TMC SPECIFICATION			NO. S 1233
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TITLE:			

PRODUCTION TEST PROCEDURE

for

Model HFRR-4

RADIO FREQUENCY TUNER

INTRODUCTION

The following procedure is designed to test, sequentially or individually, the following removable circuit board assemblies of RF Tuner Model HFRR-4:

1) 1A2 Power Supply A4663
2) 1A1A1 Counter Input - Standard Module. A4658
3) 1A1A2 Phase Detector A4659
4) 1A1A3 Counter L.O. Offset and Band Divider . . . A4660
5) 1A1A4 Gate Generator and Counting Register . . . A4661
6) 1A6 Sub-Synthesizer A4669
7) 1A8 Local Oscillator-Divider A4671
8) 1A9 1st Mixer-Amplifier and 1st IF Amplifier . . A4672
9) 1A7 Second Mixer and IF. A4670
10) 1A3 Automatic Frequncy Control A4664
11) 1A5 Phase Detector A4668

This procedure assumes:

(1) That the unit is complete except for the cards indicated above.
(2) That the complete 1A10 unit has been aligned and tested on all four bands.
(3) That front panel controls, meters and indicators will be checked during the course of this test procedure.

The test procedure for each individual card tested above indicates additional boards required for the test.

N O T E

1. Use a non-inductive tool for all variable inductor alignment.
2. The following jacks on the rear apron should be terminated with 50 ohm loads at all times:
   a) J-6 1 mc OUTPUT.
   b) J-7 250 kc OUTPUT.
   c) J-8 IF OUTPUT.
   d) J-10 IF MONITOR.
3. Stability of internally generated frequencies will depend on the amount of time power has been applied. This point affects particularly:
   a) The receiver local oscillator in A10.
   b) The 250 kc OUTPUT.
   c) The 1 mc standard in 1A1A1.
4. An asterisk * in the procedure indicates a required entry on test data sheets.
5. Whenever the VOM is used to measure resistance, have AC, -DC, +DC switch in +DC position unless otherwise indicated.

I. HFRR-4 CHASSIS and POWER SUPPLY

A. Equipment Required:
Simpson Model 260 VOM, or equivalent.
Ballantine VTVM, Model 314A or equivalent.

B. Preliminary:
1. Remove power supply card. (1A2)
2. Check front panel controls for free movement, tightness on shafts and position alignment. Check toggle switches for free movement. Check locking operation of TUNE control.
3. Check AC line fuses and spare fuse carrier (1.2A).
4. Insure that all removable circuit boards are out.
5. Set front panel controls to the following positions:

FUNCTION:	LOCAL
COUNTER MODE:	REC
BANDSWITCH:	2-4 MCS
TUNE:	MOVE CCW UNTIL STOPS ENGAGE.
RF GAIN:	MAXIMUM CCW
SILENCER:	OFF
METER FUNCTION:	LOW
LOCK:	FULLY CCW (OFF)
INPUT ATTENUATOR: . . .	DOWN (OFF)
FINE TUNE:	MID POSITION
POWER SWITCH:	OFF

6. Insert 1A2 Power supply card A4663 into A4A1 riser and plug into A2 chassis slot.

7. With a Simpson Model 260 VOM measure between:
* a) TP-3 (+) and TP-2 (-). It should be about 340 ohms.
* b) TP-6 (+) and TP-5 (-). It should be about 700 ohms.
* c) TP-9 (+) and TP-8 (-). It should be from about 4.7K ohms to 5.5K ohms. Without disturbing the test leads, move ohmmeter switch to -DC. The reading should be about 10K ohms. Return switch to +DC.
* d) TP-11 (+) to TP-8 (-). It should be about 200K ohms. Reverse the ohmmeter switch to -DC. The reading should be about 200K ohms. Return meter switch to +DC.
8. Remove ohmmeter, A2 card with extender.
9. Connect power cord to AC voltage source.

C. 1A2 POWER SUPPLY A4663 GND: TP-2
Other board required: NONE TP-5
TP-8

1. Turn power OFF.
2. Place 1A2 Power supply card into A4A1 riser card, insert in proper chassis slot.
3. Turn controls R4, R13 and R22 maximum CCW.
4. Turn Power ON.
5. Connect Simpson 260 VOM on + 50V DC range between TP-3 and TP-2.

I. HFRR-4 CHASSIS and POWER SUPPLY (cont.)

* 6. Adjust R-8 for +24V DC.
7. Connect Simpson 260 VOM on +10V DC range from TP-6 to TP-5.
* 8. Adjust R-17 for +5V. **If +5V cannot be obtained, leave R-17 at about mid-range.**
9. Connect Simpson 260 VOM on -50 DC range from TP-9 to TP-8.
* 10. Adjust R-26 for -24V DC.
11. Turn power OFF.
12. Connect Simpson 260 VOM on 10 amp range to TP-3 (+) and TP-2 (-). (meter SW in +DC)
13. Turn power ON.
* 14. Adjust R-4 for 750 ma.
15. Turn power ON.
16. Connect VOM on 10 amp scale to TP-6 (+) and TP-5 (-). Have VOM switch in +DC position.
* 17. Turn power ON. Adjust R-13 for 1.5 amps.
18. Turn power OFF.
19. Connect VOM on 100 ma. DC range, meter switch in -DC position, between TP-9 (+ lead) and TP-8 (- lead). Turn power ON.
* 20. Adjustr R-22 for 65 ma.
21. Turn power OFF. Remove VOM. Return VOM switch to +DC position.
22. Turn power ON. Repeat steps 5 through 21. All required voltage and currents should now be obtained.
23. Output Ripple Voltage check:
    a. On the VTVM select the proper scale (1 mv full scale without probe.)
    b. Connect test leads from VTVM to the listed test points and their associated grounds. Simultaneously connect the Simpson between chassis ground and the same test points as per current limiting adjustments above to serve as load for the power supplies.

TEST POINT	GROUND
TP-3	TP-2
TP-6	TP-5
TP-9	TP-8

* c. The ripple voltage should be 1m VRMs or less.
24. Turn power OFF. Remove test equipment.
25. Place A2 power supply card directly into its proper chassis slot.

II COUNTER INPUT STANDARD MODULE 1A1A1 (A4658)

A. Other cards required: 1A-2 Power Supply, 1A1 Counter Mother.

B. Equipment Required:
1. Simpson VOM, Model 260 or equivalent.
2. Signal Generator, HP606 or equivalent.
3. Oscilloscope, Tektronix Model 543A or equivalent.
4. Counter HP 5244L or equivalent.
5. 50 ohm resistance non-ductive dummy load.

C. Preliminary:
1. Insert the 1A1A1 card on extender card 1A4A3 and insert in the 1A1A1 chassis socket.
2. Counter Mode switch to REC.
3. Function switch to LOCAL.
4. Bandswitch to 2-4 MCS.
5. Connect Vertical Signal out of scope to Singal Input of Counter.
6. Turn Power to ON position.
* 7. Using the Simpson VOM, check the following DC input voltages:
TP-5 - - - - - - - - - - - - - - +5 VDC
Pin 2 - - - - - - - - - - - - - - +5 VDC
Pin 26 - - - - - - - - - - - - - - +24 VDC
* 8. Using the Simpson VOM, check the followng ground switching (Meter should be used on RX1 scale and connected between chassis ground and those points being checked.)
a. Rotate Counter Mode Switch through all positions.

	LOW	HIGH	REC
Pin 18	0 ohms	0 ohms	infinity
Pin 22	0 ohms	infinity	infinity

LEAVE SWITCH IN REC POSITION.

b. Rotate Function Switch through all positions.

	LOCAL	SYN	AFC
Pin 15	0 ohms	infinity	0 ohms

LEAVE SWITCH IN LOCAL POSITION.

c. Disconnect Simpson meter.

D. TEST:
* 1. Connect scope to TP-4. A 1 mcs sine wave at 4-6V P-P should be displayed.
2. Connect scope probe to pin 17.

D. TEST (cont.)

3. Place extender card 1A4A1 in the 1A-8 socket. Connect T-connector to RF output of Signal Generator, and connect 50 ohms load and output cable to T- connector. Connect Signal Generator output cable to pin 2 of this extender card, ground to pin 1 (cable shield). Set the signal generator to approximately 21 mcs. at a level of 500 millivolts.
4. Readjust Signal Generator frequency until the Scope and Counter indicate a frequency of 21.0000 mcs. at pin 17.
* 5. Connect Scope probe to TP-2. A 21.0000 mcs. signal at 2.8 - 4.2 VP-P should be displayed on the Scope and Counter.
* 6. Connect Scope probe to TP-3. A 1.0500 mcs. signal at 3-4 VP-P should be displayed.
7. Disconnect Scope probe and Signal Generator. Disconnect 50 ohm load on signal generator.
8. Connect Signal Generator output to counter Mode Input jack on front panel of HFRR. Set Signal Generator for 100 KC at a level of 100 millivolts.
9. Place the Counter Mode switch in the High position.
* 10. Connect Scope probe to TP-1. Tune Signal Generator so that the frequency at TP-1 is exactly 100 KC, (approximately 5V P-P).
* 11. Connect Scope probe to TP-2. A 100KC signal at 2.8-4.2 VP-P should be displayed on Scope and Counter.
* 12. Connect Scope probe to TP-3. A 5KC signal should be displayed at 3-4 volts P-P on Scope and Counter.
13. Connect Scope probe to TP-1 and tune generator to 35.0000 mcs. (100 millivolts output from generator).
* 14. Connect Scope to TP-2. A 35.0000 mcs signal at 2.8 - 4.2 VP-P should be displayed on Scope and Counter.
* 15. Connect Scope probe to TP-3, A 1.7500 mcs signal at 3-4V P-P should be displayed.
* 16. Put the Counter Mode switch in the Low Position A 17.5000 mcs signal at 3-4V P-P should now be displayed at TP-3.

E. COMPLETION

1. Remove test equipment.
2. Turn Power to OFF position.
3. Remove extender card and 1A1A1 card from socket.
4. Place 1A1A1 card in its socket if an entire system is to be tested.

III. Phase Detector Driver 1A1A2 (A4659)

A. Other cards required: 1A1, 1A2

B. Equipment required:
1. Simpson VOM, Model 260 or equivalent.
2. 2 Signal Generators, HP606 or equivalent.
3. Oscilloscope, Tektronix Model 543A with high gain preamplifier L-type plug-in or equivalent.
4. Counter HP-5244L or equivalent.
5. 50 ohm non-inductive load.

C. Preliminary
1. Insert 1A1A2 card on extender card 1A4A3 and insert in the 1A1A2 chassis socket.
2. Function switch in Local position.
3. Band switch in 2-4 mcs position.
4. Connect Vertical Signal Output of scope to Signal Input of Counter.
5. Turn Power switch to On position.
* 6. Using the Simpson VOM, check the following DC input voltages:

TP-1	+5 VDC
TP-7	+24 VDC

* 7. Using the Simpson VOM, check the following ground switching. (Meter should be used on RX1 scale and connected between chassis ground and those points being checked.)

a. Rotate Band switch through all positions.

Band switch positions	Pin A	Pin B	Pin C	Pin D
2-4	0 ohms	infinity	infinity	infinity
4-8	infinity	infinity	0 ohms	infinity
8-16	infinity	infinity	infinity	0 ohms
16-32	infinity	0 ohms	infinity	infinity
Auto	infinity	infinity	infinity	infinity

b. Rotate Mode switch through all positions.

Mode switch position	Pin S	Pin K
Local	infinity	0 ohms
Syn	0 ohms	infinity
AFC	infinity	0 ohms

c. Disconnect Simpson meter.

D. Test

* 1. Connect Scope probe to TP-6. A 1 mcs signal at a level of 6-8V P-P should be displayed with the Mode switch in the Local and AFC positions. With Mode switch in Syn. position, there should be no signal at TP-6.

2. Connect Signal Generator output to 1J6, Ext 1 mcs In, on the rear panel of HFRR. Set the Signal Generator to 1 mcs at a level of .5V RMS.

* 3. A 1 mcs signal at a level of 6-8V P-P should now be displayed at TP-6 with the Mode switch in the Syn. position.

* 4. Connect Scope probe to pin F. A 1 mcs signal at 5-6V P-P should be displayed.

* 5. Repeat step #4 for pin 10.

* 6. Repeat step #4 for pin P.

7. Disconnect Signal Generator, Scope probe and place Mode switch in Syn position.

8. Insert extender card A4A1 in 1A8 socket.

9. Connect T-connector to the RF output of the Signal Generator and connect 50 ohm load and RF output cable to the T-connector.

10. Connect the Signal Generator output cable to pin 2 on the A4A1 extender card and the cable shield to pin 1.

11. Set Signal Generator for approximately 29 mcs at a level of .5V RMS.

* 12. Connect Scope probe to TP-2. Readjust Signal Generator frequency slightly to give a frequency of precisely 362.5 KC at TP-2. The signal level should be 3-4V P-P (square wave).

* 13. Connect Scope probe to TP-3. Negative spikes of 362.5 KC at a level of 5V P-P should be displayed.

* 14. Connect Scope probe to pin W. A 362.5 KC signal at .6 - .8V P-P should be displayed.

15. Connect the second Signal Generator output to 1J2, Syn In on rear panel of HFRR. Set Signal Generator for approximately 2.4 mcs at a level of 1V RMS.

* 16. Connect Scope probe to TP-8 and readjust Signal Generator frequency to give precisely 2.40000 mcs at TP-8. The level of the signal at TP-8 should be approximately 4V P-P.

* 17. Connect Scope probe to TP-9. Rotate the Band switch through the following position. The related frequencies should be displayed at a level of approximately 4V P-P.

Band switch position	TP-9 Frequency
2-4	2.40000 mcs
4-8	1.20000 mcs
8-16	.6000 mcs
16-32	.30000 mcs

* 18. With the Band switch in the 16-32 mcs position and both Signal Generators still connected, connect Scope probe to TP-11. A 300 KC signal should be displayed at 150-250 mV P-P.

* 19. Slowly tune the Signal Generator (connected to pin 2 on the extender card inserted in the 1A8 socket) lower in frequency until the signal at TP-11 drops sharply in amplitude. Observe the frequency that the Signal Generator is now set for. It should be approximately 24 mcs.

E. Completion
1. Turn Power switch to Off position.
2. Remove test equipment.
3. Remove 1A1A2 and extender card 1A4A3 from socket. Return 1A1A2 to chassis socket.
4. Remove extender card from 1A8 socket.

IV. Local Oscillator Offset and Band Divider 1A1A3 (A4660)

A. Other cards required: 1A2, 1A1, 1A1A1, 1A1A2 and 1A1A4

B. Equipment required:
1. Simpson VOM, Model 260 or equivalent.
2. Two Signal Generators, HP606 or equivalent.
3. Oscilloscope, Tektronix Model 543A.
4. 50 ohm, non-inductive load.

C. Preliminary
1. Insert the 1A1A3 card on the 1A4A2 extender card and insert in the 1A1A3 chassis socket.
2. Counter Mode switch to Rec.
3. Function switch to Local.
4. Band Switch 2-4 mcs.
5. Turn Power switch to On position.
* 6. Using the Simpson VOM meter, check TP-5 for the DC input voltage +5V DC.
* 7. Using the Simpson VOM, check the following ground switching. (Meter should be used on RX1 scale, and connected between chassis ground and those pins being checked.)

a. Rotate the Bandswitch through the specified positions:

Band switch position	Pin P	Pin 13	Pin 12	Pin 11
2-4	0 ohms	infinity	infinity	infinity
4-8	infinity	0 ohms	infinity	infinity
8-16	infinity	infinity	0 ohms	infinity
16-32	infinity	infinity	infinity	0 ohms

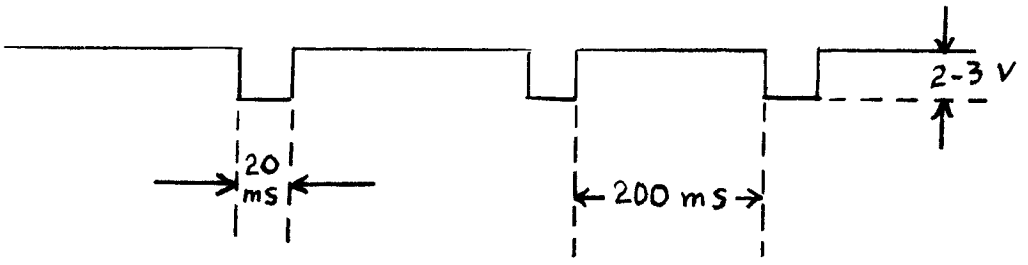
b. Rotate the Counter Mode switch through all positions.

Counter Mode	Pin 9
Low	0 ohms
High	0 ohms
Rec.	infinity

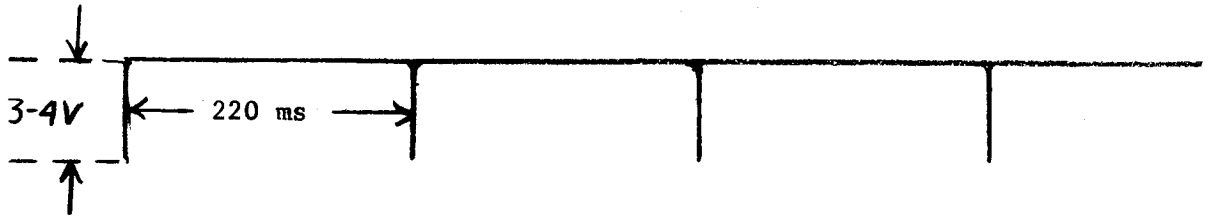
c. Disconnect Simpson meter. Leave Counter Mode switch in Rec. position and Band switch in 2-4 mcs position.

D. Test

1. Connect T-connector to RF output of Signal Generator and connect 50 ohm load and output cable to the T-connector.
2. Place extender card 1A4A1 in the 1A8 socket of the HFRR and connect Signal Generator output cable to pin 2 of this extender card and cable shield to pin 1 of extender card
3. Set the Signal Generator to approximately 21 mcs at a level of 500 mV.
* 4. Connect Scope probe to TP-2 on the 1A1A3 card. A square wave at a level of 3-4 V P-P should be displayed.
* 5. Connect Scope probe to TP-1. The following wave form should be observed at a level of 3-4V P-P.



* 6. Connect Scope probe to pin M. The following waveform at 3-4V P-P should be observed:



* 7. Connect Scope probe to TP-4. Rotate the Band switch (2-4, 4-8, 8-16, and 16-32 positions). An output signal at approximately 3V P-P should be displayed in each position.

* 8. Put Band switch in the 2-4 Mc position. Connect scope probe to TP-2 and retune Signal Generator for 1.050000 Mc. The HFRR counter should display 02.0000 Mc.

* 9. Place the Band switch in the 4-8 position. The HFRR counter should display 04.000 Mc.

* 10. Place the Band switch in the 8-16 Mc position. The HFRR counter should display 08.0000 Mc.

* 11. Place the band switch in the 16-32 Mc position. The HFRR counter should display 16.0000 Mc.

12. Connect a second Signal Generator at a freq. of 100 Kc and an output of 0.1V RMS to the Counter Mode Input Jack on the front panel of the HFRR.

* 13. Turn counter mode switch to HIGH position. The HFRR Counter should display 00.1000 Mc.

E. Completion

1. Remove test equipment.
2. Turn Power Switch to Off position.
3. Remove extender card and 1A1A3 from socket.
4. Place 1A1A3 card into its socket if an entire system is to be tested.

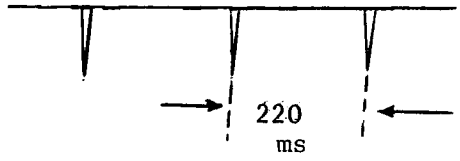
V GATE GENERATOR and COUNTING REGISTER 1A1A4(A4661)

A. Other cards required 1A2, 1A1, 1A1A1, 1A1A2.

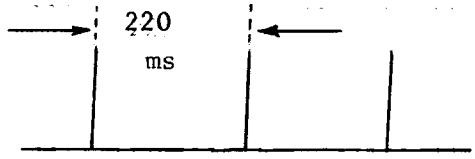
B. Equipment required:
1. Simpson VOM, Model 260 or equivalent.
2. Signal Generator, HP606 or equivalent.
3. Oscilloscope, Tektronix Model 543A, or equivalent.
4. Counter, HP5244 L or equivalent.
5. 50 OHM non-inductive load.

C. Preliminary;
1. Insert 1A1A4 in the 1A4A2 and 1A4A3 extender cards and insert in the 1A1A4 socket of the HFRR.
2. Counter Mode switch to Rec.
3. Function switch to Local.
4. Bandswitch 2-4 mcs. position.
5. Connect Vertical Signal Output of Scope to Signal Input of counter.
6. Turn Power switch to ON position.
* 7. Using the Simpson VOM, check TP-6 for DC input voltage, +5V DC, remove Simpson meter.

D. Test:
* 1. Connect Scope probe to TP-1. A 1 mcs signal at 1.5- 2VP-P should be displayed.
2. Connect Signal Generator output cable to TP-5 and cable shield to TP-2.
3. Set Signal Generator to approximately 300 KC at a level of .5V RMS.
4. Connect Scope probe to TP-5, and retune Signal Generator for precisely 300.000 KCs as displayed on counter.
* 5. Connect Scope probe to TP-3. Observe the following wave form at a level of 3-4V P-P.



* 6. Connect Scope probe to TP-4. Observe the following wave form at a level of 3-4V P-P.



V GATE GENERATOR and COUNTING REGISTER 1A1A4 (A4661) (cont.)

* 7. Counter readout on front panel of HFRR should display 06.3600.
8. Connect Scope probe to TP-5. Retune Signal Generator for a frequency of 94.335 KCs as displayed on external counter.
* 9. Counter readout on front panel of HFRR should be 02.0000 mcs.
* 10. Very slowly tune the Signal Generator while monitoring the front panel of the HFRR. Begin by monitoring the 100 cps digit to insure it reads out digits 0-9 as the Generator is tuned. Check sequentially the 1 kcs, 10 kcs, 100 kcs, and 1 mcs digits to insure that they readout digits 0-9 as the Generator is tuned. Check the 10 mcs digit to insure that it reads out digits 0-3 as the Generator is tuned.
11. Tune the Signal Generator to display 32.0000 mcs on the counter on the front panel of the HFRR.
* 12. The external counter should now be reading 1.509400 mcs.

E. COMPLETION:
1. Turn Power switch to OFF position.
2. Remove test equipment.
3. Remove 1A1A4 and extender cards from chassis socket.

VI 1A6 SUB-SYNTHESIZER A4669 GND: TP-20, 2, 9

A. Other boards required: A2, A7 (for loading)

B. Equipment required:
1. Simpson 260 VOM, or equivalent.
2. Tektronix Model 543A scope with L head, or equivalent.
3. H.P. 5244L Counter, or equivalent.
4. Low capacity alignment tool.

C. Test and alignment:
1. Turn power OFF.
2. Place A6 card into A4A1 extender, and place assembly in proper chassis slot.
3. Insert A7 card in proper chassis slot.
4. Turn power ON.
* 5. Connect VOM on +30V range to TP-8. Voltage should be +24V.
* 6. Connect scope and counter to TP-1. A 1 MC signal, about 8V P-P, should be observed.
* 7. With bandswitch in 2-4 mc position connect VOM to TP-3. The voltage should be about +22 V.DC, change the bandswitch to 4-8, 8-16, 16-32 and AUTO positions. The voltage at TP-3 should drop to OV. Return the Bandswitch to 2-4 mc position.
* 8. Connect the VOM to TP-4. With the Bandswitch in 4-8 position the reading should be about +22. In all other positions of the bandswitch the reading should be OV.
* 9. Connect the VOM to TP-5. With the bandswitch in 8-16 position, the reading should be about +22V DC. In all other positions of the bandswitch the reading should be OV.
* 10. Connect the VOM to TP-6. With the bandswitch in 16-32 position, the reading should be about +22V DC. In all other positions, the voltage should be OV.
11. Return the bandswitch to 2-4 position.
* 12. Connect the scope and counter to TP-7. A square wave at 500kc, amplitude about 2.5V P-P, should be observed.
* 13. Connect the scope and counter to TP-13. Adjust C-91 for maximum 7mc signal. Amplitude 4-5V P-P.
* 14. Place bandswitch in 4-8 position. Connect scope and counter to TP-12. Signal should approximate a rectangular 3mc signal, from 4-5V P-P.
* 15. Place bandswitch to 8-16 position. Connect scope and counter to TP-11. Adjust C32 for maximum signal. Signal should begin to approximate a rectangular wave at 5.5 mc, 4-5V P-P.
* 16. Place bandswitch to 16-32 position. Connect scope and counter to TP-10. Adjust C-9 for maximum 10.5 mc signal, 4-5V P-P.
* 17. Connect scope and counter to TP-19. Adjust the indicated controls for the desired voltage on the appropriate bandswitch position, as indicated below:

VI 1A6 SUB-SYNTHESIZER A4669 (cont.)

BANDSWITCH	CONTROL	FREQUENCY	AMPLITUDE
2-4	R-110	875 KC	2V P-P
4-8	R-79	1.5 MC	2V P-P
8-4	R-45	2.75 MC	2V P-P
16-32	R-20	5.25 MC	1.5V P-P

18. Turn power OFF.

19. Disconnect test equipment. Remove A7 card. Place A6 card directly into proper chassis slot if an entire HFRR-4 unit is being aligned.

VLA 1A8 LOCAL OSCILLATOR DIVIDER A4671

GND: TP-2
TP-6
TP-9

A. Other Cards Required: A2, A9 (for loading), counter cards 1A1A1, 1A1A2, 1A1A3, 1A1A4.

B. EQUIPMENT REQUIRED:
   a) Simpson 260 VOM, or equivalent.
   b) Millivac 28B RF voltmeter, or equivalent.
   c) Tektronix 543A scope with L head, or equivalent.
   d) HP5244L Counter or equivalent.

C. Test and alignment:
   1. Turn power OFF. Insert A9 card into proper chassis slot.
   * 2. With A8 card OUT, measure the resistances as indicated below:
      a) TP-3 to ground: about 2200 OHMS.
      b) TP-17 to ground: about 1400 OHMS.
   3. Insert A8 card into A4A1 riser and plug assembly into proper chassis slot.
   * 4. Turn power ON. With VOM on + DC range, measure the following voltages:
      a) TP-3: +24V DC.
      b) TP-17: +5V DC.
   5. Turn power OFF.
   6. Insert counter cards 1A1A1, 1A1A2, 1A1A3, 1A1A4. (tested cards)
   7. Turn power ON.
   * 8. The front panel receiver counter should read the frequency to which the receiver is ostensibly tuned.
   * 9. With MV 28B RF VTVM, measure the voltage at TP-1. (TP-9 GND). The voltage should be between .5 and 1.5 V RMS.
   * 10. Connect scope and counter to TP-7, (TP-6 GND). Place bandswitch to 2-4 position. Adjust receiver TUNE control for a reading of 02.0000 on receiver counter. At TP-7 a signal at 2.625 MC, 1.5V P-P, should be observed.
   * 11. Place bandswitch to 4-8 position. Connect scope and Counter to TP-10, (TP-6 GND). Adjust TUNE control for a reading of 04.0000 on receiver counter. At TP-10 a frequency of 5.25 mcs, 1.5V P-P, should be observed.
   * 12. Place bandswitch to 8-16 position. Connect scope and counter to TP-16, (TP-6 GND). Adjust receiver TUNE control for a reading of 08.0000 on receiver counter. At TP-16 a frequency of 10.5 mcs, 1.5V P-P, should be observed.
   * 13. Place bandswitch to 16-32 position. Adjust receiver TUNE control for a reading of 16.0000 on receiver counter. Connect scope and counter to TP-20, (TP-9 GND). A signal at 21.0000 mcs, 1.5V P-P, should be observed.
   14. Turn power OFF. Remove 1A1A1 counter card. Insert 1A1A1 card into 1A4A3 riser card. Insert assembly into 1A1A1 chassis slot. Turn power ON.
   * 15. Connect H.P 5244L counter, or equivalent, direct to TP-2 of 1A1A1, (TP-6 GND). Place bandswitch to 2-4 mc position. Adjust receiver TUNE control for reading of 02.0000 on receiver counter. The external counter should read 21.0000 mcs.

16. Move the receiver TUNE control CW so that receiver counter changes from 02.0000 to 04.0000. The external counter should change from 21.0000 mc to 37.0000 mcs.

N O T E

At any time, the external counter should read: (RCVR COUNTER X 8) +5 mcs. Without disturbing the final settings at 04.000 and 37.0000 mcs, remove the external counter and connect the MV 28B RF VTVM to TP-2 of 1A1A1 Card. Adjust the receiver TUNE control CCW from 04.0000 to 02.000. The RF voltage at TP-2 should remain at approximately 1.5V RMS.

17. Remove VTVM. Turn power OFF. Insert 1A1A1 card directly into its chassis slot. Remove A8 card from extender and insert into its proper chassis slot if an entire HFRR-4 unit is being aligned.

VIII A9 FIRST MIXER-AMPLIFIER and FIRST IF AMPLIFIER. A4672 GND: TP-2, TP-7, TP-12

A. Other Boards Required:
A2, A7, A8, 1A1A1, 1A1A2, 1A1A3, 1A1A4.

B. Equipment Required:

1. Simpson Model 260 VOM, or equivalent.
2. Tektronixs Model 543A scope with L head, or equivalent.
3. H.P. 5244L Counter, or equivalent.
4. Alignment screwdriver.
5. Non-inductive alignment tool.
6. Measurements Corp Model 82 Signal Generator, or equivalent.
7. Ballantine model 314 or equivalent.

C. Test and alignment:

1. Turn power OFF.
2. Install A2, A7, A8, 1A1A1, 1A1A2, 1A1A3, 1A1A4 cards (tested) in proper chassis slots.
* 3. With A9 card OUT, check resistance from TP-1 to ground. ON R x 10,000 scale it should be infinite.
4. Place A9 card into A4A1 extender and plug assembly into A9 chassis slot.
5. Turn power ON.
* 6. With VOM, check DC voltage at TP-1, (TP-7 GND). It should be +24 VDC.
* 7. Place bandswitch to 2-4 position. Connect scope and counter to TP-2. Adjust receiver TUNE control for 03.0000 mcs on receiver counter. Adjust R-9 for maximum 3.625 mc signal, about 1.5V P-P.
* 8. Place bandswitch to 4-8 position. Connect scope and counter to TP-4. Adjust receiver TUNE control for 06.0000 mcs on receiver counter. Adjust R-33 for maximum 7.25 mc signal, about 1.5V P-P.
* 9. Place bandswitch to 8-16 position. Connect scope and counter to TP-10. Adjust receiver TUNE control for 12.0000 mc on receiver counter. Adjust R-82 for maximum 14.5 mc signal, about 1.5V P-P.
* 10. Place bandswitch to 16-32 position. Connect scope and counter to TP-8 Adjust receiver TUNE control for 24.0000 mcs on receiver counter. Adjust R-58 for maximum 29 mc signal, about 1.0V P-P.
11. Place bandswitch to 2-4 position. Adjust receiver TUNE control for 03.0000mcs on receiver counter.
12. Turn power OFF. Remove A7 card. Connect scope and counter to TP-1 of A-7 card. Re-insert A=7 card. Turn power ON.
13. Connect signal generator at 3.000 mhz, 300 uv, to receiver antenna jack.
14. Adjust L2 & L3 for max 625.0 khz signal at TP-1 of A-7 using R-24 to keep signal level below 100 mv P-P.
15. Set signal generator to 3.000 mcs, 300 uv. The signal at TP-1 of A-7 should be 625 KC. Adjust R-24 for 84 mv P-P/30 mv rms at TP-1 of A-7.
16. Set bandswitch to 4-8. Adjust receiver TUNE control for 06.0000 mcs on receiver counter.
17. Set the signal generator to 6.000 mcs, 300 uv. Adjust L-4 & L-5 for max signal at TP-1 of A-7. Use R-47 as necessary to keep signal amplitude below 100 mv P-P.

VIII A9 (cont)

* 18. Set signal generator to 6.000 mcs, 300 uv. The signal at TP-1 of A-7 should be 1.25 mcs. Adjust R-47 for 84 mv P-P/30mv rms at TP-1 of A-7.

19. Set the bandswitch to 8-16. Adjust the receiver TUNE control for 12.0000 mcs on receiver counter. Set signal generator to 12.000 mhz, 300 uv.

20. Adjust L8 & L9 for maximum 2.500 mhz signal at TP-1 of A-7. Use R-96 to keep signal below 100 mv P-P.

* 21. Set the signal generator to 12.000 mcs, 300 uv. Adjust R-96 for 84 mv P-P/30 mv rms at TP-1 of A-7.

22. Set the bandswitch to 16-32 position. Adjust eh receiver TUNE control for 24.0000 mcs on receiver counter. Set the singal generator to 24.000 mhz, 300 uv.

23. Adjust L6 & L7 for maximum 5.00 mhz. Use R-72 to prevent the signal from exceeding 100 mv P-P.

* 24. Set the signal generator to 24.000 mcs, 300 uv. The signal at TP-1 of A-7 should be 5.000 mcs. Adjust R-72 for 84 mv P-P.

25. Turn power OFF. Remove test equipment. Remove A-7. Remove A-9 card from extender and insert A-9 in proper chassis slot.

IX A7 SECOND MIXER AND IF A4670

GND: TP-11 TP-7
TP-13 TP-18
TP-24

A. Other Boards Required:
A2, A6, A8, A9, 1A1A1, 1A1A2, 1A1A3, 1A1A4;
Card A-3 is used for part of the procedure.

B. Equipment Required:
1. Simpson Model 260 VOM, or equivalent.
2. Tektronix 543A scope with L head, or equivalent.
3. H.P. 5244L counter, or equivalent.
4. Alignment screwdriver.
5. Measurements Model 82 signal generator, or equivalent.
6. Ballantine model 314 or equivalent.

C. Test and alignment:

IMPORTANT

Very slowly changing AGC voltages are present. When the procedure indicates an unhurried adjustment, WAIT until the AGC Voltage and/or signal has stabilized.

1. Turn power OFF. Place SILENCER switch OFF. Place RF GAIN control fully CCW (AGC ON).
* 2. With A-7 card OUT, measure the resistance from TP-5 to ground. It should be approximately 800 OHMS; measure resistance TP-22 to ground. It should be about 5000 OHMS.
3. Insert A-7 card into A4A1 extender and plug assembly into proper chassis slot.
4. Insert cards A2, A6, A8, A9, 1A1A1, 1A1A2, 1A1A3, 1A1A4.
5. Turn power ON.
* 6. Measure, with VOM, the DC voltages indicated below:
a) TP-5: +24 VDC.
b) TP-22: -24 VDC.
7. Place bandswitch to 2-4 position. Adjust receiver TUNE control for 03.0000 mcs on receiver counter.
* 8. Connect scope and counter to TP-2. Adjust R-4 for maximum signal. 875 KC, 2 V P-P.
9. Connect a signal generator to the antenna input at 3.000 mcs, 500 uv.
10. Connect the VOM on -10V DC range to TP-20. Adjust R-106 VERY SLOWLY until the voltage falls to zero on -2.5V scale. Remove VOM.
* 11. Connect scope and counter to TP-1. Adjust the signal generator for a 625 KC signal at TP-1. The amplitude should be about 100 MV P-P.
* 12. Reduce the signal generator to 300 uv; this should result in about 84 mv P-P signal at TP-1. Record the amplitude at TP-1.
* 13. Connect scope and counter to TP-3. Readjust R-4 for maximum 250 KC signal, about 50 mv P-P.
* 14. Connect scope and counter to TP-4. The signal should be 250 KC, about 35 mv P-P.
* 15. Connect Ballantine to TP-6. Adjust R40 for minimum, adjust R33 for 30 mv RMS. Adjust R40 for 100 mv RMS.

* 16. Throw front panel attenuator switch up and down. In the UP position, the signal at TP-6 should drop 20db. Leave the attenuator switch DOWN (OUT).

* 17. Adjust the signal generator output for 250 KC, 100 mv RMS, at TP-6. The 100 MV signal should be obtained with 500 uv or less from the signal generator.

* 18. Slowly, adjust R-106, watching for the AGC action to "grab" the 250 KC signal at TP-6, adjust level for 30 mv rms.

NOTE

The 250 KC signal at TP-6 should remain within 4db of 30mv RMS (84 mv P-P) when the signal generator output is changed from 500 uv to 30 mv. First, be assured that the signal at TP-6 is 250 KC, 84 mv P-P with 500 uv output from generator. Then increase signal generator output to 30 mv.

Wait for conditions to stabilize, then record the amplitude at TP-6.

EXAMPLE:

SIGNAL GENERATOR	TP-6
500 uv	30 mv (RMS) 84 mv P-P
30 mv	32 mv (RMS) 90 mv P-P

The db change in this case is + .9db. The maximum signal at TP-6 with 30 mv from the signal generator should be 133 mv P-P, (47 mv RMS).

19. Return the signal generator to 500 uv. Turn power OFF. Insert A3 card. Turn power ON.

* 20. Connect scope and counter to TP-6 of A-7. When signal is stabilized at 84 mv P-P at TP-6, turn RF Gain control maximum clockwise. The signal at TP-6 should be at least ten times 84 mv P-P, or 840 mv P-P. Return the RF GAIN control to maximum CCW position. (AGC)

* 21. Connect scope and counter to TP-15 of A-7. The signal should be 250 KC, about 84 mv P-P.

* 22. Connect the scope and counter to TP-16 of A-7. The signal should be 250 KC, about 200 mv P-P.

23. Turn power OFF. Remove A-3 card. Turn power ON.

24. With the signal generator set at 3.000 mc, 30 mv, connect the socpe and counter to TP-6. Adjust the generator for a 250 KC signal at TP-6.

* 25. Under the conditions of step 24, check, with a VOM, the DC voltage at TP-23: It should be -24V DC.

* 26. Slowly adjust R-130 until the voltage at TP-23 falls to zero. (CRITICAL ADJUSTMENT)

* 27. Decrease the signal generator output to zero. Then slowly increase the generator output in small increments, watching the signal on the scope at TP-6 for AGC to "catch up". When the signal level from the generator reaches about 30 mv, the DC voltage at TP-23 should drop to zero.

* 28. Remove VOM. Set meter function switch to RF HIGH. Set the signal generator for 3.0000 mcs, 300 mv. Then adjust R-131 for full scale reading at "HI" on RF/AFC level meter.

29. Turn Power OFF. Remove test equipment. Remove 1A7 from extender Riser and insert 1A7 in proper chassis slot.

X A3 AUTOMATIC FREQUENCY CONTROL A4664

GND: TP-13
TP-14
TP-15

A. Other Boards Required:
A2, A6, A7, A8, A9, 1A1A1, 1A1A3, 1A1A4.

B. Equipment Required:
1. Simpson Model 260 VOM, or equivalent.
2. Tektronix 543A scope with L head, or equivalent.
3. H. P. 5244L counter, or equivalent.
4. Alignment screwdriver.
5. Measurement Model 82 signal generator, or equivalent.

C. Test and Alignment:
1. Turn power OFF.
2. Insert A2, A6, A7, A8, A9, 1A1A1, 1A1A2, 1A1A3, 1A1A4.
* 3. With A3 card out, check following resistances:
a) TP-1 + to TP-13-: 500 to 700 OHMS.
b) TP-20 + to TP-13-: about 800 OHMS.
4. Insert A3 card into A4A1 extender and plug into A3 chassis slot.
5. Turn power ON. Set FUNCTION switch to AFC. Set meter function switch to AFC CARRIER.
6. Locate 2 47K OHM resistors just below the two right hand relays (R66, R67). Ground the left side of the upper resistor. In lieu of this arrangement, pin 7 on the card or riser may be grounded. Listen for relay click when grounding.
* 7. With VOM, check DC voltages as follows:
a) TP-1: +24V DC.
b) TP-19: +10V DC.
c) TP-20: -10V DC.
* 8. Connect scope and counter to TP-6. Adjust R-34 for 250,000 cycles. Amplitude about .5V P-P.
* 9. Connect scope and counter to TP-7. Signal should be 250KC, at about .5V P-P.
* 10. Connect scope and counter to TP-8. Adjust R-44, T-1, for maximum 250 KC signal. Then connect scope and counter to TP-3 and adjust R-44 for zero signal. Re-check the signal at TP-8: From 2 to 3 V P-P.
* 11. Connect scope and counter to TP-10. Adjust R-57, T-2, for maximum 250 KC signal. Then connect scope and counter to TP-4 and adjust R-57 for zero signal. Re-check signal at TP-10: From 2-3V P-P.
12. Turn power OFF. Connect ohmmeter on RX1 scale between TP-16 and ground. Adjust R-3 for maximum resistance. Remove ohmmeter. Turn power ON.
13. Connect a signal generator between TP-16 and ground. Set generator to 250 KC ±10 CYCLES, 100 uv. Connect scope and counter to TP-2. Adjust L-2, L-3, L-4, L-5 for maximum signal. Change amplitude of the generator to avoid exceeding .5V P-P at TP-2.

X A3 AUTOMATIC FREQUENCY CONTROL A4664 (cont.)

N O T E

Connect scope and counter to TP-10 and check frequency of 250,000 cycles per second, adjust oscillator if necessary.

14. Remove signal generator from TP-16 and connect to antenna jack at 3.000 mcs, 10uv. Adjust receiver TUNE control for 03.0000 mc on receiver counter. Carefully adjust Receiver Fine Tune Control for a Peak as displayed on scope and for a frequency of 250 KC ±10 CPS @ 1V P/P at TP-2.

* 15. Reduce the signal generator output to 1uv. Disregard any apparent noise on the scope at TP-2. Adjust R-78 until RF/AFC carrier level meter reads between RED and GREEN.

16. Increase signal generator output to 10uv. Adjust carefully for 250KC ± 10 CPS at TP-2.

* 17. With junction of R-66, R-67 grounded, carefully adjust receiver FINE TUNE control left and right. The phase difference meter should follow in the same direction, dropping back to zero at each extreme of the scale. If this condition is not met, adjust R44 in small increments, repeating the FINE TUNE adjustments after each change in R-44 until the condition is achieved.

* 18. Adjust R-57 so that, under the conditions of step 17, the SYNC indicator is ON when the phase difference meter is "ON SCALE" and OUT when the phase differences meter drops back to zero after each extreme excursion to either side.

19. Disconnect all test equipment. Turn power OFF. Place A3 card directly into its proper chassis slot. Turn power ON. Remove ground from R-66, R-67.

* 20. Move receiver FINE TUNE control fully CW. Depress AFC tune switch and adjust receiver TUNE control carefully until RF/AFC meter indicates in the green and the phase difference meter is at center scale. Record receiver counter indication. Release AFC tune switch.

* 21. Carefully and slowly, in small increments, move the receiver FINE TUNE control CCW, allowing the phase difference meter to stabilize after each movement, until SYNC lamp goes out. Depress AFC tune switch and record receiver counter reading. The second reading must be at least 1 KC below the first reading.

22. Repeat steps 20 and 21 except that the receiver FINE TUNE control should be moved clockwise during the measurements. The second counter reading should be at least 1 KC higher than the first reading.

23. Turn power OFF.

XI 1A5 PHASE DETECTOR A4668 and 1A13 AC FILTER A4794 GND: TP-3

A. Other Boards Required:
ALL

B. Equipment Required:
1. Tektronix Model 543A scope with L head or equivalent.
2. Simpson Model 260 VOM or equivalent.
3. H. P. Model 5244L counter, or equivalent.
4. Alignment screwdriver.
5. Two HP-606 Signal generator or equivalent.

C. Alignment and Test:
1. Turn power OFF.
* 2. With A5 card OUT, measure resistances as follows:
a) TP-1 to GND: - - - - - - - - - - - - - about 2K OHMS
b) TP-2 to GND: - - - - - - - - - - - - - about 3K OHMS
3. Assure that all other cards are in place.
4. Place A5 card on A4A1 extender and place in A5 chassis slot.
5. Function SW to SYN.
6. Turn power ON.
* 7. With VOM, measure DC voltage at TP-1: +24V DC. Turn Function SW to AFC and LOCAL (VOLTAGE at TP-1 drops to 0.0V.) Return switch to SYN position.
* 8. With VOM, measure DC voltage at TP-2: -24V DC.
* 9. Connect one signal generator at 1 mc, 1V RMS, to 1J3 at rear of HFRR-4 (If a Model HFSR-4 synthesizer is available its 1 mc output may be used.) Connect scope and counter to TP-16. A 1 mc signal at 5-6V P-P should be observed.
10. Connect second signal generator to 1J2 (rear of HFRR) at 1V RMS, 300 KC. (If a Model HFRR-4 synthesizer is available, it's output may be used; if used the HFFR-4 frequency selectors should be set to 03.000 MC.)
11. Place bandswitch to 2-4 position. Adjust receiver TUNE control for a reading of 03.0000 mcs on the receiver counter.
* 12. Connect scope and counter to TP-4. A 362.5 KC signal, from .7 to 1. 0V P-P, should be observed.
* 13. Connect scope and counter to TP-5. A distorted signal of about 100 mv P-P, at a frequency of about 300 kc should be observed.
* 14. Connect scope and counter to TP-12. A signal at 62.5 KC, 2.5V P-P, should be observed.
15. Adjust receiver TUNE control for a reading of 02.5000 mcs on receiver counter.
* 16. Connect scope and counter to TP-7. Adjust T-3 for maximum 62.5 KC signal. (8V P-P)
* 17. Connect scope, DC FUNCTION, @ 1V per cm, adjust vertical control so that 0.0V is center, to TP-10, while adjusting R-20, a +2.0V DC to a -2.0V DC must be observed. The phase difference meter should go full scale to right and left. Adjust R-20 for 0.0V DC and the phase difference meter should indicate center scale.

XI 1A5 PHASE DETECTOR A4668 and 1A13 AC FILTER A4794 (cont.)

* 18. Connect scope and counter to TP-11, adjust T-4 and R-61 for maximum amplitude. A frequency of 62.500 KC at an amplitude of 6-8V P-P.

19. Tune the receiver for a frequency of 03.0000 MC on the HFRR-4 counter.

20. Remove the cable connected to 1J2.

21. Connect the scope and counter to TP-6 and adjust R-7 for a dip in the 362.5 KC signal.

22. Re-connect signal generator at 300 KC IV to 1J2. (or HFSR-4)

23. With scope and counter at TP-6, adjust R80 for 4V P-P at 62.5 KC.

* 24. Connect scope and counter TP-8 62.5 KC 4-5V P-P.

* 25. Connect scope and counter TP-13 adjust (R61) for 62.5 KC 4-5V P-P.

* 26. With receiver at 03.0000 and 2 signal generators connected, move receiver tune slowly CW then CCW; Ø diff meter should follow in same direction, then fall back toward center scale after each extreme. If this condition can be met, carefully adjust receiver tune control for center scale on Ø diff meter.

27. Adjust R64 until sync lamp <u>just</u> lights.

* 28. Then perform step 26, adjusting R61 till sync lamp remains On when Ø diff meter is on scale, and off when phase difference meter drops back toward center after a full excursion to the left or right.

* 29. Connect Scope, ((DC function), 1V CM with 0V at center of scope, with receiver in sync), observe 0V at pin 8 of extender card, tune receiver out of Sync, observe +10 V at pin 8 of extender card.

* 30. Connect scope to (scope to 20V/cm) pin 3 or 7 of extender card and observe +24V in sync, 0V out of Sync.

31. Continuity between 1 and 2 on riser card ohmmeter (RX 1) in sync, <u>infinity</u> out of sync, <u>0</u> ohms.

32. 1A13 AC FILTER and DC VOLTAGE into 1A10A1 C1.

a. Connect scope DC FUNCTION, at 1V/cm to 1A10A1C1.

b. Observe DC voltage at 1A10A1C1 when HFRR is in SYNC and phase difference meter is center scale. <u>0.0V DC</u>.

* c. Slowly detune HFRR CW until phase difference meter indicates in the red on the left. Listen for relay on 1A13 AC filter to energize and de-energize. Record the DC VOLTAGE at 1A10A1C1: must be greater than +1.5V DC.

* d. Slowly detune HFRR CCW until phase difference meter indicates in the red on the left. Listen for relay on 1A13 AC filter to energize and de-energize. Record th DC voltage at 1A10A1C1: must be greater than -1.5V DC.

33. Disconnect all test equipment, turn power OFF.
Inser 1A5 into chassis if an entire HFRR-4 is being tested.

TEST DATA SHEET - HFRR-4

I HFRR-4 Chassis and Power Supply

B-7 DC resistance checks

a. _____ ohms
b. _____ ohms
c. _____ ohms
_____ ohms
d. _____ ohms
_____ ohms

C- DC voltage adjusts

6. +24 VDC _____ (✓)
8. +5 VDC _____ (✓)
10. -24 VDC _____ (✓)

C- Current adjusts

14. 750 ma _____ (✓)
17. 1.5 amp _____ (✓)
20. 65 ma _____ (✓)
25. c. _____ (✓)

II Counter Input Standard Module

C-7 DC input voltages

TP-6 _____ VDC
pin 2 _____ VDC
pin 26 _____ VDC

C-8 Ground switching

a. Counter Mode Switch

pin 18 _____ (✓)
pin 22 _____ (✓)
pin 15 _____ (✓)

b. Function Switch

D-1 1 mcs signal — TP-4 _____ VP-P
D-5 21.0000 mcs signal — TP-2 _____ VP-P
D-6 1.0500 mcs signal — TP-3 _____ VP-P
D-10 100 KC signal — TP-1 _____ VP-P
D-11 100 KC signal — TP-2 _____ VP-P
D-12 5 KC signal — TP-3 _____ VP-P
D-14 35.0000 mcs signal — TP-2 _____ VP-P
D-15 1.7500 mcs signal — TP-3 _____ VP-P
D-16 17.5000 mcs signal — TP-3 _____ VP-P

III Phase Detector Driver

C-6 DC input voltages

TP-1 _____ VDC
TP-7 _____ VDC

C-7 Ground switching

a. Bandswitch

pin A _____ (✓)
pin B _____ (✓)
pin C _____ (✓)
pin D _____ (✓)
pin S _____ (✓)
pin K _____ (✓)

b. Mode Switch

D-1 1 mcs signal (LOCAL/AFC) — TP-6 _____ VP-P
D-3 1 mcs signal (SYN) — TP-6 _____ VP-P
D-4 1 mcs signal — pin F _____ VP-P
D-5 1 mcs signal — pin 10 _____ VP-P
D-6 1 mcs signal — pin R _____ VP-P
D-12 362.5 KC signal — TP-2 _____ VP-P
D-13 362.5 KC signal — TP-3 _____ VP-P
D-16 2.40000 mcs signal — TP-8 _____ VP-P

TEST DATA SHEET - HFRR-4 (cont.)

III Phase Detector Driver (cont.)

D-17	Bandswitch signals at TP-9	2-4	mcs
		4-8	mcs
		8-16	mcs
		16-32	mcs
D-18	300 KC signal	TP-11	mVP-P
D-19	Frequency Comparator		mcs

IV Local Oscillator Offset and Band Divider

C-6	DC input voltage	TP-5	VDC
C-7	Ground switching		
	a. Bandswitch	pin P	(✓)
		pin 13	(✓)
		pin 12	(✓)
		pin 11	(✓)
	b. Counter Mode Switch	pin 9	(✓)
D-4	Square Wave Signal	TP-2	VP-P
D-5	Observed Waveform	TP-1	VP-P
D-6	Observed Waveform	pin M	VP-P
D-7	Signal at TP-4	2-4 band	VP-P
		4-8 band	VP-P
		16-32 Band	VP-P
D-8	2-4 band signal count		(✓)
D-9	4-8 band signal count		(✓)
D-10	8-16 band signal count		(✓)
D-11	16-32 band signal count		(✓)
D-12	External High Count		(✓)

V Gate Generator and Counting Register

C-7	DC input voltage		VDC
D-1	1 mcs signal		VP-P
D-5	observed waveform	TP-3	VP-P
D-6	observed waveform	TP-4	VP-P
D-7	HFRR counter readout 06.3600 mcs		(✓)
D-9	HFRR counter readout 02.0000 mcs		(✓)
D-10	HFRR counter readout of all digits		(✓)
D-12	1.509400 mcs signal count		(✓)

VI Sub Synthesizer

C-5	DC input voltage	TP-8	VDC
C-6	1 mcs signal	TP-1	VP-P
C-7 & 10	Bandswitching	TP-3	(✓)
		TP-4	(✓)
		TP-5	(✓)
		TP-6	(✓)
D-12	500 KC signal	TP-7	VP-P
D-13	7 mcs signal	TP-13	VP-P
D-14	3 mcs signal	TP-12	VP-P
D-15	5.5 mcs signal	TP-11	VP-P

TEST DATA SHEET - HFRR-4 (cont.)

VI Sub Synthesizer (cont.)

D-16 10.5 mcs signal	TP-10	VP-P
D-17 Signals at TP-19	2-4	VP-P
	4-8	VP-P
	8-16	VP-P
	16-32	VP-P

VII Local Oscillator Divider

C-2 DC resistance checks	a. TP-3	ohms
	b. TP-17	ohms
C-4 DC input voltages	a. TP-3	VDC
	b. TP-17	VDC
C-8 Receiver tune frequency/receiver count		(✓)
C-9 TP-1 voltage		VRMS
C-10 2.625 mcs signal	TP-7	VP-P
C-11 5.25 mcs signal	TP-10	VP-P
C-12 10.5 mcs signal	TP-16	VP-P
C-13 21.0 mcs signal	TP-20	VP-P
C-15 L. O. frequency 21.0000 mcs	TP-2	(✓)
C-16 L. O. frequency 21.0000 mcs - 37.0000 mcs	TP-2	(✓)

VIII First Mixer - Amplifier and First I.F. Amplifier

C-3 DC resistance	TP-1	ohms
C-6 DC input voltage	TP-1	VDC
C-7 3.625 mcs signal	TP-2	VP-P
C-8 7.25 mcs signal	TP-4	VP-P
C-9 14.5 mcs signal	TP-10	VP-P
C-10 29.0 mcs signal	TP-8	VP-P
C-16 625 KC signal TP-1, 84 mv P-P adj		(✓)
C-20 1.25 mcs signal TP-1, 84 mv P-P adj		(✓)
C-24 2.5 mcs signal TP-1, 84 mv P-P adj		(✓)
C-28 5.0 mcs signal TP-1, 84 mv P-P adj		(✓)

IX Second Mixer and I.F.

C-2 DC resistance	TP-5	ohms
	TP-22	ohms
C-6 DC input voltages	a. TP-5	VDC
	b. TP-22	VDC
C-8 875 KC signal	TP-2	VP-P
C-11 250 KC signal	TP-1	mVP-P
C-12 250 KC signal	TP-1	mVP-P
C-13 250 KC signal	TP-3	mVP-P
C-14 250 KC signal	TP-4	mVP-P
C-15 250 KC signal	TP-6	mVP-P
C-16 Input attenuator switch operation	TP-6	(✓)
C-17 Signal generator input for 100 mVP- at	TP-6	uVRMS
C-18 AGC output level variation		db
C-20 RF reserve gain	TP-6	mVP-P
C-21 250 KC signal	TP-15	mVP-P
C-22 250 KC signal	TP-16	mVP-P

IX Second Mixer and I.F. (cont.)

C-25, 26, 27 AGC DC voltage	TP-23	(✓)
C-28 RF/AFC level meter adjust		(✓)

X Automatic Frequency Control

C-3 DC resistance	a. TP-1	ohms
	b. TP-20	ohms
C-7 DC voltages	a. TP-1	VDC
	b. TP-19	VDC
	b. TP-20	VDC
C-8 250 KC adj	TP-6	VP-P
C-9 250 KC signal	TP-7	VP-P
C-10 250 KC signal	TP-8	VP-P
C-11 250 KC signal	TP-10	VP-P
C-15 RF/AFC meter adjust		(✓)
C-17, 18, 20, 21 Check of lock in range difference meter		(✓)

XI Phase Detector and AC Filter

C-2 DC resistance	a. TP-1	ohms
	b. TP-2	ohms
C-7 DC input (+24) switching	TP-1	(✓)
C-8 DC input	TP-2	VDC
C-9 1 mcs signal	TP-16	VP-P
C-12 362.5 KC signal	TP-4	VP-P
C-13 300 KC signal	TP-5	mVP-P
C-14 62.5 KC signal	TP-12	VP-P
C-16 62.5 KC signal	TP-7	VP-P
C-17 Phase difference meter voltage (±2.0 VDC)		(✓)
C-18, 24, 25 62.5 KC signal	TP-11	VP-P
	TP-8	VP-P
	TP-13	VP-P
C-26, 28 Phase difference meter and syn lamp operation		(✓)
C-29, 30 Sync/out of sync voltages	pin 8	(✓)
	pin 3, 7	(✓)
C-32 AC Filter and DC voltage	c. 1A10A1C1	VDC
	d. 1A10A1C1	VDC

Mfg. #_____

Serial #_____

Date #_____

Tested by_____

REVISION SHEET	THE TECHNICAL MATERIEL CORP. MAMARONECK NEW YORK	S 1233 LIST NO.

DATE	REV.	SHEET	EMN #	DESCRIPTION	APP.
7/2/70	ø			ORIGINAL RELEASE FOR PRODUCTION	
6/29/72	A	19,20,		REVISED SHEET 19,20,21,22 AS PER EMN 20656	EJ