Simple, Low Cost Interface Between Kenwood Serial Ports and Contest Logging Programs

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A circuit that connects an IBM® compatible personal computer, running TR Log or CT (etc.) contest logging software, and Kenwood transceivers equipped with serial control ports. CW keying is also provided in this RFI filtered interface unit. No batteries or external power supplies are required.

Author Note: This article was written in 1990 for the ***JUG***, the monthly newsletter of the Northern California Contest Club (NCCC). I have updated it (January 1997) a bit, but it still is a bit dated. I believe that CT now uses a different parallel port CW interface so the keying portion of the interface circuit may not work with the latest CT revision(s). *Caveat Emptor*—I have been using TR!

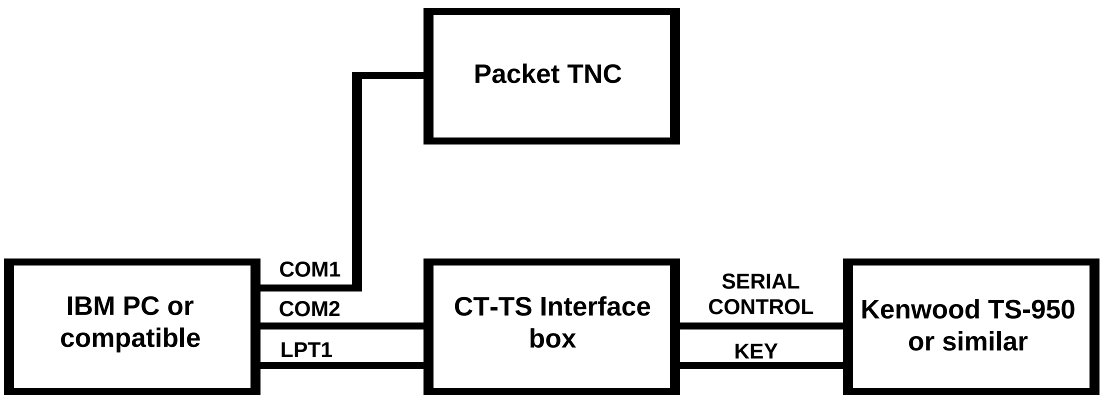

Figure 1. The computer commanded contest station.

Introduction

Contest logging programs, working with generic radios, are a tremendous improvement over pencil and paper. Dupe and partial checking in milliseconds, displaying running scores, instant (usually) determining of countries and zones, and, of course, log printing and error-free scoring at the end of the contest. Integrated CW keying make working stations simpler and helps reduce error rates.

But that's not all. When the logging program interfaces with a computer-compatible transceiver, a host of other features become available. Band-mapping stations, with the time and frequency automatically entered, is a great aid to search-and-pounce operation. If you use packet, on-screen packet spots with fast QSY to the spot frequency is another potential score booster. This integration of logging/duping/scoring, band mapping, packet spotting, and CW memory keying with rig frequency control is available to those of us with a computer compatible transceiver, a contest logging program, and an interface that connects the other two. I cannot help you with the rig or software, but with the simple, low cost interface described here, you can save the $100 that Kenwood charges for their RS-232 converter plus whatever the CW keying interface may cost. This one-transistor interface can be easily built in an evening, and provides full compatibility with the IBM® PC and Kenwood radios (TS-140, TS-440, TS-940, or later). Better yet, no external power supply is required.

The Kenwood IF-232 Interface Box

For about $100, Kenwood will gladly supply you with an interface box that allows connecting your serial-compatible rig to a PC. Inside this box is (at most) $5 worth of components which provide three functions:

- TTL to RS-232 Line Driving & Receiving
- RFI Isolation
- Power Supply

Four lines (plus ground) are connected: TXD (Transmit Data, inverted), RXD (Receive Data, inverted), RTS (Ready To Send), and CTS (Clear to Send). For RFI isolation, Kenwood employs optoisolators and separates radio ground from the interface box chassis ground. Interface and computer grounds are common.

Double inversion is provided, so the input signals are the same sense as the output signals, merely isolated and level shifted.

EIA RS-232C

The most common serial port used in computers is the RS-232C. It communicates with modems, mice, and some printers, for example. Specification standards denote that the line is driven with differential voltages ranging from ± 3V to about ±15V. The current and voltage levels are such that 15m of cable can be reliably driven at over 19.6kbps. As far as we are concerned, this is tremendous overkill for our application at 4800bps and less than 15 feet. Thus, we can take great liberties and still maintain reliable communications.

The line drivers and receivers almost universally employed for TTL level (0V to +5V) to RS-232 (–3V to +3V through –15V to +15V) level conversion are the 1488 and 1489A. These integrated circuits are inexpensive and available from numerous sources; even better is the fact that every other solution for this application is 100% compatible with the 1488/1489A as well as compatible with RS-232 specifications. This passive interface exploits this subtle difference.

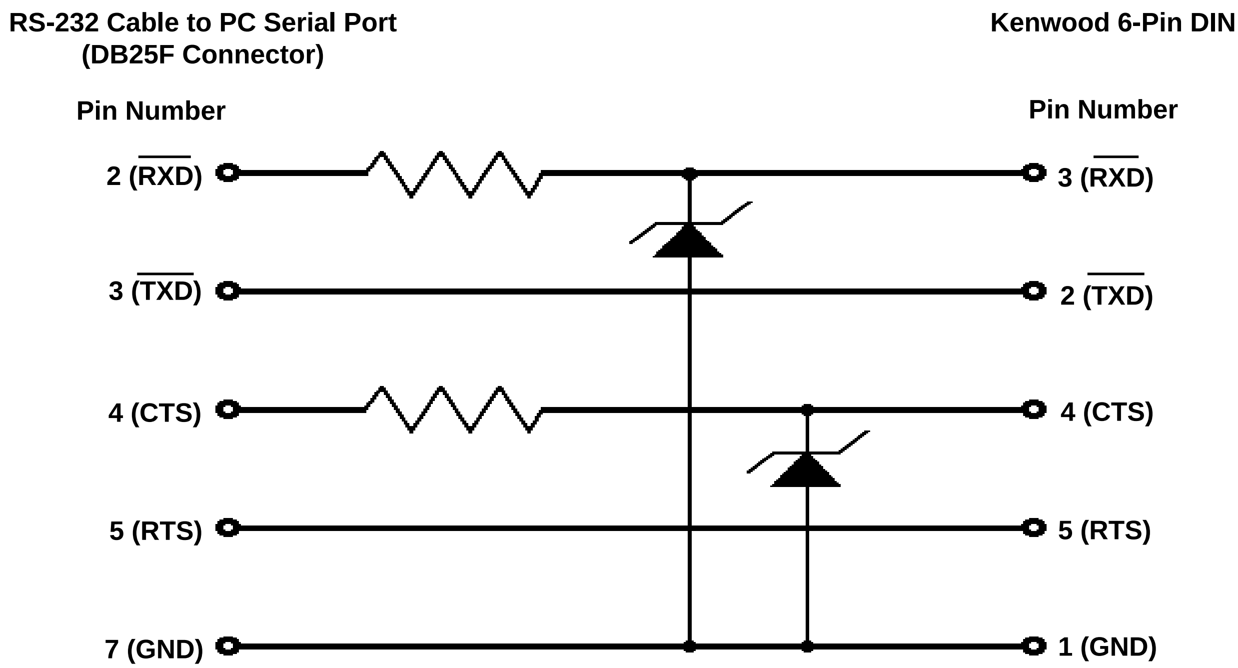

Figure 2. The simple interface.

The 1489A line receiver uses a diode clamp to limit the negative swing of the differential signal. It simply clamps the negative voltage to about –0.7V internally. It turns out that the "Low" voltage threshold is about +1.0V—in other words, a negative voltage is not even necessary—0V or +0.9V will provide a logic low as certainly as will –15V. Combining this fact with Kenwood's double inversion design means that we must only limit the positive and negative voltage swings of the RS-232 line for protection of the TTL parts. Clamping the voltage to about +5V and 0V (or –0.7V) will serve. Also, the TTL outputs of the Kenwood interface, which have 1kΩ pull-up resistors, provide sufficient swing to drive the serial line receivers directly. The four line converter can be as simple as is shown in Figure 2.

Full functionality is achieved with this circuit, although some computer noise is injected into the rig. Noise reduction is accomplished through pi low-pass filters to isolate the rig from the PC. The computer and radio ground connections are isolated at RF by an encapsulated choke. The other lines have 0.01µF disc ceramic capacitors from each input to their respective ground, plus a series encapsulated choke.

Guys that design computer buss' for a living might be in cardiac arrest at this point, but heck, it does the job, is simple (hence reliable), cheap, needs no power, and does not raise receiver noise level.

CW Keying Interface

Taking full advantage of the computer interface necessitates using the printer port for CW keying. All four serial ports are spoken for, with the rig, mouse, TNC, and network each requiring their own. This interface uses a separate three line cable to the PC parallel printer port. A miniature coax cable connects to the key jack of the rig. This circuit uses the only active device in the entire interface, the keying transistor.

The complete schematic is shown in Figure 3.

Layout and Construction

The major consideration for this low frequency, low voltage circuit is RF noise control. We must isolate the computer-generated digital noise from the receiver, and keep RF power away from the computer. I used two separate grounds, one for the rig, the other for the computer. Gluing two strips of PC board material to a piece of perf-board provides two ground surfaces plus mounting space for the components.

Layout is simple; remember your primary goal is RFI reduction. Do not neglect the bypass capacitors, and do not stack the solenoidal chokes close together. The zener diodes return to computer ground. Keep component values within a factor of two for best results. Any (working!) NPN transistor will switch the low voltage key line. There isn't much circuity, so little can go wrong. If it won't play, check the cable pin connections. It is amazingly easy to mirror-image connect the DIN plug.

No buffering is provided with this passive interface, so do not expect to run cables for miles. No connectors were used on the interface box. Connectors shown in the schematic mate with rig and computer jacks. I put my interface about midway between PC and rig, a total cable run of about twelve feet, six years ago. I haven't touched it since!

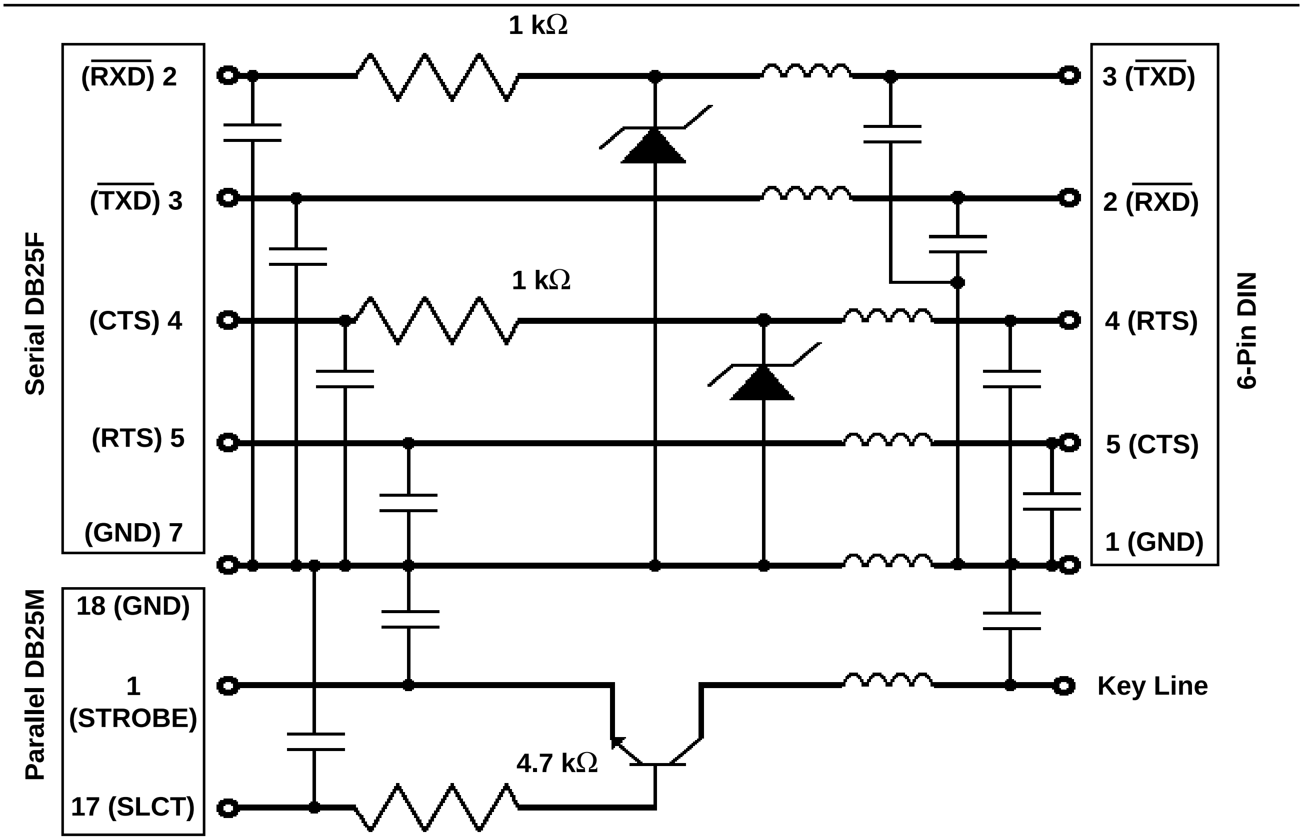

Figure 3. The completed interface, with noise reduction measures and CW keying.

Parts List

Connectors	**Quantity**
6-Pin DIN (Rig)	1
DB25M (Parallel port)	1
DB25F or DB9F (Serial port)	1

Device	**Quantity**
NPN Transistor	1
Zener Diode, 3.5V to 5.1V	2
4.7kΩ Resistor	1
1kΩ Resistor	2
100µH RF Chokes, plastic encapsulated	6
0.01µF Disc ceramic capacitors	9