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Author: Edward Wright, KH6BK

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Using the Heath SB-650 Frequency Display with the Yaesu FT-101

Who wouldn't want digital frequency readout for their '101? Don't have the time to design your own? Modify the Heath SB counter — all the information you'll need is here!

By Edward T. Wright, Jr.,* KH6BK

Previous articles in the amateur literature have described the use of the Heath SB-650 with transmitters of other than Heath manufacture. No specific information has been presented which covered interconnection of the SB-650 and FT-101. This article discusses the adaptation of the Heath frequency display unit for use with the Yaesu FT-101 transceiver. The circuit changes involve relatively simple modifications to the SB-650 and interconnection to the FT-101.

Circuit Considerations

The SB-650, as designed for use with Heath equipment, is configured to

- 1) Count up the frequency generated by the high-frequency oscillator (HFO).
- 2) Count down or subtract the frequency generated by the linear-master oscillator (LMO or VFO).
- 3) Count down or subtract the frequency generated by the beat-frequency oscillator (BFO).

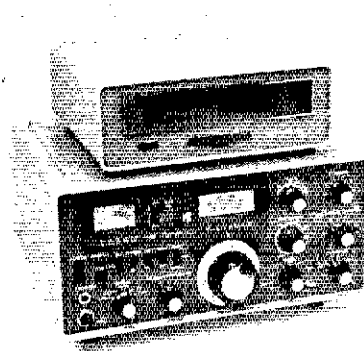
For an operating frequency of 14305.0 kHz the display readout is derived from any of the Heath HW- or SB-series transceivers as follows:

22895.0 kHz (HFO) count up
 -5196.4 kHz (VFO) count down
 17698.6
 -3393.6 kHz (BFO) count down
 14305.0 kHz SB-650 readout

The Yaesu FT-101 frequency-generating scheme requires that the counter be configured to

- 1) Count up the frequency gener-

*92626 Aahualii Place, Ewa Beach, HI 96706



ated by the high-frequency oscillator (HFO).

2) Count down or subtract the frequency generated by the variable-frequency oscillator (VFO).

3) Count up or add the frequency generated by the beat-frequency oscillator (BFO).

For an operating frequency of 14305.0 kHz, the display readout is derived from the FT-101 as follows:

20020.0 kHz (HFO) count up
 -8896.5 kHz (VFO) count down
 11123.5
 +3181.5 kHz (BFO) count up
 14305.0 kHz SB-650 readout

The frequency scheme shown above applies to all bands on the FT-101 and direct operating frequency readout is obtained on all bands, 160 through 10 meters.

The modification of the SB-650 for use with the FT-101 involves the change of the counter circuit from an "UP-DOWN-DOWN DISPLAY" sequence to

an "UP-DOWN-UP DISPLAY" sequence. Inspection of the SB-650 instruction manual circuit diagram shows that the UP-DOWN counter (IC12-17) is controlled by the presence of a high "1" enable voltage applied to the counter multiplexer circuit at either the IC11B (UP) input or IC11D (DOWN) input. A further inspection of the circuit shows that the proper time duration and sequence of enable voltages are available at IC32A, pin 1 (count up) and IC34C, pin 6 (count down). Fig. 1 shows the time duration and sequence of operation for the counting and display functions.

SB-650 Modification

The modification procedure for the SB-650 involves cutting the two foil

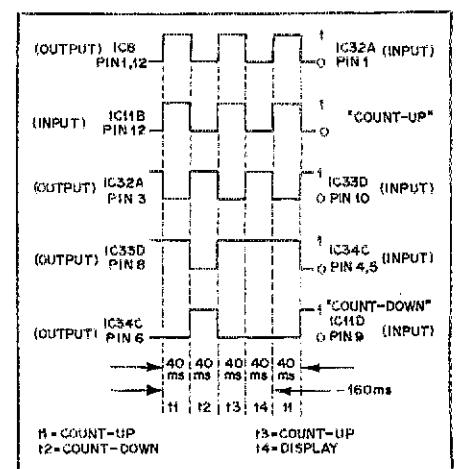


Fig. 1 — Time duration and sequence of operation for the counting and display functions of the SB-650.

leads to the counter enable gates on IC11, pins 9 and 12. Jumper wires are required from IC34C (pin 6) to IC11D (pin 9), and IC32A (pin 1) to IC11B (pin 12). Fig. 2 shows the relative locations of the jumper wires, IC pins, and foil leads to be cut.

FT-101 Modification

The modification of the FT-101 involves the addition of coaxial cables and coupling capacitors to carry the HFO, VFO and BFO signals to the rear apron. Access to the HFO, VFO and BFO circuits in the FT-101 is accomplished by installation of three coaxial cables in the FT-101 as follows:

1) Install a coaxial cable from the HFO circuit-board connector to the VFO octal socket located on the rear of the FT-101. Connect the inner conductor of one end of this cable to pin 15 and the shield to pin 18 (gnd) of circuit-board connector PB 1181A. Solder the center conductor of the other end of this cable to pin 7 and the shield to pin 8 of the VFO octal socket.

2) Install a coaxial cable from the VFO circuit-board connector to the VFO octal socket on the rear of the FT-101. Connect the inner conductor of one end of this cable to pin 11 through a .01- μ F capacitor and the shield to pin 10 of the mixer circuit-board connector, PB 1180A.

Attach the inner conductor of the other end of this coaxial cable to pin 2, and the shield to pin 8 of the VFO octal socket.

3) Install a coaxial cable from the

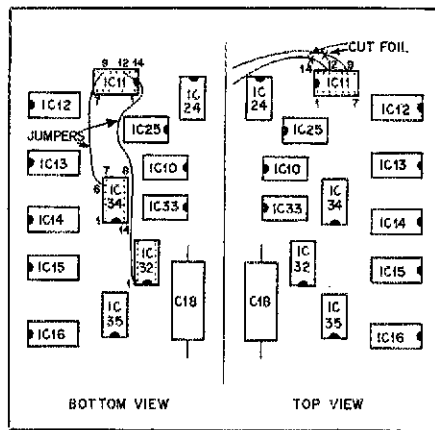


Fig. 2 — Shown here are the locations of the integrated circuits; the foils to be cut, and the placement of the additional jumpers.

BFO circuit-board connector to the VFO octal socket located on the rear of the FT-101. Solder the inner conductor to pin 6 of the BFO circuit-board connector (PB 1184A) through a .01- μ F capacitor and the shield to pin 7 (gnd). Connect the inner conductor of the other end of this cable to pin 3, and the shield to pin 8 of the VFO octal socket.

The final modification to the FT-101 requires installing a .01- μ F capacitor between the foil from test point "TP" to pin 15 on circuit board PB 1181A.

SB-650/FT-101 Interconnect Cable

Connection of the VFO octal plug to the three cables from the SB-650 is accomplished by joining the appro-

priate cables as follows:

- HFO cable: pin 7 — inner conductor
pin 8 — shield
- VFO cable: pin 2 — inner conductor
pin 8 — shield
- BFO cable: pin 3 — inner conductor
pin 8 — shield

Level Adjustment

Adjustment of the SB-650 input levels is accomplished by increasing the BFO, VFO and HFO counter input potentiometers in sequence until a stable readout is obtained. Typical voltage levels available from the FT-101 are HFO, 0.7 volt; VFO, 0.1 volt and BFO, .05 volt.

These voltage levels are sufficient to provide proper counting.

Conclusion

Modification of the SB-650 and FT-101 is a relatively simple operation which can be accomplished in an evening. One nice feature of the method described is that it does not involve drilling holes or mounting connectors on the FT-101. The final result is the direct readout of frequency computed by measuring the individual oscillator frequencies in the FT-101 and is correct on all bands of operation from 160 through 10 meters. Future use of the SB-650 with Heath equipment can be restored by removing the jumpers and installing replacement jumpers across the foil breaks leading to IC11. As an alternative, a dpdt switch can be installed on the rear apron of the SB-650 to select the counter sequence. **QST**

Strays



Among the messages sent to President-elect Carter for the QCWA Bicentennial Relay project was one from Nevada Governor Mike O'Callaghan. Here, all the Las Vegas chapter members of the Quarter-Century Wireless Association, sponsor of the event, meet with Gov. O'Callaghan to draft the message. From left to right: W7MWF; WA7RPZ, chairman; W7PBV, SCM; Gov. O'Callaghan; W7VH, director/secretary; W7OK and K7ZOK. (Las Vegas News Bureau photo)



Can your club top this? The Magic Hour 10-meter group in Philadelphia, PA, has 595 licensed years in amateur radio! Leading the group is W3OM with 65 years as an amateur. Continuing left to right in the picture are W2HX (57 years), W3NM (46), W3ADV (54), K3BJG (19), W3CQF (52), W3CAA (48), W3MOO (55), W2VU (56), W3CGS (56), W3BV (60) and, kneeling, W3PX (27 years in amateur radio).



"Tired of just listening," Robert L. Daut, Jr., of Philadelphia, PA, has decided to exchange his 15-year career as an SWL for a Novice ticket. His station, seen here, shows that he's got a good head start on building his hamshack. As an SWL he has three log books full of amateur stations, verifications, and 58 foreign countries. That gives us an idea of what to expect from this new associate member.