PORTLAND TOOL & DIE

BQC-4149

Bluetooth Audio Measurement Interface

User's Guide v1.1

Summary

The Portland Tool & Die BQC-4149 is a complete interface for measuring and characterizing Bluetooth audio devices including handsets, headsets, speakers, car kits and other devices with Bluetooth audio input or output.

Accurately measuring Bluetooth devices is challenging. The Bluetooth protocol is a dynamic and adaptive system that provides devices with many options and parameters that are normally negotiated and set in an invisible manner. Using typical PC Bluetooth interface devices as an audio bridge in test applications is not ideal as the compression codec, sample rate and other parameters cannot be directly controlled, and the engineer is left guessing as to which values are actually used by the Bluetooth link.

The BQC-4149 overcomes this by offering full control over all Bluetooth protocol settings and explicit control over the CODEC choice and display of the sample rate. This enables devices to be specifically tested under the conditions that they need to operate. For example, when testing a device that supports wide-band speech, you can be certain that the mSBC codec is in fact being used.

The instrument is controlled by a Microsoft Windows command line interface program. It provides a Bluetooth 3.0 compliant RF interface and supports A2DP, HFP and HSP. It also provides an interface for device inquiry/discovery, pairing, and control of SCO and A2DP audio streaming states.

To speed up manufacturing and quality control test scenarios, the instrument provides for pairing directly by device address rather than requiring a lengthy inquiry step first. The USB host interface is used for both audio data and instrument control. Audio is always transported in the digital domain maximizing measurement fidelity.

Table of Contents

BQC-4149 Hardware

1. Bluetooth RF interface, SMA female connector
2. Removable right-angle antenna

1. USB type B connector. Provides power, control, audio in/out.

Controlling the BQC-4149

The instrument is configured and controlled through USB interface by using the bqc4149.exe command line interface program. The bqc4149.exe program can be used interactively from a command prompt or can be called from another program or script.

To install the bqc4149.exe program, run BQC-4149-Setup-vX-XX.exe supplied with your instrument to automatically install the device driver required to control your instrument via USB. The setup program automatically installs the bqc4149.exe program and creates a program group in the Start menu. Once installed the program can be called from the command line using the following parameters:

```
Portland Tool & Die, Inc. BQC-4149 Control Utility
Version 1.0
Usage: bqc4149 [<option> <value>] [<option> <value>] ...

Options:
/?    --help                  Prints this information
/#    --instrument            Specific instrument # or serial number
/s    --save                  Save settings into [filename]
/o    --open                  Load settings from [filename]
/i    --identify              Identifies connected instruments
/l    --list                  List current instrument settings
/r    --restore               Restore factory default settings
/sd   --save-defaults         Save current settings as power on defaults
/sc   --screen-capture        [filename] to save screen bitmap into
/ba   --bluetooth-address     Bluetooth address of selected instrument
/c    --call                  Call [<friendly name> or
                              <bt address>];[A2DP|HFP].
                              The friendly name must be surrounded with
                              quotes if the name contains spaces.
                              The bt address must be formatted as
                              xx:xx:xx:xx:xx:xx.
/lc   --list-connections      List open Bluetooth connections
/d    --disconnect            Closes all connections and makes instrument
                              discoverable
/pc   --profile-codec         [HFP;NARROW_BAND|WIDE_BAND]
/q    --query                 Search for Bluetooth devices for [1-48] seconds
/bn   --bluetooth-name        Bluetooth friendly name
/lp   --list-paired           Lists the currently paired devices
/cp   --clear-paired          Clears the paired devices list
/aa   --a2dp-audio            [ON|OFF] Set the a2dp audio state
/ha   --hfp-audio             [ON|OFF] Set the hfp audio state
/br   --bluetooth-reset       Reset Bluetooth radio
/rs   --rear-panel-fs         Rear panel sample rate [44100, 48000] Hz
/to   --bluetooth-timeout     Bluetooth command timeout [0-120] Seconds
/av   --avrcp-volume          Avrcp absolute volume value [0-15]
/hv   --hfp-volume            Hfp volume value [0-15]
/mm   --man-in-the-middle     ManInTheMiddle security required [ON|OFF]
/pp   --pair-pin              Pin to be used for pairing [nnnn].
                              Must be 4 decimal digits.
/lk   --link-key              Get the link key for <bt address>.
/rl   --rssi-level            Get the current RSSI level for the current
                              connection. RSSI values range from
                              20(max) to -127(disconnected).
```

bqc4149.exe examples

Discover devices:

Command: bqc4149.exe –-query 10

Response:

```
Searching for Bluetooth devices.

Found 1 Bluetooth devices.
BT Address        | Friendly Name
----------------- | -------------
E0:D1:E6:0A:16:3C | MINIJAMBOX by Jawbone
```

Connect to device:

Command: bqc4149.exe –-call “E0:D1:E6:0A:16:3C;A2DP”

Response:

```
SUCCESS - Bluetooth connection open
```

List current instrument settings:

Command: bqc4149.exe –list

Response:

```
Listing settings for Instrument # 0 (BQC-4149)
--audio-source USB
--bluetooth-name BQC-4149
--bluetooth-address 20:FA:BB:0A:0C:97
--role SOURCE
--rear-panel-fs 48000
--bluetooth-timeout 0
--avrcp-volume 11
--hfp-volume 0
--man-in-the-middle 0
--pair-pin 0000
--profile-codec A2DP;SBC
--profile-codec HFP;WIDE_BAND

Found 2 open connection(s):
BT Address        | Profile | Codec       | SampleRate
----------------- | ------- | ----------- | ----------
E0:D1:E6:0A:16:3C | AVRCP   | ---         | STOPPED
E0:D1:E6:0A:16:3C | A2DP    | SBC         | 48000

Found 1 paired devices.
BT Address        | Link Key                         | Friendly Name
----------------- | -------------------------------- | -------------
E0:D1:E6:0A:16:3C | 072CE8B8AB0E64B66CF7789BE753F865 | MINIJAMBOX by Jawbone
```

Disconnect from device:

Command: bqc4149.exe –-disconnect

Response:

```
Closing all open connections.
Complete.
```

A Note About Opening & Closing A2DP and HFP Connections

When opening and closing connections several operation will happen in the background if the instrument and the device under test are not paired and have not previously connected.

First, the instrument and the device will assess each other's capabilities via SDP (Service Discovery Protocol).

Second, the instrument will try and pair using SSP (Simple Secure Pairing) *Just Works.*

The above steps will take some time depending on the device under test and therefore the very first time a connection is opened with a device it will take longer than subsequent connections.

When disconnecting a device after testing, it is recommended to deliberately close all open links rather than just powering the device off. If an instrument simply disappears without first closing the Bluetooth links, then the instrument may appear unresponsive for up to 60 seconds.

Finally, many devices remember the properties of the devices they pair with and do not update unless they are paired with again. For this reason, if you change the instrument's A2DP or HFP/HSP configuration you may need to re-pair with the device for the change to be effective.

Connection to 3rd party test equipment

Via USB

Connect the USB interface on the instrument to an Apple Mac or Microsoft Windows PC. The audio portion of the instrument will appear as a line level input device and requires no driver installation.

Note - The instrument appears as two distinct USB devices. An audio device and a virtual com port. The audio device requires no drivers and will function immediately. The virtual com port requires a device driver to be installed but is only required if you wish to control the instrument remotely over USB. For command port installation instructions see the following page.

A note on sample rate and bit depth

The BQC-4149 outputs 24-bit, 48 kHz PCM digital audio regardless of the sample rate of the Bluetooth link. For best results insure that your test system accepts audio at this sample rate and bit depth.

Use with Listen, Inc. SoundCheck

The BQC-4149 integrates directly with Listen, Inc.'s SoundCheck audio measurement system via the USB audio interface.

Configure SoundCheck to use the BQC-4149

First, create a hardware channel

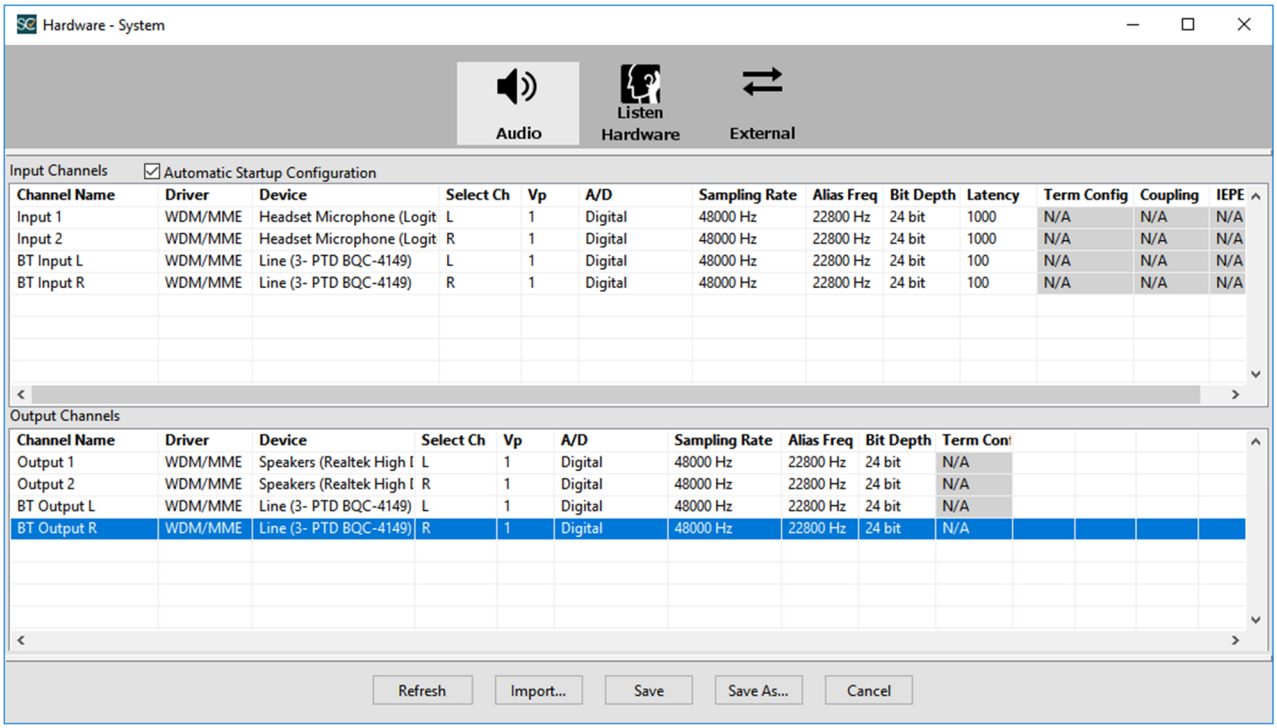
Since the BQC-4149 appears as a normal Windows audio device when connected via USB to use it with SoundCheck you configure it as you would any other WDM audio device. Follow these steps:

1. With your BQC-4149 connected and powered on start SoundCheck.

2. From the main menu open Setup and then Hardware…

3. Add input and output hardware channels.

4. The BQC-4149 uses the WDM driver, operates at 48 kHz sample rate and supports 24-bit audio. Typical input and output channel configurations are shown in the following picture:



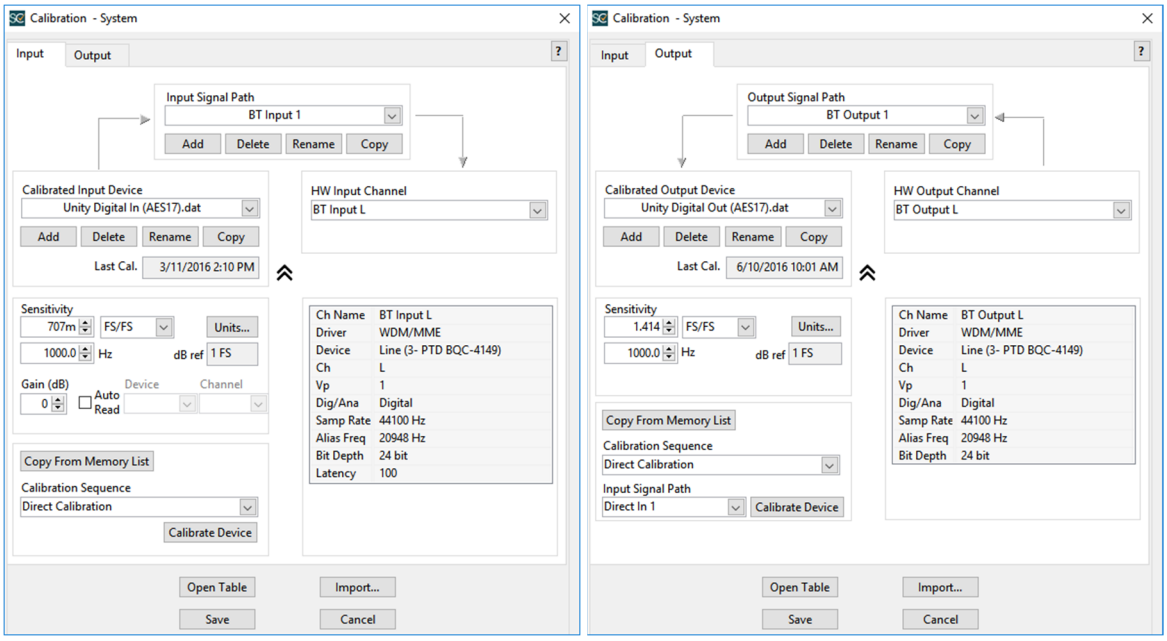
5. Save your changes.

Second, setup an input signal channel

Once the hardware channel is setup we need to add an input signal channel to the calibration table. To do so, follow these steps:

1. From the main menu open Setup and then Calibration…

2. Add input and output signal paths.



Note: If you wish your input and output units to be scaled according to AES17 then add new input and output calibrated devices with sensitivities of 0.707 (-3.01 dB) FS/FS for the input and 1.414 (+3.01 dB) FS/FS for the output.

3. Save your changes.

BQC-4149 Specifications

Bluetooth RF

Transmit Power: +4 dBm
Receive Sensitivity: -88 dBm
Connector: Female SMA-type

Bluetooth Protocol

Bluetooth 3.0 Compliant

HFP/HSP Audio Gateway or Hands Free

- Voice: CVSD
- Wide-Band Voice: mSBC

A2DP Source

- SBC

Host Interface

USB - Windows command line

Physical

130 x 65 x 30 mm L x W x H
196 g

Support and Contact Information

Sold and distributed world-wide by:

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