Table of Contents

MFJ-415B CW Adapter for MFJ HF-SSB Radios

General Description

Installing the MFJ-415B in your MFJ-9420 or MFJ-9440 Travel Radio provides the valuable option of being able to switch modes at the push of a button to enjoy world-wide CW contacts. The MFJ-415B works with virtually any key or keyer outfitted with a 3.5mm mini plug, and features adjustable semi-break-in keying, a built-in sidetone sounder, and adjustable frequency-offset. Travel Radio CW power output is typically 6 to 10 Watts.

Using the MFJ-415B

Be sure to read this manual thoroughly before installing and using your adapter. Installation requires a simple one-time alignment procedure to ensure VFO accuracy for your particular radio. Step-by-step instructions are provided in this manual.

Once installed, the adapter is activated by pressing the *CW IN/OUT* switch on the back panel of the transceiver. When turned on, additional components are connected to the transceiver's VFO circuit to shift frequency coverage into the CW portion of the band. The specific components required to make the VFO shift are selected by the jumper-plug on header J105. You must set this jumper for the model radio you are using.

The MFJ-415B provides semi-QSK T/R switching. QSK hold time is set to approximately 1/2 second at the factory, but may be reset to your preference by adjusting trimpot R102.

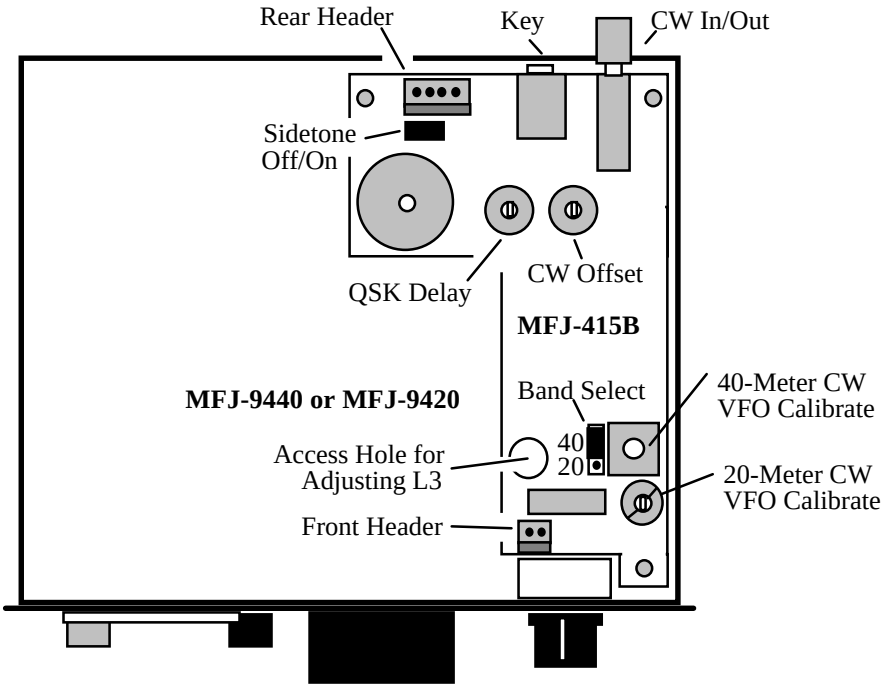
The module's CW-offset feature provides an automatic 600-Hz frequency shift between transmit and receive. This is needed to generate an audible tone in the speaker of the receiving station. The CW-offset trimpot--R103--is preset at the factory, but may be reset to personal preference. Since Travel Radios do not have RIT controls, it is especially important to set CW offset correctly.

To help you monitor sending, a 2.7 kHz sidetone sounder is built into the adapter. However, if your keyer already provides sidetone, you may disable the internal sounder by removing the shorting plug at header J104.

The MFJ-415B is designed to be totally transparent during SSB operation. When the module is turned off, the keying circuit is deactivated.

PC Board Installation (see following diagram)

- ☐ Remove the six (6) lid screws and take off the transceiver's cover.
- ☐ Remove the cap from CW adapter's *IN/OUT* push-button switch.
- ☐ Position the adapter and insert onto transceiver header pins (2 in front, 4 in back).
- ☐ Secure the module in place with three (3) #6-32 x 1/4" screws.
- ☐ Reinstall the adapter's *IN/OUT* switch cap.



Shorting Plugs

- ☐ For internal sidetone, install a shorting plug on J104. For no sidetone, remove it.
- ☐ For **MFJ-9440,** place a shorting plug on *center and rear pins* of J105.
- ☐ For **MFJ-9420,** place a shorting plug on *center and front pins* of J105.

Adjustment and Calibration

Your MFJ-415B CW adapter has been pre-adjusted at the factory, but final alignment is needed to mate the adapter with your particular radio.

☐ **Transceiver Recalibration of VFO (L3):**

Installing the module adds a small amount of stray capacitance to the VFO tank--changing the calibration of the transceiver's VFO slightly. Before the CW adapter can be aligned, you must recalibrate L3 in the transceiver VFO to eliminate this error. To do this, you'll need an accurate mid-band signal source such as a signal generator, synthesized transceiver running low power into a dummy load, or a MFJ-259 analyzer. Make sure the module is installed and the CW-adapter switch is *OFF* when making this adjustment.

MFJ-9420: Set your VFO dial and signal source to *14.250 MHz.*
MFJ-9440: Set your VFO dial and signal source to *7.200 MHz.*

Find VFO coil L3--this should be visible through the access hole in the MFJ-415B adapter. *Using an insulated tuning wand, carefully adjust L3 until the signal from your calibrated signal source is roughly zero-beat in your receiver* (exact zero-beat is not necessary). When completed, the dial is now recalibrated in the SSB mode. If you remove the CW module from your radio, you should recalibrate again to "undo" this VFO correction.

☐ **Module Calibration for CW Band (L101 or C103):**
Before attempting to calibrate, confirm the shorting plug on J105 is in the correct position for your radio. Next, set the VFO dial and signal source to the low-frequency edge of the CW band:

MFJ-9420: Signal source and VFO dial are set to 14.000 MHz.
MFJ-9440: Signal source and VFO dial are set to 7.000 MHz.

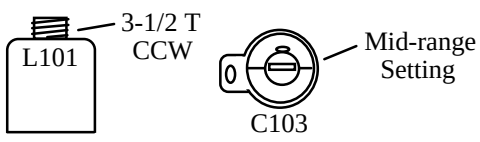
If your MFJ radio lacks a CW-band dial scale on its faceplate, set the VFO dial to the low end of the phone band. The phone-band kHz markings will provide a rough guide to your CW operating frequency.

To adjust the module, first press the adapter switch *IN* to activate the CW adapter. Relay K101 should click on and you should be able to hear CW stations with an antenna connected to your radio. To calibrate the VFO dial, adjust the appropriate trim control on the MFJ-415B module until the signal from your calibrated source is roughly zero-beat.

MFJ-9420: Use a small screwdriver to adjust C103.
MFJ-9440: Use an insulated tuning wand to adjust L101.

When this adjustment is completed, your VFO will be now be calibrated accurately for both SSB and CW operation.

Important Note: If you should ever wish to restore the factory-default settings to L101 and C103 for any reason, you may approximate them by adjusting as shown below:



☐ Module Adjustment for CW Offset (R103):

Offset is preset at the factory for roughly 600 Hz. However, if you prefer a different beat note--or if stations consistently respond to your CQs off frequency--you should reset R103.

To reset the offset, connect your MFJ radio to a dummy load and set it up to "communicate" with a second transceiver. Begin by tuning in the CW signal generated by the second radio to a comfortable pitch on your MFJ radio--as you would do when tuning in a station calling CQ. Then, while sending a reply with the MFJ radio, adjust R103 for a 600-Hz tone in the second radio's speaker. That way, you'll hear incoming signals at the pitch you prefer--and your transmitted signal will sound on-frequency to other stations listening for you. To approximate the factory-default adjustment for R103, set the arrow pointer on the trimpot so that it points to the "R" in the "R103" silkscreen marking on the pc board. Then, adjust from this starting point.

☐ Module Adjustment for QSK Hold (R102):

This establishes how long the TX relay holds in after you stop sending. QSK hold is set to approximately 1/2-second at the factory--a typical delay for 13-20 WPM sending. However, you may set this for personal preference by adjusting trimpot R102. To approximate the factory default position, set the arrow on the trimpot to the "2" in the "R102" silkscreen marking on the pc board.

Important VFO-setting Note: Radio amateurs are solely responsible for knowing the frequency they transmit on. If you work DX at the low edge of the band or if you are restricted to a sub-band within the CW allocation, make sure you know where your band-limits are. MFJ cannot be held responsible if your radio is miscalibrated or if you accidentally transmit outside the prescribed frequency allocation for your class of license.

Important Tune-button Note: When powered on, the CW module's keying circuitry will interact with--and disable--the radio's front-panel *Tune* button. If you need to generate a continuous carrier in CW mode for ATU adjustments, use the key to activate a carrier. The *Tune* function will work normally when the CW adapter is turned off.

Important Microphone Note: If the push-to-talk switch in your microphone doesn't disable the mic element during receive mode, you must unplug your mic before operating CW. If you do not, stray voice signals and noise may be picked up and transmitted on SSB along with the CW signal! The recommended MFJ-290 and Radio Shack 21-1172 microphones normally disable the mic line and may be left plugged in (so do many other PTT type mics). However, if you are aren't sure of your mic's switching circuit, check!

In Case of Difficulty

- ☐ Radio does not shift to CW band or perform CW functions when adapter is activated. Check headers to confirm sure all pins are inserted into the adapter board.

- ☐ Stations do not respond to your calls or do not reply to you on your frequency. Check *Offset* trimpot R103 for correct setup. To approximate the factory default, set R103 so the arrow points to the "R" in R103. Then, if needed, readjust.

- ☐ Stations report hearing a continuous carrier between keyed characters. Check transceiver's *carrier null* adjustment (R36). Null for minimum carrier in SSB mode. Carrier should be at least -40 dBc, or 40-dB down from full CW output.

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 **601-323-0549** or the *MFJ Factory* at **601-323-5869**. 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 601-323-6551; 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.

Schematic

Parts List

Designator	Part Number	Description
C101	203-0013	Capacitor, Electrolytic, 22 uF, 50V.
C102	200-0004	Capacitor, Disc Ceramic, .01 uF, 25V
C103	204-0001	Capacitor, Trimmer, 3-10 pF, 250V.
C104	205-0033	Capacitor, Multilayer, 33 pF, 50V.
C109	200-1004	Capacitor, Disc Ceramic, 4.7 pF, 50V.
C110	200-2024	Capacitor, Disc Ceramic, .001 uF, 50V.
D101	315-2104	Diode, Varactor, MV2104
D102, D103	300-0003	Diode, Switching, 1N4148, 50 PIV
J101	612-3002	Header Connector, 2-Position
J102	612-3004	Header Connector, 4-Position
J103	601-5005	Jack, Stereo, PCB, 3.5 mm
J104	612-0102	Header, Pin, Straight, .375, .1, 2 Position
J105	612-0103	Header, Pin, Straight, .375, .1, 3-Position
K101	408-1011	Relay, Reed Type, 12-V, SPST
L101	402-2710	Inductor, Coilcraft Slot-Ten-03-10, 22 uH
PZ1	410-1204	2.8 kHz Piezzo Buzzer
Q1, Q3	305-0002	Transistor, General Purpose PNP, 2N3906
Q2	305-0001	Transistor, General Purpose NPN, 2N3904
R101, R113	100-4470	Resistor, Film, 47K Ohms, 1/4 watt, 5%
R102	133-5100	Resistor, Trimpot, 100K Ohms
R103	133-4100	Resistor, Trimpot, 10K Ohms
R105, R117	100-5100	Resistor, Film, 100K Ohms, 1/4 watt, 5%
R106, R116	100-2100	Resistor, Film, 100 Ohms, 1/4 watt, 5%
R107, R115	100-3220	Resistor, Film, 2.2K Ohms, 1/4 watt, 5%
R108	100-3100	Resistor, Film, 1K Ohms, 1/4 watt, 5%
R114	100-4100	Resistor, Film, 10K Ohms 1/4 watt, 5%