

Bluetooth® Serial Data Interface for Elecraft K2®

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<http://n5ib.net/index.xht>

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Here's an accessory to provide a wireless RS-232 serial data link to the KIO-2 port on your K2. It plugs directly onto the KIO-2's DB9F connector on the K2 rear panel. It should work with just about any PC, tablet, or even Android® device that is Bluetooth® capable.

So far it's been successfully tested 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. Tests with *TRlog* were not successful. 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 10 W. Another user has reported success using *Amateur Contact Log v4.7*. Other users report successful operation with a K3 and KX3 (power connections and/or special cable needed) and *N1MM* logging software. Also the K2UI-MAC software has been successfully used. It is likely that other radios that employ RS-232 level control interfaces would also be compatible. Brief checks with a Yaesu FT-450D were successful.

Persons knowledgeable of the K2 suggest that the current drawn from pin 8 of the KIO-2 (about 35 mA) is pushing the envelope for the RF choke L1 on the KIO-2 board, and suggest replacing it with perhaps a dozen turns AWG26 on an FT25-43 toroid core. This prototype has so far been running without problems on an unmodified KIO-2. The KIO-2 specs recommend no more than 50 mA average current.

Bluetooth® adapter mounted on KIO2 connector on rear panel of an Elecraft® K2 (QRP version)



There are a few “trying to be too clever” wrinkles.

The RX and TX lines from the DB9 are not hardwired to the MAX3232. They connect to two pins of a four pin header strip. The jumpers on the header can configure the board to be used with either a *Data Terminal Equipment* (DTE) or *Data Communications Equipment* (DCE) eliminating the need for a null-modem cable or adapter, depending on the device to which the board is connected.

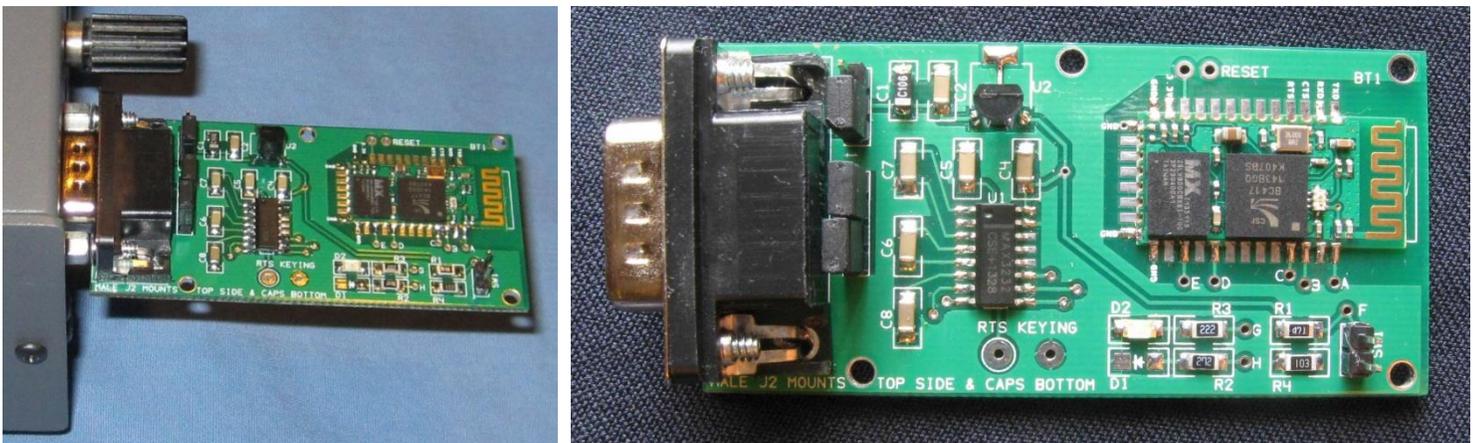
The Elecraft® KIO2’s DB9 connector has its pins 2, 3, and 5 configured as *Data Communications Equipment* (DCE). Therefore, in order to plug directly into the KIO2 the Bluetooth® adapter must be set up as *Data Terminal Equipment* (DTE).

Even the DB9 gender is configurable. A DB-9M mounts on the top of the PC board, with the surface mount bypass capacitors on the bottom. If a DB-9F is needed, it can mount on the bottom, still preserving the pin order, and the bypass caps can go on top.

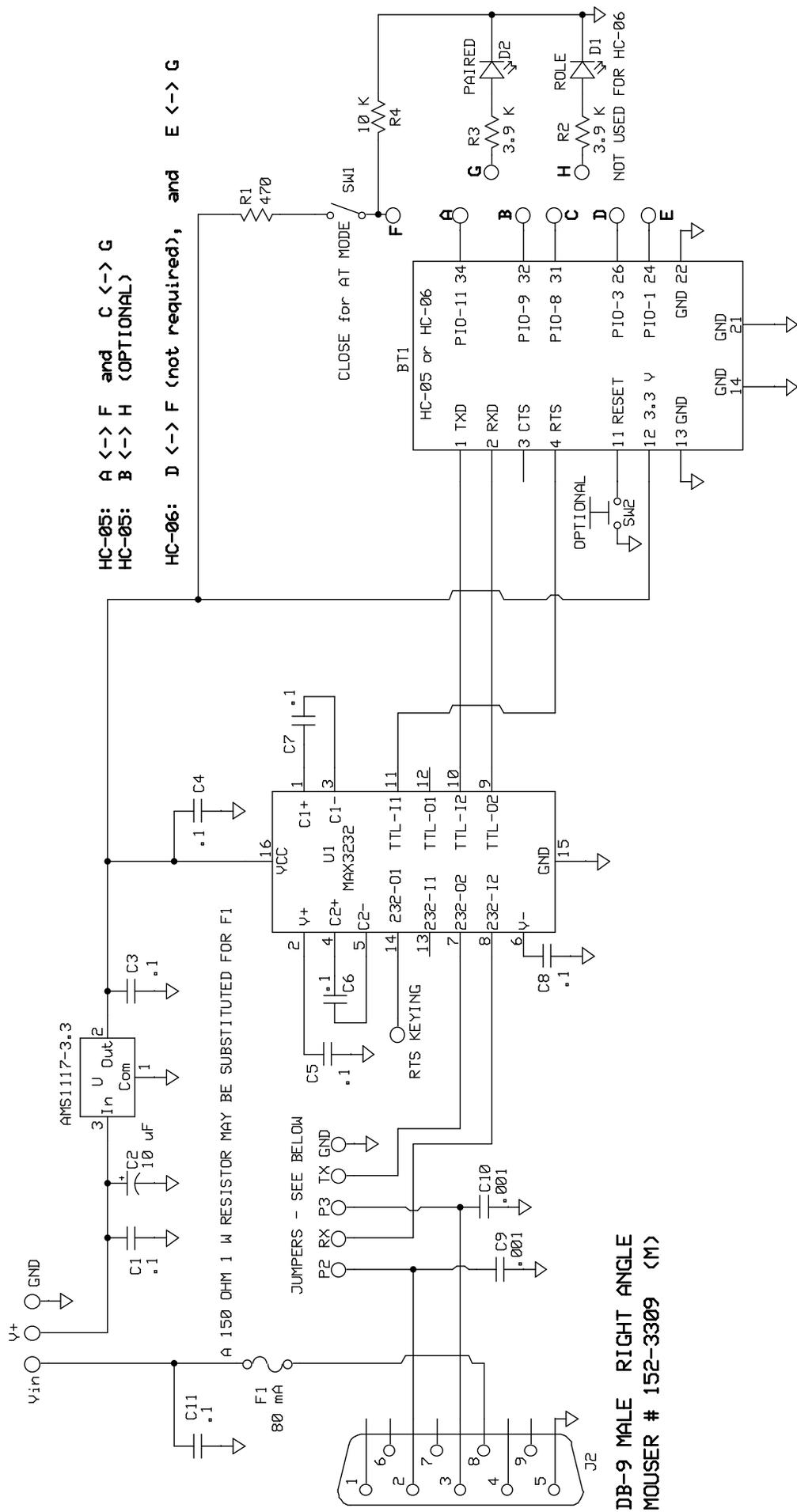
Also, though the board is hardwired for use with an HC-06 Bluetooth® module, there are two points where thin traces can be cut, then wire jumpers placed between provided pads, and an HC-05 module can be substituted. A jumper header and resistors are provided to pull up a required sense line to put an HC-05 module into command mode to be able to change the data rate. The HC-06 is already in command mode until it is *paired*.

While a set of pads labeled “RTS Keying” can be seen in the photos of the prototype below, there has been no success yet in trying to control the RTS line via the Bluetooth® link. So hopes of a wireless keying interface are thus far unfulfilled.

While the example presented was built on a custom designed two-sided printed circuit board, only a few (6 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



V_{in} = 5 to 13 VDC, 50 mA MAX
 JUMPER V_{in} - V₊ TO POWER FROM DB-9



HC-05: A <-> F and C <-> G
 HC-05: B <-> H (OPTIONAL)
 HC-06: D <-> F (not required), and E <-> G

**DB-9 MALE RIGHT ANGLE
 MOUSE # 152-3309 (M)**

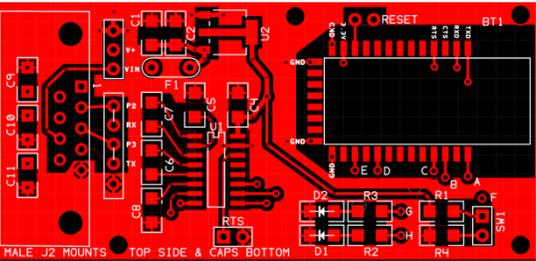
HC-06: OMIT R3, D2, R1, R4, SW1, SM2

TO CONFIGURE AS DATA TERMINAL EQUIPMENT (DTE):
 JUMPER P2-RX and P3-TX
 USE DTE CONFIGURATION FOR USE WITH ELECFRAFT K2

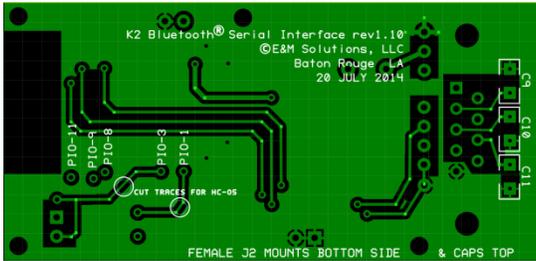
TO CONFIGURE AS DATA COMMUNICATIONS EQUIPMENT (DCE):
 JUMPER P2-RX and P3-TX

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Elecraft K2 Bluetooth Interface	
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Page 1 of 1	

Bluetooth serial port interface for Elecraft K2		
23- AUG-2014		
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ID	Quantity	Description
C1, C3-8, C-11	8	0.1 μ F 10% 50V SMT 1206
C9, C10	2	0.001 μ F 10% 50V SMT 1206
C2	1	10 μ F 10% 25V SMT 1206
R1	1	470 Ω 5% SMT 1206 (not needed for HC-06)
R2, R3	2	2.2 K Ω 5% SMT 1206 (only R3 needed for HC-06)
R4	1	10 K Ω 5% SMT 1206 (not needed for HC-06)
U1	1	MAX3232 RS-232 transceiver, SOIC-16N
U2	1	AMS1117-3.3 3.3 V series regulator, SOT-223
BT1	1	Bluetooth serial transceiver HC-06 or HC-05 Example: HC-06 - ebay item #130984502683
J2	1	DB-9 male, right angle, PC mount
SW1, SW2	2	2-pin vertical male header (not needed for HC-06)
D1, D2	2	LED indicators SMT 1206 (only D2 needed for HC-06)
F1	1	(optional) - resettable fuse 80 mA – substitute jumper or 150 Ω 1W



Top Copper

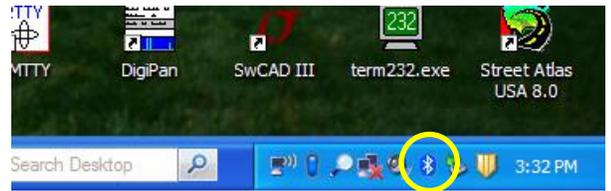


Bottom Copper

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.”

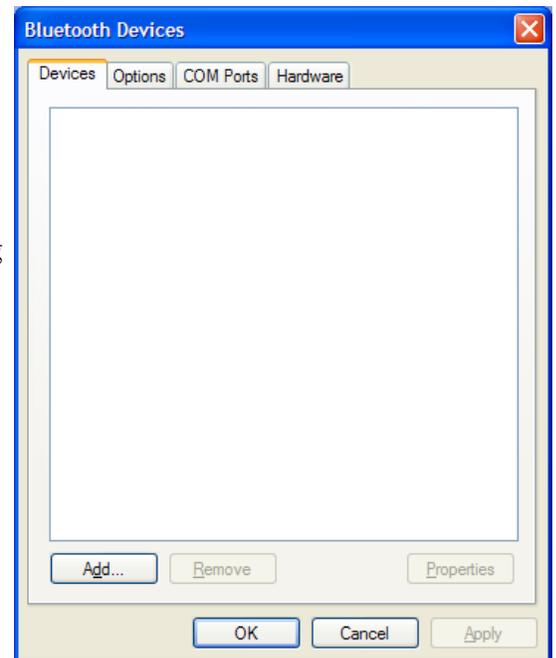


If this is the first time working with Bluetooth®, an empty list should appear.

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.

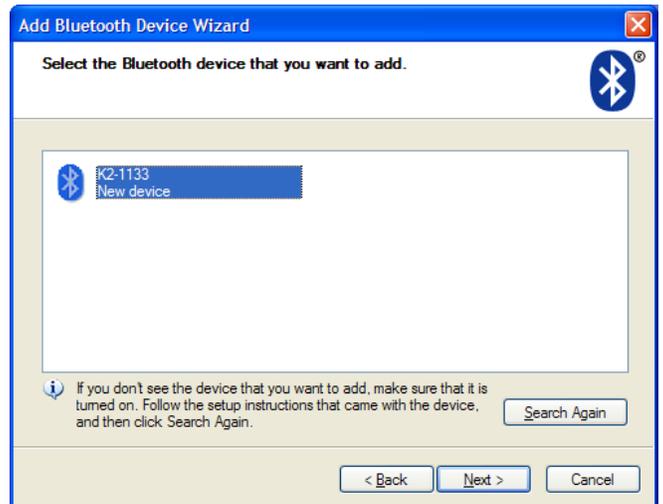
Check the box to indicate that your interface is powered up and ready to be discovered.



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

By default the serial interface is factory-named as “HC-06” or “HC-05”

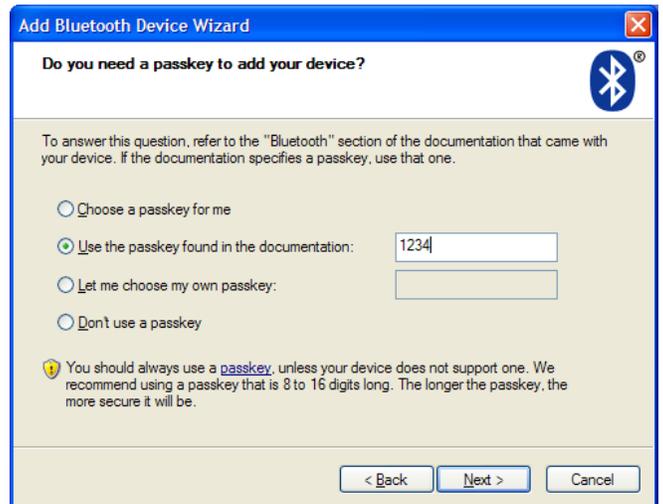
In the example shown it has been reprogrammed by the user to better indicate the device to which it will be connected. In this case, an Elecraft K2 transceiver with the serial number shown.



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.

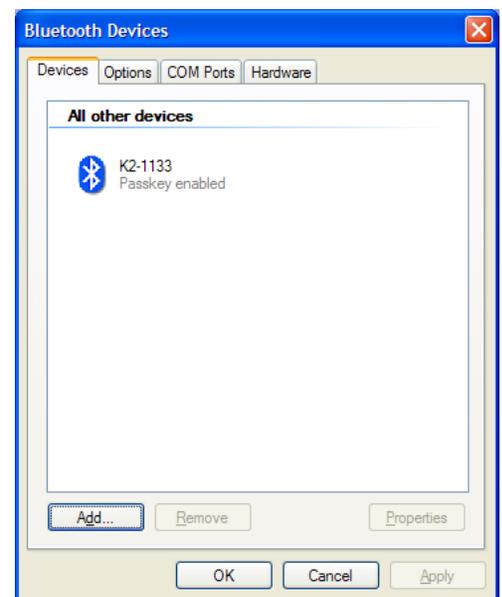


Click “Finish” and your device should appear in the Bluetooth® Device list.

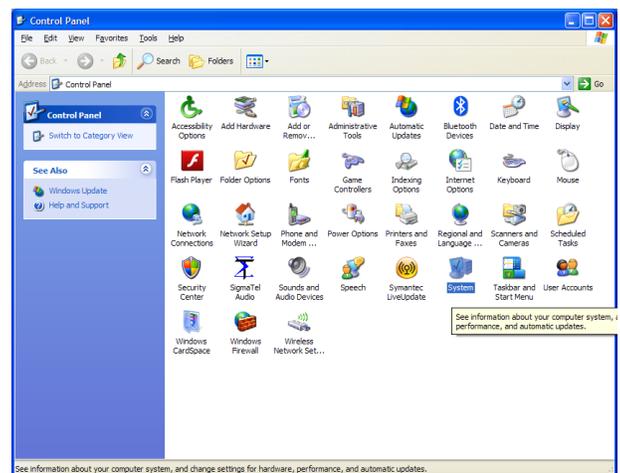
At this point you can launch an application that would normally connect to a serial port. Use the applications options menu to select the port that was assigned as “Outgoing.”

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.

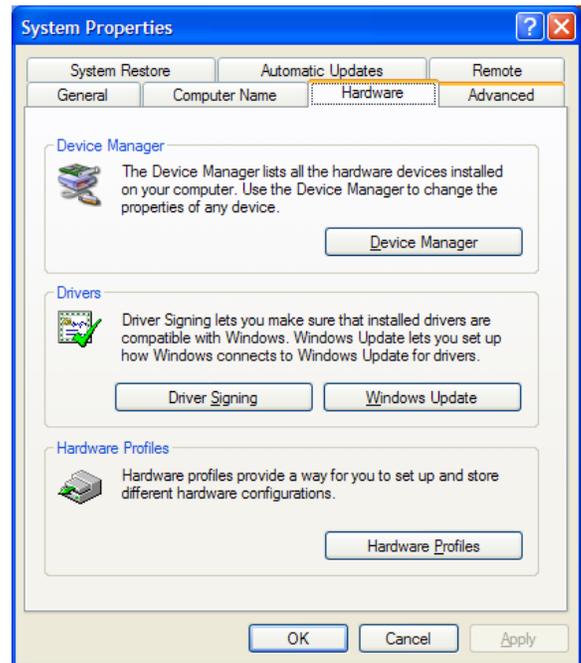
It is possible to change the COM port assignments using the Device Manager – accessible via the Windows Control Panel.



Open the Control Panel and launch the “System” task.

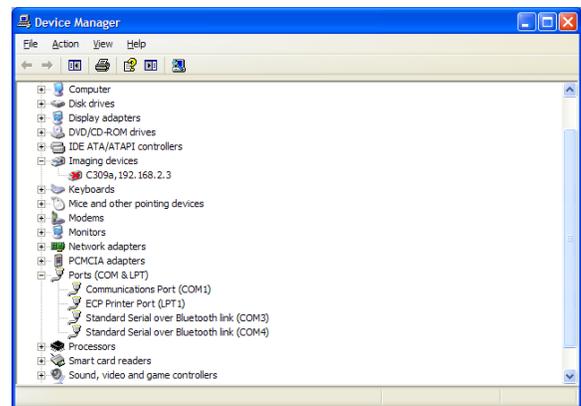


Now click the “Hardware” tab, and launch “Device Manager” A new window with a list of installed device should appear.

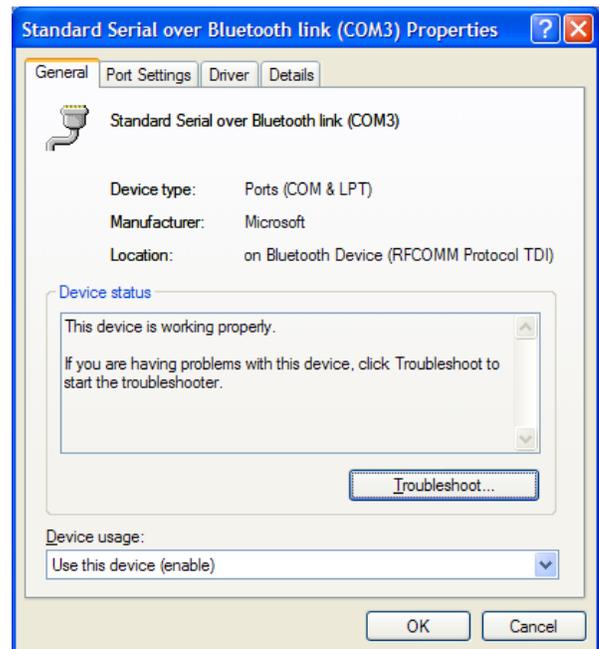


Expand the “Ports” to show the installed COM and LPT ports. You should see the same COM ports that were created when the Bluetooth® device was paired.

Double click the port you wish to modify.

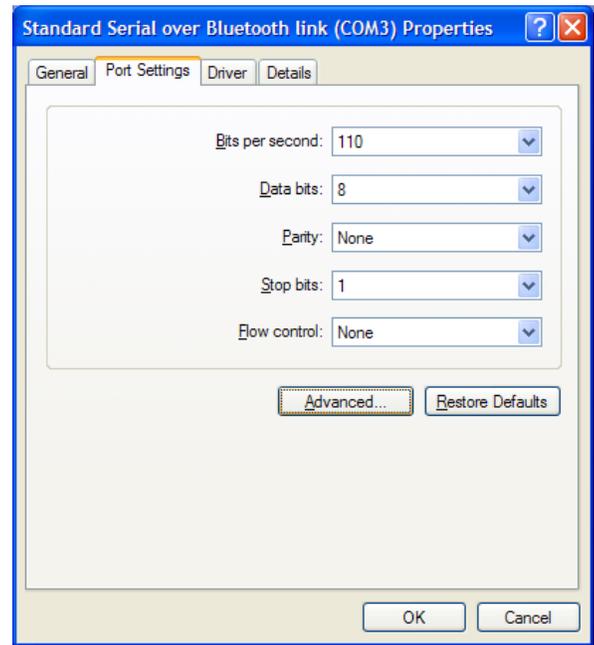


When the new window appears, click the “Port Settings” tab.



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



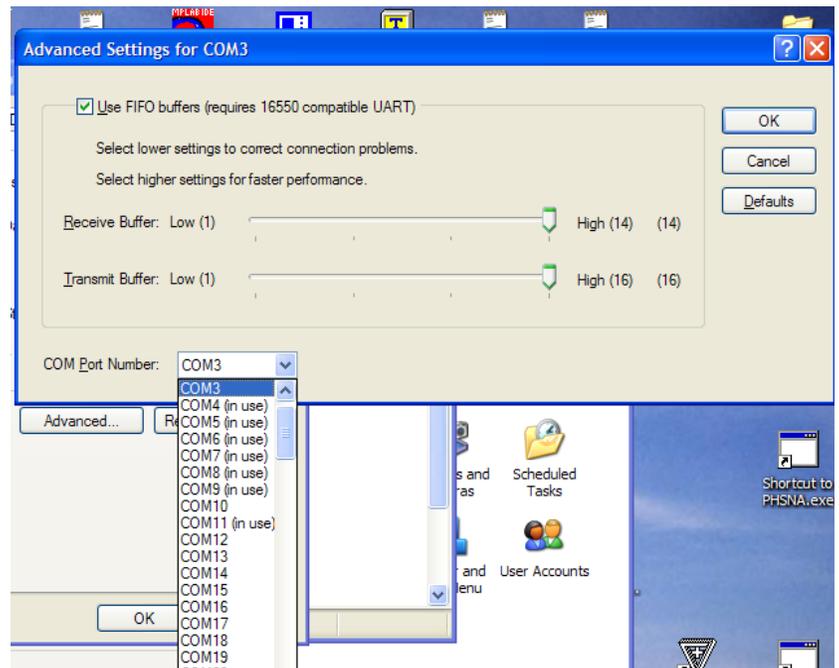
A new window will open that has a drop-down menu showing the ports available for assignment.

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 (4800 for the K2) and the rig (Elecraft). No parity, 8 data bits, 1 or 2 stop bits.

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.

Rig Interface Setup

Select Rig:

- None
- Elecraft**
- Icom
- Icom 735
- Kenwood
- Kenwood 2
- Ten Tec Omni VI
- Ten Tec Orion
- Ten Tec Fnt Pnl
- Ten Tec Pegasus

Comm Port: 1 2 3 4 5 6 7 8 9 10

Baud Rate (k): 1.2 2.4 4.8 9.6 14.4 19.2 28.8 38.4 56

Parity: Odd None Even

Data Bits: 7 8

Stop Bits: 1 2

Connection Power: None RTS DTR

Radio Polling Rate: 100 ms 500 ms 2 Sec 10 Sec

String to read frequency: FA; String to read mode: MD;

Frequency: **18.08427** Mode: **CW**

Use Frequency Test **Polling Rig** Convert to Hex End Test

Should be PH or CW Mode by: Rig Frequency Don't Use

To use the Rig Control interface, select the appropriate parameters for your radio and click test. Be sure to select the connection power option if your interface requires it. From the main form, when changing bands on your radio the band on this program should automatically change. If you need an interface for your rig, please check our website for hardware purchase options.

Please consider this rig interface section of code a beta version. I have only been able to test it personally on a Kenwood radio. I have received reports of success for all the listed rigs. If you have a rig that isn't listed and would like to do some testing, you can click Other from the list above, send commands as detailed in your radio's manual and view the radio's response below. Letting me know the commands for your radio and the format of the response will be a huge help for supporting additional rigs.

I have added additional code so that by right clicking on a DX spot that is being displayed on the DX spotting band map, your radio will change to the spot frequency. Most Elecrafts, Icoms, Kenwoods and Yaesu are now supported. If you would like to help develop and test this feature for other rigs, please click the Change Frequency button.

Unprocessed data returned: **MD3;** Copy unprocessed data to clipboard Convert from Hex Done

Change Frequency

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. For an adapter wired in the normal fashion (compatible with an Elecraft K2) a *null-modem* (pins 2 and 3 swapped) cable with DB9-F connectors on each end will be needed to connect to a computer's RS-232 serial port (or a USB-RS-232 adapter). The adapter 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 the adapter is currently configured for. If a command is issued that changes the data rate, all 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:

<i>command:</i> AT	<i>response:</i> OK	communication check (ping test)
<i>command:</i> AT+version	<i>response:</i> OKLinorV1.8	firmware version inquiry
<i>command:</i> AT+baudn	<i>response:</i> OK<newbaudrate>	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 (as-built setting for use with K2)

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

<i>command:</i> AT+name<devicename>	<i>response:</i> OKsetname	change device name
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<devicename> is a character string

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

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

Note from a knowledgeable K2 owner/user concerning use with K2 connected to other devices on its KIO2

Jim,

In order to use your device with the "K2 Twins" (or a K2 with an external KAT100 or XV transverters, you would have to build a special cable - the standard cable to the computer will not power your adapter, so you would have to build one as shown in the KAT100 manual, BUT do not cut off the white wire in the cable normally going to the computer and use the white wire to connect to the +12 volt pin (pin 8). You would also have to connect pin 1 to pick up the grounded shield connection (pin 1) - that pin is normally not connected at the computer end. Note that this is not simply a "Y" cable.

Secondly, I would recommend that a DE-9 male connector be used at all ends of this special cable, and also I would recommend that the "bluetooth adapter" end be made sufficiently short so that that end cannot be plugged into the external Elecraft device. Alternately, build the cable with the normal DE-9 female connector (which cannot be plugged into the KAT100) and use a gender changer between that connector and your bluetooth adapter.

*A standard "Y" cable at the KIO2 end **could** work, but I believe that solution has some chance for connection errors that could damage the K2 or your adapter - it all depends on the particular adapter used. That is why I recommend that you build the special cable.*