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Author: Dick Cromer, WD4MZK

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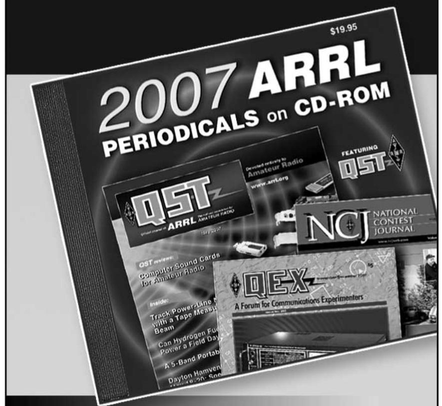

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Hints and Kinks

Conducted By Larry D. Wolfgang,* WA3VIL

MOTOR-DRIVEN ROLLER-INDUCTOR LIMIT SWITCHES

☐ In my October 1982 *QST* article I recommended the use of a slip-clutch drive mechanism for motor-driven roller inductors.[1] Since writing that article, I have tried to use a coil that had too much drag for any of the slip clutches that were available. Others may have run into the same problem when they tried to build the remote mobile-antenna matching circuit.

Fig. 1 shows a simple method of adding limit switches to stop the drive motor when the roller contact comes to the end of the coil. The polarity at pins 1 and 2 on the tuner board is reversed to change the direction of the motor. The limit switch at each end will open the positive lead to the motor. When the polarity is reversed, the diode will bypass the now-negative lead around the open limit switch, allowing the motor to start.

If the direction of travel is such that the limit switch opens the negative lead, then just change the direction of both diodes. I am sure this principle can be applied to other problems as well. — *Don Johnson, W6AAQ, Esparto, California*

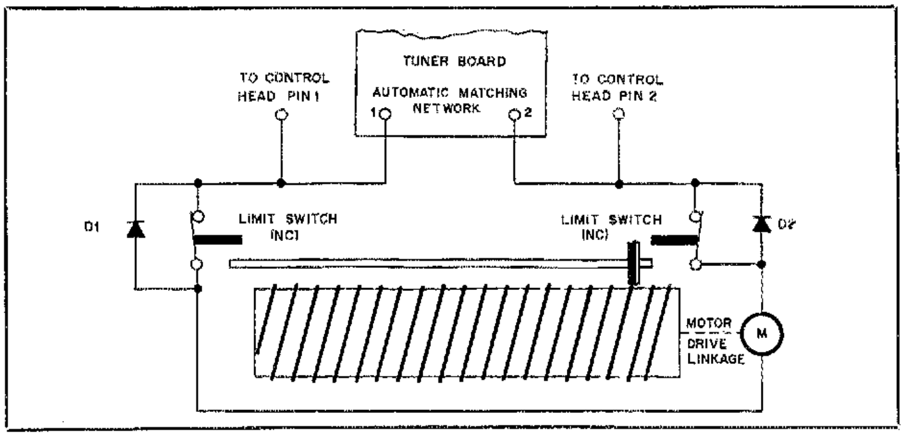

Fig. 1 — Sketch showing a method devised by Don Johnson to use limit switches with a motor-driven roller inductor.

TS-820(S) SIDETONE MONITOR MODIFICATIONS

☐ Once I became aware of the click in the sidetone signal of my Kenwood TS-820S, I couldn't bear to listen to it. Something had to be done! I also wanted to lower the normal sidetone frequency (about 850 Hz in my unit) to approximately 500 Hz. Both of these tasks were accomplished in less than an hour.

The sidetone-circuit components are located on the FIX-VOX (X50-1350-00) board. As shown in Fig. 2, the sidetone oscillator is a phase-shift type, with R48/C35, R45/C36 and R46/C37 determining the oscillator operating frequency. I used 15-kΩ, 1/4-watt, 5% resistors to replace the 10-kΩ units at R45, R46 and R48. The resulting sidetone frequency is now about 545 Hz.

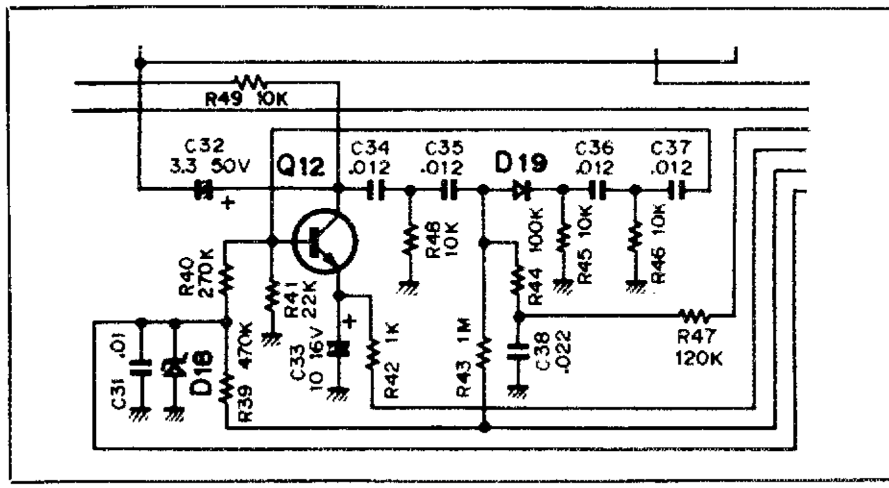

Fig. 2 — Partial schematic diagram of the TS-820(S) FIX-VOX board. This has been reproduced from the TS-820(S) service manual.

To eliminate the sidetone click I tried different values of capacitance in place of C38. I found that a 0.25-μF unit resulted in a smoother-sounding sidetone, and the click disappeared. Capacitance values up to 0.25 μF have virtually no effect on the rf output waveform. As the capacitance is increased beyond this point, the decay time of the rf-output waveform increases. This causes the on-the-air signal and sidetone signal to sound soft.

If you wish to determine the replacement capacitor value for C38 experimentally before removing the FIX-VOX board, use a probe to make contact with the above-board lead of R47 that is connected to C38. Connect the capacitor(s) between the probe end and chassis ground. Use caution during the procedure, because power is applied to the transceiver, and high-voltage dc and ac line voltage are present at nearby component areas.

The physical size of the replacement capacitor(s) is large compared to the small 0.022-μF disc-ceramic unit originally used for C38. Board space is at a premium. I paralleled two 50-V disc-ceramic capacitors and a 50-V Mylar capacitor to achieve the required value. These capacitors are what I had on hand. The Mylar unit is mounted on the component side of the board in place of C38, leaving lead lengths sufficient to act as tie points for the two disc-ceramic capacitors, which are mounted beneath the board. (A viable substitute may be a Radio Shack 0.22-μF capacitor, part no. 272-1070.)

If you mount the capacitors beneath the board, be aware that there is a limited amount of room between the board and the bottom of the chassis. Also, the capacitor body cannot extend too far beyond the edge of the board, as it might interfere with a compartment shield that is nearby.

The FIX-VOX board is removed by extracting the four mounting screws, removing the on-board connectors and the two-pin connector attached to the shielded wire that connects to the I-F (X48-1150-00) board. Use a 25-W iron and solder wicking to remove the components from the board.

Operators who use audio filters with a fixed center frequency should note that changing the sidetone frequency may not be desirable. For instance, if the filter center frequency is 800 Hz, some attenuation of a 500-Hz sidetone signal will result. — *Paul K. Pagel, N1FB, ARRL Hq.*

HW-101 TROUBLESHOOTING CHART

☐ The troubleshooting chart in my HW-101 manual does not list a check of R316 on the audio circuit board when the sympton is loss of audio in the headphones and speaker. When I experienced this problem with my rig, the S meter indicated lots of signal in the receiver. A continuity check of R316 gave an approximate reading of 22 kΩ (the correct value for that

[1] D. Johnson, "Mobile Antenna Matching — Automatically," *QST*, Oct. 1982, pp. 15-20.

*Assistant Technical Editor

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resistor). A voltage check at this point revealed that when power was applied the resistor heated up, the resistance increased and reduced the audio to almost zero. With a lighted magnifying lens I was able to see only a slight discoloration of the resistor. — *Dick Cromer, WD4MZK, Bedford, Virginia*

CHEAP, POLARIZED POWER CONNECTORS

☐ I have been using the top connectors from old 9-V transistor-radio batteries as inexpensive polarized power connectors. After removing the top from a battery, I solder the power leads from the equipment to the connector. Another connector is used on the leads from the power supply. Be careful to maintain the correct polarity. (Positive and negative leads go to the opposite sides of the connector compared to the one on the equipment. See Fig. 3.)

Connecting leads must be of a sufficient wire size to handle the required current. After the wires are soldered to the connectors, I apply a layer of epoxy over the wires to provide insulation and strength. — *Ron Zornow, N9AHU, Dundee, Illinois*

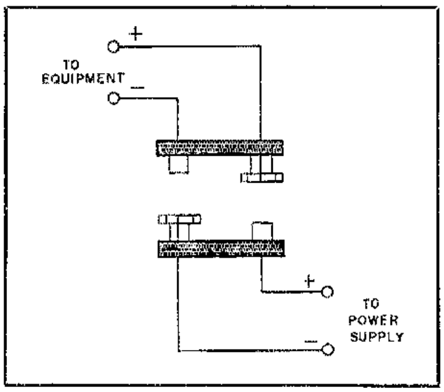

Fig. 3 — Tops from old 9-V transistor-radio batteries can be an inexpensive source of polarized power connectors.

COMPONENT REPLACEMENT ON PC BOARDS

☐ Have you ever had to replace a resistor or diode in the middle of a crowded pc-board circuit? Here is an easy way to get such a nasty job done.

Heat the wire where it comes out of the unit to be removed. The heat will flow down the wire and melt the solder. Lift that end of the component with a pliers, or use a knife blade to pry it up. Repeat the process on the other lead. A small drill bit will clear the solder from the hole. Then a new part can be soldered into the circuit. Don't use this method with a double-sided board that has plated-through holes. In this case a piece of dirty copper wire can be heated and pushed through the solder to avoid damaging the plating. This is much easier than trying to find the right place to unsolder from the bottom of the board. — *Lew Stapp, WØPHY, Hays, Kansas*

MEASURING ALTERNATING CURRENT: AN UPDATE

☐ I believe I have a better method for measuring alternating current with a VOM than the one described by Edwin Walker, WA4OFS, in

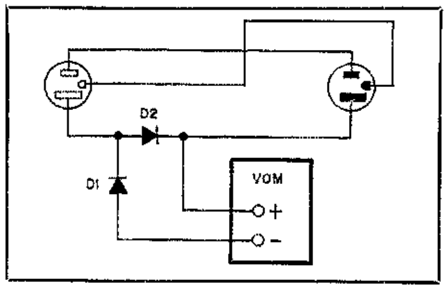

Fig. 4 — Diagram showing the method used by K2SE to measure alternating current with a VOM. Be sure the diodes and meter connect to the neutral side of the ac line for safety.

the June 1982 Hints and Kinks column. My method, shown in Fig. 4, uses diodes in place of the resistor. The diode method introduces only about a 0.6-V drop in applied voltage, regardless of load power. The resistor method produces a voltage drop that varies directly with load power. This drop amounts to 7.1 V, or almost 6% of the applied voltage at the power limit of the resistor. The diode drop would amount to only 0.5% of the applied voltage.

A second advantage of the diode method is that the power dissipation varies linearly with load power, but the resistor-circuit dissipation varies with the square of the load power. In a circuit drawing 7 A, the resistor will dissipate nearly 50 watts, but the diodes would only dissipate 1.9 watts each. The accuracy of the WA4OFS method depends on the tolerance of the resistance, but the accuracy of my method does not depend on the diode parameters.

The maximum load that can be handled by this method calculated to be 2.22 times the line voltage times the maximum dc current capability of the meter. My Radio Shack VOM can handle 2665 W on the 10-A scale. To find the required diode current rating divide the load power by 85. If you are measuring a 500-W load (even though the meter can measure a lot more) you will need 6-A diodes. The diode PIV rating need not be considered because the peak inverse voltage across either diode will be the forward voltage drop of the other diode.

One drawback of my method is that the meter does not read rms current directly. The meter reading must be multiplied by 2.22 to obtain the rms current in the circuit. For those who are curious where this "magic" number comes from, I will show a simple derivation. I'll skip the details of the integral calculus that derives equations 1 and 2, however.

$$I_{rms} = \frac{I_{pk}}{\sqrt{2}} \qquad \text{(Eq. 1)}$$

$$I_{pk} = \pi \times I_{dc} \qquad \text{(Eq. 2)}$$

Combining these equations we get

$$I_{rms} = \frac{\pi}{\sqrt{2}} \times I_{dc} = 2.22 \times I_{dc} \qquad \text{(Eq. 3)}$$

Please note that if this circuit is wired into an electrical box as suggested with the other circuit, you should not leave the load connected without the meter, since this results in half-wave rectified dc being supplied to the device under test! If the leads that should go to the meter are left dangling, one of them will be "hot" and would present a safety hazard. Plug the leads into your meter before plugging in the power cord. — *Edwin Solov, K2SE, Wayne, New Jersey*

[Editor's Note: George Woodward, W1RN, suggests that a full-wave bridge rectifier could be used, with the meter connected between the dc terminals of the bridge. In this configuration, the load would be disconnected from the line if the meter was not connected. The dc meter reading would have to be multiplied by 1.11 to obtain ac rms current. This would result in a 1.2-V drop in applied voltage instead of 0.6 V as with Solov's circuit. The diodes in this type of circuit should have a PIV rating of 400 V if the circuit is to be plugged into the power outlet with the meter disconnected.]

THE TRS-80® COLOR COMPUTER AND THE STATE-OF-THE-ART TU

☐ The State-of-the-Art Terminal unit[2,3] works well with the mechanical RTTY machines, and with only minor modification will also work with the TRS-80 Color Computer. For an RTTY beginner this TU seems to be an economical approach.

The modification to make the TU transmit with the Color Computer is the easiest to accomplish. Fig. 5 shows the circuit changes required. Remove the wire from pin 9 on U2, the XR-2206 tone generator. Add an spdt switch

[2]M. Di Julio, "State-of-the-Art Terminal Unit for RTTY," *QST*, Dec. 1980, pp. 20-22.
[3]R. Witmer, "Auto-start and Anti-space for the State-of-the-Art TU," *QST*, Nov. 1981, pp. 28-30.

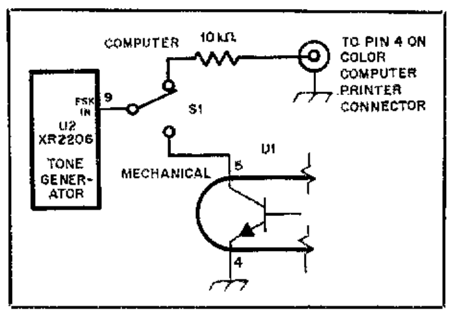

Fig. 5 — Schematic diagram of the transmit modifications for using the State-of-the-Art TU with a TRS-80 Color Computer. Additions are shown with heavier lines.

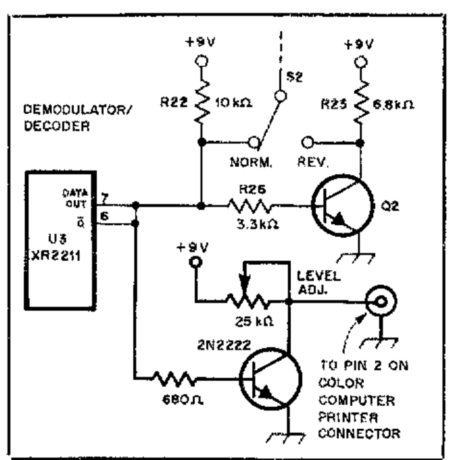

Fig. 6 — Schematic diagram of the changes to the State-of-the-Art TU for receiving with the TRS-80 Color Computer. Additions are shown with heavier lines.