PARTS LIST AND TUNE-UP PROCEDURE

Schematic Key	Designator Device Non/Motorola	Circuit Type	Application	Source
U701	KXN1229A	TCXO	Reference	Motorola
U801	57W78	RF IC	ULTZIF	Motorola
U901	14S84	HC11E09	MicroProcessor	Motorola
U1101	LP2951	DC Regulator	DC Voltage	National
U1150	LP2951	DC Regulator	DC Voltage	National
Q350	MUN511T1	Self bias PNP	Bias voltage switch	Motorola
Q505	MMBR951	NPN	First stage Amp	Motorola
Q506	MRF8372	NPN	Second stage Amp	Motorola
Q508	MRF5003	FET	Final stage Amp	Motorola
Q601	NE94430	NPN	VCO	NEC
Q602	NE94430	NPN	VCO	NEC
Q301	NE94430	NPN	LNA NEC	
Q302	NE94430	NPN	LNA	NEC
Q303	NE94430	NPN	LNA	NEC
Q501	BCW60B	NPN	Bias voltage switch	Motorola
Q503	BCW60B	NPN	Bias voltage switch	Motorola
Q502	MMBT3906	PNP	Bias voltage switch	Motorola
Q504	BSR33	PNP	Bias voltage switch	Motorola
D601	1SV239	VARACTOR	VCO	Motorola
D602	1SV239	VARACTOR	VCO	Motorola
D401	MA4CP101A	DIODE	Antenna switch	Motorola

COMMENTS: The Motorola designators are special code numbers for active devices used in Motorola radios. These devices are either identical or derived from the device family listed under Source, by the manufacturer or are proprietary to Motorola. Service people do not have access to any cross-references or given any information on proprietary devices and are prevented from making unauthorized substitutions.

The following tune-up procedure is for the factory only. There will be no customer tuning.

Tuning Procedures

There are a total of 5 tuning adjustments. All on-board tuning is performed automatically utilizing software commands. An SCI interface bus is provided for programming. D/A's replace typical manually adjusted potentiometers. All tuning information is stored in the micro-controller's internal EEPROM. The order of tuning should be followed as presented in this document. For more detailed information regarding the SCI bus and software protocols, refer to section 3.2.

All tuning adjustments should be performed with DC voltage applied to the radio's power terminals. It is preferable to use a DC Power Supply with voltage sense lines available and to use the sense connections at the radio supply input). Nominal battery voltage for the Model Series is 7.5 +/- 0.1 V. All RF signals from test equipment should be terminated at 50 ohms. "Standard RF input signal level" is defined as 1 mV into 50 ohms, or -47 dBm. "Standard test modulation" is defined as a 1 kHz tone @ +/- 1.5 kHz deviation.

Whenever the radio's codeplug information is changed (i.e., tuning squelch, warping the TCXO, etc.), the checksum byte must also be changed at the same time! If the checksum is not correct, the radio automatically uses a pre-defined set of codeplug values!

Table 5.1

	UHF		VHF		VHF	
	FP8 New Channel	**Business Freqs.**	**FP8 New Channel**	**Business Freqs.**	**FP8 New Channel**	**Business Freqs.**
*	1	464.5500	1	154.5700	1	154.5700
*	2	467.7625	2	154.6000	2	154.6000
*	3	467.9250	3	151.6250	3	151.6250
*	4	467.8500	4	151.9550	4	151.9550
	5	464.5000		**Itinerant.**	5	151.8200
	6	467.8750	5	151.7000	6	151.8800
	7	467.9000	6	151.7600	7	151.9400
	8	467.8125				**Itinerant Freqs.**
					8	151.7000
					9	151.7600

*** these freqs are also the default freqs for positions/channels1-4 on the radio**

5.1 VCO Gross Adjustment

Calculate the frequency error VCO Tune. This application is used to tune the LO VCO tank circuit for each channel to ensure that the assigned frequency will be in the middle of the operating frequency range of the VCO at which the VCO control voltage is in between 1 and 2 volt.

- Assume that radio is on and in standby mode.
- Send a serial command READ_DATA_REQ to read's byte 7 of the ULTZIF image. Binary ANDed that byte with hexadecimal byte "F8" to zero out the least significant three bits (bit 59 to bit 60 on the ULTZIF).
- Set the radio to receive a given channel.
- Measure the VCO control voltage. If the voltage reading is not between specs (1 and 2), change the setting of the byte 7 by O, Ring it with hexadecimal byte "0x" where x is in between 1 to 7.

5.2

Reference Oscillator Adjustment

The reference oscillator is a TCXO (Temperature Compensated Xtal Oscillator) with an external warp control. The warp signal is provided by an 8-bit DAC (Digital to Analog Convertor) located on the ULTZIF IC, and is fully programmable via the SCI bus. Ensure that the test equipment (especially the frequency measurement instrument) is on a 10 MHz reference line. Make sure that when this test is run that the codeplug in the test software "sets" the Power amplifier RF_VDAC voltage to its minimum bit setting (ie 00 bit setting). The default codeplug setting for the RF_VDAC (74) will be resumed once this tuning step is complete.

A) Key the transmitter, and measure the carrier frequency relative to the radio frequency selected according to the tables in section 5.1. The measurement should be performed at 25 +/- 2 degrees C. Record the frequency error.
B) Adjust the warp signal until the frequency error is within the specified limits.

Spec limit:

+/- 50 Hz

5.3

Modulating Limiting and Balancing Adjustment

This application tunes the deviation for the low frequency port and the deviation of the high frequency port to make sure the over all deviation is within the spec limit. Like 5.2, the RF_VDAC tuning value needs to be set to 00 bit setting for this test. Once this tuning step is completed then the default codeplug value for the RF_VDAC (74) is to be reset

- Assume the radio is in transmit mode without audio signal presence. Measure the deviation and make sure the reading must be less than 100.
- Send a command to make radio operated with PL code of 1 or PL tone of 71.9 Hz.

- Set ULTZIF's PL bit (bit 125) to 1, and ULTZIF's LODEV bits (bit 116 to 118) to all 0.
- Measure the deviation and change the bits 116 to 118 until the deviation is in between 200 and 300 Hz.
- Inject the audio signal of 8 mVrms and change bits 119 to 124 until the deviation is between 1350 to 1550 Hz.
- Increase the input voltage by 20 dB. and adjust until the max dev is under 2400 Hz.

5.4 Squelch Opening SINAD Adjustment

Squelch level control is provided by a 4-bit attenuation stage located on the AFIC, and is fully programmable via the SCI bus.

1. Apply a standard RF input signal to the radio on the frequency selected according to the tables in section 5.1. Use standard test modulation.
2. Adjust the radio's volume control to obtain rated output power at the speaker jack of the external audio accessory connector. This is the larger of the two input jacks (3.5 mm in diameter). Refer to section 3.3.2 for more information regarding the speaker jack and rated output power.
3. Reduce the RF input signal level to 0 mV, and then slowly increase the RF input signal level until the radio unmutes.
4. Measure the SINAD level.
5. Adjust the squelch control until the SINAD level is within the specified limits.

Spec limit:

Minimum 8 dB SINAD

Nominal *10 dB SINAD*

Maximum 12 dB SINAD

5.5 Transmitter Power Adjust

The software test program needs to have a default (initial) bit setting of 74 for the RF_VDAC line when this step begins. The setting of 74 should correspond to a value near where the final target power output needs to be. Connect the BNC adapter to the radio control top antenna port. Now connect the power meter sensor through whatever other adapters are necessary directly to the BNC side of the antenna port connector of the radio. Make sure that 7.5 V +/- 0.1V DC is connected to the radio battery contacts. Caution needs to be heeded as to the length and thickness of the cables used to connect the radio to the power supply, as cables that are either too long or too thin or a combination of both can cause a voltage drop from the supply to the radio causing erroneous tuning of the radio transmitter. Using the voltage sense lines from the DC power supply to the radio as mentioned in 5.0 is important as well in this step. Also avoid having any other RF cables between the BNC connector at the antenna port of the control top and the power measurement sensor.

PTT (transmit) the radio and monitor the power meter. The reading should be monitored within 3-5 seconds of when keyup begins. Now adjust the RF_VDAC voltage value via the codeplug

bit setting adjustment until 2.0 watt output is reached. Note: each time that the codeplug value is to be changed (either increase or decrease) the radio must stop PTTing and then the RF_VDAC codeplug value changed. Resume transmitting and again read the power meter. Repeat the above step until 2.0 watts output is achieved.

EXHIBIT 10