FX-4CR

Service manual

(Firmware Version 2.0 - 24.02.09)

For radios delivered before February 2024.
There has been a hardware evolution.

Table of contents

1 - Required Test Equipment

1.1 - Minimum hardware required to perform equipment calibration

- Power supply 12V, 5A
- DC voltmeter
- Spectrum analyzer as RF generator (*like tinySA*)
- RF power attenuator as dummy load 50 Ω, -30db, 25W minimum
- Fix or variable low power attenuator (-30db, 0db ... -120db)
- RF power meter 50 Ω, 25W minimum
- Keyer simple or double paddle

2 - Preliminary

2.1 - Notes and recommendations

ALL CONTENTS OF EEPROM WILL BE ERASED.
Before flashing version V2 alpha and subsequent versions, you must save all the settings in the user and developer menus of the official version.
If you want to return to the official version you will have to enter all the values that you have saved.

Use the empty cells in the tables to write the obtained values.

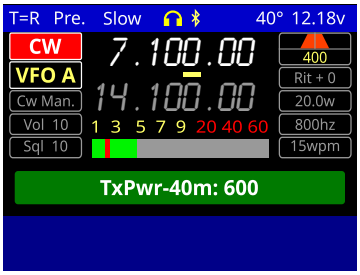
- To reset default settings, press and hold [A.B] and then power on by pressing [PWR]
- To enter in service mode, press and hold [RIT] and then power on by pressing [PWR]
- You can reset default settings and enter in service mode together by pressing [A.B] [RIT] and then power on by pressing [PWR]

1. Save all the settings from the official version if you haven't already done so and flash the V2 alpha version.
2. Connect Wattmeter, RF Dummy Load, Keyer, Power supply.
3. Reset default settings and enter in service mode (*See above how to do it*).
4. Press [MENU] and turn [TUNE] to select "Cw-key".
5. Turn [AF] to select "Straight key".
6. Perform the procedure in the order below

3 - Power calibration

3.1 - Calibrate power for each band

Select band to be calibrated, then perform the procedure. Repeat the procedure for each band.



Condition	Step 1	Step 2	TxPwr
80m, 20W, 3.600Mhz	Select CW and set PWR to 20W	Press MENU and turn TUNE to select "TxPwr-80m". Press CW keyer to transmit and turn AF to set power value.	
60m, 20W, 5.352Mhz	Select CW and set PWR to 20W	Press MENU and turn TUNE to select "TxPwr-60m". Press CW keyer to transmit and turn AF to set power value.	
40m, 20W, 7.100Mhz	Select CW and set PWR to 20W	Press MENU and turn TUNE to select "TxPwr-40m". Press CW keyer to transmit and turn AF to set power value.	
30m, 20W, 10.100Mhz	Select CW and set PWR to 20W	Press MENU and turn TUNE to select "TxPwr-30m". Press CW keyer to transmit and turn AF to set power value.	
20m, 20W, 14.100Mhz	Select CW and set PWR to 20W	Press MENU and turn TUNE to select "TxPwr-20m". Press CW keyer to transmit and turn AF to set power value.	
17m, 20W, 18.100Mhz	Select CW and set PWR to 20W	Press MENU and turn TUNE to select "TxPwr-17m". Press CW keyer to transmit and turn AF to set power value.	
15m, 20W, 21.100Mhz	Select CW and set PWR to 20W	Press MENU and turn TUNE to select "TxPwr-15m". Press CW keyer to transmit and turn AF to set power value.	
12m, 20W, 24.900Mhz	Select CW and set PWR to 20W	Press MENU and turn TUNE to select "TxPwr-12m". Press CW keyer to transmit and turn AF to set power value.	
10m, 20W, 28.100Mhz	Select CW and set PWR to 20W	Press MENU and turn TUNE to select "TxPwr-10m". Press CW keyer to transmit and turn AF to set power value.	
6m, 5W, 50.100Mhz	Select CW and set PWR to 5W	Press MENU and turn TUNE to select "TxPwr-6m". Press CW keyer to transmit and turn AF to set power value.	

4 - Meter calibration, Voltmeter and Wattmeter

4.1 - Calibrate internal voltmeter

1. Use a voltmeter to get the radio's supply voltage value.
2. Press MENU and turn TUNE to select "Volt-Cal".
3. Turn AF to adjust the value read on the voltmeter (*the value is at the top right of the screen*)

Volt-Cal	

4.2 - Calibrate internal wattmeter

1. Select 40m band, 7.100mHz.
2. Press PWR and turn AF to 20W.
3. Press MENU and turn TUNE to select "Watt-Cal".
4. Press CW keyer to transmit and turn AF to set 20W.
   (The setting acts as a divider. The indicator increases as the value decreases).

Watt-Call	

5 - Transmit IQ balance

5.1 - Transmit IQ balance setting

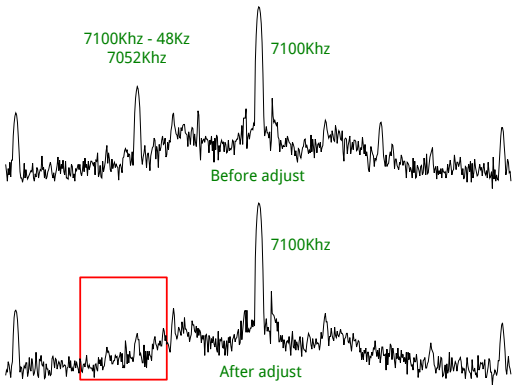
Don't kill your TinySA!

- Required attenuation between transmitter and tinySA between 50 and 60dB for 10W.
- Required attenuation between transmitter and tinySA between 60 and 70dB for 100W.

1. Connect a -30db power attenuator as dummy load and a -30db attenuator between the radio and the analyzer (tinySA).
2. For each frequency as shown in the table below:
3. Select [CW] and set [PWR] to 1W
4. Press [MENU] and turn [TUNE] to select "TxMag".
5. Press CW keyer to transmit and turn [AF] to obtain the weakest possible signal.
6. Turn [TUNE] to select "TxPha".
7. Press CW keyer to transmit and turn [AF] to obtain the weakest possible signal.
8. Repeat the "TxMag" and "TxPha" operation to obtain the weakest possible signal.

For the tinySA users:
Select Frequency, Center, set 7.1Mhz, select Span, set 200kHz

Band	Radio	Tx-mag	Tx-pha
80m	3.600Mhz		
60m	5.352Mhz		
40m	7.100Mhz		
30m	10.100Mhz		
20m	14.100Mhz		
17m	18.100Mhz		
15m	21.100Mhz		
12m	24.900Mhz		
10m	28.100Mhz		
6m	50.100Mhz		



7.100Mhz spectrum analysis before and after adjustment of the magnitude and phase.

6 - Receiver IQ balance

6.1 - Receiver IQ balance setting

1. Connect and set -70db RF generator to antenna. For each frequency as shown in the table below:
2. Press [CW] to select CW mode.
3. Press [MENU] and turn [TUNE] to select "RxMag".
4. Turn [AF] to obtain the weakest possible signal.
5. Turn [TUNE] to select "Rx-pha".
6. Turn [AF] to obtain the weakest possible signal.
7. Repeat the "RxMag" and "RxPha" operation to obtain the weakest possible signal.

Band	Radio	RF generator	RxMag	RxPha
80m	3.600Mhz	3.552Mhz		
60m	5.352Mhz	5.304Mhz		
40m	7.100Mhz	7.052Mhz		
30m	10.100Mhz	10.052Mhz		
20m	14.100Mhz	14.052Mhz		
17m	18.100Mhz	18.052Mhz		
15m	21.100Mhz	21.052Mhz		
12m	24.900Mhz	24.852Mhz		
10m	28.100Mhz	28.052Mhz		
6m	50.100Mhz	50.052Mhz		

7 - Audio signal level

7.1 - Adjust audio levels of Mic, USB audio input, and Bluetooth audio input

The default settings allow you to obtain an ALC level close to 100% for a nominal input signal.
The adjustment range is -4.5db to -39.5db

AdcMic	
AdcUsb	
AdcBt	