

# **TurboTuner-2**

**Automatic Screwdriver  
Antenna Controller**

**Model ITT-1**

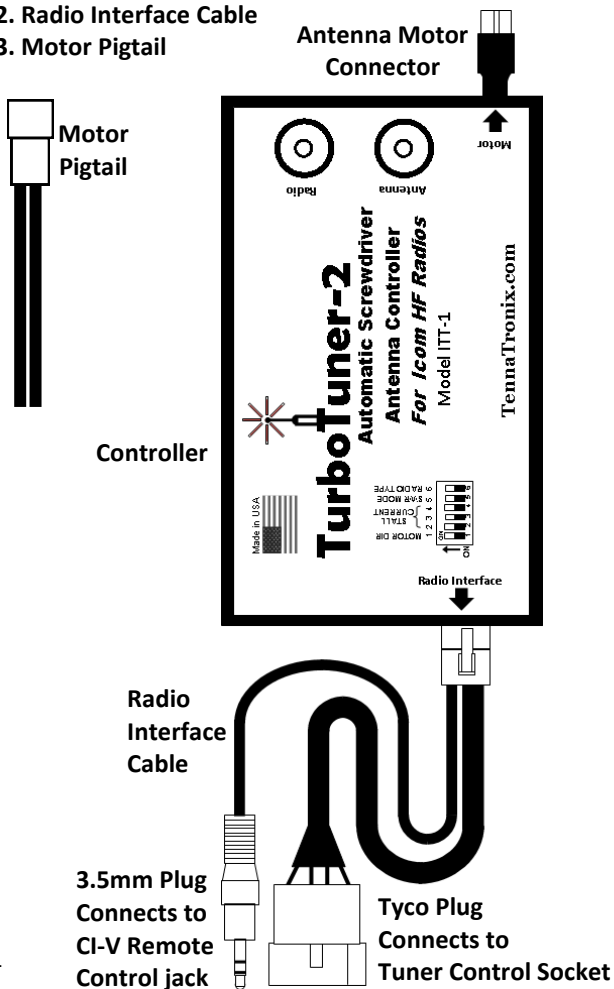
**For: Icom HF Radios  
(Firmware Version R7)**

# **User's Manual**

**TennaTronix.com**

Congratulations on purchasing the **TurboTuner-2** Automatic Screwdriver Antenna Controller. Your **TurboTuner-2** kit contains the following parts:

1. Controller
2. Radio Interface Cable
3. Motor Pigtail



# Theory of Operation

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The **TurboTuner-2** provides automatic tuning and control of screwdriver antennas. It adjusts the antenna until the minimum SWR is reached at the current operating frequency. This is accomplished by using the “Tune” function of the radio to supply RF power while the **TurboTuner-2** moves the screwdriver antenna up or down and constantly measures the SWR until the minimum is found. Once found, the antenna motor is stopped and the radio is placed back in receive mode.

Note: For IC-7000, 7100, and 7200, the SWR meter inside the radio is utilized. No RF connections are made to the **TurboTuner-2**.

There are at least 3 basic pre-requisites to ensuring successful antenna tuning:

1. The motor leads must be properly RF choked.
2. The antenna needs to be properly matched.
3. The coax cable to the antenna must be properly choked.

One of many sources for information about all of the above topics is [www.k0bg.com](http://www.k0bg.com).

## Compatible Radios

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The **TurboTuner-2** is compatible with most Icom radios that have a CI-V and Tuner jack, including the following:

IC-7200	IC-706
IC-7100	IC-718
IC-7000	IC-746

If in doubt, send an inquiry to [info@tennatronix.com](mailto:info@tennatronix.com)

# TurboTuner-2 Setup

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Prior to installation, set the DIP switches on the **TurboTuner-2** to match your installation according to the descriptions below. Note: You can always change the DIP switch settings after installation. Any changes will take effect on the next tuning cycle.

## DIP Switch Settings

	<b>SW1</b>	<b>Antenna Direction</b>	
	OFF	NORMAL	
	ON	REVERSED	
<b>SW2</b>	<b>SW3</b>	<b>SW4</b>	<b>Antenna Stall Current</b>
OFF	OFF	OFF	300 mA
OFF	ON	OFF	500 mA
ON	OFF	OFF	750 mA
ON	ON	OFF	1000 mA
ON	ON	ON	1500 mA
	<b>SW5</b>	<b>SWR Mode</b>	
	OFF	Fine	
	ON	Coarse	
	<b>SW6</b>	<b>Radio Type</b>	
	OFF	IC-700 series	
	ON	IC-7000 series	
	<b>SW1</b>	<b>Antenna Direction</b>	

### **Antenna Direction Switch (SW1)**

Sets the direction of travel for the antenna. Most installations will operate with the **NORMAL** setting. If the antenna does not move in the proper direction, change the switch to the **REVERSED** setting.

### **Antenna Stall Current Switches (SW2, SW3, SW4)**

Used to set maximum stall current. This is used to determine when the screwdriver antenna reaches the end of travel. If set too low, the antenna may reverse before reaching the end of travel. If set too high, the antenna motor may “stall” at the end of travel and not reverse, possibly causing damage to the motor. Use the following settings for some commonly used antennas:

<b>Antenna Model</b>	<b>Stall Current Setting</b>
Little Tarheel, Diamond SD330	300 mA
Tarheel Models 75-400	1000 mA
Tarheel Models 1000-1200	1500 mA
High Sierra w/ Black Hawk motor	750 mA
Hi-Q	1000 mA

### **SWR Mode (SW5)**

Set to OFF for normal operation.

Set to ON if the tuner is having difficulty stopping at the lowest SWR. Note: In this mode, the tuner may stop at a point a few tenths greater than the lowest SWR.

### **Radio Type (SW6)**

Set to OFF for IC-700 series radios (IC-706, IC-718, IC-746)

Set to ON for IC-7000 series radios (IC-7000, IC-7100, IC-7200)

# Radio Setup

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Prior to operating the **TurboTuner-2**, there are a few settings on the radio that must be adjusted as shown below:

- ✓ Set **Tuner Auto Start** to OFF.
- ✓ Set **Tuner PTT Start** to OFF.
- ✓ Set **CI-V Baud Rate** to 19200.
- ✓ Set **CI-V Address** to 70H.
- ✓ Set **CI-V Transceive** to OFF.
- ✓ Set **CI-V 731** to OFF. (Not all models have this option)

Refer to your radio's Instruction Manual for details on how to set these values. Some examples are shown below:

## For IC-7100

- Place the radio in Set Mode by pressing the **Set** button.
- Select **Connectors**, then **CI-V**. Set the **Baud**, **Address**, and **Transceive** accordingly.
- Select **Function**, then **Tuner**. Set the **Auto Start** and **PPT Start** accordingly.
- Press the **Set** button to exit Set Mode.

## For IC-7000

- Press the **[AF(set)]** button to enter Set Mode.
- Press the **[F-4 (OTH)]** button.
- Use the **[F-1]** and **[F-2]** buttons to select an item.
- Use the main **Dial** to set the desired value.
- Press the **MENU/GRP** button twice to exit Set Mode.

## For IC-706

- Place the radio in Set Mode by powering off the radio, then press and hold the **LOCK** button and power on the radio.
- Use the **MENU** button to select the desired item.
- Use the main **Dial** to set the desired value.
- Power off the radio to exit Set Mode and save the settings.

## Connections

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- Connect the 3.5 mm audio plug from the **TurboTuner-2** to the **CI-V Remote Control** jack on the back of the radio.
- Connect the 4-pin Tyco plug from the **TurboTuner-2** to the **Tuner Control Socket** on the back of the radio.
- Connect the motor cable from the screwdriver antenna to the **Motor** connector on the **TurboTuner-2**. Use the supplied pigtail if necessary. Pin 1 is Motor+ and Pin 2 is Motor-.

For IC-700 series radios only:

- Connect the RF cable from the screwdriver antenna to the **Antenna** connector on the **TurboTuner-2**.
- Connect the RF cable from the radio **Ant 1** connector to the **Radio** connector on the **TurboTuner-2**.

Note: There are no RF connections to the **TurboTuner-2** when using an IC-7000 series radio.

## Operation

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### Power On

Power-on the radio. The **TurboTuner-2** receives its power from the radio and is powered on or off whenever the radio is powered on or off.

When the **TurboTuner-2** first powers on, it will beep a Morse code 'R' followed by a number that indicates the firmware version. This signifies the **TurboTuner-2** is ready for tuning.

## Tuning

To initiate antenna tuning, press and hold the **TUNER/CALL** button on the radio for one second. This will place the radio in "Tune" mode. The radio's **TX** light should turn red, indicating the radio is transmitting. In approx. 3 seconds, the antenna will start moving and the **TurboTuner-2** will start searching for the lowest SWR. When the lowest SWR is found, the **TurboTuner-2** will beep a Morse code 'K' and return the radio to receive mode.

Press the **TUNER/CALL** button to exit "Tune" mode. Make sure you do this before changing frequency bands. This will prevent the **TurboTuner-2** from initiating another tune cycle when the band is changed.

If a low SWR cannot be found after the antenna make one reversal, the **TurboTuner-2** will beep as series of Morse code 'T's and return the radio to receive mode.

## Parking

The **TurboTuner-2** is equipped with and "Park" function which will lower the antenna to its minimum height. To "park" your antenna, press the **TUNER/CALL** button as if initiating a tuning cycle. Wait at least 2 seconds and then



press the **TUNER/CALL** button again. Upon entering “park” mode, the **TurboTuner-2** will beep a Morse Code ‘P’. When the antenna reaches its minimum height, the **TurboTuner-2** will beep a Morse Code ‘P’ again signifying completion of the “park” sequence.

Note: Once a “park” sequence has begun, it cannot be interrupted. If you need to stop the “park” sequence, power the radio off.

### Summary of Beep Codes

‘R’ – Software revision followed by a number

‘K’ – Tuning complete

‘P’ – Antenna parking has begun or ended

‘T’ – Unable to tune.

‘S’ – Serial communication error. Will beep three in a row followed by a number. If this occurs, not number and report to TennaTronix technical support.

## Troubleshooting

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<b>Problem</b>	<b>Possible Causes &amp; Solutions</b>
<b>TUNER/CALL</b> button does not work	<ul style="list-style-type: none"><li>• Make sure all the radio configuration items are set as described above.</li><li>• Make sure the selected frequency is within band.</li></ul>
Antenna reverses direction before reaching end of travel	<ul style="list-style-type: none"><li>• Stall current set too low.</li></ul>

Error indicated immediately	<ul style="list-style-type: none"> <li>• Stall current set too low.</li> <li>• Excess RFI.</li> <li>• RF cable not connected.</li> </ul>
Antenna does not reverse at end of travel.	<ul style="list-style-type: none"> <li>• Stall current set too high.</li> </ul>
When changing frequency, antenna moves in wrong direction.	<ul style="list-style-type: none"> <li>• Change DIP Switch 1 setting.</li> </ul>
Antenna won't tune on certain bands.	<ul style="list-style-type: none"> <li>• Ensure proper installation and grounding.</li> <li>• Use the radio bar-graph display or a separate SWR meter to verify actual SWR.</li> <li>• Change DIP Switch 5 setting to <b>ALTERNATE</b> SWR mode.</li> </ul>

<b>TurboTuner-2</b> dead, no beep at startup, tuning will not start	<ul style="list-style-type: none"> <li>• Ensure interface cable connected to <b>TUNER CONTROL SOCKET</b> on back of radio.</li> <li>• Remove cover and verify internal fuse is not blown. Fuse is 5x20mm 3A Fast Blow.</li> </ul>
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<p><b>TurboTuner-2</b> initiates a “park” sequence on its own.</p>	<ul style="list-style-type: none"> <li>• An anomaly in the RF signal has been detected.</li> <li>• Ensure the RF cable is connected.</li> <li>• Ensure proper system grounding.</li> <li>• Ensure proper choking of the RF cable and motor cable.</li> </ul>
<p><b>TurboTuner-2</b> beeps a series of three ‘S’</p>	<ul style="list-style-type: none"> <li>• Serial communication error. Ensure all radio configuration items set as described.</li> </ul>

# Radio Interface Connector

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The radio interface connector on the side of the **TurboTuner-2** contains the signals from the radio that are necessary to operate. Those signals are described below:

- 1: Key – Signal from controller to radio to start RF transmit.
- 2: Start – Signal from radio to controller to start tuning.
- 3: Serial Data – Serial data to/from radio.
- 4: +13.8V – DC Power from the radio.
- 5: Ground
- 6: Ground

The connector pin numbering is shown in the diagram below:



The radio interface connector on the **TurboTuner-2** is Molex part # 39-29-1068.

The part numbers for the mating connector components on the radio interface cable are:

Housing: Molex part # 39-01-2060, 6-pin Mini-Fit Jr.

Contacts: Molex part # 39-00-0066, crimp receptacles.

# Specifications & Ratings

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Supply Voltage	+13.8V DC $\pm$ 15%
Frequency Range	1.8 MHz to 54.0 MHz
Max. RF Power	100 Watts Note: No power limit when using IC-7000 series radios and RF does not pass through tuner.
Max. Antenna Motor Current	1.5 Amps
Dimensions	5.7" x 3.6" x 1.2"
Weight	8 oz.
Indoor Use Only	Controller is not weatherproof

## Warranty

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Your **TurboTuner-2** is warranted against manufacturing defects for one year from date of shipment to you. Your receipt establishes eligibility for warranty service, so save your receipt.

The **TurboTuner-2** is not warranted against damage, abuse, or other failure caused by the customer or natural calamity (such as lightning). This includes damage caused by operating the **TurboTuner-2** beyond or outside of its specifications or by not following good amateur radio practice.

## Contact

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For technical support and all other inquiries, send e-mail to:

[info@tenatronix.com](mailto:info@tenatronix.com)