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UNCLASSIFIED

TECHNICAL MANUAL

for

VARIABLE NOTCH FILTER
MODEL HNF-1
(F-711/FRR-60(V))



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

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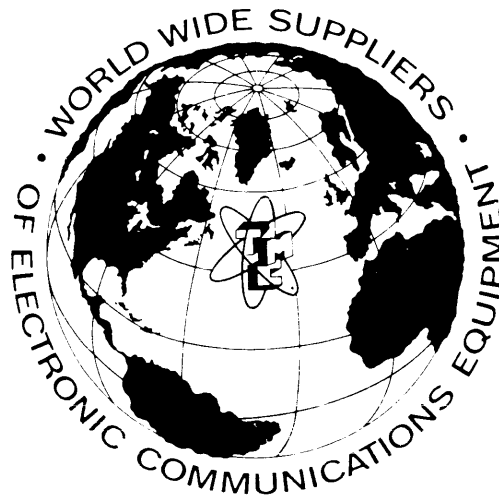
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THE TECHNICAL MATERIEL CORPORATION

C O M M U N I C A T I O N S E N G I N E E R S

700 FENIMORE ROAD

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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.

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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:

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

PROCEDURE IN THE EVENT OF DAMAGE INCURRED IN SHIPMENT

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

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

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

CHANGE NO. 1



INSTRUCTION BOOK CHANGE NOTICE

Date September 18, 1963

Manual affected: Variable Notch Filter Model HNF-1 IN -3001D

Page 4-2 Paragraph 4-2b

Change sentence to read - Signals at 455 kc + 82 cps are attenuated by "1 db".

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

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

Attn.: Director of Eng. Services.

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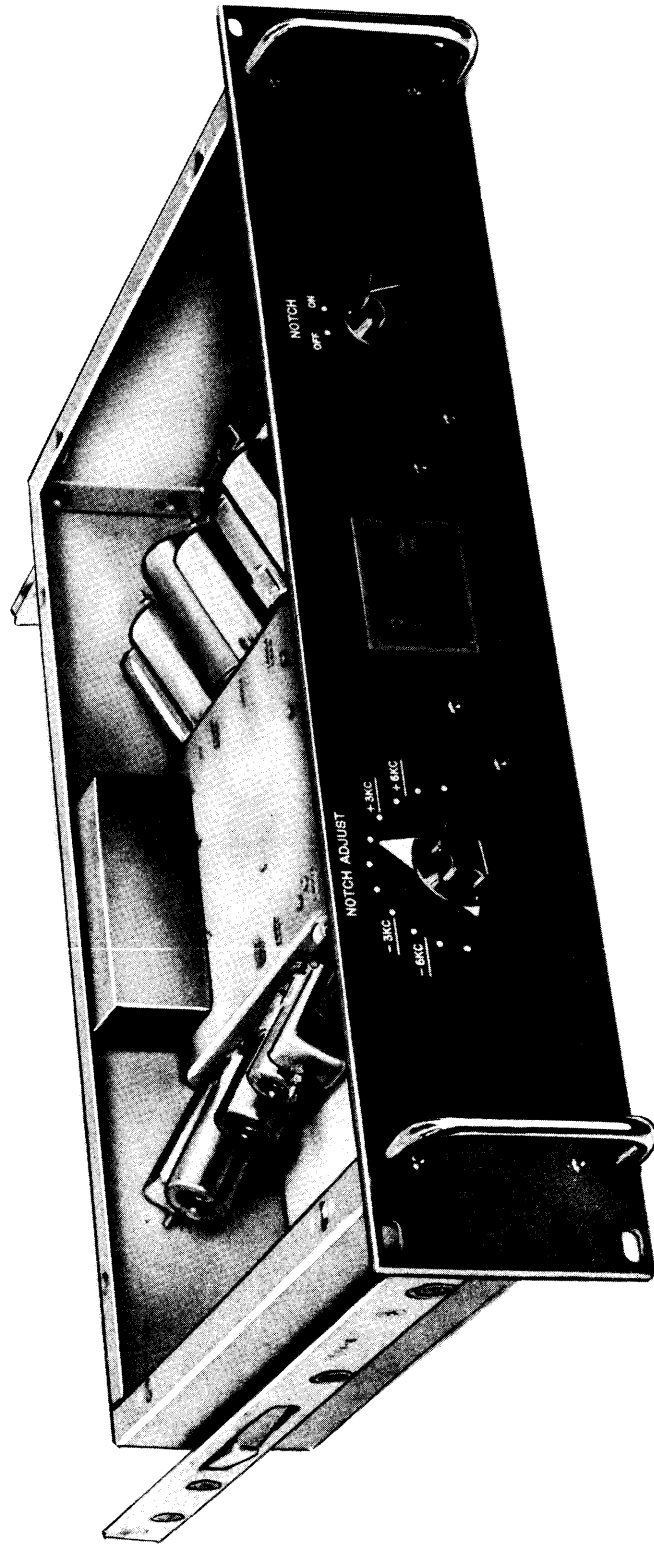


Figure 1-1. Variable Notch Filter, Model HNF-1

SECTION 1

GENERAL DESCRIPTION

1-1. PURPOSE OF EQUIPMENT

The Variable Notch Filter, Model HNF-1 is a fixed crystal band suppressor unit designed to attenuate an interfering signal within ± 8 kc of a 250-kc i-f signal. The HNF-1 is designed to be integrated into a system such as the DDR-5. In the DDR-5, the HNF-1 is functionally connected between i-f amplifiers in the HFI-1 unit.

1-2. DESCRIPTION OF EQUIPMENT

The HNF-1, a rack-mounted unit, consists of a fixed crystal band suppressor unit designed to attenuate, by approximately 60 db, any signal at 455 kc ± 10 cps. Signals within ± 82 cps of 455 kc are attenuated by 1 db. All controls are located on the front panel and all power and i-f connections are made at the rear. Provision is made to allow the signal to pass through this unit without being filtered. The unit requires an external power supply for its operation.

1-3. ELECTRICAL CHARACTERISTICS

INPUT AND OUTPUT IMPEDANCE	50-ohm coaxial
BAND REJECTION	± 82 cps at 1 db down ± 10 cps at 60 db down
POWER REQUIREMENTS	+200 vdc; 6.3 vac at 3 amp

1-4. MECHANICAL CHARACTERISTICS

DIMENSIONS (crated)	29-3/4" x 22-7/8" x 10-3/4"
(uncrated)	3-1/2" x 19" x 11"
GROSS WEIGHT	40 lbs.
NET WEIGHT	9 lbs.

1-5. ELECTRON TUBE COMPLEMENT

Table 1-1 lists the electron tubes found in the HNF-1.

TABLE 1-1. ELECTRON TUBE COMPLEMENT

REFERENCE SYMBOL	TYPE	FUNCTION
V4001	6S4	Mixer
V4002	6BA6	Amplifier
V4003	6S4	Mixer
V4004	6BA6	Amplifier
V4005	6U8	Amplifier
V4006	6AB4	Oscillator

SECTION 2 INSTALLATION

2-1. INITIAL INSPECTION

Each HNF-1 has been calibrated and tested at the factory before shipment. Upon arrival at the operating site, inspect the packing case and contents for possible damage. Unpack the equipment carefully. Inspect all packing material for parts which may have been shipped as "loose items." With respect to damage to the equipment for which the carrier is liable, the Technical Materiel Corporation will assist in describing methods of repair and the furnishing of replacement parts.

The equipment is shipped with all tubes installed. Check that all such components are properly seated in their sockets.

2-2. MECHANICAL INSTALLATION

The HNF-1 is designed for 19-inch rack mounting with all power and signal connections made on the rear panel. (See figure 2-1.)

The HNF-1 can be supplied with slides for mounting in a suitable housing. To install an HNF-1 without slides, place the unit into a suitable housing and secure the front panel to the housing with screws. To install an HNF-1 equipped for slides, set it in position on the tracks until the release buttons catch. Press the release buttons and push the HNF-1 into the equipment rack until the release buttons engage the holes in the equipment. After this, secure the front panel to the equipment rack with screws.

2-3. ELECTRICAL INSTALLATION

All necessary input and output connections for the HNF-1 are shown in figure 2-2. The power interconnect cable is connected to jack J4003. The 250-kc i-f input from the HFI-1 unit is connected to jack J4001 and the 250-kc i-f output is connected to jack J4002.

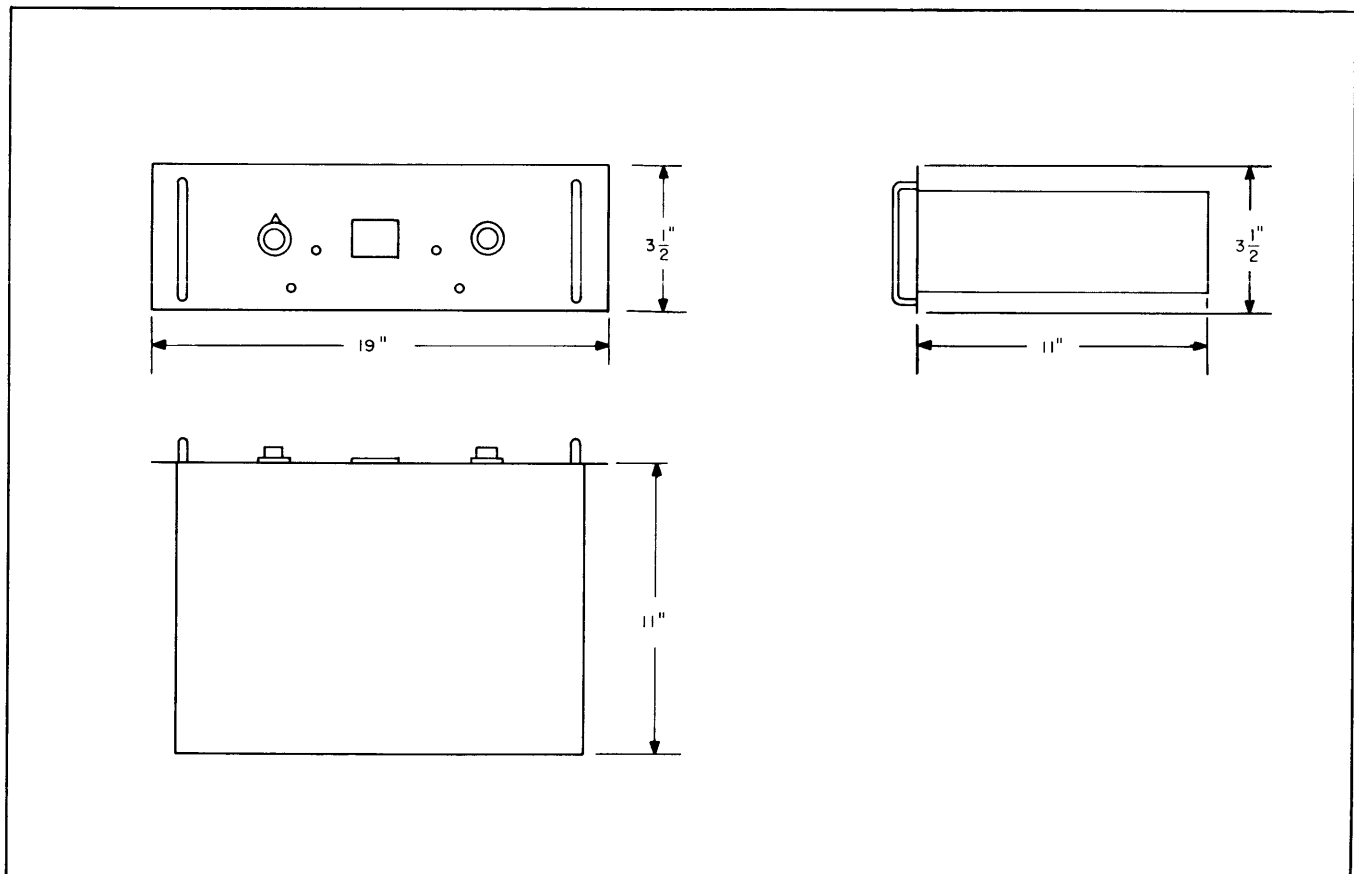


Figure 2-1. Outline Dimensional Drawing, HNF-1

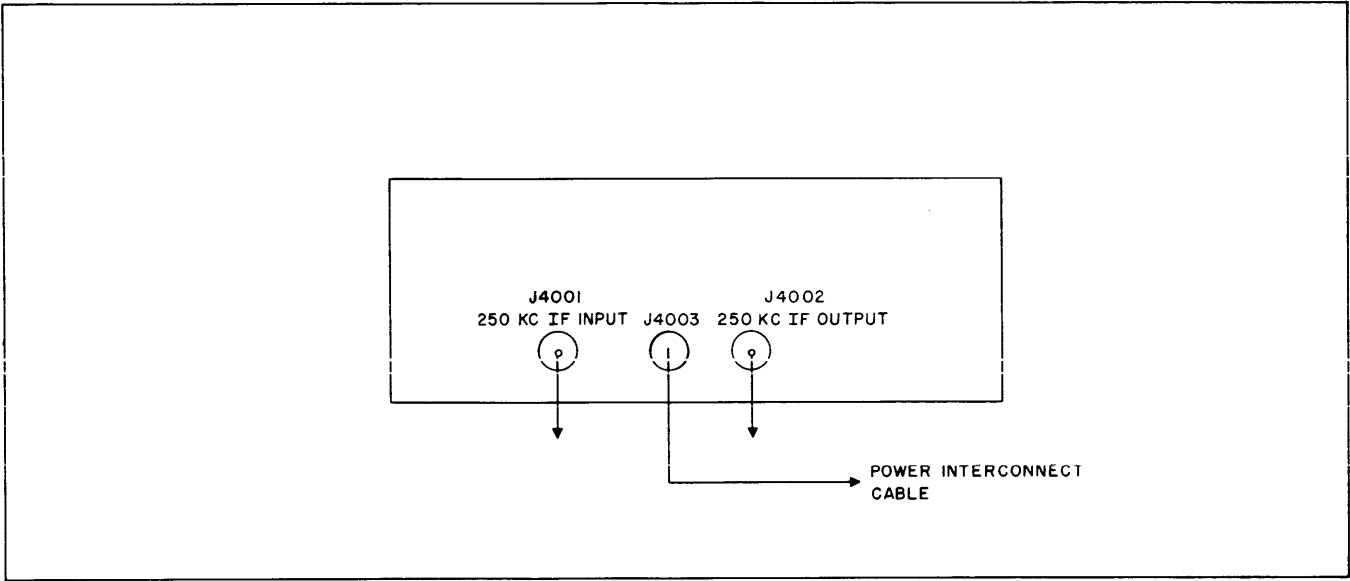


Figure 2-2. Interconnection Diagram, HNF-1

SECTION 3 OPERATOR'S SECTION

3-1. OPERATING CONTROLS (See figure 3-1.)

The HNF-1, with both its operating controls on the front panel, has been designed for maximum operating ease. NOTCH ON-OFF switch S4001 permits the signal to pass through the unit without filtering when in the OFF position. When in the ON position, the 250-kc i-f input is filtered. The NOTCH ADJUST control C4015 is used to tune the unwanted signal into the notch allowing it to be eliminated.

3-2. OPERATOR'S INSTRUCTIONS

After having installed the HNF-1 in a system and making all necessary corrections, note the following:

a. Assume that an i-f input signal exists with no interfering signal. In this case, turn NOTCH switch to OFF position and the signal completely bypasses the filter.

b. Assume that an i-f input signal exists with an interfering 251-kc tone and it is to be eliminated. Adjust the oscillator as follows: Since the input to the filter is 455 kc and the interfering tone is 251 kc the oscillator must be adjusted to generate a 204-kc signal. With the NOTCH ADJUST control set to the center position, the oscillator generates a 205-kc output. Therefore, set NOTCH ADJUST to -1 kc to obtain the desired 204 kc signal.

3-3. OPERATOR'S MAINTENANCE

If a malfunction occurs, the operator should immediately turn off equipment and visually inspect the equipment for simple defects such as wrong or missing connections, bad tubes, etc. If conditions warrant, see the troubleshooting section (Section 5) of this manual.

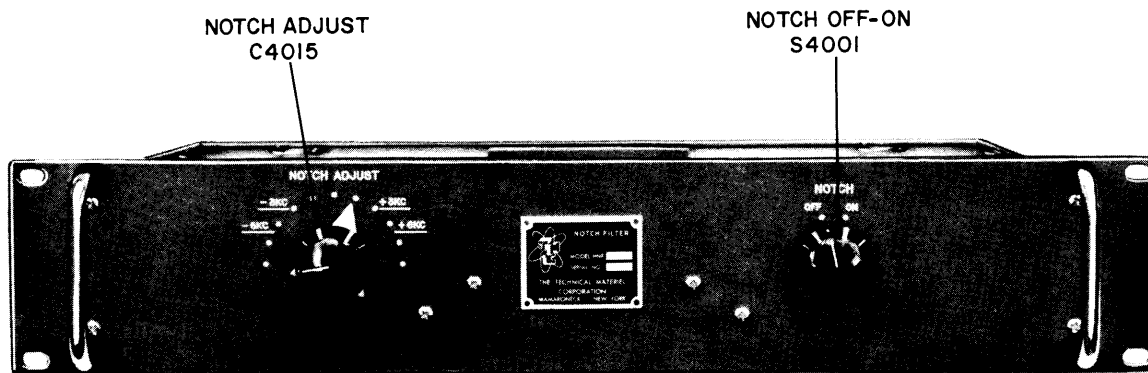


Figure 3-1. HNF-1, Front Panel Showing Controls

SECTION 4 PRINCIPLES OF OPERATION

4-1. BLOCK DIAGRAM ANALYSIS (See figure 4-1.)

The HNF-1, as mentioned previously, consists basically of a variable notch filter designed to attenuate an interfering signal within ± 8 kc of the 250-kc i-f signal.

With the NOTCH switch in the OFF position, the input i-f signal, coupled through J4001, bypasses the filter, and is coupled to J4002 completely. With the NOTCH switch in the ON position, the i-f signal is coupled to mixer V4001 where it is heterodyned with a 197-kc to 213-kc signal (frequency depends on position of NOTCH ADJUST control. This 197- to 213-kc signal, generated in oscillator V4006, is coupled through amplifier V4005.

The output from V4001, a 447-kc to 463-kc signal, is then coupled through filter Z4001 which attenuates, by approximately 60 db, any signal at 455 kc ± 10 cps. The resulting filtered signal is then amplified through amplifier V4002. This signal is then coupled to mixer V4003 along with the 197-kc to 213-kc oscillator sig-

nal where they are heterodyned to generate a 250-kc signal. The signal is amplified in amplifier V4004 and coupled to output jack J4002.

To illustrate the operation of this unit, consider the following: Assume that an input i-f signal of 250 kc with two 2-kc tones and an interfering signal at 251 kc is applied to the unit. (See figure 4-2a.) When the NOTCH ADJUST control is moved to the proper position, the 251-kc signal will be converted to the notch frequency of 455 kc. This puts oscillator V4006 at a frequency of 455 kc - 251 kc, or 204 kc. The input to filter Z4001 will look as shown in figure 4-2b.

The notch filter will remove the signal at 455 kc only; thus allowing all other frequencies to pass. The signal at the output of Z4001, as shown in figure 4-2c, is applied to mixer V4002 along with a 204-kc oscillator frequency. Here the signals are heterodyned and the output signal represents the original input signal without the 251-kc interference. (See figure 4-2d.)

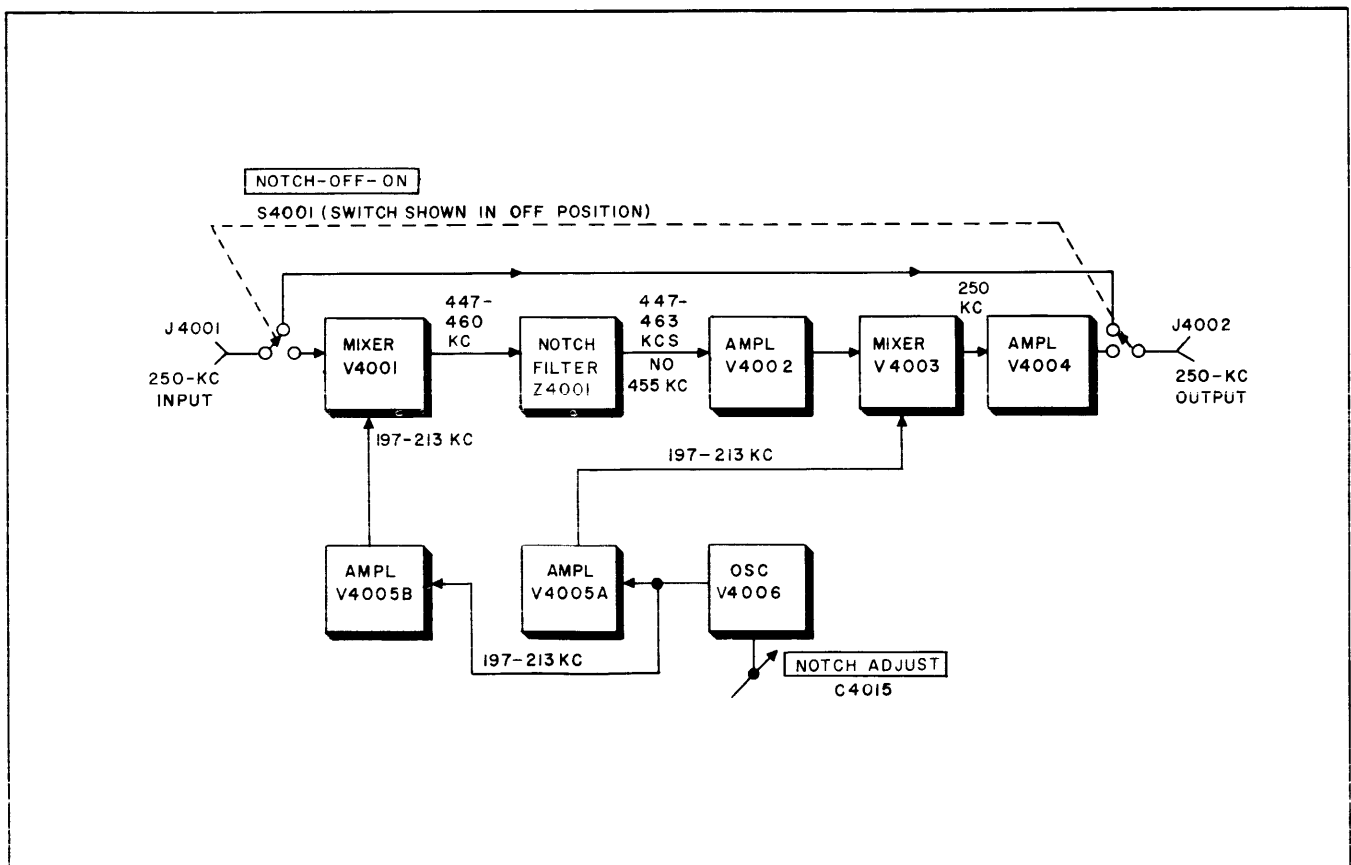


Figure 4-1. HNF-1, Block Diagram

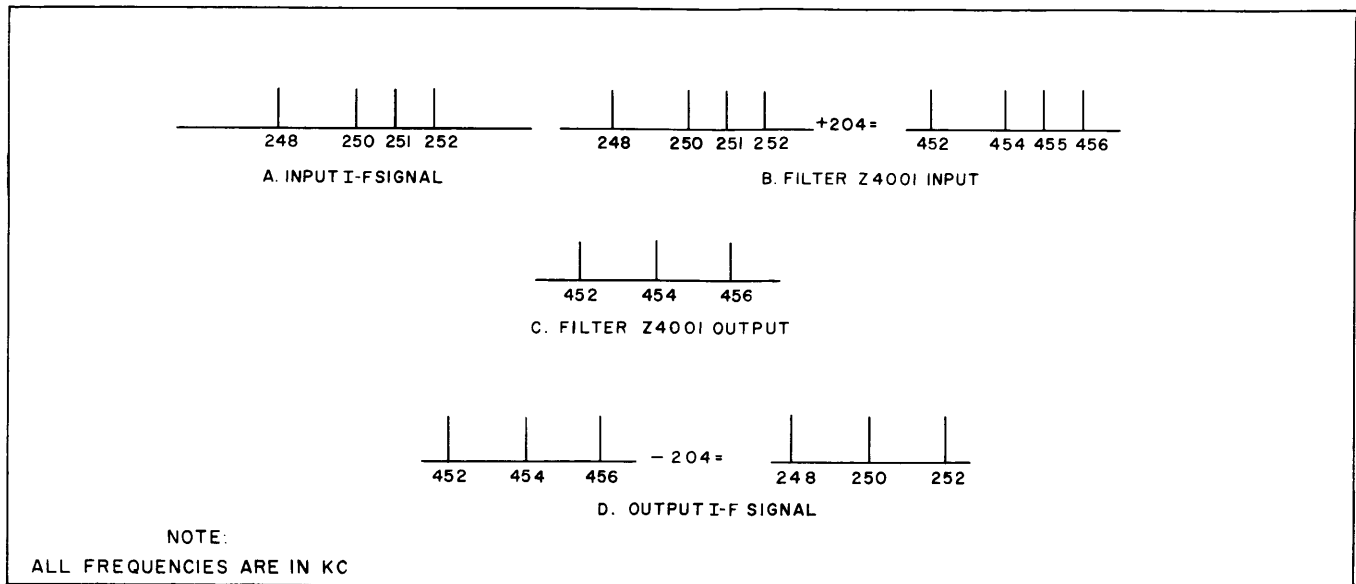


Figure 4-2, IF Signal Analysis

Since oscillator V4006 is used to convert the 250-kc signal to a 455-kc signal, and then back to 250 kc, any inherent error within the oscillator will thus be cancelled. Because of this, a relatively unstable oscillator such as V4006 can be used in the DDR-5 without affecting its stability.

4-2. DETAILED CIRCUIT ANALYSIS (See figure 8-1.)

a. OSCILLATOR V4006 AND AMPLIFIERS V4005A, V4005B.

Oscillator V4006 is a variable frequency Vackar-type (modified Colpitts) oscillator which generates a 197-kc to 213-kc output. The output frequency is controlled by NOTCH ADJUST capacitor C4015. Inductor L4002 and capacitors C4014 and C4015 comprise the oscillator tuned circuit. With C4015 at mid-capacity, corresponding to the center position of the NOTCH ADJUST control, L4002 is tuned to a frequency of 205 kc. The output from V4006 is coupled from the grid (pin 6), by coupling capacitor C4016, to the grids (pins 9 and 2) of amplifiers V4005A and V4005B.

V4005B, a pentode working into a transformer plate load (T4002), amplifies the 197-kc to 213-kc signal. This amplified signal is injected through capacitor C4001 into the cathode circuit of mixer V4001. Oscillator V4006 output which is coupled to triode amplifier V4005A is amplified through transformer T4001 and injected through capacitor C4005 into the cathode circuit of mixer V4003.

b. MIXER V4001, FILTER Z4001, AND AMPLIFIER V4002.

With NOTCH OFF-ON switch S4001 in the ON position, the 250-kc i-f signal is coupled to the grid (pin 6) of mixer V4001 along with an oscillator frequency between 197 and 213 kc, which is coupled to the cathode (pin 2).

These two signals are heterodyned in V4001, producing both additive and subtractive resultant frequencies. Transformer T4003 is tuned to a frequency band between 447-kc and 463-kc; the frequency sum of the two signals.

The converted signals from T4003 are coupled to fixed notch filter Z4001 which attenuates, by approximately 60 db, any signal at 455 kc \pm 10 cps. Signals at 455 kc \pm 82 cps are attenuated by 1 db. The frequency range of 447 kc to 463 kc represents a spread of 16 kc. Thus, it is possible to notch out an interfering signal within \pm 8 kc of the center i-f frequency. This notched signal is then coupled to amplifier V4002 where the signal is amplified through L4001 and coupled to the grid (pin 6) of mixer V4003.

c. MIXER V4003 AND AMPLIFIER V4004

The second input to this mixer is injected in the cathode circuit. These two signals are heterodyned in V4003, producing both additive and subtractive resultant frequencies. The output circuit of V4003, consisting of T4004, is designed to pass the 250-kc difference frequency between the two signals. This 250-kc signal is coupled through R4017 to the grid of V4004. The output, taken from T4005, is coupled through S4001A to J4002.

d. POWER SUPPLY CONNECTIONS

The HNF-1 has no contained power supply and all operating voltages as obtained through an external source such as Power Supply, Model HPP-1. Power supply connections are made to J4003. The B+ voltage (+200 vdc) is taken off pin K of J4003 and applied through filters C4026, C4025, C4017 and L4004 to the plates of the tubes. With NOTCH ON-OFF switch in the OFF position, B+ is removed from the plate circuit of V4006. Filament voltage of 6.3 vac is coupled from pin E of J4003 to the filaments of the tubes.

SECTION 5 TROUBLESHOOTING

5-1. GENERAL

This section discusses troubleshooting of the HNF-1 at the organizational level. A preliminary inspection procedure is given to aid in a visual analysis of conditions that may have caused equipment breakdown. The preliminary inspection is followed by a systematic troubleshooting guide which indicates the defective components.

5-2. TEST EQUIPMENT

The test equipment required for troubleshooting the HNF-1 is listed in table 5-1 below.

5-3. UNIT TROUBLESHOOTING

a. **PRELIMINARY CHECK.** A preliminary check should be performed on the HNF-1, while it is turned off, in an effort to correct conditions which lead to a breakdown. The most frequent cause of premature breakdown of components is usually caused by overheating due to improper ventilation, or loose connections and fittings. Table 5-2 lists the preliminary inspection procedures.

b. **TROUBLESHOOTING CHARTS.** Table 5-3 outlines a systematic approach to troubleshooting in an

effort to locate a defective component. Along with this troubleshooting chart, consult the voltage and resistance chart, table 5-4.

c. **PRELIMINARY PROCEDURES.** Before troubleshooting, the equipment should be placed in a system with the proper i-f input and power connections. Make sure that the power and i-f sources are operating properly. If, in the troubleshooting procedures, alignment of a stage or section is indicated, see Maintenance Section (Section 6) of this manual.

TABLE 5-1. TEST EQUIPMENT NEEDED

NAME	MODEL
Power Supply	TMC Model HFP-1 or equivalent
Signal Generator	Measurements Corp. Model 82 or equivalent
VTVM	Ballantine Model 314 or equivalent
Frequency Counter	H. P. Model 524C or equivalent
50-ohm Dummy Load	

TABLE 5-2. PRELIMINARY INSPECTION PROCEDURES

WHAT TO INSPECT	DEFECTS TO LOOK FOR	REMEDIES
J4003, Switch S4001, Power and i-f cables	Broken parts, frayed cables, broken connections, dirt, oil, corrosion.	Replace defective parts. Repair connections. Clean if necessary.
Knobs, screws, connectors	Looseness	Tighten
Wiring	Loose or frayed wires.	Resolder or rewire
Solder joints	Loose, corroded, or cold solder joints.	Clean or resolder
Resistors and Capacitors	Cracks, chipping, leaks, bulges, discoloration.	Replace defective part.
Tubes	Poor seating open or burned out.	Press tubes firmly in socket. Replace if necessary.

TABLE 5-3. UNIT TROUBLESHOOTING CHART

STEP	POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	<p>①</p> <p>See figures 5-1, 5-2, 8-1.</p>	<p>Place NOTCH switch in ON position.</p> <p>Connect VTVM between pins K and L of J4003. VTVM should indicate 200 vdc.</p> <p>Then connect VTVM between pins E and F of J4003 and measure voltage. VTVM should indicate 6.3 vac.</p>	<p>Tubes should light. B+ should be present at plates of all tubes.</p> <p>VTVM indicates 200 vdc.</p> <p>VTVM indicates 6.3 vac.</p>	<p>If B+ is not present on tubes, check J4003, L4004, L4003, C4017, C4025, C4026, R4028, R4029.</p> <p>If one or more tubes are unlit, check tube(s).</p> <p>If all tubes are unlit, check J4003, C4024 and filament circuits.</p> <p>If indications are normal, proceed to step 2.</p>
2	<p>②</p> <p>See figures 5-1, 5-2, 8-1.</p>	<p>Connect a 50-ohm load to J4002. Connect VTVM across load.</p> <p>Place NOTCH switch in OFF position.</p> <p>Connect frequency counter across dummy load and place NOTCH control in ON position.</p>	<p>VTVM indicates same voltage level as input i-f signal.</p> <p>Counter indicates a frequency of 250 kc.</p>	<p>If indication is abnormal, check NOTCH switch S4001, J4002.</p> <p>If indication is abnormal, check NOTCH switch S4001, J4002.</p> <p>If abnormal indication still exists proceed to step 3.</p>
3	<p>Ⓐ</p> <p>See figures 5-1, 5-2, 8-1</p>	<p>Connect VTVM at pin 6 of V4001 and ground.</p>	<p>VTVM indicates 1 volt rms.</p>	<p>If indication is normal, proceed to step 4.</p> <p>If indication is abnormal, check J4001, S4001, and R4001.</p>
4	<p>Ⓑ</p> <p>See figures 5-1, 5-2, 8-1.</p>	<p>Connect VTVM at pin 2 and ground.</p> <p>Set NOTCH ADJUST to mid-capacity (205 kc).</p>	<p>VTVM indicates 1 volt rms.</p>	<p>If indication is normal, proceed to step 7.</p> <p>If indication is abnormal, proceed to step 5.</p>
5	<p>Ⓑ1</p> <p>See figures 5-1, 5-2, 8-1.</p>	<p>Connect frequency counter to pin 2 of V4005.</p> <p>Rotate NOTCH ADJUST fully clockwise and counterclockwise.</p>	<p>Counter indicates 205 kc.</p> <p>Counter should indicate frequencies between 197 kc and 213 kc.</p>	<p>If indication is normal, proceed to step 6.</p> <p>If indication is abnormal, check V4006, C4015, L4002, C4014, and associated circuitry.</p>
6	<p>Ⓑ2</p> <p>See figures 5-1, 5-2, 8-1.</p>	<p>Connect VTVM at terminal B2 of T4002.</p>	<p>VTVM indicates 1 volt rms.</p>	<p>If indication is abnormal, check V4005, T4002, R4002, R4003, and C4001.</p>

TABLE 5-3. UNIT TROUBLESHOOTING CHART (CONT'D)

STEP	POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
7	Ⓒ See figures 5-2, 8-1.	Connect counter at "IN" connection of Z4001.	Counter should indicate frequency range of 447 kcs to 463 kcs, depending on position of NOTCH ADJUST.	If indication is normal, proceed to step 8. If indication is abnormal, check V4001, T4003, R4005, R4006 and associated circuitry.
8	Ⓓ See figures 5-1, 8-1.	Remove V4006. Adjust signal generator to 455 kc and connect to J4001. Connect RF VTVM to pin 1 of V4002. Vary generator <u>very slowly</u> around 455 kc. Replace V4006 when completed.	VTVM should indicate a notch at 455 kc.	If indication is normal, proceed to step 9. If indication is abnormal, check Z4001.
9	Ⓔ See figures 5-1, 5-2, 8-1.	Connect VTVM at pin 6 of V4003.	VTVM indicates 1 volt rms.	If indication is normal, proceed to step 10. If indication is abnormal, check V4002, L4001, and associated circuitry.
10	Ⓕ See figures 5-1, 5-2, 8-1.	Connect VTVM at pin 2 of V4003.	VTVM indicates 1 volt rms.	If indication is normal, proceed to step 11. If indication is abnormal, check V4005, T4001, R4014, R4015, and associated circuitry.
11	Ⓖ See figures 5-1, 5-2, 8-1.	Connect frequency counter to pin 1 of V4004.	Counter should indicate 250 kc.	If indication is normal, check V4004, T4005, S4001, J4002, and associated circuitry. If indication is abnormal, check V4003, T4004, R4017, and associated circuitry.

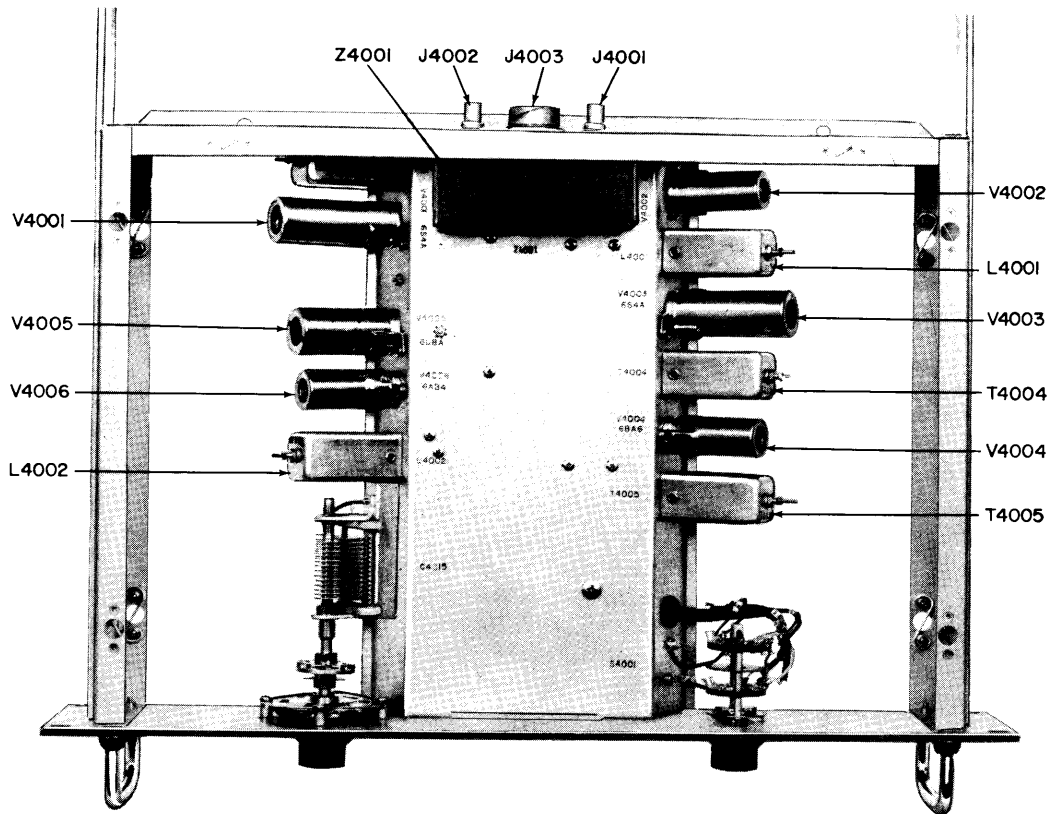


Figure 5-1. HNF-1, Top View

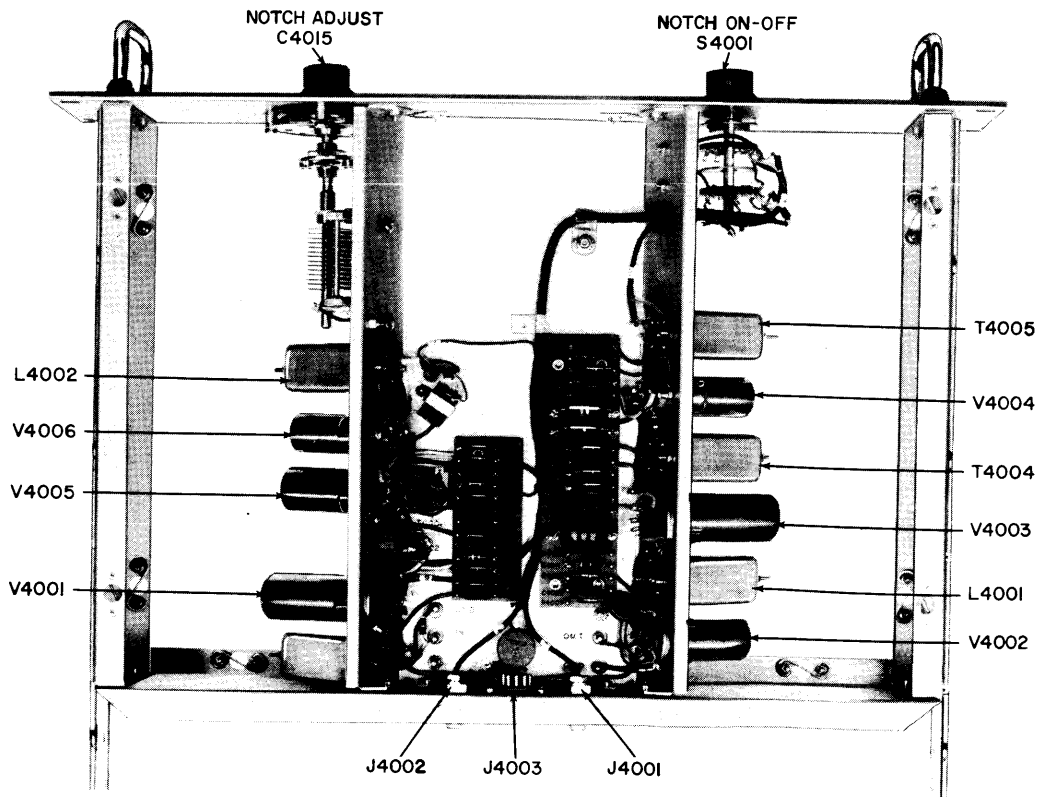


Figure 5-2. HNF-1, Bottom View

TABLE 5-4. VOLTAGE AND RESISTANCE MEASUREMENTS

TUBE AND TYPE	TYPE OF MEASUREMENT	PIN								
		1	2	3	4	5	6	7	8	9
V4001 (6S4)	DC	NC	11	NC	6.3 vac	0	0	NC	NC	185
	Ohms	NC	4.4K	NC	FIL	GND	47	NC	NC	30K
V4002 (6BA6)	DC	0	6.8	6.3 vac	0	170	140	6.8	NC	NC
	Ohms	47	1K	FIL	GND	30K	50K	1K	NC	NC
V4003 (6S4)	DC	NC	10	NC	6.3 vac	0	0.1	NC	NC	175
	Ohms	NC	4K	NC	FIL	GND	56K	NC	NC	30K
V4004 (6BA6)	DC	0	5.5	6.3 vac	0	160	135	5.5	NC	NC
	Ohms	50	680	FIL	GND	30K	50K	680	NC	NC
V4005 (6U8)	DC	140	-0.04	145	0	6.3 vac	155	2.2	1.9	-0.04
	Ohms	30K	10K	40K	GND	FIL	30K	220	180	10K
V4006 (6AB4)	DC	120	0	0	6.3 vac	NC	-3	0	NC	NC
	Ohms	15K	0	0	FIL	NC	470K	0	NC	NC

NOTES:

1. All resistive measurements were taken with a H. P. Model 410B VTVM. All measurements are taken with respect to ground with all power off. Unit was removed from cabinet and plugs disconnected from J4001, J4002, and J4003.
2. All d-c measurements were taken with a H. P. Model 410B VTVM with respect to ground. All readings are d-c unless specified otherwise. Plugs were removed from J4001 and J4002. NOTCH ADJUST control set at -6 kc and NOTCH ON-OFF in ON.

SECTION 6 MAINTENANCE

6-1. INTRODUCTION

Maintenance may be divided into three categories: operator's maintenance, preventive maintenance, and corrective maintenance. The operator's maintenance, normally the maintenance carried out by the operator as he works with the equipment, is in Section 3 of this manual. Preventive and corrective maintenance procedures are given in this section.

The HNF-1 has been designed to provide long-term, trouble-free operation under continuous duty conditions. It is recommended that any necessary maintenance be done by a competent maintenance technician familiar with troubleshooting techniques. If the trouble cannot be corrected by following the procedures in this section and section 5, it is recommended that the HNF-1 be returned to the Technical Materiel Corporation for servicing.

6-2. PREVENTIVE MAINTENANCE

In order to prevent failure of the equipment due to corrosion, tube failure, dust, or other destructive elements, it is suggested that a schedule of preventive maintenance be set up and adhered to.

At periodic intervals (at least every six months) the equipment should be removed from the rack for cleaning and inspection. All accessible covers should be removed and the wiring and all components inspected for dirt, corrosion, charring, discoloring, or grease. Dust may be removed with compressed air or soft brush. Remove dirt or grease from electrical parts with trichlorethylene. Remove dirt or grease from other parts with any good dry cleaning fluid.

WARNING

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

The preliminary inspection procedure, as outlined in table 5-2 can be used as a guide to preventive maintenance.

6-3. CORRECTIVE MAINTENANCE

The corrective maintenance procedures are essentially Technical Materiel Corporation's factory alignment procedures modified for use in the field.

a. TEST EQUIPMENT NEEDED. The test equipment needed for these alignment procedures are given in table 6-1, below. The HFP-1 Power Supply can be used with the HNF-1. To use the HFP-1, proceed as follows: Interconnect the HNF-1 and HFP-1 at J4003 and J8006. Prepare a dummy plug with pins "U" and

TABLE 6-1. TEST EQUIPMENT

NAME	MODEL
RF VTVM	Ballentine Model 314 or equivalent
Signal Generator	Measurements Corp. Model 82 or equivalent
Frequency Counter	H. P. Model 524C or equivalent
Dummy Load	50 ohm, 1/2 watt

"P" shorted, and insert J8005 on the HFP-1 Unit. This simulates the OPERATE position of the STANDBY-OPERATE switch on the HFA-1 Unit.

b. ALIGNMENT OF OSCILLATOR V4006.

(1) Connect frequency counter to B2 of T4002.

(2) Turn NOTCH ADJUST to midrange. Tune core of L4002 to a frequency of 205 kc, as indicated on counter.

(3) Turn NOTCH ADJUST to maximum capacitance. The frequency should be 196 kc within + 1.5 kc. Then adjust NOTCH ADJUST for minimum capacitance. The frequency should be 214 kc within - 1.5 kc.

c. ALIGNMENT OF MIXER V4001, FILTER Z4001, AND AMPLIFIER V4002.

(1) Remove oscillator V4006.

(2) Adjust signal generator to 455 kc and connect to J4001. Connect RF VTVM to pin 9 of V4001. Temporarily place a short jumper between green lug of T4003 and ground.

Note

Throughout these measurements always reduce the signal generator output so as to produce 1.0 volt or less at the point being measured.

(3) Adjust top core of T4003 for maximum indication on meter. Tighten lock-nut. Remove jumper and adjust bottom core of T4003 for minimum indication on meter. Tighten lock-nut.

(4) Connect meter to pin 1 of V4002. Vary signal generator frequency VERY SLOWLY around 455 kc. There should be a noticeable notch at 455 kc.

(5) Remove generator and connect to pin 1 of V4002. Tune generator to 455 kc. Connect meter to pin 6 of V4003 and adjust core of L4001 for maximum indication on meter. Tighten lock-nut.

(6) Remove generator and connect to the green lug of T4003. Adjust generator to 2.0 volts output. Connect frequency counter to signal generator. Tune generator to 454 kc.

Note

Adjust meter scale, as needed, while slowly bringing generator to 455 kc. The notch depth should exceed 50 db (actual depth may not be possible to measure because of a generator sideband (hum)).

d. ALIGNMENT OF MIXER V4003 AND AMPLIFIER V4004.

(1) Adjust signal generator to 250 kc and connect to pin 6 of V4003. Connect meter to pin 9 of V4003. Temporarily connect a short jumper between pin 1 of V4004 and ground.

(2) Adjust top core of T4004 for maximum indication on meter. Tighten lock-nut. Remove jumper and adjust bottom core of T4004 for minimum indication on meter. Tighten lock-nut.

(3) Connect meter and dummy load at J4002. Adjust core of T4005 for maximum indication on meter, adjusting generator output so as not to exceed 0.5 volts at the meter. Tighten lock-nut.

(5) Connect signal generator to J4001. Reinsert V4006 in socket. Switch S4001 to OFF and ON positions. Meter readings should not vary more than 2 db.

SECTION 7 PARTS LIST

7-1. INTRODUCTION

Reference designations have been assigned to identify all maintenance parts of the equipment. They are used for marking the equipment (adjacent to the part they identify) and are included on drawings, diagrams, and the parts list. The letters of a reference designation indicate the kind of part (generic group), such as resistor, amplifier, electron tubes, etc. The number differentiates between parts of the same generic group. Sockets associated with a particular plug-in device, such as electron tube or fuse,

are identified by a reference designation which includes the reference designations of the plug-in device. For example, the socket for tube V401 is designated XV401. Column 1 lists the reference designations of the various parts in alphabetical and numerical order. Column 2 gives the name and describes the various parts. Major part assemblies are listed in their entirety; sub-parts of a major assembly are listed in alphabetical and numerical order with reference to its major assembly. Column 3 indicates how the part is used within a major component. Column 4 lists each Technical Materiel Corporation part number.

PARTS LIST FOR VARIABLE NOTCH FILTER, MODEL HNF-1

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NUMBER
C4001	CAPACITOR, FIXED, CERAMIC DIELECTRIC: .1 uf; +80% -20%; 500 vdcw.	Cathode Bypass	CC-100-28
C4002	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20, 000 uuf; +80% -20%; 500 vdcw.	Plate Decoupling	CC-100-24
C4003	Same as C4002.	Screen Bypass	
C4004	Same as C4002.	Plate Decoupling	
C4005	Same as C4001.	Cathode Bypass	
C4006	Same as C4002.	Plate Decoupling	
C4007	Same as C4002.	Screen Bypass	
C4008	Same as C4002.	Plate Decoupling	
C4009	Same as C4001.	Cathode Bypass	
C4010	NOT USED		
C4011	Same as C4002.	Plate Decoupling	
C4012	Same as C4002.	Plate Decoupling	
C4013	CAPACITOR, FIXED, MICA DIELECTRIC: 10, 000 uuf; ±10%; 500 vdcw.	Osc. Tank	CM108G10001K
C4014	Same as C4013.	Osc. Tank	
C4015	CAPACITOR, VARIABLE, AIR DIELECTRIC: 10.3 uuf to 200 uuf; 1000 v rms.	Osc. Tuning	CB118SRX200
C4016	CAPACITOR, FIXED, MICA DIELECTRIC: 100 uuf; ±5%; 500 vdcw.	Osc. Coupling	CM15B101J
C4017	Same as C4002.	Osc. Decoupling	

PARTS LIST FOR VARIABLE NOTCH FILTER, MODEL HNF-1 (C nt'd)

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NUMBER
C4018	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20,000 uuf; +60% -40%; 150 vdcw.	Filament Bypass	CC-100-35
C4019	Same as C4018.	Cathode Bypass	
C4020	Same as C4018.	Cathode Bypass	
C4021	Same as C4002.	Filament Bypass	
C4022	Same as C4018.	Filament Bypass	
C4023	Same as C4001.	Filament Bypass	
C4024	Same as C4001.	Filament Bypass	
C4025	CAPACITOR, FIXED, CERAMIC DIELECTRIC: .1 uf; +80% -20%; 500 vdcw.	B+ Bypass	CC-100-32
C4026	Same as C4025.	B+ Bypass	
C4027	Same as C4001.	Filament Bypass	
J4001	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 round female contact; teflon insulation BNC series.	RF Input	JJ-172
J4002	Same as J4001.	RF Output	
J4003	CONNECTOR, RECEPTACLE, ELECTRICAL: 14 male contacts, rated at 17.0 amperes.	Power Input	JJ-200-2
L4001	COIL, RADIO FREQUENCY: tuned; 455-kc operating frequency; consists of two capacitors, one 180 uuf and one 2200 uuf.	Interstage i-f	AC-150
L4002	COIL, RADIO FREQUENCY: tuned; 205-kc operating frequency; consists of two capacitors, one 100 uuf and one 1000 uuf.	Osc. Coil	AC-149
L4003	COIL, RADIO FREQUENCY: molded; 27 ma; 47,000 uh.	RF Coil	CL-275-473
L4004	COIL, RADIO FREQUENCY: fixed; inductance 50.0 mh; resonant frequency .40 mc; max. dc resistance 110 ohms.	Output i-f Xmfr	CL-226-5
L4005.1	CORE, TOROID: bead type, powder iron.	Filament Choke	CI-120-1
L4005.2	Same as L4005.1.	Filament Choke	
L4005.3	Same as L4005.1.	Filament Choke	
L4005.4	Same as L4005.1.	Filament Choke	
L4006.1	Same as L4005.1.	Filament Choke	
L4006.2	Same as L4005.1.	Filament Choke	
L4006.3	Same as L4005.1.	Filament Choke	
L4006.4	Same as L4005.1.	Filament Choke	

PARTS LIST FOR VARIABLE NOTCH FILTER, MODEL HNF-1 (C nt'd)

REF SYMOBL	DESCRIPTION	FUNCTION	TMC PART NUMBER
R4001	RESISTOR, FIXED, COMPOSITION: 47 ohms; ±10%; 1/2 watt.	Terminating	RC20GF471K
R4002	RESISTOR, FIXED, COMPOSITION: 68 ohms; ±10%; 1/2 watt.	Terminating	RC20GF680K
R4003	RESISTOR, FIXED, COMPOSITION: 3900 ohms; ±10%; 1/2 watt.	Bias	RC20GF392K
R4004	Same as R4001.	Plate Decoupling	
R4005	RESISTOR, FIXED, COMPOSITION: 8200 ohms; ±10%; 1/2 watt.	Isolation	RC20GF822K
R4006	Same as R4001.	Terminating	
R4007	NOT USED		
R4008	NOT USED		
R4009	RESISTOR, FIXED, COMPOSITION: 1000 ohms; ±10%; 1/2 watt.	Cathode Bias	RC20GF102K
R4010	RESISTOR, FIXED, COMPOSITION: 22,000 ohms; ±10%; 1/2 watt.	Screen Decoupling	RC20GF223K
R4011	Same as R4001.	Plate Decoupling	
R4012	RESISTOR, FIXED, COMPOSITION: 47 ohms; ±10%; 1/2 watt.	Parasitic Supp.	RC20GF470K
R4013	RESISTOR, FIXED, COMPOSITION: 56,000 ohms; ±10%; 1/2 watt.	Grid Load	RC20GF563K
R4014	Same as R4002.	Terminating	
R4015	Same as R4003.	Cathode Bias	
R4016	Same as R4001.	Plate Decoupling	
R4017	Same as R4012.	Parasitic Supp.	
R4018	Same as R4010.	Screen Decoupling	
R4019	RESISTOR, FIXED, COMPOSITION: 680 ohms; ±10%; 1/2 watt.	Cathode Bias	RC20GF681K
R4020	Same as R4001.	Plate Decoupling	
R4021	RESISTOR, FIXED, COMPOSITION: 10,000 ohms; ±10%; 1/2 watt.	Grid Load	RC20GF103K
R4022	RESISTOR, FIXED, COMPOSITION: 220 ohms; ±10%; 1/2 watt.	Bias	RC20GF221K
R4023	RESISTOR, FIXED, COMPOSITION: 15,000 ohms; ±10%; 1/2 watt.	Screen Res.	RC20GF153K
R4024	Same as R4001.	Plate Decoupling	

PARTS LIST FOR VARIABLE NOTCH FILTER, MODEL HNF-1 (Cont'd)

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NUMBER
R4025	RESISTOR, FIXED, COMPOSITION: 180 ohms; $\pm 10\%$; 1/2 watt.	Cathode Bias	RC20GF181K
R4026	RESISTOR, FIXED, COMPOSITION: .47 megohms; $\pm 10\%$; 1/2 watt.	Grid Leak	RC20GF474K
R4027	Same as R4001.	Plate Decoupling	
R4028	RESISTOR, FIXED, COMPOSITION: 5600 ohms; $\pm 10\%$; 1 watt.	Osc. Decoupling	RC32GF562K
R4029	RESISTOR, FIXED, COMPOSITION: 15,000 ohms; $\pm 10\%$; 2 watt.	Osc. Bleeder	RC42GF153K
S4001	SWITCH, ROTARY: 2 section; 2 position; non-shorting type contacts; contact rating 1 amp, 28 volts dc or 5 amp at 110 vac.	Notch ON-OFF	SW-303
T4001	TRANSFORMER, RADIO FREQUENCY: frequency response -150-kc to 4 mc within 3 db; primary impedance 50 ohms; secondary impedance 5000 ohms; polarized, molded case.	Input Transformer Coupling	TZ-107
T4002	Same as T4001.	Coupling	
T4003	TRANSFORMER, INTERMEDIATE FREQUENCY: tuned; 455 kc operating frequency; two 2000 uuf capacitors; one resistor 10,000 ohms.	Coupling	TT-170
T4004	TRANSFORMER, INTERMEDIATE FREQUENCY: tuned; 250 kc operating frequency; consists of two 1000 uuf capacitors.	Coupling	TT-172
T4005	TRANSFORMER, INTERMEDIATE FREQUENCY: tuned; 250 kc operating frequency; consists of one 1000 uuf capacitor, and one 33,000 ohms resistor.	Output Transf.	TT-171
V4001	TUBE, ELECTRON: medium-mu triode; 9 pin miniature.	Mixer	6S4
V4002	TUBE, ELECTRON: remote-cutoff pentode; 7 pin miniature.	Ampl.	6BA6
V4003	Same as V4001.	Mixer	
V4004	Same as V4002.	Ampl.	
V4005	TUBE, ELECTRON: medium-mu triode sharp-cutoff pentode; 9 pin miniature.	Osc. Ampl.	6U8
V4006	TUBE, ELECTRON: high-mu triode; 7 pin miniature.	Osc.	6AB4
XV4001	SOCKET, ELECTRON: 9 pin miniature.	Socket for V4001	TS103P01
XV4002	SOCKET, ELECTRON: 7 pin miniature.	Socket for V4002	TS102P01
XV4003	Same as XV4001.	Socket for V4003	
XV4004	Same as XV4002.	Socket for V4004	

PARTS LIST FOR VARIABLE NOTCH FILTER, MODEL HNF-1 (Cont'd)

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NUMBER
XV4005	Same as XV4001.	Socket for V4005	
XV4006	Same as XV4002.	Socket for V4006	
Z4001	FILTER, BAND SUPPRESSION: operating frequency 455 kc; bandwidth 455 kc, ± 82 cps at 1 db, 455 kc, ± 10 cps at 60 db; input impedance 5000 ohms; output impedance 5000 ohms.	Notch Filter	FX-178

SECTION 8
SCHEMATIC DIAGRAMS

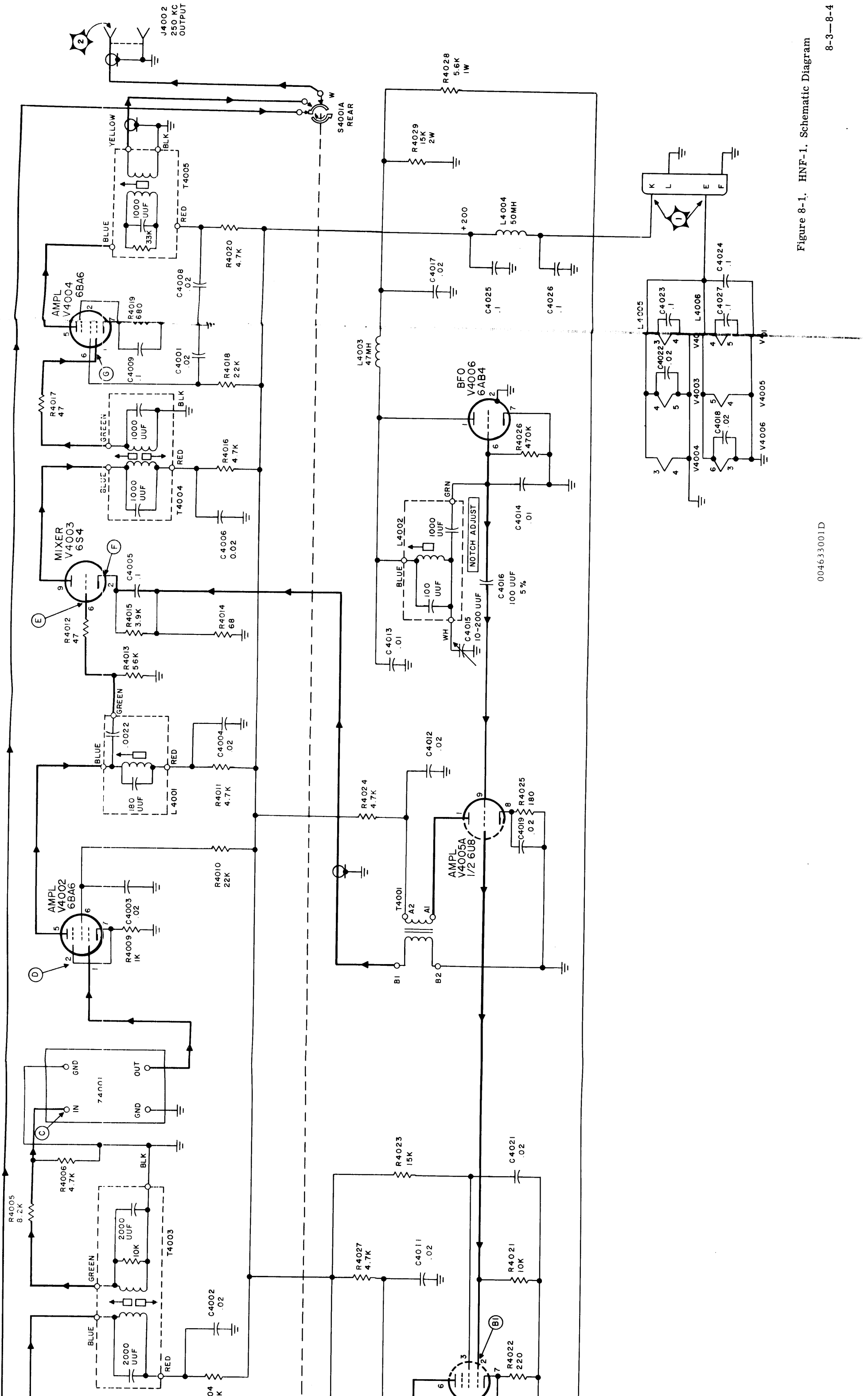
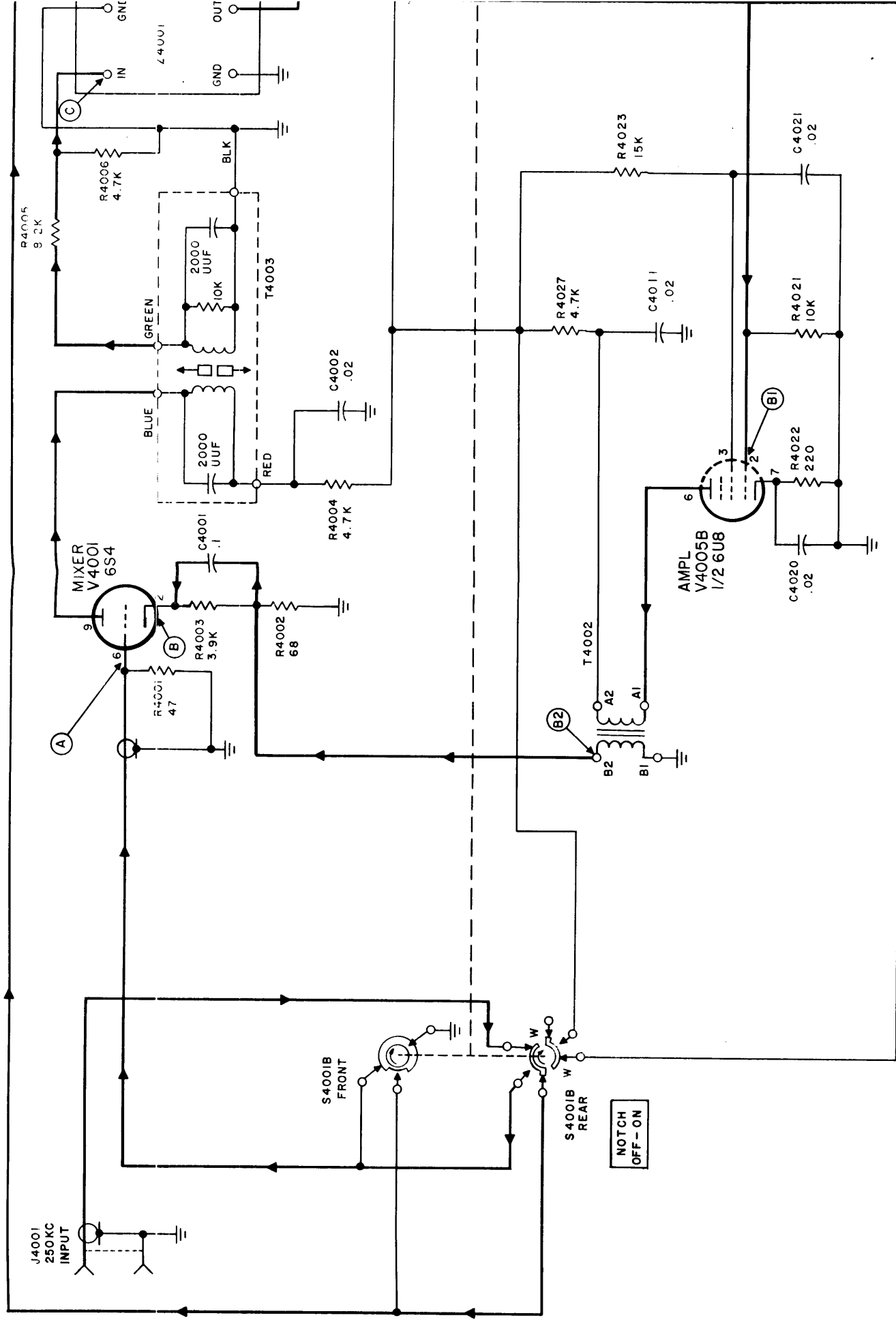


Figure 8-1. HNF-1. Schematic Diagram

004633001D



NOTES:

1. S4001 SHOWN IN OFF POSITION
2. UNLESS OTHERWISE SPECIFIED:
ALL RESISTORS ARE IN OHMS 1/2 WATT
3. INDICATES FRONT PANEL CONTROLS