MCX-1000
RT
Test Procedure

Test Engineering
650-0238-000

PREPARED BY:_____

APPROVED_____

DATE: _____

AUTHORIZED PRINT

Test Engineering Revision History Sheet				650-0238-000
REV #	**DATE**	**By:**	**Summary of Changes**	**Reason for Change**
A	3/27/85		Initial release	
B	5/14/85		CO 2701	
C	6/26/85		CO 2716	
D	10/01/97	WDH	CO 135530	
E	03/10/98	WDH	CO 138940	Clarification

TABLE OF CONTENTS

MCX-1000 R/T Module PRETEST

1. PURPOSE

This procedure provides a functional check of the MCX-1000 R/T Module (300-2259-0002).

2. EQUIPMENT REQUIRED: EQUIPMENT LISTED OR EQUIVALENT.

Multimeter	**Kiethly 178**
6 dB Pad	**RF 20 W**
Audio Distortion Meter	**Marconi TF 2337A**
Audio Oscillator	**AWA G233**
Frequency Counter	**HP 5382A**
MCX-1000 Test Panel W/MCX-1000 Adapter Cable	**CD 605**
Modulation Meter	**Boonton 8210**
Notch Filter	
Oscilloscope	**Tektronix 2445**
Power Supply	**HR40-10C**
RF Signal Generator	**Fluke 6060A**
Soldering Iron	
Spectrum Analyzer	**HP 182T w/8558B Insert**
True RMS Voltmeter	**Fluke 8920**
Watt Meter	**Coaxial Dynamics 85A**

3. SET UP:

3.1. R/T Precheck

3.1.1. Verify all resistance measured from A2P6 connector to R/T crate GND.

pin 1	9.2 k ohm ± 900 ohms	pin 5	261 ± 25 ohms
pin 2	>3M ohm	pin 6	>7.5k ohm Cap will charge
pin 3	>1M ohm	pin 7	>10M ohm
pin 4	<5 ohms	pin 8	90 ± 10 ohms

4. RECEIVER SECTION

4.1. IF Preselector Alignment.

4.1.1. Turn the power and the PTT switches to the off position.
4.1.2. Connect the test equipment per figure 1.
4.1.3. Put the test cover on the R/T under test
4.1.4. Install the R/T in a test chassis (Ensure the buffer + 15 VDC line is not touching the R/T chassis.)
4.1.5. Connect the Wattmeter to the unit under test.

4.1.6. Turn the test set power switch on.
4.1.7. Verify the UUT is not transmitting, and in the receive mode; Connect the UUT to the signal generator.
4.1.8. Verify the 15, -12. 5 and 28 Volt LED's are lit.
4.1.9. Select 130.4 MHz at the Test Fixture
4.1.10. Set the Signal Generator for 130.4 MHz, -60 dBm and 90% AM modulation.
4.1.11. Monitor the AGC voltage at R15 (see figure 2) on the audio board.
4.1.12 Adjust the RF level (no more than -40 dBm) to produce an AGC voltage of 7.5 ± 0.5 VDC.
4.1.13. Adjust A2C15, A2C19, and A2C24 for minimum AGC voltage (verify each capacitor has two null points).

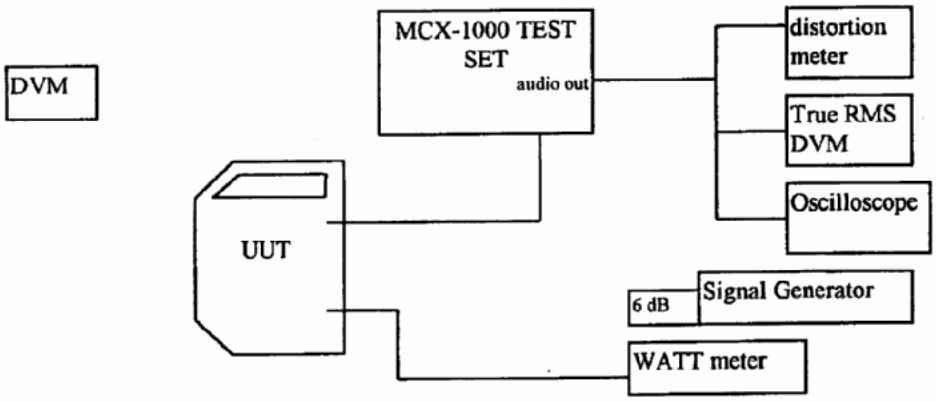

Figure 1

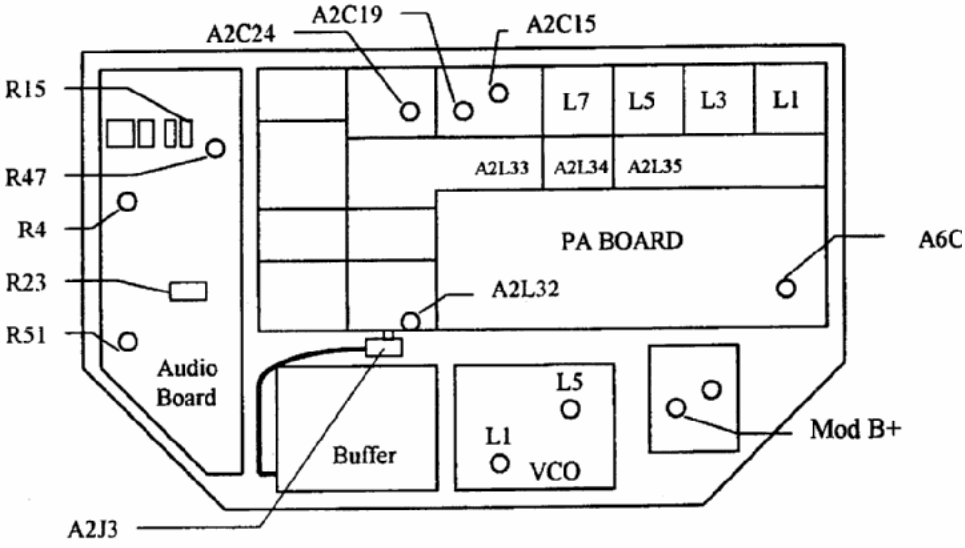

Figure 2

4.2. Preselector Alignment.

4.2.1. Connect the test equipment with the POWER OFF per figure 1.
4.2.2. Set the signal generator for 136.975 MHz 90% AM, 1 kHz signal internal modulation 3 to 5 uV
4.2.3. In the RX mode channel the test fixture to 136.975MHz.
4.2.4. Adjust the Signal Generator level for 10 to 20% audio distortion as the inductor adjustments are made.
4.2.5. Connect the tuning voltage lines (feedthrough capacitor side of 100K ohm resistors) that go to the second and fourth (A2CR2 and A2CR4) preselector sections to ground using clip leads.
4.2.6. Adjust A2C4 and A2C6 for maximum (S+N)/N.
4.2.7. Adjust the signal generator level for 10 to 15 dB (S+N)/N as the trimmer adjustments are made.
4.2.8. Channel the Transceiver and signal generator to 128.800 MHz.
4.2.9. Expand or compress A2L1 and A2L5 for maximum (S+N)/N, keeping (S+N)/N in the 10 to 15 dB range.
4.2.10. Repeat steps 4.2.6 thru 4.2.9 until maximum (S+N)/N occur at 128.800 and 136.975 MHz.
4.2.11. Remove the clip leads from the second and fourth preselector sections and connect the first and third preselector sections (A2CR1 and A2CR3) to ground.
4.2.12. Repeat steps 4.2.6 thru 4.2.9 except adjust A2C5, A2C7 and A2L3, A2L7.
4.2.13. Check at 128.800 MHz, 133.100 MHz and 136.975 MHz for distortion maximum of 10%.

4.3. Crystal Filter Alignment

4.3.1. Connect the equipment as in figure 1 and channel the test fixture and signal generator to 130.400 MHz. Ensure the signal generator frequency is within ± 300 Hz of 130.400 MHz.
4.3.2. Adjust the signal generator to 100μ V (Hard) RF output. While monitoring the AGC voltage, adjust A2C15 for minimum AGC voltage.
4.3.3. Adjust the RF signal generator for 1 kHz modulation with ± 3.0 kHz FM deviation.
4.3.4. Adjust A2C19 and A2C24 for minimum audio output (Do not move C19 or C24 far from the positions set in step 4.1.13). 1.3 VRMS, Max.

4.4. RX Noise Level

4.4.1. Set the unit to 130.400 MHz at 1mV (hard) and 90% AM modulation. Remove the modulation and measure ((S+N)/N) ratio.

Using the Fluke 8920 set a relative dB reference level; remove the modulation. The difference must be more than 52 dB.
4.4.2. Adjust A2C19 and A2C24 for min. Noise Floor. Recheck step 4.3.

4.5. Sensitivity Check

4.5.1. With the Set-up of figure 1, measure the ((S+N)/N) at the following frequencies with 2.0 μV (Hard) 90% AM (1 kHz) input from the signal generator.
Using the Fluke 8920 set a relative dB reference; remove the modulation.
The difference must be more than 8.0 dB.

128.800 MHz
133.100 MHz
136.975 MHz

4.6. 6 dB Bandwidth

4.6.1. With the Set-up of Figure 1, channel the signal generator and the test fixture to 130.400 MHz and adjust the RF input level for 3.0 μV (hard). Note the AGC voltage (R15 of the Audio Board).

4.6.2. Increase the RF input to 6μV (hard)

4.6.3. Turn the signal generator frequency so that the AGC voltage in 4.5.2 is acquired; this will occur above and below the channel frequency.

Limit Less than or equal to 130.392 MHz, Low side
Greater than or equal to 130.408 MHz, High side

4.7. AGC Dynamic Range

4.7.1. With the set-up of Figure 1, adjust the signal generator level for 3.0 μV (hard), at 130.400 MHz. 90% AM (1 kHz) and channel the test fixture to 130.400 MHz. Note the Audio output level.

4.7.2. Increase the signal generator level to 3000,000μV (hard). Monitor the net change of the audio output as the increase is made.

Requirement: 4 dB max.

4.8. Audio Distortion

4.8.1. With the Set-up of Figure 1, and the test fixture channeled to 130.400 MHz,

4.8.2. Input a 130.400 MHz 90%AM (1 kHz) signal at a level of 1,000μV (hard).

4.8.3. Measure the audio distortion.

Requirement 9.0%, Max.

5. TRANSMITTER SECTION

5.1. TX Filter Alignment

5.1.1. Turn the Unit Power OFF.

5.1.2. Connect the Equipment per figure 3. Solder the 15 V transmit line to E7 and Mod B+ to the R/T under test.

5.1.3. The RF drive for the R/T module must be provided by an external signal generator; do not use the test fixture generated RF signal.

5.1.4. Remove A2P3 and attach a test cable from the signal generator to A2J3

5.1.5. Channel the signal generator to 130.500 MHz, and set the RF level at approximately -5 dBM.

5.1.6. Place the TX-RX switch in the TX position, and verify that the wattmeter indicates some RF output. Adjustment of A2R47 may need to be adjusted in order to indicate power output (Do not exceed 13 VDC at B+).

5.1.7. Adjust the slug of A2L32 for maximum power output. Adjust the signal generator RF level to keep power output between 8 and 10 watts.

5.1.8 Place the unit in receive mode.

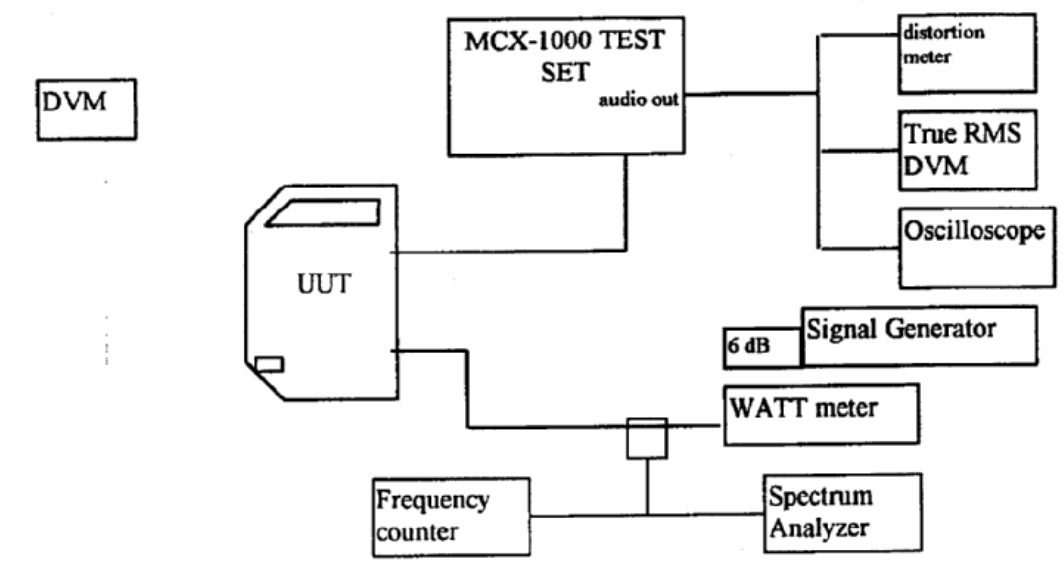

Figure 3 TX Filter Alignment Test Set-up

Caution: **Although the transmitter can take some heat, do not operate it for long periods of time (1 minute ON, 3 minute OFF) at this stage of testing. The PA board has not yet been aligned and excessive heat build up may be the result of prolonged operation.**

5.2 PA Board/Low Pass Filter Alignment

5.2.1. Connect the Equipment per figure 3. Turn the unit power on.
Note: The transmitter output power must be between 19 watts and 21 watts at all frequencies checked. Transmitter harmonics below 1 GHz must be at lease -72 dBc. Harmonics should be measured with R/T module cover in place.

5.2.2. Adjust the test fixture FREQUENCFY SELECT switch to 136.975 MHz and place the TX-RX switch in the TX position.

5.3.3. Adjust the TX POWER ADJUST pot so that the DVM indicates about 12.5 VDC.

5.3.4. Adjust the FREQUENCY SELECT switch to 136.975 MHz and adjust A6C23for maximum power output.

5.3.5. Using the thumbwheel switches to channel the radio, check for output level and power flatness at 128.900 MHz, 130.500 MHz, 133.000 MHz, and 135.1 MHz. The output level must be within the 19 to 21 watt range at all points in the band, Assure that the supply voltage to the test fixture remains at 28 VDC ± 5% at each frequency.

5.2.6. If power flatness is not observed, “tweak” the coils in the low pass filter (A2L33, A2L34, and A2L35). Repeat steps 3.2.2 through 3.2.5. Do not Transmit when tweaking the coil.

5.2.7. If power flatness is obtained (i.e., less than 2 watts variation across the band), but the output level is above or below the allowable 19 to 21 watt range, use the CARRIER level control (A3R47) pot to balance the output across the entire band. Repeat steps 3.2.4. and 3.2.5.

5.2.8. Verify that the level of MODULATED B+ voltage at which the proper output level is obtained is not greater than 13.0 VDC (measured while transmitting at 133.000 MHz).

5.2.9. Return to the RX mode. Put on the R/T module cover.

5.2.10. Connect the equipment per Figure 5 while in the RX mode.

5.2.11. Set the Spectrum Analyze to 10 dB/div. vertical sensitivity, 100 MHz/Div. frequency span, and + 10 dBm reference level.

5.2.12. Remove the high pass filter from the input of the analyzer. Activate the transmitter and note the level of fundamental signal.

5.2.13. Replace the high pass filter and increase the sensitivity of the analyzer until the harmonics are visible. Verify the harmonics under 1 GHz are at least -75 dBc.

5.2.14. Repeat steps 5.2.12 and 5.2.13 at transmit frequencies of 128.900 MHz and 136.975 MHz.

5.2.15. Place the TX-RX switch in the RX position. Turn the unit power off.

6. TEST COMPLETE