

# PathFINDER

Digitally Controlled  
Automatic Antenna Tuner

**ALPHA DELTA COMMUNICATIONS, INC.**



The Future of  
Automatic Tuners  
is here!



## Specifications

- Continuous Frequency Coverage Tuning 1.8 thru 30 MHz Plus 6 Meters
- Multifunction Backlit LCD shows Forward/Reverse Power and SWR
- Bargraph and Numeric reading for Forward Power
- Two Position Coax Switch
- Built-in 4:1 Balun for Balanced/Wire Antennas
- Wide 10:1 SWR Tuning Range
- 200 Watt PEP RF (100 Watts on 6M) Power Rating at 50% duty cycle
- Will Match Coax Loads from 6 to 800 ohms to 50 ohms and
- Balanced/Wire Loads from 24 to 3200 ohms.
- Audio Feedback Selection for Visually Impaired Users
- High Efficiency Switch-L Tuning Network
- Tuning time is 0 to 6 Seconds, 3 Seconds Average
- Direct Interface to Icom and Alinco Compatible Radios
- 11 to 15 Volt Operation, 1 Amp max
- Size: 7.5" W x 11"D x 2.5" H
- Weight: 5.5 lbs

Specifications subject to change without notice

**ALPHA DELTA COMMUNICATIONS, INC.**



The PathFINDER is a full-featured automatic antenna tuner designed for HF (1.8 to 54 MHz) transceivers using between 5 to 200 watts. The tuner uses a switched “L” configuration with 256 capacitor, 256 inductor and Hi/Lo-Z settings to provide over one hundred and thirty thousand tuning combinations. The tuning range is 0 to 3900 pf and 0 to 20 uH.

The “L” network works well with just about any coax fed antenna (dipole, vertical, beam, etc). Balanced or Wire antennas can be connected through the built-in 4 to 1 balun. Tuning time is between 0.1 and 6.0 seconds with the average being about 3 seconds.

A multi-function display provides graphical and numeric readout of forward and reverse power as well as SWR and user functions.

**Connections:** Connecting the unit to 12 Volts DC with the provided power cable will initialize the microprocessor and turn the unit on. Be sure to note that the red wire will go to the positive connection and the black wire will go to the negative connection. Only negative ground systems should be used.

The PathFINDER may draw up to 1 amp of regulated DC current. Be sure to only connect to a power supply that will provide 1 amp or more at 12 Volts. The unit has a reverse protection diode built in, but no internal fuses. If the user requires the unit to be fused, one can be added between the provide power cable and the power supply.

Once connected to power, the display will show the PathFINDER “splash screen” and software version number. This screen stays on for about 2 seconds. Once the main screen appears, the unit is now ready for operation. The unit defaults to antenna position 1, Auto/Semi mode in semi and SWR sound feedback off.

The user will connect suitable coaxial cable from the transceiver (or transmitter) to the SO-239 on the back panel of the PathFINDER. The user also will connect a suitable antenna to either SO-239s marked Antenna 1 and Antenna 2 or the Balanced terminals. A chassis ground terminal is provided for station ground if needed.





**Operation:** Once the PathFINDER is connected and the display is on, the user can operate the front panel controls and observe the changes in the display. There are eight front panel momentary push buttons. Some buttons provide more than one feature and some buttons are used in combination to provide additional features.

**Display:** When the unit is turned on, the display will show the letter “F” on the upper left side to indicate the forward power bargraph. The letter “R” will indicate the reverse power bargraph. The upper right corner will show the status and the numeric indication of the forward power. The lower right corner will show the SWR in numeric format.

The status section consists of three spaces. The first space shows a “1” or “2” for the antenna switch position. When antenna 1 is selected, the display will show a 1. When antenna 2 is selected, the display will show a 2. The second space shows the auto or semi mode. When the tuner is in semi mode, the display will show an S. When the tuner is in auto mode, the display will show an A. The third space shows the SWR sound feedback configuration. When the SWR sound feedback is off, the display will show a \* (star). When the SWR sound feedback is on, the display will show an S.

**Beeps:** There are two beep functions on the PathFINDER. The button feedback beep will sound at various times when a button is pressed. The button feedback beep is a higher pitched beep. The SWR feedback beep will only sound when that selection is turned on. The SWR feedback beep is a lower pitched beep.

**On Button:** The On button will turn the unit on and off. When the unit is on, the display will be active and the user can use the other pushbuttons. When the unit is off, the display is turned off and no button except the On button will be active. The tuner is also placed in a bypass condition and defaults to antenna 1 when off.

Even when the unit is in the off mode, it will draw a small amount of current. Since all relays are de-energized and the display is turned off, power consumption is held to a minimum.

The On button will beep to indicate button press if the unit is on or off.

**Tune Button:** The Tune button has two functions. Pressing the Tune button for more than one half second will start the tuning process if there is RF present between 5 and 125 watt. Pressing the Tune button for more that one half second will sound the button press beep. If the power is below 5 watts, a warning screen will appear to indicate that the power is too low for tuning. The screen will show the low power indication for two seconds and then return to the main screen. If the power is above 125 watt, a warning screen will appear to indicate power is too high. In the high power case, the tuner will not return to the main screen until the power is reduced.

If the SWR is above 10 to 1 and the power is above 75 watts at the same time and the Tune button is pressed, a warning screen will appear to indicate that the Power/SWR is too high. The tuner will not return to the main screen unit either the power or the SWR is reduced.

The high power or SWR screens are provided to prevent the user from invoking the tuner when conditions are present that may damage the tuner. The user should always set the transmitter the lowest power required for proper tuning.

Pressing the Tune button for less than one half second will place the tuner into a bypass mode where all relays are un-energized. The bypass mode is indicated by two fast beeps of the button press beep.

**Auto Button:** The Auto button controls how the tuning process will be invoked. In Auto mode ("A" shown in the display status area), the tuner will seek a 1.5 match (or better) when the SWR rises above 2.5. In Semi mode ("S" shown in the display status area), the tuner will seek a match only when the Tune push button is pressed. Both modes require that more than 5 watts of RF power be present.

Pressing the Auto button will toggle between the Auto and Semi mode. The button press is confirmed by the button beep.

**C and L Buttons:** The Capacitor and Inductor Up and Down switches are used for fine-tuning the inductors and capacitors and can be used in either, Auto or Semi mode. Momentarily pressing any of these buttons will increase or decrease the value by one step. For the inductors, the step is about .05 uH. For the capacitors, the step is about 10 pf.

Pressing and holding one of the switches will increment or decrement that tuning section until it reaches the maximum or minimum range. The end of range is signaled by a button beep.

Pressing both Cap and Ind Down switches at the same time will toggle the SWR feedback feature. As the SWR feedback feature is turned on, the display will show the S and sound a single beep from SWR feedback.

When the SWR feedback beep is on, the SWR will be indicated by a series of beeps after the tuning cycle has completed. One beeps indicates an SWR of less than 1.5. Two beeps is 1.5 to 2.0. Three beeps is 2.0 to 2.5. Four beeps is 2.5 to 3.0. Five beeps is SWR over 3.0.

**Ant 1-2 Button:** The Antenna 1-2 button will toggle between antenna 1 and antenna 2 on the back panel. The display will show the selection in the status section. The button press is confirmed by the button beep.

Antenna 1 can be used with coaxial cable feed line. Antenna 2 can be used with either coax or Balanced/Wire feed line. However, antenna 2 can only have one feed line connected at a time. Improper operation will occur if feed lines are simultaneously connected to the antenna 2 coax and balanced ports.

When a balanced line such as ladder line or twin lead is connected to the balanced port, it does not matter which post is connected to which wire of the feed line. If a single fed wire such as a random or long wire is used, connect the antenna to the post marked with the antenna symbol. When using a single fed wire, you must also connect an earth ground to the post marked ground on the balanced port.

**Other Interfaces:** On the back panel is the Radio Interface. This works with radios that are compatible with the Icom AH-4 and Alinco EDX-2. When connected to a compatible radio, it enables the "Tune" button on the radio. Pressing the Tune button on the radio will cause the radio to temporarily switch modes to CW, transmit 10 watts and start the PathFINDER tuning cycle. Once the tuning cycle is complete the PathFINDER will signal the radio that the tuning is complete and the radio will return to the previous mode and power settings. Note that only control signals are used in the radio interface. Power and ground must still be provided through the PathFINDER coaxial power jack. Also be sure to power the PathFINDER on first, then the radio to allow the radio to know that a remote tuner is present.

**Operational Notes:** Most tuning situations with the PathFINDER will be very straightforward. With the tuner in the Semi mode, simply transmit a continuous carrier (AM/FM/CW) and momentarily press the tune button. The tuner will find the best match and stop tuning.

The user should first use the PathFINDER with the Auto mode in Semi. This will allow user to become familiar with the tuner operations.

Note that even though the tuner can handle 200 watts, it must be tuned with reduced power. If your radio has an automatic "foldback" circuit, you will not have to lower the power manually. A foldback circuit will lower the power of the radio whenever the SWR is high. Typically, most solid states radios have foldback circuits. Tube radios and most Ten-Tec radios do not lower the power when the SWR is high. In these cases, the power should be lowered to approximately 10 to 25 watts before tuning is started.

In either mode (Auto or Semi), if power (either RF or +12) is removed after the tuning cycle starts, but before it finishes, the tuning will stop. The resultant tune will be undetermined; it may or may not be a match.

In some extreme tuning cases, the power readings may waver while transmitting a continuous carrier. This indicates that the tuner is near the tuning limits. You may be able to find a slightly better tune with the manual adjustment toggle switches. Sometimes reducing power will provide a better reading.

If reducing the RF power improves performance of the tuner, there may be RF getting into the tuner through the DC power or ground system. Placing RF chokes on the DC line or RF line may help reduce the RF interference. This problem may show up more when using the radio interface. Again, RF chokes can be placed on the line to reduce interference.

In the presence RF getting into the tuner, it is possible that the processor may lock up. In this case the display will be on, but there may be little or no control. By removing, then re-inserting the power plug on the rear panel, the processor will be reset and operation should be returned to normal. If the problem persists, takes corrective measures as mentioned above to remove the RF from getting into the tuner.

#### **FAQ:**

1. Q. Will the PathFINDER match my XXXX antenna---or what antennas will the PathFINDER match?

A. Hams use an almost infinite variety of antenna types, both commercial and homebrew, so you really need to know what characteristics your antenna possesses. On HF, the PathFINDER has a SWR tuning range of 10:1 (6 to 800 ohms) for coax fed antennas, which is much wider than most built-in transceiver tuners. On single wire or balanced type antennas, it will match from 24 to 3200 ohm loads. If your antennas fall in these ranges, it should provide a good match. It is important to note that no tuner can make a poor antenna into a good antenna--that is--any antenna should be as high as possible and in the clear as much as possible. However, the PathFINDER will allow operation with many antennas and installations that may have been previously un-workable on a given band or bands.

2. Q. Can the PathFINDER tune both coax fed and wire type antennas without an external balun?

A. Yes, both types can be switched from the front panel using the built-in custom balun. You can select from one of two coax fed antennas OR from one coax fed and one wire type (either long wire or balanced) antenna from the front panel push buttons.

3. Q. What does the digital readout display and how is it arranged?

A. The digital readout is a precision digital multi-function display that simultaneously reads power (peak and average), SWR, antenna selection and various tuner functions. Power and SWR are read on both a bar graph and a numeric display. The wattmeter function is a precision plus/minus 5% plus one digit design that is accurate from ANY reading, not just full scale as in typical analog meters. Its accuracy compares to lab type instruments. A word of explanation is necessary for the peak reading function when using SSB. A voice waveform is an extremely complex pattern and varies continuously with an almost infinite set of frequencies and energy levels from peaks to valleys. In addition, compared to a key down CW wave, you usually never fully modulate your rig due to the characteristics of the voice waveform and modulator circuitry. Also, the "sample rate" of the microprocessor control picks and displays parts of the complex waveform as you talk. As a result, with a 100 watt transceiver, you will see power numbers continuously changing as you talk like 37 watts, 45 watts, 90 watts, 67 watts, 80 watts, etc. This is perfectly normal and does represent peak powers at those moments. If we set the "sample rate" any higher, all you'd see would be a blur.

4. Q. How does the "automatic" function work and what does it do?

A. The tuner has both an automatic and a semi-automatic function--pushbutton controlled. It also has a "tune" button. In the auto mode, the tuner will "kick-in" and tune itself when the SWR is higher than approx 2.5:1. It also works when moving from one end of a band where you are tuned, to another end of the band where the SWR rises above that level. Even in the auto mode, you can retune to the lowest SWR by simply

hitting the tune button. Rarely, you may need to hit the tune button in the auto mode to deal with a complex set of impedances, if the auto doesn't "pick up". The unit always tunes when you hit the tune button. In the semi auto mode, the unit only retunes when you hit the tune button. For those who want to "fine tune" to the absolute minimum SWR, you can hit the "C"up/down and "L"up/down buttons. We have found this is seldom necessary, but is there for the "purists". Combinations of these buttons also provide other tuner functions like sound on/off, etc. And yes, it is normal for the relays to sound like popcorn popping when they are going thru their tune cycles for 3 or 4 seconds.

5. Q. What about power levels and power handling capabilities?

A. The PathFINDER is rated for 200 watts SSB/CW on HF and 100 watts SSB/CW on 6 meters, both with the typical ICAS 50% duty cycle. If you try to tune at a power level higher than approx 100 watts, the digital readout says "power too high" and the unit will not tune until you reduce the power below approx 100 watts. If you try to tune at a level below approx 5 watts, the readout says "power too low" and the unit will not tune. On 6 meters, you must manually reduce the power to approx 25 watts for tuning as there is no automatic tune lock out on this band for high power tune protection. Also, the digital wattmeter will not read an initial "power on " reading of less than 5 watts, but will read below 5 watts after it has read a higher power. The PathFINDER is not designed to be a QRP tuner, and is ideally suited for desk top transceiver operations in the 100 to 200 watt category.

6. Q. What about general coverage operation?

A. The PathFINDER provides true continuous coverage operation from 1.8 thru 30 MHz plus 6 meters. It is not limited to just ham bands. As a result, it opens up the world to MARS, CAP, Government, Military, Embassy and commercial applications. It is the most full featured, versatile auto tuner we know of, and provides those key "asked for" features for maximum operating convenience.

7. Q. Miscellaneous (but important) questions about SWR readings from two different meters, grounding and transceiver tuners?

A. Two different SWR meters (one in the transceiver or elsewhere, one in the PathFINDER) will usually provide different readings. This is normal, and due primarily to the fact that meters placed at different points along a transmission line are at different points of nulls and nodes along the line. SWR varies continuously along a transmission line and the meters will read the SWR at their position. The SWR read by the PathFINDER is correct at the tuner. This seemingly odd occurrence happens at only a few feet separation. The SWR readout at the tuner is the one to use for reference, as it will show the SWR when the tuner is tuned. An SWR meter on the "outside" (antenna side) of the tuner circuit will always show the SWR at the antenna and not the "tuned" SWR back to the transceiver. When using the PathFINDER do not rely on the SWR meter in the transceiver. The PathFINDER, like all tuners, should be grounded to a good earth ground for proper operation. This is particularly true when feeding end fed random long wires. These antenna types work "against ground" and require a good ground at the tuner. When using the PathFINDER, be sure the internal tuner in the transceiver is OFF or BYPASSED. If both tuners are on, improper operation will result. This is a very important point!

8. Q. Even though my tuner tunes my coax fed antenna to a low SWR on a band far removed

from the band the antenna is designed for, the signals seem fairly weak and down in signal strength. What does this mean?

A. Any coax fed antenna should be adjusted, as much as possible, to work near the resonant frequency within the ham band of choice. If a coax fed antenna is operated at a frequency or band far removed from the design frequency, coaxial cable losses can be introduced at such a level as to reduce both the received and transmitted signal strength even though the tuner shows a low SWR. This is not a fault with either the tuner or antenna, but a function of how coax cables operate with high, out of resonance SWRs. If the PathFINDER is operated within its SWR tuning range of 10:1 with coax fed antennas, and ideally if the operating point of the antenna is less than that, the loss problem should be minimized. For antennas to show the best efficiency over the widest range of frequencies, you could consider using wire or balanced line type feeds. The PathFINDER supports this type of output, and further details about these feeds (there are specific installation requirements), coax cable losses and antennas can be found in the ARRL Antenna book.

**Warranty:** The seller warrants that each unit sold is manufactured in accordance with seller's specifications, drawings, samples or data in effect on the date of receipt of the order, as they apply to those parts called for on the order, and that each unit is free from defects and workmanship.

The seller's liability under this warranty is limited to the repair or replacement of any unit which proves to be defective in material or workmanship under normal use and service provided the unit is returned to the Alpha Delta shipping point (or designated service center) within one year from the date of purchase and will in no case be responsible for the special or consequential damages. This warranty is in lieu of all other warranties expressed or implied.

**Service:** If you have a problem with your PathFINDER and service is needed, contact LDG Electronics by phone at 410-586-2177 or by e-mail at [alphadelta@ldgelectronics.com](mailto:alphadelta@ldgelectronics.com). If a return is necessary, be sure to package your unit to protect from damage. Include a note with your name, address, phone number, e-mail, and a brief description of the problem. Ship the unit to LDG Electronics, 1445 Parran Road, St. Leonard MD, 20685 prepaid and insured for the retail value. (LDG Electronics Inc. is not responsible for units lost or damaged in shipping).

For non-warranty repairs, the average repair cost is \$50.00. This covers most small parts. We will contact you with the cost for repairing your return. The customer is responsible for paying return shipping on non-warranty repairs. We will turn the unit around as quickly as we can. Repairs can take up to 6 weeks.