

All Mode Full Band SDR Transceiver

INSTRUCTION MANUAL

- 3D Waterfall Spectrum Diagram
- Built-in CW Decode, FT8 Encode and Decode
- Built-in WiFi for Networking



TO USERS

Thank you for purchasing this All Mode Full Band SDR Transceiver.

New design concept, advanced software radio technology and exquisite manufacturing process are adopted for this transceiver to make it with excellent quality, complete functions and flexible operation. To experience high-performance, long-distance, multifunctional, all mode and full band voice intercom communication during the use of this transceiver. Desired functions and parameters can be selected based on personal needs to make the communication more personalized and convenient, which will bring great convenience to your work and life.

Please read all instructions carefully and completely before using the transceiver.

PRECAUTIONS

Please follow the precautions as below to prevent fire, personal injury and damage to the transceiver.

- Do not touch the antenna or antenna interface while transmitting.
- Do not operate this transceiver in flammable or explosive environment, as it may cause explosions or fires.
- The main unit of the transceiver will heat up when continuously in operation for a long time.
- Do not expose this transceiver to direct sunlight for long time, and do not place it near the heating device.
- Do not place this transceiver in areas with excessive dust, moisture or splashing water, nor on unstable surfaces.
- 13.8V DC power supply should be used, do not use any DC power supply over 16V.
- Ensure to correctly connect the polarity of DC power supply and do not remove the fuse on the power cable.
- Do not allow the interfaces inside or on the rear panel of the transceiver in contact with metal or other objects.
- Do not operate or touch the transceiver with wet hands.
- Do not place the transceiver in an environment with a temperature below -20 °C or above +60 °C, especially during mobile operations.
- Please immediately cut off the power supply of this transceiver if it emits abnormal odor or smoke.
- The transmission power of this transceiver should be set to be less than the maximum allowable input value of the power amplifier, otherwise it will damage the power amplifier.

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UNPACKING INSPECTION

■ Supplied Accessories

The following accessories are supplied:

NO.	ITEM	QTY
1	Transceiver Unit	1
2	Hand Microphone	1
3	DC Power Cable	1
4	Instruction Manual	1
5	Fuse	2
4	Allen Wrench	1
5	Hand MIC Hook (2 Screws Included)	1

■ Main Features

- 7" multi-point capacitive touch screen (capacitive screen), 3D waterfall spectrum diagram
- Dynamic display of dashboard interface
- A+B or A&B dual channel hybrid stereo
- Bandwidth adjustable: 0Hz - 2700Hz for HPF and 100Hz - 20kHz for LPF
- Built-in KSV/power meter (KV)
- Automatic and manual notch filters
- Frequency band chart for automatic mode switching
- Digital Noise Reduction (DNR), Pulse noise reduction (NB)
- CAT virtual COM port (simulating FT-450 and TS-2000), CW port
- Spectrum analysis, SWR antenna standing-wave analysis
- SSB/FM Scanning mode
- Digital Recording
- WiFi networking operation
- Firmware upgrade through USB, SD and WiFi

PREPARATION

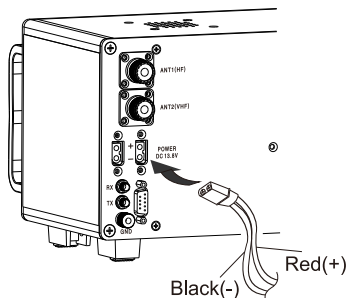
■ Connection of DC Power Cable

◆ Connection of DC Power Cable

A separate 13.8V regulated DC power supply device, with the recommended current capacity above 30A, is required to be used for this transceiver.

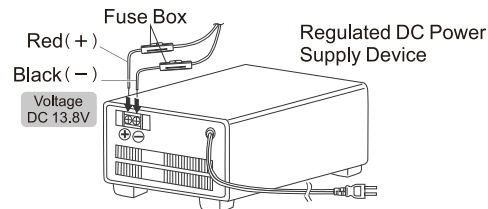
1. Have the positive and negative terminals of the DC power cable plugged into the power socket of this transceiver, notice that the polarity must be correct: Red - Positive (+) and Black - Negative (-).

- Ensure to turn off the power of this transceiver and the regulated DC power supply device before connecting the power cable.
- Two power sockets are available on the rear panel of this transceiver, which are connected in parallel and serve as backup for each other, either of them can be chose to use; It is recommended to use both two power sockets and two power cables simultaneously to increase the input current if transmitting with high power for a long time.



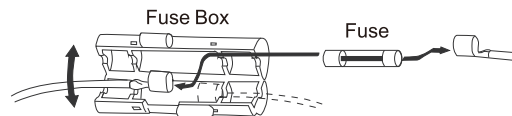
2. Have the positive and negative terminals of the DC power cable connected to the positive (+) and negative (-) terminals of the regulated DC power supply device.

- Do not connect the transceiver to AC socket directly.
- Have the transceiver connected to the regulated DC power supply device with the supplied DC power cable.
- Do not replace the supplied DC power cable with cable at low wire gauge.
- Insert the plug of regulated DC power supply device into the AC socket after connecting all cables correctly, and then turn on the regulated DC power supply device.



◆ Fuse Replacement

If a fuse blows, track down the source of the problem first, then replace the damaged fuse with a new 40A one. Please disconnect the power cable and contact the dealer or relevant repair center for assistance if the newly installed fuse continues to blow.



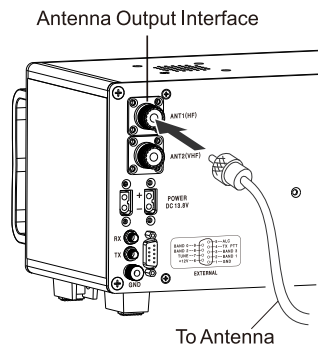
■ Antenna Connection

An antenna with impedance at 50 Ω and a low loss coaxial feeder with impedance at 50 Ω is recommended to be used to match the input impedance of the transceiver.

※ **NOTICE:** Ensure to install a matching antenna for the transceiver before transmitting, otherwise it may damage the transceiver.

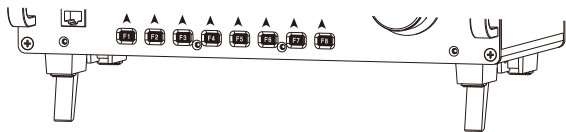
Lightning arresters should be equipped for all base radio stations to reduce the risk of fire, electric shock and damage to transceiver.

Please ensure to press [POWER] key to power off before antenna connection.



■ Use of Brackets

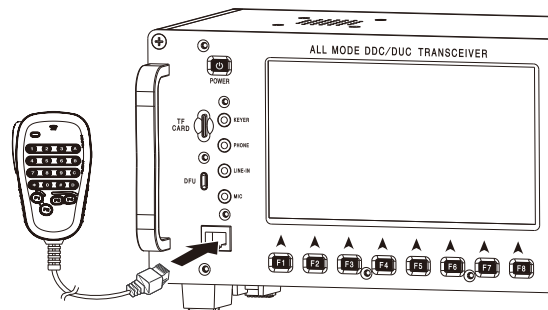
The folding brackets are available at the baseplate of the transceiver for use on the desktop.



■ Connection of Accessories

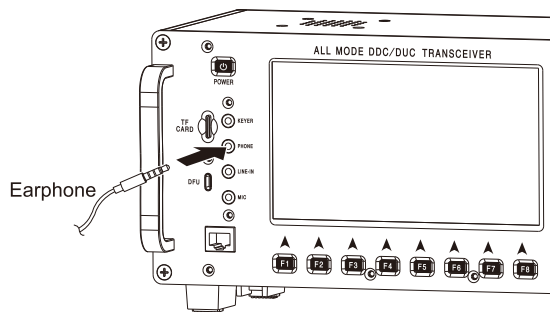
◆ Hand Microphone

To perform voice communication, please insert the supplied hand microphone plug into the standard socket on the front of the transceiver and press tightly until hearing a locking click sound.
Fix the supplied hand microphone hook at the appropriate position with the screws included in the screw set.



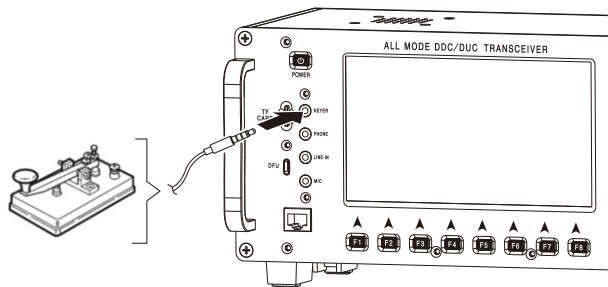
◆ External Earphone

Earphone with 3.5mm dual channel plug can be inserted into [PHONE] socket for use.



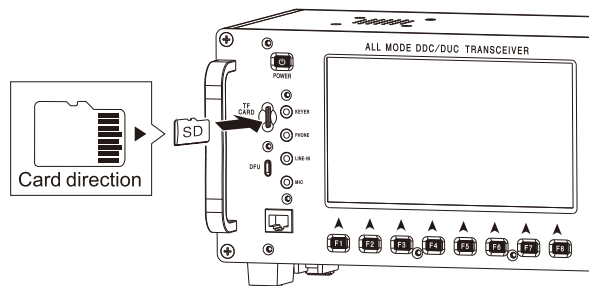
◆ CW Key

CW key can be inserted into [KEYER] socket for use.



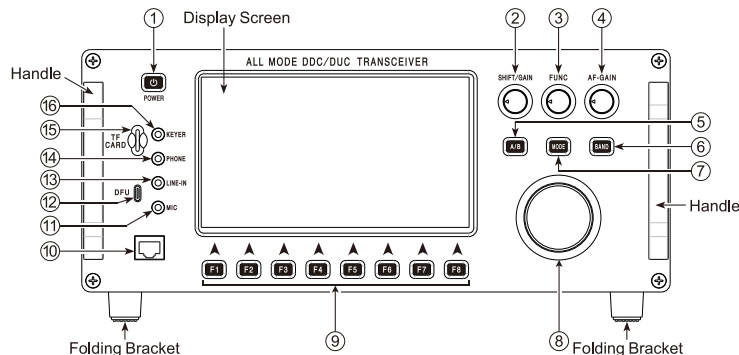
◆ Expansion SD Card

Please insert the SD card into the [TF CARD] jack to extend storage capacity with maximum 32GB.



PANEL DESCRIPTION

Front Panel



① [POWER] Power Button

- Press this button to power ON/OFF.

② [SHIFT/GAIN] Knob

- Rotate this knob to adjust Intermediate Frequency (IF) Gain, which is set by minimum noise.

③ [FUNC] Knob/Button

- Sub-encoder for menu navigation or fast access functions.
- Press this button to change adjustment mode.
FAST STEP - Fast Frequency Hopping
SET WPM - Automatic Keystroke Speed
SET RIT - Receive Tuning
SET NOTCH - Notch Filter Setting (If manual mode is enabled)
SET LPF - Bandpass LPF Setting
SET HPF - Bandpass HPF Setting
SET SQL - FM Squelch Threshold Setting

- Rotate this knob to adjust the setting value of the current mode.
- Press this button to confirm the current option in menu operation mode.

④ [AF-GAIN] Volume Knob

- Rotate this knob to adjust the audio output volume.

⑤ [A/B] Button

- Press this button to switch between primary and secondary frequencies: Frequency A and Frequency B.

⑥ [BAND] Button

- Frequency band selection, long press - memory frequency, repeatedly press - memory frequency.
- Press this button to view menu items backwards in menu operation mode.

⑦ [MODE] Button

- Press this button to switch receiving mode.

⑧ Main Tuning Knob

- Rotate this knob to adjust frequency under standby state.
- Rotate this knob to adjust output power while transmitting.

⑨ Softkeys [F1] ~ [F8]

Function keys, the functions are changed based on the mode, corresponding to the screen keys at the bottom of the screen.

- These programmable keys can be defined as different functions through the control menu settings, please refer to the instructions on the next page for details.

⑩ Hand Microphone Socket

- Insert the supplied hand microphone plug into the socket to perform intercom and function operations.

⑪ [MIC] Microphone Interface

- Connect the microphone and input audio when speaking to the microphone.

⑫ [DFU] Interface

- USB interface (Type C) connected to PC.
- Used for firmware upgrade and flashing in DFU mode.
- Connect the internal USB digital sound card port to transfer digital audio in working condition.

⑬ [LINE-IN] Interface

- Connect the PC audio output to modulate the input of the audio signal.

⑭ [PHONE] Earphone Socket

- For connecting stereo earphones.
- Do not insert mono headphones.

⑮ [TF-CARD] SD Memory Card Socket

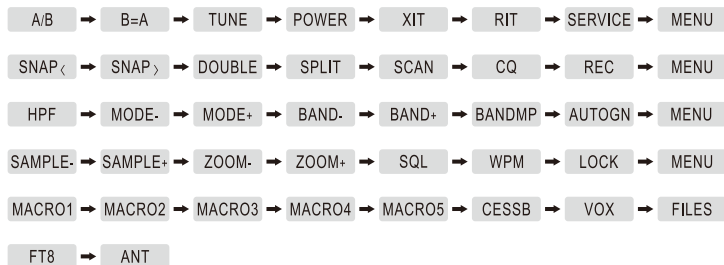
- Used for recording set values and call content, copying screen status (screenshot), firmware upgrade (flashing), etc.

⑯ [KEYER] Interface

- CW key interface, used to input the Morse code and send out.

■ Softkeys

Softkey icons are displayed at the bottom of touch screen and the physical buttons [F1]~[F8] correspond to the functions assigned to the softkeys for easy operation.



※Notice:

- After entering various menu items, press [F8] key to return to the previous level menu items until the main interface.

- The sequence of the key icons can be set by pressing the software **MENU** to select "SCREEN Settings" and then pressing the [FUNC] button (knob) to enter the next menu item "Func button 1-36" and set, with a total of 36 softkeys available for setting.

◆ Softkey Selection

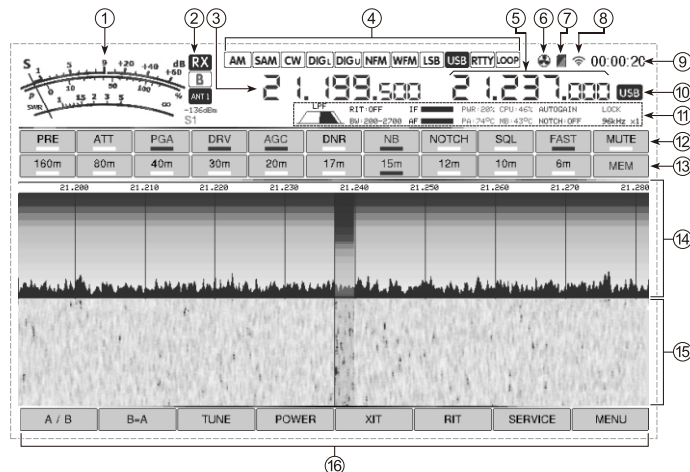
Touch screen to scroll and select the corresponding button function and assign to the softkeys [F1] ~ [F8]. Press the corresponding softkey under the function icon to select the desired function.

◆ Softkey Function Description

Softkey	Description
A/B	Switch between Frequency A and Frequency B.
B=A	Copy the information of Frequency B to Frequency A.
TUNE	Antenna tuner switch, press to highlight the icon while load automatic antenna tuner; Press again to gray the icon while no load automatic antenna tuner.
POWER	Transmission output power selection, with a total of 10 levels as 0%~100%.
XIT	Transmitting offset.
RIT	Receiving frequency offset adjustment.
SERVICE	Enter service setting menu.
MENU	Main menu
SNAP<	Automatically track strong signals on the left side.
SNAP>	Automatically track strong signals on the right side.
DOUBLE	Dual frequency receiving mode. A – VFO-A only; B – VFO-B only; A+B - Mixing of both VFO in two earphones; A&B - A in the earphone on the left while B in the earphone on the right.
SPLIT	Split frequency operation, receiving on the current main frequency and transmitting on the sub frequency (Cross-band available).
SCAN	Scanning function. Scan frequency bands or channels to search for signals.
CQ	Automatic voice call, transmit the audio signal pre-recorded into the memory card.
REC	Record the current signal into the SD card to save.
MENU	Main menu

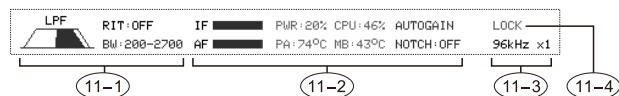
Softkey	Description
HPF	Enter the high-pass filter menu.
MODE-	Mode Selection: FM/SSB/CW etc.
MODE+	Mode selection in one group, such as NFM/WFM,LSB/USB.
BAND-	Band selection downwards.
BAND+	Band selection upwards.
BANDMP	Automatic mode switch, select a mode from the current area within the range.
AUTOGN	Automatic gain switch. ATT, DRV and PGA are allowed to be automatically controlled by the transceiver, preventing users from controlling these functions.
MENU	Main menu.
SAMPLE-	Reduce the sampling rate and bandwidth of waterfall.
SAMPLE+	Increase the sampling rate and scanning range of waterfall.
ZOOM-	Spectrum zoom out.
ZOOM+	Spectrum zoom in.
SQL	Squelch menu.
WPM	CW automatic keystroke speed.
LOCK	Lock or unlock the touch screen. Press to lock the touch screen while press and hold to unlock the touch screen.
MENU	Main menu.
MACRO1	First pre-recorded MORSE code signal.
MACRO2	Second pre-recorded MORSE code signal.
MACRO3	Third pre-recorded MORSE code signal.
MACRO4	Fourth pre-recorded MORSE code signal.
MACRO5	Fifth pre-recorded MORSE code signal.
CESSB	Voice compression function in SSB mode.
VOX	Voice control function.
FILES	File management.
FT8	FT8 operation menu.
ANT	Transmitting antenna selection.

Display Screen



- ① S-meter instrument panel indication, from top to bottom, showing:
 - Receiving signal strength indication.
 - Transmitting power level indication.
 - SWR standing-wave indication.
- ② ● TX/RX/TUNE Mode: Current receiving mode.
 - A: VFO-A only;
 - B: VFO-B only;
 - A+B: Mixing of both VFO in two earphones;
 - A&B: A in the earphone on the left while B in the earphone on the right.
 - ANT1/ANT2: Transmitting antenna selection.
 - Touch this area to switch ANT mode.
- ③ Current VFO-A frequency, touch to enter the band selection interface.
- ④ Operating mode of current VFO-A frequency, highlight with different colors after touching.

- ⑤ Current VFO-B frequency, touch to enter the band selection interface.
- ⑥ Cooling fan status indication.
- ⑦ SD card status indication: The icon is highlighted when SD card is inserted while it is gray when not.
- ⑧ WiFi status indication: The icon is highlighted when with WiFi connected while it is gray when not.
- ⑨ Clock display: Automatically synchronized with WiFi or manually set.
- ⑩ Operating mode of current VFO-B frequency, touch to select different modes.
- ⑪ Status display area for current operating frequency, instructions as follows:



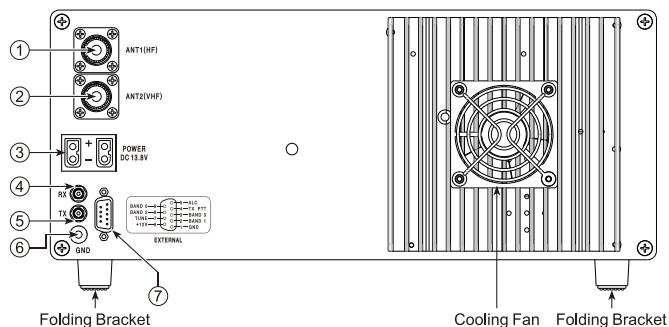
- ⑪-1 Bandpass low-frequency filter status indication.
 - RIT: Audio offset.
 - BW: Bandwidth selection of bandpass filter, touch this area to pop up the bandwidth selection menu with different settings for each module. The transmitted bandpass filter is configured if you touch this area while transmission.
- ⑪-2 Transceiver status indication.
 - IF: Intermediate Frequency (IF) status bar display.
 - AF: Current receiving volume bar display.
 - PWR: Transmitting power percentage display.
 - PA: RF power amplifier tube temperature display.
 - CPU: CPU load percentage display.
 - MB: Main board temperature display.
 - AUTO GAIN: Automatic gain corrector.
 - NOTCH: Notch filter.
- ⑪-3 Spectrum width
- ⑪-4 Lock the buttons, knobs, and screen. Press and hold softkey [LOCK] to unlock.

- ⑫ Working status display area, instructions as follows:

- PRE** Enable LNA (Low Noise Pre-Amplifier).
- ATT** Enable attenuator, press and hold for electrical level selection. The attenuator will be automatically adjusted with no responding to the user's selection when the automatic adjustment is enabled.
- PGA** Enable ADC built-in "Pre-Amplifier".
- DRV** Enable ADC Driver.
- AGC** AGC control: Automatic gain control for receiving signals.
- DNR** DNR1: Level 1 digital noise processor;
DNR2: Level 2 digital noise processor, which is the most powerful, with processing threshold adjusted in settings, it will make a gurgling sound if overset.
- NB** Pulse interference suppressor.
- NOTCH** Press to activate automatic notch filter while press and hold to activate manual filter (controlled by [FUNC] knob).
- SQ** Enable squelch, press and hold for squelch level setting, the squelch level in FM mode is displayed on S-meter.
- FAST** Frequency step acceleration.
- MUTE** Mute the transceiver. Press to mute the transceiver speaker, press and hold to mute the speaker but earphone.

- ⑬ Band display. Touch for quick band selection, MEM refers to memory band.
- ⑭ FFT (Spectrum), with one color line showing the boundary of pattern/scope, do not beyond the boundary when using.
 - Touch this area for tuning to the desired frequency range;
 - Slide this area for moving smoothly along frequency;
 - Pull open/close with 2 fingers for spectrum zoom in/out.
- ⑮ Waterfall (WTF), waterfall in different forms of 2D and 3D can be displayed.
- ⑯ Softkeys and status
 - Slide the softkey scroll bar left and right to select desired softkey.

■ Rear Panel



① [ANT1(HF)] Antenna Port

For connecting external HF antenna with impedance at 50Ω.

② [ANT2(HF)] Antenna Port

For connecting external VHF antenna with impedance at 50Ω.

③ DC13.8V Power Cable Jack

For connecting supplied DC13.8V power cable.

④ [RX] Antenna Port (Optional)

Have the signal to the RF amplification part of the transceiver directly, skipping the low-pass filter.

⑤ [TX] Antenna Port (Optional)

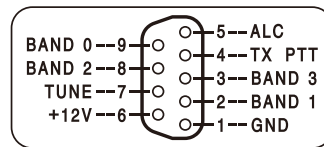
The RF signal from the transceiver DA conversion section is directly output from this interface.

⑥ [GND] Grounding Terminal

General grounding terminal of the transceiver. The grounding terminal should be well grounded to prevent issues such as electric shock and interference with television broadcasting. Connect the grounding rod with a thick wire and keep the wire length as short as possible.

⑦ [EXTERNAL] External Interface

A total of 9 pins are available for the external interface with descriptions as follows:



EXTERNAL

1. GND: Grounding

2. BAND1: BCD band identification signal 1

3. BAND3: BCD band identification signal 3

4. TX PTT: Grounding while transmitting, or transmit immediately after grounding

5. ALC: Connected to the ALC output socket of power amplifier for automatic control on output power

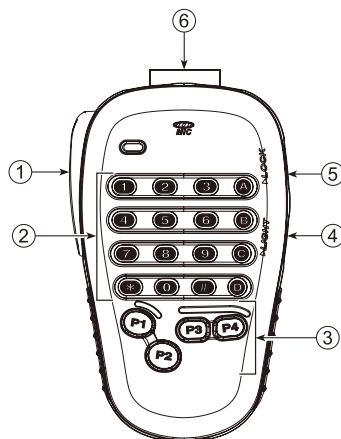
6. +12V: Power supply +12v, maximum current at 1A

7. TUNE: Antenna tuner control signal, used to enable, disable or activate antenna tuner.

8. BAND2: BCD band identification signal 2

9. BAND0: BCD band identification signal 0

■ Microphone (Multi-functional Hand Microphone)



① [PTT] Button

Press and hold this button to transmit while release to receive signal.

② Numeric Keypad (DTMF Keypad)

A total of 16 keys are available and can be customized by users through the menu, the factory default functions of each key are as follows:

- ① AGC: Automatic gain control for receiving signals.
- ② A/B: Switch between Frequency A and Frequency B.
- ③ BAND-: Band selection downwards.
- A BAND+: Band selection upwards.
- ④ UP: Frequency selection upwards.
- ⑤ Switch between VFO-A and VFO-B.
- ⑥ BAND-: Band selection downwards.
- B BAND+: Band selection upwards.

- ⑦ DOWN: Frequency selection downwards.
- ⑧ A/B: Switch between Frequency A and Frequency B.
- ⑨ BAND-: Band selection downwards.
- C BAND+: Band selection upwards.
- * AGC: Automatic gain control for receiving signals.
- O A/B: Switch between Frequency A and Frequency B.
- # BAND-: Band selection downwards.
- D BAND+: Band selection upwards.

③ Programmable Function Keys (Key P1/P2/P3/P4)

These 4 keys can be customized by users through the menu as follows:

- P1** AGC: Automatic gain control for receiving signals.
- P2** A/B: Switch between Frequency A and Frequency B.
- P3** BAND-: Band selection downwards.
- P4** BAND+: Band selection upwards.

④ Keypad Lamp Switch [LAMP]

Turn on the MIC keypad lamp.

⑤ Lock Switch [LOCK]

Lock [UP]/[DWN] keys to prevent pressing them from changing the operating frequency.

⑥ [UP]/[DWN] Keys

While unlocking, press these two keys for frequency selection upwards or downwards.

BASIC OPERATION

It is suggested to operate on the 7" multi-point capacitive touch screen with a capacitive stylus for more precise operation of the transceiver. The basic function operation descriptions are as follows:

Power ON/OFF

Ensure that the following connections are completed correctly before turning on the transceiver for the first time.

- DC Power Cable
- Antenna
- Grounding Wire
- Hand Microphone

Press [POWER] Power Button to power ON/OFF.

Volume Adjustment

Rotate [AF-GAIN] Volume Knob to adjust volume, rotate clockwise to turn volume up while counterclockwise to turn volume down.

- ◆ RF GAIN can be appropriately reduced for good reception effect if the receiving background noise is too loud.

Select Operating Band and Frequency

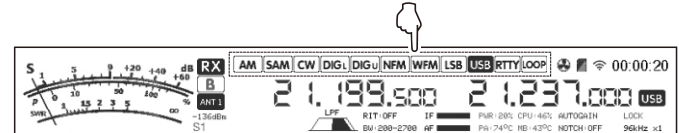
- ◆ Touch the corresponding operating frequency band on the main display interface screen lightly to switch to the current operating band.
- ◆ Or press [BAND] button for loop selection of operating band.
- ◆ Or press the softkeys ([F1] ~ [F8]) assigned with [BAND+] or [BAND-] for loop selection of operating band.
- ◆ Touch the current VFO operating frequency (MHz) to enter the band selection interface as follows:

2200m	160m	80m	40m	30m	20m
17m	15m	12m	CB	10m	6m
2m	70cm	MEM			
LW	MW	120m	90m	75m	62m
49m	41m	31m	25m	22m	19m
18m	16m	13m	11m	FM	

- ◆ Rotate the main tuning knob to select the correct operating frequency.

Select Operating Mode

- ◆ Touch the corresponding options of operating mode in the row above the frequency on the main display interface screen to activate the current operating mode when the main frequency (VFO-A) is in use, as shown below.



- ◆ Touch the operating mode on the main display interface screen to enter the operating mode selection when the sub frequency (VFO-B) is in use, as shown below.

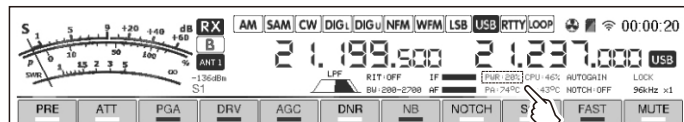
LSB	USB	CW	NFM
WFM	AM	SAM	DIGL
DIGU	IQ	LOOP	RTTY

■ Transmitting

Please set the corresponding operating band and frequency, select the correct modulation mode and set suitable output power before transmitting.

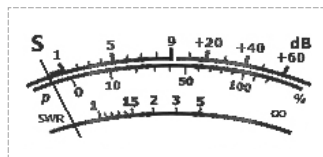
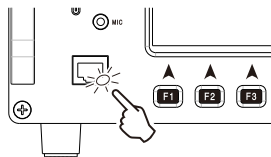
◆ Transmitting power selection:

Touch "PWR:100%" on the screen to enter the menu item of output power selection, select the appropriate value and then exit.



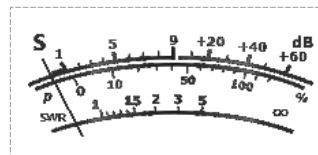
◆ In SSB mode and FM mode:

Press and hold the [PTT] button on hand microphone to light up the transmitting prompt lamp on the right side of the hand microphone socket, and red TX icon is displayed on the screen. Speak to the hand microphone at a normal volume, the transmitting modulation audio spectrum is displayed in the middle of the screen, and the corresponding output power is displayed on the power meter.



◆ In CW mode:

Press and hold the CW key, transmitting status is displayed on screen, and the corresponding output power is displayed on power meter.



■ Receiving

Select the appropriate operating frequency band in accordance with the diagram below and the appropriate operating mode, then you can receive signals from the frequency band.

2200m	160m	80m	40m	30m	20m
17m	15m	12m	CB	10m	6m
2m	70cm	MEM			
LW	MW	120m	90m	75m	62m
49m	41m	31m	25m	22m	19m
18m	16m	13m	11m	FM	

MENU FUNCTION DESCRIPTION

■ Menu Operation Method

1. Press [MENU] to enter main menu.
2. Rotate [FUNC] Knob/Button to select the corresponding submenu and press to enter.
3. Rotate [FUNC] Knob/Button to select the menu items need to be revised and press to confirm the option.

※ **Note:** Press and hold [F8] in the main menu interface to enter the calibration setting menu hidden in *Calibration. Hidden menu options should not be modified by users unless necessary.

■ Main Menu

Name	Description	Submenu Available
TRX Settings	Function and TX settings	Yes
AUDIO Settings	Audio settings	Yes
CW Settings	CW settings	Yes
SCREEN Settings	Screen display settings	Yes
Decoders	Decoding settings	Yes
ADC/DAC Settings	Digital/analog conversion settings	Yes
WIFI Settings	WiFi network settings	Yes
SD Card	Memory card management	Yes
Set Clock Time	Time setting	No
DFU Mode	DFU mode	No
OTA Update	OTA remote upgrade	No
Services	Service item	Yes
System info	Current system info is displayed	No
Support project	Support project	No
* Calibration	Calibration (*Press and hold [F8] in the main menu interface to activate this menu)	Yes

◆ TRX Settings

Name	Description	Set Values (Parameters)
RF Power	RF power	Numerical value (0-100)
Power for each band	Equalize power by band	Yes/No
Power for each mode	Equalize power by mode	Yes/No
Channel Mode	Channel mode enabled	Yes/No
Band Map	Automatic mode switching by frequency range	Yes/No
AutoGainer	Automatic gain	Yes/No
RF_Filters	Bandpass filter switch enabled	Yes/No
Two Signal Tune	2-signal tuning	Yes/No
RIT Interval	RIT interval	Numerical value (100-10000)
XIT Interval	XIT interval	Numerical value (100-10000)
Fine RIT TUNE	Best RIT effect	Yes/No
TRX Samplerate	Spectrum sampling width	Numerical value (48,96,192,384) KHz
FM Samplerate	FM sampling width	Numerical value (48,96,192,384) KHz
Freq Step	Frequency step	Numerical value (1-500000)
Freq Step FAST	Frequency step fast mode	Numerical value (1-500000)
Freq Step ENC2	Freq Step ENC2	Numerical value (1-500000)
Freq Step ENC2 FAST	Freq Step ENC2 FAST	Numerical value (1-500000)
Freq Step WFM,KHz	FM mode frequency step	Numerical value (1-1000)
CW Freq Step divider	CW frequency step	Numerical value (1-100)
Encoder Accelerate	Encoder acceleration	Yes/No
Att step, dB	Attenuation step	Numerical value (1-15) dB
Attenuation, dB	Default attenuation	Numerical value (0.5-31.5) dB
DEBUG Console	Debug console	Off/ system/ WiFi/ button/ touch/ CAT
Auto Input Switch	Auto input switch	Yes/No

Name	Description	Set Values (Parameters)
Auto Snap	Automatic tracking	Yes/No
Input Type MAIN	Main input type	MIC / LINE / USB
Input Type DIGI	Digital input type	MIC / LINE / USB
Callsign	Callsign	Input callsign
Locator	Grid	Input grid position
URSI Code	URSI code	Unicode setup
Transverter 70cm	70cm band frequency conversion	Yes/No
Transverter 23cm	23cm band frequency conversion	Yes/No
Transverter 13cm	13cm band frequency conversion	Yes/No
Transverter 6cm	6cm band frequency conversion	Yes/No
Transverter 3cm	3cm band frequency conversion	Yes/No
Custom Transverter	Custom frequency conversion	Yes/No
TUNER Enabled	Auto tuning enabled	Yes/No
ATU Enabled	Antenna tuner enabled	Yes/No
ATU Ind	Inductance parameters	Antenna tuning inductance
ATU Cap	Capacitance parameters	Antenna tuning capacitance
ATU T	Auto adjustment	Auto adjustment

◆ AUDIO Settings

Name	Description	Set Values (Parameters)
IF Gain, dB	IF gain	Numerical value (0-100)
DNR	Digital filtering	Off/ DNR1/ DNR2
AGC	Automatic gain control enabled	Yes/No
AGC Gain target,LKFS	AGC gain target	Numerical value
Mic Gain, dB	MIC gain	Numerical value dB
Mic Boost	MIC boost	Yes/No
MIC Noise Gate	MIC noise threshold	Numerical value (-120~0)
DNR1 Threshold	Digital filter 1 threshold	Numerical value

Name	Description	Set Values (Parameters)
DNR2 Threshold	Digital filter 2 threshold	Numerical value
DNR Average	Average digital filter	Numerical value
DNR Minimal	Digital filter minimum value	Numerical value
Noise blanker	Noise suppression enabled	Yes/No
NB Threshold	Noise suppression threshold	Numerical value
SSB HPF RX Pass	SSB RX high-pass filter range	Set by users
SSB HPF TX Pass	SSB TX high-pass filter range	Set by users
SSB LPF RX Pass	SSB RX low-pass filter range	Set by users
SSB LPF TX Pass	SSB TX low-pass filter range	Set by users
CW LPF Pass	CW mode low-pass filter range	Set by users
DIGI LPF Pass	Digital mode low-pass filter range	Set by users
AM LPF RX Pass	AM RX low-pass filter range	Set by users
AM LPF TX Pass	AM TX low-pass filter range	Set by users
FM LPF RX Pass	FM RX low-pass filter range	Set by users
FM LPF TX Pass	FM TX low-pass filter range	Set by users
Squelch	Squelch enabled	Yes/No
FM Squelch level,dbm	FM squelch level	Numerical value dbm
Beeper	Sound prompt enabled	Yes/No
MIC Reverber	MIC reverberation	Set by users
MIC EQ 0.3k SSB	SSB MIC equalization 0.3KHz	Set by users
MIC EQ 0.7k SSB	SSB MIC equalization 0.7KHz	Set by users
MIC EQ 1.2k SSB	SSB MIC equalization 1.2KHz	Set by users
MIC EQ 1.8k SSB	SSB MIC equalization 1.8KHz	Set by users
MIC EQ 2.3k SSB	SSB MIC equalization 2.3KHz	Set by users
MIC EQ 0.3k AMFM	AM/FM MIC equalization 0.3KHz	Set by users
MIC EQ 0.7k AMFM	AM/FM MIC equalization 0.7KHz	Set by users
MIC EQ 1.2k AMFM	AM/FM MIC equalization 1.2KHz	Set by users
MIC EQ 1.8k AMFM	AM/FM MIC equalization 1.8KHz	Set by users
MIC EQ 2.3k AMFM	AM/FM MIC equalization 2.3KHz	Set by users

Name	Description	Set Values (Parameters)
RX EQ 0.3k	RX equalization 0.3KHz	Set by users
RX EQ 0.7k	RX equalization 0.7KHz	Set by users
RX EQ 1.2k	RX equalization 1.2KHz	Set by users
RX EQ 1.8k	RX equalization 1.8KHz	Set by users
RX EQ 2.3k	RX equalization 2.3KHz	Set by users
RX AGC SSB Speed	SSB RX automatic gain control speed	Set by users
RX AGC CW Speed	CW RX automatic gain control speed	Set by users
RX AGC Max gain	RX AGC max gain	Set by users
RX AGC Hold time	RX AGC hold time	Set by users
TX Comper Speed SSB	SSB TX compression speed	Set by users
TX Comper MaxGain SSB	SSB TX maximum compression gain	Set by users
TX Comper Speed AMFM	AM/FM TX compression speed	Set by users
TX Comper MaxGain AMFM	AM/FM TX maximum compression gain	Set by users
CTCSS Frequency	CTCSS	Numerical value
SelfHear Volume	Sidetone volume	Numerical value
WFM stereo	Wide band FM stereo	Yes/No
AGC Spectral	AGC spectrum	Yes/No
TX CESSB	SSB TX voice compression enabled	Yes/No
TX CESSB Compress, dB	SSB TX voice compression	Numerical value
VAD Threshold	VAD threshold	Numerical value
VOX	VOX enabled	Yes/No
VOX Timeout, ms	VOX timeout	ms
VOX Threshold, dBFS	VOX threshold	Default set as 0

◆ CWSettings

Name	Description	Set Values (Parameters)
CW Key timeout	CW key timeout	Numerical value (50-5000ms)
CW Pitch	CW tone	Numerical value (50-10000Hz)
CW Self Hear	CW Sidetone monitoring	Yes/No

Name	Description	Set Values (Parameters)
CW Keyer	Auto key	Yes/No
CW Keyer WPM	Auto key speed	Numerical value WPM
CW Gauss filter	CW Gauss filter	Yes/No
CW DotToDash Rate	DotToDash duty rate	Numerical value
CW Iambic Keyer	Auto key rhythm	Yes/No
CW Key Invert	DotToDash inversion	Yes/No
CW PTT Type	Button control	Key / PTT / KEY+PTT

◆ Services Settings

Name	Description	Set Values (Parameters)
DX Cluster	DX cluster	New window
Propagation	Propagation diagram	New window
DayNight Map	DayNight Map	New window
Ionogram	Ionization diagram	New window
RDA Statistioes	RDA statistics	New window
SWR Analyzer	SWR analysis	Band SWR (SWR analysis by band) HF SWR (HF SWR analysis) Custom SWR (Custom SWR analysis) Custom Begin, KHz (Custom start frequency) Custom End, KHz (Custom end frequency)
Spectrum Analyzer	Spectrum analysis	Spectrum START (Start spectrum analysis) Begin, Mhz (Frequency analysis start position) End, mHz (Frequency analysis end position) Top, dBm (Top field strength) Bottom, dBm (Bottom field strength)
WSPR Beacon	WSPR beacon	Multiple values
Record CQ message	Record auto call	Expansion SD card insertion if required
FT-8	FT-8 Mode	Open F T-8 window
Locator info	Azimuth and distance calculator	New window
Callsign info	Callsign info query	New window
Self Test	Self test	New window
Auto Calibration	Auto Calibration	Calibrate SWR Calibrate Power

◆ SCREEN Settings

Name	Description	Set Values (Parameters)
FFT Zoom	Spectrum width zoom ratio	Numerical value (1/2/4/8/16) X ratio
FFT Zoom CW	Spectrum width zoom ratio in CW mode	Numerical value (1/2/4/8/16) X ratio
LCD Brightness	LCD brightness	Numerical value (0-100)
LCD Sleep Timeout	LCD sleep timeout	Numerical value (0-1000) sec, 0 refers to constant light
Color Theme	Color theme	Black/ White/ Colored CN/ CN+Green/ CN+White
Layout Theme	Layout theme	Default/ Analog/ 7 Segment digital/ Classic transposition Default+/ Analog+/ CN/ CN+ with band button
FFT Speed	Spectrum speed	Numerical value
FFT Automatic	Auto spectrum brightness	Yes/No
FFT Scale Type	Frequency type	Ampl/ Squared/ dbm
FFT Manual Bottom, dBm	Spectrum bottom field strength	Set by users
FFT Manual Top, dBm	Spectrum top field strength	Set by users
FFT Height	Spectrum height	Numerical value (1-5)
FFT Style	Spectrum style	Gradient/ Fill/ Dots/Contour
FFT BW Style	Bandwidth indicator bar style on spectrum	Fill/ translucent/ fully transparent (vertical line)
FFT Color	Spectrum color	Multiple values
WTF Color	Waterfall color	Multiple values
FFT Freq Grid	Frequency grid displayed on spectrum	Yes/No
FFT dBm Grid	Field strength grid displayed on spectrum	Yes/No
FFT Background	Spectrum background gradient	Yes/No
FFT Lens	Image spectrum	Yes/No
FFT Hold Peaks	Spectrum peak	Yes/No
FFT 3D Mode	3D spectrum	Disable/ line/ point
FFT Enabled	Spectrum displayed	Yes/No
WTF Moving	Moving waterfall	Yes/No
FFT Compressor	Spectrum compression	Yes/No

Name	Description	Set Values (Parameters)
FFT Averaging	Smooth spectrum	Numerical value
FFT Window	Spectrum display type	Dolph / Blckman / Nutall / BINutt / Hann / Hamming / No
FFT DXCluster	DX cluster displayed	Yes/No
FFT DXClusterAzimuth	DX cluster azimuth displayed	Yes/No
FFT DXCluster Timeout	DX cluster timeout displayed	Numerical value
Func button 1	A / B	VFO A/B switch
Func button 2	B=A	Copy the frequency of VFO A to VFO B
Func button 3	TUNE	Antenna tuner
Func button 4	POWER	Enter power set interface
Func button 5	XIT	Enter XIT menu
Func button 6	RIT	Enter RIT menu
Func button 7	SERVICE	Service menu
Func button 8	MENU	Main menu
Func button 9	SNAP <	Automatically track strong signals on the left side
Func button 10	SNAP >	Automatically track strong signals on the right side
Func button 11	DOUBLE	Dual frequency receiving mode
Func button 12	SPLIT	Split frequency operation
Func button 13	SCAN	Scanning
Func button 14	PLAY	Play the record in the memory card
Func button 15	REC	Record the current signal into the memory card
Func button 16	MENU	Main menu
Func button 17	HPF	Enter the high-pass filter menu
Func button 18	MODE -	Mode decrement
Func button 19	MODE +	Mode increment
Func button 20	BAND -	Band switch forward
Func button 21	BAND +	Band switch backward
Func button 22	BANDMP	Automatic mode switch
Func button 23	AUTOGN	Automatic gain switch
Func button 24	MENU	Main menu

Name	Description	Set Values (Parameters)
Func button 25	SAMPLE -	Sampling narrowing
Func button 26	SAMPLE +	Sampling widening
Func button 27	ZOOM -	Spectrum zoom out
Func button 28	ZOOM +	Spectrum zoom in
Func button 29	SQL	Squelch menu
Func button 30	WPM	CW automatic keystroke speed
Func button 31	LOCK	Lock or unlock the touch screen
Func button 32	MENU	Main menu
Func button 33	Alternative	Alternative
Func button 34	Alternative	Alternative
Func button 35	Alternative	Alternative
Func button 36	Alternative	Alternative

◆ Decoders

Name	Description	Set Values (Parameters)
CW Decoder	CW decoder enabled	Yes/No
CW Decoder Threshold	CW decoder threshold	Numerical value (0-100)
RDS Decoder	Broadcasting information decoder	Yes/No
RTTY Speed	RTTY Speed	Numerical value
RTTY Shift	RTTY Shift	Numerical value
RTTY Freq	RTTY Frequency	Numerical value
RTTY StopBits	RTTY Stop Bits	Numerical value
RTTY InvertBits	RTTY Inversion Bits	Yes/No

◆ ADC/DAC Settings

Name	Description	Set Values (Parameters)
ADC Driver	ADC function enabled	Yes/No
ADC Preamp	Digital preamplification	Yes/No
ADC Dither	ADC dither	Yes/No
ADC Randomizer	ADC Randomizer	Yes/No
ADC Shutdown	ADC function reboot	Yes/No

◆ WiFi Settings

Name	Description	Set Values (Parameters)
WiFi Enabled	WiFi network enabled	Yes/No
WiFi Network 1	WiFi network 1	Select the name of WiFi network 1
WiFi Network 1 Pass	WiFi network 1 password	Set the password of WiFi network 1
WiFi Network 2	WiFi network 2	Select the name of WiFi network 2
WiFi Network 2 Pass	WiFi network 2 password	Set the password of WiFi network 2
WiFi Network 3	WiFi network 3	Select the name of WiFi network 3
WiFi Network 3 Pass	WiFi network 3 password	Set the password of WiFi network 3
WiFi Timezone	Time zone	Automatic timing and time zone comparison, select 8 for China
WiFi CAT Server	WiFi CAT server	Yes/No
WiFiUpdateESP firmware	Networking for upgrading ESP8266 firmware	Upgrade of built-in WiFi module firmware

◆ SD Card

Name	Description	Set Values (Parameters)
File Manager	File management	Multiple operations
USB SD Card Reader	USB management SD card	Yes/No
Export Settings to SD	Export Settings to SD card	On-demand operation
Import Settings from SD	Import Settings from SD card	On-demand operation
Format SD Card	Format SD Card	Operate with caution, otherwise all data on the SD card will be lost

◆ Calibration

Name	Description	Set Values (Parameters)
Encoder invert	Encoder inversion	Yes/No
Encoder2 invert	Encoder2 inversion	Yes/No
Encoder debounce	Encoder debounce	Numerical value
Encoder2 debounce	Encoder2 debounce	Numerical value
Encoder slow rate	Encoder deceleration	Numerical value

Name	Description	Set Values (Parameters)
Encoder on falling	Encoder descent	Yes/No
Encoder acceleration	Encoder acceleration	Numerical value
RF-Unit Type	Type of power amplifier board	QRP/ BIG/ SPLIT/ RU4PN
Tangent Type	Microphone type	MH-36/ MH-48
CICCOMP 48K Shift	CIC48K compression shift	Set by users
CICCOMP 96K Shift	CIC96K compression shift	Set by users
CICCOMP 192K Shift	CIC192K compression shift	Set by users
CICCOMP 384K Shift	CIC384K compression shift	Set by users
TX CICCOMP Shift	TX CIC compression shift	Set by users
DAC Shift	DAC shift	Set by users
DAC Driver Mode	DAC mode	Set by users
RF GAIN 2200m	Power gain at 2200m band	This function needs to be operated with dedicated instruments, not suggested to be changed by users.
RF GAIN 160m	Power gain at 160m band	
RF GAIN 80m	Power gain at 80m band	
RF GAIN 40m	Power gain at 40m band	
RF GAIN 30m	Power gain at 30m band	
RF GAIN 20m	Power gain at 20m band	
RF GAIN 17m	Power gain at 17m band	
RF GAIN 15m	Power gain at 15m band	
RF GAIN 12m	Power gain at 12m band	
RF GAIN CB	Power gain at CB band	
RF GAIN 10m	Power gain at 10m band	
RF GAIN 6m	Power gain at 6m band	
RF GAIN 4m	Power gain at 4m band	
RF GAIN 2m	Power gain at 2m band	
S METER HF	S-meter value correction at HF band	Need to be operated with professional instruments.
S METER VHF	S-meter value correction at VHF band	Need to be operated with professional instruments.
ADC OFFSET	ADC offset	Set by users
LPF END	End the low-pass filter	Set by users

Name	Description	Set Values (Parameters)
HPF START	Start the high-pass filter	Set by users
BPF 0 START	Bandpass 0 starting frequency	Frequency range
BPF 0 END		
BPF 1 START	Bandpass 1 starting frequency	
BPF 1 END		
BPF 2 START	Bandpass 2 starting frequency	
BPF 2 END		
BPF 3 START	Bandpass 3 starting frequency	
BPF 3 END		
BPF 4 START	Bandpass 4 starting frequency	
BPF 4 END		
BPF 5 START	Bandpass 5 starting frequency	
BPF 5 END		
BPF 6 START	Bandpass 6 starting frequency	
BPF 6 END		
MAX PWR on Meter	Maximum power on S-meter	Mode decrement
MAX Power in TUNE	Maximum power when antenna tuning	Mode increment
SSB Power addition	SSB power enhancement	Band switch forward
SWR FWD RATE HF	Forward power correction at HF band	Band switch backward
SWR BWD RATE HF	Reflection power correction at HF band	Automatic mode switch
SWR FWD RATE 6m	Forward power correction at 6m band	Automatic gain switch
SWR BWD RATE 6m	Reflection power correction at 6m band	Main menu
SWR FWD RATE VHF	Forward power correction at VHF band	Sampling narrowing
SWR BWD RATE VHF	Reflection power correction at VHF band	Sampling widening
VCXO Correction	VCXO calibration	Spectrum zoom out
FAN Medium start	Fan startup temperature	Spectrum zoom in
FAN Medium stop	Fan stop temperature	Squelch menu

Name	Description	Set Values (Parameters)
FAN Full start	Fan full speed rotation temperature	CW automatic keystroke speed
MAX RF Temp	Maximum temperature of amplifier tube	Lock the touch screen
MAX SWR	Maximum standing wave	Main menu
FM Deviation Scale	FM deviation	Set by users
AM Modulation Index	AM depth	Set by users
RTC COARSE CALIBR	RTC Real-time clock coarse adjustment	Time coarse adjustment
RTC FINE CALIBR	RTC Real-time clock fine adjustment	Time fine adjustment
EXT 2200m	Extended output at 2200m band	Set by users
EXT 160m	Extended output at 160m band	Set by users
EXT 80m	Extended output at 80m band	Set by users
EXT 60m	Extended output at 60m band	Set by users
EXT 40m	Extended output at 40m band	Set by users
EXT 30m	Extended output at 30m band	Set by users
EXT 20m	Extended output at 20m band	Set by users
EXT 17m	Extended output at 17m band	Set by users
EXT 15m	Extended output at 15m band	Set by users
EXT 12m	Extended output at 12m band	Set by users
EXT CB	Extended output at CB band	Set by users
EXT 10m	Extended output at 10m band	Set by users
EXT 6m	Extended output at 6m band	Set by users
EXT 4m	Extended output at 4m band	Set by users
EXT FM	Extended output at FM band	Set by users
EXT 2m	Extended output at 2m band	Set by users
EXT 70cm	Extended output at 70cm band	Set by users
EXT Transv 70cm	Frequency conversion extended output at 70cm band	Set by users
EXT Transv 23cm	Frequency conversion extended output at 23cm band	Set by users
EXT Transv 13cm	Frequency conversion extended output at 13cm band	Set by users

Name	Description	Set Values (Parameters)
EXT Transv 6cm	Frequency conversion extended output at 6cm band	Set by users
EXT Transv 3cm	Frequency conversion extended output at 3cm band	Set by users
Transverter Offset, mHz	Transverter offset	Set by users
Transverter 70cm RF, mHz	Conversion frequency at 70cm band	Set by users
Transverter 70cm IF, mHz	Down-conversion frequency at 70cm band	Set by users
Transverter 23cm RF, mHz	Conversion frequency at 23cm band	Set by users
Transverter 23cm IF, mHz	Down-conversion frequency at 23cm band	Set by users
Transverter 13cm RF, mHz	Conversion frequency at 13cm band	Set by users
Transverter 13cm IF, mHz	Down-conversion frequency at 13cm band	Set by users
Transverter 6cm RF, mHz	Conversion frequency at 6cm band	Set by users
Transverter 6cm IF, mHz	Down-conversion frequency at 6cm band	Set by users
Transverter 3cm RF, mHz	Conversion frequency at 3cm band	Set by users
Transverter 3cm IF, Mhz	Down-conversion frequency at 3cm band	Set by users
NOTX NOT HAM	Not transmitting at non-ham bands	Set by users
NOTX 2200m	Not transmitting at non-ham bands	Set by users
NOTX 160m	Not transmitting at non-ham bands	Set by users
NOTX 80m	Not transmitting at non-ham bands	Set by users
NOTX 60m	Not transmitting at non-ham bands	Set by users
NOTX 40m	Not transmitting at non-ham bands	Set by users
NOTX 30m	Not transmitting at non-ham bands	Set by users
NOTX 20m	Not transmitting at non-ham bands	Set by users
NOTX 17m	Not transmitting at non-ham bands	Set by users
NOTX 15m	Not transmitting at non-ham bands	Set by users
NOTX 12m	Not transmitting at non-ham bands	Set by users
NOTX CB	Not transmitting at non-ham bands	Set by users

Name	Description	Set Values (Parameters)
NOTX 10m	Not transmitting at non-ham bands	Set by users
NOTX 6m	Not transmitting at non-ham bands	Set by users
NOTX 4m	Not transmitting at non-ham bands	Set by users
NOTX 2m	Not transmitting at non-ham bands	Set by users
NOTX 70cm	Not transmitting at non-ham bands	Set by users
ENABLE 60m Band	60m band enabled	Set by users
ENABLE 4m Band	4m band enabled	Set by users
ENABLE Air Band	Air band enabled	Set by users
ENABLE Marine Band	Marine band enabled	Set by users
OTA Update	OTA update	Remote firmware upgrade function, suggested not to enable
TX Start Delay	Transmitting delay	Set by users
LCD Rotate	LCD rotate	Suggested not to revise
TOUCHPAD horiz flip	Touch flip	Suggested not to revise
Flash GT911	Touch function enabled	Set by users
INA226_PWR_MON	INA226 power consumption monitoring	Set by users
INA226_Cur_Calc(mA/Bit)	INA226 current calibration	On-demand adjustment
ATU Averaging	Antenna tuner averaging	Set by users
CAT Type	CAT connection type	On-demand selection
LNA Compensation	Low noise amplifier compensation	Set by users
Signal Balance	Signal balance	Set by users
Linear Pwr Control	Linear power control	Set by users
IF Gain MIN	Minimum IF gain	Set by users
IF Gain MAX	Maximum IF gain	Set by users
Settings reset	Settings reset	Settings reset
Calibrate reset	Calibration settings reset	Calibration parameters reset
WiFi settings reset	WiFi settings reset	WiFi parameters reset

OTHER FUNCTIONS AND OPERATIONS

■ FT8 Digital Mode Operation

It supports FT8 mode encoding and decoding directly for this transceiver, not need to be supported by other external devices.

- Please pay attention to calibrate the time if the decoding cannot be synchronized when the FT8 mode decoding is in use.
- Please ensure to set the parameters such as working call sign and grid correctly before operation in FT8 mode.
- Please reduce the output power to avoid interfering with others due to that high power is not required for digital mode.
- The transceiver will answer the call automatically while pressing and holding CQ to be highlighted.

※ **Note:** Please turn off the signal processing function when decoding in digital mode, due to that the signal cannot be digitized in this state, otherwise the bit error rate will be high.

■ Voice Automatic CQ Call

An SD card needs to be inserted before using the voice automatic CQ call function.

- Please enter the service menu "Services" and select "Record CQ message" to record the call audio before using the voice automatic CQ call function.
- Press the CQ softkey on the main menu below the screen to transmit the pre-recorded audio, and will stop transmitting when the audio playback is completed.
Press the [FUNC] knob to stop transmitting if needed.
- Or select "Transmit WAV" option to make a call after recording audio in the service menu.
- Or press [PTT] button to transmit the audio as a modulation signal when the audio on the SD card is played. Press [FUNC] knob to exit the playback when the recording is played.

■ Control Transceiver with PC Operation

- It is compatible with two control protocols of FT-450 and TS-2000 for this transceiver, and can be selected and confirmed in the menu.

- The TYPE-C port on the front panel marked with DFU is a USB control port, a USB sound card and a USB type COM port will be recognized by PC when the transceiver is connected to PC, in which the USB sound card can be used for transmitting digital audio.
- PC control software from third-party software such as HAMRADIOELUX and HSDSR can be selected. Please refer to the software instructions for specific operations.

■ Noise Reduction Function

Two noise reduction functions of Digital Noise Reduction (DNR) and Pulse Noise Reduction (NB) are available for this transceiver.

- Digital Noise Reduction (DNR)
2 levels in total are available:
DNR1: Level 1 digital noise processor
DNR2: Level 2 digital noise processor, the threshold cannot be overset, or it will make a gurgling sound.
The ideal digital noise reduction effects can be achieved after the menu items related to digital noise reduction, such as DNR1 Threshold, DNR2 Threshold, DNR Average, DNR Minimal and DIGI LPF Pass, have been set.
- Pulse Noise Reduction (NB)
Suitable for removing continuous pulse noise interference such as starting a car.

■ SSB/FM Scan Mode

It is limited to the amateur frequency band for scanning. The scanning frequency should be set within the amateur frequency band range and not exceeded the boundary before scanning.

Two scanning mode of SSB Scanning and FM Scanning are available for this transceiver.

- SSB Scan Mode:
Press [A/B] button to select HF band and press softkey [SCAN] to start SSB scanning, then press softkey [SCAN] again to stop scanning.
- FM Scan Mode:
Press [A/B] button to select VHF band and press softkey [SCAN] to start FM scanning, then press softkey [SCAN] again to stop scanning.

■ Standing-wave Ratio

Enter menu item "SWR Analyzer" and perform standing-wave ratio analysis on the corresponding bands by menu items such as Band SWR (SWR analysis by band), HF SWR (HF SWR analysis), Custom SWR (Custom SWR analysis), Custom Begin, KHz (Custom start frequency) and Custom End, KHz (Custom end frequency). Then perform standing wave ratio calibration on the corresponding bands using the "Calibrate SWR" option in the "Auto Calibration" menu item.

Special Note: The antenna standing-wave ratio analyzed and calibrated with this transceiver is for user reference only and cannot be superior to professional antenna analysis instruments.

■ Digital Recording

Digital recording function is available with this transceiver. The SD card must be inserted into [TF CARD] jack before recording, the recording duration is related to the storage capacity of the SD card.

1. Recording audio with hand microphone: Perform CQ message recording by submenu item "Record CQ message" (Record automatic call voice) in menu item "Services Settings", related operations as follows:

- Play WAV: Play the hand MIC recording.
- Transmit WAV: Transmit the hand MIC recording.
- Record CQ message: Record audio with hand microphone.
- Delete: Delete the hand MIC recording.

2. Recording receiving audio

Press softkey [REC] in the main interface to start recording, the receiving signal will be recorded.

3. Recording file management

Press and hold softkey [CQ] in the main interface for 1 second to enter SD card file management, find the recording file with a file suffix of *.wav from the files, rotate [FUNC] knob to select the desired recording file and press [FUNC] knob to perform the recording file management operation as follows:

- Play recording: Select "Play WAV" to play the recording.
- Transmit recording: Select "Transmit WAV" to transmit the recording.
- Delete recording: Select "Delete" to delete the recording.

Notice: Operate with caution in the SD card file management interface, as there may be some important files which cannot be deleted casually, including firmware upgrade packages, etc.

■ WiFi Networking Operation

It supports WiFi networking for this transceiver.

● Searching WiFi:

Enter menu item "WiFi Setting", select "Yes" for the item "WiFi Enabled" to enable WiFi connection function.

WiFi Network 1: Select the wireless network hotspots that can be connected and used, WiFi Network 1 Pass: Input the network connection password. The WiFi icon in the main interface will be highlighted after correct connection, means that have properly connected to the network via WiFi.

● Networking operation:

"DX Cluster" (DX cluster information), "Propagation" (Propagation diagram), "DayNight Map" (Day night difference diagram) and so on can be viewed in the menu of "Services Settings" after connecting to the network correctly.

CIRCUIT TYPE DESCRIPTION AND MAIN TECHNICAL SPECIFICATIONS

■ Circuit Type Description

The RF signal is digitized by a high-speed ADC chip (LTC2208) and fed into an FPGA processor (EP4CE22E22) for DDC/DUC conversion (shifting the digital frequency spectrum downwards or upwards), like a direct conversion receiver. The I and Q orthogonal signals obtained during the conversion process are fed into the STM32 microprocessor (STM32H7).

The STM32 processor filters, demodulates, and outputs sound to the USB audio codec (WM8731), and processes the entire user interface UI.

This process is the opposite when transmitting, except that DAC (DAC5674) is the one at the end of the signal chain, which converts digital signals into analog RF signals.

■ Main Technical Specifications

Items	Parameters	Items	Parameters
Frequency Range	RX Frequency: 0.5MHz - 750 MHz TX Frequency: 0.5MHz - 30 MHz (TX on amateur band only) 144MHz - 148 MHz	Number of Memory Channels	36
		Low Noise Amplifier	LNA
		Adjustable Attenuator	0~31dB
Operating Voltage	DC13.8V±15%	TX Current	≤20A
Display Screen	7" color LCD display screen	RX Current	≤1.5A (Speaker ON)
Antenna Impedance	50Ω, SL16 socket, two antenna input options	Operating Temperature	-20℃ ~ +60℃
TX Power	≤100W (HF), ≤60W (VHF)	Storage Temperature	-40℃ ~ +85℃
Receiving Sensitivity	-110dBm @12dB SNAD	Dimensions (W×H×D)	340mm×155mm×211mm
Main Reference Frequency	122.88MHz	Weight (Hand MIC Included)	4020g
Modulation Type	CW, LSB, USB, AM, NFM, WFM, DIGI		

TROUBLESHOOTING

The problems described in the following table are some common operating faults. These types of errors are generally caused by improper connections or incorrect operation settings. Before you suspect that the transceiver has malfunctioned, please refer to these tables and relevant parts of this manual.

Problem	Possible Cause	Solution
The transceiver does not turn ON.	The power cable is inversely connected.	Connect the supplied power cable correctly: Red - Positive (+) and Black - Negative (-).
	One or more fuses of the power cable is blown.	Find the cause of the blown fuse, check and correct the issues, then replace the new fuse with same rating.
The display screen remains dark after a higher brightness level is selected.	The power supply voltage is too low.	The power supply voltage is required to be 13.8V DC, please adjust the voltage regulating power supply device and check all power cable connections if the input voltage exceeds this range.
Most of the buttons don't work.	An incorrect hand microphone is used.	Please check the hand microphone model number and whether the settings menu options are set correctly.
Cannot transmit after pressing and holding [PTT].	The microphone plug is not inserted in position into the front panel socket.	Power off and insert the supplied hand microphone plug into the standard socket on the front of the transceiver and press tightly until hearing a locking click sound.
	Transmit in receiving-only mode	Reselect the correct mode
	Transmit in receiving-only frequency	Reselect the correct frequency



All Mode Full Band SDR Transceiver