TMC SPECIFICATION			NO. S 1232
REV:			
COMPILED: W.P.H.	CHECKED: P.E.G.	APPD:	SHEET OF
TITLE:			

jb/ 1/26/70

Production Test Procedure

for

Model HFS( )-4, HFS( )-5

Reference Signal Generator

TMC SPECIFICATION			NO. S 1232
REV:			
COMPILED:	CHECKED:	APPD:	SHEET 1 OF 31

TITLE: Production Test Procedure for Model HFS( )-4, HFS( )-5

The following procedure may be used as a complete factory test and alignment procedure for the Model HFSR-4 Reference Signal Generator. It may also be used to test and align any of the twelve removable circuit boards. When used as a procedure to test and align a complete unit, it should be followed in sequence. Each section of the procedure is complete in itself for the testing of any individual circuit board. In each section, the list of tested and aligned boards required to align that section is included.

Important Notes:

1. Diagrams showing controls, test points and adjustable components on all circuit boards are included in this procedure after TEST DATA SHEETS.

2. All variable inductor and transformer alignments must be done with a non inductive tool.

3. Stability and accuracy of internally generated frequencies will depend on the amount of time power has been applied.

4. Insert 50 ohm dummy loads (BNC) in J3, J4, J6, J7 whenever the A13 circuit board is inserted in the unit.

5. Asterisk * in procedure indicates entry on test data sheets.

I. HFSR-4 Chassis:

A. Equipment Required:
Simpson Model 260 VOM or equivalent

B. Preliminary: (NO POWER CONNECTED)

1. Remove all circuit boards from chassis.
* 2. Check front panel frequency selector switches for free clockwise rotation and alignment of numerals in the Windows.
* 3. Check for proper AC LINE fuses, (1.2A), and SPARE fuse.
* 4. Check visually for proper wiring of power transformer, obvious miswirings and cold solder connections.
5. Insert power supply Card A2 (on extender) in proper chassis slot.
* 6. Measure, with Simpson 260 VOM, the resistance at the following test points to ground: (TP-3, TP-6 and TP-9 are ground.)

a.	TP-1	4K OHMS
b.	TP-2	1.5K OHMS
c.	TP-4	5K OHMS
d.	TP-5	5K OHMS
e.	TP-7	4K OHMS
f.	TP-8	6K OHMS

C. Test and Alignment:

1. Apply AC Power to J-1 (115V or 230V AC) as per customer requirement, i.e., wiring of T-1.
2. Turn Power Switch to ON. Power Lamp should light, blower should operate, and both INTERNAL and EXTERNAL STANDARD failure lamps should be unlit.
3. Turn Power Switch to OFF.

II. Power Supply (A2) (A4687):

A. Other cards required: NONE

B. Equipment required:
Simpson 260 VOM or equivalent

C. Test and Alignment:
Ballantine VTVM, Model 314A or equivalent

1. Turn Power Switch to OFF.
2. Insert A2 Card on extender in appropriate chassis slot.
3. Set R4, R13 and R22 fully CCW.
4. Set R7, R16 and R25 to mid position.
5. Connect VOM to TP-2 on +50VDC range.
6. Turn Power ON.
* 7. Adjust R-7 for +25V D.C.
8. Connect VOM to TP-5.
* 9. Adjust R-16 for +16V D.C.
10. Connect VOM to TP-8 on +10VDC range.
* 11. Adjust R25 for + 5.4V D.C.
12. Turn Power OFF.
13. Connect (+) lead of VOM to TP-2, (-) lead to TP-3. Set meter for 10 AMP function.
14. Turn Power ON.
* 15. Adjust R-4 for 800.0 milliamps.
16. Turn Power OFF.
17. Connect (+) lead of VOM to TP-5, (-) lead to TP-6, with meter set for 10 AMP function.
18. Turn Power ON.
* 19. Adjust R-13 for 1.2 amperes.
20. Turn Power OFF.
21. Connect (+) lead of VOM to TP-8, (-) lead to TP-9, with meter set for 10 AMP function.
22. Turn Power ON.
* 23. Adjust R-22 for 1.3 amperes.
24. Turn Power OFF.
25. Remove VOM.

NOTE: In the previous adjustments, the +5V supply and the +15V supply were adjusted to compensate for a drop in Voltage when additional circuit boards are inserted in the chassis.

26. On the Ballantine VTVM select the proper scale (" 1 mV without probe") and the "meter" function.

* 27. Connect test leads for Ballantine to the following test points and their associated grounds. Simultaneously connect the Simpson between chassis ground and the same test points (connection of Simpson made as per steps 13, 17, and 21). The Simpson will be used to load the power supply for the ripple voltage check.

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

** The output ripple voltage should be less than 1 mV as read on the Ballantine meter.

** Note: Extreme care should be used in this measurement. The test should be performed in a shielded area, since background noise in an unshielded area may possibly be greater than the desired maximum ripple voltage. Before attempting this measurement in an unshielded area, connect test leads to a test point and turn the POWER switch to the OFF position. Background noise should be below the maximum desired ripple voltage level. If it is not, the measurement cannot be made in an unshielded area. Care should also be used to insure that the HFSR chassis and meter are at the same ground potential for this test.

28. Remove Ballantine and Simpson meters. Turn Power OFF. Insert A-2 card in chassis socket.

III. 1 MC Distribution Card (A3) (A4688) (TP-20:GND)

A. Other boards required: A2

B. Equipment required:

1. TEKTRONIX MODEL 543A scope with "L" type plug in preamplifier.
2. H.P. Model 5244L Counter.
3. Signal Generator: Measurements Model 82, or equivalent.
4. NON INDUCTIVE ALIGNMENT TOOL.

C. Test and Alignment:

1. Turn Power OFF.
2. Insert A3 card with extender into proper slot.
3. Turn Power ON.
* 4. Connect scope and counter to TP-2. A 1MC sine wave, from 2.8 - 4V P-P should be seen.
5. Turn Power OFF. Remove scope and counter.
6. Remove A3 from extender. Carefully tape-insulate pin 2. Insert A3 on extender. Turn Power ON.
7. Connect signal generator to high side 47 ohm resistor (R17) at pin 2 of A3. Set generator to 1MC ± 10 cps. Connect scope and counter to TP-2. Set generator level to 700 mv, (2V P-P),
8. Adjust R-76 until INTERNAL standard failure lamp just lights.
* 9. Increase signal generator output. Internal alarm light should go out at approximately 725 mv from the generator.
* 10. Turn Power OFF. Disconnect signal generator, scope and counter. Remove A3 card. Remove tape from pin 2. Reinsert A3 card with extender. Turn Power ON. Internal alarm lamp should be OUT.
11. Connect signal generator to J-5 (1 MC EXTERNAL INPUT) Connect scope and counter to TP-1. Adjust generator for 1MC ± 10 cps, 700 mv RMS.

12. Adjust R-61 until external alarm lamp just goes out. (about 650 mv from generator).
13. With signal generator at 1 mc $\pm$ 10 cps, 2.8V P-P on oscilloscope, set PHASE COMPARATOR/FREQUENCY DIFFERENCE Switch to FREQUENCY DIFFERENCE.
14. Adjust R30 so that front panel meter oscillates about center scale. (With generator at 1 mc $\pm$ 10 cps oscillation will be slow).

* 15. With generator set at 1 mc $\pm$ 5 cps, oscillations will be very slow. Under these conditions, adjust R37 so that meter excursions just reach the RED. Readjust R30 as necessary to keep the swing symmetrical about center scale.

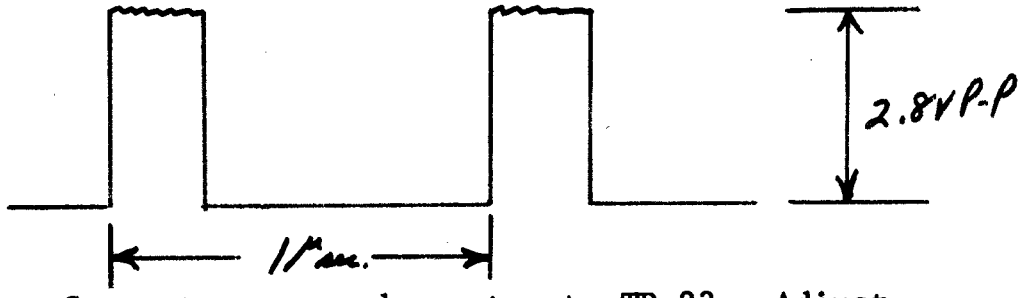
16. Move signal generator about 50 cps from 1 mc. Meter should rest at center scale. Adjust R30 as necessary.

* 17. Connect VOM on + 10V DC range to TP-8. Adjust R-48 for + 4.5VDC

18. Disconnect signal generator from J-5.

* 19. Connect VOM to TP-21 on + 10V DC range. Adjust R-56 for +4.5V DC. Remove VOM.

* 20. Connect scope and counter to TP-14. The following signal should be present:



* 21. Connect scope and counter to TP-23. Adjust L-11 for maximum 1 mc signal. (a sine wave at about 1.5V P-P)

* 22. Connect scope and counter to TP-15. Adjust R-89 for 2.8V P-P sine wave.

* 23. Verify with scope and counter that a 1 mc sine wave at about 1.5V P-P is present at TP-16 and TP-17.

* 24. Remove test equipment. Turn Power OFF. Insert A3 card in chassis if an entire HFSR-4 is being tested.

IV. 1 MC Harmonic Generator (A4) (A4689) (TP-2:GND)

A. Other boards required: A2, A3.

B. Equipment required:

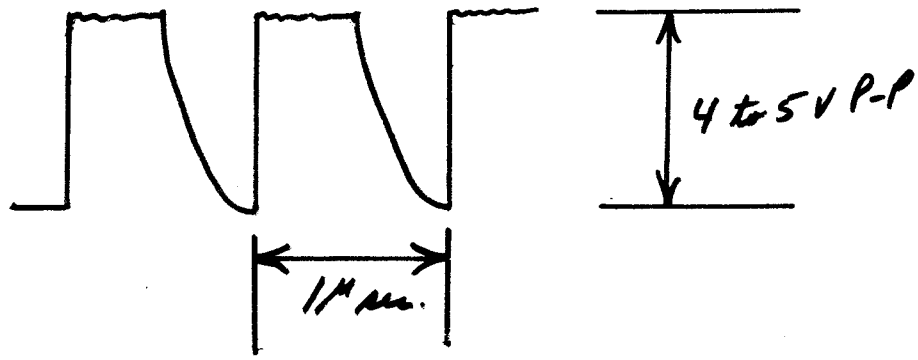
1. TEKTRONIX Model 543A scope with "L" type plug in pre-amplifier.
2. Simpson Model 260 VOM.
3. H.P. Model 5244L counter.
4. NON INDUCTIVE ALIGNMENT TOOL.

C. Test and Alignment:

1. Turn Power OFF.
2. Insert A4 card with extender into proper chassis slot.
3. Turn Power ON.
4. Make the following DC voltage measurements

* a. TP-1 +15V DC
* b. TP-3 +5V DC

* 5. Connect scope and counter to TP-5. The following wave form should be observed:



* 6. Connect scope and counter to TP-6. Adjust L-3, L-4 for maximum 11 mc signal. (.7 to 1.0V P-P)

* 7. Connect scope and counter to TP-12. Adjust L-19, L-20 for maximum 17 mc signal. (1.2-1.5V P-P)

* 8. Connect scope and counter to TP-11. Adjust L-16, L-17 for maximum 16 mc signal. (1 - 1.5V P-P)

9. Connect scope and counter to TP-9. Adjust L-9, L-10 for maximum 10 mc signal. (1.0 - 1.5V P-P)

* 10. Connect scope and counter to TP-10. Adjust L-13, L-14 for maximum 12 mc signal. (1.5 - 2.5V P-P)

* 11. Connect scope and counter to TP-8. A sine wave of amplitude .6V to 1.5V P-P should be observed, as follows:

10 MC SELECTOR	FREQUENCY
0	3 MC
1	4 MC
2	5 MC
3	6 MC

12. Connect scope and counter to TP-13. Adjust L-5, L-6 for maximum 14 mc signal. (1.5 - 2.0V P-P)

* 13. Connect scope and counter to TP-7. A clean sine wave amplitude .5 - 1.0V P-P should be observed. (1.4 MC)

14. Remove test equipment. Turn Power OFF. Insert A4 card into chassis if an entire HFSR-4 is being tested.

V. 100 KC Spectrum Generator (A5) (A-4690) (TP-1:GND)

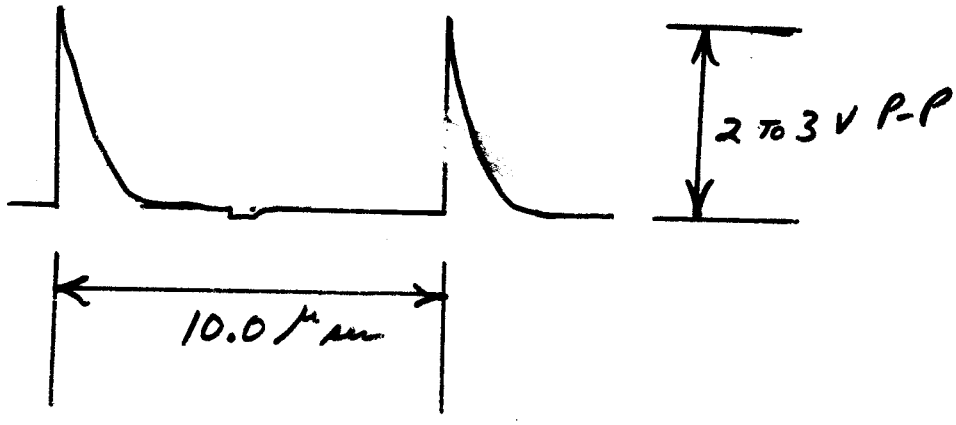
A. Other Boards required: A2, A3

B. Equipment required:

1. Simpson Model 260 VOM or equivalent.
2. TEKTRONIX Model 543A scope with "L" type plug in pre-amplifier.
3. H.P. Model 5244L counter.

C. Test and Alignment:

1. Turn Power OFF.
2. Insert A5 card with extender in proper chassis slot.
3. Turn Power ON.
* 4. With VOM, measure voltage at TP-2. It should be +15V DC.
* 5. Connect scope and counter to TP-5. The following wave form should be observed:



* 6. Connect the scope and counter to the test points indicated below, tuning the designated inductors for maximum signal. The amplitude will be approximately .8 to 1.8V P-P.

	TEST POINT	ADJUST	FREQ.
a.	6	L3, L4	16.2 mcs
b.	7	L5, L6	16.6 mcs
c.	8	L7, L8	16.9 mcs
d.	9	L9, L-10	16.4 mcs
e.	10	L-11, L-12	16.1 mcs
f.	11	L-13, L-14	16.5 mcs
g.	12	L-15, L-16	16.8 mcs
h.	13	L-17, L-18	16.3 mcs
i.	14	L-19, L-20	16.7 mcs

7. Disconnect test equipment. Turn Off Power. Insert A5 card into chassis if an entire HFSR-4 unit is being tested.

VI. .1 KC and 1 KC Frequency Selection Matrix: (A6) (A4691)
(TP-2: GND)

A. Other boards required: A2, A3, A4, A5

B. Equipment required:

1. Simpson Model 260 VOM or equivalent.
2. TEKTRONIX Model 543A scope with "L" type plug in pre-amplifier.
3. H.P. Model 5244L counter.

C. Test and Alignment:

1. Turn Power OFF.
2. Insert A6 card with extender into proper chassis slot.
3. Turn Power ON.
* 4. Measure DC voltage at TP-1. It should be +5V.
* 5. Connect scope and counter to TP-3. Rotate the .1 KC selector switch through its ten positions, and observe the frequencies listed below. Minimum amplitude is approximately 1.5V P-P.

	.1 KC SWITCH POSITION	FREQUENCY
a.	0	16.0 MC
b.	1	16.1 MC
c.	2	16.2 MC
d.	3	16.3 MC
e.	4	16.4 MC
f.	5	16.5 MC
g.	6	16.6 MC
h.	7	16.7 MC
i.	8	16.8 MC
j.	9	16.9 MC

6. Leave .1 KC switch in position "0".

* 7. Connect scope and counter to TP-4. Rotate the 1 KC selector switch through its ten positions, observing the frequencies indicated below. Minimum amplitude should be approximately 1.5V P-P.

1 KC SWITCH POSITION		FREQUENCY
a.	0	16.0 MC
b.	1	16.1 MC
c.	2	16.2 MC
d.	3	16.3 MC
e.	4	16.4 MC
f.	5	16.5 MC
g.	6	16.6 MC
h.	7	16.7 MC
i	8	16.8 MC
j.	9	16.9 MC

8. Leave 1 KC switch in position "0".

9. Remove Test equipment. Turn Power OFF. Insert A6 card into chassis if an entire HFSR-4 unit is being tested.

VII. 10 KC and 100 KC Frequency Selection Matrix: (A7) (A4691) (TP-2:GND)

A. Other boards required: A2, A3, A4, A5

B. Equipment required:

1. Simpson Model 260 VOM, or equivalent.
2. TEKTRONIX Model 543A scope with "L" type plug in pre-amplifier.
3. H.P. Model 5244L counter.

C. Test and Alignment:

1. Turn Power OFF.
2. Insert A7 card with extender into proper chassis slot.
3. Turn Power ON.

* 4. Measure DC voltage at TP-1. It should be +5V.

* 5. Connect scope and counter to TP-3. Rotate the 100 KC selector switch through its ten positions, and observe the frequencies indicated below. Minimum amplitude is approximately 1.5V P-P.

	100 KC SWITCH POSITION	FREQUENCY
a.	0	16.0 MC
b.	1	16.1 MC
c.	2	16.2 MC
d.	3	16.3 MC
e.	4	16.4 MC
f.	5	16.5 MC
g.	6	16.6 MC
h.	7	16.7 MC
i.	8	16.8 MC
j.	9	16.9 MC

6. Leave 100 KC Switch in position "0".

* 7. Connect scope and counter to TP-4. Rotate the 10 KC selector switch through its ten positions and observe the frequencies indicated below. Minimum amplitude is approximately 1.5V P-P.

	10 KC SWITCH POSITION	FREQUENCY
a.	0	16.0 MC
b.	1	16.1 MC
c.	2	16.2 MC
d.	3	16.3 MC
e.	4	16.4 MC
f.	5	16.5 MC
g.	6	16.6 MC
h.	7	16.7 MC
i.	8	16.8 MC
j.	9	16.9 MC

8. Leave 10 KC Switch in position "0".
9. Disconnect test equipment. Turn Power OFF. Insert A7 card into chassis if an entire HFSR-4 unit is being tested.

VIII. 1 MC Frequency Selection Matrix (A8) (A4692) (TP-2: GND)

A. Other boards required: A2, A3, A4, A5

B. Equipment required:

1. Simpson Model 260 VOM, or equivalent.
2. TEKTRONIX Model 543A scope with "L" type plug in pre-amplifier.
3. H.P. Model 5244L counter.

C. Test and Alignment:

1. Turn Power OFF.
2. Insert A8 card with extender into proper chassis slot.
3. Turn Power ON.
* 4. Measure the DC voltage at TP-3. It should be +5V.
* 5. Connect VOM to extender card pin D. On +30V DC scale. The reading should be +15V.
* 6. Connect scope and counter to TP-1. Rotate the 1 mc selector switch through its ten positions, observing the frequencies indicated below. The minimum required amplitude in each case is .45V P-P.

	1 MC SWITCH POSITION	FREQUENCY
a.	0	17.0 MC
b.	1	16.9 MC
c.	2	16.8 MC
d.	3	16.7 MC
e.	4	16.6 MC
f.	5	16.5 MC
g.	6	16.4 MC
h.	7	16.3 MC
i.	8	16.2 MC
j.	9	16.1 MC

7. Leave 1 MC Switch in position "0".
8. Remove test equipment. Turn Power OFF. Insert A8 card into chassis if an entire HFSR-4 unit is being tested.

IX. Basic Amplifier Mixer (A9) (A4693) GND: TP-16, 17 18, 20, 21, 22.

A. Other boards required:

A2, A3, A4, A5, A6

B. Equipment required:

1. Simpson Model 260 VOM or equivalent.
2. TEKTRONIX Model 543A scope with "L" type plug in pre-amplifier.
3. H.P. Model 5244L counter.
4. Measurements Corp. Model 82 Signal Generator, or equivalent.
5. Non Inductive tuning tool.

C. Test and Alignment:

1. Turn Power OFF.
2. Insert A9 card with extender into proper chassis slot.
3. Turn power ON.
* 4. With VOM, measure DC voltage at TP1. It should be +15V.
* 5. With VOM, measure DC voltage at TP-2. It should be +5V.
6. Connect scope and counter to TP-3. Adjust R-1 for maximum signal. It should be 1.4 mc, .5-1.0V P-P.
* 7. Connect scope and counter to TP-4. Adjust L-1 for maximum 1.4 mc signal. (approximately 1.0V P-P)
8. Adjust R-1 for zero signal at TP-4.
9. Connect scope and counter to TP-5. Adjust R-13 for maximum 11 mc signal. (1.0 - 1.5V P-P)
* 10. Connect scope and counter to TP-15. Adjust L-5 and R-11 for maximum 11 mc signal. (approximately 1.0 - 1.5V P-P)
11. Adjust R-13 for zero signal at TP-15.
12. Connect a signal generator at 12.4 mcs from TP-6 to TP-22. Set the output of the generator initially at 50,000 uv. (Do not exceed 100,000 uv)

13. Connect scope and counter. (highest sensitivity) from TP-8 to TP-21.
14. Adjust carefully and slowly the following components in the order indicated, for maximum 12.4 mc signal at TP-8: R-37, R26, L2, C78, L3, L4. Initially, the signal amplitude may be extremely small. As the signal increases, reduce the signal generator output to keep the signal amplitude at TP-8 at about .5V P-P.
    Readjust L2, C78, L3, L4 at least twice.
    Disconnect signal generator from TP-6.
15. Connect scope and counter to TP-4. Adjust R-1 for .6V P-P, 1.4mc, at TP-4.
16. Connect scope and counter to TP-15. Adjust R-13 for .35V P-P, 11 mcs, at TP-15.
17. Connect scope and counter to TP-8. Adjust T-1, C-11, C78, L2, L3, L4, R37, R-11 for maximum 12.4 mc signal at TP-8.
* 18. Repeat the adjustments of T-1, C-11, C78, L2, L3 and L-4 twice. Signal amplitude should be in excess of 1.5V P-P.
19. Adjust R-11 for a dip in signal amplitude at TP-8. This is a very small dip. If the pot has 360° rotation, do not adjust for zero signal. If no dip can be obtained, adjust R-11 for maximum signal. After dip, signal should be in excess of 1.2V P-P.
20. Adjust R26 for zero signal at TP-8.
* 21. Connect scope and counter to TP-23. Adjust R-47 for maximum 1.6 mc signal at TP-23. (at least 1.0V P-P) Then adjust R-47 for zero signal at TP-23.
22. Connect a signal generator at 14 mc. 100,000 uv between TP-11 and TP-18.
23. Connect scope and counter to TP-14.
24. Adjust, in order, R56, R-37, L6, C79, L7, L8 for maximum signal. (14 mcs) Reduce the signal generator output as necessary to prevent exceeding .5V P-P at TP-14.
25. Remove signal generator. Connect scope and counter to TP-8. Adjust R26 for 1.2V P-P at 12.4 mcs.

26. Connect scope and counter to TP-23. Adjust R-47 for .8V P-P (1.6 mcs)

* 27. Connect scope and counter to TP-14. Adjust R37, T-2, C-36,C79, L6, L7, L8 for maximum signal (14 mc). Repeat the adjustments of T2, C3, C79, L6, L7, L8 twice. Signal at TP-14 should be about 1.0V P-P.

28. Adjust R-37 for a dip in the signal at TP-14. The dip will be very small. If the pot has 360° rotation, do not adjust for zero signal. If a dip cannot be obtained adjust R-37 for maximum signal.

29. Adjust R-56 for .8V P-P at TP-14.

* 30. Connect scope and counter to TP-13. Signal should be .8V P-P, 1.4 mcs.

31. Remove test equipment. Turn Power OFF. Insert A9 card in chassis if an entire HFSR-4 unit is being tested.

X. Basic Mixer Amplifier (A10) (A4693)

Use same procedure as for A9 (Section IX) except that the following boards are required: A2, A3, A4, A5, A6, A9.

XI. Basic Mixer Amplifier (A-11) A4693)

Use same procedure as for A9, A10, Section IX, X, except that the following boards are required: A2, A3, A4, A5, A6, A7, A9, A10.

XII. Basic Mixer Amplifier (A-12) (A4694)

Use same procedure as for A9, A10, A11, Sections IX, X, XI, except that

a. output at TP-3 will be 14 mcs
b. the following boards are required:
A2, A3, A4, A5, A6, A7, A9, A10, A11

XIII. Final Mixer and Output Card (A13) (A4695)

(GND: TP2, 13, 18)

A. Other boards required: ALL

B. Equipment required:

1. FOUR 50 ohm dummy loads, (BNC), connected at J3, J4, J6, J7.
2. Simpson Model 260 VOM or equivalent.
3. TEKTRONIX Model 543A scope with "L" type plug in pre-amplifier.
4. H.P. Model 5244L counter.
5. Non Inductive tuning tool.

C. Test and Alignment:

1. Turn Power OFF
2. Insert A13 card with extender in proper chassis slot.
3. Turn Power ON.
4. Turn all frequency selectors to "0".
* 5. With VOM, measure the DC voltage at the following test points:

a. TP-1 +15V DC
b. TP-3 +25V DC
c. TP-4 +5V DC

6. Connect VOM to TP-17 on +30V range. Turn 10 MC switch to 3. Adjust R-80 for +18V. Leave VOM at TP-17.
7. Turn 10 MC switch to 0. Adjust R86 for +4V DC.
8. Repeat steps 6 and 7 until the prescribed voltages are obtained as 10 MC switch is moved from 0 to 3.
* 9. Connect scope and counter to TP-5. Adjust R-1 for maximum signal. (.5 - 1.0V P-P)
* 10. Connect scope and counter to TP-6. Signal should be about 1.0V P-P, with frequency as follows:

	10 MC SWITCH	FREQUENCY
a.	0	3 MC
b.	1	4 MC
c.	2	5 MC
d.	3	6 MC

11. Adjust R-1 for .4V P-P on the lowest signal amplitude obtained as the 10 MC switch is rotated through its four positions.
* 12. Connect scope and counter to TP-7. Adjust R-66 for maximum 14 mc signal. (about 1.0V P-P). Turn .1KC, 1 KC, 10 KC and 100 KC selectors to "9". Signal at TP-7 should increase from 14.0000 MC to 14.0999 MC in 100, 1 KC and 10 KC steps. Leave all frequency selectors at zero.
* 13. Connect scope and counter to TP-8. Adjust R-12 and L-2 for maximum 14 MC signal. Amplitude of signal should exceed 1.5V P-P.
14. Adjust R-66 for 1.5V P-P (14 mc) at TP-8.
15. Turn 10 MC selector to "3" (6 MC). Connect scope and counter to TP-9 with highest sensitivity. Adjust T-1, L-3, R-12, for maximum amplitude 20 MC signal.
16. Connect scope and counter to TP-10. Adjust R-20, L4, L5, for maximum 20 MC signal.
17. Repeat adjustments of T-1, L3, L4, L5.
18. Turn 10 MC switch to "0" (3 MC).

19. Connect VOM on +10V DC range to TP-17. Leave scope and counter at TP-10.
20. Adjust R-86 slightly for maximum signal output at TP-10. At TP-17 the voltage should be approximately +3.75V DC. Remove VOM.
21. Adjust C15, C16, C30, C31 for maximum 17 MC signal at TP-10.
22. With 10 MC switch at 3, peak T-1, L3, L4, L5. With 10 MC switch at 0, peak C15, C16, C30, C31. Repeat until optimum amplitude has been achieved.
23. Connect VOM to TP-17, on +10V DC range. Turn 10 MC switch to 1. If signal at TP-10 (18 MC) is not equal to amplitudes obtained in switch positions 0 and 3, adjust R85 for maximum signal amplitude. The voltage at TP-17 should be about +6.3V DC.
24. Turn 10 MC switch to 2. If signal at TP-10 (19 MC), is not equal to amplitudes obtained in switch positions 0, 1 and 3, adjust R87 for maximum 19 MC signal. The voltage at TP-17 should be about +11.0V DC.

    Note: The signal amplitude at TP-10 in 10 MC switch positions 0, 1, 2, 3 should be about 1V P-P.

25. Adjust R12 for a dip (not zero) in the output signal. The correct dip is very small, near the point of maximum amplitude.
26. Set front panel selectors to 00.0000. Connect scope and counter to TP-11. (16 MC) Adjust R-88 for maximum signal.
27. Move 1 MC switch through its ten positions; the amplitude should be at least .6V P-P and the frequency should be as follows:

1 MC SWITCH	FREQUENCY
0	17.0 MC
1	16.9 MC
2	16.8 MC
3	16.7 MC
4	16.6 MC
5	16.5 MC
6	16.4 MC
7	16.3 MC
8	16.2 MC
9	16.1 MC

28. Connect scope and counter to TP-12. Adjust R-88 for a signal level of 150 mv P-P. The signal is not expected to be "clean" at this point.
29. Connect scope and counter to TP-14. A clean sine wave in the range 200 KC to 3.2 MC should be observed, at an amplitude of about 1V P-P. The frequency at this point is 1/10 of the frequency indicated by the front panel frequency selectors, for example:

FRONT PANEL	FREQUENCY: TP-14
02.0000	200 KC
05.2000	520 KC
10.9999	1.09999 MC
32.0000	3.2000 MC

NOTE: The range of the unit exceeds in actuality the range of 200 KC - 3.2 MC. The test is concerned only with the range indicated.

* 30. Connect scope and counter to TP-15. Adjust R-63 for a clean sine wave, .2 - 3.2 MCS, at 2.8V P-P.
* 31. Connect scope and counter to TP-16. A clean sine wave, in the range .2 - 3.2 MC, at 2.8V P-P, should be observed.
* 32. Set front panel selectors to 02.0000. Output frequency should be 200,000 cycles.

Set front panel selectors to 10.0000. Output frequency should be 1,000,000 cycles. Move the .1 KC, 1KC, 10KC and 100 KC switches slowly, in order, to position 9, observing the frequency and amplitude. The output should change in steps to 1,999,990 cycles.

* 33. Set front panel selectors to 31.0000. Output frequency should be 3,100,000. Move the .1 KC, 1 KC, 10 KC and 100 KC selectors slowly, in order, to 31.9999. The output should step to 3.199,990 cycles.

34. Turn Power OFF. Remove test equipment. Insert A13 card in chassis if entire HFSR-4 unit is being tested.

XIV. Check of Output Jacks:

A. Other boards required: ALL

B. Terminate J3, J4, J6, J7 in 50 ohm.

C. Turn Power ON.

D. Test:

* 1. Connect scope and counter to J3. Set frequency selectors to random settings in the range 02.0000 to 32.0000 signal at J3 should be a 2.8V P-P sine wave, 1/10 the frequency of the frequency selectors.

* 2. Repeat step D with scope and counter at J4.

* 3. Connect scope and counter to J6. A 2.8V P-P, 1 mc sine wave should be observed.

* 4. Repeat step 3 with scope and counter at J-7.

5. Turn Power OFF.

I-B- 2, 3, 4,	Visual Checks	_____	Tester Initial
I-B-6	Resistance Measurements		
	a.	_____	
	b.	_____	
	c.	_____	
	d.	_____	
	e.	_____	
	f.	_____	
II-C-7	+	_____	V DC
II-C-9	+	_____	V DC
II-C-11	+	_____	V DC
II-C-15		_____	A DC
II-C-19		_____	A DC
II-C-23		_____	A DC
II-C-27	Output Ripple Voltage less than 1 mV.	_____	Tester Initial
III-C-4	1 mc,	_____	V P-P
III-C-9	Internal Alarm Out At	_____	mV RMS
III-C-10	Internal Alarm Out	_____	Tester Initial
III-C-15	Excursions Just Reach Red, Swing Symmetrical	_____	Tester Initial
III-C-17	+	_____	V DC
III-C-19	+	_____	V DC
III-C-20	Waveform As Given In Test Procedure	_____	Tester Initial
III-C-21	1 mc,	_____	V P-P
III-C-22	1 mc,	_____	V P-P
III-C-23	1 mc, TP-16	_____	V P-P
	TP-17	_____	V P-P

TITLE: TEST DATA SHEET

IV-C-4 a. + _____ V DC
b. + _____ V DC

IV-C-5 Correct Waveform Observed _____ Tester Initial

IV-C-6 11 MC _____ V (P-P)

IV-C-7 17 MC _____ V P-P

IV-C-8 16 MC _____ V P-P

IV-C-10 12 MC _____ V P-P

IV-C-11 a. 3 MC _____ V P-P
b. 4 MC _____ V P-P
c. 5 MC _____ V P-P
d. 6 MC _____ V P-P

IV-C-13 1.4 MC _____ V P-P

V-C-4 + _____ V DC

V-C-5 Correct Waveform Observed _____ Tester Initial

V-C-6 a. 16.2 mc _____ V P-P
b. 16.6 mc _____ V P-P
c. 16.9 mc _____ V P-P
d. 16.4 mc _____ V P-P
e. 16.1 mc _____ V P-P
f. 16.5 mc _____ V P-P
g. 16.8 mc _____ V P-P
h. 16.3 mc _____ V P-P
i. 16.7 mc _____ V P-P

TITLE: TEST DATA SHEET

VI-C-4 + _____ V DC

VI-C-5

a.	16 MC	_____	V P-P
b.	16.1 MC	_____	V P-P
c.	16.2 MC	_____	V P-P
d.	16.3 MC	_____	V P-P
e.	16.4 MC	_____	V P-P
f.	16.5 MC	_____	V P-P
g.	16.5 MC	_____	V P-P
h.	16.7 MC	_____	V P-P
i.	16.8 MC	_____	V P-P
j.	16.9 MC	_____	V P-P

VI-C-7

a.	16.0 MC	_____	V P-P
b.	16.1 MC	_____	V P-P
c.	16.2 MC	_____	V P-P
d.	16.3 MC	_____	V P-P
e.	16.4 MC	_____	V P-P
f.	16.5 MC	_____	V P-P
g.	16.6 MC	_____	V P-P
h.	16.7 MC	_____	V P-P
i.	16.8 MC	_____	V P-P
j.	16.9 MC	_____	V P-P

VII-C-4 + _____ V DC

VII-C-5	a.	16.0 MC	_____ V P-P
	b.	16.1 MC	_____ V P-P
	c.	16.2 MC	_____ V P-P
	d.	16.3 MC	_____ V P-P
	e.	16.4 MC	_____ V P-P
	f.	16.5 MC	_____ V P-P
	g.	16.6 MC	_____ V P-P
	h.	16.7 MC	_____ V P-P
	i.	16.8 MC	_____ V P-P
	j.	16.9 MC	_____ V P-P

VII-C-7	a.	16.0 MC	_____ V P-P
	b.	16.1 MC	_____ V P-P
	c.	16.2 MC	_____ V P-P
	d.	16.3 MC	_____ V P-P
	e.	16.4 MC	_____ V P-P
	f.	16.5 MC	_____ V P-P
	g.	16.6 MC	_____ V P-P
	h.	16.7 MC	_____ V P-P
	i.	16.8 MC	_____ V P-P
	j.	16.9 MC	_____ V P-P

VIII-C-4 + _____ V DC

VIII-C-5 + _____ V DC

VIII-C-6

a.	17.0 MC	_____	V P-P
b.	16.9 MC	_____	V P-P
c.	16.8 MC	_____	V P-P
d.	16.7 MC	_____	V P-P
e.	16.6 MC	_____	V P-P
f.	16.5 MC	_____	V P-P
g.	16.4 MC	_____	V P-P
h.	16.3 MC	_____	V P-P
i.	16.2 MC	_____	V P-P
j.	16.1 MC	_____	V P-P

IX-C-4	+ _____	V DC
IX-C-5	+ _____	V DC
IX-C-7	1.4 _____	V P-P
IX-C-10	11 MC _____	V P-P
IX-C-18	12.4 MC _____	V P-P
IX-C-21	1.6 MC _____	V P-P
IX-C-27	14 MC _____	V P-P
IX-C-30	1.4 MC _____	V P-P

X-C-4	+ _____	V DC
X-C-5	+ _____	V DC
X-C-7	1.4 MC _____	V P-P
X-C-10	11.0 MC _____	V P-P
X-C-18	12.4 MC _____	V P-P
X-C-21	1.6 MC _____	V P-P
X-C-27	14 MC _____	V P-P
X-C-30	1.4 MC _____	V P-P

XI-C-4	+ _____ V DC	
XI-C-5	+ _____ V DC	
XI-C-7	1.4 MC _____ V P-P	
XI-C-10	11.0 MC _____ V P-P	
XI-C-18	12.4 MC _____ V P-P	
XI-C-21	1.6 MC _____ V P-P	
XI-C-27	14 MC _____ V P-P	
XI-C-30	1.4 MC _____ V P-P	

XII-C-4	+ _____ V DC	
XII-C-5	+ _____ V DC	
XII-C-7	1.4 MC _____ V P-P	
XII-C-10	11.0 MC _____ V P-P	
XII-C-18	12.4 MC _____ V P-P	
XII-C-21	1.6 MC _____ V P-P	
XII-C-27	14 MC _____ V P-P	
XII-C-30	14 MC _____ V P-P	

XIII-C-5
a. + _____ V DC
b. + _____ V DC
c. + _____ V DC

XIII-C-9 _____ V P-P

XIII-C-10
a. 3 MC _____ tester initial
b. 4 MC _____
c. 5 MC _____
d. 6 MC _____

XIII-C-12 step completed _____ tester initial

XIII-C-13 14 MC _____ V P-P

XIII-C-30 clean sine wave
.2 - 3.2 MCS _____ V P-P

XIII-C-31 clean sine wave
.2 - 3.2 MCS _____ V P-P

XIII-C-32 step completed _____ tester initial

XIII-C-33 step completed _____ tester initial

XIV-D-1 step completed _____ tester initial

XIV-D-2 step completed _____ tester initial

XIV-D-3 1 MC _____ V P-P

XIV-D-4 1 MC _____ V P-P

REVISION SHEET

THE TECHNICAL MATERIEL CORP.
MAMARONECK NEW YORK

S 1232
LIST NO.

DATE	REV.	SHEET	EMN #	DESCRIPTION	APP.
7/2/70	ø			ORIGINAL RELEASE FOR PRODUCTION	

TMC FORM MLR-1 2-65—AINS.