ATD-1 Vertical Antenna & Auto Tuner Disconnect User Manual

Description

The Array Solutions ATD-1 is perfect for protecting CG, SCG, ICOM, and other remote auto-tuners by automatically grounding your auto-tuner output and vertical antenna feedpoint when the DC control voltage is disconnected. The DC control voltage may be supplied via the Array Solutions BIAS-T MASTER, or through a separate DC connection. The DC interface to the ATD-1 is a standard 2.1x5.5mm DC jack.
The DPDT relay used in the ATD-1 has 3.1kV of gap and arc capability – so in most cases there is no need to worry about breakdown even at full legal limit into most loads presented to your auto-tuner.

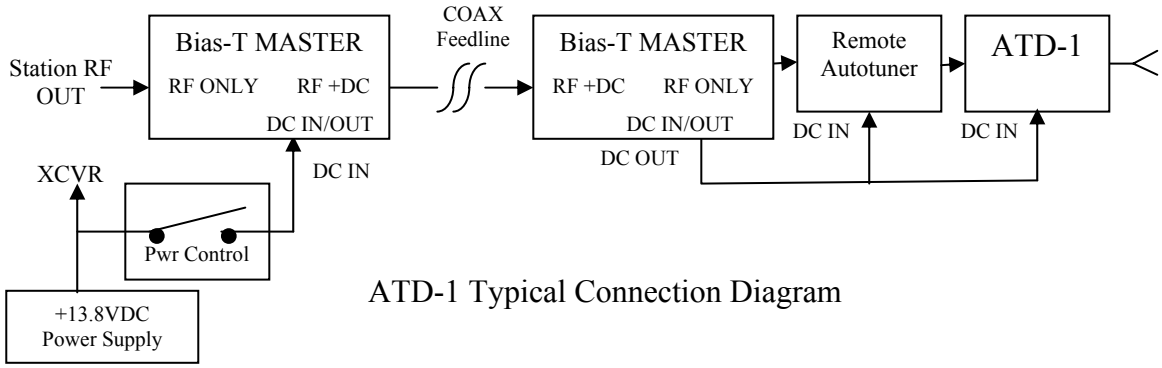
Specifications

Relay control voltage:	11-16VDC
Relay current:	125 ma to enable
RF voltage capability:	Up to 3.1KV

Connections

Simply connect the ATD-1 in-line between your remote auto-tuner output and the antenna as shown in the figure below. The DC power switch is optional, as simply turning off your shack DC voltage will automatically un-power and protect your station and/or remote auto-tuner from surges on your coax from nearby lightning strikes. The

ATD-1 includes a ground screw on the antenna-feed end of the assembly, and a mounting screw on the opposite end of the assembly. Typically, the mounting screw will be used to attach the ATD-1 to a mounting hole on your remote auto-tuner near the auto-tuner's high-voltage RF output. A good, short ground wire should be connected between the ATD-1 ground screw and a good ground point as close to the auto-tuner output and antenna feed-point as possible. You will need to provide +12VDC (11-16VDC) to the ATD-1 via a 2.1x5.5mm DC coax plug. The RF feed-thru screws are #8 stainless steel screws, so #8 solder lugs may be used to connect the input/output wires if desired. The input and output RF wires may be connected to either side of the ATD-1.



ATD-1 Typical Connection Diagram

Determining Ultimate Power Handling Capability

The power handling capability of the ATD-1 is a function of the RF voltage that is applied to it. While the 3.1KV breakdown voltage rating of the ATD-1 is normally sufficient for even legal-limit power, RF voltages at the feed-point of an electrically short antenna can be quite high. As the antenna becomes shorter, the capacitive reactance becomes higher and so the resultant voltage drop across this reactance-plus-radiation resistance increases. With an electrically short 43-foot vertical on 160 meters, the capacitive reactance is approximately 600 ohms and the radiation resistance is approximately 3-ohms. Assuming 10 ohms of ground loss (probably better than most hams can achieve), the peak voltage breakdown of this relay will occur at about 200 watts. If the ground loss increases, the frequency is increased or the antenna length is increased, more power can be applied before breakdown occurs. On 80 meters, a 43-foot vertical has an impedance of about 12-j200 ohms. Assuming 10 ohms ground loss, the breakdown voltage of the ATD-1 will easily handle 1500 watts full legal limit. You can determine what the power handling capability is for your particular un-tuned antenna as follows:

Use EZNEC or other readily available antenna modeling software to determine the input impedance of your antenna. Add your guessed-at ground loss into the resistive portion of the impedance. Now assuming that you are properly matching the antenna, calculate the current into the total resistive part of the impedance at your power level. Once you know this, calculate the peak voltage across the impedance and compare it to the 3.1KV peak breakdown rating of the ATD-1. A 43-foot antenna 80-meter example is given below:

A 43-foot antenna has an impedance of about 12-j200 ohms on 80 meters. Assuming 10 ohms ground loss, the impedance becomes 22-j200 ohms. If this is properly matched with a lossless remote auto-tuner, all power will be delivered into the real 22 ohm portion of this impedance.

At 1500 watts, $I = \sqrt{(P/R} = \sqrt{(1500/22)} = 8.3$ amps rms

The magnitude of the impedance is $|Z| = \sqrt{(22^2 + 200^2)} = 201$ ohms

Therefore, the voltage at the base of the antenna (and across the ATD-1) can be determined:

Vrms = I x |Z| = 8.3 x 201 = 1670Vrms
Vpeak = $\sqrt{2}$ x 1670 = 2360Vpeak.

The calculated 2360V peak is less than the 3100Vpeak breakdown rating of the relay in the ATD-1. And, of course, auto-tuners or even discrete matching networks are not lossless and ground losses could be higher than 10 ohms. This means there is typically even more margin.