TM 11-904

WAR DEPARTMENT TECHNICAL MANUAL

POWER UNITS

PE-95-A, -B, -C

-F, -G, AND -H

WAR DEPARTMENT · *JULY 1945*

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TM 11-904

This manual supersedes TM 11-904, 20 January 1943; TM 11-904G, 8 June 1943; TM 11-904H, 3 September 1943, and Instruction Book for 5 KW Power Unit PE-95-F, 8 June 1943; TB 11-904-1, 31 October 1944; TB 11-904-2, 7 November 1944; TB 11-904-3, 14 November 1944, including C1, 2 December 1944; and TB 11-904-4, March 1945.

POWER UNITS

PE-95-A, -B, -C, -F, -G, AND -H

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G. C. MARSHALL
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Refer to FM 21-6 for explanation of distribution formula.

CONTENTS

DESTRUCTION NOTICE

WHY—To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN—When ordered by your commander.

HOW—1. Smash—Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.
2. Cut—Use axes, handaxes, machetes.
3. Burn—Use gasoline, kerosene, oil, flame throwers, incendiary grenades.
4. Explosives—Use firearms, grenades, TNT.
5. Disposal—Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT

WHAT—1. Smash—Radiator, all instruments on control panel, cylinder block, cylinder head, manifolds, carburetor, air cleaner, fuel strainer, oil filter, spark plugs, magneto or distributor, storage battery, generator frame, fuel pump, water pump, governor, and muffler.
2. Cut—Remote control cable, remote fuel line, power cables, exhaust pipe, generator windings, belts, ignition wires, oil and fuel lines, and all connecting wires or cables in or on the unit.
3. Burn—All wires, cables, fuel, oil, packing cases, instruction books, manuals, other documents.
4. Bend—All tools, housing, fuel tank, control panel, skid base, and all other metal parts not otherwise destroyed.
5. Bury or scatter—All of the above parts.

DESTROY EVERYTHING

SAFETY NOTICE

Do not attempt adjustments or changes on wiring while the unit is in operation. Be sure to open the circuit breaker before making or changing load connections. This unit generates sufficient voltage to cause severe and possibly fatal shock. Use extra caution when operating on wet or damp ground. Be sure to provide proper ventilation when operating the unit in a confined space. Exhaust gases are poisonous and excessive inhalation may cause severe sickness or death. Do not service with gasoline while the unit is in operation or if a radio transmitter is operating in close proximity. Avoid spilling gasoline on hot engine.

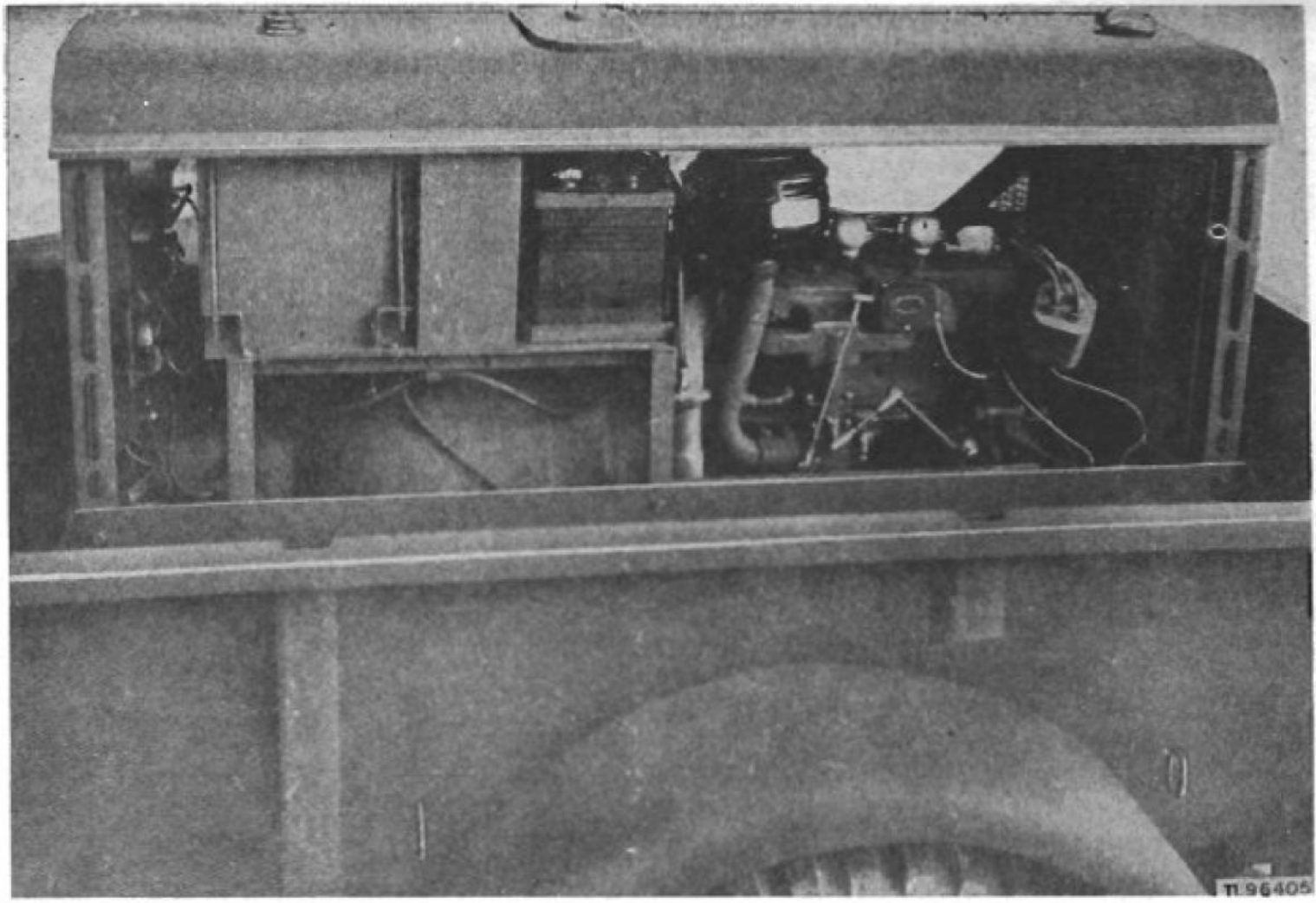

Figure 1. Power Unit PE–95–(1), installed in Trailer K–52.

This manual supersedes TM 11-904, 20 January 1943; TM 11-904G, 8 June 1943; TM 11-904H, 3 September 1943, and Instruction Book for 5 KW Power Unit PE-95-F, 8 June 1943; TB 11-904-1, 31 October 1944; TB 11-904-2, 7 November 1944; TB 11-904-3, 14 November 1944, including C1, 26 December 1944 and TB 11-904-4, March 1945.

PART ONE

INTRODUCTION

Section I. DESCRIPTION OF POWER UNIT PE-95-(*)

Note. Power Unit PE-95-(*) is used to indicate all items of this equipment included in this manual regardless of model or procurement. Thus Power Unit PE-95-(*) is used to refer to all such power units regardless of model letter. Power Units PE-95-A, PE-95-B, and PE-95-C are identical units and will be referred to throughout this manual as Power Unit PE-95-(1). Power Unit PE-95-F will be referred to by nomenclature and Power Units PE-95-G and PE-95-H will be referred to as power Unit PE-95-(2).

1. General

Power Unit PE-95-(*) is a complete, self-contained, a-c generating unit. The unit consists of an a-c generator with built-in d-c exciter. It is driven by a four-cylinder, liquid-cooled, gasoline engine which is directly connected to the generator. A control panel is mounted at one end of the unit on which all necessary meters, terminals, and controls are mounted. The complete assembly is mounted on a welded-steel skid base and inclosed within a sheet metal housing. The housing is provided with doors and removable panels enabling the operator to reach any part of the equipment.

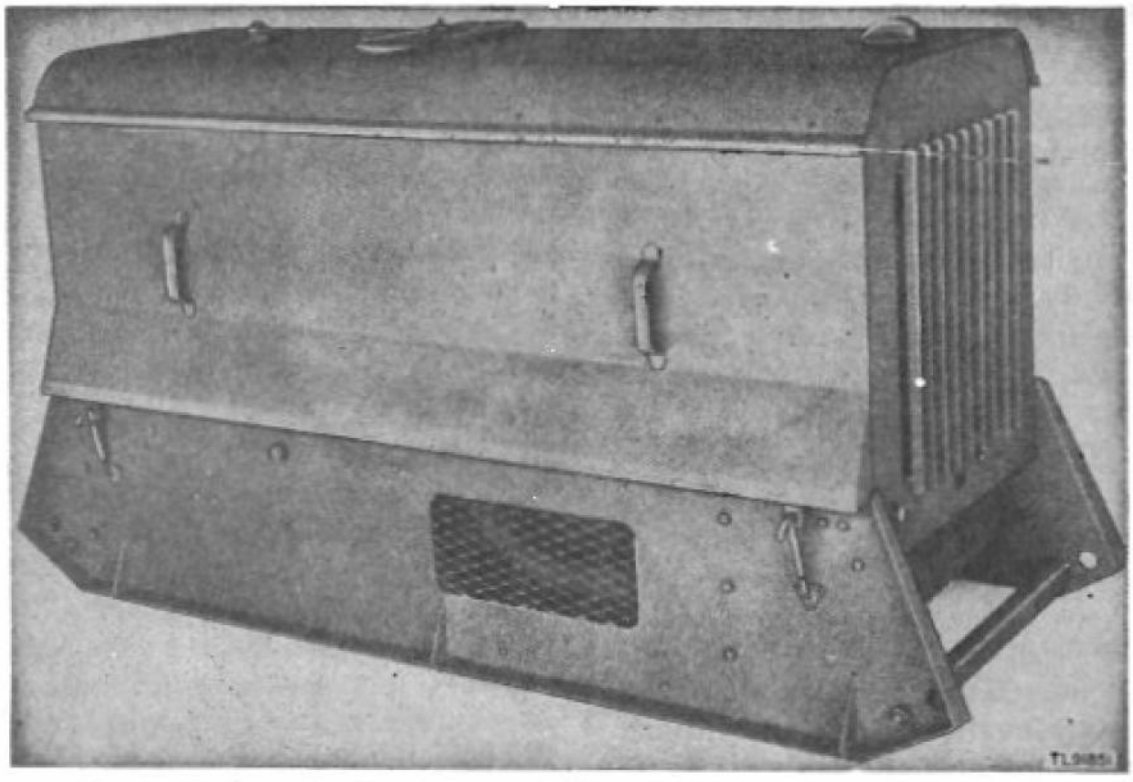

Figure 2. Power Units PE-95-(1) and PE-95-F, left side.

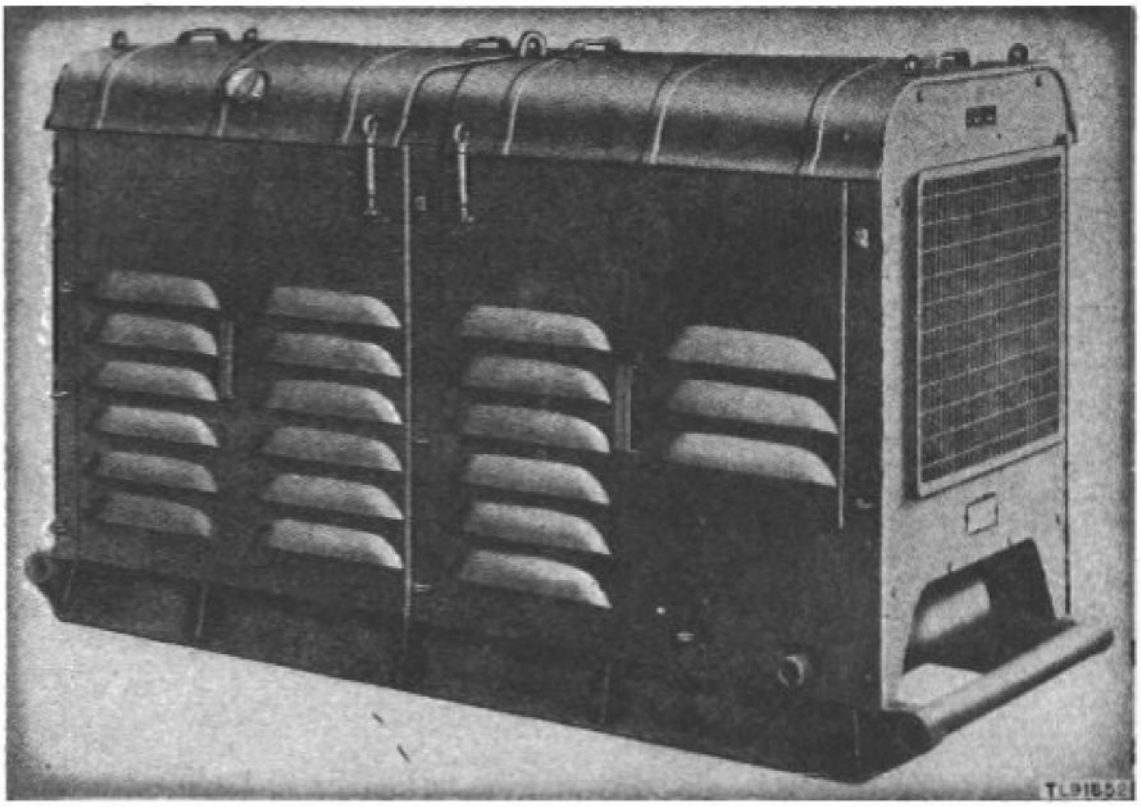

Figure 3. Power Unit PE–95–(2), panels closed.

2. Engine

Power Unit PE–95–(*) is powered by a four-cylinder, L-head, four-cycle, liquid-cooled, gasoline engine. Differences in the engines used in PE–95–(1), PE–95–F, and PE–95–(2) are explained in paragraph 10*a*.

3. Generator

Except for minor differences, the generators used on all Power Units PE–95–(*) are identical. Such differences as exist are explained in paragraph 10*b*. They are all of the revolving-field, a-c type with built-in d-c exciter. Both the alternator and d-c exciter rotating members are mounted on the same shaft and directly coupled to the engine flywheel. The engine end of the generator rotor is supported by the rear engine bearing while the other end is carried in a grease-sealed ball bearing.

4. Output Regulation

a. VOLTAGE REGULATION. The different methods of voltage regulation for the various Power Units PE–95–(*) are explained in paragraph 10*c*.

b. FREQUENCY CONTROL. Frequency control on all Power Units PE–95–(*) depends on the speed of the units and is held at 60 cycles, plus or minus 2½ percent, when the units are operating at their rated number of revolutions per minute.

5. Cooling System

A forced-circulation liquid cooling system, consisting of an automotive-type radiator, fan, and pump is used on all Power Units PE–95–(*). The fan and pump are belt-driven from the engine crankshaft. The fan is mounted so that air drawn in through the rear and sides of the unit housing is discharged through the radiator. Thermostats are provided to control automatically the operating temperature of the engine.

6. Lubrication

Basically, the lubricating systems of all Power Units PE–95–(*) are the same. They consist of a gear-type oil pump which forces the lubricating oil to the main bearings, the connecting rod bearings, and the camshaft bushings. Other internal engine parts are spray-lubricated. An oil filter and a bayonet type oil gauge (dip stick) are provided on all units.

7. Performance Characteristics

a. POWER UNIT PE–95–(1).

Approximate load	Amperes	Volts	Watts	Cycles	Exciter volts
¼ load	10.35	118.4	1,225	61.2	12
½ load	21.5	116.4	2,500	61.0	12
¾ load	32.6	114.8	3,750	60.6	12
Full load	44.5	112.5	5,000	60.0	12

b. POWER UNIT PE–95–F.

Approximate load	Amperes	Volts	Watts	Cycles	Exciter volts
¼ load	10.2	123	1,225	60.3	12
½ load	20.5	122	2,500	60.2	12
¾ load	31.0	121	3,750	60.1	12
Full load	41.6	120	5,000	60.0	12

c. POWER UNIT PE–95–(2).

Approximate load	Amperes	Volts	Watts	Cycles	Exciter volts
¼ load	20.22	123.5	2,500	60	12
½ load	41.3	121.0	5,000	59.7	12
¾ load	63.0	119.0	7,500	59.1	12
Full load	85.4	117.0	10,000	59.0	12

Note. The above values are figured at unity power factor.

8. Table of Condensed Specifications

a. POWER UNIT PE–95–(1).

Engine Ford	(gasoline)
Model ONY Cycle	4
Type cyl head	L
Number of cylinders	4
Bore	3.1875 in.
Stroke	3.75 in.
Piston displacement	119.7 cu. in.
Compression ratio	6.1 to 1
Engine speed	1,200 rpm
Type of cooling	water
Horsepower	19 at 1,200 rpm
Pistons	cast-iron
Piston rings	3 compression, 1 oil
Piston pin	floating
Lubricatio system	force feed
Air Cleaner	oil-bath type
Oil filter—Ford	renewable element
Cooling system capacity	17 qts.
Spark plug—14 mm	0.030 gap
Fuel tank capacity	10½ gals
Crankcase oil capacity	4 qts.
Governor	Pierce No. 75862
Main bearings	steel-backed, replaceable
Battery voltage	12 (two 6-volt, in series)
Generator	D. W. Onan
Rating	5 kw; 115 volt; 54.8 amps
Power factor	80%
Generator speed	1,200 rpm
Exciter	built-in
Alternator brushes	2
Exciter brushes	4
Engine	Willys-Overland
Generator bearings	1, ball
Exciter bearings	none
Fuel consumption	1.2 gals per hour
Type ignition	magneto

b. POWER UNIT PE–95–F.

Engine	Willys-Overland
Model	MB-441
Type cyl head	L
Number of cylinders	4
Bore	3⅛ in.
Stroke	4⅜ in.
Piston displacement	134.2 cu. in.
Compression ratio	6.5 to 1
Engine speed	1,200 rpm
Type of cooling	water
Horsepower	20.5 at 1,200 rpm
Pistons	semisteel
Piston rings	3 compression, 1 oil
Piston pin	full floating
Lubrication system	force feed
Air cleaner	oil-bath type
Oil filter	Purolator, renewable element
Cooling system capacity	15.5 qts.

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Spark plug—14 mm	0.025 gap
Fuel tank capacity	10½ gals
Crankcase oil capacity	5 qts
Governor	Pierce model CC–417
Main bearings	steel-backed, replaceable
Battery voltage	6
Generator	D. W. Onan
Rating	5 kw, 120/240 volt, 54.8/27.4 amps
Power factor	80%
Generator speed	1,200 rpm
Exciter	built-in
Alternator brushes	2
Exciter brushes	4
Generator bearings	1, ball
Exciter bearings	none
Fuel consumption	1.1 gals per hour
Type ignition	battery and distributor

c. Power Unit PE–95–(2).

Engine	Willys-Overland
Model	JP 441
Type cyl. head	6
Number of cylinders	4
Bore	3⅛
Stroke	4⅜
Piston displacement	134.2 cu. in.
Compression ratio	6.5 to 1
Engine speed	1,800 rpm.
Type of cooling	water
Horsepower	35 at 1,800 rpm.
Pistons	semisteel
Piston rings	3 compression, 1 oil
Piston pin	full floating
Lubrication system	force feed
Air cleaner	oil-bath type
Oil filter	Purolator, renewable element
Cooling system capacity	15.5 qts
Spark plug, 14 mm.	0.025 gap
Fuel tank capacity	10½ gals
Crankcase oil capacity	5 qts.
Governor	King-Seeley No. 7433
Main bearings	steel-backed, replaceable
Battery voltage	12 (two 6-volt, in series)
Generator	D. W. Onan OS-10
Rating	10 kw., 120/240 volt, 104/52 amps
Power factor	80%
Generator speed	1,800 rpm.
Exciter	built-in
Alternator brushes	2
Exciter brushes	4
Generator bearings	1, ball
Exciter bearings	none
Fuel consumption	1.1 gals. per hour
Type ignition	battery and distributor

9. Table of Major Components

a. Power Unit PE–95–(1).

Quantity	Name	Width (in.)	Length (in.)	Height (in.)	Weight (lb.)
	Power Unit PE–95–(1), including:	27¼	72½	38½	1,360
1	Engine with accessories.	21¾	29½	31	315
1	Generator.	21	26¾	19¼	557
1	Radiator assembly.	16	7⅝	25	28
1	Battery.	7 ea	9 ea	8¾ ea	35 ea
1	Fuel tank.	12½	20½	10½	20
1	Control panel assembly.	2½	16	17¾	18
1	Housing and skid base.	28	72½	38½	332
1	Set of tools.	Packed in tool box.			
1	Set of running spares.				

b. Power Unit PE–95–F.

Quantity	Name	Width (in.)	Length (in.)	Height (in.)	Weight (lb.)
	Power Unit PE–95–F, including:	22½	72½	38¾	1,545
1	Engine with accessories.	30¾	27	29½	400
1	Generator.	19¼	29	29¼	550
1	Radiator assembly.	8½	20¾	25⅛	34
1	Battery.	7	10¾	8	50
1	Fuel tank.	10½	21	15¾	19
1	Control panel assembly.	3	19¾	14⅛	20
1	Housing and skid base.	30¾	72½	37	451
1	Set of tools.	Packed in tool box.			
1	Set of running spares.				

c. POWER UNIT PE–95–(2).

Quantity	Name	Width (in.)	Length (in.)	Height (in.)	Weight (lb.)
	Power Unit PE–95–(2), including:	28¼	67½	38½	1,556
1	Engine with accessories.	22½	27	30½	380
1	Generator.	19	29¾	19½	640
1	Radiator assembly.	8½	20	23½	35
1	Battery.	7 ea	10⅜ ea	8 ea	50 ea
1	Fuel tank.	12	25¾	19¾	20
1	Control panel assembly.	5½	20	16½	25
1	Housing and skid base.	28¼	67½	38½	307
1	Set of tools.	Packed in tool box.			
1	Set of running spares.				

Note. Running spares are for initial issue only and are not to be requisitioned as a kit or group as shown in the table of components.

0. Descriptions of and Differences in Major Components

a. ENGINE. (1) *Power Unit PE–95–(1) (Power Units PE–95–A, PE–95–B, and PE–95–C).* Power Unit PE–95–(1) is driven by a Ford model ONY engine which is a four-cylinder, vertical, L-head, four-cycle, liquid-cooled gasoline engine. This engine has a bore of 3.1875 inches, a stroke of 3.75 inches, 119.7 cubic inches piston displacement and a compression ratio of 6.1 to 1 and develops 19 horsepower at its governed speed of 1,200 rpm. Ignition is provided by a high-tension magneto, and fuel is supplied from a built-in, 10½-gallon fuel tank. The carburetor is an up-draft, fixed-jet, float-feed type and the speed of the unit is automatically controlled by a mechanical governor which controls the carburetor throttle-valve opening. Both automatic and manual chokes are provided and the unit may be either electrically or manually started.

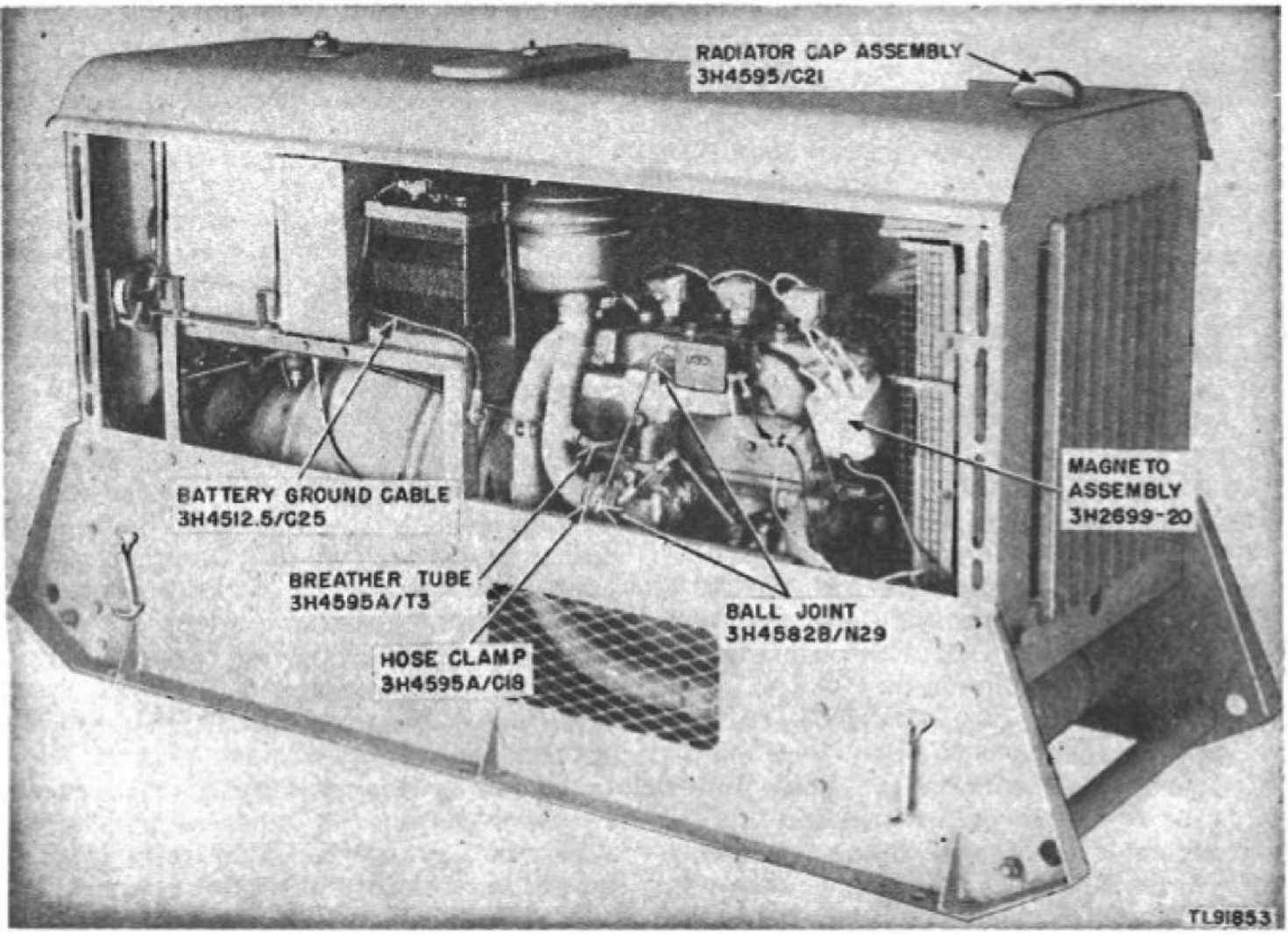


Figure 4. Power Unit PE–95–(1), left side, panels removed.

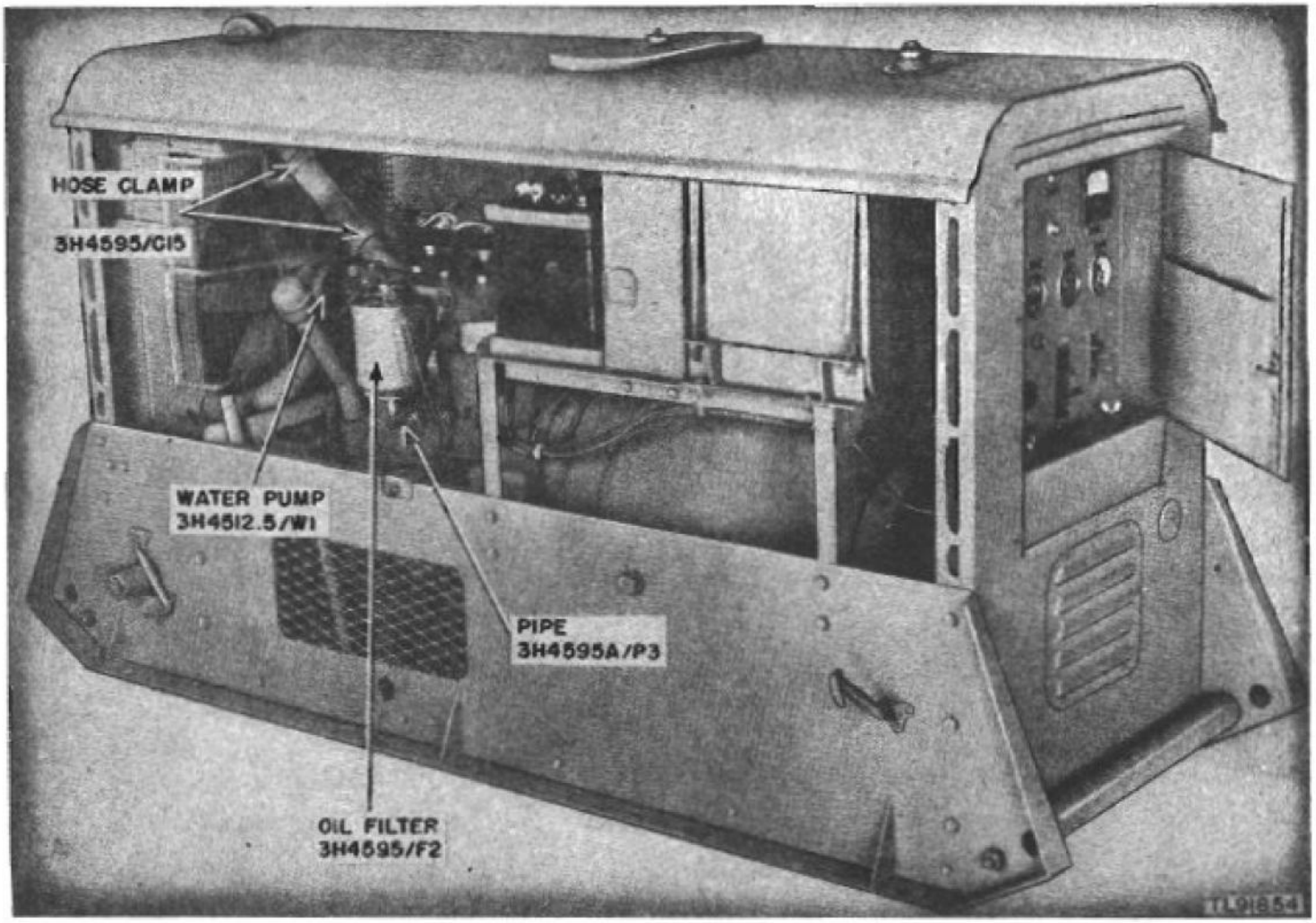


Figure 5. Power Unit PE–95–(1), right side, panels removed.

(2) *Power Unit PE–95–(2) (Power Units PE–95–G and PE–95–H).* Except for minor differences, the engines used in PE–95–(2) and PE–95–F are identical. Such differences as exist in Power Unit PE–95–F will be treated under its respective nomenclature. These units are powered by a Willys model JP-441 or an MB441 four-cylinder, vertical, L-head, four-cycle, liquid-cooled gasoline engine. Each of these engines has a bore of 3⅛ inches, a stroke of 4⅜ inches, 134.2 cubic inches piston displacement, and a compression ratio of 6.48 to 1. Each engine develops 20.5 horsepower at 1,200 rpm in Power Unit PE–95–F and 35 horsepower at 1,800 rpm in PE–95–(2). A battery ignition system is provided and a diaphragm fuel pump supplies fuel to a downdraft, fixed-jet, float-feed carburetor. Provision is made to draw fuel from either a built-in or remote fuel tank. The governor and automatic choke, while of the same type as used in PE–95–(1), differ slightly. Manual and electric starting equipment is provided.

Note. Power Units PE–95–G and PE–95–H may be equipped with either a King-Seeley or Wirshing governor, depending upon the procurement. These governors are interchangeable as units, but the parts in each are not completely interchangeable. For complete details on repairs to either of these governors, see TM 9–1831A (when published).

b. GENERATOR. (1) *Power Unit PE–95–(1).* The generator used in Power Unit PE–95–(1) a six-pole, revolving-field, a-c type with built-in d-c exciter. Both the a-c generator and the d-c exciter are located within the same housing, and the revolving field of the generator and armature of the exciter are mounted on the same shaft. The a-c generator, when driven at 1,200 rpm has an output of 5-kw, 115 volts, single phase, 60-cycle, alternating current. The frame is bolted to an adapter casting fastened directly to the engine. The rotor is directly coupled to the engine flywheel so that one end of the rotor is supported by the engine bearing, while the other end of the rotor is carried on a grease-sealed ball bearing. The built-in exciter, in addition to providing excitation for the alter-

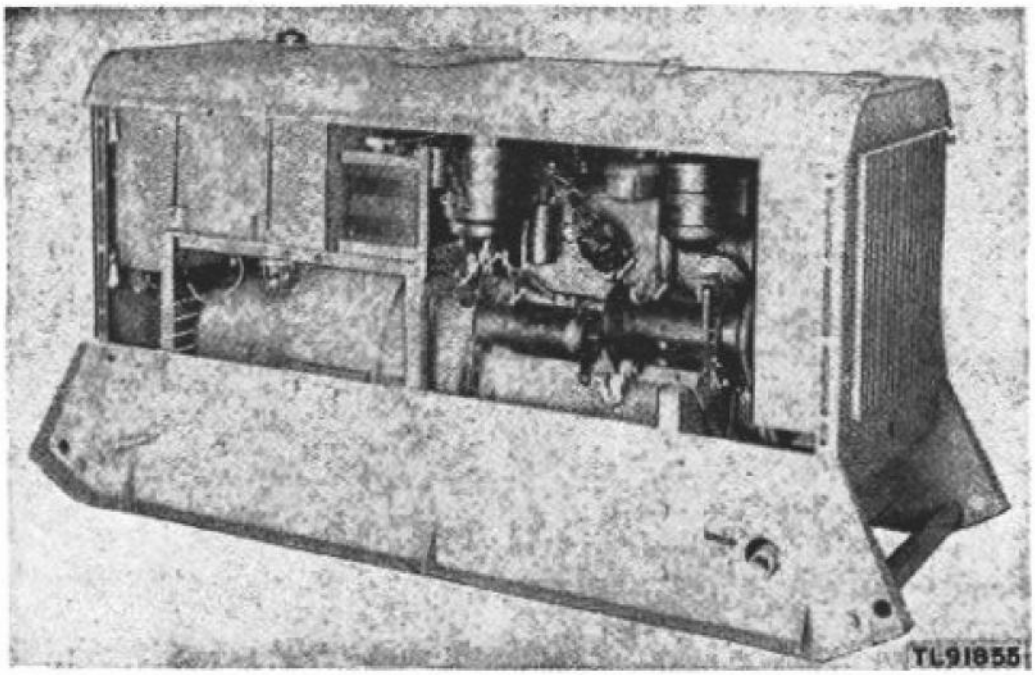


Figure 6. Power Unit PE–95–F, left side, panels removed.

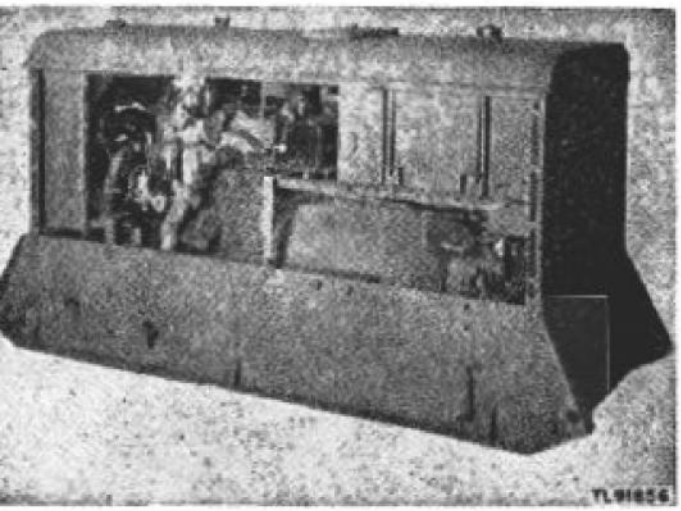


Figure 7. Power Unit PE–95–F, right side, panels removed.

tor, acts as the electric-starting motor and ttery-charging generator.

(2) *Power Units PE–95–(2) and PE–95–F.* ıe generators used in these units are identical cept that in Power Unit PE–95–F, the exciter es not function as a starting motor and bat-ry-charging generator as it does in Power nit PE–95–(2). These generators differ from ose used in Power Unit PE–95–(1) because e output may be varied to deliver either 120 240 volts. This voltage variation is accom-ished by the use of jumper connections at the ntrol-panel terminal block. The jumpers con-ct two separate windings of the alternator in rallel for 120-volt current or in series for 0-volt current.

(3) *Output.* The output of Power Unit PE–95–(1) is 5-kw, 115-volt, 60-cycle, alternating current, 80 percent power factor, when driven at 1,200 rpm. The output of Power Unit PE–95–F is 5-kw, 120/240-volt, 60-cycle, alternating current, 80 percent power factor, when driven at 1,200 rpm. The output of Power Unit PE–95–(2) is 10-kw, 120/240 volt, 60-cycle, alternating current, 80 percent power factor, when driven at 1,800 rpm.

c. VOLTAGE REGULATION. (1) *Power Units PE–95–(1) and PE–95–(2).* The voltage output of the generators used in these units is automatically regulated through the inherent characteristics of the generator. At normal operating temperature, the voltage is held within the limits of 126 volts at no load and 118 volts at full load, unity power factor, on Power Unit PE–95–(1) or when the terminal jumpers are connected for 120 volts, on Power Units PE–95–(2). On Power Units PE–95–(2), when the terminal jumpers are connected for 240 volts, the regulation is within the limits of 252 volts at no load and 236 volts at full load, unity power factor.

(2) *Power Unit PE–95–F.* This unit is provided with an automatic voltage regulator which maintains the output voltage at 120 or 240 volts, plus or minus 2½ percent, during normal operation. A small manually operated rheostat is provided for adjusting the automatic-voltage regulator.

d. FUEL SYSTEM. (1) *Power Unit PE–95–(1).*

The fuel system on these units is of the gravity-feed type. It consists of a 10½-gallon fuel tank from which fuel flows, through a conventional automotive-type fuel strainer, to the carburetor. An oil-bath air cleaner prevents dust and dirt from being drawn into the engine through the carburetor.

(2) *Power Units PE–95–(2) and PE–95–F.* These units have a diaphragm fuel pump which draws fuel from either a built-in or from a remote fuel tank. The fuel flows to the carburetor through a conventional automotive type fuel strainer. A three-way fuel valve permits selecting the source from which fuel is to be drawn and an oil-bath air cleaner prevents dust and dirt from being drawn into the engine

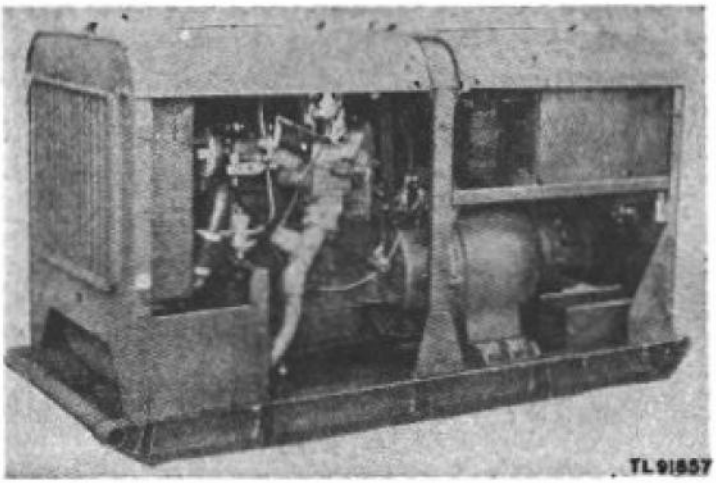


Figure 8. Power Unit PE–95–(2), right side, panels removed.

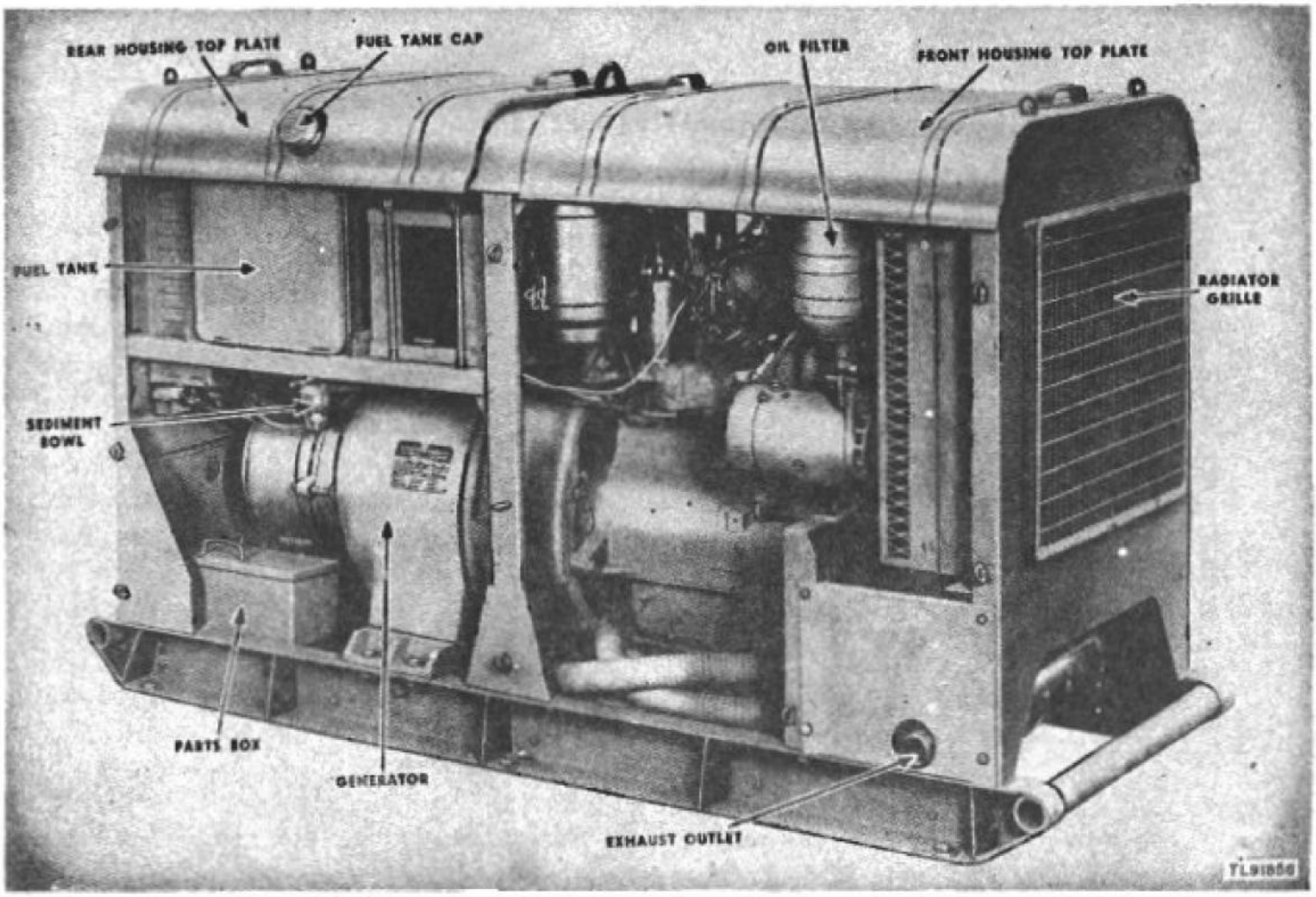


Figure 9. Power Unit PE–95–(2), left side, panels removed.

through the carburetor.

e. IGNITION. (1) *Power Unit PE–95–(1).* Ignition on these units is provided by a high-tension magneto equipped with an impulse coupling to facilitate starting at low cranking speeds.

(2) *Power Units PE–95–(2) and PE–95–F.* Ignition on these units is provided by a conventional battery, coil, and distributor system. The distributor is provided with an automatic spark advance.

f. STARTING SYSTEM. (1) *Power Unit PE–95–(1).* These units may be automatically started from either the control panel or from a remote point and provision is also made for starting them by hand. The d-c exciter on these

nits functions as both the electric-starting otor and battery-charging generator.

(2) *Power Unit PE–95–(2).* The starting stem on these units is identical with that sed in PE–95–(1).

(3) *Power Unit PE–95–F.* These units use conventional electric-starting motor and a nventional battery-charging generator. These units use a 6-volt system while that used in PE–95–(1) and PE–95–(2) is 12-volt.

g. CONTROL PANEL. The control panel on all Power Units PE–95–(*) is housed in a cabinet, within the unit housing, on the generator end of the unit. The instruments indicated in the following table are mounted on the control panels of the various units:

Instrument	Panel		
	PE–95–(1)	PE–95–F	PE–95–(2)
-c voltmeter	*	*	*
-c ammeter	*	*	*
uel gauge	*	*	*
attery-charge rate (ammeter)	*	*	*
l pressure gauge	*	*	*
ow oil-pressure light (green)		*	
ater temperature gauge	*	*	*
igh-temperature light (red)		*	
unning time meter		*	*
rcuit breaker	*	*	*
eld rheostat		*	
rouble lamp receptacle	*	*	*
art-stop switch	*	*	*
anual start-remote control switch		*	*
-c output fuse	*		*
requency meter			*

Note. See figures 10, 11, and 12.

h. AUTOMATIC CONTROLS. (1) *Power Unit E–95–(1).* The automatic controls on these nits consist of an automatic carburetor choke, utomatic speed governor, battery-charge regu-tor, circuit breaker, and temperature-control hermostat.

(2) *Power Units PE–95–(2) and PE–95–F.* hese units are provided with the same auto-atic controls as Power Unit PE–95–(1) plus low-oil-pressure cut-off switch, a high-water-mperature cut-off switch and an overspeed overnor. In addition, Power Unit PE–95–F as an automatic-voltage regulator which regu-ates the a-c generator output.

i. TOOLS AND SPARE PARTS. (1) *Power Units E–95–(1) and PE–95–F.* The tools and spare arts supplied with these units are contained in he tool box which is located between the fuel ank and battery.

(2) *Power Unit PE–95–(2).* The tools and pare parts for these units are contained in two oxes on either side of the base of the unit and elow the exciter.

(3) *Tools.* The following tools are packed in he tool boxes of all Power Units PE–95–(*):

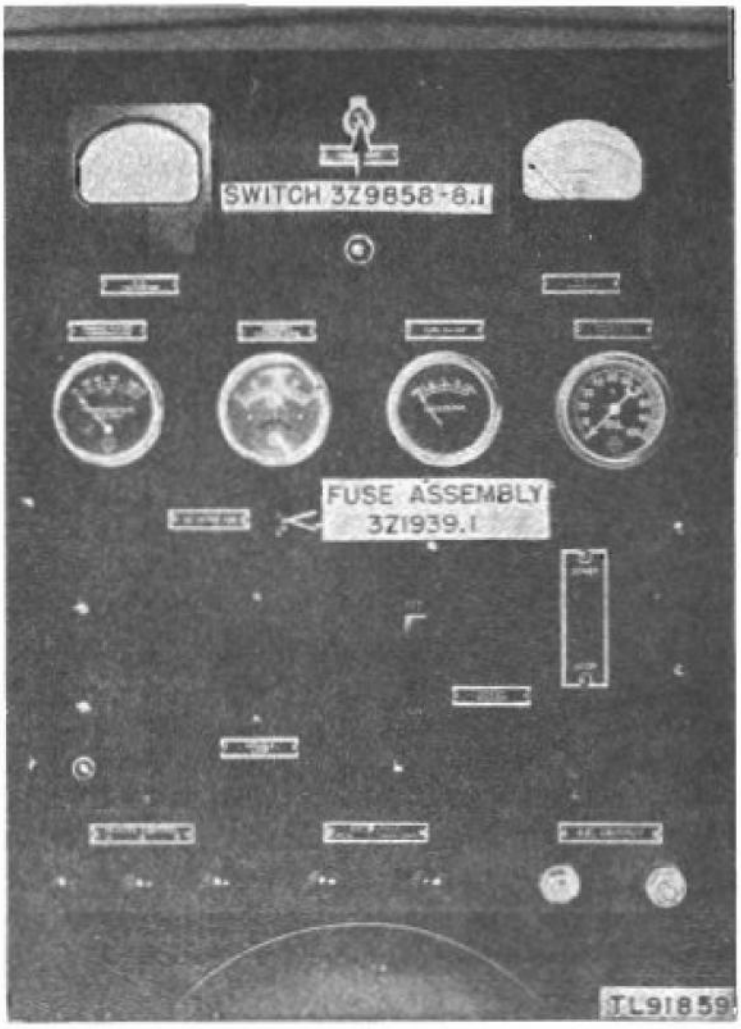


Figure 10. Power Unit PE–95–(1), control panel.

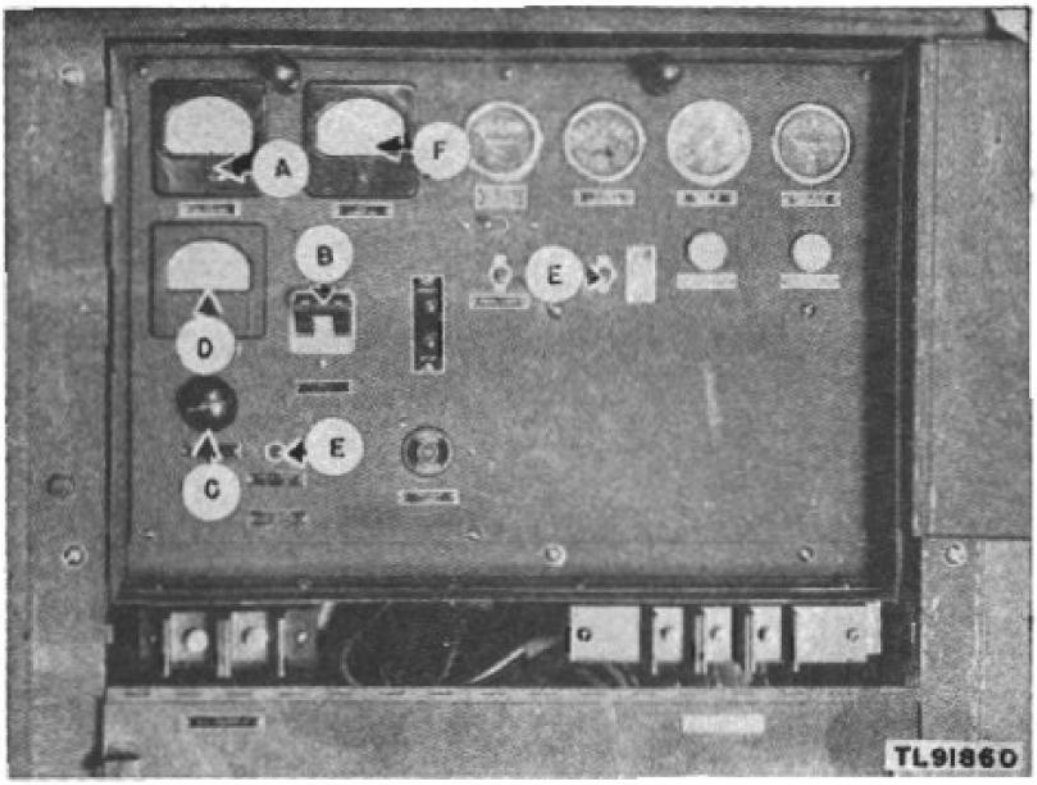


Figure 11. Power Unit PE-95-F, control panel.

1 pair of pliers
1 set of tappet wrenches
1 bottle of gasket seal
1 hammer, 1 lb machinist's
1 small screw driver
1 large screw driver
1 set of open-end wrenches
1 adjustable wrench
2 sheets #00 sandpaper
1 set of feeler gauges
1 spool of soft iron wire
1 box of cotter pins
1 can of oil, 4 oz.
2 radiator blocks
1 lifting eye
1 valve lifter
1 can of valve-grinding compound

(4) *Spare parts.* Spare parts furnished with these units are listed in paragraph 87.

(5) *Interchangeable parts.* Power Units PE-95-(1) are identical units and all parts are interchangeable. Parts for Power Units PE-95-(1) cannot be used for Power Units PE-95-F and PE-95-(2). Power Units PE-95-(2) are regarded as identical and most parts are interchangeable. Crankshaft size differs in some engines and suitable precautions must be taken to assure correct crankshaft and bearing sizes. Many engine parts for Power Units PE-95-(2) may be interchanged for those for Power Unit PE-95-F. Many of these parts may be interchanged with those for Ordnance Department truck, ¼-ton, 4 x 4, Command Reconnaissance jeep.

Section II. APPLICATION OF POWER UNIT PE-95-(*)

11. Application of Power Unit PE-95-(*)

a. NORMAL APPLICATION. Power Units PE-95-(*) are normally intended as a source of power for the following equipments:

Radio Sets SCR-299, SCR-399, SCR-499, SCR-696, SCR-698, and SCR-292.
Radio Direction-finder Central TC-8.
Radio Intercept Central TC-9.
Wire Repair Station AN/MTM-1, AN/MTM-2, and AN/MTM-3.
Radio Control Central AN/TRQ-1.
Radio Sets AN/TRC-5, AN/TRC-6, AN/FRC-2.
Fixed plant installations.

b. SPECIAL APPLICATIONS. Power Units PE-95-(*) may be used for any other applications that require an output within the ratings of the various units. The following tables are provided as a guide in installing wiring for the given loads and conditions:

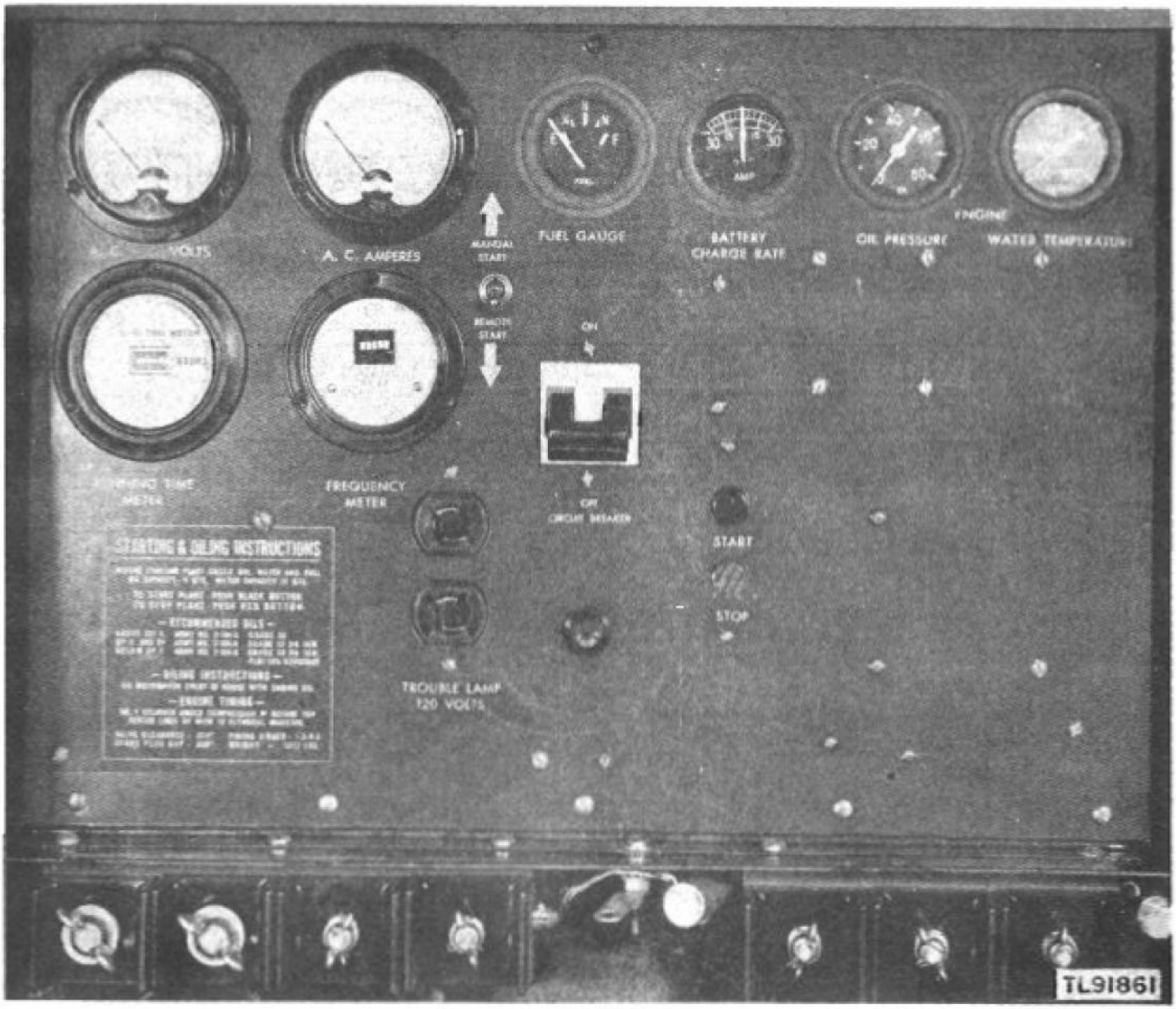


Figure 12. Power Unit PE-95-(2), control panel.

(1) *Outside wiring, unity power factor load, 120-volt system.* The wire sizes given in the following table are based on B and S wire gauge sizes.

Load in watts	Amperes (ac)	Distance in feet									
		100	200	300	400	500	600	700	800	900	1,000
500	4.17	14	14	14	12	10	10	10	8	8	8
1,000	8.34	14	12	10	10	8	6	6	6	6	4
1,500	12.5	14	10	8	6	6	6	4	4	4	2
2,000	16.7	12	8	6	6	4	4	4	2	2	2
3,000	25.0	10	6	6	4	2	2	2	2	1	0
4,000	33.4	8	6	4	2	2	1	1	0	0	
5,000	41.7	6	4	2	2	2	1	0			
6,000	50.0	6	4	2	2	0	0				
7,000	57.3	4	4	2	1	0	0				
8,000	66.7	4	2	2	0	0					
9,000	75.0	2	2	1	0						
10,000	83.4	2	2	1	0						

(2) *Outside wiring, 80 percent power factor load, 120-volt system.* The wire sizes given i the following table are based on B and S wire gauge sizes.

Load in watts	Amperes (ac)	Distance in feet									
		100	200	300	400	500	600	700	800	900	1000
500	5.2	14	14	12	10	8	6	6	6	6	4
1,000	10.4	14	10	10	8	6	6	6	4	4	4
1,500	15.6	12	8	8	6	6	4	4	4	2	2
2,000	20.8	10	8	6	4	2	2	2	2	1	1
3,000	31.3	8	6	4	4	2	2	1	1	0	0
4,000	41.7	6	4	4	2	2	1	0			
5,000	52.0	6	4	2	2	1	0				
6,000	62.5	4	2	2	1	0					
7,000	73.0	2	2	1	0	0					
8,000	83.4	2	2	1	0	0					
9,000	93.9	2	2	0							
10,000	100.4	1	1	0							

(3) *Outside wiring, unity power factor load, 240-volt system.* The wire sizes given in th following table are based on B and S wire gauge sizes.

Load in watts	Amperes (ac)	Distance in feet									
		100	200	300	400	500	600	700	800	900	1000
1,000	4.17	14	14	14	14	14	14	12	12	10	10
1,500	6.26	14	14	14	14	12	12	10	10	10	10
2,000	8.34	14	14	14	14	10	10	10	10	8	8
3,000	12.5	14	14	12	10	10	8	8	8	6	6
4,000	16.7	12	12	10	10	8	6	6	6	6	4
5,000	20.8	12	10	10	8	8	6	6	6	6	4
6,000	25.0	10	10	8	8	6	6	4	4	4	4
7,000	29.2	10	10	8	6	6	4	4	4	2	2
8,000	33.4	8	8	8	6	4	4	4	2	2	2
9,000	37.5	6	6	6	6	4	4	2	2	2	1
10,000	41.7	6	6	6	4	4	4	2	2	2	1

(4) *Outside wiring, 80 percent power factor load, 240-volt system.* The wire sizes given the following table are based on B and S wire gauge sizes.

Load in watts	Amperes (ac)	Distance in feet									
		100	200	300	400	500	600	700	800	900	1000
1,000	5.2	14	14	14	14	12	12	12	10	8	8
1,500	7.8	14	14	14	12	12	10	10	10	8	8
2,000	10.4	14	14	12	10	10	10	8	8	8	6
3,000	15.6	14	12	10	10	8	8	6	6	6	6
4,000	20.8	12	10	10	8	6	6	6	4	4	2
5,000	26.0	10	10	8	6	6	6	4	4	4	2
6,000	31.3	8	8	8	6	6	4	4	4	2	2
7,000	36.5	8	8	6	6	4	2	2	2	2	1
8,000	41.8	6	6	6	4	4	4	2	2	2	1
9,000	46.9	6	6	6	4	2	2	2	2	1	1
10,000	52.1	4	4	4	2	2	2	2	1	0	0

SECTION III. INSTALLATION AND ASSEMBLY OF POWER UNIT PE-95-(*)

12. Uncrating and Unpacking

a. Power Units PE-95-(*) are normally installed in Trailer K-52. The instructions that follow will therefore deal with the uncrating of both the power unit and trailer.

b. Carefully remove the top, ends, and sides of the crate. Drop the tailboard of the trailer and remove the fuel cans and corrugated pads from both sides of the unit. Cut the straps that hold the moistureproof barrier and remove the moistureproof wrapping.

c. Open the side panels of the unit and r move the bags of dehydrating material. C the wires that secure the flexible exhaust tub oil-drain pipe, and remote fuel connections a remove them from the inside of the unit hou ing.

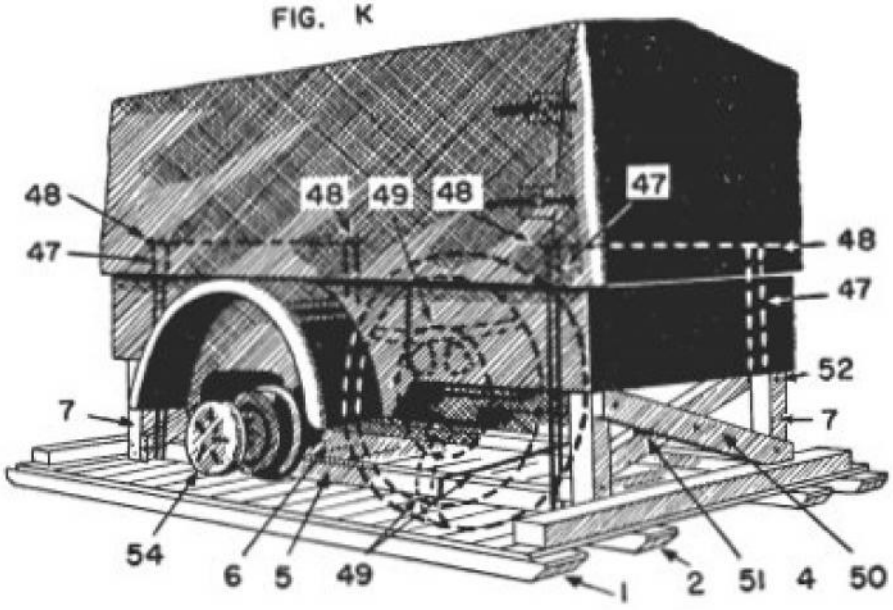
d. Leave the moistureproof barrier that under the unit where it is and cut away t rest of this material. Tighten the bolts th hold the unit to the floor of the trailer securel Check to make sure that all parts that shou

ITEM NO.	QTY.	ITEM NAME
41		CLEANER
42		RUST PREVENTIVE
43		PAPER, GREASEPROOF
44		TAPE, CELLULOSE
45		PAPER, GREASEPROOF
46		WIRE, METAL
47	4	STRAP, FLAT METAL
48	4	WOOD BLOCK
49		STRAP, FLAT METAL
50	2	BRACE, DIAGONAL
51	1	BLOCK, FILLER
52	5	BOLT, CARRIAGE
53		TAPE, ADHESIVE
54	2	BAG, PAPER
55		PAD, CORRUGATED
56	16	STRAP, CORNER
57		ADHESIVE, ASPHALT
58		PAPER, WATERPROOF
59	1	STRAP, FLAT METAL

TL96401

Figure 13. Power Unit PE–95–(*), packing details.

FIG. K



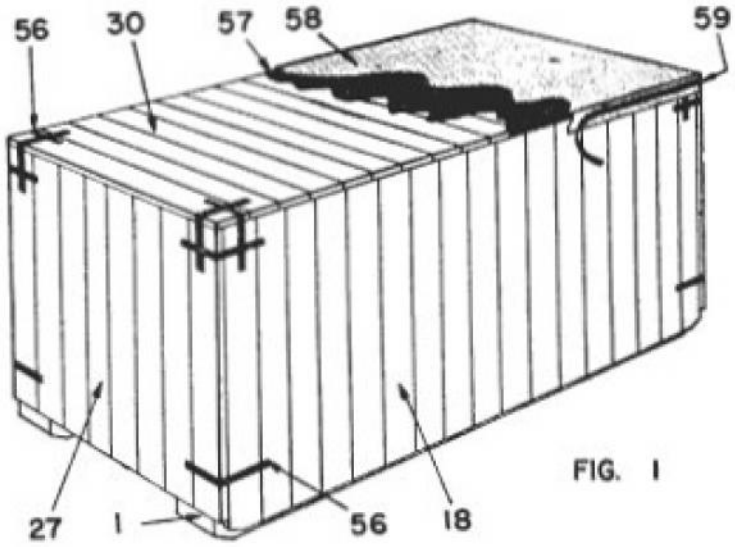


FIG. I

be removed from the inside of the unit housing have been removed.

e. Drain the rustproofing oil from the engine crankcase and install the oil-drain pipe and valve. Make sure that the valve is closed.

f. With a clean cloth, saturated with Solvent, Dry Cleaning, Federal spec No. P-S-661a, wipe off all rustproofing oil from the various control linkage.

g. Remove the spark plugs, wash them in dry-cleaning solvent and replace them in the engine. Check to see that the spark gap is correct and that the spark plugs are not damaged before replacing them.

h. Using an air hose, blow all foreign matter from the inside of the generator and from between the radiator tubes and fins.

i. Open the control cabinet and blow out all dust and dirt. Wipe off the face of the panel and all meters with a dry cloth.

j. Remove all tools and spare parts from the tool box. Wash the tools in dry-cleaning solvent or Oil, Fuel, Diesel, U. S. Army spec No. 2–102C, and dry them with a clean cloth. Do not unwrap the spare parts until they are needed.

k. Check the entire equipment, spare parts and tools, against the packing list and report any shortage or damage immediately.

l. Open the drains on the cooling system and drain any rustproofing oil or antifreeze that may be present. Be sure to close the drains when finished.

m. Cut the metal straps that hold the trailer body and trailer wheels and remove the protective wrappings from the wheel hubs and axles. Wash the axle parts with dry-cleaning solvent or Diesel oil.

n. Remove the tongue assembly from the under side of the trailer.

o. Jack up the trailer and install the wheels and inflate the tires.

p. Bolt the tongue assembly in place, remove the blocking, and roll the trailer from the base of the crate.

Note. Complete detailed instructions covering Trailer K–52 will be found in TM 9–883, including 1, and TB 9–883–1.

13. Initial Procedure

Before attempting to set up the unit for operation, inspect it thoroughly for loose parts or possible damage and make sure it is clean. Crank the unit two or three times with the hand crank and with the ignition off to make sure that all parts move freely. Make sure that all rustproofing has been removed and that all seals have been removed from the cooling system, carburetor air intake, breather, exhaust, etc.

14. Installation

a. Power Unit PE–95–(*) is normally installed in Trailer K-52 and no installation is necessary other than locating the unit and making necessary load and possibly remote fuel connections. Choose a general location that will be consistant with the assignment and the length of the attaching cables. Locate the unit as near to the center of the load as practicable.

b. If the unit is to be operated out of doors, select a dry spot and avoid low ground that might be flooded by sudden rain. Place the unit so that exhaust gases will be carried away from operating personnel. If the unit is not trailer-mounted, no special foundation is necessary. Set the unit on its skid base so that it is reasonably level and if necessary, in case of soft ground, set it on heavy planks placed under the skid base.

c. If the unit is to be operated within a building, be sure to provide adequate ventilation to carry off escaping exhaust fumes, heat generated by the unit, and supply an ample amount of oxygen. Place the unit so that the exhaust pipe may be extended to the outside of the building with the fewest possible number of bends in the exhaust line. Make certain that all exhaust connections are tight. Protect the outdoor end of the exhaust pipe against the entrance of rain. Provide not less than 2 feet of space on all sides of the unit. These instructions also apply when the unit is installed in a trailer or other vehicle.

d. If fuel is to be drawn from a remote supply, locate the remote fuel tank so that the total fuel lift, by the fuel pump, will not be more than 6 feet. This lift must be measured from the lowest point of the fuel pipe to the fuel pump intake. The total length of the fuel pipe must not exceed 20 feet and must be installed so as to have a continuous downward pitch from its connection to the unit, to its connection to the tank. Keep this fuel line as far as possible from the exhaust and be sure to provide an air vent in the remote fuel tank.

e. For connection details, see the Technical Manual for the equipment with which Power Unit PE–95–(*) is to be used.

f. PARALLEL OPERATION OF POWER UNITS PE–95–(*). These units are not suited to parallel operation.

15. Repacking Instructions

Power Unit PE–95–(*) being normally mounted in Trailer K–52, the unit will be transported in most cases, in the trailer. Prepare the unit as follows:

a. TRANSPORTING FOR TROOP MOVEMENT. Under these conditions, disassemble the connecting cables and remote control cable if used. Remove the flexible exhaust pipe and remote fuel pipe and pack them inside of the unit housing. Tie them securely in place. Coil the remote control cable and tie it firmly. Place the remote control cable inside of the generator end of the unit housing. Drain the fuel tank, fuel system, radiator and engine crankcase. Pack all loose equipment in the trailer and tie it securely in place. Lash the canvas trailer cover in place after everything has been packed. These instructions apply only to cases where the unit will be put back into service within a few days. If the unit is to be moved only a short distance, and returned to service immediately, it will not be necessary to drain the unit.

b. SHIPMENT BETWEEN AREAS. If the unit is to be transported a considerable distance, or likely to be out of service for several weeks, prepare the unit as follows:

(1) Open the drain cocks on the cooling system and completely drain the system. Close the drains and fill the cooling system with a mixture of 60 percent compound, antifreeze noncorrosive, conforming to Ordnance Department spec No. AXS–864, and 40 percent water. Operate the unit until it reaches operating temperature and then stop it and drain the cooling system.

(2) Plug all openings in the cooling system with suitable wooden plugs and seal them with nonhygroscopic tape conforming to Ordnance Department spec No. AXS–871.

(3) Drain the lubricating oil from the engine and fill the crankcase with Oil, Lubricating, Preservative, Special, Ordnance Department spec No. AXS–934, grade 1.

(4) Remove the oil-bath air cleaner from the carburetor air intake and seal the intake. Seal the exhaust outlet, crankcase breather, and magneto or distributor breather.

(5) Remove the spark plugs and while rotating the crankshaft by hand, spray the inside of the cylinders through the spark plug holes with preservative oil. Remove the valve-cover plate on the side of the engine and spray the valve mechanism with the same oil. Replace the spark plugs and valve cover plates.

(6) Drain the fuel tank. Add 1 ounce of Compound, Gum Preventive, Federal stock No. 51-C-1586-225 to 5 gallons of gasoline and place this mixture in the fuel tank. Operate the unit on this mixture for at least 5 minutes and then thoroughly drain the entire fuel system.

Note. Do not add this compound to lubricating oil.

(7) Remove and thoroughly clean the fuel strainer sediment bowl and drain the carburetor. Blow out all fuel lines and reassemble all parts.

Note. If the engine is to be moisture-vapor packed, including a dehydrating agent, remove the spark plugs and replace them with dehydrating plugs.

(8) Coat all bright metal parts with preservative oil and touch up all scratched or scraped spots on the painted surfaces of the equipment.

(9) Attach a red tag to the unit marked as follows:

Caution: This unit has been rustproofed in accordance with Signal Corps spec No. 72-0-1. Drain all rustproofing oil and refill according to applicable War Department Lubrication Order before placing back in service.

PART TWO

OPERATING INSTRUCTIONS

Note. For information on destroying the equipment to prevent enemy use, see the destruction notice at the front of manual.

Section IV. PREOPERATION PROCEDURE

16. Preparation for Use

a. Inspect the unit thoroughly to see that it s in working order. Check all fuel and electrical connections and make sure they are tight. Tighten any loose nuts, screws, or bolts. With the ignition off, turn the crankshaft a few times with the hand crank to check compression and make sure that all parts move freely. If the unit is new, or has just been removed from storage, follow applicable instructions contained in paragraph 12.

b. Before filling the fuel tank, make the following preparations:

(1) On Power Unit PE–95–(1), remove the side panel on the right-hand side (when facing the radiator). Withdraw the bayonet oil gauge and check the oil supply. On Power Unit PE–95–(2), remove the side panel from the left-hand side of the unit (when facing the radiator). Withdraw the oil gauge and check the oil supply. The bayonet gauge on Power Unit PE–95–(2) is quite long and it will be necessary to bend the gauge as it is withdrawn. On Power Unit PE–95–F, the bayonet gauge and oil-filler tube extend through the top of the housing between the battery-service cover and the radiator cap. Withdraw the gauge and check the oil supply. If the oil reservoir is empty or the oil is not up to the full mark, add oil as needed in accordance with the applicable War Department Lubrication Order (figs. 19, 20, 21).

(2) On Power Unit PE–95–F, place 6 drops of light engine oil (OE) in the oilers on the battery-charging generator and electric-starting motor.

(3) Remove the oil reservoir from the oil-bath air cleaner and clean it thoroughly. Fill it with oil as specified in the applicable War Department Lubrication Order. NEVER USE DILUTED OIL IN THE AIR CLEANER.

(4) On Power Unit PE–95–F, fill the crankcase breather with the same grade of oil as used in the air cleaner.

Note. Instructions contained in War Department Lubrication Orders are mandatory and must be observed.

(5) Blow out any dust and dirt from the control cabinet and the back of the control panel. Wipe off the face of the panel with a clean cloth.

(6) Check the storage battery. If it has been used previously, see that the level of the electrolyte in each cell is at least ½ inch above the top of the separators. If it is not, add pure water to correct the level of the electrolyte. Before adding water, check the specific gravity of the electrolyte in each battery cell with a hydrometer. A hydrometer reading of approximately 1.250 should be obtained for each cell. If the battery has not been previously used, prepare it according to instructions on the tab attached to the battery. (For complete instructions on the care of storage batteries, see TM 11–430.)

Caution: IN FREEZING TEMPERATURES, START THE UNIT OR PLACE THE BATTERY ON CHARGE IMMEDIATELY AFTER ADDING WATER.

(7) Check the battery connections. Make sure that they are clean and tight. Power Units PE–95–(1) and PE–95–(2) are supplied with two 6-volt batteries which are connected in series. Power Unit PE–95–F is supplied with but one 6-volt battery. The negative side of the

battery circuit is grounded on all Power Units PE–95–(*).

(8) Place a few drops of light engine oil (OE) on each control-rod balljoint and other moving control parts. Do not lubricate any electrical contacts. Make certain that no small oil holes have been overlooked. On Power Unit PE–95–F and PE–95–(2), place a few drops of engine oil (OE) in the oiler on the side of the distributor.

(9) Assemble all connecting and remote control cables and make the necessary connections.

(10) Open the control cabinet door and make certain that the circuit breaker is in OFF position.

(11) On Power Units PE–95–(2) and PE–95–F, place the MANUAL START-REMOTE START switch in REMOTE START position. This switch must be in REMOTE START position at all times except when the unit is being cranked by hand.

(12) Fill the radiator with clean water. In freezing temperatures, add antifreeze in accordance with the following table:

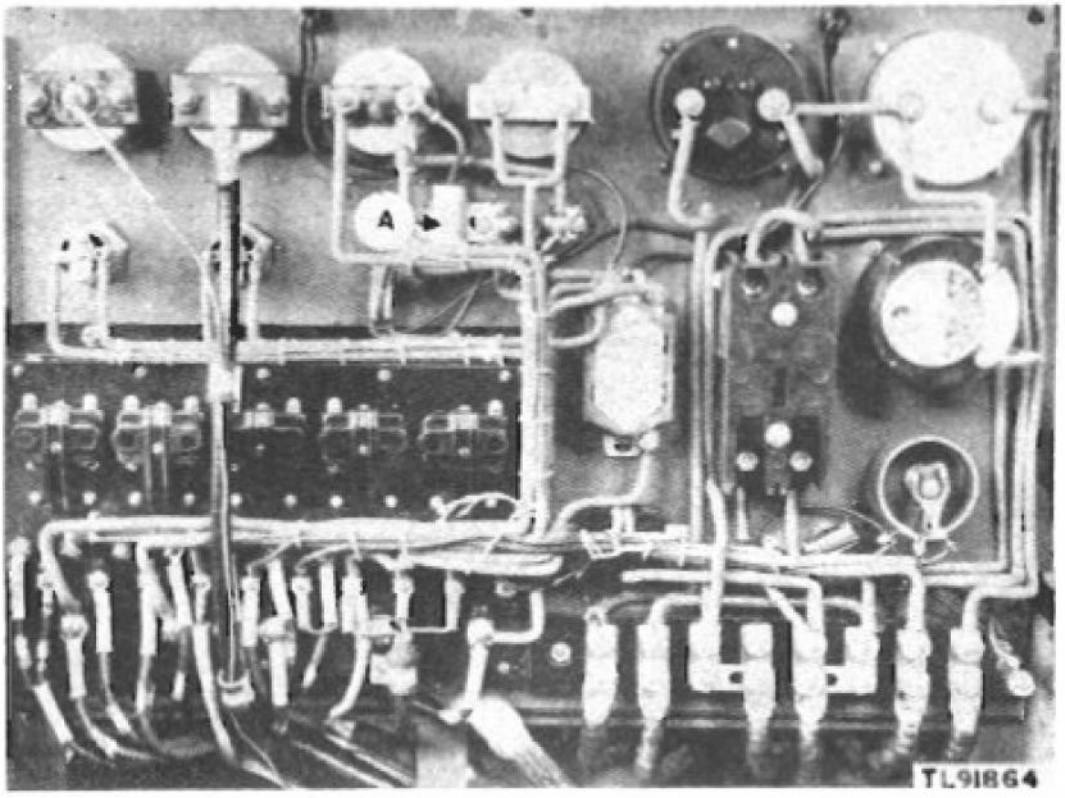
TABLE I

Lowest expected temperature	Pints, compound, antifreeze per gallon cooling system capacity	Lowest expected temperature	Pints, compound, antifreeze per gallon cooling system capacity
—10° F	2	—30° F	4
0° F	2½	—40° F	4½
—10° F	3	—50° F	5
—20° F	3½		

Protect the cooling system to at least 10° F below the lowest expected temperature.

(13) Fill the fuel tank with clean gasoline (Motor Fuel, U. S. Army spec. No. 2–103A in all combat zones or U. S. Army spec. No. 2–114 in the zone of interior.)

(14) Open the fuel-supply valve. On Power Units PE–95–(2) and PE–95–F, set the fuel-supply valve for local supply and change to remote supply, if used, after the unit is started. Check for leaks in the fuel system and correct any that may be found.



(A) Ammeter 3F1060–5
(B) Multi-breaker 3H912.50
(C) Rheostat 3Z7230–2
(D) Running time meter 3H1920/M 10
(E) Switch, rheostat, toggle 3Z9859–8
(F) Voltmeter 3F8300–14

Figure 15. Power Unit PE–95–F, control panel, rear view.

(15) On Power Units PE–95–(2) and PE–95–F, check the jumper connections on the back of the control panel and make sure that they are properly connected for the voltage output desired. These jumpers are normally connected for 120-volt output. For 120-volt output, one jumper connects terminals 3 and 4 and the other jumper connects terminals 5 and 6. For 240-volt output both jumpers are connected between terminals 4 and 5 (figs. 15 and 16).

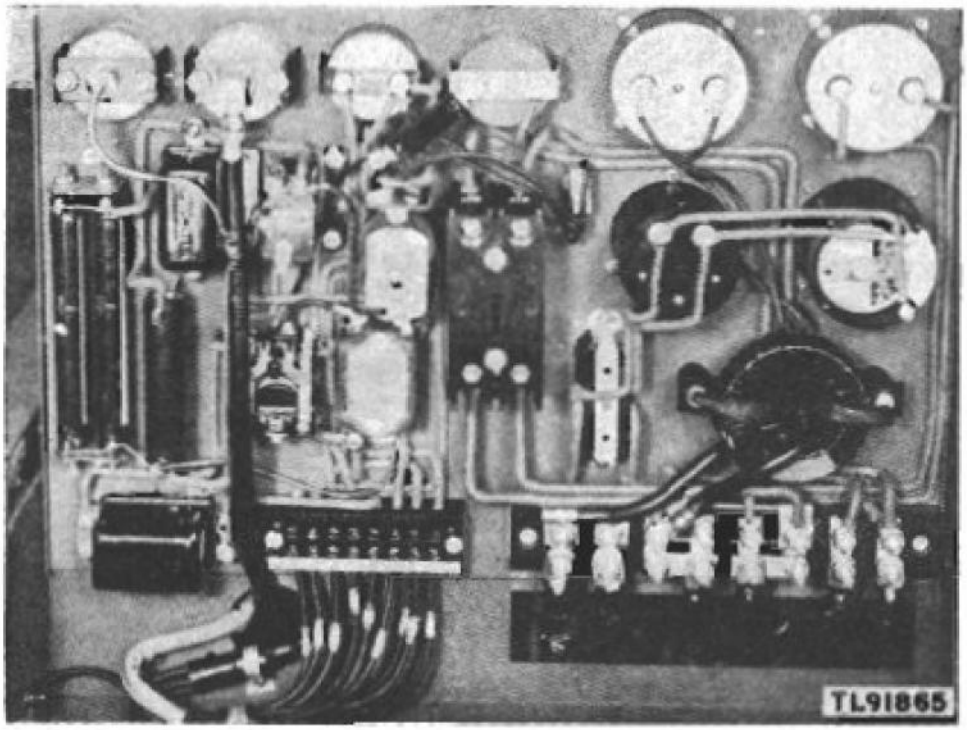


Figure 16. Power Unit PE–95–(2), control panel, rear view.

Section V. OPERATION

17. Starting

a. On Power Units PE–95–(2) and PE–95–F, operate the priming lever on the fuel pump until the sediment bowl on the fuel strainer is filled. Push the priming lever down when finished with the priming operation. If difficulty is experienced in operating the priming lever, turn the crankshaft one complete revolution with the hand crank.

b. If the unit is being operated in zero temperatures, pour the diluted oil into the crankcase at this time. Make sure that the oil and gasoline are thoroughly mixed.

c. Make sure that all instructions in paragraph 16 have been carefully followed. Press the START button on the control panel and hold it in until the engine starts and builds up oil pressure in the lubricating system. This will be indicated by the OIL-PRESSURE gauge on the control panel. Do not hold the START button in for more than 20 seconds. If the engine fails to start, wait 10 to 15 seconds and repeat the starting operation. If the engine still fails to start, check to see that the fuel-supply valve is in the correct position; check all ignition wiring; and check the oil supply. Correct any faults indicated and make another attempt to start the unit. If the unit does not start now, see the trouble chart in paragraph 57 for the possible cause.

Note. If the unit is new, remove the spark plugs, wash them in dry-cleaning solvent (SD), and check the spark gap. Correct the spark gap if necessary and replace the plugs in the engine.

d. If the storage battery is discharged or the electric starter fails to start from some other cause, all Power Units PE–95–(*) may be cranked by hand.

e. Power Unit PE–95–(1) being provided with magneto ignition, may be cranked by hand and should start even with a battery that is completely dead. Pull out the choke knob at the lower left of the radiator end of the unit. Remove the hand crank from the inside of the unit housing (on the right-hand side of the unit when facing radiator) and insert it in the hole below the radiator. Rotate the crank until

it engages the crankshaft starting-ratchet and give it a vigorous pull upward. NEVER PUSH DOWN ON THE CRANK AS SERIOUS PERSONAL INJURY MIGHT RESULT IF THE ENGINE SHOULD BACKFIRE. If the position of the crank will not permit pulling upward, disengage it and change its position.

f. Power Units PE–95–(2) and PE–95–F depend on the battery for starting ignition and cannot be started unless there is enough life in the battery to provide ignition current. If the electric starter fails to function, check the battery. If the battery shows a specific gravity reading of 1.225 or over when tested with a hydrometer or a voltmeter reading of not less than 2-volts per cell, it should furnish sufficient current for ignition. Place the MANUAL START-REMOTE START switch in MANUAL START position, insert the hand crank, pull out the choke and crank the unit. If the battery is too low, replace it with one that is known to be fully charged.

18. Adjustments and Checks After Starting

a. When the unit is manually started, push the choke in gradually as the engine warms up. On Power Units PE–95–(2) and PE–95–F, return the MANUAL START-REMOTE START switch to REMOTE START position.

b. Always check the oil pressure as soon as the unit starts to make sure that the lubricating system is functioning properly. The normal oil pressure on all Power Units PE–95–(*) is between 20 and 30 pounds. The engine oil pressure will be slightly higher when the unit is first started and will drop to normal as the engine warms up and the oil thins out.

c. Check the battery-charging ammeter and see that it shows charge. If this motor indicates discharge while the unit is running, it is an indication that trouble exists in the battery-charging circuit and the cause should be investigated.

d. The a-c voltmeter will indicate the voltage available at the output terminals. The a-c ammeter will not indicate any reading unless a load is applied to the unit.

e. If the load connections are made, apply the load by throwing the circuit breaker ON. If the circuit breaker trips or automatically throws off, it is an indication of an overload and the load must be checked and corrected before the circuit breaker is again closed. ALWAYS THROW THE CIRCUIT BREAKER OFF BEFORE MAKING OR CHANGING LOAD CONNECTIONS.

Note. Except in an emergency, allow the unit to run for at least 10 to 15 minutes before applying load.

19. Stopping

Before stopping the unit, throw the circuit breaker OFF to remove the load. Stop the unit by pressing the STOP button on the control panel or by placing the remote control switch in stop position. If the STOP button does not function, stop the unit by shutting off the fuel supply.

20. Operation of Automatic Voltage Regulator (PE-95-F)

a. Voltage regulation is accomplished in all Power Units PE–95–(*) except PE–95–F by inherent generator characteristics. In Power Unit PE–95–F, an automatic voltage regulator is provided.

b. On Power Unit PE–95–F, a manually controlled rheostat is provided in addition to the automatic voltage regulator. Either means of regulation may be used. Set the rheostat in maximum resistance position and throw the toggle switch to the left (toward the rheostat control knob). Permit the unit to reach operating temperature and adjust the automatic regulator until the voltmeter reads either 120 or 240 volts, depending on the position of the jumper connections on the control panel. This adjustment is accomplished by means of the regulating rheostat which is a part of the automatic regulator. Once this adjustment has been made, it should not be necessary to change it. The toggle switch need not be touched as the regulator will automatically take up its function whenever the unit is started.

21. Low Temperature Precautions

a. CRANKCASE. When operating the units in subzero temperatures, always drain the crankcase when the unit is to remain idle for prolonged periods. Close the oil drain before leaving the unit and attach a tag to the unit warning others that the crankcase is empty and must be filled in accordance with the War Department Lubrication Order before the unit is operated.

b. ANTIFREEZE. Watch the cooling system carefully and make sure that there is sufficient

antifreeze for the surrounding temperature.

c. STARTING. If the unit has been idle for a prolonged period in freezing temperature, crank it a few times with the hand crank before using the electric starter. Be sure that the ignition switch is off while using the hand crank.

d. HEAT REGULATION. When operating under extremely cold conditions, cover the lower half of the radiator to aid reaching the minimum operating temperature of 160° F. The most efficient operating temperature is 175° F. and the unit should not be operated at temperatures of more than 15° F. above or below this figure. Power Units PE–95–(2) and PE–95–F are provided with a high-water-temperature cut-off switch which automatically stops the unit if the engine temperature becomes too high. The cut-off point is adjustable and when only water is used in the cooling system, it should be set to cut-off at 208° F. when operating at sea level.

e. ARCTIC OPERATION. (1) *General.* When operating under arctic conditions, it is imperative that special attention be given to all normal maintenance instructions and that the engine be kept in top condition. Special precautions must be observed in the care of storage batteries, handling of lubrication, and protection of the unit.

(2) *Cold starting.* (*a*) *Batteries.* Extremely low temperatures may reduce the power output of storage batteries as much as 50 percent. When operating under such conditions, remove the batteries when the unit is not operating and store them in a moderately warm place. Keep the batteries fully charged. The specific gravity of the electrolyte in each cell must not be below 1.275 at any time. Do not attempt to use a battery that has been exposed to temperatures of —20° F. without first warming it to a moderate temperature. A fully charged battery, with electrolyte having a specific gravity of 1.275 will not freeze in temperatures as low as —40° F. A partially charged battery will, however, freeze at much higher temperatures. NEVER ADD WATER TO A BATTERY UNDER FREEZING TEMPERATURES UNLESS THE BATTERY IS TO BE CHARGED IMMEDIATELY. The following table gives the relative efficiency of a storage battery under various temperature conditions.

Temperature		Capacity in percent of 8-hour rate	
° F.	° C.	1.210 specific gravity	1.260 specific gravity
120	49	120	122
77	25	100	100 (normal)
30	—1	75	80
0	—18	55	65
—20	—29	*0	45
—30	—35	*0	33
—40	—40	*0	22

* Electrolyte frozen.

Always free the engine by cranking it a few times with the hand crank before using the electric starter when operating in freezing temperatures.

(*b*) *Carburetion.* Difficulty may be experienced when operating in cold temperatures by the formation of ice on and in the carburetor. This condition may be partially overcome by keeping the trailer cover tied down securely when the unit is trailer mounted. Keep the unit housing closed and, if necessary, also close the air intake vents in the housing. This condition has been partially remedied by the substitution of lead gaskets for the paper and asbestos gaskets in the intake manifold. In addition if results are still unsatisfactory, on Power Units PE–95–F, –G, –H, see MWO Sig. 39 for means of improvising a satisfactory hot air feed.

(*c*) *Carburetor air cleaners.* When operating under extremely low temperatures, thoroughly wash the air cleaner and its filtering element in drycleaning solvent (SD), reassemble it and allow it to dry.

(*d*) *Spark plugs.* Keep the spark plugs clean and wipe all moisture from the inside of the spark plug shields and from the porcelain insulator of the spark plugs, before starting. Adjust the spark plug gap 0.005 inch closer than normal.

(*e*) *Fuel lines.* Take extra precautions to prevent water from getting into the fuel system. If the flow of fuel is obstructed by the formation of ice in the fuel lines, thaw out the lines and remove them and blow them out with dry air. Drain any water that may be present from the fuel tank and refill it with gasoline that has been strained through filter paper or chamois skin.

Caution: STRAINING GASOLINE IN THIS MANNER WILL CREATE STATIC ELECTRICITY. MAKE SURE THAT A GOOD

METALLIC CONTACT EXISTS BETWEEN THE FUNNEL AND TANK TO INSURE AN EFFECTIVE GROUND.

Keep the fuel tank as full as possible at all times as the more fuel there is in the tank, the smaller will be the volume of air from which moisture can condense. The addition of approximately 3 percent alcohol, grade three, to the fuel in the tank, will reduce the hazard of the formation of ice in the fuel system.

(*f*) *Preheating.* If the unit is being operated outdoors, preheat it before starting by covering it with a tarpaulin, under which fire pots have been placed. Take precautions to eliminate any fire hazard when this practice is followed. When the unit is stopped, cover it completely with blankets and a tarpaulin. Draining the lubricating oil and storing it in a warm place until needed for further use will aid in starting. Follow the lubricati structions in the War Department Lubr Order carefully.

(*g*) *Generator precautions.* Ge brushes will wear more rapidly under ex ly cold conditions. Check the brushes a frequent intervals than under normal op conditions and replace them as soon as t any indication of their not functioning erly.

(*h*) *Shelter.* Protect the unit from ex to the elements as much as possible. If t is mounted in a trailer, keep the traile closed and tied securely at all times. other shelter is provided, place the unit lee of a building, embankment, trees, drift, or put up a tarpaulin to act as a break.

Section VI. EQUIPMENT OPERATION CHECK SHEET

22. Purpose and Use of Equipment Operation Check Sheet

The equipment operation check sheet for Power Units PE–95–(*) follows. Refer to this chart when preparing the unit for operation, when starting it, when operating it, and when stopping it. Items listed in the column headed Item are points on the unit to be checked during each of these steps. Normal indications given in the check sheet are those con which must exist if the unit is to p properly. For example, the fuel tank sh full before the unit is started; the fre meter should read 60 cycles when the operating under load. A corrective ac be applied to each item to obtain the indication required, thereby insuring operation, is given in the column head rective measures.

23. Equipment Operation Check Sheet for Power Unit PE-95-(*)

	Item No.	Item	Action or condition	Normal indication	Corrective measures
PREPARATORY	1	Fuel tank	Check fuel gauge	Full	Add fuel.
	2	Fuel valve	Check position	Open PE-95-(1)	Open.
				Open in local position (PE-95-F and PE-95-(2)	Set in local supply position.
	3	Lubrication oil supply	Check bayonet gauge	Full	Add oil. (See WDLO.)
	4	Air cleaner	Check oil reservoir	Oil up to bead on cleaner	Add oil. (See WDLO and arctic operation, par. 21.)
	5	Radiator	Check water level	About 2 inches below top of filler neck	Add water. (See cold weather operation, par. 21.)
	6	Crankcase breather (PE-95-F only)	Check oil level	Filled to indicated level	Add oil. (See WDLO.)
	7	Circuit breaker	Check to see that it is OFF	OFF when not running	Place in OFF position.
	8	MANUAL START-REMOTE START SWITCH	Check to see that it is in REMOTE START position when using starter	In REMOTE START position when using starter	Place in correct position for method of starting.
STARTING	9	START button	Press and hold in	Engine is cranked by starting motor	See trouble chart (par. 57).
				Engine starts	
	10	Choke (hand)	Normally in	Choke knob pushed in	None.
	11	Choke (automatic)	Normally in closed position when engine is not running	Opens choke valve as engine starts and warms up	See trouble chart (par. 57).
PERFORMANCE	12	Oil-pressure gauge	Should read between 20 and 30 pounds	20 pounds	
	13	Frequency meter	Should read about 61 cycles at no load	60 cycles under load	
	14	Battery-charge meter	Should read between 6 and 8 amperes charge	6 to 8 amperes charge	
	15	ENGINE WATER TEMPERATURE gauge	Normally at 90 when unit is not operating	Between 160 and 180 when unit is operating	
	16	A-c ammeter	Zero without load on unit	Depends on load when circuit breaker is closed	
	17	A-c voltmeter	Will read approximately 120/240 volts depending on jumper connections. 115 volts on PE-95-(1)	Depending on load and jumper connections	
STOPPING	18	Circuit breaker	Normally ON while operating. Place in OFF position	ON	
	19	STOP button	Press and hold in until engine stops turning	Engine will stop firing when button is pressed	
	20	Battery-charge meter	Shows charge while running	Should drop to zero	

Note. Starting and stopping may be performed by means of the remote control start-stop switch. Check instruments on control panel as soon after starting the unit as possible.

PART THREE

PREVENTIVE MAINTENANCE

Section VII. OPERATOR'S PREVENTIVE MAINTENANCE TECHNIQUES

4. Meaning of Preventive Maintenance

reventive maintenance is a systematic series f operations performed at regular intervals n equipment, in order to maintain top efficincy in performance, to reduce unwanted interruptions in service, and to eliminate major reak-downs. To understand what is meant by *reventive maintenance,* it is necessary to disinguish between preventive maintenance, rouble shooting, and repair. The prime funcion of preventive maintenance is to *prevent* ajor break-downs and the consequent necesity of repair. The primary function of trouble hooting and repair is to locate and correct *xisting* defects. The importance of preventive maintenance cannot be overemphasized. 'ower equipment is but one component of a omplete system. Because each component of n over-all system must be ready when needed nd able to operate at peak efficiency. Operators nd repairmen must maintain all power supply quipment properly.

5. Purpose of Operator's Maintenance

a. To insure mechanical efficiency, it is necssary to inspect the power unit systematiclly at intervals each day it is operated and t other specified intervals, so that defects may e discovered and corrected before they result in erious damage or failure. Certain scheduled naintenance services will be performed at these lesignated intervals. The services set forth in his section are those performed by the operator before operation, during operation, during stop periods, after operation, and at other pecified intervals.

b. Every operator of the individual power nit should have available WD Form 48 (Driver's Trip Ticket and Preventive Maintenance Service Record) (figs. 17 and 18). This form should be adapted to all Signal Corps power units by elimination of items pertaining only to vehicles. Items peculiar to specific power units, but not listed on WD Form 48, are covered in manual procedures under items to which they are related. Certain items listed on the form, but not pertaining to the power units involved, are crossed out on the form and eliminated from the procedure as it is written into the manual. Every organization must thoroughly school each operator in performing the maintenance procedures set forth in the manuals, whether or not the procedures are listed specifically on WD Form 48.

c. DRIVER'S TRIP TICKET AND PM SERVICE RECORD (WD FORM 48). Every operator of an individual power unit or power unit installation will provide himself with WD Form 48 (Driver's Trip Ticket and PM Service Record). To adapt this form to power unit operation, the following interpretation of various headings on that form will be necessary. *Time Out* will be interpreted as the start of a period of power-unit operation. *Time In* will be understood as the end of that operating period. *Kind of Work* will be interpreted as the equipment for which the power unit was used as a source of power. The *speedometer* heading will be ignored and the reading of the *Hour Meter* will be entered under that heading at the beginning and end of the operating period, if such a meter is provided on the unit. If no such meter is provided, only the total number of hours operated during the operating period will be recorded. No entry will be required under the heading *Trip or Load Record.* Under the heading *Passengers or Weight,* enter the load in amperes during the operating period and under the heading *Speedometer or Hour Meter,*

DRIVER'S TRIP TICKET AND P. M. SERVICE RECORD

U.S.A. NUMBER: Serial PE-95G 202611

DRIVER'S NAME: P.F.C. Frank Wilson

DATE: June 1945

REPORT TO: Sgt L. B. Hughes

TIME OUT: 0700

ORGANIZATION: 521st

TIME IN: 1700

DEPARTMENT OR ADDRESS: Bldg T779 Telegraph Ave Post

KIND OF WORK (or route): Power Supply for SCR 299

REQUESTED BY (Organization or individual): Hq 521st Sig Service Co.

DISPATCHER'S SIGNATURE: Capt James Ball

SPEEDOMETER			HOUR METER		
IN	OUT	TOTAL MILES	IN	OUT	TOTAL HOURS
X	X	X	1462	1472	10

FUEL ADDED: 15 GALS.

OIL ADDED: 1 QTS.

I HAVE PERFORMED THE "PREVENTIVE MAINTENANCE SERVICES" OF THIS FORM AND RECORDED ALL DEFICIENCIES AND ANY ACCIDENT

Frank Wilson
DRIVER'S SIGNATURE

I HAVE NOTED ALL ENTRIES ON THIS FORM AND TAKEN THE NECESSARY ACTION

DISPATCHER'S, ETC., SIGNATURE

TRIP OR LOAD RECORD	PASSENGERS OR WEIGHT	SPEEDOMETER OR HOUR METER
FROM	Average	1462
TO	14 Amps	1472
TO		
TO		
TO		
TO		
TO		
TO		
TO		

VEHICLE RELEASED AT (Speedometer or hour meter, date, hour): 1012 hours 5 April 1945 ϕ9ϕϕ

OFFICIAL USER (Signature and Grade): P.F.C. Frank Wilson

WAR DEPARTMENT FORM 48
APPROVED 18 DECEMBER 1944

TL 96113

Figure 17. WD Form 48.

DRIVER'S DAILY PREVENTIVE MAINTENANCE SERVICES

PERFORM THESE SERVICES ACCORDING TO THE INSTRUCTION IN TM 37-3810, OR VEHICLE OPERATOR'S MANUAL.

BEFORE OPERATION SERVICE

1. TAMPERING AND DAMAGE
2. FIRE EXTINGUISHERS
3. FUEL, OIL AND WATER
4. ACCESSORIES AND DRIVES
5. ~~AIR BRAKE TANKS~~
6. LEAKS - GENERAL
7. ENGINE WARM-UP
8. CHOKE OR PRIMER
9. INSTRUMENTS
10. ~~HORN AND W/S WIPERS~~
11. ~~GLASS AND R/V MIRRORS~~
12. ~~LAMPS AND REFLECTORS~~
13. ~~WHEEL AND FLANGE NUTS~~
14. ~~TIRES AND/OR TRACKS~~
15. ~~SPRINGS AND SUSPENSIONS~~
16. ~~STEERING LINKAGE~~
17. FENDERS AND BUMPERS
18. TOWING CONNECTIONS
19. BODY, ~~LOAD AND TARPS~~
20. ~~DECONTAMINATOR~~
21. TOOLS AND EQUIPMENT
22. ENGINE OPERATION
23. ~~OPERATOR'S PUBLICATIONS~~
24. ~~AMPHIBIAN ITEMS~~
24-1. ~~MATL'L'S HANDLING EQUIP ITEMS~~
24-2. ~~SPECIAL ENGINEER ITEMS~~
25. DURING OPERATION CHECK

OPERATOR'S INITIALS AL

DURING OPERATION SERVICE

26. ~~STEERING BRAKES~~
27. ~~FOOT AND HAND BRAKES~~
28. ~~CLUTCH~~
29. ~~TRANSMISSION~~
30. ~~TRANSFER~~
31. ENGINE AND CONTROLS
32. INSTRUMENTS
33. ~~STEERING GEAR~~
34. ~~RUNNING GEAR~~
35. ~~BODY AND TRAILER~~
36. ~~GUN MOUNTINGS AND ELEVATING, TRAVERSING, GYRO, AND FIRING CONTROLS~~
37. ~~AMPHIBIAN ITEMS~~
37-1. ~~MATL'L'S HANDLING EQUIP ITEMS~~
37-2. ~~SPECIAL ENGINEER ITEMS~~

OPERATOR'S INITIALS AL

AT HALT SERVICE

38. FUEL, OIL AND WATER
39. TEMPERATURES - HUBS, BRAKE DRUMS
40. ~~AXLE AND TRANSFER VENTS~~
41. ~~PROPELLER SHAFTS~~
42. ~~SPRINGS AND SUSPENSIONS~~
43. ~~STEERING LINKAGE~~
44. ~~WHEEL AND FLANGE NUTS~~
45. ~~TIRES AND/OR TRACKS~~
46. LEAKS - GENERAL
47. ACCESSORIES AND BELTS
48. AIR CLEANERS
49. ~~FENDERS AND BUMPERS~~
50. ~~TOWING CONNECTIONS~~
51. BODY, LOAD AND TARPS
52. ~~ARMAMENT AND GLASS~~
53. ~~AMPHIBIAN ITEMS~~
53-1. ~~MATL'L'S HANDLING EQUIP ITEMS~~
53-2. ~~SPECIAL ENGINEER ITEMS~~

OPERATOR'S INITIALS AL

AFTER OPERATION SERVICE

54. FUEL, OIL AND WATER
55. ENGINE OPERATION
56. INSTRUMENTS
57. ~~HORN AND W/S WIPERS~~
58. ~~GLASS AND R/V MIRRORS~~
59. ~~LAMPS AND REFLECTORS~~
60. FIRE EXTINGUISHERS
61. ~~DECONTAMINATOR~~
62.* BATTERY AND VOLTMETER
63.* ACCESSORIES AND BELTS
64.* ELECTRICAL WIRING
65. AIR CLEANERS AND BREATHER CAPS
66.* FUEL FILTERS
67. ENGINE CONTROLS
68.* ~~TIRES AND/OR TRACKS~~
69.* ~~SPRINGS AND SUSPENSIONS~~
70. ~~STEERING LINKAGE~~
71. ~~PROPELLER SHAFT, CENTER BEARING AND VENT~~
72. ~~AXLE AND TRANSFER VENTS~~
73. LEAKS - GENERAL
74. ~~GEAR CASES~~
75.* ~~AIR BRAKE TANKS~~
76. ~~FENDERS AND BUMPERS~~
77.* ~~TOWING CONNECTIONS~~
78. BODY, ~~LOAD AND TARPS~~
79. ~~ARMOR AND FRONT ROLLER~~
80. ~~VISION DEVICES~~
81. ~~TURRET AND GUN MOUNTINGS AND ELEVATING, GYRO, TRAVERSING, AND FIRING CONTROLS~~
82.* ~~TIGHTEN WHEEL, AXLE, AXLE DRIVE FLANGE, AND SPRING U-BOLT NUTS~~
83.* LUBRICATE AS NEEDED
MOLO NO. 3026
DATE 9 March 1944
84.* CLEAN ENGINE AND VEHICLE
85.* TOOLS AND EQUIPMENT
86.* ~~AMPHIBIAN ITEMS~~
87.* ~~MATL'L'S HANDLING EQUIP ITEMS~~
88.* ~~SPECIAL ENGINEER ITEMS~~

OPERATOR'S INITIALS AL

*THOSE ITEMS MARKED BY AN ASTERISK (*) REQUIRE ADDITIONAL WEEKLY SERVICES AND IT IS MANDATORY THAT THEY BE PERFORMED AS PRESCRIBED.

RECORD ANY ACCIDENT AND ALL DEFICIENCIES, INDICATING IF CORRECTED:

Bad miss - unable to locate cause.

TL96135

Figure 18. WD Form 48.

229941 O - 52 - 5

enter the total number of hours for which the load entered was carried by the unit. The *Dispatcher's Signature* will be that of the officer charged with the equipment. All other entries on the front of the form are self-explanatory. On the reverse side of WD Form 48 are listed the before-operation, during-operation, at-halt, and after-operation services. The power unit operator will line out all operations listed which do not apply to power units and will perform all remaining operations. Upon the completion of each group of service operations, the unit operator will place his initials in the space provided. The balance of the back of the form is self-explanatory (figs. 17 and 18).

26. Preventive Maintenance Services

a. GENERAL. These services are the responsibility of the commanders of operating organizations. They comprise the scheduled maintenance services performed by power unit operators (first echelon) and unit mechanics (second echelon) respectively.

b. FIRST ECHELON. Ordinarily, the power unit operator (first echelon) will replenish fuel, oil, grease, coolant, and battery liquid. He will perform necessary cleaning operations; tighten loose nuts, bolts, screws, and other fastenings; care for tools and accessories; and make such emergency repairs as are within the scope of his ability, tool equipment, and parts available. He will see that all lubrication operations scheduled for daily lubrication on the War Department Lubrication Order for the unit under his care are properly and regularly performed. These operations are performed by the operator daily, before operation, at halt (during shut-down periods), and after operation. He will assist the unit mechanic (second echelon) in performing the weekly maintenance on the unit.

c. SECOND ECHELON. The unit mechanic (second echelon) will perform the weekly and monthly maintenance operations with the assistance of the unit operator (first echelon) and all service operations within the scope of his ability, tool, and spare part equipment available. He will also perform all lubrication operations scheduled for weekly lubrication on the War Department Lubrication Order for the unit and will check to see that daily lubrication operations have been properly performed by the unit operator. The unit mechanic will report any maintenance or repair operatio beyond the scope of the second echelon to h commanding or noncommissioned officer.

27. Before-Operation Service

a. PURPOSE. This inspection schedule is d signed primarily as a check to see that t power unit has not been damaged, tamper with, or sabotaged since the after-operati service was performed. Various combat co ditions may have rendered the power unit u safe for operation, and it is the duty of t operator to determine if the power unit is condition to carry out any mission to which may be assigned. This operation cannot be e tirely omitted, even in extreme tactical situ tions.

b. PROCEDURE. Before-operation service co sists of inspecting items listed below accordi to the procedure described, and correcting reporting any deficiencies. Upon completion the before-operation service, results should reported promptly to the designated person authority.

28. Before-Operation Service Items

a. ITEM 1, TAMPERING AND DAMAGE. Ch for injury to the power unit or items of spec equipment. Check for damage that may ha resulted from falling debris, shell fire, s otage, collision, or the presence of booby tra Open the engine compartment doors and l for signs of tampering or sabotage, such loosened or damaged accessories or drive be To facilitate starting, dry any wet spark plu distributor, or magneto and wiring.

b. ITEM 3, FUEL, OIL, AND WATER. Ch the amount of fuel in the tanks, noting any dications of leaks or tampering. Add fuel necessary and check spare fuel cans. Check level. Add oil if necessary. Check level condition of coolant. Add antifreeze w water if required.

Note. Any appreciable change in levels since the after-operation service should be investigated and ported to the designated authority.

c. ITEM 4, ACCESSORIES AND DRIVES. Ch all accessories, carburetors, generators, re lators, starters, fans, shrouds, and wa pumps for loose connections or mountin Check couplings or belts for looseness wear.

d. ITEM 6, LEAKS, GENERAL. Check under the power unit and in the engine compartment for indications of fuel, oil, or water leaks. Check the cooling system for leaks, paying particular attention to radiator core and connecting hose. Check the engine crankcase, oil filters, and oil lines for indications of oil leaks. Check the fuel system for indications of leaks. Trace all leaks to their source and correct or report them to the designated authority.

e. ITEM 7, ENGINE WARM-UP.

Caution: As a precaution against fire or explosion, before starting the engine, open the side panels of the unit housing to be sure that the engine compartment is clear of gas fumes. Start the engine and note the action of the starter mechanism. Note particularly whether the starter has adequate cranking speed and, on Power Unit PE–95–F, note that the Bendix gear engages and disengages properly. If the oil pressure gauge or signal light does not indicate properly within 30 seconds, the engine should be stopped and the trouble corrected or reported to the proper authority. Permit the unit to operate for at least 15 minutes without load before closing the circuit breaker. Proceed with the following before-operation services.

f. ITEM 8, CHOKE OR PRIMER. While starting the engine, check the operation of the automatic choke. If the unit is being manually started, reset the manual choke as the engine warms up to prevent overchoking and dilution of engine oil.

g. ITEM 9, INSTRUMENTS. (1) *Oil-pressure Gauge or Light Indicator.* Check the gauge to see whether it indicates properly, and check the light indicator to see whether it fails to go out. If these instruments fail to indicate properly, stop the engine immediately, investigate the cause of the failure, and report to the proper authority.

(2) *Battery-charge ammeter.* The ammeter should show a high charging rate for the first few minutes after starting until the generator restores the current used in starting to the battery. After this period, the ammeter should register between 4 and 6 amperes, positive charge. Any unusual drop or rise in the charging rate should be investigated. A highcharge reading for an extended period may indicate a faulty battery, generator, or regulator.

(3) *Frequency meter.* Observe whether the frequency meter registers approximately 60 cycles. A frequency of 60 cycles will be indicated when the unit is operating at its correct speed when under load.

(4) *Fuel gauge.* Observe whether the gauge is operating properly. Normally, fuel tanks would be filled before operation, and the gauge should register FULL.

(5) *Voltmeter.* Note whether the voltmeter is operating properly. On Power Unit PE–95–(1) it should read approximately 115 volts when there is a load on the unit. On Power Units PE–95–(2) and PE–95–F, it should read approximately 120 or 240 volts when there is a load on the unit. This reading will depend on whether the jumper connections on the control panel are in position for 120- or 240-volt output.

(6) *A-c ammeter.* Note whether the a-c ammeter is operating properly. There will be no reading until a load is applied to the unit. When load is applied, this meter will indicate the load in amperes.

(7) *Temperature gauge.* Engine temperature should increase gradually during operation until it has reached approximately 175° F. Continued low temperature, after a reasonable warm-up period, may indicate existing troubles that should be investigated and corrected.

h. ITEM 19, BODY AND TARPAULINS. Inspect the unit housing for looseness and damage. Check to see that the foundation bolts are tight.

i. ITEM 21, TOOLS AND EQUIPMENT. See that tools and equipment belonging to the power unit are present, serviceable, and properly mounted or stowed.

j. ITEM 22, ENGINE OPERATION. If the engine has not yet reached normal operating temperature, as indicated by the temperature gauge, cover or partially cover the radiator until proper operating temperature is attained. Listen for any unusual noise or other indications of abnormal operation and correct any faults indicated, or report them to the proper authority.

k. ELECTRICAL CONTROLS. Add this item to WD Form 48 (figs. 17 and 18). Note whether electrical controls operate smoothly, and whether their operation is followed by the proper indications. Notify the proper person in authority if there is indication of faulty operation of switches, buttons, circuit breakers,

rheostats, potentiometers, relays, voltage regulators, or other electrical controls.

l. ITEM 25, DURING-OPERATION CHECK. The during-operation services should start as soon as the load is put on the unit.

29. During-Operation Service

a. GENERAL. While the power unit is in operation and delivering its normal load, listen for rattles, knocks, squeaks, or hums that may indicate trouble. Look for indications of trouble in the cooling system. Watch for smoke from any part of the power unit. Be alert to detect the odor of overheated components or units such as the generator or the wiring, fuel vapor from a leak in the fuel system, exhaust gas, or other odors indicating trouble. Watch the instruments on the control panel frequently, and note unusual instrument indications that may signify trouble in the system to which that instrument pertains.

b. PROCEDURE. During-operation service consists of observing items listed below according to the procedures following each item, and investigating any indications of serious trouble. Note minor deficiencies to be corrected or reported at the earliest opportunity, usually the next stop period.

30. During-Operation Service Items

a. ITEM 31, ENGINE AND CONTROLS. The operator must be on the alert for deficiencies in engine performance such as lack of usual power, misfiring, stalling, indications of engine overheating, or unusual exhaust smoke. Notice whether the engine responds to the controls satisfactorily, and see that the controls are in proper adjustment.

b. ITEM 32, INSTRUMENTS. Observe the readings of all instruments frequently during operation to see whether they are indicating properly.

(1) *Temperature gauge.* See that the gauge reads in normal range (except when operating under unusual conditions). Excessive engine heat may indicate trouble and should be investigated immediately.

(2) *Oil-pressure gauge.* In case of an unusual drop or no oil pressure, stop the unit immediately. (On Power Units PE–95–(2) and PE–95–F the low-oil-pressure cut-off switch will normally function under these conditions.) Report trouble to proper authority for correction. Lack of oil pressure may indicate insufficient oil, leaks, loose bearings, or a defective oil pump and may result in premature wear or may damage the engine to the extent of failure. On Power Unit PE–95–F, a green signal light will light upon oil-pressure failure.

(3) *Battery-charge ammeter.* During operation, the battery-charging ammeter must indicate a positive reading. A discharge reading may indicate trouble in the regulator, generator, battery, or other parts of the battery-charging circuit.

(4) *Frequency meter.* See that the frequency meter reads approximately 60 cycles when the unit is under load. The reading of the frequency meter will vary between 59 and 61 cycles depending on the load placed upon the generator. Readings above or below 59 or 61 cycles indicate that the engine is not operating at correct speed.

(5) *A-c ammeter.* The reading of the a-c ammeter will depend upon the load being carried by the generator. On Power Units PE–95–(1) and PE–95–F this reading should not exceed 54.8 amperes. (On Power Unit PE–95–F, this reading applies to 120 volt operation only.) On Power Unit PE–95–F, the reading should not exceed 27.4 amperes on 240-volt operation. On Power Units PE–95–(2) the a-c ammeter reading should not exceed 104 amperes on 120-volt operation and 52 amperes on 240-volt operation.

(6) *Fuel gauge.* See that the fuel gauge continues to indicate the approximate amount of fuel in the tank.

Note. On Power Units PE–95–(2) and PE–95–F, the fuel gauge will indicate only the fuel in the built-in fuel tank and not that in the remote tank when one is used.

c. ITEM 35. The operator must be on the alert for looseness of the unit housing, mounting bolts, or components which might cause damage to the equipment or injury to operating personnel.

31. At-Halt or Stop Service

a. PURPOSE. The at-halt or stop service may be regarded as minimum battle maintenance and must be performed under all tactical conditions, even though the more extensive maintenance services may be slighted or omitted altogether.

b. PROCEDURE. This service consists of investigating any deficiencies noted during operation, inspecting the following items accord-

ing to the procedures described below, and correcting any deficiencies found. At the end of the stop period, report immediately any uncorrected deficiencies to the designated individual authority.

32. At-Halt or Stop Service Items

a. ITEM 38, FUEL, OIL AND WATER. Check the fuel supply to see that it is adequate to operate the unit until the next refueling time. When refueling, use safety precautions for grounding static electricity, and allow space in the filler neck for expansion. Filler-cap vents must be open, and the cap must be replaced securely. Check the crankcase-oil level, if necessary, add oil to the proper level. Remove the radiator filler cap, being careful of steam, especially if a pressure cap is used. Check coolant to see that it is at proper level, and replenish the coolant as necessary. Do not fill the radiator to overflowing; leave sufficient space for expansion. If the engine is hot, fill the radiator slowly while the unit is running without load (engine running at governed speed).

b. ITEM 39, TEMPERATURE. Check generator or motor housings and bearings. Place hand cautiously on each bearing housing and the generator to see whether it is abnormally hot. If bearing housings are too hot to grasp with the hand, they may be inadequately lubricated, damaged, or improperly adjusted. Regular check of these items will go far to avoid premature failures or possible accidents.

c. ITEM 46, LEAKS, GENERAL. Check all fuel and oil lines, hose connections, and the water pump for leaks. Pay particular attention to the radiator core. Check the gasket between the cylinder head and cylinder block, and check all expansion plugs in the cylinder block casting. Check the oil filter, fuel strainer, carburetor, and oil pump for possible leaks. Check the gasket between the crankcase and cylinder block and check all valves and petcocks.

d. ITEM 47, ACCESSORIES AND BELTS. Check to see that all accessories, fan, water pump, and generator are secure and that drive belts are in correct adjustment and not damaged. The operator should adjust belts only in emergencies. Ordinarily he should report them for handling by the unit mechanic.

e. ITEM 48, AIR CLEANERS. If operating under extremely dusty or sandy conditions, inspect the air cleaners and breather caps to see that they are in condition to deliver clean air properly. Service if necessary.

33. After-Operation and Weekly Service

a. PURPOSE. After-operation service is particularly important. At this time the operator inspects this power unit to detect deficiencies that have developed and corrects those he is permitted to handle. The operator should report promptly, to the designated person in authority, the results of this inspection. If this schedule is performed thoroughly, the power unit should be ready to operate at a moments notice. After completion of the after-operation service, the before-operation service, with a few exceptions, is necessary only to ascertain whether or not the power unit is in the same condition in which it was left. The after-operation service should never be omitted entirely, even in extreme tactical situations, but it may be reduced to the bare fundamental services, if necessary.

b. PROCEDURES. When performing the after-operation service, the operator must remember and consider any irregularities noticed during the day in the before-operation, during-operation, and after-operation services. The after-operation service consists of inspecting and servicing the following items. Those items of the after-operation service that are marked on WD Form 48 by an asterisk require additional weekly service. The procedures for the additional weekly service are indicated in (2) of each applicable item that follows.

34. After-Operation and Weekly Service Items

a. ITEM 54, FUEL, OIL, AND WATER. (1) Check coolant level and replenish if necessary, taking care to leave sufficient space for expansion. If an appreciable amount of coolant is required, have the value of the antifreeze checked. Fill fuel tanks, observing safety precautions for grounding static electricity, and bring engine oil to proper level. Refill spare fuel, oil, and water cans. If an unusual amount of oil or coolant is required for the engine, check for leaks and report the condition.

(2) During the period when antifreeze is in use, have hydrometer test made of coolant weekly.

b. ITEM 55, ENGINE OPERATION. Note any tendency to miss or backfire when a load is applied to the unit. Note any unusual engine

noise or vibration that might indicate worn parts, loose mountings, incorrect fuel mixture, or faulty ignition. Correct or report any unsatisfactory engine-operating characteristics noted during operation.

c. ITEM 56, INSTRUMENTS. Check all instruments to see that they are securely mounted, properly connected, and undamaged.

d. ITEM 62, *BATTERY AND VOLTMETER. (1) Check the battery to see that it is clean and secure. Check to see that the battery-charge ammeter does not indicate discharge. This meter must show a zero reading when the unit is not operating. On Power Units PE–95–(2) and PE–95–F, it will show a slight discharge when the ignition switch is on and the engine not running.

(2) Clean dirt from the top of the battery weekly. If terminal connections or posts are corroded, clean them thoroughly and apply a fresh, thin coating of grease. Tighten loose terminal bolts. Remove vent caps and check the level of the electrolyte. Add water if required, taking precautions not to damage the battery during freezing temperatures. The battery should be secure, and should not be bulging, cracked, or leaking electrolyte. The battery carrier should be secure, clean, free of rust, and well painted. If mountings are loose, tighten them cautiously in order not to damage the battery case. Report any defects to the designated authority.

e. ITEM 63, *ACCESSORIES AND BELTS. (1) Check all accessories, carburetors, generators, regulators, starters, fans, shrouds, and water pumps for loose connections in couplings or mountings. Check the adjustment of the fan and water pump, and governor drive belts. Belts should deflect approximately 1 inch (fig. 48). Loose or unserviceable belts should be reported to proper authority.

(2) Tighten or adjust weekly any loose connections, linkage, or mountings on accessories. Examine all belts for fraying, wear, cracking, or presence of oil. Check all belts halfway between their respective pulleys to determine whether the belts are properly adjusted. Loose belts may cause improper operation and the unit become damaged. Tight adjustment may cause damage to both the accessories and the belts. The operator should not adjust the belts except in an emergency. Improper adjustment or unserviceable belts should be reported.

f. ITEM 64, *ELECTRICAL WIRING. (1) Check all ignition and control circuit wiring to see that it is securely connected, clean, and not damaged.

(2) Check all accessible wiring to see that it is securely connected and supported, that the insulation is not cracked or chafed, and that its conduits and shielding are in good condition and secure. Report any unserviceable wiring.

g. ITEM 65, *AIR CLEANERS AND BREATHER CAPS. (1) Check to see that oil in the air cleaner is at the correct level and not excessively dirty. Excessive dirt in the oil may be felt with the fingers. It is not usually necessary to remove the air cleaner from the carburetor air horn to make this inspection. If the oil in the cleaner is excessively dirty, clean and refill the cleaner with fresh oil. If operating in sandy or dusty territory, remove air cleaners and breather caps and clean them. In order to keep abrasive dirt out of the engine, air cleaners and breather caps must be kept clean and properly serviced at all times.

(2) Remove and disassemble the air cleaners (par. 57 (1)). Clean the bodies and elements in dry-cleaning solvent (SD). Fill the reservoirs to the correct level with clean engine oil (OE). Apply engine oil to the elements and allow excess to drain. When reassembling the cleaners, make sure that all gaskets are in good condition and in place. Reinstall the air cleaners, giving special attention to mountings to see that cleaners are pressed firmly in place against the air-horn seals, correctly aligned, and secure. Also check to see that all ducts connecting air cleaners to carburetors are secure and not damaged. Remove all breather caps and crankcase-filter cleaning elements. Wash them thoroughly in dry-cleaning solvent (SD), dip them in engine oil (OE), drain off the excess and reinstall. If breathers are of the oil-bath type, clean and service them in the same manner as the oil-bath air cleaners described above.

h. ITEM 66, *FUEL FILTERS. (1) Examine fuel filters for leakage, damage, and loose mounting.

(2) Close the fuel shut-off valve. Remove the glass filter bowl and clean it out. Replace the filter bowl and tighten the clamp securely. Note whether fuel leaks from the top of the filter bowl. If leakage is noted, replace the cork gasket at the top of the filter bowl.

i. ITEM 67, ENGINE CONTROLS. Check for worn or disconnected linkage. Also correct or report any unsatisfactory engine control linkage operation noted during operation.

j. ITEM 71, PROPELLER SHAFTS AND BEARINGS. Check couplings for loose connections, lubricant leaks from bearing housings, and damage.

k. ITEM 73, LEAKS, GENERAL. Check in the engine compartment and beneath the unit for indications of fuel, oil, or water leaks. Trace all leaks to their source and correct or report them.

l. ITEM 78, BODY AND TARPAULIN. Inspect the power-unit housing carefully for damage or loose parts.

m. ITEM 83, *LUBRICATE AS NEEDED. (1) Items such as linkage, hinges, latches, and other points that are lubricated by the operator, should be lubricated if inspection indicates the necessity. See War Department Lubrication Orders (figs. 19, 20, and 21).

(2) Lubricate in accordance with the War Department Lubrication Order. Lubricate all points shown on War Department Lubrication Order requiring weekly lubrication. The need for more frequent lubrication than is provided by the regular lubrication schedule is usually due to abnormally hot, wet, or dusty operating conditions (par. 21).

n. ITEM 84, *CLEAN ENGINE AND VEHICLE. (1) Remove dirt and excess grease from the exterior of the engine.

(2) Wipe greasy surfaces of the unit thoroughly with dry-cleaning solvent (SD). Do not rub lusterless paint enough to create a shine that might cause reflection. If the unit is cleaned, care must be taken to see that dry-cleaning solvent (SD) or dirt does not get into bearings, fuel tank, or crankcase.

o. ITEM 85, *TOOLS AND EQUIPMENT. (1) Check unit packing lists to see that all tools and equipment assigned to the unit are present and properly stowed or mounted.

(2) Clean all tools and equipment of rust, mud, or dirt, and see that they are in good condition. Report missing or unserviceable items to proper authority.

p. ELECTRICAL CONTROLS. Insert item on WD Form 48 (figs. 17 and 18).

(1) Check mechanical operation of all switches, buttons, circuit breakers, rheostats, potentiometers, relays, voltage regulators, and other electrical controls.

(2) Inspect controls for tightness of mounting, condition of wiring, and cleanliness. Tighten loose mounting screws or bolts and terminal connections. Remove any accumulation of dust, dirt, grease, or other foreign matter from control mechanisms and from the control boxes.

q. POWER CONNECTIONS. Insert item on WD Form 48 (figs. 17 and 18).

(1) Check output sockets for cleanliness and tightness of mounting, output connection for good contact, and output cables for condition.

(2) Tighten any loose connection or mounting. Clean terminal surfaces if they are corroded or dirty. Notify the person in charge if leads or cables are broken or insulation is frayed, cracked, or stripped from the conductors.

Section VIII. LUBRICATION

35. War Department Lubrication Orders

War Department Lubrication Orders are waterproofed, illustrated, numbered, and dated cards, or decalcomania labels, which prescribe approved first and second echelon lubrication instructions for mechanical equipment which requires lubrication by using organizations. Current War Department Lubrication Orders which are available are listed in the latest edition of FM 21–6, and monthly changes thereto. War Department Lubrication Orders should be requisitioned in conformance with instructions and lists in FM 21–6, which is published monthly by The Adjutant General.

36. Compliance with War Department Lubrication Orders

Instructions contained in War Department Lubrication Orders are mandatory and supersede all conflicting lubrication instructions of an earlier date. Applicable War Department Lubrication Orders which are available will be obtained, carried with the equipment at all times, and fully complied with. Difficulties ex-

perienced in obtaining and complying with such orders will be reported through technical channels to the Commanding General, Army Service Forces, Attention: Maintenance Division.

37. War Department Lubrication Orders for Power Units PE-95-A, -B, -C, -F, -G, and -H

a. War Department Lubrication Orders for Power Units PE–95–(*) are mounted on the outside of the control panel door. Figures 19, 20, and 21 are facsimiles of the War Department Lubrication Orders for Power Units PE–95–(*).

b. The lubrication intervals are based on an average operating day of 8 hours under normal conditions. Under unusual conditions, reduce the intervals.

38. Records and Reports

a. RECORDS. A complete record of lubrication must be kept for each power unit.

b. REPORTS. If lubrication instructions are closely followed and proper lubricants used, and if satisfactory results are not obtained, make a report to the signal officer responsible for the maintenance of the materiel.

Section IX. UNIT MECHANICS' PREVENTIVE MAINTENANCE TECHNIQUES

39. Scope

a. PREVENTIVE MAINTENANCE SERVICES. Regular schedules, maintenance inspections, and services are a preventive maintenance function of the using arms, and are the responsibilities of commanders of operating organizations. An efficient control system is an essential aid in determining when power units are due for periodic maintenance services either because of time elapsed or hours operated.

b. FREQUENCY. The frequency of the preventive maintenance services outlined herein is considered the minimum requirement for normal operation of this power unit. Under unusual operating conditions, such as extreme temperatures or dusty or sandy terrain, it may be necessary to perform certain maintenance services more frequently.

c. FIRST-ECHELON PARTICIPATION. Operators should be present and should assist mechanics while periodic second-echelon preventive maintenance services are performed. Ordinarily the operator should present the power unit for a scheduled preventive maintenance service in a reasonably clean condition; that is, it should be dry and should not be caked with mud or grease so that inspection and servicing will be seriously hampered. However, the power unit should not be washed or wiped thoroughly clean, since certain types of defects, such as cracks, leaks, and loose or shifted parts or assemblies, are more evident if the surfaces are slightly soiled or dusty.

d. TECHNICAL INSPECTIONS. (1) These inspections are performed by technically qualified personnel, under direct supervision of technically qualified officers. Technical inspections are made for the following purposes:

(*a*) To determine whether a power unit should be continued in service or withdrawn for overhaul or reclamation of component parts.

(*b*) To determine extent of damage and estimated cost of repair in Report of Survey and other similar proceedings.

(*c*) To discover causes of difficulties encountered by combat troops with materiel, so that efficiency may be improved.

(2) Whenever a power unit goes to a third or higher echelon maintenance shop for repair, it will receive a technical inspection to insure that all defects have been corrected before it is returned to the using organizations.

(3) Except in a theater of operations, technical inspections will be made whenever power unit accountability is transferred to determine power unit conditions.

40. Records and Reports

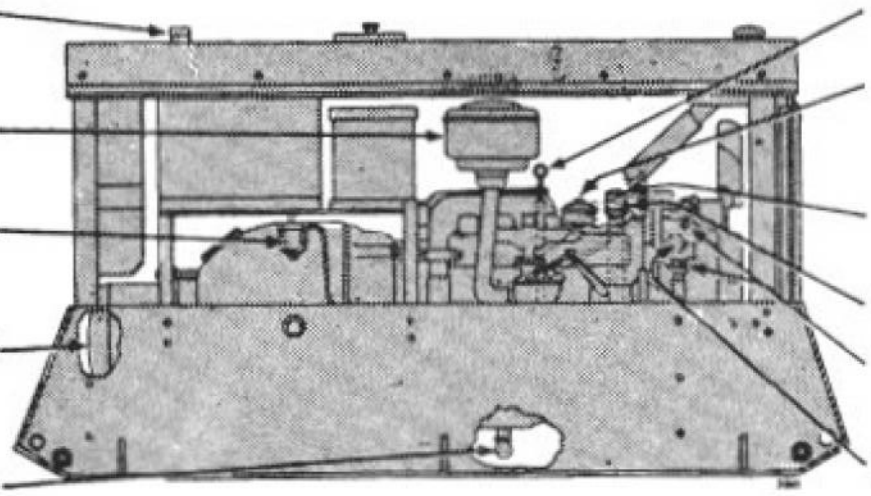
a. UNIT MECHANICS' MAINTENANCE AND TECHNICAL INSPECTION. The following War Department forms for use as work sheets, referred to in TM 37–2810 and here modified to Signal Corps requirements for use with power units, are provided to serve as reminders and records of the unit mechanics' preventive maintenance services and technical inspections:

(1) WD AGO Form 461 (Preventive Maintenance Service and Technical Inspection Work Sheet for Wheeled and Half-Track Vehicles), adapted (by elimination of solely vehicular items) to power units above 2.5 kilowatts

WAR DEPARTMENT LUBRICATION ORDER NO. 5011

WAR DEPARTMENT, WASHINGTON 25, D. C., 1 APRIL 1944

POWER UNIT PE-95-A, B, & C



Operating Hours • Lubricant

1024 ***Fuel Tank***
Flush fuel tank and fuel line. Keep fuel clean and vent in cap open. Cap. approx. 10½ gal.

OE 8 ***Air Cleaner***
Check level and refill to level mark. Every 64 hours, remove, drain, clean and refill. Every 256 hours, remove and wash all parts.

64 ***Fuel Strainer***
Remove and clean sediment bowl and screen. Also open fuel tank shut-off valve to drain water and sediment.

WB 1024 **Power Generator End Bearing**
Remove cover plate. Knead lubricant into space between inner and outer races. Re-install cover plate. Do not lubricate through plug hole.

64 ***Crankcase Drain***
Drain and refill. Cap. approx. 4 qt. (See Note)

Operating Hours • Lubricant

8 ***Crankcase Level Gage***
Check level

64 ***Oil Filter***
Remove drain plug to drain sludge. Every 256 hours, drain, clean inside of filter body and renew element. Refill crankcase, run engine a few minutes and add OE to FULL mark on gage.

256 OE **Crankcase Breather**
Wash filler cap element and saturate with OE.

OE **Crankcase Fill**
(See Note)

512 OE **Magneto Bearings**
Remove plugs in housing, lubricate each wick with 1 or 2 drops.

1024 WB **Fan Idler Pulley**
Remove pulley and support arm, clean and repack bearing. Be sure plug in pulley is tight.

COLD WEATHER—Below 0°F., drain crankcase. Refill crankcase with 75% OE SAE 10 and 25% gasoline thoroughly mixed. Check level more often. Maintain at FULL mark on gage by adding gasoline only. At end of each operating period check oil level; add gasoline to FULL mark if necessary. Start engine, run for 5 minutes before stopping. Reduce drain interval by one-half.

CRANKCASE—Drain only when hot. Refill to FULL mark on gage. Run engine a few minutes and recheck oil level. CAUTION: Be sure pressure gage indicates oil is circulating.

HOURS—Reduce hours under severe operating conditions.

CLEAN parts with SOLVENT, dry-cleaning, or OIL, fuel, Diesel. Allow parts to dry thoroughly before lubricating.

KEY

LUBRICANTS	LOWEST EXPECTED AIR TEMPERATURE		
OE—OIL, engine	**above +32°F.**	**+32°F. to 0°F.**	**below 0°F.**
Crankcase	**OE** SAE 30	**OE** SAE 10	See cold weather note
Except Crankcase	**OE** SAE 30	**OE** SAE 10	**PS**
WB—GREASE, general purpose, No. 2. All air temperatures			
PS—OIL, lubricating, preservative, special			

OIL CAN POINTS—Every 64 hours lubricate Carburetor Throttle Shaft Bearing, Governor Ball Joint, Throttle and Governor Link Bearings, Door Hinges and Locks and Hood Fasteners with OE.

DO NOT LUBRICATE—Engine Governor, Water Pump and Fan Bearings, Distributor Drive Gears and Shaft.

LUBRICATED BY MAINTENANCE PERSONNEL—Magneto Breaker Cam Pad, Power Generator End Bearing (complete disassembly service).

REFERENCE—Technical Manual TM 11-904.

Requisition LUBRICATION ORDER from Philadelphia Signal Depot, or Utah ASF Depot, Ogden, Utah, by Signal Corps Stock No.

6D10113-11

Copy of this Lubrication Order will remain with the equipment at all times. Instructions contained therein are mandatory and supersede all conflicting lubrication instructions dated prior to 1 April 1944.

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:
J. A. ULIO,
Major General,
The Adjutant General.

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Figure 19. War Department Lubrication Order, Power Unit PE-95-(1).

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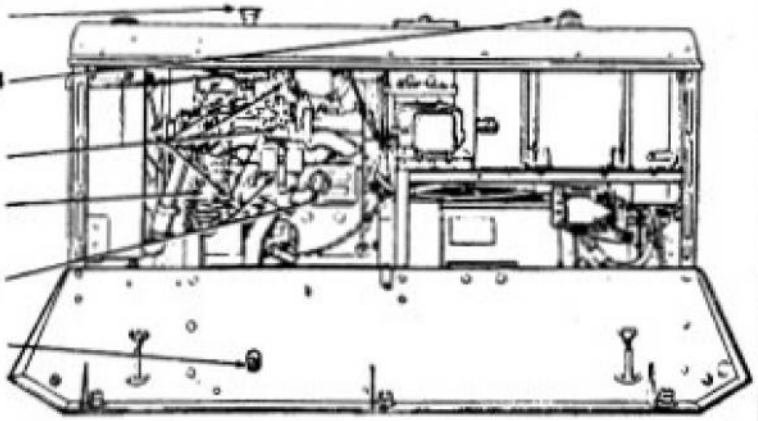
WAR DEPARTMENT LUBRICATION ORDER No. 3209

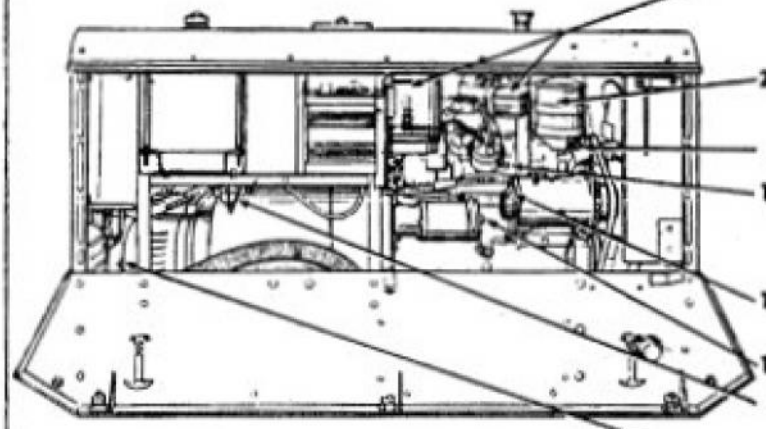
WAR DEPARTMENT, WASHINGTON 25, D. C., 19 JUNE 1944

POWER UNIT PE-95-F



Operating Hours — Lubricant

- **Crankcase Fill and Level Gage** — OE — 8
  Check level. (See Note)
- ***Fuel Tank*** — 1024
  Flush fuel tank and fuel lines. Keep fuel clean and vent in cap open. Cap. approx. 10½ gal.
- **Governor and Throttle Control Linkage** — OE — 64
- ***Fuel Pump*** — 64
  Remove and clean sediment bowl and screen. Also open fuel tank shut-off valve to drain water and sediment.
- ***Crankcase Ventilator Valve and Screen*** — 256
  Remove, clean and re-install.
- ***Crankcase Drain*** — 64
  Drain and refill. Cap. approx. 4 qt. (See Note)



Operating Hours — Lubricant

- **8 OE** — **Air Cleaners (Carburetor and Crankcase Breather)**
  Check level and refill to level mark. Every 64 hours, remove, drain, clean and refill. Every 256 hours, remove and wash all parts.
- **256** — ***Oil Filter***
  Drain, clean inside of filter body and renew element. Refill crankcase, run engine a few minutes and add OE to FULL mark on gage.
- **64** — ***Oil Filter Drain***
  Drain off sludge
- **128 OE** — **Distributor Shaft**
  3 to 5 drops. Every 256 hours, wipe breaker cam lightly with CG and lubricate breaker arm pivot with 1 or 2 drops of OE. Every 512 hours, lubricate wick under rotor with 1 drop of OE.
- **128 OE** — **Charging Generator Rear Bearing**
  6 to 8 drops
- **128 OE** — **Starting Motor Front Bearing**
  2 to 4 drops. (Covered oil hole)
- **64** — ***Fuel Strainer***
  Remove and clean sediment bowl and screen. Also open fuel tank shut-off valve to drain water and sediment.
- **512 WB** — **Exciter End Bearing**
  Remove cover plate. Knead lubricant into space between inner and outer races. Re-install cover plate.
  Do not lubricate through plug hole.

KEY

LUBRICANTS	LOWEST EXPECTED AIR TEMPERATURE		
	above +32°F.	+32°F. to 0°F.	below 0°F.
OE—OIL, engine			
Crankcase	OE SAE 30	OE SAE 10	See Cold Weather Note
Except Crankcase	OE SAE 30	OE SAE 10	PS
CG—GREASE, general purpose	CG No. 1	CG No. 0	CG No. 0
WB—GREASE, general purpose, No. 2. All air temperatures.			
PS—OIL, lubricating, preservative, special.			

COLD WEATHER—Below 0°F., drain crankcase. Refill crankcase with 3 qts. OE SAE 10, check level and mark this level "X" on the gage. Add 1 qt. gasoline to bring level from "X" to FULL mark. During operation maintain at "X" level mark by adding OE SAE 10. Immediately before shut-down, fill to "X" level mark with OE SAE 10, then add gasoline to FULL mark. Run engine five minutes.
CRANKCASE—Drain only when hot. Refill to FULL mark on gage. Run engine a few minutes and recheck oil level. CAUTION: Be sure pressure gage indicates oil is circulating.
HOURS—Reduce hours under severe operating conditions.
CLEAN parts with SOLVENT, dry-cleaning, or OIL, fuel, Diesel. Allow parts to dry thoroughly before lubricating.
OIL CAN POINTS—Every 64 hours, lubricate Hinges, Locks and Hood Fasteners with OE.

Requisition LUBRICATION ORDER from Philadelphia Signal Depot, or Utah ASF Depot, Ogden, Utah, by Signal Corps Stock No. 6G70715-9

No. 3209

DO NOT LUBRICATE—Governor, Water Pump and Fan.
LUBRICATED BY MAINTENANCE PERSONNEL—Starting Motor Rear and Outboard Bearings, Exciter End Bearing (complete disassembly service).
REFERENCE—Technical Manual TM 11-904.

Copy of this Lubrication Order will remain with the equipment at all times. Instructions contained therein are mandatory and supersede all conflicting lubrication instructions dated prior to 19 June 1944.

BY ORDER OF THE SECRETARY OF WAR.

G. C. MARSHALL,
Chief of Staff

OFFICIAL:
J. A. ULIO,
Major General,
The Adjutant General.

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which are used by the Signal Corps (figs. 23 and 24).

(2) The columns headed 6000 Mile and 1000 Mile on WD AGO Form 461 are comparable to the semiannual and monthly maintenance of power units used by the Signal Corps. Notations to that effect shall be made on this form. The column headed Tech Insp applies without modification to power units

(3) The general procedures listed in paragraph 43 are to be applied in conducting the maintenance services and technical inspection. The manner in which each item listed on the form is to be inspected and serviced is explained in detail in section XIV.

(4) Technical inspections are usually performed by third or higher echelon. The maintenance services are performed by unit mechanics (second echelon).

(5) If instructions other than those contained in either the general or the specific procedures are required for the correct performance of a preventive maintenance service or for the correction of a deficiency, consult the signal officer in charge.

b. PREVENTIVE MAINTENANCE ROSTER. (1) *Use of WD AGO Form 460* (fig. 22). Preventive maintenance services will be scheduled over a 31-day period. The inside right-hand page of Form 460 contains 31 columns for the 31 days of a month. The adjacent columns on the left-hand page will be used to list the rank and name of operator, equipment nomenclature, remarks, unit serial number (this will be the number assigned the unit by the using organization and not that of the piece of equipment). Only one line for each power unit will be used to record the periodic maintenance services performed during the month.

(2) *Recording services.* Services will be recorded on the corresponding line with the nomenclature of each power unit.

(3) *Legend.* In the column representing the appropriate date, the symbol legend for weekly W, monthly M, semiannually S, will be entered. The letter symbol P will be used to indicate equipment deadlined for lack of parts. The letter symbol A will be used to indicate equipment deadlined because of accident. The letter symbol O will indicate equipment forwarded to higher echelons for repair.

(4) *Interpretation of Symbols.* For purposes of power unit maintenance, any period of 8 operating hours or any number of periods of operation totaling 8 hours will be considered as 1 day; a total of 64 operating hours will be considered as 1 week; a total of 256 operating hours will be considered as 1 month; and a total of 1,024 operating hours will be considered as ½ year.

(5) *Entries.* The officer in charge will plot WD AGO Form 460 in advance of each monthly period making his entries in pencil. These penciled entries will be traced in with ink when the service is performed. These services will be entered in the appropriate spaces as W_1 indicating the first weekly service, W_2 indicating the second weekly service, W_3 indicating the third weekly service. These weekly services will be figured from the last preceding monthly service. The monthly services will be figured from the last preceding monthly service. The monthly services will be similarly entered with M_1, M_2, M_3, M_4, and M_5, and will be figured from the last preceding semi-annual service of the unit. The letter symbol S will be used to indicate the semiannual service. If the unit is deadlined for lack of parts, accident, or higher echelon repairs, the appropriate symbol will be entered in the proper space for each day that the unit is out of service. When the unit is returned to service, the previously plotted services will be carried out the same as if there had been no interruption of service. In the event that combat conditions make it impractical to perform the scheduled service on the scheduled date, the service will be performed at the earliest opportunity and the regularly scheduled date circled to indicate that the service was performed. A sample of WD AGO Form 460, properly filled out is shown as figure 22.

41. General Procedures

a. These general procedures are basic instructions which are to be followed when performing the services on the power unit items listed on the preventive maintenance service work sheet.

Note. Second echelon personnel must be so thoroughly trained in these procedures that they will apply them automatically.

b. All of the required identification data for the power unit should be entered in the space provided at the top of each form. The unit nomenclature should be complete, the serial number, operating organization, date, and hours of operation should also be recorded.

c. In order to indicate on the work sheet whether one of the periodic preventive maintenance services or the technical inspection is being performed, line out all words in the headings that do not apply to the service or inspection to be performed.

d. Opposite each item on these work sheets, a rectangular box is placed, either under the periodic maintenance service heading, under the technical inspection heading, or under both. These boxes indicate which of the maintenance services or inspection is to be performed for each item. Each box indicates that the item is to be inspected and corrected when necessary. Special service symbols like C, T, A, L, or S appear in some of the boxes. These symbols indicate that certain additional mandatory services are to be performed, and are explained in detail in *m* below.

e. The items in the column, not lined out on each of the above forms, should usually be performed in the numerical sequence in which they are listed, since they have been so arranged for economy of motion.

f. All defects should be corrected upon discovery, or reported or evacuated to higher echelon for correction.

g. The condition in which items are found and the correction of defects should be indicated by the following markings:

(1) Mark the box with a √ if found satisfactory.

(2) Mark the box X if adjustment is required.

(3) Mark the box XX if repair or replacement is required.

(4) When a defect is found and not corrected immediately, or if correction is to be made by higher echelon, explain under REMARKS, recording the item number of identification. When such a defect is corrected, either by organization mechanics or by higher echelon mechanics, encircle the X or XX, thus X or XX.

h. The following considerations will determine whether a maintenance operation should be referred to a higher echelon, or performed by the operating organization. Repair to power units will be performed in the lowest echelon of maintenance consistent with:

(1) Availability of suitable tools.
(2) Availability of necessary parts.
(3) Capabilities of mechanics.
(4) Time available.
(5) Tactical situation.

i. After a technical inspection, the unit should be restored to a safe operating condition, unless it is to be scheduled for repair. Any disassembled parts or assemblies that are damaged in handling during the inspection should be replaced by serviceable ones.

j. The preventive maintenance services should be performed without disassembling units, unless disassembly is prescribed in the procedures. Ordinarily, new gaskets should be used when the parts are reassembled.

k. When new or overhauled subassemblies are installed to correct deficiencies, care should be taken to see that they are clean, and properly lubricated and adjusted.

l. The general inspection of each item applies also to any supporting member or connection, and usually includes a check to see whether the item is in good condition, correctly assembled, secure, or excessively worn. The mechanics must be thoroughly trained in the following explanations of these terms.

(1) The inspection for *good condition* is usually an external visual inspection to determine whether the unit is damaged beyond safe or satisfactory limits, or whether it is in such a condition that damage will result during operation. The term *good condition* is explained further by such terms as the following: not bent or twisted, not chafed or burned, not broken or cracked, not bare or frayed, not dented or collapsed, not torn or cut, not deteriorated, and adequately lubricated.

(2) The inspection of a component to see that it is *correctly assembled* is usually an external visual inspection to determine whether it is in its normal assembled position on the unit.

(3) The check of a component to determine whether it is *secure* is usually an external visual inspection or a hand-feel, a prybar, or a wrench check for looseness in the unit. Such an inspection will always include any brackets, and all lockwashers, locknuts, locking wires, or cotter pins, used to secure the tightening.

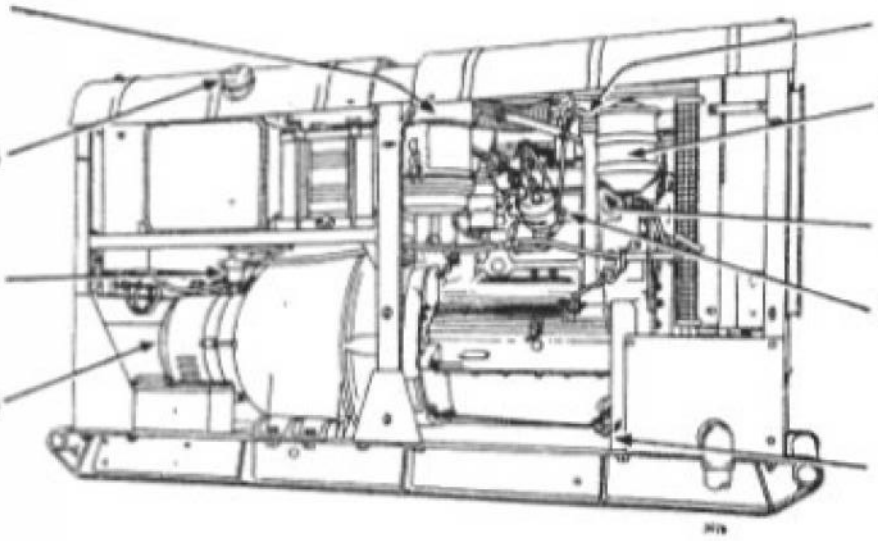
(4) The frequently used term *excessively worn*, will be understood to mean worn close to, or beyond, serviceable limits, and likely to result in failure, if not replaced before the next scheduled inspection.

m. Special service symbols, as applied to the items of the periodic preventive maintenance services, indicate that the part is to receive cer-

WAR DEPARTMENT LUBRICATION ORDER No. 3026

SIGNAL CORPS

POWER UNIT PE-95— G and H
ELECTRIC, AC, 5-10 K. W.



Operating Lubricant • Hours

Air Cleaner OE 8
Check level and refill to level mark. Every 64 hours, remove, drain, clean and refill. Every 256 hours, remove and wash all parts.

Fuel Tank 1024
Clean inside of tank and fuel line. Keep fuel clean and vent in cap open. Cap. approx. 10½ gal.

Fuel Strainer 64
Remove and clean sediment bowl and screen. Also open fuel tank shut-off valve to drain water and sediment.

Generator End Bearing WB 1024
Remove cover, repack bearing approximately ½ full. Do not lubricate through plug hole.

Operating Hours • Lubricant

8 OE **Crankcase Fill and Level Gage**
Check level (See Note)

256 ***Oil Filter***
Drain, clean inside of filter body and renew element. Refill crankcase, run engine a few minutes and add OE to FULL mark on gage.

64 ***Oil Filter Drain Plug***
Drain off sludge

128 OE **Distributor Shaft** 3 to 5 drops
Every 256 hours, wipe breaker cam lightly with CG and lubricate breaker arm pivot with 1 or 2 drops of OE. Every 512 hours, lubricate wick under rotor with 1 drop of OE.

64 ***Crankcase Drain Plug***
Drain and refill. Cap. approx. 4 qt. (See Note)

COLD WEATHER—Below 0°F., drain Crankcase. Refill Crankcase with 75% OE SAE 10 and 25% gasoline thoroughly mixed. Check level more often. Maintain at FULL mark on gage by adding gasoline only. At end of each operating period check level; add gasoline to FULL mark if necessary. Start engine, run for 5 minutes before stopping. Reduce drain interval by one-half.

CRANKCASE—Drain only when hot. Refill to FULL mark on gage. Run engine a few minutes and recheck oil level. CAUTION: Be sure pressure indicates oil is circulating.

KEY

LUBRICANTS	LOWEST EXPECTED AIR TEMPERATURE		
OE—OIL, engine	**above +32°F.**	**+32°F. to 0°F.**	**below 0°F.**
Crankcase	**OE** SAE 30	**OE** SAE 10	See Cold Weather Note
Except Crankcase	**OE** SAE 30	**OE** SAE 10	**PS**
CG—GREASE, general purpose	**CG** No. 1	**CG** No. 0	**CG** No. 0
WB— GREASE, general purpose, No. 2. All temperatures			
PS— OIL, lubricating, preservative, special			

HOURS—Reduce hours under severe operating conditions.

CLEAN parts with SOLVENT, dry-cleaning, or OIL, fuel, Diesel. Allow parts to dry thoroughly before lubricating.

OIL CAN POINTS—Every 64 hours, lubricate Hinges, Locks and Hood Fasteners with OE.

DO NOT LUBRICATE—Engine Governor, Water Pump and Fan Bearings, Fan Idler Bearing.

LUBRICATED BY SIGNAL CORPS MAINTENANCE PERSONNEL—Engine Breather.

REFERENCE—Technical Manual TM 11-904.

Requisition LUBRICATION ORDER from Philadelphia Signal Depot, or Utah ASF Depot, Ogden, Utah, by Signal Corps Stock No.
CD 10113-26

By Order of the Secretary of War:
G. C. Marshall, Chief of Staff

TL91863

9 Mar 1944
Supersedes all previous lubrication instructions.

Figure 21. War Department Lubrication Order, Power Unit PE-95-(2).

NO.	NAME AND RANK	EQUIPMENT NOMENCLATURE	REMARKS	UNIT SERIAL NO.	ACCESSORY	EQUIPMENT REG. NO.
1	Pvt BLOCK H.S	PE-74-B	FULL SERVICE	16	A-1119	
2	T/4 MONROE A.L.	PE-95-G	FULL SERVICE	17	C-6743	
3	T/5 LARKIN W.G	PE-113-B	FULL SERVICE	18	O-7221	
4	T/4 MULLER B.O	PE-95-L	FULL SERVICE	19	S-5666	
5	T/5 MACK R.T.	PE-205-B	Stand-By Service	20	B-3188	
6						
7						
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PREVENTIVE MAINTENANCE ROSTER MONTH APRIL YEAR 1945

NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	NO.
1							S							W1							W½		A	A	A				W½				1
2			W½							M2							W							W½								2
3											M3	O	O	O				W							W½								3
4	M3							W							W½							W½							M4				4
5			W2							W½							S	P	P					W1							W½		5
6																																	6
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TL96898A

ain mandatory services. For example: An inspection box with a T in it indicates that the part must not only be secure, but that the mounting bolts must be tightened properly with a wrench. These symbols are:

(1) *A, adjust.* Make all necessary adjustments in accordance with the technical manual, special bulletins, or other current directives.

(2) *C, clean.*

(*a*) Clean components of the power unit to remove lubricant or dirt, using specified dry-cleaning solvent (SD). After the parts are cleaned, rinse them in clean fluid and dry them well. Take care to keep the parts clean until reassembled. Keep cleaning fluid away from rubber or other material which it will damage.

(*b*) Clean the protective grease coating from new parts. This material usually is not a good lubricant.

Note. Gasoline will not be used as a cleaning fluid for any purpose. Solvent, Dry Cleaning, is available as a cleaning fluid through established supply channels. Oil, Fuel, Diesel, may be used for cleaning purposes when dry-cleaning solvent (SD) is not on hand. Carbon tetrachloride will be used as a cleaning fluid only in the following cases: where inflammable solvents cannot be used because of the fire hazard, and for cleaning electrical contacts including relay contacts, plugs, commutators, etc.

(3) *L, special lubrication.* Special lubrication (L) applies either to lubrication operations that do not appear on the lubrication order, or to items that do appear on the order but should be performed in connection with the maintenance operations if parts have to be disassembled for inspection.

(4) *S, serve.* Compliance with the symbol S usually consists of performing special operations, such as replenishing battery water; draining and refilling units with oil; and changing or cleaning the fuel or oil filter cartridge.

(5) *T, tighten.* All tightening operations should be performed with sufficient wrench torque (force on the wrench handle) to tighten the unit according to good mechanical practice, using the proper tool without additional extension handle. Use torque-indicating wrench where specified. Do not overtighten, as this may strip threads. Tightening will always be understood to include the correct installation of lockwashers, locknuts, and cotter pins or locking wires provided to secure the tightening.

n. When conditions make it difficult to perform the complete preventive maintenance service at one time, it can sometimes be handled in sections, planning to complete all operations within the week if possible. All available time at rest periods and in bivouac areas must be utilized if necessary. When limited by the tactical situation, items marked with special service symbols in the boxes should be given first consideration.

o. If a job order (WD AGO Form 9–76) is used when a power unit is sent to a higher echelon for the correction of any defect beyond the scope of organization maintenance, the job order number will be inserted in the space provided on the reverse side of the form.

p. The forms may be reduced to convenient size for filing by folding up the line marked Vehicle Nomenclature but are to be filed only after all items marked X or XX have been corrected.

42. Specific Procedures

a. USE OF WD AGO FORM 461. (1) The items on this form should be performed in the numerical sequence in which they are listed whenever possible, since they have been so arranged for maximum efficiency and economy of motion. The general order of the listed items is:

(*a*) A running test, and closely related items.

(*b*) Maintenance operations, consisting of operations in the engine compartment and a group of body and attachment items.

(*c*) Tools and equipment.

(*d*) Final running test.

(2) If at any time it is necessary to disassemble a unit, any special services indicated on the semiannual maintenance should be performed on the item.

(3) All monthly maintenance work sheets may be held in the organization file until the next semiannual maintenance work sheet is filed, and then destroyed. The semiannual maintenance work sheet, or technical inspection reports, may be held until the next semiannual maintenance form is filed, and then destroyed.

b. PERFORMING ITEMS ON WORK SHEET. Specific procedures for performing each item in the monthly and semiannual maintenance services and in the technical inspection are described on the following pages. Each of these

PREVENTIVE MAINTENANCE SERVICE AND TECHNICAL INSPECTION

WORK SHEET

FOR

WHEELED AND HALF-TRACK VEHICLES

(See AR 850-15)

WD No. ______

Mileage ______ Date 25 Jan '45

Organization 1st Sig Bn

Vehicle nomenclature Power Unit (Make) PE-95-( ) (Model) (Size) (Drive) Serial No. 41352 (Body Type)

Special instructions: See TM 9-2810 for detailed instructions and procedures. See vehicle maintenance manual for technical information.

Legend for marking. √—Satisfactory X—Adjustment required XX—Repair or replacement required O—Defect corrected

SYMBOLS: □ —INSPECT AND CORRECT C—CLEAN T—TIGHTEN A—ADJUST L—SPECIAL LUBRICATION S—SERVE

~~6000-MILE MAINTENANCE~~ OR TECHNICAL INSPECTION Monthly ~~1000-MILE~~ MAINTENANCE (Line out words and columns that do not apply)

~~ROAD TEST~~

1 Before Operation Inspection

3 Dash Instruments and Gages: (oil pressure) (ammeter) (voltmeter) (temperature) (fuel)

9 Engine (idle) (acceleration) (power) (noise) (governed speed)

10 Unusual Noises (attachments)

13 Temperatures

14 Leaks (engine oil) (water) (fuel)

17 Unusual Noises (engine) (belts) (accessories)

ENGINE AND ACCESSORIES

18 Cylinder Head and Gasket

19 Valve Mechanism (clearances) (lubrication) (cover gaskets)

20 Spark Plugs (gaps) (deposits)

21 Compression Test (record)

22 Battery (cables) (hold-downs) (carrier) (record gravity and voltage)

23 Crankcase (leaks) (oil level)

24 Oil Filters, Coolers, and Lines

25 Radiator (core) (shell) (shutters) (mountings) (hose) (cap and gasket) (antifreeze, record) (overflow tank) (steam relief tube and valve)

26 Water Pump, Fan, and Shroud

27 Generator, Starter, and Switch

29 Drive Belts and Pulleys

31 Distributor (cap) (rotor) (points) (shaft) (advance units)

32 Coil and Wiring (high and low voltage) (supports)

33 Manifolds and Heat Control (gaskets) (seasonal setting)

34 Air Cleaners (carburetor)

35 Breather Caps and Ventilators

36 Carburetor (choke) (throttle) (linkage) (governor)

37 Fuel Filters, Screen, and Lines

38 Fuel Pump (vacuum and pressure)

39 Starter (action) (noise) (speed)

40 Leaks (engine oil) (fuel) (water)

41 Ignition Timing (advance)

42 Engine Idle and Vacuum Test

43 Regulator Unit (connections) (voltage) (current) (cut-out)

~~44 Power Tire Pump (drive) (lines)~~

~~45 Diesel Fuel Injector Pump~~

~~46 Diesel Fuel Nozzles and Lines~~

63 Engine (mountings and braces) (ground strap) (side pans)

80 *Frame (rails and cross members)

81 *Wiring, Conduits, and Grommets

82 Fuel Tanks, Fittings, and Lines

84 Exhaust Pipes and Muffler

94 Hood (hinges) (fasteners)

98 Circuit Breaker and Fuse Block

103 *Paint and markings

104 Radio Bonding (suppressors) (filters) (condensers) (shielding)

*TRAILER ITEMS ALSO COMMON TO OTHER WHEELED VEHICLES

FOLD TO ◄— VEHICLE NOMENCLATURE LINE —► AND FILE

W. D., A.G.O. Form No. 461
April 15, 1943

TL96017

Figure 22. WD AGO Form 461, front.

RECORD: Compression pressure: Cylinder No. 1 ____ 2 ____ 3 ____ 4 ____ 5 ____ 6 ____ 7 ____ 8 ____ 9 ____ 10 ____ 11 ____ 12 ____

BATTERY: Specific Gravity—Cell No. 1 ____ 2 ____ 3 ____ 4 ____ 5 ____ 6 ____ Antifreeze protection to ____ °F.

Voltage— Cell No. 1 ____ 2 ____ 3 ____ 4 ____ 5 ____ 6 ____

Man hours required for this Monthly maintenance ____ 6,000 mile maintenance ____ or tech. inspection ____

Driver ____ (Grade or rate) Mechanic or inspector ____ (Grade or rate)

Repairs by higher echelon entered on Job Order Request No. ____ Supervising officer ____ (Grade or rate)

Repairs requested ____ (Date) (Initials) Visit forwarded ____ (Date) (Initials) Visit returned ____ (Date) (Initials)

Disposition of work sheets: Monthly—May be retained until completion of next Tech Insp, then destroy

6000 Mile—May be retained until completion of next 6000 mile, then destroy

Technical Inspection—May be retained until completion of next Tech Insp, then destroy

EARLIER DESTRUCTION MAY BE ORDERED BY LOCAL COMMAND

REMARKS OR RECOMMENDATIONS: ____

OR TECHNICAL INSPECTION

1000-MILE MAINTENANCE

ITEMS SPECIAL TO HALF-TRACKS

T		106	**Tracks** (guides) (treads) (wear)
CL&T		107	**Sprockets** (flanges) (bearings) (seals)
CT		108	**Brake** (drums) (supports) (cylinders)
CA	A	109	**Brakes Shoes** (linings) (links) (guides) (anchors)
CL&T		110	**Idlers** (flanges) (bearings)
		111	**Idler** (posts) (shackles) (shafts) (adjusting rods) (brackets)
T		112	**Frame Brackets and Cross Tube**
		113	**Bogie** (crab assemblies) (springs and blocks) (guides and slides) (arms and bolts)
CL		114	**Bogie Rollers: Upper and Lower** (tires) (bearings) (arms) (bolts)
A		115	**Track Tension** (on ground)

ITEMS SPECIAL TO AMPHIBIANS

Note: The following items 116 to 123 are the required minimum maintenance for amphibian vehicles in land operations. For marine operation requirements for water operations, consult the vehicle service and maintenance manual.

OR TECHNICAL INSPECTION

1000-MILE MAINTENANCE

T	T	116	**Rudder and Shearpins, Propeller Strut and Bearing**
		117	**Propeller Shaft Housings** (crab) (hoists) (plugs)
		118	**Hull** (plugs) (rub strakes) (decks) (hatches) (ventilators) (compartments) (bulkheads) (plates) (frame)
T	T	119	**Bilge Pumps** (drives) (valves) (controls) (lines) (strainers)
T	T	120	**Water Propeller** (shafts) (joints) (bearings) (stuffing box)
T		121	**Hand Crank Bailer and Cover**
		122	**Rudder** (shafts) (arms) (cables) (rod) (brackets) (stuffing box)
		123	**Anchor, Hand Bilge Pump and Boat Hook**

ITEMS SPECIAL TO TRAILERS

T		124	**Tow Hitch** (king pin) (tow wheel plates) (lunette) (tongue)
		125	**Air and Electric Connections**
		126	**Safety Devices** (chains) (switch and battery)

OR TECHNICAL INSPECTION

Monthly MAINTENANCE

TOOLS AND EQUIPMENT

		131	**Tools** (vehicle) (pioneer)
		132	**Fire Extinguishers**
		134	**First-Aid Kit** (if specified)
		135	**Publications and Form No. 26**
		141	**Modifications** (FSMWO's completed)
		142	**Final Road Test** (repeat items 2 to 16)

Note: Correct or report all deficiencies found during road test.

FL96018

Figure 24. WD AGO Form 461, back.

pages of specific procedure has three columns at its left edge, corresponding to the monthly maintenance, the semiannual maintenance, and the technical inspection of WD AGO Form 461, respectively. While the semiannual maintenance and technical inspection are both indicated in the same column on the work sheet, separate columns are provided in the procedure pages for clarification. The detailed procedures for each maintenance service and technical inspection will be found on the following pages opposite the item numbers in the procedure column. Very often it will be found that a particular procedure does not apply to both the monthly maintenance, the semiannual maintenance, and the technical inspection. In order to determine which procedures to follow, it is necessary simply to follow the item number down the appropriate column opposite the paragraphs whenever they are to be applied.

c. Sample. The following sample illustrates the manner in which the specific procedures described in this paragraph are to be used. Suppose work is being done on the monthly maintenance service. Item number 20, in this sample, appears in the monthly maintenance column opposite the first paragraph only, indicating the necessary procedure.

Tech. Insp.	Semi-annual	Monthly
		20

SAMPLE

SPARK PLUGS. Examine the installed spark plugs to see that their insulators are in good condition and clean; note any evidence of leakage around the insulators or gaskets.

Applies to monthly maintenance only.

Tech. Insp.	Semi-annual	Monthly
20	20	

SAMPLE

Remove the spark plugs and examine for poor condition, paying particular attention to broken insulators, excessive carbon deposits, and to electrodes which are burned thin. Replace unserviceable plugs. Report excessive deposits or damaged insulators, as these conditions may indicate incorrect heat range.

Applies both to technical inspection and semiannual maintenance.

Tech. Insp.	Semi-annual	Monthly
	20	
	20	

SAMPLE

CLEAN. Clean the deposits from the insulators and electrodes, and check the insulators to see whether they are cracked. If a plug cleaner is not available, install new or reconditioned plugs.

ADJUST. Adjust gaps to (insert here the proper specifications) by bending the grounded electrodes. After completing item 21, reinstall the plugs, using new gaskets and taking care not to overtighten them as this may cause distortion and damage.

Applies to semiannual maintenance only.

Similarly, the number 20 appears both in technical inspection and in the semiannual maintenance column opposite the second paragraph indicating that this procedure is to be performed on both of these operations. The number 20 again appears in the semiannual maintenance column only opposite the mandatory special services, *clean* and *adjust*. This corresponds with WD AGO Form 461 where the letters C and A are placed in the semiannual maintenance box opposite item number 20, indicating that the spark plugs must be cleaned and adjusted every 6 months.

43. Maintenance Items

Tech. Insp.	Semi-annual	Monthly	
			RUNNING TEST
			The operator of a power unit is often unaware of defects in the equipment which have developed gradually, and to which he has become accustomed. The fact that many operators lack the ability to detect the developing causes of failures makes it desirable for the mechanic to test the operation of the unit as part of the periodic preventive maintenance services. During and before this test, any repairs or adjustments necessary to insure safe operation should be made. The appropriate paragraph in the following service procedures should be consulted. If a defect is found during the test which does not require immediate correction, note it on the check sheet and make provisions for securing necessary replacement parts. The defect can be corrected later during the service.
			Note. If the tactical situation does not permit a complete test, perform items 3, 9, 10, and 14.
1	1	1	BEFORE-OPERATION SERVICE. Perform the before-operation service as a check to determine whether the power unit is in a satisfactory condition to make the running test safely, and that it is adequately supplied with fuel, engine oil, and coolant.
3	3	3	DASH INSTRUMENTS AND GAUGES. During the warm-up period, operate the unit without load and observe as follows:
			Oil Pressure. Observe oil pressure at frequent intervals and under all conditions of engine speed to see that the oil pressure is between 20 and 30 pounds.
			Caution: If the gauge indicates zero or excessively low oil pressure, stop the unit immediately and investigate the cause. Power Units PE–95–(2) and PE–95–F should stop automatically under these conditions through the action of the low-oil-pressure cut-off switch.
			Battery-charge Ammeter. Observe the battery-charge ammeter to see that it is indicating normally. With a fully charged battery, the reading should be about 8 to 10 amperes on the charge side when the unit is first started, and then drop to about 5 or 6 amperes. If the battery is partially discharged, the higher reading will be indicated for a longer period of time.
			A-c Voltmeter. On Power Unit PE–95–(1) the a-c voltmeter should read approximately 115 volts. The actual reading will depend upon the load on the unit. When a load is applied to the unit the reading is likely to be slightly lower while, with no load on the unit, the reading will be slightly higher.
			On Power Unit PE–95–F the a-c voltmeter should read approximately 120 or 240 volts depending on the output connections on the control panel terminal block. As in the case of Power Unit PE–95–(1), these readings will be slightly higher or lower depending upon the load on the unit.
			On Power Unit PE–95–(2) the same indications will be shown as in the case of Power Unit PE–95–F. Actual readings will depend upon the lead on the unit.
			Frequency Meter. Watch the frequency meter for proper operation and as an indication of engine speed. With the unit operating

Tech. Insp.	Semi-annual	Monthly	
			at its normal speed, the frequency meter should read approximately 60 cycles. This reading will vary between 59 and 61 cycles depending upon the load and speed of the unit.
			A-c. Ammeter. Watch the a-c ammeter for proper operation. This meter will indicate the load, in amperes, being carried by the unit.
			Temperature. Note the temperature gauge to see that it indicates in the normal range. The temperature should increase gradually during the warm-up period and normally should not exceed 180°F. The temperature, at which the gauge hesitates, indicates the opening of the thermostat. Extremely low temperature, after a reasonable warm-up period, may indicate that the thermostat is stuck open. Temperature above normal may indicate that the thermostat is stuck closed, that the cooling system lacks coolant, or that the cooling system is clogged.
			Fuel. Observe whether the fuel gauge indicates the approximate amount of fuel in the tank.
			ENGINE. Observe engine-operating characteristics as follows:
			Unusual Noises. Listen for knocks and rattles as the engine is accelerated and decelerated, and while it is under both light and heavy loads.
			Acceleration and Power. Operate the engine at various loads, noting whether the engine has normal pulling power and acceleration. A slight ping when a heavy load is suddenly applied is normal continued or heavy ping may indicate early timing, heavy accumulation of carbon, or low-octane fuel.
			Governed Speed. Check the frequency meter and observe whether the engine is operating at its rated speed.
10	10	10	UNUSUAL NOISES. Be on the alert continually for unusual noises that would indicate looseness of parts damaged or malfunctioning components.
13	13	13	TEMPERATURES. After completing the run, note as follows:
			Generator Housing. Feel the a-c generator housing cautiously for abnormal temperatures as determined by previous experience with the unit.
			Generator Bearings. Feel the bearing housings for evidence of overheating. If any bearing appears to be overheated, lack of proper lubrication or excessive wear of the bearing is indicated. Report worn bearings promptly to the proper authority.
18	18	18	CYLINDER HEAD AND GASKET. Look for cracks or indications of oil, water, or compression leaks around studs, caps screws, and gasket.
			Caution: Cylinder heads should not ordinarily be tightened unless there is a definite indication of looseness or leaks. If tightening is necessary, use a torque-indicating wrench and tighten in the sequence, and to the tension specified in the manual (pars. 64 and 65). When a new gasket is installed, tighten three times as follows: First, upon installation, second, after engine is warmed up, and third, after completing final test.
			Note. Cylinder heads must be removed and combustion deposits cleaned from the combustion chambers after every 200 hours of operation.
14	14	14	LEAKS. Look within the engine compartment and underneath

Tech. Insp.	Semi-annual	Monthly	
19			the unit for engine oil, water, and fuel leaks, and determine their source.
			VALVE MECHANISM. Remove valve mechanism covers, observe valve clearances and condition of valve mechanisms. Valve tappets, and springs should appear in good condition, correctly assembled, and secure. Make sure that valve-cover gaskets are in good condition.
	19		*Adjust.* Adjust the clearances between the valve stems and tappets. The correct clearance for Power Unit PE–95–(1) is 0.010 inch cold and that for Power Units PE–95–(2) and PE–95–F is 0.014 inch cold. Take care that the locknuts are secure when the clearances are last noted during the adjustment.
			Note. Valve tappets on Power Units PE–95–(1) are nonadjustable. If the valve clearance is in need of adjustment report to person in authority. Valves on all Power Units PE–95–(*) must be ground every 400 operating hours.
		20	SPARK PLUGS. Examine the installed spark plugs to see that their insulators are in good condition and clean, and that there is no leakage around the insulators or gaskets. When operating conditions require, the spark plugs may be removed for service. Re-
20	20		move the spark plugs and examine for poor condition, paying particular attention to broken insulators, excessive carbon deposits, and to electrodes which are burned thin. Replace unserviceable plugs. Report excessive deposits or damaged insulators, as these conditions may indicate incorrect heat range.
	20		*Clean.* Clean deposits from the electrodes and insulators, and check again for cracks. If a plug cleaner is not available, install new or reconditioned plugs.
	20		*Adjust.* Adjust gaps to 0.030 inch on Power Units PE–95–(1) and 0.025 inch on Power Units PE–95–(2) and PE–95–F. Adjust the gap by bending the grounded electrode. After completing item 21, reinstall the plugs, using new gaskets and taking care not to overtighten them, as overtightening may cause distortion and damage.
21	21		COMPRESSION TEST. With all spark plugs out, insert the compression gauge in a spark plug hole, and with the throttle wide open, rotate the engine at cranking speed until the maximum compression is indicated. Do not crank the engine more than is necessary to obtain the maximum reading. The minimum reading for Power Unit PE–95–(1) should not be lower than 70 pounds and that for Power Units PE–95–(2) and PE–95–F should not be less than 110 pounds. The battery must be fully charged to obtain maximum cranking speed. Record the compression reading for each cylinder in the space provided on the back of the form. If pressure in a cylinder is appreciably below normal, squirt sufficient engine oil on the piston head to prevent loss of compression temporarily, and recheck. Low compression, brought up to normal by oil sealing, indicates piston, ring, or cylinder wear or damage. Low compression, not brought up to normal by this method, indicates valve or gasket leakage.
22	22	22	BATTERY (CABLES, HOLD-DOWNS, CARRIER), RECORD GRAVITY, AND VOLTAGE. Inspect battery case for cracks and leaks. Clean top of battery. Inspect cables, terminals, bolts, posts, straps, and

Tech. Insp.	Semi-annual	Monthly	
			hold-downs for good condition. Test specific gravity and voltage and make a record on WD AGO Form 461. Specific gravity readings below 1.225 indicate battery should be recharged or replaced Electrolyte level should be above top of plates and may extend ½ inch above plates. Perform the high-rate discharge test according to the instructions for condition test which accompany the test instrument, and make a record of the voltage on WD AGO Form 461. Cell variation should not be more than 30 percent.
			Note. Specific gravity must be above 1.225 to make this test.
22	22		Bring electrolyte to proper level by adding distilled or clean water. Clean entire battery and carrier. Repaint carrier if corroded. Clean battery cable terminals, terminal bolts and nuts, and battery posts, and grease them lightly. Inspect bolts for serviceability. Tighten terminals and hold-downs carefully to avoid damage to battery.
23	23	23	CRANKCASE. Without load on unit, examine crankcase, valve covers, and timing-gear cover for oil leaks. Stop the engine and after oil has drained into the crankcase, see whether the oil is at the proper level.
	23	23	*Note.* If an oil change is due, drain the crankcase and refill to proper level with specified oil. Do not start the engine again until item 24 is completed.
24	24	24	OIL FILTERS, COOLERS, AND LINES. Inspect oil filters, and all external engine-oil lines to see whether they are in good condition, secure, and do not leak.
	24	24	*Note.* When due, or when oil-filter cartridge condition indicates a filter cartridge change is necessary, remove the filter cartridge, clean the case, and install a new filter cartridge of the correct type, installing new gaskets and tightening the cover securely.
25	25	25	RADIATOR (CORE, SHELL, SHUTTERS, MOUNTINGS, HOSE CAP AND GASKET, OVERFLOW TANK, AND STEAM RELIEF TUBE AND VALVE). See that these items are in good condition, correctly assembled, securely mounted and connected, and do not leak; note whether the core air passages are obstructed with dirt, insects, or trash, and whether the core fins are badly bent; examine the coolant to see whether it is so contaminated with rust, oil, or other foreign matter that the cooling system should be cleaned. If cleaning is necessary, proceed as follows: drain the radiator, taking care to save the drainings to put back into radiator if ethylene-glycol antifreeze is used. Clean the cooling system according to current directives, using only specified cleaner. Flush cleaner from the entire cooling system with clean water. Refill radiator with coolant, adding specified inhibitor, unless new antifreeze, which contains inhibitor, is used. Do not fill to top; allow room for expansion.
			Antifreeze. If antifreeze is in use, determine its protective value and make a record in the space provided on the reverse side of the work sheet.
	25	25	*Clean.* Clean the dirt, insects, and trash from the exterior of the core by blowing out with compressed air or with a stream of water applied carefully from the rear side of the core. (Do not use steam.)
			Note. Use only a suitably shaped piece of wood or blunt instrument in straightening fins; otherwise tubes may be punctured.

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	25		*Tighten.* Tighten all loose radiator mountings and hose clamps.
26	26	26	WATER PUMP, FAN, AND SHROUD. Observe water pump to see that it is in good condition, not leaking, and securely installed. Loosen drive belts and leave them loose until adjustment is made (item 29). Examine shaft for loose bearings and end play. Inspect fan blades to see whether they are in good condition, properly secured to the hub, and whether the shroud is in good condition, properly aligned with the fan, and securely mounted.
27	27	27	GENERATOR, STARTER, AND SWITCH. Note whether these items are in good condition, securely mounted, and whether the wiring connections are clean and secure; see that the starter linkage and retracting spring are in good condition and secure.
27	27		Remove the generator and starter inspection covers and see that the commutators and brushes are in good condition and not excessively worn; that the brushes are free in the holders and have sufficient spring tension to hold them in contact with commutator; and that the brush-connecting wires are secure and not chafing. Inspect slip rings and brushes if the generator is a-c type.
	27		*Clean.* Clean the commutator end of the generator and starter by blowing out with compressed air. If the commutator is dirty, clean with fine sandpaper only (#00) according to instructions in paragraph 67 and blow out the dust with compressed air. See that air passages in generator are clean and unobstructed.
	27		*Tighten.* Tighten the starter mounting bolts securely.
29	29	29	DRIVE BELTS AND PULLEYS. Observe all drive belts for evidence of fraying condition, excessive wear, and deterioration. See that all drive pulleys and hubs are in good condition and securely mounted.
29	29		*Adjust.* Adjust all accessory drive belts (par. 70*h*).
31	31	31	DISTRIBUTOR OR MAGNETO. Observe whether the distributor body and external attachments are in good condition and secure. Examine other parts of the distributor as follows:
			Cap, Rotor, and Points. Blow or wipe the dirt or dust from the distributor cap, remove the cap, and see that the cap, rotor, and the breaker-plate assembly parts are in good condition, correctly assembled, secure, and serviceably clean. Pay particular attention to cracks in the cap and rotor, corrosion of terminals, and connections in these parts, and to burning of the outer ends of the conductor strap of the rotor. Also see whether the breaker points are in good condition, well aligned, and adjusted to specifications. If the breaker-plate assembly is unserviceably dirty, remove the distributor, clean in dry-cleaning solvent (SD), dry with compressed air, lubricate parts as specified below, and reinstall in its correct position for timing. When cleaning the distributor, remove the wick and lubrication cup, clean and dry them while removed, and reinstall only after the distributor assembly is cleaned and blown dry with compressed air. If the breaker points are pitted, burned, or worn to an unserviceabe condition, install a new set of points. If the points are badly pitted, replace the capacitor also, as it is

Tech. Insp.	Semi-annual	Monthly	
			probably the cause of the pitting. Install the new points so that they are well aligned and engage squarely. If the points are slightly pitted or burned, dress them with an American-Swiss No. 6 file (or equivalent) or #00 sandpaper (do not use emery cloth), and remove the filings with compressed air.
			Shaft. Test by hand-feel for looseness, to determine whether or not the distributor camshaft is excessively worn in its bushings.
			Centrifugal Advance. Install the rotor on the upper end of the distributor camshaft and note whether the camshaft can be rotated by finger force through the normal range of movement which is permitted by the centrifugal-advance mechanism. Note also whether it returns to its original position when the fingers are removed from the rotor and that there is no binding or hanging up in the mechanism during this check.
			Special Lubrication. Lubricate the cam surfaces, the movable breaker-arm pin, the wick, and the camshaft according to the lubrication instructions. Take care to keep lubricant away from the distributor points, not to apply more lubricant than is specified, and to wipe the cam clean before lubricating its surface.
	31		*Adjust.* Adjust the breaker-point gap to 0.015 inch in Power Units PE–95–(1) and to 0.020 inch in Power Units PE–95–(2) and PE–95–F.
32	32	32	COIL AND WIRING. Examine the coil to see that it is in good condition, clean, and securely mounted. All high-voltage ignition wiring, including shielding or conduits, should be in good condition and securely fastened to all support mountings and terminals. See that all insulation and connections are clean. Inspect all low-votage wiring in the engine compartment in the same manner. Inspect resistors and capacitors for condition and connections. Inspect power-outlet receptacles and connections and convenience outlets for cleanliness and security of mounting.
			Note. Do not tighten wiring connections unless actually loose as overtightening of terminals will cause damage.
33	33	33	MANIFOLDS. Observe the intake and exhaust manifolds to see that they are in good condition, secure, and that manifold gaskets appear to be in good condition and not leaking.
	33		*Tighten.* Tighten all manifold assembly, mounting, exhaust pipe, and carburetor connecting flange nuts evenly and securely.
34	34	34	AIR CLEANERS. Remove the carburetor air-cleaner element. See that all gaskets, seals, clamps, and any connecting hose or tubes are present and in good condition. Observe the condition of the cleaning element, baffles, and body. Note the oil in the reservoir of the oil-bath cleaner, paying particular attention to the amount of dirt present in the oil. Also see that the oil level is satisfactory.
34	34		*Clean and Serve.* Wash cleaner element in dry-cleaning solvent (SD), dry, apply engine oil (OE) to the element, and drain excess oil. Refill the oil reservoir to the correct level with clean engine oil (OE). Reassemble, making certain all gaskets are in good condition and in place. Install air cleaner, being careful that it is pressed firmly into place and that the mounting is secure. Note that any

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			idle adjustment at the point where smoothest engine operation is attained. All carburetor jets on Power Units PE–95–(2) and PE–95–F, with the exception of the idle adjustment, are fixed and nonadjustable. See paragraph 57*c* for adjustment instructions.
43	43	43	REGULATOR UNIT (CONNECTION, VOLTAGE, CURRENT, AND CUT-OUT). (These instructions apply to Power Unit PE–95–F only.) See whether it is in good condition and whether connections and mountings are secure.
43	43		Connect the low-voltage circuit tester and observe the voltage regulator, current regulator, and the cut-out to see if they control the battery-charging generator output properly. Follow the instructions which accompany the test instrument. Replace if test shows faulty operation.
			Caution: This test should be made only after the regulator unit has reached normal operating temperature.
63	63	63	ENGINE MOUNTINGS AND BRACES, GROUND STRAP, AND SIDE PANS. These items should be in good condition and securely mounted and connected. Be sure to examine both front and rear engine mountings, and make certain that all mounting bolts are tight and that there are lockwashers under all nuts. Observe all bonding and see that it is secure (par. 80).
74	74	74	BEARINGS (SEALS, OIL LEVEL, AND MOUNTINGS). Examine the bearings for any excessive end play. See that they are adequately lubricated, that seals are not leaking, and that the mountings are secure.
	74	74	*Tighten.* Tighten the bearing mountings secure.
80	80	80	*FRAME (SIDE AND CROSS MEMBERS). Inspect the skid base, side rails, and cross members to see that they are in good condition, secure, and correctly aligned. If the skid base appears warped or out of line, report the condition to proper authority.
81	81	81	*WIRING, CONDUITS, AND GROMMETS. Observe these items to see that they are in good condition, properly supported, connected, and secure.
82	82	82	FUEL TANKS, FITTINGS, AND LINES. Inspect fuel tanks to see that they are in good condition and securely mounted. Examine caps for defective gaskets or plugged vents. See that the filler necks are in good condition and the caps fit securely. Check fuel lines and fittings to see that they are in good condition, securely supported, and not leaking.
	82		Remove the fuel tank drain plugs or disconnect the fuel line, open the shut-off valve, and drain off the accumulated water and sediment. Drain only until the fuel starts to run clear.
84	84	84	EXHAUST PIPES AND MUFFLER. Examine the exhaust pipe to see that it is securely attached to the exhaust manifold, that the gasket does not show visible evidence of leakage, and that the other end is secure to the muffler. Inspect the muffler to see that it is in good condition and securely mounted.
85			LUBRICATION. Inspect the lubrication of the entire power unit. On any unit where disassembly was necessary for inspection purposes, lubrication must be performed, unless it is to be scheduled

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	85	85	for repair. See applicable War Department Lubrication Order for detailed lubrication instructions. *Lubricate.* Lubricate all points of the power unit in accordance with instructions in War Department Lubrication Order, current lubrication bulletins, or directives, and the following instructions: Use only clean lubricant. Keep all lubricant containers and dispensers covered except when withdrawing lubricant. Lubrication of items on the Preventive Maintenance Service and Technical Inspection Work Sheet that are marked with an L (special lubrication symbol) should be omitted on this lubrication service *with the exception of the external lubrication cup of the distributor*. This will avoid duplication and, in some cases, overlubrication. Before applying lubricant clean the lubrication fittting or plug, so that dirt will not enter with the lubricant. If lubrication fittings, flexible lines, vents, or plugs are found missing or damaged, they should be replaced immediately. Clean the hole in which the new fitting is to be installed, install the fitting and lubricate the unit. On all unsealed bushings or joints, the lubricant should be applied until it appears at the openings. On units which are provided with lubricant retainer seals, use an appropriate hand-operated grease gun and do not force the lubricant beyond the seals. Open any clogged lubrication passages until lubricant is properly delivered. When draining oil from the engine, always drain the oil immediately after it has been warmed and agitated to a good draining condition by operation of the engine. Refill to the correct level with specified oil as soon as draining is completed. ***Caution:*** Do not fill to overflowing. Reinstall all drain and filler plugs securely. Take care that any required gaskets are in good condition and in place on the reinstalled plugs. Do not apply more than the specified amount of lubricant to generators, starters, distributors, or water pump. Wipe off excess lubricant.
94	94	94	HOOD (HINGES AND FASTENERS). Observe whether the power unit hood, hinges, fasteners, etc., are in good condition, secure, and properly lubricated.
98	98	98	CIRCUIT BREAKER, FUSE BLOCK, RHEOSTATS, AND CONTROL SWITCHES. Observe whether these items are clean, dry, in good condition, secure, and whether any electrical connections are loose. See that all fuses are held securely by their clips and that clips are clean.
100	100	100	*BODY, PANELS, SKID STRIPS, AND TARPAULINS. See that the unit housing is in good condition and that all panels are secure. Inspect to see that fasteners, latches, etc., are present and in good condition.
103	103	103	*PAINT AND MARKINGS. Examine the paint of the entire unit to see that it is in good condition, paying particular attention to any bright spots in finish that might cause glare or reflection. Inspect markings and identification for legibility. Include identification plates and their mountings if furnished.

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104	104	104
131	131	131
135	135	135
141	141	141
142	142	142

Pay particular attention to the War Department Lubrication Order and procure a new one if the old one is defaced.

RADIO BONDING (SUPPRESSORS, FILTERS, CAPACITORS, AND SHIELDING). See that their bonding connections are in good condition, clean, and secure. Note whether all items are securely mounted.

Note. Any irregularities, except cleaning and tightening, should be reported to the proper authority.

TOOLS (STANDARD). Check all the standard tools against the packing list to see that they are all present. Inspect to see that tools are in good condition, clean, properly stowed or securely mounted. Also examine the tools which have cutting edges to see that they are sharp (par. 10*i*).

PUBLICATIONS AND FORMS. See that the following are present in a legible condition:

Technical Manual;
WD AGO Form 48 (Trip Ticket);
War Department Lubrication Order;
WD AGO Form 468 (Unsatisfactory Equipment Report).

MODIFICATIONS (MWO's). Inspect the equipment to determine whether all modification work orders have been completed.

FINAL TEST. Make a final test, rechecking items 3, 9, 10, 13, and 14. Confine this test to the minimum time necessary for satisfactory observation

Note. Correct or report all deficiencies found during final test.

Section X. MOISTUREPROOFING AND FUNGIPROOFING

44. General

When operated in tropical areas where temperature and relative humidity are extremely high, Signal Corps equipment requires special attention. These are some of the problems met:

a. Resistors, capacitors, coils, chokes, transformer windings, etc., fail because of the effects of fungus growth and excessive moisture.

b. Electrolytic action, often visible in the form of corrosion, takes place in resistors, coils, chokes, transformer windings, etc., causing eventual break-down.

c. Hook-up wire insulation and cable insulation break down. Fungus growth accelerates deterioration.

d. Moisture forms electrical leakage paths on terminal boards and insulating strips, causing flash-overs.

45. Treatment

A moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection against fungus growth, insects, corrosion, salt spray, and moisture. The treatment involves the use of a moisture-and fungi-resistant varnish applied with a spray gun or brush. See TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment, for a detailed description of the varnish-spray method of moistureproofing and fungiproofing and the supplies and equipment required in this treatment.

Caution: Varnish spray may have toxic effects if inhaled. To avoid inhaling spray, use respirator if available; otherwise, fasten cheesecloth or other cloth material over nose and mouth. Never spray varnish or lacquer near an open flame. Do not smoke in a room where varnish or lacquer is being sprayed. The spray may be highly explosive.

46. Power Units PE-95-A, PE-95-B, and PE-95-C

a. PREPARATION. Make all repairs and ad-

justments necessary for proper operation of the equipment.

b. DISASSEMBLY. (1) Open the drain cock at the bottom left of the radiator and drain the cooling system. Remove the water temperature bulb from the cylinder head.

(2) Remove the terminal cover at the bottom of the control panel. This cover is just below the control panel door and is held in place by three bolts.

(3) Remove the two bolts that hold the ENGINE-WATER-TEMPERATURE gauge to the control panel and pull the entire assembly, consisting of the gauge, copper tube and temperature bulb, through the panel. (These items do not require treatment.)

(4) Remove the ground lead from the battery and remove the leads from the engine and generator to the gasoline gauge, battery-charging ammeter, START-STOP switch, convenience outlet, current transformer and ground.

(5) Disconnect the oil line from the OIL-PRESSURE gauge.

(6) Remove the eight bolts that hold the control panel to the frame, tilt the top of the panel back and remove it, bottom first, through the frame. (This panel is to be treated.)

(7) Remove the panel light bulb from its socket.

(8) Remove the leads from the a-c ammeter and the a-c voltmeter, and the battery-charging voltage regulator.

(9) Remove the screws that hold the a-c ammeter and the d-c voltmeter and remove both meters from the panel. These meters are to be treated. (See TM 11–472 for treatment of meters.)

(10) Remove the armature of the battery-charging relay and let it hang by its lead.

(11) Remove the screws that hold the battery-charging regulator to the panel and remove it from the panel. Pry the cover from the regulator and put it aside for later treatment.

(12) Remove the arm from the automatic electric choke, remove the choke from the manifold and remove the cover from the choke. Put the choke and cover to one side for later treatment.

(13) Disconnect the leads from the magneto-grounding relay, remove the relay and pry off its cover.

(14) Remove the spark-plug leads and the shield cover from the magneto.

c. CLEANING. Clean all dirt, dust, rust, fungus, oil, grease, etc., from the equipment to be processed. Clean all oil and grease from the surfaces to be varnished.

d. MASKING. (1) Mask the contacts of the battery-charging relay with masking tape.

(2) Mask the contacts of the battery-charging voltage regulator with masking tape.

(3) Mask the adjustable portions of the voltage-regulator resistors with masking tape.

(4) Mask all lugs on unfastened leads with masking tape.

(5) Mask all terminals from which leads have been removed with masking tape.

(6) Mask the moving parts in the front chamber of the automatic electric choke with paper and masking tape.

(7) Mask the terminal sockets on the magneto distributor cap with masking tape.

(8) Mask the contacts on the magneto-stopping relay with masking tape.

(9) See figures 25, 26, 27, and 28 and make sure that all indicated surfaces have been masked.

e. DRYING. Dry the panel and all detached parts that are to be treated at a temperature of 160° F. for a period of from 2 to 3 hours.

f. VARNISHING. (1) Apply three coats of moistureproofing and fungiproofing varnish (Lacquer, Fungus-resistant, speec No. 71-2202 (stock No. 6G1005.3), or equal). Allow each coat to air-dry for 15 or 20 minutes at temperature specified in subparagraph *e* above before applying the next coat.

(2) Apply varnish immediately after the equipment is dried. If varnish is not applied immediately, moisture condenses on the equipment. Varnish applied over the moisture peels off readily after the varnish has dried.

(3) Spray the battery-charging relay, the battery-charging voltage regulator and the inside of both covers.

(4) Spray the magneto-grounding relay and the inside of the relay cover.

(5) Brush three coats of varnish (Lacquer, Fungus-resistant, spec No. 71-2202 (stock No. 6G1005.3), or equal) on the outside of the starting relay.

(6) Brush three coats of fungus-resistant varnish on all wiring remaining on the complete power unit.

g. REASSEMBLY. Reassemble all parts in their original positions, replace all wires and

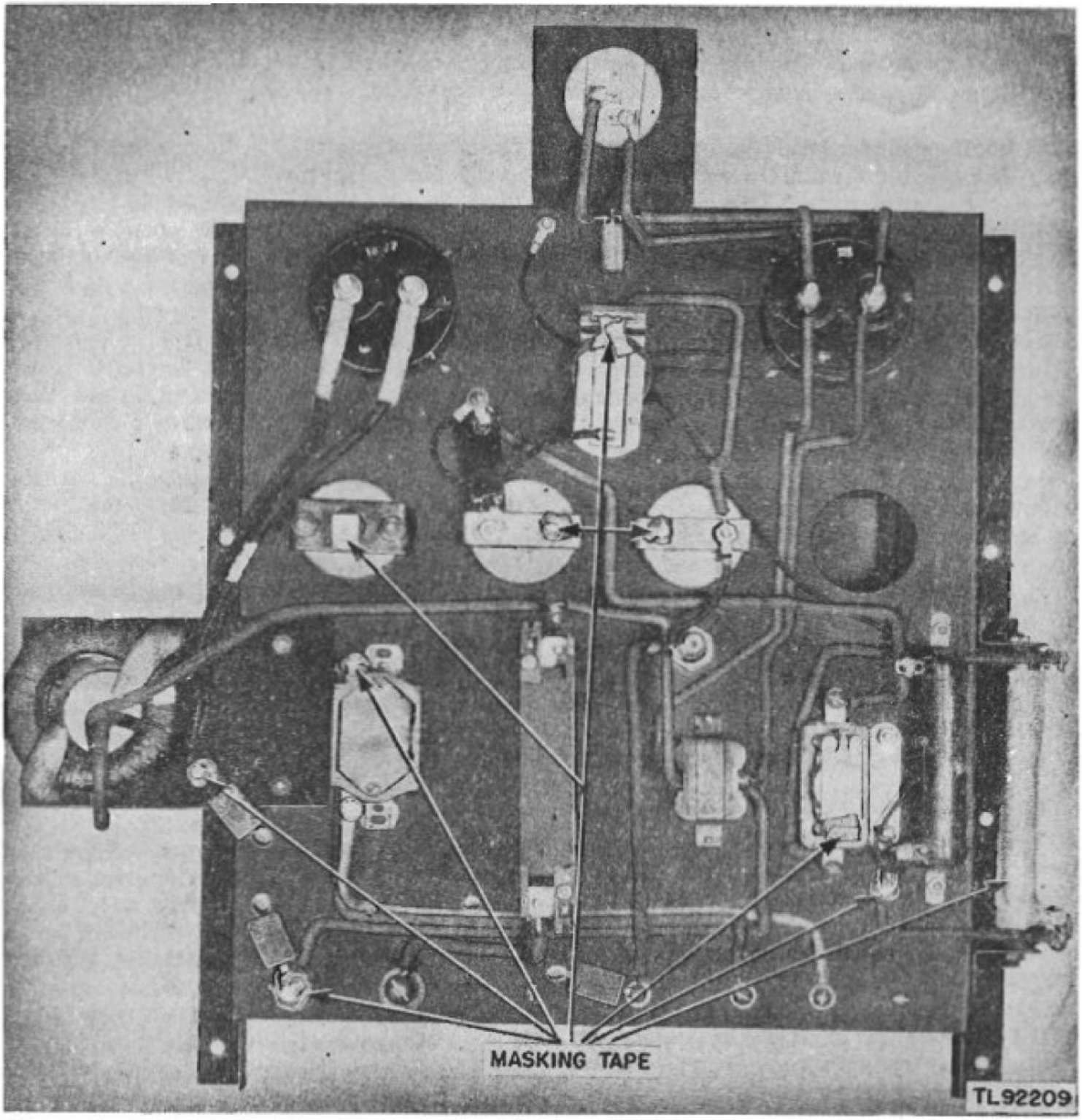


Figure 25. Power Unit PE-95-(1), panel, moistureproofing and fungiproofing details.

connections, start the unit and check its operation.

h. MARKING. Mark the letters MFP and the date of treatment on the face of the control panel.

Example: MFP—7 Sep 44.

47. Power Units PE-95-(2) and PE-95-F

a. PREPARATION. Make all repairs and adjustments necessary for proper operation of the equipment.

b. DISASSEMBLY. (1) Drain the cooling system; remove the water-temperature bulb from the cylinder head; remove the ENGINE-WATER-TEMPERATURE gauge, tube and bulb from the control panel; disconnect the oil line from the OIL-PRESSURE gauge and remove the battery-ground cable as instructed for Power Unit PE-95-A, PE-95-B, and PE-95-C.

(2) Disconnect the ground strap from the ENGINE - WATER - TEMPERATURE gauge tube and wire cables.

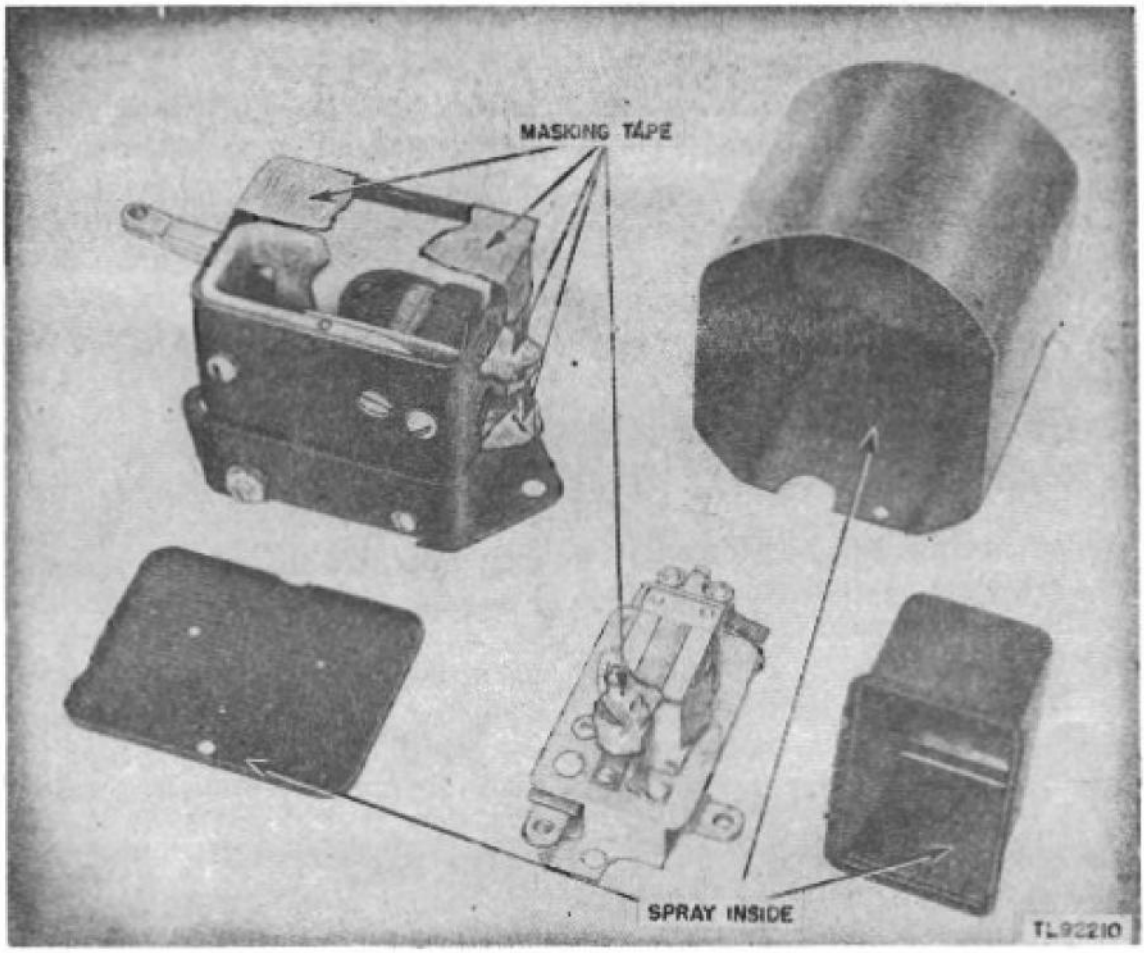


Figure 26. Power Unit PE-95-(1), automatic choke and relay, moistureproofing and fungiproofing details.

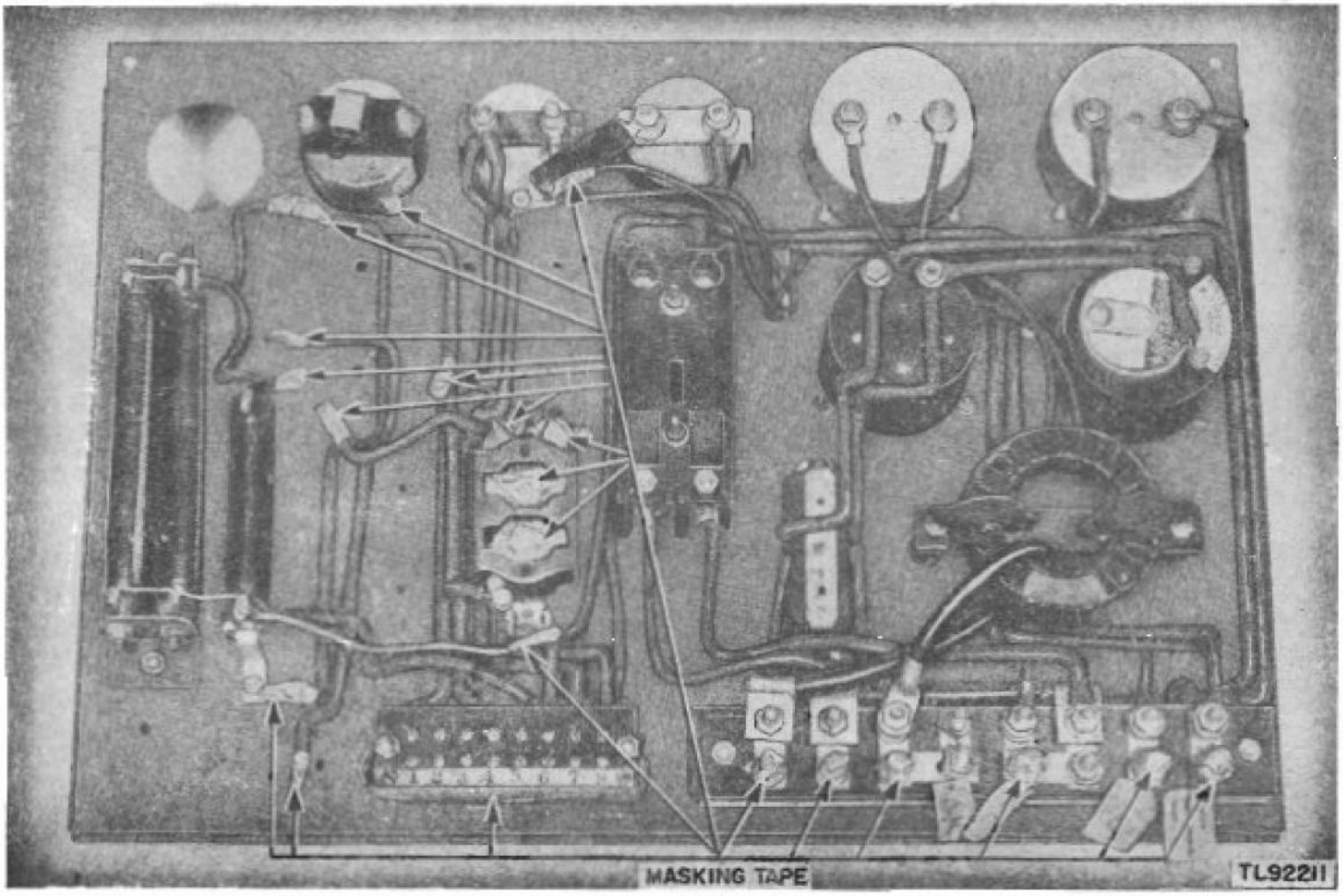


Figure 27. Power Unit PE-95-(2) and PE-95-F, fungiproofing details, panel.

(4) Remove six leads from the generator to the junction block.

(5) Remove leads Nos. 1 to 8 from the engine and generator to the junction block.

(6) Remove the leads from the battery-charging relay and from the four remote-starting relays. Remove all five relays from the control panel.

(7) Remove the fiber cover from the START-STOP switch.

(8) Remove the five bolts that hold the control panel in the panel box and remove the panel from the box.

c. CLEANING. Clean all dust, rust, fungus, oil, grease, etc., from the equipment to be processed. Clean all oil and grease from the surfaces to be varnished.

d. MASKING. (1) Mask the contacts of the battery-charging relay and the remote-control relays with masking tape.

(2) Mask the lugs of all unfastened leads with masking tape.

(3) Mask the contacts of the START-STOP switch and all connections on junction blocks with masking tape.

e. DRYING AND VARNISHING. Follow the same general instructions as given for Power Units PE–95–, PE–95–B, and PE–95–C.

f. REASSEMBLY. Reassemble all parts, start the unit and check its operation.

g. MARKING. Mark the letters MFP on the face of the control panel and date of treatment.

Example: MFP—7 Sep 44.

48. Moistureproofing and Fungiproofing after Repairs

If, during repair, the coating of protective varnish has been punctured or broken, and if complete treatment is not needed to reseal the equipment, apply a brush coat to the affected part. Be sure the break is completely sealed.

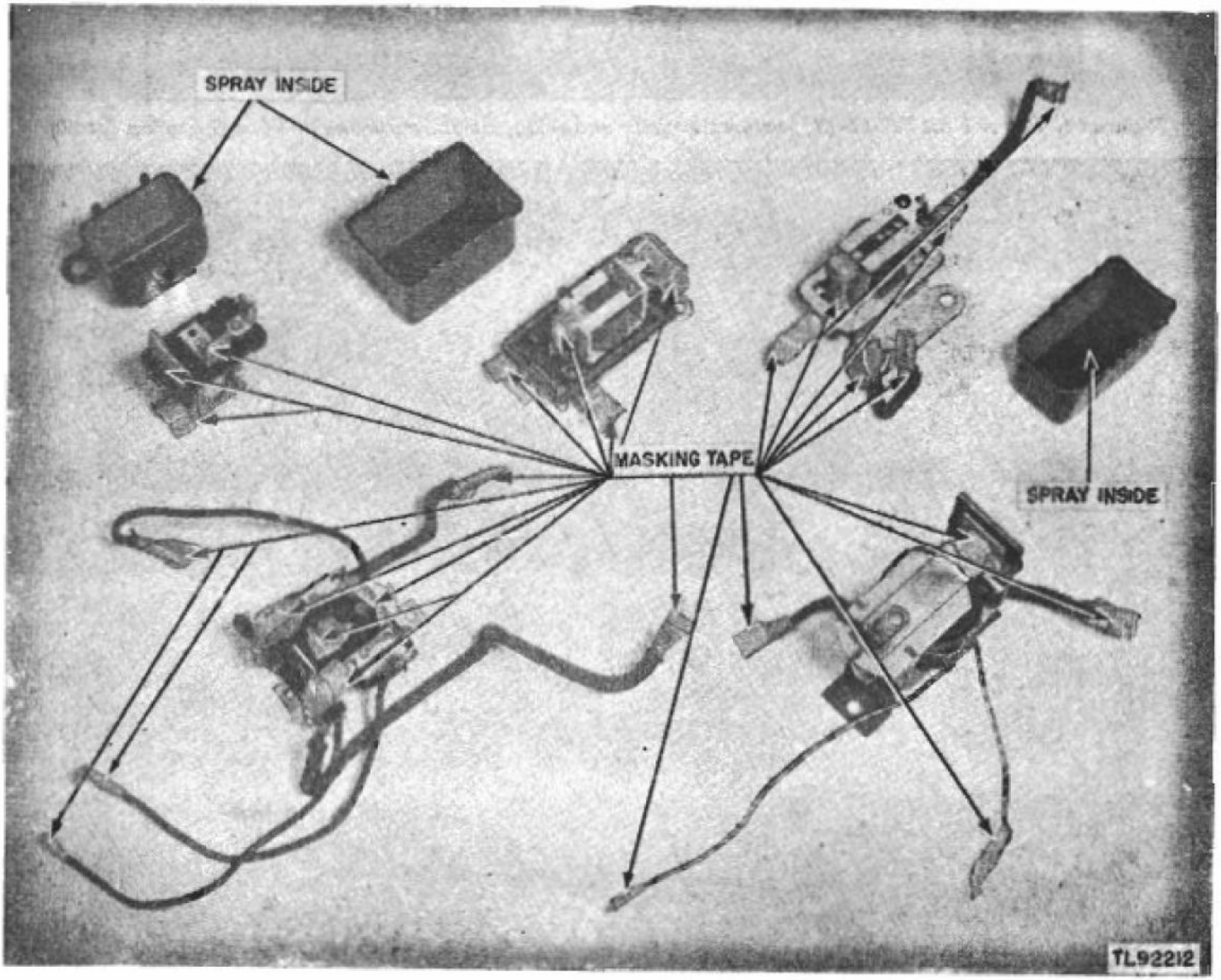


Figure 28. Power Unit PE–95–(2) and PE–95–F, relays and cut-outs, fungiproofing details.

PART FOUR

AUXILIARY EQUIPMENT

(NOT USED)

PART FIVE

REPAIR INSTRUCTIONS

Note. Failure or unsatisfactory performance of equipment used by Army Ground Forces and Army Service Forces will be reported on WD AGO Form 468 (Unsatisfactory Equipment Report); by Army Air Forces, on Army Air Forces Form 54 (unsatisfactory report). If either form is not available prepare the data according to sample form reproduced in figure 65.

Section IX. THEORY OF EQUIPMENT

49. Automatic Choke

Basically, the automatic chokes used on all Power Units PE–95–( ) are the same. These chokes are operated by a combination thermal and electrical action. When starting a cold engine, the action of a solenoid magnet in the automatic choke closes the carburetor choke valve. As the engine warms up, the action of the bimetal thermal element in the automatic choke opens the carburetor choke valve. This

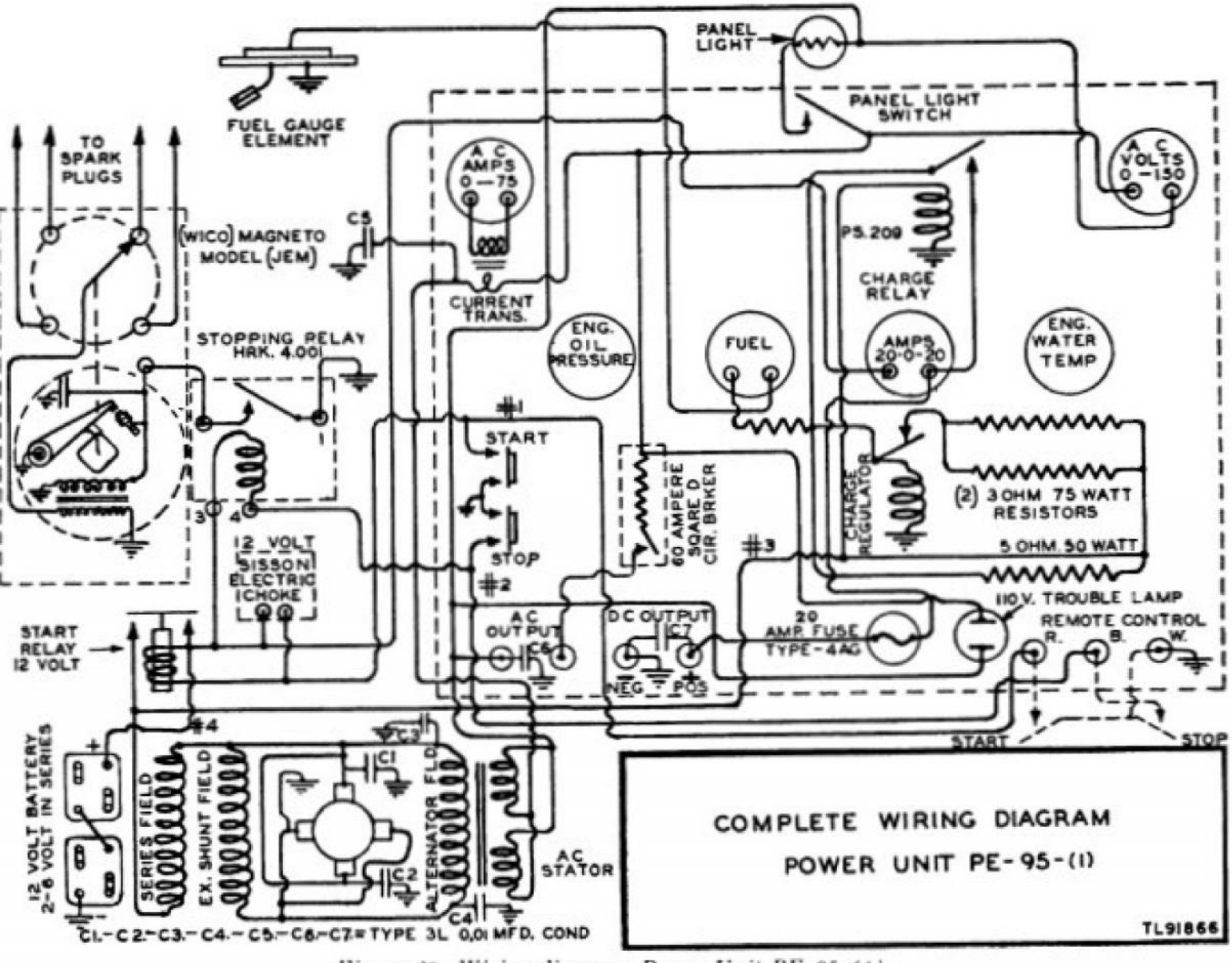


Figure 29. Wiring diagram, Power Unit PE–95–(1).

hermal action permits the choke to remain artially or fully open depending upon the emperature of the engine. Electrical energy is upplied to the solenoid of the automatic choke rom the starting battery when the START utton is pressed. The automatic choke used on ower Unit PE-95-(1) is a Sisson model 878 hile that used on Power Units PE-95-(2) nd PE-95-F is a Sisson model MC 11.

0. Engine Control System

a. POWER UNIT PE-95-(1). See wiring diaram, figure 29. When the START button in he lower right-hand corner of the control panel or the remote control start switch is operated, it closes the circuit from the battery to the exciter through the 12-volt solenoid. The exciter then functions as a motor and cranks the engine. Pressing the START button also operates the automatic choke. Pressing the STOP button closes the stopping relay which grounds the magneto and thus cuts off the ignition. The STOP button must be held in until the engine comes to a complete stop. Either starting or stopping can be accomplished by operating the remote control switch.

b. POWER UNIT PE-95-(2). See wiring diagram, figure 30.

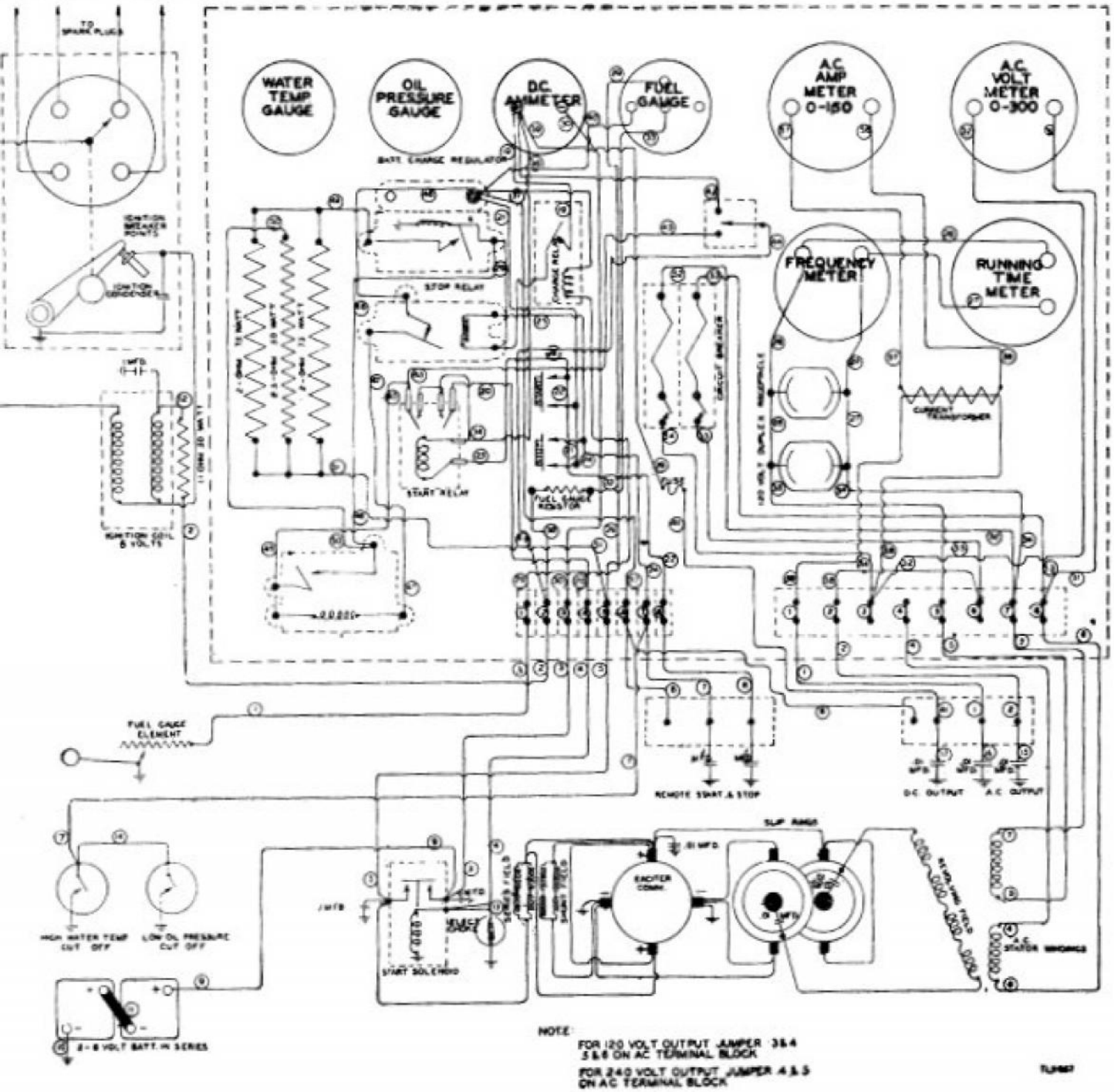


Figure 30. Wiring diagram, Power Unit PE-95-(2).

(1) With the MANUAL START-REMOTE START switch in REMOTE START position, pressing the START button energizes the coil of the start relay. This closes two pairs of contacts on that relay. The closing of the start relay contacts A supplies current to the ignition coil.
Before reaching the ignition coil, this current passes through the remote start contacts of the MANUAL START-REMOVE START switch and through a voltage-dropping resistor. Current is also supplied to the coil of the ignition relay causing its contact C to close. This current passes through the stop relay contacts D to ground.

(2) The closing of the start relay contacts B supplies current to the automatic choke and to start solenoid which closes the start switch contacts E. The closing of these contacts supplies current to the exciter field causing it to function as a motor and crank the engine.

(3) At this stage of the starting cycle, the ignition has been switched on, the carburetor is being choked, and the engine is being cranked. When the engine starts, the oil pump builds up pressure in the lubricating system as the engine's speed increases. When this pressure reaches approximately 6 pounds, the contacts of the low-oil pressure cut-off switch open. The exciter builds up voltage and supplies ignition current through another circuit. This current passes from terminal 5, through the battery-charging resistor and regulator group, through the ignition-relay contacts C to the remote start contacts of the ignition switch and through the ignition resistor to the ignition coil.

(4) Releasing the START button opens the circuit to the start relay coil and allows contacts A and B to open. The opening of contact B stops the electric choking and allows the start switch contacts to open. This opens the cranking circuit.

(5) The ignition current being supplied by the exciter does not pass through contacts A and therefore the engine does not stop when the contacts A open. However, if contacts A open before the exciter voltage has built up high enough to supply proper ignition current, the engine will stop upon release of the START button. The engine will also stop if the START button is released before the oil pressure has built up far enough to open the contacts of the low-oil pressure cut-off switch.

(6) Power Unit PE-95-(2) may be stopped by pressing the STOP button on the control panel or by operating the stop switch at a remote station. This energizes the stop relay and opens its contacts D. The opening of these contacts de-energizes the ignition relay, allowing its contacts C to open. This opens the ignition circuit and stops the unit.

(7) The fuel gauge tank-element is connected to the ignition switch so that the fuel gauge will register only while current is being supplied to the ignition system. To read the fuel gauge while the engine is not running, switch the MANUAL START - REMOTE START switch to REMOTE START position.

(8) Remote control circuits are extensions of the local control circuits connected in parallel.

c. POWER UNIT PE-95-F. Basically, the operation of the electrical control circuits on Power Unit PE-95-F are the same on Power Unit PE-95-(2). See the wiring diagram, figure 31.

51. Governor

The governors on all Power Units PE-95-(*) are of conventional fly-ball type. On Power Unit PE-95-(1) the governor is gear-driven from the camshaft while on Power Units PE-95-(2) and PE-95-F it is driven by a V-belt from the engine crankshaft. The governors are all connected to the engine throttle through suitable linkage and thus control the engine speed and generator frequency.

52. Fuel Pump

a. Power Units PE-95-(2) and PE-95-F are provided with a diaphragm fuel pump. None is provided on Power Unit PE-95-(1). This pump feeds fuel from either the built-in fuel tank or a remote fuel tank to the carburetor while the unit is in operation. It is driven by a cam on the engine camshaft.

b. A special lever arrangement transmits motion to the fuel pump diaphragm assembly. When the diaphragm assembly is drawn downward, the pressure within the pump chamber is reduced and the fuel flows from the fuel tank into the pump. The fuel passes upward into an inverted sediment bowl and then through a screen and check valve into the pump chamber. Upward movement of the diaphragm forces the

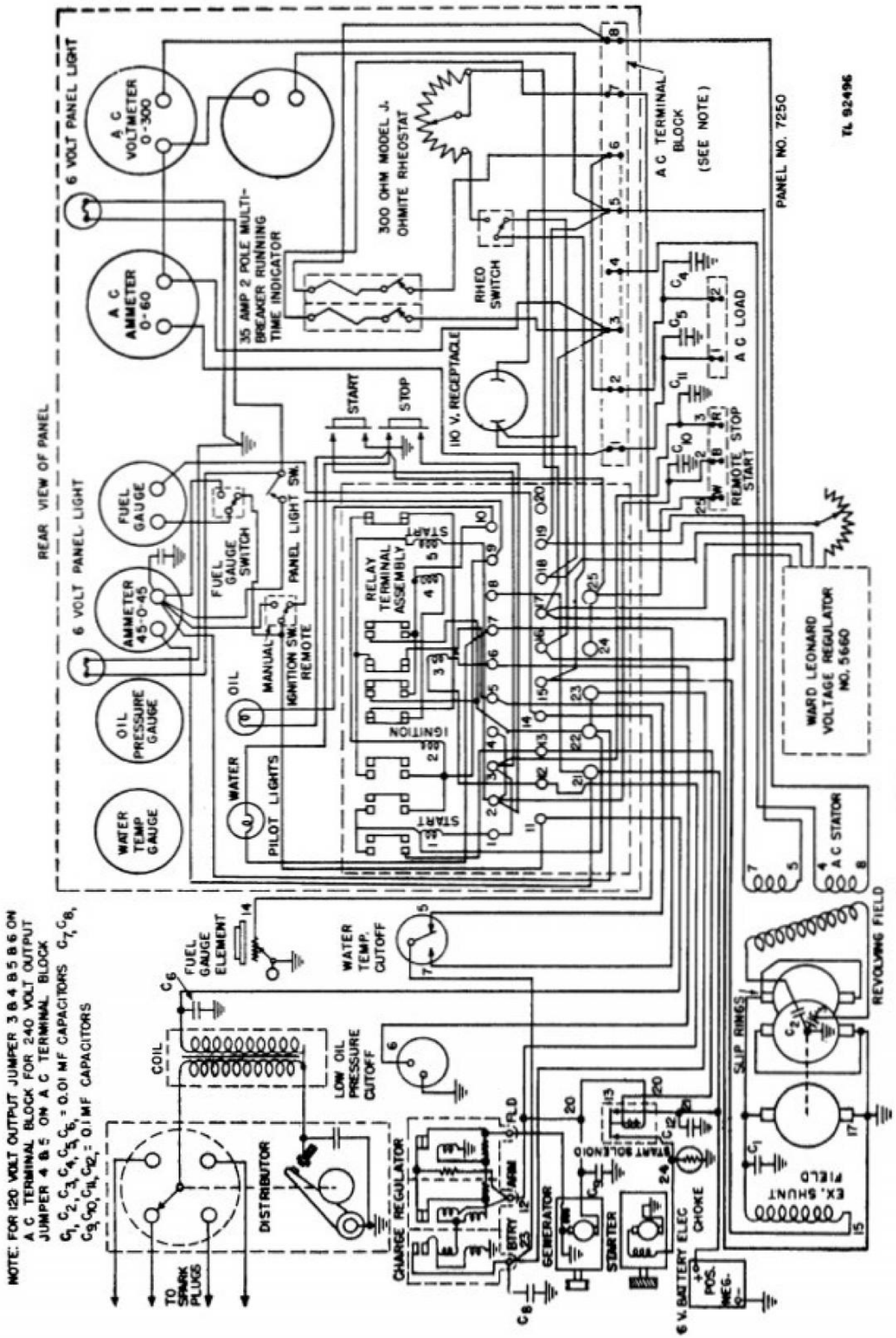
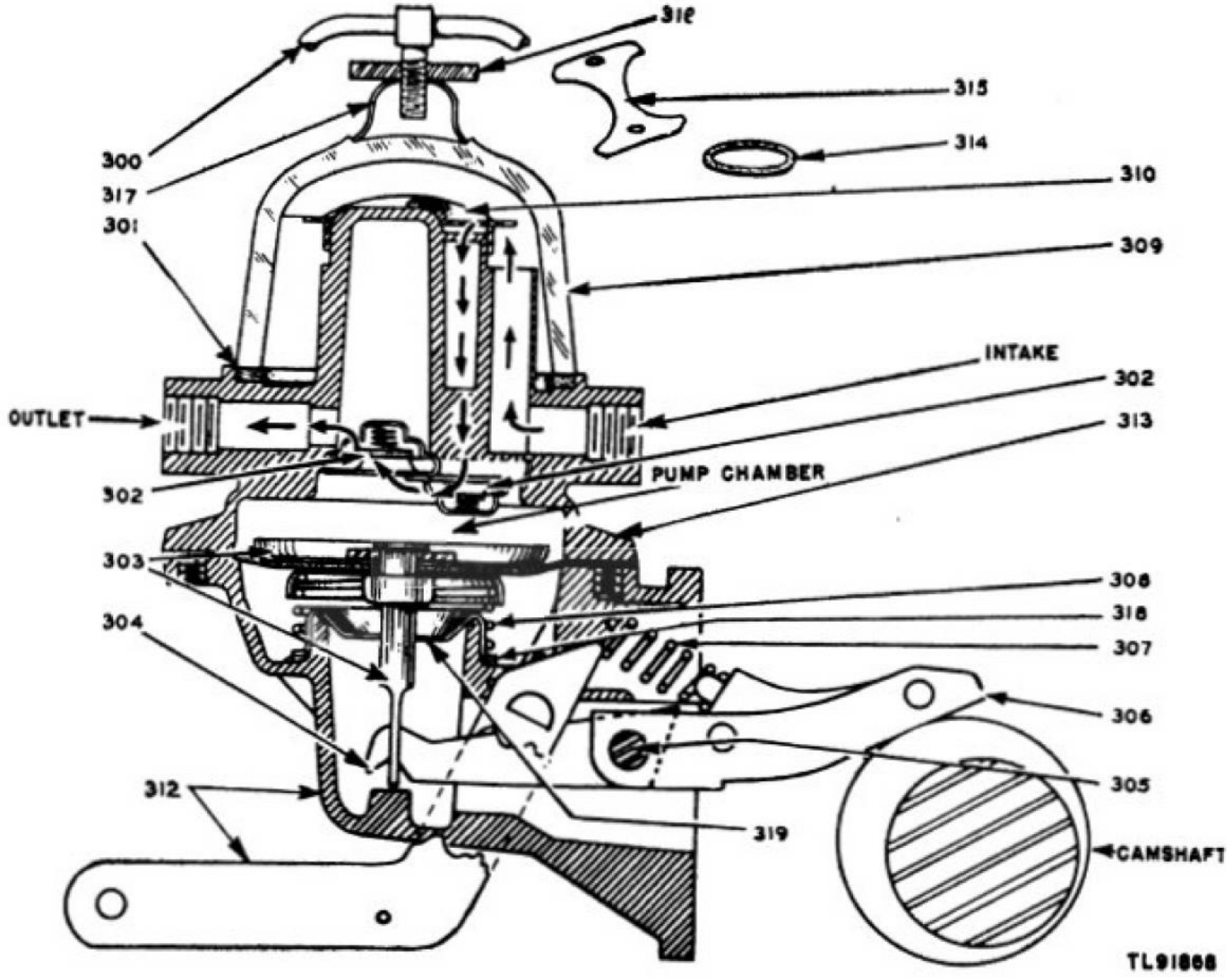


Figure 31. Wiring diagram for Power Unit PE-95-F.



300 Bail assembly.
*301 Bowl gasket (G 085–3002220).
302 Outlet and inlet valve assembly.
303 Diaphragm and pull-rod assembly.
304 Rocker-arm link.
305 Rocker-arm pin.
306 Rocker-arm assembly.
307 Rocker-arm spring.
308 Diaphragm spring.
309 Pump bowl.
310 Filtering screen assembly.
312 Body and priming lever.
313 Top cover.
314 Valve clamp.
315 Valve gasket.
316 Thumb nut.
317 Strainer bowl seat.
318 Pull-rod-seal washer.
319 Pull rod seal.
* Indicates part carried in Ordnance stock.

Figure 32. Fuel pump, Power Units PE–95–(a) and PE–95–F.

fuel from the pump chamber, through a check valve, through the fuel outlet and through the fuel line to the carburetor. A lever is provided to permit operating the pump by hand whenever it has become dry through lack of fuel or other causes.

53. Automatic Cut-Offs

Power Units PE–95–(2) and PE–95–F are provided with two automatic safety switches. These consist of a high-water temperature cut-off and a low-oil-pressure cut-off. The operation of these switches is as follows:

a. The high-water-temperature cut-off is actuated by the rise or fall of the temperature of the cooling liquid. It is electrically connected to the control system in such a manner that ignition is automatically cut off when the cooling

liquid rises to approximately 260° F. When the temperature of the cooling liquid drops to approximately 196° F., this switch closes so that ignition current is re-established and the unit may be restarted. On Power Unit PE–95–F, a red indicator light on the control panel indicates when the ignition is cut off.

b. The low-oil-pressure cut-off is actuated by the pressure in the lubricating system of the engine. The contacts of this switch open whenever the oil pressure drops below 6 pounds. Pressing the START button shunts this switch so as to provide ignition for starting. For this reason, the START button must be held in when starting, until the oil pressure builds up the required pressure to close the cut-off. This switch will function whenever the oil pressure fails through lack of oil, or some other cause, and the fault must be removed before the unit can be restarted. On Power Unit PE–95–F, a green indicator light on the control panel indicates when this switch is open.

Section XII. TEST EQUIPMENT USED IN TROUBLE SHOOTING

54. Standard Test Equipment

a. GENERAL. The standard test equipment for use with power units of 2.5 kw and over consists of the following items:

1 spark-plug adjusting tool and feeler gauge.
1 set standard-feeler gauges.
1 battery hydrometer.
1 antifreeze hydrometer.
1 cylinder compression gauge.
1 combination vacuum and pressure gauge.
1 neon-tube timing light.
1 universal battery tester.
1 low-voltage circuit tester.

b. USE OF BATTERY HYDROMETER. The battery hydrometer is provided with a graduated float. This float is usually graduated from 1.100 to 1.325. A fully charged battery will normally show a specific gravity reading of between 1.275 and 1.295 when the temperature of the battery solution (electrolyte) is 80° F. Corrections of hydrometer readings must be made to compensate for temperatures above or below 80° F. The accompanying table (fig. 33) indicates the correction necessary for various temperatures of the battery solution.

c. USE OF ANTIFREEZE HYDROMETER. The antifreeze hydrometer is similar to a battery hydrometer but is larger and has a number of graduations on its float. There is a separate graduation for each type of antifreeze and the type of antifreeze must, therefore, be known before any test can be made. The following table indicates the correct hydrometer readings at various temperatures for the three types of antifreeze in most general use.

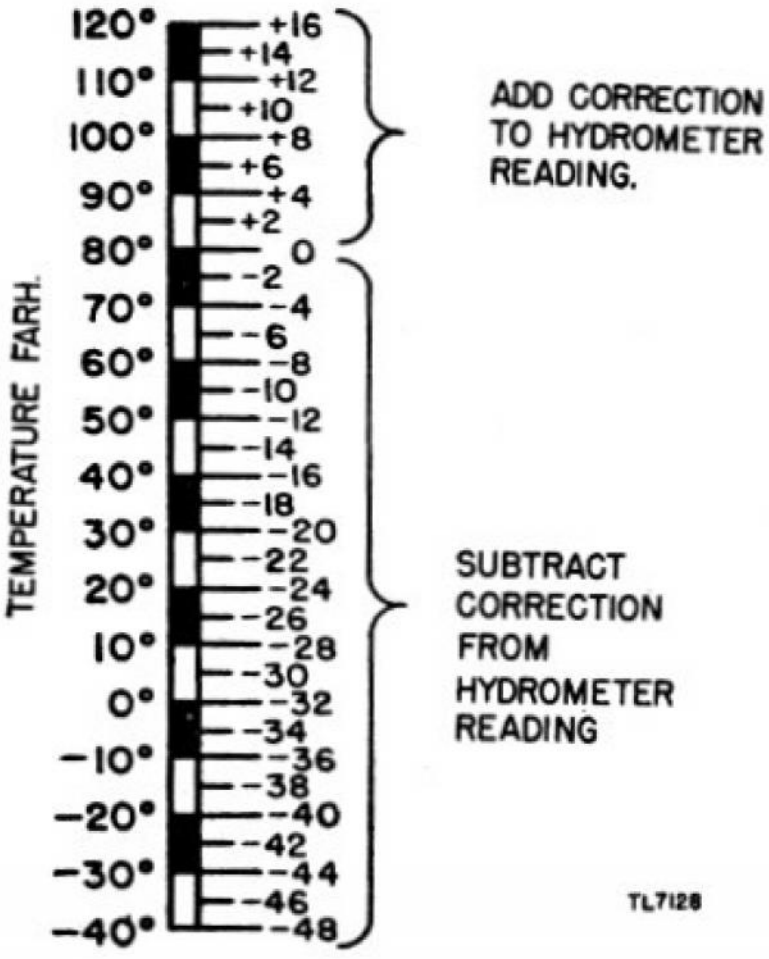


Figure 33. Corrections for hydrometer readings.

Freezing point		Methyl alcohol	Ethyl alcohol	Ethylene glycol
Degrees		Hydrometer reading	Hydrometer reading	Hydrometer reading
C.	F.			
−6	20	0.9822	0.9796	1.022
−11	10	0.9726	0.9704	1.034
−18	0	0.9638	0.9611	1.044
−23	−10	0.9560	0.9511	1.051
−29	−20	0.9493	0.9392	1.058
−34	−30	0.9421	0.9244	1.062
−40	−40	0.9358	0.9068	1.064

d. USE OF CYLINDER COMPRESSION GAUGE. This is a gauge, calibrated from 0 to 200 pounds in 5-pound divisions, with a hexagon stem equipped with a pressure-relief valve and a ball-check valve, a flexible hose connection with screw-type adapters to fit 10-, 14-, 18-mm and ⅞-inch spark-plug ports, an extension equipped with a rubber adapter for rigid compression tests, and an air-check adapter for compressed air tests. To use the equipment, remove the spark plugs from the engine. Block the automatic choke and carburetor throttle in open position. Press the rigid assembly firmly into the spark-plug port of No. 1 cylinder. Crank the engine with the cranking motor, and count the number of strokes required to reach a maximum reading (4 or 5 strokes). Release the pressure in the gauge by unscrewing the valve cap on the hexagon of the adapter one-half turn, returning the pointer to zero. Close the release valve by tightening the valve cap, and proceed to cylinder No. 2. Repeat this operation until all cylinders have been tested. A reading of approximately 100 pounds is satisfactory.

e. USE OF COMBINATION VACUUM AND PRESSURE GAUGE. This gauge is intended for diagnosing troubles in high-compression gasoline engines at a speed slightly above idling speed. It consists of a dial indicator with two indicator hands the dark hand for steady, and the light hand for fluctuating readings, a rubber hose and adapters. The equipment is for making tests for burned valves, weak valve springs, valve timing, warped and burnt manifolds, fuel pump, carburetion, and other engine functions.

(1) *Vacuum lift test* (fig. 34). The lift test is made to determine the normal compression of the engine. Connect the tee fitting to the intake manifold and attach the rubber hose. Disconnect the throttle-shaft connector link, and turn the throttle-stop screw to completely close the throttle valve. With the ignition OFF, crank the engine with the starter. Remove the distributor cap to prevent the engine from starting, or, if it is magneto equipped, ground the magneto. As the starter turns the engine, the gauge pointer will rise to where it stands when the engine is idling. If the pointer does not lift over 5 inches, the intake manifold or gaskets are faulty. If the pointer rises to a point between 10 and 15 inches and fluctuates badly, a cylinder head gasket is faulty or a bad valve condition exists.

(2) *Test with engine running.* Start the engine and block the throttle in half-open position; the pointer on the gauge should register between 18 and 21 inches. Accelerate the engine by opening and closing the throttle. The gauge pointer should drop to 2 inches and recoil to 24 inches or over. If the recoil is not more than 24 inches, there is every indication of badly diluted oil in the crankcase and poorly sealing piston rings. Allow the engine to operate at its top governed speed and hold the speed steady. If the pointer on the gauge fluctuates rapidly between 10, 21, and 22 inches, it is an indication that the valve springs are weak.

(3) *Correct setting of ignition timing.* Connect the gauge to the intake manifold. Start the engine and let the unit operate at no-load speed. Loosen the distributor lock plate and turn the distributor body in retard direction until the gauge registers 16 or 17 inches. Rotate the distributor body in advance direction until pointer on gauge indicates the highest point, with pointer fluctuating ahead. Rotate distributor body toward retard, enough to remove the fluctuation and, when pointer is steady, tighten the distributor lock plate. If the engine is in perfect condition, the gauge will remain steady between 18 and 21 inches.

(4) *Testing fuel pumps.* Connect the gauge to the intake side of the fuel pump. Start the engine and operate the unit at no-load speed. The gauge should read 8 inches or over. If the pointer indicates a lower vacuum, there is an air leak, a faulty diaphragm, or the sediment bowl gasket is not properly seated. Any reading above 8 inches is normal.

f. USE OF NEON-TUBE TIMING LIGHT. This equipment is designed for timing the ignition on all types of gasoline engines. It consists of a body which holds the neon light tube and lens, and has two wire leads with insulated contact clips for connection to equipment. Before using the timing light, check all spark plugs and the distributor points. Make sure that they are clean and adjusted to their proper gap. Observe the flywheel markings through the peephole in the flywheel housing while turning the engine by hand. Continue turning the crank until the mark T.C. appears in the center of the hole. The distributor rotor will now be op-

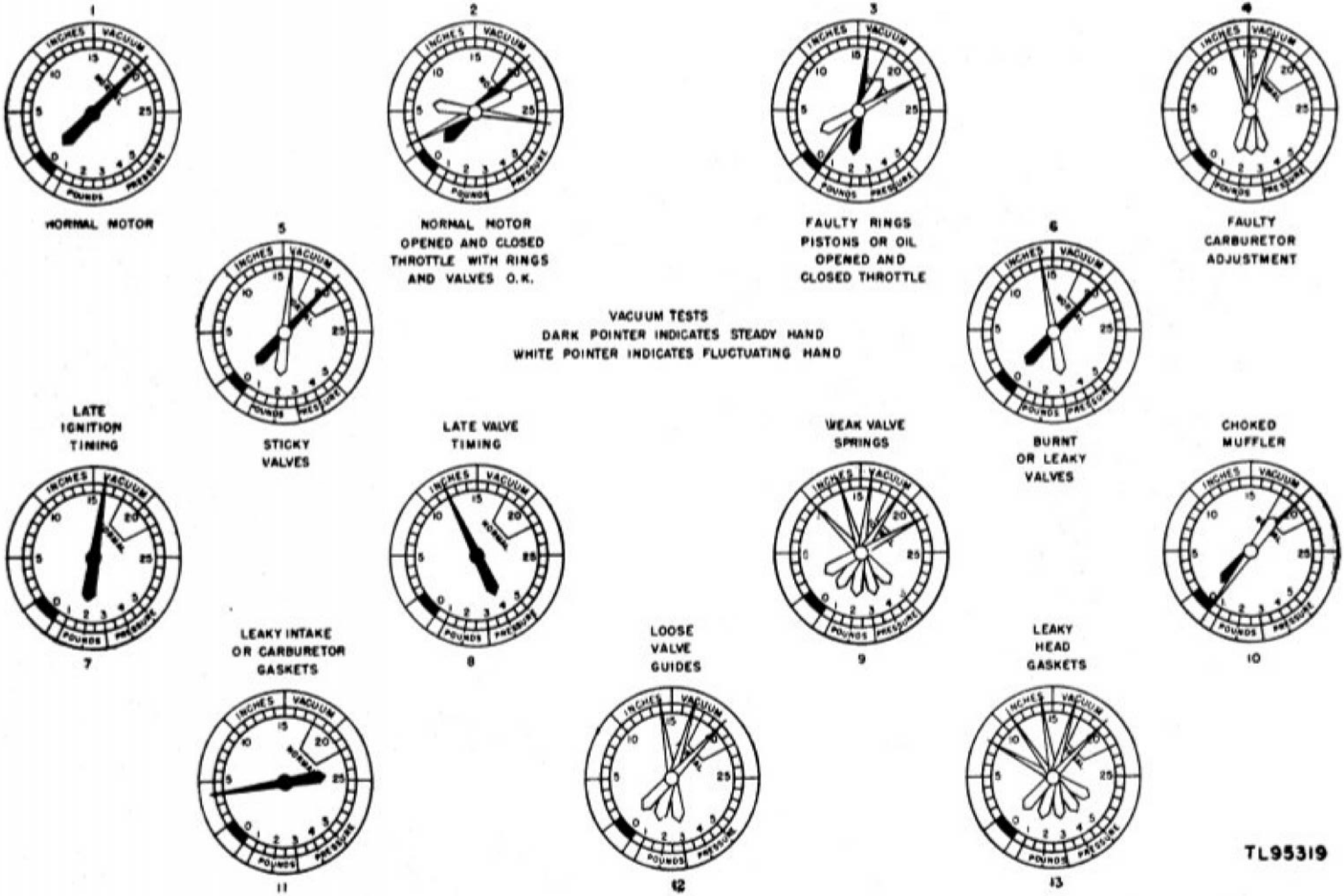


Figure 34. Dial readings for vacuum lift tests.

posite the high-tension terminal of the spark plug to be used for timing. Attach one lead of the timing light to this spark plug and ground the other lead on the engine. Start the engine and block the engine throttle in about one-fourth open position. Hold the timing light in position so that its beam is centered in the peephole. Note whether or not the timing mark on the flywheel coincides with the mark on the housing. If the marks do not coincide, loosen the distributor clamp screw and rotate the distributor housing until the marks coincide. Tighten the clamp screw and accelerate the engine. The timing marks should separate when this is done as an indication that the automatic spark advance is functioning.

g. UNIVERSAL BATTERY TESTER. There are two models of battery testers, both of which are universally used. The tester described is the prod type, with meter attached. The prods on this tester are adjustable to accommodate the various distances between battery terminals. Adjust the prods to suit the battery to be tested and scrape the surface of the battery terminals for good contact. Press the tester firmly onto the battery with one prod on a negative, and one prod on a positive terminal of a cell. Be sure that the load switch is screwed down tight. Screw this switch up when it is desired to take an open circuit reading of the battery cell. The condition of the cell will be indicated by the meter attached to the instrument.

h. LOW-VOLTAGE CIRCUIT TESTER. This is a self-contained instrument mounted in a metal box. This instrument is intended for testing the battery-charging circuit, including any current and voltage regulators, cut-out settings, and charging generator performance. The tester operates on the power generated into the battery system and will operate on either 6- or 12-volt systems. Complete operating instructions are given on a plate attached to the cover of the instrument.

55. Improvised Test Equipment

a. EQUIPMENT FOR TESTING GENERATORS. A simple test equipment for testing for open circuits, grounds, and short circuits may be improvised by the use of a storage battery, two test leads with prods, and a lamp socket and lamp inserted in series with one of the test leads. Figure 35 illustrates this equipment being used in checking a commutator. This test will determine whether or not there is an open armature winding. The same test may be used in checking field windings by placing one test prod on the collector rings and touching the other prod to the generator frame. Stator windings may be checked for open circuits by the use of the same equipment.

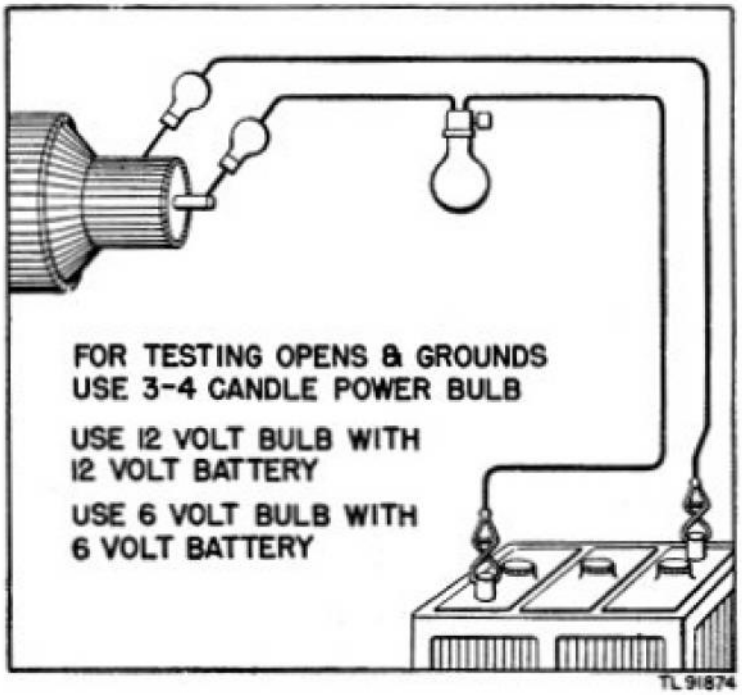


Figure 35. Checking commutator.

b. TESTING WINDINGS. (1) *General.* Most of the following testing instructions may be accomplished without disassembling the generator. In each instance where an exciter armature winding or an alternator field winding test open-circuited, short-circuited, or grounded check to see if the trouble is in the leads outside of the winding proper, and if not, report the trouble to the proper authority. These tests require a 6- or 12-volt battery, a 3- to 4-candle power, 6- or 12-volt lamp, two test leads with prods and a lamp socket in series, with one test lead as illustrated in figure 33. Before starting the tests, remove the cover from the exciter, lift all brushes high in their holders, and set the ends of the springs against them, so that the brushes will be held up. Disconnect the four stator winding cables from posts No. 4, 5, 7, and 8 of the a-c terminal block and the large exciter cable from the right-hand terminal of the solenoid starting switch. See the wiring diagram (figs. 30 and 31). Tag the cables in order to avoid error in replacing them. In using the test prods, make sure that good electrical connection is made at points of contact.

(2) *Testing stator windings for grounds.* Touch one test prod to the stator frame. Touch the other prod to cable terminal No. 4. If the lamp lights, that stator winding is grounded. Touch one prod to the frame and the other prod to terminal No. 5. If the lamp lights, that stator winding is grounded. Inspect the cables throughout their lengths, since it is possible that the ground may be in the cable instead of the winding. If so, tape the defective section of the cable with several layers of half-lapped rubber tape, followed by two layers of friction tape. If the ground is in the winding proper, notify the proper authority.

(3) *Testing stator windings for open-circuit.* Touch one test prod to cable terminal No. 5 and the other prod to terminal No. 7. If the lamp does not light, that winding is open-circuited. Repeat the test, sticking the prods through the cable insulation and into the copper of the cables near the two terminals. Do not touch the terminals. If the circuit does not test open on this test, but tests open when contact is made at the terminals, it indicates that a terminal is loose on its cable. Sweat it on securely with solder. Test the other stator windings similarly by touching the test prods to cable terminals No. 4 and No. 8.

(4) *Testing stator windings for short-circuit.* Touch one test prod to terminal No. 4 and the other to terminal No. 5. If the lamp lights, the two windings are shorted together. Connect terminal No. 4 to No. 5. Connect terminal No. 7 to one terminal of the battery. If there is a large flash or spark, both windings are short-circuited and, the No. 8 terminal should not be held in contact with the battery terminal. If there is only a small flash or spark, connect No. 8 terminal with the battery. Then, with a good d-c voltmeter, capable of registering with reasonable accuracy voltages from 0 to 8 volts, take voltage readings between terminals No. 4 and No. 8. Both readings should be almost exactly the same, one-half the battery voltage. If one reading is much higher than the other, the winding with the low reading is short-circuited. If tests indicate a short-circuit, inspect the cables throughout their lengths. If damaged cable insulation is found, wrap the damaged sections with several layers of half-lapped rubber tape and then two layers of friction tape. If the short-circuit is in the winding proper, notify the proper authority.

(5) *Testing alternator field winding for open-circuit.* Touch one test prod to each collector ring. If the lamp does not light, the field circuit is open-circuited.

(6) *Testing alternator field winding for short-circuit.* If a considerable number of turns in one coil are short-circuited, that coil will run cooler than other coils that are in good condition. Grounds at two points in the winding would short-circuit the intervening portion and the winding would test grounded.

(7) *Testing rotor windings for grounds.* Touch one test prod to the rotor shaft and the other prod to the collector ring. If the lamp lights, the alternator field winding is grounded. Touch one test prod to the rotor shaft and the other prod to the exciter commutator. If the lamp lights, the exciter armature winding or the commutator is grounded.

(8) *Testing exciter field windings for grounds.* Disconnect the shunt field lead near the upper left exciter brush holder and the series field lead near the lower left brush holder. Disconnect the heavy exciter lead from the right-hand terminal of the solenoid starting switch. Touch one test prod to the exciter frame and the other test prod to any of the field leads. If the lamp lights, the winding is grounded. Inspect the leads. If the ground is in a lead, tape the defective section with several layers of half-lapped rubber tape, then with two layers of friction tape. If the ground is in the winding proper, notify the person in authority.

(9) *Other tests.* The same equipment may be used for many other tests for grounds, open circuits, or short circuits elsewhere on the power unit. When the lamp lights, obviously the circuit between the prods is complete and *vice versa.*

Section XIII. TROUBLE-SHOOTING PROCEDURES

56. General Trouble-shooting Information

Regardless of how carefully equipment is designed, manufactured, and maintained, faults will occur in service. The repairman must locate and correct these faults as rapidly as possible. The material supplied in this manual will

aid in the rapid location of such faults. Consult the following data when necessary:

a. Engine and generator trouble charts.

b. Wiring diagrams.

c. Illustrations of components and cross-section views.

57. Sequence of Trouble-shooting Procedures

The trouble charts which follow indicate various trouble symptoms which are readily detected. When the nature of the trouble has been determined, check the various points under the heading "Possible cause." Apparent major troubles may often be reduced to minor troubles by checking the items in the prescribed order.

58. Engine Trouble Chart

Symptom	*Possible cause*	*Remedy*
a. ELECTRIC STARTER FAILS TO FUNCTION.	Battery not fully charged.	Recharge battery or replace with one fully charged.
	Battery terminals loose or corroded.	Clean and tighten battery connections.
	Faulty connection in starting circuit.	Check all connections and connecting wires. Tighten connections; replace defective wires.
	Worn or dirty commutator or brushes in starting motor.	Inspect commutator and brushes. Clean commutaton and/or replace brushes.
	Bendix drive gear jammed.	Rock crankshaft with hand crank or loosen starting motor and free Bendix gear.
	Note. Item above applies to Power Unit PE-95-F only.	
	Defective starter switch.	Place jumper across switch terminals. If starter functions, replace switch.
	Defective starter solenoid.	Place jumper between battery and starting motor connection on magnetic switch. If starter functions, replace solenoid.
	Defective starting motor.	Replace starting motor.
	Note. Item above applies to Power Unit PE-95-F only.	
b. STARTER FUNCTIONS BUT ENGINE WILL NOT START.	Ignition switch in OFF position.	Place switch in correct position.
(1) *No spark at plugs.*	Ignition switch shorted.	Disconnect switch. Replace switch if defective.
	Note. Item above applies to Power Unit PE-95-(1) only.	

Symptom	*Possible cause*	*Remedy*
	Battery not strong enough to supply both starting current and ignition.	Check battery. Replace with fully charged battery.
	High-water-temperature switch closed.	Check engine temperature.
	Low oil supply in crankcase.	Replenish oil supply.
	Low-oil-pressure switch stuck.	Disconnect switch. Replace switch if defective.
	Ignition breaker points burned or pitted.	Clean and adjust breaker points. Replace if necessary.
	Ignition breaker points out of adjustment.	Adjust breaker points.
	Defective capacitor in magneto or distributor.	Replace capacitor.
	Defective magneto.	Replace magneto and retime ignition.
	Note. Item above applies to Power Unit PE–95–(1) only.	
	Defective spark coil.	Test spark coil. Replace if defective.
	Broken or shorted ignition wire.	Check all ignition wires. Repair or replace faulty wires.
2) *Spark at Spark Plug.*	Fuel tank empty.	Fill fuel tank.
	Fuel valve closed or in wrong position.	Correct position of fuel valve.
	Fuel tank air vent clogged.	Clean air vent.
	Foreign matter in fuel.	Check fuel strainer bowl for foreign matter. Drain tank and refill with clear fuel.
	Engine flooded from excessive use of choke.	Hold choke open and crank engine.
	Fuel strainer clogged.	Clean fuel strainer. Check fuel in tank for foreign matter.
	Defective fuel pump.	Check fuel pump. Replace if defective.

Symptom	*Possible cause*	*Remedy*
	Broken fuel line.	Repair or replace fuel line.
	Carburetor clogged or defective.	Clean or replace carburetor.
	Intake manifold leak.	Check manifold for tightness. Check gaskets. Tighten manifold. Replace gaskets if necessary.
c. ENGINE STARTS BUT MISFIRES.	Spark plug fouled.	Test spark plugs. Clean or replace faulty plugs.
	Loose or broken wire in ignition system.	Inspect ignition wiring. Tighten or replace faulty wires.
	Spark plug gap too wide.	Check and correct spark plug gaps.
	Ignition breaker points out of adjustment.	Check and correct adjustment.
	Ignition breaker points burned or pitted.	Clean and adjust or replace breaker points.
	Capacitor in magneto or distributor defective.	Replace capacitor.
	Defective insulation in high-tension system.	Check high-tension wires, distributor cap, etc., for leaks. Replace defective parts.
	Valves not seating properly.	Check valve action and tappet adjustment. Look for broken springs, and bent valve stems. Make necessary adjustments or replacements.
d. ENGINE STARTS BUT RUNS UNEVENLY.	Loose cylinder head or defective cylinder head gasket.	Tighten cylinder head or replace gasket.
	Leaking intake manifold.	Check for leaks at manifold. Tighten manifold and replace gaskets if necessary.
	Faulty carburetor mixture.	Check carburetor for overflow. Replace carburetor.
	Carburetor air cleaner obstructed.	Clean air cleaner.

Symptom	*Possible cause*	*Remedy*
	Faulty governor action or adjustment.	Check governor action. Readjust governor. Replace governor if necessary.
e. ENGINE LACKS COMPRESSION.	Incorrect valve tappet adjustment.	Check tappet adjustment. Readjust tappets.
	Valve stems or tappets sticking.	Inspect valve action. Service or replace faulty parts.
	Valves in need of grinding.	Grind valves.
	Valve stems or valve guides worn.	Check valve guides. Replace worn parts.
	Valve springs weak or broken.	Inspect valve springs. Replace faulty parts.
	Cylinder head loose or gasket defective.	Tighten head or replace gasket.
	Piston rings worn or broken.	Check compression (par. 53*d*).
	Pistons and/or cylinders worn.	Check compression (par. 53*d*).
f. ENGINE LACKS POWER.	Generator overloaded.	Check load.
	Carburetor mixture faulty.	Check carburetor for overflow. Replace carburetor.
	Choke not opening properly.	Check choke action. Replace choke.
	One or more spark plugs fouled or not properly adjusted.	Inspect spark plugs. Clean and adjust or replace plugs.
	Ignition breaker points out of adjustment.	Inspect and adjust breaker points.
	Carburetor air intake obstructed.	Clean air cleaner.
	Engine overheated due to obstructed air passages.	Clean radiator air passages.
	Engine overheated due to lack of water in cooling system.	Fill radiator.
	Engine overheated due to slipping pump and fan belt.	Adjust belt. Replace if necessary.

Symptom	*Possible cause*	*Remedy*
	Engine overheated due to lack of ventilation in engine room or shelter.	Provide more ventilation.
	Engine overheated due to overload on generator.	Check and correct load.
	Engine overheated due to faulty thermostat.	Replace thermostat.
	Engine not up to operating temperature.	Check thermostat.
	Faulty lubrication.	Check crankcase oil. Use oil specified on lubrication order.
	Exhaust obstructed.	Check exhaust system. Clean as indicated.
g. EXCESSIVE OIL CONSUMPTION.	Using too light oil.	Follow lubrication order.
	Leaking oil lines.	Check for leaks and repair as indicated.
	Leaks at valve cover or crankcase.	Tighten or replace gaskets when necessary.
	Piston rings worn, broken, or stuck.	Check compression (par. 53*d*).
	Worn cylinders or pistons.	Check compression (par. 53*d*).
	Worn oil seals.	Check for leaks and replace seals where necessary.
	Worn bearings.	Check bearings. Replace bearings where necessary.
h. LOW OIL PRESSURE. (CHECK CONDITIONS IN *g* (ABOVE).)	Oil-pump screen clogged.	Clean oil-pump screen.
	Oil too light or badly diluted.	Check oil in crankcase. Follow lubrication order.
	Defective oil-pressure gauge.	Test with gauge known to be accurate. Replace gauge if faulty.

Symptom	*Possible cause*	*Remedy*
i. ENGINE KNOCKS.	Excessive carbon or lead deposits in combustion chamber.	Remove cylinder head and clean combustion chamber.
	Loose bearing.	Rock against compression with hand crank and feel for bearing play. Replace faulty bearing.
	Engine overheated.	Check remedies in subpar. f above.
	Worn pistons or cylinders.	Check compression (par. 53 *d*).
	Loose flywheel.	Rock with hand crank and feel for play. Report to proper authority.
	Loose generator coupling.	Report to proper authority.
	Low octane fuel.	Use fuel with higher octane rating if obtainable.
	Engine missing.	See *c* above.
j. EXPLOSIONS IN CARBURETOR.	Engine cold.	Cover radiator and run with hand choke part way out until engine heats up.
	Carburetor clogged.	Replace carburetor.
	Intake valve or tappet sticking.	Check valve action. Service or replace faulty parts.
	Weak or broken intake valve springs.	Inspect intake valve springs. Replace faulty parts.
	Intake valve burned, warped, or broken.	Inspect valve. Replace faulty parts.
	Intake valve tappets set too close.	Check intake valve tappet adjustment. Readjust tappet.
	Leak in intake manifold.	Check manifold and gaskets for leaks. Replace faulty parts.
	Improper timing.	Check timing.
k. ENGINE STOPS UNEXPECTEDLY.	Fuel tank empty.	Fill tank.

Symptom	*Possible cause*	*Remedy*
	Fuel line obstructed.	Clean fuel line and drain and refill fuel tank. Clean fuel strainer.
	Engine overheated.	Locate and correct cause.
	Broken ignition wire.	Inspect ignition wiring. Correct fault.
	Lack of oil.	Check oil. Refill crankcase.

59. Generator Trouble Chart

a. NO GENERATOR OUTPUT.	Circuit breaker open.	Close circuit breaker.
	Lack of excitation.	Inspect exciter brushes and commutator. Clean commutator; replace brushes.
	Open circuit, short circuit, or ground in generator.	See paragraph 54.
	Brushes not seating properly.	Check alternator brushes and slip rings. Clean slip rings; replace brushes.
	Broken wire.	Check for broken wire. Repair or replace faulty wire.
	Defective voltmeter.	Try meter known to be satisfactory. Replace defective meter.
	Defective voltage regulator.	Switch to manual control. Replace regulator if defective.

Note. Item above applies only to Power Unit PE–95–F.

b. VOLTAGE OUTPUT UNSTEADY.	Poor commutation or poor brush contact at slip rings.	Check commutator and slip rings. Check brushes. Clean commutator and slip rings; replace brushes.
	Fluctuating load.	Check load. Some fluctuating loads, such as a motor driving a single-action recoprocating pump, are normal conditions. Correct abnormal conditions.
	Loose connections. (Especially in exciter circuits.)	Check and tighten connections.

Symptom	*Possible cause*	*Remedy*
c. GENERATOR OVERHEATING.	Excessive load.	Check and correct load.
	Generator air passages obstructed.	Blow out air passages with air hose.
	Defective generator winding.	Check generator windings (par. 54).
	Lack of ventilation around unit.	Provide better ventilation.
	Faulty lubrication.	Check lubrication.
d. EXCESSIVE VOLTAGE DROP UNDER HEAVY LOAD.	See engine trouble chart for lack of engine power (par. 58*f*).	
e. CIRCUIT BREAKER TRIPS.	Load too great.	Check and correct load.
	Short circuit in load line.	Check load lines and remove short.
f. GENERATOR FREQUENCY TOO HIGH OR LOW.	Engine not operating at proper speed.	Check engine speed. Adjust engine governor.

Section XIV. DISASSEMBLY AND REPAIR

60. Governor

a. GENERAL. Low generator output may be due to low engine speed. On Power Units PE–95–(1) and PE–95–F which are not provided with a frequency meter, check the speed of the unit with a tachometer. On Power Units PE–95–(2), the frequency meter may be used as an indicator for engine speed. On Power Units PE–95–(1) and PE–95–F, a tachometer reading of 1,200 rpm is required. On Power Units PE–95–(2) a frequency reading of 59 to 61 cycles is required.

b. GOVERNOR ADJUSTMENT (PE–95–(1). If there is only a slight deviation from the correct engine speed, adjust screw C. Turning this screw clockwise will decrease the engine speed, while turning it counterclockwise, will increase the engine speed (fig. 36).

If the governor has been disconnected from the carburetor or the unit has a tendency to surge under load, adjust the governor as follows:

(1) With the spring A exerting pressure on the governor arm 9 through the screw D, adjust the length of the throttle rod so that the throttle lever clears the wide-open stop by 1/64 inch.

(2) Screw the bumper screw B out far enough so that it does not function.

(3) With the bumper screw B screwed out, adjust the screw C as explained above.

(4) If the unit has a tendency to surge under load, turn screw D out a few turns at a time, until the surging stops. The spring must be disconnected and reconnected each time the adjustment is made. Keep this screw turned in as far as possible without surging.

(5) If the unit surges without load, screw the bumper screw B in until the surging stops and set the locknut. Do not turn this screw in far enough to increase the speed of the unit.

c. GOVERNOR ADJUSTMENT (POWER UNIT PE–95–F AND PE–95–(2). The governors on Power Units PE–95–(2) and PE–95–F are belt-driven and therefore, maintain the drive belt at proper tension for the governor to function properly. Keep the belt tight enough so that it

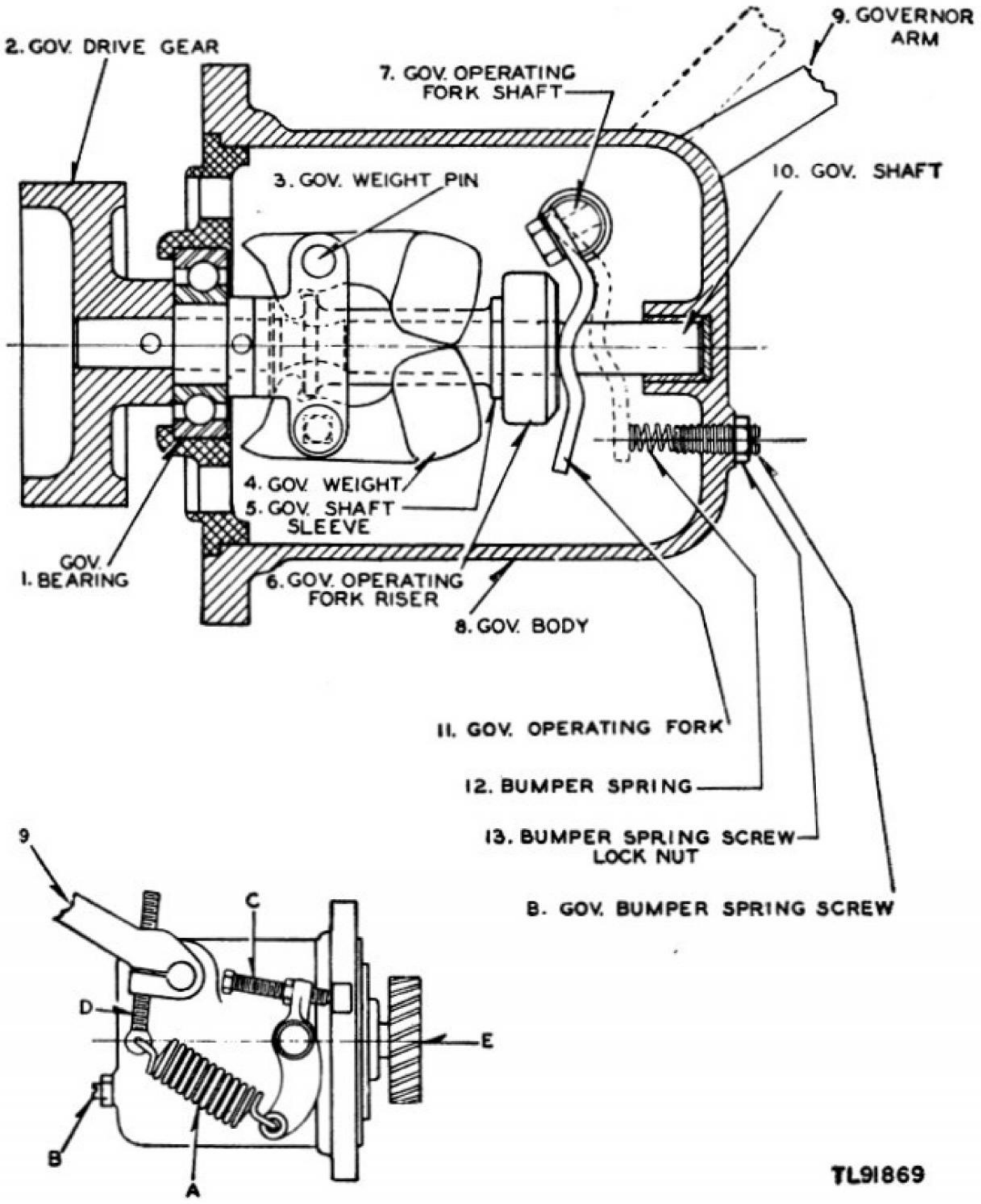


Figure 36. Power Unit PE-95-(1), governor.

can be depressed about 1 inch when pressure is applied midway between the pulleys. If it is necessary to adjust the governor, have the unit at normal operating temperature and proceed as follows (fig. 37):

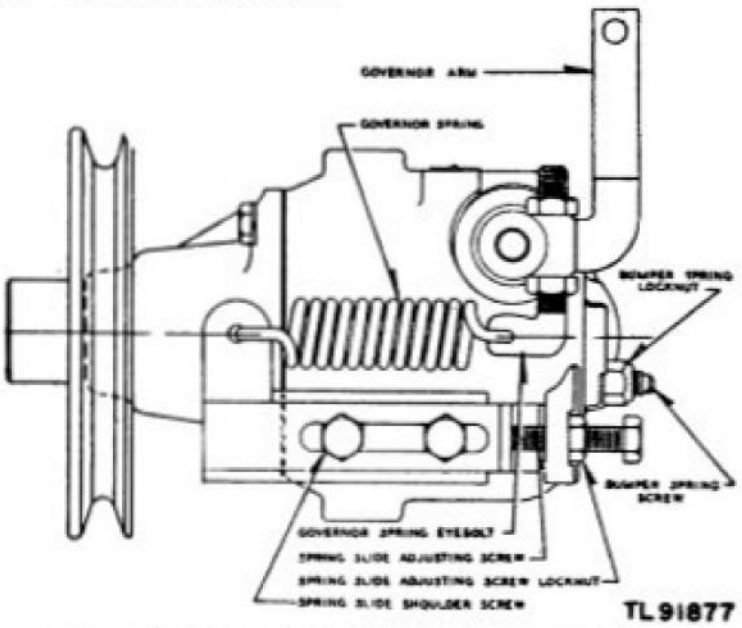


Figure 37. Power Unit PE-95-(2) and PE-95-F, governor.

(1) With spring tension on the governor spring, adjust the length of the throttle rod so that the throttle lever is 1/64 inch from the wide-open stop.

(2) Loosen the bumper-spring-screw locknut and turn the bumper-spring screw out far enough to prevent its functioning. Loosen the spring-slide shoulder screws so that the slide can be moved endwise. Start the engine and loosen the spring-slide adjusting screw locknut. Turn the screw in order to obtain the correct engine speed. (This will be indicated by correct frequency on the frequency meter on Power Unit PE-95-(2).) Watch the frequency meter while making this adjustment. At no load, the frequency should not exceed 63 cycles and the no-load voltage should not be over 126- or 252-volts, depending on the position of the a-c terminal jumpers.

(3) If the unit surges under full or part load, adjust the governor spring eyebolt downward until the surging stops. Keep the governor spring eyebolt as high as possible without causing surging. Readjust the springslide adjusting screw whenever the eyebolt adjustment is changed.

(4) If the unit surges at no load, turn the bumper screw in until the surging stops. Do not turn the bumper screw far enough to cause an increase in engine speed. Be sure that all locknuts and screws have been tightened when the adustment is finished.

d. OVERSPEED GOVERNOR. Power Units PE-95-(2) and PE-95-F are equipped with an overspeed governor to prevent overspeeding in the event of breakage of the governor drive belt, or failure of the governor from some other cause. This governor should be adjusted to a speed of approximately 1,400 rpm for Power Unit PE-95-F and 2,000 rpm for Power Units PE-95-(2). A single screw is provided for this adjustment. Turning this screw out, or in a counterclockwise direction, will increase the engine speed; while turning it in or clockwise will decrease the engine speed. When adjusting the overspeed governor, disconnect the governor link from the carburetor throttle and hold the throttle open manually. Reconnect the governor link to the throttle when the overspeed governor adjustment has been completed.

61. Carburetor

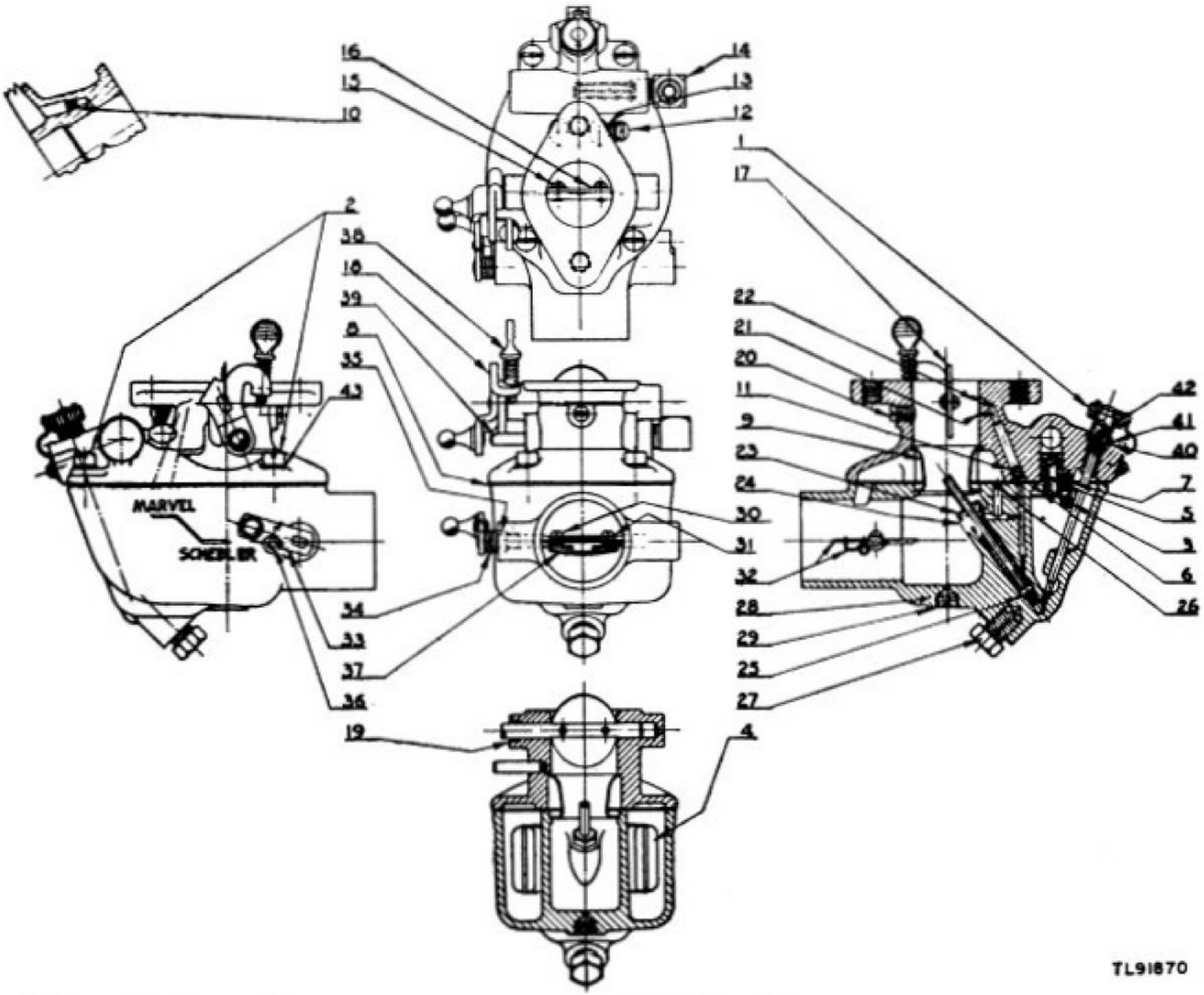
a. GENERAL. If it is determined that the carburetor is the cause of improper operation, replace the entire carburetor unit. Do not attempt to disassemble the carburetor in the field.

b. ADJUSTMENT OF POWER UNIT PE-95-(1). See figure 38 and adjust the carburetor as follows:

(1) Set the throttle-stop screw 38 so that the throttle is slightly open. Set the throttle control arm in about one-third open position. Pull out the manual choke and set the MANUAL START-REMOTE START switch in MANUAL START position. Crank the unit by hand and partially open the choke as soon as the engine starts. As the engine warms up, set the choke in wide-open position.

(2) With the governor disconnected from the throttle, set the throttle in idle position and adjust the throttle-stop screw 38 for correct idle speed. Turn the idle adjusting needle 12 in, or clockwise, until the engine starts to falter or roll from a too rich mixture. Now, turn the idle adjusting needle 12, counterclockwise until the engine runs smoothly. Turn this screw very slightly beyond this point and reconnect the governor to the carburetor.

(3) Place a load on the unit and turn the power adjusting needle 1 in, or clockwise, until the engine shows a drop in power. Turn this needle in the opposite direction (counter-



1. Power adjusting needle.
2. Bowl-cover screws.
3. Float-lever shaft.
4. Float and lever assembly.
5. Float valve.
6. Float-valve seat.
7. Float-valve seat gasket.
8. Bowl-cover gasket.
9. Venturi.
10. Economizer jet.
11. Idle jet.
12. Idle-adjusting needle.
13. Idle-adjusting needle spring.
14. Inlet elbow and screen assembly.
15. Throttle-fly screws.
16. Throttle-fly screw lockwashers.
17. Throttle-fly.
18. Throttle-shaft and lever assembly.
19. Throttle-shaft packing.
20. Idle inspection hole plug.
21. Second idle hole.
22. First idle hole.
23. Main nozzle.
24. Main nozzle gasket.
25. Maximum fuel limiting jo
26. Main nozzle air vent cap.
27. Bowl drain plug.
28. Dust strainer.
29. Dust-strainer retainer plug.
30. Choker-fly screws.
31. Choker-fly screw lockwashers.
32. Choker-fly assembly.
33. Choker shaft and lever assembly.
34. Choker-return spring.
35. Choker-shaft packing.
36. Choker-stop pin.
37. Choke-poppet valve spring.
38. Throttle stop screw.
39. Throttle stop pin.
40. Power adjusting needle gasket.
41. Power adjusting needle washer.
42. Power adjusting needle spring.
43. Cover-screw lockwashers.

Figure 38. Power Unit PE–95–(1), carburetor.

clockwise) until the engine picks up power and runs smoothly. If the engine shows a tendency to backfire when picking up a load, open the power adjusting needle a little at a time until this condition is remedied.

c. ADJUSTMENT OF POWER UNITS PE–95–(2) AND PE–95–F. On Power Units PE–95–(2) and PE–95–F, do not attempt adjustment of the carburetor unless it has been definitely determined that the carburetor is at fault. The carburetor used on these units is of the fixed-jet type and the idle adjustment is the only adjustment possible. The correct setting for this adjustment is between one half and one and one half turns open. Readjust this adjustment after the engine has reached operating temperature to the best operating position. If it is suspected that there is internal trouble in the carburetor, remove it and replace it with a complete new unit. Be sure to replace all gaskets and check for leaks when the carburetor is reinstalled on the engine.

62. Automatic Choke

Check the magnetic action of the automatic choke by holding a screwdriver blade or other steel object near the choke housing while pressing and releasing the starter button. If the magnetic action of the choke is satisfactory, the metal object will be drawn to the choke when the start button is pressed, and released, when the start button is released. The only adjustment that might be necessary to the choke is the linkage between the choke and the carburetor choke arm. Adjust this arm so that the range is from full-open to full-closed position. If the choke appears defective, replace the entire choke unit.

63. Magneto and Distributor

a. GENERAL. Ignition on Power Units PE–95–(1) is furnished by a high-tension magneto, while on Power Units PE–95–(2) and PE–95–F it is furnished by a battery, coil, and distributor. Both of these units have a breaker which consists of one stationary and one moving contact. The ignition breaker contacts eventually become pitted and must be cleaned or replaced. If not too badly pitted, the contacts may be cleaned with the ignition file which is contained in the tool box. The contact surfaces should be slightly convex (almost flat) and must make good electrical contact. A disassembled view of the magneto used on Power Units PE–95–(1) is shown in figure 41. Figure 42 is a cross-section of the distributor unit used on Power Units PE–95–(2) and PE–95–F.

b. SERVICING MAGNETO OF POWER UNIT PE–95–(1). When it becomes necessary to inspect

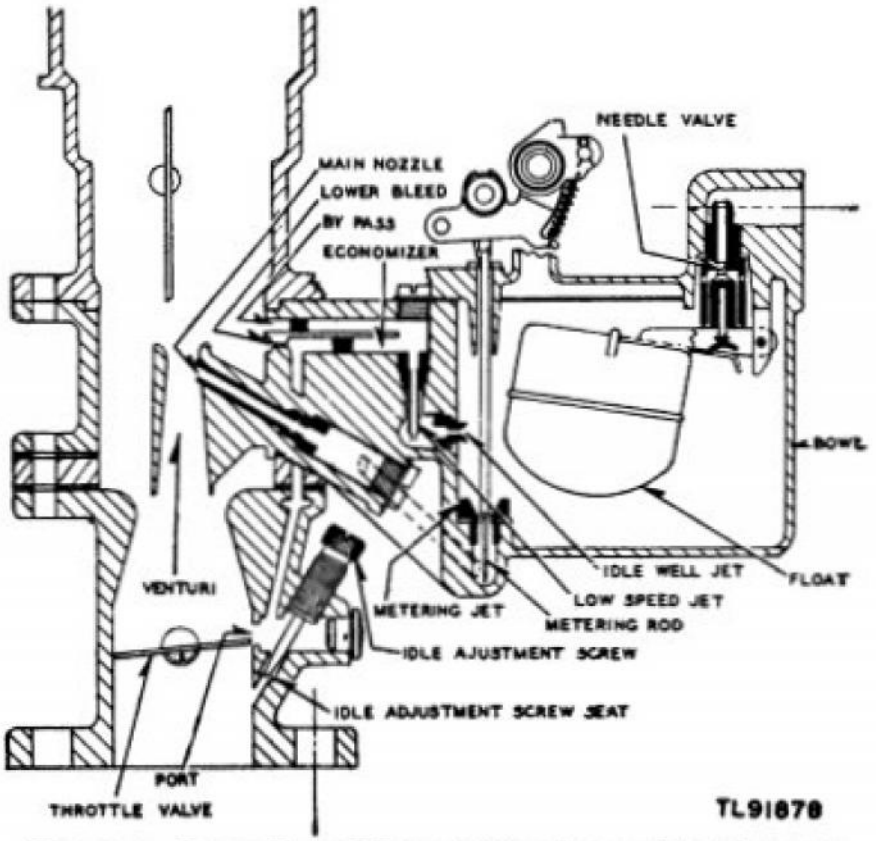
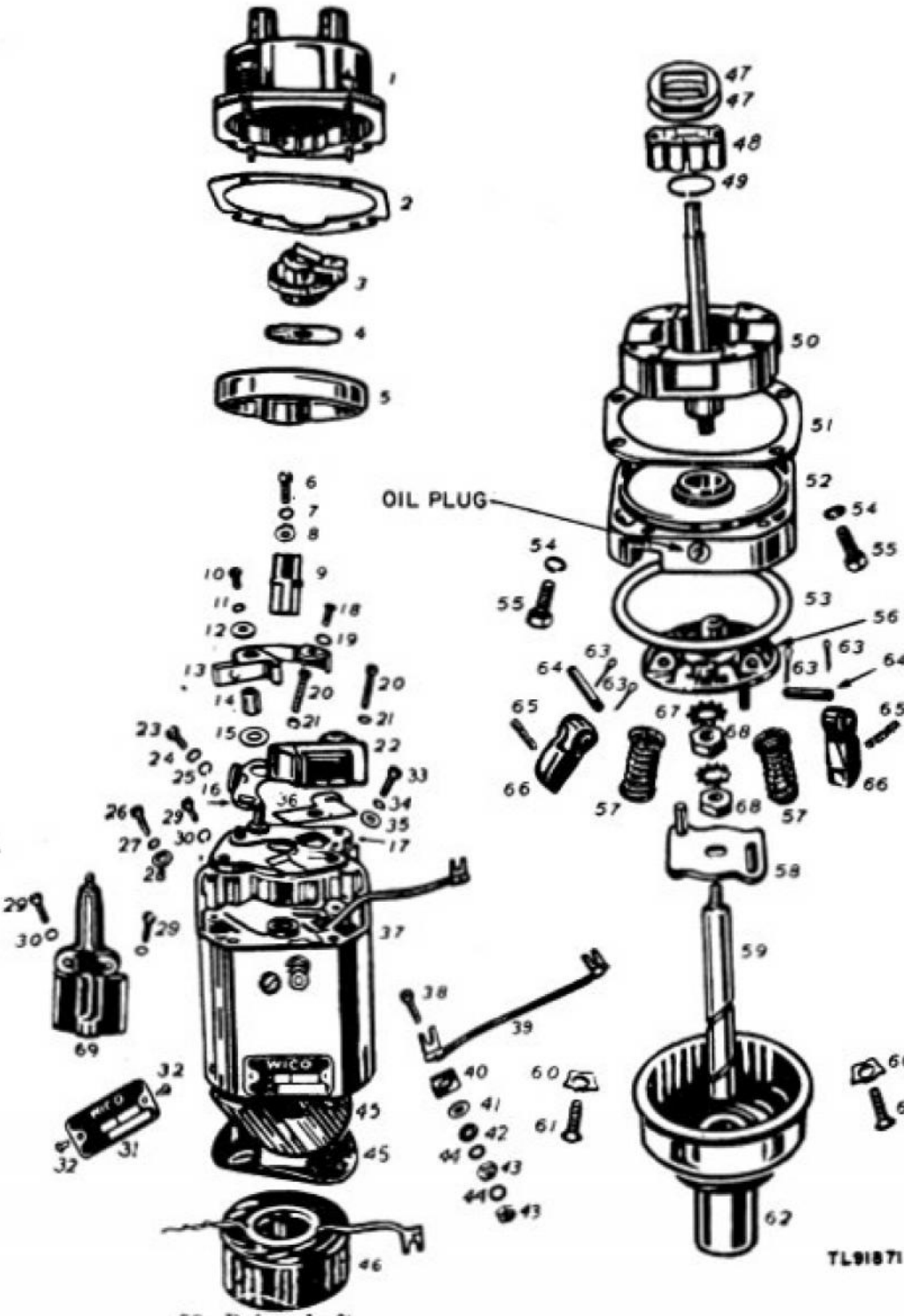


Figure 39. Power Units PE–95–(2) and PE–95–F, carburetor.

ne breaker points, to clean, or to replace them, roceed as follows:

(1) Remove the four screws that hold the istributor cap in place and remove the distributor cap. Lift off the rotor.

(2) Insert two screw drivers, 180° apart, under the edge of the breaker cover and pry it off.



1. Distributor-cap assembly.
2. Distributor-cap gasket.
3. Distributor-rotor arm.
4. Breaker-cover sealing felt.
5. Breaker cover.
6. Breaker-cam screw.
7. Breaker-cam screw lockwasher.
8. Breaker-cam screw lock plate.
9. Breaker cam.
10. Breaker-arm clamp screw.
11. Breaker-arm clamp screw lockwasher.
12. Breaker-arm clamp screw washer.
13. Breaker arm.
14. Breaker arm spacer.
15. Breaker-arm spacer washer.
16. Fixed contact.
17. Breaker plate.
18. Breaker-arm spring screw.
19. Breaker-arm spring screw lockwasher.
20. Capacitor screw.
21. Capacitor-screw lockwasher.
22. Capacitor.
23. Fixed contact.
24. Fixed contact screw lockwasher.
25. Fixed contact screw washer.
26. Breaker assembly screw.
27. Breaker assembly screw lockwasher.
28. Breaker assembly clamp washer.
29. Secondary pencil screw.
30. Secondary pencil screw lockwasher plate.
31. Breaker assembly screw.
32. Breaker assembly screw lockwasher.
33. Breaker assembly clamp washer.
34. Capacitor case gasket.
35. Main housing.
36. Ground stud.
37. Ground-stud lead group.
38. Ground-stud lock.
39. Ground-stud insulating washer.
40. Ground-stud washer.
41. Ground-stud nut.
42. Ground-stud nut lockwasher.
43. Coil shield.
44. Coil.
45. Inner-core spring washer.
46. Inner-core group.
47. Inner-core snap ring.
48. Magnetic rotor.
49. Bearing-plate gasket.
50. Bearing-plate group.
51. End plate gasket.
52. Bearing-plate clamp screw washer.
53. Bearing-plate clamp screw.
54. Support-plate group.
55. Impulse-spring group.
56. Cam-plate group.
57. Drive shaft.
58. End-plate screw clamp lockwasher.
59. End-plate clamp screw.
60. End-plate group.
61. Trip-arm pivot cotter pin.
62. Trip-arm pivot.
63. Trip-arm spring.
64. Trip arm.
65. Shakeproof lockwasher.
66. Nut.
67. Secondary pencil.

Figure 40. Power Units PE-95-(1), magneto, disassembled.

(3) The breaker contacts will now be exosed to view and may be cleaned and adjusted.

(4) When adjusting the breaker contacts, otate the engine crankshaft until the breaker oints are at their widest separation. Loosen he fixed-contact screw and turn the eccentric crew until the correct gap is reached (0.015 nch). Be sure to tighten the locking screw fter the correct adjustment has been made.

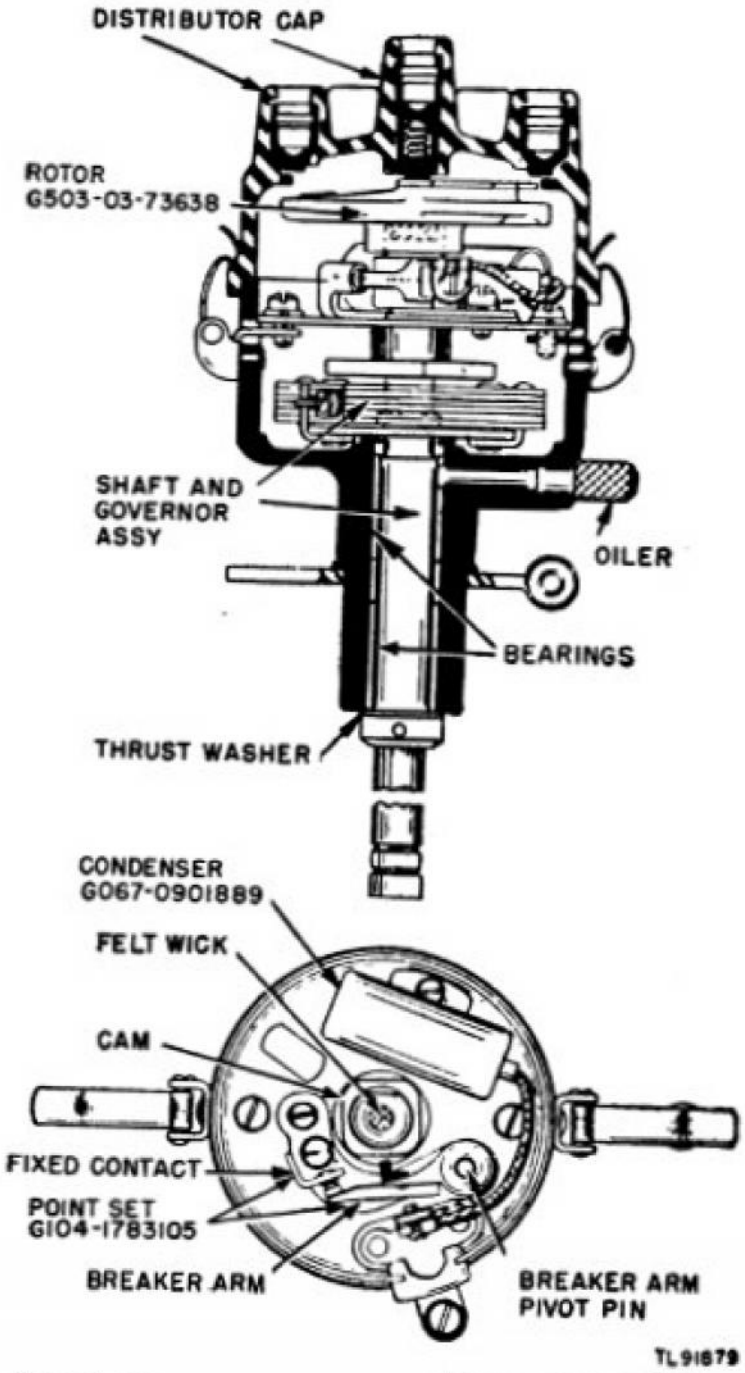
(5) If it is necessary to replace the breaker ontacts, remove the breaker-arm-spring screw 8 and lockwasher 19. Remove the breaker-rm-clamp screw 10, lockwasher 11 and washer 2. Pull the breaker arm from its pivot. Reove the breaker arm spacer 14 and washer 5. Remove the fixed-contact screw, lockasher 24 and washer 25, and pull off the fixed ontact 23. If the complete breaker assembly s to be replaced as a unit, disconnect the round and primary coil-leads from the reaker-spring screw. Remove the breaker asembly screws 26, lockwashers 27, and washers 8 and lift out the assembly.

(6) To replace the capacitor, remove the eads 39 from under the breaker-arm-clamp crew. Remove the capacitor screws 20 and ockwashers 21 and lift the capacitor from the reaker plate. When replacing the capacitor, be ure that the gasket 36 is in place.

(7) Reassemble all parts by reversing the rocedure used in disassembly. When replacing he distributor cap and rotor arm, first set the reaker-cover sealing felt 4 on the four prongs f the breaker cover. Line up the key inside of he breaker arm with the slot in the cam and ress the rotor arm down tight. Set the disibutor cap gasket 2 in place and replace the istributor cap. Fasten the distributor cap ith the four distributor-cap screws.

c. SERVICING DISTRIBUTOR FOR POWER UNITS E–95–(2) AND PE–95–F. Keep the distributor cap and distributor rotor clean. Inspect the ap and rotor carefully for cracks and badly urned contacts and for good contact between he spring-contact of the rotor and the center ontact of the distributor cap. Replace any arts that are in doubtful condition. Inspect he condition of the breaker points.

f they are slightly pitted, dress them with the gnition file contained in the tool kit and redjust them to their correct gap (0.020 inch). When adjusting the breaker-point gap, be sure hat the points are open to their widest separation. If the breaker points are badly burned or pitted, replace both points. A badly burned or pitted condition is usually an indication of a faulty capacitor and a new capacitor should be installed.



Name of part.	Ordnance stock number.
Condenser.	G067-0901889
Rotor.	G503-03-73638
Breaker arm and fixed contact.	G104-1783105

Figure 41. Power Unit PE–95–(2) and PE–95–F, ignition unit.

64. Valve Servicing

a. WHEN VALVES NEED GRINDING. (1) Lack of power in the engine may be caused by poor seating of the valves which allows the gases in the combustion chamber to escape into the intake or exhaust manifolds.

(2) By the use of the compression gauge, it can readily be determined which valves are not seating properly. Compression gauge readings should all be within 10 pounds of each other and not less than 70 pounds in Power Units PE-95-(1) and 100 pounds in Power Units PE-95-F and PE-95-(2).

(3) If no gauge is available, turn the engine with the hand crank and note whether the compression is uniformly good on all cylinders. Compression should throw the crank backward forcibly if allowed to do so when well up on the compression stroke. Compressed gases, leaking past an exhaust valve, cause a hissing noise at the exhaust outlet. If leaking past an intake valve, a hissing noise may be heard through the carburetor. Disconnect the air-cleaner horn at the carburetor and the exhaust line at the exhaust manifold, and while the engine is being cranked, listen for these sounds, if there is reason to suspect that the valves are leaking. Any valve leaks detected should be reported to the proper authority.

b. VALVE-TAPPET ADJUSTMENT. (1) The valve-tappet clearance on all Power Units PE-95-(*) should be checked with a feeler gauge. The clearance between the valve tappets and valve stem on Power Units PE-95-(1) should be 0.008 inch for the exhaust valves and 0.0125 inch for the intake valves. On Power Units PE-95-(2) and PE-95-F, both valves should be adjusted to a clearance of 0.014 inch. These clearances should be checked when the engine is cold (fig. 42).

(2) No provision is made for adjustment of the valve-tappet clearance on Power Units PE-95-(1) and when excessive or incorrect clearance is found it must be reported to higher authority.

(3) Power Units PE-95-(2) and PE-95-F are provided with adjustable valve tappets and any faulty adjustment should be corrected. All tools necessary for this operation are contained in the tool kit supplied with the equipment. Be sure, when making tappet adjustments, that the tappets are at their lowest point when the adjustment is being made.

65. Removing Cylinder Head

If it has been determined that the cylinder-head gasket is in need of replacement or that carbon removal from the combustion chamber is necessary, the cylinder head must be removed. Proceed as follows:

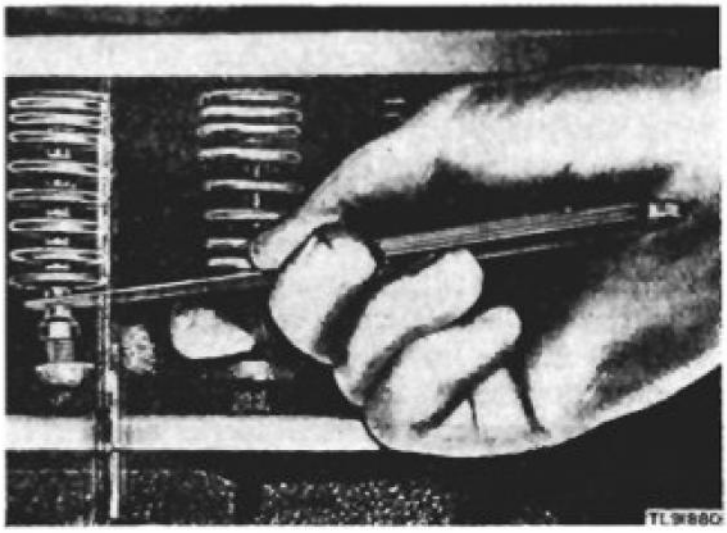


Figure 42. Checking valve tappets.

a. Remove the side and top panels of the engine housing.

b. Drain the cooling system.

c. Open the spark-plug shields and remove the spark plugs and shields from the engine.

d. Loosen the hose clamps on the upper radiator hose and remove the hose.

e. Remove all accessories attached to the cylinder head.

f. Remove the cylinder-head nuts and cap screws.

g. Lift the cylinder head from the cylinder block. If it is necessary to pry the head loose, be sure to distribute any prying pressure equally so as not to damage the cylinder head.

66. Carbon Removal

a. With the cylinder head removed, clean the carbon from the inside of the cylinder head, from the tops of the pistons, and from around the valves with a carbon scraping tool. Finish this operation with a wire brush. Have each piston at the top of its stroke when cleaning the carbon from the piston top. With a clean cloth, wipe any loose carbon particles from the inside of the cylinder.

b. Inspect the condition of both the intake and exhaust valves and their seats, while the cylinder head is removed. If the valves or valve seats appear in unsatisfactory condition, report it to the proper authority.

c. Before replacing the cylinder head, thoroughly clean the top of the cylinder block and the contact face of the cylinder head. Set the cylinder-head gasket in position and place the cylinder head on the cylinder block. Install the

cylinder-head nuts and cap screws, being sure to replace all lockwashers. Take up evenly on the cylinder-head fastenings (fig. 43).

d. Replace all accessories being sure that all gaskets and lockwashers are reinstalled. Make all necessary adjustments to any control linkage. Inspect the radiator hose before replacing it and be sure that it is in serviceable condition. Tighten the hose clamps securely. Make sure that all drains have been closed and refill the cooling system. Make sure that all spark plug wires are connected to their proper spark plugs and replace the spark-plug shields. The engine firing order on all Power Units PE–95–(*) is 1–3–4–2.

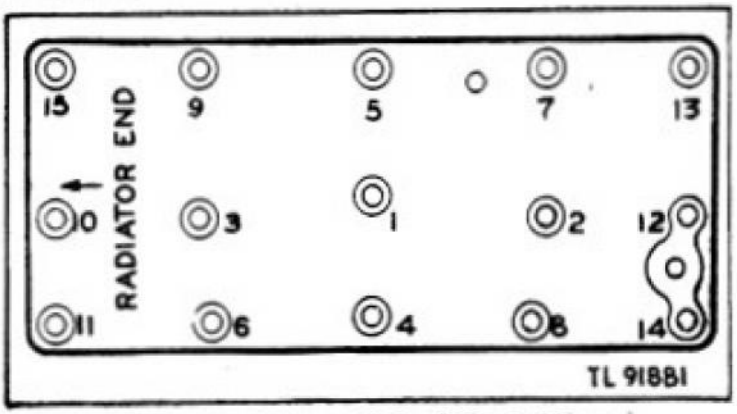


Figure 43. Power Units PE–95–(2) and PE–95–F, cylinder head tightening chart.

67. Generator Brushes

a. Blow all carbon dust and other accumulations of foreign matter from the brushes and brush rigging. If the brushes are very dirty, remove them and wipe them off with a cloth moistened with dry-cleaning solvent (SD). Be sure to replace the brushes in their original position.

b. If new brushes are installed, or the old brushes need fitting, proceed as follows:

(1) Cut a strip of #00 sandpaper slightly wider than the brush.

(2) Place the brush in its holder.

(3) Place the sandpaper under the brush with its sanded surface next to the brush.

(4) Pull the sandpaper in the direction of commutator rotation following the curvature of the commutator.

(5) Lift the brush clear of the sandpaper and return the sandpaper to its original position. Repeat this operation as often as necessary to obtain a satisfactory seat. Do this for all brushes.

68. Commutator and Collector Rings

a. While the brushes are removed, clean the commutator and collector rings. If they are slightly pitted, clean them with #00 sandpaper. Have the sanded surface of the sandpaper next to the commutator or collector rings and follow the same general procedure outlined for fitting brushes. Turn the rotor after every few strokes of the sandpaper to avoid low spots in the commutator or collector ring surfaces.

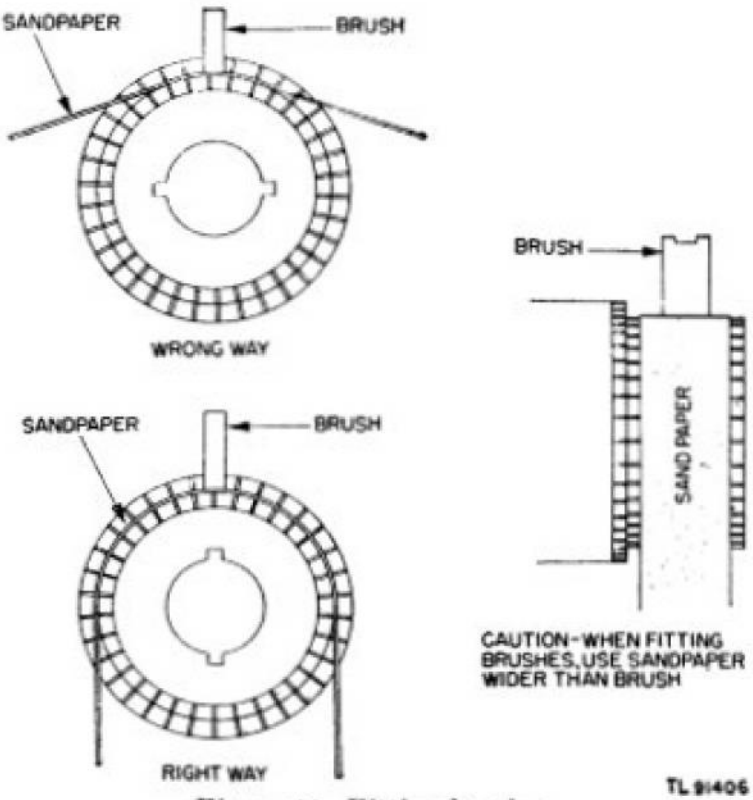


Figure 44. Fitting brushes.

b. If the commutator or collector rings are badly pitted or burned, the collector rings or commutator must be turned down in a lathe. This operation must not be attempted except by qualified personnel.

c. Inspect the commutator carefully. If one or more commutator bars are badly burned, or excessive flashing is noted when operating under load, it is an indication of an open circuit in the armature and the armature should be checked.

69. Checking Stator and Rotor Windings

a. Low output voltage, unless due to low engine speed, and poor voltage regulation, usually indicates an internal short in the armature. If this is the case, replace the armature.

b. Figure 35 illustrates the method of checking for open windings in the armature. The same test may be used for field windings by placing one test prod on the collector rings. Check stator windings for open circuits with the same equipment.

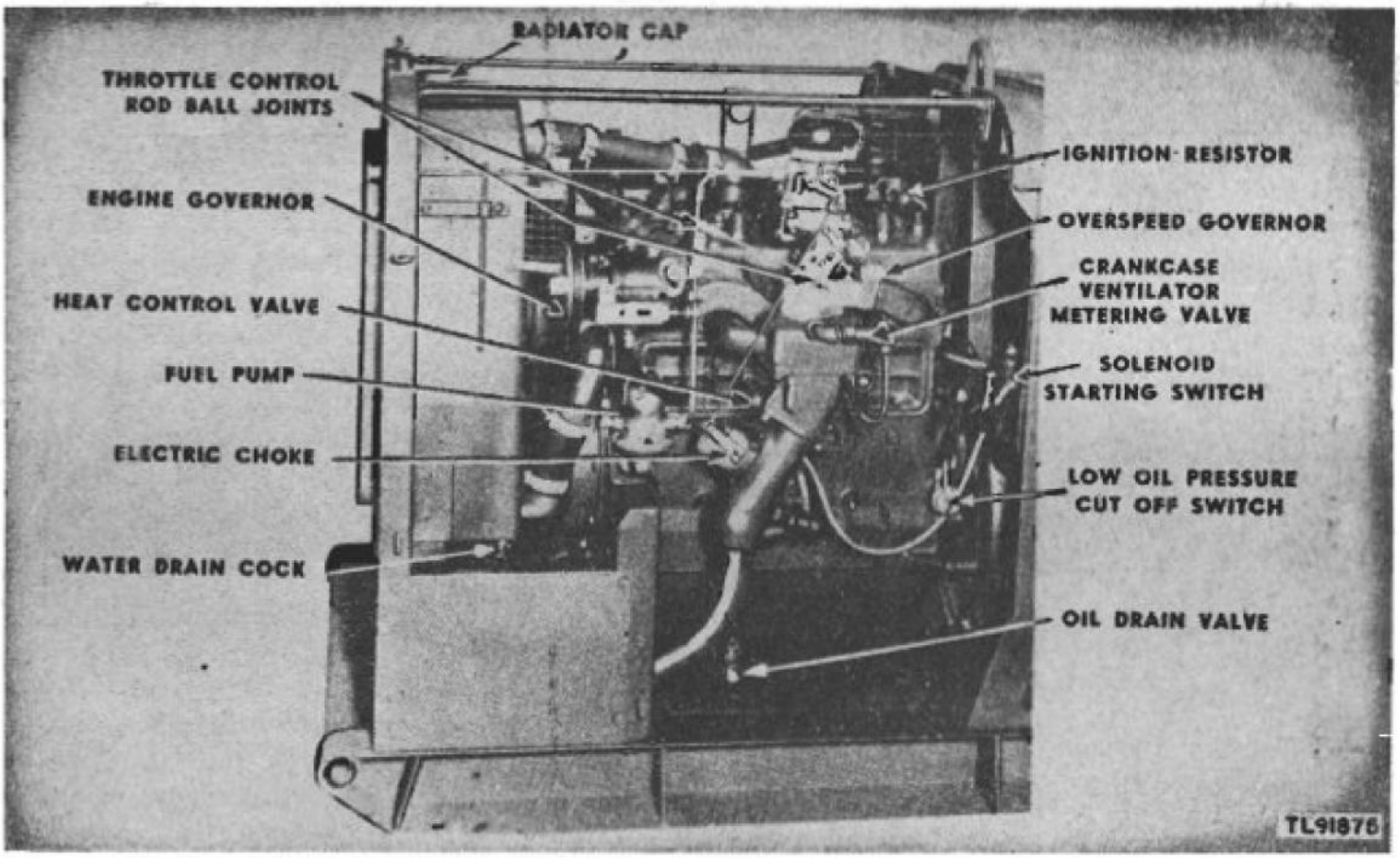
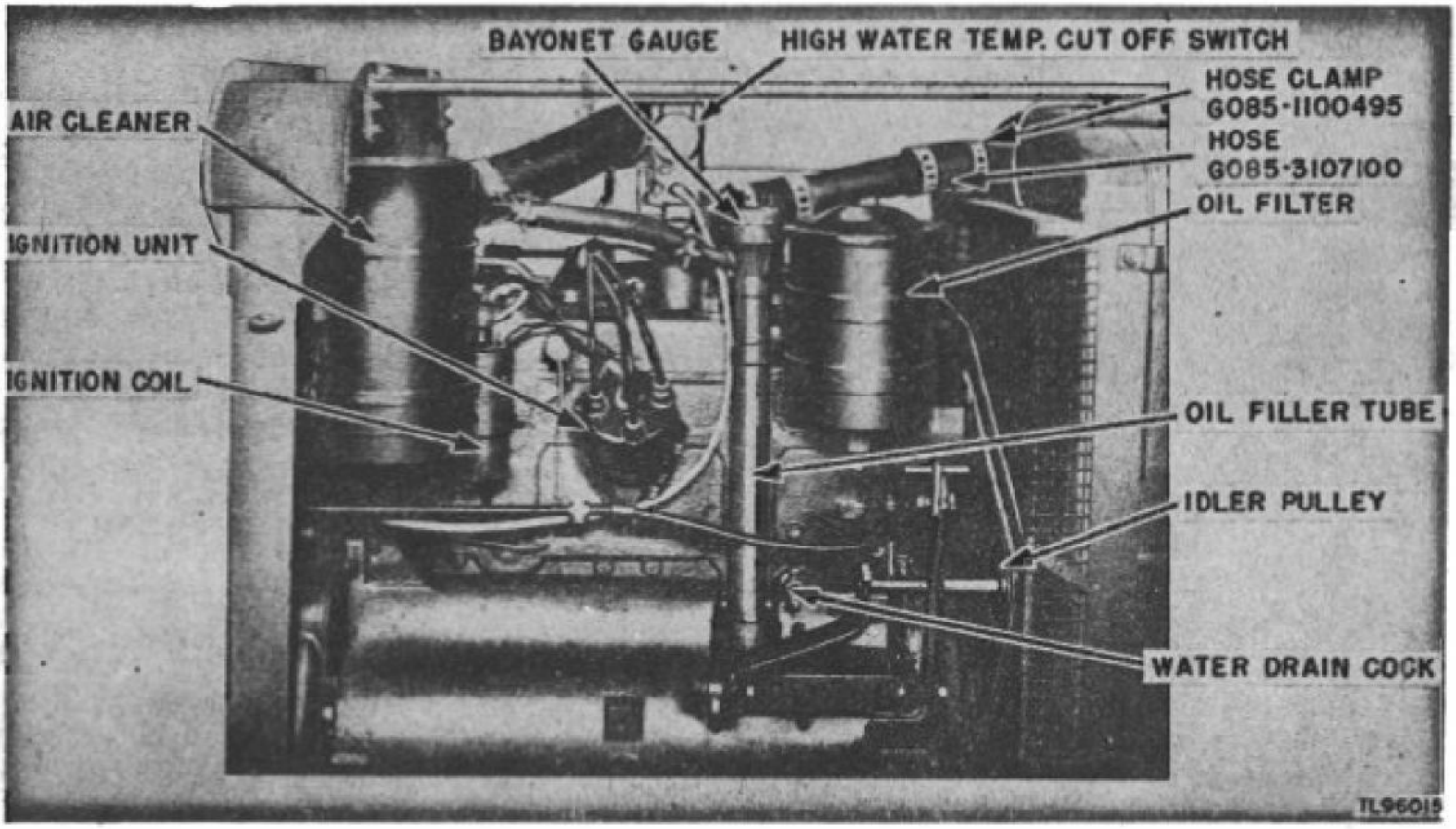


Figure 45. Power Unit PE–95–(2), engine, right side.



Name of part	Ordnance Stock number.
Hose, water-outlet and inlet.	G085-3107100
Clamp, hose.	G085-1100495

Figure 46. Power Unit PE–95–(2), engine, left side.

c. The location of grounds or shorts will require the use of an ammeter. The correct resistance reading for each armature coil is 0.005 ohms. The correct resistance of the field coils is 0.26 ohms.

70. Oil Circulating System

a. OIL PUMP ASSEMBLY. The oil pump is a planetary-gear type. It consists of two spur gears inclosed in a one-piece housing. It is provided with a relief valve to control maximum oil pressure. In operation, the oil is drawn from the crankcase through the floating oil intake. The oil then passes through a drilled passage in the crankcase to the oil pump, from which it passes through drilled passages in crankcase to crankshaft and camshaft bearings. The oil pump is driven from a spiral gear on the camshaft.

b. REMOVAL. To remove the oil pump from the engine, remove the three nuts on studs holding the oil pump to the crankcase. Slide the oil pump from the studs.

c. REPLACEMENT. When replacing the oil pump on the engine, the following procedure should be followed in order to have correct timing for the ignition. Set No. 1 piston coming up on the compression stroke, then turn flywheel so that the timing mark IGN appears on the flywheel in the center of the hole in the flywheel housing on the left-hand side. Set distributor rotor at No. 1 terminal tower in distributor cap, with breaker contacts just breaking. Hold the oil pump in one hand, with the oil-relief valve spring retainer in the same position as it would be when installed in the engine; turn shaft so that the wide side of slot in the driven-gear end is toward the operator, then line up the pin holding driven gear to shaft so that it will fall in line with the right side of the slot in pump body. Slide the assembly on studs in the crankcase, feed gear slowly into camshaft gear, checking to see, when fully set, whether the rotor on distributor has moved from its original setting. If so, remove oil pump and turn one tooth to obtain the correct setting.

d. FLOATING OIL INTAKE. (1) The floating oil intake is attached to the crankcase with two cap screws. The construction of the float and screen cause it to float on top of the oil, rising and falling in relation to the amount of oil in the crankcase. This construction prevents the circulation of water or dirt, which may have accumulated in the bottom of the oil pan, by drawing the oil horizontally from the top surface.

(2) Whenever removed, the float, screen, and tube should be cleaned thoroughly in dry-cleaning solvent (SD) to remove any accumulation of dirt. The oil pan screw torque wrench reading is 10 to 14 pounds.

e. OIL FILTER. (1) The oil filter is designed to prevent contamination of the engine oil. The filter element removes particles of dust, carbon and other foreign material from the oil which cause discoloration and sludge. The inlet line to the filter is connected to the oil distribution line at the front plug on the right-hand side of the engine. The outlet or oil return line to the engine connects to the timing chain cover.

(2) When the oil on the level indicator in the engine filler tube becomes dark, remove the oil-filter cover; remove the drain plug and drain out the sludge. Then replace the drain plug. Remove the element and install a nwe element. Install a new cover gasket; reinstall cover; start engine and check for leaks; then check oil level; add to oil supply if necessary.

f. ENGINE OIL-PRESSURE GAUGE. The ENGINE OIL-PRESSURE gauge is of the hydraulic type and measures the pressure of the oil applied to the engine bearings. It does not indicate the amount of oil in the engine crankcase or the need for changing the engine oil. A pressure tube connects the ENGINE OIL-PRESSURE gauge to the engine. It requires no special attention other than to see that the connection to the engine is tight. If the unit becomes inoperative, it should be replaced as its construction does not permit repair or adjustment.

71. Cooling System

a. DESCRIPTION. The performance of an engine is dependent to a great extent upon the proper operation of the cooling system. This system includes the engine water jacket, radiator, connecting hose, circulating pump, thermostat, and the ENGINE-WATER- TEMPERATURE gauge.

b. DRAINING COOLING SYSTEM. To drain the cooling system open the drain cock located at the lower right-hand corner of the radiator, just under the water outlet, also the drain cock

at lower left front corner of cylinder block.

c. FILLING THE COOLING SYSTEM. (1) *Instructions.* Close the drain cocks on the cylinder block and radiator. Fill the radiator with clean water, or during cold weather, with an antifreeze solution. Do not overfill the radiator while the antifreeze solution is being used, because the solution expands when heated and an appreciable amount of liquid would be lost through the overflow. The solution should be 1 inch from the bottom of the filler neck. The capacity of the cooling system is 15½ quarts.

(2) *Precaution.* Should water be lost from the cooling system and the engine overheat, do not add water immediately but allow the engine to cool, then add water slowly while the engine is running. If cold water is poured into the radiator while the engine is overheated, there is danger of cracking the cylinder block and head.

d. RADIATOR. (1) *Servicing.* The radiator is designed to cool the water under all operating conditions. The radiator core must be kept free from corrosion and scale in addition to the maintenance of other cooling units to obtain satisfactory service. At least every 1,000 operating hours remove the radiator and clean it inside and out with a cleaning solution. At the same time examine the core for leaks or damaged cells and make any needed repairs. After radiator and cooling system have been cleaned and flushed out, it is advisable to use a corrosion preventive. Rust and scale may eventually clog up water passages in both the radiator and water jacket of the engine unless a rust inhibitor is used. This condition is aggravated in some localities by the water available.

(2) *Removing and Replacing Radiator.* To remove the radiator, proceed as follows:

(*a*) Remove the front side panels from the housing and slide the front top plate back.

(*b*) Open the radiator drain cock and drain the radiator.

(*c*) Loosen the top, front-hose clamp, and either of the clamps on the hose connected to the water pump. Disconnect the water inlet elbow after loosening the clamp.

(*d*) Remove the four bolts from the front ends of the front housing top-plate guide-rods.

(*e*) Remove the three nuts which hold the fan guard. Bend the top radiator support brackets outward slightly and remove the fan guard.

(*f*) Remove the four bolts which hold the front of the exhaust compartment top plate to the housing front support.

(*g*) Remove the four bolts which hold the bottom corners of the housing front support to the skids.

(*h*) Remove four bolts from the sides of the housing front support.

(*i*) Tip the front support, with the radiator, slightly forward and remove carefully.

(*j*) Remove the two nuts which hold the bottom of the radiator to the cross-member of the front support.

(*k*) Remove the four nuts from the two top radiator supports and lift the radiator from the support.

(*l*) While the radiator is removed, install any new radiator hose needed, but do not tighten the clamps until all other connections are made after installing the radiator.

(*m*) Install the radiator by reversing the above order of procedure. Tighten the hose clamps last, and inspect the connections carefully for leaks after the radiator is filled. Stop all leaks.

(3) *Emergency repairs.* Emergency repairs may be necessary in case of puncture by bullet or shrapnel; if a tube is not completely severed, cut it or break it off with a pair of pliers. With pliers strip fins from tube above and below break for ½ inch or necessary distance to enable bending of the tube around itself and flatten, both above and below the break, thereby stopping the flow of water.

(4) *Use of a tropical Willys radiator.* (*a*) *Precaution.* In an emergency, the Willys radiator, Willys part No. A-1214, as furnished on the Willys truck, model MB, ¼-ton 4 x 4, built for the United States, may be used on Power Unit PE–95–(2). However, the engine will not be as well cooled when using this smaller radiator. The peak loads in watts for various ambient temperatures as given in the table below should not be exceeded.

Ambient temperature (degrees F.)	Full load (watts)
70	10,800
80	10,350
90	9,500
100	8,100
110	6,750
120	5,850

(*b*) *Instructions for installing the Willys radiator.*

1. Remove the radiator.

2. Install the Willys radiator on the front housing support, using two wood spacer blocks beneath the radiator to support it at the right height. These spacer blocks are included in the set of mobile spare parts. The radiator studs should pass through the holes in the blocks. Install a brace rod at the top of the radiator to connect it to the front housing support at that point. This brace rod is a 5/16-inch diameter stud 5 inches long with a 5/16–18 NC thread 1¼ inches long at each end. Use four 5/16–18 hexagon nuts with lockwashers. One end of the brace rod extends through the front housing support with a nut and lockwasher on each side of the sheet metal of the housing support. The other end extends through the metal lug on the top of the radiator, with a nut and lockwasher on each side of the lug. Tighten all nuts securely.

3. Install the radiator and front housing support on the power unit by reversing the order of procedure used in disassembling. Tighten the hose clamps last, and inspect the connections carefully for leaks after radiator is filled. Stop all leaks.

e. THERMOSTAT. The cooling system is designed to provide adequate cooling under the most adverse conditions; however, it is necessary to prevent overcooling during normal operations and to quickly warm up the engine from a cold condition. This is accomplished by use of a thermostat which is located in the water outlet on top of the cylinder head. The thermostat opening is set by the manufacturer and cannot be altered. The thermostat opens at a temperature of 145° to 155°F. To test thermostat, heat sufficient water to 170°F. and submerge thermostat. The valve should open to the limit at this temperature. If valve fails to open, a new thermostat will be required.

f. ENGINE - WATER - TEMPERATURE GAUGE. The ENGINE - WATER - TEMPERATURE gauge is connected to a thermal element in the cylinder head by means of a capillary tube. If the gauge becomes inaccurate or inoperative, it should be replaced with a new one including a thermal element and capillary tube.

g. FAN AND WATER PUMP. (1) *General.* The fan and water pump are mounted on the same shaft. The pump is of the centrifugal type and circulates the water through the cooling system. The double-row ball bearing is integral with the shaft and is packed with a special grease so that no lubrication is required. The ends of the bearings are sealed to retain the grease and prevent entrance of dust and dirt.

(2) *Construction.* The bearing is retained in the housing by a retaining wire, which snaps between the bearing and the water pump body. The seal washer has four lugs which fit into the slots in the end of the impeller. One side of the seal washer bears against the ground surface of the pump and the other against the seal. The rubber seal bears against the machined surface on the inside of the impeller. The seal maintains a constant pressure against the seal washer and impeller assuring a positive seal. The drain hole in the bottom of the housing prevents any water seepage past the seal washer entering the bearing. The impeller and pulley are pressed onto the straight shaft.

(3) *Dismantling.* Remove the fan belt and fan blade assembly. Then remove the water pump from the engine.

h. FAN BELT. The fan is driven by a 42° angle V-belt. Length outside 44⅛ inches. Width, maximum, 11/16 inch. To install fan belt, loosen clamp bolt on slotted bracket at idle pulley and move idle pulley toward engine. Slide belt over crankshaft pulley, up through fan blade assembly and over fan pulley, then over idle pulley. Adjust the fan belt by moving the idle pulley away from the engine to a point where the fan belt can be depressed 1½ inches midway between fan pulley and idle pulley. The driving of the fan and generator is on the sides of the V-belt; therefore, it is not advisable to have the fan belt so tight that it will cause excessive wear on bearings.

i. ANTIFREEZE SOLUTIONS. (1) *When required.* When air temperatures require, it is necessary to protect the cooling system with some type of antifreeze solution to prevent damage resulting from freezing.

(2) *Alcohol.* When alcohol is used in an antifreeze solution care must be taken not to spill any of the solution on the finished portions of the housing; if so spilled, it should be washed off immediately with a good supply of cold water, without wiping or rubbing. The evaporating point of a water and alcohol cooling solution is approximately 170°F. Therefore, when such a solution is used in warm weather, it must be checked frequently with a

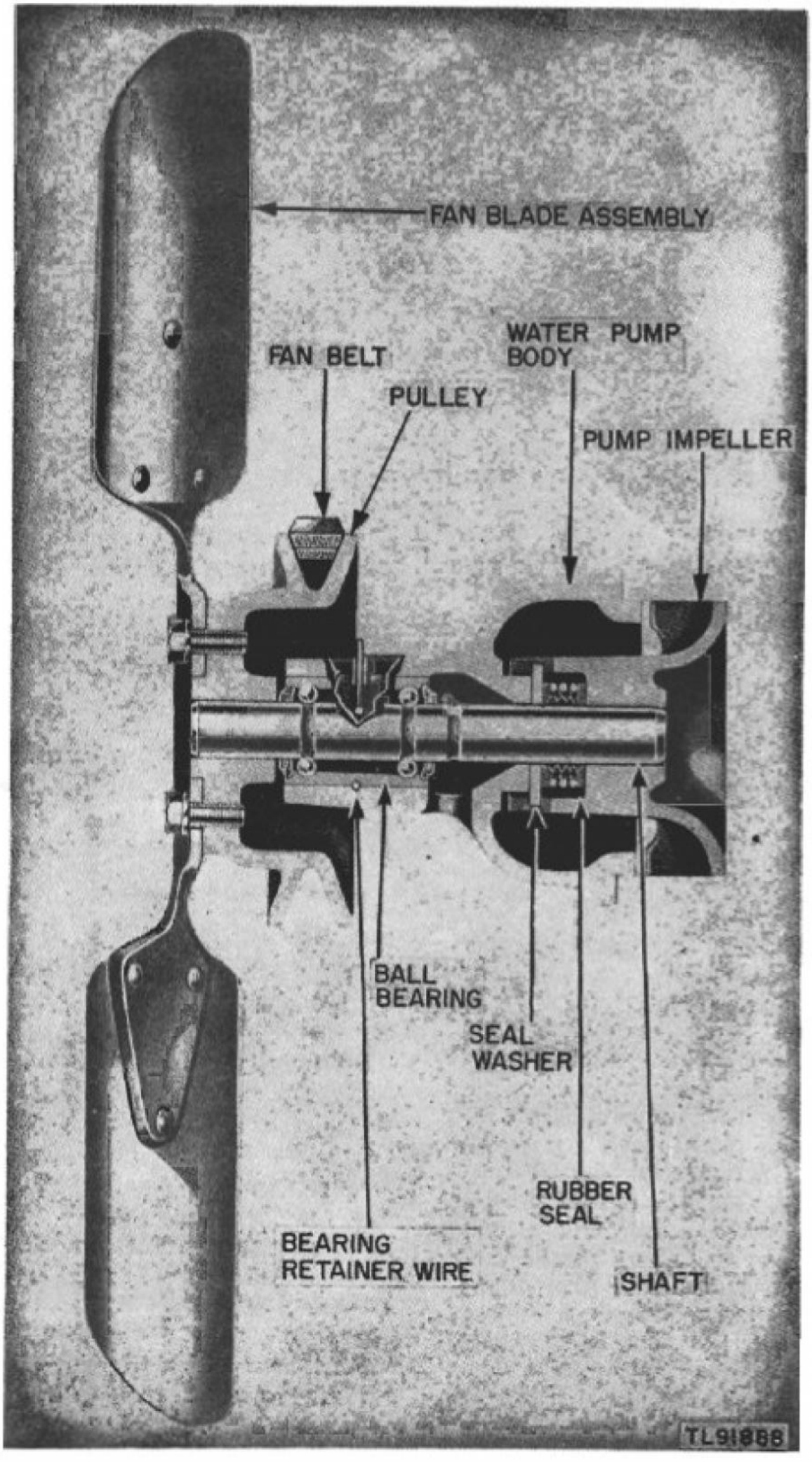
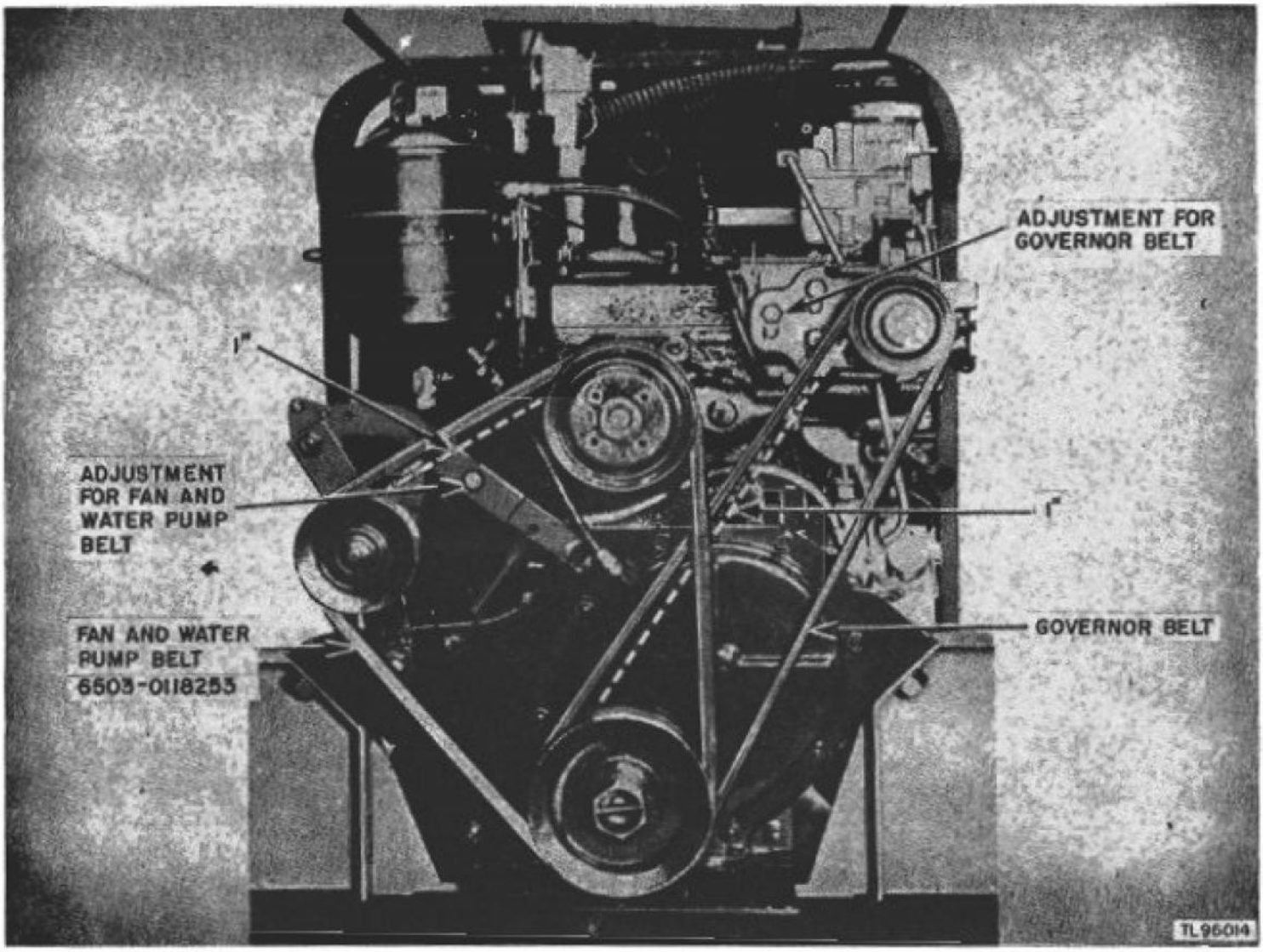


Figure 47. Fan and water pump assembly



Name of part.	Ordnance stock number.
Belt, governor drive.	
Belt, fan and water pump drive.	G503-0118253

Figure 48. Power Unit PE-95-(2) and PE-95-F, governor belt adjustment.

hydrometer as there may be considerable loss of alcohol through evaporation, thus raising the freezing point and resulting in damage due to freezing.

(3) *Ethylene glycol solution.* Ethylene glycol antifreeze solutions have the distinct advantage of possessing a higher point of distillation than alcohol and consequently may be operated at higher temperatures without loss of the solution through evaporation. Ethylene glycol has the further advantage that in a tight system only water is required to replace evaporation losses, however, any solution lost mechanically through leakage or foaming must be replaced by the addition of more ethylene glycol.

72. Exhaust System

a. EXHAUST AND INTAKE MANIFOLDS. (1) *Description.* The exhaust and intake manifolds make a unit in which the hot exhaust gases are thermostatically controlled and directed around the intake manifold to assist in vaporizing the fuel when the engine is cold, thereby aiding in warming up the engine and reducing oil dilution. This unit also minimizes the use of the carburetor choke control and maintains proper temperature of the incoming gases under all operating conditions.

(2) *Functioning.* When the engine is cold, the counterweight lever closes the heat-control valve and directs the hot exhaust gases against the intake manifold (fig. 49). As the engine warms up, the bimetal spring expands and opens the valve directing the exhaust gases into the exhaust pipe.

(3) *Servicing.* All parts are replaceable but little servicing is required. When assembling the manifolds to the cylinder block, new gaskets

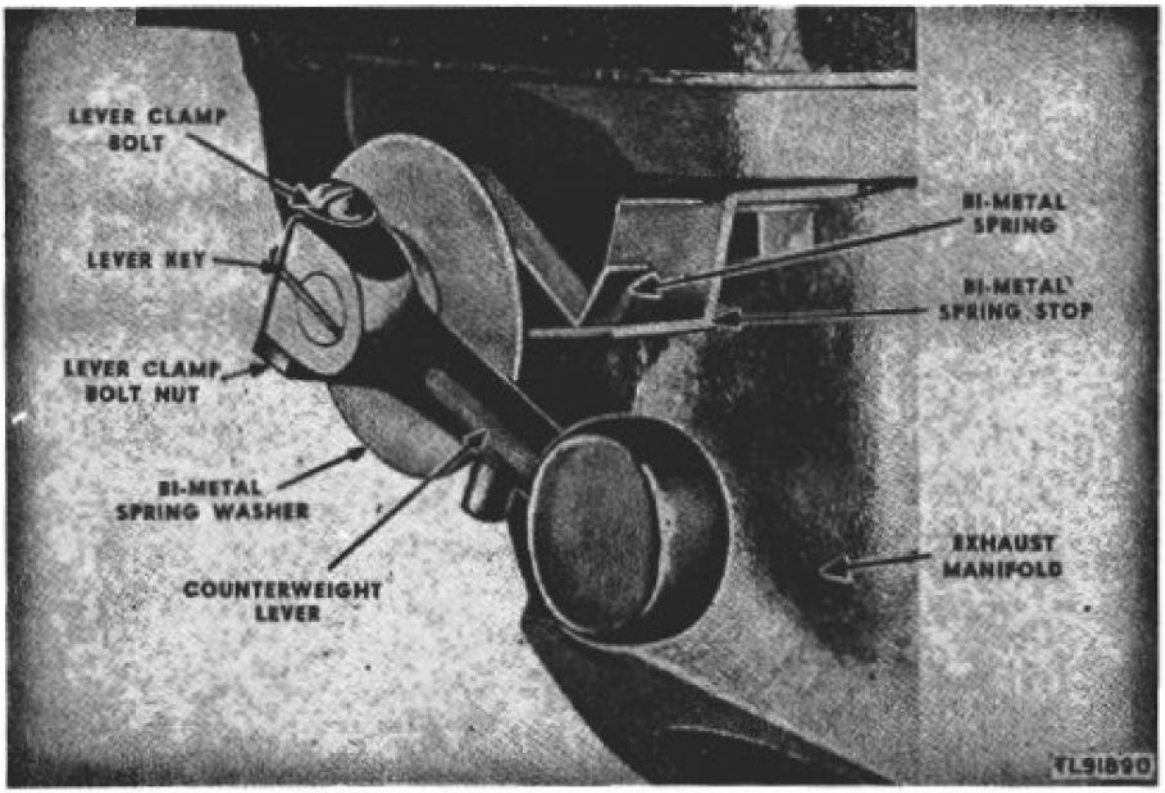


Figure 49. Heat control valve.

should be installed and the nuts drawn up evenly until they are all tight to avoid gas leakage. Torque wrench reading 31 to 35 foot-pounds.

(4) *Use of standard Willys manifold.* In an emergency, when the correct intake manifold is not available, an intake manifold assembly, Willys part No. A-1166, Government Group No. 0108, as used on the Willys truck, model MB, ¼-ton, 4 x 4, built for the United States, may be used on Power Unit PE–95–(2). The latter manifold is larger and the operation will not be as smooth while using it.

b. MUFFLER. The exhaust manifold is connected by steel tubing to the muffler mounted in the muffler compartment below the radiator. The muffler outlet is at the lower left front corner of the housing. Ten feet of flexible exhaust tubing may be connected at the outlet to carry the exhaust gases away from the power unit.

c. PRECAUTION. Do not operate the power unit inside a closed room without first having connected an exhaust line that will carry all exhaust gases out of doors. Exhaust gases are poisonous and may cause death.

d. SERVICING. If the exhaust system becomes clogged with carbon it will create a back pressure on the engine that will prevent its developing full power and will cause combustion chambers and valves to become covered with carbon to the extent that a carbon removal and valve grinding job will be necessary. Keep the exhaust system free of excessive carbon. Keep all points tight. If the flexible pipe leaks, replace it.

e. USE OF STANDARD WILLYS MUFFLER. In an emergency the standard Willys muffler, Willys part No. A–6118, as used on Willys truck, model MB, ¼-ton, 4 x 4, built for the United States, may be adapted for use on Power Unit PE–95–(2) (fig. 50). The procedure is as follows:

(1) Saw the inlet and outlet tubes of the Willys muffler off even with the ends of the muffler proper. Because of the recesses in the muffler ends this will leave about ½ inch of tube protruding from the muffler at each end.

(2) Center a standard 1½-inch pipe nipple, at least 3 inches long, in a lathe chuck. Cut off the protruding end of the nipple so the piece remaining in the chuck is 1⅞ inches long. While still in the chuck, bore to a diameter of 1.750 inches and to a depth of 0.500 inch. Remove from the chuck and place it on the protruding ½ inch of tubing on the muffler inlet. See that it fits snugly over the tubing and sets against the end of the muffler. Make a strong, tight joint by welding entirely around the fitting where it meets the end of the muffler.

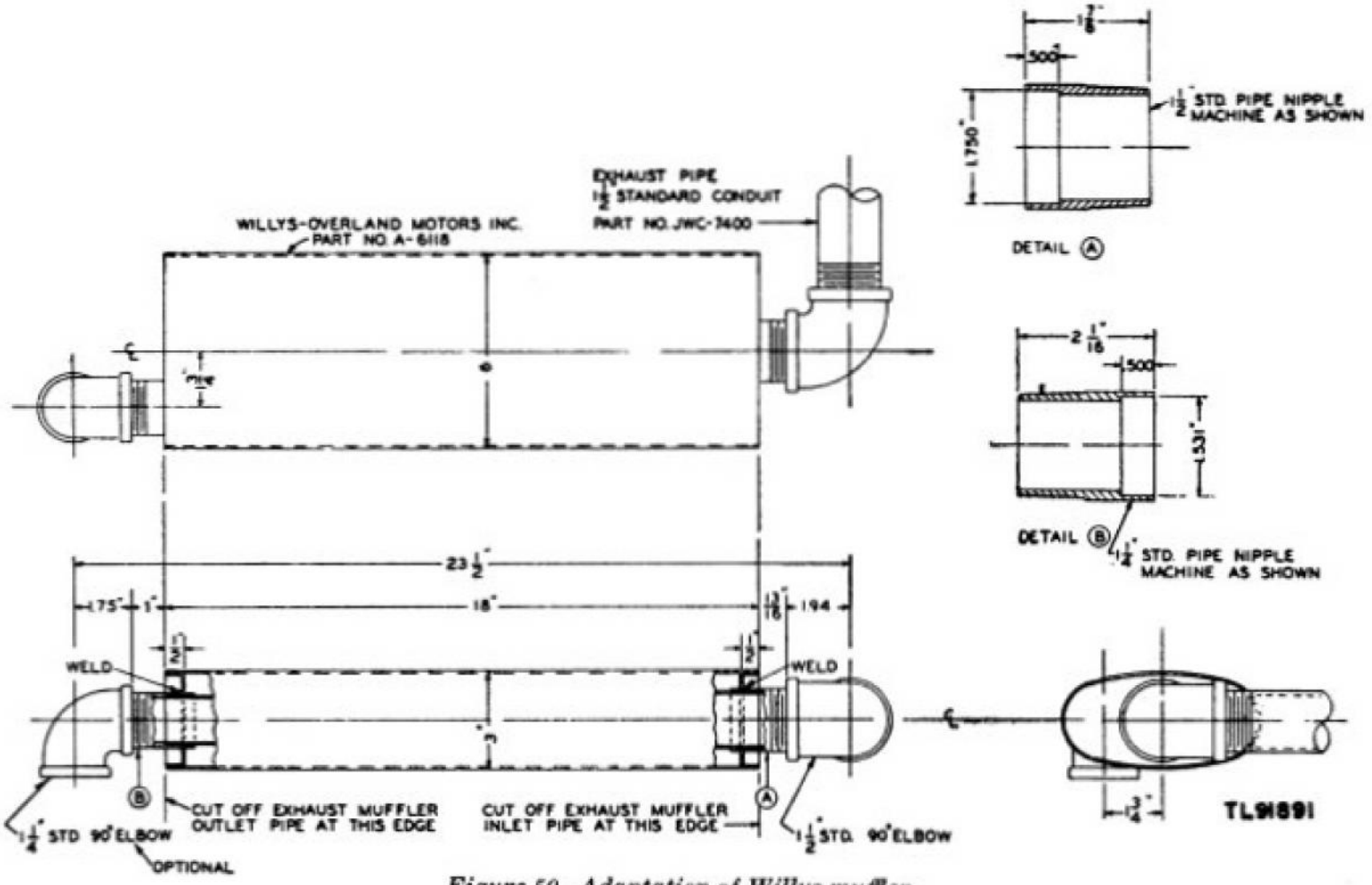


Figure 50. Adaptation of Willys muffler.

(3) Install a threaded connection at the outlet end of the muffler in the same manner, using for this purpose a standard 1¼-inch pipe nipple at least 3½ inches long cut to a length of 2 1/16 inches, bored to a diameter of 1.531 inches and to depth of 0.500 inch.

(4) Remove the left-hand front engine support bracket and cut out a portion of the bracket so as to extend the opening for the exhaust outlet 1¾ inches further forward.

(5) Remove the original muffler and install the modified Willys muffler in its place, screwing it into the original 1½-inch elbow. When screwed tightly into place the muffler should lay with its longer diameter horizontal and with its outlet nearer the front of the housing. Replace the front engine support bracket.

(6) Connect the muffler outlet to whatever exhaust line is used, making use of standard pipe fittings to assure gastight connections.

73. Spark Plugs

Keep spark plugs clean and properly adjusted. When porcelains crack or become badly eroded, or when electrodes are badly burned, install new spark plugs of same type, namely, Champion No. J-9. Set the gap between electrodes at 0.030 inch for Power Unit PE–95–(1) and 0.025-inch for Power Units PE–95–(2) and PE–95–F. When installing, make sure gaskets are in place and tighten the plugs securely.

74. Battery

The battery requires routine attention. Follow the battery manufacturer's instructions when available, otherwise check as follows:

a. Keep the water level about ⅜ inch above the plate separators. Use distilled water, clean rain water that has not been handled in metallic containers, or water known to be harmless to batteries. Avoid overfilling. Never allow water level to recede below tops of separators.

b. Keep the top of battery and the terminals clean. A coating of petroleum jelly or grease on the terminals helps prevent harmful corrosion.

c. Keep the battery in a fully charged condition. If allowed to remain in a low state of charge, sulphation of plates will reduce the capacity and greatly shorten the life of the battery. A discharged battery will freeze at 20° above zero F.

75. Solenoid Starting Switch

If it is suspected that the solenoid starting switch is not closing properly, test it by touching a heavy jumper wire across its two large terminals. If the engine is not cranked as a result, it may be assumed that the trouble is not in the solenoid starting switch and must be looked for elsewhere. If the engine is cranked as a result, touch a jumper wire from its positive terminal, to which the positive battery cable is connected, to the smaller front terminal. If the engine is not cranked as a result, the solenoid starting switch is at fault and a new one should be installed.

76. High-water-temperature Cut-off Switch

a. DESCRIPTION. The setting and functioning of the high-water-temperature cut-off switch are explained in paragraph 52. To assure proper functioning, its accuracy may be checked in the following manner.

b. CHECKING ACCURACY. Remove the radiator cap and insert the bulb of a good Fahrenheit thermometer in the water in the radiator. Set the dial at 220°. Cover the radiator and operate the engine until the water temperature exceeds 180° F. Slowly turn the dial counterclockwise until the ignition is switched off. The dial reading should then coincide with the thermometer reading.

c. ENGINE - WATER - TEMPERATURE GAUGE. The reading of the ENGINE-WATER-TEMPERATURE gauge should be checked against the thermometer reading or the calculated boiling-point temperature. If the gauge is inaccurate more than a few degrees, install a new gauge and thermal element.

77. Low-oil-pressure Cut-off Switch

The low-oil-pressure cut-off switch closes when the oil pressure drops to approximately 6 pounds per square inch, operates the stop relay, and switches off the ignition. If the engine stops unexpectedly and the water temperature is normal it may be due to the closing of the low-oil-pressure cut-off switch because of low oil pressure. If the oil pressure will not build up to about 6 pounds per square inch and open this switch, the engine will not continue to run after the START button is released. Throw the MANUAL START - REMOTE START switch to MANUAL START position and start the engine. If the ENGINE OIL PRESSURE gauge shows that the oil pressure does not build up normally, do not operate the engine until the trouble is located and corrected. If the oil pressure builds up normally and it is suspected that the low-oil-pressure cut-off switch is at fault, disconnect the wires from it, throw the MANUAL START - REMOTE START switch to REMOTE START position and start the engine electrically. If the engine runs normally and with normal oil pressure, but stops as soon as the wires are connected to the low-oil-pressure cut-off switch, the cut-off switch is at fault and a new one should be installed. The engine may be operated temporarily without the protection afforded by this switch, if necessary. If this is done, connect the two wire terminals together and tape the joint. Give special attention to the lubrication during the emergency and install a new low-oil-pressure cut-off switch at the first opportunity.

78. Battery-charging Regulator and Resistor Group

a. BATTERY - CHARGING REGULATOR. If the battery-charging regulator fails to function properly, it should be replaced with a new one. If the charging rate continues at about 10 amperes after all battery cells are known to be fully charged, it may be due to an open circuit in the regulator coil or to sticking regulator contacts. If the charging rate does not rise higher than about 2 amperes, when the battery is known to be in a low state of charge, it may be due to the regulator contacts not closing properly or, if closing, not making good electrical contact. If trouble in the battery-charging regulator is suspected, substitute a new relay. If the new relay corrects the conditions, discard the old one.

b. RESISTOR GROUP. Whenever the power unit is in operation, heat should be generated in the 2.5-ohm resistor. If it remains cold while the power unit is in operation it probably is defective. Substitute a new one. If the new one functions normally, discard the old one. Heat is generated in the 2-ohm resistors only while the battery is charging at the high rate of about 10 amperes. If one of these resistors is defective the high charging rate will be reduced and no heat will be generated in the defective resistor. Replace the defective resis-

tor with a new one. If the D.C. OUTPUT terminals are dead while the battery charging circuit is functioning normally, a blown D.C. OUTPUT fuse is indicated. Remove the cap of the screw-type fuse holder and install a new 20-ampere automotive-type fuse.

79. Relays

The relays on the control panel require no attention under normal conditions. All relays are of d-c type. In case of failure of any relay the power unit may be operated temporarily by starting it manually. By referring to the wiring diagrams (figs. 29, 30, and 31) the various relay circuits may be checked and any relay trouble thus traced to a certain relay. Substitute a new relay for the suspected relay and observe whether the condition is corrected. A defective start relay, ignition relay, or stop relay must be replaced.

80. Generator

a. ROUTINE SERVICING. (1) Remove the cover from the exciter every 256 operating hours and inspect the commutator, collector rings and brushes. Make sure that brushes move freely in holders and have uniformly good spring tension. Correct spring tension is 14.5 to 19.5 ounces for the slip ring brushes; 30 to 40 ounces for the exciter brushes when the end of the spring is even with the top of the brush holder. Replace brushes worn to less than ¾ inch in length.

(2) Sand new brushes to a good seating contact. Do this by drawing a strip of #00 sandpaper around the commutator, sanded side out, with the brush against the sanded surface. Make sure that the sandpaper contacts a large area of the curvature of the commutator. Draw the sandpaper in the direction of normal rotation. Raise the brush for each return stroke. Continue until a good seat is obtained. Fit slip ring brushes in the same manner.

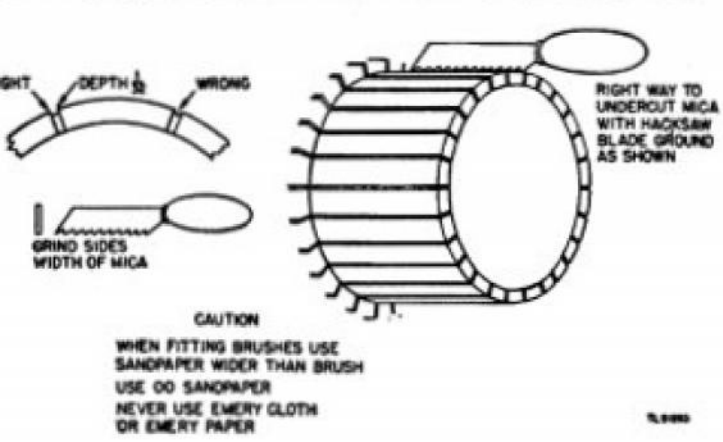


Figure 51. Care of commutator.

(3) The commutator acquires a mahogany-colored surface after being in service a short time. If smooth, this surface requires no attention. Slight roughnesses may be improved by holding a piece of #00 sandpaper against the surface while the engine operates slowly. Brushes should be lifted in holders while doing this operating. A badly worn, burned or pitted commutator will require refinishing in a lathe. After refinishing the commutator, or whenever the copper has worn down flush with the mica insulation which is between the bars, the mica must be undercut 1/32 inch as shown in figure 51. These operations should not be attempted by unauthorized personnel.

(4) The edge of the exciter brush has a small indentation that coincides with the edge of the upper left supporting boss when the ring is in proper neutral position (fig. 52). This spot is marked with yellow paint on both the ring and support boss. This setting of the brush ring in neutral position must be maintained.

(5) The slip rings require the same attention as the commutator except that there is no mica to undercut.

(6) After servicing the commutator, slip rings, and brushes, blow the sand, copper, and carbon dust from the generator.

(7) Every 1,024 operating hours, remove the bearing cover from the generator end-bell. Clean the old grease from the bearing recess and repack with general purpose grease No. 2 (WB2). Replace the cover. Use a new gasket if one is needed. Be sure to replace the retaining clips that hold the outer race of the ball bearing from turning.

b. MAJOR SERVICING. Replacement of the exciter field coils, rotor or stator (fig. 53) will require removing major parts of the generator. The housing super-structure must be removed before such work can be done. This should not be attempted except by authorized personnel.

81. Suppression Equipment

a. GENERAL. To reduce interference with radio, Power Units PE-95-(2) are equipped with capacitors, suppressors, bonding straps, internal-external tooth lockwashers and a metal housing. A complete tune up would include at

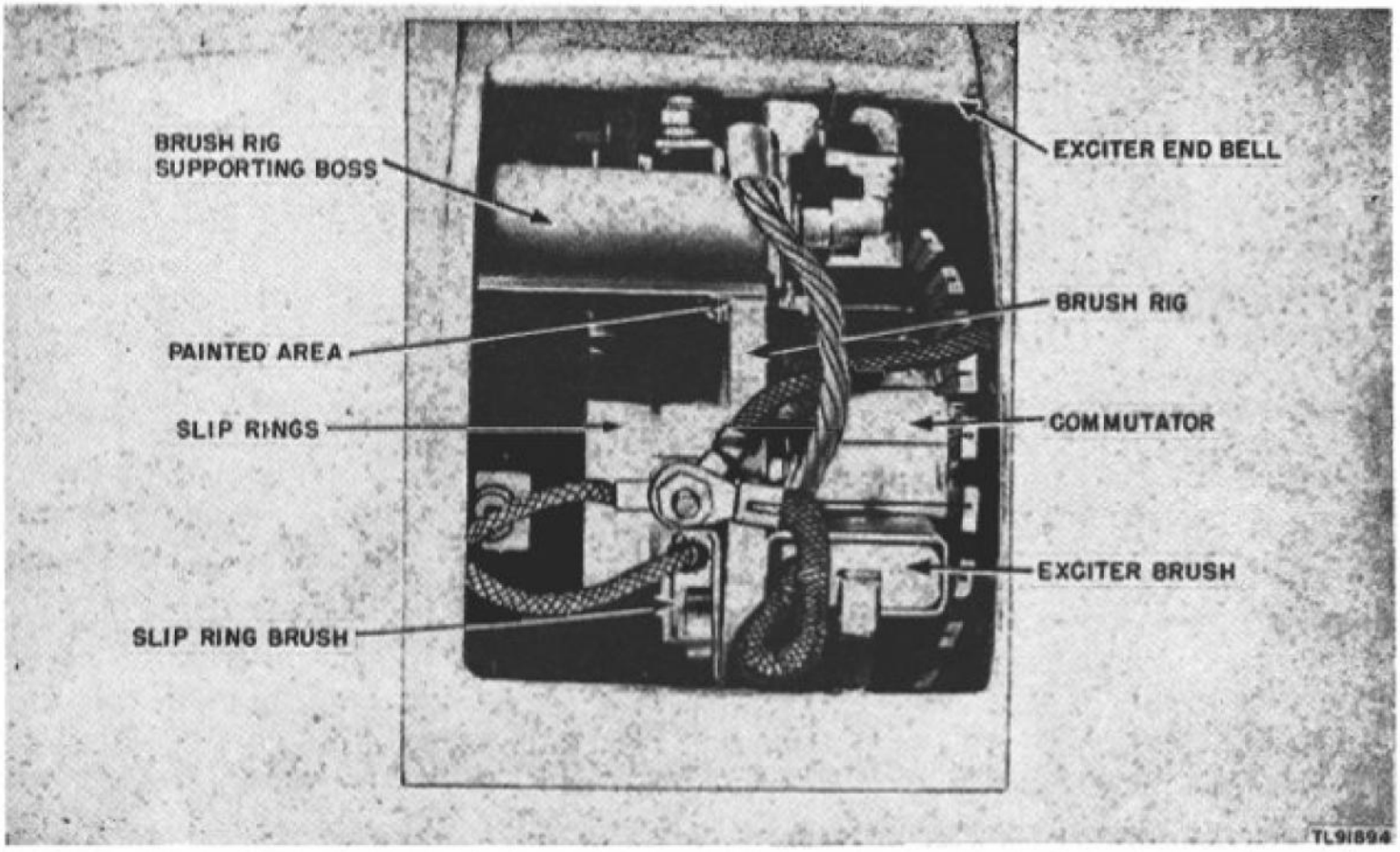


Figure 52. Neutral position of exciter brushes.

least a visual inspection of this equipment to make sure none of it is missing and that all connections are clean and tight. In case of excessive radio interference, a more thorough checkup must be made. The suppression equipment is intended to care for interference that otherwise would result from the normal operation of the power unit when in normally good condition. An abnormal condition of the power unit, or of the load, may result in more interference than the suppression equipment can control. Therefore, do not assume that the suppression equipment is at fault until the power unit has been checked thoroughly for such condition.

b. SUPPRESSION DETAILS. It is important that all components of the suppression equipment be installed in proper locations with respect to adjacent parts. Detailed information follows:

(1) Five L-type resistor-suppressors are used; one at each of the four spark plug cables, one at the distributor end of the center cable of the distributor.

(2) An 0.1-mf capacitor is connected between the battery terminal of the ignition coil and the nearer mounting screw of the coil (fig. 54).

(3) A bonding jumper is connected between the temperature gauge capillary tube and the nearer mounting screw of the ignition coil (fig. 54).

(4) The ignition-coil bracket is bonded to the air-cleaner support bracket by two ¼-inch internal-external tooth lockwashers (fig. 54).

(5) The air-cleaner support bracket is bonded to the engine block by two ¼-inch internal-external tooth lockwashers (fig. 54).

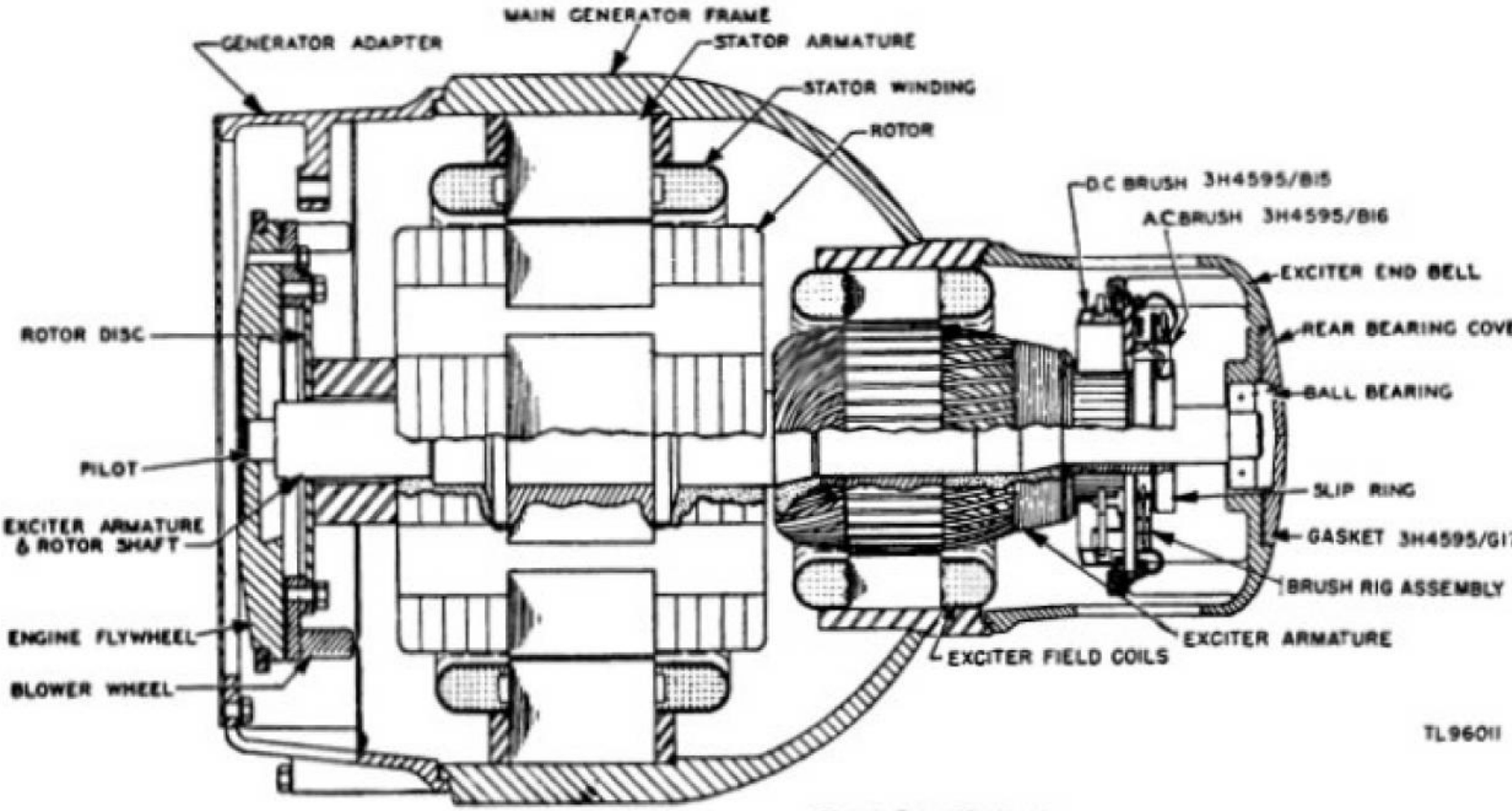
(6) The air-cleaner bracket is bonded to the air-cleaner support bracket by two ¼-inch internal-external tooth lockwashers (fig. 54).

(7) The air-cleaner bracket is bonded to the vertical air-cleaner support frame by two ¼-inch internal-external tooth lockwashers. (See fig. 55.)

(8) A 0.1-mf capacitor is connected between each of the large terminals of the solenoid starting switch and a mounting screw of the starting switch. (See fig. 56.)

(9) Four 0.01-mf bakelite-cased mica capacitors are mounted on the generator brush rig and connected as shown in figure 57.

(10) A 0.1-mf metal-clad capacitor is con-



	Signal Corps Stock No.	
	PE–95–(1) and (2)	PE–95–F
Bearing, ball	3H2342B/B2	3H4512.5/B25
Brush, a-c	3H4595/B16	3H4594/B16
Brush, d-c	3H4595/B15	3H2408/B3
Gasket, generator bearing cover	3H4595/G17	3H4595/G17
Assembly, brush rig	3H4512.5/B21	3H2408–1/R20
Armature and rotor assembly		3H2408–1/A26
Stator and winding		3H2408–1/S35
Spring, a-c brush		3H2408/S2
Spring, d-c brush		3H2408/S1

Figure 53. Generator, cross-section.

nected between the remote control stop terminal and ground as shown in figure 58.

(11) A 0.1-mf metal-clad capacitor is connected between the remote control start terminal and ground as shown in figure 58.

(12) A 0.01-mf bakelite-cased mica capacitor is connected between each of the a-c output terminals and ground as shown in figure 59.

(13) A 0.01-mf bakelite-cased mica capacitor is connected between the positive d-c output terminal and ground (fig. 59).

(14) The instrument panel is bonded to the rear end-bell of the generator by a jumper (fig. 60).

(15) The instrument panel frame is bonded to the rear end panel of the housing by four bonding jumpers (fig. 61).

(16) The right and left front side panels of the housing are bonded to the housing by welded contact bonds on the side panels which make contact with welded contact bonds on the front end panel of the housing (fig. 62).

(17) Front and rear top plates of the housing are bonded to the housing by welded contact bonds on the top plates which make contact with welded contact bonds on the center housing support (fig. 62).

(18) The front top plate of the housing is bonded to the housing by welded contact bonds on the top plate that make contact with welded contact bonds on the front end panel of the housing (fig. 62).

(19) The front top plate of the housing is bonded to the right front side panel of the housing by a welded contact bond on the side panel (fig. 62).

(20) The bottom dust pan is bonded to the

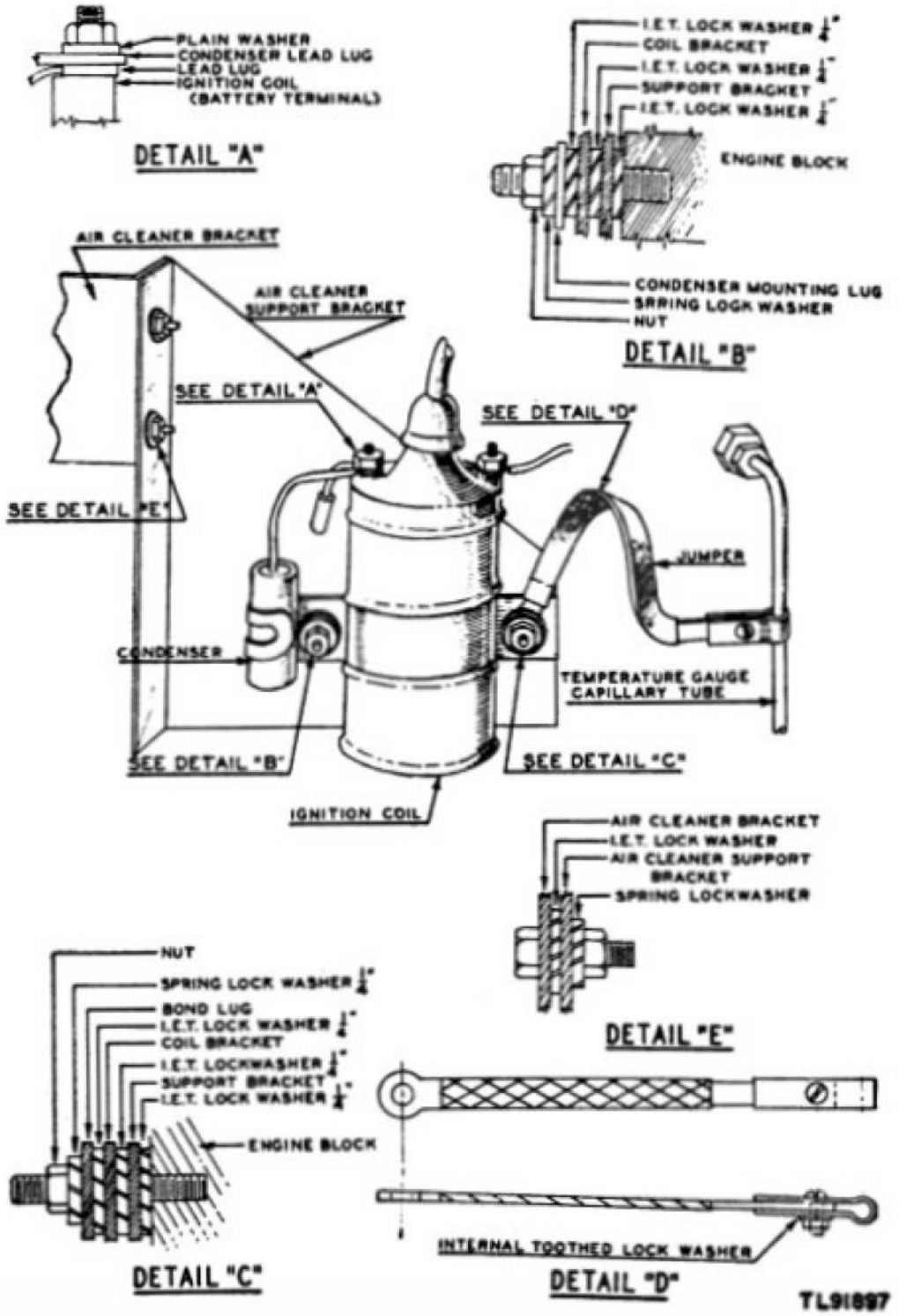


Figure 54. Ignition coil and capillary tube, suppression details.

skid base near each of its four corners by zinc-plated bolts and ¼-inch internal-external tooth lockwashers (fig. 63).

c. FAULTY CONTACTS. If switch or a-c circuit-breaker contacts are suspected of making poor contact, test one at a time by connecting a jumper across its terminal when it is in a normally closed position. If a switch or the a-c circuit-breaker tests defective, install a new one. A similar jumper test may be made across the terminals of suspected contacts of a relay or the voltage regulator. Study the wiring diagram and make sure the jumper is used across the correct terminals and only while the contacts being tested are normally closed.

d. INTERFERENCE FROM OUTSIDE SOURCES. Poor commutation at a motor may result from overload, poor condition of commutator and brush assembly, or from low voltage at the motor because of too small line wires. Radio in-

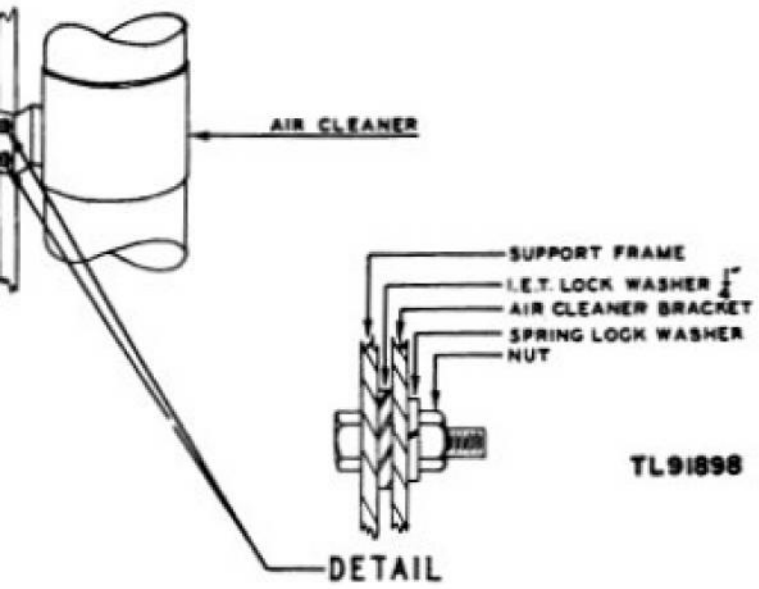


Figure 55. Air cleaner, suppression details.

terference may result. Defective lamps, transformers or appliances, or poor connections anywhere on the load circuit may result in radio interference which must be corrected at its source.

82. Power Unit PE-95-F, Voltage Regulator

a. The automatic voltage regulator used on Power Unit PE–95–F requires very little attention except to keep it from dust, dirt, and moisture. Do not oil or otherwise lubricate any of its parts.

b. The contact roller presses on the silver commutator with a pressure of 100 grams. This has been carefully adjusted and no further adjustment should be necessary. Do not lift the contact roller from the commutator as this may over-stress the contact pressure spring and reduce the contact pressure. Never touch the contact roller while the regulator is in operation as this may cause arcing at the point of contact which will result in the commutator becoming rough.

c. Remove any roughness of the commutator with jeweler's rouge or crocus cloth. Polish the surface very lightly and be sure to remove all traces of rouge after polishing. A fine black line will appear along the point of contact after the regulator has been in use a short time. This is a normal condition.

d. Should adjustment of the regulator become necessary, do not attempt to adjust the magnetic core. Adjust the solenoid spring. Move the spring to a lower position on the holder for greater sensitivity and to a higher position for less sensitivity. Decreasing the sensitivity will increase the stability of the regulator.

83. Unsatisfactory Equipment Report

a. When trouble in equipment used by Army Ground Forces or Army Service Forces occurs more often than repair personnel feel is normal, War Department Unsatisfactory Equip-

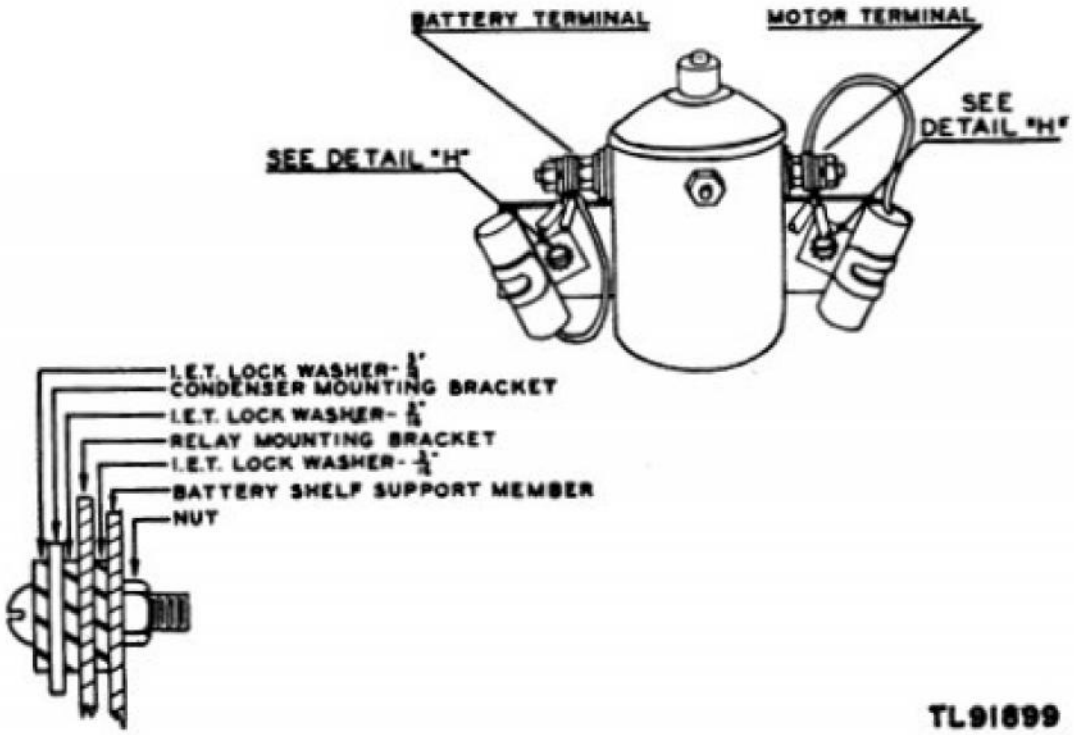


Figure 56. Solenoid starting switch, suppression details.

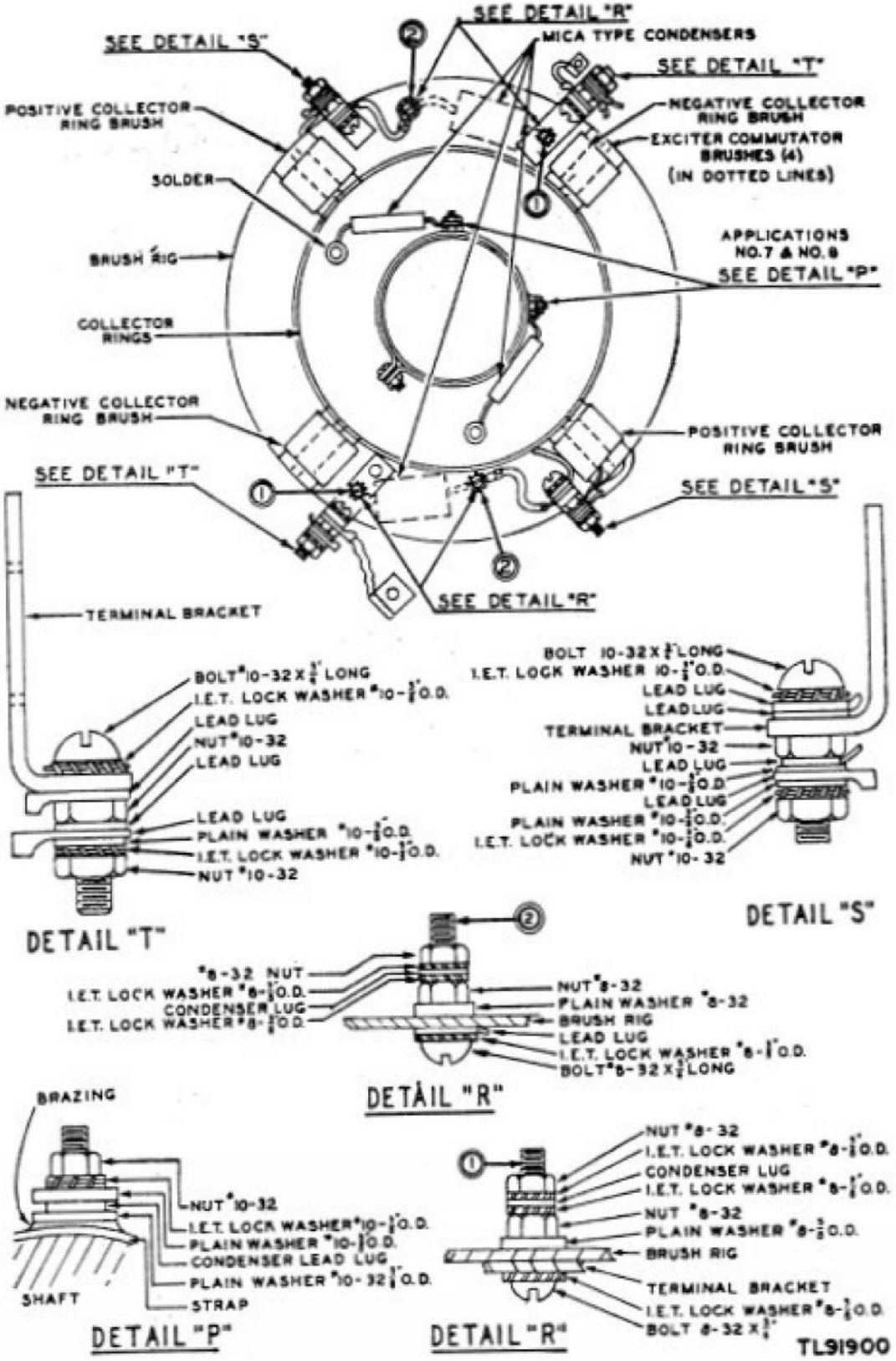


Figure 57. Brush rig, suppression details.

ment Report (WD, AGO Form 468) should be filled out and forwarded through channels to the Office of the Chief Signal Officer, Washington 25, D. C.

b. When trouble in equipment used by Army Air Forces occurs more often than repair personnel feel is normal, Army Air Forces Form 54 should be filled out and forwarded through channels. When Army Air Forces Form 54 is required but unavailable, reproduce Form 468 and forward it through channels in accordance with directions on Form 468.

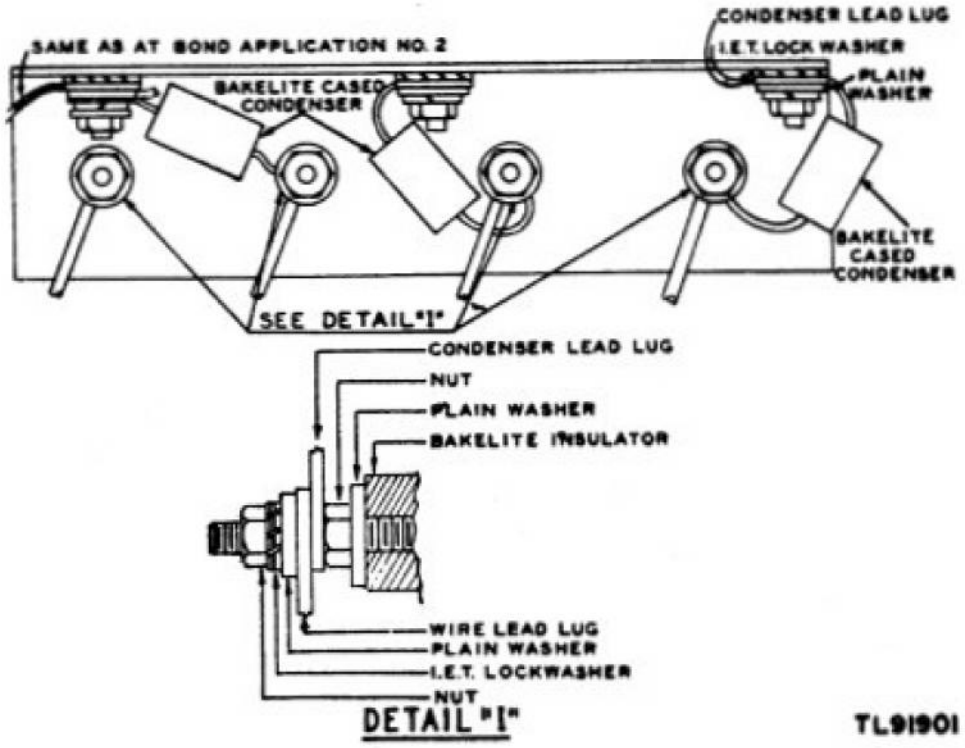


Figure 58. Remote control terminal, suppression details.

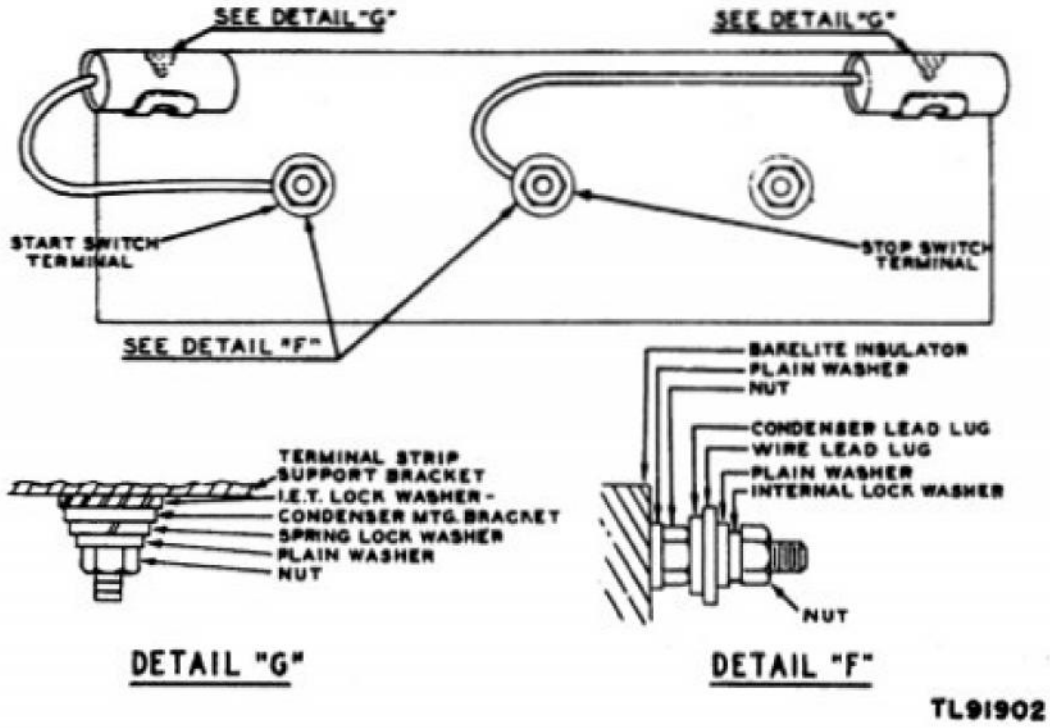


Figure 59. Output terminal, suppression details.

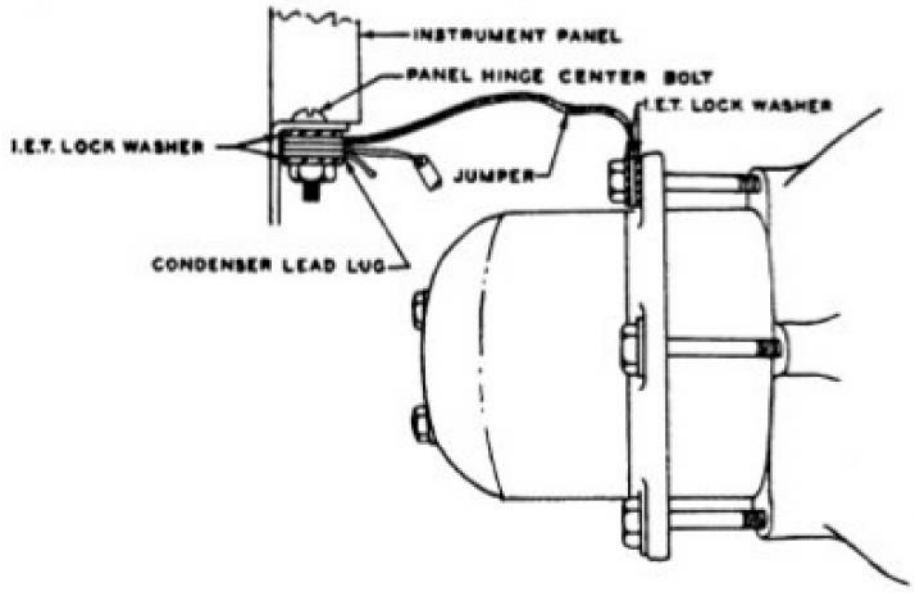


Figure 60. Instrument panel, suppression details.

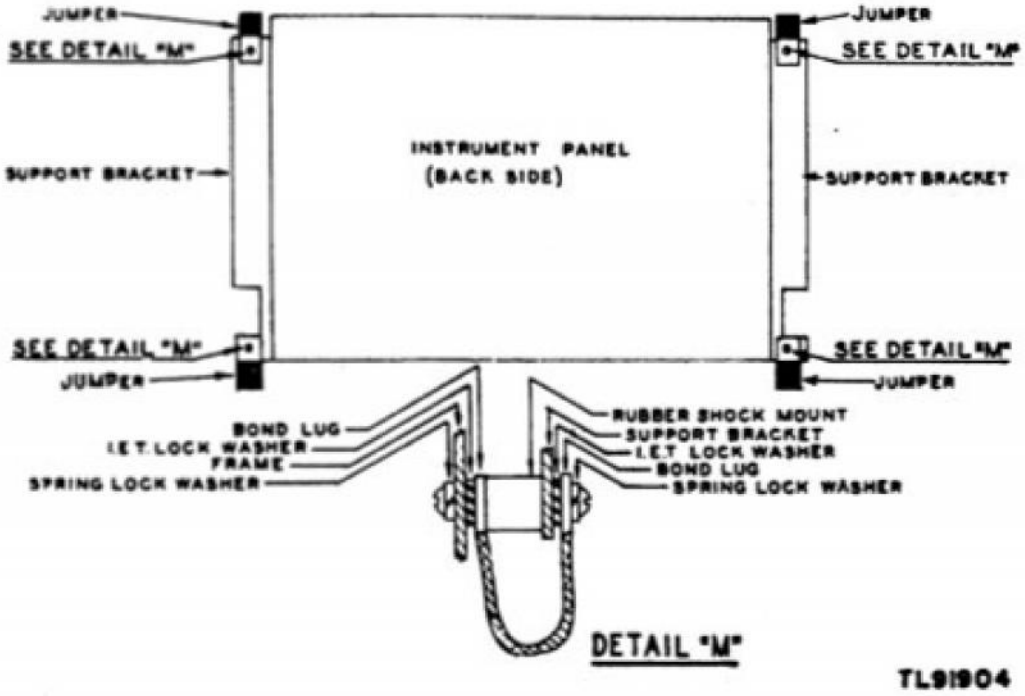


Figure 61. Instrument panel frame, suppression details.

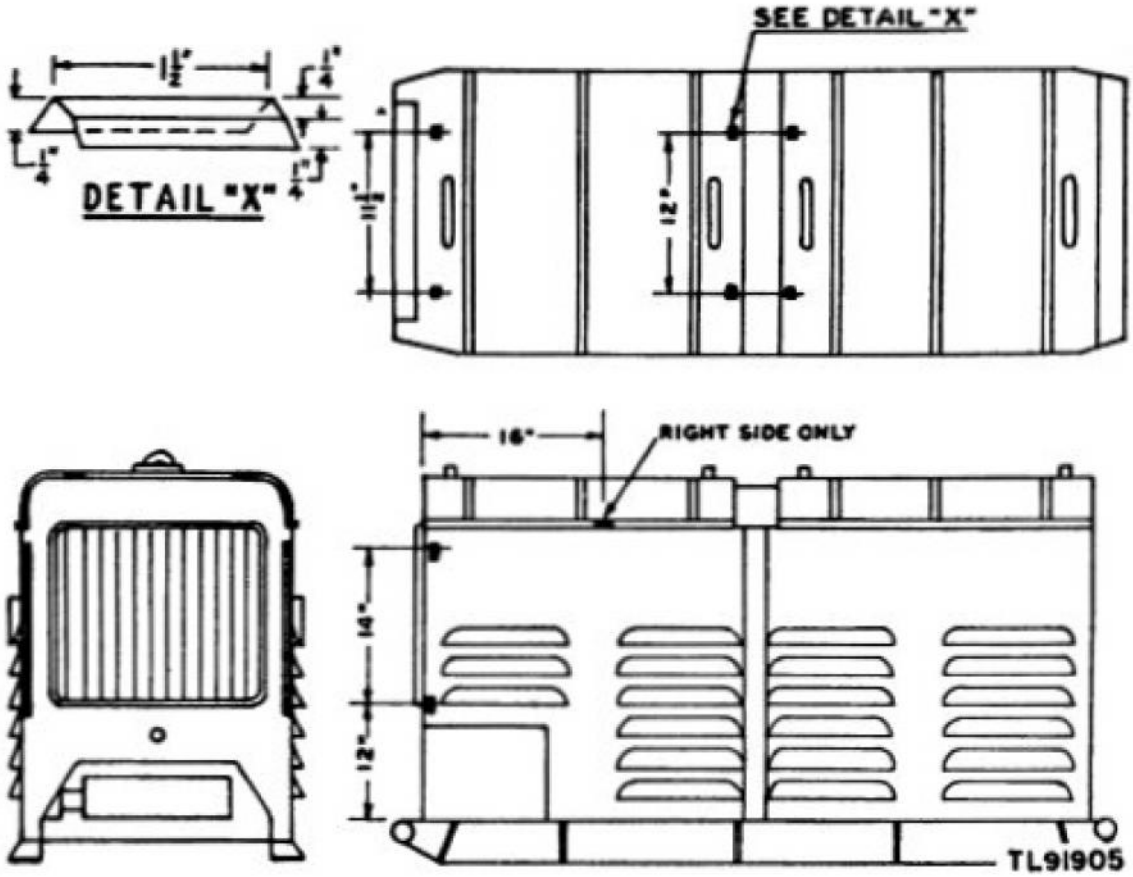


Figure 62. Housing, suppression details.

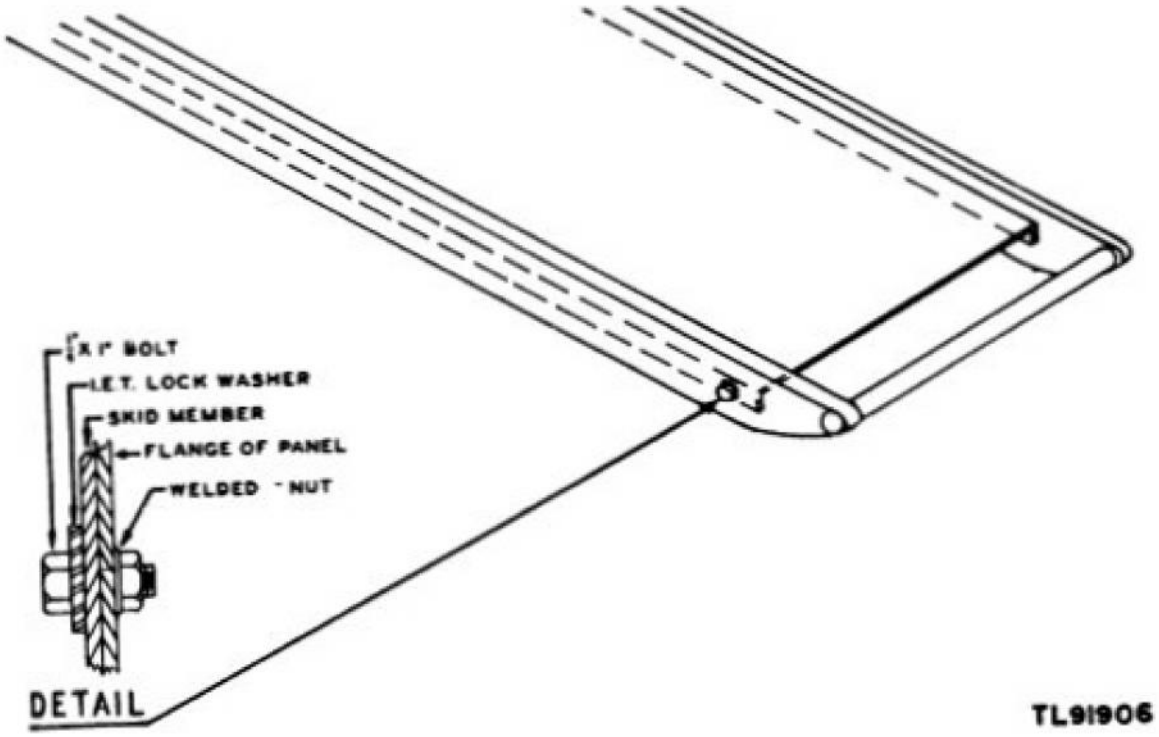


Figure 63. Dust pan, suppression details.

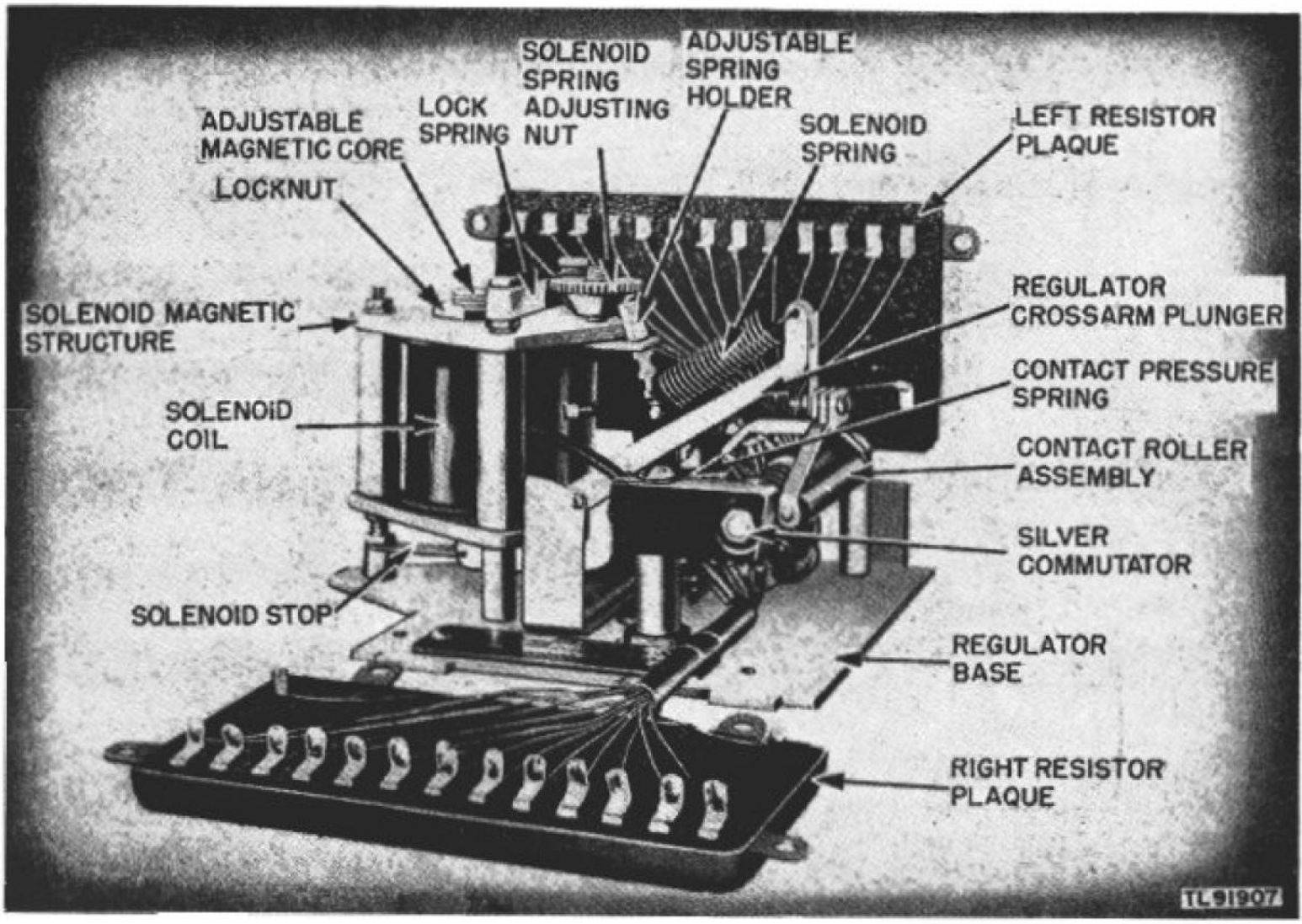


Figure 64. Power Unit PE-95-F, automatic voltage regulator (Signal Corps stock No. 3H4962-3).

84. Table of Clearances, Power Unit PE-95-(1)

Location	(Inches) (°)
Between valve stem and valve tappets	
(exhaust)	0.0125–0.0135
(intake)	0.008 –0.010
Between valve stem and valve guides	
(intake)	0.001 –0.004
(exhaust)	0.0005–0.0025
Valve, face angle	45°
Main bearings	0.002 –0.0025
Crankshaft, end play	0.002 –0.006
Connecting rod, diameter	0.0004–0.0025
Connecting rod, side clearance	0.002 –0.006
Piston to cylinder	0.002 –0.003
Piston ring gap	0.008 –0.013
Piston-ring to ring-groove	0.0005–0.001
Spark plug, point gap	0.030
Magneto-breaker, point gap	0.015
	Sequence
Engine, firing order	1–3–4–2

85. Table of Clearances, Power Units PE-95-(2) and PE-95-F

Location	(Inches) (°)
Between valve stems and tappets	0.014 (cold)
Between valve stems and guides	
(intake)	0.0015–0.00325
(exhaust)	0.002 –0.00375
Between valve tappets and guides	0.0005–0.002
Valve face angle	45°
Main bearings	0.001 –0.0025
Crankshaft end play	0.004 –0.006
Connecting rod to crankshaft	0.0005–0.0025
Connecting rod side clearance	0.005 –0.009
Piston to cylinder	0.003
Piston ring gap	0.008 –0.013
Piston rings to ring grooves	0.0005–0.001
Spark plug point gap	0.025
Distributor point gap	0.020
	Sequence
Engine firing order	1–3–4–2

WAR DEPARTMENT

UNSATISFACTORY EQUIPMENT REPORT

FOR	TECHNICAL SERVICE: Signal Corps — MATÉRIEL		DATE: 21 April 1945
FROM	ORGANIZATION: 579 Signal Repair Co.		STATION: A.P.O. 95 N.Y.N.Y.
TO	NEXT SUPERIOR HEADQUARTERS: Sig O Third Army	STATION	TECHNICAL SERVICE

COMPLETE MAJOR ITEM

NOMENCLATURE	TYPE	MODEL	
Power Unit PE-000	Diesel engine driven	UD-9	
MANUFACTURER: V-G Mfg Co.	U. S. A. REG. NO.: 000-P-44	SERIAL NO.: 21A531	DATE RECEIVED: 5 Jan 1945
EQUIPMENT WITH WHICH USED (If applicable): AN/FRC-1			

DEFECTIVE COMPONENT—DESCRIPTION AND CAUSE OF TROUBLE

PART NO.	TYPE	MANUFACTURER	DATE INSTALLED
R-000	Thrust bearing	E-Z Roll Bearing Co.	Original

DESCRIPTION OF FAILURE AND PROBABLE CAUSE (If additional space is required, use back of form)

Bearing badly worn due to inadequate dust protection.

DATE OF INITIAL TROUBLE	TOTAL TIME INSTALLED			TOTAL PERIOD OF OPERATION BEFORE FAILURE					
	YEARS	MONTHS	DAYS	YEARS	MONTHS	DAYS	HOURS	MILES	ROUNDS
19 April 1945					3	4	5		

BRIEF DESCRIPTION OF UNUSUAL SERVICE CONDITIONS AND ANY REMEDIAL ACTION TAKEN

Desert operation. Extreme sand and dust. Improvised felt washers for added protection.

TRAINING OR SKILL OF USING PERSONNEL			RECOMMENDATIONS (If additional space is required, use back of form)
POOR	FAIR X	GOOD	Additional shields should be provided.

ORIGINATING OFFICER

TYPED NAME, GRADE, AND ORGANIZATION	SIGNATURE
James Roe, Capt. Sig. C.	James Roe

FIRST ENDORSEMENT

TO CHIEF	TECHNICAL SERVICE	OFFICE	
NAME, GRADE, AND STATION		STATION	DATE

Instructions

1. It is imperative that the chief of technical service concerned be advised at the earliest practical moment of any constructional, design, or operational defect in matériel. This form is designed to facilitate such reports and to provide a uniform method of submitting the required data.
2. This form will be used for reporting manufacturing, design, or operational defects in matériel, petroleum fuels, lubricants, and preserving materials with a view to improving and correcting such defects, and for use in recommending modifications of matériel.
3. This form will not be used for reporting failures, isolated material defects or malfunctions of matériel resulting from fair-wear-and-tear or accidental damage nor for the replacement, repair or the issue of parts and equipment. It does not replace currently authorized operational or performance records.
4. Reports of malfunctions and accidents involving ammunition will continue to be submitted as directed in the manner described in AR 750-10 (change No. 1).
5. It will not be practicable or desirable in all cases to fill all blank spaces of the report. However, the report should be as complete as possible in order to expedite necessary corrective action. Additional pertinent information not provided for in the blank spaces should be submitted as inclosures to the form. Photographs, sketches, or other illustrative material are highly desirable.
6. When cases arise where it is necessary to communicate with a chief of service in order to assure safety to personnel, more expeditious means of communication are authorized. This form should be used to confirm reports made by more expeditious means.
7. This form will be made out in triplicate by using or service organization. Two copies will be forwarded direct to the technical service; one copy will be forwarded through command channels.
8. Necessity for using this form will be determined by the using or service troops.

W. D., A. G. O. Form No. 468
30 August 1944

This form supersedes W. D., A. G. O. Form No. 468, 1 December 1943, which may be used until existing stocks are exhausted.

U. S. GOVERNMENT PRINTING OFFICE 16—61568-1

TL 96278

Figure 65. Unsatisfactory Equipment Report.

APPENDIX I

MAINTENANCE PARTS

1. Maintenance Parts for Power Unit PE-95-(*)

The following information was compiled on 26 February 1945. The appropriate sections of the ASF Signal Supply Catalog for Power Unit PE-95-A, -B, -C, -F, -G, and -H are:

SIG 7-PE-95, Power Unit PE-95, Organizational Spare Parts.

ORD 7-SNL-G716, Willys 441 Engine, Standard Nomenclature List (when published).

SIG 8-PE-95, Power Unit PE-95, Higher Echelon Spare Parts.

SIG 10-556, Power Unit PE-95-F, Fixed Plant Maintenance List.

For the latest index of available catalog sections, see ASF Signal Supply Catalog SIG 2.

2. Spare Parts for Power Units PE-95-A, -B, -C, -G, and -H

a. POWER UNITS PE-95-A, -B, and -C.

Nomenclature	Signal Corps stock number	Quantity running spares
Arm, breaker, magneto	3H4595/A1	1
Bearing, connecting rod	3H4595/B13	2
Belt, fan	3H4595/B1	2
Brush, a-c	3H4595/B16	4
Brush, d-c	3H4595/B15	4
Cartridge, oil filter	3H4595/C16	2
Clamp, water hose	3H4595/C15	4
Contact, fixed	3H4595A/C14	1
Cover, cylinder front	3H4595A/C2	1
Cover, timing gear	3H4595/C17	1
Fuse, FU-42	3Z1942	6
Gasket, carburetor flange	3H4595/G7	1
Gasket, carburetor kit	3H4595/G15	1
Gasket, cover	3H4595/G17	1
Gasket, cover, oil pump	3H4595/G14	1
Gasket, cylinder head	3H4595/G12	1
Gasket, distributor cap	3H4512.5/G20	1
Gasket, filter bowl	3H4556A/L11	1
Gasket, governor	3H4595/G8	1
Gasket, magneto gear case	3H4595/G23	1
Gasket, manifold	3H4595/G13	2
Gasket, oil drain	3H4595/G18	1
Gasket, left hand	3H4595/G6	1
Gasket, right hand	3H4595/G5	1
Gasket, water pump	3H4595/G9	1
Gasket, rear water pump	3H4595/G10	1
Gasket, valve chamber	3H4595/G11	1
Hose, inlet, water	3H4595/H1	1
Hose, outlet, water	3H4595/H2	1
Pan, oil	3H4512.5/P18	1
Plug, spark, Champion N-9	3H4412-9	4
Retainer, valve spring	3H4512.5/R12	8
Rod, connecting	3H4595/R1	1
Seal, oil, crankshaft	3H4512.5/S19	1
Seal, water pump	3H4595/S2	1
Spring, brush	3H2408/S1	4
Spring, brush; Onan No. 842	3H4582B/S22	4
Spring, valve	3H4595/S7	8
Switch, start-stop	3Z9895	1
Thermostat, water, engine	3H4595/T1	1
Valve, intake	3H4595/V1	4
Valve, exhaust	3H4595/V2	4

b. POWER UNITS PE-95-G, and -H.

Nomenclature	Signal Corps stock number	Quantity running spares
Belt, fan drive	G503-0118253	1
Belt, governor drive		2
Bowl, fuel filter		1
Clamp, hose	G085-1100495	4
Condenser, distributor	GO67-0901889	1
Element, oil filter, with gasket	3320-GPW-18662B	4
Gasket, fuel filter bowl		4
Gasket, fuel pump bowl	GO85-3002220	4
Gasket, fuel pump to cyl' block	GO85-3002240	2
Gasket, lead, carburetor to manifold	G716-7033750	1
Gasket, oil filler cap	3320-GPW-6789	1
Gasket, oil filter cover bolt	3320-GPW-18675A	1
Gasket set, valve grind	3320-GPW-18387	2
Hose, radiator outlet and inlet	GO85-3107100	4
Lock, valve spring retainer	3320-GPW-6546	16

Nomenclautre	Signal Corps stock number	Quantity running spares
Plug, expansion, steel, 1¼ in.	3320–74121S	5
Point set, distributor	G104–1783105	1
Plug, spark, with gasket		12
Rotor, distributor	G503–03–73638	1
Spring, valve	3320–GPW–6513	4

Nomenclautre	Signal Corps stock number	Quantity running spares
Thermostat assembly	G503–0400093	
Valve, exhaust	3320–GPW–6505	4
Valve, intake	3320–GPW–6507	2
Brush, electrical contact, a-c	3H595/B16	4
Brush, electrical contact, d-c	3H4595/B15	4
Fuse, FU-42	3Z1942	10

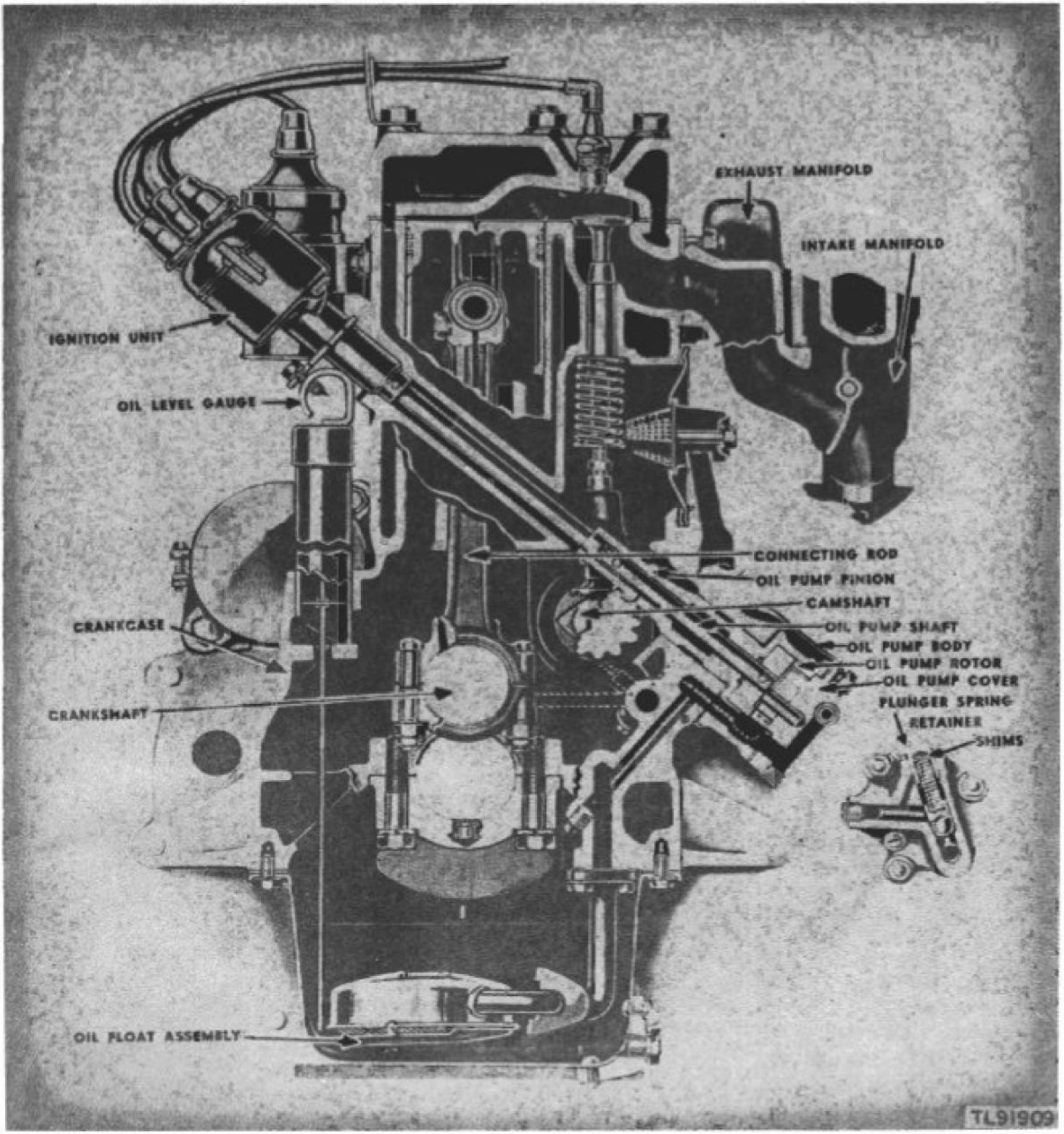
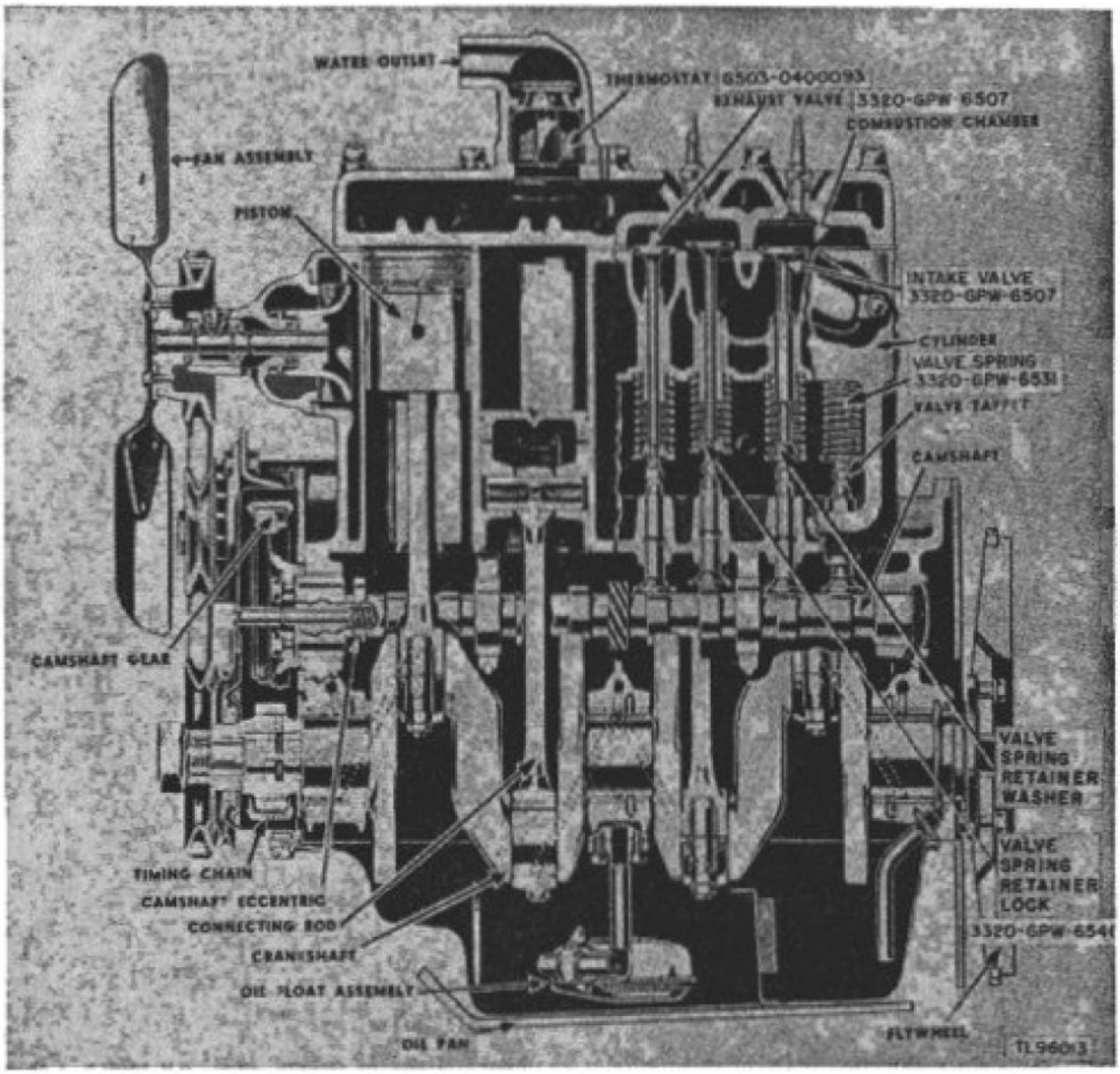
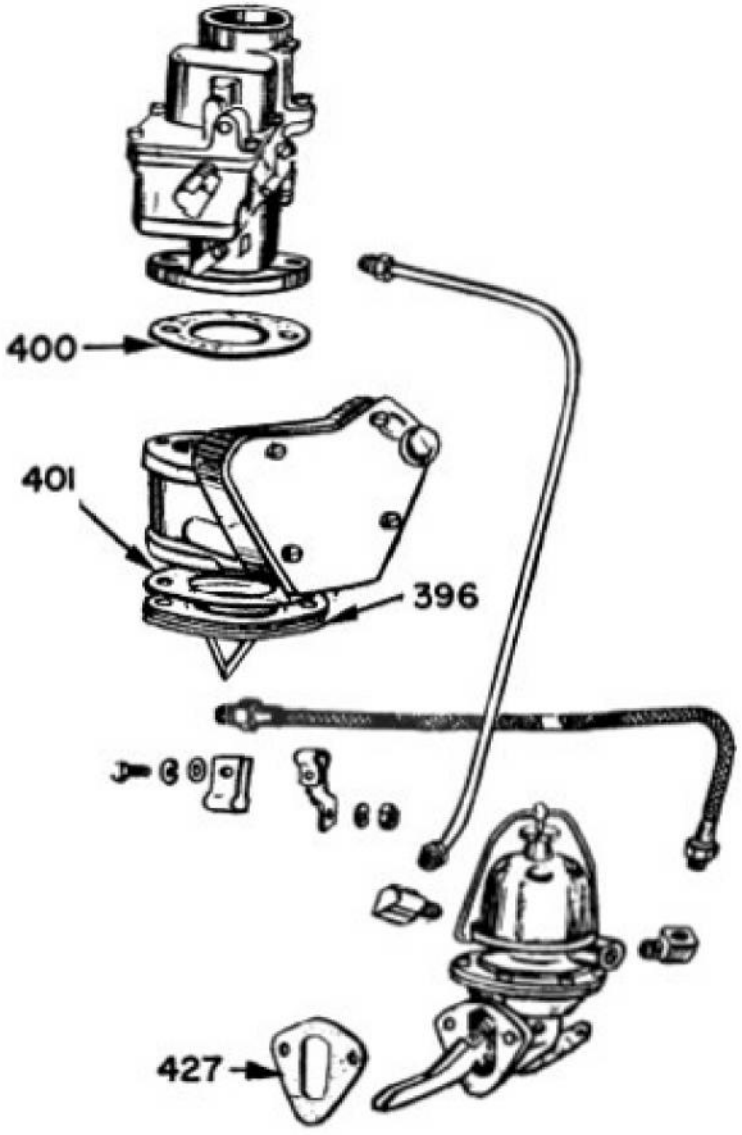


Figure 66. Power Unit PE–95–(2), engine cross-section, end view.



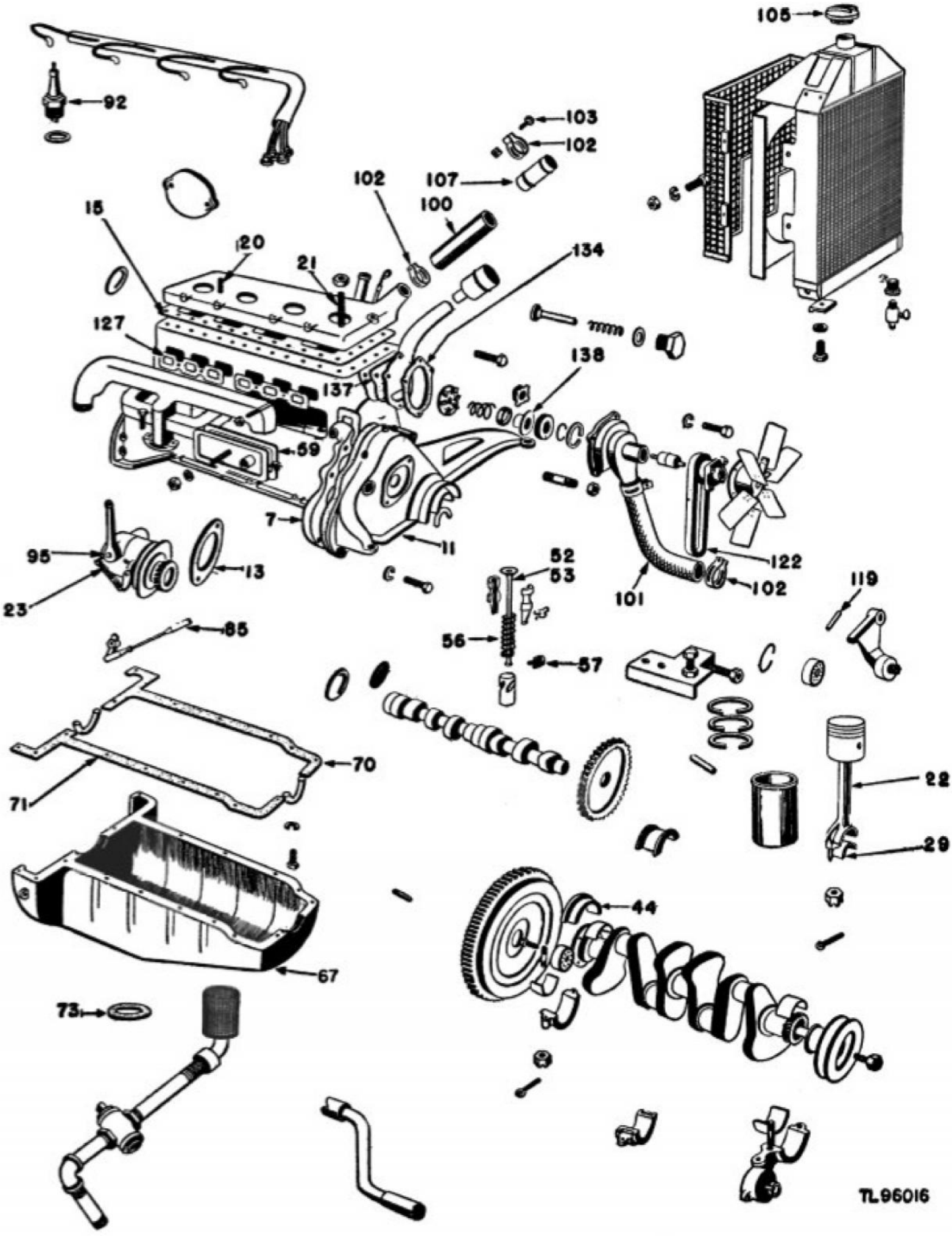
Name of part	Ordnance stock No.
Lock, valve spring retainer.	3320–GPW–6546
Spring, valve.	3320–GPW–6513
Valve, intake.	3320–GPW–6507
Valve, exhaust.	3320–GPW–6505
Thermostat.	G503–0400093

Figure 67. Power Unit PE–95–(2), engine cross-section, side view.



Name of part	Ordnance stock No.
Gasket, fuel filter bowl (427).	
Gaskets, carburetor to manifold (396, 400, 401).	G716-7033750

Figure 68. Power Unit PE-95-(2) and PE-95-F, fuel system parts.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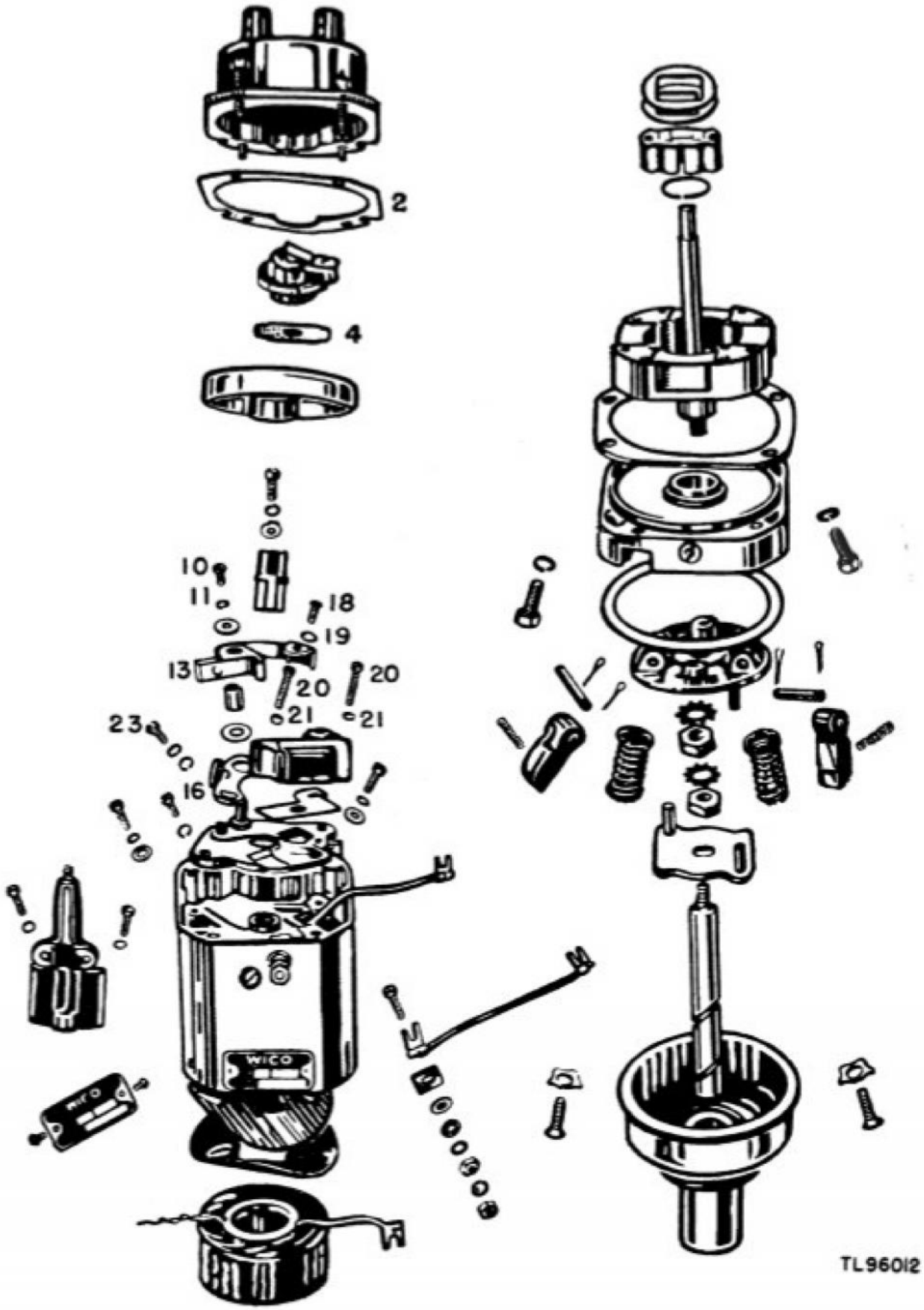
Name of part	Signal Corps Stock No.
Gasket, governor to crankcase (13).	3H4595/G8
Gasket, valve cover plate (59).	3H4595/G11
Joints, ball (85).	3H4595A/J1
Spring, valve (56).	3H4595/S7
Stud, cylinder head, short (20).	3H4512.5/S6
Stud, cylinder head, long (21).	3H4512.5/S5
Valve, intake (53).	3H4595/V1
Valve, exhaust (52).	3H4595/V2
Plug, spark (92).	3H4412-9
Pin, groove (119).	3H4512.5/P8
Gasket, base, right side (70).	3H4595/G5
Gasket, base, left side (71).	3H4595/G6
Belt, fan (122).	3H4595A/B1
Governor (95).	3H4595A/G6
Spring, governor (23).	3H4595A/S45
Gasket, manifold (127).	3H4595/G13
Bearing, connecting rod (29).	3H4595/B13
Clamp, hose (102).	3H4595/C15
Cover, cylinder block, front (11).	3H4595A/C2
Cover, timing gear (17).	3H4595/C17
Gasket, cylinder head (15).	3H4595/G12
Gasket, oil drain (73).	3H4595/G18
Assembly, radiator cap (105).	3H4595/C21
Screw, hose clamp (103).	6L7032-18.1S
Clamp, hose (102).	3H4595/C15
Thermostat, engine (107).	3H4595/T1
Hose, water (100).	3H4595/H1
Gasket, water pump (134).	3H4595/G9
Gasket, water pump, rear (137).	3H4595/G10
Seal, water pump (138).	3H4595/S2
Hose, radiator outlet (101).	3H4595/H2
Spring, valve (56).	3H4595/S7
Retainer, valve spring (57).	3H4512.5/R12
Rod, connecting (22).	3H4595/R1
Seal, oil, crankshaft (44).	3H4512.5/S19
Pan, oil (67).	3H4512.5/P18

Figure 68. Power Unit PE-95 (1), engine parts.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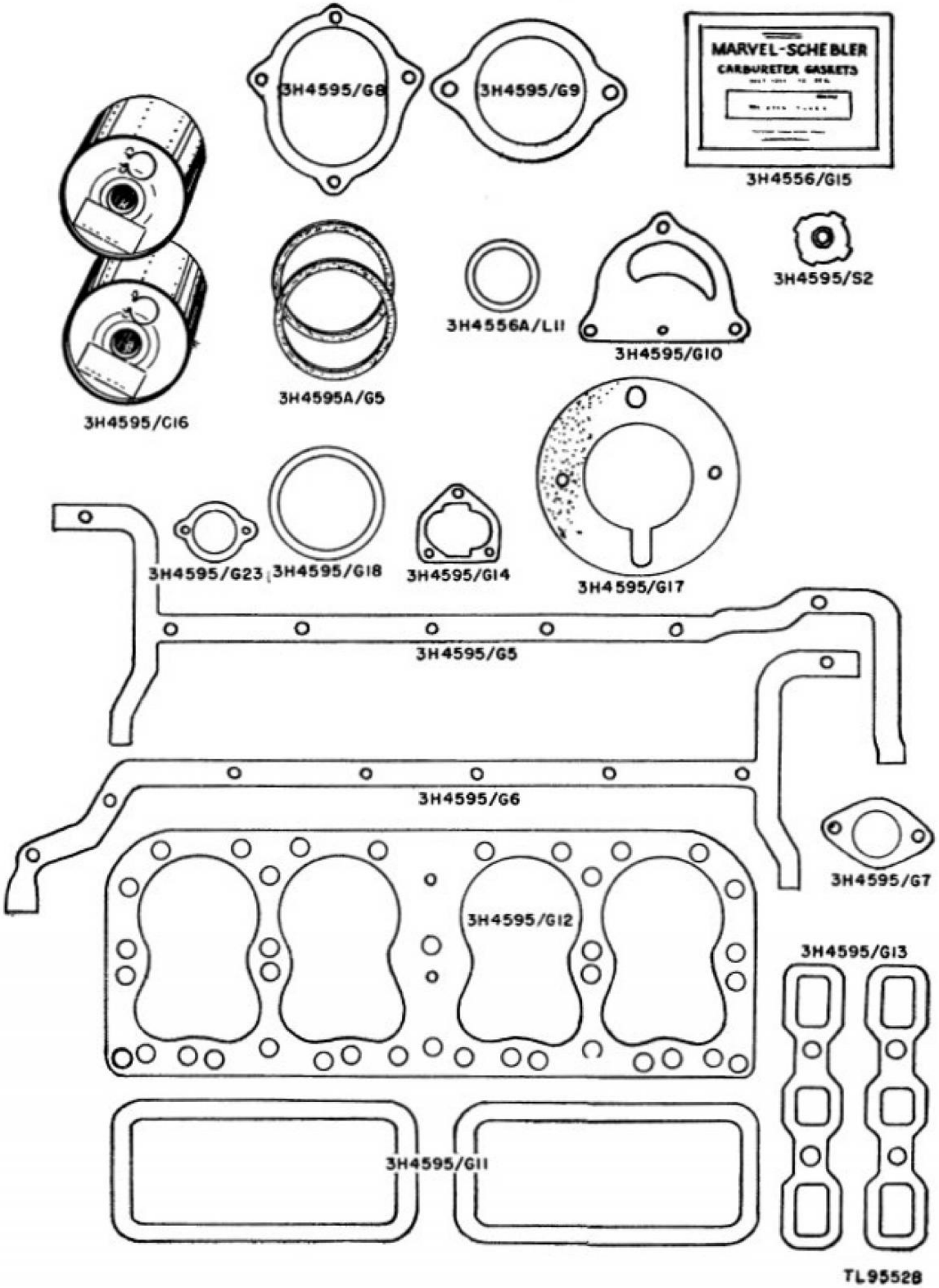
Name of part	Signal Corps Stock No.
Arm, breaker (13).	3H4595/A1
Contact, fixed (16).	3H4595A/C14
Gasket, distributor cap (2).	3H4512.5/G20
Felt, breaker cover (4).	3H4595A/F2
Screw, breaker arm clamp (10).	3H4595A/S8
Screw, breaker arm spring (18).	3H4595A/S8
Screw, condenser (20).	3H4595A/S40
Screw, fixed contact (23).	3H2699-20/S15
Washer, breaker arm clamp (11).	6L70008
Washer, breaker arm spring (19).	6L72208
Washer, condenser screw (21).	6L73006

Figure 70. Power Unit PE-95-(1), magneto parts.


3H4595/G8
3H4595/G9
MARVEL-SCHEBLER
CARBURETER GASKETS
3H4556/G15
3H4595/C16
3H4595A/G5
3H4556A/L11
3H4595/G10
3H4595/S2
3H4595/G23
3H4595/G18
3H4595/G14
3H4595/G17
3H4595/G5
3H4595/G6
3H4595/G7
3H4595/G12
3H4595/G13
3H4595/G11
TL95528

Name of part	Signal Corps Stock No.
Element, oil filter.	3H4595/C16
Gasket, water pump.	3H4595/G8
Gasket, governor.	3H4595/G9
Gasket kit, carburetor.	3H4595/G15
Gasket, oil filter cover.	3H4595A/G5
Gasket, fuel strainer bowl.	3H4556A/L11
Gasket, water pump rear.	3H4595/G10
Seal, water pump.	3H4595/S2
Gasket, magneto gearcase cover.	3H4595/G23
Gasket, oil drain.	3H4595/G18
Gasket, oil pump cover.	3H4595/G14
Gasket, generator end bell cover.	3H4595/G17
Gasket, oil pan, right side.	3H4595/G5
Gasket, oil pan, left side.	3H4595/G6
Gasket, carburetor flange.	3H4595/G7
Gasket, cylinder head.	3H4595/G12
Gasket, valve inspection plate.	3H4595/G11
Gasket, manifold.	3H4595/G13

Figure 71. Power Unit PE–95–(1), gaskets.

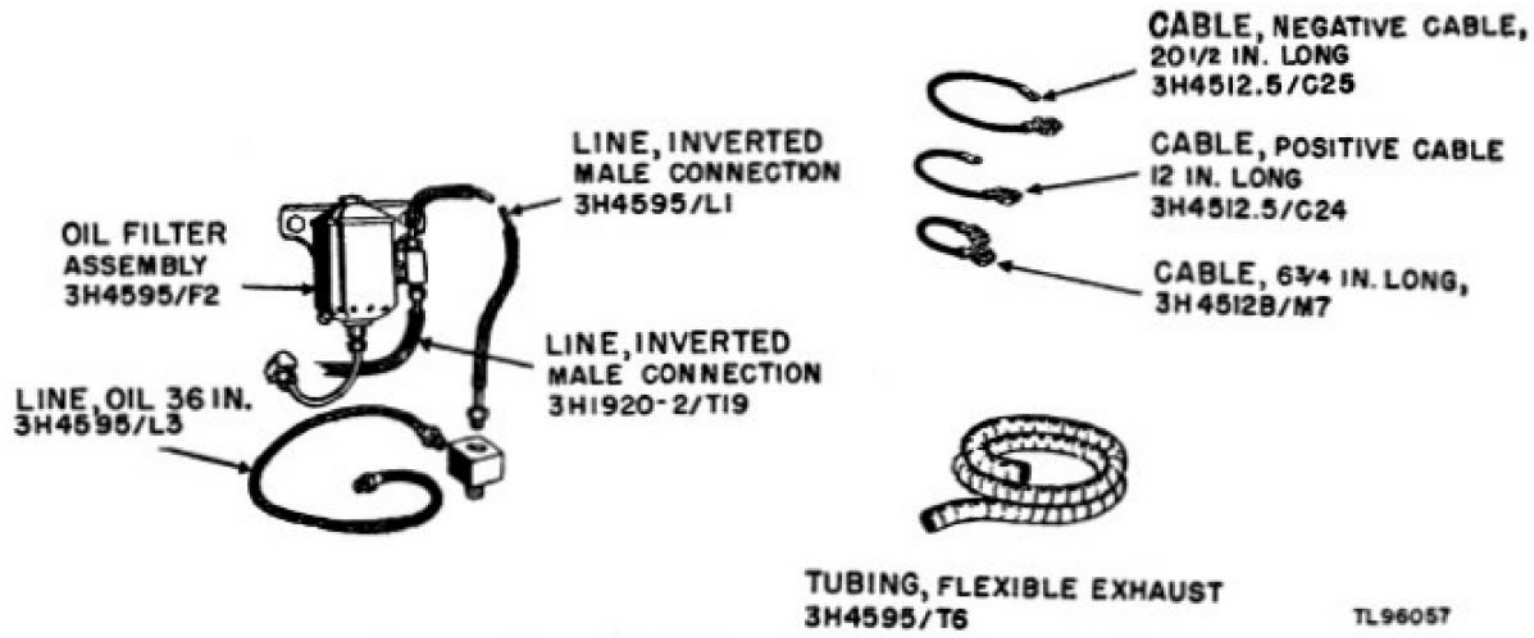


Figure 72. Power Unit PE-95-(1), miscellaneous connections.

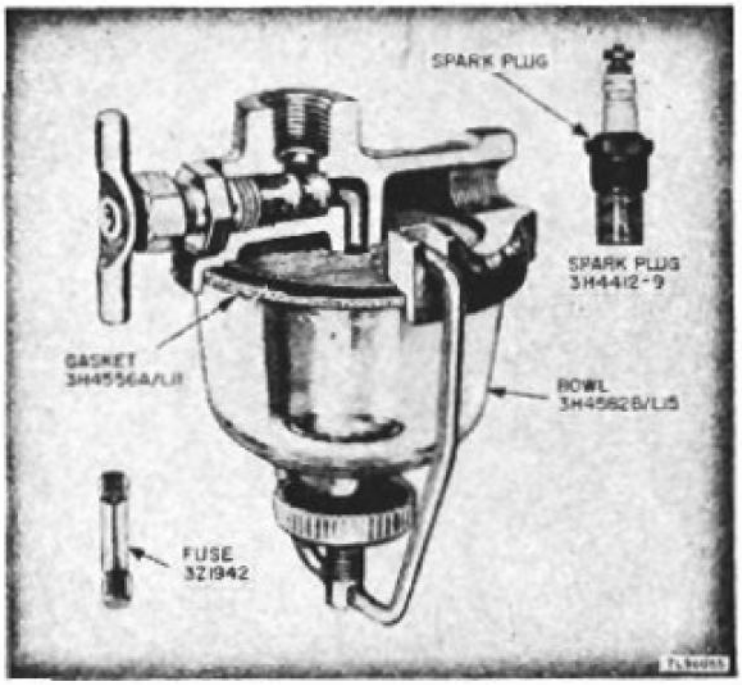


Figure 73. Fuel strainer and miscellaneous parts.

APPENDIX II

REFERENCES

1. Parts List

SIG 1, Introduction to ASF Signal Supply Catalog.
SIG 2, Complete Index to ASF Signal Supply Catalog, (when published).
SIG 3, List of Items for Troop Issue.
SIG 4-1, Allowances of Expendable Supplies.
SIG 4-2, Allowances of Expendable Supplies for Schools, Training Centers, and Boards.
SIG 5, Stock List of All Items.
ORD 7-SNL-G716, Willys 441 Engine, Standard Nomenclature List (when published).
SIG 7-PE-95, Power Unit PE-95, Organizational Spare Parts.
SIG 8-PE-95, Power Unit PE-95, Higher Echelon Spare Parts.
SIG 10-556, Power Unit PE-95-F, Fixed Plant Maintenance List.
SB 11-10, Signal Corps Kit and Materials for Moisture- and Fungi-resistant Treatment.

2. Decontamination

TM 3-220, Decontamination.

3. Demolition

FM 5-25, Explosives and Demolitions.

4. Camouflage

FM 5-20, Camouflage, Basic Principles.

5. Other Technical Publications

The following is a list of manuals and Technical Bulletins pertaining to the care and use of Power Unit PE-95-(*) and its associated equipment.

TM 11-430, Storage Batteries Used in Signal Communication Except those Pertaining to Aircraft.
TM 37-250, Basic Maintenance Manual.
TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 23, Rustproofing of Engines.
TB SIG 25, Preventive Maintenance of Power Cords.
TB SIG 55, Preventive Maintenance Service on Gasoline and Diesel Engine Components of Power Units used by the Signal Corps.
TB SIG 66, Winter Maintenance of Ground Signal Equipment.
TB SIG 69, Lubrication of Ground Signal Equipment.
TB SIG 72, Tropical Maintenance of Ground Signal Equipment.
TB SIG 75, Desert Maintenance of Ground Signal Equipment.
FM 21-6, List and Index of War Department Publications.
FM 21-7, List of Training Films, Film Strips, and Film Bulletins.
TM 9-1831A, Ordnance Maintenance: Signal Corps Power Units PE-95-F, PE-95-G, PE-95-H; Engine and Accessories (Willys Model 441) (when published).
TM 11-980, Power Unit PU-58/G.
TM 37-2810, Motor Vehicle Inspections and Preventive Maintenance Services.

6. Forms

The following is a list of forms referred to in this manual.

WD AGO Form 460 (Preventive Maintenance Roster).
WD Form 48 (Driver's Trip Ticket and PM Service Record).
AAF Form 54 (Unsatisfactory Report).
WD AGO Form 468 (Unsatisfactory Equipment Report).
WD AGO Form 461 (Work Sheet for Wheeled and Half-track Vehicles).

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