

**Quarch Technology Ltd**

**Quarch Compliance Suite**

**Setup & Test Specification**

**QCS1002 – Pin bounce during hotplug**

V1.4


Quarch Compliance Suite v1.09

FileActionHelp

SetupResults

Select Test

Connection



Connected

192.168.56.1

Server Name : localhost

Disconnect

Select a Test

Test Name	Version	Qtl Number	Licensed
Full range hotplug test	1.4	QCS1001	YES: Free
PCIe Lane Reduction	1.0	QCS1009	YES: Free
Power Margining	1.4	QCS1005	YES: Free
Power vs performance - Custom	1.0	QCS1007	YES: Free
Power vs performance - Free Test	1.0	QCS1008	YES: Free
Power vs performance - Drive Test	1.1	QCS1006	YES: Free
Pin-bounce during hotplug	1.3	QCS1002	YES: Free
Signal timing sweep during hotplug	1.4	QCS1003	YES: Free
UNH-IOL Plugfest - Basic hotplug	1.4	QCS1004	YES: Free

Description

Test Name: Pin-bounce during hotplug

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Test Requirements:

Required parts

- \* 1x Quarch breaker module, appropriate for the physical interface being tested
- \* 1x Quarch controller, making the module available to the Host PC (LAN, USB or Serial)

Setup

- \* Connect the breaker module between the Host PC and the DUT
- \* Connect the breaker to the Quarch controller and power it up
- \* Connect the Quarch controller to the Host PC (LAN, USB or Serial)

Test Running : UNH-IOL Plugfest - Basic hotplug

Server Status: Connected

## Change History

1.0		Initial Release
1.1		Re-Wrote in new format
1.3		Introduced reporting
1.4		Improved reporting design

## Contents

## Introduction

In order to show some of the lesser known capabilities of Quarch Breaker modules, Quarch has created the Pin Bounce during Hotplug test.

Pin bounce is a common issue during manual Hotplug and is cause of many faults. Using breaker modules, Quarch is able to automate different pin bounce scenarios.

This specific test takes each signal in turn, applies a “bounce pattern” to it consisting of a 10mS long bounce cycle, at 500uS intervals, whereby 50% of the cycle is allowing power to the drive and the other 50% cutting the power to the drive.

## Requirements

### Host PC

- This is the PC which will mount the storage device under test (DUT). This system required admin privileges to install and execute the QCS server. Windows and Linux are supported.

### Client PC

- This is the PC which will run the QCS client and record the results. This can be the same as the Host PC but it NOT recommended for this test. Windows and Linux are supported.

### Quarch breaker module.

- A breaker module with the correct form factor and generation as the drive under test.

### Device under Test (DUT)

- Your storage device. SAS, SATA and PCIe NVMe devices are supported.

## Installation

Initial installation and setup is described in the QCS 'Quickstart' guide. Please see this document if you are setting up for the first time. It will walk you through the QCS install process.

## Setup

Host and Client PC setup is common across all QCS tests, so some of the steps below are only required the first time you prepare for testing

- Setup the Host PC
    - As described in the QCS Quickstart document
    - Ensure the Host PC is connected to the LAN (assuming a separate Client PC is in use)
    - Use of WIFI is highly discouraged for this testing.
  - Setup the Client PC
    - As described in the QCS Quickstart document
    - Ensure the Client PC is connected to the LAN (assuming a separate Host PC is in use)
    - Use of WIFI is highly discouraged for this testing.
  - Setup the Quarch Breaker module
    - Place the Quarch breaker between the DUT and host slot. Connect the ribbon cable to the Quarch Interface kit or Quarch array module. Connect this to the Host PC.
    - Power on the Quarch Module
- Choose either USB or Serial for the Quarch Breaker Module. The Module must be accessible to the **Host** PC, so be sure you cable to the right one if using USB.

If you need to configure the breaker module settings, you can do so via TorridonTerminal: <https://quarch.com/file/torridon-terminal/>

This is also helpful to ensure you have connected the module correctly and can see it. If you cannot see the module and wish to check it is turned on, use TorridonTerminal to issue the command:

```
> run:power up
```

## Typical equipment layout

A typical equipment layout is shown below.

## Begin the test

- Start QCS server of the Host PC
- > python -m quarchpy.run qcs

The server should start up almost immediately. Note the IP address and mDNS name which you will use to connect to the server later.

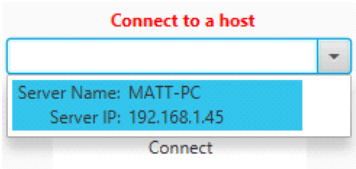
```
C:\WINDOWS\system32>python -m quarchpy.run qcs
Console Quick Edit Disabled

#####
                        Welcome to
                        Quarch Technology's
                        Quarch Compliance Suite
                        Quarchpy Version : 2.0.20.dev10
#####

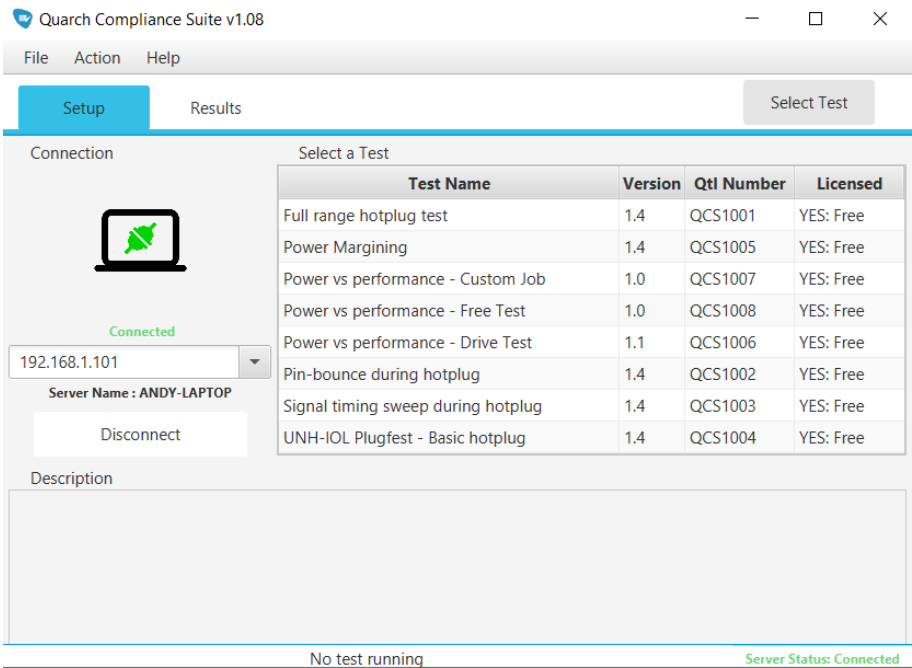
DEBUG:root:Server Name: ANDY-LAPTOP
Server Name : ANDY-LAPTOP
Server IP : 192.168.1.101
Server Status : IDLE ( 02/05/2021, 10:51:22 )
DEBUG:root:Server IP: 192.168.1.101
_
```

- Start QCS application on the Client PC
- > Double click on the QCS icon to start
- Connect the Client to the Server

- Enter the IP address of the Server into the Client connection box. If 'zeroconf' is installed on the server then it should auto detect and be visible in the connection drop-down menu for fast connection.



- Select the test to run
- In this case, select the QCS1002, 'Pin bounce during hotplug' and either double-click or select 'Select Test'



- This process can take 30 seconds or so, as the test is sent to the Server and the required applications are started on the Client.

- When the test is ready, the 'Start/Play' button will become available to begin running. If you want to change any setting for the test, you can do so now in the 'Custom Variables' window.
- When you have made any changes you require, press the run button to begin.

## Custom variables

Most tests have several variables that can be set. These allow for things such as setting the number of times that a test loops or setting the time to wait for a drive to enumerate. These will be different in each test suite.

QCS1002 has several useful settings to consider:

Custom Variables

Custom Variables

Variables left blank or "auto" will automatically have their value set as the test proceeds

STOP ON FAIL:  Stop test at first failure point

REPEATS:  Number of times to repeat each hotplug

ONTIME:  Time to wait for drive to enumerate on host

OFFTIME:  Time to wait for host to remove drive

LINKSPEED:  Value to compare drive's link speed, GB/s

LANEWIDTH:  Value to compare drive's lane width

### Stop on fail

- When set to true, the test will halt if there are any errors or test failures

### Repeats

- Amount of times to repeat each section of this test

#### OnTime

- Time to wait for drive to enumerate on system after a hotplug

#### OffTime

- Time to wait for host to remove drive

#### Link Speed

- Value to **compare** drive's link speed against

#### Lane Width

- Value to **compare** drive's lane width against

## Select the devices

As the test starts running, you will be prompted to select the Quarch Breaker Module and storage device to use. The dialogs have a rescan button: just in case you have forgotten to plug something in!

### Select the breaker module

First you will be prompted to select the Breaker Module. Here we have a QTL2270 (Gen4 PCIe U.3) module connected to the Client PC via USB.

The breaker module must be available to the **Host** PC. If this is not the case, you will not see it shown here.



Module Selection

Direct IP Address LoAdd

Rescan

Please pick the Quarch module attached to DUT. If you are using a Quarch controller, select the module attached to the controller.

Connection Type	Serial #	Connection Target
USB	QTL2270-01-002	QTL2270-01-002

Select

## Select the storage device (DUT)

Next you will be prompted to select the storage device to test.

Drive Selection

Rescan

Please pick the drive attached to selected Quarch Module

Connection Type	System Cmd	Name	Drive Path
ATA	SmartCtl	ST1000DM003-1ER162	/dev/sda
ATA	SmartCtl	Ortial M.2 120	/dev/sdb
NVME	SmartCtl	INTEL SSDPE2ME016T4	/dev/sdc
PCIE	LSPCI	Intel Corporation [8086], PCIe Data Center...	No path
SCSI	WMIC	INTEL SSDPE2ME016T4	\\.\PHYSICALDRIVE2
USB	WMIC	Kingston DataTraveler 2.0 USB Device	\\.\PHYSICALDRIVE3
IDE	WMIC	Ortial M.2 120	\\.\PHYSICALDRIVE1
IDE	WMIC	ST1000DM003-1ER162	\\.\PHYSICALDRIVE0

Select

Be sure that you select the correct DUT.

Selecting the wrong drive will show fail test points throughout half of the test as the drive being monitored in QCS is not the drive being hotplugged.

## View test progress

This test suite with default variables is fast to complete, currently under 5 minutes depending on how fast the drive under test enumerates. Customizing the test variables will increase this total test time.

Real time results are displayed in the log. Any failures will be clearly marked in red, and noted on the error counters.

If many failures occur early on, it is likely that you have a problem with the setup of the equipment. Expanding the failed rows gives more information on the failure.

## Common test failures

- **Command to a Quarch module fails to get a response.**
- Module has become disconnected or powered down. Check your cabling.
- **Command to a Quarch module returns a bad command or invalid parameter error.**
- The Module connected is not the correct one for the test, or it required an upgrade.
- **The DUT is not removed from the system correctly during the power cycle test.**
- The wrong DUT may be selected. Make sure you have chosen the right device. If uncertain, you can use TestMonkey or TorridonTerminal to manually hot swap the DUT and verify that it is powering the correct drive.
- **The DUT is not enumerated on the system after each hotplug test.**
- Does the DUT and Host system support hot plug? If you cannot manually hot plug a device in the Host and have it enumerated correctly, then the test will not work.

## Test specification

### Basis for testing

This test is for automating pin bounce scenarios to see their effect on a drive.

Your comments, requests and suggestions are very welcome and can be directed to [support@quarch.com](mailto:support@quarch.com).

Future versions of the test suite will aim to include these improvements where practical.

### Assumptions

We assume that the drive connected is in 'optimal' condition, to begin testing (ie: that it is empty and in 'out the box' condition).

We assume setup is correct with DUT and Host being capable of hotplug.

We assume PC's are connected across LAN.

## Test itinerary

- Signals used in test are determined by Quarch Module selected on test start
- All bin bounce items follow the same pattern:
  - Length : 10mS
  - Bounce periods : 500uS
  - Bounce Duty : 50%
- A signal's pin bounce start time is determined by it's source.
  - Source N :  $25\text{mS} \times (n - 1)$
  - Source 1 : 0mS
  - Source 2 : 25mS

## Test steps

### 1. Check drive powered up

Ensure drive under test is powered on and discovered by the system.

### 2. Run power down to drive

Send “run power down” command to Quarch module.

### 3. Wait 3 seconds for drive to ensure drive is powered off – Check the drive removed from system

Sleep test for 3 second.

### 4. Apply bounce pattern to signal

Bounce pattern is the same across every signal, with the only differing factor being when the bounce is started – determined by the signal source. ( e.g. source 2 = 25mS after plug )

### 5. Run power up to the drive

Send “run power up” command to Quarch module

### 6. Check drive is enumerated on the system

Poll system commands to check for drive enumeration on system

### 7. Check link speed ( PCIE devices only )

Compare link speed against link speed custom variable  
( Note – If there was no custom value input, the link speed to compare against will be what the drive originally started with )

### 8. Check lane width ( PCIE devices only )

Compare link speed against lane width custom variable  
( Note – If there was no custom value input, the lane width to compare against will be what the drive originally started with )

## Test completion

### 1. Generate Test Report

Under the “Action” tab, there is an option to auto generate a test report upon completion of the test.

**Commented [LH1]:** Perhaps make mention of the test report generation on all test descriptions?

### **Passing a pull event.**

After sending a “run power down” to the Quarch module, the test will consistently query the system command used to find the drive. A drive passes this check point if it is successfully removed from the list of drives returned from the system command.

### **Passing a plug event.**

After sending a “run power up” to the Quarch module, the test will consistently query the system command used to find the drive. A drive passes this check point if it is successfully added to the list of drives returned from the system command.

### **Passing a link speed check – NVMe / PCIe devices.**

After the DUT is powered up and discovered, the test queries the LSPCI command using “lspci -vvv”, giving a very verbose output of the drive capabilities. Found within these capabilities is its current link speed. A drive passes this check point if the link speed is consistent as to what was expected. By default – This is the link speed a drive has at the beginning of the test.

### **Passing a lane width check – NVMe / PCIe devices.**

After the DUT is powered up and discovered, the test queries the LSPCI command using “lspci -vvv”, giving a very verbose output of the drive capabilities. Found within these capabilities is its current lanewidth. A drive passes this check point if the lane width is consistent as to what was expected. By default – This is the lane width a drive has at the beginning of the test.