NACOM II MASTER

SYSTEM MANUAL

for

EXCITER SYSTEM

MODEL SBGR-4YA

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, CANADA

SYSTEM MANUAL

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MAMARONECK, N.Y. **OTTAWA, CANADA**

IN-2051

ISSUE DATE: DECEMBER 1969

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

CHANGE NO. 1

INSTRUCTION BOOK CHANGE NOTICE

Date October 9, 1970

Manual affected: Exciter System for Model SBGR-4YA System **IN** 2051

1. Delete the following pages:

   Page 5-5, Figure 5-3

   Page 5-6, Table 5-1

   Page 5-7, Table 5-1 (Cont'd)

   Page 5-8, Table 5-2; Table 5-3

   Page 5-9, Table 5-4; Table 5-5

   Page 5-10, Table 5-6; Table 5-7

   Page 5-11, Table 5-8

   Page 5-12, Table 5-8 (Cont'd)

   Page 5-13, Table 5-8 (Cont'd)

   Page 5-14, Table 5-9

   Page 5-15, Table 5-10

2. Replace Pages 5-5 thru 5-15 with Tables 5-1 and 5-2 attached to this Change Notice.

3. All references in text to Tables 5-1 thru 5-10 should be read as follows:

   Tables 5-1 thru 5-7, read as Table 5-1 - REMOTE TUNING READBACK OUTPUT CODES

   Tables 5-8 and 5-9, read as Table 5-2 - REMOTE TUNING INPUT CODES

   Table 5-10, read as REMOTE TUNINC READBACK OUTPUT CODES

SHOULD ADDITIONAL COPIES OF THIS CHANGE NOTICE BE REQUIRED, PLEASE CONTACT:

THE TECHNICAL MATERIEL CORP., 700 Fenimore Road, Mamaroneck, New York

Attn.: Director of Eng. Services.

TABLE 5-2. REMOTE TUNING INPUT CODES

Character Reception Order	Addressal Function	Action Function	5-BIT Code	CCIT Character
1	RTMU-41A Selector	A	10101	Y
		B	10110	F
		C	11010	J
		D	11001	W
		E	10011	B
	RTTD-5A Selector	1	00010	Carriage Return
		2	01010	R
		3	01100	I
		4	01000	Line Feed
		5	00100	Space
2	CHGR 10 MHz switch		11000	A
3		0	01000	Line Feed
		1	00100	Space

Note

Except for the first and tune character, characters may be received in any order, as long as the corresponding action function character follows its addressal function character. However, quickest tuning results are obtained by the reception of the characters in the order shown.

		2	01100	I
		3	00010	Carriage Return
4	CHGR 1 MHz switch		10100	S
		0	01000	Line Feed
5		1	00100	Space
		2	01100	I
		3	00010	Carriage Return
		4	01010	R
		5	00110	N

Table 5-2. Remote Tuning Input Codes (Continued)

Character Reception Order	Addressal Function	Action Function	5-BIT CODE	CCIT Character
5 (cont)		6	01110	C
		7	00001	T
		8	01001	L
		9	00101	H
6	CHGR 100 kHz switch		11100	U
7		0-9	Same as 5th character	
8	CHGR 10 kHz switch		10010	D
9		0-9	Same as 5th character	
10	CHGR 1 kHz switch		11010	J
11		0-9	Same as 5th character	
12	CHGR 0.1 kHz switch		10110	F
13		0-9	Same as 5th character	
14	CMRA MODE SELECTION switch	MODE	11110	K
15		CW	01000	LF
		PTT	00100	SP
		VOX	01100	I
		NORM	00010	CR
16	CMRA CARRIER SUPPRESSION switch		10001	Z
17		0 DB	01000	Line Feed
		3 DB	00100	Space
		6 DB	01100	I
		20 DB	00010	Carriage Return
		30 DB	01010	R
		FULL	00110	N

Table 5-2. Remote Tuning Input Codes (Continued)

Character Reception Order	Addressal Function	Action Function	5-BIT Code	CCIT Character
18	TRANSMITTER OUTPUT POWER switch	Output Power	11001	W
19		Power Level 1	01000	LF
		Power Level 2	00100	SP
		Power Level 3	01100	I
		Power Level 4	00010	CR
20	Transmitter H.V. on/off		10101	Y
21		on	01000	Line Feed
22	Fault reset		11101	Q
23		Fault reset	01000	Line Feed
24	Transmitter tune		10000	E
*	Clear			

*Clear code, received at any time before "Transmitter Tune", will delete codes from RTMU memory.

TABLE 5-1. REMOTE TUNING READBACK OUTPUT CODES

Character Transmission Order	Control or Condition	Position Indicated	Code Bits 1	Code Bits 2345
1	To reset remote readback indicator panel for new cycle		1	0000
2	CHGR 10 MHz switch	0		1111
		1		0111
		2		1011
		3		0011
		4		1101
		5		0101
		6		1001
		7		0001
		8		1110
		9		0110
	Transmitter "tuning/ready/ fault" status	*	*	
3	CHGR 1 MHz switch	0-9, same as CHGR 10 MHz switch		
	Transmitter "tuning/ready/ fault" status	*	*	
4	CHGR 100 kHz switch Equipment selected	0-9, same as CHGR 10 MHz switch		
		selected	1	
		not selected	0	
5	CHGR 10 kHz switch Memory power	0-9, same as CHGR 10 MHz switch		
		on	1	
		off	0	
6	CHGR 1 kHz switch RTTD LOCAL/REMOTE switch	0-9, same as CHGR 10 MHz switch		
		LOCAL	1	
		REMOTE	0	
7	CHGR 0.1 kHz switch VSWR and XMTR overload	0-9, same as CHGR 10 MHz switch		
		**	**	
		**	**	
8	High Voltage	on	1	1000
		off	0	1000
9	VSWR and XMTR overload	**	**	1000
		**	**	1000

*Readback of transmitter tuning status is contained in bit #1 of codes #2 and #3 combined:-

Code #2	Bit #1 Code #3	Status
1	0	tuning
0	1	ready
1	1	fault

**Readback of XMTR and VSWR overload status is contained in bit #1 of Codes #7 and #9 combined:-

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

Table 5-1. Remote Tuning Readback Output Codes (Continued)

Character Transmission Order	Control or Condition	Position Indicated	Code Bits 1	Code Bits 2345
10	XMTR overload #1	on	1	1000
		off	0	1000
11	CMRA MODE SELECTION switch	CW		1111
		PTT		0111
		VOX		1011
		NORM		0011
	XMTR overload #2	on	1	
		off	0	
12	CMRA CARRIER SUP-PRESSION switch	0 DB		1111
		3 DB		0111
		6 DB		1011
		20 DB		0011
		30 DB		1101
		FULL		0101
	XMTR overload #3	on	1	
		off	0	
13	TRANSMITTER OUTPUT POWER switch	off		1111
		1		0111
		2		1011
		3		0011
		4		1101
	XMTR overload #4	on	1	
		off	0	
14	XMTR overload #5	on	1	1000
		off	0	1000
15	XMTR overload #6	on	1	1000
		off	0	1000
16	Not used	none	0	0000
17	XMTR Selected	1	0	1110
		2	0	0110
		3	0	1010
		4	0	0010
		5	0	1100
		6	0	0100

CHANGE NO. 2

INSTRUCTION BOOK CHANGE NOTICE

Date January 29, 1971

Manual affected: NACOM II Manual GPTR-10KYA (Vol. 1) IN 393

1. Add, on the cover of each manual, a 1-1/4" x 3-1/2" gummed label providing for the following information in the format shown (reference MIL-M-63008 (TM), paragraph 3.1.1):

   Federal Item Name:

   Federal Stock No. -
   Contract No. - DAAB09- 69-C-0007
   Equipment Serial No. Range:
   36710 through 36711

2. Add, on the title page of each manual, a 1-1/4" x 3-1/2" gummed label providing the following information in the format shown (reference MIL-M-63008 (TM), paragraph 3.1.5.6):

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

SHOULD ADDITIONAL COPIES OF THIS CHANGE NOTICE BE REQUIRED, PLEASE CONTACT:

THE TECHNICAL MATERIEL CORP., 700 Fenimore Road, Mamaroneck, New York

Attn.: Director of Eng. Services.

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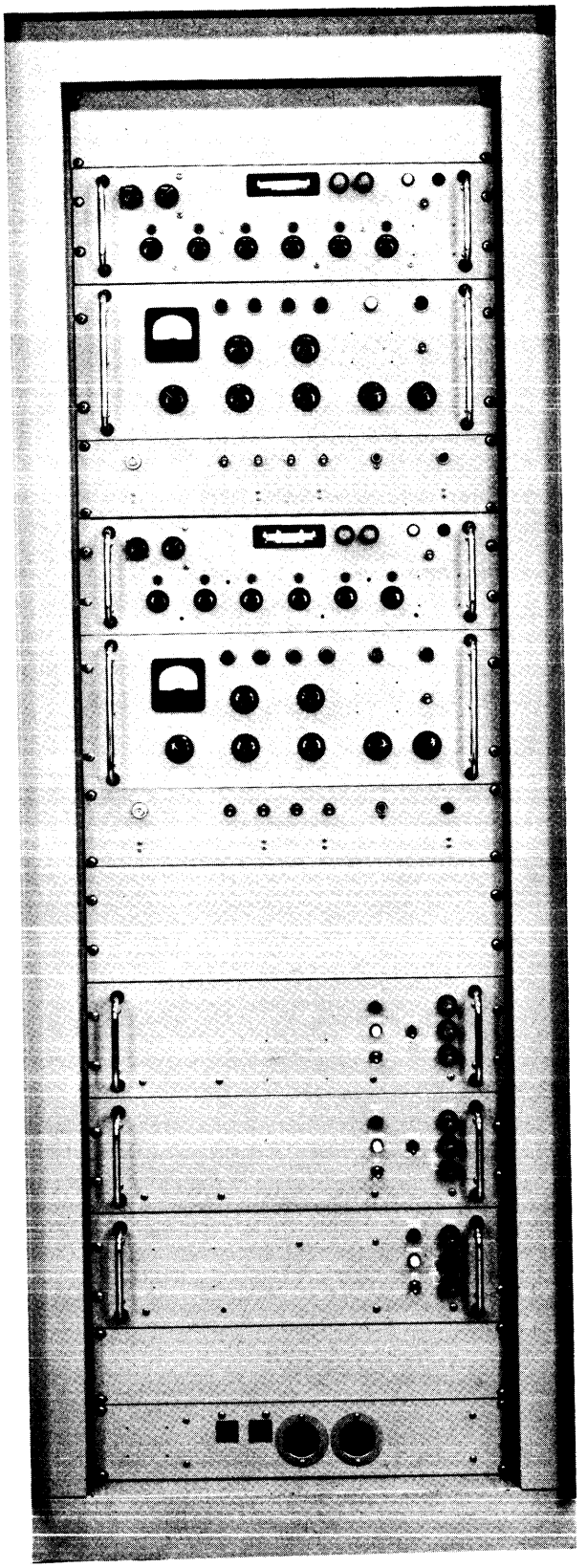


Figure 1-1. Front View SBGR-4YA

SECTION I

GENERAL INFORMATION

1-1 PURPOSE OF EQUIPMENT

The SBGR4 is a Dual Exciter system that provides two, 4 channel independent sideband transmissions, with frequency stability of 1 part in 10^8 per day in the ge of 1.6 to 29.9999 MHz. The exciter yields an output of up to 250 milliwatts and may be operated either manually or automatically. Automatic operation is accomplished via CCIT Teletype codes generated by a teletype code generator or equivalent programmer.

When teletype codes are sent from a remote control site the coded message will initiate the following: set the desired frequency in the exciter, adjust carrier suppression, and when properly interfaced with a transmitter, control high voltage on-off. A readback system furnishes essential data to the remote operator for status indications of frequency settings, high voltage ON/OFF, carrier suppression controls, transmitter "Tuning/Ready/Fault" status emission Mode, Power Level and HV overload alarm. Included in the data are readouts to display that the transmitter has been set properly for either remote or local tuning.

1-2 DESCRIPTION OF EQUIPMENT

A. Sideband Exciter CMRA-4 - The CMRA-4 provides the primary stage of frequency conversion and frequency division multiplexing in a four-Channel independent sideband transmitting system. Each CMRA-4 accepts up to four 600-ohm audio input signals, processes each separately, then combines them to yield an independent sideband output that is centered at a frequency of 1.75 MHz. The composite 1.75 MHz signal is then applied to the intermediate frequency input of the RF Translator, CHGR-4. Code information from the remote control console provides automatic carrier suppression and mode selection. Two CMRA-4s are supplied in the system to operate in conjunction with the two CHGR-4s.

B. Translator, CHGR-4- The CHGR-4 or Translator is a solid state RF generator that provides translation of [illegible] CMRA-4, to a selectable rf output range. It functions as an rf frequency exciter in a SSB transmitting system, providing amplitude modulated (AM), single sideband (SSB), or independent sideband (ISB) intelligence, on an rf carrier frequency between 1.6 and 29.999 MHz. Code information from the remote control console provides automatic frequency selection. Two CHGR-4s are supplied to provide modulated rf input for two transmitters.

C. Signal Data Converter-Storer, Model RTMU-41A - The RTMU receives coded tuning messages from the remote control console and stores codes necessary for automatic tuning, as it arrives, in a memory section. When the "transmitter tune" code is received at the end of a message, the RTMU releases the message, code by code to the RTTD, decoder unit, for processing. One RTMU provides the memory inputs to the two decoder units in the system.

D. Transmitter Decoder, RTTD-5A - The two RTTDs receive codes from the RTMU and move the associated transmitter controls accordingly. Included in this circuitry is a signal exchange between the code processing equipment and the transmitter automatic tuning section to ascertain proper sequencing between the two. The RTTD also contains the readback scanning and transmission section.

E. Test Key Unit, AX5093 - The AX5093 provides a convenient front panel application of an external audio test signal to check the operation of any channel by placing the associated switch in the "TEST" position. Other provisions are; an exciter Monitor jack and Test Key to complete the CHGR key line when operating CW. Two AX5093 units are supplied in the rack.

F. Power Distribution Panel, APP17 - The APP-17 provides two convenient 115VAC outlets on its front panel when its associated circuit breaker is closed.

SECTION 2

INSTALLATION

2-1 INTRODUCTION

The SBGR-4YA Exciter rack is shipped fully assembled and tested. Upon receipt, inspect the rack for possible damage due to shipment. With respect to damage to equipment, for which the carrier is liable, the Technical Materiel Corporation will assist in describing methods of repair and furnishing of replacement parts Figures 2-3 and 2-4 furnish interconnect cabling information.

2-2 POWER REQUIREMENTS

The SBGR-4 units leave the factory wired to operate from a 115VAC 47/63 cps, single phase line. However these units can easily be rewired for a 230VAC, 47/63 cps, single phase line by relocating connections at the power transformer primary winding in each unit. Refer to Figure 2-1 for typical RTTD and RTMU rewiring. In either case (115VAC or 230VAC) maintain a 115 vac input across the blowers by utilizing one half of the primary coil as shown in Figure 2-1.

2-3 CONNECTION TO TELETYPE LINKAGE

a. Variations In Teletype Equipment - Teletype sending and receiving equipment may vary in baud rating, loop current and level pattern. The RTMU and RTTD are designed to adapt to all standard variations by simple modifications. In all cases, figure 2-4 may be used as a connection guide.

b. Baud Rating - The tuning code input in the RTMU-41A is designed to handle pulse widths associated with a 45 baud transmission, unless specified as otherwise. Circuitry determining baud rating is contained in plug-in printed circuit card A2 (TMC Part No. A4565) in this unit. If a 75-baud pulse width is required, A2 cards are available for 75-baud input.

In either case, however, WPM rating (or the speed at which the codes enter) should not exceed 60 WPM. If the transmitter is being controlled by manual typing

at a keyboard, this speed will not ordinarily be exceeded and a 45-baud or 75-baud transmission may be used. If, on the other hand, the transmitter is tuned from a teletype transmission originating on pre-punched tape, only a 60 WPM (or 45 baud) transmission can be used.

Pulse widths in the RTTD-5 readback code output are for 45-baud transmitting equipment. However, a 75-baud output is available and this is accomplished by replacing plug-in printed circuit card A3 (TMC Part No. A-4518). The speed at which the codes leave the RTTD is determined by the baud rating (i.e.: 60 WPM for 45 baud and 100 WPM for 75 baud).

c. Current Loop - The tuning code isolation keyer input in the RTMU can operate from a neutral or polar loop but the rating of resistor RX across the input of the keyer (see figure 2-4) varies with the loop current (or voltage) rating. The RTMU is shipped without the RX resistor and this resistor must be added. Refer to TTY LOOP CHART in figure 2-4 for resistors vs. teletype ratings. Figure 2-4 shows the connection for a neutral keyed loop.

d. Level Pattern - Tuning code input circuitry in the RTMU-41A is designed to receive 5-bit codes contained in a CCIT standard 7.42 5-level transmission pattern. This circuitry is determined in plug-in printed circuit card A3 (TMC Part No. A4566-2). The pattern for the readback output codes, however, is adaptable to a range of transmissions, from 5-level up to 8-level. (The 5 bits of each readback code are contained in the first 5 bits of each code in 6-.7- or 8-level transmissions). Tuning input A3 cards are also available for 5-level up to 8-level transmission adaptability, if required; this feature defines the Model RTMU-41 (see RTMU-4( ) technical manual).

2-4 MULTIPLE TRANSMITTER CONNECTIONS

The RTTD-5 Transmitter Decoder can be combined with variations of the basic RTMU-4( ) Converter-Storer units in a variety of ways for an array of transmitters

working from a common teletype loop input. Variations of the RTMU-4 ( ) may be had by merely adding and/or subtracting plug-in printed circuit cards. Referring to Section 1 of the RTMU-4 ( ) technical manual, it may be seen that one single RTMU-41B can operate up to ten transmitters, each with an RTTD-5 unit. The RTMU-41C/RTTD-5 combination requires these two units in each transmitter in an array. Refer to the RTMU-4 ( ) manual for wiring details.

2-5 EQUIPMENT SELECTION CODES

Each equipment selection code (see table 5-9) represents a transmitter in an array. Letters A-E represent five blocks of transmitters (ten transmitters to a block); numbers 1-10 represent the transmitter within the block. As specified on the order, a matrix on plug-in printed circuit card A3 in the RTMU unit is wired for a particular A-E/1-10 combination. To identify a combination, refer to table 5-9, Available Recognition Codes, in the RTMU-4 ( ) manual; this table lists the jumper arrangement between a set of "X" and "Y" terminals on the matrix. Each RTMU is wired for an equipment selection code, whether it is to be used in an array or not; the RTMU will only open to its code.

For NACOM II Transmitter "Start Tune" connections on TB1, jump terminals 1 and 2, and terminals 3 and 8. (See Table 2-1).

TABLE 2-1

TRANSMITTER START TUNE CONTROL

TB1		
Terminal-1	*XMTR #1	START TUNE
Terminal-2	START TUNE	POSITION #1
Terminal-3	START TUNE	POSITION #2
Terminal-4	START TUNE	POSITION #3
Terminal-5	START TUNE	POSITION #4
Terminal-6	START TUNE	POSITION #5
Terminal-7	START TUNE	POSITION #6

TBI

Terminal-8	*XMTR #2	START TUNE

*Jump transmitter to position number

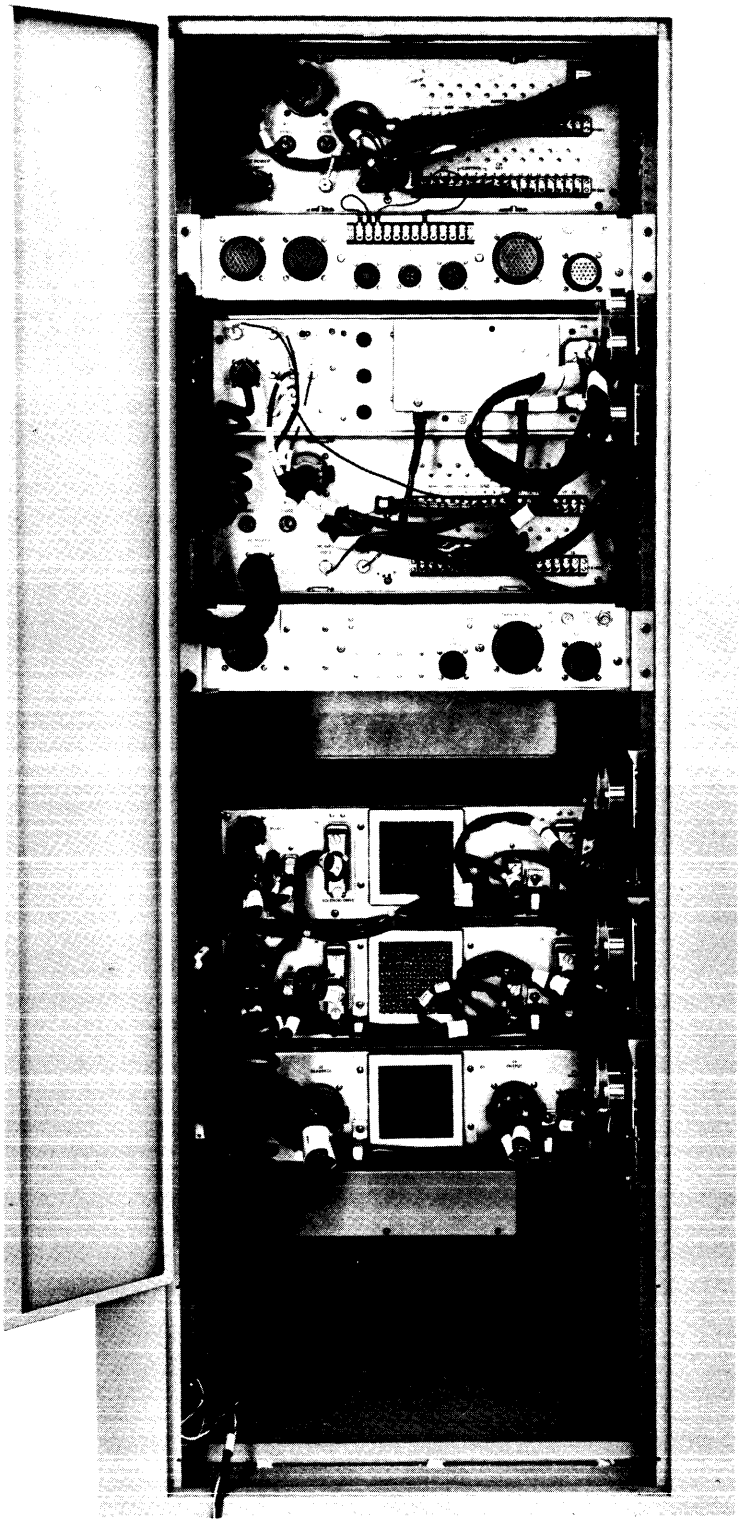
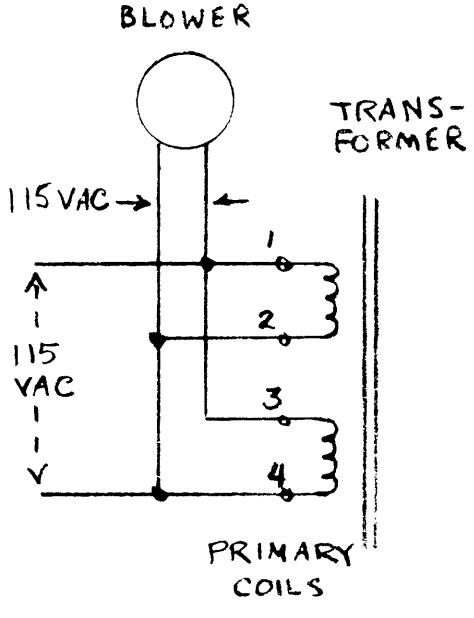
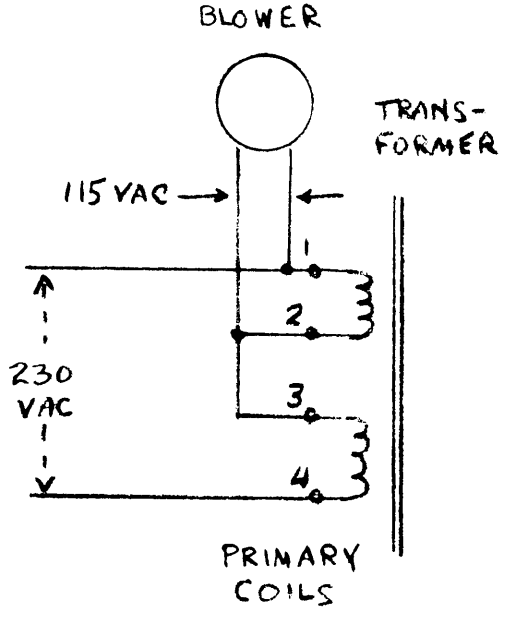


Figure 2-0. Rear View SBGR-4YA



115VAC LINE



230VAC LINE

FIGURE 2-1 TYPICAL TRANSFORMER WIRING, RTTD/RTMU 230-VS-115VAC

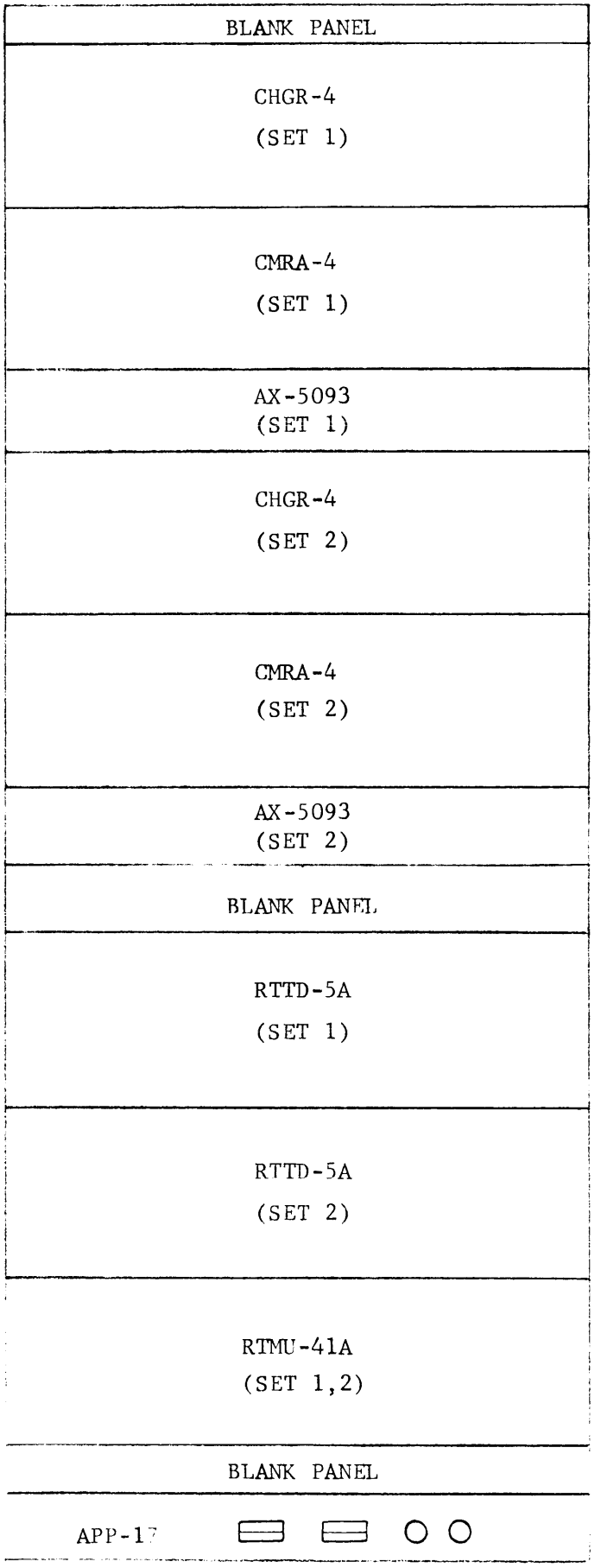
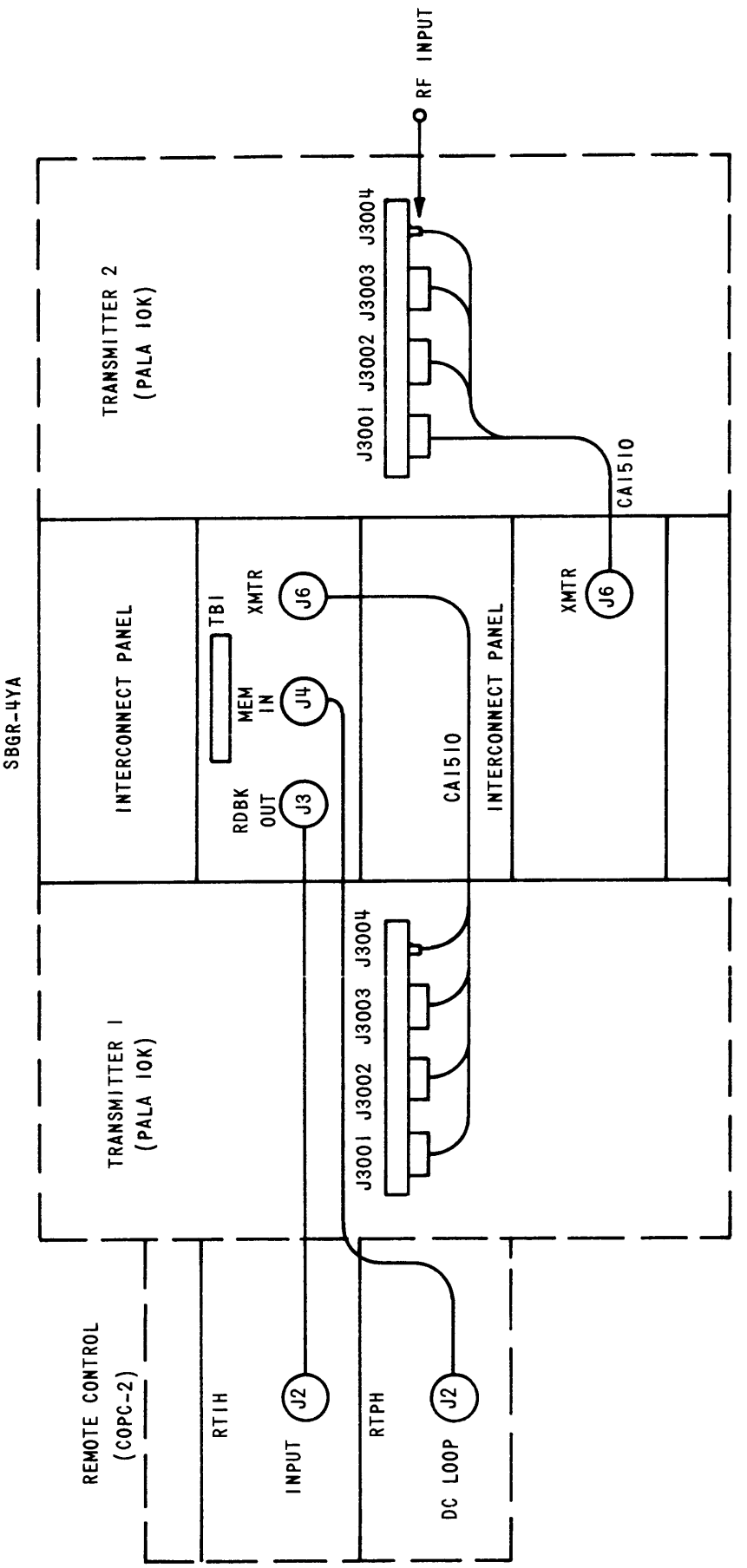
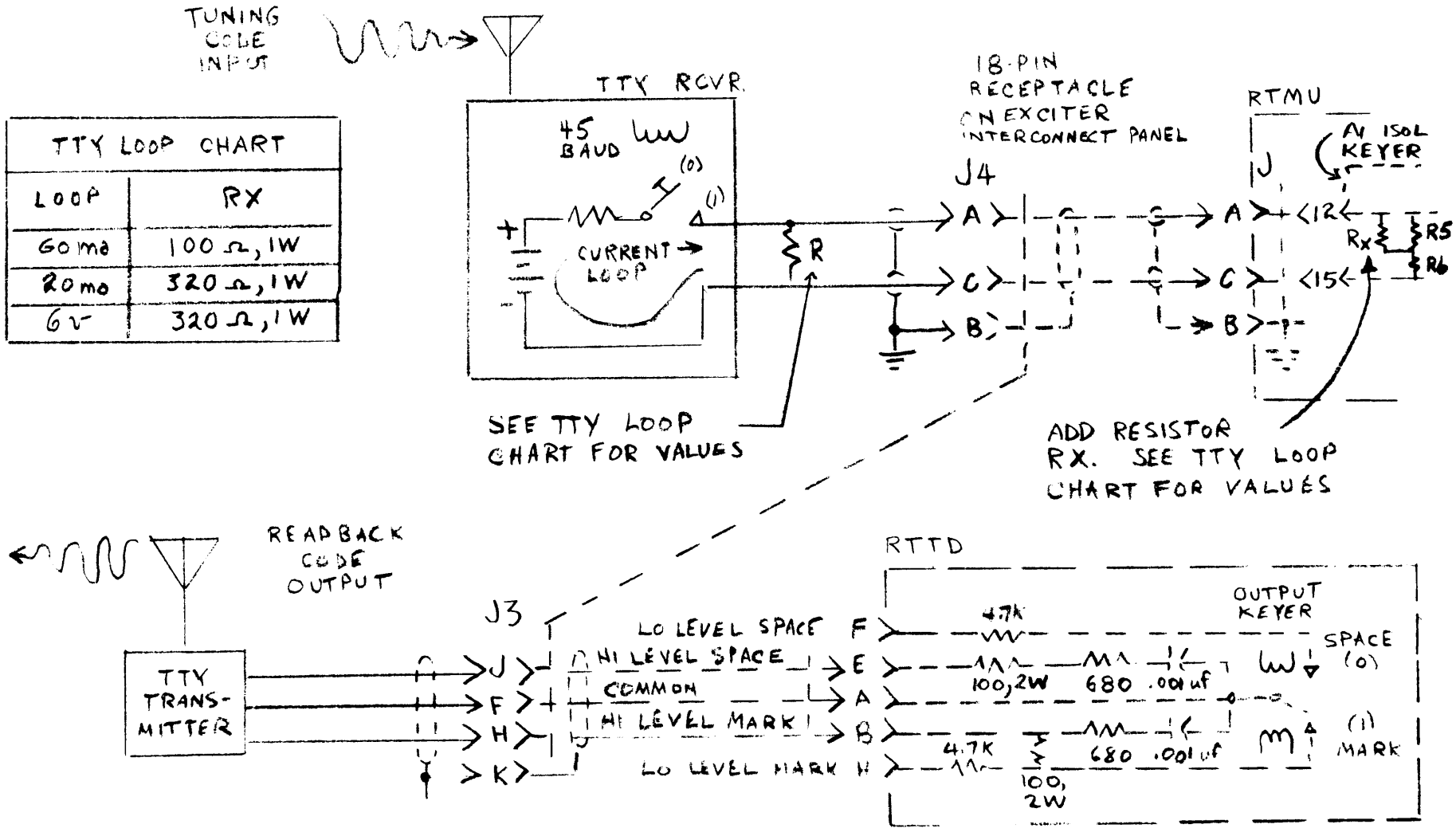


FIGURE 2-2 EQUIPMENT LOCATION, SBGR-4YA



INTERCONNECTING CABLING GPTR-10KYA

FIGURE 2-3



TTY LOOP CHART	
LOOP	RX
60 ma	100 Ω, 1W
20 ma	320 Ω, 1W
6 v	320 Ω, 1W

FIGURE 2-4 TELETYPE CONNECTION WIRING DETAILS

SECTION 3

OPERATOR'S SECTION

3-1 GENERAL

For remote control of the Exciter and Transmitter, a teletype code generator (RTPH-4) and a readback indicator (RTIH-4), working from teletype codes is required at the remote control site. Tables 5-8 and 5-9 list the necessary teletype codes for Exciter and Transmitter control. Table 5-10 lists readback codes generated from the Exciter and Transmitter. A specially designed code generator (RTPH-4), may be used for Exciter and Transmitter control, with the control board keys marked to match Exciter and Transmitter controls; or a standard CCIT teletype code generator may be used, refer to tables 5-8 and 5-9 for corresponding keyboard letters. In the same manner, a readback indicator with displays and marking appropriate for the Exciter and Transmitter may be used or standard CCIT teletype, receiving equipment can be employed, refer to figure 5-1 and tables 5-1 through 5-7 for tuning and readback codes. Generally, the specifically designed programmers and readback indicators are used in normal operation of the Exciter and Transmitter, for the sake of direct reading and expediency; teletype equipment is used mainly for testing and checking the Exciter and Transmitter at the transmitter site.

3-2 REMOTE FUNCTIONAL OPERATION

The RTMU-41A Signal Data Converter-Storer accepts teletype tuning codes from the remote control site and stores them momentarily until the "E" code (ending the message) arrives. The codes are then drawn out of the memory, one-by-one, and into the RTTD-5A Exciter/Transmitter Decoder. As each code is drawn out, the RTTD sends a positioning signal to an Exciter/Transmitter control and the control moves to the prescribed position. When all controls have been positioned, automatic tuning occurs in the Exciter and Transmitter linear power amplifier section in the same manner as for local automatic tuning. An Exciter/Transmitter selector code at the

beginning of the message enables one Exciter/Transmitter of five Exciter/Transmitter, to operate from one teletype line.

Specifically, the remote codes select an Exciter/Transmitter, set up the frequency, carrier suppression, high voltage switching, and mode selection. Frequency codes are for the 10 MHz, 1 MHz, 100 kHz, 10 kHz, 1 kHz and 0.1 kHz components in the 2.000 to 29.999 MHz frequency desired; the codes act to move these selector switches on the CHGR unit. The carrier suppression and mode selection codes act to position the CMRA CARRIER SUPPRESSION and MODE selector switches. The HV (High Voltage) on/off code energizes a H.V. on relay on the Transmitter.

The RTTD unit also functions as a control readback scanner and transmitter. The readback section specifically reads out the six frequency component settings on the CHGR, status of H.V. in the transmitter, and the setting of the CMRA CARRIER SUPPRESSION switch. Included in the readback is transmitter tuning status, a transmitter, and VSWR overload warning, mode of operation for CMRA, selected output Power Level and information to ensure that the Exciter/Transmitter is properly prepared for remote tuning. A tuning/ready/fault signal indicates to the remote operator the progress (or status) of the remote tuning phase occurring in the Exciter/Transmitter. When a "ready" signal is received, (indicating that the Exciter/Transmitter has completed tuning) another remote tuning message may be sent; the "tuning" signal indicates that the message will not be accepted. A "fault" signal indicates that the automatic tuning has failed to tune the Exciter/Transmitter within a preset time interval, and a re-cycling of the tuning phase is necessary. A transmitter overload warning indicates that an overload trip has occurred. An "equipment selected" signal indicates to the remote operator that the transmitter selector code has opened the memory input of the selected Exciter/Transmitter and that the succeeding codes will be stored. A remote/local signal indicates the position of the RTTD REMOTE/LOCAL front panel switch; if the switch is in the LOCAL position, remote tuning is not possible. Likewise, a "memory power" on/off signal indicates whether or not the RTMU memory is receiving power and able to accept the message. Readback is a con-

tinuous cycling of teletype codes.

3-3 REMOTE CONTROL PROCEDURE

a. GENERAL - Local presetting of certain controls on the Exciter/Transmitter front panels are necessary for remote tuning to take place. Preset controls per paragraph 3-5 to comply with mode of transmission employed. After the controls are preset, the remote operator should (a) scan the readback indicator to check the present frequency and carrier suppression settings, MODE and OUTPUT POWER LEVEL and (b) check the "remote/local" and "memory power on/off" signals; these signals should read "remote" and "on" respectively. When it is determined that a new frequency, carrier suppression, mode and output power level is required, the tuning message may be sent. The readback indicator may then be used again to ascertain that the controls have positioned as programmed. A more specific procedure is described in the following paragraph.

b. TUNING PROCEDURE - Refer to tables 5-8 and 5-9. Each message to an Exciter/Transmitter must include the two "equipment selector" codes for that Exciter/Transmitter. The RTMU unit is wired to accept a specific pair of codes (A-E letter and 1-10 numeral). Follow these two with a pair of codes to select and position each control, using the "character reception" order shown in table 5-8. An "addressal function" code selects the control; an "action function" positions it.

NOTE

It is not necessary to send all the codes in table 5-8; the message need only include those controls that require changing.

The CARRIER SUPPRESSION code pair should be appropriate for the transmission mode (see table 3-1). If the H.V readback indicates "off", include a H.V "on" code pair as the last control code. Then end the message with the "tune" code (teletype E); this initiates the transfer of codes from the RTMU memory into the Decoder.

If, at any time, an error is made in the message, (before the "tune" code is sent) existing codes stored in the RTMU memory may be cleared out by sending the "clear" code and a corrected message started without first sending the transmitter selector codes again. However, since the control code storage capacity for the RTMU memory is for 15 pairs, an error can usually be corrected by simply including the corrected pair of codes anywhere in the message.

c. Sample Tuning - The following procedure is for an example in which it is necessary to re-tune transmitter "A1" to 23.6251 MHz, carrier suppression -30 db, NORM MODE and output level #2. Readback is indicating; 19.5436 MHz, Carrier Suppression "Full", "Ready", "Memory Power On", REMOTE/LOCAL switch at REMOTE, but H.V. power "off". Program message as follows (using "Code" or "CCIT Equivalent" columns only if specific programmer is not available): -

Sending Order	Code	CCIT Equivalent	Significance
1	10101	Y	Selects "A" block of 10
2	00010	Carriage Return	Selects transmitter "1".
3	11000	A	Selects 10 MHz control
4	01100	I	Positions above for "2"
5	10100	S	Selects 1 MHz control
6	00010	Carriage Return	Positions above for "3"
7	11100	U	Selects 0.1 MHz control
8	01110	C	Positions above for "6"
9	10010	D	Selects 0.01 MHz control
10	01100	I	Positions above for "2"
11	11010	J	Selects 0.001 MHz control
12	00110	N	Positions above for "5"
13	10110	F	Selects 0.0001 MHz control

Sending Order	Code	CCIT Equivalent	Significance
14	00100	Space	Positions above for "1"
15	11110	K	Selects Mode Switch
16	00010	CR	Positions Mode Switch to "NORM"
	10001	Z	Selects CARRIER SUPPRESSION control.
18	01010	R	Positions above for "30DB"
19	11001	W	Selects Output Power Control
20	00100	SP	Selects Power Level #2
21	10101	Y	Selects H.V control
22	01000	Line Feed	Positions above for "ON"
23	10000	E	Exciter/Transmitter tune command

d. Readback Monitoring - If a "fault" signal appears in the readback after a "tuning" indication, the automatic tuning procedure may be re-cycled by sending another message (preceded by the two equipment selection codes) containing the "E" tune command code. This code action parallels that of the reset button located in the RTTD front panel FAULT light, used for maintenance checks. The equipment selected code should appear in the readback when the second transmitter selector code is sent and the tuning code should appear when the "tune command" code is sent. If the H.V. overload warning continues to appear in succeeding attempts at remote tuning, the Exciter/Transmitter should be examined for the cause of the trouble. If at any time, the "remote" signal changes to "local", this is an indication that remote control is being overridden at the Exciter/Transmitter site (see paragraph 3-4, MANUAL OVERRIDE). Likewise, a "memory power off" signal indicates a disabling and override of the remote control. In either of the last two cases, however, the readback from the RTTD continues and, if local tuning is taking place, a "tuning" signal will be included in the readback, together with the new frequency and carrier

suppression settings. When tuning is complete, the remote operator will see "ready" readback, However, the "local/remote" and "memory power" readbacks should be checked again before attempting another remote tuning.

Readback will continue as long as the RTTD POWER switch is in the ON position; with the switch OFF, the readback ceases.

3-4 MANUAL OVERRIDE.

The Exciter/Transmitter may be placed in manual override of the remote control system at any time. However, during remote tuning it is advisable to wait for the mechanical action to stop in the linear amplifier servo motor.

To place Exciter/Transmitter in manual override, set RTTD REMOTE/LOCAL switch at LOCAL. This the the only control necessary for switchover between remote and local operation. All other controls should remain as shown in table 3-1, in order to simplify the switchover. When the local tuning is concluded and it is desired to bring the transmitter back to remote control capability, set REMOTE/LOCAL switch back to REMOTE.

3-5 OPERATING PROCEDURE FOR SBGR-4

a. LOCAL OPERATION

NOTE

When using both exciters, perform similar action on corresponding modules.

Step	Module	Operation
1	All	Place all Power switches in OFF or Standby position
2	CHGR	Set RF Output control fully CCW. Set MHz switches to desired frequency
3	CMRA	Determine mode of transmission and, referring to paragraph 3-5 Channel Priority and Carrier Suppression

Step	Module	Operation
		control accordingly. Set controls for unused channels at "0"
4	AX5096	Place all TEST/LINE switches to LINE
5	CMR	Set Power switch to ON. If there is no audio coming into the system, Standby lamp will light. If audio is being introduced, Power lamp will be lit.
6	CHGR	Set Power switch to ON. Set Meter switch to RF and increase RF Output control until meter reads "2", which is approximately 100 MW.

b. REMOTE OPERATION

NOTE

Refer to associated remote console (COPC - 2) and transmitter manual for respective control settings.

Step	Module	Operation
1	RTTD	Set Remote/Local switch(es) to Remote
2	CMRA	Determine mode of transmission and referring to paragraph 3-5, set Channel Priority and carrier Suppression controls accordingly. Set controls for unused channels at "0"
3	AX5093	Place all TEST/LINE switches to LINE
4	All	Place all Power switches to ON. Power lamp on CMR should light, indicating presence of audio output.

A program input from the remote control console, proceeded by a "Tune" code will initiate automatic tuning.

MODE OF TRANSMISSION	CONTROL	SETTING
1 Channel SSB	A1 or B1	100

MODE OF TRANSMISSION	CONTROL	SETTING
2 Channel ISB*	A1 or B1	50
4 Channel ISB*	A1, A2, B1 and B2	25
AME	A1 or B1	50
AM	A1 or B1	30
CW (Keyed Carrier)	A1, A2, B1, and B2	0
Tone CW, FSK,FAX*	A1	50
	A2, B1, and B2	0

* If one channel of an ISB transmission is to be used for FSK or FAX, set the priority control of the channel containing the single-tone modulation at 25 (for 2 channel ISB), or 4 channel ISB).

TABLE 3-1. CARRIER SUPPRESSION SETTINGS

MODE OF TRANSMISSION	SETTING
CW (Keyed carrier telegraphy)	0 DB
AME	6 DB
SSB or two-Channel ISB with reduced carrier	20 DB
AM	6 DB
Four-channel ISB with reduced carrier	30 DB
SSB or ISB with suppressed carrier; tone CW, FSK, or FAX	FULL

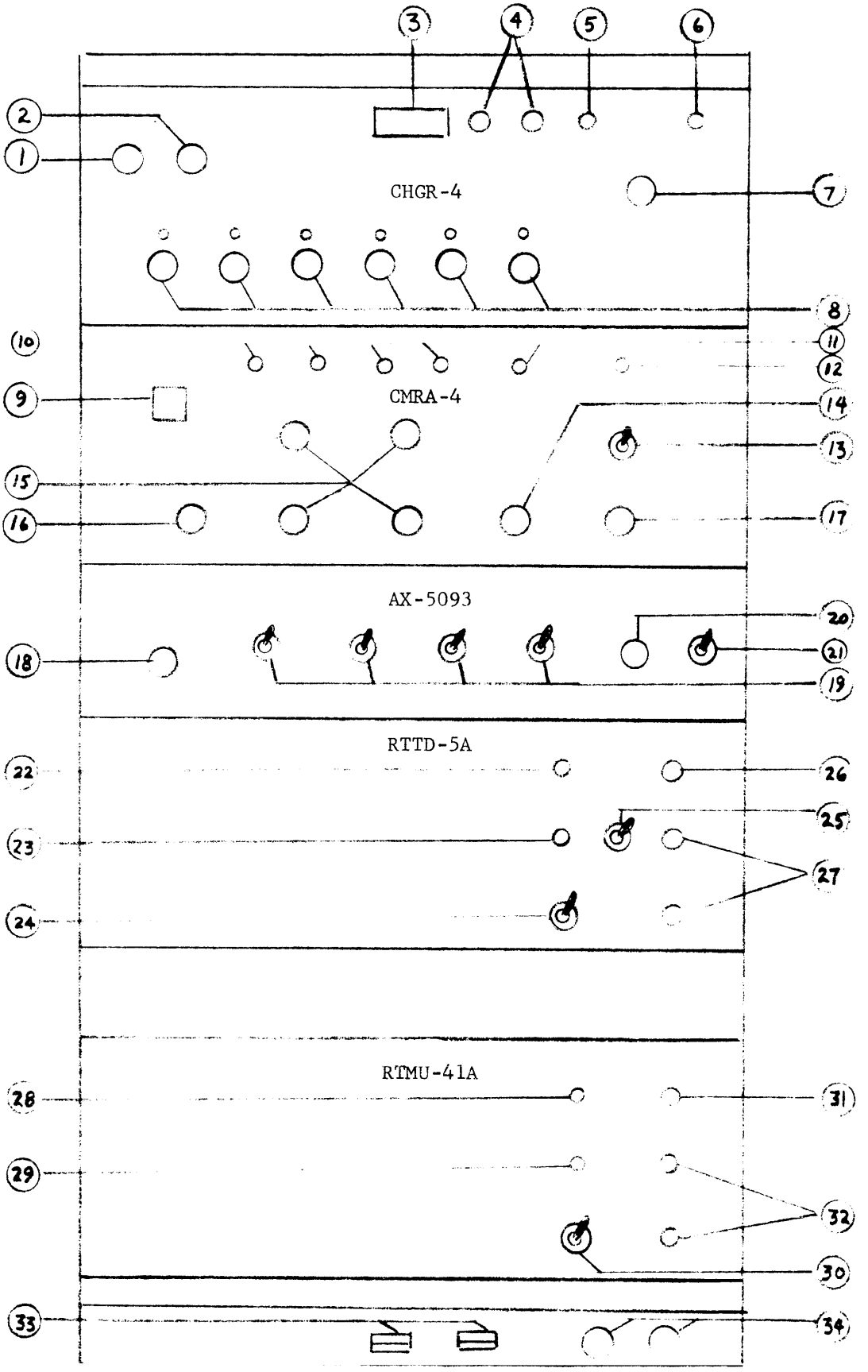


Figure 3-1. Controls and Indicators.

3-6. CONTROLS & INDICATORS

CHGR-4

Item	Panel Designation	Function
1	RF OUTPUT control	Adjust rf output level.
2	Meter switch (4 position)	Selects circuit in CHGR to be monitored by Monitor meter.
3	Monitor meter	Monitors circuit selected by Meter switch.
4	Line fuses (2)	1 ampere line voltage fuses (.5a for 230VAC operation).
5	Standby indication	Illuminates amber when ON/Standby switch is positioned to Standby.
6	Power indicator	Illuminates red when ON/Standby switch is positioned to ON.
7	ON/Standby	When positioned to ON, applies 12 and 24 VDC to modules. When positioned to Standby, removes dc voltages from all modules except 1 MHz frequency standard and illuminates Standby indicator.
8	100 Hz, 1 KHz, 10 KHz, 100 KHz, 1 MHz, 10 MHz switch	Used to select the desired operating frequency.

CMRA-4

Item	Panel Designation	Function
9	Input Level (dbm)	Indicates power input level (to each channel) between -20 dbm and +3 dbm, as selected by Meter Function switch, Item 16.
10 (4)	Channel Activity lamp (one for each channel)	Lights to indicate that corresponding channel is active (channel audio input level is -26 dbm or higher).
11	STANDBY lamp	Lights when all channels are inactive (no audio input).
12	Power lamp	Lights to indicate unit is in operation.
13	ON switch	When at ON position, energizes the unit.
14	CARRIER SUPPRESSION (db) switch	Reinserts carrier at indicated levels below full power output.

Item	Panel Designation	Function
15 (4)	CHANNEL Priority Controls (one for each channel)	Controls apportionment of output power for each channel (graduated in percentages).
16	METER FUNCTION switch	Selects channel input signal for monitoring by Input Level meter, Item 9.
	MODE switch	Selects mode of operation.

AX5093

Item	Front Panel Designation	Function
18	EXCITER MON jack	Front panel provision to monitor exciter output.
19	A1, A2, B1, B2 TEST/LINE switch	When placed in the TEST position, routes audio test signal from TEST AUDIO jack to corresponding channel input on CMRA. When placed in LINE position, normal inputs are routed through switch to respective channel inputs on CMRA.
20	TEST AUDIO jack	Capability of applying an audio test signal to CMRA through A1, A2, B1, or B2 TEST/LINE switches when in TEST position.
21	TEST KEY switch	When depressed, applies a ground for CHGR key line.

RTTD-5A

Item	Front Panel Designation	Function
22	Fault lamp & reset button	Lights if Exciter fails to tune within 10 seconds. Depressing the lamp/reset button extinguishes the lamp and recycles the auto tune sequence.
23	Power lamp	Lights to indicate power is applied to unit.
24	ON/OFF switch	Applies power to unit illuminating the Power lamp.
25	LOCAL/REMOTE switch	The Local position enables a manual override of the system. The REMOTE position enables the auto tuning function of the system.
26	Spare fuse	Spare fuse holder.
27 (2)	AC LINE fuses	(2) 1 ampere line fuses (.5a for 230 VAC operation).

RTMU-41A

Item	Front Panel Designation	Function
28	SIGNAL INPUT lamp (blue)	When lit, indicates the presence of a coded teletype signal at the RTMU input.
29	Power lamp	Indicates power supplied to RTMU through closure of ON/OFF switch.
30	ON/OFF switch	Applies power to unit when in ON position.
31	Spare fuse	Spare fuse holder.
32	AC LINE fuses	(2) 1 ampere line fuses (.5A for 230 VAC).

APP-17

Item	Front Panel Designation	Function
33	None	(2) circuit breakers that apply auxillary 115 VAC (230 VAC) outlets to respective outlets.
34	None	115 VAC (230 VAC) auxillary outlets when respective circuit breakers are closed.

SECTION 4

PRINCIPLES OF OPERATION

4-1 INTRODUCTION.

This section contains a description of the operation of the Exciter/Transmitter r e code receiving equipment (i.e.: RTMU-41A, RTTD-5A, and control lines to the units in the Exciter and Amplifier frames) at a functional level.

4-2 GENERAL (figure 4-1).

In remote operation of the Exciter/Transmitter, teletype codes sent by the remote operator serve to set the CHGR frequency controls in the Exciter. In addition, there are on/off codes for the remote control of the transmitter high voltage and codes for adjustment of the CMRA CARRIER SUPPRESSION at the Exciter stage. Included are signal exchanges between the Exciter and the Transmitter to ascertain that the proper sequences occur in the automatic tuning. Signal lines involved in the remote control system are symbolized in heavy lines in figure 4-3.

Readback of Transmitter control positions and tuning status is generated by the readback section. The readback is also in the form of teletype code. Broken lines in figure 4-3 represent readback signal lines.

All circuitry is solid state, employing binary logic components and contained on printed circuit plug-in assemblies. "A" numbers in figure 4-1 are the circuit designations of the assemblies.

4-3 BLOCK DIAGRAM ANALYSIS (REFER TO FIGURE 4-1)

a. REMOTE CONTROL - Coded inputs, representing various positioning and tune commands to the Exciter and Transmitter are applied to the RTMU, Signal Data Converter, Storer. The coded tuning messages are stored in a "memory" section until the arrival of a "tune" code signals the RTMU to release the message, code by code to the Decoder, RTTD.

Each function, such as "Mode" selection requires two (5), (6), (7), or (8) bit

codes to accomplish the necessary positioning of the "Mode" selector in the CMRA. The first code called "Address" positions a Master Stepping switch in the RTTD in a manner that permits the second portion of the code called "Action", to direct its command signal to the "Mode" selector switch in the CMRA.

As each code is being fed to the RTTD, a "Memory inhibit" signal is fed back to the RTMU to prevent the arrival of the next part of the message while the Master Stepping switch is moving. During the transfer cycle of each code, the RTMU sends a "decoder inhibit" signal to the RTTD to prevent it from supplying power to the Master Stepping switch while the code is being transferred from the RTMU to the RTTD. When the Master Stepping switch has stopped moving, it sends a "memory advance" signal back to the RTMU to draw out the next code message. This transfer of signals from the RTMU and RTTD continues until all the codes are drawn out of the memory and the necessary Exciter and Transmitter controls are positioned. The RTMU also supplies an "Equipment Selected" readback to the RTTD for application to the Indicator, (RSSA) to indicate which transmitter is being controlled. Read-back to the RTTD for application to the "Frequency and Control Indicator (RT1H) to provide the remote operator with a status indication.

b. SIGNAL FLOW - Four channel audio input is applied to Test Keyer, AX5093 for application to the CMRA input when the TEST/LINE switches are in the LINE position. Placing any of the TEST/LINE switches in the TEST position will transfer the normal audio input to the TEST AUDIO jack on the front panel of the AX5093. The AX5093 also provides front panel monitoring of the CHGR as well as manual control of the CHGR keyline.

The CHGR provides a frequency stable 1 MHz signal to the CMRA for frequency conversion and frequency division multiplexing with the audio signal. The composite 1.75 MHz output of the CMRA is applied to the intermediate frequency input of the CHGR for translation to a selected rf output range from 1.6 to 29.9999 MHz.

4-4 DETAILED REMOTE CONTROL OPERATION

a. CODE ENTRY (figure 4-3) - Tuning codes from the Programmer (RTPH) enters the SBGR-4 by way of isolation keyer A1 in the RTMU Signal Data Converter-Storer. The 5-bit binary codes are made up of pulses of current from a standard keyed teletype current loop and include a "start" pulse at the beginning and a "stop" pulse at end. Isolation keyer A1 keys a logic voltage in the input of clock timing circuit A2 and also serves to isolate the code inputs of any array of transmitters working from a common teletype loop.

Clock timing circuit A2 converts the serial pulse (signal line) code input to a parallel pulse code output with a line for each bit in the 5-bit code. The five bits of the code then pass through parallel shift register A3 on the way to integrated shift register A7, where they become stored in a "memory".

The "start" pulse in each code triggers the movement of that code into the memory. This pulse starts a clock in clock timing circuit A2 and clock pulses pace the shift-register in A3. When the shift-register shift out to the end, it generates a "stop" pulse, stopping the clock.

A3 and gating circuit A4 serve to analyze the codes for three particular types of code: (1) transmitter selector, (2) "clear", and (3) "E" code. The transmitter selector code is a 2-code combination at the beginning of the message that (via stund relay K1) effectively unlocks the input to the RTMU memory at A2, thereby allowing the rest of the codes to become stored. The "clear" code, if received at any time during the message, will result in a "clear" signal to the memory via shift timing circuit A6, dumping any existing codes out of the memory section. The "E" code, signifying the end of the message, serves to energize the code processing section in Transmitter Decoder RTTD-5 . Another effect of the correct transmitter selector code is to issue a "stunt" signal from the energized stunt relay K1 to the other transmitters in the common teletype loop, closing their memory sections to any succeeding codes in that tuning message. The energized K1 relay also generates an "equipment selected" readback.

b. "E" CODE INTO RTMU (figure 4-3). When the "E" signal arrives at shift timing circuit A6, (a) it generates a "start tune" signal from A4 and (b) it starts a clock in A6. The clock proceeds to send out a series of regularly timed "shift" pulses to integrated shift-register A7. At the same time instance, the "start tune" signal acts upon RTTD time delay relay K1 to ensure that it is in its normal (no fault) position. In this position, there is continuity for a "tune lockup" circuit (located in RTTD stepping switch gating circuit A5) used in the ensuing code transfer. A "memory advance" pulse is then generated from A5 generating a "delay pulse" from RTMU shift timing circuit A6. Meanwhile, the continuous series of shift pulses to RTMU A7 is shifting the parallel code bits in a memory section towards the output of this section. When the first code arrives at the RTMU output, a "monitor pulse" is generated back to A4 and to A6 to stop the clock. To release the first code to the RTTD it is necessary for A6 to stop the clock. To release the first code to the RTTD it is necessary for A4 to receive both monitor pulse and the end of the long delay pulse. (Duration of the delay pulse is designed to allow for the extreme condition in which there is only one code in the message and it must travel the entire length between input to output.) When both of these signals have been received, the first code is shifted out of the RTMU and into the RTTD. At this point, a reciprocating action starts between the RTTD and the RTMU, in which codes are drawn out of the RTMU's memory by successive "memory advance" signals from the RTTD. A more detailed account of this follows in the next paragraph.

c. CODE TRANSFER ACTION (FIGURE 4-3). - When the first code enters a BCD decoder section in RTTD drive input gating circuit A4, the reciprocating action starts. Referring to table 5-8, Remote Tuning Input Codes, codes intended to select a transmitter control starts with a "1" as bit #1 and codes intended to position n the control start with a "0". If bit #1 is a "1" in the first code, the tune lockup circuit (in A5) enables an SCR gate control (#1) in A5 to supply power to a

master stepping switch, A9. This switch moves to a position from the code, thus connecting the RTTD control position signal output to a particular exciter. Control. When the switch has stopped moving, it sends a "switch homed" signal back to SCR gate control #1 and this responds by sending the second "memory advance" signal back to RTMU shift timing circuit A6 for the next code. During the transf cycle of each code, RTMU A6 issues a "decoder inhibit" signal to RTTD SCR gate control #1 to prevent it (the gate) from supplying power to the master stepping switch while the code is being transferred from the RTMU memory to the RTTD BCD decoder.

The second code drawn out has a "0" for bit #1 and will position the selected exciter control. With bit #1 polarity a "0", SCR gate control #2 (also in RTTD A5) supplies power to the selected exciter stepping switch control drive. The positioning signal is received by the exciter stepping switch via the BCD decoder and via the position of the master stepping switch (positioned by the first code). When the exciter switch has homed, the second "switch homed" signal is sent back to RTTD SCR control gate #2 and it sends back the third "memory advance" signal to the RTMU to draw out the third code. This procedure is repeated until all codes have been drawn out of the memory.

At the start of the code transfer, the time delay circuit sends back a "memory inhibit" signal to the clock in the RTMU clock timing circuit A2. This is to prevent the clock from starting from another tuning message while stepping switches are moving.

d. FREQUENCY TUNING (figure 4-3) - When the 18-position master stepping switch receives the final code (E) in the message, this code sends it to position #18, the last stop in its complete revolution. (The first seven positions select exciter controls). As it travels through position #8, a ground pulse is extended to an H.V. (high voltage) on/off control logic circuit in H.V. transmitter logic circuit A6. Meanwhile (from position #8) bits #2 and #3 of the H.V. positioning

code have arrived at A6 from the BCD decoder and bit #1 (a "0") has also arrived. In accordance with the on/off code, A6 sends a control signal to an H.V. on/off relay in the transmitter, via an H.V. on/off relay (K2) in the RTTD.

A readback from the transmitter main power control also furnishes additional information to logic circuit A6. This is to prevent an H.V. "on" signal to the transmitter H.V. control when the main power circuit breaker has been turned off locally.

The master stepping switch movement in the RTTD triggers the automatic tuning system in the linear amplifier. While the master stepping switch is moving through its exciter switch positions (1-7) a ground is extended to RTTD tune relay K3, energizing it. The energized K3 latches relays in the transmitter to prevent automatic frequency tuning during the exciter switch-positioning phase. When the master stepping switch leaves position #7, the ground is removed, K3 de-energizes, sending the "tune" signal, and the transmitter switches unlatch. This allows the transmitter automatic tuning to take place, from the prepositioning information previously set up on the CHGR MHz component switches.

A time delay circuit in the RTTD shuts off the amplifier automatic tuning search action in the event of a fault (or failure to synchronize). Ordinarily, (when no fault occurs) a "READY" relay located in the transmitter goes into output condition when searching is finished and synchronization is reached. This disconnects a ground signal from the time delay circuit, disabling it. If a fault occurs, however, searching continues and the time setting (60 seconds) for the time delay K1 into its "fault" condition. K1 then (a) energizes the servo off relays in the transmitter (b) breaks the tune lockup continuity in the RTTD, (c) shuts off the -30v power supply to the master stepping switch and stepping switches throughout the exciter, (d) lights a FAULT lamp on the RTTD control panel and (e) sends a FAULT readback to the remote operator. In this event, a remote-controlled recycling of the automatic tuning can be initiated by sending

another message with one frequency digit repeated and the "E". This causes the master stepping switch to make another complete revolution and sends another "start tune" signal to the time delay circuit, resetting the time delay relay (K1) to its normal position. The master stepping switch, in its new revolution, sends another "tune" signal to the transmitter and a new tuning cycle starts.

The transmitter tuning can also be recycled locally by pushing the RTTD FAULT light. A reset button, built into the light, generates a signal at the time delay circuit paralleling that of the remote "start tune" signal. Automatic tuning then recycles in the same manner as for remote control.

A "long ground" signal from the master stepping switch provides (a) another link in the tune lockup continuity and (b) an ensurance that the transmitter high voltage relays are in their reset condition. This ground appears from the switch during its travel through positions #1 to 15, holding the tune lockup circuit in. The same ground acts, through a H.V. o/1 reset relay in the transmitter to keep high voltage switched back in, in the event of a previous overload condition.

e. READBACK SYSTEM (figure 4-3) - Inputs into the readback system originate from exciter module control positions and various relays in the linear amplifier automatic tuning system; these signals are scanned by the readback circuitry in the RTTD and sent out in serial teletype form to the remote operator. The 5-bit codes represent specific information as shown in table 5-10. Some codes contain more than one source of information (i.e. a control postion and some status information) worked into the five bits. The tuning/ready/fault status is read in bit #1 polarities in two successive codes.

Control position readouts for the CMGR MHz switches and the CMRA CARRIER SUPPression switch is contained in bits #2-5 of their codes. The 4-bit code is set up by a readback wafer on the control, next to the stepping switch drive wafer.

Readout of each code is generated by a gating pulse issuing from readback bit shift register A3 to that particular wafer. The bits arrive at A3 in parallel pulse form and are then shifted out in serial pulse form, via isolation keyer A1, for transmission to the remote operator. At the end of each code, A3 sends a shift signal to readback code shift register A2 and A2 responds by sending the energization pulse necessary for the next code readout (see "character transmission order" column, table 5-10).

In each of the CHGR control readouts, the same gating pulse that energizes the bit #2-5 readout also energizes a bit #1 readout from information elsewhere in the transmitter. The two successive gating pulses from A3 for the 10 MHz and 1 MHz controls also issue to a transmitter tuning status logic circuit for readout of the tuning/ready/fault code. This circuit has three continual sources of information: (1) the "READY" relay in the transmitter (2) tune process on/off information from the tune lockup circuit in A5 and (3) fault/no fault from time delay K1. The output is a bit #1 polarity (for two successive codes) to A3. The 100 KHz gating pulse reads out the "equipment selected" information from RTMU clock timing circuit A2. The 1 KHz gating pulse presents information as to the position of the RTTD REMOTE/LOCAL switch. The 0.1 KHz gating pulse reads out the "memory power on/off" signal from RTMU clock timing circuit A2. The 1 KHz gating pulse presents information as to the position of the RTTD REMOTE/LOCAL switch. The 0.1 KHz gating pulse reads out an alarm/no alarm signal from the the H.V. overload relay in Transmitter. Following these pulses are nine more gating pulses issuing from A3 (F1 through F9). Only three of these are used in this particular transmitter, however; these are F1, F2 and F4. F1 and F2 successive pulses enter an H.V. status readback logic circuit in H.V. transmitter logic circuit A6 to readout the H.V. status of the transmitter. Inputs to this circuit are the on/off status of the main power relay as well as that of the H.V. relay in the Transmitter. These codes contain information, in bit #1 only;

bits #2-5 are not used. F4 then serves only to read out the CMRA CARRIER SUPPRESSION readback wafer for bits #2-5 of the last code.

An "E" code (10000) is permanently set up in the circuitry of readback code shift register A2. This code is automatically sent out as the first code in each readback cycle and serves to reset the readback indicator circuitry at the remote c tions site.

It may be seen that the readback section operates independently of the remote control section and will continue to transmit as long as power is applied to the RTTD. The only connection between the two sections is a common sharing of "transmitter main power on/off" information by the H.V. on/off control and H.V. status readback logic circuit in RTTD A6.

4-5 LEDEX CONTROL (REFER TO FIGURE 4-2)

Positioning of the Ledex controlled switches requires two coded input messages from the RTMU. The first coded message, containing a 1 bit, "Addresses" or positions the Master Stepping switch in the Decoder (RTTD), so that the next coded message (Action) will be directed to the desired Ledex motor.

The 1 bit in the first coded message is applied to "And" gate, G1, while bits 2-5 are applied to the 16 Code Gates. G1 will produce an output provided; (1) a 1 bit is present, (2) no Fault has occurred, (3) the Decoder has not received a "Decoder Inhibit" signal, (4) "A" wafer, on Master Stepping switch has not "homed." Bits 2-5 will key the Code Gate that matches that particular input, producing a ground that is routed to "A" wafer, on the Master Stepping switch and paralleled to the "Action" switches on the CHGR, CMRA and the transmitter. For example, if "Action" is to be directed to the 10 MHZ switch in the CHGR, code input 11000 would be seen at J2 (See Table 5-8). The ground felt on notch homing wafer "A" would cause the Master Stepping Switch Ledex motor to be energized until the notch on "A" removes the ground to G1. Wafers "B" and "C" would be aligned as shown on Figure 4-2. Therefore, the "Address" portion of the message has only served to

position wafers A, B, and C of the Master Stepping Switch in a manner that will direct control from the next message to the 10 MHz Ledex Motor in the CHGR. If the output frequency is to be 10.0 MHz, the "Action" code, 00100 would key, Code Gate 2. The ground from Code Gate 2 would seemingly move the Master Stepping Switch again, however, the "Action" Code does not have a 1 bit, preventing G1 from energizing the Master Stepping Switch Ledex Motor. The ground from Code Gate 2 will pass through the CHGR notch homing wafer #1 and Master Stepping Switch wafer "B" to "And" gate G2. If the other 3 inputs are satisfied, G2 will provide a gating pulse to the SCR that provides a ground at its output for application to the 10 MHz Ledex Motor in the CHGR through wafer "C: of the Master Stepping Switch. The 10 MHz Ledex Motor will move "Action" switch #1, until the notch opens the ground path to the 10 MHz Ledex Motor. To adjust the remaining frequency selector switches in the CHGR would consist of "Address", than "Action" to the 1 MHz switch, the 10 KHz etc. The FUNCTION chart on Figure 4-2 indicates the various functions available from the pin of J6.

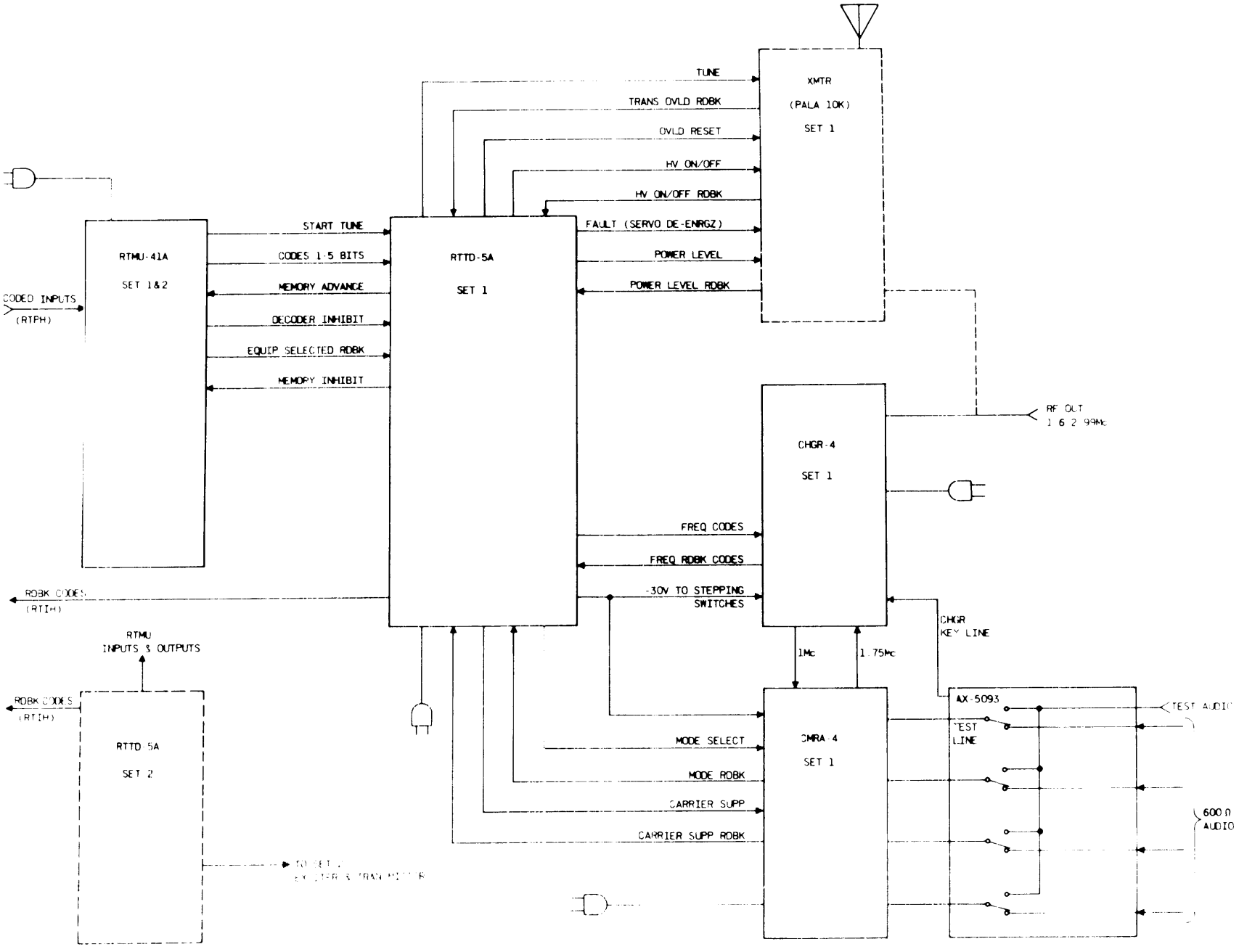


FIGURE 4 - 1 FUNCTIONAL BLOCK DIAGRAM SBGR - 4.

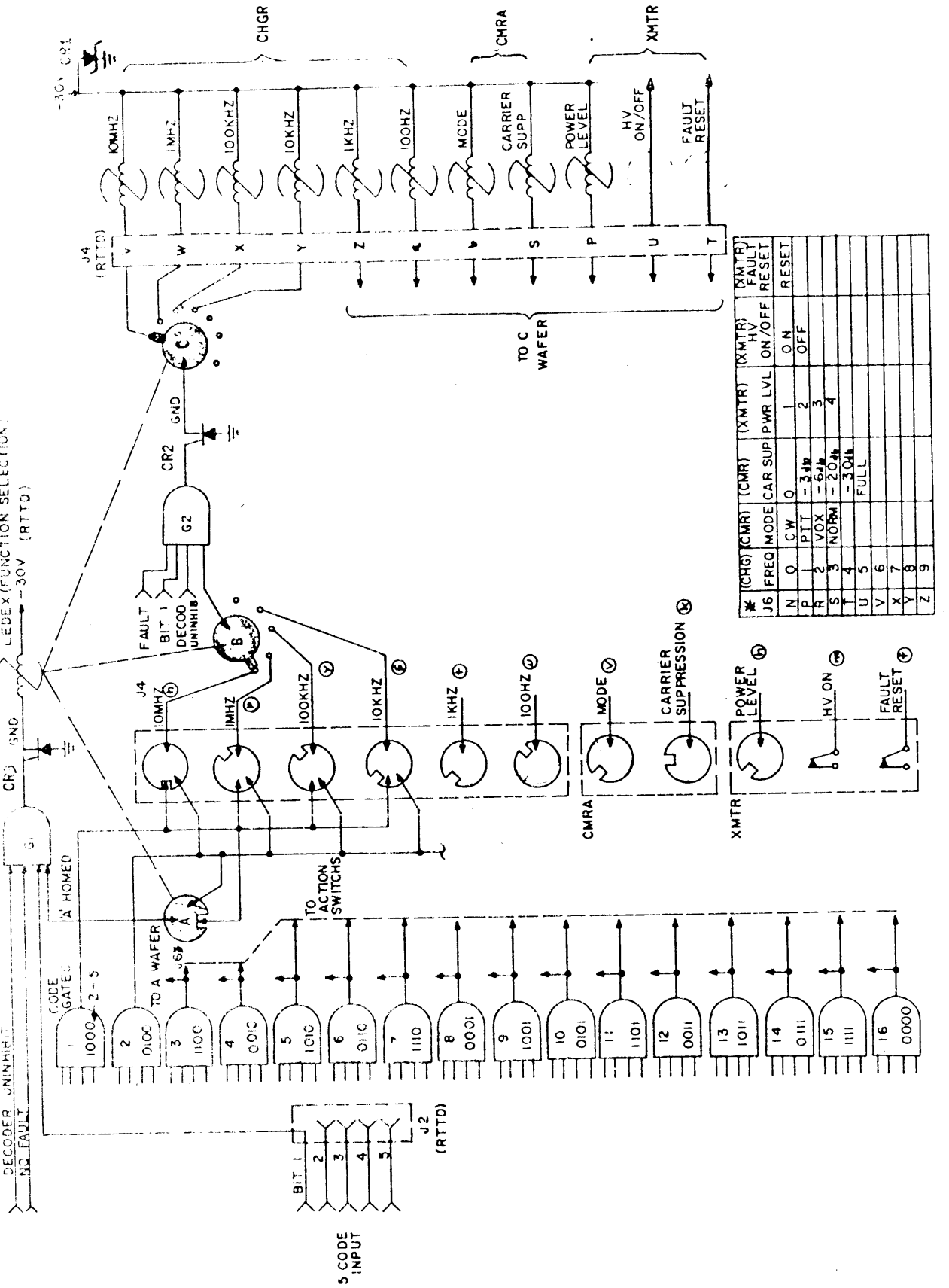
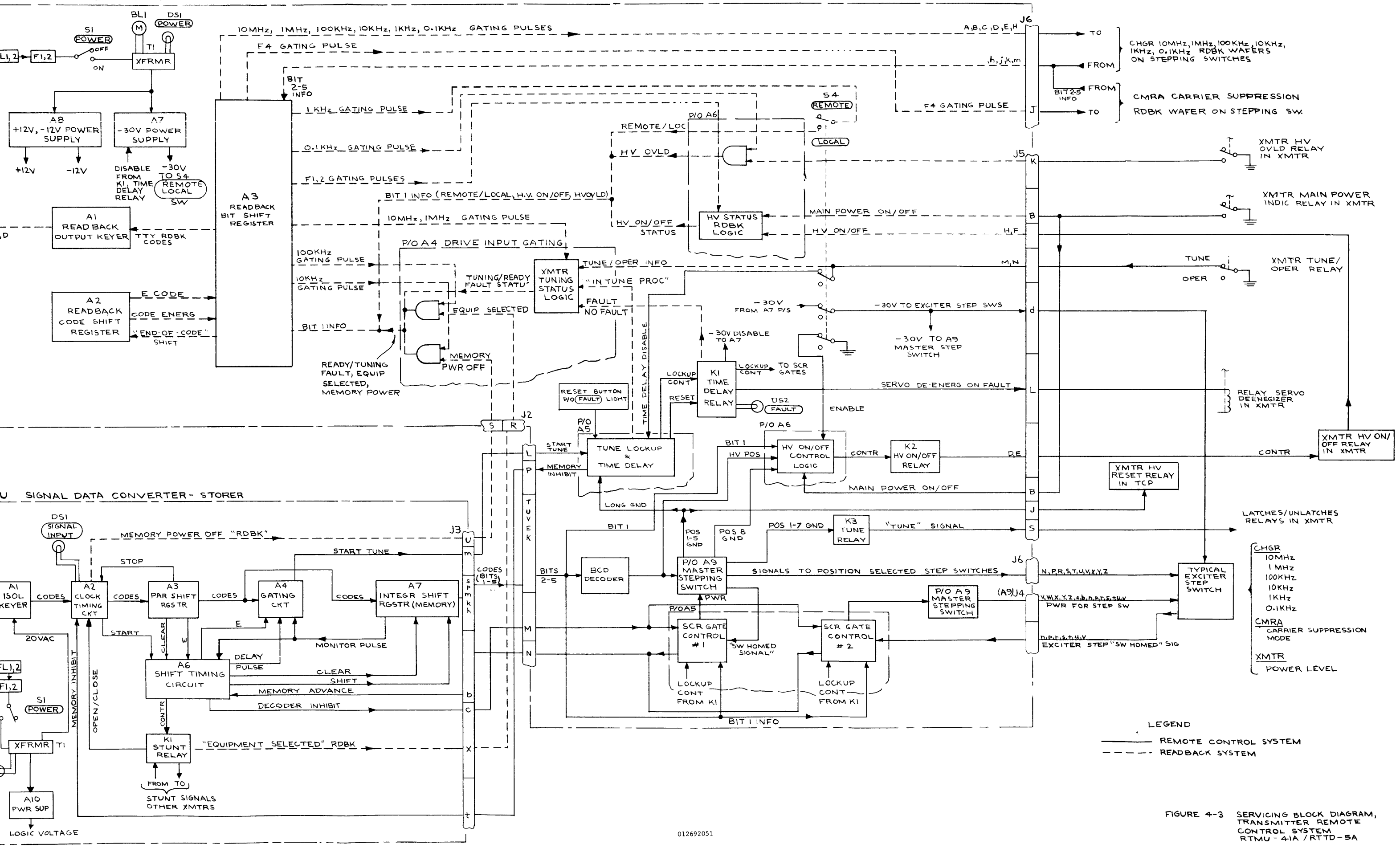


FIGURE 4-2 SIMPLIFIED LEDEX CONTROL

TRANSMITTER DECODER

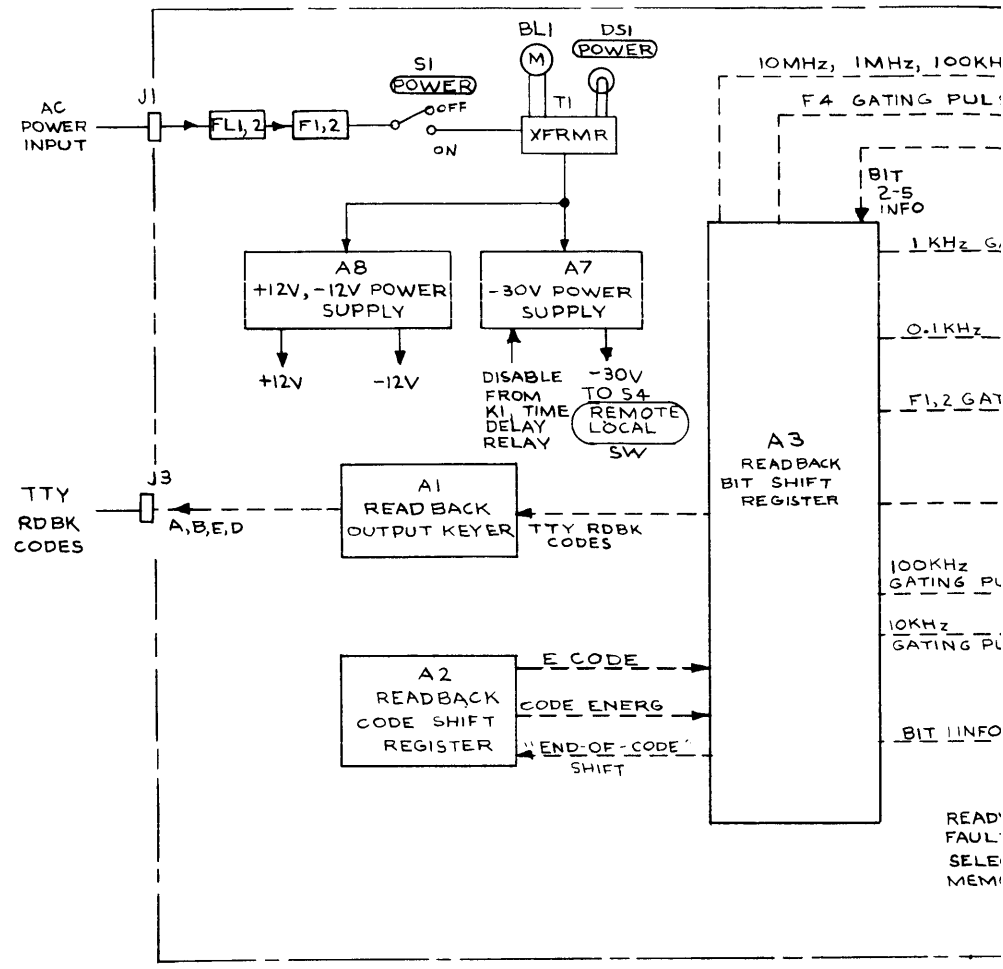
SIGNAL DATA CONVERTER- STORER



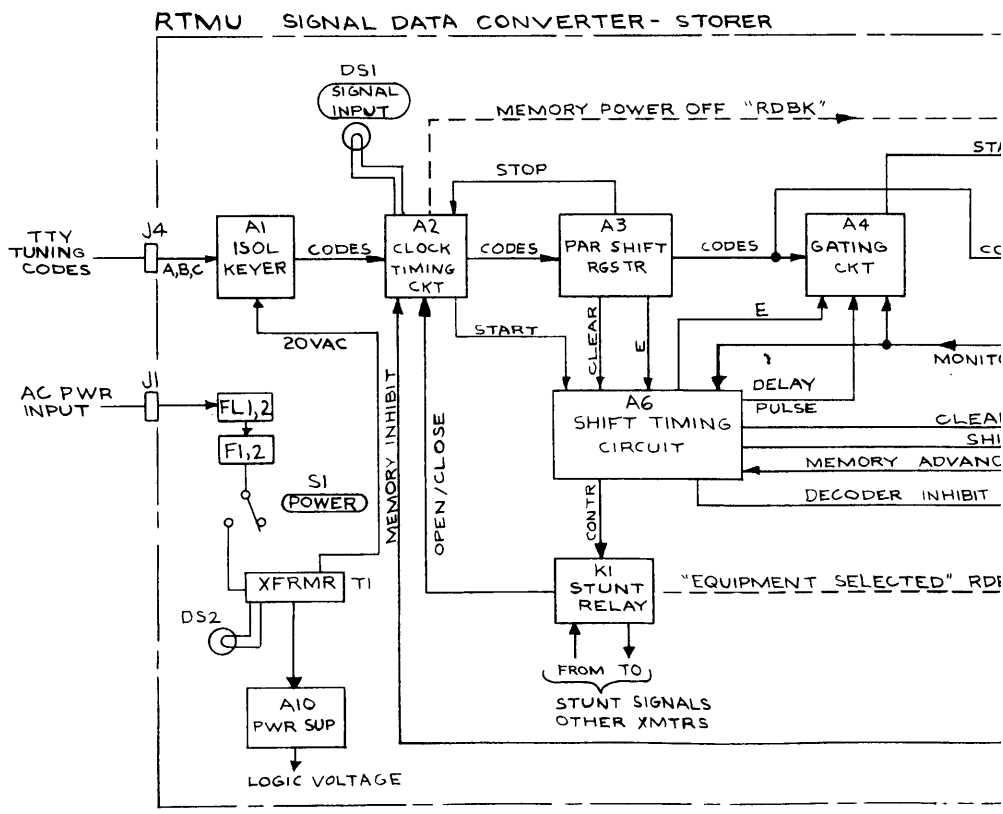
012692051

FIGURE 4-3 SERVICING BLOCK DIAGRAM, TRANSMITTER REMOTE CONTROL SYSTEM RTMU-4IA/RTTD-5A

RTTD- TRANSMITTER DECODER



RTMU SIGNAL DATA CONVERTER- STORER



SECTION 5

TROUBLESHOOTING

5-1 INTRODUCTION

The purpose of this section is to provide the technician with system troubleoting, interconnect information and troubleshooting aids. Reference should be made to the modular manuals once the problem has been localized to a particular modular unit. The wire run sheets located in Section 7 provide pin to pin connections within the Exciter rack as well as external wiring information to the Transmitter and Remote Control Console.

5-2 REMOTE CONTROL TROUBLESHOOTING PROCEDURE

The technician should be familiar with the principles of operation as set forth in Section 4, before attempting to troubleshoot the system in a logical manner. Due to the interconnecting of external units to the Exciter system, a defect that appears within the Exciter rack may very well be caused by an external defect. It therefore, is apparent that the troubleshooting techniques employed should systematically lead to the defective module (or cabling), then the defective component within the module. Particular attention should be given to Figures 4-2 and 5-1 as most of the information necessary to methodically troubleshoot the remote ledex control is readilly available without time consuming references to the schematics and wire run sheets in Section 7.

The end result of remote control to the CHGR and CMRA is the application of a ground to one side of a specific ledex motor. A constant-30VDC (supplied) by the RTTD) is applied to the other side. The availability of -30VDC to the ledex motors may quickly be checked at CR1 located on the top side of the Decoder (RTTD) chassis. The application of a ground to the cathode (extended lead) of CR2, located next to CR1 may be used to check the operation of a specific ledex motor after manually "Addressing" the Master Stepping switch to that particular ledex

The Master Stepping switch is manually Addressed by first switching the [illegible], then rotating the extended shaft of the switch assembly in a counter-[illegible] direction. To direct the Master Stepping switch to the 10MHz Index in [illegible], rotate the shaft one position, for the 1 MHz switch 2 positions, etc. Figure 5-1 illustrates a logical troubleshooting procedure that may be employed in determining the cause for an in-operative function. Figure 5-2 may [illegible] as a quick reference for point to point continuity measurements.

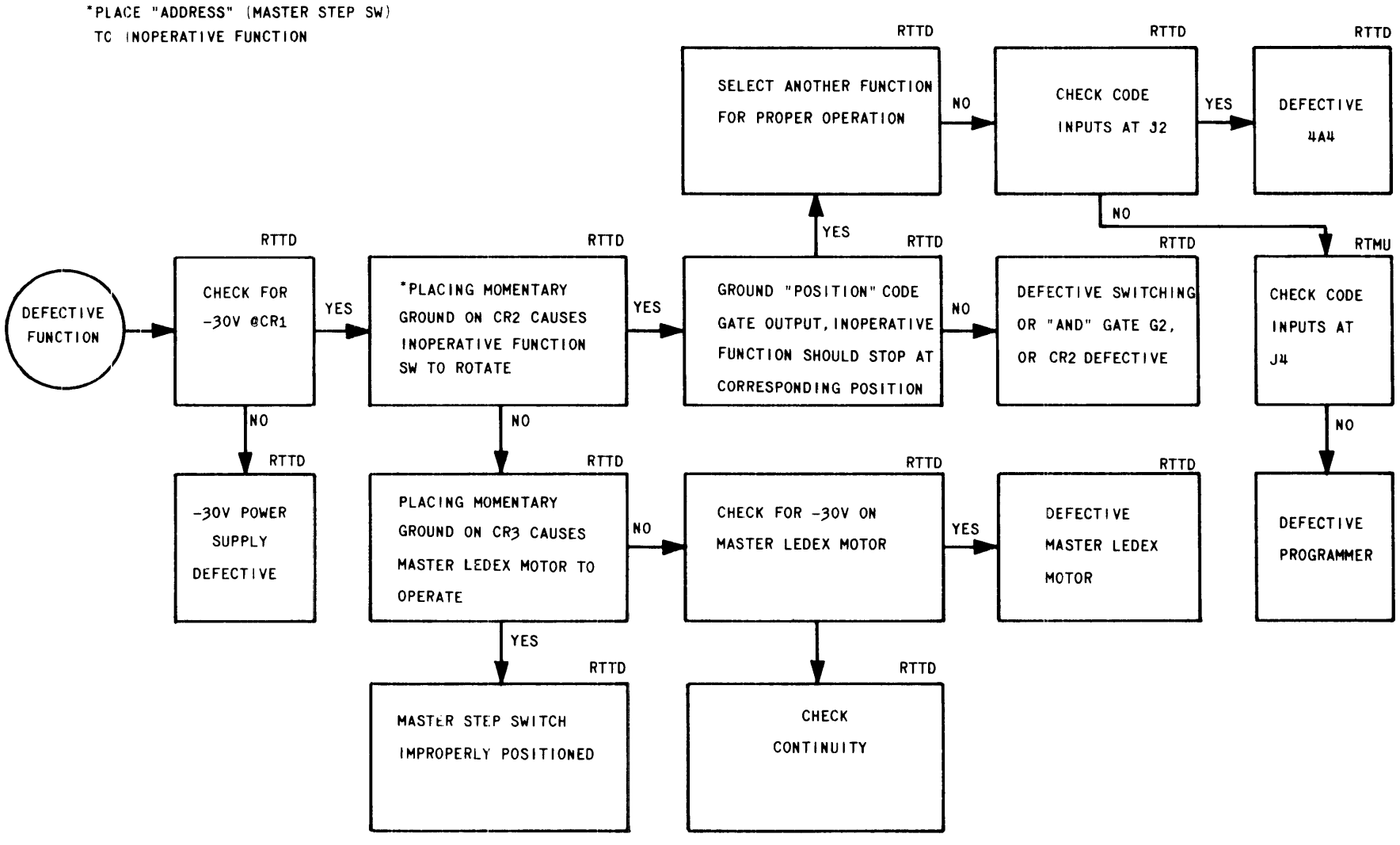
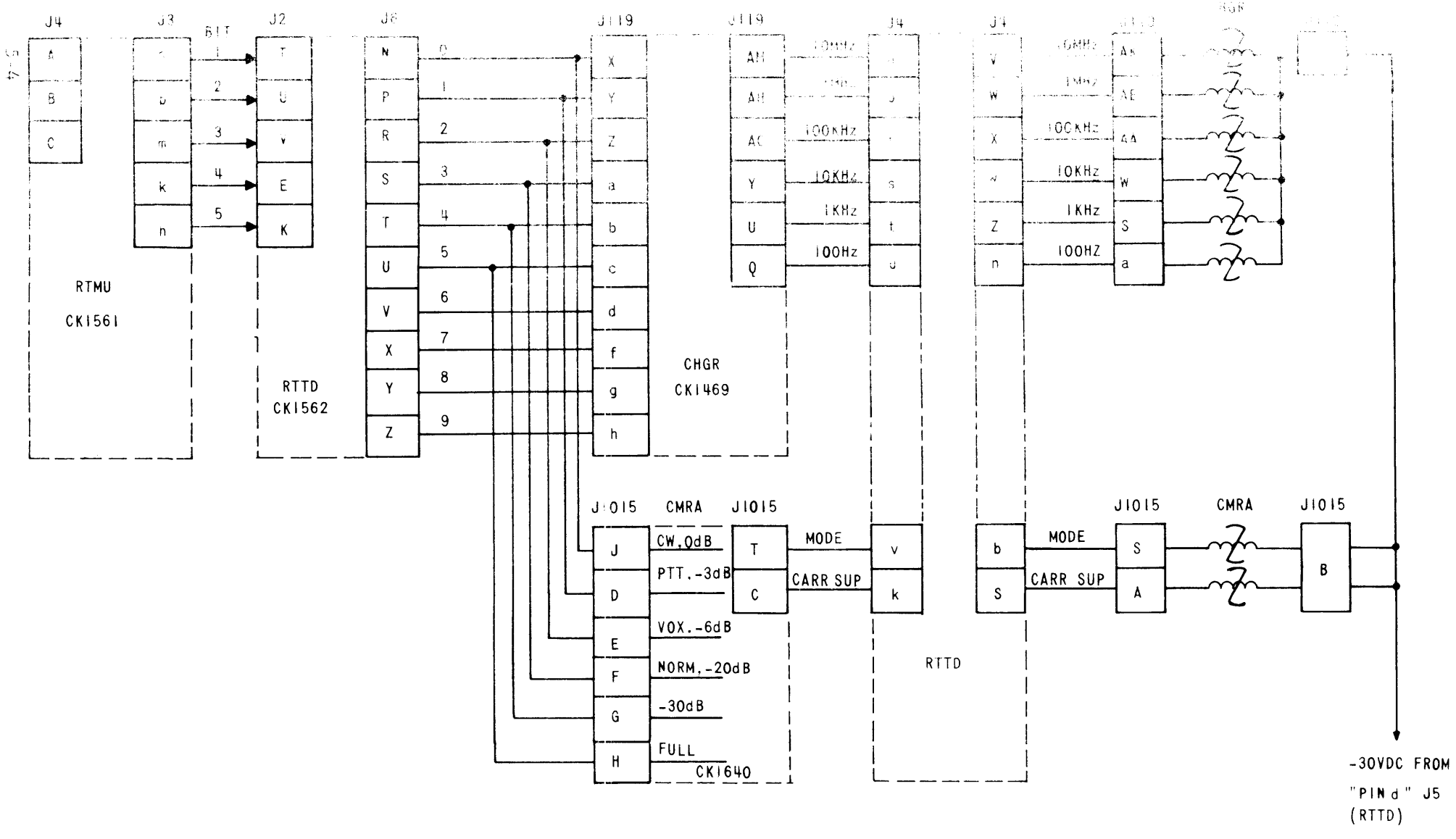
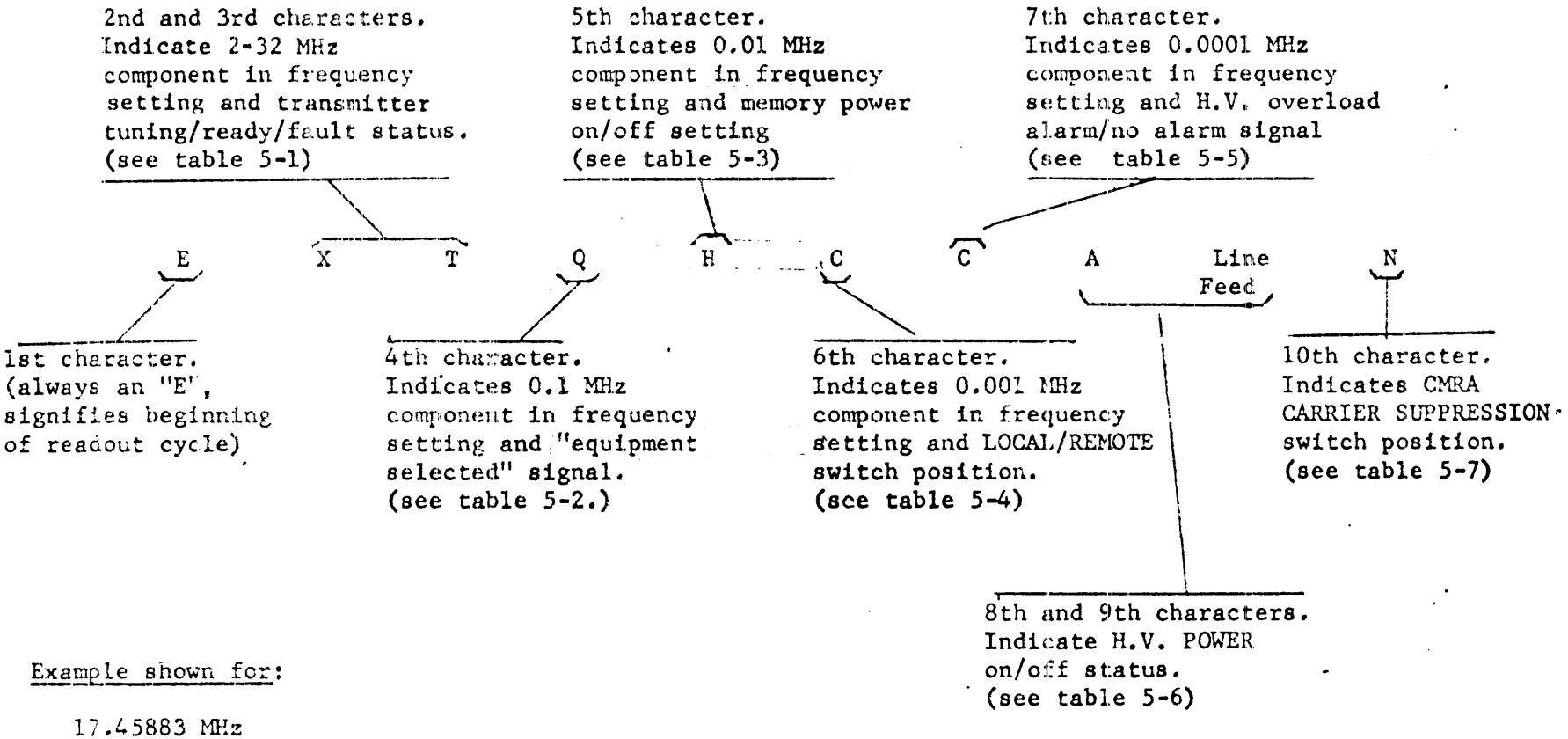


FIGURE 5-1 REMOTE CONTROL TROUBLESHOOTING BLOCK



SIMPLIFIED WIRING DIAGRAM, LEDEX CONTROL

FIGURE 5-2



Example shown for:

17.45883 MHz
Ready
Equipment Selected
Memory Power on
REMOTE/LOCAL switch at REMOTE
H.V. power on
CARRIER SUPPRESSION switch at FULL

Figure 5-3 Teletype Code Readback Translation

TABLE 5-1. 2nd and 3rd Characters in Readback

Frequency Component	Tuning Status	2nd Char. Code Bits	CCIT	3rd Char. Code Bits	CCIT
2 MHz	Tuning	01111	V	11011	Figures
3 MHz				10011	B
4 MHz				11101	Q
5 MHz				10101	Y
6 MHz				11001	W
7 MHz				10001	Z
8 MHz				11110	K
9 MHz		01111	V	10110	F
10 MHz		00111	M	11111	Letters
11 MHz				10111	X
12 MHz				11011	Figures
13 MHz				10011	B
14 MHz				11101	Q
15 MHz				10101	Y
16 MHz				11001	W
17 MHz				10001	Z
18 MHz				11110	K
19 MHz		00111	M	10110	F
20 MHz		01011	G	11111	Letters
21 MHz				10111	X
22 MHz				11011	Figures
23 MHz				10011	B
24 MHz				11101	Q
25 MHz				10101	Y
26 MHz				11001	W
27 MHz				10001	Z
28 MHz				11110	K
29 MHz		01011	G	10110	F
30 MHz		00011	0	11111	Letters
31 MHz		00011	0	10111	X
32 MHz	Tuning	00011	0	11011	Figures
2 MHz	Ready	11111	Letters	01011	G
3 MHz				00011	0
4 MHz				01101	P
5 MHz				00101	H
6 MHz				01001	L
7 MHz				00001	T
8 MHz				01110	C
9 MHz		11111	Letters	00110	N
10 MHz		10111	X	01111	V
11 MHz				00111	M
12 MHz				01011	G
13 MHz				00011	0
14 MHz				01101	P
15 MHz				00101	H
16 MHz				01001	L
17 MHz				00001	T
18 MHz				01110	C
19 MHz	Ready	10111	X	00110	N

TABLE 5-1. 2nd and 3rd Characters in Readback (cont)

Frequency Component	Tuning Status	2nd Char. Code Bits	CCIT	3rd Char. Code Bits	CCIT
20 MHz	Ready	11011	Figures	01111	V
21 MHz				00111	M
22 MHz				01011	G
23 MHz				00011	O
24 MHz				01101	P
MHz				00101	H
MHz				01001	L
27 MHz				00001	I
28 MHz				01110	C
29 MHz		11011	Figures	00110	N
30 MHz		10011	B	01111	J
31 MHz		10011	B	00111	M
32 MHz	Ready	10011	B	01011	G
1 MHz	Fault	11111	Letters	11011	Figures
2 MHz				10011	B
3 MHz				11101	Q
4 MHz				10101	Y
5 MHz				11001	W
6 MHz				10001	Z
7 MHz				11110	A
8 MHz				10110	S
9 MHz		11111	Letters	11111	Letters
10 MHz		10111	X	10111	X
11 MHz				11011	Figures
12 MHz				10011	B
13 MHz				11101	Q
14 MHz				10101	Y
15 MHz				11001	W
16 MHz				10000	-
17 MHz				11110	A
18 MHz				10110	S
19 MHz		10111	X	10111	X
20 MHz		11011	Figures	11111	Letters
21 MHz				10111	X
22 MHz				11011	Figures
23 MHz				10011	B
24 MHz				11101	Q
25 MHz				10101	Y
26 MHz				11001	W
27 MHz				10000	-
28 MHz				11110	A
29 MHz		11011	Figures	10110	S
30 MHz		10011	B	11111	Letters
31 MHz		10011	B	10111	X
32 MHz	Fault	10011	B	11011	Figures

TABLE 5-2. 4th Character in Readback

0.1 MHz Component	Equipment Selected	Code Bits	Code CCIT
0	yes	11111	Letters
1		10111	X
2		11011	Figures
3		10010	B
4		11101	Q
5		10101	Y
6		11001	W
7		10001	Z
8		11110	K
9	yes	10110	F
0	no	01111	V
1		00111	M
2		01011	G
3		00011	O
4		01101	P
5		00101	H
6		01001	L
7		00001	T
8		01110	C
9	no	00110	N

TABLE 5-3. 5th Character in Readback

0.01 MHz Component	Memory Power	Code Bits	Code CCIT
0	off	11111	Letters
1		10111	X
2		11011	Figures
3		10011	B
4		11101	Q
5		10101	Y
6		11001	W
7		10001	Z
8		11110	K
9	off	10110	F
0	on	01111	V
1		00111	M
2		01011	G
3		00011	O
4		01101	P
5		00101	H
6		01001	L
7		00001	T
8		01110	C
9	on	00110	N

TABLE 5-4. 6th Character Readback

0.001 MHz Component	LOCAL/REMOTE switch position	Code Bits	CCIT
0	LOCAL	11111	Letters
1		10111	X
2		11011	Figures
3		10011	B
4		11101	Q
5		10101	Y
6		11001	W
7		10001	Z
8		11110	K
9	LOCAL	10110	F
0	REMOTE	01111	
1		00111	M
2		01011	C
3		00011	O
4		01101	P
5		00101	H
6		01001	L
7		00001	T
8		01110	C
9	REMOTE	00110	N

TABLE 5-5. 7th Charachter Readback

0.0001 MHz Component	H. V. Overload Alarm	Code Bits	CCIT
0	alarm	11111	Letters
1		10111	X
2		11011	Figures
3		10011	B
4		11101	Q
5		10101	Y
6		11001	W
7		10001	Z
8		11110	K
9	alarm	10110	F
0	no alarm	01111	V
1		00111	M
2		01011	G
3		00011	O
4		01101	P
5		00101	H
6		01001	L
7		00001	T
8		01110	C
9	no alarm	00110	N

TABLE 5-6 8th and 9th Characters in Readback

H. V. POWER on/off condition	8th Char. Code Bits	CCIT	9th Char. Code Bits	CCIT
ON	11000	A	01000	Line Feed
OFF	01000	Line Feed	11000	A

TABLE 5-7. 10th Character in Readback

CMRA CARRIER SUPPRESSION sw. pos.	10th Char. Code Bits	CCIT
0 DB	01111	V
3 DB	01101	P
6 DB	01110	C
20 DB	00111	M
30 DB	00101	H
FULL	00110	N

TABLE 5-8. REMOTE TUNING INPUT CODES

CHARACTER RECEPTION ORDER	ADDRESSAL FUNCTION	ACTION FUNCTION	5-BIT CODE	CCIT CHARACTER
1	Transmitter Selector		2 codes (see table 1-3)	
2	CHGR 10 MHz switch		11000	A
3		0	01000	Line Feed
		1	00100	Space
		2	01100	I
		3	00010	Carriage Return
4	CHGR 1 MHz switch		10100	S
		0	01000	Line Feed
5		1	00100	Space
		2	01100	I
		3	00010	Carriage Return
		4	01010	R
		5	00110	N

* Except for the first and 18th character, characters may be received in any order, as long as the corresponding action function character follows its addressal function character. However, quickest tuning results are obtained by the reception of the characters in the order shown.

TABLE 5-8. (CONT)

CHARACTER RECEPTION ORDER	ADDRESSAL FUNCTION	ACTION FUNCTION	5-BIT CODE	CCIT CHARACTER
5 (cont)		6	01110	C
		7	00001	T
		8	01001	L
		9	00101	H
6	CHGR 100 KHz switch		11100	U
7		0-9	Same as 5th character	
8	CHGR 10 KHz switch		10010	D
9		0-9	Same as 5th character	
10	CHGR 1 KHz switch		11010	J
11		0-9	Same as 5th character	
12	CHGR 0.1 KHz switch		10110	F
13		0-9	Same as 5th character	
14	CMRA MODE SELECTION SWITCH	MODE	11110	K
15		CW	01000	LF
		PTT	00100	SP
		VOX	01100	I
		NORM	00010	CR
16	CMRA CARRIER SUPPRESSION switch		10001	Z

TABLE 5-8. (CONT)

CHARACTER RECEPTION ORDER	ADDRESSAL FUNCTION	ACTION FUNCTION	5-BIT CODE	CCIT CHARACTER
17		0 DB	01000	Line Feed
		3 DB	00100	Space
		6 DB	01100	I
		20 DB	00010	Carriage Return
		30 DB	01010	R
		FULL	00110	N
18	TRANSMITTER OUTPUT POWER SWITCH	Output Power	11001	W
19		Power Level 1-	01000	LF
		Power Level 2-	00100	SP
		Power Level 3-	01100	I
		Power Level 4-	00010	CR
20	Transmitter H.V. on/off		10101	Y
21		on	01000	Line Feed
		off	00100	Space
22	Transmitter tune		10000	E
*	Clear		01111	V

* Clear code, received at any time before "Transmitter Tune", will delete codes from RTMU memory.

TABLE 5-9. REMOTE TUNING INPUT CODES, EQUIPMENT SELECTOR

EQUIPMENT SELECTED		5-BIT CODE	CCIT CHARACTERS
	*A	10101	Y
	B	10110	F
RTMU	C	11010	J
	D	11001	W
	E	10011	B
	*1	00010	Carriage Return
	*2	01010	R
	3	01100	I
	4	01000	Line Feed
RTTD	5	00100	Space
	6	01101	P
	7	00101	H
	8	00011	0
	9	00111	M
	10	01011	G

*USED IN SBGR-4 RACK

TABLE 5-10 REMOTE TUNING READBACK OUTPUT CODES

CHARACTER TRANSMISSION ORDER	CONTROL OR CONDITION	POSITION INDICATED	CODE BITS 1 2345
1	To reset remote readback indicator panel for new cycle		1 0000
2	CHGR 10 MHz switch	0	1111
		1	0111
		2	1011
		3	0011
		4	1101
		5	0101
		6	1001
		7	0001
		8	1110
		9	0110
	Transmitter "tuning/ ready/fault" status	* *	
3	CHGR 1 MHz switch	0-9, same as CHGR 10 MHz switch	
	Transmitter "tuning/ ready/fault" status	* *	

*Readback of transmitter tuning status is contained in bit #1 of codes #2 abd #3 combined:-

Bit #1 Code #2	Code #3	Status
0	1	tuning
1	0	ready
1	1	fault

TABLE 5-10. REMOTE TUNING READBACK OUTPUT CODES (CONT)

CHARACTER TRANSMISSION ORDER	CONTROL OR CONDITION	POSITION INDICATED	CODE BITS 1	2345
4	CHGR 100 KHz switch	0-9, same as CHGR 10 MHz switch		
	Equipment selected	selected	1	
		not selected	0	
5	CHGR 10 KHz switch	0-9, same as CHGR 10 MHz switch		
	Memory power	on	1	
		off	0	
6	CHGR 1 KHz switch	0-9, same as CHGR 10 MHz switch		
	RTTD LOCAL/REMOTE switch	LOCAL	1	
		REMOTE	0	
7	CHGR 0.1 KHz switch	0-9, same as CHGR 10 MHz switch		
	Transmitter H.V. OVERLOAD alarm	alarm	1	
		no alarm	0	
8	Transmitter H.V. power status	*	*	1000
		*	*	1000
9	Transmitter H.V. power status	*	*	1000
		*	*	1000

* Readback of transmitter H.V. power status is contained in bit #1 of Codes #8 and #9 combined:-

Bit #1		Status
Code #8	Code #9	
1	0	on
0	1	off

TABLE 5-10. REMOTE TUNING READBACK OUTPUT CODES (CONT)

CHARACTER TRANSMISSION ORDER	CONTROL OR CONDITION	POSITION INDICATED	CODE BITS 1	2345
10	CMRA CARRIER SUPPRESSION switch	0 DB	0	1111
		3 DB	0	1101
		6 DB	0	1110
		20 DB	0	0111
		30 DB	0	0101
		FULL	0	0110

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. Reference symbol.

b. Description as indicated in parts list.

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

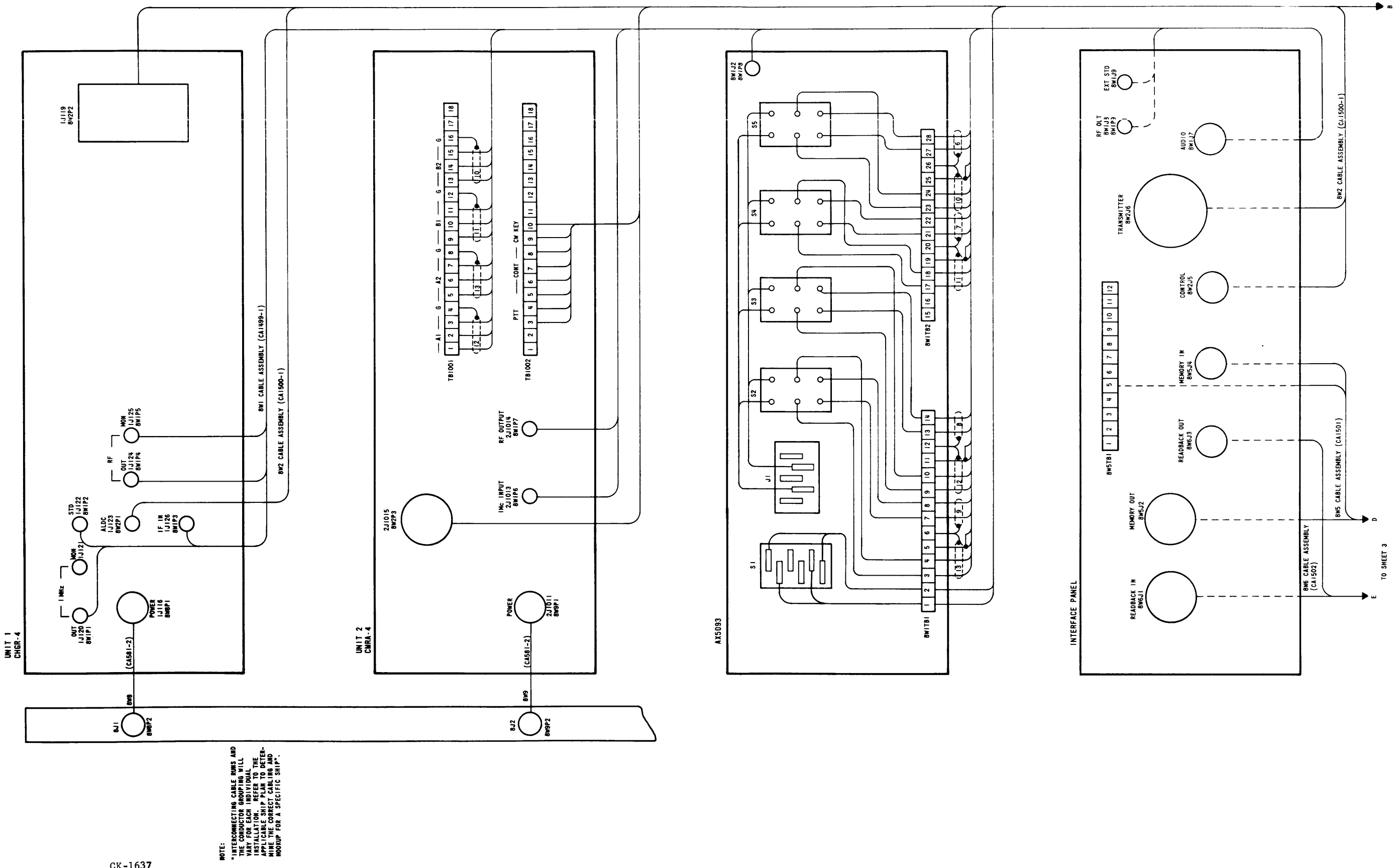
REF SYMBOL	DESCRIPTION	TMC PART NUMBER
8W1	CABLE ASSEMBLY	CA1499-1
8W3	CABLE ASSEMBLY	CA1499-2
8W2	CABLE ASSEMBLY	CA1500-1
8W4	CABLE ASSEMBLY	CA1500-2
8W5	CABLE ASSEMBLY	CA1501
8W6	CABLE ASSEMBLY	CA1502
8W7	CABLE ASSEMBLY	CA1503

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J1	JACK, TELEPHONE	JJ116-10
J2	ADAPTER, RF	UG492D/U
S1	SWITCH	SW186-3
S2	SWITCH, TOGGLE, DPDT	ST22N
S3	SAME AS S2	
S4	SAME AS S2	
S5	SAME AS S2	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J1	CONNECTOR, RECEPTACLE, FEMALE, AC	JJ173
J2	SAME AS J1	
S1	CIRCUIT BREAKER	SW381-1
S2	SAME AS S1	

SECTION 7

SCHEMATICS & WIRE RUN LISTS



NOTE:
"INTERCONNECTING CABLE RUNS AND THE CONDUCTOR GROUPING WILL VARY FOR EACH INDIVIDUAL INSTALLATION. REFER TO THE APPLICABLE SHIP PLAN TO DETERMINE CORRECT CABLE AND HOOKUP FOR A SPECIFIC SHIP".

CK-1637

Figure 7-1. Synthesizer, Electrical Frequency-Interconnection Diagram (Sheet 1 of 3)

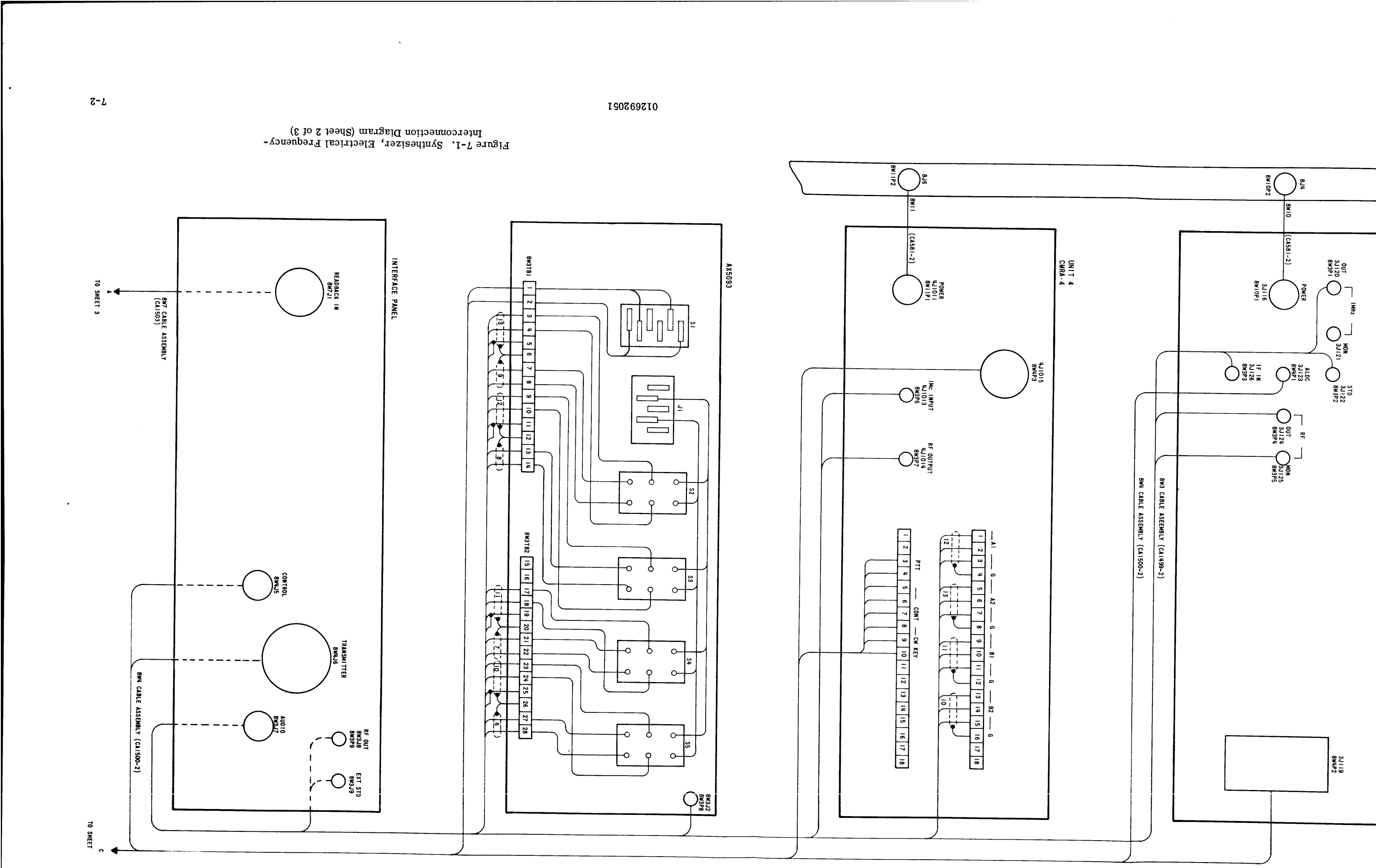


Figure 7-1. Synthesizer, Electrical Frequency-
Interconnection Diagram (Sheet 2 of 3)

CK-1637

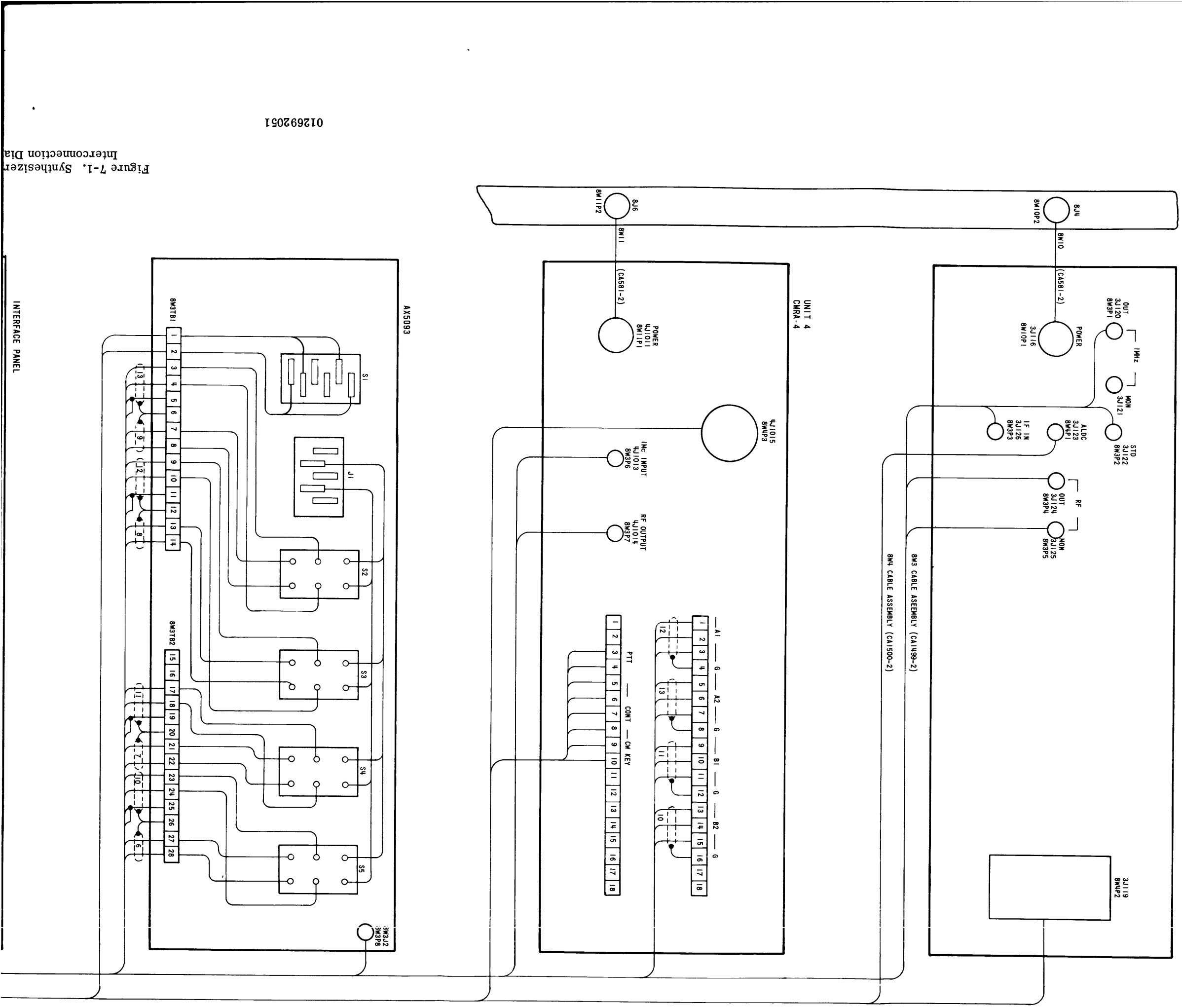


Figure 7-1. Synthesizer Interconnection Dia

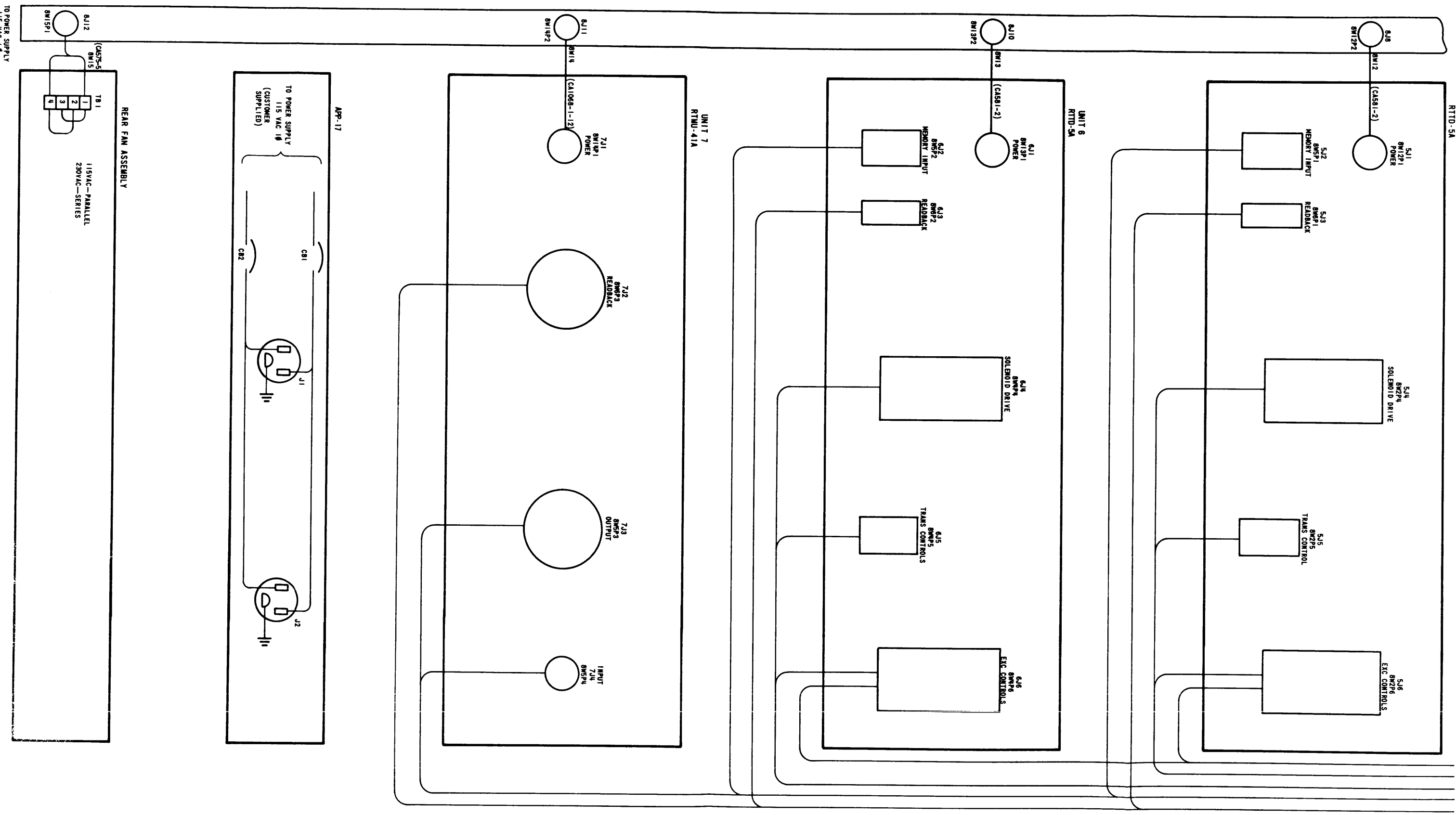
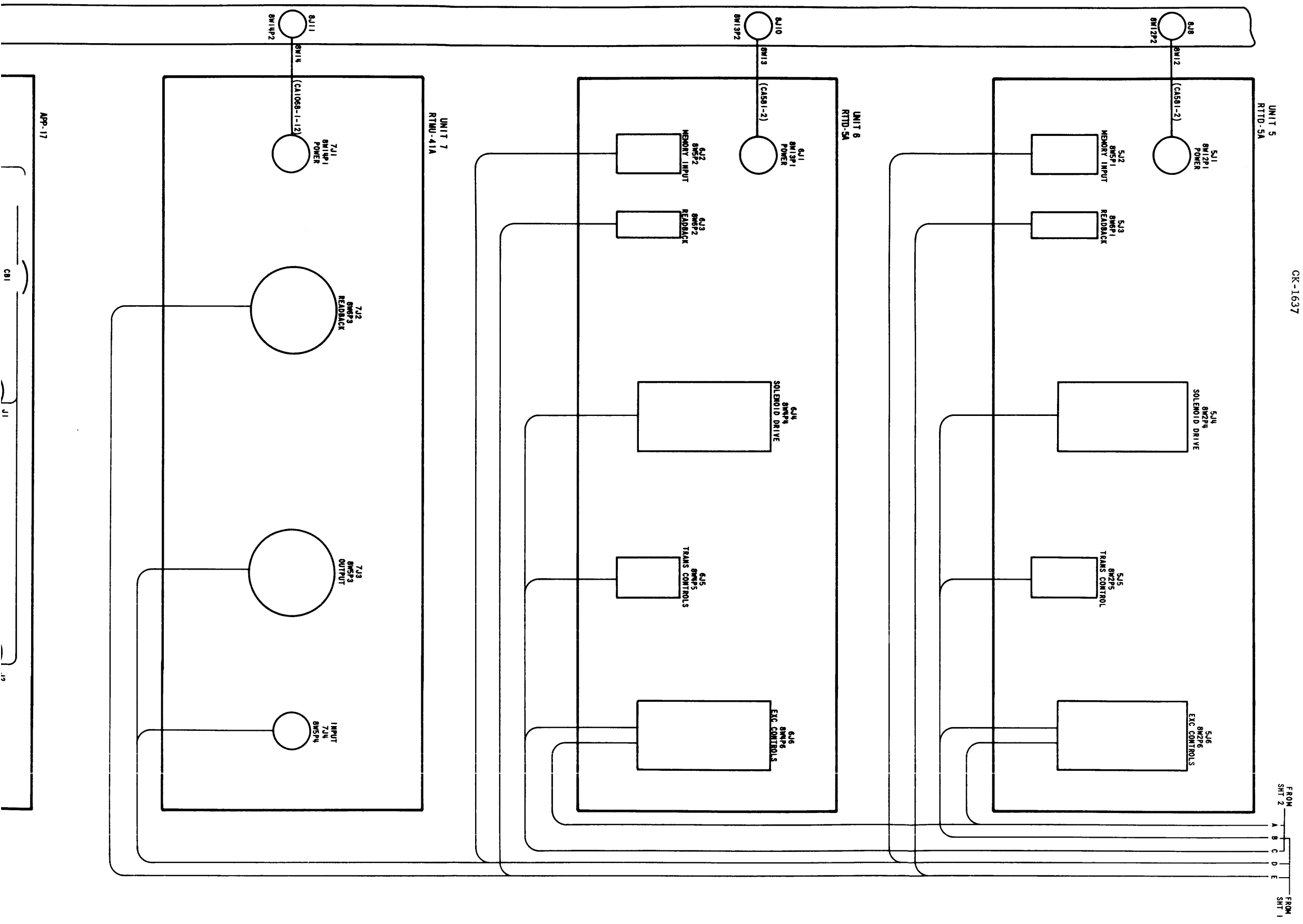


Figure 7-1. Synthesizer, Electrical Frequency-
Interconnecting Diagram (Sheet 3 of 3)



CK-1637

Figure 7-1. Synthesizer, Interconnecting Diagr

01269205I

SBGR INTERNAL WIRING (CK1637)

JACK NO.	FROM PIN	UNIT	TO	PIN	UNIT	CABLE NO.
J120		CHGR-4	J1013		CMRA-4	CA1499- 1 & 2
J122		CHGR-4	J9		INTERFACE PANEL	CA1499- 1 & 2
J126		CHGR-4	J1014		CMRA-4	CA1499- 1 & 2
J125		CHGR-4	J2		AX5093	CA1499- 1 & 2
J124		CHGR-4	J8		INTERFACE PANEL	CA1499- 1 & 2
J123		CHGR-4	J6	L	INTERFACE PANEL	CA1500- 1 & 2
			SHLD	M		
J119	L	CHGR-4	J6	K	INTERFACE PANEL	CA1500- 1 & 2
J119	A	CHGR-4	J6	A	INTERFACE PANEL	CA1500- 1 & 2
J119	B	CHGR-4	J6	B	INTERFACE PANEL	CA1500- 1 & 2
J119	C	CHGR-4	J6	C	INTERFACE PANEL	CA1500- 1 & 2
J119	D	CHGR-4	J6	D	INTERFACE PANEL	CA1500- 1 & 2
J119	E	CHGR-4	J6	E	INTERFACE PANEL	CA1500- 1 & 2
J119	F	CHGR-4	J6	F	INTERFACE PANEL	CA1500- 1 & 2
J119	H	CHGR-4	J6	G	INTERFACE PANEL	CA1500- 1 & 2
J119	J	CHGR-4	J6	H	INTERFACE PANEL	CA1500- 1 & 2
J119	K	CHGR-4	J6	J	INTERFACE PANEL	CA1500- 1 & 2
J119	X	CHGR-4	J1015	J	CMRA-4	CA1500- 1 & 2
J119	Y	CHGR-4	J1015	D	CMRA-4	CA1500- 1 & 2
J119	Z	CHGR-4	J1015	E	CMRA-4	CA1500- 1 & 2

SBGR INTERNAL WIRING (CK1637)

JACK NO.	FROM PIN	FROM UNIT	TO	TO PIN	TO UNIT	CABLE NO.
J120		CHGR-4	J1013		CMRA-4	CA1499- 1 & 2
J122		CHGR-4	J9		INTERFACE PANEL	CA1499- 1 & 2
J126		CHGR-4	J1014		CMRA-4	CA1499- 1 & 2
J125		CHGR-4	J2		AX5093	CA1499- 1 & 2
J124		CHGR-4	J8		INTERFACE PANEL	CA1499- 1 & 2
J123		CHGR-4	J6	L	INTERFACE PANEL	CA1500- 1 & 2
			SHLD	M		
J119	L	CHGR-4	J6	K	INTERFACE PANEL	CA1500- 1 & 2
J119	A	CHGR-4	J6	A	INTERFACE PANEL	CA1500- 1 & 2
J119	B	CHGR-4	J6	B	INTERFACE PANEL	CA1500- 1 & 2
J119	C	CHGR-4	J6	C	INTERFACE PANEL	CA1500- 1 & 2
J119	D	CHGR-4	J6	D	INTERFACE PANEL	CA1500- 1 & 2
J119	E	CHGR-4	J6	E	INTERFACE PANEL	CA1500- 1 & 2
J119	F	CHGR-4	J6	F	INTERFACE PANEL	CA1500- 1 & 2
J119	H	CHGR-4	J6	G	INTERFACE PANEL	CA1500- 1 & 2
J119	J	CHGR-4	J6	H	INTERFACE PANEL	CA1500- 1 & 2
J119	K	CHGR-4	J6	J	INTERFACE PANEL	CA1500- 1 & 2
J119	X	CHGR-4	J1015	J	CMRA-4	CA1500- 1 & 2
J119	Y	CHGR-4	J1015	D	CMRA-4	CA1500- 1 & 2
J119	Z	CHGR-4	J1015	E	CMRA-4	CA1500- 1 & 2

JACK NO.	FROM PIN	UNIT	JACK NO.	TO	UNIT PIN	CABLE NO.
J119	a	CHGR-4	J1015	F	CMRA-4	CA1500- 1 & 2
J119	b	CHGR-4	J1015	G	CMRA-4	CA1500- 1 & 2
J119	c	CHGR-4	J1015	H	CMRA-4	CA1500- 1 & 2
J119	d	CHGR-4	J6	V	RTTD-5A	CA1500- 1 & 2
J119	f	CHGR-4	J6	X	RTTD-5A	CA1500- 1 & 2
J119	g	CHGR-4	J6	Y	RTTD-5A	CA1500- 1 & 2
J119	h	CHGR-4	J6	Z	RTTD-5A	CA1500- 1 & 2
J119	i	CHGR-4	J1015	K	CMRA-4	CA1500- 1 & 2
J119	j	CHGR-4	J1015	N	CMRA-4	CA1500- 1 & 2
J119	k	CHGR-4	J1015	M	CMRA-4	CA1500- 1 & 2
J119	m	CHGR-4	J1015	L	CMRA-4	CA1500- 1 & 2
J119	n	CHGR-4	J4	a	RTTD-5A	CA1500- 1 & 2
J119	p	CHGR-4	J1015	B	CMRA-4	CA1500- 1 & 2
J119	w	CHGR-4	J4	Y	RTTD-5A	CA1500- 1 & 2
J119	y	CHGR-4	J4	s	RTTD-5A	CA1500- 1 & 2
J119	z	CHGR-4	J6	D	RTTD-5A	CA1500- 1 & 2
J119	AA	CHGR-4	J4	x	RTTD-5A	CA1500- 1 & 2
J119	AC	CHGR-4	J4	r	RTTD-5A	CA1500- 1 & 2
J119	AD	CHGR-4	J6	c	RTTD-5A	CA1500- 1 & 2
J119	AE	CHGR-4	J4	w	RTTD-5A	CA1500- 1 & 2

JACK NO.	FROM PIN	UNIT	JACK NO.	TO PIN	UNIT	CABLE NO.
J119	AH	CHGR-4	J4	p	RTTD-5A	CA1500-1 & 2
J119	AJ	CHGR-4	J6	B	RTTD-5A	CA1500-1 & 2
J119	AK	CHGR-4	J4	V	RTTD-5A	CA1500-1 & 2
J119	AM	CHGR-4	J4	n	RTTD-5A	CA1500-1 & 2
J119	AN	CHGR-4	J6	A	RTTD-5A	CA1500-1 & 2
J119	BT	CHGR-4	J6	e	RTTD-5A	CA1500-1 & 2
J119	BV	CHGR-4	J6	T	INTERFACE PANEL	CA1500-1 & 2
J119	BZ	CHGR-4	J6	U	INTERFACE PANEL	CA1500-1 & 2
J119	CD	CHGR-4	TB1002	5	CMRA-4	CA1500- 1 & 2
J119	CJ	CHGR-4	TB1002	7	CMRA-4	CA1500-1 & 2
J119	CK	CHGR-4	TB1002	8	CMRA-4	CA1500-1 & 2
J119	CN	CHGR-4	TB1002	6	CMRA-4	CA1500-1 & 2
J119	AX	CHGR-4	J6	3	RTTD-5A	CA1500-1 & 2
J119	q	CHGR-4	J4	u	RTTD-5A	CA1500-1 & 2
J119	r	CHGR-4	J6	H	RTTD-5A	CA1500-1 & 2
J119	s	CHGR-4	J4	Z	RTTD-5A	CA1500-1 & 2
J119	u	CHGR-4	J4	t	RTTD-5A	CA1500-1 & 2
J119	v	CHGR-4	J6	E	RTTD-5A	CA1500-1 & 2
J1015	J	CMRA-4	J6	Y	INTERFACE PANEL	CA1500-1 & 2
J1015	D	CMRA-4	J6	Z	INTERFACE PANEL	CA1500-1 & 2

JACK NO.	FROM PIN	UNIT	JACK NO.	TO PIN	UNIT	CABLE NO.
J1015	E	CMRA-4	J6	a	INTERFACE PANEL	CA1500-1 & 2
J1015	F	CMRA-4	J6	b	INTERFACE PANEL	CA1500-1 & 2
J1015	G	CMRA-4	J6	T	RTTD-5A	CA1500-1 & 2
J1015	H	CMRA-4	J6	U	RTTD-5A	CA1500-1 & 2
J1015	K	CMRA-4	J6	d	INTERFACE PANEL	CA1500-1 & 2
J1015	N	CMRA-4	J6	e	INTERFACE PANEL	CA1500-1 & 2
J1015	M	CMRA-4	J6	f	INTERFACE PANEL	CA1500-1 & 2
J1015	L	CMRA-4	J6	m	RTTD-5A	CA1500-1 & 2
J1015	B	CMRA-4	J6	d	RTTD-5A	CA1500-1 & 2
J1015	A	CMRA-4	J4	S	RTTD-5A	CA1500-1 & 2
J1015	C	CMRA-4	J4	K	RTTD-5A	CA1500-1 & 2
J1015	P	CMRA-4	J6	K	RTTD-5A	CA1500-1 & 2
J1015	R	CMRA-4	J6	J	RTTD-5A	CA1500-1 & 2
J1015	S	CMRA-4	J4	b	RTTD-5A	CA1500-1 & 2
J1015	T	CMRA-4	J4	v	RTTD-5A	CA1500-1 & 2
J1015	u	CMRA-4	J6	N	INTERFACE PANEL	CA1500-1 & 2
J1015	V	CMRA-4	J6	P	INTERFACE PANEL	CA1500-1 & 2
J1015	W	CMRA-4	J119	CE	CHGR-4	CA1500-1 & 2
J1015	X	CMRA-4	J119	CP	CHGR-4	CA1500-1 & 2
TB1001	13	CMRA-4	TB2	23	AX5093	CA1499-1 & 2

JACK NO.	FROM PIN	UNIT	JACK NO.	TO PIN	UNIT	CABLE NO.
TB1001	14	CMRA-4	TB-2	25	AX5093	CA-1499-1 & 2
TB1001	15	CMRA-4	TB-2	24	AX5093	CA-1499-1 & 2
TB1001	16	CMRA-4	TB-2	26	AX5093	CA-1499-1 & 2
TB1001	9	CMRA-4	TB-2	17	AX5093	CA-1499-1 & 2
TB1001	10	CMRA-4	TB-2	19	AX5093	CA-1499-1 & 2
TB1001	11	CMRA-4	TB-2	18	AX5093	CA-1499-1 & 2
TB1001	12	CMRA-4	TB-2	20	AX5093	CA-1499-1 & 2
TB1001	1	CMRA-4	TB-1	9	AX5093	CA-1499-1 & 2
TB1001	2	CMRA-4	TB-1	11	AX5093	CA-1499-1 & 2
TB1001	3	CMRA-4	TB-1	10	AX5093	CA-1499-1 & 2
TB1001	4	CMRA-4	TB-1	12	AX5093	CA-1499-1 & 2
TB1001	5	CMRA-4	TB-1	3	AX5093	CA-1499-1 & 2
TB1001	6	CMRA-4	TB-1	5	AX5093	CA-1499-1 & 2
TB1001	7	CMRA-4	TB-1	4	AX5093	CA-1499-1 & 2
TB1001	8	CMRA-4	TB-1	6	AX5093	CA-1499-1 & 2
TB1002	10	CMRA-4	J5	A	INTERFACE PANEL	CA-1500-1 & 2
TB1002	9	CMRA-4	J5	B	INTERFACE PANEL	CA-1500-1 & 2
TB1002	3	CMRA-4	J5	C	INTERFACE PANEL	CA-1500-1 & 2
TB1002	4	CMRA-4	J5	D	INTERFACE PANEL	CA-1500-1 & 2

JACK NO.	FROM PIN	UNIT	JACK NO.	TO PIN	UNIT	CABLE NO.
TB1	1	AX5093	J5	A	INTERFACE PANEL	CA1500- 1 & 2
TB1	2	AX5093	J5	B	INTERFACE PANEL	CA1500- 1 & 2
TB1	13	AX5093	J7	K	INTERFACE PANEL	CA1499- 1 & 2
TB1	11	AX5093	J7	L	INTERFACE PANEL	CA1499- 1 & 2
TB1	14	AX5093	J7	M	INTERFACE PANEL	CA1499- 1 & 2
TB1	12	AX5093	J7	N	INTERFACE PANEL	CA1499- 1 & 2
TB1	7	AX5093	J7	W	INTERFACE PANEL	CA1499- 1 & 2
TB1	5	AX5093	J7	X	INTERFACE PANEL	CA1499- 1 & 2
TB1	8	AX5093	J7	Y	INTERFACE PANEL	CA1499- 1 & 2
TB1	6	AX5093	J7	Z	INTERFACE PANEL	CA1499- 1 & 2
TB2	27	AX5093	J7	A	INTERFACE PANEL	CA1499- 1 & 2
TB2	25	AX5093	J7	B	INTERFACE PANEL	CA1499- 1 & 2
TB2	28	AX5093	J7	C	INTERFACE PANEL	CA1499- 1 & 2

JACK NO.	FROM PIN	UNIT	JACK NO.	TO PIN	UNIT	CABLE NO.
TB2	26	AX5093	J7	D	INTERFACE PANEL	CA1499- 1 & 2
TB2	21	AX5093	J7	E	INTERFACE PANEL	CA1499- 1 & 2
TB2	19	AX5093	J7	F	INTERFACE PANEL	CA1499- 1 & 2
TB2	22	AX5093	J7	G	INTERFACE PANEL	CA1499- 1 & 2
TB2	20	AX5093	J7	H	INTERFACE PANEL	CA1499- 1 & 2
J6	Y	INTERFACE PANEL	J6	N	RTTD-5A	CA1500- 1 & 2
J6	Z	INTERFACE PANEL	J6	P	RTTD-5A	CA1500- 1 & 2
J6	a	INTERFACE PANEL	J6	R	RTTD-5A	CA1500- 1 & 2
J6	b	INTERFACE PANEL	J6	S	RTTD-5A	CA1500- 1 & 2
J6	d	INTERFACE PANEL	J6	h	RTTD-5A	CA1500- 1 & 2
J6	e	INTERFACE PANEL	J6	j	RTTD-5A	CA1500- 1 & 2
J6	f	INTERFACE PANEL	J6	k	RTTD-5A	CA1500- 1 & 2
J6	h	INTERFACE PANEL	J4	P	RTTD-5A	CA1500- 1 & 2
J6	c	INTERFACE PANEL	J4	h	RTTD-5A	CA1500- 1 & 2
J6	g	INTERFACE PANEL	J6	L	RTTD-5A	CA1500- 1 & 2
J6	G	INTERFACE PANEL	J6	f	RTTD-5A	CA1500- 1 & 2
J6	j	INTERFACE PANEL	J5	A	RTTD-5A	CA1500- 1 & 2
J6	w	INTERFACE PANEL	J5	B	RTTD-5A	CA1500- 1 & 2
J6	r	INTERFACE PANEL	J5	D	RTTD-5A	CA1500- 1 & 2
J6	s	INTERFACE PANEL	J5	E	RTTD-5A	CA1500- 1 & 2

FROM JACK NO.	FROM PIN	FROM UNIT	TO JACK NO.	TO PIN	TO UNIT	CABLE NO.
J6	k	INTERFACE PANEL	J5	F	RTTD-5A	CA1500- 1 & 2
J6	l	INTERFACE PANEL	J5	J	RTTD-5A	CA1500- 1 & 2
J6	v	INTERFACE PANEL	J5	K	RTTD-5A	CA1500- 1 & 2
J6	m	INTERFACE PANEL	J5	L	RTTD-5A	CA1500- 1 & 2
J6	p	INTERFACE PANEL	J5	M	RTTD-5A	CA1500- 1 & 2
J6	4	INTERFACE PANEL	J5	P	RTTD-5A	CA1500- 1 & 2
J6	n	INTERFACE PANEL	J5	S	RTTD-5A	CA1500- 1 & 2
J6	t	INTERFACE PANEL	J5	T	RTTD-5A	CA1500- 1 & 2
J6	5	INTERFACE PANEL	J5	U	RTTD-5A	CA1500- 1 & 2
J6	u	INTERFACE PANEL	J5	V	RTTD-5A	CA1500- 1 & 2
J6	Q	INTERFACE PANEL	J5	E	INTERFACE PANEL	CA1500- 1 & 2
J6	R	INTERFACE PANEL	J5	F	INTERFACE PANEL	CA1500- 1 & 2
J6	S	INTERFACE PANEL	J5	G	INTERFACE PANEL	CA1500- 1 & 2
J6	V	INTERFACE PANEL	J5	H	INTERFACE PANEL	CA1500- 1 & 2
J6	W	INTERFACE PANEL	J5	I	INTERFACE PANEL	CA1500- 1 & 2
J6	X	INTERFACE PANEL	J5	J	INTERFACE PANEL	CA1500- 1 & 2
J2	F	INTERFACE PANEL	J3	r	RTMU-41A	CA1501
J2	G	INTERFACE PANEL	J3	n	RTMU-41A	CA1501
J2	H	INTERFACE PANEL	J3	l	RTMU-41A	CA1501
J2	J	INTERFACE PANEL	J3	j	RTMU-41A	CA1501

FROM JACK NO.	FROM PIN	FROM UNIT	TO JACK NO.	TO PIN	TO UNIT	CABLE NO.
J2	K	INTERFACE PANEL	J3	g	RTMU-41A	CA1501
J2	L	INTERFACE PANEL	TB1	2	INTERFACE PANEL	CA1501
J2	M	INTERFACE PANEL	TB1	3	INTERFACE PANEL	CA1501
J2	N	INTERFACE PANEL	TB1	4	INTERFACE PANEL	CA1501
J2	P	INTERFACE PANEL	TB1	5	INTERFACE PANEL	CA1501
J2	R	INTERFACE PANEL	TB1	6	INTERFACE PANEL	CA1501
J2	S	INTERFACE PANEL	TB1	7	INTERFACE PANEL	CA1501
J2	V	INTERFACE PANEL	J3	e	RTMU-41A	CA1501
J2	X	INTERFACE PANEL	J2	N	RTTD-5A	CA1501
J2	Z	INTERFACE PANEL	J3	d	RTMU-41A	CA1501
J2	Z	INTERFACE PANEL	J2	M	RTTD-5A	CA1501
J2	a	INTERFACE PANEL	J3	R	RTMU-41A	CA1501
J2	a	INTERFACE PANEL	J2	P	RTTD-5A	CA1501
J2	b	INTERFACE PANEL	J3	M	RTMU-41A	CA1501
J2	b	INTERFACE PANEL	J2	R	RTTD-5A	CA1501
J2	d	INTERFACE PANEL	J3	N	RTMU-41A	CA1501
J2	e	INTERFACE PANEL	J3	L	RTMU-41A	CA1501
J2	f	INTERFACE PANEL	J3	Q	RTMU-41A	CA1501
J2	p	INTERFACE PANEL	J3	f	RTMU-41A	CA1501
J2	s	INTERFACE PANEL	J3	K	RTMU-41A	CA1501

FROM JACK NO.	FROM PIN	FROM UNIT	TO JACK NO.	TO PIN	TO UNIT	CABLE NO.
J2	s	INTERFACE PANEL	J2	r	INTERFACE PANEL	CA1501
J2	r	INTERFACE PANEL	J2	p	INTERFACE PANEL	CA1501
TB1	2	INTERFACE PANEL	J3	W	RTMU-41A	CA1501
TB1	3	INTERFACE PANEL	J3	V	RTMU-41A	CA1501
TB1	4	INTERFACE PANEL	J3	U	RTMU-41A	CA1501
TB1	5	INTERFACE PANEL	J3	T	RTMU-41A	CA1501
TB1	6	INTERFACE PANEL	J3	S	RTMU-41A	CA1501
TB1	7	INTERFACE PANEL	J3	c	RTMU-41A	CA1501
TB1	1	INTERFACE PANEL	5J2	L	RTTD-5A	CA1501
TB1	8	INTERFACE PANEL	6J2	L	RTTD-5A	CA1501
J4	A	INTERFACE PANEL	J4	E	RTMU-41A	CA1501
J4	C	INTERFACE PANEL	J4	F	RTMU-41A	CA1501
J4	B	INTERFACE PANEL	J4	D	RTMU-41A	CA1501
5J2	F	RTTD-5A	J3	E	RTMU-41A	CA1501
5J2	S	RTTD-5A	6J2	S	RTTD-5A	CA1501
5J2	K	RTTD-5A	J3	h	RTMU-41A	CA1501
5J2	K	RTTD-5A	6J2	K	RTTD-5A	CA1501
5J2	E	RTTD-5A	6J2	E	RTTD-5A	CA1501
5J2	V	RTTD-5A	J3	m	RTMU-41A	CA1501
5J2	V	RTTD-5A	6J2	V	RTTD-5A	CA1501

JACK NO.	FROM PIN	UNIT	JACK NO.	TO PIN	UNIT	CABLE NO.
5J2	U	RTTD-5A	6J2	U	RTTD-5A	CA1501
5J2	T	RTTD-5A	J3	s	RTMU-41A	CA1501
5J2	T	RTTD-5A	6J2	T	RTTD-5A	CA1501
6J2	F	RTTD-5A	J3	E	RTMU-41A	CA1501
6J2	R	RTTD-5A	J3	M	RTMU-41A	CA1501
6J2	S	RTTD-5A	J3	P	RTMU-41A	CA1501
6J2	P	RTTD-5A	J3	R	RTMU-41A	CA1501
6J2	M	RTTD-5A	J3	d	RTMU-41A	CA1501
6J2	N	RTTD-5A	J3	e	RTMU-41A	CA1501
6J2	E	RTTD-5A	J3	k	RTMU-41A	CA1501
6J2	U	RTTD-5A	J3	P	RTMU-41A	CA1501
J1	X	INTERFACE PANEL	5J6	HH	RTTD-5A	CA1503
J1	X	INTERFACE PANEL	6J6	HH	RTTD-5A	CA1503
J1	S	INTERFACE PANEL	5J6	FF	RTTD-5A	CA1503
J1	S	INTERFACE PANEL	6J6	FF	RTTD-5A	CA1503
J1	R	INTERFACE PANEL	5J6	EE	RTTD-5A	CA1503
J1	R	INTERFACE PANEL	6J6	EE	RTTD-5A	CA1503
J1	V	INTERFACE PANEL	5J6	DD	RTTD-5A	CA1503
J1	V	INTERFACE PANEL	6J6	DD	RTTD-5A	CA1503
J1	U	INTERFACE PANEL	5J6	BB	RTTD-5A	CA1503

JACK NO.	FROM PIN	UNIT	JACK NO.	TO PIN	UNIT	CABLE NO.
J1	U	INTERFACE PANEL	6J6	BB	RTTD-5A	CA1503
J1	N	INTERFACE PANEL	5J6	CC	RTTD-5A	CA1503
J1	N	INTERFACE PANEL	6J6	CC	RTTD-5A	CA1503
J1	D	INTERFACE PANEL	5J6	AA	RTTD-5A	CA1503
J1	D	INTERFACE PANEL	6J6	AA	RTTD-5A	CA1503
J1	H	INTERFACE PANEL	5J6	x	RTTD-5A	CA1503
J1	H	INTERFACE PANEL	6J6	x	RTTD-5A	CA1503
J1	G	INTERFACE PANEL	5J6	y	RTTD-5A	CA1503
J1	G	INTERFACE PANEL	6J6	y	RTTD-5A	CA1503
J1	B	INTERFACE PANEL	5J6	w	RTTD-5A	CA1503
J1	B	INTERFACE PANEL	6J6	w	RTTD-5A	CA1503
J1	A	INTERFACE PANEL	5J6	v	RTTD-5A	CA1503
J1	A	INTERFACE PANEL	6J6	v	RTTD-5A	CA1503
J1	E	INTERFACE PANEL	5J6	t	RTTD-5A	CA1503
J1	E	INTERFACE PANEL	6J6	t	RTTD-5A	CA1503
J1	K	INTERFACE PANEL	J2	E	RTMU-41A	CA1502
J1	L	INTERFACE PANEL	J2	5	RTMU-41A	CA1502
J1	M	INTERFACE PANEL	J2	j	RTMU-41A	CA1502
J1	Ground	INTERFACE PANEL	J2	Ground	RTMU-41A	CA1502
J1	S	INTERFACE PANEL	J2	F	RTMU-41A	CA1502

FROM JACK NO.	FROM PIN	FROM UNIT	TO JACK NO.	TO PIN	TO UNIT	CABLE NO.
J1	T	INTERFACE PANEL	J2	6	RTMU-41A	CA1502
J1	U	INTERFACE PANEL	J2	K	RTMU-41A	CA1502
J1	Ground	INTERFACE PANEL	J2	Ground	RTMU-41A	CA1502
J1	a	INTERFACE PANEL	J2	G	RTMU-41A	CA1502
J1	b	INTERFACE PANEL	J2	2	RTMU-41A	CA1502
J1	c	INTERFACE PANEL	J2	1	RTMU-41A	CA1502
J1	Ground	INTERFACE PANEL	J2	Ground	RTMU-41A	CA1502
J1	g	INTERFACE PANEL	J2	H	RTMU-41A	CA1502
J1	h	INTERFACE PANEL	J2	z	RTMU-41A	CA1502
J1	j	INTERFACE PANEL	J2	m	RTMU-41A	CA1502
J1	Ground	INTERFACE PANEL	J2	Ground	RTMU-41A	CA1502
J1	D	INTERFACE PANEL	J2	N	RTMU-41A	CA1502
J1	s	INTERFACE PANEL	J2	M	RTMU-41A	CA1502
J3	A	INTERFACE PANEL	J2	D	RTMU-41A	CA1502
J3	B	INTERFACE PANEL	J2	r	RTMU-41A	CA1502
J3	C	INTERFACE PANEL	J2	b	RTMU-41A	CA1502
J3	D	INTERFACE PANEL	J2	Ground	RTMU-41A	CA1502
5J3	E	RTTD-5A	J2	K	RTMU-41A	CA1502
5J3	B	RTTD-5A	J2	3	RTMU-41A	CA1502
5J3	A	RTTD-5A	J2	9	RTMU-41A	CA1502

FROM JACK NO.	FROM PIN	FROM UNIT	TO JACK NO.	TO PIN	TO UNIT	CABLE NO.
5J3		RTTD-5A	J2	Ground	RTMU-41A	CA1502
5J3	C	RTTD-5A	J1	D	INTERFACE PANEL	CA1502
5J3	D	RTTD-5A	J1	s	INTERFACE PANEL	CA1502
6J3	E	RTTD-5A	J2	L	RTMU-41A	CA1502
6J3	B	RTTD-5A	J2	4	RTMU-41A	CA1502
6J3	A	RTTD-5A	J2	h	RTMU-41A	CA1502
6J3		RTTD-5A	J2	Ground	RTMU-41A	CA1502
6J3	C	RTTD-5A	J2	N	RTMU-41A	CA1502
6J3	D	RTTD-5A	J2	M	RTMU-41A	CA1502

SBGR4 TO TRANSMITTER (CA1510)

FROM JACK NO.	FROM PIN	FROM UNIT	TO JACK NO.	TO PIN	TO UNIT	CABLE NO.
J8		INTERFACE PANEL	J3004		TRANSMITTER	(RF INPUT)
J6	A	INTERFACE PANEL	J3001	A	TRANSMITTER	TRANSMITTER BAND (2 - 2.3)
J6	B	INTERFACE PANEL	J3001	B	TRANSMITTER	TRANSMITTER BAND (2.3 - 2.6)
J6	C	INTERFACE PANEL	J3001	C	TRANSMITTER	TRANSMITTER BAND (2.6 - 3)
J6	D	INTERFACE PANEL	J3001	D	TRANSMITTER	TRANSMITTER BAND (3 - 4)
J6	E	INTERFACE PANEL	J3001	E	TRANSMITTER	TRANSMITTER BAND (4 - 5)
J6	F	INTERFACE PANEL	J3001	F	TRANSMITTER	TRANSMITTER BAND (5 - 8)
J6	G	INTERFACE PANEL	J3001	G	TRANSMITTER	TRANSMITTER BAND (8 - 12)
J6	H	INTERFACE PANEL	J3001	H	TRANSMITTER	TRANSMITTER BAND (12 - 16)
J6	J	INTERFACE PANEL	J3001	I	TRANSMITTER	TRANSMITTER BAND (16 - 24)
J6	K	INTERFACE PANEL	J3001	J	TRANSMITTER	TRANSMITTER BAND (24 - 30)
J6	L	INTERFACE PANEL	J3001	e	TRANSMITTER	TRANSMITTER (ALDC)
J6	M	INTERFACE PANEL	J3001	s	TRANSMITTER	TRANSMITTER (ALDC SHIELD)
J6	N	INTERFACE PANEL	J3001	c	TRANSMITTER	TRANSMITTER (CARRIER ON)
J6	P	INTERFACE PANEL	J3001	d	TRANSMITTER	TRANSMITTER (CARRIER ON)
J6	3	INTERFACE PANEL	J3001	K	TRANSMITTER	TRANSMITTER (COMMON)

SBGR4 TO TRANSMITTER (CA1510)

FROM JACK NO.	FROM PIN	FROM UNIT	TO JACK NO.	TO PIN	TO UNIT	CABLE NO.
J6	Q	INTERFACE PANEL	J3002	B	TRANSMITTER	(RECEIVER MUTE COMMON)
J6	R	INTERFACE PANEL	J3002	A	TRANSMITTER	(RECEIVER MUTE N. O.)
J6	S	INTERFACE PANEL	J3002	C	TRANSMITTER	(RECEIVER MUTE N. C.)
J6	T	INTERFACE PANEL	J3002	P	TRANSMITTER	(PTT)
J6	U	INTERFACE PANEL	J3002	R	TRANSMITTER	(GROUND)
J6	V	INTERFACE PANEL	J3002	L	TRANSMITTER	(EXTERNAL INTERLOCKS COMMON)
J6	W	INTERFACE PANEL	J3002	N	TRANSMITTER	(EXTERNAL INTERLOCKS N. O.)
J6	X	INTERFACE PANEL	J3002	M	TRANSMITTER	(EXTERNAL INTERLOCKS N. C.)
J6	Y	INTERFACE PANEL	J3003	A	TRANSMITTER	NOTCH HOMING WAFER (1)
J6	Z	INTERFACE PANEL	J3003	B	TRANSMITTER	NOTCH HOMING WAFER (2)
J6	a	INTERFACE PANEL	J3003	C	TRANSMITTER	NOTCH HOMING WAFER (3)
J6	b	INTERFACE PANEL	J3003	D	TRANSMITTER	NOTCH HOMING WAFER (4)
J6	c	INTERFACE PANEL	J3003	E	TRANSMITTER	NOTCH HOMING WAFER COMMON
J6	d	INTERFACE PANEL	J3003	F	TRANSMITTER	READBACK WAFER (2)
J6	e	INTERFACE PANEL	J3003	G	TRANSMITTER	READBACK WAFER (3)
J6	f	INTERFACE PANEL	J3003	H	TRANSMITTER	READBACK WAFER (4)

SBCR4 TO TRANSMITTER (CA1510)

FROM JACK NO.	FROM PIN	FROM UNIT	TO JACK NO.	TO PIN	TO UNIT	CABLE NO.
J6	g	INTERFACE PANEL	J3003	L	TRANSMITTER	READBACK RAISE (COMMON)
J6	h	INTERFACE PANEL	J3003	J	TRANSMITTER	LEDEX GROUND
J6	j	INTERFACE PANEL	J3003	K	TRANSMITTER	-30 VDC
J6	k	INTERFACE PANEL	J3003	M	TRANSMITTER	HV ON IND
J6	l	INTERFACE PANEL	J3003	a	TRANSMITTER	FAULT IND
J6	m	INTERFACE PANEL	J3003	b	TRANSMITTER	FAULT IND
J6	n	INTERFACE PANEL	J3003	W	TRANSMITTER	TUNE
J6	p	INTERFACE PANEL	J3003	c	TRANSMITTER	REMOTE READY IND
J6	r	INTERFACE PANEL	J3003	Y	TRANSMITTER	HV ON/OFF
J6	s	INTERFACE PANEL	J3003	S	TRANSMITTER	HV ON/OFF GROUND
J6	t	INTERFACE PANEL	J3003	d	TRANSMITTER	OVERLOAD RESET
J6	u	INTERFACE PANEL	J3003	h	TRANSMITTER	24V OVERLOAD RESET
J6	v	INTERFACE PANEL	J3003	g	TRANSMITTER	VSWR OVERLOAD IND
J6	w	INTERFACE PANEL	J3003	Z	TRANSMITTER	MAIN POWER
J6	6	INTERFACE PANEL	J3003	T	TRANSMITTER	GROUND
J1		INTERFACE PANEL	J3003	f	TRANSMITTER	OVERLOAD IND N. C.
J1		INTERFACE PANEL	J3003	k	TRANSMITTER	OVERLOAD IND N. O.
J6	x	INTERFACE PANEL	J3003	j	TRANSMITTER	OVERLOAD RESET N. O.
J6	y	INTERFACE PANEL	J3001	h	TRANSMITTER	100 MW EXCITER LEVEL
J6	z	INTERFACE PANEL	J3001	j	TRANSMITTER	Shield

8W6J1 Readback Input
Readback Loop

K	Space	
L	Mark	Transmitter No. 1
M	Common	
S	Space	
T	Mark	Transmitter No. 2
U	Common	
a	Space	
b	Mark	Transmitter No. 5
c	Common	
g	Space	
h	Mark	Transmitter No. 6
j	Common	

8W7J1 Readback Input
Transmitter Overload

A	Transmitter No. 3	Normal
B	Transmitter No. 4	Overload
C	Transmitter No. 4	Shield
D	Transmitter No. 1	Normal
E	Transmitter No. 3	Overload
F	Transmitter No. 3	Shield
G	Transmitter No. 4	Normal
H	Transmitter No. 1	Overload
I	Transmitter No. 1	Shield
N	Transmitter No. 2	Overload
P	Transmitter No. 2	Shield
R	Transmitter No. 5	Normal
S	Transmitter No. 6	Overload
T	Transmitter No. 6	Shield
U	Transmitter No. 2	Normal
V	Transmitter No. 5	Overload
W	Transmitter No. 5	Shield
X	Transmitter No. 6	Normal

Ground unused Transmitter Normal if transmitter number is not applicable.

8W5J2 Memory Output

F	Bit 1
G	Bit 2
H	Bit 3
J	Bit 4
K	Bit 5
L	Start Tune 1
M	Start Tune 2

8W5J2 Memory Output (Cont'd)

N	Start Tune 3
P	Start Tune 4
R	Start Tune 5
S	Start Tune 6
X	Memory Advance
Z	Decoder Inhibit
a	Memory Inhibit
b	Equipment Selector
d	Memory Power Off
e	Optional
f	Stunt Line
p	Ground
r	Ground
s	Ground

8W6J3 Readback Output

A	Space	
B	Mark	H. Level
C	Common	
D	Shield	

8W5J4 Memory Input

A	+
B	Shield
C	-

8W2J5 Control
8W4J5

A	Key	Ground
B	Key	
C	PTT	Ground
D	PTT	
E	Receiver Mute	C.
F	Receiver Mute	N.O.
G	Receiver Mute	N.C.
H	Interlock	C.
I	Interlock	N.O.
J	Interlock	N.C.

8W2J6 Transmitter
8W4J6

A	Band 2-2.3
B	Band 2.3 - 2.6
C	Band 2.6 - 3.0
D	Band 3.0 - 4.0
E	Band 4.0 - 5.0
F	Band 5.0 - 8.0

8W2J6 Transmitter (Cont'd)
8W4J6

G	Band 8.0 - 12.0	
H	Band 12.0 - 16.0	
J	Band 16.0 - 24.0	
K	Band 24.0 - 30.0	
L	ALDC	
M	ALDC	
N	24V (Tune)	
P	24V (Tune)	
Q	Receiver Mute	C.
R	Receiver Mute	N.O.
S	Receiver Mute	N.C.
T	Transmitter Key	
U	Transmitter Key	
V	Interlock	C.
W	Interlock	N.O.
X	Interlock	N.C.
Y	Switch Position Drive	1
Z	Switch Position Drive	2
a	Switch Position Drive	3
b	Switch Position Drive	4
c	N.H. Power Level	
d	Readback Bit 2	
e	Readback Bit 3	
f	Readback Bit 4	
g	Readback Gate	
h	Solenoid Power Level	
j	-30V (Ledex Power)	
k	H.V. off Indicator	
l	Fault	
m	Fault	
n	TUNE	
p	TUNE - OPERATE	
r	H.V. ON-OFF	
s	H.V. ON-OFF	
t	Overload Reset	N.C.
u	Overload Reset	Com.
v	SWR Overload	
w	Remote Tuning IND	
x	Overload Reset	N.O.
3	Band	Com.
4	Ground	
5	Ground	
6	Ground	
y	100 MW Exciter Level	
z	Shield	

		8W1J7 Audio 8W3J7
A	600	B2
B	CT	B2
C	600	B2
D	Shield	B2

8W1J7 Audio (Cont'd)
8W3J7

E	600	B1
F	CT	B1
G	600	B1
H	Shield	B1
K	600	A1
L	CT	A1
M	600	A1
N	Shield	A1
W	600	A2
X	CT	A2
Y	600	A2
Z	Shield	A2