Qualcomm Technologies International, Ltd.

QCC711 HCI Mode

User Guide

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Qualcomm Technologies International, Ltd. is a company registered in England and Wales
with a registered office at: Churchill House, Cambridge Business Park, Cowley Road,
Cambridge, CB4 0WZ, United Kingdom.
Registered Number: 3665875 | VAT number: GB787433096.

Revision history

Revision	Date	Description
AA	May 2024	Initial release.
AB	June 2024	Updates to Sections 1 and 5.
AC	September 2024	Minor editorial updates.
AD	March 2025	Editorial updates.
AE	March 2025	Updated document access level.

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1 Introduction

The QCC711.OR.2.1 SDK supports HCI mode. It releases the HCI mode Bluetooth Subsystem (BTSS) patch, Bluetooth configuration file, and QTI manifest, to allow use of QCC711 as a Bluetooth Low Energy (BLE) controller. This document provides guidance to a user that wants to use QCC711 in HCI mode

2 HCI mode files in the SDK

Table 2-1 lists HCI mode files in the SDK.

Table 2-1 HCI mode files in the SDK

File name	Comments
qcc711_sdk/bin/btss_patch_hci_mode.bin	HCI mode BTSS patch. It contains BTSS changes for HCI mode.
qcc711_sdk/bin/btcfg_hci_mode.bin	HCI mode Bluetooth configuration file. A customer can use this to update their NVM configuration.
common/manifest/qti_manifest-hci_mode-unlicensed.bin	HCI mode QTI manifest. A customer can use this to generate a new update package for the BTSS patch.

3 Supported features and limitations

The QCC711.OR.2.1 SDK has the following features:

- Passes BLE version 5.4 Controller qualification (QDID: D061740).
- Supports Bluetooth version 5.4 PAwR Central Mode and EAD features.
- Supports an H4 HCI UART interface.

4 How to use the NVM programmer to load the HCI mode patch to a clean chip

To use HCI mode for the first time, on either a blank chip or a chip running an APSS image, a user must use `nvm_programmer.py` to load the HCI mode update package, with the command:

```
python .\nvm_programmer.py -b 0x10240000 -U <HCI_mode_update_package.bin>
```

NOTE: Once in HCI mode `nvm_programmer` and `otp_programmer` can no longer be used.

NOTE: To generate the update package for HCI mode, see Section 5.

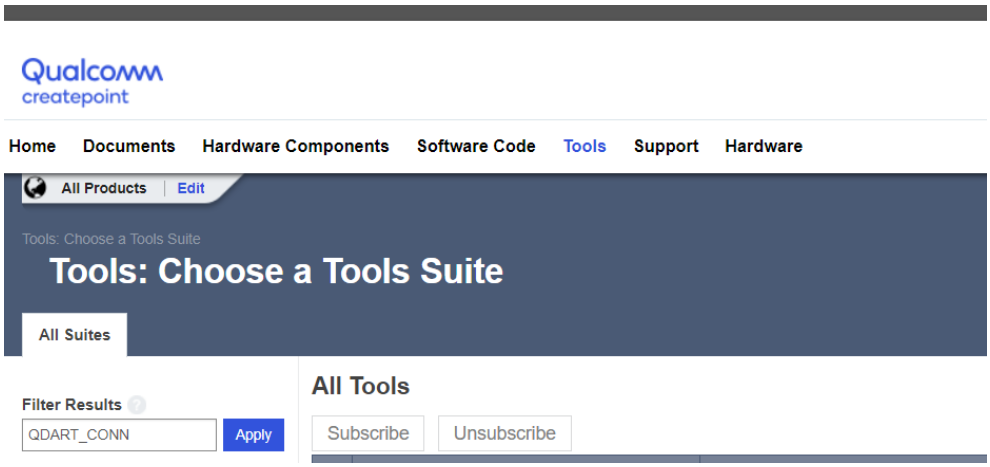
5 How to update the HCI mode patch and NVM config file on a Windows PC

NOTE: Once in HCI mode, the QDART tool is required for further updates on a Windows PC, or to revert to APPs mode.

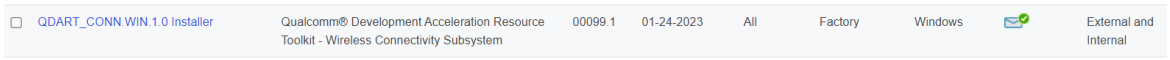
To use QDART to update the HCI mode patch and NVM config file on a Microsoft Windows PC:

Download the QDART tool from https://createpoint.qti.qualcomm.com/tools/#:

a. Search for **QDART_CONN** in the Filter Results as shown in the following screenshot.



b. Choose **QDART_CONN.WIN.1.0 Installer** to download - 99.1 is the latest version to select.



c. During installation, select the R&D type to install.

2. In HCI mode, by default, the chosen GPIOs are GPIO21(CTS), GPIO22(RTS), GPIO23(TxD) and GPIO24(RxD).

```
common/manifest/qti_manifest-hci_mode-unlicensed.bin --output
qcc71x_update_pkg-hci_mode.bin
```

NOTE: In the case that an OEM already has a Qualcomm issued License, the OEM should use their existing `OEM_Private_Key` and `OEM_Public_Key`. Generating an OEM Private-Public Key new pair, will not only result in a change of the OEM MRC Hash value, but also require a new Qualcomm issued license.

NOTE: `<OEM_Signed_Cert.json>` and `<OEM_Manifest-hci_mode.bin>`, and if required `<OEM_private_key>` and `<OEM_public_key>`, should be generated by an OEM; they are not part of the SDK. For generation instructions, see Section 6.1 of *QCC711 v2.1 Software Programming Guide* (80-70850-1).

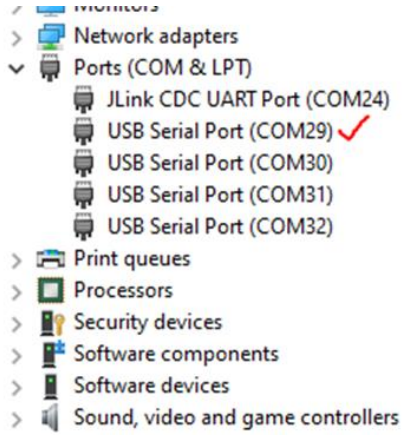
NOTE: To use QDART to load a new HCI mode update package, it is necessary to use `qcc710_tlv_generator.py` to translate the update package to TLV format.

To translate the update package to a TLV file, use:

```
qcc711_sdk/tools/scripts/qcc710_tlv_generator.py qcc71x_update_pkg-
hci_mode.bin --dst qcc71x_update_pkg-hci_mode.tlv
```

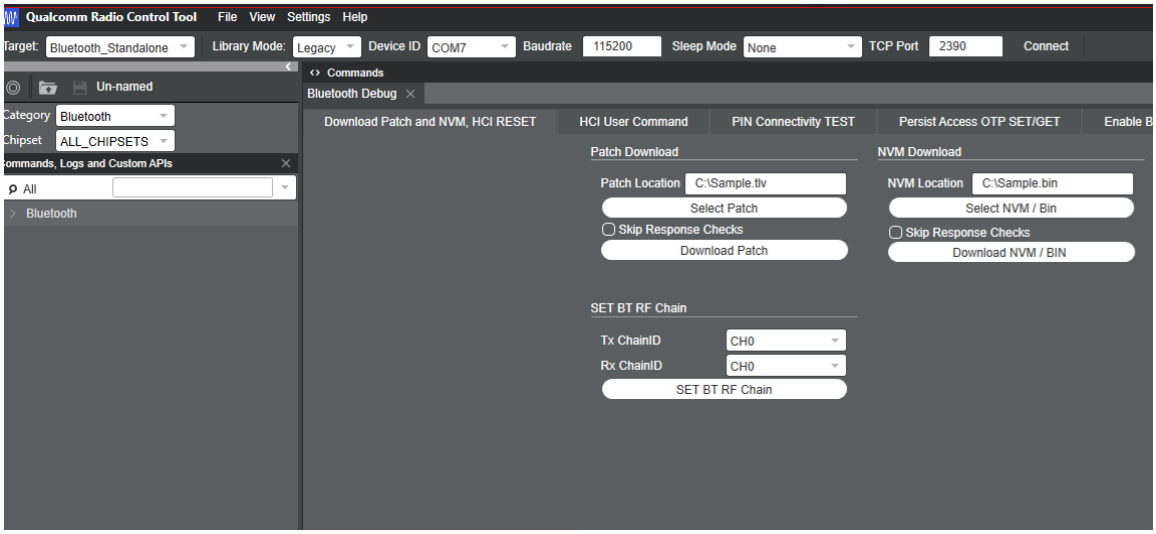
`qcc71x_update_pkg-hci_mode.bin` is the update package to be translated to TLV format. `qcc71x_update_pkg-hci_mode.tlv` is the output, and the TLV format update package.

3. For the standard Qualcomm Development board, open Device Manager, and select the lowest COM number for the USB Serial Port:

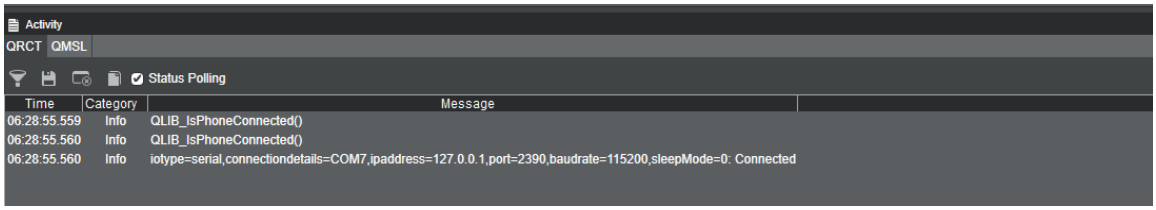


4. Execute the `QRCT` tool, and select the following settings, and then click Connect:

- **Target:** Bluetooth_Standalone
- Library mode: Legacy
- **Device ID:** COM29 <replace this with your own port number>
- Baudrate: 115200
- **Sleep Mode:** None



If the connection is successful this will be shown in the logs window.

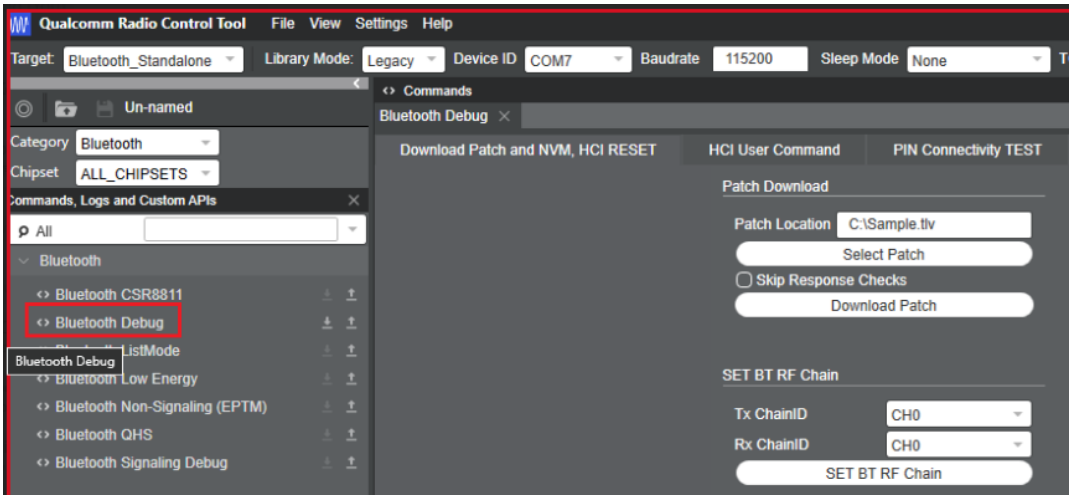


5. To download the TLV file while QCC711 is in HCI mode:

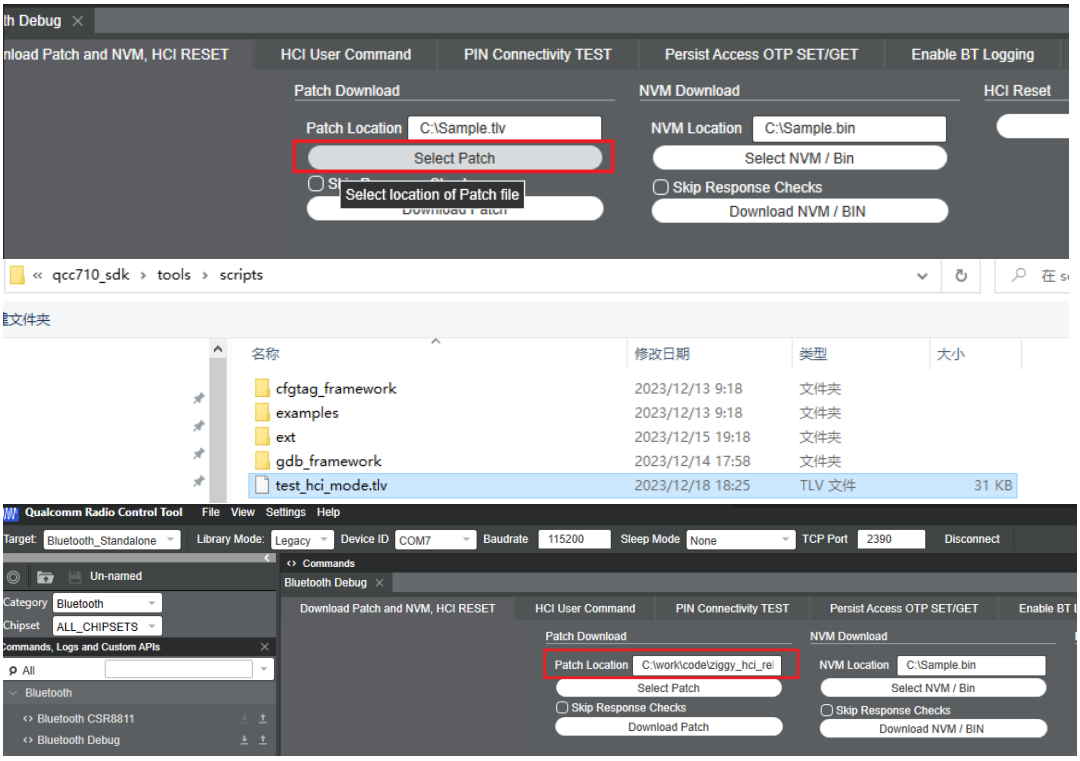
   a. Use the qcc710_tlv_generator.py tool to translate the <HCI_update_package> from .bin format to .tlv format, for example:
   >py qcc710_tlv_generator.py <HCI_update_package>.bin -d <HCI_update_package>.tlv

   b. Use the **QRCT Bluetooth Debug** tab to download the `<HCI_update_package>.tlv` file.

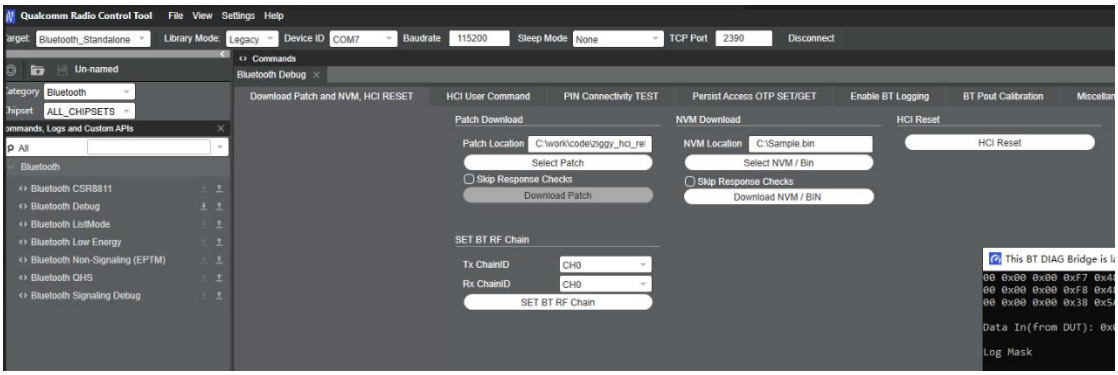
      i Double-click the **Bluetooth Debug** tab:



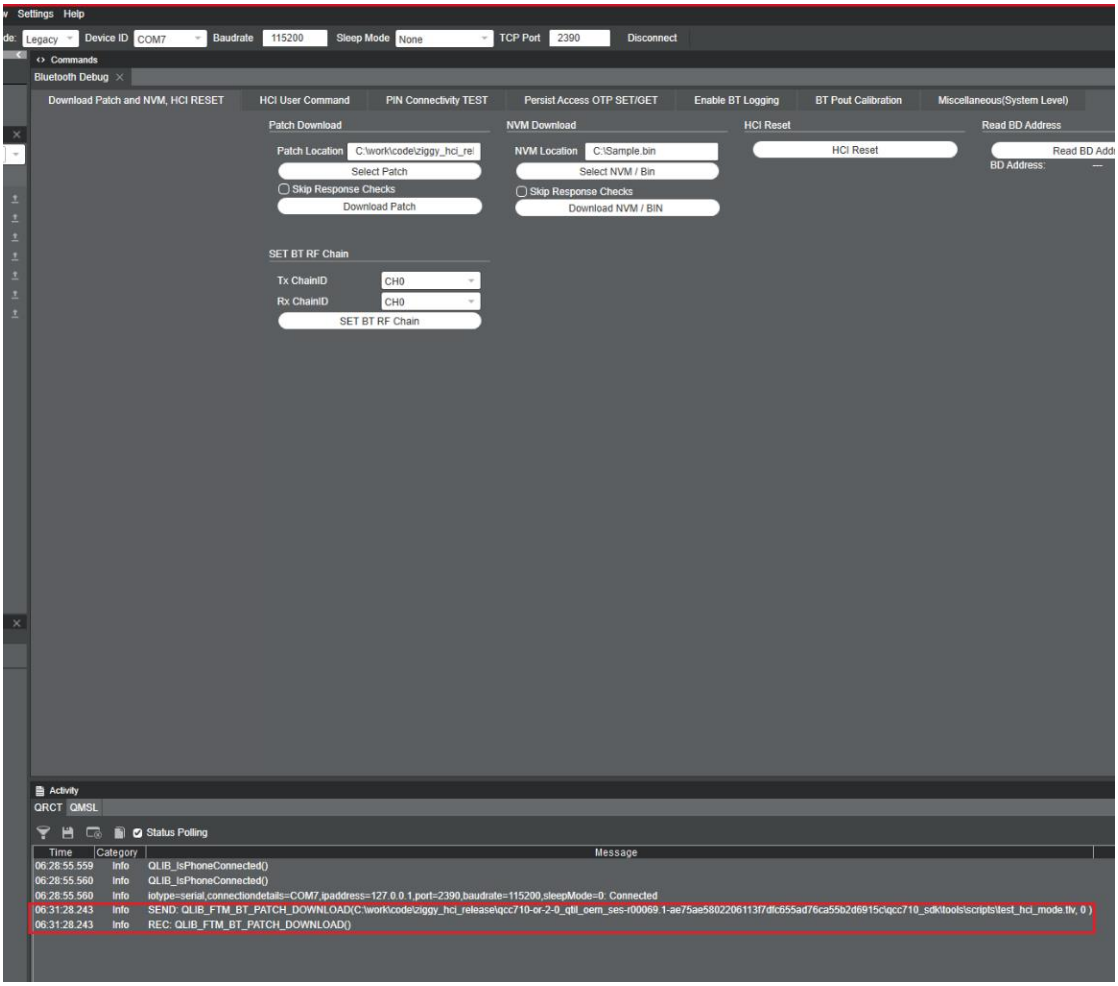
ii Click **Select Patch** to select the corresponding path of the `.tlv` file:



iii Once selected, click **Download Patch:**



iv Once it is downloaded, the logs show `QLIB_FTM_BT_PATCH_DOWNLOAD()`:



v Power cycle the device for the update.

6 Controlling QCC711 in HCI mode using HCI commands

Because QCC711 in HCI mode works as a Bluetooth controller chip, a Bluetooth host can:

- Control it using standard HCI commands
- Use the following vendor commands to download an HCI mode patch and NVM configuration files (Table 6-1 lists the command format):
  - HCI_COMMAND_CODE_VENDOR_SPECIFIC_DEBUG_OGF 0x3F
  - HCI_COMMAND_CODE_VENDOR_SPECIFIC_DEBUG_OCF 0x00

Table 6-1 QCC711 HCI command format

Field	Value
OGF	0x3F
OCF	0x00
Subopcode	0x1E
TLV fragment length	Variable
TLV fragment payload	Variable

NOTE: Due to command length limitations, the Bluetooth host must call the previously mentioned commands multiple times to send the TLV files to QCC711. The Bluetooth host should have a loop function to read fragments of TLV files to send them to QCC711. When file sending is complete, QCC711 validates the received TLV file and (if the file validates) apply it.

NOTE: The updated TLV file is saved in RRAM and is not lost during a power cycle. If a host does not have a new TLV to update, it does not need to re-download a patch.

Document references

Document	Reference
Bluetooth Core Specification	Bluetooth Specification Version 5.4, 7 February 2023
QCC711 v2.1 Software Programming Guide	80-70850-1
QDART-Connectivity	https://createpoint.qti.qualcomm.com/tools/#, 26th June 2023

Terms and definitions

Term	Definition
AP	Access point
BLE	Qualcomm® Bluetooth Low Energy
BTSS	Bluetooth subsystem
COM	Communication port
GPIO	General-purpose input/output
HCI	Host controller interface
ID	Identifier
NVM	Nonvolatile memory
OEM	Original equipment manufacturer
PC	Personal computer
PIO	Programmable input/output
QTI	Qualcomm Technologies Inc. (QTI)
QTIL	Qualcomm Technologies International, Ltd.
SDK	Software development kit
UART	Universal asynchronous receiver transmitter
USB	Universal serial bus

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