Table of contents

Introduction ................................................................. 3
Controls end user interface ........................................... 4
Protections ................................................................. 8
Basic Operations .......................................................... 10
Advanced Operating ...................................................... 15
Accessories ................................................................. 17
Firmware Upgrades ....................................................... 19
Remote Control ............................................................ 20
Menu Functions ............................................................ 21
Maintenance ................................................................. 26
Specifications ............................................................... 28
FCC information ............................................................ 30
On behalf of our development team, we want to thank you for choosing the TX-500 Discovery. The TX-500 is an ultra compact all-mode transceiver ideal for travelling; its compact size and weight mean that you can take the instrument to remarkable places, where radio work will give you an unforgettable experience.

The strong casing, protection against splashes and dust ensure the use of TX-500 in extreme conditions and guarantee its reliability. A sharp monochrome display will allow you to clearly see the information in either bright sunshine or low light, thanks to a multi-mode backlight. The transceiver parameters and functions will also make it possible to successfully use the unit at a home station or as a mobile version. Record-low current consumption in reception mode (up to 110 mA) will extend the battery life, providing for longer stay on the air without recharging.

Because the TX-500 is a software-defined radio (SDR), you can expand its capabilities using computer applications and adding new features with free firmware updates. The TX-500 Discovery has an integrated high-performance spectrum analyzer, allowing you to see signals before you hear them.

It’s high time to go off into the deep blue yonder, taking the TX-500 with you.
Controls end user interface

DEVICE BODY AND CONTROLS

Front view
## Left side

- **Power supply**: DC 9-15V
- **REM DATA**: 1 – PHONE –, 2 – DYNAMIC MIC, 3 – PTT, 4 – PHONE +, 5 – MIC (DC+), 6 – GND
- **Microphone**: 1 – PHONE –, 2 – DYNAMIC MIC, 3 – PTT, 4 – PHONE +, 5 – MIC (DC+), 6 – GND
- **SP**: 1 – GND, 2 – (+) DC 9-15V

## Right side

- **CW KEY**: 1 – GND, 2 – NC, 3 – NC, 5 – “–”, 4 – NC
- **CAT**: 1 – GND, 3 – +DC USB, 2 – RX, 4 – TX
- **ANT**: Antenna (50Ohm)
USER INTERFACE

Main display

1 9 Function buttons

2 Information bar title
3 VFO A / B

VFO A

VFO B

4 Info block 1

Filter band width

Receiver gain (0-100)

Monitor (0-100)

Radio frequency gain

Volume (-50+5)

Basic modes or alternative modes:

USB
LSB
CW
CW/R
DIG
AM
FM

5 Graph bar

Receive mode:

S

5

3

1

7

9

20

40

60

S-meter

Transmit mode:

Power output (PWR), SWR, MIC, ALC

Power output (NUM), SWR (NUM)

6 Info block 2

– Noise reduction ON
– Noise blanking ON
– Notch filter ON
– Attenuator ON
– Monitor ON
– VOX ON
– Speech compression ON
– Preamp ON
– Squelch ON
– Split mode effect ON
– Virtual intermediate frequency ON

7 Pan-adapter

Receiving or transmission channel

8 Menu

(05) CMKey > Type SINGLE

Menu Up Menu Down

– Function buttons
Protections

OVERVOLTAGE PROTECTION
When exceeding 15.0 volts, the transceiver won’t allow switching to TX mode, (the voltage indicator on the display will become inverse) a significant excess (more than 16 volts) it can cause the protective fuse to burn out, as well as the failure of the transceiver! Use a power source or battery with a voltage of 9 to 15 volts and a current of at least 2.5 Amps.

ATTENTION! Exceeding the supply voltage above 15 volts can damage the transceiver!

REVERSE POLARITY PROTECTION
If you connected a minus voltage source or battery instead of a plus, the transceiver will not turn on. You must connect the external power supply correctly, please, see the pinout of the power connector in the section "Controls end user interface".

OVERHEAT PROTECTION
The transceiver has an internal protection against the overheating of the output stage of the transmitter. If the TX continuous mode is too long, the output stage as well as the transceiver body can be heated up. If the limit value is exceeded (about 60 degrees Celsius), the transceiver won’t allow switching to TX mode. After the temperature drops, the TX prohibition mode will turn off automatically.

ATTENTION! During long-term TX mode (digital modes) do not block the air access to the rear cover of the transceiver, or reduce the power.

TIP: Unfold both rear legs to increase the air flow convection.
HIGH SWR PROTECTION

If the impedance of the antenna is different than 50 ohms and there is no antenna tuner connected, the SWR indicator on the display will show a value greater than 1.0. If the SWR value is 3.0 or more (the SWR indicator on the display will be inverse), the transceiver will automatically reduce the power output. If the value of SWR is greater than 3.0, then the output power will decrease more.

**ATTENTION!** Use a tuned antenna with a wave impedance of 50 ohms, this is ideal (max output power), or use a matching device (automatic or manual tuner).
Basic Operations

GETTING STARTED

Before using the TX-500, you'll need to connect a power supply, speaker-microphone and an antenna, at minimum.

![Connection Diagram](image)

AF GAIN — Controls receiver AF gain (volume).

USING THE MENU

The menu is used to tailor the transceiver to your operating preferences. To access the menu, push until any menu entry appears in the pan-adapter area. To change the value of a menu parameter, rotate (large knob). To exit the menu, push again.

BAND SELECTION

The TX-500 covers the 160-6 m amateur bands. Characteristics of each band are summarized below.

<table>
<thead>
<tr>
<th>Band (m)</th>
<th>Rang (Mhz)</th>
<th>Best DX</th>
</tr>
</thead>
<tbody>
<tr>
<td>160</td>
<td>1.8-2.0</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>3.5-4.0</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>~5.3-5.4</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>7.0-7.3</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>10.0-10.15</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>14.0-14.35</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Band (m)</th>
<th>Rang (Mhz)</th>
<th>Best DX</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>18.068-18.168</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>21.0-21.45</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>24.89-24.99</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>28.0-29.7</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>50-54</td>
<td></td>
</tr>
</tbody>
</table>
MODE SELECTION

Each mode is described briefly below. Later sections cover each mode in detail. Tap [MODE] one or more times to select USB (LSB), CW (CWR), DIG, AM or FM mode. Long push selects alternate modes, such as CW reverse (CWR). Also, long push returns normal mode.

- **SSB modes**: Mode is a narrow-banded voice mode that conserves space in crowded band segments. It’s the most popular mode overall. LSB (lower sideband) is usually used on 160, 80, and 40 meters, while other bands use USB (upper sideband).

- **CW mode** requires very little bandwidth, providing a high signal-to-noise ratio that’s ideal for low-power use. It’s also a popular mode for DXing and contests.

- **CWR mode** reversing the received sideband in CW mode. This may reduce the level of interference (QRM).

- **AM mode** is characterized by its good fidelity. It is much less power-efficient than SSB.

- **AM amateur** operation is often found on 160, 80, 40, and 10 meters.

- **FM mode** is most often used for local communications, and can be found on 10m and up.

- **DIG mode** typically use a computer connected to the transceiver to send/receive text. Although SSB modes can also be used for this purpose, the TX-500’s audio-based data modes (DIG) optimize settings for data rather than voice.

VFOs A and B

The TX-500 provides two VFOs. Use of VFO B is optional. Each VFO has independent frequency, mode, and filter settings:

- **VFO A** normally controls both the receive and transmit frequency. Most contacts occur between stations tuned to about the same frequency.

- **VFO B** can serve as a holding register for a second frequency of interest, then swapped with VFO A as needed (see A<>B).

- **+ - Tuning rates**: Tapping [+] or [-] selects VFO tuning rate LSB, USB, DIG (10Hz, 100Hz, 1kHz, 2.5kHz, 5kHz), CW, CWR (1Hz, 10Hz, 100Hz, 1kHz, 2.5kHz), AM, FM (100Hz, 500Hz, 1kHz, 2.5kHz, 5kHz). SSB stations often align on 0.5 or 1.0kHz boundaries.

- **A->B** To copy VFO A’s frequency to VFO B: Tap [A] → [B]. Tapping also copies VFO A’s mode and filter settings to VFO B as well.

- **B->A** To copy VFO B’s frequency to VFO A: Tap [B] → [A]. Tapping also copies VFO B’s mode and filter settings to VFO A as well.

- **A<>B** VFO A and B swap: Tap [A] → [B] to exchange VFO frequencies, modes, and all other settings.

RIT

Incremental Tuning, or receive incremental tuning, provides a means of adjusting the receive frequency without affecting your transmit frequency. This control is sometimes called a clarifier since it can be used to tune in SSB voice signals. But RIT can also be used in all modes, in the event that a station calls you slightly off-frequency. RIT and XIT use the tuning rate (1/10/100/200/300 Hz), taping [+] or [-].
XIT
XIT or transmit incremental tuning, adjusts the transmit frequency without affecting the receive frequency. RIT and XIT use the tuning rate (1/10/100/200/300 Hz), taping + or –.

- **To use RIT or XIT:** First, tap RX RIT (RX mode) or tap RX XIT (TX mode).
  - This turns on the "+0" on the display. Then adjust the offset using RIT/XIT knob.

- **To zero the RIT/XIT offset** tap CLR.

VFO lock/unlock
When the mode is activated, the inscription appears in the upper line of the display "LOCK", frequency tuning is not possible. To deactivate the mode, press the button again.

TRANSMIT SETTINGS

- **Voice Modes (SSB, AM, FM)**
  
  Choose a mode: Tap MODE to select USB / LSB, AM or FM mode.

- **MON, Monitor**
  
  Push → MON in the bottom line for MON on. Hold PTT to set the voice monitor level, rotate AF GAIN knob. High MON settings may result in audio clipping or distortion. Start with 3 to 5.

  ![Do not use the hand speaker-mic at the same time as monitor MON function in voice modes: USB LSB AM FM](image)

- **Adjust mic gain level**
  
  Push METR and select MIC, rotating TUNE/MULTI.

  ![While speaking into the mic, adjust MENU → 09 > Gain > MIC (mic gain).](image)

  ![While speaking, adjust mic gain for maximum 5-7 bars on a scale. Mic gain for the TX-500 mic is typically 3-7.](image)

- **CMR**
  
  Speech compression: To use speech compression, tap → CMR in the top line.
Adjust the level using the **MENU** → 15 > CMR Level or long push **CMR**. High CMR settings may result in distortion. Start with 1 to 3.

- **POWER** Set the power level (10-100%): tap **POWER** in the top line and rotate the knob **TUNE/MULTI**. Do not use **MIC** gain to set power level. Set mic gain to a fixed level as described above.

- **VOX** Selects push-to-talk (PTT) or voice-operated (VOX) transmit (VOX icon on). VOX hold time is set with **MENU** → 14 **VOX > MIC** (time, ms). **MENU** → 13 **VOX L** (VOX level) should be set to trigger at normal speech level, but not in response to incidental noise. Start with low settings (80-90).

- **VOX** Transmitter keying method: The VOX switch selects either VOX or PTT keying for CW mode. Most operators use VOX, allowing the transmitter to be keyed immediately whenever a hand key or keyer paddle is used. Tap **VOX** in top line and rotate **TUNE/MULTI** or tap **MENU** → 14 > **VOX > CW** (time ms).

- **METR** You can switch the transmit bar graph from **MIC**, **ALC**, **PWR**, **SWR**, **PWR Num**, **SWR Num**, by tapping **METR** in the top line. Rotate **TUNE/MULTI** knob.

- **CW modes (CW,CWR)** To switch modes tap **MODE** to select **CH** (CW normal). In some cases an interfering received signal can be eliminated by switching to **CWR** (CW reverse) using long push **MODE**.

- **CWPITCH** Set sidetone pitch using **CWPITCH**. The ideal pitch for most operators falls in the range of 600-700 Hz. The receiver's passband will be centered at the pitch you select. Tap **CWPITCH** and rotate **TUNE/MULTI** or **MENU** → 02 > **CW Pitch** (Hz). Set sidetone volume using **AF GAIN** in TX mode, **MON** ON.

**RECEIVE SETTINGS**

- **RF gain** is normally left at (-0). Reducing **RF** gain may be useful in some strong-signal conditions.

- **SQL** Squelch is used to mute the receiver until a signal appears. The control adjusts the signal threshold required for squelch to "open," unmuting the receiver.

- **IF DSP** Virtual Intermediate Frequency: Specifies the Mode of the Receiver.

  **ENABLE:** This is the operating mode, utilizing all DSP features of the radio. This mode uses a virtual Intermediate Frequency, which is offset from the operating frequency by a few kHz. This is similar to ‘homodyne’ technology.

  **DISABLE:** When IF is disabled, the radio operates in simple Direct Digital Conversion mode, and has soft reduced performances.

- **FILTER** DSP filter tuning functions (LF/HF) The (LF/HF) control is used to shape the TX-500's receive filter passband. In general, a narrow passband reduces interference (QRM) and noise (QRN), while a wider passband improves fidelity. In voice modes, CW and DIG modes long push **FILTER** selects low-cut (LF) and high-cut (HF) frequency. Pushing **FILTER** select number of filter (1-4)RX, (1-2)TX. These functions remove low- or high-pitched interfering signals. Reducing the width or shifting the passband may attenuate an interfering signal above or below the desired one.
• PRE/ATT  Preamp PRE and Attenuator ATT turns on the RF preamp. It should be used only when signals are very weak. Preamp gain can be set on a per-band basis. ATT turns on the 20-dB RF attenuator, which can protect the receiver from strong interfering signals.

• NR  Noise reduction removes random background noise (hiss or static). It has a characteristic “hollow” sound. Higher settings may attenuate weak signals. Tap ➞ NR turns on noise reduction, holding ➞ NR and displays its setting, which can be adjusted using the knob TUNE/MULTI. Tap return to exit the setting display. Tap ➞ NR again to turn noise reduction off.

• NB  Noise blanking NB can eliminate repetitive noise such as that from power lines, appliances, and vehicle ignitions systems. The NB setting is adjusted in the same way as NR (see above).

• NF  in SSB and AM modes, NF turns on auto-notch, which locates and suppresses one or more carriers automatically, Push ➞ NF to enable or disable the Notch Filter.

• TONE (Transmission tone). The transceiver will transmit a single tone. Pressing “Tone” ➞ TONE again puts the transceiver in RX mode. A long press of TONE displays the selection mode NORMAL (1000 Hz) or DUAL (two tones of 1000 Hz and 2000 Hz). The transmission power is approximately 50%.

EXAMPLE  (RX) SSB FILTER ADJUSTMENT: (CHANGE FIL-3)

Set FIL-3: Bandwidth: 2.4 kHz; Passband: 600Hz to 3kHz

1. Long-Push ➔ FILTER to enter filter adjustment menu. The parameter to be adjusted is shown in the bottom line of the display.

2. Push ➞ NumFil until FIL-3 is selected (in the bottom line).

3. Push ➞ Sel once to select “HF”. The display might now look like this: “RX SSB FIL-3, HF2700”. (‘2700’ might be any other value).

4. Rotate ➔ TUNE/MULTI to change 2700 to 3000 (notice the frequencies are in Hz, not in kHz).

5. Push ➔ FILTER to save changes and exit the filter adjustment menu.

6. CHECK YOUR WORK:
   Push ➔ FILTER a few times until FIL-3 is selected. It should now display 2.40 k.
Advanced Operating

FREQUENCY MEMORIES

V/M (VFO/Memories), The TX-500 has 100 general-purpose frequency memories (00-99), Each memory stores VFO frequency, modes, and other settings.

To store a general-purpose memory (00-99): Push V/M, then locate the desired memory by rotating the TUNE/MULTI knob. The VFO frequencies presently stored in each memory will be shown as you scroll through them. When you reach the desired memory number, push → VFO → Mem to finish, or tap V/M to cancel.

To recall a general-purpose memory: Push V/M, then select memory 00-99 using TUNE/MULTI. Tap V/M to exit.

To erase a general-purpose memory: While scrolling through memories to save or recall, push CLR.

DIG MODES (Audio Data Modes)

Many audio-generated data transmissions can be heard on the bands, using PSK31, RTTY, JT65 and other modes. A computer, sound card, and appropriate software are normally used. DIG mode is provided for this purpose.

Unlike SSB modes, DIG disables MIC and enables use AUDIO cable (connector REM/DATA).

Also DIG mode has individual audio level settings. Upper sideband is the default.

RX / TX switching can be via CAT cable (see Remote Control). You can also use the VOX function (see Basic Operations).

DIG mode settings: tap MENU → 13 VOX L → DIG > (vox level) → 14 VOX > DIG > (time, ms)

SPLIT AND XIT

Sometimes you’ll hear a DX station being called by many other stations. To ensure that he has a clear transmit channel, the DX station may say “UP” or “DOWN” to indicate that he’s listening above or below his transmit frequency.
To use split, first tap \( \rightarrow B \) to set VFO B to the same mode, frequency, and filter settings as VFO A. Then tune VFO B up about 2 kHz. Finally, tap \( \rightarrow SPL \) (the SPL icon will turn on). VFO B is now controlling your transmit frequency.

This is where the A<>B switch comes in: it reverses the A and B VFOs so that you’re temporarily receiving on your transmit frequency. During this time, tune VFO A around a bit to see if you can identify who is presently working the DX station, then position yourself just above this frequency. With any luck your next transmission will occur right where he’s listening.

XIT as an alternative to split: If you’re trying to preserve VFO B as a holding register tuned someplace else in the band, you may want to use XIT rather than split in the above situation. In this example, you’d turn on XIT and rotate the offset control to about +2.00 kHz. You’ll then be transmitting 2 kHz above VFO A. To do the equivalent of A<>B, you can briefly turn RIT on as well. Turn off RIT to listen to the DX station.

**RECEIVE AUDIO EQUALIZATION (RX EQ)**

The TX-500 provides 3 bands of receive audio equalization via the \( \rightarrow 18 \) EQL > RX menu entry. EQ RX can compensate for physical acoustics (of the room, headphones, internal speaker, external speaker), tailoring the audio to your personal preference.

**TRANSMIT AUDIO EQUALIZATION (TX EQ)**

Most microphones, including the TX-500, will provide good audio quality with little or no EQ TX. High settings can cause distortion.

If required, transmit audio equalization can compensate for microphone and voice variations.

\( \rightarrow 18 \) EQL > TX works exactly the same as EQ RX, and can be used during transmit. EQ TX is not applicable to CW. While adjusting EQ TX, monitor your voice using headphones (use \( \rightarrow MON \) to set the level), or listen to your transmitted signal on another receiver. If you hear distortion, reduce all EQ TX bands. You may also have excessive mic gain or compression.

Do not use the hand speaker-mic at the same time as monitor MON function in voice modes: USB LSB AM FM

**CROSS-MODE OPERATION,**

(CW-in-SSB) Cross-mode operation is possible in some cases. For example, you could set up VFO A for SSB receive, and VFO B for CW transmit, then enter \( \rightarrow SPL \).
Accessories

HAND SPEAKER-MIC
Hand speaker-mic, The hand speaker-mic was designed specifically for the TX-500. It includes a high-quality mic element, speaker, rugged plug, PTT switch and external speaker plug.

POWER CABLE
The power cable for external power source DC 9-15V with 3A FUSE.

MICROPHONE AND HEADPHONE ADAPTER WITH PTT
With this adapter, you can connect a regular headset or microphone and headphones. The adapter also has a PTT button to control TX/RX.

AUDIO CABLE
You can use digital modes (Audio Data Modes) with this cable. The cable connects to the PC, the connectors are used — a microphone PC (3.5 mm jack) and headphones PC (3.5 mm jack).
**CW ADAPTER**

With this adapter you can connect a CW key through a 3.5mm jack connector. Key reverse can be enabled in the menu.

**CAT-USB CABLE**

The TX-500 can interface to most common types of computers via included CAT cable. It has an PL2303 chipset and uses driver, that can be downloaded from www.lab599.com
Firmware Upgrades

New features and improvements are available to all TX-500 owners via firmware upgrades. Please visit the Discovery TX-500 software page (www.lab599.com) to obtain our free firmware download application, TX-500 Utility. This program runs on OS Windows.

CHECKING YOUR FIRMWARE REVISION

After switching on, the software version number will appear for a while.

PROGRAM VERSION UPDATE

Connect the TX-500 to a computer and run TX-500 Utility, which will load new firmware. In the TX-500 utility, select the downloaded new firmware file and select the com port to which the TX-500 transceiver is connected. While holding the third top function key, turn the TX-500. The screen will display "The loader is waiting...". Click "update" on the utility, the software update process you will see on the computer screen and TX-500 screen. Do not turn off the computer and the transceiver until the download is complete. After the software download is complete, turn off the transceiver and turn it on again. Check the new version when you turn it on.
Remote Control

COMPUTER CONTROL AND LOGGING

With appropriate software, any computer with an RS232 or USB port can be used to control the TX-500. Use CAT-USB cable (see page “Accessories”). Third-party logging and contesting software is available for various computers and operating systems. Select KENWOOD TS-2000 as the target radio.

Its CAT Interface is fully compatible with the KENWOOD TS-2000’s CAT Command set.

COM PORT SETTINGS:

- RIG Type: KENWOOD
- Baud rate: 9600
- Data bits: 8
- Parity: NONE
- Stop bits: 1
Menu Functions

00 Valcoder  VFO Encoder Mode Selector

The valcoder specifies the mode of the VFO encoder. Select with TUNE/MULTI.

- Plain: The speed of change in frequency when turning the TUNE/MULTI knob is linear. The step is determined by the setting of the TUNE/MULTI knob on the front panel, and is also mode-dependant.
- Intel: (Intelligent) The speed of change in frequency varies with the speed at which you rotate the TUNE/MULTI knob.
  Default: Intel

01 IF DSP  (Specifies the Mode of the Receiver) Select with TUNE/MULTI.

- ENABLE: This is the operating mode, utilizing all DSP features of the radio. This mode uses a virtual Intermediate Frequency, which is offset from the operating frequency by a few kHz. This is similar to ‘homodyne’ technology.
- DISABLE: When IF is disabled, the radio operates in simple Direct Digital Conversion mode, and has reduced performance.
  Default: Disable

02 CW Pitch  Defines TX ‘Offset Frequency’ for CW Mode

- Adjustable with TUNE/MULTI from 400Hz to 1200Hz.
  When working CW, the transmitter’s frequency must be offset from the received frequency such that it is equal to the frequency of the tone at which the operator wishes to copy CW. This automatically zero-beats the TX signal with the QSO partner’s received signal. Different operators prefer to listen to different tone frequencies. CW Pitch enables the operators to set the offset to their preferred tone.
  Default: 700Hz

03 CW Speed  Defines the speed of the built-in Auto-Keyer

- Adjust the speed of the Auto-Keyer with TUNE/MULTI. The minimum speed is 10cpm (2wpm), maximum speed is 300cpm (60wpm).
  Default: 100cpm

04 CW Weight  Defines the Dot/Dash Ratio of the Auto-Keyer

- Adjustable with TUNE/MULTI from 2:1 to 4.5:1.
  Default: 3:1

05 CW Key  Type / Auto / Rev Select sub-menu

- The default is mode A, which is a little more forgiving for first-time operators. Mode B may be preferred by operators who learned to do “squeeze-keying” with another keyer having this or a similar mode. Both modes provide dot- and dash-memories enabling fast code speeds, but with slightly different timing.
  Change values with TUNE/MULTI.

- Type: Single (Straight Key) or Auto (Paddle).
- Auto: Iambic A or Iambic B.
- Rev: Disable or Enable; When Enabled, the dit and dah. Side of the paddle are reversed; Preferred by left-handed Ops.
  Default: Type = auto; Auto = Iambic A; Rev = Disable.
06 AGC  Defines the AGC Time Constant (slow-fast)

> CW / SSB / AM

Select **SubMenu**, adjust with ⚙ **TUNE/MULTI**: from 1 (slow) to 10 (fast). When in RX, the AGC Level is shown at the top line of the display.

During adjustment, it only shows changes to the AGC level in the top line of the display when adjusting the timing of the current mode the radio is in. It does not change while adjusting the AGC timing for other modes. For other modes, monitor change in the bottom line of the display.

**Defaults:** CW = 5; SSB = 3; AM = 3.

Adjust for personal preference, according to band conditions.

07 RF  RF GAIN

> CW / SSB / DIG / AM / FM (Adjustable by **MODE**)  

Select **SubMenu**, adjust with ⚙ **TUNE/MULTI**. Adjust for personal preference, according to band conditions.

**Default:** CW = 0; All other Modes = 0.

08 Power  TX Power Adjustment

> TX Power: Adjustable with ⚙ **TUNE/MULTI**

Adjustable in percentage (%) of maximum TX power, from 10% to 100%.

**Default:** 100%

09 GAIN  MIC / DIG TX Audio Gain (Level)

Adjustment for Voice and Digi Modes.

> MIC: Microphone Gain; adjustable from 1 to 100.

> DIG: TX Audio Gain; adjustable from 1 to 100.

**Default:** MIC = 5; DIG = 20.

10 NR Level  Noise Reduction Level.

> Select **SubMenu**, adjust with ⚙ **TUNE/MULTI**.

Digital Signal Processing (DSP) feature for reducing noise on a noisy band. NR is most effective on CW. It is also effective on SSB, but degrades the fidelity of the received signal somewhat.

**Default:** 50

Adjust for most effective noise reduction.

11 NB Level  Noise Blanker

> Adjustable from 40 to 100 with ⚙ **TUNE/MULTI**.

The Noise Blanker is a DSP feature used for reducing certain types of pulsed noise (i.e., lightning or automotive ignition noise).

**Default:** 50

Adjust for best noise reduction.
12 SQL  Two types of Squelch: SSB/AM/FM

- SSB/AM
- FM

These are independently adjustable. Select SubMenu, adjust with TUNE/MULTI. SSB/AM also works DIG mode.

Adjust threshold from 0 to 100 with TUNE/MULTI. On a clear (unoccupied) frequency, adjust threshold level until the audio just barely shuts off and SQL on the right of the screen lights up.

Defaults: SSB/AM = 0; FM = 0.

13 VOX L  VOX Sensitivity Adjustment

- Adjust with TUNE/MULTI: from 1 to 100.
  Default: 20.

14 VOX  VOX Delay

Select SubMenu to switch CW/MIC/DIG mode

- Adjust with TUNE/MULTI: from 100ms to 10 seconds in 100ms steps.
  Default: CW = 400 ms; MIC = 1000 ms; DIG = 100ms.

⚠️ In CW mode, VOX may be switched on in order to transmit.

Setting CW VOX Delay to a higher value (i.e., 400ms) reduces the relay clicking noise. Setting to 100ms enables Fast Semi-Break-in.

15 AM/FM  Enable/Disable AM & FM Modes

- Adjust with TUNE/MULTI. Must be set by band.

Many operators do not use AM or FM Mode below 29 MHz, especially in Region One where IARU recommendations discourage use of these modes below 29 MHz.

When operating hf contests, these modes are not used. Disabling these modes enables changing modes without stepping through AM & FM.

Defaults: Enable.

16 CMR Level  Speech Compressor Level (SSB Mode-Only)

- Adjust with TUNE/MULTI: from 1 to 100.
  Normally 40 should be maximum compression level used.
  Default: 20.

17 Save Band VFO

Band change occurs only VFO A (VFO A) or together with VFO B (VFO A&B).

Defaults: VFO A

18 EQL  RX / TX

- Select RX or TX using Submenu
  - Select Band (High Freq. / Low Freq. / Mid Freq.) with Sel.
    Adjust Equalization Level with TUNE/MULTI: from 1 to 100;
Set to personal preference. You may use the built-in monitor for adjusting TX parameters.

*Defaults RX EQL*: HF = 50; LF = 100; MF = 75. *Defaults TX EQL*: HF = 100; LF = 100; MF = 100.

**19 RPAN** RX Panadapter Settings

Select sub-menu with **SEL**, adjust value with **TUNE/MULTI**.

- **AVG**: Adjustable from 1 to 100;
- **Scale**: Adjustable from 0.1 to 5.0;
- **Shift**: Adjustable from -100 to +100.

*Defaults*: AVG = 5; Scale = 0.9; Shift = 30.

**20 TPAN** TX Panadapter Settings

Select sub-menu with **SEL**, adjust value with **TUNE/MULTI**.

- **AVG**: Adjustable from 1 to 100;
- **Scale**: Adjustable from 0.1 to 5.0;
- **Shift**: Adjustable from -100 to +100.

*Defaults*: AVG = 5; Scale = 2.7; Shift = 20.

**21 TIME** Set Clock Time

- **Hour / Min**

Select sub-menu with **SEL**, adjust value with **TUNE/MULTI**.

**22 Corr TIME** Clock Accuracy Adjustment

You can speed up or slow down the clock with this adjustment.

Adjustable with **TUNE/MULTI** from -63 to +126.

*Defaults*: 0;

**23 TX Metr** SWR Num* / PWR Num* / SWR / PWR / ALC / MIC

Select parameter with **TUNE/MULTI**.

Selection defines what parameter (during TX Mode) to be displayed and the choice of display method. Normal display method is bar graph.

*Defaults*: PWR;

**24 Type Tone** Defines type of signal transmitted during TONE Mode.

Choose tone type with **TUNE/MULTI**

- **Normal** = one tone (1000 Hz) for tuning antenna matchbox or amplifier;
- **Dual** = two tones (1000Hz and 2000Hz) for testing SSB IMD.

*Defaults*: Normal;

**25 VOX** VOX for CW, DIG or Voice Modes.

Select Mode sub-menu

- CW / MIC / DIG: Enable / Disable

Set Enable / Disable with **TUNE/MULTI**.

*Defaults*: CW = Enable; MIC = Disable; DIG = Disable.
26 Beep Key  Mute or enable sound when you press keys.
Set Enable / Disable with TUNE/MULTI.
Defaults: Enable.

27 Backlight  Backlight adjustment
Select parameter with TUNE/MULTI

- dimly: night mode
- brightly: bright display
- auto: night mode, when any key is pressed, the bright display turns on for a short time.
  Defaults: brightly.

DEFAULT SETTINGS

To reset to default settings hold VM and press POWER button.
To save user settings, monitor the state of the clock battery. If the low battery \[\text{符号}\] appears on the display, replace the internal watch battery (CR2032).
CLOCK BATTERY REPLACEMENT

Required tools and parts
1. Hex key 1.5 mm;
2. Hex key 3 mm;

1. Remove the RF and RIT/XIT knobs. Using the hex key (1.5 mm), unscrew the TUNE/MENU knob.

2. With hex (3mm), unscrew the bolts indicated in the scheme.

3. With hex (3mm), loosen the bolts shown in the scheme (180 degrees) on both sides.
4. Remove the top cover. Since the top cover is mounted on internal connectors, it is remove with effort.

5. Replace the battery (CR 2032).

Reassemble the transceiver in reverse order.
Specifications

GENERAL FEATURES

- 160-6-meter ham bands;
- General ‘receive’ coverage 0.5 - 56.0 MHz;
- All modes: SSB, CW, DIG, AM, FM;
- High-performance 32-bit floating-point DSP;
- Current drain as low as 100 mA in ‘receive’ mode (backlight on, preamp off, no signal);
- External power supply DC 9-15V, 1 to 3A typical in transmit;
- High-contrast LCD with 256*128 px;
- High-performance real-time pan-adapter (48 kHz wide);
- On-line firmware updates;
- Tilted feet (rear), fold up for transportation;
- Ultra-compact size (H*W*D): 90 mm (3.5") * 207 mm (8.1") * 21 mm (0.8");
- Weight: 0.55 Kg (19.4 oz).

RECEIVER *

- Sensitivity (MDS) -136 dBm (typ. with preamp on);
- Quadrature down-sampling mixer compatible with PC-based SDR (software defined radio) applications;
- Receiver I / Q outputs for PC soundcard;
- Switchable low-noise preamp and attenuator;
- 3-band receive audio equalizer;
- 4 adjustable digital filters;
- Automatic notch filtering;
- Adjustable noise reduction and noise blanking;
- Audio Output ext. speaker, 3W typ.

TRANSMITTER *

- Adjustable output, 1 to 10W HF (7W 6m);
- Rugged, SWR and temperature-protected final amplifier stage;
- Carrier Suppression > 50 dB typ.;
- Harmonic / Spurious Outputs > 50 dB below carrier;
- CW Sidetone/Transmit offset 400-1200 Hz, adjustable;
- Speaker-microphone with PTT;
- 3-band microphone audio equalizer;
- 2 adjustable digital filters;
- DSP RF speech processing for excellent ‘punch’.

* Specifications apply only within ham bands except as noted. All measurements taken with 13.8 VDC supply.
OTHER FEATURES

- Internal CW keyer with 10-300 CPM range;
- 100 general-purpose memories store VFOs, modes, etc.;
- Computer control via USB;
- Full remote-control command set (with kenwood emulates);
- One-click online firmware upgrades (with free PC software).

PACKAGE INCLUDE

1. Speaker-microphone;
2. CAT cable for on-line software update;
3. Power cabel for external power source DC 9-15V (battery not include);
4. Headset and mic adapter with PTT (3.5 mm jack).
5. CW adapter (3.5 mm jack).
FOR CLASS B UNINTENTIONAL RADIATORS

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.

FCC INFORMATION

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.

WARNING: MODIFICATION OF THIS DEVICE TO RECEIVE CELLULAR RADIOTELEPHONE SERVICE SIGNALS IS PROHIBITED UNDER FCC RULES AND FEDERAL LAW.

CAUTION: Changes or modifications to this device, not expressly approved by Lab599 Inc., could void your authority to operate this device under FCC regulations.