Modification of RVS-8 Voting System to Mute Audio Output When no COR is active

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Our repeater uses receivers which do not mute their audio output when COR is inactive. The repeater controller also does not mute audio based on COR. Since the RVS-8 Voter passes the last selected input to the transmitter even when no COR is active, there is some unacceptable behavior of the repeater.

When the repeater keys up based on one of the receivers asserting COR, behavior is normal. However, when the signal to the receiver goes away, COR drops, starting the courtesy tone and transmitter key timeouts, and the repeater transmitter stays active for a few seconds. During this period of time, since no signal is present on any receiver, unsquelched noise is passed to the transmitter audio until the transmitter carrier drops.

The previous voting system muted the transmitter audio when no COR was active, and we desired to have the RVS-8 behave the same way. There was no configuration option to do this, nor any jumper to select that behavior. So we started looking for a simple hardware modification to do what we wanted. The modification we arrived at is shown in red on the schematic excerpt in Figure 1. The selected audio signal is routed to the output by U7, a 4051 analog multiplexer. This chip includes an inhibit input on pin 6 which is grounded in the original design, permitting whatever input is selected by pins 9, 10, and 11 to be passed to the output. If we could apply a signal to that pin that is high when no COR is active and low when any COR is active, we could mute the audio output when we want.

There are actually two signals in the circuit that are labeled “COROUT”. One is the output from pin 14 of U2, which is fed to transistor Q1, which in turn drives the COR relay coil. The signal out of U2 is active high (high when COR is asserted), but the signal at the collector of Q1, is active low. This latter signal is exactly what is needed to inhibit U7 when COR goes away.

The only concern with this signal is that it is connected to a relay coil, which can generate voltage transients when it is switched. Diode D2 is in the circuit to suppress those transients, but nevertheless, we checked the rising and falling edges of the signal with a scope and found that there was no overshoot or undershoot on them, making it safe to connect the signal to the 4051 inhibit input.

The (correct) COROUT signal is available at a test point on the board as shown on the schematic (TP19). Fortunately, all of the integrated circuits on the PCB are socketed. To complete the modification, all that was required was to remove U7 from its socket, bend pin 6 out, and reinsert the chip in the socket, with pin 6 “flying”. A wire was then soldered to this pin and connected to the COROUT test point on the PCB. The modification is shown the photo in Figure 2.

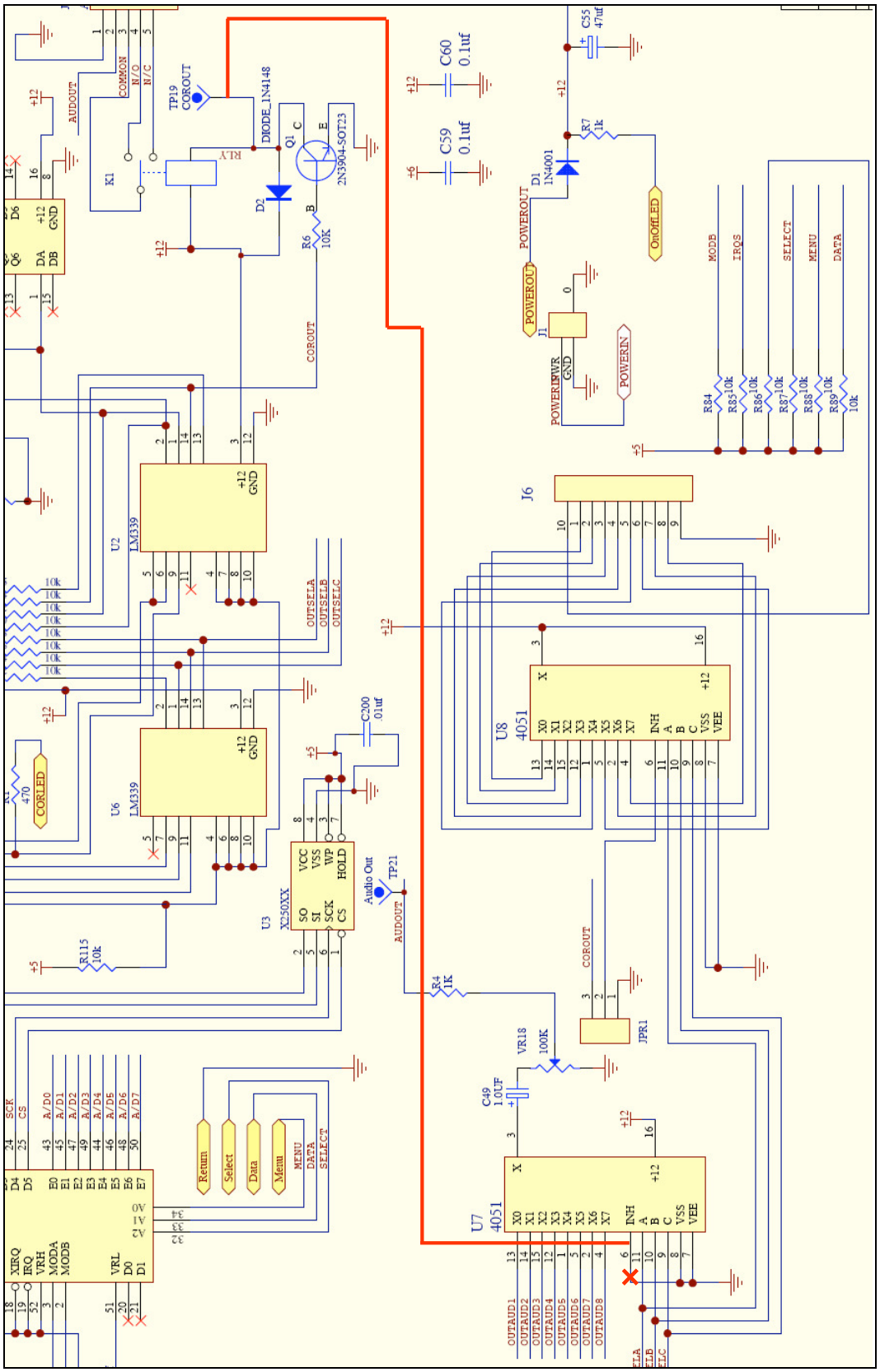

Figure 1 - Circuit modification

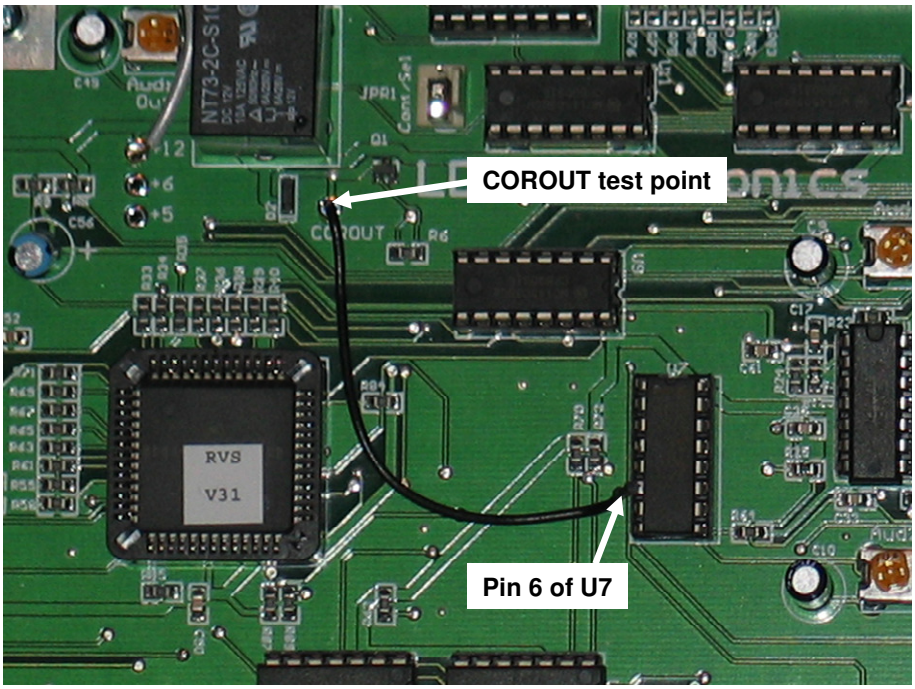

Figure 2 - Single wire is all that is needed for mod

After the modification was completed, we ran some tests with the two Hamtronics UHF link receivers. Normal operation was confirmed. Then we checked the timing of the squelch tail from the link receivers relative to the COR output to the transmitter. We wanted to ascertain the length of the noise burst, if any, that would be transmitted after the link transmitter stopped transmitting, but before the link receiver squelch closed. The left side of Figure 3 shows this timing. The top trace is the audio output that is sent to the repeater transmitter and the bottom trace is the COR output to the transmitter. It is an active low signal driven by a relay and pulled up with a 5K resistor. At the left side of the top trace, the audio output is quieted by a UHF transmitted signal. At the end of the transmission, the noise appears and continues for about 38 milliseconds. About 7 milliseconds later, the COR is unkeyed.

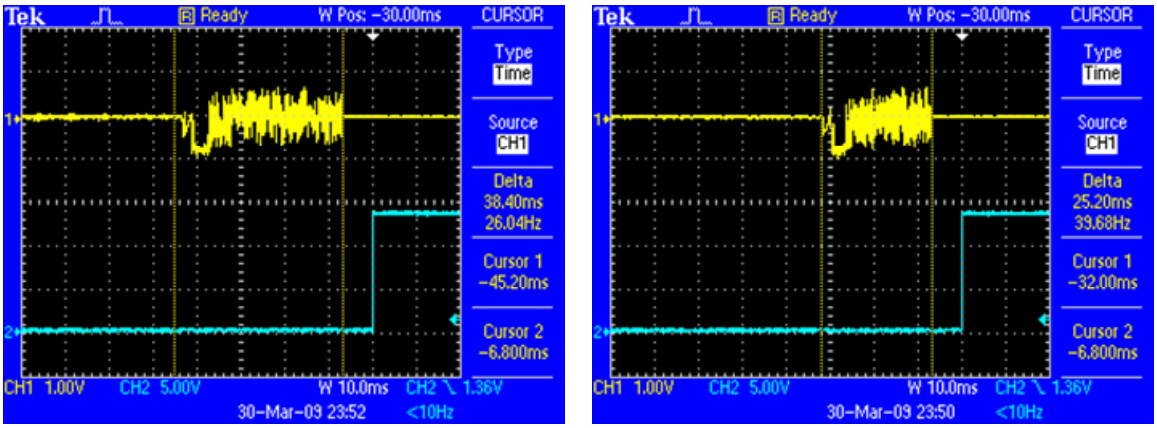

Figure 3 - Squelch tail timing at 1/2 and full squelch setting

The right side of the figure is the same setup, except with the link receiver squelch setting at full. With this setting the squelch tail noise burst is reduced to about 25 milliseconds. Based on this data, it appears that the squelch tail should not be too objectionable with this setup. It also looks like it would help to set the link receiver squelch adjustment as tight as possible to minimize this burst. The UHF link should have plenty of margin and no appreciable fading since the transmitter and receiver are not moving, so a tight squelch is probably warranted anyway.