ANTENNA TUNERS FOR BEGINNERS

BY JERRY VE6TL

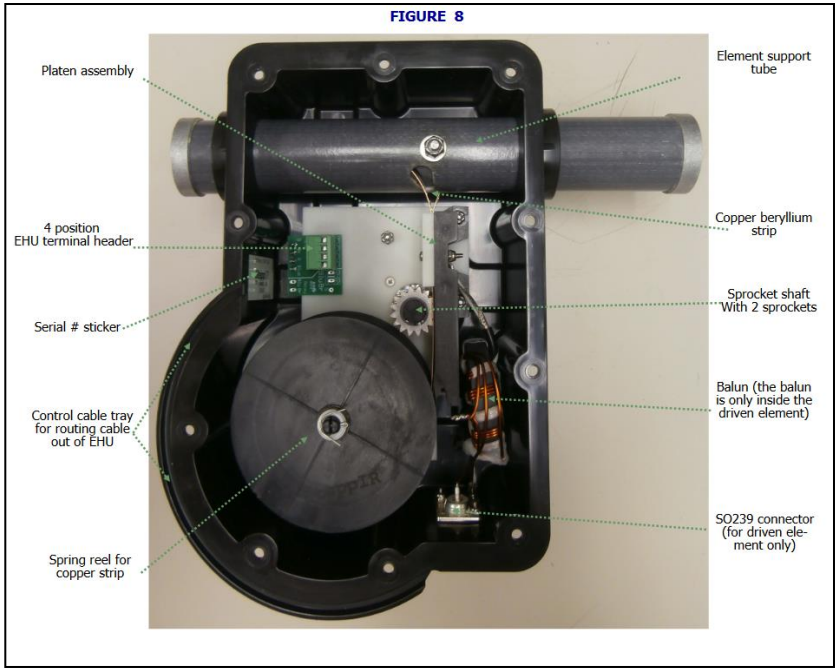
NOVEMBER 2022

SASTAR

WHAT THEY AIN'T

These devices actually tune to desired frequency

Automatic Guitar Tuner



SteppIR Element Tuner Unit

ANTENNA TUNERS DON'T TUNE THE ANTENNA!!!

WHAT THEY IS

- A better term is a “matching unit” or “match box” as they match the output of the radio to the impedance of the antenna
- Often referred to as an ATU or a “tuner” – especially on the front of a transceiver
- Matching a source impedance to load impedance allows for maximum power transfer

Z_{in}

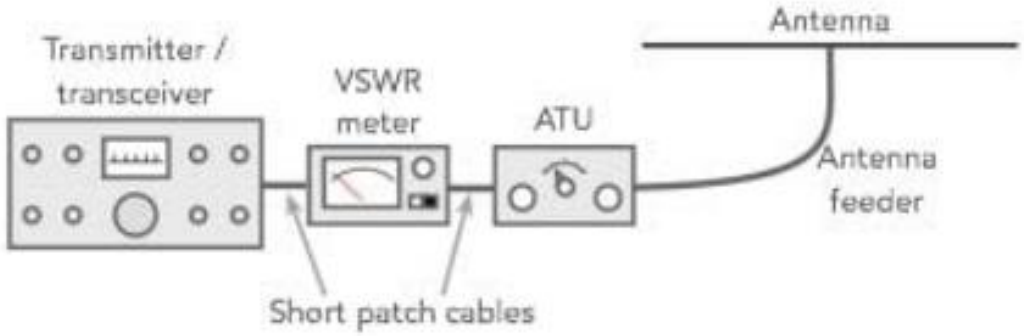
Z_{out}

WHY YOU MIGHT NEED ONE

- **Antennas are resonant at only one frequency (f_o), so Z changes (up or down) when moving away from f_o.**
- **A mismatched antenna will reflect radio waves back to the transmitter and cause an increase in VSWR as Z departs from 50Ω. Modern transmitters/amplifiers will reduce output power to protect themselves as VSWR increases (typically above 1.7:1 or 2.0:1)**
- **Your rig's built-in ATU may cover too narrow a range of VSWR for your desired antenna(s)**

WHERE TO PUT IT

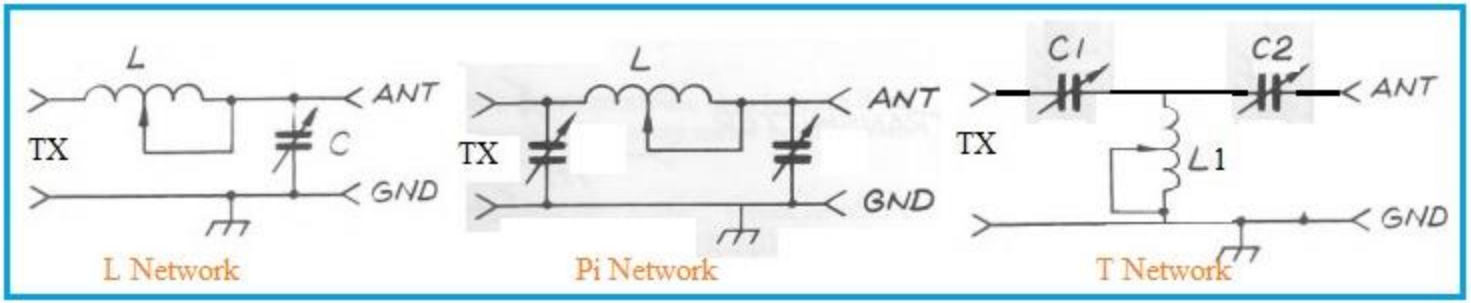
- **Best place is at the antenna (remote ATU)**
- **Most are placed in the shack, between rig and feedline to outdoor antenna**
- **If using a linear amplifier, ATU goes between amp and feedline**



TYPES

- **Automatic**
  - Senses power at ATU's input and output and tries to minimize the difference (maximum power output)
  - Many models have built-in memories
  - Easiest to use but more expensive than manual
- **Manual**
  - Requires manually adjusting for minimum VSWR
  - May not be unique – multiple combinations of X_L and X_C
  - Note settings to save time in future
  - Cheaper, smaller

TYPES – “L”, “PI”, “T” NETWORKS



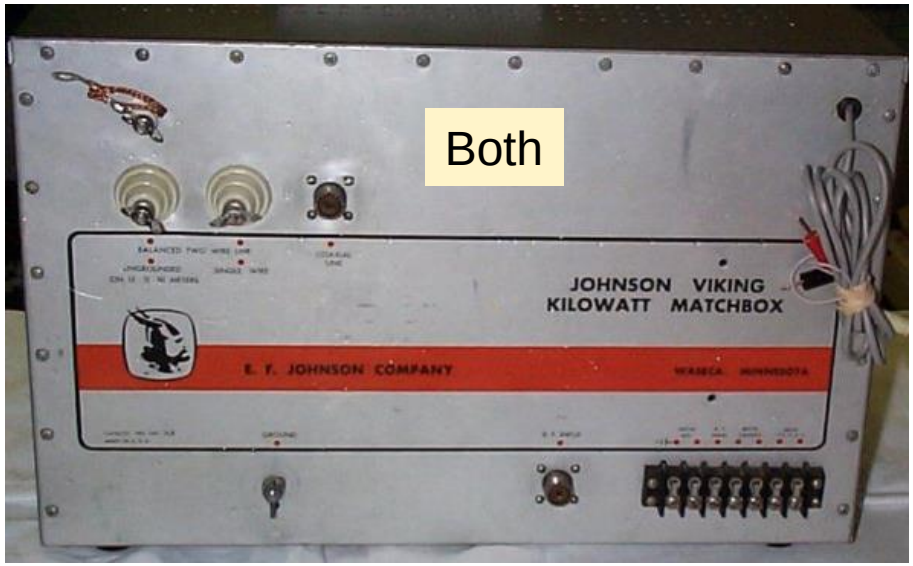
- **L network may require moving C to input side, depending on type of antenna (greater or lesser Z than transmitter)**
  - **Asymmetric – best used with unbalanced loads**
- **Pi networks match just about everything (broad banded)**
  - **More than one resonance point ➔ Possibly inefficient (heating) of roller inductor**
- **T-network is most popular today, configured with roller inductor or tapped inductance – 2 “L” networks**
  - **Often designed with the 2 capacitors as part of same component but 180° out of phase ➔ only one solution**

CONSIDERATIONS

- **Maximum power output**
- **Size & weight (if doing SOTA, POTA, etc.)**
- **Intended bands for operations 10-160m? 6m?**
- **Impedance matching range (6 to 1600Ω)**
- **Balanced or Unbalanced:**
  - ATUs often match unbalanced to unbalanced (coax to coax). You will need an ATU that supports a balanced feedline if you are using a balanced feedline. These will have two terminals to attach the open feeder. (Can often avoid with a balun – like G5RV).

BALANCED/UNBALANCED

ATU-130



CONSIDERATIONS CONT'D

- **Automatic**
  - Check if transceiver is supported
  - How much power is required for tuning (measuring VSWR)? The lower the better, to prevent rig damage.
  - Tuning memories

- **Manual**
  - Rugged construction, reliability
  - Speed of tuning (not suitable for contesting but fine for SOTA)
  - Readability
  - Ease of use
  - Safety – High voltages may be present – possible burns!)

AUTOMATIC – POPULAR CHOICES

LDG Electronics Z-100A-DXE C$297.80 - 125W (30W Digital) 6m – 160m**
Comes with 6 interface cables for most radios – 1.5lb – not weatherproof

ATU-130 Plus ATU-130+ 1.8-50MHz 200W - C$117.85 ***

**DX Engineering Oct 2022
***Ali Express Oct 2022

MANUAL

C$337.00* – Comes with built-in Dummy Load. 300W Max. 10m – 160m coverage.
Tunes unbalanced and balanced lines.
Requires 12VDC (for built-in lamp). Claims is most popular tuner in world.

*Radio World prices October 2022