TMC SPECIFICATION			NO. S 1225
REV: Ø A			
COMPILED: JZ	CHECKED:	APPD:	SHEET OF
TITLE:			

TEST PROCEDURE

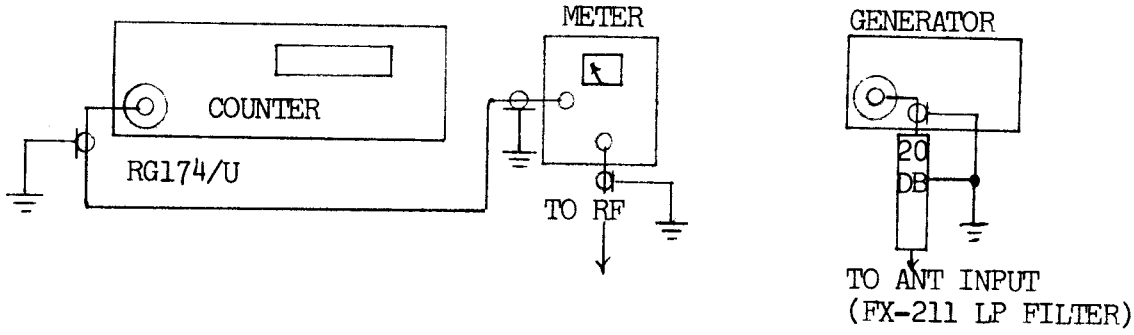
FOR

TMC MODEL VLRC

I. EQUIPMENT REQUIRED

A. Meter, Ballantine Model 861-5 or equivalent.
B. Counter, Hewlett-Packard Model 5245L or equivalent.
C. Signal Generator, Marconie TF-144H or equivalent.
D. Attenuator , Telonic Model TG-950 or equivalent.

II. EQUIPMENT HOOKUPS FOR RF ALIGNMENT



A. Input of meter, to TP-2 at RF card A4604, or to the RF output cable.

B. Output of meter is connected to the input of the counter.

C. Generator is connected through a 20db attenuator to the input of the Low Pass Filter FX-211.

III. POWER SUPPLY (A3634)

A. With voltage OFF, check with an ohm meter for B+ shorts at Pin 1 and 2 of all the PC connectors on the main chassis.

B. With AC cord disconnected, check J111 Pin 1 and 3 to ground. Reading should be infinity. Pin 2 should be grounded.

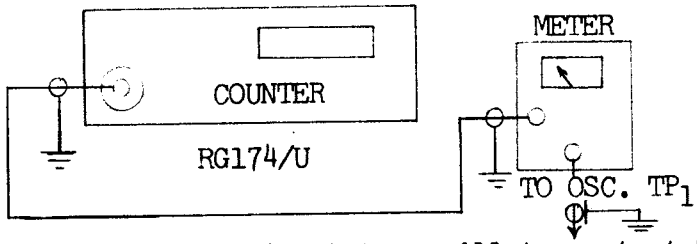
C. Turn voltage on AC and check for AC voltage at J111. (Should be approximately 120 volts).

D. Plug in Card A3634.

E. Check for +12 volts (±10%) DC on Pin 1 of all the PC connector sockets.

F. Check for -12 volts (±10%) DC on Pin 2 of all the PC connector sockets.

IV. EQUIPMENT HOOKUP FOR OSCILLATOR ALIGNMENT



A. Meter input to oscillator output TP_1.

B. Counter input connected to meter output.

V. OSCILLATOR ALIGNMENT BAND 1 (110Kc to 116Kc)

A. Oscillator alignment:

1. Set AGC decay switch to manual and turn RF gain full clockwise.
2. Short Syn DC on back panel to chassis.
3. Set bandswitch to Band 1 (10-16Kc)
4. Connect the voltmeter to TP_1 of the oscillator board. Adjust the meter range to give a consistance frequency reading on the counter.
5. Set the cam stops to give 1.0 inch travel from the low frequency end stop to the hi end stop. Adjust the tuning so the slug plate is positioned 0.05 inches from the low end stop and set the dial pointer to the low end of the tuning range.
6. Set the receiver to 16Kc and adjust L907 for 116.000Kc±50cps.
7. Set the receiver to 10Kc and adjust C930 for 110.000Kc±50cps. If the oscillator will not tune low enough to reach this frequency, increase the value of C926. If the oscillator tunes too low, decrease C926 and C906, if necessary.

8. Repeat Steps 6 and 7 until both ends of the band are in ±50cps.

B. Tracking Test Band 1

1. Check the following frequencies:

DIAL FREQUENCY	OSC. FREQUENCY	TOLERANCE
11Kc	111Kc	±50 cps
12Kc	112Kc	±50 cps
13Kc	113Kc	±50 cps
14Kc	114Kc	±50 cps
15Kc	115Kc	±50 cps

2. If the tolerances are all lower in frequency (ie., at 13Kc oscillator frequency is 112.7Kc), increase L901 slightly (one or two turns of the slug) and reset end points by repeating Steps A6 through A8.

3. If the tolerances are all higher in frequency, decrease L901 slightly and reset end points by repeating Steps A6 through A8.

4. Output should be 5MVRMS ±3db. If oscillator output is greater than 5MVRMS ±3db, increase R910. If the output is less than 5MVRMS ±3db, decrease R910.

5. Synthesizer test:

   a. Connect a variable 1.5V source to the DC Syn input J113. (Remove short)
   b. Vary the voltage in a positive direction and observe a frequency change of about 81cps.
   c. Vary the voltage in a negative direction and observe a frequency change of about 81cps in the opposite direction. (Replace short)

VI. OSCILLATOR ALIGNMENT BAND 2 (116Kc to 125Kc)

A. Oscillator alignment

1. Set bandswitch to Band 2 (16-25Kc)
2. Connect the voltmeter to TP_1 of the oscillator board. Adjust the meter range to give a consistance frequency reading on the counter.
3. Set the receiver to 25Kc and adjust L908 for 125.000Kc±50cps.

4. Set the receiver to 16Kc and adjust C931 for 116.000Kc±50cps. If the oscillator will not tune low enough to reach this frequency, increase the value of C927. If the oscillator tunes too low, decrease C927 and C913, if necessary.

5. Repeat Steps 3 and 4 until both ends of the band are in ±50cps.

B. Tracking test Band 2

1. Check the following frequencies:

DIAL FREQUENCY	OSC. FREQUENCY	TOLERANCE
17	117.000Kc	±50 cps
18	118.000Kc	±50 cps
19	119.000Kc	±50 cps
20	120.000Kc	±50 cps
21	121.000Kc	±50 cps
22	122.000Kc	±50 cps
23	123.000Kc	±50 cps

2. If the tolerances are all lower in frequency (ie., at 20Kc oscillator frequency is 119.7Kc), increase L902 slightly and reset end points by repeating Steps A3 through A5.

3. If the tolerances are all higher in frequency, decrease L902 slightly and reset end points by repeating Steps A3 through A5.

4. Output should be 5MVRMS ±3db. If oscillator output is greater than 5MVRMS ±3db, increase R916. If oscillator output is less than 5MVRMS ±3db, decrease R916.

5. Synthesizer test

   a. Connect a variable 1.5V source to the DC syn input J113.
   b. Vary the voltage in a positive direction and observe a frequency change of about 87cps.
   c. Vary the voltage in a negative direction and observe a frequency change of about 87cps in the opposite direction. (Replace short)

VII. OSCILLATOR ALIGNMENT BAND 3 (125Kc to 140Kc)

A. Oscillator alignment

1. Set bandswitch to Band 3 (25-40Kc)

2. Connect the voltmeter to TP_1 of the oscillator board. Adjust the meter range to give a consistance frequency reading on the counter.
3. Set the receiver to 40Kc and adjust L909 for 140.000Kc±50cps.
4. Set the receiver to 25Kc and adjust C932 for 125.000Kc±50cps. If the oscillator will not tune low enough to reach this frequency, increase the value of C928. If the oscillator tunes too low, decrease C928 and C920, if necessary.
5. Repeat Steps 3 and 4 until both ends of the band are in ±50cps.

B. Tracking test Band 1.

1. Check the following frequencies:

DIAL FREQUENCY	OSC. FREQUENCY	TOLERANCE
27Kc	127.000Kc	50 cps
29Kc	129.000Kc	50 cps
31Kc	131.000Kc	50 cps
33Kc	133.000Kc	50 cps
34Kc	134.000Kc	50 cps
36Kc	136.000Kc	50 cps
38Kc	138.000Kc	50 cps

2. If the tolerances are all lower in frequency (ie., at 33Kc oscillator frequency is 132.7Kc), increase L903 slightly, and reset end points by repeating Steps A3 through A5.
3. If the tolerances are all higher in frequency, decrease L903 slightly and reset end points by repeating Steps A3 through A5.
4. Output should be 5MVRMS ±3db. If oscillator output is greater than 5MV ±3db, increase R922. If oscillator output is less than 5MV ±3db, decrease R922.

5. Synthesizer test

   a. Connect a variable 1.5V source to the DC Syn input J113.
   b. Vary the voltage in a positive direction and observe a frequency change of about 98cps.
   c. Vary the voltage in a negative direction and observe a frequency change of about 98cps in the opposite direction.

(Replace short)

VIII. RF ALIGNMENT BAND 3 (25Kc to 40Kc) (disable oscillator)

A. Alignment

1. Connect Card A4604, Band 3.
2. Connect the meter to TP2.
3. Tune the receiver and the generator to the middle of the band (33Kc).
4. Adjust T1001, T1002, T1003 for maximum output on the meter.
5. Tune the receiver and generator to the high end of the band (40Kc).
6. Tune L1001, L1002, L1003 for maximum output on the meter.
7. Repeat Steps 3 to 6 until receiver is tuned for maximum output.
8. Tune the receiver to the low end of the band (25Kc).
9. Tune the generator for maximum output. Check true center frequency (Step B4a). Frequency should be 25Kc±50cps.

   a. If the error is greater than 50cps in a positive direction, ie. 25.3Kc, increase the value of C1001, C1008 and C1015, and repeat Steps 3 through 9.
   b. If the error is greater than 50cps in a negative direction, ie. 24.7Kc, decrease the value of C1001, C1008 and C1015, and repeat Steps 3 through 9.

B. Bandwidth Test and Tracking Test

1. Adjust the receiver to the low end of the band (25Kc).
2. Adjust the generator so that the meter reads 10db on the 0.1 volt scale.
3. Decrease the generator frequency so that the meter decreases by 3db. Record f1.
4. Increase the generator frequency for the second 3db point. Record f2.

   a. Record the following: $f2 - f1 = \text{Bandwidth}$

   $$\frac{f2 - f1}{2} + f1 = \text{True Center Frequency}$$

   b. Bandwidth must be greater than 500cps. If bandwidth is less than 500cps add R1026, R1027 and R1028. Start with a value of 100K and adjust each resistor so that the bandwidth of each stage is approximately 1Kc. (Do each stage individually).
   c. Check and record true center frequency for 29Kc, 33Kc, 36Kc and 40Kc. True center frequency should be ±50cps with respect with the dial.

C. Gain Test

1. Set the receiver for the high end of the band (40Kc).
2. Set the generator frequency for a peak, with luv input, to the antenna connector.
3. Output should be 1.75MV ±5db. If output is greater than 1.75MV ±5db, increase R1024 slightly. If output is less than 1.75MV ±5db, decrease R1024 slightly.

IX. ALIGNMENT BAND 2 (16Kc to 25Kc)

A. Alignment

1. Connect Card A4604, Band 2.
2. Connect the meter to TP2.
3. Tune the receiver and the generator to the middle of the band (20.5Kc)
4. Adjust T801, T802, T803 for maximum output on the meter.
5. Tune the receiver and generator to the high end of the band (25Kc).
6. Tune L801, L802, L803 for maximum output on the meter.
7. Repeat Steps 3 to 6 until receiver is tuned for maximum output.
8. Tune the receiver to the low end of the band (16Kc).
9. Tune the generator for maximum output. Check true center frequency (Step B4a). Frequency should be 16Kc±50cps.

   a. If the error is greater than 50cps in a positive direction, ie. 16.3Kc, increase the value of C801, C808 and C815, and repeat Steps 3 through 9.
   b. If the error is greater than 50cps in a negative direction, ie. 15.7Kc, decrease the value of C801, C808 and C815 and repeat Steps 3 through 9.

B. Bandwidth Test and Tracking Test

1. Adjust the receiver to the low end of the band (16Kc).
2. Adjust the generator so that the meter reads 10db on the 0.1 volt scale.
3. Decrease the generator frequency so that the meter decreases by 3db. Record f1.

4. Increase the generator frequency for the second 3db point. Record f2.

   a. Record the following: $f2 - f1 = \text{Bandwidth}$

   $$\frac{f2 - f1}{2} + f1 = \text{True Center Freq.}$$

   b. Bandwidth must be greater than 500cps. If bandwidth is less than 500cps, add R826, R827 and R828. Start with a value of 100K and adjust reach resistor so that the bandwidth of each stage is approximately 1Kc. (Do each stage individually.)
   c. Check and record true center frequency for 18.5Kc, 20.5Kc, 22.5Kc and 25Kc. True center frequency should be ±50cps with respect with the dial.

C. Gain Test

1. Set the receiver for the high end of the band (25Kc).
2. Set the generator frequency for a peak, with luv input, to the antenna connector.
3. Output should be 1.75MV ±5db. If output is greater than 1.75MV ±5db increase R824 slightly. If output is less than 1.75MV ±5db, decrease R824 slightly.

X. RF ALIGNMENT BAND 1 (10Kc to 16Kc)

A. Alignment

1. Connect Card A4604, Band 1
2. Connect the meter to TP2.
3. Tune the receiver and the generator to the middle of band (13Kc).
4. Adjust T701, T702, T703 for maximum output on the meter.
5. Tune the receiver and generator to the high end of the band (16Kc).
6. Tune L701, L702, L703 for maximum output on the meter.
7. Repeat Steps 3 to 6 until receiver is tuned for maximum output.
8. Tune the receiver to the low end of the band (10Kc).
9. Tune the generator for maximum output. Check true center frequency (Step B4a). Frequency should be 10Kc±50cps.

   a. If the error is greater than 50cps in a positive direction, ie. 10.3Kc, increase the value of C701, C708 and C715, and repeat Steps 3 through 9.

b. If the error is greater than 50cps in a negative direction, ie 9.7Kc, decrease the value of C701, C708 and C715, and repeat Steps 3 through 9.

B. Bandwidth Test and Tracking Test

1. Adjust the receiver to the low end of the band (10Kc).
2. Adjust the generator so that the meter reads 10db on the 0.1 volt scale.
3. Decrease the generator frequency so that the meter decreases by 3db. Record f1.
4. Increase the generator frequency for the second 3db point. Record f2.

a. Record the following: $f2 - f1 = \text{Bandwidth}$

$$\frac{f2 - f1}{2} + f1 = \text{True Center Frequency}$$

b. Bandwidth must be greater than 500cps. If bandwidth is less than 500cps add R726, R727 and R728. Start with a value of 100K and adjust each resistor so that the bandwidth of each stage is approximately 1Kc. (Do each stage individually.)

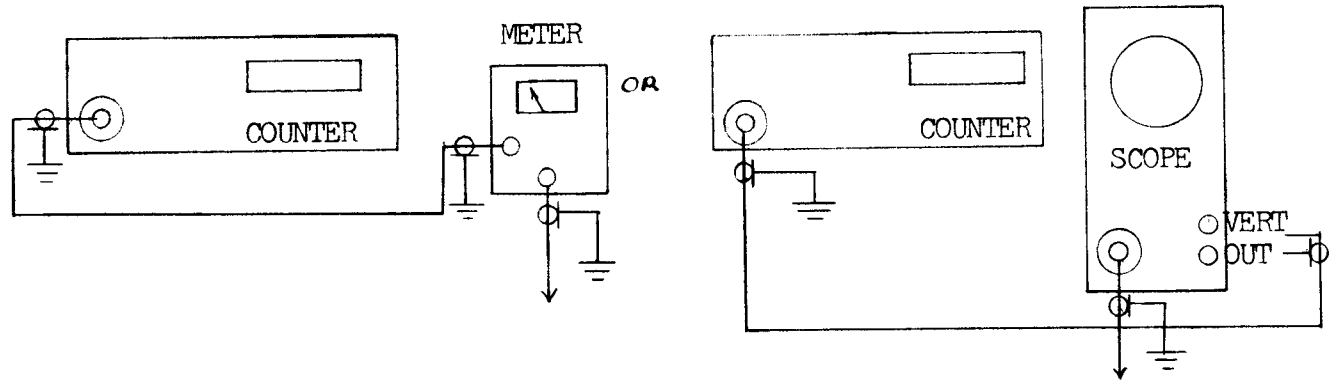
c. Check and record true center frequency for 11.5Kc, 13Kc, 14.5Kc and 16Kc. True center frequency should be ±50cps with respect with the dial.

C. Gain Test

1. Set the receiver for the high end of the band (16Kc).
2. Set the generator frequency for a peak, with luv input to the antenna connector.
3. Output should be 1.75MV ±5db. If output is greater than 1.75MV ±5db, increase R724 slightly. If output is less than 1.75MV ±5db, decrease R724 slightly.

XI. IF-102 6.36Mc to 6.39MC IF

A. Equipment Required and Hookup



1. Scope, Tektronic Model 541A or equivalent.
2. Counter, Hewlett-Packard Model 5245L or equivalent.
3. Meter, Ballantine Model 861-5 or equivalent.

B. Connect A3655 (IF102) card through an extender card to the socket marked A3655.

C. 6.5Mc Alignment procedure.

1. Connect the meter to TP1.
2. Adjust C502 for a frequency indication of exactly 6.5000Mc.
3. Adjust L501 for minimum voltage indication at TP1. The voltage at TP1 should be approximately 14MVRMS.
4. Connect the meter to Pin 22 of IF-102. The output should be 9MVRMS. (Same reading at J115 6.5Mc out).

D. 6.5Mc Rejection circuit alignment procedure.

1. Short TP1 of the oscillator card PC-381 to ground.
2. Connect scope to collector of Q507 and adjust R513 for minimum indication on the scope.
3. Adjust C502, T529 and C539 for minimum indication of 6.5Mc on the scope.

*NOTE: To complete the 6.5Mc rejection alignment procedure, a synthesizer (TMC LFSB) must be used)

4. Connect the SYN IF output J118, to the synthesizer unit.
5. Connect scope to TP1 of the Phase Detector card of the synthesizer unit.
6. Retune capacitors C529 and C539 for minimum 6.5Mc response at TP1 of the Phase Detector card.
7. Insert IF-102 module (A3655) into the chassis and align R513 for minimum response of 6.5Mc at TP1 of the Phase Detector module of the synthesizer unit.

This completes tuning for rejection of 6.5Mc in the 6.36 to 6.39Mc passband. Do not retune C502, C529, C539 and R513.

E. 6.36 to 6.39Mc Passband Alignment.

1. Replace IF-102 module (A3655), onto an extender card.

2. Disconnect short from TP1 on PC-381.
3. Place scope probe across R527.
4. Switch bandswitch to band 3 and tune to the highest frequency (40Kc).
5. Tune T501 and L506 for maximum response on scope.
6. Switch to band 1 and tune T502 and T503 for maximum response on scope.
7. Repeat Steps 4 through 6 until no further tuning is required.
8. Set bandswitch to Band 2 (25Kc). Align T504 for maximum response on scope.

F. Response of 6.36 to 6.39Mc passband.

1. Place meter on J118 (SYN IF)
2. Check all bands and all frequencies. Output should vary from 12MV to 18.5MVRMS. If output varies beyond these limits repeat Steps E4 through 8, until bandpass is aligned correctly.
3. Replace A3655 into it's socket.

XII. IF-103 100Kc IF (A4603)

A. Equipment Required

1. Scope, Tektronic Model 541A or equivalent.
2. Meter, Ballantine Model 861-5 or equivalent.
3. Counter, Hewlett-Packard Model 5245L or equivalent.
4. Generator, Marconie TF144H or equivalent.

B. Connect scope to TP410 and adjust L407 for maximum 6.5Mc.

C. Short TP408 to ground (TP404) and connect signal generator to TP401. Set input signal to 100.000Kc.

D. Set selectivity switch to .5Kc.

E. Connect scope to TP405 and adjust L401 for maximum output.

F. Short TP406 to ground and adjust L403 for maximum output.

G. Disconnect short from TP406 and adjust T403 for minimum indication. The 500cps double tuned stage should now be properly tuned.

H. Place meter at TP409. Adjust signal generator input so that there is 50Mv output.

I. Set selectivity switch to 0.1Kc position, and set R442 to it's center position.

J. Place scope at TP407 and adjust T404 for maximum 100.000Kc.

K. Now readjust R442 for a 0.1Kc bandwidth at TP407.

L. Repeat Steps J and K until a maximum 100.000Kc signal with a bandwidth of 0.1Kc is obtained.

M. Place the scope to TP409. Check the 100.000Kc with 0.1Kc bandwidth.

N. Switch the selectivity switch to 0.5Kc. Output at TP409 should be 100.000Kc with a 0.5Kc bandwidth.

O. Remove short from TP408 and generator from TP401. Output at TP409 should be between 50 to 60MV with an input signal of 0.3 microvolt input to the antenna.

P. Place meter to 100Kc output jack J116. Output should be 1.5MV.

XIII. AGC-NOISE SILENCER — 6.4MC IF

A. Place A3661 Module on the extender card.

B. Adjust R637 for 0.5V DC at TP604 with the noise silencer switch (Front Panel) on.

C. Connect an accurate 6.4Mc signal across R611 and adjust the level to 100MVRMS.

D. Ground TP602 and place meter at TP604.

E. Adjust T601 for maximum indication.

F. Remove short from TP602.

G. Switch the AGC Decay switch to the fast position and adjust R646 until the signal at TP405 located on the 100Kc IF board (A4603) just begins to drop from full RF gain position. This adjustment is called the AGC threshold level.

H. For a quick comparison, switch the AGC Decay control back and forth from Manual to Fast position. Readjust R646, if necessary.

I. Vary the RF input from 0.3 microvolts to 1.0 volt. Maximum variation of the test point voltage (TP405) should be 0.5db.

J. Replace both cards into their respective sockets.

XIV. BFO AND 600 AUDIO AMPLIFIER

A. Turn the front panel BFO control completely counterclockwise.

B. Switch the mode switch to the cw position.

C. Short TP301 to ground.

D. Connect meter to TP303

E. Adjust L304 for 97Kc.

F. Turn front panel BFO control completely clockwise. The frequency at TP303 should be 103Kc, if the control potentiometer is wired correctly.

G. Turn the mode switch to the cw position. Insert 100Kc signal at TP301.

H. Adjust the BFO for 1Kc signal at the line output terminals. Connect a 600 load to these terminals.

I. Adjust the 100Kc input signal for 3dbm 1Kc output into 600ohm load. (using meter) This corresponds to 1.1vrms.

J. Adjust R349 for 3dbm reading on the front panel meter. Meter switch must be in the 0dbm position.

K. Disconnect all leads and replace card into connector.

L. Sensitivity test:

1. Set receiver to any frequency and generator to the same frequency 0.3uv input to antenna.
2. Adjust line level control for a reading of 0dbm.
3. Voltage across 600 load should be .779V ±10%.
4. **Set IF bandwidth to .1 position.**

XV. FINAL TEST

A. Audio test:

1. Place 4ohm load across speaker output terminals.
2. Set AF gain control until 1.4vpp appears across 4ohm load (measured with scope). Output should be a clean sine wave.

B. Image rejection test;

1. Set receiver and generator to 15Kc. Set generator to .3uv with 0dbm reading on meter.
2. Change generator to 30Kc and increase gain until meter reads 0dbm. Generator should be at least 80db above .3uv.

C. AGC decay

1. Set generator and receiver to same frequency. Set generator for 0.3uv input and set the receiver to read 0dbm on meter (AGC decay switch to manual)
2. Set meter switch to signal and observe signal.
3. Switch the AGC control to fast position, and remove the RF input. It should take at least 3 seconds for meter to decay to zero.
4. Switch AGC control to medium position and repeat above procedure. With signal removed it should take at least 9 seconds for meter to decay to zero.
5. Switch AGC control to fast position and repeat above procedure. With signal removed it should take at least 16 seconds for meter to decay to zero.

D. Monitor test

1. Plug in head phones.
2. With headphones connected, speaker voltage should drop to zero and a tone should be heard in the phones.

TMC SPECIFICATION

SERIAL NO._____

MFG. NO._____

MECHANICAL_____OK

WIRING_____OK

I. POWER SUPPLY CHECK (Used with Part III)

A. B+ and B- lines_____OK (Used with Step A)
B. AC Line_____OK (Used with Step B)
C. AC Power_____OK (Used with Step C)
D. B+ (+12V±10%)_____VOLTS (Used with Step E)
E. B- (-12V±10%)_____VOLTS (Used with Step F)
F. Battery Operation_____OK (Used with Steps G & H)

II. OSCILLATOR ALIGNMENT AND TRACKING (Used with Part V, VI, and VII)

	MAX. DIAL TRACKING ERROR	RECORDED TRACKING ERROR	E OUT 5MV±3db	SYNTHESIZER	
				POS CPS	NEG CPS
BAND 1	±150cps	CPS	MV	____CPS	____CPS
BAND 2	+150cps	CPS	MV	____CPS	____CPS
BAND 3	±150cps	CPS	MV	____CPS	____CPS

III. RF ALIGNMENT BAND 3 (Used with Part VIII)

TEST FREQ.	f1 (Kc)	f2 (Kc)	BW CPS	CENTER FREQ.	OUTPUT DB 65db±5db
25K ±50CPS					db
29Kc					db
33Kc					db
36Kc					db
40Kc±50CPS					db

IV. RF ALIGNMENT BAND 2 (Used with Part IX)

TEST FREQ.	f1 (Kc)	f2 (Kc)	BW CPS	CENTER FREQ.	OUTPUT DB 65db±5db
16Kc±50CPS					db
18.5Kc					db
20.5Kc					db
22.5Kc					db
25Kc±50CPS					db

V. RF ALIGNMENT BAND 1 (Used with Part X)

TEST FREQ.	f1 (Kc)	f2 (Kc)	BW CPS	CENTER FREQ.	OUTPUT DB 65db±5db
10Kc±50CPS					db
11.5Kc					db
13Kc					db
14.5Kc					db
16Kc±50CPS					db

VI. IF-102 (Used with Part XI)

A. TP1 Voltage _____ MVRMS (Used with Step C-3)
B. 6.5Mc J115 _____ MVRMS (Used with Step C-4)
C. 6.36 to 6.39Mc Passband _____ MVRMS (Used with Step F-2)

VII. IF-103 100Kc IF (Used with Part XII)

A. Bandwidth Check at TP409

500CPS Bandwidth _____ OK (Used with Step M-N)
100CPS Bandwidth _____ OK (Used with Step M-N)

B. 100Kc Output Jack J116 _____ MV (Used with Step (P)

VIII. AGC NOISE SILENCER 6.4Mc IF (Used with Part XIII)

A. Noise Silencer Setting _____ Volts (Used with Step B)
B. T601 Adjustment _____ OK (Used with Step E)
C. AGC Operation _____ db (Used with Step I)

IX. BFO AND AUDIO AMPLIFIER (Used with Part XIV)

A. BFO Control Counter Clockwise _____ Kc (Used with Step E)
B. BFO Control Clockwise _____ Kc (Used with Step F)
C. Meter Adjustment for 3dbm _____ OK (Used with Step J)
D. Sensitivity Test _____ Volts (Used with Step L)

X. FINAL TEST (Used with Part XV)

A. Audio Test _____ OK (Used with Step A-2)
B. Image Rejection _____ db (Used with Step B-3)
C. AGC Decay (Used with Step C)

1. Fast _____ sec. (Used with Step C-3)
2. Medium _____ sec. (Used with Step C-4)
3. Slow _____ sec. (Used with Step C-5)

D. Monitor Test _____ OK (Used with Step D-2)

DATE: _____ TESTER: _____