

## TR-35 Operating Instructions

02/04/23 V0.30



The TR-35 is a 4-band 5-watt CW transceiver covering the 40-, 30-, 20-, and 17-meter bands with generous receiver tuning ranges above and below each band. Selectable receiver modes allow for narrow band CW, wideband CW, and SSB reception.

### Front Panel Controls

Refer to the front panel for the location of the switches and controls. The four rotary controls are pretty much self-explanatory. There is a keyer speed control (5-45 WPM) on the left, then the TX Power (0-5W) adjust pot, an RF gain control, and a volume control. The power on-off switch is at the upper left, the Receiver Mode / AUX switch is in the middle, and the Band selector / RIT switch is to the right. The two right-most switches are 3-position spring return toggle switches.

### Band Changes and Memories

To change bands, momentarily flip this switch upward and allow it to return to the center off position. Do this quickly, and the unit will consecutively switch from one band to another. If you flip the switch up and hold it up for a short while, the

current frequency and receive mode will be stored in a semi-permanent memory. The display will momentarily switch to a reverse optical mode to show that the current frequency has been stored. There is a separate memory for each of the four bands. To recall this memory, 2 quick successive upward clicks are required.

## RIT Function

To engage the RIT function with this switch, a quick downward push and release of the toggle is needed. The orange RIT warning LED will come on, and the display will read out the offset with 10 Hz resolution as you tune. Another quick downward toggle will dis-engage the RIT function. The Dial Lock function is also controlled with the RIT switch by using a longer engagement time of about 1.5 seconds. This will prevent tuning and band changes. To exit the lock condition, another longer switch activation is required.

## Receiver Modes

The Receiver Mode switch will toggle between Narrow Band CW and Wide Band CW with quick upward click of this switch. A longer click will engage SSB mode. The receiver IF bandwidth will be changed to accommodate the selected mode, and the display frequency reading will maintain calibration when switching between CW and SSB modes.

## AUX Switch

The AUX switch is used to activate the keyer record/playback functions. A quick switch activation will select the playback mode, and a longer switch closure will enter the record mode. The keyer playback or record mode can be exited by a short press of the AUX switch. (See below for complete instructions for the keyer memory operation.)

## Tuning and Step Size

The knob to the right of the blue OLED display is the tuning encoder. The frequency may change in 10 Hz, 100 Hz or 1 kHz steps. The tuning encoder will

tune at 40 steps per revolution, allowing tuning rates of 400Hz, 4kHz, or 40kHz per revolution. The tuning step resolution is selected by a momentary switch attached internally to the tuning encoder. Short pushes on the tuning knob will alternate between 10 and 100 Hz tuning steps. A long press will enable 1 kHz steps. The frequency readout on the display will show the tuning resolution selected with an underline bar beneath the digit selected. There is lots of tuning range above and below the selected amateur band for SWLing. The transmitter will not operate-out of-band and will display an “OOB” warning if this is attempted.

## Panel LED Functions

The blue LED Signal indicator can be used to judge the strength of the received signal. A bright blue LED would indicate a strong signal. The red LED is the battery low-level warning indicator. It will blink when the battery voltage drops below a preset level. The warning level is internally adjustable from 9 to 11.5 volts.

## Phones, Power, and Key Jacks

An external speaker or headphones can be connected to the “Phones” jack on the right side. There is more than ample audio available. Power is connected to the DC input connector on the left side. The power plug body size is 5.5mm and the center pin size is 2.1mm with positive polarity. The voltage should be between 9.5 and 14 volts. The key jack and keyer paddle jack are on the left side. Both may be connected and used randomly as you desire. This way, you are always ready for a new “SKCC” contact, as there is no need to reboot the transceiver in order to change from the keyer using paddles to a straight key.

## Transmitter Operation and Final FET Protection

The transmitter output power is adjustable from a few milliwatts to 5 watts or more depending on the power supply voltage. It should be possible to achieve the “1000 Miles per Watt” award with a station a few miles away by turning the power output down to a few milliwatts while maintaining contact! With a 12-volt supply, the output is at about 5 watts into a 50-ohm load. The final TO-220 RF

transistor is durable and has survived delivering 5 watts continuous key-down periods of more than 5 minutes during product development. The TR-35 transmitter is designed for CW duty cycle use only. Although the final FET amplifier is rugged and robust, it is not intended for extended periods of continuous key-down operation at maximum output, especially at higher DC inputs. Attempting to do so will activate a power fold-back circuit designed to prevent excessive heat build-up in the final RF amplifier FET. A poly-fuse device reacts to the current drawn by the transmitter and will slowly but temporarily increase its resistance over time and temperature, thereby reducing the RF power output. This power reduction occurs only with extended key-down operation, particularly with higher DC input voltages. At the extreme, power output could drop to zero with the receiver becoming inoperative as well. The poly-fuse is self-resetting if power is removed, and the poly-fuse is allowed several minutes to recover. Normal CW operation will not activate the power fold-back circuit, but key-down times of 10 seconds at maximum power might, particularly at higher DC input voltages. If you need more than 5 seconds or so of RF to make an antenna adjustment, simply turn down the RF power output for these adjustments. Not only will this step prevent activation of the final FET fold-back circuit, but it will also reduce QRM on the band, which is always good operating practice. The poly-fuse is also critical to the operation of the reverse polarity protection circuit.

## Sidetone Zero-Beat

The side-tone that is heard while transmitting is the actual transmitted signal being heard by the receiver. If you match the audio tone of the received signal to the tone of the side-tone, you are guaranteed to be at zero beat with the station you are communicating with.

## How to use the Keyer Record and Playback Functions

The record and playback functions are initiated with the “AUX” switch. There are two message memories provided. Each can store 25 words using the “PARIS” standard, or 125 ASCII characters if stored with no word spacing. This should be plenty for POTA or SOTA activations. Before starting to record, set the keyer speed

control to a comfortable setting. A little slower than normal might be better. Don't adjust the speed control while in record mode. To record a memory, activate and hold the "AUX" switch for about 1.5 seconds. The OLED display will show the record menu. Choose message 1 by tapping the "DIT" paddle, or message 2 by tapping the "DAH" paddle. The TR-35 sidetone will immediately respond by sounding a "1" or "2" in morse. If the sidetone sounds a little "clicky", turn down the RF gain control some. After the morse number is finished playing, you may record your message using the paddles. You can abort a record session by activating the "AUX" switch. The transmitter will be inhibited while you record your message. When your message is finished, simply stop sending, and the recording session will time out after about 3 seconds and the TR-35 will revert to regular transceiver mode. To Listen to, or play back your message, activate a short "AUX" switch closure. The playback menu will appear on the display. Be aware that the transmitter will be active while playing back a message, so remember to turn down the RF power control while checking your recorded message. Message 1 is selected by tapping the "DIT" paddle and message 2 by tapping the "DAH" paddle. The selected message will immediately start to play and will play to the end. To stop the playback at any time, tap either the DIT or DAH key. An "AUX" switch activation will also abort the message playback. The volume control must be up to hear a message.

## Reverse Optic Display Mode

Better display visibility in bright light conditions may be possible by reversing the display optics, that is, black numbers on a blue background. To do this, the TR-35 is turned on while the receiver mode switch is engaged and held until the display shows solid blue. Changing back to normal optic mode requires a power reset without the receiver mode switch engaged. Note that the reverse display mode consumes about 10ma more current from the battery.

## Internal Adjustments

There are five internally accessible adjustments: PA Bias, sidetone level, signal level LED sensitivity, audio bandpass filter frequency, and low battery detector threshold. The PA bias normally shouldn't need adjustment except at initial build.

If your TR-35 is factory built, it would be rare that this control ever needs adjustment, other than if the final RF output transistor should need to be replaced (which would also be rare). The sidetone level pot may be adjusted to set the level your liking, and the low battery level pot can be set to a level consistent with the battery type you use. This level is usually set to about 9.5 volts on factory wired units. To access these adjustments, the plastic case bottom must be removed. To do this, remove the four black screws from the case front panel, and remove the board set along with the case top half by lifting on the left side of the panel and maneuvering the BNC connector through its exit hole. All five internal adjustments will now be accessible. The sidetone level adjustment control is labeled on the left side of the lower board next to the power jack. The PA bias and battery detector adjustments are labeled on the rear of the lower board. To set the low battery point, adjust the input DC voltage to the battery voltage you wish to have the alarm flash, and adjust the low battery pot until the red LED alarm LED blinks. Be careful not to adjust the bias pot by mistake! See the on-line building procedures for instructions on setting the PA bias. The blue signal strength LED sensitivity pot is located between the bias and battery voltage warning adjustment pots and is attached to the upper board. Normally the pot is set for a faint glow of the blue signal quality LED with the RF gain control fully counterclockwise. The audio bandpass filter adjustment is labeled on the lower board at the front of the unit. The pot is adjusted for maximum sidetone audio volume while in narrow CW mode. This will be very close to the center of the rotational range.

## TR-35 Connector Wiring

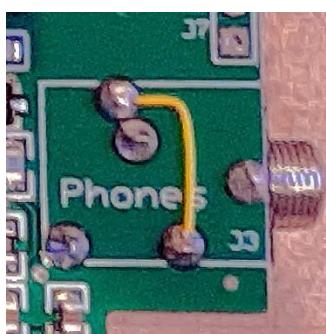
Key Jack: The Key jack will work with either a mono or a stereo 3.5mm plug. The tip and ground shell connections are used. There is no connection to the Key jack ring terminal inside the TR-35

Paddles Jack: The Paddle jack requires a stereo 3.5mm plug. The tip is the “DIT” connection, and the ring is the “DAH” connection. The shell is the ground.

Note that you may connect both a straight key and paddles and use either at any time. No need to reboot the transceiver to switch from one to the other. You're always ready for an unexpected "SKCC" contact with the straight key!

DC Power Jack: This requires a standard 5.5mm plug with a 2.1mm center pin diameter. The polarity of the center pin is positive.

Phones Jack: The Phones (speaker) jack on the 02/2022 Rev B upper board is wired for a standard 3.5mm mono plug (tip and ground). If you connect a standard stereo headphone, only one earpiece will play. Use a 3.5mm mono to stereo adaptor if you wish both earpieces to play. These adaptors are available from eBay and Amazon. There is a simple modification you can make that will



allow both headphone earpieces to play, **but only if you never intend to use a mono plug** connected to the "Phones" jack. To make this mod, the top case half must be removed by removing all the knobs and the four nuts holding the case half to the board assembly. Remove the four black case screws and lift off the upper-case half. Carefully solder in a jumper wire as shown in yellow in the photo. Once this modification is performed, **do not connect a mono plug to the phones jack**. Additionally, **do not perform this modification on earlier upper PC boards labeled "Rev A3 12/2021" in the upper right corner of the board!** Doing so will cause destruction of the audio output amplifier. The phones jack on these earlier boards is wired differently than the newer 'Rev B 02/22 boards.