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DEPARTMENT OF THE ARMY TECHNICAL MANUAL

TELETYPEWRITER SET AN/PGC-1

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DEPARTMENT OF THE ARMY *APRIL 1951*

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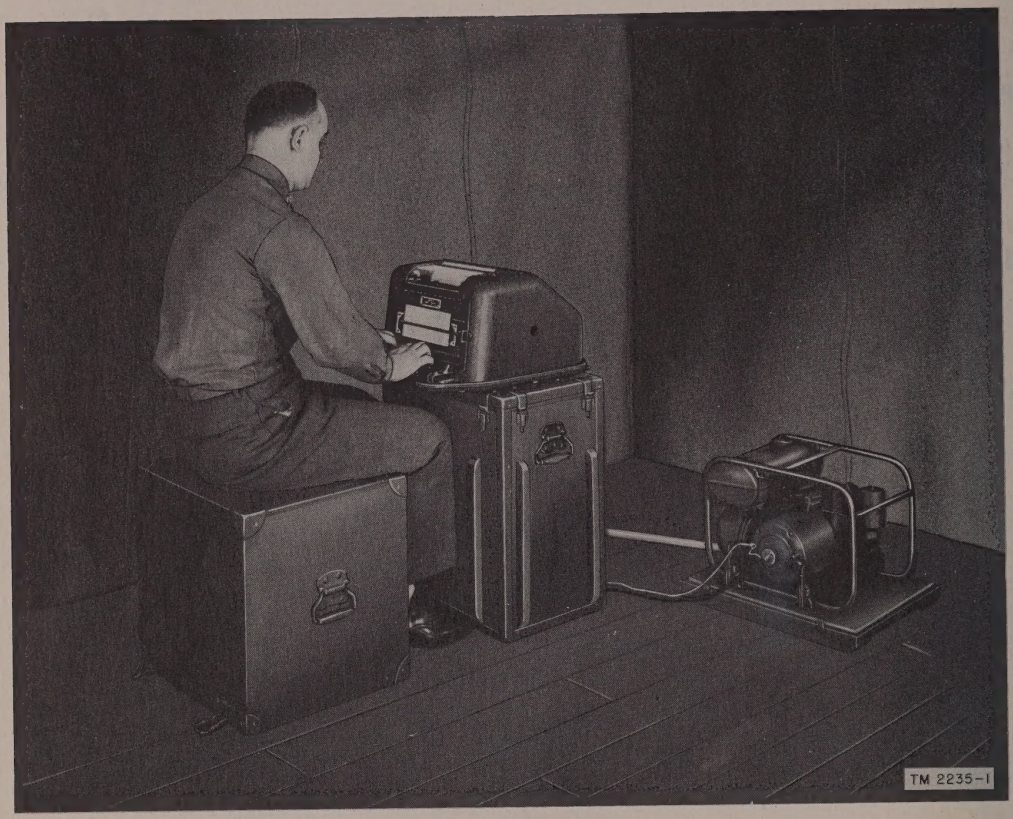


Figure 1. Teletypewriter Set AN/PGC-1, in operation.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the information and guidance of the personnel to whom this equipment is issued. They contain descriptive information for the installation, operation, maintenance, and repair of Teletypewriter Set AN/PGC-1.

b. This book is prepared in five chapters and two appendixes. The first appendix contains a list of pertinent references, and the second contains an identification table of parts.

2. Forms and Records

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

a. DD FORM 6, Report of Damaged or Improper Shipment (Reports Control Symbols CS GLD-66 (Army), S and A-70-6 (Navy), and AF-MC-U2 (Air Force)), will be filled out and forwarded as prescribed in SR-745-45-5 (Army), NAV DEPT SERIAL 85POO (Navy), and AFR 71-4 (Air Force).

b. DA AGO Form 468, Unsatisfactory Equipment Report (Reports Control Symbols CS GLD-247) will be filled out and forwarded to the Office of the Chief Signal Officer as prescribed in SR 700-45-5.

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

d. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

3. Use of Teletypewriter Set AN/PGC-1 (fig. 2)

a. GENERAL. Teletypewriter Set AN/PGC-1 is a lightweight, portable, sending and receiving teletypewriter station primarily intended for field use. The set is designed for operation in a nominal 60-milliampere d-c (direct-current) network or 20-milliampere wire-line or radio carrier system. The components of the set, which include a standard communications teletypewriter, a gasoline-engine a-c (alternating-current) generator, and a case of accessories, weigh altogether 135 pounds (less wooden carrying chests) and are designed for mounting on standard Quartermaster packboards. The covers of these components are immersion-proof, affording complete protection from the effects of weather and permitting self-floatation in amphibious activities. A wooden carrying chest is provided for each of these components to protect the set when it is transported by vehicle. Teletypewriter Set AN/PGC-1 has an over-all weight which is appreciably less than most teletypewriter equipments used by the Army. Teletypewriter Set AN/PGC-1 will permit the use of telegraph-printer service in lower operating echelons, because its lighter weight permits easier transportation, and other improvements reduce installation and operation problems.

b. TELETYPEWRITER CAPABILITIES. (1) Teletypewriter TT-4/TG, which is the teletypewriter unit of Teletypewriter Set AN/PGC-1, is capable of receiving and sending messages in standard Baudot start-stop five-unit code. Teletypewriter TT-4/TG, supplied as part of the AN/PGC-1 set, prints on neutral signals only. It can be adapted, however, to receive incoming polar signals by the addition of a polar line relay. The teletypewriter also transmits neutral signals only, although it is designed so that it may be modified for use with polar transmitting facilities. The neutral line (or carrier-system) connections can be made for half-duplex, full-duplex, receiving-only, or sending-only operation.

(2) Three standard operating speeds are possible: 368.1, 404, and 600 opm (operations per minute) (approximately 60, 66, and 100 words per minute, respectively), as determined by the motor-drive gear set in use. The machine is geared for 368.1 opm when delivered by the manufacturer, but alternate 404-opm gears are supplied as TT-4/TG accessories. The 404-opm gears must be installed in place of the normal 368.1 opm gears if this teletypewriter and a British teleprinter are used in the same circuit. Gears for 600 opm are not supplied.

(3) A VOICE FREQ LINE — D C LINE change-over switch on the left side of the machine, beneath the dust

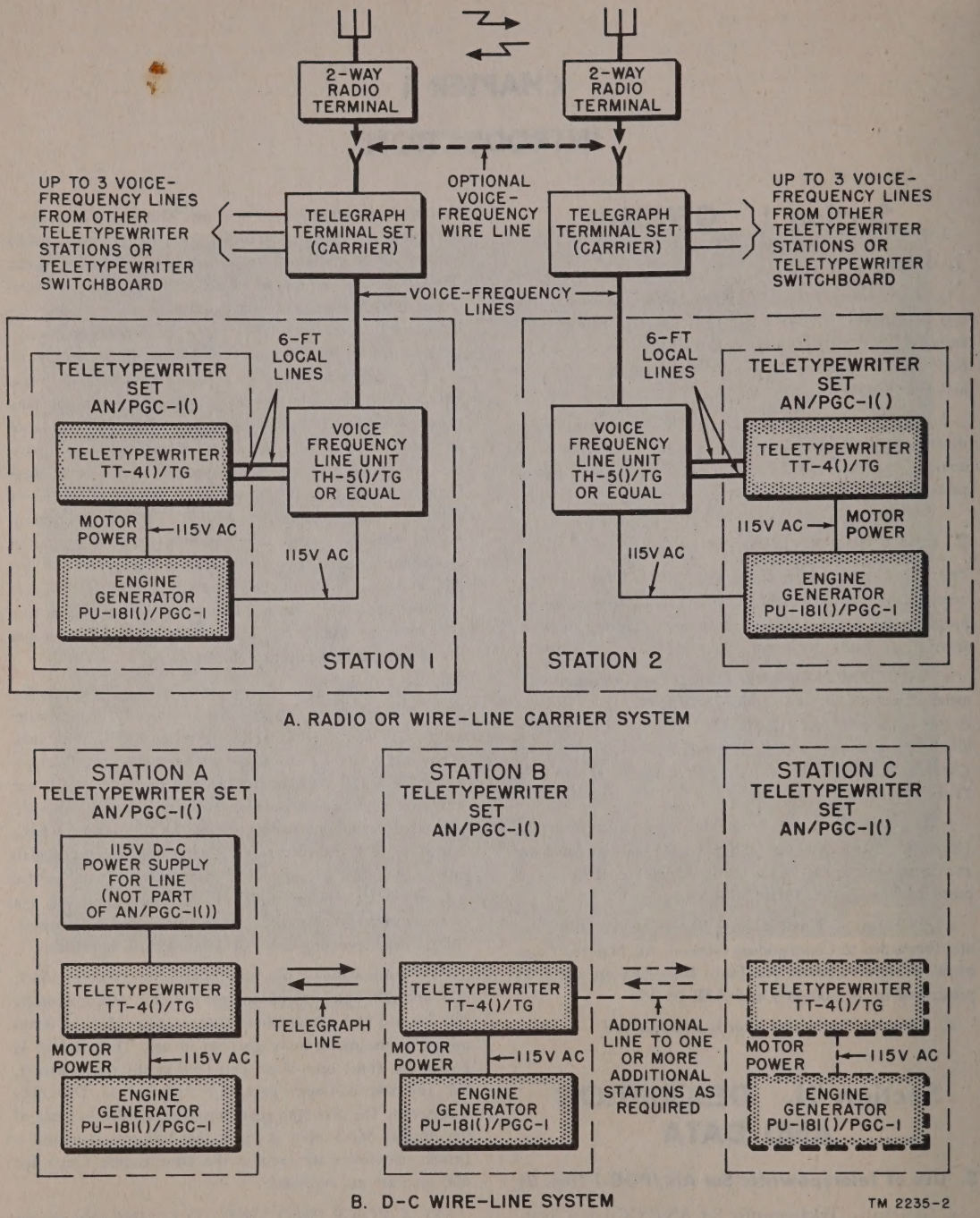


Figure 2. Teletypewriter Set AN/PGC-1 as used in wire (d-c and carrier) and radio transmission systems.

cover, permits the choice of 20-milliampere or 60-milliampere incoming d-c signals for printing operation.

(4) The service range of this teletypewriter is 25 miles at 368.1 opm, assuming the use of W-110-B field wire (wet) on a 60-milliampere simplex line connected directly to the receiving terminals. At 600 opm, the service range is 15 miles with the same line conndition.

(5) Teletypewriter TT-4/TG requires a power source of 105 to 125 volts dc or of 105 to 125 volt, single-phase, 50 to 60 cps (cycles per second), ac. The power consumption of this unit is approximately 150 watts. When this unit is used on a 25-mile directly connected telegraph line, at least one teletypewriter in the circuit also must be connected to a d-c power source furnishing a nominal 115-volt output for signal current. When it is used in a typical wire-line or radio carrier system, no d-c power source is necessary, but each teletypewriter in the circuit must be connected to a carrier-conversion unit whose electrical characteristics are equal to or similar to those of Voice Frequency Line Unit TH-5/TG, which is a component of Telegraph Terminal TH-3/TC.

(6) Functions of Teletypewriter TT-4/TG are enumerated in the table of performance characteristics (par. 6).

c. Power-Plant Capabilities. Engine Generator PU-181/PGC-1, which is the gasoline-engine driven power unit of the teletypewriter set, delivers 300 watts at nominal 120 or (optionally) 240 volts, 60-cycle, single-phase ac to meet both the motor requirements of the Teletypewriter TT-4/TG in the AN/PGC-1 set and the power input requirements of Voice Frequency Line Unit TH-5/TG. The power factor is high and may be considered as 100 percent. The engine, which develops 1.25 hp (horsepower) at 3,000 rpm (revolutions per minute), is designed to operate satisfactorily on commercial gasolines with octane ratings as low as 62, and will run approximately 7½ hours at full load on a single filling of the 1-gallon fuel tank.

4. General Description

The complete Teletypewriter Set AN/PGC-1 consists of Teletypewriter TT-4/TG, weighing 46.5 pounds with a full roll of recording paper; Engine Generator PU-181/PGC-1, weighing 60.2 pounds with a full tank of fuel; an immersion-proof accessories case, Case CY-552/PGC-1, weighing 24 pounds with normal contents; and a 30-pound wooden carrying chest, Case CY-553/PGC-1, for the accessories case (fig. 3). Also included are a 42-pound wooden carry-

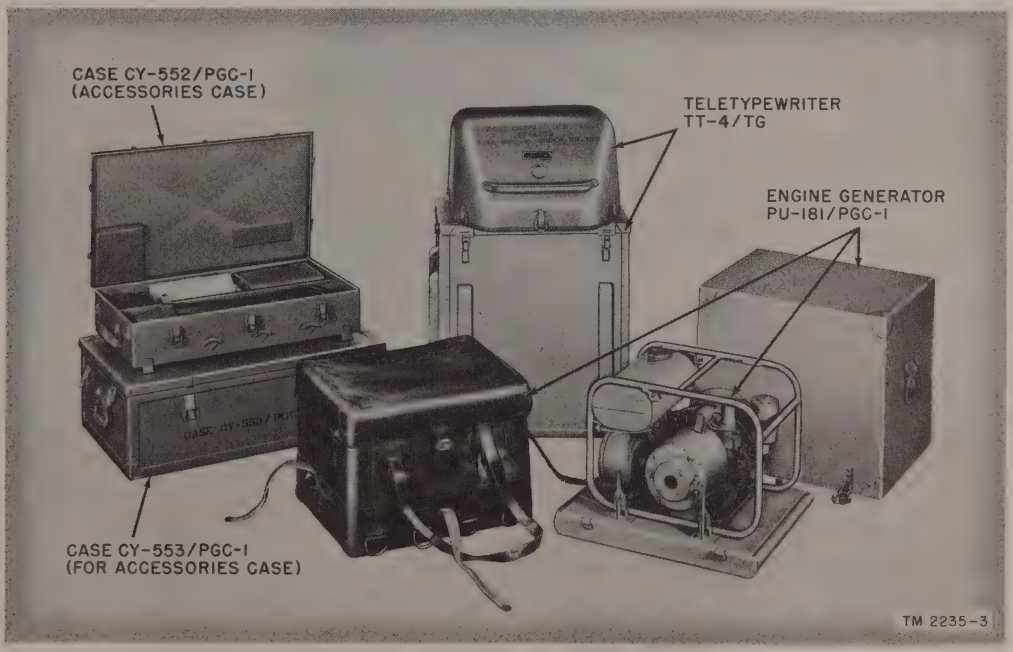


Figure 3. Components of Teletypewriter Set AN/PGC-1.

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ing chest for the teletypewriter, a 29.5-pound wooden carrying chest for the engine generator, and a 5.5-pound immersion-proof bag also for the engine generator.

a. TELETYPEWRITER TT-4/TG (figs. 4 and 5). The complete Teletypewriter TT-4/TG includes a lightweight teletypewriter, a transportation-and-storage case, Case CY-694/PGC-1, and miscellaneous small items described in the instruction book for Teletypewriter TT-4/TG. The typing unit is provided with a dust cover, an immersion-proof cover, and a base. The base is designed for mounting on a standard packboard or table. Magnesium alloys are used extensively in the construction of this teletypewriter, thus accounting for its light weight. The unit has an olive-drab crackle finish.

(1) The teletypewriter machine includes a standard-communications keyboard (fig. 5) which actuates a cam-operated transmitter, a page printer of the stationary-paper type capable of handling one-, two-, or three-copy rolls of paper, a motor and governor, and a control panel. Line terminals are located on a terminal board at the lower-left side of the

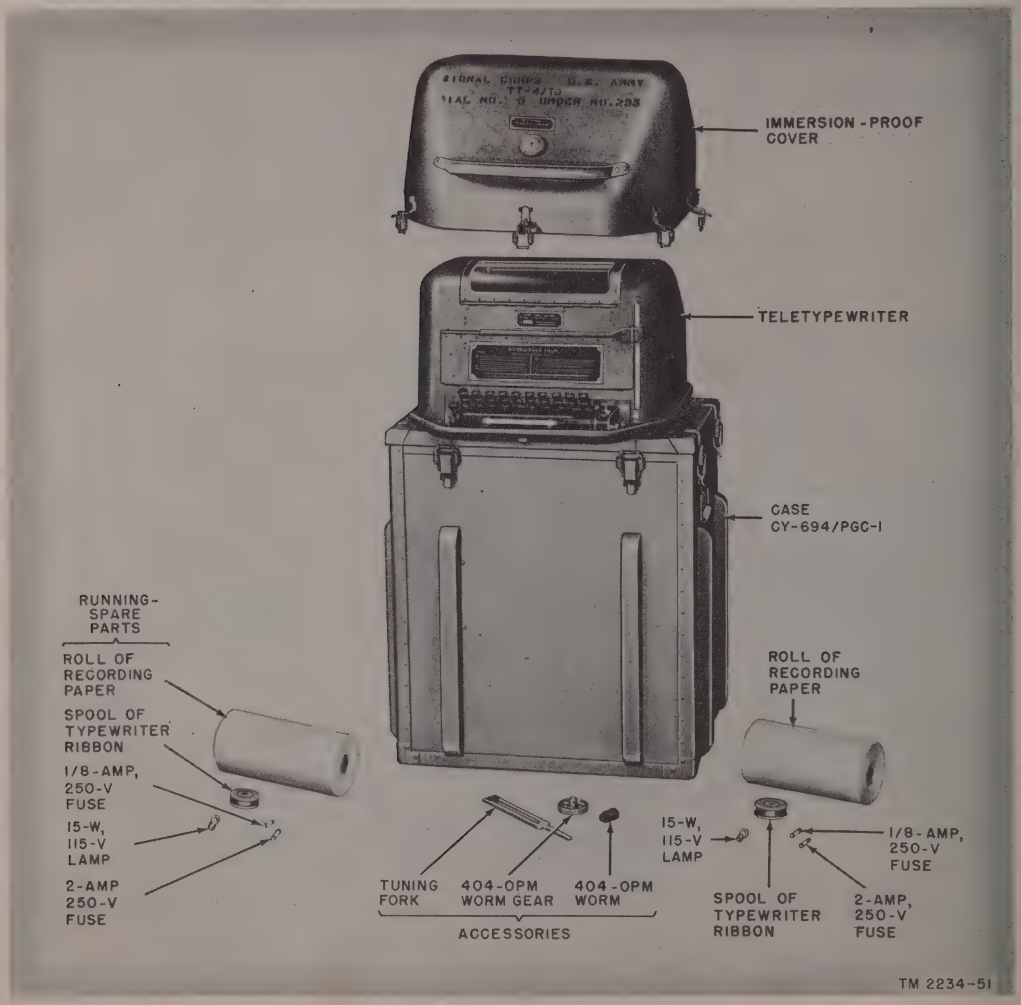


Figure 4. Components of Teletypewriter TT-4/TG.

machine. The typed copy, the control panel, and the motor-governor adjustment are illuminated by a lamp beneath the dust cover.

(2) The dust cover, which has hinged doors for accessibility to the teletypewriter ribbon and controls, should be kept on the machine at all times as a protection to the operating mechanism. The immersion-proof cover, which must be removed in order to use the machine, fits over the dust cover and is clamped to the base. Hooks are provided on the base so that the teletypewriter can be roped to a standard packboard when the machine is used in the field. The immersion-proof cover can be removed without removing the base from the packboard; thus, the teletypewriter can be connected to line and power source and can be operated without being removed from the packboard.

(3) Case CY-694/PGC-1 is a plywood carrying chest with a lusterless olive-drab enamel finish. It is used to protect the teletypewriter during storage and transportation. It is provided with straps for a tool bag, straps and brackets for a roll of recording paper, and two felt-covered blocks, which fit around the base of the teletypewriter to prevent it from slipping within the case. The interior is lined with felt pads to prevent the immersion-proof cover and base of the teletypewriter from being scratched. The case is equipped with a cover mounted with detachable hinges. The cover is held closed by six spring-loaded latches. Cleats are provided on all faces except the cover to prevent slippage between cases when large numbers are stacked together in storage or transportation. Handles, suitable for use with arctic gloves, are provided on two sides of the case. When the case is set on its unhinged end, it can be used as a table for operating the teletypewriter.

(4) For a complete description of Teletypewriter TT-4/TG, its accessories, and its running spares, refer to the instruction book for the teletypewriter.

b. Engine Generator PU-181/PGC-1 (figs. 6 through 11). (1) Engine Generator PU-181/PGC-1 is a compact, lightweight, electric generating set. The main operating components are a two-cycle magneto-ignition gasoline engine (Engine GE-12-F) and a single-phase, revolving-field, a-c generator (Generator GN-51-C). The generator is coupled directly to the engine crankshaft by means of a female splined coupling that matches the splined extension on the engine crankshaft. A two-winding stator surrounds the rotating field, which consists of a cylindrical permanent magnet mounted on the generator shaft. No brushes or slip rings are used; electrical output is obtained from the stator windings. A single 20-ampere twist-lock output receptacle and three binding post terminals are located on the outer-end casting of the generator. Two of these posts are for output, while the third, marked *G*, is for ground. Output is normally taken from the receptacle through a plug-terminated cable. The output binding posts are for use when a mating plug is not available. The entire engine-generator unit is contained in an open frame of tubular construction. It is mounted on four rubber shock mountings, which hold the unit securely in place during transportation and also absorb vibrations during operation.

(2) A rubber immersion-proof cover, Bag CW-191/PGC-1, is provided to protect the engine generator from damage by submersion, dirt, dust, or moisture during transportation (fig. 7). The cover is equipped with metal rings for packboard lashing and with shoulder straps for transportation directly on the back of a man.

(3) A wooden carrying chest, Case CY-739/PGC-1 (fig. 8), is provided for storage and vehicular transportation of the engine generator. This case contains a tool and running-spare-parts compartment in the top (fig. 9). The mounting base for the engine generator forms the bottom of this carrying chest (fig. 10). The engine-generator mounting base is equipped with wooden skids. The upper portion of the case may be fastened to the base by four spring-loaded latches (fig. 8). Four additional spring-loaded latches on the inside (fig. 10) are used to secure the engine generator

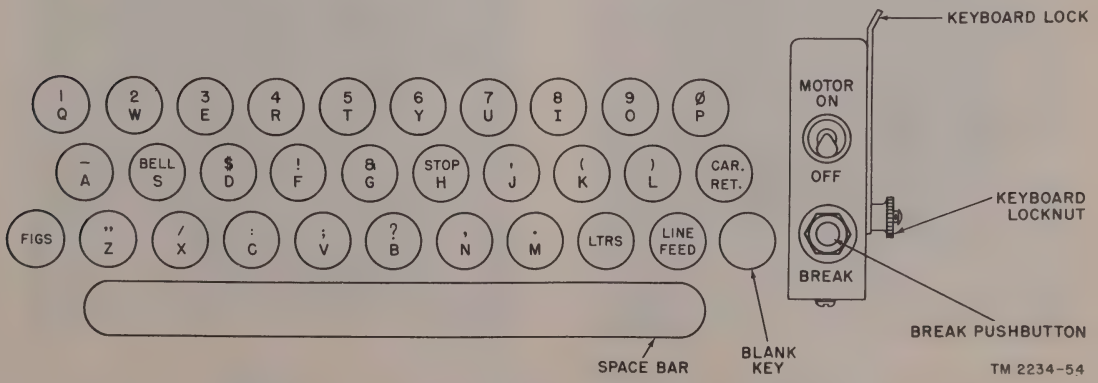


Figure 5. Standard-communications keyboard on Teletypewriter TT-4/TG, diagram.

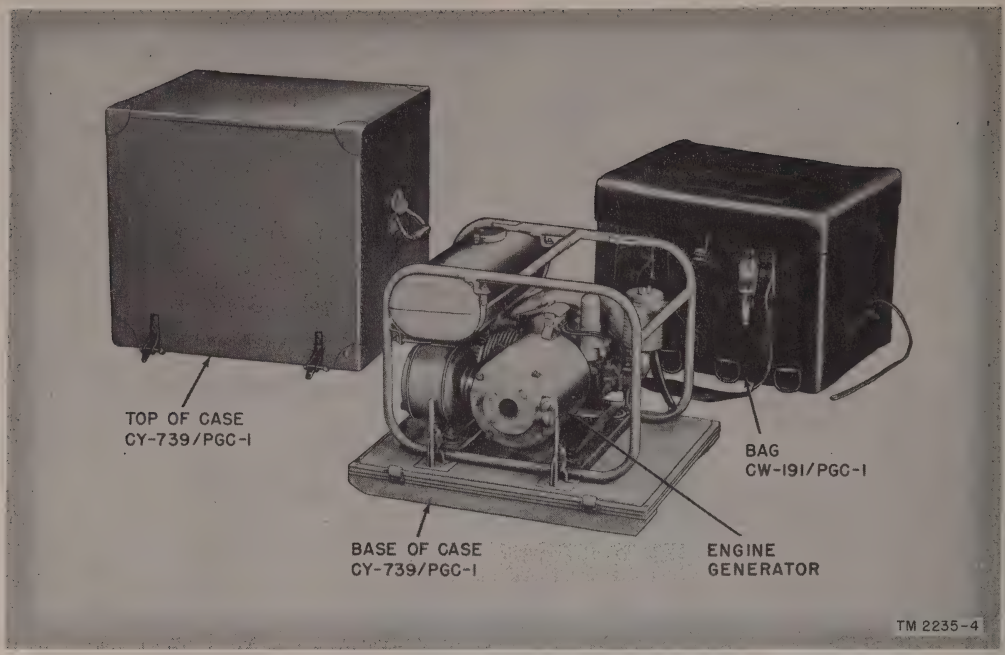


Figure 6. Components of Engine Generator PU-181/PGC-1.



Figure 7. Bag CW-191/PGC-1, containing engine generator.



Figure 8. Case CY-739/PGC-1, for Engine Generator PU-181/PGC-1.

to the base. When the engine generator is to be packed in Case CY-739/PGC-1, do not attempt to place it in the case while it is in its immersion-proof cover. The engine generator will not fit into the case with the immersion-proof cover on. Roll the immersion-proof cover and wedge it under the top portion of the engine-generator framework. The two long sides of the carrying chest are lined with felt pads to prevent the engine generator from slipping and being scarred during transportation. The chest is constructed of plywood and has a lusterless olive-drab enamel finish. The outside corners are capped with metal reinforcements, and a pair of drop handles, suitable for use with arctic gloves, are provided on the outside ends. When Case CY-739/PGC-1 is not packed, its upper portion can be used as a seat for the teletypewriter operator.

(4) For a complete description of Engine Generator PU-181/PGC-1, including details on its accessories, tools, and running-spare parts, refer to the applicable instruction book.

c. Case CY-552/PGC-1 (fig. 12). (1) Case CY-552/PGC-1 is an immersion-proof, olive-drab, sheet-aluminum carrying case for the PGC-1 accessories and running-spare parts. Two canvas strap handles are attached to the ends. The top of the case is hinged on one of the long sides and is provided with seven spring-loaded latches on the other three sides. The water seal is a synthetic-rubber gasket cemented in a bracket around all four inner edges of the cover. When the cover is latched shut, the gasket presses firmly against the edges of the case. To permit the loaded accessories case to be transported in aircraft flying at high altitudes, the case has a pressure-equalizing valve in the left end (fig. 12). This valve is actuated in either direction by a difference of 2 pounds per square inch or greater between the internal and external atmospheric pressures, permitting the case to be submerged in water to a depth of approximately 5 feet or less without resultant moisture leakage. A metal partition divides the case longitudinally; the rear section thus formed, is subdivided into three compartments. Felt pads are cemented to the inside of the cover over two of these compartments to hold the contents securely in place during transportation. A loose felt pad is provided for the small-parts compartment.



Figure 9. Case CY-739/PGC-1, tool and spare-parts compartment in top section.

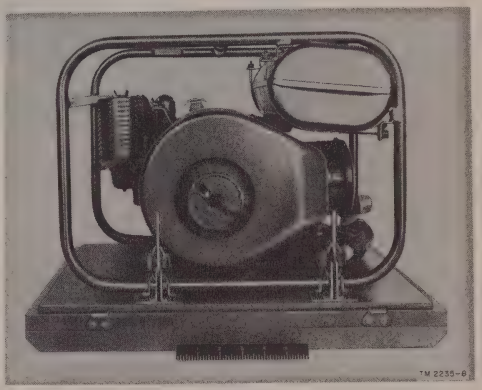


Figure 10. Engine generator, mounted on base of Case CY-739/PGC-1.

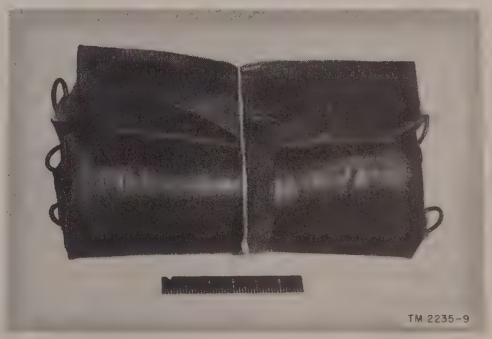


Figure 11. Bag CW-191/PGC-1, rolled for storage in Case CY-739/PGC-1.



Figure 12. Case CY-552/PGC-1, with cover open.

(2) The accessories case is designed for packboard or vehicular transportation. When transported by vehicle, the case is packed in a wooden carrying chest (Case CY-553/PGC-1, subpar. d below). For packboard transportation, the accessories case is removed from the wooden carrying chest and is tied to a packboard with a lashing rope which is supplied with the packboard. Three cleats for the packboard rope are provided on each long side of the accessories case, while two packboard carrying hooks are provided on the bottom.

(3) When properly packed, the contents of Case CY-552/PGC-1 are arranged to provide uniform weight distribution throughout the case. These contents are described in paragraph 8.

d. Case CY-553/PGC-1 (fig. 13). Case CY-553/PGC-1, which is the storage-and-transportation chest for the PGC-1 accessories case (Case CY-552/PGC-1, subpar. c above), is made of plywood clad with sheet aluminum. This chest contains a single compartment with internal shock pads and blocks and has a removable top cover fastened by six spring-loaded latches and two detachable hinges. Drop handles are provided on the outside ends of the chest. The chest has a lusterless olive-drab enamel finish.

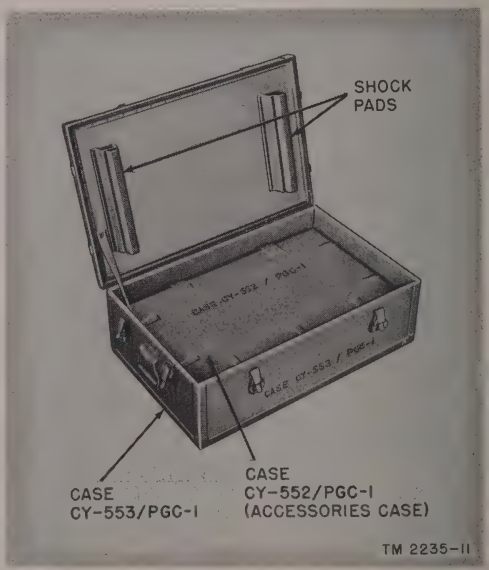


Figure 13. Case CY-553/PGC-1, cover raised showing Case CY-552/PGC-1.

5. Table of Major Components (fig. 3)

The following table of components lists only the major items supplied as part of Teletypewriter Set AN/PGC-1. For the accessories and running-spare parts supplied as part of this equipment, refer to paragraph 8.

Quantity	Packed in box No.[a]	Component	Over-all dimensions (in.)	Volume (cu ft)	Net weight (lb)	Remarks
1	1	Teletypewriter TT-4/TG.	24⅜ x 20⅞ x 16⅜	4.83	94.5	Dimensions and weight given here include Case CY-694/PGC-1 and normal contents.
1	3	Engine Generator PU-181/PGC-1.	17½ x 12¾ x 14¾	1.90	95	Dimensions and weight given here include Case CY-739/PGC-1 and normal contents.
1	2	Case CY-552/PGC-1.	27 x 16 x 6	1.50	24	For accessories and running-spare parts. Weight given here includes normal contents.
1	2	Case CY-553/PGC-1.	30½ x 19½ x 9½	3.22	30	Carrying chest or Case CY-552/PGC-1. Weight given here does *not* include contents.

[a] This set is packed for shipment in three wooden boxes.

6. Performance Characteristics

a. TELETYPEWRITER TT-4/TG CHARACTERISTICS.

Type of installation .....Portable or fixed station; sending and receiving; wire or radio.

Keyboard .....Standard communications.

Type of characters .....English.

Characters per line .....72.

Type of feed .....Friction.

Signaling code .....Baudot 5-unit start-stop; stop-impulse length equals start-impulse length multiplied by 1.42.

Type of signals .....Neutral[a].

Speed (send and receive) 368.1, 404, or 600 opm[b].

Service range[c]:

368.1 or 404 opm .....25 mi.

600 opm .....15 mi.

Motor and governor:

Type of motor .....Universal (ac or dc, series type).

Rpm .....3,600 (±5%) at all signal opm.

Governor .....Reduces motor current when motor speed exceeds critical rate.

Tuning fork .....Stroboscopic, 180 vibrations per second.

Power sources:

Motor (ac or dc):

Volts .....105 to 125.

Frequency (if ac) ....50 to 60 cps, single-phase.

Demand .....Approx 150 w.

Power sources (contd):

Line:

D C LINE .....60 ma dc[d].

VOICE FREQ LINE 20 ma dc[e].

Functions of specific components:

Upper-case H .....Stops motor.

BREAK key .....Opens line and restarts motor.

Upper-case S .....Rings signal bell.

CAR RET key .....Returns carriage to left margin[f].

LINE FEED key .....Feeds paper one line.

Space bar .....Unshifts from FIGS to LTRS when struck during FIGS operation[g]; repeats space as long as held down[h].

Blank key .....Normally operates no characters and performs no functions, but may be used to operate an added upper-case character.

Paper capacity .....Can be adjusted to accommodate standard 1-, 2-, or 3-copy roll.

Bias:

Transmitted signals .....±5% max at 368.1 opm on D C LINE.

Received signals (tolerance):

368.1 or 404 opm .....±40%.

600 opm .....±35%.

End-distortion tolerance (received signals):

368.1 or 404 opm .....35% marking or spacing.

600 opm .....30% marking or spacing.

a. TELETYPEWRITER TT-4/TG CHARACTERISTICS (contd).

RANGE adjustment (for received-signal bias and end distortion) .....Scale calibrated 0 to 120; 100 scale units equal width of one unit signal pulse (22 milliseconds at 368.1 opm).

R-f suppression .....Teletypewriter does not interfere with radio reception at frequencies between .35 and 150 mc when located 1 ft or more from radio antenna.

Safety shielding .....Points at which potentials of 30 v or more exist are shielded against accidental contact by personnel.

Total weight of installed teletypewriter (not including Case CY-694/PGC-1) .....43 lb without paper; 46.5 lb with full roll of paper.

Space requirements of installed teletypewriter (not including Case CY-694/PGC-1) .....2.73 cu ft.

Ambient temperature limits:

Teletypewriter in use ....+32°F (0°C) to +132°F (+55.6°C).

Teletypewriter in storage .....—80°F (—62.2°C) to +160°F (+71.1°C).

Min barometric pressure (operating) .....16.88 in. mercury (equivalent to approx 15,000 ft altitude).

Other climatic conditions ..Teletypewriter withstands high humidity and moisture as encountered in the tropics; has immersion-proof transportation and storage cover; is fungi-proofed and resistant to corrosion.

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[a]Transmitter sends neutral or polar signals as determined by external connections at line terminals of teletypewriter. Selector can be adapted to incoming polar signals by adding polar line relay and local 115-volt d-c supply.

[b]Speed change requires motor-gear change. Gears are supplied for 368.1 and 404 opm, only. Gears for 368.1 opm are installed when delivered by the manufacturer.

[c]Using W-110-B field wire (wet, simplexed with ground return, connected directly to coils of selector magnet) with 60 milliamperes of line current.

[d]Selector magnet directly connected in series with telegraph line.

[e]Selector magnet connected in local circuit operated by electronic devices.

[f]Manual carriage-return button also is provided at right-hand side of dust cover.

[g]This function can be eliminated by adjustment.

[h]All other functions and characters of this teletypewriter require separate actuations to obtain repetitions.

b. ENGINE GENERATOR PU-181/PGC-1 CHARACTERISTICS.

Type of installation .....Portable

Generator characteristics:

Type of generator .....Magneto (Generator GN-51-C).

Output:

Voltage .....Nominal 120 or 240.

Frequency .....60 cps.

Phase .....Single.

Max load .....300 w or va.

Regulation .....10%.

Engine characteristics:

Type of engine .....Gasoline (mixed with lubricating oil), air-cooled, 2 strokes per cycle (Engine GE-12-F).

Horsepower .....1.25 hp at 3,000 rpm.

Number of cylinders ....1.

Cylinder bore .....2 in.

Piston stroke .....1.5 in.

Piston displacement .....4.72 cu in.

Ignition system .....Magneto type.

Governor .....Electric-solenoid type actuated by rectified generator voltage.

Octane rating .....62 min.

Lubricating oil .....SAE 10.

Fuel capacity .....1 gal.

Fuel consumption (under full-load) .....7.5 hr/gal.

Space requirements of installed engine generator (not including Case CY-739/PGC-1, Bag CW-191/PGC-1, etc) ..1.8 cu ft.

Ambient-temperature limits:

Engine generator in use —30° F.

Engine generator in storage .....—60° F.

7. Packaging Data

In accordance with the military requirements established for Teletypewriter Set AN/PGC-1, components of the set are designed to permit transportation by the various means available to the different operating echelons. Where vehicular transportation is available, the complete set may be transported to the operating point in the three carrying chests, Case CY-694/PGC-1, Case CY-739/PGC-1, and Case CY-553/PGC-1. If the complete set is transported to the operating point by packboard, the teletypewriter, engine generator, accessories, tools, and running-spare parts will be inclosed in their waterproof covers only. If only two men are available to transport the set by packboard, the accessories, tools, and spare parts necessary for immediate installation and operation may be removed from the accessories case and lashed on packboard with the teletypewriter. The equipment is packed in three wooden shipping boxes by the manufacturer. These three boxes contain Case CY-694/PGC-1, Case CY-739/PGC-1, and Case CY-553/PGC-1, respectively. The teletypewriter, the engine generator, and the accessories case with its complement of normal contents are packed in their respective cases. Data on the wooden shipping crates are given in the following table. Unpacking instructions are given in chapter 2 of this instruction book.

Box No.	Dimensions (in.)		Volume (cu ft)		Gross weight (lb)		Contents
	Domestic	Export	Domestic	Export	Domestic	Export	
1	23⅛ x 17⅝ x 25⅜	28⅞ x 23⅜ x 31⅛	5.98	12.15	90	95	Case CY-694/PGC-1 containing Teletypewriter TT-4/TG, tools and instruction books.
2		30⅜ x 19⅞ x 10¾		3.76		60	Case CY-553/PGC-1 containing Case CY-552/PGC-1 with accessories and running-spare parts.
3	21 x 18½ x 20⅛		4.43				Case CY-739/PGC-1 containing Engine Generator PU-181/PG-1.

8. Accessories and Running-spare Parts (figs. 14 and 15)

The following tables list accessories and running-spare parts supplied in addition to those furnished as part of Teletypewriter TT-4/TG or as part of Engine Generator PU-181 PGC-1. Most of the accessories and running-spare parts listed in these tables are packed in Case CY-552/PGC-1. The exceptions are noted in the *Remarks* column. For the accessories and running-spare parts supplied with Teletypewriter TT-4/TG, and those supplied with Engine Generator PU-181/PGC-1, refer to the applicable instruction book.

Note. A spare roll of recording paper and a spare spool of typewriter ribbon are packed in Case CY-552/PGC-1.

a. Accessories (fig. 14).

Quantity	Item	Dimensions (in.)	Remarks
1	Cable assembly, special purpose Cord CX-1200/U.	51 x 5/16 dia including plug and spade terminals.	Type SJ-2 #18 conductor cable; two No. 1965 term. one end; Plug PL-48 (red) other end.
1	Cable assembly, special purpose, Cord CX-1201/U.	51 x 5/16 dia including plug and spade terminals.	Type SJ-2 #18 conductor cable; two No. 1965 term. one end; plug PL-47 (black) other end.
1	Cable assembly, power, Cord CX-1202/U.	77 x 1½ dia including plug and spade terminals.	Type S-2 #18 conductor cable; two No. 1965 term. one end; plug No. 9754 other end.
1	Cable assembly, power, Cord CX-1203/U.	365 x 1½ dia including plug and connector.	Type S-2 #18 conductor cable; connector H-1269 one end; plug No. 9754 other end.
1	Container MX-693/PGC-1.	10 x 6⅝ x 4⅛.	Fuel and oil can for engine generator.
1	Bag CW-160/PGC-1 (roll type).	39⅝ x 25⅛ (laid open).	Three-compartment canvas bag for cords.
1	Tool bag (roll type).	14⅜ x 14⅜ (laid open).	Cotton duck bag with seven loop holders containing tools listed in par. 45 a. Packed in CY-694/PGC-1.

b. RUNNING-SPARE PARTS (fig. 14).

Quantity	Item	Stock No.	Dimensions (in.)	Remarks
5	Fuse, ⅛ amp, 250 v.	3Z2585.2	1¼ x ¼ dia.	Spare LINE fuses for teletypewriter.
5	Fuse, 2 amp, 250 v.	3Z2602.1	1¼ x ¼ dia.	Spare MOTOR fuses for teletypewriter.

9. Associated Equipment (figs. 38 and 39)

The conversion unit most frequently used with Teletypewriter Set AN PGC-1 is Voice Frequency Line Unit TH-5 TG. This unit will convert d-c telegraph pulses from the teletypewriter transmitter to frequency-modulated carrier signals for transmission over a wire or radio voice channel. It will also convert incoming carrier signals to d-c telegraph pulses for actuation of the teletypewriter printer. A brief description of the physical and electrical characteristics of this line unit, and instructions for its protection during use and transportation with Teletypewriter Set AN/PGC-1, are given in chapter 4. The installation and operating instructions for the joint use of PGC-1 and TH-5 equipment are given in chapter 2.

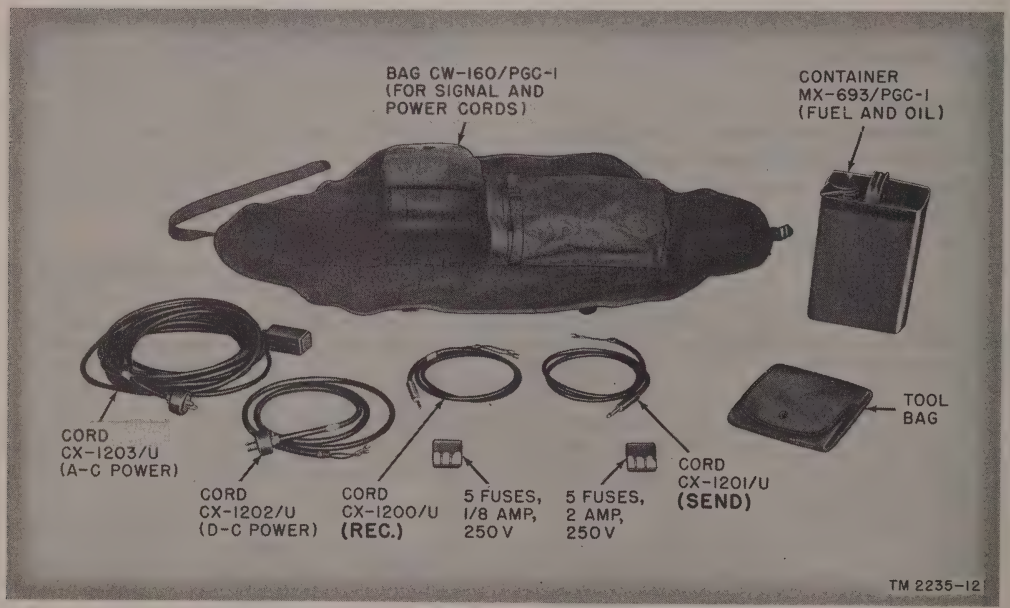


Figure 14. Accessories and running-spare parts supplied with Teletypewriter Set AN/PGC-1.

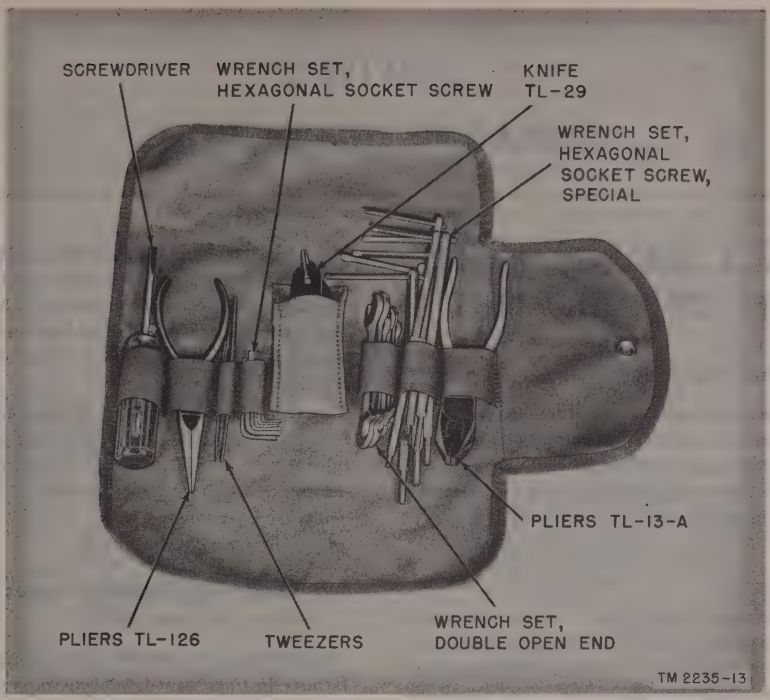


Figure 15. Tools supplied as part of Teletypewriter Set AN/PGC-1.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

10. Installation Procedure

The installation procedure will vary according to the facilities available at the installation site. Paragraphs 11 through 24 describe the procedure to be followed for the complete installation together with the variations necessary to meet varying conditions at the installation site.

11. Siting

The availability of shelter and adequate facilities to make a good ground connection are the primary considerations in selecting a site for installation. For line-current supply stations, a suitable source of d-c voltage also must be available.

a. FACILITIES FOR GROUND CONNECTION. Of all siting considerations, the availability of good ground-connection conditions is most important. The teletypewriter circuits will not function properly without a good low resistance ground connection, and the engine generator must be adequately grounded for safety. When possible, select the site within 1,000 yards of an underground piping system, or within 1,000 yards of a permanently moist area of soil. If none of these conditions is available, consult TM 11-680 for instructions on grounding teletypewriter circuits in poor grounding areas.

b. SHELTER. Since the teletypewriter and engine generator are small and light in weight, both may be sheltered in a small space. The most desirable shelter is a small building or an inclosed truck. However, if neither of these is available, a tent or canvas covered vehicle may be used. In extreme instances the equipment may be operated outdoors if the site selected is naturally dry and provided with natural cover. Avoid outdoor operation, if at all possible, for the protection of the equipment, and because extreme temperatures may affect proper functioning. Whenever shelter is not available, efforts should be made to construct a dugout, or other crude temporary shelter. When the engine generator is used inside *any* shelter, a gastight exhaust tube *must* be used to carry exhaust gases from the muffler outlet to the outside of the shelter. It is preferable, whenever possible, to house the teletypewriter and engine generator in separate shelters or separate rooms of the same shelter. In addition, the shelter must be well ventilated to protect operating personnel from possible carbon-monoxide poisoning. When freezing temperatures prevail, provisions should be made to warm the air around the equipment to prevent the lubricants from hardening.

c. D-C LINE VOLTAGE. At least one station in a d-c teletypewriter network must supply d-c voltage to the transmission circuit. If a particular installation is to supply the d-c line voltage, in siting, consider thoroughly the availability of a d-c source.

12. Removing Shipping Crates (figs. 16 and 17)

Teletypewriter Set AN/PGC-1 is shipped by the manufacturer in three nailed wooden shipping crates: one contains the complete Teletypewriter TT-4/TG in Case CY-694/PGC-1, one contains the complete Engine Generator PU-181/PGC-1 in Case CY-739/PGC-1, and one contains the accessories case, CY-552/PGC-1, packed in Case CY-553/PGC-1. Complete instructions for the removal of the domestic type shipping crates and their protective linings are given in figures 16 and 17; for oversea-type shipping crates, see figures 18 and 19. For instructions on uncrating Engine Generator PU-181/PGC-1, refer to the instruction book pertaining to that unit. Precautions *must* be observed to avoid damage to the equipment when the shipping crates are opened. Do not drop any of the crates, and do not poke tools into the excelsior.

13. Removing Contents of Case CY-694/PGC-1

a. Unfasten the six spring-loaded latches on the end of Case CY-694/PGC-1 and open the hinged cover.

b. Remove the fiberboard pads, and remove the cotton tape which secures the fiberboard carton in the space between the teletypewriter and the open end of the case.

c. Remove the fiberboard carton which contains two copies of the instruction book for Teletypewriter TT-4/TG. Open the carton, remove the instruction books from their waterproof paper bags, and inspect them. If any are missing or damaged, report this condition immediately (par. 2).

d. Unfasten the canvas straps holding the canvas bag of tools to the inside of the cover of Case CY-694/PGC-1. Unwrap and inspect these tools. Check them against the inclosed packing slip and the tool list in paragraph 45. Report any missing or damaged items immediately (par. 2). Place the unwrapped tools in the loops of the canvas tool bag, roll up the bag, and strap it to the lid of Case CY-694/PGC-1.

e. Inspect the roll of recording paper and report any damage that may be noted. Unless damage is indicated it will be unnecessary to unwrap or remove the roll of recording paper until it is to be installed in the teletypewriter.

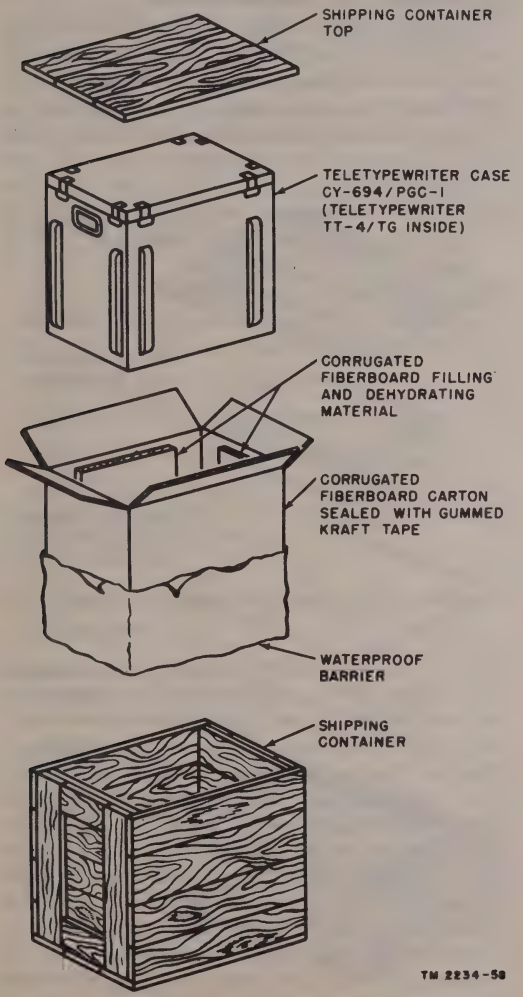


Figure 16. Teletypewriter TT-4/TG, packed for domestic shipment.

f. Complete the unpacking of Case CY-694/PGC-1, remove the immersion-proof and dust covers from the teletypewriter, and inspect the teletypewriter as directed in the instruction book of Teletypewriter TT-4/TG.

14. Removing Contents of Case CY-739/PGC-1

To open Case CY-739/PGC-1, containing the engine generator, unfasten the four spring-loaded latches on the bottom and lift off the top. Remove and open the package containing the instruction books for Engine Generator PU-181/PGC-1. Complete the unpacking of Case CY-739/PGC-1 as directed in these instruction books. Report any missing or damaged items immediately (par. 2).

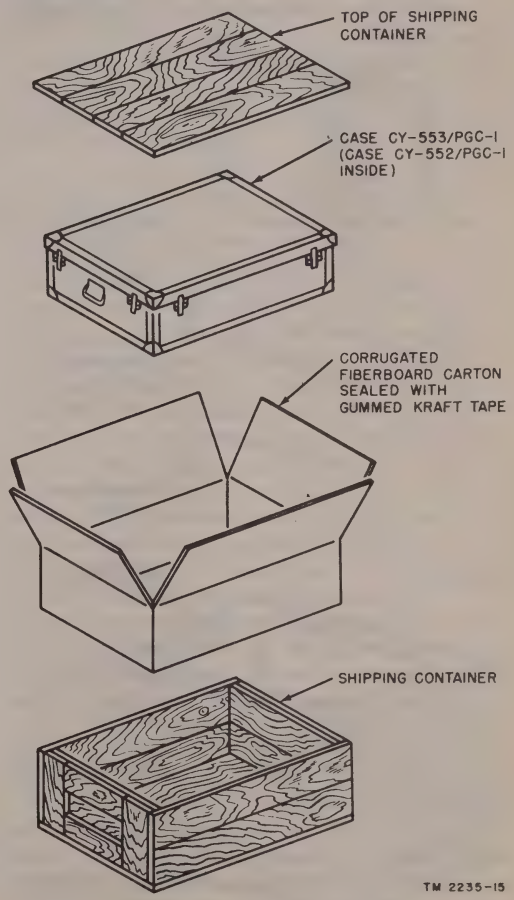


Figure 17. Case CY-552/PGC-1 in Case CY-553/PGC-1, packed for domestic shipment.

15. Removing Contents of Case CY-553/PGC-1

a. Unfasten the spring-loaded latches and open the cover of Case CY-553/PGC-1.

b. Remove the fiberboard carton which contains two copies of the instruction book for the Teletypewriter Set AN/PGC-1 (this instruction book). Open the carton, remove the instruction books from their waterproof paper bags, and inspect them. If any are missing or damaged, report this condition immediately (par. 2).

c. Remove the fiberboard paper blocks from the space between the accessories case and the carrying chest; then lift Case CY-552/PGC-1 out of Case CY-553/PGC-1.

Caution: The latches of the accessories case are provided with unusually strong springs. When opening these latches, hold them firmly to keep the spring tension from snapping the latch upward. *The latch springs are under such high tension that the latch may snap up and injure the fingers of personnel unprepared for the sudden release which occurs when the latch is opened.*

d. Unfasten the seven spring-loaded latches on the sides of the accessories case, and raise the cover.

e. Remove Cords CX-1200/U, CX-1201/U, CX-1202/U and CX-1203/U from the four waterproof paper bags packed in the long front compartment of Case CY-552/PGC. Uncoil them, remove the wrappings from the plugs and other connectors, inspect them, then remove canvas

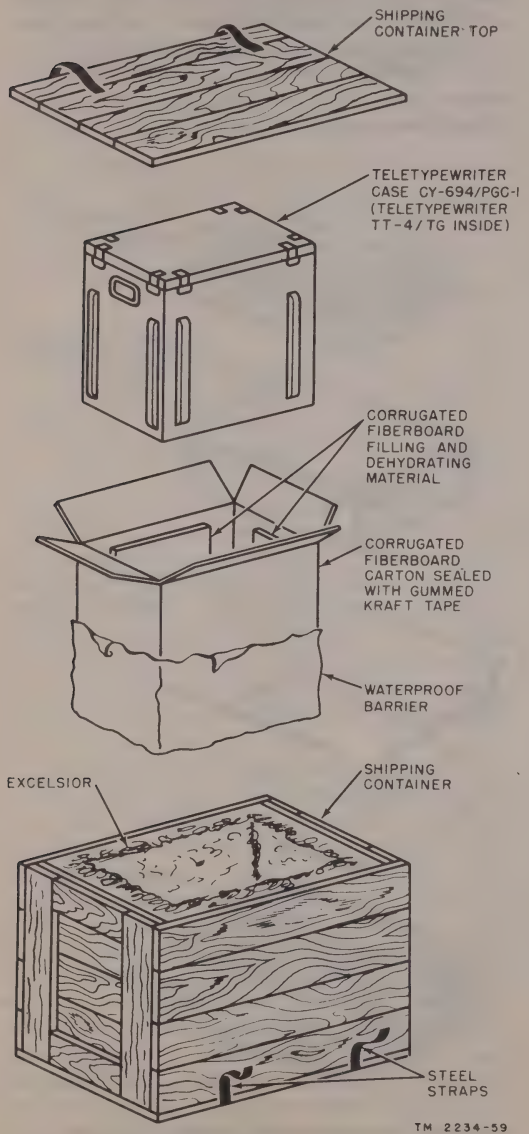


Figure 18. Teletypewriter TT-4/TG packed for oversea shipment.

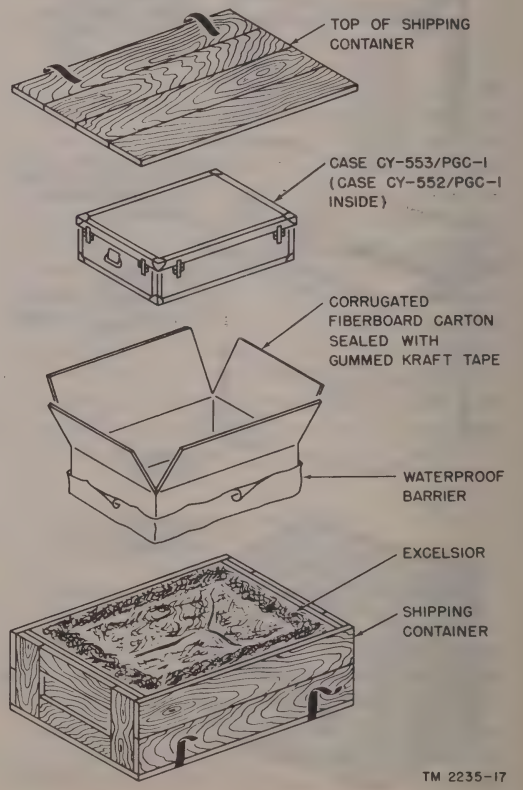


Figure 19. Case CY-553/PGC-1, packed for oversea shipment.

Bag CW-160/PGC-1 from the large waterproof paper bag in the bottom of this compartment.

f. Unwrap Bag CW-160/PGC-1, lay it open, and inspect it.

g. Place the four cables in Bag CW-160/PGC-1, roll up the bag, fasten it with its canvas straps, and replace it in the front compartment of the accessories case.

h. Remove Container MX-693/PGC-1 and its spout from the right-hand rear compartment of Case CY-552/PGC. Remove the container wrappings. Do not lose the spout which is packaged in a small separate bag. Place the spout on the container; inspect it and replace it in the right-hand rear compartment of Case CY-552/PGC. When the container is to be transported in an aircraft, leave it empty and take the filler cap off the container to prevent extreme changes in air pressure from damaging the container.

i. Inspect the spare roll of teletypewriter recording paper in the center rear compartment of Case CY-552/PGC-1. Unless obvious damage is noted, the paper roll, which is supplied as part of the complete Teletypewriter TT-4/TG, need not be unwrapped until it is necessary to install it in the teletypewriter. Leave the bags of desiccant in this compartment. Later these can be dried out and re-used if necessary.

j. Lift the removable felt pad from the left-hand rear compartment of the accessories case, then remove, unwrap, and inspect the following running-spare parts:

(1) Five 1/8-ampere, 250-volt fuses.

(2) Five 2-ampere, 250-volt fuses.

(3) One spool of typewriter ribbon.

k. Return the spare parts to the accessories case. If any of the foregoing items are missing or damaged, report this condition immediately (par. 2).

16. Unpacking Reconditioned or Other Used Equipment

Reconditioned and other used AN/PGC-1 equipment may arrive at the installation point in the three carrying chests, without the wooden shipping crates. In some instances, the carrying chests may be omitted; the teletypewriter and engine generator may arrive in their immersion-proof covers only, and the accessories case may arrive not protected by packing. Reconditioned or other used equipment may arrive in wooden shipping crates when the equipment is drawn from long-term-storage stocks or is transported overseas to its installation point. In either of these latter instances, the packaging will be similar to the arrangement shown in figures 16 and 17 or 18 and 19. In such instances, remove the crates as shown insofar as these illustrations are applicable. If any deviations from these illustrations are encountered, unpack according to standard Army procedures.

17. Removing Equipment From Carrying Chests

Except that most components will not be individually wrapped, reconditioned equipment is to be unpacked, as directed in paragraphs 13 through 15.

a. Teletypewriter TT-4/TG. After the teletypewriter has been removed from its carrying chest, place it on a table or another suitable location for operating. All installation servicing can be performed with the teletypewriter in its final position, provided there is working space available at the sides. Case CY-694/PGC-1 may be placed on its unhinged end and used as an operating table. Case CY-739/PGC-1 may be used as a seat. When the teletypewriter is transported to its installation site by packboard, without Case CY-694/PGC-1, the teletypewriter can be operated satisfactorily on the packboard. The packboard should rest on a flat, steady surface at a height convenient for the operation of the teletypewriter keyboard, preferably a surface affording knee space for the operator. Whenever a teletypewriter table, (or equivalent) is available, it should be used in preference to either the packboard or Case CY-694/PGC-1.

Note. When this equipment is used with a line unit or teletypewriter-terminal unit, Teletypewriter TT-4/TG must be placed within 6 feet of the line or terminal unit. This limit is imposed by the lengths of Cords CX-1200/U and CX-1201/U. At the line-current-supply station of a d-c teletypewriter network, the distance between Teletypewriter TT-4/TG and the d-c power-source receptacle or terminals is limited to 6 feet by the length of Cord CX-1202/U.

b. Engine Generator PU-181/PGC-1. Place Engine Generator PU-181/PGC-1 on a firm, dry, level surface in a clean and accessible location. Although this unit may be operated outdoors, it is preferable to provide shelter to protect it from the weather. Place it so that air will circulate freely about the air-cooled engine. Make sure that the exhaust from the muffler will be carried safely outside the shelter and away from operating personnel. This power unit may be located at any convenient distance up to 36 feet from the teletypewriter. Satisfactory operation may also be obtained at distances greater than 36 feet by using additional cord. If possible, locate the engine generator and teletypewriter in separate shelters or in separate rooms. To install the engine generator, take the following steps:

(1) Locate the generator near a door or window to provide for dissipation of any escaping exhaust gases.

(2) Connect one end of a suitable length of flexible exhaust tubing (or a rigid exhaust pipe if no bends are required) to the threaded exhaust outlet, and lead the other end outdoors. Use 1-inch (inside diameter) tubing when the distance from the power unit to the outside of the building is less than 10 feet. Use 1½-inch (inside diameter) tubing when this distance exceeds 10 feet.

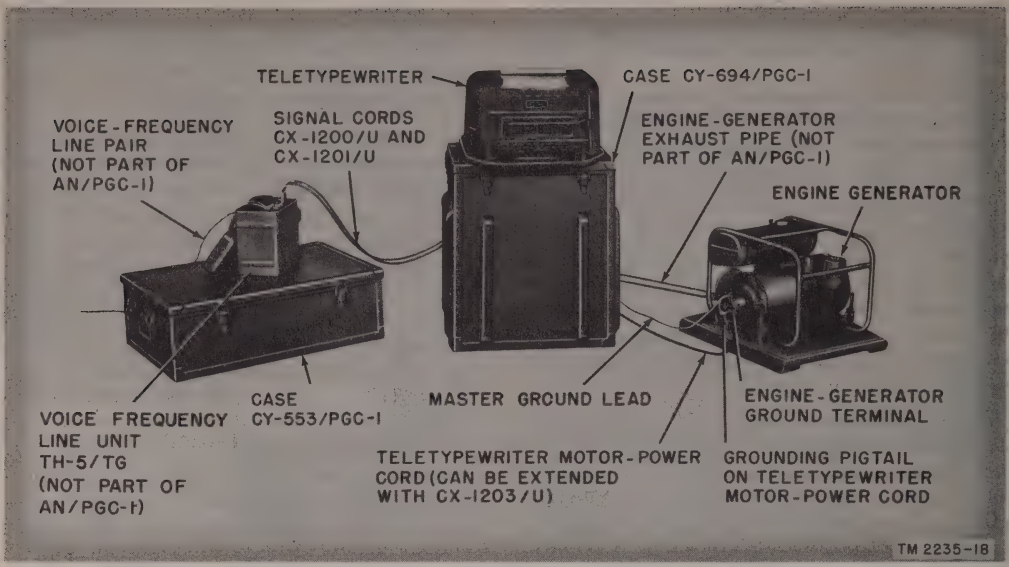


Figure 20. Teletypewriter Set AN/PGC-1, installed for use with Voice Frequency Line Unit TH-5/TG.

(3) Be sure that all exhaust connections are gastight and that the room is well ventilated.

Warning: Carbon monoxide, contained in the exhaust gasses, is odorless, tasteless, and a *deadly poison.*

18. Installation Servicing of New Equipment

Note. See engine-generator instruction book for complete instructions.

a. For Engine Generator PU-181/PGC-1. (1) Open the vent cock on the engine-generator fuel tank.

(2) Thoroughly mix 1 gallon of fuel, proportioned 16 parts gasoline to 1 part oil, in Container MX-693/PGC-1. Mix as directed in paragraph 31.

(3) Pour all of the fuel mixture from Container MX-693/PGC-1 into the engine-generator fuel tank. Be sure the vent cock on the engine-generator fuel tank is open before replacing the filler cap on this tank.

(4) Mix another gallon of fuel and oil in Container MX-693/PGC-1 as directed in paragraph 31 and store the filled container in the PGC-1 accessories case.

(5) Open the fuel-line shut-off valve of the engine generator.

(6) Start and operate the engine generator without load for a warm-up period of several minutes.

(7) When the engine is warm, adjust the carburetor needle valve until the engine runs smoothly with its choke lever in the horizontal position. Later, under load, it may be necessary to make a slight compensating adjustment with this needle valve.

(8) When the engine is warm and running smoothly, check the generator for the presence of output voltage. If an a-c voltmeter is available, connect this voltmeter across the two binding-post terminals on the right-hand side of the outer-end casting of the generator (fig. 21). A no-load voltage reading of approximately 128 should be obtained. If a suitable voltmeter is not available, connect a 115-volt lamp across the two terminals to test for the presence of voltage. If no voltmeter reading is obtained or if the lamp is not thus lighted, the generator is defective and must be replaced.

Caution: Do not touch the generator terminals. If a voltmeter reading in the 240-volt range is obtained or if the lamp burns out, reconnect the generator windings for 120-volt (loaded) output as directed in the engine-generator instruction book.

(9) Shut down the engine generator until the teletypewriter is ready for operation (unless the engine generator is needed for other electrical loads).

b. For Teletypewriter TT-4/TG. Perform all of the installation-servicing tasks listed under subparagraph (1) below before operating any new Teletypewriter TT-4/TG. If a particular installation requires one or more

of the teletypewriter modifications listed under subparagraph (2) below, make these modifications before operating the teletypewriter. The instruction book for Teletypewriter TT-4/TG contains instructions for making these modifications.

(1) *Routine servicing always required.*

Unlock platen.
Unlock type-bar carriage.
Unlock Keyboard.
Apply initial lubrication[1].
Install paper.
Check ribbon and spools.
Check fuses and lamp.

(2) *Special servicing sometimes required.*

Gear-set change for different operating speed[1].
Elimination of space-bar FIGS—LTRS unshift.
Adaptation of teletypewriter for interoperation with British teleprinters[1].

[1]To be performed *only* by qualified maintenance personnel.

19. Installation Servicing of Reconditioned and Other Used Equipment

The installation servicing required for reconditioned or other used AN/PGC-1 equipment is substantially the same as that described in paragraph 18 for new equipment, but used equipment must be inspected thoroughly before it is placed in operation. The most important inspections to be made on used AN/PGC-1 equipment are as follows:

a. For Engine Generator PU-181/PGC-1. When a used Engine Generator PU-181/PGC-1 is installed, check the generator to determine whether this power unit is wired for a 120- or 240-volt output. Adjust the wiring for a 120-volt output if 240-volt wiring is found.

b. For Teletypewriter TT-4/TG. When a used Teletypewriter TT-4/TG is installed, inspect the teletypewriter machinery carefully to determine whether any of the modifications listed in paragraph 18b(2) may have been made during the previous usage. Modify the teletypewriter, if necessary, to meet the requirements of the particular installation being made.

20. Grounding Teletypewriter Set

a. General. The importance of establishing a good low-resistance ground connection for all metallic parts of the teletypewriter set cannot be overemphasized. Safety and military security require this at all installations in all kinds of transmission systems. In teletypewriter networks using earth-return transmission lines, a good ground connection to the soil is even more important. A poor ground connection introduces cross-fire effects between multiple earth-return lines that share it, and may cause detectable radio radiation of noise on keyboard make and break at distances up to approximately 1,500 yards. This undesirable teletypewriter-noise radiation will interfere not only with reception in friendly radio receivers, but may disclose the position of the teletypewriter station and the intelligence of transmitted messages to the enemy. The teletypewriter ground lead should be clamped tightly to an underground metal water pipe. If this cannot be done, a 5- or 6-foot ground rod or pipe (GP-105/PGC-1 or equivalent) should be driven deeply into damp ground and connected to the teletypewriter set by means of field wire (W-110-B or heavier). The rod site selected may be a considerable distance from the teletypewriter, 1,000 yards, if necessary, to obtain good grounding conditions. The additional resistance of a long grounding lead usually forms only a small part of the ground-return resistance. Where two or more teletypewriter TT-4/TG units are installed at the same station, connect all of them to the same grounding point.

Warning: Never operate AN/PGC-1 equipment without good grounding connections to a point electrically in common with the structure (or earth) on which the operator stands.

b. Establishing Common Ground (figs. 20 and 21). The teletypewriter and engine generator should be grounded to the same point in the earth. There are several satisfactory methods of connecting these two units to a master ground lead. The proper choice of method depends on the facilities available. The teletypewriter may be grounded easily through the braided-metal pigtail on the end of the teletypewriter motor-power cord. The engine generator may be grounded easily by connection to the thumbscrew terminal marked G on the left-hand side of the outer-end casting of the generator.

(1) When the teletypewriter motor-power cord is to be plugged directly into the a-c output receptacle on the generator, connect both the master ground lead and the grounding pigtail on the end of the teletypewriter motor-power cord to terminal G on the generator.

(2) When the teletypewriter motor-power cord is to be extended with 30-foot Cord CX-1203/U, separate grounding leads may be run from the pigtail on the end of the teletypewriter motor-power cord and terminal G on the generator to the *same* grounding point; or one master ground lead may be connected to terminal G on the generator and a pigtail extension run alongside CX-1203/U from the teletypewriter to the master ground lead.

c. Associated Equipment. Any additional equipment that may be used with Teletypewriter Set AN/PGC-1 must be grounded also at the same point as Teletypewriter TT-4/TG. Connect the grounding lead for the associated equipment to terminal G on the generator or to either of the thumbscrew ground terminals on the ends of the tele-

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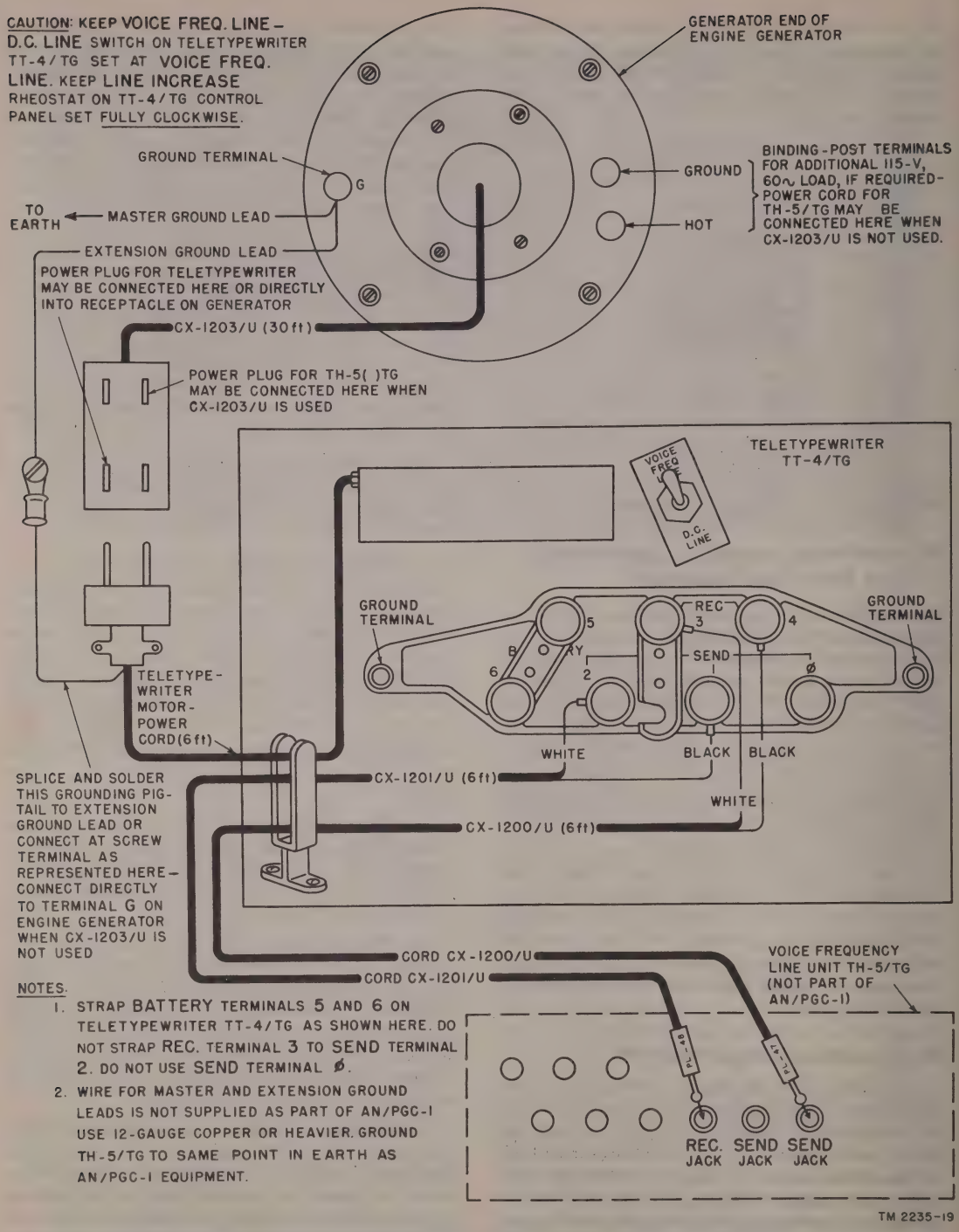


Figure 21. Teletypewriter Set AN/PGC-1 Cabling diagram for use with Voice Frequency Line Unit TH-5/TG.

typewriter line-terminal board (fig. 23). Or, connect the grounding lead for the associated equipment directly to the ground used for the teletypewriter set. Connect the other end of this ground lead to the chassis or ground lug of the associated equipment as directed in the applicable technical manual.

21. Teletypewriter Interconnections, General

Connect the signal line and line-current-supply conductors to the SEND, REC, and BATTERY terminals on the left-hand side of the teletypewriter (figs. 21, 22 and 23) only after the teletypewriter and engine generator have been properly grounded in common. (par. 17). The proper connections vary in accordance with the transmission-system requirements for the individual station. Normally, Teletypewriter Set AN/PGC-1 will form part of a wire-line or radio carrier system with half-duplex interconnections established through Voice Frequency Line Unit TH-5/TG (fig. 21). The carrier interconnections may be established sometimes through equipment other than TH-5/TG, and the AN/PGC-1 sometimes may be placed in neutral or polar d-c service without any carrier interconnections. Specific instructions for interconnections with Voice Frequency Line Unit TH-5/TG are given in paragraph 22. For interconnections with other carrier equipment, refer to the technical manual for the carrier equipment concerned. For interconnections in neutral d-c systems, see the instruction book for Teletypewriter TT-4/TG.

a. The plug-equipped receiving- and sending-signal Cords CX-1200/U and CX-1201/U may be used for interconnections between Teletypewriter TT-4/TG and associated line-terminating equipment having jacks designated REC and SEND or RED and BLK. The jacks on Voice Frequency Line Unit TH-5/TG are designated REC and SEND. The following other equipments are among those having RED and BLK jacks (corresponding to REC and SEND, respectively) that also permit the use of Cords CX-1200/U and CX-1201/U for the TT-4/TG interconnections: Line Unit BE-77, Telegraph Repeater TG-30 (intermediate), Telegraph Terminal CF-2 (carrier), Telegraph Terminal CF-6 (carrier), and Telegraph Repeater TG-30 (terminal). In general, connect the red-shelled plug on the end of Cord CX-1200/U to the jack designated REC or RED on the line terminating equipment, and connect the opposite end to the REC terminals 3 and 4 on Teletypewriter TT-4/TG; connect the black-shelled plug on the end of Cord CX-1201/U to the jack designated SEND or BLK on the line-terminating equipment, and connect the opposite end of Cord CX-1201/U to SEND terminals 1 and 2 on Teletypewriter TT-4/TG. (SEND terminal ø on Teletypewriter TT-4/TG is used only in polar, polarential, and differential systems.)

b. Cord CX-1202/U may be used for interconnections between the TT-4 BATTERY terminals 5 and 6 and a d-c power source when such connections are necessary. If this station is not supplying d-c signal current (in external or local line), strap BATTERY terminals 5 and 6 on Teletypewriter TT-4 together with the BATTERY shorting bar provided on the line-terminal board of the teletypewriter.

22. Interconnections with Voice Frequency Line Unit TH-5/TG (figs. 20 and 21)

a. Receiving-Line Interconnections. (1) Set the VOICE FREQ-LINE D C LINE toggle switch on the left-hand side of Teletypewriter TT-4/TG at VOICE FREQ LINE. Leave this switch at VOICE FREQ LINE during all use of Teletypewriter TT-4/TG with Voice Frequency Line Unit TH-5/TG.

(2) Disconnect the shorting bar from SEND terminal 2 on the line-terminal board at the lower left-hand side of Teletypewriter TT-4/TG. Leave this bar disconnected for all use of the TT-4/TG with Voice Frequency Line Unit TH-5/TG.

(3) Connect the red-shelled plug on the end of receiving-signal Cord CX-1200/U to the jack designated REC on Voice Frequency Line Unit TH-5/TG.

(4) Connect the opposite end of Cord CX-1200/U to the REC binding-post terminals 3 and 4 on the line-terminal board of Teletypewriter TT-4.

b. Sending-Line Interconnections. (1) Connect the black-shelled plug on the end of sending-signal Cord CX-1201/U to either of the two jacks designated SEND on Voice Frequency Line Unit TH-5/TG.

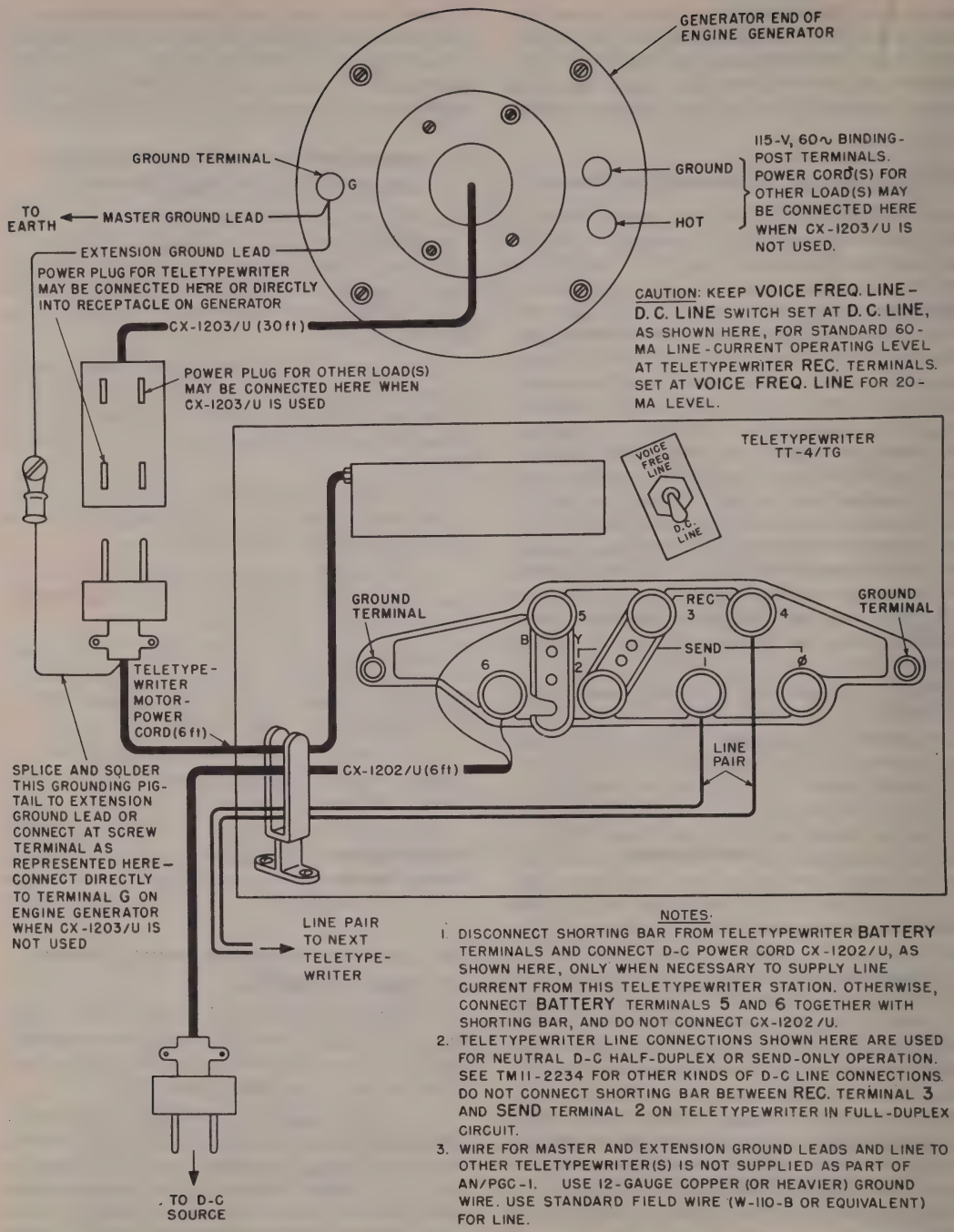
(2) Connect the opposite end of Cord CX-1201/U to SEND binding-post terminals 1 and 2 on the line-terminal board of the Teletypewriter.

(3) Complete the sending circuit by strapping BATTERY terminals 5 and 6 together with the BATTERY shorting bar on the line-terminal board of the Teletypewriter. Do not connect these terminals to a d-c power source.

23. Connecting Teletypewriter to Generator (figs. 21 and 22)

a. If Teletypewriter TT-4/TG is located within 6 feet of Engine Generator PU-181/PGC-1, plug the motor-power cord of the teletypewriter directly into the female receptacle on the outer-end casting of the generator.

b. When the teletypewriter and engine generator are located more than 6 feet and less than 36 feet apart, they may be connected through the extension power cord supplied in Case CY-552/PGC-1. In this event, plug the teletypewriter motor-power cord into either of the two female outlets in the rectangular fitting on the end of Cord CX-1203/U, and plug the opposite end of Cord CX-1203/U into the receptacle on the generator.



NOTES:

1. DISCONNECT SHORTING BAR FROM TELETYPEWRITER BATTERY TERMINALS AND CONNECT D-C POWER CORD CX-1202/U, AS SHOWN HERE, ONLY WHEN NECESSARY TO SUPPLY LINE CURRENT FROM THIS TELETYPEWRITER STATION. OTHERWISE, CONNECT BATTERY TERMINALS 5 AND 6 TOGETHER WITH SHORTING BAR, AND DO NOT CONNECT CX-1202/U.
2. TELETYPEWRITER LINE CONNECTIONS SHOWN HERE ARE USED FOR NEUTRAL D-C HALF-DUPLEX OR SEND-ONLY OPERATION. SEE TM 11-2234 FOR OTHER KINDS OF D-C LINE CONNECTIONS. DO NOT CONNECT SHORTING BAR BETWEEN REC. TERMINAL 3 AND SEND TERMINAL 2 ON TELETYPEWRITER IN FULL-DUPLEX CIRCUIT.
3. WIRE FOR MASTER AND EXTENSION GROUND LEADS AND LINE TO OTHER TELETYPEWRITER(S) IS NOT SUPPLIED AS PART OF AN/PGC-1. USE 12-GAUGE COPPER (OR HEAVIER) GROUND WIRE. USE STANDARD FIELD WIRE (W-110-B OR EQUIVALENT) FOR LINE.

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Figure 22. Teletypewriter Set AN/PGC-1 cabling diagram for use in typical d-c system.

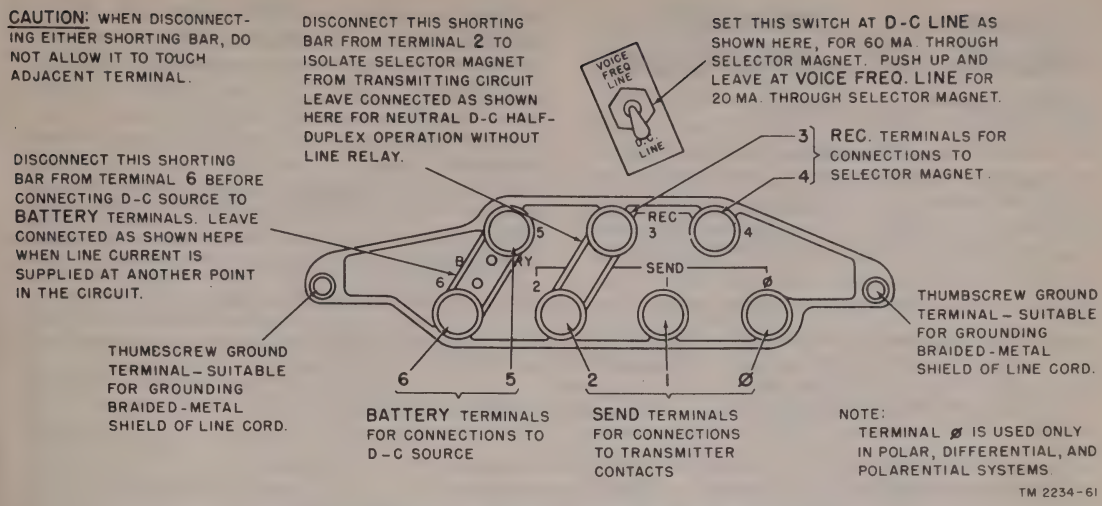


Figure 23. SEND, REC, and BATTERY terminals on Teletypewriter TT-4/TG.

c. An additional length of extension cord, not supplied with the PGC-1 set, is necessary for teletypewriter-to-generator distances of more than 36 feet.

d. Additional 115-volt, 60-cycle loads, such as Voice Frequency Line Unit TH-5/TG, a lamp bulb, or both, may be connected to the generator at the remaining female outlet on the teletypewriter end of Cord CX-1203/U, or at the pair of binding-post terminals adjacent to the output receptacle on the generator.

Caution: Do not overload Engine Generator PU-181/PGC-1, whose maximum continuous-load output is rated at 300 watts. The total demand of all loads connected to the generator in addition to Teletypewriter TT-4/TG should not exceed 150 watts.

24. Final Engine-generator Checks

Caution: Do not turn the teletypewriter and/or other loads ON before the engine warms up.

a. Re-start the engine (previously tested under no load) with the teletypewriter and all normal additional loads wired to the generator as directed in paragraph 23.

b. Allow the engine to warm up for several minutes, then turn on both the teletypewriter MOTOR switch at the right-hand end of the teletypewriter keyboard and the teletypewriter LIGHT switch on the teletypewriter control panel. Turn on all normal additional loads.

c. If the engine does not run smoothly with its choke lever in the horizontal position when all of the normal generator loads are on, increase the fuel-to-air mixture ratio slightly with the carburetor needle valve on the engine. Except in cold weather, this valve should not require readjustment on subsequent restartings, once the valve is properly adjusted with the generator operating under its normal load.

d. If possible, check the output frequency and voltage of the generator while operating under normal load. The frequency under load should fall in the range of 50 to 60 cps, and the voltage under load should be between 105 and 125 volts for satisfactory teletypewriter operation. If the frequency and voltage values are too high or too low, the trouble probably will be found in the engine-generator governor. Make the necessary adjustments or repairs before proceeding further (refer to the instruction book for the engine generator).

(1) Frequency may be checked by connecting a 115-volt, 60-cycle electric clock to the generator output and comparing its time indications with those of another timepiece of known accuracy. If the electric clock gains time, the frequency is higher than 60 cycles per second. If the electric clock loses more than 10 seconds per minute or 10 minutes per hour, the generator frequency is lower than 50 cps. Either fault may be indicated if the electric clock fails to operate.

(2) The method used to measure the generator voltage is explained in paragraph 18a(8).

Note. The installation will have been completed when the steps outlined in subparagraph d above have been performed. If the teletypewriter is not to be used immediately after installation, adjust the teletypewriter controls, check the teletypewriter performance, and replace the teletypewriter dust cover.

Section II. OPERATION UNDER USUAL CONDITIONS

25. Complete Starting Procedure

The outline of the complete starting procedure contained in this paragraph is to be used only as a guide. Detailed procedures to be followed for the engine generator and for the teletypewriter are contained in the applicable instruction books. Appropriate references are given in the right-hand column opposite each step. Follow the steps of the complete starting procedure in the order given, but follow the instructions given in the reference material in carrying out the individual steps.

Note. When Voice Frequency Line Unit TH-5/TG is used with the AN/PGC-1 equipment, be sure that the neon lamp on the panel of this line unit is lighted before using the keyboard of Teletypewriter TT-4/TG. This lamp, a busy-signal indicator, goes out while signals from this or other teletypewriter stations are being applied to the line, and glows when no signals are being applied.

	Step	For detailed instructions, refer to:
1	Check line-current level indicated by D C MILLIAMPERES meter on Teletypewriter TT-4/TG. Adjust, if necessary. *(Recheck at frequent intervals.)* *Note.* Perform step 1 after step 13 when AN/PGC-1 is used with Voice Frequency Line Unit TH-5/TG.	Paragraph 30.
2	Check fuel level in tank on Engine Generator PU-181/PGC-1. Refill, if necessary. Mix fuel in Container MX-693/PGC-1. *(Recheck every 7 hours of continuous operation.)*	Paragraph 31.
3	Start engine generator. (Teletypewriter MOTOR and LIGHT switches OFF and primary power switches OFF at all other generator loads, such as Voice Frequency Line Unit TH-5/TG.)	Engine generator instruction book.
4	Allow engine to warm up without load for approximately 5 minutes.	
5	Turn TH-5/TG primary-power switch to ON, if TH-5/TG is used with this teletypewriter station. Allow approximately 5 minutes warm-up time for this Voice-Frequency Line Unit, meanwhile performing the remaining steps in this procedure.	Applicable conversion unit instruction book, or technical manual.
6	Turn teletypewriter MOTOR switch to ON.	Instruction book for TT-4/TG.
7	Turn other generator load or loads to ON, if any and if needed.	
8	Adjust carburetor needle valve on engine generator for smooth engine operation under load, if necessary.	Instruction book for engine generator.
9	If possible, check engine-generator output voltage (115 ±10 volts) and frequency (50-60 cps) under load.	Paragraph 21.
10	Check teletypewriter motor speed and adjust it, if necessary, to 3,600 rpm, using 180-vibrations-per-second tuning fork supplied with teletypewriter. *(Recheck daily.)*	Instruction book for TT-4/TG.
11	Install and straighten or check paper and ribbon in teletypewriter. *(Recheck at frequent intervals during operation.)*	Instruction book for TT-4/TG.
12	Unlock platen, carriage, and keyboard of teletypewriter. *Note.* Unlock keyboard only when necessary to use teletypewriter for sending purposes.	Instruction book for TT-4/TG.
13	Set controls on Voice Frequency Line Unit TH-5/TG, if used with this teletypewriter station.	Applicable conversion unit instruction book or technical manual.
14	Adjust ARMATURE and RANGE dials on teletypewriter. *(Readjust weekly.)*	Instruction book for TT-4/TG.
15	Test and use teletypewriter. *(Retest at beginning of each watch.)*	Instruction book for TT-4/TG.

26. Shutting Down to Stand-by Condition

To shut down Teletypewriter Set AN/PGC-1 on a stand-by basis, depress the FIGS key, then the H key (STOP) on the teletypewriter. This stops and removes power from both the motor of this teletypewriter and the motors of any cooperating teletypewriters, but enables them to be restarted automatically when the BREAK switch is pressed at any teletypewriter in the circuit. Thus, all teletypewriters in the circuit are kept receptive to incoming signals without the necessity of continuous motor operation. Do not turn the teletypewriter MOTOR switch to OFF and do not shut down Engine Generator PU-181/PGC-1 at any time while the station is being kept open for traffic. If Voice Frequency Line Unit TH-5/TG is in use at this station, leave this unit ON, also, as long as the station is open for traffic.

27. Restarting from Stand-by Condition

Momentarily press down the BREAK push-button switch on the right-hand end of the teletypewriter keyboard to restart

the motor of this teletypewriter and the motor or motors of the cooperating teletypewriter or teletypewriters when they have been stopped as directed in paragraph 26. No steps are necessary at Engine Generator PU-181/PGC-1 or at Voice-Frequency Line Unit TH-5/TG when restarting from a stand-by condition.

28. Closing Station to Traffic

To close the station to traffic:

a. Shut down the teletypewriter by turning its MOTOR switch to OFF. Turn the teletypewriter LIGHT switch to OFF.

b. Turn the primary power switch on Voice Frequency Line Unit TH-5/TG (if used) to OFF.

c. If Engine Generator PU-181/PGC-1 is needed for other electrical loads, it may be left in operation.

29. Complete Shut-down

a. Perform the steps given in paragraph 28 a and b.

b. Turn off all other electrical loads on Engine Generator PU-181/PGC-1, if any.

c. To stop Engine Generator PU-181/PGC-1, press down its throttle-shaft lever until the engine stops.

Note. Always close the fuel-line shut-off valve when shutting down Engine Generator PU-181/PGC-1 in preparation for transportation.

30. Adjusting Line Current

a. For D-C Teletypewriter-Transmission Systems. Refer to the teletypewriter instruction book.

b. For Use With Voice Frequency Line Unit TH-5/TG. Keep the D C MILLIAMPERES reading on Teletypewriter TT-4/TG adjusted to exactly 20 milliamperes with the teletypewriter LINE INCREASE rheostat.

31. Mixing Fuel for Engine Generator

Mix the fuel for Engine Generator PU-181/PGC-1 in the ratio of 16 parts gasoline to 1 part oil in the 1-gallon Container MX-693/PGC-1, which is supplied as a PGC-1 accessory. When available, use unleaded and undyed gasoline (U.S. Army Specification No. 2-116A) and straight mineral oil (U.S. Navy Symbol 2110). If these are not available, use commercial 62-octane (or better) gasoline, and use oil, engine (OE 10, SAE 10). Container MX-693/PGC-1 is a two-compartment container. The upper compartment is separated from the lower compartment by a metal partition. The partition between the two sections is provided with an opening to permit mixing the contents of one compartment with those of the other. A threaded filler opening and cap are provided in the top of the upper compartment. A plug, designed to fit snugly into and close the opening in the partition between the compartments, is attached to the bottom of the filler opening cap by a lightweight metal chain. To mix oil and gasoline in this container proceed as follows:

a. Unscrew the cap from the filler opening and drop the plastic plug on the end of the chain into the opening in the partition between the compartments.

b. Lay the cap on top of the container, but do not pull the chain and dislodge the plastic plug.

c. Fill the upper portion of the container with oil.

d. Pull the plastic plug out of the opening between the compartments and lift it out of the container. Allow the oil to flow into the lower compartment.

e. Fill the container with gasoline.

f. Drop the plastic plug back to a random position in the container and screw the filler cap on tightly. Shake the container to mix the gasoline and oil thoroughly.

g. Keep a gallon of fuel-and-oil mixture on hand in Container MX-693/PGC-1 in readiness for the engine generator.

32. Packing Teletypewriter Set for Local Transportation

This paragraph covers the packing of Teletypewriter Set AN/PGC-1 for transportation from place to place during field usage only. When packing this equipment in preparation for storage or long-distance shipment, refer to chapter 5 of this manual.

a. Shutting Down Equipment. Shut down the teletypewriter station as directed in paragraphs 28 and 29.

b. Preparing Teletypewriter For Transportation. Prepare the teletypewriter for transportation as directed in the instruction book for the teletypewriter.

c. Preparing Engine Generator For Transportation. Prepare the engine generator for transporation as directed in the instruction book for the engine generator.

d. Packing Accessories And Running-Spare Parts. (1) *Ribbon and paper.* Pack the spare spool of typewriter ribbon beneath the removable felt pad in the small-parts compartment of Case CY-552/PGC-1. Pack the spare roll of teletypewriter recording paper in the paper-roll compartment of this case (fig. 12). Refer to the teletypewriter instruction book for the placement of other TT-4/TG accessories and running-spare parts.

(2) *Accessories and running-spare parts supplied as part of Engine Generator PU-181/PGC-1.* When the teletypewriter set is to be transported in its wooden carrying chests, pack the engine-generator accessories and running-spare parts in the compartment provided for this purpose in the top of Case CY-739/PGC-1 (fig. 9). When the teletypewriter set is to be transported by packboard, pack the engine-

generator accessories and running-spare parts as directed for such transportation in the instruction book for the engine generator, or in accordance with the note below.

(3) *Other accessories and running-spare parts.* Pack the remaining accessories and running-spare parts in Case CY-552/PGC-1 as shown in figure 12. Pack the tins of spare 2-ampere and $\frac{1}{8}$-ampere fuses under the removable felt pad in the small-parts compartment. Other small items, such as spare lamp bulbs, also should be packed in this compartment, particularly if they are fragile.

Note. When Teletypewriter Set AN/PGC-1 must be transported on packboard by an insufficient number of men to permit Case CY-552/PGC-1 to accompany the teletypewriter and engine generator, pack those accessories, running-spare parts, and tools immediately necessary for installation or operation in Bag CW-160/PGC-1, and lash this bag to the teletypewriter pack.

e. Packing Tools For Transportation. (1) *Tools supplied as part of Engine Generator PU-181/PGC-1.* When the teletypewriter set is to be transported in its wooden carrying chests, pack the engine-generator tools in the compartment provided for this purpose in the top of Case CY-739/PGC-1 (fig. 9). When the teletypewriter set is to be transported by packboard, pack the engine-generator tools as directed for such transporation in the instruction book for the engine generator or in accordance with the note at the end of subparagraph d above.

(2) *Other tools.* Insert the teletypewriter tools (tabulated in paragraph 45) in the loops of the tool bag (fig. 15); then roll up this bag and snap it shut. When the teletypewriter set is to be transported in its wooden carrying chests, strap the bag of teletypewriter tools to the inside of the lid of Case CY-694/PGC-1. When the teletypewriter set is to

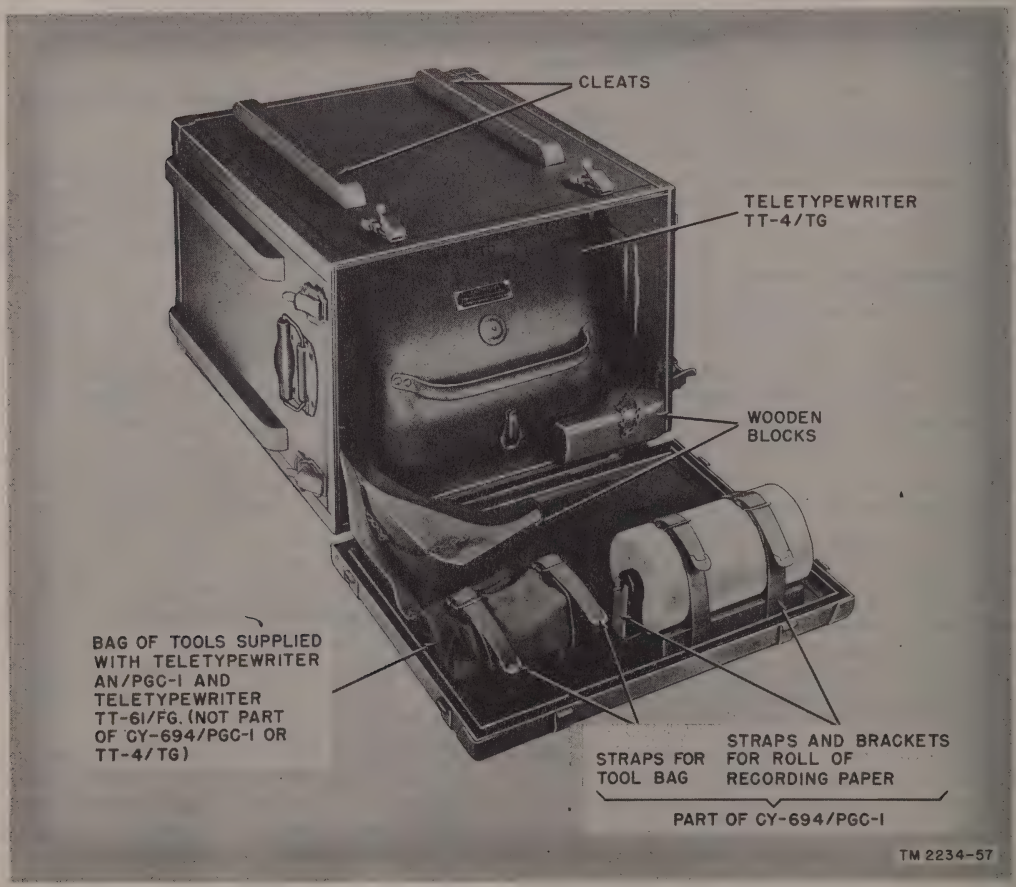


Figure 24. Teletypewriter TT-4/TG packed in Case CY-694/PGC-1.

be transported by packboard, place the bag of tools in the accessories case (CY-552/PGC-1) or in Bag CW-160/PGC-1 as explained in the note at the end of subparagraph d above.

f. Packing Teletypewriter Set In Carrying Chests. When the teletypewriter set is to be transported in its wooden carrying chests:

(1) Pack the teletypewriter in Case CY-694/PGC-1 as shown in figure 24 and as directed in the instruction book for the teletypewriter.

(2) Fasten the engine generator to the base of Case CY-739/PGC-1, as shown in figure 10, and complete the packing of CY-739/PGC-1.

(3) Close the cover of Case CY-552/PGC-1 and fasten the latches. Then place CY-552/PGC-1 in Case CY-553/PGC-1 as shown in figure 13.

(4) Close the covers of all three wooden carrying chests, and fasten them with their spring latches. The teletypewriter set now is ready for transporation.

Note. To prevent rust and other moisture damage, it is advisable to inclose two or three small bags of desiccant (drying material), if available, in each major package of AN/PGC-1 equipment. This is particularly advisable in moist climates and when the equipment is to remain packed for a considerable length of time. Place the desiccant in both the spare-parts and main compartments of Case CY-739/PGC-1 and inside Case CY-552/PGC-1 as shown in figure 12. The bags of silica gel or equivalent approved desiccant, packed with the equipment when delivered by the manufacturers may be re-used several times, provided they are baked dry (in an oven or in hot sunlight) just prior to each re-use.

g. Packing Teletypewriter Set On Packboards. When Teletypewriter Set AN/PGC-1 is to be transported on packboard, the equipment is *not* placed in its associated wooden carrying chests. Proceed as follows:

(1) *Engine generator.* Unfasten the engine generator from the base of Case CY-739/PGC-1, if necessary, and place it in its immersion-proof cover (figs. 25 through 27). Then close the cover, carefully following the steps shown in figures 28 through 32 to obtain a waterproof seal. Finally, lash the engine generator in Bag CW-191/PGC-1 to a standard Army packboard (fig. 33). Interlace the packboard rope between the cleats on the sides of the packboard and the rings at the bottom of Bag CW-191/PGC-1. It is advisable to lash additional rope in criss-cross fashion over the top of Bag CW-191/PGC-1 as shown in figure 33. Be sure the rope is strong enough and that it is properly and securely tied.

(2) *Teletypewriter.* Lash the teletypewriter in its immersion-proof cover to a standard Army packboard (fig. 34).

(3) *Accessories case.* Close the cover of the accessories Case (CY-552/PGC-1) and fasten the spring latches. Then lash Case CY-552/PGC-1 to a standard Army packboard as shown in figure 35. Interlace the packboard rope between the cleats on the sides of the packboard and the cleats on the long sides of Case CY-552/PGC-1.



Figure 25. Packing engine generator in Bag CW-191/PGC-1, step 1.

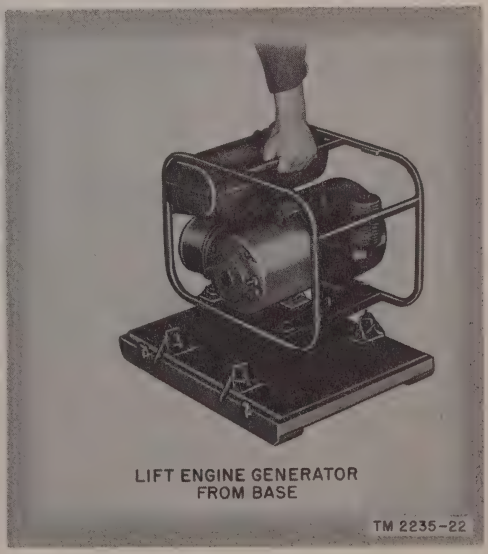


Figure 26. Packing engine generator in Bag CW-191/PGC-1, step 2.



Figure 27. Packing engine generator in Bag CW-191/PGC-1, step 3.



Figure 28. Packing engine generator in Bag CW-191/PGC-1, step 4.



Figure 29. Packing engine generator in Bag CW-191/PGC-1, step 5.



Figure 30. Packing engine generator in Bag CW-191/PGC-1, step 6.

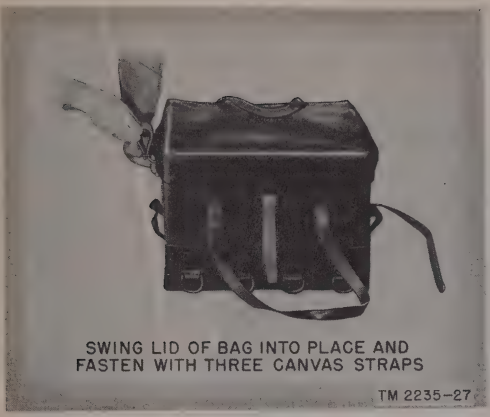


Figure 31. Packing engine generator in Bag CW-191/PGC-1, step 7.



Figure 32. Bag CW-191/PGC-1 (containing engine generator), ready for lashing to packboard or transportation by hand.



Figure 33. Engine Generator PU-181/PGC-1, lashed to packboard in Bag CW-191/PGC-1.

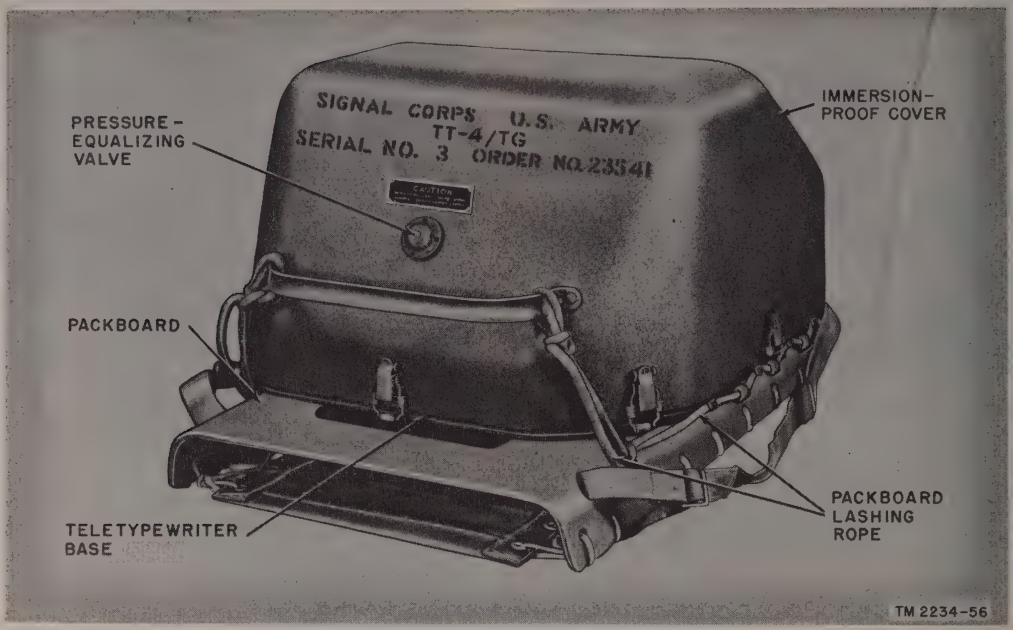


Figure 34. Teletypewriter TT-4/TG, lashed to packboard.

Section III. OPERATION UNDER UNUSUAL CONDITIONS

33. General

The operation of Teletypewriter Set AN/PGC-1 may be difficult when such climatic conditions as extreme cold, heat, humidity and moisture, sandstorms, etc., are present. This section contains general instructions on how to minimize effects of such unusual operating conditions.

34. Operation in Temperatures Below Freezing

Subfreezing temperatures and associated climatic conditions affect the efficient operation of the teletypewriter. General instructions for operation of this equipment under conditions of severe cold follow:

a. Although the teletypewriter may be operated outdoors in dry, cold weather under demand of tactical requirements, it is highly impractical to try to operate it outdoors in subfreezing weather. Tactical requirements notwithstanding, the

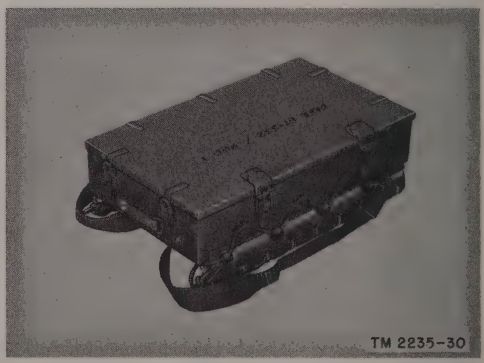


Figure 35. Case CY-552/PGC-1, lashed to packboard.

teletypewriter will not operate below +32°F (0°C). Lubricants in the machine will stiffen and the efficiency of the operator will be reduced if he suffers from the cold. If at all possible, operate the teletypewriter only in a heated shelter. If no building is available, improvise some sort of shelter with materials at hand (par. 11). In extreme emergencies, the teletypewriter may be operated in rain,

sleet, or snow if the immersion-proof cover is propped securely over the machine with just enough clearance between cover and base to permit entry of the power and signal cords and, if necessary, to permit the operator's hands to reach the keyboard.

b. If this equipment is suddenly brought into a warm atmosphere following any extended exposure to cold, condensation may occur on the outside of the machine and on the internal components. If moisture condenses on the teletypewriter at all, condensation is likely to continue until the teletypewriter reaches the temperature of its surrounding air. After the equipment has reached the temperature of the surrounding air, wipe off the outside with a dry cloth. Surround the unit with several 50-watt incandescent lamps (connected in parallel with the engine-generator output) to provide a mild circulation of warm air to dry the internal components. Connect not more than six lamps in parallel with the generator output and then *only* when no other load is connected to the generator. Use not more than three lamps if it is necessary to provide dry air during operation of the teletypewriter when the humidity is especially high.

35. Operation Under Hot Humid Climatic Conditions

When this equipment is operated in tropical climates, varying conditions may cause condensation on and within the equipment. Since these conditions may prevail more or less constantly in tropical climates, measures adopted to dry the equipment (subpar. b above) will be effective only temporarily when used. Moistureproofing and fungiproofing should be applied at frequent intervals (ch. 3), to offset the effect of the unavoidable dampness. Be particularly careful to prevent accumulations of moisture which would cause partial or complete short circuits. If the teletypewriter motor is kept running, the teletypewriter machinery will stay dry. Also take measures to prevent insects from entering the teletypewriter and the engine-generator carburetor, and inspect the unit frequently to remove any insect which may have entered the units despite precautions.

36. Operation in Arid Climates

In arid climates, the major problem encountered is that of keeping sand and dust from entering the teletypewriter mechanism. Sand and dust mix with the lubricants and form an abrasive paste on moving parts. The use of a shelter is imperative. If the shelter used is not dustproof, try to seal out as much dust as possible. Keep windows and doors shut, or if openings are not equipped with sash and doors, hang wet sacking over the openings. Cover the inside walls of crude shelters with wrapping paper. If the equipment is installed in a tent, place rocks or sand and gravel on the bottom of the tent sidewalls to prevent them from flapping when the wind blows. Never attach power cords, signal cords, or other leads to any part of a tent. Storms or sudden wind squalls may shake the tent sufficiently to break the connections or the wires. The problems arising from condensation of moisture may occasionally be encountered even in arid areas (pars. 34b and 35), if sudden changes of temperature occur.

37. High Altitudes

This equipment is designed for satisfactory operation outdoors in mountainous regions or in nonpressurized aircraft cabins at altitudes up to 15,000 feet above sea level. At higher altitudes, the surrounding air should be pressurized to at least 16.88 inches of mercury. This usually entails special pressurization equipment. Since this can seldom be done on an improvised basis, special planning will be required if this equipment is assigned for field use above 15,000 feet.

Note. The engine generator is not intended to be operated in an aircraft.

38. Salt Spray

When delivered by the manufacturer, this equipment is not treated to withstand the effect of salt-water spray or mists. This equipment should be salt-spray treated in advance by maintenance personnel, if it is to be operated under exposure to the weather at a beach or at sea. If the equipment has been exposed to salt spray or mists accidentally or in an emergency, soak a clean cloth in fresh water as soon as possible thereafter, wring it out, and wipe it over all parts of the equipment which have been exposed. When transporting the equipment on a beach, it is important to keep the teletypewriter, engine generator, accessories, tools, and running-spare parts under their immersion-proof covers.

39. Effects of Wet Weather on Line Circuits

Moisture on the conductors of any full-metallic line produces resistive line losses which increase in proportion to the amount of moisture present. Moisture also causes line-current losses in simplex (single-wire) circuits of d-c systems by decreasing the resistance between the wire conductor and ground.

40. Compensating for Line Losses

In d-c teletypewriter-transmission systems, wet-weather line losses are indicated by lowered D C MILLIAMPERES readings on the meter on the teletypewriter. Ordinary changes in the weather may cause the D C MILLIAMPERES readings to fluctuate between 40 and 80 MILLIAMPERES in a 60-milliampere standard circuit. No compensating adjustment of the LINE INCREASE rheostat on the teletypewriter control panel is necessary if the fluctuations remain within these limits, although the ideal line-current level is 60 milliamperes. If the D C MILLIAMPERES reading drops below 40,

the LINE INCREASE rheostat setting must be changed in a clockwise direction until approximately 60 (or more than 40) milliamperes are obtained again. When the weather returns to normal, adjust the LINE INCREASE rheostat approximately to its original setting. If this is not done, the line-current may increase sufficiently to blow a line fuse. Watch the D C MILLIAMPERES meter carefully whenever sudden changes in the weather appear imminent. Change the LINE INCREASE rheostat setting when necessary. It also may be necessary to readjust the ARMATURE and RANGE dials to compensate for other undesirable effects of moisture on the line, such as increased shunt capacity and increased series inductance, either of which may cause erratic typing or failure to print. Line losses in wire-line carrier systems are indicated by lowered meter readings on the carrier equipment. All compensating adjustments are made at the carrier equipment.

41. Transportation of Teletypewriter Set in Aircraft

Pack all components in their immersion-proof covers before transporting the teletypewriter set in any nonpressurized compartment of an aircraft capable of flying higher than 15,000 feet above sea level. Do not open the engine-generator cover (Bag CW-191/PGC-1) at any time during flight, unless it is opened and repacked in a pressurized cabin. If the accessories case (CY-552/PGC-1) must be opened during flight, repack it and fasten it with its spring latches before the aircraft descends. This precaution is necessary even when flying below 15,000 feet, particularly if the descent is to be rapid. Before flight, check the pressure-equalizing valves in the immersion-proof cover of the teletypewriter and in Case CY-552/PGC-1 for proper operability (instruction book for teletypewriter).

42. Interoperation with British Teleprinters

When Teletypewriter Set AN/PGC-1 is to be operated in a circuit containing one or more British teleprinter machines:

a. Adjust the teletypewriter as directed for British interoperation in the instruction book for Teletypewriter TT-/TG.

b. Operate Teletypewriter TT-4/TG as directed for British interoperation in TM 11-464.

c. No special adjustments or operating precautions are necessary at the engine generator.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

Section I. ORGANIZATIONAL TOOLS AND EQUIPMENT

43. General-purpose Tools

a. General-Purpose Tools Supplied With Equipment (fig. 15). General-purpose tools supplied as part of Teletypewriter Set AN/PGC-1 are listed in paragraph 45a.

Note. For tools supplied as part of Engine Generator PU-181/PGC-1, refer to the engine-generator instruction book.

b. General-Purpose Tools Issued For *USE WITH* equipment. Tool equipments TE-50 and TE-50-A, which are designed for the maintenance of teletypewriter equipment, are supplied to organizations responsible for the maintenance of Teletypewriter Set AN/PGC-1. In Tool Equipment TE-50, Test Unit I-236 is a component. In Tool Equipment TE-50-A, Test Unit I-236 has been replaced by Multimeter TS-297/U which is a combination volt-ohm-milliamter used in the testing of electrical components. For complete information on Test Unit I-236, see TM 11-2056; TM 11-5500 contains detailed instructions on the use of Multimeter TS-297/U.

44. Special Tools and Accessories

a. Special Tools And Accessories *SUPPLIED WITH* Equipment (figs. 14 and 15). Special tools and accessories supplied for the maintenance of Teletypewriter Set AN/PGC-1 are listed in paragraph 45 b.

b. Special Tools And Accessories *ISSUED FOR USE WITH* Equipment. In addition to Tool Equipment TE-50 or TE-50-A, which usually is supplied to organizations using Teletypewriter Set AN/PGC-1, depot personnel have special apparatus necessary for certain major tests and adjustments.

45. Maintenance Materials

Materials needed for the maintenance of Teletypewriter TT-4/TG and the plug-equipped signal and power cords are listed in the instruction book for Teletypewriter TT-4/TG. For materials needed in the maintenance of the engine generator, refer to the instruction book for Engine Generator PU-181/PGC-1. All of these materials are available through regular supply channels.

a. General-Purpose Tools Supplied With Teletypewriter Set AN/PGC-1 (fig. 15).

Quantity per equip.	Item	Stock No.	Dimensions	Remarks
1	Pliers, TL-13-A.	6R4513A	6″ long.	Has side cutters, straight nose.
1	Pliers, TL-126.	6R4626	6 to 6½″ long.	Long-chain nose without cutters.
1	Knife (electrician's folding) TL-29.	6Q60229	3¾ x ¾ x 11/16 (closed) x 17/32″.	Cutlery steel blade 2½″ x .025″ and screwdriver blade w/knife edge and locking device on one end and chain clevis on other end.
1	Screwdriver.	6R15493	6″ long; 3″ blade with 5/16″ wide x 1/32″ thick bit.	Insulated handle.
1	Tweezers.		5″ long.	Flat tip.

a. General-Purpose Tools Supplied With Teletypewriter Set AN/PGC-1 (fig. 15) (contd).

Quantity per equip.	Item	Stock No.	Dimensions	Remarks
1	Wrench set, hex. socket screw, consisting of:	6R55503-4		Allen type.
	1 wrench, hex., L shape.		1/16" across flats; arms 2 3/4" and 15/16".	For 1/4" setscrew, No. 8 cap screw.
	1 wrench, hex., L shape.		1/8" across flats; arms 2 1/4" and 3/4".	For 1/4" setscrew, No. 8 cap screw.
	1 wrench, hex., L shape.		3/32" across flats; arms 2" and 21/32".	For No. 10 .190" dia socket head setscrew, No. 5 .125" dia, and No. 6 socket head cap screws.
	1 wrench, hex., L shape.		.050" across flats; arms 1 3/4" and 1 1/2".	For No. 4 .112" dia socket head setscrew.
	1 wrench, hex., L shape.		1/16" across flats; arms 1 3/4" and 1/2".	For No. 5 and 6 setscrews.
	1 wrench, hex., L shape.		5/16" across flats; arms 1 7/8" x 39/64".	Solid hex. to fit No. 8 socket head screw & No. 4 socket head cap screw.
1	Wrench set, hex. socket screw, special (for Teletypewriter Set AN/PGC-1), consisting of:			Allen type.
	1 wrench.		7" long; .075" across flats.	For No. 8 setscrew.
	1 wrench.		7" long; .090" across flats.	For Nos. 5 and 6 cap screws and No. 10 setscrews.
	1 wrench.		7" long; 1/8" across flats.	For No. 8 cap screw.
	1 wrench.		7" long; 3/32" across flats.	For No. 10 cap screw.
	1 wrench.		7" long; 3/16" across flats.	For 1/4-28 cap screw.
1	Wrench set, double open end (15° and 75° offset), for Teletypewriter Set AN/PGC-1, consisting of:			
	1 wrench.		3 1/8" long; shank 3/16" wide; 1/4" opening both ends.	
	1 wrench.		3 3/4" long; shank 1/4" wide; 5/16" opening both ends.	
	1 wrench.		3 13/16" long; shank 1/4" wide; 11/32" opening both ends.	
	1 wrench.		3 13/16" long; shank 1/4" wide; 3/8" opening both ends.	
	1 wrench.		4 1/2" long; shank 3/8" wide; 7/16" opening both ends.	
	1 wrench.		4 1/2" long; shank 3/8" wide; 1/2" opening both ends.	

b. Special Tools and Accessories Supplied with Teletypewriter Set AN/PGC-1 (figs. 14 and 15).

Quantity	Item	Remarks
1	Tuning fork, 180 vibrations per second[a].	For teletypewriter motor-speed checks and adjustments.
1	Container MX-693/PGC-1.	Measuring, mixing, and storage can for fuel and oil for Engine Generator PU-181/PGC-1.

[a]Supplied as part of Teletypewriter TT-4/TG. Not illustrated in this manual. See teletypewriter instruction book.

Section II. LUBRICANTS AND PRESERVATIVES

46. Lubrication Instructions

Lubrication procedures for Teletypewriter TT-4/TG are given in the teletypewriter instruction book. Lubrication instructions for Engine Generator PU-181/PGC-1 are given in the applicable instruction book. No other parts of the AN/PGC-1 equipment require lubrication.

47. Rustproofing and Painting

a. If the finish on the teletypewriter or engine generator has been scarred or damaged, prevent rust and corrosion by touching up bared surfaces. Sand the surface down to the bare metal with #00 or #000 sandpaper. Obtain a bright, smooth finish. Remove rust from corroded metal by cleaning with Solvent, dry-cleaning (SD), Federal P-S-661a (Amend. 1). In severe cases, it may be necessary to use solvent (SD) to soften the rust and sandpaper to complete the preparation for painting.

Caution: Do not use steel wool. Minute particles of steel wool may enter the equipment and cause short circuits.

b. Apply approved paint with a small brush. When numerous scars and scratches warrant complete repainting, remove the unit from service, place protective masking over all areas where paint is not desired, and spray the paint over the entire surface.

48. Weatherproofing

Signal Corps equipment, when operated under severe climatic conditions such as prevail in tropical and desert regions, requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials. Moistureproofing and fungiproofing treatment required in tropical climates is fully explained in TB SIG 13 and TB SIG 72. The precautions necessary to prevent poor performance or failure of equipment in extremely cold climates are explained in TB SIG 66. The precautions necessary to prevent poor performance or equipment failure in desert areas subject to extremely high temperatures, low humidity, and excessive sand and dust are explained in TB SIG 75.

Section III. PREVENTIVE MAINTENANCE SERVICES

49. Definition and Importance of Preventive Maintenance

Preventive maintenance is a systematic series of operations performed periodically on equipment to maintain top efficiency in performance, to minimize unwanted interruptions in service, and to eliminate major break-downs. To understand what is meant by preventive maintenance, it is necessary to distinguish preventive maintenance from trouble shooting and repair. The primary purpose of preventive maintenance is to prevent breakdowns and the need of repair by making frequent inspections for signs of wear — and taking the appropriate corrective measures where necessary — before any of the parts concerned has become excessively worn or loosened. On the other hand, the primary purpose of trouble shooting and repair is the location and correction of defects that already have caused troublesome operation or break-down. Preventive maintenance is of utmost importance. Not only is valuable time and money saved by locating troubles and correcting them *before* they develop, but the usefulness of the entire system of communications depends on equipment being ready to operate at peak efficiency when needed.

50. Preventive Maintenance Procedure

Preventive maintenance procedures for Teletypewriter TT-4/TG and Engine Generator PU-181/PGC-1 are outlined in the applicable instruction book. Follow these procedures carefully, systematically combining them into one procedure with the preventive maintenance inspections and corrective measures outlined for AN/PGC-1 components in paragraph 51. Coordinate the preventive maintenance checks outlined in the three instruction books which accompany the Teletypewriter Set AN/PGC-1 so that all daily checks specified occur at the same time of day, all weekly checks on the same day, etc. Do not initial any preventive maintenance record sheets until all preventive maintenance outlined in *this* instruction book *and* those accompanying the teletypewriter and the engine generator, respectively, have been checked.

Note. When Voice Frequency Line Unit TH-5/TG is used with the AN/PGC-1 equipment, incorporate the preventive maintenance checks specified for this unit in procedure with the preventive maintenance checks on the AN/PGC-1 components. Do not initial preventive maintenance record sheets until this unit also has been checked out satisfactorily.

51. Preventive Maintenance Checklist

The following preventive maintenance checklist covers only those AN/PGC-1 components supplied in addition to the complete Teletypewriter TT-4/TG and the complete Engine Generator PU-181/PGC-1. Check the items in the following list at the intervals shown or more frequently if so ordered by your immediate superior. Be sure to observe the special precautions indicated.

51. Preventive Maintenance Checklist (contd)

Item No.	Check	When	How	Precautions
1	Cords CX-1200/U, CX-1201/U, CX-1202/U, and CX-1203/U.	Weekly	Inspect cords for dirt, dust, mildew, fungus growth, also check insulation for breaks, cuts, frays, other signs of wear, and for signs of overheating. Clean or replace, if necessary. Inspect plugs for corrosion and looseness, and bent or broken contacts. Tighten connections and straighten bent contacts. Replace plugs, if necessary.	Inspect much more often when the teletypewriter set is installed outdoors, in a tent or dugout, or is being moved constantly from place to place. Use proper-sized screwdriver when tightening screws in plugs.
2	Container MX-693/PGC-1.	Daily	See that the container is full of fuel and oil mixture for engine generator. Check the container for leaks, dents, and bent spout. Straighten dents and bent spout, if possible.	Replace the container if leak is noted or dents cannot be straightened.
3	Bag CW-160/PGC-1 and tool bag.	Weekly	Inspect for dirt, dust, mildew, fungus growth, ripped seams, and tears. Clean with solvent (SD), and mend with heavy thread, if necessary. Check canvas straps and buckles; repair or replace if necessary.	Inspect more often when these bags are in use. Keep loops on the tool bag tightly sewed in place.
4	Fuses.	Daily	Keep five spare 1/8-amp, 250-volt fuses (stock No. 3Z2585.2) and five spare 2-amp, 250-volt fuses (stock No. 3Z2602.1) on hand in Case CY-552/PGC-1.	
5	Cases for equipment.	Weekly	Inspect for damaged surfaces, chipped paint, dirt, dust, rust, corrosion, fungus growth, damaged water seal, damaged latches, hinges, and handles. Clean surfaces with clean cloth slightly moistened in solvent (SD) to remove oil, grease, or other foreign matter. Wipe with dry cloth. Inspect for damaged shock pads or blocks. Apply 1 or 2 drops of light machine oil to working parts of hinges and latches. Straighten bent surfaces (internal and external), if necessary.	Do not allow Case CY-552/PGC-1 to be submerged in water or turned upside down in rain, if water seal is damaged. Do not transport Case CY-552/PGC-1 in Case CY-553/PGC-1 when internal shock pads and blocks of CY-553/PGC-1 are badly damaged.
6	Air-pressure-equalizing valve in Case CY-552/PGC-1.	Monthly	Same as air-pressure-equalizing valve in immersion-proof cover of Teletypewriter TT-4/TG. See teletypewriter instruction book.	Do not transport case CY-552/PGC-1 in aircraft if this valve is not operating properly.
7	Tools.	Daily	Check that no tools are missing or damaged. Replace missing and damaged tools as soon as possible. Remove any rust and corrosion with sandpaper; then apply protective film of light machine oil. Re-oil tools about once a week when in frequent use.	Do not allow tools to lie around loose. Keep in tool bag when not in use. Dry tools thoroughly and re-oil immediately after exposure to rain or other moisture.

Section IV. TROUBLE SHOOTING

52. Trouble Shooting on Organizational-Maintenance Level

Trouble shooting on the organizational-maintenance level requires that the trouble be sectionalized by tracing it to the faulty component as quickly as possible. It then must be determined whether the faulty component can be repaired on the organizational level or must be sent to a depot repair shop. The repair work that can be performed at the organizational level is necessarily limited in scope by the tools, test equipment, and replaceable parts issued to the operators and repairmen concerned, and by the existing tactical situation. Organizational-maintenance personnel will make such repairs as possible within these limita-

tions. Do not undertake any repair requiring special tools or test equipment issued only to depots, nor any repair requiring greater technical skill and experience than organizational repairmen possess.

53. Visual Inspection

a. Failure of this equipment to operate properly is often caused by faults which ordinarily can be identified by visual inspection:

(1) Improperly connected power cable.

(2) Burned-out fuses.

(3) Worn, broken, burned-out, or disconnected cords or plugs.

(4) Wires broken by excessive vibration.

(5) Defective tubes in Voice Frequency Line Unit TH-5/TG.

(6) Loose ground connection (particularly in d-c system using simplex line).

b. When the cause of trouble is not immediately apparent, check as many of the foregoing items as practicable before starting a detailed examination of the component parts of the system. If possible, obtain information from the operator of the equipment regarding performance at the time the trouble occurred.

c. Visually inspect as much of the line system as possible for obvious abnormalities.

54. Sectionalizing Trouble

When the cause of trouble cannot be ascertained by visual inspection (par. 47), follow the procedure outlined in the trouble-shooting chart (par. 55) to locate the fault. Before checking the equipment as outlined in this table, be sure that the components of Teletypewriter Set AN/PGC-1 are interconnected as shown in figure 21 or 22, or in accordance with some other approved method of establishing teletypewriter interconnections. Be sure, also, that the teletypewriter has been loaded properly with paper, that its ribbon and ribbon mechanisms are in good condition, and that both fuses on the teletypewriter control panel are good. Perform the steps listed in the trouble-shooting chart in the order in which they are listed.

55. Trouble-shooting Chart

Step No.	Step	Normal indication or result	Abnormal indication or result	Corrective measures
1	See that VOICE FREQ LINE-DC LINE switch on left-hand side of teletypewriter (under dust cover) is set at desired position.			Set at desired position.
2	Check line-current level indicated by D C MILLIAMPERES meter on teletypewriter. *Note.* Perform step 2 after step 9 when Voice Frequency Line Unit TH-5/TG is used with the AN/PGC-1 set.	Reads 40 to 100 ma in d-c system; reads 20 ma when Voice Frequency Line Unit TH-5/TG is used with AN/PGC-1.	Reads too high, too low, zero, or off-scale backwards.	Check and repair or adjust line continuity and LINE INCREASE rheostat on teletypewriter. (Reverse line-pair connections if meter reads off-scale backwards.) When used with TH-5/TG, check vacuum-tube d-c amplifier, discriminator and amplifier limiter stages in TH-5/TG. Also check Cords CX-1200/U and CX-1201/U for proper connections (figs. 21 and 36).
3	Start engine generator with teletypewriter, TH-5/TG, and other loads (if used) turned off. Adjust carburetor needle valve, if necessary, for smoothest engine operation possible.	Engine runs smoothly.	Engine fails to start, is hard to start, runs and stops, overheats, or does not run smoothly.	Check fuel level in engine fuel tank if engine fails to start. See engine-generator instruction book for other troubles.
4	Connect a-c voltmeter across generator binding-post terminals. Use 400-volt scale on Multimeter TS-297/U. Leave connected for later steps in this procedure.	Meter reads approximately 128 volts ac after about 5 minutes warmup of engine.	Meter reads less than 120 volts or indicates output in 240-volt range.	Check engine governor or rewire generator for output in 120-volt range.

55. Trouble-shooting Chart (contd)

Step No.	Step	Normal indication or result	Abnormal indication or result	Corrective measures
5	Check generator frequency if possible. (par. 21.)	Frequency checks out in 50 to 60 cps range.	Frequency is less than 50 cps or more than 60 cps.	Check engine governor.
6	Turn TH-5/TG primary-power switch ON (if TH-5/TG is used with AN/PGC-1.)	Neon lamp on TH-5/TG panel glows after brief warm-up.	Neon lamp on TH-5/TG panel does not glow.	Check TH-5/TG power cord. Refer to applicable technical manual.
7	Turn teletypewriter MOTOR switch ON.	*a.* Teletypewriter motor runs freely.	*a.* Teletypewriter motor fails to start or does not run freely. *Caution:* If motor hums but labors or fails to start, turn motor switch to OFF immediately and check for mechanical binding in teletypewriter.	*a.* If motor fails to start, check power-line continuity from engine generator to motor (turn teletypewriter LIGHT switch ON to check motor-power cord); also check motor-stop mechanisms and relay in teletypewriter.
		b. Test meter at generator terminals reads approximately 118 volts.	*b.* Test meter at generator terminals reads less than 105 volts.	*b.* Check power line from engine generator to motor for loose connection or partial short circuit. Similarly, check TH-5/TG power cord and those to other generator loads. Check engine governor.
8	Check teletypewriter motor speed.	Teletypewriter motor speed checks out at 3,600 rpm.	Teletypewriter motor speed does not check out at 3,600 rpm.	Adjust speed or repair motor governor and adjust.
9	Check control settings on Voice Frequency Line Unit TH-5/TG.	All TH-5/TG control settings are in accordance with requirements of this installation.	All TH-5/TG control settings are not in accordance with requirements of this installation.	Set TH-5/TG controls correctly.
10	Adjust ARMATURE and RANGE dials on teletypewriter.	Teletypewriter renders satisfactory performance throughout operational test.	Teletypewriter does not render satisfactory performance. *Note.* Spurious signals (wild copy) printed by the teletypewriter may be due to strong noise pickup on the d-c or voice-frequency line, poor ground connection when this connection is shared with other teletypewriters, or maladjusted threshold circuit in TH-5/TG.	In d-c system, see teletypewriter instruction book for probable causes of trouble and corrective measures at teletypewriter. If TH-5/TG is used with AN/PGC-1, determine whether this teletypewriter or other equipment is at fault; disconnect cords or other conductors from line terminals of teletypewriter; then operate teletypewriter in isolating test circuit.
11	Turn ON additional generator loads, if any.	Test meter at generator terminals reads 105 volts ac or higher.	Test meter at generator terminals reads less than 110 volts ac.	Disconnect additional loads from generator. (The total demand of all loads connected to Engine Generator PU-181/PGC-1 in addition to Teletypewriter TT-4/TG and Voice Frequency Line Unit TH-5/TG should not exceed 90 watts.)
12	Disconnect test meter.			

CHAPTER 4

EQUIPMENT USED IN CONJUNCTION WITH TELETYPEWRITER SET AN/PGC-1

Section I. DESCRIPTION OF VOICE FREQUENCY LINE UNIT TH-5/TG

56. Purpose of Voice Frequency Line Unit TH-5/TG

Voice Frequency Line Unit TH-5/TG, often operated in conjunction with Teletypewriter Set AN/PGC-1, is used to convert d-c telegraph pulses from a teletypewriter keyboard into frequency-modulated carrier signals for transmission over a voice channel and to convert the received carrier signals back into d-c telegraph pulses for the actuation of the teletypewriter selector magnet.

57. Description of Voice Frequency Line Unit TH-5/TG

a. ELECTRICAL CHARACTERISTICS. (1) This line unit contains the circuits necessary for half-duplex operation between several teletypewriters sharing the voice-frequency line on a party-line basis, but simultaneous transmission by two stations on the line is not possible. A 50 to 60-cycle ringing circuit is included, which may be used by the receiving operator to send ringing impulses to the transmitting operator as a break signal; break-in operation in the usual sense is not possible. If voice-frequency ringing is needed, a separate voice-frequency telegraph-ringing unit must be added to the installation.

(2) As an alternative to telegraph operation, the switching arrangement incorporated into the line unit permits the establishment of a two-wire telephone channel.

(3) Simultaneous speech and telegraph operation is possible over a common voice-frequency facility on the speech-plus-duplex principle. For this service, a separation filter is necessary to confine the voice and telegraph signals to their proper paths. The separation filter also may be used to transfer the telegraph or telephone channels from one circuit to another.

(4) Other pertinent electrical characteristics are:

Type of modulation .....Frequency shift.
Mean carrier frequency ....1,275 cps.
Marking frequency .....1,325 cps.
Spacing frequency .....1,225 cps.
Bandwidth required .....Approx 200 cps.
Speeds .....60, 75, and 100 words per min (7.42-unit code, 6 operations per word).
Transmitted-output level ..O dbm ±2 db (fixed).
Receiver sensitivity .....—45 dbm.
Terminal impedance .....Nominal 600 ohms ±10% at 1,000 cps for 2- or 4-wire operation.
Demand .....Approx 57 watts.
Power source .....115 ±10% volts at 50 to 60 cps.
Temperature range .....—40°C (—40°F) to +65°C (+149°F).

b. PHYSICAL CHARACTERISTICS. Voice Frequency Line Unit TH-5/TG is contained in a waterproof metal carrying case 8-1/2 inches wide by 10 inches high by 6 inches deep. The case has a lusterless olive-drab enamel finish and is equipped with an olive-drab canvas shoulder strap. The operating panel and power cord are located beneath the lid of the case (figs. 36 and 37). Total weight is approximately 15 pounds.

Section II. USE AND CARE OF VOICE FREQUENCY LINE UNIT TH-5/TG

58. Use of Voice Frequency Line Unit TH-5/TG

Voice Frequency Line Unit TH-5/TG (figs. 2, 36, and 37.) may be used with Teletypewriter Set AN/PGC-1 in any of the following typical applications:

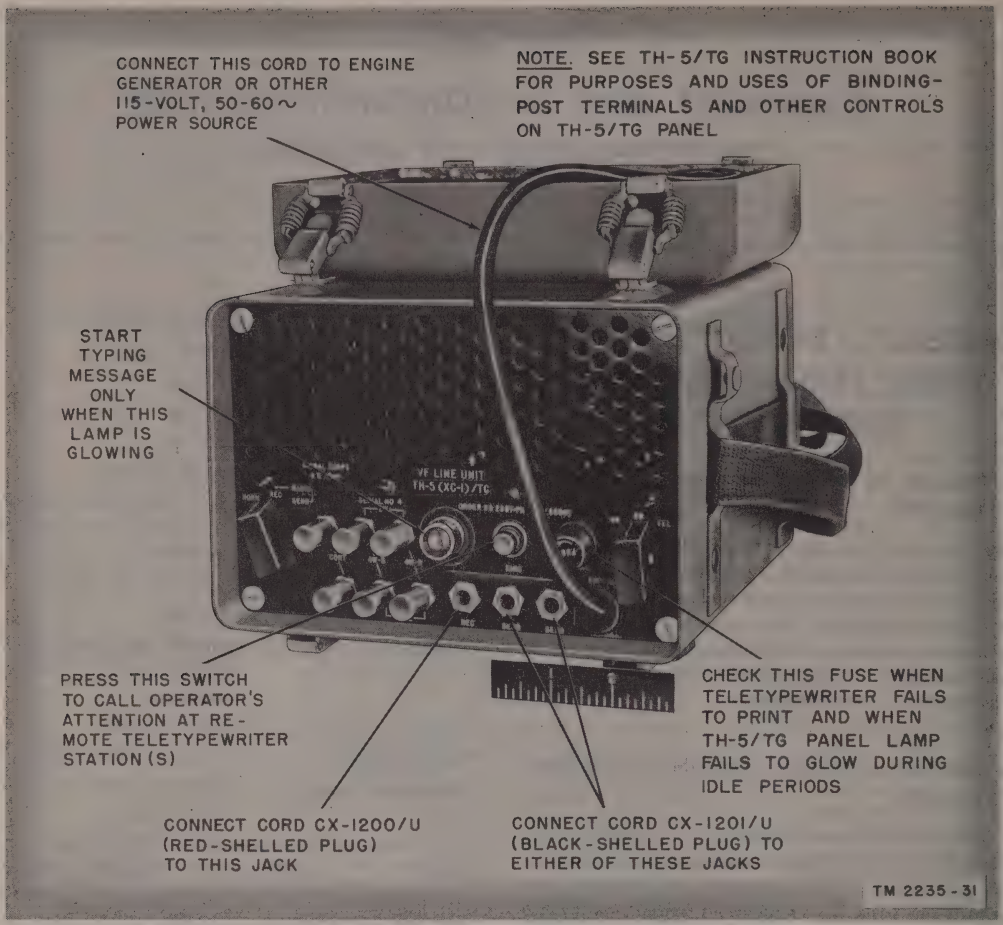


Figure 36. Voice Frequency Line Unit TH-5/TG.

a. Two or more teletypewriter stations, each using this voice-frequency line unit, may be interconnected over a pair of voice-frequency wires on a party-line basis.

b. This line unit may be used to utilize any one of the various radio channels of the Telegraph Terminal TH-3/TC of which it is a component part, the voice frequencies being converted for retransmission in either direction by the radio equipment.

c. This line unit may be used to obtain telephone plus half-duplex teletypewriter operation over one two-wire or one four-wire telephone line. (In this application, the output level in the telephone circuit suffers a 2-db impairment, and it is necessary to add band-pass and band-stop separation filters between TH-5/TG and the telephone line.)

59. Installation Instructions for Voice Frequency Line Unit TH-5/TG

a. Place Voice Frequency Line Unit TH-5/TG on a firm support as free from vibration as possible. Place it within 6 feet of Teletypewriter TT-4/TG in Teletypewriter Set AN/PGC-1.

b. Swing the top cover open, thus exposing the binding-post terminals for line connections, and the operating controls.



Figure 37. Voice Frequency Line Unit TH-5/TG, ready for transportation.

c. Unwind the power cord and lead it out of the case.

d. Set the 4W-2W-TEL switch at 4W if a four-wire line is to be used, or at 2W if a two-wire line is to be used.

e. For two-wire operation, connect the two voice-frequency line wires to the 2W binding posts. For four-wire operation, connect the voice-frequency transmitting pair to the 4W-S binding posts and the voice-frequency receiving pair to the 4W-R binding posts.

f. Connect TH-5/TG to Teletypewriter TT-4/TG in Teletypewriter Set AN/PGC-1 as directed in paragraph 22 and figure 21 of this instruction book.

Note. A tape sender may be plugged into the spare SEND jack on the panel of TH-5/TG, making either teletypewriter or tape sending available. If telephone operation is to be established over the voice-frequency line, connect the telephone to the TEL binding posts, and turn the 4W-2W-TEL switch to TEL position.

g. Connect the TH-5/TG power cord to a source of 115 volts ac at 50 to 60 cps. (This may be the Engine Generator PU-181/PGC-1 of Teletypewriter Set AN/PGC-1.)

h. For grounding instructions and other installation instructions, refer to the line unit instruction book.

60. Operating Instructions for Voice Frequency Line Unit TH-5/TG

All TH-5/TG operating instructions pertaining to the use of this voice-frequency line unit with Teletypewriter Set AN/PGC-1 are covered in chapter 2 of this instruction book.

61. Care of Voice Frequency Line Unit TH-5/TG

Give the same care to Voice Frequency Line Unit TH-5/TG as prescribed for the various components of the Teletypewriter Set AN/PGC-1 in the three applicable instruction books. Do not allow the voice-frequency line unit to be unnecessarily jarred or vibrated; jarring may damage the vacuum tubes. When Teletypewriter Set AN/PGC-1 is packed for transportation to another place in the field, disconnect TH-5/TG from the voice-frequency line, coil its power cord, and lay this cord on the panel of the line unit. Then fasten the cover of the TH-5/TG carrying case over the panel (fig. 37). When the AN/PGC-1 equipment is transported by packboard, TH-5/TG may be carried over the shoulder by means of its shoulder strap. When the AN/PGC-1 equipment is transported in its wooden carrying chests, TH-5/TG may be wrapped in cloth or other soft material and placed inside Case CY-694/PGC-1 or Case CY-739/PGC-1.

CHAPTER 5

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

62. Preparation

When it is necessary to prepare Teletypewriter Set AN/PGC-1 for long-distance shipment or limited storage, dismantle the station and pack the equipment in the three carrying chests. Place each item as directed in paragraph 32. Pack Container MX-693/PGC-1 empty, with filler cap removed. Refer to chapter 5 of the instruction book for Teletypewriter TT-4/TG for specific instructions on that unit; for specific instructions on Engine Generator PU-181/PGC-1, refer to the instruction book pertaining to that unit. Where applicable, follow the instructions given in the Army-Navy, Army, and Signal Corps packaging specifications listed in appendix I, paragraph 3 of this instruction book. Include desiccant to protect the equipment against the effects of moisture.

63. Crating Carrying Chests

The three carrying chests, with their contents packed as directed in paragraph 56, may be packed in wooden shipping crates as described in paragraph 7 (figs. 16 and 17, or 18 and 19). Where applicable, follow the instructions given in the Army-Navy, Army, and Signal Corps packaging specifications listed in appendix I, paragraph 3. Include desiccant to protect the equipment against the effects of moisture. Indicate on the crates the date on which the equipment was removed from service, and whether it was functioning properly at the time of its removal. If the equipment was not functioning properly, indicate what caused faulty operation and notify authorized maintenance personnel of this fact.

Section II. DEMOLITION TO PREVENT ENEMY USE

64. Methods of Demolition

a. SMASH. Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

b. CUT. Use axes, handaxes, machetes.

c. BURN. Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

d. EXPLODE. Use firearms, grenades, TNT.

e. DISPOSE. Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

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

65. Destruction of Components

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

a. Smash (par. 64a) the teletypewriter keyboard and panel, teletypewriter covers, teletypewriter and engine-generator frameworks, accessory case, accessories, controls, switches, all machinery parts, and all carrying chests. Obliterate nameplates and all other identifying marks.

b. Cut (par. 64b) all cords and wiring.

c. Burn (par. 64c) technical manuals, circuit labels, other diagrams, carrying chests, resistors, capacitors, coils, cords, and wiring.

d. Bury or scatter (par. 64e) any or all of the above pieces after smashing, cutting, or breaking.

DESTROY EVERYTHING

APPENDIX I
REFERENCES

Note. For availability of items listed, check SR 310-20-3 for field manuals, training circulars, training aids, Army training programs, JANAP's, Tables of Organization and Equipments (T/O&E's) Tables of Allowances (T/A's), and Tables of Basic Allowances (T/BA's). Check SR 310-20-4 for technical manuals, technical bulletins, supply bulletins, modification work orders, and Changes. Check Department of the Army Catalog SIG 1 for Signal Corps supply catalog pamphlets.

1. Technical Manuals for Equipment Associated with Teletypewriter Set AN/PGC-1

TM 11-464	The Teletypewriter Operator.
TM 11-486	Electrical Communication Systems Engineering.
TM 11-487	Electrical Communication Systems Equipment.
TM 11-680	Teletypewriter Circuits and Equipment (Fundamentals).
TM 11-2056	Test Unit I-236 and I-236-A.
TM 11-5500	Multimeter TS-297/U.

2. Painting, Preserving, and Lubrication

TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 66	Winter Maintenance of 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.

3. Packaging and Packing Information

a. Joint Army-Navy Packaging Specifications.

JAN-D-169	Desiccants, Activated.
JAN-P-100	General Specification.
JAN-P-106	Boxes, Wood, Nailed.
JAN-P-116	Preservation, Methods of.
JAN-P-125	Barrier-Materials, Waterproof, Flexible.
JAN-P-131	Barrier-Materials, Moisture-Vaporproof, Flexible.

b. U. S. Army Specification.

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

c. Signal Corps Instructions.

720-7	Standard Pack.
726-15	Interior Marking.

4. Decontamination

TM 3-220	Decontamination.

5. Demolition

FM 5-25	Explosives and Demolitions.

6. Other Publications

TB SIG 25	Preventive Maintenance of Power Cords.
TM 1-455	Electrical Fundamentals.
TM 11-462	Signal Corps Reference Data.

APPENDIX II
IDENTIFICATION TABLE OF PARTS FOR TELETYPWRITER SET AN/PGC-1

Note. The fact that an item appears in this table is not sufficient basis for requisitioning it. Requisitions must cite an authorized basis, such as T/O&E, T/A, T/BA, SIG 7-8-10, SIG 10, list of allowances of expendable material, or another authorized supply basis. The Department of the Army Supply Catalog applicable to the equipment covered in this manual is listed in SIG 7&8-AN/PGC-1. For an index of available supply catalogs in the Signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1, Introduction and Index.

Identification Table of Parts for Teletypewriter Set AN/PGC-1 (contd)

Fig. No.	Name of part and description	Function of part	Signal Corps stock No.
12	BAG CW-160/PGC-1: canvas, olive drab finish; water repellent; three compartments; canvas strap closing; approx 39 3/16" x 25 1/16" o/a.	Tool and general purpose bag.	6Z490-160
	BAG, cotton duck: olive drab; one pocket and seven loop holders.	Tool bag.	6Z481-10
	CABLE, special purpose: buna S insulated cond w/colored braid for identification; 3' 9" lg.	Interconnection of set components.	1B3018-2.28
	CABLE, special purpose: two #18 AWG stranded copper, 41 strands #34 AWG wire; buna S insulated; 30' lg.	Interconnections of set components.	1B3018-2.4
	CABLE, special purpose: two #18 AWG strands; 41 strands #34 AWG; buna S insulated.	Interconnection of set components.	1B3018-2.4
14	CABLE ASSEMBLY CX-1200/U: 3' 9" excluding terminations, #1965 terminals one end, one plug (PL-48) other end.	Interconnection of set components.	3E6000-1200.1
14	CABLE ASSEMBLY CX-1201/U: two 31965 terminals; two #18 AWG strands one end; 3' 9" excluding terminations.	Interconnection of set components.	3E6000-1201.1
14	CABLE ASSEMBLY, POWER, ELECTRICAL, CX-1202/U: type S, two #18 AWG strands; two #1965 terminals one end, plug (Hubbell) #9754 other end 6" lg.	To connect power supply.	3E6000-1202.1
14	CABLE ASSEMBLY, POWER, ELECTRICAL, CX-1203/U: plug (Hubbell) #H-1269 one end, plug (Belden) #9754 other end 30' 0" excluding terminations.	To connect power supply.	3E6000-1203.1
3, 12	CASE CY-552/PGC-1: sheet aluminum; 27" lg x 16" wd x 6" h o/a; strap handles on end; seven latches SC-D-20648.	For tools and running spare parts.	6F300-552
3, 13	CASE CY-553/PGC-1: 1/4" plywood clad with sheet aluminum; 29 11/16" lg x 19 1/4" wd x 9 5/8" h o/a; drop handles on ends; removable cover held by 8 tension latches.	To contain Case CY-552 during transportation.	6F300-553
3	CASE CY-694/PGC-1: plywood clad w/sheet aluminum, compartment for teletypewriter and tool bag, stand for paper roll; 23 3/16" lg x 20 1/4" wd x 14 1/8" h o/a.	To transport teletypewriter.	6F300-694
14	CONNECTOR, plug: two straight male contacts; 1.5" OD x 1 7/32" lg o/a.	Cable termination for CX-1202/U.	6Z1735
14	CONNECTOR, plug: straight; Belden H-1269.	Cable termination for CX-1203/U.	6Z3150-32
14	CONNECTOR, plug: two straight male contacts; 1 1/2" OD x 1 7/32" lg o/a.	Cable termination for CX-1203/U.	6Z1735
12	CONTAINER MX-693/PGC-1: rectangular sheet metal; two compartments; top sheet metal handle; 6 5/8" wd x 4 1/2" lg x 10" h o/a.	For mixing gasoline and oil for engine generator fuel.	6Z3196-693
3	ENGINE GENERATOR PU-181/PGC-1, for full details of this component of Teletypewriter Set AN/PGC-1, refer to the instruction book for this engine generator.		3H1927-181
4	FORK, tuning: equipped with shutters for viewing; fixed frequency 180 vibrations per second (90 cps); 9" lg x 7/8" wd x 1/4" thk o/a.	To measure teletypewriter motor speed.	4TK50996A

Identification Table of Parts for Teletypewriter Set AN/PGC-1 (contd)

Fig. No.	Name of part and description	Function of part	Signal Corps stock No.
4	GEAR SET: worm type; 64 tooth gear, 4 tooth worm, main shaft driving gears; concave face gear, straight face worm.	Used to obtain 404 opm.	4TK50351 4TK50353
15	KNIFE TL-29: electrician's folding type; closed 2¾" lg; two blades; 2½" sharp blade one end, screw driver blade other end.	For use in making electrical repairs.	6Q60229
	PAPER, recording: canary yellow, smooth finish 8½" wd x 340' lg.	To record messages.	4T1
15	PLIERS TL-13: straight nosed, side cutter 6" o/a.	For use in making repairs and adjustments.	6R4513
15	PLIERS TL-126: long chain nosed without cutters.	For use in making repairs and adjustments.	6R4626
	PLUG PL-48: telephone; 2 cond; single shank; red bakelite shell.	Cable termination for CX-1200/U.	2Z7228A-47R
	PLUG PL-47: telephone; 2 cond, single shank; tubular black bakelite shell.	Cable termination for CX-1201/U.	2Z7228A-47B
15	SCREW DRIVER: shock proof plastic handle; blade, 3" lg; 6" lg o/a.	For use in making repairs and adjustments.	6R5493
	TELETYPEWRITER TT-4/TG, for full details concerning this component, refer to the instruction book for this teletypewriter.		43TTT4
	TERMINAL, lug: spade type, tinned copper; for #18 AWG wire; w/2 clamping ears.	Cable termination for CX-1200/U.	3Z12073
	TERMINAL, lug: spade type, tinned copper; for #18 AWG wire; w/2 clamping ears.	Cable termination for CX-1201/U.	3Z12073
	TERMINAL, lug: spade type, tinned copper; for #18 AWG wire; w/2 clamping ears.	Cable termination for CX-1202/U.	3Z12073
15	TWEEZERS: steel chrome; flat point; 3" lg o/a.	For use in making repairs and adjustments.	6R46203
15	WRENCH SET: double open end type, six different sizes (no container); straight flats 15° and 75° offset with ¼", 5/16", 11/32", ⅜", 7/16", and ½" double open ends, respectively.	For use in making repairs and adjustments.	
15	WRENCH SET: six Allen type hexagonal wrenches; sizes across flats 1/16", (2) 5/64", 3/32", (2) ⅛", respectively. Long and short arms of different lengths.	For use in making repairs and adjustments.	6R55503-4
	WRENCH: hexagonal key type nickel plated drill rod, round T handle; .090 across flats 7" lg x 2¼" wd o/a.	For use in making repairs and adjustments.	6R57400-19
	WRENCH: hexagonal key type; CRS with tool steel tip parkerized, round T handle; 7" lg x 2¾" wd o/a.	For use in making repairs and adjustments.	6R57400-18
	WRENCH: hexagonal set screw; 3/16" across flats.	For use in making repairs and adjustments.	6R57400-21
	WRENCH: nickel plated drill rod, round T handle, hexagonal set screw type; .075" across flats, 7" lg x 2¼" wd o/a.	For use in making repairs and adjustments.	6R57400-20

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ERRATA FOR TM-11-2235 (AN/PGC-1)

Personnel having custody of this technical manual will make the following changes or make suitable notations beside each affected paragraph and figure in the technical manual to indicate the presence of this information.

NOTE: Wherever in text and illustrations in the manual the fuse F1 is designated as a 2-ampere, 250-volt fuse, change the designation to read: 1.6-ampere, 250-volt.

Page 3, Par. 3. In subparagraph c, line 9, change "3000" to read: 3600.

Page 10, Par. 6. In subparagraph b, change "1.25 hp at 3000 rpm" to read: 125 hp at 3600 rpm.

Page 12, Par. 8b. Change Stock No. "3Z2585.2" to read: 3Z2585; and "3Z2602.1" to read: 3Z2601F6.

Page 12, Par. 9. In the title, change "(Figs. 38 and 39)" to read: (figs. 36 and 37).

Page 24, Par. 25. In the chart, step 9, change "Paragraph 21" to read: Paragraph 24.

Page 32, Par. 42, line 5. Change "TT- /TG" to —TT-4A/TG—.

Page 33, Par. 45a. For the "Tweezers" add the Stock No. —6R46203—.

Page 36, Par. 51, item 4. Change "3Z2585.2" to —3Z2585—; change "3Z2602.1" to —3Z2601F6—.

Page 37, Par. 54, line 2 Change "(par. 47)" to —(par. 53)—.

Page 38, Par. 55 In Step No. 5, change "(par. 21)" to —(par. 24)—.

Page 42, Par. 63, line 2. Change "56" to —32—.

Page 48, Index "D". Under Description —Teletypewriter Set AN/PGC-1, change page "3" to —1—.

Page 48, Index "E". Engine GE-12-F, add page —3—.

Page 49, Index "E". "Engine Generator PU-181/PGC-1", make the changes necessary to read:

	Paragraph	Page
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Fuel and oil	3, 6, 18, 31	1, 9, 18, 25
Horsepower	3, 6	1, 9
Installation	17, 18	17, 18
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Operation	18, 25, 28	18, 24, 25
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Temperature limitations	6	9
Transportation	3, 4, 32, 62, 63	1, 3, 25, 42
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Page 50, Index "I". Under "Installation — Used equipment", change "17, 19" (both occurrences) to —16, 17—.

Page 53, Index "T". Under "Teletypewriter TT-4A/TG — Controls" add pages —31, 37—.

-4972 7-11-52 The NCR Co.

August 27, 1951

ERRATA FOR TM-11-2328 (AN/TSC-1)

Personnel having custody of this technical manual will make the following changes or make suitable notations beside each affected paragraph and figure in the technical manual to indicate the presence of this information.

NOTE: Wherever in text and illustrations to the manual the word TI is designated as a Subpoint, 220-volt line, change the designation to read 110-volt.

Page 5, Par. 3. In subparagraph g, line 2, change "2000" to read 2050.

Page 10, Par. 8. In subparagraph b, change "1.25 kg at 2000 rpm" to read 125 kg at 2100 rpm.

Page 12, Par. 8b. Change Stock No. "1223202" to read 1223205 and "1223201" to read 1223200 1A.

Page 12, Par. 9. In the title change "(Pars. 10 and 39)" to read (Par. 38 and 39)

Page 24, Par. 25. In the third sub 6. change "Paragraph 21" to read Paragraph 24.

Page 31, Par. 42, line 5. Change "117- /170" to "-117-A/TC-".

Page 33, Par. 45a. For the "Two-pin" add the Stock No. "1184203".

Page 34, Par. 51, item 4. Change "1223203" to "1223203-; change "327502" to "1230010-".

Page 52, Par. 94, line 2. Change "(par. 42)" to "(par. 35)".

Page 52, Par. 95 In Sup No. 3, change "(par. 21)" to "(par. 24)".

Page 62, Par. 83, line 2. Change "58" to "32".

Page 69, Index "D". Under Description "Teleprinter Set AN/TSC-1, change page "3" to "1".

Page 69, Index "E". Engine CE-1-E, add page "3".

Page 69, Index "G". "Engine Generator EE-181/TSC-1", make the change necessary to read:

	Paragraph	Page
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Page 69, Index "I". Under "Installation — Used equipment", change "17, 18" (both occurrences) to —18, 17—.

Page 69, Index "T". Under "Teleprinter Set AN/TSC-1 — Control" add page —31, 37—.