

# TM 5-6115-200-20

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

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ORGANIZATIONAL MAINTENANCE

GENERATOR SET

GASOLINE ENGINE: 3 KW, AC

120 V, 1 AND 3 PHASE

120/240 V, SINGLE PHASE

120/208 V, 3 PHASE

60 CYCLE; SKID MOUNTED

(HOLLINGSWORTH MODEL JHGW3A)

FSN 6115-649-8916



*HEADQUARTERS, DEPARTMENT OF THE ARMY*  
*MAY 1960*



## SAFETY PRECAUTIONS

Always disconnect the ignition cable from the spark plug before working on the engine or generator. This precaution will guard against accidental starting and possible injury to personnel.

Do not fill the fuel tank while the engine is in operation. Gasoline spilled on a hot engine may explode and cause serious injury. When filling the fuel tank, always provide a metal-to-metal contact between the container and fuel tank. This will prevent a spark from being generated as gasoline flows over the metallic surfaces.

Do not operate the generator set with the air shroud or cover removed. Such operation will prevent proper air cooling and will result in overheating and serious damage to the engine.

Never operate the generator set in an enclosed area unless the exhaust gases are piped to the outside. Exhaust gases contain carbon monoxide, which is a poisonous, odorless, and colorless gas.

The fumes developed by the chemical reaction of heat and carbon tetrachloride are deadly. Be careful not to inhale these fumes. Exercise extreme caution when extinguishing fires on or around the generator set in unventilated or confined areas.

See that the generator set is properly grounded before operating. Serious, possibly fatal, shock may result from contact with components carrying current during operation, especially when the unit or surrounding area is damp or wet.

Do not attempt to work on the control box while the generator set is operating.

TECHNICAL MANUAL }  
 No. 5-6115-200-20 }

HEADQUARTERS  
 DEPARTMENT OF THE ARMY  
 WASHINGTON 25, D. C., 2 May 1960

GENERATOR SET, GASOLINE ENGINE: 3 KW, AC, 120 V, 1 AND 3 PHASE, 120/240 V,  
 SINGLE PHASE, 120/208 V, 3 PHASE, 60 CYCLE; SKID MOUNTED,  
 (HOLLINGSWORTH MODEL JHGW3A) FSN 6115-649-8916

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# CHAPTER 1

## INTRODUCTION

### Section I. GENERAL

#### 1. Scope

*a.* This manual is published for the use of the personnel to whom the Hollingsworth Model JHGW3A generator set is issued. It contains information on organizational maintenance of the equipment, its accessories, and auxiliaries. This manual also provides instructions on shipment and limited storage.

*b.* Appendix I, References, contains a list of publications applicable to this manual. Appendix II contains the maintenance allocation chart. The organizational maintenance repair parts are contained in TM 5-6115-200-20P.

*c.* Request any recommendations for changes, additions, deletions, and other corrections for the improvement of this manual, be forwarded by letter to the Commanding General, U. S. Army Engineer Maintenance Center, Corps of Engineers, P. O. Box 119, Columbus 16, Ohio, ATTN: EMCJM. Direct communication is authorized.

#### 2. Organizational Maintenance Record and Report Forms

The following record and report forms are used by organizational maintenance personnel for recording and reporting maintenance operations.

*a.* DA Form 5-22 (Unserviceable Part Identification Tag)

*b.* DA Form 5-31 (Shop Job Order Register)

*c.* DA Form 5-73 (Record of Engineer Equipment Requiring Repair Parts Support)

*d.* DA Form 5-73a (Change to Record of Engineer Equipment Requiring Repair Parts Support)

*e.* DA Form 5-77 (Equipment Data Work Sheet for Engineer Supplies and Equipment)

*f.* DA Form 9-79 (Parts Requisition)

*g.* DA Form 55-169 (Daily Dispatching Record of Motor Vehicles)

*h.* DA Form 348 (Driver Qualification Record)

*i.* DA Form 460 (Preventive Maintenance Roster)

*j.* DA Form 464 (Work Sheet for Preventive Maintenance and Technical Inspection of Engineer Equipment)

*k.* DA Form 468 (Unsatisfactory Equipment Report)

*l.* DA Form 478 (Organizational Equipment File)

*m.* DA Form 811 (Work Request and Job Order)

*n.* DA Form 1115 (Property Turn-In Tag)

*o.* DA Form 1546 (Request for Issue or Turn-In)

*p.* DD Form 6 (Report of Damaged or Improper Shipment)

### Section II. DESCRIPTION AND DATA

#### 3. Description

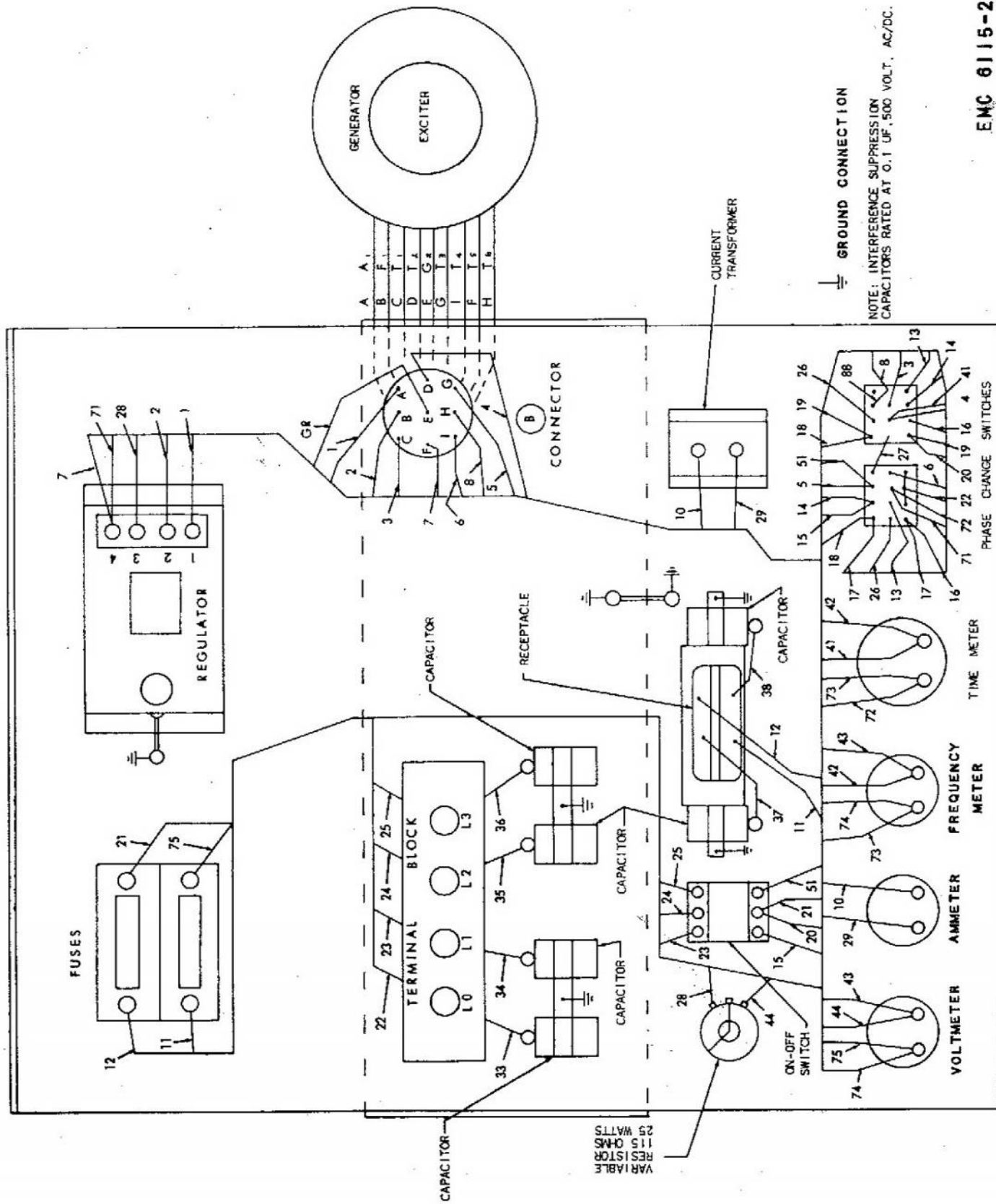
A general description and illustrations of the generator set are contained in TM 5-6115-200-10. A more detailed description of the specific components is provided in the applicable maintenance sections of this manual.

#### 4. Identification

The identification plates that are mounted on the major components of this generator set are described, located, and illustrated in TM 5-6115-200-10. One identification plate, mounted on the left side of the magneto, lists the manu-







EMC 6115-200-20/2

Figure 2. Practical wiring diagram.





## CHAPTER 2

### INSTALLATION AND OPERATING INSTRUCTIONS

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#### Section I. SERVICE UPON RECEIPT OF EQUIPMENT

#### 7. Unloading New Equipment

*a. General.* The generator set is packed completely assembled in a wooden crate and is secured to the base of the crate with four bolts. The bottom of the crate is constructed to form a skid which can be used for sliding the generator set short distances.

*b. Crated.* Remove any tiedown cables and blocking. The base of the crate is adaptable to handling by either sling hoist, rollers, or fork-lift.

*c. Uncrated.* Remove any tiedown cables and blocking. Lift the generator set by the skid frame or slide the generator set on the skid frame.

#### 8. Unpacking New Equipment

Before unpacking, place the generator set as near as possible to its intended operating location. Remove the top and one end of the crate and untie the ropes that secure the canvas cover around the base of the crate. Slide the generator set from the crate. Remove the canvas cover from the generator set.

**Caution:** Exercise extreme care in the use of bars, hammers, and similar tools while uncrating to avoid damaging the equipment.

#### 9. Removal of Protective Material and Devices

Remove all protective tape from the exhaust outlet, air cleaner, fuel tank cap, and the blow-torch.

#### 10. Inspection and Servicing of New Equipment

*a. Inspection.* Make a thorough investigation of the generator set for possible damage incurred during shipment or unloading. Inspect fuel lines for cracks and tight connections.

Replace or tighten missing or loose nuts, bolts, and screws. Refer to paragraph 15 for preventive maintenance services as a guide for inspecting the generator set. Report to field maintenance any deficiencies that cannot be corrected.

#### *b. Servicing.*

- (1) Perform the before-operation services described in TM 5-6115-200-10.
- (2) Lubricate the generator set in accordance with the current lubrication order.
- (3) Perform the preventive maintenance services described in paragraph 15.
- (4) See that the fuel tank is filled with the proper grade of gasoline.

**Warning:** Always provide a metal-to-metal contact between the fuel tank and container when pouring fuel into the fuel tank.

#### 11. Installation or Setting-Up Instructions

*a. Location.* Avoid muddy, sandy, or dusty locations if possible. A base plan is given in figure 1.

*b. Leveling.* The generator set will operate while on a slight angle, but must be as nearly level as possible at all times. Position blocks or planks under the unit, if necessary, to obtain proper leveling.

*c. Indoor Installation.* If the unit is to be operated within a vehicle or building, be sure that adequate ventilation is provided and that the exhaust is piped to the outside. Use as few bends as possible in the exhaust line and see that all connections are tight. At least 2 feet of space should be provided on each side of the unit.



**Warning:** If the generator set is to be operated within an enclosed area, exhaust gases must be piped to the outside and sufficient ventilation be made available.

*d. Grounding.* Ground the generator set as instructed in TM 5-6115-200-10. Pay particu-

lar attention to the warning note contained in the instructions.

*e. Load Connections.* Make the generator set load connection as in TM 5-6115-200-10.

*f. Servicing.* Service the generator set as directed in paragraph 10.

## Section II. MOVEMENT TO A NEW WORK SITE

### 12. Dismantling for Movement

#### *a. Preparation for Movement.*

- (1) Prepare the unit for movement to a new location as directed in TM 5-6115-200-10.
- (2) Disconnect the extension piping for the exhaust system if the unit has been operating in an enclosed area.
- (3) Remove any anchoring devices.

#### *b. Movement of the Generator Set.*

- (1) If the new location is close by and terrain permits, the unit may be skidded or carried by a forklift.
- (2) For long distance moving, use a suitable lifting device and position the

unit on a carrier. See that the unit is blocked and tied down to prevent movement or shifting.

- (3) Refer to the basic issue items list appearing in TM 5-6115-200-10 for items that should be carefully packed to prevent loss, damage or pilferage during shipment.
- (4) If the unit will be exposed to the weather during shipment, cover with a paulin tied securely.

### 13. Reinstallation After Movement to a New Work Site

Follow the procedures outlined in paragraph 11 for reinstallation.

## CHAPTER 3

### GENERAL MAINTENANCE INSTRUCTIONS

*Note.* No special tools or equipment are needed to perform organizational maintenance on the generator set.

#### Section I. PREVENTIVE MAINTENANCE SERVICES

#### 14. General

*a.* Preventive maintenance is performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equivalent to 3 calendar months or 250 hours of operation, whichever occurs first.

*b.* The preventive maintenance services to be performed at quarterly intervals are listed and

described in paragraph 15. The number opposite each service refers to a corresponding number on DA Form 464 and indicates the services to be performed. The number listed under "Inspection" indicates the minimum inspection requirements for the equipment.

*c.* Lubrication will be as prescribed in TM 5-6115-200-10 and in the lubrication order, LO 5-6115-200-20 (fig. 3).

#### 15. Quarterly Preventive Maintenance

Inspection	Service Quarterly	
1	1	
2	2	
3	3	
4	4	
5	5	
6	6	
7	7	
11	11	

**GENERAL**

*Before-operation services.* Inspect and perform services listed in daily before-operation services (TM 5-6115-200-10).

*Lubrication.* Inspect the generator set for missing or damaged fittings. Inspect the lubricant level in the engine base.

Lubricate the generator set as specified in the current lubrication order (LO 5-6115-200-20). Replace missing or damaged fittings.

*Tools and equipment.* Inspect the condition of tools and equipment assigned to the machine.

See that tools and equipment assigned to the generator set are clean, serviceable, and properly stowed or mounted.

*Fire extinguisher.* Inspect the fire extinguisher for full charge by shaking and judging by sound and weight. Do not discharge the contents. Inspect for corrosion and insecure mounting.

See that all extinguisher defects are corrected or the extinguisher is replaced.

*Publications.* See that a copy of this technical manual TM 5-6115-200-20, the current lubrication order, and DA Form 285 are on, or with the equipment and in serviceable condition.

*Appearance.* Inspect the general appearance of the generator set, paying particular attention to lack of cleanness, illegibility of identification markings, and condition of the paint.

See that all deficiencies noticed are corrected or reported to field maintenance.

*Modification.* See that all available modification work orders applying to the generator set have been completed and recorded on DA Form 478, DA Form 5-73, and DA Form 5-73a, as applicable.

**ENGINE AND ACCESSORIES**

*Cylinder head, manifold, and muffler.* Inspect the cylinder head and intake manifold for leaks, loose mounting screws and nuts, and defective gaskets. Inspect the exhaust muffler and fittings for damage or evidence of leakage.



**LUBRICATION  
ORDER**

# LO 5-6115-200-20

26 FEBRUARY 1960

**GENERATOR SET, GASOLINE ENGINE: 3 KW, AC, 120V, 1 AND 3 PHASE,  
120/240 V, SINGLE PHASE, 120/208 V, 3 PHASE, 60 CYCLE; SKID  
MOUNTED (HOLLINGSWORTH MODEL JHGW3A)  
W/WISCONSIN ENGINE MODEL AENLD**

REFERENCE: SM 10-1-C4-1

Intervals are based on normal operations. Reduce to compensate for abnormal operation and severe conditions. During inactive periods sufficient lubrication must be performed for adequate preservation.

Clean parts with SOLVENT, Dry-cleaning, or with OIL, fuel Diesel. Dry before lubricating. Drain crankcase only when hot after operation; replenish and check level when cool.

- KEY -

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above +32°F	+40°F to -10°F	0°F to -65°F	
OE-OIL, Engine, Heavy Duty					Intervals given are in hours of normal operation.
Crankcase	1 1/2 QT	OE 30 or 9250	OE 10 or 9110	OES	
Air Cleaner	3/16 QT				
OES-OIL, Engine, Subzero					

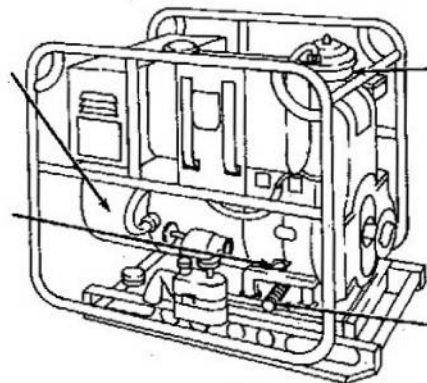
LUBRICANT • INTERVAL

INTERVAL • LUBRICANT

Generator  
(Sealed bearings, no  
lubrication required.)

Crankcase Fill  
and Level Plug  
(Check level.)  
(See key.)

OE 5



5 OE

Air Cleaner  
(Refill oil reservoir to  
level mark; every 50  
hours disassemble entire  
unit, clean, re-oil and re-  
assemble.)  
(See note 2.)

50

Crankcase Drain Plug  
(Drain and refill.)

**NOTES:**

1. FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW -10°F. Remove lubricants prescribed in the key for temperatures above -10°F. Clean parts with SOLVENT, dry-cleaning. Relubricate with lubricants specified in the key for temperatures below -10°F

Copy of this Lubrication Order will remain with the equipment at all times; instructions contained herein are mandatory.

BY ORDER OF WILBER M. BRUCKER,  
SECRETARY OF THE ARMY:

L. L. LEMNITZER  
General, United States Army,  
Chief of Staff

OFFICIAL:

R. V. LEE  
Major General, United States Army,  
The Adjutant General

2: AIR CLEANER. When operating under dusty conditions clean Air Cleaner every 10 operating hours.

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Figure 3. Lubrication order—LO 5-6115-200-20.

Inspection	Service Quarterly	
	11	Tighten any loose nut or screw. Replace a defective cylinder head gasket (par. 58). Replace a defective intake manifold gasket (par. 54). Replace a defective muffler or fitting (par. 63). During the first quarterly servicing of a new or reconditioned engine, inspect all of the cylinder head screws and nuts for looseness after the engine has warmed to operating temperature. Tighten any loose screws to a torque of 32 ft-lb.
12	12	<i>Valve mechanism.</i> Inspect the valve inspection cover and gasket for oil leaks. Measure the valve clearance if excessive valve noise is noticed.
	12	Adjust the valve clearance (par. 55). Replace a damaged valve inspection cover or gasket.
	13	<i>Compression test.</i> Remove the spark plug and insert a compression gage into the spark plug hole. Rotate the engine with the starting rope until a stabilized reading is obtained on the gage. The correct reading is 85 to 95 psi. Record the reading on DA Form 464.
	13	If the compression reading is low, inspect the cylinder head bolts for looseness. Tighten any loose bolts and retest the compression. If low compression persists, the trouble lies with the cylinder head gasket, valves, or piston rings. Replace a faulty cylinder head gasket (par. 58). Measure the valve clearance (par. 55). Report equipment having signs of defective valves or worn piston rings to field maintenance.
14	14	<i>Crankcase and breather.</i> Inspect for leaks around the engine crankcase. Inspect the crankcase breather line for kinks, damaged tubing, and loose fittings.
	14	Tighten any loose fittings on the crankcase breather line. Replace a damaged breather line (par. 57). Correct all oil leaks or report the conditions to field maintenance.
17	17	<i>Fan and air shroud.</i> Inspect the air shroud, flywheel fins, cylinder head, and air shroud cover for signs of accumulated dust or dirt. Inspect the air shroud and cover for dents or obstructions that might restrict the normal flow of air.
	17	Remove the air shroud to repair or to remove any dust and dirt from inside the shroud (par. 62). Clean all dust and dirt from the flywheel and cylinder head vanes. Replace all defective parts that are beyond repair.
18	18	<i>Sheave.</i> Inspect the sheave for cracks, breaks, or looseness on the shaft. Inspect the chamfered pin, which holds the sheave and the nut and shaft extension together, for looseness.
	18	Tighten the nut and shaft extension if it has worked loose on the crankshaft. Replace any defective parts. See that the chamfered pin is tight (par. 59).
20	20	<i>Governor and linkage.</i> Inspect the external governor controls for insecure mounting and loose or excessively worn connections. Inspect the governor controls and linkage for proper functioning while the engine is in operation.
	20	Tighten all loose connections and replace defective or missing parts (pars. 46 and 47). Adjust the governor controls, as required (par. 47). If proper control of the engine cannot be obtained within the range of the governor control lever, report the condition to field maintenance.
33	38	<i>Fuel pump.</i> Inspect the fuel pump for leaks, damage, or loose fittings. Inspect the pump for loose mounting and assembly bolts and screws. Inspect the fuel pump gasket for leaks.
	38	Tighten all loose nuts and screws and replace any damaged fittings. Replace a faulty fuel pump or gasket (par. 42).
39	39	<i>Carburetor and linkage.</i> Inspect the carburetor for loose or missing mounting and assembly bolts and screws. Inspect all connections and gaskets for leaks. Inspect the linkage for free movement and signs of excessive wear or looseness.
	39	Adjust or replace a defective carburetor (par. 45). Tighten or replace missing bolts or screws.
40	40	<i>Fuel strainer.</i> Inspect the fuel strainer for leaks and loose mounting. Inspect the strainer bowl for accumulation of dirt and water. Inspect for cracked or damaged parts and evidence of leakage around connections.
	40	Remove and clean the strainer bowl if it contains dirt or water. Inspect and clean the strainer screen. Tighten any loose connections and replace any defective parts (par. 41).



Inspection	Service Quarterly	
41	41	<i>Air cleaner.</i> Inspect the air cleaner for insecure mounting. Remove the air cleaner (par. 48). Inspect the condition of the cover and filter element. Inspect the oil in the oil cup, paying particular attention to the quality of the oil and its level.
	41	Clean and service the air cleaner in accordance with the current lubrication order. Reassemble and install the air cleaner, being sure that the air cleaner gasket is in place and the oil is at the correct level in the oil cup.
43	43	<i>Fuel tank, cap, and gasket.</i> Inspect the fuel tank for loose mounting screws. Remove the fuel tank cap and fuel strainer (par. 41). Inspect the strainer for dirt and defects. Inspect the cap chain and gasket. The cap should fit securely and the air vent be open. Inspect the tank for leaks.
	43	Replace a leaking or damaged fuel tank (par. 43). Replace a defective fuel tank cap. Clean the strainer. Replace a damaged strainer.
44	44	<i>Fuel lines.</i> Inspect the fuel lines for leaks, loose connections, and damages.
	44	Tighten all loose or leaking connections. Replace or repair damaged fuel lines or tubes (par. 44). Replace all defective fittings.
46	46	<i>Spark plugs.</i> Inspect the installed spark plug for signs of leakage around the gasket. Inspect the ignition cable terminal sleeve for looseness on the spark plug.
	46	Remove and clean the spark plug (par. 50). Inspect for broken insulators or electrodes burned thin. See that the spark plugs and gasket are in good condition. Replace a defective spark plug and gasket. Adjust the electrode gap to 0.030 inch. Torque the spark plug to 24 to 26 ft-lb. See that the ignition cable terminal sleeve fits tightly on the spark plug.
49	49	<i>Magneto.</i> Inspect for loose mounting screws and nuts and evidence of oil leakage around the ignition magneto mounting gasket. Remove the ignition system shield and inspect the condition and setting of the magneto contacts (par. 52). The correct contact gap setting is 0.015 inch.
	49	Tighten loose mounting screws and nuts. Replace a faulty mounting gasket (par. 52). Clean and adjust the magneto contacts. Install new contacts if badly burned or pitted. Remove and clean the magneto vent screens (par. 52). Replace a defective magneto.
53	53	<i>Air heater tube.</i> Inspect the air heater tube for signs of accumulated dust or dirt. Inspect for dents or obstructions that might restrict the normal flow of air.
	53	Remove the air intake heater tube to repair or to remove any dust or dirt (par. 48). Repair or replace all damaged or missing parts.
59	59	<i>Regulator, rheostat.</i> Inspect the voltage regulator and rheostat controls for insecure mounting and improper operation. The voltage regulator should hold a given voltage while the generator set is operating.
	59	Tighten or replace all loose or missing mounting screws. If the voltage regulator does not hold a given voltage, report the deficiency to field maintenance.
84	84	<i>Base and skids.</i> Inspect the generator set skid frame for breaks, cracks, damage, and loose or missing bolts and nuts.
	84	Tighten or replace all loose or missing bolts and nuts. Report a damaged or defective generator set skid frame to field maintenance.
172	172	<i>Armature, commutator, and sliprings.</i> Inspect all visible parts of the exciter and generator for accumulation of grease, dirt, dust, and oil. Inspect the electrical contact brushes for wear and loose wire connections. Inspect for brushes that are chipped, cracked, sticking in holders, or otherwise defective. Inspect the brush springs in the brush holders for unequal pressure. Inspect the commutator for excessive wear, pitting, and high mica between the segments. The mica must be below the surface of the segments. Inspect the sliprings for pitting and excessive wear.
	172	Blow dust and dirt from inside the generator and exciter with compressed air. Clean the commutator, brushes, and sliprings. Replace worn or defective brushes (par. 67). Brushes must be free in their holders and brush wire leads in good condition. See that all connections are tight. Adjust or replace brush holders (par. 68). If the commutator or sliprings are excessively pitted or rough, or if the mica is high between the commutator segments, report the condition to field maintenance.

Inspection	Service Quarterly
174	174
	174
175	175
	175

**Cooling fan.** Inspect the fan for dirt, dust, cracks, or other mechanical damage. Inspect for a loose mounting nut.

Clean the cooling fan. Repair or replace a damaged fan (par. 66). Tighten a loose mounting nut.

**Control panel and instruments.** Inspect all controls and instruments on the front of the control panel for damage or inoperative conditions. Inspect for accumulation of dust and dirt, loose connections, cracked or frayed wiring insulation, corroded terminals, and loose or missing mounting screws and nuts.

**Warning:** When servicing any part of the electrical system or making any connections, be sure the generator set is not in operation.

Blow any accumulated dust and dirt from inside the control box with low-pressure compressed air. Tighten or replace any loose or missing mounting screws and nuts. Repair, replace, or report damaged or defective instruments and wiring to field maintenance.

## Section II. TROUBLESHOOTING

### 16. General

This section provides information useful in diagnosing and correcting operation or failure of the generator set and its components. Each trouble symptom stated is followed by a list of probable causes of trouble. The possible remedy recommended is described opposite the probable cause. Any operational trouble that is beyond the scope of organizational maintenance must be reported to field maintenance, 3d echelon.

### 17. Engine Fails to Start or Is Hard to Start

<i>Probable cause</i>	<i>Possible remedy</i>
Spark plug dirty or damaged	Remove, clean, and inspect the spark plug and adjust the gap (par. 50). Replace if defective.
Fuel lines or tubes clogged	Clean the fuel lines or tubes with compressed air. Replace if defective (par. 44).
Fuel pump defective	Replace the fuel pump (par. 42).
Carburetor out of adjustment or defective	Adjust or replace the carburetor (par. 45).
Magneto contact set out of adjustment	Inspect the magneto contact set and clean and adjust as necessary (par. 52).
Ignition cable defective	Inspect for cracked, broken, or oil soaked insulation. Replace a defective cable (par. 51).
Ignition timing improper	Set the ignition timing (par. 52).

### 18. Engine Misses or Runs Erratically

<i>Probable cause</i>	<i>Possible remedy</i>
Spark plug dirty or damaged	Remove, clean, and inspect the spark plug and adjust the gap (par. 50). Replace if defective.
Ignition cable connections loose or shorted	Tighten all connections and inspect for damaged or defective insulation. Replace a defective cable (par. 51).
Magneto contact set out of adjustment	Clean and adjust (par. 52).
Valve clearance incorrect	Adjust the valve clearance (par. 55).
Carburetor out of adjustment or defective	Adjust or replace the carburetor (par. 45).
Fuel pump defective	Replace the fuel pump (par. 42).
Sediment or water in fuel system	Clean the fuel system.

### 19. Engine Stops Suddenly

<i>Probable cause</i>	<i>Possible remedy</i>
Fuel lines or tubes clogged	Clean the fuel lines or tubes with compressed air. Replace if defective (par. 44).

<i>Probable cause</i>	<i>Possible remedy</i>
Magneto defective or contact set out of adjustment.....	Inspect the contact set and clean or adjust. Replace a defective magneto (par. 52).
Spark plug dirty or damaged.....	Remove, clean, and inspect the spark plug and adjust the gap (par. 50). Replace a defective spark plug.

## 20. Engine Overheats

<i>Probable cause</i>	<i>Possible remedy</i>
Exhaust muffler clogged or defective.....	Clean the muffler. Replace a defective muffler (par. 63).
Ventilation around generator set poor.....	Improve the ventilation.
Air passages clogged or dirty.....	Remove and clean the air shroud, cover, screen, and rim (par. 52).

## 21. Engine Lacks Power

<i>Probable cause</i>	<i>Possible remedy</i>
Carburetor out of adjustment or defective.....	Adjust or replace the carburetor (par. 45).
Governor controls out of adjustment.....	Adjust the governor controls (par. 47).
Poor ignition spark.....	Inspect the spark plug (par. 50). Examine the magneto contact set and clean or adjust (par. 52).
Compression poor.....	Test the compression (par. 15). Adjust the valve clearance (par. 55).

## 22. Engine Noisy

<i>Probable cause</i>	<i>Possible remedy</i>
Valve clearance incorrect.....	Adjust the valve clearance (par. 55).
Carbon in combustion chamber excessive.....	Remove the cylinder head and scrape the carbon from the cylinder head and top of piston (par. 58).
Improper ignition timing.....	Set the ignition timing (par. 52).
Flywheel loose.....	Tighten the flywheel (par. 60).

## 23. Engine Backfires

<i>Probable cause</i>	<i>Possible remedy</i>
Ignition timing improper.....	Set the ignition timing (par. 52).
Intake valve sticking.....	Remove the spark plug and pour a small amount of penetrating oil into the engine block to loosen the valve. -See that sticking valves are freed.

## 24. Exhaust Smoke Excessive

<i>Probable cause</i>	<i>Possible remedy</i>
Carburetor out of adjustment or defective.....	Adjust or replace a defective carburetor (par. 45).

## 25. Ac Generator Fails to Build Up Rated Voltage

<i>Probable cause</i>	<i>Possible remedy</i>
Brushes sticking or worn.....	Clean the brushes and brush holders. Replace any defective brushes (par. 67).
Commutator or sliprings dirty.....	Clean the commutator or sliprings (par. 67).
Residual magnetism lost.....	Restore residual magnetism (par. 67).
Brush spring tension incorrect.....	Adjust brush spring tension (par. 68).

## 26. Ac Generator or Exciter Overheats

<i>Probable cause</i>	<i>Possible remedy</i>
Brush pressure excessive.....	Adjust the brush spring tension (par. 68).
Ventilation covers clogged.....	Clean the ventilation covers.
Generator cooling fan loose or defective.....	Tighten the fan. Replace a defective cooling fan (par. 66).

## 27. Ac Generator Frequency Too High or Too Low

<i>Probable cause</i>	<i>Possible remedy</i>
Governor controls out of adjustment.....	Adjust the governor controls (par. 47).



## 28. Ac Generator or Exciter Brushes Sparking

<i>Probable cause</i>	<i>Possible remedy</i>
Brushes dirty or improperly seated.....	Clean or replace and reseat brushes (par. 67).
Brush pressure weak.....	Adjust the brush spring tension (par. 68).
Commutator or sliprings rough.....	Clean the commutator and sliprings (par. 67).
Brushes not at neutral plane setting.....	Adjust the brush rigging (par. 68).

## 29. Ac Generator Noisy

<i>Probable cause</i>	<i>Possible remedy</i>
Brushes worn or broken.....	Replace worn or broken brushes (par. 67).
Generator cooling fan loose.....	Tighten the generator cooling fan (par. 66).

## 30. Ac Voltage Erratic

<i>Probable cause</i>	<i>Possible remedy</i>
Commutator or sliprings rough.....	Clean the commutator and sliprings (par. 67).
Brush holders loose.....	Tighten and aline the brush holders (par. 67).
Brush contact poor.....	Inspect the brush spring tension. Reseat or replace the brushes (par. 67).
Terminal connections loose.....	Make the connections secure.

## 31. Ac Generator Voltage Drops Under Load

<i>Probable cause</i>	<i>Possible remedy</i>
Brush pressure weak.....	Inspect and adjust the brush spring tension (par. 68).
Brushes dirty or improperly seated.....	Clean or replace and reseat the brushes (par. 67).
Commutator or sliprings rough.....	Clean the commutator and sliprings (par. 67).

## 32. Field Expedient Repairs

Operating troubles may occur while the generator set is operating in the field where supplies and repair parts are not available and normal remedial action cannot be performed. When this condition exists, the expedient remedies listed below may be used only upon the decision of the unit commander. Equipment so repaired must be removed from operation at the earliest possible moment and properly repaired before being placed in operation again.

<i>Trouble symptom</i>	<i>Expedient remedy</i>
Fuel pump defective.....	Bypass the fuel pump (par. 42d).
Brush too short or broken.....	Install a like brush (par. 67d).
Interference suppression capacitors shorted.....	Jump and/or disconnect shorted capacitor (par. 39b).
Ammeter defective.....	Disconnect the leads from the ammeter (par. 70).

**Caution:** Care must be taken to inspect the commutator for sparking and the generator for overheating when the unit is being operated with the ammeter leads disconnected. These symptoms will be the only indications of generator overloading that will be apparent to the operator.

## Section III. RADIO INTERFERENCE SUPPRESSION

### 33. Definitions

a. *Interference.* The term "interference" as used herein applies to electrical disturbances in the radio frequency range which are generated by the generator set and which may interfere with the proper operation of radio receivers or other electronic equipment.

b. *Interference Suppression.* The term "interference suppression" as used herein applies to the methods used to eliminate or effectively

reduce radio interference generated by the generator set.

### 34. Purpose of Interference Suppression

The tactical importance of effective interference suppression cannot be stressed too greatly. Since the electrical disturbances generated by the generator set are composed partly of electrical waves in the radio frequency range, they must be suppressed for two important reasons. First, they will interfere with the proper opera-

ion of the friendly radio net and, second, they will enable the enemy to locate the equipment and its associated units.

### 35. General Sources of Interference

Generally, radio interference is generated anywhere a spark occurs, or where a high-frequency current is present. A spark is a small amount of current jumping an air gap in response to the force of a relatively high voltage. The gasoline engine ignition system is a common source. Magneto breaker points, generator commutators, relay contacts, and static charges collecting on the frame are other common sources which in some way must be suppressed.

### 36. General Methods Used to Attain Proper Suppression

Essentially, suppression is attained by providing a low-resistance path to ground for the stray currents. The methods used to attain suppression include shielding the ignition and high-frequency wires, grounding the frame with bonding straps, and using capacitors and resistors where necessary.

### 37. Interference Suppression Components

The generator set is equipped with the following radio interference suppression components:

*a. Control Box Panel-to-Control Box Bonding Strap.* The bonding strap (5, fig. 4C) is secured to the control box panel (7) and to the control box.

*b. Generator-to-Control Box Bonding Strap.* The control box bonding strap (3, fig. 4B) is secured to the bottom of the control box (4) and to the top of the generator frame (9).

*c. Skid Frame-to-Unistrut Ground Strap.* The bonding strap (4, fig. 4A) is secured to the unistrut (3) and to the skid frame (7).

*d. Capacitors on the Brushes.* Two capacitors (5, fig. 4B) are mounted on the brush holder ring (6). One capacitor is connected to a commutator brush holder terminal and one capacitor is connected to a slipping brush holder terminal.

*e. Capacitors on Output Terminals.* Four capacitors (8, fig. 4C) are mounted on the base

of the control box. They are connected to the output terminals.

*f. Capacitors on Receptacle Connector.* Two capacitors (6) are mounted on the rear of the control box panel (7) and are connected to the receptacle connector.

*g. Lockwashers.* The generator set is bonded in numerous places with IT (internal teeth), ET (external teeth), and IET (internal-external teeth) lockwashers. These lockwashers are used to insure a good metal-to-metal contact and to provide proper shielding and grounding of components.

*h. Ignition Magneto.* The ignition magneto is mounted on the left side of the engine, and its components are housed in a metal frame and an ignition shield to provide radio shielding. Three IT lockwashers are used to mount the ignition magneto to the engine.

*i. Spark Plug.* The spark plug is located on top of the cylinder head. It is integrally shielded and radio-interference suppressed.

*j. Ignition Cable Assembly.* The ignition cable assembly is connected to the ignition magneto and the spark plug. The cable is insulated and enclosed in copper braided shielding. The shielding is grounded at the ignition magneto and spark plug connections.

### 38. Replacement of Suppression Components

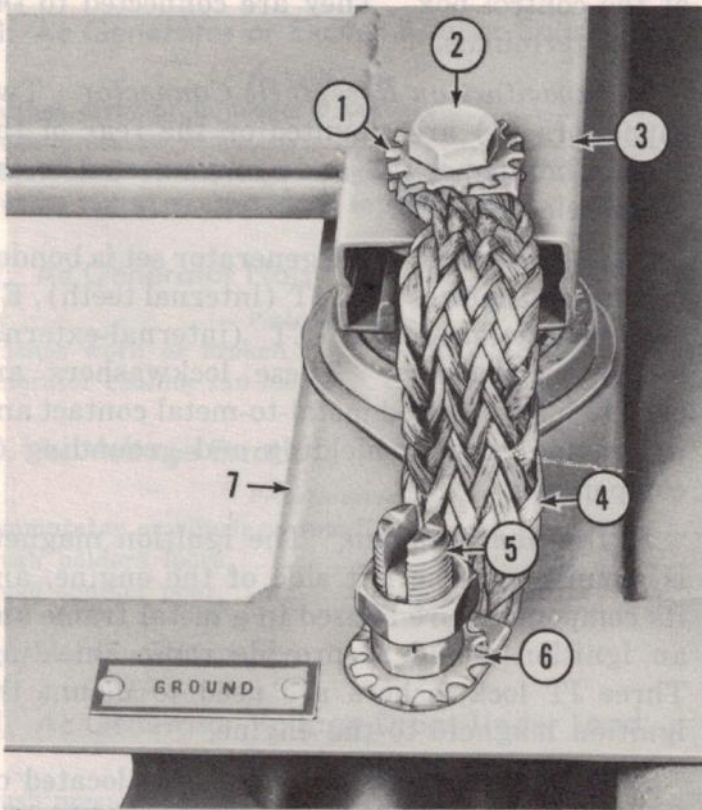
*a. General.* When replacing interference suppression components, always replace with the identical parts to provide proper interference suppression. Take special care to obtain firm metal-to-metal contact and be sure all connections are clean and tight.

*b. Control Box Panel-to-Control Box Bonding Strap.*

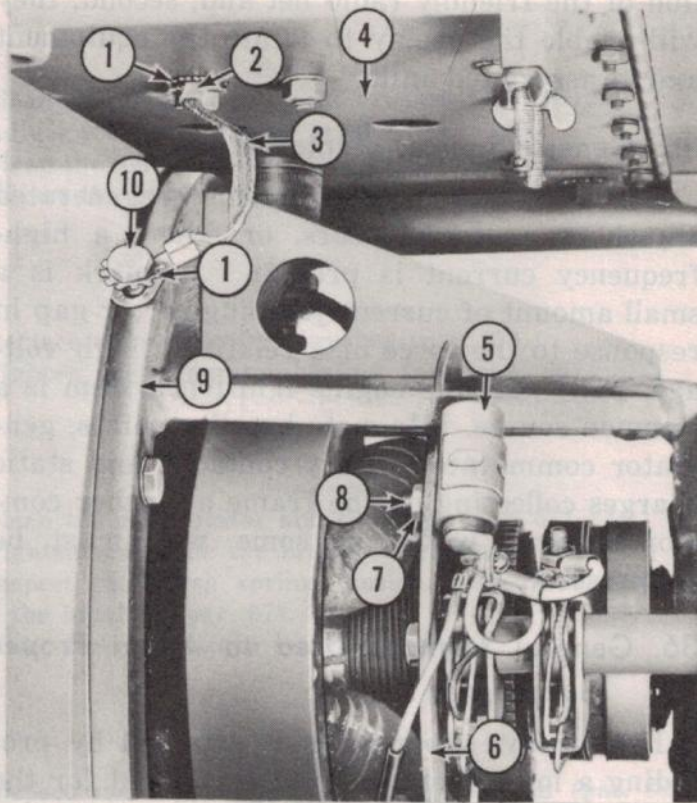
(1) *Removal.* Remove the two screws (3, fig. 4C), lockwashers, and hex-nuts (4) that secure the bonding strap (5) to the control box (2) and to the control box panel (7). Remove the bonding strap.

(2) *Installation.* Position the bonding strap (5) to the control box panel (7) and to the control box (2) and secure with two screws (3), lockwashers, and hex-nuts (4).

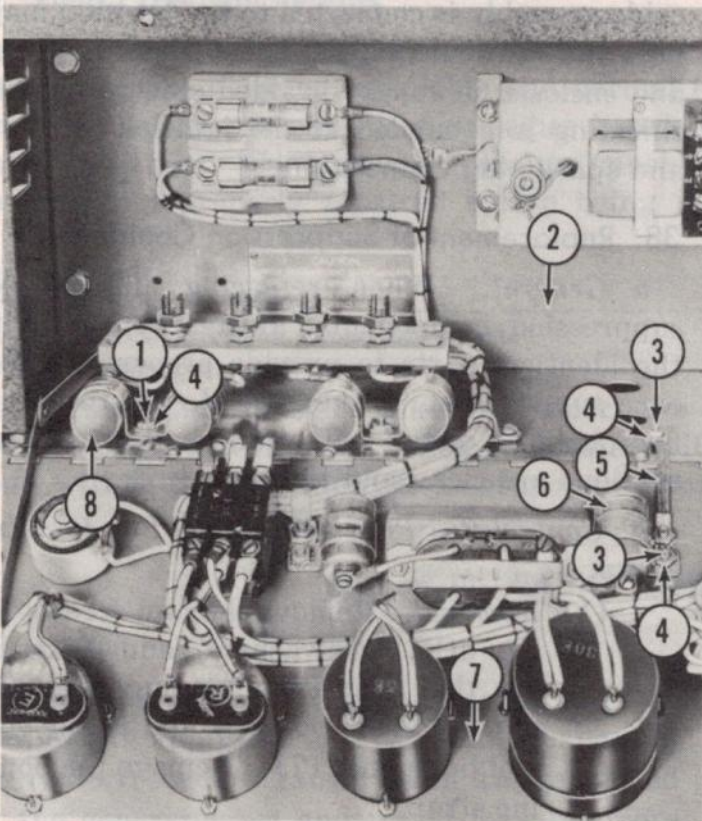




A



B



C

Figure 4. Radio interference suppression components.

EMC 6115-200-20/4



- 1 Washer, lock, IET,  $\frac{3}{8}$  in. (3 rqr)
- 2 Bolt, machine,  $\frac{3}{8}$ -16 x 2 $\frac{1}{4}$  in.
- 3 Unistrut
- 4 Bonding strap

- 5 Ground terminal
- 6 Washer, lock, IET,  $\frac{5}{16}$  in. (2 rqr)
- 7 Skid frame

A—Unistrut-to-skid frame bonding strap.

- 1 Washer, lock, IET,  $\frac{1}{4}$  in. (3 rqr)
- 2 Nut, hex,  $\frac{1}{4}$ -20
- 3 Bonding strap
- 4 Control box
- 5 Capacitor, 0.1  $\mu$ f, 100-v, dc (2 rqr)

- 6 Brush holder ring
- 7 Nut, hex, No. 10-32 (2 rqr)
- 8 Screw, machine, No. 10-32 x  $\frac{1}{2}$  in. (2 rqr)
- 9 Generator frame
- 10 Screw, cap,  $\frac{1}{4}$ -20 x  $\frac{1}{2}$  in.

B—Main generator capacitors.

- 1 Screw, machine, No. 10-32 x  $\frac{1}{2}$  in. (2 rqr)
- 2 Control box
- 3 Screw, machine, No. 10-32 x  $\frac{3}{8}$  in. (2 rqr)
- 4 Nut, hex, No. 10-32 (4 rqr)

- 5 Bonding strap
- 6 Capacitor, 0.1  $\mu$ f, 500-v, ac/dc (2 rqr)
- 7 Control box panel
- 8 Capacitor, 0.1  $\mu$ f, 500-v, ac/dc (4 rqr)

C—Terminal board and receptacle connectors.

Figure 4—Continued.

### c. Generator-to-Control Box Bonding Strap.

#### (1) Removal.

(a) Remove the hex-nut (2, fig. 4B) and two lockwashers (1) that secure the bonding strap (3) to the control box (4).

(b) Remove the screw (10) and lockwasher (1) that secure the strap to the generator frame (9). Remove the bonding strap.

(2) *Installation.* Position the bonding strap (3) and secure to the generator frame (9) with a screw (10) and lockwasher (1), and to the control box (4) with a hex-nut (2) and two lockwashers (1).

### d. Skid Frame-to-Unistrut Ground Strap.

#### (1) Removal.

(a) Remove the bolt (2, fig. 4A), three lockwashers (1), and hex-nut that secure the bonding strap (4) to the unistrut (3).

(b) Remove the ground terminal (5), two lockwashers (6), and hex-nut that secure the bonding strap to the skid frame (7).

#### (2) Installation.

(a) Position the bonding strap (4) to the skid frame (7) and secure with the ground terminal (5), two lockwashers (6), and hex-nut.

(b) Secure the other end of the bonding

strap (4) to the unistrut (3) with a bolt (2), three lockwashers (1), and a hex-nut.

### e. Capacitors on Output Terminals.

#### (1) Removal.

(a) Remove the leads from the four capacitors (8, fig. 4C).

(b) Remove the screw (1), two lockwashers, and hex-nut (4) that secure the two capacitors (8) to the control box (2).

(c) Remove the other two capacitors in the same manner.

#### (2) Installation.

(a) Position the two capacitors (8) to the control box (2) and secure with a screw (1), two lockwashers, and nut (4).

(b) Install the remaining two capacitors in the same manner.

(c) Connect the leads to the four capacitors.

### f. Capacitors on the Receptacle Connector.

#### (1) Removal.

(a) Disconnect the lead from the capacitor (6).

(b) Remove the screw (3), lockwashers, and nut (4) that secure the capacitor to the control box panel (7). Remove the capacitor.

(c) Remove the other capacitor in the same manner.

(2) *Installation.*

- (a) Position the capacitor (6) to the control box panel (7) and secure with the screw (3), lockwasher, and nut (4).
- (b) Install the other capacitor in the same manner.
- (c) Install the leads to the capacitors.

g. *Capacitors on the Brushes.*

(1) *Removal.*

- (a) Remove the capacitor lead from the capacitor (5, fig. 4B).
- (b) Remove the screw (8), two IET lockwashers, and hex-nut (7) that secure the capacitor to the brush holder ring (6).
- (c) Remove the other capacitors in the same manner.

(2) *Installation.*

- (a) Position the capacitor (5) and secure to the brush holder ring (6) with a screw (8), two IET lockwashers, and hex-nut (7).
- (b) Install the lead to the capacitor.
- (c) Install the other capacitor in the same manner.

*h. Spark Plug.* Refer to paragraph 50 for instructions on replacement of the spark plug.

*i. Ignition Cable.* Refer to paragraph 51 for

instructions on replacement of the ignition cable.

### 39. Testing of Radio Interference Suppression Components

*a. Test the capacitors for leaks and shorts on a capacitor tester. Replace a defective capacitor. If test equipment is not available and interference is indicated, isolate the cause of the interference by trial and error method of replacing each capacitor in turn until the cause of interference is determined and eliminated.*

*b. Field Expedient Repairs.* If inspection or operation indicates that a brush capacitor or a capacitor in the control box is shorted, the capacitor may be eliminated from the electrical circuit by performance of the following steps:

- (1) Stop the generator set (TM 5-6115-200-10).
- (2) Remove the shorted capacitor.
- (3) If interference suppression is mandatory, a substitute capacitor must be used. A capacitor of equal or higher voltage and equal or higher rating will be satisfactory. A capacitor of lower rating will have a limited life. A capacitor of lower rating may or may not provide sufficient interference suppression.
- (4) Start and operate the generator set (TM 5-6115-200-10).

## Section IV. FUEL SYSTEM

### 40. General

The fuel system consists of a fuel tank assembly, fuel lines, fuel strainer, fuel pump, intake air cleaner, air intake heater, float carburetor, and governor controls. The fuel is gravity-fed from the fuel tank through the fuel strainer to the fuel pump which pumps the fuel to the carburetor.

### 41. Fuel Strainer

*a. Removal.*

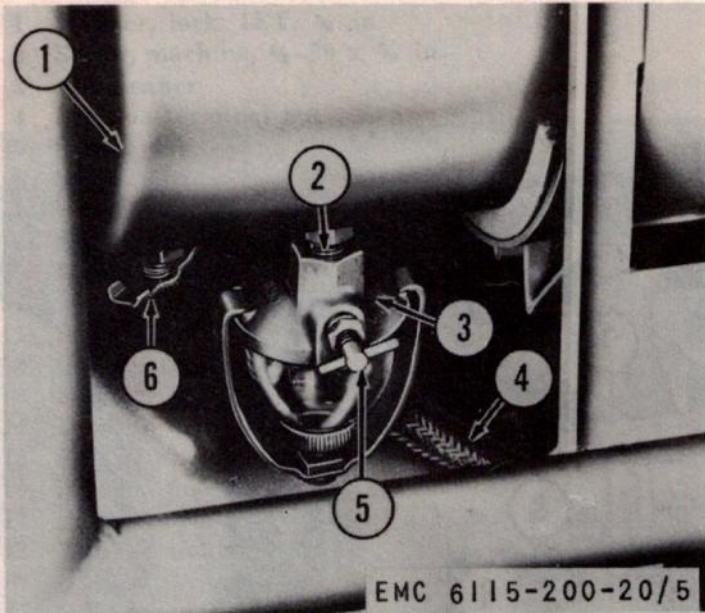
- (1) Open the draincock (6, fig. 5) and drain the fuel into a suitable container.
- (2) Remove the fuel line (4) from the fuel strainer (3).

- (3) Remove the fuel strainer from the nipple (2) in the fuel tank (1).

*b. Cleaning, Inspection, and Repair.*

- (1) Clean all metal parts in an approved cleaning solvent and dry thoroughly.
- (2) Inspect all metal parts for cracks, breaks, or other damage. Examine the needle valve packing and gasket for a dried or cracked condition.
- (3) Inspect all threaded parts for damaged threads. Inspect the strainer cover and see that the fuel passages are not clogged.
- (4) Inspect the bowl for chips and cracks.
- (5) Replace all defective parts.





- |                        |                |
|------------------------|----------------|
| 1 Fuel tank            | 4 Fuel line    |
| 2 Nipple, close (spec) | 5 Needle valve |
| 3 Fuel strainer        | 6 Draincock    |

Figure 5. Strainer, removal points.

#### c. Installation.

- (1) Install the fuel strainer (3) on the nipple (2) in the bottom of the fuel tank (1).
- (2) Connect the fuel line (4) to the fuel strainer.
- (3) Close the draincock (6) and fill the fuel tank.

## 42. Fuel Pump

#### a. Removal.

- (1) Close the needle valve (5, fig. 5) on the fuel strainer (3).
- (2) Remove the coupling tube nut (23, fig. 6) that connects the fuel pump-to-carburetor fuel tube (22) to the adapter (24) on the fuel pump (25).
- (3) Remove the coupling tube nut (23) that connects the fuel pump-to-fuel strainer fuel line (45) to the street elbow (26) on the fuel pump (25).
- (4) Remove the two screws and lockwashers that secure the fuel pump (25) to the engine block. Remove the fuel pump and mounting gasket from the engine block.
- (5) Remove the adapter (24) from the street elbow (26). Remove the elbow

from the fuel pump. Remove the adapter (24) from the fuel pump.

#### b. Cleaning, Inspection, and Repair.

- (1) Clean the external surface of the fuel pump with a clean cloth dampened with an approved cleaning solvent.
- (2) Inspect the fuel pump and mounting gasket for cracks, breaks, and other damage. Replace a defective fuel pump or gasket.
- (3) Inspect the operation of the fuel pump by placing a thumb over the fuel outlet opening and operating the fuel pump rocker arm by hand. Pressure will build up at the outlet opening if the pump is functioning properly. Replace a defective fuel pump.
- (4) Wash the fittings in an approved cleaning solvent and inspect the threads for wear and damage. Replace all defective parts.

#### c. Installation.

- (1) Install the street elbow (26) and the adapter (24) in the fuel pump (25). Install the pipe nipple in the street elbow.
- (2) Position the gasket and fuel pump (25) on the engine block and secure with two lockwashers and screws.
- (3) Install the fuel pump-to-carburetor fuel tube (22) on the adapter (24) in the fuel pump.
- (4) Install the fuel pump-to-fuel strainer fuel line (45) on the adapter (24) in the fuel pump.
- (5) Open the needle valve (5, fig. 5) on the fuel strainer.

#### d. Field Expedient Repair.

- (1) Disconnect the fuel tank-to-fuel pump fuel line.
- (2) Disconnect the fuel pump-to-carburetor fuel tube.
- (3) Connect a fuel line from the fuel tank to the carburetor.

## 43. Fuel Tank

#### a. Removal.

- (1) Open the draincock (6, fig. 5) and drain the fuel into a suitable container.



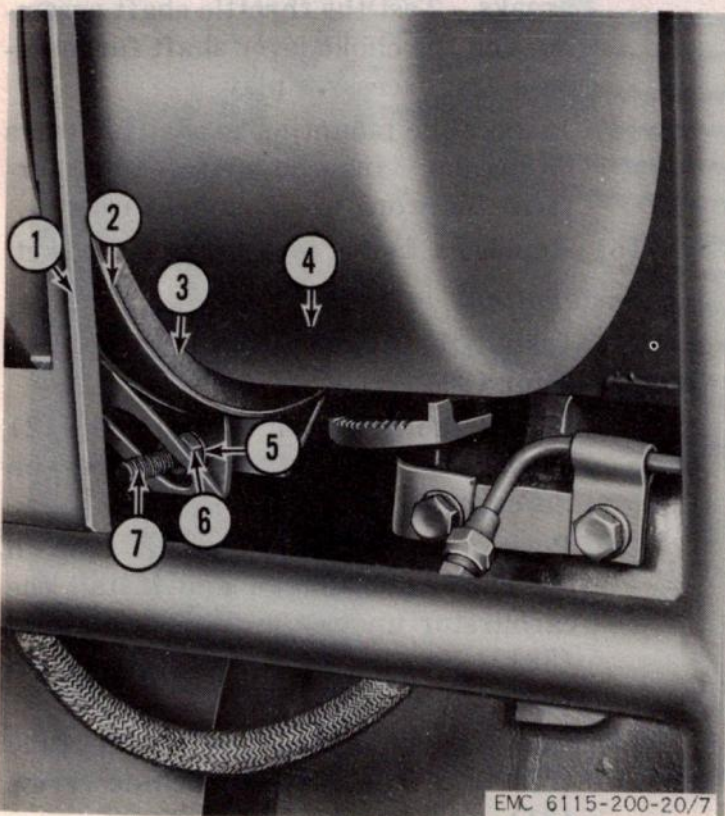




- 1 Washer, lock, IET,  $\frac{1}{4}$  in.
- 2 Screw, machine,  $\frac{1}{4}$ -28 x  $\frac{3}{8}$  in.
- 3 Air cleaner
- 4 Ignition terminal nut
- 5 Spark plug
- 6 Ignition cable
- 7 Hose clamp
- 8 Screw, machine, No. 10-24 x  $1\frac{1}{8}$  in.
- 9 Locknut (spec)
- 10 Elbow, street
- 11 Air heater tube
- 12 Governor control rod
- 13 Muffler
- 14 Ignition magneto terminal nut
- 15 Elbow, 90°
- 16 Ignition magneto cover
- 17 Screw, machine, No. 10-24 x  $\frac{5}{8}$  in. (4 rqr)
- 18 Knurled nut (spec)
- 19 Ground switch assembly
- 20 Stop grounding lever
- 21 Washer, lock, No. 10 (4 rqr)
- 22 Fuel pump-to-carburetor fuel tube
- 23 Coupling tube nut (3 rqr)

- 24 Adapter (2 rqr)
- 25 Fuel pump
- 26 Elbow, street,  $\frac{1}{8}$  in.
- 27 Plug, pipe,  $\frac{3}{8}$ -18
- 28 Gasket
- 29 Engine block
- 30 Carburetor
- 31 Screw, machine,  $\frac{1}{4}$ -20 x 1 in.
- 32 Tube
- 33 Gasket
- 34 Washer, lock,  $\frac{5}{16}$  in. (2 rqr)
- 35 Coupling tube nut
- 36 Crankcase breather line
- 37 Screw, cap,  $\frac{5}{16}$ -18 x 1 in. (2 rqr)
- 38 Intake manifold
- 39 Air cleaner bracket
- 40 Elbow
- 41 Ignition magneto
- 42 Washer, flat,  $\frac{5}{16}$  in. (4 rqr)
- 43 Washer, lock, IT,  $\frac{5}{16}$  in. (4 rqr)
- 44 Screw, machine,  $\frac{5}{16}$ -18 x  $\frac{5}{8}$  in. (4 rqr)
- 45 Fuel pump-to-fuel strainer fuel line

Figure 6—Continued.



- 1 Frame
- 2 Strap (2 rqr)
- 3 Pad (4 rqr)
- 4 Fuel tank
- 5 Washer, lock,  $\frac{1}{4}$  in. (2 rqr)
- 6 Nut, hex,  $\frac{1}{4}$ -20 (2 rqr)
- 7 Screw, machine,  $\frac{1}{4}$ -20 x  $2\frac{1}{4}$  in. (2 rqr)

Figure 7. Fuel tank, removal points.

- (2) Disconnect the fuel line (4) from the fuel strainer (3).
- (3) Remove the two machine screws (7, ng. 7), lockwashers (5), and nuts (6) that secure the straps (2) around the fuel tank (4). Remove the straps.
- (4) Remove the fuel tank and four strap pads (3) from the frame (1).
- (5) Remove the fuel strainer (par. 41).

#### b. Cleaning, Inspection, and Repair.

- (1) Clean the inside and outside of the tank with an approved cleaning solvent and dry thoroughly.
- (2) Clean the fuel tank mounting straps with a cloth dampened with an approved cleaning solvent.
- (3) Inspect the cap and gasket for cracks and wear. Replace a defective cap or gasket.
- (4) Inspect the tank for cracks, breaks, and other defects. Replace a defective tank.
- (5) Replace all defective hardware.

#### c. Installation.

- (1) Install the fuel strainer (par. 41).



- (2) Install the four strap pads (3) on the fuel tank (4).
- (3) Aline the fuel tank (4) on the frame (1) and secure with the two straps (2), machine screws (7), lockwashers (5), and nuts (6).
- (4) Connect the fuel line (4, fig. 5) to the fuel strainer (3).
- (5) Close the draincock (6).
- (6) Fill the fuel tank (TM 5-6115-200-10).

#### 44. Fuel Line and Tube Assemblies

*a. Inspection.* With the engine running, inspect the lines and tubes for leaks. Inspect the tubes for wear and deterioration. See that the fuel lines are not crimped, especially at bends and coupling tube nuts, and that they do not restrict the flow of fuel.

*b. Removal.* All the fuel lines and tubes are removed in a similar manner. Remove the coupling tube nuts on both ends of the tubes and/or lines. Replace all damaged coupling tube nuts.

*c. Replacement.* If a copper tube is to be replaced and a replacement tube is not available, a new tube may be fabricated. Use the old tube as a pattern to form the new one. Bend the tube, using a rounded surface as a form; otherwise, the tube may crimp or split. Install a coupling tube nut on each end of the fabricated tube.

*d. Installation.* Install the fuel lines and/or tubes by screwing the coupling tube nuts on the components to which the lines and/or tubes are connected.

#### 45. Carburetor

##### *a. Removal.*

- (1) Disconnect the fuel tube (22, fig. 6) from the elbow (40) on the carburetor (30).
- (2) Loosen the machine screw (31) in the tube (32).
- (3) Remove the cotter pin from the governor control rod (12) behind the carburetor, then unhook the control rod (12) from the governor control lever.

- (4) Remove the two capscrews (37) and lockwashers (34) that secure the carburetor to the intake manifold (38). Remove the carburetor and mounting gasket (33).
- (5) Remove the governor control rod (12) from the throttle shaft swivel block on the carburetor (30).
- (6) Remove the elbow (40) from the carburetor.

##### *b. Cleaning and Inspection.*

- (1) Clean the external surface of the carburetor with a clean cloth dampened with an approved cleaning solvent.
- (2) Inspect the carburetor for insecure mounting between the upper and lower sections. Be sure the mounting is tight enough to prevent leakage of fuel and air. Replace any missing mounting screws.
- (3) Inspect the body for cracks and breaks. Test the throttle shaft assembly and the choke lever shaft for looseness and excessive play.
- (4) Inspect the mounting gasket for tears or breaks. Inspect all threaded surfaces for worn or damaged threads.
- (5) Replace a faulty carburetor or gasket.

##### *c. Installation.*

- (1) Install the elbow (40) in the carburetor (30).
- (2) Install the governor control rod (12) in the throttle shaft swivel block on the carburetor.
- (3) Position the mounting gasket (33) in the carburetor flange and install the carburetor under the intake manifold (38). Secure with two lockwashers (34) and capscrews (37).
- (4) Position the carburetor in the tube (32) and tighten the machine screw (31).
- (5) Push the governor control lever and the governor control rod (12) completely forward. Turn the control rod in the throttle shaft swivel block until the bent end of the control rod is alined with the hole in the end of the governor control lever.



(6) Position the control rod in the hole and secure with the cotter pin.

(7) Connect the fuel tube (22) to the elbow (40) on the carburetor.

d. *Adjustment.* Refer to TM 5-6115-200-10 for instructions on adjustment of the carburetor.

#### 46. Governor Control Lever, Rod, and Spring

##### a. *Removal.*

(1) Remove the cotter pin (1, fig. 8) and disengage the governor control rod (2) from the governor control lever (3).

(2) Remove the governor control rod from

the carburetor throttle shaft swivel block.

(3) Unhook the spring (6) from the adjusting screw (10) on the governor control assembly (12).

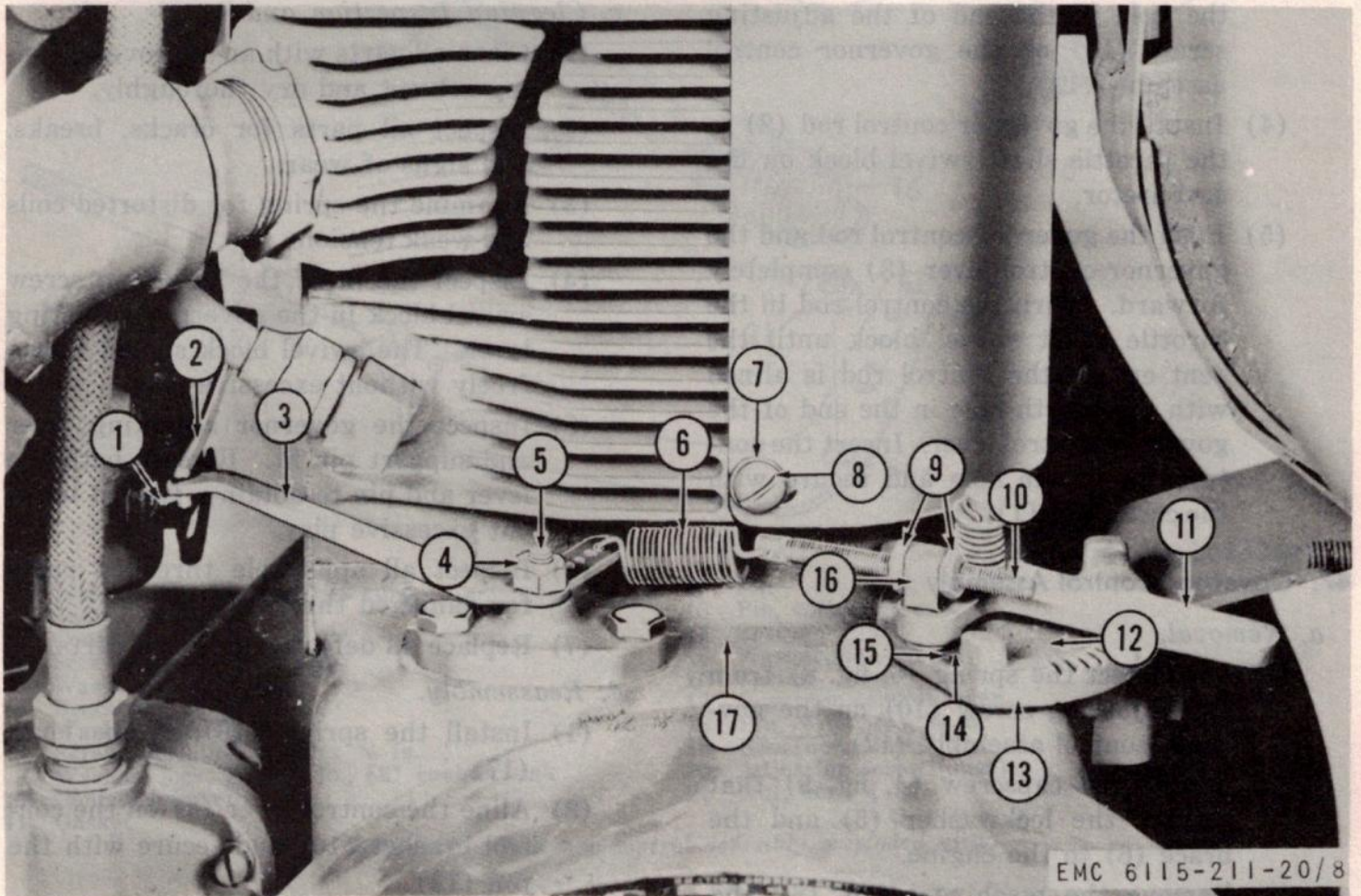
(4) Remove the hex-nut (4) that secures the governor control lever (3) on the governor yoke (5) and remove the governor control lever and spring.

(5) Disconnect the spring from the control lever.

##### b. *Cleaning, Inspection, and Repair.*

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Test the spring tension and replace



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- 1 Pin, cotter,  $\frac{3}{4}$  x  $\frac{1}{2}$  in.
- 2 Governor control rod
- 3 Governor control lever
- 4 Nut, hex,  $\frac{1}{4}$ -28
- 5 Governor yoke
- 6 Spring
- 7 Washer, lock,  $\frac{1}{4}$  in. (4 rqr)
- 8 Screw, machine,  $\frac{1}{4}$ -20 x  $\frac{3}{8}$  in. (4 rqr)
- 9 Self-locking nut (spec) (2 rqr)

- 10 Adjusting screw (spec)
- 11 Control lever
- 12 Governor control assembly
- 13 Control bracket
- 14 Screw, machine,  $\frac{1}{4}$ -20 x  $\frac{5}{8}$  in.
- 15 Washer, lock, ET,  $\frac{1}{4}$  in., 82° countersunk
- 16 Swivel lock
- 17 Engine block

Figure 8. Governor control assembly, removal points.



the spring if it is weak or if the coils are distorted.

- (3) Inspect the governor control lever and the control rod for signs of wear, cracks, and breaks. Straighten a bent control rod or control lever.
- (4) Replace all defective or worn parts.

*c. Installation.*

- (1) Hook the spring (6) in the fourth hole from the fulcrum of the governor control lever (3).
- (2) Position the governor control lever on the governor yoke (5) with the row of five holes toward the engine and secure with the hex-nut (4).
- (3) Hook the other end of the spring in the hole in the end of the adjusting screw (10) on the governor control assembly (12).
- (4) Install the governor control rod (2) in the throttle shaft swivel block on the carburetor.
- (5) Push the governor control rod and the governor control lever (3) completely forward. Turn the control rod in the throttle shaft swivel block until the bent end of the control rod is aligned with the fourth hole in the end of the governor control lever. Insert the control rod in the hole and secure with the cotter pin (1).

## 47. Governor Control Assembly

*a. Removal.*

- (1) Disconnect the spring (6, fig. 8) from the adjusting screw (10) on the governor control assembly (12).
- (2) Loosen the capscrew (4, fig. 9) that secures the lockwasher (5) and the brace (6) to the engine.
- (3) Remove the machine screw (8) and lockwasher (9) that secure the control bracket (10) on the engine block. Remove the governor control assembly and mounting gasket (11).

*b. Disassembly.*

- (1) Remove the outside self-locking nut (1) from the adjusting screw (20) and remove the adjusting screw from the

swivel block (2). Remove the inside self-locking nut (1) from the adjusting screw.

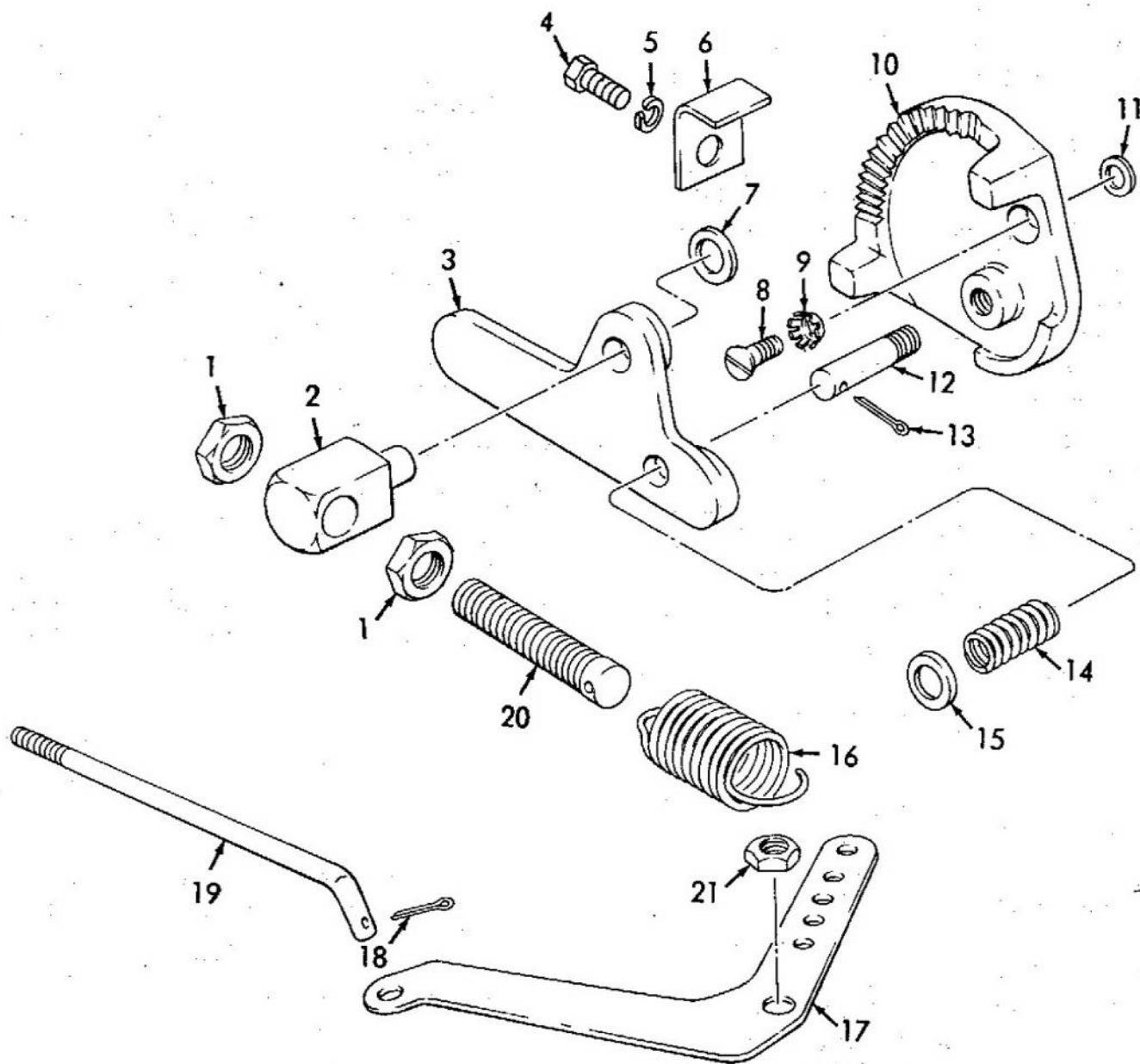
- (2) Remove the cotter pin (13) from the pin (12) and remove the flat washer (15) and spring (14) from the pin.
- (3) Remove the flat washer (7) and the swivel block (2) from the control lever (3).
- (4) Remove the pin (12) from the control lever (3) and the control bracket (10). Remove the control lever (3) from the control bracket (10).
- (5) Remove the spring (16) from the adjusting screw (20) and the governor control lever (17).

*c. Cleaning, Inspection, and Repair.*

- (1) Clean all parts with an approved cleaning solvent and dry thoroughly.
- (2) Inspect all parts for cracks, breaks, and signs of wear.
- (3) Examine the spring for distorted coils and weak tension.
- (4) Inspect the fit of the adjusting screw swivel block in the governor adjusting lever. The swivel block should rotate freely without excessive play.
- (5) Inspect the governor adjusting lever and support pin fit. Replace both the lever and pin to obtain a free fit without excessive play.
- (6) Inspect all applicable threaded parts for damaged threads.
- (7) Replace all defective or worn parts.

*d. Reassembly.*

- (1) Install the spring (16) on the lever (17).
- (2) Align the control lever (3) on the control bracket (10) and secure with the pin (12).
- (3) Install the swivel block (2) in the control lever (3) and install the flat washer (7) on the protruding end of the swivel block.
- (4) Install the spring (14) and flat washer (15) on the pin (12) and secure with the cotter pin (13).
- (5) Install the inside self-locking nut (1)



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- |   |   |
|---|---|
| 1 Self-locking nut (spec) (2 rqr)                       | 12 Pin  |
| 2 Swivel block  | 13 Pin, cotter, $\frac{1}{16}$ x 1 in.            |
| 3 Control lever   | 14 Spring   |
| 4 Screw, cap, $\frac{3}{8}$ -16 x 1 in.                 | 15 Washer, flat, $\frac{9}{32}$ in.               |
| 5 Washer, lock, $\frac{3}{8}$ in.                       | 16 Spring   |
| 6 Brace   | 17 Governor control lever                         |
| 7 Washer, flat, No. 8                                   | 18 Pin, cotter, $\frac{3}{4}$ x $\frac{1}{2}$ in. |
| 8 Screw, machine, $\frac{1}{4}$ -20 x $\frac{5}{8}$ in. | 19 Governor control rod                           |
| 9 Washer, lock, ET, $\frac{1}{4}$ in., 82° countersunk  | 20 Adjusting screw (spec)                         |
| 10 Control bracket                                      | 21 Nut, hex, $\frac{1}{4}$ -28                    |
| 11 Gasket   |   |

Figure 9. Governor control assembly, exploded view.

on the adjusting screw (20). Install the other end of the spring (16) in the adjusting screw (20).

- (6) Install the adjusting screw (20) in the swivel block (2) and secure with the outside self-locking nut (1).

*e. Installation.*

- (1) Aline the mounting gasket (11) in the governor control assembly on the en-

gine block and secure with the lock-washer (9) and machine screw (8).

- (2) Position the brace (6) on the control bracket (10) and tighten the capscrew (4).

- (3) Connect the spring (6, fig. 8) on the adjusting screw (10) and the governor control assembly (12).

- f. Adjustment.* Since the speed of the engine



is regulated by the governor controls, a tachometer must be used to obtain the correct engine speed while the governor controls are being adjusted.

*Note.* Adjustment of the governor controls normally need not be made unless the adjusting screw nuts have become loose or the control assembly is disassembled.

- (1) Start the engine and allow it to warm up (TM 5-6115-200-10).
- (2) Place a tachometer at the front of the engine and position it in accordance with instructions furnished with the tachometer.
- (3) After the engine has warmed up, operate the unit at no load and read the tachometer. The no-load speed should be approximately 3,720 rpm.
- (4) Apply a full load to the generator and read the tachometer. The indication should now be 3,600 rpm. If the full-load rpm cannot be obtained within the adjustment range of the governor control lever, adjust the governor control assembly as instructed in (5) through (11) below. If the governor control assembly adjustment does not correct the deficiency, or if the difference between no-load and full-load speeds is too great, report the condition to field maintenance.
- (5) Before adjusting the governor controls, see that the spring (16, fig. 9) is connected in the fourth hole from the fulcrum of the governor control lever (17).
- (6) Remove the cotter pin (18) from the governor control rod (19).
- (7) Remove the governor control rod from the governor control lever (17) then position the control rod and control lever, as directed in paragraph 46, and install the cotter pin (18).
- (8) Position the governor adjusting lever (17) completely forward on the control bracket (10).
- (9) Adjust the two self-locking nuts (1) on the adjusting screw (20), as necessary, to obtain the desired engine speed reading on the tachometer. More tension on the spring gives a higher speed and less tension reduces the speed.

(10) When the rpm reading is satisfactory, tighten the two self-locking nuts (1) equally, a little at a time, until both self-locking nuts are tight against the adjusting screw swivel block (2). Recheck the rpm reading.

(11) Stop the engine and remove the tachometer.

*Note.* Carburetor adjustment may be necessary to obtain a satisfactory and even running speed during setting of governor controls. Refer to TM 5-6115-200-10 for carburetor adjustment instructions.

## 48. Air Cleaner

### a. Removal.

- (1) Remove one machine screw (8, fig. 6) and square nut, and remove the air heater tube (11) from the air cleaner (3). Remove the hose clamp (7) from the air cleaner.
- (2) Remove one capscrew (37) and lockwasher (34) that secure the air cleaner bracket (39) to the intake manifold (38).
- (3) Remove one capscrew (2) and lockwasher (1) and remove the air cleaner (3) and the air cleaner bracket (39).

### b. Cleaning, Inspection, and Repair.

- (1) Clean all parts in an approved cleaning solvent and dry thoroughly.
- (2) Inspect the air cleaner for cracks and breaks.
- (3) Inspect all threaded parts for damaged threads.
- (4) Replace all defective parts.

### c. Installation.

- (1) Install the air cleaner (3) and the air cleaner bracket (39) and secure with one lockwasher (1) and capscrew (2).
- (2) Aline the air cleaner bracket (39) on the intake manifold (38) and secure with one lockwasher (34) and capscrew (37).
- (3) Install the hose clamp (7) on the air cleaner. Install the air heater tube (11) in the air cleaner (3) and secure with one machine screw (8) and square nut.

## Section V. IGNITION SYSTEM

### 49. General

The ignition system provides a properly timed spark to ignite the mixture of fuel and air in the combustion chamber of the engine. The current for the ignition is produced by an ignition magneto composed of an armature, magnetic rotor, and coil. The timing of this current for the spark plug is controlled by a set of contact points and a capacitor under the magneto ignition system shield. The ignition system shield also houses a ground switch pushbutton for stopping the engine.

### 50. Spark Plug

#### a. Testing Ignition for Spark.

- (1) Remove the ignition terminal nut (4, fig. 6) from the spark plug (5) and remove the ignition cable (6) from the spark plug.
- (2) Hold the ignition cable terminal one-eighth inch from the spark plug shielding and rotate the engine slowly with the sheave assembly (6, fig. 10). If a hot spark jumps the air gap, the ignition system to the spark plug is operating normally.
- (3) If the spark is weak or if there is no spark, inspect all ignition system components, including the ignition cable, for loose connections and short circuits. Inspect the magneto contact set (par. 52).
- (4) After a satisfactory spark is obtained, connect the ignition cable (6, fig. 6) to the spark plug (5) and secure with the ignition terminal nut (4).

#### b. Removal.

- (1) Disconnect the ignition cable (see a above).
- (2) Remove all dirt and foreign matter from around the base of the spark plug (5).
- (3) Remove the spark plug and the spark plug gasket from the top of the cylinder head.

#### c. Cleaning and Inspection.

- (1) Clean the spark plug with a conventional spark plug cleaner or, if a

cleaner is not available, remove the carbon deposits from the electrodes. Be careful not to damage the electrode or insulator.

- (2) Inspect the insulator for chips and cracks.
- (3) Inspect the electrodes for burns, pitting, and poor alinement. The grounded outside electrode must be directly alined with the insulated inside electrode. Measure the spark plug gap (see d below).
- (4) Inspect for damaged threads.
- (5) Replace a defective spark plug.

#### d. Spark Plug Gap.

- (1) Measure the spark plug gap. The gap should be set at 0.030 inch.
- (2) Adjust the spark plug gap and reinspect the electrode alinement.

#### e. Installation.

- (1) Install the gasket and spark plug (5) in the top of the cylinder head.
- (2) Tighten the spark plug to a torque of 24 to 26 ft-lb.
- (3) Connect the ignition cable (6) to the spark plug and secure with the ignition terminal nut (4).

### 51. Ignition Cable

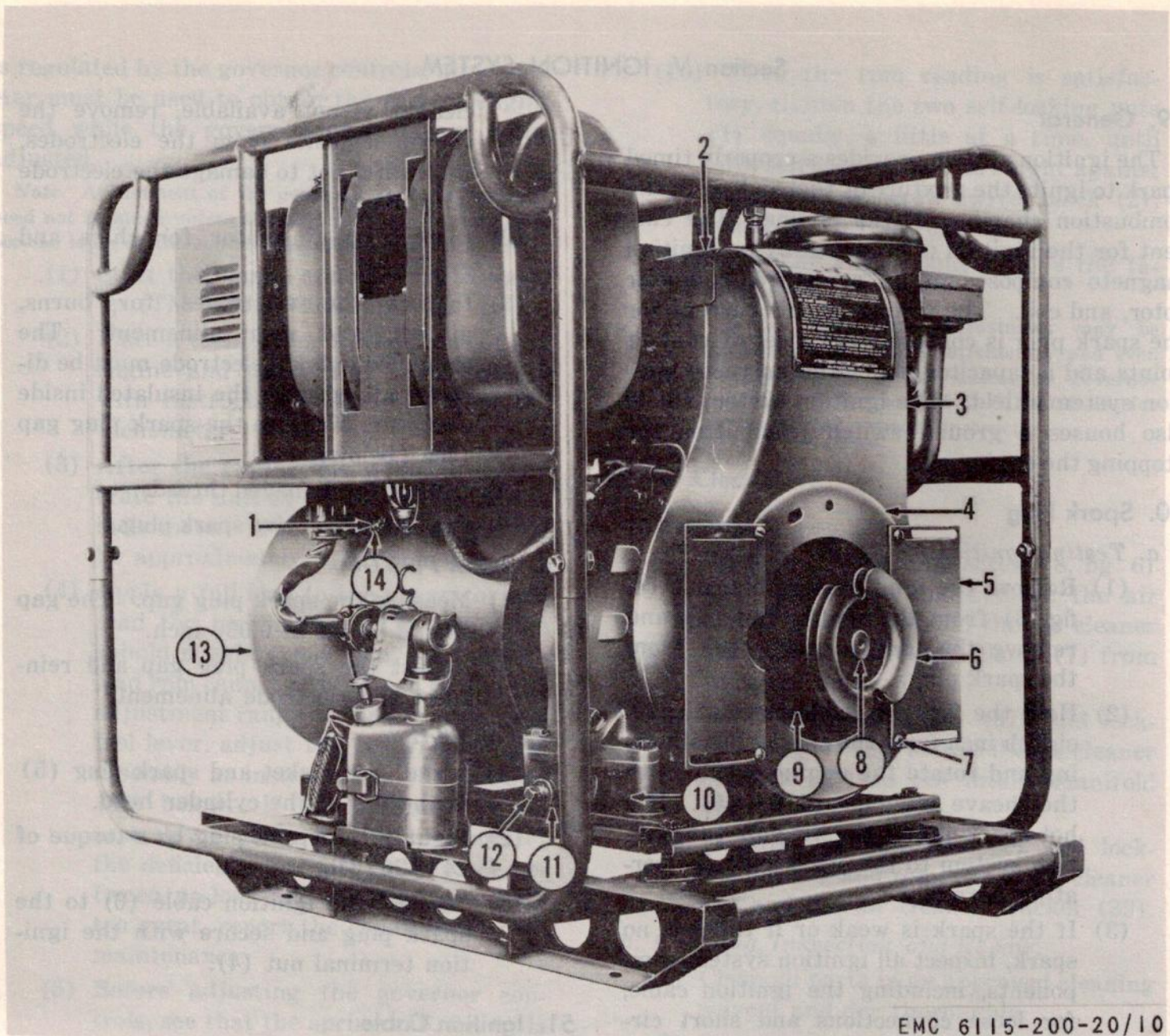
#### a. Removal.

- (1) Remove the ignition terminal nut (4, fig. 6) from the spark plug (5) and remove the other terminal nut (14) from the ignition magneto (41).
- (2) Remove the machine screw and lock-washer that secure the ignition cable clamp to the side of the cylinder head.
- (3) Remove the ignition cable (6) by lifting the cable terminal from the spark plug and the ignition magneto. Remove the clamp from the ignition cable.

#### b. Cleaning and Inspection.

- (1) Clean the ignition cable with a clean cloth dampened with an approved cleaning solvent.





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- |  |                                     |
|--|-------------------------------------|
| 1 Screw, cap, ¼-20 x ⅝ in. (4 qqr)     | 8 Crankshaft                        |
| 2 Air shroud cover                     | 9 Screen                            |
| 3 Air shroud                           | 10 Engine block                     |
| 4 Air shroud screen rim                | 11 Coupling                         |
| 5 Air baffle (2 qqr)                   | 12 Plug, pipe, ¼ in.                |
| 6 Sheave assembly                      | 13 Exciter cover                    |
| 7 Screw, machine, ¼-20 x ⅜ in. (4 qqr) | 14 Washer, lock, IET, ¼ in. (4 qqr) |

Figure 10. Generator set, front view.

(2) Inspect the ignition cable insulation and shielding for breaks, wear, and fraying.

(3) Inspect the terminals for corrosion and broken or cracked insulators.

(4) Replace a defective ignition cable.

#### c. Installation.

(1) Install the clamp on the ignition cable (6). Position the ignition cable ter-

minals in the ignition magneto (41) and secure with the ignition terminal nut (14).

(2) Position the other terminal of the ignition cable (6) in the spark plug (5) and secure with the other ignition terminal nut (4).

(3) Position the ignition cable clamp on the cylinder head and secure with the lockwasher and machine screw.



## 52. Ignition Magneto

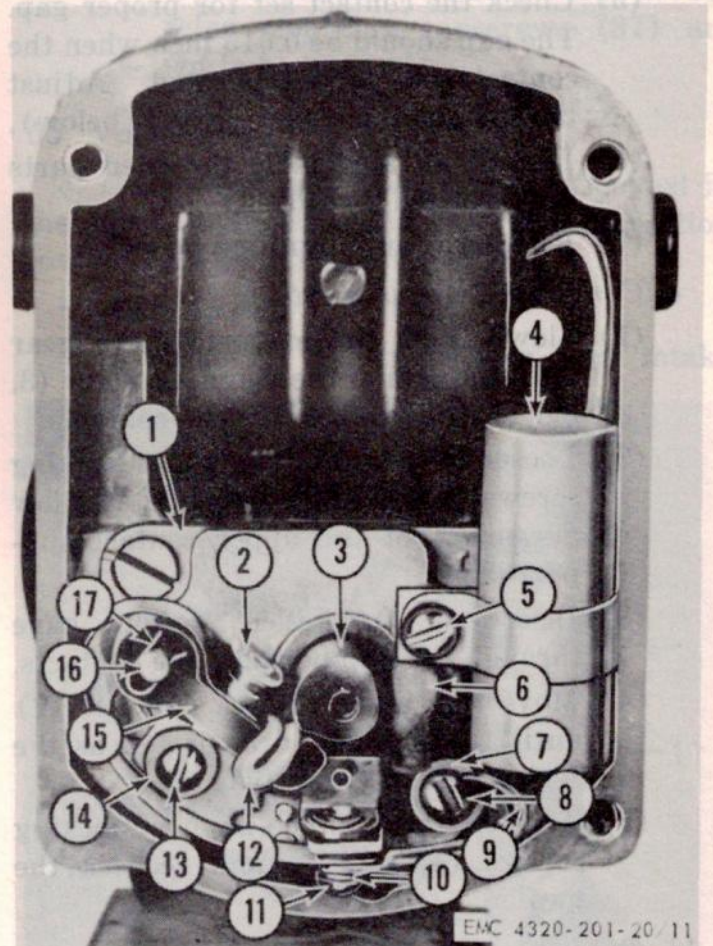
### a. Removal.

- (1) Remove the fuel pump-to-carburetor fuel tube (par. 44).
- (2) Remove the ignition magneto terminal nut (14, fig. 6) that secures the ignition cable (6) in the ignition magneto (41) and remove the cable from the magneto.
- (3) Remove the ignition cable fiber outlet insulator from the ignition magneto cover (16).
- (4) Remove the magneto drive gear inspection pipe plug (27) from the engine block (29).
- (5) Turn the engine slowly until the timing mark, located on the magneto drive gear, centers in the drive gear inspection hole.
- (6) Remove the machine screw (44), lockwasher (43) and flat washer (42) that secure the magneto stop grounding lever (20) and the lower side of the magneto mounting flange to the gear housing of the engine. Remove the grounding lever.
- (7) Remove the hex-nut, two lockwashers, and machine bolt that secure the upper side of the magneto mounting flange to the gear housing and remove the ignition magneto (41) and mounting gasket (28) from the engine block.
- (8) Remove the four machine screws (17) and lockwashers (21) that secure the ignition magneto cover (16) to the magneto. Remove the ignition magneto cover and lead shield gasket.
- (9) Remove the knurled nut (18) that secures the ground switch assembly (19) in the magneto ignition system shield and remove the ground switch assembly.
- (10) Remove the snapping from the ground switch pushbutton and separate the bushing, pushbutton spring, and pushbutton.
- (11) Remove the screw and lockwasher that secure the vent cover and screen on the side of the magneto and remove

the vent cover and screen. Remove the vent cover and screen mounted on the opposite side of the magneto in a similar manner.

### b. Cleaning, Inspection, and Repair.

- (1) Clean the exterior surfaces of the magneto with a cloth dampened with an approved cleaning solvent. Do not submerge the magneto in the solvent.
- (2) Clean the vent covers and screens with



- 1 Bearing support plate
- 2 Upper contact support
- 3 Magnetic rotor
- 4 Capacitor
- 5 Screw, machine, No. 8-32 x 1/4 in.
- 6 Cam wick and holder assembly
- 7 Washer, flat, No. 8
- 8 Screw, rd-hd, contact support locking, No. 8-32 x 3/8 in.
- 9 Capacitor wire lead
- 10 Washer, lock, No. 6 (2 rqr)
- 11 Screw, rd-hd, breaker arm terminal, No. 6-32 x 3/8 in.
- 12 Breaker arm flat wick
- 13 Screw, rd-hd, contact support locking, No. 6-32 x 3/8 in.
- 14 Washer, flat, No. 6
- 15 Breaker arm and spring
- 16 Fulcrum pin
- 17 Retaining ring

Figure 11. Magneto contact set, adjustment points.



an approved cleaning solvent and dry thoroughly. Inspect the screens for tears or clogging.

- (3) Inspect the magneto housing and ignition shield for cracks, breaks, and other damage.
- (4) Inspect the contact set for dirt, grease, oil, and pitted contacts. Clean the contacts in place with a breaker point file. Be sure to file directly across the face of the contacts.
- (5) Check the contact set for proper gap. The gap should be 0.015 inch when the contacts are fully separated. Adjust the contact gap if necessary (c below).
- (6) Inspect all applicable threaded parts for damaged threads.
- (7) Replace a faulty ignition magneto.

*c. Contact Set Adjustment.*

- (1) Slowly turn the magneto drive gear until the cam of the magnetic rotor (3, fig. 11) fully separates the contacts.
- (2) Loosen the contact support locking screws (8 and 13) just enough to allow movement of the upper contact support (2).
- (3) Insert a 0.015-inch feeler gage through the gap between the contacts.
- (4) Move the upper contact support (2) until a very slight drag is felt as the feeler gage is withdrawn.
- (5) Tighten the contact support locking screws (13 and 8) and recheck the gap.

*d. Timing and Installation.*

- (1) Remove the spark plug (par. 50).
- (2) The flywheel, located behind the air shroud screen rim (4, fig. 10) is marked with the letters DC near one of the air circulating vanes. This vane is further identified by an X mark cast on the end. Turn the starter sheave assembly (6) over slowly until air blows out of the spark plug hole, and the X marked vane on the flywheel is visible through the round hole at the top of the air shroud screen rim (4).

- (3) Remove the pipe plug (27, fig. 6) from the engine block (29).
- (4) Position the magneto (41) and gasket (28) on the engine block (29) so that the X marked tooth of the magneto gear is visible through the inspection hole which contained the plug (27).
- (5) Install the bolt through the engine gear housing and the top of the magneto mounting flange and secure loosely with one lockwasher and hex-nut. Position the lockwasher (43), flat washer (42), and stop grounding lever (20) on the machine screw (44). Install the capscrew through the lower section of the magneto mounting flange and tighten the capscrew (44) and the hex-nut, equally, a little at a time, until the magneto is securely mounted on the gear housing of the engine.
- (6) When the magneto is properly timed, the impulse coupling will snap when the DC and X marked vane of the flywheel lines up with the round hole at the top of the air shroud screen rim (4, fig. 10). This can be checked by turning the starter sheave assembly slowly by hand.
- (7) Install the spark plug (par. 50).
- (8) Install the pipe plug (27) of the magneto drive gear in the engine gear housing.
- (9) Install the ignition cable fiber outlet insulator in the magneto cover (16). Position the ignition cable (6) in the shield and secure with the ignition magneto terminal nut (14).
- (10) Install the fuel pump-to-carburetor fuel tube (par. 44).
- (11) Inspect for proper ignition timing with a neon timing light while the engine is running. If the ignition timing is correct, the flywheel timing mark will appear in the ignition spark advance inspection hole in the air shroud screen rim at the same instant the timing light flashes.



### 53. General

The engine is a single-cylinder, four-cycle, L-head, air-cooled, gasoline-driven unit. The engine is started manually by use of a starting rope and sheave assembly mounted at the front of the engine flywheel. A crankcase breather line is located at the upper left side of the engine. Engine lubrication is supplied by a plunger-type oil pump which directs oil from the crankcase to the connecting rod bearing and all other internal parts of the engine.

### 54. Intake Manifold

#### a. Removal.

- (1) Remove the two capscrews (37, fig. 6) and lockwashers (34) that secure the lower flange of the intake manifold (38) to the carburetor (30).
- (2) Remove the two capscrews and lockwashers that secure the upper flange of the intake manifold to the engine block.
- (3) Remove the intake manifold (38) and manifold gasket. Remove the carburetor mounting gasket (33).

#### b. Cleaning, Inspection, and Repair.

- (1) Clean the intake manifold with an approved cleaning solvent and dry thoroughly.
- (2) Inspect the intake manifold for cracks and breaks. Remove any metal burs from the mounting flanges.
- (3) Inspect the mounting gasket for breaks and signs of deterioration. Inspect the gasket that separates the intake manifold and carburetor for a defective condition.
- (4) Inspect all applicable threaded parts for damaged threads.
- (5) Replace all defective parts or faulty gaskets.

#### c. Installation.

- (1) Position the carburetor mounting gasket (33) on the carburetor (30).
- (2) Position the mounting gasket for the intake manifold (38) on the engine block, then install the intake manifold.

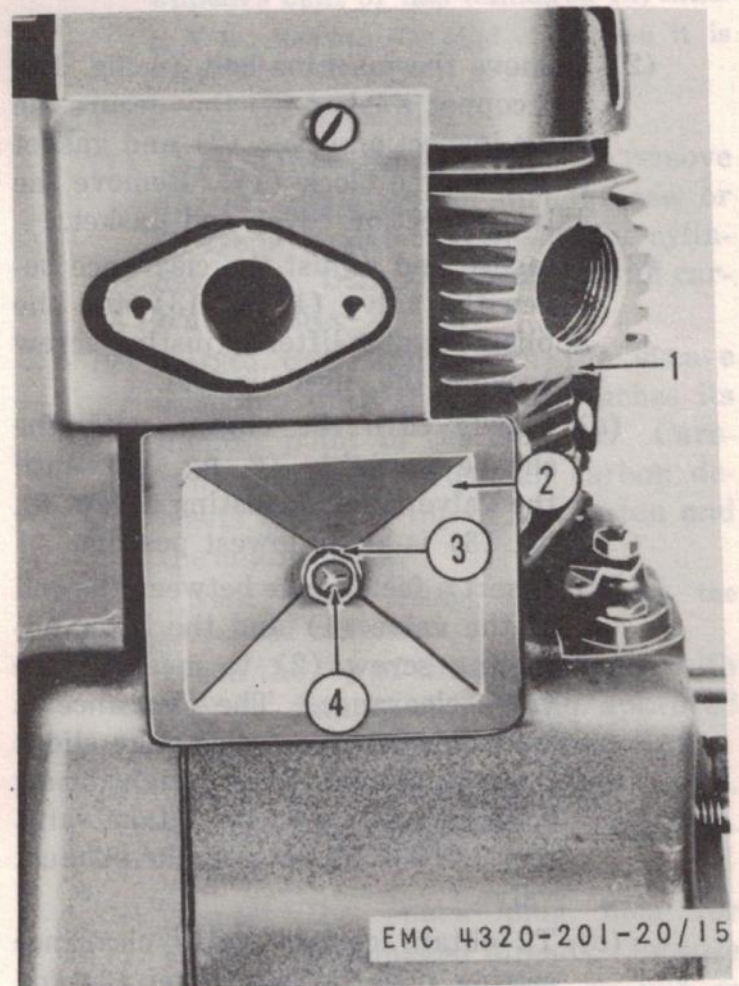
- (3) Install the two capscrews, with lockwashers, that secure the intake manifold to the engine block. Do not tighten the capscrews at this time.
- (4) Install the two capscrews (37), with lockwashers (34), that secure the intake manifold to the carburetor (30).
- (5) Tighten all the capscrews. The intake manifold capscrews must be tightened to a torque pull of 9 ft-lb. The carburetor mounting capscrews (37) are not to be torqued.

### 55. Valve Lifters

a. *General.* The valve lifters are located in the valve chamber behind the valve inspection cover on the left side of the engine.

#### b. Adjustment.

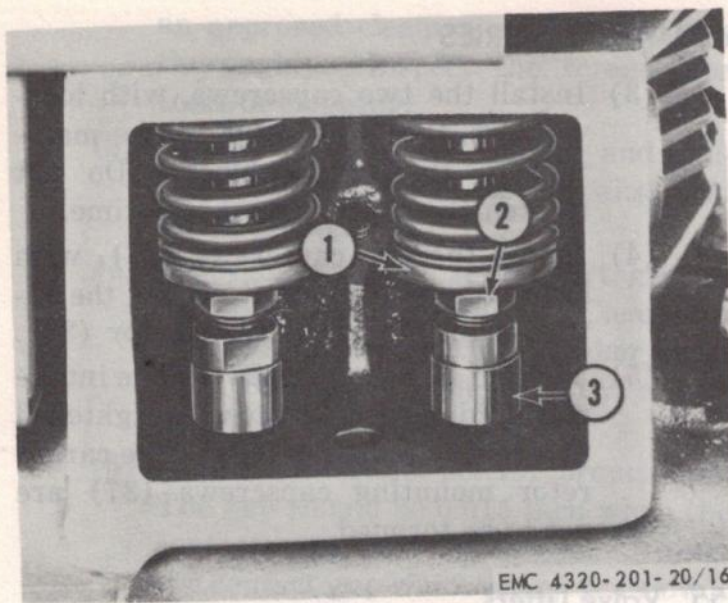
- (1) Remove the carburetor and intake



- 1 Engine block
- 2 Valve inspection cover
- 3 Washer, copper,  $\frac{5}{16}$  in.
- 4 Bolt, machine,  $\frac{5}{16}$ -18 x 2 in.

Figure 12. Valve inspection cover, removal points.





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- 1 Valve (2 rqr)
- 2 Screw, valve lifter adjusting (2 rqr)
- 3 Valve lifter (2 rqr)

Figure 13. Valve lifters, adjustment points.

manifold as an assembly (pars. 45 and 54).

- (2) Remove the machine bolt (4, fig. 12) and copper washer (3) that secure the valve inspection cover (2) and gasket to the engine block (1). Remove the valve inspection cover and gasket.
- (3) Measure and adjust the clearance between the valve (1, fig. 13) and the applicable valve lifter adjusting screw (2), while the engine is cold.
  - (a) Slowly turn the engine with the sheave assembly (6, fig. 10) until the valve lifter adjusting screw (2, fig. 13) is at its lowest position.
  - (b) Insert a feeler gage between the end of the valve (1) and the lifter adjusting screw (2) to measure the valve clearance. The clearance is correct when the feeler gage slides through the gap with a slight drag; 0.008 of an inch on the intake valve and 0.016 of an inch on the exhaust valve.
  - (c) To obtain correct valve clearance setting, hold the valve lifter (3) and turn the adjusting screw until the proper clearance is obtained. The adjusting screw is self-locking and will remain at the set position.

(d) Measure and adjust the other valve in the same manner.

- (4) Clean the valve inspection cover, bolt, copper washer, and cover gasket with an approved cleaning solvent. Inspect for damage and replace any defective part.
- (5) Position the gasket and valve inspection cover (2, fig. 12) on the engine block (1) and secure with the copper washer (3) and machine bolt (4).
- (6) Install the carburetor and intake manifold (pars. 45 and 54).

## 56. Crankcase Oil Drain Fittings

### a. Removal.

- (1) Remove the oil drain pipe plug (12, fig. 10) and drain the oil from the engine into a suitable container.
- (2) Remove the coupling (11) from the pipe nipple and remove the pipe nipple from the engine block (10).

### b. Cleaning, Inspection, and Repair.

- (1) Clean all parts in an approved cleaning solvent and inspect for cracks and damaged threads.
- (2) Replace any defective part.

### c. Installation.

- (1) Install the pipe nipple in the engine block (10).
- (2) Install the coupling (11) on the pipe nipple.
- (3) Install the oil drain pipe plug (12) and lubricate the engine in accordance with the current lubrication order.

## 57. Crankcase Breather Line

### a. Removal.

- (1) Remove the coupling tube nut (35, fig. 6) from the breather line elbow in the tube (32).
- (2) Remove the other breather line coupling tube nut from the breather line elbow in the rear of the engine block (10, fig. 10) and remove the breather line (36, fig. 6).



- (3) Remove one breather line elbow from the air cleaner bracket (39) and the other elbow from the engine block.

*b. Cleaning, Inspection, and Repair.*

- (1) Clean the breather line and elbows with an approved cleaning solvent and dry with compressed air.
- (2) Inspect the breather line for cracks, breaks, and dents.
- (3) Inspect all applicable threaded fittings for damaged threads.
- (4) Replace a defective breather line or elbow.

*c. Installation.*

- (1) Install one breather line elbow in the tube (32) and the other elbow in the engine block (10, fig. 10).
- (2) Install the crankcase breather line (36, fig. 6) and secure the coupling

tube nuts (35) to the breather line elbows.

## 58. Cylinder Head

*a. Removal.*

- (1) Remove the spark plug (par. 50).
- (2) Remove the machine screw and lock-washer that secure the air shroud (3, fig. 10) to the rear of the cylinder head (4, fig. 14).
- (3) Remove the five capscrews (2 and 3) and flat washers (1) that secure the cylinder head to the engine block (6).

*Note.* Pay particular attention to the location of the different length capscrews for their reinstallation.

- (4) Remove the cylinder head and the cylinder head gasket (19, fig. 15). Discard the gasket.
- (5) Remove the cylinder head stud (5, fig. 14) from the engine block if the stud appears bent or has damaged threads.

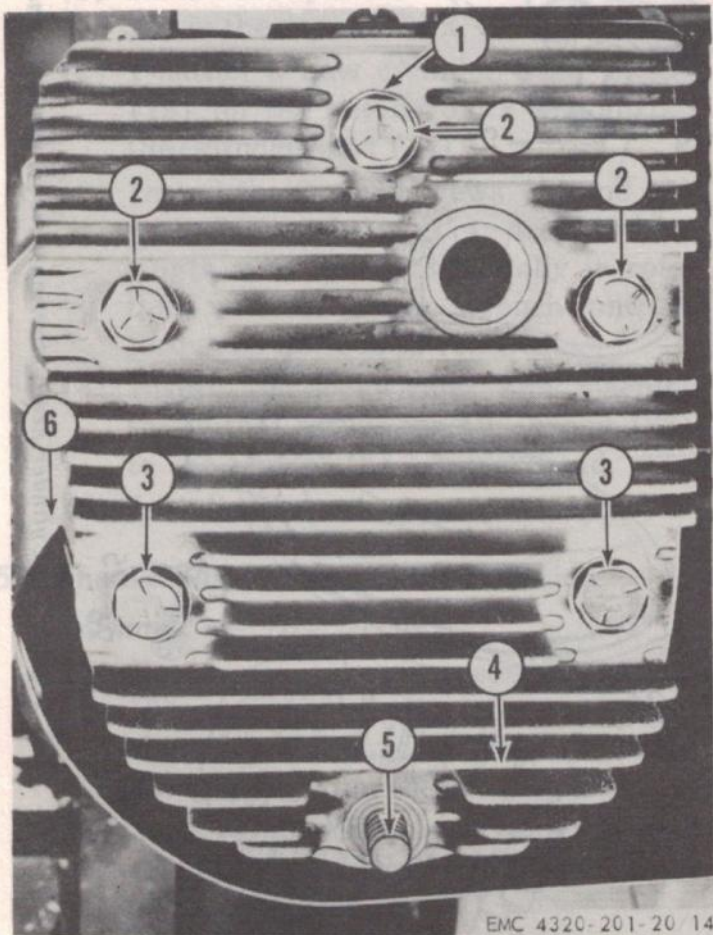
*Note.* Remove the stud only when it is absolutely necessary.

*b. Cleaning and Inspection.*

- (1) Use a wire brush or scraper to remove any accumulations of dirt, grease, or oil from the external fins of the cylinder head. Scrape or brush off all carbon deposits.
- (2) Rotate the engine with the sheave assembly until the piston reaches its highest point in the cylinder. Carefully scrape or brush all carbon deposits from the top of the piston and the engine block.

*Note.* Avoid spilling dirt around the valves and valve seats.

- (3) Clean the top of the engine block with a cloth dampened with an approved cleaning solvent and dry thoroughly.
- (4) Clean the cylinder head with an approved cleaning solvent and dry thoroughly.
- (5) Inspect the spark plug hole for stripped or damaged threads. Be sure the cylinder head is not cracked or warped. Replace a defective cylinder head.
- (6) Inspect the cylinder head capscrews



- 1 Washer, flat,  $1\frac{3}{32}$  in. (6 rqr)
- 2 Screw, cap,  $\frac{3}{8}$ -16 x  $1\frac{1}{2}$  in. (3 rqr)
- 3 Screw, cap,  $\frac{3}{8}$ -16 x  $1\frac{1}{4}$  in. (2 rqr)
- 4 Cylinder head
- 5 Stud, cylinder head,  $\frac{3}{8}$ -24-16 x  $3\frac{1}{4}$  in.
- 6 Engine block

Figure 14. Cylinder head, removal points.



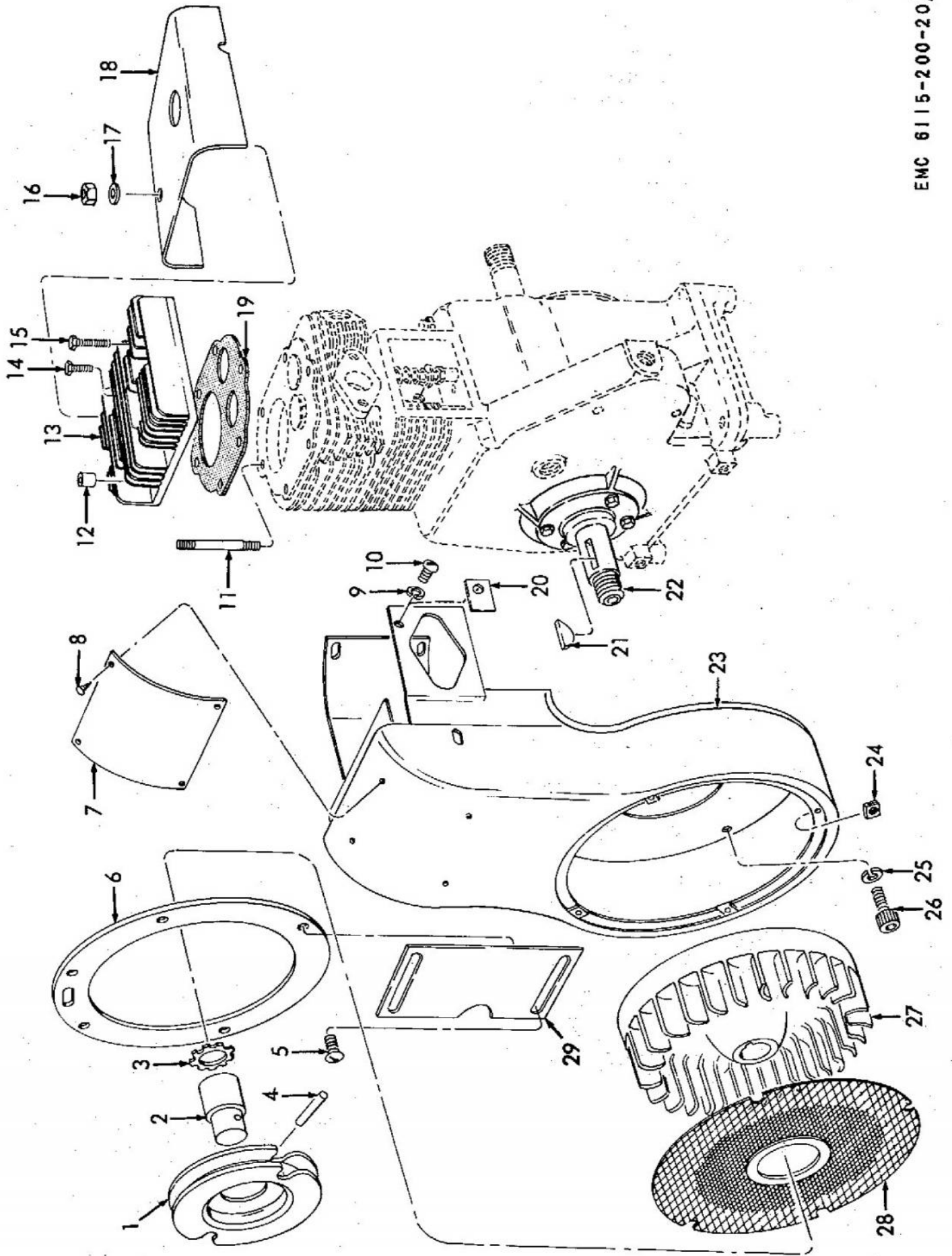


Figure 15. Cylinder head, starting sheave, flywheel, and air shroud, exploded view.

1	Sheave	16	Nut, hex, $\frac{3}{8}$ -24
2	Nut and shaft extension	17	Washer, flat, $1\frac{13}{32}$ in. (6 rqr)
3	Washer, lock, ET, $\frac{7}{8}$ in.	18	Air shroud cover
4	Pin, straight, chamfered, $\frac{1}{4}$ x $1\frac{1}{4}$ in.	19	Cylinder head gasket
5	Screw, machine, $\frac{1}{4}$ -20 x $\frac{1}{2}$ in. (4 rqr)	20	Ignition cable assembly clamp
6	Air shroud screen rim	21	Key, woodruff, No. 22, $\frac{1}{4}$ x $1\frac{3}{8}$ in.
7	Instruction plate	22	Crankshaft
8	Screw, self-tapping, No. 4-24 x $\frac{1}{4}$ in. (4 rqr)	23	Air shroud
9	Washer, lock, $\frac{1}{4}$ in. (4 rqr)	24	Nut, sheet spring, No. 14A (4 rqr)
10	Screw, machine, $\frac{1}{4}$ -20 x $\frac{3}{8}$ in. (4 rqr)	25	Washer, lock, $\frac{5}{16}$ in. (2 rqr)
11	Stud, plain, $\frac{3}{8}$ -16-24 x $3\frac{1}{4}$ in.	26	Screw, cap, socket-head, $\frac{5}{16}$ -18 x $\frac{1}{2}$ in. (2 rqr)
12	Stud spacer	27	Flywheel
13	Cylinder head	28	Screen
14	Screw, cap, $\frac{3}{8}$ -16 x $1\frac{1}{4}$ in. (2 rqr)	29	Baffle (2 rqr)
15	Screw, cap, $\frac{3}{8}$ -16 x $1\frac{1}{2}$ in. (3 rqr)		

Figure 15—Continued.

and stud for damaged threads. Replace defective cylinder head capscrews and studs.

#### c. Installation.

- (1) Install the cylinder head stud (11, fig. 15) in the engine block.
- (2) Position a new cylinder head gasket (19) on the engine block and install the cylinder head (13).
- (3) Install the five capscrews (14 and 15) with flat washers (17), according to length, and tighten gradually in rotation with a torque wrench until a torque of 32 ft-lb is reached.
- (4) Install the lockwasher and machine screw that secure the air shroud (23) to the rear of the cylinder head.
- (5) Install the spark plug (par. 50).

### 59. Sheave and Nut and Shaft Extension

#### a. Removal and Disassembly.

- (1) Remove the sheave assembly (6, fig. 10) counterclockwise from the crankshaft (8). Remove the lockwasher (3, fig. 15) from the crankshaft (22).
- (2) Remove the chamfered pin (4) and separate the sheave (1) from the nut and shaft extension (2).

#### b. Cleaning, Inspection, and Repair.

- (1) Clean all parts with an approved cleaning solvent and dry thoroughly.
- (2) Inspect the sheave for cracks and breaks.
- (3) Inspect the sheave and the nut and

shaft extension for fit. Replace both to obtain a tight fit.

- (4) Be sure that the chamfered pin fits tightly when installed.
- (5) Replace all loose fittings or defective parts.

#### c. Reassembly and Installation.

- (1) Assemble the nut and shaft extension (2) in the sheave (1) and secure with the chamfered pin (4).
- (2) Position the lockwasher (3) on the crankshaft (22). Install the sheave assembly (6, fig. 10) and tighten securely on the crankshaft.

### 60. Flywheel

#### a. Removal.

- (1) Remove the sheave and the nut and shaft extension (par. 59).
- (2) Remove the air shroud rim and screen (par. 62).
- (3) Remove the flywheel (27, fig. 15) from the crankshaft (22) by tapping lightly on the front end of the crankshaft with a soft metal hammer and, at the same time, exerting an outward pull at the fins on the flywheel.
- (4) Remove the woodruff key (21) from the keyway in the crankshaft.

#### b. Cleaning and Inspection.

- (1) Clean the flywheel with an approved cleaning solvent and dry thoroughly.
- (2) Inspect the flywheel and bore for cracks, nicks, or other flaws. Examine



the key and keyways for nicks or metal burs.

- (3) See that the flywheel timing mark is legible.
- (4) Replace a defective flywheel or woodruff key.

*c. Installation.*

- (1) Install the woodruff key (21) in the keyway in the crankshaft (22).

- (2) Position the flywheel (27), with its keyway aligned with the key in the crankshaft, and install the flywheel.
- (3) Install the air shroud screen and rim (par. 62).
- (4) Install the sheave and the nut and shaft extension (par. 59).

## Section VII. COOLING AND EXHAUST SYSTEMS

### 61. General

*a. Cooling System.* The engine is air cooled by forced air from the flywheel. The air shroud encloses the flywheel and three sides of the engine. The air shroud cover encloses three sides of the cylinder head. Cooling air is drawn through the air shroud screen and into the air shroud by the fins on the flywheel. The air is forced up around the sides and top of the engine and out through the openings in the air shroud and air shroud cover.

*b. Exhaust System.* The exhaust system consists of elbows and a muffler to allow disbursement of engine exhaust with a minimum amount of noise.

### 62. Air Shroud, Cover, Screen, Rim, and Baffles

*a. Removal and Disassembly.*

(1) *Air shroud cover.*

- (a) Remove the ignition cable from the spark plug (par. 51).
- (b) Remove the machine screw (10, fig. 15) and lockwasher (9) that secure the ignition cable assembly clamp (20) and one side of the air shroud cover (18) to the cylinder head (13).
- (c) Remove the hex-nut (16) and flat washer (17) from the stud (11).
- (d) Remove the air shroud cover (18) and the stud spacer (12) from the cylinder head (13).

(2) *Screen, rim, and baffles.*

- (a) Remove the sheave and the nut and shaft extension (par. 59).
- (b) Remove the four machine screws

(5) and remove the two baffles (29), the rim (6), and the screen (28) from the air shroud (23).

(3) *Air shroud.*

- (a) Remove the intake manifold (par. 54).
- (b) Remove the flywheel (par. 60).
- (c) Remove the capscrew and lockwasher that secure the air cleaner bracket (39, fig. 6) to the bracket clip on the air shroud (23, fig. 15).
- (d) Remove the three remaining machine screws (10) and lockwashers (9) that secure the air shroud on the rear and the side of the engine block.
- (e) Remove the two capscrews (26) and lockwashers (25) that secure the air shroud (23) to the front of the engine block.
- (f) Remove the air shroud from the engine.
- (g) Remove the four nuts (24) from the front of the air shroud.
- (h) Remove the hex-nut, lockwasher, and capscrew that secure the bracket clip on the side of the air shroud. Remove the bracket clip.

*b. Cleaning, Inspection, and Repair.*

- (1) Clean the air shroud, cover, screen, and rim with an approved cleaning solvent to remove all dirt and grease. Dry thoroughly.
- (2) Inspect for dents, cracks, and rust. Inspect all applicable screws and nuts for damaged threads.
- (3) Replace all defective parts.

- (4) Remove any loose paint and repaint where necessary, as instructed in TM 9-2851.

*c. Reassembly and Installation.*

(1) *Air shroud.*

- (a) Position the bracket clip on the side of the air shroud; then install the capscrew and secure from inside the air shroud with the lockwasher and hex-nut.
- (b) Install the four nuts (24) on the front of the air shroud.
- (c) Position the air shroud (23) on the front of the engine block and secure with the two lockwashers (25) and socket-head capscrews (26).
- (d) Install the three lockwashers (9) and screws (10) that secure the air shroud at the rear and right side of the engine block.
- (e) Install the lockwasher and capscrew that secure the air cleaner bracket to the bracket clip.
- (f) Install the flywheel (par. 60).
- (g) Install the intake manifold (par. 54).

(2) *Screen, rim, and baffles.*

- (a) Aline the screen (28), rim (6), and 2 baffles (29) on the air shroud (23) and secure with the 4 machine screws (5).
- (b) Install the sheave and the nut and shaft extension (par. 59).

(3) *Air shroud cover.*

- (a) Install the stud spacer (12) and the air shroud cover (18) on the cylinder head (13).

- (b) Secure the shroud cover (18) with the flat washer (17) and hex-nut (16).

- (c) Secure one side of the air shroud cover (18) and the ignition cable assembly clamp (20) on the cylinder head (13) with one lockwasher (9) and machine screw (10).

- (d) Install the ignition cable on the spark plug (par. 51).

### 63. Muffler and Fittings

*a. Removal.*

- (1) Remove the muffler (13, fig. 6) from the street elbow (10).
- (2) Loosen the locknut (9) and remove the street elbow (10) from the engine block. Remove the locknut from the street elbow.
- (3) Remove the elbow (15) from the muffler (13).

*b. Cleaning, Inspection, and Repair.*

- (1) Clean all parts with an approved cleaning solvent and dry thoroughly.
- (2) Inspect the muffler for holes, cracks, and excessive rust.
- (3) Replace a defective part.

*c. Installation.*

- (1) Install the elbow (15) on the muffler (13).
- (2) Install the locknut (9) on the street elbow (10). Install the street elbow in the engine block and secure with the locknut.
- (3) Install the muffler (13) in the street elbow (10).

## Section VIII. MAIN GENERATOR AND EXCITER

### 64. General

The main generator is directly coupled to the engine. The electrical contact brushes for the main generator are mounted inside the exciter cover. The exciter cover must be removed to inspect and service the brush rigging assembly, commutator, and slippings.

### 65. Exciter Cover

*a. Removal.* Remove the four capscrews (1, fig. 10) and lockwashers (14) and remove the exciter cover (13) from the stator frame.

*b. Cleaning and Inspection.*

- (1) Clean the exciter cover with an approved cleaning solvent.



(2) Inspect the exciter cover for cracks, breaks, and elongated holes. Replace an unserviceable exciter cover.

(3) Replace all unserviceable hardware.

*c. Installation.* Install the exciter cover (13) on the stator frame and secure with the four lockwashers (14) and capscrews (1).

## 66. Cooling Fan

### *a. Removal.*

(1) Remove the exciter cover (par. 65).

(2) Remove the cotter pin (4, fig. 16), hex-nut (2), lockwasher (6), and flat washer (1) and remove the cooling fan (5) from the rotor shaft (3).

### *b. Installation.*

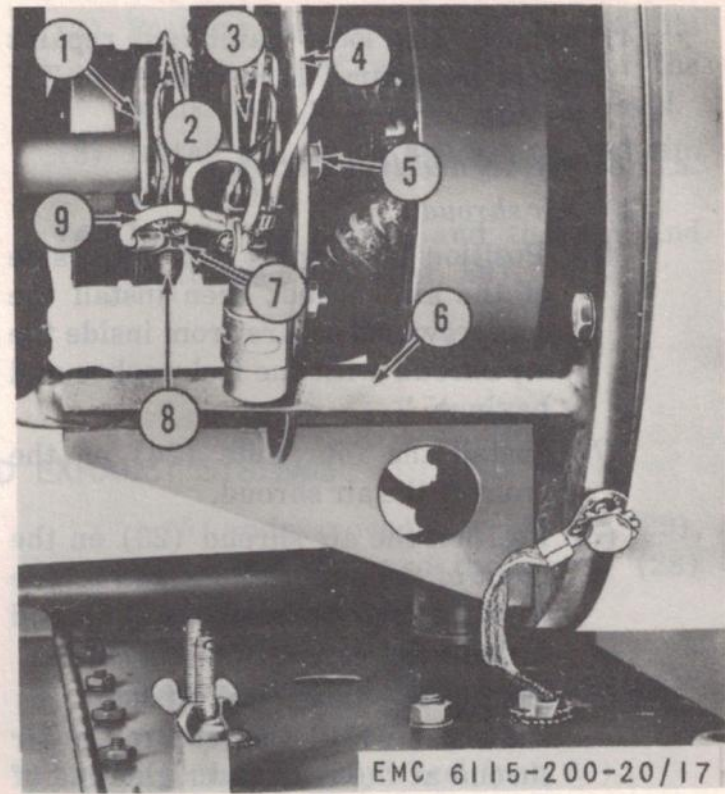
(1) Install the cooling fan (5) on the rotor shaft (3) and secure with the flat washer (1), lockwasher (6), hex-nut (2), and cotter pin (4).

(2) Install the exciter cover (par. 65).

## 67. Generator Brushes

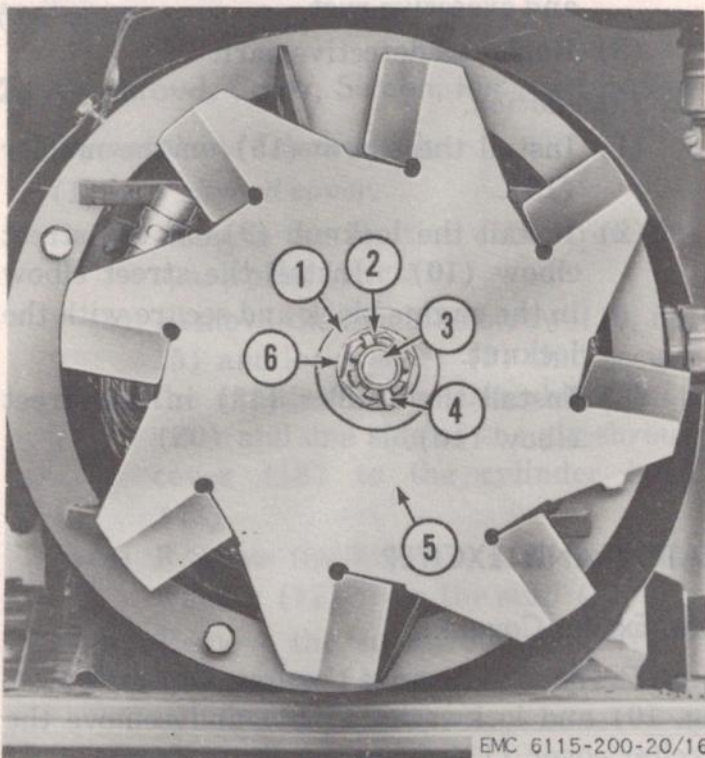
### *a. Removal.*

(1) Remove the exciter cover (par. 65).



- 1 Brush holder (4 qqr)
- 2 Brush spring (4 qqr)
- 3 Brush (4 qqr)
- 4 Brush holder ring
- 5 Screw, cap,  $\frac{1}{4}$ -20 x  $\frac{3}{4}$  in. (2 qqr)
- 6 Frame
- 7 Nut, hex, No. 10-32 (10 qqr)
- 8 Brush holder terminal (4 qqr)
- 9 Brush lead (4 qqr)

Figure 17. Main generator, brush removal points.



- 1 Washer, flat (spec)
- 2 Nut, hex (spec)
- 3 Rotor shaft
- 4 Pin, cotter,  $\frac{1}{8}$  x 1 in.
- 5 Cooling fan
- 6 Washer, lock (spec)

Figure 16. Cooling fan, removal points.

(2) Remove one hex-nut (7, fig. 17) and lockwasher and remove the brush lead (9) from the brush holder terminal (8).

(3) Raise the brush spring (2) in the brush holder (1) and remove the electrical contact brush (3) from the brush holder.

(4) Remove the other three brushes in the same manner.

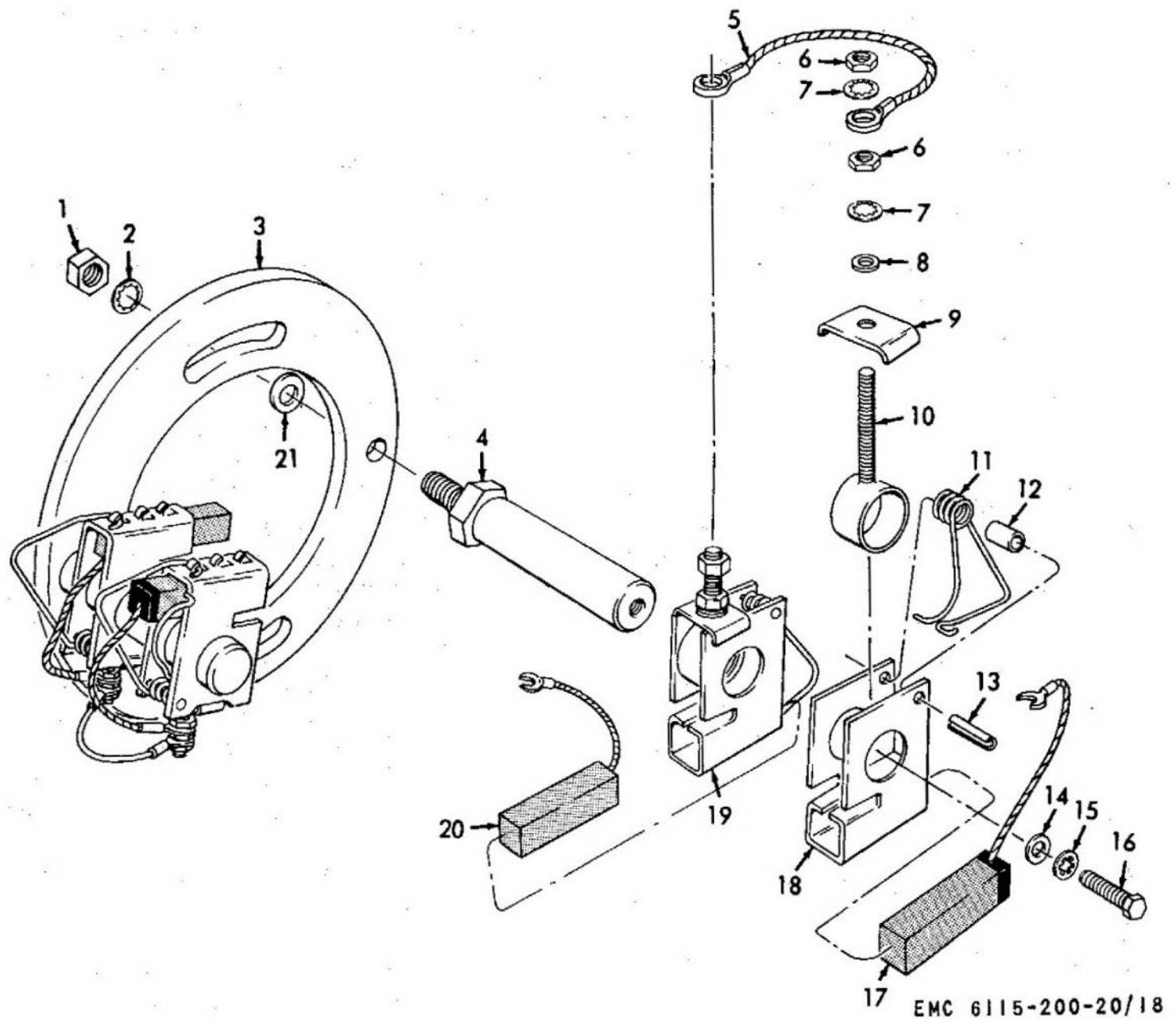
*Note.* Pay particular attention to the location of the 2 different types of electrical contact brushes. The 2 cushioned brushes (17, fig. 18) must always be installed in the commutator positioned brush holders and the plain brushes (20) must always be installed in the slipping positioned brush holders.

### *b. Cleaning and Inspection.*

(1) Clean the electrical contact brushes and brush holders with compressed air.

(2) Inspect the electrical contact brushes





- |  |  |
|--|--|
| 1 Nut, hex, $\frac{5}{16}$ -18 (2 rqr)         | 12 Brush spring bushing (4 rqr)                      |
| 2 Washer, lock, IT, $\frac{5}{16}$ in. (2 rqr) | 13 Compression pin (4 rqr)                           |
| 3 Brush holder ring                            | 14 Washer, flat, $\frac{1}{4}$ in. (2 rqr)           |
| 4 Brush holder stud with insulation (2 rqr)    | 15 Washer, lock, IT, $\frac{1}{4}$ in. (2 rqr)       |
| 5 Electrical lead (2 rqr)                      | 16 Screw, cap, $\frac{1}{4}$ -20 x $\frac{1}{2}$ in. |
| 6 Nut, hex, No. 10-32 (10 rqr)                 | 17 Electrical contact brush (commutator) (2 rqr)     |
| 7 Washer, lock, IT, No. 10 (10 rqr)            | 18 Commutator brush holder (2 rqr)                   |
| 8 Washer, flat, $\frac{7}{32}$ in. (4 rqr)     | 19 Slipping brush holder (2 rqr)                     |
| 9 Brush holder terminal clamp (4 rqr)          | 20 Electrical contact brush (slipping) (2 rqr)       |
| 10 Brush holder terminal (4 rqr)               | 21 Washer, flat, $\frac{5}{16}$ in. (2 rqr)          |
| 11 Brush spring (4 rqr)                        |  |

Figure 18. Electrical contact brush rigging assembly, exploded view.

for freedom of movement in the brush holders.

- (3) Inspect the electrical contact brushes for an oil soaked, chipped, or burned condition.
- (4) Replace damaged electrical contact brushes or brushes that are worn to less than one-half the original length.

Note. Never replace an electrical contact brush individually. Always replace a complete set of brushes.

- (5) Inspect the commutator and sliprings for wear, pitting, or a burned condition.
- (6) Clean the sliprings and commutator with a cloth dampened with an ap-



proved cleaning solvent. Slight surface defects or embedded dirt should be removed by holding a pad of No. 00 sandpaper with a wooden block against the commutator and sliprings while rotating the armature. Follow up this procedure by using a piece of canvas in a similar manner to polish the sliprings and commutator.

**Caution:** Do not use lubricants or emery cloth to clean the commutator or sliprings. The residue from emery cloth will cause electrical shorting and the lubricant will prevent effective electrical contact.

*c. Installation.*

- (1) Raise the brush spring (2, fig. 17) in the brush holder (1) and install the electrical contact brush (3) in the brush holder.
- (2) Install the brush lead (9) on the brush holder terminal (8) and secure with one lockwasher and hex-nut (7).
- (3) Install the other three brushes in the same manner.
- (4) Install the exciter cover (par. 65).

*d. Field Expedient Repair.* If inspection or operation indicates that the brushes are too short or broken, a brush must be substituted in the electrical circuit by performance of the following steps:

- (1) Remove the defective brush (*a* above).
- (2) Sand or file to size a brush from another generator or automotive equipment. Replace with a correct size brush as soon as possible to avoid damage to the equipment.
- (3) Install the substitute brush (*c* above).

*e. Restoring Residual Magnetism.*

- (1) Remove the exciter cover (par. 65).
- (2) Raise the four brushes (3) from the commutator and slipring surfaces and place paper or other insulating material under the ends of the brushes.
- (3) Connect a source of 6- or 12-volt direct current to the two brush holder assemblies. Momentary contact is sufficient, and either polarity is satisfactory in this exciter circuit.

- (4) Remove the paper from the commutator and slipring surfaces.
- (5) Install the exciter cover (par. 65).

## 68. Brush Rigging

*a. Removal and Disassembly.*

- (1) Remove the cooling fan (par. 66).
- (2) Remove the electrical contact brushes (par. 67).
- (3) Remove the capacitors (par. 38).
- (4) Remove the two capscrews and flat washers that secure the brush rigging to the rear of the frame.
- (5) Remove the two capscrews (5, fig. 17) and flat washers and remove the brush holder ring (4) from the frame (6).
- (6) Remove the hex-nut (6, fig. 18) and lockwasher (7) that secure the electrical lead (5) on the brush holder terminal (10) and remove the lead.
- (7) Remove the hex-nut (6), lockwasher (7), and flat washer (8) and the terminal clamp (9) from the brush holder terminal (10). Remove the brush holder (18) from the brush holder stud (4).
- (8) Remove the two capscrews (16), lockwashers (15), and flat washers (14) that secure the brush holder studs (4) to the supports mounted in the frame.
- (9) Separate the brush holder terminal (10) from the brush holder (18).
- (10) Remove the compression pin (13) that secures the brush spring (11) in the brush holder. Remove the brush spring (11) and bushing (12) from the brush holder.
- (11) Remove and disassemble the three remaining brush holders in the same manner.
- (12) Remove the hex-nut (1), lockwasher (2), and flat washer (21) that secure the brush holder stud (4) to the brush holder ring (3). Remove the other brush holder stud in the same manner.

*b. Cleaning, Inspection, and Repair.*

- (1) Clean all parts, except the brush holder studs, with an approved cleaning solvent and dry thoroughly.

- (2) Inspect the brush holder studs for cracked and broken insulation.
- (3) Inspect all applicable threaded parts for damaged threads.
- (4) Replace all defective parts.

*c. Reassembly and Installation.*

- (1) Install the brush holder stud (4) in the brush holder ring (3) and secure with the flat washer (21), lockwasher (2), and hex-nut (1). Install the other brush holder stud in the same manner.
- (2) Install the bushing (12) in the brush spring (11) and install the brush spring in the brush holder (18). Secure the brush spring in the brush holder body with the compression pin (13).
- (3) Position the brush holder terminal (10) in the brush holder (18) and loosely install the terminal clamp (9), flat washer (8), lockwasher (7), and hex-nut (6) on the brush holder terminal (10).
- (4) Position the brush holder (18) on the brush holder stud (4) and tighten the hex-nut (6) until enough tension is on the brush holder terminal to hold the brush holder in a secure position on the brush holder stud.
- (5) Reassemble and install the three remaining brush holders in the same manner.
- (6) Position the two electrical leads (5) on the brush holder terminals (10) and install one lockwasher (7) and hex-nut (6).
- (7) Position the brush holder ring (4, fig. 17) on the frame (6).
- (8) Install the two flat washers, lockwashers, and capscrews (5) that secure the brush rigging to the frame.
- (9) Secure the brush rigging to the rear

of the frame with the two flat washers and capscrews.

- (10) Install the capacitors (par. 38).
- (11) Install the electrical contact brushes (par. 67).
- (12) Install the cooling fan (par. 66).

*d. Brush Spring Tension Adjustment.*

- (1) Remove the exciter cover (par. 65).
- (2) Attach the hook of a spring scale to the tension arm of a brush spring (2) and pull in line with the brush (3) until the tension arm is just free of the brush.
- (3) Read the scale and repeat with each brush in turn. The commutator brush spring tension should be approximately 22 ounces and the slipring brush tension should be approximately 16 ounces.
- (4) Hook the adjusting arm of each brush spring in the brush holder notch which most closely approximates the correct brush tension.
- (5) Replace worn brushes or weak brush springs as necessary to achieve the correct brush spring tension.
- (6) Install the exciter cover (par. 65).

*e. Neutral Plane Brush Rigging Setting.*

- (1) Loosen the two capscrews (5) and the two capscrews that secure the brush rigging to the rear of the frame (6).
- (2) Start and operate the generator set with rated load (TM 5-6115-200-10).
- (3) Move the brush holder ring of the brush rigging with or against the direction of rotation until the point of least sparking at the commutator brushes is determined.
- (4) Tighten the four capscrews to secure the brush holder ring.
- (5) Stop the generator set (TM 5-6115-200-10).

## Section IX. CONTROL BOX AND INSTRUMENTS

### 69. General

All the generator set controls and instruments are housed in the control box at the rear of the

generator set. Controls and instruments must be replaced when they become inoperative or show indications of incorrect readings under



normal operations. Be particularly careful when handling instruments, as they are sensitive and accurately adjusted.

**Warning:** Before working on any controls and instruments be sure the generator set is not in operation.

*Note.* Tag all leads and applicable terminals for identification before removing a control or instrument.

## 70. Ammeter

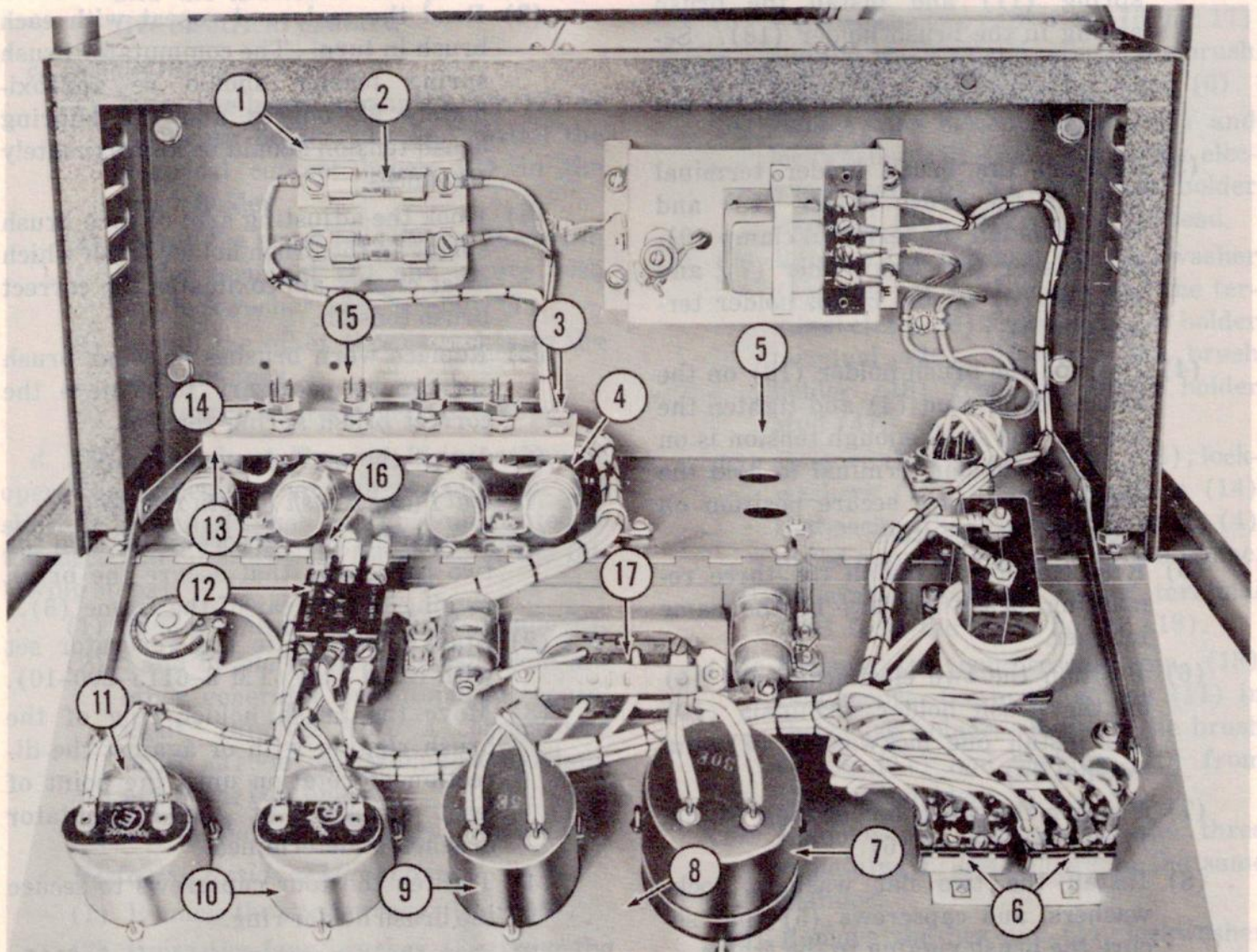
### a. Removal.

- (1) Tag and remove the leads from the ammeter (10, fig. 19).

- (2) Remove the three screws, nuts, and lockwashers and remove the ammeter from the front of the control box panel (8).

### b. Installation.

- (1) Install the ammeter (10) in the front of the control box panel (8) and secure with the three screws, nuts, and lockwashers.
- (2) Install the tagged leads to their respective terminals on the ammeter (10).



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- |  |   |
|--|---|
| 1 Fuse block   | 10 Ammeter  |
| 2 Fuse (2 rqr)   | 11 Voltmeter  |
| 3 Screw, cap, $\frac{1}{4}$ -20 x $1\frac{1}{2}$ in. (4 rqr) | 12 Output ON-OFF toggle switch                            |
| 4 Spacer (4 rqr)   | 13 Terminal board   |
| 5 Control box  | 14 Terminal stud nut (4 rqr)                              |
| 6 Phase changeover switch                                    | 15 Terminal stud (spec) (4 rqr)                           |
| 7 Elapsed time meter   | 16 Screw, machine, No. 10-32 x $1\frac{3}{4}$ in. (2 rqr) |
| 8 Control box panel  | 17 Electrical receptacle connector (120 volt)             |
| 9 Frequency meter  |   |

Figure 19. Generator control box, inside view.



## 71. Voltmeter

### a. Removal.

- (1) Tag and remove the leads from the voltmeter (11, fig. 19).
- (2) Remove the three screws, nuts, and lockwashers and remove the voltmeter (11) from the front of the control box panel (8).

### b. Installation.

- (1) Install the voltmeter (11) in the front of the control box panel (8) and secure with the three screws, nuts, and lockwashers.
- (2) Install the tagged leads to their respective terminals on the voltmeter (11).

## 72. Elapsed Time Meter

### a. Removal.

- (1) Tag and remove the leads from the elapsed time meter (7, fig. 19).
- (2) Remove the three screws, nuts, and lockwashers and remove the elapsed time meter (7) from the front of the control box panel (8).

### b. Installation.

- (1) Install the elapsed time meter (7) in the front of the control box panel (8) and secure with the three screws, nuts, and lockwashers.
- (2) Install the tagged leads to their respective terminals on the elapsed time meter (7).

## 73. Frequency Meter

### a. Removal.

- (1) Tag and remove the leads from the frequency meter (9, fig. 19).
- (2) Remove the three screws, nuts, and lockwashers and remove the frequency meter (9) from the front of the control box panel (8).

### b. Installation.

- (1) Install the frequency meter (9) in the front of the control box panel (8) and secure with the three screws, nuts, and lockwashers.
- (2) Install the tagged leads to their respec-

tive terminals on the frequency meter (9).

## 74. Changeover Panel

### a. Removal and Disassembly.

- (1) Remove the cotter pin (10, fig. 20) from the mounting shaft (11) at the rear of the control box panel. Remove one flat washer (8), changeover plate spring (9), and flat washer (8) from the mounting shaft (11).
- (2) Remove the knurled nut (3) from the stud and spacer (5) at the front of the control box panel. Remove the changeover panel (4), mounting shaft (11), and the knurled nut (3) and retainer chain (2) from the front of the control box panel.
- (3) Remove the machine screw (16) and lockwasher (15) that secure the changeover panel (4) and the retainer chain (2) to the mounting shaft (11). Separate the retainer chain, changeover panel, and mounting shaft.
- (4) Remove the machine screw (1) that secures the retainer chain (2) to the knurled nut (3).
- (5) Remove the hex-nut (7) and lockwashers (6) that secure the stud and spacer (5) at the rear of the control panel and remove the stud and spacer from the front of the control panel.
- (6) Remove the hex-nut (12) and lockwasher (13) that secure the changeover plate spacer (14) at the rear of the control panel and remove the spacer from the front of the control box panel.

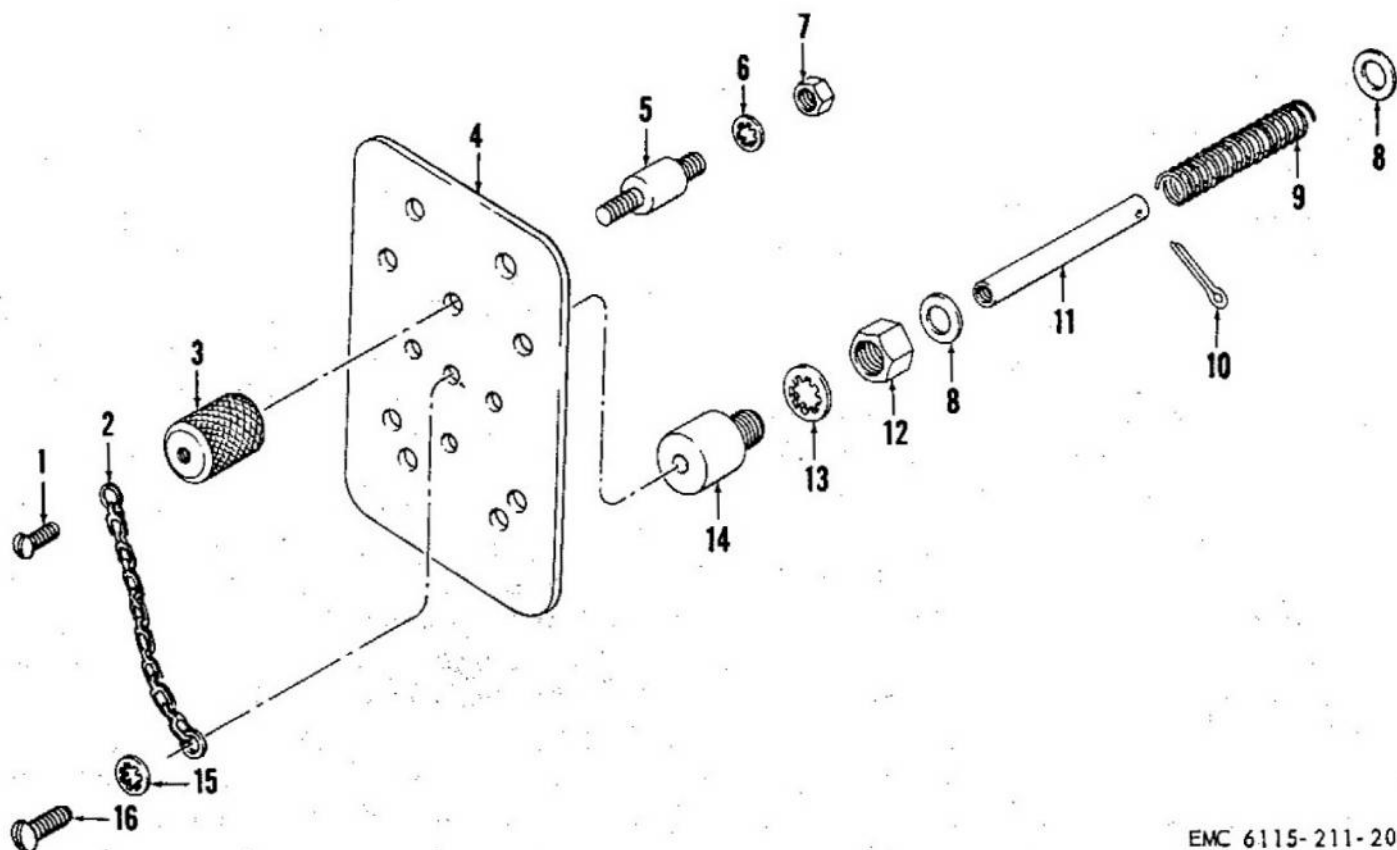
### b. Cleaning, Inspection, and Repair.

- (1) Clean all parts with an approved cleaning solvent and dry thoroughly.
- (2) Inspect all parts for cracks, breaks, and signs of wear.
- (3) Inspect the fit of the mounting shaft in the changeover plate spacer. The shaft should move freely in the spacer.
- (4) Replace all defective parts.

### c. Reassembly and Installation.

- (1) Install the changeover plate spacer





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- |   |                                    |    |                                     |
|---|------------------------------------|----|-------------------------------------|
| 1 | Screw, machine, No. 6-32 x 1/4 in. | 9  | Changeover plate spring             |
| 2 | Retainer chain                     | 10 | Pin, cotter, 1/16 x 3/4 in.         |
| 3 | Knurled nut (spec)                 | 11 | Mounting shaft                      |
| 4 | Changeover panel                   | 12 | Nut, hex, 3/8-16                    |
| 5 | Stud and spacer                    | 13 | Washer, lock, IT, 3/8 in.           |
| 6 | Washer, lock, IT, 1/4 in.          | 14 | Changeover plate spacer             |
| 7 | Nut, hex, 1/4-20                   | 15 | Washer, lock, IT, No. 10            |
| 8 | Washer, flat, 1/4 in. (2 rqr)      | 16 | Screw, machine, No. 10-32 x 3/8 in. |

Figure 20. Changeover panel and mounting, exploded view.

- (14) in the front of the control box panel and secure it at the rear of the control panel with the lockwasher (13) and hex-nut (12).
- (2) Install the stud and spacer (5) in the front of the control panel and secure it at the rear of the control panel with the lockwasher (6) and hex-nut (7).
- (3) Secure the retainer chain (2) to the knurled nut (3) with the machine screw (1).
- (4) Position the changeover panel (4) and the retainer chain (2) at the end of the mounting shaft (11) and secure it to the shaft with the lockwasher (15) and machine screw (16).
- (5) Install the mounting shaft through the changeover plate spacer (14) from the front of the control box panel.
- (6) Aline the holes in the changeover

panel in the position applicable to the setting of the selector toggle switches. Install the knurled nut (3) on the stud and spacer (5) in the front of the control box panel to secure the changeover panel in position.

- (7) Position one flat washer (8), changeover plate spring (9), and the flat washer (8) on the mounting shaft (11) in the rear of the control box panel and secure with the cotter pin (10).
- (8) Refer to TM 5-6115-200-10 for instructions on proper settings for the changeover panel and selector switches.

## 75. Electrical Receptacle Connector (120-Volt)

### a. Removal.

- (1) Tag and remove the leads from the

electrical receptacle connector (17, fig. 19).

- (2) Remove the two screws from the front of the control box panel (8) and remove the electrical receptacle connector (17) from the rear of the control box panel.

*b. Installation.*

- (1) Align the electrical receptacle connector (17) from the rear of the control box panel (8) and secure with the two screws from the front of the panel.
- (2) Install the tagged leads to their respective terminals on the electrical receptacle connector (17).

## 76. Cable Clamp

*a. Removal.*

- (1) Remove the two cotter pins from the bottom of the machine screws (16, fig. 19).
- (2) Remove the two wing nuts and remove the bottom portion of the cable clamp from the 2 machine screws (16).
- (3) Remove the two machine screws (16) from the inside of the control box (5) and remove the top half of the cable clamp from the underneath side of the control box.

*b. Installation.*

- (1) Align the top half of the cable clamp to the bottom of the control box (5) and secure with the two machine screws (16) from the inside of the control box.
- (2) Install the lower half of the cable clamp on the two machine screws (16) and secure with the two wing nuts.
- (3) Install the two cotter pins in the machine screws (16).

## 77. Phase Changeover Toggle Switch

*a. Removal.*

- (1) Remove the changeover panel (par. 74).
- (2) Remove the two screws which secure the phase changeover toggle switch (6, fig. 19) to the control box panel (8).
- (3) Tag and remove the leads from the

phase changeover toggle switch (6) and remove the phase changeover toggle switch (6) from the rear of the control box panel (8).

- (4) Remove the other phase changeover toggle switch in the same manner.

*b. Installation.*

- (1) Install the phase changeover toggle switch (6) from the rear of the control box panel (8).
- (2) Install the tagged leads to their respective terminals on the phase changeover toggle switch.
- (3) Secure the phase changeover toggle switch (6) to the control box panel (8) with the two screws.
- (4) Install the other phase changeover toggle switch in the same manner.
- (5) Install the phase changeover plate (par. 74).

## 78. Output ON-OFF Toggle Switch

*a. Removal.*

- (1) Tag and remove the wire leads from the output ON-OFF toggle switch (12, fig. 19).
- (2) Remove the hex-nut from the front of the control box panel (8) and remove the output ON-OFF toggle switch (12) from the rear of the control box panel (8).

*b. Installation.*

- (1) Install the output ON-OFF toggle switch (12) from the rear of the control box panel (8) and secure at the front of the control box panel with the hex-nut.
- (2) Connect the tagged leads to their respective terminals on the output ON-OFF toggle switch.

## 79. Terminal Studs and Terminal Board

*a. Removal.*

- (1) Loosen the terminal stud nut (14, fig. 19) and disconnect and tag all external load lines from the terminal stud (15).
- (2) Remove the hex-nut that secures the wire lead to the terminal stud. Re-



move and tag the lead and remove the terminal stud from the mounting hole in the fiber terminal board (13).

- (3) Remove the three remaining terminal studs in a similar manner.
- (4) Remove the four hex-nuts, lockwashers, and capscrews (3) that secure the terminal board (13) and terminal board spacers (4) on the inside of the control box (5). Remove the terminal board and spacers.

*b. Cleaning, Inspection, and Repair.*

- (1) Clean the terminal board and spacers with a cloth dampened with an approved cleaning solvent and dry thoroughly.
- (2) Inspect the terminal board, spacers, and terminal studs for cracks and breaks.
- (3) Inspect the terminal studs for broken terminal nut retainer chains.
- (4) Inspect all applicable threaded parts for damaged threads.
- (5) Replace all defective parts.

*c. Installation.*

- (1) Install the four capscrews (3) in the terminal board (13) and position the terminal board spacers (4) on the capscrews.
- (2) Position the terminal board and spacers on the inside of the control box (5), push the capscrews through the rear panel, and secure from outside the

control box with the four lockwashers and hex-nuts.

- (3) Position the terminal stud (15) in the mounting hole in the terminal board (13).
- (4) Connect the tagged wire lead to the terminal stud and secure with the hex-nut.
- (5) Install the three remaining terminal studs in a similar manner.
- (6) After the terminal studs have been installed, connect the tagged external load lines to the proper terminal studs and secure with the terminal stud nuts (14).

## 80. Fuse Block

*a. Removal.*

- (1) Tag and remove the four leads from the fuse block (1, fig. 19).
- (2) Remove the two fuses (2) from their holders.
- (3) Remove the two screws, hex-nuts, and lockwashers and remove the fuse block (1) from the control box (5).

*b. Installation.*

- (1) Aline the fuse block (1) on the control box (5) and secure with the two machine screws, lockwashers, and hex-nuts.
- (2) Install the two fuses (2) in their holders.
- (3) Install the four tagged leads to their respective terminals on the fuse block.

## CHAPTER 4

### SHIPMENT AND LIMITED STORAGE

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#### Section I. SHIPMENT WITHIN ZONE OF INTERIOR

##### 81. Preparation of Equipment for Shipment

a. Drain the fuel tank. Empty and clean the fuel strainer bowl. Operate the engine until the fuel is used from the fuel line and carburetor.

b. Remove the engine air cleaner and drain the oil. Clean the air cleaner thoroughly. Install the empty air cleaner.

c. Refer to TM 9-1005 for preservation, packaging, and shipping instructions.

d. Crate the generator set in accordance with the shipping dimensions shown in TM 5-6115-200-10.

##### 82. Loading Equipment for Shipment

Load the generator set on the carrier, using a fork lift, or the unit may be loaded by attaching a sling around the crate and using a suitable hoist. Block or tie the unit to the carrier deck to prevent shifting during transportation. Place wooden planks lengthwise to the skid frame or crate and nail them to the carrier deck. Tie down the unit to the carrier with straps in at least two places.

**Warning:** Be extremely careful when lifting the generator set with a hoist and do not allow the unit to swing freely or strike other equipment, buildings, or persons nearby the loading zone.

#### Section II. LIMITED STORAGE

##### 83. Preparation of Equipment for Storage

a. *Inspection.* Make a complete inspection of the generator set, as described in paragraph 10. Correct any deficiencies noted or report them to field maintenance.

##### b. *Preservation.*

(1) *Cleaning and drying.* Prior to the application of any preservative or paint, thoroughly clean all surfaces to be coated either with an approved cleaning solvent, or high pressure steam cleaning as applicable. Care will be taken to prevent damage to electrical circuits and accessories during the cleaning operation. After cleaning and before applying preservatives or paints, all surfaces and parts will be thoroughly dried.

(2) *Painting.* Surfaces will be cleaned; rust, corrosion, and so on will be removed and repainted as required. This

includes all surfaces which may be effectively protected by paint without interference to the operation of the equipment, if practicable. Refer to TM 9-2851 for painting instructions.

c. *Lubrication.* Lubricate the generator set in accordance with the current lubrication order.

##### 84. Inspection and Maintenance of Equipment in Storage

a. *General.* The generator set must be inspected and maintained while in limited storage.

b. *Inspection.* When equipment has been placed in storage, all scheduled preventive maintenance services, including inspection, will be suspended and preventive maintenance inspection will be performed as specified herein. Refer to AR 743-505.

c. *Worksheet and Preventive Maintenance.*



DA Form 464 will be executed on each major item of equipment when equipment is initially placed in limited storage and every 30 days thereafter. Required maintenance will be performed promptly to insure that the equipment is mechanically sound and ready for immediate use.

*d. Operation.* Equipment in limited storage must be operated long enough to bring it up to operating temperature and for complete lubrication of all bearings, gears, and so on, at least every 30 days. Equipment must be serviced and in satisfactory operating condition before it is operated.

## APPENDIX I

### REFERENCES

---

#### 1. Dictionaries of Terms and Abbreviations

- AR 320-5 Dictionary of United States Army Terms.  
AR 320-50 Authorized Abbreviations and Brevity Codes.

#### 2. Fire Protection

- TM 5-687 Repairs and Utilities: Fire Protection Equipment and Appliances;  
Inspections, Operations, and Preventive Maintenance.  
TM 9-1799 Ordnance Maintenance: Fire Extinguishers.

#### 3. Lubrication

- LO 5-6115-200-20 Generator Set, Gasoline Engine: 3 Kw, Ac, 120 V, 1 and 3 Phase,  
120/240 V. Single Phase, 120/208 V, 3 Phase, 60 Cycle; Skid  
Mounted (Hollingsworth Model JHGW3A) W/Wisconsin Engine  
Model AENLD.

#### 4. Operating Instructions

- TM 5-6115-200-10 Operator's Manual: Generator Set, Gasoline Engine; 3 Kw, Ac, 120 V,  
1 and 3 Phase, 120/240 V, Single Phase, 120/208 V, 3 Phase, 60  
Cycle; Skid Mounted (Hollingsworth Model JHGW3A) FSN 6115-  
649-8916.

#### 5. Painting

- TM 9-2851 Painting Instructions for Field Use.

#### 6. Preventive Maintenance

- AR 750-5 Maintenance Responsibilities and Shop Operation.  
TM 5-505 Maintenance of Engineer Equipment.

#### 7. Publication Indexes

- DA Pam 108-1 Index of Army Motion Pictures, Film Strips, Slides, and Phono-  
Recordings.  
DA Pam 310-1 Index of Administrative Publications.  
DA Pam 310-2 Index of Blank Forms.  
DA Pam 310-3 Index of Training Publications.  
DA Pam 310-4 Index of Technical Manuals, Technical Bulletins, Supply Bulletins,  
Lubrication Orders, and Modification Work Orders.  
DA Pam 310-5 Index of Graphic Training Aids and Devices.  
DA Pam 310-25 Index of Supply Manuals; Corps of Engineers.

#### 8. Radio Interference Suppression

- TM 11-483 Radio Interference Suppression.



## 9. Shipment and Limited Storage

AR 743-505

TM 9-1005

Limited Storage of Engineers Mechanical Equipment.  
Ordnance Preservation, Packaging, Packing, Storage, and Shipping.

## 10. Supply Publications

SM 10-1-C4-1

TM 5-6115-200-20P

Petroleum, Petroleum-Base Products, and Related Material.  
Organizational Maintenance Repair Parts and Special Tool Lists.  
Generator Set, Gasoline Engine; 3 Kw, Ac, 120 V, 1 and 3 Phase,  
120/240 V, Single Phase, 120/208 V, 3 Phase, 60 Cycle; Skid  
Mounted, (Hollingsworth Model JHGW3A) FSN 6115-649-8916.

## 11. Training Aids

FM 21-5

FM 21-6

FM 21-30

Military Training.  
Techniques of Military Instruction.  
Military Symbols.

## APPENDIX II

### MAINTENANCE

---

#### Section I. PREFACE

##### 1. General

This appendix contains a maintenance allocation chart listing all maintenance and repair operations authorized for the various echelons.

##### 2. Maintenance

Maintenance is any action taken to keep materiel in a serviceable condition or to restore it to serviceability when it is unserviceable. Maintenance of materiel includes the following:

*a. Service.* To clean, to preserve, and to replenish fuel and lubricants.

*b. Adjust.* To regulate periodically to prevent malfunction.

*c. Inspect.* To verify serviceability and to detect incipient mechanical failure by scrutiny.

*d. Test.* To verify serviceability and to detect incipient mechanical failure by use of special equipment such as gages, meters, and so on.

*e. Replace.* To substitute serviceable assemblies, subassemblies, and parts for unserviceable components.

*f. Repair.* To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes but is not limited to, inspecting, cleaning, preserving, adjusting, replacing, welding, riveting, and straightening.

*g. Overhaul.* To restore an item to *completely serviceable* condition as prescribed by serviceability standards developed and published by heads of technical services. This is accomplished through employment of the technique of "Inspect and Repair Only as Necessary" (IROAN). Maximum utilization of diagnostic and test equipment is combined with minimum disassembly of the item during the overhaul process.

##### 3. Explanation of Columns

*a. Functional Group.* The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes are taken from the Corps of Engineers Functional Grouping Indexes, and appear on the maintenance allocation chart in their correct numerical sequence. These indexes are normally set up according to their proximity to each other and their function.

*b. Components and Related Operation.* This column contains the functional index grouping heading, subgroup headings, and a brief description of the part starting with the noun name. It also designates the operation to be performed such as service, adjust, inspect, test, replace, repair, and overhaul.

##### *c. Echelon Maintenance.*

*Column 1. First Echelon.* First echelon maintenance is that maintenance performed by the user or operator of the equipment, such as servicing, cleaning, lubricating, and limited adjustments. It also includes removal and replacement of items to accomplish servicing and lubrication.

*Column 2. Second Echelon.* Second echelon maintenance is that maintenance performed by trained personnel provided for that purpose in the using organization, such as replacement of all items in column 2, limited parts fabrication from bulk material, adjustments, and repair of assemblies, components, and end items that can be accom-



lished without extensive dis-assembly.

*Column 3. Third Echelon.* Third echelon maintenance is that maintenance performed by specially trained units in direct support of the using organization, such as replacement of all items in columns 2 and 3, repair assemblies, components, and end items, and fabricate parts from bulk material.

*Column 4. Fourth Echelon.* Fourth echelon maintenance is that maintenance performed by units organized as semifixed or permanent shops to serve lower echelon maintenance within a geographical area, such as replacement of items in columns 2, 3, and 4, repair end items,

overhaul assemblies, components, and fabricate general use common hardware and parts.

*Column 5. Fifth Echelon.* Fifth echelon maintenance is that maintenance authorized to overhaul assemblies, components, end items, and replacement of all parts in columns 2, 3, 4, and 5.

*d. Symbol "X".* The symbol "X" placed in the appropriate column indicates the lowest echelon responsible for performing that particular maintenance operation, but does not necessarily indicate repair parts will be stocked at that level.

*e. Remarks.* The remarks column is used to explain why maintenance, that would normally be done at a lower echelon, is moved to a higher echelon because of some peculiarity in the construction of the end item.

## Section II. MAINTENANCE ALLOCATION CHART

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
01	<b>ENGINE:</b>						
0100	<b>ENGINE ASSEMBLY:</b>						
	Engine assembly, gasoline:						
	Service.....	X					
	Inspect.....	X					
	Test.....		X				
	Replace.....			X			
	Repair.....			X			
	Overhaul.....				X		
0101	<b>CYLINDER HEAD:</b>						
	Head, cylinder:						
	Replace.....		X				
0102	<b>CRANKSHAFT:</b>						
	Crankshaft:						
	Replace.....			X			
	Bearing and gasket:						
	Replace.....			X			
0104	<b>PISTONS, CONNECTING RODS:</b>						
	Piston:						
	Replace.....			X			
	Repair.....			X			
	Rod assembly, connecting:						
	Replace.....			X			
	Repair.....			X			

Compression.

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
0105.1	<b>VALVES:</b> Valve; insert, valve seat: Replace ----- Repair ----- Springs, guides: Replace -----			X X X			
0105.2	<b>TAPPETS:</b> Lifter, valve: Adjust ----- Replace -----		X	X			
0105.3	<b>CAMSHAFTS:</b> Camshaft assembly: Replace ----- Repair -----			X X			
0105.5	<b>TIMING GEARS:</b> Gears, timing: Replace -----			X			
0106.1	<b>OIL PUUMP:</b> Body assembly, oil pump: Replace ----- Repair -----			X X			
0106.5	<b>CRANKCASE VENTILATION:</b> Line assembly, breather: Replace -----		X				Fabricate.
0106.6	<b>OIL PAN:</b> Gasket, pan: Replace ----- Plug, drain, fill: Replace -----			X X			
0108	<b>MANIFOLDS:</b> Gasket, intake: Replace -----		X				
0111.1	<b>HAND CRANKING DEVICES:</b> Rope, starting: Replace -----	X					
03	<b>FUEL SYSTEM:</b>						
0301	<b>CARBURETOR:</b> Carburetor, float: Adjust ----- Replace -----	X		X			External.
0302	<b>FUEL PUMP:</b> Pump, fuel: Replace -----		X				
0304	<b>AIR CLEANER:</b> Air cleaner, intake: Service ----- Heater assembly, air intake: Adjust -----	X X					
0306	<b>TANKS, LINES, FITTINGS:</b> Fuel tank: Service ----- Cap and chain: Replace ----- Line, fuel: Replace -----	X X X		X			Fabricate.
0308	<b>ENGINE SPEED GOVERNOR:</b> Bearing and yoke, governor: Replace -----			X			



Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
0308.4	<b>GOVERNOR CONTROLS:</b> Control assembly, governor: Adjust.....	X					
0309	<b>FUEL FILTERS:</b> Strainer, sediment: Service.....	X					
04	<b>EXHAUST SYSTEM:</b>						
0401	<b>MUFFLER AND PIPES:</b> Muffler: Replace.....		X				
06	<b>ELECTRICAL SYSTEM:</b>						
0604.2	<b>MAGNETO:</b> Service..... Replace..... Repair.....		X X	X			Clean and Lubricate. Install kit.
0605	<b>WIRING, SPARK PLUGS:</b> Cable assembly: Replace..... Spark plug: Service..... Adjust..... Replace.....		X X X X				
22	<b>MISCELLANEOUS BODY, CHASSIS OR HULL AND ACCESSORY ITEMS:</b>						
2201	<b>CANVAS ITEMS:</b> Canvas cover: Replace..... Repair.....	X		X			
2207	<b>WINTERIZATION EQUIPMENT:</b> Blowtorch assembly: Service.....	X					
41	<b>ELECTRIC GENERATORS:</b>						
4100	<b>GENERATOR ASSEMBLY:</b> Generator, ac: Inspect..... Test..... Replace..... Repair..... Overhaul.....	X		X X X	X		
4100.1	<b>ROTOR ASSEMBLIES:</b> Rotor assembly: Test..... Replace..... Repair..... Overhaul.....			X X X		X	
4100.2	<b>STATOR ASSEMBLIES:</b> Stator, generator: Test..... Replace..... Repair..... Overhaul.....			X X X		X	
4100.3	<b>BRUSH HOLDERS:</b> Brush, electrical contact generator: Adjust..... Replace.....		X X				
4100.5	<b>FRAME SUPPORTS AND HOUSINGS:</b> Bearing, ball, annular: Replace.....			X			

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
4100.7	<b>CONTROL PANELS, HOUSINGS, CUBICLES:</b> Ammeter: Replace----- Meter, time totalizing: Replace----- Frequency meter: Replace----- Voltmeter: Replace----- Wiring harness: Replace-----		X				Fabricate.
4100.8	<b>MASTER CONTROL ASSEMBLY:</b> Switch, load: Replace-----		X				
4100.10	<b>SWITCHES:</b> Switch, toggle: Replace-----		X				
4100.11	<b>REGULATOR, VOLTAGE OR CURRENT:</b> Voltage regulator assembly: Test----- Replace----- Repair----- Regohm, plug in unit: Adjust----- Replace-----			X X X			
4100.12	<b>RESISTORS:</b> Resistor, voltage control: Replace-----			X			
4100.16	<b>TRANSFORMER CURRENT:</b> Transformer, current: Replace-----			X			
4100.17	<b>TERMINAL BLOCKS:</b> Terminal, power: Replace----- Repair-----		X X				
4100.19	<b>RADIO INTERFERENCE SUPPRESSION:</b> Capacitor: Replace-----		X				
4106.2	<b>STATOR ASSEMBLY:</b> Stator, generator: Test----- Replace----- Repair----- Overhaul-----			X X X		X	
6 7603	<b>FIRE FIGHTING EQUIPMENT:</b> <b>FIRE EXTINGUISHER:</b> Extinguisher, fire: Replace-----	X					



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By Order of *Wilber M. Brucker*, Secretary of the Army:

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Trans Terminal Comd (2)	5-97 (2) 6-585 (2)
Army Terminals (1)	5-129 (2) 6-630 (2)
OS Sup Agcy (2)	5-167 (2) 7-11 (2)
Dist Engr (2) except Buffalo, Chicago, Detroit, Alaska, Los Angeles, New Orleans, New York, Louisville, Pittsburgh, San Francisco, Omaha, Seattle, Kansas City, Baltimore, Ft. Worth, Eastern Ocean, Philadelphia, Rock Island, St. Louis, & St. Paul (1)	5-215 (2) 7-12 (2)
	5-216 (2) 9-367 (2)
	5-217 (2) 10-200 (2)
	5-225 (2) 10-201 (2)
	5-226 (2) 10-202 (2)
	5-227 (2) 29-7 (2)
	5-315 (2) 39-51 (2)
	5-317 (2) 39-61 (2)
	5-355 (2) 39-71 (2)

NG: State AG (3); units—same as Active Army, except allowance is one copy to each unit.

USAR: Same as Active Army, except allowance is one copy to each unit.

For explanation of abbreviations used, see AR 320-50.



TM 5-6115-200-20 GENERATOR SET GASOLINE ENGINE—1960