MFJ-1642 Portable Whip Tuner with Artificial Ground

IMPORTANT: Please read entire manual before attempting to operate this equipment. This unit does not provide a dc or low frequency earth ground from the counterpoise terminal. A separate wire should be connected from the station ground bus to an electric ground. Do not place any counterpoise or non-coaxial feed wires near metallic or RF sensitive devices.

Introduction

The MFJ-1642 is a 150 watt, 80-10 meter antenna tuner designed for tuning short whips as well as virtually any random length wire antenna. It is perfect for either fixed station or portable use, and, with its built-in artificial ground tuning system, will match any transmitter or transceiver to virtually any antenna.

The MFJ-1642 tuner section uses a reversible "L" network. The advantage of the “L” network is that it has only two tuning controls, and only one tuning solution for given impedance match. The MFJ-1642 has rear panel connectors for coaxial input and a “Hi-Z/Lo-Z” switch for reversing the “L” network. An internal input-isolating current balun provides isolation of DC and RF grounds for optimum tuning of the RF counterpoise.

MFJ-1642 Supplied Components (30-10 meter operation)

- MFJ-1956 12 ft. telescopic whip antenna
- Counterpoise assembly (6, 14, and 26 ft. long wires)

MFJ-1642 Optional Components (40-80 meter operation)

- MFJ-63 Loading Coil Assembly for 40-80 meter operation with the MFJ-1956 12 ft. telescopic whip antenna

Installation

1. Locate the MFJ-1642 in a convenient location at the operating position. Avoid placing the tuner near microphones, speech processors, computers, TNC's or other RF sensitive devices.

WARNING: High RF voltages exist at the antenna and counterpoise terminals. Avoid touching these terminals while transmitting!

2. Connect your transceiver’s output to the SO-239 (UHF female) connector labeled TRANSMITTER on the back of the tuner. You will need an external SWR Wattmeter connected in line between the transmitter and whip tuner.

3. Connect the MFJ-1956 12 ft. telescopic whip antenna to the 3/8x24 stud on the top of the unit. For 40-80 meter operation with the MFJ-1956, you will need the optional MFJ-63 coil assembly.

Using the MFJ-1642

***CAUTION*: Never Change The Antenna or Inductor Selector Switch Position While Transmitting! Never Apply More Than 150 Watts To The MFJ-1642.**

Preset the controls on the MFJ-1642 as follows:

- ANTENNA to maximum inductance - Position "A".
- MATCHING to minimum capacitance – Position "10"
- NORM/+C switch to NORM
- COUNTERPOISE to minimum inductance – Position "L"
- Hi-Z/Lo-Z switch (back of unit) to Lo-Z.

Most modern solid state transceivers do not require tuning and loading adjustments. If the transceiver has a built in antenna tuner, be sure it is turned off or disabled. If your transmitter has an adjustable output circuit, it must be properly tuned to a 50 ohm load at the operating frequency before adjusting the tuner. This should be done with a dummy load.

Tuning Procedure

WARNING: Never transmit while changing the INDUCTOR SELECTOR.

1) First, tune for maximum receiver noise as follows:
    - While listening to your desired receive frequency, adjust the ANTENNA control for maximum receiver noise.
    - Adjust the MATCHING control for maximum receiver noise.
    - Adjust the COUNTERPOISE control for maximum receiver noise.

      Note: If no noise peak is evident, try adding extra capacitance with the NORM/+C switch. Then reverse the HI-Z/LO-Z switch and re-try with both positions of the NORM/+C switch.
2) Apply just enough power on CW (or AM/FM/RTTY) to obtain a noticeable deflection on your external SWR Wattmeter.
3) Carefully adjust the ANTENNA, MATCHING and COUNTERPOISE controls for minimum SWR as follows.
    - Adjust the MATCHING capacitor for minumum SWR.
    - Adjust the COUNTERPOISE inductor for minimum SWR.
    - Try plus or minus a position or two on the ANTENNA inductor, along with tuning the MATCHING capacitor to see if lower SWR is achievable.

    Note: These controls interact. Go back and forth between these adjustments as required until minimum SWR is obtained.

4) The transmitter power may now be increased up to a maximum of 150 watts. ***Note:*** The MFJ-1642 will reduce the SWR of most antenna systems to below 1.5:1.

In Case of Difficulty

If this tuner **fails to tune,** please double check all connections and follow the tuning procedure again.

The power rating of this tuner is 150 watts on 80-10 meters. If this tuner **arcs** at the rated power levels, please double-check all connections and follow the tuning procedure again.

If you are still unsuccessful, please read the following ANTENNA HINTS text.

Grounding Hints

To minimize RFI, antennas should be kept away from other wiring as much as possible. Also, the antenna should be adequately insulated to prevent arcing or accidental contact if placed near other objects.

For safety, it is always best to use both dc and RF grounds. A DC ground may not be practical in some portable locations, however.

It is always important to have a good RF ground, provided by the counterpoise, when using any whip or long-wire antenna. This is because the MFJ-1642 tuner needs something to "push" against in order to force current into the antenna. If a good RF ground is not available, RF will usually find its way back into the power line (RFI), transmitter audio circuits (RF feedback), or the operator (RF burns).

Water pipes provide good dc and ac safety grounds, but they are often inadequate for RF grounding because they are long single conductors. RF grounds require large "spread out" surfaces with direct multiple connections to the equipment ground point. Water pipes, heating ducts, or multiple ground rods may work (especially if they are all connected together with jumper wires), but the best RF grounds are radial systems or multi-wire counterpoises.

Antenna Hints

WARNING: **For operator safety, a good earth ground should be installed and connected to the case of the MFJ-1642. Make certain the safety ground connects to the same terminal that connects to the transmitter and other station accessories.**

A binding post labeled "COUNTERPOISE" is provided for counterpoise or other RF ground connection(s). This post *will not* provide a safety ground.

Matching Problems

Most matching problems occur when the antenna system presents extremely high impedance to the tuner. This occurs when the antenna is approximately a half-wavelength long at the frequency at which you are trying to tune.

MFJ-1642 Artificial Ground

The MFJ-1642 contains a series L-circuit that is used to tune the RF ground system (either a counterpoise or a ground wire). The MFJ-1642 will achieve minimum SWR when the COUNTERPOISE switch is properly set.

Installation of a Suitable Counterpoise / Artificial Ground

The MFJ-1642 includes a counterpoise set of wires that will work well from 80-10 meters. It is important to keep the last few feet of the counterpoise wires as far as possible (two feet minimum) from each other and other near-by conductors.

You can also build your own counterpoise system if you desire. A RF counterpoise system can be as simple as a single wire a quarter wave long or less, or as complicated as several wires cut for different bands. Always insulate counterpoise wires and keep them from accidentally contacting animals, people, RF sensitive devices and wiring. For best performance, try to position the counterpoise wires in a straight line if possible.

A counterpoise wire ***must be well insulated***. For best performance, several wires a quarter-wavelength long on different frequencies should be connected together at the COUNTERPOISE post of the MFJ-1642.

When counterpoise wires are located indoors, they can be laid on a floor under a carpet, placed in an attic, or stapled to a basement ceiling. If you place the counterpoise under the carpet or where someone may contact it, be sure to use well insulated wire and multiple counterpoise wires. Insulate the far end of the counterpoise wire(s) with electrical tape to prevent accidental contact.

When counterpoise wires are used outdoors, only place them high enough to walk under. Use multiple wires spaced a few feet apart (at minimum).

DANGER: Touching counterpoise and/or antenna wires while transmitting can cause an RF burn. The wire must be well insulated and the end properly insulated.

There are cases very little deflection of the SWR Wattmeter can be seen. However, even though the meter may not indicate much SWR change while adjusting the COUNTERPOISE control, even the slightest SWR drop indicates that the artificial ground is helping.

Tuning Out Reactance of Long Ground Leads

If the station ground has a long lead, you can connect it to the COUNTERPOISE binding post of the MFJ-1642. Connect the station ground bus and accessories to the GROUND post. **Do not reverse these wires.** Follow the same procedure for minimizing SWR described in the tuning procedure.

WARNING: This unit does NOT provide a dc or ac safety ground through the COUNTERPOISE terminal. A separate wire from the station ground bus to an electrical or earth ground must be used.

TVI and RFI Hints

It is possible for RF to flow down power cables into the house wiring. This may cause TVI, Stereo, VCR or other RFI problems. As a precaution, a ferrite core can be clamped around power leads. The MFJ-701 RFI-FREE CHOKE KIT makes it easy to eliminate common RFI problems.

Technical Assistance:

If you have any problem with this unit first check the appropriate section of this manual. If the manual does not reference your problem or your problem is not solved by reading the manual, you may call *MFJ Technical Service* at **662-323-0549** or the *MFJ Factory* at **662-323-5869**. You will be best helped if you have your unit, manual and all information on your station handy so you can answer any questions the technicians may ask.

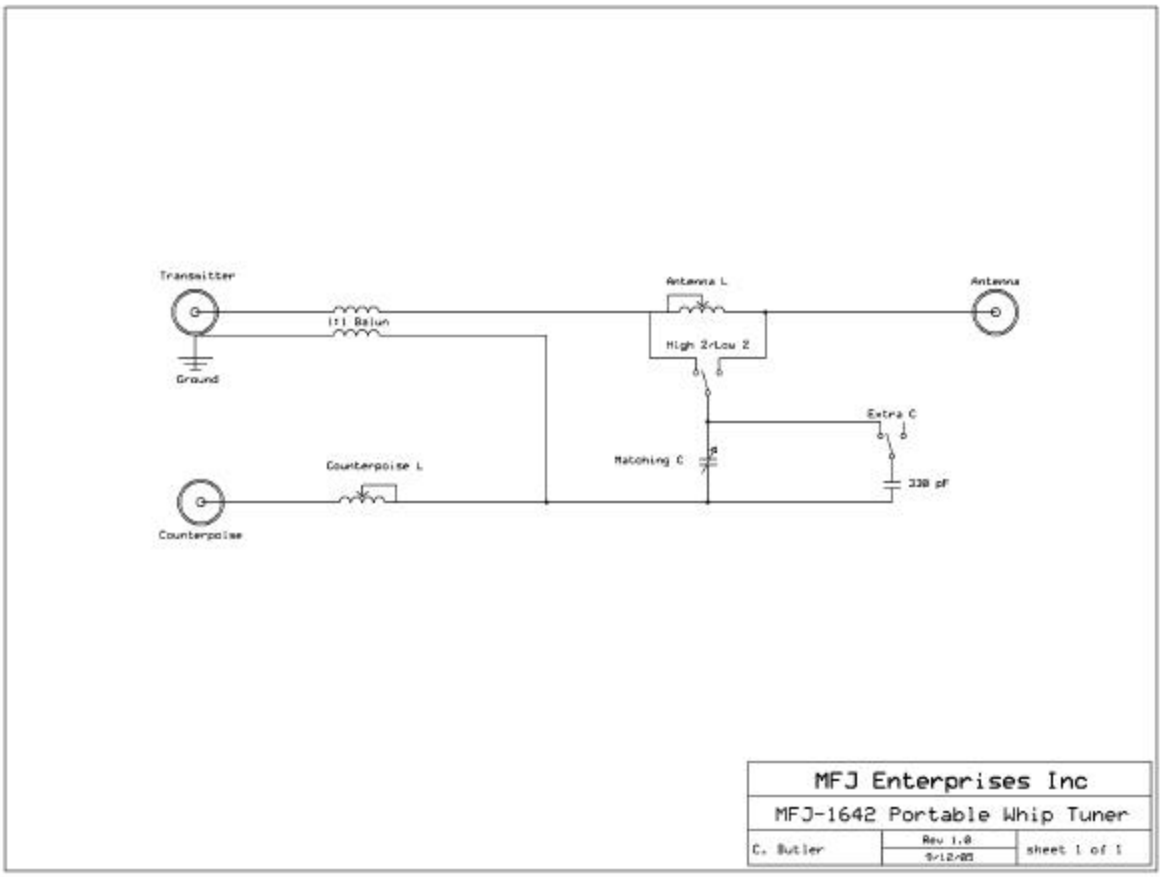
You can also send questions by mail to MFJ Enterprises, Inc., 300 Industrial Park Road, Starkville, MS 39759; by Facsimile (FAX) to 662-323-6551; or by email to techinfo@mfjenterprises.com. Send a complete description of your problem, an explanation of exactly how you are using your unit, and a complete description of your station.

Tuning Chart

You may wish to remove or make a copy of this page and place it near the tuner. Insert your own values for each frequency according to your station.

Freq MHz	Counterpoise	Matching	Antenna	Hi/Lo Z switch	Extra cap switch
1.8					
1.8					
2.0					
2.0					
3.5					
3.5					
3.5					
3.75					
3.75					
3.75					
4.0					
4.0					
4.0					
7.15					
7.15					
10.1					
10.1					
14.2					
18.1					
18.1					
21.2					
21.2					
24.9					
28.5					

Schematic


Transmitter
Ground
1:1 Balun
Antenna L
High 2-Low 2
Antenna
Extra C
330 pF
Matching C
Counterpoise L
Counterpoise
MFJ Enterprises Inc
MFJ-1642 Portable Whip Tuner
C. Butler
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