All About Antenna Tuners

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Why would I have an antenna tuner ?

To achieve optimal power transfer from the radio to the antenna, a good impedance match between the radio and the antenna must exist. An antenna tuner attempts to match the antenna's impedance to the radio's 50 ohm impedance at its antenna connector. The tuner inserts variable amounts of capacitance and/or inductance into the path to the antenna lead-in to provide this match. Most solid state radios being sold currently will scale back on the power as the radio senses a mismatch between radio and antenna. This protects the radio's final amplifier. The tuner allows the radio to see a correct impedance match and transmit with full power. Many antennas have fairly narrow bandwidth – a bandwidth of only +/- 35 KHz at a given frequency on the 80 meter band is not unusual. Constant tuning of the actual antenna is not usually a desirable activity. A good antenna tuner will help to extend the bandwidth by maintaining a reasonable match between radio and antenna for a broader frequency range.

Types of Antenna Tuners - Cost, Power Ratings, and Frequency Coverage

Antenna tuners may be divided into two general groups: manual and automatic. The manual tuner usually provides an SWR meter to indicate tuning and constantly monitors the match between radio and antenna. To accomplish this, the tuner will have several controls and dials (knobs) used to set and fine tune it. This can add complexity to the usage that some find objectionable. As the user switches bands, re-tuning is necessary. This can lead to quite a bit of adjusting if one is "band hopping" to find that certain contact.

The automatic tuner is generally easier to use than a manual one, providing operator convenience. Rather than adjusting knobs to achieve a match, the automatic circuitry progresses through a set of "trial and error" settings seeking the best match. This takes only a few seconds the first time that particular frequency is used with the tuner. Most modern antenna tuners have memories that retain adjustment settings for given frequencies and can recall these settings instantly. These tuners can usually be tuned manually with front panel controls if one prefers manual control. Many of the less expensive tuners provide only a broad indication of the match achieved, some with no visual indication of match.

How much will I need to spend for an antenna tuner ?

Following are some sample prices from Fall, 2011, popular manufacturer's catalogs.

MFJ

MFJ-902 - $99 – Mini-tuner for travel, manual, 150 watts, 80 to 10 Meters
MFJ-941E - $129 – manual tuner, 300 watts, 80 to 10 Meters
MFJ-9982 - $629 – manual, 2500 watt, 160 to 10 Meters
MFJ-993B - $229 – automatic, analog & digital meter, 300 watts, 160 to 10 Meters
MFJ-994B - $359 – automatic , 600 Watts, analog meter, 160 to 10 Meters

LDG

Z-11 Pro-II - $169 – auto tuner, 125 watts, covers 6 Meter band
AT-200 Pro-II - $229 – auto tuner, 250 watts, covers 6 Meter band
AT-1000 Pro - $499 – auto tuner, 1,000 watts

Power ratings range from QRP to max legal power. Price increases as power handling capacity increases.

Frequency coverage – Tuners generally cover HF to 10 Meters or HF to 6 Meters.

Where do I place the tuner ?

Less expensive tuners are generally placed near the radio and connected to the radio via a short coax jumper cable. Tuners may also be placed at the base of an antenna (at ground level or tower mounted) and connected via remote control cabling and coax cable. The antenna tuner is normally the only SWR metering device needed. An SWR meter placed between the radio and tuner is superfluous as it will always see a good match. An SWR meter after the tuner is generally superfluous also as the tuner has already provided this information. Antenna tuners that accept twin-lead or ladder line feeds are also available.

How do I use it ?

Manual tuner:

Adjust inductance and capacitance values up and down for best match using the tuner's control knobs. Recording the settings for a frequency facilitates quick tuning the next time the operator goes to that frequency. Monitor the tuner's meter for best SWR. Don't forget to re-tune when changing bands.

Automatic tuner:

Auto-tune button: Press this button to have the tuner key the radio transmitter at reduced power and perform the needed adjustments to capacitance and inductance. Many of the newer tuners have a special adapter cable that allows them to control the radio. If yours does not provide the reduced power functionality, it is good practice to manually reduce transmit power to a few watts for the initial tuning cycle.

Radio-initiated: Built-in tuners are in this category and tune on transmit. A manual tune button is usually provided to summon a manual tune cycle. Many of the third-party auto-tuners provide this same functionality via a custom connection cable. Reduced power during the initial tune cycle is always recommended.

Power initiated: Key the transmitter (and on SSB, provide an audio input to the mic so that RF power is produced) and allow the tuner to progress through a tuning cycle. Again, reduced power is wise.