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› Malahit ATU-100 Antenna Tuner DIY Kit User Manual

Malahit ATU-100

Malahit ATU-100 Automatic Antenna Tuner DIY Kit User Manual

Brand: Malahit | Model: ATU-100

1. INTRODUCTION

The Malahit ATU-100 is a Do-It-Yourself (DIY) kit for an automatic antenna tuner, designed by N7DDC. This kit is intended for amateur radio enthusiasts who wish to assemble their own high-quality antenna tuning unit. It features a 0.96-inch OLED screen for clear data display and comes with the latest 3.2 version firmware pre-programmed. The tuner is designed to operate across a wide frequency range of 1.8-50MHz, automatically matching antenna impedance to optimize radio performance.

2. SETUP AND ASSEMBLY

This section provides detailed instructions for assembling your ATU-100 kit. While the kit includes pre-soldered SMD components and chips, careful attention to detail is required for successful assembly of the remaining parts.

2.1 Kit Contents

Before beginning assembly, verify that all components listed below are present in your kit. Refer to the image for a visual representation of the kit contents.

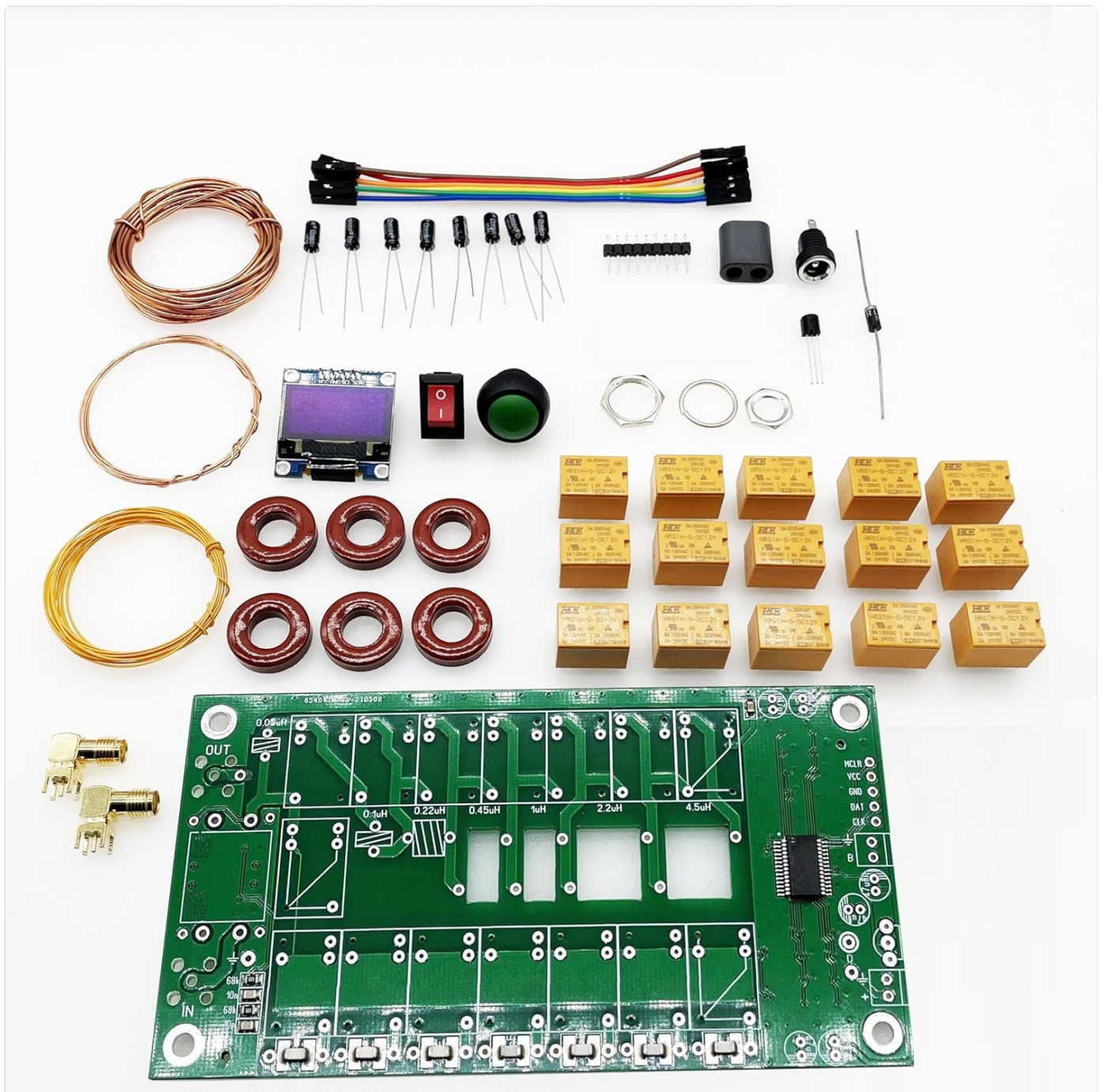


Image: Overview of all components included in the Malahit ATU-100 DIY kit, featuring the PCB, toroids, relays, OLED display, wires, and various electronic parts.

- Printed Circuit Board (PCB) with pre-soldered SMD components
- Toroid cores (various sizes for inductors)
- Relays (multiple units)
- 0.96-inch OLED Display module
- Capacitors (through-hole and high-voltage SMD)
- Inductor wires (enameled copper wire)
- Connectors (power jack, coax connectors)
- Push buttons and switches
- Jumper wires and header pins
- Diodes and other discrete components

2.2 Tools Required

The following tools are recommended for assembly:

- Soldering Iron with a fine tip
- Solder (rosin core, electronics grade)
- Wire Cutters/Strippers
- Small Pliers (needle-nose recommended)
- Magnifying Glass or Loupe (highly recommended for small components)
- Multimeter (for continuity checks)
- Small diameter rods (e.g., Allen wrenches) for winding coils (4mm and 6mm recommended)
- Electrical Tape or insulating material (if using a metal enclosure)

2.3 Assembly Steps

Follow these steps carefully to assemble your ATU-100. It is crucial to take your time and verify each step before proceeding.

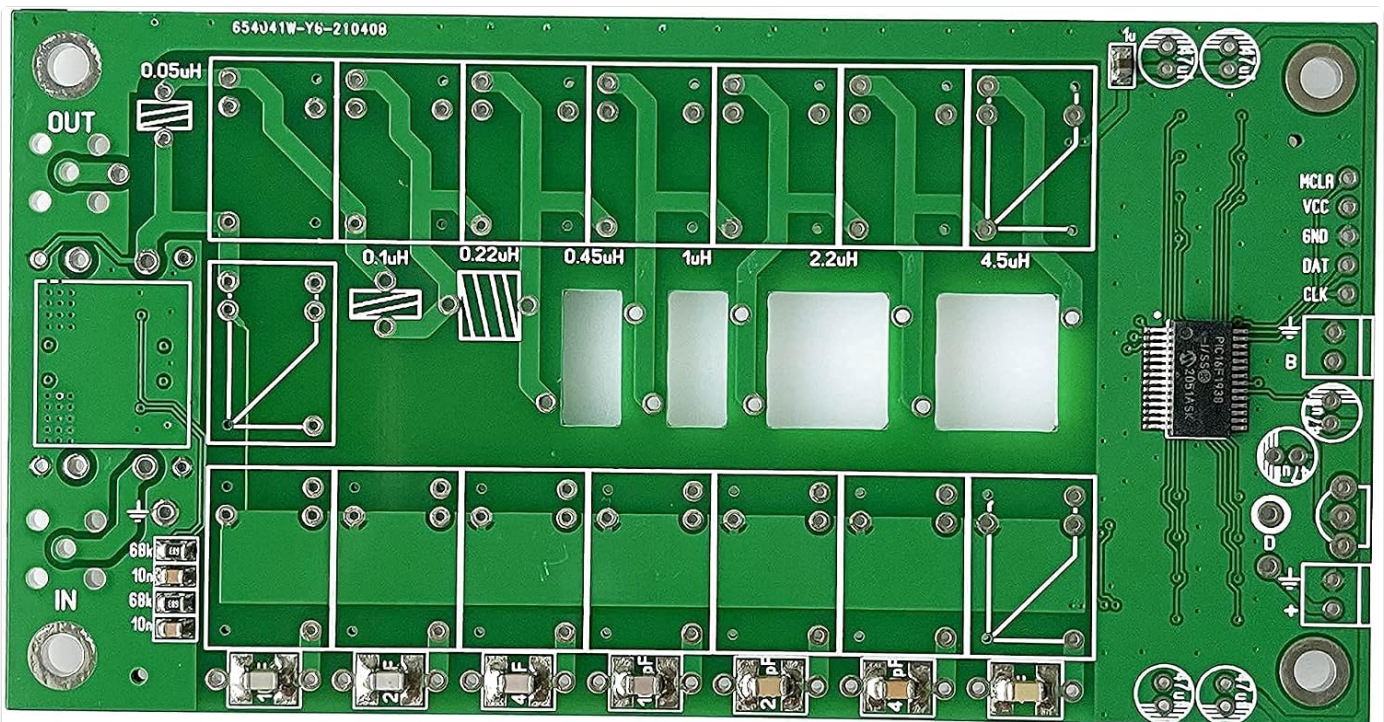


Image: Close-up view of the ATU-100 Printed Circuit Board (PCB), showing component outlines and connection points.

1. **Prepare the PCB:** Ensure the PCB is clean and free of debris. All Surface Mount Device (SMD) components should already be soldered in place.
2. **Wind the Toroids:** This is a critical step.
 - Refer to the provided instruction sheet for specific wire lengths and winding turns for each toroid.
 - For the binocular core (tandem match transformer), ensure correct wire routing. The four small holes just outside the binocular toroid's diagram on the PCB are for these connections.
 - Use appropriate diameter rods (e.g., 4mm and 6mm Allen wrenches) to wind the air core inductors.
 - It is recommended to wind and install the toroids **before** soldering the relays, as this provides more working space.

- Ensure the enamel insulation is removed from the ends of the wires before soldering. A hot soldering iron can help burn off the varnish.

3. **Install Relays:** Carefully insert and solder all relays into their designated positions on the PCB. Ensure correct orientation.

4. **Install Capacitors:** Solder the through-hole capacitors. Pay close attention to the polarity of electrolytic capacitors; the marked side on the capacitor should align with the white mark on the PCB's silkscreen.

5. **Install Diodes:** Solder any remaining diodes. For vertically installed diodes, ensure the white ring mark on the diode aligns with the marking on the PCB.

6. **Connect the OLED Display:**

- Before soldering the slip-on terminals to the OLED module, make a diagram of the pinout (Gnd, VCC, SCL, SDA) as these markings may become obscured.
- Connect the OLED display to the PCB using the provided wires, ensuring correct pin alignment.

7. **Connect Switches and Buttons:**

- Wire the Auto, BYP (Bypass), and Tune switches to the PCB. Note that the wire connecting half of the Auto, BYP, and Tune switches typically goes to GROUND, not the positive (+) wire, as might be mistakenly depicted in some generic diagrams. The other side of the Tune switch receives the positive wire.
- Use appropriate wire gauges. For initial power connections, 18 AWG stranded insulated wire may be used, but smaller gauges (e.g., 22 AWG stranded insulated wire) are necessary for other connections, especially for the small PCB holes for Auto and BYP switches.

8. **Power Connections:** Connect the power input jack and any on/off switch wiring. Ensure correct polarity for the power supply.

9. **Coax Connectors:** Solder the input ("IN") and output ("OUT") coax connectors to the PCB. Double-check that the center pin connects to the signal trace and the outer shield connects to ground.

10. **Final Inspection:** After all components are soldered, perform a thorough visual inspection for:

- Cold solder joints or solder bridges.
- Correct component orientation (diodes, capacitors, relays).
- Proper wire routing and secure connections.
- No short circuits, especially if installing into a metal enclosure. Consider adding electrical tape or insulation to the inside of the enclosure where solder points might contact the metal.

When you assemble the kit, you will get:

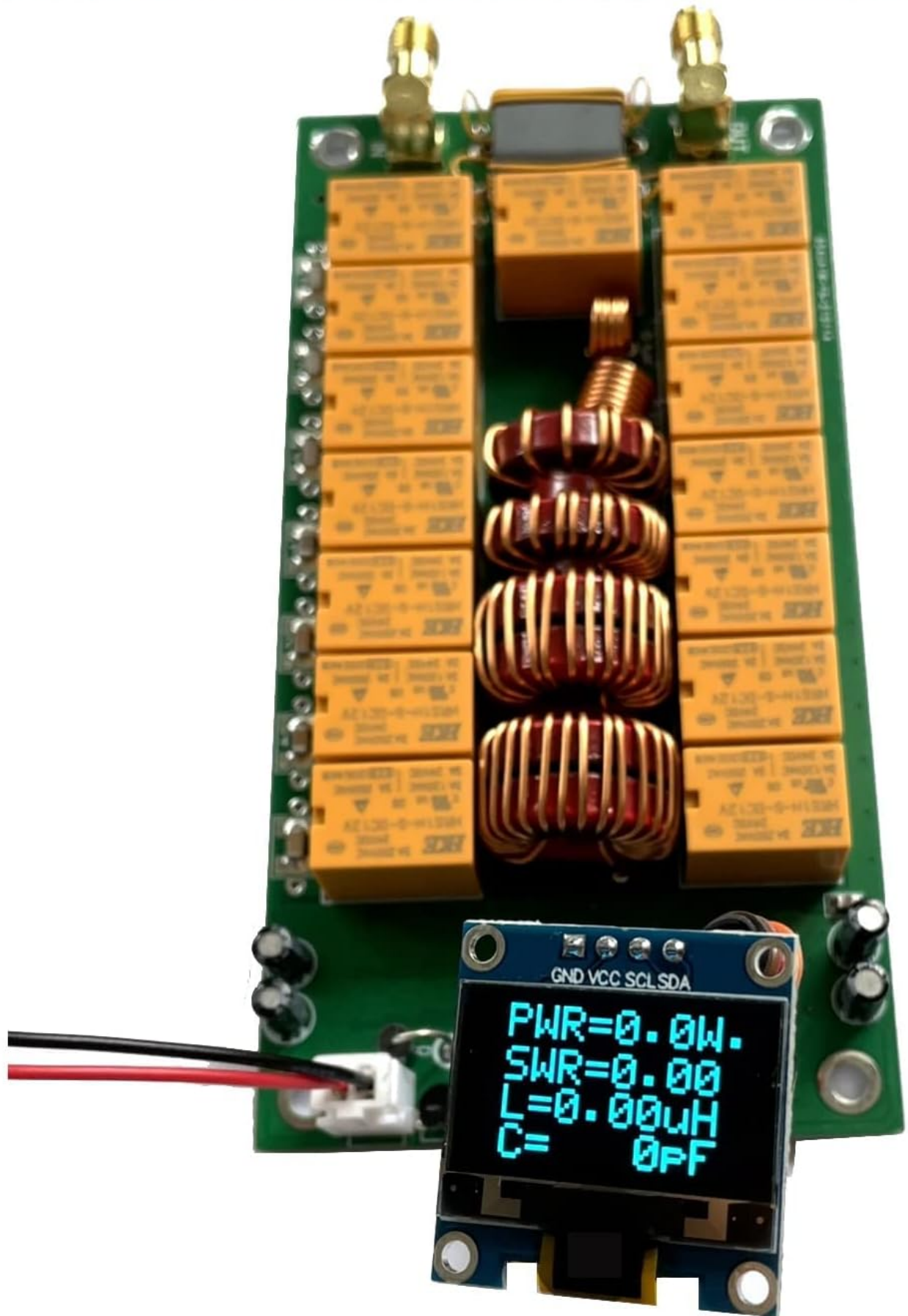


Image: A fully assembled Malahit ATU-100 unit, showcasing the PCB, toroids, relays, and the connected OLED display showing operational parameters.

ATU-100 Antenna Tuner

DIY Kits



When you assemble correctly and successfully, you will get a beautiful and compact tuner (pictured on the right)

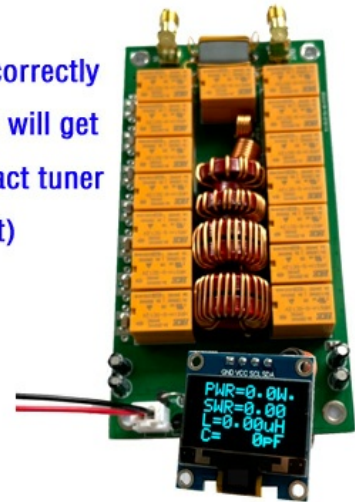


Image: A combined view showing the schematic diagram of the ATU-100 and a detailed image of the assembled unit, useful for understanding component placement and connections.

3. OPERATING INSTRUCTIONS

Once assembled and connected to your radio and antenna, the ATU-100 is designed for straightforward operation.

1. **Power On:** Connect a 10-15 VDC power supply to the tuner. The OLED display should illuminate.
2. **Connect Equipment:** Connect your radio's antenna output to the "IN" port of the ATU-100 and your antenna to the "OUT" port.
3. **Automatic Tuning:** The ATU-100 is an automatic tuner. When RF power is applied (e.g., by transmitting a low-power carrier), the tuner will automatically begin the tuning process to achieve the lowest possible Standing Wave Ratio (SWR).
4. **Monitor Display:** The OLED display will show key parameters such as:
 - **PWR:** Transmitted power in Watts.
 - **SWR:** Standing Wave Ratio. The goal is to achieve an SWR close to 1.0.
 - **L:** Inductance value in microhenries (uH).
 - **C:** Capacitance value in picofarads (pF).
5. **Manual Tuning (if applicable):** While primarily automatic, some versions or configurations may allow for manual adjustments or bypass modes via the dedicated buttons. Refer to the specific firmware documentation for advanced features.
6. **Recommended Power:** While tuning, it is recommended to use a maximum power of 30 watts. After tuning is complete and a low SWR is achieved, the tuner can handle up to 100 watts for operation.

4. MAINTENANCE

The ATU-100 is a robust device, but proper care ensures its longevity and performance.

- **Keep Clean:** Regularly clean the exterior of the tuner with a soft, dry cloth. Avoid using harsh chemicals or abrasive materials.
- **Protect from Elements:** Keep the tuner away from moisture, extreme temperatures, and direct sunlight.
- **Inspect Connections:** Periodically check all soldered connections and wiring for any signs of wear or looseness.
- **Firmware Updates:** If new firmware versions become available, follow the manufacturer's instructions for updating. The kit comes with version 3.2 pre-programmed.

5. TROUBLESHOOTING

If you encounter issues with your ATU-100, consider the following common problems and solutions:

Problem	Possible Cause	Solution
No display / Relays constantly click	Incorrect wiring, power supply issue, or assembly error.	Verify power supply voltage (10-15 VDC) and polarity. Check all wiring connections, especially to the OLED display and switches, for correct pinout and secure soldering. Inspect for any solder bridges or short circuits on the PCB. Ensure all components are correctly oriented (diodes, capacitors).
Tuner not matching / High SWR	Incorrect antenna connection, faulty components, or insufficient power for tuning.	Ensure antenna and radio are correctly connected to "OUT" and "IN" ports respectively. Verify all toroid windings are correct (number of turns, wire length, enamel removed). Check all relays for proper function. Ensure minimum power for tuning (1 watt) is applied.
Intermittent operation	Loose connections or cold solder joints.	Re-inspect all solder joints, especially those subject to mechanical stress. Re-solder any suspicious connections. Ensure all connectors are firmly seated.

6. SPECIFICATIONS

Key technical specifications for the Malahit ATU-100 Automatic Antenna Tuner:

Parameter	Value
Power Supply Range	10-15 VDC
Max Current	450mA
Max Working Power	100 watts
Max Measured Power	150 watts
Minimum Power for Tuning Start	1 watt
Recommended Max Power While Tuning	Not above 30 watts

Parameter	Value
Minimum Measured Power	0.1 watt
Step for Measurement (under 10W)	0.1 watt
Step for Measurement (above 10W)	1 watt
Power Measurement Accuracy	10%
Maximum Inductance Set	8.5 uH
Minimal Step for Setting Inductance	0.1 uH
Maximum Installed Capacity	1870 pF
Minimal Step for Setting Capacity	10 pF
Product Dimensions	5.9 x 3.9 x 1.9 inches
Item Weight	8.8 ounces
Frequency Range	1.8-50MHz
Impedance	50 Ohm

7. SUPPORT AND WARRANTY

For technical support, questions regarding assembly, or warranty information, please contact the seller or manufacturer directly. Refer to your purchase documentation for specific contact details.

As this is a DIY kit, successful operation is dependent on correct assembly. While the kit includes high-quality components, the manufacturer is not responsible for issues arising from incorrect assembly or modification.