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TECHNICAL MANUAL

for

REMOTE CONTROL GROUP

MODEL COPC-1

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, CANADA

TECHNICAL MANUAL

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ISSUE DATE: JANUARY 1970

REMOTE CONTROL GROUP
MODEL COPC-1

Remote Control Group Model COPC-1 is identical to Communications Control Console COPC-2 without the cabinet console. The COPC-1 consists solely of the three modular units:

Indicator Panel ID-1677/URT
Channel/Frequency Indicator ID-1678/URT
Programmer, Electronic Command Signal, C-8335/URT

The above three units are completly described in the Technical Manual for the COPC-2. Figures A, B, and C of this addendum depict individual overall dimensions, weight, center of gravity and other individual unit installation data for the three units.

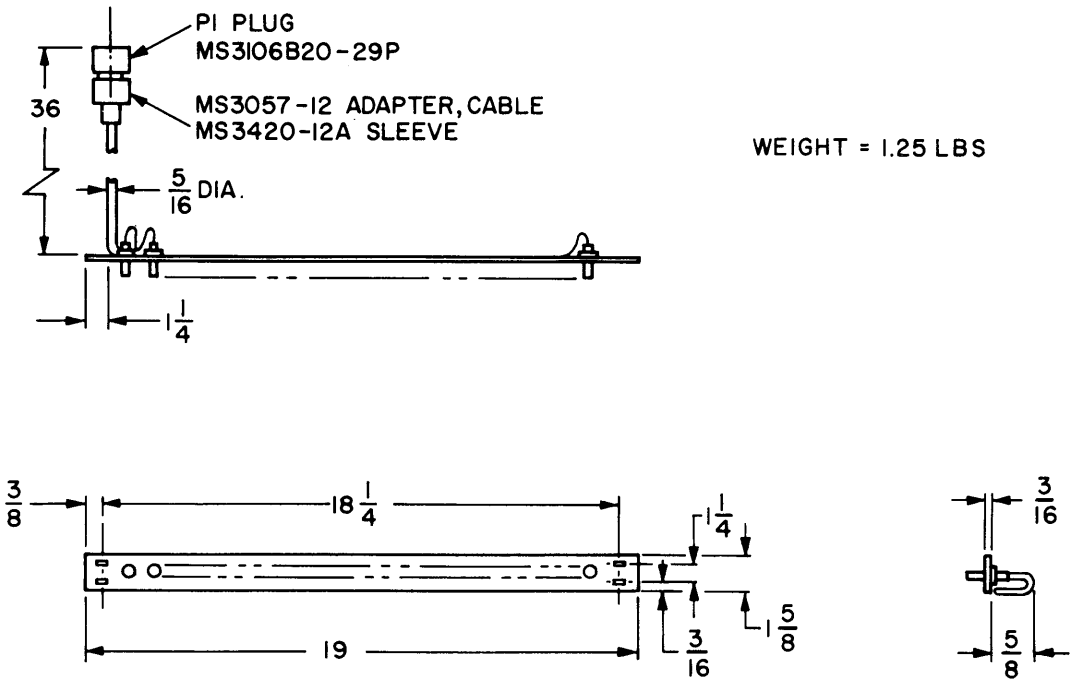

Figure A. Outline Dimensions, of Indicator Panel

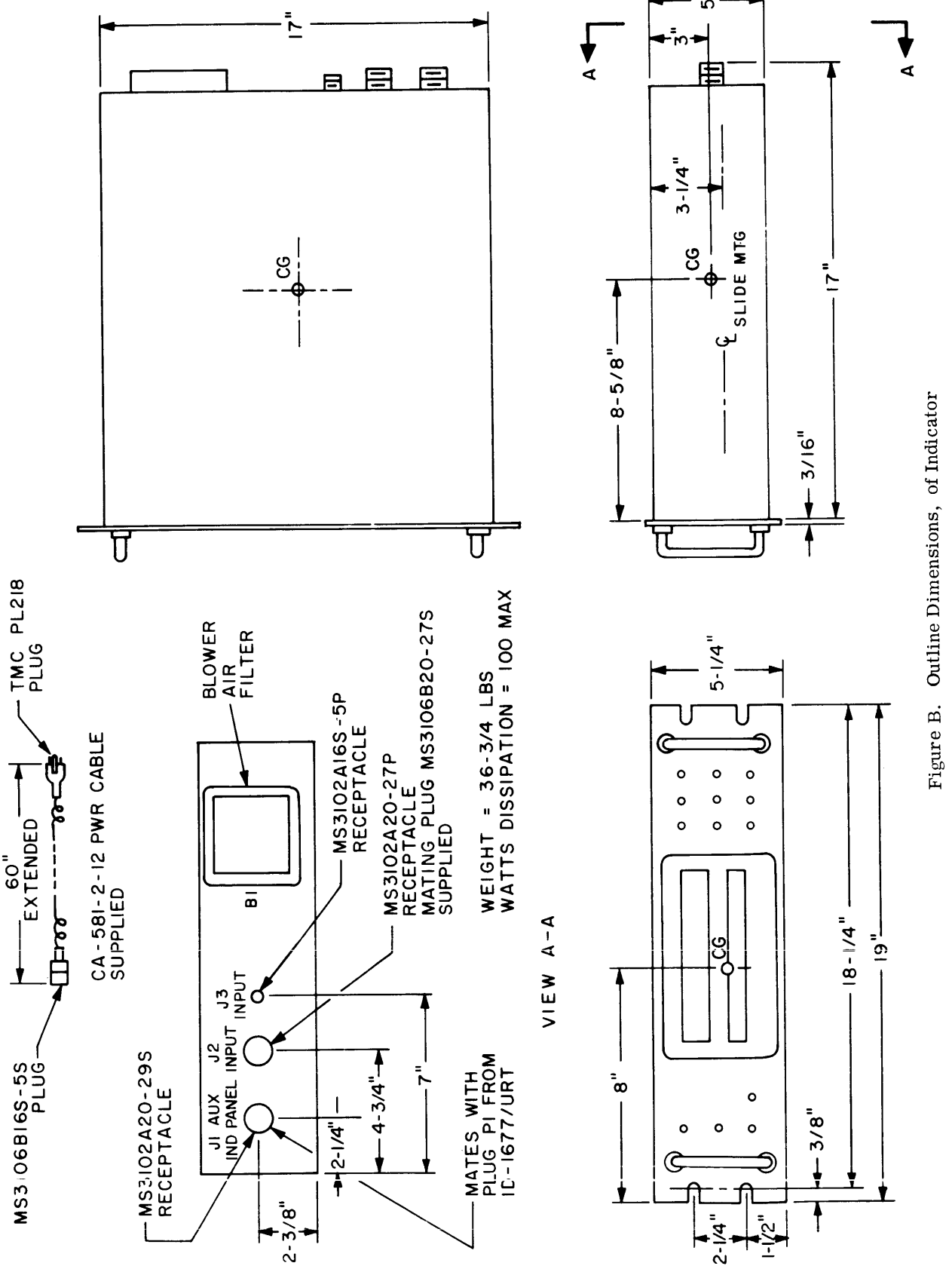

Figure B. Outline Dimensions, of Indicator

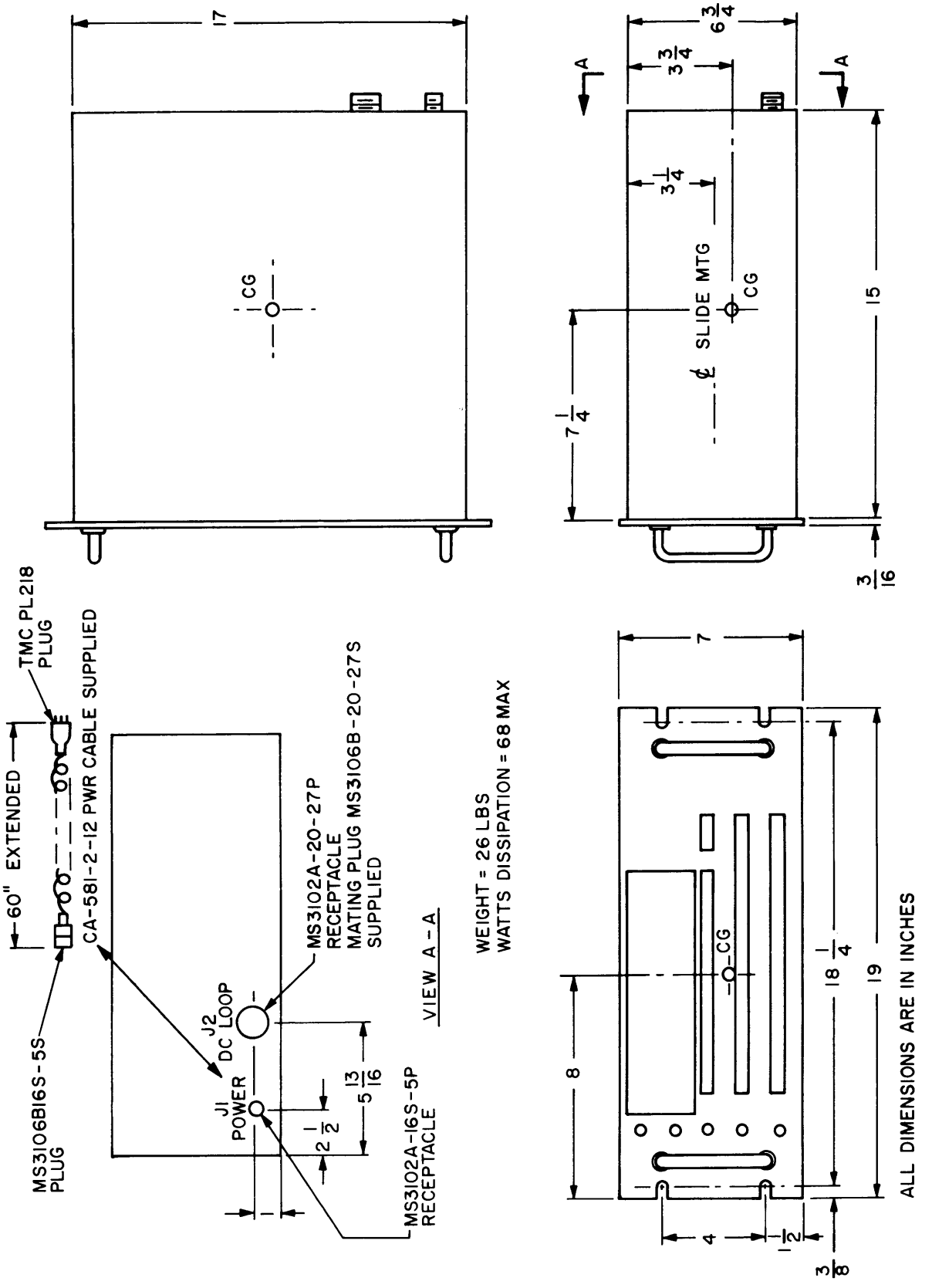

Figure C. Outline Dimensions, of Programmer

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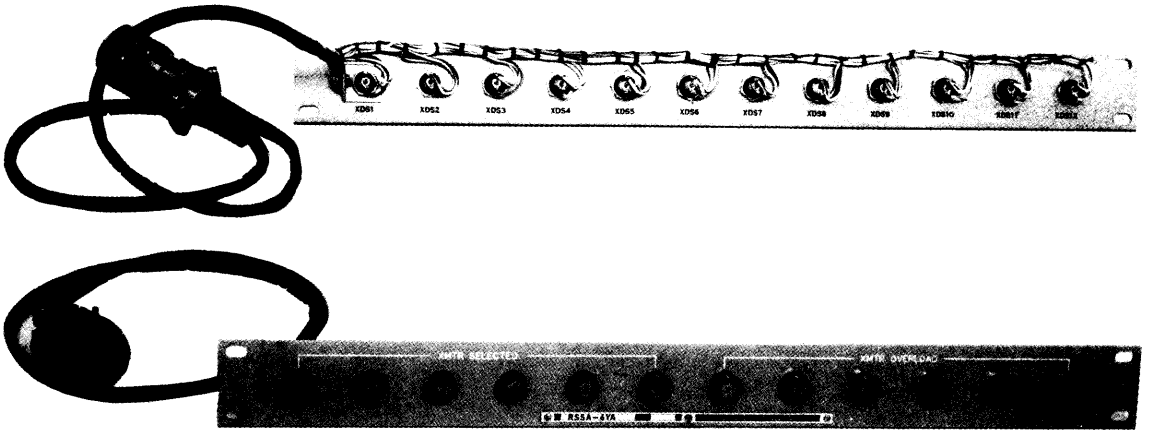
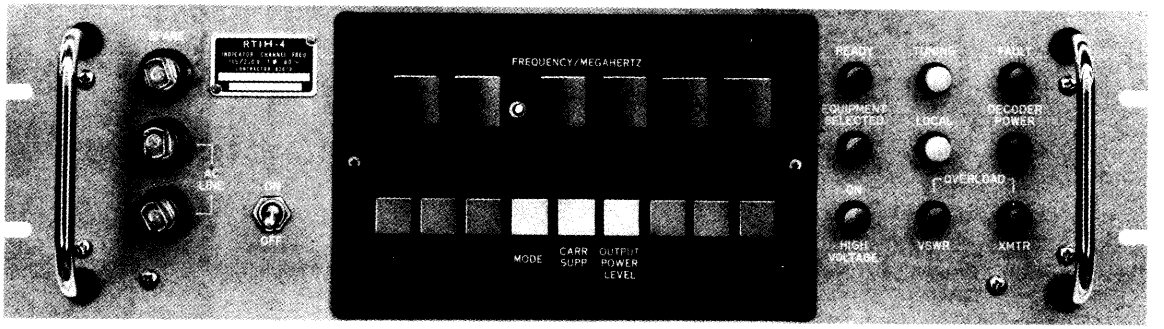
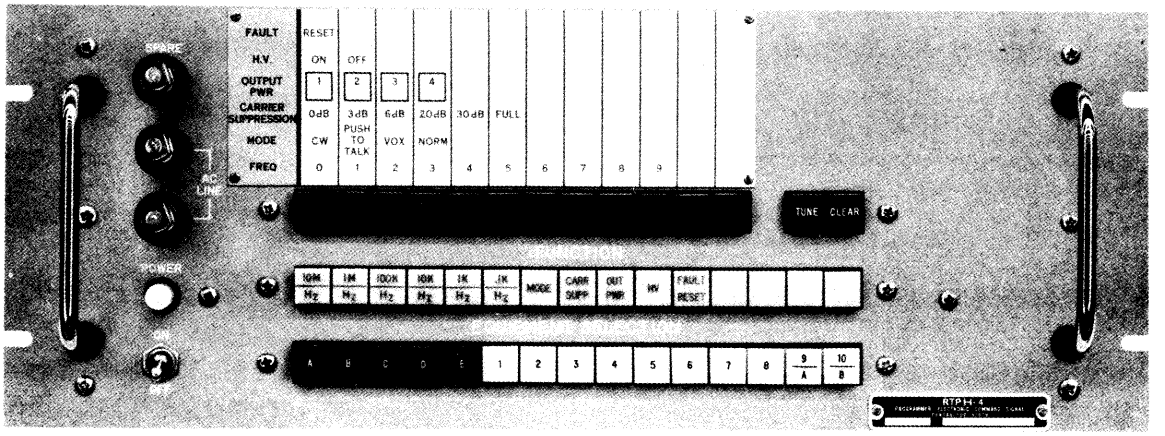


ID-1677/URT



IO-1678/URT



C-8335/URT

Figure 1-1. Front Panel Views of Indicator Panel, Frequency Indicator, and Electronic Programmer Reading From Top to Bottom

SECTION I
GENERAL INFORMATION

1-1. SCOPE

The context of this manual covers Communications Control Console, Model COPC-2 as used in association with Radio Transmitting Set AN/URT-37 (V) 1 and similar equipment.

1-2. GENERAL DESCRIPTION (See figure 1-1.)

Communications Control Console Model COPC-2 is a control programming and monitoring unit for the remote teletype signal control of sideband transmitters. Remote tuning of the transmitter is accomplished by programming transmitter control settings on a pushbutton keyboard. Five-level binary codes generated from the keyboard reach the transmitter memory (code storage) section via associated teletype linkage. A readback indicator in the COPC-2 receives transmitter control position readback codes, in similar coding, from teletype linkage, and displays the settings by digital indicators and projection screens.

The COPC-2 may be used for remote control and monitoring of a series of transmitters, using the same programmer and readback indicator. Equipment selection buttons on the programmer (in five letters and six numerals) can be combined to select and tune up to 30 transmitters. This arrangement is for five "blocks" of transmitters with six single transmitters to a block. A light indicator display works with the readback indicator to reveal which transmitter is associated with the control position readback.

The COPC-2 comprises modular units (described in paragraph 1-3) mounted in a slope front cabinet. All circuitry is solid state design, with encapsulated binary logic modules on printed circuit plug-in cards throughout. The overall cabinet dimensions are 65 inches high by 22 inches wide by 24 inches deep. The programmer and readback modules are on tilt-lock component slides and lock in the up or down position for servicing; these units contain their own power supplies. Where cooling is required, modules include individual forced-air cooling systems with removable air filters. Cabinets and modules are finished in light gray enamel per MIL-E-15090.

1-3. DESCRIPTION OF MODULAR UNITS (See figure 1-2.)

a. ELECTRONIC COMMAND SIGNAL PROGRAMMER, C-8335/URT. The C-8335/URT contains the pushbutton keyboard marked with transmitter controls for programming a teletype tuning message to be sent to the transmitter. It includes a CLEAR pushbutton for correcting errors and a TUNE pushbutton for energizing the transmitter tuning controls to respond to the message. A row of EQUIPMENT SELECTION pushbuttons are included and provide a selection of five 6-transmitter blocks for address. The contact keying code output is in CCIT 5-level teletype pattern at 74.2-baud speed. Shift-register timing is such as to allow transmission with 8-level pattern equipment if necessary.

b. CHANNEL/FREQUENCY INDICATOR, ID-1678/URT. The ID-1678/URT displays a readback of control positions from a continuous cycling of teletype codes from the transmitter. Code input is through an isolation keyer and can be connected directly to any standard teletype current loop in 5-level through 8-level equipment. The frequency to which the transmitter is tuned appears in a lighted digital display down to the .0001-mc component. Control positions are projected onto individual indicator screens. Transmitter tuning status and warning signals are on a light panel.

c. INDICATOR PANEL ID-1677/URT. The ID-1677/URT is a light indicator panel operating in conjunction with Channel/Frequency Indicator ID-1678/URT to identify which transmitter (of a block of transmitters) is represented in the ID-1677/URT display. Lights enable an identification of up to six transmitters. The ID-1677/URT is a passive device and works from a signal input from Channel/Frequency Indicator ID-1678/URT. Overload lights indicate the location of an overload in a block of transmitters.

1-4. REFERENCE DATA

Table 1-1 lists quick-reference technical data on the COPC-2 and includes the nominal specifications defining this equipment. Table 1-2 lists teletype output codes for transmitter controls, resulting from specific pushbuttons on the C-8335/URT keyboard. Table 1-3 lists readback code inputs required to energize specific displays in the ID-1678/URT indicator panel.

TABLE 1-1. TECHNICAL SPECIFICATIONS

TUNING CODE OUTPUT:	5-bit codes in serial teletype wet (mercury) contact keying from polar relay. 5-level codes (adaptable up to 8-level* transmission equipment) with 74.2-baud transmission speed. Codes per table 1-2.
READBACK CODE INPUT:	From teletype loop, 60 ma or 20 ma, neutral or polar. 5-level codes (adaptable up to 8-level* transmission equipment) with 74.2-baud transmission speed. Codes per table 1-3.

* In 6-, 7- or 8-level pattern, code is in first 5 bits.

TABLE 1-1. TECHNICAL SPECIFICATIONS (cont)

POWER SUPPLY REQUIREMENTS:	115/230 VAC 50/60 cps, single phase, 168 watts maximum consumption.
AMBIENT TEMPERATURE AND HUMIDITY:	0 to 50° C and up to 95% relative humidity.
OVERALL DIMENSIONS:	65 inches high x 22 inches wide x 24 inches deep.

TABLE 1-2. PUSHBUTTON CODES

Pushbutton (C-8335/URT, figure 3-1)	5-Bit Code, 12345	Equivalent CCIT TTY Character
FAULT:		
RESET	01000	Line Feed
H.V.:		
ON	01000	Line Feed
OFF	00100	Space
OUTPUT PWR:		
1	01000	Line Feed
2	00100	Space
3	01100	I
4	00010	Carriage Return
CARRIER SUPPRESSION:		
0db	01000	Line Feed
3db	00100	Space
6db	01100	I
20db	00010	Carriage Return
30db	01010	R
FULL	00110	N
MODE:		
CW	01000	Line Feed
PUSH-TO-TALK	00100	Space
VOX	01100	I
NORM	00010	Carriage Return

TABLE 1-2. PUSHBUTTON CODES (cont)

Pushbutton (C-8335/URT, figure 3-1)	5-Bit Code, 12345	Equivalent CCIT TTY Character
FREQ:		
0	01000	Line Feed
1	00100	Space
2	01100	I
3	00010	Carriage Return
4	01010	R
5	00110	N
6	01110	C
7	00001	T
8	01001	L
9	00101	H
TUNE	10000	E
CLEAR	01111	V
FUNCTION:		
10 MHz	11000	A
1 MHz	10100	S
100 KHz	11100	U
10 KHz	10010	D
1 KHz	11010	J
.1 KHz	10110	F
MODE	11110	K
CARR SUPP	10001	Z
OUT PWR	11001	W
HV	10101	Y
FAULT RESET	11101	Q
EQUIPMENT SELECTION:		
A	10101	Y
B	10110	F
C	11010	J

TABLE 1-2. PUSHBUTTON CODES (cont)

Pushbutton (C-8335/URT, figure 3-1)	5-Bit Code, 12345	Equivalent CCIT TTY Character
EQUIPMENT SELECTION: (cont)		
D	11001	W
E	10011	B
1	00010	Carriage Return
2	01010	R
3	01100	I
4	01000	Line Feed

TABLE 1-2. PUSHBUTTON CODES (cont)

Pushbutton (C-8335/URT, figure 3-1)	5-Bit Code, 12345	Equivalent CCIT TTY Character
EQUIPMENT SELECTION: (cont)		
5	00100	Space
6	01101	P
7	00101	H
8	00011	O
9/A	00111	M
10/B	01011	G

TABLE 1-3. READBACK CODES

Character Reception Order	Display (figure 3-1)	Indication	Code Bits	
			1	2345
1	Resets indicator for new cycle		1	0000
2	ID-1678/URT FREQUENCY/ MEGAHERTZ 10-MHz digit	0		1111
		1		0111
		2		1011
		3		0011
	ID-1678/URT Transmitter READY/TUNING/FAULT lamps	See note*.		
3	ID-1678/URT FREQUENCY/ MEGAHERTZ 1-MHz digit	0		1111
		1		0111
		2		1011
		3		0011
		4		1101
		5		0101
		6		1001
		7		0001
		8		1110
		9		0110

* Readback for READY/TUNING/FAULT lamps is contained in bit #1 of codes #2 and #3 combined:

Bit #1

Code #2	Code #3	Lamp
1	0	READY
0	1	TUNING
1	1	FAULT

TABLE 1-3. READBACK CODES (cont)

Character Reception Order	Display (figure 3-1)	Indication	Code Bits	
			1	2345
3 (cont)	ID-1678/URT FREQUENCY/ READY/TUNING/FAULT lamps	See note*.		
4	ID-1678/URT FREQUENCY/ MEGAHERTZ 100-kHz digit	0-9, same as for 1-MHz digit.		
	ID-1678/URT EQUIPMENT SELECTED lamp	On	1	
		Out	0	
5	ID-1678/URT FREQUENCY/ MEGAHERTZ 10-kHz digit	0-9, same as for 1-MHz digit.		
	ID-1678/URT DECODER POWER lamp	On	1	
		Out	0	
6	ID-1678/URT FREQUENCY/ MEGAHERTZ 1-kHz digit	0-9, same as for 1-MHz digit.		
	ID-1678/URT LOCAL lamp	On	1	
		Out	0	
7	ID-1678/URT FREQUENCY/ MEGAHERTZ .1-kHz digit	0-9, same as for 1-MHz digit.		
	ID-1678/URT VSWR & XMTR OVERLOAD lamps		*	
8 (Function 1)	ID-1678/URT HIGH VOLTAGE lamp	On	1	1000
		Out	0	1000
9 (Function 2)	ID-1678/URT VSWR & XMTR OVERLOAD lamps		*	1000
10 (Function 3)	ID-1677/URT XMTR OVERLOAD lamp #1	On	1	1000
		Out	0	1000
11 (Function 4)	ID/1677/URT XMTR OVERLOAD lamp #2	On	1	
		Out	0	
	ID-1678/URT MODE indicator	CW		1111
		PUSH-TO-TALK		0111
		VOX		1011
		NORM		0011
12 (Function 5)	ID-1677/URT XMTR OVERLOAD lamp #3	On	1	
		Out	0	

* Readback for VSWR and XMTR OVERLOAD lamps is contained in bit #1 of codes #7 and #9 combined:

	Bit #1	
Code #7	Code #9	Lamp
1	1	OVERLOAD/VSWR
0	1	OVERLOAD/XMTR

TABLE 1-3. READBACK CODES (cont)

Character Reception Order	Display (figure 3-1)	Indication	Code Bits 1	Code Bits 2345
12 (Function 5) (cont)	ID-1678/URT CARR SUPP indicator	0db		1111
		3db		0111
		6db		1011
		20db		0011
		30db		1101
		FULL		0101
13 (Function 6)	ID-1677/URT XMTR OVERLOAD lamp #4	On	1	
		Out	0	
	ID-1678/URT OUTPUT POWER LEVEL indicator	MAIN PWR OFF		1111
		1		0111
		2		1011
		3		0011
		4		1101
14 (Function 7)	ID-1677/URT XMTR OVERLOAD lamp #5	On	1	1000
		Out	0	1000
15 (Function 8)	ID-1677/URT XMTR OVERLOAD lamp #6	On	1	1000
		Out	0	1000
16 (Function 9)	Not used			
17 (Function 10)	ID-1677/URT XMTR SELECTED lamps #1 thru #6	1	0	1110
		2	0	0110
		3	0	1010
		4	0	0010
		5	0	1100
		6	0	0100

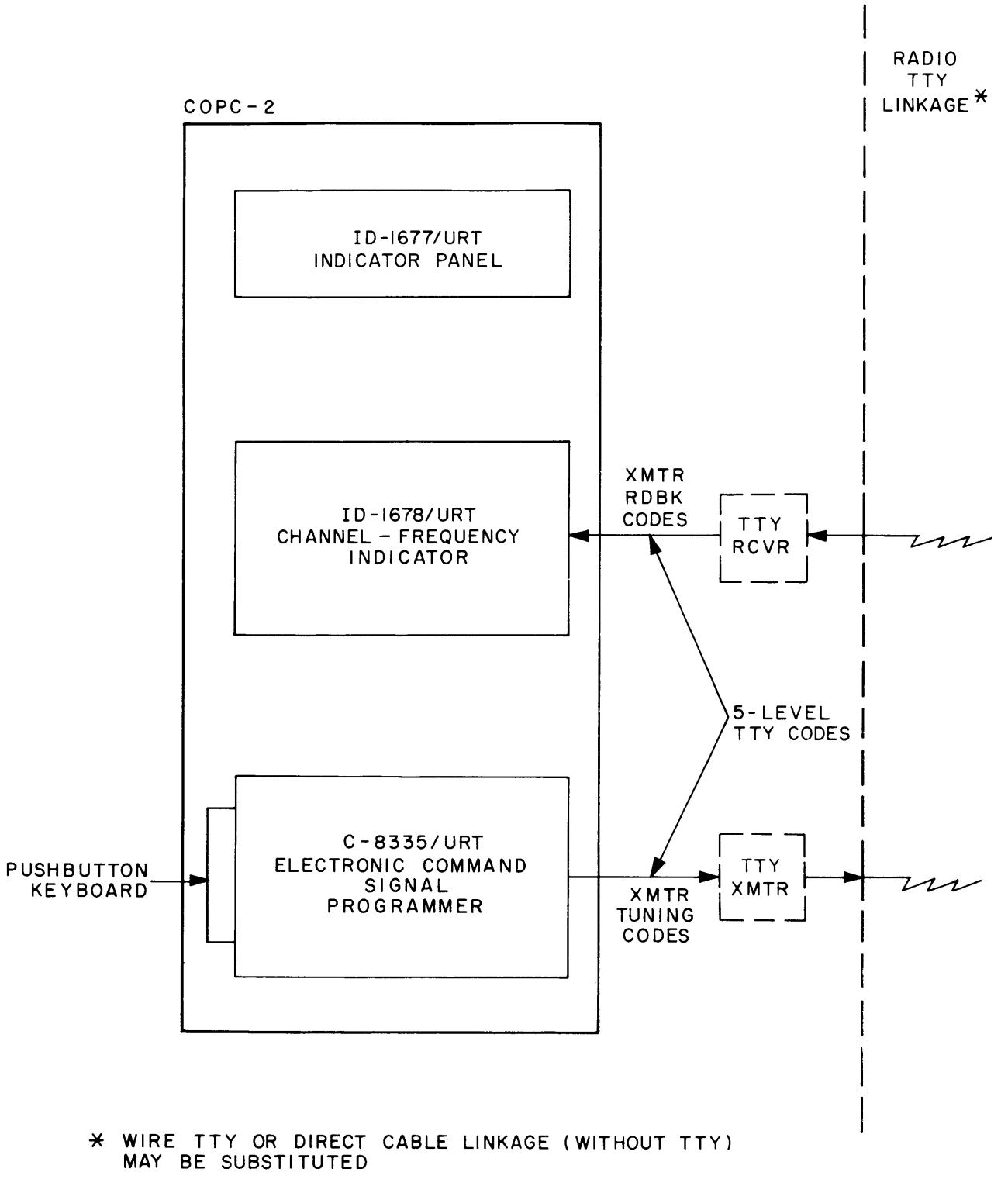


Figure 1-2. Functional Block Diagram, Communications Control Console, COPC-2

SECTION II
INSTALLATION

2-1. UNPACKING AND HANDLING

Inspect the COPC-2 packing cases for possible damage when they arrive at the operating site. With respect to damage to equipment for which the carrier is liable, the Technical Materiel Corporation will assist in describing methods of repair and the furnishing of replacement parts.

2-2. POWER REQUIREMENTS

Each console leaves the factory wired to operate from a 115-vac 50/60 cps, single-phase power source. The console can be rewired for operation from a 220-vac 50/60 cps, single-phase source by changing transformer primary winding jumper leads in each rack modular unit. Refer to figure 2-1 for typical primary connections. In units containing a blower, ensure that 115 vac is maintained across the blower as shown.

2-3. SITE SELECTION

The console (figure 1-1) may be located in any enclosure (room, deck or van) with sufficient clearance as depicted in figure 2-2. Allow a minimum of two feet above the console for adequate heat dissipation and to prevent back pressure in the cooling-air exhaust stream. The console is designed for fixed station, transportable or ship installation. Remote readback into the console is by means of conventional teletype linkage by a cable from the teletype loop current supply. The connector (INPUT J2) for this cable is located on the Channel/Frequency Indicator rear panel. The length of the cable should be consistent with the loop current supply, so as to prevent line drop (see paragraph 2-4b (3) (c)).

2-4. INSTALLATION REQUIREMENTS

a. ASSEMBLY OF CONSOLE. Install modular units and blank panels into the console as shown in figure 1-1. Connect modular unit power supply inputs to ac power strip console as shown in figure 5-1. Modular units ID-1678/URT and C-8335/URT are slide-mounted on tilt-lock drawer slides. The external part of the slide mount arrives pre-installed in the cabinet; the internal part arrives pre-installed on the modular unit. To install a unit, refer to figure 2-3 and proceed as follows:

(1) Pull the center section of the cabinet-mounted (external) portion of the slide-mount out until it locks in an extended position.

(2) Position the unit-mounted (internal) portion of the slide mount in the tracks of the external portion and ease the modular unit into the cabinet until the release buttons engage the holes in the track.

(3) Depress the release buttons and slide the modular unit completely into the rack.

(4) Secure the modular unit front panel to the rack flange with machine screws and fiber washers supplied in shipment.

b. EXTERNAL WIRING CONNECTIONS. All system wiring shall be connected at the rear panels of Channel/Frequency Indicator ID-1678/URT and Electronic Command Signal Programmer C-8335/URT (figure 5-1). Figure 2-4 contains wire-run information for constructing individual cables to each connector. Since the readback input requirements may vary due to the quantity and types of the remote transmitters, an analysis should be made as to necessary connections before proceeding to make up the cables. This analysis may be made from information contained in the following sub-paragraphs.

(1) Programming Output. The console is capable of controlling up to thirty remote single transmitters or fifteen remote dual-diversity transmitters. This remote equipment may be arranged as one single transmitter, or an array of up to thirty single transmitters; one dual-diversity transmitter, or an array of up to fifteen dual-diversity transmitters. In all cases, one single teletype code channel output (DC LOOP, J2) from the C-8335/URT controls all of the transmitters in an arrangement. Single and dual-diversity transmitters may be combined in an arrangement as long as transmitter-halves do not exceed thirty when totaled up.

(2) Readback Input. Cable connections to the ID-1678/URT may vary in accordance with the particular transmitters used. ID-1678/URT contains a single input (INPUT J2) on its rear panel. Some varieties of transmitters contain a readback selector in which a readback is triggered by the EQUIPMENT SELECTION code pushbuttons on the C-8335/URT keyboard; in this case only one teletype channel is required for the readback input from one transmitter block at the console. For transmitters not containing a readback selector, readback issues from each transmitter via a separate teletype channel and a selector switch may be required at INPUT J2.

(3) Variations in Teletype Linkage Equipment.

(a) General. Although the programming output and readback input circuitries in the console are designed to operate with 74.2-baud (100 WPM) teletype linkages, these circuits are designed to adapt to a variety of baud ratings, current loops, and code levels in the teletype linkage equipment.

(b) Baud Rating.

Note

Baud (or WPM) rating capacity of the console is based on the clock timing circuit in the remote readback input. The timing circuit is designed to match pulse widths within each code. The readback codes themselves may enter at any speed up to 100 WPM.

The baud rating at the readback input is determined by plug-in P/C (printed circuit) board A9 in the ID-1678/URT; that of the programming output is determined by plug-in P/C board A3 in the C-8335/URT. In Communication Control Console COPC-2 these boards are designed for a 75-baud operation; 45-baud (60 WPM) P/C boards are also available.

(c) Current Loop. In the readback input, the teletype equipment output current loop operates through isolation keyer P/C board A2 in the Channel/Frequency Indicator. The keyer will operate from a 20-ma or 60-ma loop. When working from a 60-ma loop, however, by-pass resistor R5 on P/C board A2 by adding a strap around it at terminals provided on the board.

(d) Code Levels. Although the COPC-2 uses a 5-level code, programming code output and readback code input circuitry contains shift registers paced for adaptability up to an 8-level teletype linkage equipment. No adjustments are necessary for the adaptation.

2-5. CABLE ASSEMBLIES

Wire the programming output cable and the readback input cable in accordance with wire-run information in figure 2-4.

2-6. TRANSMITTER POWER LEVEL NOTATIONS

Blank spaces are provided opposite the words "OUTPUT POWER" on a printed chart directly above a row of blank buttons on the programmer (figure 3-1); these spaces are to be filled in with the four wattage adjustments for the transmitter output power. These stepped power adjustments are made in the transmitter at the time of its installation.

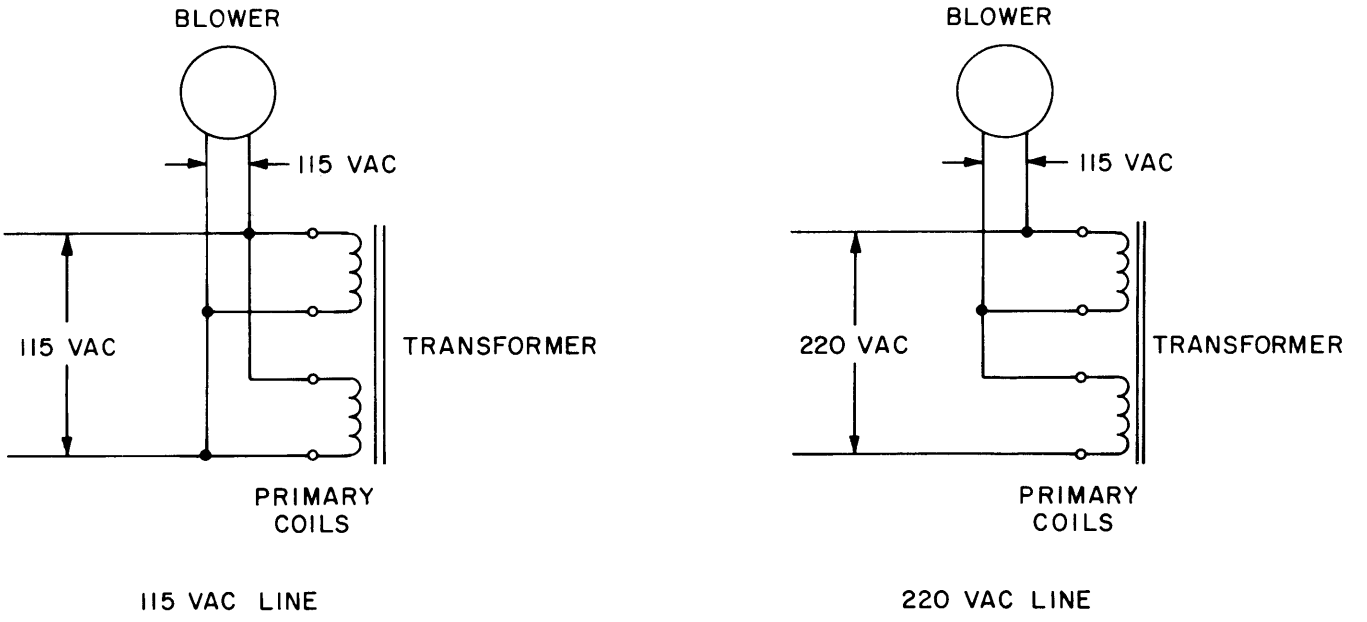


Figure 2-1. 115-220 VAC Conversion

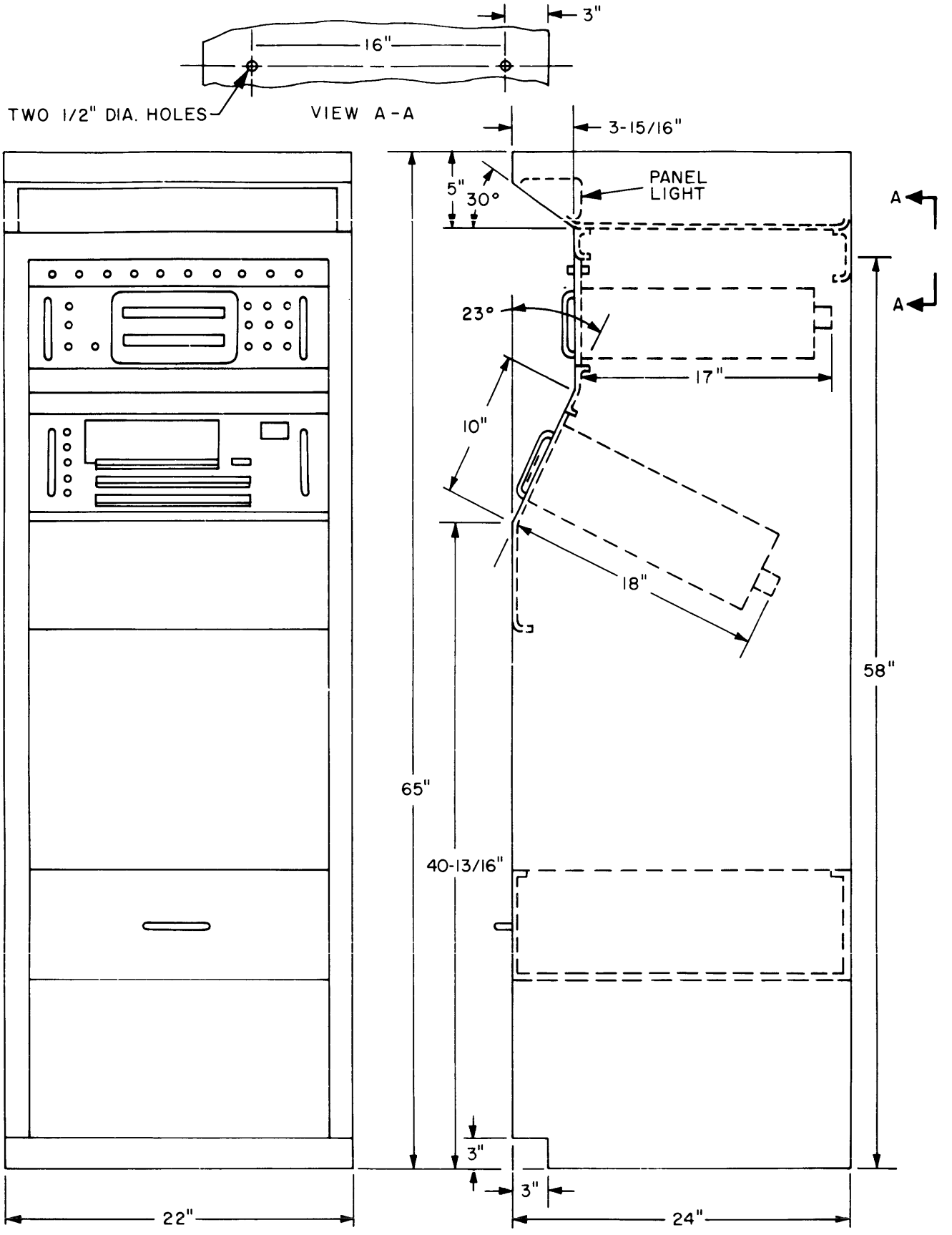


Figure 2-2. Outline and Dimensions of Console

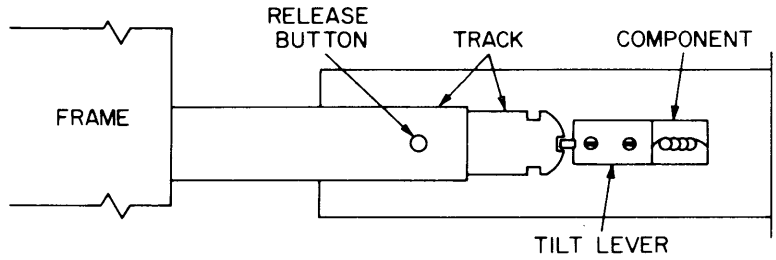


Figure 2-3. Slide Mount Details

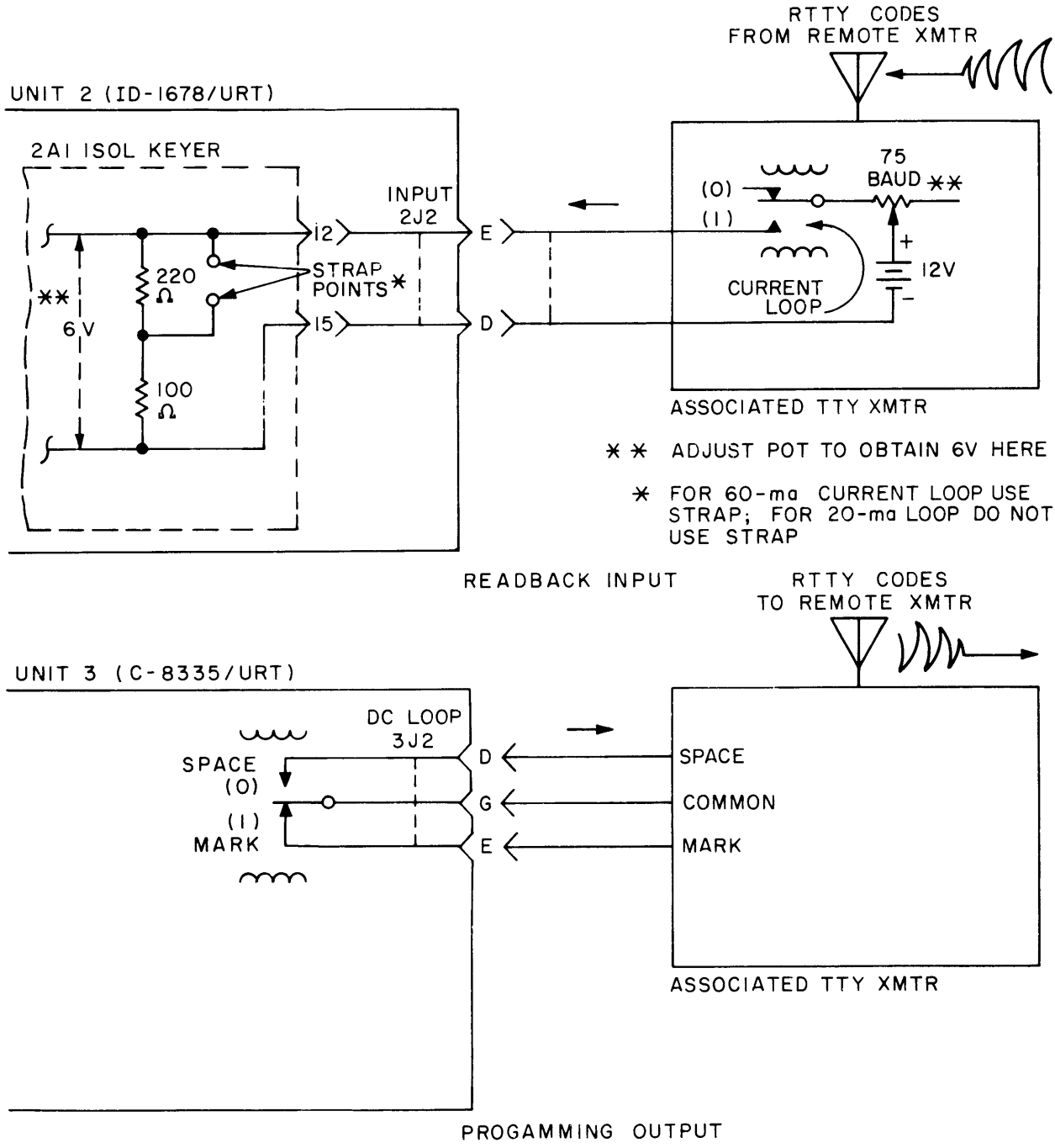


Figure 2-4. External Wiring Connections

SECTION III
OPERATOR'S SECTION

3-1. FUNCTIONAL OPERATION

a. GENERAL. Communications Control Console COPC-2 functions as a pushbutton control unit for the tuning of a remote sideband transmitter by teletype code. (See figure 1-2.) The console includes a readback indicator for the readback of transmitter control positions.

b. CAPABILITIES. The COPC-2 can tune the transmitter for a variety of transmission modes and one console can control and monitor up to thirty single transmitters.

(1) Transmission Modes. The following transmission modes are controlled at the console.

(a) Carrier frequency (in 0.1-kHz steps)*
(b) Transmitter on/off control mode
(c) Carrier suppression
(d) Output power level (in 4 levels)**
(e) High voltage on/off
(f) Fault reset (for automatic tuning)
(g) Mode selection

(2) Multiple Transmitter Control. The pushbutton control unit can be used to separately tune up to thirty transmitters by utilizing the EQUIPMENT SELECTION row of pushbuttons on Electronic Signal Command Programmer C-8335/URT. (See figure 3-1.) Pushbuttons, numbered A, B, C, D and E, and 1 through 6, afford a selection of five blocks (A through E) of transmitters with six transmitters (1 through 6) in each block.

(3) Readback Monitoring. When the EQUIPMENT SELECTION pushbuttons are depressed, a readback is generated from the selected transmitter in the selected block. *** This readback of control positions and transmitter status is displayed on the ID-1678/URT panel (figure 3-2). A light in the 1-6 XMTR SELECTED row on the ID-1677/URT panel (figure 3-3) indicates which transmitter is represented in the display. Readback is continuous from a selected transmitter until another transmitter is selected.

*Automatic tuning and loading (to the selected frequency) takes place in the transmitter.
**See paragraph 2-6.
***For transmitters containing readback selectors.

Readback display is in the same terminology as that of the programmer pushbuttons and also includes transmitter tuning status information. A READY light indicates that the transmitter is ready to tune. An EQUIPMENT SELECTED light indicates, after C-8335/URT EQUIPMENT SELECTION pushbuttons have been depressed, that the transmitter memory section (in Signal Data Converter-Storer CV-2520(V)/URC) has opened and is ready for the tuning message. A TUNING indication is received while the transmitter is in the process of tuning from the programmed message; a READY indication arrives again when tuning is complete.* A FAULT signal signifies failure of the transmitter to synchronize or tune as programmed. A LOCAL light indicates that the transmitter's controls have not been set for remote tuning. A DECODER POWER light indicates that the transmitter memory (CV-2520(V)/URC) power input has been disconnected or that its input signal is disconnected and, therefore remote tuning is not possible. When the HIGH VOLTAGE light is on, the transmitter's high voltages are turned on. If either the transmitter amplifier or the transmitter VSWR (voltage standing wave ratio) indicator section becomes overloaded at any time, the VSWR or XMTR OVERLOAD lamps will light. This last indication is from any transmitter in the block, regardless of the last transmitter selected. In this case, one of the 1-6 XMTR OVERLOAD lamps on the ID-1677/URT panel will light at the same time, to indicate the transmitter with the overload.

3-2. OPERATING PROCEDURE

a. DESCRIPTION OF CONTROLS. Table 3-1 lists controls, pushbuttons and readback indicators, including the function of each item. Reference is made to these items as they appear in figure 3-1, Front Panel Controls, COPC-2. On the C-8335/URT programming panel, yellow FUNCTION pushbuttons are used to select a transmitter control and the row of twelve blank blue pushbuttons, directly above, are used to position the selected control in accordance with the printed chart above the blank pushbuttons.

*In the case of a rapid tuning (and due to the length of the readback cycle) the operator may often have a steady READY indication throughout a tuning.

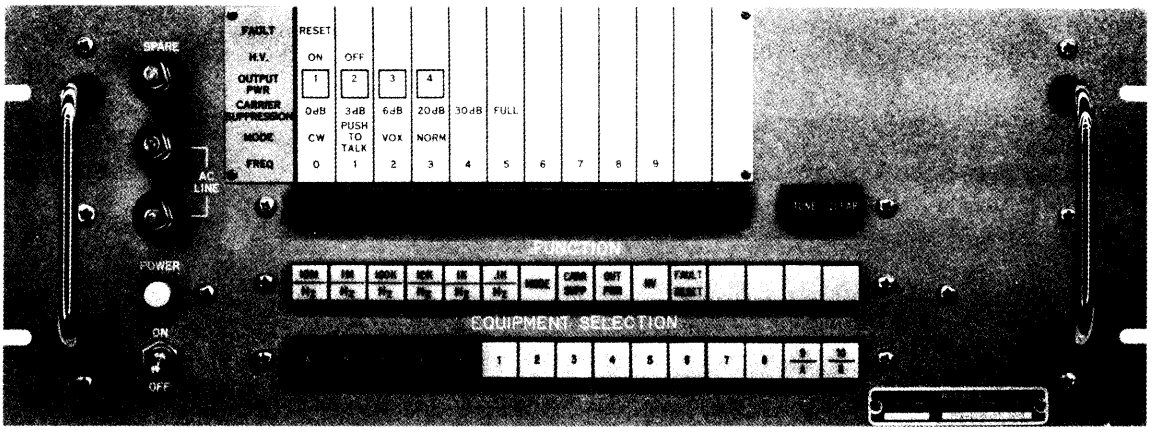


Figure 3-1. Front Panel Controls of Electronic Programmer C-8335/URT

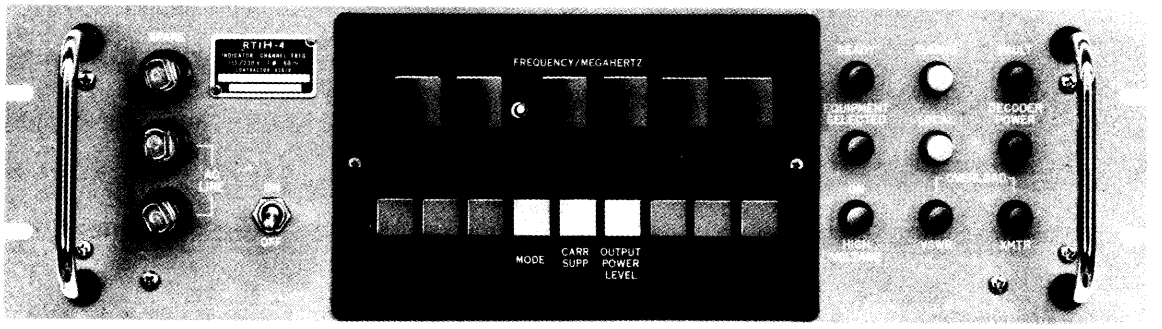


Figure 3-2. Front Panel Controls of Channel/Frequency Indicator ID-1678/URT

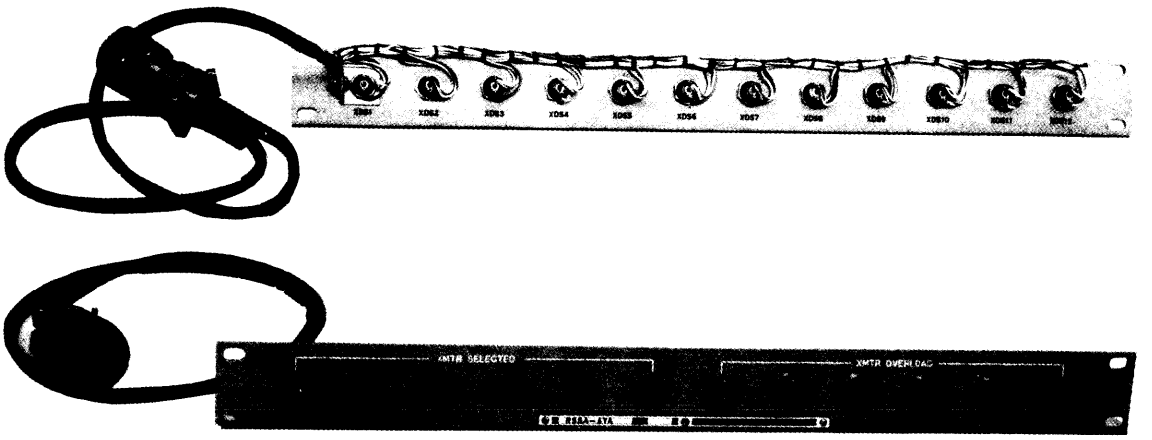


Figure 3-3. Front Panel View of Indicator Panel IF-1677/URT

TABLE 3-1. CONTROL FUNCTIONS

Module	Control	Function
ID-1677/URT	XMTR SELECTED lights (1-6)	Indicates the transmitter (in a block of six) represented in the ID-1678/URT readback display.
	XMTR OVERLOAD lights (1-6)	Indicates the transmitter (in a block of six) represented by the VSWR or XMTR OVERLOAD lights on the ID-1678/URT.
ID-1678-URT	ON/OFF switch	Connects ac line voltage to ID-1678/URT.
	FREQUENCY/MEGAHERTZ digital display	Indicates 2.0000- to 32.0000-MHz frequency to which transmitter is tuned.
	Mode display	Indicates transmitter on/off control mode setting (CW, PUSH-TO-TALK, VOX* or NORM).
	CARR SUPP display	Indicates transmitter carrier suppression setting referenced to 0 db (PEP)**. Settings are 0, 3, 6, 20 and 30 db and FULL.
	OUTPUT POWER LEVEL display.	Indicates power level setting (1, 2, 3 or 4) of transmitter. If power has been disconnected from transmitter, indicates "MAIN PWR OFF". (See paragraph 2-6.)
	READY lamp (green)	Indicates transmitter tuning is complete.

*Voice operated transmission.
**Peak envelope power.

TABLE 3-1. CONTROL FUNCTIONS (cont)

Module	Control	Function
ID-1678/URT (cont)	TUNING lamp (yellow)	Indicates transmitter is in the process of tuning from a programmed message or from a local tuning.
	FAULT lamp (red)	Indicates transmitter has failed to synchronize to frequency indicated in FREQUENCY/MEGAHERTZ display.
	EQUIPMENT SELECTED lamp (green)	Indicates intended transmitter has opened memory section for tuning message.
	LOCAL lamp (yellow)	Indicates transmitter is on local control and cannot be tuned by console.
	DECODER POWER lamp (red)	Indicates transmitter cannot be tuned due to disconnection of memory power input.
	HIGH VOLTAGE ON lamp (green)	Indicates transmitter high voltages are switched on.
	OVERLOAD/VSWR lamp (red)	Indicates an overload condition in the VSWR section of a transmitter within the selected block.
	OVERLOAD/XMTR lamp (red)	Indicates an overload condition in the power amplifier section of a transmitter within the selected block.
C-8335/URT	POWER lamp	Light indicates C-8335/URT is receiving ac line voltage.
	ON/OFF switch	Connects ac line voltage to C-8335/URT.
	Twelve blank pushbuttons (blue)	FREQ: 0-9 selection for 10 MHz, 100 kHz, 10 kHz, 1 kHz and 0.1 kHz components in transmitter carrier frequency. MODE: Selects transmitter on/off control mode (CW, PUSH-TO-TALK, VOX, NORM) CARRIER SUPPRESSION: Selects level of carrier suppression in signal from transmitter. OUTPUT POWER: Selects transmitter power level at output. Levels 1, 2, 3 and 4 are preset at transmitter for particular applications and marked in blocks provided. H.V.: ON/OFF positions control transmitter high voltages. FAULT: Pushing RESET pushbutton recycles transmitter automatic tuning in the event of a FAULT indication at ID-1678/URT.

TABLE 3-1. CONTROL FUNCTIONS (cont)

Module	Control	Function
C-8335/URT (cont)	TUNE pushbutton (green)	Energizes transmitter to tune to programmed message.
	CLEAR pushbutton (red)	Used for correction of error in a programmed message (before TUNE pushbutton). Erases codes in transmitter memory section.
	FUNCTION pushbuttons (yellow):	
	10 MHz	Selects 10 MHz component control.
	1 MHz	Selects 1 MHz component control.
	100 kHz	Selects 100 kHz component control.
	10 kHz	Selects 10 kHz component control.
	1 kHz	Selects 1 kHz component control.
	.1 kHz	Selects .1 kHz component control.
	MODE	Selects control for transmitter on/off selection.
	CARR SUPP	Selects control for transmitter carrier suppression selection.
	OUT PWR	Selects control for transmitter output power level selection.
	HV	Selects control for transmitter high voltage on/off selection.
	FAULT RESET	Selects control for resetting transmitter tune-recycling.
	EQUIPMENT SELECTION pushbuttons	A through E (black) selects transmitter block. 1 through 6 (white) selects transmitter within block (7, 8, 9/A and 10/B not used).

b. SEQUENCE OF OPERATION. In general, remote tuning procedure is to:

(1) Select the transmitter by C-8335/URT EQUIPMENT SELECTION pushbuttons.

(2) Check ID-1678/URT readback display for indication that transmitter is ready for remote tuning.

(3) Check ID-1678/URT readback display for present transmitter settings.

(4) Determine which controls require repositioning and program new settings by C-8335/URT keyboard pushbuttons.

(5) Energize transmitter's automatic tuning system (C-8335/URT TUNE pushbutton).

(6) Check new control positions on ID-1678/URT readback indicator.

When formulating a programming message on the C-8335/URT keyboard, the operator should keep in mind that although the transmitter's memory storage (30 code capacity) is more than adequate for the 12 control code pairs (24 codes) from the C-8335/URT, repeats during any one message should be limited so as not to overrun the code capacity. For correcting errors during a programming, the C-8335/URT CLEAR button may be used; this erases any previous codes in the transmitter's memory.

Note

Neither the EQUIPMENT SELECTION codes nor the CLEAR code become stored in the transmitter memory. Codes that are stored are the tuning codes (yellow and blue pushbuttons) and the TUNE code.

c. OVERLOAD. If an overload occurs in a transmitter (as indicated by an OVERLOAD/XMTR light on the ID-1678/URT), observe XMTR OVERLOAD light 1-6 on the ID-1677/URT panel to identify the transmitter represented. Usually the transmitter has overloaded due to overdriving by the exciter portion or a fault in the level-sensing circuits in the automatic tuning section. Repeat the tuning message three times for that transmitter. If an overload occurs on each tuning cycle, the transmitter requires troubleshooting.

If an overload occurs in the VSWR (voltage standing wave ratio) indicator section at the output of the transmitter (as indicated by a VSWR OVERLOAD light on the ID-1678/URT), observe XMTR OVERLOAD lights 1-6 on the ID-1677/URT for transmitter identification. Usually a VSWR overload is due to a

fault at the associated antenna or antenna connections. As in the case of transmitter overload, recycling the automatic tuning three times may rectify the situation; if not, this area will require troubleshooting.

d. CARRIER SUPPRESSION SETTINGS. The CARRIER SUPPRESSION settings for each transmitter may vary with the transmitter model. When the transmitter model is known, refer to the technical manual for that model for recommended settings. This is usually influenced by the particular preset "channel priority" setting. The channel priority setting determines intelligence routing and modes (1-, 2- or 4- channel) of transmission. CARRIER SUPPRESSION settings are then determined by the basis of economy and standard modes of reception.

e. FAULT. If the FAULT lamp lights in the readback after a frequency tuning, the automatic tuning system in the transmitter may have developed a transient error. The tuning may be re-cycled by sending another message. Program the message as follows:

(1) EQUIPMENT SELECTION pushbutton (black) for block.
(2) EQUIPMENT SELECTION pushbutton (white) for transmitter.
(3) FAULT RESET FUNCTION pushbutton (yellow).
(4) FAULT RESET pushbutton (blue).
(5) TUNE pushbutton (red).

If three such messages continue to result in a FAULT indication, troubleshooting is indicated for the automatic tuning section of the transmitter.

3-3. SUMMARY OF OPERATING PROCEDURES.

a. GENERAL. Table 3-2 lists, as an example, the step-by-step procedure for the remote tuning of a single transmitter (#1 transmitter in "A" block). In this example, transmitter operation is to be:

(1) 23.9657 MHz frequency
(2) Push-to-talk control
(3) Carrier suppressed at 20db below PEP
(4) Output power to be at level #3.

TABLE 3-2. TYPICAL REMOTE TUNING FOR SINGLE TRANSMITTER

Step	Controls	Operation
1	C-8335/URT EQUIPMENT SELECTION pushbuttons.	Push "A" button, then "1" button.
2	ID-1678/URT light indicator panel and ID-1677/URT light indicator panel.	Observe lights for transmitter's condition to receive message. If the transmitter is ready ID-1677/URT "1" lamp will light (in the XMTR SELECTED row) and the ID-1678/URT EQUIPMENT SELECTED and READY lights will be on. If, however, either the LOCAL or DECODER POWER lights are on, the transmitter has not been properly set up for a remote tuning.
3	ID-1678/URT.	When step 2 observations indicate transmitter is ready, check display on ID-1678/URT center panel and the HIGH VOLTAGE ON lamp to determine what controls require changing.
4	C-8335/URT yellow (FUNCTION) and blue pushbuttons.	Assuming that all the transmitter controls require changing to the new tuning, proceed to push the pushbuttons in the following sequence: FUNCTION "10 MHz" pushbutton Blue FREQ "2" pushbutton FUNCTION "1 MHz" pushbutton Blue FREQ "3" pushbutton FUNCTION "100 kHz" pushbutton Blue FREQ "9" pushbutton FUNCTION "10 kHz" pushbutton Blue FREQ "6" pushbutton

TABLE 3-2. TYPICAL REMOTE TUNING FOR SINGLE TRANSMITTER (cont)

Step	Controls	Operation
4 (cont)		FUNCTION "1 kHz" pushbutton Blue FREQ "5" pushbutton FUNCTION ".1 kHz" pushbutton Blue FREQ "7" pushbutton FUNCTION "MODE" pushbutton Blue MODE "PUSH TO TALK" pushbutton FUNCTION "CARR SUPP" pushbutton Blue CARR SUPP "20db" pushbutton FUNCTION "OUT PWR" pushbutton Blue OUTPUT PWR "3" pushbutton FUNCTION "HV" pushbutton Blue HV "ON" pushbutton
5	C-8335/URT TUNE push-button.	After the transmitter has been programmed (step 4), energize the transmitter's automatic tuning by pushing the C-8335/URT TUNE pushbutton. This will cause the transmitter decoder to draw the tuning instruction codes out of the transmitter memory and move the controls accordingly.
6	ID-1678/URT	Observe the readback display. The new control position readings should come up quickly (within 10 seconds). The READY light and EQUIPMENT SELECTED light should go out as soon as the TUNE pushbutton is pushed and, while the transmitter is tuning, the TUNING light will be on. When it has finished tuning, the READY light will replace the TUNING light again. The FREQUENCY/MEGA-HERTZ reading should be changed to "23.9657", MODE should be "PUSH-TO-TALK", CARR SUPP should be "20 db", OUTPUT POWER LEVEL should be "3" and the HIGH VOLTAGE ON lamp should be on.

SECTION IV
PRINCIPLES OF OPERATION

4-1. FUNCTIONAL SECTION DESCRIPTIONS

a. INTRODUCTION. The following text is a description of the functioning of major plug-in assemblies and is divided into the programming and readback functions of the COPC-2. The programming function is entirely contained in Electronic Command Signal Programmer C-8335/URT. The readback function is contained in Channel/Frequency Indicator ID-1678/URT and Indicator Panel ID-1677/URT. All circuitry (with the exception of the power supplies) is in encapsulated binary logic networks with binary d-c inputs and outputs at each network.

4-2. FUNCTIONAL DESCRIPTION OF ELECTRONIC COMMAND SIGNAL PROGRAMMER, C8335/URT.

The C-8335/URT is primarily a teletype code generator. Components of the generator are keyboard assembly A6, code register A5, shift register A3, gating circuit A4 and output keyer A2. Power supply A1 furnishes the logic voltages for all the components.

Keyboard assembly A6 consists of three rows of pushbuttons all with a common mechanical linkage. The linkage is arranged so as to hold a depressed pushbutton down until the next pushbutton is depressed. The two exceptions to this are the CLEAR pushbutton (A6S13) and the TUNE pushbutton (A6S14). Although they also release previously depressed pushbuttons, they are momentary-contact types and pop up (breaking contact) when released. Each pushbutton forms a switch closure with ground and the ground is extended to code register A5.

When a ground reaches a particular input on A5, a 5-bit code is set up. (See table 1-2.) The bits of this code appear simultaneously (parallel bits) at pins 15, 3, Y, B and F of A5. These bits are then brought over to gating circuit A4.

The arrival of these bits at A4 generates a pulse to pin C of shift register A3, starting a clock (timing generator) in A3. The clock energizes a shift register (in A3) and this proceeds to shift each bit of the code (one-by-one) over to output keyer A2. The code appears at the output of A2 in the form of contact keying from a polarized relay. Depending on the TTY equipment to be run, either a high level or a low level output may be used; the high level output offers more resistance in the line. (See paragraph 2-b(1).)

Shift register A3 shifts ten times. The first shift creates the start pulse, the next five shifts move the bits out to the keyer, and the remaining four shifts give the C-8335/URT the ability to work with 7- or 8-level teletype sending equipment if 5-level is not available. Shift rate is for a 100 WPM (or 75 baud) transmission. At the end of the cycle, the last shift turns off the clock. When the next pushbutton is depressed and the next code arrives at A4, the energizing pulse from A4 restarts the clock and the cycle is repeated.

4-3. FUNCTIONAL DESCRIPTION OF CHANNEL/FREQUENCY INDICATOR, ID-1678/URT.

The ID-1678/URT is the display unit for a continuous cycling of teletype readback codes from the remote transmitter (table 1-3). These codes represent specific transmitter control positions and, in general, the transmitter's status in a remote tuning operation. The last code to be received in each cycle is a XMTR SELECTED code. This represents a 1-6 number, signifying which transmitter in a block of six is represented in the readout. The signal for this is forwarded from the ID-1678/URT unit to one of the six lamps on Indicator Panel ID-1677/URT, via the connection of ID-1678/URT receptacle J1 and ID-1677/URT plug P1.

As the serial teletype pulses of each code enter the ID-1678/URT, they are converted into parallel pulses. The serial pulses (figure 5-4) enter the ID-1678/URT at receptacle J2 and pins 12 and 15 of isolation keyer A2. Pulses are from a standard keyed teletype current loop and include a start pulse at the beginning and a stop pulse at the end. A keyer at the output of A2 keys a -12V logic voltage at the input of timing circuit A9. A9 converts these serial pulses into five parallel bit pulses (for each code) and routes them to timing circuit A8. A8 places bit #1 information on lamp driver A3 and bit #2-5 information simultaneously on frequency gating circuits A5 and A4 and position driver cards A16, A15, A14 and A1. Readout will not occur from a particular driver or gating circuit, however, until it receives a gating pulse from the shift register

The shift register (composed of P/C boards A7 and A6) produces sixteen gating pulses (one for each code). Gating outputs are connected to the various drivers and gating circuits so as to read out each code in a certain order. This is the predetermined order in which the cycle of codes arrives from the remote transmitter readback unit. In this way the code that is intended to drive a particular display is read out on that display. A cycle of gating pulses will appear in the following order:

1. 10 MHz
2. 1 MHz
3. 100 MHz
4. 10 KHz
5. 1 KHz
6. 0.1 KHz
7. Function 1
8. Function 2
9. Function 3
10. Function 4
11. Function 5
12. Function 6
13. Function 7
14. Function 8
15. Function 9
16. Function 10

The FREQUENCY/MEGAHERTZ gating pulses are for reading out the six codes for the six digits on this front panel display. Function 1 through 10 gating pulses are for reading out a variety of codes and these vary from transmitter to transmitter. Specifically, for the ID-1678/URT, function #1 through #8 and #10 gating pulses are used; function #9 pulse is not used. Chassis wiring is of universal design and includes receptacles and sockets for the full complement of drivers and display units for all ten readout functions. At the beginning of the cycle, A7 produces eight shifts (or gating pulses) and triggers shift register A6. A6 then proceeds to produce eight more shifts to make the total sixteen.

There are three types of display on the ID-1678/URT front panel: (1) a digital readout display, (2) lamp display, and (3) a projection readout display. The six digital readout (FREQUENCY/MEGAHERTZ) displays (DS10, 11, 13, 14, 15 and 16) are driven by six BCD* decoders: ZX10, 11, 13, 14, 15 and 16. The decoders receive a BCD input from the frequency gating circuits, A5 and A4. The resulting output from a decoder is one ground signal; this ground forms a return for + 200V through a 0-9 digit-shaped filament in the indicator. Lamp DS12 forms the decimal point in this display and is on constantly. The nine-lamp display, to the right of the digital readout, is for a variety of information; panel lettering varies on different models. The specific panel lettering for the ID-1678/URT is shown in figure 5-4. Each lamp is individually controlled by a ground signal from lamp driver A3. Directly below the digital readout, on the front panel, is the projection readout display group. This group has spaces and sockets in it for nine indicator units, DS17 through DS25. Each indicator unit is driven by a P/C board driver (A11 through A19). Drivers and projection readout pairs may be 12 position types (for a transmitter control of up to 12 positions) or dual 6-position types (for two transmitter controls of up to 6 positions each). Panel lettering will also vary from model to model. Specifically, for the ID-1678/URT, three of the nine spaces are utilized; these are:

Function	Position Type	Driver	Readout Unit	Panel Lettering
4	12-position	A16	DS20	MODE
5	12-position	A15	DS21	CARR SUPP
6	12-position	A14	DS22	OUTPUT POWER LEVEL

Drivers A11, 12, 13, 17, 18 and 19 and readout indicators DS17, 18, 19, 23, 24 and 25 are not included in the make-up of the ID-1678/URT, although sockets are present in the universal wiring. Each driver receives a code and (upon the receipt of its gating pulse) presents one ground signal to its indicator. The indicator contains a grid of lamps, one for each input. The lamp receiving the ground illuminates and casts the image of the film onto the indicator's projection screen via an individual projection lens and film in front of it.

The final code to arrive in the cycle (table 1-3) is for transmitter identification. This code, representing a 1-6 figure, is gated from one dual 6-position driver A1 (in the ID-1678/URT configuration) to produce a ground from one of its outputs to one of the six lamps in Indicator Panel ID-1677/URT.

Information in one code is often for more than one display. The digital readouts always use bits #2-5. Bit #1 of these first six codes, however, drives other displays. Reference to table 1-3 will show these specific cases for the ID-1678/URT configuration. It may be seen, as in the case of the 10-MHz and 1-MHz code transmissions, that the significant information is contained in the polarity relationship of bit #1 in two successive codes. The other half of the dual 6-position driver (A1) receives the 1-6 bit #1 codes for the XMTR OVERLOAD lamps in Indicator Panel ID-1677/URT from codes #10 through #15.

The "E" teletype character (table 1-3) is the first to arrive in each readback cycle and functions to reset ID-1678/URT circuitry for the new cycle. The E code (10000) causes an "E" pulse to issue from pin 2 of A8 to pin R of shift-register A7, setting it for the new cycle.

The bit shift register in timing circuit A9 is so arranged as to allow ten shifts (in a time interval of 135 milliseconds**) for the passage of each code. This corresponds with the time required for a standard 8-level transmission and adapts the ID-1678/URT to operate from a 7-level or 8-level teletype linkage, if 5-level is not available. In all cases, pulse widths in the shift register are 13.5 milliseconds* each for receiving a 74.2-baud** transmission.

*Binary coded decimal

**Available in 220 and 22 milliseconds for 45.5 baud equipment.

SECTION V
MAINTENANCE

5-1. LOGICAL TROUBLESHOOTING PROCEDURE

a. INTRODUCTION. The procedure described in this section is aimed at directing the troubleshooter to the faulty component, connection or wire by logical choice in as few steps as possible. The basis for the steps is the structure of the console. The console is divided into three modular units, each unit having a unique and independent function (i.e., programming or readback). The ID-1678/URT and C-8335/URT modular units are further sub-divided into removable plug-in P/C (printed circuit) boards and other subassemblies. Refer to figure 5-1 for the console cable connecting diagram. The schematic wiring diagram and a component location illustration for the ID-1677/URT unit are provided in figures 5-2 and 5-3. Schematic wiring diagrams and component location illustrations for the ID-1678/URT unit are provided in figures 5-4 through 5-18. Schematic wiring diagrams and component location illustrations for the C-8335/URT unit are provided in figures 5-19 through 5-28.

In the troubleshooting procedure, a faulty subassembly can be removed and replaced quickly, placing the COPC-2 back in operation; troubleshooting and repair of the removed subassembly can then be continued at a different time or locality, if necessary. In troubleshooting a COPC-2, there are five basic steps to be taken. These are:

(1) Symptom recognition.
(2) Symptom elaboration.
(3) Determining the faulty modular unit.
(4) Localizing the faulty subassembly within the unit.
(5) Localizing the faulty component within the subassembly.

b. SYMPTOM RECOGNITION. At the first sign of trouble, it is important to determine whether or not it is the COPC-2 that is giving the trouble or some associated equipment (i.e., the remote transmitter, teletype linkage, etc.)

c. SYMPTOM ELABORATION. After it has been determined that the COPC-2 is at fault, the symptom should be examined more closely. Using the keyboard in the programmer, and referring to Section 3 Operating Procedures, experiment with all of the pushbuttons in order to define which area is giving trouble.

d. DETERMINING THE FAULTY MODULAR UNIT. When the area of the trouble has been defined, refer to table 5-1, Troubleshooting Chart. This chart will serve as an aid in determining whether it is a programming or readback problem and in identifying the faulty modular unit.

e. LOCALIZING THE FAULTY SUBASSEMBLY WITHIN THE MODULAR UNIT. When the modular unit has been discovered, it may be left in the console for purposes of system troubleshooting or it may be removed for bench test troubleshooting. In either case, reference to either the programming functional section description or the readback functional section description should reveal the faulty subassembly, P/C board, or wiring connection area. Subassemblies may be located by referring to major component location diagrams for each modular unit in Section 5.

It should be pointed out here that a shortcut can be performed in this step by using spare plug-in subassemblies as a "substitution check" to reveal the one at fault.

f. LOCALIZING THE FAULTY COMPONENT WITHIN THE SUBASSEMBLY OR AREA. When the faulty subassembly has been discovered, it is generally expedient at this time to replace it from the spares supply. Further troubleshooting of the subassembly may then be performed in a modular unit at a different site or time.

5-2. OPERATIONAL CHECK OF PROGRAMMER (C-8335/URT).

The programmer output codes are conventional teletype characters; therefore, when a teletypewriter is coupled to the programmer through a d-c loop, the output codes may be observed in the form of the equivalent TTY characters. The procedure is as follows:

(1) Remove remote d-c loop plug, connected to jack J2.
(2) Connect local 20-ma or 60-ma d-c loop (depending on the system) to DC LOOP jack J2.
(3) Connect appropriate teletypewriter to output of d-c loop.
(4) Refer to table 1-2, Pushbutton Codes, and depress pushbuttons on front panel of the programmer. Check output codes on teletypewriter by referring to equivalent CCIT TTY character column in table 1-2.

5-3. OPERATIONAL CHECK OF READBACK INDICATOR (ID-1678/URT).

The input codes to the readback indicator are also conventional teletype characters; therefore, when the appropriate teletypewriter is coupled to the readback indicator, through a d-c loop, the operation of the front panel displays may be observed. The procedure is as follows:

(1) Remove the remote d-c loop connected to jack J2 of the readback indicator.

TABLE 5-1. TROUBLESHOOTING CHART, COPC-2

Symptom	Functional Section Indicated
DECODER POWER lamp is out but new programming of transmitter fails to bring a change on display of ID-1678/URT panel.	Readback (ID-1678/URT)
Lamps on ID-1677/URT panel all extinguished.	Readback (ID-1678/URT)
One lamp in display on ID-1677/URT panel fails to light.	Readback (ID-1677/URT)
ID-1678/URT EQUIPMENT SELECTED lamp fails to light after C-8335/URT EQUIPMENT SELECTOR pushbuttons are depressed.	Programming (C-8335/URT)
ID-1678/URT FAULT lamp does not light, although FREQUENCY/MEGAHERTZ readback cannot be made to match programmed figures.	Readback (ID-1678/URT)
A particular pushbutton on the C-8335/URT fails to bring results as evidenced in the readback.	Programming (C-8335/URT)
ID-1678/URT EQUIPMENT SELECTED lamp lights but C-8335/URT TUNE pushbutton fails to precipitate tuning in transmitter as evidenced in readback display.	Programming (C-8335/URT)

(2) Connect a local 20-ma or 60-ma d-c loop (depending on the system) to jack J2 of the readback indicator.

(3) Connect the other end of the d-c loop to an appropriate teletypewriter.

(4) Refer to programming table 5-1 and depress the appropriate keys on the teletypewriter. The keys must be depressed in the numerical order shown in table 5-2, starting with character 1 and ending with character 17.

(5) Observe output display on front panel of the readback indicator.

5-4. FUSE REPLACEMENT

Front panel AC LINE indicator-fuse pairs are for instant notification of a short in the a-c line input to each modular unit. A light in the fuse cartridge holder cap indicates a blown fuse. SPARE fuse holders as the front panel contain spare fuse cartridges for replacement. Power supply circuitry beyond the a-c input of each modular unit includes a short-proof feature; therefore, the indicated short can only occur in the a-c input section. Before replacing the fuse cartridge pull out the unit on its drawer slides and inspect the POWER switch wiring and the power transformer for possible cause.

5-5. PREVENTIVE MAINTENANCE

In order to prevent equipment failure due to dust, dirt or other destructive elements, it is suggested that a schedule of preventive maintenance be set up and adhered to.

At periodic intervals, the equipment should be removed from its mounting for cleaning and inspection. The wiring and all components should be inspected for dirt, dust, corrosion, grease or other harmful conditions. Remove dust with a soft brush or vacuum cleaner. Remove dirt or grease with any suitable cleaning solvent. Use of carbon tetrachloride should be avoided due to its highly toxic effects. Trichlorethylene or methylchloroform may be used, providing the necessary precautions are observed.

WARNING

When using toxic solvents, make certain that adequate ventilation exists. Avoid prolonged or repeated breathing of the vapor. Avoid prolonged or repeated contact with skin. Flammable solvents shall not be used on energized equipment or near any equipment from which a spark may be received. Smoking, "hot work", etc. is prohibited in the immediate area.

CAUTION

When using trichlorethylene, avoid contact with painted surfaces, due to its paint removing effects.

TABLE 5-2. READBACK TEST CODE CHART

1. Reset Cycle 10000--E

2. 10 MHz
   0-01111-V/Ltrs
   1-00111-M/X
   2-01011-G-Fig
   3-00011-O/B

3. 1 MHz
   0-01111-V/Ltrs
   1-00111-M/X
   2-01011-G/Fig
   3-00011-O/B
   4-01101-P/Q
   5-00101-H/Y
   6-01001-L/W
   7-00001-T/Z
   8-01110-C/K
   9-00110-N/F

4. 100 kHz Same as 1 MHz
   Equipment Selected #1 Bit 1 - ON
   0 - OFF

5. 10 kHz Same as 1 MHz
   Decoder Power #1 Bit - 1 ON
   0 OFF

6. 1 kHz Same as 1 MHz
   Local #1 Bit - 1 - ON
   0 - OFF

7. 0.1 kHz Same as 1 MHz
   VSWR and XMTR Overload

8. High Voltage
   ON - 11000 - A
   OFF - 01000 - Line Feed

Note: Ready/Tuning/Fault information is contained in Bit #1 of 10 MHz and 1 MHz combined.

Bit #1		
Code #2	Code #3	Lamp
1	0	Ready
0	1	Tuning
1	1	Fault

Note: Information is contained in Bit #1 of Codes #7 and #9.

Bit #1		
Code #7	Code #9	
1	1	VSWR
0	1	XMTR

9. VSWR and XMTR Overload (See Note under #7 Above)
   ? 1000

10. XMTR Overload #1
    ON - 11000 - A
    OFF - 01000 - Line Feed

11. Mode
    CW - 01111 - V/Ltrs
    PTT - 00111 - M/X
    VOX - 01011 - G/Fig
    NORM - 00011 - O/B

Note: Xmtr overload #2 information is contained in Bit #1 of Mode code.
Bit #1
1 - ON
0 - OFF

12. Carrier Suppression
    0 db - 01111 - V/Ltrs
    3 db - 00111 - M/X
    6 db - 01011 - G/Fig
    20 db - 00011 - O/B
    30 db - 01101 - P/Q
    Full - 00101 - H/Y

Note: Xmtr overload #3 information is contained in Bit #1 of Carrier Suppression Code.
Bit #1
1 - ON
0 - OFF

TABLE 5-2. READBACK TEST CODE CHART (cont)

13. Output Power Level
    Main Power Off - 01111 - V/Ltrs
    1 - 00111 - M/X
    2 - 01011 - G/Fig
    3 - 00011 - O/B
    4 - 01101 - P/Q

    Note: Xmtr overload #4 information is contained in Bit #1 of Power Level.
    Bit #1
    1 - ON
    0 - OFF

14. Xmtr Overload #5
    On - 11000 - A
    Off - 01000 - Line feed

15. Xmtr Overload #6
    On - 11000 - A
    Off - 01000 - Line Feed

16. (Not Used)

17. Xmtr Selected
    1 - 01110 - C
    2 - 00110 - N
    3 - 01010 - R
    4 - 00010 - Carriage Return
    5 - 01100 - I
    6 - 00100 - Space

a. LUBRICATION OF PROGRAMMER (C-8335/URT). Inspect pushrods and linkage of the front panel buttons monthly, to make sure no grease or dirt has accumulated. If grease or dirt is observed, clean thoroughly with methylchloroform, using caution. After cleaning the linkage, sparingly apply a light machine oil. If the linkage remains free of grease and dirt for six months or more, apply a light machine oil sparingly at six month intervals. Lubricate slides of programmer and readback indicator drawers with a heavier grade of machine oil at six month intervals.

b. CLEANING OF AIR FILTER ON READBACK INDICATOR. Remove air filter from rear panel of readback indicator, and wash in a cleaning agent at about 3 month intervals. Make sure the filter is dry and replace.

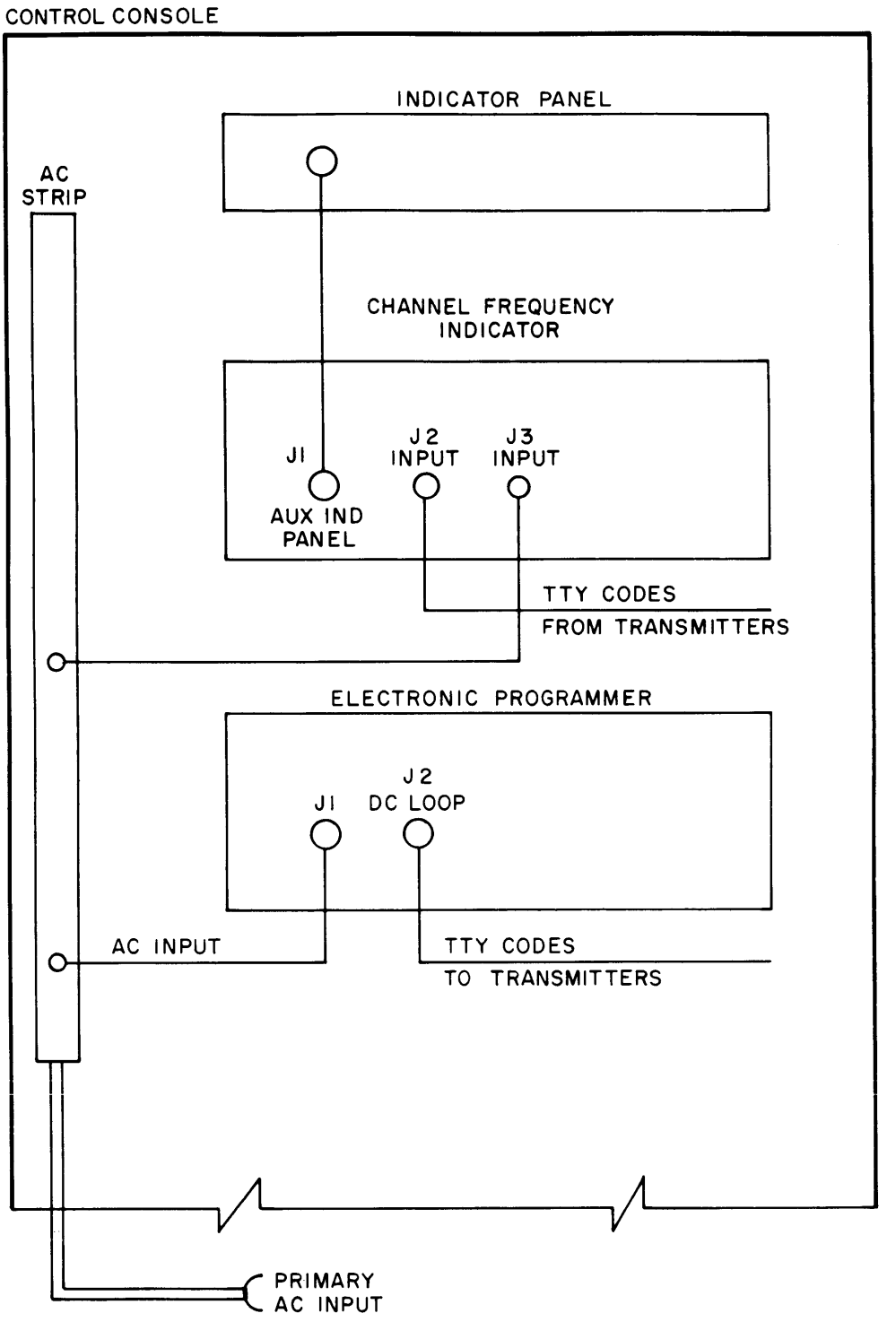


Figure 5-1. Cable Connecting Diagrams of Communications Control Console

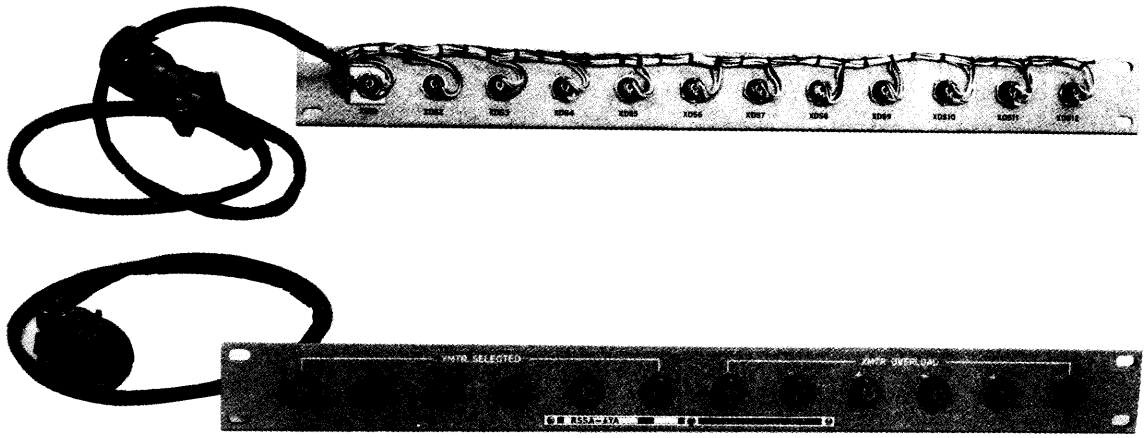
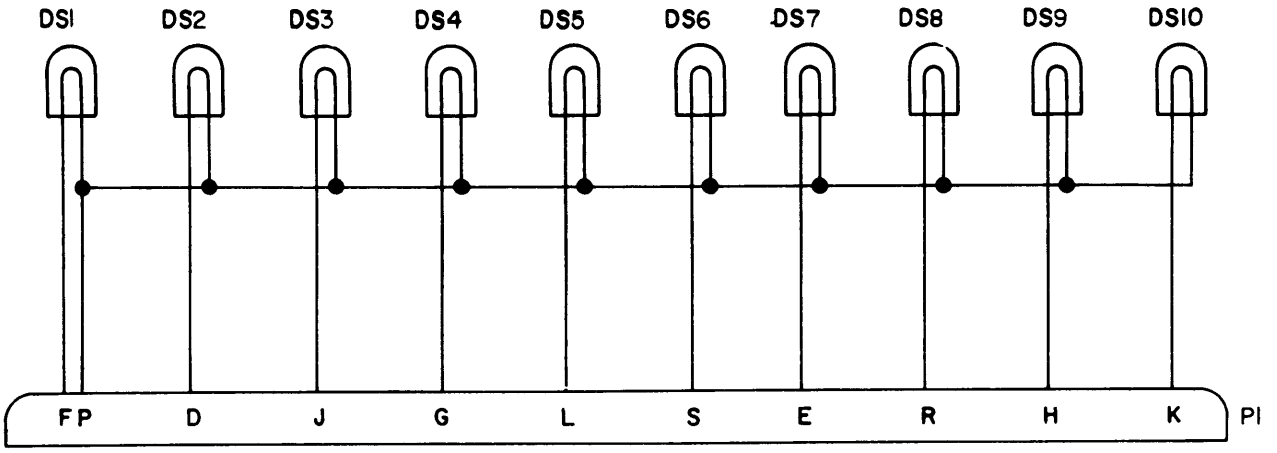


Figure 5-2. Component Locations, Unit 1 (ID-1677/URT)



SYMBOLS	
LAST	MISSING
DS10 P1	

CK1213

Figure 5-3. Schematic Wiring, Unit 1 (ID-1677/URT)

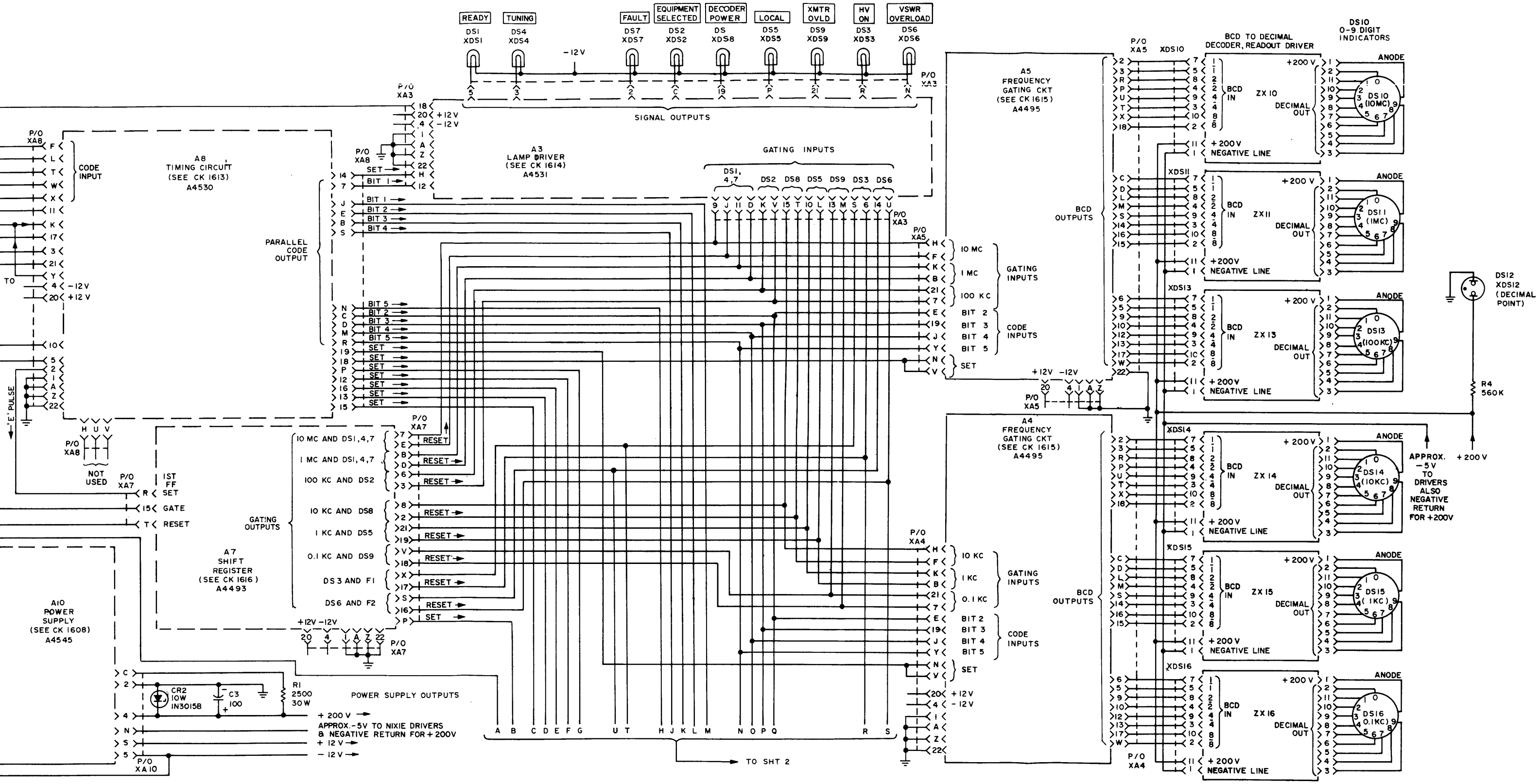
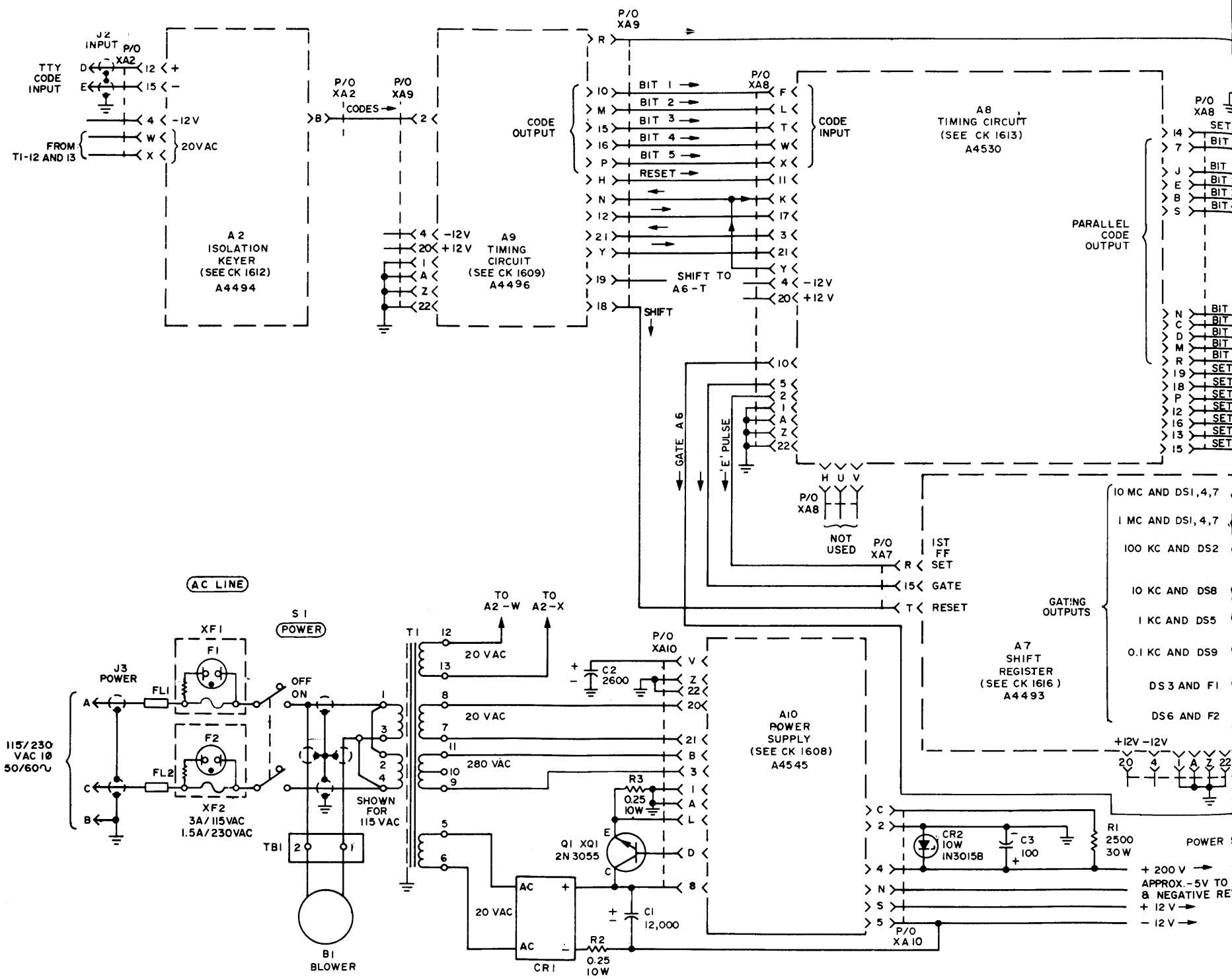
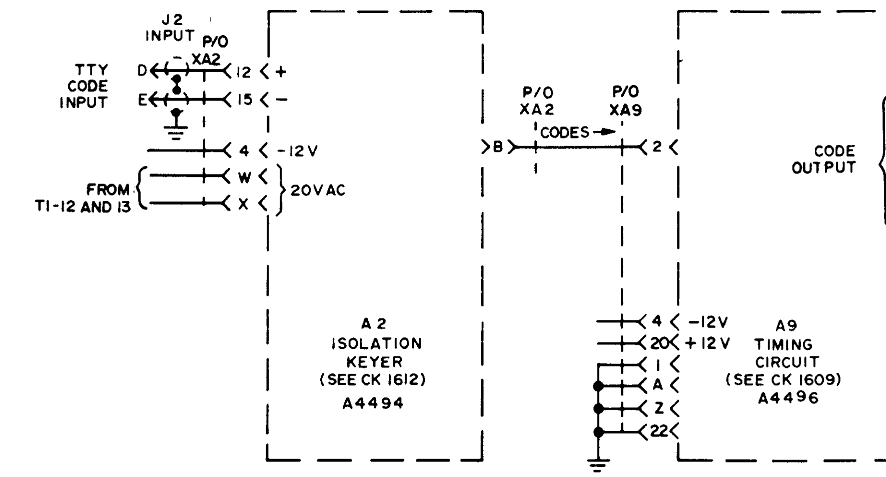
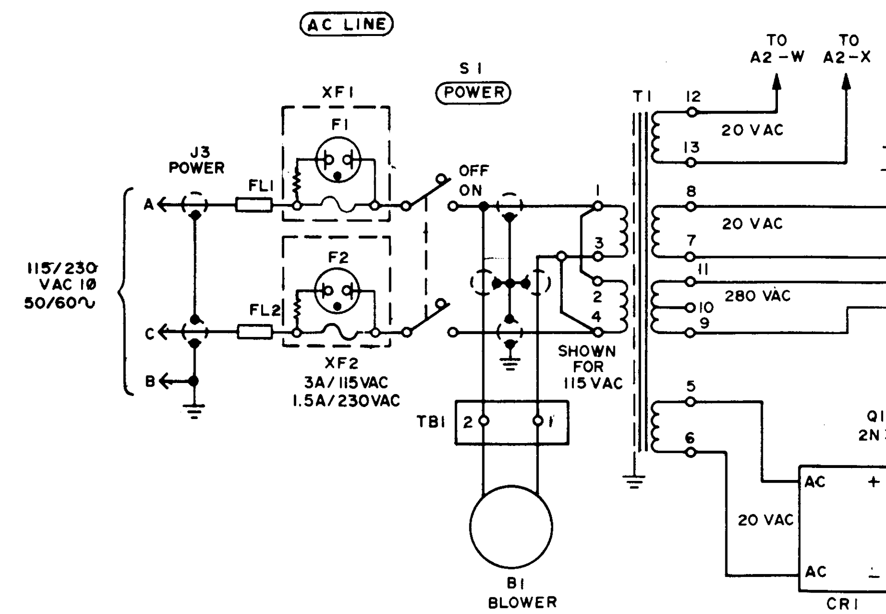


Figure 5-4. Schematic Wiring, Unit 2 (ID-1678/URT) (Sheet 1 of 2)


J2 INPUT
P/O XA2
TTY CODE INPUT
D
E
12 +
15 −
4 −12V
FROM T1-12 AND 13
W
X
20VAC
A2 ISOLATION KEYER (SEE CK 1612) A4494
P/O XA2
P/O XA9
CODES
8
2
4 −12V
20 +12V
1
A
Z
22
A9 TIMING CIRCUIT (SEE CK 1609) A4496
P/O XA9
R
CODE OUTPUT
10
M
15
16
P
H
N
12
21
Y
19
18
BIT 1
BIT 2
BIT 3
BIT 4
BIT 5
RESET
SHIFT TO A6-T
SHIFT
P/O XA8
F
L
T
W
X
11
K
17
3
21
Y
4 −12V
20 +12V
CODE INPUT
A8 TIMING CIRCUIT (SEE CK 1613) A4530
P/O XA8
14
7
J
E
B
S
SET
BIT
PARALLEL CODE OUTPUT
N
C
D
M
R
19
18
P
12
16
13
15
10
5
2
1
A
Z
22
GATE A6
'E' PULSE
H U V
P/O XA8
NOT USED
P/O XA7
1ST FF
R SET
15 GATE
T RESET
GATING OUTPUTS
10 MC AND DS1,4,7
1 MC AND DS1,4,7
100 KC AND DS2
10 KC AND DS8
1 KC AND DS5
0.1 KC AND DS9
DS3 AND F1
DS6 AND F2
+12V −12V
20 4 1 A Z 22
A7 SHIFT REGISTER (SEE CK 1616) A4493
AC LINE
S1 POWER
XF1
F1
FL1
F2
FL2
XF2
3A/115VAC
1.5A/230VAC
J3 POWER
A
C
B
115/230 VAC 1Ø 50/60~
OFF
ON
1
3
2
4
SHOWN FOR 115 VAC
TB1
2
1
B1 BLOWER
T1
12
13
20 VAC
TO A2-W
TO A2-X
8
7
11
10
9
280 VAC
5
6
20 VAC
AC
AC
CR1
C2 2600
P/O XA10
V
Z
22
20
21
B
3
1
A
L
D
8
A10 POWER SUPPLY (SEE CK 1608) A4545
R3 0.25 10W
Q1 XQ1 2N3055
E
C
C1 12,000
R2 0.25 10W
C
2
CR2 10W 1N3015B
C3 100
R1 2500 30W
4
N
S
5
P/O XA10
+ 200 V
APPROX. −5V TO
8 NEGATIVE RE
+ 12 V
− 12 V
POWER



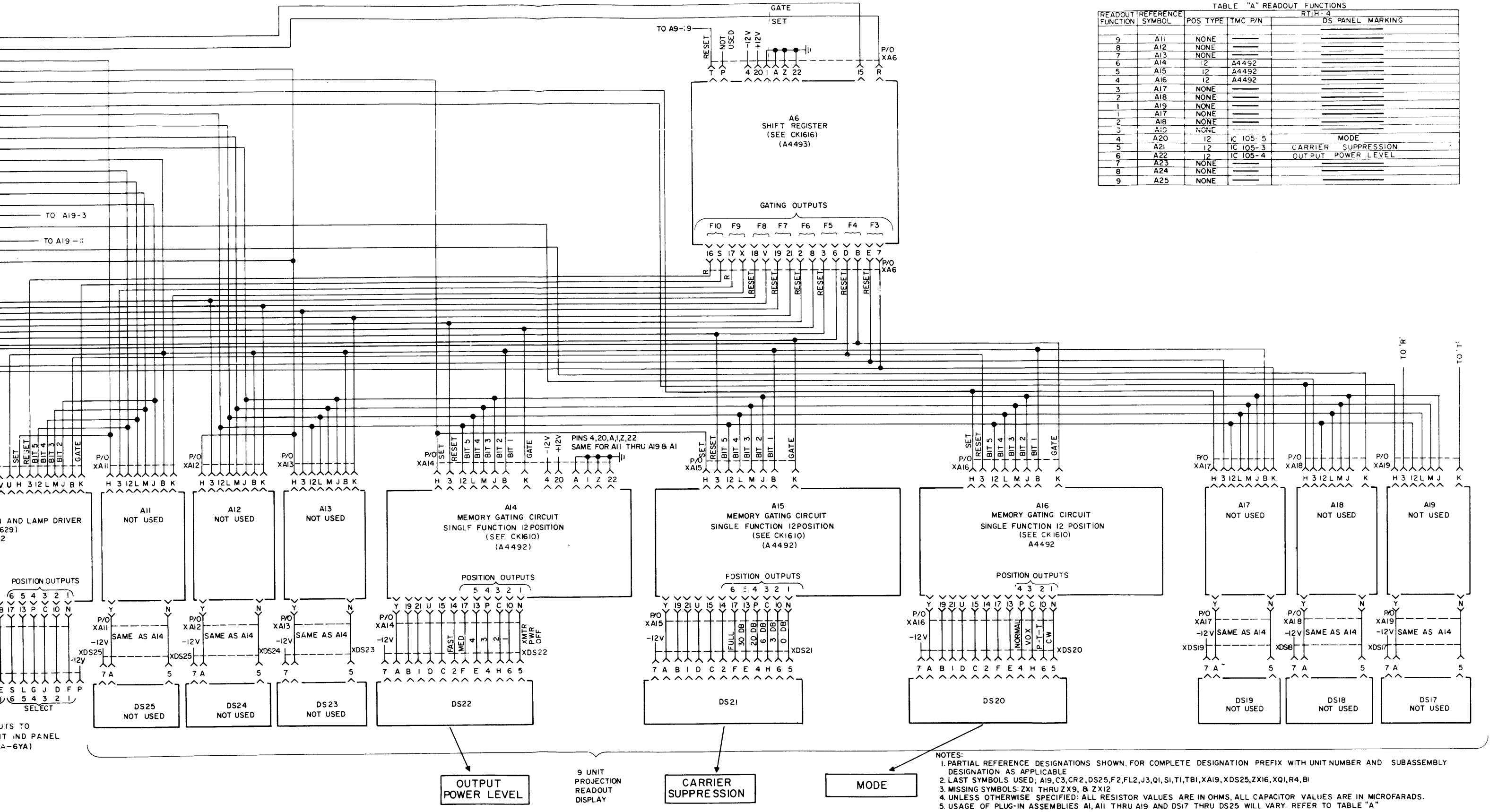
J2
INPUT
P/O
XA2
TTY
CODE
INPUT
D
E
12
15
+
-
4
-12V
FROM
T1-12 AND 13
W
X
20VAC
A2
ISOLATION
KEYER
(SEE CK 1612)
A4494
B
P/O
XA2
CODES
P/O
XA9
2
CODE
OUTPUT
4
-12V
20
+12V
1
A
Z
22
A9
TIMING
CIRCUIT
(SEE CK 1609)
A4496



AC LINE
J3
POWER
115/230
VAC 1Ø
50/60∿
A
C
B
FL1
FL2
XF1
F1
F2
XF2
3A/115VAC
1.5A/230VAC
S1
POWER
OFF
ON
TB1
B1
BLOWER
SHOWN
FOR
115 VAC
T1
12
13
20 VAC
TO
A2-W
TO
A2-X
8
7
20 VAC
11
10
9
280 VAC
5
6
20 VAC
AC
AC
+
CR1
Q1

TABLE "A" READOUT FUNCTIONS

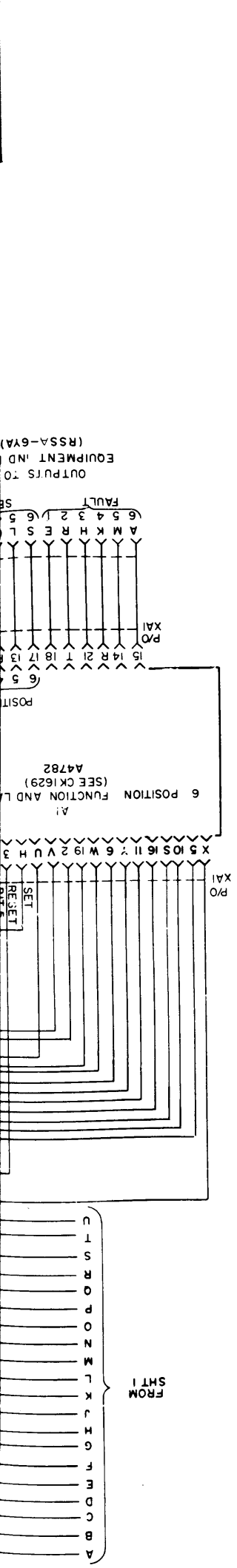
READOUT FUNCTION	REFERENCE SYMBOL	RTH-4 POS TYPE	TMC P/N	DS PANEL MARKING
9	A11	NONE	——	——
8	A12	NONE	——	——
7	A13	NONE	——	——
6	A14	12	A4492	——
5	A15	12	A4492	——
4	A16	12	A4492	——
3	A17	NONE	——	——
2	A18	NONE	——	——
1	A19	NONE	——	——
1	A17	NONE	——	——
2	A18	NONE	——	——
3	A19	NONE	——	——
4	A20	12	IC 105-5	MODE
5	A21	12	IC 105-3	CARRIER SUPPRESSION
6	A22	12	IC 105-4	OUTPUT POWER LEVEL
7	A23	NONE	——	——
8	A24	NONE	——	——
9	A25	NONE	——	——



NOTES:
1. PARTIAL REFERENCE DESIGNATIONS SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATION AS APPLICABLE
2. LAST SYMBOLS USED; AI9, C3, CR2, DS25, F2, FL2, J3, QI, SI, TI, TBI, XAI9, XDS25, ZX16, XQI, R4, BI
3. MISSING SYMBOLS: ZX1 THRU ZX9, & ZX12
4. UNLESS OTHERWISE SPECIFIED: ALL RESISTOR VALUES ARE IN OHMS, ALL CAPACITOR VALUES ARE IN MICROFARADS.
5. USAGE OF PLUG-IN ASSEMBLIES AI, AII THRU AI9 AND DSI7 THRU DS25 WILL VARY. REFER TO TABLE "A"

CK1660

Figure 5-4. Schematic Wiring, Unit 2 (ID-1678/URT) (Sheet 2 of 2)


FROM SHT 1
A
B
C
D
E
F
G
H
J
K
L
M
N
P
Q
R
S
T
U
P/O XA1
SET
RESET
X 5 10 S 16 11 Y 6 W 19 2 V U H 3
XA1
A1
6 POSITION FUNCTION AND L
(SEE CK1629)
A4782
POSITI
6 5
15 14 R 21 T 18 17 13
P/O XA1
A M K H R E S L
6 5 4 3 2 1
FAULT
OUTPUTS TO
EQUIPMENT AND
(RSSA-6YA)

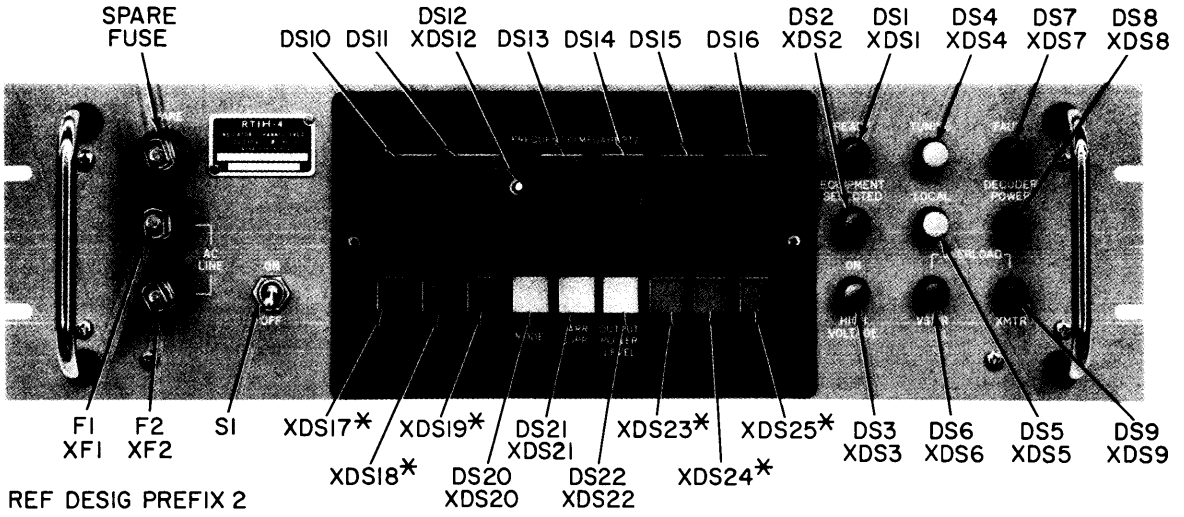


Figure 5-5. Major Component Locations, Front Panel of Unit 2 (ID-1678/URT)

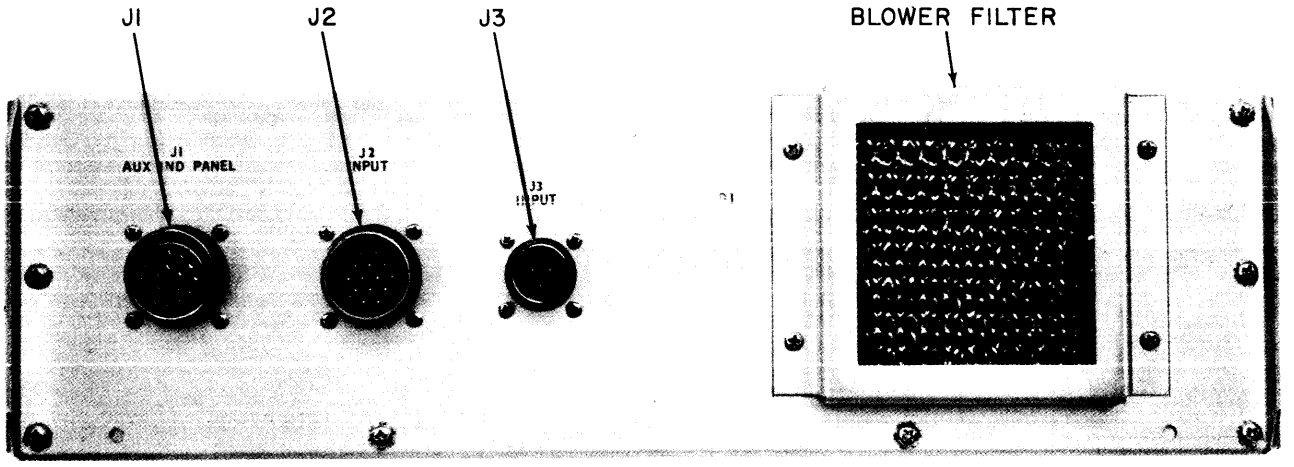


Figure 5-6. Major Component Locations, Rear Panel of Unit 2 (ID-1678/URT)

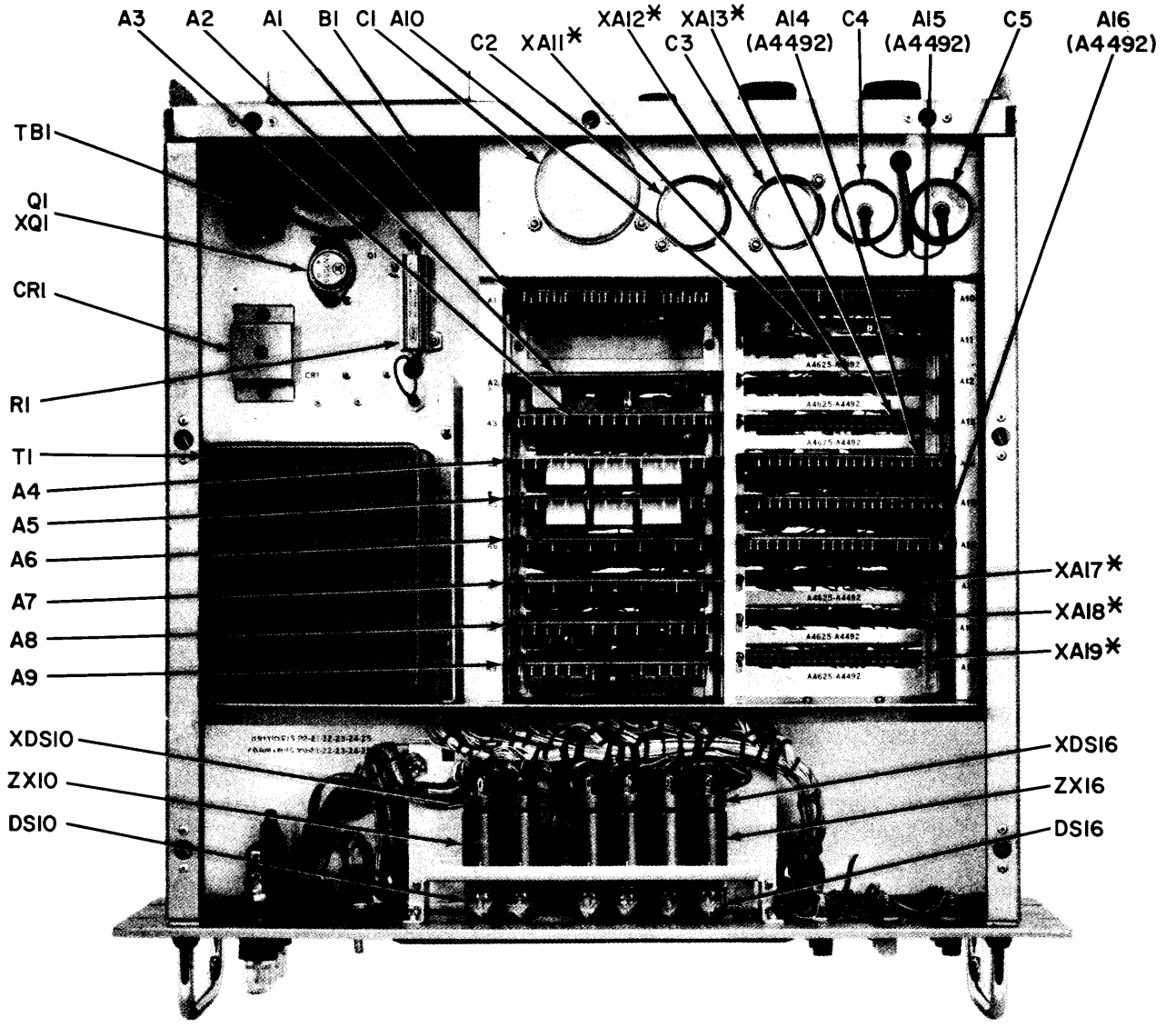


Figure 5-7. Major Component Locations, Top View of Unit 2 (ID-1678/URT)

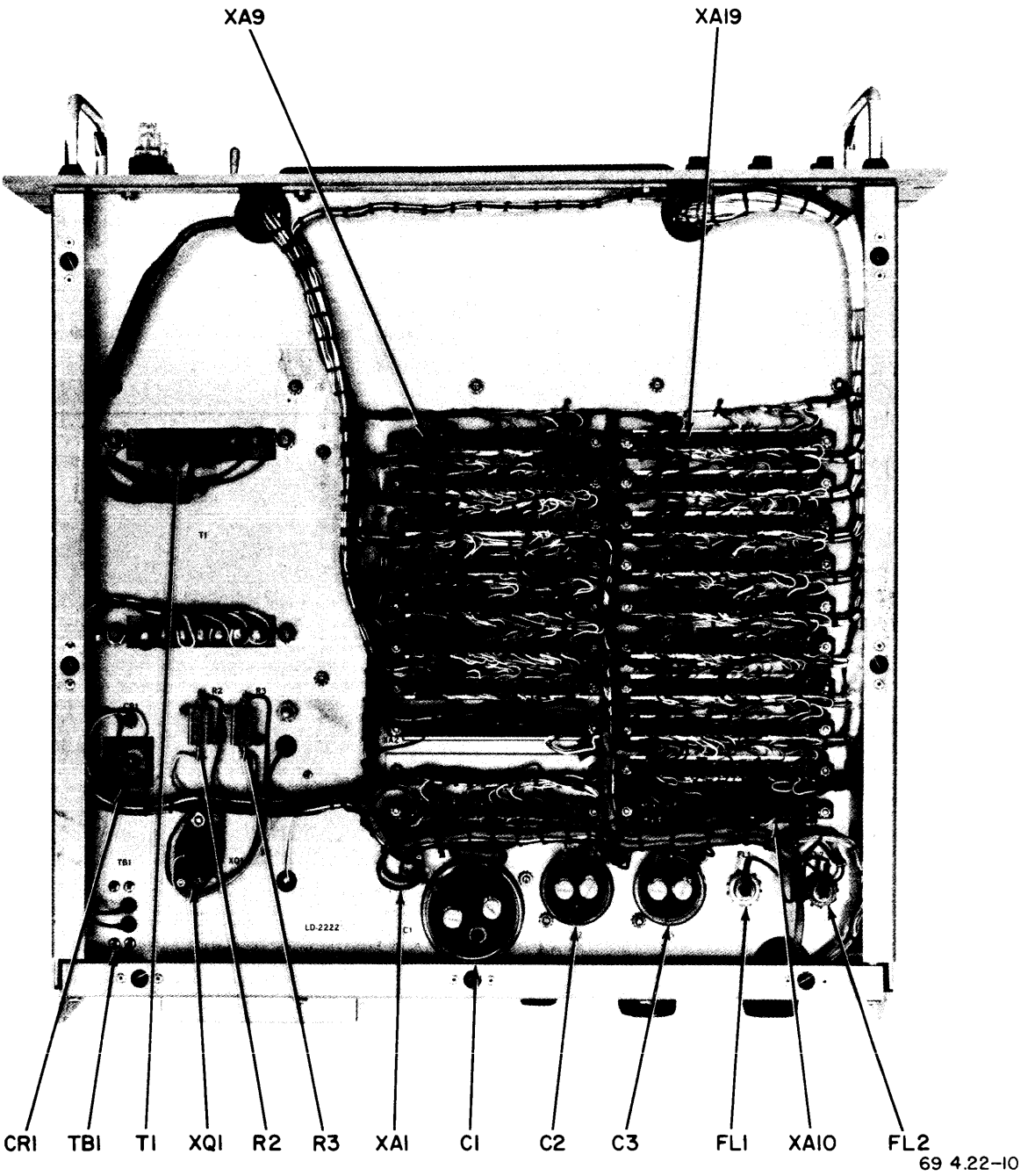
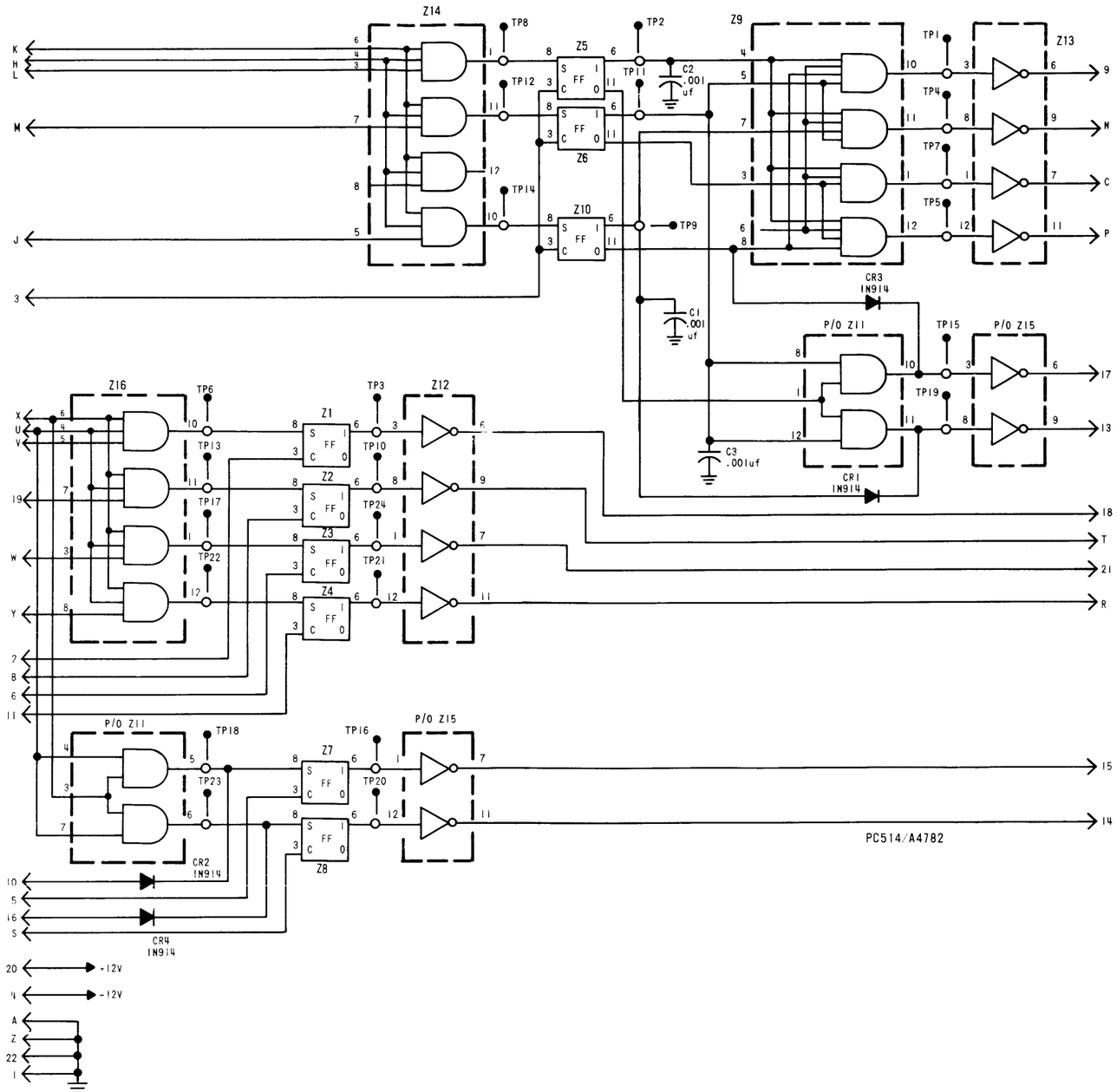


Figure 5-8. Major Component Locations, Bottom View of Unit 2 (ID-1678/URT)



MODULE VOLTAGE AND GND CHART

SYMBOL	PIN CONNECTION		
	+12V	-12V	GND
Z1 THRU Z8, Z10	10	2	5
Z9,Z11,Z14,Z16		2	
Z12,Z13,Z15	10		5

LAST SYMBOL	MISSING SYMBOL
C3 CR4 TP24 Z16	

NOTE:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE.

CK1629

Figure 5-9. Schematic Wiring, 6-Position Driver 2A1

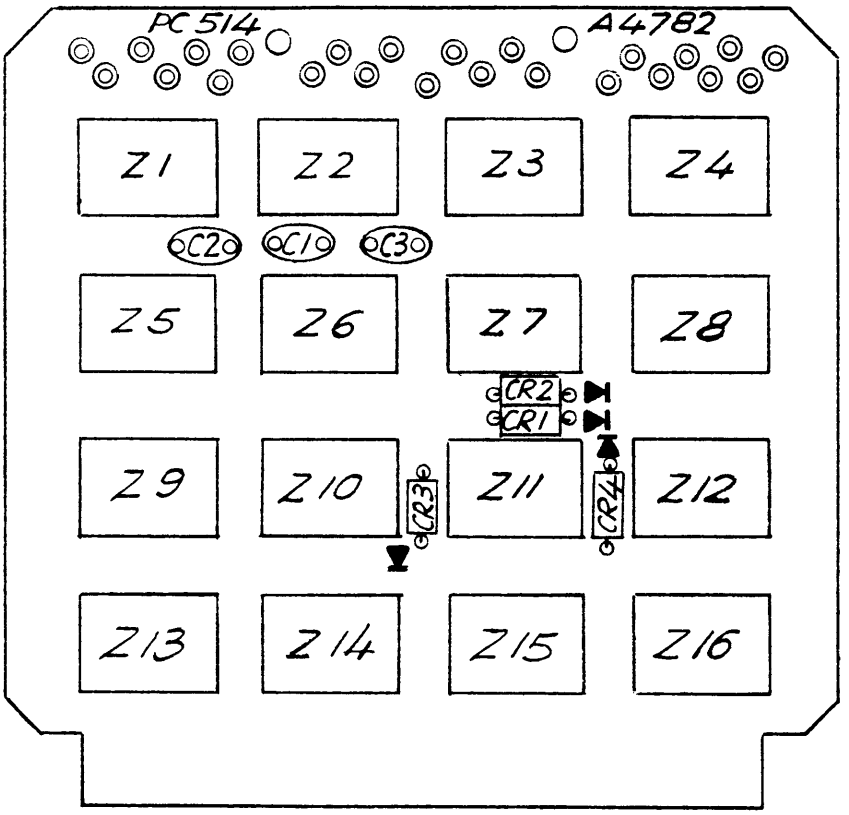
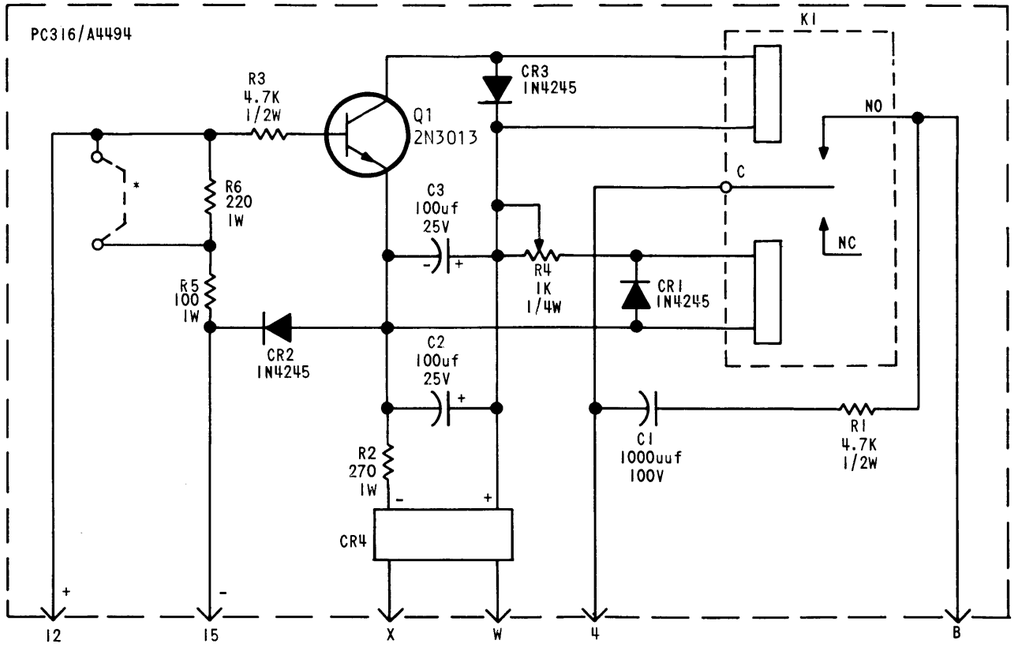


Figure 5-9A. Component Location, 6-Position Driver 2A1



LAST SYMBOL	MISSING SYMBOL
R6 C3 CR4 K1 Q1	

NOTES

1. PARTIAL REFERENCE DESIGNATIONS AS SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION (S) AS APPLICABLE
* 2. STRAP IS INCLUDED WHEN 60mA LOOP IS USED
STRAP IS NOT INCLUDED WHEN 20mA OR 6 VOLT LOOPS ARE USED.

CK1612

Figure 5-10. Schematic Wiring, Isolation Keyer 2A2

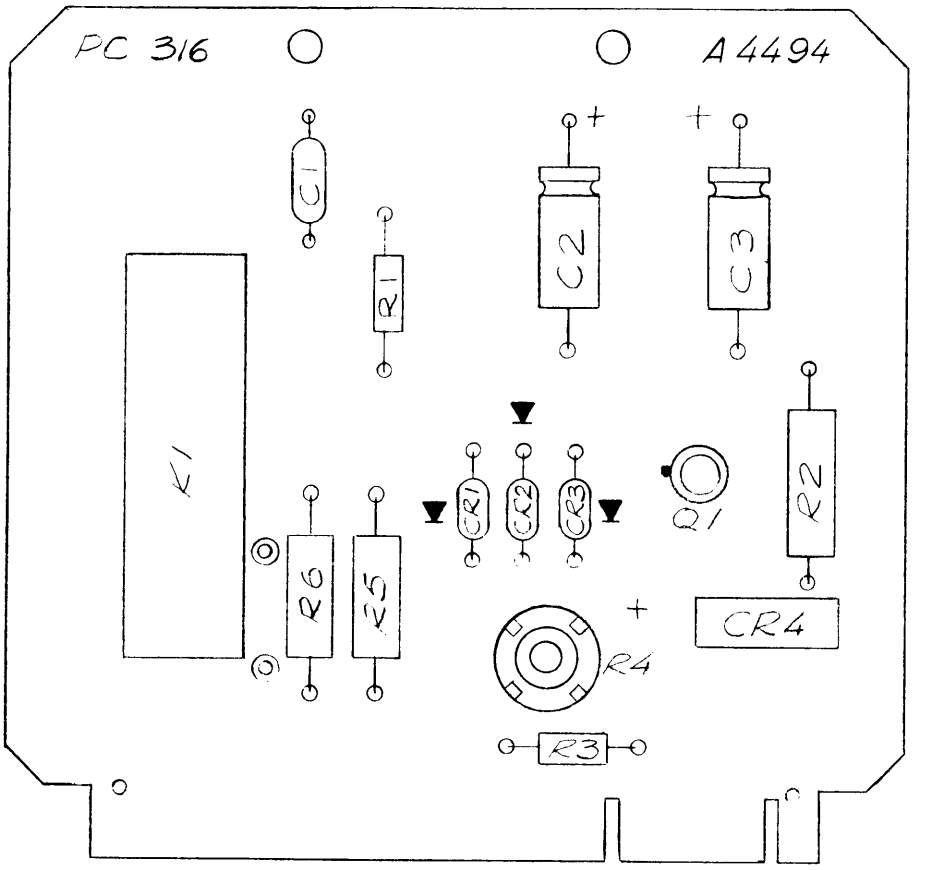
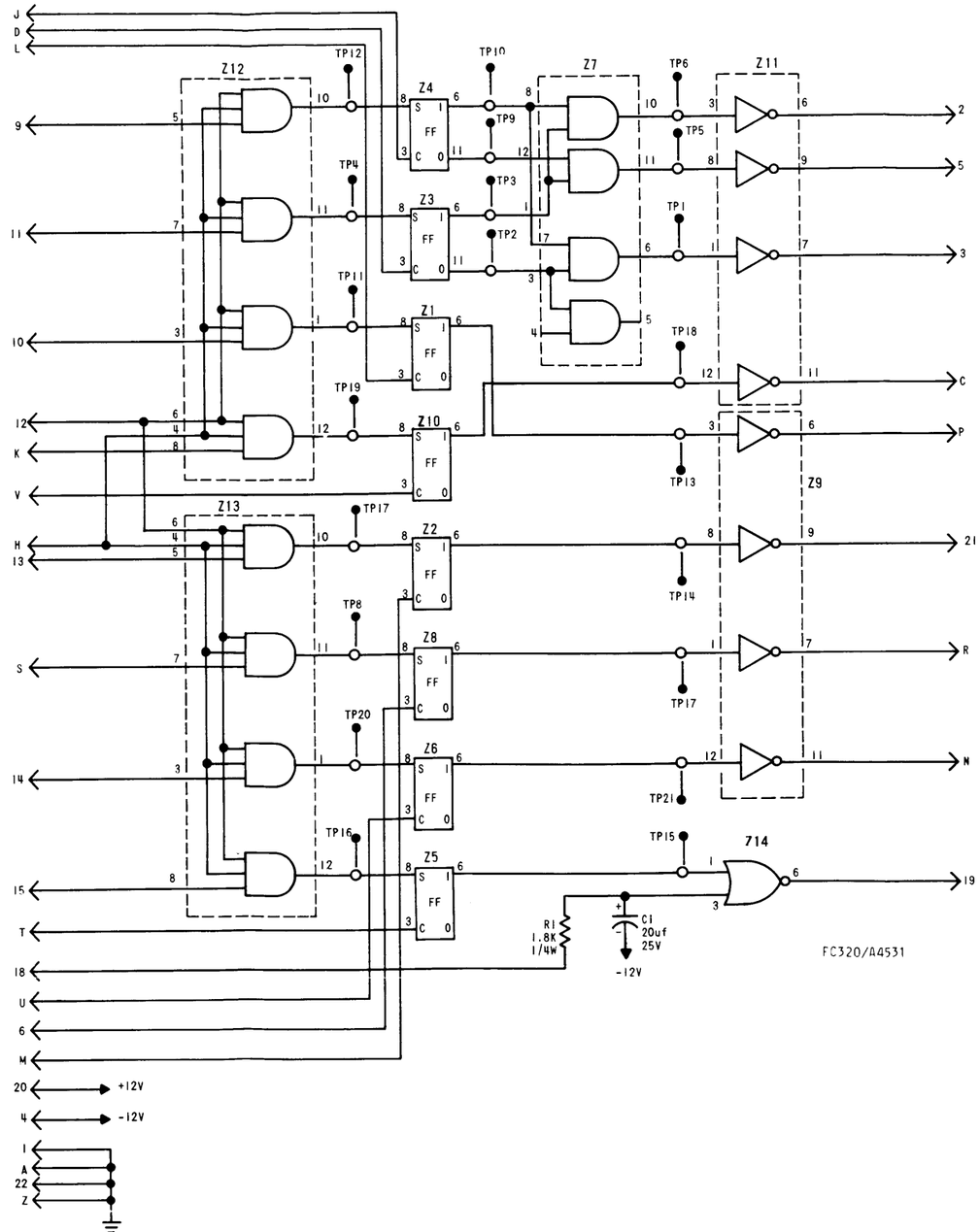


Figure 5-10A. Component Location, Isolation Keyer 2A2



MODULE VOLTAGE AND GND CHART

SYMBOL	PIN CONNECTIONS		
	+12	-12V	GND
Z1 THRU Z6, Z8, Z10	10	2	5
Z7, Z11 THRU Z13		2	
Z9, Z14	10		5

LAST SYMBOL	MISSING SYMBOL
C1 R1 TP21 Z14	

NOTE:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE

CK1614

Figure 5-11. Schematic Wiring, Lamp Driver 2A3

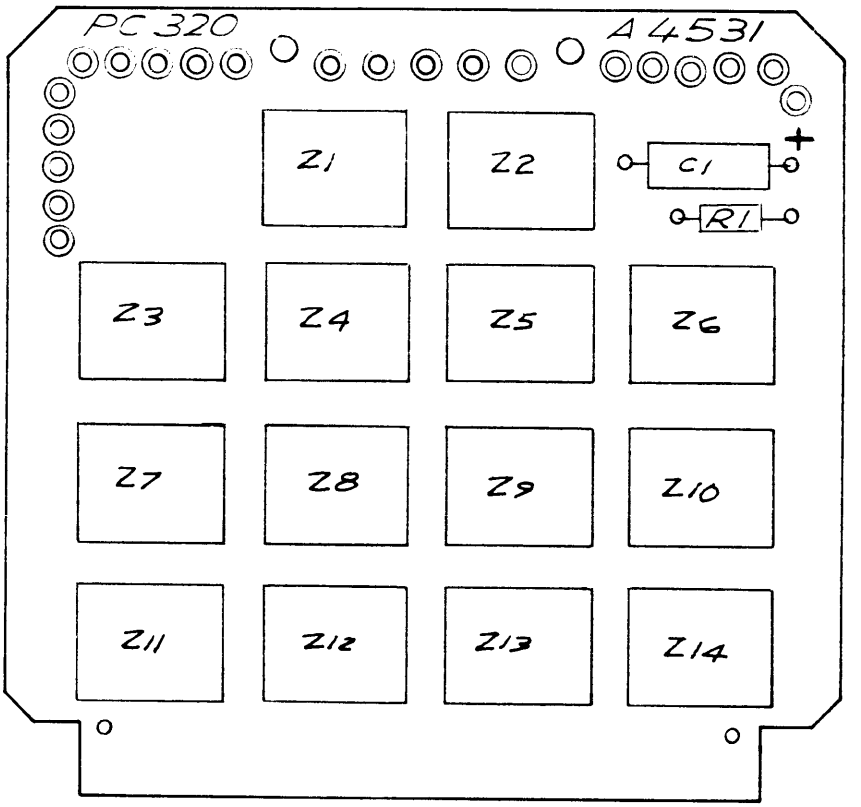
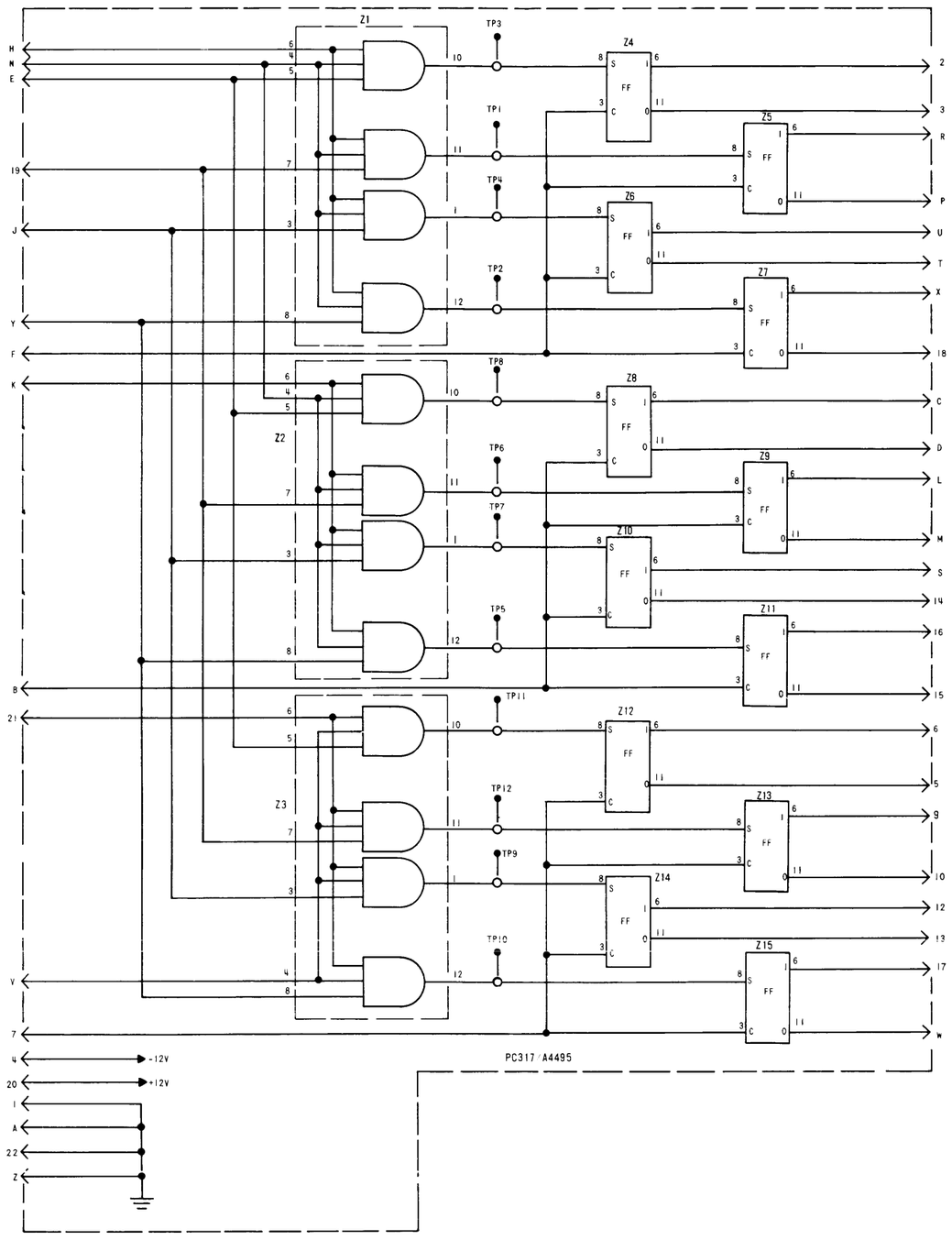


Figure 5-11A. Component Location, Lamp Driver 2A3



MODULE VOLTAGE & GND CHART			
SYMBOL	PIN CONNECTIONS		
	+12V	-12V	GND
Z1, Z2, Z3		2	
Z4 THRU Z15	10	2	5

LAST SYMBOL	MISSING SYMBOL
TP12 Z15	

NOTE:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN: FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE

CK1615

Figure 5-12. Schematic Wiring, Frequency Gating Circuit 2A4, 2A5

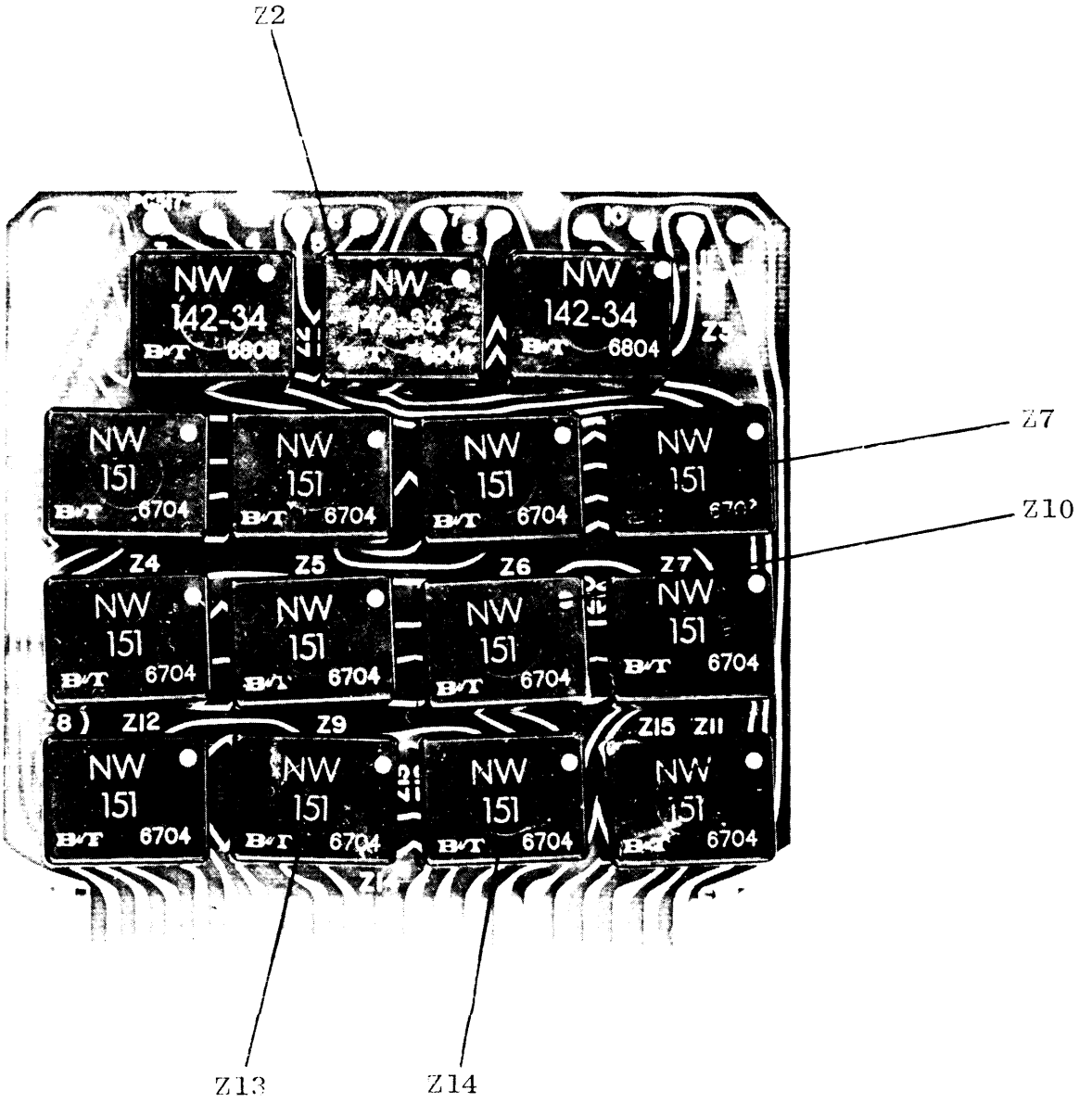
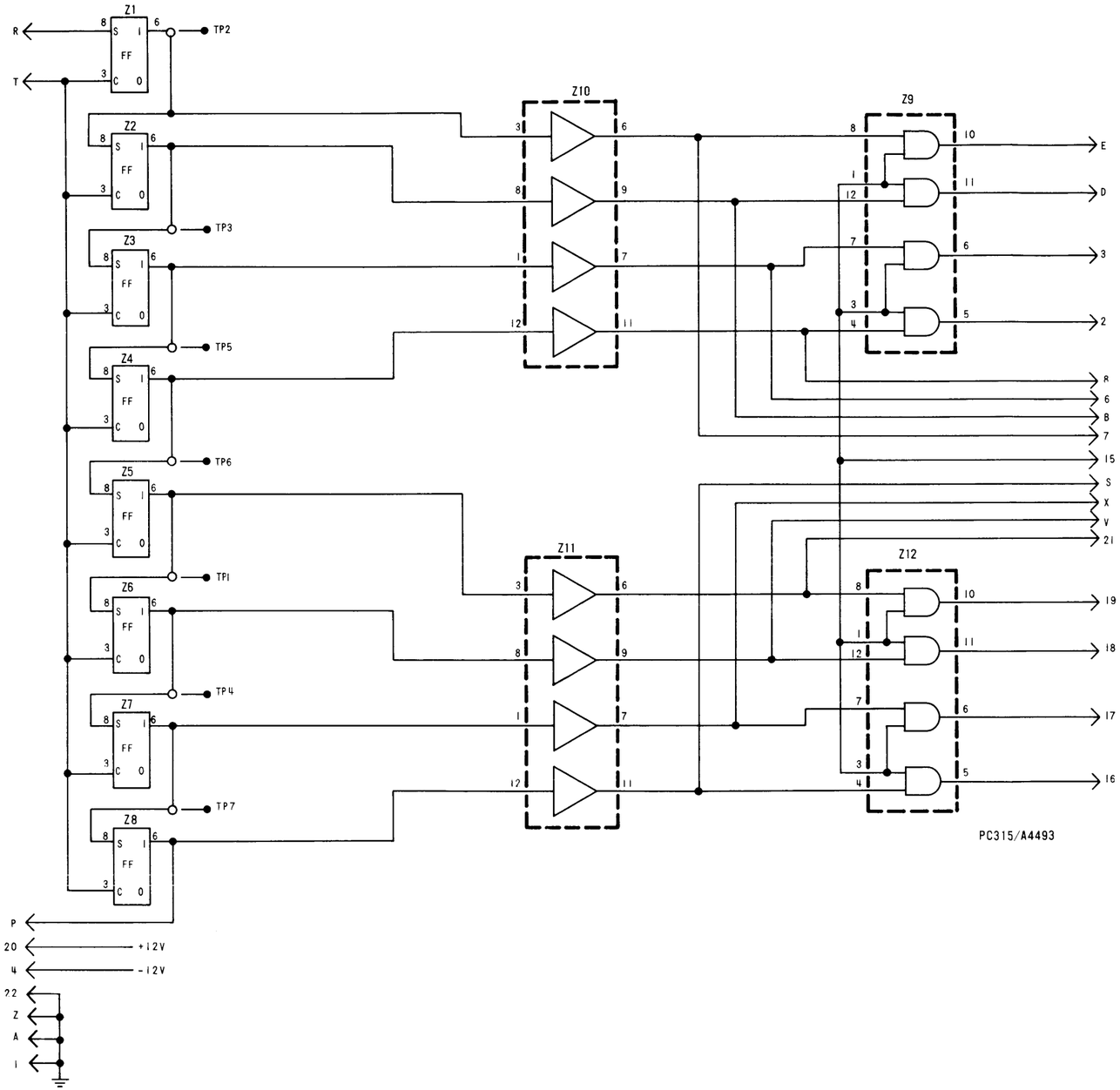


Figure 5-12A. Component Location, Frequency Gating Circuit 2A4, 2A5



MODULE VOLTAGE & GND CHART			
SYMBOL	PIN CONNECTIONS		
	+12V	-12V	GND
Z1 THRU Z8	10	2	5
Z9, Z12		2	
Z10, Z11		2	5

LAST SYMBOL	MISSING SYMBOL
TP7 Z12	

NOTE:

PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE.

CK1616

Figure 5-13. Schematic Wiring, Shift Register 2A6, 2A7

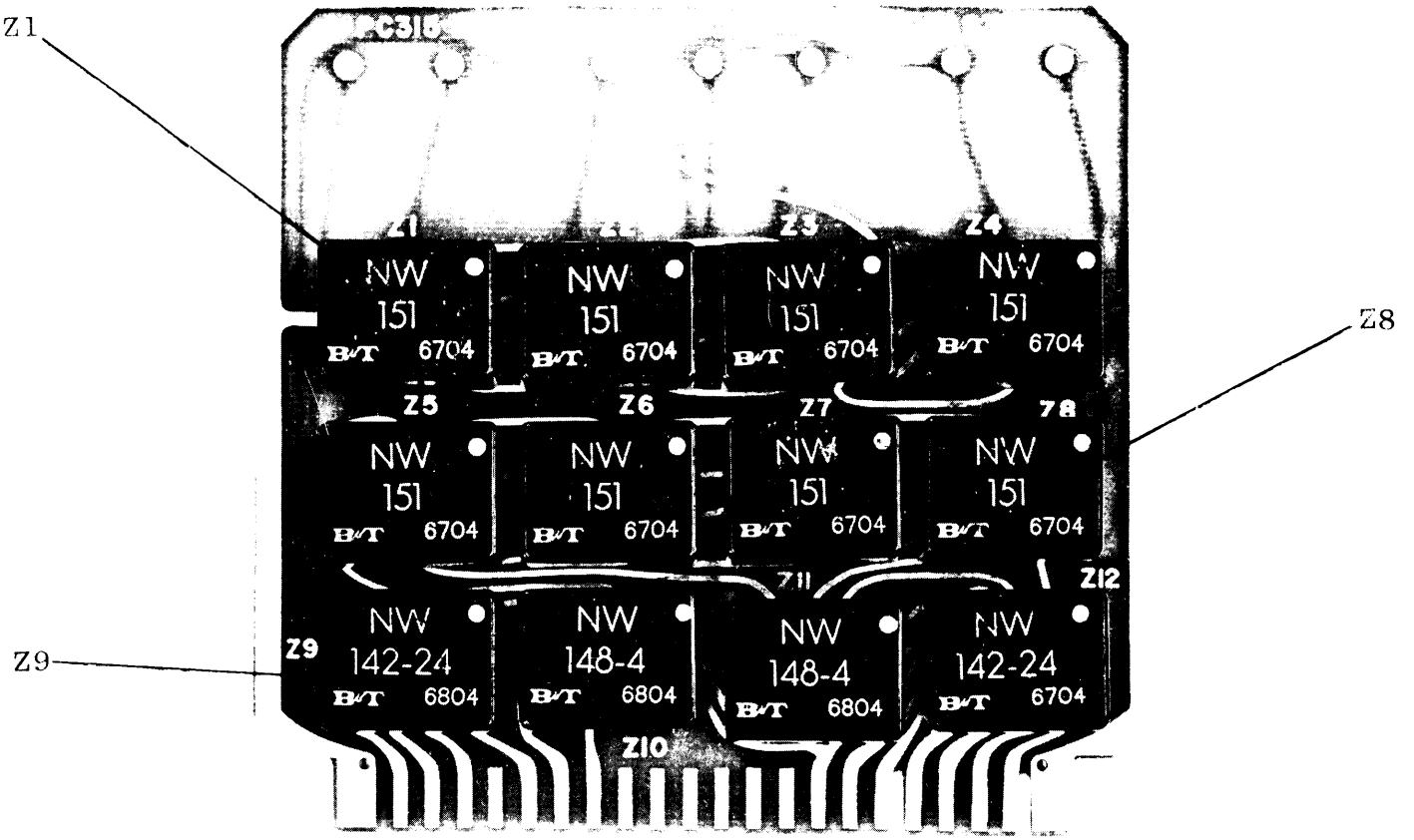
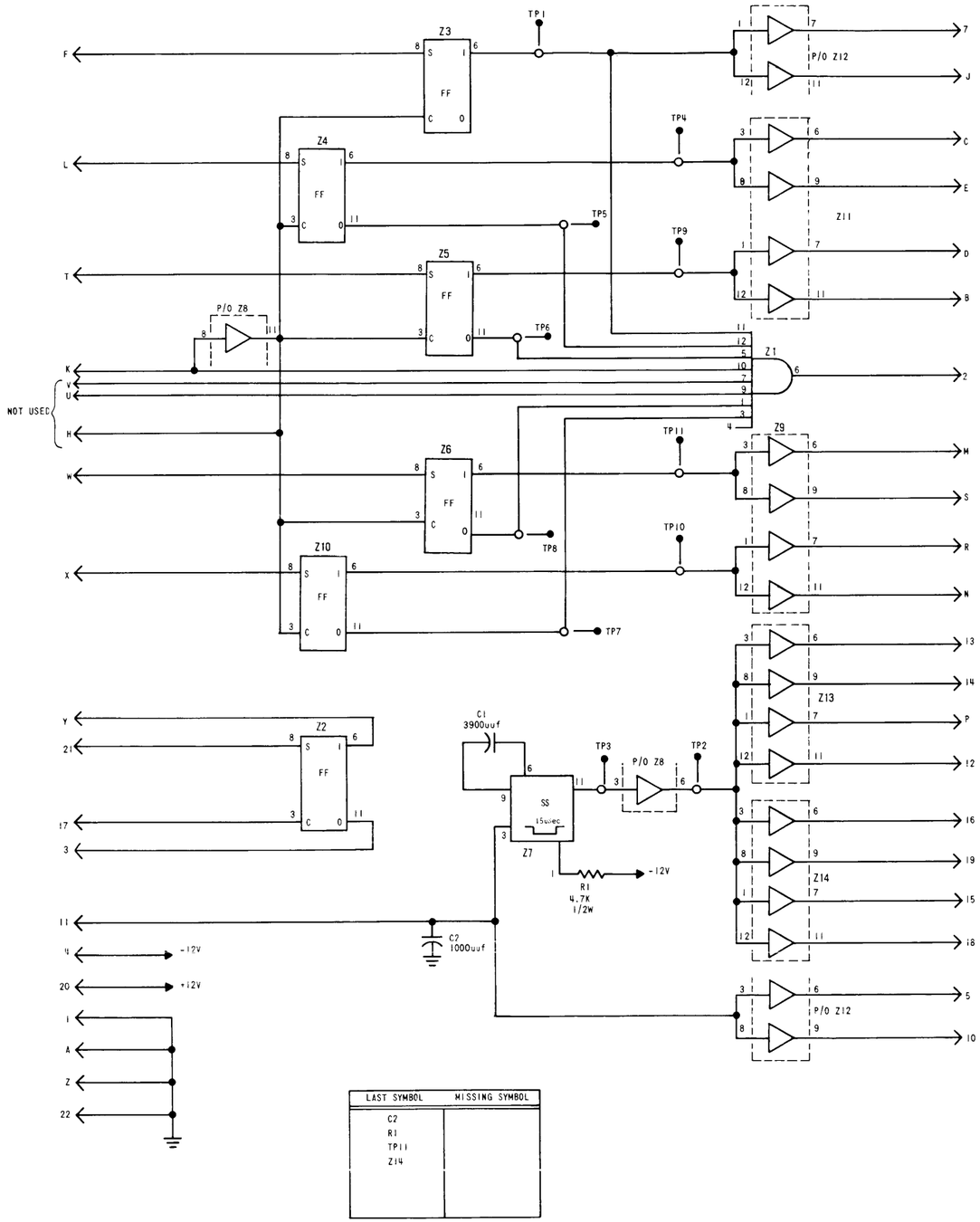


Figure 5-13A. Component Location, Shift Register 2A6, 2A7



MODULE VOLTAGE AND GND CHART			
	PIN CONNECTIONS		
SYMBOL	+12V	-12V	GND
Z1		2	
Z1 THRU Z7.Z10	10	2	5
Z8.Z9.Z11 THRU Z14		2	5

NOTE:

1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN: FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE

LAST SYMBOL	MISSING SYMBOL
C2	
R1	
TP11	
Z14	

CK1613

Figure 5-14. Schematic Wiring, Timing Circuit 2A8

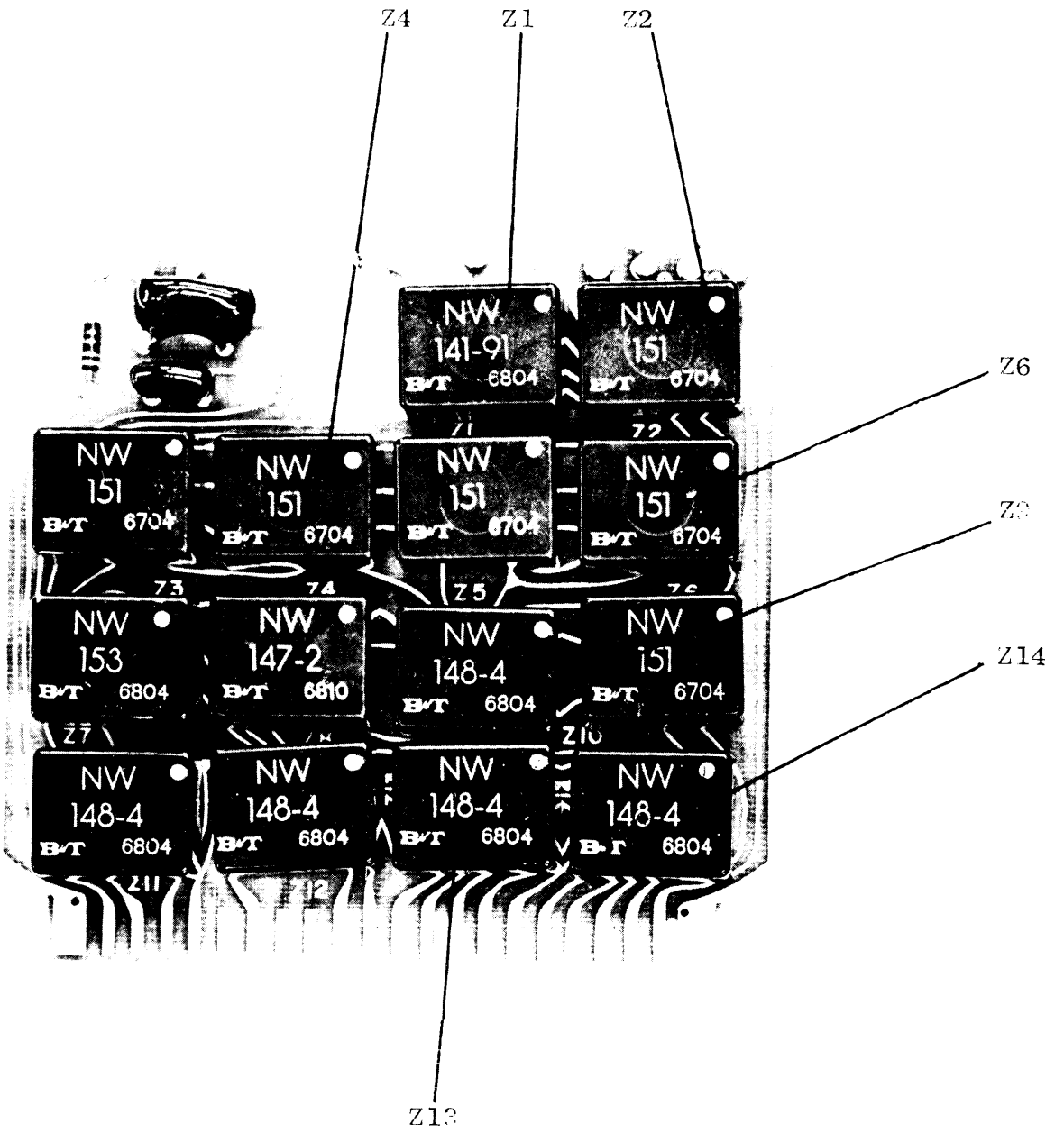
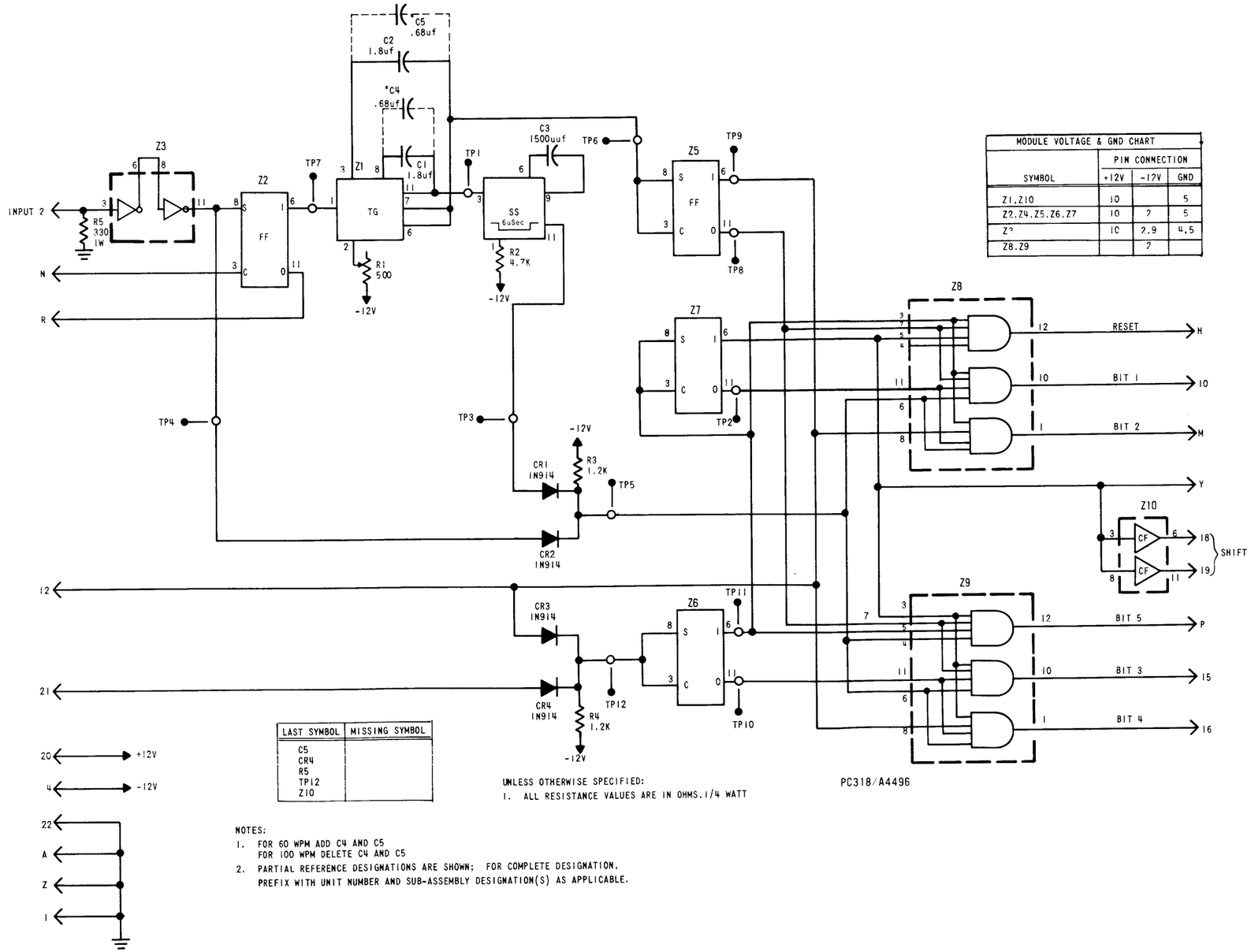


Figure 5-14A. Component Location, Timing Circuit 2A8



MODULE VOLTAGE & GND CHART			
	PIN CONNECTION		
SYMBOL	+12V	-12V	GND
Z1,Z10	10		5
Z2,Z4,Z5,Z6,Z7	10	2	5
Z3	10	2,9	4,5
Z8,Z9		2	

LAST SYMBOL	MISSING SYMBOL
C5	
CR4	
R5	
TP12	
Z10	

UNLESS OTHERWISE SPECIFIED:
1. ALL RESISTANCE VALUES ARE IN OHMS. 1/4 WATT

NOTES:
1. FOR 60 WPM ADD C4 AND C5
   FOR 100 WPM DELETE C4 AND C5
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE.

CK1609

Figure 5-15. Schematic Wiring, Timing Circuit 2A9

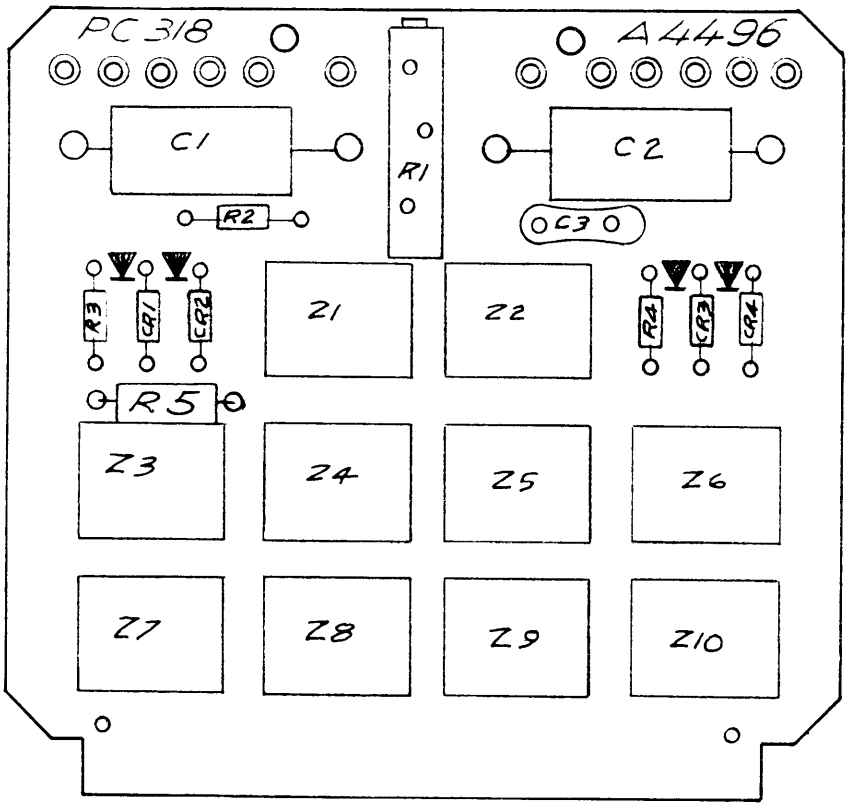
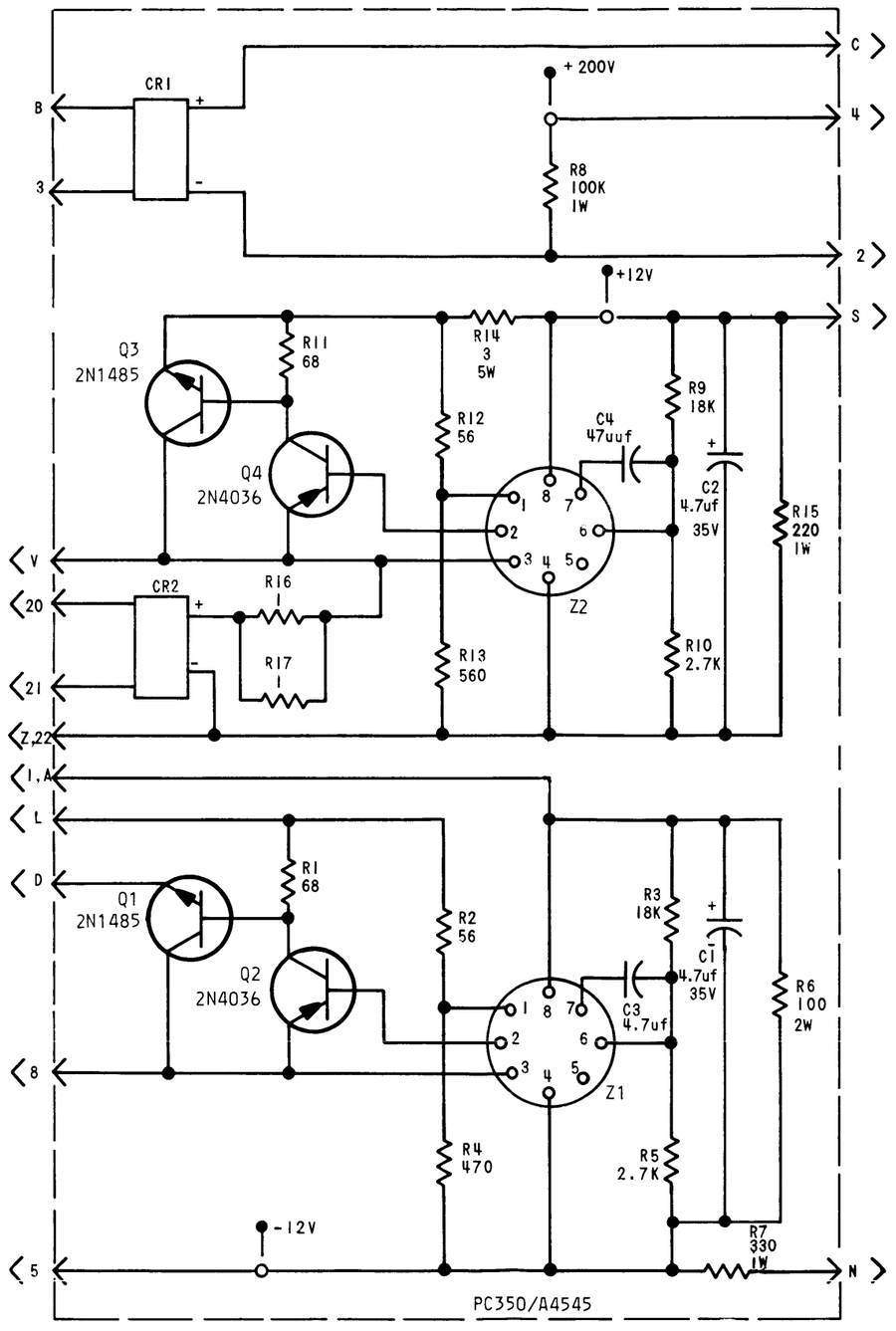


Figure 5-15A. Component Location, Timing Circuit 2A9



LAST SYMBOL	MISSING SYMBOL
C4	
CR2	
Q4	
R17	
Z2	

UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTANCE VALUES ARE IN OHMS, 1/2 WATT
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE

CK1608

Figure 5-16. Schematic Wiring, Power Supply 2A10

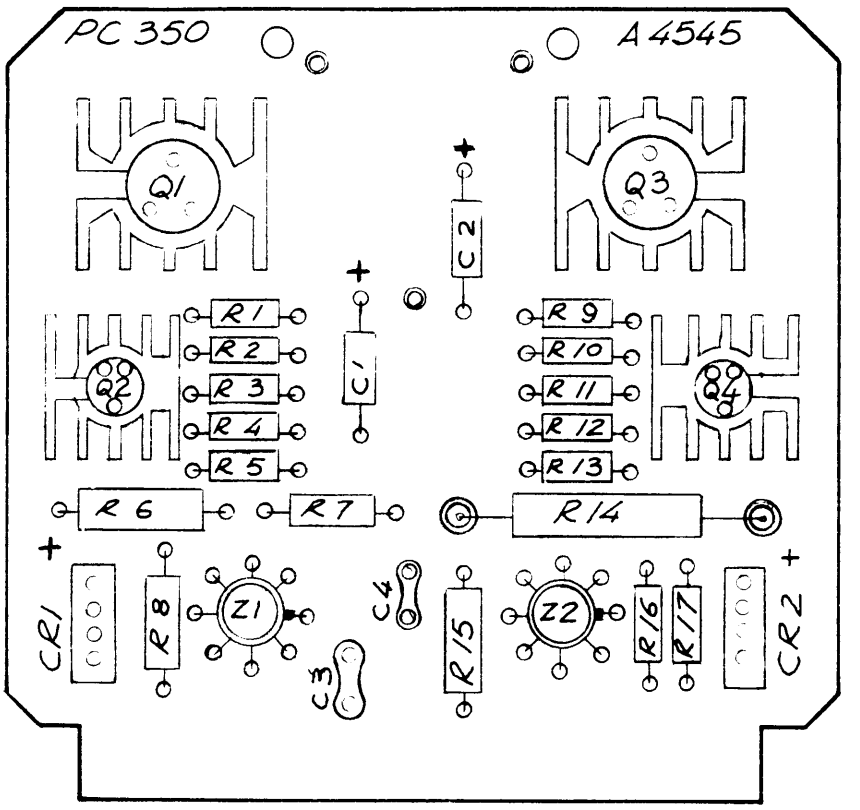
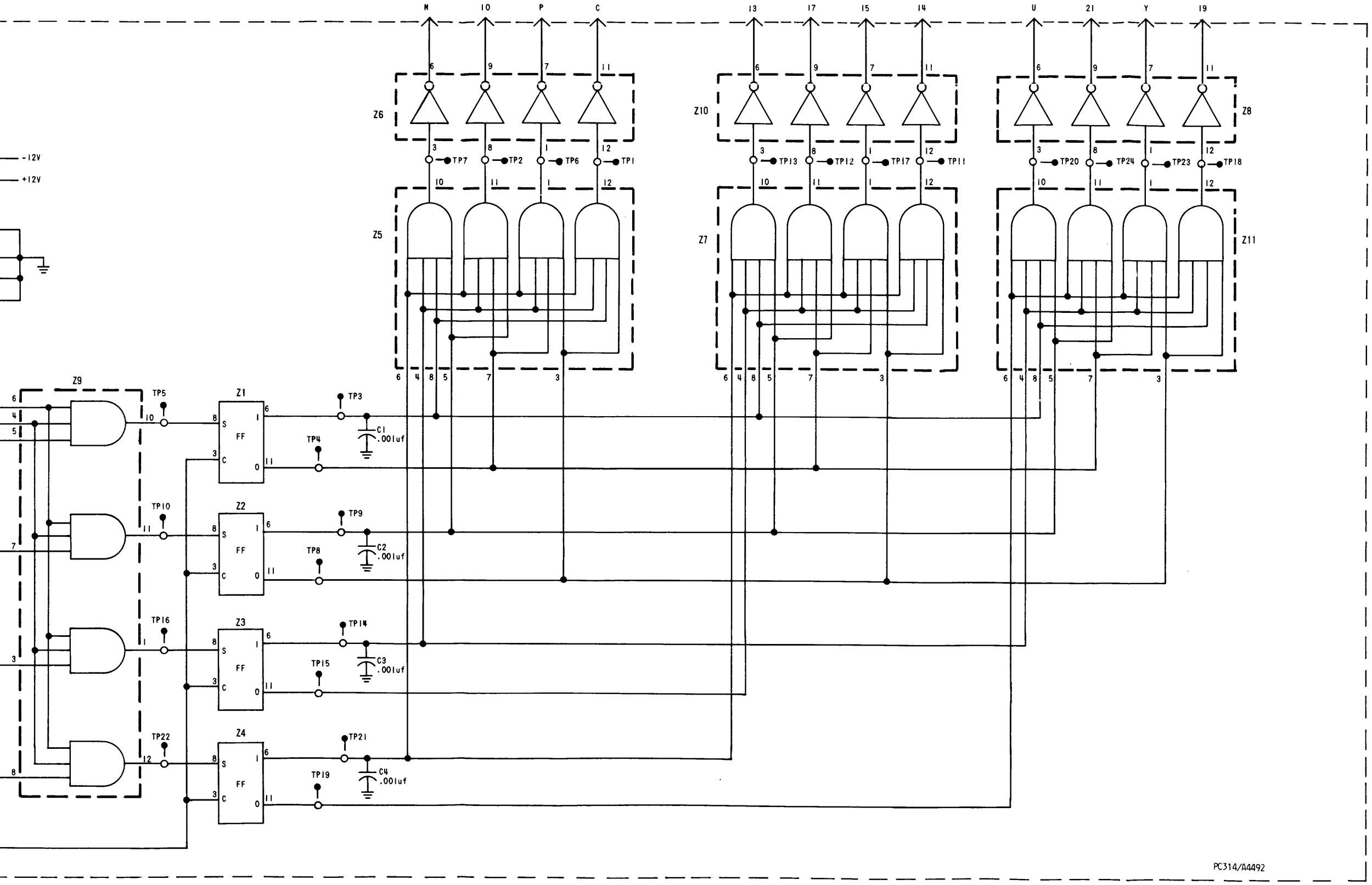


Figure 5-16A. Component Location, Power Supply 2A10



LAST SYMBOL	MISSING SYMBOL
C4 TP24 Z11	

MODULE VOLTAGE AND GND CHART			
	PIN CONNECTIONS		
SYMBOL	+12V	-12V	GND
Z1 THRU Z4	10	2	5
Z5, Z7, Z9, Z11		2	
Z6, Z8, Z10	10		5

NOTE:

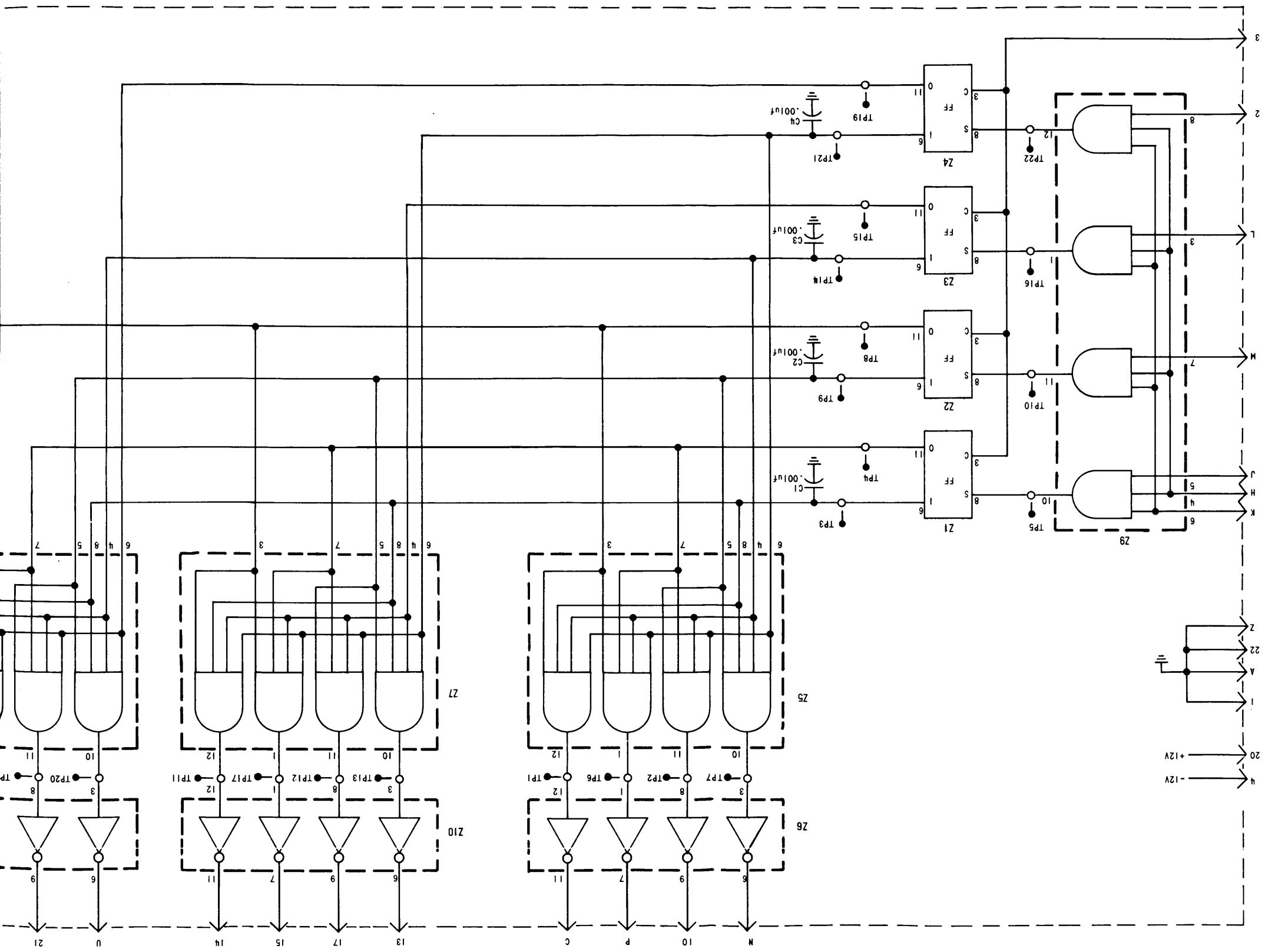
1. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE

CK1610

Figure 5-17. Schematic Wiring, 12-Position Driver 2A14, 2A15

Fig

00170205O



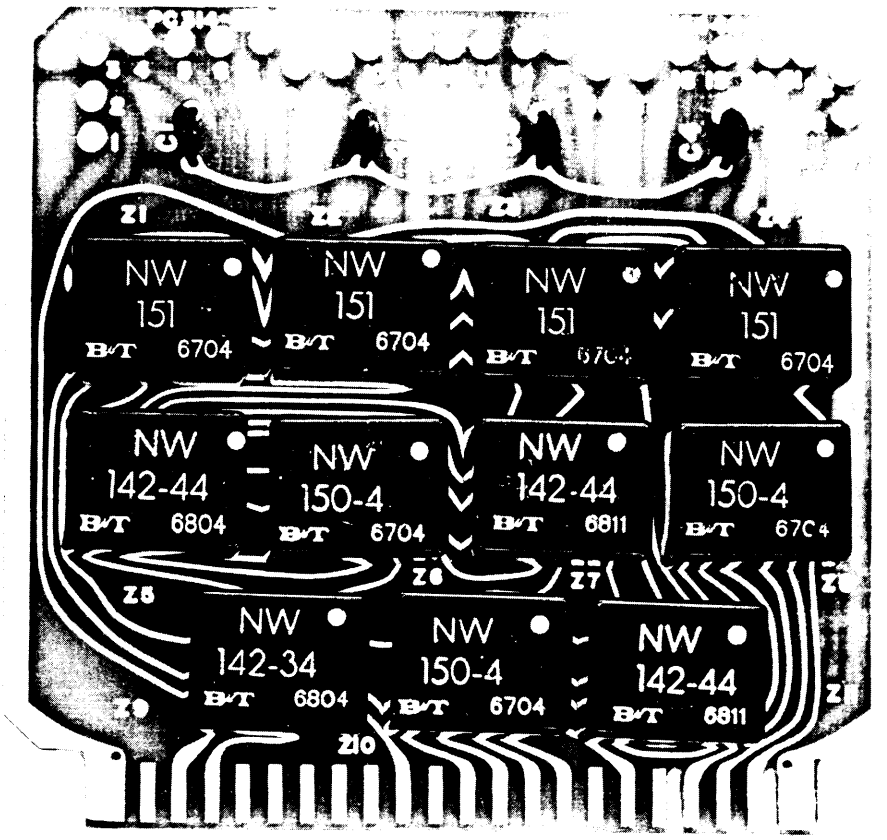
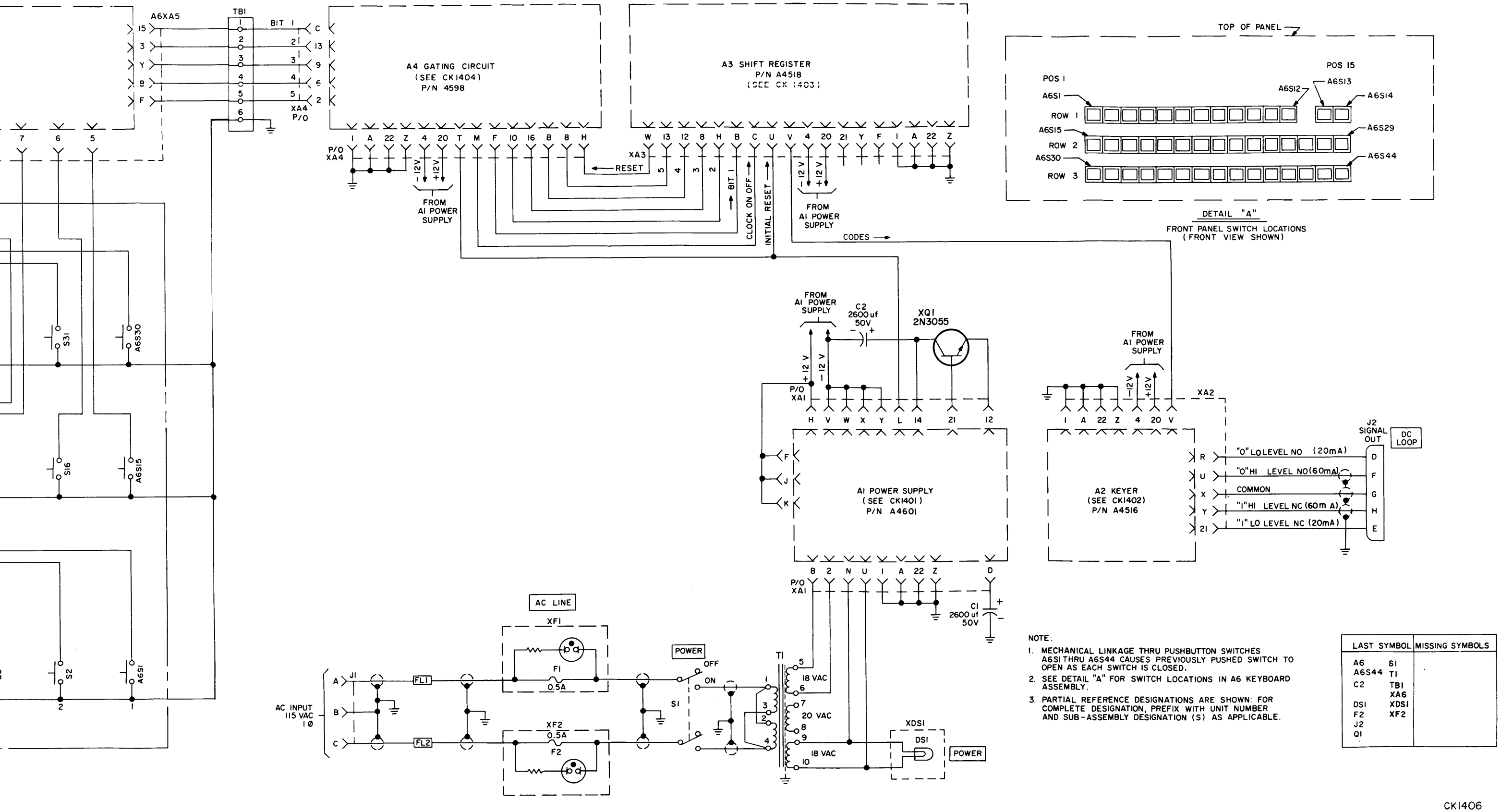


Figure 5-17A. Component Location, Memory Gating 2A14, 2A15, 2A16

Figure 5-18. Deleted



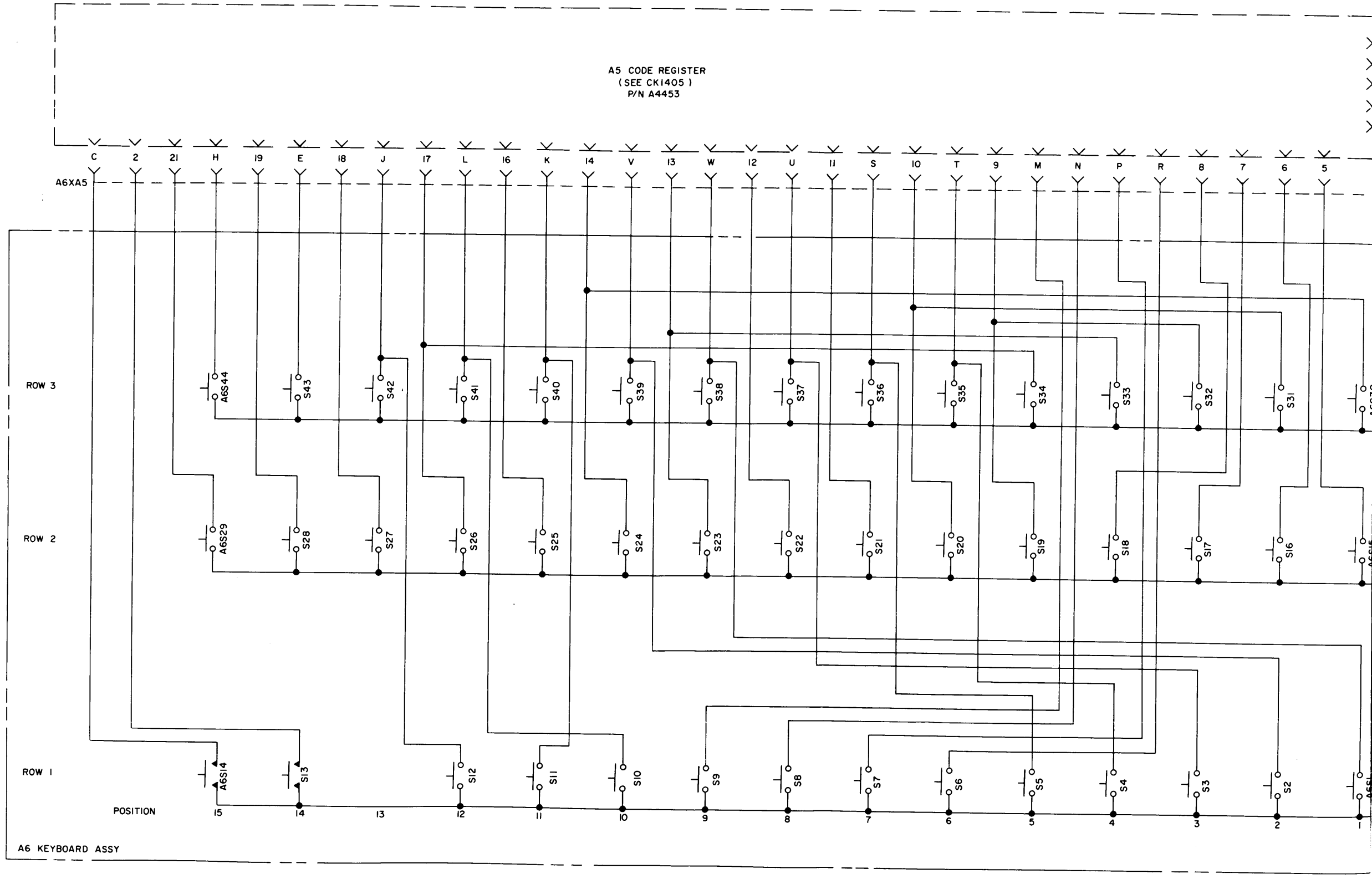
NOTE:

1. MECHANICAL LINKAGE THRU PUSHBUTTON SWITCHES A6S1 THRU A6S44 CAUSES PREVIOUSLY PUSHED SWITCH TO OPEN AS EACH SWITCH IS CLOSED.
2. SEE DETAIL "A" FOR SWITCH LOCATIONS IN A6 KEYBOARD ASSEMBLY.
3. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN: FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION (S) AS APPLICABLE.

LAST SYMBOL	MISSING SYMBOLS
A6	S1
A6S44	T1
C2	TB1
	XA6
DS1	XDS1
F2	XF2
J2	
Q1	

CK1406

Figure 5-19. Schematic Wiring, Unit 3 (C-8335/URT)


A5 CODE REGISTER
(SEE CK1405)
P/N A4453
C 2 21 H 19 E 18 J 17 L 16 K 14 V 13 W 12 U 11 S 10 T 9 M N P R 8 7 6 5
A6XA5
ROW 3
A6S44 S43 S42 S41 S40 S39 S38 S37 S36 S35 S34 S33 S32 S31
ROW 2
A6S29 S28 S27 S26 S25 S24 S23 S22 S21 S20 S19 S18 S17 S16
ROW 1
A6S14 S13 S12 S11 S10 S9 S8 S7 S6 S5 S4 S3 S2
POSITION
15 14 13 12 11 10 9 8 7 6 5 4 3 2
A6 KEYBOARD ASSY

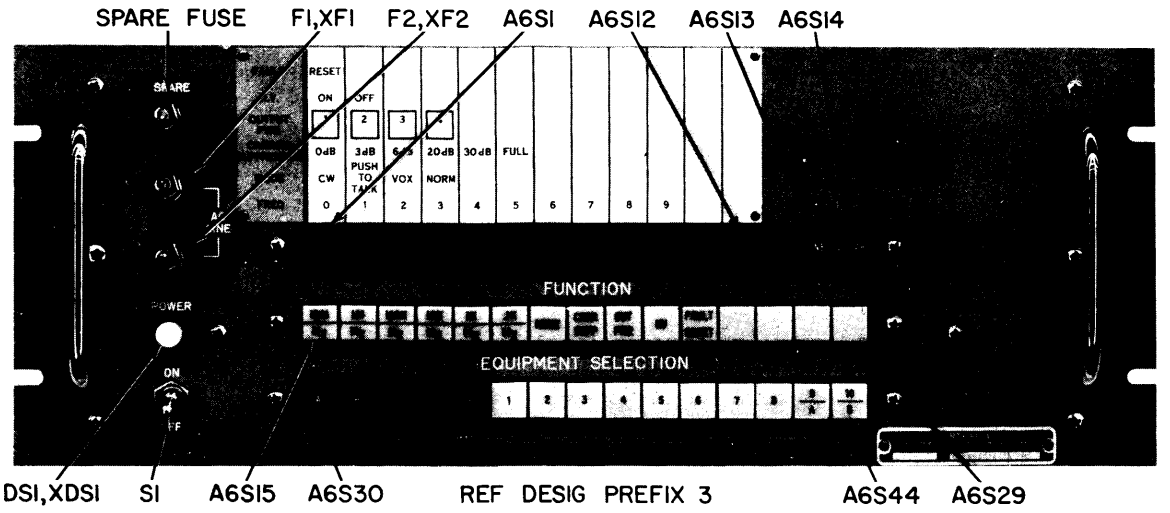


Figure 5-20. Major Component Locations, Front Panel of Unit 3 (C-8335/URT)

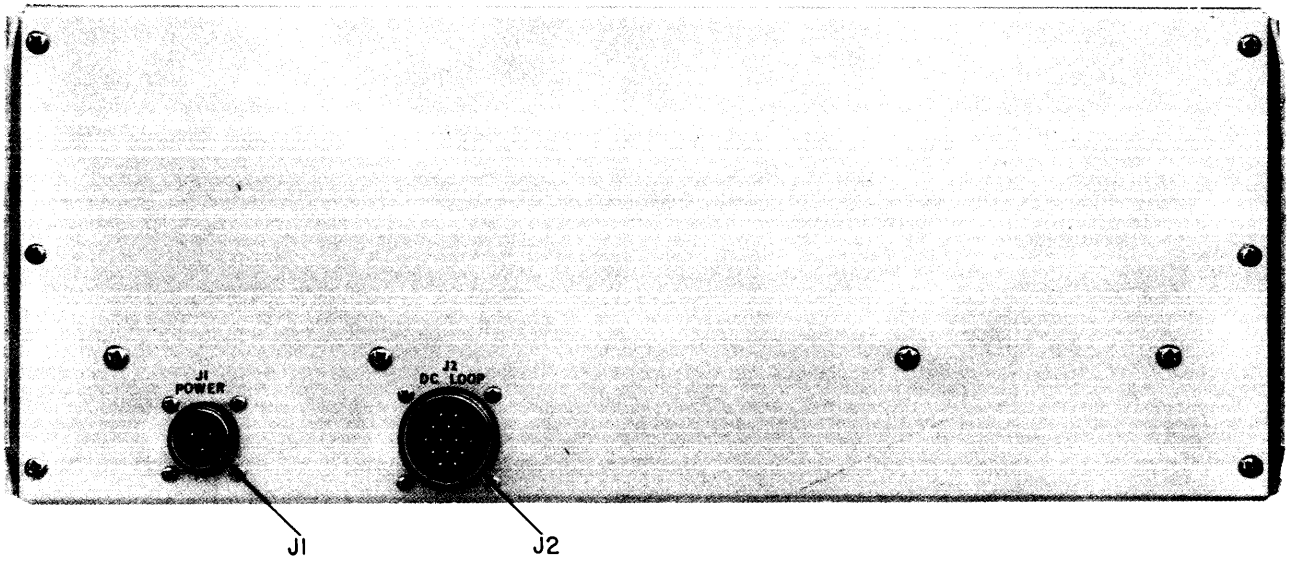


Figure 5-21. Major Component Locations, Rear Panel of Unit 3 (C-8335/URT)

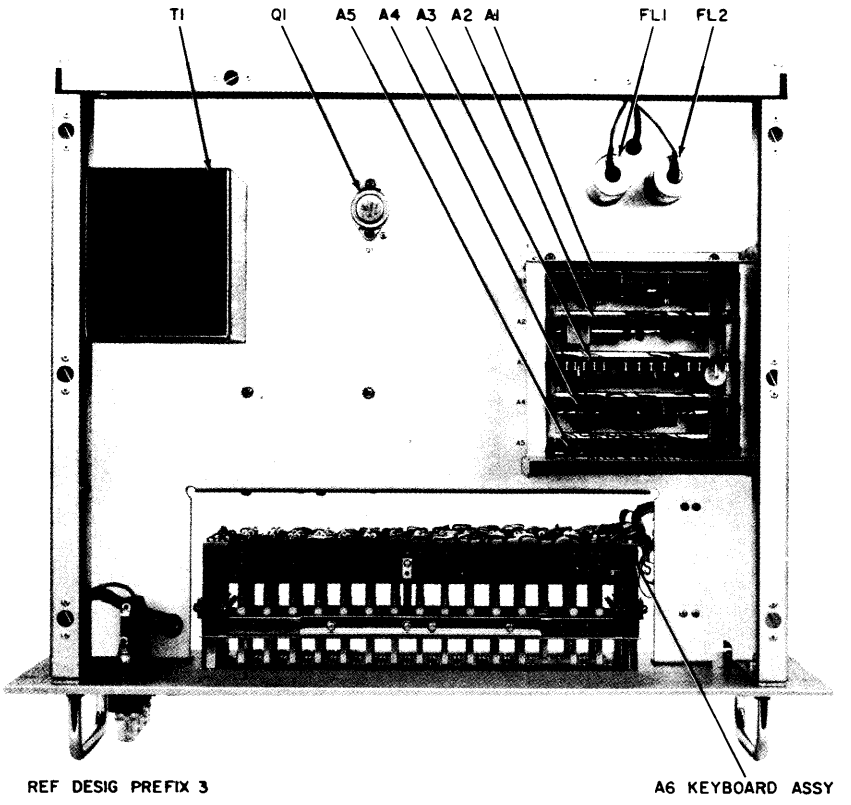


Figure 5-22. Major Component Locations, Top View of Unit 3 (C-8335/URT)

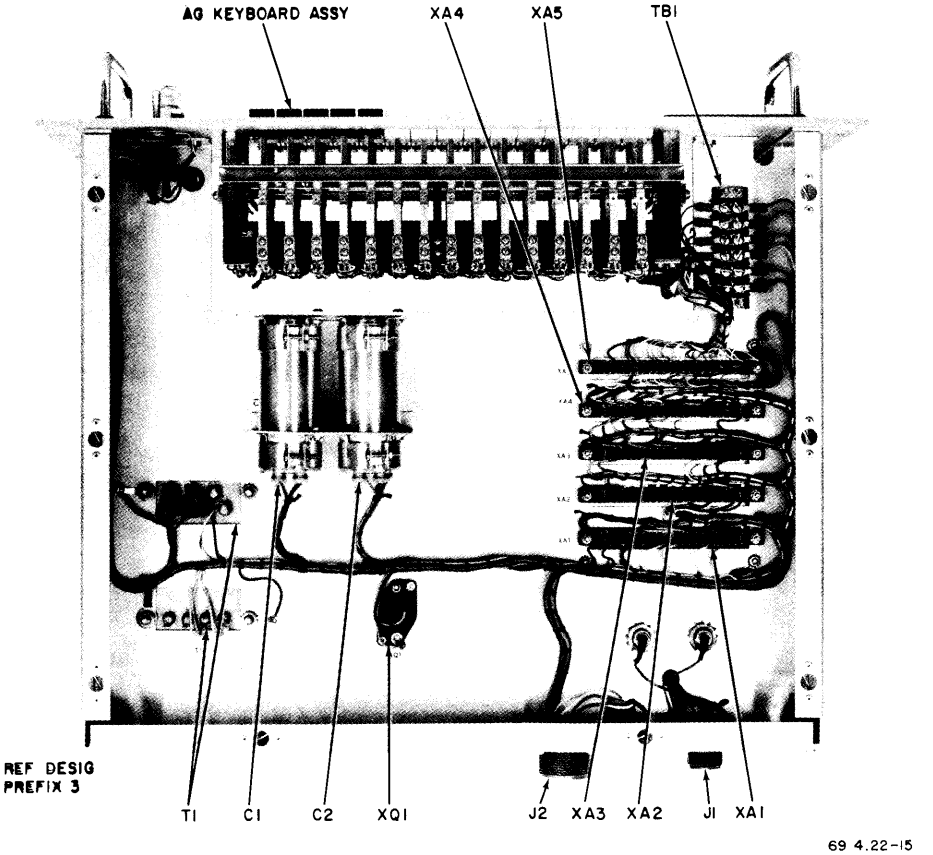
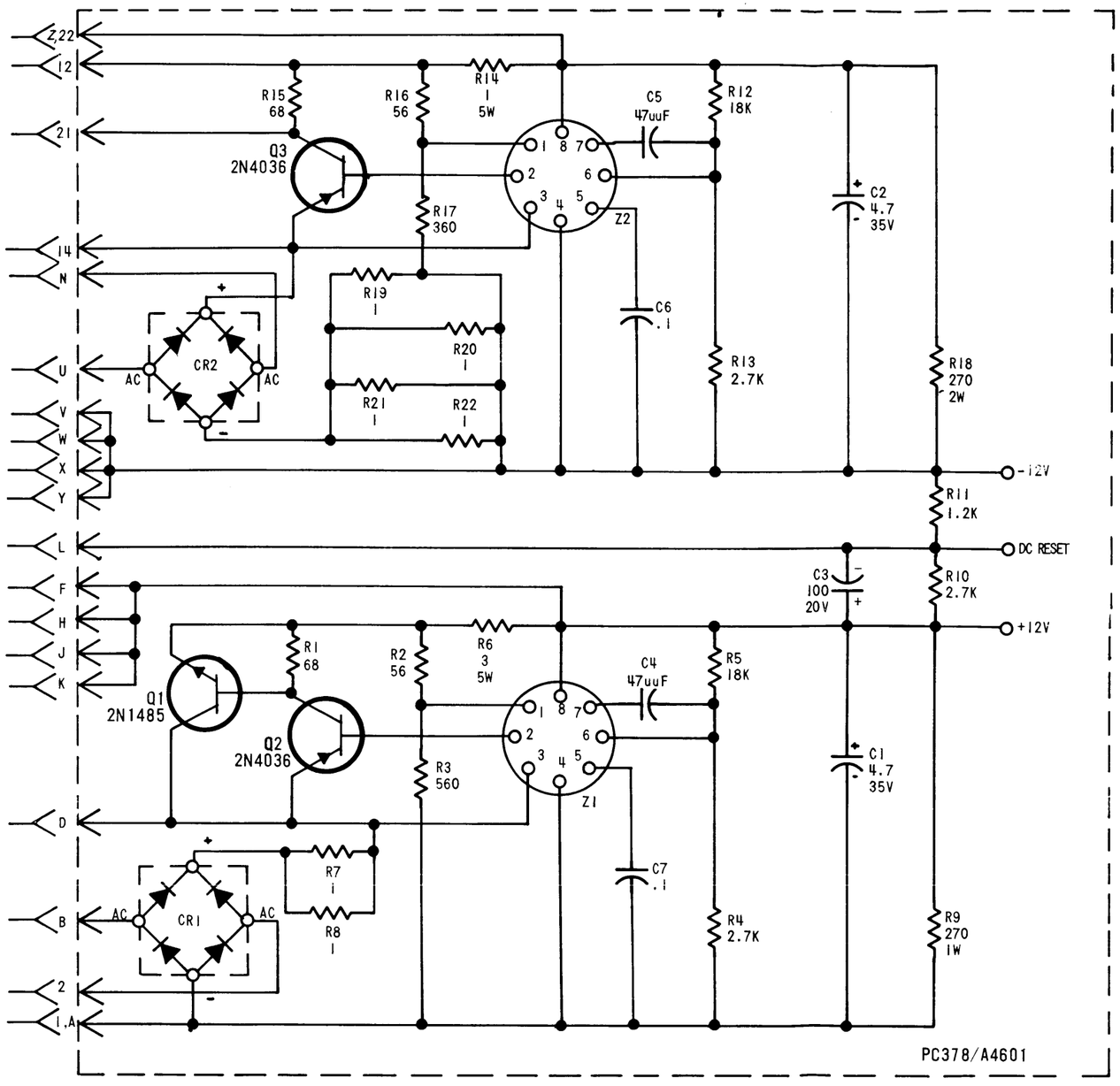


Figure 5-23. Major Component Locations, Bottom View of Unit 3 (C-8335/URT)



LAST SYMBOLS	MISSING SYMBOLS
C7	
CR2	
Q3	
R22	
Z2	

UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTANCE VALUES ARE IN OHMS, 1/2W
2. ALL CAPACITANCE VALUES ARE IN MICROFARADS
3. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE

CK1401

Figure 5-24. Schematic Wiring, Power Supply 3A1

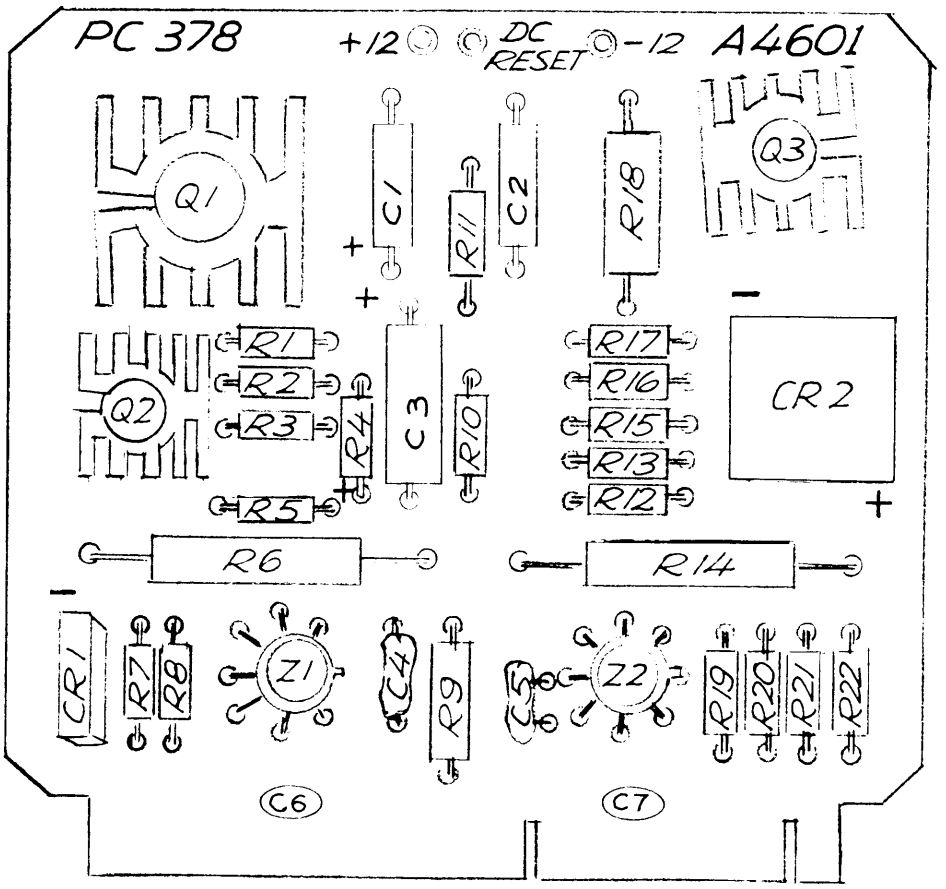
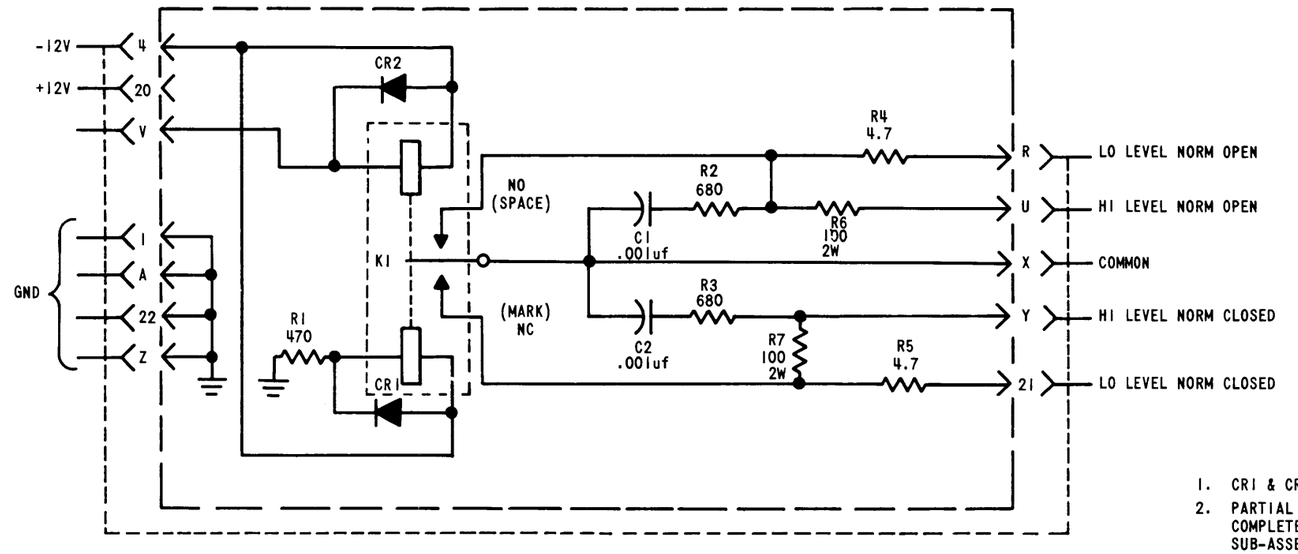


Figure 5-24A. Component Location, Power Supply 3A1



NOTES

1. CR1 & CR2 ARE TYPE 1N4245
2. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER & SUB-ASSEMBLY DESIGNATION(S) AS APFLICABLE

UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE IN OHMS, 1/2 WATT

LAST SYMBOLS	MISSING SYMBOLS
C2	
CR2	
K1	
R7	

CK1402

Figure 5-25. Schematic Wiring, Output Keyer 3A2

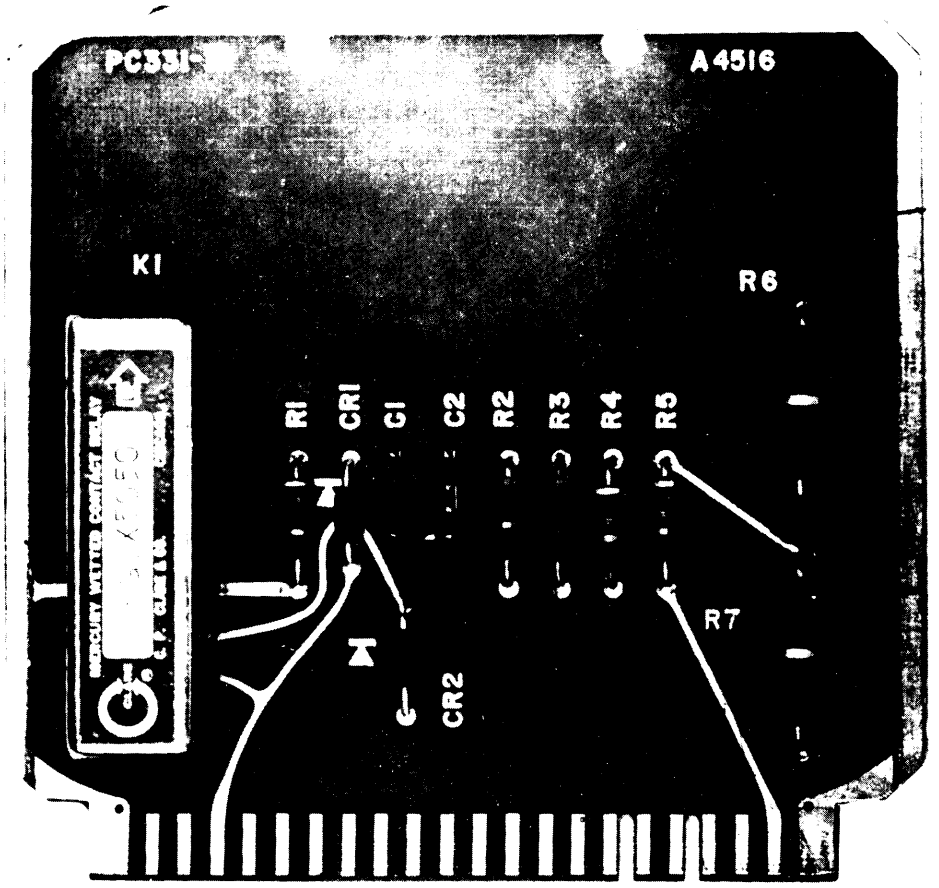
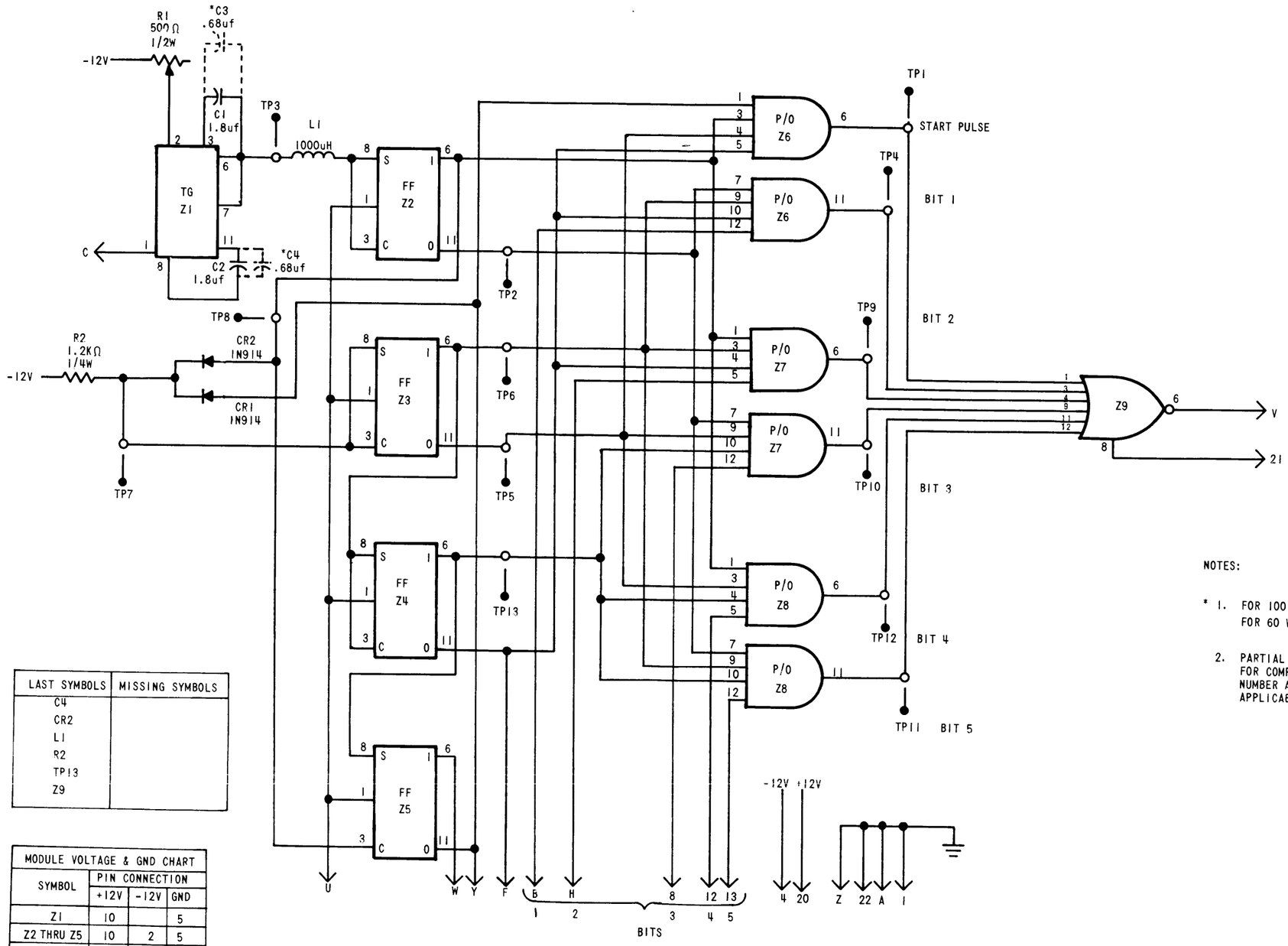


Figure 5-25A. Component Location, Output Keyer 3A2



LAST SYMBOLS	MISSING SYMBOLS
C4	
CR2	
L1	
R2	
TP13	
Z9	

MODULE VOLTAGE & GND CHART			
SYMBOL	PIN CONNECTION		
	+12V	-12V	GND
Z1	10		5
Z2 THRU Z5	10	2	5
Z6.7.8		2	
Z9	10	2	5

NOTES:

* 1. FOR 100 WPM OPERATION, DELETE C3 & C4
FOR 60 WPM OPERATION, ADD C3 & C4

2. PARTIAL REFERENCE DESIGNATION ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE

CK1403

Figure 5-26. Schematic Wiring, Shift Register 3A3

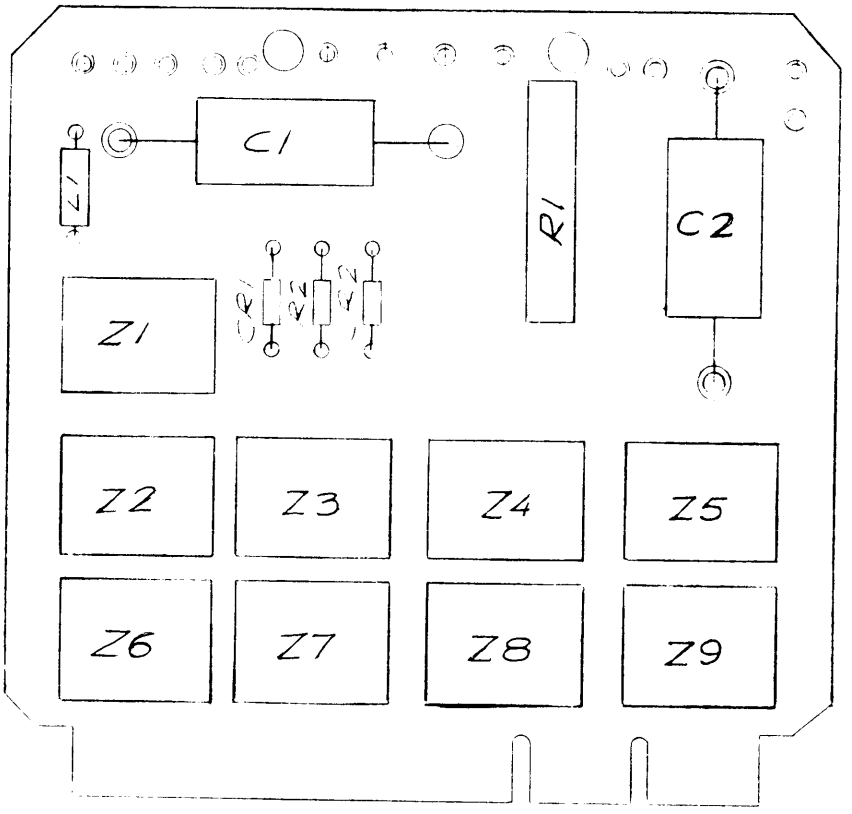
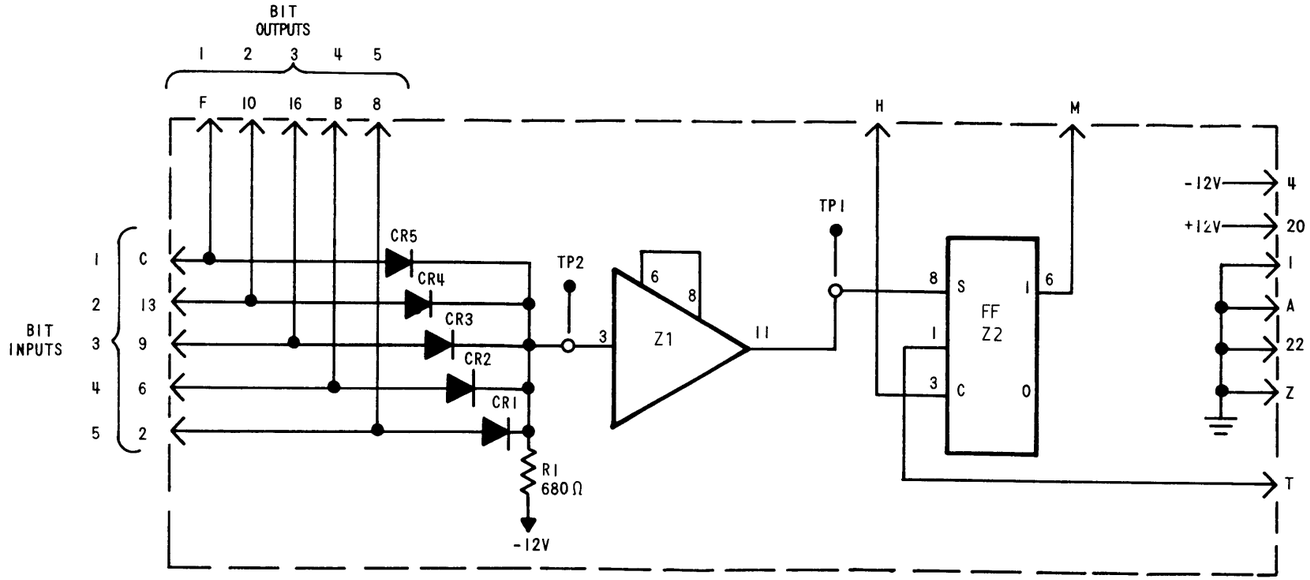


Figure 5-26A. Component Location, Shift Register 3A3



MODULE VOLTAGE & GND CHART			
SYMBOL	PIN CONNECTION +12V	-12V	GND
Z1	10	2 & 9	4 & 5
Z2	10	2	5

LAST SYMBOL	MISSING SYMBOL
CR5	
R1	
TP2	
Z2	

NOTES:

1- ALL DIODES ARE TYPE 1N914.
2- PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUB-ASSEMBLY DESIGNATION(S) AS APPLICABLE.

CK1404

Figure 5-27. Schematic Wiring, Gating Circuit 3A4

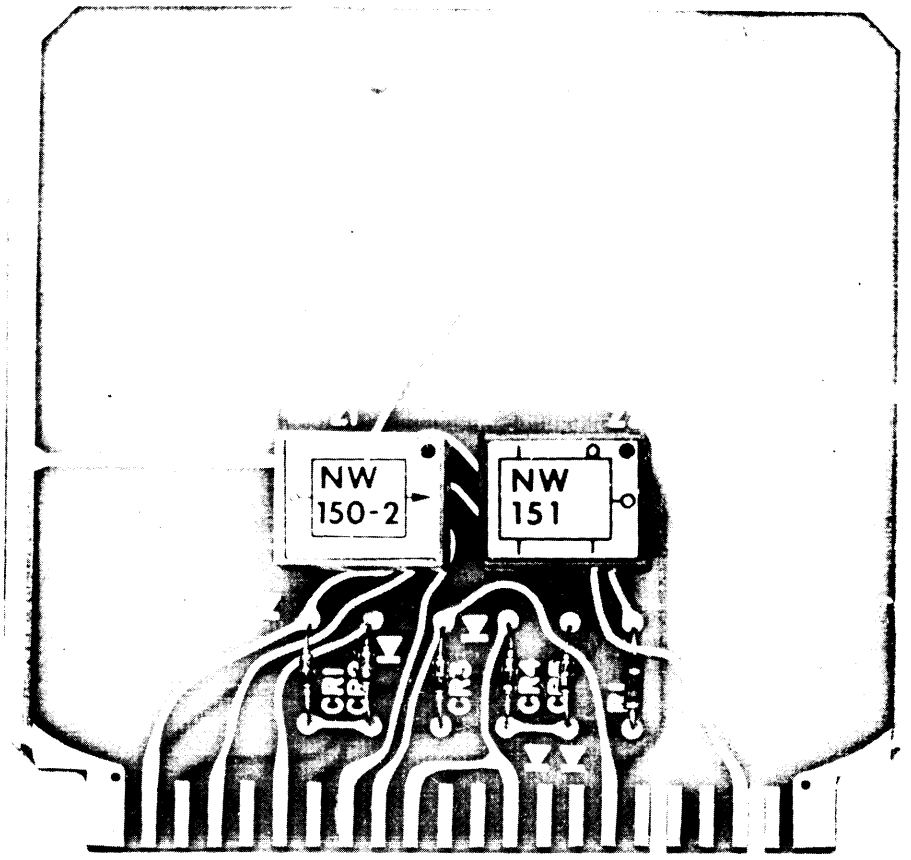
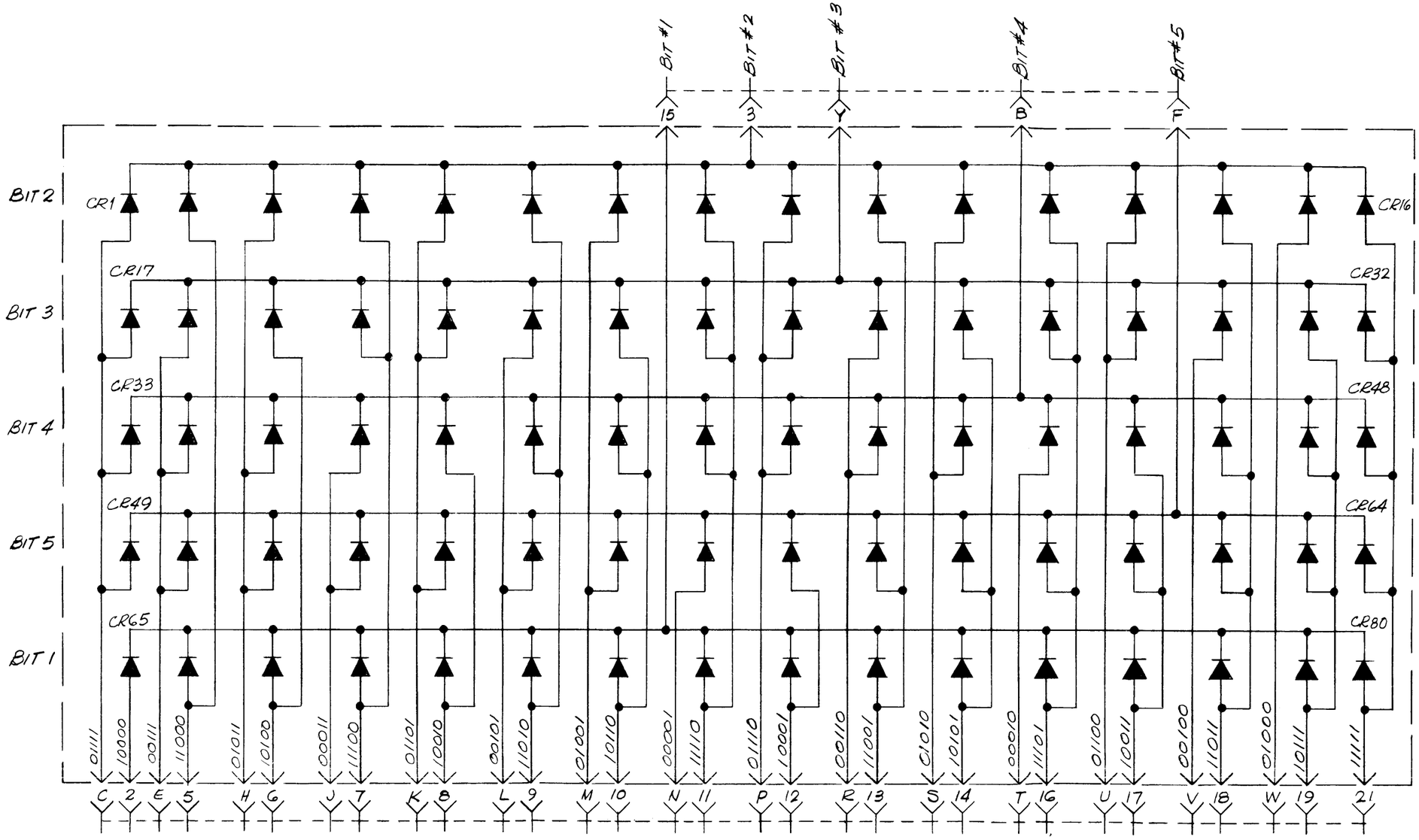


Figure 5-27A. Component Location, Gating Circuit 3A4



LAST SYMBOL = CR80

NOTE:

1- ALL DIODES ARE TYPE IN914

2- PARTIAL REFERENCE DESIGNATIONS ARE SHOWN; FOR COMPLETE DESIGNATION, PREFIX WITH UNIT NUMBER AND SUBASSEMBLY DESIGNATION (S) AS APPLICABLE.

CK1405

Figure 5-28. Schematic Wiring, Code Register 3A5

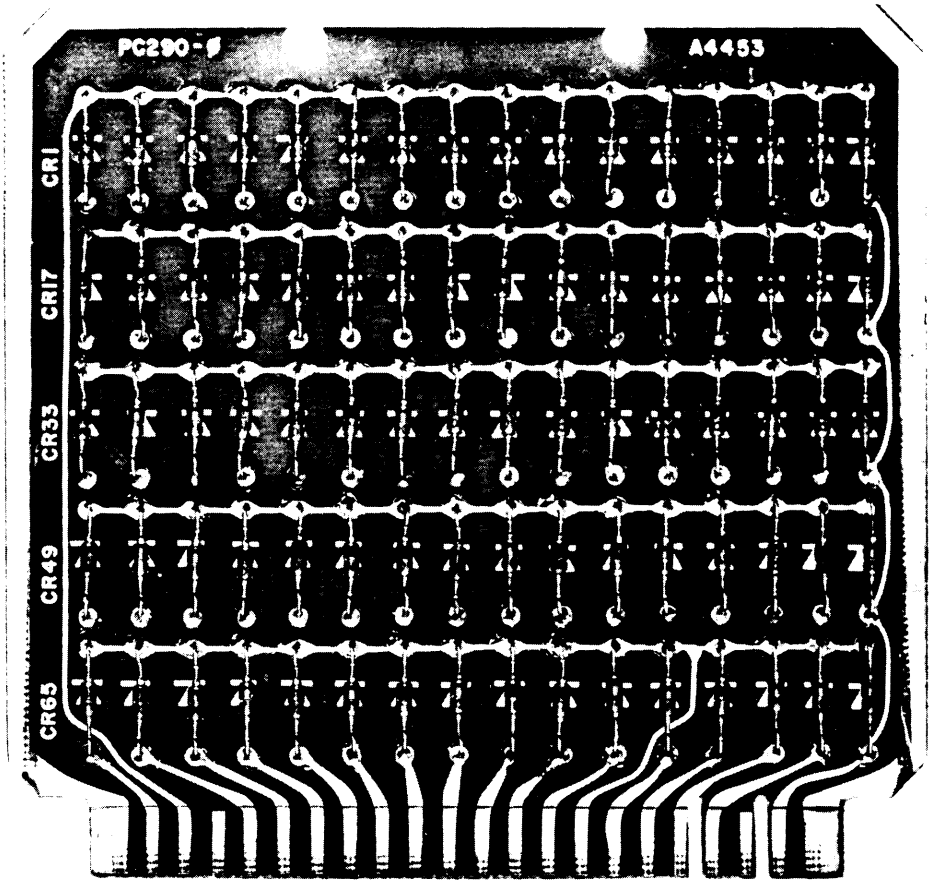


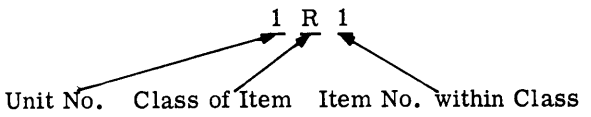
Figure 5-28A. Component Location, Code Register 3A5

SECTION VI
PARTS LIST

6-1. INTRODUCTION

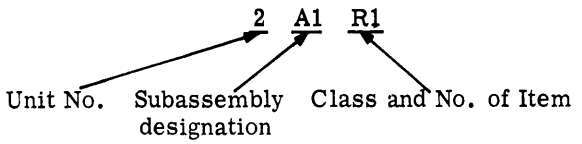
a. REFERENCE DESIGNATIONS - The unit numbering method of assigning reference designations has been used to identify units, assemblies, subassemblies and parts of the COPC-2 Communications Control Console. This method has been expanded as much as necessary to adequately cover the various degrees of subdivision in the equipment. Examples of this unit numbering method and typical expansions of the same are illustrated by the following:

Example 1:



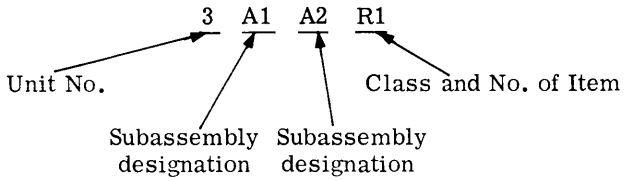
Read as: First (1) resistor (R) of first unit (1) of COPC-2.

Example 2:



Read as: First (1) resistor (R) of first (1) subassembly (A) of second (2) unit of COPC-2.

Example 3:



Read as: First (1) resistor (R) of second (2) subassembly (A) of first (1) subassembly (A) of third (3) unit of COPC-2.

b. REFERENCE DESIGNATION PREFIX - Partial reference designations are used on the equipment and illustrations. The partial reference designations consist of the class letter(s) and the identifying item number. The complete reference designations may be obtained by placing the proper prefix before the partial reference designations. Prefixes are provided on illustrations following the notation "REF DESIG PREFIX".

6-2. LIST OF UNITS

Table 6-1 is a listing of the modular units comprising Communications Control Console COPC-2. The units are listed by unit numbers in numerical order for each set; thus, when the complete reference designation of a part is known, the table will furnish the identification of the unit in which the part is located, since the first number of a complete reference designation identifies the unit. Table 6-1 also provides the following information for each unit listed: (1) quantity per equipment, (2) official name, (3) designation, (4) colloquial name, and (5) location of the first page of its parts listing in table 6-2.

6-3. MAINTENANCE PARTS LIST.

Table 6-2 is a listing of maintenance parts in each modular unit. Parts are listed in unit numbering order. Where an identical unit is used more than once, one table serves for all units. The complete reference designations are listed in the REF DESIG column, with the omission of the unit prefix number. The unit prefix number(s) are shown at the head of each unit list.

Some small subassemblies are recommended by the manufacturer as non-reparable from a labor or re-alignment cost analysis comparison to the cost of replacing the subassembly. These subassemblies are so noted in the NAME AND DESCRIPTION column and their parts are not included in the list. Other subassemblies are partially reparable, from this point of view. Partially reparable subassemblies are symbolized as "PR" in the NOTES column; their parts are included in the list. Parts that are replaceable are symbolized "R"; parts that are not replaceable are symbolized "NR".

TABLE 6-1. LIST OF UNITS

Unit	Qty	Name of Unit	Designation	Colloquial Name	Page
1	1	Indicator Panel	ID-1677/URT	Indicator Panel, Model RSSA-6Y	6-4
2	1	Indicator, Channel Frequency	ID-1678/URT	Channel-Frequency Indicator, Model RTIH-4	6-5
3	1	Programmer, Electronic Command Signal	C-8335/URT	Programmer, Model RTPH-4	6-15

TABLE 6-2. MAINTENANCE PARTS LIST

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG NO.
1		RSSA-6YA PANEL, INDICATOR: ID-1677/URT. Model RSSA-6YA is used in conjunction with RTIH-4 to identify specific transmitters represented in the RTIH-4.	
DS1		LAMP, INCANDESCENT: Single contact, T-1-3/4 base, 28 v ac or dc, 0.04 amps. 82679 Dwg BI110-6, 08806 P/N 330.	
DS2 thru DS12		SAME AS DS1.	
XDS1		LIGHT, INDICATOR: white lens cap, engraved black "1", hole mounting socket with solder lug terminals 0.550 in. dia by 1.279 in. lg. 82679 P/N TS187R1W1B.	
XDS2		LIGHT, INDICATOR: white lens cap, engraved black "2", hole mounting socket with solder lug terminals. 0.550 in. dia by 1.279 in. lg. 82679 in. lg. 82679 P/N TS107R1W2B.	
XDS3		LIGHT, INDICATOR: white lens cap, engraved black "3", hole mounting socket with solder lug terminals. 0.550 in. dia by 1.279 in. lg. 82679 P/N TS187R1W3B.	
XDS4		LIGHT, INDICATOR: white lens cap, engraved black "4", hole mounting socket with solder lug terminals. 0.550 in. dia by 1.279 in. lg. 82679 P/N TS187R1W4B.	
XDS5		LIGHT, INDICATOR: white lens cap, engraved black "5", hole mounting socket solder lug terminals. 0.550 in. dia by 1.279 in. lg. 82679 P/N TS187R1W5B.	
XDS6		LIGHT, INDICATOR: white lens cap, engraved black "6", hole mounting socket with solder lug terminals. 0.550 in. dia by 1.279 in. lg. 82679 P/N TS187R1W6B.	
XDS7		LIGHT, INDICATOR: red lens cap, engraved black "1" hole mounting socket with solder lug terminals. 0.550 in. dia by 1.279 in. lg. 82679 P/N TS187R1R1B.	
XDS8		LIGHT, INDICATOR: red lens cap, engraved black "2", hole mounting socket with solder lug terminals. 0.550 in. dia by 1.279 in. lg. 82679 P/N TS187R1R2B.	
XDS9		LIGHT, INDICATOR: red lens cap, engraved black "3" hole mounting socket with solder lug terminals. 0.550 in. dia by 1.279 in. lg. 82679 P/N TS187R1R3B.	
XDS10		LIGHT, INDICATOR: red lens cap, engraved black "4", hole mounting socket with solder lug terminals 0.550 in. dia by 1.279 in. lg. 82679 P/N TS187R1R4B.	
XDS11		LIGHT, INDICATOR: red lens cap, engraved black "5" hole mounting socket with solder lug terminals. 0.550 in. dia by 1.279 in. lg. 82679 P/N TS187R1R5B.	
XDS12		LIGHT, INDICATOR: red lens cap, engraved black "6", hole moutning socket with solder lug, terminals. 0.550 in. dia by 1.279 in. lg. 82679 P/N TS187R1R6B.	
J1		Connector, Receptacle, Metal. P/N MS-3106B-20-29P.	

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG NO.
		RTIH-4, INDICATOR, CHANNEL-FREQUENCY: ID-1678/URT. Monitor unit for remote tuning system which has control positions.	
A1		CIRCUIT CARD ASSEMBLY: 3 capacitors, 16 integrated circuits, 4 semiconductors, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4782.	
A2		CIRCUIT CARD ASSEMBLY: 6 resistors, 3 capacitors, 1 relay, 1 transistor, 4 semiconductors, plug-in type; 4.375 in. lg by 4.125 in. wd by 0.375 in. hg. 82679 P/N A4494.	
A3		CIRCUIT CARD ASSEMBLY: 1 resistor, 1 capacitor, 14 integrated circuits, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4531.	
A4		CIRCUIT CARD ASSEMBLY: 15 integrated circuits, plug-in item; 4.375 in. hg. by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4495.	
A5		SAME AS A4.	
A6		CIRCUIT CARD ASSEMBLY: 12 integrated circuits, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4493.	
A7		SAME AS A6.	
A8		CIRCUIT CARD ASSEMBLY: 2 capacitors, 1 resistor, 14 integrated circuits, plug-in type. 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 A4530.	
A9		CIRCUIT CARD ASSEMBLY: 5 resistors, 3 capacitors, 10 integrated circuits, 4 semiconductors, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4496.	
A10		CIRCUIT CARD ASSEMBLY: 17 resistors, 2 capacitors, 2 integrated circuits, 4 transistors, 2 semiconductors, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4545.	
A11		NOT USED.	
A12		NOT USED.	
A13		NOT USED.	
A14		CIRCUIT CARD ASSEMBLY: 4 capacitors, 11 integrated circuits, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4492.	
A15		SAME AS A14.	
A16		SAME AS A14.	

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG NO.
B1		FAN, AXIL: 115 VAC, 50/60 Hz, CMF-45 at 60 Hz free delivery. Plastic blade, aluminum housing with black enamal finish. 3.625 in. by 3.625 in. by 1.500 in. o/a. 82679 P/N BL131.	
C1		CAPACITOR, FIXED, ELECTROLYTIC: 1200 uf, 40 wvdc, 2.063 in. dia by 4.500 in. lg. Dwg CE112-12, 80183 P/N 36D123G040BC2A.	
C2		CAPACITOR, FIXED, ELECTROLYTIC: 2600 uf, 50 wvdc, 1.438 in. dia by 3.500 in. lg. Dwg CE112-6, 80183 P/N36D262G050AB6B.	
C3		CAPACITOR, FIXED, ELECTROLYTIC: 100 uf, 450 wvdc, 1.438 in. dia by 3.500 in. lg. Dwg CE112-13, 80183 P/N 36D101G450AB6A.	
CR1		RECTIFIER, SEMICONDUCTOR DEVICE: 100 PIV per leg DC or recurrent volts; full wave rectification. 1.125 in. lg by 1.125 in. wd by 0.406 in. high. Solder lug terminals. 82679 P/N RX108-2.	
CR2		SEMICONDUCTOR DEVICE, DIODE: MIL type 1N3015B.	
DS1		LAMP, INCANDESCENT: single contact, T- 1 3/4 base, 28 v ac or dc, 0.04 amps. Dwg BI110-7, 08806 P/N 327.	
DS2 thru DS9		SAME AS DS1.	
DS10		INDICATOR, DIGITAL DISPLAY: displays numerals 0 thru 9, minimum supply voltage 170 vdc, 14 pin type terminals. 1.020 in. dia by 1.120 in. hg from mtg surface. 82679 P/M BI118.	
DS11		SAME AS DS10.	
DS12		LAMP, GLOW: 110-125 vac, cylindrical clear lens. 0.284 in. dia by 1.328 in. lg. Dwg BI119-HL7. 72619 P/N 507-3836-1537-600.	
DS13 thru DS16		SAME AS DS10.	
F1		FUSE, CARTRIDGE TYPE: 0.5 amp, 125 v. 0.250 in. dia by 1.250 in. lg. Dwg FU102-1.5, 71400 P/N MDL-1 1/2.	
F2		SAME AS F1.	
J1		CONNECTOR: MIL type MS3102A20-29S.	
J2		CONNECTOR: MIL type MS3102A20-27P.	

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG NO.
J3		CONNECTOR: MIL type MS3102A14S1P.	
Q1		TRANSISTOR: MIL type 2N3055.	
R1		RESISTOR: MIL type RE75G2501.	
R2		RESISTOR: MIL type RE65GR250.	
R3		SAME AS R2.	
S1		SWITCH: MIL type ST22K.	
T1		TRANSFORMER, POWER, STEP-UP, STEP DOWN: primary; 115/230V, 50/60 cps, 1 phase: secondary; 20v, 6A DC, 20v, 600 MADC, 280v CT, 25 MADC, 15v, 65 MADC. Hermatically sealed metal case, stud mounted. 13 solder stud terminals. 5.000 in. lg by 4.375 in. wd by 3.750 in. hg. 82679 P/N TF355.	
TB1		TERMINAL BOARD: barrier type; two 6-32 thd single screw lugs. Phenolic body 0.406 in. by 0.875 in. by 1.500 in. Dwg TM100-2, 86178 P/N 2-164YD.	
XA1		CONNECTOR, RECEPTACLE, ELECTRICAL: 22 double sided female contacts rated at 5 amps and 1,800 v RMS. Phenolic housing with floating bushing and eyelet termianls. Accepts printed circuit board thickness of 0.054 in. to 0.071 in. 82679 P/N JJ319-22-DFE.	
XA2 thru XA19		SAME AS XA1.	
XDS1		LIGHT INDICATOR: Green lens. 1.35 to 28v. T-1-3/4 lamp base. 2 terminals. 0.437 in. dia by 1.500 in. lg. Dwg TS153-9, 72619 P/N 162-8430-1472-502.	
XDS2		SAME AS XDS1.	
XDS3		SAME AS XDS1.	
XDS4		LIGHT, INDICATOR: yellow lens, 1.35 to 28v. T-1-3/4 lamp base, 2 terminals. 0.437 in. dia by 1.500 in. lg. Dwg TS153-10, 72619 P/N 162-8430-1473-502.	
XDS5		SAME AS XDS4.	
XDS6		SAME AS XDS1.	
XDS7		LIGHT, INDICATOR: Red lens. 1.35 to 28V. T-1-3/4 lamp base. 2 terminals. 0.437 in. dia by 1.500 in. lg. Dwg TS153-502, 72619 P/N 162-8430-1471-502.	
XDS8		SAME AS XDS7.	
XDS9		SAME AS XDS7.	
XDS10		SOCKET, ELECTRON TUBE: 14 silver plated beryllium copper contacts. 1.562 in. lg by 0.750 in. wd by 0.646 in. hg. Dwg TS192, 83594 P/N SK136.	

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG NO.
XDS11 thru XDS16		SAME AS XDS10.	
XF1		FUSEHOLDER, LAMP INDICATING: 15 amps, neon lamp, clear knob, accommodates 1/4 in. dia by 1.250 in. lg fuse. Dwg FH104-3, 71400 P/N HKL-X.	
XF2		SAME AS XF1.	
Z1		VOLTAGE REGUALTOR: input voltage 40 v; output voltage 30 v; power dissipation 400 ma. 0.330 in. dia by 0.500 in. lg. 82679 P/N VR104.	
Z2		SAME AS Z1.	
ZX1 thru ZX9		NOT USED.	
ZX10		INTEGRATED CIRCUIT, DECODER: 200 $\pm$ 10VDC at 4.0 ma. Provides circuitry for indicator, digital display. 12 pins. 0.989 in dia by 1.641 in. lg. 82679 P/N IC104.	
ZX11 thru ZX16		SAME AS ZX10	
A1		CIRCUIT CARD ASSEMBLY: 3 capacitors, 16 integrated circuits, 4 semiconductors, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4782.	
A1C1 thru A1C3		CAPACITOR, FIXED, CERAMIC: 1,000 pf, GMV, 500 wvdc. 0.310 in. dia by 0.156 in. thk; 0.250 in. lead spacing. 82679 P/N CC100-29.	
A1CR1 thru A1CR4		SEMICONDUCTOR DEVICE: MIL type IN914.	
A1Z1 thru A1Z8		INTEGRATED CIRCUIT, DIGITAL FLIP-FLOP: 11 pins, plastic case; -4.5 input voltage, -9.5 output voltage. 0.895 in. lg by 0.678 in. wd by 0.495 in. hg. 82679 P/N NW151.	
A1Z9		INTEGRATED CIRCUIT, DIGITAL AND GATE: 11 pins, plastic case; -12 supply voltage. 0.875 in. lg by 0.875 in. lg by 0.625 in. wd by 0.438 in. hg. 82679 P/N NW142-44.	
A1Z10		SAME AS A1Z1.	
A1Z11		INTEGRATED CIRCUIT, DIGITAL AND GATE: 11 pins, plastic case: -12 supply voltage. 0.875 in. lg by 0.625 in. wd by 0.125 in. hg. 82679 P/N NW142-24.	

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG NO.
A1Z12		INTEGRATED CIRCUIT, DIGITAL POSITIVE EMITTER FOLLOWER: 12 pins, plastic case; -6vdc input voltage, -6.7 vdc output voltage. 0.865 in. lg by 0.678 in. wd by 0.495 in. hg. 82679 P/N NW148-4.	
A1Z13		SAME AS A1Z12.	
A1Z14		INTEGRATED CIRCUIT, DIGITAL AND GATE: 11 pins, plastic case; -12 supply voltage. 0.875 in. lg by 0.625 in. wd by 0.438 in. hg. 82679 P/N NW 142-34.	
A1Z15		SAME AS A1Z12.	
A1Z16		SAME AS A1Z14.	
A2		CIRCUIT CARD ASSEMBLY: 6 resistors, 3 capacitors, 1 relay, 1 transistor, 4 semiconductors, plug-in type; 4.375 in. lg by 4.125 in. wd by 0.375 in. hg. 82679 P/N A4494.	
A2C1		CAPACITOR, FIXED, MICA: 1,000 uuf, ± 1/2% tol, 100 wvdc. 0.640 in. lg by 0.591 in. wd by 0.198 in. thk. 82679 P/N CM11F102D1S.	
A2C2		CAPACITOR: MIL type CL65BG101KP3.	
A2C3		SAME AS A2C2.	
A2CR1		SEMICONDUCTOR DEVICE: MIL type 1N4245.	
A2CR2		SAME AS A2CR1.	
A2CR3		SAME AS A2CR1.	
A2CR4		RECTIFIER, SEMICONDUCTOR DEVICE: 1.5 vdc output current, 200 peak reverse v. 0.688 in. wd by 0.469 in. hg by 0.250 in. thk. 82679 P/N DD130-200-1.5.	
A2K1		RELAY, ARMATURE: mercury wetted contacts rated at 2 amps max, 500 v max. 2 windings rated at 250 ohms each ± 10%. 2.063 in. lg by 0.625 in. hg by 0.625 in. wd. wire lead mounted. 82679 P/N RL167-1.	
A2Q1		TRANSISTOR: MIL type 2N3013.	
A2R1		RESISTOR: MIL type RC20GF472J.	
A2R2		RESISTOR: MIL type RC32GF271J.	
A2R3		SAME AS A2R1.	
A2R4		RESISTOR, VARIABLE, COMPOSITION: 1,000 ohms, ± 10% tol, clockwise modified log taper. 0.500 in. lead mounted. 82679 P/N RV111-U-102A.	
A2R5		RESISTOR: MIL type RC32GF101J.	
A2R6		RESISTOR: MIL type RC32GF221J.	
A3		CIRCUIT CARD ASSEMBLY: 1 resistor, 1 capacitor, 14 integrated circuits; plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4531.	
A3C1		CAPACITOR, FIXED, ELECTROLYTIC: 20 uf, - 10% + 150% at 125 cps, 25°C, 50 wvdc. 0.312 in. dia by 0.750 in. lg. Dwg CE105-20-25, 14655 P/N NLW20-25.	
A3R1		RESISTOR: MIL type RC07GF182J.	

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG NO.
A3Z1 thru A3Z6		SAME AS A1Z1.	
A3Z7		INTEGRATED CIRCUIT, DIGITAL AND GATE: 11 pins, plastic case; supply voltage, -12v. 0.1875 in. lg by 0.625 in. wd by 0.438 in. hg. 82679 P/N NW142-24.	
A3Z8		SAME AS A1Z1.	
A3Z9		INTEGRATED CIRCUIT, DIGITAL INVERTER: 11 pins, plastic case; supply voltage; variable by usage. 0.875 in. lg by 0.625 in. wd by 0.438 in. hg. 82679 P/N NW150-4.	
A3Z10		SAME AS A1Z1.	
A3Z11		SAME AS A3Z9.	
A3Z12		SAME AS A1Z14.	
A3Z13		SAME AS A3Z12.	
A3Z14		INTEGRATED CIRCUIT, DIGITAL NOR GATE: 11 pins, plastic case; supply voltage, + and -12v. 0.875 in. lg by 0.625 in. wd by 0.438 in. hg. 82679 P/N NW145-61.	
A4		CIRCUIT CARD ASSEMBLY: 15 integraged circuits, plug-in item; 4.375 in. hg. by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4495.	
A4Z1 thru A4Z3		SAME AS A1Z14.	
A4Z4 thru A4Z15		SAME AS A1Z1.	
A5		SAME AS A4.	
A6		CIRCUIT CARD ASSEMBLY: 12 integrated circuits, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4493.	
A6Z1 thru A6Z8		SAME AS A1Z1.	
A6Z9		SAME AS A3Z7.	
A6Z10		INTEGRATED CIRCUIT, DIGITAL POSITIVE EMITTER FOLLOWER: 12 pins, plastic case; -6 vdc input, -6.7 output. 0.865 in. lg by 0.678 in. wd by 0.495 in. hg. 82679 P/N NW148.	
A6Z11		SAME AS A6Z10.	
A6Z12		SAME AS A3Z7.	

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG NO.
A7		SAME AS A6.	
A8		CIRCUIT CARD ASSEMBLY: 1 resistor, 2 capacitors, 14 integrated circuits; plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4530.	
A8C1		CAPACITOR, FIXED, MICA: 3,900 uuf, ± 2% tol, 500 wvdc, 0.680 in. lg by 0.540 in. wd by 0.270 in. thk. 82679 P/N CM112F392F5S.	
A8C2		CAPACITOR, FIXED, MICA: 1,000 uuf, ± 1% tol, 100 wvdc, 0.790 in. lg by 0.570 in. wd by 0.340 in. thk. 82679 P/N CM111F102F1S.	
A8R1		SAME AS A2R1.	
A8Z1		INTEGRATED CIRCUIT, DIGITAL AND GATE: 11 pins, plastic case; supply voltage, -12v. 0.875 in. lg by 0.625 in. wd by 0.438 in. hg. 82679 P/N NW141-91.	
A8Z2 thru A8Z6		SAME AS A1Z1.	
A8Z7		INTEGRATED CIRCUIT, DIGITAL, SINGLE SHOT GENERATOR: 11 pins, plastic case; supply voltage, + and -12v. 0.875 in. lg by 0.625 in. wd by 0.438 in. hg. 82679 P/N NW153.	
A8Z8		INTEGRATED CIRCUIT, COMPLEMENTARY EMITTED FOLLOWER: 11 pins, plastic case; supply voltage; -12v. 0.875 in. lg by 0.625 in. wd by 0.438 in. hg. 82679 P/N NW147-2.	
A8Z9		SAME AS A6Z10.	
A8Z10		SAME AS A1Z14.	
A8Z11 thru A8Z14		SAME AS A6Z10.	
A9		CIRCUIT CARD ASSEMBLY: 5 resistors, 3 capacitors, 10 integrated circuits, 4 semiconductors, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4496.	
A9C1		CAPACITOR, FIXED, PLASTIC: 1.8 uf, ± 5% tol, 0.656 in. dia by 1.250 in. lg. 82679 P/N CN112A185J.	
A9C2		SAME AS A9C1.	
A9C3		CAPACITOR, FIXED, MICA: 1500 pf, ± 1/2% tol, 500 wvdc. 0.440 in. lg by 0.473 in. wd by 0.170 in. thk. 82679 P/N CM112F152D5S.	
A9CR1		SAME AS A1CR1.	
A9CR2		SAME AS A9CR1.	

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG NO.
A9CR3		SAME AS A1CR1.	
A9CR4		SAME AS A1CR1.	
A9R1		RESISTOR, VARIABLE, WIRE WOUND: 500 ohms, ± 10% tol, 1/2 watt. 1.250 in. lg by 0.250 in. wd by 0.313 in. hg. wire lead mounted. 82679 P/N RV121-1-501.	
A9R2		RESISTOR: MIL type RC07GF472J.	
A9R3		RESISTOR: MIL type RC07GF122J.	
A9R4		SAME AS A9R3.	
A9R5		RESISTOR: MIL type RC32GF331J.	
A9Z1		INTEGRATED CIRCUIT, DIGITAL TIMING GENERATOR: 11 pins, plastic case; supply voltage -12v. 0.875 in. lg by 0.625 in. wd by 0.438 in. hg. 82679 P/N NW142-34.	
A9Z2		SAME AS A1Z1.	
A9Z3		INTEGRATED CIRCUIT, DIGITAL DUAL INVERTER: 11 pins, plastic case; supply voltage, + and -12v. 0.875 in. lg by 0.625 in. wd by 0.438 in. hg. 82679 P/N NW150-2.	
A9Z4		SAME AS A8Z7.	
A9Z5		SAME AS A1Z1.	
A9Z6		SAME AS A1Z1.	
A9Z7		SAME AS A1Z1.	
A9Z8		INTEGRATED CIRCUIT, DIGITAL AND GATE: 11 pins, plastic case; supply voltage, -12v. 0.875 in. lg by 0.625 in. wd by 0.438 in. hg. 82679 P/N NW142-43.	
A9Z9		SAME AS A9Z8.	
A9Z10		SAME AS A8Z8.	
A10		CIRCUIT CARD ASSEMBLY: 17 resistors, 4 capacitors, 2 integrated circuits, 4 transistors, 2 semiconductors, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4545.	
A10C1		NOT USED.	
A10C2		NOT USED.	
A10C3		CAPACITOR, FIXED, MICA: 47 uuf, ±2%, tol, 500 wvdc. 0.440 in. lg by 0.473 in. wd by 0.170 in. thk. 82679 P/N CM11E470G5S..	
A10C4		SAME AS A10C3.	
A10CR1		RECTIFIER, SEMICONDUCTOR DEVICE: peak reverse v, 260 v. 1.50 vdc output current, 0.688 in. wd by 0.469 in. hg by 0.250 in. thk. 82679 P/N DD130-200-1.5.	
A10CR2		RECTIFIER, SEMICONDUCTOR DEVICE: 1.5 vdc output current, peak reverse v, 600 v. 0.688 in. hg by 0.250 in. thk. 82679 P/N DD130-600-1.5.	

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG NO.
A10Q1		TRANSISTOR: MIL type 2N1485.	
A10Q2		TRANSISTOR: MIL type 2N4036.	
A10Q3		SAME AS A10Q1.	
A10Q4		SAME AS A10Q2.	
A10R1		RESISTOR: MIL type RC20GF680J.	
A10R2		RESISTOR: MIL type RC20GF560J.	
A10R3		RESISTOR: MIL type RN60D1802D.	
A10R4		RESISTOR: MIL type RC20GF471J.	
A10R5		RESISTOR: MIL type RN60D2711D.	
A10R6		RESISTOR: MIL type RC20GF101J.	
A10R7		SAME AS A9R5.	
A10R8		RESISTOR: MIL type RC32GF104J.	
A10R9		SAME AS A10R3.	
A10R10		SAME AS A10R5.	
A10R11		SAME AS A10R1.	
A10R12		SAME AS A10R2.	
A10R13		RESISTOR: MIL type RC20GF561J.	
A10R14		RESISTOR, FIXED, WIRE WOUND: 3 ohms, ±5% tol, 5 watts. 0.250 in. dia by 1.000 in. lg, wire lead mounted. 82679 P/N RR114-3W.	
A10R15		SAME AS A2R6.	
A10R16		RESISTOR: MIL type RC20GF1R0J.	
A10R17		SAME AS A10R16.	
A10Z1		VOLTAGE REGULATOR, input voltage, 40V, output voltage 30V, power dissipation 400 mw. 0.330 in. dia by o.175 in. deep. 8 pin leads 0.500 in. lg. 82679 P/N VR104.	
A10Z2		SAME AS A10Z1.	
A14		CIRCUIT CARD ASSEMBLY: 4 capacitors, 11 integrated circuits, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4492.	
A14C1		SAME AS A1C1.	
A14C2		SAME AS A1C1.	
A14C3		SAME AS A1C1.	
A14C4		SAME AS A1C1.	
A14Z1		SAME AS A1Z1.	
A14Z2		SAME AS A1Z1.	
A14Z3		SAME AS A1Z1.	
A14Z4		SAME AS A1Z1.	
A14Z5		SAME AS A1Z9.	
A14Z6		SAME AS A1Z12.	
A14Z7		SAME AS A1Z9.	
A14Z8		SAME AS A1Z12.	
A14Z9		SAME AS A1Z14.	
A15		SAME AS A14.	
A16		SAME AS A14.	

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG NO.
3		RTPH-4, PROGRAMMER, ELECTRONIC COMMAND SIGNALS, C-8335/URT. Model RTPH-4 allows one control location to take command over many transmitter systems. Instructions are programmed by means of push buttons on the front of the unit.	
A1		CIRCUIT CARD ASSEMBLY: 22 resistors, 7 capacitors, 2 voltage regulators, 3 transistors, 2 semiconductors, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg 82679 P/N A4601.	
A2		CIRCUIT CARD ASSEMBLY: 7 resistors, 2 capacitors, 1 relay, 2 semiconductors, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4516.	
A3		CIRCUIT CARD ASSEMBLY: 2 resistors, 2 capacitors, 9 integrated circuits, 1 coil, 2 semiconductors, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4518.	
A4		CIRCUIT CARD ASSEMBLY: 1 resistor, 2 integrated circuits, 5 semiconductors, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4598.	
A5		CIRCUIT CARD ASSEMBLY: 80 semiconductors, plug-in item, 4.375 in. lg by 4.125 in. wd by 0.375 in. hg. 82679 P/N A4453.	
A6		SWITCH ASSEMBLY: 3 Banks of 15 ea. push-button switches. 3.125 in. hg by 11.125 in. wd by 3.750 in. deep. 82679 P/N SW518.	
C1		CAPACITOR, FIXED, ELECTROLYTIC: 2600 uf, 50 wvdc. 1.438 in. dia by 3.500 in. lg. Dwg CE112-6, 80183 P/N 36D262G050AB6B.	
C2		SAME AS C1.	
DS1		LAMP INCANDESCENT: Single contact, T-1-3/4 base, 28 vac or dc, 0.04 amps. Dwg BI110-7, 08806 P/N 327.	
F1		FUSE CARTRIDGE TYPE: 1 amp, 125 v. 0.250 in. dia 1.250 in. lg. Dwg FU102-1, 71400 P/N MDL-1.	

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG NO.
F2		SAME AS F1.	
FL1		FILTER, RADIO INTERFERENCE: current, 5 amps; voltage rating, 500 vdc; 250 vac at 60 cps. 1.000 in. dia by 2.688 in. lg. Dwg FI105-2, 80183 P/N 5JX100.	
FL2		SAME AS FL1.	
J1		CONNECTOR: MIL type MS3102A14S1P.	
Q1		TRANSISTOR: MIL type 2N3055.	
S1		SWITCH: MIL type ST22K.	
T1		TRANSFORMER, POWER, STEP DOWN: Primary, 115/230 V, 50/60 hz, 1 phase. Secondary, 18 v, 30 madc; 20v, 200 madc; 18v, 2 adc. Hermetically sealed metal case, stud mtd. 3.875 in. hg by 3.937 in. lg by 3.375 in. wd. 82679 P/N TF376.	
XA1		CONNECTOR, RECEPTACLE, ELECTRICAL: 22 double sided female contacts rated at 5 amps and 1800 volts, RMS. Phenolic housing with floating bushing and eyelet terminals. Accepts printed circuit board thickness of 0.054 in. to 0.071 in. 82679 P/N JJ319-22-DFE.	
XA2		SAME AS XA1.	
XA3		SAME AS XA1.	
XA5		SAME AS XA1.	
XDS1		LIGHT, INDICATOR: translucent white lens. 1.35 to 28 V T-1-3/4 lamp base. 2 terminals. 0.437 in. dia by 1.500 in. lg. Dwg TS153-12, 72619 P/N 162-8430-1475-502.	
XF1		FUSEHOLDER, LAMP INDICATING: 90-250 v, 15 amps, neon lamp, clear knob, accommodates 1/4 in. dia by 1 1/4 in. lg fuse. Dwg FH104-3, 71400 P/N HKL-X.	
XF2		SAME AS XF1.	
XQ1		SOCKET, SEMICONDUCTOR DEVICE: 2 pin contact accommodation, 0.040 in. or 0.050 in. dia; polarized; 1 terminal lug grounding strap; 1.578 in. lg, 1.000 in. wd 0.172 in. thk. Dwg TS166-1, 91506 P/N 8038-1G1.	
A1		CIRCUIT CARD ASSEMBLY: 22 resistors, 7 capacitors, 2 voltage regulators, 3 transistors, 2 semiconductors, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4601.	
A1C1		CAPACITOR, FIXED, ELECTROLYTIC: 4.7uf, 10% tol, 35 wvdc, 0.175 in. dia by 0.438 in. lg. 82679 P/N CE123-475-35B2.	

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG NO.
A1C2		SAME AS A1C1.	
A1C3		CAPACITOR, FIXED, ELECTROLYTIC: 100 uf, ±10% tol, 20 wvdc, 0.341 in. dia by 6.750 in. lg. 82679 P/N CE123-107-20S2.	
A1C4		CAPACITOR, FIXED, MICA: 47uuf, ± 2% tol, 500 wvdc. 0.440 in. lg by 0.473 in. wd by 0.170 in. thk. 82679, P/N CM111E470G5S.	
A1C5		SAME AS A1C4.	
A1C6		CAPACITOR, FIXED, CERAMIC: 10,000 uuf, +80% - 20% tol, 25 wvdc; 0.385 in. dia by 0.156 in. thk, 0.250 in. lead spacing. 82679 P/N CC100-41.	
A1C7		Same as A1C6.	
A1CR1		RECTIFIER, SEMICONDUCTOR DEVICE: peak reverse v, 260 v. 0.688 in. wd, 0.469 in. hg, 0.250 in. thk. 82670 P/N DD130-200-1.5.	
A1CR2		RECTIFIER, SEMICONDUCTOR DEVICE: 200 PIV; plastic case, 4 wire lead mounted. 0.750 in. lg by 0.750 in. wd by 0.438 in. hg. 82679 P/N DD143-27.	
A1Q1		TRANSISTOR: MIL type 2N1485.	
A1Q2		TRANSISTOR: MIL type 2N4036.	
A1Q3		SAME AS A1Q2.	
A1R1		RESISTOR: MIL type RC20GF680J.	
A1R2		RESISTOR: MIL type RC20GF560J.	
A1R3		RESISTOR: MIL type RC20GF561J.	
A1R4		RESISTOR: MIL type RN60D2711D.	
A1R5		RESISTOR: MIL type RN60D1802D.	
A1R6		RESISTOR, FIXED, WIRE WOUND: 3 ohms, ± 5% tol, 5 watts. 0.250 in. dia by 1.000 in. lg, wire lead mounted. 82679 P/N RR114-3W.	
A1R7		RESISTOR: MIL type RC20GF1R0J.	
A1R8		SAME AS A1R7.	
A1R9		RESISTOR: MIL type RC32GF271J.	
A1R10		RESISTOR: MIL type RC20GF272J.	
A1R11		RESISTOR: MIL type RC20GF122J.	
A1R12		SAME AS A1R5.	
A1R13		SAME AS A1R4.	
A1R14		RESISTOR, FIXED, WIRE WOUND: 1 ohm, ±5% tol, 5 watts. 0.250 in. dia by 1.000 in. lg, wire lead mounted. 82679, P/N RR114-1W.	
A1R15		SAME AS A1R1.	
A1R16		SAME AS A1R2.	
A1R17		RESISTOR: MIL type RC20GF361J.	
A1R18		RESISTOR: MIL type RC42GF271J.	
A1R19		SAME AS A1R7.	
A1R20		SAME AS A1R7.	
A1R21		SAME AS A1R7.	
A1R22		SAME AS A1R7.	

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG NO.
A1Z1		VOLTAGE REGULATOR: input voltage 40v; output voltage 30v; 400 mw power dissipation. 0.330 in. dia by 0.175 in. lg. 82679 P/N VR104.	
A1Z2		SAME AS A1Z1.	
A2		CIRCUIT CARD ASSEMBLY: 7 resistors, 2 capacitors, 1 relay, 2 semiconductors, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N A4516.	
A2C1		CAPACITOR, FIXED, MICA: 1,000 uuf, ±1% tol, 500 wvdc, 0.640 in. lg, 0.591 in. wd by 0.198 in thk. 82679, P/N CM111F102J1S.	
A2C2		SAME AS A2C1.	
A2CR1		SEMICONDUCTOR: MIL type 1N4245.	
A2CR2		SAME AS A2CR1.	
A2K1		RELAY, ARMATURE: mercury wetted contacts rated at 2 amps max, 500 v max. 2 windings rated at 250 ohms each ± 10%. 2.063 in. lg by 0.625 in. hg by 0.625 in. wd, wire lead mounted. 82679 P/N RL167-1.	
A2R1		RESISTOR: MIL type RC20GF471J.	
A2R2		RESISTOR: MIL type RC20GF681J.	
A2R3		SAME AS A2R2.	
A2R4		RESISTOR: MIL type RC20GF4R7J.	
A2R5		SAME AS A2R4.	
A2R6		RESISTOR: MIL type RC20GF101J.	
A2R7		SAME AS A2R6.	
A3		CIRCUIT CARD ASSEMBLY: 2 resistors, 2 capacitors, 9 integrated circuits, 1 coil, 2 semiconductors, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82579 P/N A4518.	
A3C1		CAPACITOR, FIXED, PLASTIC: 1.8 uf, ±5% tol. 0.406 in. dia by 0.813 in. lg. 82679 P/N CN112A185J.	
A3C2		SAME AS A3C1.	
A3CR1		SEMICONDUCTOR: MIL type 1N914.	
A3CR2		SAME AS A3CR1.	
A3L1		COIL, RF, FIXED: 1000 uh, ±10%, 17.5 ohms max dc res. 0.157 dia, 0.450 in. lg. 82679 P/N CL275-102.	
A3R1		RESISTOR, VARIABLE, WIRE WOUND: 500 ohms, ±10% tol, 1/2 watt. 1.250 in. lg by 0.250 in. wd by 0.313 in. hg, wire lead mounted. 82679 P/N RV121-1-501.	
A3R2		RESISTOR: MIL type RC07GF122J.	

REF DESIG	NOTES	NAME AND DESCRIPTION	FIG NO.
A3Z1		INTEGRATED CIRCUIT, DIGITAL TIMING GENERATOR: 11 pins, plastic case; -8v output voltage. 0.895 in. lg by 0.678 in. wd by 0.495 in. hg. 82679 P/N NW152.	
A3Z2		INTEGRATED CIRCUIT, DIGITAL FLIP FLOP: 11 pins, plastic case; -4.5v input voltage, -9.5 v output voltage. 0.895 in. lg by 0.678 in. wd by 0.495 in. hg. 82679 P/N NW 151.	
A3Z3		SAME AS A3Z2.	
A3Z4		SAME AS A3Z2.	
A3Z5		SAME AS A3Z2.	
A3Z6		INTEGRATED CIRCUIT, DIGITAL AND GATE: 11 pins, plastic case; supply voltage, - 12 v. 0.875 in. lg by 0.625 in. wd by 0.438 in. hg. 82679 P/N NW141-42.	
A3Z7		SAME AS A3Z6.	
A3Z8		SAME AS A3Z6.	
A3Z9		INTEGRATED CIRCUIT, DIGITAL NOR GATE: 11 pins, plastic case; supply voltage, + and -12v. 0.875 in. lg by 0.625 in. wd by 0.438 in. hg. 82679 P/N NW145-61.	
A4		CIRCUIT CARD ASSEMBLY: 1 resistor, 2 integrated circuits, 5 semiconductors, plug-in item; 4.375 in. lg by 4.125 in. wd by 0.750 in. hg. 82679 P/N P/N A4598.	
A4CR1 THRU A4CR5		SAME AS A3CR1.	
A4R1		RESISTOR: MIL type RC07GF681J.	
A4Z1		INTEGRATED CIRCUIT, DIGITAL DUAL INVERTER: 11 pins, plastic case; supply voltage, + and -12v. 0.875 in lg by 0.625 in. wd by 0.438 in. hg. 82679 P/N NW150-2.	
A4Z2		SAME AS A3Z2.	
A5		CIRCUIT CARD ASSEMBLY: 80 Semiconductors, plug-in item, 4.375 in. lg by 4.125 in. wd by 0.375 in. hg. 82679 P/N A4453.	
A5CR1 THRU A5CR80		SAME AS A3CR1.	
A6		SWITCH ASSEMBLY: 3 banks of 15 each push button switches. 3.125 in. hg by 11.125 in. wd by 3.750 in. deep. 82679 P/N SW518.	