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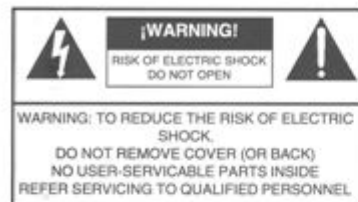
AT4K 2500 Watt Antenna Tuner

Owner's Manual



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WARNING: TO PREVENT FIRE OR ELECTRICAL SHOCK DO NOT EXPOSE TO RAIN OR MOISTURE



An appliance and cart combination should be moved with care. Quick stops, excessive force and uneven surfaces may cause the appliance and cart combination to overturn.



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of untraced "dangerous voltage" within the product's enclosure. Failure to observe sufficient magnitude increases the risk of electric shock to persons.



The exclamation mark within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (including instructions in the literature accompanying the appliance).

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE. DO NOT OPEN THE CABINET WHILE OPERATING. REFER SERVICING TO QUALIFIED PERSONNEL ONLY.

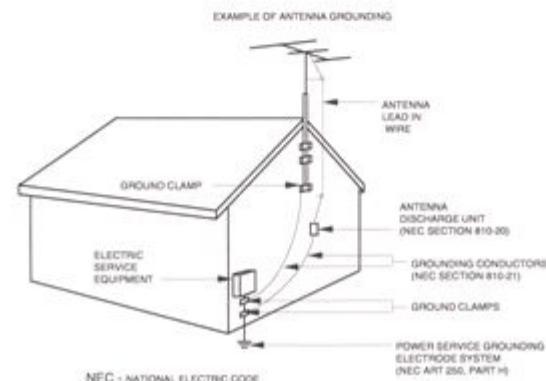
CAUTION: TO PREVENT ELECTRIC SHOCK, DO NOT USE THE THREE WIRE CORD WITH AN EXTENSION CORD RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.

1. Read Instructions—All the safety and operating instructions should be read before the appliance is operated.
2. Retain Instructions—The safety and operating instructions should be retained for future reference.
3. Heed Warnings—All warnings on the appliance should be adhered to.
4. Follow Instructions—All operating and use instructions should be followed.
5. Cleaning—Unplug this appliance from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
6. Do Not Use Attachments—not recommended by the manufacturer or they may cause hazards.
7. Water and Moisture—Do not use this product near water—for example, near a bathtub, wash bowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool—and the like.
8. Accessories—Do not place this product on an unstable cart, stand, tripod, bracket, or table. The product may fall, causing serious injury to a child or adult, and serious damage to the appliance.
9. Ventilation—This product should never be placed near or over a radiator or heat register. This product should not be placed in a built-in installation such as a bookcase or rack unless

- proper ventilation is provided or the manufacturer's instructions have been adhered to. Any slots or openings in the cabinet are provided for ventilation. To ensure reliable operation of the video product and to protect it from overheating, these openings must not be blocked or covered. The openings should never be blocked by placing the product on a bed, sofa, rug, or other similar surface.
10. Grounding or Polarization—this product is equipped with a 3-wire line cord receptacle. It is intended for use with a 3-wire properly grounded power socket. Do not defeat the safety purpose of the supplied line cord and plug.
11. Power Sources—This product should be operated only from the type of power source indicated on the marketing label. If you are not sure of the type of power supplied to your home, consult your appliance dealer or local power company.
12. Power-cord Protection—Power-supply cords should be routed so they are not likely to be walked on or pinched by items placed upon or against them. Pay particular attention to cords at plugs, convenience receptacles, and the point where they exit.
13. Lightning—For added protection for this product during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the wall outlet.

14. Power Lines—An outside antenna system should not be located in the vicinity of overhead power lines, other electric light or power circuits, where it can fall into such power lines or circuits. When installing an outside antenna system, extreme care should be taken to keep from touching such power lines or circuits as contact with them may be fatal.
15. Overloading—Do not overload wall outlets and extension cords as this can result in a risk of fire or electric shock.
16. Object and Liquid Entry—Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short-out parts that could result in a fire or electric shock. Never spill liquid of any kind on the product.
17. Servicing—Do not attempt to service this product yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.
18. Damage Requiring Service—Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
 - a. When the power-supply cord or plug is damaged.
 - b. If liquid has been spilled, or objects have fallen into the product.
 - c. If the product has been exposed to rain or water.
 - d. If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions. An improper adjustment may result in damage and will often require extensive work by a qualified

- technician to restore the product to its normal operation.
 - e. If the product has been dropped or the cabinet has been damaged.
 - f. When the product exhibits a distinct change in performance—this indicates a need for service.
19. Replacement Parts—when replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer or have the same characteristics as the original parts. Unauthorized substitutes may result in fire, electric shock or other hazards.
 20. Safety Checks—Upon completion of any service or repairs to this product, ask the service technician to perform safety checks to determine that the product is in proper operating condition.
 21. Outdoor Antenna Grounding—Before attempting to install this product, be sure the antenna or cable system is grounded so as to provide some protection against voltage surges and built-up static charges.
 - a. Use No. 10 AWG copper, No. 8 AWG aluminum, No. 17 AWG copper-clad steel or bronze wire or larger, as ground wire.
 - b. Secure antenna lead-in and ground wires to house with stand-off insulators spaced from 4 feet to 6 feet apart.
 - c. Mount antenna discharge unit as close as possible to where lead-in enters house.
 - d. A driven rod may be used as the grounding electrode where other types of electrode systems do not exist. Refer to the National Electric Code, ANSI/NFPA 70-1990 for information.
 - e. Use jumper wire not smaller than No. 6 AWG copper or equivalent, when a separate antenna grounding electrode is used.



Thank you for purchasing a Palstar AT4K Antenna Tuner. This antenna tuner has been designed and manufactured to high quality standards, and will provide reliable operation for many years.

Please carefully read the Owner's Manual in order to take advantage of the many interesting features that will provide years of enjoyable amateur radio operation.

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The Palstar AT4K Antenna Tuner is an American made impedance matching network that can provide unbalanced or balanced output.

The AT4K T-matching network utilizes a 1:1 unbalanced-to-balanced transformer in the input of the network. When the network is properly tuned, a 50 Ohm impedance will be presented to both the input and output of the balun allowing it to operate at maximum efficiency.

The AT4K optimizes the performance of your antenna and transmitter by providing adjustable impedance matching using a T type circuit configuration. The AT4K also measures the power and Voltage Standing Wave Ratio (VSWR) which al-

lows you to tune the SWR to the lowest ratio for the selected transmit frequency.

Integrated into the AT4K is a frequency compensated lighted dial dual-movement SWR meter. The meter features the ability to read True Active Peak and Peak Hold.

Designed to handle both Balanced line feeds and coax feeds, the AT4K features a front panel mounted switch to select between feeds.

Tuning is achieved with the front panel mounted controls. The dual Vernier dials allows for tuning with precision and accuracy, while the Inductor crank handle facilitates coarse adjustments.

Front Panel Indicators and Controls

Metering Dual movement cross needle power and frequency compensated coupler

Controls

Input Tuning 480 pF variable capacitor (6kV Peak)
Output Tuning 480 pF variable capacitor (6kV Peak)
Inductance 24 μ H roller .040 x .300" copper silver-plated edgewound copper strap rated at 5kV and 10 amps—10" long

Antenna Selector Switch 6 position: Coax 1 tuned and tuner Bypass, Coax 2 tuned and tuner Bypass; Bypass and balanced antenna Wafer switches are ceramic (7kV/10A)

Power Range Switch 2 position 300 W-LO /3000 W-HI

Rear Panel Connectors

Coax 1 SO239 connector (silver/gold/TFE)
Coax 2 SO239 connector (silver/gold/TFE)
Bypass SO239 connector (silver/gold/TFE)
RF INPUT SO239 connector (silver/gold/TFE)
Balanced Line Dual High Voltage Nylon66™ terminal post

Other

Frequency Coverage 1.8 — 29.5 MHz
Power 2500 W single tone continuous, 4 kW PEP
Impedance Range See charts of power.complex Z in appendix per band

Balanced Output 1:1 current type Balun at input-Ferrite
Dimensions 6.5"H x 15"W x 16"D (incl. terminals)
Weight 22 lbs.
Materials Chassis, brackets and top cover are gold chem.-film coated aluminum (.090) & powder coated. Hardware is brass and silver plated copper.

Front Panel Front label is matte powder coat + screened

Unpacking

Carefully remove the AT4K from the shipping carton and inspect it for signs of damage. If any damage is apparent, notify the transportation carrier or dealer immediately. **We recommend keeping the packing carton for moving, storing or reshipping the tuner to us for repair if required.**

Location

Select a location for the AT4K that allows the connectors to be free from any possible contact during operation and with unrestricted air flow for cooling.

or through the tuned circuit depending on the setting of the OUTPUT SELECTOR switch on the front panel.

For coax feed (unbalanced) select the coax (OUT) position. This done by switching the red TUNED OUTPUT button on the lower front panel between the OUTPUT knob and the INDUCTOR knob to the coax (OUT) position.

For a balanced feed antenna, connect a balanced feedline to the white Nylon 66™ BALANCED OUTPUT posts on the



WARNING: Balanced antennas will produce high RF voltages at the output post connectors. RF burns may result if touched during transmission.

Installation Procedures

Connect a coax cable from your transmitter to the RF INPUT connector on the rear panel. Keep the cable as short as possible. If you use a linear amplifier, connect your transmitter to the linear amplifier input and the linear amplifier output to the AT4K. Connect coax cable(s) from your antenna to COAX 1 or COAX 2 connectors on the rear panel. These connectors are either direct from the transmitter

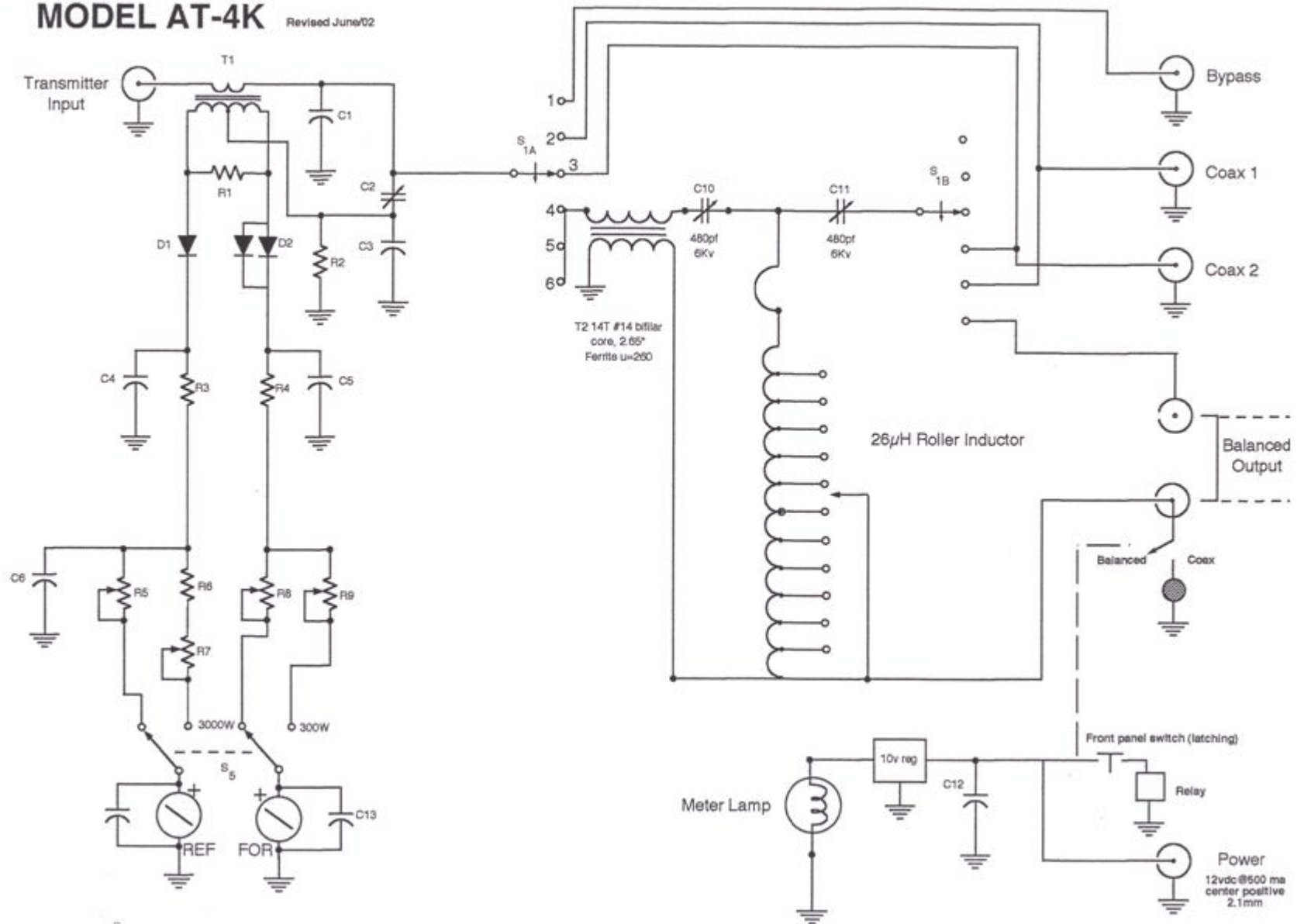
back panel and make sure that the red TUNED OUTPUT button on the lower front panel is in the BALANCED (IN) position.

Connect a dummy load to the BYPASS connector using a coax cable. This lets you select the dummy load from the OUTPUT SELECTOR switch. Any antenna that does not require the use of an antenna tuner may be connected to the BYPASS connector if desired.

Schematic Diagram

MODEL AT-4K

Revised June02



COAX 1 coaxial connector for output to Antenna One.

COAX 2 coaxial connector for output to Antenna Two.

BYPASS coaxial connector for output to dummy load or third coax output. Bypasses tuner, but meter circuits are on if AC adaptor is connected to jack located on rear panel.

RF INPUT coaxial connector for input from transmitter or amplifier.



BALANCED OUTPUT two nylon High Voltage post connectors for output to RF balanced twin-lead antennas. Copper strap jumper.

12 VDC INPUT (2.1 mm plug) for supplied 12VDC ac adapter at 500mA to power the meter lamp and fan. Note: there is a ferrite TOROIDAL core on the end of the adapter connector to minimize the ingress of RF into the active circuits in the tuner.

PLEASE DO NOT REMOVE

GROUND post/wing nut type ground connector.

FIGURE 1 REAR PANEL CONNECTORS



1. POWER/SWR METER Dual needle meter displays FORWARD and REFLECTED power in watts. SWR is measured where the two needles intersect on the red scale.

2. DIRECT-TUNED MODE SWITCH Six-position rotary switch selects an output coaxial connector with direct mode which bypasses the tuner and tuned position which passes antenna through the tuner components.

a. BYPASS selects BYPASS COAX connector bypassing the tuner matching circuit but providing SWR, FORWARD & REFLECTED power meter readings.

b. DIRECT COAX 1 selects COAX 1 connector bypassing the tuner matching circuit but providing SWR, FORWARD and REFLECTED meter readings.

c. DIRECT COAX 2 selects COAX 2 connector bypassing the tuner matching circuit but providing SWR, FORWARD and REFLECTED meter readings.

d. TUNED COAX 1 selects COAX 1 connector through the impedance matching T circuit.

e. TUNED COAX 2 selects COAX 2 connector through the tuner matching T circuit.

f. BALANCED OUT selects the balanced Delrin output connectors located after the impedance matching circuit.

3. PEAK HOLD Select to read Peak Hold on the SWR meter.

4. PEAK Select PEAK to read AVG Peak.

5. RANGE Select metering range: 3000 Watts (IN)/300 Watts (OUT).

6. POWER Select to turn on metering with backlight.

7. INDUCTOR 24 μH continuously variable silver plated edgewound roller inductor driven by a crank handle. Coupled to the crank handle is a gear-driven precision mechanical counter and an insulated coupler to raise the inductor above ground.

8. TUNED OUTPUT Balanced (IN) lifts ground off roller inductor for BALANCED LINE FEED. Direct-Tuned switch must be in the TUNED balanced line position. Coax (OUT) puts direct ground on roller inductor for COAX feed. Direct-Tuned switch must be set to TUNED coax 1 or coax 2.

9. OUTPUT Continuously vernier adjustable output capacitor. Minimum capacitance is zero on dial & 100 is max capacitance.

10. INPUT Continuously vernier adjustable input capacitor. Zero is minimum capacitance & 100 is max capacitance.

4. Any time a new or different antenna is connected, it is necessary to repeat the tuning procedure for the new Antenna. Be sure to write down the new settings for future use with that antenna.

Power Specifications (assuming single tone key down)

Antenna Impedance	Max Power Rating
8 Ω – 15 Ω	500 watts (all bands)
15 Ω – 25 Ω	1000 watts (all bands)
25 Ω – 50 Ω	1500 watts (all bands)
50 Ω – 2000 Ω	160M — 2000 watts 80M - 15M — 2500 watts 10M — 1000 watts (29.5 Mhz max)



IF IN ANY DOUBT ABOUT YOUR ANTENNA IMPEDANCE PLEASE USE A PALSTAR ZM30 ANTENNA ANALYZER BEFORE ATTEMPTING HIGH POWER OPERATION.

Troubleshooting

You hear a spitting sound while tuning your AT4K at high power

You are probably tuning into an impedance that is on the low side (20Ω – 40Ω).

In this event, either reduce transmitter/amplifier power to a lower setting or change to a higher antenna impedance by using a different antenna or modifying the existing antenna.

Also, try to find the highest capacitance setting (i.e. closer to 100 on the dial) on the antenna knob. This will probably require re-adjustment of the inductance setting.

As seen in the chart below an antenna

capacitance setting that is too low under these conditions will result in excessively high voltages, high losses, and poor efficiency.

1500 Watts into a 25 Ω load @3.5Mhz

Ant Cap	Inductor	Voltage	Loss
100 pF	11.7 μH	4550	16%
200 pF	6 μH	2400	8%
300 pF	4 μH	1600	6%

In the first instance the tuner will arc and suffer almost 16% loss of which 80% will be dissipated in the roller inductor.

Limited Warranty

Palstar Inc. warrants products manufactured by it to be free from defects in material and workmanship under normal use and service **for a period of three (3) years for the AT-AUTO, AT5K, AT4K, AT 1500CV, BT 1500A, R30, and ZM30 and all other products for one (1) year from the date of delivery to the first buyer** (the "Warranty Period"). Palstar Inc's obligation under this warranty is limited to repair or replacement of the product; at its option at the Palstar factory in Piqua, OH.

Effective only when the product is returned to the factory with all transportation charges prepaid and examination of the product discloses in Palstar's judgment, to have been defective during the Warranty Period.

The Warranty Period shall not extend beyond its original term with respect to interim in-warranty repairs by Palstar. This Warranty Period shall not apply to any product which has been repaired or altered by anyone other than Palstar without prior written authorization. Warranty does not extend to any products which have been subject to damage from improper installation, application or maintenance in accordance with the operating specification. Palstar neither assumes nor authorizes any person to assume for it any obligation or liability other than herein stated.

Repair Policy

When sending in a product for service, please "double" box it carefully and ship it insured for your protection. Please include a note clearly describing the problem, how you wish the item returned and how you wish to pay for the service. Package your radio properly. Palstar Inc. is not responsible for merchandise damaged in shipment. Our service rate is \$30 per hour (1/2 hr. minimum).

Return Policy

All returns must receive prior authorization from Palstar. Returned items must be received in original—AS SHIPPED—condition including the original box, manuals, accessories, and copy of sales receipt. Returns must be within 14 days of purchase. Returned items are subject to a 25% restocking fee. Shipping is not refundable.