Setup and Configuration

The steps below will guide you through the Class 1 Bluetooth Module setup for the Xport Robot Controller. You will need the following:

- ✓ Class 1 Bluetooth Module
- ✓ Bluetooth USB device or Bluetooth-equipped PC
- ✓ PC running Windows 9x/Me/NT/2000/XP with a parallel port, 400 Mbytes of available hard drive space and administrator privileges
- ✓ Xport software installation CD
- ✓ Xport 2.0
- ✓ Parallel Port Interface and 10-pin ribbon cable
- ✓ Xport Robot Controller Robot Board
- ✓ Game Boy Advance (GBA) or GBA SP

1. It is assumed that your PC is equipped with Bluetooth communications. The most popular Bluetooth peripheral is a USB module or "dongle". We recommend the Class 1 USB Bluetooth module from Linksys. It is available from many online retailers such as Amazon. However, any Bluetooth module should work the XRC Class 1 Bluetooth Module, including Class 2 and 3 modules from other manufacturers.

2. In order for the Bluetooth module on the XRC to connect to your PC's Bluetooth module and vice-versa, it must allow unsecured serial port connections to/from clients. To configure your PC's Bluetooth accordingly, bring up the Advanced Configuration by right-clicking on the Bluetooth icon in the system tray (**Figure 1**).

Figure 1: Bring up the Bluetooth Advanced Configuration

3. Click on the "Client Applications" tab. This tab contains settings associated with connections from the *PC to the XRC Class 1 Bluetooth Module* (among other things). Make sure that the "Bluetooth Serial Port" application does not require a secure connection, as indicated by the "Not Required" text in **Figure 2** next to the Bluetooth Serial Port. Also make sure that there is a COM port associated with the serial port. **Figure 2** shows COM8 associated with the client serial port. You can click on

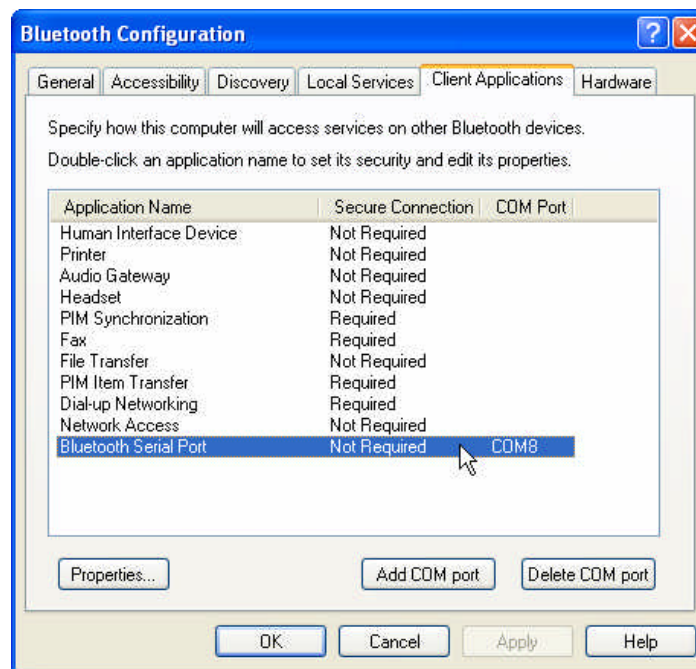the "Properties..." button to change the settings if necessary.

Figure 2: Examine the "Client Applications" tab

4. Next, click on the "Local Services" tab. This tab contains settings associated with connections from the *XRC Class 1 Bluetooth Module to the PC* (among other things). Make sure that the "Bluetooth Serial Port" service does not require a secure connection, as indicated by the "Not Required" text in **Figure 3**. Also make sure that there is a COM port associated with the serial port. **Figure 3** shows COM7 associated with the serial port. You can click on the "Properties..." button to change the settings if necessary.
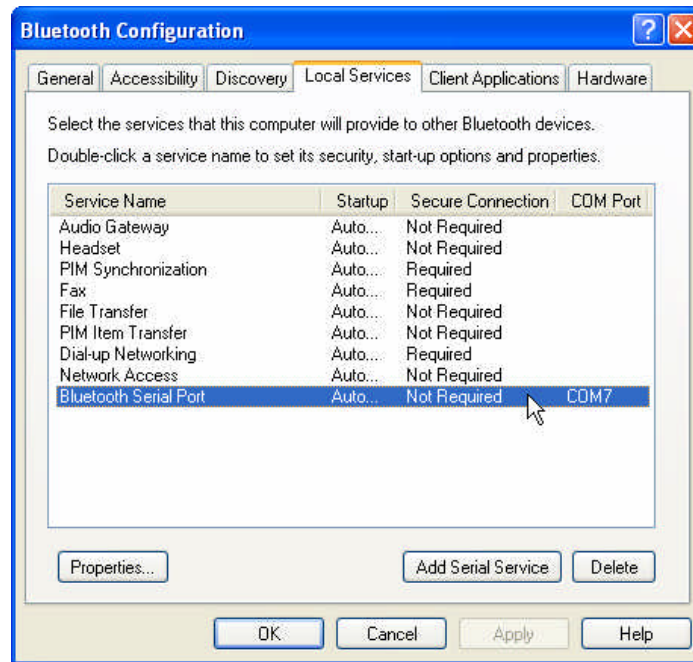
Figure 3: Examine the "Local Services" tab

5. Before dismissing the "Bluetooth Configuration" dialog, click on the "Hardware" tab and write down the device address (**Figure 4**) to use later. It is a set of 6 hexadecimal bytes. You are now finished configuring your PC's Bluetooth device.
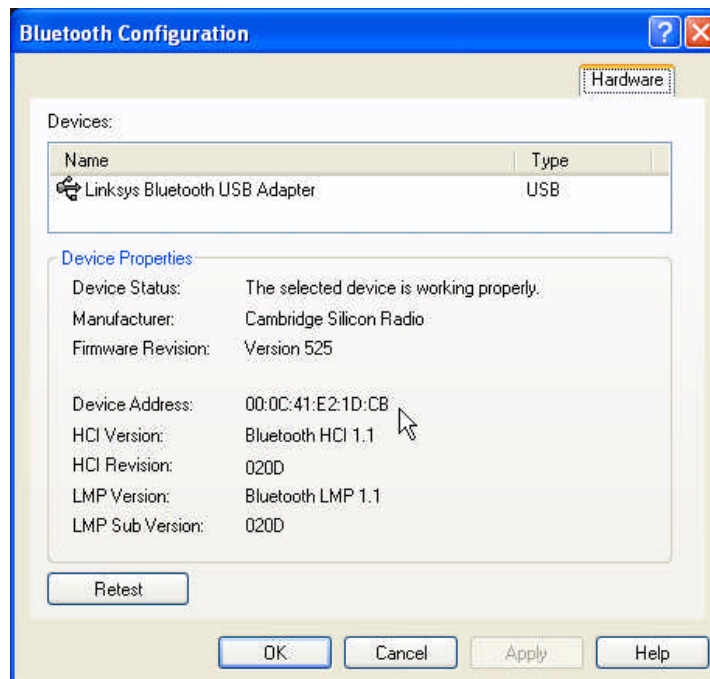

Figure 4: Write down device address to use later

6. Next, bring up HyperTerminal. It can usually be found through the Start menu (Start→Programs→Accessories→Communications→HyperTerminal) or it can be downloaded here: http://www.hilgraeve.com/htpe/download.html.

7. Name the new connection when it comes up as shown in **Figure 5**.

Figure 5: Name the HyperTerminal connection

8. Next, select the COM port used by the serial port in the "Client Applications" tab we examined in step 3 as shown in **Figure 6**. The COM port will vary from machine to machine.

Figure 6: Select COM port

9. Next, set the communications properties as shown in **Figure 7**.
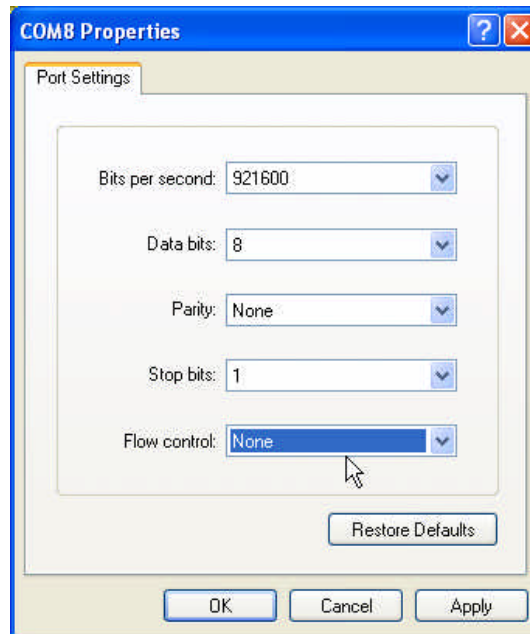
Figure 7: Set communications properties

10. After dismissing the communications properties dialog, the terminal window will appear. Save the connection by clicking on File→Save. Leave the terminal window up, as we will return to it later.

11. *If you have already installed the Xport software release that came with your Bluetooth Module, you may skip this step and proceed to step 7. This release contains the examples we will use in this guide.* Insert the Xport Software CD into your PC's CD-ROM drive and run "setup.exe". This will install the Xport utilities, Cygwin, GCC, eCos, source code and examples for the XRC.

12. It is assumed that you have set up the XRC as described in the *Xport Robot Controller User Guide.* Namely, the Xport needs to be plugged into the Robot Board and the Xport needs to be plugged into a Gameboy Advance.

13. Plug the Bluetooth module into the Robot Board Bluetooth socket. Make sure each of the pins is in its respective socket location before pressing down on the module. When the module is fully inserted, it should resemble **Figure 8**.
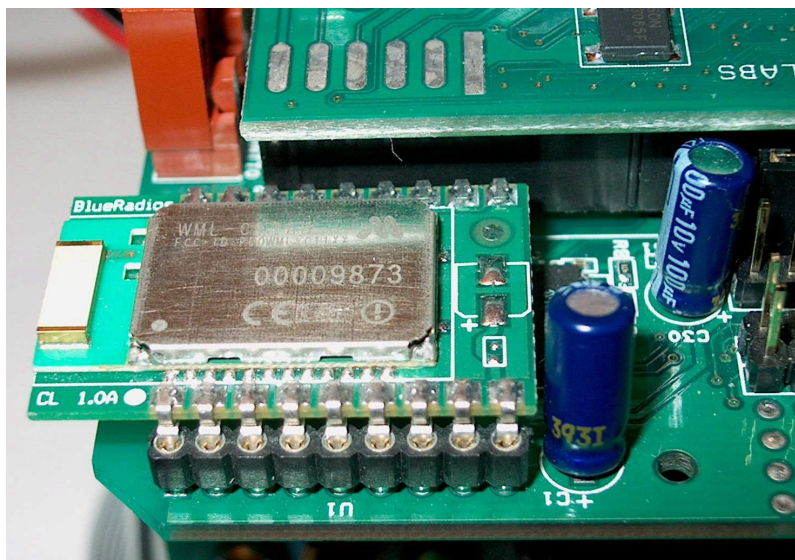
Figure 8: Insert the Bluetooth Module into the Bluetooth socket on the XRC

14. Plug the Parallel Port Interface into your PC's parallel port.

15. With the GBA and XRC powered off, plug one end of the 10-pin ribbon cable into the Parallel Port Interface and the other end into the Xport's Cport. Refer to **Figures 9** and **10**.
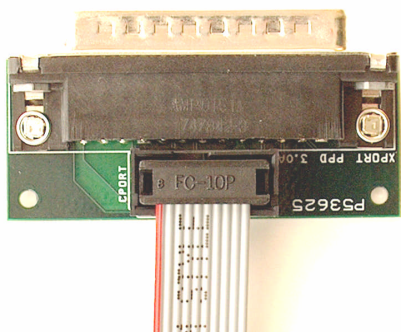

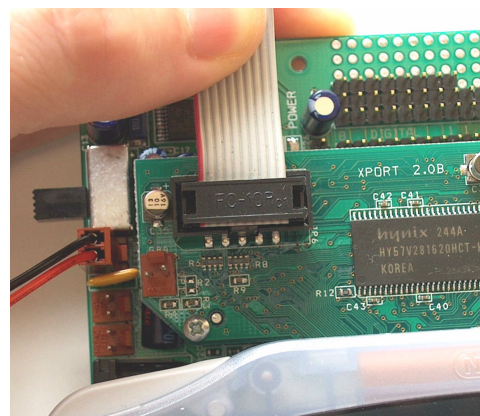**Figure 9: Plug Cport cable into Parallel Port Interface**

Figure 10: Plug Cport cable into Xport

16. Bring up the "Xport shell". This can either be found on the desktop or through the Start menu (Start→Programs→Xport). Change directories by typing "cd examples/xrc/robot1/btterminal".

17. Run "make upload". This will configure the Xport logic and flash, but before it does so, it will ask you to toggle the GBA power switch. Toggling the power is necessary before any programming operation.

18. Turn the XRC on and then turn the GBA on. After the GBA initializes, you should see the text "Waiting for connection..." on the LCD. Leave your GBA and XRC powered up in this state.

19. From your PC, double-click on the "My Bluetooth Places" icon, which should be installed on your desktop (**Figure 11**). This will bring up the Bluetooth Neighborhood window.
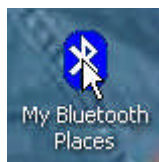

Figure 11: Double click on the "My Bluetooth Places" icon to bring up the Bluetooth Neighborhood window

20. Click on the "View devices in range" on the left side of the Bluetooth Neighborhood window as shown in **Figure 12**.
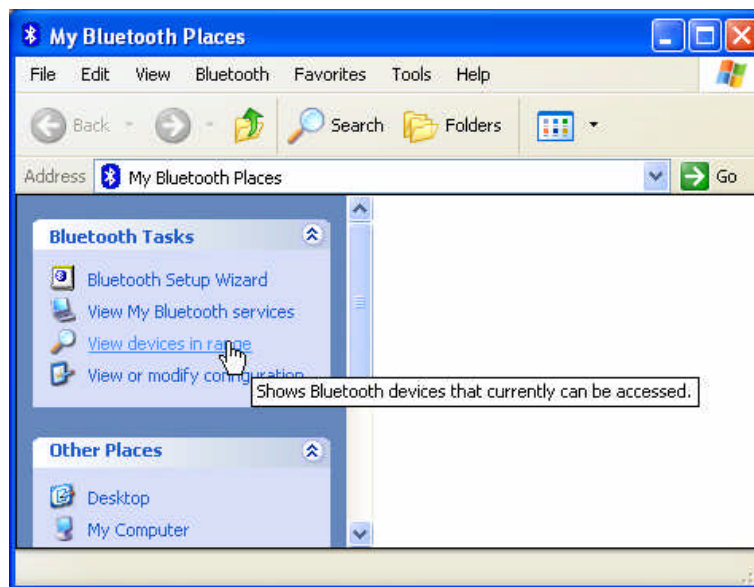

Figure 12: Click on "View devices in range"

21. You should see the XRC come up as a PDA icon named "BlueRadios" or similar.

22. Right-click on the icon and select "Discover Available Services" as shown in **Figure 13**.
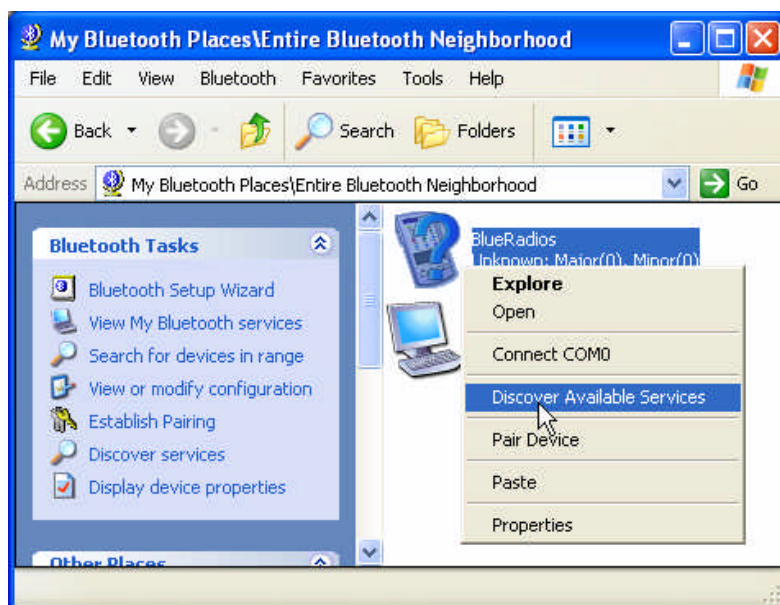
Figure 13: Select "Discover Available Services"

23. You should see a serial connector appear named "COM0 on BlueRadios" or similar. Right-click on this icon and select "Connect to Bluetooth Serial Port" as shown in **Figure 14**.
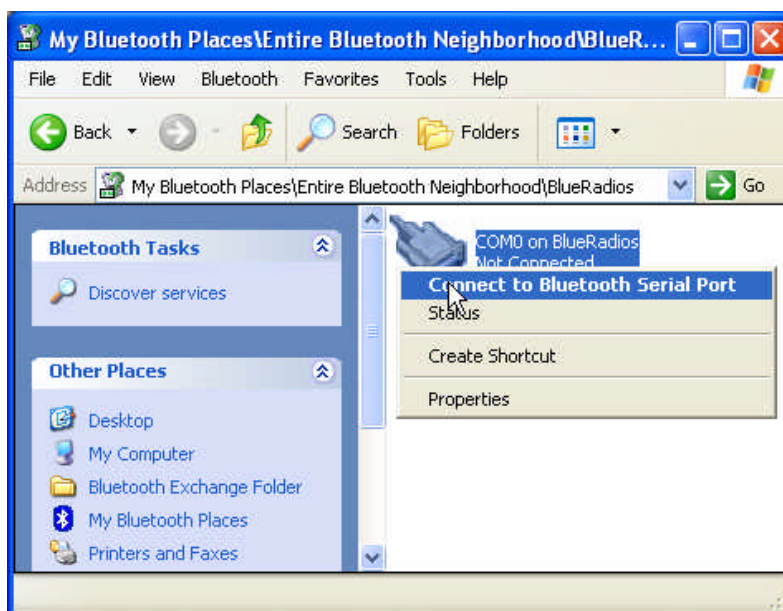

Figure 14: Select "Connect to Bluetooth Serial Port"

24. It should then connect after about 15 seconds. When connected, the icon changes as shown in **Figure 15**.
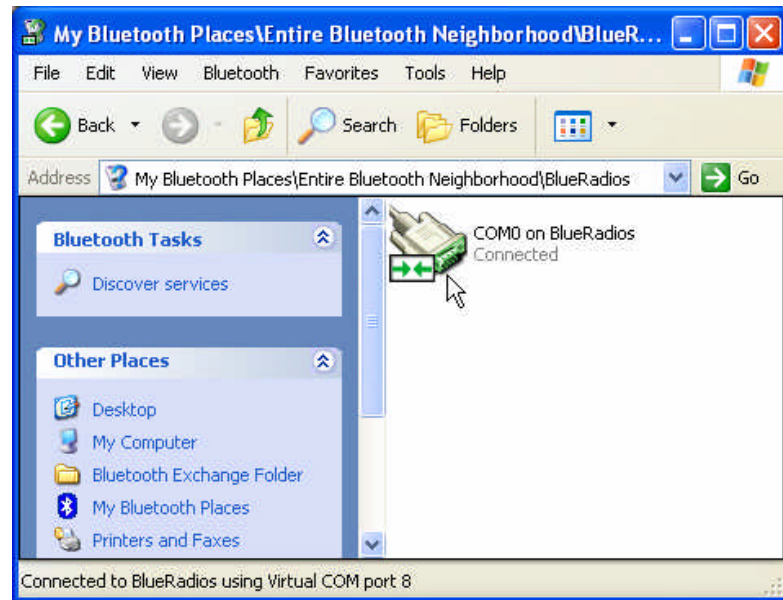
Figure 15: This icon indicates a successful connection

25. Now go back to the HyperTerminal window that we brought up in step 10. You should be able to type into this window and see the text appear on the Gameboy screen. Similarly, if you press any of the buttons on the Gameboy the corresponding letters will appear on the HyperTerminal screen.

You have just performed a successful connection! If you want to perform this connection again, you only have to bring up the Bluetooth Neighborhood window, scan for available devices and connect to the XRC.

Performing a master connection

The connection we just performed was such that the PC was the master (initiator) and the XRC/GBA was the slave. From the XRC/GBA's perspective it was a slave connection. Most people prefer the opposite connection (XRC/GBA is the master and the PC is the slave) because it requires fewer steps. Let's walk through setting up this type of connection, which we call a master connection.

1. From the ~xport/examples/xrc/robot1/btterminal directory, bring up btterminal.cxx in a text editor. Look for the "#define HOST..." line toward the top of the file. Replace the Bluetooth Device address with the device address noted in step 5 in the previous section. Make sure to remove the colons and capitalize the letters. Also note that there are may be zeroes but no letter Os.

2. Compile by running "make termmaster.bin".

3. Upload into the Xport by running "xpcomm termmaster.bin".

4. Turn the XRC and GBA on to run the new program. After about 15 seconds, you should see the Bluetooth icon in the system tray on your PC turn from white to green as shown in **Figure 16**.

Figure 16: This icon indicates a successful connection

5. Bring up HyperTerminal again and create a new connection identical to the connection you created in steps 7, 8, and 9 of the previous section, except use the COM port for the serial port indicated in the "Local Services" tab that we examined in step 4 of the previous section.

6. After the new terminal window is displayed, you can type exactly as you did before.

Now, every time you run this program, it will connect to your PC automatically. This is why most prefer the master connection – it does not require the extra steps that the slave connection requires.

Wrapping up

Of course, the btterminal example is not very useful, but is good for testing and for becoming familiar with the different connection types. Another example you might try is the "btdiffmove" example that allows the user to move a differential base by typing commands into a terminal window. Again, this is a silly example meant only to convey some basic concepts. Normally, a program running on the PC or another XRC will programmatically send and receive data instead of going through a terminal program.

The Bluetooth connections that are created can run at data rates up to 150Kbytes/second in both directions with ranges up to 100 meters. They behave very similarly to a physical serial cable with the added advantage of built-in error correction and flow control.   It is also possible to connect from one XRC Bluetooth module to another by issuing a master connect using the other module's device address while the other module is waiting for a slave connection.

Contacting Us

We are interested in hearing from you! Please send you bug reports, questions and suggestions to support@charmedlabs.com.