Introduction

To check out the Bluetooth DSC board, there are several steps:

1. Verify that the Bluetooth module is powering up and working.
2. Verify that the PIC is powered up and working.
3. Verify that the Bluetooth module and the PIC chip are communicating with each other.
4. Verify that the PIC chip is communicating with the encoders.

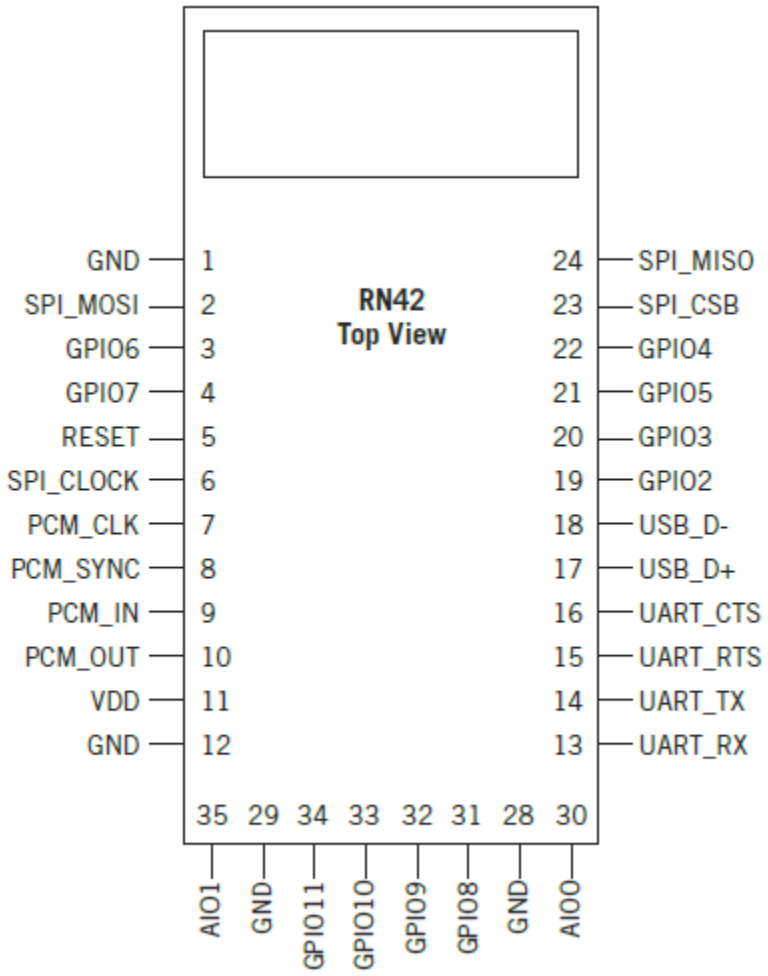
Basic Bluetooth Module Checks

The first step is to check out the Bluetooth module. The green and red LEDs on the board are good indicators of whether the Bluetooth module is working. When the board is powered up, the green LED should glow solid, and the red LED should flash.

If the red LED doesn't flash:

- check the voltage at pin 11 to make sure that there is 3.3V there. If there is not, check the installation of U2, the 3.3V voltage regulator, and the traces between it and the Bluetooth module, for any issues (bad solder, cracked trace, etc.).
- Check the soldering at pins 1, 11, 12, 28, and 29 of the Bluetooth module to make sure that the pins are soldered to the pads.

See the diagram below for the pinouts of the Bluetooth module. Note that the pin numbering is nonsequential in places.



Basic PIC Chip Checks

Check pin 14 of the PIC chip for 3.3V. Pin 14 is the supply voltage for the PIC.

Also check pin 4 for 3.3V. Pin 4 is the reset pin and if grounded will cause the PIC chip to restart, so under normal circumstances it should be 3.3V. R2 is the resistor through which it is held at 3.3V.

Use an oscilloscope, a frequency counter, or a general coverage receiver to ensure that there is a 4 MHz sine wave signal on pin 16. If not, check the soldering around X1, C4, C5, and R5.

If there are no obvious issues around the PIC chip but its oscillator isn't running, try reprogramming the PIC chip, or replacing it with another chip. But it's more likely that there is a problem with the soldering or the board traces if the PIC chip oscillator doesn't start up.

Basic Encoder Checks

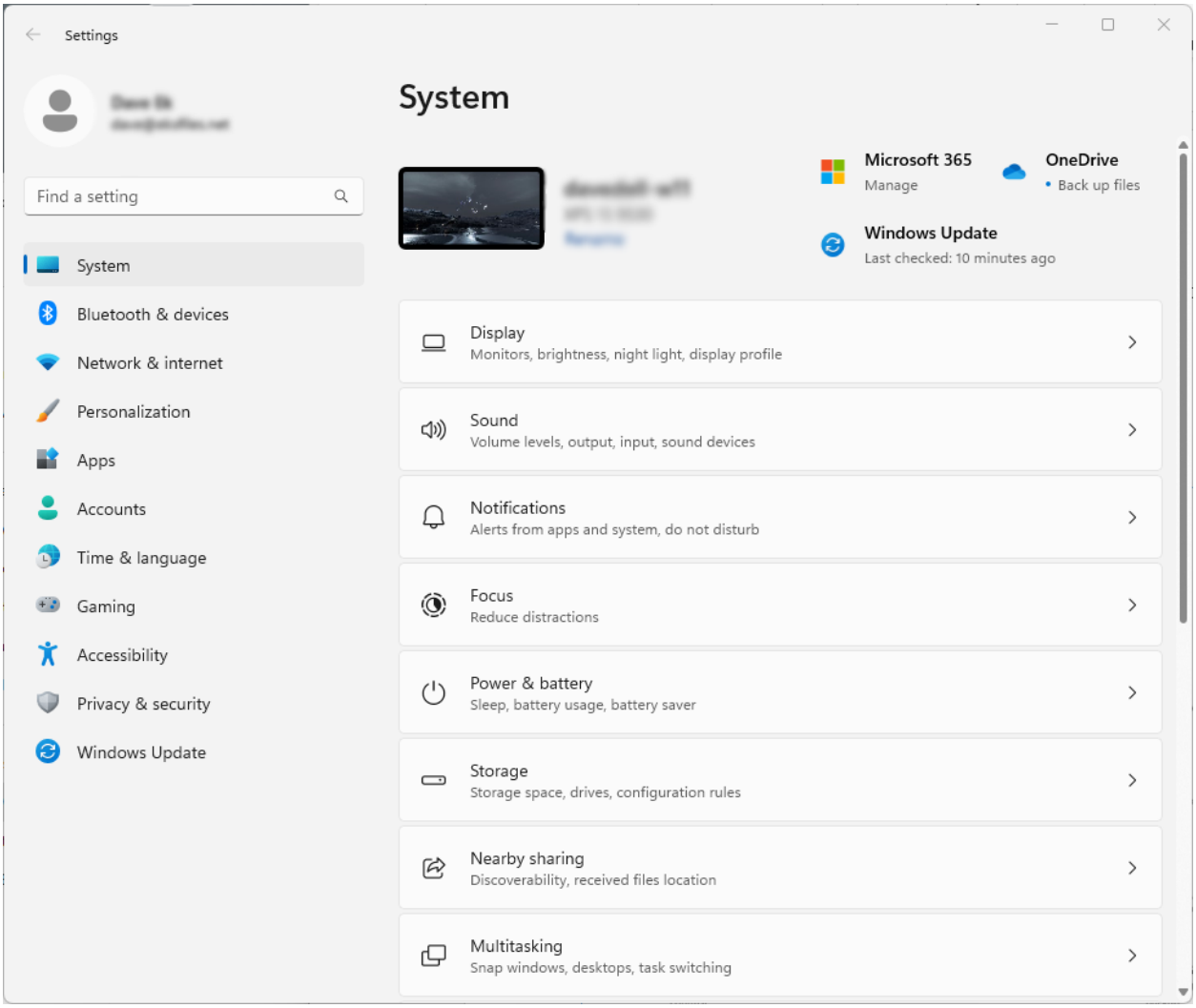
Check pins 2 and 6 of J1 for 5V. If there isn't 5V at those pins, check the installation of U1 and the traces from U1 to J1.

Pairing the Bluetooth Module

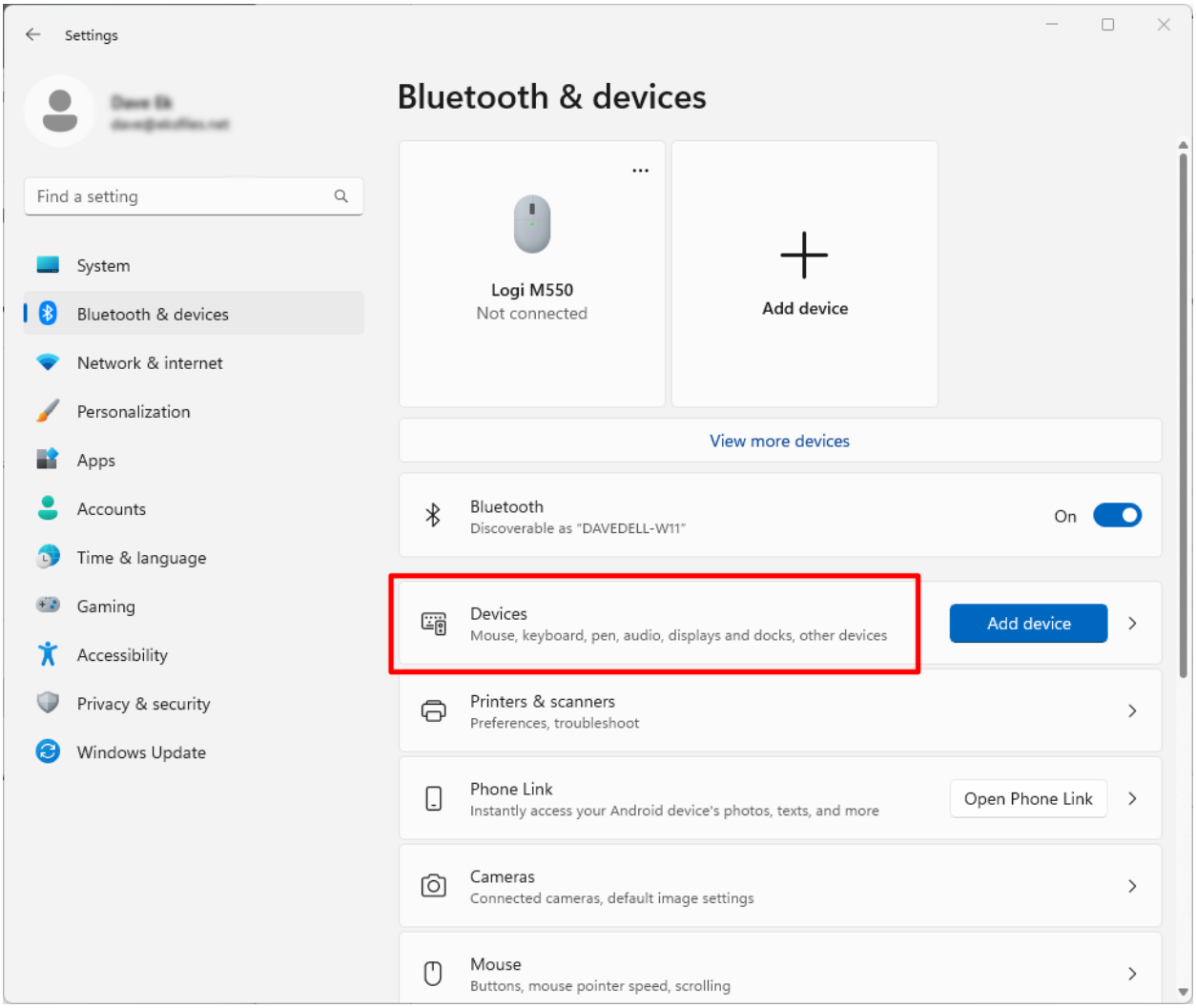
If everything checks out so far, it's time to try to pair the Bluetooth module with a PC. Below are instructions for this process, both for Windows 10 and Windows 7.

Pairing with a Windows 11 PC

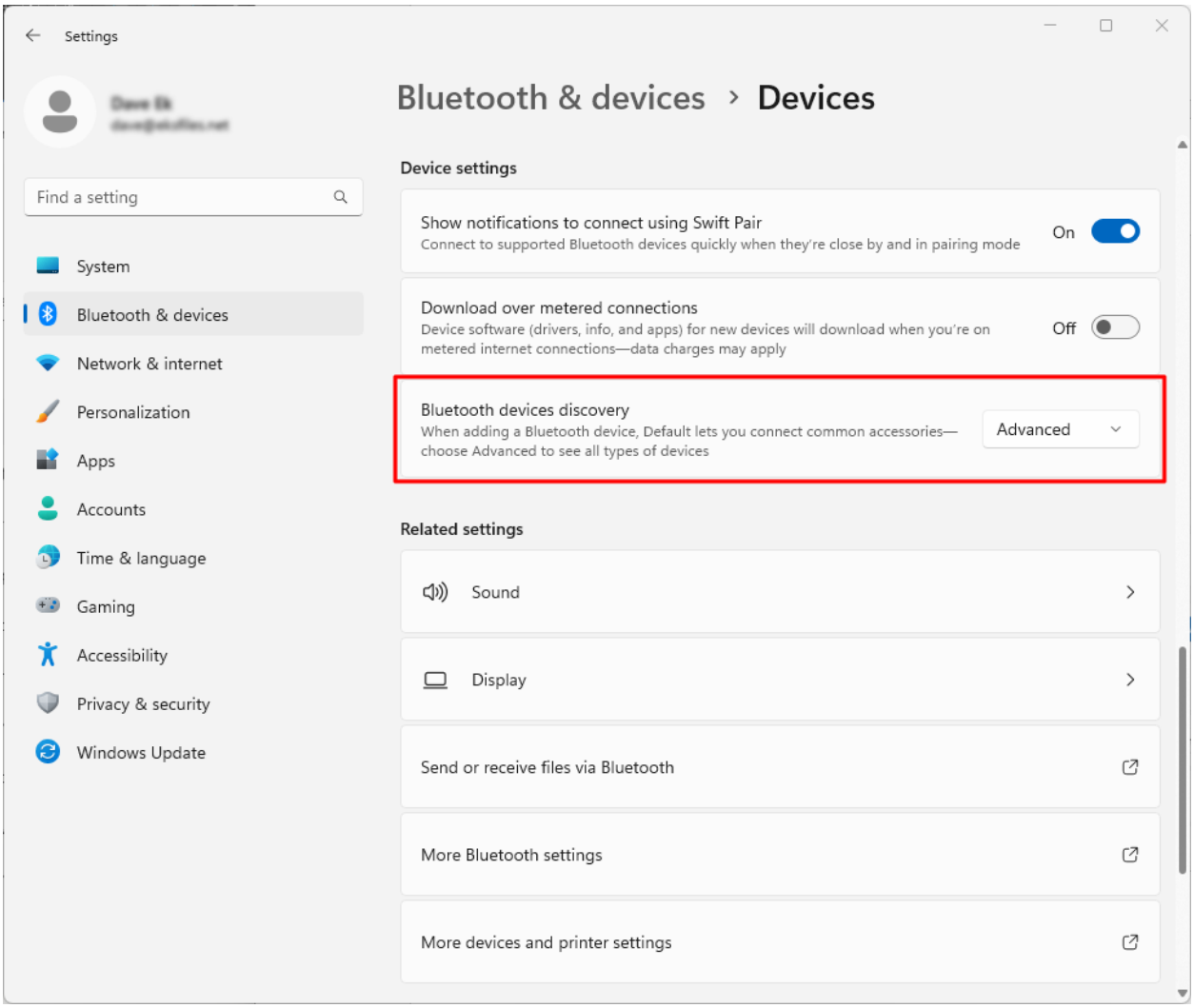
Open Windows Settings and click the "Bluetooth & devices" link on the left.



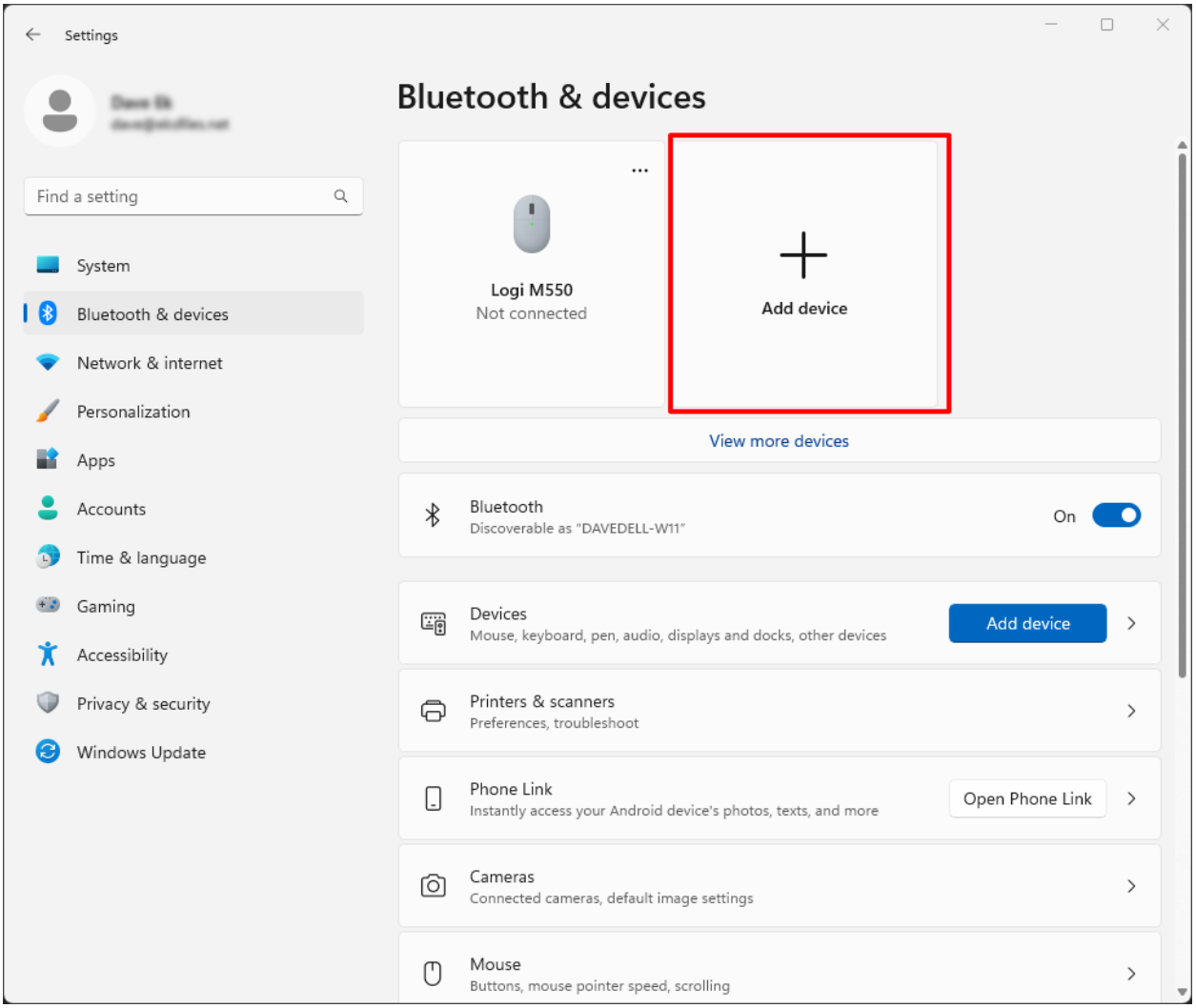
If this is the first time you're pairing one of these devices, you'll need to click on the "Devices" box (not the "Add device" button) to change one of Windows' Bluetooth settings.



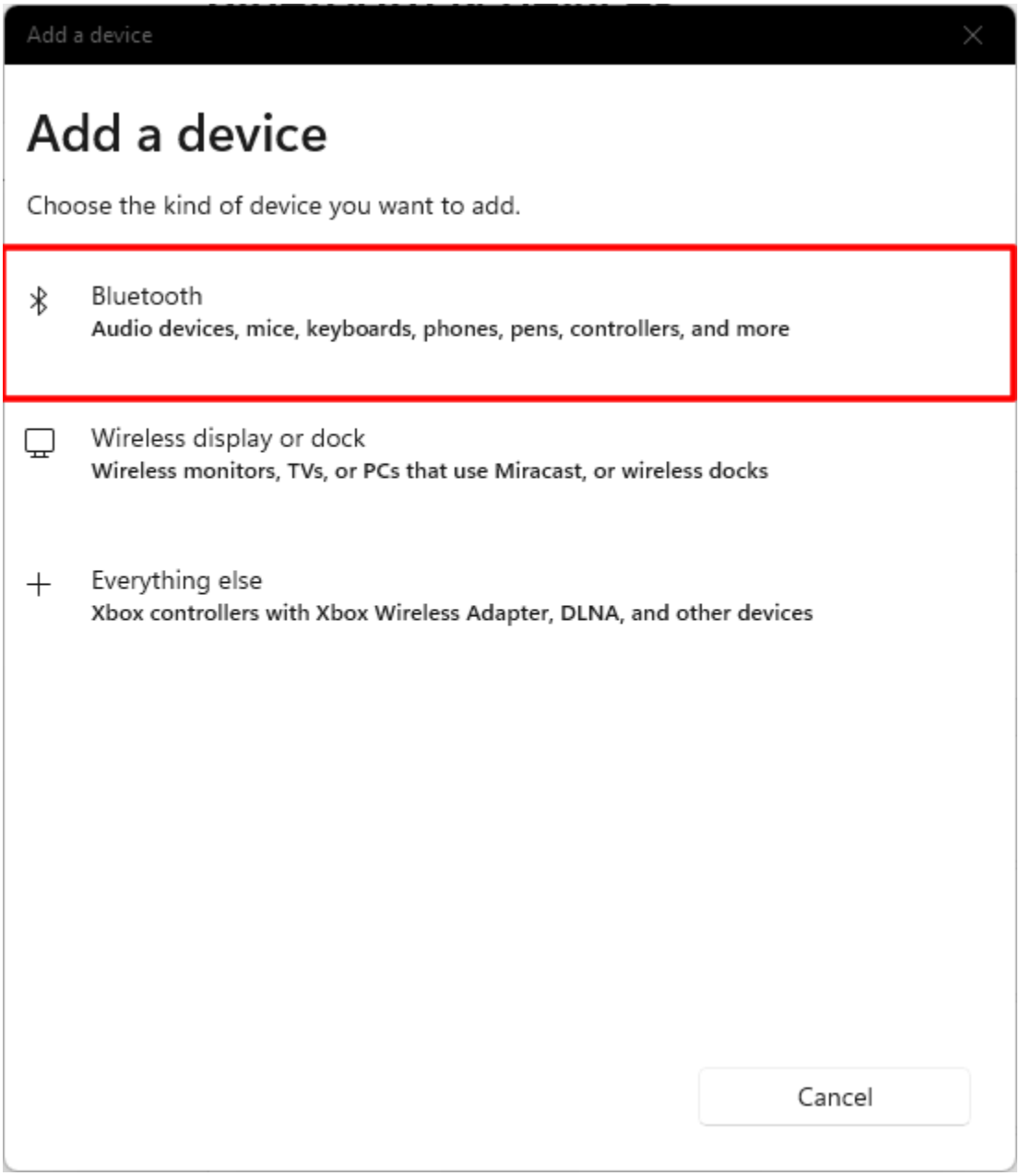
Scroll towards the bottom of the Devices screen and find the “Bluetooth devices discovery” setting and change its value to “Advanced.” (It’s possible that this setting doesn’t exist in earlier versions of Windows 11, so if you don’t see this setting, skip to the next step.)



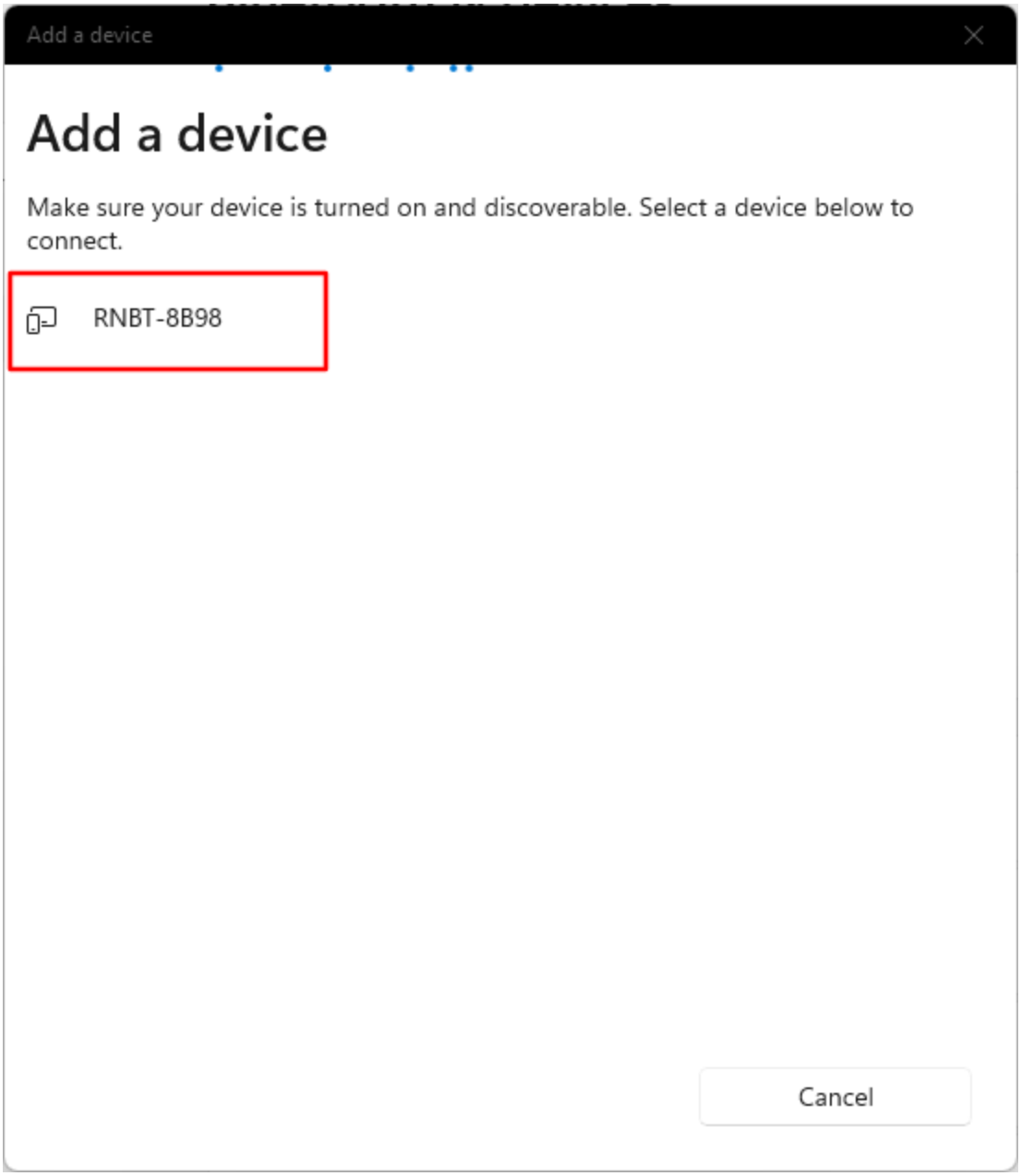
Now go back to the previous settings page and click the big “Add device” button.



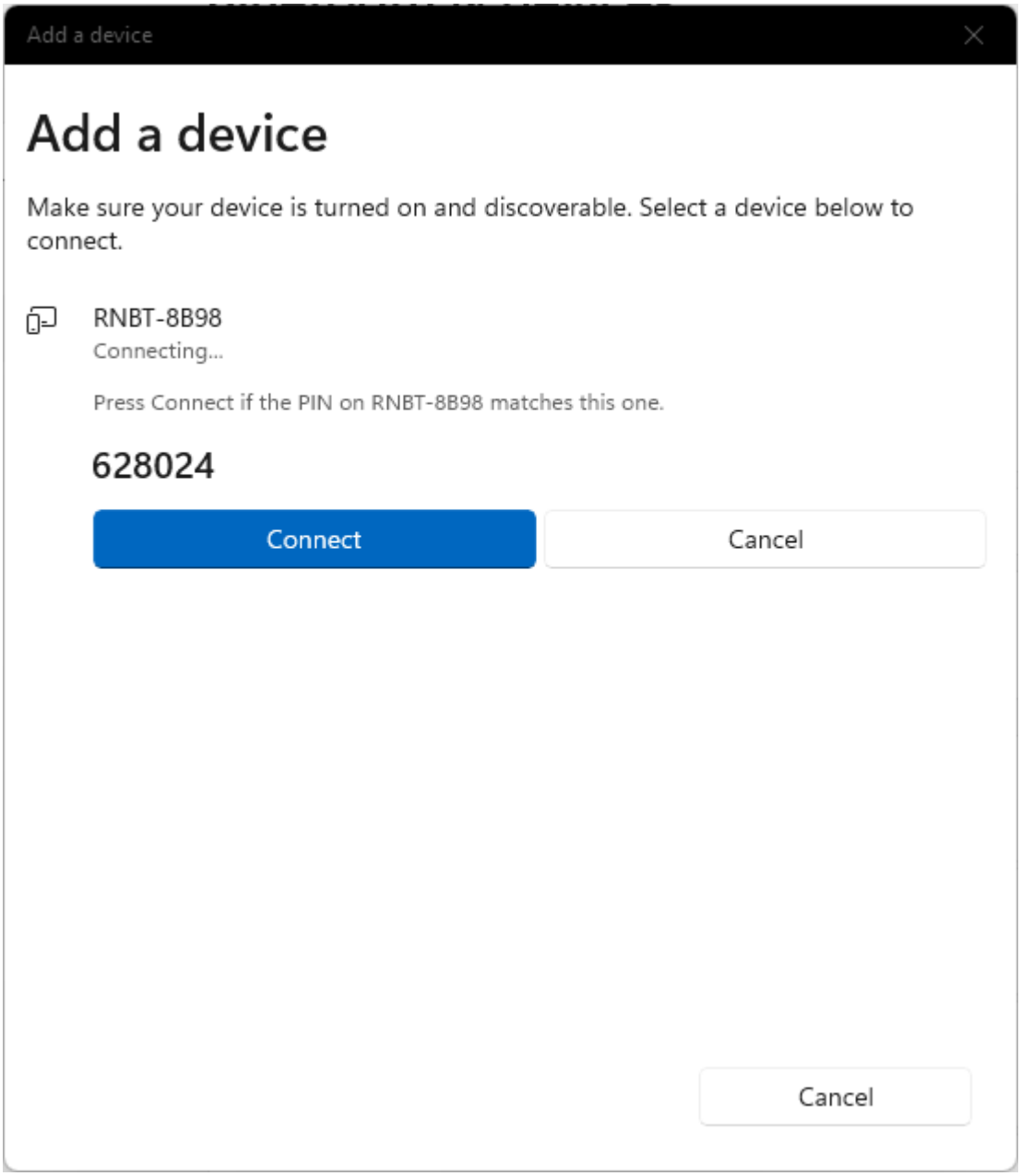
In the ensuing dialog box, select “Bluetooth” from the list.



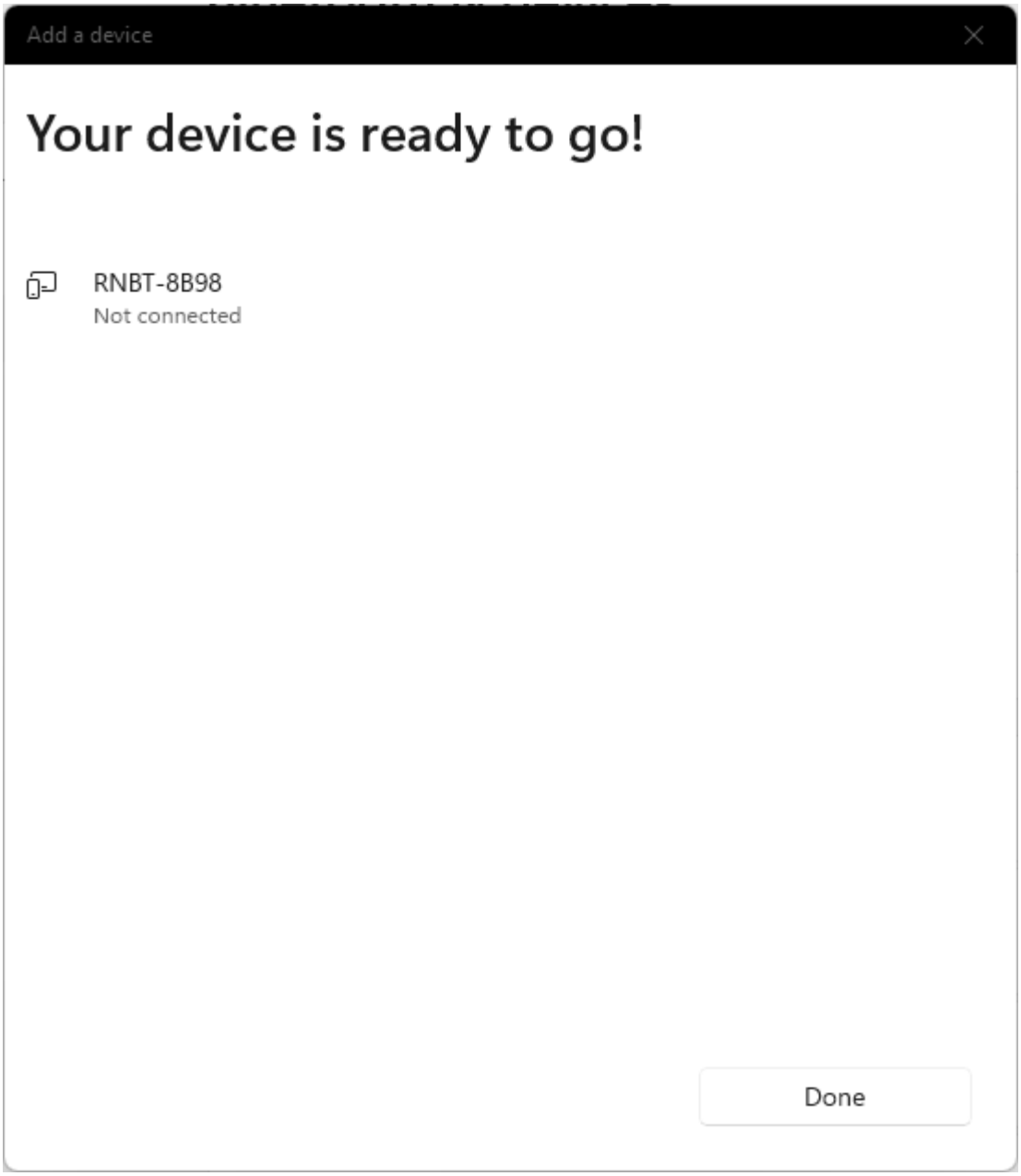
At this point, Windows will begin searching for your Bluetooth device, so make sure it's powered up—the red LED should be slowly flashing. The device name (starts with "RNBT") should soon appear in the list of discovered devices. Click on the device name to pair the device with your computer.



Windows will ask you to confirm the pairing. Click the “Connect” button (don’t worry about the PIN matching—there’s no way to see what the PIN is on the device).

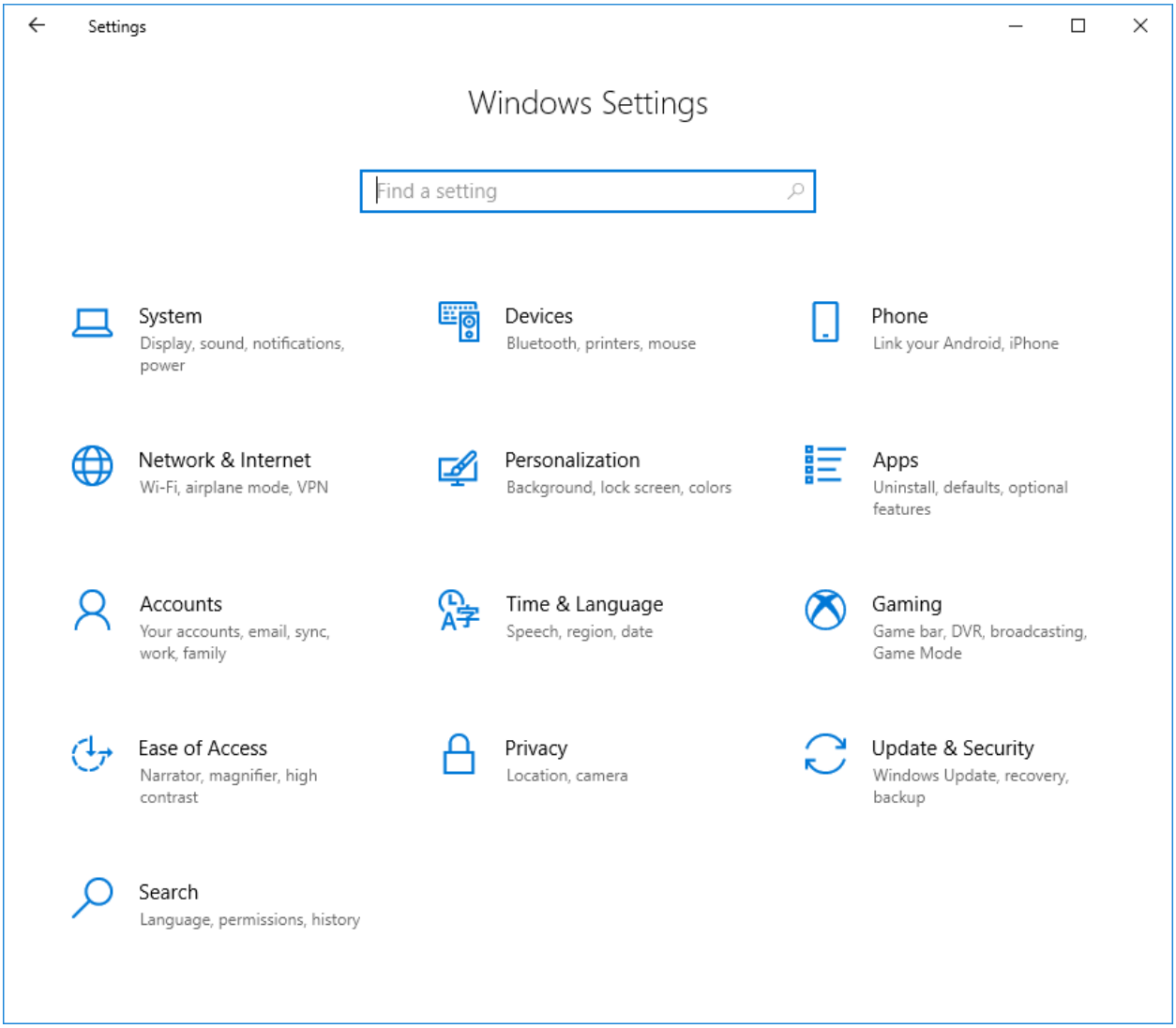


When Windows finishes pairing with the device, you'll see this confirmation. You're now ready to connect to the device via Bluetooth and configure it for use.

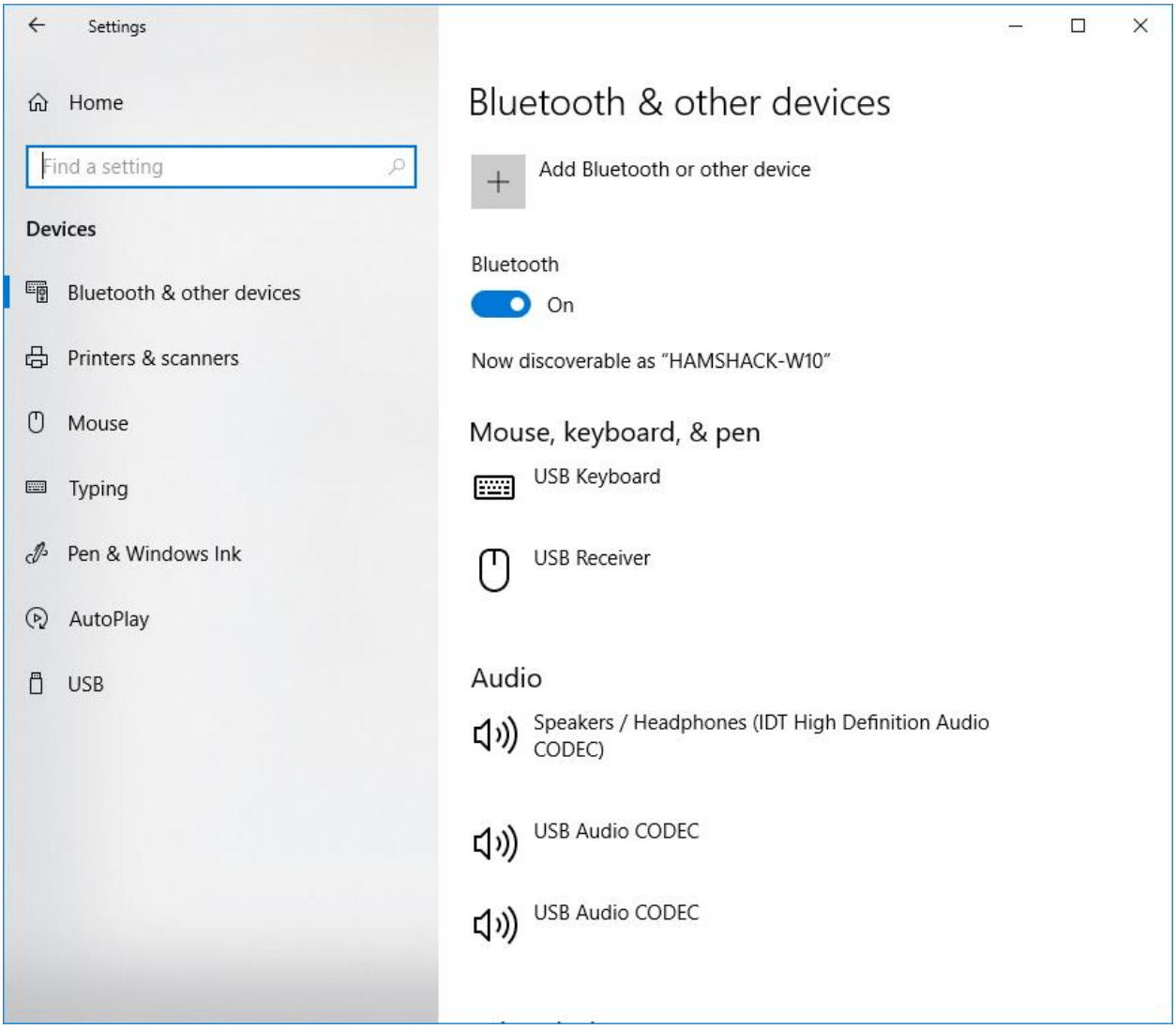


Pairing with a Windows 10 PC

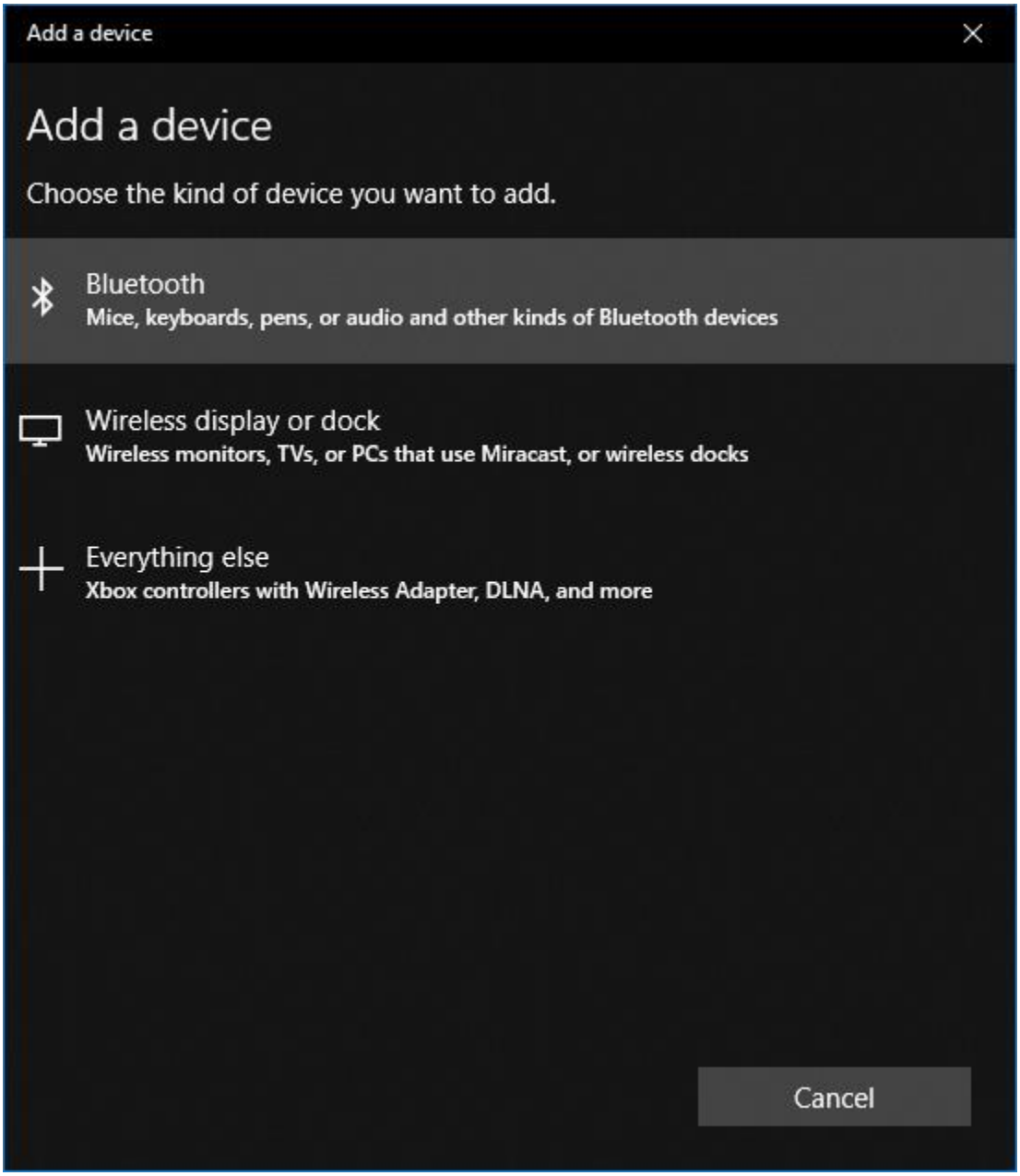
Open Windows Settings, and click the “Devices” link.



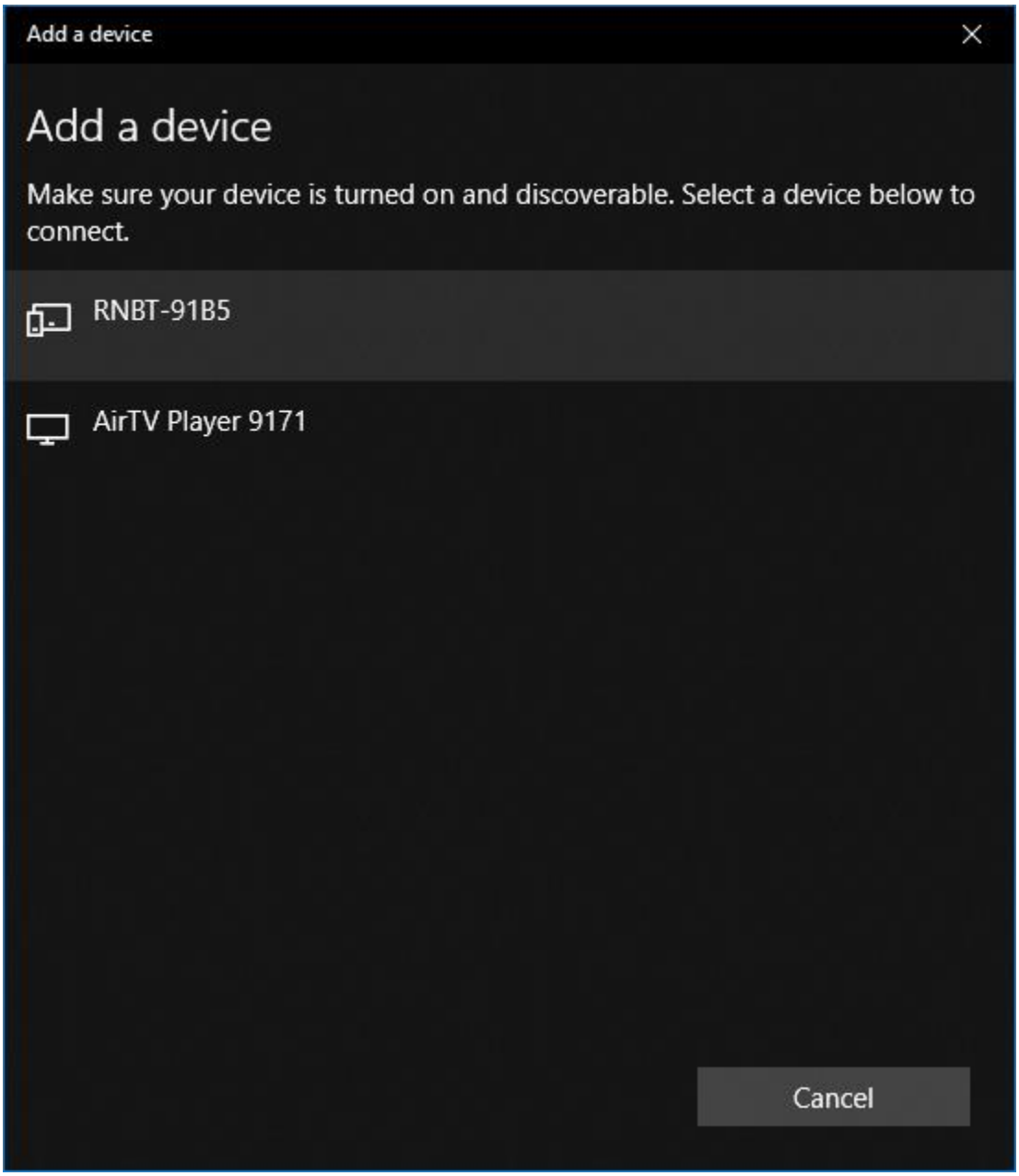
On the “Bluetooth & other devices” page, make sure Bluetooth is turned on. Then click “Add Bluetooth or other device.”



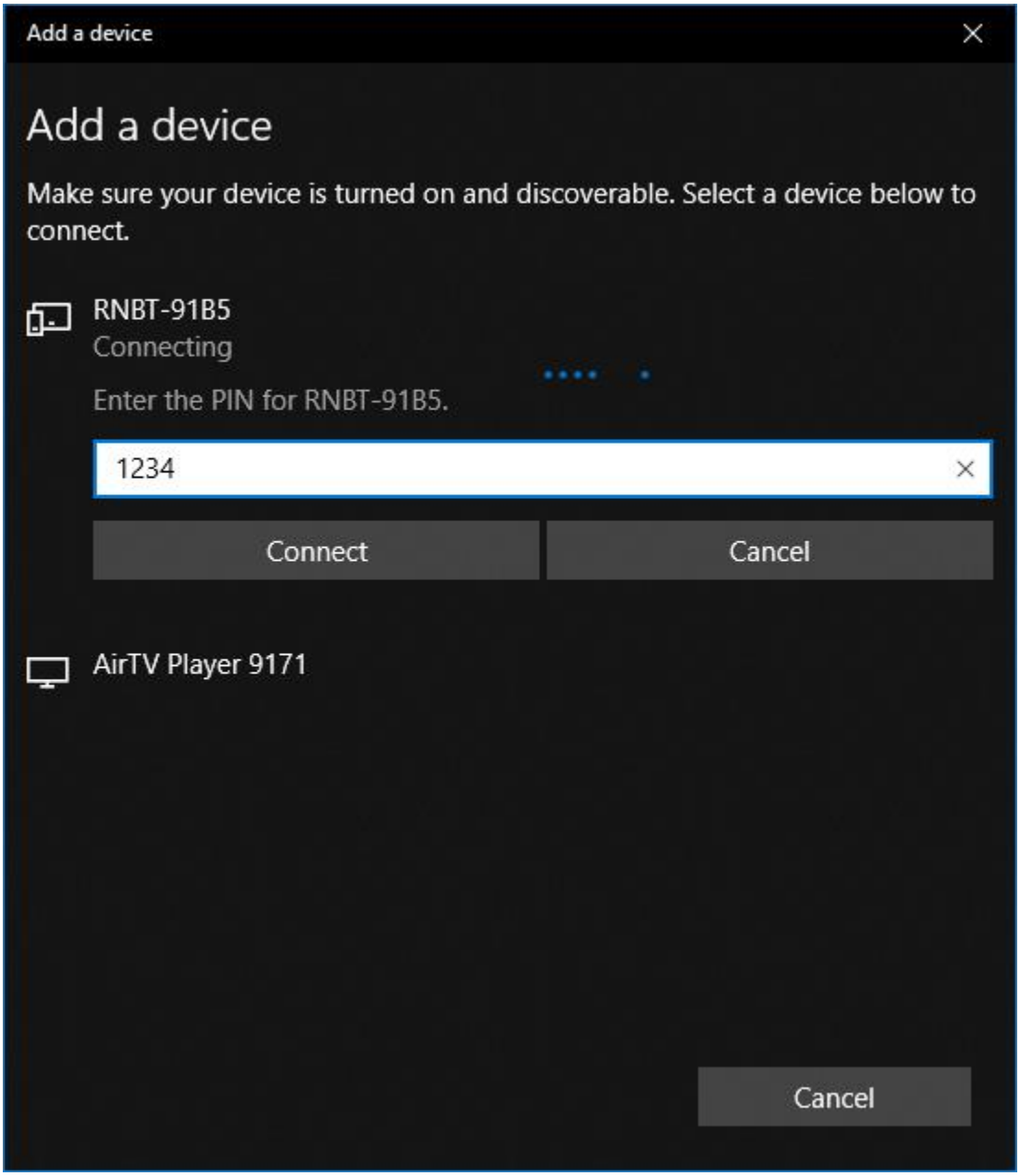
In the “Add a device” window that appears, click the “Bluetooth” link.



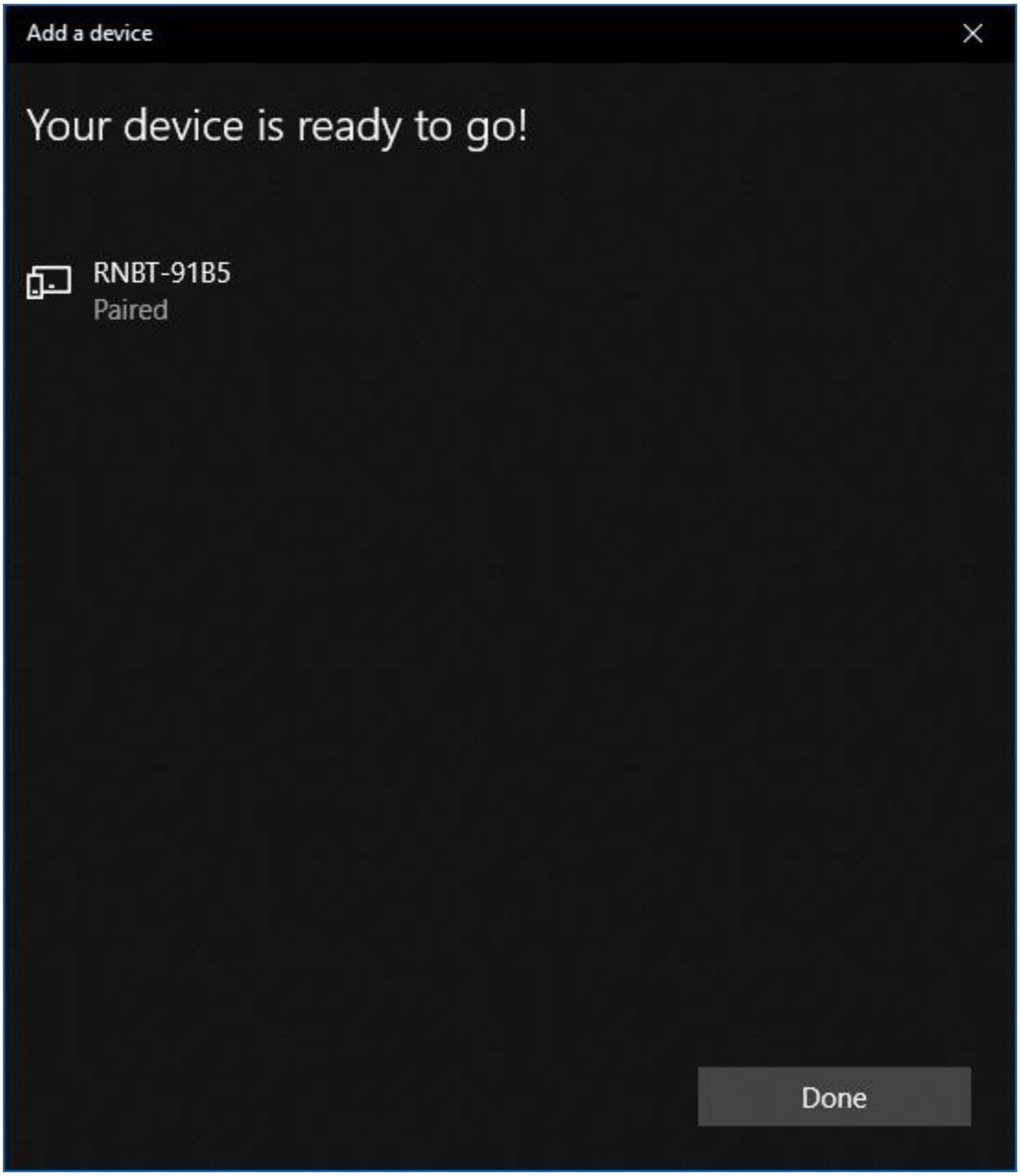
Make sure the Bluetooth device is turned on (the yellow LED should be flashing). It may take a moment for the device to appear in the list under “Add a device.” The name for the device may vary, but in the example below it is “RNBT-91B5.” Once the device appears in the list, click on it.



When you click on it, it may prompt you to enter a PIN. Enter “1234” and click the “Connect” button.



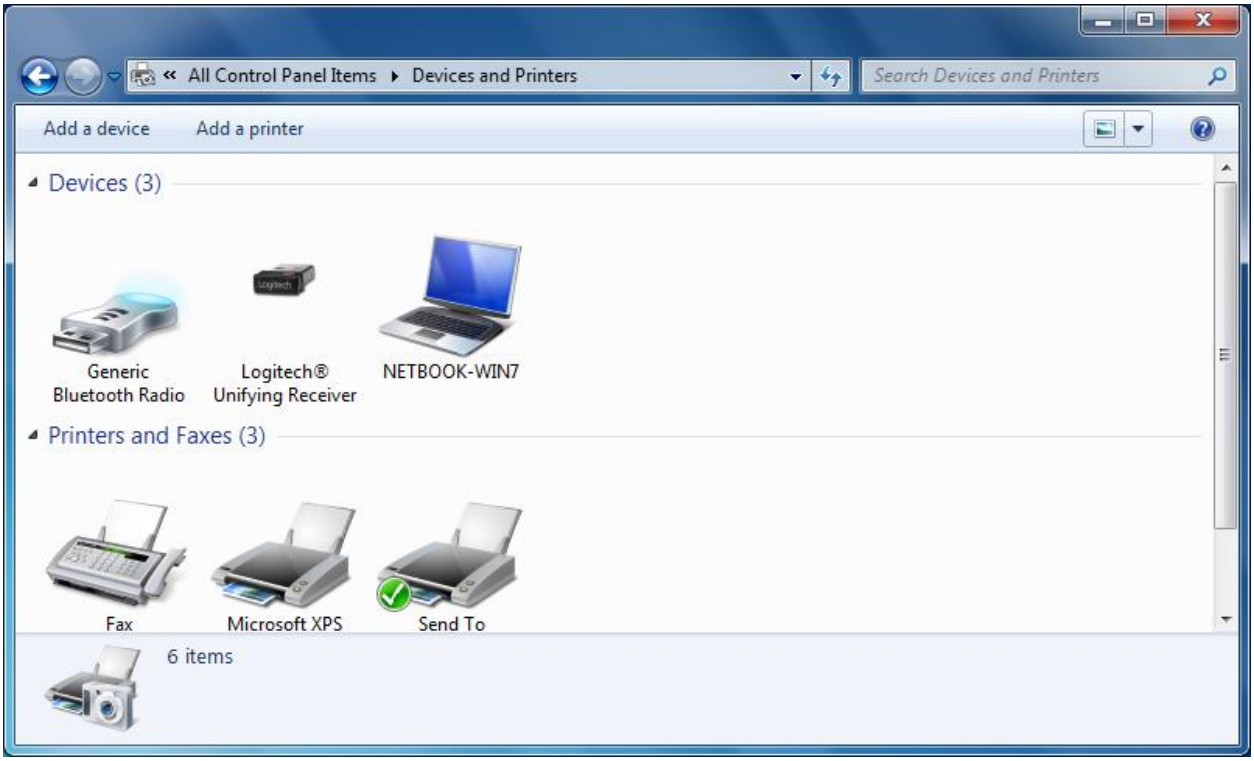
Once Windows reports that the device is paired, you're ready to go. Click the "Done" button.



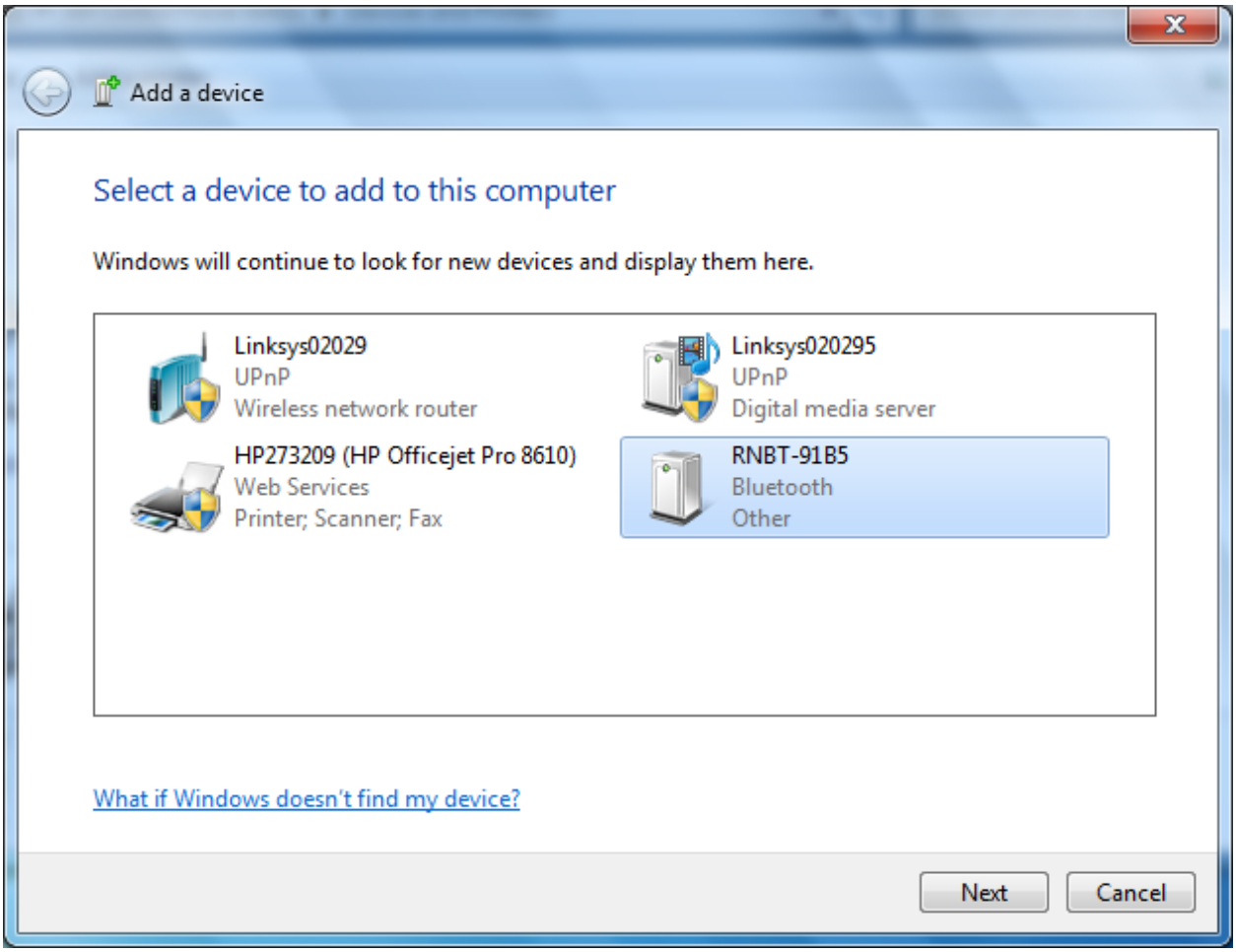
Pairing the Bluetooth module with a Windows 7 PC

Open the Control Panel and navigate to “Devices and Printers.”

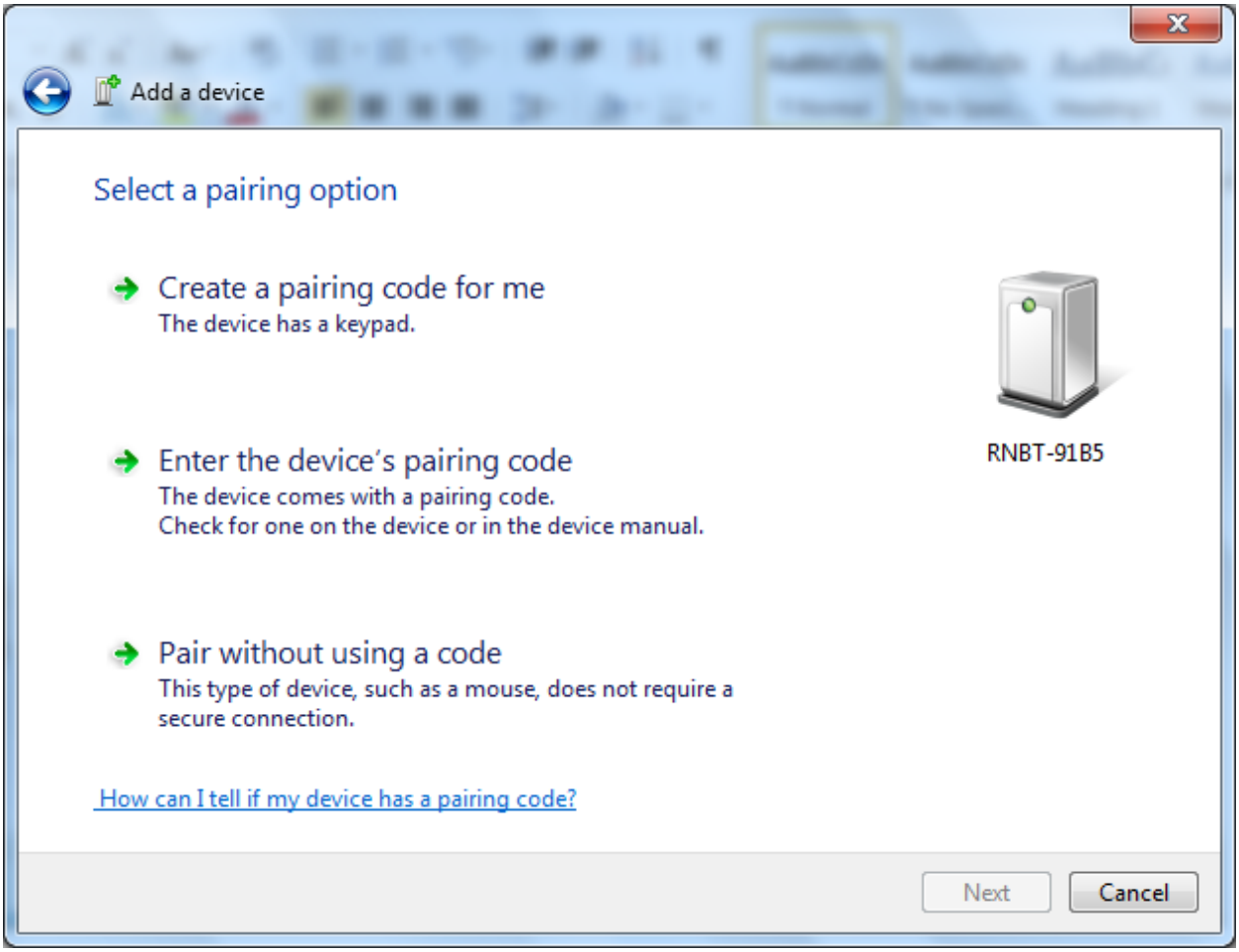
Turn on the Bluetooth device (the red LED should begin flashing), and then click the “Add a device” link.



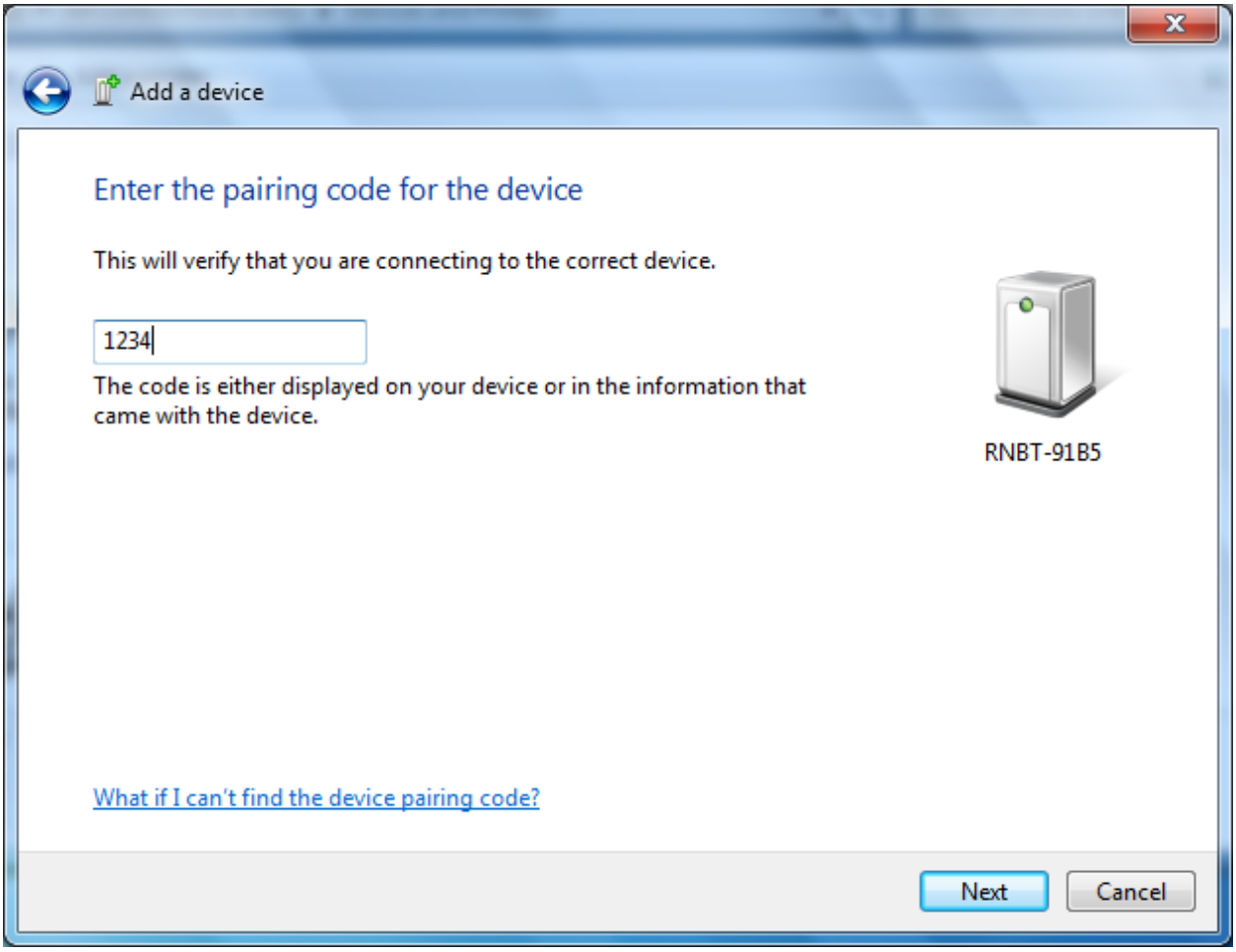
In the “Add a device” window that appears, it may take a moment for the Bluetooth device to appear in the list. The name may vary, but in the example below it is “RNBT-91B5”. Click the device in the list to select it, then click the “Next” button.



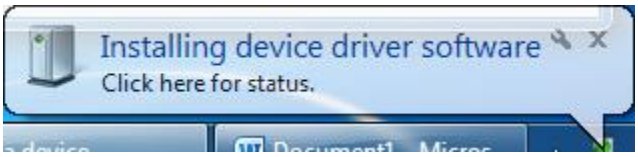
After a moment, the display will change to ask you to select a pairing option. Click “Enter the device’s pairing code.”



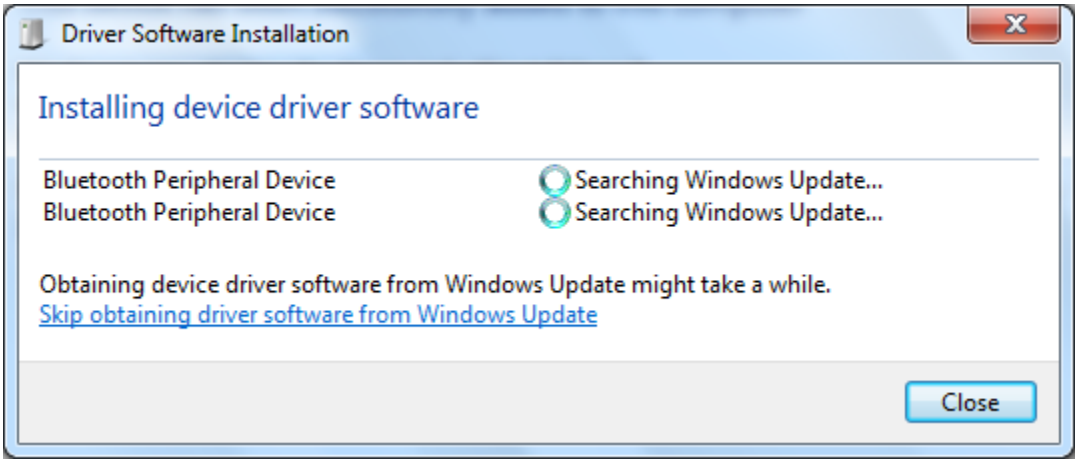
Next, enter the pairing code (1234), and click the “Next” button.



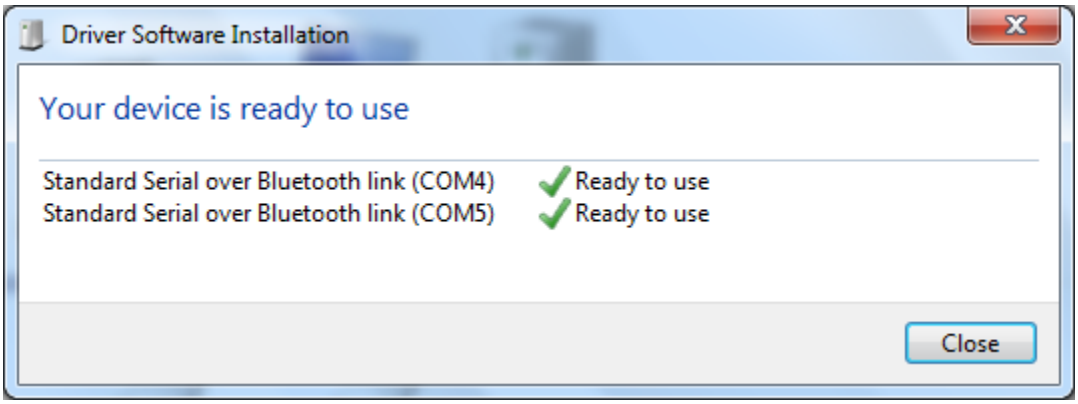
You’ll probably see the “Installing device driver software” notification balloon pop up near the task bar. Click on the balloon to see the progress of the device driver installation.



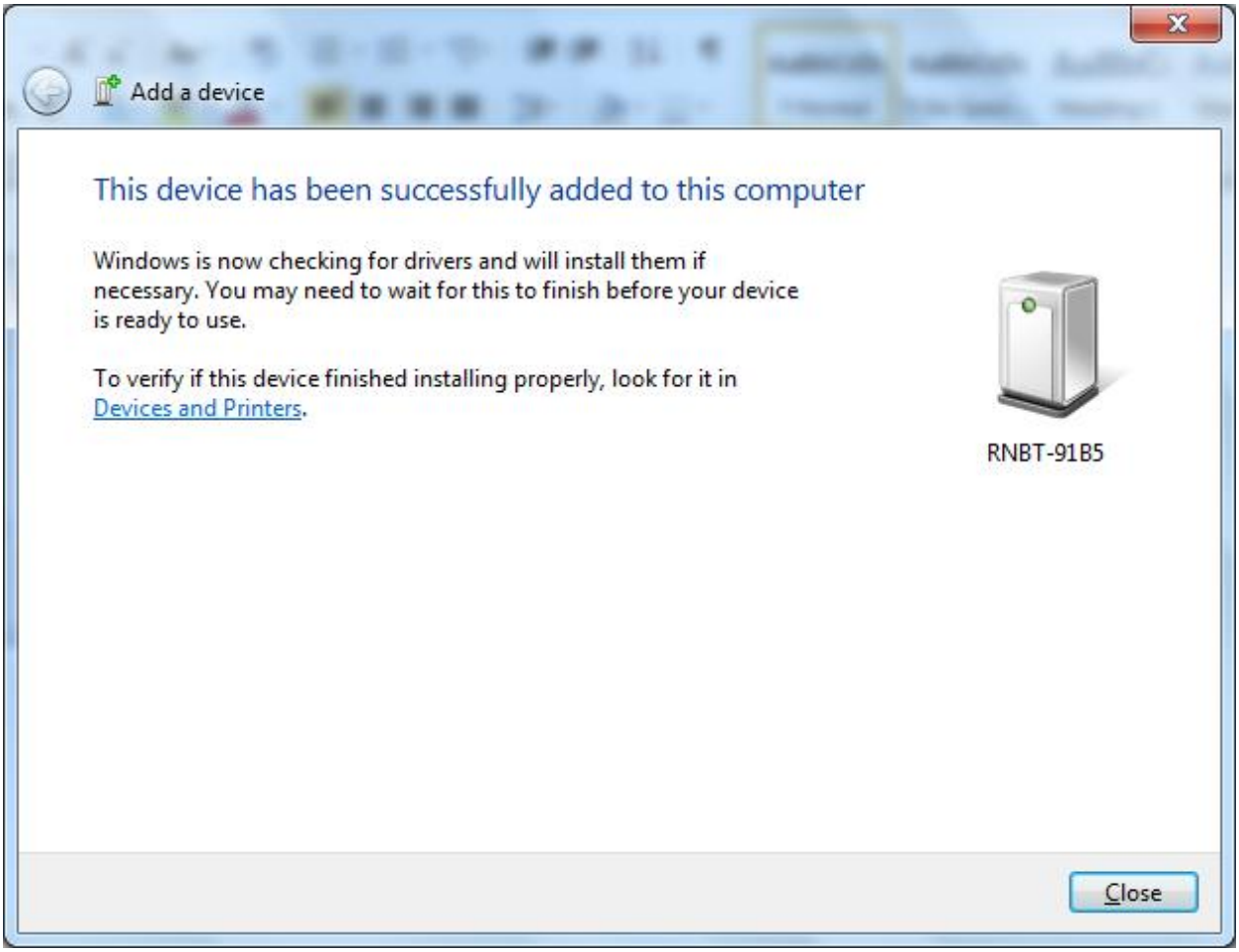
You should see two devices listed in the progress window. This step may take a while.



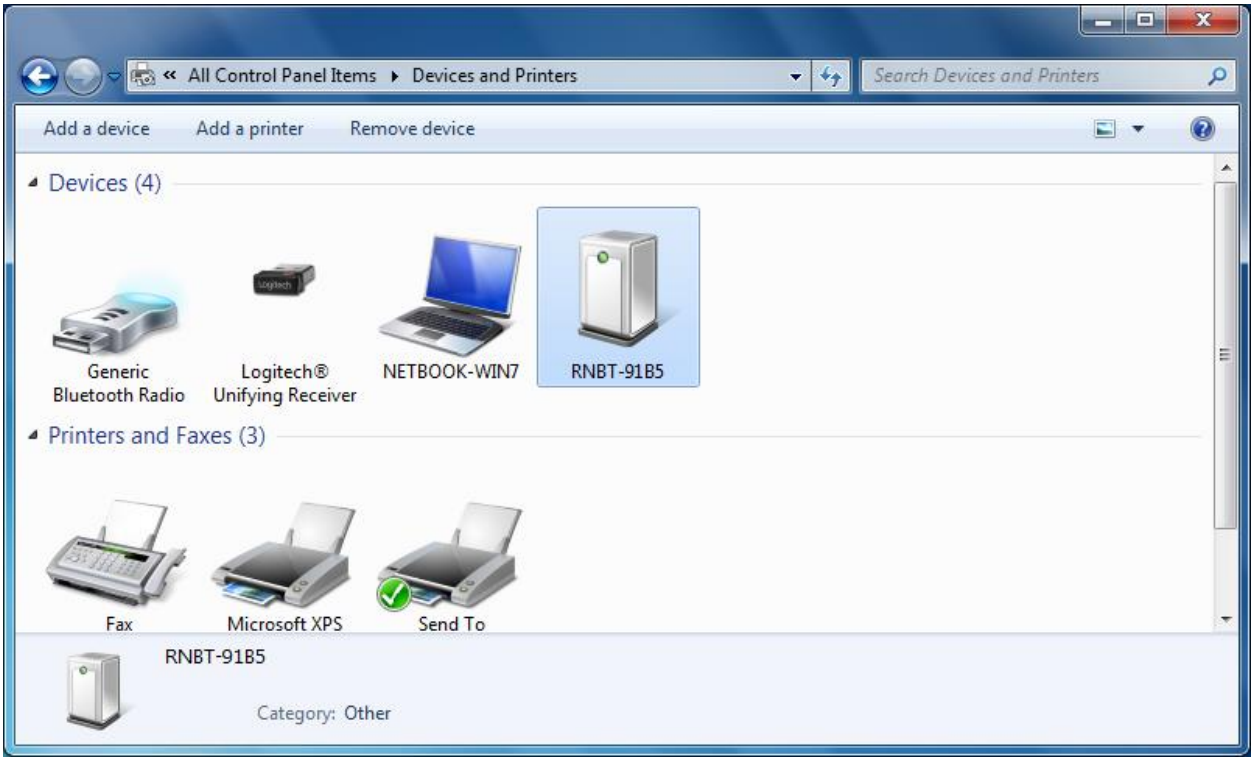
When the driver software installation is complete, you should see both devices listed with COM ports as in the example below. Note those COM port numbers for later use, then click “Close.”



Finally, you'll be given confirmation that the Bluetooth device has been successfully added. Click the "Close" button to close the window.

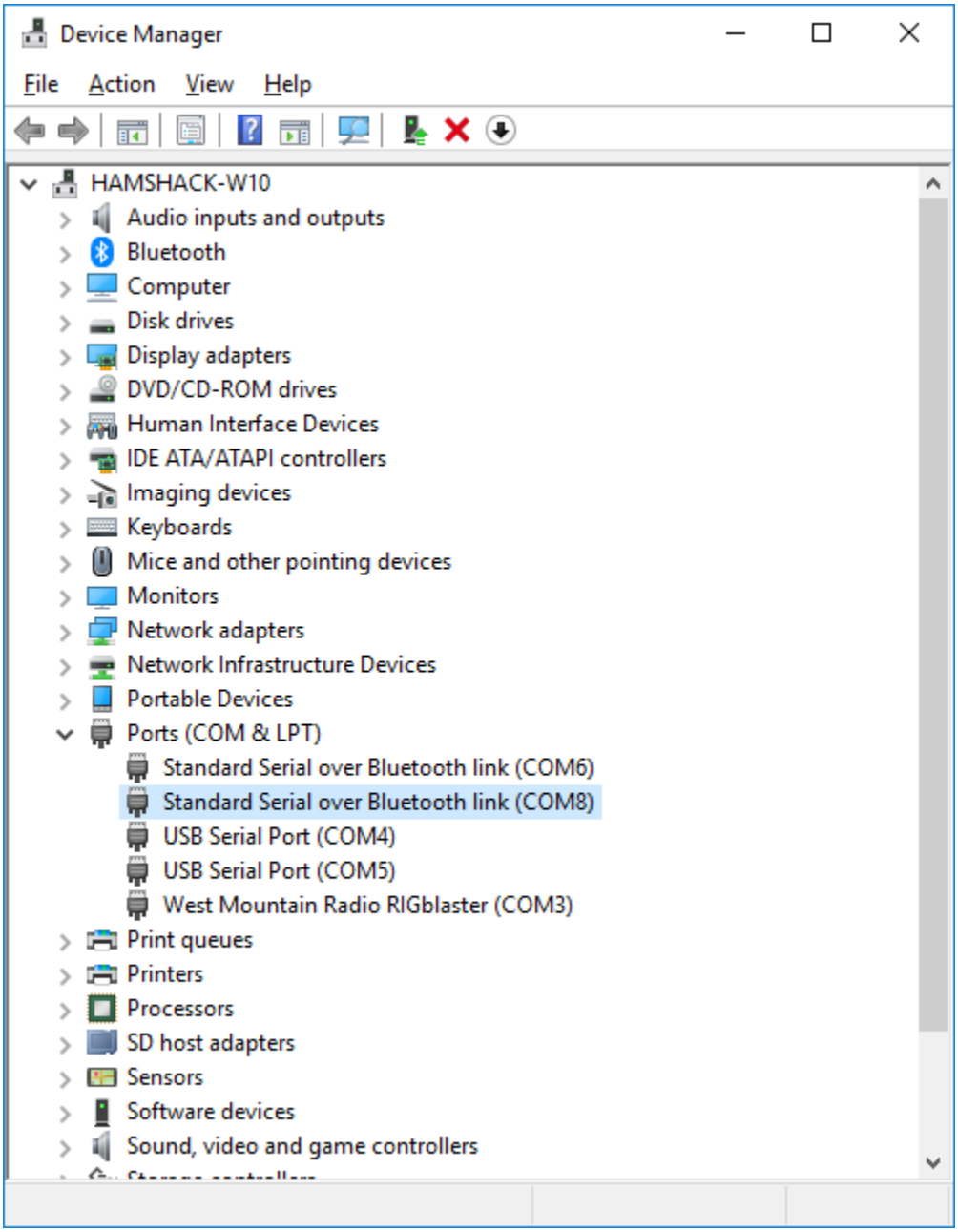


Now you'll see your Bluetooth device listed in the "Devices and Printers" window.



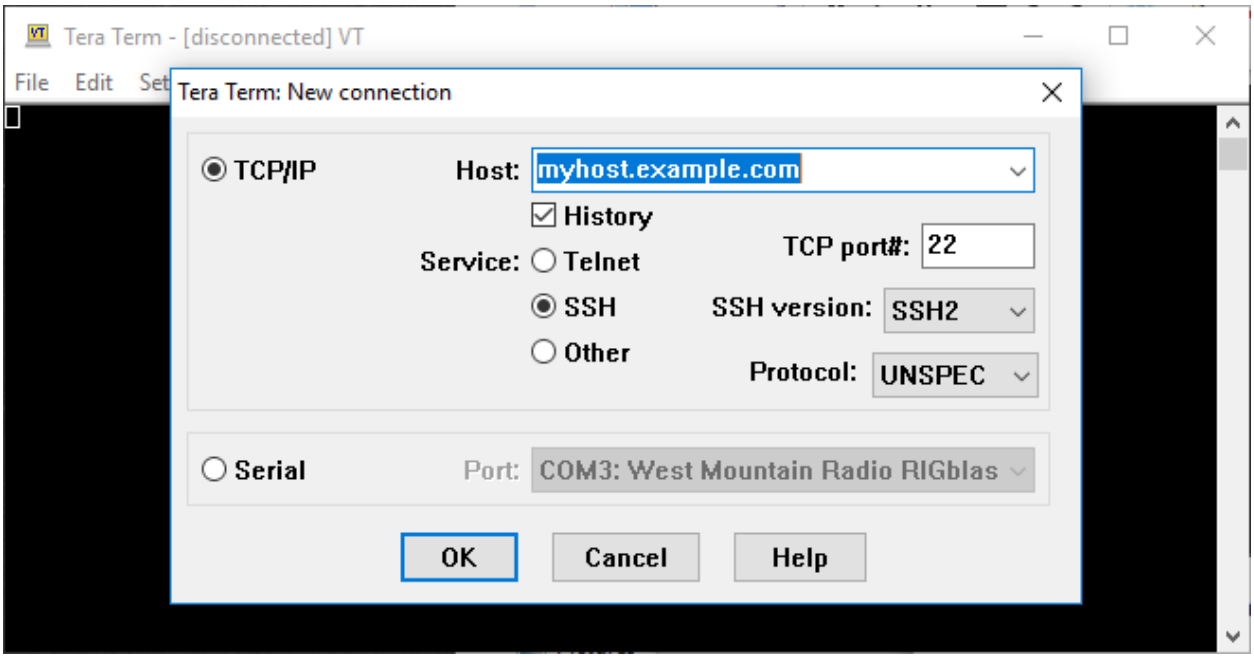
Finding the COM Ports Connected to the Bluetooth Module

If you now open the Device Manager (in either Windows 7 or 10), you should see two new COM ports appear in the “Ports (COM & LPT)” list. One of these two ports will be used to connect to the Bluetooth module to configure it. Only one of the ports will work for this purpose, and you may have to use trial and error to figure out which one.

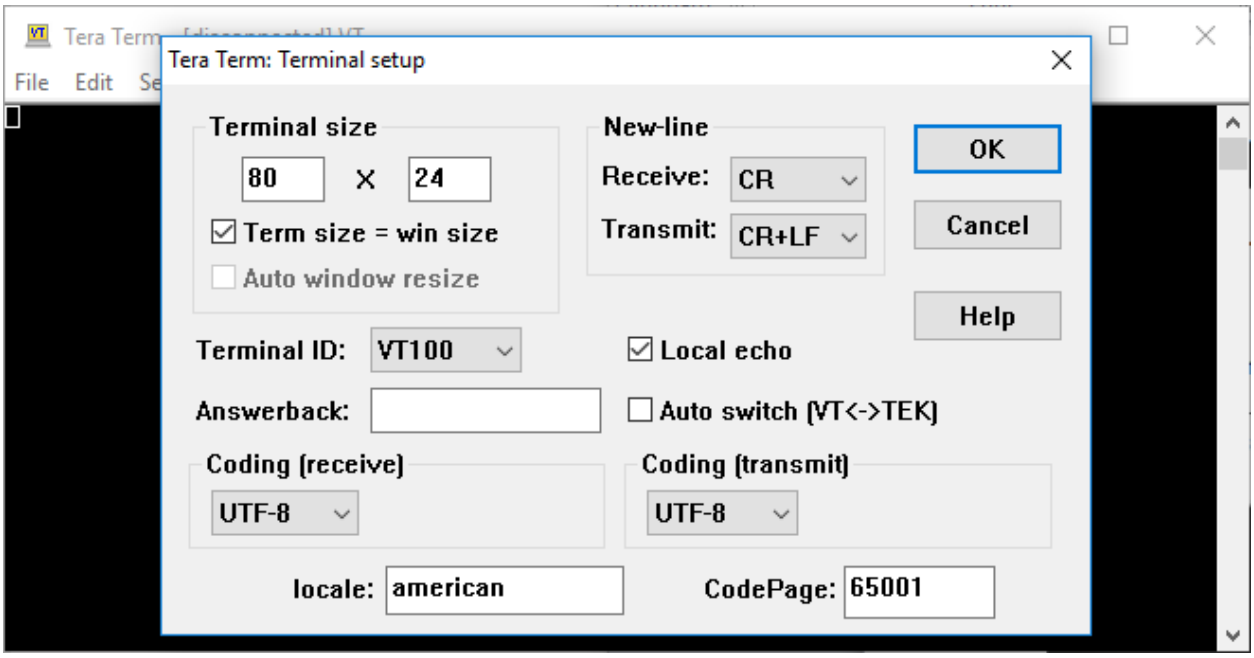


Connecting to and Configuring the Bluetooth Device

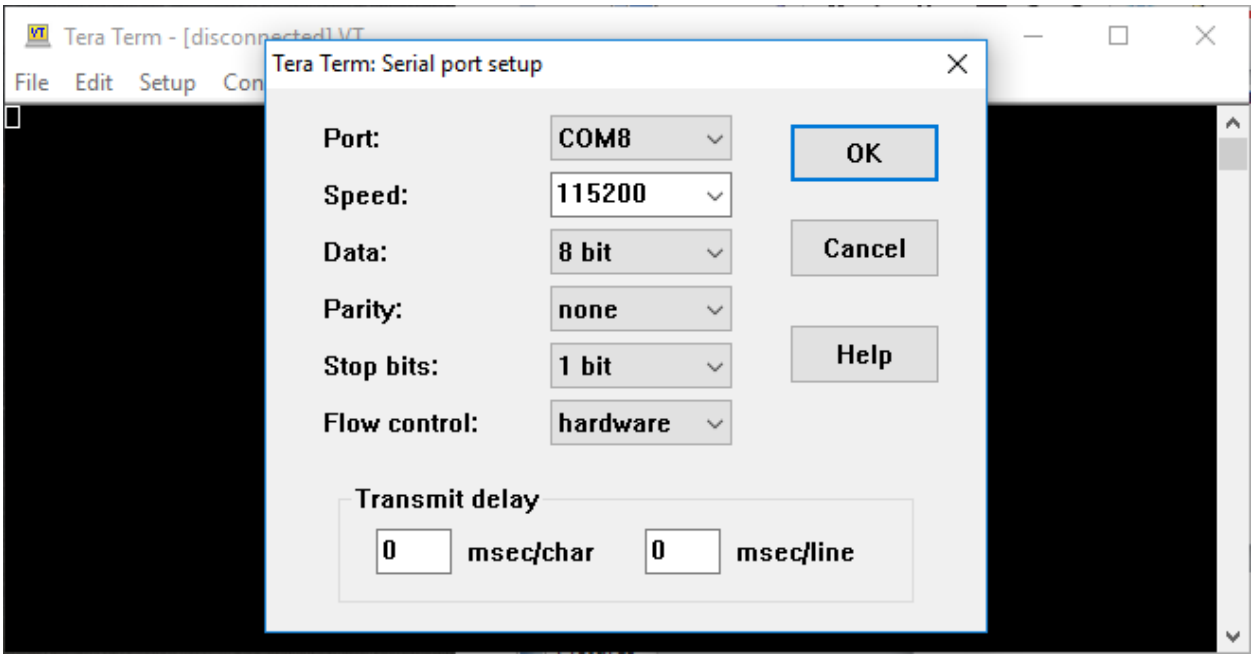
Open the Tera Term program (other terminal software like PuTTY or HyperTerminal can be used instead, if you prefer—it's up to you to translate these instructions for those programs). Tera Term automatically displays the "New connection" window when it launches. Click the "Cancel" button—we're going to make some configuration changes to Tera Term before we connect to the Bluetooth module.



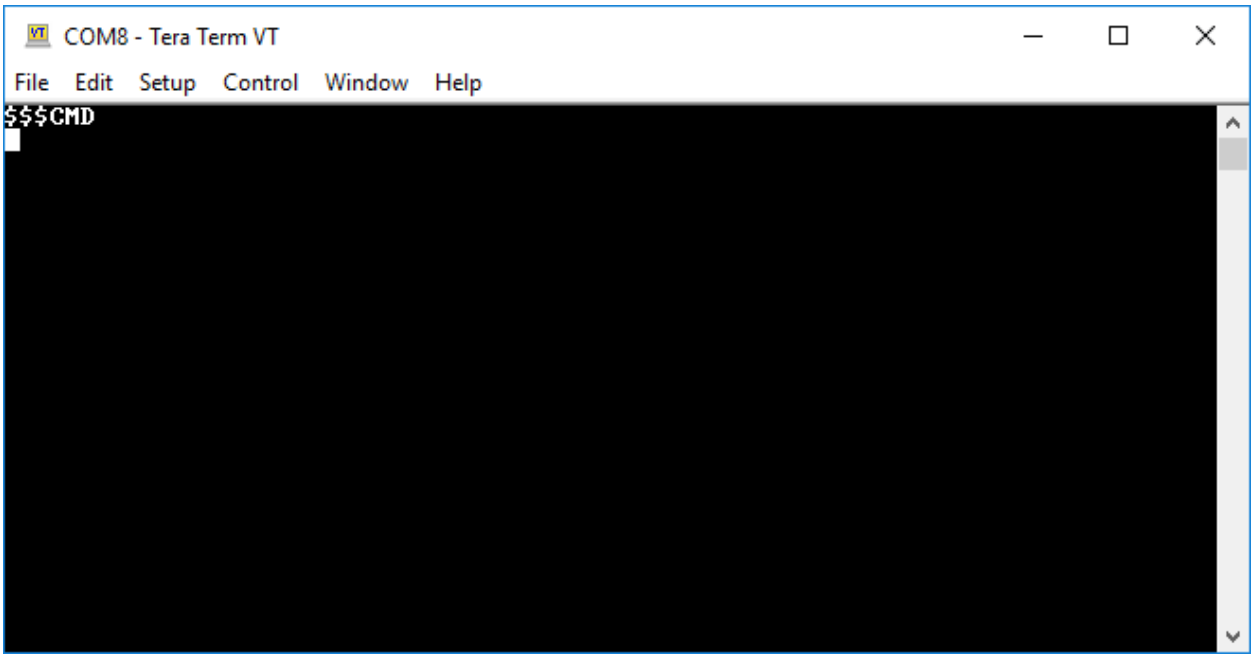
In the main menu, click “Setup” and then select “Terminal…” from the list to launch the “Terminal setup” windows. In the “New-line” box, set “Transmit” to “CR+LF”, and then check the “Local echo” box. Then click “OK”.



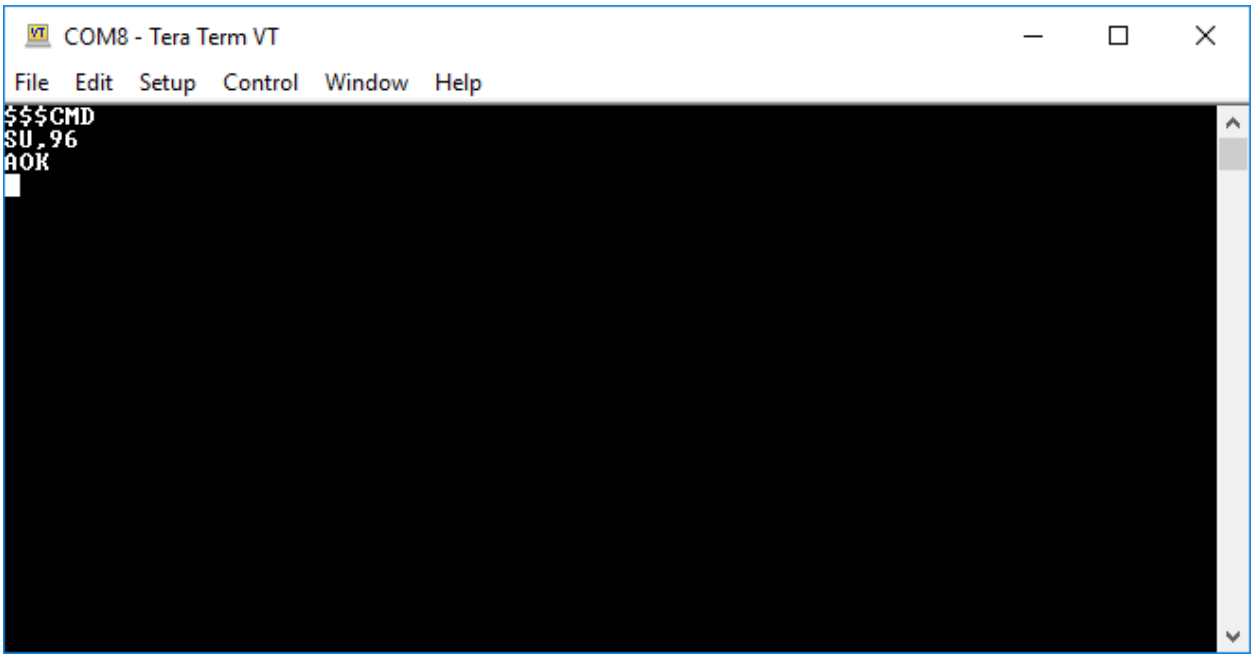
Next, in the main menu, click “Setup” and select “Serial Port…” from the list. Set “Port” to be one of the two ports you identified using the Device Manager. Set “Speed” to “115200”, “Data” to “8 bit”, “Parity” to “none”, “Stop bits” to “1 bit”, and “Flow control” to “hardware”. Click the “OK” button, and Tera Term will automatically establish a connection to the Bluetooth device. If it is successful, the yellow LED on the board should stop flashing and glow solid. If this does not happen, change the serial port setup to use the other of the two ports identified in Device Manager and try again.



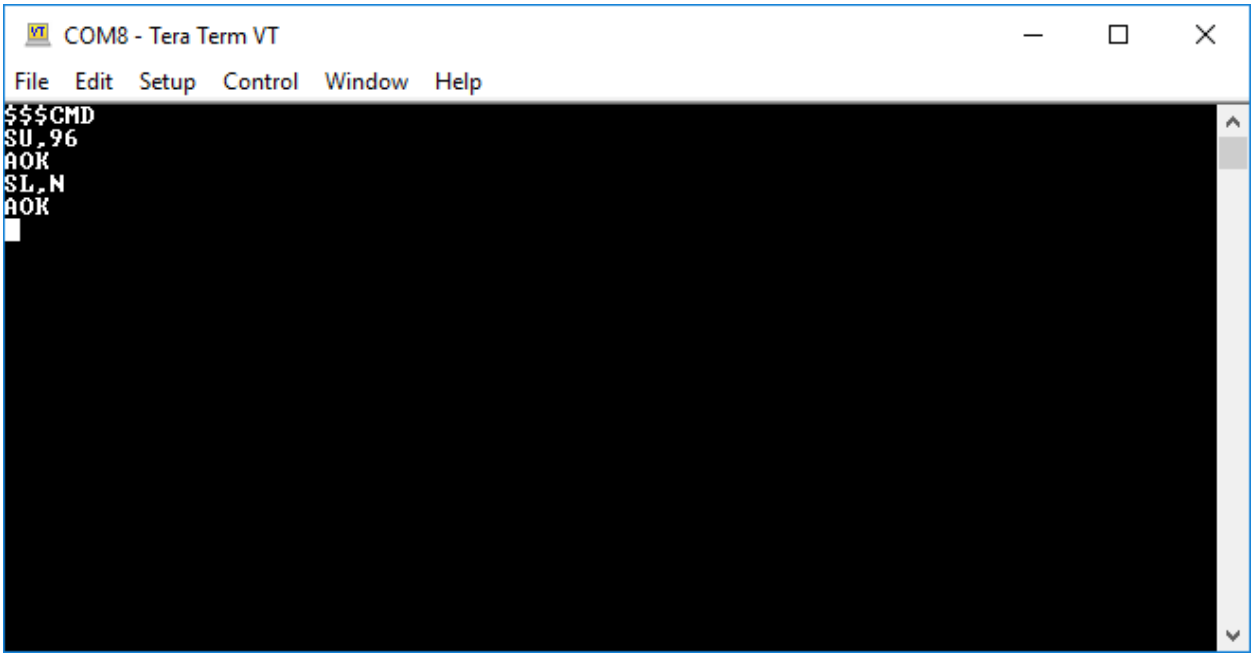
If the connection is successful, type “$$$” to enter command mode (this must be done within 60 seconds of connecting—otherwise you’ll have to disconnect and reconnect). If you are successful in entering command mode, the Bluetooth device will respond with “CMD”. The yellow LED will flash rapidly while in command mode.



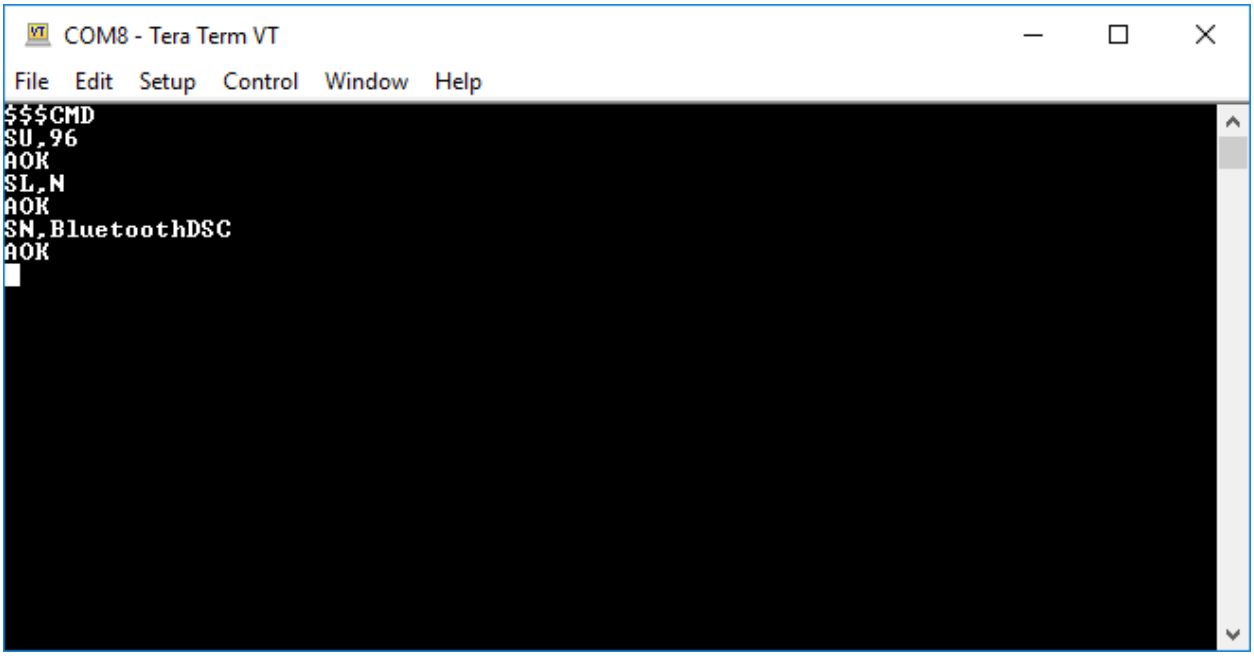
Now we can configure the Bluetooth module to communicate with the PIC chip. To set the baud rate to 9600, type “SU,96” and hit Enter. The Bluetooth module should respond with “AOK”.



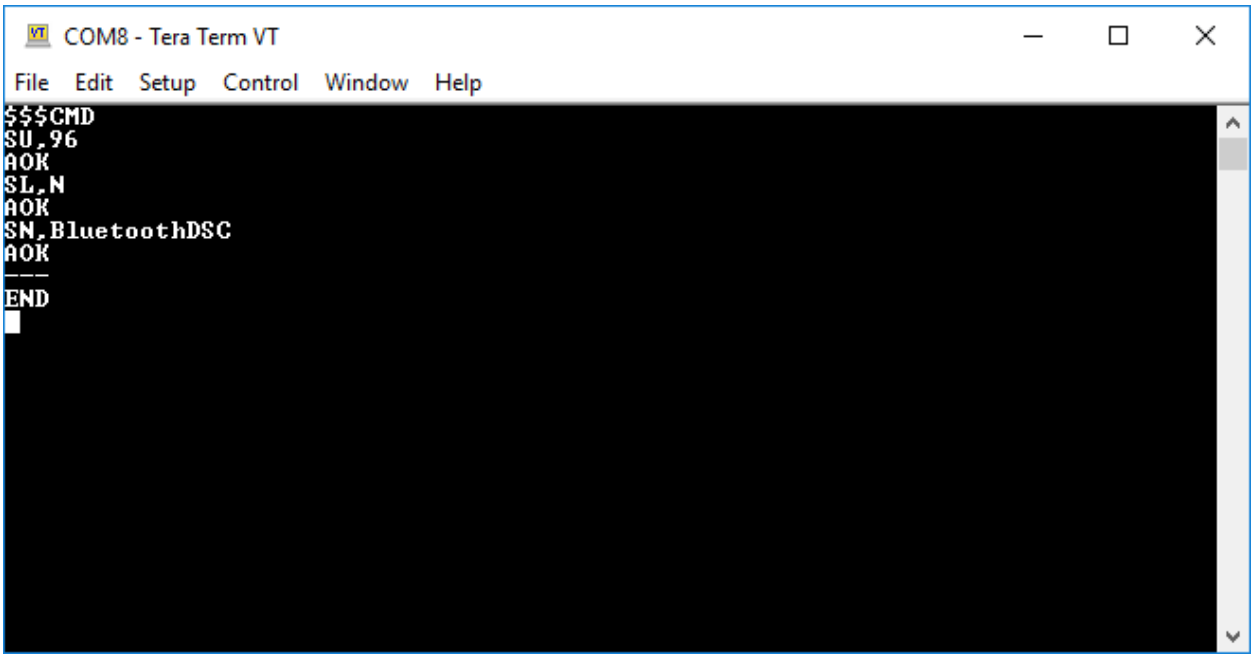
Next, type “SL,N” and hit Enter to set the parity to none. Again, the response should be “AOK”.



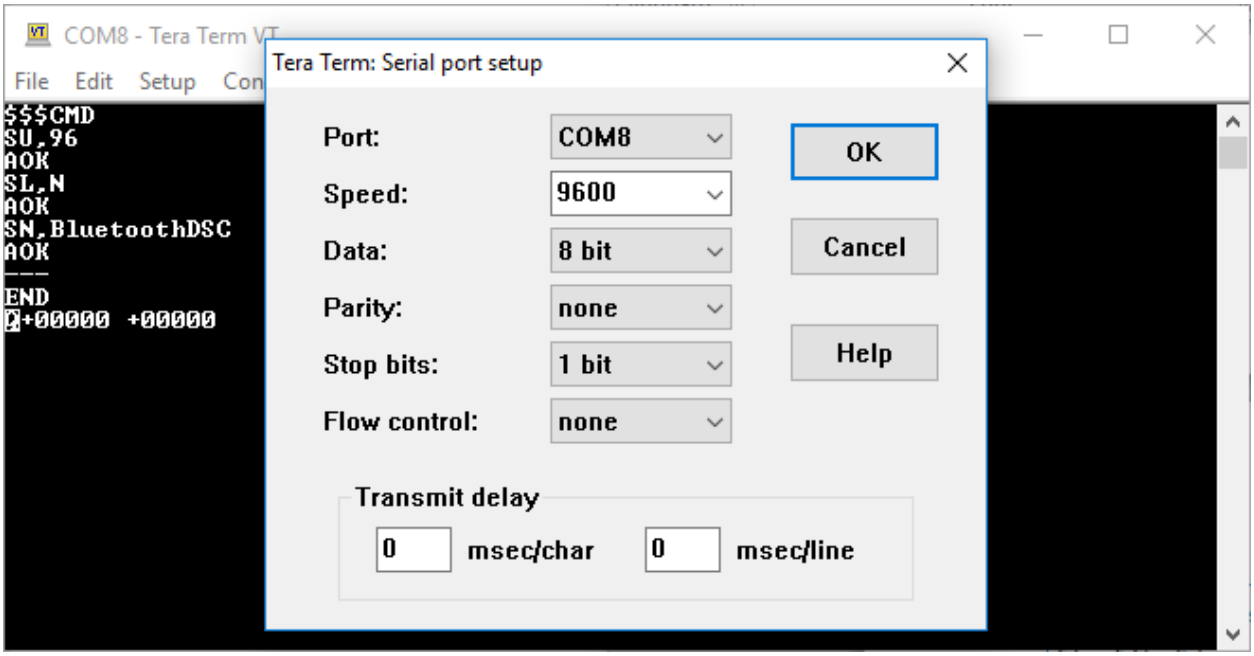
Finally, an optional step is to change the name of the device from “RNBT-91B5” to something more meaningful, such as “BluetoothDSC”. To do so, type “SN,BluetoothDSC” and hit Enter. The response should once again be “AOK”. (Note that if you change the name of the device, you won’t see that change immediately—you may need to remove and re-pair the device in order to see that change.)



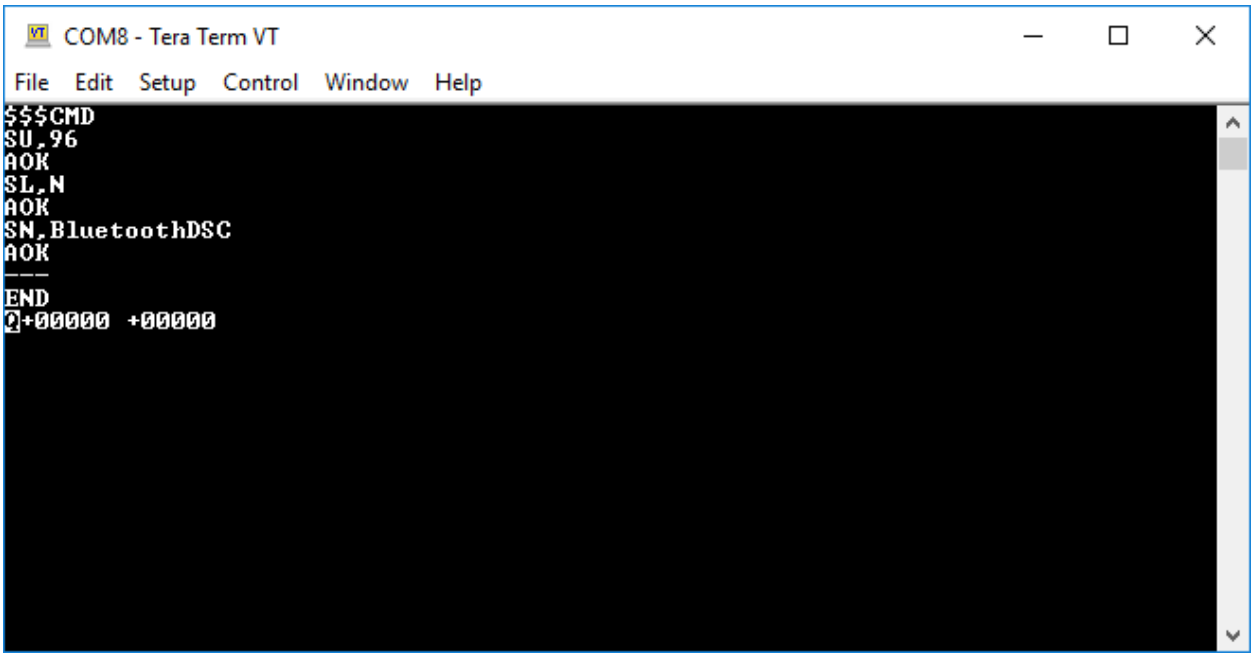
Typing “---” and hitting Enter will take the Bluetooth device out of command mode—you should get “END” as a response. When you exit command mode, the yellow LED will once again glow solidly. You should not have to reperform these configuration steps unless you reset the Bluetooth device to factory settings.



Now, change Tera Term’s port settings to 9600 baud and no flow control.



Next we'll test communication with the PIC. Type "Q". The PIC chip should respond with "+00000 +00000" (or some other numbers in the same format if you have encoders connected). That's your confirmation that the Bluetooth module and the PIC are communicating successfully.



If no response is received from the PIC chip, check the soldering on pins 5 and 13 of the Bluetooth module and on pins 6 and 18 of the PIC chip. Also check the traces between those pins.

Testing the encoder connections

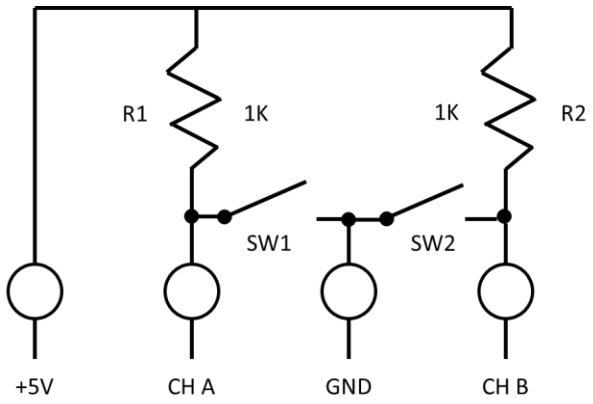
The last thing to test is to make sure the board can read the encoders correctly. Instead of using Tera Term for this part of the testing, you can use the EkBox Tester, which you can read about on this page:

http://eksfiles.net/digital-setting-circles/building-the-circuit/

A direct link to the EkBox Tester download is this:

http://eksfiles.net/wp-content/uploads/2009/07/EkBoxTester_1_0_1_0_exe.zip

The easiest way to test would be to plug actual encoders in and see if the encoder counts change when the encoders are turned. If encoders aren't available, they can be mocked up with the following circuit:



The switches need to be alternately closed and opened in a certain pattern to simulate a rotary encoder. The order is as follows:

Step	Channel A	Channel B
1	Open	Open
2	Open	Closed
3	Closed	Closed
4	Closed	Open
5	Open	Open

Following this sequence should cause the encoder count to either increase or decrease four or five times. Reversing the steps will cause the encoder count to change in the opposite direction. Make sure to test both encoder connections, as there are two.