HF/50MHz TRANSCEIVER

FX-4CR

bg2fx.com

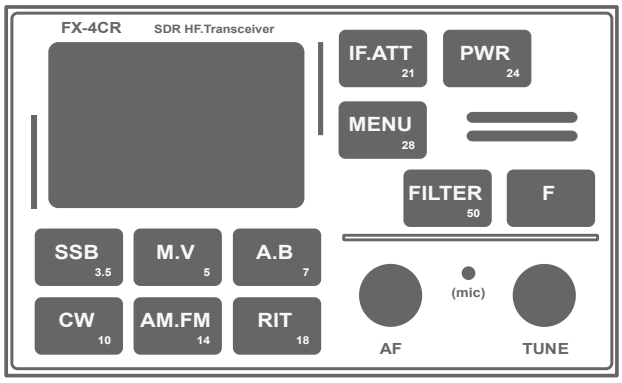
Operation manual

Table of contents

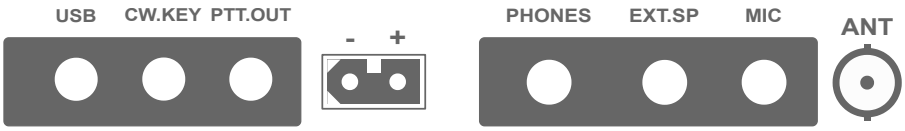
1 - Specifications

Transmission:	3.5 MHz - 54 MHz *(amateur radio frequencies)*
Reception:	3.5 MHz - 54 MHz
Operating modes:	USB, LSB, CW, AM, FM
Frequency steps:	10 Hz, 100 Hz, 1 kHz, 5 kHz, 10 kHz, 100 kHz
Receiving sensitivity:	-121 dBm *(0,20 µv)*
Filter bandwidth:	• SSB: 1,5 kHz, 1,8 kHz, 2,1 kHz, 2,4 kHz, 2,7 kHz, 3,0 kHz • CW : 50 Hz, 100 Hz, 200 Hz, 300 Hz, 500 Hz, 800 Hz • AM : 6 kHz, 9 kHz • FM : 5 kHz, 10 kHz
Power range:	0,1 - 20 W continuously adjustable *(54 MHz/5 W)*
Frequency stability:	+- 0.5 PPM
Spurious emission:	-43 dB *(Second and third harmonic)*
Carrier Suppression:	-50 dB
Antenna impedance:	50 Ohms
Microphone impedance:	2,2 kOhms
Audio output power:	1 W
Voltage range:	10 V – 18 V DC *(~ 14 V recommended, keep maximum voltage below 16V for long term operation)*
Power consumption:	• Receive: ~ 210 mA *(DC - 13.8 V)* • Transmit: ~ 3.3 - 4.0 A *(20 W)*
Operating temperature:	-20 °C, +40 °C
Overall size:	length: 107 mm, width: 65 mm, height: 43 mm
Radio weight:	0,46kg
Functional characteristics:	• 2.0" TFT display screen • SDR receiver circuit design *(24 kHz digital intermediate frequency)* • Spectrum display and waterfall plot • Adjustable DSP noise reduction • Dual VFO operation VFO-A and VFO-B with split operation mode • Dial speed acceleration • Build-in microphone • Bluetooth and USB connection for sound card and serial port • Ultra wide input voltage: 10 V - 18 V • Quick switching among various frequency bands and convenient operation
Included Items:	• Transceiver • Hand microphone • Power cable with spare fuses • USB data cable • Instruction manual • Box Carrying Case

2 - Panel description

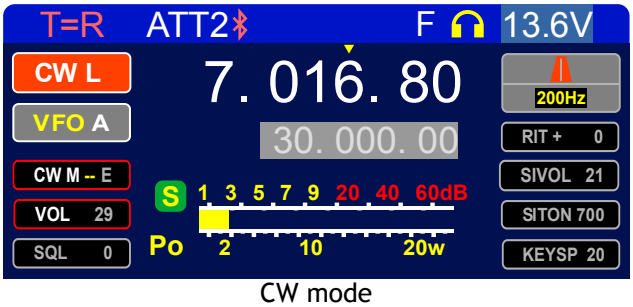


IF.ATT	Press to switch attenuator between ATT, ATT1, ATT2 *(ATT=none)* Press and hold and then turn AF to adjust the AGC setting.
PWR	Press to power on. Press and hold to power off. Press and then turn AF to adjust the power setting.
MENU	Press to change loudspeaker or earphone. Press and hold to enter the menu.
FILTER	Press to change the filter bandwidth.
F	Press to enter band selection mode. Press and hold to lock the keypad.
SSB	Press to switch to SSB mode. Press to select LSB or USB. Press and hold in SSB mode to turn Noise Reduction ON or OFF. Press and hold in CW mode to select the upper or lower carrier.
M.V	Temporarily unavailable. *(This function will be restored later by a firmware update)*
A.B	Press to switch between VFO A and VFO B. Press and hold to swap vfo.
CW	Press to enter CW *(Iambic electronic Keyer or Straight key)*. Press and hold to reverse the dit and dah paddles.
AM.FM	Press to switch to AM and FM mode. Press and hold to activate wideband receive mode *(RX only)*.
RIT	Press to turn RIT ON or OFF. Can be set as PTT when you want to use the internal microphone.
AF	Turn to adjust the volume. Press and then turn to adjust the squelsh. In SSB mode adjusts mic gain and DSP. In CW mode adjusts the speed, volume and pitch of the CW monitor.
TUNE	Turn to adjust the frequency. Press or press and turn to adjust the tuning step.

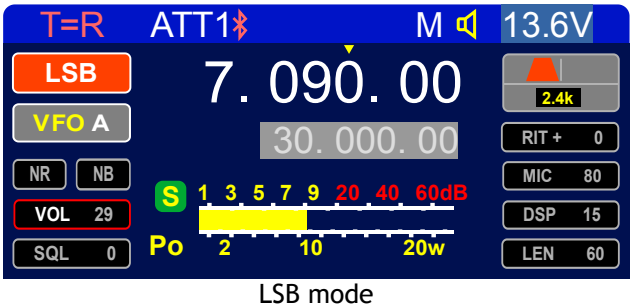


USB	USB connector	**PHONES**	Earphone connector
CW.KEY	Keyer connector	**EXT.SP**	Loudspeaker connector
PTT.OUT	PTT control output connector	**MIC**	Handheld microphone connector
- +	Power XT60 type connector	**ANT**	Antenna BNC type connector

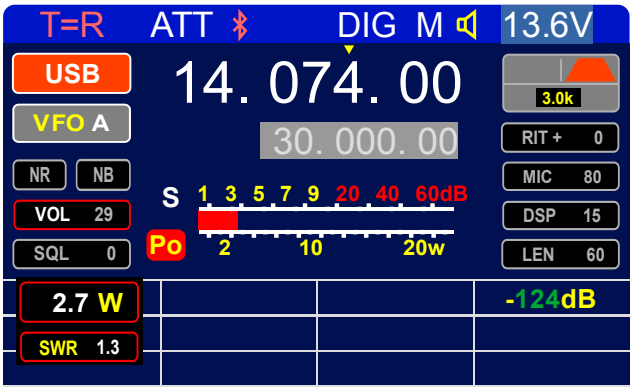
3 - Display



CW mode



LSB mode



USB DIGITAL mode *(transmission)*

AM *(RX only)*

T≠R T=R RX	Split, Normal or RX only
ATT ATT1 ATT2	Receive attenuator
ᛒ	Bluetooth connection
🎧 🔈	Loudspeaker or earphone
S M F	AGC speed (slow, middle, fast)
DIG	Digital mode (no sound)
13.6V	Supply voltage
7.016.80	VFO A
30.000.00	VFO B
-124dB	Current RSSI
CW L	Current mode
VFO A	Current VFO
200Hz	Filter bandwidth
S Po	S-meter or Pwr indicator
2.7W	Current power output
SWR 1.3	Current SWR
CW M --E	Electronic or straight key
AF 29	Volume
SQL 0	Squelch
RIT+ 0	Offset frequency
KEYSP 20	Auto keyer speed
NB NR	Noise reduction, noise blanker
MIC 80	Microphone Gain
DSP 15	Depth digital noise reduction
LEN 60	Noise reduction network length

4 - Keypad function

Each button or knob has several functions

- Press: just hit it
- Press and hold: press and hold more than one second
- Turn: turn right or left to change values
- Press then turn: hold down the knob and turn right or left to change the values

Note

When a setting is selected it's apair highlighted with red contour.
To exit a setting, it is necessary to press button or knob again. If no action is taken, the transceiver will automatically exit the setting after a few seconds.

5 - Basic operation

5.1 - Switching power (ON or OFF)

Press PWR to power on.
Press and hold PWR to power off.

5.2 - Volume adjustment (VOL)

Turn AF to adjust the audio volume. *(The volume setting ranges from 0 to 99)*.
When (NR) is active, press to cycle through DSP, LEN.

5.3 - Squelch (AF)

Press and hold AF until SQL is highlighted, then turn AF to adjust the squelsh.
Press and hold AF again to exit the squelsh setting.

5.4 - Frequency selection (TUNE)

Turn TUNE to adjust the frequency.
Press then turn TUNE to select the tuning step of
10 Hz, 100 Hz, 1 kHz, 5 kHz, 10 kHz or 100 kHz.

5.5 - Band selection (F)

Press F to enter the band selection menu.
Turn TUNE or select a band by pressing the BUTTON containing the band name in the lower right corner.
Press F again to exit the band selection menu.

- Band selection (T=R, T≠R mode)
  80m (3.500 4.000), **60m** (5.350 5.365), **40m** (7.000 7.350), **30m** (9.998-10.150), **20m** (14.000-14.350),
  17m (18.068-18.168), **15m** (21.000 21.450), **12m** (24.800 25.000), **10m** (27.000 30.000), **6m** (50.000 54.000)
- Band selection (RX mode)
  90m (3.200 3.900), **75m** (3.900 4.000), **60m** (4.700 5.600), **49m** (5.900 7.000),
  41m (7.100 7.800), **31m** (9.400 9.900), **25m** (11.600 13.100), **22m** (13.570 13.870),
  19m (15.100 15.800), **16m** (17.480 17.900), **13m** (21.450 21.750), **11m** (25.600 27.405), **10m** (28.000 29.999)

5.6 - Mode selection (SSB)

Press SSB to select SSB mode.
Press SSB to switch between *(LSB)*, *(DIG_L)*, *(USB)* and *(DIG_U)*.
Use *(DIG_L)* and *(DIG_U)* modes for digital mode operation.
(In DIG mode the speaker is muted and the filter is set to 3.0 kHz).

5.7 - Mode selection (CW)

Press CW to select CW mode.
Press CW to switch between the Iambic electronic keyer *(CW A)* and the straight key *(CW M)*.
In *(CW A)* press and hold CW to reverse the dit and dah paddles.
Press and hold SSB to select the higher or lower carrier. *(Which can be useful to avoid interference on nearby frequencies)*.
Press then turn AF to adjust keyer speed KEYSP, press again to adjust monitor frequency SITON, and press again to adjust monitor volume SIVOL.

5.8 - Mode selection (AM.FM)

Press AM.FM to select *(AM)* and *(FM)* mode.
Press AM.FM to switch between *(AM)* and *(FM)*.

5.9 - VFO A.B (A.B)

Press [A.B] to toggle between VFO A and VFO B.
Press and hold [A.B] to swap frequencies.

5.10 - Offset frequency (RIT)

Press [RIT] to turn *(RIT)* ON or OFF. *(RIT)* will be highlighted when active.
Press [TUNE] to adjust the reception offset.
Press [TUNE] to select the frequency step.
(See MENU RIT_PTT to define function)

5.11 - Automatic Gain Control (AGC)

Press and hold [IF.ATT] and then turn [AF] to adjust AGC level.

5.12 - Attenuator (ATT)

Press [IF.ATT] to switch attenuator between ATT, ATT1, ATT2. Indicator appears on top of the screen.
(For ATT1, the incoming signal power is reduced by 15dB and for ATT2 it's reduced by 35dB)

5.13 - Bandwidth (FILTER)

Press [FILTER] to toggle between filter bandwidth options in each mode.

- BLU: 1,5 kHz, 1,8 kHz, 2,1 kHz, 2,4 kHz, 2,7 kHz, 3,0 kHz
- CW : 50 Hz, 100 Hz, 200 Hz, 300 Hz, 500 Hz, 800 Hz
- FM : 5 kHz, 10 kHz
- AM : 6 kHz, 9 kHz

5.14 - DSP noise reduction (NR)

Press and hold [SSB] to turn noise reduction ON or OFF. *(NR)* will be highlighted when active.
Press and hold [AF] until DSP is highlighted, then turn [AF] to adjust DSP and LEN strength.
(The DSP may be unstable in some scenarios. If the noise reduction system freezes, reset it by turning the device OFF and ON, then turning the (DSP) back on).

5.15 - Impulse noise blanker (NB)

Press and hold [M.V] to turn Noise Blanker ON or OFF. *(NB)* will be highlighted when active.

5.16 - Microphone Gain (MG)

Press [AF] to enter microphone setting, then turn [AF] to adjust the microphone gain.
Press [AF] again to exit the microphone setting.

5.17 - Transmit power (PWR)

Press [PWR] to enter power setting, then turn [AF] to adjust the power.
Press [PWR] again to exit the power setting.
(The power setting ranges from 0.1 to 20 W, 54 MHz/5 W).

5.18 - Receive mode only (RX)

Press and hold [AM.FM] until *(RX)* appears on the top of the screen.
Press and hold [AM.FM] until *(T=R)* appears to return to transceiver mode.

5.19 - Key lock (LOCK)

Press and hold [F] until LOCK is appears on the top of the screen.
Press and hold [F] until LOCK disappears.

5.20 - Menu (MENU)

Press and hold [MENU] to enter the menu.
Press and hold [MENU] again to exit the menu.
Turn [AF] or press [MENU] to scroll through menu options, then turn [TUNE] to change the value of the selected menu item.

6 - Menu setting

		(Note values here before any changes) →	Notes
0	**MENU**	Changes the automatic menu exit delay.	
1	**IF 1**	The intermediate frequency of the device is 24.000 kHz. The IF setting ranges from 20.000 kHz to 28.000 kHz. *(Can effectively avoid some interference in the intermediate frequency part)*	
2	**CW_DELAY**	Adjusts the delay between CW transmit and receive after input. *(by * 10mS, 10=100mS)*	
3	**AGC_SPEED**	Selects the time constant for the Automatic Gain Control circuit: 0. Slow 1. Medium 2. Fast	
4	**BLUETOOTH**	Wireless Bluetooth. *(name: FX-4CR)* 0. OFF 1. ON	
5	**RIT_PTT**	The RIT can be used as PTT when you want to use internal microphone. 0. OFF *(RIT as RIT)* 1. ON *(RIT as PTT)*	
6	**ENCODE_FREQ**	The tuning step automatically changes, depending on the TUNE rotating speed. 0. current step * 1 1. current step * 2 2. current step * 3 3. current step * 4 4. current step * 5 5. current step * 6	
7	**TX_FILTER**	TX Filter Bandwidth: 0. 1.5kHz 1. 1.8kHz 2. 2.1kHz 3. 2.4kHz 4. 2.7kHz 5. 3.0kHz	
8	**TR_DIFFERE**	Transmit and Receive 0. Transmit and receive on main frequency 1. Transmit on secondary frequency and receive on main frequency *(In split mode cross-band operation is possible)*.	

7 - Data communication

7.1 - USB and Bluetooth Cat control

- When you connect bluetooth with FT8CN *(an Android based FT8 software)* the transceiver appear as 'FX-4CR'.
  On FT8CN settings set Rig to FX-4CR or TS-590 and refer to FT8CN *(for detailed settings)*.
- When you connect the transceiver to the computer with the supplied USB cable, one COM port and one AUDIO port are recognized on the computer.
  On digital mode software set Rig to Kenwood TS-590S, Baud Rate to 115200 and PTT to RTS.

7.2 - Digital mode operation

- Connect the USB cable to the transceiver and the computer and turn on the transceiver.
- Verify that the computer detects the USB cable.
- Set digital mode by pressing SSB until DIG_U appears on the top of the screen.
  (The speaker should be muted and the filter will be set to 3.0 kHz).
- Set the Volume to 3 by turning AF
- Set the computer audio output volume to 50%.
- Open the digital mode software and adjust the settings.

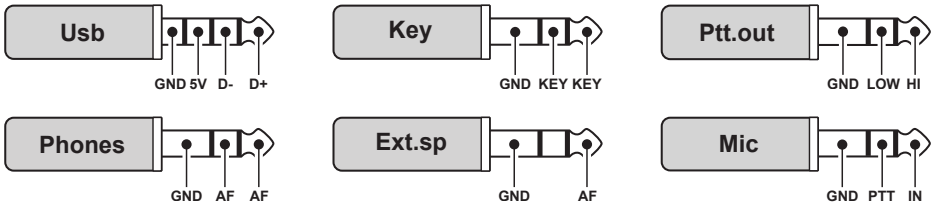
7.3 - Setup for WSJT-X

1. Go to File -> Settings -> Radio
2. Select TS-590S for RIG. Select the COM port for the USB connection. Choose RTS mode for PTT and test PTT.
3. Select USB audio sources for input and output under Sound Card settings.
4. Monitor WSJT-X cascade to verify FT8 signals are visible.
5. Check received audio power using dB meter at bottom to left of the WSJT-X main screen.
6. Adjust AF until it reads about 60 dB.
7. Select a free frequency on the band and start transmitting.
8. Monitor the power meter during transmission.
9. Adjust the mic gain to achieve output power close to the power setting selected in the power menu.

Important

- Monitor SWR and output power when using digital modes, especially when using higher supply voltages.
- Using high powers with high SWR can damage the radio, especially when running high duty cycle digital modes.
  - SSB mode can use 20W.
  - CW mode must use less than 10W.
  - FT8 power usage is limited to 5W.

8 - Connectors



Ptt.out, LOW: low level when transmit, HI: hight level when transmit.
(LOW and HI are the complement to adapt with different PA, TTL level)

9 - Firmware update

Important

- Plug the USB cable on the FX-4CR side first, and then plug the computer side.
- Unplug the USB cable on the computer side, and unplug the USB cable on the FX-4CR side, in the reverse order as the first time.
- Be sure to follow the entire sequence closely to avoid damage to your computer.

On transceiver

1. Start by connecting computer and transceiver in respect of procedure.
2. Press and hold F first, then press PWR and then release F and **KEEP HOLDING** PWR *(remember not to let go during the entire download process !)*
3. After the download is completed, let go PWR

On computer

1. The latest BG2FX firmware: https://bg2fx.com/downlaods
2. The STM32Cube programming software: https://www.st.com/en/development-tools/stm32cubeprog.html
3. Install and run STM32Cube.
4. Select USB from the top right menu of the STM32 Cube application.
5. Click on Connect.
6. Click Download and select the latest firmware file: *(Example: FX-4CR_2023.xx.xx.hex)*
7. Click Start Schedule and wait for the schedule to complete.
8. Once programming is complete, click Disconnect.

10 - Development mode

Important

- This section describes how to calibrate your radio.
- Before any modification note the values present in this mode.
- **ANY INCORRECT VALUES CAUSE DYSFUNCTIONS**

(Note values here before any changes)						
0	**POW_CORRE**	Internal Power Meter Calibration				
1	**AGC_STARE**	AGC starting threshold				
2	**S_CORRECT**	RSSI display Calibration				
3	**TCXO**	TCXO Calibration	25000000			
4	**SPE_DISPLAY**	Transmit spectrum display				
5	**RX_AMP_MA**	Manual / automatic IQ balance *(receive IQ balance)*				
6	**ALC_START**	MIC ALC start point setting				
7	**ALC_MIC**	MIC maximum gain setting	60			
8	**TX_AMP_80M**	Emission spurious setting amplitude				
9	**TX_PHASE_80M**	Emission spurious setting phase				
10	**TX_AMP_60M**	Emission spurious setting amplitude				
11	**TX_PHASE_60M**	Emission spurious setting phase				
12	**TX_AMP_40M**	Emission spurious setting amplitude				
13	**TX_PHASE_40M**	Emission spurious setting phase				
14	**TX_AMP_30M**	Emission spurious setting amplitude				
15	**TX_PHASE_30M**	Emission spurious setting phase				
16	**TX_AMP_20M**	Emission spurious setting amplitude				
17	**TX_PHASE_20M**	Emission spurious setting phase				
18	**TX_AMP_17M**	Emission spurious setting amplitude				
19	**TX_PHASE_17M**	Emission spurious setting phase				
20	**TX_AMP_15M**	Emission spurious setting amplitude				
21	**TX_PHASE_15M**	Emission spurious setting phase				
22	**TX_AMP_12M**	Emission spurious setting amplitude				
23	**TX_PHASE_12M**	Emission spurious setting phase				
24	**TX_AMP_10M**	Emission spurious setting amplitude				
25	**TX_PHASE_10M**	Emission spurious setting phase				
26	**TX_AMP_6M**	Emission spurious setting amplitude				
27	**TX_PHASE_6M**	Emission spurious setting phase				

10.1 - Enter in development mode

Press and hold MENU and then PWR keep holdding MENU until enter development mode.

10.2 - Calibrate output power

1. Set 40m band: freq 7.050Mhz.
   Press PWR and set 20W.
   Set CW M and press Straight Key.
   Read the value on an external power meter connected on dummy load and compare with value on screen.
   Turn off the radio.
2. Enter development mode.
   Adjust value [0-POW_CORRE]
   (if the output power is lower than the value on screen, decrease this value otherwise increase it)
   Exit MENU turn off the radio and repeat the operation until the desired result.

10.3 - Calibrate the power limits of each band

For eatch band (80m, 10m) press PWR and set 20W (5W for 6m band).
Set CW M and press Straight Key.
Adjust AF to read 20W on the screen.

10.4 - Receive IQ balance setting

Press and hold IF.ATT and then PWR keep holdding IF.ATT until two lines of setting appear.

The receiver must be set to CW and be tuned to the generator frequency + 48Khz.
The image signal is suppressed by adjusting the [AMP] and [PHASE] values.
The two sets of values are adjusted in conjunction with each other.
Usually [PHASE] only needs to be adjusted once.

In normal use, you can adjust [AMP] without entering the hidden menu.
To do this press and hold FILTER and a line of setting values appears at the bottom of the screen.

Band	Receiver	Generator
80M band	3.648Mhz	3.600Mhz
60M band	5.360Mhz	5.312Mhz
40M band	7.148Mhz	7.100Mhz
30M band	10.148Mhz	10.100Mhz
20M band	14.148Mhz	14.100Mhz
17M band	18.100Mhz	18.052Mhz
15M band	21.148Mhz	21.100Mhz
12M band	24.800Mhz	24.752Mhz
10M band	28.448Mhz	28.400Mhz
6M band	50.148Mhz	50.100Mhz

Example of frequency tunning

Thank you for your support and purchase

User manuel by F5BUD
Other informations: https://bg2fx.com/about-us