

# **BT800 Series HID Proxy**

**Application Note** 

version 1.1

Laird's BT800 series USB HCI devices support HID proxy mode. With HID proxy function enabled, BT800/BT810/BT820 can connect to a BLE keyboard and mouse without the BT driver being loaded. One typical user scenario is at the computer's BIOS screen. This application note illustrates how to enable this HID proxy function by modifying a few keys in the Bluetooth Persistent Store. The function is not enabled in production.

### **R**EQUIREMENTS

- BT800 development board or BT820 USB dongle
- Windows PC

**Note:** Windows 8 is used in this guide. Windows 7 and XP can be used for the first time modification.

- CSR BlueSuite
- CSR USB driver or CSR USB-SPI adaptor for BT800 development kit.
- **Notes:** 1. CSR BlueSuite is made available only to OEMs under a Laird NDA. OEMs should contact <u>LT-wirelessinfo@lairdtech.com</u> to obtain the NDA. After BlueSuite is installed, PStools can be found under the CSR folder.
  - 2. CSR USB driver is provided along with the CSR BlueSuite. The CSR USB-SPI adaptor is available at: <a href="http://parts.digikey.com/1/parts/1406287-converter-usbspi-dev-sys-1808-1a.html">http://parts.digikey.com/1/parts/1406287-converter-usbspi-dev-sys-1808-1a.html</a>
  - 3. Due to the proprietary nature of the third party software (CSR BlueSuite) used for HID proxy mode, we only support HID proxy mode for OEMs and **NOT** for individual customers.

# **ENABLING THE HIG PROXY FUNCTION**

### Changing the VID and PID

**Note:** This step (changing the VID and PID) is only required for the BT820 USB dongle. Please refer to the *"Modifying VID and PID for the BT820"* application note for information on this step.

## Installing CSR USB Driver

When the BT800 development board is first plugged in the PC USB port, Windows installs the driver automatically. It is recognized as the "Generic Bluetooth Radio" in the Windows device manager.



Figure 1: Generic Bluetooth Radio in Device Manager

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Complete the following steps to install the CSR USB driver:

1. Right-click on Generic Bluetooth Radio, then click Update Driver Software.



Figure 2: Contexual Rollout

2. Select the *Driver* tab and click **Update Driver**.



Figure 3: Update Driver button in Properties panel

- 3. Click Browse my computer for driver software.
- 4. Click Let me pick from a list of device drivers on my computer.
- 5. Click Have Disk.



Figure 4: Have Disk button

6. Navigate to where the CSR driver is located on your computer, and select *CSRBlueCoreUSB.inf.* Proceed through the windows until software installation is complete.

4	Locate File		×
Look in: 🌗	win32 🗸	G 🤌 📂 🖽 -	
Name	*	Date modified	Ту
CSRBlue	CoreUSB	2/3/2011 11:11 AM	Se
usbspi (الم		1/21/2011 1:02 PM	Se
<			>
File <u>n</u> ame:	CSRBlueCoreUSB	✓ <u>O</u> pen	
Files of type:	Setup Information (*.inf)	<ul> <li>✓ Cancel</li> </ul>	
			×
🔶 🗕 Update [	Driver Software - CSR BlueCore Bluetooth		
Select the c Select disk Show comp Model CSR BlueC	levice driver you want to install for this ha at the manufacturer and model of your hardware device that contains the driver you want to install, click Have hatible hardware iore Bluetooth at is digitally signed.	rdware. e and then click Next. If you hav Disk. Have Disk.	ve a
<u>Tell me w</u>	rhy driver signing is important		_
		<u>N</u> ext Ca	ncel
📀 👖 Update [	Driver Software - CSR BlueCore Bluetooth		×
Windows h	as successfully updated your driver softw	are	
Windows has f	inished installing the driver software for this device:		
I CSR	BlueCore Bluetooth		
		C	lose

Figure 5: CSR USB Driver installation

The BT800 development board is now recognized as *CSR BlueCore Bluetooth* in Windows device manager. It can be found by expanding "Universal Serial Bus controllers".

the sound, video and game controllers					
🕀 🚛 System devices					
🗄 🖷 🏺 Universal Serial Bus controllers					
🗝 🖶 Generic USB Hub					
🗝 🖶 Generic USB Hub					
🗝 🖶 Generic USB Hub					
🔤 🖣 Intel(R) 7 Series/C216 Chipset Family USB Enhanced Host Co					
🔤 🖣 Intel(R) 7 Series/C216 Chipset Family USB Enhanced Host Co					
🔤 🚽 Intel(R) USB 3.0 eXtensible Host Controller					
🔤 🚽 Intel(R) USB 3.0 Root Hub					
· · · · · · ·					

Figure 6: CSR BlueCore Bluetooth in Device Manager

You can skip to Open PStools if you are not planning to use the SPI adaptor.

# **CSR USB-SPI Adaptor**

An RJ45 cable comes with the adaptor. Cut the RJ45 cable in half. Plug in the RJ45 jack into the adaptor and connect the open end to the development board.



Figure 7: CSR USB SPI adaptor

Table 1 details RJ45 pins and their corresponding SPI signals.

Signal	RJ45 Connector Pin		
SPI_CS8	1		
SPI_MOSI	5		
SPI_CLK	7		
SPI_MISO	3		
GND	8		

Table 1: RJ45 to SPI wiring



Figure 8: Wire numbering in RJ45 jack

## **Open PStools**

After invoking PStools, you must select either USB transport or SPI transport to access the PSkeys.

On the BT800 DVK board, there is a 10-pin header for SPI and WLAN Coexistence and a SPI/PCM switch. Be sure to put SPI/PCM switch on the SPI position before plugging the development board to your PC if an SPI interface will be used for opening PStools.



Figure 9: BT800 DVK Board, SPVPCM switch set to SPI

In PStools, select either USB or SPI transport as shown in Figure 10 and Figure 11.

Choose Transport		
C SPI BCCMD C BCSP	<u>P</u> ort	\\\csr0
C H <u>4</u>	B <u>a</u> ud	<u> </u>
С н <u>5</u>		🔲 Use <u>C</u> ache
	OK	Cancel

Figure 10: Selecting USB transport

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Choose Transport		
© <u>SPI BCCMD</u> © <u>B</u> CSP © H <u>4</u>	<u>P</u> ort B <u>a</u> ud	USB SPI (268437)
○ н <u>5</u>		🔲 Use <u>C</u> ache
○ <u>U</u> SB	01	K Cancel

Figure 11: Selecting SPI transport

PStools first reads all the PSkeys from the module. This process takes about ten seconds and then the screen in Figure 12 appears with *Bluetooth address* highlighted on the list and the MAC address shown on the right.

**Note:** The Bluetooth address of your module will be different than the one displayed in Figure 12 because this is a unique address. Do not attempt to change it or you might put the module in nonoperational condition.

😵 BlueCore Persistent Store		↔ <u> </u>
Ele Entry Stores Bootmode View Factory Help		
Filter:	Bluetooth Address:	
AFH RSSI treading period when in low power mode AFH RSSI treading period when in low power mode AGC hysteresis levels Allow LM to use enc. mode=2 Allow LM to use enc. mode=2 ANA.cmX, FTRIM offset when using 12 dB Fatten ANA.cmX, FTRIM offset when using 12 dB Fatten ANA.cmX, FTRIM offset when using 5 dB IF atten ANA.cmX, FTRIM register initial value ANA.cmX, FTRIM register initial value ANA.cmX, FTRIM register initial value ANA.cmX, FTLM register initial value ANA.cmX, FTLM register initial value ANA.cmX, LU. tegister initial value Analogue multiplexer setting B AFR cache timeout Audio input gain when using built-in codec Audio output gain when using built-in codec BCSP link establishment book BCSP link establishment book BCSP link establishment sync retiries BCSP link establishment ton BCSP link establi	NAP         UAP           0080         38         0926ab	
The local device's Bluetooth address. This should be unique to this device. It is allocated during manufacturing. The type bdadt can be viewed as a uint16[4] array: 1st uint16: The top 8 bits of the LAP are in the bottom 8 bits of this word. The top 8 bits of this word must be zero.		
2nd uint16: The bower 15 bits of the LAP 3rd uint16: The bits UAP is in the bottom 8 bits of this word. The top 8 bits of this word must be zero.	1 (0×0001) PSKEY_BDADDR 	-1
Eresentation	Head Heconnect Heset & Ulose Ulose	

Figure 12: PStools opened successfully

## Modifying the pskeys for HID Proxy Mode

There are several pskeys to be modified. To simplify the process, customers can merge the *HClandHIDKeys.psr.* To do this, follow these steps:

1. In the menu bar, select **File > Merge**.



Figure 13: Merge psr file

2. Select the *HClandHIDKeys.psr* file and click **Open**.

🗑 Open Persiste	nt Store File				X
Look <u>i</u> n:	\mu HIDfile		•	← 🗈 💣 📰▼	
G.	Name	*		Date modified	Туре
Recent Places	E HCIandHID	Keys.psr		1/22/2014 4:53 PM	PSR File
Desktop					
Libraries					
Computer					
Network					
	•	1	11		•
	File <u>n</u> ame:	HClandHIDKeys	s.psr	•	<u>O</u> pen
	Files of type:	Persistent Store	Files	•	Cancel

Figure 14: Select HClandHIDKeys.psr file

### **Enabling HID Mode**

The HCI and HID mode keys have been written to the module, but HID mode has not yet been selected. You can merge the *EnableHID.psr* file to select HID. However, it is very important to understand that the module must be in HCI mode before Pskeys can be accessed again with pstools if further changes are to be made.

📦 BI	lueCore Persistent Sto	ore	
File	Entry Stores Bo	otmode View Factory	Help
	Merge		
	Run Query		
	Dump	or BCSP and H5 backet error rate	=
	Exit	n for EDR ime	
AF AF AF	H RSSI reading period H RSSI reading period v H RSSI threshold	when in low power mode	

Figure 15: Merge psr file

After the *EnableHID.psr* file is merged, close the pstools and reinsert the BT800 development board or BT820 dongle into to the PC. Beware that omitting "*HClandHIDKeys.psr" will cause the BT8XX non-operational.* The device is now recognized USB Composite Device.

👩 Open Persiste	nt Store File				x
Look in:	🔋 HIDfile		•	← 🗈 💣 📰 ▼	
(Ba	Name	*		Date modified	Туре
Becent Places	📧 EnableHID.p	osr		1/22/2014 4:56 PM	PSR File
Hecchi Hacca	🖻 HCIandHID	Keys.psr		1/22/2014 4:53 PM	PSR File
Desktop					
Libraries					
Computer					
Network					
	•				4
	File <u>n</u> ame:	EnableHID.psr		•	<u>O</u> pen
	Files of type:	Persistent Store Files		•	Cancel

Figure 16: Select EnableHID.psr file

### Installing the Switcher Service

There is a service called VFPRadioSupportService provided by CSR. By enabling this service, Windows 8 is able to "switch" the HID device into HCI mode temporarily. Follow these steps to install the service:

- 1. Copy these two files (VFPRadioSupportService.exe and VFPRadioSupportService\_PS.dll) into the C:\Windows\System32 directory. Note that administrative privileges are probably required.
- 2. Open a command prompt with Admin rights and navigate to the C:\Windows\System32 directory.

C41.	Administrator: Command Prompt	- 🗆 🗙
Microsoft Windows [Versi (c) 2013 Microsoft Corpo	on 6.3.9600] ration. All rights reserved.	^
C:\Windows\system32>		

Figure 17: Open Command Prompt with Administrative right

3. Enter *sc create VFPRadioSupportService binPath="C:\Windows\System32\VFPRadioSupportService.exe* to create the service.



Figure 18: Create system service

- 4. Plug in the HIDenabled BT8xx device.
- 5. Open Device Manager, right click USB Composite Device, and select Update Driver.



Figure 19: Update Driver Software with "CsrRadios\_HID.inf"

- 6. Navigate to where *CsrRadios\_HID.inf* is located and select it.
- 7. Click Open.

4	Locate File				×
Look in: 🔒	HID v	•	3 🦻	► 🔝 🌂	
Name	*	0	)ate m	odified	Ту
CsrRadio	s_HID	1	1/26/2	2012 10:56	Se
<					>
File <u>n</u> ame:	CsrRadios_HID		~	<u>O</u> pen	
Files of type:	Setup Information (*.inf)		V	Cancel	

Figure 20: Select CsrRadios\_HID.inf file

The BT8XX device is now recognized as Generic Bluetooth Radio.

- All
File Action View Help
<ul> <li>Win8Test</li> <li>Audio inputs and outputs</li> <li>Batteries</li> <li>Bluetooth</li> <li>Generic Bluetooth Radio</li> <li>Microsoft Bluetooth Enumerator</li> </ul>

Figure 21: Select "CsrRadios\_HID.inf" file

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- <b>CA</b>	Administrator: Command Prompt – 🗖	×
Microsoft Windows [Version (c) 2013 Microsoft Corporat	6.3.9600] ion. All rights reserved.	^
C:\Windows\system32>sc crea 2\UFPRadioSupportService.ex [SC] CreateService SUCCESS	te vfpradiosupportservice binPath="C:\Windows\Systeme e"	n3
C:\Windows\system32>sc quer	y vfpradiosupportservice	
SERVICE_NAME: vfpradiosuppo TYPE STATE WIN32_EXIT_CODE SERVICE_EXIT_CODE CHECKPOINT WAIT_HINT C:\Windows\system32>	rtservice : 10 WIN32_OWN_PROCESS : 4 RUNNING (STOPPABLE, NOT_PAUSABLE, ACCEPTS_PRESHUTDOWN) : 0 (0x0) : 0 (0x0) : 0x0 : 0x0 : 0x0	~

Figure 22: Vfpradiosupportservice service is now running.

8. By updating the driver with the CSR USB driver again as shown in previous section. It is possible to access the pskeys again.

Choose Transport		
O <u>S</u> PI BCCMD O <u>B</u> CSP O H4	<u>P</u> ort B <u>a</u> ud	\\.\csr0
⊂ н <u>5</u> ⊙ <u>U</u> SB	OK	Use <u>C</u> ache

Figure 23: Select USB transport

## **Enabling the HCI Mode**

You can merge *EnableHCI.psr* to select HCI mode. The BT8Xxx is recognized as Generic Bluetooth Radio even after the switcher service has been stopped.

🔯 Open Persiste	nt Store File			×
Look <u>i</u> n:	🔒 HIDfile	•	← 🗈 💣 📰 ▼	
C.	Name	*	Date modified	Туре
Provent Planes	EnableHCI.p	IST	1/22/2014 4:58 PM	PSR File
Recent Flaces	📧 EnableHID.p	IST	1/22/2014 4:56 PM	PSR File
	🖻 HCIandHID	Keys.psr	1/22/2014 4:53 PM	PSR File
Desktop				
Libraries				
Computer				
Network				
	•	III		•
	File <u>n</u> ame:	EnableHC1.psr	•	<u>O</u> pen
	Files of type:	Persistent Store Files	•	Cancel

Figure 24: Merge EnableHCI.psr

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<b>CN.</b>	Administrator: Command Prompt – 🗖	×
PID FLAGS	: 2372 :	^
C:\Windows\system32>sc_sto	p vfpradiosupportservice	
SERUICE_NAME: ofpradiosupp TYPE STATE WIN32_EXIT_CODE SERUICE_EXIT_CODE CHECKPOINI WAIT_HINI	ortservice : 10 WIN32_OWN_PROCESS : 3 STOP_PENDING (STOPPABLE, NOT_PAUSABLE, ACCEPTS_PRESHUTDOWN) : 0 (0×0) : 0 (0×0) : 0×0 : 0×0	
C:\Windows\system32>sc que SERVICE_NAME: vfpradiosupp TYPE STATE WIN32_EXIT_CODE SERVICE_EXIT_CODE CHECKPOINT WAIT_HINT	ry vfpradiosupportservice ortservice : 10 WIN32_OWN_PROCESS : 1 STOPPED : 0 (0x0) : 0 (0x0) : 0x0	
C:\Windows\system32>_		$\mathbf{v}$

*Figure 25: Vfpradiosupportservice service is stopped* 

File Action View Help
<ul> <li>Win8Test</li> <li>Audio inputs and outputs</li> <li>Batteries</li> <li>Bluetooth</li> <li>Generic Bluetooth Radio</li> <li>Microsoft Bluetooth LE Enumerator</li> </ul>

Figure 26: BT8XX is recognized as Generic Bluetooth Radio