NAVSHIPS 96028 *(Non-Registered)*

TECHNICAL MANUAL

for

TELEGRAPH TERMINAL AN/UCC-1A(V)

DEPARTMENT OF THE NAVY
BUREAU OF SHIPS

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LIST OF EFFECTIVE PAGES

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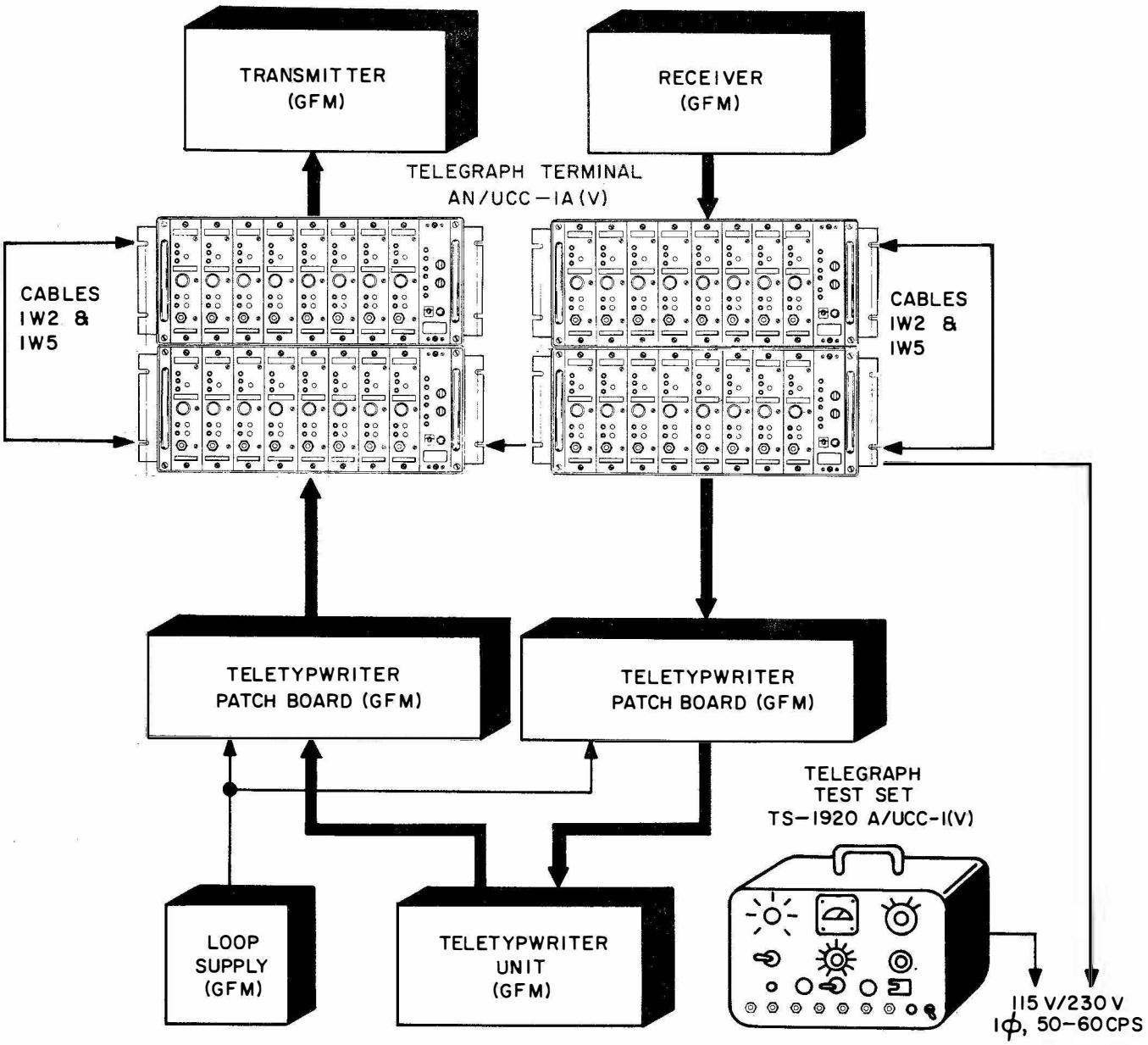


Figure 1-1. Telegraph Terminal AN/UCC-1A(V), Relationship of Units

SECTION 1

GENERAL INFORMATION

1-1. SCOPE.

This manual provides installation, operation, troubleshooting and maintenance procedures and a parts list for Telegraph Terminal AN/UCC-1A(V), hereafter referred to as the Telegraph Terminal (see figure 1-1). This technical manual is in effect upon receipt. Extracts from this publication may be made to facilitate the preparation of other Department of Defense publications.

1-2. GENERAL DESCRIPTION.

a. The Telegraph Terminal is a modular carrier-telegraph equipment intended for use with single or twin sideband radio circuits, voice frequency wire lines, or microwave circuits.

b. The Telegraph Terminal comprises the following equipment:

(1) Cabinet, Electrical Equipment, CY-3956/UCC-1(V)
(2) Keyer, Frequency Shift, KY-490A(P)/UCC-1(V)
(3) Converter, Frequency Shift, CV-1522A(P)/UCC-1(V)
(4) Control-Attenuator, C-4702A/UCC-1(V)
(5) Test Set, Telegraph, TS-1920A/UCC-1(V)

c. Equipment quantities are determined by installation requirements except for item (5) which is required once at each installation. Items (2), (3), and (4) are plug-in components that mount in item (1). Item (5) is a self contained unit.

d. The Telegraph Terminal may be used in the following configurations:

(1) Operation with up to 16 narrow band modules with a 375 to 3025 cps bandwidth.
(2) Operation with up to four wide band modules with a 1870 to 3315 cps bandwidth.
(3) Operation as a non-diversity, frequency-diversity, or rf-diversity system.

e. The Telegraph Terminal incorporates special testing equipment required for aligning its keying and converting circuitry.

1-3. DESCRIPTION OF UNITS.

a. CABINET, ELECTRICAL EQUIPMENT, CY-3956/UCC-1(V), (see figure 1-2). Each Cabinet used in the equipment houses one Control-Attenuator C-4702A/UCC-1(V), and eight Frequency Shift Keyers KY-490A(P)/UCC-1(V) or eight Frequency Shift Converters CV-1522A (P)/UCC-1(V) (or any combination, totaling eight, of the latter two components). Voice-frequency input and output transformers are mounted on the Cabinet. The L brackets supplied with the Cabinet allow standard 19-inch relay rack installation. Cabinet interconnector wiring permits diversity combinations and connection of voice-frequency circuits to individual or parallel composite lines by means of switch settings on the plug-in units.

b. KEYER, FREQUENCY SHIFT, KY-490A(P)/UCC-1(V), (see figure 1-3). Each Keyer accepts dc telegraph signals from an external loop, and supplies the appropriate voice-frequency mark/space frequency-shift output signal. Keyer switches may be set to:

(1) allow 60 or 20 ma loop operation.
(2) allow neutral or polar-loop operation.
(3) provide normal or reversed voice-frequency signal sense.
(4) place the output signal on an individual output line or on the composite output line.
(5) enable interconnection of two Keyers, to form a frequency-diversity pair so that a single dc-telegraph input produces outputs at two different voice frequencies.

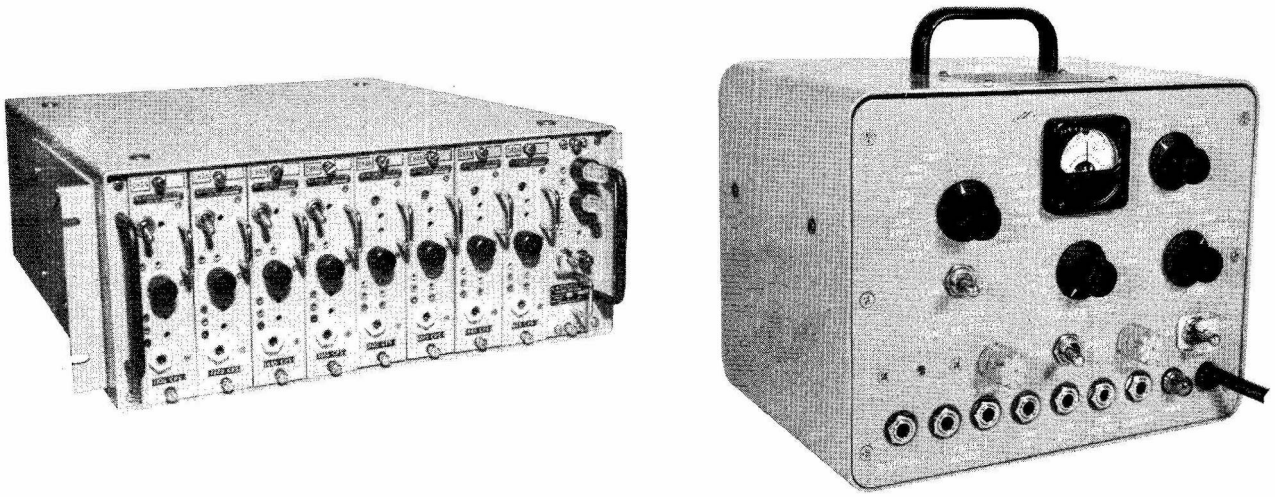


Figure 1-2. Telegraph Terminal AN/UCC-1A(V)

The Keyer has its own power supply; all active Keyer components are contained on a plug-in printed-circuit card that is interchangeable with cards of other Keyers.

c. CONVERTER, FREQUENCY SHIFT, CV-1522A(P)/UCC-1(V), (see figure 1-3). Each Converter accepts a particular frequency-shift voice-frequency signal, and produces an electronic keying signal for operation of a dc-telegraph loop. Switch settings allow the voice-frequency input to be obtained from either the composite line or an individual line, and allow connection of either two or four Converters to form diversity combinations. The Converter has its own power supply; all active Converter components are contained on a plug-in printed-circuit card that is interchangeable with cards of other Converters.

d. CONTROL-ATTENUATOR, C-4702A/UCC-1(V) (see figure 1-3). AC power for the Telegraph Terminal cabinet is fused and switched at the Control-Attenuator front panel. The unit also has switches that permit selection of the cabinet mode of operation (master or slave) and connection of the cabinet composite voice-frequency lines to the connectors at the rear of the cabinet.

e. TEST SET, TELEGRAPH, TS-1920A/UCC-1(V) (see figure 1-2). This unit is used for alignment and test of other Telegraph Terminal units. It provides facilities for tone level measurement, loop current measurement, reversals generation (75 or 150 baud), phase distortion measurement, audible signal tracing, and fsk tone generation. The Test Set contains a panel mounted dc microammeter with associated switch, a delay adjustment network to equalize the phase delay in individual channels of a receive diversity combination, an audio amplifier and speaker that gives an audible indication of the vf signal, a dot generator that provides electronic keying signals at rates of 75 and 150 baud for alignment of narrow or wide band keyers, and a tone generator which provides 20 mark and 20 space tones for alignment of the narrow and wide band converters.

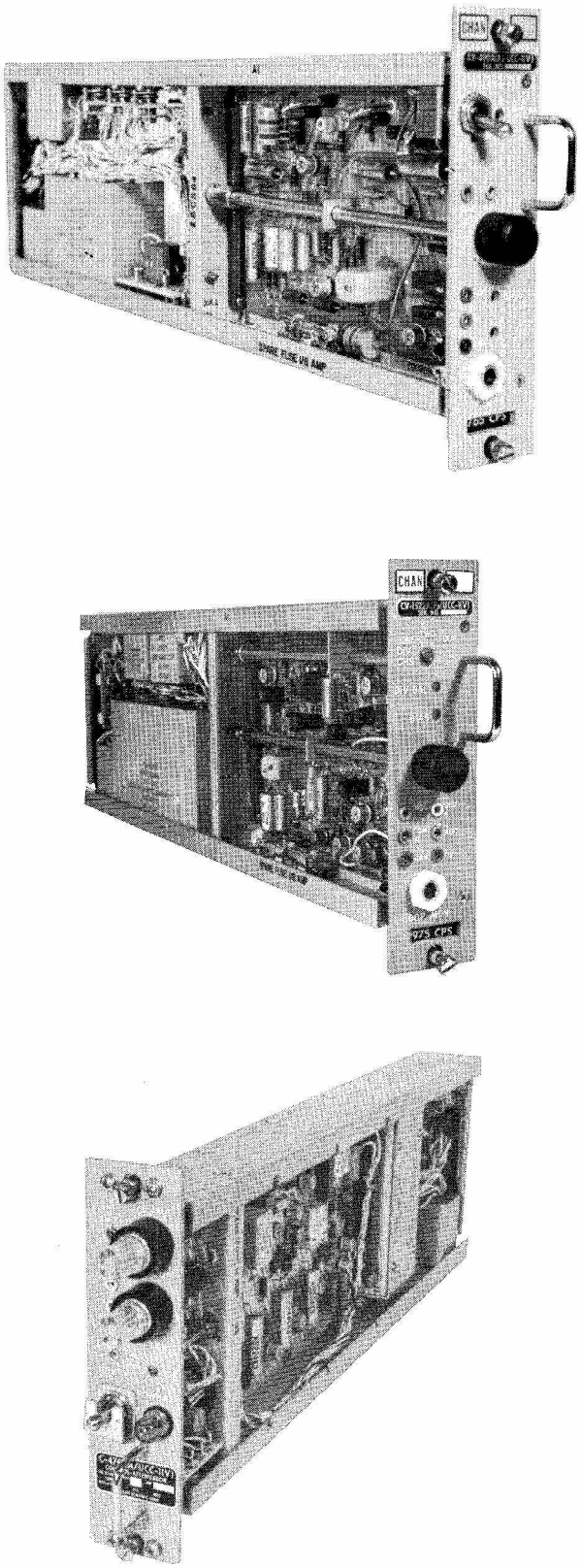


Figure 1-3. Keyer, Frequency Shift, KY-490A(P)/UCC-1(V); Converter, Frequency Shift, CV-1522A(P)/UCC-1(V); and Control-Attenuator, C-4702A/UCC-1(V)

1-4. TYPICAL TERMINAL CONFIGURATIONS.

Typical terminal configurations using the Telegraph Terminal units are illustrated in figures 1-4 and 1-5.

a. Figure 1-4 shows a 16-channel space-diversity or RF-diversity terminal comprising 16 Keyers and 32 Converters (operating in a full-duplex mode) housed in 6 Cabinets. The 16-channel space-diversity or RF-diversity terminal occupies 42 inches of vertical space.

b. Figure 1-5 shows a 16-channel non-diversity full-duplex terminal comprising 16 Keyers and 16 Converters housed in 4 Cabinets. The 16-channel non-diversity terminal occupies 28 inches of vertical space.

1-5. TYPICAL SYSTEM CONFIGURATIONS.

Typical system configurations that can be established using Telegraph Terminal units are illustrated in figures 1-6 through 1-8.

a. Figure 1-6 shows an 8-channel frequency-diversity, space-diversity system configuration.

(1) At the transmitter site, signals from 8 telegraph loops are applied to 8 frequency-diversity Keyer pairs housed in 2 Cabinets. The composite 16-tone output (8 frequency-diversity pairs) is applied to the radio transmitter and sent over a radio link.

(2) At the receiver end, 2 radio receivers, arranged for space-diversity operation, are used to receive the radio signals, in order to obtain improved reception should fading exist at either one of the radio-receiver locations. Each diversity group comprises 2 frequency-diversity pairs of Converters, one pair per radio receiver. The outputs of the four Converters are compared and are used to key one telegraph loop. Thus, 32 Converters housed in four cabinets are used at the receiving end of the radio link.

b. Figure 1-7 shows a 6-channel frequency-diversity full-duplex system. At each end of the link, 12 Keyers and 12 Converters are housed in 3 Cabinets. One Cabinet houses 8 Keyers, a second houses 4 Keyers and 4 Converters, and a third houses 8 Converters.

c. Figure 1-8 shows a 4-channel frequency-diversity, RF-diversity system.

(1) At the transmitting end of the system, 8 Keyers, housed in a Cabinet, are arranged to obtain 4 frequency-diversity pairs. The composite 8-tone output is coupled through a patch panel to radio transmitters A and B, which broadcast the information to radio receivers A and B, respectively. The radio transmitters and receivers operate on two different frequencies (designated "A" and "B"), thus obtaining the system's RF-diversity. RF-diversity operation assures good results in the presence of fading at either one of the RF signal frequencies.

(2) At the receiving station, 16 Converters, housed in 2 Cabinets, are arranged to obtain four 4-channel frequency-diversity combinations. Each frequency-diversity channel comprises two frequency-diversity pairs, one operated by each of the radio receivers. The outputs of each of the 4-channel frequency-diversity combinations key a single dc telegraph loop.

1-6. REFERENCE DATA.

a. KEYING RATE.	
(1) Narrow-band module	75 bauds (nominal)
b. FREQUENCY STABILITY (under all operating and environmental conditions).	± 3 cps for both mark and space frequencies on all channels
c. TELEGRAPH LOOPS.	
(1) Types of signals	
(a) Receive loops	Neutral
(b) Send loops	Neutral or Polar
(2) Loop current	
(a) Neutral	20 or 60 ma
(b) Polar	10 or 30 ma

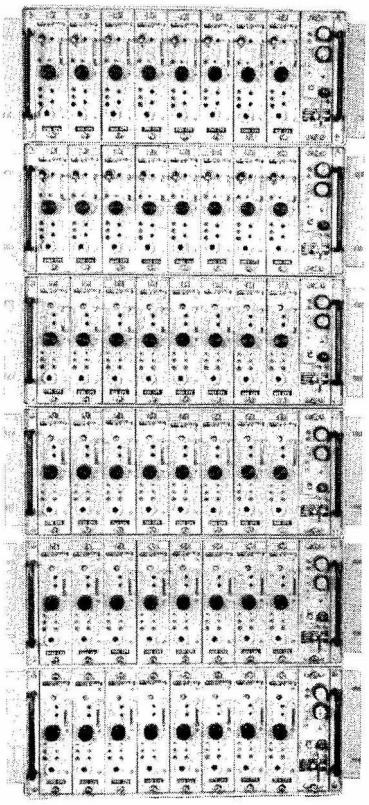


Figure 1-4. 16 Channel Space-Diversity or RF Diversity Terminal

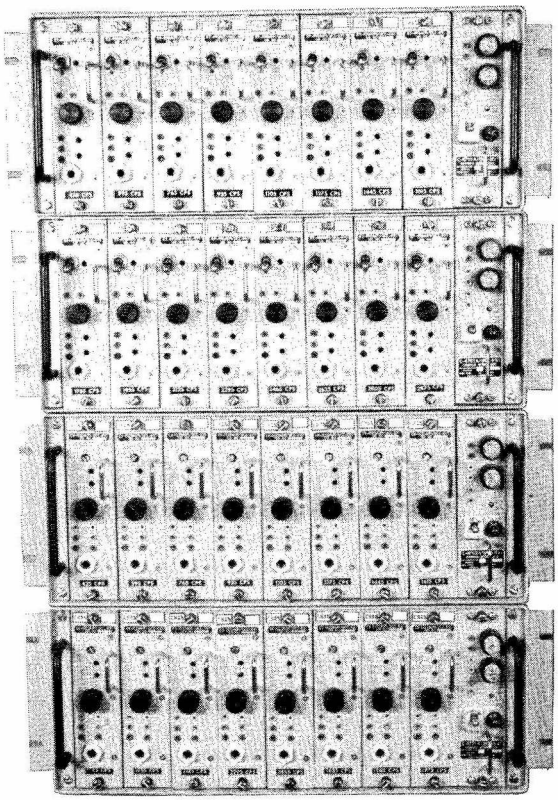


Figure 1-5. 16 Channel Non-Diversity Terminal

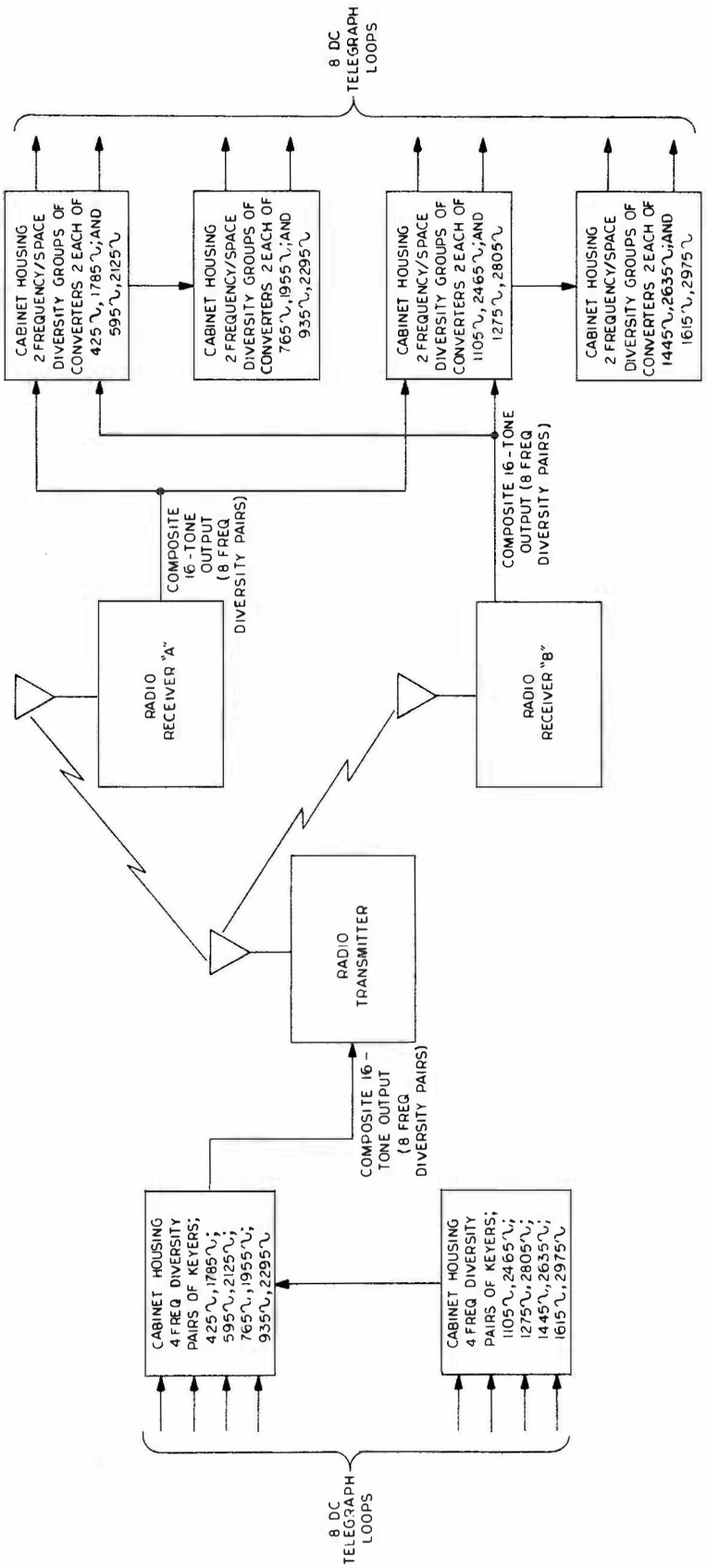


Figure 1-6. 8 Channel Frequency Diversity/Space Diversity System

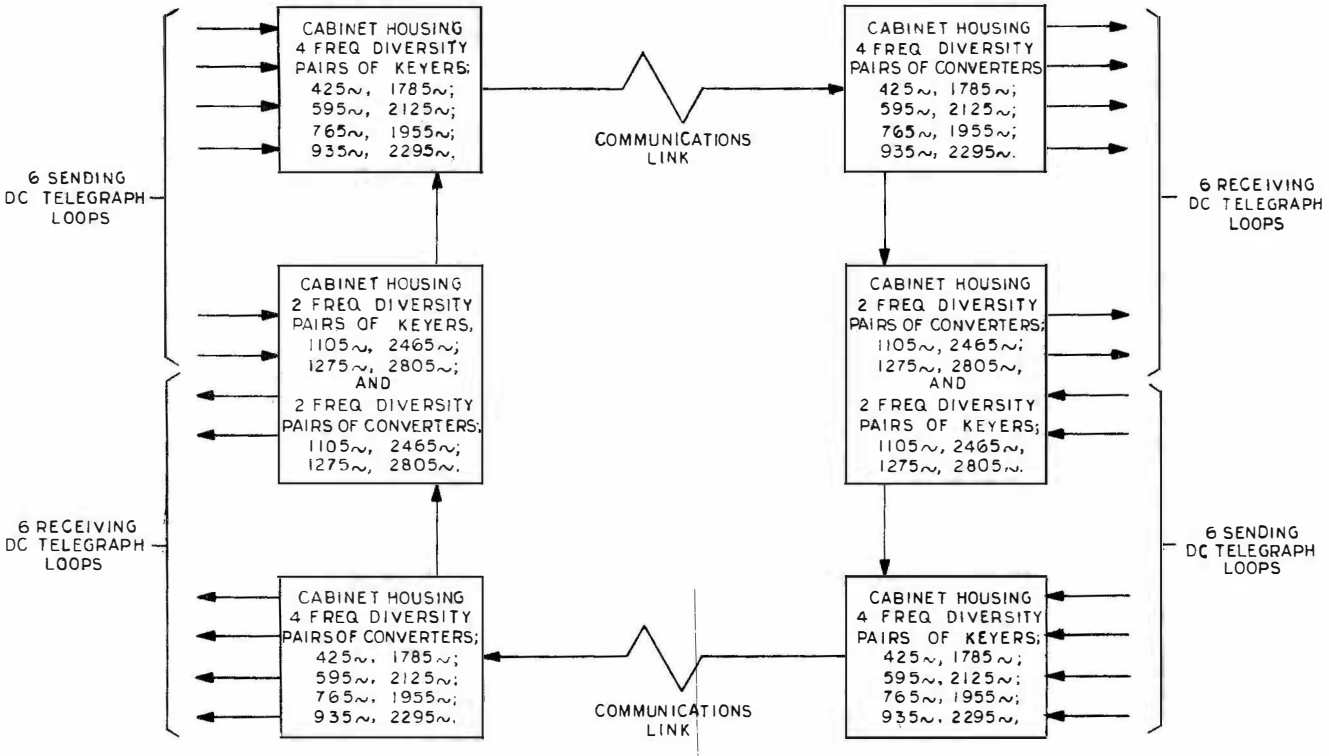


Figure 1-7. 6 Channel Frequency Diversity System

(3) Loop battery	120 volts dc supplied from loop
d. KEYER.	
(1) Number of modules per Cabinet	8
(2) Input resistance	
(a) 20 or 30 ma loop	300 ohms
(b) 60 ma loop	100 ohms
(3) Output impedance	600 ohms, ungrounded, center-tapped
(4) Individual output levels	-24 to +6 dbm, continuously adjustable
e. CONVERTER.	
(1) Number of modules per Cabinet	8
(2) Input impedance	600 ohms, ungrounded, center-tapped
(3) Input levels	
(a) Maximum	+10 dbm
(b) Minimum	-40 dbm
(4) Output resistance	540 ohms
(5) Phase distortion	0.2 ms maximum
(6) Phase distortion control	0-5 ms delay, continuously variable
f. CONTROL-ATTENUATOR.	
(1) Input and output impedance	600 ohms ct ungrounded
(2) Input level	
(a) Maximum	+18 dbm
(b) Minimum	-24 dbm
(3) Output level	-38 dbm to +6 dbm continuously variable
g. POWER REQUIREMENTS.	
(1) Type	
(a) Voltage	115/230 $\pm$ 10%

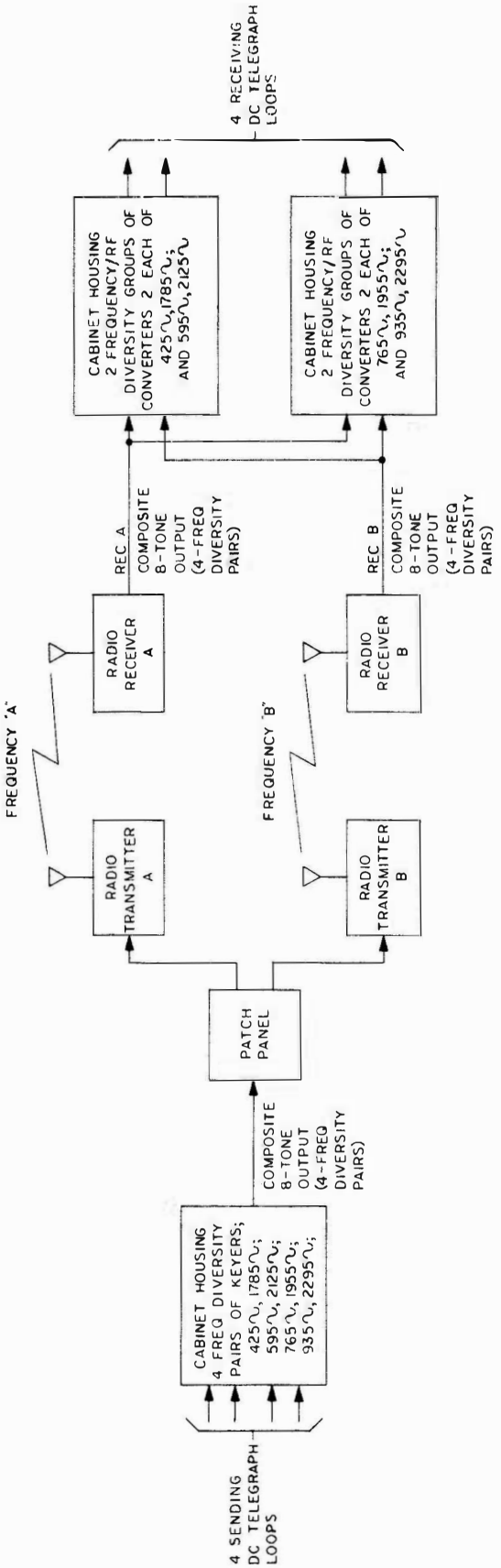


Figure 1-8. 4 Channel Frequency Diversity/RF Diversity System

(b) Frequency 50 to 60 cps ± 5%
(c) Phase Single

(2) Power consumption
(a) Keyer 2 watts
(b) Converter 3 watts
(c) Control-Attenuator 1 watt
(d) Test Set 14.5 watts

h. FSK TONE FREQUENCIES. Table 1-1 lists the tone frequencies of the Telegraph Terminal. Table 1-2 lists the frequency-diversity combinations.

TABLE 1-1. FSK TONE FREQUENCIES*

CENTER FREQUENCY CPS	MARK FREQUENCY CPS	SPACE FREQUENCY CPS
425	467.5	382.5
595	637.5	552.5
765	807.5	722.5
935	977.5	892.5
1105	1147.5	1062.5
1275	1317.5	1232.5
1445	1487.5	1402.5
1615	1657.5	1572.5
1785	1827.5	1742.5
1955	1997.5	1912.5
2125	2167.5	2082.5
2295	2337.5	2252.5
2465	2507.5	2422.5
2635	2677.5	2592.5
2805	2847.5	2762.5
2975	3017.5	2932.5
**1955	2040	1870
**2380	2465	2295
**2805	2890	2720
**3230	3315	3145

*SIGNAL SENSE switch in NORMAL position. With SIGNAL SENSE switch in REVERSE position, interchange MARK and SPACE frequencies.

**Wide-band (± 85 cps).

TABLE 1-2. FREQUENCY-DIVERSITY COMBINATIONS*

NARROW-BAND (CPS)		NARROW-WIDE BAND (CPS)
NORMAL COMBINATIONS	NORMAL AND REVERSE** COMBINATIONS	
425-1785	425**-1785	425-1105
595-2125	595**-1955	595-1445
765-1955	765**-2125	765-1275
935-2295	935**-2295	935-1615
1105-2465	1105**-2465	
1275-2805	1275**-2635	
1445-2635	1445**-2805	
1615-2975	1615**-2975	

*These combinations are recommended so that a system utilizing a Telegraph Terminal AN/UCC-1A(V) at one station is compatible with a different Telegraph Terminal at another station in the system.

**To use the NORMAL/REVERSE Diversity Combinations, the SIGNAL SENSE switch on modules 425 cps to 1615 cps must be set to the REVERSE position, and that on modules 1785 cps to 2975 cps must be set to the NORMAL position.

1-7. EQUIPMENT SUPPLIED.

The equipment supplied for Telegraph Terminal is listed in Table 1-3. Note that the Telegraph Terminal is a variable equipment, the quantities and types of units supplied varying as required. Table 1-4 provides a breakdown of the unit's transistor-diode complement.

TABLE 1-3. EQUIPMENT SUPPLIED

QTY PER EQUIP	NOMENCLATURE		COMMON NAME	OVER-ALL DIMENSIONS (IN.)	VOLUME (CU FT)	WEIGHT (LB)
	NAME	DESIGNATION				
As Required	Cabinet, Electrical Equipment	CY-3956/UCC -1(V)	Cabinet	6-63/64 H 16-61/64 W 20-7/8 D	1.45	22
As Required	Keyer, Frequency Shift	KY-490A(P)/ UCC-1(V)	Keyer	6-3/4 H 1-5/8 W 19-1/2 D	0.124	4-1/2
As Required	Converter, Frequency Shift	CV-1522A(P)/ UCC-1(V)	Converter	6-3/4 H 1-5/8 W 19-1/2 D	0.124	5-1/2

TABLE 1-3. EQUIPMENT SUPPLIED (Continued)

QTY PER EQUIP	NOMENCLATURE		COMMON NAME	OVER-ALL DIMENSIONS (IN.)	VOLUME (CU FT)	WEIGHT (LB)
	NAME	DESIGNATION				
As Required	Control-Attenuator	C-4702A/UCC-1(V)	Control-Attenuator	6-3/4 H 1-5/8 W 19-1/2 D	0.124	3-1/4
1	Test Set, Telegraph	TS-1920A/UCC-1(V)	Test Set	8-3/4 H 9 W 7 D	0.32	10-1/8
2	Technical Manual for Telegraph Terminal AN/UCC-1A(V)	NAVSHIPS 96028		11-1/2 H 9-1/2 W 1 D		
1	Maintenance Standards Handbook for Telegraph Terminal AN/UCC-1A(V)	NAVSHIPS 96028.42		11-1/2 H 9-1/2 W 1/2 D		
1	Performance Standards Sheet for Telegraph Terminal AN/UCC-1A(V)	NAVSHIPS 96028.32				
1	Operating Instruction Chart for Telegraph Terminal AN/UCC-1A(V)	NAVSHIPS 96028.21				

1-8. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED.

Table 1-5 lists the equipment and publications required but not supplied.

TABLE 1-4. TRANSISTOR AND DIODE COMPLEMENT*

UNIT	376D 7013	2N 329AM	2N 338	2N 388	2N 398	2N 404	2N 1039	2N 1309	1N 277M	1N 538M	1N 645M	1N 3022B	1N 3026B
Keyer						5					4		1
Converter	1	1			5	7			10		9	1	1
Control-Attenuator			1	1		9	2	1	1		2	1	
Test Set	1					6			4	3		1	

*Type totals and total complement per equipment vary with number of units used and are not given in this table.

TABLE 1-5. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED

QTY PER EQUIP	NOMENCLATURE		REQUIRED USE
	NAME	DESIGNATION	
1	Electronic Multimeter	ME-6E/U	Trouble shooting and maintenance procedures
1	Multimeter	AN/PSM-4C	Trouble shooting and maintenance procedures
1	Oscilloscope	AN/USM-105A	Trouble shooting and maintenance procedures
1	Frequency Meter	AN/TSM-16	Trouble shooting and maintenance procedures
1	Transistor Test Set	TS-1100A/U	Trouble shooting and maintenance procedures
1	Telegraph Distortion Analyzer Test Set		
1	Instruction Book for Electronic Multimeter ME-6E/U	NAVSHIPS 92423	
1	Instruction Book for Multimeter AN/PSM-4C	NAVSHIPS 92051	
1	Instruction Book for Oscilloscope AN/USM-105A	NAVSHIPS 93658A	
1	Instruction Book for Frequency Meter AN/TSM-16	TM 11-2698	
1	Instruction Book for Transistor Test Set TS-1100A/U	NAVSHIPS 93277	

SECTION 2

INSTALLATION

2-1. UNPACKING AND HANDLING.

Exercise caution when unpacking the equipment to avoid damage to the fragile components; check for damage during shipment. Be sure that all of the printed circuit cards are firmly seated in their connectors on the modules and that all of the modules are firmly seated in their connectors on the cabinet.

2-2. POWER REQUIREMENTS.

Power requirements for the Telegraph Terminal and the Test Set are listed in paragraph 1-6 g. Telegraph Terminal ac power distribution is shown in figure 5-8.

2-3. SITE SELECTION AND INSTALLATION REQUIREMENTS.

a. Telegraph Terminal AN/UCC-1A(V) is a modular type equipment, therefore the number of cabinet units constituting an equipment group may vary, depending on the configuration used. The Telegraph Terminal Cabinet units may be mounted on a table top or in a standard 19 inch relay rack. The Test Set may be mounted on the Telegraph Terminal Cabinet or used as a portable instrument.

b. To protect transistorized circuitry, do not install any Telegraph Terminal units near any equipment that radiates heat.

c. Provide at least two feet of space in front of the cabinets to allow the removal of module units.

d. Outline drawings of the Electrical Equipment Cabinet and the Test Set are shown in figures 2-1 and 2-2 respectively.

2-4. CABLE ASSEMBLIES AND CONFIGURATIONS.

The cable assemblies used in the Telegraph Terminal system vary with circuit configurations. Table 2-1 lists the cables necessary for all configurations. Table 2-2 lists the Cabinet connectors and their function. Figure 2-3 illustrates jack locations on rear panel of Cabinet unit.

a. SAMPLE CIRCUIT CONFIGURATIONS.

(1) 4 CHANNEL NON-DIVERSITY. The configuration uses four Keyer units and four Converter units in one cabinet. Figure 2-4 illustrates all connections involved.

(2) 5 TO 16 CHANNEL NON-DIVERSITY. In any configuration from 5 to 16 channels more than one cabinet is necessary. Figure 2-5 illustrates all cable connections involved. The Keyer cabinets and the Converter cabinets are independent except for power.

(3) DIVERSITY. Cabinet interconnections for diversity operation (figures 2-6 and 2-7) are similar to non-diversity but the positions of the Keyers and Converters in the cabinets must be checked. For two-diversity operation positions A1 and A2, A3 and A4, A5 and A6, or A7 and A8 are used. For four-diversity operation positions A1, A2, A3 and A4 or A5, A6, A7 and A8 are used. The dc loop connections for two-diversity operation (A1, A3, A5 or A7) and four-diversity operation (A1 or A5) are listed in table 2-3.

(4) INDIVIDUAL. Any position (A1 through A8) of a cabinet may be used for an individual channel, regardless of how the other cabinet units are used. In this mode tone inputs and outputs are connected to the INDIVIDUAL jack pins.

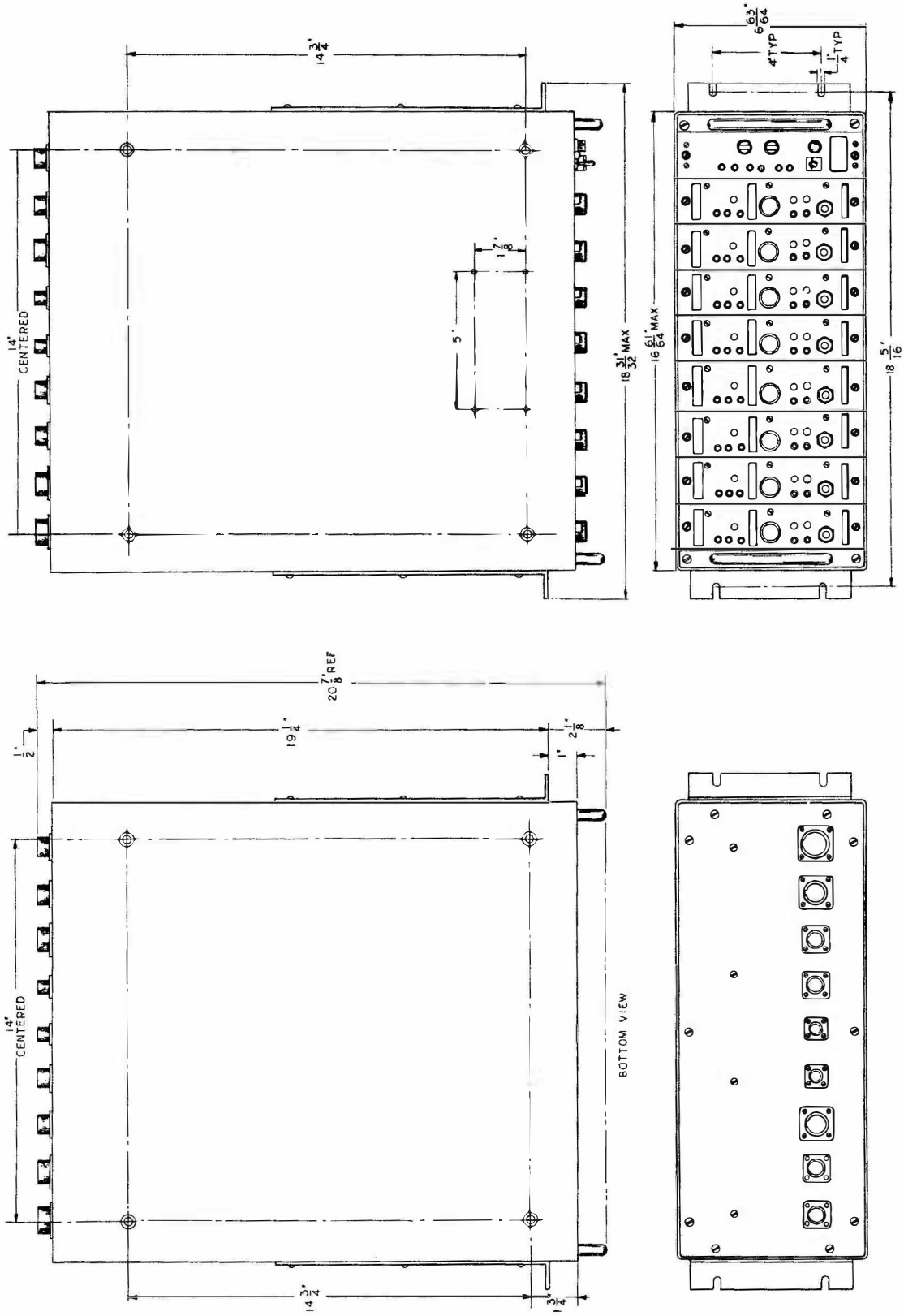


Figure 2-1. Cabinet, Electrical Equipment CY-3956/UCC-1(V), Outline D awing

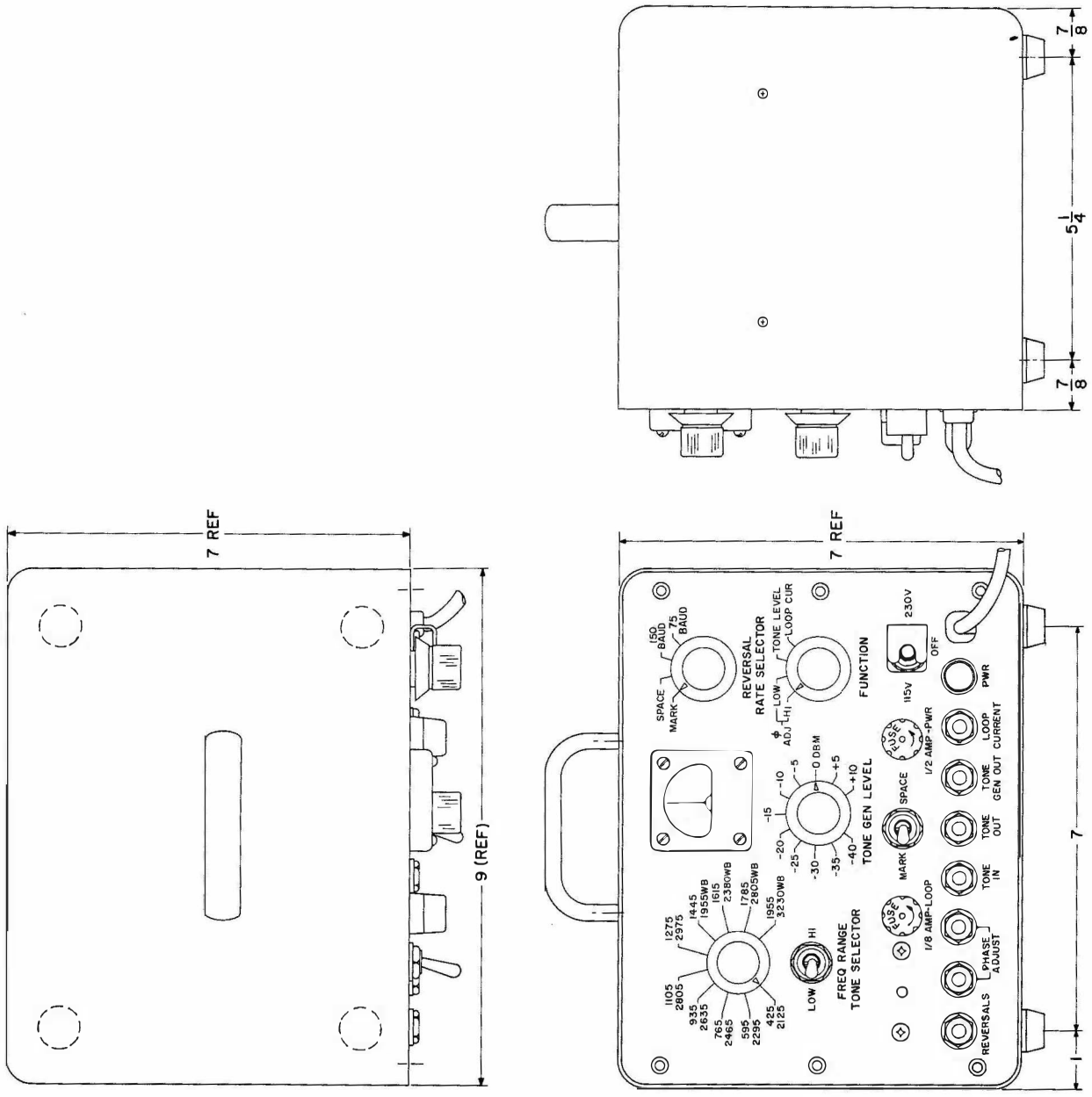


Figure 2-2. Test Set TS-1920 A/UCC-1(V), Outline Drawing

TABLE 2-1. CABLE ASSEMBLIES

SYMBOL	NUMBER COND	ACTIVE COND	TYPE NO.	FROM	TO	PLUG
1W1	3	3	TSGA-3	Cabinet J1	AC Line	MS3116E-12-3S
1W3	3	3	TSGA-3	Cabinet J3	Communication Link Transmit	MS3116E-14-5S
1W4	4	4	TSGA-4	Cabinet J4 or J5	Communication Link Receive	MS3116E-8-4S
1W6-A[1]	20	16	TTHFWA-10	Cabinet J8	Teletypewriter Patchboard	MS3116E-14-19S
1W6-B[2]	10	8	TTHFWA-5			
1W6-C[3]	6	4	TTHFWA-3			
1W7	30	24	MSCA-30	Cabinet J9	Audio Patchboard	MS3116E-16-26S
1W8-A[1]	6	4	TTHFWA-3	2-Channel Cabinet[4]	Teletypewriter Patchboard	MS3116E-8-4S
1W8-B[2]	3	2	TTHFWA-1-1/2			
1W9	7	6	MSCA-7	2-Channel Cabinet[4]	Communication Link	MS3116E-12-8S
1W10	3	3	TSGA-3	Test Adapter	AC Line	MS3116F-12-3S
1W2	3	3	*	Cabinet J2	Cabinet J1	MS3116F-12-3S
1W5	4	4	*	Cabinet J6/J7	Cabinet J6 or J7	MS3116F-12-10S

[1]Non-Diversity [2]Two Module Diversity [3]Four Module Diversity [4]Not Supplied *Supplied

TABLE 2-2. CABINET CONNECTOR FUNCTIONS

CONNECTOR	REFERENCE DESIGNATION	FUNCTION
AC POWER IN	J1	Connects ac power (115/230 volts, 60 cps) to all units (through power switch and fuses on the Control-Attenuator).
AC POWER OUT	J2	Connects ac power (115/230 volts, 60 cps) for other Cabinets.
PARALLEL TONES XMIT	J3	Connects common send bus to radio transmitter when MODE switch (on Control-Attenuator) is set to MASTER. Not used when MODE switch is set to SLAVE.
PARALLEL TONES RCV A AND RCV B	J4 and J5	Connects common receive A(B) bus to radio receiver output when MODE switch (on Control-Attenuator) is set to MASTER. No used when MODE switch is set to SLAVE.
INTERCONNECT A AND B	J6 and J7	Connects common receive A bus, receive B bus, transmit bus, and chassis ground of master Cabinet to the same buses of slave Cabinet.
DC LOOPS	J8	Connects dc loops to the dc input of Keyers or to dc output of Converters. Refer to Table 2-3 for pin connectors associated with each unit in the Cabinet.
INDIVIDUAL TONES	J9	Connects VF lines to individual VF input of Converters or to individual VF output of Keyers when the unit is set for INDIVIDUAL operation. Refer to Table 2-3 for pin connections associated with each unit in the Cabinet.

b. AC POWER OPTIONS. The Telegraph Terminal may be operated from either a 115 or 230 volt, 50 to 60 cycle power source. Before connecting the equipment to a power source, proceed as follows:

(1) Check if power source is 115 or 230 volts ac.

(2) Check position of POWER switch locking guard on front panel of each Control Attenuator (figure 3-1) and the Test Set (figure 3-4).

(a) For 115 volt operation position the locking guard so that the POWER switch can be operated only to the OFF and 115V positions.

(b) For 230 volt operation position the locking guard so that the POWER switch can be operated only to the OFF and 230V positions.

c. AC POWER CONNECTIONS.

(1) Set all POWER switches to OFF.

(2) Interconnect all units with ac power cables 1W2 (see figure 2-2 for example).

(3) Connect cable 1W1 from the AC POWER IN jack to a source of 115 or 230 volt ac power.

d. DC LOOP CONNECTIONS. For each cabinet used connect cable 1W6 from DC LOOPS jack to external signal loop connectors or teletypewriter patchboard.

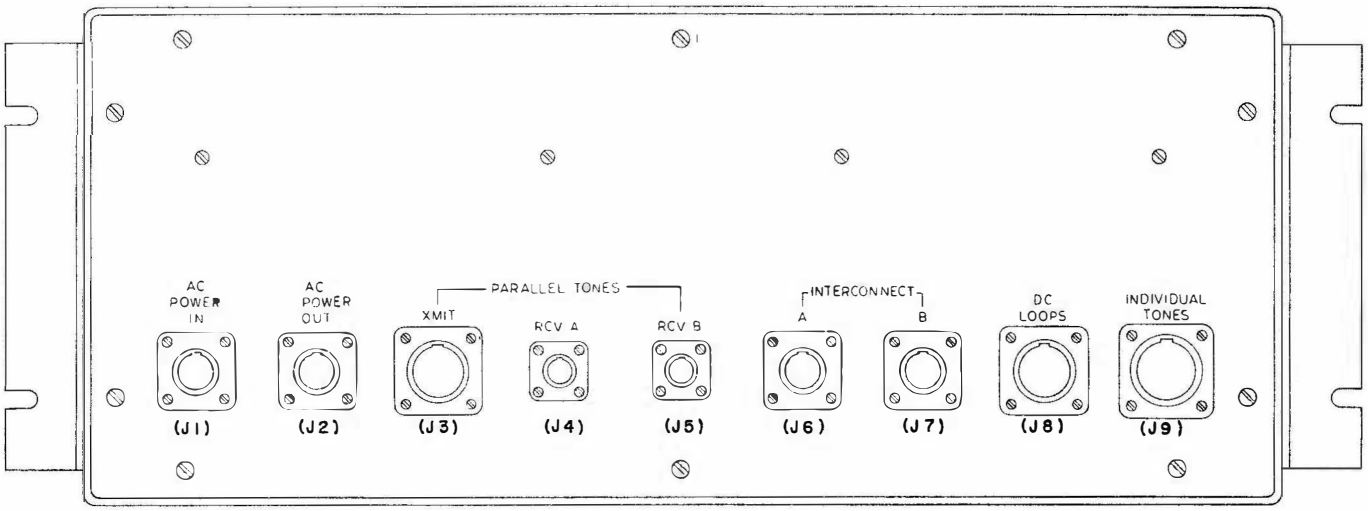


Figure 2-3. Cabinet Rear View

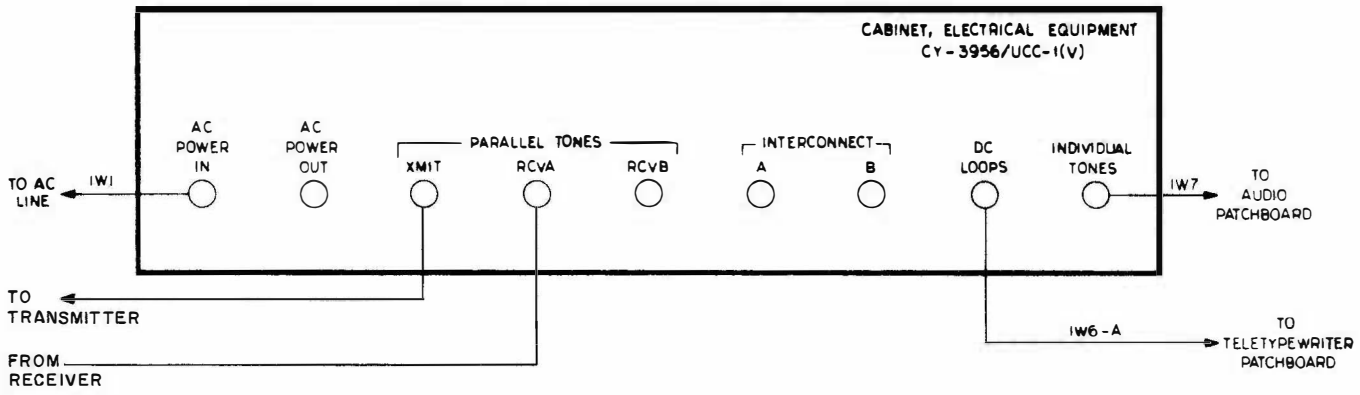


Figure 2-4. Four Channel Non-Diversity Connection Diagram

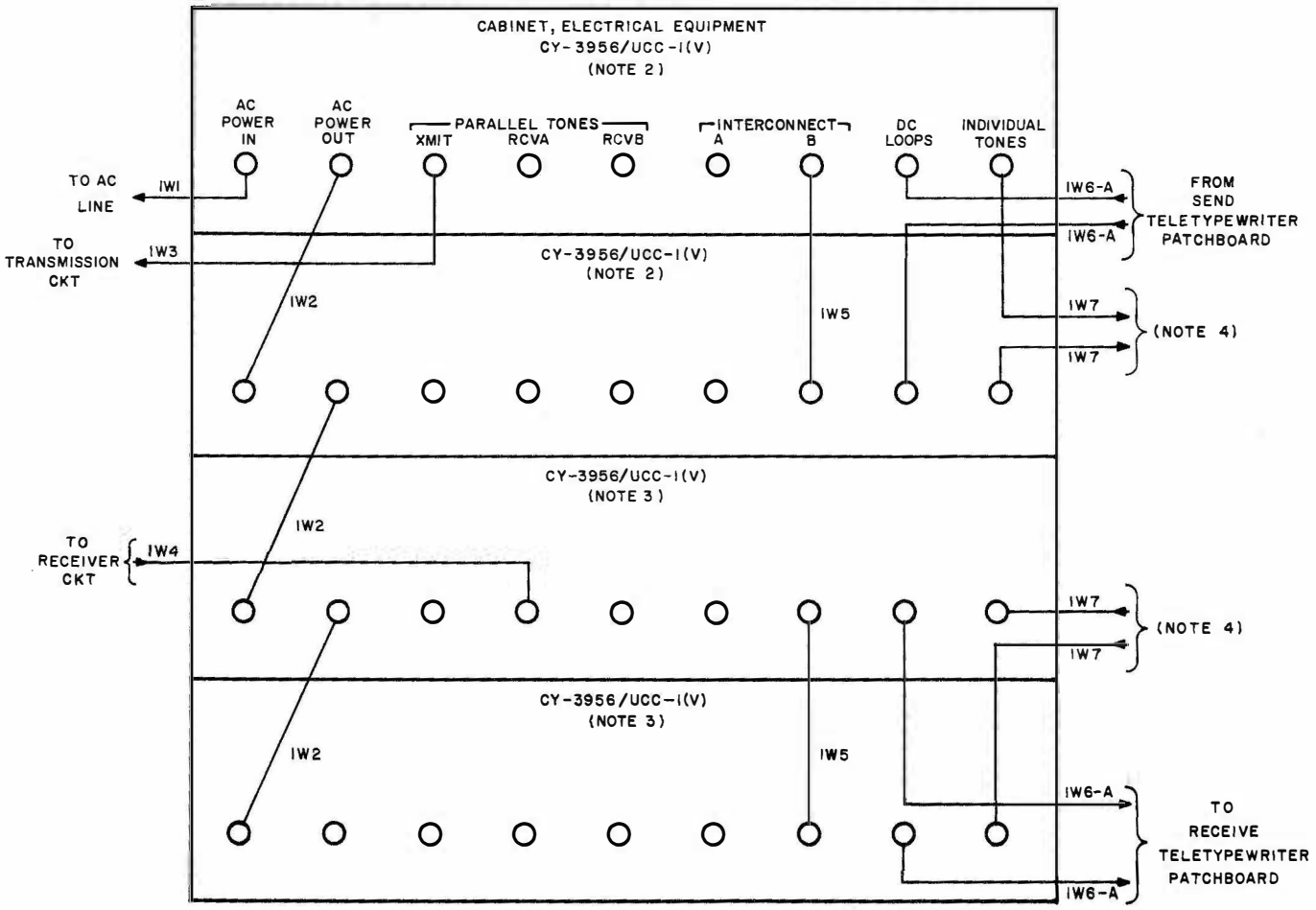


Figure 2-5. Five to 16 Channel Non-Diversity Connection Diagram

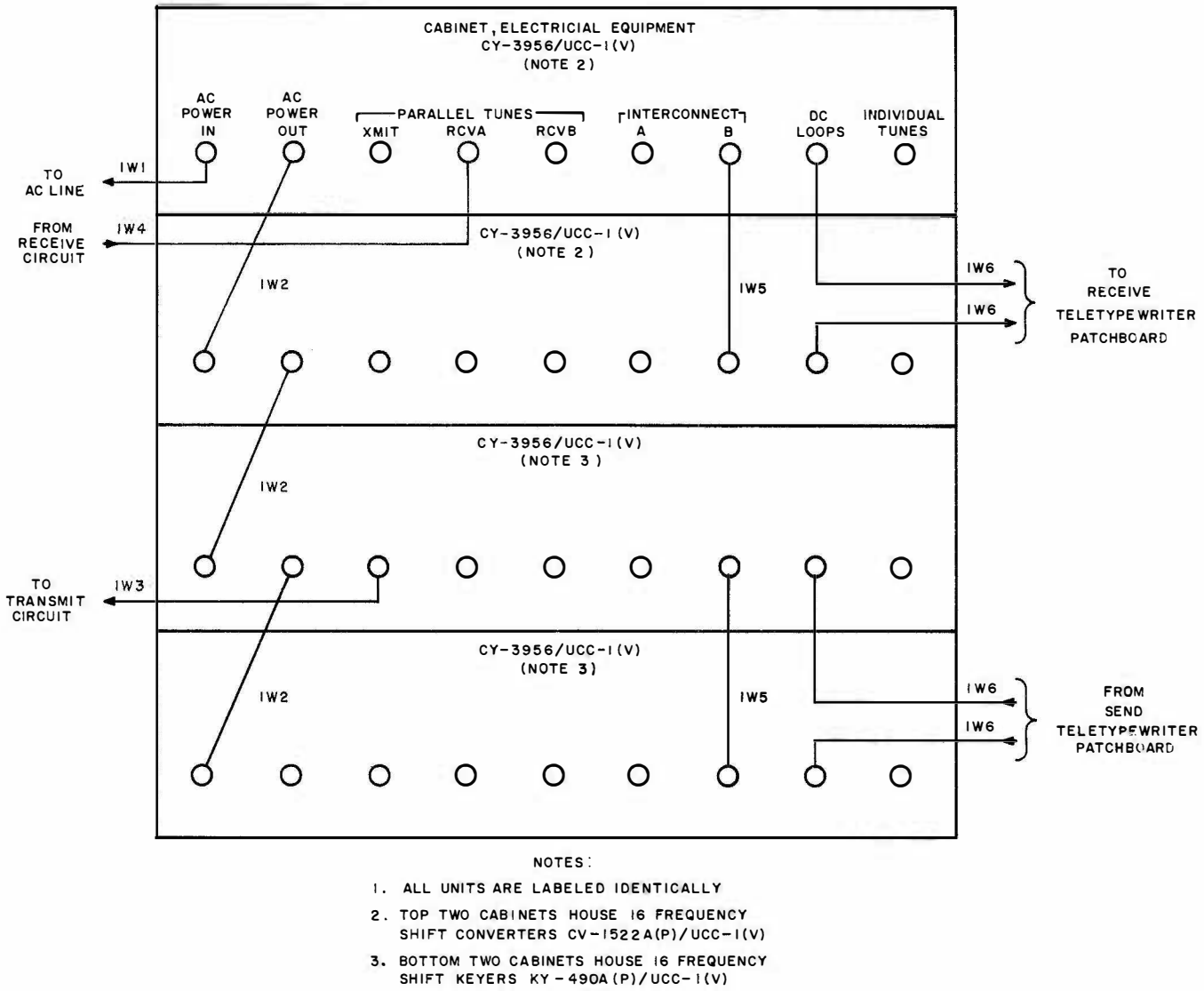
NOTE

One side of dc loop must be grounded. For minimum rf interference connect the negative lead to ground. The loop current control must be connected in the positive leg of the external dc loop power supply.

2-5. INSPECTION AND ADJUSTMENT.

The following procedures should be completed before the equipment is energized.

a. CONTROL-ATTENUATOR. (figure 2-8)
   (1) Withdraw Control-Attenuator from each cabinet.
   (2) If cabinet is to be a master set MODE switch to MASTER; otherwise set to SLAVE.
   (3) Replace Control-Attenuator.



NOTES:

1. ALL UNITS ARE LABELED IDENTICALLY
2. TOP TWO CABINETS HOUSE 16 FREQUENCY SHIFT CONVERTERS CV-1522A(P)/UCC-1(V)
3. BOTTOM TWO CABINETS HOUSE 16 FREQUENCY SHIFT KEYERS KY-490A(P)/UCC-1(V)

Figure 2-6. 8 Channel Frequency Diversity Connection Diagram

b. KEYER (figure 2-9)

(1) Withdraw each Keyer from cabinet.

(2) On the printed circuit card, patch black jack to adjacent white POL jack for polar operation or to adjacent yellow NEUT jack for neutral operation.

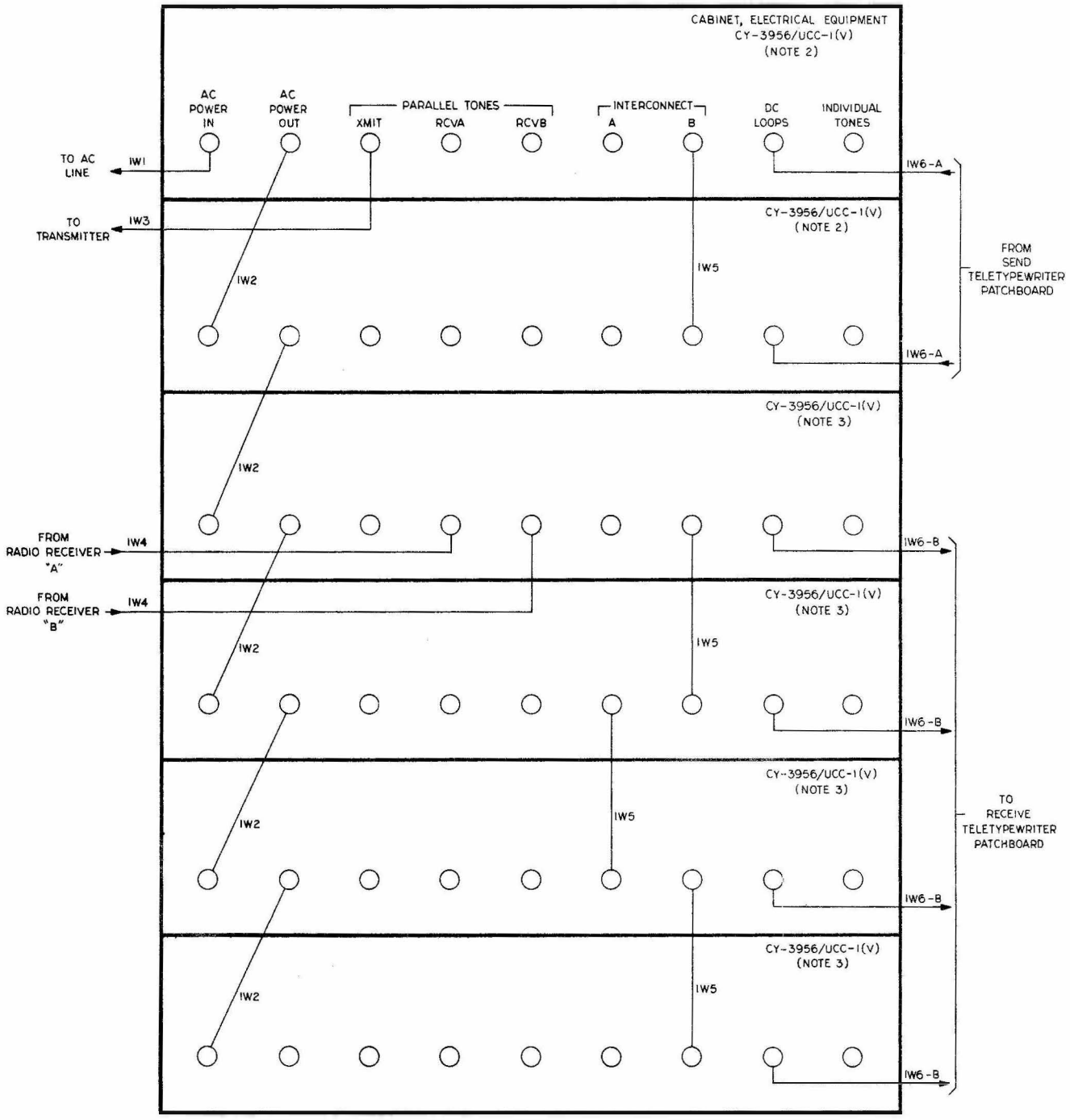
(3) On the printed circuit card, patch black jack to adjacent green 20 MA or to adjacent 60 MA jack, depending on external supply loop current.

(4) Set TONE OUTPUT switch to PARALLEL.

(5) Set SIGNAL SENSE switch to NORMAL if space frequency is lower than center frequency. Set SIGNAL SENSE switch to REVERSE if space frequency is higher than center frequency.

(6) Set DC LOOP switch to DIVERSITY or NON-DIV position according to Keyer function.

(7) Replace Keyer in cabinet.



NOTES:

1. ALL UNITS ARE LABELED IDENTICALLY.
2. TOP 2 CABINETS HOUSE 16 FREQUENCY SHIFT KEYERS KY-490A(P)/UCC-1(V).
3. BOTTOM 4 CABINETS HOUSE 32 FREQUENCY SHIFT CONVERTERS CV-1522A(P)/UCC-1(V); 2 PER CHANNEL.

Figure 2-7. 16 Channel Space Diversity Connection Diagram

TABLE 2-3. DC LOOPS (J8) AND INDIVIDUAL TONES (J9) PINS ASSOCIATED WITH EACH UNIT IN CABINET

POSITION	KEYER LOOP INPUT OR CONVERTER LOOP OUTPUT DC LOOPS (J8)	KEYER INDIVIDUAL VF OUTPUT OR CONVERTER INDIVIDUAL VF INPUT INDIVIDUAL TONES (J9)
A1	A(+) B(-)	A, B(ct), C
A2	C(+) D(-)	D, E(ct), F
A3	E(+) F(-)	G, H(ct), J
A4	G(+) H(-)	K, L(ct), M
A5	J(+) K(-)	N, P(ct), R
A6	L(+) M(-)	S, T(ct), U
A7	N(+) P(-)	V, W(ct), X
A8	R(+) S(-)	Y, Z(ct), a

c. CONVERTER (figure 2-10).

(1) Withdraw each Converter from cabinet.

(2) Set TONE INPUT switch at:

(a) PARALLEL/A or PARALLEL/B position to connect converter to PARALLEL TONES RCV A or RCV B input connector, respectively.

(b) INDIV to connect Converter to individual input line associated with station in the cabinet into which Converter is plugged.

(3) Set SIGNAL SENSE switch to NORMAL if space frequency is lower than center frequency. Set SIGNAL SENSE switch to REVERSE if space frequency is higher than center frequency.

(4) Set DIVERSITY CHS switch to ONE, TWO or FOUR according to diversity to be used.

(5) Replace Converters in cabinet.

The following procedures should be completed with the system energized but before it is placed on-line.

d. KEYER LOOP CURRENT ADJUSTMENT. With the external loop set to furnish steady current from a 20 or 60 ma supply, adjust loop current for each loop as follows:

(1) Using a test cable with phone jacks at both ends, connect LOOP CURRENT jack on Test Set (see figure 3-4) to LOOP MON jack on Keyer (see figure 3-2) associated with signal loop being adjusted. When signal loop is driving two Keyers in diversity, LOOP MON jack on either Keyer may be used.

(2) Set Test Set FUNCTION switch to LOOP CUR.

(3) Adjust external signal loop resistance as necessary to obtain a Test Set meter reading of 20 or 60 ma, depending on loop power supply.

(4) Remove test cable from Keyer.

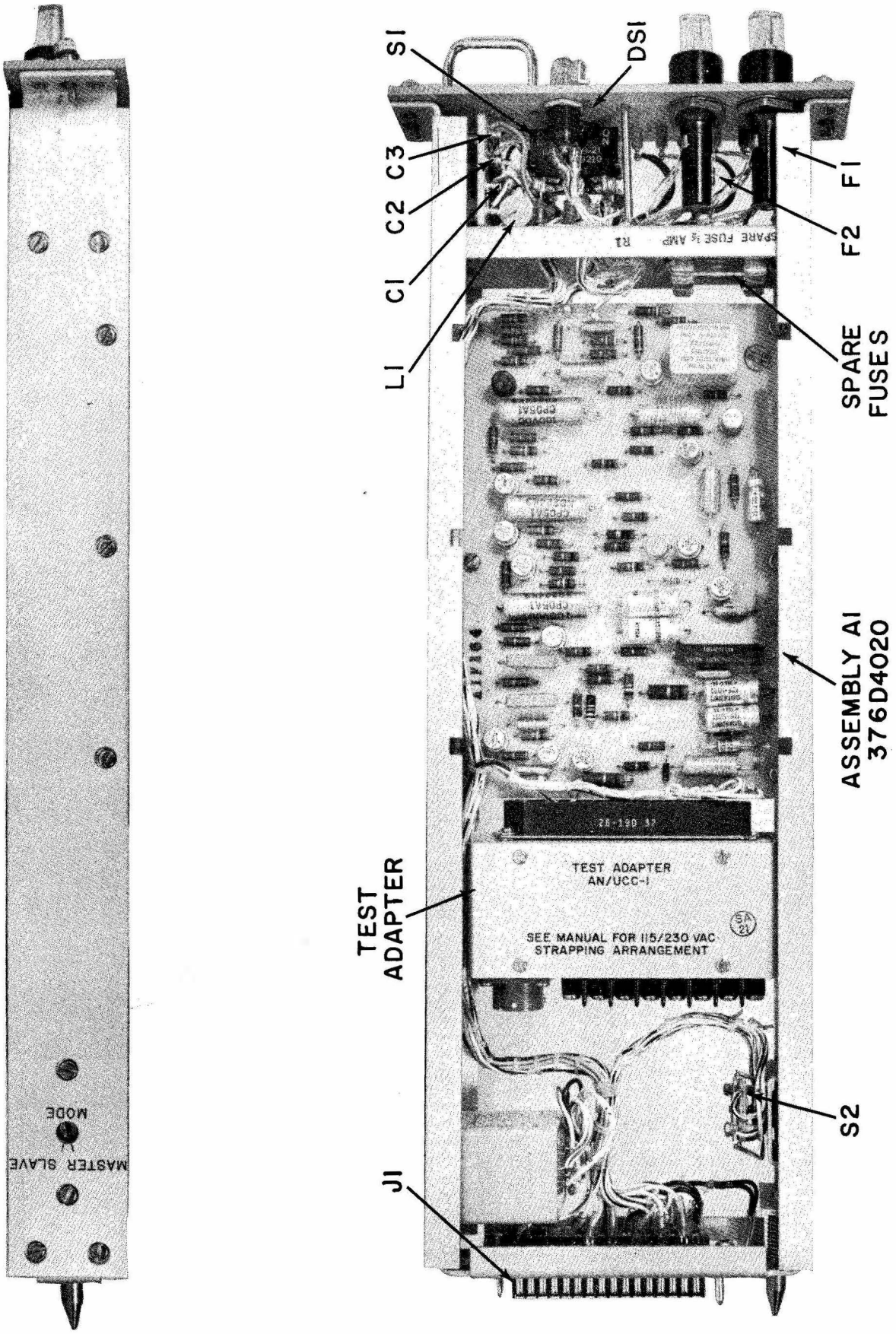


Figure 2-8. Control-Attenuator, Top and Left Side View

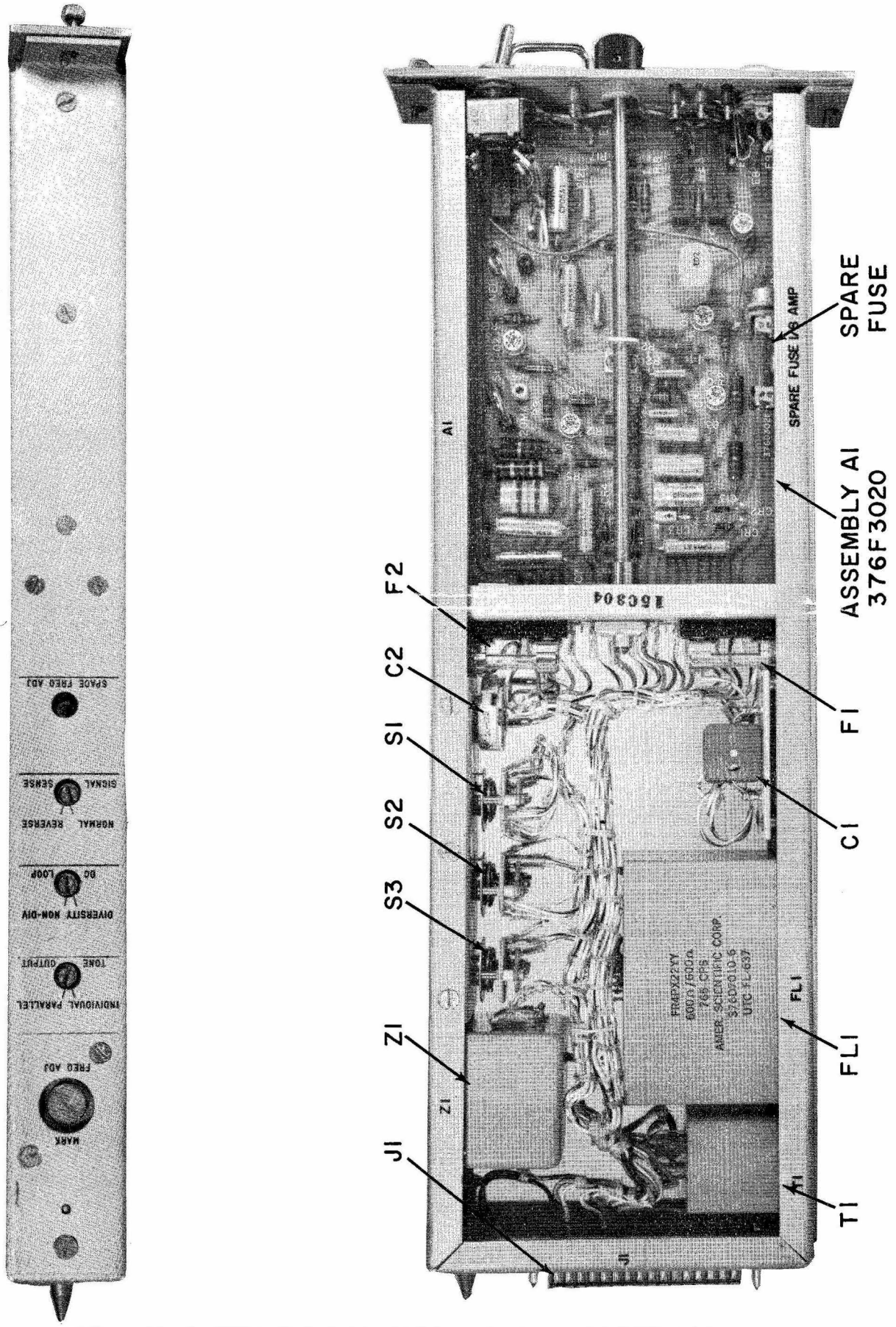


Figure 2-9. Keyer, Frequency Shift, Top and Left Side View

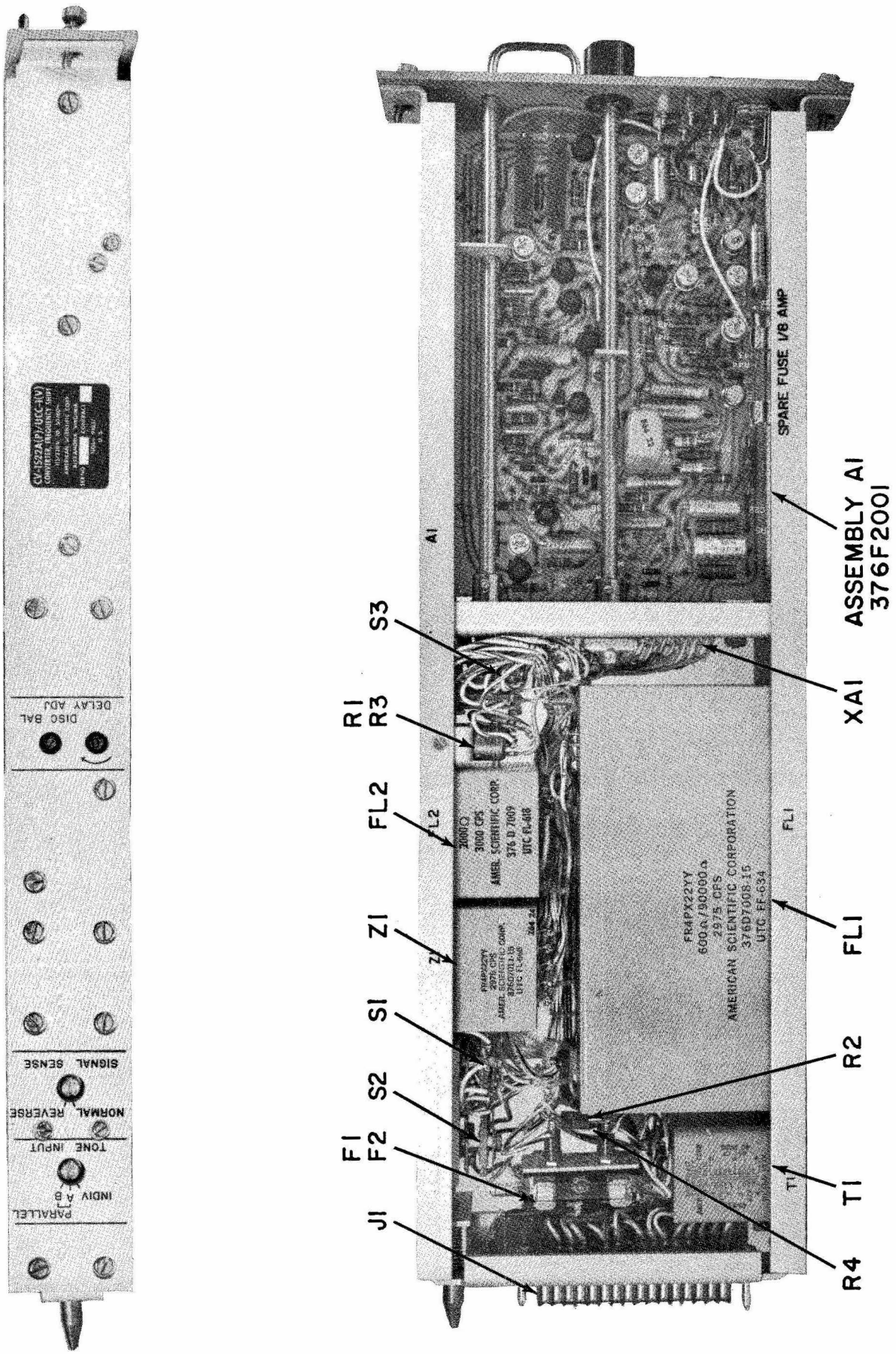


Figure 2-10. Converter, Frequency Shift, Top and Left Side View

e. DIVERSITY DELAY EQUALIZATION ADJUSTMENT. This procedure identifies the Converter unit in a diversity combination posessing the largest natural delay and allows other Converters in the combination to be adjusted for equal delay.

NOTE

When Converter delay adjust controls are turned maximum ccw all delays will be within one millisecond of each other.

(1) Rotate DELAY ADJ control (see figure 2-10) on every Converter of the diversity combination fully counterclockwise.

(2) Short-circuit each outgoing loop at DC LOOPS connector J8 on the cabinet rear panel (see figure 2-3) or at any other convenient point on the line.

(3) Transmit dot cycles to the diversity combination from the opposite end of the communication link.

(4) Set FUNCTION switch on Test Set (see figure 3-4) to PHASE ADJ/LOW.

(5) Using test cables with phone jacks at each end, connect LOOP MON jack (see figure 3-3) of one Converter to the left-hand PHASE ADJUST jack on the Test Set, and the LOOP MON jack on the second Converter to right-hand PHASE ADJUST jack.

(6) Observe indication on the Test Set meter. If deflection to the left is noted, the Converter connected to the left-hand PHASE ADJUST jack presents the larger delay; therefore, disconnect the test cable from the LOOP MON jack of the Converter connected to the right-hand PHASE ADJUST jack. If deflection to the right is noted, the Converter connected to the right-hand PHASE ADJUST jack presents the larger delay; therefore, disconnect the test cable from the LOOP MON jack of the Converter connected to the left-hand PHASE ADJUST jack.

(7) Plug the test cable removed in (6), above, into the LOOP MON jack of the next Converter in the diversity combination.

(8) Determine which Converter of the new pair presents the larger delay by repeating step (6). Repeat steps (6) and (7) until all Converters of the diversity combination have been compared and the reference Converter has been identified.

(9) Make certain that the test cable plugged into the left-hand PHASE ADJUST jack is connected to the reference Converter. Connect the other test cable to one of the Converters that needs delay adjustment. If possible, use an extender cable or extender module to extend (from the Cabinet) the Converter requiring delay adjustment.

(10) Observe the Test Set meter. If indication is not 0 (zero), adjust DELAY ADJ control on the Converter connected to the right-hand PHASE ADJUST jack until a meter indication of zero is obtained.

(11) Set Test Set FUNCTION switch to PHASE ADJ/HI.

(12) Repeat step (10) for the fine adjustments of the DELAY ADJ control.

(13) Set FUNCTION switch to PHASE ADJ/LOW. For 4-module diversity operation, proceed to step (14), which follows.

(14) Remove test cable from the Converter adjusted in steps (10) through (13) and plug it into LOOP MON jack of one of the other Converters of the diversity combinations.

(15) Repeat steps (9) through (13) until all Converters of the diversity combinations have the same delay. Disconnect the short circuits connected in (2), above.

f. DIVERSITY BALANCE ADJUSTMENT. The procedure outlined below indicates which Converter of the diversity combination presents the least gain and uses that particular Converter as a reference to decrease the gain of the other Converters in the diversity combination, until all Converters have equal gain.

(1) Adjust DIV BAL control (see figure 3-3) on every Converter of the diversity combination for maximum amplitudes, as observed on an oscilloscope with the vertical input across test points DISC B (grd) and DISC A.

(2) Adjust DIV BAL control on every Converter of the diversity combination until the amplitude of each Converter equals the smallest amplitude observed in step (1).

(3) Disconnect oscilloscope from cabinet.

g. DISCRIMINATOR BALANCE ADJUSTMENT.

(1) Set TONE INPUT switch to INDIV (see figure 2-10).

(2) Connect oscilloscope across DISC B (grd) and DISC A test points on Converter.

(3) Make certain that no signal is being sent to the Converter then note the voltage point on the oscilloscope.

(4) Transmit dot cycles to the Converter from the opposite end of the communications link.

(5) Adjust DISC BAL control for a crossover pattern on the oscilloscope with the crossover centered at the voltage point noted in (3) above.

(6) Disconnect oscilloscope from cabinet.

h. CONVERTER LOOP CURRENT ADJUSTMENT.

(1) Transmit a steady mark to the Converter from the opposite end of the communications link.

(2) Connect a patch cord between Converter LOOP MON jack and Test Set LOOP CURRENT jack.

(3) Set Test Set FUNCTION switch to LOOP CUR

(4) Adjust loop-current control of the external loop power supply (external to the Telegraph Terminal) to obtain a reading of 20 ma or 60 ma, depending on loop supply.

NOTE

For two Converter diversity operation the Converters in cabinet stations A1, A3, A5, and A7 are connected to the loops. For four Converter diversity operation the Converters in cabinet stations A1 and A5 are connected to the dc loops.

i. DISTORTION BIAS ADJUSTMENT.

(1) Transmit reversal signals to the Converter, from the opposite end of the communication link.

(2) Connect a patch cord between the Converter LOOP MON jack and the LOW Z IN jack on the Analyzer of the Data Analysis Center.

(3) Adjust Converter BIAS control for a minimum distortion reading on the Analyzer.

(4) For 2-Converter or 4-Converter diversity operation, perform procedures (5) and (6) below.

(5) Set diversity-combination Converters in the Cabinet.

(a) For 2-Converter diversity operation, set the DIVERSITY CHS switch on each Converter to TWO.

(b) For 4-Converter diversity operation, set DIVERSITY CHS switch on each Converter to FOUR. Replace Converters in Cabinet.

(6) Check for minimum distortion on 2-Converter diversity pairs by connecting the Analyzer to the LOOP MON jack on the Converter in Cabinet stations A1, A3, A5, or A7. If adjustment is needed, adjust the BIAS controls on these Converters. Check for minimum distortion and make BIAS adjustments on 4-Converter diversity combinations in the same manner, for Converters in Cabinet station A1 or A5, only.

(7) Disconnect test cables and equipment.

2-6. INTERFERENCE REDUCTION.

For minimum rf interference, connect the negative side of each dc loop to ground.

SECTION 3

OPERATION

3-1. FUNCTIONAL OPERATION.

a. Telegraph Terminal AN/UCC-1A(V) operates automatically in various types of telegraph transmission systems. It accepts dc telegraph signals and converts them into voice frequency signals at the transmission end of the communication link.; voice frequency signals from up to 16 channels are combined on a single communication circuit. At the opposite end of the communication link the Telegraph Terminal separates the voice frequency signals and converts them into electronic keying signals for receiving telegraph loops.

b. The Telegraph Terminal comprises different numbers of modules as required for specific system configurations and capacities. Transmitting and receiving conversions between telegraph loop keying signals and voice frequency signals are performed by cabinet housed Keyers and Converters. Switches on the Keyers and Converters determine the system interconnection between modules. A Test Set provides special meter circuitry, a reversal generator, and an fsk tone generator required for adjustment of the Telegraph Terminal.

3-2. OPERATING PROCEDURES.

Once the Telegraph Terminal is installed, initial switch setting and adjustments have been made (see Section 2), and power is applied (b, below), equipment operation is automatic. Operator attention is not required except for starting and stopping procedures, and for testing equipment operation with the Test Set.

a. DESCRIPTION OF CONTROLS. - Except for Test Set controls used during operator's maintenance (see par. 3-3), only the POWER switches are used by the operator. Telegraph Terminal front-panel controls (see figure 3-1 through 3-4) their functions are listed below: procedures for their use are provided in Sections 2 and 5.

(1) CONTROL-ATTENUATOR (see figure 3-1).

(a) LINE FUSES 1/2 AMP - Two fuses which protect the two sides of the ac line. Equipped with blown-fuse indicators.

(b) POWER switch - Controls application of line power to modules housed in the Cabinet (115 volts or 230 volts depending on the power source and position of locking guard).

(c) POWER indicator - Lights to indicate power is on.

(d) XMIT - Two test points for monitoring the composite parallel-tones transmit signal.

(e) RCV A - Two test points for monitoring the composite parallel-tones receive signal applied to PARALLEL TONES RCV A connector.

(f) RCV B - Two test points for monitoring the composite parallel-tones receive signal applied to PARALLEL TONES RCV B connector.

(g) ATTEN - A screwdriver adjustment for setting the desired output level.

(2) KEYER (See figure 3-2).

(a) TONE OUT - Test point for monitoring tone output level.

(b) MOD - Test point for monitoring switching levels of the diode modulator.

(c) -18V - Test point for monitoring -18 volt output of power supply.

(d) OV - Test point connected to circuit ground.

(e) GRD - Test point connected to chassis ground.

(f) LOOP MON jack - Test jack used to place test equipment in series with the telegraph loop.

(g) BIAS control - A screwdriver adjustment for obtaining zero bias distortion of the voice frequency signal (detected as an average frequency equal to the channel center frequency as indicated on a frequency counter).

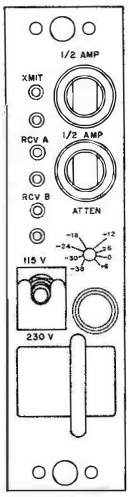


Figure 3-1. Control-Attenuator Front Panel

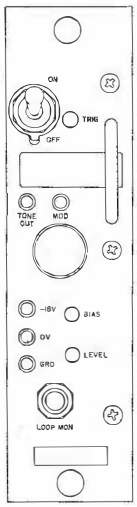


Figure 3-2. Keyer, Front Panel

(h) LEVEL control - A screwdriver adjustment for obtaining required power output level (monitored at TONE OUT test point).

(i) TRIG control - A screwdriver adjustment for obtaining keying at one-half nominal loop current level for neutral loop operation.

(j) ON-OFF switch - Switches tone signal on or off.

(3) CONVERTER (see figure 3-3).

(a) TONE IN - Test point for monitoring tone input to AGC circuits.

(b) AGC OUT - Test point for monitoring input to agc detector.

(c) DISC A, DISC B - Test points for monitoring discriminator output.

(d) -18V - Test point for monitoring -18V power supply output.

(e) OV - Test point connected to chassis ground.

(f) LOOP MON - Test jack to place test equipment in series with the loop.

(g) DIV BAL control - Screwdriver adjustment for equalizing gain of Converters used in a frequency diversity combination.

(h) BIAS control - Screwdriver adjustment for obtaining zero bias distortion in keyed output.

(i) DIV CHS - Screwdriver adjustment for selecting diversity channels.

(4) TEST SET (see figure 3-4).

(a) PWR 115V/OFF/230V switch - Controls application of ac power to Test Set.

(b) PWR indicator - Lights to indicate that power is being applied to Test Set.

(c) FUNCTION switch.

1 PHASE ADJ/LOW position - Connects output of phase-adjustment measurement network to panel-meter M1 circuit, through series resistance, for low-sensitivity indication.

2 PHASE ADJ/HI position - Connects output of phase-adjustment measurement network to panel-meter M1 circuit, for high-sensitivity indication.

3 TONE LEVEL position - Connects output of tone-level rectifier to panel-meter M1 circuit.

4 LOOP CUR position - Applies fraction of loop current to panel-meter M1 circuit.

(d) REVERSAL RATE SELECTOR switch.

1 MARK position - Steady circuit closure (100 ohms) presented across tip to ring of REVERSALS jack.

2 SPACE position - Steady open circuit presented across tip to ring of REVERSALS jack.

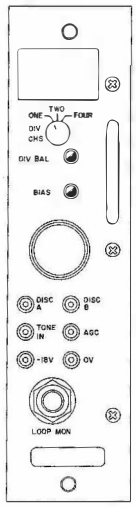


Figure 3-3. Converter Front Panel

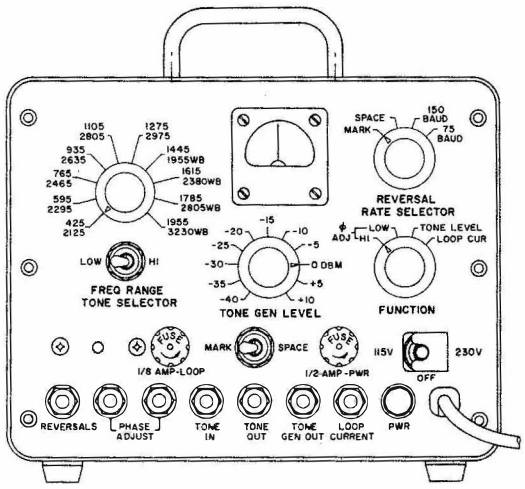


Figure 3-4. Test Set Front Panel

3 150 BAUD position - Mark and space conditions of 1 and 2, above, alternating at 150 baud, appear across REVERSALS jack.

4 75 BAUD position - Same as 3, above, except at rate of 75 baud.

(e) TONE SELECTOR switches

1 TONE SELECTOR - A ten-position switch, used in conjunction with the FREQ. RANGE switch, to select tone desired.

2 FREQ. RANGE - A two-position switch to select either the high or low range of the TONE SELECTOR switch.

3 MARK-SPACE - A two-position switch to select either the mark or space frequency desired.

(f) TONE GEN LEVEL control - A continuously variable control to select the desired output level of the tone generator.

(g) TONE GEN OUT jack - A test jack used to connect the output of the tone generator to the unit under test.

(h) REVERSALS jack - A test jack (requires negative tip) at which steady mark, steady space, and alternating mark and space signals appear as noted in (d), above.

(i) PHASE ADJUST jacks - Two test jacks used to connect the keying outputs of two Converters to the phase-adjustment measurement network, for equalizing delays.

(j) TONE INPUT jack - A test jack used to connect voice-frequency signals to the audio circuit, for audible indication on the Test Set loudspeaker and for level indication on the panel meter.

(k) TONE OUTPUT jack - A test jack used to connect a headset (1000 ohms) to the Test Set; disconnects Test Set loudspeaker from the circuit.

(l) LOOP CURRENT jack - A test jack used to connect telegraph loops to the panel-meter circuit.

(m) PANEL METER - A center scale multimeter used for delay equalization and for tone level and loop current indications.

(n) 1/8 AMP LOOP fuse - Fuse connected in series with the REVERSALS jack to protect the equipment in case of a short circuit across the output loop.

(o) 1/2 AMP PWR fuse - Fuse connected in series with one side of the ac power line.

b. SEQUENCE OF OPERATION. - Operating procedures for the Telegraph Terminal involve starting and stopping the equipment. Once started, the equipment requires no operator attention except for the maintenance procedures detailed in paragraph 3-3.

(1) STARTING PROCEDURE.

(a) Note setting of ATTEN Control on Control-Attenuator, then turn ATTEN Control to -38 DBM.

(b) Set POWER switch on the Control-Attenuator of each cabinet to the on position (i.e. 115V or 230V, depending on power source)

NOTE

If Test Set is to be used, set its POWER switch to 115V or 230V, depending on power source, and allow one hour to stabilize. The Telegraph Terminal starting procedure is independent of Test Set operation.

(c) After one minute, turn ATTEN Control on Control-Attenuator to original setting.

(d) Check that POWER indicator lights, and that neither fuse indicator indicates a blown fuse.

(2) STOPPING PROCEDURE. - Set POWER switch on the Control-Attenuator in each Cabinet OFF (If Test Set is in use, set its POWER switch to OFF.) This procedure applies also in emergencies.

3-3. OPERATOR'S MAINTENANCE.

a. OPERATING CHECKS. - The Telegraph Terminal operates automatically, requiring operator attention and/or maintenance only in cases of malfunction. Use the following list of quick-checks to assure proper operation.

(1) KEYER CHECKS (see figures 3-2 and 3-4).

(a) Connect a patch cord between Keyer LOOP MON jack and Test Set LOOP CURRENT jack. Set Test Set FUNCTION switch to LOOP CUR, and check that the meter indicates:

1 20ma or 60ma (dependent on external loop supply) if the Keyer is in the steady-marking condition, or

2 10ma or 30ma if a zero-bias reversal signal is being applied to the Keyer.

(b) Connect a patch cord (having a PL-55 on one end, and two tip jacks on the other) between the Test Set TONE INPUT jack (PL-55) and the Keyer TONE OUT and GRD test points (connecting ground tip jack to GRD test point). Set Test Set FUNCTION switch to TONE LEVEL, and check for:

1 a meter indication of approximately 0 DB, and

2 a steady audible tone, which indicates application of a steady marking or spacing condition, or

3 a variable tone, which indicates application of a reversal signal.

NOTE

The tone frequency will vary depending on the individual module frequency.

(c) If the correct indications are not obtained in (a) or (b) refer to paragraph c.

(2) CONVERTER CHECKS (see figures 3-3 and 3-4).

(a) Connect a patch cord (having a PL-55 plug on one end and two tip jacks on the other) between the Test Set TONE INPUT jack and the Converter TONE IN and OV test points (connect ground tip jack to OV). Set Test Set FUNCTION switch to TONE LEVEL. A varying audible tone indicates that an fsk signal is being applied to the Converter.

NOTE

The tone frequency will vary, depending on the individual module frequency.

(b) Connect a patch cord between Converter LOOP MON jack and Test Set LOOP CURRENT jack. Set Test Set FUNCTION switch to LOOP CUR, and check for a meter indication of:

1 20ma or 60ma (depending on external loop supply), if the Converter is in the steady-marking condition.

2 10ma or 30ma, if a reversal signal is being applied to the Converter.

(c) If the correct indications are not obtained in (a) or (b), above, proceed to c, below.

b. PREVENTIVE MAINTENANCE. - Refer to Maintenance Standards Handbook for Telegraph Terminal AN/UCC-1A(V), NAVSHIPS 96028.42.

c. EMERGENCY MAINTENANCE.

(1) DEFECTIVE POWER FUSES.

CAUTION

Replace a defective fuse only with one of the correct value.

(a) A blown power fuse, on the Control-Attenuator is identified by a lighted blown-fuse indicator on the unit's front panels (see figure 3-1). For spare fuse location on Control-Attenuator, see figure 2-8.

(b) A blown power fuse, on the Keyer or Converter, is evident from the absence of the proper output signal and power supply voltages at the front-panel test points (see figures 3-2 and 3-3). For power fuse and spare fuse locations on the Keyer and Converter, see figures 2-9 and 2-10, respectively.

(c) A blown power fuse on the Test Set is identified by an unlighted PWR indicator when the PWR switch is in the ON position (see figure 3-4).

(2) DEFECTIVE D.C. LOOP FUSES.

CAUTION

Replace a defective fuse only with one of the correct value.

(a) A blown DC LOOP fuse, on the Keyers and Converters, is evident when the associated TTY stays in a steady spacing condition, or when no indication is obtained in performance of a(1)(a) or a(2)(b), respectively. For DC LOOP fuse and spare fuse location on the Keyer and Converter, see figures 2-9 and 2-10, respectively.

(b) A blown 1/8 AMP LOOP fuse on the Test Set is indicated when a reversal signal is not obtained at the REVERSALS jack when the REVERSAL RATE SELECTOR switch is set to either 150 BAUD or 75 BAUD.

(3) DEFECTIVE KEYER. - A defective Keyer can be replaced by one (of same channel frequency) known to be operative. Replace a defective Keyer printed-circuit card with any Keyer printed-circuit card known to be operative.

(4) DEFECTIVE CONVERTER. - A defective Converter can be replaced by one (of the same channel frequency) known to be operative. Replace a defective Converter printed-circuit card with any Converter card known to be operative.

(5) DEFECTIVE CONTROL-ATTENUATOR. - Replace a defective Control-Attenuator with any Control-Attenuator known to be operative.

SECTION 4

TROUBLESHOOTING

4-1. OVER-ALL FUNCTIONAL DESCRIPTION.

a. The over-all functional diagram of the Telegraph Terminal is shown in figure 4-1. Each terminal provides up to 16 different narrow band voice-frequency tone modules (keyers or converters), each passing a different band of frequencies. Associated with each channel is an oscillator which, when keyed by a telegraph loop, generates one frequency representing a mark and another representing a space (frequency shift keying). The two frequencies are symmetrically disposed with respect to the center of the pass-band. The output from any set of different keyers can be combined on a single line for transmission over a single 3kc communication link. At the receiving end of the communication link the Telegraph Terminal reverses the process performed at the transmission end. The 3kc tone signal is applied to a set of receiving tone converters having the same band-pass characteristics as the keyers used at the transmission end. Each converter accepts one voice frequency signal which it converts into an electronic keying signal for a receiving telegraph loop.

b. Diversity combination switching is provided in the Telegraph Terminal at both the transmitting and receiving stations; thus, one telegraph signal can be used to key two different tone keyers at the transmitting station. In this case, the corresponding tone converters at the receiving station both develop keying signals. However, the best signal of the diversity pair operates the receiving telegraph loop, thereby preserving the telegraph signals when fading occurs at one of the two converters in the frequency diversity pair.

c. Diversity switching at the receiving station also permits space-diversity or rf diversity operation, in which tone signals obtained from two different radio receivers are used to operate two identical sets of tone converters. For this type of operation, each pair of identical tone converters provides a single keying signal. Frequency diversity and space or rf diversity can be combined, in which case sets of four tone converters are used to produce single keying signals.

d. In place of the 16 narrow band FSK tones, the Telegraph Terminal can provide eight narrow and four wide band tones, the wide band tones using the band portion of the upper eight narrow band tones plus the 3025 to 3350 cps band. Thus, the lower eight narrow band tones and the four wide band tones may be used simultaneously.

e. The Telegraph Terminal is modular in construction so that the number of keyers or converters provided can be varied by increasing or decreasing the total number of modules.

f. Special test facilities required to align the Telegraph Terminal are incorporated in the portable Test Set.

4-2. FUNCTIONAL SECTION DESCRIPTION.

a. KEYER CIRCUIT DESCRIPTION (see figure 4-2).

(1) The dc telegraph loop is connected to Schmitt trigger A1Q1-A1Q2 through the 60-20 MA switching circuit and the POLAR-NEUTRAL bias switching circuit that connects an adjustable trigger-level bias point into the input circuit for neutral operation, and a fixed triggering level bias point for polar operation. The adjustable bias point sets the trigger level at half the rated loop current value (10 or 30ma). The input level applied to the Schmitt trigger is the sum of the trigger-level bias and the IR drop produced by loop current through the 60-20 MA switching circuit resistors. The change in input resistance for 20 ma and 60 ma loop operation assures that the voltage magnitude of the signals applied to the Schmitt trigger is the same for both types of operation.

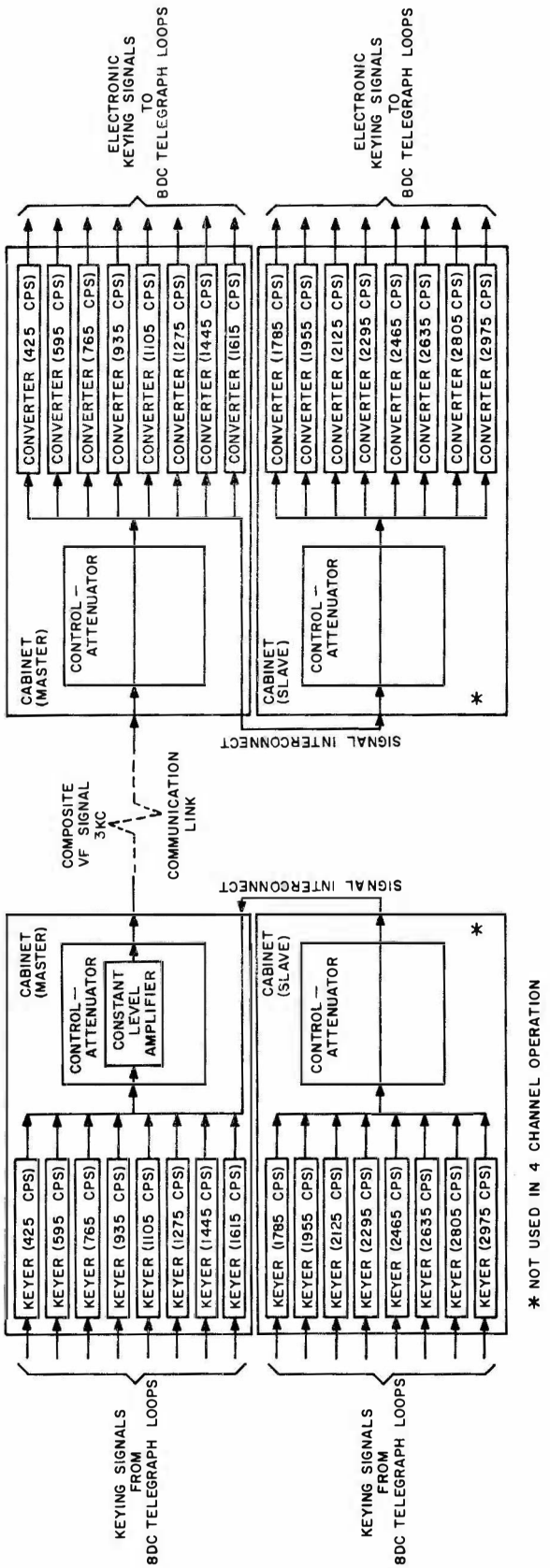


Figure 4-1. Telegraph Terminal AN/UCC-1A(V) Over-all Functional Block Diagram

(2) In neutral operation, the Schmitt trigger circuit is turned on (A1Q2 conducting) when loop current flows, and is turned off (A1Q2 not conducting) in the absence of a loop current. In polar operation, the trigger circuit is turned on by a negative loop current and turned off by positive loop current. Schmitt trigger output either forward or reverse biases the diode modulator.

(a) When forward-biased, the diode modulator connects an additional capacitance (C1-C2) into the tank circuit (Z1) of oscillator A1Q3-A1Q4, which consequently oscillates at the lower (normally, space) frequency.

(b) When reverse-biased, the diode modulator removes the additional capacitance from the oscillator tank circuit which then oscillates at the higher (normally, mark) frequency.

NOTE

See Table 1-1 for the mark and space frequencies.

(3) Connection of the diode modulator between the associated bias network and the Schmitt trigger is determined by the SIGNAL SENSE NORMAL-REVERSE switch S1, which makes the Telegraph Terminal compatible with other terminals having opposite mark or space frequencies. When this switch is set to:

(a) NORMAL, the diode modulator is reverse biased when the Schmitt trigger is on, and forward-biased when the Schmitt trigger is off. Thus, oscillator output is at the mark frequency when loop current flows and at the space frequency when loop current does not flow.

(b) REVERSE, the diode modulator is forward biased when the Schmitt trigger is on, and reverse-biased when the Schmitt trigger is off, producing results opposite of those in (a) above.

The output of oscillator A1Q3-A1Q4 is applied through output amplifier A1Q5 to output filter FL1.

(4) Power for the Keyer circuits (-18 volts dc) is supplied by a power supply on the Keyer which comprises a full-wave rectifier, an R-C filter, and a Zener-diode regulator.

b. KEYER DIVERSITY COMBINATIONS (see figure 4-3).

(1) Keyer modules plugged into Cabinet stations A1 and A2 can be connected to form a frequency-diversity pair. The same thing is true of Keyers plugged into stations A3 and A4, stations A5 and A6, and stations A7 and A8. Since connections for all of these station pairs are the same, figure 4-3 applies to all of them.

(a) With the DC LOOP switches (on any of the above-mentioned pairs of Keyers) in the DIVERSITY position, the inputs of both modules are connected to the same dc telegraph loop input; thus, the two Keyers both process the same input data.

(b) The modules plugged into the two stations are chosen to form a standard frequency-diversity pair. For example, in narrow-band operation, channel 425 cps and 785 cps modules, respectively, might be plugged into stations A1 and A2 of the Cabinet. Refer to Table 1-2 for frequency-diversity combinations.

(2) The output of each Keyer is applied to the arm of TONE OUTPUT switch S3, which, when set to:

(a) PARALLEL, applies the channel output through the constant level amplifier (in the Control-Attenuator) to the composite-tone-line output transformer in the Cabinet.

(b) INDIVIDUAL, applies the tone output to an associated output transformer in the Cabinet.

c. CONVERTER CIRCUIT DESCRIPTION (see figure 4-4).

(1) Either the composite-tone signal or an individual tone signal is fed to input filter FL1, a band-pass filter that blocks all frequencies other than those associated with the particular tone. Filter output is applied to the adjustable delay network, which provides the means for equalizing delays for tones which are being combined in diversity operation.

(2) Delay-network output is applied through emitter follower A1Q1 to amplifier A1Q2, which drives the AGC attenuation network whose output, in turn, drives the AGC detector (via 4-stage amplifier A1Q3 through A1Q6). AGC detector output is fed to AGC control amplifier A1Q7 (through emitter follower A1Q9), which controls the attenuation network. At the minimum normal input-signal level, signal feedback to the AGC attenuator provides zero attenuation. Any increase in the input signal, above this minimum level, produces an increase of attenuation.

(3) The signal from the AGC amplifier is applied to limiter A1Q8, which receives its dc power from the AGC detector.

(a) The limiter clips (thereby removing amplitude modulation from) the tone signal. The clipping level is determined by the reference signal from the AGC detector, so that, as the average amplitude of the tone signal increases, the clipping level is raised; consequently, the average amplitude of the signal is preserved.

(b) When two or four converters are operated in diversity, gains are controlled by the gain of the channel having the highest level input, so the output of that converter is held approximately at the standard level dictated by the gain control (DIV BAL A1R31). Since gain of the other converters is held at the same level as that of the controlling converter, the output levels of these converters are in the same proportion to the output of the controlling converter, as the input levels of these converters are to the input level of the controlling converter; this provides a better signal-to-noise ratio for the combination than does controlling the converters individually.

(4) Limiter A1Q8 output is applied through amplifier A1Q10 to discriminator Z1, which generates a dc signal of one polarity when the tone signal is at the mark frequency and of opposite polarity when the tone signal is at the space frequency. Discriminator output, added to a reference level supplied by the trigger-level network, is fed through emitter follower A1Q11 to the output circuits. The polarity of the discriminator output connection between the trigger-level network and the emitter follower is determined by SIGNAL SENSE switch S1. When S1 is set to:

(a) NORMAL, connection polarity is such that the discriminator supplies a negative level to the emitter follower when the tone signal is at the space frequency and a positive level when the tone signal is at the mark frequency.

(b) REVERSE, a positive level is applied to the emitter follower for a space frequency tone, and a negative level is applied for a mark frequency tone.

A1Q11 is cut off by a positive input and holds A1Q13 of the amplifier A1Q12-A1Q13 in the off condition; with A1Q13 cut off, zero loop current flows. When a negative level is applied to emitter follower A1Q11, A1Q13 of the amplifier is turned on, so that electronic switch A1Q14 presents a low-impedance path to the dc-telegraph loop and the external loop supply drives current through it.

d. CONVERTER DIVERSITY COMBINATIONS. - Connections for individual Converters, to form diversity combinations are shown in figures 4-5 and 4-6. Two factors determine the diversity connections: switch settings on the individual Converters, and Cabinet positions (stations) occupied by the Converters: Because Cabinet wiring for the first four stations is identical to that for the last four stations, figures 4-5 and 4-6 illustrate only one 4-station group.

(1) Referring to figure 4-5, each converter, regardless of the station into which it is plugged, can be connected to an associated individual input transformer or to either one of two composite input line transformers (designated as RCV A and RCV B). The two composite input lines are used in the frequency-diversity, space-diversity system. From this system, two Converter modules are assigned to each Channel. One group of four Converters (for the eight channels) processes signals from radio Receiver A, which appear on the RCV A input line; the other group of four Converters processes signals from radio receiver B, on the RCV B input line. With the TONE INPUT switches set as shown, the Converters in stations A1 and A3 are connected to PARALLEL A, and those in stations A2 and A4 are connected to PARALLEL B: the Converters in stations A1 and A3 function as a frequency-diversity pair, and those in A2 and A4 function as a frequency-diversity pair, those in A1 and

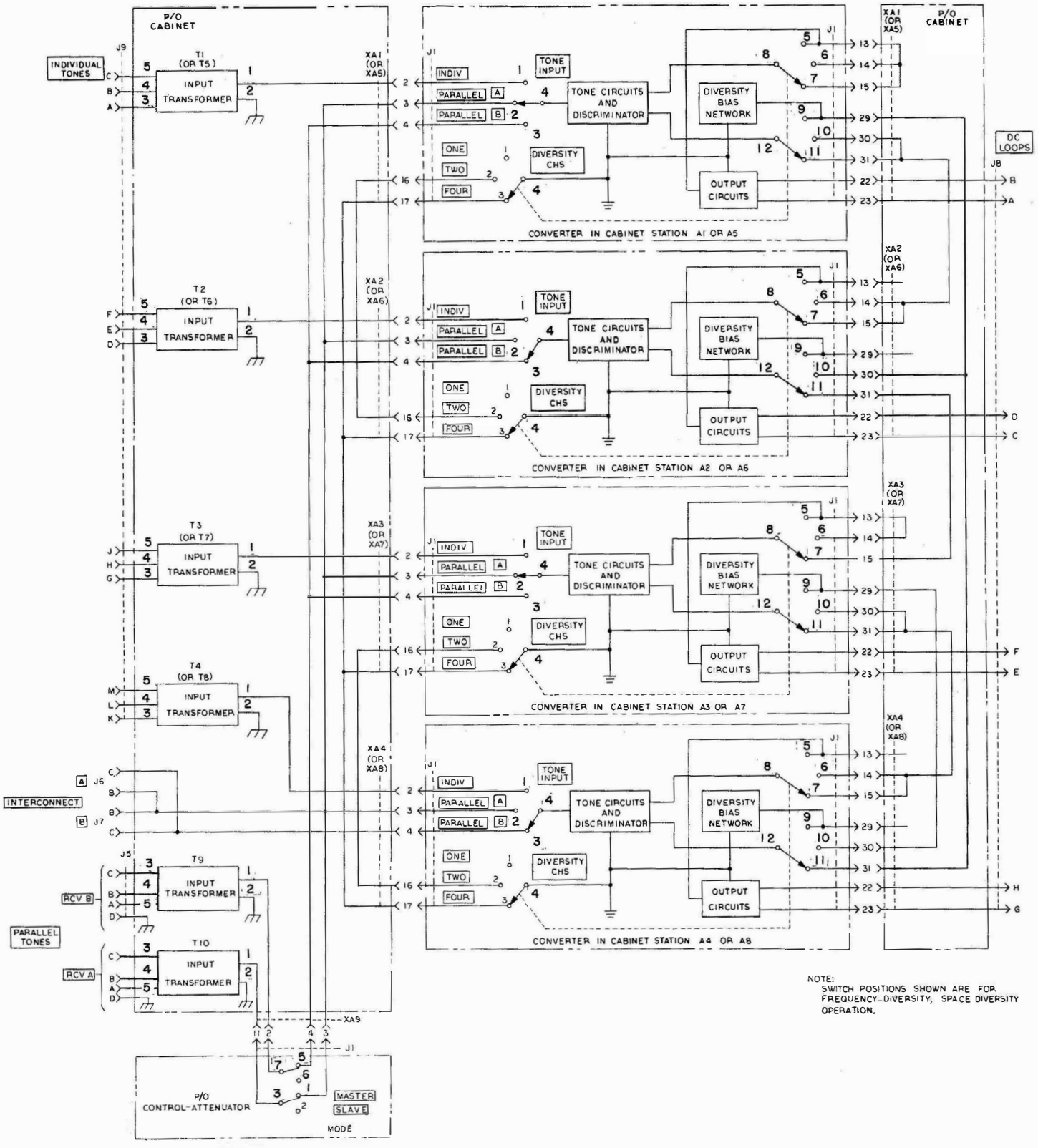


Figure 4-5. Converter Diversity Combination Block Diagram

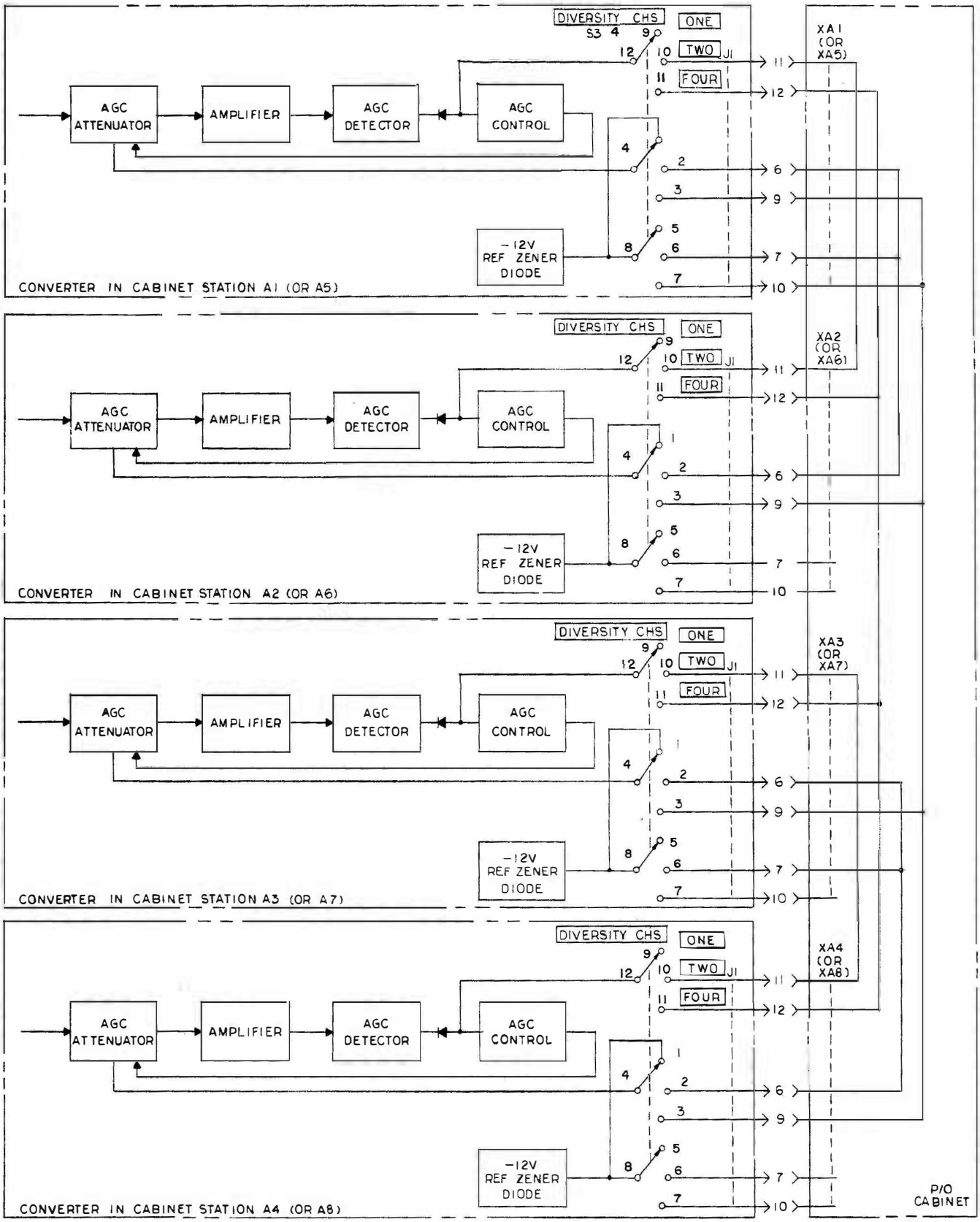


Figure 4-6. Converter Diversity Combination AGC Connections, Block Diagram

A2 function as a space-diversity pair, and those in A3 and A4 function as a space-frequency pair. For example, the Converters in the first two stations might be 425 cps channels; those in A3 and A4 would be 1785-cps channels, thereby forming a narrow-band frequency-diversity combination (Table 1-2). In this combination, outputs of the four discriminators are added in series and applied between the bias network on the station A1 Converter and the input to the keyer circuit of the station A1 Converter (as can be verified by tracing the path through the DIVERSITY CHS switches on figure 4-5, which are shown in the FOUR position). In order to combine the outputs of all four converters, the four converters circuit grounds must be tied together, this function being performed by one bank of the DIVERSITY CHS switches, through the associated Cabinet wiring.

(2) To use the Converters in stations A1 through A4 as two frequency-diversity pairs (figure 4-5), the DIVERSITY CHS switch on each Converter is set to TWO and the Converters must be rearranged (see Table 1-2). For example, the Converters used in stations A1 through A4, respectively, might be 425 cps, 1785 cps, 595 cps, and 2125 cps, the first two and the last two functioning as narrow-band frequency-diversity pairs.

(a) With the DIVERSITY CHS switches on the four Converters set to TWO:

1 discriminator outputs on station A1 and A2 modules are placed in series between the bias network and the input to the output circuits on the station A1 Converter.

2 outputs of the discriminators on the station A3 and A4 Converters are placed in series between the bias network and the output circuits on the station A3 Converter.

3 the grounds on the station A1 and A2 Converters are tied together, and those on the station A3 and A4 Converters are tied together.

(b) Since no space-diversity pairs are involved, all four of the TONE INPUT switches are set to the same position so that all four Converters are connected to the same composite tone line.

(3) As shown in figure 4-5, the composite input transformers are connected to the Cabinet's composite-tone lines through Control-Attenuator MODE switches, and the composite-tone lines are connected to the INTERCONNECT A and INTERCONNECT B connectors. The composite-tone lines are connected to the corresponding lines in other Cabinets when more than one Cabinet is used; in this case, the MODE switch is set to MASTER in one of the Cabinets and to SLAVE in each of the other Cabinets. The tone inputs are then received through the input transformers in that Cabinet where the MODE switch is in the MASTER position.

(4) Each Converter can operate its own Keyer, by placing the DIVERSITY CHS switch on the module to ONE. Each Converter can be connected to an individual input line by setting the unit's TONE INPUT switch to INDIV.

(5) Figure 4-6 illustrates the intermodule AGC circuit connections for diversity operation. Notice that these connections are made through another bank of the DIVERSITY CHS switch.

(a) When a group of Converters is used in a diversity combination, the inputs to the AGC control amplifiers for all modules in the group are connected together. This common connection is on the anode of a diode (on each Converter) whose cathode is connected to the output of the AGC detector for that Converter. The Converter receiving the largest signal input produces the most negative detector output, which back-biases the diodes on the other Converters of the group, effectively disconnecting them from the common AGC control amplifier input point. Thus, the AGC control amplifiers on all Converters of the group are driven by the AGC detector of the Converter receiving the largest input signal. AGC attenuation depends upon the level of the AGC control amplifier output with respect to a -12-volt reference level developed by a Zener diode on each Converter.

(b) When the station A1 and A2 Converters are connected as a frequency-diversity pair (DIVERSITY CHS switches set to TWO), the Zener diode of the station A1 Converter serves as the reference for both Converters. Similarly if the Converters in stations A3 and A4, A5 and A6, or A7 and A8 are used as diversity pairs, the reference voltage is supplied by the Zener diodes on the Converters in stations A3, A5, and A7, respectively.

(c) When the Converters in stations A1 through A4 (or A5 through A8) form a frequency-diversity, space-diversity combination (DIVERSITY CHS switches set to FOUR), the reference level is supplied by the Zener diode of the station A1 (or station A5) Converter.

e. CONTROL-ATTENUATOR CIRCUIT DESCRIPTION (see figure 4-7).

(1) The Control Attenuator supplies power to the other modules in the cabinet thru POWER SWITCH S1. It also contains the CONSTANT LEVEL AMPLIFIER, which has provision for setting the composite-tone output level. This output level will remain essentially constant as individual tones are added to, or removed from the composite-tone signal.

(2) When MODE switch S2 is in the MASTER position, the composite-tone signal is fed to the four-stage amplifier (A1Q1 thru A1Q4) of the CONSTANT-LEVEL AMPLIFIER. The output of A1Q4 is coupled thru a low-pass filter to A1Q5, an emitter-follower stage.

(3) The output of A1Q5 is fed to AGC Amplifier A1Q10, and the output of A1Q10 is fed into AGC detector A1Q11, which is essentially a half-wave rectifier.

(4) The output of the AGC detector is fed to one side of differential amplifier A1Q12 and A1Q13. A resistive divider provides the bias to A1Q12, and calibration of the +6 dbm output level is set by A1R46.

(5) The output of the differential amplifier, taken from A1Q13, is fed to a two stage direct-coupled amplifier consisting of A1Q14 and A1Q6. The emitter output of A1Q6 supplies the operating voltage for A1Q1 and A1Q2, thereby providing AGC to these two stages.

(6) The output of emitter-follower A1Q5 is also fed thru OUTPUT LEVEL control R1 to A1Q7, a driver stage which is transformer-coupled to push-pull amplifier A1Q8 and A1Q9. The output of this amplifier is then fed to the composite-tone-line output transformer in the cabinet.

f. TEST SET CIRCUIT DESCRIPTION (see figure 4-8).

(1) REVERSALS OUTPUT. The reversals rate generator consists of a baud timer (astable multivibrator), a reversal bistable multivibrator, and an electronic switch output circuit. Baud timer Q1-Q2, which can be set to run at either 75 or 150 baud, drives electronic switch Q5 (through bistable Q3-Q4), so that alternating marks and spaces are supplied at the selected baud. In both the 75 baud and 150 baud positions, reversal rate selector switch S2 provides a loop closure at REVERSALS jack J1 through electronic switch Q5 in series with a hundred ohm resistor (R23) when set to:

(a) 75 BAUD, the reversals rate generator runs at 75 baud.
(b) 150 BAUD, the reversals rate generator runs at 150 baud.
(c) MARK, a steady loop closure is provided through R23.
(d) SPACE, the REVERSALS jack presents an open circuit to the loop.

(2) TONE LEVEL MEASUREMENT AND AUDIBLE INDICATION. Tone signals connected to TONE LEVEL jack J4 are applied through input transformer T2 to emitter follower Q6, which drives audio amplifier Q7 and rectifier CR7-CR8. The audio amplifier drives loudspeaker LS1 through output transformer T3 and TONE OUTPUT jack J6, giving audible indication of tone signals. The output of the rectifier is applied through function switch S3 (when set to TONE LEVEL) to meter M1. The meter indication is used in equalizing the output tone levels of the individual channel outputs.

(3) LOOP CURRENT MEASUREMENT. Signals connected to LOOP CURRENT jack J5 are applied to the meter circuit through FUNCTION switch S3 when the switch is set to LOOP CUR. The loop current is divided by the circuit (resistors R28 and R29) so that only a small portion of the total current flows through the meter.

(4) DELAY ADJUSTMENT. The phases of the channel signals applied to PHASE ADJUSTMENT jacks J3 and J4 are compared to one another by a delay measurement network whose resultant output is a signal whose dc component is:

(a) Proportional to the difference in phase between the two input signals.
(b) Dependent in polarity on which channel signal is subject to the greater delay.

The delay comparison network output is applied through FUNCTION switch S3 (when set to PHASE ADJ/LOW or PHASE ADJ/HIGH) to meter M1.

(5) TONE GENERATOR. The Tone Generator produces the mark and space frequencies for the 20 FSK Tones. Two oscillators operating near 10 megacycles are mixed together to produce the desired frequency output. The desired channel is selected by the combined settings of the TONE SELECTION switch and the FREQ. RANGE switch S4. MARK-SPACE switch S5 selects either the mark or space frequency for the particular tone selected. The output level is determined by the setting of TONE GEN LEVEL potentiometer R1, and is applied to TONE GEN OUT jack J7.

4-3. LOGICAL TROUBLESHOOTING.

System troubles may be located by progressive substitution or elimination of modules and units. Initially, the Keyer and Converter Cabinets of the Telegraph Terminal should be disconnected from the communication link, and connected together. The sending loops of the station are then used to key the receiving loops of the station through the Telegraph Terminal. By substitution and elimination, the trouble is isolated to the Cabinet or to one of the Keyers, Converters, or Control-Attenuators, or to a cable. At the module level, trouble is isolated to the printed-circuit card or to the module frame, by card substitution.

NOTE

A basic assumption of system trouble shooting is that either the Keyers or the Converters are known to be operating normally. This implies that trouble is encountered in either transmission or reception but not in both simultaneously.

4-4. TEST EQUIPMENT.

Test equipments required for trouble shooting the Telegraph Terminal include the Oscilloscope and Multimeter called out in Table 1-5, as well as Multimeter AN/PSM-4C, hereafter referred to as the PSM-4C.

4-5. SYSTEM TROUBLESHOOTING.

a. PRELIMINARY CHECK. - Apply power to the equipment, and perform the following steps in sequence.

(1) Check that all Cabinets are receiving power as indicated by POWER indicator lamp in Control-Attenuators.

(2) If any POWER indicator is not lighted, check fuses on that Control-Attenuator. Replace defective fuse(s). If any fuse blows again, do not replace until short-circuit has been localized and eliminated.

(3) If trouble affects single module check associated fuse. Replace defective fuse; if fuse blows again do not replace until short circuit has been localized and eliminated.

(4) Disconnect Telegraph Terminal from communication link and connect Keyer cabinet PARALLEL TONES XMIT jack to PARALLEL TONES REC jack on the Converter cabinet.

(5) Key receiving loops from sending loops.

(6) If step (5) is:

(a) Successful, trouble exists in communication link, at opposite end of link, or in the interface cable. Check out external equipment as required.

(b) Not successful, proceed to the sectionalization procedures in paragraph b.

b. SECTIONALIZATION.

(1) GENERAL. - To sectionalize a malfunction to a Telegraph Terminal module, proceed in the sequence described below.

(a) Perform the operator's maintenance detailed in paragraph 3-3.

(b) Check the test-point voltage levels as described in (2), below.

(c) If the voltage-level checks are satisfactory, but the equipment continues to malfunction, proceed to the procedures provided in (3), below. (A Test Set malfunction may be sectionalized by determining which of its normal functions the Test Set fails to perform. To localize the trouble to a stage or part, refer to paragraph c, below.) Location of test points referred to in the following procedures are shown in figure 3-1, 3-2, 3-3, and 5-1 through 5-5. Waveforms for the Telegraph Terminal are illustrated on the aprons of the appropriate service block diagrams (see figure 4-2, 4-4, 4-7 and 4-8).

(2) VOLTAGE CHECKS. - For each Telegraph Terminal module, check for the correct voltage levels, which are listed in Table 4-1.

(a) If the signal at a specified test point is a dc voltage, make the measurement with the Multimeter; if an ac waveform, use the Oscilloscope. Each waveform listed calls out the figure (apron) that illustrates the correct waveform; switch settings required for production of the correct waveforms are defined on the specified figure.

(b) Any module that does not provide the specified voltage levels is faulty. Proceed to paragraph (3), below, and/or to paragraph c, below, for further troubleshooting instructions.

(c) If all voltage level indications are correct but equipment continues to malfunction, proceed to paragraph (3), below.

(3) PROCEDURES. If the malfunction is not sectionalized by checking voltage levels as described in (2) above, refer to table 4-2 which identifies trouble types and specifies for each trouble, the appropriate troubleshooting procedure (table 4-3) to be performed.

c. LOCALIZATION OF TROUBLE TO STAGE AND PART.

(1) When a trouble has been sectionalized to a printed-circuit card by means of the procedures of paragraph 4-5a and b, isolate the trouble to a stage and part by monitoring signal levels and dc levels on that card.

TABLE 4-1. TEST POINT VOLTAGE LEVELS

UNIT	TEST POINT	CORRECT VOLTAGE
KEYER	TONE OUT - GRD	ac waveform (see figure 4-2)
	MOD - 0V	ac waveform (see figure 4-2)
	-18V - 0V	-18
	0V - GRD	0
CONVERTER	TONE IN - 0V	-3.3; ac waveform (see figure 4-4)
	AGC OUT - 0V	ac waveform (see figure 4-4)
	DISC A - 0V	-4
	DISC B - 0V	-4
	DISC A - DISC B	ac waveform (see figure 4-4)
	-18V -0V	-18

TABLE 4-2. RECEIVING AND TRANSMITTING TROUBLES

TYPE OF TROUBLE	TABLE 4-3 STEP NO.	
	RECEIVE	TRANSMIT
Keying not successful on any channel	2	1
Keying not successful on any channel (8 channel)	4	3
Trouble limited to single diversity combination	5 & 6	5 & 6
Trouble limited to single module	7	7

TABLE 4-3. TELEGRAPH TERMINAL, TYPICAL TROUBLES

TROUBLE	TEST	CORRECTION
1. Keying not successful on any Keyer (Transmission trouble, two cabinets in parallel, a master and a slave).	a. At the slave Cabinet only, disconnect INTERCONNECT cable connecting the two Cabinets. Note The Master Cabinet is the Cabinet from whose PARALLEL TONES XMIT jack the output is being taken. The other Cabinet is the slave Cabinet.	
	b. Key receiving loop from one of the sending loops, using a Keyer in the master cabinet. If keying is successful, proceed to test c. If not proceed to test e.	
	c. Remove Control-Attenuator from slave Cabinet. If short-circuit is obtained across pins A and D of INTERCONNECT/A jack, proceed to test d. If not, see correction column.	Short-circuit in group-attenuator, MODE switch, wiring or connector on Control-Attenuator. Replace defective component, or repair defective wiring.
	d. Remove Keyers from slave Cabinet, one at a time, until short-circuit indicated in test c has been eliminated.	If short-circuit is eliminated by removal of one of the Keyers, localize trouble to a component or defective wiring on that module. If short-circuit is not eliminated

TABLE 4-3. TELEGRAPH TERMINAL, TYPICAL TROUBLES (Continued)

TROUBLE	TEST	CORRECTION
		by removal of all modules, a short-circuit in the Cabinet wiring or connectors is indicated. Replace defective connector, or repair defective wiring.
	e. Disconnect INTERCONNECT cable from master Cabinet. Again attempt keying. If successful, see correction column. If not, proceed to test f.	Defective INTERCONNECT cable or one of its terminating connectors. Replace defective connector, or repair defective cable.
	f. Remove Control-attenuator from both cabinets. Set MODE switch on Control-Attenuator taken from slave cabinet to MASTER position. Set ATTEN control to -10 and plug slave module into master cabinet. Attempt keying. If successful see correction column, if not proceed to test g.	Defective MODE switch, Constant Level Amplifier, or wiring on Control-Attenuator initially in master cabinet.
	g. Interchange master-slave function of the two Cabinets by interchanging Control-Attenuators, and by moving output cable connectors to PARALLEL TONES XMIT jack of Cabinet initially in slave mode. Reconnect INTERCONNECT cable. Again attempt keying. If keying is successful, see correction column. If not, proceed to test h. Note If keying is successful in test g an alternate path for transmission has been established; therefore, it can be used to maintain normal operation, and the indicated repair can be completed when convenient.	Defective output transformer, PARALLEL TONES XMIT connector, or wiring in Cabinet initially in the master mode. Replace defective component, or repair defective wiring.

TABLE 4-3. TELEGRAPH TERMINAL, TYPICAL TROUBLES (Continued)

TROUBLE	TEST	CORRECTION
	h. Disconnect INTERCONNECT cable. Again attempt keying. If successful, perform tests c through f for the Cabinet placed in slave mode in test g above. If not successful, see correction column.	Defective cable connecting transmitting equipment to receiving equipment. Replace defective cable.
2. Keying not successful on any Converter (Receiving trouble, two Cabinets in parallel.)	a. Waveform 1 of figure 4-4 observed on Oscilloscope connected between TONE IN and 0V test points on any Converter in the master Cabinet. If trouble is really affecting all receiving channels, as assumed, the normal waveshape will not be observed.	
	b. Disconnect INTERCONNECT cable at slave Cabinet only. If waveform in test a, above, is now observed, perform test c and d. If not, proceed to test e.	
	c. Remove Control-Attenuator from slave Cabinet. If short-circuit is obtained (1) across pins B and D of INTERCONNECT/A jack while PARALLEL TONES RCV A channel is being used or (2) across pins C and D while PARALLEL TONES RCV B channel is being used, proceed to test d. If not, see correction column.	Short-circuit in MODE switch connector, or wiring in assembly. Replace defective component, or repair defective wiring.
	d. Remove Converters from slave Cabinet, one at a time, until short-circuit indicated in test c is eliminated.	If short-circuit is eliminated by removal of one of the Converters, localize trouble to a component or defective wiring on that module. If short-circuit is not eliminated by removal of all Converters, a short-circuit in the frame wiring or connector is indicated. Replace defective connector, or repair defective wiring.

TABLE 4-3. TELEGRAPH TERMINAL, TYPICAL TROUBLES (Continued)

TROUBLE	TEST	CORRECTION
	e. Disconnect INTERCONNECT cable from master Cabinet. If normal signal is now observed, see correction column. If not, proceed to test f.	Defective INTERCONNECT cable. Replace or repair cable.
	f. Remove Control-Attenuators from both Cabinets. On Control-Attenuator taken from slave Cabinet, set MODE switch to MASTER and plug unit into master Cabinet. If waveform 1 of figure 4-4 is now observed, see correction column. If not, proceed to test g.	Defective MODE switch, or module wiring on Control-Attenuator initially in the master Cabinet. Replace defective switch, or repair defective wiring.
	g. Interchange the master-slave functions of the two Cabinets. Move input connector to the PARALLEL TONES RCV A or RCV B jack of the new master Cabinet (initially in the slave mode). Reconnect INTERCONNECT cable. If normal indication is observed, proceed to test h; if not, see correction column. Note If normal indication is observed in test g an alternate path for transmission has been established; it may be used to obtain normal operation and the indicated repair may be made when convenient.	Defective input transformer, PARALLEL TONES RCV A or RCV B, or Cabinet wiring in frame initially in master mode. Replace defective component.
	h. Disconnect INTERCONNECT cable. Check for waveform 1 of figure 4-4 on oscilloscope connected between TONE IN and 0V test points on the Converter in the new master cabinet. Perform tests c	

TABLE 4-3. TELEGRAPH TERMINAL, TYPICAL TROUBLES (Continued)

TROUBLE	TEST	CORRECTION
	and d on the cabinet placed in the slave mode during step g.	
3. Keying not successful on any Keyer (Transmission trouble single cabinet, eight channel)	a. 0 dbm level indicated on multimeter connected between pins A and D (grd) of INTERCONNECT/A jack. If correct level is indicated proceed to test b; if not proceed to test d.	
	b. 0 dbm level indicated on multimeter connected between TP1 and TP2 on Control-Attenuator. If level is indicated proceed to test c; if not, see correction column.	Defective Constant Level Amplifier, connector, or wiring. Replace defective component or repair defective wiring.
	c. 0 dbm level indicated on multimeter connected between pins C and D of PARALLEL TONES XMIT jack.	If not obtained; defective output transformer, jack, or cabinet wiring. Replace defective component.
	d. Check for -18 volts between -18V and 0V test points on any Keyers. If obtained, proceed to test e. If not, see correction column.	Defective Control-Attenuator, Cabinet, connection, or wiring, Trace for loss of ac power. Replace defective component or wiring.
	e. Remove Control-Attenuator. Check for short-circuit across pins A and D of INTERCONNECT/A jack. If so, proceed to test f. If not, see correction column.	Defective CONSTANT LEVEL AMPLIFIER, MODE switch, connector or wiring in Control-Attenuator. Replace defective component, or repair wiring.
	f. Remove Keyers, one at a time, until short-circuit indicated in e, above, is eliminated or all Keyers have been removed. Refer to correction column.	If removal of a Keyer eliminates the short-circuit, check for defective component or wiring in input circuit of that Keyer (see c, below). Replace defective component, or repair wiring. If removal of all Keyers does not eliminate the short-circuit, a short-circuit exists in Cabinet wiring or connectors.

TABLE 4-3. TELEGRAPH TERMINAL, TYPICAL TROUBLES (Continued)

TROUBLE	TEST	CORRECTION
4. Keying not successful on any Converter (Receiving trouble, single Cabinet, 8-channel operation.)	a. Check for Multimeter indication of -18 volts between -18V and 0V test points on any Converter. If indicated, proceed to test b. If not, see correction column.	Defective Control-Attenuator/Cabinet connection or wiring. Trace loss of ac power. Replace defective component or wiring.
	b. Remove Control-Attenuator. Check for a short-circuit on INTERCONNECT/A jack (1) across pins B and D if PARALLEL TONES RCV A is in use, (2) across pins C and D if RCV B is in use. If a short-circuit is indicated, proceed to test c. If not, proceed to test d.	
	c. Remove Converters, one at a time, from Cabinet until all Converters have been removed or the short-circuit detected in b, above, has been eliminated; then see correction column.	Defective component or wiring in input circuit on that Converter. Replace defective component or wiring.
	d. Test for continuity between pins 2 and 4 and between pins 3 and 11 of Control-Attenuator.	An open, in either case, indicates defective Control-Attenuator MODE switch. Replace switch or assembly. If continuity is observed in both cases, check for defective input transformer, Cabinet wiring, or connector. Replace defective component (see c, below), or repair defective wiring.
5. Trouble involving a diversity pair.	a. Remove module of pair in slave station of Cabinet (stations A2, A4, A6, and A8). Key, using remaining channel of diversity combination. If keying is successful, see correction column. If not, proceed to test b.	Defective module that was removed from Cabinet.

TABLE 4-3. TELEGRAPH TERMINAL, TYPICAL TROUBLES (Continued)

TROUBLE	TEST	CORRECTION
	b. Remove Keyer (or Converter) through which keying was unsuccessful in test a, and remove corresponding Converter (or Keyer). Plug Keyer (or Converter) that was removed during test a and corresponding Converter (Keyer) into master station (A2, A3, A5, or A7). Proceed to test c.	
	c. Key with modules installed in test b.	If keying is successful, defective module tested in a, above. If keying is not successful, defective station wiring or connector.
6. Trouble involving 4-channel diversity combinations.	Perform the tests of 5 a, b, c on all four modules of the diversity combination by inserting them one at a time into the master station (A1, A3, A5, or A7).	If one module fails to provide successful keying, the module is defective; replace or repair. If all modules fail to provide successful keying, defective station wiring or connector.
7. Trouble involving a single tone module (Keyer or Converter)	a. Replace printed-circuit card assembly and then key. If keying is successful, see correction column. If not, proceed to test b.	Defective printed-circuit card originally in module. Repair printed-circuit card.
	b. Move Keyer (or Converter) module to another station and also move corresponding Converter (or Keyer) module to the same station. See station cabling diagram and use stations that are connected. Attempt keying.	If keying is successful, defective Cabinet wiring at original station position. Repair wiring. If keying is not successful, defective component in module (see c, below); repair module.

(2) Signal waveforms are shown on the apron of the appropriate servicing block diagrams (see figures 4-2, 4-4, 4-7 and 4-8). In general, amplitudes should be within 20% of those shown. However, this is based on locally applied inputs at nominal levels. Where the Converter input is being derived from the opposite end of a communication link, it may be down by as much as -40 db, with a corresponding decrease in the waveform amplitude. The appearance of the carrier in the Keyer and Converter waveforms depends upon the channel being monitored.

(3) Location of a component in a unit can be found in figures 3-1, 3-2, 3-3, and 5-1 through 5-5. Location of a component in a circuit is shown in figures 5-6 through 5-10. Figure 5-11 illustrates the required set up for reversals adjustment procedures. Figures 5-13 and 5-14 show the response curves of Telegraph Terminal filters.

(4) The Keyer and Converter waveforms were taken on modules. Test jacks that do not have waveforms have only dc levels that did not impart visual information (refer to Table 4-1 for the voltages at these jacks).

(5) Typical transistor voltages for the printed-circuit cards are listed in Tables 4-4 through 4-7. Voltage measurements should be within 10% of listed values. All measurements were made with respect to circuit ground using the PSM-4C. Input conditions, where pertinent, are noted on the Tables.

TABLE 4-4. KEYER CARD VOLTAGE LEVELS (STEADY MARK 20MA INPUT)

TRANSISTOR	VOLTAGE
Q1 base	+1.7
emitter	-1.6
collector	-9.7
Q2 base	-1.6
emitter	-1.9
collector	-1.6

TRANSISTOR	VOLTAGE
Q3 base	-1.4
emitter	-1.3
collector	-8.5
Q4 base	-8.5
emitter	-9.4
collector	-18

TRANSISTOR	VOLTAGE
Q5 base	-.5
emitter	-1.4
collector	-18

TABLE 4-5. CONVERTER CARD VOLTAGE LEVELS (STEADY MARK FREQUENCY INPUT)

TRANSISTOR	VOLTAGE
Q1 base	-2.9
emitter	-2.8
collector	-15.5
Q2 base	-2.7
emitter	-2.5
collector	-13.2
Q3 base	- .2
emitter	- .2
collect or	-11.6
Q4 base	-4.2
emitter	-4
collector	-6.4
Q5 base	-6.4
emitter	-6.3
collector	-11.2

TRANSISTOR	VOLTAGE
Q6 base	-11.2
emitter	-11
collector	-15
Q7 base	-19.2
emitter	-13.9
collector	-18
Q8 base	-2.3
emitter	0
collector	0
Q9 base	-14.4
emitter	-14.2
collector	-18
Q10 base	0
emitter	-1
collector	-18

TRANSISTOR	VOLTAGE
Q11 base	-1.6
emitter	-1.2
collector	-18
Q12 base	-1.2
emitter	-3
collector	-18
Q13 base	-3.1
emitter	-2.9
collector	-3.1
Q14 base	-17
emitter	-17.5
collector	-17.5

TABLE 4-6. TEST SET CARD PC-53438030 VOLTAGE LEVELS

TRANSISTOR	VOLTAGE
Q1 base	+2
emitter	0
collector	-3.5
Q2 base	+2.4
emitter	0
collector	-5.3
Q3 base	-3.2
emitter	-3.8
collector	-7.8

TRANSISTOR	VOLTAGE
Q4 base	-3.2
emitter	-3.8
collector	-8
Q5 base	-11.8
emitter	-11.9
collector	-7.8

TRANSISTOR	VOLTAGE
Q6 base	-6.8
emitter	-6.6
collector	-12.6
Q7 base	-1.8
emitter	-1.8
collector	-11.7

TABLE 4-7. CONSTANT LEVEL AMPLIFIER CARD VOLTAGE LEVELS

TRANSISTOR	VOLTAGE
Q1 base	-.06
emitter	0.0
collector	-2.6
Q2 base	-.07
emitter	0.0
collector	-2.75
Q3 base	-.18
emitter	0.0
collector	-6.3
Q4 base	-.31
emitter	-.17
collector	-6.1
Q5 base	-6.0
emitter	-5.8
collector	-18.0

TRANSISTOR	VOLTAGE
Q6 base	-3.3
emitter	-3.1
collector	-12.0
Q7 base	-6.6
emitter	-6.5
collector	-12.6
Q8 base	-6.6
emitter	-6.5
collector	-12.6
Q9 base	-.19
emitter	-.08
collector	-6.4
Q10 base	-.31
emitter	-.16
collector	-8.7

TRANSISTOR	VOLTAGE
Q11 base	+.02
emitter	-.22
collector	-9.9
Q12 base	-10.8
emitter	-11.0
collector	0.0
Q13 base	-10.4
emitter	-11.0
collector	-.18
Q14 base	-.18
emitter	-.005
collector	-.93

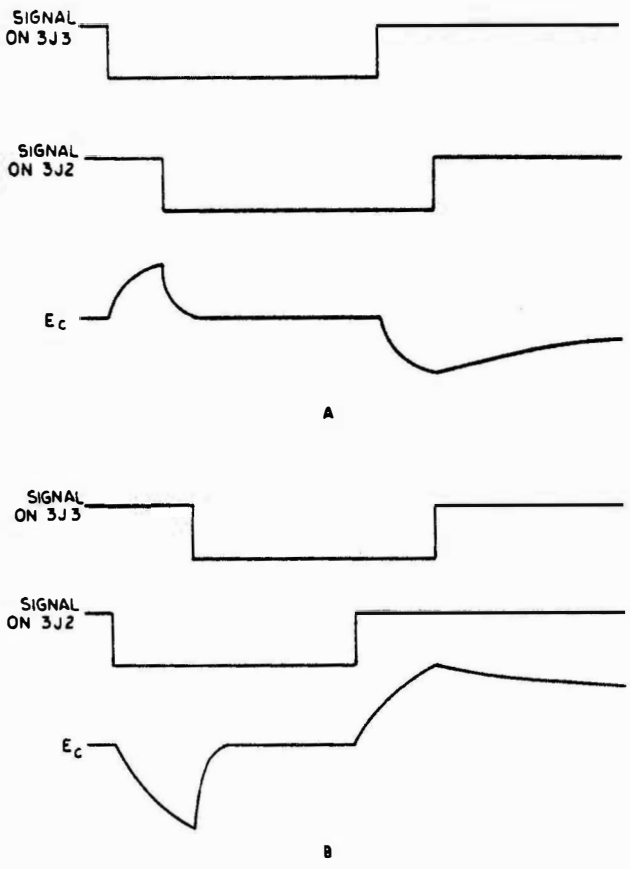


Figure 4-9. Phase Adjustment Measurement Network Waveforms

SECTION 5

MAINTENANCE

5-1. FAILURE, PERFORMANCE, AND OPERATIONAL REPORTS.

The Bureau of Ships no longer requires the submission of Failure Reports for all equipments. Failure Reports and Performance and Operational Reports are to be accomplished for designated equipments (refer to Electronics Installation and Maintenance Book, NAVSHIPS 900,000) only to the extent required by existing directives. All failures shall be reported for those equipments requiring the use of Failure Reports.

5-2. USE OF ADJUSTMENT PROCEDURES.

Adjustments that are dependent upon system connections are given in paragraph 2-5 and are performed as a part of the installation procedure; they may also be performed as specified in the general procedures of paragraph 5-4. Procedures that are independent of system connections, provided in paragraph 5-4, should be performed only when specified as part of the general procedures of paragraph 5-4. Refer to figures 5-1 through 5-11, as required, during performance of adjustment or repair.

5-3. TEST EQUIPMENT REQUIRED FOR REPAIR.

Test equipment required for repair of the Telegraph Terminal are the Frequency Counter FR-67 and the Electronic Multimeter ME-6D/U (hereafter referred to as the Frequency Counter and the Multimeter).

5-4. GENERAL ADJUSTMENT PROCEDURES.

a. ADJUSTMENTS AFTER CHANGE IN SYSTEM CONFIGURATION. - Perform procedures of paragraph 2-5 for all modules affected by the change in system configuration.

b. ADJUSTMENTS AFTER REPLACEMENT OR REPAIR OF KEYER PRINTED-CIRCUIT CARD ASSEMBLY.

(1) Perform procedure of paragraph 2-5.

(2) Perform procedure of paragraph 5-5.

c. ADJUSTMENTS AFTER REPLACEMENT OR REPAIR OF CONVERTER PRINTED-CIRCUIT CARD ASSEMBLY. - Perform procedure of paragraph 2-5.

d. ADJUSTMENTS AFTER REPLACEMENT OR REPAIR OF CONSTANT LEVEL AMPLIFIER PRINTED-CIRCUIT CARD ASSEMBLY. - Perform procedure of paragraph 5-6.

e. ADJUSTMENTS AFTER REPLACEMENT OR REPAIR OF TEST SET PRINTED-CIRCUIT CARD ASSEMBLY 3A1. - Perform procedure of paragraph 5-7.

5-5. KEYER ADJUSTMENTS.

a. TONE-LEVEL ADJUSTMENT. - Perform the tone-level adjustment procedure as follows:

(1) Using test cable with phone jacks at each end, connect Keyer LOOP MON jack (see figure 3-2) to Test Set REVERSALS jack (see figure 3-4).

(2) Using test cable with tip jack at one end and phone jack at the other end, connect Keyer TONE test point (see figure 3-2) to Test Set TONE INPUT jack (see figure 3-4).

(3) Place Test Set REVERSAL RATE switch in 75 BAUD position for narrow-band, or in 150 BAUD position for wide-band keyer.

(4) Provide steady mark to Keyer from dc signal loop.

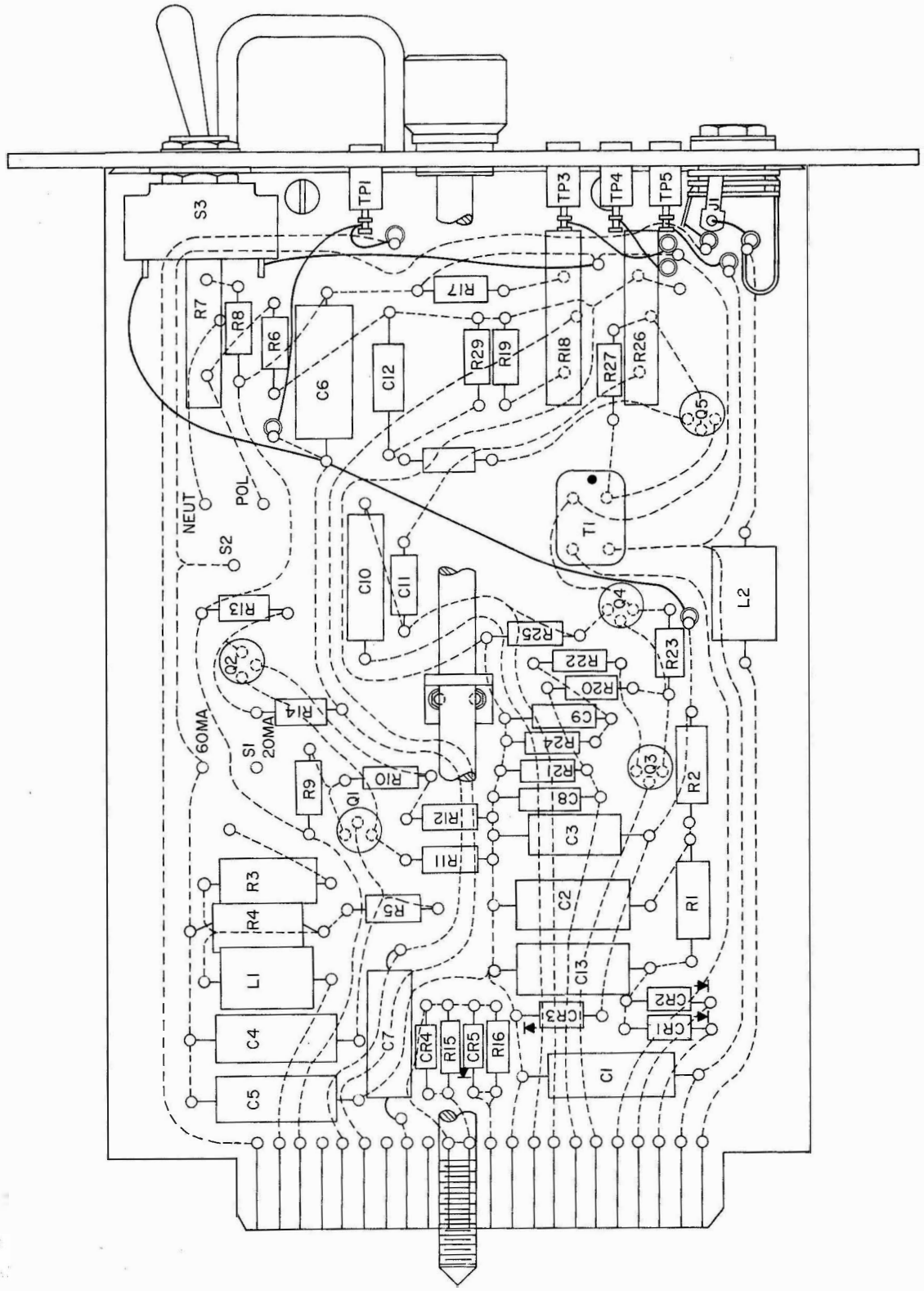


Figure 5-1. Keyer Card Assembly 1A1A1, Component Location

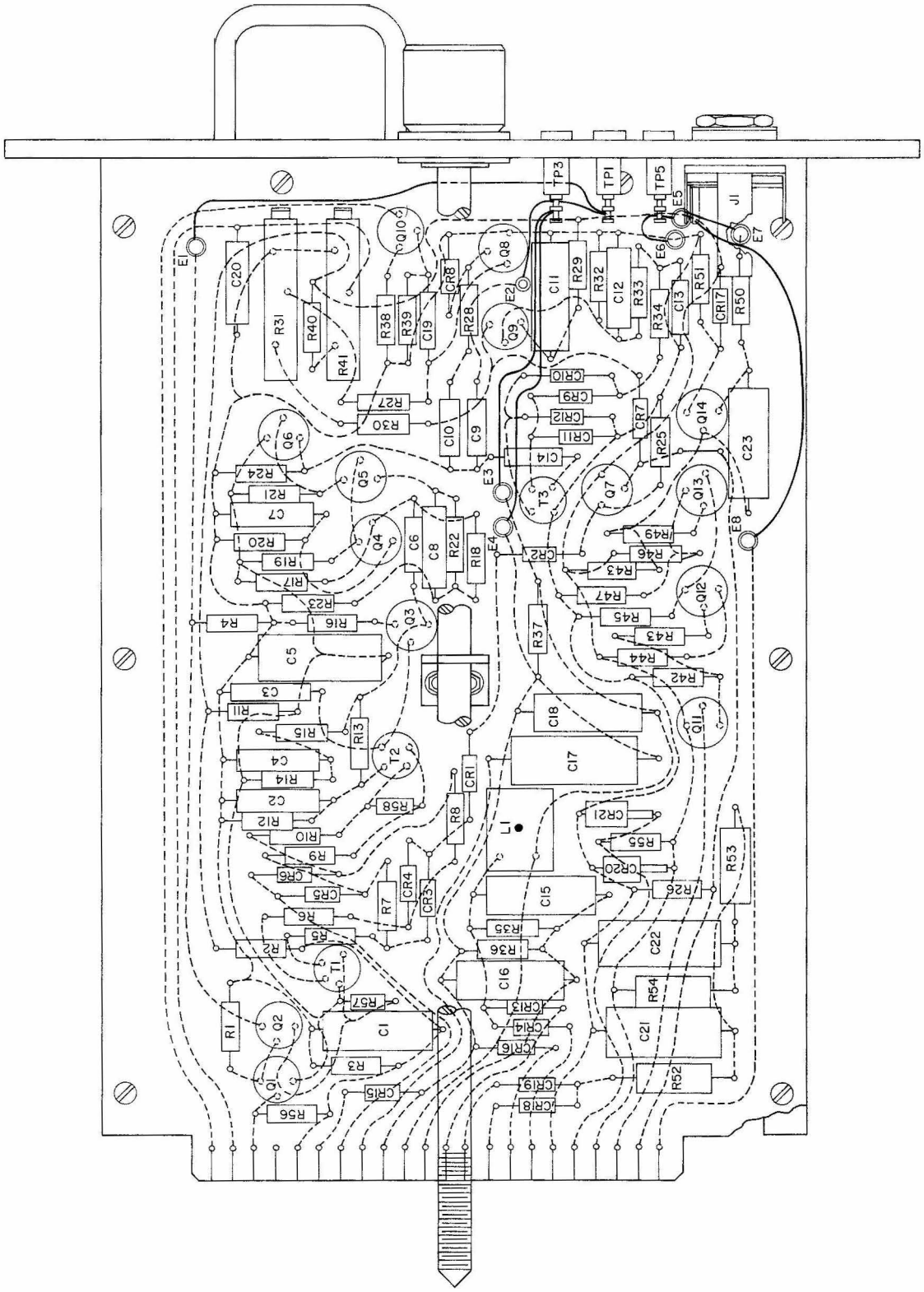


Figure 5-2. Converter Card Assembly 1A2A1, Component Location

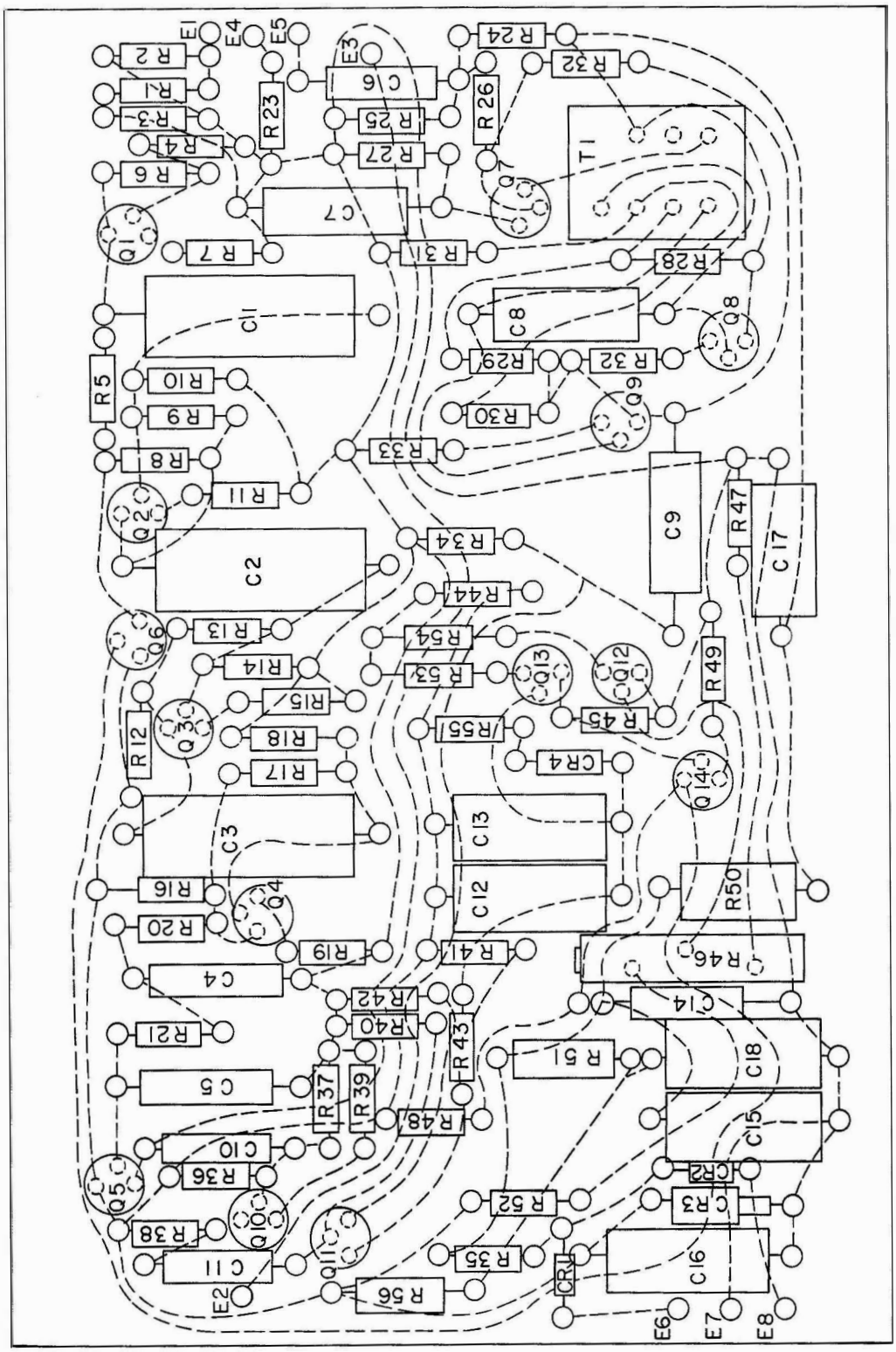


Figure 5-3. Control-Attenuator Card Assembly 1A3A1, Component Location

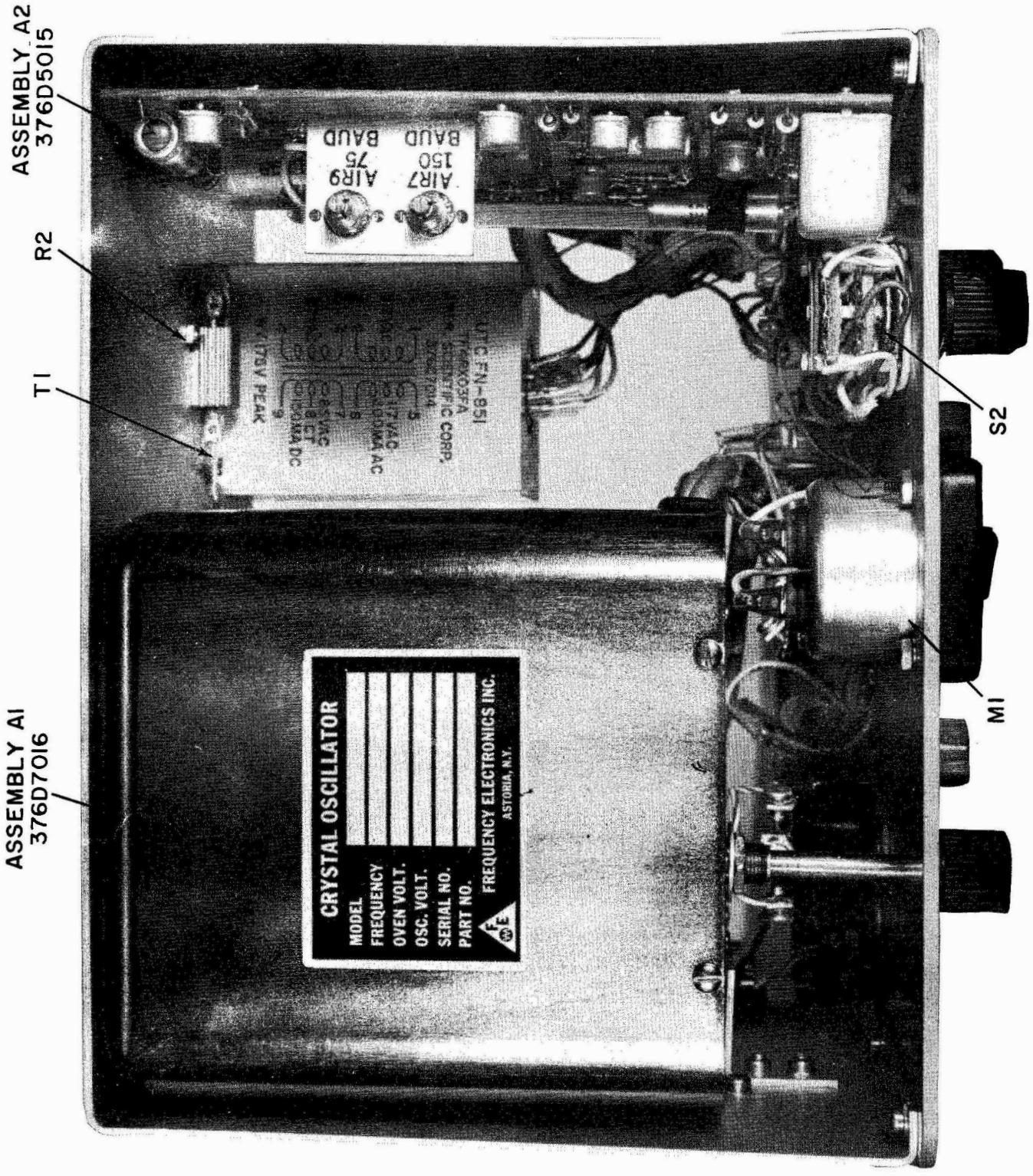


Figure 5-4. Test Set Component Location

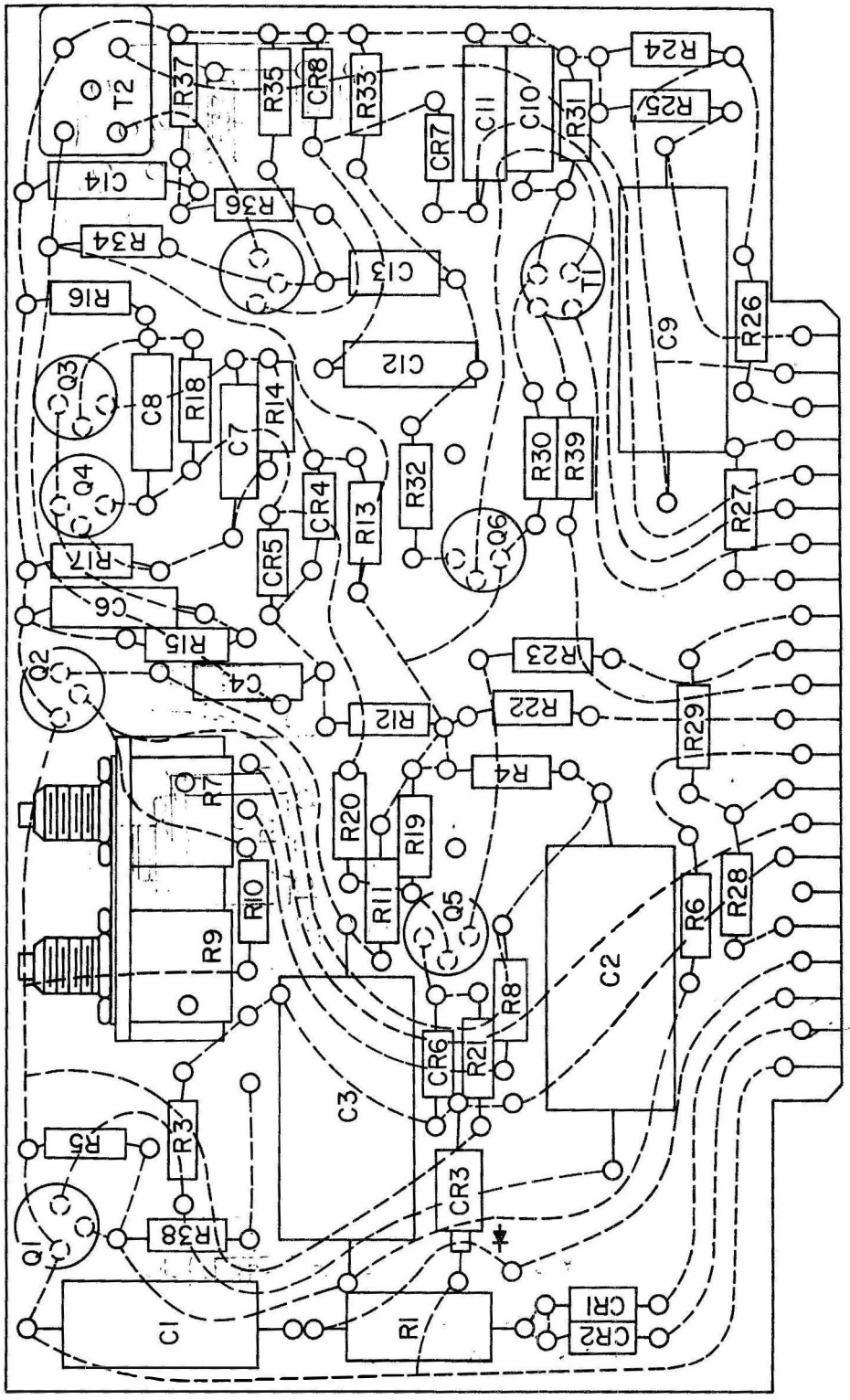


Figure 5-5. Test Set Card Assembly, 3A1, Component Location

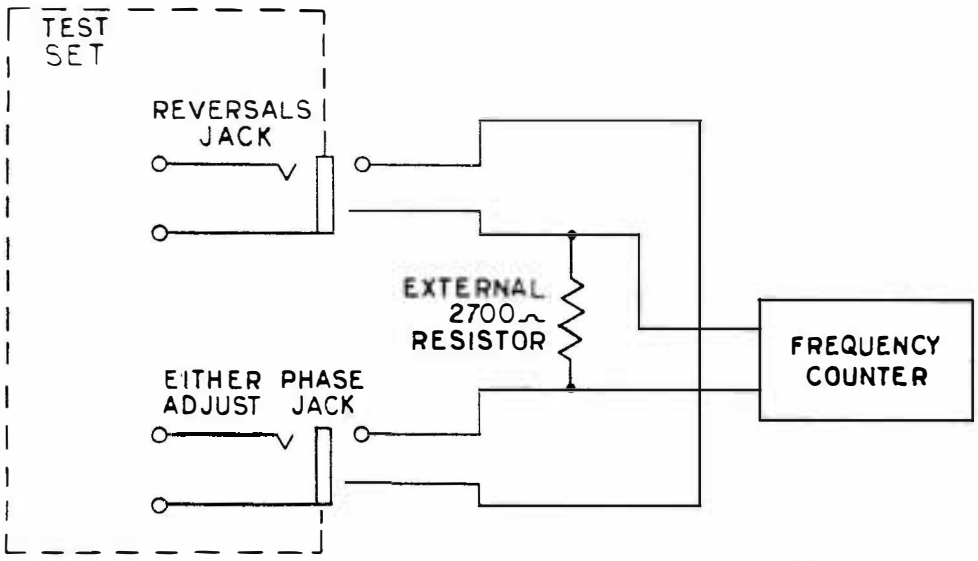


Figure 5-11. Reversals Adjustment Test Set-up

NOTE

FSK tone switching between mark and space frequencies should now be audible from Test Set loudspeaker.

(5) Set Test Set FUNCTION switch to TONE LEVEL.

(6) Observe indication on Test Set front-panel meter. If required, adjust Keyer LEVEL control (with screwdriver) to obtain a Test Set meter indication of 0 DB.

(7) Disconnect test cables.

b. TRIGGERING-LEVEL ADJUSTMENT. - The triggering-level adjustment affects Keyer operation only in neutral loop operation. The triggering level, adjusted at the factory, does not normally require readjustment unless the Keyer printed-circuit card or some component of the Schmitt trigger circuit on the card is replaced. To adjust the triggering level, an external means of varying the loop current supplied to the Keyer is required. Perform the procedure as follows:

(1) Using a test cable with phone jacks at each end, connect Keyer LOOP MON jack (see figure 3-2) to Test Set LOOP CURRENT jack (see figure 3-4).

(2) Set Test Set FUNCTION switch to LOOP CUR.

(3) Using test cable with jack on one end and phone jack at other end, connect Keyer TONE test point to Test Set TONE INPUT jack.

(4) Supply current for the external loop to the Keyer, at the nominal value (as indicated by the Test Set meter indication of 20ma or 60ma, depending on loop supply). A steady mark tone should be heard from the Test Set loudspeaker.

(5) Decrease loop current until a change in tone is heard. Note value of loop current at which the change of tone occurs, as indicated on the Test Set meter.

(6) Increase loop current until a change in tone is again heard. Note value of loop current at which this change occurs.

(7) The two current values noted in steps (5) and (6) should be symmetrical with respect to one-half of the nominal value of loop current as indicated on the Test Set meter. If not, make a slight adjustment of the Keyer TRIG control and repeat steps (5) and (6).

(8) Repeat steps (5) through (7) as necessary to obtain the value specified in step (7).

(9) Readjust loop current to nominal value.

(10) Disconnect test cables.

c. FREQUENCY AND BIAS ADJUSTMENT. - Perform the frequency and bias adjustment procedure as follows:

(1) Using test cable with phone jacks at each end, connect Keyer LOOP MON jack (see figure 3-2) to Test Set REVERSALS jack (see figure 3-4).

(2) Connect Frequency Counter to TONE test point on Keyer. Connect Frequency Counter ground to GRD test point.

(3) Supply steady mark current to Keyer from external loop.

(4) Set Test Set REVERSAL RATE SELECTOR to MARK.

(5) Check indication on Frequency Counter, which should correspond exactly to channel mark frequency listed in Table 1-1. If Frequency Counter indication is erratic, place a 0.01 MF capacitor across its input.

(6) If indication observed in step (5) differs from specified readings, withdraw Keyer from Cabinet and turn MARK FREQ ADJ (figure 2-9) control slightly.

(7) Replace Keyer in Cabinet and again observe Frequency Counter indication. If different from specified reading, repeat step (6).

(8) Repeat step (7) until correct indication is obtained.

(9) Set REVERSAL RATE SELECTOR to SPACE, and check that Frequency Counter indication corresponds exactly to space frequency listed in Table 1-1.

(10) If indication observed in step (9) differs from specified reading, withdraw Keyer from Cabinet and turn SPACE FREQ ADJ control (see figure 2-9) slightly.

(11) Replace Keyer in Cabinet and again observe Frequency Counter indication. If different from specified reading, repeat step (10).

(12) Repeat step (11) until correct indication is obtained.

(13) Set Test Set REVERSAL RATE SELECTOR to 75 BAUD for narrow-band, or to 150 BAUD for wide-band.

(14) Adjust BIAS control as necessary (see figure 3-2) to obtain frequency counter indication that corresponds exactly to center frequency as listed in Table 1-1.

5-6. CONSTANT-LEVEL AMPLIFIER ADJUSTMENT.

a. With Control-Attenuator MODE switch set to MASTER position and any one keyer providing steady dbm tone:

(1) Set Control-Attenuator ATTEN. control (see figure 3-2) to .+6 dbm.

(2) Using test cable with phone jack on one end and tip jacks at the other end, connect Control-Attenuator XMIT test points (see figure 3-2) to Test Set TONE IN jack (see figure 3-4).

(3) Adjust Constant-Level Amplifier CAL +6 DBM control, 1A3A1R46 for +6 DBM indication on Test Set meter.

(4) Disconnect test cable.

5-7. TEST SET REVERSALS RATE ADJUSTMENT.

a. Remove screws from sides of Test Set Case.

b. Remove Test Set from case.

c. Set FUNCTION switch to LOOP CUR and connect test set-up shown in figure 5-11.

d. Energize Test Set.
e. Set REVERSALS RATE selector to 75 BAUD.
f. Adjust potentiometer 3A2R9 as necessary to obtain frequency counter indication of 37.5 cps (see figure 5-5).
g. Set REVERSAL RATE selector to 150 BAUD.
h. Adjust potentiometer 3A2R7 as necessary to obtain frequency counter indication of 75 cps (see figure 5-5).
i. Deenergize Test Set and replace in case.

5-8. TONE GENERATOR FREQUENCY ADJUSTMENT.

a. Remove screws from sides of Test Set case.
b. Remove Test Set from case.
c. Remove knob from TONE SELECTOR switch.
d. Remove screws from front panel and move it aside.
e. Remove Tone Generator from Test Set and remove case of Tone Generator.
f. Energize Test Set for at least one hour.
g. Connect frequency counter to TONE GEN OUT jack and record space frequency of all tones.
h. Calculate difference between recorded frequencies and correct frequencies.
i. If the calculated difference is constant, adjust SPACE potentiometer (see figure 5-15) until correct frequency is obtained.
j. Any channel still not reading the correct space frequency should now be corrected by adjusting the individual channel potentiometer.
k. Set selector switches to 2975 and MARK. Adjust the NARROW BAND MARK potentiometer to obtain the correct frequency output.
l. Set selector switches to 1955WB and MARK. Adjust the WIDE BAND MARK potentiometer to obtain the correct frequency output. All forty frequencies should now be correct.
m. Deenergize Test Set and reassemble.

5-9. TRANSISTOR REPLACEMENT TECHNIQUES.

a. Transistors are extremely sensitive to heat and may be destroyed if subjected to excessive temperatures for even short periods of time. For this reason, the soldering technique used in transistor replacement is extremely important. Whenever possible, use a low-powered soldering iron, preferably 25 to 35 watts. Provide a heat sink of some sort between the soldering iron and the transistor lead. This is easily done by grasping the transistor lead being soldered (using long-nosed pliers) just above point of soldering iron contact. The pliers will dissipate excess heat before it is conducted to the transistor. Use of the heat sink is essential, and should be employed whenever a soldering iron contacts a transistor lead.
b. Apply the soldering iron to the transistor lead only long enough to melt the solder. Never bring the soldering iron into contact with the body of the transistor, or metal that is in direct contact with the body of the transistor.
c. Transistor connection points on the printed-circuit card are not keyed. To avoid the possibility of inserting the substitute transistor backwards (which would reverse the connections to the emitter and collector), mark the emitter-terminal connection point on the printed-circuit card, before removing the transistor. Refer to figures 5-1, 5-2, 5-3 and 5-5 for the location of the transistors on the printed-circuit cards.
d. Some soldering irons, when plugged into the ac line, have a voltage existing between the metal body of the iron and earth ground. This voltage causes leakage currents that can seriously damage a transistor when the iron is brought into contact with the transistor lead. Such effects can be nullified by connecting a jumper lead from the metal body of the iron, to the ground point of the printed-circuit card being repaired.

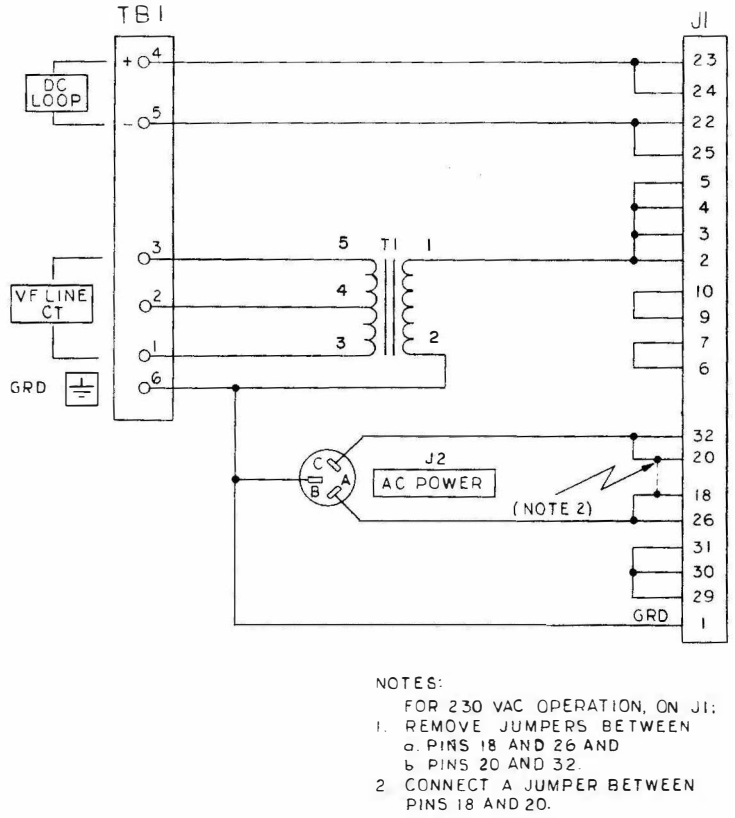


Figure 5-12. Test Adapter, Schematic Diagram

5-10. PRINTED-CIRCUIT REPAIR TECHNIQUES.

Printed-circuit repair is more difficult than and requires more skill than conventional-equipment repair. The following discussion describes acceptable procedures for replacing components and servicing printed-circuit cards, and identifies the tools and materials required for performing these procedures. Read these instructions carefully before attempting any printed-circuit repair: follow them scrupulously while performing any repair.

a. GENERAL. - Since the cost of a printed-circuit card is high, particularly when compared with that of an individual component, never try to save the component at the expense of a printed-circuit card. Most components may be clipped from the card, thereby protecting the card's printed-circuit conductor (i.e., the copper foil beneath the visible solder coating) and preventing any undue component damage. In using the soldering iron to remove the leads of a clipped-off component, to connect a new component, or to repair the printed-circuit card itself, take care when applying the iron to the printed-circuit card. These cards are easily damaged by heat; prolonged application of heat destroys the adhesiveness of the bonding agent that holds the printed-circuit conductor to the card.

b. SPECIAL EQUIPMENT REQUIRED.

(1) Pencil-type soldering iron, 25 watts maximum, 3/16-inch diameter tip.
(2) Small twist drills, numbers 30 through 60.
(3) Wire clipper.
(4) Pliers.
(5) One-half inch brush.
(6) Rosin-alcohol solder flux.

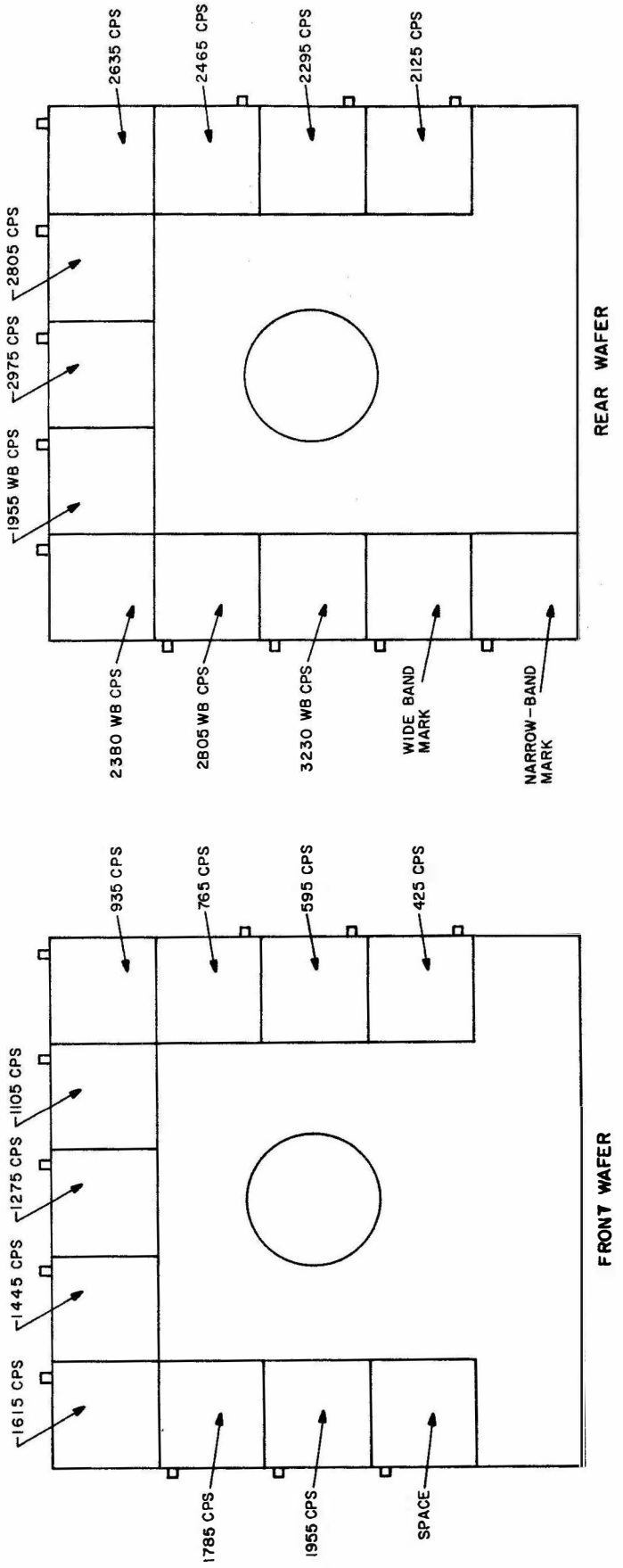


Figure 5-15. Tone Generator Frequency Alignment & Component Location

(7) Alcohol.
(8) Knife.

c. REMOVING A DEFECTIVE COMPONENT.

(1) CLIPPING OUT THE COMPONENT. - Using the wire clipper, cut (close to the lead hole, but allowing some of the lead to extend through the hole) both leads of the component, and remove the component. Carefully straighten the lead end that extends through each hole, so that it may be easily withdrawn as described in (2), below.

(2) UNSOLDERING LEAD ENDS. - Exerting slight pressure, apply the tip of a hot pencil-type soldering iron to the tip of the lead end. (Keep the iron away from the printed-circuit foil.) As the lead end absorbs the heat, solder will melt and the lead will break from its juncture to the printed-circuit foil. Remove the soldering iron immediately, and, using the pliers, quickly pull the lead free; brush away excess solder. Do not force or twist the lead to remove it from the card.

(3) CLEANING LEAD HOLE. - As the lead end is removed, solder may flow into the open hole and cause shorts on the printed-circuit foil; to remove the solder, tap the card gently while the solder is soft. Should this fail to clean out the hole, carefully drill (using a drill of appropriate size) out the solder. Apply the drill to the printed-circuit side of the card; drilling from the other side may ruin the card by loosening the foil as the drill passes through it.

d. INSTALLING NEW COMPONENT.

(1) Using a knife, scrape the leads of the component to be installed.

(2) Bend the leads so that they fit snugly into the holes where the component is to be installed. Mount the component on the card, gently pushing the leads through the holes. Bend each end of the lead close to the foil.

(3) Apply flux to the joint. Touch the lead with the tip of the hot soldering iron, and apply a small amount of fluxless 60/40 solder to the junction.

(4) Remove the soldering iron as soon as solder flows into the joint. Hold the component firmly until the solder sets.

(5) Using a small amount of alcohol, remove excess flux.

(6) Once the solder cools, check that the joint is secure and clean. Remove any solder that may have flowed onto the foil, to eliminate the possibility of a short circuit.

e. REPAIRING PRINTED-CIRCUIT CONDUCTOR. - The printed-circuit conductor is, essentially, the thin copper foil which connects the circuit components; it is bonded to the card proper and is covered by a solder coating. Although the printed-circuit conductor can withstand proper handling and will operate with no trouble under normal rated service conditions, it is liable to damage. Should any part of the conductor be damaged (i.e., split or raised from the card proper), perform required repairs as follows:

(1) When part of the conductor has raised from the card, remove it by snipping both its ends, close to the card; a split in the conductor does not require cutting.

(2) Bend a piece of tinned 20- or 22-gauge copper wire into the shape of a staple. The staple should be long enough to span defective portion of the conductor and to allow clinching at approximately one-fourth of an inch from either end, once placed into position on the printed-circuit card.

(3) From the printed-circuit side of the card, drill two small holes (of proper size) to receive the staple ends. Unless the printed-circuit conductor is approximately one-fourth of an inch wide, do not drill these holes directly into the foil, but drill them near enough so that the staple is parallel to the foil. Should the foil be one-fourth of an inch wide, drill the two holes directly into the printed-circuit foil. If the repair is not in a congested printed-circuit area, proceed to step (4), below. Otherwise, insert the staple from the component side of the card, and, on the other side, clinch each end diagonally across the printed-circuit conductor. Then proceed to step (5), below.

(4) If room permits, drill two extra holes in the printed-circuit card, each one adjacent to the one of the previously drilled holes. From the printed-circuit side of the card, insert the staple ends into the holes furthest from the area under repair. Holding the staple flush against the card, bend each end back through to the adjacent hole closest to it. Pulling it taut, clinch each lead end across the printed-circuit conductor.

(5) Solder the two joints as described in paragraph 5-10d.

SECTION 6

PARTS LIST

6-1. INTRODUCTION.

Reference designations, per unit designation method of MIL-STD-16B, have been assigned to identify all maintenance parts of the equipment. They are used for marking the equipment (adjacent to the part they identify) and are included on drawings, diagrams, and parts list. The "letter(s)" of a reference designation indicates the kind of part (generic group), such as resistor, capacitor, semiconductor device, etc. The "number" differentiates between parts of the same generic group. In each major unit, parts of one generic group are numbered consecutively, beginning with "1" and continuing to the total number contained in that unit. Sockets associated with a particular plug-in device, such as a lamp or a fuse, are identified by a reference designation which includes the reference designation of the plug-in device; for example, the socket for fuse F7 is designated XF7.

The 5-digit parenthetical number appearing at the end of the short part description is the code, per H4-2, identifying the manufacturer. (See Table 6-3.)

NOTE

Total quantities for the major units listed in Table 6-1 depend on the Telegraph Terminal configuration. Configurations can vary as follows:

1. One Cabinet can accommodate up to eight (8) Keyers or eight (8) Converters or any combination of these, plus one (1) Control-Attenuator.
2. One Test Set is required at a station.

TABLE 6-1. LIST OF UNITS

UNIT NO.	* QTY	NAME OF UNIT	DESIGNATION	COLLOQUIAL NAME	PAGE
1		Cabinet, Electrical Equipment	CY-3956/UCC-1(V)	Cabinet	6-2
1A1		Keyer, Frequency Shift	KY-490A(P)/UCC-1(V)	Keyer	6-4
1A1A1		Keyer, Printed-Circuit Card	376F3020	Keyer Card	6-4
1A2		Converter, Frequency Shift	CV-1522A(P)/ UCC-1(V)	Converter	6-7
1A2A1		Converter, Printed-Circuit Card	376F2001	Converter Card	6-8
1A3		Control-Attenuator	C-4702A/UCC-1(V)	Control-Attenuator	6-12

*See Note above.

TABLE 6-1. LIST OF UNITS (Continued)

UNIT NO.	* QTY	NAME OF UNIT	DESIGNATION	COLLOQUIAL NAME	PAGE
1A3A1		Constant-Level Amplifier, Printed-Circuit Card	376D4020		6-13
1A3A2		Test Adapter	376D4010	Test Adapter	6-16
3		Test Set, Telegraph	TS-1920A/ UCC-1(V)	Test Set	6-17
3A1		Tone Generator	376D7016		6-17
3A2		Test Set, Printed-Circuit Card	376D5015	Test Set, Card	6-18

*See Note above.

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST

CABINET, ELECTRICAL EQUIPMENT, CY-3956/UCC-1(V), UNIT 1

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1		CABINET, ELECTRICAL EQUIPMENT: c/o; facilities to mount and plug in the Control-Attenuator, Keyer frequency shift and Converter frequency shift modules; voice frequency input and output transformers which are mounted in the Cabinet; (05885)	1-2
1J1		CONNECTOR, RECEPTACLE, ELECTRICAL: 3 pin contacts; MIL-C-26482 type no. MS3112E-12-3P (96906)	
1J2		CONNECTOR, RECEPTACLE, ELECTRICAL: 3 socket contacts; MIL-C-26482 type no. MS3112E-12-3S (96906)	
1J3		CONNECTOR, RECEPTACLE, ELECTRICAL: 5 pin contacts; MIL-C-26482 type no. MS3112E-14-5P (96906)	
1J4		CONNECTOR, RECEPTACLE, ELECTRICAL: 4 pin contacts; MIL-C-26482 type no. MS3112E-8-4P (96906)	
1J5		Same as 1J4	
1J6		CONNECTOR, RECEPTACLE, ELECTRICAL: 10 pin contacts; MIL-C-26482 type no. MS3112E-12-10P (96906)	
1J7		Same as 1J6	
1J8		CONNECTOR, RECEPTACLE, ELECTRICAL: 19 pin contacts; MIL-C-26482 type no. MS3112E-14-19P (96906)	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST(Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1J9		CONNECTOR, RECEPTACLE, ELECTRICAL: 26 pin contacts; MIL-C-26482 type no. MS3112E-16-26P (96906)	
1P1		CONNECTOR, PLUG, ELECTRICAL: 3 socket contacts; MIL-C-26482 type no. MS3116E-12-3S (96906)	
1P2		CONNECTOR, PLUG, ELECTRICAL: 3 pin contacts; MIL-C-26482 type no. MS3116E-12-3P (96906)	
1P3		CONNECTOR, PLUG, ELECTRICAL: 5 socket contacts; MIL-C-26482 type no. MS3116E-14-5S (96906)	
1P4		CONNECTOR, PLUG, ELECTRICAL: 4 socket contacts; MIL-C-26482 type no. MS3116E-8-4S (96906)	
1P5		Same as 1P4	
1P6		CONNECTOR, PLUG, ELECTRICAL: 10 socket contacts; MIL-C-26482 type no. MS3116E-12-10S (96906)	
1P7		Same as 1P6	
1P8		CONNECTOR, PLUG, ELECTRICAL: 19 socket contacts; MIL-C-26482 type no. MS3116E-14-19S (96906)	
1P9		CONNECTOR, PLUG, ELECTRICAL: 26 socket contacts; MIL-C-26482 type no. MS3116E-16-26S (96906)	
1T1		TRANSFORMER, AUDIO FREQUENCY: 600 ohms primary, 600 ohms secondary, 300 to 3500 cycles ±2db; 376C7001 (05885)	
1T2		Same as 1T1	
1T3		Same as 1T1	
1T4		Same as 1T1	
1T5		Same as 1T1	
1T6		Same as 1T1	
1T7		Same as 1T1	
1T8		Same as 1T1	
1T9		Same as 1T1	
1T10		Same as 1T1	
1T11		Same as 1T1	
1XA1		CONNECTOR, RECEPTACLE, ELECTRICAL: 32 contacts; rated at 5 amperes; polarized; 26-190-32 (02660)	
1XA2		Same as 1XA1	
1XA3		Same as 1XA1	
1XA4		Same as 1XA1	
1XA5		Same as 1XA1	
1XA6		Same as 1XA1	
1XA7		Same as 1XA1	
1XA8		Same as 1XA1	
1XA9		Same as 1XA1	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST (Cont)

KEYER, FREQUENCY SHIFT KY-490A(P)/UCC-1(V), UNIT 1A1

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A1	1	KEYER, FREQUENCY SHIFT: c/o; one channel (tone keyer) which accepts dc telegraph signals and transmits frequency shift keying signal, switching to allow 60 to 20 ma neutral or polar loop operation, switching to connect two modules; (05885)	1-3 and 2-9
1A1C1		CAPACITOR, FIXED, MICA DIELECTRIC: factory selected; 100 μμf to 10,000 μμf range, ±5%, 500vdcw; 1 section; MIL-C-5B type no. CM20D---J (81349)	
1A1C2		CAPACITOR, VARIABLE, CERAMIC DIELECTRIC: 20-125 μμf., 600 vdcw; MIL-C-81 type no. CV12D121 (81349)	
1A1FL1	1	FILTER, BANDPASS: 600 ohms ±5% impedance at each center frequency; 376D7010- (05885)	
1A1F1		FUSE, CARTRIDGE: 1/8 ampere, 250v; MIL-F-15160 type no. F02A250V 1/8A (81349)	
1A1F2		Same as 1A1F1	
1A1P1		CONNECTOR, RECEPTACLE, ELECTRICAL: 32 contacts; rated at 5 amperes; polarized; 26-159-32 (02660)	
1A1R1		RESISTOR, FIXED, COMPOSITION: 100,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF104J (81349)	
1A1S1		SWITCH, ROTARY: 2 poles, 2 position; 376D7012-4 (05885)	
1A1S2		Same as 1A1S1	
1A1S3		SWITCH, ROTARY: 1 pole, 2 position; 376D7012-5 (05885)	
1A1T1		TRANSFORMER, POWER STEP-DOWN: 115/223vac primary; 85vac center tapped secondary; 376C7000 (05885)	
1A1XA1		CONNECTOR, RECEPTACLE, ELECTRICAL: 22 contacts; MIL-C-21097 type no. A022a2 (81349)	
1A1XF1		FUSEHOLDER: c/o; bakelite mounting block with four clips; rated at 15 amperes, 250v; 351011 (75915)	
1A1Z1	1	TUNED CIRCUIT: 600 ohms ±5% at each center frequency; 376D7004- (05885)	

KEYER, PRINTED-CIRCUIT CARD 376F3020, UNIT 1A1A1

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A1A1		KEYER, PRINTED-CIRCUIT CARD: c/o; a printed circuit board which mounts and supplies the circuitry for the below listed items; (05885)	5-1
1A1A1CR1		SEMICONDUCTOR DEVICE, DIODE: silicon; MIL-S-19500 type no. 1N645M (81349)	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A1A1CR2		Same as 1A1A1CR1	
1A1A1CR3		SEMICONDUCTOR DEVICE, DIODE: Zener, 18v; MIL-S-19500/115 type no. 1N3026B (81349)	
1A1A1CR4		Same as 1A1A1CR1	
1A1A1CR5		Same as 1A1A1CR1	
1A1A1C1		CAPACITOR, FIXED, PAPER DIELECTRIC: .047 µf ±10%, 200vdcw; 1 section; MIL-C-25 type no. CP05A1KC473K3 (81349)	
1A1A1C2		CAPACITOR, FIXED, ELECTROLYTIC: 22 µf ±10%, 50vdcw; 1 section; MIL-C-26655 type no. CS13AG220K (81349)	
1A1A1C3		CAPACITOR, FIXED, ELECTROLYTIC: 22 µf ± 10%, 35vdcw; 1 section; MIL-C-26655 type no. CS13AF220K (81349)	
1A1A1C4		CAPACITOR, FIXED, PAPER DIELECTRIC: .1 µf ±10%, 100vdcw; 1 section; MIL-C-25 type no. CP05A1KB104K3 (81349)	
1A1A1C5		Same as 1A1A1C4	
1A1A1C6		CAPACITOR, FIXED, PAPER DIELECTRIC: .15 µf ±10%, 100vdcw; 1 section; MIL-C-25 type no. CP05A1KB154K3 (81349)	
1A1A1C7		Same as 1A1A1C1	
1A1A1C8		CAPACITOR, FIXED, ELECTROLYTIC: 15 µf ±10%, 20vdcw; 1 section; MIL-C-26655 type no. CS13AE150K (81349)	
1A1A1C9		Same as 1A1A1C8	
1A1A1C10		Same as 1A1A1C1	
1A1A1C11		CAPACITOR, FIXED, ELECTROLYTIC: 4.7 µf ±10%, 35vdcw; 1 section; MIL-C-26655 type no. CS13AF4R7K (81349)	
1A1A1C12		CAPACITOR, FIXED, ELECTROLYTIC: 22 µf ±10%, 15vdcw; 1 section; MIL-C-26655 type no. CS13AD220K (81349)	
1A1A1C13		CAPACITOR, FIXED, ELECTROLYTIC: 60 µf ±20%, 50vdcw; 1 section; MIL-C-3965 type no. CL65BJ600MP3 (81349)	
1A1A1J1		JACK, TELEPHONE: break contacts; receives 1/4 inch plug, telephone; MIL-J-641 type no. JJ-089 (81349)	
1A1A1L1		CHOKE, RADIO FREQUENCY: 2500 µh ±10%, 85 degrees C max. operating temp; MIL-C-15305 type no. MS16223-20 (96906)	
1A1A1L2		Same as 1A1A1L1	
1A1A1Q1		TRANSISTOR: germanium, PNP; MIL-S-19500/20 type no. 2N404 (81349)	
1A1A1Q2		Same as 1A1A1Q1	
1A1A1Q3		Same as 1A1A1Q1	
1A1A1Q4		Same as 1A1A1Q1	
1A1A1Q5		Same as 1A1A1Q1	
1A1A1R1		RESISTOR, FIXED, COMPOSITION: 680 ohms ±5%, 1w; MIL-R-11 type no. RC32GF681J (81349)	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A1A1R2		Same as 1A1A1R1	
1A1A1R3		RESISTOR, FIXED, COMPOSITION: 150 ohms ± 5%, 2w; MIL-R-11 type no. RC42GF151J (81349)	
1A1A1R4		RESISTOR, FIXED, COMPOSITION: 330 ohms ±5%, 2w; MIL-R-11 type no. RC42GF331J (81349)	
1A1A1R5		RESISTOR, FIXED, COMPOSITION: 1,000 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF102J (81349)	
1A1A1R6		Same as 1A1A1R5	
1A1A1R7		RESISTOR, VARIABLE: 5,000 ohms ± 10%, 3/4w; MIL-R-27208 type no. RT11C2P502 (81349)	
1A1A1R8		RESISTOR, FIXED, COMPOSITION: 4,700 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF472J (81349)	
1A1A1R9		Same as 1A1A1R8	
1A1A1R10		Same as 1A1A1R8	
1A1A1R11		RESISTOR, FIXED, COMPOSITION: 560 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF561J (81349)	
1A1A1R12		RESISTOR, FIXED, COMPOSITION: 6,800 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF682J (81349)	
1A1A1R13		RESISTOR, FIXED, COMPOSITION; 12,000 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF123J (81349)	
1A1A1R14		RESISTOR, FIXED, COMPOSITION: 15,000 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF153J (81349)	
1A1A1R15		RESISTOR, FIXED, COMPOSITION: 3.3 meg ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF335J (81349)	
1A1A1R16		Same as 1A1A1R15	
1A1A1R17		RESISTOR, FIXED, COMPOSITION: 1,200 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF122J (81349)	
1A1A1R18		RESISTOR, VARIABLE: 1,000 ohms ± 10%, 3/4w; MIL-R-27208 type no. RT11C2P102	
1A1A1R19		Same as 1A1A1R5	
1A1A1R20		RESISTOR, FIXED, COMPOSITION: 47,000 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF473J (81349)	
1A1A1R21		RESISTOR, FIXED, COMPOSITION: 10,000 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF103J (81349)	
1A1A1R22		Same as 1A1A1R11	
1A1A1R23		Same as 1A1A1R13	
1A1A1R24		RESISTOR, FIXED, COMPOSITION: 1500 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF152J (81349)	
1A1A1R25		RESISTOR, FIXED, COMPOSITION: 5600 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF562J (81349)	
1A1A1R26		Same as 1A1A1R7	
1A1A1R27		RESISTOR, FIXED, COMPOSITION: 68,000 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF683J (81349)	
1A1A1R28		RESISTOR, FIXED, COMPOSITION: 56 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF560J (81349)	
1A1A1R29		RESISTOR, FIXED, COMPOSITION: 390 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF391J (81349)	
1A1A1TP1		JACK, TIP: green teflon body; beryllium copper contacts; press-fit mtg; accommodates standard test pin; SKT-10 (98291)	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A1A1TP2		Same as 1A1A1TP1, except orange body (98291)	
1A1A1TP3		Same as 1A1A1TP1, except violet body (98291)	
1A1A1TP4		Same as 1A1A1TP1, except brown body (98291)	
1A1A1TP5		Same as 1A1A1TP1, except black body (98291)	
1A1A1T1		TRANSFORMER, AUDIO FREQUENCY: 600 ohms ±5% primary; 600 ohms ±5% secondary; 300 to 3500 cycles ±2db; 376C7003 (05885)	

CONVERTER, FREQUENCY SHIFT CV-1522A(P)/UCC-1(V), UNIT 1A2

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2	2	CONVERTER, FREQUENCY SHIFT: c/o; one channel which accepts a particular voice-frequency signal and produces an electronic keying signal. Switching allows inputs from composites or individual line and connection of either 2 or 4 modules; (05885)	1-3 and 2-17
1A2FL1	2	FILTER, BANDPASS: 600 ohms input impedance; 90,000 ohms output impedance; 376D7008- (05885)	
1A2FL2		FILTER, LOWPASS: 2000 ohms, 3000 cps; 376D7009 (05885)	
1A2F1		FUSE, CARTRIDGE: 1/8 ampere, 250v; MIL-F-15160 type no. F02A250V1/8A (81349)	
1A2F2		Same as 1A2F1	
1A2J1		CONNECTOR, RECEPTACLE, ELECTRICAL: 32 contacts, rated at 5 amperes; polarized; 26-159-32 (02660).	
1A2R1	2	RESISTOR, VARIABLE: ±5%, 1/2w; MIL-R-94 type no. RV6LAYSA---B (81349)	
1A2R2		RESISTOR, FIXED, COMPOSITION: factory selected; 10 ohms to 1000 ohms range ±5%, 1/2w; MIL-R-11 type no. RC20GF---J (81349)	
1A2R3		RESISTOR, VARIABLE: 100,000 ohms ±5%, 1/2w; MIL-R-94 type no. RV6LAYSA104B (81349)	
1A2R4	2	RESISTOR, FIXED, COMPOSITION: ±5%, 1/2w; MIL-R-11 type no. RC20GF---J (81349)	
1A2S1		SWITCH, ROTARY: 4 poles, 2 position; 376D7012-1 (05885)	
1A2S2		SWITCH, ROTARY: 1 pole, 3 position; 376D7012-2 (05885)	
1A2S3		SWITCH, ROTARY: 6 poles, 3 position; 2 decks; 376D7012-3 (05885)	
1A2T1		TRANSFORMER, POWER, STEP-DOWN: 115/223vac primary, 85vac secondary ct; 376D7000 (05885)	
1A2XA1		CONNECTOR, RECEPTACLE, ELECTRICAL: 22 contacts; MIL-C-21097 type no. A022a2 (81349)	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2XF1		FUSEHOLDER: c/o; bakelite mounting block with two clips; 350267 (75915)	
1A2XF2		Same as 1A2XF1	
1A2Z1	2	FILTER, BANDPASS: c/o; 16 channels ranging from 425 cps to 2975 cps; 376D7011- (05885)	

CONVERTER, PRINTED-CIRCUIT CARD 376F2001, UNIT 1A2A1

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2A1		CONVERTER, PRINTED-CIRCUIT CARD: c/o; a printed-circuit board which mounts and supplies the circuitry for the below listed items; (05885)	5-2
1A2A1CR1		SEMICONDUCTOR DEVICE, DIODE: silicon; MIL-S-19500 type no. 1N645M (81349)	
1A2A1CR2		Same as 1A2A1CR1	
1A2A1CR3		Same as 1A2A1CR1	
1A2A1CR4		Same as 1A2A1CR1	
1A2A1CR5		Same as 1A2A1CR1	
1A2A1CR6		Same as 1A2A1CR1	
1A2A1CR7		SEMICONDUCTOR DEVICE, DIODE: germanium; MIL-S-19500 type no. 1N277M (81349)	
1A2A1CR8		Same as 1A2A1CR7	
1A2A1CR9		Same as 1A2A1CR7	
1A2A1CR10		Same as 1A2A1CR7	
1A2A1CR11		Same as 1A2A1CR7	
1A2A1CR12		Same as 1A2A1CR7	
1A2A1CR13		Same as 1A2A1CR7	
1A2A1CR14		Same as 1A2A1CR7	
1A2A1CR15		Same as 1A2A1CR7	
1A2A1CR16		Same as 1A2A1CR7	
1A2A1CR17		Same as 1A2A1CR1	
1A2A1CR18		Same as 1A2A1CR1	
1A2A1CR19		Same as 1A2A1CR1	
1A2A1CR20		SEMICONDUCTOR DEVICE, DIODE: Zener, 18v; MIL-S-19500/115 type no. 1N3026B (81349)	
1A2A1CR21		SEMICONDUCTOR DEVICE, DIODE: Zener, 12v; MIL-S-19500/115 type no. 1N3022B (81349)	
1A2A1C1		CAPACITOR, FIXED, ELECTROLYTIC: 47 μf ±10%, 20vdcw; 1 section; MIL-C-26655/2 type no. CS13AE470K (81349)	
1A2A1C2		CAPACITOR, FIXED, ELECTROLYTIC: 15 μf±10%, 20vdcw; 1 section; MIL-C-26655/2 type no. CS13AE150K (81349)	
1A2A1C3		CAPACITOR, FIXED, CERAMIC DIELECTRIC: .0033 μf ±10%, 500vdcw; 1 section; MIL-C-11015 type no. CK63BX332K (81349)	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2A1C4		Same as 1A2A1C2	
1A2A1C5		CAPACITOR, FIXED, ELECTROLYTIC: 100 μf ±10%, 20vdcw; 1 section; MIL-C-26655/2 type no. CS13AE101K (81349)	
1A2A1C6		CAPACITOR, FIXED, ELECTROLYTIC: .39 μf ±10%, 35vdcw; 1 section; MIL-C-26655/2 type no. CS13AFR39K (81349)	
1A2A1C7		Same as 1A2A1C2	
1A2A1C8		Same as 1A2A1C2	
1A2A1C9		Same as 1A2A1C6	
1A2A1C10		CAPACITOR, FIXED, ELECTROLYTIC: .56 μf ±10%, 35vdcw; 1 section; MIL-C-26655/2 type no. CS13AFR56K (81349)	
1A2A1C11		Same as 1A2A1C1	
1A2A1C12		CAPACITOR, FIXED, ELECTROLYTIC: 4.7 μf ±10%, 35vdcw; 1 section; MIL-C-26655/2 type no. CS13AF4R7K (81349)	
1A2A1C13		CAPACITOR, FIXED, ELECTROLYTIC: 2.2 μf ±10%, 20vdcw; 1 section; MIL-C-26655/2 type no. CS13AE2R2K (81349)	
1A2A1C14		Same as 1A2A1C13	
1A2A1C15		CAPACITOR, FIXED, PAPER DIELECTRIC: .033 μf ±10%, 100vdcw; 1 section; MIL-C-25 type no. CP05A1KB333K3 (81349)	
1A2A1C16		Same as 1A2A1C15	
1A2A1C17		CAPACITOR, FIXED, PAPER DIELECTRIC: .1 μf ±10%, 100vdcw; 1 section; MIL-C-25 type no. CP05A1KB104K3 (81349)	
1A2A1C18		CAPACITOR, FIXED, PAPER DIELECTRIC: .022 μf ±10%, 200vdcw; 1 section; MIL-C-25 type no. CP05A1KC223K3 (81349)	
1A2A1C19		Same as 1A2A1C10	
1A2A1C20		Same as 1A2A1C2	
1A2A1C21		CAPACITOR, FIXED, ELECTROLYTIC: 60 μf ±20%, 50vdcw; 1 section; MIL-C-3965/4 type no. CL65BJ600MP3 (81349)	
1A2A1C22		CAPACITOR, FIXED, ELECTROLYTIC: 47 μf ±10%, 35vdcw; 1 section; MIL-C-26655/2 type no. CS13AF470K (81349)	
1A2A1C23		Same as 1A2A1C18	
1A2A1J1		JACK, TELEPHONE: break contacts; receives 1/4 inch plug, telephone; MIL-J-641 type no. JJ-089 (81349)	
1A2A1L1		REACTOR: 63 henries nominal; 4400 ohms dc resistance, 10v, 60 cycles; 376C7005 (05885)	
1A2A1Q1		TRANSISTOR: germanium, PNP; MIL-S-19500/174 type no. 2N398 (81349)	
1A2A1Q2		TRANSISTOR: germanium, PNP; MIL-S-19500/20 type no. 2N404 (81349)	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2A1Q3		Same as 1A2A1Q1	
1A2A1Q4		Same as 1A2A1Q1	
1A2A1Q5		Same as 1A2A1Q1	
1A2A1Q6		Same as 1A2A1Q2	
1A2A1Q7		Same as 1A2A1Q2	
1A2A1Q8		Same as 1A2A1Q2	
1A2A1Q9		Same as 1A2A1Q2	
1A2A1Q10		Same as 1A2A1Q1	
1A2A1Q11		TRANSISTOR: silicon, PNP; MIL-S-19500/110 type no. 2N329AM (81349)	
1A2A1Q12		Same as 1A2A1Q2	
1A2A1Q13		Same as 1A2A1Q2	
1A2A1Q14		TRANSISTOR: silicon, NPN; 376D7013 (05885)	
1A2A1R1		RESISTOR, FIXED, COMPOSITION: 10,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF103J (81349)	
1A2A1R2		RESISTOR, FIXED, COMPOSITION: 68,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF683J (81349)	
1A2A1R3		RESISTOR, FIXED, COMPOSITION: 12,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF123J (81349)	
1A2A1R4		RESISTOR, FIXED, COMPOSITION: 910 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF911J (81349)	
1A2A1R5		Same as 1A2A1R1	
1A2A1R6		Same as 1A2A1R1	
1A2A1R7		RESISTOR, FIXED, COMPOSITION: 100 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF101J (81349)	
1A2A1R8		Same as 1A2A1R7	
1A2A1R9		RESISTOR, FIXED, COMPOSITION: 1,000 ohms ±5%; 1/2w; MIL-R-11 type no. RC20GF102J (81349)	
1A2A1R10		Same as 1A2A1R9	
1A2A1R11		RESISTOR, FIXED, COMPOSITION: 330 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF331J (81349)	
1A2A1R12		Same as 1A2A1R9	
1A2A1R13		RESISTOR, FIXED, COMPOSITION: 100,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF104J (81349)	
1A2A1R14		Same as 1A2A1R9	
1A2A1R15		RESISTOR, FIXED, COMPOSITION: 15,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF153J (81349)	
1A2A1R16		RESISTOR, FIXED, COMPOSITION: 470 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF471J (81349)	
1A2A1R17		Same as 1A2A1R2	
1A2A1R18		RESISTOR, FIXED, COMPOSITION: 27,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF273J (81349)	
1A2A1R19		Same as 1A2A1R3	
1A2A1R20		RESISTOR, FIXED, COMPOSITION: 5600 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF562J (81349)	
1A2A1R21		RESISTOR, FIXED, COMPOSITION: 4700 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF472J (81349)	
1A2A1R22		RESISTOR, FIXED, COMPOSITION: 8,200 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF822J (81349)	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2A1R23		RESISTOR, FIXED, COMPOSITION: 82 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF820J (81349)	
1A2A1R24		RESISTOR, FIXED, COMPOSITION: 2,200 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF222J (81349)	
1A2A1R25		RESISTOR, FIXED, COMPOSITION: 33,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF333J (81349)	
1A2A1R26		RESISTOR, FIXED, COMPOSITION: 220,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF224J (81349)	
1A2A1R27		Same as 1A2A1R3	
1A2A1R28		RESISTOR, FIXED, COMPOSITION: 3,900 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF392J (81349)	
1A2A1R29		RESISTOR, FIXED, COMPOSITION: 390 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF391J (81349)	
1A2A1R30		Same as 1A2A1R28	
1A2A1R31		RESISTOR, VARIABLE: 20,000 ohms ±10%, 3/4w; MIL-R-27208 type no. RT11C2P203 (81349)	
1A2A1R32		RESISTOR, FIXED, COMPOSITION: 150,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF154J (81349)	
1A2A1R33		Same as 1A2A1R9	
1A2A1R34		Same as 1A2A1R9	
1A2A1R35		RESISTOR, FIXED, COMPOSITION: 47,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF473J (81349)	
1A2A1R36		Same as 1A2A1R35	
1A2A1R37		Same as 1A2A1R32	
1A2A1R38		RESISTOR, FIXED, COMPOSITION: 1,300 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF132J (81349)	
1A2A1R39		RESISTOR, FIXED, COMPOSITION: 6,800 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF682J (81349)	
1A2A1R40		Same as 1A2A1R24	
1A2A1R41		RESISTOR, VARIABLE: 2,000 ohms ±10%, 3/4w; MIL-R-27208 type no. RT11C2P202 (81349)	
1A2A1R42		Same as 1A2A1R18	
1A2A1R43		RESISTOR, FIXED, COMPOSITION: 2,700 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF272J (81349)	
1A2A1R44		RESISTOR, FIXED, COMPOSITION: 1,800 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF182J (81349)	
1A2A1R45		Same as 1A2A1R16	
1A2A1R46		Same as 1A2A1R3	
1A2A1R47		Same as 1A2A1R43	
1A2A1R48		RESISTOR, FIXED, COMPOSITION: 820 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF821J (81349)	
1A2A1R49		Same as 1A2A1R24	
1A2A1R50		Same as 1A2A1R7	
1A2A1R51		Same as 1A2A1R35	
1A2A1R52		RESISTOR, FIXED, COMPOSITION: 180 ohms ±5%, 1w; MIL-R-11 type no. RC32GF181J (81349)	
1A2A1R53		Same as 1A2A1R52	
1A2A1R54		Same as 1A2A1R52	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A2A1R55		Same as 1A2A1R20	
1A2A1R56		Same as 1A2A1R13	
1A2A1R57		RESISTOR, FIXED, COMPOSITION: 4,700 ohms ± 5%, 1/4w; MIL-R-11 type no. RC07GF472J (81349)	
1A2A1R58		RESISTOR, FIXED, COMPOSITION: 6,800 ohms ± 5%, 1/4w; MIL-R-11 type no. RC07GF682J (81349)	
1A2A1TP1		JACK, TIP: green teflon body; beryllium copper contacts; press-fit mtg; accommodates standard test pin; SKT-10 (98291)	
1A2A1TP2		Same as 1A2A1TP1, except blue body (98291)	
1A2A1TP3		Same as 1A2A1TP1, except orange body (98291)	
1A2A1TP4		Same as 1A2A1TP1, except yellow body (98291)	
1A2A1TP5		Same as 1A2A1TP1, except violet body (98291)	
1A2A1TP6		Same as 1A2A1TP1, except brown body (98291)	
1A2A1T1		TRANSFORMER, POWER, ISOLATION: 10,000 ohms primary; 10,000 ohms secondary; 376C7006-1 (05885)	
1A2A1T2		TRANSFORMER, POWER, ISOLATION: 10,000 ohms primary; 10,000 ohms secondary; 376C7006-2 (05885)	
1A2A1T3		TRANSFORMER, AUDIO FREQUENCY: 50,000 ohms primary; 1000 ohms secondary; 376C7007 (05885)	

CONTROL-ATTENUATOR C-4702A/UCC-1(V), UNIT 1A3

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A3		CONTROL ATTENUATOR: supplies power for the send and receive modules at 115vac, 47 cycles to 63 cycles, fused and switched; MODE switches are supplied to connect composite voice frequency lines to connectors mounted on frame; (05885)	1-3 and 2-8
1A3C1		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 6800 μμf ± 20%, 500vdcw; MIL-C-11015/11A type no. CK62AW682M(81349)	
1A3C2		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10,000 μμf ± 20%; 500vdcw; MIL-C-11015 type no. CK63AW103M (81349)	
1A3C3		Same as 1A3C2	
1A3DS1		LAMP, GLOW: midget flange base; rated at 0.0003 ampere, 105 to 125v; MS25252-NE-2D (96906)	
1A3F1		FUSE, CARTRIDGE: 1/2 amp, 250v; MIL-F-15160 (81349)	
1A3F2		Same as 1A3F1	
1A3L1		CHOKE, RADIO FREQUENCY: 2500 μh; MS16223-20 (96906)	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A3P1		CONNECTOR, RECEPTACLE, ELECTRICAL: 32 contacts, rated at 5 amperes; polarized; 26-159-32 (02660)	
1A3S1		SWITCH, TOGGLE: dpst; MS35059-21 (96906)	
1A3S2		SWITCH, ROTARY: 3 poles, 2 position; 376D7012-8 (05885)	
1A3TP1		JACK, TIP: green teflon body, beryllium copper contacts; press-fit mtg; accommodates standard test pin; SKT-10 (98291)	
1A3TP2		Same as 1A3TP1	
1A3TP3		Same as 1A3TP1, except yellow body (98291)	
1A3TP4		Same as 1A3TP3	
1A3TP5		Same as 1A3TP1, except orange body (98291)	
1A3TP6		Same as 1A3TP5	
1A3XDS1		LIGHT, INDICATOR: yellow lens; 2 solder lug terminals; MIL-L-3661 type no. LH74LC13YN (81349)	
1A3XF1		FUSEHOLDER: c/o; clear transparent indicating knob; black holder; MIL-F-19207 type no. FHL17G (81349)	
1A3XF2		Same as 1A3XF1	

CONSTANT-LEVEL AMPLIFIER, PRINTED CIRCUIT CARD 376D4020, UNIT 1A3A1

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A3A1		CONSTANT-LEVEL AMPLIFIER, PRINTED CIRCUIT CARD: c/o; a printed-circuit board which mounts and supplies circuitry for the below listed items; (05885)	5-3
1A3A1CR1		SEMICONDUCTOR DEVICE, DIODE: silicon; MIL-S-19500 type no. 1N645M (81349)	
1A3A1CR2		Same as 1A3A1CR1	
1A3A1CR3		SEMICONDUCTOR DEVICE, DIODE: Zener, 12v; MIL-S-19500/115 type no. 1N3022B (81349)	
1A3A1CR4		SEMICONDUCTOR DEVICE, DIODE: germanium; MIL-S-19500 type no. 1N277M (81349)	
1A3A1C1		CAPACITOR, FIXED, PAPER: .22μf ±10%, 100vdcw; 1 section; MIL-C-25 type no. CP05A1KB224K3 (81349)	
1A3A1C2		Same as 1A3A1C1	
1A3A1C3		Same as 1A3A1C1	
1A3A1C4		CAPACITOR, FIXED MICA: 1000 μμf ±5%, 500vdcw; 1 section; MIL-C-5 type no. CM20D102JN3 (81349)	
1A3A1C5		Same as 1A3A1C4	
1A3A1C6		CAPACITOR, FIXED, ELECTROLYTIC: 15 μf ±10%, 20vdcw; 1 section; MIL-C-26655 type no. CS13AE150K (81349)	
1A3A1C7		CAPACITOR, FIXED, ELECTROLYTIC: 47 μf ±10%, 20vdcw; 1 section; MIL-C-26655 type no. CS13AE470K (81349)	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A3A1C8		CAPACITOR, FIXED, PAPER: .0047 μf ±10%, 600vdcw; 1 section; MIL-C-25 type no. CP05A1KF472K3(81349)	
1A3A1C9		Same as 1A3A1C7	
1A3A1C10		CAPACITOR, FIXED, ELECTROLYTIC: 22 uf ±10%; 15vdcw; 1 section; MIL-C-26655 type no. CS13AD220K (81349)	
1A3A1C11		Same as 1A3A1C10	
1A3A1C12		CAPACITOR, FIXED, ELECTROLYTIC: 560 uf ±20%, 6vdcw; 1 section; MIL-C-3965 type no. CL65BB561MP3 (81349)	
1A3A1C13		Same as 1A3A1C12	
1A3A1C14		CAPACITOR, FIXED, ELECTROLYTIC: 10 uf ±10%, 20vdcw; 1 section; MIL-C-26655 type no. CS13AF100K (81349)	
1A3A1C15		CAPACITOR, FIXED, ELECTROLYTIC: 60 uf ±20%, 50vdcw; 1 section; MIL-C-3965 type no. CL65BJ600MP3 (81349)	
1A3A1C16		CAPACITOR, FIXED, ELECTROLYTIC: 100 uf, ±10%, 20vdcw; 1 section; MIL-C-26655 type no. CS13AE101K (81349)	
1A3A1C17		CAPACITOR, FIXED, ELECTROLYTIC: 100 uf ±20%, 25vdcw; 1 section; MIL-C-3965 type no. CL65BG101MP3 (81349)	
1A3A1C18		Same as 1A3A1C15	
1A3A1Q1		TRANSISTOR; germanium, PNP; MIL-S-19500/126 type no. 2N1309 (81349)	
1A3A1Q2		TRANSISTOR: germanium, PNP; MIL-S-19500/20 type no. 2N404 (81349)	
1A3A1Q3		Same as 1A3A1Q2	
1A3A1Q4		Same as 1A3A1Q2	
1A3A1Q5		Same as 1A3A1Q2	
1A3A1Q6		Same as 1A3A1Q2	
1A3A1Q7		Same as 1A3A1Q2	
1A3A1Q8		TRANSISTOR: germanium, PNP; MIL-S-19500/89 type no. 2N1039 (81349)	
1A3A1Q9		Same as 1A3A1Q8	
1A3A1Q10		Same as 1A3A1Q2	
1A3A1Q11		Same as 1A3A1Q2	
1A3A1Q12		TRANSISTOR: silicon, NPN; MIL-S-19500/65 type no. 2N388 (81349)	
1A3A1Q13		TRANSISTOR: germanium, NPN; MIL-S-19500/69 type no. 2N338 (81349)	
1A3A1Q14		Same as 1A3A1Q2	
1A3A1R1		RESISTOR, FIXED, COMPOSITION: 620 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF621J (81349)	
1A3A1R2		RESISTOR, FIXED, COMPOSITION: 10,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF103J(81349)	
1A3A1R3		RESISTOR, FIXED, COMPOSITION: 2.7 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF2R7J (81349)	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A3A1R4		RESISTOR, FIXED, COMPOSITION: 2700 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF272J (81349)	
1A3A1R5		RESISTOR, FIXED, COMPOSITION: 6200 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF622J (81349)	
1A3A1R6		RESISTOR, FIXED, COMPOSITION: 100,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF104J (81349)	
1A3A1R7		RESISTOR, FIXED, COMPOSITION: 47 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF470J (81349)	
1A3A1R8		Same as 1A3A1R5	
1A3A1R9		Same as 1A3A1R6	
1A3A1R10		Same as 1A3A1R10	
1A3A1R11		Same as 1A3A1R7	
1A3A1R12		Same as 1A3A1R5	
1A3A1R13		Same as 1A3A1R6	
1A3A1R14		Same as 1A3A1R5	
1A3A1R15		RESISTOR, FIXED, COMPOSITION: 200 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF201J (81349)	
1A3A1R16		Same as 1A3A1R5	
1A3A1R17		Same as 1A3A1R6	
1A3A1R18		Same as 1A3A1R5	
1A3A1R19		Same as 1A3A1R15	
1A3A1R20		RESISTOR, FIXED, COMPOSITION: 2200 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF222J (81349)	
1A3A1R21		Same as 1A3A1R20	
1A3A1R22		RESISTOR, FIXED, COMPOSITION: 47,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF473J (81349)	
1A3A1R23		RESISTOR, FIXED, COMPOSITION: 6.8 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GFGR8J (81349)	
1A3A1R24		RESISTOR, FIXED, COMPOSITION: 39,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF393J (81349)	
1A3A1R25		Same as 1A3A1R22	
1A3A1R26		RESISTOR, FIXED, COMPOSITION: 3000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF302J (81349)	
1A3A1R27		RESISTOR, FIXED, COMPOSITION: 510 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF511J (81349)	
1A3A1R28		Same as 1A3A1R26	
1A3A1R29		RESISTOR, FIXED, COMPOSITION: 100 ohms ±5%, 1/2w; MIL-R-11; type no. RC20GF101J (81349)	
1A3A1R30		Same as 1A3A1R26	
1A3A1R31		Same as 1A3A1R29	
1A3A1R32		RESISTOR, FIXED, COMPOSITION: 10 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF100J (81349)	
1A3A1R33		Same as 1A3A1R32	
1A3A1R34		Same as 1A3A1R5	
1A3A1R35		Same as 1A3A1R32	
1A3A1R36		Same as 1A3A1R6	
1A3A1R37		Same as 1A3A1R26	
1A3A1R38		Same as 1A3A1R8	
1A3A1R39		RESISTOR, FIXED, COMPOSITION: 330 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF111J (81349)	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A3A1R40		Same as 1A3A1R5	
1A3A1R41		Same as 1A3A1R5	
1A3A1R42		Same as 1A3A1R1	
1A3A1R43		Same as 1A3A1R6	
1A3A1R44		RESISTOR, FIXED, COMPOSITION: 1000 ohms ±5% 1/2w; MIL-R-11 type no. RC20GF102J (81349)	
1A3A1R45		RESISTOR, FIXED, COMPOSITION: 510 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF511J (81349)	
1A3A1R46		RESISTOR, VARIABLE; 500 ohms ± 10%, 3/4w; MIL-R-27208 type no. RT11C2P501 (81349)	
1A3A1R47		Same as 1A3A1R5	
1A3A1R48		Same as 1A3A1R2	
1A3A1R49		Same as 1A3A1R32	
1A3A1R50		RESISTOR, FIXED, COMPOSITION: 1800 ohms ± 5%, 2w; MIL-R-11 type no. RC42GF182J (81349)	
1A3A1R51		RESISTOR, FIXED, COMPOSITION: 1000 ohms ± 5%, 1w; MIL-R-11 type no. RC32GF102J (81349)	
1A3A1R52		Same as 1A3A1R27	
1A3A1R53		RESISTOR, FIXED, COMPOSITION: 20 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF200J (81349)	
1A3A1R54		Same as 1A3A1R53	
1A3A1R55		Same as 1A3A1R6	
1A3A1R56		Same as 1A3A1R51	
1A3A1T1		TRANSFORMER, OUTPUT: 600 ohms ct primary; 600 ohms split secondary; 200-20,000 cps ± 2db; 376C7019 (05885)	

TEST ADAPTER ASSEMBLY, UNIT 1A3A2

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
1A3A2		TEST ADAPTER ASSEMBLY: a removable assembly which provides for operation and testing of an individual Keyer or Converter external to and independent of the Cabinet; it is stored in the Control-Attenuator; (05885)	2-8
1A3A2J1		CONNECTOR, RECEPTACLE, ELECTRICAL: 32 contacts, rated at 5 amperes; polarized; 26-190-32 (02660)	
1A3A2J2		CONNECTOR, RECEPTACLE, ELECTRICAL: 3 pin contacts; MIL-C-26482 type no. MS3112E-12-3P(96906)	
1A3A2P1		NOT USED	
1A3A2P2		CONNECTOR, RECEPTACLE, ELECTRICAL: 3 socket contacts; MIL-C-26482 type no. MS3116E-3S (96906)	
1A3A2TB1		TERMINAL BOARD: 6 screw terminals; single row; MIL-T-16784 type no. 40TB6 (81349)	
1A3A2T1		TRANSFORMER, AUDIO FREQUENCY: 600 ohms primary, 600 ohms secondary 300 to 3500 cycles ± 2db; 376C7001 (05885)	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST (Cont)

TEST SET, TELEGRAPH TS-1920A/UCC-1(V), UNIT 3

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
3		TEST SET, TELEGRAPH: c/o; a dc microammeter and associated switching; delay adjustment network; voice frequency audio amplifier and loudspeaker; voice frequency rectifier; dot cycle generator; tone generator; (05885)	1-2
3A1		TONE GENERATOR: 600 ohms output impedance; 376D7016 (05885)	
3C1		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 6800 $\mu\mu$f ± 20%, 500vdcw; MIL-C-11015/11A type no. CK62AW682M (81349)	
3DS1		LAMP, GLOW: midget flange base; rated at 0.0003 ampere, 105v to 125v; MS25252-NE2D (96906)	
3F1		FUSE, CARTRIDGE: 1/2 ampere, 250v; MIL-F-15160 type no. FO2A250V 1/2A (81349)	
3F2		FUSE, CARTRIDGE: 1/8 ampere, 250v; MIL-F-15160 type no. FO2A250V 1/8A (81349)	
3J1		JACK, TELEPHONE: break contacts; receives 1/4 inch plug, telephone; MIL-J-641 type no. JJ-089 (81349)	
3J2		Same as 3J1	
3J3		Same as 3J1	
3J4		Same as 3J1	
3J5		Same as 3J1	
3J6		Same as 3J1	
3J7		JACK, TELEPHONE: MIL-J-641 type no. JJ-033(81349)	
3L1		CHOKE, RADIO FREQUENCY: 2500 μh, MS16223-20 (96906)	
3LS1		LOUDSPEAKER, PERMANENT MAGNET: 1000 ohms impedance; 400 to 3000 cps frequency response; 75db (0db 1v per microbar) output level; MC-11J(54715)	
3M1		AMMETER: panel type; 50-0-50 dc ma full scale value; 376B7015 (05885)	
3P1		CONNECTOR, PLUG, ELECTRICAL: 3 contacts, 2 flat, 1 "U" shape; 15 amps; MIL-C-3767 type no. UP121M (81349)	
3R1		RESISTOR, VARIABLE: 5000 ohms ± 20%, 2w; MIL-R-94 type no. RV4NAYSD502A (81349)	
3S1		SWITCH, TOGGLE: dpdt ctr. off; MIL-S-3950 type no. MS35059-21 (96906)	
3S2		SWITCH, ROTARY: 3 poles, 4 positions; non-shorting type, 2 wafers, solder lug contacts; 376D7012-6 (05885)	
3S3		SWITCH, ROTARY: 2 poles, 4 positions; non-shorting type, 1 wafer, solder lug contacts; 376D7012-7 (05885)	
3S4		SWITCH, TOGGLE: spdt; MIL-S-3950 type no. MS35058-23 (96906)	
3S5		SWITCH, TOGGLE: dpdt; MIL-S-3950 type no. MS35059-23 (96906)	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
3XA1		CONNECTOR, RECEPTACLE, ELECTRICAL: 22 lug contacts; all contacts rated at 5 amperes; 1800vrms; gold plated; MIL-C-21097A/1 type no. A022a2 (81349)	
3XDS1		LIGHT, INDICATOR: yellow lens; 2 tinned solder lug contacts; MIL-L-3661 type no. LH74LC13YN (81349)	
3XF1		FUSEHOLDER: 2 tinned solder lug contacts, rated at 15 amperes, 250v; MIL-F-19207 type no. FHN20G (81349)	
3XF2		Same as 3XF1	

TEST SET PRINTED-CIRCUIT CARD 376D5015, UNIT 3A2

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
3A2		TEST SET PRINTED-CIRCUIT CARD: c/o; a printed-circuit board which mounts and supplies the circuitry for the below listed items; (05885)	5-5
3A2CR1		SEMICONDUCTOR DEVICE, DIODE: silicon; MIL-S-19500 type no. 1N645M (81349)	
3A2CR2		Same as 3A2CR1	
3A2CR3		SEMICONDUCTOR DEVICE, DIODE: Zener; 12v, 1w; MIL-S-19500 type no. 1N3022B (81349)	
3A2CR4		SEMICONDUCTOR DEVICE, DIODE: germanium; MIL-S-19500/201 type no. 1N277M (81349)	
3A2CR5		Same as 3A2CR4	
3A2CR6		Same as 3A2CR1	
3A2CR7		Same as 3A2CR4	
3A2CR8		Same as 3A2CR4	
3A2C1		CAPACITOR, FIXED, ELECTROLYTIC: 60 μf ± 20%, 50vdcw; 1 section; MIL-C-3965 type no. CL65BJ600MP3 (81349)	
3A2C2		CAPACITOR, FIXED, PAPER DIELECTRIC: .47 μf ± 10%, 100vdcw; 1 section; MIL-C-25 type no. CP05A1KB474K3 (81349)	
3A2C3		Same as 3A2C2	
3A2C4		CAPACITOR, FIXED, MICA DIELECTRIC: 510 μμf ± 5%, 300vdcw; 1 section; MIL-C-5 type no. CM15D511J3 (81349)	
3A2C5		NOT USED	
3A2C6		CAPACITOR, FIXED, ELECTROLYTIC: 15 μf ±10%, 20vdcw; 1 section; MIL-C-26655/2 type no. CS13AE150K (81349)	
3A2C7		CAPACITOR, FIXED, MICA DIELECTRIC: 390 μμf±5%, 300vdcw; 1 section; MIL-C-5 type no. CM15D391J3 (81349)	
3A2C8		Same as 3A2C7	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
3A2C9		CAPACITOR, FIXED, PAPER DIELECTRIC: .22μf ± 10%; 100vdcw; 1 section; MIL-C-25 type no. CP05A1KB224K3 (81349)	
3A2C10		Same as 3A2C6	
3A2C11		Same as 3A2C6	
3A2C12		CAPACITOR, FIXED, ELECTROLYTIC: 4.7 μf ±10%, 35vdcw; 1 section; MIL-C-26655/2 type no. CS13AF4R7K (81349)	
3A2C13		CAPACITOR, FIXED, ELECTROLYTIC: 2.2μf ±10%, 20vdcw; 1 section; MIL-C-26655/2 type no. CS13AE2R2K (81349)	
3A2C14		CAPACITOR, FIXED, ELECTROLYTIC: 33 μf ± 10%, 10vdcw; 1 section; MIL-C-26655/2 type no. CS13AC330K (81349)	
3A2Q1		TRANSISTOR: germanium; PNP; MIL-S-19500/20 type no. 2N404 (81349)	
3A2Q2		Same as 3A2Q1	
3A2Q3		Same as 3A2Q1	
3A2Q4		Same as 3A2Q1	
3A2Q5		TRANSISTOR: silicon; NPN; 376D7013 (05885)	
3A2Q6		Same as 3A2Q1	
3A2Q7		Same as 3A2Q1	
3A2R1		RESISTOR, FIXED, COMPOSITION: 33 ohms ± 5%; 2w; MIL-R-11 type no. RC42GF151J (81349)	
3A2R2		RESISTOR, FIXED, WIREWOUND: 150 ohms ± 10%; 6w; MIL-R-18546 type no. RE65G1500	
3A2R3		RESISTOR, FIXED, COMPOSITION: 4700 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF472J (81349)	
3A2R4		RESISTOR, FIXED, COMPOSITION: 27,000 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF273J (81349)	
3A2R5		RESISTOR, FIXED, COMPOSITION: 33,000 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF333J (81349)	
3A2R6		Same as 3A2R5	
3A2R7		RESISTOR, VARIABLE: 10,000 ohms ± 10%, 1/2w; MIL-R-94 type no. RV6LAYSA103A (81349)	
3A2R8		RESISTOR, FIXED, COMPOSITION: 22,000 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF223J (81349)	
3A2R9		Same as 3A2R7	
3A2R10		Same as 3A2R5	
3A2R11		Same as 3A2R3	
3A2R12		Same as 3A2R5	
3A2R13		RESISTOR, FIXED, COMPOSITION: 1800 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF182J (81349)	
3A2R14		Same as 3A2R4	
3A2R15		RESISTOR, FIXED, COMPOSITION: 680 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF681J (81349)	
3A2R16		Same as 3A2R5	
3A2R17		Same as 3A2R5	
3A2R18		Same as 3A2R4	

TABLE 6-2. TELEGRAPH TERMINAL AN/UCC-1A(V), MAINTENANCE PARTS LIST (Cont)

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG. NO.
3A2R19		RESISTOR, FIXED, COMPOSITION: 560 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF561J (81349)	
3A2R20		RESISTOR, FIXED, COMPOSITION: 1200 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF122J (81349)	
3A2R21		RESISTOR, FIXED, COMPOSITION: 47,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF473J (81349)	
3A2R22		RESISTOR, FIXED, COMPOSITION: 100 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF101J (81349)	
3A2R23		Same as 3A2R22	
3A2R24		RESISTOR, FIXED, COMPOSITION: 2700 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF272J (81349)	
3A2R25		Same as 3A2R24	
3A2R26		RESISTOR, FIXED, COMPOSITION: 220,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF224J (81349)	
3A2R27		Same as 3A2R8	
3A2R28		RESISTOR, FIXED, COMPOSITION: 33 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF330J (81349)	
3A2R29		Same as 3A2R4	
3A2R30		RESISTOR, FIXED, COMPOSITION: 56,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF563J (81349)	
3A2R31		RESISTOR, FIXED, COMPOSITION: 82,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF823J (81349)	
3A2R32		Same as 3A2R22	
3A2R33		RESISTOR, FIXED, COMPOSITION: 3,300 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF332J (81349)	
3A2R34		Same as 3A2R8	
3A2R35		RESISTOR, FIXED, COMPOSITION: 10,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF103J (81349)	
3A2R36		RESISTOR, FIXED, COMPOSITION: 68 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF680J (81349)	
3A2R37		RESISTOR, FIXED, COMPOSITION: 1,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF102J (81349)	
3A2R38		RESISTOR, FIXED, COMPOSITION: 18,000 ohms ±5%, 1/2w; MIL-R-11 type no. RC20GF183J (81349)	
3A2R39		RESISTOR, FIXED, COMPOSITION: factory selected; 3,900 ohms to 7,500 ohms ± 5%, 1/2w; MIL-R-11 type no. RC20GF---J (81349)	
3A2T1		TRANSFORMER, POWER STEP-DOWN: 115/223vac, 50 to 60 cps primary; 85 vac secondary; 115vac secondary; 376C7014 (05885)	
3A2T2		TRANSFORMER, POWER ISOLATION: 10,000 ohms primary; 10,000 ohms secondary; 376C7006-2 (05885)	
3A2T3		TRANSFORMER, AUDIO FREQUENCY: 10,000 ohms ct primary; 1200 ohms secondary; 376C7002 (05885)	

TABLE 6-3. LIST OF MANUFACTURERS

MFR CODE	NAME	ADDRESS
02660	Amphenol-Borg Electronics Corp.	Broadview (Chicago), Illinois
54715	Shure Bros. Inc.	Evanston, Illinois
75382	Kulka Electric Mfg. Co., Inc.	Mount Vernon, New York
75915	Littelfuse, Inc.	Des Plaines, Illinois
81349	Military Specifications	
96906	Military Standards	
98291	Sealectro Corp.	New Rochelle, New York
05885	American Scientific Corp.	Alexandria, Virginia

6-2. NOTES.

The following notes provide information as referenced in Table 6-2.

(1) The part number for 1A1, 1A1FL1, and 1A1Z1 depends upon the Keyer's assigned frequency; refer to Table 6-4.

TABLE 6-4. KEYER VARIABLE COMPONENT PART IDENTIFICATION

FREQUENCY CPS	KEYER, FREQUENCY SHIFT PART NUMBER (1A1)	FILTER, BANDPASS PART NUMBER (1A1FL1)	TUNED CIRCUIT PART NUMBER (1A1Z1)
425	376F3000-2	376D7010-2	376D7004-2
595	376F3000-4	376D7010-4	376D7004-4
765	376F3000-6	376D7010-6	376D7004-6
935	376F3000-8	376D7010-8	376D7004-8
1105	376F3000-10	376D7010-10	376D7004-10
1275	376F3000-12	376D7010-12	376D7004-12
1445	376F3000-14	376D7010-14	376D7004-14
1615	376F3000-16	376D7010-16	376D7004-16
1785	376F3000-1	376D7010-1	376D7004-1
1955	376F3000-3	376D7010-3	376D7004-3
2125	376F3000-5	376D7010-5	376D7004-5
2295	376F3000-7	376D7010-7	376D7004-7
2465	376F3000-9	376D7010-9	376D7004-9
2635	376F3000-11	376D7010-11	376D7004-11
2805	376F3000-13	376D7010-13	376D7004-13
2975	376F3000-15	376D7010-15	376D7004-15

(2) The part number for 1A2, 1A2R1, 1A2R4, 1A2FL1, and 1A2Z1 depends upon the Converter's assigned frequency; refer to Table 6-5.

TABLE 6-5. CONVERTER VARIABLE COMPONENT PART IDENTIFICATION

FREQUENCY CPS	CONVERTER, FREQUENCY SHIFT PART NUMBER (1A2)	RESISTOR VALUE (1A2R1)	RESISTOR VALUE (1A2R4)	FILTER, BANDPASS PART NUMBER (1A2FL1)	FILTER, BANDPASS PART NUMBER (1A2Z1)
425	376F2000-2	2500 ohms	omit	376D7008-2	376D7011-2
595	376F2000-4	1000 ohms	omit	376D7008-4	376D7011-4
765	376F2000-6	500 ohms	omit	376D7008-6	376D7011-6
935	376F2000-8	500 ohms	omit	376D7008-8	376D7011-8
1105	376F2000-10	500 ohms	270 ohms	376D7008-10	376D7011-10
1275	376F2000-12	500 ohms	270 ohms	376D7008-12	376D7011-12
1445	376F2000-14	500 ohms	270 ohms	376D7008-14	376D7011-14
1615	376F2000-16	500 ohms	270 ohms	376D7008-16	376D7011-16
1785	376F2000-1	500 ohms	270 ohms	376D7008-1	376D7011-1
1955	376F2000-3	500 ohms	270 ohms	376D7008-3	376D7011-3
2125	376F2000-5	500 ohms	180 ohms	376D7008-5	376D7011-5
2295	376F2000-7	500 ohms	180 ohms	376D7008-7	376D7011-7
2465	376F2000-9	500 ohms	180 ohms	376D7008-9	376D7011-9
2635	376F2000-11	500 ohms	180 ohms	376D7008-11	376D7011-11
2805	376F2000-13	500 ohms	180 ohms	376D7008-13	376D7011-13
2975	376F2000-15	500 ohms	180 ohms	376D7008-15	376D7011-15