

TECHNICAL MANUAL

**OPERATOR'S AND ORGANIZATIONAL MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS)**

**TERMINAL, TELEGRAPH-TELEPHONE AN/TCC-29
(NSN 5805-00-902-3087)**

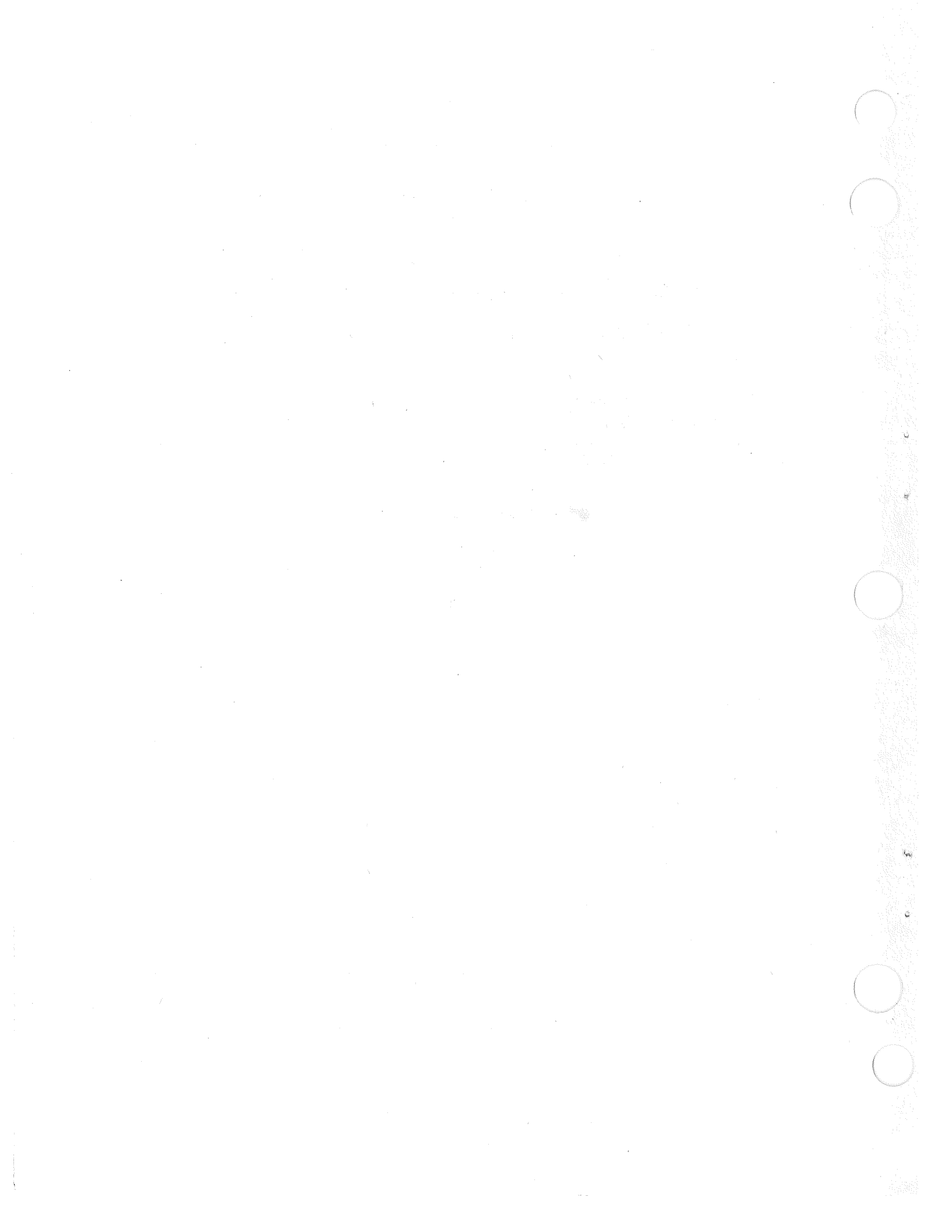
including

**TERMINAL, TELEGRAPH TH-22/TG
(NSN 5805-00-907-8300)**

and

**CONVERTER, TELEGRAPH-TELEPHONE SIGNAL CV-425/U
(NSN 5805-00-985-9088)**

This copy is a reprint which includes current pages from Changes 1 through 5. The title is changed by Change 5 to read as shown above.



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**OPERATOR'S AND ORGANIZATIONAL MAINTENANCE MANUAL
INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST**

**TERMINAL, TELEGRAPH-TELEPHONE AN/TCC-29
(INCLUDING TERMINAL, TELEGRAPH TH-22/TC
AND CONVERTER, TELEGRAPH-TELEPHONE SIGNAL CV-425/U)**

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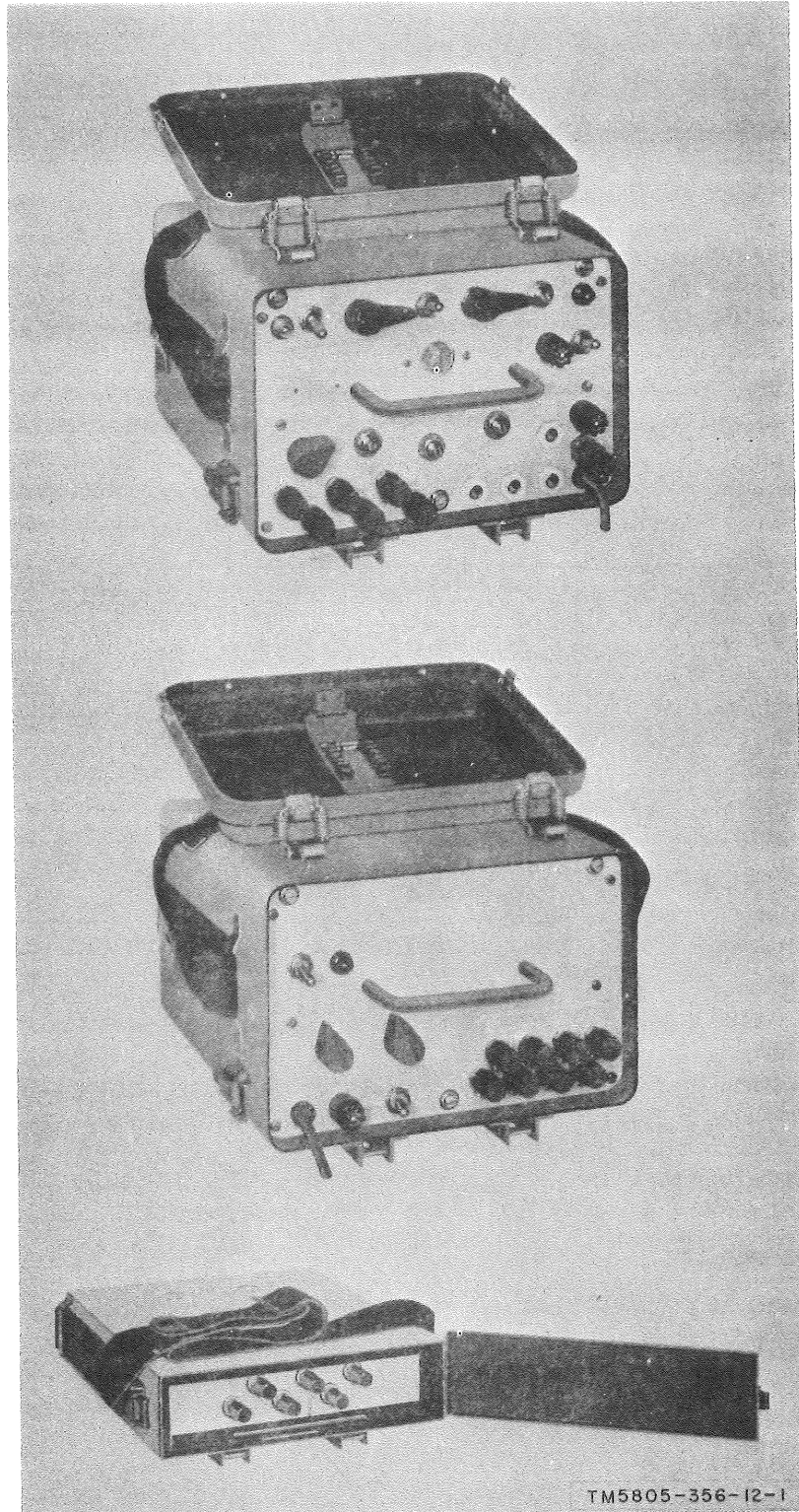


Figure 1-1. Terminal, Telegraph-Telephone AN/TCC-29.

CHAPTER 1 INTRODUCTION

Section I. GENERAL

1-1. Scope

a. This manual describes Terminal, Telegraph-Telephone AN/TCC-29 (fig. 1-1), running spares (fig. 1-2), and covers the installation, operation, and operator's organizational maintenance of the equipment. It includes instructions for operation under usual and unusual conditions, cleaning and inspection of the equipment, and replacement of parts available to organizational maintenance personnel.

b. The official nomenclature for the equipment shown in figure 1-1 is Terminal, Telegraph-Telephone AN/TCC-29, hereafter abbreviated as AN/TCC-29. The AN/TCC-29 comprises Terminal, Telegraph TH-22/TG; Converter, Telegraph Telephone Signal (CV-425/U; and Filter Assembly, Electrical F-316/U. Hereafter, these are abbreviated as TH-22/TG, CV-425/U, and F-316/U, respectively.

c. The maintenance allocation chart is contained in appendix III.

d. An organizational repair parts list is contained in appendix IV.

1-2. Indexes of Publications

a. *DA Pam 310-4*. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. *DA Pam 310-7*. Refer to DA Pam 310-7 to deter-

mine whether there are modification work orders (MWO's) pertaining to the equipment.

1-3. Forms and Records

a. *Reports of Maintenance and Unsatisfactory Equipment*. Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

b. *Report of Packaging and Handling Deficiencies*. Fill out and forward DD Form 6 (Report of Packaging and Handling Deficiencies) as prescribed in AR 700-58 (Army)/NAVSUP PUB 378 (Navy)/AFR 71-4 (Air Force)/and MCO P4030.29 (Marine Corps).

c. *Discrepancy in Shipment Report (DISREP) (SF 361)*. Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38 (Army)/NAVSUP PUB 459 (Navy)/AFM 75-34 (Air Force)/and MCO P4610.19 (Marine Corps).

1-3.1. Reporting of Equipment

Publication Improvements

The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commander, US Army Electronics Command, ATTN: AMSEL-MA-C, Fort Monmouth, NJ 07703.

Section II. DESCRIPTION AND DATA

1-4. Purpose and Use

a. *Purpose*. The AN/TCC-29 (fig. 1-1) permits simultaneous transmission of telegraph pulses and speech, in the vf (voice frequency) range. The telegraph signals utilize part of the frequency band used by the telephone channel, while permitting the channel to carry speech.

b. *Use*. The AN/TCC-29 may be used in point-to-point systems, network systems, switched systems, and remote control radio systems.

(1) In a point-to-point system two fixed teletypewriter stations may communicate with one another, using AN/TCC-29.

(2) In a network system, any of three or more teletypewriter stations may communicate with any other station in the network, by using a prearranged code call.

(3) In a switched system, where communication is between teletypewriter stations connected through a switchboard, the station operator contacts the switchboard operator who then connects the station to another station.

(4) In a remote control radio system, where radio and wire facilities are integrated, control devices automatically connect a radio transmitter upon receipt of the proper calling signal, and automatically disconnect the transmitter when the calling signal is removed. This type of control is normally used with push-to-talk radio; the term *push-to-talk radio* describes a radio which transmits and receives on the same frequency, so transmission and reception cannot be carried on simultaneously. Normally, the radio transmitter is disabled and the receiver is

functioning (standby condition). To transmit, a direct current (dc) closure must be provided to turn on the transmitter and disable the receiver. This closure is supplied by:

- (a) A remote control unit, when operating over a two-wire circuit, and
- (b) The TH-22/TG, when operating over a four wire circuit.

a. TH-22/TG.

Input power requirements:

Alternating current (ac)	115/230 volts \pm 10%; 50 to 60 cycles per second (cps) \pm 3 cps. Power consumption, 20 watts maximum.
Direct current (dc)	26 volts \pm 4 volt, battery. Power consumption, 24 watts maximum.
Local send and receive loops (power)	20 milliamperes (ma) dc \pm 2 ma, 130 volts (\pm 10 volts). Provisions for use of external loop supply in receive teletypewriter using EXT BAT jack.
External loop resistance	0 to 1,000 ohms (including resistance of loop equipment).
Operational modes:	
Mode 1	60, 75, and 100 words per minute: Space frequency, 1,232.5 cps (\pm 3 cps). Mark frequency, 1,317.5 cps (\pm 3 cps).
Mode 2	200 words per minute: Space frequency, 1,232.5 cps (\pm 3 cps). Mark frequency, 1,317.5 cps (\pm 3 cps).
Type of modulation	Frequency shift
Bandwidth	1,200 cps to 1,400 cps (approx)
Line requirements	Two-wire or four-wire
Line impedance	Terminating impedance required at binding post, 600 ohms.
Distortion of transmitted signal (over-all peak)	Less than 5%
Transmitter output level	0 millidecibels (dbm) \pm 2 db adjustable.
Mark and Space power level differences	1 decibel (db), maximum
Method of quieting local transmitter during periods of nontransmission	
Carrier-suppression time delay	Carrier suppression 2 to 3 seconds
Carrier-power level during carrier suppression	More negative than -48 dbm \pm 3 dbm.
Method of quieting a remote transmitting unit from a local transmitter	
Break-in-circuit frequency	Break-in circuit 1,180 cps \pm 1 cps
Break-in circuit transmitting signal power level	0 dbm to + 10 dbm (variable)
Break-in receiver circuit disable (method of restoring circuit deactivated by break-in signal)	RESET switch
Break-in receiver circuit sensitivity to break-in signal	Operates with break-in signal down to -30 dbm
Break-in receiver circuit minimum effective break-in signal duration	0.25 second
Home copy	Can be provided on two-wire or four-wire operation or, can be disabled on four-wire full-duplex basis.
Signaling methods:	
VF signaling transmitter output	Produces 1,232.5 cps \pm 3 cps output level at 0 dbm (\pm 2 dbm).
VF signaling receiver input	Accepts 1,232.5 cps tone from the line at signal power input from 0 dbm to -48 dbm (\pm 3 dbm), and produces an audible alarm.
20-cps alarm transmitter output	Produces 20 cps, 180 volt peak-to-peak signal.
20-cps alarm receiver input	Produces an audible signal upon reception of a 45-volt peak-to-peak 20 cps squarewave.
DC closure signaling:	
For common battery circuit (two-wire line)	Through holding coil
For push-to-talk radio link (four-wire line)	Between front-panel terminals
Transmitter signal transition delay	5 to 8 milliseconds
Receiver range levels	0 dbm to -25 dbm (\pm 3 dbm) or 9 dbm to -48 dbm (\pm 3 dbm), (internal strapping option).
Receiver indication of insufficient input signal level	Threshold circuit: When the input signal reaches a level of -50 dbm (\pm 5 dbm), the receiver is held in a steady Mark condition and the THRESHOLD indicator lamp lights.
Line connections	Two-wire teletypewriter communication with local telephone operation.

c. System Application. Details on system application are presented in paragraphs 1-10 through 1-14.

1-5. Technical Characteristics

Technical characteristics of the three units constituting the AN/TCC-29 are detailed below.

	Four-wire teletypewriter communication with local telephone operation.
Ring alarm	Panel-mounted loudspeaker.
Operating temperature range	-40° to 131° F
<i>b. CV-425/U.</i>	
Input power requirement	115/230 vac + 10%, 50 to 60 cps ± 3 cps
Power consumption	25 watts maximum
Type of modulation	Frequency shift
Telegraph signaling frequency	1,232.5 cps
Telephone signaling frequency	1,600 cps
Oscillator stability for telegraph and telephone signaling frequencies	± 10 cps
Telegraph and telephone output power signaling level	0 dbm (± 2 db)
Low frequency signal input	20 cps
20-cps loop circuit types	Two-wire and four-wire
20-cps ringing voltage	180 volts peak-to-peak
20-cps circuit input impedance	1,500 ohms
20-cps ringer circuit minimum-voltage input requirement	50 volts peak-to-peak at 20 cps with two-wire or four-wire operation.
Receiver sensitivity on line side	Low, -30 dbm; high—48 dbm
Sensitivity on loop side	25 volts peak
Frequency limits	Telegraph signaling, 1,195 to 1,260 cps Telephone signaling, 1,570 to 1,630 cps
Maximum distortion	1%
Output line impedance	600 ohms ± 10% when transmitting
Input line impedance	8,000 ohms ± 10% when receiving
Prevention of equipment operation on spurious frequencies	Time-delay guard circuit
<i>c. F-316/U.</i>	
Input operating power requirement	None
Input signal power requirement	Up to + 5 dbm to any of the three terminal pairs, without signal degradation or distortion.
Types of filtering	Band-pass and band-stop
Band-pass Mark and Space power-level differences	1 db maximum
Band-pass midfrequency	1,275 cps
Band-pass differential delay	1.5 milliseconds
Band-pass insertion loss from telegraph side to line side	4 db maximum
Band-pass insertion loss from telegraph side to line side in frequency band between 1,180 cps and 1,475 cps	6 db maximum
Band-pass insertion loss from telegraph side to line side below 1,000 cps and within 1,600- to 3,500-cps band	80 db maximum
Band-stop insertion loss from telephone side to line side within 0- to 1000-cps band and 1,600- to 3,500 cps band	4 db maximum
Band-stop insertion loss from telephone side to line side within 1180 cps and 1475 cps	80 db or greater
Supervisory signal	20 cps at 100 ma
Impedance at line telephone and telegraph terminals	600 ohms
Operating temperature	-40°F. to -80°F.
Non-operating temperature	+ 160°F. to -80°F.
Relative humidity	Up to 97% for 20 hours; up to 100% with condensation for 4 hours.
Elevation	Operating: Up to 10,000 feet above sea level; nonoperating: Up to 25,000 feet above sea level.
Orientation	Operating: Any position up to 20° from normal operating position.

1-6. Items Comprising an Operable Equipment

FSN	Qty	Nomenclature	FSN	QTY	Nomenclature.
		NOTE	5805-985-9088	1	Converter, Telegraph-Telephone Signal CV-425/U; Ring down signal; switchboard side; ac receive and transmitted, 20 cps signal received from switchboard, 20 cps signal transmitted to switchboard; line side 1232.5 to 1600 cps signal transmitted to line; 1232.5 to 1600 cps signal
		The part number is followed by the applicable five digit Federal supply code for manufacturers, distributor, or Government agency; etc., which is identified in SB 708-42.			

FSN	QTY	Nomenclature
		received from line; communication circuit handled; 117 vac, 600 cps single phase; or 26 vdc.
5915-908-6289	1	Filter Assembly, Electrical F-316/U: Insertion loss between 0 and 3500 cps is 80 db or greater; 600 ohms balanced impedance, hermetically sealed.
5805-985-9090	1	Terminal, Telegraph TH-22/TG: Multiplexing data; freq-div type; 1 channel, 1 xmt and 1 rec channel, 1175 to 1375 cps freq range, 200 words per min operational speed; 2-wire and 4-wire line termination; cpr pwr requirements 117 v, 60 cyc, single ph, ac; 26 vdc; 7¼ in. X 10½ in. X 10¼ in. oa.

1-6.1. Running Spares

Running spares of the AN/TCC-29 are shown in figure 1-2.

1-7. Description of AN/TCC-29

The AN/TCC-29 (fig. 1-1) consists of the three self-contained units described below. In normal applications the front panels of these units can be connected in various ways to achieve a variety of system con-

figurations (para 1-4).

a. Description of TH-22/TG.

(1) The TH-22/TG (fig. 1-3) is a lightweight, transistorized, frequency-shift-keying (fsk) device which shifts input voice frequencies over two-wire lines ((one-way reversible (or half duplex)) or four-wire lines ((two-way simultaneous (full duplex))). It provides means for breaking in on a telegraph transmission from the receiving end, and for transmitting telegraph data and voice frequency simultaneously over a two-wire vf circuit.

(2) The TH-22/TG can be operated from its transit case (fig. 1-3) in a permanent location or in a vehicle, or it can be removed from the case, if required, and mounted in a rack. A mating connector (fig. 1-3) is available for use when a 26-volt dc input power source is required; the permanently wired ac power cable, to the unit, is normally wrapped around a front panel handle during transit. All circuitry is contained within a front plate, two side plates, and a hinged rear panel (fig. 1-4) which pivots downward to allow access to three printed circuit (PC) boards. Inter-

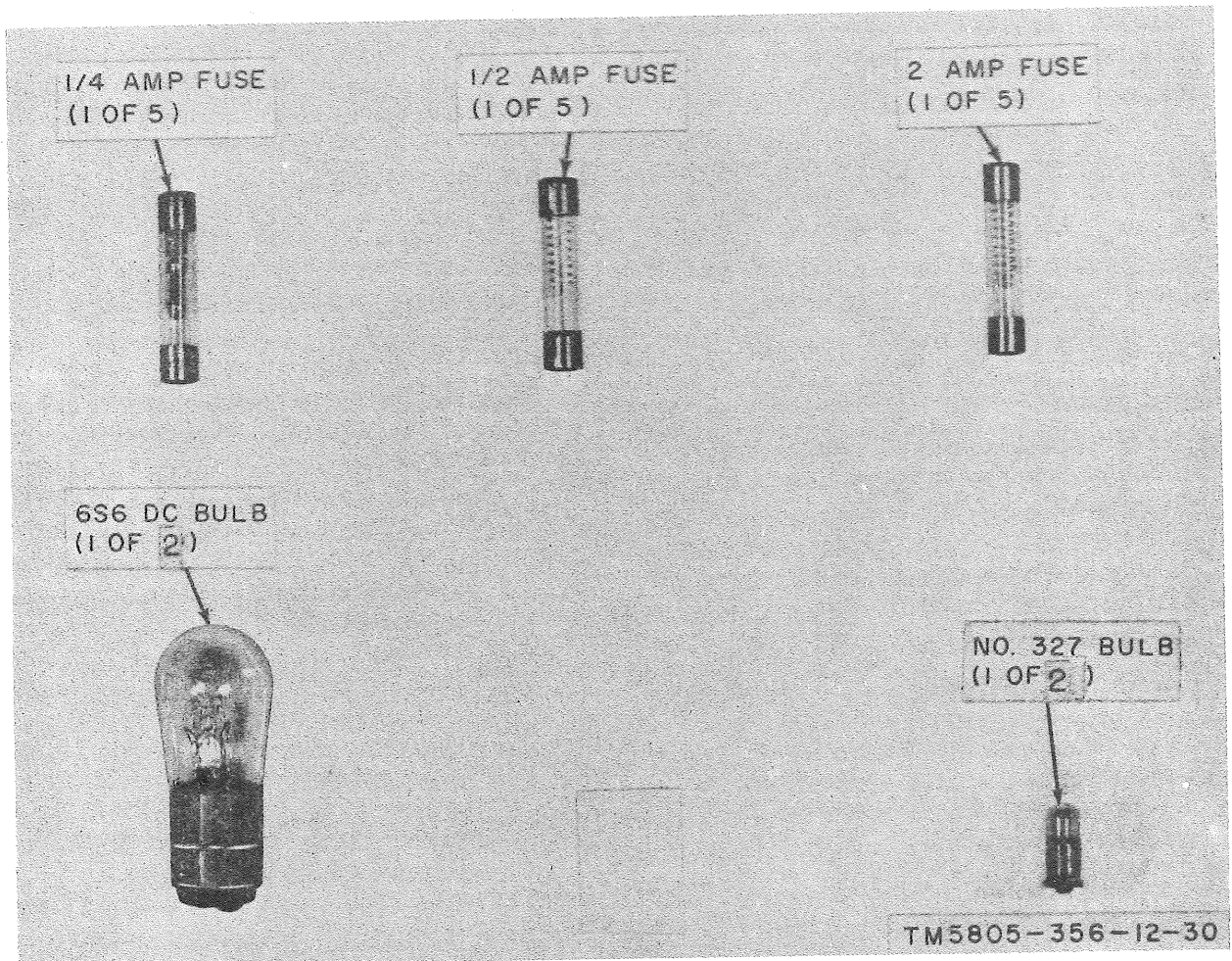


Figure 1-2. Terminal, Telegraph-Telephone AN/TCC-29, running spares.

nally, three connectors (fig. 1-5) accept the three plug-in PC boards, 1A1, 1A2 (fig. 1-4) and 1A3 (fig. 1-5). When the hinged rear panel is pivoted downward, the PC boards can be removed and the center card-guide (fig. 1-5) with attached connectors can be lifted upward. The PC boards can then be reinserted in the connectors, providing easy access to PC board test points as well as to chassis wiring below the connector (fig. 1-5).

- (3) The PC boards are keyed so that no board can mistakenly be inserted in

an incorrect connector-bracket slot. Each PC board contains an identifying bracket-slot number on an extractor handle (fig. 1-4 and 1-5). During normal operation, the three PC boards are positioned horizontally, and are held in place by the hinged rear panel.

- (4) Access to a ballast indicator (1DS3) as well as a screwdriver adjust control (internal battery loop adjust (1R12)) can be obtained from the bottom of the TH-22/TG (fig. 1-6).

b. Description of CV-425/U.

- (1) A lightweight fsk device, the CV-

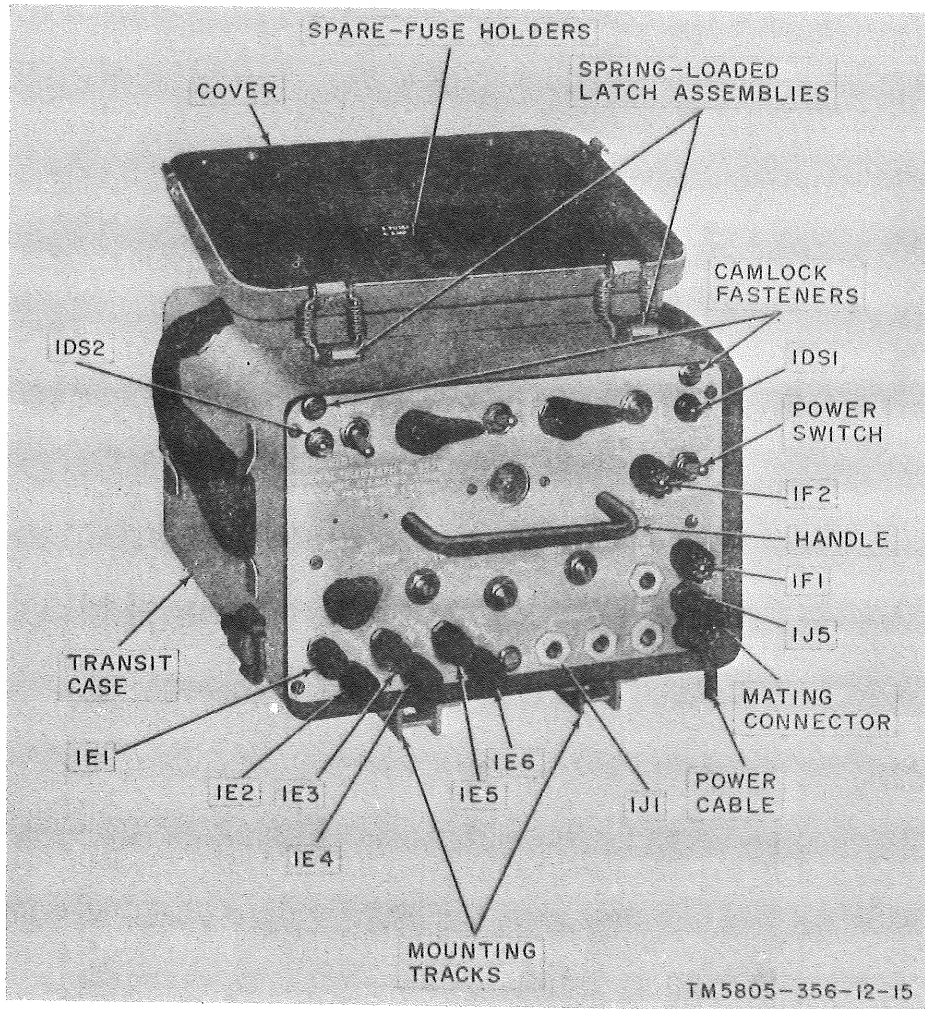


Figure 1-3. Terminal, Telegraph TH-22/TG, front view of panel.

425/U (fig. 1-7) converts incoming 20-cps ringing signals to 1232.5-cps signals for telegraph signaling, and 20-cps ringing signals to 1600-cps signals for telephone signaling over circuits that will not pass 20-cps low frequency ringing signals. It also converts incoming 1232.5-cps and 1600-cps signals to 20-cps signals.

- (2) The CV-425/U can be operated from its transit case (fig. 1-7) in a permanent location or in a vehicle, or it can be removed from the case, if required, and mounted in a rack. The

permanently wired ac power cable is normally wrapped around a front panel handle during transit, with the transit case cover attached. All circuitry is contained within a front plate, two side plates, and a hinged rear panel (fig. 1-8) which pivots downward for access to the two PC boards. Internally, two connectors (fig. 1-9) accept the two plug-in PC boards, 3A1 and 3A2 (fig. 1-8). When the hinged rear panel is pivoted downward, the printed circuit cards can be removed, and the center card-guide

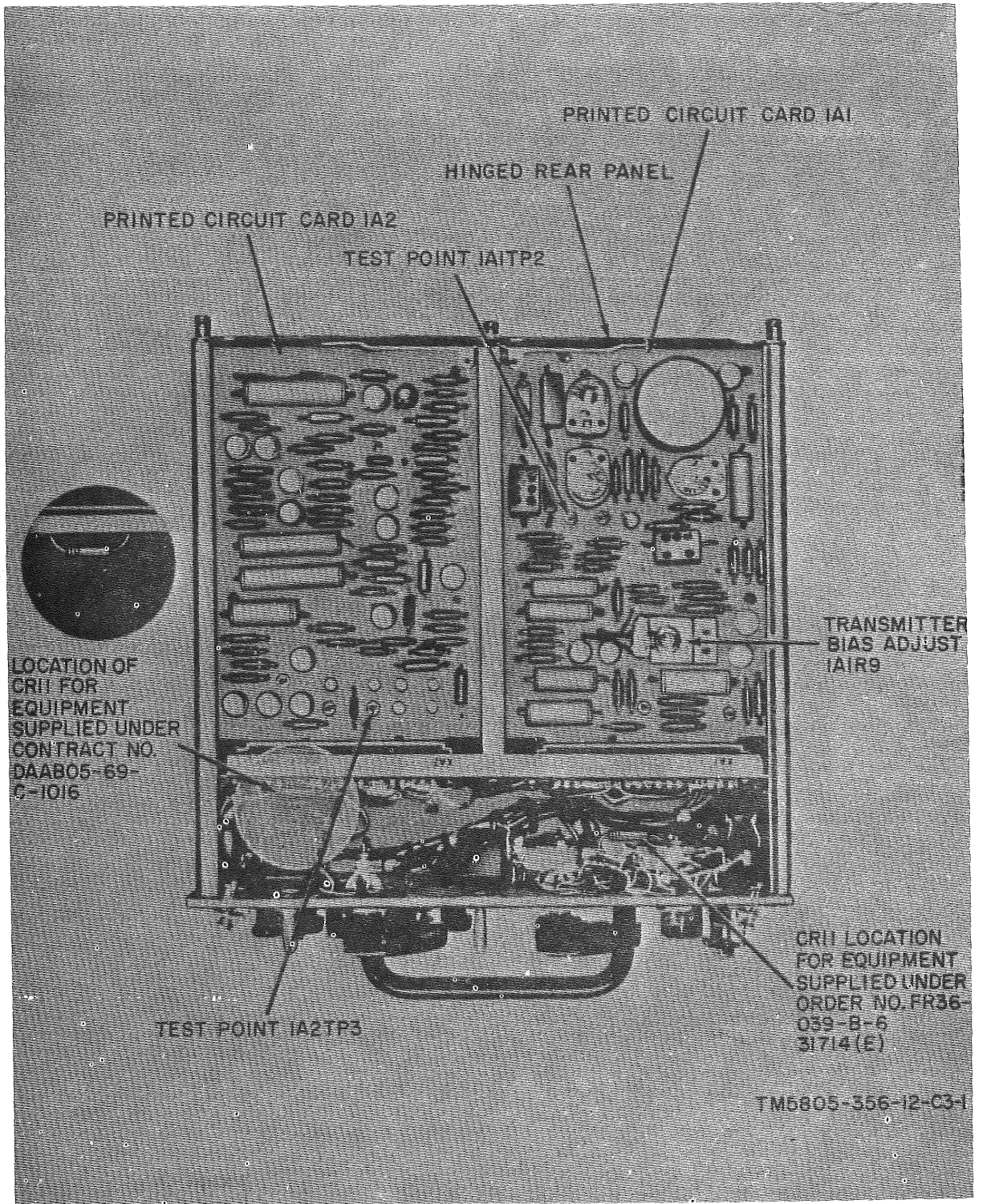


Figure 1-4. Terminal, Telegraph TH-22/TG, top view.

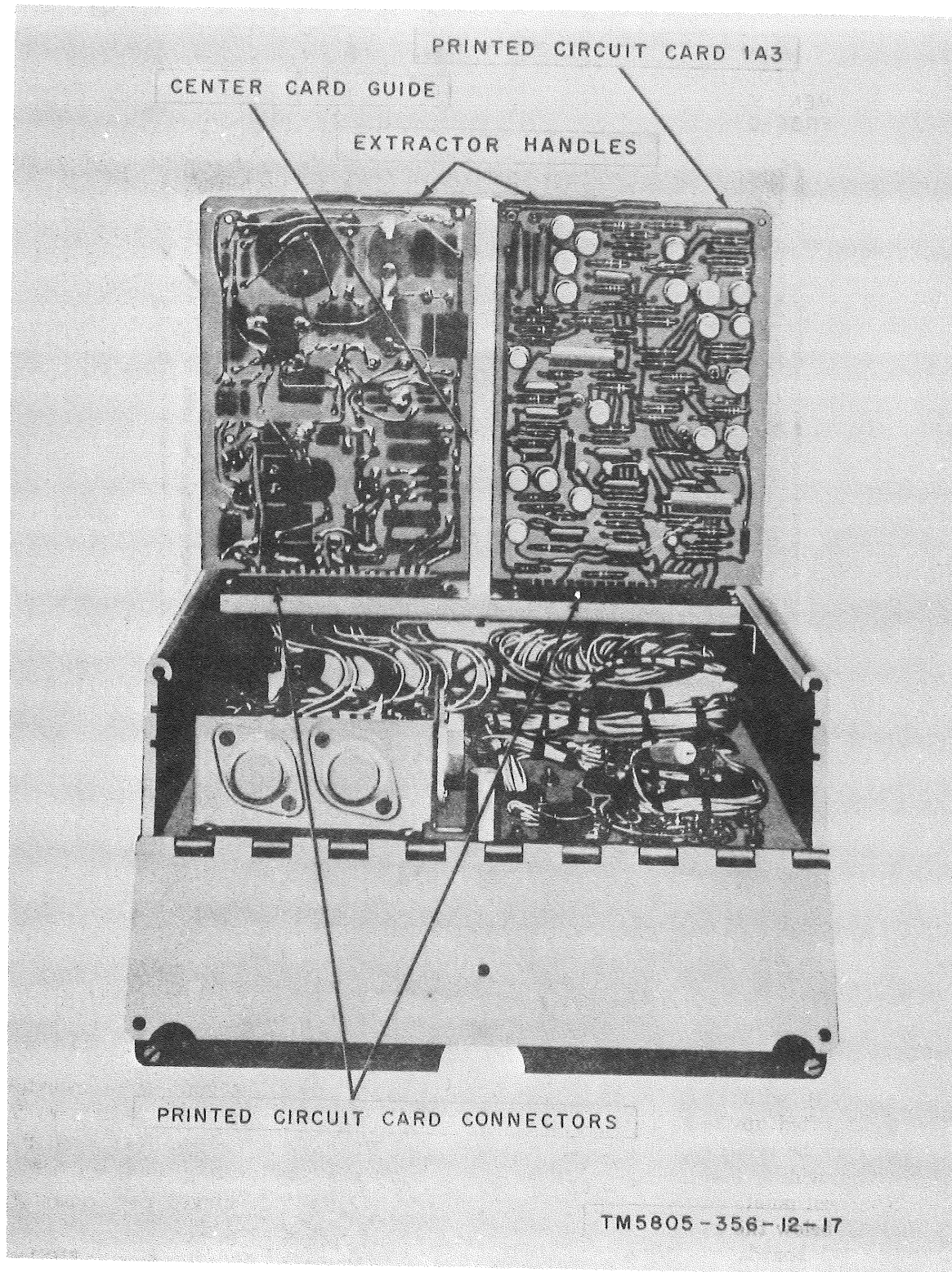


Figure 1-5. Terminal, Telegraph TH-22/TG, PC cards in test position.

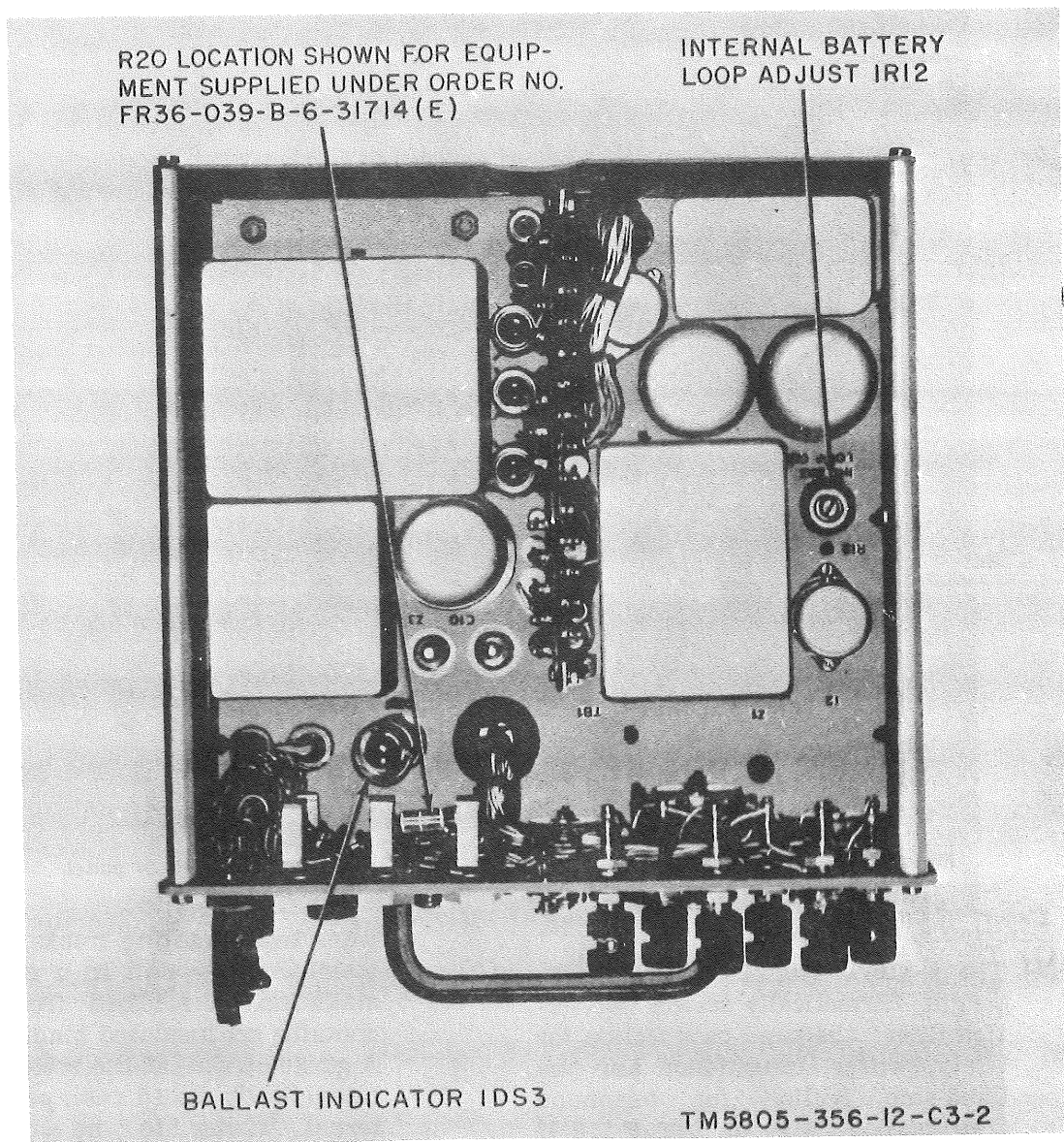


Figure 1-6. Terminal, Telegraph TH-22/TG, bottom view.

- (fig. 1-9) with attached connectors can be lifted upward. The PC boards can then be reinserted in the connectors, providing easy access to the PC board test points as well as to chassis wiring below the connector (fig. 1-9).
- (3) The PC boards are keyed, so that neither can mistakenly be inserted in an incorrect connector-bracket slot. Each PC board contains an identify-

- ing bracket slot number on an extractor handle (fig. 1-9). During normal operation, the two boards are positioned horizontally, and are held in place by the hinged rear panel (fig. 1-8 or 1-8-1).
- (4) Access to a ballast indicator 3DS1 can be obtained from the bottom of the unit (fig. 1-10).

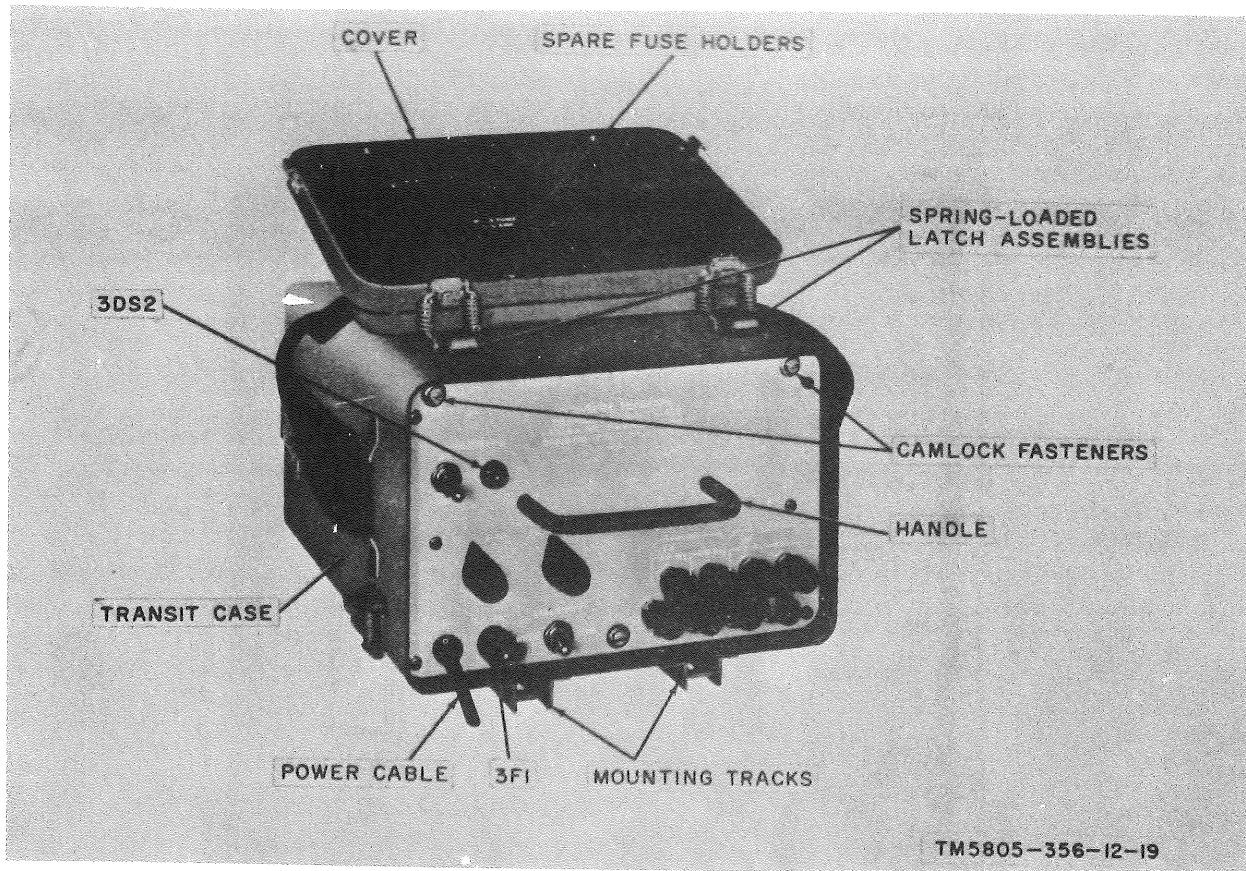


Figure 1-7. Converter, Telegraph-Telephone Signal CV-425/U, front view of panel.

c. Description of F-136/U.

- (1) The F-316/U (fig. 1-11) is a light-weight, hermetically sealed, two-section filter: the band-pass section for teletypewriter transmission and the band-stop section for telephone transmission. Use of the F-316/U permits simultaneous teletypewriter and telephone service; the band-pass and band-stop sections of the F-316/U separate the teletypewriter and telephone signals.
- (2) The hermetically sealed unit is enclosed in a steel, waterproof case (fig. 1-11); a carrying strap is connected to each side of the case for ease in transportation. The band filter is always operated within its case and requires no ac input power. the bottom of the transit case con-

tains two mounting tracks, used for stabilizing the unit in a mobile installation. A recessed front panel contains six insulated binding posts. A gasketed slot, at the bottom of the hermetically sealed case, permits external wiring to be connected through the gasket and permit operation with the transit case cover attached.

1-8. Description of Minor Components

a. TH-22/TG.

- (1) *Transit case.* The TH-22/TG transit case (fig. 1-3) is wraparound type, drawn-aluminum structure with a carrying strap attached on each side. An internal set of guide rails on each side of the case permits sliding the

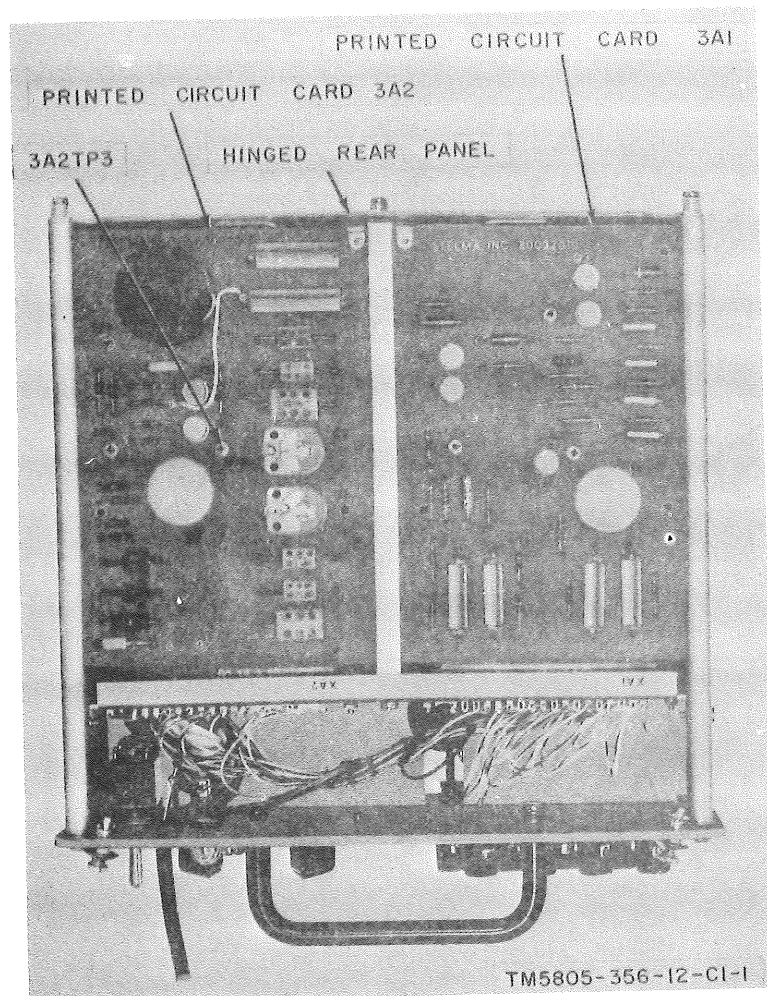


Figure 1-8. Converter, Telegraph-Telephone Signal CV-425/U, top view.

chassis into and out of the case. At the front of the case, three 1/4-turn, captive camlock fasteners secure the chassis to the transit case. At the bottom of the case, which is completely waterproof with its transit case cover attached, are two external mounting tracks used to stabilize the unit in a mobile installation.

- (2) *Transit case cover.* The transit case cover (fig. 1-3) is attached to the case by four spring-loaded latch assemblies. The upper two keep the cover's top edge connected to the case so that, with the cover open, the cover rests on the case top, remaining permanently fastened to the

case. Five spare fuse holders are contained within the transit case cover.

- (3) *Power cable and connectors.* A 6-foot, three-wire power cable (fig. 1-3), permanently wired to the front of the unit, terminates in a three-terminal male plug.

b. *CV-425/U.* The CV-425/U transit case (fig. 1-7), transit case cover, and power cable and connectors (fig. 1-7), are like those described in *a* above.

c. *F-316/U.* The unit's transit case cover is attached to the case by four spring-loaded latch assemblies (fig. 1-11). With the cover closed, the unit is waterproof.

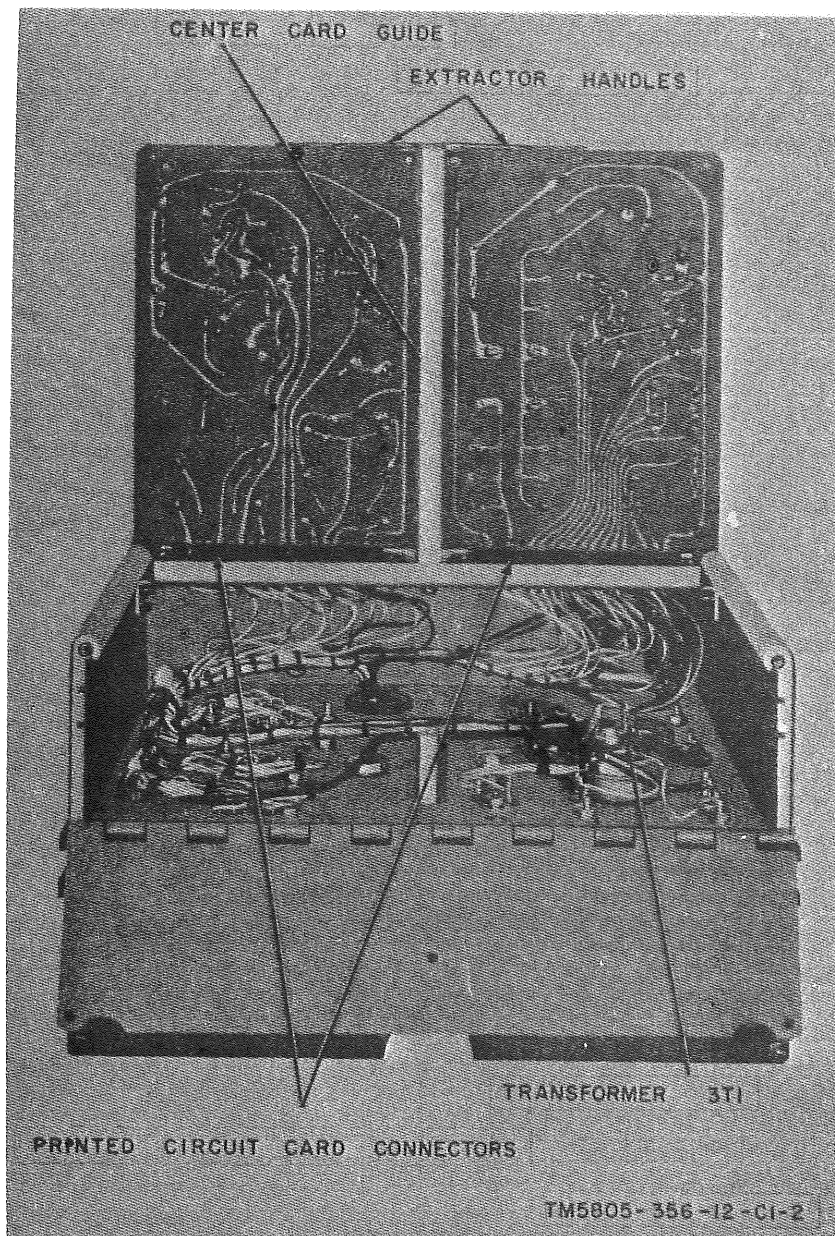


Figure 1-9. Converter, Telegraph-Telephone Signal CV-425/U, PC board in test position.

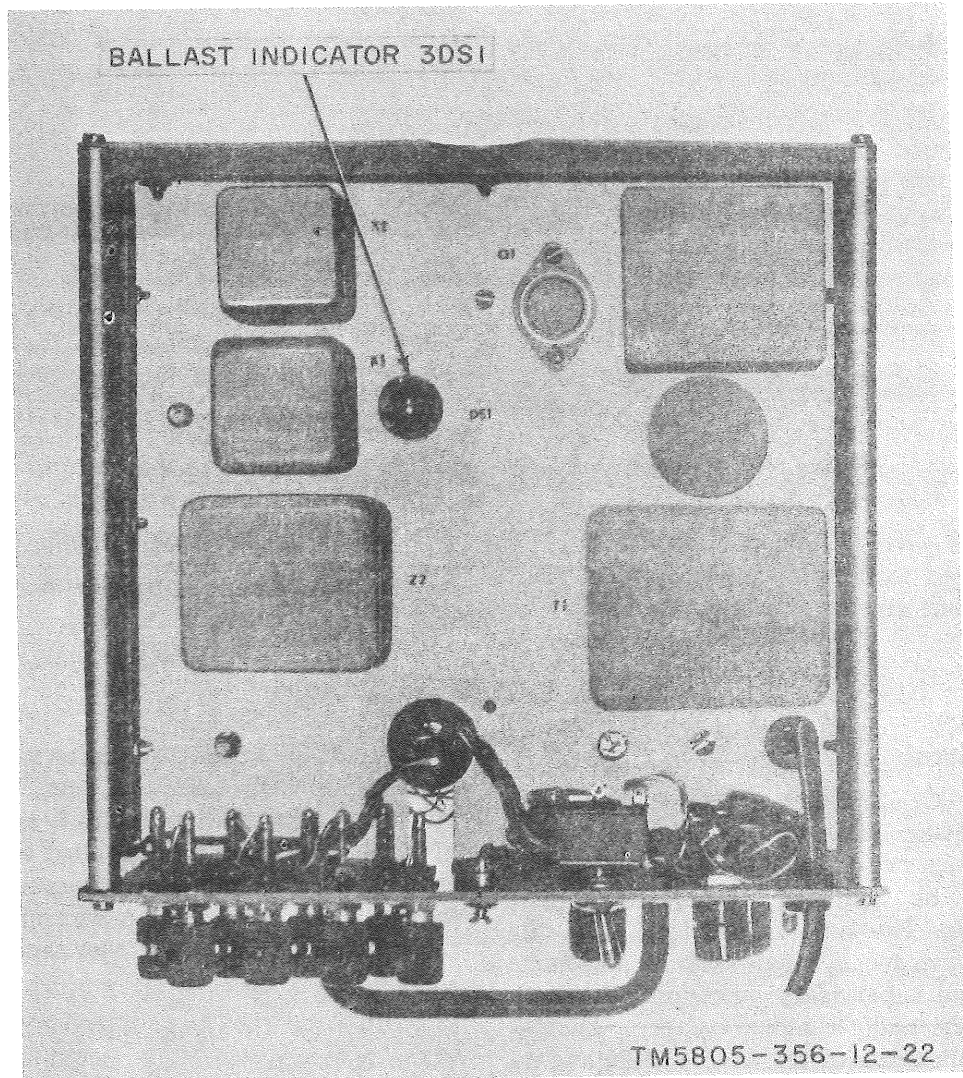


Figure 1-10. Converter, Telegraph-Telephone Signal CV-425/U, bottom view.

1-9. Additional Equipment Required

The following additional equipment is *not* furnished as part of the AN/TCC-29 but would normally be required for its operation.

a. Teletypewriter. One or more teletype-writers, with or without loop supplies, are normally used with the TH-22/TG.

b. Line Matching Device. A hybrid circuit network is normally used for matching purposes in a full-duplex operation.

c. Telephone. Telephone Set TA-312/PT, or a similar set, is normally used for vocal communication.

d. Transmitter and Receiver. A transmitting and receiving device, with a remote control unit, is required when using the AN/TCC-29 with a push-to-talk radio circuit and remote control unit.

e. Telephone Field Wire. Standard telephone field wire is required for all external connections to the AN/TCC-29.

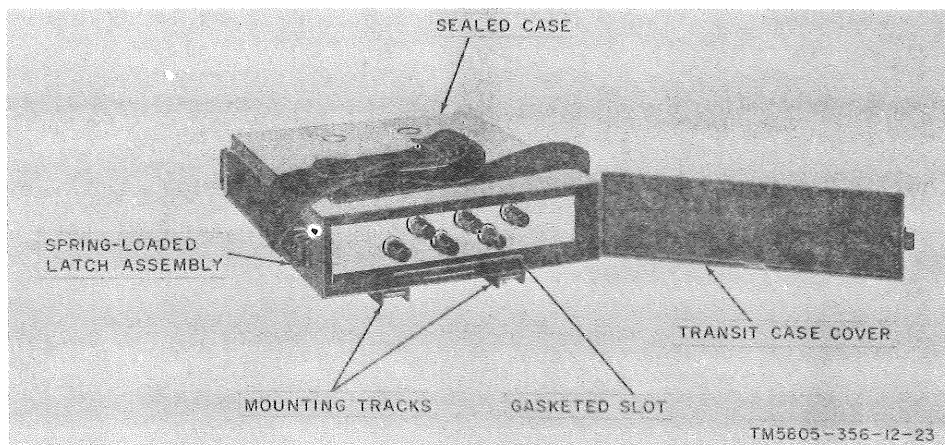


Figure 1-11. Filter Assembly, Electrical F-316/U, front view of panel.

f. *Hybrid Circuit Network TA-31/A.* This device is used to permit connection of a four-wire telephone circuit to a telephone.

g. *Mounting MT-791/U.* This device is required for vehicular mounting of the AN/TCC-29.

Section III. SYSTEM APPLICATION

1-10. General

The AN/TCC-29 which utilizes existing telephone facilities, does not require a special dc teletypewriter switchboard, since telephone loops may be switched through telephone switchboards. The unit is provided with the components needed to retain normal telephone signaling and supervisory procedures for both local-battery and common-battery switchboards. Applications of the AN/TCC-29 and its components are discussed in paragraphs 1-11 through 1-14.

1-11. Telegraph-Only Service

Telegraph-only service is designed solely for the teletypewriter communication; speech transmission is not involved.

a. *Use on Local Battery Switchboard.* Figure 1-12 illustrates a teletypewriter station connected over a loop circuit through a local-battery switchboard. The switchboard operator is provided with a monitoring TH-22/TG and a teletypewriter. The teletypewriter station operator may initiate a call by depressing the RING switch of his TH-22/TG, thereby initiating a "drop" at the local-battery switchboard;

the switchboard operator uses his teletypewriter to acknowledge the call, and then uses his TH-22/TG to ring the called teletypewriter station. At the end of the communications, the calling teletypewriter station operator rings the switchboard operator who then disconnects the circuit.

b. *Use on Common Battery Switchboard.* When a common-battery switchboard is used in place of a local-battery switchboard (a above), the following procedure is used:

- (1) The TH-22/TG 4W-2W-TEL switch is used to call the switchboard operator. When the 4W-2W-TEL switch is in the TEL position, an open circuit to dc is presented to the line (this position corresponds to the common-battery telephone receiver being on its hookswitch).
- (2) To initiate a call, the teletypewriter station operator rotates the 4W-2W-TEL switch to the 2W position (corresponding to removing the telephone receiver from its hookswitch), so that

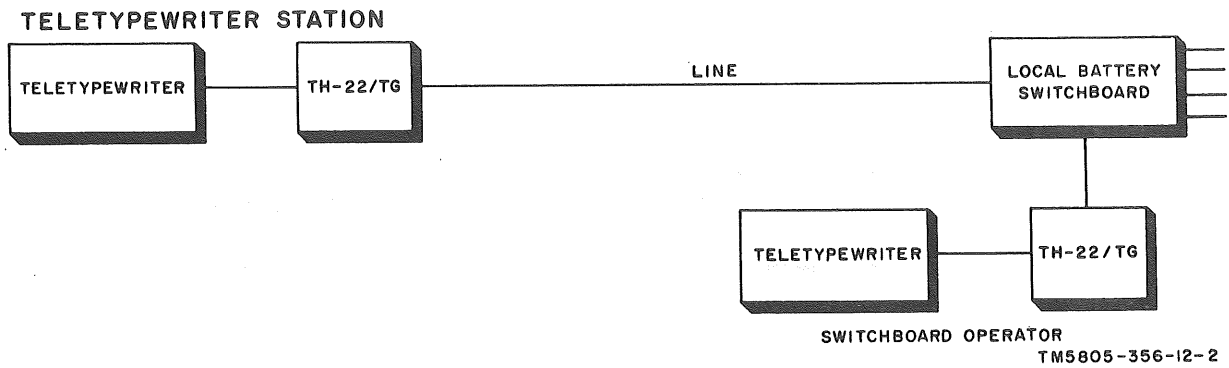


Figure 1-12. Local battery switchboard, telegraph-only service.

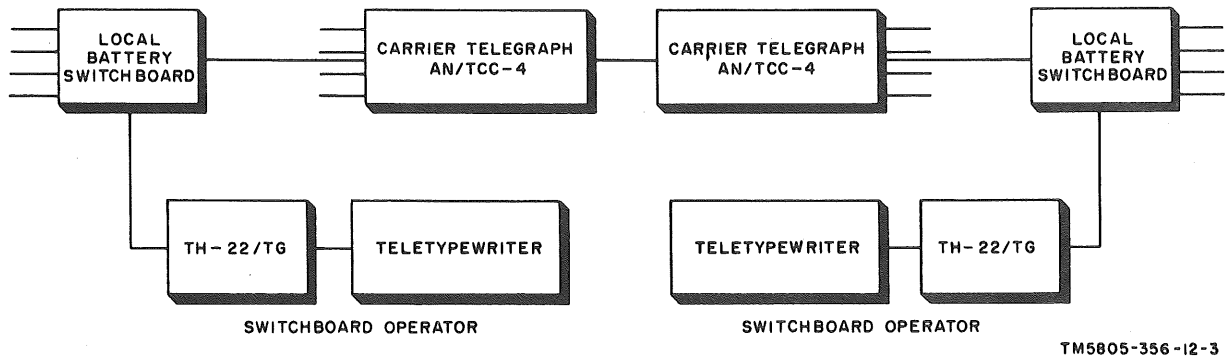


Figure 1-13. Carrier telegraph system, telegraph-only service.

a holding coil in the TH-22/TG is placed across the two-wire line; a dc closure is therefore provided at the switchboard, and the switchboard supervisory lamp lights. The switchboard operator uses an associated teletypewriter to acknowledge the call, and then uses the TH-22/TG at the switchboard, to ring the called teletypewriter station.

- (3) At the termination of the call, each of the two teletypewriter station operators returns his associated 4W-2W-TEL switch to the TEL position, removing the holding coils from the line and causing the switchboard supervisory lamp to go out. The switchboard operator then disconnects the circuit.

c. *Use on Carrier Telegraph System.* Figure 1-13 illustrates telegraph service over a trunk, where the trunk is provided by one of the

channels of a carrier system; the AN/TCC-4 loop circuits are connected to the TH-22/TG.

d. *Use On Trunks not Passing 20-Cycle Ringing.* Figure 1-14 illustrates an arrangement in which the trunk facility between the two-local (or common-) battery switchboards does not pass the 20-cps signal; the CV-425/U is used to obtain a ringing signal, and changes the 20-cps signal to 1,232.5 cps.

e. *Use With Push-to-Talk Radio.*

- (1) *Two-wire basis.* Figure 1-15 illustrates an arrangement with point-to-point, push-to-talk radio controlled by a remote control unit on a two-wire basis.

(a) *Transmission procedure using a remote control unit.* The teletypewriter station operator operates the TH-22/TG SEND-REC-NORM switch to the SEND position, thereby placing the holding coil of the

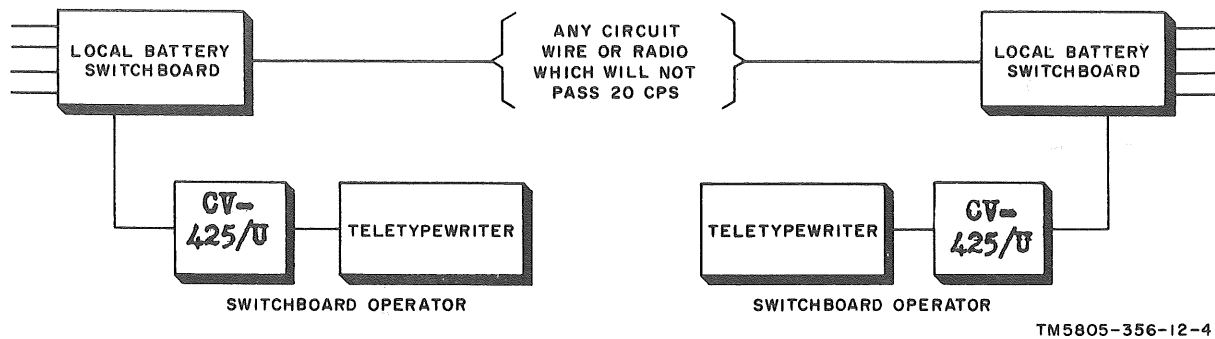


Figure 1-14. Trunk facility using converter, Telegraph-Telephone Signal CV-425/U, telegraph-only service.

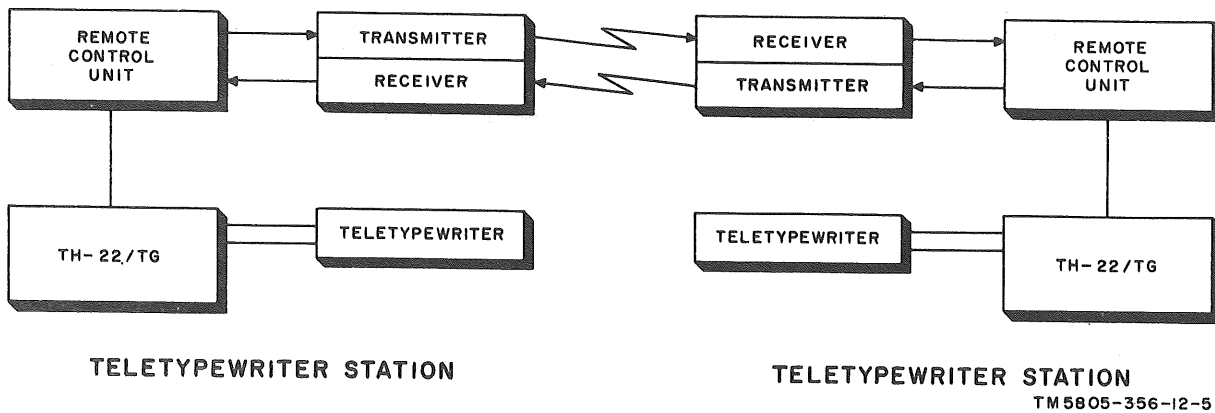


Figure 1-15. Push-to-talk radio circuit on two-wire basis using remote control unit, telegraph-service only.

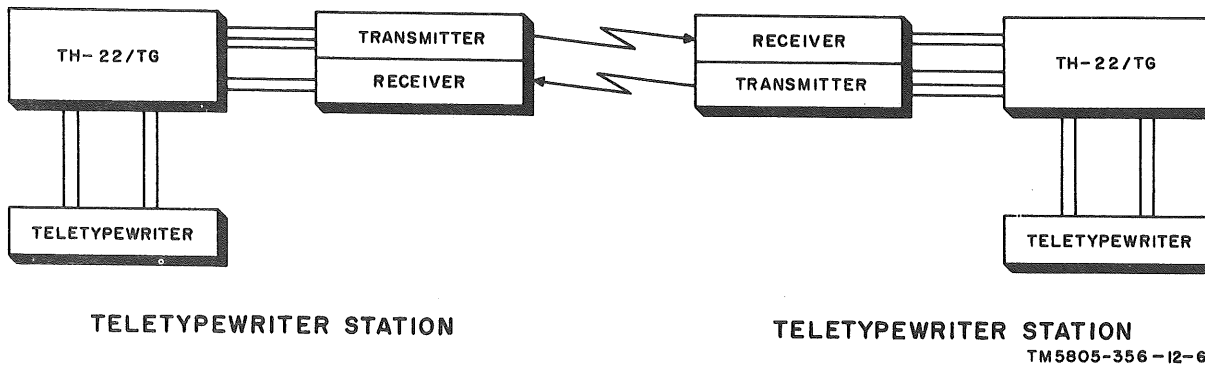


Figure 1-16. Push-to-talk radio on four-wire basis.

TH-22/TG across the line. A dc closure is therefore provided, and the remote control unit energizes the radio transmitter. The teletypewriter station operator may then transmit the message.

(b) Reception procedure using a remote control unit. The teletypewriter station operator sets the TH-22/TG SEND-REC-NORM switch to the NORM position. This removes the dc closure from the line and causes

the remote control unit, to disable the transmitter and activate the receiver.

(2) *Four-wire basis.* Figure 1-16 illustrates an arrangement with point-to-point, push-to-talk radio on a four-wire basis. A remote control unit is not required. Note that one additional wire must be used to control the radio transmitter in push-to-talk applications. Five wires are used; four for message transmission and reception, and one for transmitter control.

(a) *Transmission procedure.* The teletypewriter station operator sets the SEND-REC-NORM switch to the SEND position; this provides a dc closure through the transmitter control wire and one conductor of the transmitting pair, thereby energizing the radio transmitter and disabling the radio receiver. The teletypewriter station operator may then transmit the message.

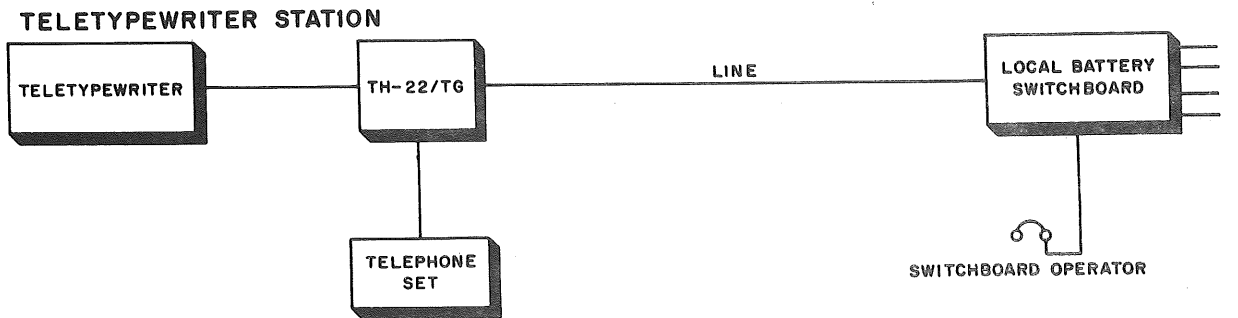
(b) *Reception procedure.* The teletypewriter station operator operates the SEND-REC-NORM switch to the NORM position; consequently, the equipment is arranged for reception.

1-12. Alternate Telegraph-Telephone Service

Alternate telegraph-telephone service is designed to provide a two-wire channel for either telegraph or telephone use. However, telegraph and telephone service cannot be used at the same time.

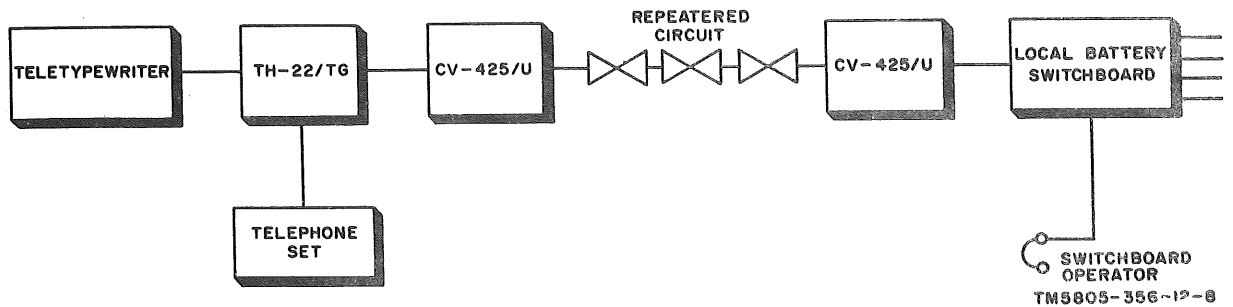
a. *General.* In alternate telegraph-telephone service with the 4W-2W-TEL switch in the 2W position, teletypewriter transmission is possible over the two-wire line. With the 4W-2W-TEL switch set to TEL, speech transmission is possible over the two-wire line. The 4W-2W-TEL switch is normally in the TEL position.

b. *Use on Loops or Trunks Passing 20-Cycle Ringing.* Figure 1-17 illustrates alternate tele-



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Figure 1-17. Switchboard loop circuit passing 20 cps, alternate telegraph-telephone service.



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Figure 1-18. Switchboard loop circuit using CV-425/U, alternate telegraph-telephone service.

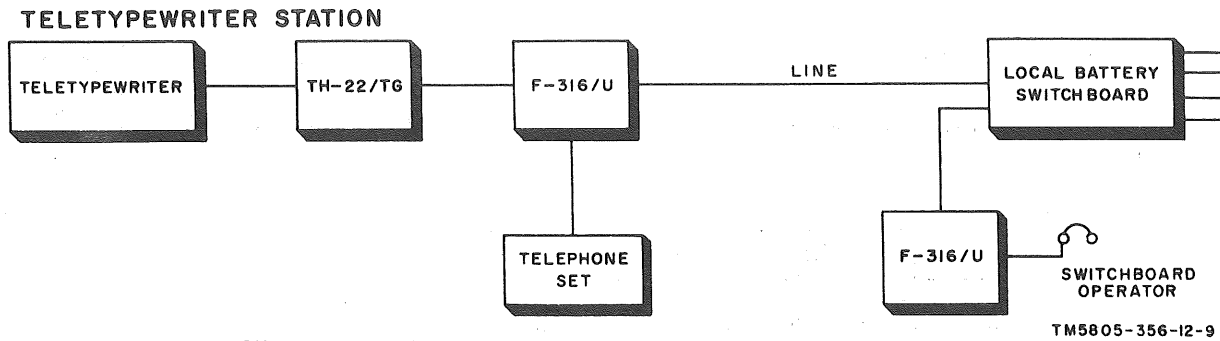


Figure 1-19. Switchboard loop circuit using F-316/U, simultaneous telegraph-telephone service.

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graph-telephone service on a loop circuit. The teletypewriter station operator telephones the switchboard operator and requests connection to another teletypewriter station. The two stations, through telephone communication, arrange for teletypewriter operation. At both teletypewriter stations, the 4W-2W-TEL switch is set to the 2W position. When teletypewriter communication is completed, the switch is returned to the TEL position.

c. *Use on Loops or Trunks not Passing 20-Cycle Ringing.* Figure 1-18 illustrates alternate telegraph-telephone service on a "repeated" loop circuit using the CV-425/U. The circuits function as outlined in b above and paragraph 1-11d.

1-13. Simultaneous Telegraph-Telephone Service

Simultaneous telegraph-telephone service is designed to provide a two-wire vf channel over which telegraph and telephone transmission may exist at the same time. However, both telegraph and telephone circuits must be switched (or signaled) at the same time. They cannot be switched (or signaled) separately. In transmission, the F-316/U is used to combine teletypewriter and telephone transmission at the terminal. An F-316/U must be used at the local switchboard to separate the telephone transmission for operator's use. Figure 1-19 illustrates simultaneous telegraph-telephone service. The circuit used may be either a local or common-battery loop. After the two stations are connected by the switchboard operator, simultaneous teletypewriter and speech trans-

mission can take place. For the receiving teletypewriter station to interrupt (break-in) the transmission receive, the TH-22/TG break-in switch can be operated.

1-14. Speech Plus Half-Duplex and Full Duplex Service

Speech plus half- and full-duplex service is designed to provide a two-wire or four-wire vf channel over which telegraph and telephone transmission may exist at the same time. The telegraph circuit and telephone circuit are completely independent of each other and are switched (or signaled) separately. The F-316/U is used to separate teletypewriter and telephone transmission.

a. *Use on Two-Wire Facility.* Figure 1-20 illustrates speech plus half-duplex service on a two-wire facility. The telephone and teletypewriter stations may be at the same or different locations. The teletypewriter station must have a CV-425/U and a TH-22/TG associated with it, to permit the teletypewriter station operator to signal the switchboard or the distant terminal on point-to-point circuits. The telephone station requires a CV-425/U, only if the line will not pass a 20-cps ringing signal. In switched systems, the teletypewriter circuit and the telephone circuit each use a different switchboard.

b. *Use on Four-Wire Facility.* Figure 1-21 illustrates speech plus full-duplex service on a four-wire facility (any four-wire facility may be used, including a full-duplex radio operation). Two F-316/U units are required at the transmitting station and two at the receiving

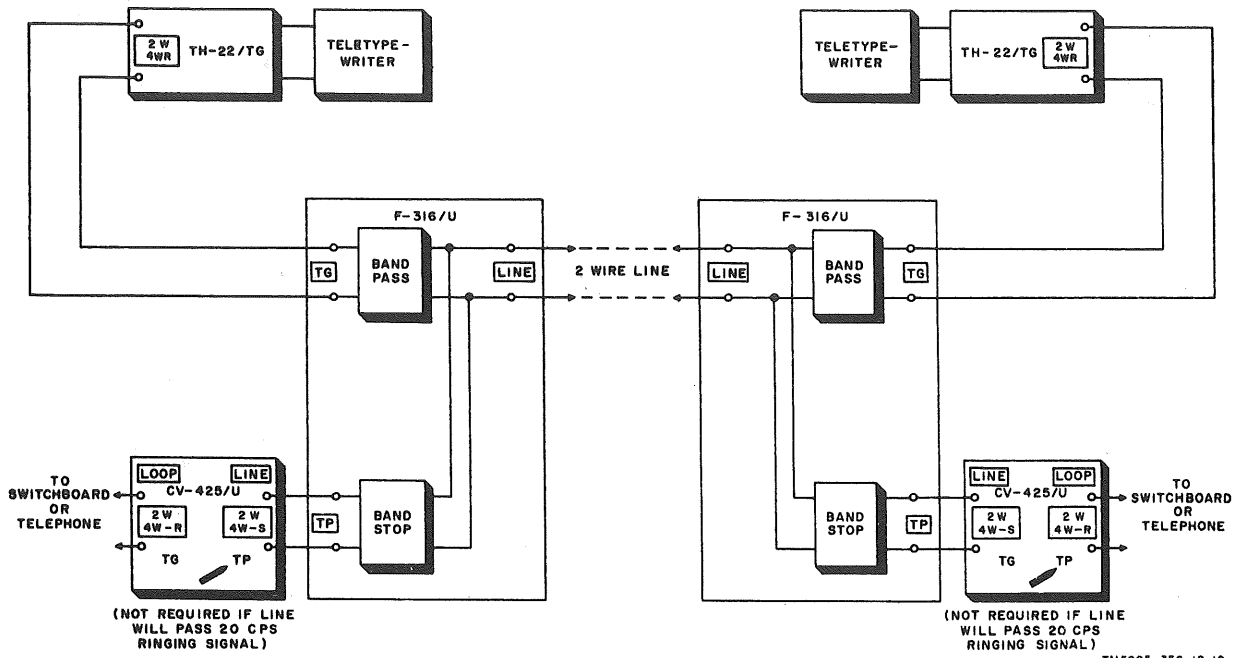


Figure 1-20. Two-wire facility, speech plus half-duplex service.

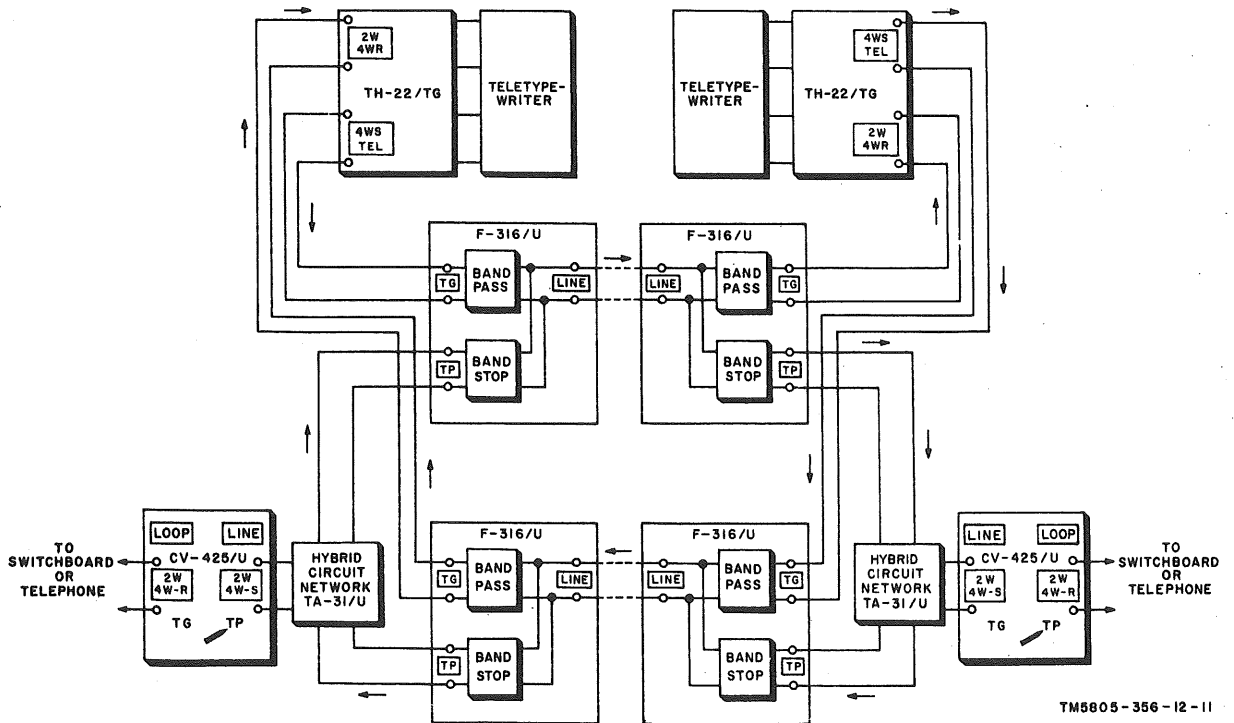


Figure 1-21. Four-wire facility, speech plus full-duplex service.

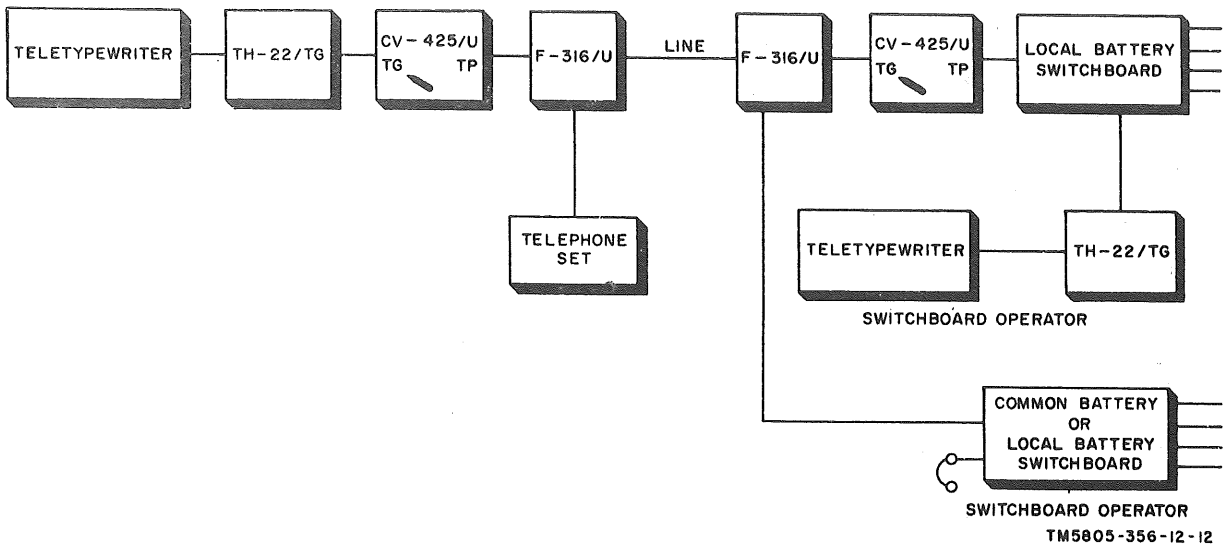


Figure 1-22. Switchboard loop circuit using Filter Assembly, Electrical F-316/U, speech plus half-duplex service.

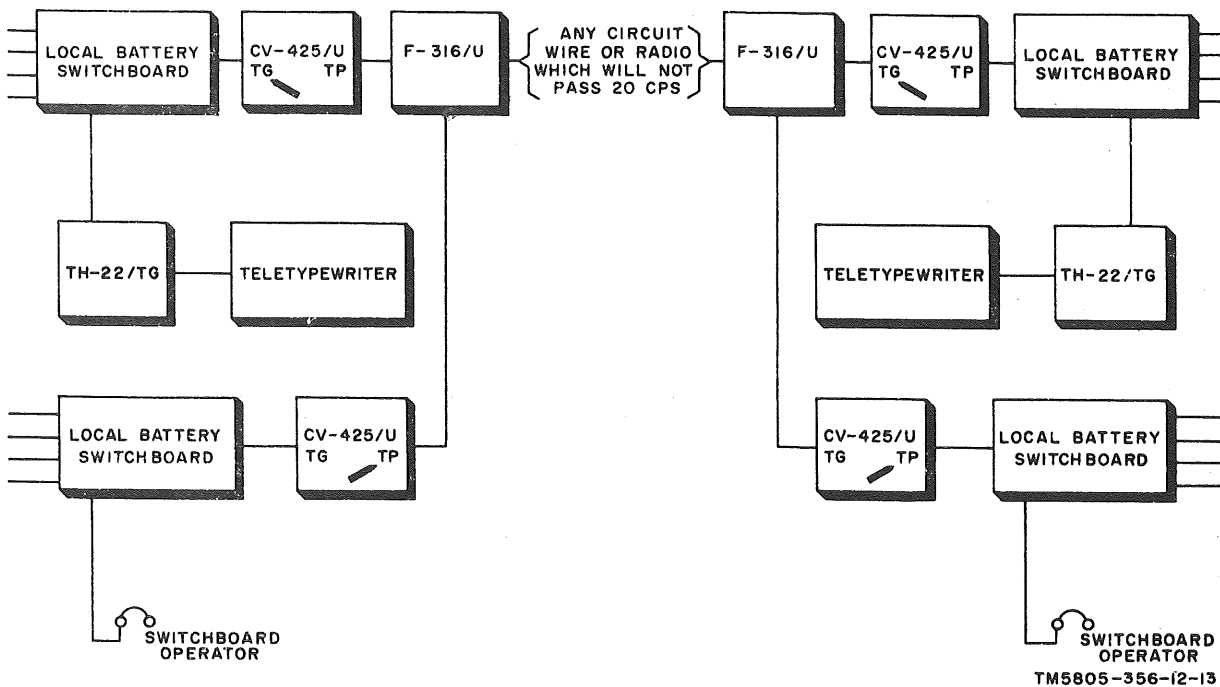
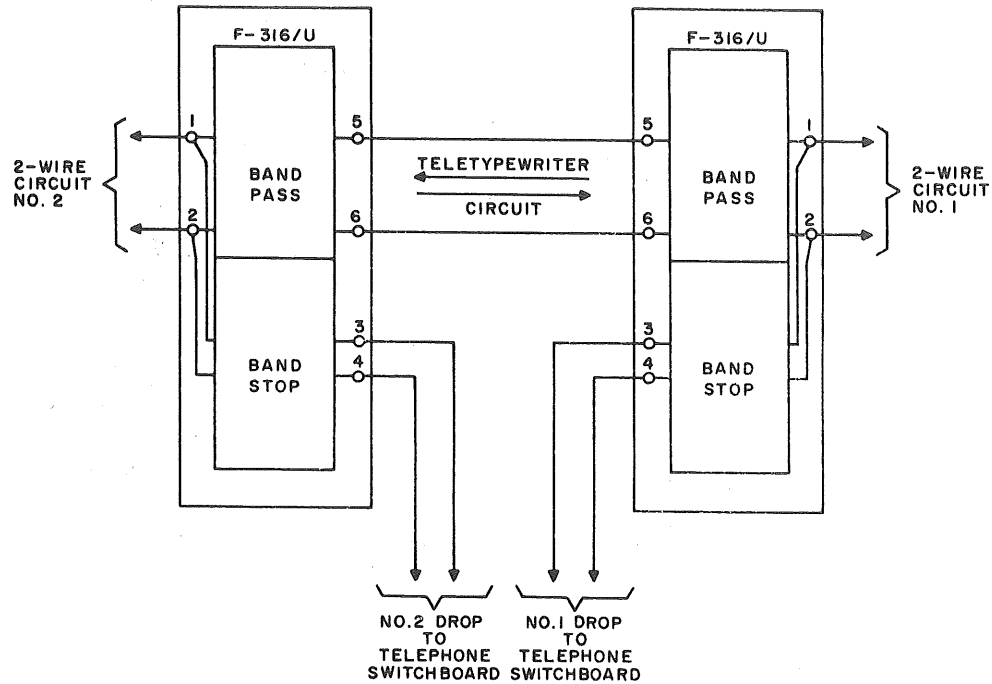


Figure 1-23. Switchboard trunk circuit using Filter Assembly, Electrical F-316/U, speech plus half-duplex service.

station. In addition, Hybrid Circuit Network TA-31/U is required to adapt the four-wire telephone circuit so that it may be connected to a telephone.

c. Use on a Switchboard Loop Circuit. The F-316/U (fig. 1-22) separates the paths of the teletypewriter and telephone signals. The teletypewriter signal is passed to a local-battery



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Figure 1-24. Telephone circuit dropped at intermediate station using Filter Assembly, Electrical F-316/U.

switchboard, and the telephone signal is passed to either a common- or local-battery switchboard. The CV-425/U operates the drop at the teletypewriter switchboard, since the telegraph portion of the F-316/U will not pass 20 cps. Operating procedures for the teletypewriter station operator and the switchboard operator are similar to those outlines in paragraph 1-11. The telephone switchboard operator uses the normal operating procedure.

d. Use on Trunk Circuit. Figure 1-23 illustrates the simultaneous use of teletypewriter and telephone circuits over the same trunk facility; separate local battery teletypewriter and telephone switchboards are used, and the

required teletypewriter-telephone transmission separation is performed at the switchboard location by means of the F-316/U.

e. Dropping Circuits at Intermediate Points. Figure 1-24 illustrates speech plus half-duplex service, in which the telephone circuit is dropped at an intermediate station while the teletypewriter circuit is continued through to the terminal. In this arrangement, two F-316/U units are connected back-to-back. Note that the same arrangement could be used in which the teletypewriter circuit is dropped and the telephone circuit is continued through to the terminal.

CHAPTER 2

SERVICE UPON RECEIPT OF EQUIPMENT

2-1. System Planning

The manner in which the AN/TCC-29 will be set up is determined by installation requirements. All three AN/TCC-29 components may be installed in either a fixed installation or in a vehicle. Perform the procedures in *a* through *d* below when making the installation.

a. Locate the TH-22/TG less than 6 feet from its associated teletypewriter, to prevent excessive line loss. Location of the CV-425/U or the F-316/U is not dependent on placement of associated equipment; the CV-425/U may use as much as 5 miles of wire on the loop side.

b. Place the AN/TCC-29 components in a part of the building (or area) in which there is not much traffic.

c. If the components cannot be placed on a table or bench, place them on the floor (or ground), with the control panels right-side up and facing the operator.

d. When the equipment is not in use, keep the components covered to minimize their exposure to the humidity and weather conditions.

2-2. Unpacking

a. Packaging Data. When packed for shipment, the TH-22/TG, CV-425/U, and F-316/U are placed in individual cardboard cartons that are placed in a corrugated cardboard outer carton. The technical manuals and running spares are each packed in a waterproof barrier bag; these bags are also placed in the outer carton. The outer carton is 23 inches long, 12 inches high, and 12 inches wide; the total weight of the carton and its contents is 49 pounds. A typical shipping carton and its contents is shown in figure 2-1.

b. Removing Contents. Remove the contents

from the waterproof corrugated shipping carton shown in figure 2-1, as described below:

- (1) Remove the waterproof tape from around the top and bottom of the outer carton.
- (2) Pull open the top of the outer carton.
- (3) Remove the barrier bags containing technical manual and running spares.
- (4) Remove the packing, and take out each of the three waterproof inner cartons.
- (5) Remove the waterproof tape from around the top and bottom of each waterproof carton.
- (6) Pull open the top of each waterproof carton, and remove the inclosed unit.

2-3. Checking Unpacked Equipment

a. Remove each equipment components from its transit case (as described in (1) and (2) below), and inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6 (para 1-3).

- (1) TH-22/TG and CV-425/U.
 - (a) Unsnap the four spring-loaded latch assemblies; holding bottom of transit case cover (top remains permanently fastened to the case), swing cover (on its hinge) and rest it on top of the transit case (figs. 1-3 and 1-7).
 - (b) Unscrew the three 1/4-turn captive camlock fasteners on front panel.
 - (c) Grasp unit's front panel handle, and withdraw unit from its transit case. Place unit in a convenient inspection area.
 - (d) Unwind the power cord from the front handle of the unit.

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**CORRUGATED
CARDBOARD
INNER CARTON**

**CORRUGATED
CARDBOARD
INNER CARTON**

**CONVERTER,
TELEGRAPH-
TELEPHONE
SIGNAL CV-425/U
(PACKED)**

**FILTER ASSEMBLY,
ELECTRICAL
F-316/U
(PACKED)**

**TERMINAL,
TELEGRAPH
TH-22/TG**

**SPARES INSIDE
WATERPROOF
BARRIER BAG**

WATERPROOF TAPE

**TECHNICAL
MANUALS
INSIDE
WATERPROOF
BARRIER BAG**

**CORRUGATED
CARDBOARD
INNER CARTON**

**CORRUGATED
CARDBOARD
OUTER CARTON**

**NOTE:
ALL UNITS ARE
PACKAGED IDENTI-
CALLY TO THAT
SHOWN FOR
TH-22/TG**

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Figure 2-1. Typical packing diagram for AN/TCC-29.

(2) *F-316/U*.

(a) Unsnap the four spring-loaded latch assemblies; holding the bottom of the transit case cover (fig. 1-7) (top remains permanently fastened to case), swing the cover (on its hinge) and rest it on the top of the transit case.

NOTE

The F-316/U filter is hermetically sealed and should not be removed from its case; it requires no power input.

(b) Place in a convenient inspection area.

b. See that the equipment is complete as listed on the packing slip. Report all discrepancies in accordance with TM 38-750. Shortage of a minor assembly or part that does not affect the proper functioning of the equipment should not prevent the use of the equipment.

c. If the equipment has been used or reconditioned, see whether it has been changed by a modification work order (MWO). If the equipment has been modified, see that any operational instruction changes resulting from the modification have been entered in the manual.

NOTE

Current MWO's applicable to the equipment are listed in DA Pam 310-7.

2-4. Siting

The best location for wire equipment depends on local conditions, such as the following: the need to house the equipment where its shelter cannot be seen; the type of housing available; possible installation in a vehicle; the terrain; and the need of easy access to messengers.

a. The choice of location for the TH-22/TG depends on the location of the associated equipment. To prevent excessive line (copper) loss, place the TH-22/TG not more than 6 feet from its associated teletypewriter.

b. Placement of the CV-425/U or the F316/U does not depend on the location of the associated equipment. The CV-425/U may use as much as 5 miles of wire on the loop side.

2-5. Tools and Test Equipment Required For Installation

The only equipment required for all installations is

tool equipment TE-123, and Multimeter AN/URM-105 (multimeter). Telephone Set TA-312/PT is required for telephone operation (para 2-10c)

2-6. Installation of AN/TCC-29**NOTE**

The procedures described in paragraphs 2-7 and 2-8 should be performed by installing or maintenance personnel.

Installation of the AN/TCC-29 includes internal strapping connections, power-input strapping and switch setting, external jack connections, and front panel terminal connections. These procedures are described in paragraphs 2-7 through 2-10, below.

2-7. TH-22/TG Internal Strapping Connections

a. The TH-22/TG has provisions for high or low sensitivity, break-in disable, common battery, and four-wire home copy. The terminal connections for these operations are made, as required, on PC boards 1A2 (fig. 2-3) and 1A3 (fig. 2-2) of the TH-22/TG. The inclusion or removal of these functions can be made by connecting or removing strapping ((1) through (4) below). Obtain access to the strapping points as follows:

(1) Operate the power ON-OFF switch to the OFF position (fig. 1-3 and 3-1).

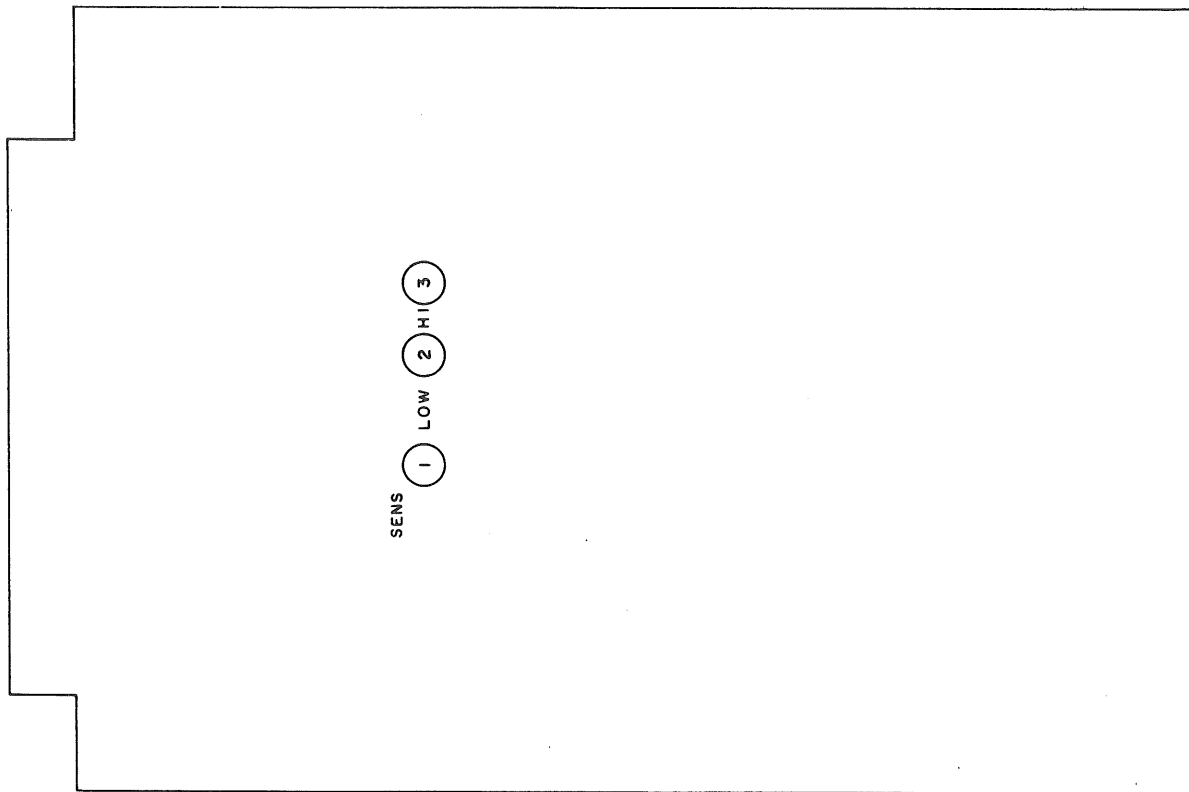
(2) Loosen the three captive screws on the rear panel, and lower the rear panel (fig. 1-4).

(3) Remove PC boards 1A1, 1A2, and 1A3, by pulling outward on the card extractor handles (fig. 1-5).

(4) Pivot the center card-guide upward. When required, the PC boards can be reinserted in the connector bracket cardslot, and then checked in this test position, with power on.

b. Make the required strapping changes, on the component side of PC board 1A2 and/or 1A3, as described below.

(1) *Low-high sensitivity*. When shipped, the TH-22/TG is strapped for high sensitivity (input signals from 0 dbm to -48 dbm). To operate at low sensitivity (input signals from 0 dbm to



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Figure 2-2. TH-22/TG PC card 1A3 strapping locations.

—25 dbm), disconnect the jumper from between terminals 2 and 3 on PC board 1A3 (fig. 2-2), and connect the jumper between terminals 2 and 1.

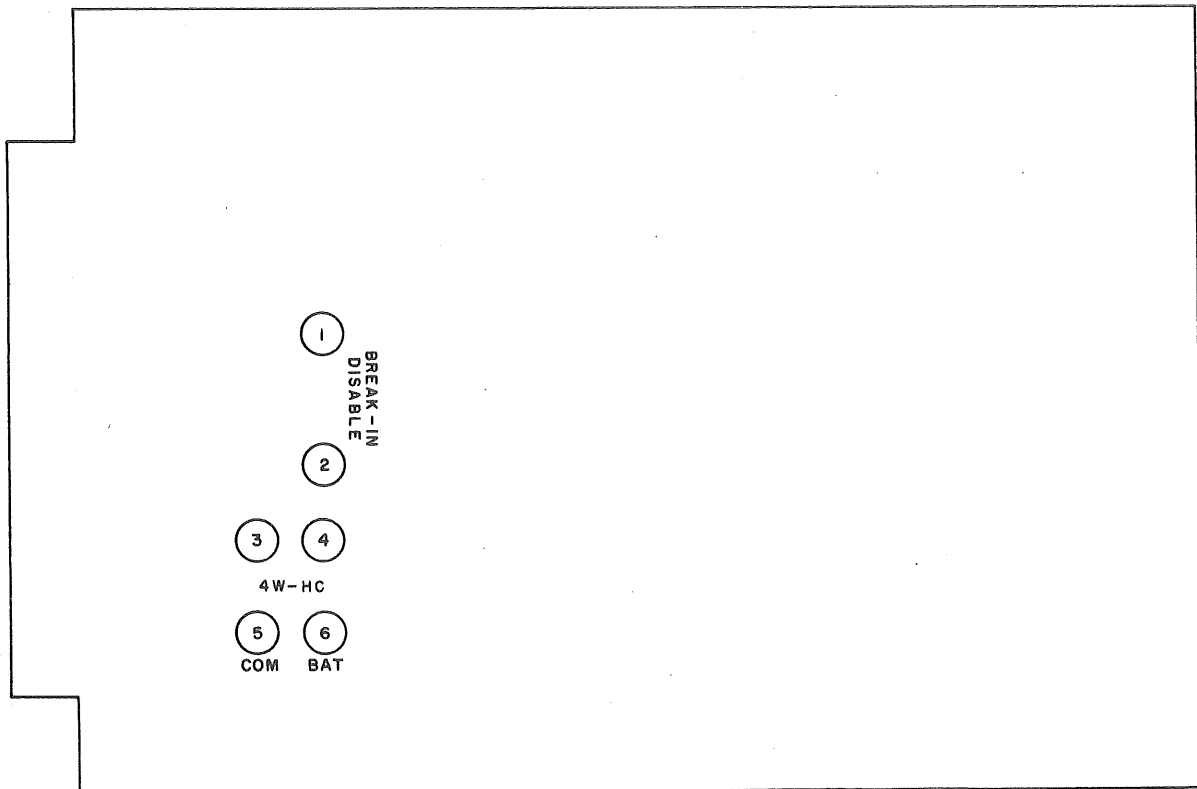
- (2) *Break-in disconnect.* To disconnect the break-in circuit, connect a jumper between terminals 1 and 2 on PC board 1A2 (fig. 2-3).
- (3) *Common battery.* When shipped, the unit is set for operation with separate loop supplies. To make use of the common battery, connect a jumper between terminals 5 and 6 on PC board 1A2 (fig. 2-3).
- (4) *Four-wire home copy.* When shipped, the unit is set for operation with no home copy. To have home copy on a 4-wire connection, connect a jumper between terminals 3 and 4 on PC board 1A2 (fig. 2-3).

Caution: Make certain the connections and switch settings of paragraph 2-8 are performed before the unit is connected to a power source. Otherwise, when the equipment is turned on, a front panel fuse will blow and possible damage to the equipment can result.

2-8. Power Input Strapping Connection and Switch Settings

a. The CV-425/U is factory-strapped for operation from 115 volts ac. If the unit is to be operated from 230-volt ac input or, if it is required to change the strapping from 230 volts to 115 volts, proceed as follows:

- (1) With the multimeter, measure the voltage to be applied to the unit.
- (2) Loosen the three captive screws on the hinged rear panel, and lower the rear panel (fig. 1-8).



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Figure 2-3. TH-22/TG PC card 1A2 strapping locations.

- (3) Remove PC board 3A1 and 3A2, by pulling outward on card-extractor handles (fig. 1-9).
 - (4) Pivot center card-guide upward. When required, the PC boards can be reinserted in the connector-bracket slot and then checked with the power on.
 - (5) For CV-425/U operation from a 230-volt ac source, remove straps from terminals 1 and 2 and terminals 3 and 4 on transformer 3T1 (fig. 1-9), and then connect a strap between terminals 2 and 3.
 - (6) For CV-425/U operation from a 115-volt ac source, remove straps from terminals 2 and 3 on transformer 3T1 (fig. 1-9), and then connect two straps; one between terminals 1 and 2 and the other strap between terminals 3 and 4.
- b. The TH-22/TG operates from a 115-volt

ac source, a 230-volt ac source, or a 26-volt dc source. The 115 and 230-volt ac power input is applied to the unit through the power cable (fig. 1-3). The 26-volt dc power source must be applied to the mating connector at jack IJ5. Before either the 115/230 power cable or the 26-volt power cable is connected to a power source, use the multimeter to measure the voltage that is to be applied to the unit. The 115 VAC-230 VAC-26 VDC switch should be set to the appropriate position.

2-9. External Jack Connections

The TH-22/TG contains four front panel jack connections. Prior to operation, make connections to these jacks as follows:

- a. Insert the send plug (black shell) of the sending teletypewriter into either of the TH-22/TG SEND jacks. If home copy is required, first make the four-wire home copy strapping connection (para 2-7b(4)) and then connect

the receiver plug (red shell) of the home copy teletypewriter into the second SEND jack. Only one teletypewriter connected to the SEND jack should contain a loop supply.

b. If the receiving teletypewriter contains a loop supply, insert the receive plug (red shell) of the receiving teletypewriter into the front panel EXT BAT jack. If the receiving teletypewriter does not contain a loop supply, insert the receive plug (red shell) of the receiving teletypewriter into the front panel REC jack.

2-10. Front Panel Terminal Connections

The front panel terminal connections required for the four basic types of operation are described below.

a. *Operation Over Two-Wire Line (Half-Duplex)*. During 2-wire operation, the AN/TCC-29 uses the same pair of wires for both the transmitting and the receiving circuits. A typical illustration of the 2-wire operation is shown in figure 1-20. Make connections as follows:

- (1) Connect a pair of wires between the 2W-4WR binding posts of the TH-22/TG and the TG binding posts of the F-316/U.
- (2) Connect a pair of wires between the TP binding posts of the F-316/U and the LINE/2W 4W-S binding posts of the CV-425/U.
- (3) Connect a pair of wires between the LOOP/2W 4WR binding posts of the CV-425/U and a telephone or switchboard.
- (4) Connect a pair of wires between the LINE binding posts of the F-316/U and the 2-wire line.

b. *Operation Over a Four-Wire Line (Full-Duplex)*. During 4-wire operation, the AN/TCC-29 uses one pair of wire lines for receiving signals from the distant terminal, and another pair for transmitting signals to the distant terminal. A typical illustration of four-wire operation is shown in figure 1-21. Make the wire connections as outlined below.

Note. An additional F-316/U is required for speech plus full-duplex operation.

- (1) Connect a pair of wires between the 4WS/TEL binding posts of the TH-

22/TG and the TG binding posts of the F-316/U.

- (2) Connect a pair of wires between the 2W 4WR binding posts of the TH-22/TG and the TG binding post of a second F-316/U.
- (3) Connect a pair of wire lines between the transmitting circuit and the LINE binding posts of the *first* F-316/U.
- (4) Connect the pair of wire lines used in the receiving circuit, to the LINE binding posts of the *second* F-316/U.
- (5) Connect the TP binding posts of both the first and second F-316/U, to Hybrid Circuit Network TA-31/U.
- (6) Connect Hybrid Circuit Network TA-31/U, to the LINE/2W 4W-S binding posts of the CV-425/U.
- (7) Connect a pair of wires between the LOOP/2W 4W-R binding of the F-316/U and a switchboard or telephone.

c. *Telephone Operation Using TH-22/TG*. To obtain telephone operation when a TH-22/TG is used (fig. 1-17), connect a telephone at the 4WS TEL binding posts of the TH-22/TG. Ringing signals for the circuit will be supplied from the TH-22/TG or from the telephone.

d. *Operation Over Four-Wire, Push-to-Talk Radio Circuit Using TH-22/TG*. When the TH-22/TG is used in conjunction with a push-to-talk radio circuit (fig. 1-16), make the connections outlined below.

- (1) Connect CONT binding post E1 (fig. 1-3), to the relay winding connection point on the radio transmitter.
- (2) Connect CONT BINDING post 1E2 to 4WS/TEL binding post 1E3.
- (3) Connect 4WS/TEL binding post 1E3, to the talking battery side of the radio transmitter input circuit.
- (4) Connect 4WS/TEL binding post 1E4, to the other side of the transmitter input circuit.
- (5) Connect 2W/4WR binding post 1E5, to one side of the radio receiver output.
- (6) Connect 2W/4WR binding post 1E6, to the other side of the radio receiver output.

CHAPTER 3 OPERATING INSTRUCTIONS

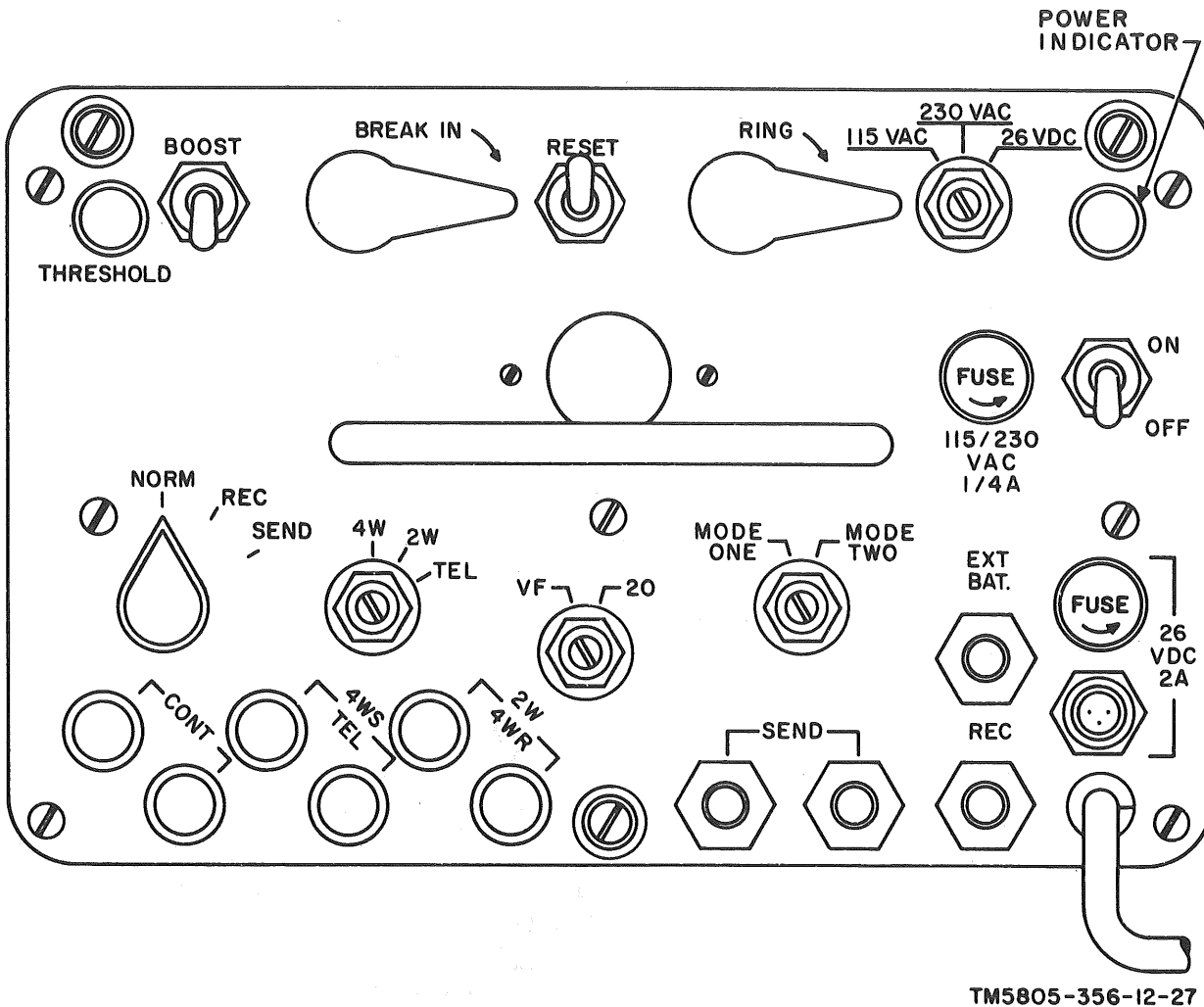
Section I. OPERATOR'S CONTROLS AND INDICATORS

3-1. TH-22/TG Controls, Indicators, and Fuses (fig. 3-1)

Control, indicator, or fuse	Function
THRESHOLD indicator lamp -----	Lights to indicate low or no signal present at 4WS/TEL or 2W/4WR terminals.
BOOST switch (spring-return toggle) switch -----	When set to the up position, boosts output break-in signal amplitude.
BREAK IN (spring-return rotary) switch -----	Initiates break-in function during telegraph communication over two-wire line facility.
RESET (spring-return toggle) switch -----	Resets receive break-in circuitry.
RING (spring-return rotary) switch -----	Initiates vf or 20-cps ringing signal.
115VAC-230VAC-26VDC (3-position screwdriver) switch.	Selects one of three operating voltages.
Power indicator lamp -----	Lights to indicate that power is applied to the unit.
ON/OFF (2-position toggle) switch -----	Controls application of power to the unit.
NORM-REC-SEND (3-position rotary) switch -----	Arranges unit for either wire or for radio operation. When set to— (1) NORM, unit is set for operation over wire lines. (2) SEND, unit is set for transmitting over radio circuits. (3) REC, unit is set for receiving over radio circuits.
4W-2W-TEL (3-position screwdriver) switch -----	Arranges unit for type of line facility (two-wire or four-wire) telegraph operation or for telephone operation.
VF-20 (2-position) switch -----	Produces output signal frequency at 1232.5 cps (VF position) or 20 cps (20 position).
MODE ONE/MODE TWO (2-position rotary) switch -----	Arranges the unit for one of two output word rates. When set to— (1) MODE ONE, output rate of 60, 75, or 100 words per minute is produced. (2) MODE TWO, output rate of 200 words per minute is produced.
115/230VAC ¼A fuse -----	Protects power supply from overload on 115-volt or 230-volt line.
26VDC (2A) fuse -----	Protects data terminal from overload from dc input.

3-2. CV-425/U Controls, Indicators, and Fuses (fig. 3-2)

Control, indicator, or fuse	Function
POWER/ON-OFF (2-position toggle) switch -----	Controls application of 115 or 230-volts ac to unit.
POWER indicator lamp -----	Lights to indicate that power has been applied to the unit.
TP-TG (2-position rotary) switch -----	Arranges unit for either telegraph ringing signals or telephone ringing signals. When set to— (1) TP, 1600 cps output frequency is provided for telephone line. (2) TG, 1232.5 cps output frequency is provided for telegraph line.



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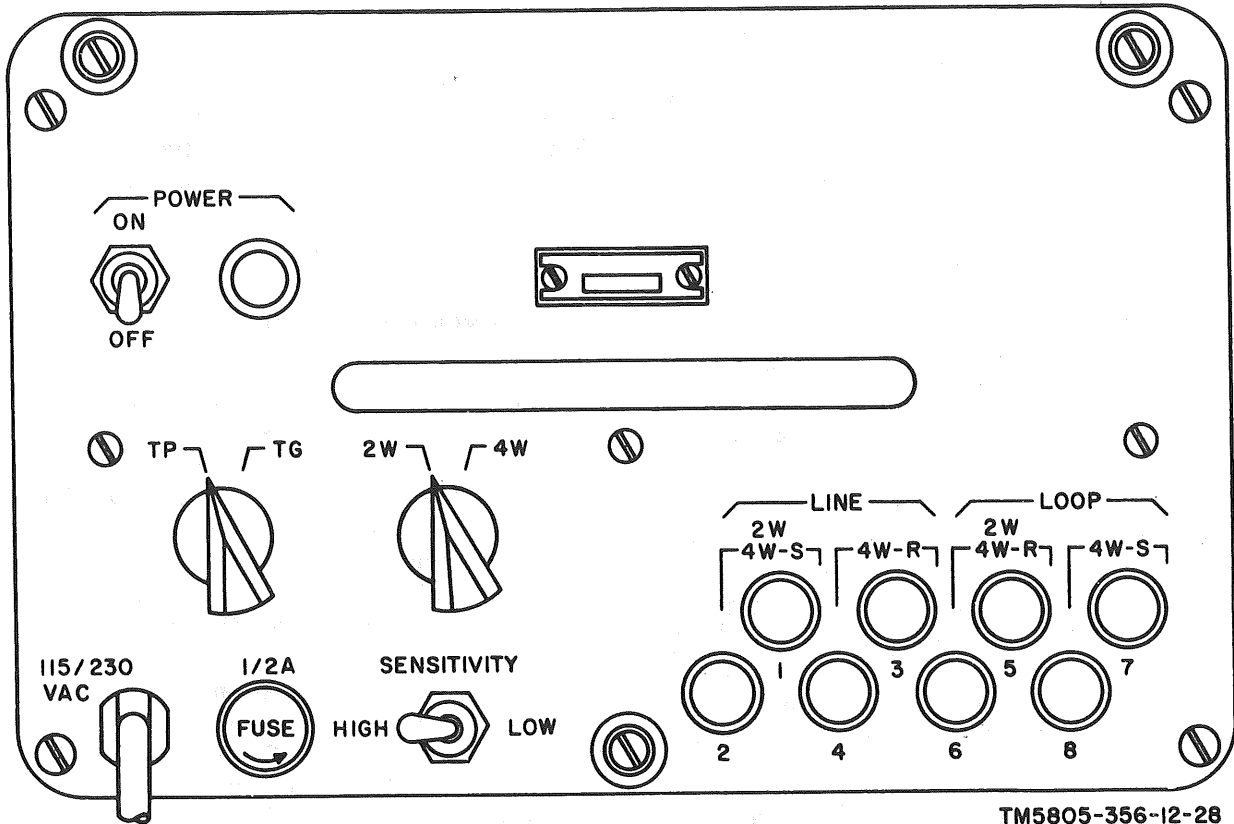
Figure 3-1. TH-22/TG front panel.

Control, indicator, or fuse	Function
2W-4W (2-position rotary) switch	Arranges converter for either two-wire or four-wire operation.
SENSITIVITY (2-position toggle) switch	Changes unit sensitivity, to compensate for variations of the ringing-signal input voltage. When set to— (1) HIGH, sensitivity to weak ringing signals is increased. (2) LOW, sensitivity to strong ringing signals is reduced.
1/2 A fuse	Protects power supply from overload on 115-volt or 230-volt ac line.

3-3. F-316/U
(fig. 3-3)

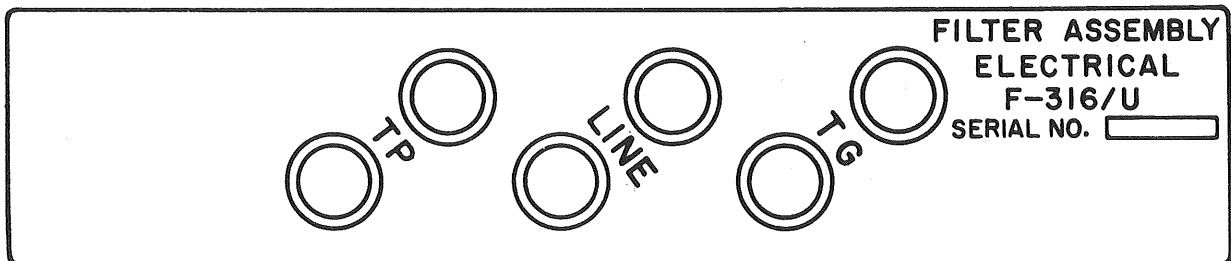
There are no controls on the F-316/U. Use

of the F-316/U depends on its binding post connection with the associated TH-22/TG and CV-425/U.



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Figure 3-2. Converter, Telegraph-Telephone Signal CV-425/U front panel.



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Figure 3-3. F-316/U front panel.

Section II. OPERATING PROCEDURES

3-4. Types of Operation

a. The AN/TCC-29 may be used with various types of equipment (switchboards, telephones, transmitters, etc.) In many configurations (paras 1-10 through 1-14). Before operation, the equipment's particular application must first be decided upon (paras 1-10 through 1-14), and the proper connections have to be made (paras 2-6 through 2-10).

b. To operate the equipment, perform the following procedures:

- (1) Preliminary starting procedure (para 3-5).
- (2) Starting procedure (para 3-6).
- (3) Procedures for desired type of operation (para 3-7).
- (4) Stopping procedure (para 3-8).

3-5. Preliminary Starting Procedure

a. The AN/TCC-29 binding post connections should be made for one of the system configurations listed in paragraphs 1-10 through 1-14. Once the AN/TCC-29 has been installed and connections and controls have been arranged to satisfy the requirements of a particular system, their arrangement is not normally changed until the system is changed.

b. Make certain the 115- or 230-volt ac connections and switches on the TH-22/TG and the CV-425/U are correct before the units are turned on (para 2-8).

Caution: The power input setting of the 115VAC-230VAC-26VDC selector switch and the strapping of transformer 3T1 in the CV-425/U (para 2-8) should be checked before the power cords of the units are connected to external line voltages. Incorrect switch setting or power transformer strapping will cause front panel fuses to blow and possible equipment damage when the equipment is connected to its ac power source.

3-6. Starting Procedure

a. After the internal strapping connections and the line and loop connections (paras 2-9

and 2-10) have been made, connect the power cords of the TH-22/TG and CV-425/U to the appropriate power source.

b. Operate the TH-22/TG ON-OFF switch (fig. 3-1) to the ON position; the TH-22/TG POWER indicator lamp should light.

c. Operate the CV-425/U POWER/ON-OFF switch (fig. 3-2) on the ON position; the CV-425/U POWER indicator should light.

Note. Occasionally, the TH-22/TG will lock in the break-in condition (indicated by audible alarm) immediately after applying power. If this condition occurs, momentarily operate the front panel RESET switch.

3-7. Procedures for the Desired Type of Operation

a. *General.* Since the TH-22/TG and the CV-425/U can be operated in various modes and in combinations of these various modes, the operating procedures of the AN/TCC-29 are given in the form of switch settings which are used to obtain individual operating characteristics. To operate the AN/TCC-29 equipment for a desired system application, set the switches and controls as described in *b* and *c* below. Tables 3-1 and 3-2 contain operational information for various types of two-wire and four-wire configurations for the TH-22/TG and the CV-425/U, respectively, Paragraph *d* below contains information about the F-316/U front panel terminals.

b. *TH-22/TG Switch Settings.*

- (1) Operate the NORM-REC-SEND switch to—
 - (a) NORM, for all types of wire system operation.
 - (b) SEND, when transmitting (REC when receiving), for radio system operations on a push-to-talk basis. The use of a remote control unit is required in this application.
- (2) Operate 4W-2W-TEL switch to—
 - (a) 4W, when the TH-22/TG is connected over a four-wire line.
 - (b) 2W, when the TH-22/TG is connected over a two-wire line.

- (c) TEL, when the TH-22/TG is used for connecting a telephone set (instead of a teletypewriter) in the circuit.
- (3) Operate the MODE ONE/MODE TWO switch to:
- (a) MODE ONE, when operating at a 60, 75, or 100 word per minute input rate.
 - (b) MODE TWO, when operating at a 200 word per minute input rate.
- (4) Set VF-20 switch to—
- (a) VF, to produce a 1232.5-cps vf signal output.
 - (b) 20 to produce a 20-cps alarm signal output.
- Note.* When the output signal from the TH-22/TG is connected directly to the F-316/U, the TH-22/TG VF-20 switch must be set to the VF position since the F-316/U will not pass a 20-cps signal.
- (5) Operate the BREAK IN switch, to initiate a break-in function during telegraph communication over a two-wire facility. (The break-in signal causes the remote teletypewriter to run open and also produces an aural break-in 1180-cps tone at the remote TH-22/TG; the local teletypewriter also runs open until the remote RESET switch is set.)
- (6) Operate the BOOST switch, in conjunction with the BREAK IN switch, when operation of the BREAK IN switch alone does not produce a break-in signal at the remote teletypewriter.
- (7) Operate the RESET switch to reset

the receive break-in circuitry. (The pressing of the reset switch silences the break-in aural tone and also stops the local and remote teletypewriters from running open.)

- (8) Operate the RING switch, to transmit a vf or 20 cycle ring signal.

c. CV-425/U Switch Settings.

- (1) Operate the TP-TG switch to—
- (a) TP, to cause a 20-cps alarm signal at the loop terminals, and a 1600 cps signal at the line terminals of the unit.
 - (b) TG, to produce a 20-cps alarm signal at the loop terminals and a 1232.5-cps signal at the line terminals of the unit.
- (2) Set the 2W-4W switch to—
- (a) 2W, when the CV-425/U is connected between a two-wire line and a two-wire loop.
 - (b) 4W, when the CV-425/U is connected between a four-wire line and a four-wire loop.
- (3) Set the SENSITIVITY switch to—
- (a) the HIGH position, to increase sensitivity to weak ringing signals.
 - (b) the LOW position, to decrease sensitivity to strong ringing signals.

d. F-316/U Controls. The F-316/U contains no front panel switches. However, three sets of front panel terminal connections must be made to put the unit into operation. The LINE terminals should be connected to the line wires; the TP terminals should be connected to telephone lines; the TG terminals should be connected to telegraph lines.

e. TH-22/TG Operating Information.

Item	Type of operation	Control and switch settings			
		4W-2W-TEL	NORM-REC-SEND	VF-20	BOOST
1	Two-wire telephone; point-to-point or local battery switchboard.	TEL, for talking and magnetoringing; 2W, for telegraph terminal ringing.	NORM -----	VF or 20 as required.	Not used -----
2	Two-wire teletype; point-to-point or local battery switchboard.	2W -----	NORM -----	VF or 20 as required.	Depress to increase break-in signal amplitude.
3	Two-wire teletype over push-to-talk radio; point-to-point or local battery switchboard.	2W -----	SEND, to transmit; NORM, to receive.	VF -----	Depress to increase break-in signal amplitude.
4	Two-wire teletype over common battery switchboard.	TEL, in idle condition; 2W for operation.	NORM -----	VF -----	Depress to increase break-in signal amplitude.
5	Four-wire teletype; one-way reversible on wire.	4W -----	NORM -----	VF or 20 as required.	Depress to increase break-in signal amplitude.
6	Four-wire teletype; one-way reversible on push-to-talk radio.	4W -----	SEND, to transmit; REC, to receive.	VF -----	Depress to increase break-in signal amplitude.
7	Four-wire teletype; full-duplex over wire or two-way radio.	4W -----	NORM, for wire; SEND, for radio.	VF or 20 as required.	Depress to increase break-in signal amplitude.

Control and switch settings				Remarks
BREAK IN	RESET	MODE ONE/ MODE TWO	RING	
Not used -----	Not used -----	Not Used -----	Depress for 3 seconds to signal remote terminal.	Telephone operation possible on 4WS-TEL terminals only.
Depress to break in on remote terminal.	Depress to reset the break-in circuitry.	MODE ONE for 60, 75, or 100 wpm input rate; MODE TWO for 200 wpm input rate.	Depress for 3 seconds to signal remote terminal.	To break in on a message being received operate the BREAK IN switch.
Depress to break in on remote terminal.	Depress to reset the break-in circuitry.	MODE ONE for 60, 75, or 100 wpm input rate; MODE TWO for 200 wpm input rate.	Depress for 3 seconds to signal remote terminal.	In the SEND position of the NORM-REC-SEND switch, a holding coil is placed across the line to turn on the radio transmitter. A remote control unit is used in this application.
Depress to break in on remote terminal.	Depress to reset the break-in circuitry.	MODE ONE for 60, 75, or 100 wpm input rate; MODE TWO for 200 wpm input rate.	Depress for 3 seconds to signal remote terminal.	Refer to paragraph 2-7b(3) for strapping connection which provides common battery.
Depress to break in on remote terminal.	Depress to reset the break-in circuitry.	MODE ONE for 60, 75, or 100 wpm input rate; MODE TWO for 200 wpm input rate.	Depress for 3 seconds to signal remote terminal.	The CONT binding posts provide dc closure in SEND position to turn on radio transmitter.
Depress to break in on remote terminal.	Depress to reset the break-in circuitry.	MODE ONE for 60, 75, or 100 wpm input rate; MODE TWO for 200 wpm input rate.	Depress for 3 seconds to signal remote terminal.	Refer to paragraph 2-7b(4) for removal of home copy connection.

f. CV-425/U Operating Information.

Type of operation	Set TP-TG switch to—	Set SENSITIVITY high-low switch to—	Set 2W-4W switch to—
1. Two-wire telephone -----	TP	LOW	2W
2. Two-wire telegraph -----	TG	LOW	2W
3. (Two Converters used with 2-wire telephone, 2-wire telegraph.)			
Telephone channel converter -----	TP	LOW	2W
Telegraph channel converter -----	TG	HIGH	2W
4. Four-wire telegraph -----	TG	LOW	4W
5. Alternate telephone or telegraph -----	TP or TG	LOW	2W

3-8. Stopping Procedure

To remove power from the AN/TCC-29, operate the TH-22/TG ON-OFF and the CV-425/U POWER/ON-OFF switch to the OFF

positions. To remove all power from the AN/TCC-29, disconnect the TH-22/TG and the CV-425/U power cords from their power sources. Remove all jacks and wires, and replace the covers on all three units.

Section III. OPERATION UNDER UNUSUAL CONDITIONS

3-9. General

The AN/TCC-29 will operate in regions where extreme cold, heat, humidity, and sand conditions prevail. Therefore, the limits of the AN/TCC-29 operation are the limits imposed upon its associated equipment.

when it is set up in swampy areas, moisture conditions are more acute than normal in the tropics. Ventilation is very poor, and the high relative humidity causes condensation of moisture on the equipment whenever the temperature becomes lower than that of the surrounding air. To minimize this condition, keep the TH-22/TG and CV-425/U connected to a power source.

3-10. Operation In Arctic Conditions

a. Keep the equipment warm and dry. Keep the TH-22/TG and CV-425/U connected to a power source at all times.

b. When equipment which has been exposed to the cold is brought into a warm room, moisture will form on the equipment until the equipment reaches room temperature. When the equipment has reached room temperature, dry it thoroughly. Moisture also may arise when equipment warms up during the day, after exposure during a cold night.

3-12. Operation in Desert Climates

a. Conditions similar to those in tropical climates often prevail in desert areas. Use the measure described in paragraph 3-11 to insure proper operation.

b. The main problem which arises with operation in desert areas is the large amount of dust which enters the equipment. Although the individual units of the AN/TCC-29 are mounted in dustproof cases, be careful to place the units in as dustfree a location as possible.

3-11. Operation in Tropical Climates

When operated in tropical climates, the AN/TCC-29 may be installed in tents, huts, or when necessary, in underground dugouts. When equipment is installed below ground level or

c. Never tie power cords or wiring connections to the inside or outside of tents. Desert areas are subject to sudden wind squalls which may jerk connections loose or break the lines.

CHAPTER 4 MAINTENANCE INSTRUCTIONS

Section I. OPERATOR'S MAINTENANCE

4-1. Scope of Operators Maintenance

The maintenance duties assigned to the operator of the AN/TCC-29 are listed below, together with a reference to the paragraphs covering the specific maintenance functions. The required materials are listed in paragraph 4-2.

- a. Operator's daily preventive maintenance checks and services (para 4-5).
- b. Cleaning (para 4-6).

4-2. Materials

The following materials are required for operator's preventive maintenance:

- a. Brush, paint 1/2 inch width (Federal Stock No. 8020-262-9084).
- b. Cleaning compound (Federal Stock No. 7930-395-9542).
- c. Lint free cloth.

4-3. Operator's Preventive Maintenance

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

a. *Systematic Care.* The procedures given in paragraph 4-6 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. *Preventive Maintenance Checks and Services.* The preventive maintenance checks and services chart (para 4-5) outlines functions to be performed at daily intervals. These checks

and services are to maintain the AN/TCC-29 in a combat serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist the operator in maintaining combat serviceability, the preventive maintenance checks and services chart indicates what to check, how to check, and what the normal indications are; the *References* column lists the illustrations, paragraphs, or manuals that contain detailed repair or replacement procedures. If the defect cannot be remedied by the operator, higher level maintenance or repair is required. Records and reports of these checks and services must be made in accordance with the requirements set forth in TM 38-750.

4-4. Preventive Maintenance Checks and Services Periods

a. Paragraph 4-5 specifies checks and services that must be accomplished daily for the AN/TCC-29 under special conditions listed below.

- (1) *In vehicular installations.*
 - (a) Before the vehicle starts the mission.
 - (b) When the equipment is initially installed.
 - (c) When the equipment is reinstalled after removal for any reason.
 - (d) At least once each week if the equipment is maintained in a standby condition.
- (2) *In transportable and mobile installations.*
 - (a) When the equipment is initially installed.

(b) When the equipment is reinstalled after removal for any reason.

(c) At least once each week if the equipment is maintained in a standby condition.

b. Paragraph 4-10 specifies organizational checks and services that must be performed once each week for the AN/TCC-29.

c. Paragraph 4-11 specifies organizational checks and services that must be performed once each month.

4-5. Daily Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	End item equipments.	a. Check equipment for completeness b. Check to see that the applicable technical manuals are on hand and in usable condition.	a. App. II. b. DA Pam 310-4.
2	Case exteriors	Wipe clean with a dry, lint free cloth	Para 4-6.
3	Control panel	Wipe clean with a dry, lint free cloth	Para 4-6.
4	Front panel controls and connections.	Check for presence of all switch knobs, easy switch rotation, and correct cable connections.	Figs. 1-1, 1-2, and 1-3.
5	Vehicular mounting.	Tighten loose nuts or bolts. Replace missing hardware as required.	Figs. 1-1, 1-2, and 1-3.
<p><i>Note.</i> Sequences No. 6 through No. 14 indicated below must be performed only during interruptions of scheduled system service. Notify personnel at remote station that the following connections and procedures will be performed at both local and remote stations.</p>			
6	Connections	Connect the three units of a local and remote AN/TCC-29 as shown in fig. 1-20. Operate the VF-20 switch to the VF position.	Para 2-10a for AN/TCC-29 (connections for local and remote units).
7	ON-OFF switch for TH-22/TG.	Operate the TH-22/TG ON-OFF switch to the ON position. Power indicator lamp should light.	Fig. 1-3.
8	POWER/ON-OFF switch for CV-425/U.	Operate the CV-425/U POWER ON-OFF switch to the ON position. Power Indicator (fig. 3-2) should light.	Fig. 3-2.
9	Loop current	Adjust teletypewriter loop current for 21ma. If loop current is supplied by TH-22/TG, connect multimeter in series with loop and adjust INT BAT LOOP CUR (1R12) (fig. 1-6) for a loop current of 21ma.	Have higher level maintenance personnel perform procedure in para 4-10d if current is not 21 ma.
10	Teletypewriter (local).	a. Type letters "R" and "Y" alternately for 5 complete lines. Connect a field telephone to the LINE terminals of the remote F-316/U. Error-free copy (R and Y) is printed; the THRESHOLD indicator of the remote TH-22/TG goes out; a twittering tone is heard in the field telephone. b. Stop typing while listening to the receiver of the field telephone. A steady tone is heard in receiver of field telephone for approximately 3 seconds. Then, the tone stops and simultaneously the remote TH-22/TG THRESHOLD indicator lights.	a. None. b. None.
11	RING switch (local TH-22/TG).	a. Operate and hold the local TH-22/TG RING switch for at least 3 seconds. The remote TH-22/TG sounds, and a steady tone is heard in the remote receiver field telephone. The remote TH-22/TG THRESHOLD indicator is extinguished. b. With connecting lines capable of passing 20 cps, set the local TH-22/TG VF/20 switch to the 20 position and operate the RING switch. The remote TH-22/TG ringer sounds.	a. Fig. 3-1. b. Fig. 3-1.

Sequence No.	Item	Procedure	References
12	Field telephones (local and remote).	Connect field telephones at local and remote CV-425/U LOOP/2W 4W-R bonding posts. Ring from and communicate between both telephones. Both telephones ring and speech is clear.	Fig. 3-2.
13	Break-in disable setup.	<p>a. Operate the TH-22/TG controls for two-wire teletype point-to-point connection.</p> <p>b. Operate the CV-425/U controls for two-wire teletype. Type a message on local teletypewriter; copy should be printed on remote teletypewriter.</p>	<p>a. Para 3-7e.</p> <p>b. Para 3-7f.</p>
14	Break-in operation.	<p>a. For break-in operation, no connection should exist between terminals 1 and 2 on PC board 1A2. If connection exists, refer unit to higher level maintenance for strapping changes.</p> <p>b. Operate BREAK IN switch on remote TH-22/TG. If, after 3 seconds, the remote teletypewriter does not stop printing, operate the BOOST pushbutton while operating the BREAK-IN switch. After approximately 3 seconds the audible break-in alarm sounds at both the local and remote TH-22/TG units; the remote teletypewriter stops printing; and the local teletypewriter runs open. Operate the RESET pushbutton on the local TH-22/TG. Now, the break-in alarms on both units stop and the local teletypewriter stops.</p> <p><i>Note.</i> Occasionally when the BOOST switch is operated, the increased transmitter power may cause the remote TH-22/TG, generating the break-in signal, to break-in on itself. This condition is indicated by the sounding of the break-in audio alarm and immediate running open of the teletypewriter associated with the TH-22/TG originating the break-in signal. To correct this condition operate the RESET switch of the remote TH-22/TG. Three conditions which could typically result from this action are as follows: (1) the remote teletypewriter continues typing a message which means that the break-in signal was not received by the local TH-22/TG (if this is the case, the remote TH-22/TG BREAK-IN switch must be operated again); (2) the remote teletypewriter runs open which means that the local TH-22/TG has received the break-in signal but that the local operator has not yet operated the RESET pushbutton; (3) the remote teletypewriter stops which means that the local TH-22/TG has generated a reset signal which now allows a message to be transmitted from the remote unit to the local unit.</p>	<p>a. Fig. 2-3.</p> <p>b. None.</p>

4-6. Cleaning

Inspect the exterior surfaces of the AN/TCC-29 units. The exterior surfaces should be clean, and free of dust, dirt, grease, and fungus.

a. Remove dust and loose dirt with a clean, lint free cloth or soft brush.

Warning: Cleaning compound is flammable

and its fumes are toxic. Provide adequate ventilation. **DO NOT** use near a flame.

b. Remove grease, fungus, and ground-in dirt from the cases; use a cloth dampened (not wet) with cleaning compound.

c. Clean the front panels with a soft, clean cloth.

Section II. ORGANIZATIONAL MAINTENANCE

4-7. Scope of Organizational Maintenance

a. Paragraphs 4-8 through 4-12 contain instructions covering organizational maintenance of the AN/TCC-29 and include instructions for performing preventive maintenance services and repair functions to be accomplished by the organizational repairman.

b. Organizational maintenance of the AN/TCC-29 consists of the following:

- (1) Preventive maintenance (paras 4-9 and 4-10).
- (2) Troubleshooting (para 4-11).
- (3) Repairs and adjustments (para 4-12).

4-8. Tools, Materials, and Test Equipment

a. *Tools.* Tool Equipment TE-123.

b. *Test Equipment.*

- (1) Multimeter AN/VRM-105.
- (2) Telephone Set TA-312/PT (field telephone).

c. *Materials.*

- (1) Cleaning compound (Federal Stock No. 7930-395-9542).
- (2) Lint free cloth.
- (3) Brush, paint 1/2 inch width (Federal Stock No. 8020-262-9084).

4-9. Organizational Preventive Maintenance

a. Preventive maintenance is the systematic care, inspection, and servicing of the equip-

ment to maintain it in serviceable condition, prevent breakdowns, and to assure operational capability. Preventive maintenance is the responsibility of all levels concerned with the equipment and includes the inspection, testing, and repair of the equipment parts that tests indicate would probably fail before the next scheduled periodic service. Preventive maintenance checks and services of the equipment at the organizational level are made at weekly and monthly intervals unless otherwise specified by the commanding officer. The preventive maintenance checks and services should be scheduled concurrently with the periodic services schedule of the carrying vehicle for all vehicular installations. When the equipment is a component of a major item (such as a van or shelter), the maintenance service and inspection procedures provided in the manual of the major item may be used.

b. Maintenance forms and records to be used and maintained on this equipment are specified in TM 38-750. All deficiencies or shortcomings will be recorded and those not corrected during inspection and service will be immediately reported to high level maintenance; use forms and procedures specified in TM 38-750.

c. Perform all services listed in the organizational monthly preventive maintenance checks and services chart (para 4-11) in the sequence listed. Perform the procedures indicated in the *Procedures* column. Refer to the appropriate references as indicated in the *References* column.

4-10. Weekly Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Chassis and case interior.	Clean all internal parts of the unit that are easily accessible.	Figs. 1-4 through 1-6 and 1-8 through 1-10.
2	Gaskets	Inspect waterproof gaskets for leaks and worn or loose edges. Gaskets must be clean, flexible, and in good condition.	Fig. 1-1.
3	Power cords, plugs, and line wire.	Inspect power cord and line wire for damaged insulation, especially at connecting points. Look for improper connections which strain the wires or connections. Wipe the power cords, plugs, and sockets with a clean, dry cloth.	Figs. 1-3 and 1-7.

Sequence No.	Item	Procedure	References
4	Fuses and fuse-holders.	Inspect fuse cap and fuse ends for burning, charring, and corrosion. Check fuseholder for cleanliness. Brush away all dirt and dust.	Figs. 1-3 and 1-7.
5	Mounting -----	Tighten loose nuts or bolts. Replace missing hardware as required.	Figs. 1-3 and 1-7.

4-11. Monthly Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Binding posts ---	Inspect the binding posts for dirt, rust, and corrosion. Clean the binding posts with a soft bristled brush.	Figs. 1-3, 1-7, and 1-11.
2	Capacitors and resistors.	Inspect for loose or corroded connections and for cracked or damaged insulation. Wipe off moisture with a clean, dry cloth.	Figs. 1-4 through 1-6, and 1-8 through 1-10.
3	Jacks and switches	Inspect the mechanical action of each switch and jack. Note the contact separation and see that the contacts close with a slight follow when the switch is operated. Inspect the mechanical action of each jack by inserting a plug. Inspect for dirt and corrosion on all exposed elements and contacts. Examine the contacts for dirt, pits, and buildups.	Figs. 1-3 and 1-7.
4	Wiring -----	Inspect for cracked, frayed, or torn insulation. Check for loose connections and dirty contacts. Tighten loose screw connections. Resolder loose or broken soldered connections. Clean all connections before reconnecting.	Figs. 1-4 through 1-6, and 1-8 through 1-10.

4-12. Troubleshooting

a. General. Troubleshooting of the AN/TCC-29 is based on the operational checks contained in the daily checks and services chart. To troubleshoot the AN/TCC-29, perform the operational checks (items 7 through 14) in the operators daily preventive maintenance checks and services chart (para (4-5)). If normal

operation is not obtained, refer to the items in the troubleshooting chart (*b* below). Perform the checks and corrective measures indicated in the chart. If the suggested corrective measure does not restore normal equipment operation, higher level maintenance is required. Note on the repair tag what corrective measures were taken.

b. Troubleshooting Chart.

Item No.	Trouble symptom	Probable trouble	Checks and corrective measures
7	TH-22/TG power indicator lamp does not light for 115/230 volt ac operation.	<i>a.</i> Defective fuse 1F2 (fig. 1-3) or improper seating of power cord plug. <i>b.</i> Defective power indicator lamp (fig. 1-3).	<i>a.</i> Check fuse (para 4-13), replace as necessary. If fuse is good, check seating of power cord plug. <i>b.</i> Replace power indicator lamp (para 4-13).
7	TH-22/TG power indicator lamp does not light for 26 volt dc operation.	<i>a.</i> Defective fuse 1F1 (fig. 1-3) or improper seating of connector at jack 1J5 (fig. 1-3). <i>b.</i> Defective power indicator lamp (fig. 1-3).	<i>a.</i> Check fuse, replace if necessary (para 4-13). If fuse is good, check seating of connector at jack 1J5. <i>b.</i> Replace power indicator lamp (para 4-13).

Item No.	Trouble symptom	Probable trouble	Checks and corrective measures
7	TH-22/TG power indicator lamp does light, fuses and indicators are not defective.	Defective power supply.	Connect negative lead of multimeter to a suitable ground. Connect positive lead of multimeter to inner conductor of jack 1J1 (fig. 1-3). Normal indication should be 130 volt dc. If trouble is not corrected, higher level repair is required.
10	TH-22/TG power indicator lamp lights; unit receives normally but does not transmit.	Incorrect voltages in transmit circuitry.	Place PC boards in the test position (para. 2-7a). Measure voltage at 1A1TP2 (fig. 1-4). Normal indication should be +18 volts dc. If voltage is not correct, higher level repair is required.
10	TH-22/TG functions normally except that break-in circuit does not operate even after BOOST switch is operated.	Incorrect voltages in break-in circuit.	Place PC boards in the test position (para 2-7a). Measure voltage at 1A2TP3 (fig. 1-4). Normal indication should be +18 volts dc. If voltage is not correct, higher level repair is required.
11	When operated, the RING switch does not produce an audible ring.	Bad ballast indicator 1DS3 (fig. 1-6).	Replace ballast indicator (fig. 1-6) (para 4-13).
8	CV-425/U POWER indicator does not light.	Defective fuse (3F1) (fig. 1-7).	Check power strapping of transformer 3T1 (fig. 1-9) for proper strapping (para 2-8). Check fuse (fig. 1-7); replace if necessary.
8	CV-425/U POWER ON indicator does not light.	a. Improper seating of power cable (fig. 1-7). b. Defective power indicator 3DS2, (fig. 1-7).	a. Check seating of power cable. b. Check indicator lamp (para 4-13).
8	CV-425/U POWER ON indicator does not light; fuses and indicators check OK.	Defective power supply.	Place PC boards in the test position (paras 2-7a through d). Measure voltage at 3A2TP3 (fig. 1-8). Normal indication should be minus 18 volts dc. If voltage is not correct, higher level repair is required.
12	The unit does not pass a ring signal.	Bad ballast indicator 3DS1 (fig. 1-10).	Replace indicator (para 4-13).

4-13. Repairs and Adjustments

a. *Replacement of Front Panel Lamps* (figs. 1-3 and 1-7). All front panel indicators should be replaced as follows:

- (1) Operate the ON-OFF switch to the OFF position.
- (2) Unscrew the lamp cover.
- (3) Remove lamp from lamp cover.
- (4) Replace lamp and lamp cover; and turn ON-OFF switch to the ON position.

b. *Replacement of Front Panel Fuses* (figs. 1-3 and 1-7). All fuses, which are located on the front panel, should be replaced as follows:

- (1) Operate the ON-OFF switch to the off position.
- (2) Depress and turn fuseholder cap counterclockwise and remove the fuseholder cap and fuse.
- (3) Remove the fuse from the fuseholder cap.

- (4) Insert a new fuse in the cap and replace fuseholder cap in the fuseholder base.

c. Replacement of Ballast Lamp (figs. 1-6 and 1-10). Replace ballast lamps in the TH-22/TG and CV-425/U as follows:

- (1) Turn the power ON-OFF switch to the OFF position.
- (2) Remove power cable from power source; remove all the connections from front panel of unit.
- (3) Obtain access to 1DS3 (fig. 1-6) or 3DS1 (fig. 1-10) on bottom of unit.
- (4) Twist the ballast lamp counterclockwise and remove ballast lamp from its socket. Insert a new ballast lamp in the socket.
- (5) Replace field wire and power cable connections.
- (6) Apply power to the unit.

d. Loop Current Adjustment.

- (1) When the loop current is supplied by the teletypewriter being used, proceed as follows:

- (a) Connect the multimeter (set to measure current) in series with the loop.
 - (b) Connect the teletypewriter receive plug to the TH-22/TG front panel EXT BAT jack.
 - (c) Adjust the loop current adjustment on the teletypewriter for a multimeter indicating 21 milliamperes.
- (2) When the loop current is supplied by the TH-22/TG, proceed as follows:
 - (a) Turn the power ON-OFF switch to the OFF position.
 - (b) Obtain access to the INT BAT LOOP CUR (1R12) adjustment on the bottom of the unit (fig. 1-6).
 - (c) Connect the teletypewriter receive plug to the TH-22/TG REC jack.
 - (d) Connect the multimeter (set to measure current) in series with the loop.
 - (e) Turn the power ON-OFF switch to the ON position.
 - (f) Adjust INT BAT LOOP CUR (1R12) (fig. 1-6) for a multimeter indication of 21 milliamperes.

CHAPTER 5 AUXILIARY EQUIPMENT

5-1. Purpose of Auxiliary Equipment

Although it is possible to install the AN/TCC-29 at a fixed location, it can also, with the use of mounting MT-791/U, be mounted in a vehicle.

5-2. Installation of AN/TCC-29

Components on Mounting MT-791/U

a. Set the tracks of the components to be

mounted into the grooves of the mounting. When the component is firmly in place, pull forward the locking handles on the front panel of the mounting. Four clamps, set in the grooves of the mounting, engage slots at the end of the tracks when the locking handles are pulled forward.

b. To remove the component from the mounting, push the locking handles backward, to disengage the four clamps.

CHAPTER 6

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

6-1. Disassembly of AN/TCC-29

a. Disassembly of TH-22/TG and CV-425/U.

- (1) Set the power ON-OFF switch to the OFF position.
- (2) Disconnect the power cord from the power source.
- (3) Disconnect all plugs and wires connected to the jacks and binding posts.
- (4) If the unit is vehicular-mounted, push the mounting's locking handles backward, to disengage the four locking clamps and remove the unit from the mounting.
- (5) Place the unit in its transit case, tighten the three 1/4-turn captive camlock fasteners (figs. 1-3 and 1-7).
- (6) Place the cover on front of the transit case and tighten the four spring-loaded latch assemblies to fasten the case cover to the transit case.

b. Disassembly of F-316/U.

- (1) Disconnect all wires from the binding posts.
- (2) If the unit is vehicular-mounted, push the mounting's locking handles backward to disengage the four locking clamps and remove the unit from the mounting.
- (3) Place the cover on the front of the transit case and tighten the four

spring-loaded latch assemblies to secure the case cover to the transit case.

6-2. Repacking

a. Packaging.

- (1) *Technical manuals.* Package the technical manuals within a bag fabricated from waterproof paper. Seal the seams with pressure-sensitive tape.
- (2) *Running spares.* Place the spare fuses in the clips provided inside the cover assemblies (fig. 1-1). Wrap each lamp securely within two layers of corrugated fiberboard; secure the fiberboard wrapping with gummed paper tape.
- (3) *Power cords and carrying slings.* Wind the power cords into coils that can be stored against the front panels; wrap the coils in corrugated fiberboard and secure them with gummed paper tape. Close and secure the cover assemblies and tighten the carrying slings; fold the slack ends of the carrying slings and secure them with cord or heavy string.

b. Packing.

- (1) *Running spares packages.* Wrap the TH-22/TG and CV-425/U spare lamp packages separately with waterproof wrapping paper. Seal the seams of each package with pressure-sensitive

tape and secure the packages to their respective unit (TH-22/TG or CV-425/U), with pressure-sensitive tape.

- (2) *Wrapping.* Wrap the TH-22/TG, CV-425/U, and F-316/U separately within fiberboard and secure each unit warpping with gummed paper tape. Lay the packaged technical manuals (a(1) above) on top of the associated packaged component and secure the package with pressure-sensitive tape. Place each package within a close-fitting bag fabricated of waterproof wrapping paper and seal the seams of the bag with pressure-sensitive tape.

- (3) *Shipping boxes.* When shipped as single units, shipping boxes are not required. When shipped in multiples of three units, fabricate a wooden box large enough to contain the three units snugly. Pack the units in the wooden box; use filler material as required.
- (4) *Strapping.* When packed for inter-theater shipment, apply steel strapping girthwise.
- (5) *Markings.* Mark each single unit or wooden box as prescribed in MIL-STD-129B and the pertinent instructions in the shipment directive.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

6-3. Authority for Demolition

Demolition of equipment will be accomplished only upon the order of the commander. The destruction procedure outlined in paragraph 27 will be used to prevent further use of the equipment.

6-4. Methods of Destruction

Use any or all of the following methods to destroy the equipment:

a. Smash. Smash the controls, tubes, switches, capacitors, coils, and transformers; use sledges, axes, handaxes, pickaxes, hammers, or crowbars.

b. Cut. Cut the power cables and slash the wiring on the terminal boards; use axes, handaxes, and machetes.

c. Burn. Burn the power cables, wiring, and technical manuals; use gasoline, kerosene, oil, flamethrowers, or incendiary grenades.

d. Bend. Bend the front panels, cases, and cover assemblies.

e. Explode. If explosives are necessary, use firearms, grenades, or TNT.

f. Dispose. Bury or scatter the destroyed parts in slit trenches, foxholes, or throw them into streams.

APPENDIX I REFERENCES

The following is a list of applicable references available to the operator and organizational maintenance personnel of Terminal, Telegraph-Telephone AN/TCC-29.

AR 310-25	Dictionary of United States Army Terms
AR 310-50	Authorized Abbreviations and Brevity Codes
AR 750-1	Army Materiel Maintenance Concepts and Policies
DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply Bulletins, and Lubrication Orders
SB 11-573	Painting and Preservation Supplies Available for Field Use For Electronics Command Equipment
SB 38-100	Preservation, Packaging, Packing and Marking Materials, Supplies, and Equipment Used by The Army
TM 11-6625-203-12	Operator and Organizational Maintenance Multimeter AN/URM-105, Including Multimeter ME-77/U
TM 38-750	The Army Maintenance Management System (TAMMS)

APPENDIX III

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

A3-1. General

a. This appendix assigns maintenance functions to be performed on components, assemblies, and subassemblies by the lowest appropriate maintenance category.

b. Column in the maintenance allocation chart are as follows:

- (1) *Part or components.* This column shows only the nomenclature or standard item name. Additional descriptive data are included only where clarification is necessary to identify the component. Components, assemblies, and subassemblies are listed in top-down order. That is, the assemblies which are part of a component are listed immediately below that component, and subassemblies which are part of an assembly are listed immediately below that assembly. Each generation breakdown (components, assemblies, or subassemblies) is listed in disassembly order or alphabetical order.
- (2) *Maintenance function.* This column indicates the various maintenance functions allocated to the categories.
 - (a) *Service.* To clean, to preserve, and to replenish lubricants.
 - (b) *Adjust.* To regulate periodically to prevent malfunction.
 - (c) *Inspect.* To verify serviceability and detect incipient electrical or mechanical failure by scrutiny.
 - (d) *Test.* To verify serviceability and to detect incipient electrical or mechanical failure by use of special equipment such as gages, meters, etc.
 - (e) *Replace.* To substitute serviceable components, assemblies, or subassemblies, for unserviceable components, assemblies, or subassemblies.
 - (f) *Repair.* To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes but is not limited to welding, grinding, riveting, straightening, and replacement of parts other than the trial and error replacement of running spare type items such as fuses, lamps, or electron tubes.
 - (g) *Align.* To adjust two or more components of an electrical system so that their functions are properly synchronized.
 - (h) *Calibrate.* To determine, check, or rectify the graduation of an instrument, weapon, or weapons system, or components of a weapons system.
 - (i) *Overhaul.* To restore an item to *completely serviceable* condition as prescribed by serviceability standards. This is accomplished through employment of the technique of "Inspect and Repair Only as Necessary" (IROAN). Maximum utilization of diagnostic and test equipment is combined with minimum disassembly of the item during the overhaul process.
 - (j) *Rebuild.* To restore an item to a standard as near as possible to original or new condition in appearance, performance and life expectancy. This is accomplished through the maintenance technique of com-

plete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements using original manufacturing tolerances and/or specifications, and subsequent reassembly of the item.

- (3) *Operator, organization, direct support, general support and depot.* The symbol X indicates the categories responsible for performing that particular maintenance operation, but does not necessarily indicate that repair parts will be stocked at that level. Categories higher than those marked by X are authorized to perform the indicated operation.
- (4) *Tools required.* This column indicates codes assigned to each individual tool equipment, test equipment, and maintenance equipment referenced. The grouping of codes in this column of the maintenance allocation chart indicates the tool, test, and maintenance equipment required to perform the maintenance function.

- (5) *Remarks.* Entries in this column will be utilized when necessary to clarify any of the data cited in the preceding columns:

c. Columns in the allocation of tools for maintenance functions are as follows:

- (1) *Tools required for maintenance functions.* This column lists tools, test, and maintenance equipment required to perform the maintenance functions.
- (2) *Operator, organization, direct support, general support, and depot.* The dagger (†) indicates the categories normally allocated the facility.
- (3) *Tool code.* This column lists the tool code assigned.

A3-2. Maintenance by Using Organizations

When this equipment is used by Signal services organizations organic to theater headquarters or communication zones to provide theater communications, those maintenance functions allocated up to and including general support are authorized to the organization operating this equipment.

SECTION II. MAINTENANCE ALLOCATION CHART

PART OR COMPONENT	MAINTENANCE FUNCTION	MAINTENANCE CATEGORY				TOOLS REQUIRED	REMARKS
		O/C	D	S	D		
TERMINAL, TELEGRAPH-TELEPHONE AN/TCC-29	service	X				10	Preventive Maintenance
	adjust	X				4,10 5,6,7	Operational (inside TH-22/TC) Loop and bias of TH-22/TC External of components Internal of components
	inspect	X				10	Operational
	test	X				4	Voltages, resistances and continuity of power supplies. Voltage and signal levels, relay operations, chassis mounted parts.
	repair	X		X		5,6,7,9 1,2,3,5,6,7,8,9,11,12 10	All tests Replace components and printed cards All repairs except printed cards
	align overhaul	X		X		11 2,3,5,6,7,12	All repairs Frequency and Oscillator of send circuit By component
	service	X				10	Preventive Maintenance
	inspect test	X				10 4	Operational Voltage, Resistances and continuity of power supply.
	replace repair	X		X		5,6,7,9 1,2,3,5,6,7,8,9,11,12	Voltage and signal levels, relay operation chassis mounted parts. All tests
	align overhaul	X		X		10 11 2,3,5,6,7,12 1,2,3,5,6,7,8,9,11,12	Replace printed cards All repairs except printed cards All repairs Oscillator of send circuit
RECEIVE CARD 1A1	test			X		5,6,7 5,6,7,9,11,12 10	Voltage and signal levels All tests
	replace repair	X		X		11	All tests
SEND CARD 1A2	test			X		5,6,7 5,6,7,9,11,12 10	Signal levels All tests
	replace repair	X		X		11	All tests
	align	X		X		2,3,5,6,7,12	Oscillator

PART OR COMPONENT	MAINTENANCE FUNCTION	MAINTENANCE CATEGORY				TOOLS REQUIRED	REMARKS
		O/C	O	DS	D		
FILTER ASSEMBLY F-316/U	service inspect test	X	X			3,7	Preventive Maintenance Operational Frequency Return to Direct Support for proof test
	replace		X				Preventive Maintenance
TERMINAL, TELEGRAPH TH-22/TG	service	X	X			10	Operational (on front panel)
	adjust	X	X			4,10 5,6,7 10	Operational (on inside) Loop and bias
	inspect test	X	X			4	Operational Voltage, resistance and continuity of power supply.
	replace repair		X	X		5,6,7,9	Voltage and signal levels - Chassis mounted parts. All tests
BREAK-IN DETECTOR CARD 1A2	replace repair	X	X			1,2,3,5,6,7,8,9,11,12	All tests
	align overhaul		X	X		10 11	Replace printed cards All repairs except printed cards
	test		X	X		2,3,5,6,7,12	All repairs
	replace repair		X	X		1,2,3,5,6,7,8,9,11,12	Frequency and oscillator of send circuit
RECEIVE CARD 1A3	test		X	X		5,6,7	Voltage and signal levels
	replace repair	X	X			5,6,7,9,11,12 10 11	All tests
SEND CARD 1A1	adjust test		X	X		5,6,7	Voltage and signal levels
	replace repair align	X	X			5,6,7,9,11,12 10 11	All tests Bias level (R9) Voltage and signal levels
			X	X		2,3,5,6,7,12	Oscillator and frequency

TOOLS REQUIRED FOR MAINTENANCE FUNCTIONS	MAINTENANCE CATEGORY				TOOL CODE	REMARKS
	O/C	D	S	G		
ATTENUATOR TS-402/U					1	
CAPACITOR, DECADE (FSW 6625-220-9441)					2	
MULTIMETER AN/URM-105					3	
MULTIMETER TS-352/U					4	
OSCILLOSCOPE AS/USM-81					6	
TEST SET TS-140/PCM					7	
TEST SET, TELETYPEWRITER AN/GCM-1					8	
TEST SET, TRANSISTOR TS-1836/U					9	
TOOL EQUIPMENT TE-123					10	
TOOL KIT, ELECTRONICS TK-105					11	
TERMINAL, TELEGRAPH-TELEPHONE AN/TCC-29					12	
						P/O AN/URM-2A
						Shop support only

APPENDIX IV ORGANIZATIONAL MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST

Section I. INTRODUCTION

A4-1. Scope

This appendix lists repair parts; special tools; and other support equipment required for performance of organizational maintenance of the AN/TCC-29. This appendix is current as of 1 December 1975.

A4-2. General

This Repair Parts and Special Tools list is divided into the following sections:

a. Section II - Repair Parts List. A list of repair parts authorized for use in performance of maintenance. The list also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending numerical sequence, with the parts in each group listed in figure and item number sequence.

b. Section III. Special Tools List. Not applicable.

c. Section IV - National Stock Number and Part Number Index. A list, in ascending National item identification number (NIIN, last seven digits) sequence, of all National stock numbers appearing in the listings, followed by a list, in alphameric sequence, of all part numbers appearing in the listings. National stock number and part numbers are cross-referenced to each illustration figure and item number appearance.

A4-3. Explanation of Columns

The following provides an explanation of columns found in the tabular listings:

a. Illustration. This column is divided as follows:

(1) *Figure number.* Indicates the figure number of the illustration in which the item is shown.

(2) *Item number.* The number used to identify each item called out in the illustration.

b. Source, Maintenance, and Recoverability Codes (SMR).

(1) *Source code.* Source codes are assigned to support items to indicate the manner of acquiring support items for maintenance, repair or overhaul of end items. Source codes are entered in the first and second positions of the Uniform SMR Code format as follows:

<i>Code</i>	<i>Definition</i>
PA	Item procured and stocked for anticipated or known usage.
PD	Support item, excluding support equipment, procured for initial issue or outfitting and stocked only for subsequent or additional initial issues or outfittings. Not subject to automatic replenishment.
XD	A support item that is not stocked. When required, item will be procured through normal supply channels.

NOTE

Cannibalization or salvage may be used as a source of supply for any items source codes above except those coded XA, XD, and aircraft support items as restricted by AR 700-42.

(2) *Maintenance code.* Maintenance codes are assigned to indicate the levels of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the Uniform SMR Code format as follows:

(a) The maintenance code entered in the third position will indicate the lowest maintenance level authorized to remove, replace and use the support item. The maintenance code entered in the third position will indicate one of the following levels of maintenance:

<i>Code</i>	<i>Application/Explanation</i>
O	Support item is removed, replaced, used at the organizational level.

(b) The maintenance code entered in the fourth position indicates whether the item is to be repaired and identifies the lowest maintenance level with the capability to perform complete repair (i.e., all authorized maintenance functions). This position will contain one of the following maintenance codes:

<i>Code</i>	<i>Application/Explanation</i>
H	The lowest maintenance level capable of complete repair of the support item is the general support level.
Z	Nonreparable. No repair is authorized.

(3) *Recoverability code.* Recoverability codes are assigned to support items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the Uniform

SMR Code format as follows:

<i>Codes</i>	<i>Definition</i>
Z	Nonreparable item. When unserviceable, condemn and dispose at the level indicated in position 3.
H	Reparable item. When uneconomically reparable, condemn and dispose at the general support level.

c. National Stock Number. Indicates the National stock number assigned to the item and will be used for requisitioning purposes.

d. Part Number. Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements, to identify an item or range of items.

NOTE

When a stock numbered item is requisitioned, the repair part received may have a different part number than the part being replaced.

e. Federal Supply Code for Manufacturer (FSCM). The FSCM is a 5-digit numeric code listed in SB 708-42 which is used to identify the manufacturer, distributor, or Government agency, etc.

f. Description. Indicates the Federal item name and, if required, a minimum description to identify the item.

g. Unit of Measure (U/M). Indicates the standard of the basic quantity of the listed item as used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr, etc). When the unit of measure differs from the unit of issue, the lowest unit of issue that will satisfy the required units of measure will be requisitioned.

h. Quantity Incorporated in Unit. Indicates the quantity of the item used in the breakout shown on

the illustration figure, which is prepared for a functional group, subfunctional group, or an assembly.

A4-4. Special Information

Not applicable.

A4-5. How to Locate Repair Parts

a. When National stock number or part number is unknown:

(1) *First.* Using the table of contents, determine the functional group within which the repair part belongs. This is necessary since illustrations are prepared for functional groups, and listings are divided into the same groups.

(2) *Second.* Find the illustration covering the functional group to which the repair part belongs.

(3) *Third.* Identify the repair part on the illustration and note the illustration figure and item number of the repair part.

(4) *Fourth.* Using the Repair Parts Listing, find the figure and item number noted on the illustration.

b. When National stock number or part number is known:

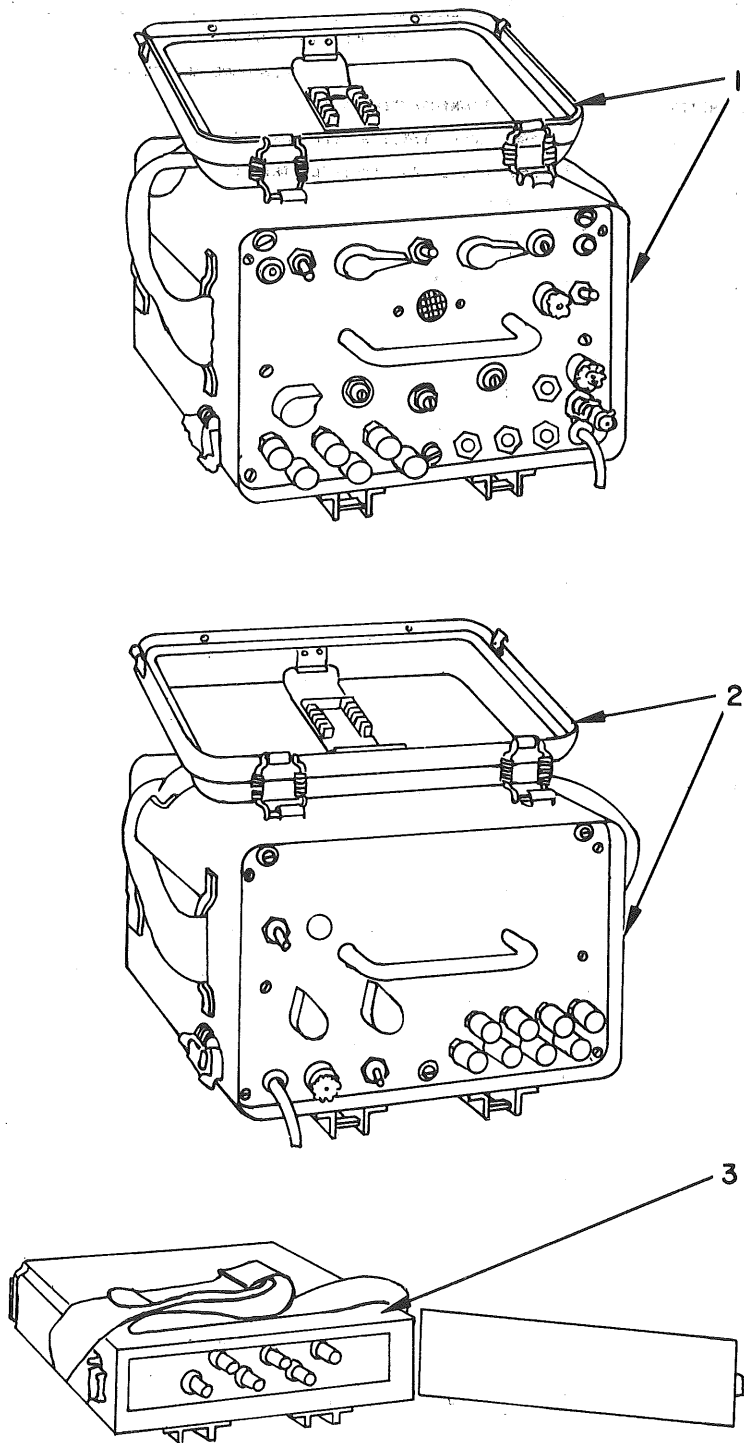
(1) *First.* Using the Index of National Stock Numbers and Part Numbers, find the pertinent National stock number or part number. This index is in ascending NIIN sequence followed by a list of part numbers in ascending alphameric sequence, cross-referenced to the illustration figure number and item number.

(2) *Second.* After finding the figure and item number, locate the figure and item number in the repair parts list.

A4-6. Abbreviations

Not applicable.

(Next printed page is A4-4.)



ELIKE001

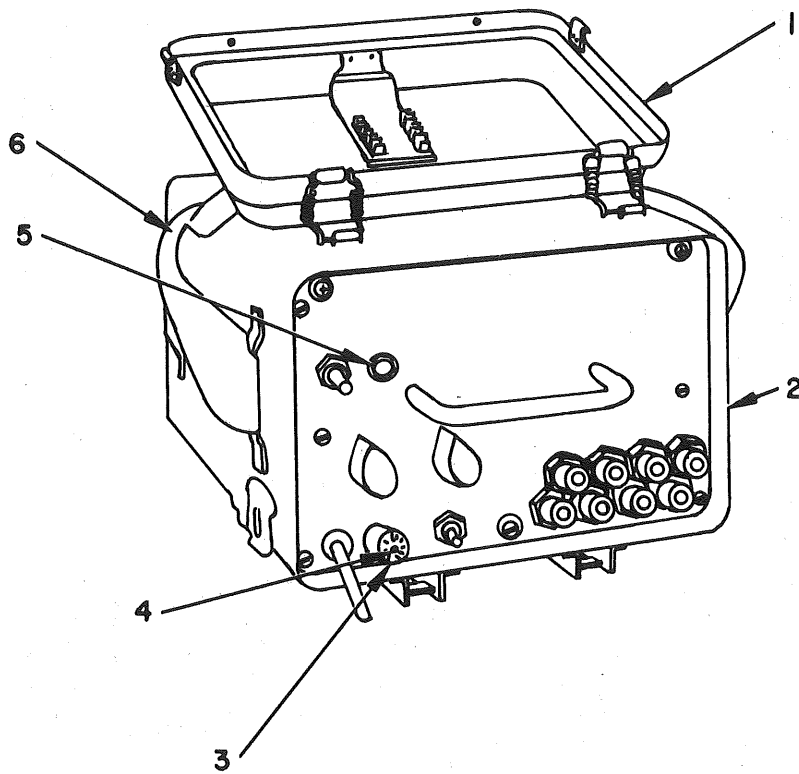
Figure 1. Terminal, Telegraph - Telephone AN/TCC-29.

SECTION II

TM11-5805-356-12

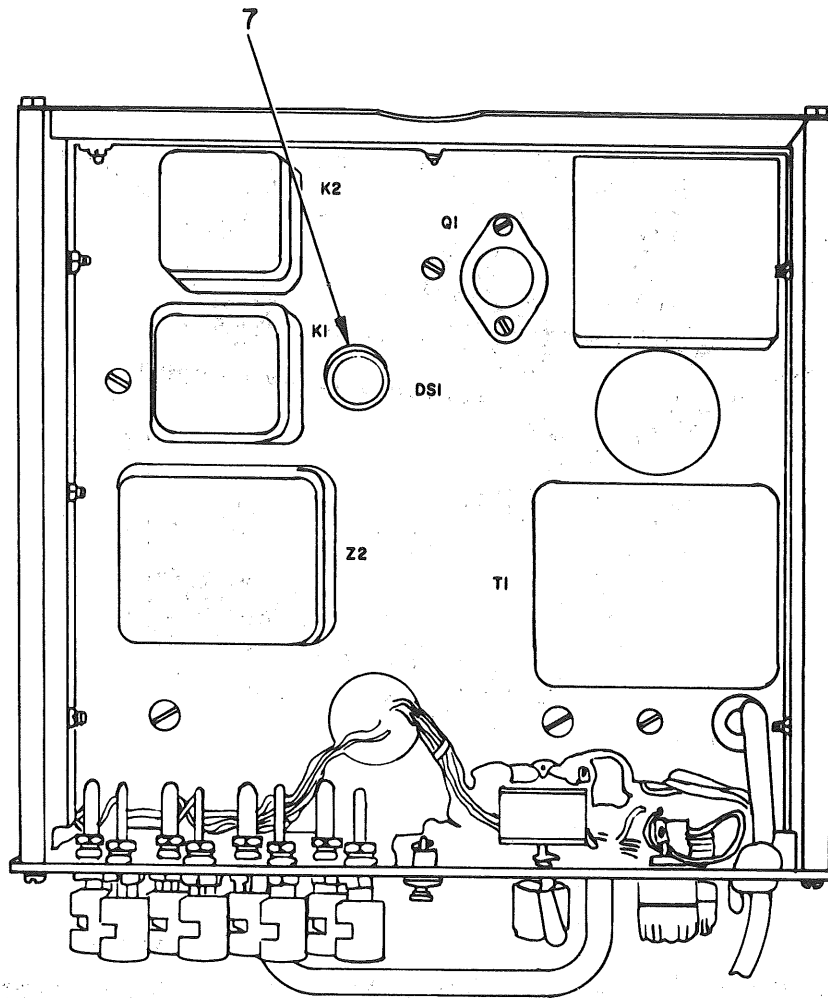
(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	FEDERAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION <i>USABLE ON CODE</i>	U/M	QTY INC IN UNIT
						GROUP 00 TERMINAL, TELEGRAPH- TELEPHONE AN/TCC-29		
1	1	PDOHH	5805-00-907-8300	TH22TG	80058	TERMINAL, TELEGRAPH	EA	1
1	2	PDOHH	5805-00-985-9088	CV425U	80058	CONVERTER, TLG TELEPHONE SIGNAL	EA	1
1	3	PAOZZ	5915-00-941-9779	F316U	80058	FILTER ASSEMBLY, ELECTRICAL	EA	1

A4-5, Change 5



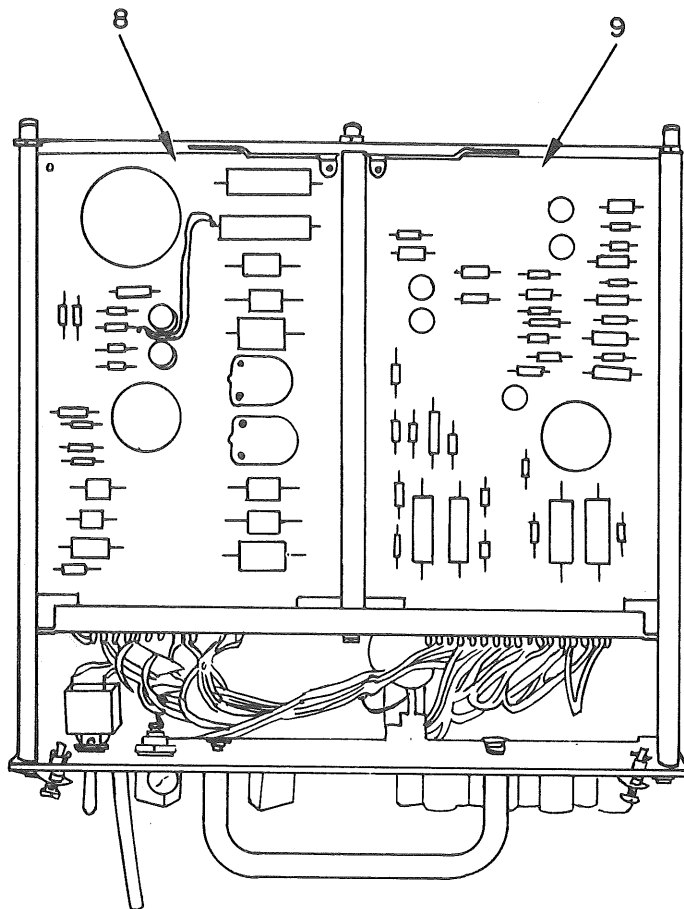
ELIKE002

Figure 2. Converter, Telegraph - Telephone Signal CV-425/U (Sheet 1 of 3).



ELIKE003

Figure 2. Converter, Telegraph - Telephone Signal CV-425/U (Sheet 2 of 3).

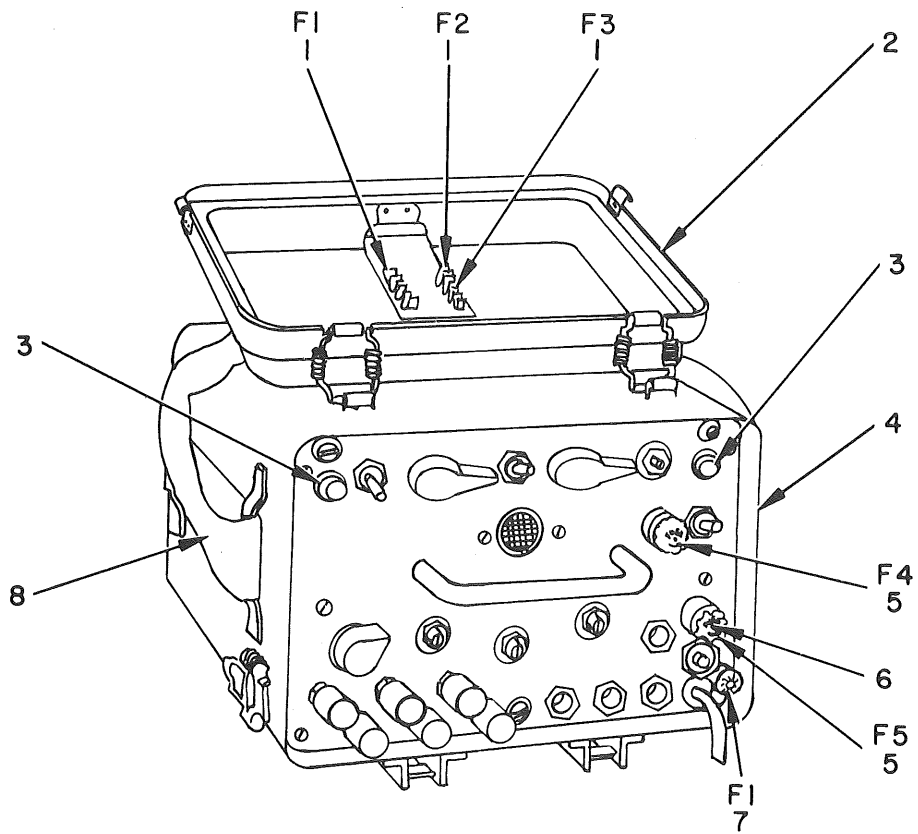


ELIKE004

Figure 2. Converter, Telegraph - Telephone Signal CV-425/U (Sheet 3 of 3).

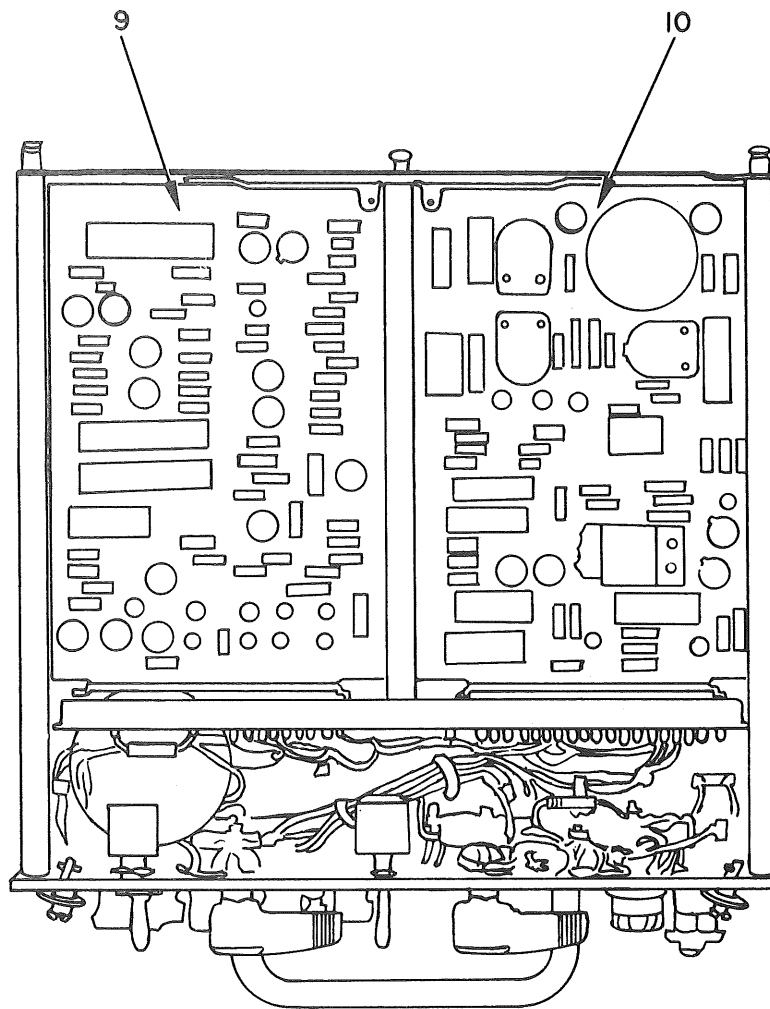
(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	FEDERAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION <i>USABLE ON CODE</i>	U/M	QTY INC IN UNIT
						GROUP 01 CONVERTER, TELEGRAPH- TELEPHONE SIGNAL CV-425/U		
2	1	PA0HH	5805-00-999-5031	SCC98314GR3	80063	COVER ASSEMBLY	EA	1
2	2	PA0HH	5805-00-999-5034	SMD98003GR3	80063	CASE, ELEC, EQUIPMENT, CABINET	EA	1
2	3	PA0ZZ	5920-00-281-0224	F02A250V1-2AS	81349	FUSE, CARTRIDGE	EA	1
2	4	X00ZZ		34200HSA2	80063	CAP, ELECTRICAL	EA	1
2	5	PA0ZZ	6240-00-155-7836	MS25237	96906	LAMP, INCANDESCENT	EA	1
2	6	PA0ZZ	5340-00-356-4895	SCB983168	80063	STRAP, WEBBING	EA	1
2	7	PA0ZZ	6240-00-143-3060	MS15567-1	96906	LAMP, INCANDESCENT	EA	1
2	8	PA0HH	5805-00-999-5033	D80032020	96238	SEND CARD	EA	1
2	9	PA0HH	5805-00-999-5035	D80032010	96238	RECEIVE CARD	EA	1

A4-9/(A4-10 blank) Change 5



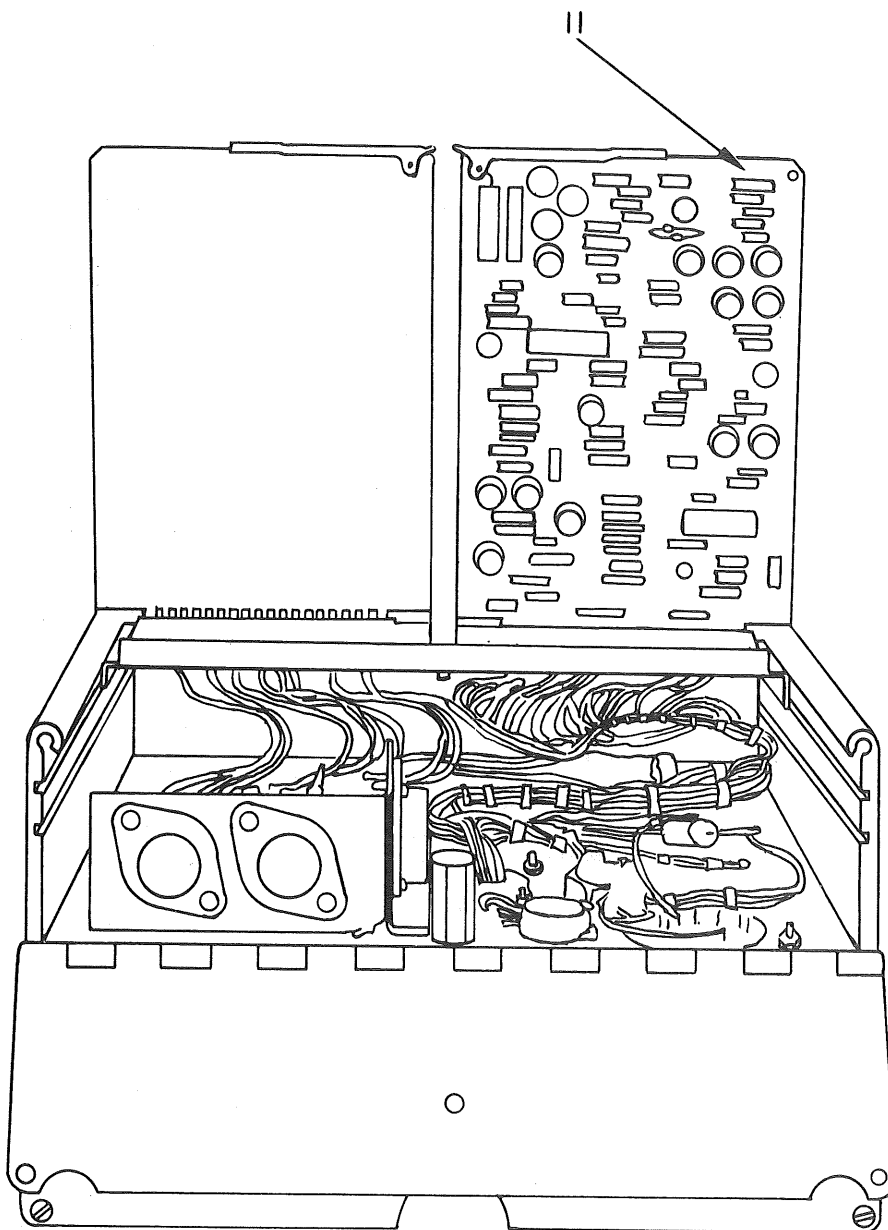
ELIKE005

Figure 3. Terminal, Telegraph TH-22/G (Sheet 1 of 4).



ELIKE006

Figure 3. Terminal, Telegraph TH-22/G (Sheet 2 of 4).



ELIKE007

Figure 3. Terminal, Telegraph TH-22/G (Sheet 3 of 4).

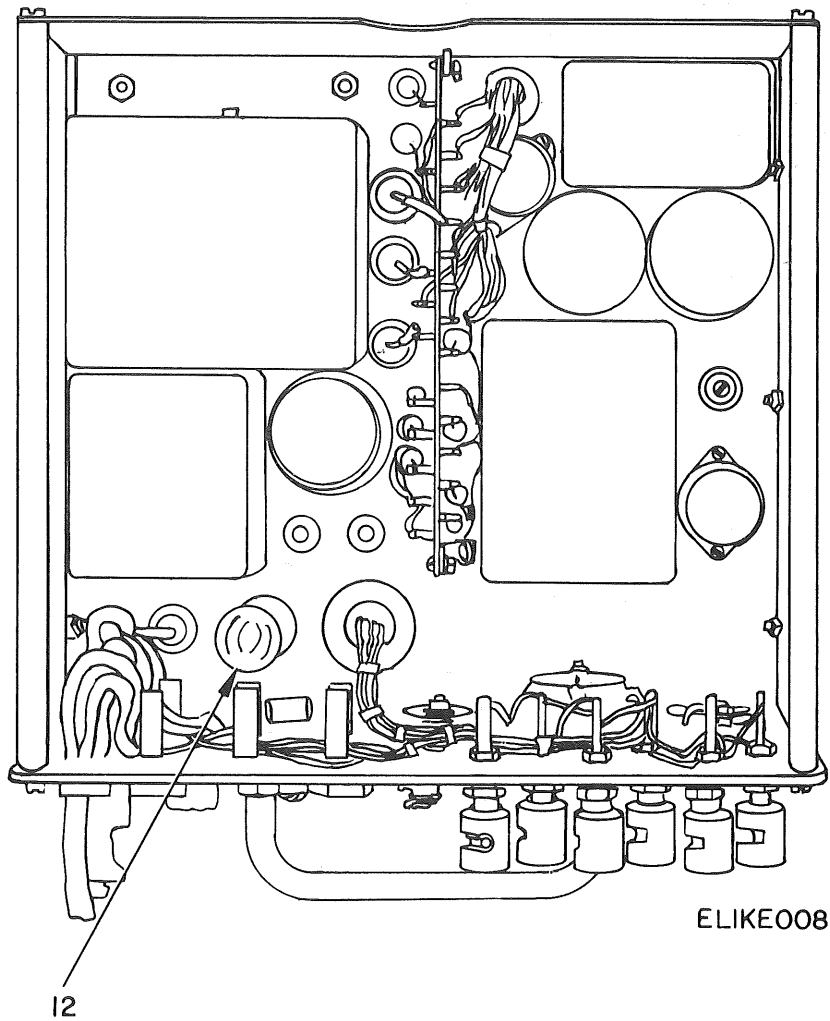


Figure 3. Terminal, Telegraph TH-22/G (Sheet 4 of 4).

SECTION II

TM11-5805-356-12

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8)
(a) FIG NO.	(b) ITEM NO.	SMR CODE	FEDERAL STOCK NUMBER	PART NUMBER	FSCM	DESCRIPTION <i>USABLE ON CODE</i>	U/M	QTY INC IN UNIT
						GROUP 02 TERMINAL, TELEGRAPH TH-22/TG		
3	1	PAOZZ	5920-00-474-6125	F02A250V2AS	81349	FUSE, CARTRIDGE	EA	3
3	2	PAOHH	5805-00-999-5031	SCC98314GR4	80063	COVER ASSEMBLY	EA	1
3	3	PAOZZ	6240-00-155-7836	MS25237	96906	LAMP, INCANDESCENT	EA	2
3	4	PAOHH	5805-00-999-5028	SCD98303GR4	80063	CASE, ELEC, EQUIPMENT, CABINET	EA	1
3	5	PAOZZ	5920-00-280-5031	F02A250V1-4AS	81349	FUSE, CARTRIDGE	EA	2
3	6	XDOZZ		34200HSA2	80063	CAP, ELECTRICAL	EA	2
3	7	PAOZZ	5920-00-474-6125	F02A250V2AS	81349	FUSE, CARTRIDGE	EA	1
3	8	PAOZZ	5340-00-356-4895	SCB983168	80063	STRAP, WEBBING	EA	1
3	9	PAOHH	5805-00-999-5030	D80030010	96238	BREAK IN DETECTOR CARD	EA	1
3	10	PAOHH	5805-00-999-5029	D80030030	96238	SEND CARD	EA	1
3	11	PAOHH	5805-00-999-5032	D80030020	96238	RECEIVE CARD	EA	1
3	12	PAOZZ	6240-00-143-3060	MS15567-1	96906	LAMP, INCANDESCENT	EA	1

A4-15 Change 5

SECTION IV

NATIONAL STOCK NUMBER AND PART NUMBER INDEX

TH11-5805-356-12

STOCK NUMBER	FIGURE NO.	ITEM NO.	STOCK NUMBER	FIGURE NO.	ITEM NO.
6240-00-143-3060	2	7	5915-00-941-9779	1	3
6240-00-143-3060	3	12	5805-00-985-9088	1	2
6240-00-155-7836	2	5	5805-00-999-5028	3	4
6240-00-155-7836	3	3	5805-00-999-5029	3	10
5920-00-280-5031	3	5	5805-00-999-5030	3	9
5920-00-281-0224	2	3	5805-00-999-5031	2	1
5340-00-356-4895	2	6	5805-00-999-5031	3	2
5340-00-356-4895	3	8	5805-00-999-5032	3	11
5920-00-474-6125	3	1	5805-00-999-5033	2	8
5920-00-474-6125	3	7	5805-00-999-5034	2	2
5805-00-907-8300	1	1	5805-00-999-5035	2	9

PART NUMBER	FSCM	FIG. NO.	ITEM NO.	PART NUMBER	FSCM	FIG. NO.	ITEM NO.
CV425U	80058	1	2	MS15567-1	96906	3	12
D80030010	96238	3	9	MS25237	96906	2	5
D80030020	96238	3	11	MS25237	96906	3	3
D80030030	96238	3	10	SCB983168	80063	2	6
D80032010	96238	2	9	SCB983168	80063	3	8
D80032020	96238	2	8	SCC98314GR3	80063	2	1
F02A250V1-2AS	81349	2	3	SCC98314GR4	80063	3	2
F02A250V1-4AS	81349	3	5	SCD98303GR4	80063	3	4
F02A250V2AS	81349	3	1	SMD98003GR3	80063	2	2
F02A250V2AS	81349	3	7	TH22TG	80058	1	1
F316U	80058	1	3	34200HSA2	80063	2	4
MS15567-1	96906	2	7	34200HSA2	80063	3	6

By Order of the Secretary of the Army

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:

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

Distribution:

Active Army:

USASA (2)
CNGB (1)
CC-E (7)
Dir of Trans (1)
CofEngrs (1)
TSG (1)
CofSptS (1)
USAAESWBD (5)
USACDCEA (1)
USACDCCBRA (1)
USACDCCEA (1)
USACDCCEA
Ft Huachuca (1)
USACDCOA (1)
USACDCQMA (1)
USACDCTA (1)
USACDCADA (1)
USACDCARMA (1)
USACDCAVNA (1)
USACDCARTYA (1)
USACDCSWA (1)
USAMC (5)
USCONARC (5)
ARADCOM (5)
ARADCOM Rgn (2)
OS Maj Comd (4)
LOGCOMD (2)
USAMICOM (4)
USASMC (2)
USASCC (4)
MDW (1)
Armies (2)
Corps (2)
USAC (3)
Div (5)
BG (5)
Svc Colleges (2)
Br Svc Sch (2) except
USASCS (25)
USASESCS (25)
USATC AD (2)
USATC Armor (2)
USATC Engr (2)
USATC Inf (2)

USASTC (2)
WRAMC (1)
Army Pic Cen (2)
USACDCEC (10)
Instl (2) except
Ft Monmouth (70)
Ft Hancock (4)
Ft Gordon (10)
Ft Huachuca (10)
WSMR (5)
Ft Carson (25)
Ft Knox (12)
Army Dep (2) except
LBAD (14)
SAAD (30)
TOAD (14)
FTWOAD (10)
LEAD (7)
SHAD (3)
NAAD (5)
SVAD (5)
CHAD (3)
ATAD (10)
GENDEP (OS) (2)
Sig Sec, GENDEP (OS) (5)
Sig Dep (OS) (12)
Sig Fld Maint Shops (2)
AMS (1)
USAERDAA (2)
USAERDAW (13)
USACRREL (2)
Units org under fol TOE:
5-52 (2)
6-555 (2)
6-557 (2)
9-367 (2)
11-57 (2)
11-97 (2)
11-98 (2)
11-117 (2)
11-127 (2)
11-155 (2)
11-157 (2)
11-158 (2)
11-500 AA-AC (2)
11-587 (2)
11-592 (2)
11-597 (2)
19-55 (2)
19-56 (2)
19-256 (2)
55-201 (2)
55-202 (2)

NG: State AG (3).

USAR: None.

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



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