UNCLASSIFIED

TECHNICAL MANUAL

for

DIVERSITY RADIO RECEIVER

MODEL DDR-5B

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, CANADA

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IN - 308 Issue Date: 1 July 1963

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

Warranty

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

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

1. That any claim of defect under this warranty is made within sixty (60) days after discovery thereof and that inspection by TMC, if required, indicates the validity of such claim to TMC's satisfaction.

2. That the defect is not the result of damage incurred in shipment from or to the factory.

3. That the equipment has not been altered in any way either as to design or use whether by replacement parts not supplied or approved by TMC, or otherwise.

4. That any equipment or accessories furnished but not manufactured by TMC, or not of TMC design shall be subject only to such adjustments as TMC may obtain from the supplier thereof.

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

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

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

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

*Electron tubes also include semi-conductor devices.

PROCEDURE FOR RETURN OF MATERIAL OR EQUIPMENT

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

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

PROCEDURE FOR ORDERING REPLACEMENT PARTS

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

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

PROCEDURE IN THE EVENT OF DAMAGE INCURRED IN SHIPMENT

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

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

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

Addendum

for

Dual Diversity Receiver

Models DDR-5A and DDR-5B

(AN/FRR-60(v))

The purpose of this addendum is to provide information concerning the replacement of glass windows used in DDR-5 cabinets. Also provided in this addendum is information relative to the use of continuous rotation switches on DDR-5 modular units.

a. REPLACEMENT OF DDR-5 GLASS WINDOWS - To remove and install glass windows in DDR-5 cabinet doors, proceed as follows:

(1) Loosen screws securing hinge of window assembly to cabinet and remove window assembly (frame and hinge as a complete unit) from cabinet.

(2) Remove eight screws (item 2, figure 1 of this addendum) securing top, bottom, and side window frames together; corner angle braces (item 3, figure 1) should become loose inside frame.

NOTE

If window glass is still intact when performing step 3 below, considerable pressure may be needed (due to tight fit of rubber U channel) to separate window frame from glass pane.

(3) Carefully pull window frames apart.

(4) Remove rubber U channel from bottom side of window frame and place on new piece of glass; refer to figure 2 of this addendum for details of window glass. Coat rubber U channel with vaseline.

(5) Position bottom side of window frame over rubber U channel as indicated in figure 2. Using rubber mallet or other suit-

able impliment, tap window frame gently until glass and rubber U channel are seated firmly in frame.

(6) Secure one corner angle brace to bottom end of left and right side of window frame. Secure two corner angle braces to top side of frame.

(7) Using procedure outlined in steps (4) and (5) above, fit left and right sides of window frame on new piece of glass. Left and right side of frame should be positioned so that corner angle braces slide freely into bottom of frame.

(8) Secure corner angle braces to bottom of frame.

(9) Using procedure outlined in steps (4) and (5) above, fit top side of window frame on new piece of glass. Secure corner angle braces to left and right side of frame.

(10) Position window assembly on cabinet and secure hinge to cabinet with screws.

b. CONTINUOUS ROTATION SWITCHES - In preparation for automatic tuning, various modular units contained in the DDR-5 receivers have been engineered with continuous rotation switches as indicated below. For convenience during operation, it should be noted that these switches do not contain mechanical stops and may be continuously rotated in either direction without harmful effect to the switch itself or to the associated circuitry.

Modular Unit	Switch Designation
Control Synthesizer and Standard HFS-1	1 MC 100 KC 10 KC 1 KC .1 KC

Modular Unit (Cont)	Switch Designation (Cont)
Automatic Frequency Control AFC-3	TUNING KCS
IF Amplifier HFI-1	CHANNEL A IF BANDWIDTH KC CHANNEL B IF BANDWIDTH KC
Variable Notch Filter HNF-1	NOTCH ADJUST
Detector and Audio Amplifier HFA-1	CHANNEL A DETECTION CHANNEL A BFO CHANNEL B DETECTION CHANNEL B BFO
Audio Filter HAF-1	CHANNEL A HIGH CUTOFF CHANNEL A LOW CUTOFF CHANNEL B HIGH CUTOFF CHANNEL B LOW CUTOFF

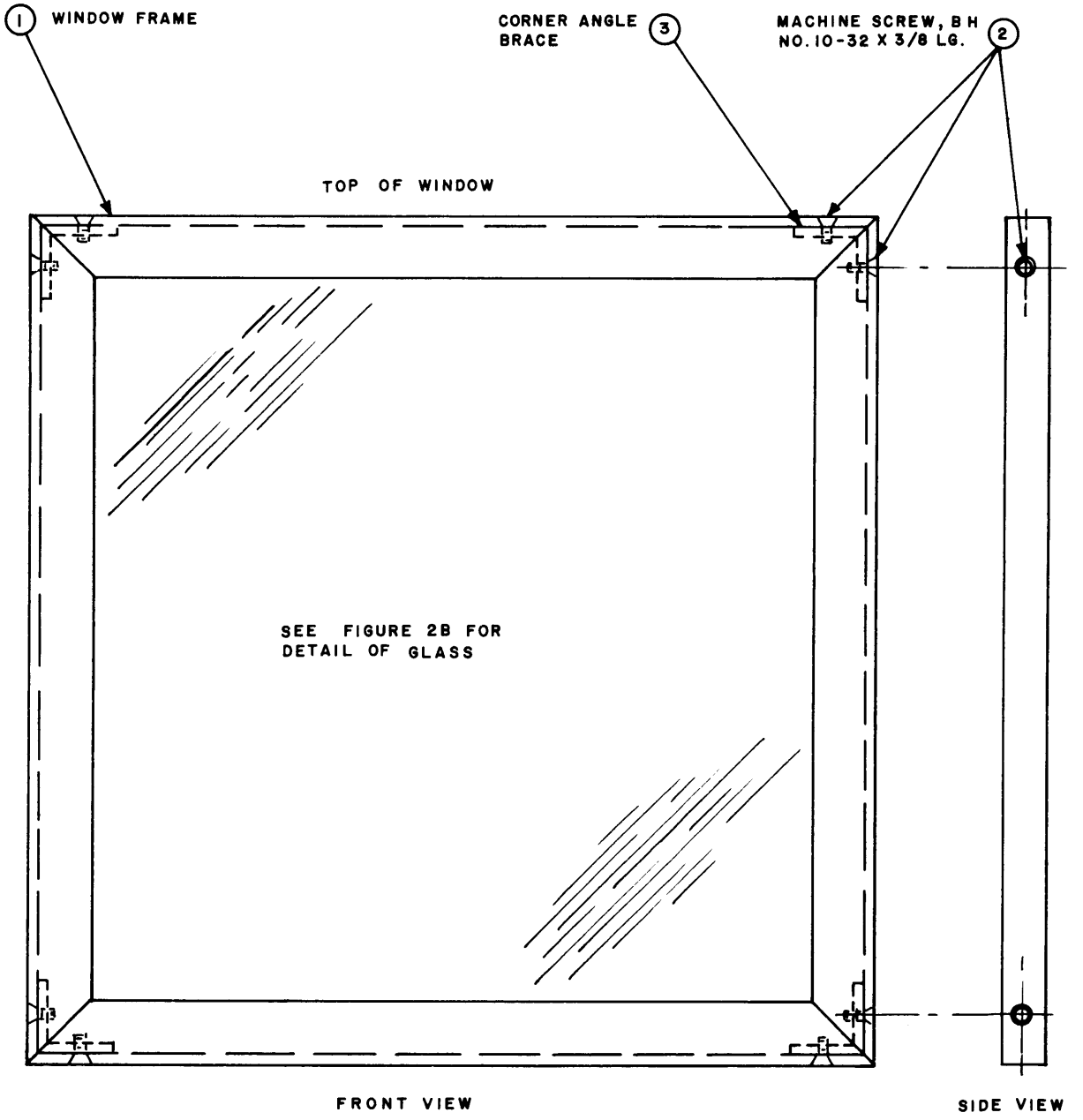
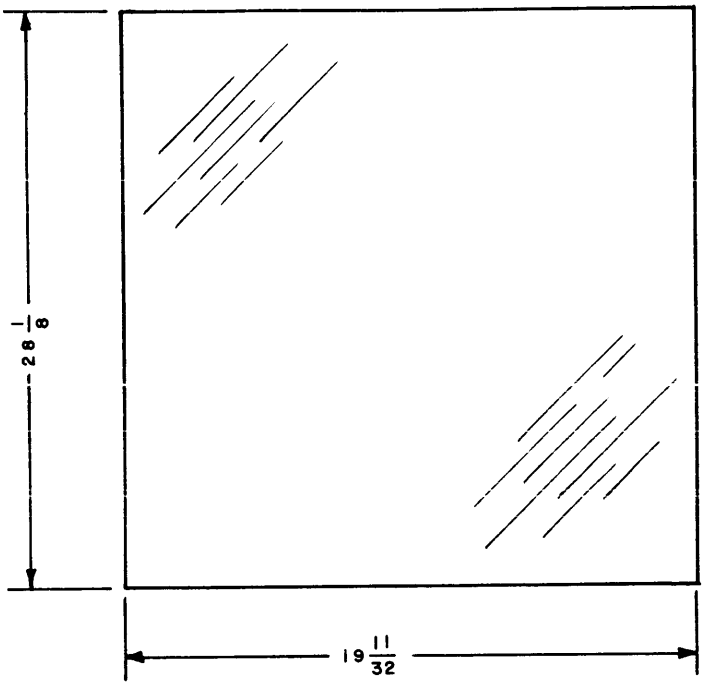


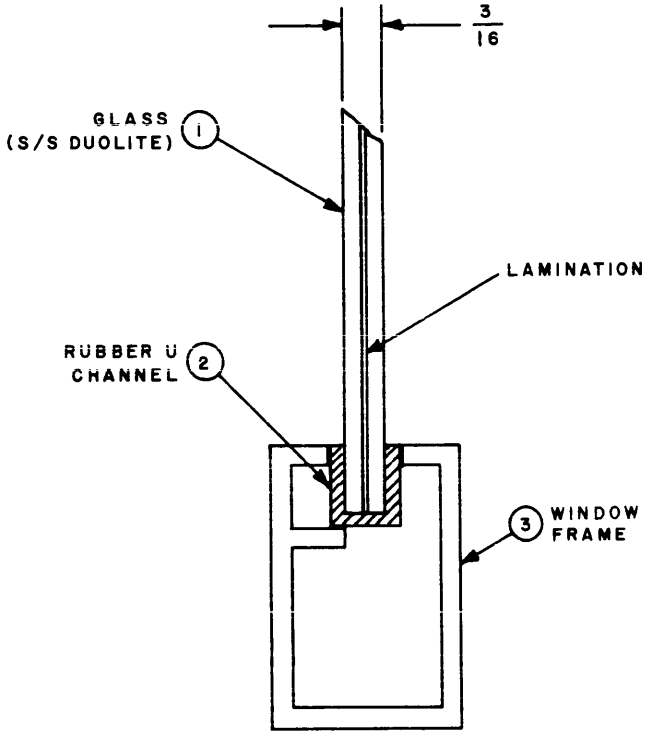
FIGURE 1. WINDOW ASSEMBLY



NOTE:

1. MATERIAL: STANDARD 3/16 THICK SAFETY SHEET GLASS, CLEAR, TRANSPARENT, S/S DUOLITE.
2. MUST BE SQUARE DIAGONALLY TO WITHIN 1/32 OF AN INCH.

A. WINDOW GLASS



B. FRAME AND U CHANNEL

FIGURE 2. DETAILS OF WINDOW FRAME AND GLASS

CHANGE NO. 1

INSTRUCTION BOOK CHANGE NOTICE

Date October 14, 1963

Manual affected: Dual Diversity Receiver DDR-5B IN -3001/308

page 2-7 Remove and destroy Fig 2-4, cabling interconnection diagram, dual receiver DDR-5B. Substitute the attached revised Fig 2-4

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

THE TECHNICAL MATERIEL CORP., 700 Fenimore Road, Mamar neck, New York

Attn.: Direct r of Eng. Services.

CHANGE NO. 2

INSTRUCTION BOOK CHANGE NOTICE

Date October 24, 1963

Manual affected: Diversity Radio Receiver DDR-5B IN 309

1. Page 2-2
Title of figure should be changed to read as follows:

Figure 2-2. DDR-5B Dimensional Outline Drawing.

2. Page 3-13. Paragraph 3-3h
In step (7) add the following:

NOTE

When performing step (c), tuning must be done very carefully so that AFC-3 does not lock onto one of the tone frequencies.

(c) On Automatic Frequency Control AFC-3, depress RESET button (24) while simultaneously turning TUNING KCS control (20) clockwise from -3 position to point where signals are no longer heard and maximum indication is obtained on CARRIER LEVEL meter (19).

(d) On IF Amplifier HFI-1, set CHANNEL A IF BANDWIDTH KC switch at 3.5 L SSB or 7.5 L SSB.

(e) Ensure that teletype equipment is operating properly

3. Subsequent to this change notice, DDR-5B manuals, previously index-numbered IN 308, will be index-number d IN 309

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

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

Attn.: Director of Eng. Services.

CHANGE NO. 3 DDR-5B

INSTRUCTION BOOK CHANGE NOTICE

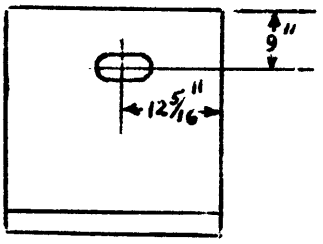
Date 4-14-64

Manual affected: Diversity Radio Receiver Model DDR-5B IN -309

Page 2-2. Figure 2-4.

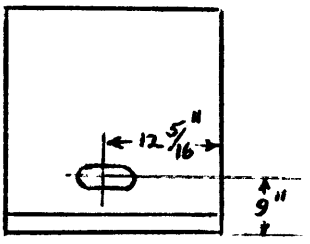
Change location of cutout in bottom front view as indicated below.

WAS



BOTTOM FRONT VIEW

NOW



BOTTOM FRONT VIEW

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

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

Attn.: Direct r f Eng. Services.

RECORD OF CORRECTIONS MADE

Change No.	Date of Change	Date Entered	Entered By

FOREWORD

The DDR-5B comprises 11 modular units; these modular units are used in various receiver configurations as well as the DDR-5B. As a practical matter, individual manuals are written for each modular unit and then combined as required with a system manual to cover the overall receiver.

With this package, an individual manual is provided for each modular unit in the DDR-5B with the exception of Audio Switch Panel HSP-2, Power Panel HPP-1, Speaker Panel HSS-1, and Equipment Rack RAK-21B1. Information concerning these units is grouped together in one manual located in the appendix.

The DDR-5B manual given in this package discusses each modular unit only to the extent that it effects the system. Detailed information concerning any modular unit is available in the individual manual.

Commercial and military nomenclature for the DDR-5B, the cabinet, and the modular units that constitute the DDR-5B are as follows:

Diversity Radio Receiver

TMC: Dual Diversity Receiver, Model DDR-5B
MIL: Receiving Set, Radio: AN/FRR-60 (v)

Continuous RF Tuner

TMC: RF Tuner, Model HFR-1
MIL: Tuner, Radio Frequency: TN-376/UR

Control Synthesizer and Standard

TMC: Control Synthesizer, Model HFS-1
MIL: Generator, Reference Frequency: 0-941/UR

Automatic Frequency Control

TMC: Automatic Frequency Control Model AFC-3
MIL: C-4099/FRR-60 (v)

IF Amplifier

TMC: IF Amplifier, Model HFI-1
MIL: Amplifier, Intermediate Frequency: AM-3295/FRR-60 (v)

Detector and Audio Amplifier

TMC: AF Amplifier, Model HFA-1
MIL: Amplifier, Audio Frequency: AM-3296/FRR-60 (v)

Variable Notch Filter

TMC: Notch Filter, Model HNF-1
MIL: Filter, Band Pass, Band Suppression F-711/FRR-60 (v)

Power Supply

TMC: Power Supply, Model HFP-1
MIL: Power Supply: PP-341/FRR-60 (v)

Audio Filter

TMC: Audio Filter, Model HAF-1
MIL: Filter, Band Pass, Band Suppression F-712/FRR-60 (v)

Speaker Panel

TMC: Loudspeaker Panel, Model HSS-1
MIL: Loudspeaker, Permanent Magnet: LS-491/FR

Audio Switch Panel

TMC: Audio Switch Panel, Model HSP-2
MIL: Panel, Signal Distribution, Radio: SB-1865/FR

Power Panel

TMC: Utility Panel, Model HPP-1
MIL: Panel, Power Distribution: SB-1866/FR

Cabinet

TMC: Cabinet, Electrical Equipment, Model RAK-21B1
MIL: Cabinet, Electrical Equipment, CY-3566/FRR-60 (v)

ORDERING OF REPLACEMENT PARTS

The reference symbols for DDR-5B spare parts are listed in numerical series as listed below. This is done in an effort to decrease errors in ordering and unnecessary delay in shipment. When ordering any part, the reference symbol, the part number, and the modulator unit in which the part is used should be clearly stated.

MODULAR UNIT	SPARE PARTS NUMBERS SERIES
Continuous RF Tuner, Model HFR-1	1000 -
Control Synthesizer and Standard, Model HFS-1	3000 -
Variable Notch Filter, Model HNF-1	4000 -
Automatic Frequency Control, Model AFC-3	5000 -
IF Amplifier, Model HFI	100 - 6000 -
Detector and Audio Amplifier, Model HFA-1	7000 - 7199
Audio Filter, Model HAF-1	7200 -
Power Supply, Model HFP-1	8000 -
Electrical Cabinet, Model RAK-21B1	9000 - 9099
Audio Switch Panel, Model HSP-2	9200 - 9299
Speaker Panel, Model HSS-1	9300 - 9399
Power Panel, Model HPP-1	9400 - 9499

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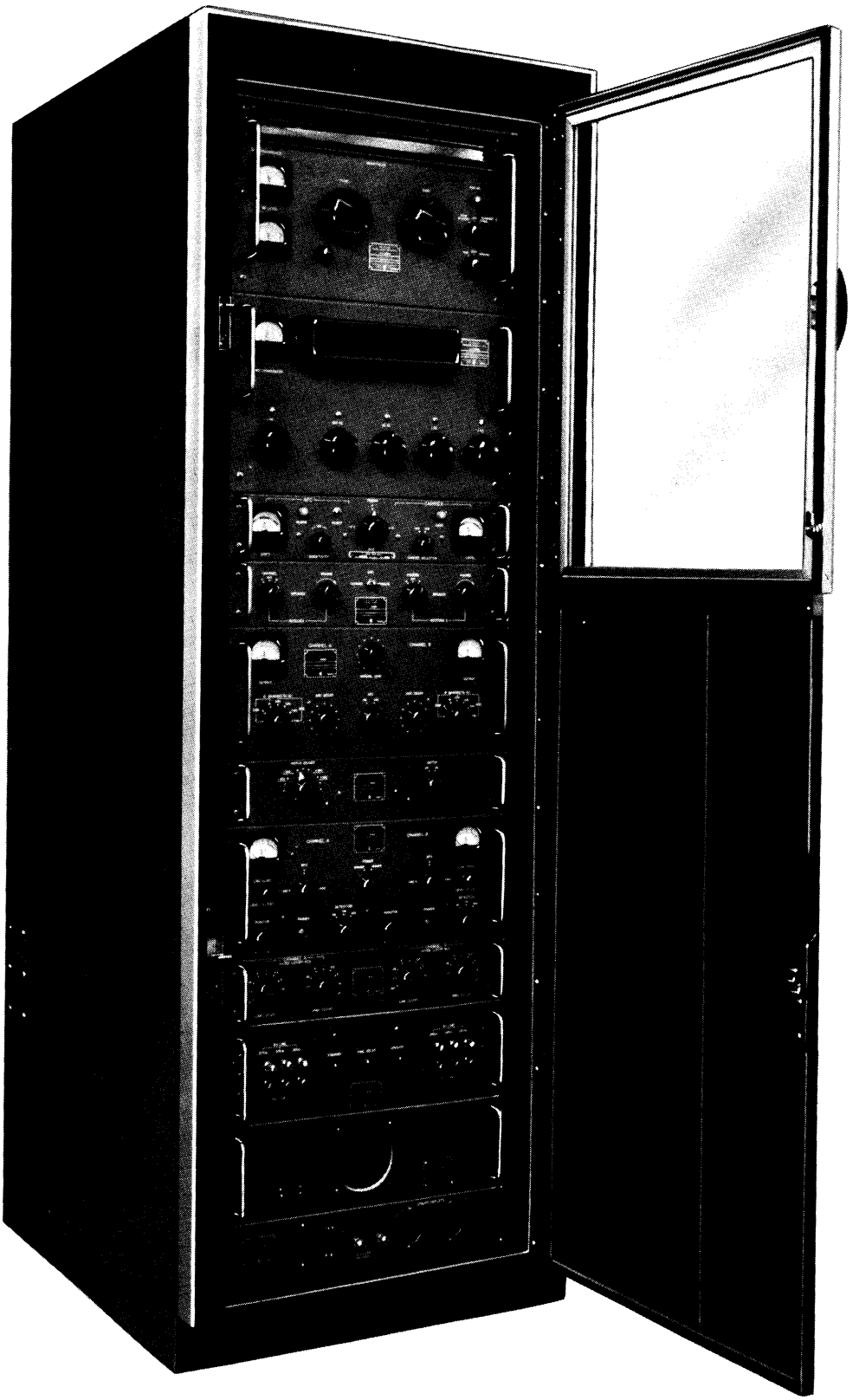


Figure 1-1. Diversity Radio Receiver, Model DDR-5B

SECTION 1

GENERAL INFORMATION

1-1. GENERAL DESCRIPTION.

Diversity Radio Receiver Model DDR-5B (figure 1-1) is a receiving system covering the frequency range of 2 to 32 mc for the reception of SSB, ISB, AM, AM equivalent, CW, MCW, FSK, FAX, pulse, and phase signals. Noise figure and sensitivity for the DDR-5B is 6 db over the band (refer to Table 1-1). The 2 to 32 mc range covered by the DDR-5B is divided into eight r-f bands; continuous coverage (non-synthesized) or synthesized coverage in 100 cycle steps is provided. One complete DDR-5B, by itself, is non-diversity operated; however, when two complete DDR-5B's are present, the interconnection of their agc lines (via terminal strip A-3063) enables space-diversity or frequency-diversity operation.

The DDR-5B comprises various modular units (refer to paragraph 1-2) mounted in a single rack, and is used in fixed-station or mobile communications systems. Figure 1-2 illustrates the chassis locations of the modular units that are contained in the DDR-5B.

The receiver is capable of accepting input variations of 70 db without agc and at least 100 db with agc without affecting the technical characteristics. Further, the receiver will continue to provide usable signal output over a 150 db dynamic range. Front-panel controls enable operating personnel to adjust the agc voltage in order to cope with various signal conditions.

Front-panel meters are provided on the receiver to facilitate the monitoring of r-f input signals, audio output signals, automatic frequency control drift, carrier level, i-f output, and locking of the synthesizer frequency with the high frequency oscillator of Continuous RF Tuner HFR-1.

An alignment signal, an internally generated low-level r-f signal from the synthesizer (HFS-1), facilitates accurate and rapid tuning of the complete system in the absence of any received signal. This locally-generated signal is also usable as a maintenance tool for checking the alignment of the DDR-5B.

A positive filtered forced-air cooling system using squirrel cage blowers is incorporated within the electrical equipment cabinet (RAK-21B1). Washable air filters are used to filter out external dust.

1-2. DESCRIPTION OF UNITS.

a. GENERAL. - Paragraphs b through l below give a brief description of the modular units used in the DDR-5B. For more detailed information pertaining to these units, refer to the individual modular-unit manuals.

b. CONTINUOUS RF TUNER, MODEL HFR-1 (TN-376/UR). - Continuous RF Tuner, Model HFR-1, provides coverage from 2 to 32 mc in eight bands and displays the tuned frequency on a 14" slide rule dial. This unit will accept a synthesized control voltage from Model HFS-1 Synthesizer for extreme stability. HFR-1 converts the r-f frequency to a first i-f of 1.75 mc. The HFR-1 obtains its operating voltage from Power Supply, Model HFP-1.

c. CONTROL SYNTHESIZER AND STANDARD, MODEL HFS-1 (0-941/UR). - Control Synthesizer and Standard, Model HFS-1, monitors the oscillator frequency in Continuous RF Tuner HFR-1, and provides correction voltage to maintain the free-running oscillators to a stability of 1 part of 10^8 for a 24-hour period. The frequency of the incoming r-f signal is displayed on the front panel in 1" high illuminated numerals. Change of frequency in 100 cycle increments is accomplished by means of detented switches. The HFS-1 obtains its operating voltages from Power Supply, Model HFP-1.

d. AUTOMATIC FREQUENCY CONTROL UNIT, MODEL AFC-3 (C-4099/FRR-60 (v)). - Automatic Frequency Control, Model AFC-3, accepts a 250 kc input signal from IF Amplifier HFI-1, and provides automatic frequency control to compensate for a frequency drift in the distant transmitter. The AFC-3 automatically synchronizes to a received signal ±50 cps and suppressed 30 db at 1 microvolt above noise threshold and will remain synchronized for approximately ±1000 cps of drift at a maximum drift rate of 10 cps/second. As used in the DDR-5B, the AFC-3 obtains its operating voltage from Power Supply, Model HFP-1.

e. IF AMPLIFIER, MODEL HFI-1 (AM-3295/FRR-60 (v)). - IF Amplifier, Model HFI-1 accepts a 1.75 mc input signal from Continuous RF Tuner HFR-1, processes this signal through front-panel selectable bandpass filters, and converts this signal to 250 kc for further demodulation in Audio Amplifier HFA-1. Rear panel facilities are provided for connection to Notch Filter HNF-1. This unit obtains its operating voltage from Power Supply, Model HFP-1.

f. VARIABLE NOTCH FILTER, MODEL HNF-1 (F-711/FRR-60 (v)). - Variable Notch Filter, Model HNF-1, accepts a 250 kc input signal from IF Amplifier HFI-1 and, when used, will attenuate an interfering signal within ±8 kc of the 250 kc input signal.

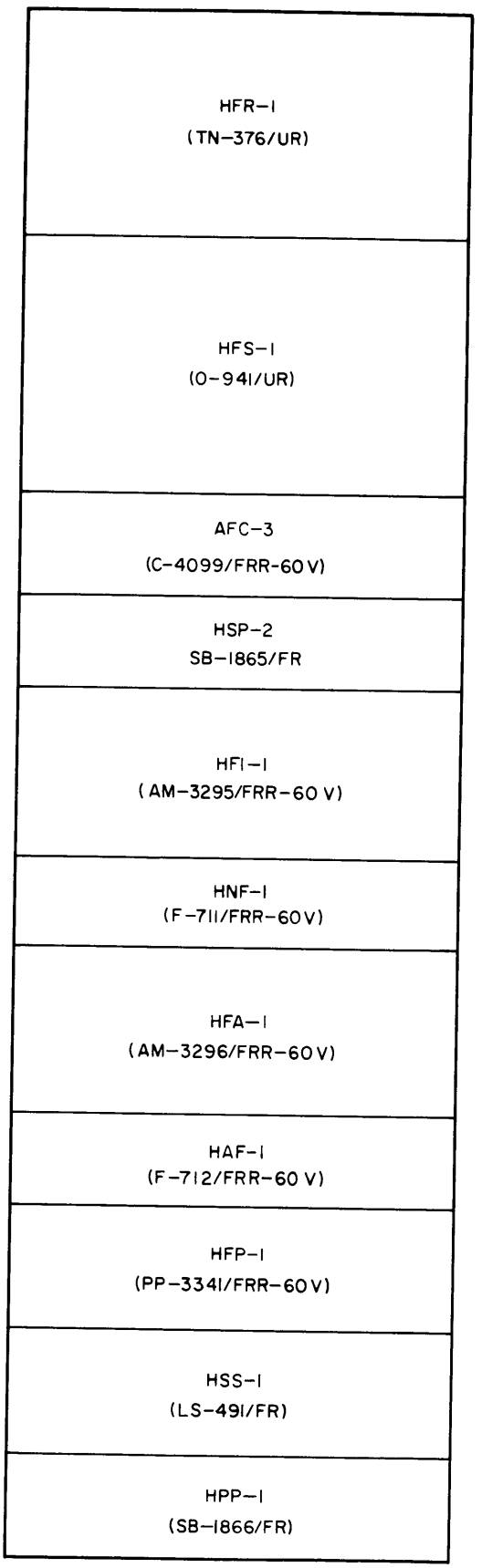


Figure 1-2. DDR-5B Modular-Unit Chassis Locations

Filtering action of the HNF-1 can be engaged or disengaged by means of front-panel controls. Signals from the HNF-1 are returned to IF Amplifier HFI-1 for bandpass filtering. The HNF-1 obtains its operating voltages from Power Supply, Model HFP-1.

g. DETECTOR AND AUDIO AMPLIFIER MODEL HFA-1 (AM-3298/FRR-60 (v)). - Detector and Audio Amplifier, Model HFA-1, accepts dual 250 kc input signals from IF Amplifier HFI-1, demodulates these signals and provides dual audio channel outputs. Facilities are incorporated on the rear panel to channel the input to a passive dual audio filter. The HFA-1 accepts its operating voltages from Power Supply, Model HFP-1.

h. AUDIO FILTER, MODEL HAF-1 (F-712/FRR-60 (v)). - Audio filter, Model HAF-1, requires no operating voltages other than the signal fed to it. It accepts dual audio signals from the audio amplifier, and is adjustable by front-panel controls to vary the upper and lower frequency cutoff point of each audio filter to suit operational requirements. Front-panel controls have been human-engineered to minimize confusion when establishing audio bandpass. i.e.; When the right control (HIGH CUTOFF) of either channel is turned counterclockwise, the high frequency cutoff point of the lo-pass filter is decreased. When the left control (LOW CUTOFF) is turned clockwise, the low frequency cutoff point of the hi-pass filter is increased, with the resultant narrowing of the total bandpass.

i. POWER SUPPLY, MODEL HFP-1 (PP-3341/FRR-60 (v)). - Power Supply, Model HFP-1 provides regulated B+, regulated bias voltages, and filament voltages to one complete rack of DDR-5B components.

j. AUDIO SWITCH PANEL, MODEL HSP-2 (SB-1865/FR). - Audio Switch Panel, Model HSP-2, filters and interconnects Channel A and Channel B audio output to terminal strip A-3063 for further application to local equipment such as single-channel or multichannel teletype converter units. The HSP-2 provides front-panel controls to: apply Channel A or Channel B audio signals to the loudspeaker, disconnect audio signals from the loudspeaker, adjust audio level of signals applied to the loudspeaker, and combine or separate the agc of both receivers.

k. SPEAKER PANEL, MODEL HSS-1, (LS-491/FR). - Speaker Panel, Model HSS-1 houses a single 4-inch p-m speaker that is used to monitor the receiver.

l. POWER PANEL, MODEL HPP-1, (SB-1866/FR). - Power Panel, Model HPP-1, is an auxiliary panel containing two fused convenience outlets for use with external test equipment.

1-3. REFERENCE DATA.

Table 1-1 lists the reference data that is pertinent to the DDR-5B receiver. For reference data concerning the modular units used in the DDR-5B, refer to the individual modular-unit manuals.

1-4. EQUIPMENT SUPPLIED.

Table 1-2 lists the equipment supplied with the DDR-5B.

TABLE 1—1. DDR-5B, TECHNICAL SPECIFICATIONS

a. Frequency Range	2 to 32 mcs, synthesized in 100 cycle steps.
b. Tuning	DDR-5B can be tuned to any one of eight RF 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 16-24 mc BAND 8 24-32 mc
c. Modes of Operation	SSB, ISB, AM, CW, MCW, FSK, FAX, pulse, and phase.
d. Stability	Synthesized stability of 1 part in 10^8 for 24 hours for a change in ambient temperature of 15°C within the limits of 0 to 50 degrees C. Unsynthesized stability of 20 to 50 parts in 10^6 without afc. With afc, the residual audio output will remain within 1 cycle of the transmitted intelligence.

TABLE 1—1. DDR-5B, TECHNICAL SPECIFICATIONS (CONT'D)

e. Input Impedance	Nominal 50 ohms, unbalanced.
f. Noise Figure and Sensitivity	6 db or better over the band, i.e.; with a 1 μv signal and a 7.5 KC bandwidth, the output signal to noise ratio is 15 db or better.
g. Intermodulation	Intermodulation products are down 60 db from the maximum tone in the desired sideband as a result of two signals in the unwanted sideband.
h. Image Ratio	80 db referenced to 1 μv input signal.
i. Spurious Response, as defined by CCIR	Better than 100 db referenced to 1 μv. For synthesized operation, all spurious will be no greater than .01 μv when referred to the antenna.
j. IF Rejection	Better than 80 db average.
k. AFC Characteristics	Automatically synchronizes to a received signal plus or minus 50 cps and suppressed 30 db at 1 μv above noise threshold and will remain synchronized for approximately $\pm$1000 cps at a maximum drift rate of 10 cps per second. Memory circuit will maintain tuning position during signal fades or momentary outages.
l. IF Selectivity	Seven optional bandwidths selected from the following: 1. 250 to 7500 cps usb ±1.5 db 2. 250 to 7500 cps lsb ±1.5 db 3. 250 to 3500 cps usb ±1.5 db 4. 250 to 3500 cps lsb ±1.5 db 5. 250 to 6000 cps usb ±1.5 db 6. 250 to 6000 cps lsb ±1.5 db 7. 1 kc symmetrical ±1.5 db 8. 6 kc symmetrical ±1.5 db 9. 15 kc symmetrical ±1.5 db
m. Tunable IF Rejection	Notch rejection with plus or minus 82 cycles at the 1 db points, and plus or minus 10 cycles at the 60 db points. Notch tunable across the full i-f of 15 kc.
n. AGC	Output remains within plus or minus 1.5 db for a 100 db change in input within the input voltage range of 1 μv to .1 volt. The agc circuit has a fast attack time and a front panel adjustable decay time from 1 to 10 seconds. The agc voltage is derived from the strongest of 2 i-f channel signals.
o. Phase Distortion	The system is capable of receiving pulse or phase information without seriously degrading intelligence when the 15 kc symmetrical i-f strip of IF Amplifier HFI-1 is used in synthesized operation.
p. Audio Amplifier	Plus or minus 1.5 db 20 cps to 20 KC. Bandpass is dependent on filter selected. Output adjustable from 0 to 1 watt.

TABLE 1—1. DDR-5B, TECHNICAL SPECIFICATIONS (CONT'D)

q. Audio Frequency Distortion	Intermodulation products are down at least 40 db through the audio channels.
r. Adjustable Audio Filtering	Passive audio filters provide adjustable low pass and high pass cutoff points at approximately: 100 cps 250 cps 500 cps 1 KC 2.5 KC 5.0 KC 10 KC Separate filtering is provided for each audio channel.
s. Output	Four 600 ohm balanced and centertapped output terminals per receiver channel. Two independent 0-1 mw outputs. Two independent 0-1 watt outputs. Two independent 4, 8, or 16 ohm 0-1 watt outputs.
t. Hum Level	Minus 50 db at 1 watt audio output.
u. Power Supply	115/230 volts at 48 - 62 cps, single phase input. Maximum power at 115 volts is approximately 1000 watts. B Plus and B Minus maintained within 1% from no load to full load and with plus or minus 10% line voltage variation. B Plus ripple does not exceed 100 mv. B Minus ripple does not exceed 5 mv. All voltage outputs separately fused using blown fuse indicator type holders.
v. Temperature and Humidity	The equipment is designed to operate in an ambient of 0°to 50° C and any value of humidity up to 90%.
w. Special Shielding Feature	Electronically shielded cabinet with "Screen Room" type of line filter gives a minimum attenuation of 70 db from the receiver to the power line.

TABLE 1—2. EQUIPMENT SUPPLIED

NOMENCLATURE		QTY PER EQUIP.	OVERALL DIMENSIONS (IN)			GROSS SHIPPING WEIGHT	WEIGHT (LBS)
NAME	MILITARY DESIGNATION		HEIGHT	WIDTH	DEPTH		
Continuous RF Tuner, Model	TN-376/UR	1	10-1/2	19	19-3/4		58
Control Synthesizer Standard, Model HFS-1	0-941/UR	1	10-1/2	19	20-1/4		43
Automatic Frequency Control, Model AFC-3	C-4099/FRR-60 (v)	1	3-1/2	19	16-3/4	Refer to paragraph 2-1	16
IF Amplifier, Model HFI-1	AM-3295/FRR-60 (v)	1	7	19	14		25
Variable Notch Filter, Model HNF-1	F-711/FRR-60 (v)	1	3-1/2	19	11		9
Detector and Audio Amplifier, Model HFA-1	AM-3296/FRR-60 (v)	1	7	19	14		20
Audio Filter, Model HAF-1	F-712/FRR-60 (v)	1	3-1/2	19	14		10
Power Supply, Model HFP-1	PP-3341/FRR-60 (v)	1	5-1/4	19	18		67
Audio Switch Panel, Model HSP-2	SB-1865/FR	1	3-1/2	19	10-3/4		6
Speaker Panel, Model HSS-1	LS-491/FR	1	5-1/4	19	4-1/4		3
Power Panel, Model HPP-1	SB-1866/FR	1	3-1/2	19	4-1/2		3
Rack, Model RAK-21B1	CY-3566/FRR-60 (v)	1	69	24-1/2	30		350
Lead, Electrical							
CA-409-32-2.25	--------	3					
CA-412-34-54.0	--------	2					
CA-412-34-34.0	--------	1					
Cable Assembly, RF							
CA-480-3-72		4					
CA-480-3-90		2					
CA-480-3-97		3				Refer to paragraph 2-1.	
CA-480-3-112		5					
CA-480-3-10.5F		4					
CA-480-3-11.5F		2					

TABLE 1—2. EQUIPMENT SUPPLIED (CONT'D)

NOMENCLATURE		QTY PER EQUIP.	OVERALL DIMENSIONS (IN)			GROSS SHIPPING WEIGHT	WEIGHT (LBS)
NAME	MILITARY DESIGNATION		HEIGHT	WIDTH	DEPTH		
Cable Assembly, Special Purpose							
CA-686-1		1					
CA-687-1		1					
CA-687-2		1					
CA-703		1					
CA-704		1					
CA-705-2		1					
Cable Assembly, Power							
CA-696		1					
CA-706-1		1					
CA-718		1					
Tools in kit form							
TP-114		1					
TP-115		1					
TP-116-1		1					
TP-117-1		1					
TP-117-2		1					
TP-117-3		1					
TP-118-1		1					
TP-118-2		1					
TP-119-1		1					
WR-100-2		1					
WR-100-5		1					
WR-100-18		1					
WR-100-19		1					

SECTION 2

INSTALLATION

2-1. UNPACKING AND HANDLING.

Figure 2-1 is a typical illustration of the method used to pack the DDR-5B for shipment. Gross shipping weight of the DDR-5B packing case and contents is 872 pounds. Inspect the DDR-5B packing case 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.

Using figure 2-1 as a guide, unpack the DDR-5B in the reverse order of the indicated packing procedure; refer to Table 1-2 for information regarding size and weight of RAK-21B1 and modular units. Inspect the contents of each box for possible damage, and inspect the packing material for parts that may have been shipped as loose items. Compare the material received against that listed in Table 1-2 to ensure that all equipment is received. Most of the cable assemblies used in the DDR-5B are mounted in RAK-21B1 and taped in place. Some equipment interconnect cables are shipped as loose items.

2-2. POWER REQUIREMENTS.

All units of the DDR-5B leave the factory wired for 115 volt, 50/60 cycle operation. Change may be made to 230 volt, 50/60 cycle operation by making minor wiring changes. Consult the installation section of the individual modular-unit manuals for wiring-change information.

CAUTION

If 230 volt, 50/60 cycle operation is used, all line fuses must be reduced to one half their rated current values to assure adequate circuit protection. Regulated and high voltage fuses remain the same with either line voltage.

Power consumption of the DDR-5B is approximately 1000 watts; power cabling of sufficient size to provide 15 amperes (approximately 10 amps for receiver and 5 amps for external equipment plugged into convenience outlet) at 115 vac, single phase, is adequate. For information concerning the connection of power cables, refer to paragraph 2-3, e.

2-3. INSTALLATION.

a. ANTENNA. - The DDR-5B is normally used with a sloping V, rhombic, or log-periodic antenna. The antenna input to the receiver is 50 ohms unbalanced. Many antennas can be adapted to this 50-ohm unbalanced input by means of Technical Material Corporation's Rhombic Antenna Coupler, Model RAC.

b. LOCATION OF RECEIVER. - Before attempting to install the DDR-5B, ensure that adequate power (paragraph 2-2) is available at the selected site or location. After unpacking and inspecting the cabinet (RAK-21B1), remove modular-units and place the cabinet in its operating location. It is advisable to do this while modular units are not installed because the added weight of the assembled receiver will make movement more difficult. Refer to dimensional outline drawing figure 2-2 when choosing the operating location. Sufficient space to open front and rear cabinet doors is one of the prime considerations when choosing the operating location. The DDR-5B has self-contained squirrel cage blowers for cooling; air intakes for the blowers are located at the lower rear of the cabinet, and air exhaust is through openings in the top of the cabinet. Air intake and exhaust ports should be kept clear to assure adequate heat dissipation.

c. INSTALLATION OF RECEIVER. - Each compartment of the cabinet (RAK-21B1) is equipped with tracks that attach to slide mechanisms of the associated modular unit. To install any modular unit in its compartment, proceed as follows:

(1) Untape or unstrap cable assemblies, NEGATOR B motors, and all other components secured to the RAK-21B1 frame for shipment.

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

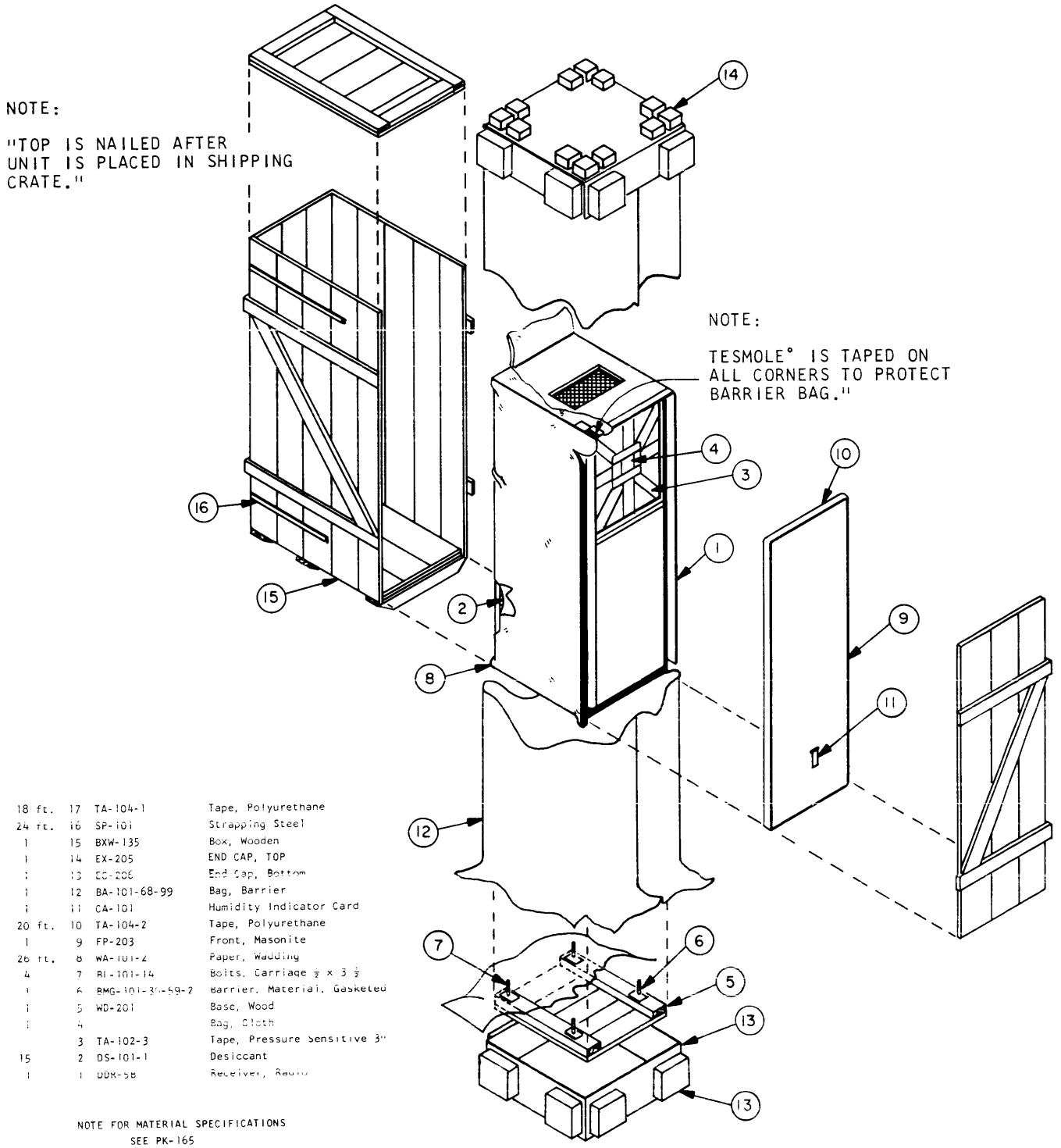
(3) Position slide mechanisms of modular unit in tracks, and ease modular unit forward into rack until rearward release fingers or lock buttons engage hole in track.

(4) Make the necessary cable and electrical connections as described in paragraph 2-3, d.

(5) Depress forward release fingers or lock buttons, and slide modular unit completely into compartment.

(6) Secure front panel of modular unit to RAK-21B1 with screws.

d. CABLING. - Untape or unstrap all cable assemblies, NEGATOR B motors, and all other components attached to the frame of RAK-21B1 for shipment, and proceed as outlined in the following paragraphs.



18 ft.	17	TA-104-1	Tape, Polyurethane
24 ft.	16	SP-101	Strapping Steel
1	15	BXW-135	Box, Wooden
1	14	EX-205	END CAP, TOP
1	13	EC-206	End Cap, Bottom
1	12	BA-101-68-99	Bag, Barrier
1	11	CA-101	Humidity Indicator Card
20 ft.	10	TA-104-2	Tape, Polyurethane
1	9	FP-203	Front, Masonite
26 ft.	8	WA-101-2	Paper, Wadding
4	7	RI-101-14	Bolts, Carriage $\frac{1}{2}$ x 3 $\frac{1}{2}$
1	6	BMG-101-3[illegible]-59-2	Barrier, Material, Gasketed
1	5	WD-201	Base, Wood
1	4		Bag, Cloth
	3	TA-102-3	Tape, Pressure Sensitive 3"
15	2	DS-101-1	Desiccant
1	1	DDR-5B	Receiver, Radio

NOTE FOR MATERIAL SPECIFICATIONS
SEE PK-165

Figure 2-1. DDR-5B, Preparation for Shipment, Typical

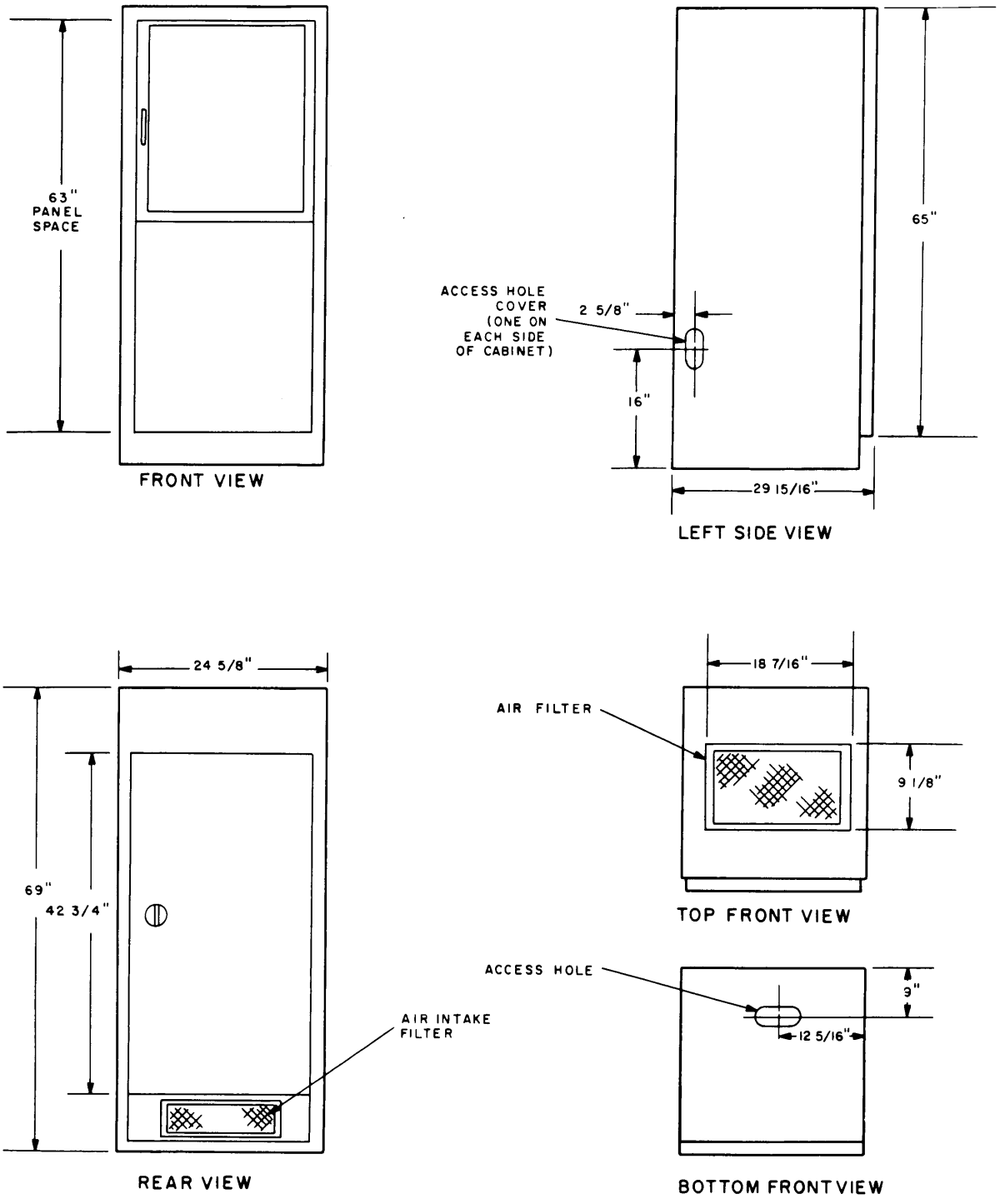


Figure 2-2. DDR-5A, Dimensional Outline Drawing

(1) CABLE ENTRY. - Cable entry is accomplished through openings with removable covers. These openings are located on both sides of the cabinet near the bottom, and in the center of the bottom. Main power should enter by means of armored cable. Antenna and audio connections are made to terminal strip A-3063 located approximately 20 inches above the floor at the right inside rear of the cabinet (considered as viewed from the rear). Antenna cabling should be RG 8, 9, 10, or 11/U, or equivalent, and terminated in quick-disconnect fittings (TMC Part No. PL-169). Audio cabling required is 2 audio pairs.

(2) SINGLE RECEIVER (NON-DIVERSITY) CABLING CONNECTIONS. When used in single receiver operation, the DDR-5B is operated as a non-diversity receiver. Figure 2-3 (a rack assembly wiring diagram of the DDR-5B) illustrates the cabling connections between the various modular units contained in the receiver. Refer to figure 2-3 and connect cables as illustrated.

CAUTION

Cables and electrical wiring should be carefully positioned to prevent snagging or catching as units slide in and out of equipment rack. Ensure that NEGATOR B motors used to retract the cable assembles are functioning properly.

(3) DUAL RECEIVER (DIVERSITY-SPACE OR FREQUENCY) CABLING CONNECTIONS. - When two complete DDR-5B's are present in a given operation, the interconnection of their agc lines as shown in connection diagram figure 2-4 enables either space-diversity or frequency-diversity operation.

e. POWER CONNECTIONS. - Refer to paragraph 2-2 for information regarding DDR-5B power requirements, and proceed as follows:

(1) Remove four screws holding line filter AF-103 in place on left side of cabinet viewed from rear. Orient filter so that cover can be removed; remove cover and connect three-wire power cable as listed below:

LEAD	CONNECTING POINT
White	Line lug
Green	Grounding screw
Black	Line lug

(2) Connect power cable to 115 volt, 60 cycle, single-phase source.

(3) Using Simpson Model 260 VOM or equivalent, measure voltage at convenience outlets on front panel of receiver; reading should be 115 volts.

2-4. INSPECTION AND ADJUSTMENT.

a. GENERAL. - Although each modular unit of the DDR-5B has been aligned and thoroughly checked against the manufacturer's specifications prior to shipment, it is necessary to insure correct installation and proper DDR-5B operating condition by performing the following checkout procedures. These procedures must be performed after the equipment is installed and prior to releasing the equipment to operating personnel. If the results of any particular procedure are unsatisfactory, refer to the appropriate modular-unit manual for remedial information. Special tools and test equipment required for inspection and adjustment procedures are listed in Tables 5-1 and 5-2 respectively.

NOTE

When checking the complete DDR-5B system, the procedures should be performed in the sequence given. However, if it is necessary to check any particular modular unit, the procedures in the paragraph covering that modular unit need only be performed.

When using any of the following procedures on an individual basis, ensure that all controls are returned to their normal operating condition upon completion.

b. PRELIMINARY OPERATIONS. - Refer to figure 3-1 for location of controls, and proceed as follows:

(1) Set switches and controls as listed below:

MODULAR UNIT	SWITCH OR CONTROL DESIGNATION	POSITION
Power Supply HFP-1	MAIN POWER	STANDBY (blowers should operate)
Audio Filter HAF-1	All controls	OUT
Detector and Audio Amplifier HFA-1	POWER	STANDBY
	CHANNEL A DETECTION	CW
	CHANNEL A BFO	O
	CHANNEL A LEVEL ADJUST	Mid-position
	CHANNEL B DETECTION	CW
	CHANNEL B BFO	O
	CHANNEL B LEVEL ADJUST	Mid-position

MODULAR UNIT	SWITCH OR CONTROL DESIGNATION	POSITION
Variable Notch Filter HNF-1	NOTCH	OFF
	NOTCH ADJUST	O
IF Amplifier HFI-1	MANUAL GAIN	Fully counterclockwise until switch clicks off
	CHANNEL A AGC DECAY	Fully counterclockwise
	CHANNEL A IF BANDWIDTH KC	6 DSB
	CHANNEL B AGC DECAY	Fully counterclockwise
	CHANNEL B IF BANDWIDTH KC	6 DSB
	AFC	OFF
Audio Switch Panel HSP-2	RECEIVER 1 SPEAKER CHANNEL*	A
	RECEIVER 1 SPEAKER VOLUME	Fully clockwise
	RECEIVER 2 SPEAKER CHANNEL**	_____
	RECEIVER 2 SPEAKER VOLUME**	_____
	AGC**	
Automatic Frequency Control AFC-3	SENSITIVITY	Fully clockwise
	TUNING KCS	O
	CARRIER SELECTOR	OSC
Control Synthesizer and Standard HFS-1	All controls	Position of controls is of no significance at this time
Continuous RF Tuner HFR-1	BAND	BAND 1 (2-3 Mc)
	TUNE	2.0 Mc
	TUNE/SYNC/OPERATE	SYNC
	NOISE SILENCER/OFF/ ALIGNMENT SIGNAL	_____

* Audio sync tone is heard only when this switch is set at A.
** This switch is not used.

(2) On Detector and Audio Amplifier HFA-1 set POWER switch (52) at OPERATE; STANDBY lamp (59) should go off and yellow TIME DELAY lamp (58) should light. After approximately 60 seconds, TIME DELAY lamps should go off and the red OPERATE lamp (57) should light. Nixie lights (10) of Control Synthesizer and Standard HFS-1 should indicate, and MEGACYCLE DIAL (1) of Continuous RF Tuner should be illuminated.

(3) Pull out Power Supply HFP-1. Using Simpson Model 260 VOM, check voltage at test points TP8001 and TP8002; if potential at TP8001 or TP8002 is not exactly 200 volts, adjust R8014 and/or R8025 until proper voltage is obtained. Push HFP-1 back into compartment.

c. CHECKOUT PROCEDURE FOR CONTROL SYNTHESIZER AND STANDARD HFS-1, HFO CIRCUITS OF CONTINUOUS RF TUNER HFR-1, AND SYSTEM STABILITY. - Proceed as follows:

NOTE

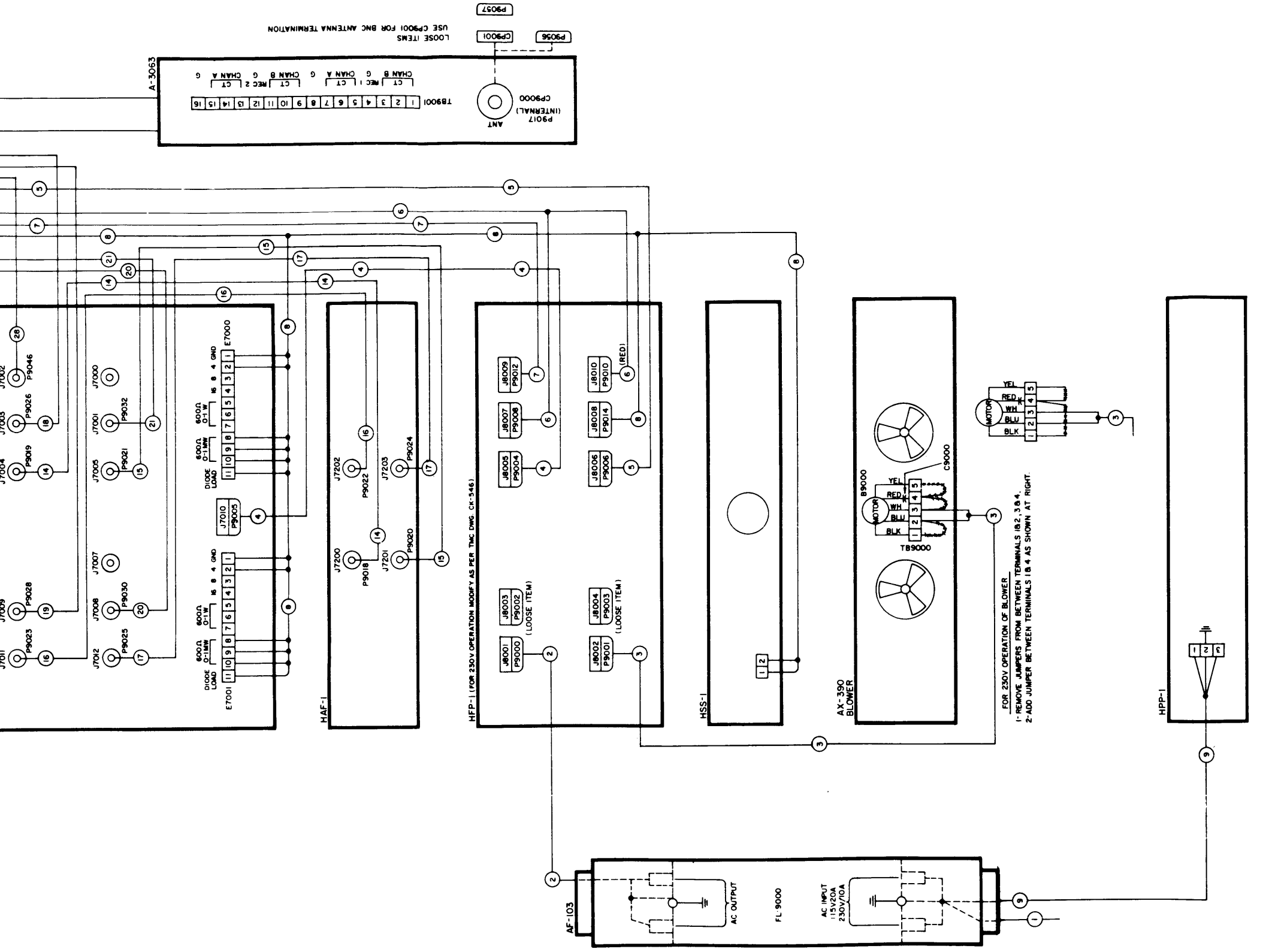
Numbers enclosed in parentheses are call-outs referenced to figure 3-1.

(1) Ensure that preliminary procedures outlined in paragraph 2-4, b have been completed.

(2) Remove plug from J1313 of Continuous RF Tuner HFR-1, and connect Hewlett Packard Model 524C Frequency Counter of equivalent to J1313.

(3) Set 1 MC nixie selector (14) of Control Synthesizer and Standard HFS-1 at position 2 (all other selectors should be in position 0).

(4) Carefully tune Continuous RF Tuner HFR-1 around 2.0 mc until a zero beat is obtained; SYNC IND lamp (3) may flicker until proper point is found.

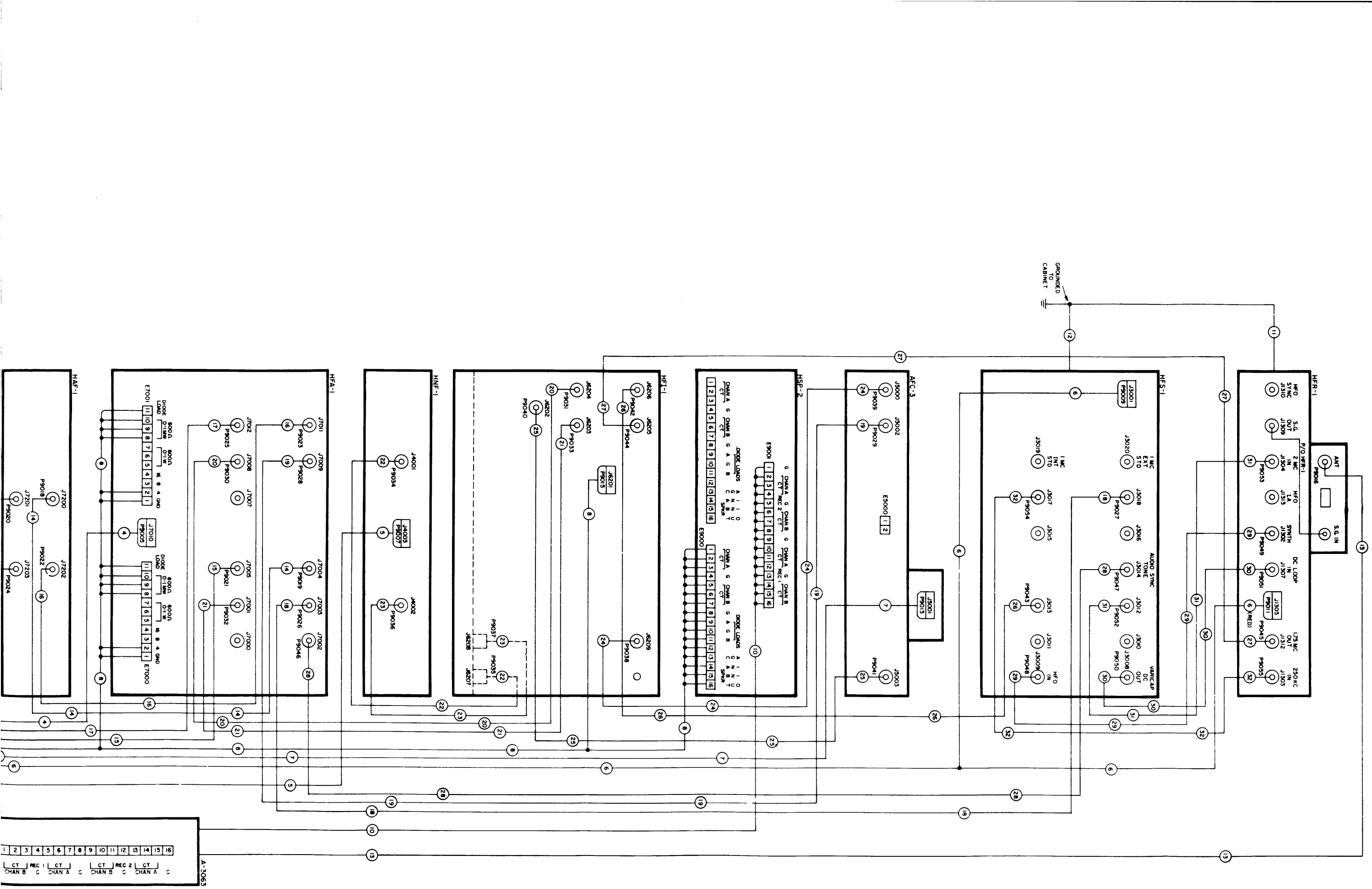


ITEM	PART NUMBER	DESCRIPTION	SYMBOL
32	CA-480-3-112	250 KC OUTPUT	
31	CA-480-3-128	2 MC OUTPUT	
30	CA-480-3-128	OSC. CONTROL VOLTAGE	
29	CA-480-3-112	HFO OUTPUT	
28	CA-480-3-140	AUDIO FREQ. SYNCH TONE	
27	CA-480-3-112	1.75 MC IF OUTPUT	
26	CA-480-3-128	2 MC CONVERTER INJ.	
25	CA-480-3-77	2 MC CONVERTER INJ.	
24	CA-480-3-90	250 KC IF OUTPUT, CHAN. A & B	
23	CA-480-3-97	250 KC IF OUTPUT, CHAN. A & B	
22	CA-480-3-97	250 KC IF OUTPUT, CHAN. A & B	
21	CA-480-3-112	250 KC IF OUTPUT, CHAN. A	
20	CA-480-3-112	250 KC IF OUTPUT, CHAN. B	
19	CA-480-3-97	250 KC OR RCC OUTPUT TO PRODUCT DET.	
18	CA-480-3-140	250 KC TO PRODUCT DET	
17	CA-480-3-72	AUDIO INTERCONNECT, CHAN. B	
16	CA-480-3-72	AUDIO INTERCONNECT, CHAN. B	
15	CA-480-3-72	AUDIO INTERCONNECT, CHAN. A	
14	CA-480-3-72	AUDIO INTERCONNECT, CHAN. A	
13	CA-480-3-97	ANTENNA INPUT	
12	CA-412-30-54.00	GROUND STRAP FOR HFS-1	W9010
11	CA-412-30-54.00	GROUND STRAP FOR HFR-1	W9009
10	CA-705-2	AUDIO OUTPUT	
9	CA-718	AC INPUT TO HPP-1	W9007
8	CA-703	POWER & AUDIO INTERCONNECT	
7	CA-687-2	POWER INTERCONNECT	
6	CA-704	POWER INTERCONNECT	
5	CA-687-1	POWER INTERCONNECT	
4	CA-686-1	POWER INTERCONNECT	
3	CA-706-1	AC INPUT TO BLOWER	
2	CA-696	AC INPUT TO HFP-1	
1		AC INPUT TO AF-103	

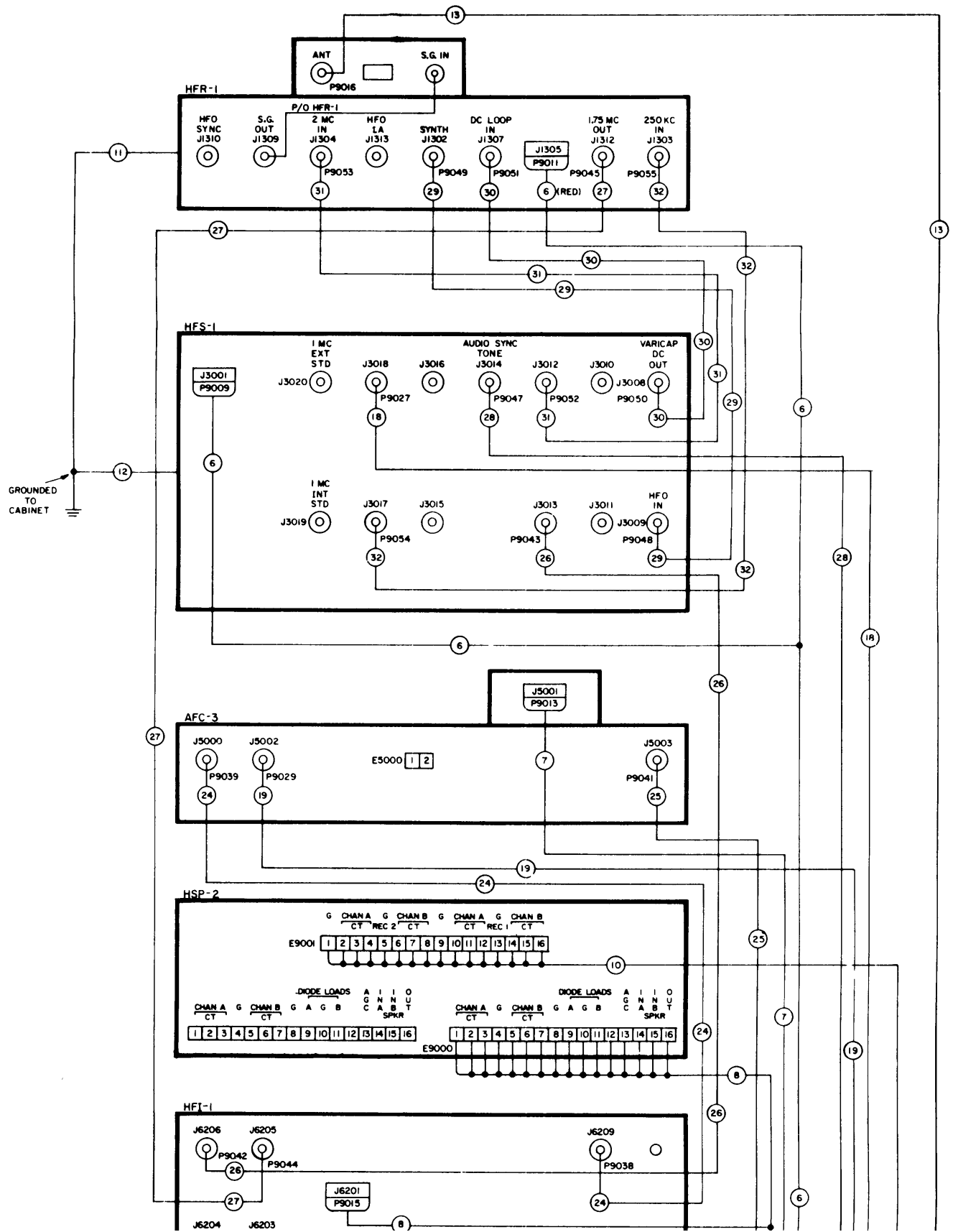
REV D — LIST OF MATERIAL

P9054, 9055 W9030 — P9052, 9053 W9029 — P9050, 9051 W9028 — P9048, 9049 W9027 — P9046, 9047 W9026 — P9044, 9045 W9025 — P9042, 9043 W9024 — P9040, 9041 W9023 — P9038, 9039 W9022 — P9036, 9037 W9021 — P9034, 9035 W9020 — P9032, 9033 W9019 — P9030, 9031 W9018 — P9028, 9029 W9017 — P9026, 9027 W9016 — P9024, 9025 W9015 — P9022, 9023 W9014 — P9020, 9021 W9013 — P9018, 9019 W9012 — P9016, 9017 W9011 — W9008, E9001 — P9014, 9015 W9006 — P9012, 9013 W9005 — P9008 THRU 9011 W9004 — P9006, 9007 W9003 — P9004, 9005 W9002 — W9001, P9001 — W9000, P9000 — TO BE INSTALLED BY CUSTOMER

Figure 2-3. Cabling Interconnections, DDR-5B



TEMS
0001 FOR BNC ANTENNA TERMINATION


ANT
P9016
S.G. IN
HFR-1
P/O HFR-1
HFO SYNC J1310
S.G. OUT J1309
2 MC IN J1304
HFO LA J1313
SYNTH J1302
DC LOOP IN J1307
J1305
P9011
1.75 MC OUT J1312
250 KC IN J1303
P9053
P9049
P9051
P9045
P9055
31
29
30
6 (RED)
27
32
HFS-1
J3001
P9009
1 MC EXT STD
J3020
J3018
J3016
AUDIO SYNC TONE
J3014
J3012
J3010
VARICAP DC OUT
J3008
P9027
P9047
P9052
P9050
18
28
31
30
1 MC INT STD
J3019
J3017
J3015
J3013
J3011
HFO IN
J3009
P9054
P9043
P9048
32
26
29
GROUNDED TO CABINET
J5001
P9013
AFC-3
J5000
J5002
E5000
1
2
7
J5003
P9039
P9029
P9041
24
19
25
HSP-2
G CHAN A CT G CHAN B CT REC 2
G CHAN A CT G CHAN B CT REC 1
E9001
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
10
DIODE LOADS
A G CHAN A CT
G CHAN B CT
G A G B
A I I O
G N N U
C A B T
SPKR
E9000
8
HFI-1
J6206
J6205
J6209
P9042
P9044
P9038
26
27
24
J6201
P9015
J6204
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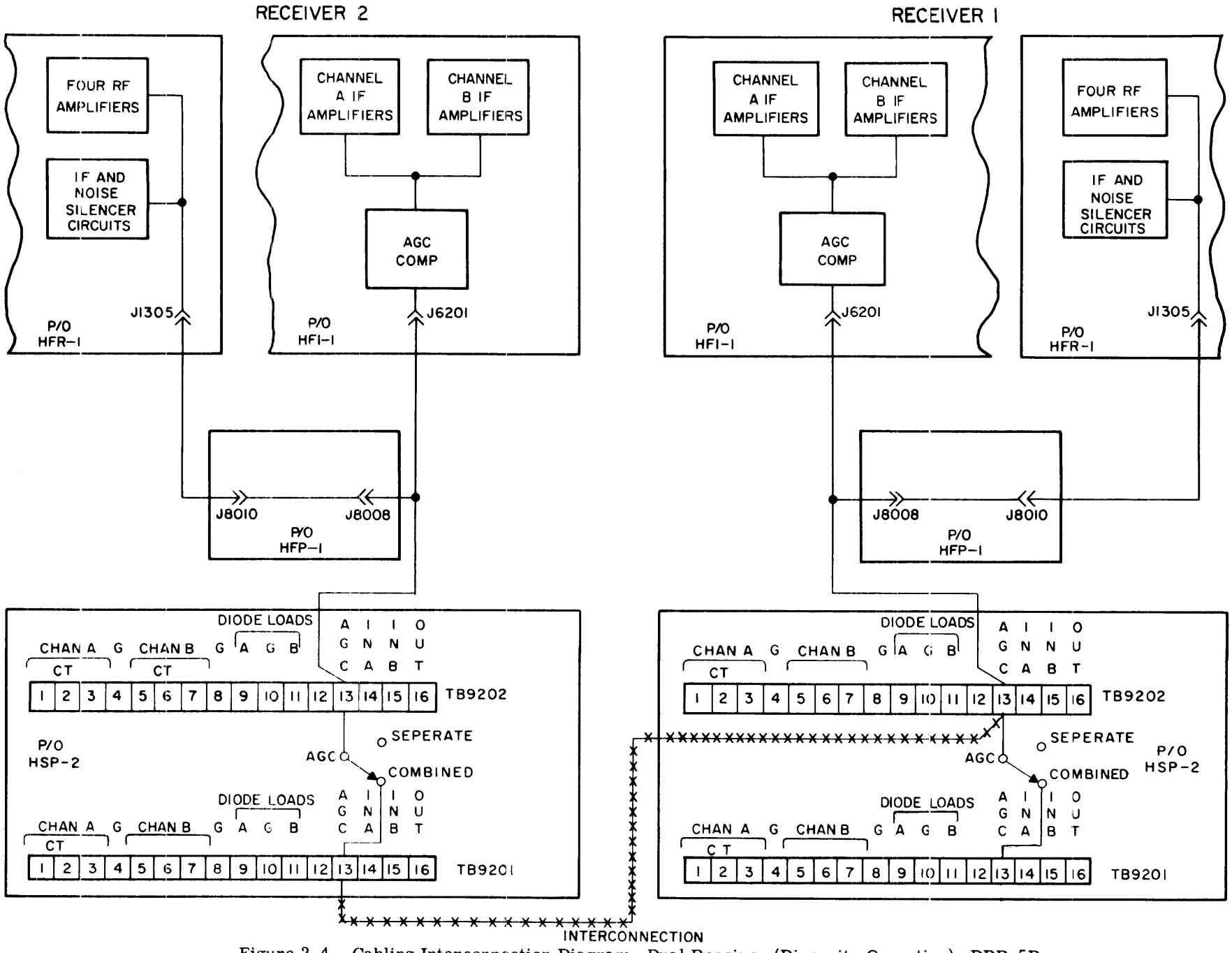


Figure 2-4. Cabling Interconnection Diagram, Dual Receiver (Diversity Operation), DDR-5B

(5) Set TUNE/SYNC/OPERATE switch (5) of HFR-1 at OPERATE; SYNC IND lamp should light, and reading on frequency counter should be 3.75 mc.

(6) Synchronize system at each of the frequencies indicated in HFR-1 TUNE CONTROL column of Table 2-1 as outlined in (a), (b), and (c) below. Compare frequency counter readings with those given in Table 2-1.

(a) Set TUNE/SYNC/OPERATE switch of HFR-1 at SYNC.

(b) Set appropriate HFS-1 nixie selectors (11 through 15) at positions indicated in Table 2-1.

(c) Carefully tune HFR-1 for zero beat at selected frequency.

(d) Set TUNE/SYNC/OPERATE switch of HFR-1 at OPERATE; SYNC IND lamp should light.

TABLE 2—1. BAND 1 (2-3 MC) SYNCHRONIZATION, DDR-5B

a. 100 KC SEL SET AT:	HFR-1 TUNE CONTROL	FREQ. COUNTER
1	2.1 mc	3.85 mc
2	2.2 mc	3.95 mc
3	2.3 mc	4.05 mc
4	2.4 mc	4.15 mc
5	2.5 mc	4.25 mc
6	2.6 mc	4.35 mc
7	2.7 mc	4.45 mc
8	2.8 mc	4.55 mc
9	2.9 mc	4.65 mc
b. 100 KC SEL AT POS. 9 AND 10 KC SET AT:	HFR-1 TUNE CONTROL	FREQ. COUNTER
1	2.91 mc	4.66 mc
2	2.92 mc	4.67 mc
3	2.93 mc	4.68 mc
4	2.94 mc	4.69 mc
5	2.95 mc	4.70 mc
6	2.96 mc	4.71 mc
7	2.97 mc	4.72 mc
8	2.98 mc	4.73 mc
9	2.99 mc	4.74 mc
c. 100 KC AND 10 KC SEL AT POS. 9 AND 1 KC SEL AT:	HFR-1 TUNE CONTROL	FREQ. COUNTER
1	2.991 mc	4.741 mc
2	2.992 mc	4.742 mc
3	2.993 mc	4.743 mc
4	2.994 mc	4.744 mc
5	2.995 mc	4.745 mc
6	2.996 mc	4.746 mc
7	2.997 mc	4.747 mc
8	2.998 mc	4.748 mc
9	2.999 mc	4.749 mc
d. 100 KC AND 10 KC SEL AT POS. 9 AND .1 KC SEL AT:	HFR-1 TUNE CONTROL	FREQ. COUNTER
1	2.9991 mc	4.7491 mc
2	2.9992 mc	4.7492 mc
3	2.9993 mc	4.7493 mc
4	2.9994 mc	4.7494 mc
5	2.9995 mc	4.7495 mc
6	2.9996 mc	4.7496 mc
7	2.9997 mc	4.7497 mc
8	2.9998 mc	4.7498 mc
9	2.9999 mc	4.7499 mc

(7) Restore 100 KC, 10 KC and .1 KC nixie selectors of Control Synthesizer and Standard HFS-1 to position 0, and set 1 MC nixie selector at position 3. Synchronize system at 3 mc in accordance with procedure outlined in step (6) above. Reading on frequency counter should be 4.75 mc.

(8) Set 1 MC nixie selector as indicated below and synchronize system at indicated frequencies of each band in accordance with procedure outlined in step (6) above. Frequency ounter reading should be 1.75 above the selected frequency.

1 MC SELECTOR POSITION	BAND	TUNE CONTROL	FREQ. COUNTER
3	2	3 mc	4.75 mc
4	2	4 mc	5.75 mc
4	3	4 mc	5.75 mc
5	3	5 mc	6.75 mc
6	3	6 mc	7.75 mc
6	4	6 mc	7.75 mc
7	4	7 mc	8.75 mc
8	4	8 mc	9.75 mc
8	5	8 mc	9.75 mc
9	5	9 mc	10.75 mc
10	5	10 mc	11.75 mc
11	5	11 mc	12.75 mc
12	5	12 mc	13.75 mc
12	6	12 mc	13.75 mc
13	6	13 mc	14.75 mc
14	6	14 mc	15.75 mc
15	6	15 mc	16.75 mc
16	6	16 mc	17.75 mc
16	7	16 mc	17.75 mc
17	7	17 mc	18.75 mc
18	7	18 mc	19.75 mc
19	7	19 mc	20.75 mc
20	7	20 mc	21.75 mc
21	7	21 mc	22.75 mc
22	7	22 mc	23.75 mc
23	7	23 mc	24.75 mc
24	7	24 mc	25.75 mc
24	8	24 mc	25.75 mc

1 MC SELECTOR POSITION	BAND	TUNE CONTROL	FREQ. COUNTER
25	8	25 mc	26.75 mc
26	8	26 mc	27.75 mc
27	8	27 mc	28.75 mc
28	8	28 mc	29.75 mc
29	8	29 mc	30.75 mc
30	8	30 mc	31.75 mc
31	8	31 mc	32.75 mc

(9) Using procedure outlined in step (6) above, synchronize system at 15 mc. Tune Continuous RF Tuner HFR-1 slightly to both sides of 15 mc, and check for swing of SYNCHRONIZE meter (2).

(10) Set TUNE/SYNC/OPERATE switch (5) at TUNE; SYNCHRONIZE meter (9) should be centered. If SYNCHRONIZE meter is not centered, adjust R1320 as required to center meter circuit.

(11) Return TUNE/SYNC/OPERATE switch to OPERATE and tune HFR-1 until SYNC IND lamp (3) goes out and SYNCHRONIZE meter returns to center. If SYNCHRONIZE meter does not return to center of its scale, adjust R3442 on 3400 deck of Control Synthesizer and Standard HFS-1 unit as required to center the meter.

(12) Remove frequency counter from J1313, and replace plug removed in step (1).

d. CHECKOUT PROCEDURE FOR AUTOMATIC FREQUENCY CONTROL AFC-3. - Proceed as follows:

NOTE

Numbers enclosed in parentheses are callouts referenced on figure 3-1.

(1) Ensure that preliminary procedures described in paragraph 3-4, b have been completed.

(2) Synchronize system at any frequency. If necessary, refer to step (6) of paragraph 2-4, c for proper synchronizing procedure.

(3) Set AFC switch (32) of IF Amplifier HFI-1 at ON.

(4) Set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch (4) of Continuous RF Tuner HFR-1 at ALIGNMENT SIGNAL.

(5) Depress and hold down RESET button (24) on Automatic Frequency Control AFC-3. Adjust TUNING KCS control (20) for maximum indication of CARRIER LEVEL meter (19); CARRIER LEVEL meter should indicate in green portion of scale. Release RESET button.

(6) Check CARRIER FADE lamp (18) and AFC ALARM lamp (23) of AFC-3; they should not be lit. AFC DRIFT meter (22) should remain at zero center scale.

(7) Set CARRIER SELECTOR switch (17) of AFC-3 at RCC; there should be no change in indications.

(8) Set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch of Continuous RF Tuner HFR-1 at OFF; pointer of CARRIER LEVEL meter on AFC-3 should deflect and CARRIER FADE lamp should light. Return NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch to ALIGNMENT SIGNAL.

(9) Turn SENSITIVITY control (21) of Automatic Frequency Control AFC-3 fully counterclockwise; CARRIER FADE lamp should light and pointer of CARRIER LEVEL meter should deflect. Turn SENSITIVITY control fully clockwise.

(10) Set CARRIER SELECTOR switch of AFC-3 at OSC. Set AFC switch of IF Amplifier HFI-1 at OFF.

e. CHECKOUT PROCEDURE FOR IF AMPLIFIER HFI-1. - Proceed as follows:

NOTE

This procedure also checks Detector and Audio Amplifier HFA-1 in the SSB mode of operation; it also checks the tuning of Automatic Frequency Control AFC-3. Numbers enclosed in parenthesis are callouts referenced to figure 3-1.

(1) Ensure that preliminary procedures outlined in paragraph 2-4, b have been completed.

(2) Synchronize system at any frequency. If necessary, refer to step (6) of paragraph 2-4, c for proper syncrhonizing procedure.

(3) Ensure that NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch (4) of Continuous RF Tuner HFR-1 is set at ALIGNMENT SIGNAL.

(4) Ensure that MANUAL GAIN control (30) of IF Amplifier HFI-1 is turned fully counterclockwise.

(5) Remove screws securing HFI-1 front panel to equipment rack and pull HFI-1 out until compartment tracks lock in extended position. Ensure that HFI-1 is securely locked in position, and proceed as follows:

(a) Set CHANNEL A IF BANDWIDTH KC switch (35) and CHANNEL B IF BANDWIDTH KC switch (34) at 1 DSB and blank position respectively.

(b) Adjust R116 on 1 KC SYM strip for 1 volt reading on CHANNEL A OUTPUT meter (31), and lock adjustment. 1 volt reading on CHANNEL A OUTPUT meter corresponds to .707 volts rms into a 50-ohm load at J102 on i-f strip.

(c) Set CHANNEL B IF BANDWIDTH KC switch at 1 DSB; CHANNEL A OUTPUT and CHANNEL B OUTPUT meters should read approximately 1 volt. Set CHANNEL B IF BANDWIDTH KC switch at blank position.

(d) Using procedure outlined in steps (a), (b), and (c) above, adjust 6 KC SYM and 15 KC SYM i-f strips for 1 volt reading on CHANNEL A OUTPUT meter. Set CHANNEL A IF BANDWIDTH KC and CHANNEL B IF BANDWIDTH KC switches at corresponding 6 DSB or 15 DSB position during adjustment.

(e) Set AFC switch (32) at ON.

(6) Set CHANNEL A DETECTION switch (46) and CHANNEL B DETECTION switch (43) of Detector and Audio Amplifier HFA-1 at SSB.

(7) On Automatic Frequency Control AFC-3, adjust SENSITIVITY control (21) fully counterclockwise, depress RESET button (24) for approximately six seconds, and turn TUNING KCS control (20) midway between 0 and -3. Pointer of CARRIER LEVEL meter (19) will deflect and CARRIER FADE lamp (18) will light.

(8) Using procedure outlined in steps (5a), (5b), (5c) above, adjust 3.5 KC USB and 7.5 KC USB i-f strips of IF Amplifier HFI-1 for 1 volt reading on CHANNEL A OUTPUT meter. Set CHANNEL A IF BANDWIDTH KC and CHANNEL B IF BANDWIDTH KC controls at corresponding 3.5 U SSB or 7.5 U SSB position during adjustment.

(9) Set TUNING KCS control of Automatic Frequency Control AFC-3 midway between 0 and +3.

(10) Using procedure outlined in steps (5a), (5b), and (5c) above, adjust 3.5 KC LSB and 7.5 KC LSB i-f strips for 1 volt reading on CHANNEL A OUTPUT meter. Set CHANNEL A IF BANDWIDTH KC controls at corresponding 3.5 L SSB or 7.5 L SSB position during adjustment.

(11) Turn AFC switch of IF Amplifier HFI-1 to OFF; turn TUNING KCS control of Automatic Frequency Control AFC-3 to 0; turn NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch of Continuous RF Tuner HFR-1 to OFF.

(12) Replace cover on IF Amplifier HFI-1, slide unit into compartment, and secure panel to equipment rack with screws.

f. CHECKOUT PROCEDURE FOR AGC DECAY CIRCUIT. - Proceed as follows:

NOTE

Numbers enclosed in parentheses are callouts referenced to figure 3-1.

(1) Ensure that procedures outlined in paragraph 2-4, b have performed.

(2) Ensure that CHANNEL A AGC DECAY control (36), CHANNEL B AGC DECAY control (33), and MANUAL GAIN control (30) of IF Amplifier HFI-1 are turned fully counterclockwise.

(3) Rotate MANUAL GAIN control of HFI-1 slightly clockwise until switch clicks on. RF LEVEL meter (9) on Continuous RF Tuner HFR-1 should indicate maximum; meter may be pegged.

(4) Slowly rotate MANUAL GAIN control of IF Amplifier HFI-1 to full clockwise position; pointer on RF LEVEL meter of HFR-1 should follow.

(5) Rotate MANUAL GAIN control of HFI-1 counterclockwise to point just before switch clicks off; RF LEVEL meter of Continuous RF Tuner HFR-1 should again indicate maximum.

(6) Rotate CHANNEL A AGC DECAY and CHANNEL B AGC DECAY controls of IF Amplifier HFI-1 fully clockwise; rotate MANUAL GAIN control fully counterclockwise to OFF. Reading on RF LEVEL meter of HFR-1 should decay to zero in approximately 15 to 20 seconds.

g. CHECKOUT PROCEDURE FOR DETECTOR AND AUDIO AMPLIFIER HFA-1. - Proceed as follows:

NOTE

Numbers enclosed in parentheses are callouts referenced to figure 3-1.

(1) Ensure that procedures outlined in paragraph 2-4, b have been performed.

(2) Check to see that AGC DECAY controls (33 and 36) of IF Amplifier HFI-1 are set at fully clockwise position.

(3) Ensure that Detector and Audio Amplifier HFA-1 controls are set in positions listed below:

CONTROL	POSITION
CHANNEL A LEVEL ADJUST (49) and CHANNEL B LEVEL ADJUST (42)	Mid position
LOAD switch (Channel A and B). These switches are located on top rear portion of HFA-1 chassis.	OUT
CHANNEL A DETECTION (46) and CHANNEL B DETECTION (43)	CW

(4) Synchronize system at any frequency. If necessary, refer to step (6) of paragraph 2-4, c for proper synchronizing procedure.

(5) Set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch (4) of Continuous RF Tuner HFR-1 at ALIGNMENT SIGNAL.

(6) Adjust CHANNEL A BFO control (50) and CHANNEL B BFO control (40) of Detector and Audio Amplifier HFA-1 for maximum indication on respective CHANNEL A LINE LEVEL meter.

(7) Adjust CHANNEL A LEVEL ADJUST control and CHANNEL B LEVEL ADJUST control of HFA-1 for 0 VU indication on respective LINE LEVEL meters.

(8) Set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch of Continuous RF Tuner HFR-1 at OFF.

(9) Set CHANNEL A DETECTION and CHANNEL B DETECTION switches of Detector and Audio Amplifier HFA-1 at AM.

(10) Set CHANNEL A IF BANDWIDTH KC switch (35) and CHANNEL B IF BANDWIDTH KC switch (34) of IF Amplifier HFI-1 at 15 DSB.

(11) Remove screws securing Detector and Audio Amplifier HFA-1 front panel to equipment rack, and pull HFA-1 out until compartment tracks lock in extended position. Ensure that HFA-1 is securely locked in position.

(12) Connect signal generator, Measurements Corp. Model 82 or equivalent, to J1001 of Continuous RF Tuner HFR-1. Adjust signal generator for frequency selected in step (4) above; modulate signal 30% with 1 kc. Adjust signal generator output to 10 uv.

(13) Check to see that system is still synchronized at frequency selected in step (4).

(14) With RECEIVER 1 SPEAKER CHANNEL switch (28) of Audio Switch Panel HSP-2 set at A, adjust signal generator frequency until a 1 kc tone is heard. RF LEVEL meter of Continuous RF Tuner HFR-1 should indicate approximately 20 db above 1 uv.

(15) Plug headphones into CHANNEL A PHONES jack (47) of Detector and Audio Amplifier HFA-1. Rotate CHANNEL A MONITOR control (48); volume of 1 kc tone should vary.

(16) Set RECEIVER 1 SPEAKER CHANNEL switch of Audio Switch Panel HSP-2 at B; 1 kc tone should be heard.

(17) Plug headphones into CHANNEL B PHONES jack (44) of HFA-1. Rotate CHANNEL B MONITOR control (45); volume of 1 kc tone should vary.

(18) Remove signal generator from J1001 of Continuous RF Tuner HFR-1.

(19) Remove headphones from CHANNEL B PHONES jack of Detector and Audio Amplifier HFA-1; slide HFA-1 into compartment and secure front panel to equipment rack with screws.

h. CHECKOUT PROCEDURE FOR AUDIO FILTER HAF-1. - Proceed as follows:

NOTE

Numbers enclosed in parentheses are callouts referenced to figure 3-1.

(1) Ensure that preliminary procedures described in paragraph 2-4, b have been performed.

(2) Synchronize system at any frequency. If necessary, refer to step (6) of paragraph 2-4, c for proper synchronizing procedure.

(3) Check to see that CHANNEL A AGC DECAY control (36) and CHANNEL B AGC DECAY control (33) of IF Amplifier HFI-1 are set at fully clockwise position.

(4) Set HFR-1, HFA-1, HFI-1 and HSP-2 controls as listed below:

MODULAR UNIT	CONTROL	POSITION
Continuous RF Tuner HFR-1	NOISE SILENCER/OFF/ ALIGNMENT SIGNAL (4)	ALIGNMENT SIGNAL
Detector and Audio Amplifier HFA-1	CHANNEL A DETECTION (46) and CHANNEL B DETECTION	CW

MODULAR UNIT	CONTROL	POSITION
IF Amplifier HFI-1	CHANNEL A IF BANDWIDTH KC (35) and CHANNEL B IF BANDWIDTH KC (34)	15 DSB
Audio Switch Panel	RECEIVER 1 SPEAKER CHANNEL (28)	A

(5) Set CHANNEL A HIGH CUTOFF switch (55) and CHANNEL A LOW CUTOFF switch (56) of Audio Filter HAF-1 at 5 kc position.

(6) Adjust CHANNEL A BFO control (50) of Detector and Audio Amplifier HFA-1 for a peak on CHANNEL A LINE LEVEL meter (51); peak should occur at +5 kc and -5 kc approximately.

(7) Repeat steps (5) and (6) above for 2.5 kc, 1 kc, .5 kc, .25 kc and .1 kc positions of CHANNEL A HIGH CUTOFF and CHANNEL A LOW CUTOFF switches of Audio Filter HAF-1. Adjustment of BFO in .25 kc and .1 kc position will be critical.

(8) Set CHANNEL A HIGH CUTOFF and CHANNEL B LOW CUTOFF switches of HAF-1 at OUT.

(9) Set RECEIVER 1 SPEAKER CHANNEL switch of Audio Switch Panel HSP-2 at B, and use procedures outlined in steps (5), (6), and (7) above to check Channel B high cutoff and low cutoff filter networks.

(10) Upon completion, set HAF-1, HFR-1, HSP-2, and HFI-1 controls as listed below:

MODULAR UNIT	CONTROL	POSITION
HAF-1	CHANNEL B HIGH CUTOFF and CHANNEL B LOW CUTOFF	OUT
HFR-1	NOISE SILENCER/OFF/ALIGNMENT SIGNAL	OFF
HSP-2	RECEIVER 1 SPEAKER CHANNEL	A
HFI-1	CHANNEL A AGC DECAY and CHANNEL B AGC DECAY	Fully counterclockwise

(11) Check to see that MANUAL GAIN control (30) of HFI-1 is set at fully counterclockwise position.

i. CHECKOUT PROCEDURE FOR SENSITIVITY AND AGC. - Proceed as follows:

NOTE

Number enclosed in parentheses are callouts referenced to figure 3-1.

(1) Ensure that preliminary procedures outlined in paragraph 2-4, b have been completed.

(2) Set Continuous RF Tuner HFR-1 controls as listed below:

CONTROL	POSITION
BAND (2)	BAND 1 (2-3 Mc)
TUNE (8)	2.5 Mc
TUNE/SYNC/OPERATE (5)	SYNC
NOISE SILENCER/OFF/ ALIGNMENT SIGNAL (4)	OFF

(3) Tune Control Synthesizer and Standard HFS-1 to 02.5000 mc.

(4) Set CHANNEL A IF BANDWIDTH KC control (35) and CHANNEL B IF BANDWIDTH KC control (34) of IF Amplifier HFI-1 at 6 DSB and blank position respectively.

(5) Set CHANNEL A DETECTION switch (46) of Detector and Audio Amplifier HFA-1 at CW.

(6) Carefully tune Continuous RF Tuner HFR-1 to obtain zero beat at 2.5 mc; set TUNE/SYNC/OPERATE and NOISE SILENCER/OFF/ALIGNMENT SIGNAL switches of HFR-1 at OPERATE and ALIGNMENT SIGNAL respectively.

(7) Using CHANNEL A BFO control (50) of Detector and Audio Amplifier HFA-1 obtain a zero beat then turn NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch of Continuous RF Tuner HFR-1 to OFF.

(8) Connect 20 db pad to output of signal generator, Measurements Corp. Model 82 or equivalent, and connect output of pad to J1001 of HFR-1.

(9) Adjust signal generator for unmodulated 2.5 mc signal at 100,000 uv output level. Vernier tune signal generator for zero beat in loudspeaker. RF LEVEL meter of HFR-1 should read approximately 60 to 80 db above 1 uv.

(10) Reduce signal generator output to zero; reading on RF LEVEL meter of Continuous RF Tuner HFR-1 should fall to zero.

(11) Slowly increase signal generator output, note generator output at instant that pointer of RF LEVEL meter deflects from zero; deflection should occur at approximately 10 uv output. 10 uv corresponds to sensitivity of 1 uv due to 20 db pad (sensitivity-generator output divided by 10).

(12) Return signal generator output to 100,000 uv, and adjust CHANNEL A BFO control of Detector and Audio Amplifier HFA-1 for maximum indication on CHANNEL A LINE LEVEL meter. Adjust CHANNEL A LEVEL ADJUST control of HFA-1 for 0 uv indication.

(13) Decrease signal generator output; reading on CHANNEL A LINE LEVEL meter should not change more than 3 db from 0 uv level.

(14) Repeat steps (2) through (13) above for the following frequencies: 3.5 mc, 5 mc, 7 mc, 10 mc, 14 mc, 20 mc, and 28 mc.

j. SIGNAL PLUS NOISE/NOISE CHECKOUT PROCEDURE. - Proceed as follows:

NOTE

Numbers enclosed in parentheses are callouts referenced to figure 3-1.

(1) Ensure that preliminary procedures outlined in paragraph 2-4, b have been completed. Connect signal generator to J1001 of Continuous RF Tuner HFR-1 through 20 db pad.

(2) Tune Continuous RF Tuner HFR-1 and Control Synthesizer and Standard HFS-1 to 2.5 mc. Set TUNE/SYNC/OPERATE switch (5) of HFR-1 at SYNC; tune HFR-1 around 2.5 mc, and obtain zero beat. Set TUNE/SYNC/OPERATE switch at OPERATE.

(3) Set HFI-1 and HFA-1 controls as follows:

MODULAR UNIT	CONTROL	POSITION
IF Amplifier HFI-1	CHANNEL A IF BANDWIDTH KC (35)	15 DSB
Detector and Audio Amplifier HFA-1	CHANNEL A DETECTION (46)	Blank position

(4) Remove screws securing front panel of Detector and Audio Amplifier HFA-1 to equipment rack, and pull HFA-1 out until compartment tracks lock in extended position. Connect Ballentine Model 314 AC VTVM to terminals 5 and 7 of Channel A terminal strip E7000.

(5) Adjust signal generator for 2.5 mc signal at 10 uv output.

(6) Set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch (4) of Continuous RF Tuner HFR-1 at ALIGNMENT SIGNAL. Adjust CHANNEL A BFO control (50) of Detector and Audio Amplifier HFA-1 for zero beat in loudspeaker, and turn NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch to OFF.

(7) Adjust signal generator output frequency to obtain approximate 500 cycle tone in loudspeaker.

(8) Adjust CHANNEL A LEVEL ADJUST control (49) on Detector and Audio Amplifier HFA-1 for 0 VU indication on CHANNEL A LINE LEVEL meter (51).

(9) Adjust VTVM for 10 v full scale range.

(10) Set MANUAL GAIN control (30) of IF Amplifier HFI-1 for 10 v full scale reading on VTVM.

(11) Disconnect output of signal generator, and note decrease in VTVM reading; reading should be down at least 15 db.

(12) Repeat steps (2) through (11) above for 14 mc and 28 mc frequencies.

(13) Remove signal generator and VTVM, and return MANUAL GAIN control of HFI-1 to fully counter-clockwise position.

(14) Slide Detector and Audio Amplifier HFA-1 into compartment, and secure front panel to equipment rack with screws.

k. FINAL NOISE SILENCER CHECKOUT PROCEDURE. - Proceed as follows:

NOTE

Numbers enclosed in parentheses are callouts referenced to figure 3-1.

(1) Ensure that preliminary procedures outlined in pargraph 2-4, b have been completed.

(2) Tune Continuous RF Tuner HFR-1 and Control Synthesizer and Standard HFS-1 to 15 mc; set HFR-1, HSP-2, HFI-1, and HFA-1 controls as listed below.

(3) Tune Continuous RF Tuner HFR-1 around 15 mc until zero beat is obtained, and turn TUNE/SYNC/OPERATE switch of HFR-1 to OPERATE.

MODULAR UNIT	CONTROL	POSITION
Continuous RF Tuner HFR-1	TUNE/SYNC/OPERATE (5)	SYNC SYNC
	NOISE SILENCER/OFF ALIGNMENT SIGNAL (4)	NOISE SILENCER
Audio Switch Panel HSP-2	RECEIVER 1 SPEAKER CHANNEL (28)	A
	RECEIVER 1 SPEAKER VOLUME (29)	Fully clockwise
Detector and Audio Amplifier HFA-1	CHANNEL A DETECTION (46)	CW
	CHANNEL A LEVEL ADJUST (49)	Fully clockwise
	CHANNEL A BFO (50)	0 (to obtain tone if any)
IF Amplifier HFI-1	CHANNEL A IF BANDWIDTH KC (35)	15 DSB

(4) Remove screws securing front panel of HFR-1 to equipment rack, and pull HFR-1 out until compartment track locks in extended position. Loosen locknut of L1203, and adjust L1203 for minimum background noise and zero indication of RF LEVEL meter. Background noise will increase on either side of correct adjustment. Tighten L1203 locknut.

NOTE

R1210 may have some effect on correct adjustment of L1203.

(5) Set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch of HFR-1 at OFF.

(6) Slide HFR-1 into compartment, and secure front panel to equipment rack with screws.

1. TWO TONE TEST. - Proceed as follows:

NOTE

Numbers enclosed in parentheses are callouts referenced to figure 3-1.

(1) Ensure that preliminary procedures outlined in paragraph 2-4, b have been completed.

(2) Set up test equipment as shown in connection diagram figure 2-5.

NOTE

A sideband generator system with Model CBE Sideband Exciter may be used in place of the two signal generators.

(3) Set CHANNEL A AGC DECAY control (36) and CHANNEL B AGC control (33) of IF Amplifier HFI-1 fully clockwise.

(4) Using frequency counter to determine correct frequency, set signal generator A at 2.501 mc with 0.3 volts output.

(5) Connect frequency counter to the "T" at signal generator B. Using frequency counter to determine correct frequency, adjust signal generator B to 2.501575 mc, with .3 volts output.

(6) Set Control Synthesizer and Standard HFS-1 nixie selectors for 2.5 mc, and carefully tune Continuous RF Tuner HFR-1 for zero beat at 2.5 mc. Set TUNE/SYNC/OPERATE switch (5) of HFR-1 at OPERATE. Perform steps (3) through (10).

(7) Connect Channel A i-f output of IF Amplifier HFI-1 at J6203 to signal input jack of spectrum analyzer.

(8) Set CHANNEL A IF BANDWIDTH KC control (35) of HFI-1 at 3.5 U SSB.

(9) Adjust spectrum analyzer for oscilloscope presentation and measure amplitude of third order products; these should be down at least 40 db, as shown on figure 2-6.

(10) Upon completion, leave test equipment set up for HNF-1 checkout procedure (paragraph 2-4, m).

m. CHECKOUT PROCEDURE FOR VARIABLE NOTCH FILTER HNF-1. - Proceed as follows:

NOTE

Numbers enclosed in parentheses are callouts referenced to figure 3-1.

(1) Ensure that preliminary procedures outlined in paragraph 2-4, b have been completed.

(2) Ensure that signal generators and frequency counter care connected as shown in figure 2-5. Ensure that steps (3) through (10) of the Two Tone Test (paragraph 2-4, n) have been completed.

(3) Set NOTCH control (38) of Variable Notch Filter HNF-1 at ON.

(4) Observe spectrum analyzer while simultaneously rotating NOTCH ADJUST control (39) of HNF-1 to eliminate each tone in succession.

(5) Remove all test equipment, and restore HNF-1 controls to normal.

NOTE

In complete DDR-5B system checkout, this is the last checkout procedure. Remove all test equipment, restore all controls to positions noted in step (4) of paragraph 2-4, b.

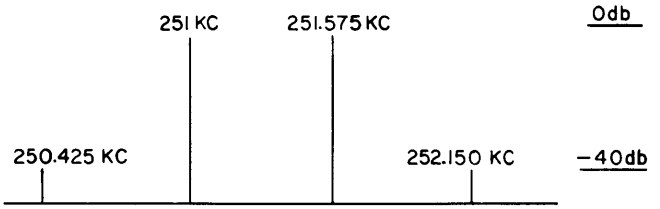


Figure 2-6. Scope Picture, Two Tone Test, DDR-5B

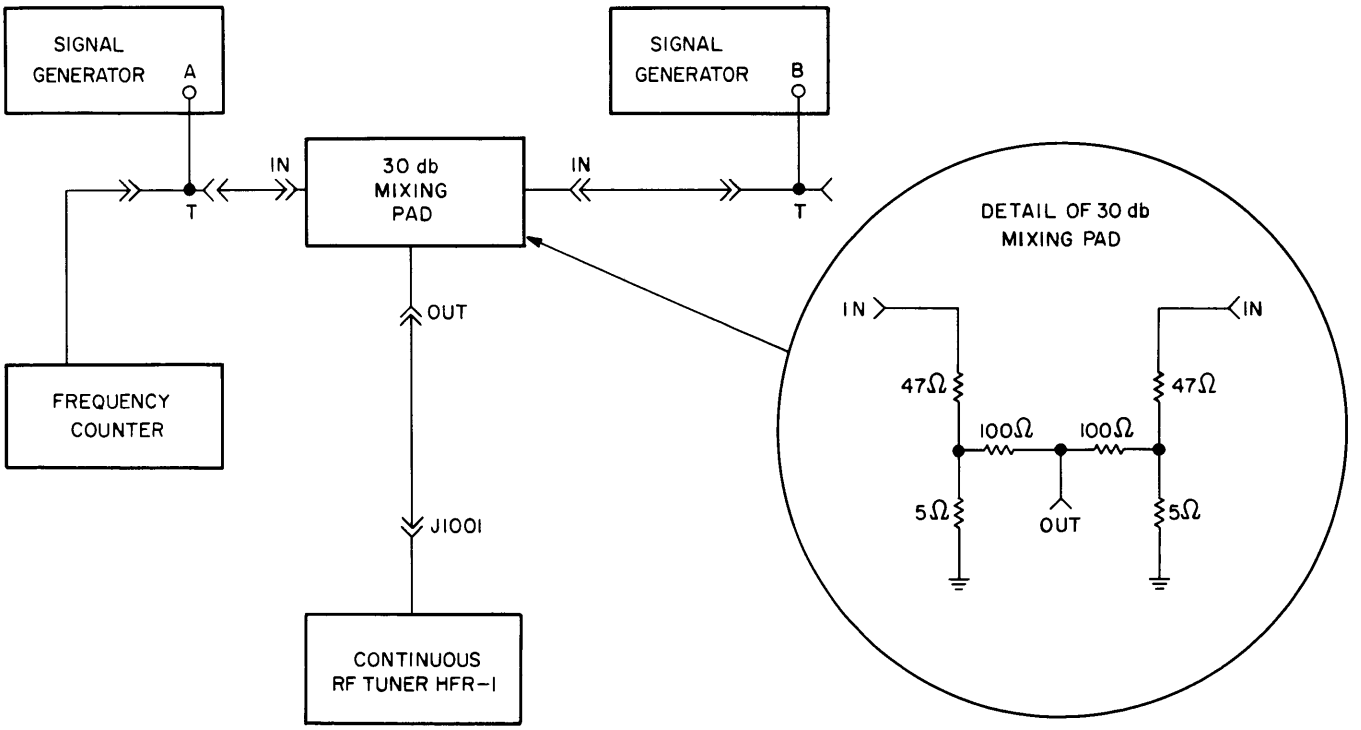


Figure 2-5. Connection Diagram for Two Tone Test, DDR-5B

SECTION 3

OPERATOR'S SECTION

3-1. GENERAL.

Paragraphs 3-3, a through 3-3, h provide instructions for operating the DDR-5B. Operating procedures for two complete DDR-5B's as used in space-diversity or frequency-diversity reception are similar to those given in paragraphs 3-3, a through 3-3, h and therefore will not be discussed in this manual.

3-2. CONTROLS AND INDICATORS.

a. FRONT PANEL. - Figure 3-1 illustrates the location of all DDR-5B front-panel controls and indicators used during normal operation with the exception of the MAIN POWER switches (refer to paragraph 3-2, b). Figure 3-1 is arranged as a pullout page in order that it may serve as a reference for procedures given in Sections 2, 3, and 4. Table 3-1 lists the controls and indicators and the function of each.

b. MAIN POWER SWITCHES. - One MAIN POWER switch is located on the rear apron of the HFP-1 chassis. These switches must be set at STANDBY during DDR-5B operation.

TABLE 3—1. CONTROLS AND FUNCTIONS, DDR-5B

MODULAR UNIT	SERIAL DESIGNATION (Figure 3-1)	PANEL DESIGNATION	FUNCTION
Continuous RF Tuner HFR-1	1	MEGACYCLES	Displays r-f band selected by operation of BAND control knob; refer to serial designation 2.
	2	BAND	Rotates illuminated MEGACYCLE dial to the desired r-f band. R-f bands are arranged as follows: 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 16-24 mc BAND 8 24-32 mc
	3	SYNC IND	Lights to indicate that the system is synchronized. This indicator functions only when HFR-1 is operating synthesized.
	4	NOISE SILENCER/ OFF/ALIGN-MENT SIGNAL	NOISE SILENCER position activates noise silencer circuits; disables alignment signal generator, and connects ANT input jack to first r-f amplifier circuit. OFF position disables output of noise silencer, disables alignment signal generator, and connects ANT input jack to first r-f amplifier circuit.

TABLE 3—1. CONTROLS AND FUNCTIONS, DDR-5B (CONT'D)

MODULAR UNIT	SERIAL DESIGNATION (Figure 3-1)	PANEL DESIGNATION	FUNCTION
Continuous RF Tuner HFR-1 (cont)			ALIGNMENT SIGNAL position activates alignment signal generator, disables output of noise silencer, and connects CAL input jack to first r-f amplifier circuit.
	5	TUNE/SYNC/ OPERATE	TUNE position grounds d-c correction voltage from synthesizer causing HFO circuits to free run, and de-energizes audio tone relay of HFA-1 to remove audio sync sync tone from Channel A audio amplifier. In this position, SYNCHRONIZE meter should read zero center scale. SYNC position grounds d-c correction voltage from synthesizer causing HFO circuits to free run, and energizes audio sync tone relay of HFA-1 to inject sync tone in Channel A audio amplifier. OPERATE position causes synthesizer circuits to control HFO circuits for synthesized operation in 100 cycle steps, and de-energizes audio sync tone relay of HFA-1 to remove sync tone from Channel A audio amplifier.
	6	LOCK	Locks TUNE control in position.
	7	RF LEVEL	Meter indicates strength of antenna input signal or alignment signal in db above 1 uv.
	8	TUNE	Moves slide rule pointer along dial of selected band to the appropriate frequency. This control is fitted with a lock; refer to serial designation 6.
	9	SYNCHRONIZE	Meter indicates amount and polarity of d-c voltage required to keep the system synchronized. When system is out of synchronization, meter reads zero center scale. This meter functions only when HFR-1 is operating synthesized.
Control Synthesizer and Standard HFS-1	10	Nixie indicators (no front panel designation)	Indicates the frequency of incoming signals.
	11	10 KC	Tunes HFS-1 in 10 KC steps.
	12	1 KC	Tunes HFS-1 in 1 KC steps.
	13	.1 KC	Tunes HFS-1 in 100 cycle steps.

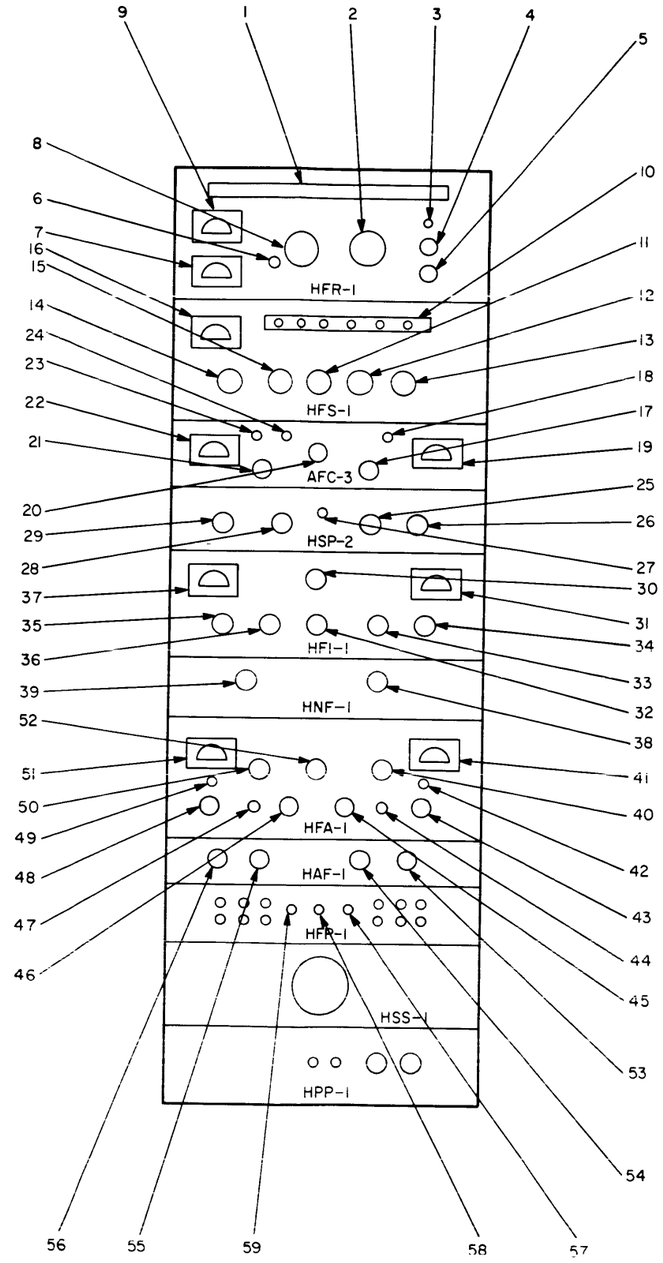


Figure 3-1. Front-Panel Controls and Indicators

TABLE 3—1. CONTROLS AND FUNCTIONS, DDR-5B (CONT'D)

MODULAR UNIT	DESIGNATION (Figure 3-1)	PANEL DESIGNATION	FUNCTION
Control Synthesizer and Standard HFS-1 (cont)	14	1 MC	Tunes HFS-1 in 1 mc steps between 2 and 32 mc.
	15	100 KC	Tunes HFS-1 in 100 KC steps.
	16	1 MC COMPARATOR	Meter indicates frequency error in internal 1 mc standard.
Automatic Frequency Control AFC-3	17	CARRIER SELECTOR	Selects source of 250 kc AFC-3 injection frequency supplied to HFA-1 product detectors. In RCC (reconstructed carrier) position, AFC-3 obtains 250 kc by reconstructing 250 kc carrier from received signal. In OSC (oscillator) position, AFC-3 obtains 250 kc from its local oscillator. AFC-3 is effective in either position.
	18	CARRIER FADE	Lamp lights to indicate deep fade of received carrier.
	19	CARRIER LEVEL	Meter indicates level of carrier.
	20	TUNING-KCS	Tunes AFC-3 converter injection oscillator to enable operator to synchronize to the received signal.
	21	SENSITIVITY	Controls gain of carrier amplifier stage. May be backed off to eliminate noise.
	22	AFC DRIFT	Indicates total drift of receiver i-f carrier. Center scale reading is zero drift. The dial is color-coded as follows: Color — Drift (approx.) Green — 500 cps Yellow — 500 cps-1 kc Red — 1 kc +
	23	AFC ALARM	Lamp lights to indicate carrier drift of 250 kc has exceeded approximately ± 750 cps off center.
	24	RESET	Recenters AFC-3 oscillators when operator is required to tune to another station or resynchronize due to a drifted signal.
Audio Switch Panel HSP-2	25	RECEIVER 2 SPEAKER CHANNEL**	Connects channel A or channel B audio signals to receiver 2 speaker.

**This control is not used.

TABLE 3—1. CONTROLS AND FUNCTIONS, DDR-5B (CONT'D)

MODULAR UNIT	SERIAL DESIGNATION (Figure 3-1)	PANEL DESIGNATION	FUNCTION
Audio Switch Panel HSP-2 (cont)	26	RECEIVER 2 SPEAKER VOLUME**	Varies audio level of receiver 2 signals.
	27	AGC*	SEPARATE position disconnects the circuits of receiver 1 from those of receiver 2. COMBINED position connects the circuits of receiver 1 to those of receiver 2.
	28	RECEIVER 1 SPEAKER CHANNEL	Connects channel A or channel B audio signals to receiver 1 speaker.
	29	RECEIVER 1 SPEAKER VOLUME	Varies audio level of receiver 1 speaker.
IF Amplifier HFI-1	30	MANUAL GAIN	Controls gain of agc circuits. At partial clockwise position, MANUAL GAIN control overrides agc circuits. As MANUAL GAIN control is rotated clockwise, MANUAL GAIN control has decreasing effect and agc circuits have increasing effect on gain. When set at fully counterclockwise position, MANUAL GAIN control is switched off and agc circuits control gain.
	31	CHANNEL B OUTPUT	Displays i-f output of channel B.
	32	AFC	Connects 250 kc input from AFC-3 to amplifier V6201B of HFI-1 when set at ON. Connects 250 kc input from HFS-1 to amplifier V6201B when set at OFF.
	33	CHANNEL B AGC DECAY	Varies the discharge time constant of the channel B agc network. Clockwise position provides slow agc characteristics.
	34	CHANNEL B IF BANDWIDTH KC	Permits selection of double sideband or single-sideband signals and desired bandwidth.
	35	CHANNEL A IF BANDWIDTH KC	Permits selection of DSB or SSB signals and desired bandwidth.

*This control is not used.

**This control is used only when two DDR-5B's are interconnected for space-diversity or frequency-diversity operation (refer to paragraph 2-3, d).

TABLE 3—1. CONTROLS AND FUNCTIONS, DDR-5B (CONT'D)

MODULAR UNIT	SERIAL DESIGNATION (Figure 3-1)	PANEL DESIGNATION	FUNCTION
IF Amplifier HFI-1 (cont)	36	CHANNEL A AGC DECAY	Varies the discharge time constant of the channel A agc network. Clockwise position provides slow agc characteristics.
	37	CHANNEL A OUTPUT	Displays i-f output of Channel A.
Variable Notch Filter HNF-1	38	NOTCH	Permits signal to pass through HNF-1 without filtering when set at OFF. When set at ON, i-f input signal is filtered.
	39	NOTCH ADJUST	Varies frequency of internal oscillator ±8 kc from 250 kc input signal.
Detector and Audio Amplifier HFA-1	40	CHANNEL B BFO	Permits BFO frequency to be shifted approximately 5 kc on either side of 250 kc.
	41	CHANNEL B LINE LEVEL	Meter indicates channel B audio level across 0-1 mw output line.
	42	CHANNEL B LEVEL ADJUST	Varies overall HFA-1 Channel B output level.
	43	CHANNEL B DETECTION	Determines AM, CW, or SSB mode of operation.
	44	CHANNEL B PHONES	Facilitates monitoring channel B audio output with 8 k ohm headphones.
	45	CHANNEL B MONITOR	Varies signal level at CHANNEL B PHONES jack.
Detector and Audio Amplifier HFA-1	46	CHANNEL A DETECTION	Determines AM, CW, or SSB mode of operation.
	47	CHANNEL A PHONES	Facilitates monitoring Channel A audio output with 8 k ohm headphones.
	48	CHANNEL A MONITOR	Varies signal level at CHANNEL A PHONES jack.
	49	CHANNEL A LEVEL ADJUST	Varies overall HFA-1 channel A output level.
	50	CHANNEL A BFO	Permits BFO frequency to be shifted approximately 5 kc on either side of 250 kc.
	51	CHANNEL A LINE LEVEL	Meter indicates channel A audio level across 0-1 mw output line.

TABLE 3—1. CONTROLS AND FUNCTIONS, DDR-5B (CONT'D)

MODULAR UNIT	SERIAL DESIGNATION (Figure 3-1)	PANEL DESIGNATION	FUNCTION
Detector and Audio Amplifier HFA-1 (cont)	52	POWER	OPERATE position closes operate path of K8001 relay in Power Supply HFP-1. HFP-1 then automatically steps through time delay stage to operate condition. (refer to individual modular-unit manual). STANDBY position opens operate path of K8001 relay in HFP-1.
Audio Filter HAF-1	53	CHANNEL B HIGH CUTOFF	Determines high end of Channel B audio band.
	54	CHANNEL B LOW CUTOFF	Determines low end of Channel B audio band.
	55	CHANNEL A HIGH CUTOFF	Determines high end of Channel A audio band.
	56	CHANNEL A LOW CUTOFF	Determines low end of Channel A audio band.
Power Supply HFP-1	57	OPERATE	Lamp lights to indicate that HFP-1 is in operate condition and sending power to all units of DDR-5B.
	58	TIME DELAY	Lamp lights to indicate that HFP-1 is going through time delay stage (approximately 60 seconds) between standby and operate condition.
	59	STANDBY	Lamp lights to indicate that HFP-1 is in standby condition and is sending power to frequency standard (HFS-1) and oscillator ovens.
		MAIN POWER (located at rear of HFP-1 chassis)	STANDBY position energizes HFP-1.

3-3. OPERATING PROCEDURES.

WARNING

Voltages employed in the DDR-5B are high enough to be fatal. Every precaution should be taken by operating personnel to minimize the danger of shock.

a. GENERAL. - Haphazard operation or improper setting of controls will result in poor reception; for this reason, the operator should first familiarize himself with all controls and indicators on the DDR-5B. Refer to figure 3-1 and Table 3-1 for the location and function of DDR-5B controls and indicators, and proceed as described in paragraphs b through h below.

b. STARTING PROCEDURE. - Before attempting to start the DDR-5B, refer to the cabling instructions provided in Section 2, and ensure that the necessary cabling connections and terminations for the appropriate type of operation have been made. Proceed as follows:

NOTE

Numbers enclosed in parentheses are callouts referenced to figure 3-1.

(1) Ensure that POWER switch (52) of Detector and Audio Amplifier HFA-1 is set at STANDBY. Set MAIN POWER switch of Power Supply HFP-1 at STANDBY, green STANDBY lamps (59) should light immediately.

(2) Ensure that controls of HAF-1, HFA-1, HNF-1, HFI-1, HSP-2, AFC-3 and HFR-1 units are set at positions listed in Table 3-2. At this time controls on Control Synthesizer and Standard HFS-1 are of no significance.

(3) Set POWER switch of Detector and Audio Amplifier HFA-1 at OPERATE; yellow TIME DELAY lamps (58) of Power Supply HFP-1 should light immediately. Red OPERATE lamp (57) should light after period of approximately 60 seconds.

TABLE 3—2. PRELIMINARY CONTROL POSITIONS

MODULAR UNIT	SWITCH OR CONTROL DESIGNATION	SERIAL DESIGNATION (Figure 3-1)	POSITION
Audio Filter HAF-1	CHANNEL A HIGH CUTOFF	55	OUT
	CHANNEL A LOW CUTOFF	56	OUT
	CHANNEL B HIGH CUTOFF	53	OUT
	CHANNEL B LOW CUTOFF	54	OUT
Detector and Audio Amplifier HFA-1	POWER	50	STANDBY
	CHANNEL A LEVEL ADJUST	49	Mid position
	CHANNEL B LEVEL ADJUST	42	Mid position
	CHANNEL A DETECTION	43	See paragraphs 3-3, c, e, f, g, and h.
	CHANNEL B DETECTION	46	See paragraphs 3-3, d, e, f, g, and h.
	CHANNEL A BFO	52	0
	CHANNEL B BFO	40	0
Variable Notch Filter HNF-1	NOTCH	38	OFF
	NOTCH ADJUST	39	Mid position

TABLE 3—2. PRELIMINARY CONTROLS POSITIONS (CONT'D)

MODULAR UNIT	SWITCH OR CONTROL DESIGNATION	SERIAL DESIGNATION (Figure 3-1)	POSITION
IF Amplifier HFI-1	MANUAL GAIN	30	Fully counterclockwise until switch clicks off.
	CHANNEL A AGC DECAY	36	Fully counterclockwise.
	CHANNEL B AGC DECAY	33	Fully counterclockwise.
	CHANNEL A IF BANDWIDTH KC	35	See paragraph 3-3, d, e, and f.
	CHANNEL B IF BANDWIDTH KC	34	See paragraph 3-3, d, e, and f.
	AFC	32	OFF
Audio Switch Panel HSP-2	RECEIVER 1 SPEAKER CHANNEL	28	A
	RECEIVER 1 SPEAKER VOLUME	29	Fully clockwise
Automatic Frequency Control AFC-3	SENSITIVITY	21	Fully clockwise
	TUNING KCS	20	0
	CARRIER SELECTOR	17	OSC
Continuous RF Tuner HFR-1	TUNE/SYNC/ OPERATE	5	SYNC
	NOISE SILENCER/ OFF/ALIGNMENT SIGNAL	4	OFF

c. TUNING RECEIVER. - Instructions provided in the following procedure are for synthesized operation of the DDR-5B. To use the DDR-5B in non-synthesized operation, set the nixie selectors of Control Synthesizer and Standard HFS-1 at blank positions, and tune only Continuous RF Tuner HFR-1 to the frequency of the incoming signal. For synthesized operation, synchronize the DDR-5B at the incoming signal frequency in the following manner:

NOTE

Numbers enclosed in parentheses are callouts referenced to figure 3-1.

(1) Start the DDR-5B as outlined in paragraph 3-3,b. If searching for signals, proceed to step (2) below. If tuning to a known signal, proceed to step (3) below.

(2) When searching for a signal, proceed as follows:

(a) Set TUNE/SYNC/OPERATE switch (5) of Continuous RF Tuner HFR-1 at TUNE; this removes audio sync tone and grounds the correction voltage from Control Synthesizer and Standard HFS-1.

(b) Using BAND control (2) and TUNE control (8) of HFR-1, search for incoming signal. When incoming signal is found, set TUNE/SYNC/OPERATE control of HFR-1 at SYNC.

(c) Tune Control Synthesizer and Standard HFS-1 to frequency of incoming signal found in step (b) above. Zero beat should be obtained; SYNC IND lamp (3) of HFR-1 may flicker until proper point is found.

(d) Proceed to step (4) below.

(3) When tuning to a known signal, proceed as follows:

(a) Tune Continuous RF Tuner HFR-1 and Control Synthesizer and Standard HFS-1 to frequency of incoming signal.

(b) Carefully tune HFR-1 around selected frequency until a zero beat is obtained. SYNC IND lamp may flicker until proper point is found.

(c) Proceed to step (4) below.

(4) Set TUNE/SYNC/OPERATE switch (4) of HFR-1 at OPERATE; SYNC IND lamp of HFR-1 should be lit, and SYNCHRONIZE meter (9) of HFR-1 should indicate zero center scale or nearly so. Carefully tune HFR-1 to bring SYNCHRONIZE meter to zero center scale, and tighten LOCK control (6) to prevent inadvertent changing of frequency setting.

NOTE

The RF LEVEL meter of Continuous RF Tuner indicates incoming signal strength in db 1 microvolt. CHANNEL A OUTPUT meter (37) and CHANNEL B OUTPUT meter (31) of IF Amplifier HFI-1 should indicate between 0.6 volt and 1.4 volts.

The CHANNEL A LINE LEVEL meter (51) and CHANNEL B LINE LEVEL meter (41) of Detector and Audio Amplifier HFA-1 indicate the audio output in db or VU. Standard O VU audio output level is maintained by adjustment of the CHANNEL A LEVEL ADJUST control (49) and CHANNEL B LEVEL ADJUST control (42).

d. AM RECEPTION. - Proceed as follows:

NOTE

Numbers enclosed in parentheses are callouts referenced to figure 3-1.

(1) Ensure that procedures outlined in paragraphs 3-3,b have been completed.

(2) Using procedure outlined in paragraph 3-3,c, synchronize DDR-5B at selected frequency. Tighten LOCK control (6) of Continuous RF Tuner HFR-1 to prevent changing of frequency setting.

NOTE

Selection of Channel A or Channel B signals is dependent upon setting of RECEIVER 1 SPEAKER CHANNEL switch (28) of Audio Switch Panel HSP-2 (see table 3-2). Both channels are similar; therefore, only Channel A will be considered in steps (3) through (10) below.

(3) On IF Amplifier HFI-1, set CHANNEL A IF BANDWIDTH KC switch (35) at 15 DSB or 6 DSB in accordance with bandwidth of received signal.

(4) On Detector and Audio Amplifier HFA-1, set CHANNEL A DETECTION switch (46) at AM.

(5) On Detector and Audio Amplifier HFA-1, adjust CHANNEL A LEVEL ADJUST control (49) to obtain O VU indication for received signals on CHANNEL A LINE LEVEL meter (51).

(6) Adjust RECEIVER 1 SPEAKER VOLUME control (29) of Audio Switch Panel HSP-2 for desired volume level.

(7) On IF Amplifier HFI-1 adjust CHANNEL A AGC DECAY control (36) and CHANNEL B AGC DECAY control (33) in accordance with nature of received signal. As a general rule, CHANNEL A AGC DECAY and CHANNEL B AGC DECAY controls are adjusted to prevent CHANNEL A LINE LEVEL and CHANNEL B LINE LEVEL meters from swinging above O VU.

(8) If impulse noise is present in received signal, eliminate noise by setting NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch (4) of Continuous RF Tuner HFR-1 at NOISE SILENCER.

(9) If interfering signals are present, set NOTCH control (38) of Variable Notch Filter HNF-1 at ON, and adjust NOTCH ADJUST control (39) as required to attenuate interfering signals.

(10) If interference due to local environment, transmitters, etc., is present in received signal, adjust CHANNEL A HIGH CUTOFF switch (55) and CHANNEL A LOW CUTOFF switch (56) of Audio Filter HAF-1 for minimum interference.

(11) If received signal drifts, proceed as follows:

(a) Set AFC switch (32) of IF Amplifier HFI-1 at ON.

(b) On Automatic Frequency Control AFC-3, depress RESET button (24) while simultaneously adjusting TUNING KCS control (20) for maximum indication on CARRIER LEVEL meter (19); meter should be approximately in center of green. Release RESET button.

NOTE

SENSITIVITY control (21) may be backed off to eliminate noise.

(c) On Automatic Frequency Control AFC-3, check CARRIER FADE lamp (18) and AFC ALARM lamp (23); lamps should not be lit. AFC DRIFT meter (22) should be at zero center scale.

(12) To monitor the audio output before it is filtered, plug headphones into CHANNEL A PHONES jack (47) or CHANNEL B PHONES jack (44) of Detector

and Audio Amplifier HFA-1 as required. Note that associated CHANNEL A MONITOR control (48) or CHANNEL B MONITOR control (45) varies the volume of audio signal in the headphones.

e. CW RECEPTION. - Operate the receiver controls for CW signals in the same manner as for AM signals (paragraph 3-3,d), with the following exceptions:

(1) In step (3), set CHANNEL A IF BANDWIDTH KC switch of IF Amplifier HFI-1 at 1 DSB.

(2) In step (4), set CHANNEL A DETECTION switch of Detector and Audio Amplifier HFA-1 at CW. Adjust CHANNEL A BFO control (52) for comfortable pitch (about 800 cycles).

(3) In step (7) turn CHANNEL A AGC DECAY control (36) of IF Amplifier HFI-1 clockwise to provide slow agc decay; adjust CHANNEL A AGC DECAY control to provide proper discharge time constant so that agc developed by strong adjacent-channel signals will not reduce receiver gain while listening to weak signals. If keying is at slow speed so that agc brings up noise between characters, adjust MANUAL GAIN control (30) of IF Amplifier HFI-1 to reduce gain and prevent blocking.

f. SINGLE-SIDEBAND RECEPTION. - Operate the receiver controls for single-sideband signals in the same manner as for AM signals (paragraph 3-3,d) with the following exceptions:

(1) When searching for random SSB signals, first tune Continuous RF Tuner HFR-1 to the incoming signal, and then synchronize Control Synthesizer and Standard HFS-1 to Continuous RF Tuner HFR-1. Tuning for random SSB signals must be done very carefully.

(2) In step (3), set CHANNEL A IF BANDWIDTH KC switch of IF Amplifier HFI-1 at appropriate 3.5 U SSB, 3.5 L SSB, 7.5 U SSB, or 7.5 L SSB position in accordance with required bandwidth of received signal.

(3) In step (4), set CHANNEL A DETECTION switch of Detector and Audio Amplifier HFA-1 at SSB.

(4) When using automatic frequency control as outlined in step (11), particular attention should be paid to the following:

(a) When tuned to a lower sideband, the TUNING KCS control should be set between 0 and +3. When tuned to an upper sideband, the TUNING KCS control should be set between 0 and -3.

(b) If carrier is not suppressed more than 30 db and phase of received signal is of primary importance, CARRIER SELECTOR switch (17) of Automatic Frequency Control AFC-3 should be set at RCC. In this mode of operation, the AFC-3 will restore the carrier.

(5) Turn CHANNEL A AGC DECAY control (36) of IF Amplifier HFI-1 clockwise to provide slow agc decay; adjust CHANNEL A AGC DECAY control to provide proper discharge time constant so that agc developed by strong adjacent-channel signals will not reduce receiver gain while listening to weak signals.

g. RECEPTION OF FSK AND FAX SIGNALS. - This procedure applies to the DDR-5B when the audio output at terminal strip A-3063 (see figure 4-2) is connected to teletype terminal equipment such as TMC's Frequency Shift Converter, Model CFA-1. When using teletype equipment that employs the i-f output of the DDR-5B, adjustment of Detector and Audio Amplifier HFA-1 controls should be omitted.

Depending upon the nature of received FSK or FAX signals, the DDR-5B is tuned with either the 1 kc symmetrical bandpass filter or the narrow-band (3.5 kc) upper side band filter and with the BFO adjusted for desired audio output. Proceed as follows:

NOTE

Numbers enclosed in parentheses are callouts to figure 3-1.

(1) Start the DDR-5B as outlined in paragraph 3-3,b.

(2) Plug headphones into CHANNEL A PHONES jack (47) of Detector and Audio Amplifier HFA-1 in order to monitor DDR-5B.

(3) Using procedure outlined in paragraph 3-3,c, synchronize DDR-5B at frequency of incoming signal. Tighten LOCK control (4) of Continuous RF Tuner HFR-1 to prevent inadvertent changing of frequency setting.

NOTE

Selection of Channel A or Channel B signals is dependent upon the setting of RECEIVER 1 SPEAKER CHANNEL switch (28) of Audio Switch Panel HSP-2 (see table 3-2). Both channels are similar; therefore, only Channel A will be considered in steps 4 through 11.

(4) On IF Amplifier HFI-1, set CHANNEL A IF BANDWIDTH KC switch (35) at 1 DSB.

(5) On Detector and Audio Amplifier HFA-1, set CHANNEL A DETECTION switch (46) at CW. Adjust CHANNEL A BFO control (50) for proper operation of teletype equipment.

(6) Adjust CHANNEL A LEVEL ADJUST control (49) of HFA-1 to obtain 0 VU indication on CHANNEL A LINE LEVEL meter (51).

h. RECEPTION OF VOICE-FREQUENCY TELEGRAPH (VFT) SIGNALS. - Depending upon the nature of the received signal, VFT signals will be received with synthesized or non-synthesized DDR-5B operation. To receive VFT signals from a synthesized transmitter, tune the DDR-5B to the assigned fre-

quency of the incoming signal, and operate the DDR-5B in the same manner as for single-sideband reception (paragraph 3-3,f). For reception of VFT signals from a non-synthesized transmitter, proceed as follows:

NOTE

Numbers enclosed in parentheses are call-outs referenced to figure 3-1.

(1) Check to see that teletype terminal equipment is connected to the appropriate terminal of terminal strip A-3063. Start the DDR-5B as outlined in paragraph 3-3,b.

(2) Set TUNE/SYNC/OPERATE switch (5) of Continuous RF Tuner HFR-1 at TUNE. With TUNE/SYNC/OPERATE switch at TUNE, the synthesizer (HFS-1) will have no effect on Continuous RF Tuner HFR-1; the setting of HFS-1 nixie selectors is of no significance.

(3) On Detector and Audio Amplifier HFA-1, set CHANNEL A DETECTION switch (46) at SSB.

NOTE

Reception of upper and lower sideband signals is possible on either channel. However, for simplicity and clarity in this procedure, reception of upper and lower sideband signals is confined to Channel A.

(4) On IF Amplifier HFI-1, set CHANNEL A IF BANDWIDTH KC switch (88) at 3.5 U SSB or 7.5 U SSB if receiving upper sideband signals and at 3.5 L SSB or 7.5 L SSB if receiving lower sideband signals.

(5) Plug headphones into CHANNEL A PHONES jack (47) of Detector Audio Amplifier HFA-1 and monitor receiver while tuning Continuous RF Tuner HFR-1 to incoming signal. Tighten LOCK control (6) to prevent inadvertent changing of frequency setting. Proceed to step (6) or step (7).

(6) If receiving upper sideband signals, proceed as follows:

(a) On IF Amplifier HFI-1, set CHANNEL A IF BANDWIDTH KC switch at 3.5 L SSB or 7.5 L SSB. Set AFC switch (32) at ON.

(b) Plug headphones into CHANNEL A PHONES jack of Detector and Audio Amplifier HFA-1 and monitor receiver while performing step (c) below.

NOTE

When performing step (c), tuning must be done very carefully so that AFC-3 does not lock onto one of the tone frequencies.

(c) On Automatic Frequency Control AFC-3 depress RESET button (24) while simultaneously turning TUNING KCS control (20) counterclockwise from +3 position to point where signals are no longer heard and maximum indication is obtained on CARRIER LEVEL meter (19).

(d) On IF Amplifier HFI-1, set CHANNEL A IF BANDWIDTH KC switch at 3.5 U SSB or 7.5 U SSB.

(e) Ensure that teletype equipment is operating properly.

(7) If receiving lower sideband signals, proceed as follows:

(a) On IF Amplifier HFI-1, set CHANNEL A IF BANDWIDTH KC switch at 3.5 U SSB or 7.5 U SSB. Set AFC switch (32) at ON.

(b) Plug headphones into CHANNEL A PHONES jack of Detector and Audio Amplifier HFA-1 and monitor receiver while performing step (c) below.

3-4. EMERGENCY OPERATING PROCEDURES.

The corresponding units of all DDR-5 receivers are interchangeable. At installations where two complete DDR-5B's are being used in space-diversity operation, both receivers can be slaved to one synthesizer (Control Synthesizer and Standard HFS-1) should the synthesizer of either receiver become defective. If the anticipated repair time for the defective HFS-1 indicates the necessity for this emergency measure, disconnect cables from modulator units of receiver containing defective HFS-1 as listed below, and reconnect cables as indicated in figure 3-2. If necessary, refer to Section 5 for cable-fabrication information.

MODULATOR UNIT OF RECEIVER CONTAINING DEFECTIVE HFS-1	DISCONNECT CABLE FROM:
HFR-1	J1304, J1302, and J1307
HFI-1	J6206
HFA-1	J7003

3-5. OPERATOR'S MAINTENANCE.

a. GENERAL. - The operator should observe that modulator unit controls, indicator lamps, and meters are in good condition and functioning properly (see figure 3-1 and Table 3-1). Daily during operation, all electrical quantities measurable with built-in meters should be observed and compared with established standards for irregularity. Any noticeable irregularity is an indication of trouble.

b. REPLACEMENT OF FUSES. - Fuses for all modulator units contained in the DDR-5B are located in Power Supply HFP-1. Figure 3-3 shows the location of fuses and the associated blown fuse indicators. Table 3-5 lists all fuses located in the HFP-1 and the function of each. Observe the blown fuse indicators on the HFP-1, and replace fuses as required.

CAUTION

Do not replace a fuse with one of higher rating. If a fuse burns out immediately after replacement, do not replace it a second time until the trouble has been located and corrected.

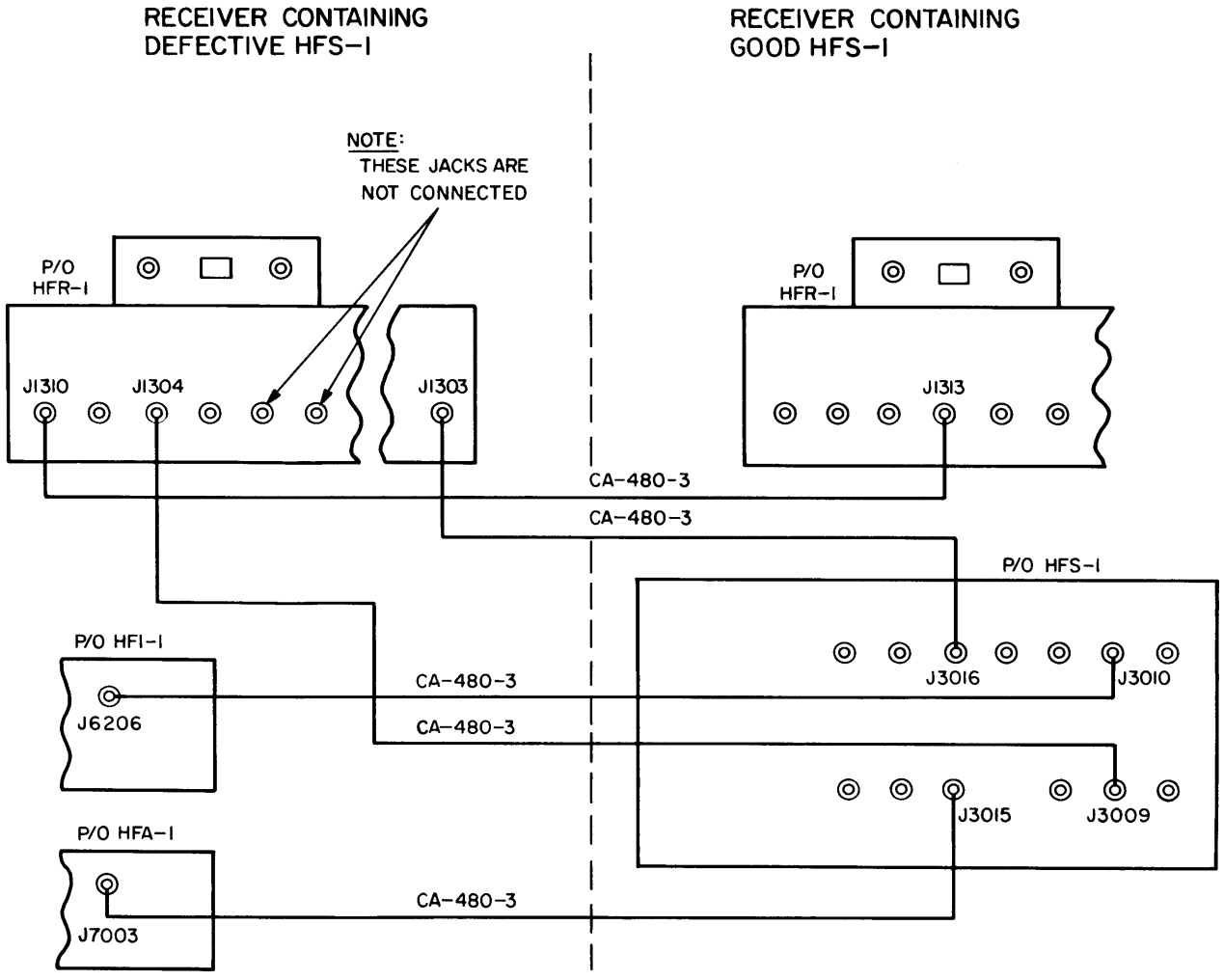


Figure 3-2. Connection Diagram, Slaving Two DDR-5B Receivers to One Synthesizer (HFS-1)

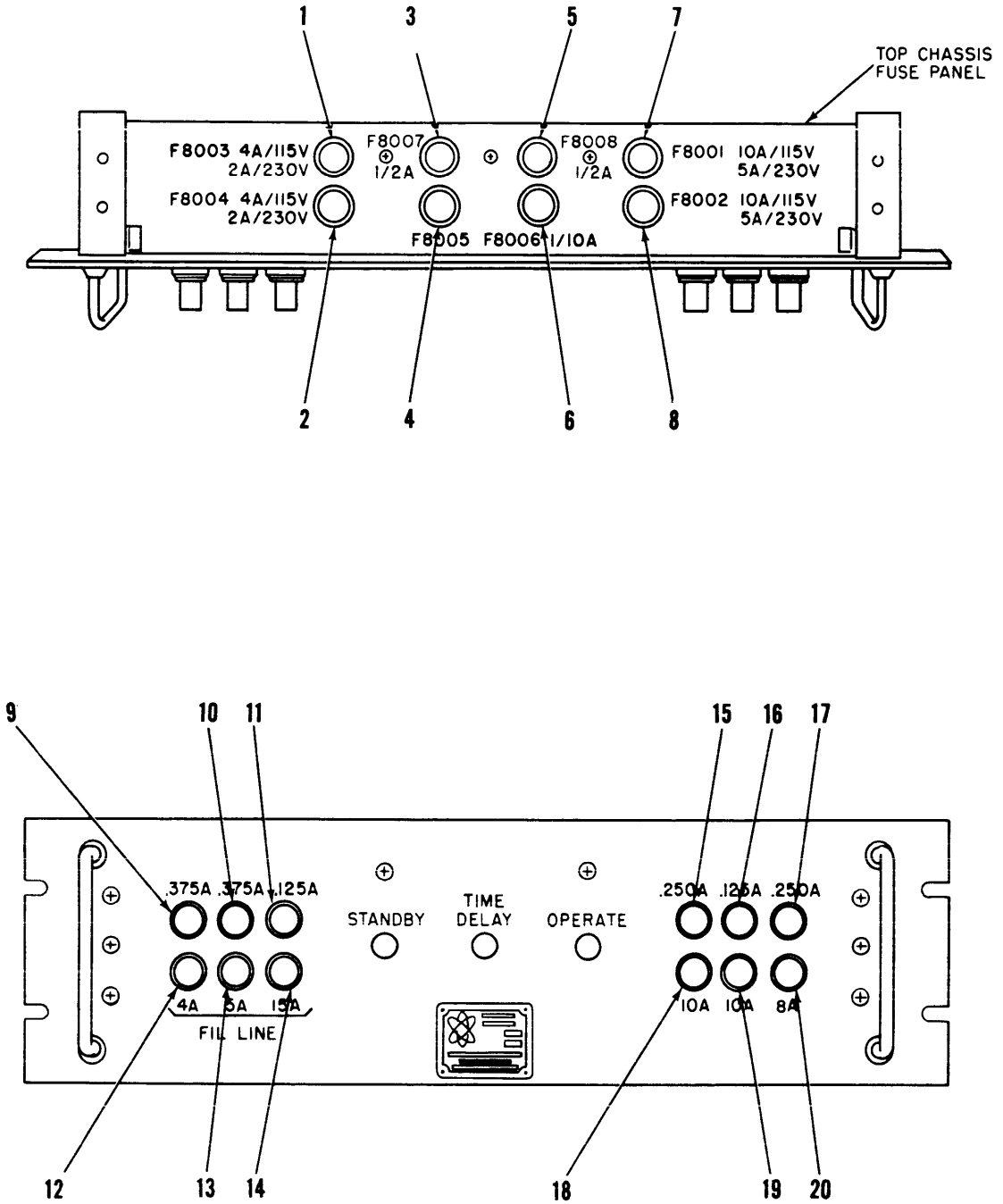


Figure 3-3. Indicator Light and Fuse Locations, HFP-1

TABLE 3—3. FUSE LOCATIONS AND FUNCTIONS, POWER SUPPLY HFP-1

SERIAL DESIGNATION (Figure 3-3)	PANEL DESIGNATION (Figure 3-3)	CIRCUIT PROTECTED	SCHEMATIC SYMBOL
1	F8003 4A/115V 2A/230V	Line voltage supply to frequency stabilizing ovens in AFC and HFR	F8003
2	F8004 4A/115V 2A/230V		F8004
3	F8007 1/2A	Input to section "A" B+ regulator circuit in HFP-1	F8007
4	F8005 2A/115V 1A/230V	Loose item	F8005
5	F8008 1/2A	Input to section "B" B+ regulator circuit in HFP-1	F8008
6	F8006 1/10A	Input to bias supply circuit in HFP-1*	F8006
7	F8001 10A/115V 5A/230V	Main line voltage input to HFP-1	F8001
8	F8002 10A/115V 5A/230V		F8002
9	B+ LINE .375A	Section "A", B+ supply to HFA-1	F8019
10	B+ LINE .375A	Section "A", B+ supply to HFS-1	F8012
11	B+ LINE .125A	Section "B", B+ supply to HNF-1	F8010
12	FIL LINE 4A	Filament supply to HNF-1	F8009
13	FIL LINE 5A	Filament supply to AFC-3	F8015
14	FIL LINE 15A	Filament supply to HFS-1	F8011
15	B+ LINE .250A	Section "B", B+ supply to AFC-3	F8016
16	B+ LINE .125A	Section "B", B+ supply to HFI-1	F8014
17	B+ LINE .250A	Section "B", B+ supply to HFR-1	F8018
18	FIL LINE 10A	Filament supply to channel A and B BFO tubes in HFA-1**	F8020
19	FIL LINE 10A	Filament supply to HFI-1	F8013
20	FIL LINE 8A	Filament supply to HFR-1	F8017

* Individual bias supply outputs to the HFI-1, AFC-3, and HFR-1 are not fused in the HFP-1.

**Separate filament supplies to other tubes in HFA-1 audio channels A and B are not fused in the HFP-1.

c. REPLACEMENT OF ELECTRON TUBES. - The operator should check the general condition of elecron tubes; tubes that appear to be defective should be checked on a reliable tube tester and replaced as required. When testing or replacing miniature tubes, particular attention should be paid to the following:

(1) When withdrawing miniature tubes from their sockets, pull them straight out; do not rock or turn them.

(2) If pins of miniature tube are bent, straighten them with a proper pin straightener before replacing tube.

d. OPERATING CHECKS. - The alignment signal, a built-in test feature, can be used by the operator to check the performance of the modulator units contained in the DDR-5B; refer to the equipment performance check given in Section 4.

SECTION 4

TROUBLESHOOTING

4-1. INTRODUCTION.

This section contains both troubleshooting information and functional analysis of the DDR-5B. The information given in this section, coupled with the information provided in the individual modular-unit manuals, will facilitate the location of equipment troubles.

4-2. OVERALL FUNCTIONAL ANALYSIS.

a. GENERAL. - Functional analysis for synthesized and non-synthesized operation is given in the following paragraphs.

b. FUNCTIONAL ANALYSIS, SYNTHESIZED OPERATION. - Refer to figure 4-1.

(1) RF AMPLIFICATION AND FIRST CONVERSION. - R-f signals from the antenna are applied to Continuous RF Tuner HFR-1. Within the HFR-1, a selected frequency in the range of 2 mc to 32 mc undergoes four stages of amplification and is beat with a high frequency oscillator (HFO) output signal of 3.75 mc to 33.75 mc to produce a first i-f of 1.75 mc. Noise silencer stages employed in the HFR-1 eliminate impulse noise from the 1.75 mc output signal. The 1.75 mc i-f signal from Continuous RF Tuner HFR-1 is applied to IF Amplifier HFI-1.

A sample of the HFO output signal from Continuous RF Tuner HFR-1 is applied to synthesizer and crystal oscillator circuits in Control Synthesizer and Standard HFS-1 where it is converted to a 4.25 mc to 3.25 mc signal. This 4.25 mc to 3.25 mc signal contains the error, if any, of the HFO circuit contained in Continuous RF Tuner HFR-1. Depending upon the setting of front-panel controls, Control Synthesizer and Standard HFS-1 develops a 4.25 mc to 3.25 mc standard signal. A phase detector circuit in the HFS-1 compares the two nominally identical signals and develops a d-c voltage that is used to correct the HFO output of Continuous RF Tuner HFR-1 thereby maintaining high stability.

(2) SECOND CONVERSION AND IF AMPLICATION. - The 1.75 mc i-f signals applied to IF Amplifier HFI-1 are beat with a 2 mc injection frequency that is obtained from Control Synthesizer and Standard HFS-1 or from Automatic Frequency Control AFC-3. The resultant, a highly stable second i-f of 250 kc, is extended to Variable Notch Filter HNF-1. Operation of the HNF-1 is determined by the setting of front-panel controls. When used, the HNF-1 will attenuate interfering signals within ± 8 kc of the center 250 kc i-f. The 250 kc i-f is returned from the HNF-1 to IF Amplifier where it is fed through selectable bandpass filters and i-f amplifiers. The HFI-1 provides dual-channel (Channel A and B), amplified 250 kc output signals that are extended to Detector and Audio Amplifier HFA-1.

Two agc voltages, one for each channel, are developed in IF Amplifier HFI-1. The strongest agc voltage is selected by means of an agc comparator circuit and applied to the i-f amplifier stages of the HFI-1, to the r-f amplifier stages of Continuous RF Tuner HFR-1, and to Audio Switch Panel HSP-2.

NOTE

The agc voltages of two DDR-5B receivers can be combined for diversity operation by means of front-panel switches located on the HSP-2 (refer to paragraph 2-3, d).

(3) DETECTION AND AUDIO AMPLIFICATION. - Channel A and Channel B signals (AM, CW, and SSB) received by Detector and Audio Amplifier HFA-1 are demodulated and extended to Audio Filter HAF-1. A beat frequency oscillator incorporated in the HFA-1 is used to demodulate CW signals, and a 250 kc injection frequency received from Control Synthesizer and Standard HFS-1 or Automatic Frequency Control AFC-s is used to demodulate SSB signals. Audio Filter HAF-1, a passive audio filter, eliminates particular types of interference due to environment, terrain, or local transmitters. Audio signals from the HAF-1 are returned to Detector and Audio Amplifier HFA-1 where they are amplified. The amplified audio output signals from HFA-1 are extended over dual channels to Audio Switch Panel HFP-2. The HSP-2 provides facilities for switching either Channel A or Channel B audio signals to the loudspeaker.

c. FUNCTIONAL ANALYSIS, NON-SYNTHESIZED OPERATION. - Non-synthesized operation is similar to synthesized operation (paragraph 4-2, b) with the following exceptions:

(1) The HFO circuit of Continuous RF Tuner HFR-1 is free running; stability is 20 to 50 parts in 10^6 as compared to one part in 10^8 for synthesized operation.

(2) The origin of the 2 mc injection frequency used in the second conversion stage is limited to Automatic Frequency Control AFC-3.

(3) The origin of the 250 kc injection frequency used to demodulate SSB signals in the detection stage is limited to Automatic Frequency Control AFC-3.

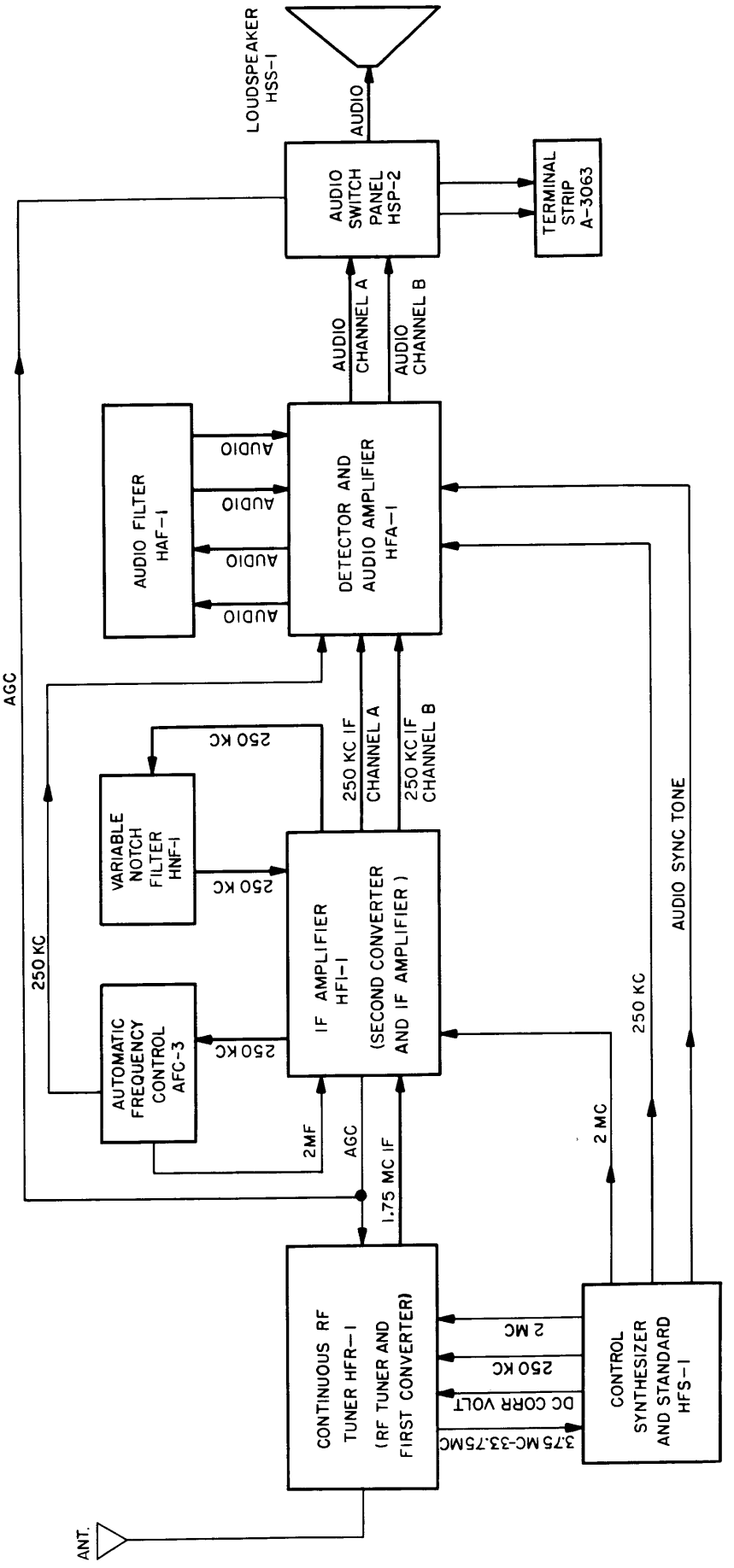


Figure 4-1. Simplified Block Diagram, DDR-5B

4-3. EQUIPMENT PERFORMANCE CHECK.

Figure 4-2 is a detailed servicing block diagram of the DDR-5B. When used in conjunction with the Equipment Performance Check (Table 4-1), figure 4-2 will aid the technician in localizing trouble to a particular modular unit. Front-panel meters and indicators and built-in test features will provide sufficient information to localize common troubles. Once the trouble is localized to a modular unit, refer to the appropriate modular-unit manual for detailed information necessary to verify the probable cause and to locate faulty components. The results of defective front-panel indicator lamps and meters, and the remedial procedures concerned are obvious and, therefore, are not mentioned in Table 4-1.

WARNING

Voltages employed in the DDR-5B are high enough to be fatal. Every precaution should be taken by maintenance technicians to minimize the danger of shock.

TABLE 4—1. EQUIPMENT PERFORMANCE CHECK, DDR-5B

NOTE

Faulty cables and cable connectors can be the cause of many troubles. Before proceeding with troubleshooting procedures, check cables and cable connectors.

Numbers enclosed in parentheses are callouts referenced to figure 3-1.

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
1	Set DDR-5B controls as listed in paragraph 2-4,b.	STANDBY lamp (59) should light.	Defective contacts of relay K8001 or transformer T8001 in Power Supply HFP-1.
		Blowers on both racks should operate.	Blown F8001 or F8002 fuse, or defective blower unit.
2	Set POWER switch (52) of Detector and Audio Amplifier HFA-1 at OPERATE.	STANDBY indicator lamp (59) should be extinguished and TIME DELAY lamp (58) should light. After approximately 60 seconds, TIME DELAY lamp should be extinguished and OPERATE lamp (57) should light. MEGACYCLE dial of Continuous RF Tuner HFR-1 should be illuminated.	Defective K8001, K8002, or K8003 relays or related circuitry in Power Supply HFP-1.
		Nixie selectors of Control Synthesizer and Standard HFS-1 should indicate.	Defective HFS-1 circuitry as follows: NIXIE LIGHT — HFS-1 DECK 10 MC — 3500-3600 deck 1 MC — 3500-3600 deck 100 KC — 3400 deck 10 KC — 3300 deck 1 KC — 3200 deck .1 KC — 3100 deck
		SYNCHRONIZE meter of Continuous RF Tuner HFR-1 should indicate approximately 1 volt.	Defective SYNCHRONIZE meter circuitry of related VTVM circuitry of HFR-1. Defective phase detector or related 3400 deck circuitry of Control Synthesizer and Standard HFS-1.

TABLE 4—1. EQUIPMENT PERFORMANCE CHECK, DDR-5B (CONT'D)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
2 (Cont'd)		1 MC COMPARATOR meter of Control Synthesizer and Standard HFS-1 should indicate approximately center scale.	Defective 1 MC standard circuitry or 1 MC comparator circuitry of HFS-1.
3	Using procedure outlined in step 6 of paragraph 2-4, c synthronize DDR-5B at high and low frequencies of each band.	Zero beat should be heard and SYNC IND lamp (3) of Continuous RF Tuner HFR-1 should light when receiver is synchronized. NOTE Audio sync tone is heard only when RECEIVER 1 SPEAKER CHANNEL switch (28) is set at A.	Defective audio sync tone relay or associated audio amplifier circuitry of Detector and Audio Amplifier HFA-1. Defective phase detector or associated 3400-deck circuitry of Control Synthesizer and Standard HFS-1.
4	On Continuous RF Tuner HFR-1, set NOISE SILENCER/ OFF/ALIGNMENT SIGNAL switch at ALIGNMENT SIGNAL. Set RECEIVER 1 SPEAKER CHANNEL switch (28) of HSP-2 at B and then at A.	CHANNEL A OUTPUT meter (37) and CHANNEL B OUTPUT meter (31) IF Amplifier HFI-1 should indicate approximately 1 volt. RF LEVEL meter (7) of Continuous RF Tuner HFR-1 should indicate. With CHANNEL A BFO control (50) CHANNEL B BFO control (40) of Detector and Audio Amplifier HFA-1 set at 0, alignment signal tone should not be heard in loudspeaker, and CHANNEL A LINE LEVEL meter (51) and CHANNEL B LINE LEVEL meter (41) of HFA-1 should not indicate.	Defective HFI-1 selectable i-f strips and associated CHANNEL A IF BANDWIDTH KC or CHANNEL B IF BANDWIDTH KC switch, i-f amplifier circuitry, or second-converter stage circuitry. Defective agc comparator circuit of IF Amplifier HFI-1. Incorrect setting of CHANNEL A BFO or CHANNEL B BFO control. Defective beat frequency oscillator circuits of HFA-1 unit.
5	Set RECEIVER 1 SPEAKER CHANNEL switch (28) of Audio Switch Panel HSP-2 at B and then at A while simultaneously adjusting associated CHANNEL A BFO control (50) and CHANNEL B BFO control (40) for	Alignment signal tone should be heard in loudspeaker.	Incorrect setting of Audio Filter HAF-1 controls or defective HAF-1 filter networks. Defective audio amplifier, beat frequency oscillator, product detector, or cathode follower circuitry of Detector and Audio Amplifier HFA-1.

TABLE 4—1. EQUIPMENT PERFORMANCE CHECK, DDR-5B (CONT'D)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
5 (Cont'd)	comfortable tone on loudspeaker.		
6	On IF Amplifier HFI-1, set AFC switch (32) at ON.	AFC ALARM lamp (23) and CARRIER FADE lamp (18) of Automatic Frequency Control AFC-3 should light.	Defective phase detector or FADE relay circuitry of associated AFC-3 unit.
7	On Automatic Frequency Control AFC-3, depress and hold down RESET button (24) while adjusting TUNING KCS control (20) for maximum reading on CARRIER LEVEL meter (19). Release RESET button.	AFC ALARM lamp should be extinguished, and AFC DRIFT meter (22) should be at zero center scale. CARRIER FADE lamp should be extinguished, and reading on CARRIER LEVEL meter should be approximatey in center of green.	Defective AFC-3 phase detector, FADE relay contacts, or 250 kc oscillator and associated circuitry. Defective FADE relay and associated circuitry, or 250 kc filter and associated circuitry of AFC-3.
8	On AFC-3, turn SENSITIVITY control (21) fully counterclockwise; return SENSITIVITY control to fully clockwise position.	CARRIER FADE lamp of AFC-3 should light, and reading on CARRIER LEVEL meter should fall to 0 when SENSITIVITY control is set fully counterclockwise. CARRIER FADE lamp should be extinguished, and reading on CARRIER LEVEL meter should be at maximum when SENSITIVITY control is restored to fully clockwise position.	Defective agc-sensitivity networks of AFC-3. Defective i-f input and carrier amplifier circuits of AFC-3. Same as above.
9	On IF Amplifier HFI-1, set AFC switch (32) at OFF.	Pointer of CARRIER LEVEL meter (19) and AFC DRIFT meter (22) of Automatic Frequency Control AFC-3 should deflect completely to left.	
10	On IF Amplifier HFI-1, set CHANNEL A IF BANDWIDTH KC switch (35) at 1 DSB, 6 DSB, and 15 DSB while CHANNEL B IF BANDWIDTH KC switch (34) is set at blank position.	Reading on CHANNEL A OUTPUT meter (37) should be approximately 1 volt.	Defective CHANNEL A IF BANDWIDTH KC switch, or defective 1 KC SYM, 6 KC SYM, or 15 KC SYM i-f strip of HFI-1.
11	Repeat step 10 with CHANNEL B IF BANDWIDTH KC switch set at 1 DSB, 6 DSB, and	Reading on CHANNEL B OUTPUT meter (31) should be approximately 1 volt.	Defective CHANNEL B IF BANDWIDTH KC switch, or defective 1 KC SYM, 6 KC SYM, or 15 KC SYM i-f strip of HFI-1.

TABLE 4—1. EQUIPMENT PERFORMANCE CHECK, DDR-5B (CONT'D)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
11 (Cont'd)	15 DSB while CHANNEL A IF BANDWIDTH KC switch is set at blank position.	NOTE Alignment signal tone will not be heard unless RECEIVER 1 SPEAKER CHANNEL switch (28) of Audio Switch Panel HSP-2 is set at B.	Defective CHANNEL B IF BANDWIDTH KC switch, or defective 1 KC SYM, 6 KC SYM, or 15 KC SYM i-f strip of HFI-1.
12	Set AFC switch of IF Amplifier HFI-1 at ON. On Automatic Frequency Control AFC-3, depress RESET button (24) for approximately 6 seconds; turn TUNING KCS control (20) midway between 0 and -3.	CARRIER FADE lamp (18) should light pointer of CARRIER LEVEL meter (19) should deflect completely to left when TUNING KCS control is adjusted.	Defective converter injection oscillator circuitry of Automatic Frequency Control AFC-3.
13	Set CHANNEL A DETECTION switch (46) and CHANNEL B DETECTION switch (43) of Detector and Audio Amplifier HFA-1 at SSB, and repeat steps 10 and 11 with CHANNEL A IF BANDWIDTH KC and CHANNEL B IF BANDWIDTH KC switches of HFI-1 at 3.5 U SSB, and 7.5 U SSB.	Reading on corresponding CHANNEL A OUTPUT meter or CHANNEL B OUTPUT meter should be approximately 1 volt.	Defective CHANNEL A IF BANDWIDTH KC OR CHANNEL B IF BANDWIDTH KC switch. Defective Channel A or Channel B 3.5 KC USB or 7.5 KC USB i-f strip of IF Amplifier HFI-1.
14	On Automatic Frequency Control AFC-3, depress RESET button and turn TUNING KCS control midway between 0 and +3. Repeat steps 10 and 11 with CHANNEL A IF BANDWIDTH KC switches of IF Amplifier HFI-1 set at 3.5 L SSB and 7.5 L SSB.	See steps 12 and 13.	Defective CHANNEL A BANDWIDTH KC or CHANNEL B IF BANDWIDTH KC switch. Defective Channel A or Channel B 3.5 KC LSB or 7.5 KC LSB i-f strip of IF Amplifier HFI-1.
15	Set AFC switch of IF Amplifier HFI-1 at OFF.	Pointer of CARRIER LEVEL meter (19) and AFC DRIFT meter (22) of Automatic Frequency Control AFC-3 should deflect completely to left.	

TABLE 4—1. EQUIPMENT PERFORMANCE CHECK, DDR-5B (CONT'D)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
16	Restore CHANNEL A DETECTION and CHANNEL B DETECTION switch of Detector and Audio Amplifier HFA-1 to CW position. Turn TUNING KCS control of Automatic Frequency Control AFC-3 to 0.		
17	On Detector and Audio Amplifier HFA-1, adjust CHANNEL A BFO control (50) and CHANNEL B BFO control (40) between 0 and 5 KC for maximum indication on associated CHANNEL A LINE LEVEL meter (51) or CHANNEL B LINE LEVEL meter (41).	Reading on CHANNEL A LINE LEVEL and CHANNEL B LINE LEVEL meter should vary with adjustment of associated CHANNEL A BFO or CHANNEL B BFO control.	Defective Channel A or Channel B beat frequency oscillator of HFA-1. Defective Channel A or Channel B audio Amplifier circuitry of HFA-1. Defective CHANNEL A HIGH CUTOFF, CHANNEL A LOW CUTOFF, CHANNEL B HIGH CUTOFF or CHANNEL B LOW CUTOFF switch of Audio Filter HAF-1. Defective Channel A or Channel B filter networks of HAF-1.
18	On Detector and Audio Amplifier HFA-1, adjust CHANNEL A LEVEL ADJUST control (49) and CHANNEL B LEVEL ADJUST control (42) for 0 VU indication on associated CHANNEL A LINE LEVEL or CHANNEL B LINE LEVEL meter.	Reading on CHANNEL A LINE LEVEL and CHANNEL B LINE LEVEL meter should be adjustable with corresponding CHANNEL A LEVEL ADJUST or CHANNEL B LEVEL ADJUST control.	Defective CHANNEL A LEVEL ADJUST or CHANNEL B LEVEL ADJUST control of HFA-1. Defective Channel A or Channel B audio amplifier circuitry of HFA-1.
19	Set RECEIVER 1 SPEAKER CHANNEL switch (28) of Audio Switch Panel HSP-2 first at B and then at A.	Alignment signal tone should be heard in loudspeaker for each setting of RECEIVER 1 SPEAKER CHANNEL switch.	Defective RECEIVER 1 SPEAKER CHANNEL switch of Audio Switch Panel HSP-2. Defective Channel A or Channel B audio amplifier circuitry of Detector and Audio Amplifier HFA-1.
20	Adjust CHANNEL A BFO and CHANNEL B BFO controls between 0 and 5 KC for maximum indication on associated CHANNEL A LINE LEVEL or CHANNEL B LINE LEVEL meter.	Reading on CHANNEL A LINE LEVEL and CHANNEL B LINE LEVEL meter should be same as noted in step 18.	Same as step 17.

TABLE 4—1. EQUIPMENT PERFORMANCE CHECK, DDR-5B (CONT'D)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
21	Restore CHANNEL A BFO and CHANNEL B BFO controls of Detector and Audio Amplifier HFA-1 to 0 position.	Alignment signal tone should not be heard in loudspeaker, and pointer on CHANNEL A LINE LEVEL meter should deflect completely to the left (see step 17).	
22	On IF Amplifier HFI-1 set CHANNEL A IF BANDWIDTH KC switch (35) and CHANNEL B IF BANDWIDTH KC switch (34) at 15 DSB.		
23	On Audio Filter HAF-1, set CHANNEL A HIGH CUTOFF switch (55) and CHANNEL A LOW CUTOFF switch (56) at 5. Adjust CHANNEL A BFO control (50) of Detector and Audio Amplifier HFA-1 for maximum reading on associated CHANNEL A LINE LEVEL meter (51).	Maximum reading on CHANNEL A LINE LEVEL meter should be obtained with corresponding CHANNEL A BFO control at approximately +5 position.	Defective CHANNEL A HIGH CUTOFF or CHANNEL A LOW CUTOFF switch of Audio Filter HAF-1. Defective Channel A filter networks of HAF-1.
24	Repeat step 23 for 2.5 KC, 1 KC, .5 KC, .25 KC, and .1 KC positions of CHANNEL A HIGH CUTOFF and CHANNEL A LOW CUTOFF switches of Audio Filter HAF-1.	Maximum reading on CHANNEL A LINE LEVEL meter should be obtained at corresponding positions of associated CHANNEL A BFO control.	Defective CHANNEL A HIGH CUTOFF or CHANNEL A LOW CUTOFF switch of HAF-1.
25	Set CHANNEL A HIGH CUTOFF and CHANNEL A LOW CUTOFF switch of Audio Filter HAF-1 at OUT. Set RECEIVER 1 SPEAKER CHANNEL switch (28) of Audio Switch Panel HSP-2 at B.		
26	Repeat steps 22 and 23 using CHANNEL B HIGH CUTOFF switch (53) and CHANNEL B LOW CUTOFF switch (54) of Audio Filter HAF-1 and CHAN-	Maximum reading on CHANNEL B LINE LEVEL meter should be obtained at corresponding positions of associated CHANNEL B BFO control.	Defective CHANNEL B HIGH CUTOFF or CHANNEL B LOW CUTOFF switch of Audio Filter HAF-1. Defective Channel B filter networks of HAF-1.

TABLE 4—1. EQUIPMENT PERFORMANCE CHECK, DDR-5B (CONT'D)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
26 (Cont'd)	NEL B BFO control of Detector and Audio Amplifier HFA-1.		
27	Restore CHANNEL A BFO and CHANNEL B BFO controls of Detector and Audio Amplifier HFA-1 to 0 position.	Pointer of CHANNEL A LINE LEVEL meter (51) and CHANNEL B LINE LEVEL meter (41) should deflect completely to left (see steps 24 and 26).	
28	On Continuous RF Tuner HFR-1 set NOISE SILENCER/ OFF/ALIGNMENT SIGNAL switch (4) at OFF. Note reading of RF LEVEL meter (7).		
29	Turn MANUAL GAIN control (30) of IF Amplifier HFI-1 until switch clicks on. Slowly rotate MANUAL GAIN control of HFI-1 to full clockwise position.	RF LEVEL meter (7) of Continuous RF Tuner HFR-1 should read maximum when switch on MANUAL GAIN control clicks on; meters may be pegged. As MANUAL GAIN control is rotated clockwise, pointer of RF LEVEL meter should follow to position noted in step 28.	Defective MANUAL GAIN control, or agc and manual gain circuitry of IF Amplifier HFI-1.
30	Restore all DDR-5B controls to normal operating condition.		

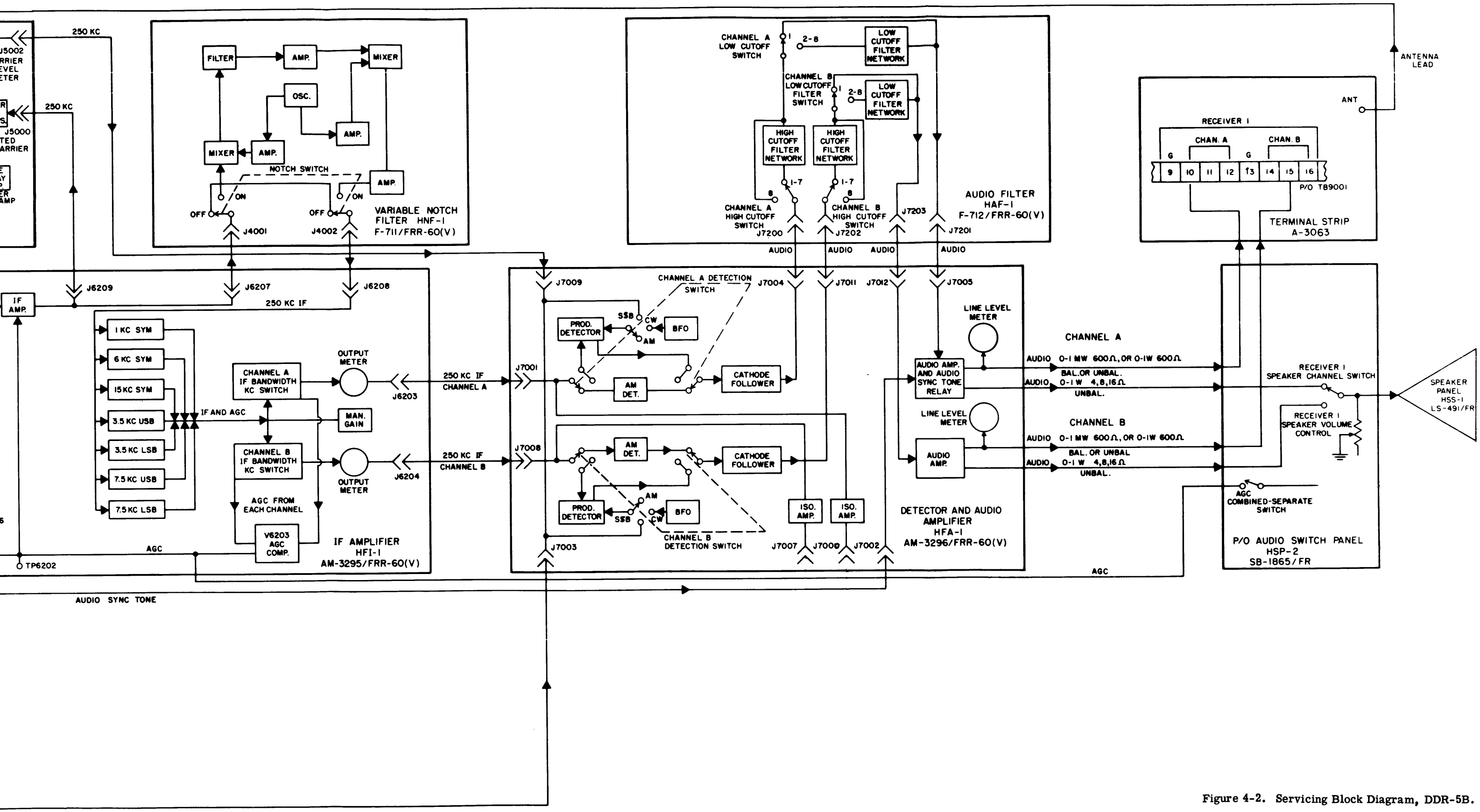
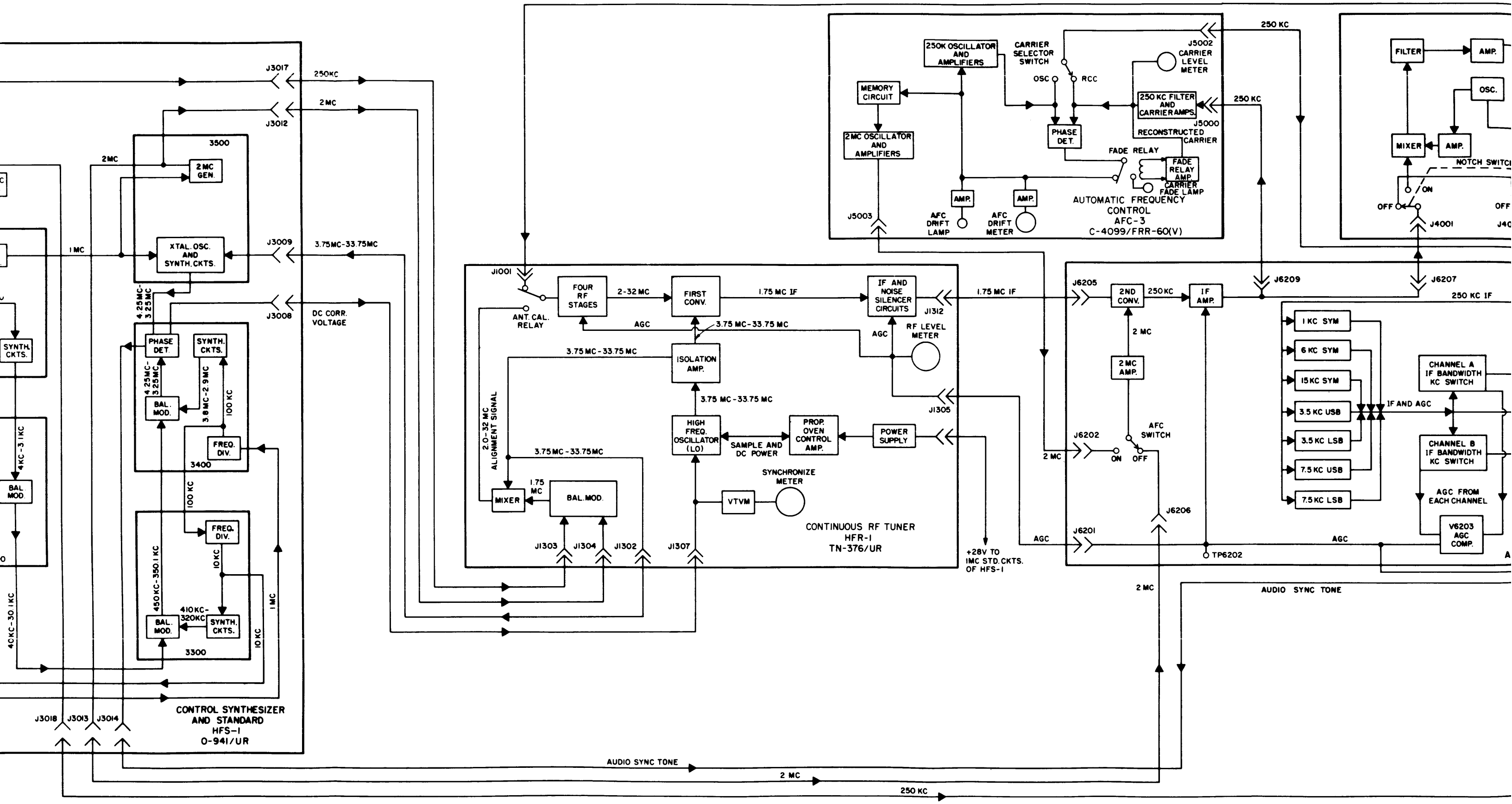
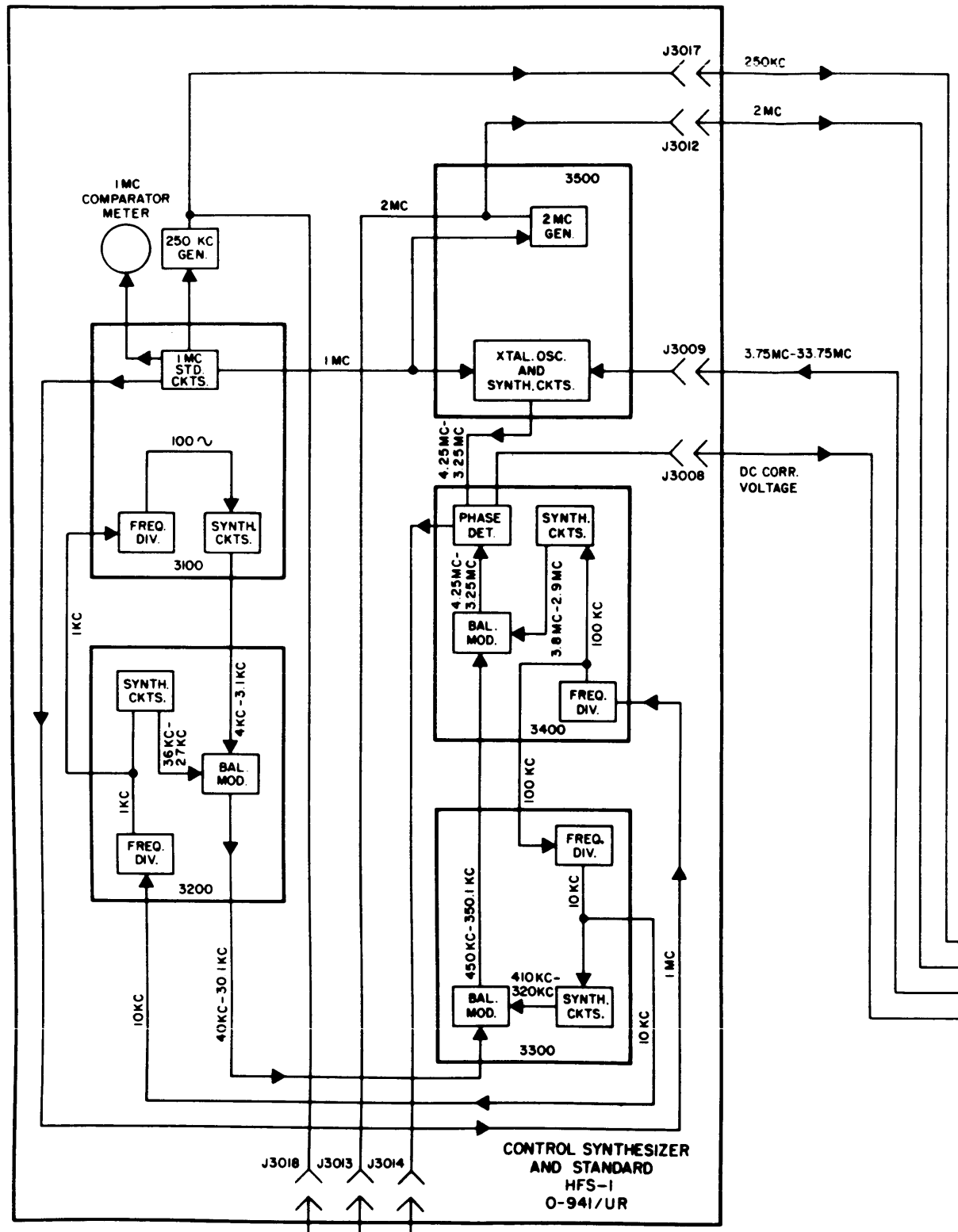
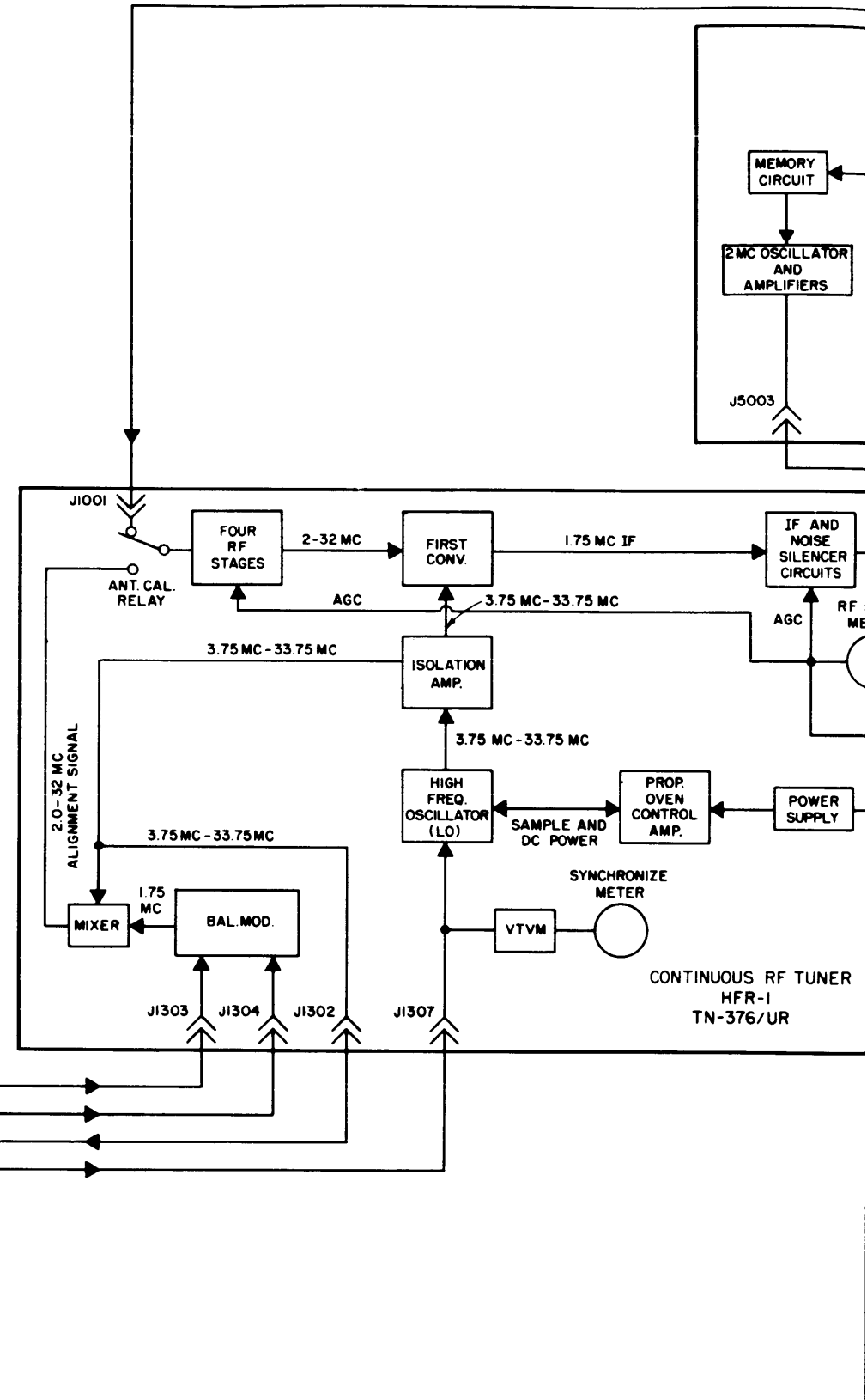


Figure 4-2. Servicing Block Diagram, DDR-5B.


J3017
250KC
2MC
J3012
3500
2MC
2MC GEN.
1MC
XTAL. OSC. AND SYNTH. CKTS.
J3009
3.75MC-33.75MC
J3008
DC CORR. VOLTAGE
4.25MC-3.25MC
PHASE DET.
SYNTH. CKTS.
BAL. MOD.
3.8MC-2.9MC
100 KC
FREQ. DIV.
3400
100 KC
FREQ. DIV.
10KC
450KC-350.1KC
410KC-320KC
BAL. MOD.
SYNTH. CKTS.
3300
10 KC
1MC
4KC-3.1KC
BAL. MOD.
40KC-30.1KC
SYNTH. CKTS.
J3018
J3013
J3014
CONTROL SYNTHESIZER AND STANDARD
HFS-1
0-941/UR
250K OSCILLATOR AND AMPLIFIERS
CARRIER SELECTOR SWITCH
OSC
RCC
J5002
CARRIER LEVEL METER
MEMORY CIRCUIT
250 KC FILTER AND CARRIER AMPS.
250 KC
J5000
RECONSTRUCTED CARRIER
2MC OSCILLATOR AND AMPLIFIERS
PHASE DET.
FADE RELAY
FADE RELAY AMP
CARRIER FADE LAMP
AMP.
AMP.
AFC DRIFT LAMP
AFC DRIFT METER
AUTOMATIC FREQUENCY CONTROL
AFC-3
C-4099/FRR-60(V)
J5003
J1001
ANT. CAL. RELAY
FOUR RF STAGES
2-32 MC
FIRST CONV.
1.75 MC IF
IF AND NOISE SILENCER CIRCUITS
J1312
AGC
3.75 MC-33.75 MC
AGC
RF LEVEL METER
3.75 MC-33.75 MC
ISOLATION AMP.
3.75 MC-33.75 MC
2.0-32 MC ALIGNMENT SIGNAL
HIGH FREQ. OSCILLATOR (LO)
SAMPLE AND DC POWER
PROP. OVEN CONTROL AMP.
POWER SUPPLY
J1305
3.75MC-33.75MC
1.75 MC
MIXER
BAL. MOD.
SYNCHRONIZE METER
VTVM
J1303
J1304
J1302
J1307
CONTINUOUS RF TUNER
HFR-1
TN-376/UR
+28V TO IMC STD. CKTS. OF HFS-1
J6205
2ND CONV.
250KC
IF AMP.
J6209
J6207
250 KC IF
2 MC
2MC AMP.
J6202
ON
OFF
AFC SWITCH
2 MC
J6206
J6201
AGC
AGC
TP6202
2 MC
AUDIO SYNC TONE
1 KC SYM
6 KC SYM
15KC SYM
3.5 KC USB
3.5 KC LSB
7.5 KC USB
7.5 KC LSB
CHANNEL A IF BANDWIDTH KC SWITCH
IF AND AGC
CHANNEL B IF BANDWIDTH KC SWITCH
AGC FROM EACH CHANNEL
V6203 AGC COMP.
FILTER
AMP.
OSC.
MIXER
AMP.
NOTCH SWITCH
ON
OFF
OFF
J4001
AUDIO SYNC TONE
2 MC
250 KC





AUDIO SYNC TONE

2 MC

250 K

SECTION 5
MAINTENANCE

5-1. GENERAL.

Maintenance is divided into three categories: operator's maintenance, preventive maintenance, and repair. Repair procedures given in this section are confined to cable connectors, cable assemblies, and those items that are not part of any of the DDR-5B modular units or of RAK-21B1. Repair procedures for RAK-21B1 components or for any modular unit contained in the DDR-5B are given in the appropriate modular-unit manual. Preventive maintenance includes information necessary to insure optimum performance of the DDR-5B. For this reason, alignment and adjustment information is included under preventive maintenance. Operator's maintenance for the DDR-5B is described in Section 3.

5-2. SPECIAL TOOLS AND TEST EQUIPMENT.

Special tools required for DDR-5B maintenance are illustrated in Figure 5-1; Table 5-1 lists each tool and the modular unit on which the tool is used. Table 5-2 lists the special test equipment required for DDR-5B maintenance.

TABLE 5—1. SPECIAL TOOLS, DDR-5B

TMC PART NO.	DESCRIPTION	WHERE USED
TP-114	Core alignment tool.	HFR-1
TP-115	Piston capacitor alignment tool.	HFR-1
TP-116-1	Screwdriver, Xcelite R188, 8" long, modified-hollow ground to .013".	All units
TP-117-1	1/4" Spintite, Xcelite #HS-6, modified-3/16" hole drilled through handle to receive concentric screw driver.	All units
TP-117-2	5/16" Spintite, Xcelite #HS-8, modified-3/16" hole drilled through handle to receive concentric screw driver.	All units
TP-117-3	5/16" Spintite, Xcelite #HS-10 modified-3/16" hole drilled through handle to receive concentric screw driver.	All units
TP-118-1	Miniature tube puller (7 pin), Kellems #1116.	All units
TP-118-2	Miniature tube puller (9 pin), Kellems #1316.	All units
TP-119-1	Piston capacitor alignment tool, JFD#5284.	HFS-1
WR-100-2	Hexagon wrench, .05" head, fits #3-4 setscrew.	All units
WR-100-5	Hexagon wrench, 3/32" head, fits #10-12 setscrew.	All units
WR-100-18	Hexagon wrench, 5/64" head, fits #8 setscrew.	All units
WR-100-19	Hexagon wrench, 1/16" head, fits #5-6 setscrew.	All units

Figure 5-1. Special Tools, DDR-5B

TABLE 5—2. SPECIAL TEST EQUIPMENT

ITEM	MANUFACTURER
Frequency Counter	Hewlett Packard Model 524C or equivalent.
Signal Generator	Measurements Corp., Model 82, or equivalent (2 required).
Spectrum Analyzer	Singer Metrics, Model SB-12A or equivalent.
VOM	Simpson, Model 260 or equivalent.
Vacuum Tube Voltmeter	Hewlett Packard, Model 410B or equivalent.
R-f Voltmeter	Ballentine Laboratories, Model 314 or equivalent. **NOTE** If an r-f voltmeter is not available, use the vacuum tube voltmeter listed above with an r-f probe.

5-3. PREVENTIVE MAINTENANCE.

a. GENERAL. - The DDR-5B has been designed to provide longterm, trouble-free operation under continuous duty conditions. However, similar to any other piece of equipment that contains assemblies of many electrical and mechanical parts, optimum performance and service life of the DDR-5B are dependent upon an adequate preventive maintenance schedule that is strictly adhered to.

b. CLEANING AND INSPECTION. - At periodic intervals (at least every six months) each modular unit should be removed from the cabinet for cleaning and inspection. All accessible covers should be removed and the wiring and all components inspected for dirt, corrosion, charring, discoloring, or grease; in particular, the tube sockets should be carefully inspected for deterioration. Dust may be removed with a soft brush or a vacuum cleaner if one is available. Remove dirt or grease from electrical parts with trichloroethylene. Remove dirt or grease from other parts with any good dry cleaning fluid.

WARNING

When using trichloroethylene, make certain that adequate ventilation exists. Avoid prolonged contact with skin.

Carefully inspect equipment for loose solder connections or screws, especially those on solder lugs. Tighten and resolder connections as required.

c. REPLACEMENT OF ELECTRON TUBES. - While the modular units are out of the cabinet for periodic inspection, all electron tubes should be checked and replaced as required. Particular attention should be paid to the following:

(1) When withdrawing miniature tubes from their sockets, pull them straight out; do not rock or turn them. If pins of miniature tubes are bent, straighten them with a proper pin straightener before replacing the tube.

(2) Some circuits, for example oscillator circuits, may function better with one tube than with another even though both tubes are new or both tubes measure the same when checked on a tube tester.

(3) Tubes should not be replaced or discarded merely because they have been used for some time. Satisfactory operation in a circuit is the final proof of tube quality; the tube in use may work better than a new tube.

d. GEAR LUBRICATION. - Examine all gears and gear assemblies contained in the modular units. If any of the gears show signs of becoming dry, coat them heavily with a molybdenum disulphide compound such as Molykote Type G made by the Alpha Corporation of Greenwich, Conn.

e. ALIGNMENT AND ADJUSTMENT. - The alignment and adjustment procedures for Continuous RF Tuner HFR-1 given in this section utilize Control Synthesizer and Standard HFS-1 and the audio sync tone generated by Detector and Audio Amplifier HFA-1. With the exception of the procedures given in paragraphs (1), (2), and (3) below, all alignment and adjustment is accomplished on an individual modular-unit basis. Refer to the appropriate modular-unit manual for the necessary alignment or adjustment procedures.

(1) ALIGNMENT OF HFO CIRCUITS OF CONTINUOUS RF TUNER HFR-1. - Proceed as follows:

NOTE

Numbers enclosed in parentheses are callouts referenced to figure 3-1.

(a) Set DDR-5B controls as listed in step (1) of paragraph 2-4, b.

(b) Set Control Synthesizer and Standard HFS-1 nixie selectors (11 through 15) for 2.0 mc.

(c) Carefully tune HFR-1 for zero beat at 2.0 mc. If zero beat is obtained with dial pointer of HFR-1 exactly at 2.0 mc, no adjustment is necessary. If zero beat is not obtained with dial pointer exactly at 2.0 mc, insert alignment tool TP-115 in rear orifice on top of HFO oven of HFR-1, and adjust oscillator trimmer until zero beat is obtained.

(d) Set HFS-1 nixie selectors for 3.0 mc.

(e) Carefully tune HFR-1 for zero beat at 3.0 mc. If zero beat is not obtained with dial pointer exactly at 3.0 mc, insert alignment tool TP-114 in front orifice on top of HFO oven of HFR-1 and adjust HFO trimmer until zero beat is obtained.

(f) Repeat steps (a) through (e) above until no further adjustment is necessary.

CAUTION

When performing step (g) below, be sure to remove alignment tools before attempting to rotate BAND control (6) of HFR-1.

(g) Using procedures outlined in steps (b) through (f) above, align HFO circuits of Continuous RF Tuner HFR-1 at high and low frequencies of each band.

(2) ALIGNMENT OR R-F CIRCUITS CONTINUOUS RF TUNER HFR-1. - Proceed as follows:

NOTE

Numbers enclosed in parentheses are callouts referenced to figure 3-1.

(a) On HFR-1, remove top cover of r-f turret to expose "L" and "C" adjustments of r-f tuner strips.

(b) Set DDR-5B controls as listed in step (1) of paragraph 2-4, b.

(c) Set Control Synthesizer and Standard HFS-1 nixie selectors for 2.0 mc, and tune HFR-1 to 2.0 mc exactly.

(d) Set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch (4) of HFR-1 at ALIGNMENT SIGNAL.

(e) Using alignment tool TP-115 adjust inductors L1001, L1005, L1007, and L1009 of HFR-1 for maximum indication on associated RF LEVEL meter. Adjustment of L1001 will be very broad.

(f) Set HFS-1 nixie selectors for 3.0 mc, and tune both HFR-1 units to 3.0 exactly.

(g) Ensure that NOISE SILENCER/OFF/ALIGNMENT SIGNAL switches of both HFR-1 units are set at ALIGNMENT SIGNAL.

(h) Using alignment tool TP-114, adjust capacitors C1009, C1015, C1023, and C1031 of HFR-1 for maximum indication on RF LEVEL meter.

(i) Repeat steps (c) through (h) above until no further peaking can be obtained.

(j) Repeat procedure outlined in steps (c) through (j) above for high and low frequencies of each band. Adjust inductors at low end of band and capacitors at high end of band; in all cases, adjustment of input inductor will be very broad.

(3) ADJUSTMENT OF SYNCHRONIZE METER CIRCUIT OF CONTINUOUS RF TUNER HFR-1. - To adjust the SYNCHRONIZE meter circuit of Continuous RF Tuner HFR-1 set the TUNE/SYNC/OPERATE switch (figure 3-1, callout 5) at TUNE or SYNC, and adjust R1320 for zero center scale on the SYNCHRONIZE meter.

5-4. REPAIR.

a. GENERAL. - Repair encompasses those procedures necessary to fix and replace defective DDR-5B components. As stated in paragraph 5-1, repair procedures given in this section are confined to cable connectors and cable assemblies. Repair procedures for RAK-21B1 components or any modular unit contained in the DDR-5B can be found in the appropriate modular unit-manual.

NOTE

When a component fails in a highly precise frequency sensitive element of any DDR-5B modular unit, it is generally more practical to replace the entire assembly than to fix the component. Such assemblies may then be returned to the factory for repair and adjustment. The same is true of complicated mechanical assemblies. Installation of parts peculiar without special tools makes the replacement of the entire assembly more practical than disassembly, fabrication, and reassembly.

b. ELECTRICAL LEADS CA-412. - Electrical leads CA-412 are ground straps connected to RAK-21B1 and DDR-5B modular units as shown in figure 2-3. As indicated below, the last group of digits in the part number indicates the length of the wire before hardware is attached; 1/4 inch of sleeving should be stripped from each end in order to attach hardware. Repair of these leads is obvious, and therefore no further information is provided in this manual.

TMC PART NO.	LENGTH
CA-412-34-54	54 inches
CA-412-34-34	34 inches

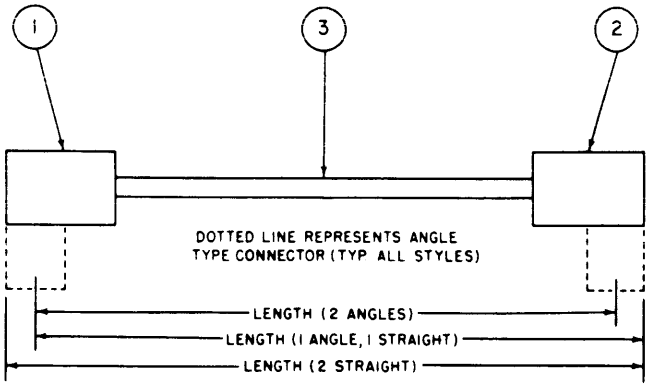
c. CABLE ASSEMBLIES CA-480-3. - Cable assemblies CA-480-3 (figure 5-2) are single-wire coaxial used for interconnecting modular units of

the DDR-5B as shown in figure 2-3. Use the information provided in figure 5-2 when repairing any of the CA-480-3 cable assemblies.

d. CABLE ASSEMBLIES CA-686 AND CA-687. - Cable assemblies CA-686 and CA-687 (figure 5-3) are multi-wire, special-purpose cables used for interconnecting DDR-5B modular units as shown in figure 2-3. Refer to the information provided in figure 5-3 when repairing any of the CA-686 or CA-687 cable assemblies. Correct wire gauge can be determined by the first two digits of the appropriate part number.

e. CABLE ASSEMBLIES CA-696, CA-706-1, AND CA-719. - Cable assemblies CA-696, CA-706-1, and CA-718 are power cables used to connect a-c input to Power Supply HFP-1, Blower AX-390, and Power Panel HPP-1 respectively (see figure 2-3). Repair of these cables is obvious upon inspection; therefore no further information is provided in this manual.

f. CABLE ASSEMBLIES CA-703, CA-704, AND CA-705-1. - Cable assemblies CA-703, CA-704, and CA-705-1 (figures 5-4, 5-5, and 5-6) are multi-wire special-purpose cables used for interconnecting DDR-5B modular units as shown in figure 2-3. Refer to the information provided in the appropriate illustration when repairing any CA-703, CA-704, or CA-705-1 cable assembly. Correct wire gauge can be determined by the first two digits of the appropriate part number.



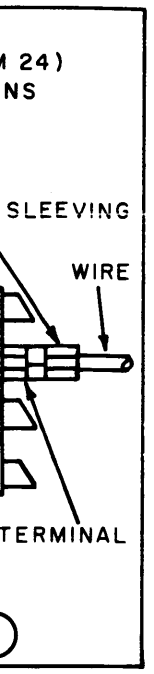
ITEM 1		ITEM 2		ITEM 3	
(CONNECTOR)	SERIES	(CONNECTOR)	SERIES	(CABLE)	OHMS
PL-169	BNC	PL-169	BNC	RG-174/U	50

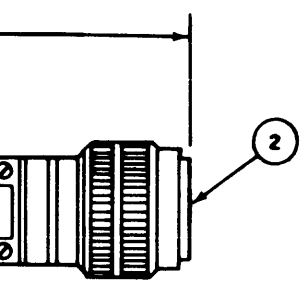
NOMENCLATURE SHALL BE DESIGNATED AS SHOWN IN THE FOLLOWING EXAMPLES

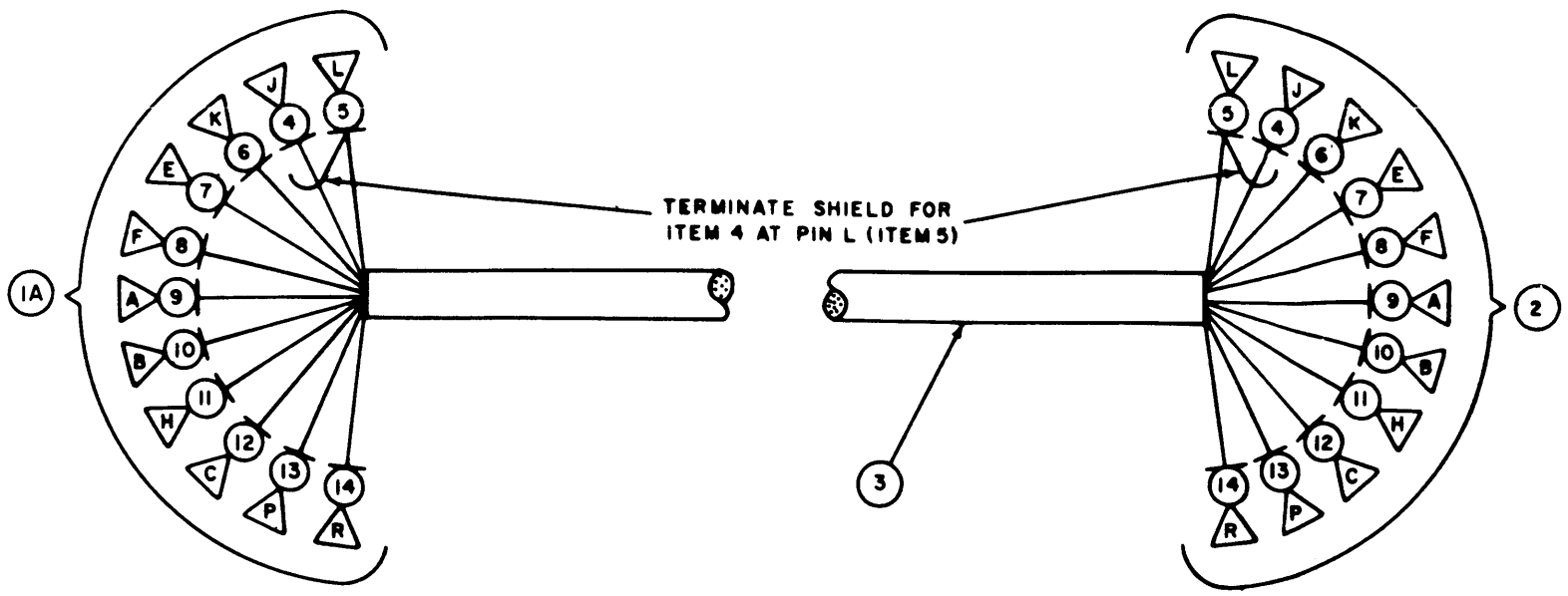
CA-480-3-LENGTH

FOR 10 FOOT LENGTHS OR LESS, EXPRESS IN INCHES	FOR OVER 10 FOOT LENGTHS, EXPRESS IN FEET TO THE NEAREST FOOT OR HALF FOOT USING THE LETTER "F"
CA-480-1-120 = 120 INCHES	CA-480-1-11F = 11 FEET
CA-480-1-14 = 14 INCHES	CA-480-1-200F = 200 FEET
CA-480-1-8.25 = 8 1/4 INCHES	CA-480-1-12.50F = 12 1/2 FEET

Figure 5-2. Cable Assemblies CA-480-3

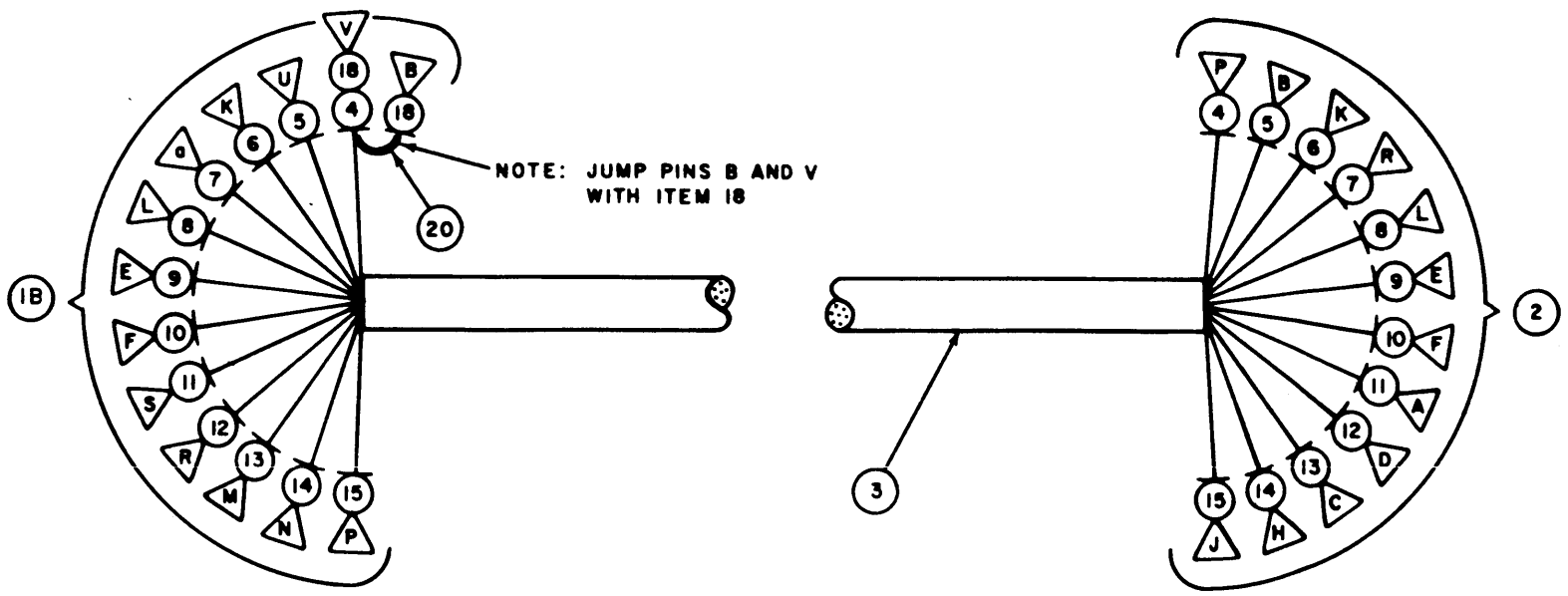






CA-687-1 AND CA-687-2

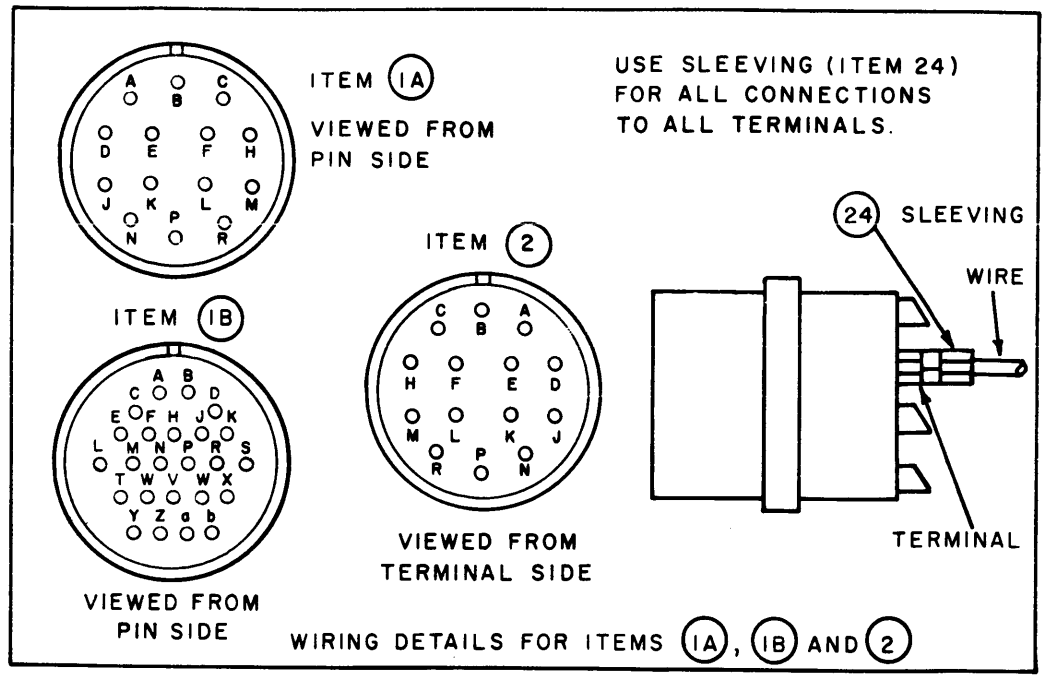
CA-687-1 AND CA-687-2			
ITEM	PART NO.	DESCRIPTION	SYMBOL
21	CD-101-1-MW	CORD, LACING	BLACK
19	PX-100-1-.095	INSULATION, SLEEVING	BLACK
17	MS-3420-12A	BUSHING, CABLE, ADAPTER TELESCOPING	BLACK
16	MS-3420-8A	BUSHING, CABLE, ADAPTER TELESCOPING	BLACK
14	MWC 20(7)U9	CABLE, INSULATED	WHITE
13	MWC 20(7)U90		WHT/BLK
12	MWC 20(7)U6		BLUE
11	MWC 20(7)U7		VIOLET
10	MWC 20(7)U98		WHT/GREY
9	MWC 20(7)U8		GREY
8	MWC 16(19)U91		WHT/BRN
7	MWC 16(19)U1		BROWN
6	MWC 22(7)U2		RED
5	MWC 20(7)U0	CABLE, INSULATED	BLACK
4	MWC 22(7)S5	CABLE, INSULATED, SHIELDED	GREEN
3	CA-687-1 (PX-100-4-.375)	INSULATION, SLEEVING	YELLOW
	CA-687-2 (PX-100-3-.375)	INSULATION, SLEEVING	ORANGE
2	PL-212-2	CONNECTOR, PLUG (14 PIN, FEMALE)	
1A	PL-212-1	CONNECTOR, PLUG (14 PIN, MALE)	

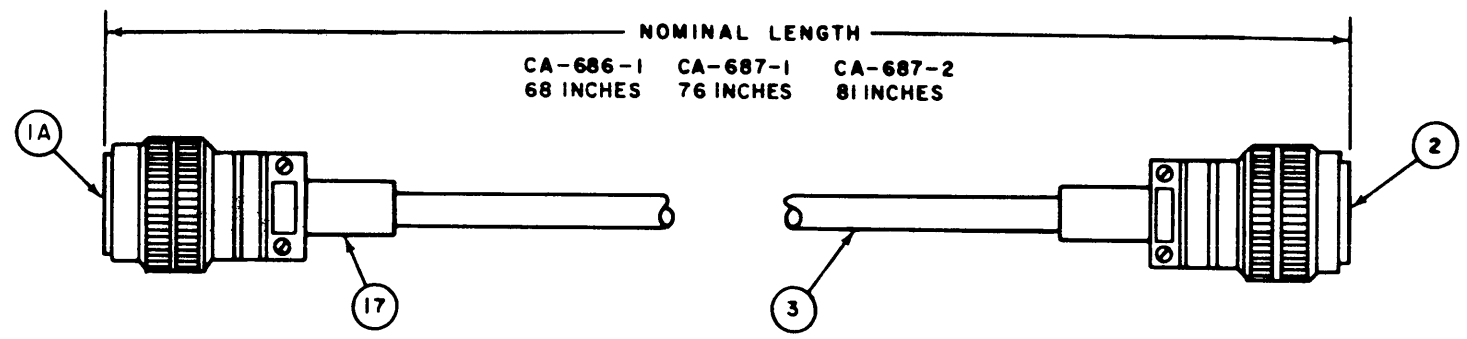


CA-686-1

CA-686-1			
ITEM	PART NO.	DESCRIPTION	SYMBOL
21	CD-101-MW	CORD, LACING	BLACK
20	PX-104-7-.022	INSULATION, SLEEVING, VINYL COVERED	GREY
19	PX-100-1-.095	INSULATION, SLEEVING	BLACK
18	WL-100-8	BUSS WIRE NO. 24	
17	MS-3420-12A	BUSHING, CABLE, ADAPTER, TELESCOPING	BLACK
16	MS-3420-8A	BUSHING, CABLE, ADAPTER, TELESCOPING	BLACK
15	MWC 20(7)U3	CABLE, INSULATED	ORANGE
14	MWC 20(7)U96		WH/BLUE
13	MWC 20(7)U6		BLUE
12	MWC 20(7)U94		WH/YELLOW
11	MWC 20(7)U4		YELLOW
10	MWC 20(7)U91		WH/BROWN
9	MWC 20(7)U1		BROWN
8	MWC 20(7)U0		BLACK
7	MWC 20(7)U92		WH/RED
6	MWC 20(7)U2		RED
5	MWC 20(7)U95		WH/GRN
4	MWC 20(7)U90	CABLE, INSULATED	WH/BLK
3	PX-100-5-.375	INSULATION, SLEEVING	GREEN
2	PL-212-2	CONNECTOR PLUG (14 PIN, FEMALE)	
1B	PL-212-3	CONNECTOR PLUG (24 PIN, MALE)	

Figure 5-3. Cable Assemblies CA686-1, CA-687-1, and CA-687-2

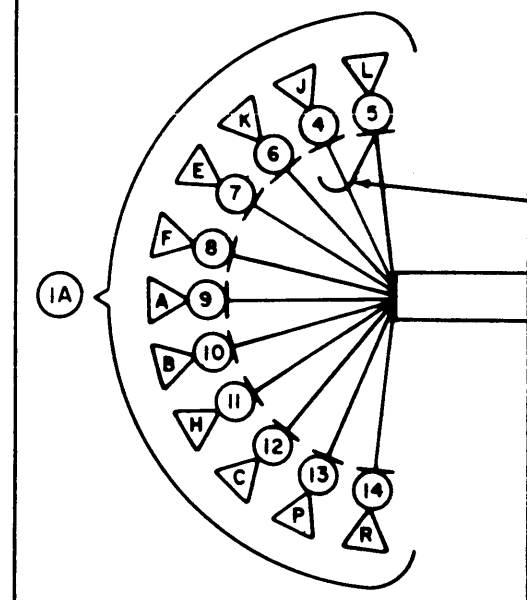


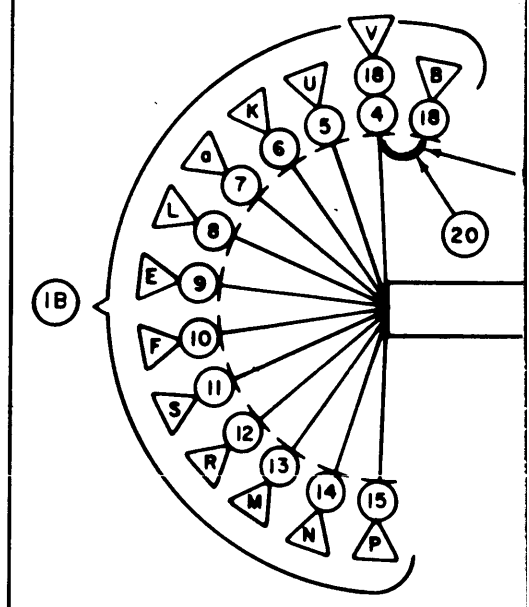


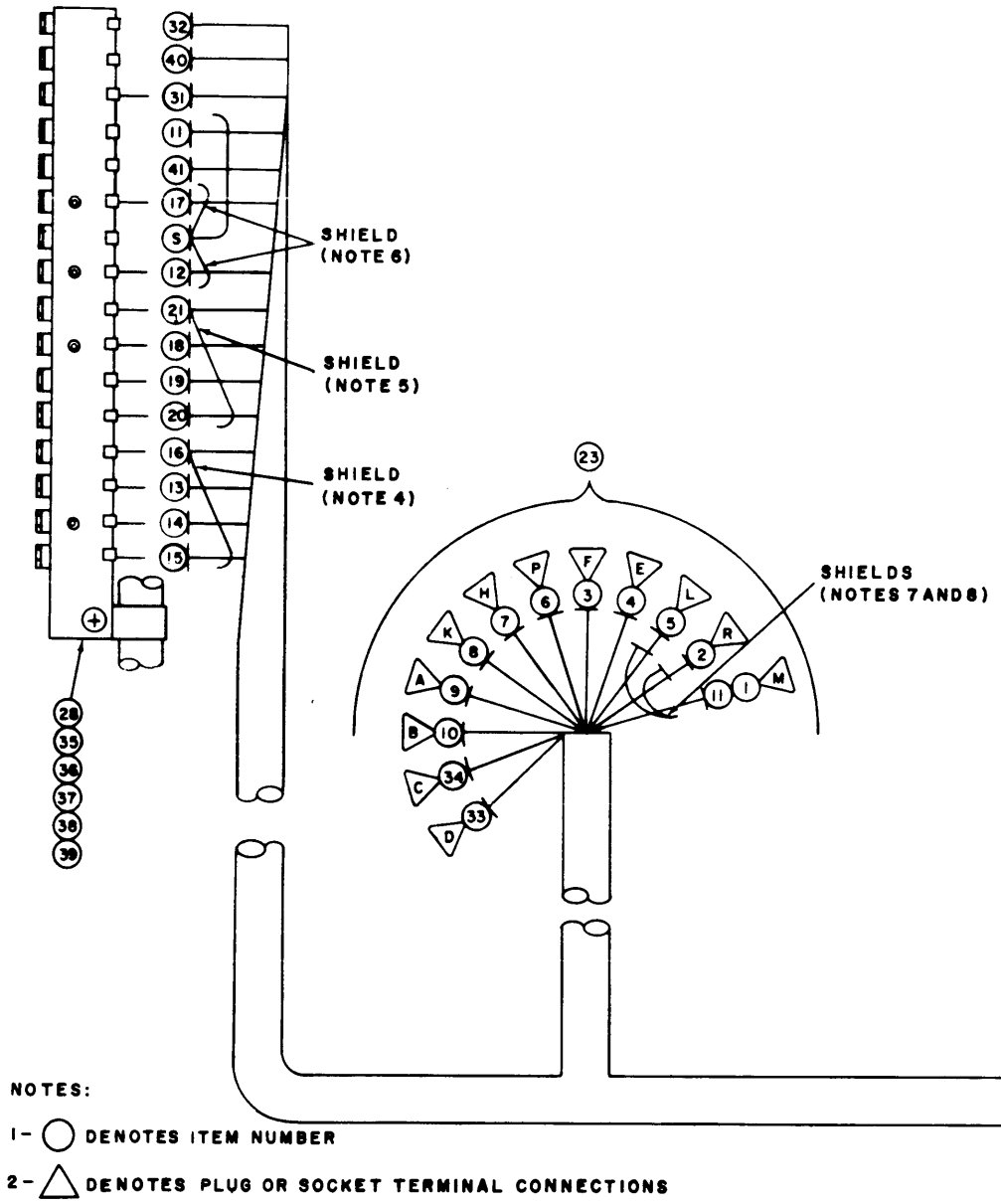
CA-686-1, CA-687-1, AND CA-687-2

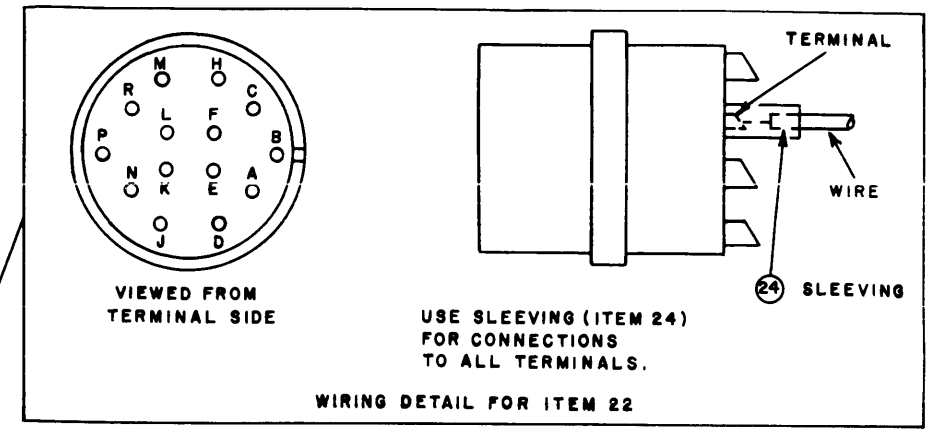
NOTES:

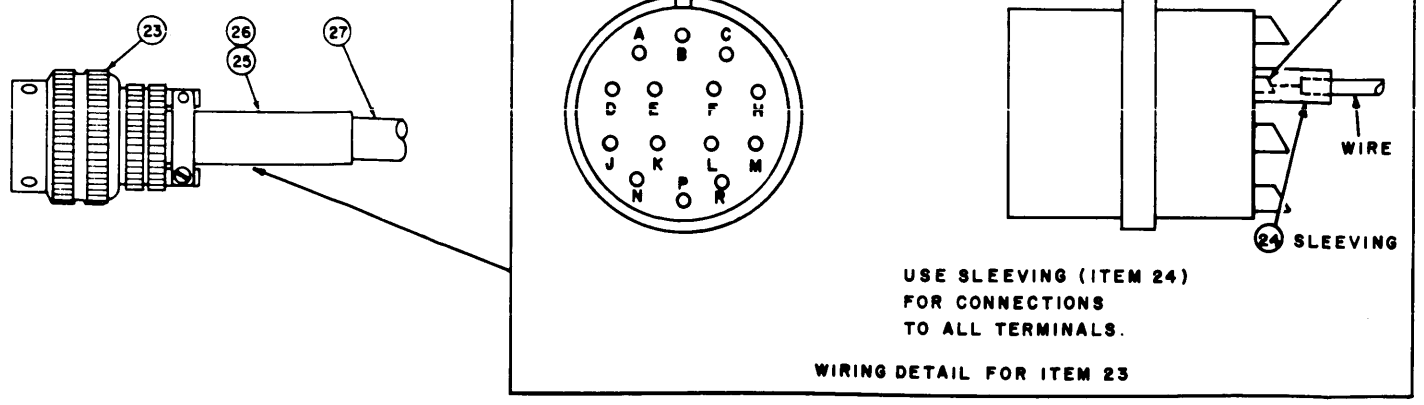
1. ◯ DENOTES ITEM NUMBER
2. ▽ DENOTES PLUG OR SOCKET TERMINAL CONNECTIONS











NOTES:

1- ◯ DENOTES ITEM NUMBER

2- △ DENOTES PLUG OR SOCKET TERMINAL CONNECTIONS

3- ⬡ DENOTES EQUIPMENT TERMINAL CONNECTIONS AND ITEM NUMBER

4- TERMINATE SHIELDS FOR ITEMS (13) (14) (15) AT ITEM (16)

5- " " " " (18) (19) (20) " " (21)

6- " " " " (11) (12) (17) " " (S)

7- TERMINATE SHIELD FOR ITEM (1) AT TERMINAL R

8- " " " " (11) " " L

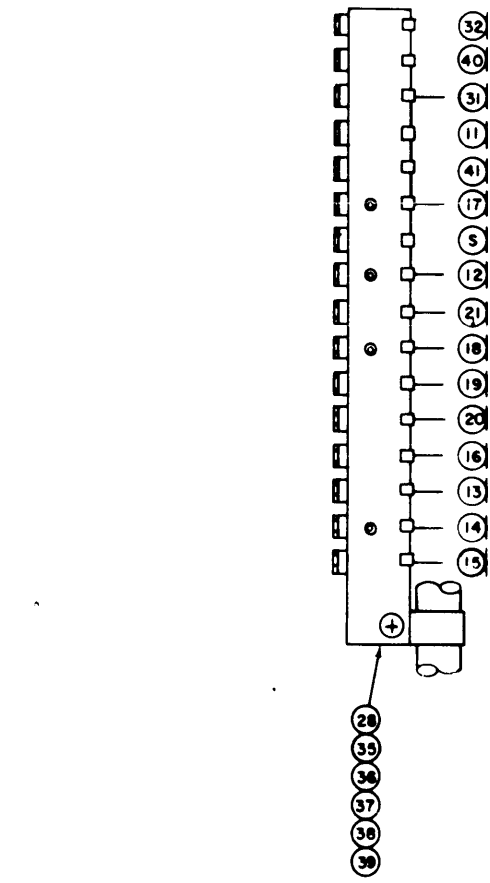
9- TERMINATE SHIELDS FOR ITEMS (12) THRU (15) AT ITEM (16)

10- " " " " (17) " (20) " " (21)

11- TERMINATE SHIELD FOR ITEM (1) AT TERMINAL R

REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL
	41	MWC 22(7) U0	CABLE, INSULATED	BLACK
	40	MWC 22(7) U96	CABLE, INSULATED	WH/BLU
1	39	SCBP0632 BN 6	SCREW, MACHINE	
1	38	FW 06 HBN	WASHER, FLAT	
1	37	LWE 06 MRN	LOCKWASHER, EXT.	
1	36	NTH0632BN8	NUT, HEXAGON	
1	35	CU-102-5	CLAMP, "G" TYPE	
	34	MWC 18(16)U91	CABLE, INSULATED	WH/BRN
	33	MWC 18(16)U1	↕	BROWN
	32	MWC 22(7) U7	↕	VIOL.
	31	MWC 22(7) U6	CABLE, INSULATED	BLUE
	30	CD-101-1MW	CORD, LACING	BLACK
14	29	TE 120-2	LUGS	
1	28	TM105-16-AL	FANNING STRIP	
16 FT.	27	PX 100-1	INSULATION, SLEEVING	BLACK
2	26	MS 3420 12A	BUSHING, CABLE, ADAPTER TELESCOPING	BLACK
2	25	MS 3420-8A	BUSHING, CABLE, ADAPTER TELESCOPING	BLACK
	24	PX 100-1-.095	INSULATION SLEEVING	BLACK
1	23	PL-212-2	CONNECTOR, PLUG FEMALE	
1	22	PL-212-1	CONNECTOR, PLUG MALE	
	21	MWC 22(7) U0	CABLE, INSULATED	BLACK
	20	↕ S6	CABLE, INSULATED, SHIELDED	BLUE
	19	↕ S4	↕	YELLOW
	18	↕ S2	↕	RED
	17	↕ S3	CABLE, INSULATED, SHIELDED	ORNG
	16	↕ U0	CABLE, INSULATED	BLACK
	15	↕ S6	CABLE, INSULATED, SHIELDED	BLUE
	14	↕ S4	↕	YELLOW
	13	↕ S2	↕	RED
	12	↕ S3	↕	ORNG
	11	MWC 22(7) S5	CABLE, INSULATED, SHIELDED	GREEN
	10	MWC 22(7) U2	CABLE, INSULATED	RED
	9	↕ 96	↕	WH/BLU
	8	↕ U6	↕	BLUE
	7	↕ U7	↕	VIOLET
	6	↕ U0	↕	BLACK
	5	MWC 22(7) U0	↕	BLACK
	4	MWC 18(16) U1	↕	BROWN
	3	MWC 18(16)U91	↕	WH/BRN
	2	MWC 22(7) U0	CABLE, INSULATED	BLACK
	1	MWC 22(7) S5	CABLE, INSULATED, SHIELDED	GREEN

Figure 5-4. Cable Assembly CA-703



NOTES:

1- ◯ DENOTES

2- △ DENOTES

3- ⬡ DENOTES

4- TERMINATE

5- "

6- "

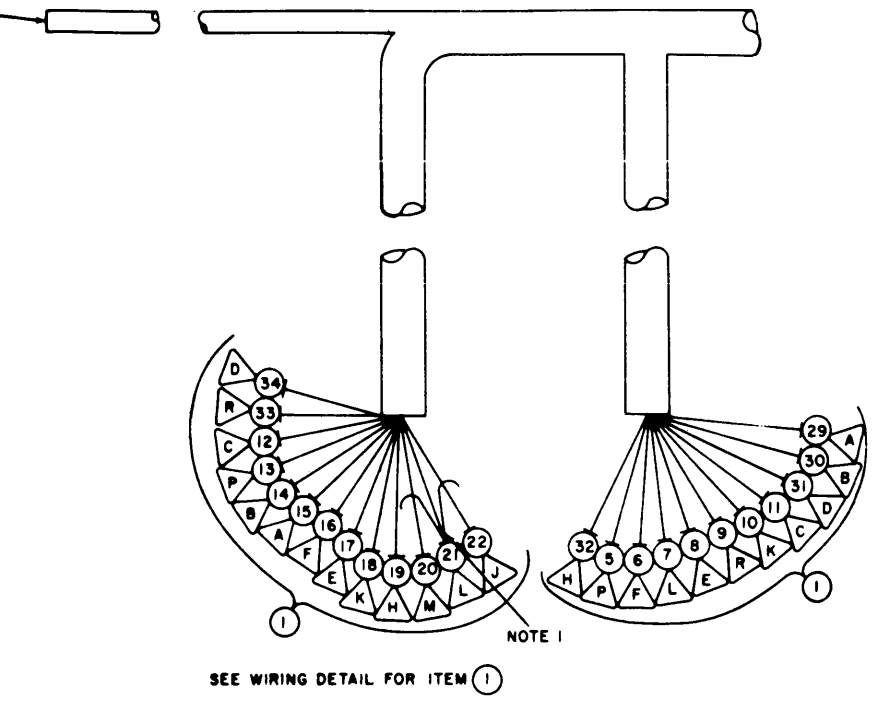
7- TERMINATE

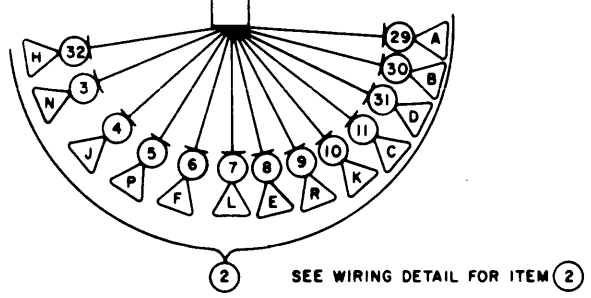
8- "

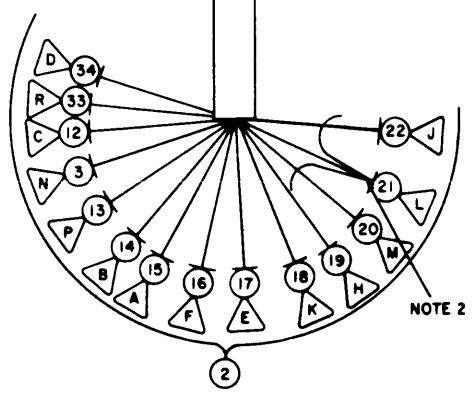
9- TERMINATE

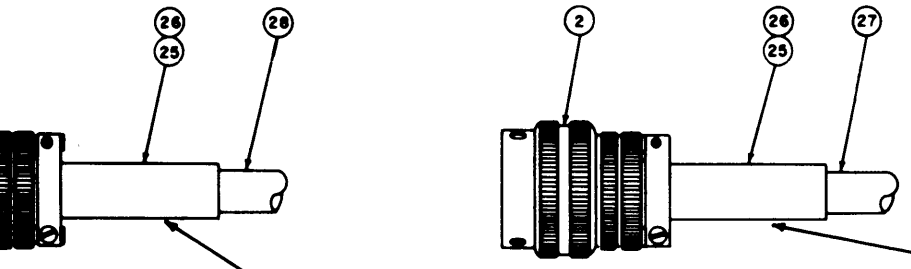
10- "

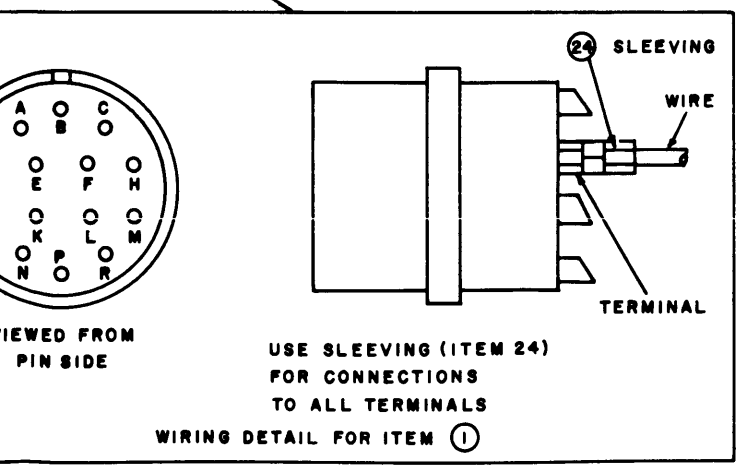
11- TERMINATE

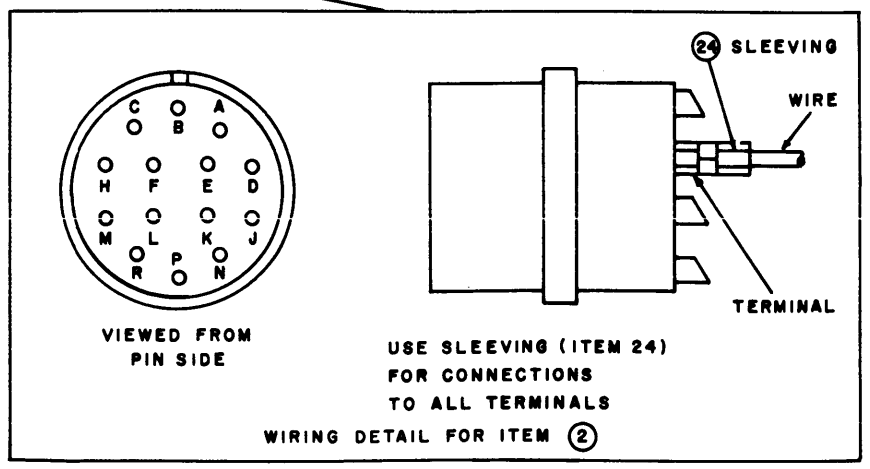












NOTES

1 – TERMINATE SHIELD FOR ITEM (20) AND (22) AT TERMINAL (L)

2 – TERMINATE SHIELD FOR ITEM (20) AND (22) AT TERMINAL (L)

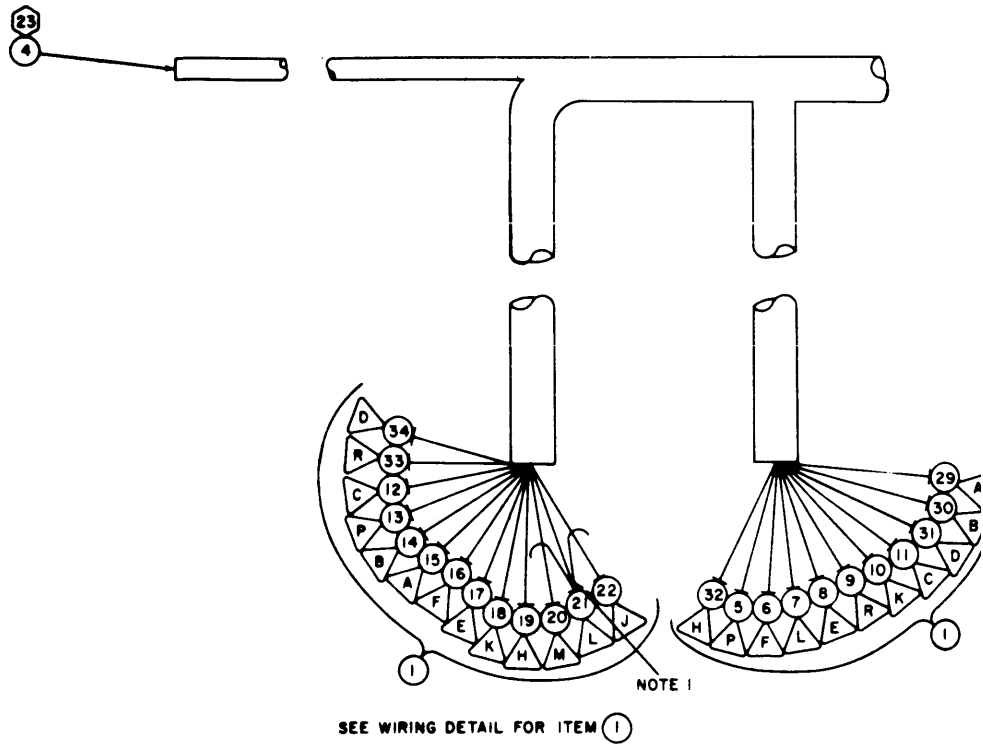
3 – (○) DENOTES ITEM NUMBER

4 – (△) DENOTES PLUG OR SOCKET TERMINAL CONNECTIONS

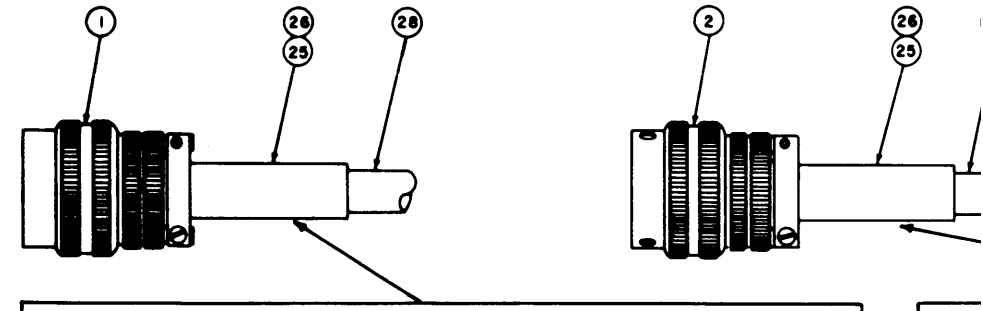
5 – (⬡) DENOTES EQUIPMENT TERMINAL CONNECTIONS AND ITEM NUMBER

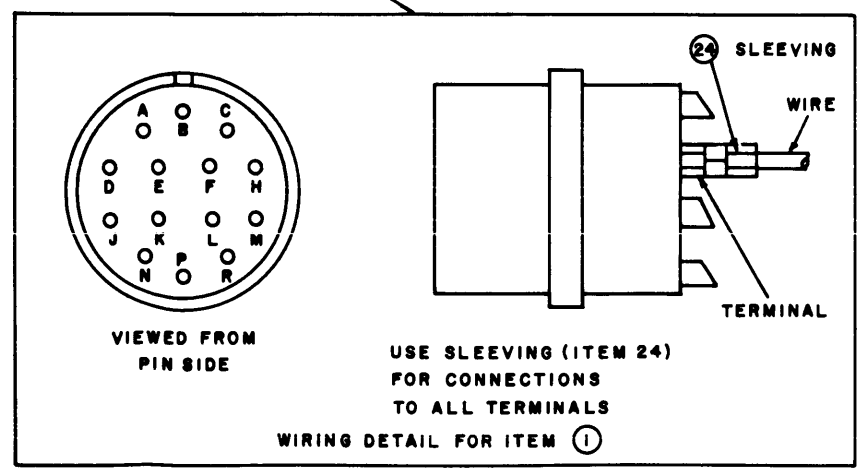
ITEM	PART NO.	DESCRIPTION	SYMBOL
34	MWC16(19)U91	CABLE, INSULATED	WH/BRN
33	MWC16(19)U	CABLE, INSULATED	BROWN
32	MWC16(19)U91	CABLE, INSULATED	WH/BRN
31	MWC16(19)U91	CABLE, INSULATED	WH/BRN
30	MWC16(19)U1	CABLE, INSULATED	BROWN
29	MWC16(19)U1	CABLE, INSULATED	BROWN
28	PX-100-1	INSULATION SLEEVING	BLACK
27	CD-101-1-MW	CORD LACING	BLACK
26	MS-3420-12A	BUSHING, CABLE ADAPTER, TELESCOPING	BLACK
25	MS-3420-8A	BUSHING, CABLE ADAPTER, TELESCOPING	BLACK
24	PX 100-1-095	INSULATION SLEEVING	BLACK
23	TE-159-32957	TERMINAL, SOLDERLESS	
22	MWC22(7)S5	CABLE, INSULATED, SHIELDED	GREEN
21	MWC22(7)U0	CABLE, INSULATED	BLACK
20	MWC22(7)S4	CABLE, INSULATED, SHIELDED	YELLOW
19	MWC22(7)U7	CABLE, INSULATED	VIOLET
18	MWC22(7)U2	↕	RED
17	MWC16(19)U1	↕	BROWN
16	MWC16(19)U91	↕	WH/BRN
15	MWC18(16)U8	↕	GRAY
14	MWC18(16)U98	↕	WH/GRAY
13	MWC22(7)U93	↕	WH/ORNG
12	MWC22(7)U6	↕	BLUE
11	MWC22(7)U6	↕	BLUE
10	MWC22(7)U2	↕	RED
9	MWC22(7)U96	↕	WH/BLU
8	MWC16(19)U1	↕	BROWN
7	MWC16(19)U0	↕	BLACK
6	MWC16(19)U91	↕	WH/BLU
5	MWC22(7)U3	↕	ORANGE
4	MWC18(16)U9	↕	WHITE
3	MWC22(7)U90	CABLE, INSULATED	WH/BLK
2	PL-212-2	CONNECTOR, RECEPTACLE FEMALE	
1	PL-212-1	CONNECTOR, RECEPTACLE MALE	

Figure 5-5. Cable Assembly CA-704

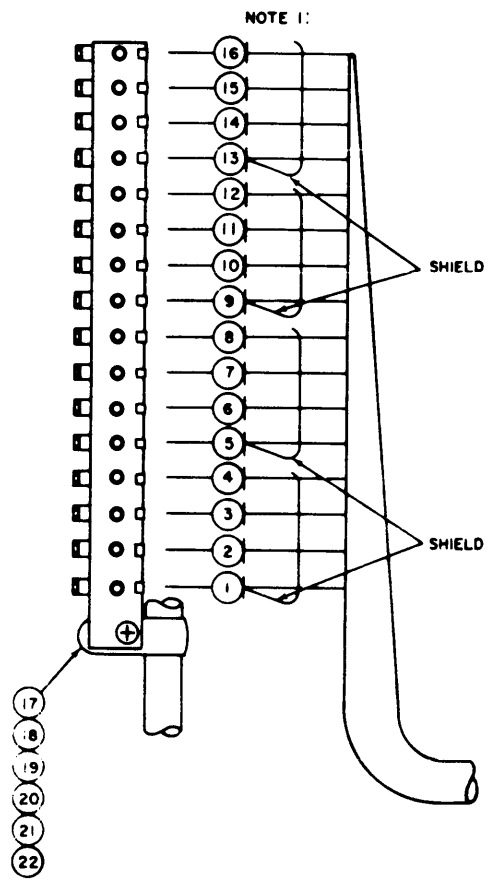


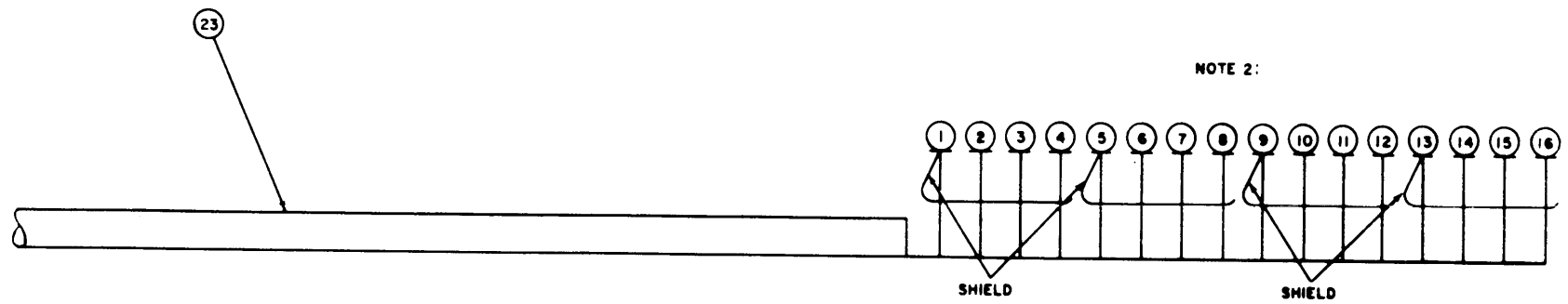
SEE WIRING DETAIL FOR ITEM (1)





WIRING DETAIL FOR ITEM (1)





NOTES:

1 - TERMINATE SHIELDS FOR ITEMS (2) (3) AND (4) AT ITEM (1)
" " " " (6) (7) " (8) " " (5)
" " " " (10) (11) " (12) " " (9)
" " " " (14) (15) " (16) " " (13)

2 - TERMINATE SHIELDS FOR ITEMS (2) (3) AND (4) AT ITEM (1)
" " " " (6) (7) " (8) " " (5)
" " " " (10) (11) " (12) " " (9)
" " " " (14) (15) " (16) " " (13)

REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL
X	24	CD-101-1-MW	CORD, LACING	BLACK
X	23	PX-100-1-.500	INSULATION, SLEEVING	BLACK
1	22	NTH0636BN8	NUT, HEX	
1	21	FW06HBN	WASHER, FLAT	
1	20	LWE06MRN	WASHER, LOCK, EXTERNAL	
1	19	SCBP0632BN6	SCREW, MACHINE	
1	18	CU-102-5	CLAMP, "G" TYPE	
1	17	TM-105-16AL	TERMINAL STRIP	
	16	MWC 22(7) S93	CABLE, INSULATED, SHIELDED	WH/ORN
	15	MWC 22(7) S92	CABLE, INSULATED, SHIELDED	WH/RED
	14	MWC 22(7) S91	CABLE, INSULATED, SHIELDED	WH/BRN
	13	MWC 22(7) UO	CABLE, INSULATED	BLACK
	12	MWC 22(7) S9	CABLE, INSULATED, SHIELDED	WHITE
	11	MWC 22(7) S8	CABLE, INSULATED, SHIELDED	GRAY
	10	MWC 22(7) S7	CABLE, INSULATED, SHIELDED	VIOLET
	9	MWC 22(7) UO	CABLE, INSULATED	BLACK
	8	MWC 22(7) S6	CABLE, INSULATED, SHIELDED	BLUE
	7	MWC 22(7) S5	CABLE, INSULATED, SHIELDED	GREEN
	6	MWC 22(7) S4	CABLE, INSULATED, SHIELDED	YELLOW
	5	MWC 22(7) UO	CABLE, INSULATED	BLACK
	4	MWC 22(7) S3	CABLE, INSULATED, SHIELDED	ORANGE
	3	MWC 22(7) S2	CABLE, INSULATED, SHIELDED	RED
	2	MWC 22(7) S1	CABLE, INSULATED, SHIELDED	BRN
	1	MWC 22(7) UO	CABLE, INSULATED	BLK

Figure 5-6. Cable Assembly CA-705-1