UNCLASSIFIED

TECHNICAL MANUAL

for

DUAL DIVERSITY RADIO RECEIVER MODEL DDR-5A (AN/FRR-60(V))

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

UNCLASSIFIED

TECHNICAL MANUAL

for

DUAL DIVERSITY RADIO RECEIVER MODEL DDR-5A (AN/FRR-60(V))

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

IN 308

Issue Date: 15 April 1963

NOTICE

THE CONTENTS AND INFORMATION CONTAINED IN THIS INSTRUCTION MANUAL IS PROPRIETARY TO THE TECHNICAL MATERIEL CORPORATION TO BE USED AS A GUIDE TO THE OPERATION AND MAINTENANCE OF THE EQUIPMENT FOR WHICH THE MANUAL IS ISSUED AND MAY NOT BE DUPLICATED EITHER IN WHOLE OR IN PART BY ANY MEANS WHATSOEVER WITHOUT THE WRITTEN CONSENT OF THE TECHNICAL MATERIEL CORPORATION.

WORLD WIDE SUPPLIERS OF ELECTRONIC COMMUNICATIONS EQUIPMENT

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,

MODEL DDR-5A

The purpose of this addendum is to provide information that will aid field-service personnel when ordering replacement parts.

Replacement parts for DDR-5A modular units are grouped in series as listed below. When ordering any part, the part number, the reference symbol, and the modular unit in which the part is used should be clearly stated. Because of redundancy in reference symbols, it is particularly important to specify the modular unit when ordering replacement parts for Diversity Visual Monitor DVM-4 or IF Amplifier HFI-1.

MODULAR UNIT	SPARE PARTS REF. SYMBOL SERIES
Diversity Visual Monitor, Model DVM-4	100
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-1	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-22A1	9000-9099

MODULAR UNIT	SPARE PARTS REF. SYMBOL SERIES (Cont)
Audio Switch Panel Model HSP-2	9200-9299
Speaker Panel Model HSS-1	9300-9399
Power Panel, Model HPP-1	9400-9499

ADDENDUM

FOR

DUAL DIVERSITY RECEIVER,

MODEL DDR-5A

The purpose of this addendum is to provide information that will aid field-service personnel when ordering replacement parts.

Replacement parts for DDR-5A modular units are grouped in series as listed below. When ordering any part, the part number, the reference symbol, and the modular unit in which the part is used should be clearly stated. Because of redundancy in reference symbols, it is particularly important to specify the modular unit when ordering replacement parts for Diversity Visual Monitor DVM-4 or IF Amplifier HFI-1.

MODULAR UNIT	SPARE PARTS REF. SYMBOL SERIES
Diversity Visual Monitor, Model DVM-4	100
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-1	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-22A1	9000-9099

MODULAR UNIT	SPARE PARTS REF. SYMBOL SERIES (Cont)
Audio Switch Panel Model HSP-2	9200-9299
Speaker Panel Model HSS-1	9300-9399
Power Panel, Model HPP-1	9400-9499

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

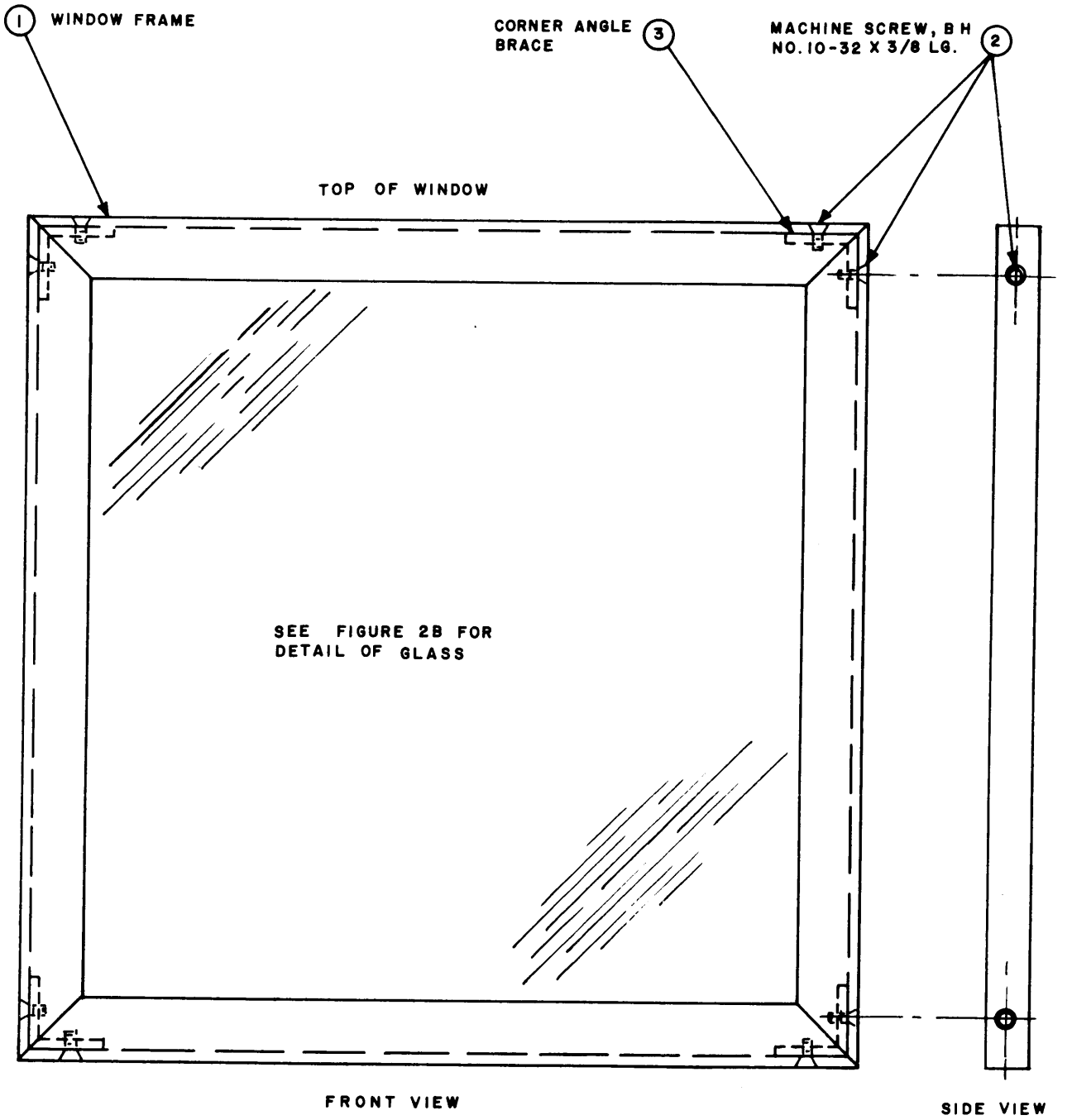
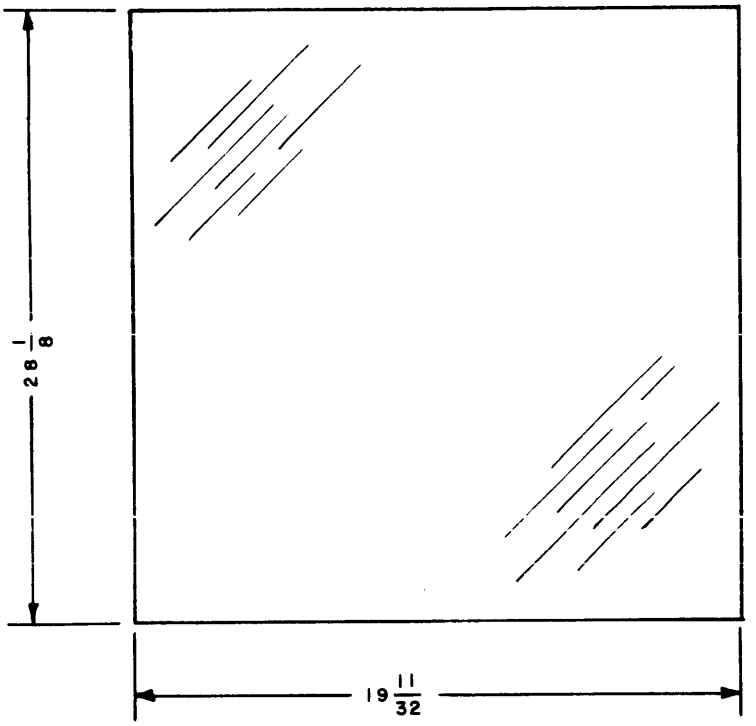


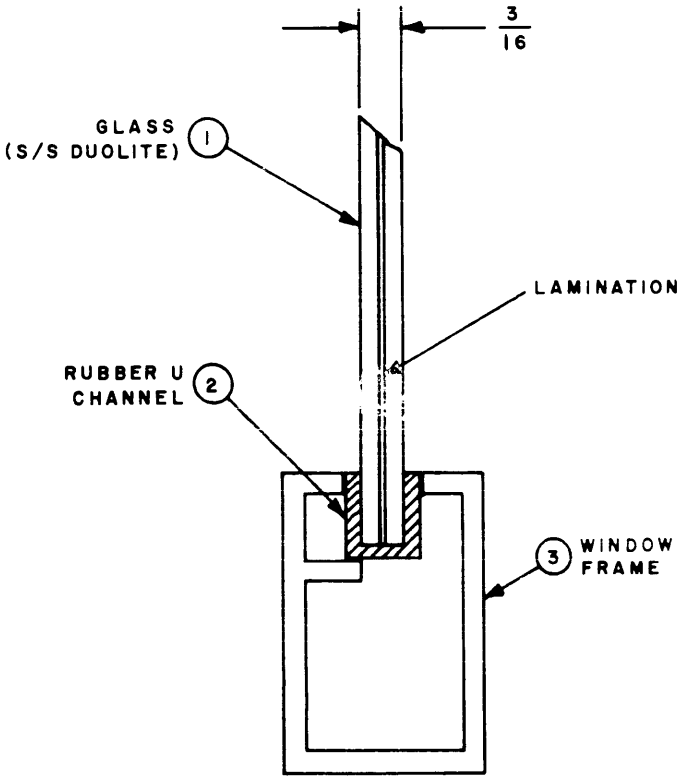
FIGURE 1. WINDOW ASSEMBLY



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

RECORD OF CORRECTIONS MADE

Change No.	Date of Change	Date Entered	Entered By

CHANGE NO. 1

INSTRUCTION BOOK CHANGE NOTICE

Date September 27, 1963

Manual affected: Dual Diversity Radio Receiver IN -308
Model DDR-5A

page 4-11/4-12 Figure 4-2 Servicing Block Diagram

Control Synthesizer and Standard HFS-1 block:

Change output jack number J3015 to J3017

Change output jack number J3010 to J3012

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. 2

INSTRUCTION BOOK CHANGE NOTICE

Date March 30, 1964

Manual affected: Dual Diversity Radio Receiver Model DDR-5A IN -308

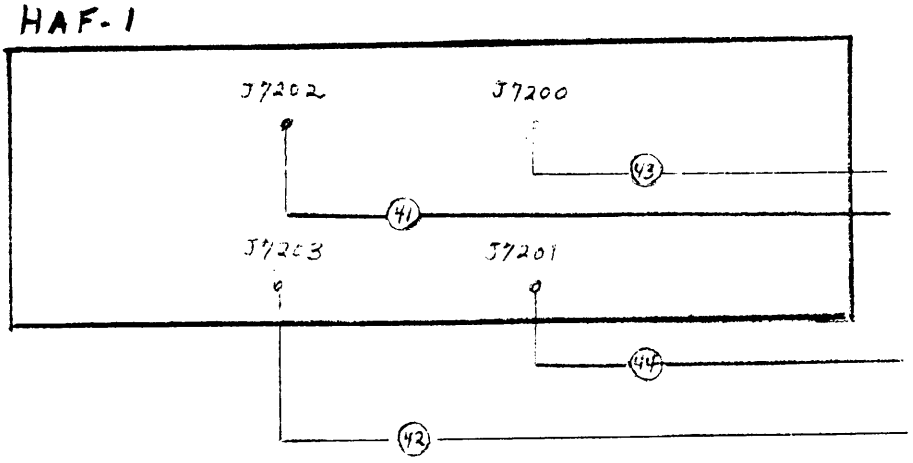
Page 2-2. Paragraph 2-3c

Add the following sentence to the beginning of paragraph 2-3c: "Refer to figure 1-2 for proper location of modular units in the DDR-5A cabinet."

Page 2-9/2-10. Page 2-11/2-12

Figures 2-4 and 2-5

Change jack designations on Audio Filter HAF-1 as indicated below:



INSTRUCTION BOOK CHANGE NOTICE

Date March 30, 1964

Manual affected: Dual Diversity Radio Receiver IN -308
Model DDR-5A

Page 2-16. Paragraph 2-4e

1. Change step (5d) to read as follows:

(d) Using general procedure outlined in steps (a), (b), and (c) above and with CHANNEL A IF BANDWIDTH KC and CHANNEL B IF BANDWIDTH KC switches set at appropriate 6 DSB, 15 DSB, or blank position, adjust 6 KC SYM and 15 KC SYM i-f strips for 1 volt reading on CHANNEL A OUTPUT and CHANNEL B OUTPUT meters.

2. Change step (8) to read as follows:

(8) Using general procedure outlined in steps (5a), (5b), and (5c) above and with CHANNEL A IF BANDWIDTH KC and CHANNEL B IF BANDWIDTH KC switches set at appropriate 3.5 KC USB, 7.5 KC USB, or blank position, adjust 3.5 U SSB and 7.5 U SSB i-f strips for 1 volt reading on CHANNEL A OUTPUT and CHANNEL B OUTPUT meters.

3. Change step (10) to read as follows:

(10) Using general procedure outlined in steps (5a), (5b), and (5c) above and with CHANNEL A IF BANDWIDTH KC and CHANNEL B IF BANDWIDTH KC switches set at appropriate 3.5 KC LSB, 7.5 KC LSB, or blank position, adjust 3.5 KC LSB and 7.5 KC LSB i-f strips for 1 volt reading on CHANNEL A OUTPUT and CHANNEL B OUTPUT meters.

INSTRUCTION BOOK CHANGE NOTICE

Date March 30, 1964

Manual affected: Dual Diversity Radio Receiver IN -308
Model DDR-5A

Page 2-17. Paragraph 2-4g. CHECKOUT PROCEDURE FOR DETECTOR AND AUDIO AMPLIFIER HFA-1 OF RCVR No. 1

1. Change step (6) to read as follows:

   Adjust CHANNEL A BFO control (80) and CHANNEL B BFO control (83) of HFA-1 for maximum indication on associated CHANNEL A LINE LEVEL or CHANNEL B LINE LEVEL meter.

2. Delete steps (11) and (19).

CHANGE NO. 3

INSTRUCTION BOOK CHANGE NOTICE

Date 3/31/64

Manual affected: Dual Diversity Radio Receiver, Model DDR-5A IN -308

Page 2-1. Table 2-1

Change contents of Box No. 1 and Box No. 8 as follows:

1. Add "Instruction Manuals, 2 each; Loose Items; and Test Data" to Box No. 1.

2. Delete "Instruction Manual, 2 each; Loose Items; and Test Data" from Box No. 8.

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

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

Attn.: Director of Eng. Services.

FOREWORD

The DDR-5A comprises 12 modular units; these modular units are used in various receiver configurations as well as the DDR-5A. 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-5A with the exception of Audio Switch Panel HSP-2, Power Panel HPP-1, Speaker Panel HSS-1, and Equipment Rack RAK-22A1. Information concerning these units is grouped together in one manual located in the appendix.

The DDR-5A 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-5A, the cabinet, and the modular units that constitute the DDR-5A are as follows:

Dual Diversity Receiver

TMC: Dual Diversity Receiver, Model DDR-5A
MIL: Receiving Set, Radio: AN/FFR-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

Diversity Visual Monitor

TMC: Diversity Visual Monitor, Model DVM-4
MIL: Monitor, Radio Frequency: IP-641/URR

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

TME: 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: Rack, Model RAK-22A1
MIL: Cabinet, Electrical Equipment: CY-3567/FRR-60 (v)

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

LIST OF ILLUSTRATIONS

LIST OF TABLES

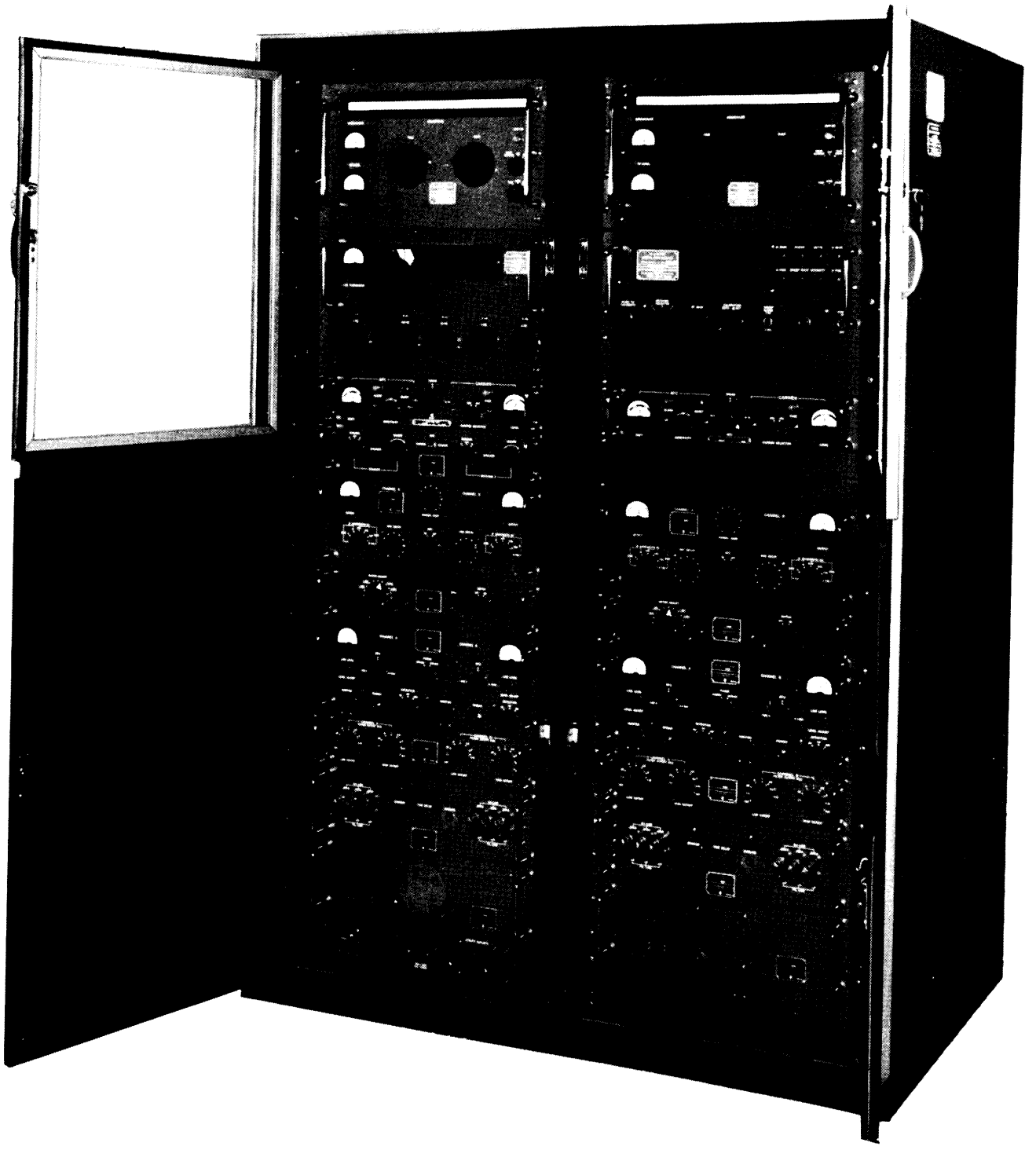


Figure 1-1. Dual Diversity Radio Receiver, Model DDR-5A

SECTION 1
GENERAL INFORMATION

1-1. GENERAL INFORMATION.

Dual Diversity Radio Receiver Model DDR-5A (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-5A is 6 db over the band (refer to Table 1-1). The DDR-5A comprises various modular units (refer to paragraph 1-2) mounted in a double rack, and is used in fixed-station or mobile communications systems. The 2 to 32 mc range covered by the DDR-5A is divided into eight r-f bands; continuous coverage (non-synthesized) or synthesized coverage in 100 cycle steps is provided. Automatic frequency control, visual monitoring, variable audio filtering, i-f bandpass selection, and tuneable i-f notch filtering is also provided.

Figure 1-2 illustrates the chassis locations of the modular units that are contained in the DDR-5A. With the exception of the synthesizer (HFS-1), the Audio Switch Panel (HSP-2), and the Power Panel (HPP-1), all units in the left side of the cabinet constitute receiver 1 and all units in the right side of the cabinet constitute receiver 2. The HFS-1, HSP-2, and HPP-1 are common to both receivers.

Flexibility of space-diversity or single-receiver operation is provided in order to fulfill various operational requirements and to maintain receiver operability during emergency conditions. In space-diversity operation, the first converter stage of receiver 2 is slaved to the first converter stage of receiver 1, and the agc voltages of both receivers are combined. The DDR-5A 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 DDR-5A 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.

Single-receiver operation is made possible by changing the interconnecting cables (refer to Section 2). In single-receiver operation, receiver 2 must operate non-synthesized, whereas receiver 1 can operate synthesized or non-synthesized. HSP-2 front-panel controls enable operating personnel to separate the agc circuits of receiver 1 and receiver 2 when using single-receiver operation.

Front-panel meters are provided on the DDR-5A 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 receiver 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 useable as a maintenance tool for checking the alignment of the DDR-5A.

A positive filtered forced-air cooling system using squirrel cage blowers is incorporated within the electrical equipment cabinet (RAK-22A1). Washable air filters are used to filter out external dust.

1-2. DESCRIPTION OF UNITS.

a. GENERAL. - Paragraphs b through m below give a brief description of the modular units used in the DDR-5A. 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 (O-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 in 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 Unit, Model AFC-3, accepts a 250 kc input signal from IF Amplifier HFI-1, and provides automatic frequency control to compensate for a combined frequency drift of ±1000 cycles in the receiver and the distant transmitter. The AFC-3 will restore a carrier suppressed as much as 30 db. The AFC-3 obtains its operating voltage from Power Supply, Model HFP-1.

RECEIVER 1	RECEIVER 2
HFR-1	HFR-1
HFS-1	DVM-4
	BLANK PANEL
AFC-3	AFC-3
HSP-2	BLANK PANEL
HFI-1	HFI-1
HNF-1	HNF-1
HFA-1	HFA-1
HAF-1	HAF-1
HFP-1	HFP-1
HSS-1	HSS-1
HPP-1	BLOWER

Figure 1-2. DDR-5A Chassis Locations

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 the 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 the i-f amplifier and provides 60 db of attenuation for 20 cycles of any one interfering signal over the entire passband of the i-f signal. Once the interfering signal has been rejected, the notch filter returns the signal to the i-f amplifier for further demodulation. The notch filter obtains its operating voltages from Power Supply, Model HFP-1.

g. DETECTOR AND AUDIO AMPLIFIER, MODEL HFA-1 (AM-3296/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 provide 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 Detector and Audio Amplifier HFA-1, and is adjustable by front-panel controls to vary the upper and lower frequency cut-off point of each audio filter to suit operational requirements. Front-panel controls have been human engineered to minimize confusion when estabishing audio bandpass. i.e: when the controls are turned away from the OUT position (HIGH CUTOFF control turned counterclockwise; LOW CUTOFF control turned clockwise), the total audio bandpass is decreased. Conversely, when the controls are turned toward the OUT position, the total audio bandpass is increased.

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 in one complete rack of DDR-5A components.

j. DIVERSITY VISUAL MONITOR, MODEL DVM-4 (IP-641/URR). - Diversity Visual Monitor, Model DVM-4, provides visual indication of i-f input signals to Detector and Audio Amplifier HFA-1. The DVM-4 indicates proper or improper tuning of the DDR-5A receiver.

k. AUDIO SWITCH PANEL, MODEL HSP-2 (SB-1865/FR). - Audio Switch Panel, Model HSP-2, facilitates selection of Channel A or Channel B audio signals to be applied to the loudspeaker. The HSP-2 filters and interconnects Channel A and Channel B audio output to terminal strip A-3083 for further application to local equipment such as teletypewriters etc.

l. 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 either receiver 1 or receiver 2.

m. 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-5A system. For reference data concerning the modular units used in the DDR-5A, refer to the individual modular-unit manuals.

1-4. EQUIPMENT SUPPLIED.

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

TABLE 1-1. DDR-5A, TECHNICAL SPECIFICATIONS

a. Frequency Range	2 to 32 mcs, synthesized in 100 cycle steps.
b. Tuning	DDR-5A 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

TABLE 1-1. DDR-5A, TECHNICAL SPECIFICATIONS (C nt'd)

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 $15^{o}C$ 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.
e. Input Impedance	Nominal 50 ohms, unbalanced.
f. Noise Figure and Sensitivity	6 db or better over the band, i.e., with a 1 uv signal and a 7.5 KC bandwidth, the output signal to noise ratio is 15 db or better.
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 uv input signal.
i. Spurious Response, as defined by CCIR	Better than 120 db referenced to 1 uv. For synthesized operation, all spurious will be no greater than .01 uv 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 uv above noise threshold and will remain synchronized for plus or minus 1 KC drift at a maximum drift rate of 10 cycles 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 uv 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.

TABLE 1-1. DDR-5A. TECHNICAL SPECIFICATIONS (C nt'd)

p. Audio Amplifier Response	Plus or minus 1.5 db 20 cps at 20 KC. Bandpass is dependent on filter selected. Output adjustable from 0 to 1 watt.
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 cut off points at: 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 4, 8 or 16 ohm 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 1500 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	DESIGNATION		Height	Width	Depth		
Continuous RF Tuner, Model HFR-1	TN-376/UR	2	10 1/2	19	19 3/4		58
Control Synthesizer and Standard, Model HFS-1	0-941/UR	1	10 1/2	19	20 1/4	See Table 2-2	43
Automatic Frequency Control Unit, Model AFC-3	C-4099/FRR-60 (v)	2	3 1/2	19	16 3/4		16
IF Amplifier Model HFI-1	AM-3295/FRR-60 (v)	2	8 3/4	19	14		25
Variable Notch Filter, Model HFN-1	F-711/FRR-60 (v)	2	3 1/2	19	11		9
Audio Amplifier, Model HFA-1	AM-3296/FRR-60 (v)	2	7	19	14		20
Audio Filter, Model HAF-1	F-712/FRR-60 (v)	2	3 1/2	19	14		10
Power Supply, Model HFP-1	PP-3341/FRR-60 (v)	2	5 1-4	19	18		67
Diversity Visual Monitor, Model DVM-4	IP-641/URR	1	7	19	14 5/16		28
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	2	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-22A1	Cy-3567/FRR-60 (v)	1					660
Lead, Electrical	CA-409-32-2	4					
	CA-412-34-54	4					
	CA-412-36-34	2					
Cable Assembly, RF	CA-480-3-72	8					
	CA-480-3-90	4					
	CA-480-3-97	6					
	CA-480-3-112	9					
	CA-480-3-10.5 F	3					
	CA-480-3-11.5 F	6					
	CA-480-3-12.5 F	4					
	CA-480-3-13.5 F	1					
	CA-480-3-14F	1					
Cable Assembly, Special Purpose	CA-686-1	2					
	CA-687-1	2					
	CA-687-2	2					
	CA-703	2					
	CA-704	2					
	CA-705-1	1					

TABLE 1-2. EQUIPMENT SUPPLIED (Cont'd)

NOMENCLATURE		QTY. PER EQUIP.	Overall dimensions (in)			Gross Shipping Weight	Weight (lbs)
NAME	DESIGNATION		Height	Width	Depth		
Cable Assembly, Power	CA-696	2				See Table 2-2	
	CA-706-1	2					
	CA-718	1					
Cable Assembly, AC Power	CA-701-1	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.

The DDR-5A is shipped in eight boxes as listed in Table 2-1; box number and contents are stenciled on the outside of each box. Table 2-2 lists the gross weight and size of shipping boxes. Inspect all boxes for possible damage when they arrive 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.

Figures 2-1 and 2-2 are typical illustrations of the method used to pack RAK-22A1 and the DDR-5A modular units respectively for shipment. Using figures 2-1 and 2-2 as a guide, unpack RAK-22A1 and the modular units in the reverse order of the indicated packing procedure; refer to Table 1-2 for information regarding size and weight of RAK-22A1 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 2-1 to ensure that all equipment is received. All cable assemblies used in the DDR-5A are mounted in RAK-22A1 and taped in place or shipped as loose items in box No. 1.

TABLE 2-1. CONTAINER CONTENTS, DDR-5A SHIPMENT

BOX NO.	CONTENTS
1	Cabinet, Electrical Equipment CY-3567/FRR-60 (V), TMC Model RAK-22, 1 each. RAK-22 Complete with Loudspeaker, Permanent Magnet LS-491/FR, TMC Model HSS-1, 2 each. Panel, Power Distribution SB-1866/FR, TMC Model HPP-1, 1 each.
2	Tuner, Radio Frequency TN-370/UR, TMC Model HFR-1, 1 each. Monitor, Radio Frequency IP-641/URR, TMC Model DVM-4, 1 each.
3	Tuner, Radio Frequency TN-376/UR, TMC Model HFR-1, 1 each. Generator, Reference Signal O-941/UR, TMC Model HFS-1, 1 each.
4	Power Supply PP-3341/FRR-60(V), TMC Model HFP-1, 2 each.
5	Panel, Signal Distribution, Radio, SB-1865/FR, TMC Model HSP-2, 1 each. Amplifier, Audio Frequency AM-3296/FRR-60(V), TMC Model HFA-1, 2 each.
6	Filter, Band Pass-Band Suppression F-711/FRR-60(V), TMC Model HNF-1, 2 each. Control, Receiver G-4099/FRR-60(V), TMC Model AFC-3, 2 each.
7	Amplifier, Intermediate Frequency AM-3295/FRR-60(V), TMC Model HFI-1, 2 each.
8	Filter, Band Pass-Band Suppression F-712/FRR-60(V), TMC Model HAF-1, 2 each. Instruction Manuals, 2 each; Loose Items; and Test Data.

TABLE 2-2. SHIPPING DATA (LEVEL A), DDR-5A

Box No.	Gross Weight (lbs)	Outside Dimensions (in)			Volume (cu. ft.)
		length	width	height	
1	1017	75 1/4	36 3/8	56 3/8	89.4
2	239	36	26 3/4	34 3/4	19.4
3	250	36	26 3/4	34 3/4	19.4
4	231	31 1/8	23 1/4	22 3/4	9.4
5	181	32	23 1/2	30 1/2	13.5
6	186	32	23 1/2	30 1/2	13.5
7	181	32	23 1/2	30 1/2	13.5
8	104	25 3/8	16 1/8	29	6.9

2-2. POWER REQUIREMENTS.

All units of the DDR-5A 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-5A is approximately 1500 watts; power cabling of sufficient size to provide 20 amperes 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-5A is normally used with a sloping V, rhombic, or log-periodic antenna. For information concerning any of these antennas, refer to the appropriate handbook pertaining to antennas. For antenna cabling requirements, refer to paragraph 2-3,d.

b. LOCATION OF RECEIVER. - Before attempting to install the DDR-5A, ensure that adequate power (paragraph 2-2) is available at the selected site or location. After unpacking and inspecting the cabinet (RAK-22A1), place it 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 2-3 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-5A 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. No consideration needs to be given to heat dissipation except that the air intake and exhaust be kept clear.

c. INSTALLATION OF RECEIVER. - Each compartment of the cabinet (RAK-22A1) is equipped with tracks that attach to slide mechanisms of the associated modular unit. Modular units to be mounted on the left side of the cabinet are marked with an "L" in the serial number; modular units to be mounted on the right side of the cabinet are marked with an "R". To install any modular unit in its compartment, proceed as follows:

NOTE

A slight up-down adjustment on cabinet tracks may be necessary when and if modular units are interchanged from one side of the cabinet to the other.

(1) Untape or unstrap cable assemblies, NEGATOR B motors, and all other components secured to the RAK-22A1 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-22A1 with screws.

d. CABLING. - Untape or unstrap all cable assemblies, NEGATOR B motors, and all other components attached to the frame of RAK-22A1 for shipment, and proceed as outlined in the following paragraphs.

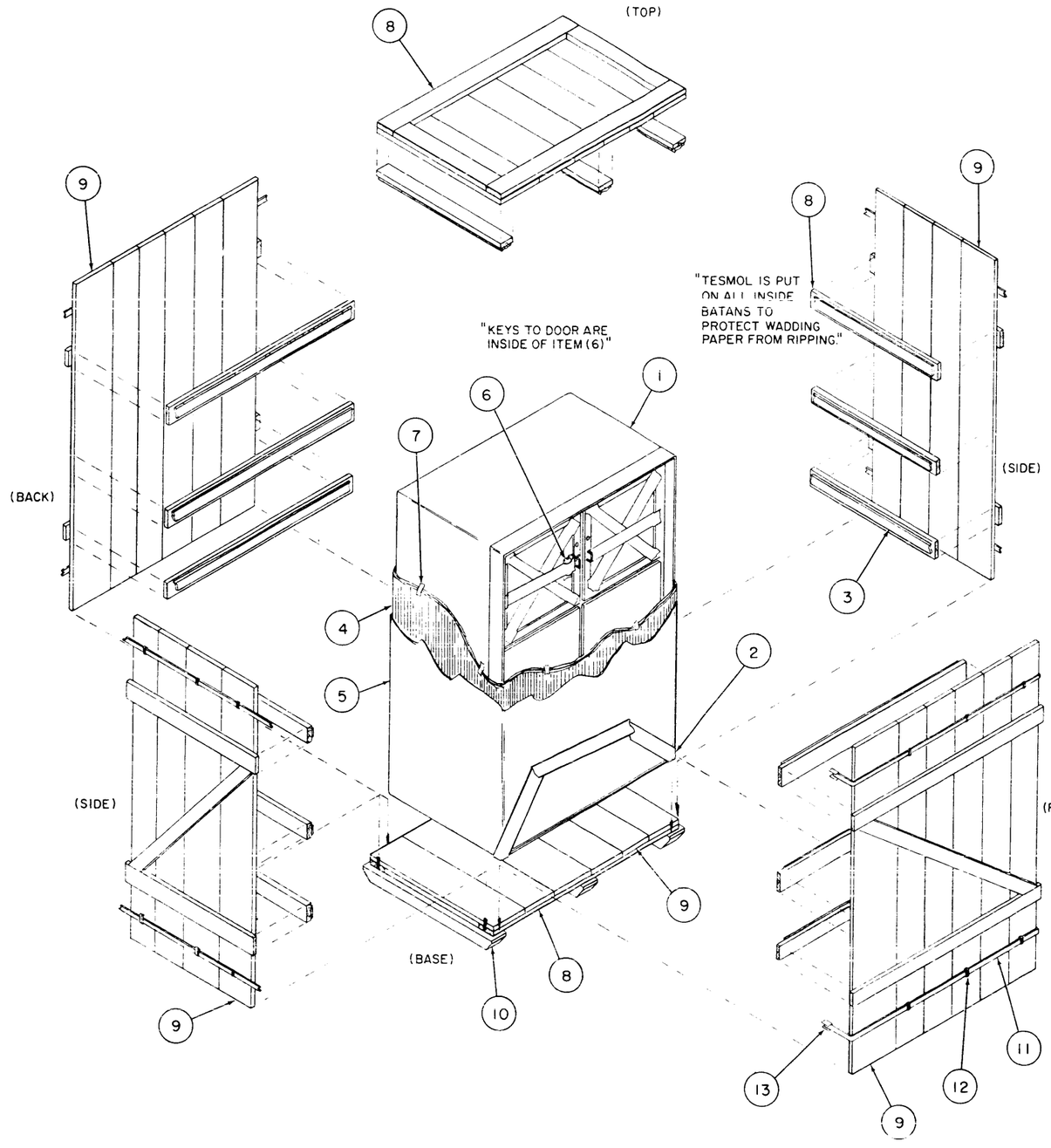
(1) CABLE ENTRY. - Cable entry is accomplished through openings with removable covers. These openings are located on both sides of the cabinet near the bottom, on the center post at the rear, and in the center of the bottom. Main power should enter the center of the bottom by means of shielded BX cable. Antenna and audio connections are made to terminal strip A-3083 located approximately 15 inches above the floor at the right inside rear of the cabinet (considered as viewed from the front). Antenna cabling (2 runs are required) 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 4 audio pairs.

(2) DIVERSITY SYSTEM CABLING CONNECTIONS. - Under normal conditions, the DDR-5A is operated as a diversity receiver. Refer to connection diagram figure 2-4, and connect cables as illustrated.

CAUTION

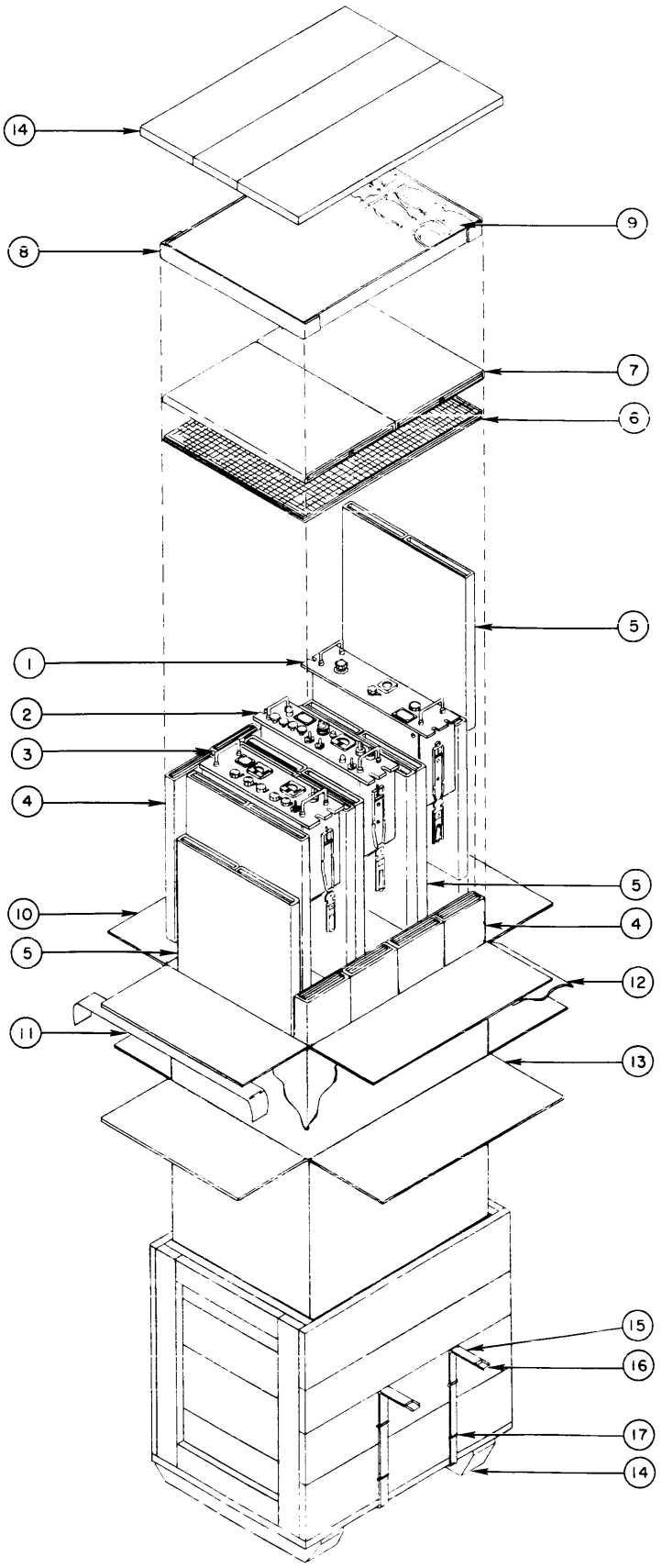
Cables and electrical wiring should be carefully positioned to prevent snagging or catching as units slide in and out of equipment rack. Ensure that NEGATOR B motors used to retract the cable assemblies are functioning properly.

(3) SINGLE RECEIVER SYSTEM CABLING CONNECTIONS. - Under unusual or emergency conditions the DDR-5A can be operated as two separate receivers.



REQ'D	ITEM	PART NUMBER	DESCRIPTION
			LIST OF MATERIAL
2	13	SE-101	SEALS, STRAPPING
	12	SL-101	STEEL, STAPLE FFN-105
	11	SP-101	STRAPPING, STEEL QQ-S-781B
3	10		LUMBER NOMINAL 2x4 GROUP 3
	9		LUMBER NOMINAL 1" INCH GROUP I
	8		LUMBER 7/8 x 2 3/4" GROUP I
	7	TA-101-2	TAPE, MASKING 3/4 INCH UUT-106
1	6		BEAMOUS BAG
28FT	5	WP-101-1	PAPER, WATERPROOF UUP-271C
28FT	4	WA-101-2	PAPER, WADDING PPP-C-843
	3	TA-104-2	TAPE, POLYURETHANE 3" MIL-P-26514
	2	TA-102-3	TAPE, PRESSURE SENSITIVE "3" WIDTH PPP-60 TYPE III CLASS I
1	1	RAK-22	DDR-5A

Figure 2-1. RAK-22A1, Preparation for Shipment, Typical



LIST OF MATERIAL		
ITEM	DESCRIPTION	SPECIFICATION
1	MODULAR UNIT	
2	MODULAR UNIT	
3	MODULAR UNIT	
4	PAD, FIBERBOARD	PPP-B-636 TYPE 1, CLASS 1
5	CELL, FIBERBOARD	PPP-B-636 TYPE 1, CLASS 1
6	PAPER, TISSUE	UU-P-553
7	PAD, FIBERBOARD	PPP-B-636 TYPE 1, CLASS 1
8	TRAY, FIBERBOARD	PPP-B-636 TYPE 1, CLASS 1
9	DESICCANT	MIL-D-3464
10	BOX, FIBERBOARD	PPP-B-636 TYPE 1, CLASS 1
11	TAPE, PRESSURE SENSITIVE	PPP-T-60 TYPE III, CLASS 1
12	BAG, BARRIER	MIL-B-131 CLASS 1
13	BOX, FIBERBOARD	PPP-B-636 TYPE 1, CLASS 2
14	BOX, WOOD	PPP-B-621 STYLE 2
15	STRAP	QQ-S-781
16	SEAL, STRAPPING	
17	STAPLE	FF-N-105

Figure 2-2. Modular Units, Preparation for Shipment, Typical

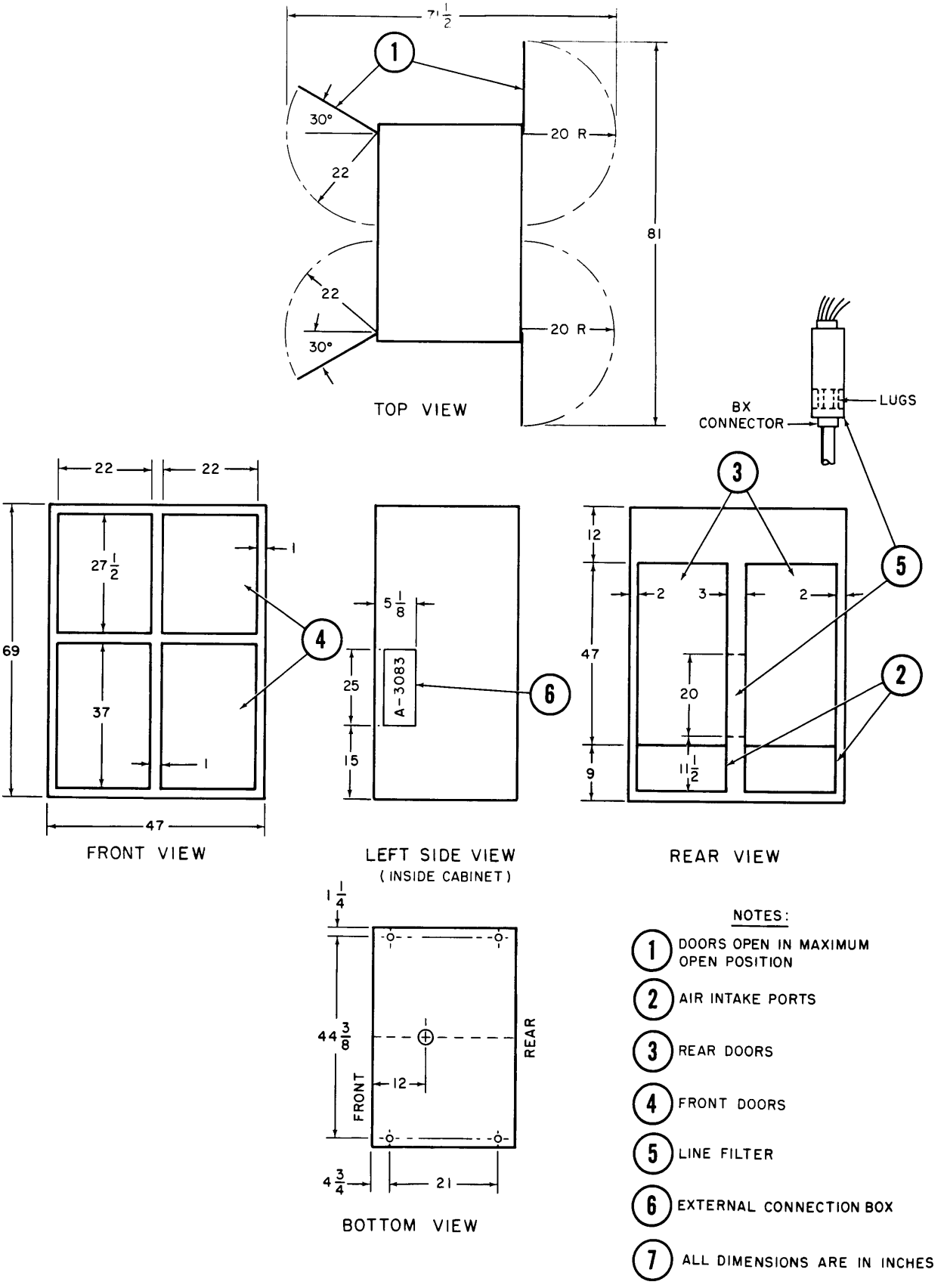


Figure 2-3. DDR-5A, Dimensional Outline Drawing

If it is necessary to use the DDR-5A in single-receiver operation, refer to figure 2-5 and proceed as follows: for operation with receiver 1 synthesized and receiver 2 non-synthesized connect cables as illustrated; for operation with both receivers non-synthesized connect cables to both receivers as indicated for receiver 2.

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

(1) Remove four screws holding line filter AF-103 in place at rear center of cabinet. 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 VOM, measure voltage at convenience outlets on front panel of receiver 1; reading should be 115 volts.

2-4. INSPECTION AND ADJUSTMENT.

a. GENERAL. - Although each modular unit of the DDR-5A has been aligned and thoroughly checked against the manufacturer's specifications prior to shipment, it is necessary to insure correct installation and proper DDR-5A 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.

Inspection and adjustment procedures given in this manual cover the DDR-5A as used in diversity operation. If single-receiver operation is required, the following procedures can be modified to cover the particular method of operation. The procedures given in paragraphs 2-4,d through 2-4,m are for receiver 1; upon completion of paragraph 2-4,m, remove all test equipment, restore all controls to positions noted in step 4 of paragraph 2-4,b, and proceed with receiver 2 checkout procedures starting with paragraph 2-4,o. If the results of any particular procedure are unsatisfactory, refer to the appropriate modular-unit manual for remedial information.

NOTE

When checking the complete DDR-5A 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 (both units)	MAIN POWER	STANDBY (blowers on both racks should operate)
Audio Filter HAF-1 (both units)	All controls	OUT
Detector and Audio Amplifier HFA-1 (both units)	POWER	STANDBY
	CHANNEL A DETECTION	CW
	CHANNEL A BFO	0
	CHANNEL A LEVEL ADJUST	Mid-position
	CHANNEL B DETECTION	CW
	CHANNEL B BFO	0
	CHANNEL B LEVEL ADJUST	Mid-position
Variable Notch Filter HNF-1 (both units)	NOTCH	OFF
	NOTCH ADJUST	0
IF Amplifier HFI-1 (both units)	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

MODULAR UNIT	SWITCH OR CONTROL DESIGNATION	POSITION
Audio Switch Panel HSP-2	RECEIVER 1 SPEAKER CHANNEL	A
	RECEIVER 1 SPEAKER VOLUME	Fully clockwise
	RECEIVER 2 SPEAKER CHANNEL	A
	RECEIVER 2 SPEAKER VOLUME	Fully clockwise
Automatic Frequency Control AFC-3 (both units)	SENSITIVITY	Fully clockwise
	TUNING KCS	0
	CARRIER SELECTOR	OSC
Diversity Visual Monitor DVM-4	RECEIVER SELECTOR	1
	SWEEP RANGE	±5 kc
	CALIBRATION ZERO SET	0
	POWER	OFF
Control Synthesizer and Standard HFS-1	All controls	Position of controls is of no significance at this time.
Continuous RF Tuner HFR-1 (rcvr No. 1)	BAND	BAND 1 (2-3 Mc)
	TUNE	2.0 Mc
	TUNE/SYNC/OPERATE	SYNC
	NOISE SILENCER/OFF/ ALIGNMENT SIGNAL	OFF
Continuous RF Tuner HFR-1 (rcvr No. 2)	BAND	BAND 1 (2-3 Mc)
	TUNE	Away from 2.0 Mc
	TUNE/SYNC/OPERATE*	TUNE
	NOISE SILENCER/OFF/ ALIGNMENT SIGNAL	OFF

*In diversity operation, the TUNE/SYNC/OPERATE switch of receiver 2 remains at TUNE at all times.

(2) On both HFA-1 units set POWER switch (figure 3-1, callouts 48 and 81) at OPERATE; STANDBY indicator lamps (64 and 67) should go off and yellow TIME DELAY indicator lamps (63 and 66) should light. After approximately 60 seconds, TIME DELAY indicator lamps should go off and the red OPERATE indicator lamps (62 and 65) should light. HFS-1 nixie lights (114) should indicate, and MEGACYCLE DIAL (3 and 12) of both HFR-1 units should be illuminated.

(3) Pull out both HFP-1 units. Using Simpson Model 260 VOM, check voltage at test points TP8001 and TP8002 on both units. If potential at TP8001 or TP8002 is not exactly 200 volts, adjust R8014 and/or R8025 on the appropriate unit until proper voltage is obtained. Push both HFP-1 units back into compartment.

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

NOTE

For the sake of brevity and clarity in the following procedure, the modular units contained in receiver 1 are designated HFR-1 No. 1, HFI-1 No. 1, HFA-1 No. 1, etc. The modular units contained in receiver 2 are designated HFR-1 No. 2, HFI-1 No. 2, HFA-1 No. 2, etc. 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) Remove plug from J1313 of Continuous RF Tuner HFR-1 No. 2, and connect Hewlett Packard Model 524C Frequency Counter or equivalent to J1313.

(3) Set 1 MC nixie selector (108) of Control Synthesizer and Standard HFS-1 at position 2 (all other selectors should be in position 0).

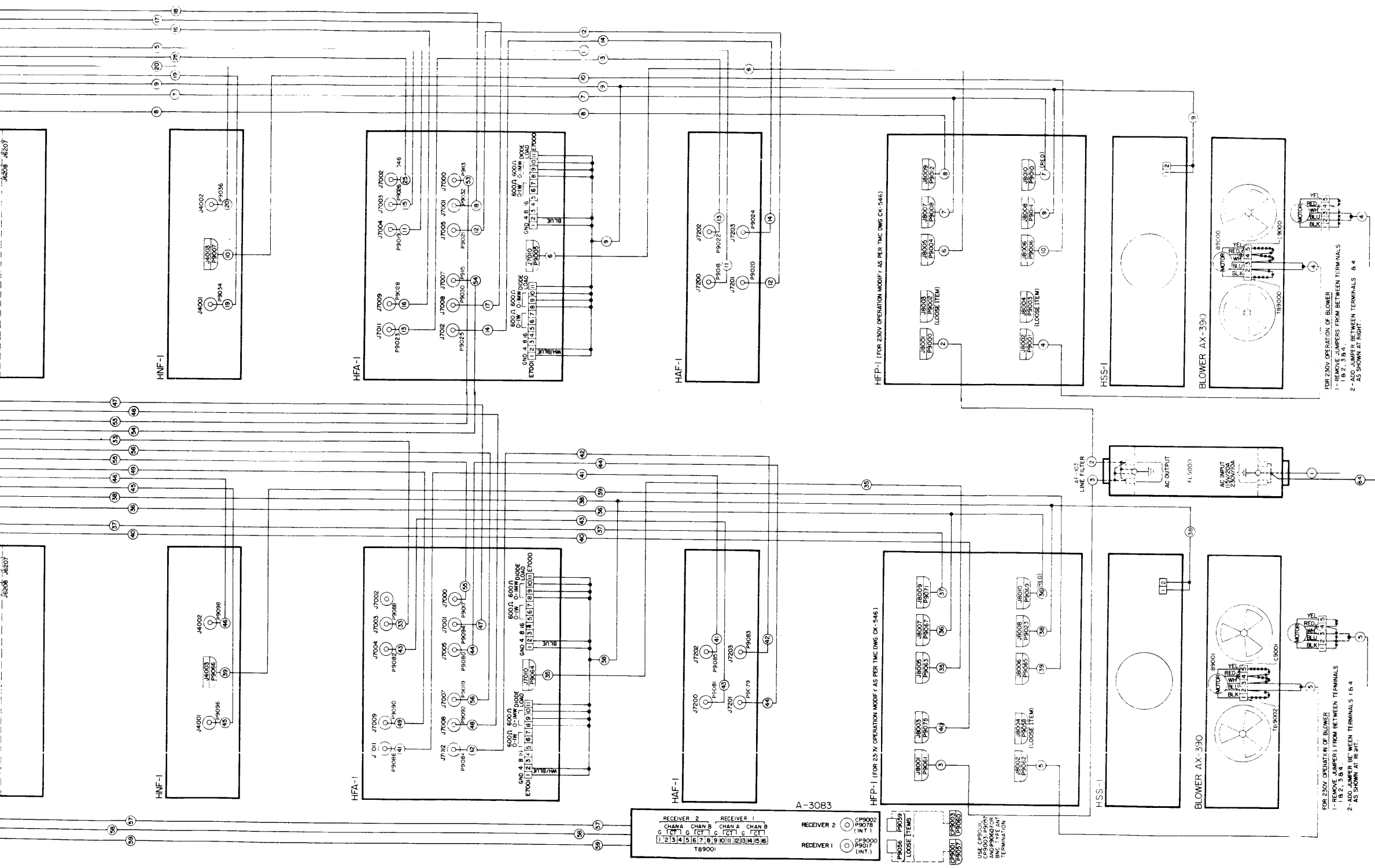
(4) Carefully tune Continuous RF Tuner HFR-1 No. 1 around 2.0 mc until a zero beat is obtained. SYNC IND lamp (9) of HFR-1 No. 1 may flicker until proper point is found.

NOTE

Reference to the SYNC IND lamp are with respect to receiver 1. The SYNC IND lamp of receiver 2 should remain lit at all times.

(5) Set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch (17) on HFR-1 No. 2 at ALIGNMENT SIGNAL.

(6) Carefully move TUNE control (14) of HFR-1 No. 2 until null is found. On either side of null, SYNC IND lamp will flicker and tone of increasing frequency will be heard.



	66	CA-412-36-34	GROUND STRAP FOR AFC-3	W9064
	65	CA-412-36-34	GROUND STRAP FOR AFC-3	W9063
	64	CA-718	AC INPUT TO HPP-1	W9003
	63	CA-412-34-54	GROUND STRAP NOT TERMINATED	W9040
	62		HFR-1	W9039
	61		HFS-1	W9010
	60	CA-412-34-54	GROUND STRAP FOR HFR-1	W9009
E9001	59	CA-705-1	AUDIO LINE OUTPUTS	W9008
P9077,78	58	CA-480-3-112	ANTENNA INPUT	W9041
P9016,17	57	CA-480-3-13.5F	ANTENNA INPUT	W9011
P9119,20	56	CA-480-3-11.5F	I.F. OUTPUT CHANNEL "B"	W9062
P9117,18	55	CA-480-3-11.5F	I.F. OUTPUT CHANNEL "A"	W9061
P9115,16	54	CA-480-3-12.5F	I.F. OUTPUT CHANNEL "B"	W9060
P9113,14	53	CA-480-3-12.5F	I.F. OUTPUT CHANNEL "A"	W9059
P9105,106	52	CA-480-3-112	1.75MC I.F. OUTPUT	W9058
P9099,100	51	CA-480-3-90	250KC I.F. OUTPUT(CHANNEL "A" & "B")	W9052
P9101,102	50	CA-480-3-90	2MC CONVERTOR INJECTION FREQUENCY	W9053
P9089,90	49	CA-480-3-97	250KC OSCILLATOR OR RCC OUTPUT TO PRODUCT DETECTOR	W9047
P9091,92	48	CA-480-3-112	250KC I.F. OUTPUT CHANNEL "B"	W9048
P9093,94	47	CA-480-3-112	250KC I.F. OUTPUT CHANNEL "A"	W9049
P9097,98	46	CA-480-3-97	250KC OUTPUT(FILTERED) FROM NOTCH FILTER	W9051
P9095,96	45	CA-480-3-97	250KC I.F. OUTPUT CHANNEL "A" & "B" TO NOTCH FILTER	W9050
P9079,80	44	CA-480-3-72	AUDIO INTERCONNECT, CHANNEL "A" INPUT	W9042
P9081,82	43	CA-480-3-72	AUDIO INTERCONNECT, CHANNEL "A" OUTPUT	W9043
P9083,84	42	CA-480-3-72	AUDIO INTERCONNECT, CHANNEL "B" INPUT	W9044
P9085,86	41	CA-480-3-72	AUDIO INTERCONNECT, CHANNEL "B" OUTPUT	W9045
P9075,76	40	CA-701	AC LINE CORD FOR DVM-4	W9038
E9002 P9073,74	39	CA-687-1	POWER INTERCONNECT CABLE	W9034
P9065,66	38	CA-703	POWER AND AUDIO OUTPUT INTERCONNECT CABLE	W9037
P9067,68 P9069,70	37	CA-687-2	POWER INTERCONNECT CABLE	W9036
P9063,64	36	CA-704	POWER INTERCONNECT CABLE	W9035
P9111,112	35	CA-686-1	POWER INTERCONNECT CABLE	W9033
P9087,88	34	CA-480-3-12.5F	OUTPUT ISOLATION AMPLIFIER	W9058
P9109,110	33	CA-480-3-14 F	250KC OUTPUT	W9046
P9103,104	32	CA-480-3-11.5 F	250KC OUTPUT	W9057
P9107,108	31	CA-480-3-12.5F	2MC OUTPUT	W9054
P9054,55	30	CA-480-3-11.5F	2MC OUTPUT	W9056
P9052,53	29	CA-480-3-112	250KC OUTPUT	W9030
P9050,51	28	CA-480-3-10.5 F	2MC OUTPUT	W9029
P9048,49	27	CA-480-3-10.5 F	OSCILLATOR CONTROL VOLTAGE	W9028
P9046,47	26	CA-480-3-112	HFO OUTPUT	W9027
P9044,45	25	CA-480-3-11.5 F	AUDIO FREQUENCY SYNCH TONE	W9026
P9042,43	24	CA-480-3-112	1.75MC I.F. OUTPUT	W9025
P9040,41	23	CA-480-3-10.5F	2MC CONVERTOR INJECTION FREQUENCY	W9024
P9038,39	22	CA-480-3-90	2MC CONVERTOR INJECTION FREQUENCY OUTPUT	W9023
P9036,37	21	CA-480-3-90	250KC I.F. OUTPUT (CHANNEL "A" & "B")	W9022
P9034,35	20	CA-480-3-97	250KC OUTPUT(FILTERED) TO NOTCH FILTER	W9021
P9032,33	19	CA-480-3-97	250KC I.F. OUTPUT CHANNEL "A" & "B" TO NOTCH FILTER	W9020
P9030,31	18	CA-480-3-112	250KC I.F. OUTPUT CHANNEL "A"	W9019
P9028,29	17	CA-480-3-112	250KC I.F. OUTPUT CHANNEL "B"	W9018
P9026,27	16	CA-480-3-97	250KC OSCILLATOR OR RCC OUTPUT TO PRODUCT DETECT.	W9017
P9024,25	15	CA-480-3-11.5 F	250KC TO PRODUCT DETECTOR	W9016
P9022,23	14	CA-480-3-72	AUDIO INTERCONNECT, CHANNEL "B" INPUT	W9015
P9020,21	13	CA-480-3-72	AUDIO INTERCONNECT, CHANNEL "B" OUTPUT	W9014
P9018,19	12	CA-480-3-72	AUDIO INTERCONNECT, CHANNEL "A" INPUT	W9013
P9006,7	11	CA-480-3-72	AUDIO INTERCONNECT, CHANNEL "A" OUTPUT	W9012
E9000 P9014,15	10	CA-687-1	POWER INTERCONNECT CABLE	W9003
P9012,13	9	CA-703	POWER AND AUDIO OUTPUT INTERCONNECT CABLE	W9006
P9008,9 P9010,11	8	CA-687-2	POWER INTERCONNECT CABLE	W9004
P9004,5	7	CA-704	POWER INTERCONNECT CABLE	W9004
P9062	6	CA-686-1	POWER INTERCONNECT CABLE	W9002
P9001	5	CA-706-1	AC INPUT TO BLOWER	W9032
P9061	4	CA-706-1	AC INPUT TO BLOWER	W9031
P9060	3	CA-696	AC INPUT TO HFP-1	W9031
	2	CA-696	AC INPUT TO HFP-1	W9000
	1		AC INPUT LINE (TO BE INSTALLED BY CUSTOMER)	
	ITEM	TMC PART NO.	FUNCTION	SYM

Figure 2-4. Cabling Interconnections, Diversity Operation, DDR-5A

00463308

RECEIVER 2

RECEIVER 1

HFR-1

ANT P9077 S.G. IN

(P/O HFR-1)

HFO SYNC J1310 P9112 | S.G. OUT J1309 | 2 MC IN J1304 P9108 | HFO I.A. J1313 | SYNTH J1302 | DC LOOP IN J1307 | J1305 P9070 | 1.75 MC OUT J1312 P9105 | 250 KC IN J1303 P9110

GROUNDED TO CABINET

HFR-1

ANT P9086 S.G. IN

(P/O HFR-1)

HFO SYNC J1310 | S.G. OUT J1309 | 2 MC IN J1304 P9053 | HFO I.A. J1313 P9111 | SYNTH J1302 P9049 | DC LOOP IN J1307 P9051 | J1305 P9011 | 1.75 MC OUT J1312 P9045 | 250 KC IN J1303 P9055

GROUNDED TO CABINET

DVM-4

J1101 P9116 | J1102 P9018 | J1103 | J1104 P9114 | J1105 P9020

J1130 P9176

HFS-1

J3001 P9009

1 MC EXT STD J3020

J3018 P9027 | J3016 P9109 | AUDIO SYNC TONE J3014 | J3012 P9047 | J3010 P9052 | VARICAP DC OUT P9103 J3008

1 MC INT STD J3019

J3017 P9054 | J3015 P9087 | J3013 P9043 | J3011 P9107 | HFO IN P9048 J3009

BLANK

P9068

GROUNDED TO CABINET

AFC-3

J5001 P9072

J5000 P9099 | J5002 P9089 | E5000 1 2 | J5003 P9110

GROUND AT OVEN MTG. SCREW ON AFC-3

GROUND TO CABINET

AFC-3

J5001 P9013

J5000 P9039 | J5002 P9029 | E5000 1 2 | J5003 P9041

GROUND AT OVEN MTG SCREW ON AFC-3

GROUND TO CABINET

BLANK

HSP-2

E9001

RECEIVER 2 | CHAN A | CHAN B | DIODE LOADS | ANALOG SPKR | 4 WIRE OUT | CHAN A | CHAN B | DIODE LOADS | ANALOG SPKR | 4 WIRE IN | RECEIVER 1

E9002 E9000

HFI-1

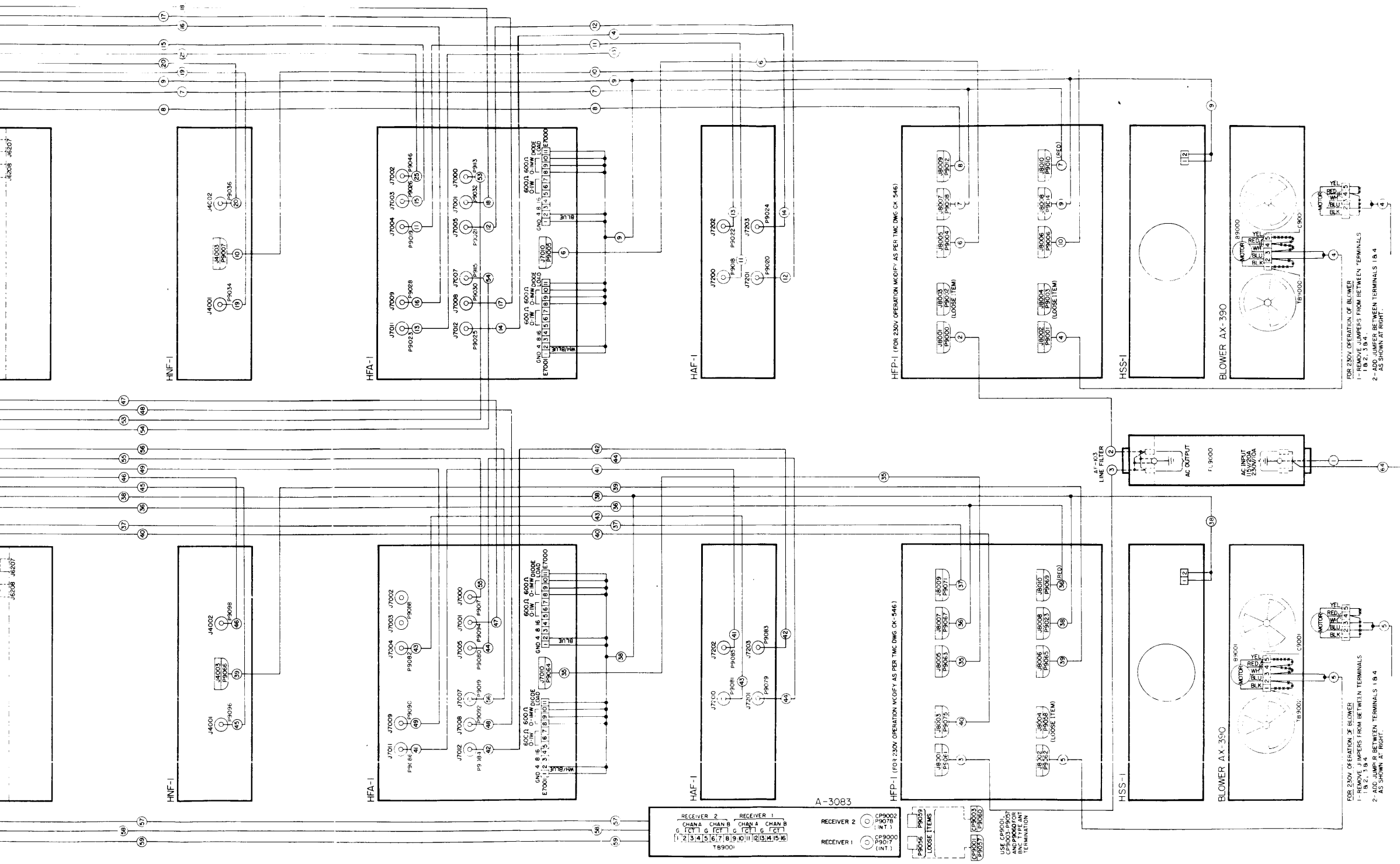
J6206 P9104 | J6205 P9106 | J6209 P9100 | J6201 P9074 | J6204 P9091 | J6203 P9093 | J6202 P9102 | P9095 P9097 | J6208 J6207

HFI-1

J6206 P9042 | J6205 P9044 | J6209 P9038 | J6201 P9015 | J6204 P9031 | J6203 P9033 | J6202 P9040 | P9035 P9037 | J6208 J6207

HNF-1

HNF-1



ITEM	TMC PART NO	FUNCTION	SYM
66	CA-412-36-34	GROUND STRAP FOR AFC-3	W9064
65	CA-412-36-34	GROUND STRAP FOR AFC-3	W9063
64	CA-718	AC INPUT TO HPP-1	W9007
63	CA-412-34-54	GROUND STRAP NOT TERMINATED	W9040
62		HFR-1	W9039
61		HFS-1	W9010
60	CA-412-34-54	GROUND STRAP FOR HFR-1	W9009
59	CA-706-1	AUDIO LINE OUTPUTS	W9008
58	CA-480-3-112	ANTENNA INPUT	W9041
57	CA-480-3-13.5F	ANTENNA INPUT	W9011
56	CA-480-3-11.5F	I.F. OUTPUT CHANNEL "B"	W9062
55	CA-480-3-11.5 F	I.F. OUTPUT CHANNEL "A"	W9061
54	CA-480-3-12.5F	I.F. OUTPUT CHANNEL "B"	W9060
53	CA-480-3-12.5F	I.F. OUTPUT CHANNEL "A"	W9059
52	CA-480-3-112	1.75MC I.F. OUTPUT	W9058
51	CA-480-3-90	250KC I.F. OUTPUT (CHANNEL "A" "B" "B")	W9052
50	CA-480-3-90	2MC CONVERTOR INJECTION FREQUENCY	W9053
49	CA-480-3-97	250KC OSCILLATOR OR RCC OUTPUT TO PRODUCT DETECTOR	W9047
48	CA-480-3-112	250KC I.F. OUTPUT CHANNEL "B"	W9048
47	CA-480-3-112	250KC I.F. OUTPUT CHANNEL "A"	W9049
46	CA-480-3-97	250KC OUTPUT (FILTERED) FROM NOTCH FILTER	W9051
45	CA-480-3-97	250KC I.F. OUTPUT CHANNEL "A" "B" "B" TO NOTCH FILTER	W9050
44	CA-480-3-72	AUDIO INTERCONNECT, CHANNEL "A" INPUT	W9042
43	CA-480-3-72	AUDIO INTERCONNECT, CHANNEL "A" OUTPUT	W9043
42	CA-480-3-72	AUDIO INTERCONNECT, CHANNEL "B" INPUT	W9044
41	CA-480-3-72	AUDIO INTERCONNECT, CHANNEL "B" OUTPUT	W9045
40	CA-701	AC LINE CORD FOR DVM-4	W9038
39	CA-687-1	POWER INTERCONNECT CABLE	W9034
38	CA-703	POWER AND AUDIO OUTPUT INTERCONNECT CABLE	W9037
37	CA-687-2	POWER INTERCONNECT CABLE	W9036
36	CA-704	POWER INTERCONNECT CABLE	W9035
35	CA-686-1	POWER INTERCONNECT CABLE	W9033
29	CA-480-3-112	250KC OUTPUT	W9030
28	CA-480-3-10.5F	2MC OUTPUT	W9029
27	CA-480-3-10.5 F	OSCILLATOR CONTROL VOLTAGE	W9028
26	CA-480-3-10.5 F	HFO OUTPUT	W9027
25	CA-480-3-11.5 F	AUDIO FREQUENCY SYNCH TONE	W9026
24	CA-480-3-112	1.75MC I.F. OUTPUT	W9025
23	CA-480-3-12.5F	2MC CONVERTOR INJECTION FREQUENCY	W9004
22	CA-480-3-90	2MC CONVERTOR INJECTION FREQUENCY OUTPUT	W9023
21	CA-480-3-90	250KC I.F. OUTPUT (CHANNEL "A" "B" "B")	W9022
20	CA-480-3-97	250KC OUTPUT (FILTERED) TO NOTCH FILTER	W9021
19	CA-480-3-97	250KC I.F. OUTPUT CHANNEL "A" "B" "B" TO NOTCH FILTER	W9020
18	CA-480-3-112	250KC I.F. OUTPUT CHANNEL "A"	W9019
17	CA-480-3-112	250KC I.F. OUTPUT CHANNEL "B"	W9018
16	CA-480-3-97	250KC OSCILLATOR OR RCC OUTPUT TO PRODUCT DETECT.	W9017
15	CA-480-3-11.5 F	250KC TO PRODUCT DETECTOR	W9016
14	CA-480-3-72	AUDIO INTERCONNECT, CHANNEL "B" INPUT	W9015
13	CA-480-3-72	AUDIO INTERCONNECT, CHANNEL "B" OUTPUT	W9014
12	CA-480-3-72	AUDIO INTERCONNECT, CHANNEL "A" INPUT	W9013
11	CA-480-3-72	AUDIO INTERCONNECT, CHANNEL "A" OUTPUT	W9012
10	CA-687-1	POWER INTERCONNECT CABLE	W9003
9	CA-703	POWER AND AUDIO OUTPUT INTERCONNECT CABLE	W9006
8	CA-687-2	POWER INTERCONNECT CABLE	W9005
7	CA-704	POWER INTERCONNECT CABLE	W9004
6	CA-686-1	POWER INTERCONNECT CABLE	W9002
5	CA-706-1	AC INPUT TO BLOWER	W9042
4	CA-706-1	AC INPUT TO BLOWER	W9001
3	CA-696	AC INPUT TO HFP-1	W9031
2	CA-696	AC INPUT TO HFP-1	W9000
1		AC INPUT LINE (TO BE INSTALLED BY CUSTOMER)	

Figure 2-5. Cabling Interconnections, Single-Receiver Operation, DDR-5A

RECEIVER 2
(NON-SYNTHESIZED)

RECEIVER 1
(SYNTHESIZED)

HFR-1

ANT
S.G. IN
(P/O HFR-1)
HFO SYNC J1310
S.G. OUT J1309
2 MC IN J1304
HFO I.A. J1313
SYNTH J1302
DC LOOP IN J1307
1.75 MC OUT J1312
250 KC IN J1303
J1305 P9070
P9105
P9110
GROUNDED TO CABINET

HFR-1

ANT
S.G. IN
P9016
(P/O HFR-1)
HFO SYNC J1310
S.G. OUT J1309
2 MC IN J1304
HFO I.A. J1312
SYNTH J1302
DC LOOP IN J1307
J1305 P9011
1.75 MC OUT J1312
250 KC IN J1303
P9053
P9111
P9049
P9051
P9045
P9055
GROUNDED TO CABINET

DVM-4

J100 P9076
J101
J102
J103
J104
J105
P9116
P9018
P9114
P9020

HFS-1

J3001 P9009
J3020
1 MC EXT STD
J3018
J3016
AUDIO SYNC TONE J3014
J3012
J3010
VARICAP DC OUT J3008
P9027
P9109
P9104
P9052
P9103
J3019
1 MC INT STD
J3017
J3015
J3013
J3011
HFO IN J3009
P9054
P9087
P9043
P9107
P9048

BLANK

P9068
GROUNDED TO CABINET

AFC-3

J5001 P9072
J5000
J5002
J5003
E5000
P9091
P9089
P9101
GROUND AT OVEN MTG. SCREW ON AFC-3
GROUND TO CABINET

AFC-3

J5001 P9013
J5000
J5002
J5003
E5000
P9039
P9029
P9041
GROUND AT OVEN MTG. SCREW ON AFC-3
GROUND TO CABINET

BLANK

HSP-2

E9001
CHAN A
CHAN B
DIODE LOADS
INPUT A B C SPKR
RECEIVER 2
RECEIVER 1
E9002
E9000

HFI-1

J6206
J6205
P9104
P9106
J6201 P9074
J6209
P9100
J6204
J6203
P9091
P9093
J6202
P9102
P9095
P9097
J6208
J6207

HFI-1

J6206
J6205
P9042
P9044
J6201 P9015
J6209
P9038
J6204
J6203
P9031
P9033
J6202
P9040
P9035
P9037
J6208
J6207

HNF-1

HNF-1

(7) Set TUNE/SYNC/OPERATE switch (7) of HFR-1 No. 1 at OPERATE.

(8) Set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch of HFR-1 No. 2 at OFF; system is synchronized. SYNC IND lamp of HFR-1 No. 1 should light, and reading on frequency counter should be 3.75 mc.

(9) Synchronize system at each of the frequencies indicated in HFR-1 TUNE CONTROL column of Table 2-3 in the following manner:

(a) Set TUNE/SYNC/OPERATE switch of HFR-1 No. 1 at SYNC.

(b) Set appropriate HFS-1 nixie selectors (108 through 112) at positions indicated in Table 2-3.

(c) Carefully tune HFR-1 (No. 1 for zero) beat at selected frequency.

(d) Set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch of HFR-1 No. 2 at ALIGNMENT SIGNAL.

(e) Tune HFR-1 No. 2 back and forth through selected frequency and obtain a null.

(f) Set TUNE/SYNC/OPERATE switch of HFR-1 No. 1 and NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch of HFR-1 No. 2 at OPERATE and OFF respectively.

(g) Compare frequency counter readings with those given in Table 2-3.

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

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

TABLE 2-3. BAND 1 (2-3 MC) SYNCHRONIZATION, DDR-5A (Cont'd)

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, 10 KC AND 1 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

(10) Restore 100 KC, 10 KC, 1 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 (9) above. Reading on frequency counter should be 4.75 mc.

(11) Set 1 MC nixie selector as indicated below and synchronize system at indicated frequencies of each band in accordance with procedure outlined in step (9) above. Frequency counter 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
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

(12) Using procedure outlined in step (9) above, synchronize system at 15 mc. Tune HFR-1 No. 1 slightly to both sides of 15 mc, and check for symmetrical swing of SYNCHRONIZE meter (2). If swing is not symmetrical, adjust R3442 on 3400 deck of HFS-1 unit until symmetrical swing is obtained.

NOTE

The SYNCHRONIZE meter of HFR-1 No. 2 is not used in the tuning operation.

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

d. CHECKOUT PROCEDURE FOR AUTOMATIC FREQUENCY CONTROL AFC-3 OF RCVR NO. 1. - Proceed as follows:

NOTE

Unless otherwise specified, all controls mentioned in this procedure are located on receiver 1. Numbers enclosed in parenthesis are callouts referenced to figure 3-1.

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

(2) Synchronize system at any frequency. If necessary, refer to step (9) of paragraph 2-4,c for proper synchronizing procedure.

(3) Set AFC switch (89) of IF Amplifier HFI-1 at ON.

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

(5) Depress and hold down RESET button (102) on AFC-3. Adjust TUNING KCS control (100) for maximum indication on CARRIER LEVEL meter (107);

reading on CARRIER LEVEL meter should be approximately in center of green. Release RESET button.

(6) Check CARRIER FADE lamp (106) and AFC ALARM lamp (104) of AFC-3; they should not be lit. AFC DRIFT meter (103) should remain at zero center scale.

(7) Set CARRIER SELECTOR switch (105) of AFC-3 at RCC; there should be no change in indications.

(8) Set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch of 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 (101) of 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 and AFC switch of HFI-1 at OSC and OFF respectively.

e. CHECKOUT PROCEDURE FOR IF AMPLIFIER HFI-1 OF RCVR NO. 1. Proceed as follows:

NOTE

This procedure also checks the HFA-1 unit of receiver 1 in the SSB mode of operation; it also checks the tuning of the AFC-3 unit of receiver 1. Unless otherwise specified, all controls mentioned in this procedure are located on receiver 1; 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 (9) of paragraph 2-4,c for proper synchronizing procedure.

(3) Ensure that NOISE SILENCER/OFF/ ALIGNMENT SIGNAL switch (8) of Continuous RF Tuner HFR-1 is set at ALIGNMENT SIGNAL.

(4) Ensure that MANUAL GAIN control (93) of 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 (88) and CHANNEL B IF BANDWIDTH KC switch (91) at 1 DSB and blank position respectively.

(b) Adjust R116 on 1 KC SYM strip for 1 volt reading on CHANNEL A OUTPUT meter (92), and lock adjustment. 1 volt reading on CHANNEL A OUTPUT meter corresponds to .707 volts rms into a 50-ohm load at J102 on IF 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 (89) at ON.

(6) Set CHANNEL A DETECTION switch (78) and CHANNEL B DETECTION switch (72) of Detector and Audio Amplifier HFA-1 at SSB.

(7) On Automatic Frequency Control AFC-3, depress RESET button (102) for approximately six seconds, and turn TUNING KCS control (100) midway between 0 and -3. Pointer of CARRIER LEVEL meter (107) will deflect and CARRIER FADE lamp (106) will light.

(8) Using procedure outlined in steps (5a), (5b), and (5c) above adjust 3.5 KC USB and 7.5 KC USB i-f strips of 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 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 HFI-1 to OFF; turn TUNING KCS control of AFC-3 to 0; turn NOISE SILENCER/OFF/ALIGNMENT/SIGNAL switch of HFR-1 to OFF.

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

f. CHECKOUT PROCEDURE FOR AGC DECAY CIRCUIT OF RCVR NO. 1. - Proceed as follows:

NOTE

Unless otherwise specified, all controls mentioned in the following procedure are located on receiver 1. Numbers enclosed in parenthesis are callouts referenced to figure 3-1.

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

(2) Ensure that CHANNEL A AGC DECAY control (87), CHANNEL B AGC DECAY control (90), and

MANUAL GAIN control (93) 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 (1) on Continuous RF Tuner HFR-1 should indicate maximum; meter may be pegged.

(4) Slowly rotate MANUAL GAIN control of 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 HFR-1 should again indicate maximum.

(6) Rotate CHANNEL A AGC DECAY and CHANNEL B AGC DECAY controls of 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 OF RCVR NO. 1. - Proceed as follows:

NOTE

Unless otherwise specified, all controls mentioned in this procedure are located on receiver 1. Numbers enclosed in parenthesis 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 (87 and 90) of IF Amplifier HFI-1 are set at fully clockwise position.

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

Control	Position
CHANNEL A LEVEL ADJUST (77) and CHANNEL B LEVEL ADJUST (73)	Mid position
LOAD switch (channel A and B). These switches are located on top rear portion of HFA-1 chassis.	OUT
CHANNEL A DETECTION (78) and CHANNEL B DETECTION (72)	CW

(4) Synchronize system at any frequency. If necessary, refer to step (9) of paragraph 2-4,c for proper synchronizing procedure.

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

(6) Adjust CHANNEL A BFO control (80) and CHANNEL B BFO control (83) of 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 HFR-1 at OFF.

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

(10) Set CHANNEL A IF BANDWIDTH KC switch (88) and CHANNEL B IF BANDWIDTH KC switch (91) of HFI-1 at 15 DSB.

(11) Remove screws securing 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 HFR-1. Adjust signal generator for frequency selected in step 4; 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 (95) of Audio Switch Panel HSP-2 set at A, adjust signal generator frequency until a 1 kc tone is heard. Reading on RF LEVEL meter of HFR-1 should be approximately 20 db above 1uv, which is 10uv.

(15) Plug headphones into CHANNEL A PHONES jack (76) of HFA-1. Rotate CHANNEL A MONITOR control (75); volume of 1 kc tone should vary.

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

(17) Plug headphones into CHANNEL B PHONES jack (74) of HFA-1. Rotate CHANNEL B MONITOR control (82); volume of 1 kc tone should vary.

(18) Remove signal generator from J1001 of HFR-1; remove headphones from CHANNEL B PHONES jack of HFA-1.

(19) Slide HFA-1 into compartment and secure front panel to equipment rack with screws.

h. CHECKOUT PROCEDURE FOR AUDIO FILTER HAF-1 OF RCVR NO. 1. - Proceed as follows:

NOTE

Unless otherwise specified, all controls mentioned in the following procedure are located on receiver 1. Numbers enclosed in parenthesis 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 (9) of paragraph 2-4,c for proper synchronizing procedure.

(3) Check to see that CHANNEL A AGC DECAY control (87) and CHANNEL B AGC DECAY control (90) of IF Amplifier HFI-1 are set at fully clockwise position.

(4) Set Continuous RF Tuner HFR-1, Detector and Audio Amplifier HFA-1, HFI-1, and Audio Switch Panel HSP-2 controls as listed below:

MODULAR UNIT	CONTROL	POSITION
HFR-1	NOISE SILENCER/OFF/ ALIGNMENT SIGNAL (7)	ALIGNMENT SIGNAL
HFA-1	CHANNEL A DETECTION (47) and CHANNEL B DETECTION (54)	CW
HFI-1	CHANNEL A IF BAND-WIDTH KC (88) and CHANNEL B IF BAND-WIDTH KC (91)	15 DSB
HSP-2	RECEIVER 1 SPEAKER CHANNEL (95)	A

(5) Set CHANNEL A HIGH CUTOFF switch (70) and CHANNEL A LOW CUTOFF switch (71) of HAF-1 at 5 kc position.

(6) Adjust CHANNEL A BFO control (80) of HFA-1 for a peak on CHANNEL A LINE LEVEL meter (79); 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 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 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 HFR-1, HSP-2, HAF-1, 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 counter-clock-wise

(11) Check to see that MANUAL GAIN control (93) of HFI-1 is set at fully counterclockwise position.

i. CHECKOUT PROCEDURE FOR RCVR NO. 1 SENSITIVITY AND AGC. - Proceed as follows:

NOTE

Unless otherwise specified, all controls mentioned in this procedure are located on receiv-1. Numbers enclosed in parenthesis are call-outs 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 (6)	BAND 1 (2-3 Mc)
TUNE (5)	2.5 Mc
TUNE/SYNC/OPERATE (7)	SYNC
NOISE SILENCER/OFF/ ALIGNMENT SIGNAL (8)	OFF

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

(4) Set CHANNEL A IF BANDWIDTH KC control (88) and CHANNEL B IF BANDWIDTH KC control (91) of IF Amplifier HFI-1 at 6 DSB and blank position respectively.

(5) Set CHANNEL A DETECTION switch (78) of Detector and Audio Amplifier HFA-1 at CW.

(6) Carefully tune 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 (80) of HFA-1, obtain a zero beat then turn NOISE SILENCER/OFF/ ALIGNMENT SIGNAL switch of 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 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 VU 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. RCVR NO. 1 SIGNAL PLUS NOISE/NOISE CHECK-OUT PROCEDURE. - Proceed as follows:

NOTE

Unless otherwise specified, all controls mentioned in the following procedure are located on receiver 1. 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. Connect signal generator to J1001 of Continuous RF Tuner HFR-1 through 20 db pad.

(2) Tune HFR-1 and Control Synthesizer and Standard HFS-1 to 2.5 mc. Set TUNE/SYNC/OPERATE switch (7) 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 IF Amplifier HFI-1 and Detector and Audio Amplifier HFA-1 controls as follows:

MODULAR UNIT	CONTROL	POSITION
HFI-1	CHANNEL A IF BANDWIDTH KC (88)	15 DSB
	CHANNEL B IF BANDWIDTH KC (91)	Blank position
HFA-1	CHANNEL A DETECTION (78)	CW

(4) Remove screws securing front panel of 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 (8) of HFR-1 at ALIGNMENT SIGNAL. Adjust CHANNEL A BFO control (83) of 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 (77) on HFA-1 for 0 VU indication on CHANNEL A LINE LEVEL meter (79).

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

(10) Set MANUAL GAIN control (93) of 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) for 14 mc and 28 mc frequencies.

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

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

k. RCVR NO. 1 FINAL NOISE SILENCER CHECK-OUT PROCEDURE. - Proceed as follows:

NOTE

Unless otherwise specified, all controls mentioned in the following procedure are located on receiver 1. 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) Tune Continuous RF Tuner HFR-1 and Control Synthesizer and Standard HFS-1 to 15 mc; set HFR-1, Audio Switch Panel HSP-2, IF Amplfiier HFI-1, and Detector and Audio Amplifier HFA-1 controls as listed below:

MODULAR UNIT	CONTROL	POSITION
HFR-1	TUNE/SYNC/OPERATE	SYNC
	NOISE SILENCER/OFF/ ALIGNMENT SIGNAL	NOISE SILENCER
HSP-2	RECEIVER 1 SPEAKER CHANNEL	A

MODULAR UNIT	CONTROL	POSITION
HSP-2	RECEIVER 1 SPEAKER VOLUME	Fully clockwise
HFA-1	CHANNEL A DETECTION	CW
	CHANNEL A LEVEL ADJUST	Fully clockwise
	CHANNEL A BFO	0 (to obtain tone if any)
HFI-1	CHANNEL A IF BAND-WIDTH KC	15 DSB

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

(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 on 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. RCVR NO. 1 TWO TONE TEST. - Proceed as follows:

NOTE

Unless otherwise specified, all controls mentioned in this procedure are located in receiver 1. 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) Set up test equipment as shown in connection diagram figure 2-6.

NOTE

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

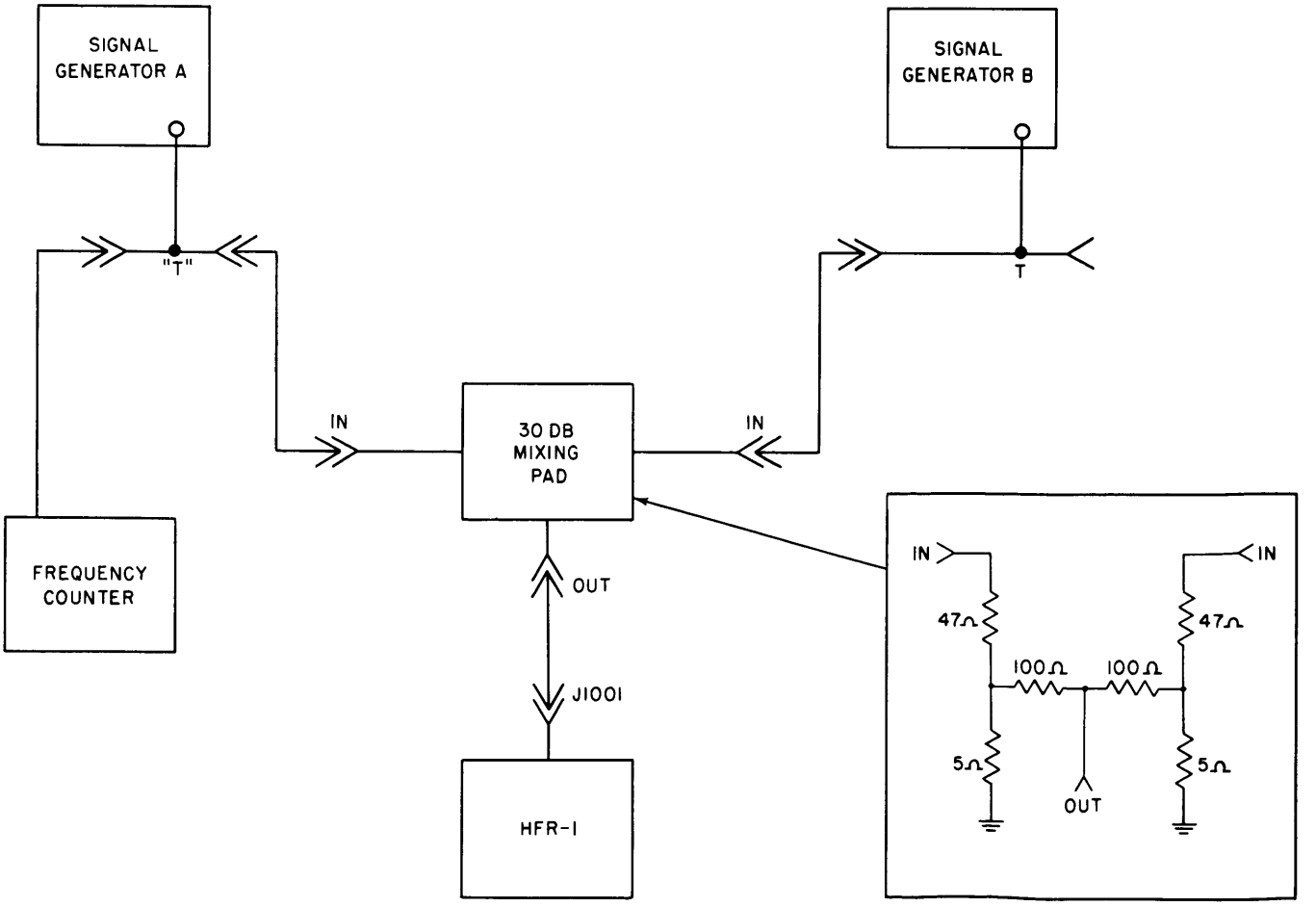


Figure 2-6. Connection Diagram for Two Tone Test, Rcvr No. 1,DDR-5A

(3) Set CHANNEL A AGC DECAY control (87) and CHANNEL B AGC control (90) 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 (7) of HFR-1 at OPERATE.

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

(8) Set CHANNEL A IF BANDWIDTH KC control (88) 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 2-7.

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

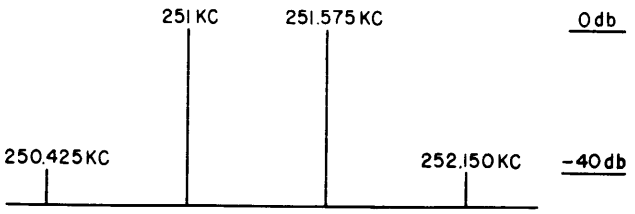


Figure 2-7. Scope Picture, Two Tone Test, DDR-5A

m. Checkout Procedure for Variable Notch Filter HNF-1 of Rcvr No. 1. - Proceed as follows:

NOTE

Unless otherwise specified, all controls mentioned in this procedure are located on receiver 1. 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) Ensure that signal generators and frequency counter are connected as shown in figure 2-6. Ensure that steps (3) through (10) of the Rcvr No. 1 Two Tone Test (paragraph 2-4,n) have been completed.

(3) Set NOTCH control (86) of HNF-1 at ON.

(4) Observe spectrum analyzer while simultaneously rotating NOTCH ADJUST control (85) 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-5A system checkout, this is the last checkout procedure for receiver 1. Remove all test equipment, restore all controls to positions noted in step 4 of paragraph 2-4,b, and proceed with receiver 2 checkout procedures given in paragraphs 2-4,n through 2-5,u, and the Diversity Visual Monitor DVM-4 and Combined-Separate AGC checkout procedures given in paragraphs 2-4,u and 2-4,w respectively.

n. Checkout Procedure for Automatic Frequency Control AFC-3, IF Amplifier HFI-1, and AGC Decay Circuit for Rcvr No. 2. - Conduct these procedures exactly as outlined for the corresponding receiver 1 modular units; all references to controls and functions on receiver 1 with the exception of these given in paragraph 2-4,b should be changed to receiver 2. Proper sequence for these procedures and paragraph reference for corresponding receiver 1 checkout procedures are given below. When performing step (2) of paragraphs 2-4,d and 2-4,e, use the general procedure to synchronize the HFR-1 of receiver 1 first and the HFR-1 unit of receiver 2 second.

Procedural Sequence	Modular Unit	Rcvr No. 1 Paragraph Reference
1	AFC-3	2-4,d
2	HFI-1	2-4,e
3	AGC Decay Circuit	2-4,f

o. Checkout Procedure for Detector and Audio Amplifier HFA-1 of Rcvr No. 2. - Conduct this check exactly as for the HFA-1 of receiver 1 (paragraph 2-4,g); all references to controls and functions on receiver 1 with the exception of those given in paragraph 2-4,b should be changed to receiver 2. When performing step (4), use the general procedure to synchronize the HFR-1 unit of receiver 1 first and the HFR-1 unit of receiver 2 second.

NOTE

The TUNE/SYNC/OPERATE switch of the HFR-1 unit on receiver 2 is set at TUNE at all times.

p. Checkout Procedure for Audio Filter HAF-1 of Rcvr No. 2. - Conduct this check exactly as for the HAF-1 receiver 1 (paragraph 2-4,h); all references to controls and functions on receiver 1 with the exception of those given in paragraph 2-4,b should be changed to receiver 2. When performing step (2), use the general procedure to synchronize the HFR-1 unit

of receiver 1 first and the HFR-1 unit of receiver 2 second.

q. Checkout Procedure for Rcvr No. 2 Sensitivity and AGC. - Conduct this check exactly as for receiver 1 (paragraph 2-4,i); all references to controls and functions on receiver 1 with the exception of those given in paragraph 2-4,b should be changed to receiver 2.

NOTE

The TUNE/SYNC/OPERATE switch on the HFR-1 unit of receiver 2 is set at TUNE at all times.

r. Rcvr No. 2 Signal Plus Noise/Noise Checkout Procedure. - Conduct this procedure exactly as for receiver 1 (paragraph 2-4,j); all references to controls and functions on receiver 1 with the exception of those given in paragraph 2-4,b should be changed to receiver 2.

NOTE

The TUNE/SYNC/OPERATE switch on the HFR-1 unit of receiver 2 is set at TUNE at all times.

s. Rcvr No. 2 Final Noise Silencer Checkout Procedure. - Conduct this procedure exactly as outlined in the Rcvr No. 1 Final Noise Silencer Check (paragraph 2-4,k); all references to controls and functions on receiver 1 with the exception of of those given paragraph 2-4,b should be changed to receiver 2.

NOTE

The TUNE/SYNC/OPERATE switch on HFR-1 of receiver 2 is set at TUNE at all times. When synchronizing system in steps (2) and (3), follow the procedure outlined in step (9) of paragraph 2-4,c.

t. Rcvr No. 2 Two Tone Test. - Conduct this procedure exactly as outlined in the Two Tone Test for receiver 1 (paragraph 2-4,l); all references to controls and functions on receiver 1 with the exception of those given in paragraph 2-4,b should be changed to receiver 2.

NOTE

The TUNE/SYNC/OPERATE switch on HFR-1 of receiver 2 is set at TUNE at all times. When performing step (6), use the TUNE/SYNC/OPERATE switch on the Continuous RF Tuner HFR-1 of receiver 1.

u. Checkout Procedure for Variable Notch Filter HNF-1 of Rcvr No. 2. - Conduct this check exactly as for the HNF-1 of receiver 1 (paragraph 2-4,m); all references to controls and functions on receiver 1 with the exception of those given in paragraph 2-4,b should be changed to receiver 2.

v. Checkout Procedure for Diversity Visual Monitor DVM-4. - Proceed as follows:

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

(2) Using procedure outlined in step (9) of paragraph 2-4,c, synchronize both Continuous RF Tuners HFR-1 and Control Synthesizer and Standard HFS-1 at 2.5 mc.

(3) Set Continuous RF Tuner HFR-1, IF Amplifier HFI-1, and Diversity Visual Monitor DVM-4 controls as follows:

Modular Unit	Control	Position
HFR-1 (both units)	NOISE SILENCER/OFF/ ALIGNMENT SIGNAL	ALIGNMENT SIGNAL
HFR-1 (both units)	AFC	ON
DVM-4	SWEEP RANGE	±5 KC

(4) Set POWER switch (23) of DVM-4 at ON, and allow approximately 5 minutes for warm up. Turn RF GAIN control (24) of DVM-4 fully clockwise; adjust RF GAIN control as necessary during this procedure.

(5) Press PUSH TO CALIBRATE button (26) of DVM-4, and hold it down while centering pulse on screen with CALIBRATION ZERO SET control (20). Release PUSH TO CALIBRATE button.

(6) On Automatic Frequency Control AFC-3 of receiver 1 ensure that CARRIER SELECTOR switch (105) is set at OSC; press and hold down RESET button (102) for approximately six seconds.

(7) Ensure that RECEIVER SELECTOR switch (25) of DVM-4 is set at 1.

(8) Rotate TUNING KCS control (100) of AFC-3 on receiver 1 toward +3; pulse pattern on DVM-4 should move left. Return TUNING KCS control to 0; pulse pattern should center. Rotate TUNING KCS control toward -3; pulse pattern should move right. Return TUNING KCS control to 0; pulse pattern should center.

(9) On IF Amplifier HFI-1 of receiver 1, place CHANNEL A IF BANDWIDTH KC switch (88) and CHANNEL B IF BANDWIDTH KC switch (91) at blank positions; pulse pattern on DVM-4 should disappear. Place CHANNEL A IF BANDWIDTH KC switch at 15 DSB; pulse pattern should reappear. Return CHANNEL A IF BANDWIDTH KC switch to a blank position, and place CHANNEL B IF BANDWIDTH KC switch at 15 DSB; pulse pattern should reappear.

(10) Set SWEEP RANGE switch (21) of DVM-4 at ±1 KC, and repeat step 7.

(11) Set AFC switch of HFI-1 on receiver 1 at OFF.

(12) Set RECEIVER SELECTOR and SWEEP RANGE

switches of DVM-4 at 2 and ±5 KC respectively. Repeat steps 4 through 10 for receiver 2.

(13) Upon completion, place POWER switch of DVM-4 at OFF. Set CHANNEL A IF BANDWIDTH KC and CHANNEL B IF BANDWIDTH KC switches of both HFI-1 units at 15 DSB. Ensure that AFC switch of both HFI-1 units are set at OFF.

w. Checkout Procedure for Combined-Separate AGC. - Proceed as follows:

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

(2) Using procedure outlined in step (9) of paragraph 2-4,c synchronize system at 2.5 mc.

(3) Ensure that NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch (8) on Continuous RF Tuner HFR-1 of receiver 1 is set at ALIGNMENT SIGNAL; set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch (17) on HFR-1 of receiver 2 at OFF.

(4) Set AGC switch (97) of Audio Switch Panel HSP-2 at SEPARATE; RF LEVEL meter (1) on HFR-1 of receiver 1 should indicate.

(5) Place AGC switch of HSP-2 at COMBINED; RF LEVEL meter on both HFR-1 units should indicate.

(6) Set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch on HFR-1 of receiver 1 at OFF; set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch on HFR-1 of receiver 2 at ALIGNMENT SIGNAL.

(7) Repeat steps (4) and (5); in step (4) only the RF LEVEL meter on HFR-1 of receiver 2 will indicate.

(8) Upon completion, remove all test equipment and restore all controls to normal operating condition.

SECTION 3
OPERATOR'S SECTION

3-1. GENERAL.

Paragraphs 3-3,a through 3-3,h provide operating instructions for diversity operation. Although the DDR-5A is capable of diversity or single-receiver operation, single-receiver operation is unlikely except in emergencies or during maintenance down time. If it is necessary to use the DDR-5A in single-receiver operation, refer to the emergency operating procedures given in paragraph 3-4.

3-2. CONTROLS AND INDICATORS.

a. FRONT PANEL. - Figure 3-1 illustrates the location of all DDR-5A 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 Section 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 each HFP-1 chassis. Both switches must be set at STANDBY during DDR-5A operation.

TABLE 3-1. CONTROLS AND FUNCTIONS, DDR-5A

MODULAR UNIT	SERIAL DESIGNATION (Figure 3-1)	PANEL DESIGNATION	FUNCTION
Continuous RF Tuner HFR-1 (Rcvr No. 1)	1	RF LEVEL	Meter indicates strength of antenna input signal or alignment signal in db above 1 uv.
	2	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.
	3	MEGACYCLES	Displays r-f band selected by operation of BAND control knob; refer to serial designation 3.
	4	LOCK	Locks TUNE control in position.
	5	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. 7.
	6	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

TABLE 3-1. CONTROLS AND FUNCTIONS, DDR-5A (C nt'd)

MODULAR UNIT	SERIAL DESIGNATION (Figure 3-1)	PANEL DESIGNATION	FUNCTION
Continuous RF Tuner HFR-1 (Rcvr No. 1) (Cont'd)	7	TUNE/SYNC/OPERATE	TUNE position grounds d-c correction voltage from synthesizer causing HFO circuits to free run, and de-energizes audio sync tone relay of HFA-1 to remove audio 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.
	8	NOISE SILENCER/ OFF/ALIGNMENT 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. ALIGNMENT SIGNAL position activates alignment signal generator, disables output of noise silencer, and connects CAL input jack to first r-f amplifier circuit.
	9	SYNC IND	Lights to indicate that the system is synchronized. This indicator functions only when HFR-1 is operating synthesized.
Continuous RF Tuner HFR-1 (Rcvr No. 2)	10	RF LEVEL	Same as 1.
	11	SYNCHRONIZE	Same as 2.
	12	MEGACYCLES	Same as 3.
	13	LOCK	Same as 4.
	14	TUNE	Same as 5.
	15	BAND	Same as 6.
	16	TUNE/SYNC/OPERATE	Same as 7.
	17	NOISE SILENCER/ OFF/ ALIGNMENT SIGNAL	Same as 8.
	18	SYNC IND	Same as 9.

TABLE 3-1. CONTROLS AND FUNCTIONS, DDR-5A (C nt'd)

MODULAR UNIT	SERIAL DESIGNATION (Figure 3-1)	PANEL DESIGNATION	FUNCTION
Diversity Visual Monitor DVM-4	19		Displays pulse pattern of channel A or B i-f signal applied to detection circuits of HFA-1 unit. I-f signals from HFA-1 unit on RCVR No. 1 or RCVR No. 2 may be applied to DVM-4; refer to serial designation 25.
	20	CALIBRATION ZERO SET	Calibrates DVM-4. Centers reference pulse on zero reference line of oscilloscope.
	21	SWEEP RANGE	Selects narrow (±1 KC) or wide (±5KC) sweep range.
	22		Lights to indicate that DVM-4 is energized.
	23	POWER	Energizes DVM-4 when set at ON. De-energizes DVM-4 when set at OFF.
	24	RF GAIN	Adjusts height of pulse pattern on oscilloscope.
	25	RECEIVER SELECTOR	Selects i-f signal from receiver 1 or receiver 2 HFA-1 units.
	26	PUSH TO CALIBRATE	Energizes marker oscillator and applies signal to oscilloscope for calibration. Disables receiver input to mixer.
Automatic Frequency Control AFC-3 (Rcvr No. 2)	27	AFC ALARM	Lamp lights to indicate carrier drift of 250 kc has exceeded approximately ± 750 cps off center.
	28	RESET	Recenters AFC-3 oscillators when operator is required to tune to another station or re-synchronize due to a drifted signal.
	29	CARRIER LEVEL	Meter indicates level of carrier.
	30	CARRIER FADE	Lamp lights to indicate deep fade of received carrier.
	31	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.
	32	TUNING-KCS	Tunes AFC-3 converter injection oscillator to enable operator to synchronize to the received signal.
	33	SENSITIVITY	Controls gain of carrier amplifier stage. May be backed off to eliminate noise.
	34	AFC DRIFT	Indicates total drift of receiver i-f carrier. Center scale reading is zero drift. The dial

TABLE 3-1. CONTROLS AND FUNCTIONS, DDR-5A (Cont'd)

MODULAR UNIT	SERIAL DESIGNATION (Figure 3-1)	PANEL DESIGNATION	FUNCTION
Automatic Frequency Control AFC-3 (Rcvr No. 2) (Cont'd)	34 (Cont'd)		is color-coded as follows: Color — Drift (approx.) Green — 500 cps Yellow — 500 cps-1kc Red — 1 kc +
IF Amplifier HFI-1 (Rcvr No. 2)	35	CHANNEL A OUTPUT	Displays i-f output of channel A.
	36	CHANNEL A IF BANDWIDTH KC	Permits selection of DSB or SSB signals and desired bandwidth.
	37	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 psoition, MANUAL GAIN control is switched off and agc circuits control gain.
	38	CHANNEL B OUTPUT	Displays i-f output of channel B.
	39	CHANNEL A AGC DECAY	Varies the discharge time constant of the channel A agc network. Clockwise position provides slow agc characteristics.
	40	CHANNEL B AGC DECAY	Varies the discharge time constant of the channel B agc network. Clockwise position provides slow agc characteristics.
	41	CHANNEL B IF BANDWIDTH KC	Permits selection of double sideband or single-sideband signals and desired bandwidth.
	42	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 V6201 when set at OFF.
Variable Notch Filter HNF-1 (Rcvr No. 2)	43	NOTCH ADJUST	Varies frequency of internal oscillator ±8 kc from 250 kc input signal.
	44	NOTCH	Permits signal to pass through HNF-1 without filtering when set at OFF. When set at ON, i-f input signal is filtered.
Detector and Audio Amplifier HFA-1 (Rcvr No. 2)	45	CHANNEL A LINE LEVEL	Meter indicates channel A audio level across 0-1 mw output line.
	46	CHANNEL A BFO	Permits BFO frequency to be shifted approximately 5 kc on either side of 250 kc.
	47	CHANNEL A DETECTION	Determines AM, CW, or SSB mode of operation.

TABLE 3-1. CONTROLS AND FUNCTIONS, DDR-5A (Cont'd)

MODULAR UNIT	SERIAL DESIGNATION (Figure 3-1)	PANEL DESIGNATION	FUNCTION
Detector and Audio Amplifier HFA-1 (Rcvr No. 2) (Cont'd)	48	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.
	49	CHANNEL B BFO	Permits BFO frequency to be shifted approximately 5 kc on either side of 250 kc.
	50	CHANNEL B LINE LEVEL	Meter indicates channel B audio level across 0-1 mw output line.
	51	CHANNEL B MONITOR	Varies signal level at CHANNEL B PHONES jack.
	52	CHANNEL B LEVEL ADJUST	Varies overall HFA-1 Channel B output level.
	53	CHANNEL B PHONES	Facilitates monitoring channel B audio output with 8 k ohm headphones.
	54	CHANNEL B DETECTION	Determines AM, CW, or SSB mode of operation.
	55	CHANNEL A PHONES	Facilitates monitoring channel A audio output with 8K ohm headphones.
	56	CHANNEL A LEVEL ADJUST	Varies overall HFA-1 channel A output level.
	57	CHANNEL A MONITOR	Varies signal level at CHANNEL A PHONES jack.
Audio Filter HAF-1 (Rcvr No. 2)	58	CHANNEL B HIGH CUTOFF	Determines high end of Channel B audio band.
	59	CHANNEL B LOW CUTOFF	Determines low end of Channel B audio band.
	60	CHANNEL A HIGH CUTOFF	Determines high end of Channel A audio band.
	61	CHANNEL A LOW CUTOFF	Determines low end of Channel A audio band.
Power Supply HFP-1 (Rcvr No. 2)	62	OPERATE	Lamp lights to indicate that HFP-1 is in operate condition and sending power to all units of DDR-5A
	63	TIME DELAY	Lamp lights to indicate that HFP-1 is going through time delay stage (approximately 60 seconds) between standby and operate condition.

TABLE 3-1. CONTROLS AND FUNCTIONS, DDR-5A (Cont'd)

MODULAR UNIT	SERIAL DESIGNATION (Figure 3-1)	PANEL DESIGNATION	FUNCTION
Power Supply HFP-1 (Rcvr No. 2) (Cont'd)	64	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.
Power Supply HFP-1 (Rcvr No. 1)	65	OPERATE	Same as 62.
	66	TIME DELAY	Same as 63.
	67	STANDBY	Same as 64.
		MAIN POWER	STANDBY position partially energizes HFP-1 by placing it in standby condition.
Audio Filter HAF-1 (Rcvr No. 1)	68	CHANNEL B HIGH CUTOFF	Same as 58.
	69	CHANNEL B LOW CUTOFF	Same as 59.
	70	CHANNEL A HIGH CUTOFF	Same as 60.
	71	CHANNEL A LOW CUTOFF	Same as 61.
Detector and Audio Amplifier HFA-1 (Rcvr No. 1)	72	CHANNEL B DETECTION	Same as 54.
	73	CHANNEL B LEVEL ADJUST	Same as 52.
	74	CHANNEL B PHONES	Same as 53.
	75	CHANNEL A MONITOR	Same as 57.
	76	CHANNEL A PHONES	Same as 55.
	77	CHANNEL A LEVEL ADJUST	Same as 56.
	78	CHANNEL A DETECTION	Same as 47.
	79	CHANNEL A LINE LEVEL	Same as 45.
	80	CHANNEL A BFO	Same as 46.
	81	POWER	Same as 48.
	82	CHANNEL B MONITOR	Same as 51.

TABLE 3-1. CONTROLS AND FUNCTIONS, DDR-5A (Cont'd)

MODULAR UNIT	SERIAL DESIGNATION (Figure 3-1)	PANEL DESIGNATION	FUNCTION
Detector and Audio Amplifier HFA-1 (Rcvr No. 1) (Cont'd)	83	CHANNEL B BFO	Same as 49.
	84	CHANNEL B LINE LEVEL	Same as 50.
Variable Notch Filter HNF-1 (Rcvr No. 1)	85	NOTCH ADJUST	Same as 43.
	86	NOTCH	Same as 44.
	87	CHANNEL A AGC DECAY	Same as 39.
IF Amplifier HFI-1 (Rcvr No. 1)	88	CHANNEL A IF BANDWIDTH KC	Same as 36.
	89	AFC	Same as 42.
	90	CHANNEL B AGC DECAY	Same as 40.
	91	CHANNEL B IF BANDWIDTH KC	Same as 41.
	92	CHANNEL A OUTPUT	Same as 35.
	93	MANUAL GAIN	Same as 37.
	94	CHANNEL B OUTPUT	Same as 38.
Audio Switch Panel HSP-2	95	RECEIVER 1 SPEAKER CHANNEL	Connects channel A or channel B audio signals to receiver 1 speaker.
	96	RECEIVER 1 SPEAKER VOLUME	Varies audio level of receiver 1 signals.
	97	AGC	SEPARATE positions disconnects the agc circuits of receiver 1 from those of receiver 2. COMBINED position connects the agc circuits of receiver 1 to those of receiver 2.
	98	RECEIVER 2 SPEAKER CHANNEL	Connects channel A or channel B audio signals to receiver 2 speaker.
	99	RECEIVER 2 SPEAKER VOLUME	Varies audio level of receiver 2 signals.
Automatic Frequency Control AFC-3 (Rcvr No. 1)	100	TUNING KCS	Same as 32.
	101	SENSITIVITY	Same as 33.
	102	RESET	Same as 28.
	103	AFC DRIFT	Same as 34.
	104	AFC ALARM	Same as 27.

TABLE 3-1. CONTROLS AND FUNCTIONS, DDR-5A (Cont'd)

MODULAR UNIT	SERIAL DESIGNATION (Figure 3-1)	PANEL DESIGNATION	FUNCTION
Automatic Frequency Control AFC-3 (Rcvr No. 1) (Cont'd)	105	CARRIER SELECTOR	Same as 31.
	106	CARRIER FADE	Same as 30.
	107	CARRIER LEVEL	Same as 29.
Control Synthesizer and Standard HFS-1	108	1 MC	Tunes HFS-1 in 1 mc steps between 2 and 32 mc.
	109	100 KC	Tunes HFS-1 in 100 KC steps.
	110	10 KC	Tunes HFS-1 in 10 KC steps.
	111	1 KC	Tunes HFS-1 in 1 KC steps.
	112	.1 KC	Tunes HFS-1 in 100 cycle steps.
	113	1 MC COMPARATOR	Meter indicates frequency error in internal 1 mc standard.
	114	Nixie indicators (no front panel designation)	Indicates the frequency of incoming signals.

3-3. OPERATING PROCEDURES.

WARNING

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

a. GENERAL. - For the reasons mentioned in paragraph 3-1, only space-diversity operation will be discussed in the following paragraphs. 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-5A. Refer to figure 3-1 and Table 3-1 for the location and function of DDR-5A controls and indicators, and proceed as described in paragraphs b through h below.

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

NOTE

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

(1) Ensure that POWER switch (48 and 81) of both Detector and Audio Amplifier HFA-1 units is set at STANDBY. Set MAIN POWER switch of both Power Supply HFP-1 units at STANDBY; green STANDBY indicator lamps (64 and 67) should light immediately.

(2) Ensure that modular-unit controls are set at positions listed in Table 3-2. At this time, HFS-1 controls are of no significance.

(3) Set POWER switch of Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2, at OPERATE; yellow TIME DELAY lamps (63 and 66) of Power Supply HFP-1 No. 1 and HFP-1 No. 2 should light immediately. Red OPERATE lamp (62 and 65) should light after period of approximately 60 seconds.

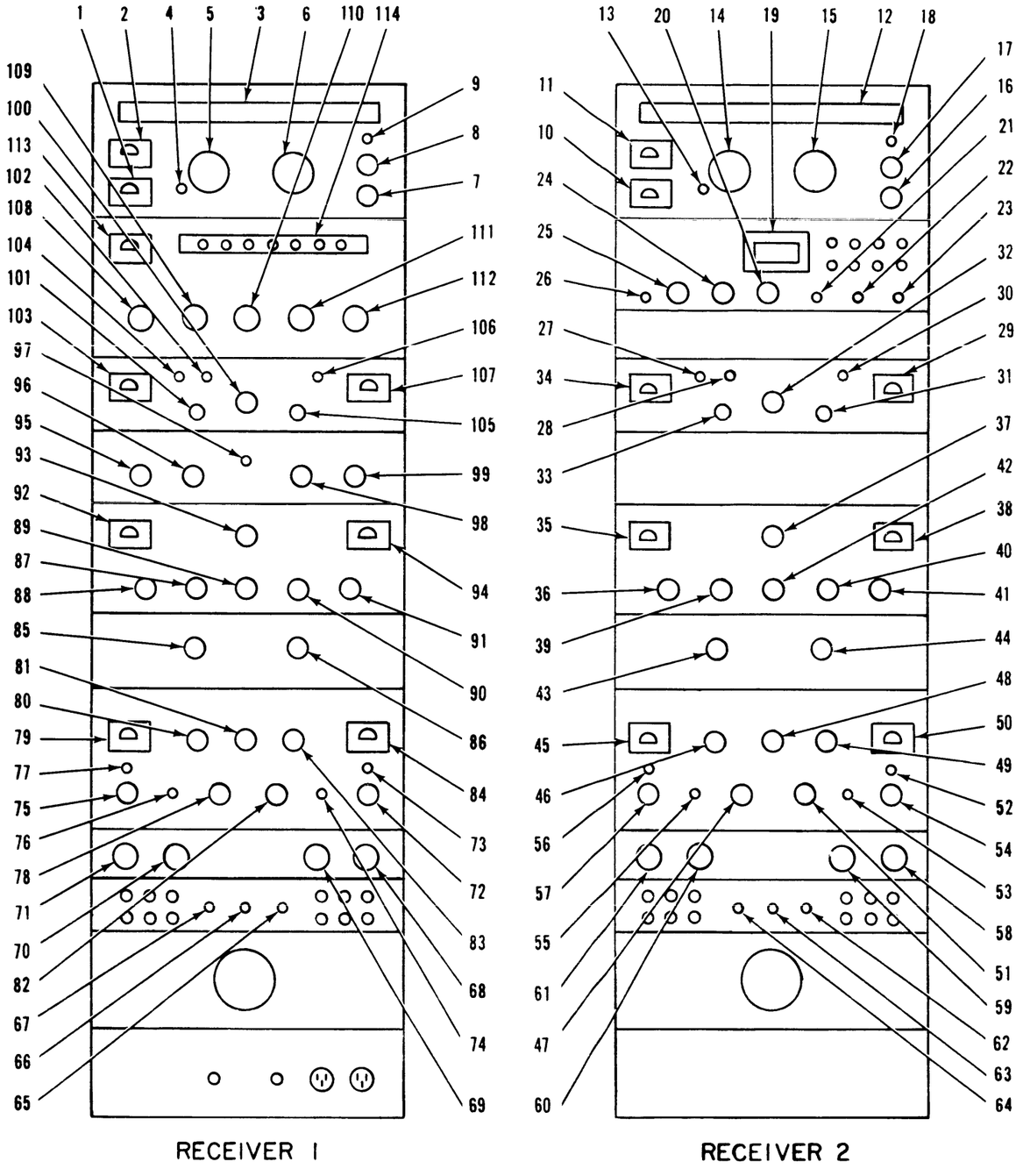


Figure 3-1. Front Panel Controls and Indicators, DDR-5A

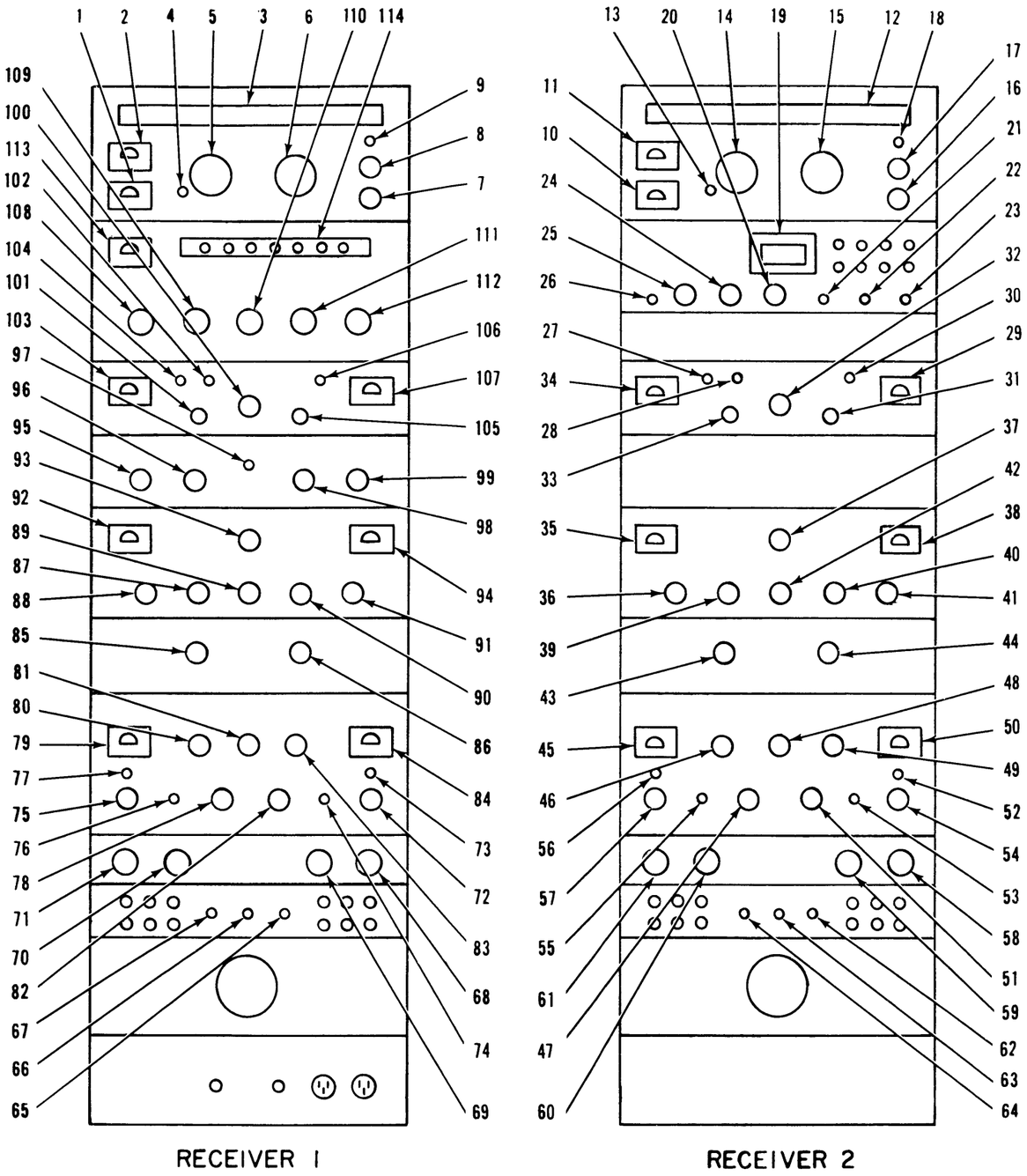


Figure 3-1. Front Panel Controls and Indicators, DDR-5A

TABLE 3-2. PRELIMINARY CONTROL POSITIONS

MODULAR UNIT	SWITCH OR CONTROL DESIGNATION	SERIAL DESIGNATION (Figure 3-1)	POSITION
Audio Filter HAF-1 No. 1 and HAF-1 No. 2	CHANNEL A HIGH CUTOFF	60 and 70	OUT
	CHANNEL A LOW CUTOFF	61 and 71	OUT
	CHANNEL B HIGH CUTOFF	58 and 68	OUT
	CHANNEL B LOW CUTOFF	59 and 69	OUT
Detector and Audio Amplifier HFA-1 No. 1 and HFA-1 No. 2	POWER	48 and 81	STANDBY
	CHANNEL A LEVEL ADJUST	56 and 77	Mid position
	CHANNEL B LEVEL ADJUST	52 and 73	Mid position
	CHANNEL A DETECTION	47 and 78	See paragraph 3-3, d, e, f, g, and h.
	CHANNEL B DETECTION	54 and 72	See paragraph 3-3, d, e, f, g, and h.
	CHANNEL A BFO	46 and 80	0
	CHANNEL B BFO	49 and 83	0
Variable Notch Filter HNF-1 No. 1 and HNF-1 No. 2	NOTCH	44 and 85	OFF
	NOTCH ADJUST	43 and 86	Mid-position.
IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2	MANUAL GAIN	37 and 93	Fully counterclockwise until switch clicks off.
	CHANNEL A AGC DECAY	39 and 87	Fully counterclockwise.
	CHANNEL B AGC DECAY	40 and 90	Fully counterclockwise.
	CHANNEL A IF BANDWIDTH KC	36 and 88	See paragraph 3-3, d, e, f, g and h.
	CHANNEL B IF BANDWIDTH KC	41 and 91	See paragraph 3-3, d, e, f, g and h.
	AFC	42 and 89	OFF
Audio Switch Panel HSP-2	RECEIVER 1 SPEAKER CHANNEL	95	A
	RECEIVER 1 SPEAKER VOLUME	96	Fully clockwise.
	RECEIVER 2 SPEAKER CHANNEL	98	A

TABLE 3-2. PRELIMINARY CONTROL POSITIONS (Cont'd)

MODULAR UNIT	SWITCH OR CONTROL DESIGNATION	SERIAL DESIGNATION (Figure 3-1)	POSITION
Audio Switch Panel HSP-2 (Cont'd)	RECEIVER 2 SPEAKER VOLUME	99	Fully clockwise.
	AGC	97	COMBINED
Automatic Frequency Control AFC-3 No. 1 and AFC-3 No. 2	SENSITIVITY	33 and 101	Fully clockwise.
	TUNING KCS	32 and 100	0
	CARRIER SELECTOR	31 and 105	OSC
Diversity Visual Monitor DVM-4	RECEIVER SELECTOR	25	1
	SWEEP RANGE	21	±5 KC
	CALIBRATION ZERO SET	20	Mid position
	POWER	23	OFF
Continuous RF Tuner HFR-1 No. 1	TUNE/SYNC/OPERATE	7	SYNC
	NOISE SILENCER/OFF/ ALIGNMENT SIGNAL	8	OFF
Continuous RF Tuner HFR-1 No. 2	TUNE/SYNC/OPERATE	16	TUNE *
	NOISE SILENCER/OFF/ ALIGNMENT SIGNAL	17	OFF

* The TUNE SYNC OPERATE switch on HFR-1 of receiver 2 remains at TUNE at all times during synthesized operation.

c. TUNING RECEIVER. - Synchronize the DDR-5A at a selected frequency in the following manner:

NOTE

For the sake of brevity and clarity in this procedure, all modular units contained in receiver 1 are designated HFR-1 No. 1, HFI-1 No. 1, HFA-1 No. 1, etc. All modular units contained in receiver 2 are designated HFR-1 No. 2, HFI-1 No. 2, HFA-1 No. 2, etc.

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

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

(2) Tune Continuous RF Tuner HFR-1 No. 1 and Control Synthesizer and Standard HFS-1 to selected frequency. Tune Continuous RF Tuner HFR-1 No. 2 slightly away from same frequency.

(3) Carefully tune HFR-1 No. 1 around selected frequency until a zero beat is obtained. SYNC IND lamp may flicker until proper point is found.

NOTE

References to the SYNC IND lamp are with respect to receiver 1. The SYNC IND lamp of receiver 2 should remain lit at all times.

(4) Set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch (17) of HFR-1 No. 2 at ALIGNMENT SIGNAL.

(5) Carefully move TUNE control (14) of HFR-1 No.

2 until null is found. On either side of null, SYNC IND lamp will flicker, and tone of increasing frequency will be heard.

(6) Set TUNE/SYNC/OPERATE switch (7) of HFR-1 No. 1 at OPERATE.

(7) Set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch of HFR-1 No. 2 at OFF; system is synchronized. SYNC IND lamp of HFR-1 No. 1 should be lit, and SYNCHRONIZE meter (2 and 11) of both HFR-1 units should indicate zero center scale or nearly so. Carefully tune HFR-1 units to bring SYNCHRONIZE meter to zero center scale, and tighten LOCK control (4 and 13) to prevent inadvertent changing of frequency setting.

NOTE

The RF LEVEL meter of both HFR-1 units will indicate incoming signal strength in db above 1 microvolt. CHANNEL A OUTPUT meter (35 and 92) and CHANNEL B OUTPUT meter (38 and 94) of IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2 should indicate between 0.6 volt and 1.4 volts.

The CHANNEL A LINE LEVEL meter (45 and 79) and CHANNEL B LINE LEVEL meter (50 and 84) of Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2 indicate the audio output in db or VU. Standard 0 VU audio output level is maintained by adjustment of the CHANNEL A LEVEL ADJUST control (56 and 57) and CHANNEL B LEVEL ADJUST control (52 and 73).

d. AM RECEPTION. - Proceed as follows:

NOTE

For the sake of brevity and clarity in this procedure, the modular units contained in receiver 1 are designated HFR-1 No. 1, HFI-1 No. 1, HFA-1 No. 1, etc. The modular units contained in receiver 2 are designated HFR-1 No. 2, HFI-1 No. 2, HFA-1 No. 2, etc. Numbers enclosed in parenthesis are callouts referenced to figure 3-1.

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

(2) Using procedure outlined in paragraph 3-3,c, synchronize DDR-5A at selected frequency. Tighten LOCK control (4 and 13) of Continuous RF Tuners HFR-1 No. 1 and HFR-1 No. 2 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 (95) and RECEIVER 2 SPEAKER CHANNEL switch (98) of HSP-2 unit (see table 3-2). Both channels are similar; therefore, only Channel A will be considered in steps 3 through 10.

(3) On IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2, set CHANNEL A IF BANDWIDTH KC switches (88 and 36) at 15 DSB or 6 DSB in accordance with bandwidth of received signal.

(4) On Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2, set CHANNEL A DETECTION switches (78 and 47) at AM.

(5) On HFA-1 No. 1 and HFA-1 No. 2, adjust CHANNEL A LEVEL ADJUST control (77 and 56) to obtain 0 VU indication for received signals on associated CHANNEL A LINE LEVEL meter (79 and 45).

(6) Adjust RECEIVER 1 SPEAKER VOLUME control (96) and RECEIVER 2 SPEAKER VOLUME control (99) of Audio Switch Panel HSP-2 unit for desired volume level.

(7) On IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2, adjust CHANNEL A AGC DECAY control (39 and 87) and CHANNEL B AGC DECAY control (40 and 90) 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 0 VU.

(8) If impulse noise is present in received signal, eliminate noise by setting NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch (8 and 17) of Continuous RF Tuners HFR-1 No. 1 and HFR-1 No. 2 at NOISE SILENCER.

(9) If interfering signals are present, set NOTCH controls (85 and 43) of Variable Notch Filters HNF-1 No. 1 and HNF-1 No. 2 to attenuate interfering signals as required.

(10) If interference due to local environment, transmitters, etc., is present in received signal, adjust CHANNEL A HIGH CUTOFF switch (70 and 60) and CHANNEL A LOW CUTOFF switch (71 and 61) of Audio Filters HAF-1 No. 1 and HAF-1 No. 2 for minimum interference.

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

(a) Set AFC switch (89 and 42) of IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2 at ON.

(b) On Automatic Frequency Control AFC-3 No. 1 and AFC-3 No. 2, depress RESET button (102 and 28) while simultaneously adjusting TUNING KCS control (100 and 32) for maximum indication on CARRIER LEVEL meter (107 and 29); meter should be approximately in center of green. Release RESET button.

NOTE

SENSITIVITY control (101 and 33) may be backed off to eliminate noise.

(c) On AFC-3 No. 1 and AFC-3 No. 2, check FADE indicator lamp (106 and 30) and ALARM indicator lamp (104 and 27); lamps should not be lit. AFC DRIFT meter (103 and 34) should be at zero center scale.

(12) To monitor the audio output before it is filtered, plug headphones into CHANNEL A PHONES jack (55 and 76) or CHANNEL B PHONES jack (53 and 74) of Detector and Audio Amplifier HFA-1 No. 1 or HFA-1 No. 2 as required. Note that associated CHANNEL A MONITOR control (57 and 75) or CHANNEL B MONITOR control (51 and 82) varies the volume of 1 kc tone 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 switches of IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2 at 1 DSB.

(2) In step (4), set CHANNEL A DETECTION switches of Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2 at CW. Adjust CHANNEL A BFO control (80 and 46) for maximum indication on associated CHANNEL A LINE LEVEL meters.

(3) In step (7), turn CHANNEL A AGC DECAY control (87 and 39) of IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2 clockwise to provide slow agc decay; adjust CHANNEL A AGC DECAY controls 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 (37 and 93) of both HFI-1 units to reduce gain and prevent blocking.

(4) For visual indication of proper or improper tuning of receiver, operate Diversity Visual Monitor DVM-4 as indicated in Table 3-3.

TABLE 3-3. DVM-4 OPERATION, CW RECEPTION

STEP	CONTROL	OPERATION	PURPOSE
1	POWER switch	Turn to ON; determine that red indicator lights.	Energizes monitor unit.
2	SWEEP RANGE switch	Set to ±5 KC	Selects wide sweep range.
3	PUSH TO CALIBRATE switch.	Depress and hold.	Energizes marker oscillator and applies signal to oscilloscope for calibration. Disables receiver input to mixer.
4	CALIBRATION ZERO SET control.	Adjust control to center reference pulses on zero reference line of oscilloscope screen (figure 3-2).	Calibrates monitor unit.
5	PUSH TO CALIBRATE switch.	Release.	Feeds receiver inputs to mixer stage.
6	RECEIVER SELECTOR switch.	Set to 1.	Feeds i-f output from receiver 1 to mixer stage of monitor unit.
7		Check receiver 1 pulse pattern on oscilloscope (figures 3-3 and 3-4).	Determines that monitor unit is operating.
8	RF GAIN control.	Adjust control until pulse pattern is 1 to 1-1/2 inches high.	Maximizes pulse pattern.
9		Set nixie selectors of HFS-1 at 00.0000, and tune HFR-1 #1 until pulse pattern is centered on zero reference line of oscilloscope screen (figure 3-2).	Ensures that receiver 1 is correctly tuned.
10	SWEEP RANGE switch.	Set to ± 1 KC.	Selects narrow sweep range.
11		Repeat steps 3 through 5. However, see figure 3-6 rather than figure 3-2.	Calibrates monitor unit.

TABLE 3-3. DVM-4 OPERATION, CW RECEPTION (Cont'd)

NOTE

Repeat steps 3 through 5 whenever SWEEP RANGE switch position is changed. See figure 3-2 for desired pattern when SWEEP RANGE switch is set to ±5 KC. See figure 3-5 for desired pattern when SWEEP RANGE switch is set to ±1 KC.

STEP	CONTROL	OPERATION	PURPOSE
12		Fine tune HFR-1 #1 until pulse pattern is centered on zero reference line oscilloscope screen (figure 3-5).	Ensures that receiver 1 is correctly tuned.
13	RECEIVER SELECTOR switch.	Set to 2.	Feeds i-f output from receiver 2 mixer stage.
14		Repeat steps 8 through 13 for receiver 2.	Ensures correct tuning of receiver 2.
15		Carefully tune synthesizer (HFS-1) for zero beat at frequency setting of HFR-1 #1 and HFR-1 #2.	
16	SWEEP RANGE switch.	Set to ± 5 KC.	Selects wide sweep range.
17		Repeat steps 3 through 5.	Calibrates monitor unit.
18	RECEIVER SELECTOR switch.	Set to 1 or 2 as desired.	Continuous monitoring of receiver tuning.

NOTE

When the monitor unit is employed for continuous monitoring, drift, fading, and interference appears on the oscilloscope. Modulation appears as irregularities in pulse shape. Sidebands are not visible.

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 No. 1 to the incoming signal, synchronize Control Synthesizer and Standard HFS-1 to HFR-1 No. 1, then synchronize Continuous RF Tuner HFR-1 No. 2. Tuning for random SSB signals must be done very carefully.

(2) In step (3), set CHANNEL A IF BANDWIDTH KC switches of IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2 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 switches of Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2 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 (31 and 105) of Automatic Frequency Control AFC-3 No. 1 and AFC-3 No. 2 should be set at RCC. In this mode of operation, the AFC-3 will restore the carrier.

(5) Turn CHANNEL A AGC DECAY control (87 and 39) of both HFI-1 units clockwise to provide slow agc decay; adjust CHANNEL A AGC DECAY controls to provide proper dischrage time constant so that agc developed by strong adjacent-channel signals will not

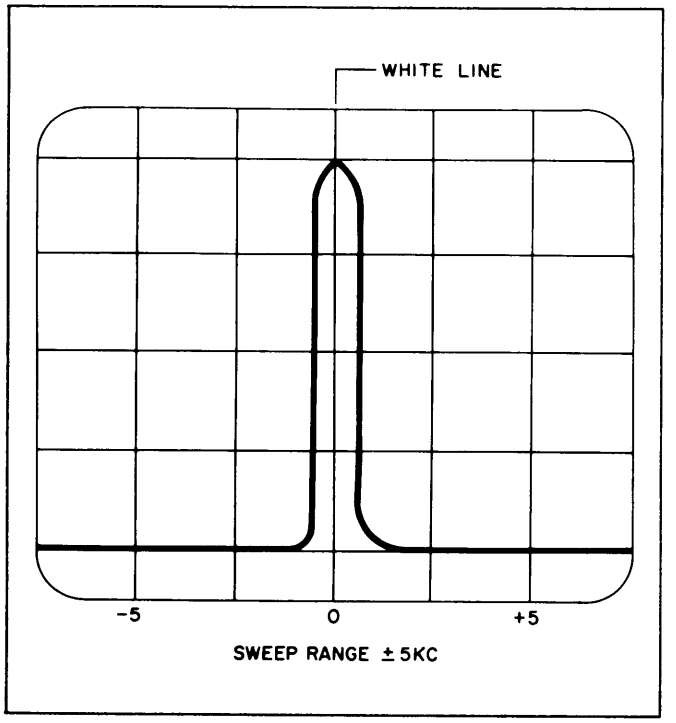


Figure 3-2. Reference Marker or Correctly Tuned Signal Pulse, Sweep Range at ±5 KC

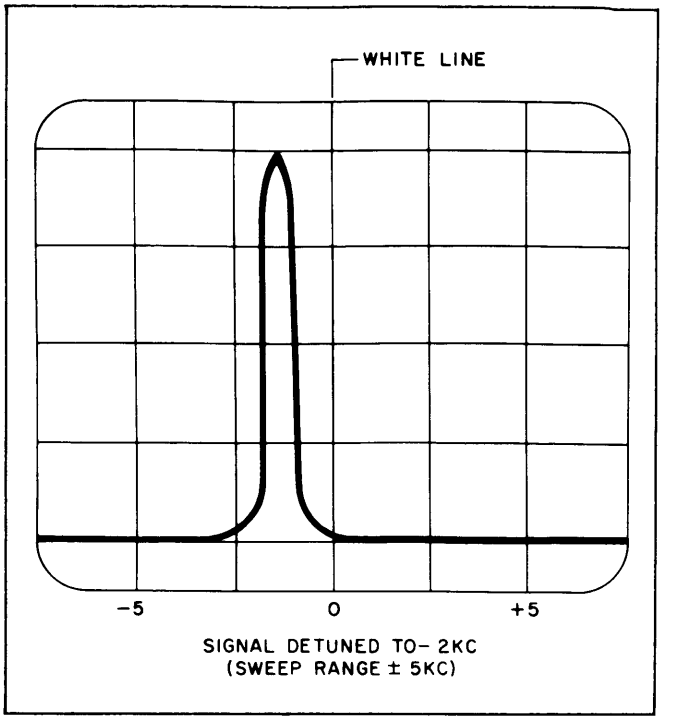


Figure 3-3. Incorrectly Tuned Signal, Sweep Range at ±5 KC

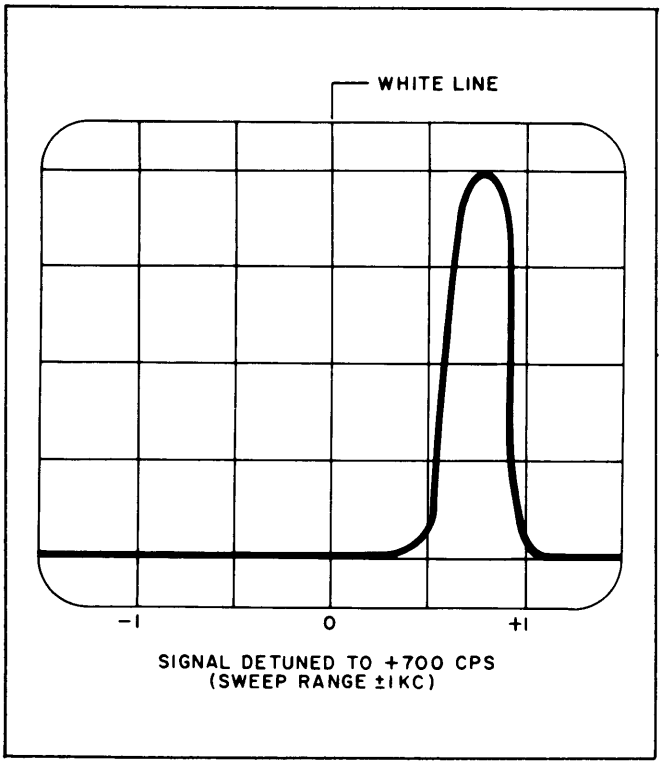


Figure 3-4. Incorrectly Tuned Signal, Sweep Range at ±1 KC

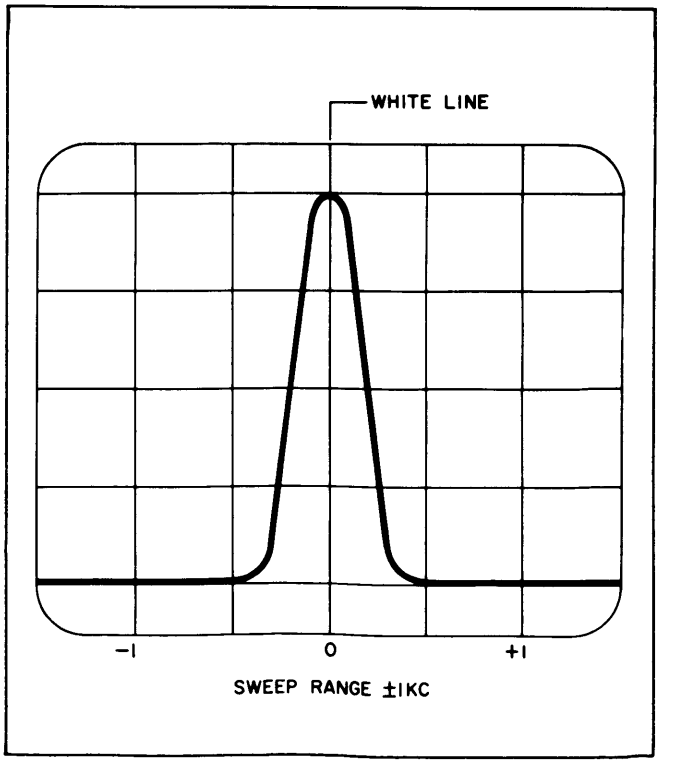


Figure 3-5. Reference Marker or Correctly Tuned Signal Pulse, Sweep Range at ±1 KC

reduce receiver gain while listening to weak signals.

g. RECEPTION OF FSK OR FAX SIGNALS. - This procedure applies to the DDR-5A when the audio output at terminal strip A-3083 (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-5A, adjustment of Detector and Audio Amplifier HFA-1 No. 1 and HFA-1 No. 2 controls should be omitted.

Depending upon the nature of received FSK or FAX signals, the DDR-5A 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

For the sake of brevity and clarity in this procedure, the modular units contained in receiver 1 are designated HFR-1 No. 1, HFA-1 No. 1, HFI-1 No. 1, etc. The modular units contained in receiver 2 are designated HFR-1 No. 2, HFA-1 No. 2, HFI-1 No. 2, etc. Numbers enclosed in parenthesis are callouts referenced to figure 3-1.

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

(2) Plug headphones into CHANNEL A PHONES jack (55 or 76) of Detector and Audio Amplifier HFA-1 No. 1 or HFA-1 No. 2 in order to monitor DDR-5A.

(3) Using procedure outlined in paragraph 3-3,b, synchronize DDR-5A at frequency of incoming signal. Tighten LOCK control (4 and 13) of Continuous RF Tuner HFR-1 No. 1 and HFR-1 No. 2 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 (95) and RECEIVER 2 SPEAKER CHANNEL switch (98) 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 Amplifiers HFI-1 No. 1 and HFI-1 No. 2, set CHANNEL A IF BANDWIDTH KC switch (88 and 36) at 1 DSB.

(5) On Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2, set CHANNEL A DETECTION switch (78 and 47) at CW. Adjust CHANNEL A BFO control (46 and 80) for proper operation of teletype equipment.

(6) Adjust CHANNEL A LEVEL ADJUST control (77 and 56) of both HFA-1 units to obtain 0 VU indication on CHANNEL A LINE LEVEL meter (45 and 79).

(7) For visual indication of proper or improper tuning of receiver, operate Diversity Visual Monitor DVM-4 as indicated in Table 3-4.

TABLE 3-4. DVM-4 OPERATION, FREQUENCY SHIFT OPERATION (850 CYCLE)

NOTE

An FSK pulse usually consists of a mark frequency and a space frequency. Normally, the mark frequency is higher. When tuning in an FSK pulse on standby transmitting condition, the frequency shift usually is on the mark frequency, while the mark pulse peak indication appears to the right of the zero reference line on the oscilloscope screen. With start of pulse transmission, the mark and space pulse peaks of the receiver signals should be tuned to be equally distant from the zero reference line. For convenience in tuning 850-cycle shift FSK pulses, a calibrated screen is included. This screen is calibrated 425 cycles from the zero reference line.

STEP	CONTROL	OPERATION	PURPOSE
1	POWER switch	Turn to ON. Determine that red indicator lights.	Energizes monitor unit.
2	SWEEP RANGE switch	Set to ±5 KC.	Selects wide sweep range.
3	PUSH TO CALIBRATE switch	Depress and hold.	Energizes marker oscillator and applies signal to oscilloscope for calibration. Disables receiver input to mixer.

TABLE 3-4. DVM-4 OPERATION, FREQUENCY SHIFT OPERATION (850 CYCLE) (Cont'd)

STEP	CONTROL	OPERATION	PURPOSE
4	CALIBRATION ZERO SET control	Adjust control to center reference pulses on zero reference line of oscilloscope (figure 3-2).	Calibrates monitor unit.
5	PUSH TO CALIBRATE switch	Release.	Feeds receiver inputs to mixer stage.
6	RECEIVER SELECTOR switch	Set to 1.	Feeds i-f output from receiver 1 to mixer stage of monitor unit.
7		Check receiver 1 pulse pattern on oscilloscope (figures 3-3 and 3-4).	Determines that monitor unit is operating.
8	RF GAIN control	Adjust control until pulse pattern is 1 to 1-1/2 inches high.	Maximizes pulse pattern.
9		If signal is being keyed, tune receiver 1 until pulsating peaks are equidistant from zero reference line (figure 3-6).	Ensures that receiver 1 is correctly tuned.
10		If signal is static, tune receiver 1 so test pulse pattern coincides with right reference line.	Ensures that receiver 1 is correctly tuned.
11	SWEEP RANGE switch	Set to -1 KC.	Selects narrow sweep range.
12		Repeat steps 2 through 5. However, see figure 3-5 rather than figure 3-2.	Calibrates monitor unit.
		NOTE Repeat steps 3 through 5 whenever SWEEP RANGE switch position is changed. See figure 3-2 for desired pattern when SWEEP RANGE switch is set to -5 KC. See figure 3-5 for desired pattern when SWEEP RANGE switch is set to -1 KC.	
13		Fine tune receiver 1 until pulsating peaks are equidistant from zero reference line (figure 3-7) or single pulse pattern is centered on the right 425-cycle line (steps 9 and 10).	Ensures that receiver 1 is correctly tuned.
14	RECEIVER SELECTOR switch	Set to 2.	Feeds i-f output from receiver 2 to mixer stage.
15		Repeat steps 9 through 13 for receiver 2.	Ensures correct tuning of receiver 2.
16	SWEEP RANGE switch	Set to ±5 KC.	Selects wide sweep range.
17		Repeat steps 3 through 5.	Calibrates monitor unit.
18	RECEIVER SELECTOR switch	Set to 1 or 2 as desired.	Continuous monitoring of receiver tuning.

TABLE 3-4. DVM-4 OPERATION, FREQUENCY SHIFT OPERATION (850 CYCLE) (Cont'd)

STEP	CONTROL	OPERATION	PURPOSE
		NOTE When the monitor unit is employed for continuous monitoring, drift, fading, and interference appears on the oscilloscope. Modulation appears as irregularities in pulse shape. Sidebands are not visable.	

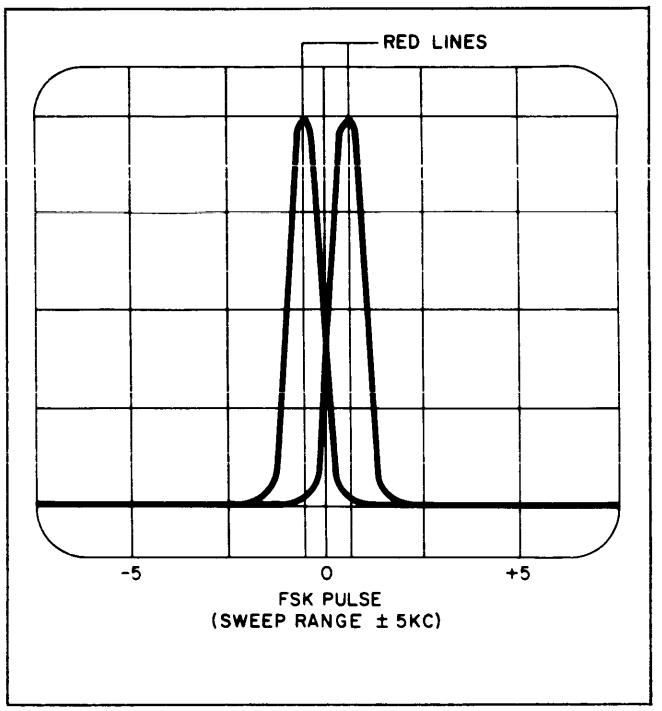


Figure 3-6. Frequency Shift Signal Correctly Tuned, Sweep Range at ±5 KC

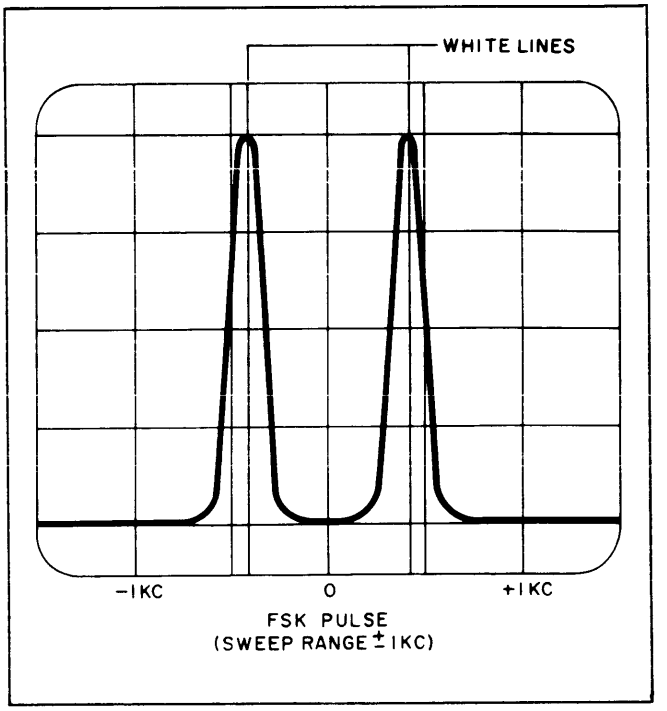


Figure 3-7. Frequency Shift Signal Correctly Tuned, Sweep Range at 1 KC

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-5A operation. To receive VFT signals from a synthesized transmitter, tune the DDR-5A to the assigned frequency of the incoming signal, and operate the DDR-5A in the same manner as for single-sideband reception (paragraph 3-3,f). For reception of VFT signals from a nonsynthesized transmitter, proceed as follows:

NOTE

For the sake of brevity and clarity in this procedure, all modular units contained in receiver 1 are designated HFR-1 No. 1, HFI-1 No. 1, HFA-1 No. 1, etc. All modular units contained in receiver 2 are designated HFR-1 No. 2, HFI-1 No. 2, HFA-1 No. 2, etc. Numbers enclosed in parenthesis are callouts referenced to figure 3-1.

(1) Check to see that teletype terminal equipment is connected to the appropriate terminal of terminal strip A3083. Start the DDR-5A as outlined in paragraph 3-3,b.

(2) Set TUNE/SYNC/OPERATE switch (7) of Continuous RF Tuner HFR-1 No. 1 at TUNE. With TUNE/SYNC/OPERATE switch at TUNE, Control Synthesizer and Standard HFS-1 will have no effect on Continuous RF Tuners HFR-1 No. 1 or HFR-1 No. 2; the setting of HFS-1 nixie selectors is of no significance.

(3) On Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2, set CHANNEL A DETECTION switch (47 and 78) 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 Amplifiers HFI-1 No. 1 and HFI-1 No. 2, set CHANNEL A IF BANDWIDTH KC switch (88 and 36) 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 (76) of Detector and Audio Amplifier HFA-1 No. 1 and monitor receiver while tuning Continuous RF Tuner HFR-1 No. 1 to incoming signal. Tighten LOCK control (4) to prevent inadvertent changing of frequency setting.

(6) Repeat step 5 for receiver 2 with headphones plugged into CHANNEL A PHONES jack (55) of Detector and Audio Amplifier HFA-1 No. 2; proceed to step (7) or step (8) below.

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

(a) On IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2, set CHANNEL A IF BANDWIDTH KC switch (88 and 36) at 3.5 L SSB or 7.5 L SSB. Set AFC switch (89 and 42) at ON.

(b) Plug headphones into CHANNEL A PHONES jack of Detector and Audio Amplifier HFA-1 No. 1, and monitor receiver 1 while performing step (c) below.

NOTE

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

(c) On Automatic Frequency Control AFC-3 No. 1, depress RESET button (102) while simultaneously turning TUNING KCS control (100) counterclockwise from +3 position to point where signals are no longer heard and maximum indication is obtained on CARRIER LEVEL meter (105).

(d) Plug headphones into CHANNEL A PHONES jack (55) of Detector and Audio-Amplifier HFA-1 No. 2. Repeat step (c) using RESET button (28) and TUNING KCS control (32) of Automatic Frequency Control AFC-3 No. 2; maximum indication should be obtained on CARRIER LEVEL meter (29) of AFC-3 No. 2.

(e) On IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2, set CHANNEL A IF BANDWIDTH KC switch at 3.5 U SSB or 7.5 U SSB.

(f) Ensure that teletype equipment is operating correctly.

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

(a) On IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2, set CHANNEL A IF BANDWIDTH KC switch at 3.5 U SSB or 7.5 U SSB. Set AFC switch (89 and 42) at ON.

(b) Plug headphones into CHANNEL A PHONES jack of Detector and Audio Amplifier HFA-1 No. 1, and monitor receiver 1 while performing step (c) below.

NOTE

When performing step (c), tuning must be done very carefully so that Automatic Frequency Control AFC-2 does not lock onto one of the tone frequencies.

(c) On Automatic Frequency Control AFC-3 No. 1, depress RESET button (102) while simultaneously turning TUNING KCS control (100) clockwise from -3 position to point where signals are no longer heard and maximum indication is obtained on CARRIER LEVEL meter (105).

(d) Plug headphones into CHANNEL A PHONES jack (55) of Detector and Audio Amplifier HFA-1 No. 2. Repeat step (c) using RESET button (28) and TUNING KCS control (32) of Automatic Frequency Control AFC-3 No. 2; maximum indication should be obtained on CARRIER LEVEL meter (29) of AFC-3 No. 2.

(e) On IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2, set CHANNEL A IF BANDWIDTH KC switch at 3.5 L SSB or 7.5 L SSB.

(f) Ensure that teletype equipment is operating properly.

3-4. EMERGENCY OPERATING PROCEDURES.

a. GENERAL. - If it becomes necessary to use the DDR-5A in single-receiver operation due to an emergency or maintenance down time on any of the modular units, proceed as described in the following paragraphs.

b. SYNTHESIZED SINGLE-RECEIVER OPERATION. - In single-receiver operation, only receiver 1 can operate synthesized. The modular units in both receivers are interchangeable (refer to paragraph 2-3,c); therefore, if any modular unit of receiver 1 becomes defective, the corresponding unit of receiver 2 can be substituted thus making synthesized operation possible. Ensure that receiver 1 cabling connections have been made as indicated in figure 2-5. Synthesized single-receiver operating procedures are similar to those given to paragraphs 3-3,b through 3-3,h except that all references to modular units contained in receiver 2 should be omitted.

c. NON-SYNTHESIZED SINGLE-RECEIVER OPERATION. - To use both receivers or either receiver in non-synthesized single-receiver operation, ensure that cabling connections have been made as indicated for receiver 2 in figure 2-5, and proceed as outlined in paragraphs 3-3,b through 3-3,h with the following exceptions:

(1) Because Control Synthesizer and Standard HFS-1 is not being used, all references to HFS-1 should be omitted.

(2) The TUNE/SYNC/OPERATE switch (16) of Continuous RF Tuner HFR-1 No. 2 is not set at TUNE at all times. Use the TUNE/SYNC/OPERATE switch

of HFR-1 No. 2 in the same manner as indicated for the TUNE/SYNC/OPERATE switch (7) of Continuous RF Tuner HFR-1 No. 1.

(3) The AFC switch (42 and 89) of IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2 must be set at ON at all times in order to provide a 2 mc injection frequency for the second converter stage of HFI-1 No. 1 and HFI-1 No. 2 (see figure 4-1).

(4) All references to controls and indicators on modular units except Audio Switch Panel HSP-2 and Diversity Visual Monitor DVM-4 must be confined to the receiver being operated.

3-5. OPERATOR'S MAINTENANCE.

a. GENERAL. - The operator should observe that modular 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 modular units contained in the DDR-5A, with the exception of the Diversity Visual Monitor DVM-4, are located in Power Supply HFP-1 No. 1 and HFP-1 No. 2. For information regarding location and type of DVM-4 fuses, refer to the DVM-4 modular-unit manual. Figure 3-8 shows the location of fuses and the associated blown fuse indicators. Table 3-5 lists all fuses located in Power Supply HFP-1 No. 1 or HFP-1 No. 2 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.

c. REPLACEMENT OF ELECTRON TUBES. - The operator should check the general condition of electron tubes; tubes that appear to be defective should be checked on a reliable tube tester and replaced as required. When testing or replacing minature 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 modular units contained in the DDR-5A; refer to the equipment performance check given in Section 4.

TABLE 3-5. FUSE LOCATIONS AND FUNCTIONS, HFP-1

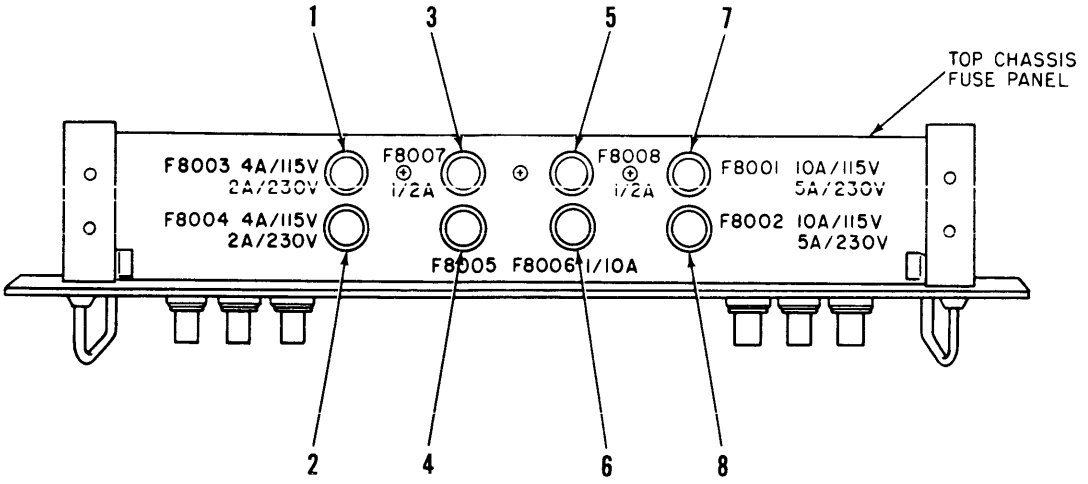
SERIAL DESIGNATION (Figure 3-8)	PANEL DESIGNATION (Figure 3-8)	CIRCUIT PROTECTED	SCHEMATIC SYMBOL
1	F8003 4A/115V 2A/230V	Line voltage supply to frequency stabilizing ovens in AFC and HFR.	F8003
2	F8004 4A/115V 2A/230V		F8004
3	F8007 1/2A	Input to section "A" B+ regulator circuit in HFP-1.	F8007
4	F8005 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

TABLE 3-5. FUSE LOCATIONS AND FUNCTIONS, HFP-1 (Cont'd)

SERIAL DESIGNATION (Figure 3-8)	PANEL DESIGNATION (Figure 3-8)	CIRCUIT PROTECTED	SCHEMATIC SYMBOL
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.



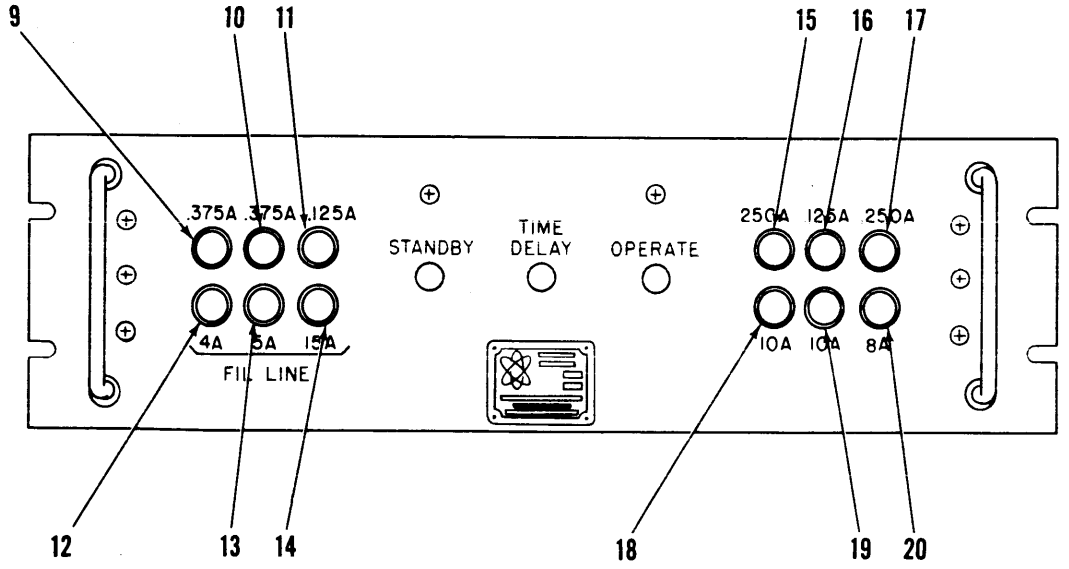


Figure 3-8. Indicator Lights and Fuse Locations, HFP-1

SECTION 4
TROUBLESHOOTING

4-1. INTRODUCTION.

This section contains both troubleshooting information and functional analysis of the DDR-5A. 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 diversity and non-synthesized single-receiver operation is given in the following paragraphs. Although synthesized single-receiver operation is possible, funtional analysis is similar to that given for diversity operation, and therefore will not be discussed in this manual.

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

NOTE

For the sake of brevity and clarity in this discussion, the modular units contained in receiver 1 are designated as follows: HFR-1 No. 1, HFI-1 No. 1, HFA-1 No. 1, etc. The modular units contained in receiver 2 are designated as follows: HFR-1 No. 2, HFI-1 No. 2, HFA-1 No. 2, etc.

(1) RF AMPLIFICATION AND FIRST CONVERSION. - R-f signals from antennas 1 and 2 are simultaneously applied to Continuous RF Tuners HFR-1 No. 1 and HFR-1 No. 2. Within HFR-1 No. 1 and HFR-1 No. 2 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 Continuous RF Tuners eliminate impulse noise from the 1.75 mc output signal. The 1.75 mc i-f signal from HFR-1 No. 1 and HFR-1 No. 2 is applied simultaneously to IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2.

A sample of the HFO output signal from Continuous RF Tuner HFR-1 No. 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 No. 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 ciucuit 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 No. 1 thereby maintaining high stability. The corrected 3.75 mc to 33.75 mc signal from the HFO circuit of Continuous RF Tuner HFR-1 No. 1 is applied to the HFO circuit of Continuous RF Tuner HFR-1 No. 2 thus slaving HFR-1 No. 2 to HFR-1 No. 1.

(2) SECOND CONVERSION AND IF AMPLIFICATION. - The 1.75 mc i-f signals applied to IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2 are beat with a 2 mc injection frequency that is obtained from the Control Synthesizer and Standard HFS-1 or from Automatic Frequency Control AFC-3 No. 1 and AFC-3 No. 2. The resultant, a highly stable second i-f of 250 kc, is extended to Variable Notch Filters HNF-1 No. 1 and HNF-1 No. 2. Operation of HNF-1 No. 1 and HNF-1 No. 2 is determined by the setting of front-panel controls. When used, HNF-1 No. 1 and HNF-1 No. 2 will attenuate interfering signals within ±8 kc of the center 250 kc i-f. The 250 kc i-f is returned from HNF-1 No. 1 and HNF-1 No. 2 to IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2 where it is fed through selectable bandpass filters and i-f amplifiers. HFI-1 No. 1 and HFI-1 No. 2 each provide dual channel (Channel A and B) amplified 250 kc output signals that are extended to Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2.

Two agc voltages corresponding to the selected Channel A and Channel B i-f amplifiers are developed in IF Amplifier HFI-1 No. 1; likewise two agc voltages are developed in IF Amplifier HFI-1 No. 2. Within each receiver the strongest agc voltage is selected and applied to the i-f amplifier stages of HFI-1 No. 1 and HFI-1 No. 2 unit, to the r-f amplifier stages of Continuous RF Tuners HFR-1 No. 1 and HFR-1 No. 2, and to the common Audio Switch Panel HSP-2. The agc voltages of each receiver can be combined or separated by means of a front-panel switch located on Audio Switch Panel HSP-2.

(3) DETECTION AND AUDIO AMPLIFICATION. - Channel A and Channel B signals (AM, CW, and SSB) received by Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2 are demodulated and extended to Audio Filters HAF-1 No. 1 and HAF-1 No. 2. A beat frequency oscillator incorporated in the HFA-1 unit is used to demodulate CW signals, and a 250 kc injection frequency received from the Control Synthesizer and Standard HFS-1 or Automatic Frequency Control AFC-3 No. 1 and AFC-3 No. 2 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 trans-

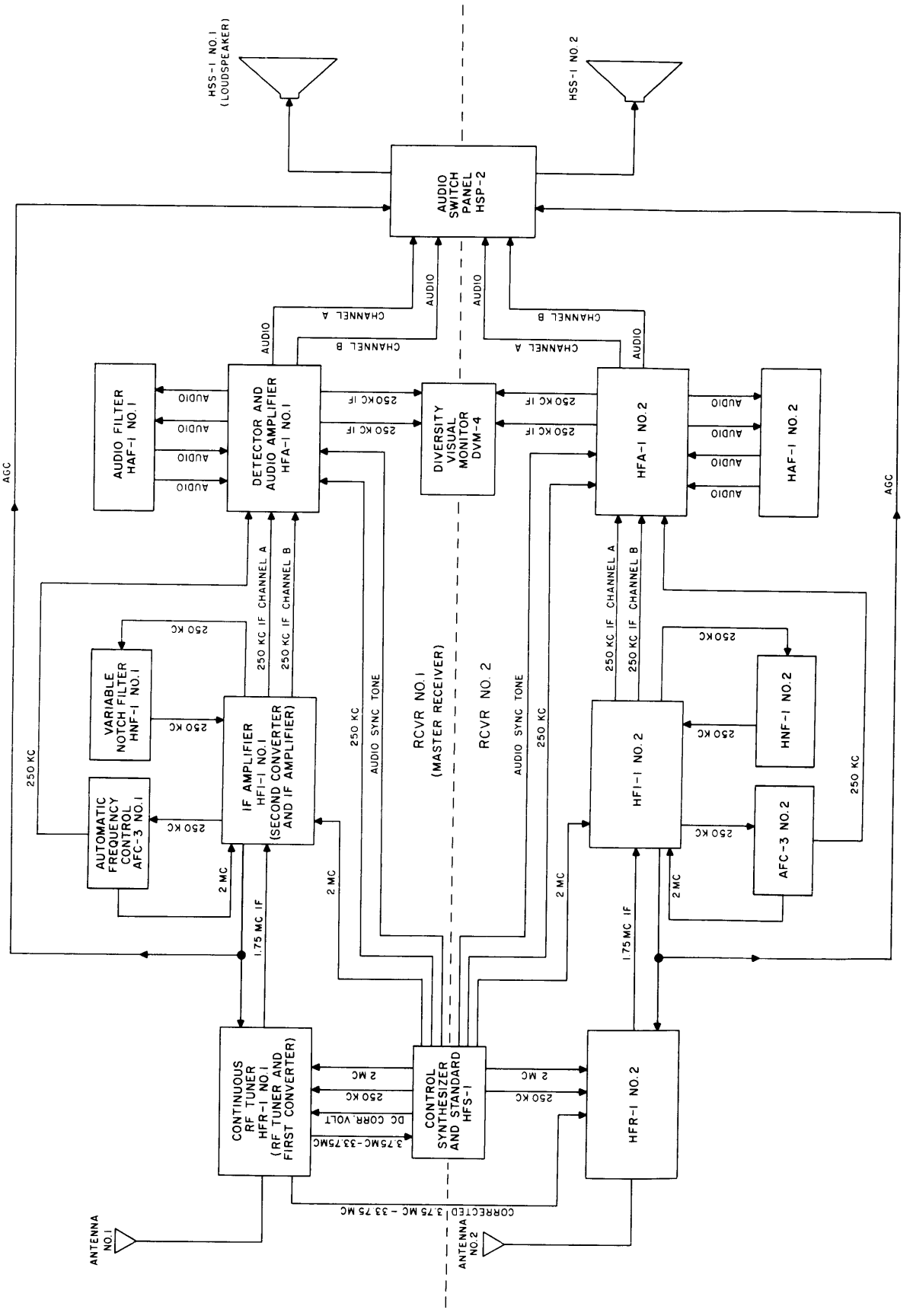


Figure 4-1. Simplified Block Diagram, DDR-5A

mitters. Audio signals from HAF-1 No. 1 and HAF-1 No. 2 are returned to Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2 where they are amplified. The amplified audio output signals from HFA-1 No. 1 and HFA-1 No. 2 are extended over dual channels to common Audio Switch Panel HSP-2. The HSP-2 provides facilities for switching either Channel A or Channel B audio signals of receiver 1 or receiver 2 to the corresponding speaker.

A sample of the Channel A and Channel B signals received by Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2 is applied to Diversity Visual Monitor DVM-4. The DVM-4 indicates proper or improper tuning of the DDR-5A. Tuning is shown on an oscilloscope indicator as a lateral positioning of a pulse pattern along a calibrated time base. Analysis of received signals or any interference being experienced provides the operator with a very useful tool for proper reception of any type of signal.

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

(1) Continuous RF Tuner HFR-1 No. 2 is not slaved to Continuous RF Tuner HFR-1 No. 1 (see figures 2-5 and 4-1).

(2) The HFO circuits of Continuous RF Tuners HFR-1 No. 1 and HFR-1 No. 2 are free running; stability is 20 to 50 parts in 10^6 as compared to one part in 10^8 for synthesized operation.

(3) The origin of the 2 mc injection frequency used in the second conversion stage is limited to Automatic Frequency Control AFC-3 No. 1 and AFC-3 No. 2.

(4) 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 No. 1 and AFC-3 No. 2.

4-3. EQUIPMENT PERFORMANCE CHECK.

Figure 4-2 is a detailed servicing block diagram of receiver 1. Receiver 2 and receiver 1 are similar, therefore only receiver 1 is shown. 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-5A are high enough to be fatal. Every precaution should be taken by maintainence technicians to minimize the danger of shock.

TABLE 4-1. EQUIPMENT PERFORMANCE CHECK, DDR-5A

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 parenthesis are callouts referenced to figure 3-1.

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
1	Set DDR-5A controls as as listed in paragraph 2-4,b.	STANDBY lamps (64 and 67) should light.	Defective contacts of relay K8001 or transformer T8001 in associated Power Supply HFP-1 No. 1 or HFP-1 No. 2.
		Blowers on both racks should operate.	Blown F8001 or F8002 fuse, in Power Supply HFP-1 No. 1 or HFP-1 No. 2 or defective blower unit.

TABLE 4-1. EQUIPMENT PERFORMANCE CHECK, DDR-5A (C nt'd)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
2	Set POWER switch (48 and (81) of Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2 at OPERATE.	STANDBY indicator lamps (64 and 67) should be extinguished and TIME DELAY lamps (63 and 66) should light. After approximately 60 seconds, TIME DELAY lamps should be extinguished and OPERATE lamps (62 and 65) should light. MEGACYCLE DIAL of Continuous RF Tuners HFR-1 No. 1 and HFR-1 No. 2 should be illuminated.	Defective K8001, K8002, or K8003 relays or related circuitry in associated Power Supply HFP-1 No. 1 or HFP-1 No. 2.
		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
		SYNCHRONIZE meter of Continuous RF Tuners HFR-1 No. 1 and HFR-1 No. 2 should indicate approximately 1 volt.	Defective SYNCHRONIZE meter circuitry or related VTVM circuitry of associated HFR-1 unit. Defective phase detector or related 3400 deck circuitry of Control Synthesizer and Standard HFS-1.
		1 MC COMPARATOR meter of Control Synethesizer and Standard HFS-1 should indicate approximately center scale.	Defective 1 mc standard circuitry or 1 mc comparator of HFS-1
3	Using procedure outlined in step (9) of paragraph 2-4,c, synchronize DDR-5A at high and low frequencies of each band.	Zero beat should be heard and SYNC IND lamp (9) of Continuous RF Tuner HFR-1 No. 1 should light when receiver 1 is synchronized.	Defective audio sync tone relay or associated audio amplifier circuitry of Detector and Audio Amplifier HFA-1 No. 1. Defective phase detector or associated 3400-deck circuitry of Control Synthesizer and Standard HFS-1. Defective HFO circuitry of HFR-1 No. 2.
		A null should be obtained when receiver 2 is synchronized. SYNC IND lamp of Continuous RF Tuner HFR-1 No. 2 should be lit at all times.	Defective HFO circuitry of HFR-1 No. 2.
4	On Continuous RF Tuners HFR-1 No. 1 and HFR-1 No. 2, set NOISE SILENCER/ OFF/ALIGNMENT SIGNAL switch at ALIGNMENT SIGNAL. Set RECEIVER 1 SPEAKER CHANNEL	CHANNEL A OUTPUT meter (35 and 92) and CHANNEL B OUTPUT meter (38 and 94) of IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2 should indicate approximately 1 volt.	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.

TABLE 4-1. EQUIPMENT PERFORMANCE CHECK, DDR-5A (C nt'd)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
4 Cont'd	and RECEIVER 2 SPEAKER CHANNEL switches (95 and 98) of Audio Switch Panel HSP-2 at B and then at A.	RF LEVEL meter (1 and 10) of both HFR-1 units should indicate With CHANNEL A BFO control (46 and 80) and CHANNEL B BFO control (49 and 83) of Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2 set at 0, alignment signal tone should not be heard in loud speakers, and CHANNEL A LINE LEVEL meter (45 and 79) and CHANNEL B LINE LEVEL meter (50 and 84) of both HFA-1 units should not indicate.	Defective agc comparator circuit of associated HFI-1 unit. Incorrect setting of CHANNEL A BFO or CHANNEL B BFO control. Defective beat frequency oscillator circuits of associated HFA-1 unit.
5	Set RECEIVER 1 SPEAKER CHANNEL and RECEIVER 2 SPEAKER CHANNEL switches (95 and 98) of Audio Switch Panel HSP-2 at B and then at A while simultaneously adjusting associated CHANNEL A BFO control (46 and 80) and CHANNEL B BFO control (49 and 83) for comfortable tone on loudspeaker.	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 Amplifiers HFA-1 No. 1 or HFA-1 No. 2.
6	On IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2 set AFC switch (42 and 89) at ON.	AFC ALARM lamp (27 and 104) and CARRIER FADE lamp (30 and 106) of Automatic Frequency Control AFC-3 No. 1 and AFC-3 No. 2. should light.	Defective phase detector or FADE relay circuitry of associated AFC-3 unit.
7	On Automatic Frequency Control AFC-3 No. 1 and AFC-3 No. 2 depress and hold down RESET button (28 and 102) while adjusting tuning KCS control (32 and 100) for maximum reading on CARRIER LEVEL meter (29 and 107). Release RESET button.	AFC ALARM lamp should be extinguished, and AFC DRIFT meter (34 and 103) should be at zero center scale. CARRIER FADE lamp should be extinguished, and reading on CARRIER LEVEL meter should be approximately in center of green.	Defective AFC-3 phase detector or 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 Automatic Frequency Control AFC-3 No. 1 and AFC-3 No. 2, turn SENSITIVITY control (33 and 101) fully counterclockwise; return SENSITIVITY control to fully clockwise position.	CARRIER FADE lamp of both AFC-3 units should light, and reading on CARRIER LEVEL meter should fall to 0 when SENSITIVITY control is set fully counterclockwise.	Defective agc-sensitivity networks of associated AFC-3 unit. Defective i-f input and carrier amplifier circuits of associated AFC-3 unit.

TABLE 4-1. EQUIPMENT PERFORMANCE CHECK, DDR-5A (C nt'd)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
8 Cont'd		CARRIER FADE lamps should be extinguished, and reading on CARRIER LEVEL meters should be at maximum when SENSITIVITY control is restored to fully clockwise position	Same as above.
9	On IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2 set AFC switch (42 and 89) at OFF.	Pointer of CARRIER LEVEL meter (45 and 79) and AFC DRIFT meter (34 and 103) of Automatic Frequency Control AFC-3 No. 1 and AFC-3 No. 2 should deflect completely to left.	See step 7.
10	On IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2 set CHANNEL A IF BANDWIDTH KC switch (88 and 36) at 1 DSB, 6 DSB, and 15 DSB while CHANNEL B IF BANDWIDTH KC switch (91 and 41) is set at blank position.	Reading on CHANNEL A OUTPUT meter (92 and 35) 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 associated HFI-1 unit.
11	Repeat step 10 with CHANNEL B IF BANDWIDTH KC switch set at 1 DSB, 6 DSB, and 15 DSB while CHANNEL A IF BANDWIDTH KC Switch is set at blank position.	Reading on CHANNEL B OUTPUT meter (94 and 38) 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 associated HFI-1 unit.
	NOTE Alignment signal tone will not be heard unless RECEIVER 1 SPEAKER CHANNEL switch (95) and RECEIVER 2SPEAKER CHANNEL switch (98) of AudioSwitch Panel HSP-2 are set at B.		
12	Set AFC switch of IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2 at ON. On Automatic Frequency Control AFC-3 No. 1 and AFC-3 No. 2, depress RESET button (102 and 28) for approximately 6 seconds; turn TUNING KCS control (100 and 32) midway between 0 and -3.	CARRIER FADE lamp (106 and 30) should light and pointer of CARRIER LEVEL meter (107 and 29) should deflect completely to left when TUNING KCS control is adjusted.	Defective converter injection oscillator circuitry of associated AFC-3 unit.
13	Set CHANNEL A DETECTION switch (47 and 78) and CHANNEL B DETECTION switch (54 and 72) of Detector and Audio Amplifiers HFA-1 No. 1	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 associated IF Amplifier HFI-1 No. 1 or

TABLE 4-1. EQUIPMENT PERFORMANCE CHECK, DDR-5A (Cont'd)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
13 Cont'd	and HFA-1 No. 2 at SSB, and repeat steps 10 and 11 with CHANNEL A IF BANDWIDTH KC and CHANNEL B IF BAND-WIDTH KC switches of IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2 at 3.5 U SSB, and 7.5 U SSB.		HFI-1 No. 2
14	On Automatic Frequency Control AFC-3 No. 1 and AFC-3 No. 2, 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 Amplifiers HFI-1 No. 1 and HFI-1 No. 2 set at 3.5 L SSB and 7.5 L SSB.	See steps 12 and 13.	Defective CHANNEL A BAND-WIDTH 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 associated IF Amplifier HFI-1 No. 1 or HFI-1 No. 2.
15	Set AFC switch of IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2 at OFF.	Pointer of CARRIER LEVEL meter (107 and 29) and AFC DRIFT meter (34 and 103) of both AFC-3 units should deflect completely to left.	See step 7.
16	Restore CHANNEL A DETECTION and CHAN-NEL B DETECTION switch of Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2 to CW position. Turn TUNING KCS con-trol of Automatic Fre-quency Control AFC-3 No. 1 and AFC-3 No. 2 to 0.	———	———
17	On Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2, adjust CHANNEL A BFO control (80 and 46) and CHANNEL B BFO control (83 and 49) between 0 and 5 KC for maximum indication on associated CHANNEL A LINE LEVEL meter (79 and 45) or CHANNEL B LINE LEVEL meter (84 and 50.	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 associated HFA-1 unit. Defective Channel A or Channel B audio amplifier circuitry of associated HFA-1 unit. Defective CHANNEL A HIGH CUTOFF, CHANNEL A LOW CUTOFF, CHANNEL B HIGH CUTOFF or CHANNEL B LOW CUTOFF switch of associated Audio Filter HAF-1 No. 1 or HAF-1 No. 2.

TABLE 4-1. EQUIPMENT PERFORMANCE CHECK, DDR-5A (C nt'd)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
17 Cont'd			Defective Channel A or Channel B filter networks of associated HAF-1 unit.
18	On Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2, adjust CHANNEL A LEVEL ADJUST control (77 and 56) and CHANNEL B LEVEL ADJUST control (73 and 52) 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 associated HFA-1 unit. Defective channel A or channel B audio amplifier circuitry of associated HFA-1 unit.
19	Set RECEIVER 1 SPEAKER CHANNEL and RECEIVER 2 SPEAKER CHANNEL switch (95 and 98) of Audio Switch Panel HSP-2 first at B and then at A.	Alignment signal tone should be heard in lousdpeaker for each setting of RECEIVER 1 SPEAKER CHANNEL and RECEIVER 2 SPEAKER CHANNEL switch.	Defective RECEIVER 1 SPEAKER CHANNEL or RECEIVER 2 SPEAKER CHANNEL switch of HSP-2 unit. Defective channel A or channel B audio amplifier circuitry of associated Detector and Audio Amplifier HFA-1 No. 1 or HFA-1 No. 2.
20	On Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2, 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.
21	Restore CHANNEL A BFO and CHANNEL B BFO controls of both HFA-1 units to 0 position.	Alignment signal tone should not be heard in loudspeaker, and pointer on CHANNEL A LINE LEVEL and CHANNEL B LINE LEVEL meter should deflect completely to the left (see step 17).	See step 17.
22	On IF Amplifiers HFI-1 No. 1 and HFI-1 No. 2 set CHANNEL A IF BANDWIDTH KC switch (88 and 36) and CHANNEL B IF BANDWIDTH KC switch	———	———

TABLE 4-1. EQUIPMENT PERFORMANCE CHECK, DDR-5A (Cont'd)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
22 Cont'd	(91 and 41) at 15 DSB.		
23	On Audio Filters HAF-1 No. 1 and HAF-1 No. 2, set CHANNEL A HIGH CUTOFF switch (70 and 60) and CHANNEL A LOW CUTOFF switch (71 and 61) at 5. Adjust CHANNEL A BFO control (80 and 46) of Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2 for maximum reading on associated CHANNEL A LINE LEVEL meter (79 and 45).	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 associated Audio Filter HAF-1 No. 1 or HAF-1 No. 2. Defective Channel A filter networks of associated HAF-1 unit.
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 both HAF-1 units.	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 associated HAF-1 unit.
25	Set CHANNEL A HIGH CUTOFF and CHANNEL A LOW CUTOFF switches of Audio Filters HAF-1 No. 1 and HAF-1 No. 2 at OUT. Set RECEIVER 1 SPEAKER CHANNEL and RECEIVER 2 SPEAKER CHANNEL switch (95 and 98) of Audio Switch Panel HSP-2 at B.	———	———
26	Repeat steps 22 and 23 using CHANNEL B HIGH CUTOFF switch (68 and 58) and CHANNEL B LOW CUTOFF switch (69 and 59) of Audio Filters HAF-1 No. 1 and HAF-1 No. 2 and CHANNEL B BFO control of Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2.	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 associated Audio Filter HAF-1 No. 1 or HAF-1 No. 2. Defective Channel B filter networks of associated HAF-1 unit.

TABLE 4-1. EQUIPMENT PERFORMANCE CHECK, DDR-5A (Cont'd)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
27	Restore CHANNEL A BFO and CHANNEL B BFO controls of Detector and Audio Amplifiers HFA-1 No. 1 and HFA-1 No. 2 to 0 position.	Pointer of CHANNEL A LINE LEVEL meter (79 and 45) and CHANNEL B LINE LEVEL meter (84 and 50) should deflect completely to left (see steps 24 and 26).	See steps 24 and 26.
28	On Continuous RF Tuners HFR-1 No. 1 and HFR-1 No. 2 set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch (8 and 17) at OFF. Note reading of RF LEVEL meter (1 and 10).	———	———
29	Turn MANUAL GAIN control (37 and 93) of IF Amplifiers HFI No. 1 and HFI-1 No. 2 until switch clicks on. Slowly rotate MANUAL GAIN control of both HFI-1 units to full clockwise position.	RF LEVEL meter (1 and 10) of Continuous RF Tuners HFR-1 No. 1 and HFR-1 No. 2 should read maximum when switch on MANUAL GAIN control clicks on; meters may be pegged. As MANUAL GAIN controls are rotated clockwise, pointers of RF LEVEL meters should follow to position noted in step 28.	Defective MANUAL GAIN control, or agc and manual gain circuitry of associated IF Amplifier HFI-1 No. 1 or HFI-1 No. 2.
30	Restore all DDR-5A controls to normal operating condition.	———	———

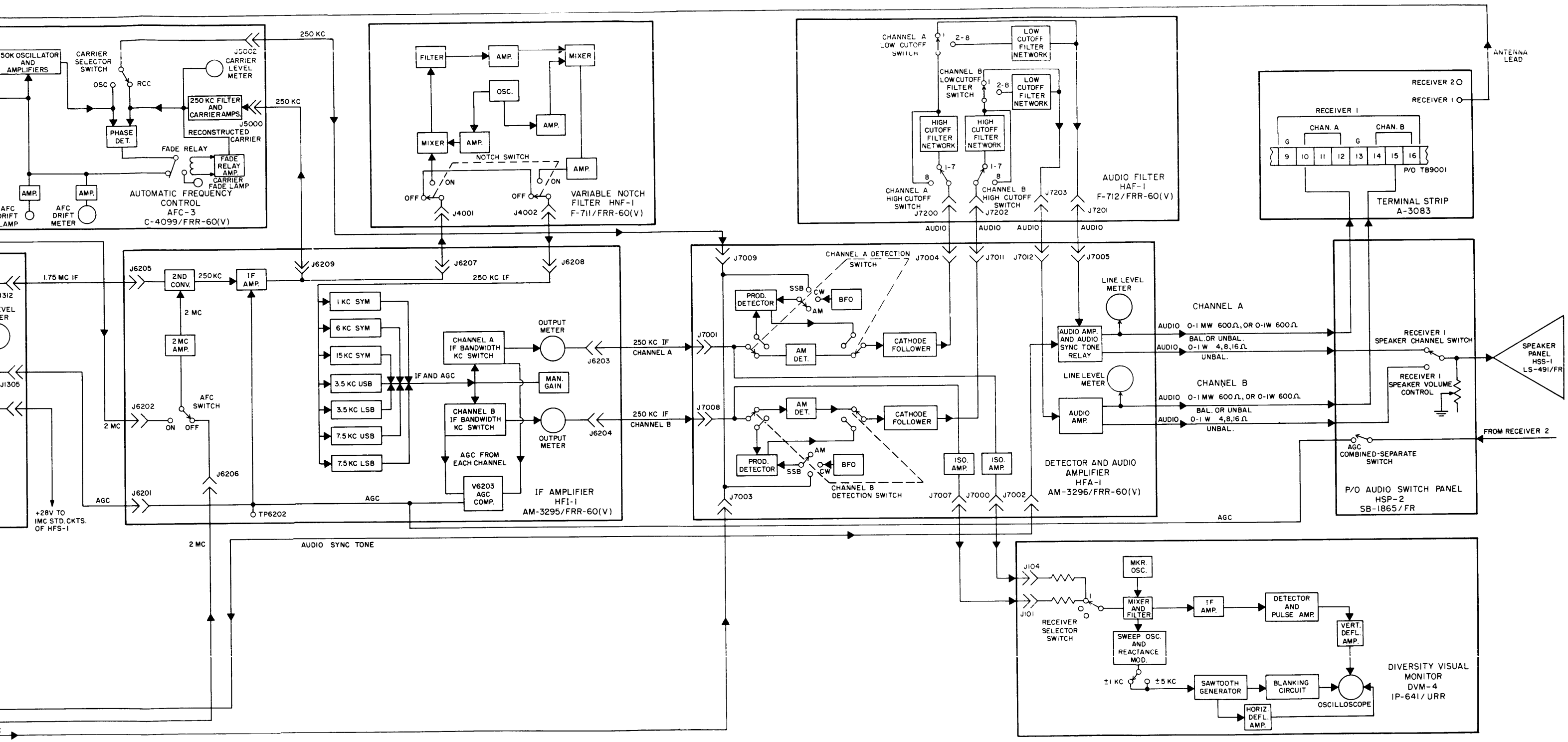
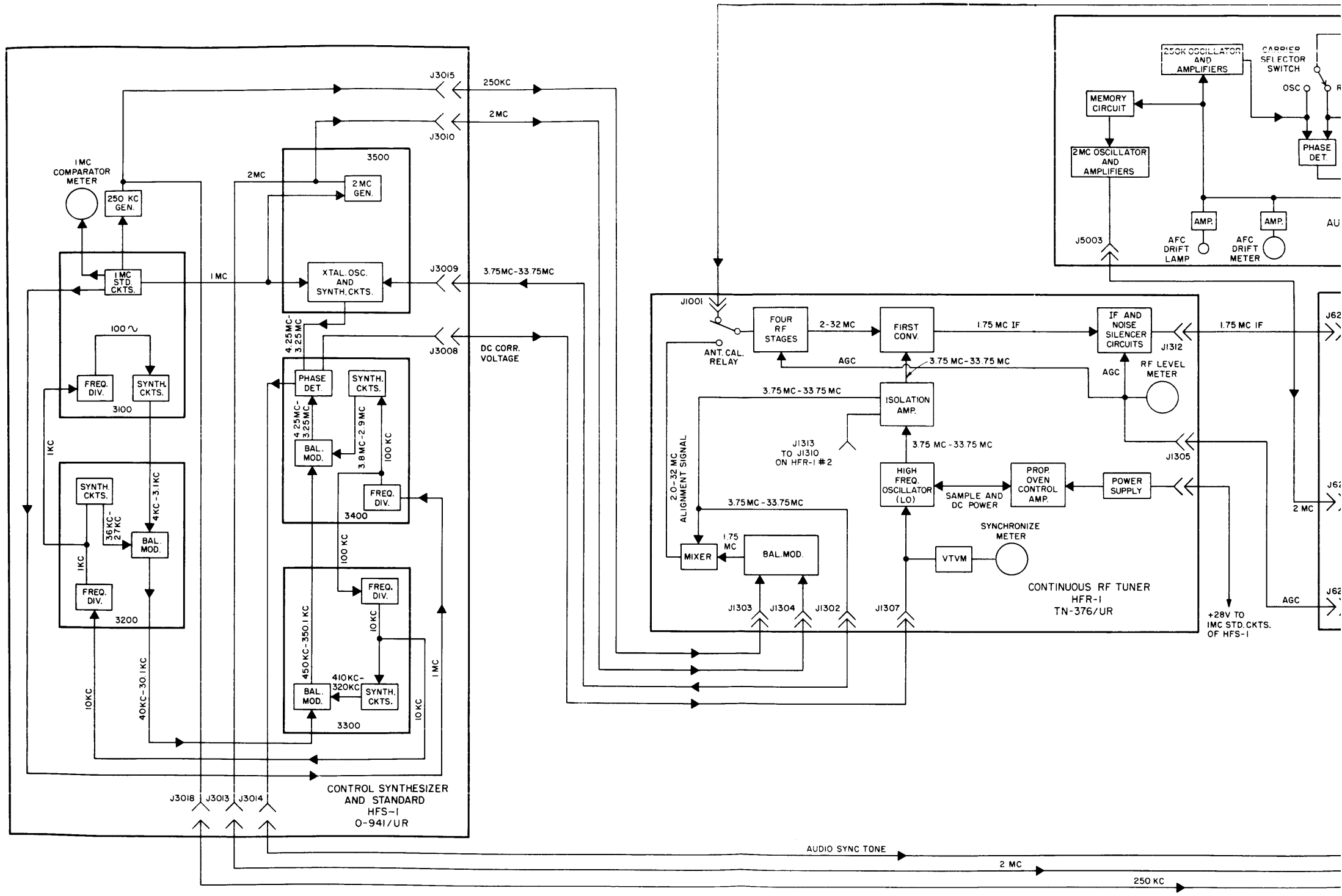


Figure 4-2. Servicing Block Diagram, DDR-5A


J3015
250KC
2MC
J3010
1MC COMPARATOR METER
250 KC GEN.
3500
2MC
2MC GEN.
1MC STD. CKTS.
1MC
XTAL. OSC. AND SYNTH. CKTS.
J3009
3.75MC-33.75MC
4.25MC-3.25MC
J3008
DC CORR. VOLTAGE
100 ∿
FREQ. DIV.
SYNTH. CKTS.
3100
PHASE DET.
SYNTH. CKTS.
4.25MC-3.25MC
3.8MC-2.9MC
100 KC
BAL. MOD.
FREQ. DIV.
3400
1KC
SYNTH. CKTS.
36KC-27KC
4KC-3.1KC
BAL. MOD.
FREQ. DIV.
3200
100 KC
FREQ. DIV.
10KC
450KC-350.1KC
410KC-320KC
BAL. MOD.
SYNTH. CKTS.
3300
10KC
40KC-30.1KC
1MC
10KC
J3018
J3013
J3014
CONTROL SYNTHESIZER AND STANDARD
HFS-1
O-941/UR
250K OSCILLATOR AND AMPLIFIERS
CARRIER SELECTOR SWITCH
OSC
MEMORY CIRCUIT
PHASE DET.
2MC OSCILLATOR AND AMPLIFIERS
AMP.
AMP.
J5003
AFC DRIFT LAMP
AFC DRIFT METER
J1001
ANT. CAL. RELAY
FOUR RF STAGES
2-32 MC
FIRST CONV.
1.75 MC IF
IF AND NOISE SILENCER CIRCUITS
J1312
1.75 MC IF
AGC
3.75 MC-33.75 MC
AGC
RF LEVEL METER
3.75MC-33.75MC
ISOLATION AMP.
J1313 TO J1310 ON HFR-1 #2
3.75 MC-33.75 MC
J1305
2.0-32 MC ALIGNMENT SIGNAL
HIGH FREQ. OSCILLATOR (LO)
SAMPLE AND DC POWER
PROP. OVEN CONTROL AMP.
POWER SUPPLY
3.75MC-33.75MC
SYNCHRONIZE METER
1.75 MC
MIXER
BAL. MOD.
VTVM
J1303
J1304
J1302
J1307
CONTINUOUS RF TUNER
HFR-1
TN-376/UR
+28V TO IMC STD. CKTS. OF HFS-1
2 MC
AGC
AUDIO SYNC TONE
2 MC
250 KC

00463308

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-5A modular units or of RAK-22A1. Repair procedures for RAK-22A1 components or for any modular unit contained in the DDR-5A are given in the appropriate modular-unit manual. Preventive maintenance includes information necessary to insure optimum performance of the DDR-5A. For this reason, alignment and adjustment information is included under preventive maintenance. Operator's maintenance for the DDR-5A is described in Section 3.

5-2. SPECIAL TOOLS AND TEST EQUIPMENT.

Special tools required for DDR-5A 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-5A maintenance.

TABLE 5-1. SPECIAL TOOLS, DDR-5A

TMC PART NO.	DESCRIPTION	WHERE USED
TP-114	Core alignment tool.	HFR-1
TP-115	Piston capacitor alignment tool.	HFR-1
TP-116-1	Screw driver, 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 screwdriver.	All units
TP-117-2	5/16" Spintite, Xcelite #HS-8, modified-3/16" hole drilled through handle to receive concentric screwdriver.	All units
TP-117-3	5/16" Spintite, Xcelite #HS-10 modified-3/16" hole drilled through handle to receive concentric screwdriver.	All units

TABLE 5-1. SPECIAL TOOLS, DDR-5A (Cont'd)

TMC PART NO.	DESCRIPTION	WHERE USED
TP-118-1	Minature tube puller (7 pin), Kellems #1116.	All units
TP-118-2	Noval 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 set screw.	All units
WR-100-5	Hexagon wrench, 3/32" head, fits #10-12 set screw.	All units
WR-100-18	Hexagon wrench, 5/64" head, fits #8 set screw.	All units
WR-100-19	Hexagon wrench, 1/16" head fits #5-6 set screw.	All units

TABLE 5-2. SPECIAL TEST EQUIPMENT, DDR-5A

ITEM	MANUFACTURER
Frequency Counter	Hewlett Packard, Model 524C, or equivalent
Signal Generator	Measurements, Model 82, or equivalent
Vacuum Tube Voltmeter	Hewlett Packard, Model 410B, or equivalent
R-f Voltmeter *	Ballantine Laboratories, Model 314, or equivalent

* If an r-f voltmeter is not available, use the vacuum tube voltmeter listed above with an r-f probe.

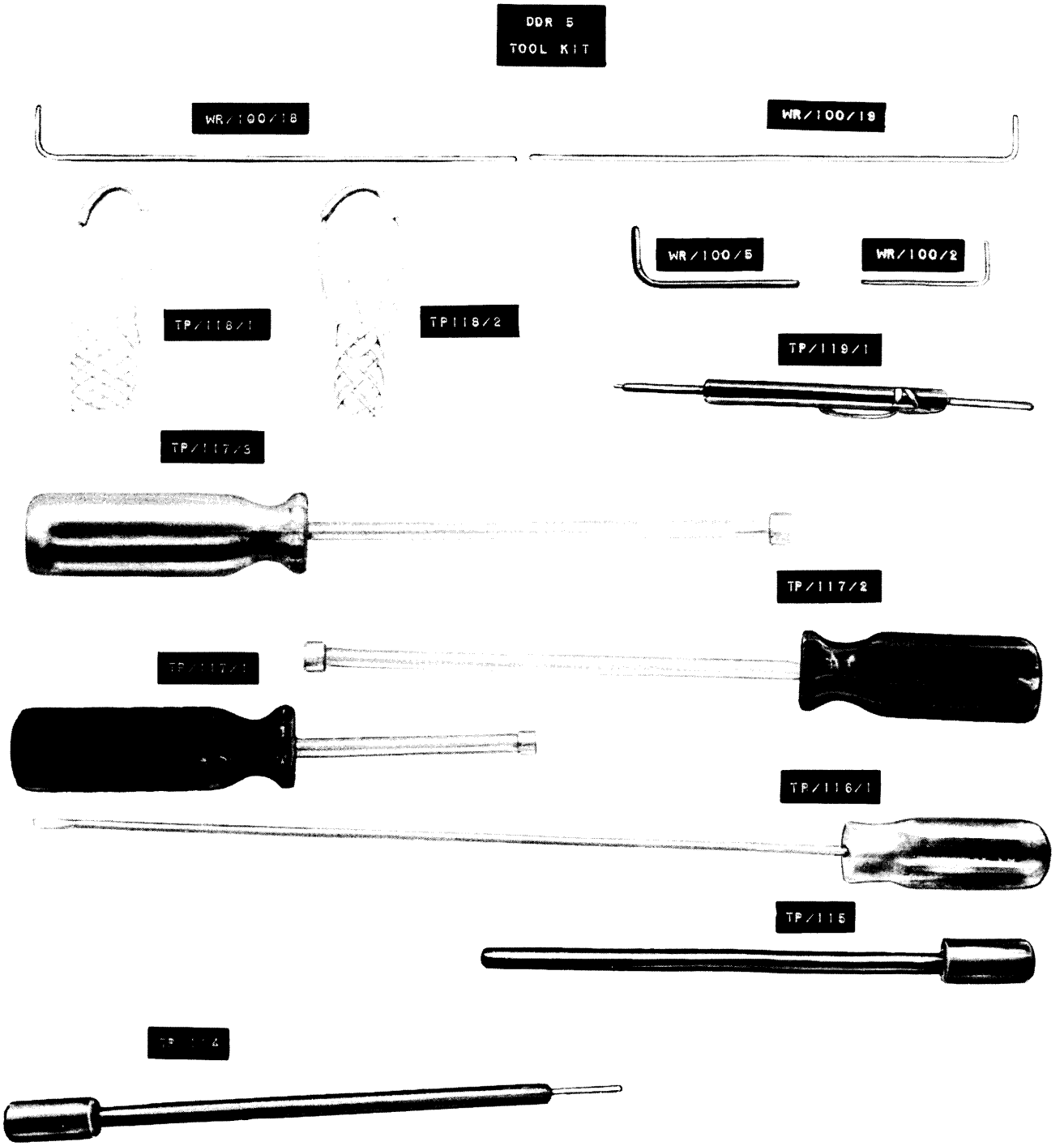


Figure 5-1. Special Tools, DDR-5A

5-3. PREVENTIVE MAINTENANCE.

a. GENERAL. - The DDR-5A has been designed to provide long-term, 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-5A 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 the 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 TUNERS HFR-1 NO. 1 and HFR-1 NO. 2. - Proceed as follows:

NOTE

For the sake of brevity and clarity in this procedure, the modular units contained in receiver 1 are designated HFR-1 No. 1, HFI No. 1, HFA-1 No. 1, etc. The modular units contained in receiver 2 are designated HFR-1 No. 2, HFI-1 No. 2, HFA-1 No. 2, etc. Numbers enclosed in parenthesis are callouts referenced to figure 3-1.

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

(b) Set Control Synthesizer and Standard HFS-1 nixie selectors (108 through 112) for 2.0 mc.

(c) Carefully tune HFR-1 No. 1 for zero beat at 2.0 mc. If zero beat is obtained with dial pointer of HFR-1 No. 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 No. 1, and adjust oscillator trimmer until zero beat is obtained.

(d) Set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch (17) of HFR-1 No. 2 at ALIGNMENT SIGNAL.

(e) Carefully tune HFR-1 No. 2 for a null at 2.0 mc. If null is obtained with dial pointer of HFR-1 No. 2 exactly at 2.0 mc, no adjustment is necessary. If null is not obtained with dial pointer exactly at 2.0 mc, insert alignment tool in rear orifice on top of HFO oven of HFR-1 No. 2, and adjust oscillator trimmer until null is obtained.

(f) Set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch HFR-1 No. 2 at OFF, and set HFS-1 nixie selectors for 3.0 mc.

(g) Carefully tune HFR-1 No. 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 No. 1, and adjust HFO trimmer until zero beat is obtained.

(h) Set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch of HFR-1 No. 2 at ALIGNMENT SIGNAL.

(i) Carefully tune HFR-1 No. 2 for a null at 3.0 mc.

If null 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 No. 2, and adjust HFO trimmer until null is obtained.

(j) Repeat steps (b) through (i) above until no further adjustment is necessary.

CAUTION

When performing step (k) below, be sure to remove alignment tools before attempting to rotate BAND controls (6 and 15) of HFR-1 units.

(k) Using procedures outlined in steps (b) through (j) above, align HFO circuits of both HFR-1 units at high and low frequencies of each band.

(2) ALIGNMENT OF R-F CIRCUITS OF CONTINUOUS RF TUNERS HFR-1 NO. 1 AND HFR-1 No. 2. - Proceed as follows:

NOTE

For the sake of brevity and clarity in this procedure, the modular units contained in receiver 1 are designated HFR-1 No. 1, HFI-1 No. 1, HFA-1 No. 1, etc. The modular units contained in receiver 2 are designated HFR-1 No. 2, HFI-1 No. 2, HFA-1 No. 2, etc. Numbers enclosed in parenthesis are callouts referenced to figure 3-1.

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

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

(c) Set HFS-1 nixie selectors for 2.0 mc, and tune both HFR-1 units to 2.0 mc exactly.

(d) Set NOISE SILENCER/OFF/ALIGNMENT SIGNAL switch (8 and 17) of both HFR-1 units at ALIGNMENT SIGNAL.

(e) Using alignment tool TP-115 (see figure 5-1) adjust inductors L1001, L1005, L1007, and L1009 of HFR-1 No. 1 for maximum indication on associated RF LEVEL meter. Adjustment of L1001 will be very broad.

(f) Repeat step (e) for HFR-1 No. 2.

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

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

(i) Using alignment tool TP-114 (see figure 5-1), adjust capacitors C1009, C1015, C1023, and C1031 of HFR-1 No. 1 for maximum indication on associated RF LEVEL meter.

(j) Repeat step (i) for HFR-1 No. 2.

(k) Repeat steps (c) through (j) above until no further peaking can be obtained.

(l) Repeat procedure outlined in steps (c) through (k) 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 TUNERS HFR-1 NO. 1 AND HFR-1 NO. 2. - To adjust the SYNCHRONIZE meter circuit of either HFR-1 unit set the TUNE/SYNC/OPERATE switch (figure 3-1, callout 7 or 16) 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-5A 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-22A1 components or any modular unit contained in the DDR-5A can be found in the appropriate modular-unit manual.

NOTE

When a component fails in a highly precise frequency sensitive element of any DDR-5A 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-409 AND CA-412. - Electrical leads CA-409 and CA-412 (see figures 2-4 and 2-5) are single-wire jumper leads fabricated in accordance with the information listed below. The first 3 groups of significant letters and digits of each entry in the TMC No. Column indicate Technical Materiel's part number and type. The last group of digits indicates the length of the wire before attaching hardware to the ends. 1/4 inch of sleeving should be stripped from each end of electrical leads CA-412 in order to attach hardware; 3/8 inch should be stripped from each end of electrical leads CA-409.

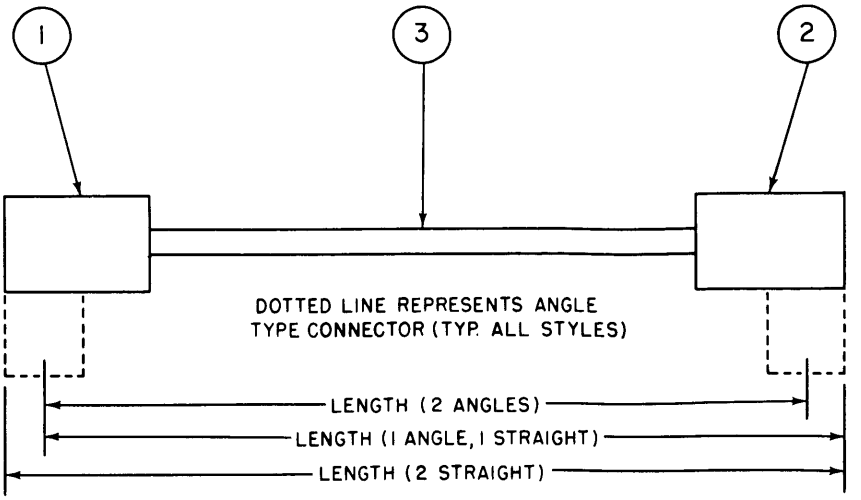
TMC NO.	WIRE NO.	SLEEVING NO.	SLEEVING COLOR	TERMINATION OF END NO. 1	TERMINATION OF END NO. 2
CA-412-34-54	WL-103-8(25/32)	PX-100-1-1.00	BLACK	TE-141-8	TE-141-8
CA-412-36-34	WL-103-5(3/8)	PX-100-1-375	BLACK	TE-141-1 (No. 10)	TE-141-1-(No. 6)
CA-409-32-2	MWC-22(7)UO	----------	BLACK	TE-120-2 (No. 6)	TE-120-2 (No. 6)

c. CABLE ASSEMBLIES CA-480. - Figure 5-2 illustrates the fabrication of all CA-480-3 cable assemblies used for interconnecting modular units of the DDR-5A (see figures 2-4 and 2-5). If required, repair or make up new cable assemblies in accordance with the information provided in figure 5-2.

d. CABLE ASSEMBLIES CA-686 AND CA-687. - Figure 5-3 illustrates the fabrication of all CA-686 and CA-687 cables used for interconnecting modular units of the DDR-5A (see figures 2-4 and 2-5). If required, repair or make up new cable assemblies in accordance with the information provided in figure 5-3.

e. CABLE ASSEMBLIES CA-696, CA-701-1, CA-706-1, AND CA-718. - Figure 5-4 illustrates the fabrication of power cable assemblies CA-696, CA-701-1, CA-706-1, and CA-718 used for interconnecting modular units of the DDR-5A (see figures 2-4 and 2-5). If required, repair or make up new cable assemblies in accordance with the information provided in figure 5-4.

f. CABLE ASSEMBLIES CA-703, CA-704, AND CA-705-1. - Figures 5-5, 5-6, and 5-7 illustrate the fabrication of cable assemblies CA-703, CA-704, and CA-705-1 used for interconnecting modular units of the DDR-5A. If required, repair or make up new cable assemblies in accordance with the information given in the appropriate illustration.



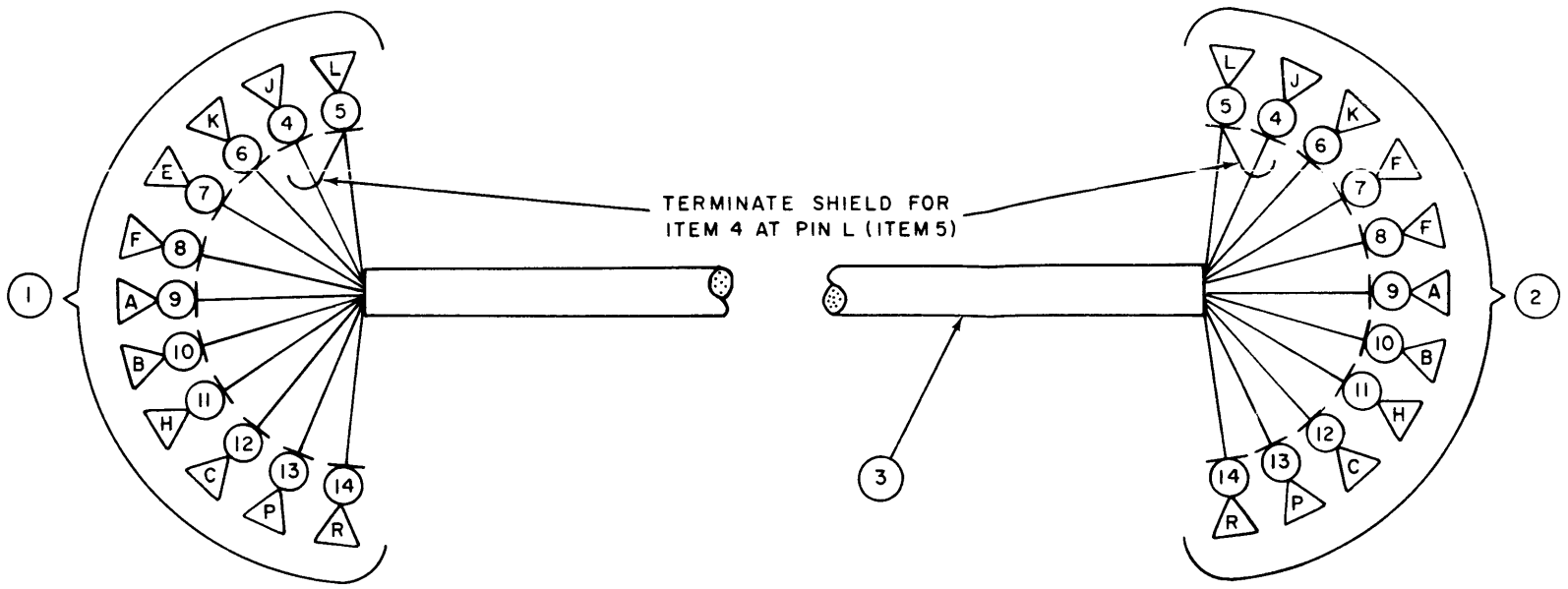
ITEM 1		ITEM 2		ITEM 3	
(CONNECTOR)	SERIES	(CONNECTOR)	SERIES	(CABLE)	OHMS
PL-169	BNC	PL-169	BNC	RG-174/U	50

NOMENCLATURE SHALL BE DESIGNATED AS SHOWN IN THE FOLLOWING EXAMPLES:

CA-480-3-LENGTH

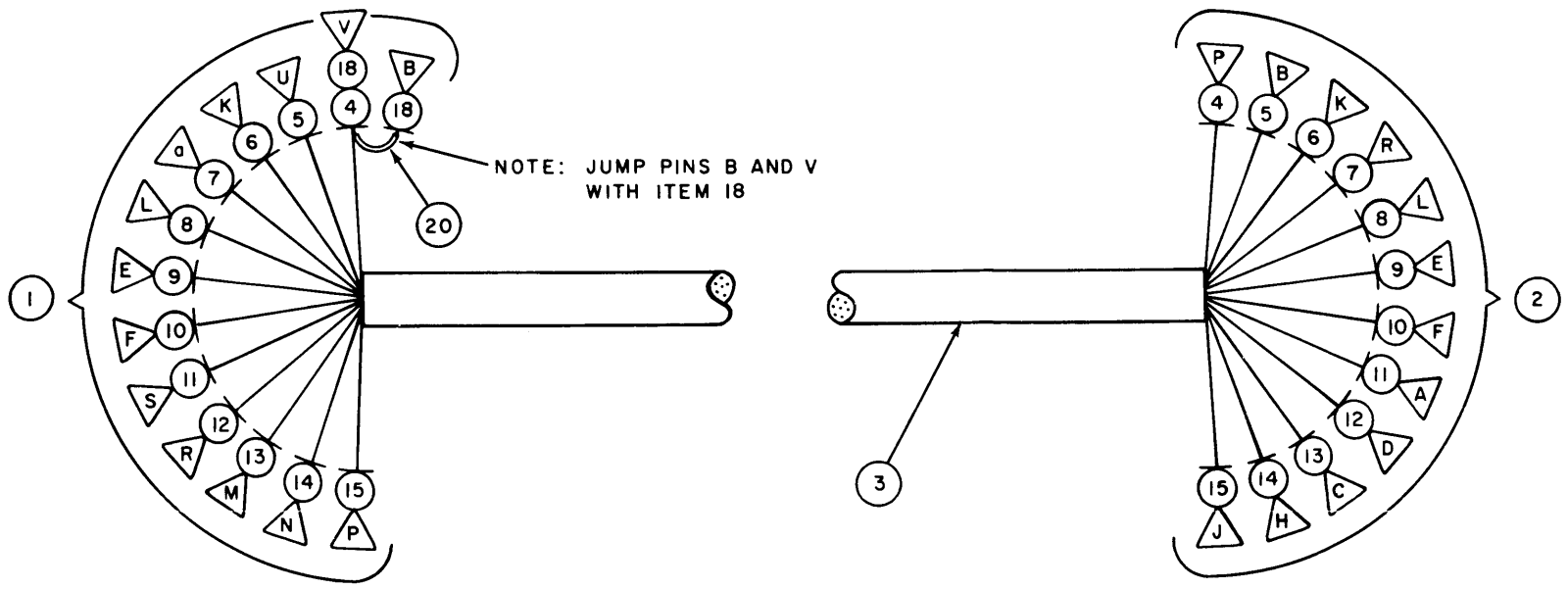
FOR 10 FOOT LENGTHS OR LESS, EXPRESS IN INCHES.	FOR OVER 10 FOOT LENGTHS, EXPRESS IN FEET TO THE NEAREST FOOT OR HALF FOOT USING THE LETTER "F".
CA-480-1-120 = 120 INCHES	CA-480-1-11F = 11 FEET
CA-480-1-14 = 14 INCHES	CA-480-1-200F = 200 FEET
CA-480-1-8.25 = $8\frac{1}{4}$ INCHES	CA-480-1-12.50F = $12\frac{1}{2}$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

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



CA-687-1 AND CA-687-2

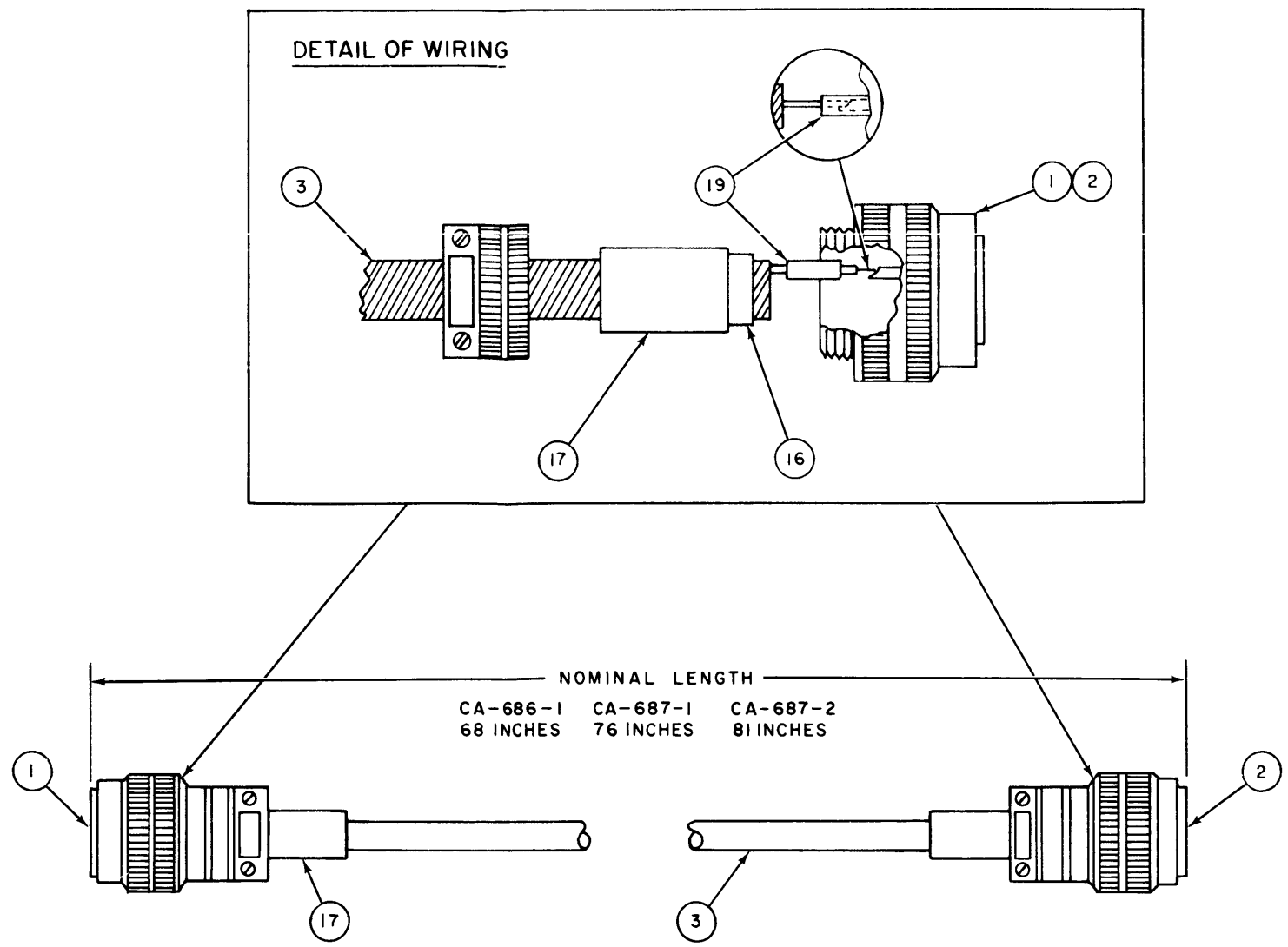
CA-687-1 AND CA-687-2			
ITEM	PART NO.	DESCRIPTION	SYMBOL
21	CD-101-1-MW	CORD, LACING	BLACK
19	PX-100-1-.095	INSULATION, SLEEVING	BLACK
17	MS-3420-12A	BUSHING, CABLE, ADAPTER TELESCOPING	BLACK
16	MS-3420-8A	BUSHING, CABLE, ADAPTER TELESCOPING	BLACK
14	MWC 20(7)U9	CABLE, INSULATED	WHITE
13	MWC 20(7)U90	↕	WH / BLK
12	MWC 20(7)U6	↕	BLUE
11	MWC 20(7)U7	↕	VIOLET
10	MWC 20(7)U98	↕	WH / GREY
9	MWC 20(7)U8	↕	GREY
8	MWC 16(19)U91	↕	WH / 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)	
1	PL-212-1	CONNECTOR, PLUG (24 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)	
1	PL-212-3	CONNECTOR PLUG (24 PIN, MALE)	

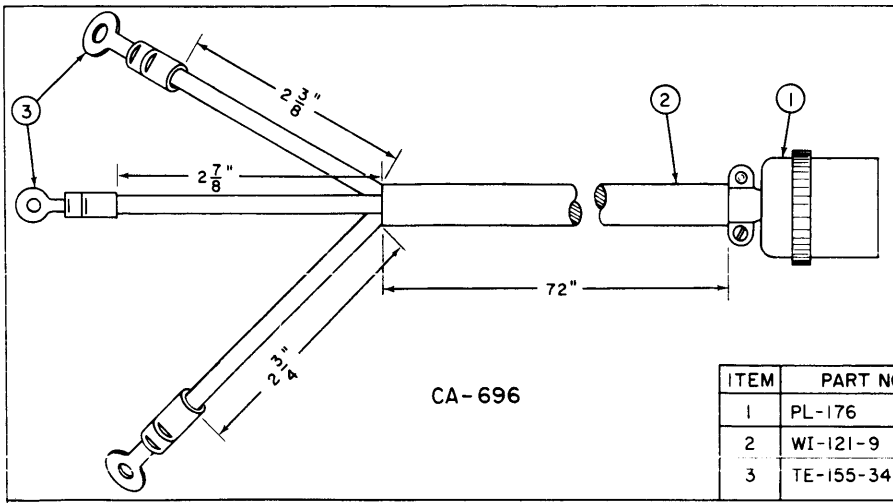
Figure 5-3. Cable Assemblies CA-686-1, CA-687-1, and CA-687-2, Fabrication



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

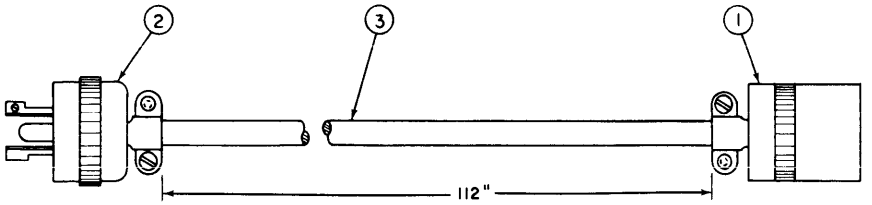
NOTES:

1. ◯ DENOTES ITEM NUMBER
2. ▽ DENOTES PIN CONNECTIONS
3. ◯ = DENOTES END OF SHIELD — END OF SHIELD
4. BUSHING SHOULD BE PUT ON PLUG SIDE BEFORE MOUNTING PLUG
5. THIS SYMBOL DENOTES END OF INSULATION AND NAIL DRIVING POINT. WIRE MUST BE STRIPPED 1/2" BEYOND THIS POINT AND TINNED 3/8" UNLESS OTHERWISE SPECIFIED. — = — 1/2"
6. WIRES SHOULD BE PLACED IN CABLE IN NUMERICAL SEQUENCE AS THEY APPEAR IN ITEM COLUMN. SPACE LACING APPROX. 3/4" APART. — 3/4" —



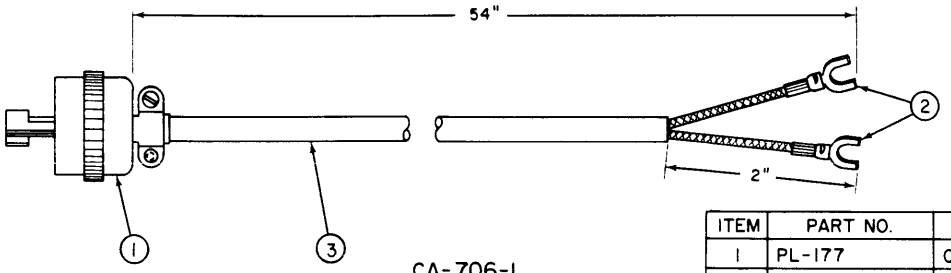
CA-696

ITEM	PART NO.	DESCRIPTION
1	PL-176	PLUG, TWIST LOCK, FEMALE
2	WI-121-9	WIRE, RUBBER SHEATHED
3	TE-155-34170	TERMINAL, SOLDERLESS



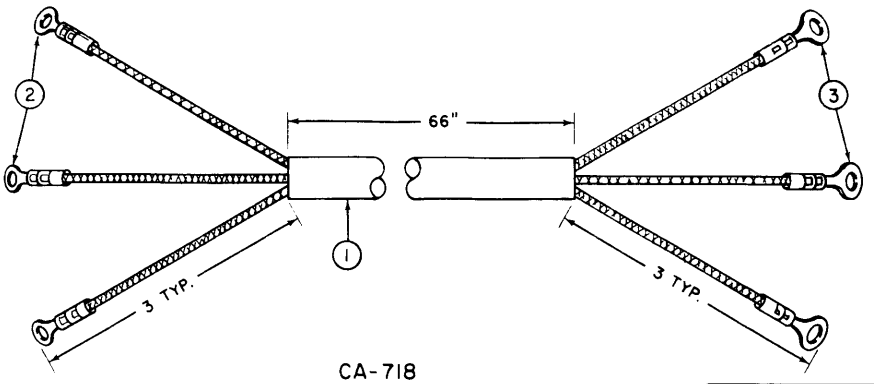
CA-701-1

ITEM	PART NO.	DESCRIPTION
1	PL-100	PLUG, TWIST LOCK, FEMALE
2	PL-177	PLUG, TWIST LOCK, MALE
3	WI-121-1	WIRE, RUBBER SHEATHED



CA-706-1

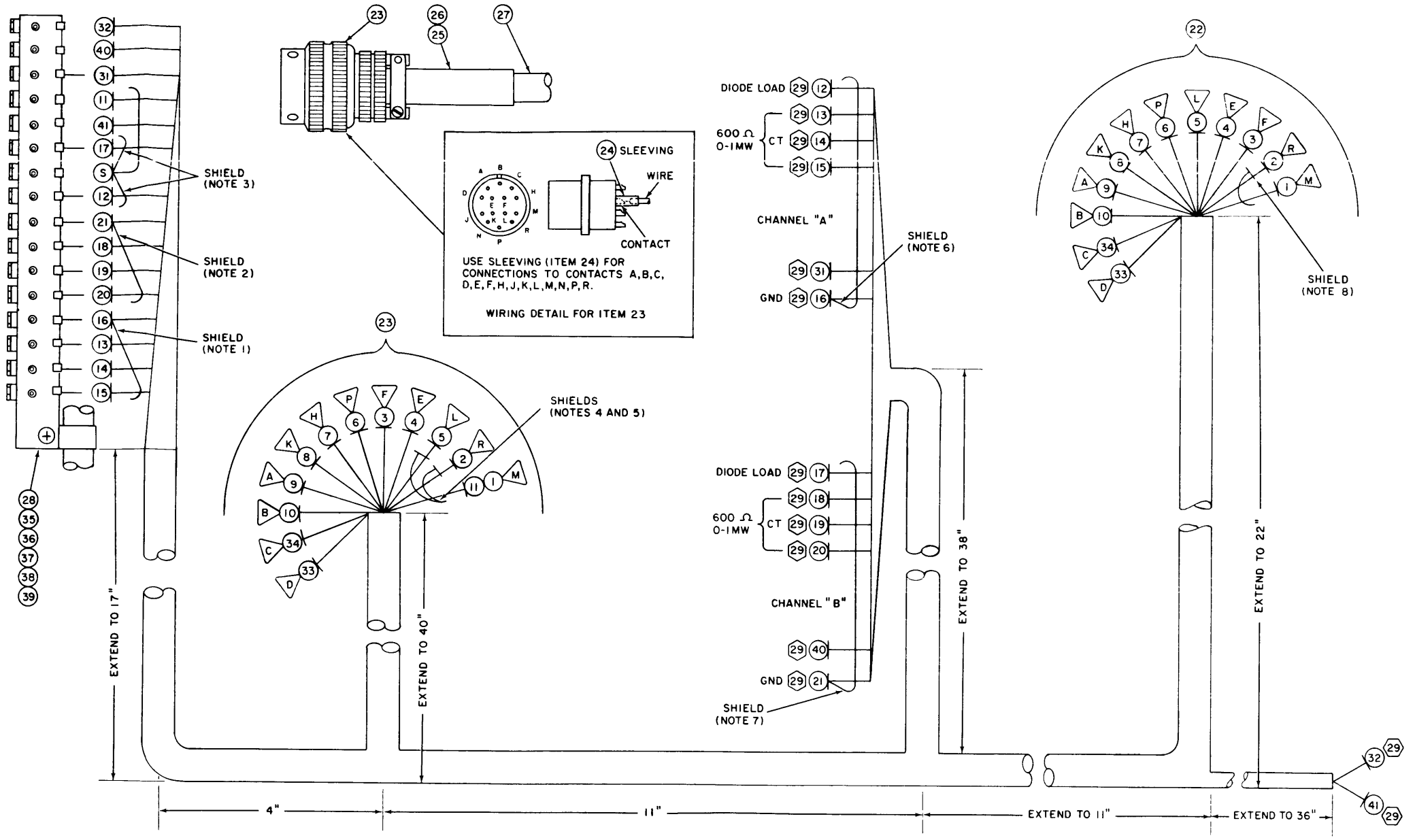
ITEM	PART NO.	DESCRIPTION
1	PL-177	CONNECTOR, PLUG
2	TE-120-2	TERMINAL, SOLDERLESS
3	WI-112-1	CABLE, AC, RUBBER SHEATHED

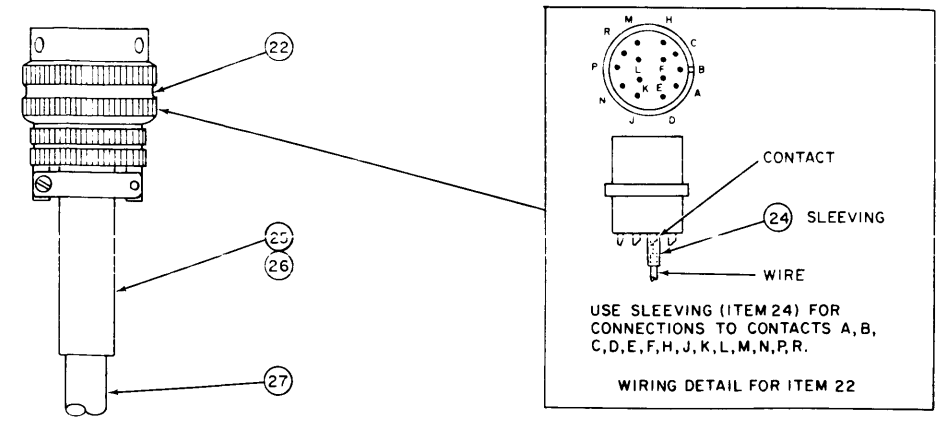


CA-718

ITEM	PART NO.	DESCRIPTION
1	WI-121-9	WIRE, RUBBER SHEATHED SERVICE CORD
2	TE-156-32945	SOLDERLESS TERMINAL, PLASTIC GRIP
3	TE-159-34161	SOLDERLESS TERMINAL, PLASTIC GRIP

Figure 5-4. Cable Assemblies CA-696, CA-701-1, CA-706-1, CA-718, Fabrication

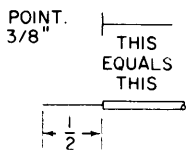




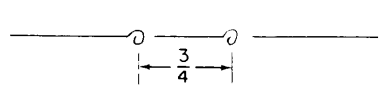
NOTES:

1 - TERMINATE SHIELDS FOR ITEMS (13) (14) (15) AT ITEM (16)
2 - " " " " (18) (19) (20) " " (21)
3 - " " " " (11) (12) (17) " " (S)
4 - TERMINATE SHIELD FOR ITEM (1) AT PIN R
5 - " " " " (11) " " L
6 - TERMINATE SHIELDS FOR ITEMS (12) THRU (15) AT ITEM (16)
7 - " " " " (17) " (20) " " (21)
8 - TERMINATE SHIELD FOR ITEM (1) AT PIN R

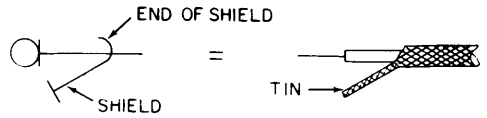
9 - THIS SYMBOL DENOTES END OF INSULATION AND NAIL DRIVING POINT. WIRE MUST BE STRIPPED 1/2" BEYOND THIS POINT AND TINNED 3/8" UNLESS OTHERWISE SPECIFIED.



10 - WIRES SHOULD BE PLACED IN CABLE IN NUMERICAL SEQUENCE AS THEY APPEAR IN ITEM COLUMN. SPACE LACING APPROX. 3/4" APART.

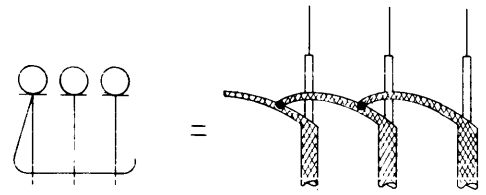


11 -



ABOVE SYMBOL DENOTES PIGTAIL SHIELD

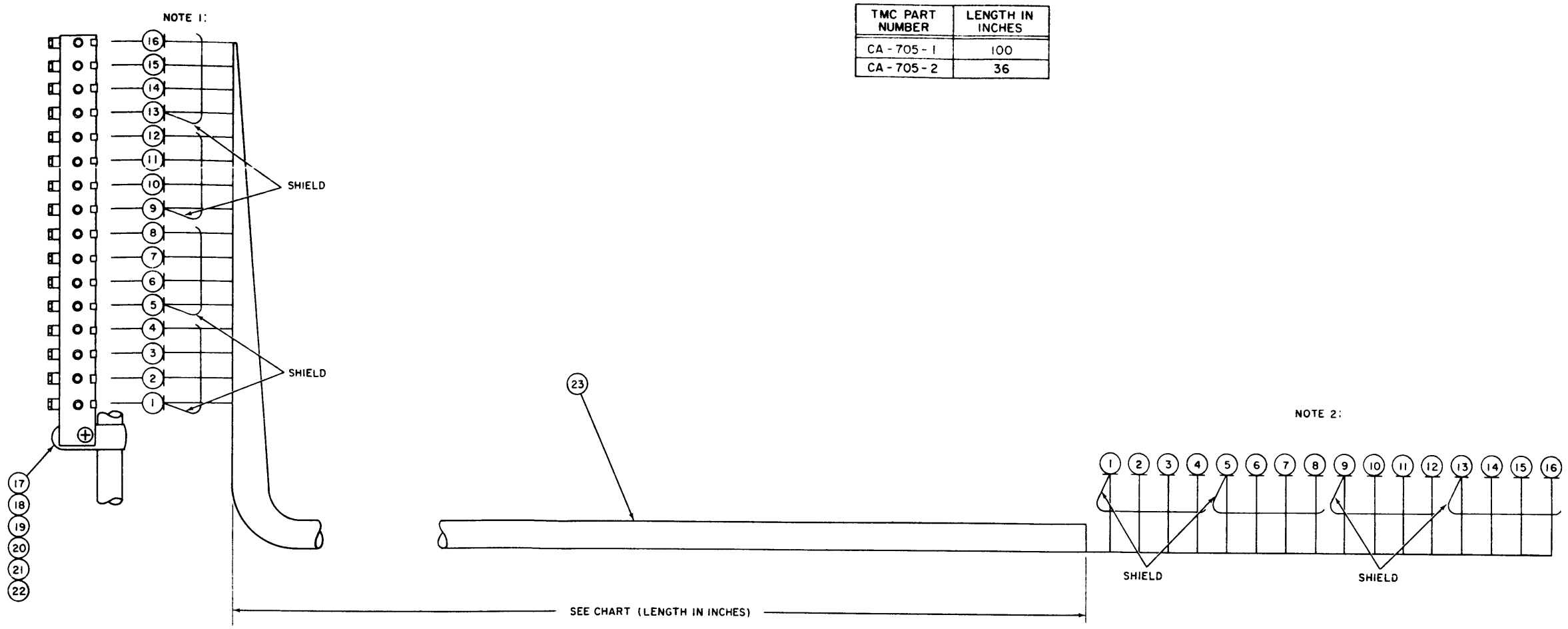
12 -



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		VIOLET
	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 5-5. Cable Assembly, CA-703, Fabrication

TMC PART NUMBER	LENGTH IN INCHES
CA-705-1	100
CA-705-2	36



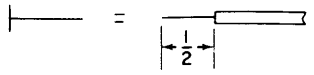
REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL
X	24	CD-101-1-MW	CORD, LACING	BLACK
X	23	PX-100-1-.500	INSULATION, SLEEVING	BLACK
1	22	NTH0636BN8	NUT, HEX	
1	21	FW06HBN	WASHER, FLAT	
1	20	LWE06MRN	WASHER, LOCK, EXTERNAL	
1	19	SCBP0632BN6	SCREW, MACHINE	
1	18	CU-102-5	CLAMP, "G" TYPE	
1	17	TM-105-16AL	TERMINAL STRIP	
	16	MWC 22(7) S93	CABLE, INSULATED, SHIELDED	WH/ORNG
	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

NOTES:

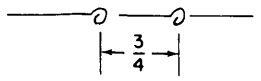
1 - TERMINATE SHIELDS FOR ITEMS (2) (3) AND (4) AT ITEM (1)
" " " " (6) (7) " (8) " " (5)
" " " " (10) (11) " (12) " " (9)
" " " " (14) (15) " (16) " " (13)

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

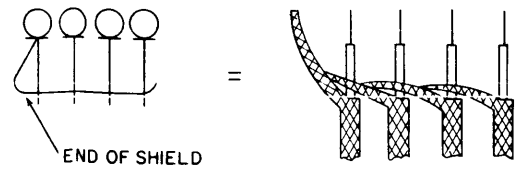
3 - THIS SYMBOL DENOTES END OF INSULATION AND NAIL DRIVING POINT. WIRE MUST BE STRIPPED 1/2" BEYOND THIS POINT AND TINNED 3/8" UNLESS OTHERWISE SPECIFIED



4 - WIRES SHOULD BE PLACED IN CABLE IN NUMERICAL SEQUENCE AS THEY APPEAR IN ITEM COLUMN. SPACE LACING APPROX. 3/4" APART.



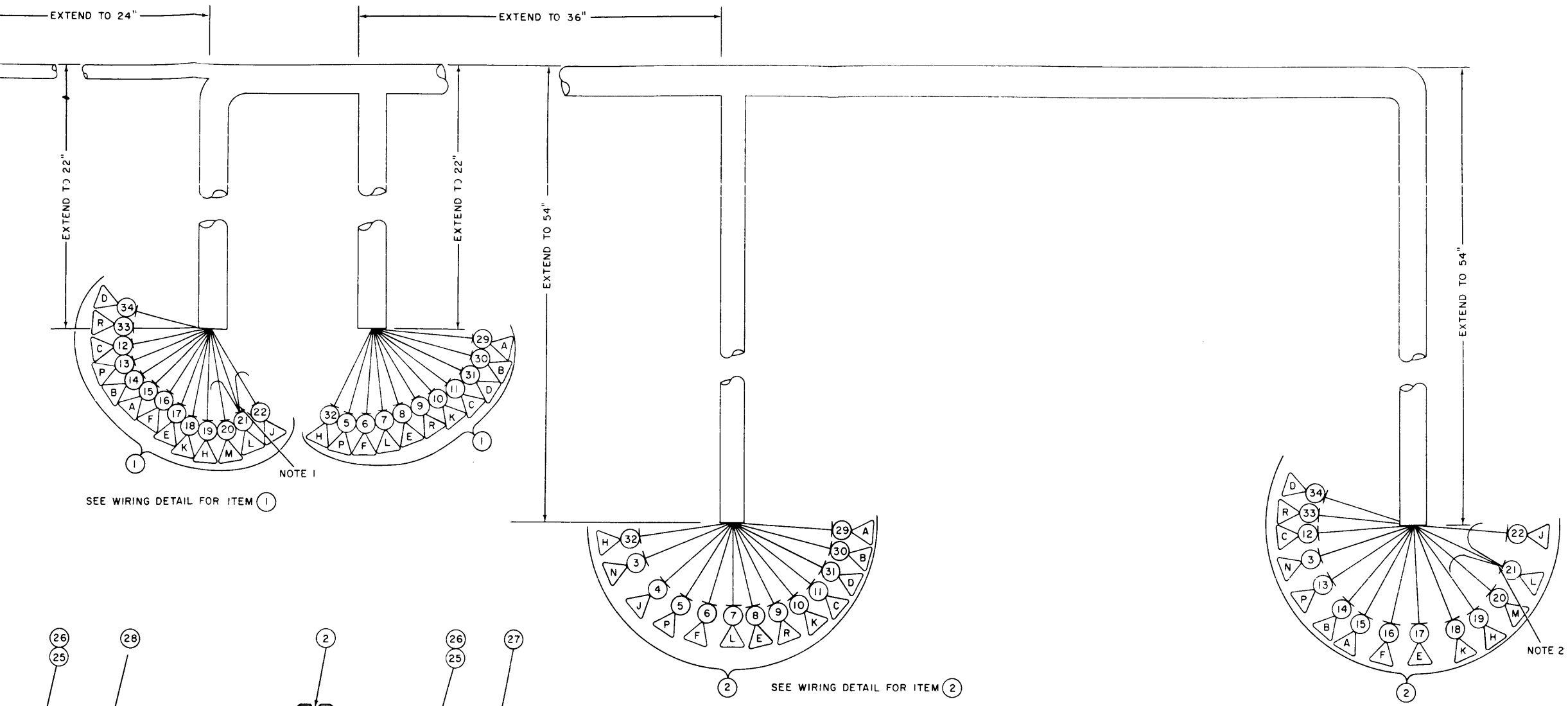
5 -



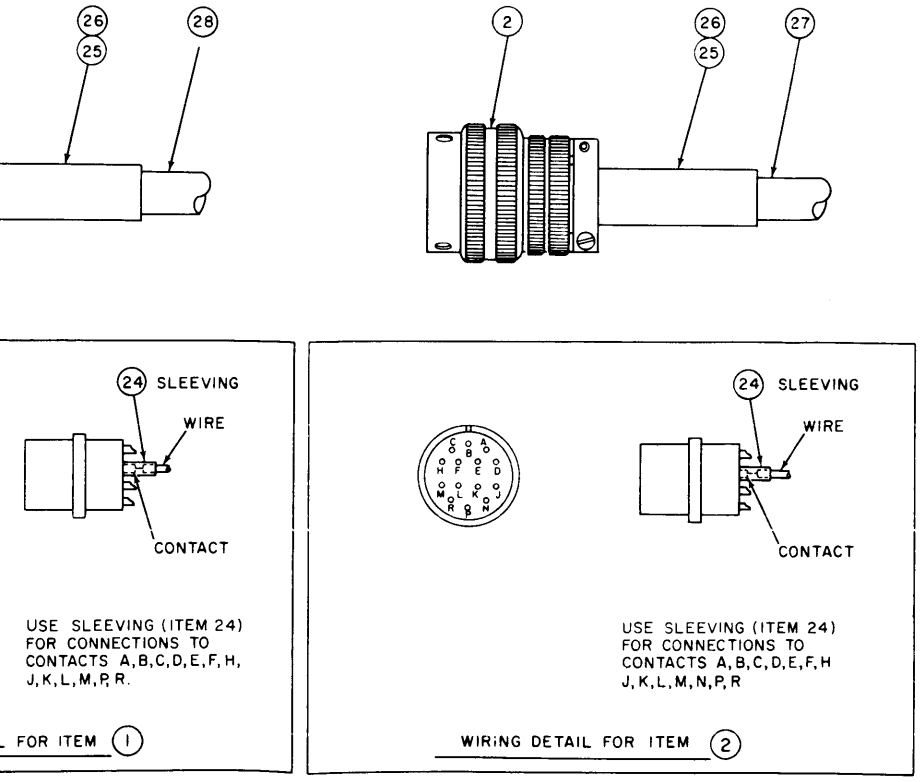
ABOVE SYMBOL DENOTES COMMON SHIELDING

00463308

Figure 5-6. Cable Assembly CA-704, Fabrication



ITEM	PART NO.	DESCRIPTION	SYMBOL
34	MWC16(19)U91	CABLE, INSULATED	WH/BRN
33	MWC16(19)U1	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	MWC 22(7)S5	CABLE, INSULATED, SHIELDED	GREEN
21	MWC 22(7)U0	CABLE, INSULATED	BLACK
20	MWC22(7)S4	CABLE, INSULATED, SHIELDED	YELLOW
19	MWC22(7)U7	CABLE, INSULATED	VIOLET
18	MWC 22(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	



NOTES:

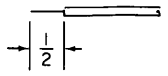
1- TERMINATE SHIELD FOR ITEM (20) AND (22) AT PIN △L

2- TERMINATE SHIELD FOR ITEM (20) AND (22) AT PIN △L

3- ◯ DENOTES ITEM NUMBER

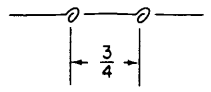
4- △ DENOTES PIN CONNECTION

5- THIS SYMBOL DENOTES END OF INSULATION AND NAIL DRIVING POINT. WIRE MUST BE STRIPPED 1/2" BEYOND THIS POINT AND TINNED 3/8" UNLESS OTHERWISE SPECIFIED.

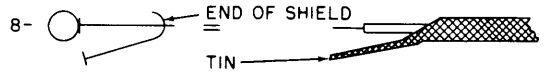


6- WIRES SHOULD BE PLACED IN CABLE IN NUMERICAL SEQUENCE AS THEY APPEAR IN ITEM COLUMN. SPACE LACING APPROXIMATELY 3/4" APART.

7-

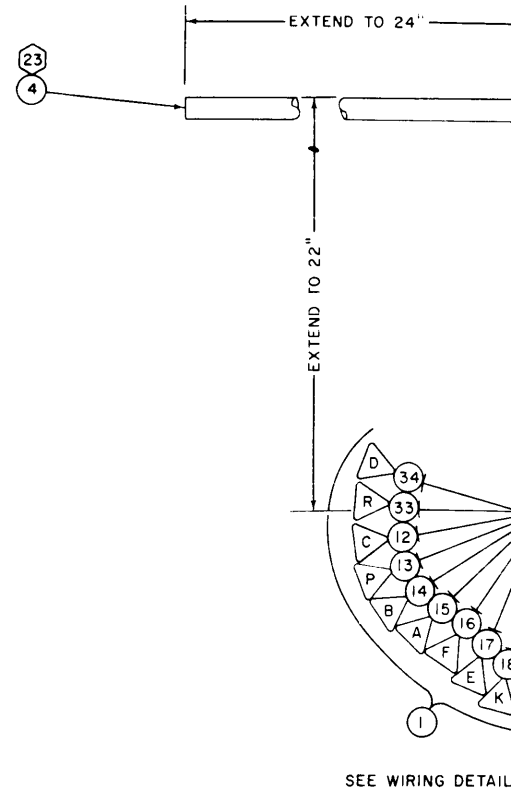


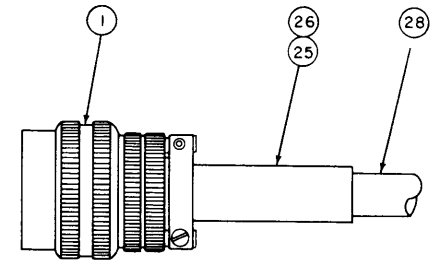
8-

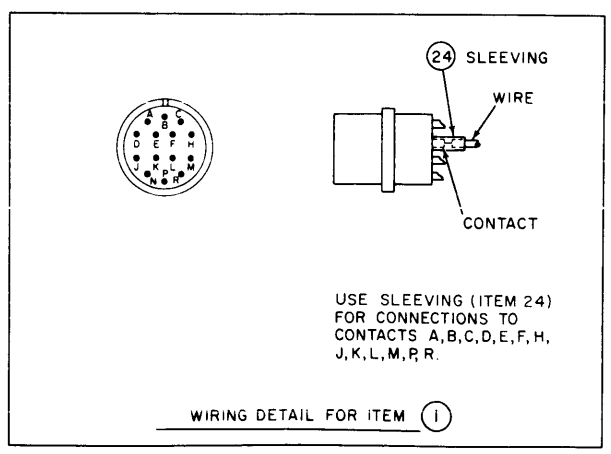


ABOVE SYMBOL DENOTES PIGTAIL SHIELD.

Figure 5-7. Cable Assembly, CA-705-1, Fabrication


EXTEND TO 24"
EXTEND TO 22"
23
4
D
34
R
33
C
12
P
13
B
14
A
15
F
16
E
17
K
18
1
SEE WIRING DETAIL


1
26
25
28


24 SLEEVING
WIRE
CONTACT
USE SLEEVING (ITEM 24) FOR CONNECTIONS TO CONTACTS A,B,C,D,E,F,H, J,K,L,M,P,R.
WIRING DETAIL FOR ITEM 1

00463308