

mAT-10R Universal Remote QRP Tuner

Operating manual

Thank you for choosing this MAT-TUNER product. Before using this tuner, please read all instructions carefully and thoroughly.

IMPORTANT PRECAUTIONS

◆ **Never** touch the antenna or antenna connector while the transceiver is transmitting, as this may cause burns!

◆ **Never** use the antenna tuner during thunderstorms. This may lead to electric shock, fire, or damage to the tuner. Always disconnect the antenna before a thunderstorm approaches.

◆ **Never** operate the tuner with its cover open. Contact with internal components during transmission may result in painful RF burns.

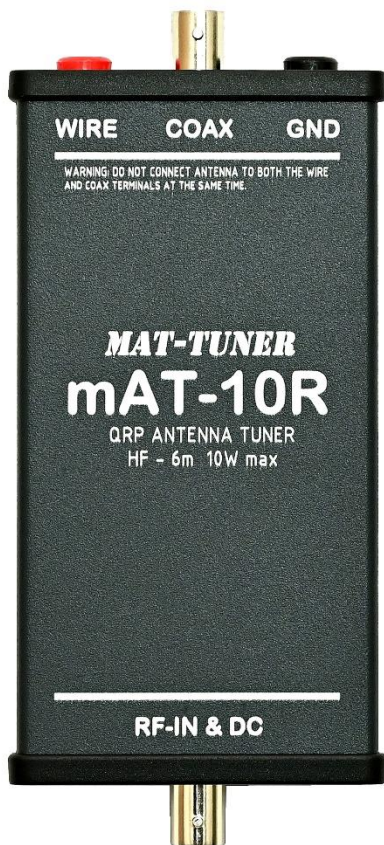
◇ Always turn off the transceiver's power before connecting or disconnecting any cables. Inserting or removing cables while the power is on may damage both the transceiver and the tuner.

◇ This product is not designed to be waterproof. If used outdoors, it must be protected from rain, dew, and moisture.

◇ This tuner is specifically designed for QRP transceivers. Please ensure that the RF power input from your transceiver to the tuner does not exceed the tuner's maximum allowable input power.

PRODUCT INTRODUCTION

The mAT-10R is a newly designed universal QRP HF automatic tuner compatible with various common QRP HF transceivers. It can also be used with HF transceivers capable of up to 100W RF output power, provided that the RF power input



to the tuner is limited to no more than the tuner's maximum allowable input power. Exceeding this limit may cause damage to the tuner.

The mAT-10R is an automatic tuner powered via the feedline. When using it, no additional control or power cables are required. It must be used together with a Bias-Tee such as the mAT-4117 or mAT-BT1. For more information about the mAT-4117 and mAT-BT1, please refer to their respective manuals.

The mAT-10R features two types of antenna interfaces: a BNC coaxial connector and banana jack sockets. You can connect the antenna feedline using the tuner's BNC connector, or use the banana jacks to directly connect a wire antenna. Its compatible antenna types and impedance range are exceptionally broad, far exceeding those of many other tuners you may have considered—including many built-in transceiver tuners.

TUNER OUTLINE



The top section features two types of antenna connectors: a BNC jack and banana binding posts, designed for connecting coaxial feedlines and wire antennas, respectively.

Please note: Only one connector type can be used

at a time. **DO NOT SIMULTANEOUSLY CONNECT ANTENNAS TO BOTH THE BNC JACK AND BANANA BINDING POSTS.**

The BNC jack is centrally located and labeled "COAX". The banana binding posts are positioned on both sides, labeled "WIRE" (red) and "GND" (black). The red "WIRE" post is for antenna connection, while the black "GND" post is for connecting a ground wire or counterpoise. When using a wire antenna, we strongly recommend connecting the "GND" post to a well-grounded earth wire. If proper grounding is unavailable, a counterpoise may be substituted. Effective grounding significantly enhances transceiver performance.

The bottom section features a BNC jack labeled "RF-IN&DC", which serves as the combined RF input and DC power supply port. Both RF signal and power supply are delivered through a single coaxial cable.

The mAT-10R tuner must be used in conjunction with a Bias-Tee. The function of the Bias-Tee is to combine the RF signal and DC power supply, delivering both to the tuner through a single coaxial cable. We recommend using either the mAT-4117 or mAT-BT1 Bias-Tee. Other Bias-Tee models may also be compatible for use.

The mAT-10R utilizes latching relays, which consume virtually no power after tuning is completed. You may use common alkaline batteries to power the Bias-Tee. Suitable options include a 9V stacked battery or multiple 1.5V alkaline batteries. After tuning is complete, you may turn off the Bias-Tee's power switch to conserve battery energy and prevent potential erroneous operations of the tuner caused by strong interference.

INSTALLATION

Important: Turn off the transceiver and DC power supply before connecting any cables.

1. **Mount the tuner.** Secure the tuner to an antenna mast using self-locking nylon cable ties or self-adhesive cable straps. If used outdoors for extended periods, implement waterproofing measures to prevent rain or dew from entering the tuner and causing damage.
2. **Connect the antenna.**
 - For coaxial feedline connections: Attach the feedline's BNC plug to the "COAX" jack on the top panel.
 - For wire antennas: Insert the antenna wire into the "WIRE" banana jack (red) and the ground wire into the "GND" banana jack (black).

Reminder: Never connect antennas to both types of connectors simultaneously.

3. **Connect the Bias-Tee.** Use a coaxial cable with BNC plugs to connect the tuner's bottom "RF-IN&DC" jack to the RF and DC output port of the Bias-Tee.
4. **Connect the transceiver.** Use another coaxial cable to link the Bias-Tee's RF input port to the transceiver's antenna jack.
5. **Connect the power supply.** Use a DC power cable to connect the Bias-Tee's DC power input port to a DC power source or battery. Ensure the voltage and current comply with the Bias-Tee and tuner specifications. Reverse polarity must be avoided.
6. **If using an SWR meter,** connect it between the transceiver and the Bias-Tee. Never install an SWR meter between the Bias-Tee and the tuner.

Critical Note: The coaxial cable between the tuner and Bias-Tee carries both RF signals and DC power. Do not insert any devices (e.g., SWR meters, power meters, or baluns) that could cause a DC short between the cable's center conductor and shield.

ABOUT GROUNDING

When using a coaxial feed line to connect to an antenna, your antenna has its own grounding system. In this case, the tuner may not require an additional ground connection.

If you are using a wire antenna, we strongly recommend connecting the terminal labeled **“GND”** on the tuner to a ground rod or ground radial system. This will significantly improve the transmit and receive performance of your station and reduce electromagnetic interference to other nearby devices.

All tuners, including the **MAT-TUNER**, are highly recommended to be connected to a well-established ground when operating with wire antennas.

TRANSCEIVER CONFIGURATION

The mAT-10R allows a maximum RF input power of 10W. As long as your transceiver outputs no more than 10W of RF power, the tuner can be used directly without additional configuration. If your transceiver's maximum output power exceeds 10W, please adjust its settings to ensure the output power does not exceed 10W.

Operation

The operation of the mAT-10R is performed using the transceiver and Bias-Tee. After powering on both devices, follow this complete tuning procedure:

1. Set your transceiver to the desired frequency.
2. Configure the transceiver's transmission mode to FM, FSK, RTTY, or other modes that provide a stable carrier wave.
3. The transmit power of the transceiver is set between 3-6W.
4. Press and hold the PTT on the transceiver to maintain a stable carrier output.
5. Turn off the Bias-Tee's power, wait a few seconds, then restore power. The tuner will begin automatic tuning. During this process, you can observe changing SWR readings on either your transceiver or an external SWR meter.
6. When the antenna's SWR stabilizes and no longer changes, this indicates the tuner has completed its tuning cycle. You may then power off the Bias-Tee to stop supplying power to the tuner. Finally, reconfigure your transceiver's output power and operating mode to your desired settings.

This completes one full tuning cycle. If you change the frequency on your transceiver and the antenna's SWR becomes unacceptable, you must repeat these steps to initiate a new tuning cycle. Even if the transmitter

frequency remains unchanged, restarting the tuning cycle may potentially achieve a lower SWR.

TUNING INSTRUCTIONS

Setting the Tuner to Bypass

Turn off the power switch on the Bias-Tee and wait a few seconds. While keeping the transceiver in receive mode, turn the power switch of the Bias-Tee back on to supply power to the tuner. Wait for 3 seconds—the tuner will enter **bypass mode**. In this state, the RF input is directly connected to the antenna, rendering the tuner inactive.

Tuning

The mAT-10R tuner features three tuning modes: **Memory Tuning**, **Quick Tuning**, and **Full Tuning**. These modes are controlled via the power switch of the Bias-Tee.

1. **Memory Tuning**

When tuning is initiated for the first time after changing the transceiver's frequency, the tuner automatically starts **Memory Tuning**. It measures the current frequency, retrieves the corresponding tuning data stored in memory, and configures the tuner's LC circuit based on this data. The tuner then measures the antenna's SWR. If the SWR is $\leq 1:1.5$, tuning is successful, and the tuner enters standby mode. This process is completed within 0.5 seconds.

2. **Quick Tuning**

If the SWR remains above 1:1.5 after Memory Tuning, the tuner automatically switches to **Quick Tuning**. This process takes approximately a few seconds. During Quick Tuning, the tuner re-adjusts the LC circuit to optimize the SWR. If the SWR is reduced to $\leq 1:1.5$, the tuner saves the current LC configuration to memory for future Memory Tuning operations and then enters standby mode. This completes the Quick Tuning process.

3. **Full Tuning**

If the transceiver's frequency remains unchanged and a new tuning cycle is initiated by cycling the Bias-Tee's power switch, the tuner will automatically commence the **Full Tuning** process. This mode may achieve a lower SWR, but it requires a longer time to complete.

Generally, the first tuning cycle at a new frequency performs memory tuning, the second tuning cycle performs quick tuning, and the third tuning cycle performs full tuning. If the data stored in the memory for that frequency is invalid from previous use, both the first and second tuning cycles are executed within a single tuning cycle.

Tuning Tips

- While the transmitter is transmitting, turn on the Bias-Tee to power the tuner, and the tuner will initiate a tuning cycle. If the transmitter frequency remains unchanged, repeating the tuning cycle may achieve a lower SWR.
- While the transmitter is in receive, power on the Bias-Tee to supply the tuner. This will place the tuner in bypass.
- Once the tuning cycle is complete, power off the Bias-Tee to cut power to the tuner. This saves energy and improves the tuner's noise immunity.

TECHNICAL SPECIFICATIONS

- Frequency Range: 1.8-54 MHz
- Maximum Power: 10W (SSB/Digital)
- Tuning Power: 3-6 W
- Tuning Time: Max. 10 sec (Full Tune), 0.1 sec (Memory Tune)
- Memory Channels: 16,000
- Power Supply: DC 7-14V, 0.1A max.
- Operating Temperature: -10°C ~ +60°C
- Dimensions: 142 x 67 x 28 mm
- Weight: 200 g

TECHNICAL SUPPORT

Visit our Support Center at: <http://www.mat-tuner.com>.

Our website provides links to product manuals in case you misplace this one! If you are considering purchasing other MAT-TUNER products, our website also has complete product specifications and photographs to assist in your decision-making. You will also find links to all our quality MAT-TUNER dealers, who are ready to help you with your purchase.

PURCHASE ADVISORY

To ensure access to reliable after-sales service and technical support, we strongly recommend purchasing our products exclusively through our authorized dealers. A detailed list of authorized distributors across major countries and regions is available on our website <http://www.mat-tuner.com/buy.php>. Please note that products purchased through unauthorized channels may not be eligible for after-sales service or technical support.

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