Automatic Band Select and Serial Interface for Icom HF Radios

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This project is an interface box for Icom rigs that includes a band output port and a CI-V–to–computer serial interface. The band output port drives things like relay-switched DuneStar band filters (Model 600, for example), remote coax switches, etc., and does not require a computer. The CI-V interface allows rig control via computer, and makes logging programs like TR-Log and CT really shine.

Figure 1 is the band select driver portion schematic. When I designed it, I thought I was being really clever—using an IC designed as a consumer-audio output meter as an analog-to-digital converter with an external reference and controlled-current output drivers. Then came the April (1997) NCCC meeting: N6TV brought in his OH-made solid state DXpedition kW amplifier, and there in the diagrams was an Icom interface virtually identical to my "clever" circuit. So much for unique ideas…at least this means this design should be easy to duplicate and get running for other builders! One major difference from the commercial design is that Figure 1 properly decodes 30m. Unfortunately, other WARC bands are not separated (12m decodes as 10m; 17m decodes as 15m) because Icom's voltage level scheme uses the same voltage for these band pairs.
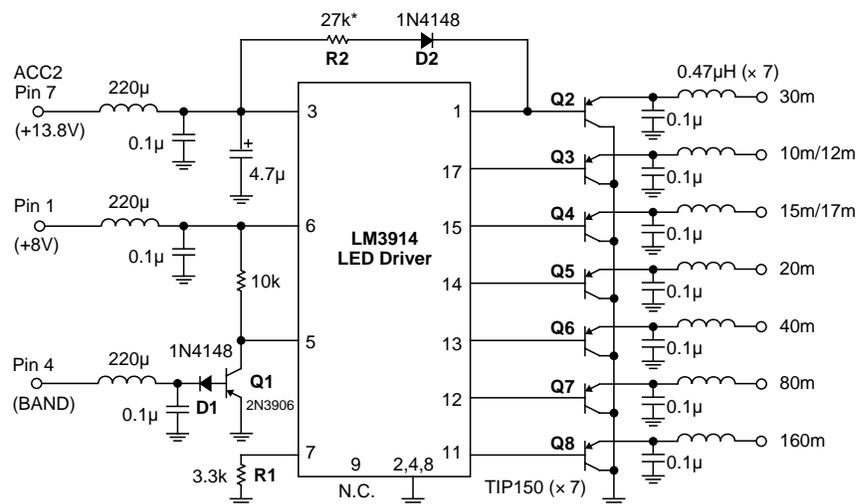

Figure 1. The Icom Band-Select Decoder

The band decoder takes three inputs from the Icom rig: power, a reference voltage of +8V, and the "BAND" voltage. This band voltage varies from 0V for 30m to over 7V for 160m (see the Table, below, for values measured on my particular rig). The LM3914 is designed as an LED bar graph meter for low-cost consumer audio electronics. It is used in its "moving dot" mode instead of the bar graph mode, so only one output is active at a time. Note that no base current limiting resistors are needed for the output transistors: the LED driver functions as a current source which provides the needed base current limiting. Base current drive is set by R1. Q1 and D1 act as a level-shifter, raising the zero-volt 30m level about a volt so that the first "dot" is active. R2 and D2 compensate for a

LM3914 "funny"—the first output draws several hundred microamperes of current even when the other outputs are selected. This is enough to turn on Q2 slightly. R2 compensates by providing another path for this current. Its value might need tweaking for individual LM3914s and different supply voltages. D2 prevents reverse current flow from the relay into the rig.

The CI-V–to–computer serial interface schematic appears as Figure 2. It uses a low-cost dual op-amp and a zener diode for level conversion. A 555 timer is used as an oscillator and charge pump to produce the negative voltage. Since power is already available from the band decoder port, no attempt at self-powering through the RS-232 port is made. You could probably derive the negative supply from the serial port and eliminate the 555 charge pump. Icom uses a unique system with bidirectional control (with multi-radio capability) through a single wire (plus ground). A standard miniature (1/8") mono phone plug connects to the radio's "CI-V" port. A normal 9-pin or 25-pin DB connector attaches to the computer's serial port.
Like most of these interfaces, getting the hardware built and connected is only part of the task; convincing the software in the computer and the radio to speak is usually much more frustrating, especially if you have not done it before with a given program or rig. You are on your own here!
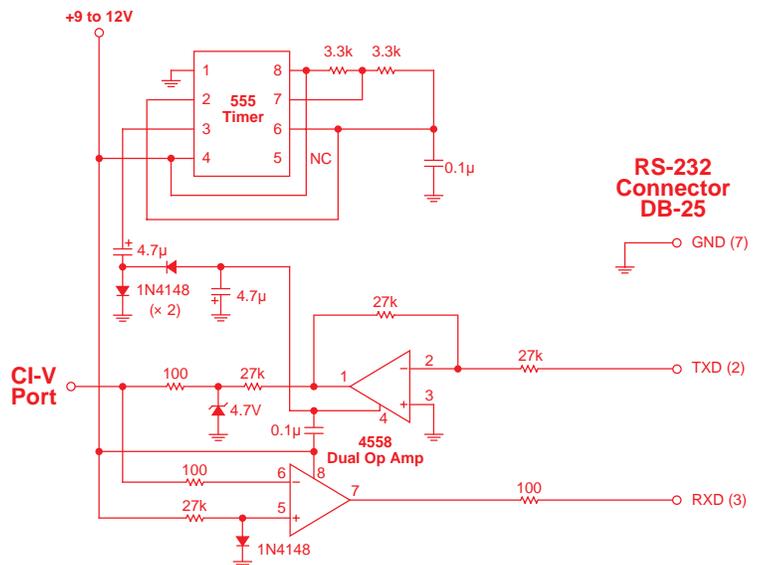

Figure 2. CI-V to Serial Converter

Figure 3 shows the complete interface schematic. I tried to minimize the number of different resistor and capacitor values; only R1 and R2 are critical; the others may vary quite a bit without affecting circuit operation. The component cost of the full interface is relatively low: well under $20 at Digi-Key mail order prices. You can probably build this box for under $10 by visiting the flea market and the local "junk stores".
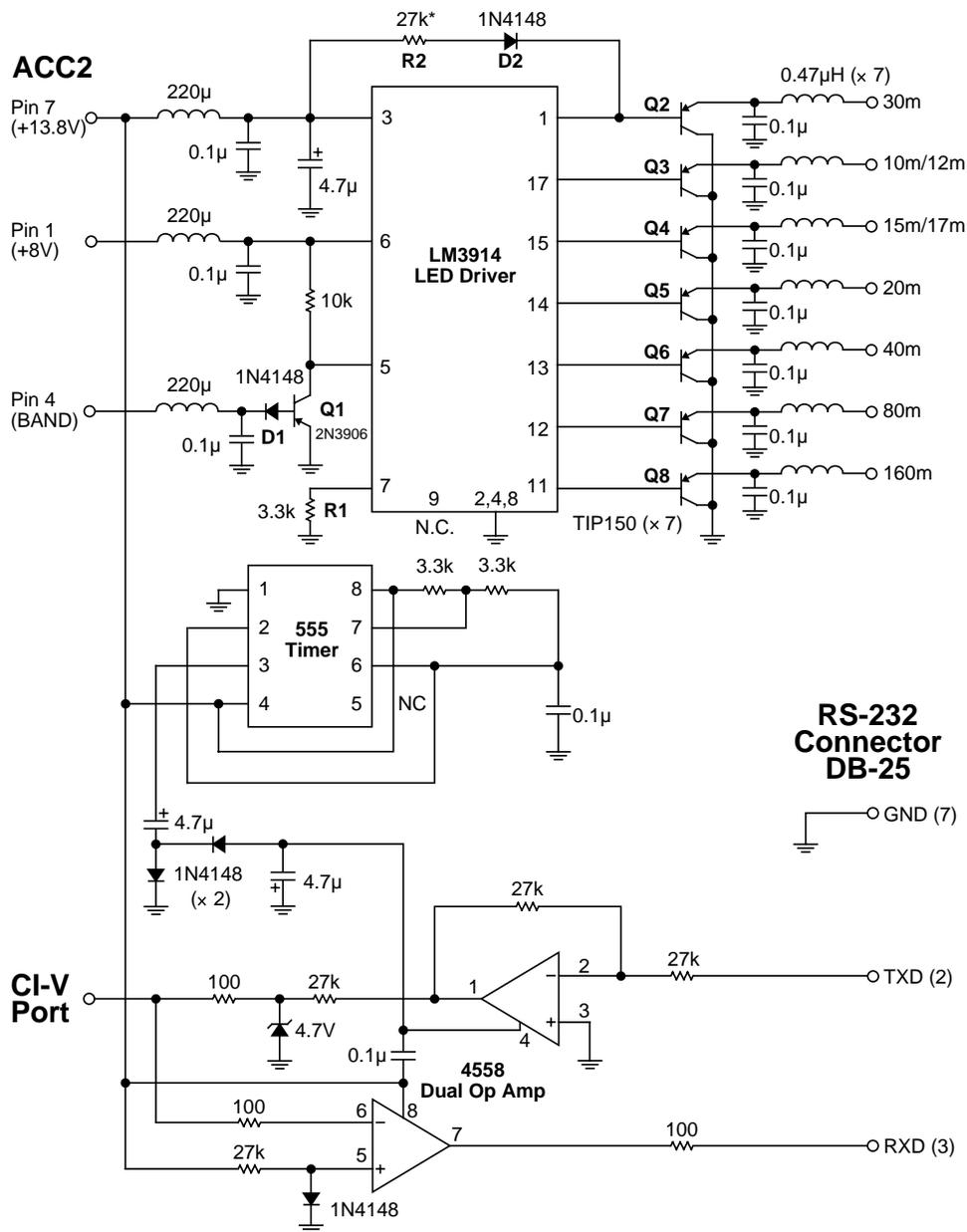
73 & GL de Bob, K6XX

Figure 3. Full Interface Schematic

Appendix: Measured *BAND* Pin Voltages

Band	BAND Pin Voltage
10	3.5
15	4.3
20	5
30	0
40	6
80	6.6
160	7.5

Measured BAND *output voltage on my particular IC756.*