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.

← Settings	— 0) ×
Date III incidential of	Bluetooth & devices	
Find a setting Q System Bluetooth & devices Network & internet Personalization	Logi M550 Not connected Add device	
	View more devices	
 Accounts Time & language 	Bluetooth Discoverable as "DAVEDELL-W11" On	D
 Gaming Accessibility 	Devices Mouse, keyboard, pen, audio, displays and docks, other devices	>
 Privacy & security Windows Update 	Printers & scanners Preferences, troubleshoot	>
	Phone Link Instantly access your Android device's photos, texts, and more Open Phone Link	>
	Cameras Connected cameras, default image settings	>
	O Mouse Buttons, mouse pointer speed, scrolling	>

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.)

← Settings	_		×
Dave Sk develjeterilet.vet	Bluetooth & devices > Devices		
	Device settings		
Find a setting Q	Show notifications to connect using Swift Pair Connect to supported Bluetooth devices quickly when they're close by and in pairing mode		
System Bluetooth & devices Notwork & internet	Download over metered connections Device software (drivers, info, and apps) for new devices will download when you're on metered internet connections—data charges may apply		
 Personalization Apps 	Bluetooth devices discovery When adding a Bluetooth device, Default lets you connect common accessories— choose Advanced to see all types of devices	~]
Accounts	Related settings		
Gaming	口)) Sound	>	
AccessibilityPrivacy & security	Display	>	
Windows Update	Send or receive files via Bluetooth	Ø	
	More Bluetooth settings	Ø	
	More devices and printer settings	Ø	
 Network & internet Personalization Apps Accounts Time & language Gaming Accessibility Privacy & security Windows Update 	Device software (drivers, info, and apps) for new devices will download when you're on metered internet connections—data charges may apply Off Bluetooth devices discovery Advanced When adding a Bluetooth device, Default lets you connect common accessories— Advanced to see all types of devices Advanced Related settings Image: Common accessories and the set of the set	• • • • • • • • • • • • • • • • • • •	



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.

Add	a device X
A	dd a device ose the kind of device you want to add.
*	Bluetooth Audio devices, mice, keyboards, phones, pens, controllers, and more
Ð	Wireless display or dock Wireless monitors, TVs, or PCs that use Miracast, or wireless docks
+	Everything else Xbox controllers with Xbox Wireless Adapter, DLNA, and other devices
	Cancel

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.

Add a device	
Add a device	
Make sure your device is turned on and discoverable. Sel connect.	ect a device below to
j⊒ RNBT-8B98	
	Cancel

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).

Add	a device		\times
Ac	d a device		
Mak conr	e sure your device is turned on and disco nect.	overable. Select a device below	to
Ē	RNBT-8B98 Connecting		
	Press Connect if the PIN on RNBT-8B98 mate	hes this one.	
	628024		
	Connect	Cancel	
		Cancel	

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.

Add a device	×	
Your device is ready to go!		
D RNBT-8B98 Not connected		
	Done	

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."

← Settings	- 🗆 X
命 Home	Bluetooth & other devices
Find a setting	+ Add Bluetooth or other device
Devices	
Bluetooth & other devices	Bluetooth On
Printers & scanners	Now discoverable as "HAMSHACK-W10"
🖱 Mouse	Mouse, keyboard, & pen
Typing	USB Keyboard
🖉 Pen & Windows Ink	USB Receiver
AutoPlay AutoPlay	
🖞 USB	Audio
	丸 ŵ) Speakers / Headphones (IDT High Definition Audio CODEC)
	式 ッ) ^{USB Audio CODEC}
	J ッ) ^{USB Audio CODEC}

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.

Add a device	×
Add a device	
Make sure your device is turned on and discoverable. Select a device below connect.	/ to
5. RNBT-91B5	
AirTV Player 9171	
Cancel	

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."



					• ×
	All Control Panel Item	s Devices and Printers 	↓ 4 ₂	Search Devices and Printers	Q
Add a device	Add a printer				• 0
Devices (3) —					^
Generic Bluetooth Radio	Logitech® Unifying Receiver	NETBOOK-WIN7			E
Printers and Fa	ixes (3)				
Fax 6 it	Microsoft XPS	Send To			
20					

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.

		100	×
G	Add a device		
	Select a device to add to this compute Windows will continue to look for new devices an	er nd display them here.	
	Linksys02029 UPnP Wireless network router HP273209 (HP Officejet Pro 8610) Web Services Printer; Scanner; Fax	Linksys020295 UPnP Digital media server RNBT-91B5 Bluetooth Other	
	What if Windows doesn't find my device?	Next	ancel

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.

	and the second second		×
0	Add a device		
	Enter the pairing code for the device		
	This will verify that you are connecting to the correct device.		
-	1234		
	The code is either displayed on your device or in the information that came with the device.	-	
		RNBT-91B5	
	What if I can't find the device pairing code?		
		Next Car	ncel

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.

Driver Software Installation	×
Installing device driver software	
Bluetooth Peripheral Device Searching Windows Update Bluetooth Peripheral Device Searching Windows Update	
Obtaining device driver software from Windows Update might take a while. Skip obtaining driver software from Windows Update	
	Close

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."

Driver Software Installation		×
Your device is ready to use		
Standard Serial over Bluetooth link (COM4) Standard Serial over Bluetooth link (COM5)	Ready to use Ready to use	
		Close

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

Add a device	×
This device has been successfully added to this computer Windows is now checking for drivers and will install them if necessary. You may need to wait for this to finish before your device is ready to use. To verify if this device finished installing properly, look for it in Devices and Printers.	RNBT-91B5
	Close



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.

<u>v</u>	Tera T	erm -	[disconnected] VT					_	\times
File	Edit	Set	Tera Term: New conn	ection				×	
				Heat	muhaet even	anle com			^
			I CENE	Service:	History O Telnet	ТСР ро	rt#: 22		
					🖲 SSH	SSH version:	SSH2	\sim	
					0 Other	Protocol:	UNSPEC	~	
			⊖ Serial	Port:	COM3: West	Mountain Rad	io RIGblas	s ~	
				ОК	Cancel	Help			
									~

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".

Tera Term: Term: Terminal setup	× • ×	
Terminal size 80 × 24 ✓ Term size = win size	New-line Receive: CR ~ OK Transmit: CR+LF ~ Cancel	
Auto window resize Terminal ID: VT100 ~ Answerback:	Help Local echo Auto switch (VT<->TEK)	
Coding (receive) UTF-8 v	Coding (transmit) UTF-8 ~	
locale: american	CodePage: 65001	~

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.

M	Tera T	erm - [di	sconn	ected] \/T						-	×
File	Edit	Setup	Con	Tera Term: Serial port setu	ip				×		
				Port:	COM8	~		ОК	1		^
				Speed:	115200	~]		·		
				Data:	8 bit	~		Cancel			
				Parity:	none	~			_		
				Stop bits:	1 bit	~		Help			
				Flow control:	hardware	\sim]				
				Transmit delay	y ¢char 0		mse	c/line			

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".

M	COM8	- Tera T	erm VT			_	×
File	Edit	Setup	Control	Window	Help		
\$\$\$ SU.	CMD 96						^
AOK SL	N						
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.

💻 COM8 - Tera Term V	T			~	- 🗆	\times
File Edit Setup Con	Tera Term: Serial port setup)		^ _		
\$\$\$CMD \$U,96 40k	Port:	COM8	ОК			
SL,N AOK	Speed:	9600 、	· · · · · · · · · · · · · · · · · · ·			
SN,BluetoothDSC AOK	Data:	8 bit	Cancel			
 END Q +00000 +00000	Parity:	none	/			
	Stop bits:	1 bit 🕓	, Help			
	Flow control:	none	/			
	Transmit delay 0 msec/	char O	msec/line			

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.