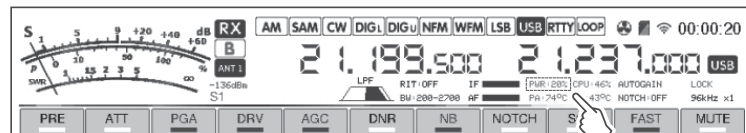


## ■ Transmitting

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

### ◆ Transmitting power selection:

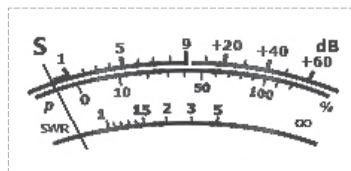
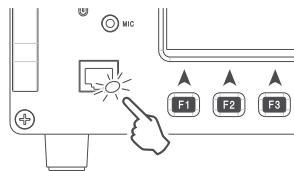
Touch "PWR:100%" on the screen to enter the menu item of output power selection, select the appropriate value and then exit.



0%	10%	20%	30%	40%
50%	70%	80%	90%	100%

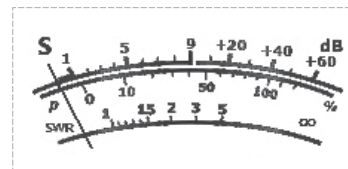
### ◆ In SSB mode and FM mode:

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
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/ 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	Aautomatic 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 MaxGainAMFM	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 Statisticocs	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 FT-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 / Blackman / Nuttall / Blackman / Hann / Hamming / No
FFT DXCluster	DX cluster displayed	Yes/No
FFT DXClusterAzimuth	DX cluster azimuth displayed	Yes/No
FFT DXClusterTimeout	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

### ◆ 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

## 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 callsign 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 HAMRADIODELUX and HDSDR 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.

## FCC STATEMENT

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter.

### Radiation Exposure Statement

To maintain compliance with FCC's RF Exposure guidelines, This equipment should be installed and operated with minimum distance of 20cm from your body.

## 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	≤18A
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**