

# Antenna Tuner

USER MANUAL

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# Introduction

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This user manual covers the operation of the magnetic loop antenna remote tuning system.

## Hardware

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The magnetic loop antenna tuner has been built with simplicity in mind. The front panel consists of 3 hardware buttons, one potentiometer and one LED.

Figure 1 and Figure 2 show the front and rear panels of the antenna tuner's control unit. The following elements are labeled on the pictures:

1. "p" power button
2. LED indicator
3. "-" decrease button
4. "+" increase button
5. Fine-tuning potentiometer
6. RJ45 connector, connects with the capacitor box via a straight-through shielded Ethernet cable
7. DC power connector (12 V / 1 A, pin: +, ring: -), connect to a power adapter for charging the internal battery pack

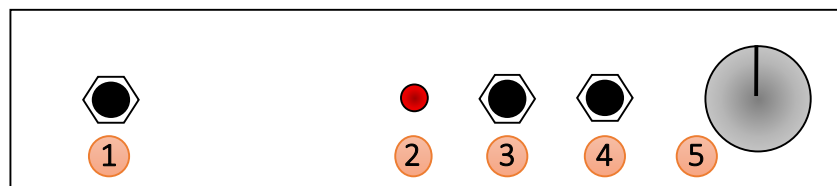


Figure 1 – front panel



Figure 2 – rear panel

## Operating Instructions

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The antenna tuner features the following operation modes:

- Power off: device powered-off, zero current consumption
- Standby: normal operation mode for tuning the antenna
- Settings: service mode for adjusting the operating parameters

The antenna tuner is operated by short- or long-pressing one of the "p", "+" and "-" push-buttons.

Figure 3 shows the state diagram of the antenna tuner's operating states. In the following diagram, state transitions are achieved by briefly pressing the “p”, holding it for 0.5 or 5 seconds. The LED state changes are shown along the state transitions.

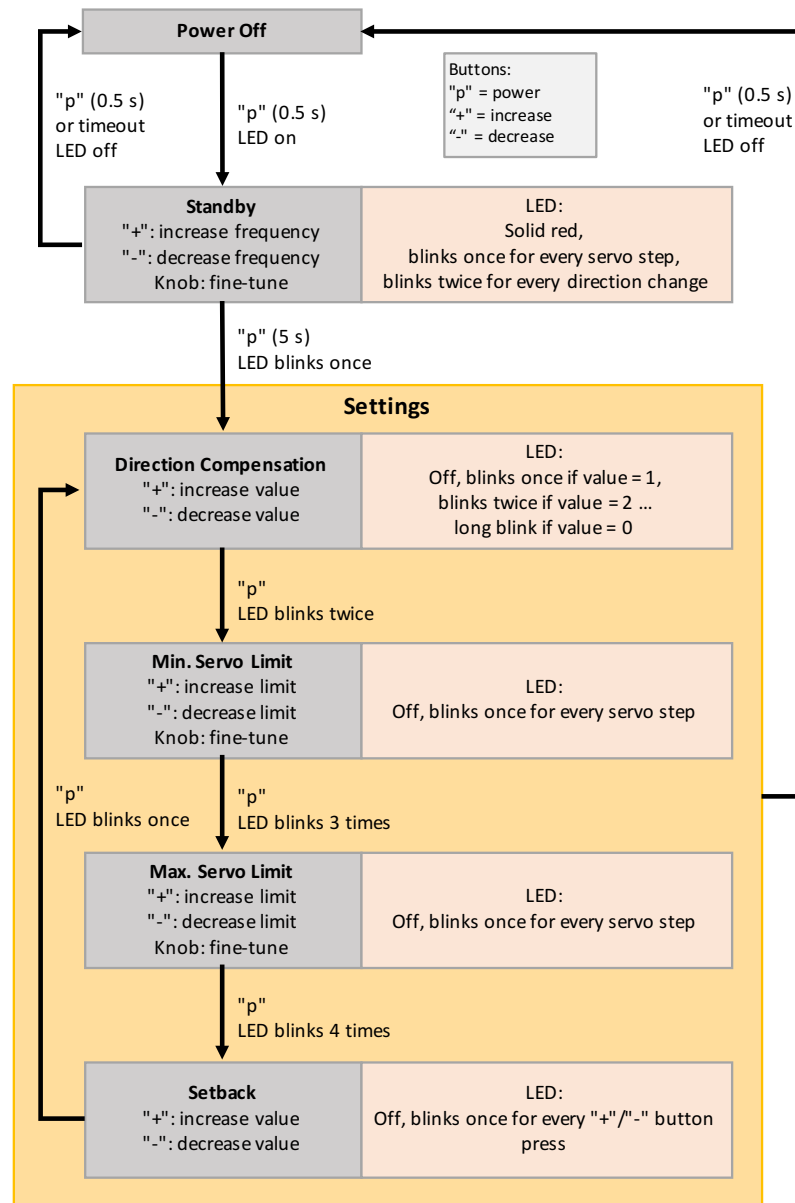


Figure 3 – navigation structure

The unit is turned on by pressing the “p” button for the duration of half a second. The LED will light-up solid red. Within this state, the user can decrease or increase the antenna’s resonance frequency by pressing the “+” and “-” buttons; then fine-tune it by turning the knob of the potentiometer. The LED will blink for every adjustment step. Changing the tuning direction will cause the LED to blink twice.

Once the antenna has been tuned, it is advisable to turn off the tuner control unit before transmitting over the air. This will ensure that the antenna does not get accidentally detuned due to RF interference with the tuner electronics. Turning off is achieved by pressing the “p” button for half a second. When the unit is turned back on, the servo will slightly move away and then come back to its previous tuning position.

The system will automatically turn of after 10 minutes of inactivity in order to save battery power.

# Adjusting the Settings

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The settings mode is entered by pressing the “p” button for 5 seconds while in the standby mode. The LED will blink once and then stay off, signaling that the first settings menu entry has been activated.

The following parameters can be adjusted via the settings mode.

## Direction Compensation

This is the first item in the list after entering the settings. Consequently, the LED will blink once and then turn off when entering this setting.

This value tells the control unit how much the servo must “overshoot” its target position in order to compensate for the mechanical slop (backlash) of the servo’s reduction gears. For a given signal value, the angle of the servo axle will be slightly different depending on the direction of rotation. In order to counter the effect, the servo will move slightly further beyond pre-set position. Greater values will cause a larger overshoot. There will be no overshoot if this value is set to 0.

This value can be adjusted by pressing the “+” and “-” push-buttons. For each button press, the LED will blink an equal amount of times to the value that has been set. One slightly longer blink tells that the value has been set to 0.

## Minimum Servo Limit

This is the next parameter to be set. Briefly pressing the “p” button while in the Direction Compensation mode will activate this setting. The LED will blink twice and then turn off.

This value determines the lower limit of the servo rotation range. This value must be set such that the rotor of tuning capacitor is fully driven-in (highest capacitance) without causing the servo to bind against the mechanical stop inside the capacitor.

This value can be adjusted using the “+” and “-” buttons then fine-adjusted using the fine-tuning potentiometer knob. The LED will blink once for every adjustment step.

## Maximum Servo Limit

This is the analogue of the previous setting at the other end of the capacitor’s range of rotation. The LED will blink 3 times when entering this setting. Adjustment is performed in a similar way as in the previous setting.

## Setback

This is the next parameter to be set. Briefly pressing the “p” button while in the Maximum Servo Limit mode will activate this setting. The LED will blink 4 times and then turn off.

This value determines the amount of angular distance the servo must step back prior to moving in the opposite direction.

Some RC servos have a built-in hysteresis that require a minimum delta in the signal value before starting to rotate in the opposite direction. Increasing (decreasing) the control signal by one step will normally cause the servo shaft to rotate by one step in the desired direction. Decreasing (increasing) the signal by one step after it has been increased (decreased) will have no effect on the servo position; decreasing (increasing) by X steps, where X is the threshold, will cause the servo to rotate back by X steps

in one shot. In order to be able to decrease (or increase) by 1 step after a change of direction, the servo first moved (set-back) X steps in the opposite direction then moved X+1 steps in the intended direction. This forces the servo to rotate by exactly 1 step irrespective if a direction change has occurred.

This value determines the amount of X which is described above.

Upon setting this value, the LED will blink for every press of the “+” or “-” button push and the servo will move X steps back and forth. The servo won’t be able to move if X is less than the required threshold.