

TEST PROCEDURE

FOR SX500

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1 - Before Starting

1.1 Test Equipment required

- 1) Marconi 2955 Test Set, or similar from another manufacturer
- 2) Bench power supply
- 3) SX test jig
- 4) Digital Multimeter
- 5) Sinadder
- 6) Various leads shown on the setup diagram
- 7) PC with serial port lead, running windows and the SX500 programming software if programming the units to wanted frequency.

1.2 Setting Options

To save space there are no blob links on SX500. Units are built for 12.5, 20, or 25 kHz channel spacing, 3 kHz audio response, and are then modified by assembly as required according to information in the non frequency banded options table. Test should check that options are correct at this stage.

1.3 Frequency Programming

The units need to be programmed before testing if the frequencies required are different from the master PIC. The pc serial port connects to the transceiver via the test jig. The serial parallel switch on the SX test jig must be set to serial when programming radio. See set up drawing.

1.4 Instrument Settings

2955

transmitter test
AF filter 15 kHz LO pass
AF gen frequency 300 Hz
AF gen level 2.65 V RMS
AF gen on
scope vertical +/- 6 kHz (+/- 3 kHz for 12.5 kHz CS radios)
scope horizontal 500uS/div
75 W max input

Power supply

voltage +7.2 V
current limit 200 mA

SX Test Jig

Standby: ON
RSSI: Doesn't matter
SQOR: Doesn't matter

TXE: OFF
Power: Doesn't matter
Mod input: analog
TCV option: doesn't matter.
TX mod level: 0 dB
Parallel / serial: Parallel

Select channel in centre of switching frequency range.

SX500 Test Adaptor

Left hand switch: VCO
Right hand switch: Analog

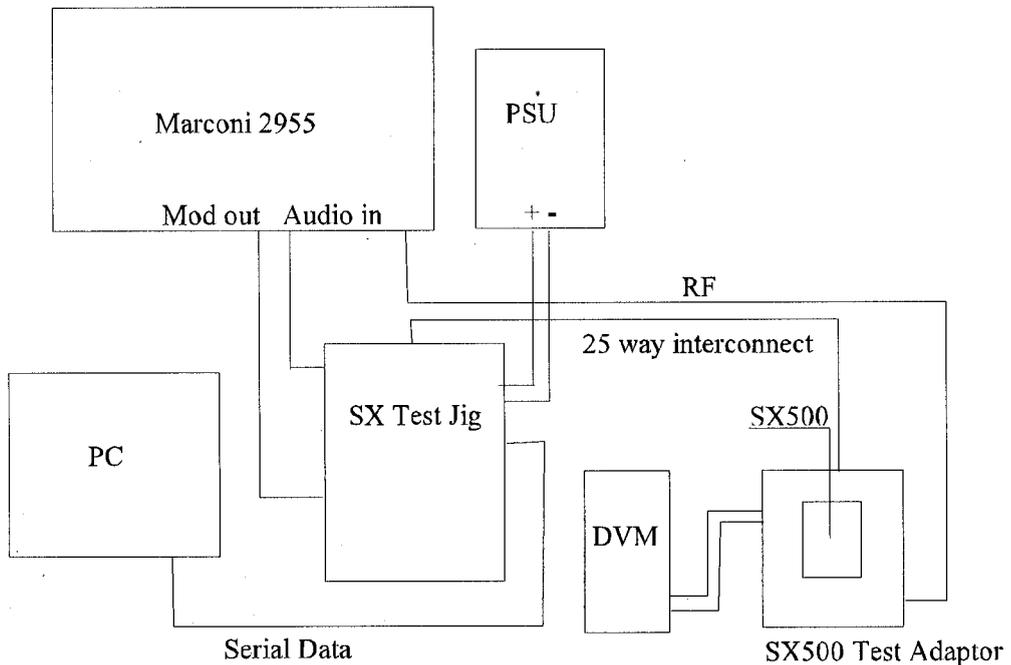


FIG1 - SX500 TEST SET UP

Multimeter

range to measure up to 5V

2 Test Procedure

Alignment of the transmitter and receiver should be performed close to the center of the range of frequencies specified by the customer. Avoid testing receivers on multiples of 1 MHz as often there are interference problems on these frequencies.

- 2.1 Inspect boards for missing components, solder shorts, dry joints and damage.
- 2.2 Plug the radio into the test jig, making sure the spring probe is correctly aligned with

TP1. Current taken by jig and radio should be 100 mA +/- 10 mA.

- 2.3 Tune C8 On the VCO module to give a control voltage of 2.5 v +/- 200 mV in receive
- 2.4 Switch TXE to ON. Tune C4 on the VCO module to give a control voltage of 2.5 v +/- 200 mV in transmit.
- 2.5 Set output power to that required using RV4. At 100 mW current taken should be less than 170 mA.
- 2.6 Adjust RV3 to give the flattest possible tops on the modulation recovered by the test set.
- 2.7 Set the deviation using RV2 on the motherboard as below

Channel Spacing, kHz	Maximum deviation, +/- kHz
12.5	2.0
20	3.2
25	4.0

- 2.8 Change the AF frequency to 1 kHz, and switch TX mod level to -19.6 dB. Adjust the analog gain using RV1 on the motherboard to give the deviation as in the table below.

Channel Spacing, kHz	Minimum Deviation, +/- kHz	Maximum deviation, +/- kHz
12.5	1.45	1.55
20	2.3	2.5
25	2.9	3.1

- 2.9 Adjust the trimmer on X1 to give a transmit frequency +/- 200 Hz from the nominal frequency. Check that the frequencies requested by the customer are correctly programmed.
- 2.10 Switch TXE to OFF. Turn RV5 fully anti-clockwise. Change the test set to receive mode, with the level at -20 dBm, and at the correct deviation for the channel spacing (see table in section 2.7 above). Check that the 0.4 ...3.0 kHz bandpass filter is in use.
- 2.11 Tune L14 for maximum recovered audio. This should be 80...100 mV RMS.
- 2.12 Switch the Right hand switch on the test adaptor to digital and check a squared output is seen with approximately 50/50 duty cycle.
- 2.14 Set the RF level to -70 dBm. Distortion with 1 kHz mod should be < 5 % (bpf in).

Audio bandwidth (- 3 dB point) should be as in the table below.

Channel Spacing (kHz)	- 3 dB bandwidth (kHz)	
	minimum	maximum
12.5	3	4
20	4	5
25	5	6

- 2.15 Reduce the RF level until the audio is at around 12 dB SINAD. Tune F2 first and then F1 for best SINAD, reducing the level as you go to keep the audio noisy. Sensitivity should be better than figures in the table below.

Channel Spacing (kHz)	Minimum sensitivity dBm/12 dB SINAD, 0.3..3.4 kHz bpf
25	-117
20	-116
12.5	-114

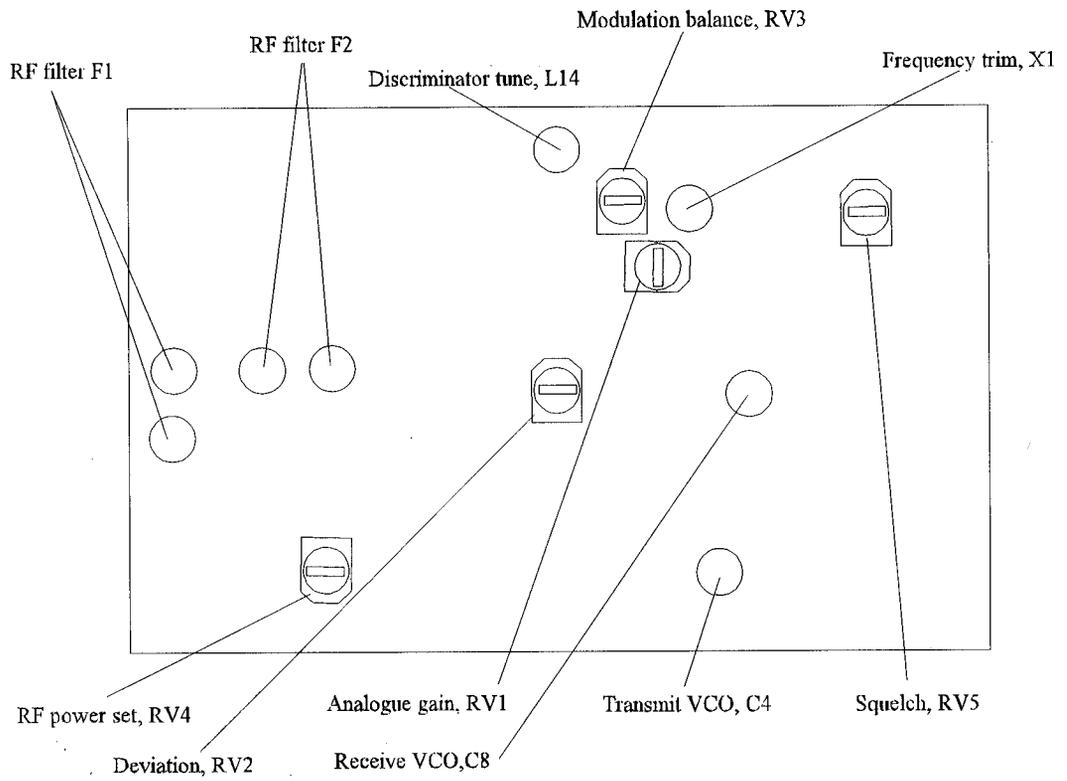
- 2.16 Set the RF level to -117 dBm or the 12dB SINAD point, whichever is higher. Turn RV5 clockwise until the squelch closes, and then back off until the squelch just opens. Check that the squelch is fully closed when the RF level is reduced by 3 dB. Recheck that the squelch is fully open at the original level.

For transceivers with extended audio or for use in radio-modems then the squelch should be set to fully open at -113 dBm and fully closed at -116 dBm

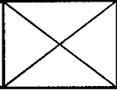
- NB. Unless specifically requested by the customer the radio should be sent in parallel mode.

Fig. 2

Adjustment locations for SX500



Para	Test description		Lower limit	Upper limit	Result
2.1	Inspection		 	 	
2.2	Receive current		90 mA	110 mA	
2.3	Tune receive synthesiser.		2.3 V	2.7 V	
2.4	Tune transmit synthesiser.		2.3 V	2.7 V	
2.5	Set transmit power		As required - 0.5 dB	As required + 0 dB	
2.5	Record transmit current		 	170 mA @100mW	
2.6	Set modulation balance		 	 	
2.7	Set maximum deviation	12.5 kHz CS	 	2.0 KHz	
		20 kHz CS		3.2 kHz	
		25 kHz CS		4.0 kHz	
2.8	Set modulation gain	12.5 KHz CS	1.45 kHz	1.55 kHz	
		20 kHz CS	2.3 kHz	2.5 kHz	
		25 kHz CS	2.9 kHz	3.1 kHz	
2.9	Trim frequency		-200 Hz	+ 200 Hz	
2.11	Tune discriminator. Record audio level.		80 mV RMS	95 mV RMS	
2.12	Check Data/CTCSS output		 	 	
2.13	Distortion		 	5 %	
2.14	RX audio bandwidth	12.5 kHz CS	3 kHz	4 kHz	
		20 kHz CS	4 kHz	5 kHz	
		25 kHz CS	5 kHz	6 kHz	
2.15	Tune RF filters and record sensitivity for 12 dB SINAD	12.5 KHz CS	-114 dBm	 	
		20 kHz CS	-116 dBm	 	
		25 kHz CS	-117 dBm	 	
2.16	Set squelch	fully open at	 	-117 dBm or 12 dB SINAD ⁽¹⁾	

		fully closed at	-3 dB below open level		
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Note 1 - Transceivers with extended audio or for use in radio-modems should be set for squelch fully open at -113 dBm

4 Change History

Issue D 22/04/02

References to SX500L removed. Distortion and audio bandwidth checks added. Sensitivity for 20 kHz units added. Squelch window increased to 3 dB. Instruction to align at band center added.