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## FT-101 MODIFICATION FOR W.A.R.C. 3-BAND OPERATION

**General:** All original FT-101s, from Mark I through FT-101-F, can be modified using the enclosed kit and instructions. Note that it is not intended for modification of the FT-101-ZD. Although the modification is not electronically complex, some difficult soldering is involved and some prior experience in kit assembly or electronic construction will be required. International Radio cannot assume responsibility for damage resulting from failure to understand or follow the instructions. In the interest of safety, the equipment must be disconnected from its power source during the modification. A miniature (25 watt) soldering iron (with its tip grounded to the chassis to avoid possible damage to solid state devices) should be used. Detailed instructions follow, but the modifier should supplement them by referring to the equipment instruction manual for schematics and other data.

### Instructions:

- ( ) 1. The FT-101 should be in perfect working order. Remove the top cover the bottom cover, and the cabinet.
- ( ) 2. Store the screws, lock washers and nuts in a small box or other safe place. Place the bare unit on a pad on the bench, right side up.
- ( ) 3. See Fig. 1. Locate the bank of crystals on the right side of the top chassis, behind the front panel.
- ( ) 4. Stand the unit on edge so that both the top and bottom chassis can be viewed. Looking at the bank of crystals, identify the 15-meter (X4) (27.02 MHz) crystal and the 11-meter (X5) (33.02 MHz) crystal. Now see Fig 2. Looking at the bottom chassis, identify the TC-19 (15 meter) and TC-20 (11-meter) capacitors. NOTE: If in doubt about the crystals or trimmers, apply power to the set and tune in the 100 KHz CAL signal on each band. Touching an insulated screwdriver to the hot end of the proper crystal or trimmer will cause a change in the tone of the CAL signal. Disconnect the power line.
- ( ) 5. Look again at Fig. 1. Temporarily remove the existing 15-meter (X4) (27.02 MHz) crystal and replace it with the new 18-meter (24.02 MHz) crystal. This is a test only and the 27.02 MHz crystal will be used later for 15 meters. Mark the crystal for later identification.

- ( ) 6. Replace the existing 11-meter (X5) (33.02 MHz) crystal with the new 30.52 MHz (24 MHz band) crystal. This is a test only, but the 11-meter (33.02 MHz) crystal will no longer be used. Mark the 33.02 MHz crystal for later identification.
- ( ) 7. Apply power now and tune the receiver in the receive mode.
- a. Switch to 15 meters. An 18.1 MHz signal should come in at 100 on the black dial, with peaking at about 7 on the preselector.
  - b. Switch to 11 meters. A 24.9 MHz signal should come in at 900 on the red dial, with peaking at about 8 on the preselector.
  - c. No alignment is necessary, ordinarily, but if the receiver is dead on the 18.1 band, tweak the TC-19 (15 meter) trimmer the minimum amount needed for the rig to come back to life.
  - d. If the receiver is dead on the 24.9 band, tweak the TC-20 (11-meter) trimmer the minimum amount needed for the rig to come back to life.
  - e. When the entire modification is completed, further alignment can be done.
- ( ) 8. Shut the set off and disconnect the power line. Place the unit on its bottom. Remove the top cover (marked "Danger - High Voltage") of the power amplifier. Use an insulated screwdriver to ground the plate caps of the tubes to be sure the filter capacitors are discharged to ground.
- ( ) 9. Locate the two-section loading capacitor operated by the "Loading" control. Connect the two sections in parallel by soldering a short jumper lead between the two lugs on the top of the stationary sections of the variable capacitor. Replace the top cover of the power amplifier.
- ( ) 10. Leave the new 30.52 MHz crystal in the 11-meter (X5) position, but move the new 24.02 MHz crystal from its temporary 15-meter (X4) position and plug it into the front left socket (Spare X). Now, restore the old 27.02 MHz 15-meter crystal in the third socket on the right (X4). If the "Spare X" socket is in use, a new crystal socket will be installed later.
- ( ) 11. Remove the two screws and spacers that support the crystal socket board and set them aside. Move the socket board upward and angled a bit from the chassis. Stand the FT-101 on its end with the socket board at the top. Carefully unsolder the lead from the hot pin of the 15-meter (X4) crystal socket. The hot pin is the one that is not soldered to the others. Now, solder an insulated 2" extension wire to that lead and insulate the joint.
- ( ) 12. Solder a 3" insulated lead to the hot side of the spare (X) (front left) socket. If the spare socket is already in use, wire in a new socket and solder the 3" lead to it instead. Solder a 3" insulated lead to the hot side of the 15-meter (X4) socket. Dress all three leads backward under the rear of the socket board so that the three wire ends will stick out of one side of the back support. Remount the socket board, using the original screws, spacers and rear shield.
- ( ) 13. Look at Figures 1 and 3. Solder a short bare wire to the upper right corner of the crystal socket shield (looking toward the front of the set). Look again at Figure 3.

- ( ) 14. Judge where you are going to spot the relay on the shield. Spot it so it is centered over the head of the rear mounting screw, with pin 4 close to the short bare wire you just soldered. Remove the protective film from the mounting tape and press the relay against the shield.
- ( ) 15. Look at Figure 3. Cut, strip and tin the three wires coming from the crystal sockets:
  - a. the new wire to the 15-meter socket: solder it to pin 4 of the relay.
  - b. the new wire to the spare socket: solder it to pin 1 of the relay.
  - c. the extended wire (originally to the 15-meter socket): solder it to pin 3 of the relay.
  - d. solder the bare ground wire to pin 2 of the relay.
  - e. solder a 2' (two-foot) insulated wire to pin 5 of the relay.

If the pin-out of the relay differs from Figure 3, connect as shown in Figure 4.

- ( ) 16. Place the unit on its bottom. See Figure 4. There is a screw above the IF and AF jacks on the back, which holds the top edge of the jack panel. Remove the screw. It will not be used again. Carefully enlarge the screw hole to 1/4" so that the sub-miniature switch can be mounted in that hole.
- ( ) 17. The relay coil lead from pin 5 of the relay should be threaded carefully to the bottom of the set until it can be brought up to the new switch. Look at Figure 4. Trim and tin the end of the lead and solder it to one terminal of the switch (not in the middle).
- ( ) 18. Solder a 10" piece of insulated wire to the middle terminal of the switch. Thread that wire downward through the grommited hole in the base, to the area of the VFO socket.
- ( ) 19. Turn the set on its side. Cut, trim and tin the wire and solder it to pin 5 of the VFO socket (+13.5V).
- ( ) 20. Turn the set bottom side up. Locate the small rectangular window in the shield plate above the band switch (about one third of the way back from the front panel). NOTE: in later models of the FT-101, the 11-meter band was disabled (in accordance with FCC regulations) by shorting out an inductance. The shorting wire, known as the umbilical cord, had brown insulation and the short loop of it is accessible through the window. If your set has that loop, cut the loop to allow use of the 11-meter position for use on the WARC 24 MHz band. Early sets labelled the CB position as 11m; later sets used "aux." The latter usually have the umbilical cord.
- ( ) 21. Remove the metal shield plate above the band switch by taking out only the eight sheet metal screws. Do not remove the two nuts. Examine the switch carefully and note its operation by turning the BAND control on the front panel. Note especially the switch wafer farthest from the front panel. See Figure 5. Use a good light and turn the BAND knob on the front panel and watch the wafer as you turn the knob to the WWV position. In that position, the little contact ear rotated by the shaft should be between the two wiper contacts of a blank lug. See Figure 5. Now, an insulated jumper wire is to be connected between that blank lug and the 40-meter lug at the bottom of the wafer, nearest the chassis. Examine Figure 5 carefully.

**SUGGESTIONS:** Make the jumper by making a small hook at the stripped end of the solid wire. Stand the set on its end and thread the hook to the 40 meter lug. Insert the tip of a cold soldering iron against the lug to check that no insulation will be scorched if the iron is hot. If satisfied, turn on the iron and solder. If not, temporarily remove the board supporting the five compression trimmers adjacent to this part of the bandswitch. Carefully maneuver the board up and out of the way until you can get your soldering iron tip up against the lower lug without scorching any of the adjacent wiring.

- ( ) 22. See Figure 6. A similar difficult operation must be performed on the eighth wafer from the front of the set. In this case, the upper 20-meter lug has a red/white wire on it -- standing at the back and looking toward the front it is the top lug of the right half. It is not the lug with red/white wire on the other side of the top support. Straight down from that right side lug, at the very bottom, there is a bare WWV lug. A jumper must be connected between those two lugs, top to bottom, and it will require extreme patience and care. Make a hook in the end of an insulated wire jumper (of about 4" length, for now); trim and tin it well and insert the tinned hook in the lower (blank) lug. Then bend the upper end of the lead to hold it in place while soldering at the lower lug. When the lower connection is fully made, cut, strip and tin the jumper to solder the top end on the upper 20-meter lug, leaving the existing R/W lead in place.
- ( ) 23. Now, replace the metal shield plate above the band switch. Do not replace the set in the cabinet yet. you can now test the set (with a dummy load for transmitting, of course). to peak up the crystal alignment, refer back to Step 7.

**CONGRATULATIONS! YOU HAVE COMPLETED THE FT-101 MODIFICATION AND NOW HAVE AN ALL-WARC BAND RIG WITH INCREASED UTILITY AND MARKET VALUE!**

### OPERATION:

1. 10.1 MHz: The WWV position of the Band Switch now tunes from 10.0 to 10.5 MHz, unless the original 16.02 MHz (X10) crystal has been changed. that is, someone may have obtained and installed an 8C1 Range Change crystal at some time, so as to obtain a tuning range of 9.5 to 10.0 MHz in order to listen to foreign broadcast stations as well as WWV. To operate in the 10.1 MHz band the original 16.02 MHz crystal must be reinstalled. If it has been lost or never provided, a new one is available from International Radio for \$12.
2. 21 MHz and 18.1 MHz: the 15-meter position of the Band Switch now provides 21 MHz and 18.1 MHz, depending upon the position of the new toggle switch on the rear panel. In one position, 21.0 to 21.5 MHz will be tuned. Tuning will be as usual, except that the loading will be approximately two points more clockwise. In the other position, 18.0 to 18.5 MHz will be tuned. an 18.1 MHz signal will come in at 100 on the black dial and peak at about 7 on the preselector.
3. 24 MHz: The 11-meter position of the Band Switch now provides 24.0 to 25.0 MHz. 24.9 MHz comes in at 900 on the red dial and peaks at about 8 on the preselector.
4. To have a clean note, output power should be kept to a moderate level, and an antenna tuner is advisable to minimize spurious radiations.

5. If we can estimate that the final amplifier's efficiency is roughly 50% on the higher bands and 60% on the lower bands, and has a plate voltage of 600 volts, the following approximate powers should be derived:

<u>IC READING</u>	<u>POWER INPUT</u>	<u>50% OUTPUT</u>	<u>60% OUTPUT</u>
50 MA	30W	15W	18W
100	60	30	36
150	90	45	54
200	120	60	72
250	150	75	90
300	180	90	108
330	198	99	119

6. Some "economy" versions of the FT-101, such as the FT-101-EE or FE, did not include a full complement of crystals, as indicated in Figure 1. International Radio does not supply crystals, and we refer you to Jan Crystals in Fort Myers, Florida: 1-800-JAN-XTAL

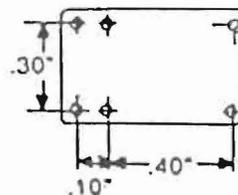
7. PARTS LIST - FT-101 WARC BAND KIT

- 1 each crystal 24.02 18 MHz
- 1 each crystal 30.52 24 MHz
- 1 each miniature SPDT toggle switch
- 1 each miniature low-capacity SPDT Relay
- 48" insulated hook-up wire
- 6" solid wire (for jumpers)
- 6" thin high-quality solder
- 1" double stick mounting tape
- 1 each INSTRUCTIONS

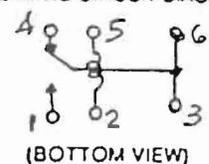
RELAY DETAILS

Relay pins are delicate. Solder them carefully - do not pull on their leads.

PRINTED CIRCUIT DIAGRAM



SCHEMATIC CIRCUIT DIAGRAM



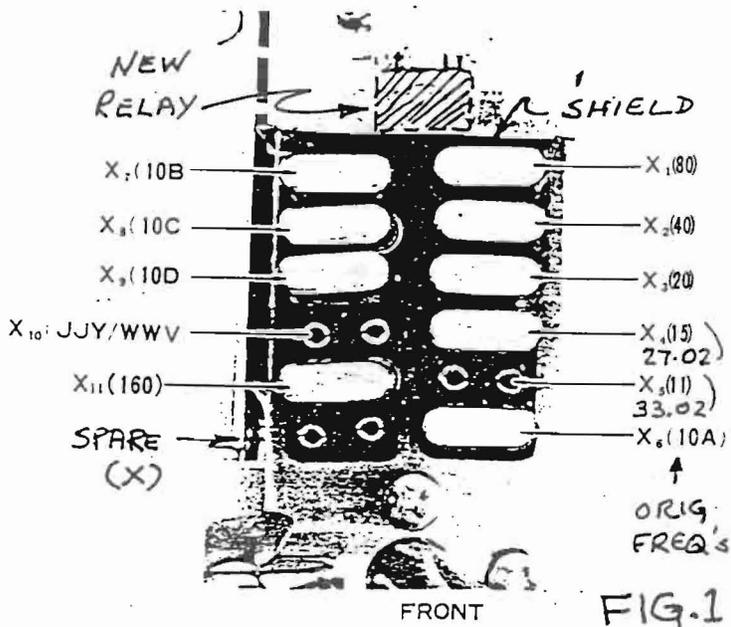


FIG. 1

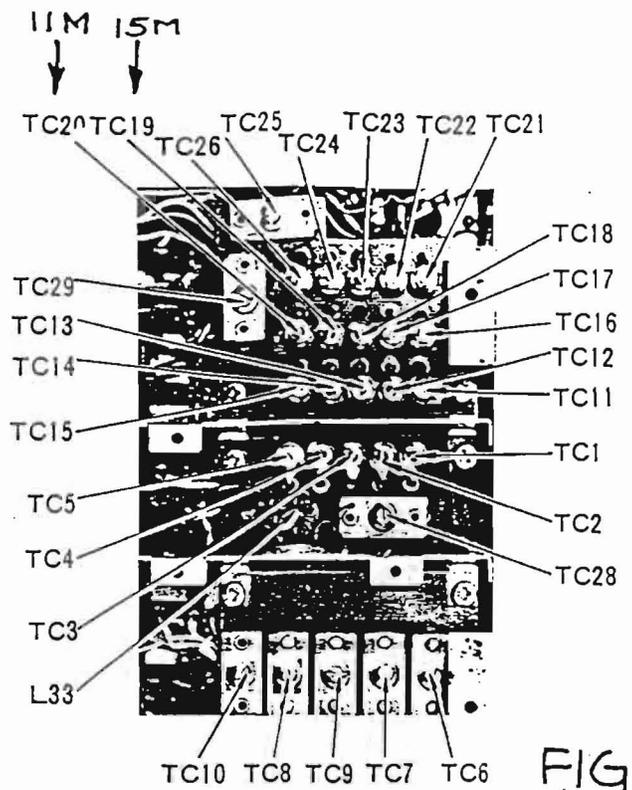


FIG. 2

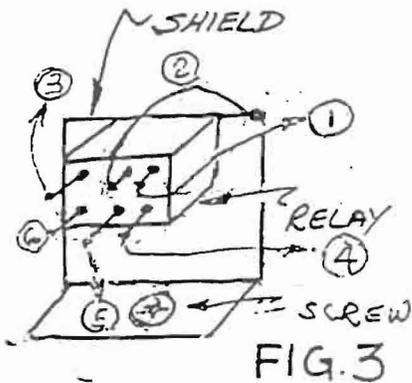


FIG. 3

RELAY PIN CONNECTIONS  
 1 to "X" socket (new)  
 2 to Ground point  
 3 lead originally to 15M  
 4 to 15M socket (new)  
 5 to new Power switch  
 6 Tied to 3 internally

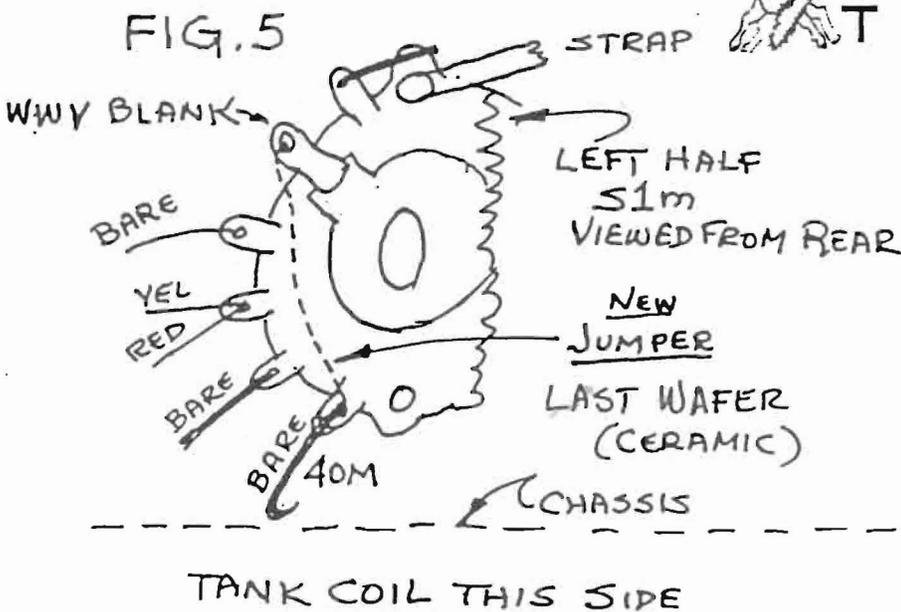
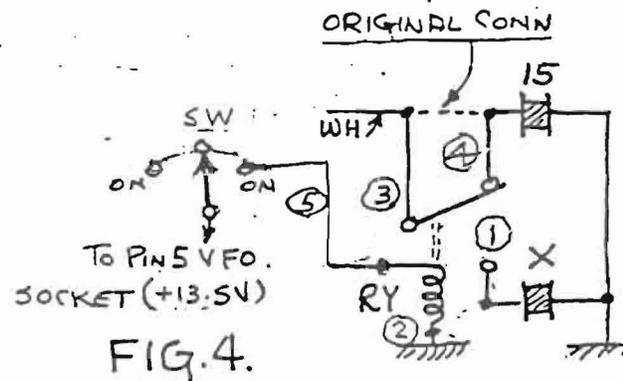


FIG. 5

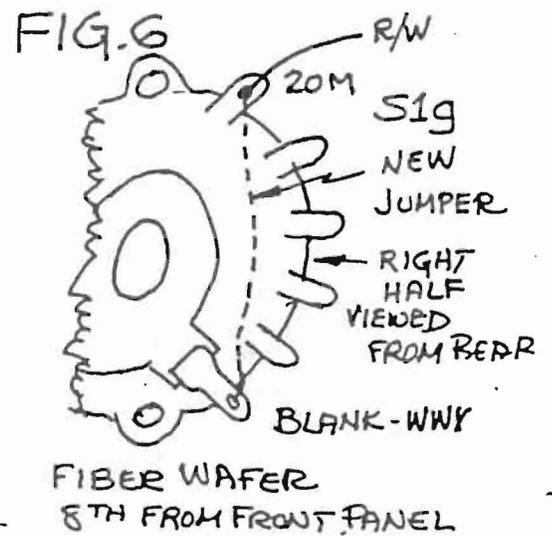


FIG. 6

Please follow this constructive suggestion from KD5OM:

The WARC kit went in smoothly, although I haven't decided to install the 17 meter portion as of yet. Everything is working fine. I do have one small tip. The jumper on the wafer switch towards the front of the radio was a bear! After an hour of failed attempts due to the fact that I couldn't seem to get enough heat to the lower lug, I started searching for an alternative method. I don't know if the author of the conversion attempted this, but I removed the board supporting the five compression trimmers adjacent to this part of the band switch. I very carefully maneuvered the board up and out of the way and was able to get my entire soldering iron inside to the lower lug without scorching any of the adjacent wiring. That step could have lasted an entire 3 minutes instead of all the frustration and anxieties involved in the previous attempts. You might want to look into revising the instructions.

(N4ML)