PARTS LIST AND TUNE-UP PROCEDURE

Schematic Key	Designator Non/Motorola	Device Circuit Type	Application	Source
Y501	08B01	Crystal	Reference	KSS
U501	5185165C01	Digital IC	DFP99	Motorola
U401	5185164C01	Analog IC	AFP 99	Motorola
U301	5185163C01	RF IC	RFP99	Motorola
U201	5185130C30	TEMIC	LNA_PA	Motorola
Q201	MMBD352	Diode	LNA	Motorola
Q202	BFS520	NPN	LNA	Philips
Q501	MUN5111T1	PNP	Bias voltage switch	
Q502	FMG8A	NPN	Bias voltage switch	
Q601	BFS520	NPN	VCO	Philips
Q602	BFS520	NPN	VCO	Philips
Q622	BFS520	NPN	VCO	Philips
Q801	21T11	NPN	Reference	
Q802	MMBT3904	Dual Diodes	Reference	Motorola
Q902	MMBT3906	PNP	Audio Switch	Motorola
Q903	MUN5111T1	PNP	Bias voltage switch	
Q1001	MMBTA13	Darlington NPN	Vibrator	Motorola
Q1003	MUN5111T1	PNP	Bias voltage switch	
U101	5105109Z43	SW-392	Antenna switch	Macom

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.

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TUNE UP PROCEDURE

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

Tuning Procedures

There are a total of 4 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 3.6 +/- 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					
FP99 Channel	**Frequencies**	**FP99 Channel**	**Frequencies**		
1	462.5625	8	467.5625		
2	462.5875	9	467.5875		
3	462.6125	10	467.6125		
4	462.6375	11	467.6375		
5	462.6625	12	467.6625		
6	462.6875	13	467.6875		
7	462.7125	14	467.7125		

(* next to channel 1 and 2)

* these frequencies are also the default frequencies for positions/channels1-2 on the radio

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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 byte 7 of the DFP99 image. Binary ANDed that byte with hexadecimal byte "F8" to zero out the least significant three bits.
- ·   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 AFP99 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 DFP's PL bit to 1.

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- 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. deviation 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

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