carburetor, carburetor float bowl, and fuel line. Seal all openings after the fuel has been thoroughly drained from the fuel system.

*Note.* The use of gum preventive compound is a preventive measure only and not a corrective treatment. It will not remove existing deposits nor prevent the formation of gum in gasoline which has already deteriorated in storage.

## 35. Refinishing

When painted surfaces of the equipment become scratched or otherwise damaged, rust and corrosion may be prevented by thoroughly cleaning and then touching up the damaged surfaces.

*a.* Remove all traces of oil or grease with solvent (SD) and thoroughly sandpaper the portions to be refinished. Apply light, even coats of paint with a small brush. Two light coats are better than one heavy coat.

*b.* If the painted surfaces have become blistered from heat, remove all old paint with paint remover. Thoroughly sandpaper the surfaces or rub them down with fine steel wool. Apply a smooth, even priming coat, sandpaper it lightly, and then apply a finish coat.

***Caution:*** Avoid getting paint on moving parts in such manner as to hinder their movement. Do not paint electrical contacts and avoid getting paint into oil and breather holes.

## Section III. PREVENTIVE MAINTENANCE

### 36. Meaning of Preventive Maintenance

*a.* Preventive maintenance is a systematic series of operations performed periodically in order to keep equipment operating at top efficiency. The primary purpose of preventive maintenance is to prevent major break-downs and the consequent need for repair. The primary function of trouble shooting and repair is to locate and correct existing defects.

*b.* Preventive maintenance is of utmost importance since the failure or inefficient operation of one piece of equipment may cause the failure of an entire system. It is necessary to inspect the power unit systematically each day that it is operated and at weekly intervals, so that defects may be discovered and corrected before they result in serious damage or failure.

*c.* Preventive maintenance services are the responsibility of operating organizations. They comprise the scheduled maintenance services performed by power unit operators and maintenance personnel, respectively. Ordinarily, the power unit operator will replenish fuel and lubricant. He will perform necessary cleaning operations, tighten loose nuts, bolts, screws, and other fastenings, care for tools and accessories, and make such emergency repairs as are within the scope of his ability, tool equipment, and parts available. He will perform all daily lubrication operations, before operation, at halt (during shut-down periods), and after operation (par. 41). He will assist the unit mechanic in performing the weekly maintenance on the unit. Maintenance personnel will perform the weekly and monthly maintenance operations (pars. 42 and 43), assisted by the operator. The unit mechanic will also see that daily lubrication operations have been properly performed by the operator. Any maintenance or repair operations beyond the scope of maintenance personnel will be reported to the officer in charge.

## 37. Daily Maintenance Services

*a.* Every operator of an individual power unit or power unit installation will use DD Form No. 110. To adapt this form to power unit operation, the following interpretations of various headings on the form are necessary. Boxes not explained will be ignored.

*b.* Under OPERATOR fill in the name of the operator of the power unit. The space under REG No. will contain the nomenclature and serial number of the power unit. The operator will place the name of his senior noncommissioned officer in the space following REPORT TO. Fill in the unit designation under DISPATCHING ORGANIZATION. Place the date that the form is completed in the box headed DATE. TIME IN will be interpreted as the time the power unit is started. TIME OUT will be interpreted at the time the power unit is stopped for the day. Enter the total number of operating hours for the day under TOTAL MILES. The amount of fuel (gasoline and oil mixture) added during the operating day is entered in the box headed FUEL. The power unit load will be entered in the column headed LOAD. Under SPEEDOMETER enter the number of hours the power unit carried the load.

*c.* Listed on the reverse side of DD Form 110 are the before-operation, during-operation, at-halt, and after-operation-and-weekly services. The power unit operator will line out all listed operations which do not apply to Engine Generator PU–181/PGC–1 and will perform all remaining operations. Upon the completion of each group of service operations the unit operator will place his initials in the space provided. The rest of the back of the form is self-explanatory.

*d.* Power unit operators must be thoroughly familiar with the items that apply to Engine Generator PU–181/PGC–1 and with the manner in which the items are to be inspected and serviced. When tactictal situations prohibit the accomplishment of all operations listed on DD Form 110, as many of the listed items as possible will be performed.

(1) The general inspection and service of each item also applies to any supporting member, connection, or associated part, and usually consists of a check to see whether or not it is in good condition, correctly assembled, secure, or excessively worn.

(2) The inspection for good condition is usually a visual inspection to determine whether or not the unit is damaged beyond safe or serviceable limits, or if it is in such condition that damage will result from operation. The term good condition is applicable if the equipment is not in any of the following conditions: bent or twisted, chafed or burned,

broken or cracked, bare or frayed, dented or collapsed, torn or cut, improperly alined, or improperly lubricated.

(3) Inspection for correct assembly is usually a visual inspection to determine whether or not the item is in its normal position and properly alined.

(4) To check the item for security, use a screw driver, wrench, or pliers or feel it by hand. Such an inspection should include all mountings, nuts, bolts, screws, and other fastenings. All cotter pins, locking wires, locknuts, and lockwashers should be checked for proper installation.

(5) Excessive wear means wear which is likely to result in failure if the item is not replaced before the next scheduled inspection.

*e.* Any defects or unsatisfactory operation characteristics beyond the scope of repair of organizational maintenance must be reported at the earliest opportunity to the offier in charge.

## 38. Before-operation Service

*a.* PURPOSE. This inspection schedule is designed primarily as a check to see that the power unit has not been damaged, tampered with, or sabotaged since the last after-operation service was performed. Various combat conditions may have rendered the power unit unsafe for operation, and it is the duty of the operator to determine if the unit is in condition to operate satisfactorily. This inspection cannot be entirely omitted, even under extreme tactical situations.

*b.* PROCEDURE. Before-operation service consists of inspecting items listed according to the procedure described below and correcting or reporting all deficiencies. Upon completion of the before-operation service, results should be reported promptly to the officer or non-commissioned officer in charge.

(1) *Fuel.* Add fuel if necessary, noting any indications of leakage or tampering.

(2) *Leaks, general.* Check under the power unit for indication of leaks. Trace leaks to source and correct the cause.

## 39. During-operation Service

*a.* GENERAL. While the power unit is in operation and delivering its normal load, listen for rattles, knocks, squeaks, or hums that may indicate trouble. Make certain that rattles are not caused by loose fastenings. Watch for smoke from any part of the unit. Be alert to detect the odor of overheated components, fuel vapor from a leak in the fuel system, and exhaust gases or other odors that may be an indication of trouble. Watch for abnormal indications.

*b.* Unusual Operation and Noises. Be alert for deficiencies in engine performance such as lack of usual power, misfiring, unusual noise or stalling, indications of engine overheating, or unusual exhaust smoke. Notice whether the engine responds properly to change in load. Note minor deficiencies and correct or report them at the earliest opportunity, usually the next stop period.

## 40. At-halt or Stop Service

The at-halt or stop service may be regarded as minimum battle maintenance and must be performed under all tactical conditions, even though the extensive maintenance services may be slighted or omitted altogether. This service consists of investigating any deficiencies noted during operation, applying the procedures described, and correcting all deficiencies. At the end of the stop period, report any uncorrected defects to the officer in charge.

## 41. After-operation Service

*a.* Purpose. After-operation service is particularly important. At this time, the operator inspects the power unit to detect deficiencies that may have developed and corrects those he is permitted to handle. Promptly report the results of this inspection to the officer in charge. If this schedule is performed thoroughly, the power unit should be ready to operate at a moment's notice. Upon completion of the after-operation service, the before-operation service, with but few exceptions, consists mainly of ascertaining whether or not the power unit has been tampered with. Never omit the after-operation service, even in abnormal situations; reduce it, when necessary, to the bare fundamental services.

*b.* Procedure. When performing the after-operation service, remember and consider any irregularities noticed during the day in the before-operation and during-operation services. The after-operation service consists of inspecting the items below:

(1) *Fuel.* Fill the fuel tank in accordance with instructions.

(2) *Clean equipment.* Thoroughly clean the entire exterior of the unit with a clean cloth dampened with solvent (SD) or fuel oil (DA). Do not rub lusterless paint sufficiently to create a shine that might cause reflections. Do not allow the cleaning solvent to get into the bearings, fuel tank, or crankcase.

(3) *Electrical wiring.* Check ignition and other wiring for defects and dirty or loose connections.

(4) *Tools and equipment.* Check the unit packing list to see that all tools and equipment are present and properly stowed or mounted. Remove contents from the toolbox and thoroughly

clean the inside of the box. Remove rust and dirt from tools and wash in fuel oil (DA) or solvent (SD). Wipe the cleaned tools with a cloth moistened with engine oil (OE 10) and replace them in the toolbox. Check all other equipment to see that it is present and in good condition. Report any missing or unsatisfactory item to the officer in charge.

(5) *Springs and suspensions.* Check that the shockmount bolts are secure. See that the rubber mountings are in good condition and free from oil or grease.

(6) *Lubrication.* Refer to section II above and perform lubrication operations scheduled for daily lubrication. Perform other lubrication operations scheduled for this particular period.

## 42. Weekly Maintenance Service

Weekly or at the end of every 64 hours of operation, see that all daily lubrication and maintenance services have been performed. Perform all other services listed in the Weekly column on DA AGO Form 464. Make appropriate entries on the form to indicate that services have been performed and to indicate additional services or repairs that might be required. Remove the cover from the air cleaner and carefully brush any accumulation of dust and dirt from the cleaner element. Renew the filter element if it is badly clogged or damaged. Service the air cleaner twice weekly when the unit is being operated in extremely dusty areas. *Do not apply oil to the air cleaner element.*

## 43. Monthly and Annual Maintenance Service

At the end of every 256 hours of operation, perform the services indicated in the Monthly column on DA AGO Form 464. Make appropriate entries on the form to indicate services performed. At the end of every 2,048 hours of operation, perform the services and inspections indicated in the Technical Inspection column on DA AGO Form 464. Follow the marking legend and symbols which are printed in the upper right-hand corner of the form when marking the form.

## 44. WD AGO Form 460 (Preventive Maintenance Roster)

*a.* Routine preventive maintenance of Engine Generator PU–181/PGC–1 is performed as part of normal operation and is reported on DD Form 110 (par. 37). In addition, however, Engine Generator PU–181/PGC–1 must have special scheduled services performed weekly and monthly by trained personnel. For longer operating hours, the intervals must be shortened. For example, a power unit operating 16 hours daily requires a weekly service twice a week and monthly service twice a month.

*b.* Schedule services for a month in advance, using WD AGO Form 460. On the left-hand page write the names of the responsible mechanics, the power units in their care, and the normal operating hours of each unit. Under UNIT SERIAL NO. give the numbers assigned to each power unit by your organization. If no such number is assigned, put the manufacturer's serial number in the EQUIPMENT REG NO. column.

*c.* On the right-hand page, show in pencil the service which will come due during the month. Weekly services are numbered to show when the monthly service is due. When services are actually performed, write over the entries in ink. If a unit is dead-lined by accident or for repair by field maintenance, show this fact on the roster but do not reschedule.

## 45. Technical Inspections

These inspections are made by technically qualified personnel. They are made for any of the following purposes:

*a.* To determine whether a power unit should be continued in service, or overhauled, or salvaged.

*b.* To determine extent of damage and estimated cost of repair in Reports of Survey and the like.

*c.* To discover the cause of difficulties encountered in service.

*d.* To insure that all defects have been corrected in a field shop before the unit is returned to the using organization.

*e.* To determine the condition of a unit at the time accountability for it is transferred.

## 46. DA AGO Form 464 Services

DA AGO Form 464 is provided as a guide in the performance of necessary periodic services and inspections. Make appropriate entries on this form whenever any of the operations listed on the form are performed. Following are detailed instructions for items on DA AGO Form 464 which apply to Engine Generator PU–181/PGC–1. The use of this form is explained in TM 37–2810.

*a.* Fill in the appropriate spaces at the top of work sheet.

*b.* The double columns of blocks, or groups, are used for recording the completion of items.

(1) For a TI (technical inspection) use the left-hand blocks in each column.

(2) For the weekly inspection, use the right-hand blocks.

(3) For a monthly inspection, use the left-hand blocks.

*c.* An open block opposite an item means the item is to be inspected and corrected. In each inspection, make sure that the item and its

supporting member or connection are in good condition, correctly assembled, secure, and not excessively worn. If an item is found to be satisfactory, put a check mark (√) in the box. If an adjustment is needed, put an X in the box. If a repair is required, use XX. If a replacement is needed, use XXX. When the repair, adjustment, or replacement is made, circle the mark.

*d.* Some of the boxes have letters in them. These letters mean that, besides the usual inspection and correction, one or more of the following special services should be performed. When the special services have been performed, circle the letter or letters.

(1) *C—Clean.* Using solvent (SD), remove oil, grease, or dirt; rinse and dry. Gasoline will not be used as a cleaning fluid for any purpose.

(2) *T—Tighten.* Use the correct wrench and do not overtighten. Make sure that locknuts, lockwashers, cotter keys, and locking wires are in place.

(3) *A—Adjust.* Make adjustments as directed in paragraph 47.

(4) *L—Lubricate.* Perform special operations as directed in paragraph 47.

(5) *Service.* Perform special operations as directed in paragraph 47.

*e.* During a technical inspection make only such adjustment, repair, or replacements, and perform only those special services which are necessary to restore the unit to a safe operating condition. Replace damaged parts after the inspection.

## 47. Specific Procedures

Following are detailed instructions for the items on Form DA AGO Form 464 which apply to Engine Generator PU–181/PGC–1.

*a.* Locating Inspection or Service To Be Performed. Look down the column marked for the inspection or service which is to be performed. At each place where an item number appears in the column, follow the instructions to the right of the number. On each item make a general inspection, whether or not it is mentioned.

*b.* Marking Work Sheet When Items Are Completed. As the items are completed, mark the work sheet accordingly and rule out all items not mentioned here, as they do not apply.

*c.* Items To Be Written in on Work Sheet. Numbered blank spaces have been provided in all blocks, or groups, on DA AGO Form 464 to cover any item not listed. In the following table of detailed instructions, there are four items which do not appear among the various headings which are to be written in opposite the appropriate printed item number shown, at the time this work sheet is prepared:

| *Item No. and heading to be written in* | | *Where heading is to be written in* |
|---|---|---|
| 8 | Housing | Opposite blank space No. 8. |
| 21 | Noise and vibration | Opposite blank space No. 21 in engine and accessories group. |
| 175 | Temperatures | Opposite blank space No. 175 in generators group. |
| 211 | Final running test | Opposite blank space No. 211 below graders group. |

*d.* Table of Detailed Instructions for Work Sheet Items.

| TI | Monthly | Weekly | Action |
|---|---|---|---|
| 1 | 1S | 1S | *Before-operation Services.* Follow the before-operation procedure given in paragraph 38. |
| 2 | 2L | 2L | *Lubrication.* Refer to paragraphs 28 through 29. |
| 3 | 3C | 3C | *Tools and equipment.* All standard tools should be present (tool list, par. 6*e*), in good condition, and properly stowed. See that tools with cutting edges are sharp. Sharpen if necessary. |
| 4 | 4 | 4 | *Fire extinguisher.* Inspect to see that it is in good condition and full charged. |
| 5 | 5 | 5 | *Publications.* A supply of DD Form 110, WD AGO Form 460, and DA AGO Form 464 should be present and in legible condition. The technical manual for the equipment should be included. |
| 6 | 6 | 6 | *Appearance.* Inspect the equipment for any damage to the finish and clean off all traces of oil, grease, dust, and dirt. |
| 7 | 7 | 7 | *Modifications* (MWO's completed). Check that all modification work orders and other directives have been complied with. |
| 8 | 8 | 8 | *Housing.* Inspect the unit frame to see that it is in good condition. See that all fastenings are secure. |
| | | | ENGINE AND ACCESSORIES |
| 11 | 11 | 11 | *Cylinder head, manifold, and gaskets.* Remove muffler and inspect for carbon deposits in exhaust ports and muffler (par. 70). Remove carbon, if necessary, and inspect for leaks and cracks. Tighten all mounting bolts and connections. |
| | | | *Note.* This operation should be performed halfway between weekly services, because an excessive amount of carbon may accumulate in a week. |
| | 11 | -- | Remove the carburetor, muffler, and cylinder head and inspect for carbon deposits in the cylinder head, exhaust, and intake ports and on top of the piston. Remove carbon if necessary. |

| TI | Monthly | Weekly | Action |
|---|---|---|---|
| 20 | 20 | 20 | *Governor and linkage.* Inspect the governor and all connecting linkage, and see that they are secure and in good operating condition. Check linkage connections to see that they are not excessively worn. Check the plunger linkage and the attached throttle shaft to see that the parts are working freely and do not bind. |
| 21 | 21 | 21 | *Noise and vibrations* (insert this item on DA AGO Form 464) (*Engine mountings and exhaust*) While operating the engine, listen for any unusual noises in the engine. Notice any excessive vibration that might indicate damaged, loose, or inadequately lubricated parts. Service. Tighten mountings securely. |
| | | | FUEL SYSTEM |
| 39 | 39 | 39 | *Carburetor and linkage.* Check for good condition, correct assembly, and secure installation. Be sure the carburetor does not leak. Inspect choke, throttle linkage, and governor. |
| 41 | 41 | 41 | *Air cleaner and precleaners.* Remove the air cleaner element (par. 72). Examine the disassembled air cleaner parts to see that they are in good condition. Note particularly whether the cleaner element is damaged. |

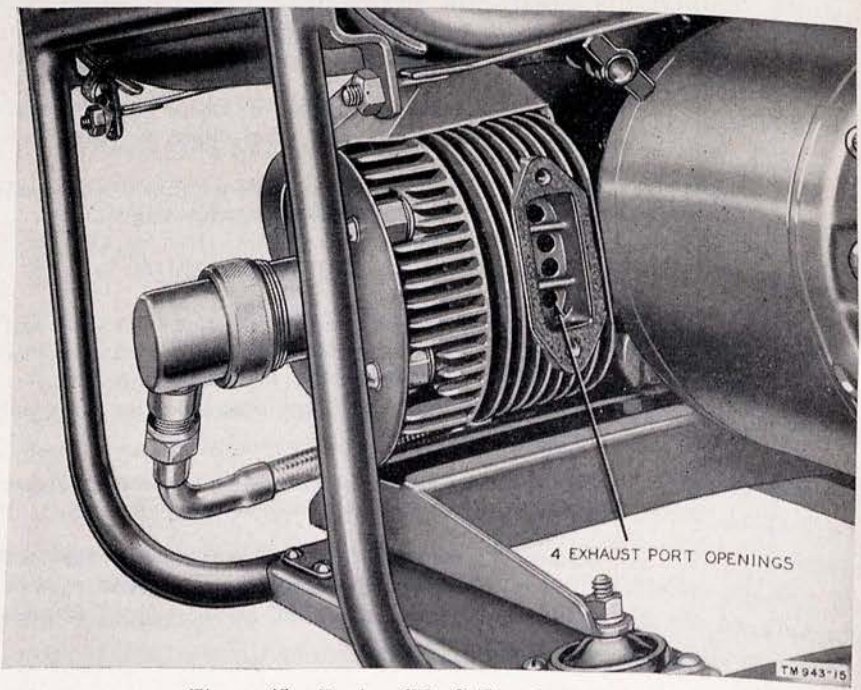



*Figure 15. Engine GE–12–F, exhaust ports.*

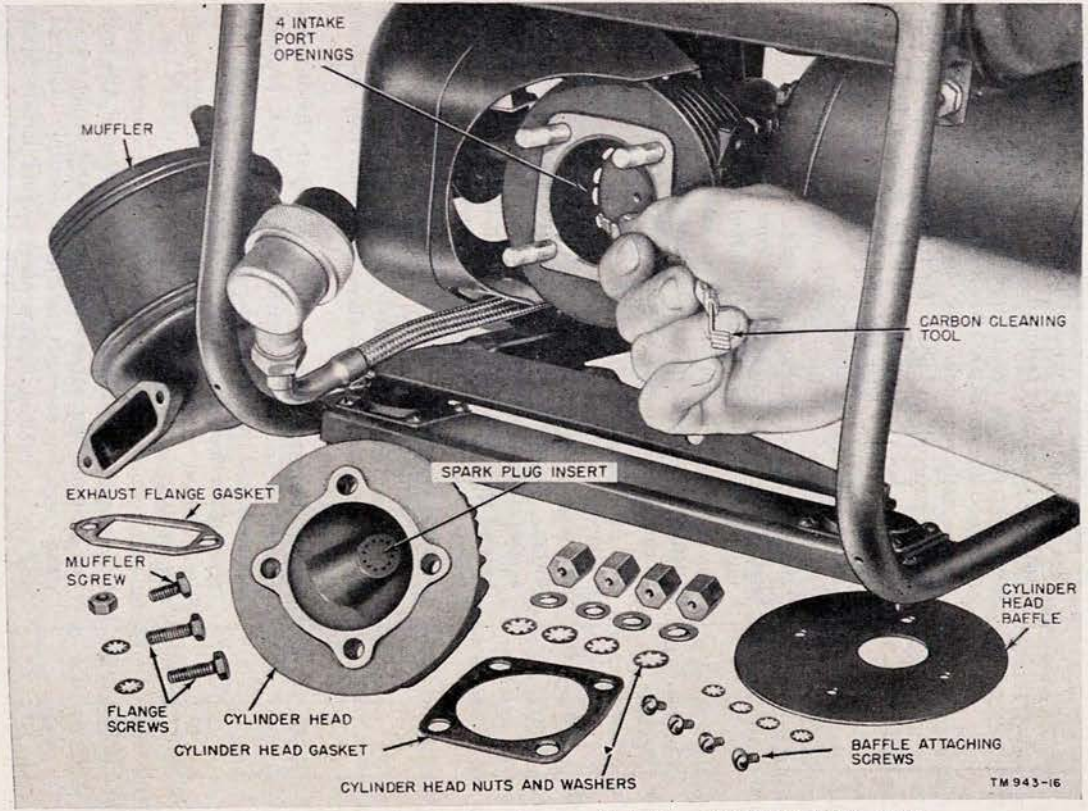



*Figure 16. Engine GE–12–F, disassembled for cleaning intake ports.*

| TI | Monthly | Weekly | Action |
|---|---|---|---|
| ------ | 41 | 41 | *Clean.* Clean the element by brushing off accumulated dirt (par. 72). Replace element if clogged or damaged. Reassemble cleaner, making certain that all gaskets are in good condition and in place. Reinstall air cleaner. See that cleaner is pressed firmly in place against the seal and is securely fastened. |
| 43 | 43 | 43 | *Tank, filler element, cap, and gasket.* See that the tank, vent, and line are in good condition, correctly assembled, and securely mounted. See that the fuel tank air vent is unobstructed, and check for fuel leaks from the tank or line. Look underneath unit for signs of fuel leaks. Observe whether filler cap and gasket are in good condition and securely attached. |
| ------ | 43 | ------ | *Tighten.* Tighten all fuel tank mountings and fuel line support clips or brackets securely. |
| ------ | 43 | 43 | *Serve.* Drain water and sediment from fuel tank by opening drain cock. Keep open until fuel runs clean. Clean the cock, being careful to prevent leakage.<br>***Caution:*** When performing this operation, use a container to catch the drainings, and use every precaution not to spill the fuel. Remove spilled fuel before starting the engine. |
| 46 | 46 | 46 | *Spark plugs.* Remove the spark plug and examine its condition. Measure the gap. Look for broken insulator, excessive carbon deposits, and electrodes which are burned thin. Clean deposits from insulators and electrodes, and check insulator for cracks.<br>Remove the spark plug adapter and clean all combustion deposits from the small holes in the adapter.<br>*Note.* Report excessive carbon deposits and burned or cracked insulators, since these conditions may indicate incorrect heat range. |
| ------ | 49 | ------ | *Magneto.* Remove flywheel and check that the breaker points are in good condition, well aligned, engaged squarely, and that the gap is satisfactory (par. 76). Replace unserviceable points. |
| ------ | 49 | ------ | *Adjust.* Adjust magneto breaker-point gap to .020 inch. Check magneto timing. |
| ------ | 49 | ------ | *Lubricate.* See paragraphs 28 through 29. |
| 50 | 50 | 50 | *Coil, wirings, switches.* See that the magneto coil, the ignition governor, and other wiring on the unit are in a good clean condition, correctly assembled, securely mounted, and are not rubbing against other engine parts. Make sure that the terminal block is in good condition. Examine suppressors, filter, capacitors, and shielding to see that their bonding connections are serviceable and securely mounted. |
| 50 | 50 | 50 | *Clean.* Clean all exposed wiring with a dry cloth.<br>*Note.* Do not disturb connections unless they are actually loose. Overtightening may result in damage to the terminals. |

| TI | Monthly | Weekly | Action |
|---|---|---|---|
| 175 | 175 | 175 | *Temperatures.* (Insert this item on DA AGO Form 464). With the unit running, feel the generator housing cautiously for abnormal temperatures (based on experience with the unit). Feel the bearing housings of the generator for overheating. If the bearings appear to be overheated, excessive wear of the bearings is indicated. Report worn bearings promptly to the officer in charge. |
| 211 | 211 | 211 | *Final running test.* (Insert this item on DA AGO Form 464). |
| ------ | ------ | ------ | *Engine, idle.* Observe whether the engine runs smoothly at normal governed and idling speeds. At all times during the test, note any tendency of the engine to stall. |
| ------ | ------ | ------ | *Power and noise.* Observe whether the engine has normal pulling power and operating characteristics with different loads. When operating, listen for unusual engine noises such as ping. Listen for noises that might indicate damaged, excessively worn, or inadequately lubricated engine parts. |
| ------ | ------ | ------ | *Smoke.* During the running test, look for any indication of excessive or unusual smoke from the exhaust. |
| ------ | ------ | ------ | *Noise and vibrations (Engine mountings and exhaust).* While operating the engine, listen for any unusual noises and watch for excessive vibration (item 21). |
| ------ | ------ | ------ | *Clean.* Clean and dry the exterior of the engine thoroughly, being careful to keep the solvent (SD) away from electrical wiring and equipment. Soap and hot water, which are not harmful to insulation, should be used when available. |
| ------ | ------ | ------ | *Generator.* Check temperature of generator housing and bearings (item 175). |

## Section IV. TROUBLE SHOOTING

### 48. Principle of Two-Cycle Engine (fig. 17)

*a.* When the piston travels away from the crankshaft, a charge of fuel vapor in the cylinder is compressed. At the same time, a partial vacuum, created in the crankcase, causes the reed valve, attached to the carburetor, to open. Fuel-air mixture is then drawn into the crankcase (A, fig. 17). At the end of the compression stroke of the piston (B, fig. 17), the spark plug ignites the compressed fuel vapor in the combustion chamber, and the explosion which follows forces the piston toward the crankshaft on its power stroke (C, fig. 17).

*b.* As the piston moves toward the crankshaft on its power stroke, it compresses the fuel vapors which have been drawn into the crankcase through the reed valve. When the piston passes the exhaust port

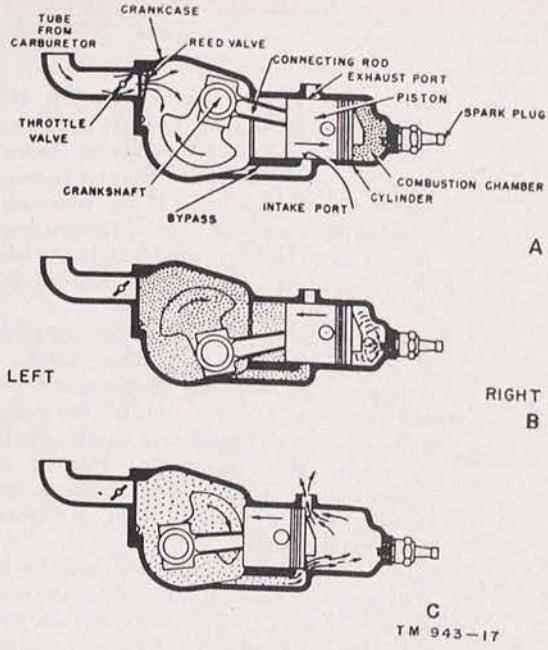



*Figure 17. Two-stroke-cycle engine, diagram of operating principle.*

openings, the ports are uncovered and most of the burned gases pass out of the cylinder and into the exhaust.

*c.* Just after the exhaust ports open, the piston uncovers the intake port openings and the compressed fuel vapors from the crankcase pass through the bypass and intake port holes and into the cylinder. Fuel vapors are directed upward by a deflector located on the piston head (A, fig. 17). The momentum of the flywheel carries the piston through the compression stroke. The continuous succession of these cycles produces a constant, smooth flow of power.

*d.* In engines of this type, lubrication of internal parts is accomplished with oil, mixed with gasoline (fuel), that is drawn into the base of the engine in the form of vapor.

## 49. Engine Ignition System

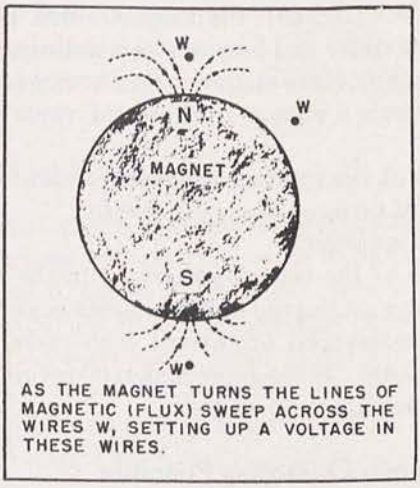
The magneto has a rotating, permanent magnet in the flywheel (rotor) and a stationary coil (stator). The primary winding of the coil is in series with the breaker points. The secondary winding is connected to the spark plug. As the permanent magnet (flywheel) rotates, the magnetic flux through the coil is repeatedly reversed, and an induced current flows in the primary circuit when the contact points are closed. When the contact points open, the primary cur-

rent stops flowing and the magnetic field immediately collapses, thus inducing a very high voltage in the secondary winding of the coil. This potential is fed through the magneto cable to the spark plug where it jumps the spark plug gap. (See TM 10–580 for a more complete discussion of magnetos.)

## 50. Theory of Generator Operation

(fig. 18)

*a.* Generator GN–51–C is designed to produce a 60-cycle ac. A 60-cycle ac is one which starts at zero, increases to a maximum value in the positive direction, decreases to zero, increases to a maximum



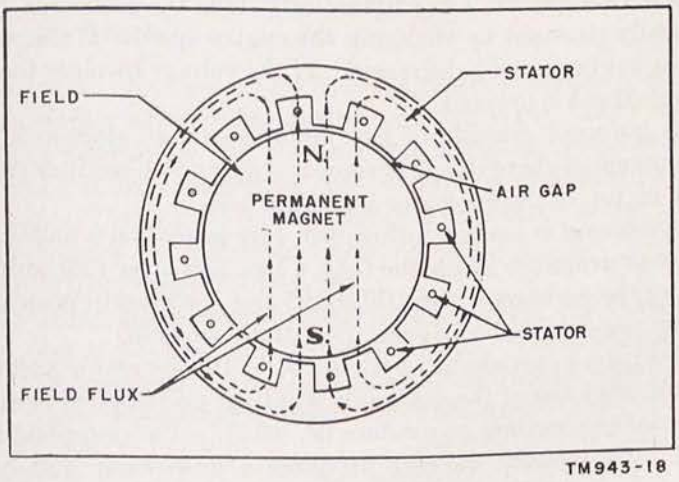




*Figure 18. Theory of generator operation.*

value in the negative direction, decreases to zero again, and repeats this cycle 60 times in 1 second.

*b.* The generator is a rotating-field type and requires no commutator or brushes. The rotor of the generator consists of a permanent magnet in the form of a cylinder which is mounted on the generator shaft. It is made of nickel-aluminum-cobalt alloy and produces a strong magnetic field. This magnet is surrounded by a copper structure which prevents it from losing it magnetism if the generator is accidentally short-circuited.

*c.* A simplified diagram of the rotor (fig. 18) shows the line of the magnetic flux leaving the north pole and entering the south pole. When such a rotor is placed within a stator which has copper wire windings in its slots (fig. 18), the magnetic flux lines pass through the iron core of the stator and between its windings. When the rotor is turned by the engine, these magnetic flux lines sweep past the stator windings and generate a voltage in them, the value of which depends on:

(1) Strength of the rotating magnet.
(2) Number of turns of wire in the stator.
(3) Speed of rotation.

*d.* The direction of the voltage generated in the wires depends on whether a north or a south pole of the magnet is sweeping past them. This in turn causes reversal of current each cycle, as mentioned in subparagraph *a.* above. If the rotor makes 60 revolutions in 1 second, there will be 60 reversals or 60 cycles.

## 51. Electric Governor Operating Principle

*a.* Mounted above the carburetor is a small, solenoid-type, electric governor. Its function is to automatically hold the generator voltage substantially constant by changing the engine speed. If the voltage drops, the engine speed is increased. If the voltage becomes too high, the engines speed is lowered.

*b.* The governor consists of two major parts, an electric solenoid (fig. 10) mounted above the carburetor and a dry-disk rectifier (fig. 10) mounted on top of the generator inner end bell.

*c.* The solenoid is made up of copper wire wound on a hollow tube, a plunger or armature inside the tube, a link and lever connecting the plunger to the carburetor throttle shaft, and a spring to position the plunger in response to the magnetic pull of the solenoid.

*d.* A voltage, approximately one-tenth of the generator voltage, is tapped off from one of the generator windings and applied across the terminals of the rectifier to produce dc, which is then supplied to the solenoid. The electric current produces a downward pull on the plunger, which tends to position it in the center of the tube. The

downward movement of the plunger closes the engine throttle by means of the connecting link and lever. The small tension spring attached to the top of the plunger balances the magnetic pull of the solenoid and tends to position the engine throttle so that the correct engine speed is produced to maintain substantially constant voltage.

*e.* To summarize the operation of the electric governor, note that engine operation differs somewhat from that of an engine equipped with a mechanical governor. A mechanical governor attempts to hold the speed constant. With this arrangement, the voltage drop, which takes place with increase in load, depends on both the engine speed drop and the inherent voltage drop of the generator.

*f.* The electric governor depends on voltage alone and not on engine speed. Thus, closer voltage regulation can be obtained because the engine speed is increased automatically as load is applied and this action partly compensated for the inherent voltage drop in the generator.

## 52. Meaning of Trouble-Shooting

The primary function of trouble-shooting is to locate and correct the causes of faulty operation and equipment failure. All mechanical equipment is subject to occasional failure. Whenever difficulty with the equipment is experienced, the operator or the repairman must be able to locate and to correct the cause as quickly as possible. The trouble charts (par. 53) indicate various difficulties that are likely to be experienced; symptoms which indicate that trouble exists, the possible cause, and suggested remedy. Reference to various illustrations and diagrams in this instruction book will aid in localizing the seat of the trouble.

## 53. Trouble Charts

*a.* General. No matter how well equipment is designed and manufactured, faults will develop during service. When faults occur, the repairman must locate and correct them as rapidly as possible. The information in this instruction book will aid in the rapid location of such faults. Consult the trouble-shooting data below when necessary.

(1) Engine and generator trouble charts.
(2) Wiring diagrams (fig. 19).
(3) Illustrations of components. Front, top, and bottom views aid in locating and identifying parts. Cross-sectional views of components are also valuable. Exploded views show all parts in relative positions to each other.

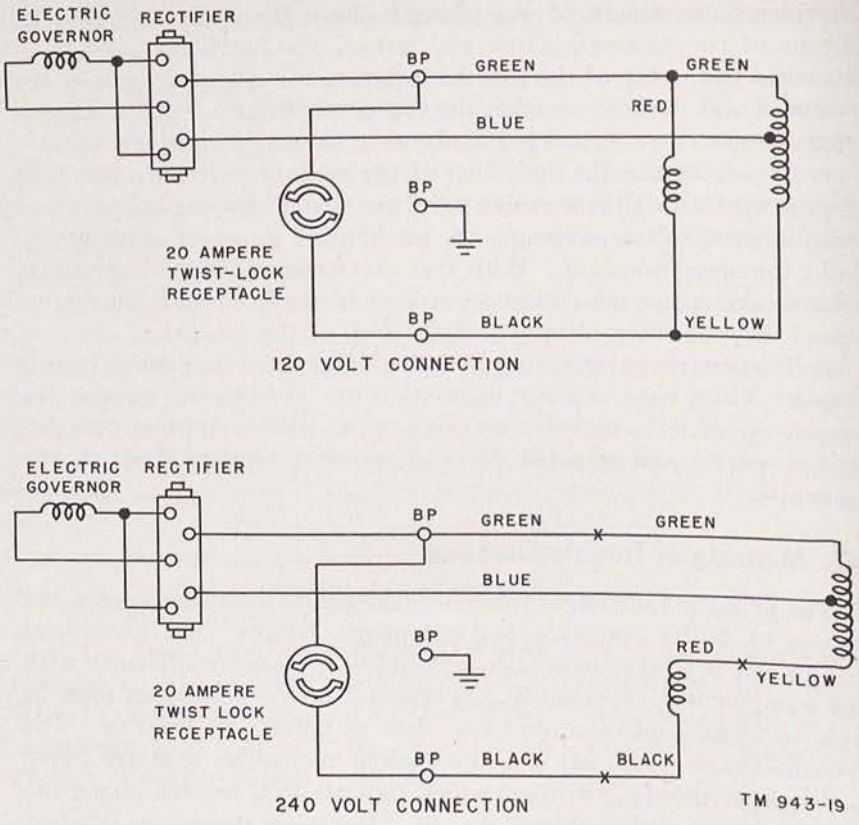



*Figure 19. Generator connection diagram.*

### *b.* Engine Fails to Start or is Hard to Start.

| Possible cause | Check | Remedy | Par. ref. |
|---|---|---|---|
| No fuel in tank | Fuel tank | Fill | 14 |
| Fuel line shut-off not open | Shut-off valve | Open | 16*b* |
| Air vent not open | Air vent | Open | 16*b* |
| Defective spark plug | Spark plug | Replace | 74 |
| Excessive carbon in spark plug, or spark plug adapter. | Spark plug and adapter | Clean | 74 |
| Spark plug gap too wide | Spark plug | Adjust to 0.035 in | 74 |
| Wet spark plug | Spark plug | Dry or replace | 74 |
| Water or dirt in fuel | Fuel tank | Drain, clean, and refill | 47*d*, item 43 |
| Carburetor nozzle clogged | Carburetor nozzle | Clean out | 71 |
| Cylinder port holes plugged | Cylinder port holes | Clean out | 79 |
| Muffler plugged | Muffler | Clean out or replace | 70 |
| Magneto points out of adjustment | Magneto points | Adjust gap to 0.020 in | 75 |
| Broken (open) magneto cable | Magneto cable | Replace | 75 |
| Defective capacitor | Magneto | Replace | 77 |
| Engine flooded | Crankcase | Open and drain | 16*e* |

### *c.* Engine Overheats and Lacks Power.

| Possible cause | Check | Remedy | Par. ref. |
|---|---|---|---|
| Incorrect fuel mixture | Fuel tank | Drain and refill | 14 |
| Cylinder port holes partially plugged. | Cylinder port holes | Clean out | 79 |
| Improper ignition timing | Ignition timing | Retime | 92 |
| Carburetor needle valve not properly adjusted. | Needle valve adjusting knob. | Reset | 94 |
| Carbon on top of piston and inside of cylinder head. | Cylinder and piston head. | Clean | 79 |
| Wrong type of spark plug | Spark plug | Use Champion J–11 or equivalent. | 74 |
| Low compression | Compression | Replace or clean piston rings. | 79 |

### *d.* Engine Misfires.

| Possible cause | Check | Remedy | Par. ref. |
|---|---|---|---|
| Carburetor choke lever not in running position. | Choke lever | Move forward toward engine. | 16*b* |
| Chafed or broken magneto high-tension cable. | Magneto cable | Replace | 75 |
| Carburetor needle valve not properly adjusted. | Needle valve adjusting knob. | Reset | 94 |

### *e.* Excessive Smoke From Exhaust.

| Possible cause | Check | Remedy | Par. ref. |
|---|---|---|---|
| Incorrect ratio of oil to gas | Fuel | Replace with correct mixture. | 14 |
| Too rich a mixture in carburetor | Carburetor adjusting knob. | Reset | 94 |

### *f.* Poor Cylinder Compression.

| Possible cause | Check | Remedy | Par. ref. |
|---|---|---|---|
| Loose cylinder head | Cylinder head nuts and gasket. | Replace gasket or tighten cylinder head nuts. | 85*f* |
| Worn or stuck piston rings | Piston rings | Replace or free rings | 79 |
| Loose spark plug | Spark plug | Tighten | 74 |

### *g.* Poor Crankcase Compression.

| Possible cause | Check | Remedy | Par. ref. |
|---|---|---|---|
| Faulty gasket on crankcase magneto backplate. | Magneto plate gasket | Replace | 8*b*(*e*) |
| Faulty carburetor gasket | Gasket | Replace | 8*b*(*d*) |

### *h.* Generator Fails to Deliver Rated Voltage.

| Possible cause | Check | Remedy | Par. ref. |
|---|---|---|---|
| Engine not up to speed | Engine speed | Adjust governor | 95*c* |
| Engine lacks power | Engine | See engine trouble chart | 53*c* |
| Defective generator | Generator | Replace | 82 |

### *i.* Governor Fails to Operate (Engine Overspeed).

| Possible cause | Check | Remedy | Par. ref. |
|---|---|---|---|
| Open circuit in governor coil | Solenoid coil | Replace governor | 73 |
| Broken wire from generator to coil | Connecting wire | Repair or replace | 85 |
| Generator fails to develop voltage | Generator | Replace generator | 82 |

### *j.* Interference With Nearby Radio.

| Possible cause | Check | Remedy | Par. ref. |
|---|---|---|---|
| Defective generator | Generator | Replace | 82 |
| Loose spark plug shield | Spark plug shield | Tighten | 85*f* |
| Defective magneto-cable shielding | Magneto-cable shielding | Replace | 75 |
| Magneto-cam ground brush not seating. | Magneto-cam ground brush. | Loosen or replace | 85*e* |

# CHAPTER 4

# FIELD MAINTENANCE

## Section I. GENERAL

### 54. General

This chapter is written specifically for repair mechanics or crews concerned with field maintenance and repair. All instructions are complete in every detail and keyed to appropriate illustrations.

### 55. Preliminary Inspection

Preliminary inspections will be made by technically qualified personnel. The equipment will be referred to field maintenance crews after preventive maintenance services and technical inspections are recorded in detail on DA AGO Form 464. The use of this form is explained in paragraph 42. This constitutes a TECHNICAL INSPECTION; see paragraph 45 and determine the extent of repair necessary.

## Section II. CLEANING AND STRIPPING

### 56. Cleaning

*a.* Engine Generator. Thoroughly clean the entire exterior of the unit with a clean cloth dampened with solvent (SD) or oil (DA). Do not allow the cleaning solvent to get into the bearings, fuel tank, or crankcase. *Gasoline will not be used as a cleaning fluid for any purpose.* See paragraph 31*b* for approved cleaners. Scrape out any mud or dirt between cylinder cooling fins.

*b.* Bag CW–191/PGC–1. Unfold the bag, and brush and clean it with soap and water. Dry thoroughly and refold.

*c.* Case CY–739/PGC–1. Remove mud and dirt from the case with soap and water or solvent (SD).

*d.* Tools and Running Spare Parts. All tools and running spare parts should be removed from the compartment in the carrying case. Clean the tools with solvent (SD), see that all tools are present and in

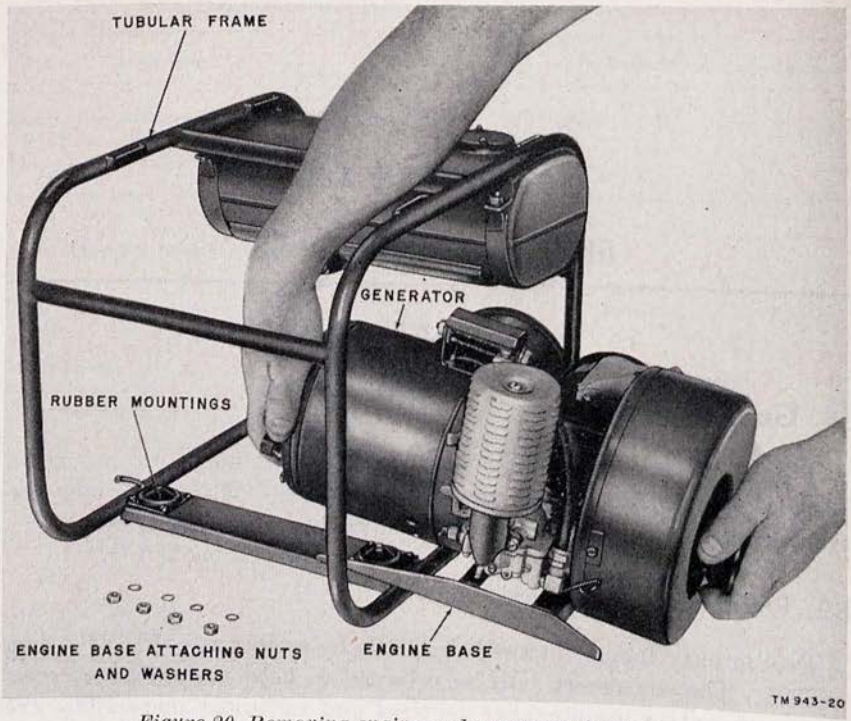



*Figure 20. Removing engine and generator from frame.*

good condition (see tool list, par. 6*e*, and spare parts list, par. 6*d*). Special tools for the equipment must be in order.

## 57. Stripping

Remove the engine and generator from the tubular frame as a complete unit.

*a.* Engine and Generator Removal from Tubular Frame.

(1) Close the fuel shut-off valve and disconnect the fuel line at the fuel shut-off valve (fig. 22).

(2) Remove the nut and washer from each stud that holds the engine base to the rubber-shock mountings (fig. 20). Separate the engine and generator from the frame.

(3) Remove the engine from its mounting base by taking out the four screws that hold it in place (fig. 21).

*b.* Generator Removal from Engine.

(1) Disconnect the two lead wires from the rectifier to the electric governor at the governor.

(2) Unscrew the three hexagonal head cap screws from the back side of the bearing adapter.

(3) Tap the generator until it disengages from the engine crankshaft.

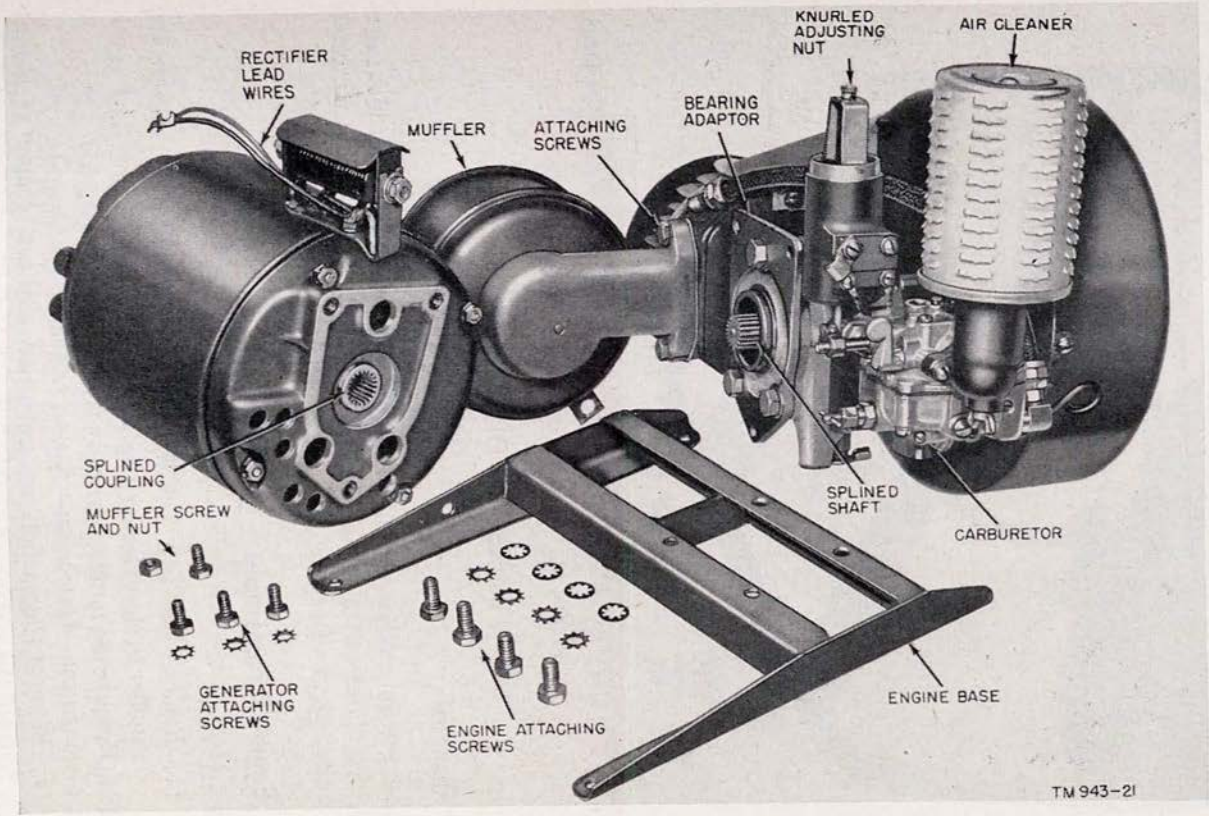



*Figure 21. Generator disassembled from engine.*

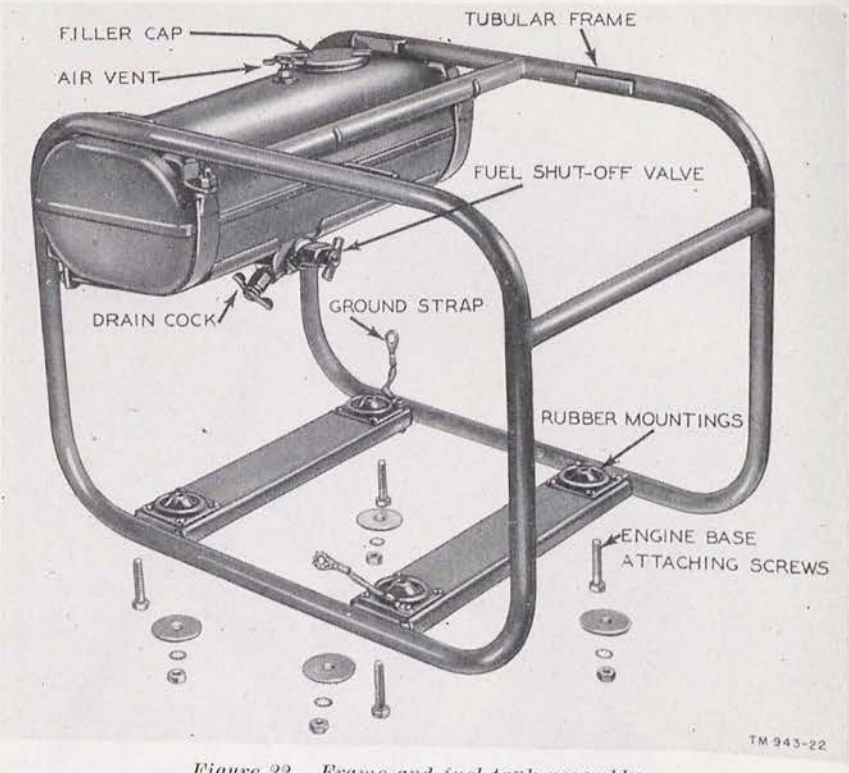



*Figure 22. Frame and fuel tank assembly.*

## Section III. DISASSEMBLY

### 58. General

This section covers complete disassembly and cleaning of the parts and assemblies of the entire unit before detailed inspection to determine the extent of repair or replacement of parts.

### 59. Engine Disassembly

*a.* Muffler.

(1) Remove the two screws and lockwashers that attach the muffler to the cylinder (fig. 21).

(2) Remove the muffler assembly from the engine.

*b.* Carbutetor—Governor—Air Cleaner.

(1) Remove the carburetor, governor, and air cleaner as a unit from the engine (fig. 21).

(2) Remove the four screws that hold the carburetor to the crankcase. Lift off the carburetor and governor, and remove the gasket.

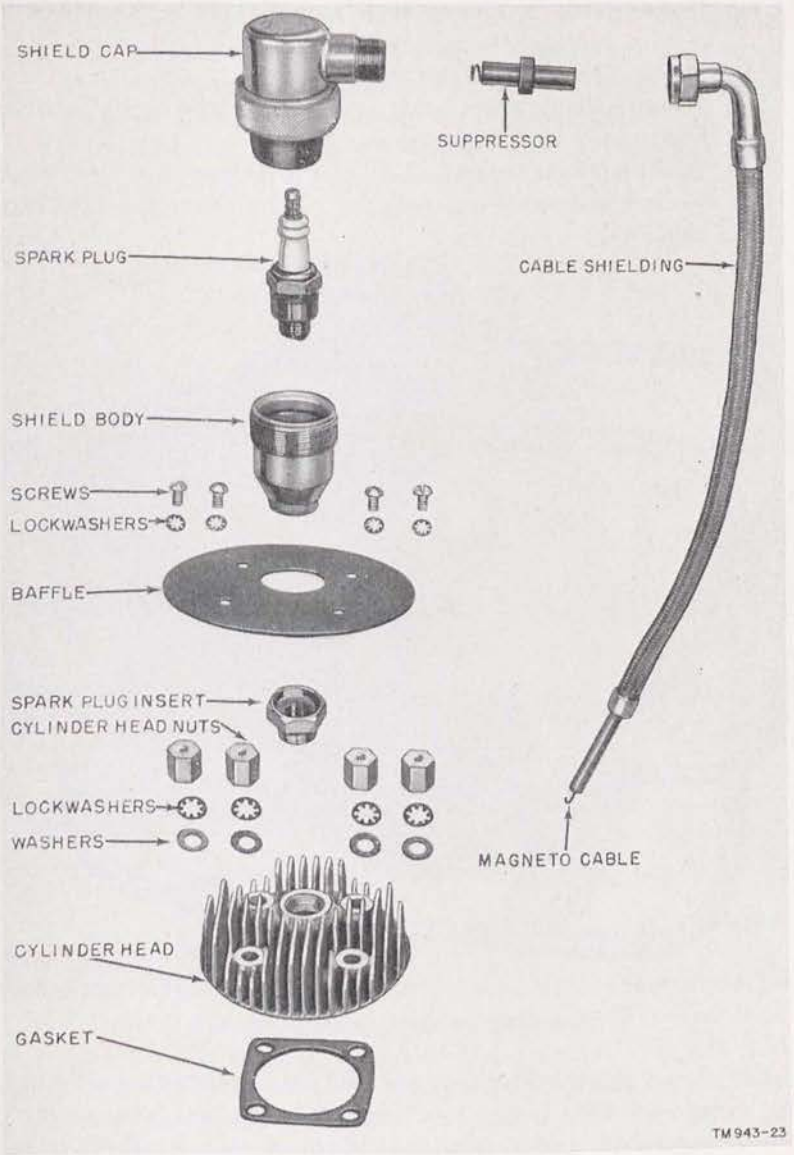



*Figure 23. Spark plug, shield, and cylinder head.*

*c.* Ignition Cable—Spark Plug—Baffle Plate.

(1) Unscrew the ignition cable shielding nut from the spark plug shield cap (fig. 23) and remove the suppressor resistor.

(2) Unscrew and remove the spark plug shield cap.

(3) Unscrew the spark plug from the cylinder head and remove the spark plug shield body.

(4) Unscrew the four roundhead screws and lockwashers and remove the cylinder head baffle plate.

*d.* Flywheel Housing—Magneto Flywheel.

(1) Remove the flywheel housing (fig. 25), which is attached by four screws with lockwashers.

(2) Insert a punch (or rod) through the starter pulley, turn counterclockwise, and unscrew the pulley from the crankshaft (fig. 24).

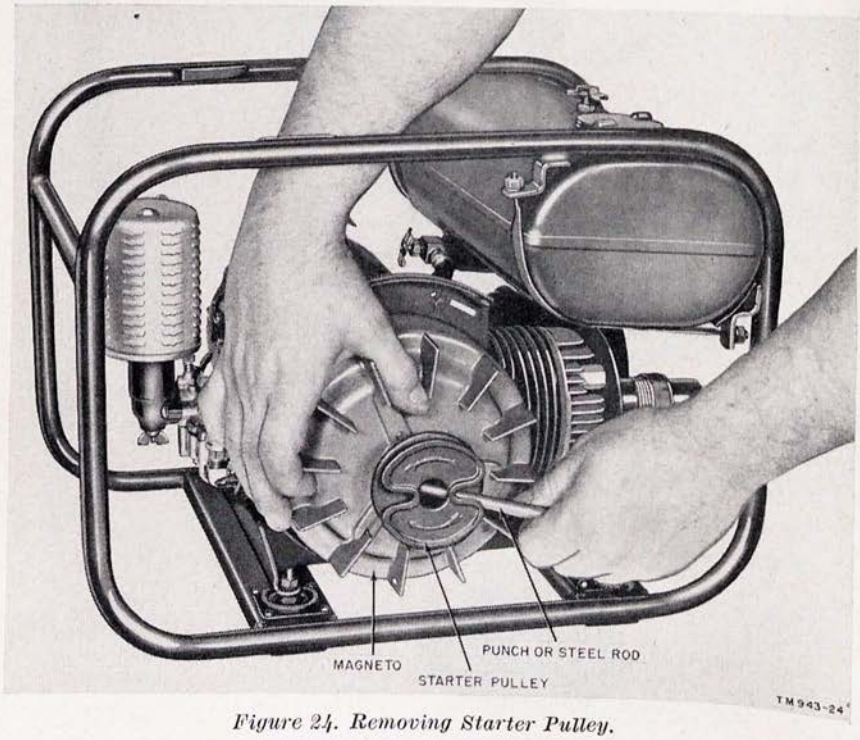



*Figure 24. Removing Starter Pulley.*

(3) Screw the flywheel removal tool onto the crankshaft and tap its end with a hammer until the flywheel loosens on the crankshaft taper (fig. 25). Pull on the flywheel to take advantage of any crankshaft end play. Remove the flywheel from the crankshaft.

*e.* Magneto.

(1) Remove the magneto-cam suppressor brush (fig. 39).

(2) Remove the two screws and lockwashers that attach the stator plate to the backplate (fig. 39), and then remove the stator plate assembly after unfastening the wire end of the magneto cable from around the terminal on the coil.

(3) Remove the two screws and lockwashers that hold the backplate to the crankcase. Remove the backplate and backplate gasket from the crankcase. The ignition (spark plug) cable and shielding will come off with the backplate.

(4) Remove the cam spring washer and the magneto cam by pulling them off the crankshaft.

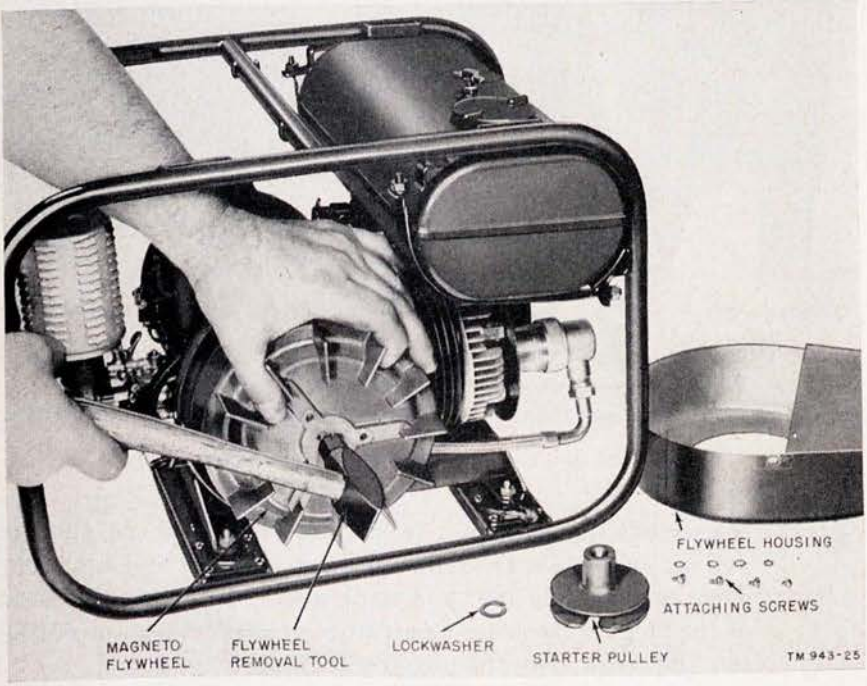



*Figure 25. Removing engine flywheel.*

*f.* Cylinder Head and Cylinder Removal From Crankcase.

(1) Remove the four nuts, lockwashers, and plain washers that attach the cylinder head to the cylinder and lift off the cylinder head. Remove the spark plug insert from the cylinder head (fig. 23).

(2) Remove the cylinder head gasket.

(3) Remove the four nuts that attach the cylinder to the crankcase and pull off the cylinder (fig. 26).

*g.* Piston, Piston Rings, and Connecting Rod.

(1) Working through the opening in the crankcase where the carburetor has been removed, unscrew the two cap screws and lockwashers that hold the connecting rod bearing cap to the connecting rod, and remove the cap (fig. 27). Push the connecting rod and piston up through the crankcase.

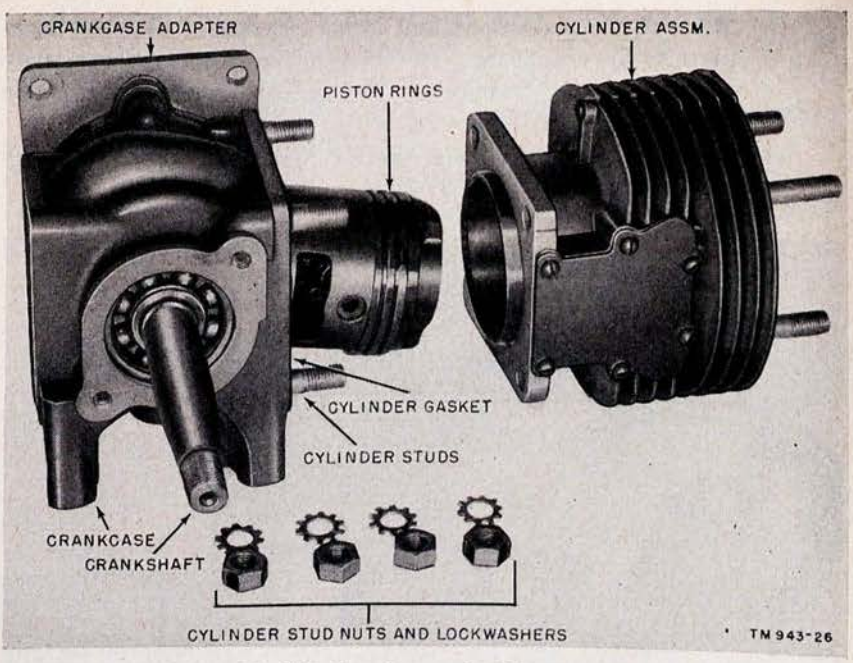



*Figure 26. Cylinder disassembled from crankcase.*

(2) To remove the cotter pin from the piston, turn the pin 90° and straighten out the bulge, using a hammer and a punch. Then turn the pin 180° and straighten out the opposite side of the bulge. By using a pair of pliers, withdraw the cotter pin (fig. 28). Tap the piston pin from the piston.

(3) Spread the top piston ring and remove it from the piston. Remove the second and third rings in the same manner.

*h.* CRANKSHAFT AND MAIN BEARINGS. The crankshaft is a one-piece drop forging and is counterweighted to reduce vibration. It is installed on two ball bearings which are lubricated by the oil component of the fuel-oil mixture.

(1) Remove the three screws and lockwashers that attach the crankcase adapter to the crankcase.

(2) Screw the flywheel removal tool over the end of the crankshaft and drive the shaft-end bearing and adapter out of the crankcase (fig. 29).

(3) The main bearings are pressed on the crankshaft and should be removed only if they are worn. (Always replace main bearing when crankshaft requires replacement). To replace a worn bearing, place the crankshaft in an arbor press, with the bearing properly supported, and press off the bearing.

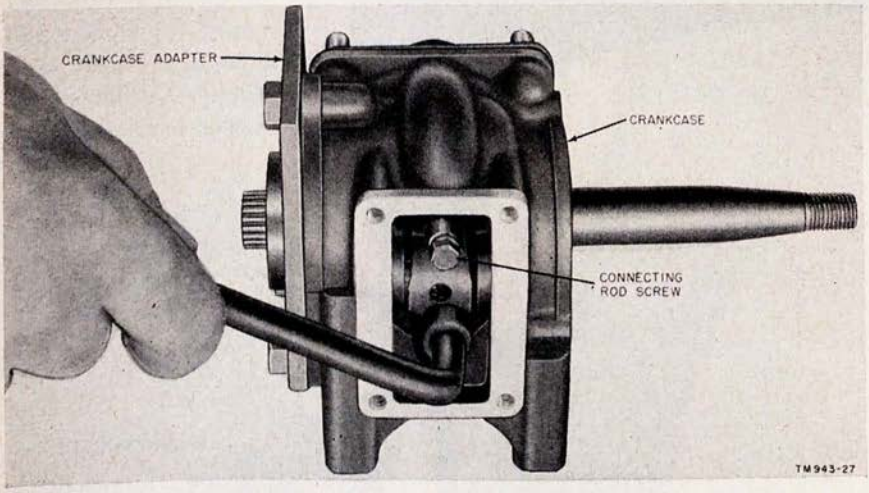



*Figure 27. Removing connecting rod bearing cap screws.*

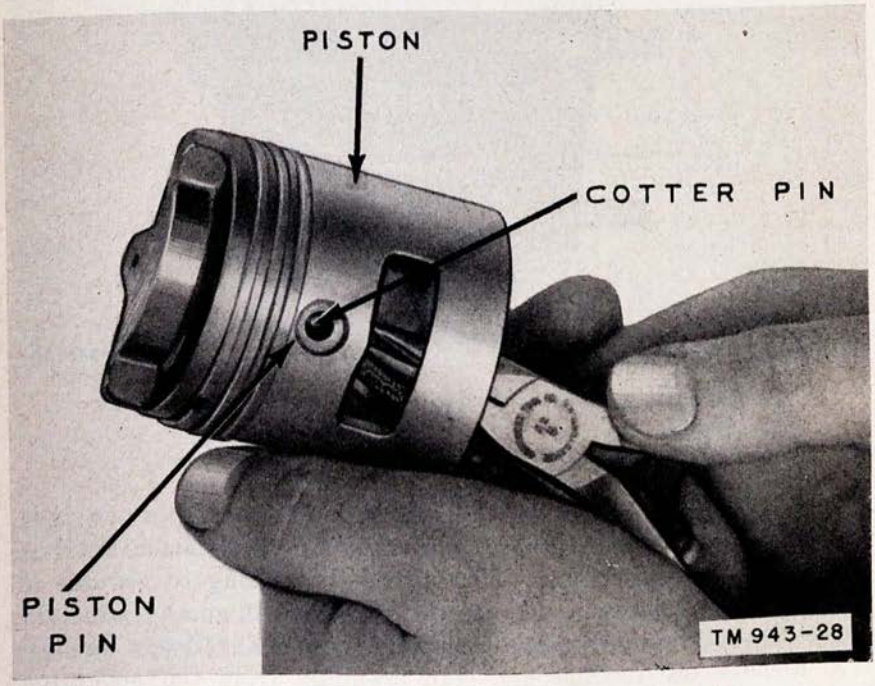



*Figure 28. Removing piston pin retaining cotter pin.*

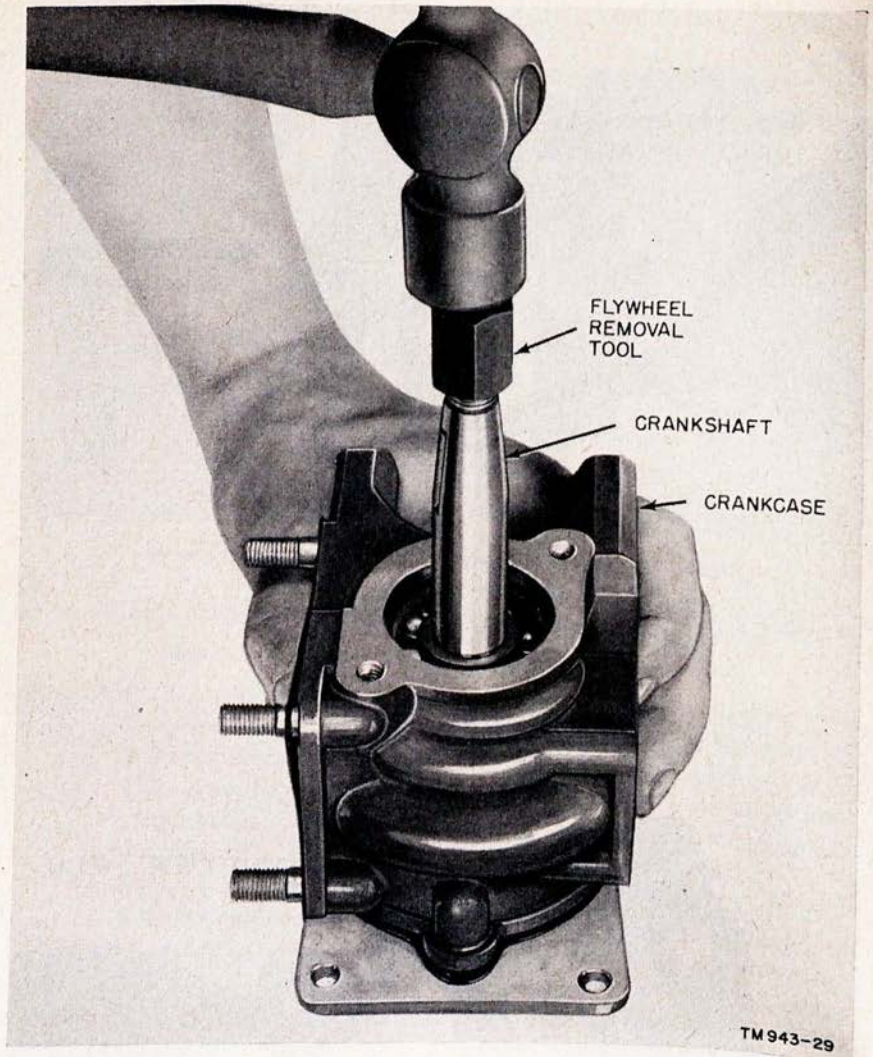



*Figure 29. Removing crankshaft from crankcase adapter.*

## 60. Generator Disassembly

If the generator fails to deliver current, replace it with a new unit. Do not attempt any field service. Generator GN–51–C has no brushes, commutator, or slip rings. Hence, there is nothing to get out of adjustment or require maintenance. However, if at any time the generator requires a complete disassembly, proceed as follows (fig. 30):

*a.* Remove the rectifier and lead assembly from the generator. Unfasten the two generator leads attached to the rectifier. Unscrew the bolt that attaches the rectifier to the generator housing.

*b.* Remove the four Pal nuts and main nuts from the generator through-bolts at the end bell on the engine end by unscrewing the through-bolts from the outboard end.

*c.* Remove the end bell at the engine end by tapping it at the outside edges with a block of wood or soft metal. Avoid damaging the machined surfaces.

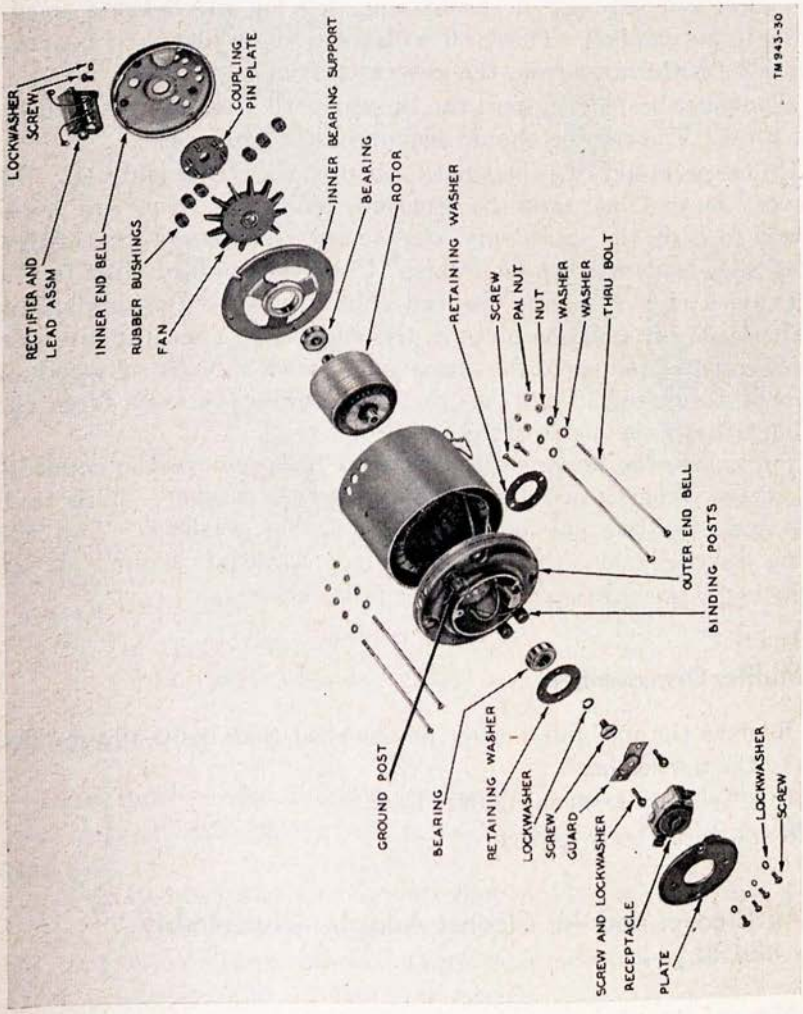



*Figure 30. Generator GN–51–C, exploded view.*

*d.* Next, remove the fan with rubber mounted spline by unscrewing the two Allen-head setscrews and pulling the fan assembly from the shaft.

*e.* Separate the fan from the rubber mounted spline by holding the fan and pulling the spline straight out.

*f.* Next, remove the electrical outlet cover on the outboard end. This will expose the lead guard which may be removed by taking out the two screws at the bottom of the outlet cavity.

*g.* After removing the lead guard, remove the guard covering the shaft screw and loosen the hexagonal head shaft screw. Keep the shaft from turning by holding the shaft on the engine end with a wrench or pair of pliers. When this screw has been removed, the rotor shaft will slip out of the bearing, leaving the bearing in its housing in the end bell. The shaft with the bearing plate and bearing can now be withdrawn from the generator frame.

*h.* The inner bearing support can be separated from the rotor in an arbor press. The bearing should remain on the rotor shaft.

*i.* Unless necessary, it is best not to disturb the outlet end bell. If, however, the end bell must be removed, remember there are leads fastened to it on the inside, and that it must be removed carefully, so that these leads will not be broken. Unsolder the lead clips in the outlet cavity after removing the lead clips from their terminals, and slip the leads through the holes in the end bell. Then tap the end bell, where it is joined to the stator shell, with a block of wood or soft metal to remove it from the shell. Unsolder the leads from the binding posts on the inside of the end bell.

*j.* To remove the bearing from the end bell, remove the countersunk screws from inside the bearing retainer washer. This will loosen both the internal and external retainer washers. Tap the bearing carefully on the outside edge, working around it to distribute the pressure equally, until it falls out.

## 61. Muffler Disassembly

*a.* Remove the nut and washer on the stud that holds the muffler body to the muffler head.

*b.* Lift the body from the muffler head.

*c.* Remove the body gasket.

## 62. Air Cleaner and Air Cleaner Adapter Disassembly (fig. 31.)

*a.* Remove the wingnut and washer from the top of the air cleaner.

*b.* Remove the cover, filter element, base, and cork washer.

*c.* Do not remove the stud from the air cleaner adapter unless it is damaged and replacement is required.

*d.* Remove the adapter from the carburetor body by removing the two screws and lockwashers.

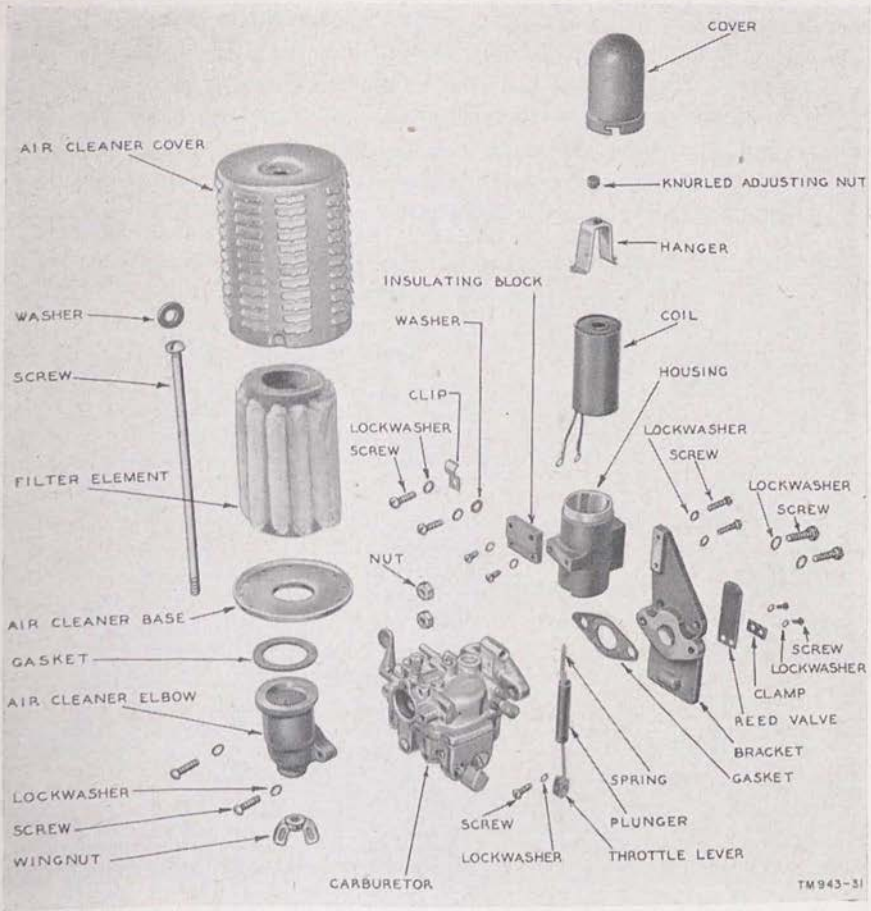



*Figure 31. Air cleaner, electric governor, and carburetor*

## 63. Carburetor Disassembly

Parts must be removed separately and in order indicated.

*a.* Separate the carburetor from the electric governor (figs. 31 and 32).

(1) Remove the two screws that hold the carburetor to the governor mounting bracket.

(2) Loosen the screw on the throttle lever attached to the solenoid plunger and throttle shaft.

(3) Slide the throttle lever from the throttle shaft. Separate the governor from the carburetor.

*b.* Remove the complete main adjustment screw and gland assembly from the fuel bowl.

*c.* Remove the body retaining screws and lockwasher and separate the upper body and fuel bowl assemblies.

*d.* Remove the float pinion pin and float from the fuel bowl.

*e.* Remove the large plug screws, and then the inlet needle and seat and gasket assembly from the fuel bowl.

*f.* Remove the idle adjustment screw (20), spring, idle tube and gasket. Also remove the main nozzle channel-plug screw from the upper body.

*g.* Remove the throttle shutter shaft and lever assembly.

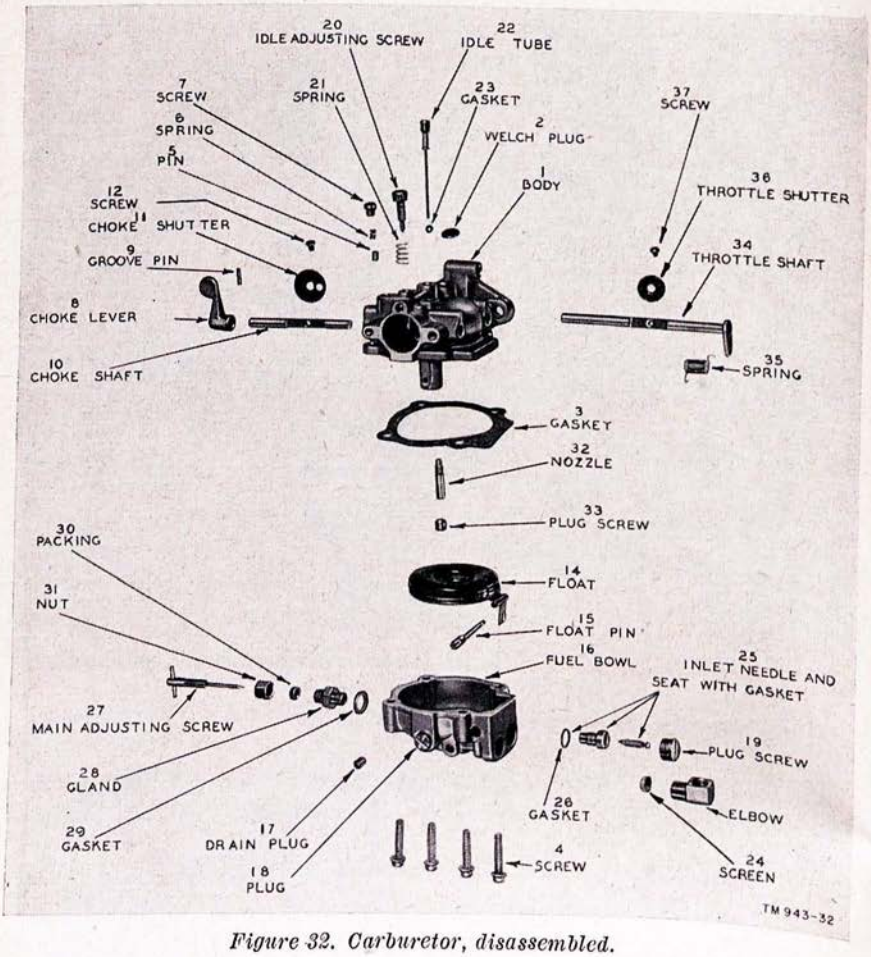



*Figure 32. Carburetor, disassembled.*

## 64. Electric Governor

(fig. 31)

*a.* Remove the solenoid top cover and unscrew the knurled adjusting nut to release the upper end of the plunger return spring. The plunger, throttle lever, and spring will drop out of the bottom of the governor.

*b.* Remove the two screws that hold the solenoid wire terminals to the bakelite terminal block. Remove the upper bracket by squeezing it together and by pulling it up.

*c.* Remove the solenoid coil through the top of the governor casting.

## 65. Magneto Stator Plate and Magneto Backplate Disassembly

*a.* Breaker-Point Removal (fig. 39).

(1) Remove the screw that holds the breaker plate to the stator plate.

(2) Remove the breaker-arm wire lock spring and washer.

(3) Lift the breaker arm from the breaker plate. Be careful not to lose the coil tension spring.

*b.* Capacitor Removal (fig. 39).

(1) Remove the screw and lockwasher from the stud end of the capacitor.

(2) Remove the lead and breaker-plate leaf spring.

(3) Remove the two screws and the clamp that hold the capacitor to the stator plate and take off the capacitor.

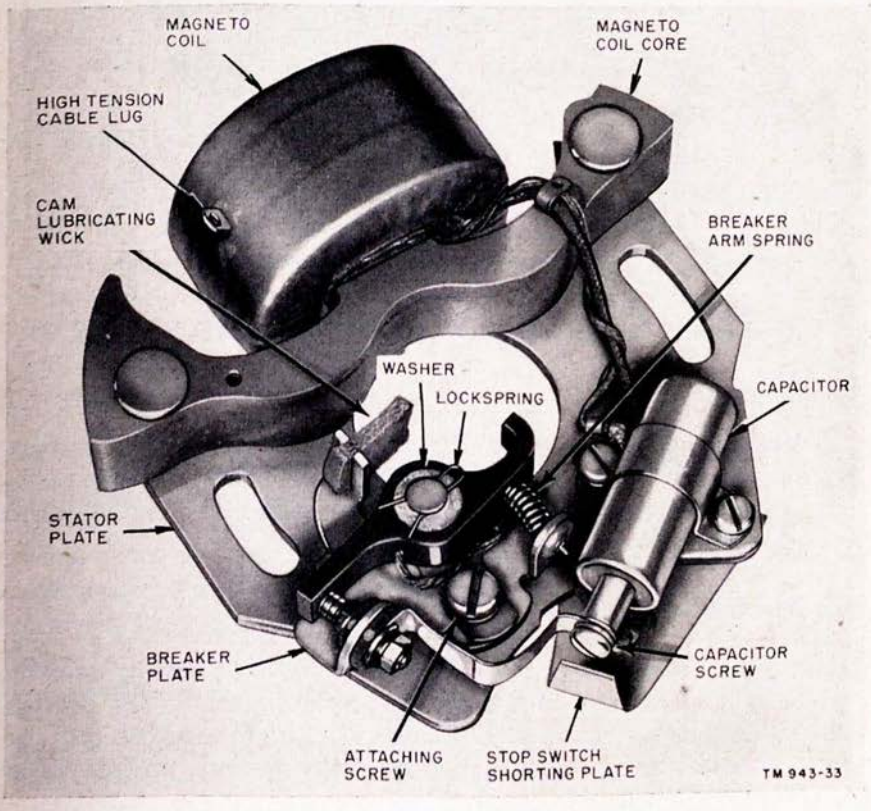



*Figure 33. Magneto stator plate.*

*c.* Backplate and Cable Disassembly (fig. 34).

(1) Unscrew the shielding retaining screw and locknut to release the shielding from the backplate.

(2) Pull the cable from the shielding.

(3) Do not remove the oil seal from the backplate unless inspection indicates the need for replacement.

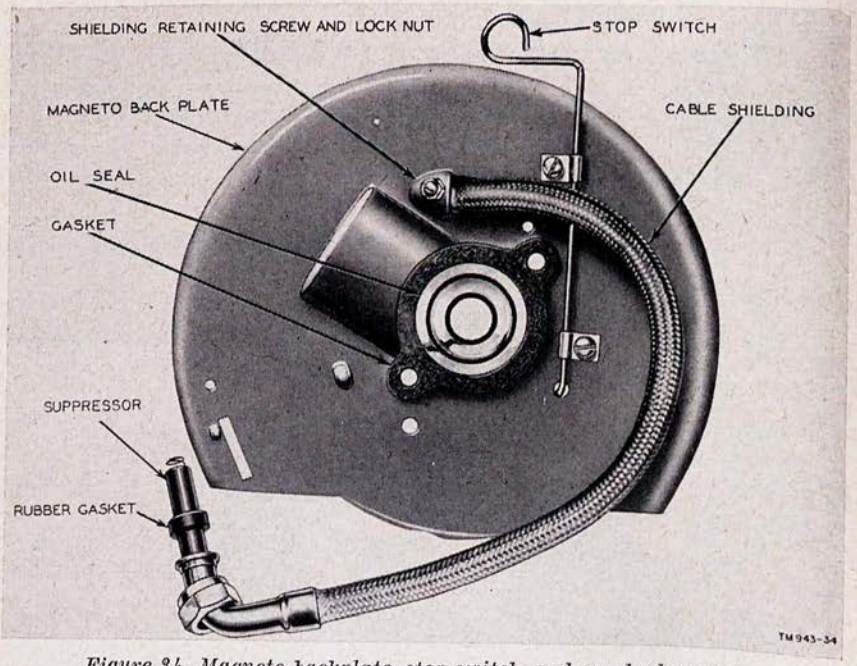



*Figure 34. Magneto backplate, stop switch, and spark plug cable.*

## Section IV. CLEANING, INSPECTION, AND REPAIR

### 66. General

This section consists of detailed instructions for cleaning, inspecting, and checking various parts and assemblies to determine the extent of wear or damage. It also provides information on whether repair or replacement of the part or assembly is required.

### 67. Bag CW–191/PGC–1

Carefully inspect the bag both inside and outside for any evidence of leakage. Check for rips, loose seams, loose straps and handles, and lashing rings. Inspect straps and buckles to see that they are not worn and are in good condition. Report any unsatisfactory condition to the officer in charge.

## 68. Case CY–739/PGC–1

*a.* Remove the top from the base of the case and inspect the base to see that it is in good condition. Check to see that the engine generator hold-down clamps are in good condition, not rusted, and that the springs are not stretched or broken. See that the clamps and latch hooks are fastened securely and that the plywood is not split, warped, or rotted.

*b.* Inspect the spring catches on the top section of the case to see that they are in good condition, not rusted, that the springs are not stretched or broken, and that the catches are fastened securely to the case. Inspect the carrying handles to see that they are in good condition and securely fastened. Inspect the metal reinforcing corners to see that they are secure and undamaged.

*c.* Inspect the plywood top and sides of the case to see that the plywood is not split, warped, rotted, or separated at the joint. Inspect the tool and spare parts compartment to see that it is in good condition and that the sliding door and catch function properly.

*d.* Inspect the finish of the case to see that it is in satisfactory condition. Touch up minor scratches with two light coats of paint. If the surface of the case is badly damaged, repaint the entire case, after first removing the original paint.

## 69. Tools and Running Spare Parts

*a.* Spare Parts. Check the unit packing list to see that all spare parts (par. 5*d*) are present and in new condition.

*b.* Tools. Check the unit packing list to see that all tools (par. 5*e*) are present and in good, clean condition. Replace all worn or damaged tools.

## 70. Muffler

*a.* Clean the muffler body, stud, and head with solvent (SD). Dry thoroughly.

*b.* Inspect the condition of the head and body for dents, breaks, or cracks. Replace all defective parts. Pay particular attention to condition of gaskets, and if they are defective in any way, replace with new gaskets.

## 71. Carburetor

*a.* Reed Valve Inspection (fig. 31). Check the carburetor reed valve to be sure that it seats fully. The reed is concaved approximately .002 inch. *To function properly, the concave side of the reed*

*must seat against the back of the carburetor.* If the reed is bent, replace it. Remove any obstruction found under the reed.

*b.* Cleaning (fig. 35). After the carburetor is disassembled, thoroughly wash all parts in clean solvent (SD). Remove any gum formation with acetone, benzine, or alcohol. Blow out the following three sections of the unit carefully with clean compressed air as follows:

(1) *Main nozzle (Y) and air bleed vent tube (U).* It is only necessary to remove the main nozzle from the uper body casting when replacement is required.

(2) *Idle fuel supply channel (J).* Install the idle tube (L) and gasket in the upper body casting, and then place the air hose at the open end of the idle fuel supply channel (J) at the point where the idle adjustment screw (D) installation is made.

(3) *Fuel inlet channel (A).* Place the air hose at that point of the fuel body where the fuel line connection is made, and carefully blow out the fuel inlet channel. Be certain that the inlet connection screen is clean and in place.

*c.* Inlet Needle and Seat. A constant gasoline level in the bowl and all channels of the carburetor is maintained by inlet needle and seat assembly (C) and float (F).

*d.* Float Setting. To check the float setting, proceed as follows:

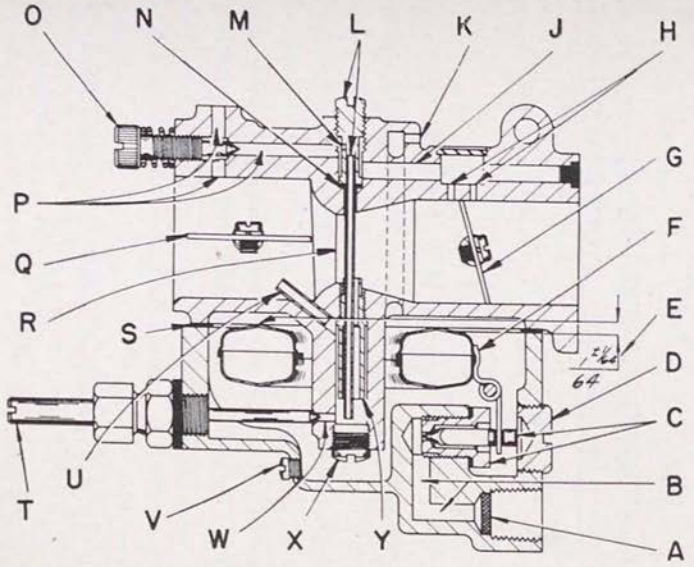
(1) Separate the fuel bowl assembly from the upper assembly and gasket (par. 63*b* and *c*).

(2) With the fuel bowl assembly held in the upside down position, then the lowest point of the float, at its free end, should project $\frac{1}{64}$ of an inch below the rim of the fuel bowl. If resetting is required, remove the float (par. 63*d*) and slightly bend the vertical float lever to obtain proper measurement. When inspection indicates that the fuel level continues to rise beyond the float setting point, remove the inlet needle and seat and clean their seating surfaces with a soft cloth. Place the inlet needle in its seat and tap very lightly while turning the inlet needle with the thumb and forefinger several times to reseat. Reinstall, then, if the proper fuel level is not maintained, install a new inlet needle and seat assembly. (*Do not change float setting from manufacturer's specifications.*)

## 72. Air Cleaner

(fig. 31)

The air cleaner prevents dust and grit from entering the engine and thus causes wear to moving parts of the unit. If the engine is operated under extremely severe, dusty conditions, remove the cover and brush




A Fuel Inlet Screen
B Fuel Inlet Supply Channel
C Inlet Needle and Seat
D Fuel Bowl Plug Screw
E Float Setting
F Float
G Throttle Shutter
H Idle Fuel Discharge Ports
J Idle Fuel Channel
K Fuel Bowl Air Vent
L Idle Tube
M Idle Tube Fuel Outlet Orifice
N Idle Tube Gasket
O Idle Adjustment Screw
P Idle Air Bleed Supply Channels
Q Choke Shutter
R Venturi
S Body Gasket
T Main Adjustment Screw
U Main Nozzle Air Bleed Tube
V Fuel Bowl Drain Screw
W Main Fuel Adjustment Orifice
X Main Nozzle Channel Plug Screw
Y Main Nozzle

*Figure 35. Carburetor, cross-sectional view.*

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dust accumulations from the filter element every 28 hours. Do not dip filter element in oil. When operating conditions are normal, clean the element every 56 hours. Examine the filter element periodically to see that no openings are present which might allow entry of foreign material. Replace clogged or damaged element.

## 73. Electric Governor

(fig. 31)

*a.* Check the governor solenoid for open circuit and damaged wires. Replace if necessary.

*b.* Check the solenoid plunger for out-of-round and easy passage through solenoid.

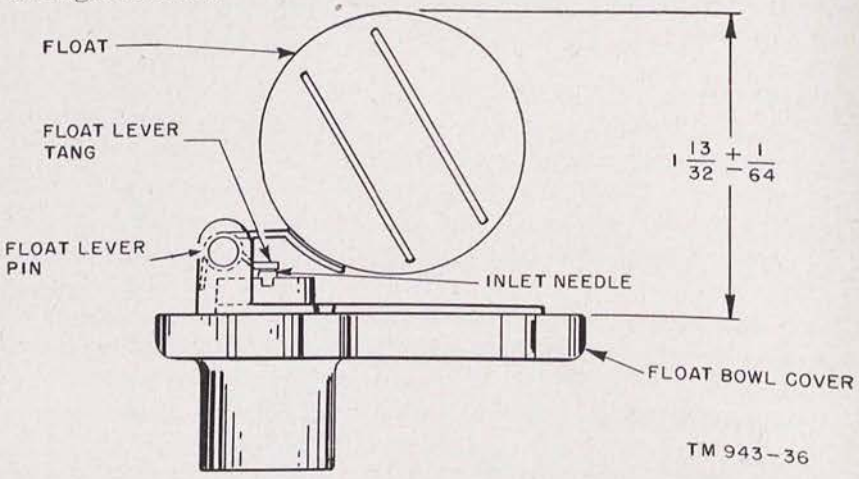


*Figure 36. Carburetor float-level adjustment.*

*c.* Check the plunger return spring. All coils must close. Replace spring as follows:

(1) With a small punch, drive out the upper brass pin in the plunger and remove the spring.

(2) Insert the large end of the new spring in the plunger and install the brass pin in the plunger and through loop in the lower end of the spring. Lightly peen the pin ends to secure them and file the pin ends sufficiently to secure necessary clearance.

*d.* Check the plunger linkage and the attached throttle lever to see that the parts work freely and do not bind.

## 74. Spark Plug

Clean the spark plug with solvent (SD) and set the gap to .035 inch (fig. 37). Make the adjustment by bending the side electrode only.

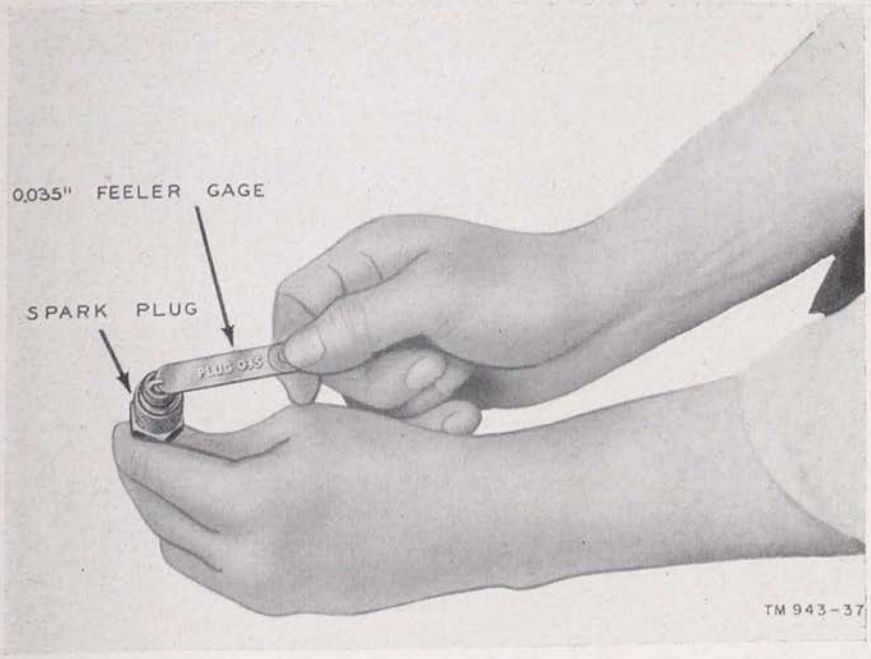


*Figure 37. Checking spark plug gap.*

If the porcelain is cracked or broken, replace the plug. If the gasket is not in good condition, replace with new gasket. When replacing the plug, use a Champion J–11 spark plug (or one in equivalent heat range). Remove and discard the terminal nut before installing the shield cap. Test the spark plug as follows:

*a.* Lay the spark plug metal body on the tubular frame. Unscrew the packing nut from the shield cap. Hold the magneto cable so that the spring at the end of the cable touches the spark plug terminal.

*b.* Spin the engine with the starting rope and watch for sparks at plug points.

*c.* If no spark occurs at the plug points, remove the ignition cable from the plug and check the magneto. If the magneto is operating properly, clean, re-gap, or replace the spark plug and retest.

## 75. Magneto

(fig. 38)

*a.* Inspection and testing of the magneto spark must be made with the magneto assembled to the engine.

*b.* Remove the magneto cable from the spark plug and hold the end of the suppressor about $\frac{3}{16}$ inch away from a point on the engine or frame. Spin the engine with the starting rope and watch for a spark at the end of the ignition cable. The spark plug must be re-

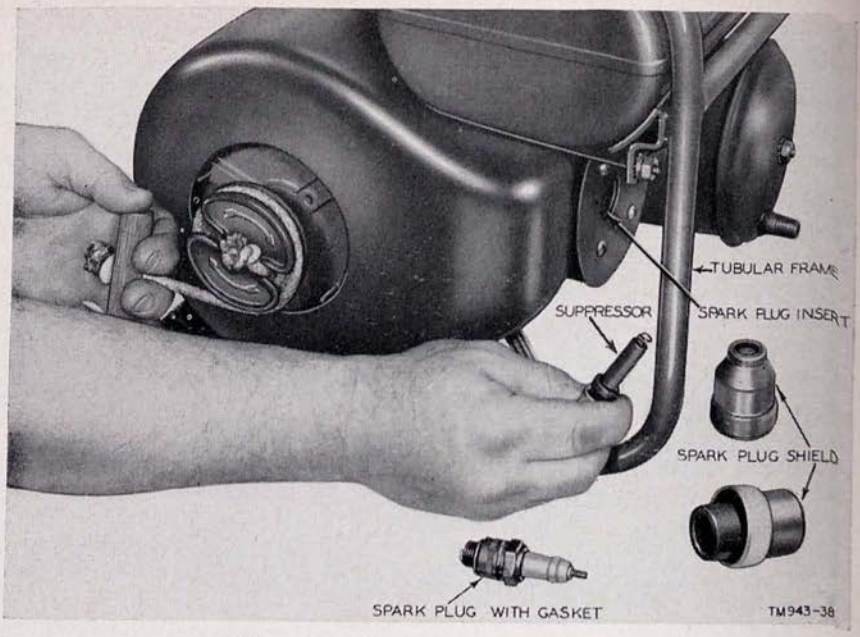


*Figure 38. Checking magneto spark.*

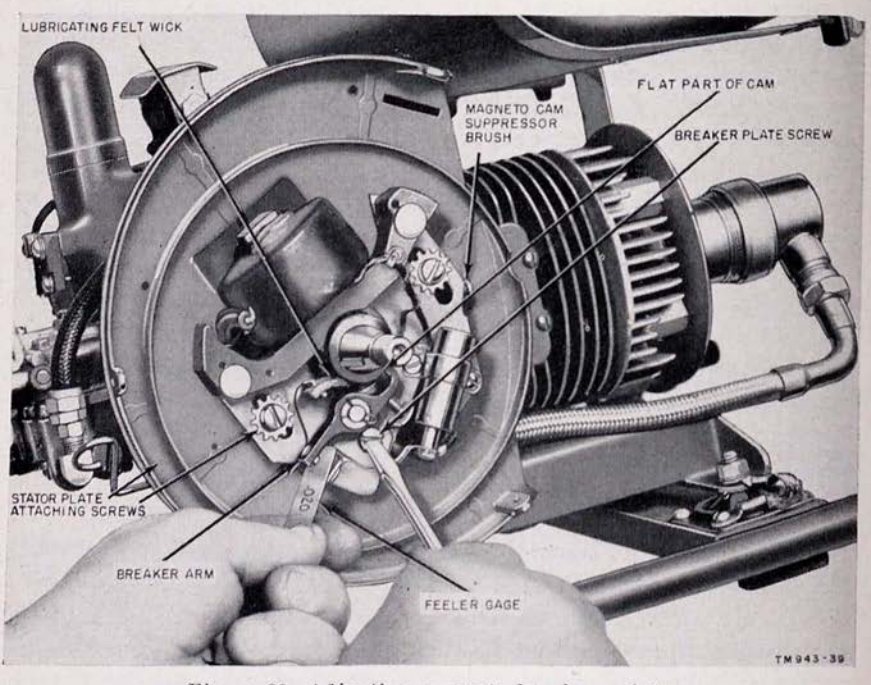


*Figure 39. Adjusting magneto breaker points.*

moved so the engine will spin freely. If the magneto is operating properly, a spark should jump the gap. If a spark, strong enough to jump the gap, is not produced, check the magneto points and capacitor. Also inspect the magneto cable carefully to be sure that it is connected properly and is in good condition. If the magneto does not generate a satisfactory spark, check the following:

(1) Check the breaker points (par. 76).
(2) Check the capacitor and replace if necessary (par. 77).
(3) If magneto is defective, replace entire magneto (par. 78).

## 76. Breaker-point Inspection

If either contact point is badly pitted or worn away, replace both points at the same time to assure satisfactory operation. Replace breaker points as follows:

*a.* Remove breaker points (par. 65*a*).
*b.* Install new breaker points (par. 86).

## 77. Magneto Capacitor Inspection

If no spark or a weak spark occurs after the magneto points have been replaced, the trouble may be in the capacitor. Replace the capacitor in place of extensive capacitor testing.

*a.* Remove capacitor (par. 65*b*).
*b.* Replace capacitor (par. 86).

## 78. Magneto Coil Testing

If no spark occurs after magneto points and magneto capacitor have been replaced, the magneto coil is probably defective. In place of extensive coil tests, replace the entire magneto assembly as follows:

*a.* Remove magneto (par. 59*e*).
*b.* Replace new magneto (par. 86).

## 79. Cylinder, Piston, Piston Rings, and Connecting Rod Inspection

*a.* General. The piston is made of a special aluminum alloy which is very light. The standard clearance between the piston skirt and cylinder is .0025 to .0035 inch to compensate for the expansion of the hot piston. The lands of the piston are smaller than the skirt to allow for greater expansion at the piston head. Three compression piston rings are used. The connecting rod is made of a special bronze material and uses no inserts. The piston pin end of the rod has a needle bearing.

*b.* Cleaning and Inspection. Clean all carbon from the piston head and piston ring grooves. Clean the piston and rings in solvent (SD). Thoroughly clean the piston grooves. Inspect the piston for cracks and condition of grooves and ring lands. If there are any cracks or chips, the piston should be replaced. Clean the connecting rod bearings with solvent (SD) and inspect them for excessive wear or defects. If a connecting rod bearing is worn or defective, replace the entire rod. Make a check of the engine exhaust port holes and intake port holes to remove carbon deposits that have built up at these points (figs. 15 and 16). Carbon deposits in the exhaust and intake port holes restrict the passage of gases to and from the cylinder and reduce power output. Clean all dirt and oil out of the air passages in the cylinder-cooling fins. Clean the cylinder in solvent (SD). Check all clearances and tolerances as follows:

(1) Insert the skirt of the piston in the cylinder with the piston pin in its normal direction and measure the clearance at the bottom of the skirt at a point 90° from the axis of the piston pin (fig. 40). This clearance should be from .0025 to .0035 inch. Remove the piston from the cylinder and measure the diameter of the piston skirt at 90° from the axis of the pin. If the skirt is less than 1.993 inches, replace the piston.

(2) Take several readings of the inside diameter of the cylinder wall with an inside micrometer. Take the readings at points from top to bottom of the space in which the piston travels, both parallel to the crankshaft and at right angles to it. Standard cylinder bore is 2.0010 to 2.0015 inches. If the micrometer reading of the standard bore is exceeded by .005 inch, or if it is more than .003 inch out-of-round, replace the cylinder. Inspect the inside of the cylinder wall for marks. If it is seriously scored or marred, replace the cylinder.

(3) Insert a piston ring in the cylinder. (Use the piston to push the ring in.) Check the gap between the ends of the piston ring with a feeler gage (fig. 41). If this gap measures more than .030 inch, discard the ring. Before installing a new ring, check the gap. If there is not at least .010-inch clearance between the ends of the new rings, file the ends of the ring until this clearance is obtained. Check each piston ring in this manner.

(4) Spread each piston ring with a ring spreading tool and slip the ring over the piston and into its groove. Rings must move freely in the piston grooves. Check clearance between the ring and the piston land with the feeler gage (fig. 42). This side clearance should be .004 to .006 inch. If the piston ring grooves are worn to .008 inch or more (side clearance),

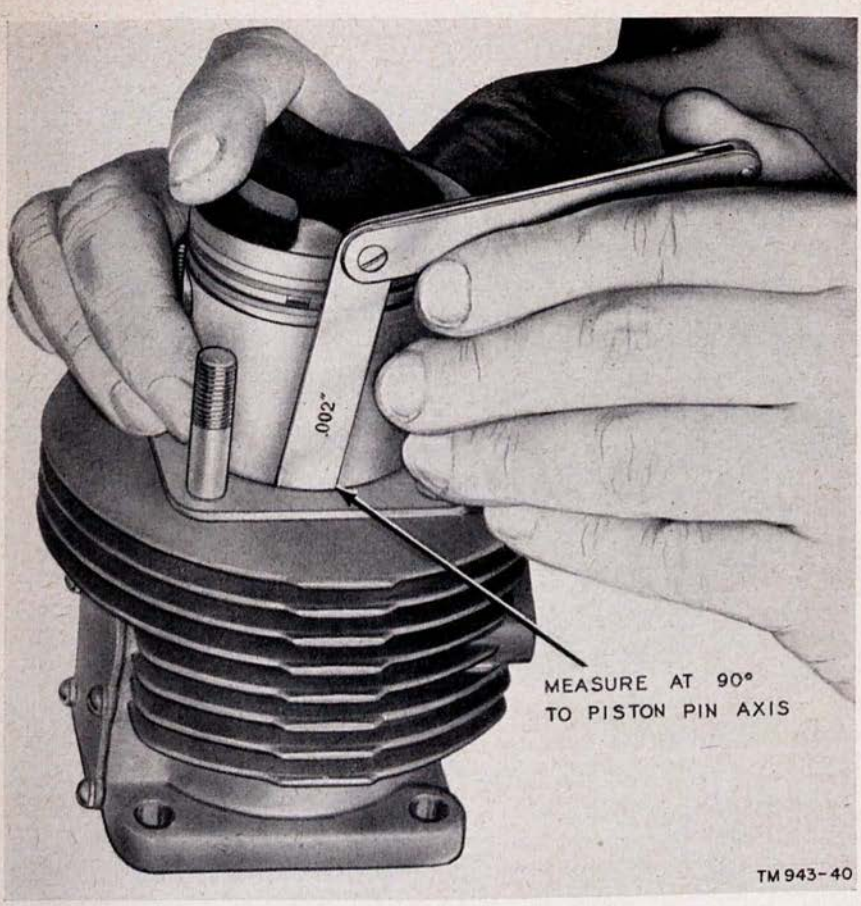


*Figure 40. Checking piston skirt clearance in cylinder.*

replace the piston or rings, whichever is required to obtain proper fit.

(5) Check the piston pin for wear. If the piston pin is worn to .002 inch or more from the new diameter, .3751 to .3753 inch, replace the pin. The piston pin should be a light tap fit in the piston. If the piston pin is loose, the cotter pin will shear off.

(6) Install the connecting rod on the crankshaft. The bearing should fit without noticeable looseness and should not bind even when dry. If the connecting rod bearing is loose on the crankshaft, remove the connecting rod cap and file the mating surfaces. Keep the surfaces perfectly flat and even, and file until the proper fit is secured. In fitting the cap, always be sure to assemble it to the connecting rod with the matching marks on the same side.

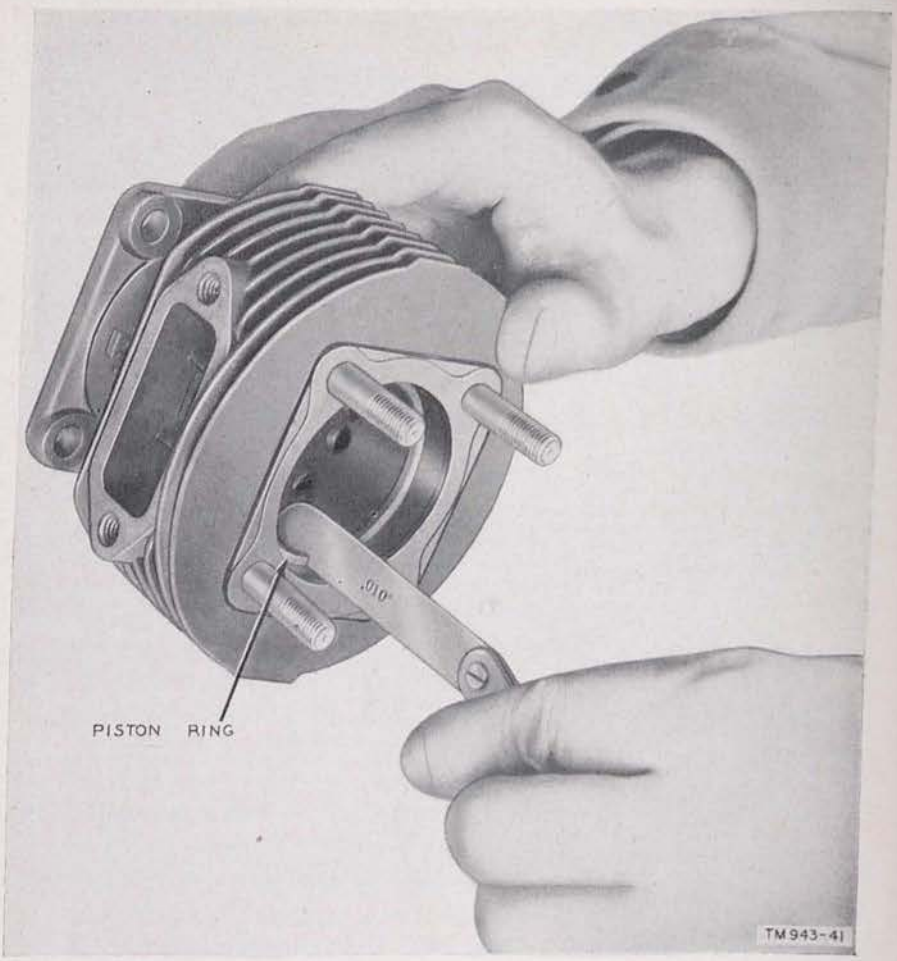


*Figure 41. Checking piston ring gap.*

## 80. Crankshaft and Main Bearings Inspection

*a.* After the main bearings have been removed, cover them carefully (if they are to be re-used) to keep dust and dirt out of the ball races. Bearings must be thoroughly cleaned with solvent (SD) and carefully dried before being reinstalled.

*b.* Check the crank pin diameter (diameter should be .6230 to .6235 inch). Crank pin width should be .8120 to .8170 inch. Inspect the crank pin. If it is roughened or grooved, replace the crankshift. Inspect the keyway of the crankshaft and if the shaft has been chipped at these points, replace the crankshaft.

## 81. Cylinder Head and Spark Plug Insert Inspection

*a.* Scrape and blow accumulated dirt and oil out of the air passages in the cylinder head fins. These must allow free circulation of air to prevent overheating of the engine.

*b.* Scrape and clean carbon deposits from the inside of the cylinder head and wash the head thoroughly in solvent (SD). Inspect the spark plug insert. Be sure it is clean and threads are not stripped. Clean in solvent (SD) after poking out any dirt or carbon in the small holes.

*c.* Examine the cylinder head gasket and replace if burned, torn, or damaged.

## 82. Generator Cleaning and Inspection

If the generator fails to deliver current, replace it with a new unit as extensive testing of the rectifier and field windings are beyond the scope of the field service. If the generator is disassembled as outlined in paragraph 60 cleaning and inspection may be accomplished as follows:

*a.* Clean the end shields with solvent (SD), but do not get solvent on any of the wires. Brush accumulations of dirt or oil out of the windings and stator. Clean the rotor in solvent (SD).

*b.* The two end bearings are double-seal, prelubricated ball bearings, and should not be cleaned in solvent (SD). If the bearings are defective, replace them. No lubricant is necessary on the bearings.

*c.* The fan, with rubber mounted spline, is cleaned with solvent (SD) and thoroughly dried immediately. Check the rubber mountings. Replace if defective. Keep oil away from mountings. Check threads for Allen-head lockscrews.

## 83. Engine Specifications, Fits, and Tolerances

| | |
|---|---|
| Spark plug gap | 0.035 inch. |
| Magneto point gap | 0.020 inch. |
| Piston skirt diameter | 1.9980 to 1.9985 inches. |
| Piston skirt and cylinder clearance | 0.0025 to 0.0035 inch. |
| Piston ring gap | 0.010 to 0.030 inch. |
| Piston ring to land side clearance | 0.004 to 0.006 inch. |
| Piston pin diameter | 0.3751 to 0.3753 inch. |
| Piston pin bore in piston | 0.3750 to 0.3753 inch. |
| Piston pin clearance in piston | 0.0002 to 0.0003 inch. |
| Cylinder bore | 2.001 to 2.0015 inches. |
| Maximum wear tolerance on cylinder bore | 0.005 inch. |
| Maximum out-of-round tolerance | 0.003 inch. |
| Crank pin diameter | 0.6230 to 0.6235 inch. |
| Crank pin width | 0.8120 to 0.8170 inch. |
| Connecting rod bearing clearance (crank pin end) | 0.0025 to 0.0035 inch. |


*Figure 42. Checking piston ring side clearance.*

## Section V. REASSEMBLY

### 84. General

This section covers complete reassembly of Engine Generator PU–181/PGC–1 after detailed inspection and repair or replacement of defective parts. Adjustments and final testing of the engine generator power unit after reassembly are covered in section VI and section VII.

## 85. Engine Reassembly

*a.* Crankshaft and Main Bearings (fig. 43).

(1) Press the old bearings or replacement bearings on the crankshaft. This must be done on a press, and the bearings must be properly supported.

(2) Press the crankcase adapter over the bearing on the splined end of the crankshaft.

(3) Replace the crankcase adapter gasket and install the crankshaft assembly in the crankcase. This will be a light drive fit. Avoid cocking the bearing when inserting it in the crankcase. Attach the adapter to the crankcase with the three screws and lockwashers.

*b.* Piston, Piston Rings, and Connecting Rod (fig. 44). When all parts have been cleaned and inspected and defective parts replaced, reassemble the piston rings and the connecting rod as follows:

(1) Spread the piston rings and install them in the piston grooves. If the old rings are being re-used, transpose them by installing the bottom ring in the top groove and the top ring in the bottom groove.

(2) Position the connecting rod in the piston and install the piston pin. This should be a light tap fit. If the piston pin is loose in the piston, it will shear the cotter pin. Side movement of the pin may occur and cut grooves in the cylinder liner. Install a new cotter pin to lock the piston pin in the piston. Spread the center of the cotter pin with a sharp V-shaped tool after the pin is in place.

(3) After the piston and the connecting rod are joined, remove the connecting rod cap and assemble the connecting rod to the crankshaft through the opening in the crankcase. The port in the side of the piston must face toward the flywheel end of the crankshaft. Use a socket wrench to tighten the two cap screws and lockwashers (fig. 27).

*c.* Cylinder and Piston Assembly. After the piston and the connecting rod have been assembled and fitted to the crankshaft, place the cylinder gasket in position on the crankcase studs. Make sure that the port in the side of the piston and the hump or baffle on the piston head are on the flywheel side and then slide the cylinder over the piston. Turn the cylinder so that the intake passage cover plate faces the flywheel end of the crankshaft and lower the cylinder onto the studs (fig. 26). Place a lockwasher on each stud and then install and tighten the stud nuts. Tighten these nuts alternately, a little at a time.

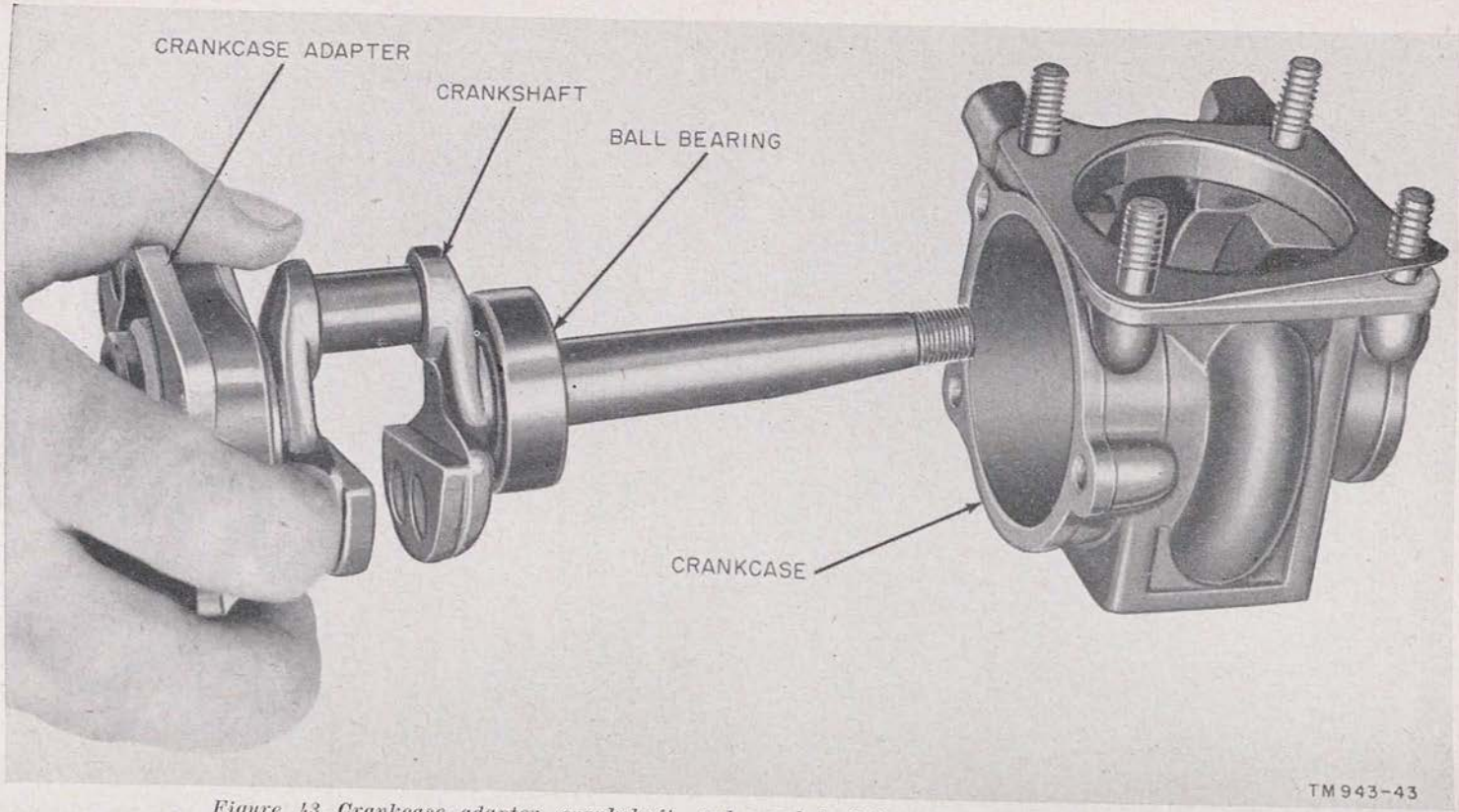


*Figure 43. Crankcase adapter, crankshaft, and crankshaft bearing, removed from crankcase.*

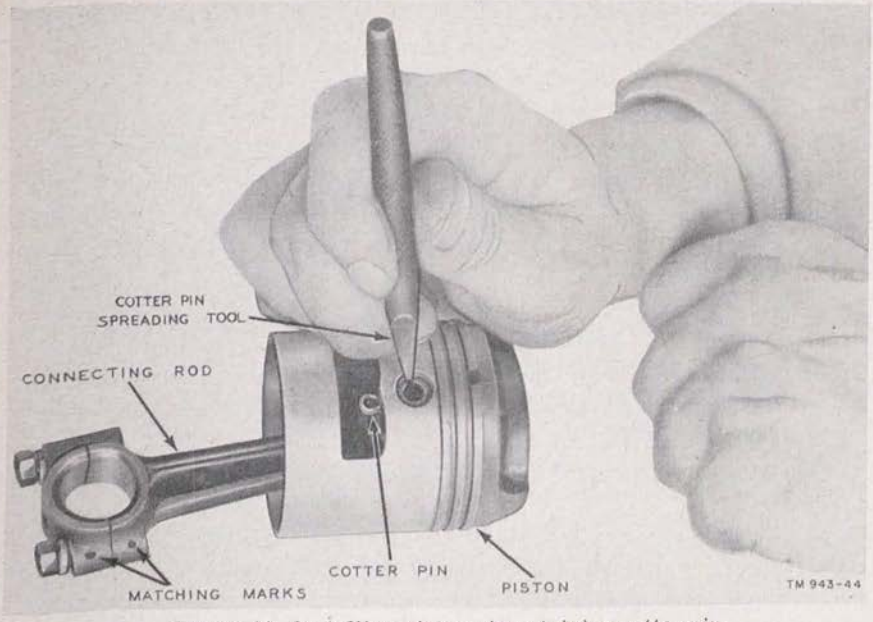


*Figure 44. Installing piston pin retaining cotter pin.*

*d.* Cylinder Head and Cylinder Assembly (fig. 23).

(1) Coat both sides of the cylinder head gasket with grease and place the gasket on top of the cylinder. If the gasket which was removed is damaged or bent, replace it with a new one. Place the cylinder head over the studs and on the cylinder head gasket.

(2) Insert a plain washer and lockwasher over each stud and install the cylinder head nuts. Tighten the cylinder head nuts evenly, a little at a time while the engine is cold. Tighten nuts in diagonally opposite pairs.

*e.* Magneto Reinstallation to Engine.

*Note.* For reassembly of magneto, see paragraph 86.

(1) Install the backplate (with ignition cable and shielding attached) (fig. 34) on the engine crankcase with the two screws and lockwashers. Use a new gasket if the old gasket is defective.

(2) Push the magneto cam on to the crankshaft. The guide on the cam slides in the keyway on the crankshaft. Slide the magneto-cam washer on to the shaft.

(3) Reinstall the magneto-cam, carbon ground brush on the backplate.

(4) Install the magneto assembly (fig. 33) on the backplate with the two screws and lockwashers. Connect the ignition cable

to the lead wire on the coil. Time the magneto in accordance with the instructions in paragraph 93.

*f.* Spark Plug Insert, Baffle, Spark Plug (fig. 23). After the magneto has been timed, perform the following functions:

(1) Screw the spark plug insert into the cylinder head.

(2) Attach the cylinder head baffle with the four screws and lockwashers.

(3) With the spark plug gasket in place on the spark plug, insert the plug through the shield body and install it in the spark plug insert.

(4) Screw the spark plug shield cap to the shield body.

(5) Screw the nut on the magneto-cable shielding onto the shield cap after pushing the suppressor resistor and magneto cable into the shield cap.

*g.* Magneto Flywheel and Magneto Flywheel Housing (figs. 24 and 25).

(1) Install the flywheel on the crankshaft; see that the flywheel key is positioned properly in the keyway on the crankshaft and flywheel.

(2) Replace the starter pulley and washer. Screw the pulley up tight against the flywheel by inserting a punch or steel rod through the pulley for leverage.

(3) Install the magneto flywheel housing assembly with three screws and lockwashers.

*h.* Muffler.

(1) Place the muffler gasket on the muffler head.

(2) Attach the muffler body to the muffler head with the nut and washer.

(3) Put two lockwashers on each of the muffler mounting screws. Insert the screws through the holes in the mounting flange, place the gasket in position, and attach the muffler assembly to the cylinder.

*i.* Carburetor, Governor, and Air Cleaner. These three parts are installed to the engine as a unit.

*Note.* For reassembly of carburetor, governor, and air cleaner, see paragraph 87.

(1) Place a lockwasher on each of the four carburetor, mounting screws, insert the screws through the holes in the carburetor mounting flange, and place the mounting gasket in position.

(2) Determine which is the top of the engine and install the carburetor, governor, and air cleaner assembly so that the governor and air cleaner are pointing up. Tighten the mounting screws securely.

*j.* Engine Reassembly to Mounting Base (fig. 21).

(1) Reassemble the engine to the angle iron base by using four cap screws and eight lockwashers.

(2) Attach the muffler to the muffler support bracket on the engine base by using the screw, nut, and lockwasher provided.

## 86. Magneto Stator Plate and Magneto Backplate Assembly (fig. 34)

*a.* Backplate and Cable.

(1) Press the oil seal into the magneto backplate.

(2) Push the magneto cable into the cable shielding. Insert the suppressor into the spark plug end of the cable shielding.

(3) Push the cable shielding into the backplate and tighten the retaining screw and locknut.

*b.* Stator Plate Assembly. If breaker points and the capacitor have been removed, reinstall them as follows (fig. 33):

(1) Place the breaker plate in position on the stator plate, with the breaker-arm mounting pin passing through the inner hole in the breaker plate. Secure it by inserting the screw and lockwasher through the other hole in the breaker plate.

(2) Mount the capacitor to the stator plate with the clamp and screws provided. Do not tighten the capacitor clamp screws at this time.

(3) Place the primary lead from the magneto coil on the stud on the end of the capacitor; place one end of the leaf spring over the primary lead and secure it with the nut and lockwasher. Place the second lead from the coil under the head of the inner capacitor clamp screw.

(4) Slide the capacitor into position and tighten the clamp screws securely. Before tightening the inner clamp screw, install the breaker arm on its mounting stud. Coat the mounting stud with grease and be sure to install a washer both under and on top of the arm. Bend the ground lead that protrudes from the breaker arm sharply to the right and then form a loop in this wire. Remove the inner capacitor clamp screw and secure the end of the breaker-arm lead under the head of this screw. Replace the screw and tighten it securely. The bend in the breaker-arm lead is important to prevent up and down movement.

(5) Slip the lock spring in the groove in the top of the breaker-arm mounting stud and adjust the breaker-point gap as instructed in paragraph 92.

## 7. Carburetor, Air Cleaner, and Governor Reassembly (fig. 31)

*a.* Air Cleaner and Air Cleaner Adapter.

(1) Screw the air cleaner stud into the air cleaner elbow.

(2) Place the cork washer, base, and filter element over the stud on the elbow.

(3) Slide the air cleaner cover over the filter and down onto the base.

(4) Attach the cover with the washer and wingnut.

*b.* Carburetor Reassembly (fig. 32). Reassemble the carburetor as follows:

(1) Replace the throttle shutter (36), shaft and lever assembly (34) in the body (1). The spring (35) holds the throttle shutter open.

(2) Install the idle adjustment screw (20), spring (21), idle tube (22), gasket (23), and the main nozzle (32) and channel plug screw (33) in the upper body (1).

(3) Replace the inlet needle, and seat with the gasket (25) in the fuel bowl (16). Replace the large plug screw (19).

(4) Replace the float (14) in the float bowl with the float lever pin (15).

(5) Fasten the upper body (1) to the fuel bowl (16) with four screws and lockwashers. Be sure to replace the gasket (3) and tighten the screws securely.

(6) Replace the main adjustment screw (27) and the gland assembly (28) in the lower body.

(7) Fasten the air cleaner elbow to the carburetor with two screws and lockwashers.

*c.* Electric Governor (fig. 31). Assemble the electric governor as follows:

(1) If a new plunger spring is being installed, insert the new spring with the loop end in the plunger. Install the brass pin by passing it through the loop in the end of the spring and lightly peen the ends of the pin. After peening the ends of the pin, file them flush with the plunger surface.

(2) Hold the governor housing with the machined collar up and insert the solenoid coil in the housing. Two leads come out of the bottom of the coil. These leads must be passed through the housing before the coil is pushed into place.

(3) Insert the mounting lip on one leg of the spring hanger in one of the holes on the inside of the machined collar of the housing and squeeze the other leg in until it can be snapped into the other hole in the collar.

(4) Push the plunger and plunger spring up through the solenoid

coil and hook the upper end of the plunger spring to the bottom of the plunger adjusting screw. Pass the screw through the hole in the spring hanger and screw on the knurled adjusting nut.

(5) Place the terminals of the solenoid coil leads on the screws which are provided to secure them to the bakelite block attached to the governor body and place the screws into the block.

(6) Install the carburetor and governor mounting bracket on the engine.

(7) Loosen the clamping screw on the throttle arm and slide the arm onto the throttle shaft.

(8) Adjust the governor as instructed in paragraph 95.

## 88. Generator Reassembly

To reassemble the generator after complete overhaul, proceed as follows:

*a.* Press one of the ball bearings into the outlet end bell. Apply pressure on the outer ring of the bearing only.

*b.* Two retainer washers are provided to hold the outboard bearing in place. These washers are secured by two flathead machine screws, the heads of which are countersunk into the inner washer. Insert the screws through the countersunk holes from the inside and pull them up tightly.

*c.* Pass the four leads from the stator assembly through the rubber grommet in the end bell. Solder the terminals to the ends of the wires. Solder the spade type terminals to the wires which have the red tracer and yellow tracer. Solder the other two terminals to the wires which have the black tracer and green tracer.

*d.* See that the rectifier connection leads are brought out through the rubber grommet in the main generator shell. These leads must be soldered to two solder lugs on the rectifier after it is attached to the generator.

*e.* Press the inboard bearing into the inner bearing support (intermediate end bell). Apply pressure only to the outer ring of the bearing.

*f.* Place the outboard end bell in position on the stator shell and insert the generator rotor through the inboard end of the generator. Make sure that the rotor is inserted with the tapped end of the shaft at the outboard end.

*g.* Place the inner bearing support in position and make sure that the holes for the through-bolts are lined up correctly. Press the bearing support securely into the main generator shell.

*h.* Insert the rotor shaft retaining screw and lockwasher in the

tapped end of the rotor shaft through the outlet cavity and tighten it securely. Install the retainer guard over the retaining crew and secure it with the two screws provided.

*i.* Refer to figure 12 and connect the generator output leads to the output receptacle for the voltage desired. Mount the receptacle to the outlet cover and install the cover.

*j.* Turn the rotor shaft so that the keyway is up and place the half-moon key in the keyway. Slide the fan onto the shaft. Make sure that the key is seated properly and insert one of the Allen-head set-screws in the recess in the fan and drive it down tightly. Insert the second Allen-head setscrew in the same hole and tighten it securely.

*k.* Insert the six rubber bushings in the holes in the hub of the fan and press them in flush. Insert the six pins in the splined coupling plate into the holes in the six rubber bushings and press the coupling plate in as far as it will go.

*l.* Place the inboard end bell in position and tap it into place. Make sure that the holes for the through-bolts are lined up and that the tapped rectifier mounting hole is at the top. Insert the four through-bolts from the outboard end and place the washers, lockwashers, and one nut on each through-bolt. Tighten the through-bolt nuts gradually, turning alternate nuts a little at a time until the end bells are pulled securely into place. Install the locknuts on the through-bolts and pull them up tightly.

*m.* Install the rectifier on the top of the generator and secure it with the screw provided. Solder the two leads to the soldering lugs on the rectifier. Connect the two leads on the rectifier to the terminal block on the electric governor.

## 89. Generator Reassembly to Engine
(fig. 21)

*a.* Engage the female spline of the coupling on the generator with the male spline on the crankshaft of the engine. Push the generator on as far as possible and line up the three holes in the generator with the three holes in the bearing adapter.

*b.* Secure the generator to the adapter with three hexagonal head cap screws, nuts, and lockwashers.

*c.* The two lead wires from the rectifier connect to the two terminal screws on the bakelite terminal block on the governor body.

## 90. Generator and Engine Reassembly to Tubular Frame
(fig. 20)

*a.* Slide the engine, generator, and angle iron base assembly into the tubular frame and onto the rubber-shock mountings. Line up the holes in the angle iron base with the holes in the rubber mountings.

*b.* Place a plain washer on each of the mounting screws and pass the screws up through the rubber mountings and angle iron base. Place a lockwasher on each of the screws and install the nuts on the screws.

*c.* Install the fuel line from the fuel tank fitting to the fitting on the carburetor float bowl.

*d.* Make sure that the ground straps on opposite corners are attached to the mounting screws.

## Section VI. ADJUSTMENTS

### 91. General

This section includes all adjustments necessary before the final testing of the equipment after reassembly, as described in section V. The instructions covered are as follows:

*a.* The setting of magneto breaker points and timing of the engine.

*b.* The regulation and setting of all carburetor adjustments.

*c.* Adjustment and setting of electric governor.

### 92. Magneto Breaker Points and Magneto Timing (fig. 39)

When installing the magneto to the engine or installing breaker points, perform the following operations in the order given:

*a.* To adjust the breaker points, crank the engine clockwise, by hand, until the breaker points are fully opened or until the breaker-arm fiber end that rides on the cam is at the highest point on the cam.

*Note.* The highest point on the cam is the end of the flat portion of the cam which passes under the breaker-arm fiber as the engine is turned clockwise. The breaker-arm fiber must rest on this point when measuring the breaker-point gap.

*b.* Loosen the crew which holds the breaker plate in position and move the plate up or down, as necessary, to obtain proper point opening.

*c.* Measure the point opening with a feeler gage. The correct opening is .020 inch.

*d.* After the setting is accomplished, tighten the lockscrew. Recheck the point gap after tightening the lockscrew. Lubricate the cam (par. 23).

*Note.* Make the breaker-plate setting only in the manner prescribed above. Never loosen the contact on the plate nor bend the breaker-arm.

## 93. Magneto Timing
(fig. 45)

When installing a magneto or replacing the breaker points, the engine and magneto must be timed as follows:

*a.* Check the breaker-contact-point opening (par. 92).

*b.* Remove the spark plug shield cap, spark plug, and spark plug shield body. Also, remove the cylinder head baffle and the cylinder head spark plug insert. The spark plug insert must be removed so that the timing gage can be inserted into the cylinder head.

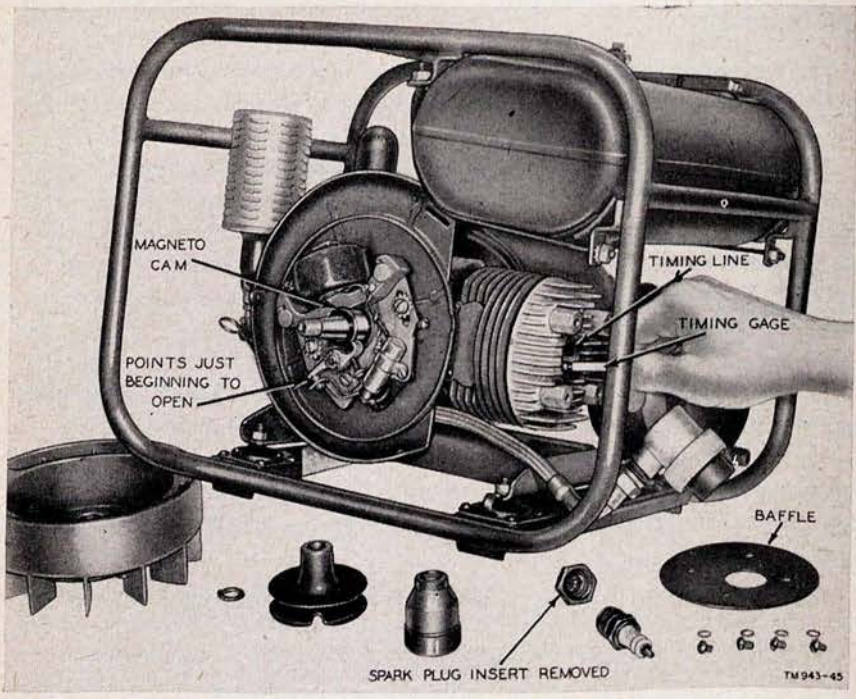


*Figure 45. Checking magneto timing with timing gage.*

*c.* Insert the timing gage furnished with the equipment in the spark plug hole and cylinder head until it touches the top of the piston. If necessary, crank the engine slightly until the *lower edge* of the recess on the gage is flush with the top of the spark plug hole. Withdraw the gage.

*d.* Crank the engine against the direction of rotation about ¼ turn. Again insert the gage through the spark plug hole until it touches the top of the piston. Then crank the engine in the direction of rotation until the *top edge* of the recess in the gage in flush with the top of the spark plug hole.

*e.* Loosen the stator plate screws and move the stator plate until the breaker points begin to break. Tighten the plate screws.

*f.* Recheck to determine if the *top edge* of the recess in the gage is flush with the top of the spark plug hole when the magneto points begin to break. If the setting is exactly as described, the timing is then set so that a spark occurs when the piston is ⅛ inch from top dead center.

## 94. Carburetor Adjustments and Settings

*a.* Functions (figs. 32 and 35).

(1) *Inlet needle and seat.* A constant gasoline level in the bowl and all channels of the carburetor is maintained by the inlet needle and seat assembly (C) and the float (F).

(2) *Idle and slow speeds.* Fuel, reaching its level in the carburetor, passes the main adjustment screw (T) through channel (W) and into the idle tube (L). High manifold vacuum or suction at the throttle shutter (G) draws this fuel upward past the idle tube outlet orifice (M) where it mixes with air from channel (J) and into the air stream at idle discharge ports (H) where it mixes with additional air passing the slightly opened throttle shutter (G).

(3) *High speeds and full power.* When the engine is pulling a load, the throttle shutter (G) has opened further, reducing suction and minimizing fuel discharge at (H) and increasing air flow to a high velocity through venturi (R). This air draws fuel from the main nozzle (Y) supplied from the bowl past the main adjustment (T) through channel (W). As the engine speed or load increases, air is automatically bled into the main nozzle through the tube (U) which causes a proper proportion of fuel in relation to adjustment to be metered at that speed range.

*b.* Adjustment After Reassembly. Separate manual carburetor adjustments are provided: the main adjustment screw (27) controlling power range mixture and the idle adjustment screw (20) governing idle mixture at closed throttle.

(1) *Initial adjustment.* Completely close idle adjustment screw (20) by turning in (clockwise) until it is seated (without forcing); then turn it back in the opposite direction about ¾ of a turn. Proceed in like manner with the main adjustment screw (27). Open the main adjustment about ¾ of a turn after first being closed. Now choke and start the engine in the usual manner and run it until it is thoroughly warm.

(2) *Power range adjustment.* With the engine running at a constant speed of approximately ½ open throttle position, slowly turn main adjustment screw inward (clockwise) until the motor begins to lose speed, then turn back in the opposite direction (usually ⅛ of a turn) until maximum speed and power is obtained. Final setting should be approximately ¾ turn open.

(3) *Idle mixture adjustment.* This adjustment should be made only after the power range adjustment mentioned in subparagraph (2) above has been completed. With the engine idling at closed throttle position, slowly turn the idle adjustment screw (20) inward (clockwise) until the motor begins to lose speed and miss or flutter; then turn back in the opposite direction (usually about ⅛ of a turn) until the engine functions smoothly and steadily. Final setting should be approximately ¾ turn open.

(4) *Final adjustment.* Alternately open and close the throttle a few times for adjustment test. If acceleration hesitancy or stalling at idle speed occurs, the entire adjustment procedure, outlined in *a* through *b*(3) above, should be repeated. Preceding instructions cover the cold motor start only. A warm motor requires only the opening of the throttle and one or two vigorous pulls on the starter rope without further carburetor adjustment. Regardless of altitude or climatic conditions, a proper carburetor adjustment can be made by following the above rules—which eliminates jet changes.

## 95. Electric Governor Adjustments
(fig. 31)

The electric governor is responsive to generator voltage and not to engine speed. Do not short-circuit nor excessively overload the generator during testing or operation. A short circuit will drop the generator voltage to near zero with the result that the engine throttle will open wide and cause the engine to race.

*a.* Plunger Position. If it is necessary to adjust the electric governor, proceed as follows:

(1) Remove the twist-lock cover from the governor.

(2) Turn the knurled adjusting nut so that half of the adjusting screw is above the spring support and the other half is below. This will provide a temporary setting which will have to be changed after the unit is started and is operating at normal temperature.

(3) Note the position of the plunger when the throttle is closed completely. The top of the plunger should be approximately

$\frac{1}{16}$ to $\frac{3}{32}$ inch above the top of the solenoid tube with the throttle in closed position.

(4) If adjustment of the plunger is necessary, loosen the throttle shaft clamp screw and turn the clamp on the throttle shaft until the correct plunger level is attained. Be sure to tighten the setscrew. Recheck the plunger level after the setscrew is tightened to make sure that the clamp did not shift on the throttle shaft while the screw was being tightened.

*b.* Engine Speed and Voltage Adjustment. To increase the engine speed and generator voltage, turn the adjusting nut down (clockwise). To reduce the engine speed and generator voltage, turn the adjusting nut up (counterclockwise). Be sure to replace the twist-lock cover when adjustment of the governor is completed.

## Section VII. FINAL TESTING

### 96. Engine Run-in and Test

The engine should be run in after overhauling. This run-in should never be for less than 2 hours. After all adjustments have been completed as outlined in section VI, set up the engine on the test stand and perform the operations below.

### 97. Preliminary Inspection

Examine the engine thoroughly for loose nuts, bolts, and screws. Do not tighten the head nuts unless there is a definite indication of looseness or leaks. Leaks or blow-by in gasket around the spark plug or head studs is usually indicated by black carbon streaks. Inspect the governor linkage to the carburetor for binding. Inspect the spark plug gap.

### 98. Test Runs

Run the engine for 1 hour with no load. After the 1-hour run, if the engine has shown no indication of trouble, such as compression leaks or loose parts, run the engine for 1 hour with a full-load (300 watts at 110 volts).

### 99. Final Inspection

Inspect the engine for compression leaks or loose parts. Check the fuel system for leaks, particularly at fuel-line connections and at the carburetor and intake shut-off valve.

## Section VIII. REFINISHING AND RUSTPROOFING

### 100. Painting and Refinishing

Rust and corrosion may be prevented by thoroughly cleaning and then touching up damaged or worn painted surfaces. Paint wears off on the tubular frame and blisters on engine parts.

*a.* Where paint has worn off, remove all traces of oil or grease with solvent (SD) and thoroughly sandpaper the spots. Apply two light, even coats of paint with a small brush.

*b.* Where engine surfaces have been blistered, remove the old paint with paint remover and thoroughly clean with sandpaper or steel wool. Apply a smooth, even priming coat; sandpaper the priming lightly with fine sandpaper and apply two light, even coats of finish paint.

*c.* Refinish the entire unit whenever it receives a complete overhaul.

**Caution:** Avoid getting paint on moving parts. Do not paint electrical contacts.

### 101. Submersion in Water

If a power unit has been submerged in either salt of fresh water, proceed as follows:

*a.* To minimize damage by corrosion, remove the water from all parts. If this is not possible, treat the parts to prevent their contact with the atmosphere. As soon as possible after removal from the water, coat all parts with oil to keep air from contacting the wet metal parts. Do not attempt to operate the unit immediately.

*b.* Dismantle the unit promptly and thoroughly clean and re-oil each part. If the submersion occurred in salt water, all parts other than electrical equipment should be washed in hot, fresh water, dried and flushed with lubricating oil that has been heated to 180° F.

*c.* Electrical equipment should be thoroughly flushed with fresh water, dried, and overhauled before using. While these parts are being overhauled, they should be checked visually for corrosion, the condition of all insulation determined, and all electrical circuits thoroughly tested before reassembly. All windings that are otherwise serviceable should be baked in an oven at 140° F. for 4 hours before reassembly. The shielded high-tension ignition wire must be replaced.

*d.* A careful inspection must be made of each part salvaged to ascertain not only the extent of the damage caused by corrosion, but also to locate any defects caused by the sudden cooling action of the water in

cases where the engine was at operating temperature at the time of submersion.

*Note.* In cases where the engine has been submerged in salt water for any length of time, parts made of aluminum will invariably be damaged beyond further use.

### 102. Rustproofing

Apply this treatment immediately after the power unit is shut down, while it is still warm.

*a.* Drain the entire fuel system, including the crankcase.

*b.* Turn the power unit upside down.

*c.* Remove the spark plug and the crankcase drain cock.

*d.* While the engine is being rotated by hand, spray preservative engine oil (PL) through the spark plug hole and drain cock hole to coat the interior surfaces of the engine. Use an air-atomizing type of spray gun and dry air.

*e.* After the engine has cooled, remove grease and dirt from the exterior.

*f.* Seal the exhaust pipe, and cover the air cleaner with Tape, adhesive, waterproof cloth (Signal Corps stock No. 6Z8624–1).

*g.* Be sure all surfaces are dry; then spray all unpainted exterior surfaces, including wiring, with Compound, Insulation, Ignition (Ordnance Spec No. AXS–858).

## Section IX. SUPPRESSION

### 103. Suppression Equipment

Engine Generator PU–181/PGC–1 has been suppressed to reduce interference with radio equipment. Resistors, bonding straps, a tubular shielding, a spark plug shield, and internal-tooth (IT), internal-external-tooth (IET), and external-tooth (ET) lockwashers have been used. Failure to replace any of the items used to suppress the equipment will result in the loss of suppression characteristics. It is vitally important to reinstall each supression component in its exact original position when reassembling the equipment or replacing parts.

## 104. Type and Location of Components

The type and location of the various suppression components used on Engine Generator PU–181/PGC–1 are as follows:

| Description of application | Components | Size or value | Quantity |
|---|---|---|---|
| High-tension spark plug lead. | Resistor inserted in shielding at spark plug end. | 10,000 ohms | 1 |
| | Lead incased in metal braid tubing | 3/8" x 12" | 1 |
| Spark plug | Spark plug inclosed in metal shield | 14-mm Breeze | 1 |
| Cylinder head baffle | Baffle plate bonded to cylinder head by IT lockwashers. | No. 8 | 4 |
| Magneto sator plate | Bonded to backplate by IET lockwashers. | 1/4" | 2 |
| Magneto backplate | Bonded to engine crankcase by IT lockwashers. | 1/4" | 2 |
| Engine fan housing | Bonded to magneto backplate by IET lockwashers. | No. 10 | 3 |
| Adapter assembly | Bonded to generator housing by IET lockwashers. | 1/4" | 3 |
| Cylinder block | Bonded to engine crankcase by ET lockwashers. | 5/16" | 4 |
| Crankcase mounting, feet | Bonded to engine base by ET lockwashers. | 5/16" | 4 |
| Carburetor | Bonded to crankcase by IT lockwashers. | No. 10 | 2 |
| Outlet plate | Bonded to generator housing by IT lockwashers. | No. 8 | 2 |
| Crankshaft | Bonded to magneto backplate by brush-bond assembly. | | 1 |
| Engine base | Bonded to subframe by bond strap and ET lockwashers. | Bond strap: 1/4" x 3" | 1 |
| | | ET lockwashers: 1/4" | 2 |
| Fuel tank | Bonded to subframe by bond strap and and IET lockwashers. | Bond strap: 1/4" x 3"<br>IET lockwasher: 1/4" | 1 |

# CHAPTER 5

# SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

## Section I. SHIPMENT AND LIMITED STORAGE

### 105. Preparation for Storage or Shipment

*a.* If Engine Generator PU–181/PGC–1 is not to be used for 30 days or more, or is to be transported to a remote point, rustproof the equipment as instructed in paragraph 27. Treat the fuel system as instructed in paragraph 28.

*b.* After the engine generator has been processed as instructed in paragraphs 27 and 28, place it on the wooden base of Case CY–739/PGC–1 and secure it with the hold-down clamps that are attached to the wooden base.

*c.* Inspect all tools and spare parts to see that they are present and in good condition. Replace any damaged or missing parts or tools. Wrap each tool and spare part in a moistureproof wrapping and mark it for identification. Place all tools and space parts in the compartment provided in the top of Case CY–739/PGC–1.

*d.* Carefully fold Bag CW–191/PGC–1 and stow it in the upper part of Case CY–739/PGC–1, above the tool compartment door.

*e.* Place the required amount of desiccant about the equipment in accordance with current specifications and directives. Place the top of the Case CY–739/PGC–1 over the engine generator and attach it to the base by means of the spring catches which are provided.

*f.* If the equipment is to be shipped overseas or any considerable distance, prepare an outer packing case in accordance with existing specifications, and protect the equipment in accordance with applicable JAN specifications.

## Section II. DEMOLITION TO PREVENT ENEMY USE

### 106. Methods of Demolition

*a. Smash.* Use sledges, axes, handaxes, pickaxes, hammers, crowbars, and heavy tools.

*b. Cut.* Use axes, handaxes, and machetes.

*c. Burn.* Use gasoline, kerosene, oil, flame throwers, and incendiary grenades.

*d. Explode.* Use firearms, grenades, TNT.

*e. Dispose.* Bury in slit trenches, fox holes, and other holes. Throw in streams. Scatter.

*Note.* Use anything immediately available for destruction of this equipment.

## 107. Destruction of Components

When ordered by your commander, destroy all equipment to prevent its being used or salvaged by the enemy.

*a. Smash* cylinder, cylinder head, spark plug shielding, spark plug, carburetor, flywheel magneto, fuel tank, generator, tubular frame, Case CY–739/PGC–1, tools, and spare parts.

*b. Cut* all connecting wires and cables.

*c. Burn* packing case, waterproof cover, fuel, oil, technical manuals, technical bulletins, instruction books, and other documents.

*d. Bury or scatter* all remaining parts of the equipment.

*e. Destroy everything.*

# APPENDIX I

# REFERENCES

*Note.* For availability of items listed, check SR 310–20–4.

## 1. Supply Publications

| | |
|---|---|
| SB 11–47 | Preparation and Submission of Requisitions for Signal Corps Supplies. |
| SB 11–76 | Signal Corps Kit and Materials for Moisture- and Fungi-Resistant Treatment. |
| SB 38–5–3 | List of Standard Lubricants, Hydraulic Fluids, Liquid Fuels and Preservative Materials Used by the Department of the Army. |

## 2. Packaging and Packing Instructions

*a.* Joint Army-Navy Packaging Specifications.

| | |
|---|---|
| JAN–D–169 | Desiccants, Activated. |
| JAN–P–100 | General Specification. |
| JAN–P–106 | Boxes, Wood, Nailed. |
| JAN–P–116 | Preservation, Methods of. |
| JAN–P–121 | Barrier-Materials, Greaseproof. |
| JAN–P–125 | Barrier-Materials, Waterproof, Fexible. |
| JAN–P–131 | Barrier-Material, Moisture-Vapor-proof, Flexible. |
| JAN–P–140 | Adhesives, Water-Resistant, Case-Liner. |
| JAN–P–197 | Anti-Friction Bearings and Bearing Parts. |
| JAN–P–658 | Electrical Equipment and Spare Parts (electronic, electrical and electro-mechanical). |

*b.* U. S. Army Specification.

| | |
|---|---|
| 100–2E | Marking Shipments by Contractors (and Signal Corps Supplement thereto). |

*c.* Signal Corps Instructions.

| | |
|---|---|
| 720–1 | Preparation of Gasoline and Diesel Engines. |
| 720–3 | Preservation of Internal Combustion Engines. |
| 720–7 | Standard Pack. |
| 726–15 | Interior Marking. |

## 3. Other Publications

| | |
|---|---|
| SB 11–100 | Serviceability Standards for Signal Equipment in Hands of Troops. |
| TB ORD 313 | Spark Plugs. |
| TB SIG 13 | Moistureproofing and Fungiproofing Signal Corps Equipment. |
| TB SIG 23 | Rustproofing of Engines. |

| | |
|---|---|
| TB SIG 66 | Winter Maintenance of Signal Equipment. |
| TB SIG 72 | Tropical Maintenance of Ground Signal Equipment. |
| TB SIG 75 | Desert Maintenance of Ground Signal Equipment. |
| TB SIG 183 | Preventive Maintenance Guide for Power Equipment. |
| TB 11–2525–1 | Starting Power Units in Arctic Areas Using Miller Utility Heater Model OG–31–A. |
| TM 1–455 | Electrical Fundamentals. |
| TM 9–2857 | Storage Batteries Lead-Acid Type. |
| TM 10–550 | Fuels and Carburetion. |
| TM 10–580 | Automotive Electricity. |
| TM 11–453 | Shop Work. |
| TM 11–462 | Signal Corps Tactical Communication Reference Data. |
| TM 11–483 | Suppression of Radio Noises. |
| TM 37–2810 | Motor Vehicle Inspection and Preventive Maintenance Services. |
| TM 55–405 | Preventive Maintenance of Electric Motors and Generators. |

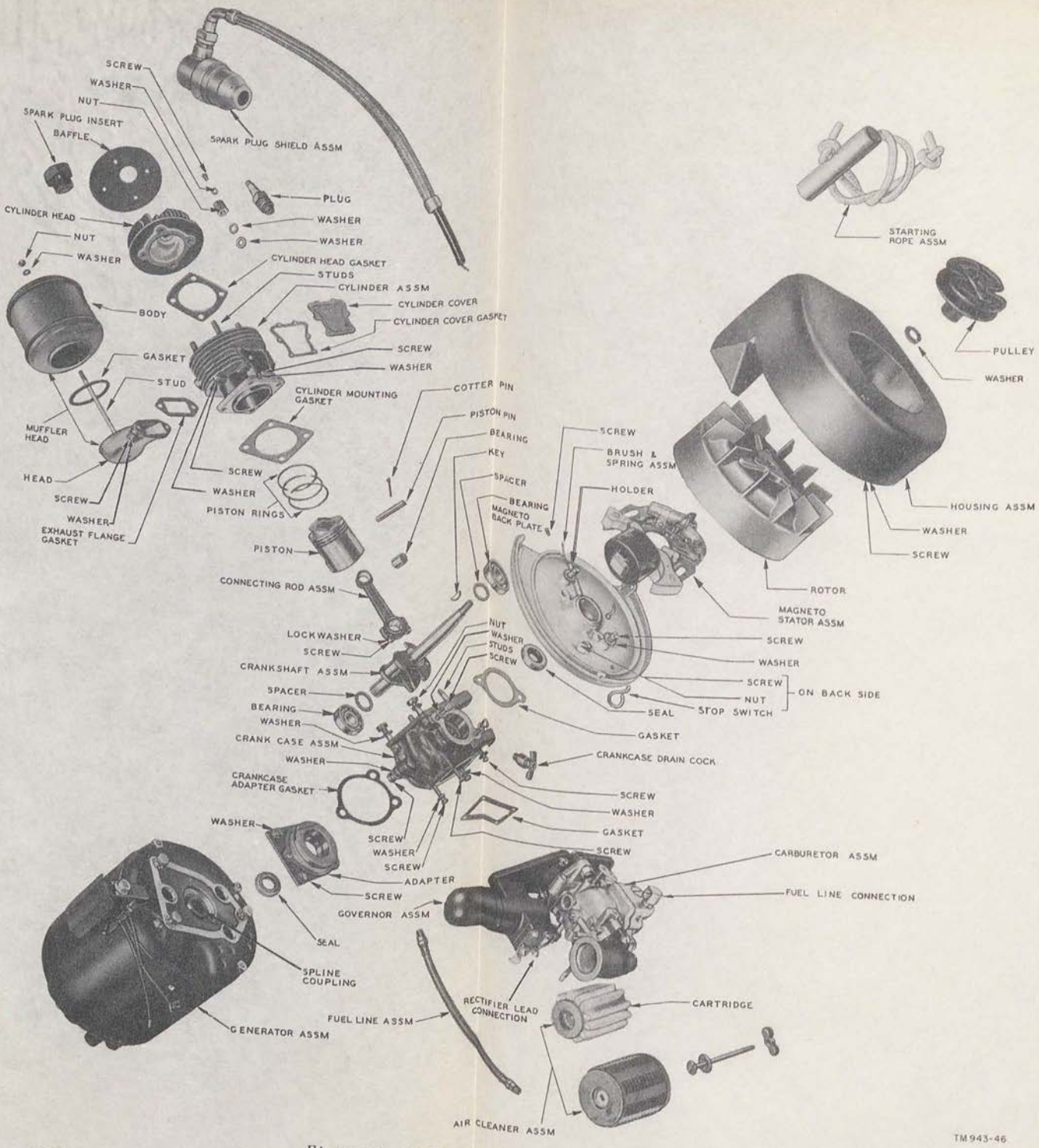


*Figure 46. Engine and generator, exploded view.*

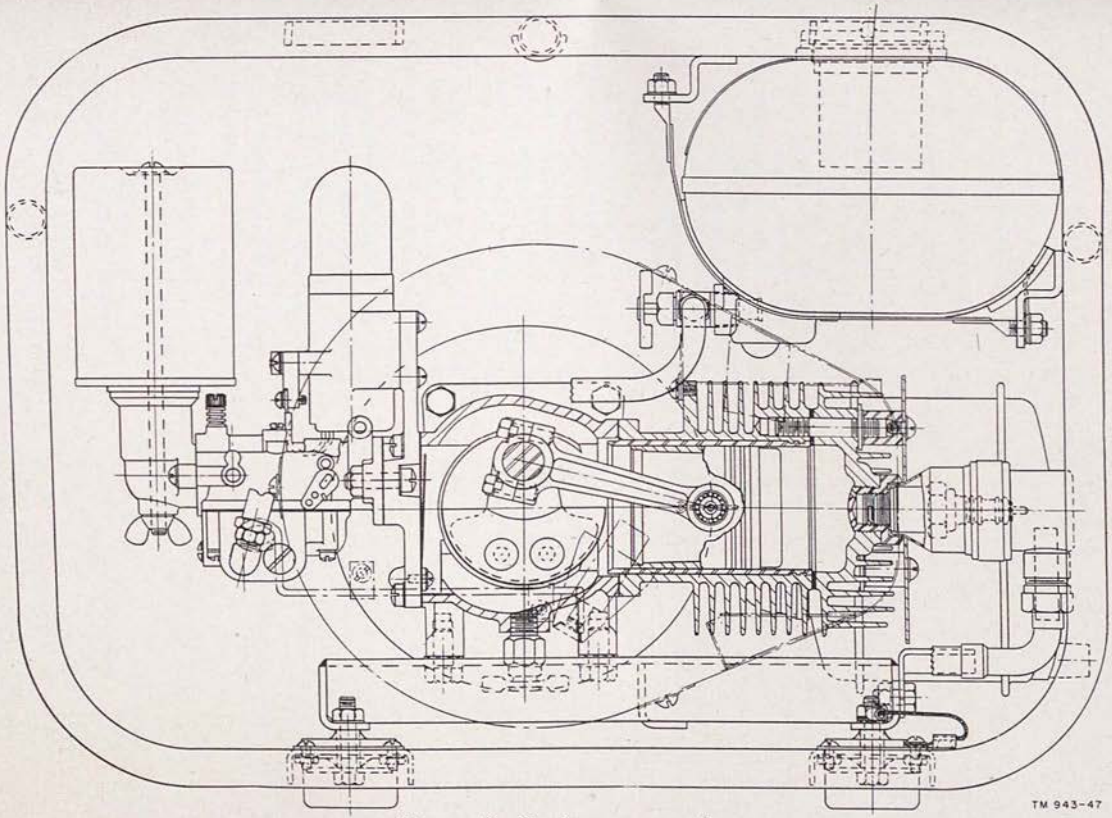


*Figure 47. Engine, cross section.*

# APPENDIX II

*Table of standard nuts, bolts, screws, and washers.*

| Quantity | Item | Size | Length | Thread | Where used |
|---|---|---|---|---|---|
| 1 | Screw, hex. head cap | ¼ | ½ | NC 20 | Muffler bracket to frame mtg. |
| 1 | Nut, hex | ¼ | | NC 20 | Muffler bracket to frame mtg. |
| 1 | Lockwasher | ¼ | | | Used with above. |
| 3 | Screw, hex. head cap | ¼ | ½ | NC 20 | Generator to bearing adapter mtg. |
| 3 | Lockwasher | ¼ | | | Used with above. |
| 2 | Screw, hex. head cap | ¼ | ⅞ | NC 20 | Muffler head to cylinder mtg. |
| 2 | Lockwasher | ¼ | | | Used with above. |
| 4 | Screw, hex. head cap | 5/16 | ⅜ | NC 18 | Crankcase to motor base mtg. |
| 8 | Lockwasher | 5/16 | | | Used with above. |
| 3 | Screw, hex. head cap | 5/16 | ¾ | NC 18 | Bearing adapter to crankcase mtg. |
| 3 | Lockwasher | 5/16 | | | Used with above. |
| 1 | Screw, hex. head cap | ¼ | ⅜ | NC 20 | Rectifier to generator mtg. |
| 1 | Lockwasher | ¼ | | | Used with above. |
| 2 | Screw, fillister-head cap | ¼ | ⅞ | NC 20 | Fan housing backplate to crankcase mtg. |
| 2 | Lockwasher | ¼ | | | Used with above. |
| 2 | Screw, fillister-head cap | ¼ | ⅞ | NC 20 | Adapter to carburetor mtg. |
| 2 | Nut, hex | ¼ | | NC 20 | Adapter to carburetor mtg. |
| 2 | Lockwasher | ¼ | | | Used with above. |
| 2 | Screw, fillister-head cap | ¼ | ⅝ | NC 20 | Magneto backplate mtg. |
| 2 | Lockwasher | ¼ | | | Used with above. |
| 1 | Screw, roundhead machine. | #12 | 5/8 | NC 24 | Air cleaner to carburetor mtg. |
| 1 | Wingnut, standard | #12 | | NC 24 | Air cleaner to carburetor mtg. |
| 4 | Bolt, hex. head machine | ¼ | 1¼ | NC 20 | Motor base to frame mtg. |
| 6 | Lockwasher | ¼ | | | Motor base to frame mtg. |
| 1 | Screw, roundhead machine. | #6 | ⅜ | NC 32 | Radio shielding to backplate mtg. |
| 1 | Nut, hex. machine screw | #6 | | NC 32 | Radio shielding to backplate mtg. |
| 2 | Screw, roundhead machine. | #6 | ⅜ | NC 32 | Governor to generator lead mtg. |
| 2 | Lockwasher | #6 | | | Used with above. |
| 6 | Screw, roundhead machine. | #6 | 3/16 | NC 32 | Intake passage cover mtg. |
| 6 | Lockwasher | #6 | | | Used with above. |
| 2 | Screw, roundhead machine. | #6 | 3/16 | NC 32 | Reed valve to carburetor mtg. |
| 2 | Lockwasher | #6 | | | Used with above. |
| 1 | Screw, roundhead machine. | #8 | ¼ | NC 32 | Fan housing to cylinder mtg. |
| 1 | Lockwasher | #8 | | | Used with above. |
| 1 | Screw, roundhead machine. | #8 | ¼ | NC 32 | Radio ground brush and spring mtg. |
| 14 | Screw, roundhead machine. | #8 | ⅜ | NC 32 | Shock mount to frame mtg. |
| 14 | Lockwasher | #8 | | | Used with above. |
| 2 | Screw, roundhead machine. | #8 | ½ | NC 32 | Shock mount to frame mtg. |
| 6 | Lockwasher | #8 | | | Used with above. |

*Table of standard nuts, bolts, screws, and washers*—Continued

| Quantity | Item | Size | Length | Thread | Where used |
|---|---|---|---|---|---|
| 16 | Nuts, hex. machine screw | #8 | | NC 32 | Shock mount to frame mtg. |
| 2 | Screw, roundhead machine. | #8 | 5/8 | NC 32 | Governor housing to carburetor adapter mtg. |
| 2 | Lockwasher | #8 | | | Used with above. |
| 2 | Screw, roundhead machine. | #8 | 5/8 | NC 32 | Governor terminal to insulation block mtg. |
| 2 | Lockwasher | #8 | | | Used with above. |
| 2 | Screw, roundhead machine. | #8 | 5/8 | NC 32 | Air cleaner elbow mtg. |
| 2 | Lockwasher | #8 | | | Used with above. |
| 2 | Screw, roundhead machine. | #8 | 3/16 | NC 32 | Shorting switch lever to backplate mtg. |
| 2 | Lockwasher | #8 | | | Used with above. |
| 3 | Screw, roundhead machine. | #10 | 1/4 | NC 24 | Fan housing to backplate mtg. |
| 3 | Lockwasher | #10 | | | Used with above. |
| 4 | Screw, roundhead machine. | #10 | 5/16 | NC 24 | Cylinder head baffle mtg. |
| 4 | Lockwasher | #10 | | | Used with above. |
| 1 | Screw, fillister-head machine. | #8 | 1/2 | NC 32 | Throttle lever to carburetor shaft mtg. |
| 1 | Lockwasher | #8 | | | Used with above. |
| | Screw, fillister-head machine. | #12 | 5/8 | NC 24 | Carburetor adapter to crankcase mtg. |
| 4 | Lockwasher | #12 | | | Used with above. |
| 4 | Nut, hex | 1/4 | | NC 20 | Fuel tank to loop frame mtg. |
| 5 | Lockwasher | 1/4 | | | Used with above. |
| 2 | Nut, hex | 1/4 | | NC 20 | Rectifier to bracket mtg. |
| 2 | Lockwasher | 1/4 | | | Used with above. |
| 1 | Nut, hex. brass | 1/4 | | NF 28 | Muffler to muffler head mtg. |
| 1 | Lockwasher | 1/4 | | | Used with above. |
| 4 | Nut, hex | 5/16 | | NF 24 | Cylinder to crankcase mtg. |
| 4 | Lockwasher | 5/16 | | | Used with above. |
| 1 | Lockwasher | 7/16 | | | Starter pully to crankcase mtg. |
| 4 | Lockwasher | 5/16 | | | Cylinder head to cylinder mtg. |
| 1 | Pin, cotter | 5/32 | 3/4 | | Piston pin to piston mtg. |
| 1 | Washer, standard | 3/16 | | | Air cleaner to carburetor mtg. |
| 1 | Washer, brass | #8 | | | Insulating block to governor mtg. |
| 4 | Burr, riveting | 5/16 | | | Cylinder head baffle to cylinder head mtg. |
| 4 | Burr, riveting | 1/4 | | | Rectifier to bracket mtg. |
| 1 | Key, Woodruff | #7 | | | Magneto to crankcase mtg. |

# INDEX

TECHNICAL MANUAL

ENGINE GENERATOR PU-181/PGC-1

CHANGES No. 1

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *28 May 1951*

TM 11-943, 9 April 1951, is changed as follows:

# APPENDIX III

(Added)

# IDENTIFICATION TABLE OF PARTS

*Note.* The fact that a part is listed in this table is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as T/O&E, T/A, SIG 7 & 8, SIG 7-8-10, SIG 10, list of allowances of expendable material, or another authorized supply basis. For an index of available supply catalogs in the Signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1.

| Name of part and description | Function of part | Signal Corps stock No. |
|---|---|---|
| ENGINE GENERATOR: Sig C Engine Generator PU-181/PGC-1; 300 w at 100% pf, 120/240 v, single ph, 60 cyc ac; shock mtd in unit frame; incl Sig C Engine GE-12-F and Sig C Generator GN-51-C; 17⅛" lg x 14⅛" wd x 12 13/16" h. | Power supply for Signal Corps communication equipment. Part of Teletypewriter Set AN/PGC-1. | 3H1927-181 |
| ENGINE, gasoline: skeleton; Sig C Engine GE-12-F w/o carburetor, air cleaner, muffler, governor, fuel tank, toolbox w/tools, running spares, or canvas cover; incl special helicoil insert and spark plug adapter; crankcase milled for cable shield clearance. | Basic engine | 3H1900.2 |
| ENGINE, gasoline: complete; Sig C Engine GE-12-F; 1.25 hp at 3600 rpm; 1 cyl, 2 cyc, horiz; 2" bore x 1½" stroke; air-cooled; flywheel magneto ignition; manual starting, rope; elec governor. | Provides power to drive generator | 3H1912F |
| GENERATOR, ac: Sig C Generator GN-51-C; 300-w output at 3600 rpm, 100% pf; 120/240 v, single ph, 60 cyc, 2 wire; direct drive. | Produces ac | 3H2351C |
| AIR CLEANER GROUP | | |
| CLEANER, air: cartridge type; replaceable; aluminum; 2 7/16" OD x 3½" h. | Filters air entering engine through carburetor. | 3H1912A/C30 |
| CLEANER ELEMENT, air: felt, wire core; reusable; 2¼" OD x 3½" h. | Filters foreign matter from air passing through air cleaner. | 3H1913A/C18 |
| GASKET: for air cleaner mtg; cork; 1 7/16" OD x 3/32" thk | Seal between air cleaner and carburetor air intake. | 3H1912A/G8 |
| STUD: thd ea end ¾" lg, #12-24 NCT-2; 6⅛" lg o/a | Secures air cleaner cover in place | 6L31134-11 |

## CARBURETOR AND FUEL GROUP

| | | |
|---|---|---|
| ADAPTER, breather pipe: 90° elbow; aluminum; 1⅜″ dia x 1¾″ wd x 2″ h o/a. | Connector used to mount air cleaner and carburetor. | 3H5J–3 |
| ADAPTER, carburetor: irregular oblong; aluminum; 4 13/16″ lg x 2 7/16″ wd x 9/16″ thk o/a. | Spacer for carburetor and for mounting solenoid. | 3H5J–2 |
| CAP: filler cap; cast brass; steel tube, under side | Cover for fuel tank filler opening and measure for lubricating oil. | 3H685.2–2 |
| CARBURETOR: horiz draft; w/o air cleaner and air cleaner elbow; Tillotson model #MD49A. | Meters and mixes fuel and air entering engine. | 3H753–4.1 |
| COCK: rotary plug type valve; brass; 1¼″ lg x ¾″ d | Fuel tank air vent | 6Z211S–3 |
| COCK: nonremovable screw plug; brass; 1 3/16″ lg | Two used:<br>Provides drain for fuel tank.<br>Provides drain for crankcase. | 3H1912A/C35 |
| CONTAINER: fuel tank; approx 1 gal cap; oval oblong shape | Container for fuel and oil mixture | 3H1905. 4 |
| FITTING, tubing: 90° elbow; for 3/16″ dia tubing, ⅜″–24 female thd, inverted flare one end; ⅛″ male std pipe thd other end. | For connection of fuel line to carburetor | 6Z3888A–11 |
| FLOAT, carburetor: hollow angular ring w/lever | Controls fuel level in carburetor | 3H2050–4 |
| GASKET: gaskoid; three holes; 1¾″ lg x 1″ wd x .016″/.019″ thk o/a. | Seal between carburetor and air cleaner elbow. | 3H2154–4 |
| GASKET: gaskoid; three holes; 2⅜″ lg x 1 7/16″ wd x .016″/.019″ thk o/a. | Seal between carburetor and adapter | 3H2154–25 |
| GASKET: vellumoid; five holes; 2 13/16″ lg x 1 11/16″ wd x 1/32″ thk. | Seal between crankcase and carburetor adapter. | 3H1912A/G3 |
| GASKET: corprene, one hole; 2¼″ OD x 1¾″ ID x ⅛″ thk | Seal for fuel tank cap | 3H1912B/G2 |
| GASKET SET: c/o float cover gasket, needle valve packing, packing gland gasket, inlet seat gasket, and bypass plug screw gasket; for Tillotson carburetor model MD–49A. | Gaskets for carburetor | 3H2155–14 |
| LEVER: throttle control; brass | Operates carburetor throttle control from solenoid governor. | 3H2681.9 |

| Name of part and description | Function of part | Signal Corps stock No. |
|---|---|---|
| **CARBURETOR AND FUEL GROUP—Continued** | | |
| LINE, fuel: straight; ⅜″ OD x 12½″ lg o/a | Transmits fuel from container to carburetor | 3H2689.1–39 |
| NUT, packing: hex. 5/16″–32 NFT–2 | Closure for packing seal and adjusting screw. | 3H6226/S9 |
| PLUG, machine thread: ½″–20 NFT–2 | Plugs hole in fuel bowl | 3H4419–9 |
| PLUG, machine thread: 5/16″–24 NFT–2 | Plugs hole in fuel bowl | 3H4419–10 |
| PLUG, machine thread: ¼″–28 NFT–2 | Plugs hole in main fuel channel | 3H4419–8 |
| SCREW, machine: slot drive, straight side, binding head; 5/32″ lg. | Holds choke shuttle to choke shaft | 6L6632–3.3S–2 |
| SCREW, machine: slot drive; Fil H; ⅞″ lg | Mounts float bowl to carburetor body | 6L20908–14.32 |
| VALVE, angle: ¼″ male std pipe thd on screen end; ⅜″–24 thd for inverted flare fitting on other end. | Controls fuel supply to carburetor | 3H1922/V1 |
| VALVE, reed: 2 13/16″ lg x ¾″ wd x .010″ thk o/a | Prevents backflow of fuel mixture from engine crankcase through carburetor. | 3H1912A/V1 |
| **CYLINDER BLOCK AND CRANKCASE GROUP** | | |
| ADAPTER, bearing | Provides generator to engine mounting and housing for bearing. | 3H5J–1 |
| BEARING, ball: single row radial | Bearing for crankshaft | 3H4575A/199 |
| COCK: removable screw plug valve; single male ⅛″ std pipe thd | Draincock for crankcase | 3H1912A/C35 |
| CRANKSHAFT | Converts reciprocating motion to rotary motion. | 3H1912A/C70 |
| GASKET: vellumoid; four holes; 3 7/16″ lg x 3″ wd x .015″ thk | Seal between crankcase and generator adapter flange. | 3H1912A/G5 |
| GASKET: asbestos millboard or equal; seven holes; 2 1/16″ lg x 2¼″ wd x 1/32″ thk. | Seal for intake passage cover | 3H1912B/G1 |

| | | |
|---|---|---|
| GASKET, vellumoid; three holes; 3″ lg x 2⅛″ wd x .015″ thk | Seal between crankcase and magneto backplate. | 3H1912A/G6 |
| GASKET: vellumoid; five holes; 2 15/16″ lg x 2 15/16″ wd x .015″ thk. | Seal between cylinder and crankcase | 3H1912A/G2 |
| PIN, wrist | Retains connecting rod in piston | 3H1912A/P22 |
| PISTON, engine: metal ring seal; std size; three compression seal ring grooves; 2″ dia x 2½″ lg. | Receives impulse caused by combustion of fuel within combustion chamber and transmits it to crankshaft through the wrist pin and connecting rod assembly. | 3H4216.6 |
| PULLEY | For starter rope used in starting engine | 3H1912A/P55 |
| RING SET, piston: three compression type rings; std 2″ dia x .090″ wd. | Seal between piston and cylinder wall | 3H1912A/R21 |
| ROD, connecting | Transfers reciprocating motion of piston to crankshaft. | 3H1912A/R31 |
| SEAL, oil: steel and synthetic rubber; .668″ ID x 1.254″ OD x ¼″ thk. | Prevents oil seepage at crankshaft bearing | 3H1912A/S3 |
| WASHER, flat: 1″ OD x 2 1/32″ ID x 3/64″ thk | To take up end play of crankshaft | 6L58030 |
| WASHER, lock: steel; irregular shape; 17/32″ wd x 15/32″ lg .0359 thk; 15/64″ dia hole. | Connecting rod cap screw lockwasher | 6L71004–28 |
| **CYLINDER HEAD GROUP** | | |
| ADAPTER, spark plug | To shield spark plug points from excess carbon deposit. | 3H5J |
| GASKET: steelbestos, graphite coated; one cyl opening; five holes; 2⅜″ lg x 2⅜″ wd x 1/16″ thk. | Seal between cylinder and cylinder head | 3H1912A/G4 |
| HEAD, cylinder: incl helicoil w/o adapter | Provides covering for cylinder, mounting for spark plug, and combustion chamber for ignition of fuel. | 3H2500–10 |
| NUT, hexagon: 5/16″–24 NF, ⅜″ d bottom side for cyl head stud, drilled and tapped through 10–24 NC top side for baffle screw. | Fastens cylinder head to cylinder | 6L3505–24–9 |

| Name of part and description | Function of part | Signal Corps stock No. |
|---|---|---|
| **EXHAUST SYSTEM GROUP** | | |
| ADAPTER, exhaust pipe | Exhaust outlet from cylinder | 3H1912B/H15 |
| GASKET: asbestos millboard; three holes; 2 15/16" lg x 1 5/32" wd x 1/16" thk. | Seal for exhaust flange | 3H1912B/G3 |
| GASKET: compressed asbestos; 2 33/64" OD x 2 9/32" ID x 1/16" thk. | Seal between muffler body and exhaust flange. | 3H2154.9-7 |
| GASKET: asbestos millboard; 2 5/16" ID x 2 1/2" OD x 1/16" thk o/a. | Seal between muffler head and cylinder | 3H4600-214A/G1 |
| MUFFLER | Reduces engine exhaust sound | 3H3981-18 |
| SCREW, machine: slot drive; hex. head; 1/4"-20 NCT-2; 7/8" lg. | Mounts muffler to cylinder block | 6L7920-14.81S |
| STUD: 1/4" dia x 5 3/8" lg | Mounts muffler body to exhaust flange | 6L31186 |
| **IGNITION SYSTEM GROUP** | | |
| BRUSH, electrical contact: noise suppression; magneto cam grounding. | Suppresses r-f currents created by magneto. | 3H2351B/B10 |
| CAM: magneto; steel | Actuates magneto breaker points | 3H680-2 |
| CAPACITOR, fixed: paper dielectric; capacitance, min 160,000 $\mu\mu$f, max 200,000 $\mu\mu$f; working voltage, 200 v dc. | Prevents arcing between magneto breaker points. | 3H2699-9/C1 |
| COIL, magneto: ignition type | To generate voltage for ignition | 3H986-1 |
| CONTACT ASSEMBLY, magneto: c/o breaker plate w/contact points, felt cam wiper and one breaker plate spring, one breaker arm w/point and connecting lead wire; breaker plate, steel and brass; tungsten points; breaker arm, laminated phenolic; fungus treated. | Actuated by breaker cam which is timed to break contacts at precise moment spark is required in cylinder. Interrupts primary circuit at moment when armature is at peak voltage position. | 3H1032A-13 |

| | | |
|---|---|---|
| FLYWHEEL: mts magneto magnets | Rotation of flywheel carries moving parts through nonpower stroke, cools engine, and provides magnetic field for magneto. | 3H2103W |
| MAGNETO, ignition: flywheel type | Generates high-tension current for ignition and times spark delivered to spark plug. | 3H2699–54 |
| PLUG, spark: mach thd, 14 mm dia; hot type; 13/16" hex | Means for introducing ignition spark into combustion chamber. | 3H4412–11 |
| SCREW, machine: slot drive; #8–32 NCT–2; 7/16" lg | Mounts capacitor to stator of magneto | 6L6632–7.86SF |
| SCREW, machine: slot drive; #10–32 NFT–2; 5/16" lg | Mounts breaker arm and plate to stator | 6L20910–5.93 |
| SCREW, machine: slot drive; #6–32 NFT–2; 5/16" lg | Fastens lead from coil and breaker points to magneto capacitor. | 6L2096–5.93 |
| SHIELD, cable: brass ferrule soldered to one end, brass elbow flared on both ends soldered to other end; 13½" lg x 1½" wd x 7/16" OD. | Shielding for ignition cable | 3H5240.7–2 |
| SHIELD ASSEMBLY, spark plug: brass; chrome plated; rubber. | Shielding for spark plug | 3H5240.15–1 |
| STATOR, magneto: flywheel type; c/o plate mtd w/magneto coil, capacitor, spark cut-out switch plate, breaker arm and plate w/contact points, felt cam oiler, and coil lead wires. | Provides ignition voltage | 3H5340D |
| SUPPRESSOR, electrical noise: resistor type | Reduces radiation of r-f currents | 3Z1891–43 |
| WASHER, lock: .140" ID x .251" OD x .031" thk | Locks mounting of capacitor and shorting plate to stator of magneto. | 6L71002–15 |
| WASHER, spring: 1" OD x 23/32" ID in flat x .030" thk; 1/16" concave. | Magneto cam spring washer | 6L73041 |
| WICK | Lubrication pad for cam | 6Z9446–2 |
| WIRE, electrical: insulated; #16 AWG conductor; soft copper | Provides high-tension current connection between magneto and spark plug. | 1B816.135 |

| Name of part and description | Function of part | Signal Corps stock No. |
|---|---|---|
| **GOVERNOR GROUP** | | |
| BOARD, terminal: 1⅛″ wd x 29/32″ h x ¼″ thk o/a | Insulator for fastening solenoid terminals and lead clip. | 3Z770–2.90 |
| COIL, solenoid | Exerts magnetic pull on governor which regulates carburetor. | 3H5248–13 |
| GOVERNOR | Maintains constant engine speed | 3H2475–6 |
| MOUNTING: A bracket | Bracket for governor adjusting spring screw | 3H3900.10 |
| NUT, knurled: #6–32 NC | To adjust solenoid plunger spring | 6L3406–32K.3 |
| SCREW, adjusting | Controls governor plunger spring | 6L4716–11 |
| SPRING: helical extension type; .190″ OD x ⅞″ lg; 41 turns | Governor plunger return spring | 3H5255.3 |
| WASHER, flat: brass, tin plate; .172″ ID x ⅜″ OD x .032″ thk | Mounts under lead clip on solenoid insulator strip. | 6L58023–54 |
| **GENERATOR GROUP** | | |
| BEARING, ball: .5906″ bore, 1.3780″ OD x .5670″ wd | Bearing for generator rotor shaft | 3H2351A/B10 |
| CONNECTOR, receptacle: straight type; 20 amp, 250 v; two female curved parallel contacts; 2 15/16″ lg x 1⅜″ wd x 1 1/16″ h. | Power outlet connection for generator | 6Z780S |
| CUSHION | Permits flexibility of flexible coupling on drive hub. | 3H1420 |
| HUB: drive half of flexible coupling | Couples engine crankshaft to driven half of coupling. | 3H2551–4 |
| HUB: driven half of flexible coupling | Couples generator rotor shaft to driving member of coupling. | 3H2551–5 |
| POST, binding: screw type; phenolic cap, brass base | Power outlet connection for generator | 3Z737–7.1 |
| RECTIFIER, metallic: input, 13 v ac, 60 cyc, 2 amp; output, 6.5 v dc, 1.5 amp; ⅞″ dia x 3½″ lg o/a; three d-c connections to generator; two a-c connections to solenoid. | Provides dc for actuation of electric governor. | 3H4845–9 |

| | | |
|---|---|---|
| SCREW, set: Allen drive; csink head; #10-32 NFT-2; 3/16" lg | Secures driven half of coupling to generator shaft. | 6L18510-3.31-3 |
| **MISCELLANEOUS GROUP** | | |
| BAG: Army-Navy Bag CW-191-PGC-1; nylon, olive drab, rubber covered. | Waterproof closure for engine generator | 3H160-191 |
| BASE, engine | Mounts engine and generator to loop frame | 3H175-4 |
| CASE: Army-Navy Case CY-739/PGC-1 | Covering for engine generator | 3H772-739 |
| FASTENER, latch: steel, bonderized; 2 5/8" lg x 2 3/16" wd x 4 3/8" h o/a. | Holds engine generator to carrying case | 3H1944-1 |
| MAINTENANCE PARTS KIT, carburetor: for Tillotson carburetor model MD49A. | Maintenance parts for carburetor | 3H2700.10 |
| MOUNT, vibration: 1 3/4" lg x 1 3/4" wd x 5/8" thk o/a | Vibration shock mounting for engine | 6Z8502-1 |
| ROPE ASSEMBLY: cotton sash cord; 1/4" dia | Used to crank engine | 3H1922/R25 |
| WASHER, flat; 1 3/8" dia x .0747" thk o/a; flat disk | Prevents rebound of vibration shock mounts | 6L58024-51 |
| **TOOL EQUIPMENT GROUP** | | |
| ABRASIVE, sheet: sandpaper; grit size #0000 | Used as an abrasive | 6Z7500-0000.2 |
| BRUSH, cleaning: hammer shape; wire bristles; steel; 5 1/2" lg x 2 1/2" wd x 1/4" thk. | For cleaning engine generator | 6Z1415-3 |
| GAGE, depth: spark timing | For timing ignition | 6Q45684 |
| GAGE, thickness: flat type; six leaves | For checking spark plug and magneto point gaps. | 6Q45706-3 |
| PULLER, wheel: knock-off type | Used to remove magneto flywheel | 6R7395-2 |
| SCRAPER, carbon | Used to scrape carbon from cylinder head and port holes. | 6R14010-1 |
| SCREWDRIVER: for slot drive; 4" lg blade; bit, 1/4" wd x .039" thk. | For driving slot drive screws | 6R15610 |
| WRENCH: special double-end socket w/sliding bar handle; 27/32"-1 1/32" hex. openings. | For positioning or removing spark plug and spark plug adapter. | 6R55527-33 |

| Name of part and description | Function of part | Signal Corps stock No. |
|---|---|---|
| TOOL EQUIPMENT GROUP—Continued | | |
| WRENCH: double open end; 3/8"–7/16" openings | For positioning or removing fuel line between fuel tank and carburetor. | 6R55514–12 |
| WRENCH: double end sockets; 5/16"–7/16" openings | To position or remove connecting rod cap screws. | 6R55510–14.1 |
| WRENCH: double end box; 1/2"–9/16" openings | To remove or replace nuts and hexagonal cap screws. | 6R59347.2 |
| COMMON HARDWARE GROUP | | |
| KEY, machine: Woodruff #7; steel; 1/8" thk x 3/4" lg | | 6L995–7 |
| KEY, machine: Woodruff #3; steel; 1/8" wd x 1/2" lg | | 6L995–3 |
| NUT, hexagon: mach screw nut; steel; #6–32; 7/64" thk; 13/16" across flats. | | 6L3603–32–19Z |
| NUT, hexagon: steel; #5/16–18; 1/2" thk; 17/64" across flats | | 6L3505–18–421 |
| NUT, hexagon: steel; #1/4–20; 13/64" thk; 7/16" across flats | | 6L3504–20–7Z |
| NUT, hexagon: steel, cadmium plated; #6–32 NCT–2; 3/32" thk; 5/16" across flats. | | 6L3606–32–5C1 |
| NUT, hexagon: brass; #1/4–28; 7/32" thk; 7/16" across flats | | 6L3504–28–7. 4 |
| NUT, hexagon: steel; #10–24; 1/8" thk; 3/8" across flats | | 6L3610–24–6Z |
| NUT, lock: palnut type; steel; #10–24; 3/32" thk; 23/64" across flats. | | 6L3660–24–5Z |
| NUT, thumb: steel, nickel plated; #12–24; 17/32" h; 1 1/16" wd across wings. | | 6L3892–24–17. 1 |
| PIN, cotter: steel; 3/32" dia x 3/4" lg o/a | | 6L974–6–36 |
| SCREW, drive: slot drive; P–K; RH; brass; #0; 1/8" lg | | 6L5016–2–5 |
| SCREW, machine: slot drive; RH; steel; #6–32; 3/8" lg; 3/8" lg thread. | | 6L6632–6. SZ |

| | |
|---|---|
| SCREW, machine: slot drive; Fil H; steel; #¼–20; ⅞″ lg; ⅞″ lg thread. | 6L7920–4–14. 3Z |
| SCREW, machine: slot drive; RH; steel; #10–24; 5/16″ lg; 5/16″ lg thread. | 6L7024–5. 1Z |
| SCREW, machine: slot drive; RH; steel; #8–32; 3/16″ lg; 3/16″ lg thread. | 6L6832–3. 1Z |
| SCREW, machine: slot drive; RH; steel; #10–24; ¼″ lg; ¼″ lg thread. | 6L7024–4. 1Z |
| SCREW, machine: slot drive; RH; steel; #8–32; ¼″ lg; ¼″ lg thread. | 6L6832–4. 1SZ |
| SCREW, machine: slot drive; RH; steel; #6–32; 5/16″ lg; 5/16″ lg thread. | 6L6632–5. 1SZ |
| SCREW, machine: hex. head; steel; #5/16–18; ¾″ lg; ¾″ lg thread. | 6L7918–5–12Z |
| SCREW, machine: hex. head; steel; #¼–20; ¾″ lg; ¾″ lg thread. | 6L7920–4–12SZ |
| SCREW, machine: hex. head; steel; .216″ dia; #12–28 NF; 1 1/16″ lg; 7/16″ lg thread; 3/32″ thk head, 5/16″ across flats; .216″ dia x ¼″ shoulder. | 6L20912–11. 81S |
| SCREW, machine: slot drive; RH; steel; #12–24; 5⅞″ lg; 2″ lg thread; 3/32″ thk head; ⅜″ dia head; 3/16″ dia x 3⅞″ lg. | 6L20912–94.1Z |
| SCREW, machine: slot drive; Fil H; steel; #12–24; ⅝″ lg; ⅝″ lg thread. | 6L7224–10.3Z |
| SCREW, machine: slot drive; RH; steel; #8–32; ⅝″ lg; ⅝″ lg thread. | 6L6832–10.1Z |
| SCREW, machine: slot drive; RH; steel; #6–32; 5/16″ lg; 5/16″ lg thread. | 6L6632–5.1S |
| SCREW, machine: slot drive; Fil H; steel; #¼–20; ½″ lg; ½″ lg thread. | 6L7920–4–8.3Z |
| SCREW, machine: slot drive; Fil H; steel; #8–32; ½″ lg; ½″ lg thread. | 6L6832–8.3SZ |
| SCREW, machine: hex. head; steel; #5/16–18; ⅝″ lg; ⅝″ lg thread | 6L7918–5–10Z |

| Name of part and description | Function of part | Signal Corps stock No. |
|---|---|---|
| COMMON HARDWARE GROUP—Continued | | |
| SCREW, machine: hex. head; steel; #¼–20; ½″ lg; ½″ lg thread | | 6L7920–4–8Z |
| SCREW, machine: hex. head; steel; #¼–20; 1¼″ lg; ¾″ lg thread | | 6L7920–4–20Z |
| SCREW, machine: slot drive; RH; steel; #8–32; ⅜″ lg; ⅜″ lg thread. | | 6L6832–6.1SZ |
| SCREW, machine: slot drive; flat head; steel, nickel plated; #10–32; ¾″ lg; ¾″ lg thread. | | 6L7032–12.7S |
| SCREW, machine: slot drive; RH; steel; nickel plated; #10–32; ¾″ lg; ¾″ lg thread. | | 6L7032–12.5S |
| SCREW, machine; slot drive; RH; steel; #6–32; ⅜″ lg; ⅜″ lg thread. | | 6L6632–6.49S |
| SCREW, machine: slot drive; RH; steel, #8–32; 5/16″ lg; 5/16″ lg thread. | | 6L6832–5.1Z |
| SCREW, machine: hex. head; steel; #¼–20; ⅜″ lg; ⅜″ lg thread | | 6L7920–4–6Z |
| SCREW, self-tapping: slot drive; P-K type Z; RH; sheet metal; brass, zinc plated, cronak dip; #2; blunt unslotted point; ⅛″ lg. | | 6L18202–2.1Z |
| SCREW, self-tapping: slot drive; P-K type Z; RH; brass; #4; ¼″ lg. | | 6L18204–4.1–1 |
| WASHER, flat: std wrought iron, zinc plated, cronak dip; round; ¼″ ID x 9/16″ OD x 1/14″ thk. | | 6L71004–33 |
| WASHER, flat: steel, zinc plated; round; .188″ ID x 7/16″ OD x .046″ thk. | | 6L71003–27Z |
| WASHER, flat: steel, zinc plated, cronak finish; round; .750″ OD x .313″ ID x .063″ thk. | | 6L71012–11 |

| | |
|---|---|
| WASHER, lock: steel; round; .320″ ID x .594″ OD x .030″ thk; shakeproof type; internal twisted teeth. | 6L72218C |
| WASHER, lock: steel; round; .256″ ID x .466″ OD x .025″ thk; shakeproof type; internal twisted teeth. | 6L72214C |
| WASHER, lock: steel; round; .195″ ID x .395″ OD x .022″ thk; shakeproof type; twisted external type. | 6L71110C |
| WASHER, lock: steel; round; .320″ ID x .588″ OD x .030″ thk; shakeproof type; twisted external teeth. | 6L71118–1 |
| WASHER, lock: steel; round; .195″ ID x .370″ OD x .022″ thk; shakeproof type; internal twisted teeth. | 6L72210C |
| WASHER, lock: steel; round; .141″ ID x .267″ OD x .040″ thk; split-ring type. | 6L71002–17F |
| WASHER, lock: steel; round; .256″ ID x .494″ OD x .025″ thk; shakeproof type; twisted external teeth. | 6L71114–1Z |
| WASHER, lock: steel; round; .221″ ID x .393″ OD x .022″ thk; shakeproof type; internal twisted teeth. | 6L72212C |
| WASHER, lock: steel, zinc plated; round; .168″ ID x .325″ OD x .020″ thk; shakeproof type; internal twisted teeth. | 6L72208C |
| WASHER, lock: steel, dulite finish; round; .142″ ID x .275″ OD x .018″ thk; shakeproof type; internal twisted teeth. | 6L71003–28F |
| WASHER, lock: steel, zinc plated; round; .256″ ID x .670″ OD x .035″ thk; shakeproof type; external, internal twisted teeth. | 6L72014–20 |
| WASHER, lock: steel; round; .142″ ID x .275″ OD x .018″ thk; shakeproof type; internal twisted teeth. | 6L72206C |
| WASHER, lock: steel; round; .168″ ID x .370″ OD x .020″ thk; shakeproof type; twisted external teeth. | 6L71108C |
| WASHER, lock: steel, dulite finish; round; .578″ OD x .328″ ID x 1/16″ thk; split ring type. | 6L71009–2F |

| Name of part and description | Function of part | Signal Corps stock No. |
|---|---|---|
| COMMON HARDWARE GROUP—Continued | | |
| WASHER, lock: steel, zinc plated, iridite finish; round; .180″ ID x .265″ OD x .049″ thk; split ring type. | | 6L71003–25F |
| WASHER, lock: steel, zinc plated, iridite finish; round; .206″ ID x .337″ OD x .047″ thk; split ring type. | | 6L71003–26F |
| WASHER, lock: steel; round; .116″ ID x .245″ OD x .016″ thk; shakeproof; internal twisted teeth. | | 6L72203Z |

[AG 412.5 (21 May 51)]

BY ORDER OF THE SECRETARY OF THE ARMY:

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*Major General, USA*
*Acting The Adjutant General*

J. LAWTON COLLINS
*Chief of Staff, United States Army*

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U. S. GOVERNMENT PRINTING OFFICE: 1951

TECHNICAL MANUAL

# ENGINE GENERATORS PU-181/PGC-1 and PU-181A/PGC-1

CHANGES No. 2

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *25 October 1951*

TM 11-943, 9 April 1951, is changed as follows:

The title of the manual is changed to read—

ENGINE **GENERATORS** PU-181/PGC-1 **and PU-181A/PGC-1**

# CHAPTER 1

# INTRODUCTION

*Note* (Added). Engine Generator PU-181A/PGC-1, procured on Order Nos. 13179-Phila-51 and 7106-Phila-51, is essentially the same as Engine Generator PU-181/PGC-1. All information contained in TM 11-943 which pertains to Engine Generator PU-181/PGC-1 applies equally to Engine Generator PU-181A/PGC-1, unless otherwise stated herein. Throughout the technical manual, except where dimensions are involved, reference to Engine GE-12-F applies equally to Engine GE-12-G; reference to Generator GN-51-C applies equally to Generator GN-51-D; and reference to Case CY-739/PGC-1 applies equally to Case CY-739A/PGC-1, unless otherwise stated. Except for the generator, the PU-181A/PGC-1 procured on Order No. 13179-Phila-51 is identical to the PU-181A/PGC-1 procured on Order No. 7106-Phila-51. Generators GN-51-C and GN-51-D may be interchanged as complete units. All parts of these generators, however, are not interchangeable. With the exception of the spark plug and shielding assembly, the over-all appearance of Engine Generators PU-181/PGC-1 and PU-181A/PGC-1 is the same. Engine GE-12-G differs from Engine GE-12-F in the following respects: The spark plug, spark plug shield, and ignition cable shielding assembly used on Engine GE-12-G is equipped with a self-shielded and self-suppressed spark plug and a new ignition cable shielding assembly.

## 3. General Description

* * * * * * *

*a.1* (Added). Engine Generator PU-181A/PGC-1 is the same as Engine Generator PU-181/PGC-1, except that Engine GE-12-G has been substituted for Engine GE-12-F and Engine Generator PU-181A/PGC-1 may be equipped with either Generator GN-51-C or Generator GN-51-D.

*b.* Engine GE-12-F is * * * at 3,600 rpm. **The over-all length of Engine GE-12-G is slightly greater than that of Engine GE-12-F because of the use of the self-shielded and self-suppressed spark plug.**

*c.* (Superseded). Generators GN–51–C and GN–51–D are single-phase, 60-cycle units of the revolving-field type. They are coupled to the engine by means of a male spline on the end of the engine crankshaft and a splined, flexible coupling. The electrical characteristics of these two generators are identical, and they may be interchanged as complete assemblies. When replacing parts, check the parts list carefully since all parts are not interchangeable.

***Caution*** (Added). Some of the equipment supplied on Order Nos. 13179–Phila–51 and 7106–Phila–51 is supplied with Generator GN–51–C; the balance of the equipment is supplied with Generator GN–51–D. Always check the generator name plate to determine which generator is used and which instructions to follow when working on the electrical components of Engine Generator PU–181A/PGC–1.

* * * * * * *

*g.* Rescinded.

## 6. Tabular Data

*a.* Weights and Dimensions (Superseded).

| Item | Height (in.) | Width (in.) | Length (in.) |
|---|---|---|---|
| Engine Generator PU–181/PGC–1 | 12 13/16 | 15¼ | 17¼ |
| Engine Generator PU–181A/PGC–1 (with Generator GN–51–C) | 12 13/16 | 15¼ | 18¼ |
| Engine Generator PU–181A/PGC–1 (with Generator GN–51–D) | 12 13/16 | 16 | 18¼ |
| Generator GN–51–C | 6 | 6 | 7¾ |
| Generator GN–51–D | 6 | 6 | 8 |
| Engine GE–12–F | 9½ | 13¼ | 16½ |
| Engine GE–12–G | 9⅝ | 8½ | 17¼ |
| Case CY–739/PGC–1 | 19¼ | 16⅜ | 19¾ |
| Case CY–739A/PGC–1 | 20¼ | 17⅜ | 20¼ |
| Bag CW–191/PGC–1 | 13 | 14½ | 18 |

* * * * * * *

*c.* Condensed Table of Specifications.

(1) *Engine.*

* * * * * * *

*Note* (Added). With the exception of the spark plug, all of the above specifications apply to Engine Generators PU–181/PGC–1 and PU–181A/PGC–1. The spark plug used on Engine Generator PU–181A/PGC–1 is a Champion XE–J 11, 14-mm, self-shielded type.

(2) *Generator.*

* * * * * * *

*Note* (Added). The PU–181A/PGC–1 uses Generator GN–51–D (Franklin Electric Co.). All electric characteristics of Generators GN–51–C and GN–51–D are the same.

*d.* SPARE PARTS (fig. 8). The following running * * * of the case.

* * * * * * *

*Note* (Added). No suppressor is supplied with Engine Generator PU-181A/PGC-1. This unit is equipped with a self-shielded spark plug which is self-suppressed.

*e.* TOOLS (fig. 9). The following tools * * * of the case:

| Quantity | Item |
|---|---|
| * | * |
| 1 | Wrench double-end box, ½–9/16. |
| 1 | **Wrench, open-end, 3/8–7/16.** |

## 8. Uncrating and Unpacking, Domestic Shipment

* * * * * * *

## 8.1. Uncrating and Unpacking, Export Shipment
(Added)

*a.* Engine Generators PU–181/PGC–1 and PU–181A/PGC–1 are shipped in Case CY–739/PGC–1 and CY–739A/PGC–1, respectively. The engine generator is processed and mounted on the base of the case. The engine flywheel and the carburetor are secured with corrugated fiberboard pads to prevent movement; the required amount of dessicant, in bags, is tied within the tubular frame of the unit. The rubberized bag (Bag CW–191/PGC–1), tools, and spare parts are packed within the top section of the case. This section of the case is placed over the unit and secured to the base by means of snap latches.

*b.* The top, corners, and bottom of the case are protected with corrugated fiberboard pads, and the case then is placed in a fiberboard carton. This carton is inclosed in a moisture-vaporproof barrier. The complete equipment then is placed in a waterproof outer carton. This entire packing assembly then is placed in a wooden packing case which is bound with metal strapping. The packaging of equipment for export is illustrated in figure 10.1.

*c.* To unpack equipment which is export packed, cut the metal straps; withdraw the nails that secure the top of the case and lift the equipment from the case. Carefully open the outer carton, the moisture-vaporproof barrier, and the inner carton, and lift out the shipping case which contains the equipment. Release the snap fasteners and remove the top section of the case. Carefully inspect the equipment for possible damage and check the contents of the case against the packing list. If any unsatisfactory condition is

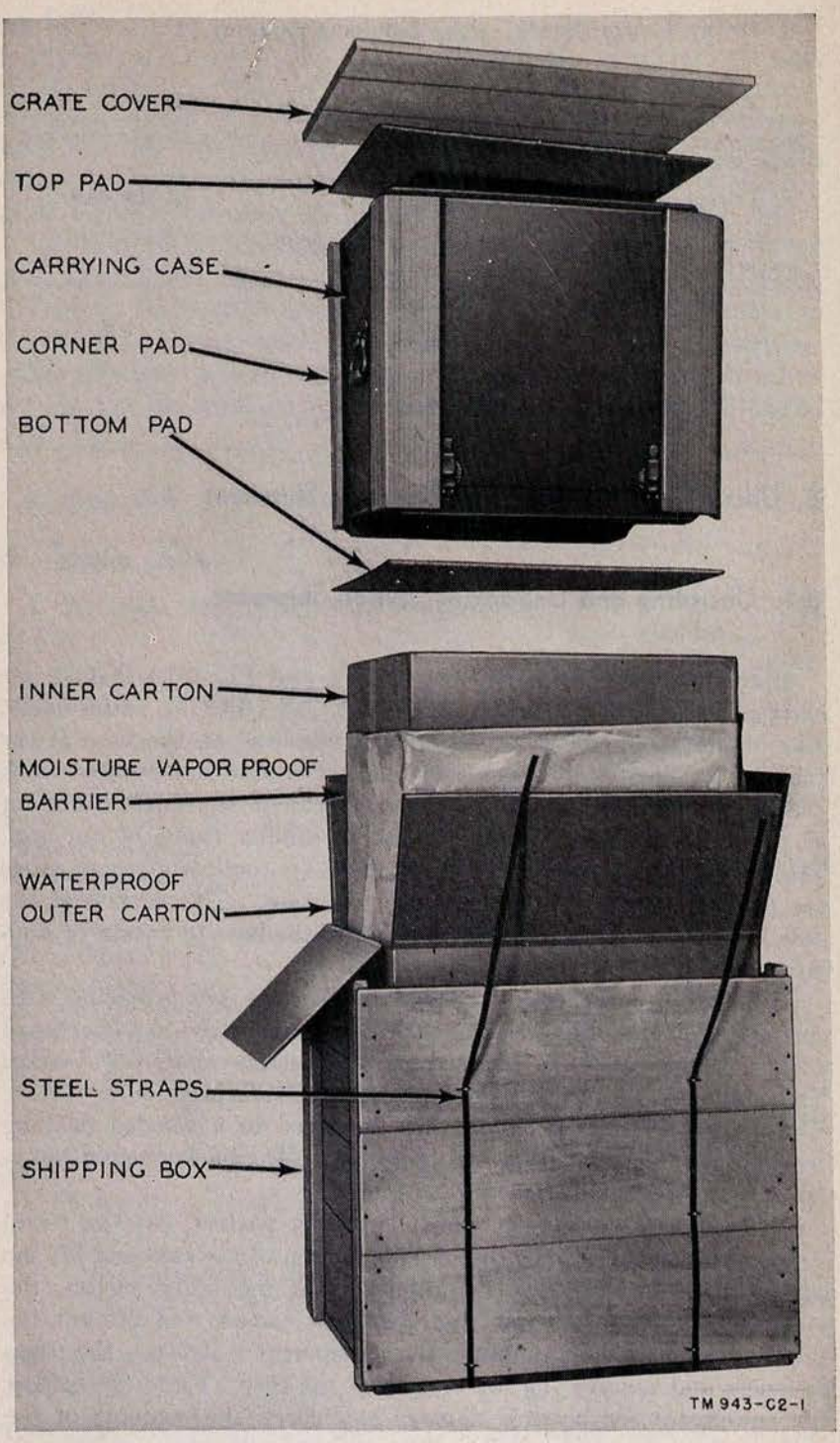


*Figure 10.1* (Added). *Engine Generator PU–181A/PGC–1, export packing.*

found, fill out and forward DD Form 6 in accordance with SR 745–45–5/AFR 71–4.

*d.* The spare parts have been processed and wrapped to protect them against corrosion and damage. Each package is labeled clearly. Do not open the packages containing the spare parts until the parts are to be used.

## 31. Routine Lubrication

*a.* LUBRICATION ORDERS. Lubrication orders are * * * an earlier date. **The lubrication order for the equipment covered in this technical manual is reproduced in figure 48.**

* * * * * * *

## 53. Trouble Charts

* * * * * * *

*c.* ENGINE OVERHEATS AND LACKS POWER.

| Possible cause | Check | Remedy | Par. ref |
|---|---|---|---|
| * | * | * | * |
| Wrong type of spark plug. | Spark plug_____ | Use Champion J–11 or equivalent **for PU–181/PGC–1.** **Use Champion XE–J 11 for PU–181A/PGC–1.** | 74 |
| * | * | * | * |

* * * * * * *

*j.* INTERFERENCE WITH NEARBY RADIO.

| Possible cause | Check | Remedy | Par. ref |
|---|---|---|---|
| * | * | * | * |
| Magneto-cam ground brush not seating. | Magneto-cam ground brush. | Loosen or replace____ | 85*e* |
| **Defective spark plug___** | **Spark plug_____** | **Replace spark plug__** | **74** |

## 59. Engine Disassembly

* * * * * * *

*c.* IGNITION CABLE—SPARK PLUG—BAFFLE PLATE.

* * * * * * *

*c.1* (Added). ENGINE GE–12–G, SPARK PLUG AND IGNITION SHIELDING (fig. 23.1). Unscrew the ignition cable shielding nut from

the shielded spark plug. Be careful not to lose or damage the contact insert in the end of the shielded cable. Use the special spark plug wrench provided in the tool kit and remove the spark plug from the cylinder head.

* * * * * * *

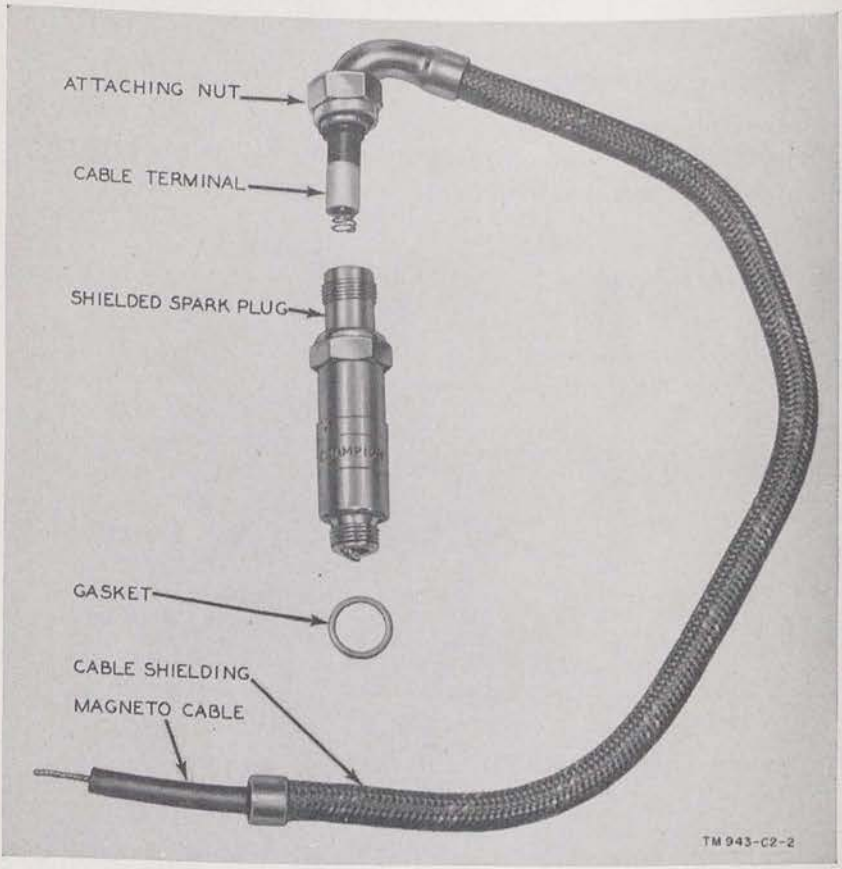


*Figure 23.1* (Added). *Engine GE–12–G, spark plug and shielding assembly.*

## 71. Carburetor

* * * * * * *

*d.* Float Setting (fig. 36). To check the float setting, proceed as follows:

* * * * * * *

## 103. Suppression Equipment

Engine Generator PU–181/PGC–1 * * * or replacing parts.

*Note* (Added). Engine Generator PU–181A/PGC–1 is equipped with a Champion XE–J 11, self-shielded spark plug.

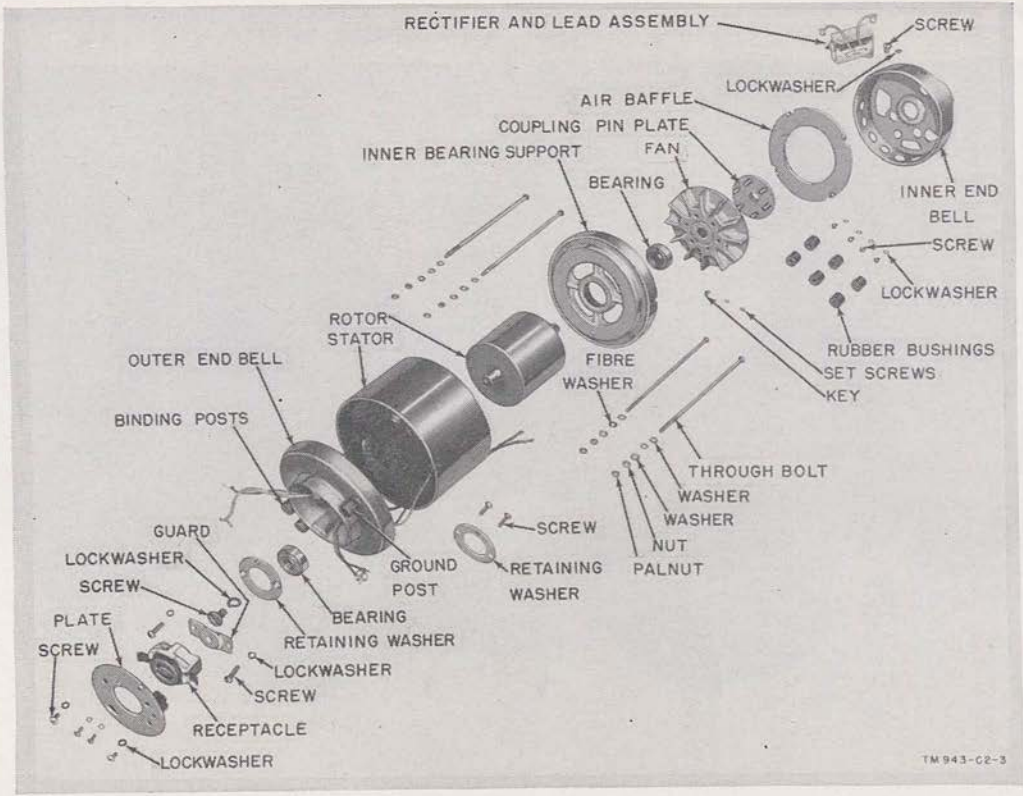


*Figure 30.1* (Added). *Generator GN–51–D, exploded view.*

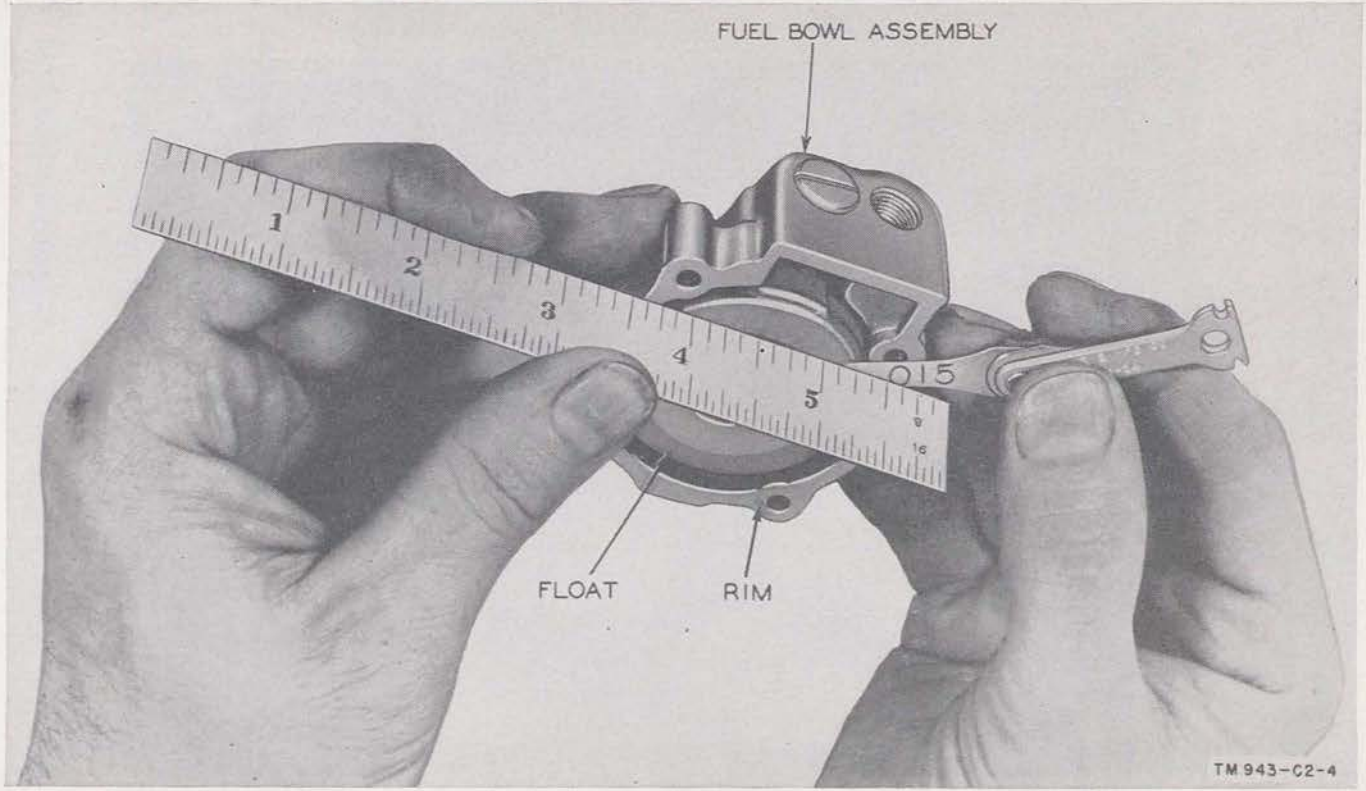


*Figure 36* (Superseded). *Carburetor float-level adjustment.*

## 104. Type and Location of Components

The type and * * * are as follows:

* * * * * * *

*Note* (Added). No separate resistor is required in the high-tension spark plug lead on Engine Generator PU-181A/PGC-1. This unit is equipped with a self-shielded and self-suppressed spark plug.

**LUBRICATION ORDER** LO 11-947

(Supersedes LO 11-947, 15 Sept 47)

# POWER UNITS PE-210 & PE-210-A
# POWER UNITS PE-214-B & PE-214-C
# POWER UNIT PU-181/PGC-1

**References:** TM 11-947 and TM 11-945

Clean parts with SOLVENT, dry cleaning, or Oil, fuel, Diesel.

Interval — Lubricant

Each Refill — **OE** FUEL TANK

Fuel mixture shall consist of ½ pint of OE to each gallon of gasoline. Oil measure is integral part of each fuel tank cap. Two different size caps are used. Measuring cups are either two inches deep or four inches deep. Use four small cups full of OE to each gallon of gasoline or two large cups full of OE to each gallon of gasoline. Mix oil and gasoline THOROUGHLY in separate container before pouring into fuel tank. Fuel tank capacity is 1 gallon.

CAUTION: Never use gasoline to which oil has not been added. Open fuel tank vent cock before starting engine.

**KEY**

**OE—OIL**, engine, OE 10. All temperatures.

**NOTE**

DO NOT LUBRICATE—
Generator Bearings,
Carburetor Air Cleaner.

Copy of this lubrication order will remain with the equipment at all times; instructions contained herein are mandatory and supersede all conflicting lubrication instructions dated prior to the date of this lubrication order.

BY ORDER OF THE SECRETARY OF THE ARMY:
J. LAWTON COLLINS
Chief of Staff, United States Army

OFFICIAL:
EDWARD F. WITSELL
Major General
The Adjutant General

TM 943-C2-5

*Figure 48* (Added). *Facsimile of Lubrication Order LO 11-947.*

# APPENDIX III

# IDENTIFICATION TABLE OF PARTS FOR ENGINE GENERATOR PU-181/PGC-1

* * * * * * *

# APPENDIX IV

# IDENTIFICATION TABLE OF PARTS FOR ENGINE GENERATOR PU-181A/PGC-1

(Added)

*Note.* The following parts replace parts of similar name and description which appear in the identification table of parts for Engine Generator PU-181/PGC-1. Otherwise all parts listed in appendix III for Engine Generator PU-181/PGC-1 are the same for Engine Generator PU-181A/PGC-1.

| Name of part and description | Function of part | Signal Corps stock No. |
|---|---|---|
| ENGINE GENERATOR: Engine Generator PU-181A/PGC-1; 300 w at 100% pf; 120/240 v; single phase; 60 cyc ac; shock mtd in unit frame. | Power supply for Signal Corps communication equipment. Part of Teletypewriter Set AN/PGC-1. | 3H1927-181A |
| ENGINE, gasoline: complete Engine GE-12-G; 1.25 hp at 3600 rpm; 1 cyl, 2 cyc, horiz; 2" bore x 1½" stroke; air cooled; flywheel magneto ignition; manual starting, rope; elec governor. | Provides power to drive generator. | 3H1912G |
| GENERATOR, ac: Generator GN-51-D; 300-w output at 3600 rpm; 100% pf; 120/420 v; single phase; 60 cyc; 2 wire; direct drive. | Generates 60-cycle ac | 3H2351D |
| CASE: Case CY-739A/PGC-1 | Covering for engine generator. | 3H772-739A |
| FITTING, pipe: 45° street elbow; ⅛" male to ⅛" female IPS; Weatherhead #3350X2. | Fuel line extension to fuel tank. | 6Z3888-107 |
| HUB: driven half of flexible coupling; JMCO #3019. | Couples generator to engine. | 3H2551-8 |
| PLUG, spark: mach thd, 14 mm; hot type; 13/16" hex.; Champion XE-J 11. | Means for introducing spark into combustion chamber. | 3H1912-8.1 |
| SHIELD, cable: c/o Titeflex #153-1864 conduit, terminal #36927, and 7-mm cable; Titeflex #B-38443. | Shielding for ignition cable and conductor for high-tension ignition current. | 3H5240.3-2 |

[AG 412.5 (5 Oct 51)]

By order of the Secretary of the Army:

Official:
WM. E. BERGIN
*Major General, USA*
*The Adjutant General*

J. LAWTON COLLINS
*Chief of Staff, United States Army*

Distribution:

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For explanation of distribution formula, see SR 310–90–1.



U. S. GOVERNMENT PRINTING OFFICE: 1951

Changes in force: C 2, C 3, C 4, and C 5



TM 11-943
*C 5

# ENGINE GENERATORS PU-181/PGC-1 AND PU-181A/PGC-1 AND POWER UNIT PE-214-D

CHANGE NO. 5

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *25 October 1963*

TM 11-943, 9 April 1951, is changed as follows:

Note. The parenthetical reference to previous Changes (example: "page 5 of C 2") indicates that pertinent material was published in that change.

Page 1. Add paragraph 1.1.

## 1.1. Index of Publications

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment. DA Pam 310-4 is an index of current technical manuals, technical bulletins, supply bulletins, lubrication orders, and modification work orders that are available through publications supply channels. The index lists the individual parts (-10, -20, -35P, etc.) and the latest changes to and revisions of each equipment publication.

Delete paragraph 2 and substitute:

## 2. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions in TM 38-750.

b. Report of Damaged or Improper Shipment. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58 (Army), NAVSANDA Publication 378 (Navy), and AFR 71-4 (Air Force).

*This change supersedes C 1, 28 May 1951.

c. Reporting of Equipment Manual Improvements. The direct reporting, by the individual user, of errors, omissions, and recommendations for improving this manual is authorized and encouraged. DA Form 2028 (Recommended Changes to DA Technical Manual Parts Lists or Supply Manual 7, 8, or 9) will be used for reporting these improvements. This form will be completed in triplicate using pencil, pen, or typewriter. The original and one copy will be forwarded direct to—Commanding Officer, U.S. Army Electronics Materiel Support Agency, ATTN: SELMS-MP, Fort Monmouth, N.J., 07703. One information copy will be furnished to the individual's immediate supervisor (officer, noncommissioned officer, supervisor, etc.).

Page 23, chapter 3 (page 3 of C 3).

Delete sections I, II, and III and substitute:

## Section I. OPERATOR'S MAINTENANCE

### 25. Scope of Operator's Maintenance

The maintenance duties assigned to the operator of the equipment are listed below together with a reference to the paragraphs covering the specific maintenance functions. The tools required are listed in appendix VII.

a. Daily preventive maintenance checks and services (par. 28).

b. Weekly preventive maintenance checks and services (par. 29).

c. Cleaning (par. 30).

### 26. Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to assure that the equipment is serviceable.

a. Systematic Care. The procedures given in paragraphs 28, 29, and 30 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services charts (pars. 28 and 29) outline functions to be performed at specific intervals. These checks and services are to maintain Army electronic equipment in a combat serviceable condition; that is, in good general (physical) condition and in good

operating condition. To assist operators in maintaining combat serviceability, the charts indicate what to check, how to check, and what the normal conditions are; the References column lists the illustrations, paragraphs, or manuals that contain supplementary information. If the defect cannot be remedied by the operator, higher echelon maintenance or repair is required. Records and reports of these checks and services must be made in accordance with the requirements set forth in TM 38-750.

## 27. Preventive Maintenance Checks and Services Periods

Preventive maintenance checks and services of the equipment are required daily and weekly.

a. Paragraph 28 specifies the checks and services that must be accomplished daily and under the conditions listed below.

(1) When the equipment is initially installed.
(2) When the equipment is reinstalled after removal for any reason.
(3) At least once each week if the equipment is maintained in standby condition.

b. Paragraph 29, specifies additional checks and services that must be performed on a weekly basis.

## 28. Daily Preventive Maintenance Checks and Services Chart

| Sequence No. | Item | Procedure | References |
|---|---|---|---|
| 1 | Exterior surfaces ..... | Clean exterior surfaces of grease, oil, and dirt. | Par. 30. |
| 2 | Equipment .. | Inspect to see if the equipment has been tampered with or damaged. | |
| 3 | Fuel ..... | Check fuel supply, and add fuel as needed. | Par. 14. |
| 4 | Leaks ..... | Inspect fuel lines for leaks. | Par. 16. |
| 5 | Controls | While making operating checks (item 6) observe that the mechanical action of manual controls on the equipment are free of external or internal binding. | Par. 15. |

| Sequence No. | Item | Procedure | References |
|---|---|---|---|
| 6 | Operation ... | Operate the equipment. During operation, be alert for any unusual signs or conditions. | Pars. 16-24. |

## 29. Weekly Preventive Maintenance Checks an and Services Chart

| Sequence No. | Item | Procedure | References |
|---|---|---|---|
| 1 | Cable shielding ..... | Inspect cable shielding for cracks, frayed shielding, and loose connections. | Fig. 23. |
| 2 | Handles and latches (PU-181(*)/ PGC-1 only) | Inspect handles and latches on the case for looseness. Replace or tighten as necessary. | Par. 3e and fig. 3. |
| 3 | Metal surfaces ..... | Inspect exposed metal surfaces for rust and corrosion. Clean as required. | Par. 30. |
| 4 | Pulley ..... | Inspect the pulley for wear, rough surfaces, or loose mounting. Clean off oil and grease. | Fig. 2 and par. 17. |
| 5 | Fuel tank, cap, and gasket. | Inspect the fuel tank for insecure mounting. Inspect the fuel tank cap gasket; inspect the fuel tank strainer for dirt and defects. | Fig. 5. |
| 6 | Output posts. | Inspect the output posts on the generator for tightness. | Fig. 5. |

## 30. Cleaning

Inspect the exterior of the equipment. The exterior surfaces should be clean, and free of dust, dirt, grease and fungus.

a. Remove dust and loose dirt with a clean soft cloth.

Warning: Cleaning compound is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame or while equipment is operating.

b. Remove grease, fungus, and ground-in dirt from the equipment and the case; use a cloth dampened (not wet) with cleaning compound (Federal stock No. 7930-395-9542).

c. Remove dirt and carbon from the spark plugs with a brush.

d. Clean the exterior surfaces of the equipment; use a soft clean cloth. If dirt is difficult to remove, dampen the cloth with water; mild soap may be used for more effective cleaning.

## Section II. ORGANIZATIONAL MAINTENANCE

### 31. Scope of Organizational Maintenance

a. This section contains instructions covering second echelon maintenance of the equipment. It includes instructions for performing preventive and periodic maintenance services and repair functions to be accomplished by the organizational repairman.

b. Second echelon maintenance of the equipment includes:

(1) Preventive maintenance (pars. 34 - 38).

(2) Adjustment of magneto and governor (par. 95).

### 32. Tools, Materials, and Test Equipment Required

A list of parts authorized for second echelon maintenance appears in appendix VI (page 1 of C 4). The tools, materials, and test equipment required for organizational maintenance are listed below.

a. Tools.

(1) Dresser, contact points.

(2) Knife TL-29.

(3) Tool set, general mechanics.

(4) Wrench, Allen type 3/32 inch.

b. Materials.

(1) Cleaning compound (Federal stock No. 7930-395-9542).

(2) Cleaning cloth.

(3) Fine sandpaper.

c. Test Equipment.

(1) Multimeter AN/URM-105.

(2) Test Set, Electrical Power AN/URM-100.

### 33. Organizational Preventive Maintenance

a. Preventive maintenance is the systematic care, inspection, and servicing of equipment to maintain it in serviceable condition, prevent breakdowns, and assure maximum operational capability. Preventive maintenance is the responsibility of all echelons concerned with the equipment

and includes the inspection, testing, and replacement of parts, subassemblies, or units that inspection and tests indicate would probably fail before the next scheduled periodic service. Preventive maintenance checks and services of the equipment at the second echelon level are made at monthly and quarterly intervals unless otherwise directed by the commanding officer.

b. Maintenance forms and records to be used and maintained in this equipment are specified in TM 38-750.

## 34. Monthly Maintenance

Perform the maintenance functions indicated in the monthly preventive maintenance checks and services chart (par. 35) once each month. A month is defined as approximately 30 calendar days of 8-hour-per-day operation. If the equipment is operated 16 hours a day, the monthly preventive maintenance checks and services should be performed at 15-day intervals. Adjustment of the maintenance interval must be made to compensate for any unusual operating conditions. Equipment maintained in a standby (ready for immediate operation) condition must have monthly preventive maintenance checks and services performed on it. Equipment in limited storage (requires service before operation) does not require monthly preventive maintenance.

## 35. Monthly Preventive Maintenance Checks Services and Services Chart

| Sequence No. | Item | Procedure | References |
|---|---|---|---|
| 1 | Tools..... | Inspect the condition of tools. Thoroughly clean the tools and tool box. | App. VI & par. 38. |
| 2 | Cylinder head, muffler, exhaust pipe. | Inspect the cylinder head, muffler and exhaust pipe for cracks, leaks, and defective gaskets. | Figs. 2, 15, and 16. |
| 3 | Hareware ... | Tighten or replace all loose or missing hardware. | Fig. 46. |
| 4 | Carburetor .. | Inspect carburetor for leaks, insecure mounting, unsatisfactory operation, or defective gasket. | Par. 5d, figs. 5 and 31. |

| Sequence No. | Item | Procedure | References |
|---|---|---|---|
| 5 | Air cleaner .. | Inspect the air cleaner for excess dirt or grit, remove and clean the air cleaner if necessary. | Pars. 62 & 72 & figs. 10 & 31. |
| 6 | Governor and linkage | Inspect the governor for insecure mounting. Inspect linkage and connections to see that they are not excessively worn, do not bind, and are properly adjusted. | Pars. 2f & 95. |
| 7 | Spark plugs . | Inspect spark plug for insecure installation and leakage around the spark plug gasket. Remove the spark plug and inspect for cracked insulation, excessive carbon deposits, and burnt electrodes. Clean spark plug with a spark plug cleaner. | Par. 20 & figs. 2 & 14. |
| 8 | Magneto .... | Inspect the magneto for insecure mounting and check the breaker points for improper alignment and adjustment. Inspect the capacitor for damaged lead and insecure mounting. | Pars. 91 & 92 & figs. 33 & 45. |
| 9 | Generator ... | Inspect the generator for insecure mounting. Check generator output according to par. 56. There should be no evidence of excessive arcing. | |
| 10 | Stop switch | Inspect the stop switch for dirt, loose connection, and insecure mounting. | Par. 21 & figs. 11 & 46. |

## 36. Quarterly Maintenance

Quarterly preventive maintenance checks and services on the equipment are required. Periodic weekly and monthly services constitute a part of the quarterly preventive maintenance checks and services and must be performed concurrently. All deficiencies or shortcomings will be recorded in accordance with the requirements of TM 38-750. Perform all the checks and services listed in the quarterly preventive maintenance checks and services chart (par. 37) in the sequence listed.

## 37. Quarterly Preventive Maintenance Checks and Services Chart

| Sequence No. | Item | Procedure | References |
|---|---|---|---|
| 1 | Publications . | See that all publications are complete, serviceable, and current. | DA Pam 310-4. |
| 2 | Modifications | Check DA Pam 310-4 to determine if new applicable MWO's have been published. All URGENT MWO's must be applied immediately. All NORMAL MWO's must be scheduled. | TM 38-750 & DA Pam 310-4. |
| 3 | Spare parts .. | Check all spare parts (operator and organizational) for general condition and method of storage. There should be no evidence of overstock, and all shortages must be on valid requisitions. | App. VII & TM 11-2805-200-10P, |
| 4 | Preservation | Check all surfaces for evidence of fungus. Remove rust and corrosion and spot-paint bare spots. | Par. 38 & TM 9-213. |
| 5 | Mounting ... | See that all bolts, nuts, and washers are correctly positioned and properly tightened. Check for cracked, bent, or broken frame. | |
| 6 | Bag CW-191/ PGC-1, case CY-739(*)/ PGC-1, (PU-181 (*)/PGC-1 only). | Inspect bag for mildew, rot, tears, and fraying material. Inspect case for splintering, holes. Remove rust and corrosion and spot-paint bare spots. | Figs. 3 & 4 & par. 5g. |

## 38. Touchup Painting Instructions

Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TM 9-213.

Page 93, Delete appendix I and substitute:

# APPENDIX I

## REFERENCES

Following is a list of applicable references available to the operator and unit repairman of the equipment.

| | |
|---|---|
| DA Pam 310-4 | Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders. |
| TM 9-213 | Painting Instructions for Field Use. |
| TM 11-2805-200-10P | Operator Maintenance Repair Parts and Special Tools List: Engine GE-12B -C, -D, -E, -F, and -G. |
| TM 11-6625-203-12 | Operation and Organizational Maintenance: Multimeter AN/URM-105, Including Multimeter ME-77/U. |
| TM 38-750 | The Army Equipment Record System and Procedures. |

By Order of the Secretary of the Army:

EARLE G. WHEELER,
*General, United States Army,*
*Chief of Staff.*

Official:

J. C. LAMBERT,
*Major General, United States Army,*
*The Adjutant General.*

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NG: State AG (3); units — same as Active Army except allowance is one copy to each unit.
USAR: None.
For explanation of abbreviations used, see AR 320-50.

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