



*"Wireless Solutions for High-Tech Industries"*

## Model M15 - Changing/Adding Crystals

### Mentor Radio Company Model M15 Instructions for Changing or Adding Crystals

#### Changing Crystals:

1. Remove top cover (remove 4 screws, 2 each side, pry/lift cover upward and off). Mark front for easy reassembly.
2. Unplug and remove pair of crystals for channel to be changed. The crystals are just behind the channel selector switch. The pair nearest the front panel are for the channel which is selected when the channel selector switch is fully counter clockwise. When you look at the front of the M15, the crystals to the left are for the transmitter and those to the right are for the receiver. Most crystals are marked with the channel frequency, the decimal point being replaced by the letter "T" if it is a transmit crystal or by the letter "R" if it is a receive crystal.
3. Insert the new pair of crystals into the empty sockets, making sure that the transmit is to the left and the receive crystal is to the right (as you look towards the front panel).
4. If the new channel frequency is different from the old one by more than 0.20 MHz, you must readjust the "tuning voltage" (Vt). This is done by gently adjusting the Vt trimmer potentiometer associated with the channel you have changed, using a small screw driver. These trimmers are in a row just to the right of the receive crystals, in the same order from front to back.

With the cover off, apply power (14 vdc) to the radio. The antenna need not be connected, but the speaker must be connected. Turn up the receiver volume control. Adjust the Vt trimmer potentiometer for the channel being changed to get the maximum "white noise" (hiss) at the speaker.

5. Replace the cover and screws.
6. Change the frequency label on the M15 front panel to show the new frequency.

## **Adding Crystals**

The exact procedure depends on the number of channels already installed and the number of channels there will be after crystals are added. A pair of crystals is used for each channel. Although there is printed circuit board space for 6 channels, most M15's shipped with three channels or less contain crystal sockets and trim pots for only three channels. To increase the number of channels to four or more then requires installing more crystal sockets and trim pots (Mentor Radio Co. part nos. 1101376 and 1101440-103).

The M15 frequency selector switch can be set for up to six positions by means of its adjustable "stops". Single channel M15's are shipped with the channel switch set for two positions and by means of jumpers on the rear of the pc board, between crystal socket positions 1 and 2, both switch positions select the same channel. If one channel is to be added to a single channel M15, no change in the stops is required, but the two jumpers must be removed. All other channel additions require resetting the stops (see below).

After adding trim pots and crystal sockets (if necessary), removing jumpers (if necessary) and changing switch stops (if necessary) proceed as in steps 3-6 above.

## **Changing Switch Stops**

Switch stops are set by two small pins inserted in holes in the front section of the switch. One pin must be removed from a hole and inserted into a new hole. If one or more channels are being added, the new pin position will be one or more positions clockwise from its present position. First note how many switch positions already exist and then move the frequency selector knob to its most counter-clockwise position (called "position 1"), viewed looking at the front panel.

### **For access to the front of the switch:**

1. Remove the top and bottom covers. Mark them "top" and "bottom" and mark the front of each, for easier reassembly.
2. Remove the knob of the channel select switch (loosen one slotted set screw).
3. Remove and save the hex nut and lock washer from the front of the switch.
4. Remove and save the two flat head screws on each side of the front bezel. The front bezel can now be slid approx. 1 in. forward, then tilted up away from the M15, revealing the switch's front face.
5. If there is an adhesive-backed foil cover over the pin holes on the front of the switch, carefully peel this off and save. Note whether one or two small steel pins, approx. 3/16" long, come out stuck to the adhesive (usually they don't). If one or both did come out, determine from which holes they have come, if possible, and carefully save them—you will need to put them back in their proper holes.
6. Most of the time the pins will remain in their holes, and the problem at this point is then to get the correct pin out of its present hole. The hole at the top of the switch is called "hole position 1". There should always be a pin in that hole. (If the pin should come out, put it back in.) The other pin will be in the hole position number, moving clockwise, one higher than the number of channels the radio has had available. (Examples: for a one or two channel radio, the pin is in position 3; for a three channel radio, the pin is in position 4, etc. Position 7 is at the bottom.)

7. Sometimes the pin will come out by holding the radio switch face down and tapping on the switch (cover hole position 1 so that it won't also come out). However, sometimes it will be necessary to use a small but strong magnet held over the pin's hole while tapping on the switch. After the pin is removed, put it back into the correct new hole.
8. Replace the foil if used. Check that the switch now can select the desired number of positions (you can temporarily reinstall the knob to help rotate the switch shaft). Reassemble the M15 in the reverse order listed above. Make sure no wires are pinched between metal parts and keep wires close to the front panel. When tightening the switch hex nut, make sure the pc board isn't stressed and doesn't become twisted.

