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TECHNICAL MANUAL

for

ELECTRONIC PROGRAMMER

MODEL RTPF-1

THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, N.Y. OTTAWA, ONTARIO

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IN-4096

Issue Date: 12 April 1966

NOTICE

THE TECHNICAL MATERIEL CORPORATION
COMMUNICATIONS ENGINEERS
700 FENIMORE ROAD MAMARONECK, N. Y.

Warranty

The Technical Materiel Corporation, hereinafter referred to as TMC, warrants the equipment (except electron tubes,* fuses, lamps, batteries and articles made of glass or other fragile or other expendable materials) purchased hereunder to be free from defect in materials and workmanship under normal use and service, when used for the purposes for which the same is designed, for a period of one year from the date of delivery F.O.B. factory. TMC further warrants that the equipment will perform in a manner equal to or better than published technical specifications as amended by any additions or corrections thereto accompanying the formal equipment offer.

TMC will replace or repair any such defective items, F.O.B. factory, which may fail within the stated warranty period, PROVIDED:

1. That any claim of defect under this warranty is made within sixty (60) days after discovery thereof and that inspection by TMC, if required, indicates the validity of such claim to TMC's satisfaction.
2. That the defect is not the result of damage incurred in shipment from or to the factory.
3. That the equipment has not been altered in any way either as to design or use whether by replacement parts not supplied or approved by TMC, or otherwise.
4. That any equipment or accessories furnished but not manufactured by TMC, or not of TMC design shall be subject only to such adjustments as TMC may obtain from the supplier thereof.

Electron tubes*furnished by TMC, but manufactured by others, bear only the warranty given by such other manufacturers. Electron tube warranty claims should be made directly to the manufacturer of such tubes.

TMC's obligation under this warranty is limited to the repair or replacement of defective parts with the exceptions noted above.

At TMC's option any defective part or equipment which fails within the warranty period shall be returned to TMC's factory for inspection, properly packed with shipping charges prepaid. No parts or equipment shall be returned to TMC, unless a return authorization is issued by TMC.

No warranties, express or implied, other than those specifically set forth herein shall be applicable to any equipment manufactured or furnished by TMC and the foregoing warranty shall constitute the Buyers sole right and remedy. In no event does TMC assume any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of TMC Products, or any inability to use them either separately or in combination with other equipment or materials or from any other cause.

*Electron tubes also include semi-conductor devices.

PROCEDURE FOR RETURN OF MATERIAL OR EQUIPMENT

Should it be necessary to return equipment or material for repair or replacement, whether within warranty or otherwise, a return authorization must be obtained from TMC prior to shipment. The request for return authorization should include the following information:

1. Model Number of Equipment.
2. Serial Number of Equipment.
3. TMC Part Number.
4. Nature of defect or cause of failure.
5. The contract or purchase order under which equipment was delivered.

PROCEDURE FOR ORDERING REPLACEMENT PARTS

When ordering replacement parts, the following information must be included in the order as applicable:

1. Quantity Required.
2. TMC Part Number.
3. Equipment in which used by TMC or Military Model Number.
4. Brief Description of the Item.
5. The *Crystal Frequency* if the order includes crystals.

PROCEDURE IN THE EVENT OF DAMAGE INCURRED IN SHIPMENT

TMC's Warranty specifically excludes damage incurred in shipment to or from the factory. In the event equipment is received in damaged condition, the carrier should be notified immediately. Claims for such damage should be filed with the carrier involved and not with TMC.

All correspondence pertaining to Warranty Claims, return, repair, or replacement and all material or equipment returned for repair or replacement, within Warranty or otherwise, should be addressed as follows:

THE TECHNICAL MATERIEL CORPORATION
Engineering Services Department
700 Fenimore Road
Mamaroneck, New York

RECORD OF CORRECTIONS MADE

Change No.	Date of Change	Date Entered	Entered By

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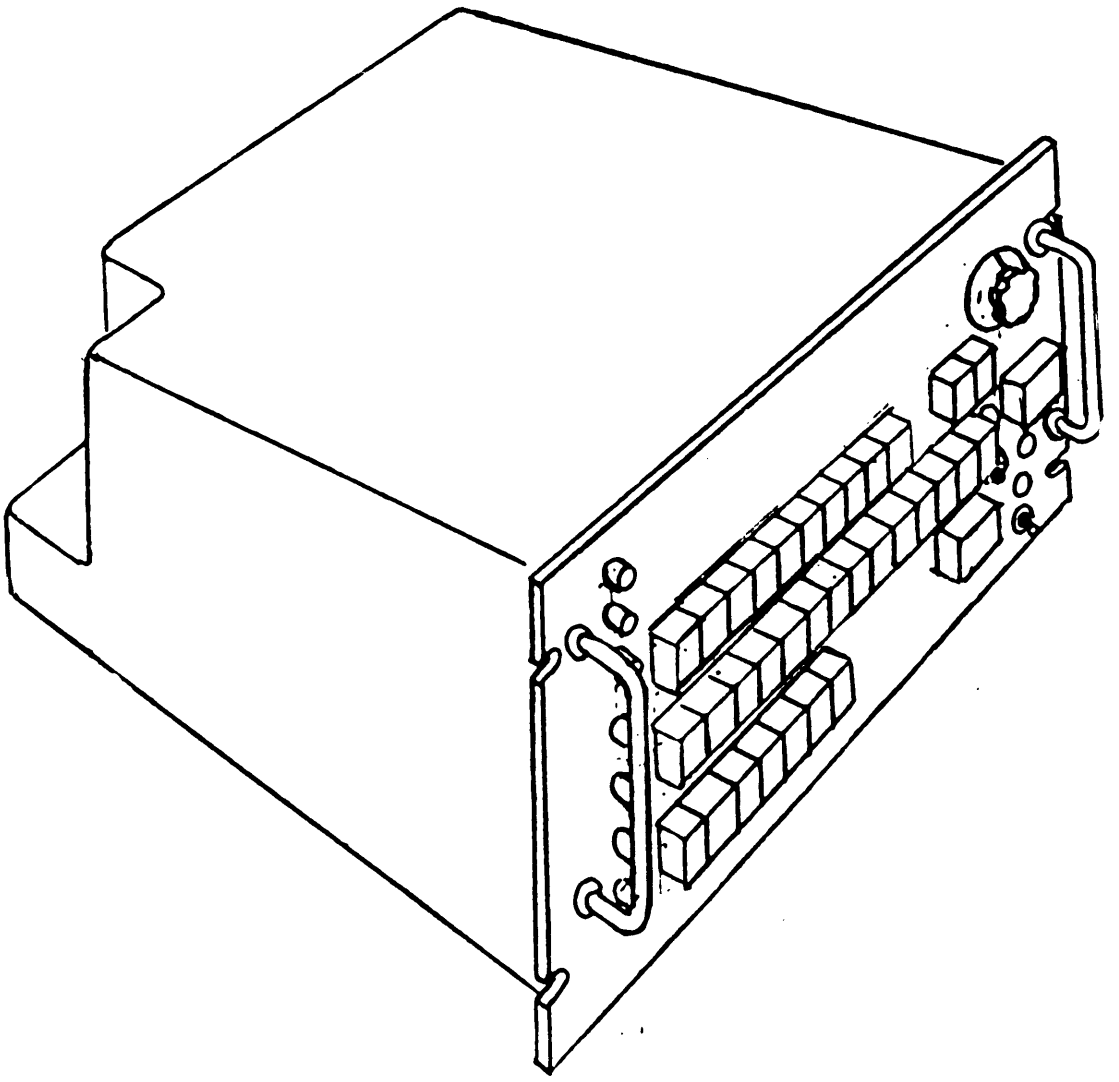

4096-1

Figure 1-1. Electronic Programmer, Model RTPF-1

SECTION 1
GENERAL INFORMATION

1-1 FUNCTIONAL DESCRIPTION

Model RTPF-1 Electronic Programmer is a teletype code generator with a key-board for the remote tuning of TMC's TechniMatiC receivers by wire or FSK radio transmission. Features include keying output for teletype transmission, a pulse output for a card/tape puncher, a pulse input for reading from a card/tape reader and controls for a re-punch operation. Five operations are possible with the RTPF. These are:

a. Manual remote tuning of the receiver by push-button keyboard.

b. Pre-programming of tuning message on card or tape through associated puncher.

c. Rapid remote tuning of the receiver by the pre-programmed punched card or tape from the associated card/tape reader.

d. A simultaneous remote receiver tuning by push-button with a recording made on tape or card by associated puncher.

e. Repunching a copy of a previously punched message by associated puncher.

1-2 PHYSICAL DESCRIPTION

The RTPF (see figure 1-1) is a 19-inch rack modular unit. The front panel is 19 inches wide x 9 inches high x 3/16 inch thick and is finished in gray enamel. The chassis extends 21 inches behind the panel.

The push-button keyboard employs switches for coding. Binary logic circuitry is made up of plug-in printed circuit cards with encapsulated transistor/diod logic modules mounted on them.

1-3 TECHNICAL SPECIFICATIONS

SIGNAL OUTPUT:	Dry contact keying for serial pulses in 7.42-unit t letype transmission pattern with 22 millisecond (60 WPM) or 13.7 millisecond (100 WPM) pulse widths.
CARD/TAPE PUNCH OUTPUT	0 to -10V parallel pulses in 5-bit code. See table 1-1 for code vs. push-buttons.
CARD/TAPE READER INPUT:	0 to -10V parallel pulses in 5-bit code. See table 1-1 for adaptibility to ASCII 7-bit codes.

TABLE 1-1. CODE VS. PUSH-BUTTONS

PUSH-BUTTON	5-BIT CODE	TELETYPE CHARACTERS	
		CCIT	ASCII*
KILOCYCLES			
0	01000	Line Feed	H
1	00100	Space	D
2	00010	Carriage Return	B
3	01001	L	I
4	01100	I	L
5	00110	N	F
6	01011	G	K
7	01101	P	M
8	01110	C	N
9	00111	M	G
CARRIER:			
AFC	01000	Line Feed	H
SYN	00010	Carriage Return	B

TABLE 1-1. CODE VS. PUSH-BUTTONS (cont'd)

PUSH-BUTTON	5-BIT CODE	TELETYPE CHARACTERS	
		CCIT	ASCII*
MEGACYCLES:			
17 MC 2	01001	L	I
18 MC 3	01000	Line Feed	H
19 MC 4	00100	Space	D
20 MC 5	01100	I	L
21 MC 6	01010	R	J
22 MC 7	01110	C	N
23 MC 8	01101	P	M
24 MC 9	01111	V	O
25 MC 10	00110	N	F
26 MC 11	00111	M	G
27 MC 12	01011	G	K
28 MC 13	00011	O	C
29 MC 14	00101	H	E
30 MC 15	00001	T	A
31 MC 16	00010	Carriage Return	B

* With first 5 bits of 7-bit code transmitted in reverse.

TABLE 1-1. CODE VS. PUSH-BUTTONS (cont'd)

PUSH-BUTTON	5-BIT CODE	TELETYPE CHARACTERS	
		CCIT	ASCII*
FUNCTION:			
MC 2-16	11001	W	Y
MC 17-31	10001	Z	Q
100 KC	10011	B	S
10 KC	10010	D	R
1 KC	10111	X	W
.1 KC	10101	Y	U
CAR	11100	U	\
TUNE	10000	E	P

* With first 5 bits of 7-bit code transmitted in reverse.

SECTION 2
INSTALLATION

2-1 INITIAL INSPECTION

Each RTPF has been thoroughly checked and tested at the factory before shipment. Upon arrival at the operating site, inspect case and its contents immediately for possible damage. Unpack the equipment carefully. Inspect all packing material for parts which may have been shipped as "loose items".

With respect to damage to the 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 MECHANICAL INSTALLATION

Overall dimensions and mounting data are shown in figure 2-1. If the RTPF is to be used in a TMC rack system, refer to system manual for location and mounting instructions. The unit is designed to be mounted by its front panel, with or without chassis drawer slides. When shipped as part of a system, the drawer slides are shipped premounted in the rack. When the RTPF is shipped alone, no slides are included unless specified on the order; however, the chassis sides contain threaded mounting holes for TMC TK-115 slides, if required.

2-3 ELECTRICAL INSTALLATION

If the RTPF arrives as part of the shipment of a TMC rack system, refer to the system manual for connection of cables to associated equipment within the rack. When the RTPF is to be used separately, however, make the following connections:-

a. Line voltage input with P2007 plug on cable extension.

b. Signal output to r mote receiver at J1009 receptacle.

c. Connection to card/tap puncher at J1007 receptacle (refer

to figure 7-1 for d tails).

d. Connection to card/tape reader at J1007 receptacle (refer to figure 7-1 for details).

e. Connection to recognition code generator (see paragraph 2-6) at J1008 receptacle (refer to figure 7-1 for details).

When shipped separately, mating plugs are furnished for these connections.

2-4 60 WPM VS. 100 WPM OPERATION

Codes may be generated from the RTPF at any rate of speed at regular or irregular intervals. The pulse widths of bits within the codes, however, depend upon the clock generator circuit in printed circuit plug-in card Z1005. Cards are available for pulse widths corresponding with 60 wpm or 100 wpm speeds, based on the standard 7.42-unit teletype transmissions pattern. The RTPF is shipped with the 60 wpm card installed unless specified as otherwise on the order. The Z1005 cards are marked "60 wpm" or "100 wpm" to distinguish them.

2-5 CCIT AND ASCII CODES

Although the RTPF is generally operated with a TMC card/tape puncher-reader, it can be operated to send a message punched by CCIT or ASCII teletype equipment. As long as the codes correspond with those shown in table 1-1, a message may be sent that has been previously punched by CCIT 5-bit code equipment. Reference is included in table 1-1 to the CCIT character for each code. In using ASCII 7-bit code equipment however, the characters are punched as shown in table 1-1 and the tape is then flipped over as it is fed into a 5-bit read r in order that the first 5 bits of th 7-bit code may be transmitt d in r v rs , with th sprocket holes properly

aligned. Manuals on TMC's 5-bit readers contain more detailed information on this method.

2-6 RECOGNITION CODE GENERATOR

In all operations in which the message is sent to TMC receivers, an additional recognition code generator is required. The recognition code, sent as the first code in the message, selects a specific receiver by opening the code storage input gate in that receiver. TMC code generators are made with a code capacity to select up to 100 receivers. For a list of TMC receiver recognition codes, see table 2-1. The table includes references to letters and numerals appearing on TMC code generator push-buttons, and equivalent CCIT and ASCII characters. To open a receiver it is required to send a letter followed by a numeral.

TABLE 2-1. RECEIVER RECOGNITION CODES

TMC GENERATOR PUSH-BUTTON	5-BIT CODE	TELETYPE CHARACTERS	
		CCIT	ASCII*
A	10101	Y	U
B	10110	F	V
C	11010	J	Z
D	11001	W	Y
E	10011	B	S
F	11100	U	
G	10100	S	K
H	10010	D	R
I	10001	Z	Q
J	11000	A	X

* With first 5-bits of 7-bit code transmitted in r v rse. See paragraph 2-6

TABLE 2-1. RECEIVER RECOGNITION CODES (cont'd)

TMC GENERATOR PUSH-BUTTON	5-BIT CODE	TELETYPE CHARACTERS	
		CCIT	ASCII*
1	01010	R	J
2	01001	L	I
3	00101	H	E
4	00110	N	F
5	01100	I	L
6	00011	O	C
7	01011	G	K
8	01101	P	M
9	01110	C	N
10	00111	M	G

* With first 5-bits of 7-bit code transmitted in reverse. See paragraph 2-6.

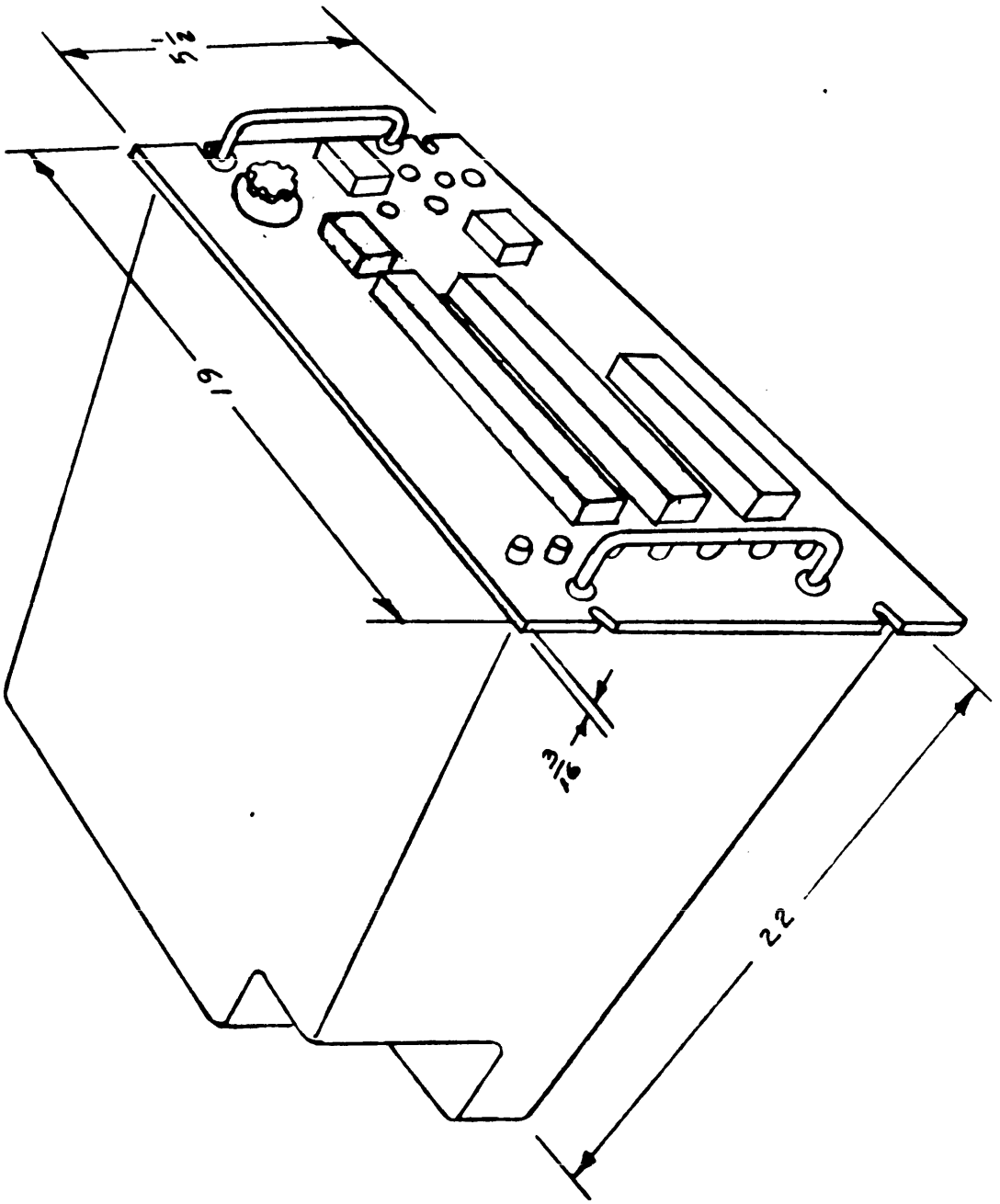

Figure 2-1. Overall and Mounting Dimensions, RTPF

SECTION 3
OPERATOR'S SECTION

3-1 GENERAL

There are five operations possible with the RTPF. These operations are selected by the mode selector switch in the upper right-hand corner of the control panel (see figure 3-1). Description of the operations is as follows:-

Switch Position	Operation
MANUAL PROGRAM	Manual remote tuning of the receiver by push-buttons.
TAPE PUNCH	Pre-programming a receiver tuning on punched card or tape by push-buttons.
TAPE READER	Rapid remote tuning of the receiver from the pre-programmed punched card or tape.
MANUAL PROGRAM/ TAPE PUNCH	Manual remote tuning of the receiver by push-buttons with simultaneous recording on punched card or tape.
RE-PUNCH	Energization of associated card/tape puncher to make a copy of a previously punched message.

The last four card/tape operations require an associated card/tape puncher or reader. The MANUAL PROGRAM operation requires no puncher or reader. All remote tuning operations of TMC receivers require an associated recognition code generator (see paragraph 2-6).

3-2 MANUAL PROGRAM OPERATION

Set mode selector switch at MANUAL PROGRAM. Set PROGRAMMER POWER ON OFF switch to ON. PROGRAMMER POWER LAMP will light. The keyboard buttons are marked to correspond with TMC's TechniMatic receivers. Specific sequence of remote tuning is spelled out in the TMC

manual for the receiver system in which the RTPF is employed. However, some generalizations may be made on procedure here.

Refer to figure 3-1. Buttons in the FUNCTION row represent controls on the receiver. Buttons in the KILOCYCLES, CARRIER, and MEGACYCLES rows represent control positions. The TUNE button is pushed at the end of the message. When a button is pushed in, it stays in momentarily until the next button is pushed, releasing it. When a FUNCTION button is pushed in, the appropriate row of control position buttons light up to indicate that one button in that row must be selected. When one button is selected and pushed in, the lights in that control position row are extinguished and the FUNCTION row lights up again, to indicate that the next FUNCTION button must be pressed. When the next FUNCTION button is pressed, the FUNCTION row extinguishes and the appropriate control position row lights up again. The FUNCTION buttons and the corresponding rows of control positions that light up are as follows:-

FUNCTION button	Control position row
MC 2-16	MEGACYCLES
MC 17-31	MEGACYCLES
100 KC	KILOCYCLES
10 KC	KILOCYCLES
1 KC	KILOCYCLES
.1 KC	KILOCYCLES
CAR	CARRIER

A coded character appears at the RTPF output each time a button is pushed. When the CAR(rier) button is pushed, the two CARRIER buttons, AFC and SYN, light up for selection. The CARRIER codes are for selecting either the automatic frequency control (AFC) or the

synthesizer (SYN) as a source of i f and product detector injection frequencies in the receiver. Pushing the TUNE button, at the end of the message, presents the "E" code at the output. The TUNE button is a momentary contact and acts to release the last previous button and extinguish all button lights. The "E" character is generally used in the receiver to energize the tuning mechanisms, the receiver having previously stored the message in its memory section. The first two codes in the message, however, must be generated by the recognition code generator.

Example: To tune the receiver for a 26.5781 mc carrier using automatic frequency controlled injection frequencies, after sending a letter and numeral for the recognition code, press the following buttons:-

MC17-31, 26MC11; 100KC, 5; 10KC, 7; 1KC, 8; .1KC, 1; CAR, AFC; TUNE.

3-3. TAPE PUNCH OPERATION

Set mode selector switch at TAPE PUNCH. Set PROGRAMMER POWER and PUNCH READER POWER switches to ON; their corresponding lamps will light. Push buttons in the same manner as that described for MANUAL PROGRAM operation, including the TUNE button at the end. Each button punches the 5-bit code (see table 1-1) on the card or tape. A hole represents a "1"; no hole represents "0". When finished, set the two POWER switches to OFF.

3-4. TAPE READER OPERATION

Set mode selector switch at TAPE READER. Set PROGRAMMER POWER and PUNCH-READER POWER switches to ON; their corresponding lamps will light. If the card/tape reader does not have an automatic starter, press TAPE READ button to start message transmission from pre-programmed punched tape. If a series of messages are to be sent, employing a timer, plug timer into TIMER jack on front panel

and switch off the timer automatic starter. The timer will then control the message transmission.

3-5. MANUAL PROGRAM/TAPE PUNCH OPERATION

Set mode selector switch at MANUAL PROGRAM/TAPE PUNCH. Set PROGRAMMER POWER and PUNCH READER POWER switches to ON. Then proceed to send message in the same manner as for MANUAL PROGRAM. Message will be recorded on the punched card or tape at the same time. The punched card or tape may then be used at some future date to tune the receiver in a TAPE READER operation.

3-6. RE-PUNCH OPERATION

After a card or tape has been punched in a TAPE PUNCH or MANUAL PROGRAM/TAPE PUNCH OPERATION, a copy may be made on a card or tape. Set mode selector switch at RE-PUNCH. Set PROGRAMMER POWER and PUNCH-READER POWER switches to ON; their corresponding lamps will light. Feed previously punched card or tape into reader input and new card or tape into puncher input. Press TAPE READ button to start copy.

The RE-PUNCH operation is included in TechniMatiC systems to provide two particularly useful features. One feature is the renewing of a worn tape or card. The other is generation of a tape of a series of tuning messages made from selected pre-punched cards. Such a tape can then be used in a TAPE READER operation with an associated timer to set up a scheduled automatic tuning of receivers throughout the day.

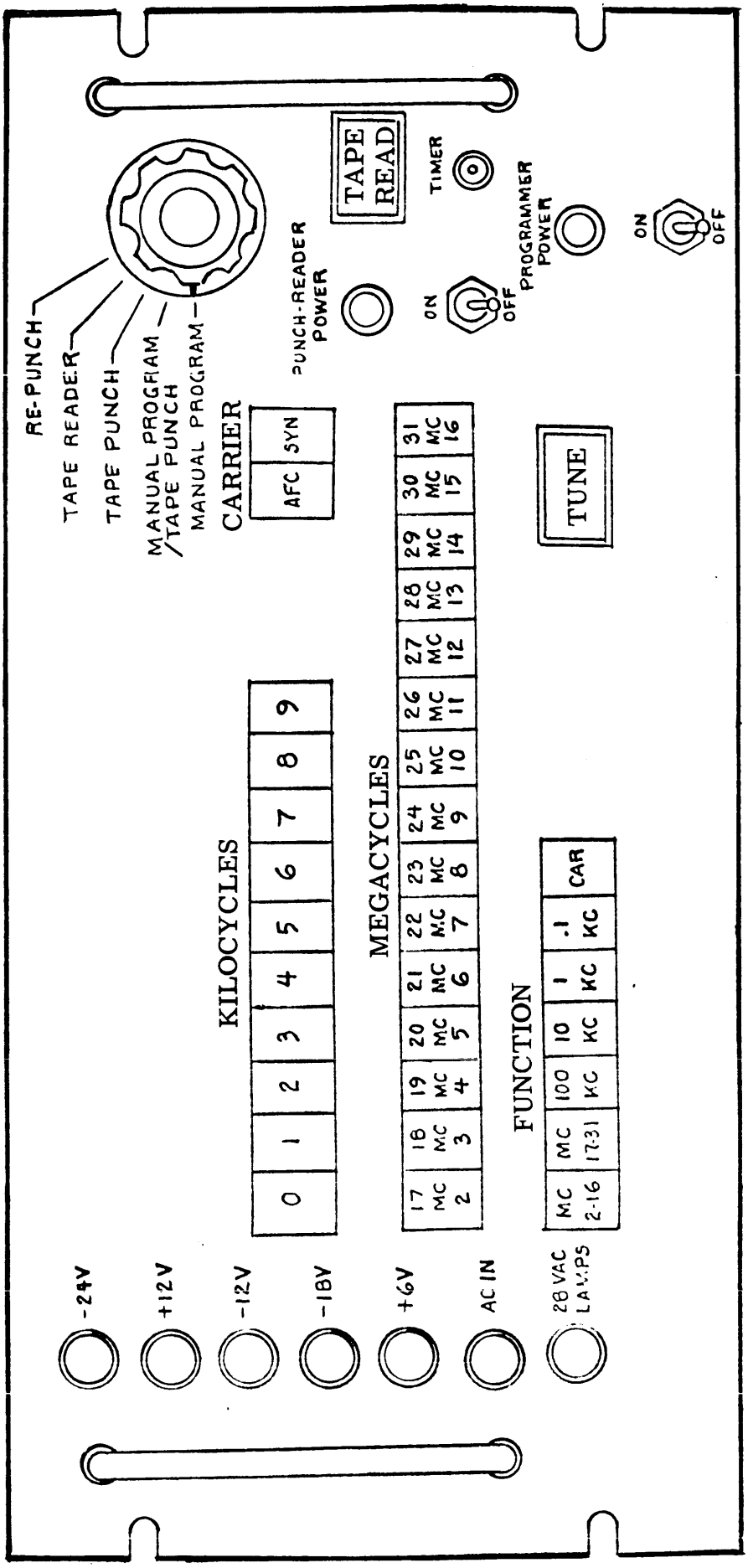

Figure 3-1. RTPF-1 Front Panel

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SECTION 4
PRINCIPLES OF OPERATION

4-1. INTRODUCTION

Model RTPF Electronic Programmer operates through a push-button keyboard and binary logic circuitry. A 5-position mode selector switch makes the necessary connections between components for the 5 modes of operation, i.e., MANUAL PROGRAM, MANUAL PROGRAM/TAPE PUNCH, TAPE PUNCH, TAPE READER and RE-PUNCH. The logic circuitry is seven plug-in printed circuit cards. The logic circuits on the cards are transistor/diode type in the form of encapsulated modules mounted on the cards. Cards are mounted in a bin (see figure 5-1), the cards plugged into receptacles in the floor of the bin. Cards are referred to in figure 7-1 by Z1000 series circuit numbers and their "A" assembly numbers. The "A" number appears printed on the card and the "Z" and "A" numbers appear on one side of the bin adjacent to its receptacle. The encapsulated logic modules are identified by Z1-and-up series of circuit numbers and these numbers appear printed on the card adjacent to the modules.

4-2. FUNCTIONAL ANALYSIS (figure 4-1)

a. MANUAL PROGRAM OPERATION. - Each depressed push-button on the keyboard generates a 5-bit code in the form of parallel pulses. With the mode selector switch in the MANUAL PROGRAM position, these pulses proceed into Z1001 Amplifier Circuit. Z1001, upon reception of each code, sends a series of pulses to Z1002 Shift-Register via Z1005 Timing Circuit. The signal energizes the shift-register and the 5 bits are pulled one-by-one out of Z1001 and, in serial pulse form,

these proceed over to a polar relay in Z1006 Keying Circuit. The polar relay presents J1009 output receptacle with dry-contact keying to be used with an external power supply for transmission to the remote receiver. After the code has been shifted out in this way, Z1005 Timing Circuit sends a second pulse to Z1002 Shift-Register; this pulse resets the register for the next code.

The external recognition code generator (see paragraph 2-6) generates the letter and numeral codes in parallel pulse form at J1008 receptacle. These codes, the first ones to be sent in the message, follow the same route and processing as those issuing from the keyboard.

b. MANUAL PROGRAM/TAPE PUNCH OPERATION. - With the mode selector switch set to MANUAL PROGRAM/TAPE PUNCH, codes generated from the keyboard push-buttons follow the same route and processing as described for MANUAL OPERATION (see paragraph 4-2a). In addition, each code, issuing from Z1001 Amplifier Circuit in parallel pulse form, is routed to the associated puncher. As Z1001 receives each code, it releases a "start process" pulse to the tape puncher. This pulse is used by the puncher to energize the punching mechanism for one code.

c. TAPE PUNCH OPERATION. - With the mode selector switch set to TAPE PUNCH, codes generated from keyboard push-buttons become routed, in parallel pulse form, through the Z1001 Amplifier Circuit and out to the puncher only. The pulse normally sent to Z1005 Timing Circuit is cut off and Z1002 Shift-Register receives no energizing pulse from Z1005. As a result, there is no issue from Z1002 to Z1006. As in MANUAL PROGRAM/TAPE PUNCH operation, a "start proc ss" pulse

issues from Z1001 for each code, energizing the puncher.

d. TAPE READER OPERATION. - With the mode selector switch set to TAPE READER, the input to Z1001 Amplifier Circuit is disconnected from the keyboard and connected to the reader through memory circuit, Z1000. The codes, in the form of parallel pulses from the reader, are routed to Z1001. As in the TAPE PUNCH operation, the pulse normally sent to Z1005 Timing Circuit is cut off. The energizing pulse to trigger Z1005 Timing Circuit pulses to Z1002 will now be supplied to Z1005 by Z1004 Gating Circuit.

Upon the reception of a-c power, via the RTPF PUNCHER/READER POWER switch, if the reader has an automatic starter, it will proceed to scan the first code on its tape and send the code to Z5000 Memory Circuit. At the end of the scan, the reader also sends a "search complete" pulse back to Z1004 Gating Circuit. This pulse sets a gate in Z1004 to open upon the reception of a pulse from Z1001. When Z1001 then receives the first code from the reader, it releases the first pulse to momentarily open the gate. The resulting "start search" pulse from the Z1004 gate to the reader causes the reader to scan the second code on the tape, send it to Z1001 Amplifier Circuit, and send the second "search complete" pulse back to Z1004 Gating Circuit. From this point on, the reciprocal action continues, with each code and "search complete" pulse from the reader generating the next "start search" pulse from the RTPF.

If the reader does not have an automatic starter, the operator depresses the RTPF TAPE READ momentary contact button and this generates the first energizing "start search" puls to the reader. From that point on, the reciprocal action takes place as described before.

As each "s arch complete" pulse com s back from the r ader, besides resetting the gate in Z1004, it also caus s Z1005 Timing Circuit to send one set of bit-energizing pulses to the shift-register in Z1002. The Z1005 then follows it with a pulse to reset the shift-register for the next code.

If an automatic timer is employed to send out a series of tuning messages at timed intervals, the timer (connected at the RTPF front panel TIMER jack) will generate the initial "start search" pulse to the reader for each message.

e. RE-PUNCH OPERATION. - The re-punch operation involves making a copy of a previously punched card or tape on a new card or tape. In this case, the punched card or tape is placed in the reader and the new card or tape is placed in the puncher. The RTPF then reads the data as in the TAPE READER operation and sends the code to the puncher as in TAPE PUNCH operation.

With the mode selector switch set to RE-PUNCH, the codes from the reader are routed to Z1001 Amplifier Circuit via Z1000. Pressing the TAPE READ button will generate the first "start search" pulse to the reader and the first code pulses will travel to the puncher via Z1000 and Z1001. At the end of the code the reader sends back the "search complete" pulse, setting Z1004 gate. The end-of-code pulse from the first code through Z1001 then produces the "start search" pulse for the next code via Z1004 gate. The reciprocal action is repeated, as in the TAPE READER operation, until all the codes are read.

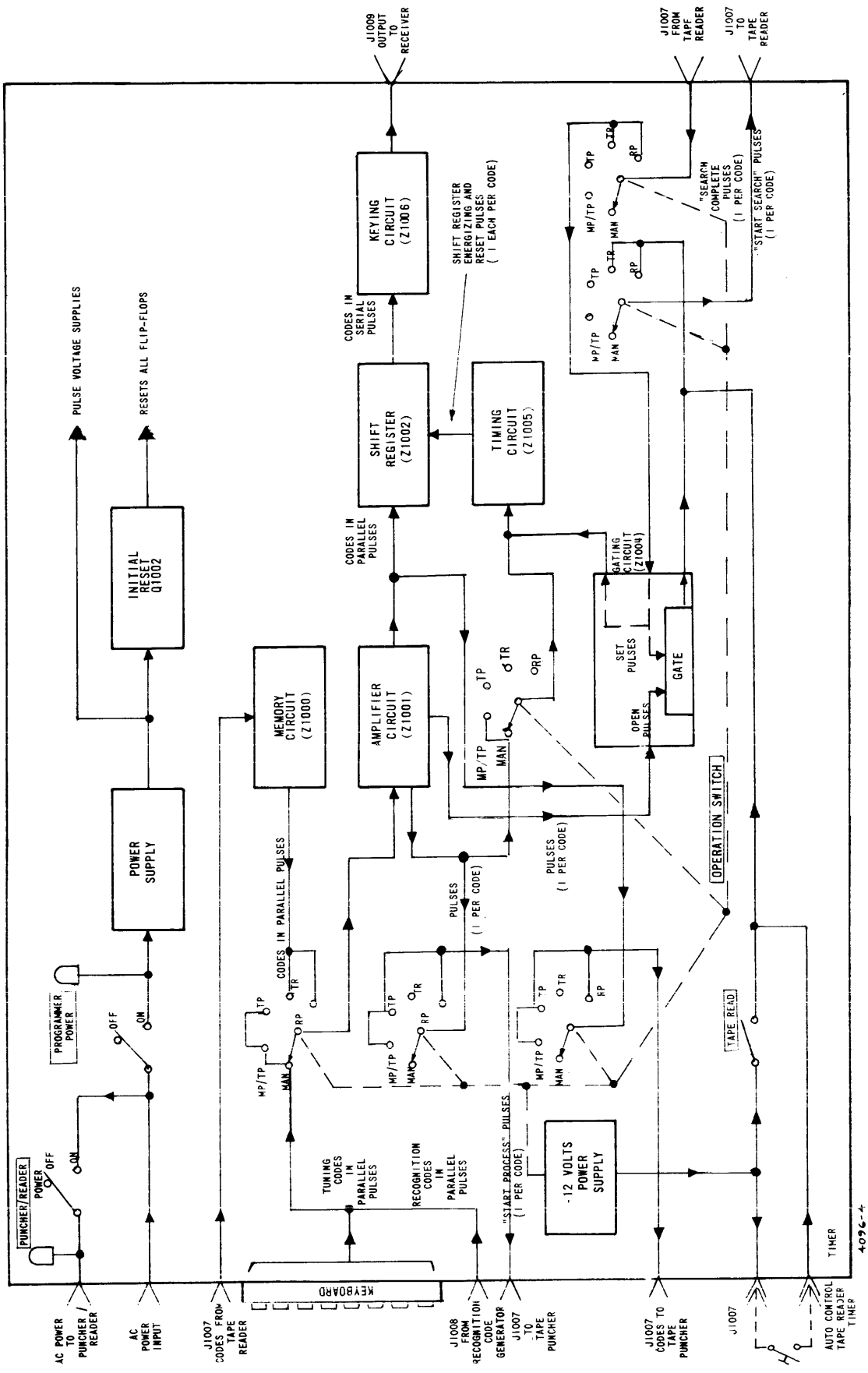

Figure 4-1. Finctional Block Diagram, RTTF

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SECTION 5
MAINTENANCE

5-1. 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 methyl chloroform 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.

SECTION 6
PARTS LIST

6-1. INTRODUCTION

The parts list presented in this section is a cross-reference list of parts identified by a reference designation and TMC part number. In most cases, parts appearing on schematic diagrams are assigned reference designations in accordance with MIL-STD-16. Wherever practicable, the reference designation is marked on the equipment, close to the part it identifies. In most cases, mechanical and electro-mechanical parts have TMC part numbers stamped on them.

To expedite delivery when ordering any part, specify the following:

a. Generic name.

b. Reference designation.

c. TMC part number.

d. Model and serial numbers of the equipment containing the part being replaced; this can be obtained from the equipment nameplate.

For replacement parts not covered by warranty (refer to warranty sheet in front of manual), address all purchase orders to:

The Technical Materiel Corporation
Attention: Sales Department
700 Fenimore Road
Mamaroneck, New York

PARTS LIST

for

ELECTRONIC PROGRAMER, RTPF-1

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1001	CAPACITOR, FIXED, ELECTROLYTIC: 20 uf, -10% +150% at 120 cps at 25°C; 50 WVDC; polarized; insulated tubular case.	CD105-20-50
C1002	Same as C1001.	
C1003	CAPACITOR, FIXED, ELECTROLYTIC: polarized; 2600 uf, 50 WVDC; insulated clear plastic case.	CE112-6
C1004	Same as C1003.	
C1005	CAPACITOR, FIXED, ELECTROLYTIC: polarized; 9200 uf, 15 WVDC; insulated clear plastic case.	CE112-10
C1006	Same as C1003.	
C1007	Same as C1003.	
C1008	CAPACITOR, FIXED, CERAMIC DIELECTRIC:rated at 470,000 uuf, +80% -20%; radial lead type terminals.	CC112R474Z
C1009	Same as C1005.	
C1010	Same as C1003.	
C1011	Same as C1008.	
C1012	Same as C1003.	
C1013	CAPACITOR, FIXED, ELECTROLYTIC: polarized; 1500 uf, 25 WVDC; insulated clear plastic case.	CE112-7
C1014	Same as C1013.	
C1015	Same as C1003.	
C1016	Same as C1003.	
C1017	CAPACITOR, FIXED, ELECTROLYTIC: 50 uf, -10% +150% at 120 cps at 25°C; 25 WVDC; polarized; insulated tubular case.	CE105-50-25
C1018	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 100, 000 uuf, +80% -20%; 100 WVDC.	CC100-28

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1019	Same as C1018.	
CR1001	SEMICONDUCTOR DEVICE, DIODE: silicon.	1N1582
CR1002 thru CR1004	Same as CR1001.	
CR1005	SEMICONDUCTOR DEVICE, DIODE: silicon.	1N2977B
CR1006 thru CR1009	Same as CR1001.	
CR1010	Same as CR1005.	
CR1011	SEMICONDUCTOR DEVICE, DIODE: silicon.	1N1200A
CR1012 thru CR1014	Same as CR1011.	
CR1015	SEMICONDUCTOR DEVICE, DIODE: silicon.	1N2986B
CR1016 thru CR1019	Same as CR1001.	
CR1020	SEMICONDUCTOR DEVICE, DIODE: silicon.	1N1804A
CR1021	SEMICONDUCTOR DEVICE, DIODE.	1N2982B
CR1022	SEMICONDUCTOR DEVICE, DIODE.	1N270
CR1023	Same as CR1022.	
CR1024	Same as CR1022.	
CR1025	NOT USED	
CR1026	NOT USED	
CR1027 thru CR1037	Same as CR1022.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
DS1001	LAMP, NEON: 110/125V AC/DC; nominal current rating 0.6 ma, 1/15 watt; midget flange base T-2 bulb.	BI111-1
DS1002	Same as DS1001.	
DS1003	NON-REPLACEABLE ITEM. (Part of XF1001)	
DS1004	NON-REPLACEABLE ITEM. (Part of XF1007)	
DS1005	NON-REPLACEABLE ITEM. (Part of XF1005)	
DS1006	NON-REPLACEABLE ITEM. (Part of XF1004)	
DS1007	NON-REPLACEABLE ITEM. (Part of XF1003)	
DS1008	NON-REPLACEABLE ITEM. (Part of XF1002)	
DS1009	NON-REPLACEABLE ITEM. (Part of XF1006)	
DS1010	LAMP, INCANDESCENT: 28.0 volts AC/DC; 0.04 amps; single contact, T-1-3/4 bulb.	BI110-7
DS1011 thru DS1061	Same as DS1010.	
F1001	FUSE, CARTRIDGE: 2-1/2 amps; time lag; 1-1/4" long x 1/4" dia.; slow-blow.	FU102-2.5
F1002	FUSE, CARTRIDGE: 3/8 amp; 1-1/4" long x 1/4" dia; quick acting.	FU100-.375
F1003	FUSE, CARTRIDGE: 2 amps; 1-1/4" long x 1/4" dia; quick acting.	FU100-2
F1004	FUSE, CARTRIDGE: 1-1/2 amps; 1-1/4" long x 1/4" dia; quick acting.	FU100-1.5
F1005	Same as F1002.	
F1006	FUSE, CARTRIDGE: 1 amp; 1-1/4" long x 1/4" dia; quick acting.	FU100-1
F1007	Same as F1006.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J1000	CONNECTOR, RECEPTACLE, ELECTRICAL: 22 female contacts; accomodates 1/16" printed circuit board.	JJ312-44
J1001 thru J1006	Same as J1000.	
J1007	CONNECTOR, RECEPTACLE, ELECTRICAL: female; 37 NO. 20 contacts; 5 amps, 500V RMS.	JJ310-3
J1008	CONNECTOR, RECEPTACLE, ELECTRICAL: felame; 25 NO. 20 contacts; 5 amps, 500V RMS.	JJ310-2
J1009	CONNECTOR, RECEPTACLE, ELECTRICAL: 11 round female contacts, rated at 3 amps 1800V RMS; key polarization; micro miniature type.	JJ311-1S
J1010	CONNECTOR, RECEPTACLE, ELECTRICAL; male; AC power; 2 contacts; 250 volts at 10 amps, 125 volts at 15 amps; polarized; twist lock type.	JJ175
J1011	JACK, TELEPHONE: closed circuit; bulk head mounting.	JJ033
K1001	RELAY, ARMATURE: DPDT; 5,000 ohms, +10% DC resistance; operating voltage 20.5 VDC; current rating 4.1 ma, 85 mu at 25°C; 8 contacts rated for 1 amp at 29 VDC RES; clear high impact styrene dust cover case.	RL156-4
K1002	RELAY, ARMATURE: SPDT; mercury-wetted contacts, rated for 2 amps at 500 V; polarized relay adjusted for 1% unbalanced, 60 cps, 120 VAC.	RL167-1
K1003	Same as K1001.	
K1004	Sams as K1001.	
Q1001	TRANSISTOR: germanium, hi current.	2N456A
Q1002 thru Q1005	Same as Q1001.	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R1001	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, ±5%; 1/2 watt.	RC20GF102J
R1002	Same as R1001.	
R1003	RESISTOR, FIXED, WIREWOUND: 50 ohms; 5 watts.	RW107-54
R1004	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, ±5%; 2 watts.	RC42GF102J
R1005	RESISTOR, FIXED, COMPOSITION: 410 ohms, ±5%; 2 watts.	RC42GF411J
R1006	Same as R1003.	
R1007	RESISTOR, FIXED, WIREWOUND: 1,000 ohms, current rating 70 ma; 5 watts.	RW107-34
R1008	RESISTOR, FIXED, WIREWOUND: 100 ohms, current rating 223 ma; 5 watts.	RW107-18
R1009	RESISTOR, FIXED, WIREWOUND: 1 ohm, current rating 5,000 ma; 25 watts.	RW111-1
R1010	RESISTOR, FIXED, WIREWOUND: 300 ohms current rating 18 ma; 10 watts.	RW109-15
R1011	RESISTOR, FIXED, WIREWOUND: 150 ohms, current rating 258 ma; 10 watts.	RW109-11
R1012	RESISTOR, FIXED, WIREWOUND: 100 ohms, current rating 315 ma; 10 watts.	RW109-9
R1013	RESISTOR, FIXED, COMPOSITION: 100 ohms, ±5% 2 watts.	RC42GF101J
R1014	RESISTOR, FIXED, COMPOSITION: 680 ohms, ±5% 2 watts.	RC42GF681J
R1015	RESISTOR, FIXED, WIREWOUND: 25 ohms, current rating 1,000 ma; 25 watts.	RW111-6
R1016	RESISTOR, FIXED, COMPOSITION: 330 ohms, ±5%; 2 watts.	RC42GF331J
R1017	RESISTOR, FIXED, COMPOSITION: 47,000 ohms, ±5%; 1/2 watt.	RC20GF473J

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R1018	Same as R1017.	
R1019	RESISTOR, FIXED, COMPOSITION: 470 ohms, ±5%; 1/2 watt.	RC20GF471J
R1020	Same as R1001.	
R1021	Same as R1001.	
R1022	RESISTOR, FIXED, COMPOSITION: 18,000 ohms, ±5%; 1/2 watt.	RC20GF183J
R1023 thru R1026	Same as R1022.	
R1027	RESISTOR, FIXED, COMPOSITION: 10 ohms, ±5%; 1/2 watt.	RC20GF100J
R1028 thru R1030	Same as R1027.	
R1031	Same as R1001.	
R1032	NON-REPLACEABLE ITEM. (Part of XF1001)	
R1033	NON-REPLACEABLE ITEM. (Part of XF1007)	
R1034	NON-REPLACEABLE ITEM. (Part of XF1005)	
R1035	NON-REPLACEABLE ITEM. (Part of XF1004)	
R1036	NON-REPLACEABLE ITEM. (Part of XF1003)	
R1037	NON-REPLACEABLE ITEM. (Part of XF1002)	
R1038	Same as R1001.	
S1001	SWITCH, TOGGLE: SPST; bat type handle.	ST103-1-62
S1002	Same as S1001.	
S1003-1	SWITCH, PUSHBUTTON.	SW407
S1003-2 thru S1003-35	Same as S1003-1	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
S1004	SWITCH, ROTARY: 4 sections, 5 positions; 15 angle of throw; stud mounted.	SW359
S1005	SWITCH, PUSHBUTTON: SPDT; illuminated; current rating 6 amps at 220 VAC or 0.25 amps at 220 VDC; operating voltage 2,000 volts; green button, black plastic case.	SW371-1
T1001	TRANSFORMER, POWER, STEP-DOWN: primary 105, 115, 125 volts, 50/60 cps, single phase; secondary 20, 3V RMS at 1.5 ADC, 20.3V RMS at 300 MADC; stud mounted; hermetically sealed rectangular steel case.	TF294
T1002	TRANSFORMER, POWER, STEP-DOWN: primary 105, 115, 125V 50/60 cps, single phase, secondary 33V RMS no load at 225 ADC, 20V RMS no load 150 MADC; hermetically sealed rectangular steel case.	TF290
T1003	TRANSFORMER, POWER, STEP-DOWN: primary 105, 115, 125V, 50/60 cps, single phase; secondary 27.9V RMS no load at 016 amps; stud mounted; hermetically sealed rectangular steel case.	TF291
TB1001	TERMINAL STRIP, BARRIER: 6 double right angle solder type terminals; o/a dim. 3-1/8" lg. x 5/16" wide; bakelite body.	TM127-6
TB1002	Same as TB1001.	
XDS1001	LIGHT, INDICATOR: with white lens; accepts T-3-1/4 single contact, midget flange lamp.	TS154-5
XDS1002	Same as XDS1001.	
XF1001	FUSEHOLDER, LAMP INDICATING: accomodates cartridge fuse 1-1/4" long x 1/4" dia; 90 to 300V, 20 amps; neon lamp type with a 220K ohm lamp resistor; tramsparent clear flat sided knob; black body. (consists of DS1003, R1032.)	FH104-3
XF1002	FUSEHOLDER, LAMP INDICATING: accomodates cartridge fuse 1-1/4" long x 1/4" dia; 6.4 to 13V, 20 amps; incandescent lamp type with a 40 ohm lamp resistor; transparent red flat sided knob; brown body.	FH104-9

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XF1002	(cont) (consists of DS1008, R1037).	
XF1003	Same as XF1002. (consists of DS1007, R1036).	
XF1004	FUSEHOLDER, LAMP INDICATING: accomodates cartridge fuse 1-1/4" long x 1/4" dia; 22 to 33V, 20 amps; incandescent lamp type with a 330 ohm lamp resistor; transparent amber flat sided knob; brown body. (consists of DS1006, R1035).	FH104-11
XF1005	FUSEHOLDER, LAMP INDICATING: accomodates cartridge fuse 1-1/4" long x 1/4" dia; 4 to 6V, 20 amps; incandescent lamp type with a 15 ohm lamp resistor; transparent red flat sided knob; brown body. (consists of DS1006, R1034).	FH104-8
XF1006	FUSEHOLDER, LAMP INDICATING: accomodates cartridge fuse 1-1/4" long x 1/4" dia; 13 to 22V, 20 amps; incandescent lamp type without lamp resistor; transparent amber flat sided knob; brown body. (consists of DS1009)	FH104-10
XF1007	Same as XF1004. (consists of DS1004, R1033).	
XK1001	SOCKET, RELAY: with retainer; 12 beryllium copper gold plated contacts; black phenolic base.	TS171-1
XK1002	NOT USED	
XK1003	Same as XK1001.	
XK1004	Same as XK1001.	
XQ1001	SOCKET, TRANSISTOR: 7 pin contact accomodation, 0,040 or 0.050 dia; polarized; 1 terminal lug grounding strap; o/a dim. 1-37/64" x 1" max.	TS166-1
XQ1002 thru XQ1005	Same as XQ1001.	
XZ1000 thru XZ1007	NOT USED	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XZ1008	SOCKET, MODULE.	RS180-2
XZ1009	Same as XZ1008.	
Z1000	INPUT BUFFER MODULE. (See separate parts list for breakdown).	A4124
Z1001	INPUT CIRCUIT NO. 1 MODULE. (See separate parts list for breakdown).	A3686
Z1002	CONVERTOR CIRCUIT NO. 1 MODULE. (See separate parts list for breakdown).	A3695
Z1003	RESET CIRCUIT NO. 1 MODULE. (See separate parts list for breakdown).	A3694
Z1004	RTPF-1 CONTROL BOARD. (See separate parts list for breakdown).	A3804
Z1005	TIMING CIRCUIT NO. 3 MODULE. (See separate parts list for breakdown)	A3803
Z1006	RELAY DRIVE CIRCUIT MODULE. (See separate parts list for breakdown)	A4210
Z1007	NOT USED	
Z1008	NETWORK, BUFFER AMPLIFIER	NW109
Z1009	Same as Z1008.	

PARTS LIST

for

INPUT BUFFER MODULE

Z1000 A4124

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.47 uf, ±5%; 50 WVDC; epoxy encapsulated case.	CN114R47-5J
C2	CAPACITOR, FIXED, ELECTROLYTIC: 5 uf, -10% +150% at 120 cps at 25°C; 15 WVDC; polarized; insulated tubular case.	CE105-5-15
R1	RESISTOR, FIXED, COMPOSITION: 4,700 ohms, ±5 %; 1/2 watt.	RC20GF472J
R2	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, ±5% 1/2 watt.	RC20GF102J
R3	Same as R1.	
Z1	NETWORK, FLIP-FLOP AMPLIFIER: operating frequency 100 Kc; operating temperature range -35°C to +65°C; 12 male contacts, epoxy case.	NW107-4X
Z2 thru Z4	Same as Z1.	
Z5	NETWORK, DIGITAL INVERTER: operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW105-11
Z6	NETWORK, ONE SHOT GENERATOR: operating frequency 100 Kc; operating temperature range -35°C to +65°C; 12 male contacts, epoxy case.	NW111-1
Z7	Same as Z6.	
Z8	Same as Z1.	

PARTS LIST

for

INPUT CIRCUIT NO. 1

Z1001 A3686

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R1	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, ±5%; 1/2 watt.	RC20GF102J
R2	RESISTOR, FIXED, COMPOSITION: 22,000 ohms, ±5%; 1/2 watt.	RC20GF223J
R3	Same as R1.	
R4	Same as R2.	
R5	Same as R1.	
R6	Same as R2.	
R7	Same as R1.	
R8	Same as R2.	
R9	Same as R1.	
R10	Same as R2.	
TP1	TERMINAL STUD: feed thru.	TE168-2C
TP2 thru TP6	Same as TP1.	
Z1	NETWORK, BUFFER AMPLIFIER: operating frequency 100 Kc; operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW109-11
Z2 thru Z4	Same as Z1.	
Z5	NETWORK, EMITTER FOLLOWER:	NW120-11
Z6	Same as Z5.	
Z7	Same as Z5.	
Z8	Same as Z1.	

INPUT CIRCUIT NO. 1

Z1001 A3686

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
Z9	NETWORK, GATE AMPLIFIER: operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW121-23
Z10	NETWORK, NAND GATE AMPLIFIER	NW104-22

PARTS LIST

for

CONVERTER CIRCUIT NO. 1

Z1002 A3695

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1	CAPACITOR, FIXED, MICA DIELECTRIC: 220 uuf, ±5%; 500 WVDC; straight wire leads.	CM111E221J5 S
R1	RESISTOR, FIXED, COMPOSITION: 4,7000 ohms, ±5%; 1/2 watt.	RC20GF472J
TP1	TERMINAL, STUD: feed thru.	TE168-2C
TP2 thru TP8	Same as TP1.	
Z1	NETWORK, FLIP-FLOP AMPLIFIER: operating frequency 100 Kc; operating temperature range -35°C to +65°C; 12 male contacts, epoxy case.	NW107-4X
Z2 thru Z4	Same as Z1.	
Z5	NETWORK, BUFFER AMPLIFIER: operating frequency; operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW109-11
Z6 thru Z8	Same as Z1.	
Z9	NETWORK, EMITTER FOLLOWER: operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW118-11
Z10	NETWORK, GATE AMPLIFIER: operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW108-26
Z11	Same as Z10.	
Z12	NETWORK, ONE SHOT GENERATOR: operating frequency; operating temperature range -35oC to +65°C; 12 male contacts, epoxy case.	NW111-1

PARTS LIST

for

RESET CIRCUIT NO. 1

Z1003 A3594

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1	CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.10 uf, ±5%; 50 WVDC; operating temperature range -55°C; epoxy encapsulated case.	CN114R10-5J
C2	Same as C1.	
R1	RESISTOR, FIXED, COMPOSITION: 4,700 ohms, ±5%; 1/2 watt.	RC20GF472J
R2	RESISTOR, FIXED, COMPOSITION: 390,000 ohms, ±5%; 1/2 watt.	RC20GF394J
R3	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, ±5%; 1/2 watt.	RC20GF104J
TP1	TERMINAL, STUD: feed thru.	TE168-2C
TP2 thru TP8	Same as TP1.	
Z1	NETWORK, BUFFER AMPLIFIER: operating frequency 100 Kc; operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW109-11
Z2	NETWORK, OHE SHOT GENERATOR: operating frequency 100 Kc; operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW111-11
Z3	Same as Z1.	
Z4	NETWORK, NAND GATE AMPLIFIER: operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW104-21
Z5	NETWORK, DIGITAL INVERTER: operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW105-11
Z6	NETWORK, EMITTER FOLLOWER: operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW118-11
Z7	Same as Z6.	

RESET CIRCUIT NO. 1

Z1003 A3694

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
Z5	NETWORK, POSITIVE EMITTER FOLLOWER: operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW112-11
Z9 thru Z11	Same as Z8.	

PARTS LIST

for

CONTROL BOARD MODULE

Z1004 A3904

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1	CAPACITOR, FIXED, METALIZED PLASTIC: 0.10uf ±5%; 50 WVDC; operating temperature range -55°C to +130°C; epoxy encapsulated.	CN114R10-5J
C2	CAPACITOR, FIXED, MICA DIELECTRIC: 220 uuf ±5%; 500 WVDC; straight wire leads.	CM111E221J5S
C3	Same as C1.	
CR1	SEMICONDUCTOR DEVICE, DIODE.	1N270
R1	RESISTOR, FIXED, COMPOSITION: 4,700 ohms, ±5%; 1/2 watt.	RC20GF472J
R2	Same as R1.	
R3	Same as R1.	
TP1	TERMINAL, STUD: feed thru.	TE168-2C
TP2 thru TP6	Same as TP1.	
Z1	NETWORK, FLIP-FLOP AMPLIFIER: operating frequency 100 Kc; operating temperature range -35°C to +65°C; 12 male contacts, epoxy case.	NW107-4X
Z2	NETWORK, BUFFER AMPLIFIER: operating frequency 100 Kc; operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW109-11
Z3	NETWORK, OR GATE AMPLIFIER	NW121-26
Z4	NETWORK, ONE SHOT GENERATOR: operating frequency 100 Kc; operating temperature range -35°C to +65°C; 12 male contacts, epoxy case.	NW111-1
Z5	NETWORK, NAND GATE AMPLIFIER: operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW104-21
Z6	Same as Z4.	

Z1004 A3804

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
Z7	NETWORK, EMITTER FOLLOWER: operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW118-11
Z8	Same as Z4.	
Z9	Same as Z2.	
Z10	Same as Z2.	

PARTS LIST

for

TIMING CIRCUIT NO. 3

Z1005 A3803

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1	CAPACITOR, FIXED, METALIZED PLASTIC: 47 uf, ±5%; 50 WVDC; operating temperature range -55°C to +130°C; epoxy encapsulated.	CN114R47-5J
C2	CAPACITOR, FIXED, METALIZED PLASTIC: 3.0 uf, ±5%; 50 WVDC; operating temperature range -55°C to +130°C; epoxy encapsulated.	CN114-3RO-5J
C3	CAPACITOR, FIXED, METALIZED PLASTIC: 2.0 uf, ±5%; 50 WVDC; operating temperature range -55°C to +130°C; epoxy encapsulated.	CN114-2RO-5J
C4	CAPACITOR, FIXED, METALIZED PLASTIC: 10 uf, ±5%; 50 WVDC; operating temperature range -55°C to +130°C; epoxy encapsulated.	CN114R10-5J
C5	CAPACITOR, FIXED, ELECTROLYTIC: 3 uf, -10% +150% at 120 cps at 25°C; 15 WVDC; polarized insulated tubular case.	CE105-3-15
C6	CAPACITOR, FIXED, METALIZED PLASTIC: 68 uf, ±5%; 50 WVDC; operating temperature range -55°C to +130°C; epoxy encapsulated.	CN114R68-5J
R1	RESISTOR, FIXED, COMPOSITION: 4,700 ohms, ±5%; 1/2 watt.	RC20GF472J
R2	RESISTOR, VARIABLE, COMPOSITION: miniature; 100 ohms, ±10%; rated for .5 watts at 50°C; transistor type case, TO-9.	RV116-201-8-3
R3	Same as R1.	
R4	RESISTOR, FIXED, COMPOSITION: 10,000 ohms, ±5%; 1/2 watt.	RC20GF103J
TP1	TERMINAL, STUD: feed thru.	TE168-2C
TP2 thru TP6	Same as TP1.	
Z1	NETWORK, BUFFER AMPLIFIER: operating frequency 100 Kc; operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW109-11

TIMING CIRCUIT NO. 3

Z1005 A3803

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
Z2	NETWORK, GATE AMPLIFIER: operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW108-26
Z3	Same as Z1.	
Z4	NETWORK, ONE SHOT GENERATOR: operating frequency 100 Kc; operating temperature range -35°C to +65°C; 12 male contacts, epoxy case.	NW111-1
Z5	Same as Z1.	
Z6	NETWORK, CLOCK GENERATOR: operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW113-1X
Z7	NETWORK, FLIP-FLOP AMPLIFIER: operating frequency 100 Kc; operating temperature range -35°C to +65°C; 12 male contacts, epoxy case.	NW107-4X
Z8	Same as Z4.	
Z9	Same as Z4.	
Z10	Same as Z1.	

PARTS LIST

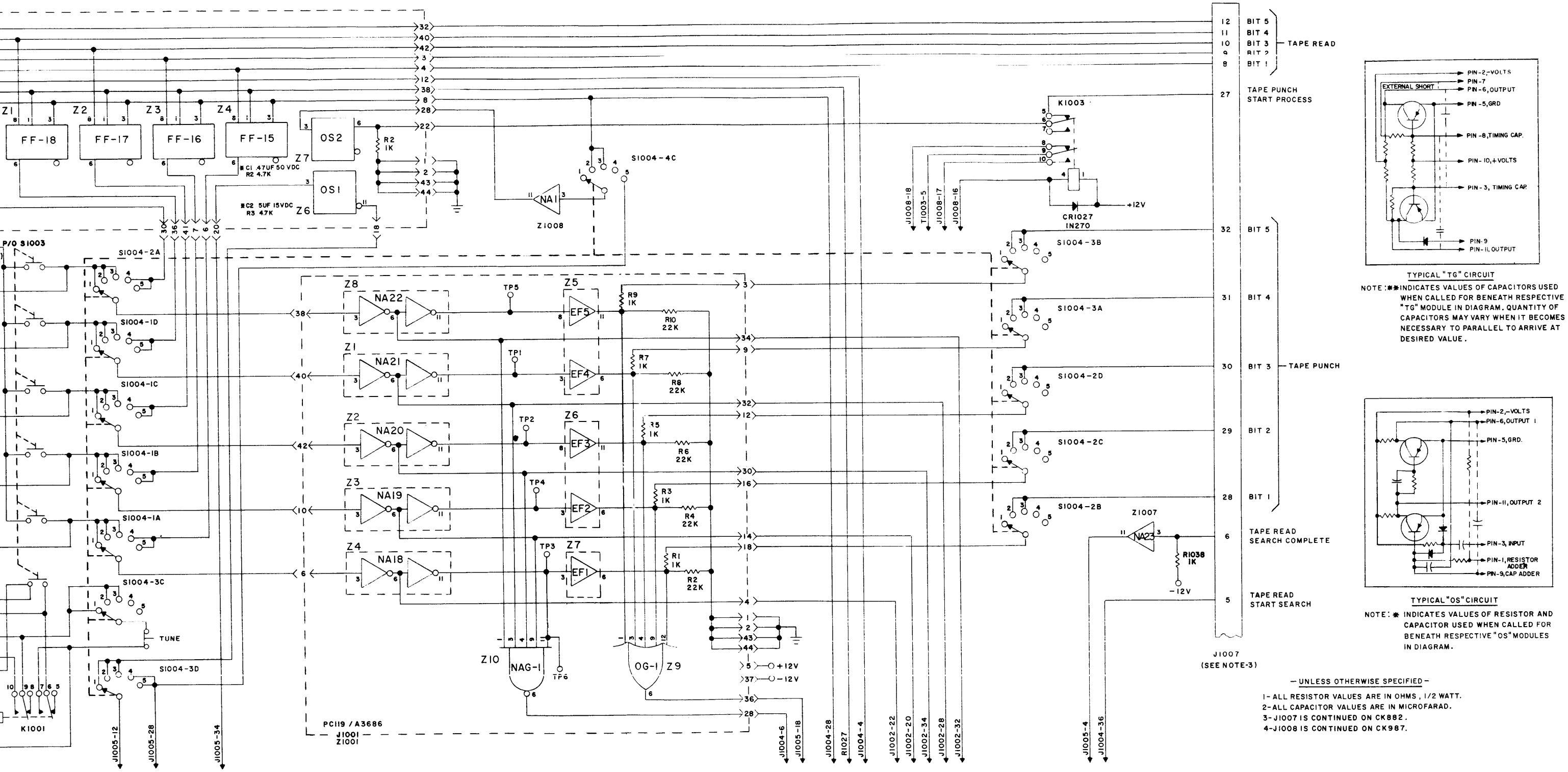
for

RELAY DRIVE CIRCUIT

Z1006 A4210

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
K1	RELAY, ARMATURE: SPDT; mercury-wetted contacts, rated for 2 amps at 500 V; polarized; relay adjusted for 1% unbalanced, 60 cps, 120 VAC.	RL167-1
TP1	TERMINAL, STUD: feed thru.	TE168-2C
TP2 thru TP9	Same as TP1.	
Z1	NETWORK, RELAY DRIVER	NW110-1
Z2	Same as Z1.	
Z3	NETWORK, BUFFER AMPLIFIER: operating frequency 100 Kc; operating temperature range -35°C to +85°C; 12 male contacts, epoxy case.	NW109-11
Z4	Same as Z3.	
Z5	NETWORK, OR GATE AMPLIFIER: operating temperature -35°C to +85°C; 12 male contacts, epoxy case.	NW121-23
Z6 thru Z9	Same as Z3.	

SECTION 7
SCHEMATIC DIAGRAMS



TYPICAL "TG" CIRCUIT

NOTE: ** INDICATES VALUES OF CAPACITORS USED WHEN CALLED FOR BENEATH RESPECTIVE "TG" MODULE IN DIAGRAM. QUANTITY OF CAPACITORS MAY VARY WHEN IT BECOMES NECESSARY TO PARALLEL TO ARRIVE AT DESIRED VALUE.

TYPICAL "OS" CIRCUIT

NOTE: * INDICATES VALUES OF RESISTOR AND CAPACITOR USED WHEN CALLED FOR BENEATH RESPECTIVE "OS" MODULES IN DIAGRAM.

— UNLESS OTHERWISE SPECIFIED —

1- ALL RESISTOR VALUES ARE IN OHMS, 1/2 WATT.
2- ALL CAPACITOR VALUES ARE IN MICROFARAD.
3- J1007 IS CONTINUED ON CK882.
4- J1008 IS CONTINUED ON CK987.

FIGURE 7-1. Detailed Logic Diagram, RTPF (Sheet 1 of 2)

S1004 ROTARY SWITCH	
POSITION	FUNCTION
1	MANUAL PROGRAM
2	MANUAL PROGRAM / TAPE PUNCH
3	TAPE PUNCH
4	TAPE READER
5	RE-PUNCH

CK1005-C

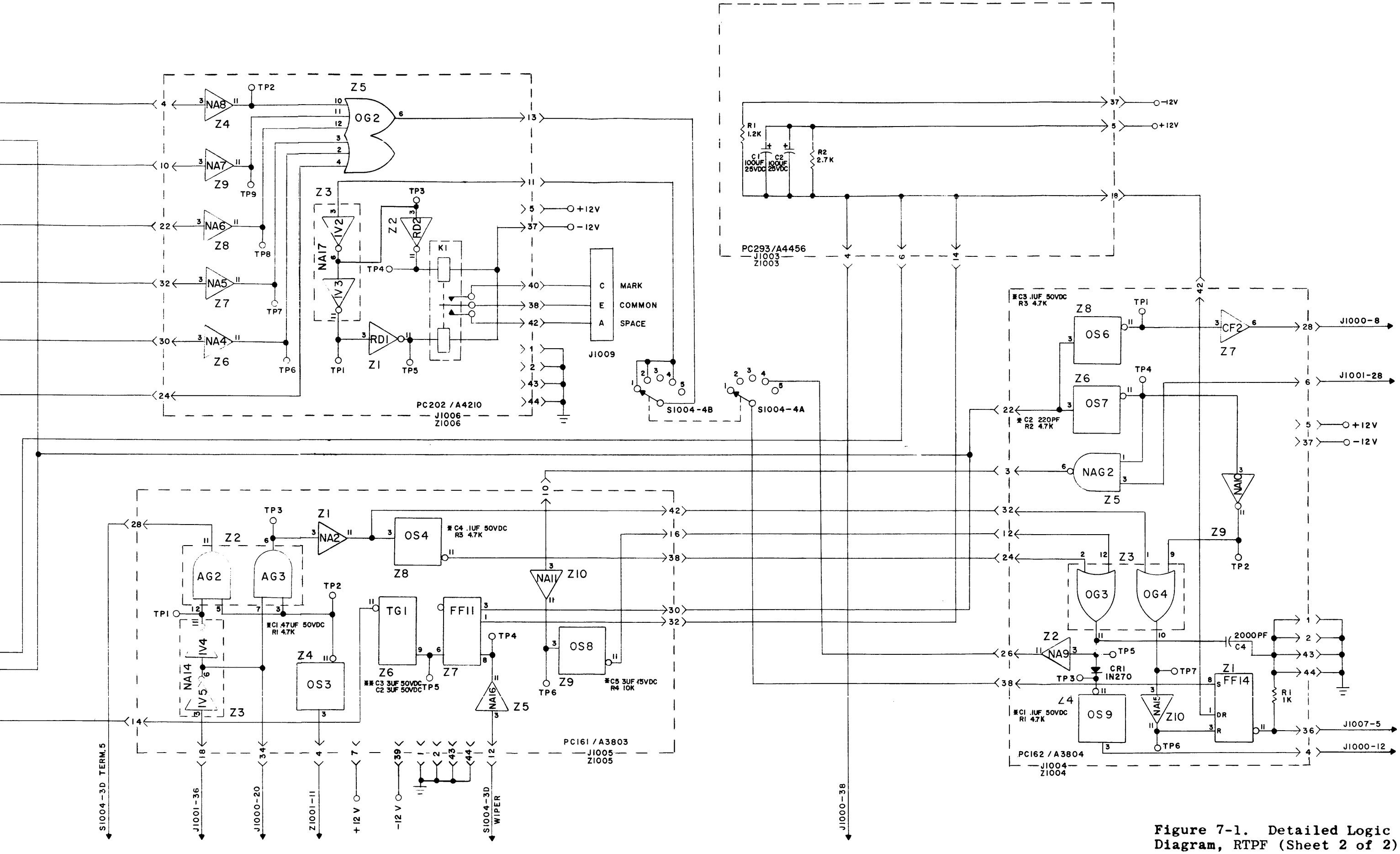
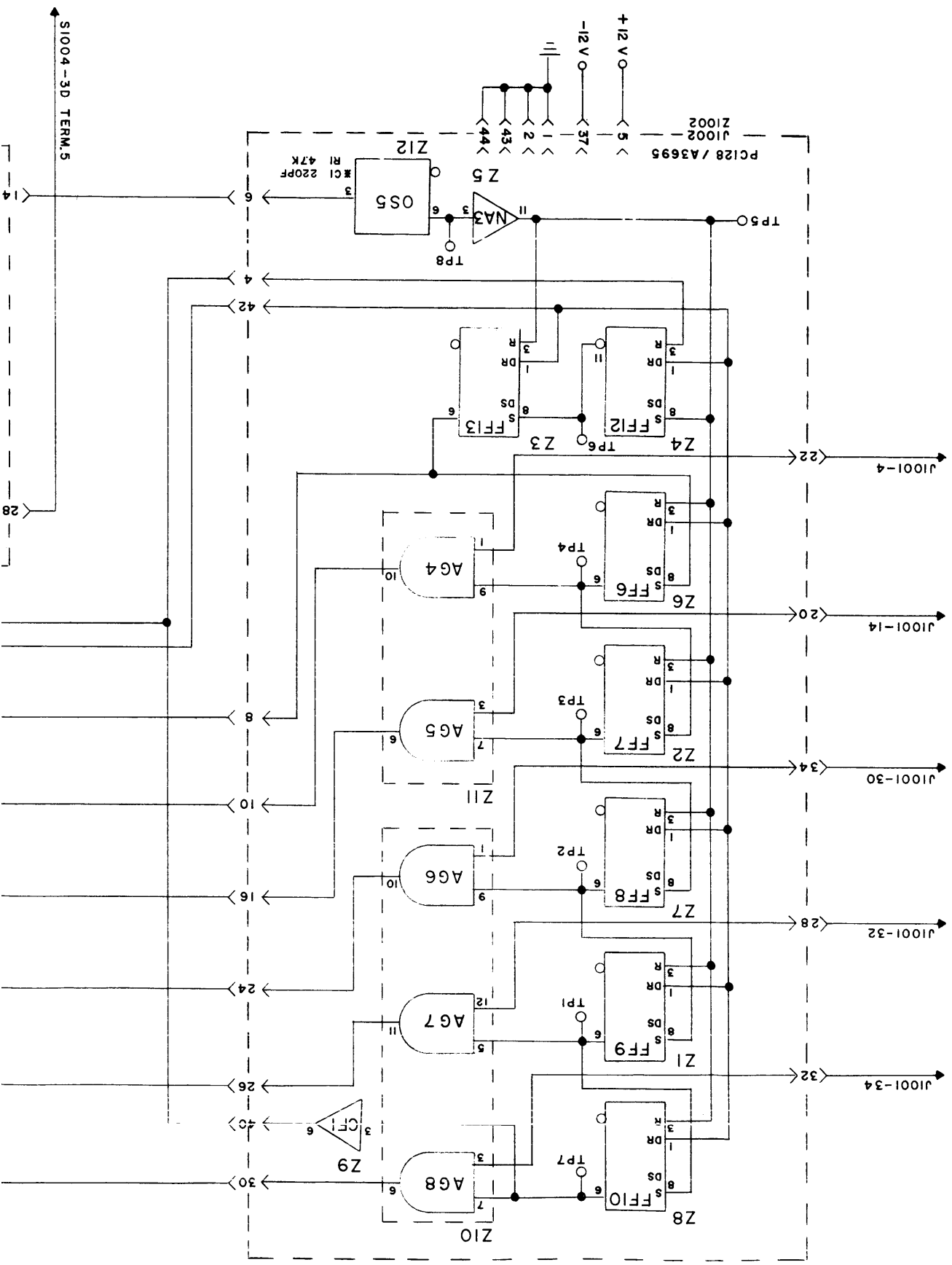


Figure 7-1. Detailed Logic Diagram, RTPF (Sheet 2 of 2)


SI004-3D TERM.5
PC128 / A3695
J1002
Z1002
+12 V
-12 V
44
43
2
1
37
5
Z12
Z5
OS5
NA3
TP8
TP5
Z4
FFI2
Z3
FFI3
TP6
J1001-4
22
Z6
FFF6
AG4
TP4
J1001-14
20
Z2
FF7
AG5
TP3
Z11
J1001-30
34
Z7
FFF8
AG6
TP2
J1001-32
28
Z1
FF9
AG7
TP1
J1001-34
32
Z8
FFI0
AG8
TP7
Z10
Z9
CI1
14
6
4
42
8
10
16
24
26
40
30

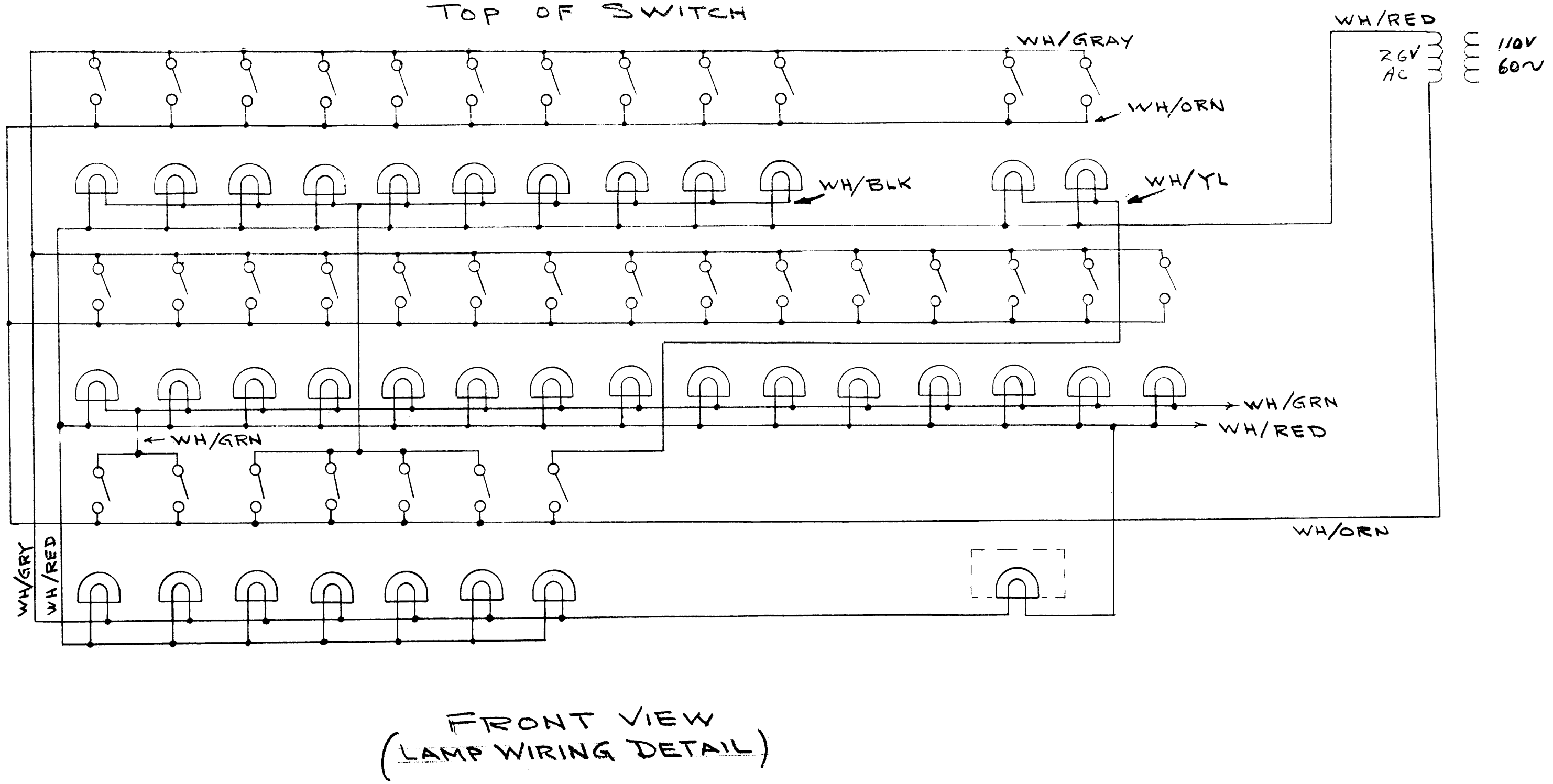


FIGURE 7-2. Wiring Schematic, RTPF Keyboard (sheet 1 of 2)

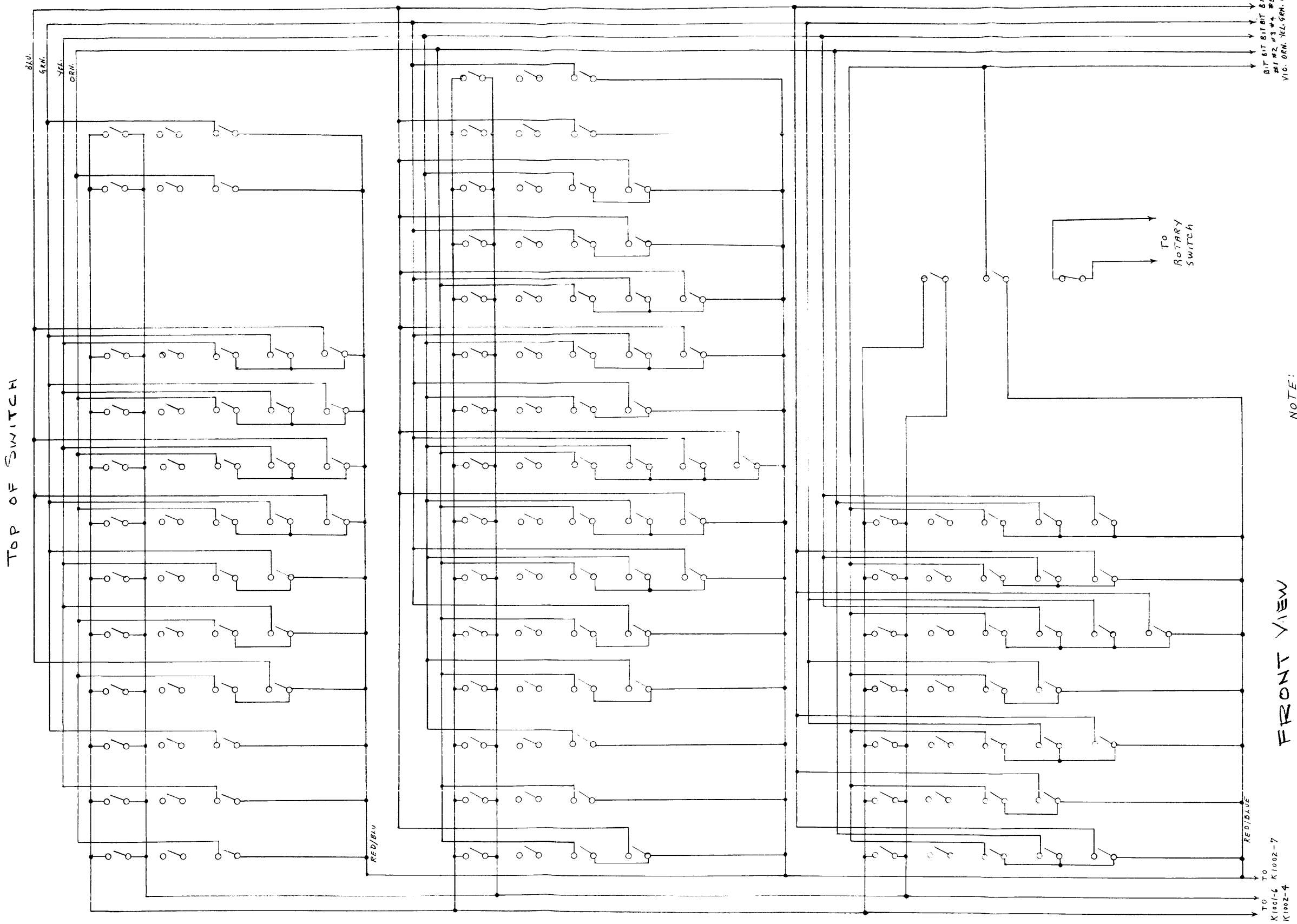


FIGURE 7-2. Wiring Schematic, RTPF Keyboard (Sheet 2 of 2)

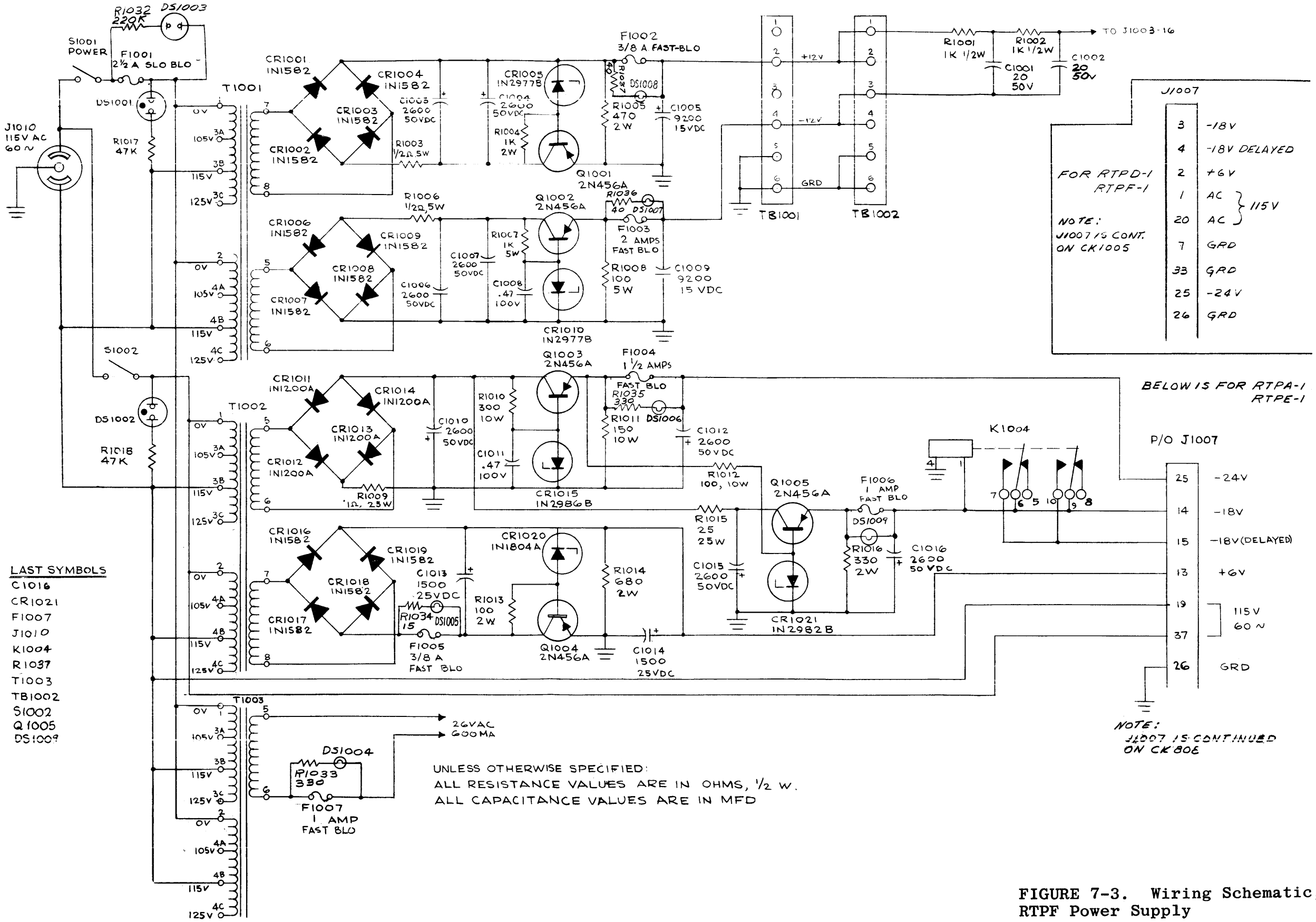


FIGURE 7-3. Wiring Schematic, RTPF Power Supply