

# mAT-125E

## HF-SSB General Automatic Antenna Tuner

*Instruction Manual Version V3.0*

### INTRODUCTION

The mAT-125E is a universal automatic antenna tuner that can be used with most HF transceivers. Working frequency range of 1.8-54MHz, 120 watts maximum RF power. Built-in rechargeable lithium batteries eliminates the need for external 12 vDC power supply.,

The tuner does not need a control cable to connect the transceiver. It only requires connection to the transceiver via coaxial cable. Tunes dipoles, verticals, Yagis, or virtually any coax-fed antenna. Matching range of 5-1500 ohms, far in excess of the capability of typical internal automatic antenna tuners or other external units.

The mAT-125E has 16,000 frequency memories. When tuning on or near a previously tuned frequency, the mAT-125E uses “Memory Tune” to recall the previous tuning parameters in a fraction of a second. If no memorized settings are available, the tuner runs a full tuning cycle, storing the parameters for memory recall on subsequent tuning cycles on that frequency. In this manner, the mAT-125E “learns” as it is used, adapting to the bands and frequencies as it goes. You can also start a tuning cycle manually whenever necessary.

The tuner has four fine-tuning buttons. After automatic tuning, you can make more fine adjustments manually to adjust for lower SWR if desired.

Two 18650 lithium batteries are installed in the interior of the mAT-125E, which provides power for the tuner. Because of the use of advanced magnetic retaining relays, the power consumption of mAT-125E is very small, and lithium battery can power the unit for long periods of time after it is fully charged. Special chargers are provided with tuners. Use the included charger only for charging internal batteries.

### SPECIFICATIONS

- 0.1 to 120 watts SSB and CW peak power, 30 watts on PSK and digital modes, and 100 watts on 6 meters.
- Latching relays for ultra-low power operation.
- 16,000 memories for instantaneous frequency and band changing.
- Tuning time: 0.1 to 5 seconds full tune, 0.1 seconds memory tune.
- 1.6 to 54.0 MHz coverage. Built-in frequency sensor.
- Tunes 5 to 1500 ohm loads.
- Includes a lithium battery charger and rechargeable batteries
- For dipoles, verticals, Vees, beams, whip, wire or any coax-fed antenna.
- Dimensions: 20cm x 13cm x 4cm (L x W x H).
- Weight: 0.8 kg.

### AN IMPORTANT WORD ABOUT POWER LEVELS

**The mAT-125E is rated at 120 watts maximum power input at most. Many ham transmitters and transceivers, and virtually all amplifiers, output well over 120 watts. Power levels that significantly exceed specifications will definitely damage or destroy your mAT-125E. If your tuner fails during overload, it could also damage your transmitter or transceiver. Be sure to observe the specified power limitations.**

**FRONT PANEL**

On the front panel there are six pushbuttons and four LED indicator lights.

[TUNE]: Initiates a tuning cycle, Online/Bypass state switching, Multifunctional buttons.

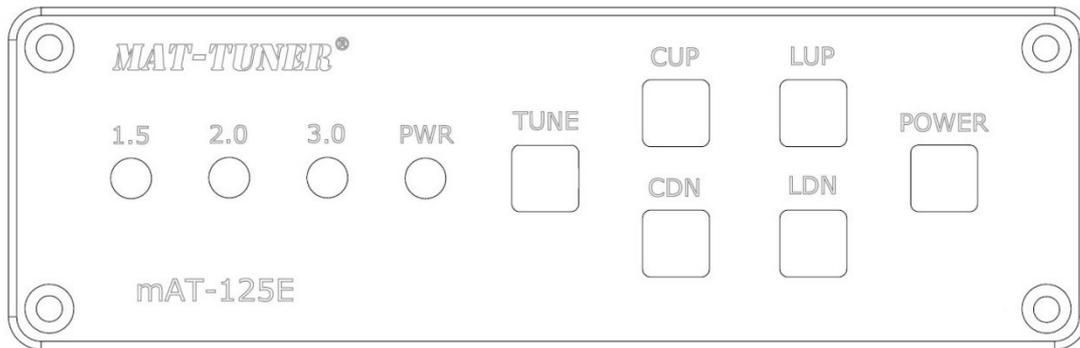
[CUP] / [CDN]: Manually increase/decrease capacitance.

[LUP] / [LDN]: Manually increase/decrease inductance.

[POWER]: Power button.

1.5, 2.0, and >3.0 LEDs: Indicate SWR.

PWR: Power light.



**REAR PANEL**

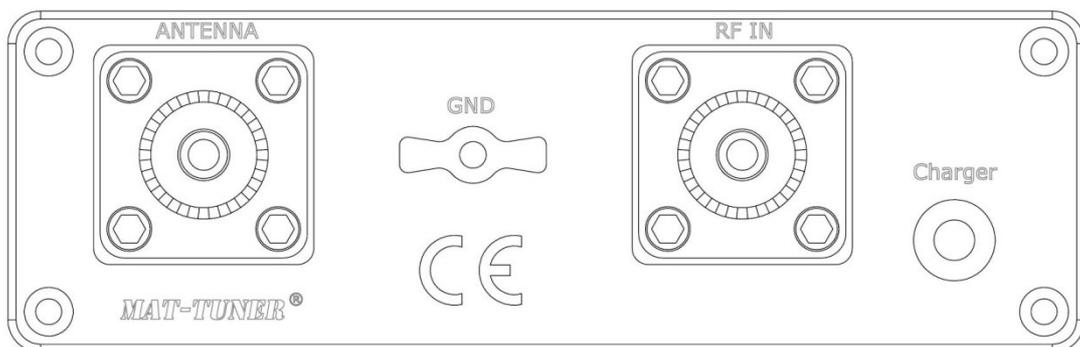
The rear panel of the mAT-125E features four connectors.

**ANTENNA:** SO-239 connector for coax cable from antenna.

**RF IN:** Connect a 50 ohm coax jumper cable from this standard SO-239 connector to the ANT jack on the back of the transceiver.

**Charger:** Charging socket.

**GND:** Connect to antenna system ground.



*This picture is for reference only and may change later.*

**INSTALLATION**

The mAT-125E tuner is designed for indoor operation only. If you use it outdoors (Field Day, for example), you must protect it from rain or moisture. Always turn your radio off before plugging or unplugging anything. The radio may be damaged if cables are connected or disconnected while the power is on.

## USABLE TRANSCEIVERS

Most HF transceivers can use mAT-125E. They only need to satisfy two conditions: the RF power level can be adjusted below 20 W, and they have at least one of AM, FM, CW, FSK, RTTY modes to output constant carrier.

It should be noted that in the tuning process, a larger VSWR can be detected by the transceiver. Because the output power of the transceiver is very low, this high VSWR should not damage the transceiver. Some transceivers are very sensitive to this high VSWR even at low power levels and they may turn off the transmitting carrier, which will cause the tuning to stop. Yaesu transceivers are particularly susceptible to this issue. For Yaesu, the mAT-30 tuner will not cause the radio to stop transmitting in the presence of higher VSWR while tuning, even at low power output.

## INSTALLATION

1. Connect the HF/50 MHz antenna jack on the transceiver to the “RF IN” jack on the back of the mAT-125E, using a 50 ohm coax cable rated 120 watts or greater.
2. Connect the antenna feedline coax to the “ANTENNA” jack on the rear of the mAT-125E.
3. Grounding the mAT-125E tuner will enhance its performance and safety. We recommend that you connect your tuner to a suitable ground; a common ground rod connected to buried radials is preferred, but a single ground rod or a cold water pipe can also be used. We strongly recommend the use of a properly installed, high quality lightning arrestor on all antenna cables

## OPERATION

As with other general tuners, a constant RF signal of 1-20 watts power level is needed to be present at the tuner input during the tuning cycle. This signal should be CW, FM, FSK, or RTTY. The power level of the input RF signal must not be greater than 20 watts, otherwise it will shorten the life of the tuning cycle, and the tuner can be damaged.

The mAT-125E has two modes of operation: automatic and semi-automatic. Users can easily switch between the two modes of work by using multi-function combination buttons.

**Automatic Mode:** When the RF signal is input into the mAT-125E, the tuner verifies that the power at its input (FORWARD) is within the predefined range (1-20W). Power above this range can damage the relays due to hot switching, while power below the predefined range can cause inaccurate tuning. If the tune power is within the specified range, the tuner captures a 20ms sample of the signal. The sample signal frequency is divided by 128 and measured by a counter. The tuner reads the tuning data corresponding to the measured frequency from its internal memory (such data exists if tuning was previously performed for this frequency). The tuner sets the tuning network according to that data and measures the resulting VSWR, and displays the current VSWR by the LED of the front panel. Even if SWR is higher than 2:1 the tuning cycle will not be activated unless the TUNE key is pressed and released.

**Semi-automatic:** When the RF signal is input into the mAT-125E, the tuner only measures the current VSWR and displays the results through the LED on the front panel. A tuning cycle is not initiated until the [TUNE] key is pressed. When the [TUNE] key is pressed and released, similar to the automatic mode, the tuner measures the frequency of the input signal, reads the configuration data from the corresponding memory, and configures the LC tuning network. After completing the above operation, the tuner will measure the current VSWR. If  $VSWR < 1.5$ , the tuning is completed. If it is higher, a new tuning cycle is started. When the tuner completes the tuning process it stores the tuning network data in memory in a location corresponding to the current frequency.

**Manual:** Regardless of whether the tuner is in automatic or semi-automatic mode, you can fine tune the current LC tuning network by pressing the [CUP], [CDN], [LUP], and [LDN] key. After the manual seat adjustment is completed, you can save the current configuration data in the corresponding memory by pressing the [TUNE]+[LUP] combination key.

## **TUNING**

The steps to start tuning are as follows:

- Set the radio to the FM, FSK or RTTY mode, to give the transceiver output a stable carrier signal
- Reduce output power to 20 watts or less.
- Press and hold the transceiver's [PTT] button, then press the [TUNE] button once on the front panel of mAT-125E to start the automatic tuning.
- Return to the previous mode and power level after tuning, the tuning process completion.
- After tuning, the front panel's three lights are used to display the current VSWR.

## **ONLINE / BYPASS SWITCHING**

There are two ways to switch the state of the tuner. Shortly press the [TUNE] button and the [TUNE] +[CDN] combination button. If the 1.5 indicator flashes once, it means that the current state is online, and if the 3.0 indicator flashes once, it means that the current state is offline.

## **COMBINATION BUTTON**

A combination button is formed by [TUNE] and other buttons ([CDN], [LUP], [LDN]) to perform part of the function operation. The combination button means that the [TUNE] button is first pressed and held, the other button is pressed, and then they are released together.

**[TUNE]+[CDN]:** Online/Bypass switching. When the 1.5 light flashes, it indicates that the current status is online. When the 3.0 light is flashing, it indicates that it is bypass.

**[TUNE]+[LDN]:** Automatic/semi-automatic mode switching. When the 1.5 light flashes, it indicates that the current mode is automatic. When the 3.0 light is flashing, it indicates that it is semi-automatic.

**[TUNE]+[LUP]:** The matching data of the tuning network is saved to the corresponding memory.

## **AUTOMATIC SHUTDOWN**

The tuner has automatic shutdown function for saving battery power. When the function is activated, the tuner will turn off automatically if no button is pressed in about 3 minutes. Because the tuner uses magnetic latching relays, the current tuning state will not be affected after the tuner is turned off.

In shutdown state, press the [TUNE] button and then press [POWER] button to boot, you can open or close the automatic shutdown function. When the 1.5 light blinks once, it indicates that this function is activated. When the 3.0 light blinks once, this function is turned off.

## **FLASHING OF THE INDICATOR LIGHT WHEN STARTING UP**

When the mAT-125E is powered on, the LED on the front panel flashes to indicate the settings for current tuning

1.5: If flashing once, it indicates semi-automatic mode. If flashing twice, automatic.

2.0: If flashing once, it indicates automatic shutdown function is off. If not flashing, indicating automatic shutdown function in on.

**BATTERY REPLACEMENT**

The tuner uses two 18650 lithium batteries with a recommended capacity of 2000-2500 mAh. The tuner contains a battery protection circuit. When the tuner is first used or the battery is replaced, it must be charged to activate the internal protection circuit before it can work properly.

**SAFETY PRECAUTIONS**

*Never operate the tuner with its cover removed. Contact with the components inside the tuner while transmitting will result in painful RF burns.*

*Locate the tuner so that the rear terminals are not accessible during operation. The single wire connection may have high voltage while transmitting.*

*Disconnect all antennas from the tuner during lightning storms.*

**TRANSPORT**

Because there are two lithium batteries installed inside the tuner, please comply with local laws when transporting.

**TECHNICAL SUPPORT**

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

**PRODUCT FEEDBACK**

We encourage product feedback! Tell us what you really think of your *MAT-TUNER* product. In an email tell us how you used the product and how well it worked in your application. We like to share your comments with our staff, our dealers, and even other customers at the *MAT-TUNER* website.

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