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TECHNICAL MANUAL  
for  
TECHNIMATIC TUNED RECEIVER  
MODEL DDDR-5M



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

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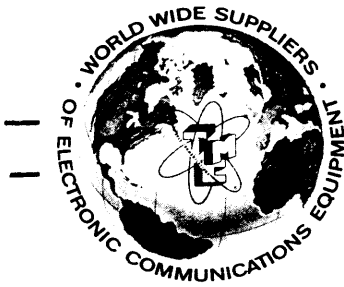
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\*Electron tubes also include semi-conductor devices.



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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.

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

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



## FOREWORD

The DDRR-5M TechniMatiC\* Tuned Receiver is made up of 19 major components in quantities as shown below:-

<u>QTY</u>	<u>MODEL NO.</u>	<u>TITLE</u>
2 . . .	HFRR-2B . . .	Radio Frequency Tuner
2 . . .	HFSR-1 . . .	Reference Signal Generator
2 . . .	AFC-3 . . .	Automatic Frequency Control
2 . . .	MSA-1 . . .	Multiple Sideband Adapter
2 . . .	MCGA-1 . . .	Multiplex Carrier Generator
3 . . .	HFP-1 . . .	Power Supply
1 . . .	BSP-6B . . .	Bridging Speaker Amplifier
2 . . .	RTTD-1 . . .	Receiver Decoder
2 . . .	RTMU-2 . . .	Converter-Storer, Signal Data
2 . . .	AK-101 . . .	Isolation Keyer

The DDRR-5M manual consists of the following manuals, covering the DDRR-5M system and individual components:-

DDRR-5M system manual  
HFR-2 manual (w/addendum describing HFRR-2B)  
HFS-1 manual (w/addendum describing HFSR-1)  
AFC-3 manual  
MSA-1 manual  
MCG-1 manual (w/addendum describing MCGA-1)  
HFP-1 manual  
BSP-6B manual  
RTTD-1 manual  
RTMU-2 manual  
AK-101 manual

\*Trademark applied for.

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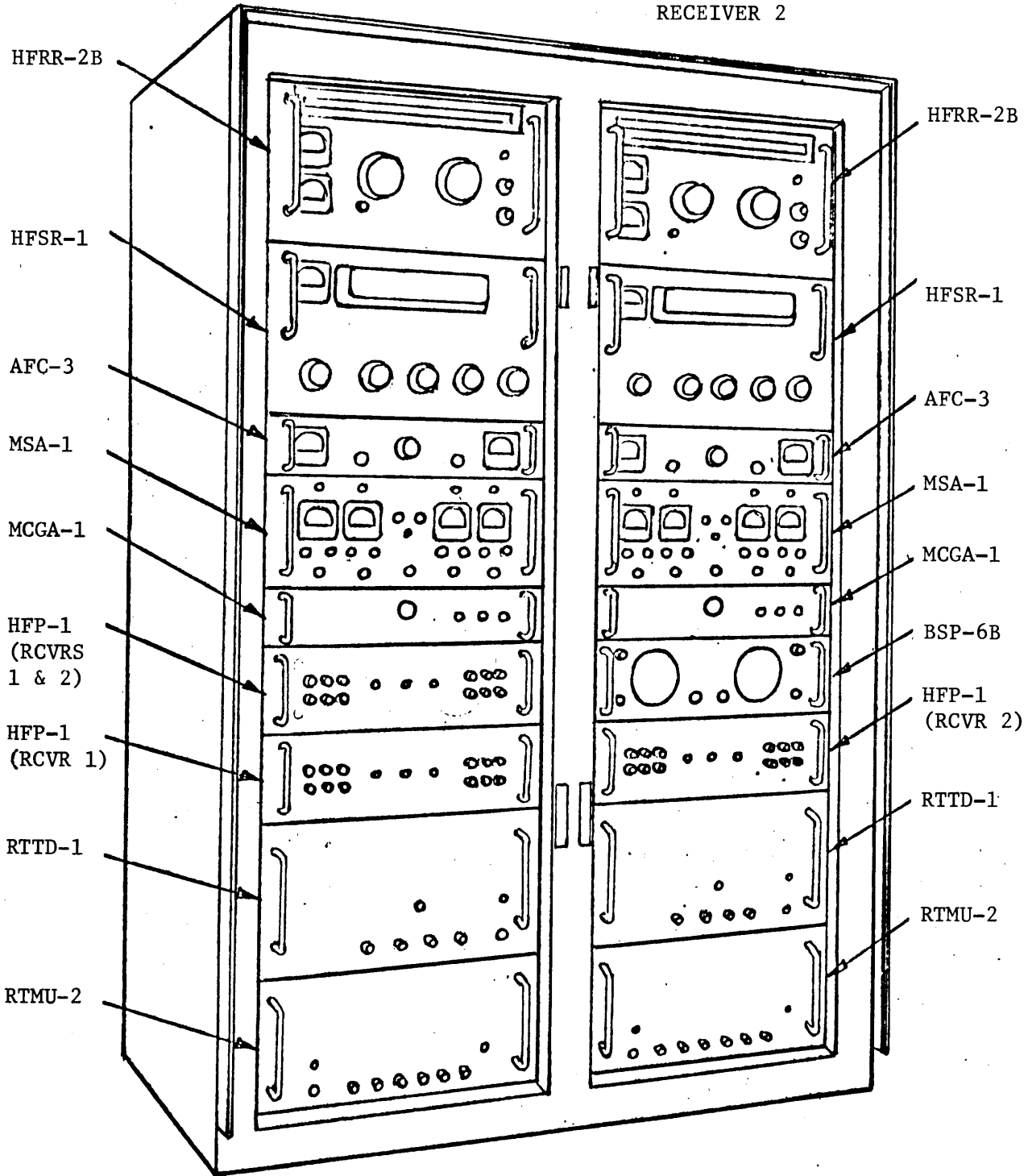
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RECEIVER 1

RECEIVER 2



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Figure 1-1. Technimatic Tuned Receiver, Model DDRR-5M

# SECTION 1

## GENERAL INFORMATION

### 1-1. GENERAL DESCRIPTION

TechniMatiC\* Tuned Receiver, Model DDDR-5M, is a dual diversity, 4-channel ISB receiver for the 2-32 mc frequency range, tunable in 100-cps steps. It may be tuned either manually or by a teletype coded signal from a remote control station. Control by teletype signal makes the receiver adaptable to pre-programmed punched card or punched tape for automatic tuning from remote or local equipment as well as remote keyboard control by radio or wire telegraph transmission.

In the 4-channel ISB reception, the carrier may range from full to suppressed. Each channel may contain voice, a combination of voice frequency tone telegraph channels, FAX channels, data transmission or any type of information that may be contained within 100 cps to 3100 cps. The output of each channel has an individually adjustable AGC decay and squelch control to suit that particular type of signal. The DDDR-5M HFO stability, referenced to a built-in 1 mc standard, is within 1 part in  $10^8$ . For signals from a relatively unstable transmitter (and containing a partial carrier), an AFC circuit is available. This circuit compensates for transmitter/receiver drift to produce audio that is precise to within 1 cps.

Other features include r-f tuning dial calibration signals (referenced to the 1-mc standard), an r-f noise silencer, carrier drift/level monitoring and isolated dynamic speaker monitoring for all 8 audio channel outputs.

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\* Trademark applied for.

1-2. DESCRIPTION OF UNITS (figure 1-2)

a. GENERAL. - Paragraphs 1-2b through 1-2k give a brief description of modular units used in the DDRR. For more detailed information pertaining to a unit, refer to the individual modular unit manual.

b. RADIO FREQUENCY TUNER, MODEL HFRR-2B - The HFRR-2B tunes to the 2-32 mc input in 8 bands and displays the frequency on a 14-inch slide-rule dial. The tuner converts the r-f to a first i-f of 1.75 mc. In the remote operation, it receives information from the HFSR to automatically set its band switch and tune to the frequency, with aid from a servo unit in the RTTD.

c. REFERENCE SIGNAL GENERATOR, MODEL HFSR-1. - The HFSR-1 monitors the HFO frequency in the HFRR and provides correction voltage to maintain the free-running oscillator to a stability of 1 part in  $10^8$  (the stability of its 1-mc frequency standard). It also provides stabilized injection frequencies of 2 mc and 250 kc to the MSA for the second receiver i-f and audio detection, derived from the same 1-mc standard.

In remote control, slave stepping switches tune the HFSR from coded inputs; connections made by the switches then act, with a servo unit in the RTTD, to tune the HFRR by TechniMatic action.

d. MULTIPLE SIDEBAND ADAPTER, MODEL MSA-1. - The MSA-1 converts the 1.75 mc i-f stage from the HFRR into a 250 kc i-f, separates and demultiplexes the four channels and produces 4 discrete audio channels at the DDRR output. It contains a separate AGC and SQUELCH adjustment for



each channel.

e. AUTOMATIC FREQUENCY CONTROL, MODEL AFC-3. - The AFC-3 can be used to compensate for transmitter drift when receiving from a relatively unstable transmitter, provided that the signal includes a partial\* carrier. When using the AFC, this unit supplies the 2-mc and 250-kc injection frequencies to the MSA, in lieu of those from the HFSR. These frequencies vary to compensate for transmitter drift to produce audio identical to within 1 cps of the audio at the transmitter.

f. MULTIPLEX CARRIER GENERATOR, MODEL MCGA-1. - The MCGA-1 routes the 2-mc and 250-kc injection frequencies, from HFSR or AFC source, to the MSA; it also includes oven-controlled 2-mc and 250-kc oscillators as a third source, for emergencies. In addition, the MCGA uses the 250-kc source to create the 243.71-kc and 256.29-kc injection frequencies necessary for de-multiplexing the translated channels in the MSA. In remote operation, a code-operated slave stepping switch sends the HFSR/AFC source selector switch into the position selected by the remote operator.

g. SIGNAL DATA CONVERTER-STORER, MODEL RTMU-2. - The RTMU-2 receives the coded 5-bit character pulse input to the DDDR representing the remote tuning directions for all the controls. These directions include an address selector character, individual to each receiver system and to each DDDR, which "opens" its RTMU for the rest of the tuning directions. This character is followed by the tuning direction characters and

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\*See table 1-1, Stability.

the last character (an "E") ending the message. As the characters advance into the RTMU, they are stored into a temporary magnetic-core memory section until the "E" character arrives. The "E" then has the effect of moving the characters from the RTMU into the RTTD, energizing the RTTD at the same time. The RTMU supplies a continuous coded readback of DDRR control positions to the remote operator. This unit contains its own power supply.

h. RECEIVER DECODER, MODEL RTTD-1. - The RTTD-1 receives the tuning codes from the RTMU and routes them to the proper controls on the HFSR and MCGA units. This unit decodes each addressal function code into a control location and routes the subsequent action function code to the slave stepping switch on the control. The RTTD also includes the servo unit and sequential relays used in tuning the HFRR from codes received by the HFSR. This unit contains its own power supply.

i. BRIDGING SPEAKER AMPLIFIER, MODEL BSP-6B. - The BSP-6B has two dynamic speakers for monitoring the two receiver systems. Each speaker has a 4-channel selector switch.

j. POWER SUPPLY, MODEL HFP-1. - The HFP-1 converts line voltage into plate, bias and filament voltages for the HFRR, HFSR, AFC, MSA, MCGA and BSP units. It also supplies crystal ovens throughout the system with heater element voltages. The STANDBY position of the rear chassis switch is used to place the receiver system in standby condition. In this condition, only crystal oven heater elements and HFO filament power is supplied to maintain frequency stability.

k. ISOLATION KEYER, MODEL AK-101. - Isolation Keyer, Model AK-101, provides a selection of three types of teletype tuning code inputs into the RTMU-2: 60 ma neutral, 60 ma polar, and 20 ma polar. This unit also serves as isolation inputs for the tuning codes into the two receiver systems in the DDRR-5M.

1-3. REFERENCE DATA

Table 1-1 lists the reference data that is pertinent to the DDRR-5M. For data concerning modular units, refer to the modular unit manual.

TABLE 1-1. DDRR-5M TECHNICAL SPECIFICATIONS

Frequency range:	2 to 32 mc
Tuning:	In 100-cps steps within 8 r-f bands as listed below: -  BAND 1 - 2-3 mc BAND 2 - 3-4 mc BAND 3 - 4-6 mc BAND 4 - 6-8 mc BAND 5 - 8-12 mc BAND 6 - 12-16 mc BAND 7 - 17-24 mc BAND 8 - 24-32 mc
Mode of operation:	4-channel ISB, single or dual diversity
Channel width:	3 kc, nominal
Maximum r-f bandwidth:	15 kc, symmetrical around carrier.
Stability:	For synthesized operation, receiver frequency stability is 1 part in $10^8$ for 24 hours for a change in ambient temperature within the limits of 0 to 50°C.

TABLE 1-1. DDRR-5M TECHNICAL SPECIFICATIONS (CONTD)

Stability: (cont)	For reception of reduced carrier signals (-30 db maximum*), receiver stability is as described above with the addition of a transmitted carrier drift compensator (AFC) reducing the error in the audio output to within 1 cps. AFC will function at a maximum carrier drift rate of 10 cps per second and a total deviation of + 750 cps. Memory circuit for signal fades.
Noise Figure and Sensitivity:	6 db or better over the band, i. e, with a 1 uv signal and a 7.5-kc bandwidth, the output signal-to-noise ratio is 15 db or better.
Antenna Input Impedance:	Nominal 50 ohms, unbalanced.
Audio Outputs:	Four 3-kc wide channels for 600-ohm loads; 0-10 mw per channel.
Audio Response: (per channel):	Flat within $\pm 1.5$ db from 250 cps to 3-kc.
Multiplexed Channel Translation:	Displaced by 6.29 kc.
Intermodulation: (1 or 2-channel reception)	Intermodulation products are down 60 db from the maximum tone in the desired sideband as a result of two signals in the unwanted sideband.
Image Ratio:	80 db referenced to 1 uv input signal.
Spurious Response: (as defined by CCIR)	For synthesized operation, no greater than .01 uv when referred to the antenna.
IF Rejection:	Better than 80 db average.
AGC:	Four separate AGC systems, one for each channel, with an adjustable 1-10 second decay time for each channel. Output remains within $\pm 1.5$ db for a 60 db change in input within input range of 1 uv to 0.1 volt.

\*With a 5-microvolt input signal at the antenna.

TABLE 1-1. DDRR-5M TECHNICAL SPECIFICATIONS (CONTD)

Audio Frequency Distortion:	Intermodulation products are better than 50 db below full output through the audio channel.
Hum Level:	Minus 50 db at full audio output.
Remote Tuning Input:	Keying for serial pulses in 7.42-unit teletype transmission pattern with 22 millisecond (60 WPM) or 13.7 millisecond (100 WPM) pulse widths*, selected by printed circuit card insertion. Pulse=mark(1). No pulse=space (0). 60 ma neutral, polar, or 20 ma polar.
Remote Tuning Input Teletype Codes:	See Table 1-2.
Remote Tuning Read-back Output:	Dry Contact keying through polar relay for serial pulses in 7.42-unit teletype transmission pattern. 60 WPM or 100 WPM transmission speed, selected by printed circuit card insertion. Constant cycling of 6 position codes. Relay contacts closed in mark(1) condition, opened in space (0) condition.
Remote Tuning Read-back Output Codes:	See Table 1-3.
Power Supply Requirements:	115 VAC or 230 VAC, 50/60 cps, single phase power. (NOTE: DDRR-5M supplied wired for 115 VAC unless specified as otherwise on order).
Ambient Temperature and Humidity:	0 to 50°C and up to 90% relative humidity.
Overall Dimensions:	69 inches high x 47 inches wide x 30 inches deep.

\*As specified.



TABLE 1-2. REMOTE TUNING INPUT CODE, DDDR-5M

CHARACTER RECEPTION ORDER*	ADDRESSAL FUNCTION	ACTION FUNCTION	5-BIT CODE	TELETYPE CHARACTERS	
				CCIT	ASCII**
1	Receiver Selector		2 codes (see table 1-4)		
2	HFRR BAND & TUNING controls and HFSR MC switch (2-16 MC)		11001	W	Y
	HFRR BAND & TUNING controls and HFSR MC switch (17-31 MC)		10001	Z	Q

\*Except for the 1st and 14th 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 (about 20 seconds) are obtained by the reception of the characters in the order shown.

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

TABLE 1-2. REMOTE TUNING INPUT CODE, DRRR-5M (Cont.)

CHARACTER RECEPTION ORDER	ADDRESSAL FUNCTION	ACTION FUNCTION	5-BIT CODE	TELETYPE CHARACTERS	
				CCIT	ASCII*
3		2 or 17 MC	01001	L	I
		3 or 18 MC	01000	Line Feed	H
		4 or 19 MC	00100	Space	D
		5 or 20 MC	01100	I	L
		6 or 21 MC	01010	R	J
		7 or 22 MC	01110	C	N
		8 or 23 MC	01101	P	M
		9 or 24 MC	01111	V	O
		10 or 25 MC	00110	N	F
		11 or 26 MC	00111	M	G
		12 or 27 MC	01011	G	K
		13 or 28 MC	00011	O	C
		14 or 29 MC	00101	H	E

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

TABLE 1-2. REMOTE TUNING INPUT CODE, DRRR-5M (Cont.)

CHARACTER RECEPTION ORDER	ADDRESSAL FUNCTION	ACTION FUNCTION	5-BIT CODE	TELETYPE CHARACTERS	
				CCIT	ASCII*
3 (Cont)		15 or 30 MC	00001	T	A
		16 or 31 MC	00010	Carriage Return	B
4	HFSR 100 KC switch		10011	B	S
		0	01000	Line Feed	H
5		1	00100	Space	D
		2	00010	Carriage Return	B
		3	01001	L	I
		4	01100	I	L
		5	00110	N	F
		6	01011	G	K

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

TABLE 1-2. REMOTE TUNING INPUT CODE, DDDR-5M (Cont.)

CHARACTER RECEPTION ORDER	ADDRESSAL FUNCTION	ACTION FUNCTION	5-BIT CODE	TELETYPE CHARACTERS	
				CCIT	ASCII*
5		7	01101	P	M
(Cont)		8	01110	C	N
		9	00111	M	G
6	HFSR 10 KC switch		10010	D	R
7		0-9	Same as 5th character		
8	HFSR 1 KC switch		10111	X	W
9		0-9	Same as 5th character		
10	HFSR .1 KC switch		10101	Y	U
11		0-9	Same as 5th character		

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

TABLE 1-2. REMOTE TUNING INPUT CODE, DRRR-5M (cont'd)

CHARACTER RECEPTION ORDER	ADDRESSAL FUNCTION	ACTION FUNCTION	5-BIT CODE	TELETYPE CHARACTERS	
				CCIT	ASCII*
12	MCGA-1 INT/AFC/SYN switch		11100	U	/
13		INT	No code		
		AFC	01000	Line Feed	H
		SYN	00010	Carriage Return	B
14		Energizes decoder	10000	E	P

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



TABLE 1-3. REMOTE TUNING READBACK OUTPUT CODE, DRRR-5M

CHARACTER TRANSMISSION ORDER	CONTROL	POSITION INDICATED	5-BIT CODE	TELETYPE CHARACTERS	
				CCIT	ASCII*
1	To reset readback indicator panel for new cycle		10000	E	P
2	HFRR BAND & TUNE controls and HFRR MC switch	2 MC	11001	W	Y
		3 MC	11000	A	X
		4 MC	10100	S	T
		5 MC	11100	U	/
		6 MC	11010	J	Z
		7 MC	11110	K	↑
		8 MC	11101	Q	]
		9 MC	11111	None	←
		10 MC	10110	F	V
		11 MC	10111	X	W
		12 MC	11011	None	[

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

TABLE 1-3. REMOTE TUNING READBACK OUTPUT CODE, DRRR-5M (Cont.)

CHARACTER TRANSMISSION ORDER	CONTROL	POSITION INDICATED	5-BIT CODE	TELETYPE CHARACTERS	
				CCIT	ASCII*
2 Cont.		13 MC	10011	B	S
		14 MC	10101	Y	U
		15 MC	10001	Z	Q
		16 MC	10010	D	R
		17 MC	01001	L	I
		18 MC	01000	Line Feed	H
		19 MC	00100	Space	D
		20 MC	01100	I	L
		21 MC	01010	R	J
		22 MC	01110	C	N
		23 MC	01101	P	M
	24 MC	01111	V	O	
	25 MC	00110	N	F	

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

TABLE 1-3. REMOTE TUNING READBACK OUTPUT CODE, DRRR-5M (Cont.)

CHARACTER TRANSMISSION ORDER	CONTROL	POSITION INDICATED	5-BIT CODE	TELETYPE CHARACTERS	
				CCIT	ASCII*
2 Cont.		26 MC	00111	M	G
		27 MC	01011	G	K
		28 MC	00011	O	C
		29 MC	00101	H	E
		30 MC	00001	T	A
3	HFSR 100 KC switch	31 MC	00010	Carriage Return	B
		0	01000	Line Feed	H
		1	00100	Space	D
		2	00010	Carriage Return	B
		3	01001	L	I
		4	01100	I	L
		5	00110	N	F

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

TABLE 1-3. REMOTE TUNING READBACK OUTPUT CODE, DRRR-5M (Cont.)

CHARACTER TRANSMISSION ORDER	CONTROL	POSITION INDICATED	5-BIT CODE	TELETYPE CHARACTERS	
				CCIT	ASCII*
3 Cont.	HFSR 100 KC switch	6	01011	G	K
		7	01101	P	M
		8	01110	C	N
		9	00111	M	G
4	HFSR 10 KC switch	0-9	Same as 3rd character		
5	HFSR 1 KC switch	0-9	Same as 3rd character		
6	HFSR .1 KC switch	0-9	Same as 3rd character		

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

TABLE 1-3. REMOTE TUNING READBACK OUTPUT CODE, DRRR-5M (cont'd)

CHARACTER TRANSMISSION ORDER	CONTROL	POSITION INDICATED	5-BIT CODE	TELETYPE CHARACTERS	
				CCIT	ASCII*
7**	MCGA INT/AFC/SYN switch and receiver status "in tune process"/ "ready"	INT	No code		
		AFC and "in tune process"	01100	I	L
		AFC and "ready"	01001	L	I
		SYN and "in tune process"	00110	N	F
		SYN and "ready"	00011	O	C

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

\*\* Four blank code time intervals occur between transmission of #6 and #7 characters.

TABLE 1-4. RECEIVER SELECTOR CHARACTER CODES

Note: Each DDDR receiver may have a different receiver selector code ( a double 5-bit code as specified on order). The first code represents a letter and the second a numeral, both corresponding with the push-buttons on TMC's RTRS code transmitting equipment. Available codes are as shown below. The letter and numeral appear printed on the RTMU Z5003 printed circuit card.

<u>RTRS PUSH- BUTTON</u>	<u>5-BIT CODE</u>	<u>CCIT TELETYPE CHARACTER</u>	<u>ASCII* TELETYPE CHARACTER</u>
A	10101	Y	U
B	10110	F	V
C	11010	J	Z
D	11001	W	Y
E	10011	B	S
F	11100	U	/
G	10100	S	K
H	10010	D	R
I	10001	Z	Q
J	11000	A	X
1	01010	R	J
2	01001	L	I
3	00101	H	E
4	00110	N	F
5	01100	I	L
6	00011	O	C
7	01011	G	K
8	01101	P	M
9	01110	C	N
10	00111	M	G

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

## **SECTION 2**

### **INSTALLATION**

#### 2-1. UNPACKING AND HANDLING.

Inspect the DDRR packing cases for possible damage when it arrives at the operating site. With respect to equipment damage for which the carrier is liable, The Technical Materiel Corporation will assist in describing methods of repair and the furnishing of replacement parts. Inspect the packing material for parts that may have been shipped as loose items. Most of the cable assemblies used in the DDRR are mounted in the rack and taped in place.

#### 2-2. RACK INSTALLATION.

Figure 2-1 shows overall dimensions, clearances and other installation data pertinent to locating the DDRR rack. The room or van in which the receiver is placed should have adequate ventilation.

#### 2-3. POWER REQUIREMENTS.

The DDRR leaves the factory wired for 115 vac, 50/60 cps operation, unless otherwise specified on order. The receiver is also available for 230 volt, 50/60 cps operation on special order.

Input power is to be applied to the DDRR by means of a 3-conductor shielded power cable of sufficient size to provide 20 amperes at 115 volts a-c. Connect the power cable to the input of AF-103 Line Filter in the rear of RECEIVER No. 1 rack. The connection points for the 3 conductors are No. 10 screw terminals.

## 2-4. ASSEMBLY OF RECEIVER.

a INSTALLATION OF MODULAR UNITS. - Refer to figure 1-1 for information regarding location of all modular units. All major units are slide-mounted on tilt-lock drawer slides. To install any slide-mounted unit in its compartment, refer to figure 2-2 and proceed as follows:

(1) Untape or unstrap cable assemblies and all other components fastened to the rack frame for shipment.

### **CAUTION**

Start by installing bottom units first per steps 2 through 6 in order to avoid rack tipping over from extended center of gravity.

(2) Pull center section of associated compartment track out until it locks in an extended position.

(3) Position slide mechanisms of modular unit in tracks, and ease modular unit forward into rack until release buttons engage holes in track.

(4) Make the necessary cable and electrical connections as described in paragraph 2-4b. To prevent the cables extending from the modular units from snagging, utilize the cable retractors located inside the rack in the rear (see figure 2-3).

(5) Depress release buttons and slide modular unit completely into compartment.

(6) Secure front panel of modular unit to rack with screws.

b INTERCONNECTING CABLING. - Connect cabling as shown in figure 2-5 Interconnect Cabling Diagram.

c REMOTE TUNING & READBACK SPEED SELECTION. - Remote tuning input and readback output teletype is adjustable to either 60 WPM or 100 WPM by inserting printed circuit cards in the memory and readback card bins



of the RTMU. The DRRR is shipped with the 60 WPM cards installed in the bins.\* Clock circuit card Z5001 with a "60 WPM" decal is installed in J5008 receptacle of the memory bin; card number Z5015 with a "60 WPM" decal is installed in J5022 receptacle in the read-back bin. Z5001 and Z5015 cards with "100 WPM" decals are available on order.

### NOTE

60-100 WPM refers to the speed of character transmissions from the RTMU readback output, based on 5 characters to a word, with each character immediately following the other. In the RTMU tuning input, however, the 60 and 100 WPM refers to the two pulse widths (22 and 13.7 milli-seconds, respectively) associated with these speeds, within each character. The characters themselves may be fed into the RTMU at any speed or timing.

#### 2-5. CONNECTION OF EXTERNAL EQUIPMENT.

a ANTENNA. - Two antennas are required for space diversity operation. Each receiver in the DRRR is normally used with a sloping V, rhombic, or log-periodic antenna. The antenna input to the receiver is for a 50 ohms, unbalanced transmission line. Make both antenna connections at the vertical panel located inside RECEIVER No. 2 rack rear door on left. Connect RECEIVER No.2 antenna to J8501 jack and RECEIVER No. 1 antenna to J8502 jack. Two TMC UG88/U type BNC plugs are supplied in shipment. Use RG58/U cable or equivalent.

b AUDIO LINES. - Connect audio output lines for channels A1, A2, B1 and B2 at the filter box inside RECEIVER No. 2 rear rack door as shown in figure 2-4.

c REMOTE TUNING SIGNAL SOURCE. - Connect teletype tuning code keying input at terminals 1 and 2 of TB9501 terminal block on AK-101 Isolation Keyer assembly for each receiver, located inside rack rear service door at right. See figure 2-6 (shown for 60 ma neutral) for

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\*Unless specified as otherwise on order

connection details. The AK-101 represents 25K resistance across the teletype equipment output. To obtain the 60 ma current and a 12-volt drop across the AK-101, insert a 200-ohm resistor across TB9501 terminals 1 and 2.

d REMOTE TUNING READBACK INDICATOR. - Connect remote tuning teletype readback keying output at terminals 1, 2 and 3 of TB9502 terminal block on AK-101 Isolation Keyer assembly for each receiver system. See figure 2-6 for connection details. Run teletype readback outputs out separately from each receiver system to separate readback indicators or to a selector switch for the same indicator.

#### 2-6. INITIAL ADJUSTMENTS.

The DRRR has been factory tested and aligned as a complete receiver system before disassembly for shipment. No initial adjustments of chassis mounted variable components are necessary before operation.

#### 2-7. DIVERSITY CONNECTIONS.

The two receiver systems in the DRRR may be operated separately, in frequency diversity or in space diversity. The cable (shown in figure 2-5) running from HFSR receptacle J3020 in RECEIVER #2 to HFSR receptacle J3019 in RECEIVER #1 is for diversity operation, using the 1-mc standard in receiver #2 HFSR as a common 1-mc standard reference for both receivers. When the DRRR is to be used for single receiver operation, remove the cable. For either space or frequency diversity, if a voice combiner is not being used in the audio outputs, tie the two receiver AGC outputs together. This is done by installing a jumper wire between terminals 1 and 3 of terminal block TB8501 on A4070 audio filter box located on the rear outer wall of RECEIVER #2 rack (see figure 2-5). Terminal 2 is for shield ground, if required. For single receiver operation, do not install the jumper wire.

## 2-7. DIVERSITY CONNECTIONS (cont'd)

For space diversity operation, install similarly coded Z5003 cards in the RTMU units of both receiver systems (see table 1-4). This will enable the simultaneous tuning of both receiver systems from one coded tuning message. For frequency diversity, install differently coded Z5003 cards in order that the two messages may be sent containing the different frequency codes.

## 2-8. MULTIPLE RECEIVER SITES.

When more than one DRRR is controlled by the same remote control station, make connections to the next DRRR receiver/s as shown in figure 2-6. Continue to jumper the teletype tuning code keying inputs together from the common signal source (teletype equipment). Each of the two receivers in each DRRR represents 25K resistance across this source. To obtain the 12V drop across each receiver, place the 200-ohm resistor across TB9501 terminals 1 and 2 of the first receiver in the first DRRR only. When each receiver contains a different Receiver Selector letter/numeral code (see table 1-2) in its RTMU unit, continue to run the stunt and stunt ground jumpers between receivers as shown, attaching them at terminals 6 and 7 of TB9501 in each receiver. Stunt wires between receivers with similar recognition codes are not necessary. In all cases, run teletype readback outputs out separately from each receiver to separate readback indicators or to a selector switch for the same indicator.

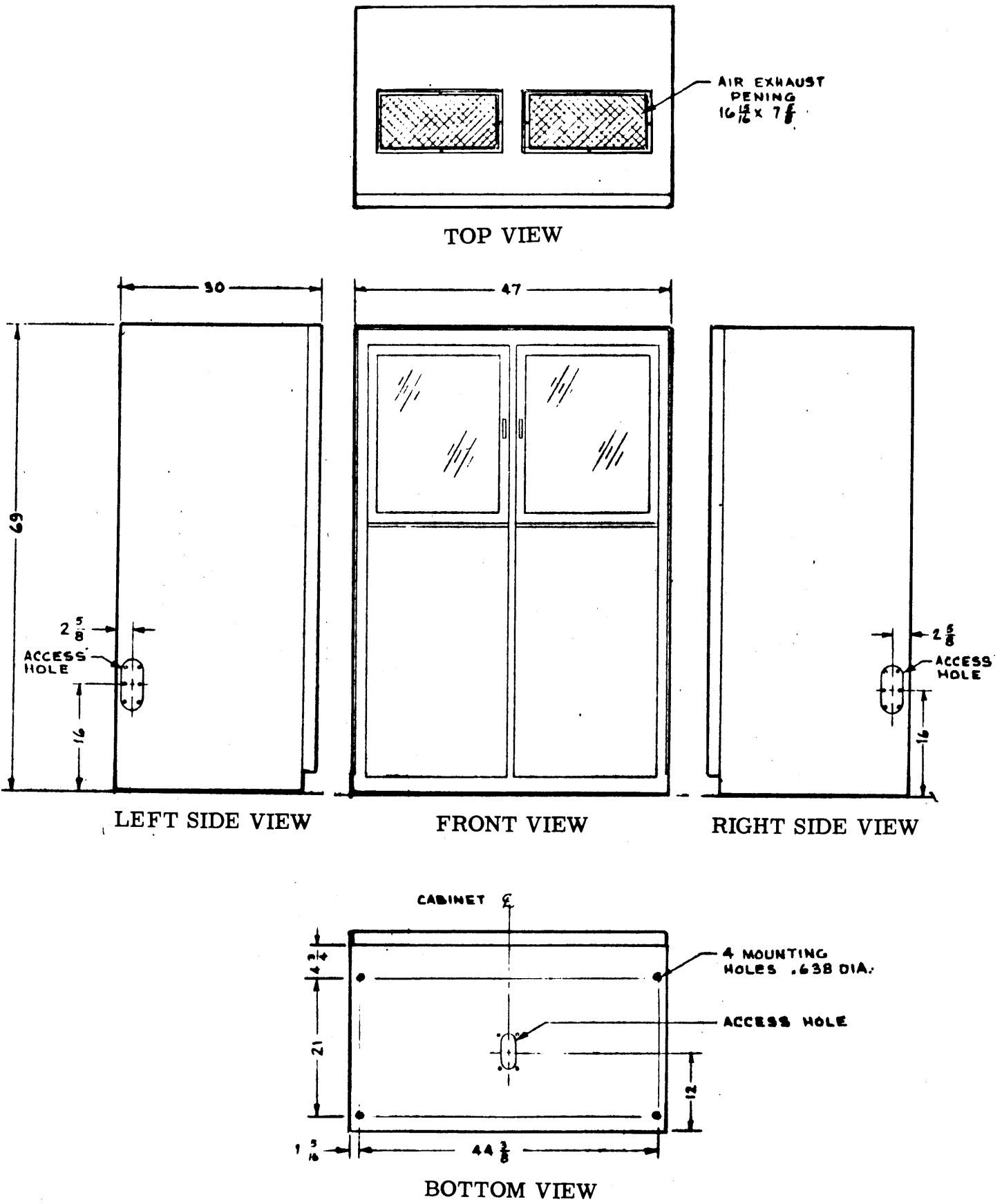


Figure 2-1. Installation Dimensions, DDRR-5M (Sheet 1 of 2)

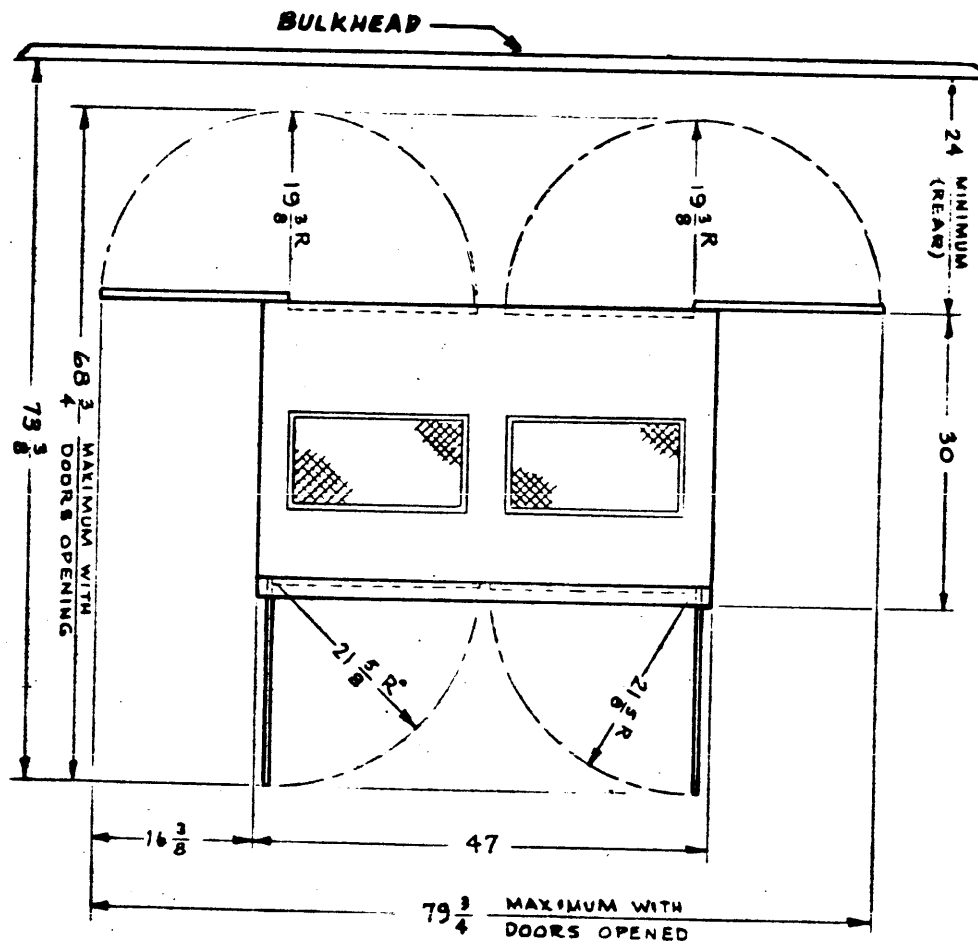


Figure 2-1. Installation Dimensions, DDRR-5M (Sheet 2 of 2)

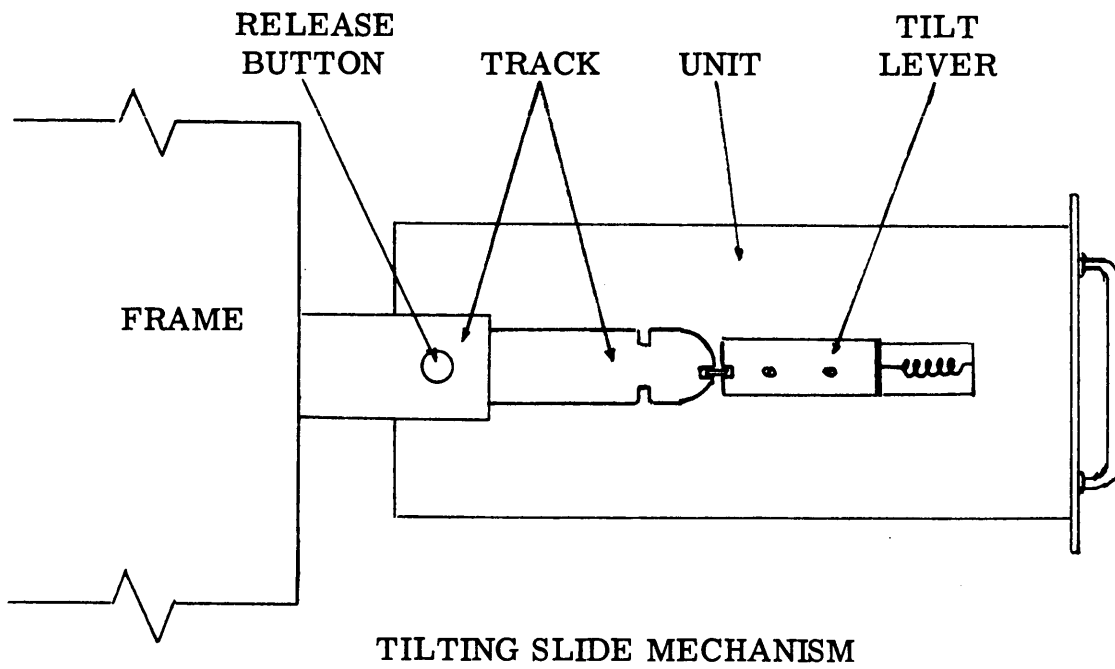
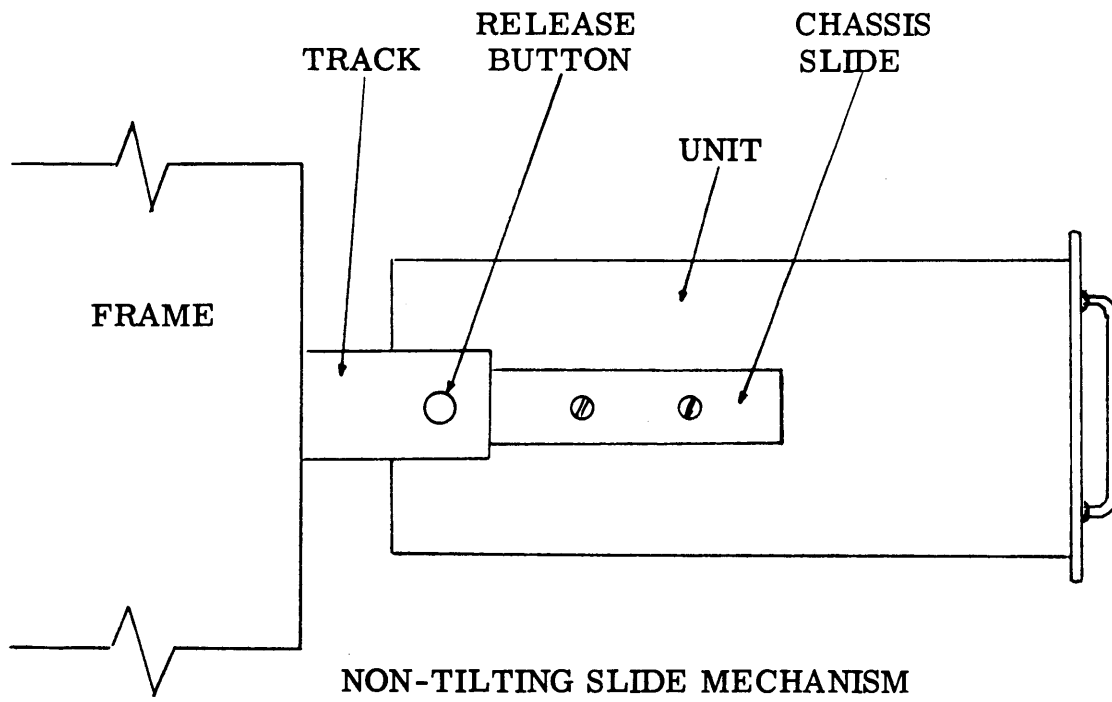


Figure 2-2. Slide Mounting Details

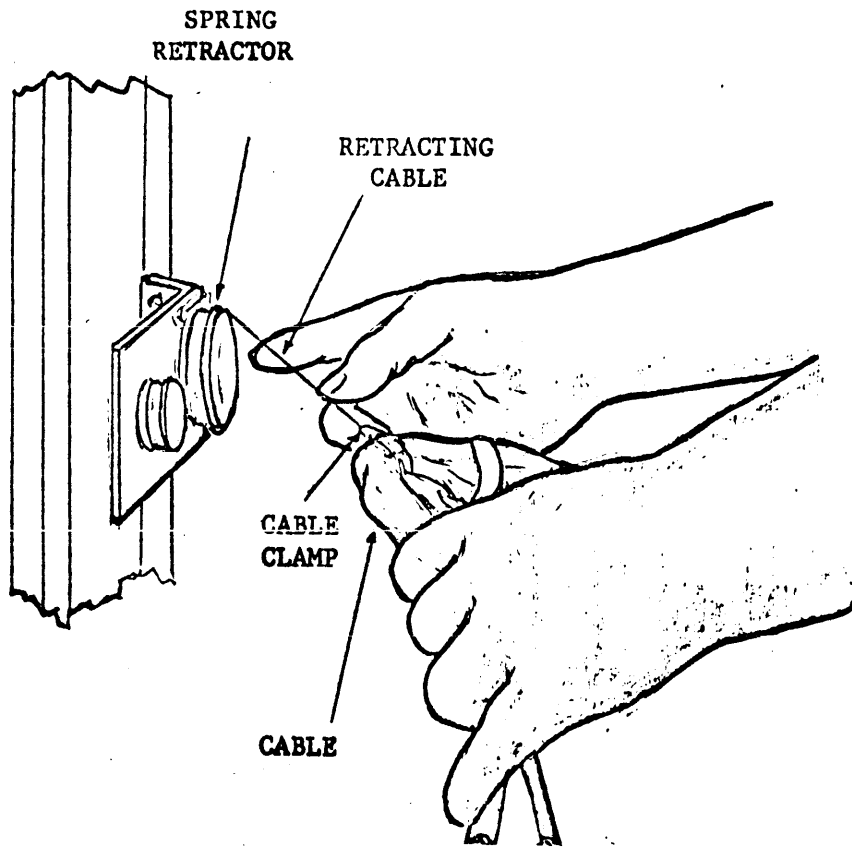


Figure 2-3. Attaching Cable Retractor

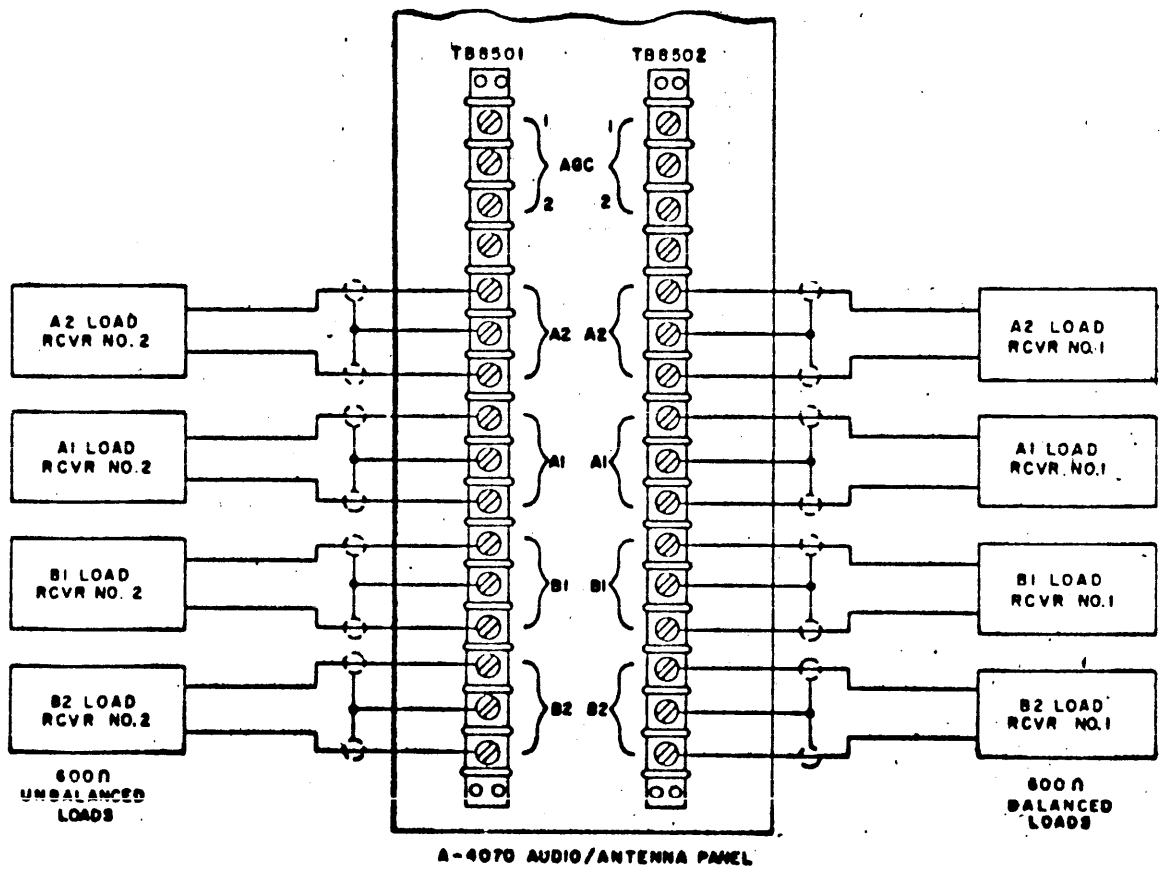
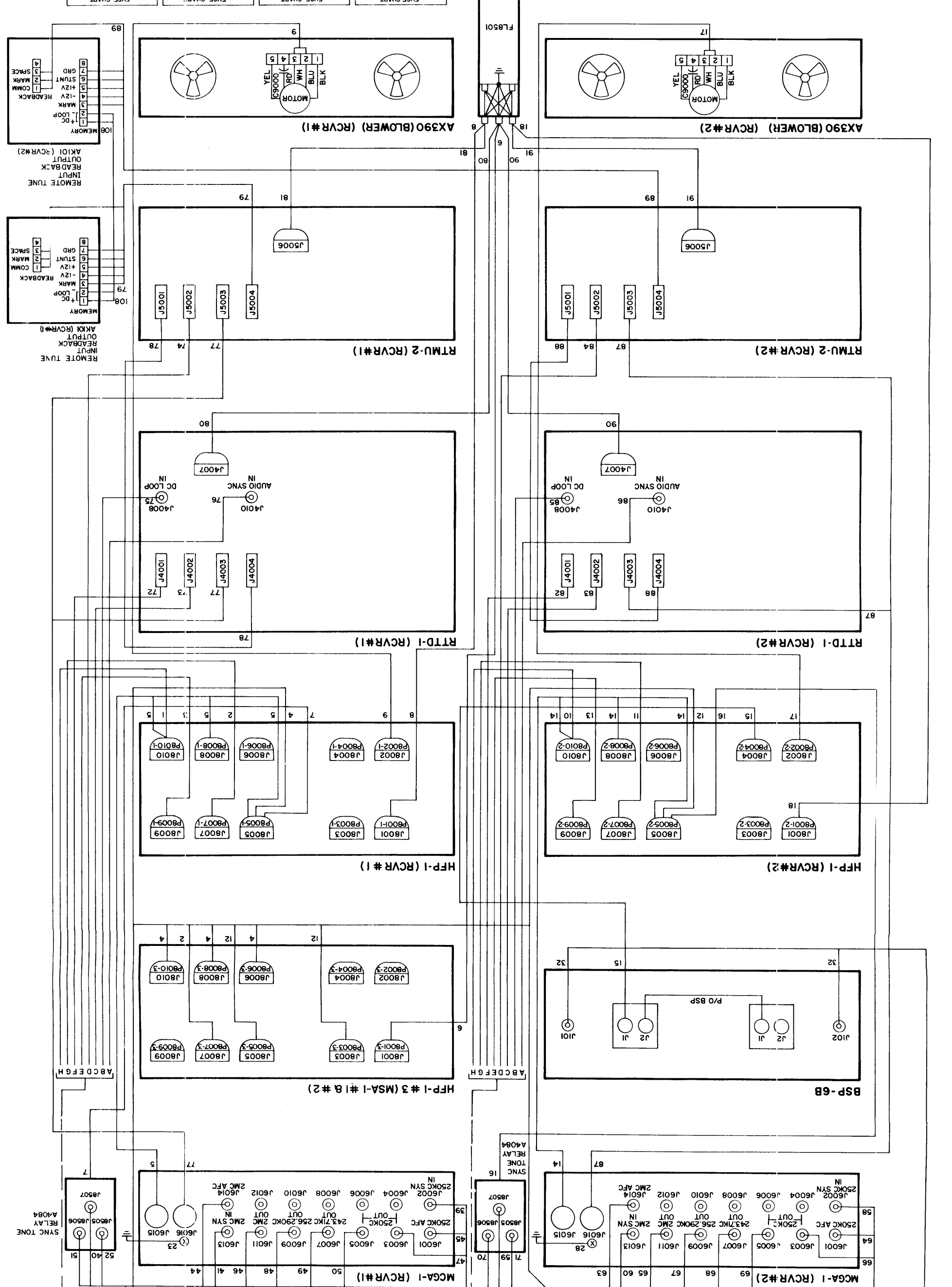


Figure 2-4. Connection Diagram, Audio Loads

13	CA104-10 (W8513)	26	CA412-36-3-1(W8526)	39	CA110-2	52	CA110-2	65	CA110-3	78	CA923-2 (W8544)	91	CA696-3 (W8557)	104	CA480-3-5 (W8570)
12	PV0 CA11511-1(W8512)	25	3-4-5-1(W8525)	38	CA110-2	51	CA110-2	64	CA1138-1 (W8543)	77	CA1138-1 (W8543)	90	CA696-3 (W8557)	103	CA480-3-5 (W8570)
11	CA1036-2 (W8511)	24	3-4-5-1(W8524)	37	CA110-2	50	CA110-2	63	CA480-3-150(W8542)	76	CA480-3-150(W8542)	89	CA1138-2 (W8554)	102	(W8568)
10	CA1037-9 (W8510)	23	3-4-5-1(W8523)	36	CA110-2	49	CA110-2	62	CA480-3-150(W8541)	75	CA480-3-150(W8541)	88	CA1138-2 (W8554)	101	(W8567)
9	CA708-1 (W8509)	22	3-4-5-1(W8522)	35	CA110-2 (W8535)	48	CA110-2	61	CA927-2 (W8539)	74	CA927-2 (W8539)	87	CA1138-2 (W8553)	100	(W8566)
8	CA986-1 (W8508)	21	3-4-5-1(W8521)	34	CA480-3-112(W8534)	47	CA480-3-150(W8533)	60	CA480-3-150(W8532)	73	CA910-2 (W8539)	86	CA480-3-150(W8532)	99	(W8565)
7	CA1061-5 (W8507)	20	3-4-5-1(W8520)	33	CA480-3-150(W8533)	46	CA480-3-150(W8532)	59	CA480-3-150(W8531)	72	CA1140-1 (W8538)	85	CA480-3-150(W8531)	98	(W8564)
6	CA986-1 (W8506)	19	CA412-34-5-4 (W8519)	32	CA1111-1 (W8532)	45	CA1111-1 (W8531)	58	CA1110-3	71	CA1110-3	84	CA927-3 (W8550)	97	(W8563)
5	CA1033-1 (W8505)	18	CA696-1 (W8518)	31	CA1113-1 (W8531)	44	CA1113-1 (W8530)	57	CA1110-3	70	CA1110-3	83	CA910-3 (W8549)	96	(W8562)
4	CA1113 (W8504)	17	CA708-1 (W8517)	30	CA480-15-10F (W8530)	43	CA480-15-12F (W8529)	56	CA1110-3	69	CA1110-3	82	CA1110-3 (W8548)	95	(W8561)
3	CA1044-9 (W8503)	16	CA1081-3 (W8516)	29	CA480-15-12F (W8528)	42	CA480-15-12F (W8527)	55	CA1110-3	68	CA1110-3	81	CA696-3 (W8557)	94	(W8560)
2	CA1036-12(W8502)	15	CA884-3 (W8515)	28	CA412-36-4-7 (W8528)	41	CA412-36-4-7 (W8527)	54	CA1110-3	67	CA1110-3	80	CA696-3 (W8556)	93	(W8559)
1	CA1037-11 (W8501)	14	CA1033-2 (W8514)	27	CA412-36-6-4 (W8527)	40	CA110-2	53	CA480-3-112(W8536)	66	CA110-3	79	CA1139-1(W8545)	92	CA480-3-5 (W8570)

13	CA104-10 (W8513)	26	CA412-36-3-1(W8526)	39	CA110-2	52	CA110-2	65	CA110-3	78	CA923-2 (W8544)	91	CA696-3 (W8557)	104	CA480-3-5 (W8570)
12	PV0 CA11511-1(W8512)	25	3-4-5-1(W8525)	38	CA110-2	51	CA110-2	64	CA1138-1 (W8543)	77	CA1138-1 (W8543)	90	CA696-3 (W8557)	103	CA480-3-5 (W8570)
11	CA1036-2 (W8511)	24	3-4-5-1(W8524)	37	CA110-2	50	CA110-2	63	CA480-3-150(W8542)	76	CA480-3-150(W8542)	89	CA1138-2 (W8554)	102	(W8568)
10	CA1037-9 (W8510)	23	3-4-5-1(W8523)	36	CA110-2	49	CA110-2	62	CA480-3-150(W8541)	75	CA480-3-150(W8541)	88	CA1138-2 (W8554)	101	(W8567)
9	CA708-1 (W8509)	22	3-4-5-1(W8522)	35	CA110-2 (W8535)	48	CA110-2	61	CA927-2 (W8539)	74	CA927-2 (W8539)	87	CA1138-2 (W8553)	100	(W8566)
8	CA986-1 (W8508)	21	3-4-5-1(W8521)	34	CA480-3-112(W8534)	47	CA480-3-150(W8533)	60	CA480-3-150(W8532)	73	CA910-2 (W8539)	86	CA480-3-150(W8532)	99	(W8565)
7	CA1061-5 (W8507)	20	3-4-5-1(W8520)	33	CA480-3-150(W8533)	46	CA480-3-150(W8532)	59	CA480-3-150(W8531)	72	CA1140-1 (W8538)	85	CA480-3-150(W8531)	98	(W8564)
6	CA986-1 (W8506)	19	CA412-34-5-4 (W8519)	32	CA1111-1 (W8532)	45	CA1111-1 (W8531)	58	CA1110-3	71	CA1110-3	84	CA927-3 (W8550)	97	(W8563)
5	CA1033-1 (W8505)	18	CA696-1 (W8518)	31	CA1113-1 (W8531)	44	CA1113-1 (W8530)	57	CA1110-3	70	CA1110-3	83	CA910-3 (W8549)	96	(W8562)
4	CA1113 (W8504)	17	CA708-1 (W8517)	30	CA480-15-10F (W8530)	43	CA480-15-12F (W8529)	56	CA1110-3	69	CA1110-3	82	CA1110-3 (W8548)	95	(W8561)
3	CA1044-9 (W8503)	16	CA1081-3 (W8516)	29	CA480-15-12F (W8528)	42	CA480-15-12F (W8527)	55	CA1110-3	68	CA1110-3	81	CA696-3 (W8557)	94	(W8560)
2	CA1036-12(W8502)	15	CA884-3 (W8515)	28	CA412-36-4-7 (W8528)	41	CA412-36-4-7 (W8527)	54	CA1110-3	67	CA1110-3	80	CA696-3 (W8556)	93	(W8559)
1	CA1037-11 (W8501)	14	CA1033-2 (W8514)	27	CA412-36-6-4 (W8527)	40	CA110-2	53	CA480-3-112(W8536)	66	CA110-3	79	CA1139-1(W8545)	92	CA480-3-5 (W8570)



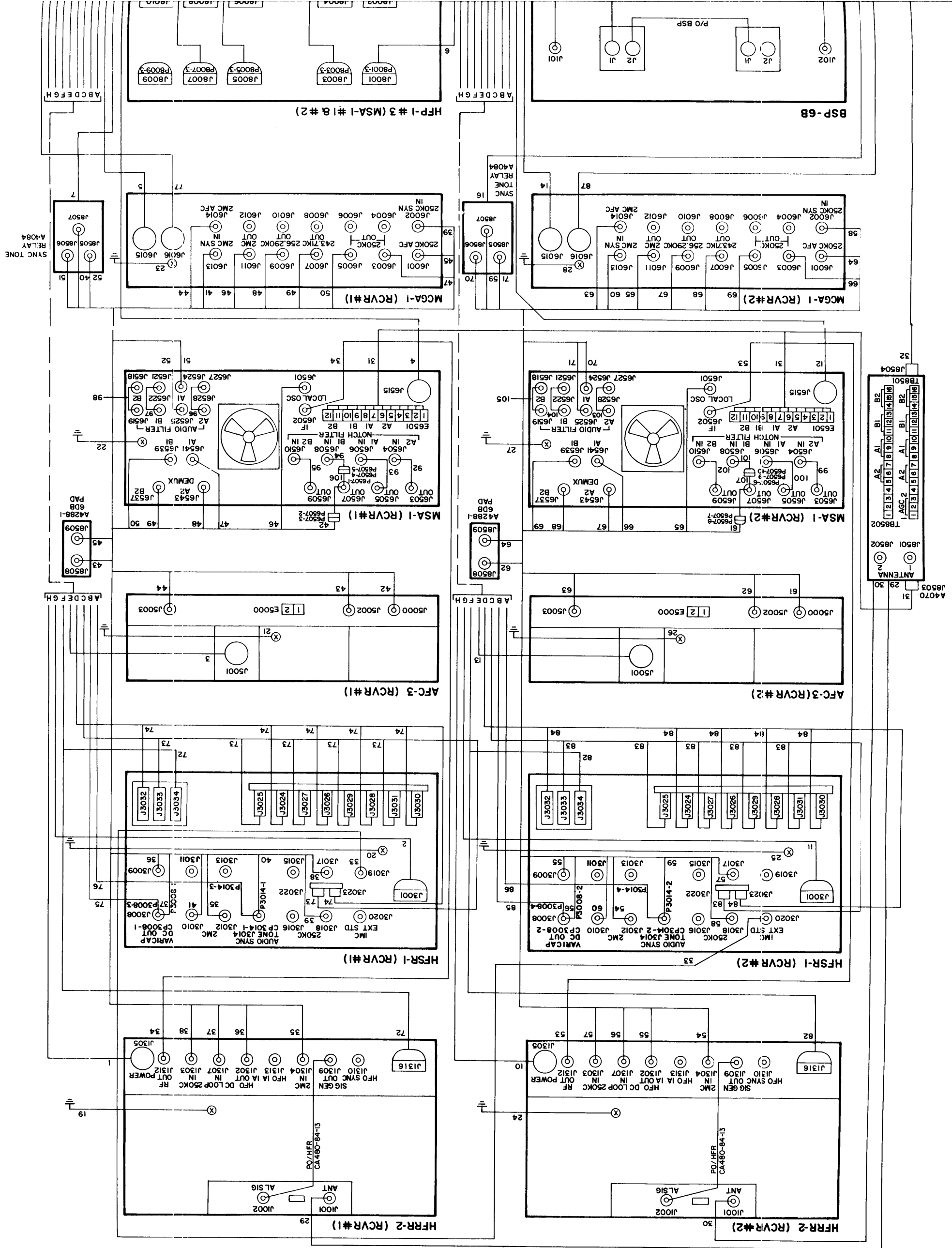
\* HFP-1 #3 ONLY.  
 .5A FUSE USED IN  
 FUSE CHART

NOTE: UNLESS OTHERWISE SPECIFIED:  
 ALL CORRESPONDING "P" SYMBOLS IN RECEIVER #1 ARE DASH (-) ONE.  
 ALL CORRESPONDING "P" SYMBOLS IN RECEIVER #2 ARE DASH (-) TWO.  
 EXCEPT HFP'S WHICH ARE SYMBOLIZED.

Figure 2-5. Interconnecting Cabling Diagram, DDRR-5M 2-10/2-11



THE TECHNICAL MATERIEL CORP.  
 MAHARONECK, NEW YORK  
 MODEL DDRR-5M  
 CK95-C



CK-995C  
 001165354

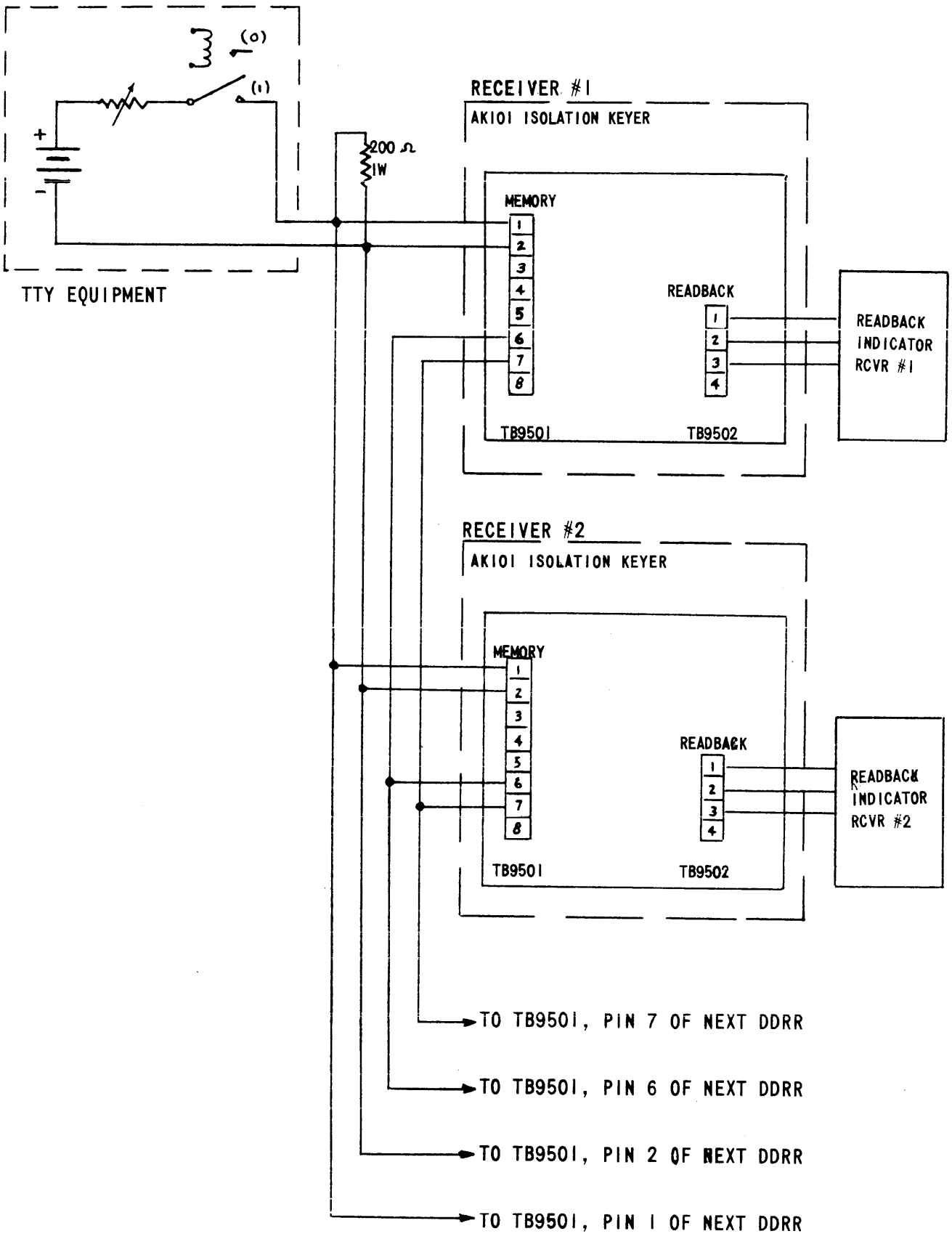


Figure 2-6. Multiple Receiver Connections, DRR-5M Remote Control.

## **SECTION 3**

### **OPERATOR'S SECTION**

#### 3-1. GENERAL.

The DDDR may be operated either manually or by the remote control teletype signal input. The coded message in the teletype input, containing tuning information (see Table 1-2), may originate from a push-button keyboard, with buttons for each character, or from the insertion of a pre-programmed punched card or tape. The readback output (see Table 1-3) back to the remote control station begins cycling upon application of a-c power to the RTMU and provides the remote operator continuous information on control positions.

Control functions should be reviewed by the operator (remote or local) for familiarization. These functions are depicted in Figure 4-1 and described in detail in the individual modular manuals.

#### **CAUTION**

Front panel knobs for HFSR and MCGA controls may be rotated in the clockwise direction only. Do not force knobs in the counter-clockwise direction.

#### 3-2. RECEIVER CAPABILITIES.

The receiver is capable of receiving up to 4 discrete voice channels symmetrical about one carrier and contained in the two sidebands of an ISB transmission. Each channel may contain any form of audio intelligence: voice, code, teletype, etc. In two-channel ISB transmission, the

intelligence will appear at the direct channel outputs, A1 and B1. In four-channel multiplexed ISB, in addition to A1 and B1, the translated channels will appear at A2 and B2 outputs. A single AM transmission signal may be received by using the output of A1 or A2, whichever sideband gives the best reception.\* A SSB transmission will result in an A1 output for an upper sideband transmission or a B1 output for a lower sideband transmission. A single FSK or FAX transmission, (without a carrier component) requires that the receiver be tuned to the r-f center frequency plus or minus the a-f center frequency in order to have the intelligence frequencies emerge at channel B1 or A1 respectively. The one or more FSK or FAX transmissions sent in on a SSB or ISB transmission, however, will appear at the channel output similar to its channel origin at the transmitter. The one or more MCW codes sent as keyed tones appearing in the sidebands of a SSB or ISB transmission will appear as keyed audio tones in the channel or channels as originated at the transmitter end. In all SSB and ISB transmissions with a reduced carrier (suppressed no lower than 30 db below PEP) and in all single AM or MCW transmissions, the carrier component in the signal may be used in the AFC Automatic Frequency Control unit to compensate for transmitted signal drift. In SSB and ISB transmissions with no carrier component present, the AFC unit cannot be used; the same is true of the single FSK or FAX signal transmission with the receiver tuned as mentioned above, since there

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\* Provided that the carrier frequencies are in 100-cps increments.

is no carrier component to lock onto. In most cases, if the transmitter is synthesized (with a correction loop for its oscillator similar to the HFSR the incoming signal remains stable enough that (using the HFSR) the AFC is not required. In all remote tuning operations, the HFSR Synthesizer is used to relay the frequency figure to the HFRR. Therefore, remote tuning coverage is in the 100-cps steps since this is the synchronizing adjustment points of the HFSR. In local tuning, the HFSR may be used or not, as transmitting stability conditions require. When the HFSR is not used, the HFRR has continuous tuning coverage.

In summation, each receiver is designed primarily to simultaneously receive 4 channels of an assortment of intelligence from one ISB transmission. In addition, it is also capable of receiving the other types of transmission previously outlined. For simplicity, the following operating instructions in Table 3-1 and 3-2 are in terms of receiving a 4-channel multiplexed ISB signal.

3-3. REMOTE TUNING.

a. INITIAL PRESETTING OF CONTROLS. - Before tuning the receiver by remote control, preset the controls as described in table 3-1.

TABLE 3-1. CONTROL PRESETTINGS, REMOTE TUNING

COMPONENT	CONTROL	POSITION
HFRR	NOISE SILENCER/OFF/ ALIGNMENT switch	OFF
HFRR	TUNE/SYNC/OPERATE	OPERATE
HFRR	TUNE knob	Optional*

\* Loosen LOCK control on TUNE knob.

TABLE 3-1. CONTROL PRESETTINGS, REMOTE TUNING (CONT)

COMPONENT	CONTROL	POSITION
HFRR	1 MC STD EXT/INT switch on rear chassis	For space or frequency diversity, set rcvr #1 to EXT and rcvr #2 to INT. For single receiver operation, set to INT on either receiver.
HFSR	MC knob	Optional
HFSR	100 KC knob	Optional
HFSR	10 KC knob	Optional
HFSR	1 KC knob	Optional
HFSR	.1 KC knob	Optional
AFC	CARRIER SELECTOR switch	OSC
AFC	TUNING/KCS knob	0
AFC	SENSITIVITY knob	Fully cw
MSA	CHANNELS A1, A2, B1 and B2 LINE LEVEL knobs	These are initially set against type of signal and load in steps 6, 7 and 8 of Table 3-2.
MSA	CHANNELS A1, A2, B1 and B2 SQUELCH ADJUST knobs	
MSA	CHANNELS A1, A2, B1 and B2 AGC DECAY knobs	
MSA	MONITOR LEVEL knob	Fully ccw
MSA	MONITOR SELECT knob	Optional
MCGA	INT/AFC/SYN switch	Optional
BSP	RECEIVERS 1 and 2 A1, A2, B1 and B2 switches	Optional

TABLE 3-1. CONTROL PRESETTINGS, REMOTE TUNING (CONT)

COMPONENT	CONTROL	POSITION
BSP	RECEIVERS 1 and 2 INCR knobs	Fully ccw
HFP (all 3)	MAIN POWER, STANDBY/OFF switch (located on rear chassis)	STANDBY*
MSA	STANDBY/ON switch	ON**
RTTD	AC POWER ON/OFF switch	ON
RTMU	POWER ON/OFF switch	ON

\* All three HFP units are left in STANDBY, with their STANDBY lamps on, while the receiver is not in use. On initial use of receiver, allow 24 hours to elapse before setting the MSA-1 STANDBY/ON switch to ON, in order to stabilize crystal ovens.

\*\* All HFP STANDBY lamps will go out and TIME DELAY lamps will come on. After 60 seconds TIME DELAY lamps will go out and OPERATE lamps will come on, signifying that receiver is ready for operation.

b. REMOTE TUNING PROCEDURE. - Table 3-2 is the procedure for tuning one receiver in the DDRR for a 4-channel multiplexed ISB transmission.

TABLE 3-2. REMOTE TUNING FOR 4-CHANNEL ISB

STEP	OPERATION AT REMOTE PANEL
1	Send "receiver selector" code.
2	Send codes 1 thru 11 for HFSR MC, 100 KC, 10 KC, 1 KC and .1 KC switches in accordance with Table 1-2.
3	Send codes 12 and 13 for MCGA AFC/SYN switch to set switch to SYN.
4	Send "E" code (10000).

TABLE 3-2. REMOTE TUNING FOR 4-CHANNEL ISB (CONT)

STEP	OPERATION AT REMOTE PANEL
5	Observe readback indicator panel. After 25 seconds (max) from the time that the "E" code was sent, readback indications should agree with codes sent and "ready" readback signal should register. The "ready" signal indicates that the receiver HFRR HFO is synchronized with the HFSR.
6	When the ISB signal starts to come into the receiver, have the local operator at the receiver site make initial adjustments to the MSA-1 LINE LEVEL knobs to bring "OVU" readings on the MSA-1 LINE LEVEL meters. Leave the knobs in those positions for subsequent tunings.
7	Monitoring each channel output, have the local operator make an adjustment to the channel AGC DECAY knob at the MSA-1 to obtain the clearest signal for that type of intelligence (i. e. : audio, teletype, etc.) If this channel is to be used subsequently for the same type of intelligence, the knob may be left in that position for future tunings.
8	Monitoring each channel output, have the local operator make an adjustment to the MSA-1 channel SQUELCH ADJUST knob for point just before the CHANNEL lamp goes out. These knobs may be left in these positions for subsequent tunings.
9	If there are wavering tones in the output caused by an unstable transmitter, the AFC unit may be used to correct this.* Transmit the receiver selector code again and then send the MCGA AFC/ SYN codes to set switch to AFC. Send the "E" code. Monitoring each channel output, have the local operator tune the AFC unit at the receiver site in accordance with paragraph 3-3c(2).
<p>* If there is a carrier reduced no lower than 30db.</p>	



c. LOCAL ADJUSTMENTS AT RECEIVER SITE. -

(1) HFRR NOISE SILENCER. - If local interference causes a noise of the impulse type, set the HFRR NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch to NOISE SILENCER.

(2) AFC TUNING. - Check to ensure that the AFC TUNING/KCS knob is at 0, that SENSITIVITY knob is fully clockwise, and that CARRIER SELECTOR switch is at OSC. Observing CARRIER LEVEL meter, hold down RESET button and adjust TUNING/KCS knob to obtain peak on CARRIER LEVEL meter. Then release RESET button and observe DRIFT meter. Needle will remain steady and within green zone through tone frequency variations, if the AFC is locked onto the carrier. If this condition is not realized, the control loops are locked onto a sideband and the process should be repeated. When the AFC has been adjusted satisfactorily, the SENSITIVITY knob may be backed off, if necessary, to eliminate noise.

In the case of tuning in an ISB signal containing tone telegraph channels, a steady telegraph tone on one of the sidebands may be captured instead of the carrier. To prevent this, the operator should vary the HFRR TUNE knob and monitor the audio output to identify the carrier by its relative position and level to the sideband tones. Before moving the HFRR TUNE knob, disconnect the remote code input by placing the RTMU POWER switch to OFF; after the carrier has been located, return the TUNE knob to regain the HFRR SYNC light and zero center-of-scale

3-4. LOCAL TUNING.

a. PRESETTING OF CONTROLS. - Before manually tuning the receiver, preset the controls as described in table 3-3.

TABLE 3-3. CONTROL PRESETTINGS, LOCAL TUNING

COMPONENT	CONTROL	POSITION
HFRR .....	NOISE SILENCER/OFF/ALIGNMENT switch .....	OFF
HFRR .....	TUNE/SYNC/OPERATE .....	TUNE
HFRR .....	BAND switch .....	Optional
HFRR .....	TUNE knob .....	Optional*
HFRR .....	1 MC STD EXT/INT switch on rear chassis .....	For space or frequency diversity, set rcvr #1 to EXT and rcvr #2 to INT. For single receiver operation, set to INT on either receiver.
HFSR .....	MC knob .....	Optional
HFSR .....	100 KC knob .....	Optional
HFSR .....	10 KC knob .....	Optional
HFSR .....	1 KC knob .....	Optional
HFSR .....	.1 KC knob .....	Optional
AFC .....	CARRIER SELECTOR switch .....	OSC

\*Loosen LOCK control on TUNE knob

TABLE 3-3. CONTROL PRESETTINGS, LOCAL TUNING (CONT)

COMPONENT	CONTROL	POSITION
AFC .....	TUNING/KCs knob .....	0
AFC .....	SENSITIVITY knob .....	Fully cw
MSA .....	CHANNELS A1, A2, B1 and B2 LINE LEVEL knobs .....	Fully cw
MSA .....	CHANNELS A1, A2, B1, and B2 SQUELCH ADJUST knobs .....	Mid-position
MSA .....	CHANNELS A1, A2, B1, and B2 AGC DECAY knobs .....	Mid-position
MSA .....	MONITOR LEVEL knob .....	Fully ccw
MSA .....	MONITOR SELECT knob .....	Optional
MCGA .....	INT/AFC/SYN switch .....	SYN
BSP .....	RECEIVERS 1 and 2 A1, A2, B1 and B2 switches .....	Optional
BSP .....	RECEIVERS 1 and 2 INCR knobs .....	Fully ccw
HFP .....	MAIN POWER, STANDBY/OFF switch (located on rear chassis) .....	STANDBY*
MSA .....	STANDBY/ON switch .....	ON**

\*All three HFP units are left in STANDBY, with their STANDBY lamps on, while the receiver is not in use. On initial use of receiver, allow 24 hours to elapse before setting the MSA-1 STANDBY/ON switch to ON, in order to stabilize crystal ovens.

\*\*All HFP STANDBY lamps will go out and TIME DELAY lamps will come on. After 60 seconds TIME DELAY lamps will go out and OPERATE lamps will come on, signifying that receiver is ready for operation.

TABLE 3-3. CONTROL PRESETTINGS, LOCAL TUNING (CONT)

COMPONENT	CONTROL	POSITION
RTTD .....	AC POWER ON/OFF switch .....	OFF
RTMU .....	POWER ON/OFF switch .....	OFF

b. LOCAL TUNING PROCEDURE. - Table 3-4 is the procedure for tuning one receiver in the DDDR for a 4-channel multiplexed ISB transmission.

TABLE 3-4. LOCAL TUNING FOR 4-CHANNEL ISB

STEP	COMPONENT	OPERATION
1	HFRR & HFSR	Set HFRR BAND and TUNE controls for carrier frequency. If HFSR stabilization is not to be used, set MC, 100 KC, 10 KC, 1 KC, and .1 KC knobs to bring zeros on digital display and HFRR TUNE/SYNC/OPERATE switch to OPERATE; then proceed to step 3. If HFSR stabilization is to be used, set knobs to bring the same frequency on digital display down to the .1 KC increment. Set HFRR TUNE/SYNC/OPERATE switch to SYNC.
2	HFRR	Observe SYNC IND light and SYNCHRONIZE meter on HFRR. If SYNC IND lamp does not light and remain steadily lit, readjust TUNE knob until SYNC IND lamp lights steadily and SYNCHRONIZE meter reads zero center scale or nearly so. Then set TUNE/SYNC/OPERATE switch to OPERATE. Carefully readjust TUNE knob to bring SYNCHRONIZE meter needle to zero center scale.
3	MSAA	When the ISB signal starts to come into the receiver, adjust LINE LEVEL knobs to bring "0 VU" readings on the

TABLE 3-4. LOCAL TUNING FOR 4-CHANNEL ISB (CONT)

STEP	COMPONENT	OPERATION
3 (cont)	MSAA	LINE LEVEL meters. Turn MONITOR LEVEL knob clockwise to obtain audio at MONITOR jack. Using MONITOR SELECT switch, adjust AGC DECAY knob for each channel to obtain clearest signal for that type of intelligence (i.e.: voice, teletype, etc.). Then adjust SQUELCH ADJUST knob for each channel to point just before the CHANNEL lamp goes out.
4	AFC & MCGA	If there are wavering tones in the output caused by an unstable transmitter, the AFC unit may be used to correct this.* Tune the AFC unit in accordance with paragraph 3-3c (2).
5	HFRR	If local interference causes a noise of the impulse type, set the NOISE SILENCER/OFF/ALIGNMNET SIGNAL switch to NOISE SILENCER.
*If there is a carrier reduced no lower than 30 db.		

## SECTION 4

# PRINCIPLES OF OPERATION

### 4-1. INTRODUCTION.

Functional and detailed analysis for local- and remote-controlled operation of the DDDR is given in the following paragraphs. Local-controlled operation analysis of one receiver system is given first; analysis of the remote control tuning circuits follows separately.

### 4-2. FUNCTIONAL ANALYSIS.

#### a. LOCAL-CONTROLLED OPERATION (Figure 4-1).

(1) RF AMPLIFICATION AND FIRST CONVERSION. - R-f signals from the antenna are applied to Continuous RF Tuner HFRR. Within the HFRR, a BAND switch and TUNE control selects the carrier frequency in the 2 to 32 mc range. This frequency undergoes 4 stages of amplification and is beat with a high frequency oscillator (HFO) output signal of 3.75 mc to 33.75 mc to produce the first i-f of 1.75 mc. The HFO is tuned by a connection to the TUNE control. Noise silencer stages may be switched in to eliminate noise in the 1.75 mc stage by means of the NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch. In the ALIGNMENT SIGNAL position, this switch cuts out the antenna input and replaces it with a 2 to 32 mc alignment signal in order to check HFRR TUNE dial calibrations. The alignment signal is derived by beating a stabilized 2 mc and 250 kc together (from the 1-mc frequency standard in the HFSR) and producing a 1.75-mc signal which is then beat with the tuned output of the HFO. The OFF position of the switch cuts out the noise silencer circuit, disconnects the alignment signal and reconnects the HFRR to the antenna.

A sample of the HFO output signal from the HFRR is applied to the synthesizer and crystal oscillator circuits in Reference Signal

Generator HFSR where it is converted to a 3.25 to 4.25 mc signal\*. This 3.25 to 4.25-mc signal contains the error, if any, of the HFO circuit contained in the HFRR. Depending upon the setting of the MC, 100 KC, 10 KC, 1 KC and .1 KC controls on the HFSR, this unit develops a 3.25 to 4.25 mc standard signal. A phase detector circuit in the HFSR compares the two nominally identical signals and develops a d-c voltage that is used to correct the HFO output of the HFRR, thereby maintaining a high stability. As the operator adjusts the HFRR TUNE control to synchronize with the HFSR, a difference frequency (audio sync tone) is produced from the HFSR phase detector. This tone is routed through an audio amplifier and to a PHONES jack in the MSA, providing a "zero beat" for the operator as a guide in bringing the TUNE knob towards synchronization. This step tunes the HFRR to within the "capture range" of the HFSR. When this capture range has been reached, the d-c correction voltage reaches a point that lights the HFRR SYNC IND light, also. The consequent setting of the TUNE/SYNC/OPERATE switch to OPERATE disconnects the audio sync tone and leaves only the d-c correction voltage connected to the HFO. A further adjustment of the TUNE knob then brings d-c correction voltage down to the point that causes the needle on the HFRR SYNCHRONIZE meter to read zero center scale and the HFRR is fully synchronized with the HFSR.

(2) SECOND CONVERSION AND IF AMPLIFICATION. - The 1.75-mc i-f signals from the HFRR are applied to the mixer in the MSA Multiple Sideband Adapter. It will be noticed that the sidebands have become temporarily inverted in the spectrum at the output of the HFRR first converter. This situation is corrected in the MSA mixer, in which the 1.75 mc is mixed with a 2-mc injection frequency to produce a

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\* Depending on the setting of the HFSR MC switch.

250-kc difference frequency carrier. The difference frequencies produced by the 2 mc and sidebands re-invert the sidebands to their original positions in the spectrum. At this point, the translated channel B2, in the lower sideband runs from approximately 243 kc to 246 kc, direct channel B1 from 246.5 kc to 249.5 kc, direct channel A1 in the upper sideband from 250.5 kc to 253.5 kc and translated channel A2 from 254 kc to 257 kc. The entire spectrum is introduced to four band-pass filters and i-f amplifiers. The effect of the filters is to separate and pass the four channels on to individual audio product detector circuits, at the same time blocking the carrier component.

(3) DETECTION AND AUDIO AMPLIFICATION. - Frequencies from direct channels, A1 and B1, get mixed with 250 kc (from the MCGA unit) in the audio detector to produce the nominal .1 kc to 3 kc difference audio outputs. Channel A2, the upper sideband translated frequency band of 254 kc to 257 kc, gets mixed with a 256.29 kc injection frequency to produce the original .1 kc to 3 kc audio input into the transmitter. Channel B2, the lower sideband translated frequency, is mixed with a 243.71 kc injection frequency to produce the .1 kc to 3 kc.

The MCGA functions as the supplier of the four injection frequencies to the MSA audio detectors. The SYN/AFC/INT switch affords a selection of 3 sources for the basic 2 mc and 250 kc injection frequencies. In SYN position, these two frequencies are taken from the HFSR referenced to its highly stable 1 mc frequency standard. If the AFC feature is required, due to a shifting transmitted signal, the switch is set to AFC and the two frequencies originate in the AFC unit with suitable correction-loop deviations



to compensate for the drift.

The INT position of the MCGA switch, in which the MCGA crystal oscillators may be used as 2 mc and 250 kc sources, is not required in the DDDR configuration, but can be used in an emergency.

The 250 kc, regardless of its source, is divided in the MCGA to supply the direct channel MSA product detectors (A1 and B1) and translated into the proper frequencies to supply the translated channel (A2 and B2) product detectors. In the translation, the 250 kc is fed into a mixer in the MCGA where it is heterodyned with a 6.29-kc injection frequency to produce a sum frequency of 256.29 kc and a difference frequency of 243.71 kc. Narrow band-pass filters in the mixer output sort out and direct the two frequencies to the proper audio detectors in the MSA.

(4) AUTOMATIC FREQUENCY CONTROL. - The AFC works from an input of the partially suppressed 250-kc carrier tapped off of the MSA mixer output. When the AFC 2-mc oscillator is fine-tuned properly by the TUNING/KCS control, the 2 mc from the AFC back into the MSA mixer corrects the 250 kc carrier mixer output enough to slip it through the AFC narrow band-pass 250 kc filter and discard the sidebands. The 250 kc carrier is then compared with the output of a 250-kc crystal oscillator in a phase detector. Any error is issued in the form of a d-c alteration (or correction) voltage which controls the 250-kc oscillator in a fast reacting loop and the 2-mc oscillator in a slower reacting loop. The 250-kc oscillator altered output is used for an injection frequency source, via the MCGA for the MSA A1 and B1 product detectors. The AFC 2-mc oscillator output is used as

the source for the MSA mixer injection frequency. Any error or drift in the transmitted carrier frequency is therefore compensated for by producing a similar error in the product detector 250-kc injection frequency, thus maintaining the proper sideband-to-carrier relationship through the product detector and the proper audio (difference frequency) output. The effect of the slow 2-mc correction loop is to reduce any large frequency excursions at the MSA input to smaller proportions that may be handled easily by the faster acting 250 kc loop. The RESET button is held down while tuning the 2-mc oscillator, cutting off the d-c correction loops during this phase.

(5) CHANNEL ADJUSTMENTS. - The MSA has a separate LINE LEVEL, AGC DECAY and SQUELCH ADJUST control for each of the 4 channels, adjusting these quantities for individual load and signal conditions. The AGC generated from each MSA i-f amplifier is combined (through two comparators) into one feedback and acts on the r-f and i-f amplifier stages in the HFRR to prevent intermodulation between channels. Isolated headset monitoring of each channel is possible at the MSA MONITOR jack by means of the MONITOR SELECT switch or the BSP dynamic speaker may be used for this.

(6) MONITORING INDICATORS. - Monitoring instruments on the receiver are the HFRR RF LEVEL indicator, indicating strength of incoming signal and translated from fluctuations in the AGC feedback, the 4 MSA channel LINE LEVEL meters, the AFC carrier LEVEL indicator, carrier FADE alarm lamp, and carrier DRIFT meter and DRIFT ALARM lamp. Although the AFC has a memory circuit for temporary carrier fades, a lengthy fade indication requires readjustment of the signal to pick up the lost carrier. The DRIFT ALARM lamp comes on

when the transmitted carrier drift is about to become large enough to escape the AFC capture range.

(7) POWER SUPPLIES. - The three HFP Power Supply units in the DRRR convert line voltages into plate, bias, filament and crystal oven heater voltages for the HFRR, HFSR, AFC, MSA, and MCGA units. The RTTD, RTMU and BSP units include their own individual power supply circuitry and work directly from the rack line voltage. Referring to figure 1-1, receiver #1 HFP unit supplies the HFRR, HFSR, AFC, and MCGA units in receiver system #1; receiver #2 HFP unit supplies these units in receiver system #2. The third HFP unit, in receiver #1 rack, supplies the MSA units in both receiver systems.

Each HFP can be set in two operating conditions; these conditions are STANDBY (for receiver standby) and OPERATE (for receiver operation). In the STANDBY condition, the HFP, with its MAIN POWER STANDBY/OFF switch in STANDBY, supplies filament voltage to the HFRR HFO tube and oven heater voltages to the MCGA and AFC oscillators. The 115/230 VAC line supplied to the HFRR generates a 28 VDC source there which is routed to the HFSR 1-mc standard oven. To set this HFP into OPERATE condition, the corresponding receiver system MSA STANDBY/ON switch is set to ON. This acts on the HFP control relay to trigger the time delay relay. After 60 seconds the HFP goes into OPERATE condition and the balance of the power supply voltages go to the other units. Receiver #1 HFP is controlled in this way by the STANDBY/ON switch in MSA #1; HFP #2 and #3 units are controlled by MSA #2.

(8) DIVERSITY OPERATION. - When the two receiver systems are to be operated in either space or frequency diversity, the cable running from J3020 receptacle on HFSR #1 to J3019 on HFSR #2 (see paragraph 2-7) is left in. In addition, HFSR #1 LMC INT/EXT switch is set at EXT and HFSR #2 LMC switch is set at INT (see table 3-1). This results in both receivers #1 and #2 using the output of the HFSR #2 1-MC frequency standard as a reference for frequency stabilization and correction loops to ensure uniform audio frequency output.

b. REMOTE CONTROL TUNING SYSTEM (figure 4-1).

(1) GENERAL. - In remote controlled operation, the DDDR components function in the same way as in locally controlled operation, with the exceptions shown in the following paragraphs. The AK-101 Isolation Keyer, the RTMU Signal Data Converter-Storer and the RTTD Receiver Decoder function only in the remote controlled operation. These three units act to translate remote control signals to controls on the DDDR. The controls that are moved in this way are symbolled  $\textcircled{R}$  as remote-actuated controls in figure 4-1.

(2) CODE INPUT. - The RTMU receives the tuning information via AK-101 Isolation Keyer at J5004 in the form of 5-bit character teletype serial pulses, coded as shown in table 1-2. Referring to table 1-2, it may be seen that there are two types of code functions: The "addressal function" and the "action function", selecting the control and positioning it, respectively. The addressal function characters may come into the RTMU in any sequence as long as their corresponding action function characters follow them. The quickest tuning action is had, however, by programming the messages to enter in the order shown in table 1-2. This order permits the servo action on the HFRR TUNE control to stabilize more quickly. For the purposes

of simplification, the following description is based on receiving the characters in the sequence shown in table 1-2.

The first two characters (Receiver Selector) are coded for each RTMU to open it for the rest of the characters (see table 1-4). They enter the input gate which is initially open. The RTMU recognition circuit samples these codes and, if they are coded correctly, leaves the input gate open for the succeeding characters. If the codes are not correct, the recognition circuit closes the gate. The next character to be received is the first tuning character (2-16 MC or 17-31 MC). This character and all the following tuning characters, including the receiver tune (10000) are stored temporarily in the RTMU memory cores. Before the 10000 character moves into the memory cores, it causes the "E" pulse generator to send an energizing pulse through J5001 and J4004 into the RTTD. It also causes the RTMU output gate to open and the input gate to close while the characters are consequently drawn out of the RTMU and into the RTTD.

(3) DECODING ACTION. - The RTTD includes circuitry for a punched-tape input (not used in the DDDR), as well as the electrical 5-bit parallel pulse input, J4004. The tape advance timer, besides functioning to advance tape into the RTTD, also sends out "advance" pulses into the RTMU, each one triggered by the preceding code entry into the RTTD. When the RTTD receives the energizing "E" pulse from the RTMU, it causes the tape advance timer circuit to send the first "advance" pulse back to the RTMU through J4004 and J5001. This (1) lights the RTTD red TUNE light and (2) shifts the shift-register for the RTMU memory cores one position to push out the first 5-bit character into the parallel input of the RTTD at J4004. The 5-bit character sets up 5 sensitive input relays in the RTTD to "1"

or "0" positions. Successive relays in the RTTD energize one another to bring the first 5-bit code, representing either 2-16 MC or 17-31 MC, to the control location decoder. If the code is for 2-16 MC, the decoder moves the master decoder rotary switch into position #1; if the code is 17-31 MC, the switch is moved into position #2. Wafers on the same switch (not shown) have assumed the selected position (1 or 2) and connected the RTTD output to one of two sets of 5 pins in J4001. These pins are connected via a cable to the decoder rotary switch attached to the MC control on the HFSR. If they are coded for 2-16 MC, they are connected to one decoder switch wafer to receive the subsequent 2-31 MC code. If they are coded for 17-31 MC, they are connected to the other HFSR MC decoder switch wafer to receive the 2-31 MC code.

The next "advance" pulse from the RTTD tape advance timer to the RTMU pushes out the next character. This character is the 2-31 MC code (or action function code), for positioning the HFSR MC control. Through the input relays, the 5 bits, representing the 2-31 MC information, are routed to the 5 wafers on the master decoder switch which is now in position 1 or 2. The parallel bits travel from J4001 down to the HFSR MC decoder switch and the code is translated by the HFSR decoder switch into one of the 2-31 MC positions (see table 1-2). The decoder switch motor then drives the MC control shaft to this position. The next advance pulse from the RTTD draws out the next character (10011) which represents the addressal function code (or control location code) for selecting the HFSR 100KC control. This code moves the RTTD master decoder switch to position #3. The following character (the 0 to 900 KC code) is then set up on 4 pins of J4002 with the RTTD master decoder switch in position #3. Referring to table 1-2, it will be noticed

that all action functions codes (or control position codes) begin with a "0" bit and that the last 4 bits contain the coded information. The 4 bits travel in parallel down to the decoder switch on the HFSR 100KC control, positioning it in the same manner as for the MC control.

This is repeated for the 10KC, 1KC and .1KC controls on the HFSR. The coded bits for these leave the RTTD from J4002. The same procedure applies for the MCGA INT/AFC/SYN switch characters which leave the RTTD from J4003.

(4) SERVO TUNING ACTION. - The MC, 100 KC, 10 KC, 1 KC and .1 KC information sent to the HFSR from the RTTD is also used by the HFSR to set the HFRR BAND switch and TUNE capacitor. After this action, the audio sync tone and d-c correction voltage take over to tune the HFRR HFO to a point where it is synchronized and locked onto the HFSR frequency stabilizer. Briefly, this occurs as follows.

As the RTTD master decoder switch moves from position #6 to position #12 as the result of receiving the MCGA code, the decoder switch also energizes the HFRR BAND switch motor and temporarily deactivates the HFRR TUNE servo motor while the BAND motor is energized.

The 2-31 MC code sent to the MC HFSR decoder switch, besides positioning the MC control, also works through an extra wafer on the switch, through HFSR J3034, and into J1316 on HFRR via a homing switch to position the 8-position BAND switch. In the HFRR there is a tuning servo motor geared to drive the TUNE capacitor control. This servo motor is driven by the servo unit in the RTTD through J4001 in the RTTD and J1316 in the HFRR. After the BAND switch is positioned, the 100 KC code, besides positioning the HFSR 100 KC switch, also works through an extra wafer on the 100 KC and MC switches and through HFSR J3033 to send a signal into the RTTD servo amplifier through J4002. This signal causes the servo amplifier to contain a

change in phase in its a-c output to the HFRR tuning servo motor. The change in phase, in effect, starts the servo motor turning in the proper direction (cw or ccw) in order to bring the HFRR HFO frequency towards that of the HFSR synchronizing circuits as quickly as possible. As the RTTD servo unit thus tunes the HFRR HFO closer and closer to the HFSR, the phase detector in the HFSR emits an audio sync tone to the RTTD servo unit of lower and lower frequency. When a zero beat is produced, the d-c correction voltage takes over to perform the final adjustment and synchronization through the RTTD servo unit. A magnetic clutch in the HFRR, triggered by the audio sync tone, acts to slow down the servo motor as the d-c correction voltage approaches zero, minimizing the overcorrection swings. To prevent continual searching due to an error, after 30 seconds from the time that the RTTD has been energized (from the "E" pulse), a delay circuit (not shown) in the RTTD shuts off the RTTD power supply.

(5) "E" CODE ACTION. - After the MCGA codes have been drawn out of the RTMU, the "E" code (10000) is pulled out of the cores as the last code. This code energizes relays in the RTTD that (a) turn off the advance pulses (b) send a "tune complete" pulse back to the RTMU re-opening its code input gate, (c) energizes the RTMU "ready" readback relay (see paragraph 4-2c), and (d) shuts off the RTTD power.

c. CONTROL POSITION READBACK. - The readback of control positions functions independently of the tuning circuits. The entire circuit is contained in the RTMU with 4-bit parallel codes from each DDDR control functioning as the input through J5002 and J5003. Through these connectors, a diode matrix in the RTMU is wired to the DDDR controls, with 4 wires to each decoder switch. Each 4-wire



group is attached to the 4-bit readout code output of the switch. Open or closed contacts set up a 4-bit code on the RTMU matrix row for that control. The readback has two shift-registers which function to read out each row "bit-by-bit" and row-by-row, respectively, sending out a 7.42 pattern 5-bit character code in serial pulse form from J5004. The code is the same as the action function codes in the tuning input with the first bit always a "0". A readback exists for each of the stepping-switch-actuated controls ( on figure 4-1). Connection of the RTMU to the a-c line voltage starts the readback shift-register and the consequent readback of control positions, whether the controls are moving or stationary. The cycling of the 13 rows\* is continuous, supplying the remote control station with continuous information on DDDR control positions. Flip-flops in the RTMU always set up a 10000 code on the first (top) readout row. This character is the first to be transmitted out of the RTMU on each cycle and is generally used at the remote control station to reset its readout panel at the start of each new cycle.

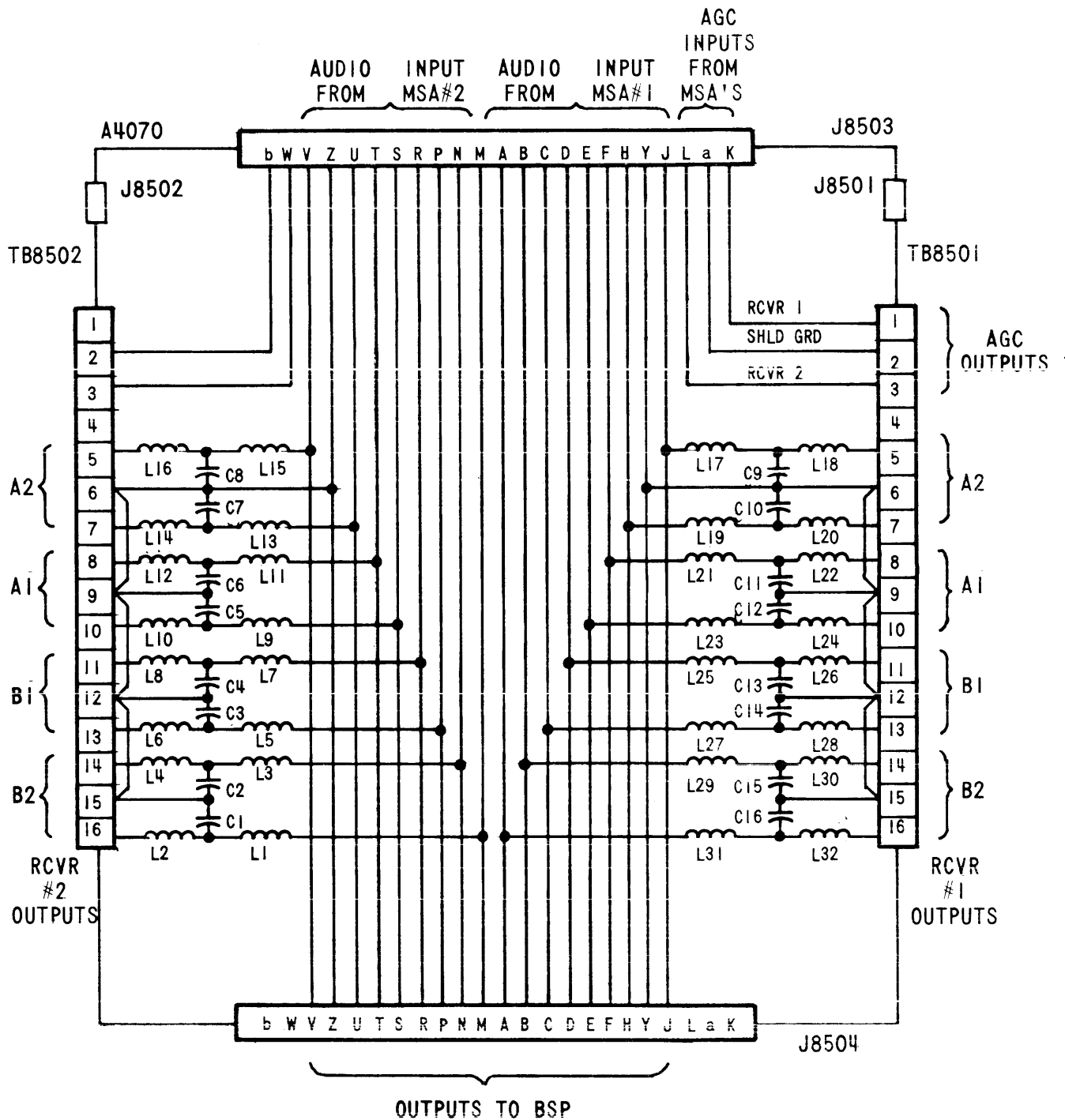
The RTMU includes two relays (not shown in figure 4-1) that set up either a "ready" or "in tune process" readback code on the matrix. These relays are controlled by the sync signal from the HFSR, the HFRR servo motor action and the 10000 code moving into the RTTD. When the HFSR has issued a sync signal, the HFRR servo motor has stopped and the RTTD has received the 10000 code, the RTMU "ready" code is set up on the matrix. Until all 3 of these conditions are satisfied, the "in tune process" code remains set up.

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\* Only 7 rows are connected to controls in the DDDR-5M



**SECTION 5**  
**SCHEMATIC DIAGRAMS**



NOTES:

1. ALL COILS ARE 10  $\mu$ h.
2. ALL CAPACITORS ARE 510  $\mu$ uf.

Figure 5-1. Wiring Schematic, A4070 Audio/Antenna Panel

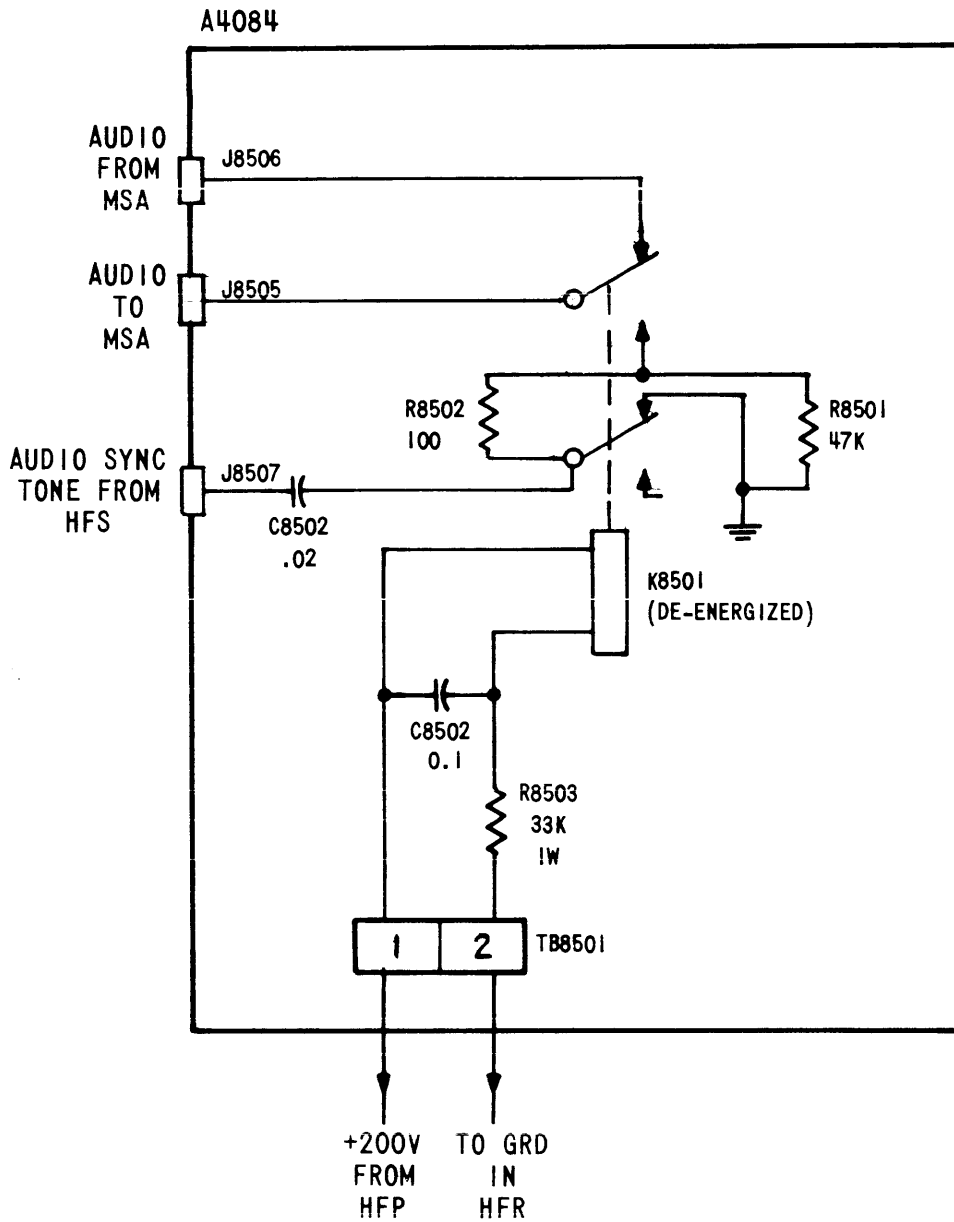


Figure 5-2. Wiring Schematic, A4084 Sync Tone Relay

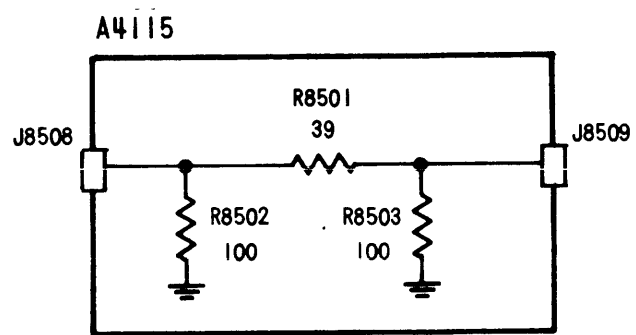


Figure 5-3. Wiring Schematic, A4115 Attenuator Pad

## 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

PARTS LIST  
for  
CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
B9000-1	FAN, CENTRIFUGAL: dual; voltage rating 115/230 VAC; current rating 1.2/0.6 amps; single phase, 50/60 cps (Hz); black anodize housing.	BL112-2
B9000-2	Same as B9000-1.	
C8501	CAPACITOR, FIXED, MICA DIELECTRIC: 510 uuf, $\pm 5\%$ ; 500 WVDC.	CM15F511J03
C8501-1	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20,000 uuf, $+80\%$ $-20\%$ ; 500 WVDC.	CC100-24
C8501-2	Same as C8501-1.	
C8502	Same as C8501.	
C8502-1	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 100,000 uuf, $+80\%$ $-20\%$ ; 500 WVDC.	CC100-32
C8502-2	Same as C8502-1.	
C8503 thru C8516	Same as C8501.	
C9000-1	CAPACITOR, FIXED, PAPER DIELECTRIC: 4 uf, $\pm 10\%$ ; 370 WVAC.	CP113-1
C9000-2	Same as C9000-1.	
CP3000 thru CP3008	NOT USED	
CP3008-1	CONNECTOR, ADAPTER, ELECTRICAL: 52 ohms; series BNC; TEE type.	UG274/U
CP3008-2	Same as CP3008-1.	
CP3009 thru CP3014	NOT USED	
CP3014-1	Same as CP3008-1.	
CP3014-2	Same as CP3008-1.	



## PARTS LIST (CONT)

CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
F8000 thru F8013	NOT USED	
F8014	FUSE, CARTRIDGE: 1/2 amp; time lag; 1-1/4" long x 1/4" dia.; slo-blo.	FU102-.5
F8015 thru F8018	NOT USED	
F8019	Same as F8014.	
FL8501	FILTER, RADIO INTERFERENCE: 0 to 400 Hz; 250 VAC, 600 VDC; 20 amps max.; attenuation 60 db min. from 150 Kc thru 10 Kmc; hermetically sealed case.	AF103
J8501	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 female contact, straight type; series BNC to BNC. Part of W8529.	JJ172
J8502	Same as J8501. Part of W8530.	
J8503	CONNECTOR, RECEPTACLE, ELECTRICAL: 24 number 20 male contacts; nominal current rating 7.5 amps at 500 V RMS.	JJ200-4
J8504	CONNECTOR, RECEPTACLE, ELECTRICAL: 24 number 20 female contacts; nominal current rating 7.5 amps at 500 V RMS.	JJ200-3
J8505	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 round female contact, straight type; series BNC to BNC.	UG625*/U
J8505-1	NOT USED	
J8505-2	Same as J8505.	
J8506	Same as J8505.	
J8506-1	NOT USED	
J8506-2	Same as J8505.	
J8507	Same as J8505.	
J8507-1	NOT USED	
J8507-2	Same as J8505.	

## PARTS LIST (CONT)

## CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J8508	NOT USED	
J8508-1	Same as J8505.	
J8508-2	Same as J8505.	
J8509	NOT USED	
J8509-1	Same as J8505.	
J8509-2	Same as J8505.	
K8501	RELAY, ARMATURE: DPDT; 20,000 ohms; operating voltage 80 VDC.	RL105
K8501-1	NOT USED	
K8501-2	Same as K8501.	
L8501	COIL, RADIO FREQUENCY: fixed; 10 uh, $\pm 5\%$ ; phenolic coil form.	CL270-10
L8502 thru L8532	Same as L8501.	
MP8501	RETRACTING ASSEMBLY: spring	A3517
MP8502 thru MP8515	Same as MP8501.	
MP8516	FILTER, AIR CONDITIONING: replaceable type; steel mesh, steel frame; 16-7/8" x 7-5/8" x 1/2" o/a.	AD103-5
MP8517	Same as MP8516.	
MP8518	FILTER, AIR CONDITIONING: replaceable type; steel mesh, steel frame; 16-7/8" x 7-5/8" x 1/5" o/a.	AD103-11
MP8519	Same as MP8518.	
P1	CONNECTOR, PLUG, ELECTRICAL: AC; 2 female contacts, straight type, rated for 10 amps at 250 V; polarized; twist lock type; midget size, brown bakelite. Part of W8515.	PL176

## PARTS LIST (CONT)

CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
P101	CONNECTOR, PLUG, ELECTRICAL: 9 female contacts, rated for 7.5 amps; miniature hexagon type. Part of W8532.	PL189-9S
P102	Same as P101. Part of W8532.	
P1001-1	CONNECTOR, PLUG, ELECTRICAL: 1 male contact; voltage rating 500 V peak; nominal impedance 50 ohms; polarized; twist lock type; series BNC. Part of W8529.	PL244-1
P1001-2	Same as P1001-1. Part of W8530.	
P1302-1	Same as P1001-1. Part of W8535.	
P1302-2	Same as P1001-1. Part of W8537.	
P1303-1	Same as P1001-1. Part of W8535.	
P1303-2	Same as P1001-1. Part of W8537.	
P1304-1	Same as P1001-1. Part of W8535.	
P1304-2	Same as P1001-1. Part of W8537.	
P1305-1	CONNECTOR, PLUG, ELECTRICAL: 14 number 16 female contacts, rated for 17 amps at 500 V RMS. Part of W8501.	PL212-2
P1305-2	Same as P1305-1. Part of W8510.	
P1306	NOT USED	
P1307-1	Same as P1001-1. Part of W8535.	
P1307-2	Same as P1001-1. Part of W8537.	
P1308 thru P1311	NOT USED	
P1312-1	Same as P1001-1. Part of W8534.	
P1312-2	Same as P1001-1. Part of W8536.	
P1313 thru P1315	NOT USED	

PARTS LIST (CONT)  
 CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
P1316-1	CONNECTOR, PLUG, ELECTRICAL: with hood; 37 male con- tacts, removeable crimp pin style; current rating 5 amps at 500 V RMS; polarized. Part of W8538.	JJ313-3H
P1316-2	Same as P1316-1. Part of W8548.	
P3001-1	Same as P1305-1. Part of W8502.	
P3001-2	Same as P1305-1. Part of W8511.	
P3002 thru P3007	NOT USED	
P3008-1	Same as P1001-1. Part of W8535.	
P3008-2	Same as P1001-1. Part of W8537.	
P3008-3	Same as P1001-1. Part of W8541.	
P3008-4	Same as P1001-1. Part of W8551.	
P3009-1	Same as P1001-1. Part of W8535.	
P3009-2	Same as P1001-1. Part of W8537.	
P3010-1	Same as P1001-1. Part of W8535.	
P3010-2	Same as P1001-1. Part of W8537.	
P3011	NOT USED	
P3012-1	Same as P1001-1. Part of W8535.	
P3012-2	Same as P1001-1. Part of W8537.	
P3013	NOT USED	
P3014-1	Same as P1001-1. Part of W8535.	
P3014-2	Same as P1001-1. Part of W8537.	
P3014-3	Same as P1001-1. Part of W8542.	
P3014-4	Same as P1001-1. Part of W8552.	
P3015	NOT USED	

## PARTS LIST (CONT)

CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
P3016	NOT USED	
P3017-1	Same as P1001-1. Part of W8535.	
P3017-2	Same as P1001-1. Part of W5837.	
P3018-1	Same as P1001-1. Part of W8535.	
P3018-2	Same as P1001-1. Part of W8537.	
P3019-1	Same as P1001-1. Part of W8533.	
P3020-1	NOT USED	
P3020-2	Same as P1001-1. Part of W8533.	
P3021	NOT USED	
P3022-1	CONNECTOR, PLUG, ELECTRICAL: 11 female contacts, rated for 2 amps at 1,800 V RMS at sea level; polarized. Part of W8539.	PL247-25
P3022-2	Same as P3022-1. Part of W8549.	
P3023-1	Same as P3022-1. Part of W8540.	
P3023-2	Same as P3022-1. Part of W8550.	
P3024-1	Same as P3022-1. Part of W8540.	
P3024-2	Same as P3022-1. Part of W8550.	
P3025-1	Same as P3022-1. Part of W8539.	
P3025-2	Same as P3022-1. Part of W8549.	
P3026-1	Same as P3022-1. Part of W8540.	
P3026-2	Same as P3022-1. Part of W8550.	
P3027-1	Same as P3022-1. Part of W8539.	
P3027-2	Same as P3022-1. Part of W8549.	
P3028-1	Same as P3022-1. Part of W8540.	
P3028-2	Same as P3022-1. Part of W8550.	

PARTS LIST (CONT)  
CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
P3029-1	Same as P3022-1. Part of W8539.	
P3029-2	Same as P3022-1. Part of W8549.	
P3030-1	Same as P3022-1. Part of W8540.	
P3030-2	Same as P3022-1. Part of W8550.	
P3031-1	Same as P3022-1. Part of W8539.	
P3031-2	Same as P3022-1. Part of W8549.	
P3032-1	Same as P3022-1. Part of W8540.	
P3032-2	Same as P3022-1. Part of W8550.	
P3033-1	Same as P3022-1. Part of W8539.	
P3033-2	Same as P3022-1. Part of W8549.	
P3034-1	CONNECTOR, RECEPTACLE, ELECTRICAL: with hood; 25 female contacts, removeable crimp pin style; current rating 5 amps at 500 V RMS; polarized. Part of W8538.	JJ310-2H
P3034-2	Same as P3034-1. Part of W8548.	
P4000	NOT USED	
P4001-1	CONNECTOR, RECEPTACLE, ELECTRICAL: with hood; 37 female contacts, removeable crimp pin style; current rating 5 amps at 500 V RMS; polarized. Part of W8538.	JJ310-3H
P4001-2	Same as P4001-1. Part of W8548.	
P4002-1	Same as P1316-1. Part of W8539.	
P4002-2	Same as P1316-1. Part of W8549.	
P4003-1	Same as P1316-1. Part of W8543.	
P4003-2	Same as P1316-1. Part of W8553.	
P4004-1	Same as P1316-1. Part of W8544.	
P4004-2	Same as P1316-1. Part of W8554.	
P4005	NOT USED	

## PARTS LIST (CONT)

CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
P4006	NOT USED	
P4007-1	Same as P1. Part of W8546.	
P4007-2	Same as P1. Part of W8556.	
P4008-1	Same as P1001-1. Part of W8541.	
P4008-2	Same as P1001-1. Part of W8551.	
P4009	NOT USED	
P4010-1	Same as P1001-1. Part of W8542.	
P4010-2	Same as P1001-1. Part of W8552.	
P5000-1	Same as P1001-1. Part of W8535.	
P5000-2	Same as P1001-1. Part of W8537.	
P5001-1	Same as P1305-1. Part of W8503.	
P5001-2	Same as P1305-1. Part of W8513.	
P5001-3	Same as P1316-1. Part of W8544.	
P5001-4	Same as P1316-1. Part of W8554.	
P5002-1	Same as P1001-1. Part of W8535.	
P5002-2	Same as P1001-1. Part of W8537.	
P5002-3	Same as P1316-1. Part of W8540.	
P5002-4	Same as P1316-1. Part of W8550.	
P5003-1	Same as P1001-1. Part of W8535.	
P5003-2	Same as P1001-1. Part of W8537.	
P5003-3	Same as P1316-1. Part of W8543.	
P5003-4	Same as P1316-1. Part of W8553.	
P5004-1	CONNECTOR, PLUG, ELECTRICAL: with hood; 15 male contacts, removeable crimp pin style; current rating 5 amps at 500 V RMS; polarized. Part of W8545.	JJ313-1H

PARTS LIST (CONT)  
 CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
P5004-2	Same as P5004-1. Part of W8555.	
P5005	NOT USED	
P5006-1	Same as P1. Part of W8547.	
P5006-2	Same as P1. Part of W8557.	
P6001-1	Same as P1001-1. Part of W8535.	
P6001-2	Same as P1001-1. Part of W8537.	
P6002-1	Same as P1001-1. Part of W8535.	
P6002-2	Same as P1001-1. Part of W8537.	
P6003-1	Same as P1001-1. Part of W8535.	
P6003-2	Same as P1001-1. Part of W8537.	
P6004	NOT USED	
P6005-1	Same as P1001-1. Part of W8535.	
P6005-2	Same as P1001-1. Part of W8537.	
P6006	NOT USED	
P6007-1	Same as P1001-1. Part of W8535.	
P6007-2	Same as P1001-1. Part of W8537.	
P6008	NOT USED	
P6009-1	Same as P1001-1. Part of W8535.	
P6009-2	Same as P1001-1. Part of W8537.	
P6010	NOT USED	
P6011-1	Same as P1001-1. Part of W8535.	
P6011-2	Same as P1001-1. Part of W8537.	
P6012	NOT USED	
P6013-1	Same as P1001-1. Part of W8535.	



## PARTS LIST (CONT)

CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
P6013-2	Same as P1001-1. Part of W8535.	
P6014-1	Same as P1001-1. Part of W8535.	
P6014-2	Same as P1001-1. Part of W8537.	
P6015-1	Same as P1305-1. Part of W8505.	
P6015-2	Same as P1305-1. Part of W8514.	
P6016-1	CONNECTOR, PLUG, ELECTRICAL: 11 female contacts; 4 contacts rated for 17 amps, 7 contacts rated for 7.5 amps at 500 V RMS. Part of W8543.	PL212-7
P6016-2	Same as P6016-1. Part of W8553.	
P6501-1	Same as P1001-1. Part of W8535.	
P6501-2	Same as P1001-1. Part of W8537.	
P6502-1	Same as P1001-1. Part of W8534.	
P6502-2	Same as P1001-1. Part of W8536.	
P6503-1	Same as P1001-1. Part of W8558.	
P6503-2	Same as P1001-1. Part of W8565.	
P6504-1	Same as P1001-1. Part of W8558.	
P6504-2	Same as P1001-1. Part of W8565.	
P6505-1	Same as P1001-1. Part of W8559.	
P6505-2	Same as P1001-1. Part of W8566.	
P6506-1	Same as P1001-1. Part of W8559.	
P6506-2	Same as P1001-1. Part of W8566.	
P6507-1	CONNECTOR, PLUG, ELECTRICAL: RF; series BNC. Part of W8572.	UG260*/U
P6507-2	CONNECTOR, PLUG, ELECTRICAL: RF; series BNC. Part of W8572.	PL243-1
P6507-3	Same as P1001-1. Part of W8535.	

PARTS LIST (CONT)  
 CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
P6507-4	Same as P6507-2. Part of W8572.	
P6507-5	Same as P1001-1. Part of W8560.	
P6507-6	Same as P6507-1. Part of W8573.	
P6507-7	Same as P6507-2. Part of W8573.	
P6507-8	Same as P1001-1. Part of W8537.	
P6507-9	Same as P6507-2. Part of W8573.	
P6507-10	Same as P1001-1. Part of W8567.	
P6508-1	Same as P1001-1. Part of W8560.	
P6508-2	Same as P1001-1. Part of W8567.	
P6509-1	Same as P1001-1. Part of W8561.	
P6509-2	Same as P1001-1. Part of W8568.	
P6510-1	Same as P1001-1. Part of W8561.	
P6510-2	Same as P1001-1. Part of W8568.	
P6511 thru P6514	NOT USED	
P6515-1	CONNECTOR, PLUG, ELECTRICAL: 24 number 20 female contacts, rated for 7.5 amps at 500 V RMS. Part of W8504.	PL212-4
P6515-2	Same as P6515-1. Part of W8504.	
P6516	NOT USED	
P6517	NOT USED	
P6518-1	Same as P1001-1. Part of W8564.	
P6518-2	Same as P1001-1. Part of W8571.	
P6519-1	Same as P1001-1. Part of W8564.	
P6519-2	Same as P1001-1. Part of W8571.	

## PARTS LIST (CONT)

CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
P6520	NOT USED	
P6521-1	Same as P1001-1. Part of W8563.	
P6521-2	Same as P1001-1. Part of W8570.	
P6522-1	Same as P1001-1. Part of W8563.	
P6522-2	Same as P1001-1. Part of W8570.	
P6523	NOT USED	
P6524-1	Same as P1001-1. Part of W5835.	
P6524-2	Same as P1001-1. Part of W5837.	
P6525-1	Same as P1001-1. Part of W8535.	
P6525-2	Same as P1001-1. Part of W8537.	
P6526	NOT USED	
P6527-1	Same as P1001-1. Part of W8562.	
P6527-2	Same as P1001-1. Part of W8569.	
P6528-1	Same as P1001-1. Part of W8562.	
P6528-2	Same as P1001-1. Part of W8569.	
P6529 thru P6536	NOT USED	
P6537-1	Same as P1001-1. Part of W5835.	
P6537-2	Same as P1001-1. Part of W5837.	
P6538	NOT USED	
P6539-1	Same as P1001-1. Part of W8535.	
P6539-2	Same as P1001-1. Part of W8537.	
P6540	NOT USED	
P6541-1	Same as P1001-1. Part of W8535.	
P6541-2	Same as P1001-1. Part of W8537.	

## PARTS LIST (CONT)

CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
P6542	NOT USED	
P6543-1	Same as P1001-1. Part of W8535.	
P6543-2	Same as P1001-1. Part of W8537.	
P8001-1	Same as P1. Part of W8508.	
P8001-2	Same as P1. Part of W8515.	
P8001-3	Same as P1. Part of W8506.	
P8002-1	CONNECTOR, PLUG, ELECTRICAL: 2 prong male; current rating 10 amps at 250 V or 15 amps at 125 V; polarized; midget size, twist lock type. Part of W8509.	PL177
P8002-2	Same as P8002-1. Part of W8515.	
P8003-1	NOT USED	
P8003-2	NOT USED	
P8003-3	Same as P8002-1. Part of W8504.	
P8004	Same as P8002-1. Part of W8515.	
P8005-1	CONNECTOR, PLUG, ELECTRICAL: 24 number 20 male contacts, rated for 7.5 amps at 500 V RMS. Part of W8504.	PL212-3
P8005-2	Same as P8005-1. Part of W8504.	
P8005-3	Same as P8005-1. Part of W8504.	
P8006-1	NOT USED	
P8006-2	NOT USED	
P8006-3	CONNECTOR, PLUG, ELECTRICAL: 14 number 16 male contacts, rated for 17 amps at 500 V RMS. Part of W8504.	PL212-1
P8007-1	Same as P8006-3. Part of W8502.	
P8007-2	Same as P8006-3. Part of W8511.	
P8007-3	Same as P8006-3. Part of W8504.	

PARTS LIST (CONT)  
CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
P8008-1	Same as P8006-3. Part of W8505.	
P8008-2	Same as P8006-3. Part of W8514.	
P8008-3	Same as P8006-3. Part of W8504.	
P8009-1	Same as P8006-3. Part of W8503.	
P8009-2	Same as P8006-3. Part of W8513.	
P8010-1	Same as P8006-3. Part of W8501.	
P8010-2	Same as P8006-3. Part of W8510.	
P8010-3	Same as P8006-3. Part of W8504.	
P8501	NOT USED	
P8502	NOT USED	
P8503	Same as P6515-1. Part of W8531.	
P8504	Same as P8005-1. Part of W8532.	
P8505-1	Same as P1001-1. Part of W8535.	
P8505-2	Same as P1001-1. Part of W8537.	
P8506-1	Same as P1001-1. Part of W8535.	
P8506-2	Same as P1001-1. Part of W8537.	
P8507-1	Same as P1001-1. Part of W8535.	
P8507-2	Same as P1001-1. Part of W8537.	
P8508-1	Same as P1001-1. Part of W8535.	
P8508-2	Same as P1001-1. Part of W8537.	
P8509-1	Same as P1001-1. Part of W8535.	
P8509-2	Same as P1001-1. Part of W8537.	
R8501	RESISTOR, FIXED, COMPOSITION: 47,000 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF473J
R8501-1	NOT USED	

PARTS LIST (CONT)  
CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R8501-2	Same as R8501.	
R8502	RESISTOR, FIXED, COMPOSITION: 100 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF101J
R8502-1	NOT USED	
R8502-2	Same as R8502.	
R8503	RESISTOR, FIXED, COMPOSITION: 33,000 ohms, $\pm 5\%$ ; 1 watt.	RC32GF333J
R8503-1	NOT USED	
R8503-2	Same as R8503.	
R8504-1	Same as R8502.	
R8504-2	Same as R8502.	
R8505-1	Same as R8502.	
R8505-2	Same as R8502.	
R8506-1	RESISTOR, FIXED, COMPOSITION: 39 ohms, $\pm 5\%$ ; 1/2 watt.	RC20GF390J
TB6501-1	TERMINAL BOARD, FANNING: twelve terminals, angle type; left end feed.	TM105-12AL
TB6501-2	Same as TB6501-1.	
TB8501	TERMINAL BOARD, BARRIER: sixteen 6-32 thd. x 1/4" long binding head machine screws; black phenolic body.	TM100-16
TB8502	Same as TB8501.	
TB8503	TERMINAL BOARD, BARRIER: two 6-32 thd. x 1/4" long binding head machine screws; black phenolic body.	TM102-2
TB8503-1	NOT USED	
TB8503-2	Same as TB8503.	
TB9000-1	TERMINAL BOARD, BARRIER: five 6-32 thd. x 1/4" long binding head machine screws; black phenolic body.	TM102-5

## PARTS LIST (CONT)

## CABINET, ELECTRICAL EQUIPMENT, RAK-22K

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
TB9000-2	Same as TB9000-1.	
TB9501-1	TERMINAL BOARD, FANNING: eight terminals, angle type; right end feed. Part of W8545.	TM105-8AR
TB9501-2	Same as TB9501-1. Part of W8555.	
TB9502-1	TERMINAL BOARD, FANNING: four terminals, angle type; left end feed. Part of W8545.	TM105-4AL
TB9502-2	Same as TB9502-1. Part of W8555.	
W8501	CABLE ASSEMBLY, ELECTRICAL, SPECIAL PURPOSE: consists of two connectors, P1305-1, P8010-1.	CA1037-11
W8502	CABLE ASSEMBLY, ELECTRICAL, SPECIAL PURPOSE: consists of two connectors, P3001-1, P8007-1.	CA1036-12
W8503	CABLE ASSEMBLY, ELECTRICAL, SPECIAL PURPOSE: consists of two connectors, P5001-1, P8009-1.	CA1044-9
W8504	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of ten connectors, P6515-1, P6515-2, P8003-3, P8005-1, P8005-2, P8005-3, P8006-3, P8007-3, P8008-3, P8010-3.	CA1115-1
W8505	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of two connectors, P6015-1, P8008-1.	CA1033-1
W8506	CABLE ASSEMBLY, ELECTRICAL: AC power; consists of 72" length rubber sheathed cable, 3 solderless type terminal lugs, and 1 connector, P8001-3.	CA696-1
W8507	CABLE ASSEMBLY, ELECTRICAL, SPECIAL PURPOSE	CA1061-5
W8508	Same as W8506. Consists of 1 connector, P8001-1.	
W8509	CABLE ASSEMBLY, ELECTRICAL: AC power; consists of 1 connector, P8002-1.	CA706-1
W8510	CABLE ASSEMBLY, ELECTRICAL, SPECIAL PURPOSE: consists of 2 connectors, P1305-2, P8010-2.	CA1037-9
W8511	CABLE ASSEMBLY, ELECTRICAL, SPECIAL PURPOSE: consists of two connectors, P3001-2, P8007-2.	CA1036-2
W8512	Same as W8504.	
W8513	CABLE ASSEMBLY, ELECTRICAL, SPECIAL PURPOSE: consists of two connectors, P5001-2, P8009-2.	CA1044-10

PARTS LIST (CONT)  
CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
W8514	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of two connectors, P6015-2, P8008-2.	CA1033-2
W8515	CABLE ASSEMBLY, ELECTRICAL: power; consists of two connectors, P1, P8004.	CA884-3
W8516	Same as W8507.	
W8517	Same as W8509. consists of one connector, P8002-2.	
W8518	Same as W8506. consists of one connector, P8001-2.	
W8519	LEAD, ELECTRICAL: consists of 54" length of size 25/32 wire, insulation sleeving, two solderless type terminal lugs.	CA412-34-54.00
W8520	Same as W8519.	
W8521	LEAD, ELECTRICAL: consists of 34" length of size 3/8 wire, insulation sleeving, two solderless type terminal lugs.	CA412-36-34.00
W8522	LEAD, ELECTRICAL: consists of 64" length of size 3/8 wire, insulation sleeving, two solderless type terminal lugs.	CA412-36-64.00
W8523	LEAD, ELECTRICAL: consists of 47" length of size 3/8 wire, insulation sleeving, two solderless type terminal lugs.	CA412-36-47.00
W8524	Same as W8519.	
W8525	Same as W8519.	
W8526	Same as W8521.	
W8527	Same as W8522.	
W8528	Same as W8523.	
W8529	CABLE ASSEMBLY, ELECTRICAL: RF; consists of 12 feet of black coaxial cable, two connectors, J8501, P1001-1.	CA480-15-12F
W8530	CABLE ASSEMBLY, ELECTRICAL: RF; consists of 10 feet of black coaxial cable, two connectors, J8502, P1001-2.	CA480-15-10F



## PARTS LIST (CONT)

## CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
W8531	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of one connector, P8503, and two terminal boards, TB6501-1, TB6501-2.	CA1113-1
W8532	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of two connectors, P102, P8504.	CA1111-1
W8533	CABLE ASSEMBLY, ELECTRICAL: RF; consists of 150" length of black coaxial cable, two connectors, P3019-1, P3020-2.	CA480-3-150
W8534	CABLE ASSEMBLY, ELECTRICAL: RF; consists of 112" length of black coaxial cable, two connectors, P1312-1, P6502-1.	CA480-3-112
W8535	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of 36 connectors, P1302-1, P1303-1, P1304-1, P1307-1, P3008-1, P3009-1, P3010-1, P3012-1, P3014-1, P3017-1, P3018-1, P5000-1, P5002-1, P5003-1, P6001-1, P6002-1, P6003-1, P6005-1, P6007-1, P6009-1, P6011-1, P6013-1, P6014-1, P6501-1, P6507-3, P6524-1, P6525-1, P6537-1, P6539-1, P6541-1, P6543-1, P8505-1, P8506-1, P8507-1, P8508-1, P8509-1.	CA1110-2
W8536	Same as W8534. consists of two connectors, P1312-2, P6502-2.	
W8537	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of 36 connectors, P1302-2, P1303-2, P1304-2, P1307-2, P3008-2, P3009-2, P3010-2, P3012-2, P3014-2, P3017-2, P3018-2, P5000-2, P5003-2, P6001-2, P6002-2, P6003-2, P6005-2, P6007-2, P6009-2, P6011-2, P6013-2, P6014-2, P6501-2, P6507-8, P6524-2, P6525-2, P6537-2, P6539-2, P6541-2, P6543-2, P8505-2, P8506-2, P8507-2, P8508-2, P8509-2.	CA1110-3
W8538	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of 3 connectors, P1316-1, P3034-1, P4001-1.	CA1140-1
W8539	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of 7 connectors, P3022-1, P3025-1, P3027-1, P3029-1, P3031-1, P3033-1, P4002-1.	CA910-2
W8540	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of 7 connectors, P3023-1, P3024-1, P3026-1, P3028-1, P3030-1, P3032-1, P5002-3.	CA927-2

PARTS LIST (CONT)  
CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
W8541	Same as W8533. consists of two connectors, P3008-3, P4008-1.	
W8542	Same as W8533. consists of two connectors, P3014-3, P4010-1.	
W8543	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of three connectors, P4003-1, P5003-3, P6016-1.	CA1138-1
W8544	CABLE ASSEMBLY, ELECTRICAL, SPECIAL PURPOSE: consists of two connectors, P4004-1, P5001-3.	CA923-4
W8545	CABLE ASSEMBLY, ELECTRICAL, SPECIAL PURPOSE: consists of one connector, P5004-1, and two terminal boards, TB9501-1, TB9502-1.	CA1139-1
W8546	CABLE ASSEMBLY, ELECTRICAL: AC power; consists of one connector, P4007-1.	CA696-3
W8547	Same as W8546. consists of one connector, P5006-1.	
W8548	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of three connectors, P1316-2, P3034-2, P4001-2.	CA1140-2
W8549	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of 7 connectors, P3022-2, P3025-2, P3027-2, P3029-2, P3031-2, P3033-2, P4002-2.	CA910-3
W8550	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of 7 connectors, P3023-2, P3024-2, P3026-2, P3028-2, P3030-2, P3032-2, P5002-4.	CA927-3
W8551	Same as W8533. consists of two connectors, P3008-4, P4008-2.	
W8552	Same as W8533. consists of two connectors, P3014-4, P4010-2.	
W8553	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of three connectors, P4003-2, P5003-4, P6016-2.	CA1138-2
W8554	CABLE ASSEMBLY, ELECTRICAL, SPECIAL PURPOSE: consists of two connectors, P4004-2, P5001-4.	CA923-5
W8555	CABLE ASSEMBLY, ELECTRICAL, SPECIAL PURPOSE: consists of one connector, P5004-2 and two terminal boards, TB9501-2, TB9502-2.	CA1139-2

PARTS LIST (CONT)  
CABINET, ELECTRICAL EQUIPMENT, RAK-22B

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
W8556	Same as W8546. consists of one connector, P4007-2.	CA480-3-5
W8557	Same as W8546. consists of one connector, P5006-2.	
W8558	CABLE ASSEMBLY, ELECTRICAL: RF; consists of two connectors, P6503-1, P6504-1.	
W8559	Same as W8558. consists of two connectors, P6503-1, P6504-1.	
W8559	Same as W8558. consists of two connectors, P6505-1, P6506-1.	
W8560	Same as W8558. consists of two connectors, P6507-5, P6508-1.	
W8561	Same as W8558. consists of two connectors, P6509-1, P6510-1.	
W8562	Same as W8558. consists of two connectors, P6527-1, P6528-1.	
W8563	Same as W8558. consists of two connectors, P6521-1, P6522-1.	
W8564	Same as W8558. consists of two connectors, P6518-1, P6519-1.	
W8565	Same as W8558. consists of two connectors, P6503-2, P6504-2.	
W8566	Same as W8558. consists of two connectors, P6505-2, P6506-2.	
W8567	Same as W8558. consists of two connectors, P6507-10, P6508-2.	
W8568	Same as W8558. consists of two connectors, P6509-2, P6510-2.	
W8569	Same as W8558. consists of two connectors, P6527-2, P6528-2.	
W8570	Same as W8558. consists of two connectors, P6521-2, P6522-2.	
W8571	Same as W8558. consists of two connectors, P6518-2, P6519-2.	
W8572	CABLE ASSEMBLY, ELECTRICAL: RF; consists of two connectors, P6507-1, P6507-2.	
W8573	Same as W8572. consists of three connectors, P6507-6, P6507-7, P6507-9.	