XGM950
LABORATORY TESTING PROCEDURES

UNIT TEST - (UNIT ASSEMBLED)

TEST PREPARATION

1) Install 4 “AA” alkaline batteries (observe polarity markings).
   - Left top terminal is the system minus polarity
   - Right bottom terminal is the system plus polarity.

2) Turn on unit by pressing the power button.

SYSTEM TEST

1) Radiated Transmit and Receive performance may be observed.

2) Audio out & Audio in are available at the Headset jack.

LABORATORY TEST - (UNIT UN-ASSEMBLED)

TEST PREPARATION

1) Disassemble unit (6 screws – 4 behind batteries). Remove the PCB from the cabinet.

2) Remove the antenna and install a 50 ohm coax cable in its place.

3) Either clip alligator leads or solder test leads to the power supply connections. The positive terminal is the lower left PCB mounting hole. The negative terminal is the lower right PCB mounting hole below the VCO shield can. (battery side view)

4) Connect 6VDC power source to the terminals, observing correct polarity.

5) Connect an 8-ohm load through the Headset jack (right connection of 3.5mm stereo-phone plug).

6) Connect a audio generator with 10uF coupling capacitor through the Headset jack (left connection of 3.5mm stereo-phone plug).

7) Select desired channel 1- 22 using CH up/down keypad switch. The rubber keypad may be removed from the front cabinet and used directly on the PCB.

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LABORATORY TESTING PROCEDURES

SPECIFIC TEST METHODS AND GUIDANCE

Modulation Characteristics – ***(paragraph 2.1047(a) of the Rules)***

FOR TX AUDIO FILTER RESPONSE

1. Connect audio generator with 10uF coupling capacitor to microphone input jack. Press PTT button.
2. Connect RF output with modulation meter. (Filters of modulation meter should be set to a 25Hz to 15KHz.)
3. Adjust audio generator about 4-5mVrms for 0.75KHz modulation.
4. While transmitting, sweep generator and note measurement.
5. Please compensate the back-ground noise level.

Modulation Characteristics – ***(paragraph 2.1047(b) of the Rules***

FOR TX AUDIO LOW PASS FILTER RESPONSE.

1. Connect audio generator with 10uF coupling capacitor to microphone input jack. Press PTT button.
2. Connect AC voltmeter or other test equipment via jumper wire to TP-9.
3. Adjust audio generator for 200mV.
4. While transmitting, sweep generator and note measurement.

Occupied Bandwidth – ***(paragraph 2.1049(c) of the Rules)***

1. Connect an audio frequency sweep generator with 10uF coupling capacitor to microphone input jack.
2. Adjust audio generator to a frequency of 2500Hz and a level of 100mV rms (+16dB above 10-12mV per FCC).
3. With a spectrum analyzer, transmit the radio and monitor the transmitter though an antenna.
4. Note required measuements per FCC.

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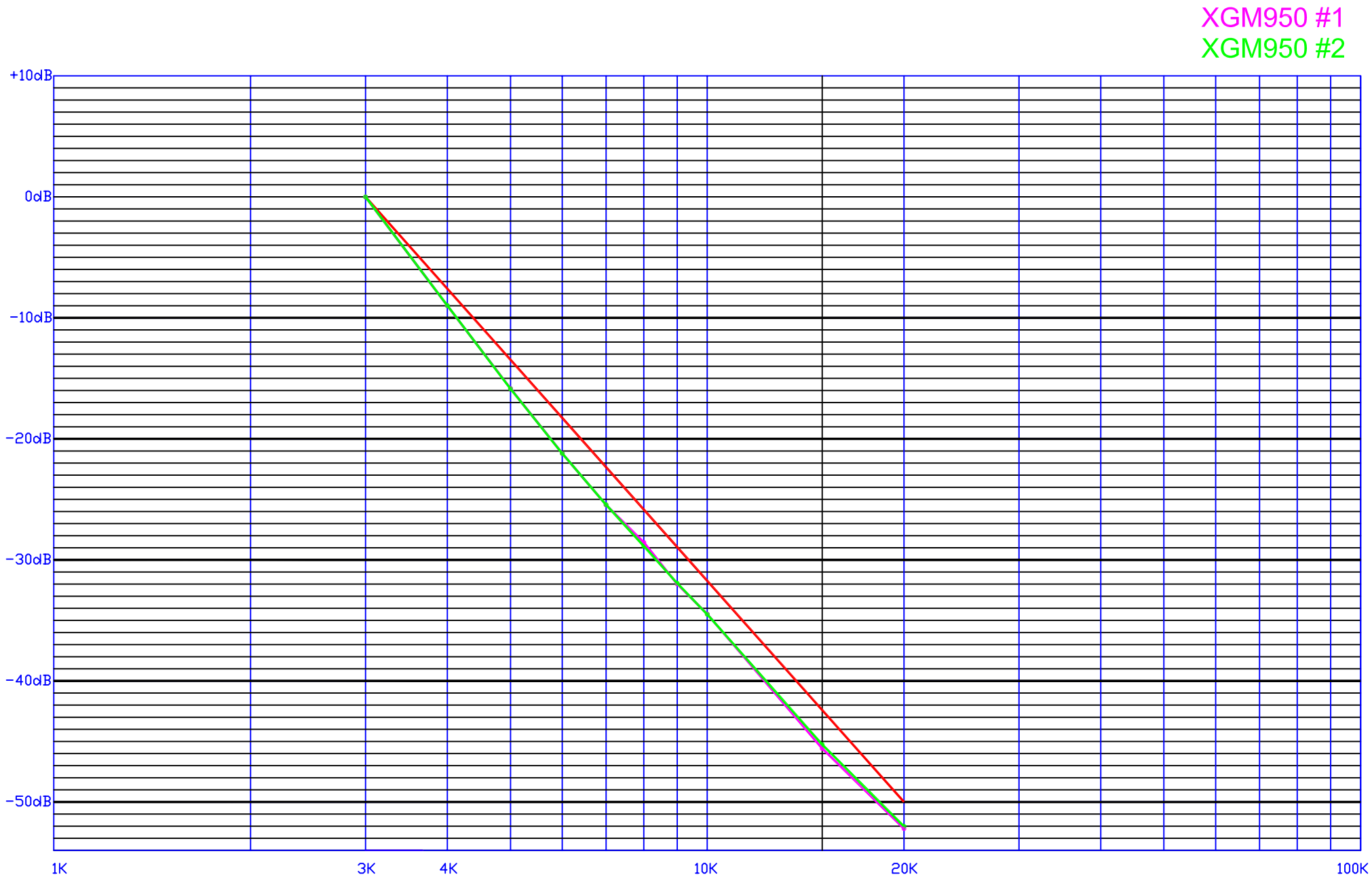
TX AUDIO TEST RESULT

Frequency Response of Audio Low Pass Filter (150mV input)

	3K	4K	5K	6K	7K	8K	9K	10K	15K	20K
#1	0	-8.90	-15.80	-21.10	-25.30	-28.90	-32.00	-34.50	-45.40	-52.1
#2	0	-9.00	-15.90	-21.20	-25.30	-28.90	-31.90	-34.50	-45.20	-50.2

Frequency Response of the Audio Low Pass Filter



XGM950
ALIGNMENT PROCEDURE

1. REFERENCE TEST EQUIPMENT

A. HP8921A Cell site test set or HP8920A, B Communication Test Set with Spectrum Analyzer option.
B. Fluke 187 Digital Voltmeter
C. HP E3615A Power supply

2. TEST POINT

A. ANTENNA	: Test point is not prepared. Use antenna contact with Antenna ground.
B. VCO reference voltage	: Test point 1 is prepared.
C. RX audio output	: Test point (J24) is prepared or use ear-jack(3.5mm).
D. TX Mic. Input	: Test point (MIC IN) is prepared or use ear-jack(3.5mm) with 10uF coupling capacitor.
E. Battery Vcc	: Test point is not prepared. Please use mechanical contact. It is posited on bottom left corner of PCB.
F. Up Key	: Test point (UP) is prepared.
G. Down Key	: Test point (DOWN) is prepared.
H. Function/Power Key	: Test point (POWER) is prepared.
I. Monitor Key	: Test point (MONITOR) is prepared.
J. PTT Key	: Test point (PTT) is prepared.
K. SCAN Key	: Test point (SCAN) is prepared.

Note. : All key can be activated when connect with ground.

3. VCO ALIGNMENT

A. Set unit to Channel 1 and connect a voltmeter to TP1 (VCO PD).
B. Press & hold PTT.
C. Extend L303 until the voltmeter reads 3.0V.
D. ***Put shield-can on VCO area and monitor the voltage on TP1.*** The voltage should be 1.2Vdc +/-0.2Vdc. If the voltage is not 1.2Vdc +/-0.2Vdc, realign L303 until meet to requirement.
E. Release PTT button so units is in receiving mode and monitor the voltage on TP1. The voltage should be in the range 1.0Vdc +/-0.5V
F. Set unit to channel 14.
6. Press & hold the PTT switch and observe the voltage on TP4. The voltage should be 2 – 3,5 Vdc.
7. Release PTT and observe the voltage on TP4. The voltage should read between 2.0 - 3.5 Vdc.

Note : VCO shield-can should be soldered after VCO alignment is finished.

4. TRANSMITTER FREQUENCY ALIGNMENT

A. Press & hold the PTT button.
B. Align CT201 trimmer capacitor such that the output frequency is equal to the channel frequency with a maximum error of +/- 200 Hz. CT201 is located on the right side of 20.95MHz X-tal.

5. TRANSMITTER OUTPUT POWER CONFIRMATION

A. Set unit to channel 1 and power Hi mode.
B. Press & hold the PTT button.
C. Transmit power should normally be between 3.7W to 4,5W.
D. Set unit to channel 14.
E. Press & hold the PTT button. Ensure that Tx Power should be between 0.3-0.6W.

6. TRANSMITTER DEVIATION ALIGNMENT

A. Connect an audio generator (600 ohms) to the ear jack. The audio frequency should be set at 1KHz with a level of 200mV RMS.
B. Connect an FM deviation meter (communications test set) to Antenna contact. Set the monitor to read peak to peak divided by two [(pk-pk)/2] deviation. Set filter of equipment from 25Hz to 15KHz.
C. Press & hold the PTT button.
D. Align RV2 for +/- 2.2 kHz deviation (+/-0.1KHz). RV2 is located on the bottom of the VCO shield can.
E. Decrease audio generator level until deviation reads +/- 1.5 kHz (approximately 12mV) and record generator level. Level should be between 6 mV and 8 mV.
F. Confirm that transmit audio distortion is less than 5%.

7. RECEIVER ALIGNMENT

A. Set the output level of the RF signal generator for -47dBm. The generator should be set for 1.5 kHz deviation at 1 kHz audio.
B. Set volume level 4 (It is initial.).
C. Connect Audio analyzer to J24.
D. Set equipment filter 25Hz to 15KHz.
E. Align CF2 to get a maximum output level & a minimum distortion and confirm that Rx audio distortion is less than 3%.
F. Confirm that Rx Sensitivity is less than –120dBm (nominally –123dBm) by reducing the output level of the RF signal generator until a 12 dB SINAD reading is achieved.
H. Set SSG output level until 9dB sinad sensitivity and align RV1 until the unit is un-squelched.
I. Set signal generator level to –47dBm.
J. With 1.5KHz deviation at 1KHz modulation, set volume for maximum audio. Audio level should be on over than 1.4Vrms.

8. BATTERY INDICATOR CONFIRMATION

A. Set unit to receiving mode. Don’t set transmitter mode..
B. Set power supply voltage to 6V.
C. Decrease power supply voltage until low battery icon blinks.

9. POWER OFF CURRENT CONSUMPTION

A. Set power supply voltage to 6V and connect to unit.
B. Confirm current. It must be less than 100uA.

10. FREQUENCIES TABLE

Channel	Freq. MHz	Channel	Freq. MHz
1	462.5625	12	467.6625
2	462.5875	13	467.6875
3	462.6125	14	467.7125
4	462.6375	15	462.5500
5	462.6625	16	462.5750
6	462.6875	17	462.6000
7	462.7125	18	462.6250
8	467.5625	19	462.6500
9	467.5875	20	462.6750
10	467.6125	21	462.7000
11	467.6375	22	462.7250

XGM950
PRODUCTION SPECIFICATION

1. GENERAL SPECIFICATION

	Items	Specifications
1	**Tx Frequency range**	462.550MHz ~ 467.7125MHz
2	**Tx VCO Frequency range**	Same as item 1
3	**RX Frequency range**	Same as item1
4	**RX VCO Frequency range**	441.150MHz ~ 446.3125MHz (Lower Heterodyne)
5	**Channel Number** **Channel Spacing**	22CH 25KHz
6	**Frequency Control**	PLL Synthesizer with Temperature Compensated Crystal Reference
7	**IF frequencies**	21.4 MHz for 1'st IF 450KHz for 2'nd IF
8	**Modulation**	FM (F3E emissions)
9	**Standard Test Modulation signal**	Modulated audio Frequency : 1KHz Test modulation : +/-1.5KHz
10	**TX Frequency stability**	Max. +/-2.5ppm (-30℃ to +60℃)
11	**Nominal test temperature Range**	25℃ +/- 5℃
	Extreme operating temperature Range	-20℃ to +50℃
12	**Antenna Impedance**	50 ohm +/- 25 ohm
13	**Power source**	4 AA Alkaline batteries or 4 AA Ni-HM rechargeable batteries
14	**Test Power Supply Voltage**	6.0Vdc. +/-0.1Vdc
	Extreme Supply Voltage Range	4.2Vdc to 6.5Vdc
15	**Battery life time (Typ. 5/5/90 duty)**	Min. 45 Hours
16	**Microphone**	Self contained Electret
17	**Speaker**	Self contained 8 ohm

2. DETAILED SPECIFICATION

A. RECEIVER SECTIONS

* Normal test condition *

	TYP.	LIMIT
1. MAXIMUM USABLE SENSITIVITY * 1KHz +/-1.5KHz DEV. * REF. CHANNEL 1 & 8	-124dBm	<-120dBm
2. 20dB QUIETING SENSITIVITY * 1HKz +/-1.5KHz DEV. * REF. CHANNEL 1 & 8, 12dB SINADDER	-118dBm	<-116dBm
3. ADJACENT CHANNEL TWO SIGNAL SELECTIVITY & SENSITIZATION * +/- 1 CHANNEL SPACING		>50dB
4. INTER-MODULATION SPURIOUS RESPONSE ATTENUATION		>50dB
5. SPURIOUS EMISSIONS * CONDUCTIVE CONNECTION		<-53dBm
6. RECEIVE FREQUENCY RESPONSE * REF. 1KHz +/-1.5KHz DEV. 250Hz 3KHz	 -18.0dB -12.0dB	 +/-2.0dB +/-3.0dB
7. AUDIO OUTPUT LEVEL * REF. 1KHz +/-1.5KHz DEV. * (No LOAD) * Volume Max.	1.8V	>1.3V
8. AUDIO OUTPUT DISTORTION * REF. 1KHz +/-1.5KHz DEV. * (No LOAD)		<5%
9. MAX. S/N RATIO * REF. 1KHz +/-1.5KHz DEV. * (No LOAD)	36 dB	>30dB
10. RX VCO REF. VOLTAGE * REF. CHANNEL 1 * REF. CHANNEL 8	1.0V 2.0V	+/-0.3V +/-0.3V
11. SQUELCH THRESHOLD * REF. 1KHz +/-1.5KHz DEV.*	9dBsinadder	-3dB - +3dB
16. CURRENT CONSUMPTION * Un-squelched Volume Max. * Squelched * Power Off	200mA 35mA 50uA	+/-40mA <40mA <100uA

B. TRANSMITTER SECTIONS

	TYP	LIMIT
1. TRANSMITTER FREQUENCY TOL. * REF. CHANNEL 1		<+/-200Hz
2. TRANSMITTER RF POWER * REQUIRED CONDUCTIVE CONNECTION * REF. CHANNEL 1 Hi Power Low Power	 4.0W 0.4W	 +0.3W / –0.3W +/-0.2W
3. TRANSMITTER OCCUPIED BANDWIDTH * REQUIRED CONDUCTIVE CONNECTION * REF. CHANNEL 1 @12.5KHz		<-50dBC
4. TRANSMITTER SPURIOUS * REQUIRED CONDUCTIVE CONNECTION * REF. CHANNEL 8		<-50dBC
5. MODULATION SENSITIVITY * REF. 1KHz AUDIO * CHANNEL 1 , @+/-1.5KHz	 7mV	 +/-3mV
6. MODULATION LIMITING * REF. 1KHz AUDIO, CHANNEL 1 * (INPUT AUDIO ; 200mVrms)	 +/-2.2KHz	 +/-0.2KHz
7. CTCSS CODE DEVIATION * CH 1 * CH38	 0.4KHz 0.4KHz	 +/-0.1KHz +/-0.1KHz
8. MODULATION AUDIO DISTORTION * REF. 1KHz AUDIO +/-1.5KHz	 3%	 <5%
8.TX AUDIO FREQUENCY RESPONSE * REF. 1KHz AUDIO, CHANNEL 1 * (INPUT AUDIO ; 3mVrms) 250Hz 3KHz 6KHz	 -31.0dB +6.0dB -16.0dB	 +/-3.0dB +/-3.0dB +/-3.0dB
9. TX MODUALTION S/N * REF. 1KHz AUDIO, CHANNEL 1 * (REF. INPUT AUDIO ; 7mVrms)	 	 >30dB
10. TX VCO REF. VOLTAGE * CHANNEL 1 * CHANNEL 14	 1.0V 2.0V	 +/-0.3V +/-0.3V
11. CURRENT CONSUMPTION Power Hi	1100mA	+/-200mA

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SEMICONDUCTOR DESIGNATIONS AND FUNCTIONS

Designator	Description	Application
CPU1	W741S81A	Micro controller
D1	KDS114E	TX,RX switch
D3	KDS114E	Squelch temperature compensation
D4	KDS160	TX PA temperature compensation
D5	KDS114E	VOX rectifier
D13	KDS114E	TX,RX switch
D201	KDS114E	Reset for micro controller
D301	KDS114E	VCO TX,RX switch
D6	KDS113E	VCO Vcc switch
IC1	DBL5018	IF IC
IC2	LM386	Speaker amplifier
IC201	TB31202	PLL IC
IC3	XC6201	4V regulator
IC4	LM324	OP amp.
IC5	LM324	OP amp.
LED1	SML210MT	LED for backlit
Q1	NE5510279A	TX PA
Q3	BFQ67W	TX driver
Q4	BFQ67W	TX driver
Q5	KRC404E	CTCSS Limitor
Q6	2SC4226	RX LNA
Q7	KTA2014E	PTT switch
Q8	2SC4226	RX MIXER
Q9	2SC4083	IFA
Q10	KRA306E	VCO Vcc switch
Q11	BFQ67W	TX pre-driver
Q12	KRC404E	Speaker amplifier Vcc switch
Q13	KRA226	TX Vcc switch
Q14	KRA306E	RX Vcc switch
Q16	KRA226	Speaker amplifier Vcc switch
Q17	KRC405E	TX audio Mute
Q18	KRA226	Main Vcc switch
Q19	KRC401E	VCO TX,RX switch
Q21	KRC404E	VOX amplifier
Q22	KRC4075E	Audio amplifier
Q23	KRC405E	RX audio mute
Q301	2SC4226	VCO
Q302	2SC4226	VCO