Explore USB with this USB to CI-V Interface

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A few beta testers of a new satellite antenna controller interface that I have been developing requested that the new interface include universal serial bus (USB) capability. Most new computers, particularly laptops, no longer come with a serial port — only USB ports. Adapters to run serial devices from a USB port are available, but they add cost and don’t always work as expected. I found, for example, that the USB-to-serial interface adapter I use for computer Doppler control of my satellite radio via the radio’s CI-V (ICOM-developed serial control interface) remote control port is not very well behaved. It frequently crashes my computer right at an inopportune time. I have resisted studying USB; it just seemed to be too intimidating. However, the requests from beta testers and my frustration with frequent computer crashes pushed me over the edge. To my surprise, USB isn’t all that difficult.

A USB Adapter That Works

What follows is a description of a simple and inexpensive USB interface that you can build. The particular application described here is a USB to CI-V interface you can use to control a radio with CI-V remote control port capability and common radio frequency control software like SatPC32.

Making it Happen

There is one major drawback to the FTDI232RL device — it only comes in surface mount packages, which makes it a challenge to work with. Fortunately, a board is available to help with this issue. The e-PBoard Design product called the SSOP-28 to DIP-28 IC Adapter makes working with this surface mount device doable. The little adapter board has pre-tinned solder pads for the surface mount shrink small-outline package (SSOP) device and pins that simulate an older (and larger) dual in-line package (DIP) (see Figure 3). The adapter board is moderately difficult to solder for the soldering neophyte but it can be done with some care and patience. Besides, learning to solder surface mount components is a good skill to master in today’s technology climate. The 2007 ARRL Handbook has a good discussion of soldering surface mount components to help you get started.

I used wire wrap techniques to make intra-DIP pin connections on the underside of the adapter board, as shown in Figure 3. A simulated 28 pin DIP socket is made on the main circuit board using two 14 pin in-line sockets. This allows for the adapter board with the installed device to be used in other USB related projects without having to duplicate a

![Figure 1 — Schematic diagram of the CI-V to USB interface adapter.](image)

| Table 1 | Parts Required for Interface Adapter |
|---|---|---|---|---|
| C1 — 100 pF capacitor | P4570-ND | Digi-key | $0.07 |
| C2 — 0.1 μF capacitor | P4583-ND | Digi-key | $0.13 |
| C3 — 0.01 μF capacitor | P4582-ND | Digi-key | $0.07 |
| J1 — Two circuit jack to match CV-I cable | 609-1039-ND | Digi-key | $0.87 |
| J2 — USB B jack, or 3 position header | wm4201-ND | Digi-key | $0.25 |
| Q1 — FTDI232RL USB IC | 604-00043 | Parallax | $4.10 |
| 14-pin header plug female | S7012-ND | Digi-key | $0.65 |
| Ferrite bead | 240-2172-1-ND | Digi-key | $0.05 |
| SSOP-28 to DIP IC adapter | E28-0023 | e-PBoard Design | $9.25 |


Notes appear on page 55.
lot of interconnections between pins. The fer-
rite beads, capacitors, USB jack and connector
for the CI-V cord (I used a 3-position header as
shown in Figures 2 and 3 in place of a jack) are
mounted on the main circuit board. The parts
are listed in Table 1.

The purpose of the few ancillary compo-
nents is fairly straightforward. The capaci-
tors provide bypass routes for unwanted
stray currents. The ferrite beads between the
CI-V remote jack of the radio and the inter-
face provide some blocking of unwanted
stray RF that might get into the system from
the transceiver. Likewise, the ferrite bead in
the USB power line provides some blocking
of unwanted noise getting into the system
from the computer power supply.

Making it Play

Before you plug the USB interface into
your computer’s USB port, it would be a
good idea to download the drivers and read
the documentation provided on the Web site.
The installation of the drivers was pretty
seamless on Windows 98 and XP comput-
ers I have used to date with the steps in the
documentation predicting what actually
happened! Download the drivers to a place
on your hard drive where you can find them
and plug the interface into a USB port. If all
goes well, and you have no wiring errors,
the Windows Installation Wizard should take
over and guide you through the driver instal-
lation process.

During one of my first attempts at build-
ing the interface I had inadvertently left a
ground pin unconnected. When I plugged
the interface into the computer, a warning
window conveniently appeared letting me
know that the USB interface was not working
properly. That caused me to recheck the wir-
ing; after I found and corrected my error, the
driver installation went as predicted.

Putting it to Use

If you are using the interface with
SatPC32 (which is the only software pack-
age that I tested the interface with for Doppler
tracking), you will need to know the COM
Port assignment given to the interface by
the computer. That is easily found by right-
clicking on MY COMPUTER, right-clicking
on PROPERTIES, HARDWARE, DEVICE
MANAGER, and finally PORTS (COM & LPT).
You will see USB SERIAL PORT (COM#)
listed as shown in Figure 4; that is the COM
Port assignment you will use when you
CONFIGURE RADIO SETUP in the SatPC32
Setup menu. Mine is COM 6 as shown in the
screen shot of Figure 4.

So this simple project allows you to
explore USB and access your USB port for
this as well as other projects. The FTDI232RL
is a wonderful device that is easy to set up and
use, and is well supported by the manufac-
turer. Most importantly, the drivers that sup-
port the device are well behaved and should
minimize the potential for software conflicts
and computer crashes. The SSOP adapter
board is an equally useful addition that allows
you to handle USB devices in the human
(non surface mount) environment. Finally,
once you have tamed the USB port for this
project, you might consider adapting the
project to other serial-related projects around
your shack.

Notes

4 www.ftdichip.com/.  
6 www.epboard.com/eproducts/proto-adapter.htm#SSOToDIPAdapter.  
7 The ARRL Handbook for Radio Communica-
from your ARRL dealer or the ARRL Book-
store, ARRL order no. 9760. Telephone 860-
594-0355, or toll-free in the US 888-277-5289;
www.arrl.org/shop/; pubsales@arrl.org.

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Figure 2 — Completed hand-wired prototype of the adapter including adapter board. J2 is on the right.

Figure 3 — The e-PBoard Design adapter board removed from the project board to show wiring.

Figure 4 — The Windows DEVICE MANAGER screen showing the COM6 assignment of the USB port. Your port number will differ depending on your quantity of assigned COM ports.