Bluetooth® Serial Data Interface for CI-V and CAT-62
## © Jim Giammanco, N5IB
### *http://n5ib.net/index.xht*
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02 June 2015

Here's an accessory to provide a wireless serial data link to the CAT connection of your radio. Using plug-in jumpers it can be configured to work with the CI-V bus used by Icom for many of its radios, or for the CAT-62 connection such as used on several Yaesu models. Check your radio's users manual to determine if this device would be compatible. It employs 3.3 V logic level, non-inverted, serial data, using open drain drivers for "wired OR" operation. On the computer side, it should work with just about any PC, tablet, or even Android® device that is Bluetooth® capable.
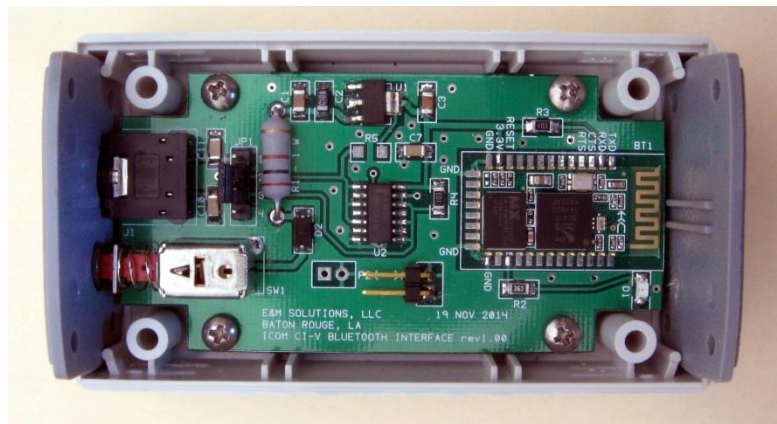
So far, the interface device has been successfully tested using a Yaesu FT-817 (CAT-62) as well as an Icom IC-706MKIIG (CI-V) with N3FJP's *Amateur Contact Log v3.4*, and with *Ham Radio Deluxe v5.22.0.02*. There have been a few occasions when HRD has decided it wanted to halt and close, but upon re-launching HRD the connection was re-established. These tests were on an older laptop running WinXP-SP3 with a USB-plugin Bluetooth® dongle. Though not in a shielded enclosure, no RFI troubles to or from noted so far using coax-fed antennas at up to100 W. Though not yet tested, other control/logging software, such as *Amateur Contact Log v4.7* and *N1MM* should also function as long as the software supports the target radio.
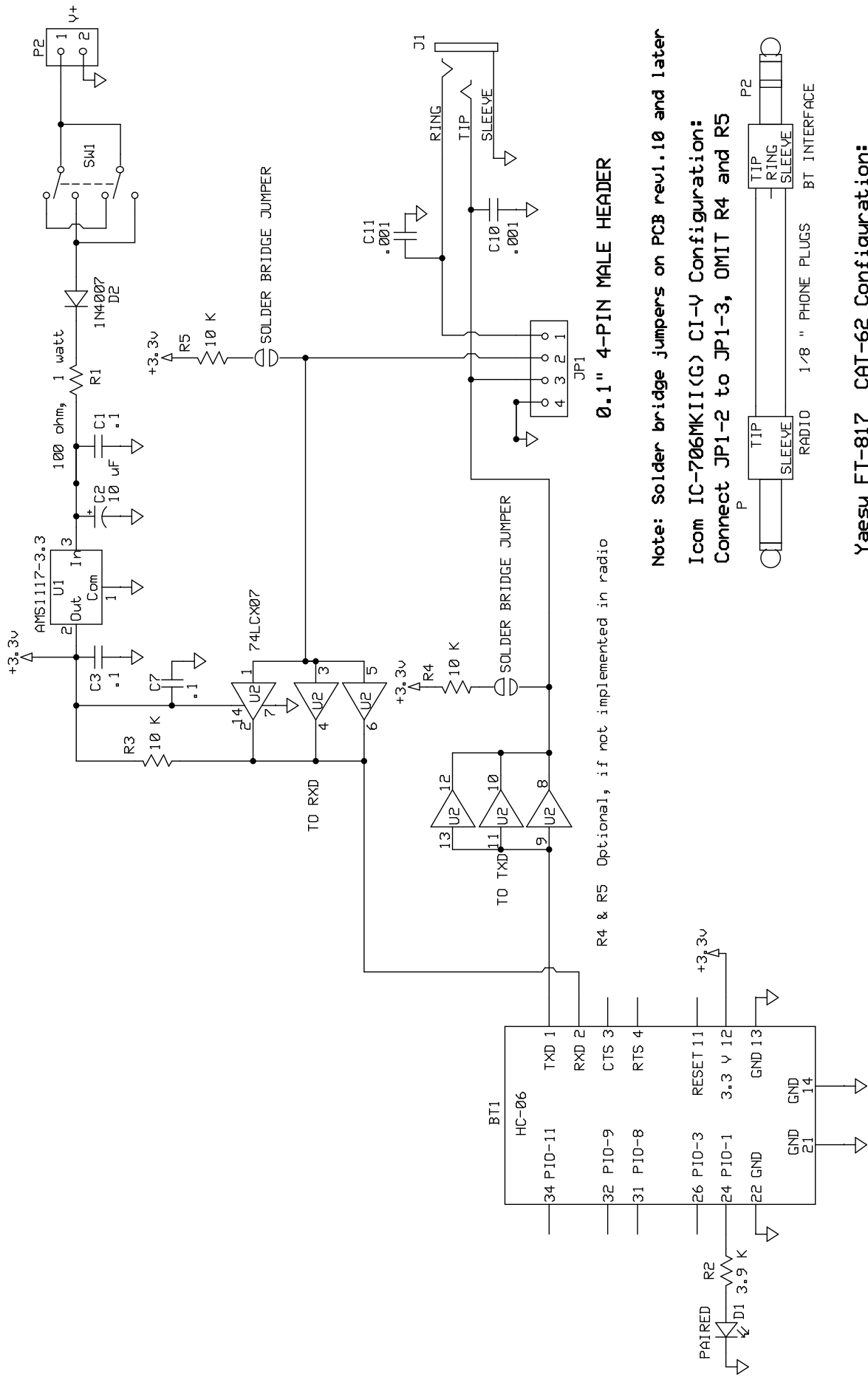
The interface requires about 35 to 40 mA (slightly more when in the "discoverable" mode). Battery power is possible (a few hours on a 9 V battery) but connection to a source of 8 to 14 V DC is more appropriate. Most radios have 13.8 V available somewhere on the rear panel connections. Pads are provided on the circuit board for power connection, and an ON-OFF pushbutton switch is board mounted. There is room inside the (optional) case for a set of AAA cells, or even a lithium photo battery.
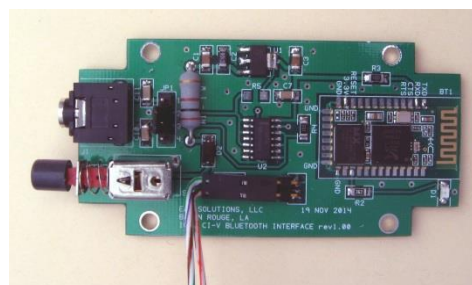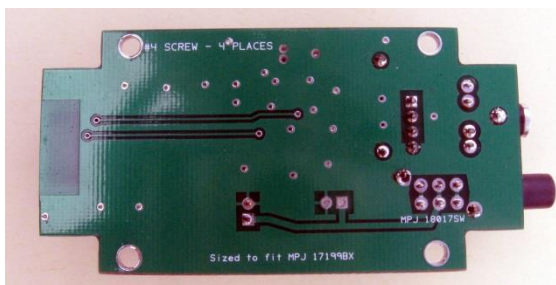
Connection to the target radio is via a 3.5 mm (1/8") stereo phone jack. For a CI-V connection, only the tip and sleeve of the jack are used, so a mono plug can be used. All three conductors are employed for the CAT-62 connection.

The serial data rate is set by default at 9600 baud, but can be changed from a PC using an appropriate TTL (3.3V) serial data interface.

While the example presented was built on a custom designed two-sided printed circuit board, only a few (5 minimum) connections need be made to the 34-pin surface mount Bluetooth® module, so wire connections could be used on perfboard or Manhattan-style construction. Sufficient schematic and parts information is provided that modestly experienced builders should be able to duplicate this project.
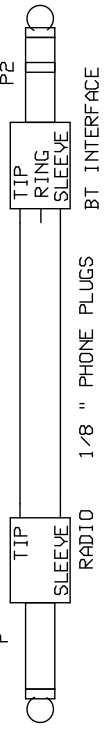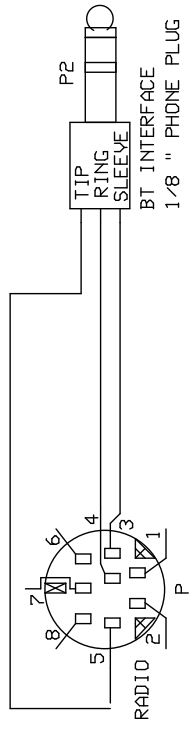
P2
V+
1
2

SW1

1N4007
D2

100 ohm, 1 watt
R1

C1 .1

C2
10 uF

AMS1117-3.3
U1
In 3
Com 1
Out 2

+3.3v

C3 .1

C7 .1

74LCX07

+3.3v

R3 10 K

U2 1 2 14 7

U2 3 4

U2 5 6

TO RXD

SOLDER BRIDGE JUMPER

R4 10 K
+3.3v

U2 13

U2 11

U2 9

12

10

8

TO TXD

R5 10 K
+3.3v

SOLDER BRIDGE JUMPER

JP1

4 3 2 1

0.1" 4-PIN MALE HEADER

J1

RING
TIP
SLEEVE

C11 .001

C10 .001

Note: Solder bridge jumpers on PCB rev1.10 and later

Icom IC-706MKII(G) CI-V Configuration:
Connect JP1-2 to JP1-3, OMIT R4 and R5

P2

TIP
RING
SLEEVE
BT INTERFACE

1/8 " PHONE PLUGS

P

TIP
SLEEVE
RADIO

Yaesu FT-817 CAT-62 Configuration:
Connect JP1-1 to JP1-2, OMIT R5, INSTALL R4

P2

TIP
RING
SLEEVE
BT INTERFACE
1/8 " PHONE PLUG

6
4
3
7
1
8
2
5
MINI DIN-8
P
RADIO
VIEWED FROM REAR OF DIN PLUG

R4 & R5 Optional, if not implemented in radio

BT1
HC-06

34 PIO-11
32 PIO-9
31 PIO-8
26 PIO-3
24 PIO-1
22 GND

TXD 1
RXD 2
CTS 3
RTS 4
RESET 11
3.3 V 12
GND 13
GND 14

+3.3v

GND 21

PAIRED
R2 3.9 K
D1

CURRENT REQUIRED ABOUT 30 mA AT 8 to 15 V
Replace R1 with a jumper for operation with supply voltage less than 6 V

E&M Solutions, LLC

Icom CI-V & Yaesu CAT-62 Interface with Bluetooth

Rev 1.00
01 JAN 2015
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| Bluetooth serial port interface for CI-V and CAT-62		
01- Jan-2015		
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ID	Quantity	Description
C1, C3, C7	3	0.1 µF 10% 50V SMT 1206
C10, C11	2	0.001 µF 10% 50V SMT 1206
C2	1	10 µF 10% 25V SMT 1206
R2	1	3.9 K 5% SMT 1206
R3, R4, R5	2	10 K Ω 5% SMT 1206 (R4 and R5 optional – see schematic)
JP1	1	4 pin, 0.1" spaced male header strip
U1	1	AMS1117-3.3 3.3 V series regulator, SOT-223
U2	1	74LCX07 hex buffer/driver with open drain outputs, SOIC-16
BT1	1	Bluetooth serial transceiver HC-06 Example: HC-06 - ebay item #130984502683
J1	1	3.5 mm (1/8") stereo phone jack (*e.g.* eBay item 281276235578)
SW1	1	SPST switch (DPDT used on PC board) Marlin P Jones #18017 SW
D1	2	LED indicator, any color, blue preferred, SMT 1206
D2	1	1N4007 diode, SMT 1206
R1	1	100 Ω 1W, use with power source greater than 7 V – see schematic
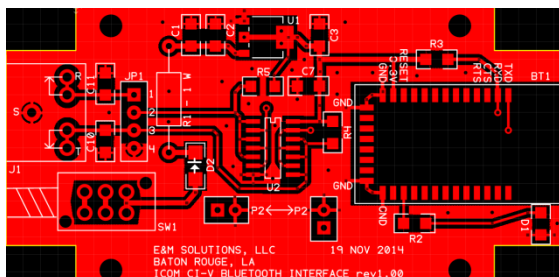
Top Copper, rev1.00
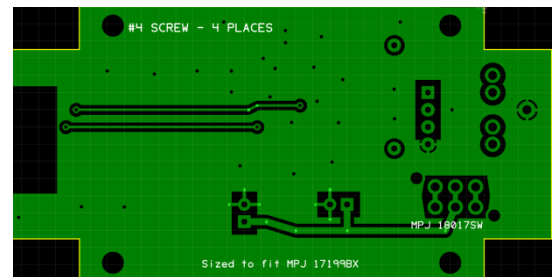
Bottom Copper, rev1.00

Setting up a Bluetooth® serial data interface
Example shown on a Dell 600 running WinXP SP3

If Bluetooth® is available on the PC, either by virtue of an internal Bluetooth® transceiver or an external device, the Bluetooth® icon should appear in the taskbar.
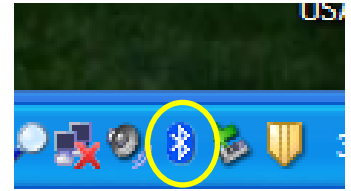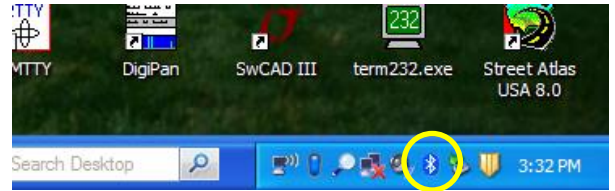
Click the Bluetooth® icon to open a pop-up menu.
Select "Show Bluetooth Devices."
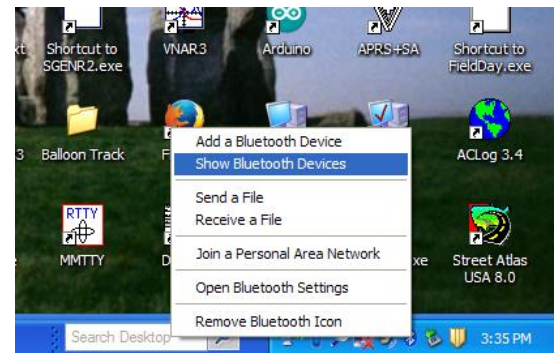
If this is the first time working with Bluetooth®, an empty list should appear.

Be sure that your Bluetooth® interface card is powered up and is *discoverable*. The LED should be flashing if the device is working and is discoverable.

The interface does not need to be connected to a device (such as a K2-KIO2) at this time. The *pairing* operation does not depend on the hardware connection that will be made to the interface.

Click the "add" button to open a Wizard.
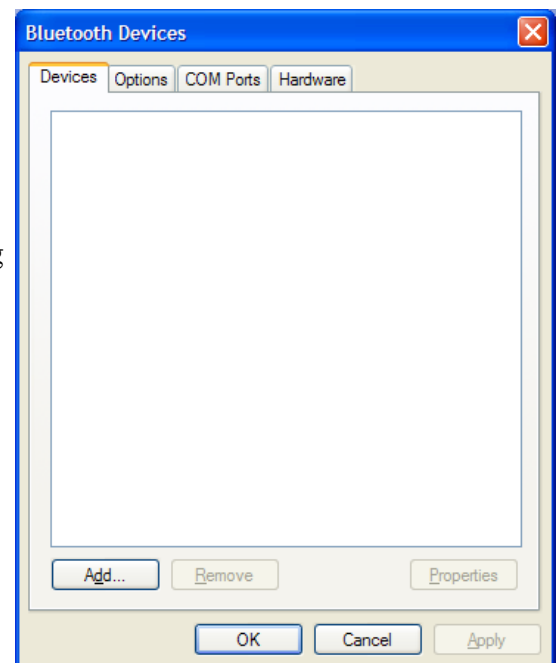
The Wizard will lead you through the steps to discover and install the remote Bluetooth® device.

Check the box to indicate that your interface is powered up and ready to be discovered.

After a few seconds your device should appear. Click on it to select it, then click "Next"

By default the serial interface is factory-names as "HC-06" or "HC-05"

In the example shown it has been reprogrammed by the user to better indicate the device to which it will be connected. In this case, an Elecraft K2 transceiver with the serial number shown.
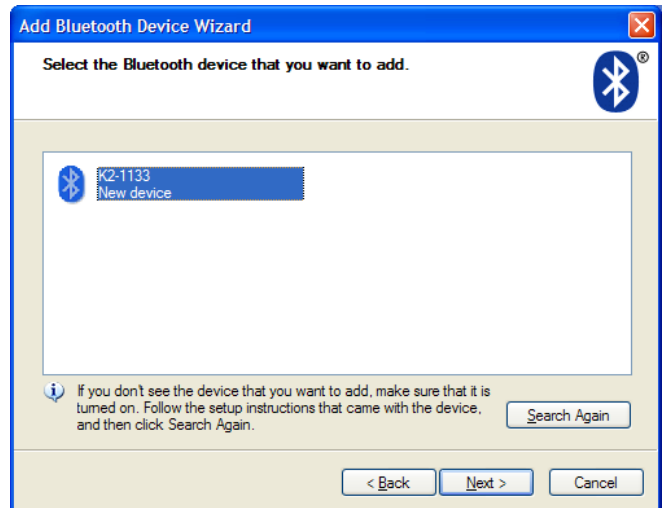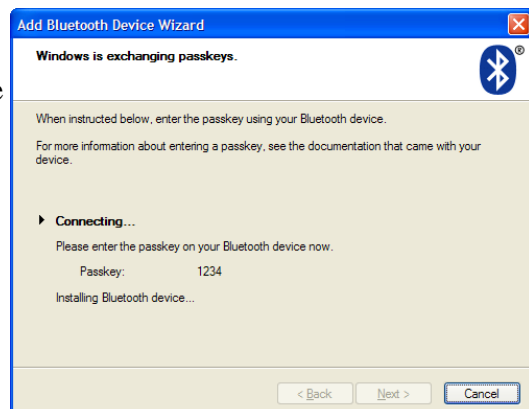
You'll need to enter the passkey for the device. The manufacturer's default passkey is "1234." That also may be reprogrammed by the user if desired.

Click the button, and then enter the passkey.

Then click "Next"
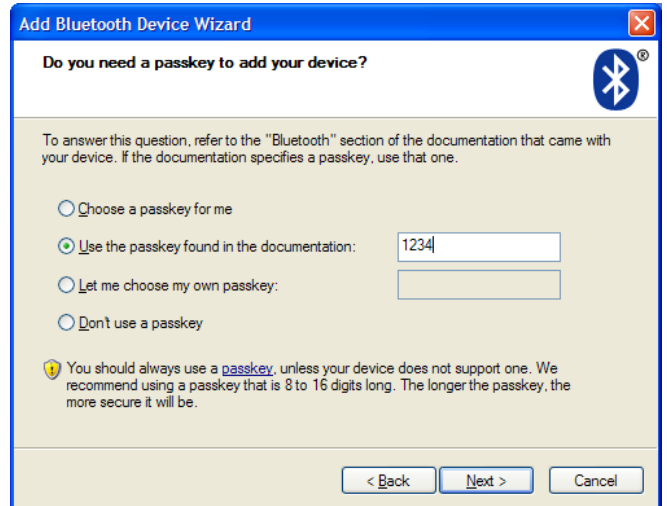
A new window should appear for a few seconds and then disappear as the PC exchanges setup information with the Bluetooth® device.

In a few seconds the pairing process should complete.

Pay particular attention to the COM ports that have been assigned.

Make a special note of the "Outgoing" COM port. That is the one you will use to connect to your device.

Click "Finish" and your device should appear in the Bluetooth® Device list.

At this point you can launch an application that would normally connect to a serial port. Use the applications options menu to select the port that was assigned as "Outgoing."

However, it is possible that the Bluetooth® setup process could assign COM port numbers that are not available as options in some applications. For instance, Term232 only allows COM1 through COM4.
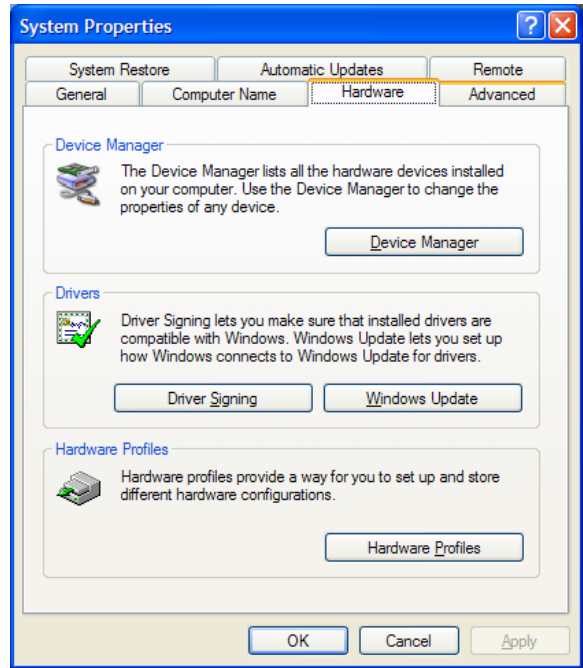
It is possible to change the COM port assignments using the Device Manager – accessible via the Windows Control Panel.
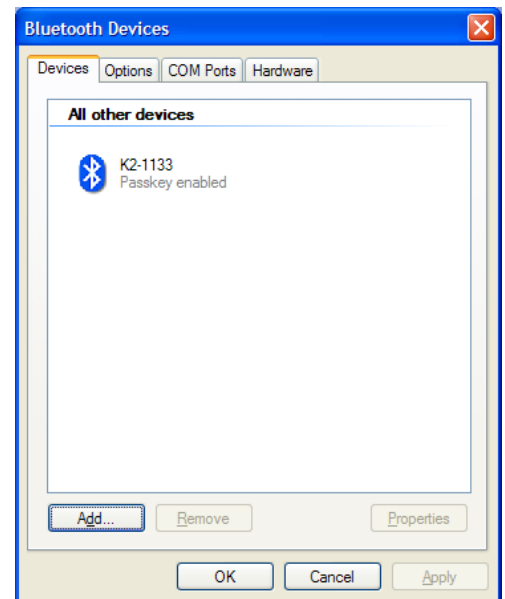
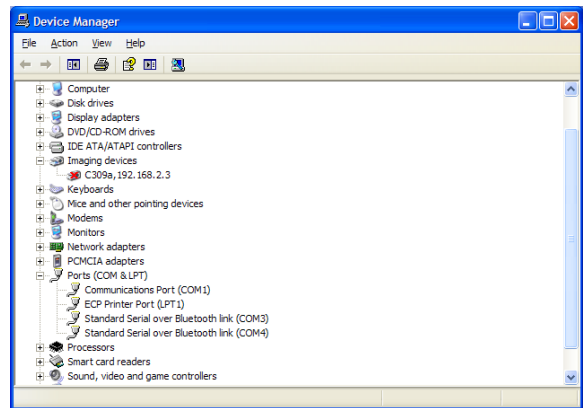Open the Control Panel and launch the "System" task.
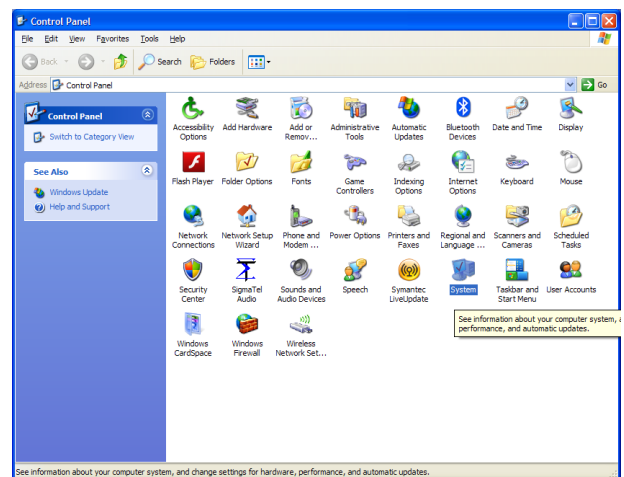
Now click the "Hardware" tab, and launch "Device Manager" A new window with a list of installed device should appear.
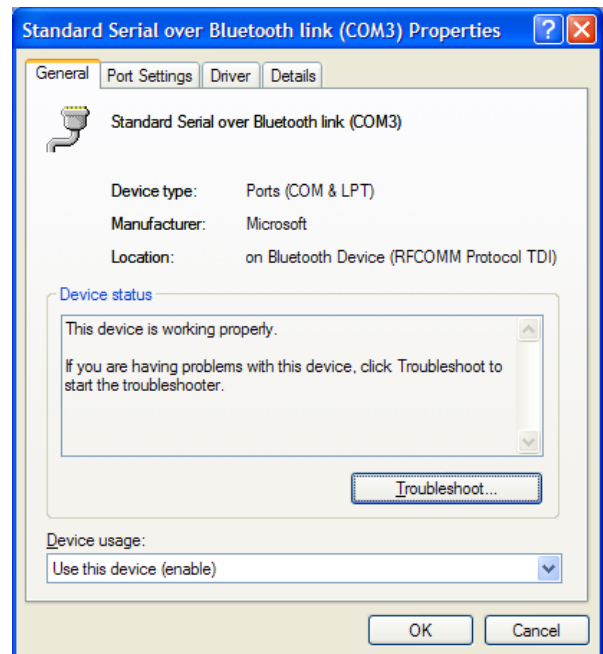
Expand the "Ports" to show the installed COM and LPT ports. You should see the same COM ports that were created when the Bluetooth® device was paired.
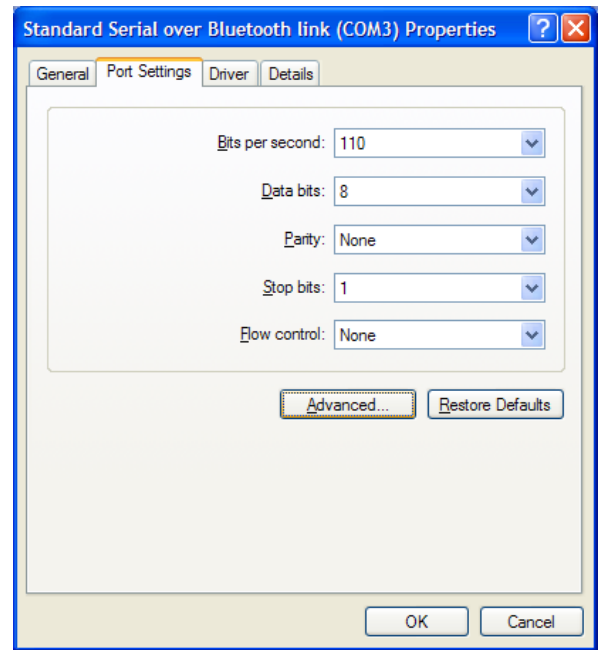
Double click the port you wish to modify.

When the new window appears, cick the "Port Settings" tab.

Don't pay any attention to the Baud Rate report. The Bluetooth® module has its data rate hard programmed and cannot be changed with Device Manager.

Then click the "Advanced" button

A new window will open that has a drop-down menu showing the ports available for assignment.

Note that many of the ports may be marked as "in use."
Most of the time these are left over assignments from previously launched applications and can usually be ignored without incident.

Click to port number you wish to reassign to your Bluetooth® device, and respond with a "Yes" or "OK" to the various dire sounding system warnings.

Your Bluetooth® COM port should be reassigned.
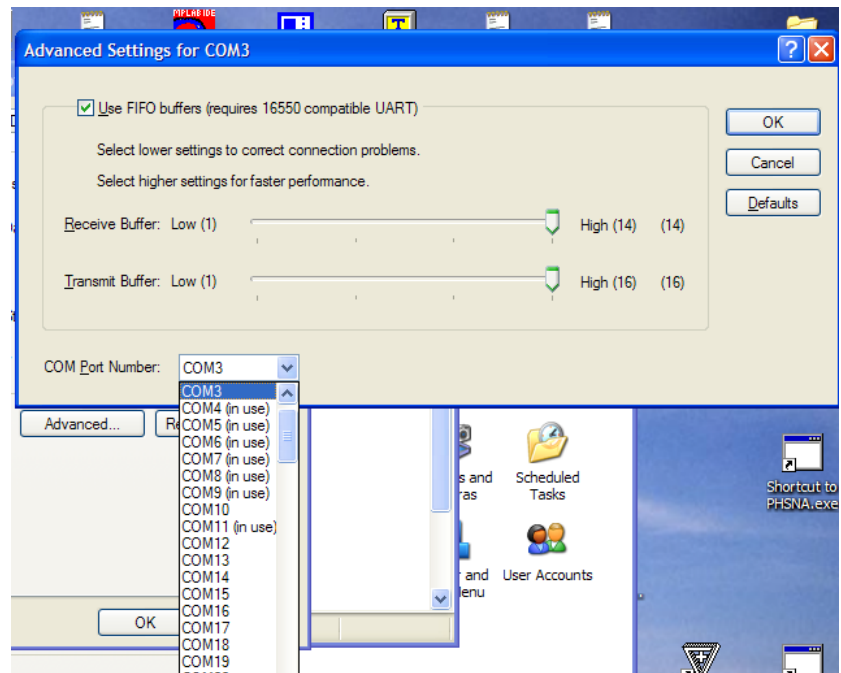
You have to close Device Manager and re-launch it in order to see that the changes have taken place.

At this point you should have a Bluetooth® serial port that can be accessed by your favorite logging or rig control application. For example, the "Rig Interface" settings for N3FJP's Amateur Contact Log look like the screen below. Just select the appropriate COM port (the outgoing one, remember), set the Baud Rate (*e.g*., 4800 for the K2) and the rig (*e.g*., Elecraft). No parity, 8 data bits, 1 or 2 stop bits.

Note that for Icom rigs you will have to edit the command strings to insert the proper CI-V address (*e.g*., hex 58 for the 706Mk2G). Remember that you **must** select the baud rate that the Bluetooth® is configured for. The rate can only be changed bt reprogramming the module (see later in this document).

Chose "None" for "Connection Power" and select a convenient polling rate – 2 s is generally adequate.

Click "Test" and you should get a response from the rig. You should also notice that the LED on the Bluetooth® module has stopped flashing and is now steadily illuminated.

Configuring the Bluetooth® module using AT commands

When a HC-06 equipped Bluetooth® adapter is *unpaired* (the LED is flashing) the unit can accept configuration commands via the wired serial port connection. The Bluetooth® unit must be configured to employ separate TX and RX connections to a 3.3 V USB-Serial adapter. This means that R4 and R5 must be installed, and a jumper placed between JP1-1 and JP1-2.

Connect the RX line of the USB-Serial adapter to the TIP connection of J1, connect the TX line of the USB-Serial adapter to the RING connection of J1, and connect the GROUND of the USB-Serial adapter to the SLEEVE connection of J1.

The Bluetooth® unit will have to be powered by a DC source of 5 to 12 V, capable of about 40 mA. The V+ and GND pins on the 3-pin header can be used to connect a power source.

Commands must be sent at the data rate for which the Bluetooth® device is currently configured. If a command is issued that changes the data rate, subsequent commands must be sent at the new rate.

It is best to store the desired commands a short ASCII text files and use a terminal program such as Term232 to transmit the command strings. An internal time-out timer requires that the command string be transmitted within about a 2 second window, generally too quick to type commands by hand.

Each command begins with "AT" followed by additional parameters. The module will respond to indicate that the command has been received and processed.

Here are commands that are known to function with the HC-06 modules being used in this adapter:

command: **AT**   *response*: **OK**   communication check (ping test)

command: **AT+version**   *response*: **OKLinvorV1.8**   firmware version inquiry

command: **AT+baudn**   *response*: **OK<newbaudreate>**   change data rate
        note: in the above command, "n" represents a hexadecimal number
        n=1 for 1200 baud
        n=2 for 2400 baud
        n=3 for 4800 baud
        n=4 for 9600 baud (module manufacturer's default)
        n=5 for 19200 baud
        n=6 for 38400 baud
        n=7 for 57600 baud
        n=8 for 115200 baud
        n=9 for 230400 baud
        n=A for 460800 baud
        n=B for 921600 baud
        n=C for 1382400 baud

command: **AT+name<devicename>**   *response*: **OKsetname**   change device name
        <devicename> is a character string (default HC-06)

command: **AT+PIN<4 digit code>** *response*: **OK<4 digit code>**   change pass key
        <4 digit code> is the password or *passkey* used when pairing the device (default 1234)

HC-05 modules, which can be either master or slave Bluetooth© devices, have a more extensive set of AT commands.