CWLab04 Hardware Interfacing Notes

WN2A 26 June 2004, Revised January 2008

This paper's purpose is to *suggest* some Hardware Interfacing ideas that may help the CWLab04 user. The author assumes that the reader can adapt these ideas to his or her own particular station equipment, as everyone has a different setup.

1.0) Receiving with CWLab04: Soundcard inputs

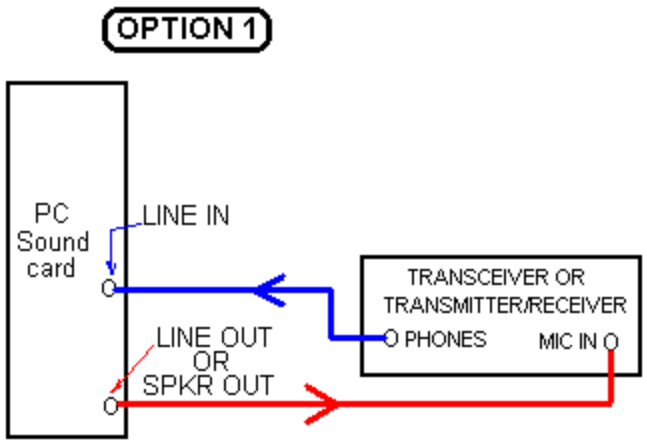
RX with CWLab04 is easy to impliment with different input sources. Your Soundcard LINE INPUT or MIC INPUT can be used , depending on what you have available. LINE INPUT is preferred, with a direct connection to the receiver speaker or headphone output jack. The MIC INPUT has been used, even with a microphone acoustically coupled to receiver speaker.

2.0) Transmitting with CWLab04:

2.1) Option 1: Driving Sideband Transmitters/Tranceivers from Soundcard.

The simplest way to use it is just the same way PSK31, JT44 and other digital modes are implimented; that is, by directly driving the Transmitter Microphone Input. This will only work with Single-Side Band (SSB) Transmitters/Tranceivers.Otherwise, one does not obtain A1 emission. The operator must be very careful not to overdrive the transmitter, so it is best to back off the mic gain. To generate a pure audio tone, CWLab04 uses 16 bit resolution at 8000 samples/second, so the audio sine wave should be very clean and low in harmonics, so long as the transmitter is not overdriven. If there are any concerns,use a potentiometer to set the level and a simple audio filter (low-pass cutoff or band-pass centered around 800 Hz), with TX TONE set to 800 Hz should do the job. Both cables should be audio or microphone shielded coax. A set of RF low pass filters may be needed if RF interference becomes an issue.

Figure 1: Direct Connection (Option 1)



2.2) Option 2: Soundcard to Hard-Key Converter:

Here the RX connection from receiver to soundcard line input is same as in section 1.0 but the TX arrangement is different from section 2.1. The Homebrew rigs used by the author required a hard key to ground connection. The circuit shown in Fig 2 and in the photos Fig 3-6 uses a full-wave audio detector with an open-collector transistor. This arrangement allows for accurate conversion of keyed audio to an open-collector control line suitable as key input to a transmitter. Most CW-only rigs have this as the only keying option. The circuit will respond/decay within about a millsecond, and it is driven right from the PC speaker terminals. In fact, mine was built inside a PC speaker, and has connections for a 9 Pin D-Type connector for my rig interface. A detailed description of my “Power Interface” which I used on all my homebrew rigs is given at the end of this paper.

The circuit works in this manner:

First, the Operator manually grounds the T/R RELAY line (at J2-9). This energizes the T/R Relay (connected between pin J2-9 and +12 volts not shown). The T/R Relay in my rig has contacts that powers +12T (at J2-1 and J2-2). This then powers up the audio detector circuit U1. When audio of approx 17mV or greater is present at the speaker terminals, the detector threshold will be exceeded and U1 will drive 11 volt pulses at CR1 and CR2, and filter at C8. This will bias Q1 and Q2 on, and result in a key closure to ground at pin 8. Parts list is Table 1 .See Table 2 for typical voltages. Figure 7 are the resultant keyed output at Pin 9. Note the 50% duty cycle, even at 24WPM.

2.3) Option 3 (Proposed Only):

Soundcard to Hard-Key Converter, LF Tone Detect, Automatic T/R:

This is same as 2.2) except that instead of manually grounding the T/R RELAY line, the use of a low frequency audio tone could be sensed by a NE567 PLL circuit and with additional parts can provide an open collector pull-down to J2-9. In the CWLab04 SETUP Menu several frequency choices are available to generate this LF tone (similiar to "PL" tone) . (I am only proposing this option here; at my station I use Option 2 but someone with time and the knowledge should have no problem doing this!)

Some Comments:

The earlier CWLab programs *were* able to use the LPT ports to control the T/R RELAY line, however with Windows 2K/Xp, this became problematic. A functional work-around for this was provided by Labview's manufacturer, National Instruments, but its installation was deemed too complicated for CWLab04. So, we could either go with Option 2 (manual,as I have done) or make provision for Option 3 (proposed with Automatic T/R).

Fig 2. Soundcard to Hard-Key Interface. (Option 2)

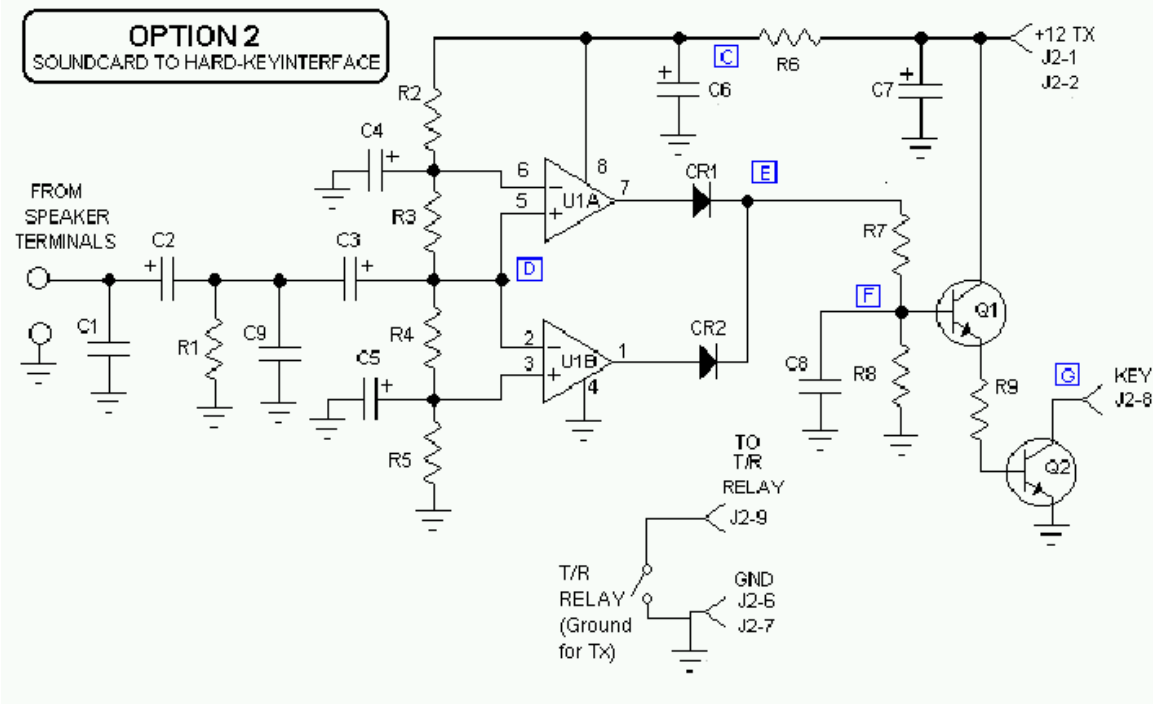


Table 1: Parts List

REFERENCE DESIGNATOR	PART NUMBER(S)/ DESCRIPTION	QTY
U1	LM358,LM2904,LM1458 ETC DUAL OP AMP	1
Q1,Q2	2N3415,2N3904,2N2222A,2N4124 GP NPN SILICON	2
CR1,CR2	1N4148,1N4149,1N914,1N916 SI DIODE	2
C1,C8,C9	.01 MICROFARAD X7R CHIP OR DISC CAP	3
C2	6.8 MICROFARAD 10 VOLT TANT OR ELECTRO	1
C3,C4,C5,C6,C7	1.5 MICROFARAD 25 VOLT TANT OR ELECTRO	5
R1,R6	100 OHM CHIP OR LEADED RESISTOR	2
R2,R5	390K OHM CHIP OR LEADED RESISTOR	2
R3,R4	820 OHM CHIP OR LEADED RESISTOR	2
R7,R8	100K OHM CHIP OR LEADED RESISTOR	2
R9	3.6K OR 3.9K OHM CHIP OR LEADED RESISTOR	
J2	9-PIN D-TYPE (MALE)	1

Table 2: Typical Test Point Voltages. Transmit Mode (TX)

Audio tone input approx 40-50 mVRMS at speaker terminals.

Test Point C	12.5 volts
Test Point D	6.25 volts
Test Point E	10 volts
Test Point F	4.9 volts
Test Point G	0.0-0.25 volts

Step-by-Step Construction Photos:

Figure 3. The Subject PC Speaker, Unmodified

Figure 4: The PCB Assembly

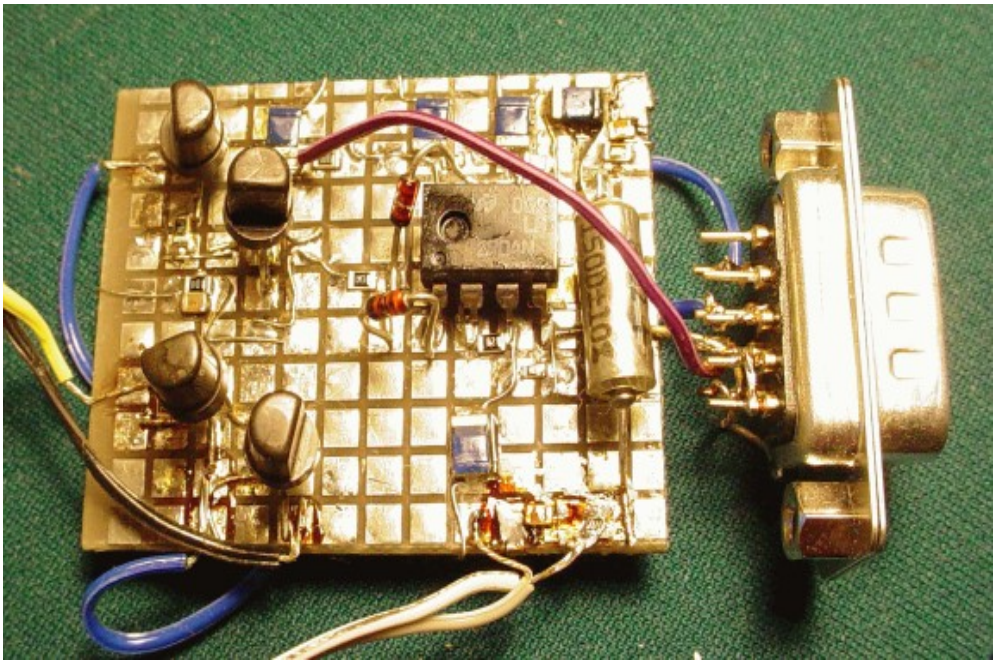


Figure 5 : Installation

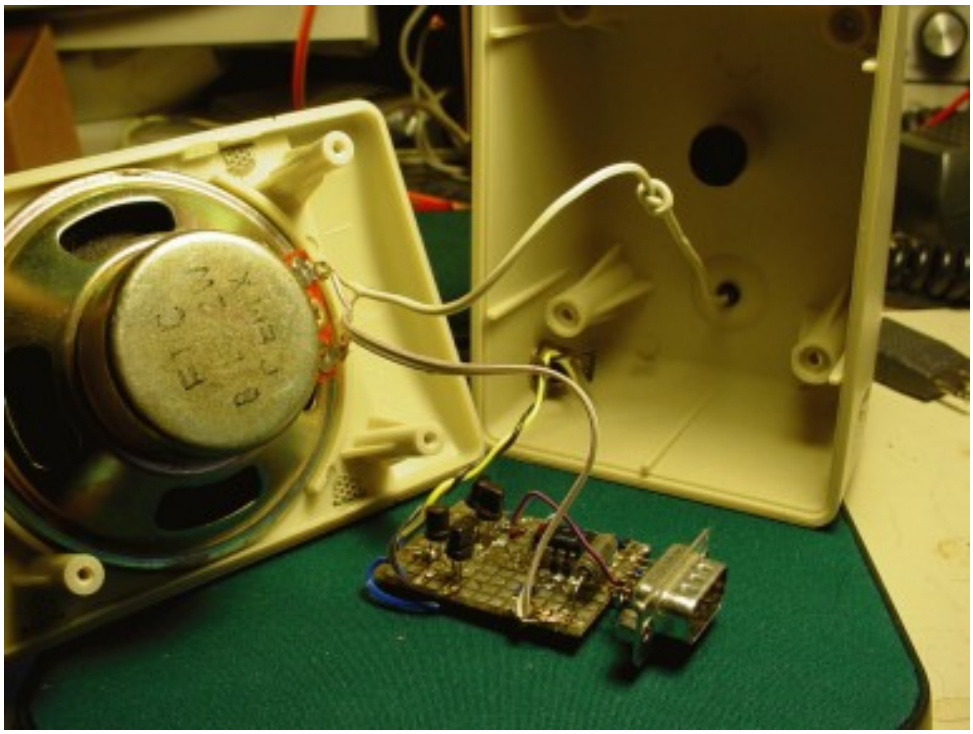
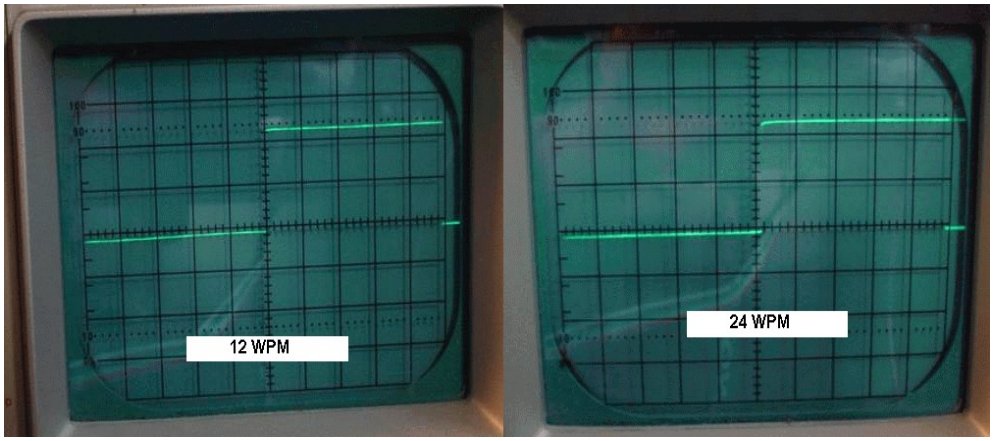


Figure 6: The Finished Product:

Figure 7: Keyed Output (@Pin 9). Both 12 and 24 WPM are $$$ (synch dits)



Appendix A. The WN2A Power Interface:

(Following section not required for CWLab04)

The Method used to interconnect the "gear" at WN2A.

Originally my homebrew rigs had a variety of different connectors for supplying power and connecting control lines (such as Keying, T/R Control,etc). In an effort to put an end to this chaotic arrangement, I decided to use one type connector for all the requirements, and make that connector a most common one could obtain: The 9 pin D-Type. It can handle the voltages, control signals and ground returns that I needed and then some. It can be used to connect any Transmitter, Receiver and VHF/UHF Transverter and any keyer together to a common Bus breakout point (such as T/R Relay & Antenna Tuner Box) . Only one type cable is required, so one can make extra cables for backup purposes, or interchangeabilty. Both ends of each cable is terminated in a female 9-pin D-type connector. Wiring is Pin 1 to Pin 1, Pin 2 to Pin 2 and so on. Each cable is between 1 to about 3 ft (30 to 100 cm) long and each can handle 2 amps per conductor.

Figure A1 describes the Connector Pin –Out and their functions:

Figure A1: Interface Pin-Out

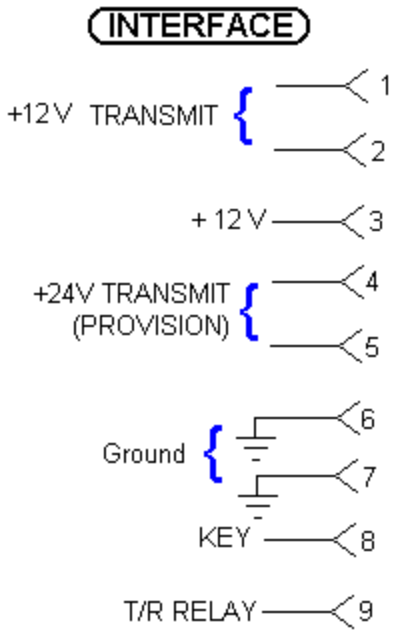


Figure A2: T/R Relay and Antenna Tuner.

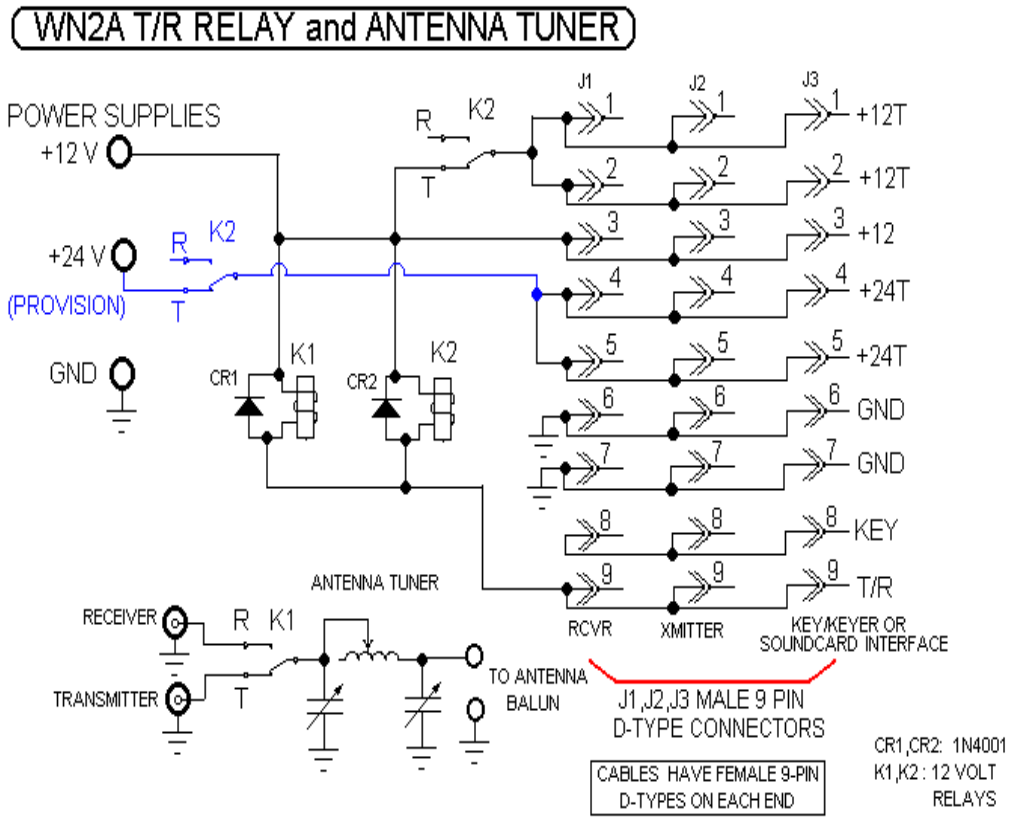
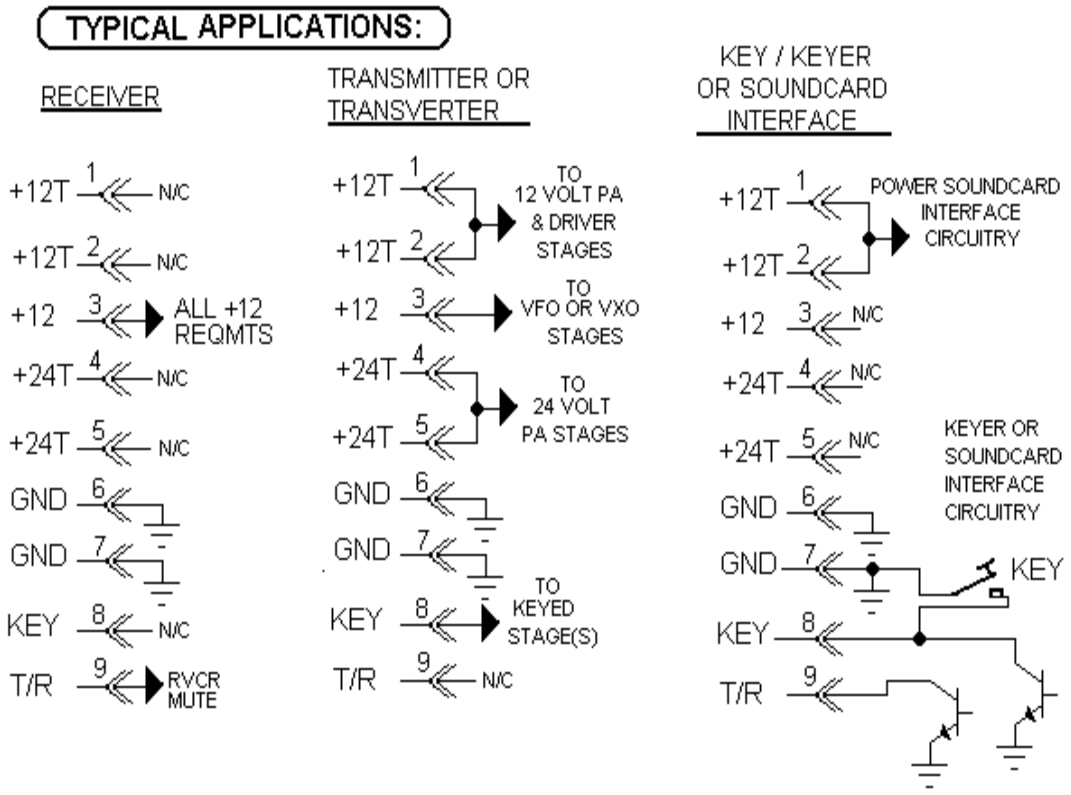


Figure A3 : Typical Applications



WN2A 26 JUNE 2004, Revised 4 January 2008
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