DATE [illegible] 20, 1962 SHEET 1 OF 21	TMC SPECIFICATION NO. S- 698	C
JA, [illegible], NP COMPILED / CHECKED	TITLE:	
APPROVED		

HFR-1 TEST PROCEDURE

PART 1 and PART 2

OGILVIE PRESS, INC., BROOKLYN 17, N. Y. STOCK NO. 459M

DATE November 20, 1962	TMC SPECIFICATION NO. S- 698	C
SHEET 2 OF 21		
JA COMPILED / N.P. CHECKED	TITLE: HFR-1 TEST PROCEDURE - PART 1	
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A. Test Equipment Required

1. Standard Signal Generator, Measurements Model 82
   a) Pad, Measurements Model 80-ZH3
   b) Cable, TMC CA480-3-48
2. Power Supply, TMC HFP-1 (tested)
   a) Cable TMC CA-704 (to J8010 & J1305)
   b) Connector Plug TMC PL212-3 modified (jump U & P)
   c) Line Cord (for A-C power connection)
3. Vacuum Tube Voltmeter, H.P. Model 410B
4. Multi-meter, Simpson 260
5. Electronic Counter, H.P. Model 524C
   a) Cable, TMC CA480-3-48
6. Thermometer, Rascher & Betzold Inc., #14-4470

B. Tools - Special or Modified

1. Alignment Tool - TMC TP114
2. Alignment Tool - TMC TP115
3. 3/16" Spintite, Xcelite #HS-6)
4. 1/4" Spintite, Xcelite #HS-8)-----Modified 3/16" hole drilled through plastic handles.
5. 5/16" Spintite, Xcelite #HS-10)
6. 1/8" Blade Screw Driver, 8" long Xcelite R188
   (modify - Hollow ground to .013")
7. Miniature Tube Puller (7 pin), Kellems #1116
8. Noval Tube Puller (9 pin), Kellems #1316

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C. Preliminary

* 1. Check the unit for mechanical faults.

* 2. Check for obvious wiring errors.

3. Connect P1004 to J1306.

4. Measure the resistance to ground on pin K of J1305.

* 5. With S1301 switched to ALIGNMENT SIGNAL position, the resistance should be 9.5K ±10%.

* 6. With S1301 switched to OFF position, the resistance should be 34.5K ±10%.

7. Connect power cable to J1305 and P1301 to J1 on OVEN AMPLIFIER. Turn the power on and measure the following voltages.

* 8. Between J1306 pin 13 and ground - 200 VDC (if this voltage is incorrect, Adjust pot. on HFP-1).

" " " 11 " " - 32 VDC ±10%.

" " " 10 " " - 150 VDC ±5%.

" " " 1 " " - 6.5 VDC ±0.33V

" " CR-1305 " - 27 VDC ±1.6V

* RECORD ON TEST DATA SHEET

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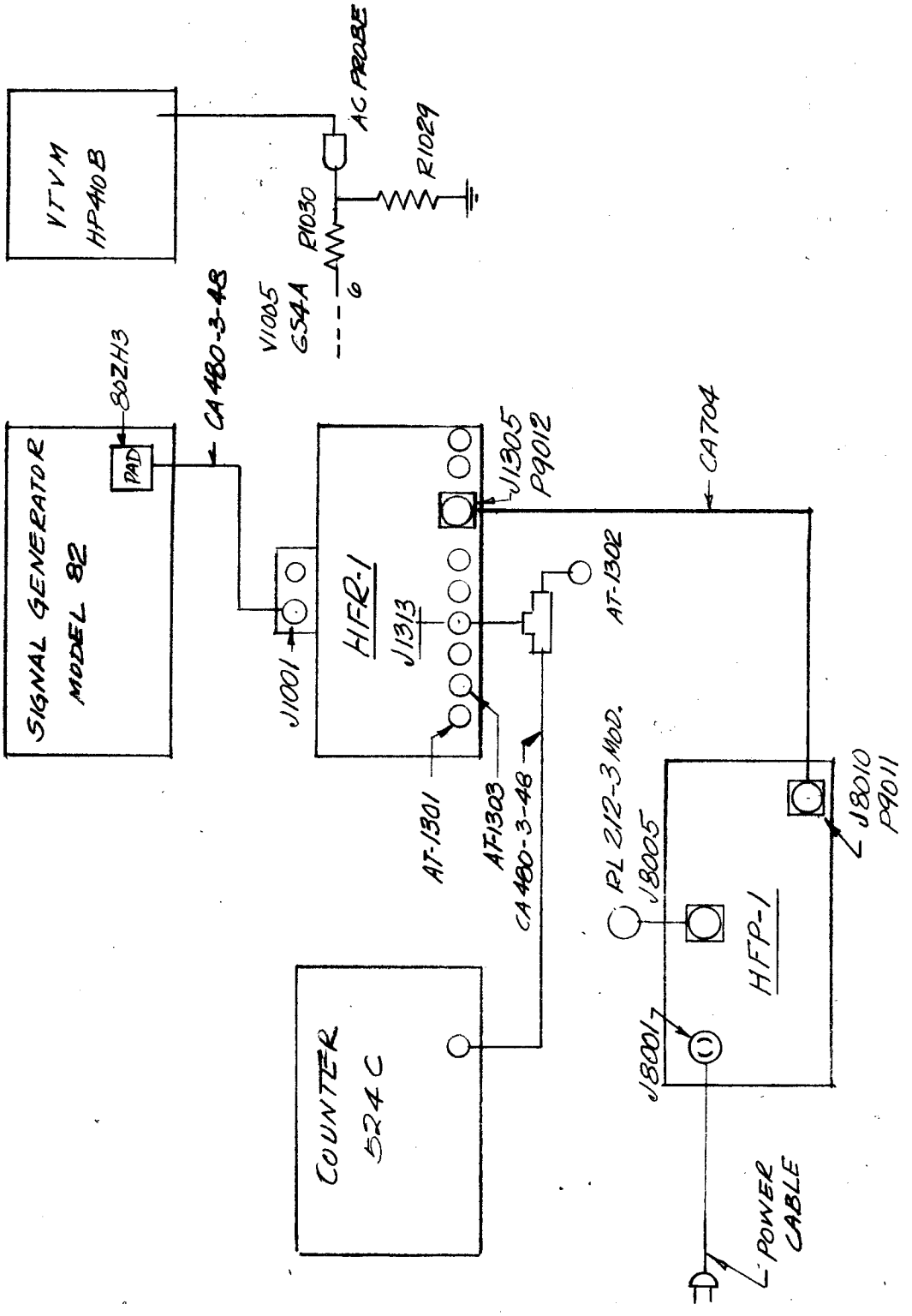
CONNECTION DIAGRAM



D. Alignment RF Circuits

1. Connect Signal Generator and VTVM as per Connection Diagram

2. Set Receiver Band switch to Band 1, tuning dial to 2 mc, switch S1302 to "Tune".

3. Set Signal Generator to 2 mc modulation off, attenuator to 1V output.

4. Tune inductors (use tool TP115) L1001, L1005, L1007, L1009 for maximum output on VTVM, simultaneously reducing Signal Generator output as needed to maintain approximately 0.5V on VTVM (this keeps circuits from overloading and produces a good indication of peaking). A clear and distinct indication of tuning should result on each stage except the ANTENNA stage (L1001) where the circuit is so broadly tuned that it will appear to be very sluggish, therefore, a very careful observance of the VTVM is required as the peaking will appear to be very small in amplitude.

   If an indication of output on VTVM is not readily discernible at the start, tune Signal Generator through adjacent frequencies, searching for a peak. This will help to determine the way inductors have to be adjusted, other wise a stage-by-stage tuning of stages becomes necessary.

5. Set Receiver Tuning dial to 3 mc.

6. Set Signal Generator to 3 mc attenuator as needed.

7. Tune capacitors (use tool TP114) C1009, C1015, C1023, C1031 for maximum output. The same conditions as in C-4 will prevail.

8. Repeat procedure C-4 and then C-7 (in that order), until no further improvement is discernible on VTVM.

9. Procedures C-4 and C-7 are used to align all other bands. All bands are aligned at the end frequencies, therefore, appropriate selection of Signal Generator frequencies, Receiver dial settings, and band selection must be made. The band switch automatically selects the appropriate circuitry to be aligned.

E. Alignment of HF Oscillator Circuits

1. Connect Counter as per Connection Diagram (Disconnect Signal Generator and VTVM).

2. Set Receiver Band switch to Band 1, tuning dial to 2 mc. Switch S1302 to "Tune".

3. Tune inductor L1013 to 3.7500 mc on counter.

4. Set tuning dial to 3 mc.

5. Tune capacitor C1047 to 4.7500 mc on counter.

6. Repeat procedure D-2,3,4,5 until further adjustment becomes unnecessary.

7. Align all bands. Use procedure set forth in D2,3,4,5,6. Use table below for band and tuning dial setting. Tune inductors and capacitors to the frequency shown.

BAND	SET TUNING DIAL TO	TUNE OSC. TO	USE ADJUSTMENT
1	2	3.7500	L1013
	3	4.7500	C1047
2	3	4.7500	L1021
	4	5.7500	C1073
3	4	5.7500	L1053
	6	7.7500	C1093
4	6	7.7500	L1054
	8	9.7500	C1113
5	8	9.7500	L1055
	12	13.7500	C1132
6	12	13.7500	L1042B
	16	17.7500	C1151
7	16	17.7500	L1147B
	24	25.7500	C1172
8	24	25.7500	L1052B
	32	33.7500	C1193

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8. Replace inner cover, insulation and outer cover (use hardware called for on assembly).

9. Connect proportional oven control jack to P1301 power cable and let oven temperature rise to a stable point. This temperature may be between 72°C and 78°C, as an initial setting. Once this setting is obtained, stability must be within +0.5°C. Approximate time required for oven temperature to stabilize is 1-1/2 hrs.

10. Once oven stability has been attained, all oscillator circuits must be retuned. The normal frequency drift is approximately -1.2% of the indicated frequency. To retune circuits, use procedure D-7.

F. PERFORMANCE MEASUREMENTS

1. Sensitivity.

(a) Connect Signal Generator and VTVM as per connection diagram.

(b) Set receiver S1302 to "Tune" S1301 to "OFF" band switch and tuning to the test frequency.

(c) Set Signal Generator to test frequency, modulation off, attenuator to produce 1.0V output on VTVM. (Receiver must be tuned carefully to test frequency to obtain maximum output).

Output shall be 1.0V across R-1029 (mixer grid 6BA4A V1005). Input shall be 1000 μv or less (read pad calibration mark). The gain shall be 1000 or more, exceptions are as shown on table.

BAND	FREQ. MC.	μV INPUT LIMITS (FOR 1.0V OUTPUT)	μV INPUT TYPICAL	TYP. GAINS (FOR REF.)
1	2	500 to 1000	800	1250
	3	450 to 1000	500	2000
2	3	800 to 1600	1600	625
	4	500 to 1200	1000	1000
3	4	500 to 1100	800	1250
	6	330 to 1000	330	3000
4	6	500 to 1100	1090	920
	8	450 to 1000	500	2000
5	8	500 to 1000	600	1675
	12	330 to 1000	330	3000
6	12	500 to 1000	600	1675
	16	330 to 1000	400	2500
7	16	500 to 1100	800	1250
	24	450 to 1000	500	2000
8	24	450 to 1000	500	2000
	32	500 to 1300	1200	835

In case of low gain use the stage by stage gain chart as an aid in localizing the fault.

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TITLE: HFR-1 TEST PROCEDURE - PART 1

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* 2. HF Oscillator Output:

(a) Connect VTVM across R-1031, 270 ohm resistor in cathode circuit of 6S4A, V1005 mixer.

(b) Set band switch and tuning dial as per table.

(c) Set S-1302 to "Tune" and S-1301 to "OFF".

(d) Input to antenna jack J-1301 must be zero or disconnected.

Output across R-1031 shall be at least 0.75V and not more than 1.3V. Output across J-1313 shall be at least 0.2V and not more than 0.5V. Output across J-1302 shall be at least 40MV and not more than 100MV. Output across J-1310 shall be at least 20MV and not more than 110MV.

BAND	DIAL FREQ.	R1031 VOLTS	OUTPUT ACROSS J1313 (AT1302) VOLTS	J1302 UV	J1310 (AT1301) UV
1	2	1.25	0.46	92	77
	2.5	1.25	0.49	96	61
	3	1.25	0.49	99	50
2	3	1.0	0.24	48	31
	3.5	1.1	0.26	51	29
	4	1.1	0.25	50	24
3	4	0.9	0.23	44	110
	5	0.9	0.23	45	84
	6	0.85	0.21	41	63
4	6	0.9	0.25	49	45
	7	0.95	0.24	47	35
	8	0.9	0.22	43	28
5	8	0.85	0.30	60	26
	10	0.85	0.28	56	38
	12	0.75	0.22	44	54
6	12	1.0	0.31	62	38
	14	1.05	0.29	58	29
	16	1.0	0.25	50	20
7	16	1.0	0.41	83	86
	20	1.0	0.43	87	62
	24	0.95	0.36	74	36
8	24	0.95	0.39	80	69
	28	0.95	0.35	73	47
	32	1.15	0.27	36	30

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* 3. Calibration.

(a) Connect counter as per connection diagram.

(b) Set S1302 to "Tune" and S1301 to "OFF".

(c) Set band switch and tuning dial as needed.

(d) Input to antenna jack J1001 must be zero or disconnected.

Dial calibration shall be as follows:

CHECK POINTS	BAND	± TOLERANCE IN Kc/s	± DIAL DIVISION	±% OF ΔF
100 KC	1	10	1	1
100 KC	2	10	1	1
200 KC	3	20	2	1
200 KC	4	20	2	1
.5 MC	5	37.5	1.5	1
.5 MC	6	37.5	1.5	1
1 MC	7	80	.8	1
1 MC	8	80	.8	1

4. Oven Temperature and Stability.

(a) Insert thermometer into the oven through the hole marked "C" (capacitor alignment hole) until it comes to rest.

CAUTION: BAND SWITCH KNOB MUST NOT BE TURNED DURING THIS OPERATION.

The oven temperature shall be between 72° C. and 78°C. as an initial setting. (This variation may be found between one receiver and another it is not to be construed as a temperature variation tolerance in a single receiver.) The temperature stability shall be ±0.5°C. EXAMPLE: If oven temperature was found to be 75°C. at one reading and 76°C. at another and never less than 75°C. no more than 76°C. then the initial setting can be considered as 75.5°C. and the stability ±0.5°C.

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THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y.

HFR-1, PART 1 TEST DATA SHEET #1

SERIAL NO.:_____

MFG. NO.:_____

C-1 Mechanical errors _____ OK

-2 Wiring errors _____ OK

-5 Pin K of J1305 & ground, S1301 to ALIGNMENT SIGNAL position, 9.5K ±10% _____ ohms

-6 Pin K of J1305 & ground, S1301 to OFF position 34.5K±10% _____ ohms

-8 J1306 pin 13 & ground, 200 VDC _____ volts
" " 11 " 32VDC ±10% _____ volts
" " 10 " 150VDC ±5% _____ volts
" " 1 " 6.5VDC ±0.33V _____ volts
CR-1305 & ground, 25VDC ±1.6V _____ volts

F-1 Sensitivity

BAND	FREQ.M.C.	uv INPUT FOR 1 V ACROSS R1029	MAX uv INPUT LIMIT
1	2	_____	1000
	3	_____	1000
2	3	_____	1600
	4	_____	1200
3	4	_____	1100
	6	_____	1000
4	6	_____	1100
	8	_____	1000
5	8	_____	1000
	12	_____	1000
6	12	_____	1000
	16	_____	1000
7	16	_____	1100
	24	_____	1000
8	24	_____	1000
	32	_____	1300

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TITLE: HFR-1 TEST PROCEDURE PART 1

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HFR-1, PART 1 TEST DATA SHEET #2

F-2 HF Oscillator Output (VTVM readings)

BAND	DIAL FREQ.	R1031 .75V MIN.	J1313 .2V to .5V	J1302 40MV to 100MV	J1310 20MV to 110MV
1	2				
	2.5				
	3				
2	3				
	3.5				
	4				
3	4				
	5				
	6				
4	6				
	7				
	8				
5	8				
	10				
	12				
6	12				
	14				
	16				
7	16				
	20				
	24				
8	24				
	28				
	32				

HFR-1, PART 1 TEST DATA SHEET #3

F-3 Dial Calibration

BAND	CHECK POINTS	± DIAL DIV.	MAX. DIVISION ERROR
1	100 KC	1	_____
2	100 KC	1	_____
3	200 KC	2	_____
4	200 KC	2	_____
5	.5 MC	1.5	_____
6	.5 MC	1.5	_____
7	1 MC	.8	_____
8	1 MC	.8	_____

DATE: _____

TESTER: _____

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APPROVED	RESISTANCE CHART (for reference only)	

Using ohm meter - Simpson #260 - the following resistance to ground should result:

1. RF Power Plug P1004 disconnected.

   Pin "K" = 22.5KΩ, S1301 on "Alignment Signal"
   = 43K Ω, S1301 on "Off"

2. RF Power Plug P1004 connected.

   Pin "K" = 9.5K Ω, S1301 on "Alignment Signal"
   = 34.5KΩ, S1301 on "Off" and
   = 34.5KΩ, Band switch on band 1, Tune RF tuning from stop-to-stop. Also, turn band switch through 8 bands.

3. Pin "A" = Infinite (open)

4. Pin "B" - Infinite (open)

5. Pin "L" = 0 (short)

6. Pins "D" & "F" = 0 (short)

7. Pins "E" & "R" = 0 (short)

8. Pin "C" = 85 Ω (ohm meter must be polarized positive).

9. Pin "N" = 125K Ω, S1301 on "Alignment"
   = 145K Ω, S1301 on "Off"

10. Pin "P" = infinite, S1302 on "Tune" and "Operate"
    = 125 Ω, S1302 on "Sync"

11. Pins "M" & "J" = 200K Ω (ohm meter must be polarized negative).

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D-C VOLTAGE CHART (for reference only) #1

HFR-1 (MAIN CHASSIS & TUNER)

CIRCUIT CK 601 SYMBOLS AS SHOWN

SYMBOL & TUBE	FUNCTION	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V 1001 417 A	1st RF Amplifier	+118	-	0	+0.43	+0.43	+0.91	+0.43	+0.43	6.3 A-C
V 1002 6AH6	2nd RF Amplifier	0	0	0	6.3 A-C	+154	+145	+1.7	-	-
V 1003 6BA6	3rd RF Amplifier	+0.3	0	0	6.3 A-C	+159	+97	+0.95	-	-
V 1004 6BA6	4th RF Amplifier	+0.2	0	0	6.3 A-C	+155	+107	+0.92	-	-
V 1005 6S4A	1st Mixer	-	+10.5	0	6.3 A-C	0	0	-	-	+187
V 1006 6AH6	Isolation Amplifier	0	+1.72 (I)	0	6.3 A-C	+140	+140	+1.72 (I)	-	-
V 1007 6AB4	HF Oscillator	+112	-	0	+6.3	-1.5 to -2.5 (II)	-1.5 to -2.5 (II)	0	-	-
V 1201 6BA6	1.75 MC IF Amplifier	0 (III)	+1.1	6.3 A-C	0	+177	+103	+1.1	-	-
V 1202 6BE6	1.75 MC Push-Pull IF	0	+1.45 (IV)	6.3 A-C	0	+180	+83	0	-	-
V 1203 6BE6	1.75 MC Push-Pull IF	0	+1.45 (IV)	6.3 A-C	0	+180	+83	0	-	-
V 1204 6AH6	1st Noise Silencer Amp.	0	0	0	6.3 A-C	+170	+142	+1.6	-	-
V 1205 6AH6	2nd Noise Silencer Amp.	0	0	6.3 A-C	0	+170	+143	+1.6	-	-
V 1301 7360	Balanced Modulator	+3.5	+160	0	6.3 A-C	0	+165	+165	+38 (V)	+38 (V)
V 1302 6EW6	RF Align. Output	0	+3.	6.3 A-C	0	+186 (V)	+120 (V)	0	-	-
V 1303 0A2	+150V Voltage Regulator	+150	-	-	0	+150	-	0	-	-
V 1304 12AU7	Meter Sync.	+183	0 (VI)	+9.1 (VII)	0	0	+183	0	+9.1 (VII)	6.3 A-C

(I) J1313 terminated 47 Ω. (II) After Alignment, Band 1 to 8. (III) At Zero signal (IV) R1210 Adjusted for balance. (V) R1309 Adjusted for balance, S1301 on Align. Signal. (VI) S1302 on Tune. (VII) R1320 adjusted for balance.

All voltages are ±10%, and referred to ground.

D-C VOLTAGE CHART #2 (for reference only)

OVEN PROPORTIONAL CONTROL UNIT

CIRCUIT CK 601 SYMBOL A1017 & RT1001, HR1001, HR1002.

SYMBOL & TYPE	FUNCTION	EMITTER		BASE		COLLECTOR			DIODES	
		Room Temp.	Oven Temp	Room Temp.	Oven Temp	Room Temp.	Oven Temp		Cathode	Anode
Q1 2N338	1st D-C Amplifier	+0.75	+0.75	+0.15	+1.3	+6.9	+3.6			
Q2 2N336	2nd D-C Amplifier	+6.0	+3.6	+6.9	+3.6	+6.8	+15.0			
Q3 2N1701	Driver	+5.3	+3.0	+6.0	+3.6	+5.4	+19.0			
Q4 2N1702	Output	+0.32	+0.17	+5.3	+3.0	+5.4	+19.0			
Q5 2N1702	Output	+0.32	+0.17	+5.3	+3.0	+9.2	+24.0			
CR-1 1N1820	Voltage Regulator								+18.0	0
CR-2 1N758	Voltage Regulator								+9.3	0
CR-3 SG22	Emitter Bias								0	0.75
J1	Connector	Pin A	Pin H	Pin C	Pin E	Pin J	Pin B			
		0	+0.15 to +1.3	+9.3	+28.0	+5.4 to +19.0	+9.2 to +24.0			

Room Temperature = 25°C approx. Voltages taken within the first 2 min. after energizing unit.
Oven Temperature = 72°C to 78 C. Initial setting stabilized to ±1/2°C. Voltages then taken.
All voltages are ±10% and referred to ground.

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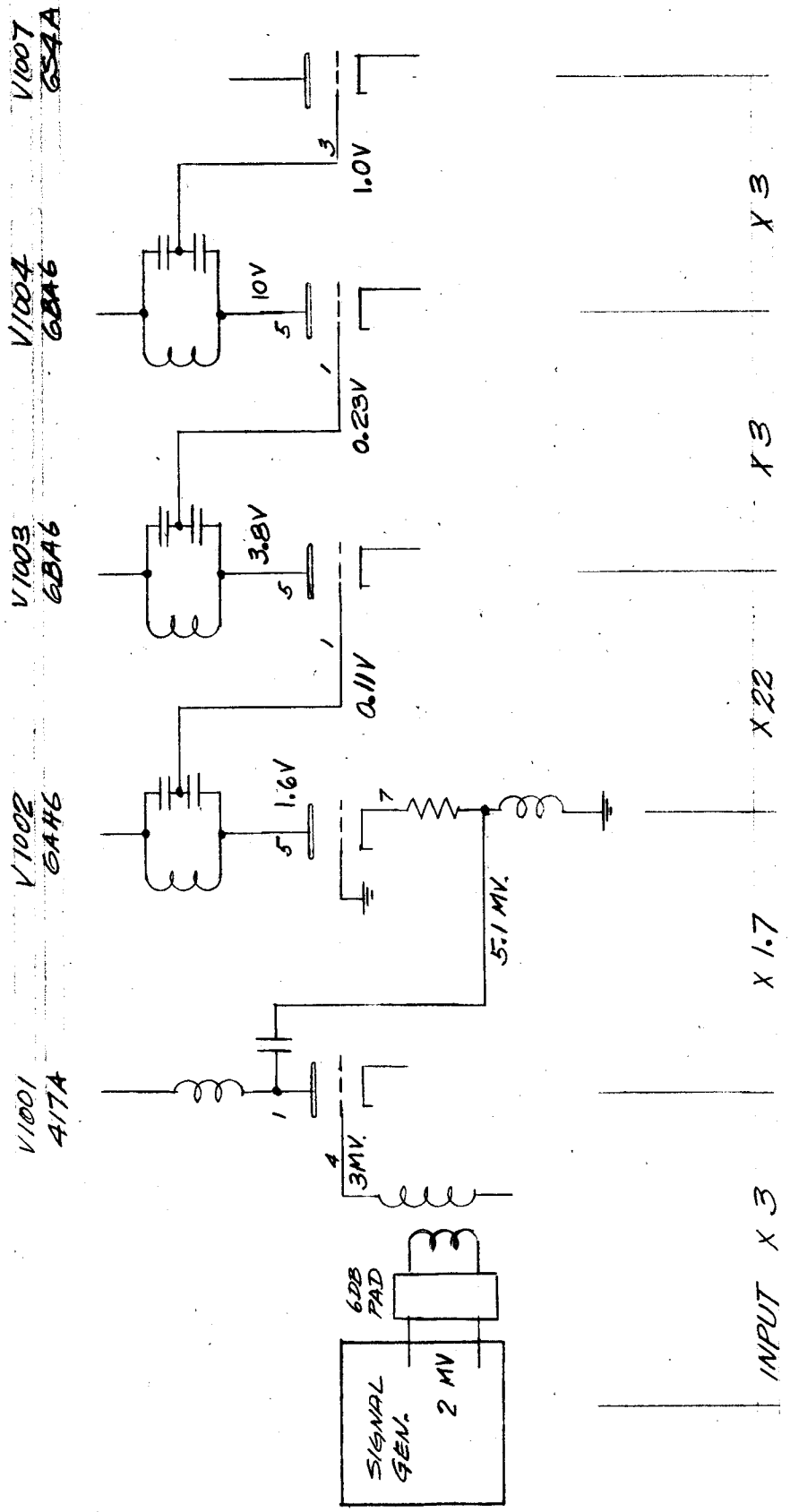
JA COMPILED / CHECKED	**TITLE:** HFR-1 TEST PROCEDURE PART 1	
APPROVED	STAGE GAIN CHART (for reference only)	



TMC SPECIFICATION NO. S-698

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FRD COMPILED | N.P CHECKED

TITLE: HFR-1 TEST PROCEDURE PART 2

APPROVED

A. Test Equipment Required

1. Standard Signal Generator - Measurements Mo. 82 or equivalent.
2. Power Supply - TMC HFP-1.
3. Cable - TMC CA-704
4. VTVM H.P. Mo. 410B, or equivalent.
5. TEKTRONIX Oscilloscope - Mo. 545A with TYPE L plug-in unit, or equiv.
6. RF Voltmeter - Ballantine Mo. 314 or equivalent.
7. 470 ohm 1/2 watt dummy load.

B. The 1.75 MC IF

1. Connect the RF generator, set to 1.75 Mc to pin 3, V-1005. Adjust output as needed.
2. Connect RF voltmeter to pin 9, V-1005.
3. Place a short jumper between the green and white lugs of T-1201.
4. Tune the core of T-1002 for maximum indication on meter.
5. Remove jumper from T-1201.
6. Tune the core of T-1201 for minimum indication on meter. Tighten lock-nut.
7. Disconnect meter from V-1005 and connect it to pin 5, V-1201 (adjust generator for 1 volt on the meter).
8. Connect a short jumper across the green lugs of T-1202.
9. Tune the bottom core of T-1202 for maximum indication on meter. Tighten lock-nut.
10. Remove jumper and tune the top core of T-1202 for minimum indication on meter. Tighten lock-nut.
11. Place a 50 ohm dummy load on J-1312.
12. Disconnect meter from V-1201 and connect it across this dummy load.
13. Tune the core of T-1203 for maximum indication on meter. Tighten lock-nut.
14. Adjust R-1210 for slight dip as indicated on meter. Tighten lock-nut.

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* 15. Check 3 db bandwidth. It should be approximately ±10 Kc at 1.75 Mc. Remove RF voltmeter from J1312.

C. The Noise Silencer

1. Switch VTVM to DC range and connect to pin 1 of V-1204. Adjust R-1230 for maximum negative voltage.

2. Tune L-120] for maximum negative reading. Tighten lock-nut.

3. Tune L-1202 for maximum negative reading. Tighten lock-nut.

4. Connect VTVM to pin 5 of V-1205, switch to AC range. Adjust R1230 for a reading of 10.0 VRMS. Tighten lock-nut.

5. Turn noise silencer on with S-1301.

6. Connect oscilloscope to red lug of L-1203. Tune core for minimum 1.75 Mc signal.

7. Remove oscilloscope from L=1203 and connect it to the yellow lug of T-1203.

8. Modulate input signal with 1 Kc at between 50 and 80 percent.

* 9. Adjust C-1231 until notch appears in output. See Figure "B".

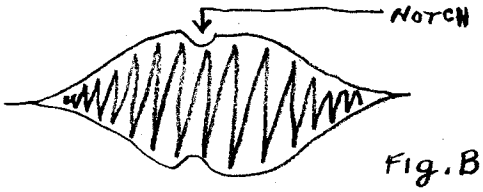

Fig. B

* 10. Adjust C-1231 until notch just disappears.

11. Remove all test equipment.

D. The Signal Generator

1. Adjust RF generator to 1.75 Mc, unmodulated, and connect it to J-1303.

2. Connect RF voltmeter to pin 2, V-1302.

3. Turn S-1301 to "ALIGNMENT SIGNAL" position.

4. Detune T-1301 by turning cores to maximum counter-clockwise position.

5. Tune the top core of T-1301 for maximum indication on the meter. Tighten lock-nut.

6. Tune the bottom core T-1301 for maximum indication on the meter. Tighten lock-nut.

7. Remove RF generator from J-1303 and connect to J-1304.

8. Remove meter from V-1302 and connect it to pin 3, V-1301.

9. Tune RF generator to 2 Mc and adjust output so that the meter indicates approximately 3 volts.

10. Remove meter and connect it to unmarked terminal between green and black lugs of T-1301.

11. Adjust Balance Control, R-1309, for minimum indication on meter, decreasing the scale of the meter as needed. Tighten lock-nut.

E. The Sync. Meter Amplifier

1. Turn S-1302 to the "Tune" position.

2. Adjust R-1320 for zero center. Tighten lock-nut.

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APPROVED		

HFR-1, PART 2 TEST DATA SHEET

SERIAL NO.:_____

MFG. NO.:_____

B-15 The 1.75 Mc IF bandwidth should not be more than 3 db down at 1.75 Mc ±10 Kc. Response 3 db points_____ Mc and _____Mc.

C-9 Waveform on T-1203_____OK

C-10 Final Adjustment of C-1231_____OK

D- Signal Generator section_____OK

E- Sync. Meter Amplifier Section_____OK.

DATE:_____

TESTER:_____

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