HF/50MHz TRANSCEIVER

FX-4CR

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Operation manual

(Firmware Version 1.6 - 23.12.30)

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1 - Specifications

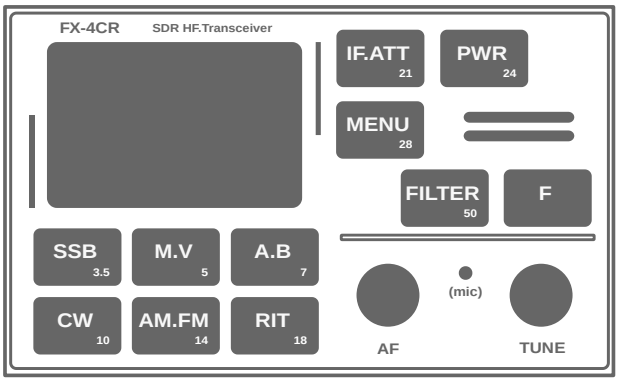
Transmitter:	3.5 MHz - 54 MHz *(amateur radio frequencies)*
Receiver:	3.5 MHz - 54 MHz
Operating modes:	USB, LSB, CW, AM, FM
Frequency steps:	10 Hz, 100 Hz, 1 kHz, 5 kHz, 10 kHz, 100 kHz
Receiving sensitivity:	-121 dBm *(0,20 µv)*
Filter bandwidth:	• SSB: 1,5 kHz, 1,8 kHz, 2,1 kHz, 2,4 kHz, 2,7 kHz, 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 height and weight:	• 107 mm L x 65 mm W x 43 mm H, 0.44 Kg • 4.2" L x 2.6" W x 1.7" H, 0.97 Lbs
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 • Built-in microphone • 99 Memories channels • 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

Important

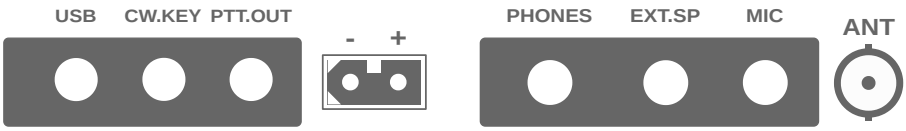
- Monitor SWR and output power when using digital modes, especially when using higher supply voltages.
- Using high powers with high SWR can damage the radio, especially when running high duty cycle digital modes.
  - SSB mode can use 20W.
  - CW mode must use less than 10W *.
  - FT8 power usage is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

    * *(depending on the ambient temperature)*

2 - Panels description

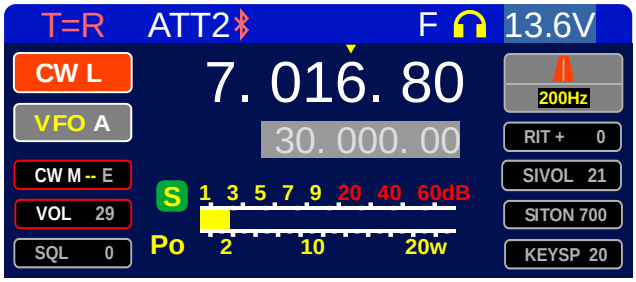


IF.ATT	Press to switch attenuator between ATT, ATT1, ATT2 *(ATT=none)* Press and hold and then turn AF to adjust the MGC setting *(Manual IF Gain Control)*.
PWR	Press to power on. Press and hold to power off. Press and then turn AF to adjust the RF output power setting.
MENU	Press to change loudspeaker or headphones. 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	Press to toggle between VFO and MEMORY.
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. Press and hold for CW practice mode (E). *(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 squelch. In SSB mode adjusts mic gain and DSP. In CW mode adjusts the speed, volume and pitch of the CW sidetone.
TUNE	Turn to adjust the frequency. Press and turn to adjust the tuning step. When in Memory mode: press and turn to select memory channel.

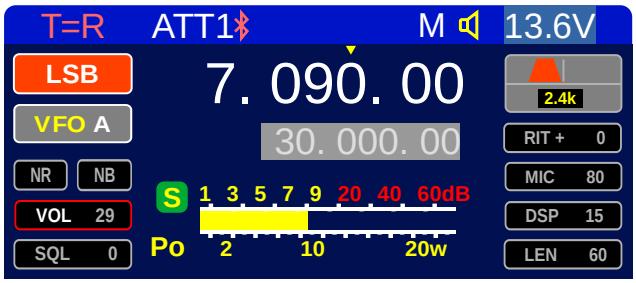


USB	USB connector	**PHONES**	Headphones connector
CW.KEY	Keyer connector	**EXT.SP**	Loudspeaker connector
PTT.OUT	PTT control output connector	**MIC**	Handheld microphone connector
- +	Power XT60 type connector	**ANT**	Antenna BNC type connector

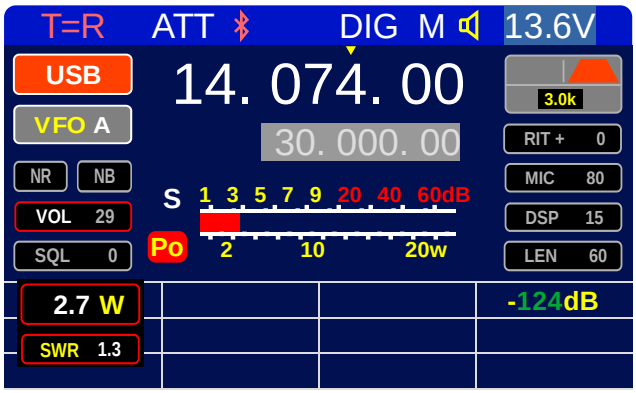
3 - Display



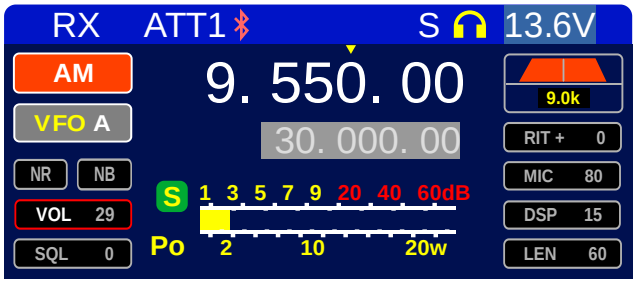
CW mode



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 headphones
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
VOL 29	Audio 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 is 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 (PWR)

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

5.2 - Volume adjustment (AF)

Turn [AF] to adjust the audio volume. *(The volume setting ranges from 0 to 99).*
Press to adjust MIC gain. When (NR) is active, press to switch between MIC, DSP, LEN.
In CW mode, press to adjust KEYSP, SITON or SIVOL.

5.3 - Squelch (AF)

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

5.4 - Frequency selection (TUNE)

Turn [TUNE] to adjust the frequency.
Press [TUNE] then turn [TUNE] to change the frequency multiplier.

- Turn clockwise: 1k, 100, 10
- Turn counterclockwise: 1k, 10k, 100k

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.

- Ham bands T=R or T≠R *(RIT)*
  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)
- Broadcast bands RX only
  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)

Note:

By default, transmission on the **60m** band and **6m** band is disabled.

- To activate transmission on **60m**, press and hold [M/V] and then [PWR] hold [M/V] until "60m TX" appears.
- To activate transmission on **6m**, press and hold [FILTER] and then [PWR] hold [FILTER] until "6m TX" appears.
- Repeat the operation to disable transmit on these bands.

5.6 - Mode selection (SSB)

Press [SSB] to select SSB mode.
Press [SSB] to switch between *(LSB)*, *(LSB-DIG)*, *(USB)* and *(USB-DIG)*.
(In digital mode, DIG appears on top of the screen. The speaker mute and the audio 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 Sidetone frequency SITON, and press again to adjust Sidetone volume SIVOL.

5.8 - Mode selection (AM.FM)

Press AM.FM to select *(AM)* or *(FM)* mode.
Press and hold AM.FM until (RX) appears to activate broadcast bands receiver mode.
Press and hold AM.FM will revert to ham bands again.

5.9 - VFO or MEMORY mode (M.V)

(Prior to entering Memory mode select 1 kHz VFO step for easiest setting of frequency).
(Empty channels are assigned 3500 kHz).
Press M.V to switch between VFO or MEMORY mode.
In VFO mode turn TUNE for frequency adjustment.
In MEMORY mode press then turn TUNE to select a memory from 1 to 99.
Adjust the frequency by turning TUNE Frequency, mode and filter bandwidth will be automatically stored in the selected memory.

5.10 - VFO A.B and SPLIT (A.B)

In VFO mode press A.B to toggle between VFO A and VFO B.
In MEMORY mode press A.B to toggle between CH A and CH B.
Press and hold A.B until *(T≠R)* appears to enter split mode.
Press and hold A.B until *(T=R)* appears to exit split mode.
(In split mode, while transmitting, the main frequency display shows the transmit frequency and the sub frequency display shows the receive frequency. Cross-band operation is possible in split mode).

5.11 - VFO A.B (A.B)

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

5.12 - Offset frequency (RIT)

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

5.13 - Manual Gain Control (MGC)

Press and hold IF.ATT and then turn AF to adjust MGC level. *(32 is the std level)*

5.14 - 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)

5.15 - Bandwidth (FILTER)

Press and hold FILTER and turn AF to adjust the I/Q balance.
Press FILTER to toggle between filter bandwidth options in each mode.

- 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
- FM : 5 kHz, 10 kHz
- AM : 6 kHz, 9 kHz

5.16 - 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).

5.17 - 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.
(In practice, the gain setting should not be advanced further than 10 to avoid distortion).

5.18 - 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).

5.19 - 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.

5.20 - Key lock (LOCK)

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

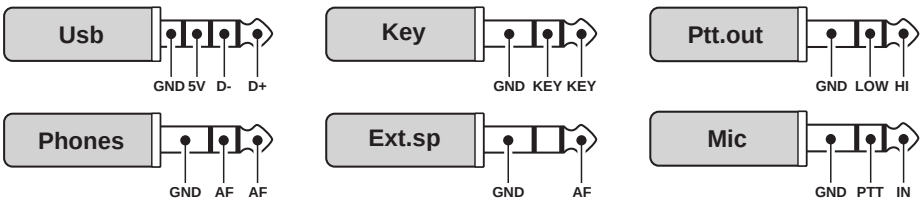
5.21 - Menu (MENU)

Press MENU to mute the speaker.
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. *(0 - 99 by 5mS, Ex: 20 = 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	**TX_AF_COMP**	Audio compression level. (1 to 99)	
9	**LCD_BL**	Backlight control: 0. Delayed off 1. Always on	

7 - Connectors



Ptt.out, LOW: low level on transmit, HI: hight level on transmit.
(LOW and HI options available for different PA input/TTL levels)
(All connectors standard 3.5mm stereo / 3 or 4 poles coaxial plugs).

8 - Data communication

8.1 - CAT via Bluetooth

- For Bluetooth connection with the Android based FT8CN *(an Android based FT8 software)*, set Bluetooth to 'on' in the Menu, and pair transceiver with Android device.
- In the FT8CN app the transceiver should appear as 'FX-4CR'.
- In FT8CN settings set Rig to FX-4CR or TS-590S.
  (For detailed settings refer to the FT8CN app / documentation).

8.2 - Connection with USB cable

- Connect the supplied USB cable to the transceiver and the computer, and turn on the transceiver.
- Transceiver should show in COM port list as well as two audio channels *(USB PnP device)*.
  (Because Windows assigns data to physical USB ports, always try to reuse the working COM port).
- For software, set Rig to Kenwood TS-590S, baudrate to 115200 and PTT to RTS.

8.3 - Setting up digital mode software e.g. WSJT-X

- Launch your digimode software and set the following parameters:
  Rig: Kenwood TS-590S
  Baud-rate: 115200
  Ptt: RTS
  Com: port as noted above
  Audio-tab: “USB PnP device” for both channels
- Digimode frequency setting and PTT/tune should now control the transceiver.
- Adjust settings as follows:
  - Receiver, with antenna connected: adjust AF level via Windows sound control sliders until RX level is roughly mid-scale (50 or 60 dB) in dB meter at the bottom of WSJT-X main screen. Waterfall should now show signals and main screen decoded messages
  - Transmitter, with dummy load connected: Hit “tune” key in digimode software and set power slider (e.g. of WSJT-X) to 100%. Adjust computer audio level controls until power no longer increases. Then reduce level e.g. to -30% from maximum, not exceeding 5W.
- Reconnect antenna. You're set to respond to CQs or send CQ calls yourself on a free sub-channel. For more details refer to the individual software user documentation.

9 - Firmware update

Important

- **Plug** the USB cable on the transceiver side first, and then insert in computer.
- **Unplug** the USB cable from computer, then from transceiver.

On transceiver

1. Start by connecting transceiver and computer in respect of procedure.
2. Press and hold F press PWR and then release F **KEEP HOLDING** PWR
   (REMEMBER, not to let go during the entire download process)
   If you let go of the button, you will lose the connection to the STM32Cube Programmer.

On computer

1. Download the latest BG2FX firmware file from:
   https://bg2fx.com/downloads
2. Unzip firmware file to a location on your computer.
3. Download and install the STM32Cube Programmer from:
   https://www.st.com/en/development-tools/stm32cubeprog.html
4. Install and run STM32Cube Programmer.
5. Select USB from the top right menu of the STM32Cube Programmer.
6. If you do not see your USB port listed, you might need to hit the **Refresh** button next to the port dropdown.
7. Click on the green **Connect** button.
8. Click the **Open** tab and select the unziped firmware file. *(Example: FX-4CR_2023.xx.xx.hex)*
9. Click the **Download** button in the STM32Cube Programmer.
10. After the download is completed, let PWR
    This will disconnect the transceiver from the STM32Cube Programmer.

10 - Development mode

Important

- Any incorrect values cause malfunctions

This section describes how to calibrate your radio. Before any modification note the values present in this mode.

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 holding **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 or mike PTT.
   Read the value on an external power meter with connected 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

To set up correct power settings for all bands press PWR and set 20W (5W for 6m band).
Set *(CW M .-)* and press straight key or mike PTT.
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.

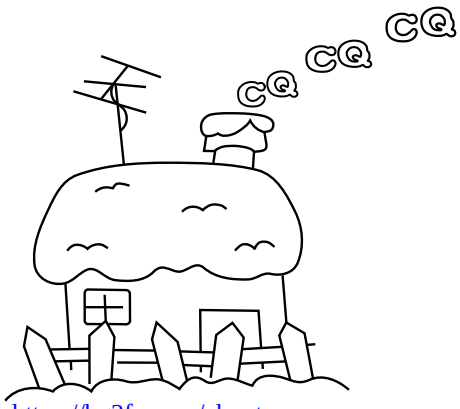
In normal use, you can adjust [AMP] without entering the hidden menu.
To do this press and hold FILTER and a line of setting values appears at the bottom of the screen.

10.5 - Example of frequency tunning

Band	Receiver	Generator	Note
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	

Thank you for your support and purchase

User manual by F5BUD



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