

# **ALIGNMENT      PROCEDURE**

Marine Radio

MODEL:    MR F55 / MR F75

REVISION:    C

**USA and European Versions**

TOTAL PAGES: 10

# MRF75 / 55 ALIGNMENT INSTRUCTION

## 1.0 TEST CONDITION:

- 1.1. STANDARD DC POWER: 13.8VDC
- 1.2. STANDARD AUDIO FREQUENCY: 1KHz
- 1.3. STANDARD RF INPUT: 1mV
- 1.4. MEASUREMENT CHANNEL: CH14 (156.700MHz)
- 1.5. STANDARD AUDIO LOADING: 8  $\Omega$
- 1.6. ANTENNA IMPEDANCE: 50  $\Omega$
- 1.7. STANDARD REF. MODULATION:  $\pm 3$ KHz
- 1.8. STANDARD REF. AUDIO OUTPUT: 500mW
- 1.9. FREQUENCY TABLE:

| <b>WX CHANNEL FREQUENCY</b> |         |    |         |
|-----------------------------|---------|----|---------|
| 01                          | 162.550 | 06 | 162.500 |
| 02                          | 162.400 | 07 | 162.525 |
| 03                          | 162.475 | 08 | 162.650 |
| 04                          | 162.425 | 09 | 161.775 |
| 05                          | 162.450 | 10 | 163.275 |
|                             |         |    |         |

| <b>European Private Channels</b>     |        |          |          |          |
|--------------------------------------|--------|----------|----------|----------|
| Country                              | CH NO. | TX (MHz) | RX (MHz) | Used for |
| UK                                   | P1     | 157.850  | 157.850  |          |
|                                      | P2     | 161.425  | 161.425  |          |
| Denmark                              | P3     | 155.500  | 155.500  |          |
|                                      | P4     | 155.525  | 155.525  |          |
| Finland, Norway<br>& Sweden          | P3     | 155.500  | 155.500  |          |
|                                      | P4     | 155.525  | 155.525  |          |
|                                      | P5     | 155.650  | 155.650  |          |
| Holland                              | P1     | 157.850  | 157.850  |          |
|                                      | P6     | 157.550  | 162.150  |          |
| Belgium                              | P6     | 157.550  | 162.150  |          |
|                                      | P7     | 162.425  | 162.425  |          |
| Denmark, Finland,<br>Norway & Sweden | P8     | 155.625  | 155.625  |          |
|                                      | P9     | 155.775  | 155.775  |          |
|                                      | P0     | 155.825  | 155.825  |          |

date: Sept. 02, 2003

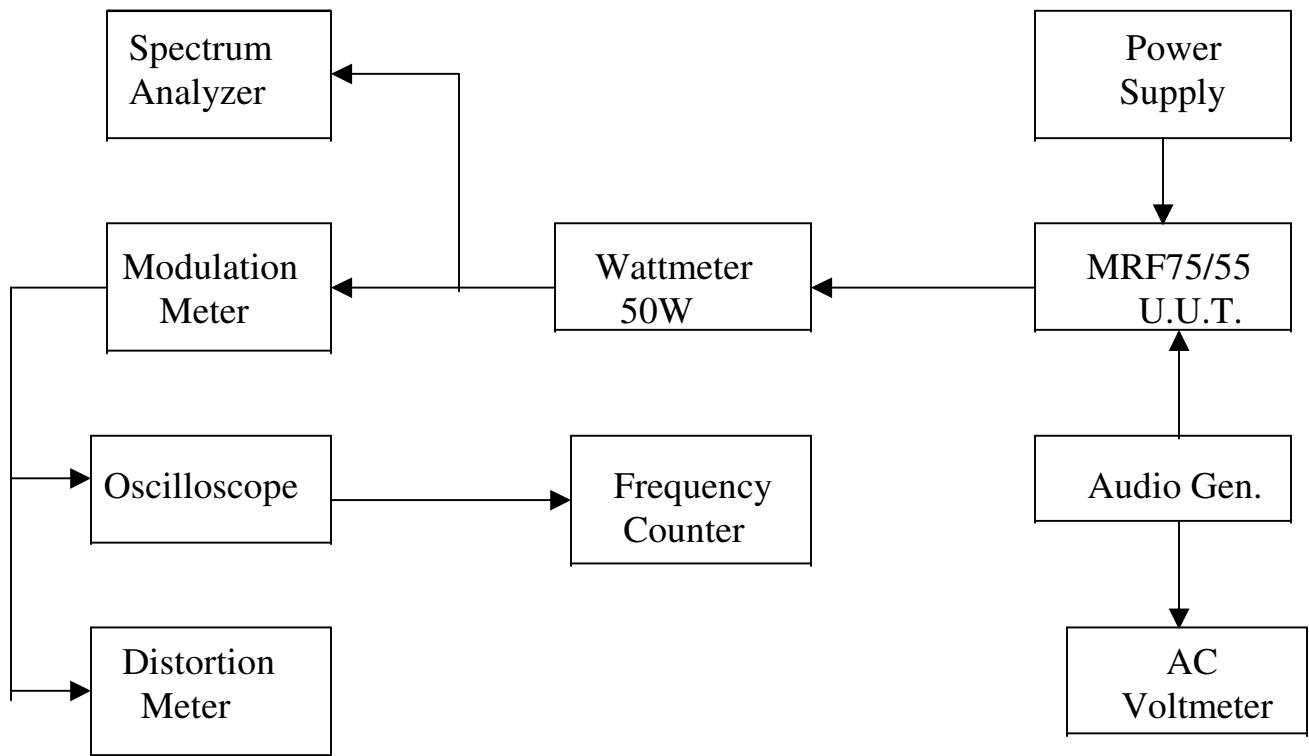
| Channel Number | Channel Map |        |       | Frequency (MHz) |         |         | Power            |
|----------------|-------------|--------|-------|-----------------|---------|---------|------------------|
|                | USA         | Canada | Int'l | TX              | RX      | RX VCO  |                  |
| 01             |             | X      | X     | 156.050         | 160.650 | 139.250 |                  |
| 01A            | X           |        |       | 156.050         | 156.050 | 134.650 |                  |
| 02             |             | X      | X     | 156.100         | 160.700 | 139.300 |                  |
| 03             |             | X      | X     | 156.150         | 160.750 | 139.350 |                  |
| 03A            | X           |        |       | 156.150         | 156.150 | 134.750 |                  |
| 04             |             |        | X     | 156.200         | 160.800 | 139.400 |                  |
| 04A            |             | X      |       | 156.200         | 156.200 | 134.800 |                  |
| 05             |             |        | X     | 156.250         | 160.850 | 139.450 |                  |
| 05A            | X           | X      |       | 156.250         | 156.250 | 134.850 |                  |
| 06             | X           | X      | X     | 156.300         | 156.300 | 134.900 |                  |
| 07             |             |        | X     | 156.350         | 160.950 | 139.550 |                  |
| 07A            | X           | X      |       | 156.350         | 156.350 | 134.950 |                  |
| 08             | X           | X      | X     | 156.400         | 156.400 | 135.000 |                  |
| 09             | X           | X      | X     | 156.450         | 156.450 | 135.050 |                  |
| 10             | X           | X      | X     | 156.500         | 156.500 | 135.100 |                  |
| 11             | X           | X      | X     | 156.550         | 156.550 | 135.150 |                  |
| 12             | X           | X      | X     | 156.600         | 156.600 | 135.200 |                  |
| 13             | X           | X      | X     | 156.650         | 156.650 | 135.250 | 1W for USA & CAN |
| 14             | X           | X      | X     | 156.700         | 156.700 | 135.300 |                  |
| 15             | X           |        |       | NO TX           | 156.750 | 135.350 |                  |
| 15             |             | X      | X     | 156.750         | 156.750 | 135.350 | 1W for INT & CAN |
| 16             | X           | X      | X     | 156.800         | 156.800 | 135.400 |                  |
| 17             | X           | X      | X     | 156.850         | 156.850 | 135.450 | 1W FOR CAN       |
| 18             |             |        | X     | 156.900         | 161.500 | 140.100 |                  |
| 18A            | X           | X      |       | 156.900         | 156.900 | 135.500 |                  |
| 19             |             |        | X     | 156.950         | 161.550 | 140.150 |                  |
| 19A            | X           | X      |       | 156.950         | 156.950 | 135.550 |                  |
| 20             | X           | X      | X     | 157.000         | 161.600 | 140.200 | 1W FOR CAN       |
| 20A            | X           |        |       | 157.000         | 157.000 | 135.600 |                  |
| 21             |             | X      | X     | 157.050         | 161.650 | 140.250 |                  |
| 21A            | X           | X      |       | 157.050         | 157.050 | 135.650 |                  |
| 22             |             |        | X     | 157.100         | 161.700 | 140.300 |                  |
| 22A            | X           | X      |       | 157.100         | 157.100 | 135.700 |                  |
| 23             |             | X      | X     | 157.150         | 161.750 | 140.350 |                  |
| 23A            | X           |        |       | 157.150         | 157.150 | 135.750 |                  |

|     |   |   |   |         |         |         |            |
|-----|---|---|---|---------|---------|---------|------------|
| 24  | X | X | X | 157.200 | 161.800 | 140.400 |            |
| 25  | X | X | X | 157.250 | 161.850 | 140.450 |            |
| 26  | X | X | X | 157.300 | 161.900 | 140.500 |            |
| 27  | X | X | X | 157.350 | 161.950 | 140.550 |            |
| 28  | X | X | X | 157.400 | 162.000 | 140.600 |            |
| 60  |   | X | X | 156.025 | 160.625 | 139.225 |            |
| 61  |   |   | X | 156.075 | 160.675 | 139.275 |            |
| 61A | X | X |   | 156.075 | 156.075 | 134.675 |            |
| 62  |   |   | X | 156.125 | 160.725 | 139.325 |            |
| 62A |   | X |   | 156.125 | 156.125 | 134.725 |            |
| 63  |   |   | X | 156.175 | 160.775 | 139.375 |            |
| 63A | X |   |   | 156.175 | 156.175 | 134.775 |            |
| 64  |   | X | X | 156.225 | 160.825 | 139.425 |            |
| 64A | X | X |   | 156.225 | 156.225 | 134.825 |            |
| 65  |   |   | X | 156.275 | 160.875 | 139.475 |            |
| 65A | X | X | X | 156.275 | 156.275 | 134.875 |            |
| 66  |   |   | X | 156.325 | 160.925 | 139.525 |            |
| 66A | X | X | X | 156.325 | 156.325 | 134.925 | 1W FOR CAN |
| 67  | X | X | X | 156.375 | 156.375 | 134.975 | 1W FOR USA |
| 68  | X | X | X | 156.425 | 156.425 | 135.025 |            |
| 69  | X | X | X | 156.475 | 156.475 | 135.075 |            |
| 70  | X | X | X | NO TX   | 156.525 | 135.125 |            |
| 71  | X | X | X | 156.575 | 156.575 | 135.175 |            |
| 72  | X | X | X | 156.625 | 156.625 | 135.225 |            |
| 73  | X | X | X | 156.675 | 156.675 | 135.275 |            |
| 74  | X | X | X | 156.725 | 156.725 | 135.325 |            |
| 77  | X | X | X | 156.875 | 156.875 | 135.475 | 1W FOR CAN |
| 78  |   |   | X | 156.925 | 161.525 | 140.125 |            |
| 78A | X | X |   | 156.925 | 156.925 | 135.525 |            |
| 79  |   |   | X | 156.975 | 161.575 | 140.175 |            |
| 79A | X | X |   | 156.975 | 156.975 | 135.575 |            |
| 80  |   |   | X | 157.025 | 161.625 | 140.225 |            |
| 80A | X | X |   | 157.025 | 157.025 | 135.625 |            |
| 81  |   |   | X | 157.075 | 161.675 | 140.275 |            |
| 81A | X | X |   | 157.075 | 157.075 | 135.675 |            |
| 82  |   |   | X | 157.125 | 161.725 | 140.325 |            |
| 82A | X | X |   | 157.125 | 157.125 | 135.725 |            |
| 83  |   | X | X | 157.175 | 161.775 | 140.375 |            |

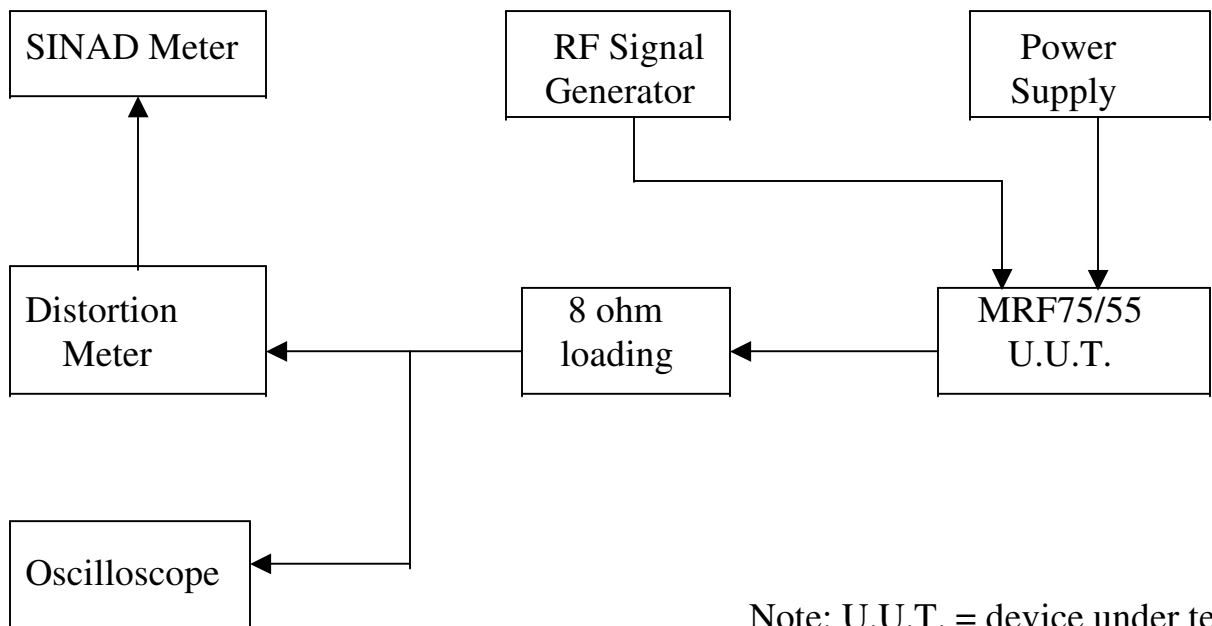
|     |   |   |   |         |         |         |  |
|-----|---|---|---|---------|---------|---------|--|
| 83A | X | X |   | 157.175 | 157.175 | 135.775 |  |
| 84  | X | X | X | 157.225 | 161.825 | 140.425 |  |
| 84A | X |   |   | 157.225 | 157.225 | 135.825 |  |
| 85  | X | X | X | 157.275 | 161.875 | 140.475 |  |
| 85A | X |   |   | 157.275 | 157.275 | 135.875 |  |
| 86  | X | X | X | 157.325 | 161.925 | 140.525 |  |
| 86A | X |   |   | 157.325 | 157.325 | 135.925 |  |
| 87  | X | X | X | 157.375 | 161.975 | 140.575 |  |
| 87A | X |   |   | 157.375 | 157.375 | 135.975 |  |
| 88  | X | X | X | 157.425 | 162.025 | 140.625 |  |
| 88A | X |   |   | 157.425 | 157.425 | 136.025 |  |

1.8. TEST EQUIPMENT SETUP AS BELOW:

A. TX test equipment setup:



B. RX test equipment setup:



Note: U.U.T. = device under test

## **2.0 Alignment Procedure.**

### **2.1 VCO Adjust.**

#### **2.1.1 VCO Voltage Adjust: ( Item1-3 for USA version; Item 4-6 for EU version)**

1. Test point TP1 connect to the multi-meter, set UUT for USA RX mode CH01A.
2. Adjust IFT L115 for  $1.2 \pm 0.1V$  on the Multi-meter read, then checking WX mode CH10 should be less than 3.8V.
3. Set UUT for Marine TX MODE : CH01A  $\geq 1.5V$ , CH88A  $\leq 3.8 V$ .
4. Test point TP1 connect to the multi-meter. In test mode, set UUT for RX mode CHP3.
5. Adjust IFT L115 for  $1.0 \pm 0.1V$  on the Multi-meter read, then checking RX mode CHP7 should be less than 3.8V.
6. Set UUT for TX MODE : CHP3  $\geq 1.0V$ , CHP7  $\leq 3.8 V$ .

### **2.3 RX Section Alignment . ( Marine and WX )**

#### **2.3.1 Audio Distortion Adjust:**

1. UUT set to Marine mode CH14, output of RF signal generator connect to **TP4**. Audio dummy load connect to **TP11**. (@ $8\Omega$  load)
2. Set RF S.S.G Freq.: 21.400MHz, Mod.:  $\pm 3KHz$ , Fmod.: 1KHz, Output level:1mV.
3. Squelch Volume set to minimum position, volume control set to around middle position.
4. Adjust IFT L123 for maximum audio output and minimum distortion at the distortion meter. ( distortion less than 5%).
5. Set volume control to maximum position, audio output power shall be more than 3 Watts. (Note: The audio volume of MRF75 is by electrical control, total 16 steps from minimum to maximum.)

#### **2.3.2 Sensitivity Adjust:**

1. RX RF bandwidth alignment: Apply Spectrum analyzer's Track Gen. Output connect to the UUT antenna terminal and input connect to the UUT TP15(S1), center frequency set 160MHz, span set 50MHz; Turn on the UUT DC power, adjust IFT L116, L117, L119 & L120 refer to attached table curve, then short TP15 & TP18 ( S1 & S2).
2. UUT set to Marine mode CH14, output of RF signal generator connect to **TP9**.
3. Set RF S.S.G Freq.: 156.700MHz, Mod.:  $\pm 3KHz$ , Fmod.: 1KHz, Output level:0.25uV.
7. Adjust the volume control for 2V output on distortion meter read.
8. Adjust L116, L117, L119 & L120 for more than 12dB at SINAD meter.
9. Repeat as needed. Check all channels sensitivity must met the D.T.S. specifications.

### **2.3.3 T- Squelch Sensitivity Adjust:**

1. UUT set to Marine mode CH14, output of RF signal generator to antenna input terminal.
2. Set RF S.S.G Freq.: 156.700MHz, Mod.:  $\pm 3$ KHz, Fmod.: 1KHz, Output level: -110dBm.
3. Volume control and Squelch control set to maximum position, (C.W)
4. Adjust the VR105 to mute the speaker, then turn the RF S.S.G. output level to -107dBm.
5. Slowly turn **VR105** to a position that the audio output on the speaker just appears from no output. Turn the RF S.S.G. output level to -113dBm, the audio must be off from the speaker.

### **2.3.4 RX Signal Meter Display Adjust:**

1. UUT set to Marine mode CH14, output of RF signal generator to antenna input terminal.
2. Turn the RF S.S.G output for **30dB** on the SINAD meter showing.
3. Adjust VR104 for 9 characters displayed at the RX signal strength of the LCD.

### **2.3.5 Maximum S/N Detector : ( SQUELCH set MINIMUM )**

1. UUT set to Marine mode CH14, output of RF signal generator to antenna input terminal.
2. Set RF S.S.G Freq.: 156.700MHz, Mod.:  $\pm 3$ KHz, Fmod.: 1KHz, Output level: 1mV.
3. The Volume control turn to 0.5 watts audio output for reference A dB.
4. Then off the Modulation, here the audio output for reference B dB.  $S/N \geq 42$ dB.

### **2.3.6 DSC Decoder Detector.**

1. UUT set to Marine mode CH14, output of RF signal generator to antenna input terminal.
2. Set RF S.S.G Freq.: 156.700MHz, Mod.:  $\pm 1$ KHz, Fmod.: 1300Hz, Output level: 1uV.
3. Test point **TP3** connect to the oscilloscope, check the TP3 output DC level should be Hi on the oscilloscope screen (around 4.5V).
4. Then change the S.S.G Fmod. to 2100Hz, check the DC level should be low.

### **2.3.7 WX Alert Decoder Frequency Alignment. --- USA VERSION ONLY**

Turn on the UUT, set WX mode, adjust VR108 for 1050Hz  $\pm$  1Hz output at **TP2**.

### **2.3.8 GPS receive detector & USE GPS TERMINAL WRITE THE EUROPE VERSION PRIVATE CHANNELS BY PC SOFTWARE CONTROL.**

1. Connect the GPS output to the UUT's GPS input terminal, LCD display should be showing the correct longitude and latitude data.
2. Program the Europe private channel: The UUT under the test mode, press "UIC" key, will show "program mode" on the LCD display. Then write the private channels to the UUT through computer software controller. If successfully write down, you will hear two sounds "di, di" from UUT speaker.



## **2.4 TX Section Alignment.**

### **2.4.1 TP16 and Frequency Alignment:**

1. UUT set to Marine mode CH14, TP16 connect to RF power-meter input terminal. Note, please don't assembly the RF power module before alignment TP16.
2. Set UUT to TX mode, check the output TX power should be more than 14dBm.
3. Adjust the trimmer capacitor VC100 to 156.700000MHz  $\pm$  10Hz on frequency counter.

### **2.4.2 TX Output Power Alignment and APC Function Detector.**

1. UUT set to Marine mode CH14, input of power-meter to antenna input terminal.
2. Set UUT to TX Hi power mode, adjust the VR101 for 25 watts power output.
3. Set UUT to TX low power mode, adjust the VR102 for 1 watt power output.
4. Check all channels should be met the DTS specification.
5. TX Automatic Power Control (APC) detector: The TX output power drift must be within  $\pm$  0.2watt when fine turn the DC power supplier from 12.5 to 15.0V

### **2.4.3 TX Signal Meter Indicator Alignment.**

3. UUT set to Marine mode CH14, input of power-meter to antenna input terminal.
4. Set UUT to TX low mode, adjust the VR100 for "two" characters displayed at the TX signal strength of the LCD display.
5. Set UUT to hi power mode, check the signal indicator should be full bars display at the LCD.

### **2.4.4 TX modulation Deviation Alignment and DSC data detection:**

1. UUT set to Marine mode CH14, input of power-meter to antenna input terminal. Input of MIC socket to the audio frequency signal generator output terminal.
2. Set audio frequency signal generator @ FREQ.: 1000Hz Output level: 500mVrms.  
Note: The AF signal O/P to UUT between should be add one 10uF capacitor in series.
3. Set UUT to TX Low power mode, adjust VR103 for 4.7KHz deviation on modulation meter for **MRF55**. Adjust VR103 for 4.7KHz deviation on modulation meter for **MRF75**.
4. Decrease the AF output level. Check the 3KHz deviation modulation sensitivity should be between 2-8 mV for **MRF55**; Check the 3KHz deviation modulation sensitivity should be between 7-13 mV for **MRF75**;
5. Decrease the AF output level for 2.5KHz deviation on modulation meter, check the modulation distortion must be less than 5.0% on the audio distortion meter.
6. On test mode, press the "distress" key will send out 2.1KHz data, press the "distress" key again will send out 1.3KHz data, third press the "distress" key exit DSC data detect.

### **2.4.5 TX Second Harmonic Detect.**

1. UUT set to Marine mode CH14, input of power-meter to antenna input terminal.
2. Set UUT to TX Hi power mode, the second harmonic (313.7XXMHz) must be less than -55dB refer to fundament carrier 156.700MHz.
3. All channels should be met the DTS specification.

### **3.0 TEST MODE DESCRIPTION:**

1. Press both keys “Channel Down” & “Scan” synchronously, then turn on the DC power enter test mode, the LCD will show the model number, software version and checksum.
2. Press the “channel up” key can select USA CH01, CH14, CH88 and WX CH10 four channels for USA version. Press the “channel up” key can select CHP3, CH14 and CHP7 three channels for Europe version.
3. Press “UIC” key enter European country channel programmable.
4. Press “scan” key to checking the LCD display’s all segments and icons.
5. Press “16/9” key eliminate all setting, reset the unit to default setting.
5. First press the “distress” key will send out data 2.1KHz and TX turn on; Second press the “distress” key send out data 1.3KHz; Third press the “distress” key exit DSC data test.
6. Press “call/set” exit test mode.