High Speed Interconnect Tester

Users Guide

Version 1.4
10/20/2011

i.   Revision History

Revision	Date	Description
V1.0	4/4/11	Initial Version
V1.1	5/3/11	Change Pre-Emphasis to -15 to 15, added log file section, added pre-emphasis tap definitions, added explanations for status and config window
V1.2	5/25/11	Added Pre-Emphasis pictures
V1.3	10/7/11	Update for Enhancement 1
V1.4	10/20/11	Misc. cleanup

ii.   Reference Documents

Document #	Title	Author
-	-	-

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1   Introduction

The Quantum Parametrics' **H**igh **S**peed **I**nterconnect **T**ester (HSIT) is designed to enable at speed testing of cables, slip-rings, backplanes, and other interconnects. The HSIT's eight generic DC, low speed and high speed channels are configured through technology specific Connector Saver Modules such as USB, FireWire, HDMI, DisplayPort, SATA, SAS, PCIe, etc… Quantum Parametrics provides a variety of Connector Saver Modules.

1.1 HSIT Components

Figure 1 - HSIT with Connector Saver

1.1.1   HSIT Tester

The High Speed Interconnect Tester (HSIT) is a generic interconnect (cables, slip-rings, backplanes, etc.) tester with:

- Eight (8) high speed (600Mb/s to 6.5Gb/s),
- Eight (8) lower speed (150Mb/s to 1.6Gb/s) and
- Eight (8) DC channels

Coupled with a technology specific Connector Saver Modules the HSIT provides both a simple to operate production tester and highly configurable engineering tool.

1.1.2   Configurable Parameters

Configurable Parameters	High Speed SERDES (Differential)							
Amplitude (mVp-p)	1200	1000	900	800	700	600	400	200
Data Rate Range	600 Mb/s to 6.5 Gb/s							
Pre-Emphasis	Pre-Tap, Post-Tap1, Post-Tap2				-15 to 15[1]			
Adaptive Equalization (dB)	0 to 15							
DC Gain (dB)	12	9	6	3	0			
	LVDS (Differential)							
Amplitude (mVpeak)	100 to 600mV (3mV increments)							
Data Rate Range	150 Mb/s to 1.6 Gb/s							
	DC Threshold Levels							
V_{HT} (short)	3.3V to V_{LT} + 200mV							
V_{LT} (open)	0V to V_{HT} - 200mV							

Table 1 - Configurable Parameters

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[1] -15 to 15 equal the dB change from VOD

1.1.3   HSIT Application Software

The HSIT application software controls the testing
process and logs the test results.

1.1.3.1 Log File

For each test the configuration and results are logged
into a log file for tracking purposes. The log file is
typically found in the following directory location:

C:\program files\quantum
parametrics\ita\logresults\

The log file format is shown below:

```
Serial/Batch Number: 12345678
Test Result: PASS

Tester GUID: 0x0012BEFFFE2FC6FA
Tester ID:ID: 049-USB3_SAMB
Technology Type: [USB 3.0 StdA to Micro B]

Start Time: 2011-04-08 11:10:03
Stop  Time: 2011-04-08 11:10:17

DC Test: PASS
  Signal 1 - VBUS Power: PASS
  Signal 2 - GND_PWR:    PASS
  Signal 3 - SDP1_Drain: PASS
  Signal 4 - SDP2_Drain: PASS

LSPD Test: PASS
 Test Duration: 5 Secs
 Test Parameters:
  UTP_D – 480Mb/s
  Amplitude: 400mV

 Test Results:
  Chan 1 Continuity: PASS
  Signal UTP_D+/-: PASS

HSPD Test: PASS
 Test Duration: 5 Secs
 Test Parameters:
  SDP1 and SPD2 – 5.0Gb/s
  Amplitude: 800mV
  Pre-EmphTap0: 0dB
  Pre-EmphTap1: 0dB
  Pre-EmphTap2: 0dB
  RxDCGain: 0dB
  RxEqualization: 3dB

 Test Results:
  Chan 1 Continuity: PASS
  Signal SDP1+/-: PASS
  Chan 2 Continuity: PASS
  Signal SDP2+/-: PASS
```

1.1.4   DC Adaptor

A 12V DC power supply is included to power the HSIT.

1.2 Other Required Equipment

1.2.1   Host Computer

The HSIT application runs on a PC running Microsoft Windows XP or Windows 7. Minimal hard disk space and memory are required.

1.2.2   1394 Interface

The HSIT application communicates with the HSIT instrument via IEEE-1394 (the Backchannel). The host computer must provide a 1394 open host controller interface (OHCI). PCI, PCMCIA, and integrated OHCI are acceptable. The HSIT has three bilingual ports. The Backchannel uses VersaPHY™[2] technology for communication between the PC and the HSIT. While VersaPHY is supported by most OHCI implementations, QP has found that the TI TSB82AA2B OHCI IEEE-1394b controller does not support VersaPHY packets.

The HSIT application installation will install custom 1394 drivers. These drivers should allow applications currently using 1394 to continue to use the 1394. Additionally the HSIT application is designed to support multiple HSIT testers operating at the same time.

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[2] VersaPHY™ is a trademark of Astek Corporation, all rights reserved.

2   HSIT Tour

2.1 Front Panel

The HSIT's front panel has a Connector Saver Module (CSM) opening. The CSMs are designed to adapt the generic HSIT to technology specific connectors. A USB 3.0 Std. A to Micro B CSM is shown in the picture below.

Figure 2 - Front Panel

2.1.1   Example Connector Saver

Most of the HSIT enclosure user interface is provided through the technology specific CSM. The figure below shows an example Connector Saver configuration.

When the CSM is correctly plugged in and power to the HSIT is ON the Active LED is solid green. When the HSIT is selected (identified, see section 3.6.1) in the software UI the Active LED blinks green to indicate that that HSIT has been selected by the software.

Upon power up, the Testing LED is solid red, meaning the tester hasn't been configured and pressing the Loaded button will have no effect. After software initialization, a test may be started when the LED is off. After the "Loaded" switch is pressed (or the test is started in the software UI) and through the duration of the test, Testing LED blinks amber. This means a test is running. DO NOT unplug the cable or press the Loaded button. When a test is not running the Testing LED is off, meaning it is safe to load/unload cables.

Upon power up the Pass/Fail LED is off. Also, while testing (the Testing LED is blinking amber) the Pass/Fail LED is off. When a test completes: if all tests (DC, Lower Speed, High Speed) pass, the Pass/Fail LED becomes solid green. If any test (DC, Lower Speed, High Speed) fails, the Pass/Fail LED blinks red.

The user presses the "Loaded" switch when the cable is loaded and a test is ready to begin. When pressed, the HSIT sends a message to the software indicating that a test is ready to be started. This allows tests to be running without the user interacting with the software.
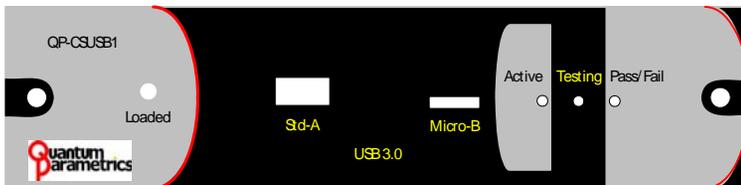

Figure 3 - Example Connector Saver Face Plate

2.1.2   Multi-Connection

Multiple HSITs may be connected to a single host computer to allow multiple cables to be tested at the same time.

2.2 Back Panel

Figure 4 - Back Panel

2.2.1   Backchannel Connectors

The Backchannel connectors provide an IEEE-1394 connection between the HSIT and the PC running the HSIT application. All three (3) ports are bilingual connections and support a maximum data rate of S800 (768.43 Mb/s).

2.2.2   Tester Power

The HSIT is powered by the included 12 volt power supply connected to the back of the tester.

2.2.3   ON – OFF Switch

The ON – OFF switch connects and disconnects the 12 volt power supply from the HSIT internal circuitry.

3   HSIT User Interface

3.1 Start Application

Execute the ITA.exe file; this can be done through the Windows Start menu.

3.2 Initial Screen

If no HSITs are connected to the PC when ITA.exe is executed, the "Selected Tester Status" box will display "NO DEVICE." When one or more HSITs are connected, the following screen will be presented:
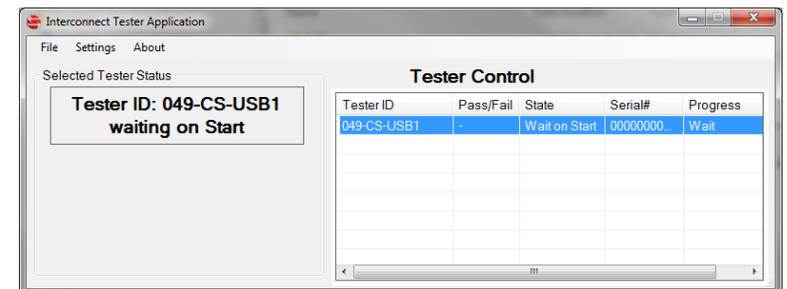

Figure 5 – Initial view after HSIT connection

The "Tester Control" box on the right side of the window shows the testers that are connected. The selected tester's status is displayed in the "Selected Tester Status" box on the left side of the screen.

3.3 Tester Settings

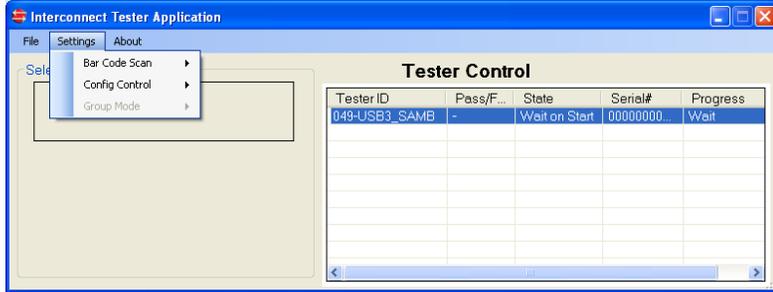The Settings menu allows the user to configure non-technology specific tester parameters (see figure below).

Figure 6 - Tester Settings Menu

3.3.1   Bar Code Scan

HSIT optionally supports a Bar Code Scanner to enter serial numbers. The HSIT application will prompt the user to enter a serial number when a test is started while this mode is enabled. This can be done either by scanning or manually at the prompt.

3.3.2   Configuration Control

By default the HSIT is ready to run a test without any user configuration. However, at times it may be desirable to adjust individual test parameters. This is done by turning the "Config Control" to ON (the menu displays the current status of "Config Control"). This extra step prevents inadvertent changes to test parameters.

3.3.3   Group Mode

By default each HSIT runs as an individual tester. Future revisions of the HSIT application will allow multiple connected testers to be grouped together and started at the same time.

3.4   Status and Configuration

The Status and Configuration window can be accessed by right clicking on the desired tester from the Tester Control window and selecting "Configuration" as in the figure below. Different Connector Saver modules will have different configuration screens. The HSIT application detects the Connector Saver module present. If a module is present, then the HSIT application will load the default Configuration file for that module.

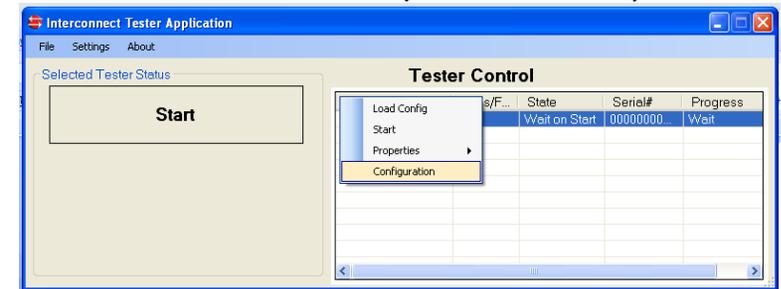**Note: In order to edit Configuration settings, "Config Control" must be set to "On." (See Section 3.3.2.)**

Figure 7 - Accessing the Status and Configuration Window

3.4.1   The Status and Configuration Window

The exact details of the Status and Configuration window change based on the attached CSM. The USB 3.0 Standard A to Micro B Connector Saver example configuration window below shows Connector Saver information, test information, and configurable parameters for that technology.
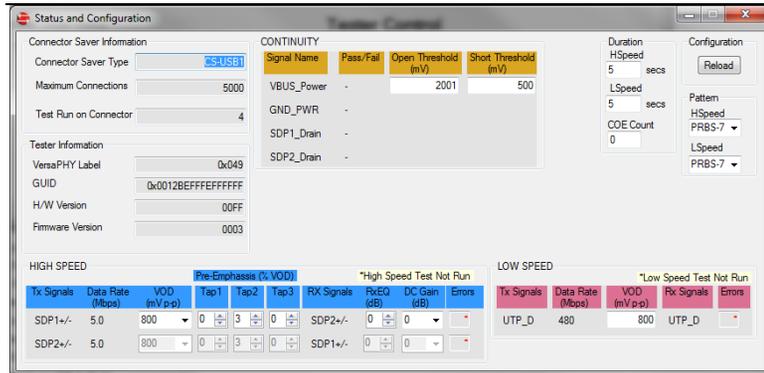
Figure 8 - Tester Status and Configuration Window

3.4.1.1Connector Saver Information

The Status and Configuration window provides information about the Connector Saver Module (CSM) in the Connector Saver Information area. Specifically, it provides the name of the CSM in the Connector Saver Type. This information is read form the CSM and is not editable. The Maximum Connections indicates how many plug/unplug cycles the connectors on the CSM can tolerant before they may cause failures, based on the connector specification.

3.4.1.2Tester Information

The Status and Configuration window provides information about the HSIT in the Tester Information area. The VersaPHY Label is a unique name for the HSIT being addressed by the HSIT application. The Global Unique Identifier (GUID) is IEEE-1394 worldwide unique id for this specific HSIT. The H/W and Firmware version indicate the revision of the HSIT and firmware running on it.

3.4.1.3CONTINUITY

The CONTINUITY area scales to support 0 to 8 DC continuity test signals. The number of signals and signal names are determined by the configuration file for the connected Connector Saver Module (CSM). The Open and Short Thresholds are initially set by the configuration file however these values are user configurable.

The HSIT detects the continuity of a signal by applying a signal to one end of a conductor and measures the value at the other end of all connected conductors to determine if the conductor is connected correctly. The **Short threshold** is the voltage level that will be used to determine if the conductor is connected (shorted) from one end to the other. The **Open threshold** is the voltage level that will be used to determine if the conductor is not connected (open) from one end to the other.

3.4.1.4HIGH SPEED

The HIGH SPEED test area allows the user to configure both the transmitter and receiver parameters and see the status for each differential pair tested. The HIGH SPEED area scales to support 1 to 8 high speed (600Mb/s to 6.5Gb/s) channels. The number and names of the Transmit and Receive signals are provided in CSM associated configuration file. If no high speed channels are found in the configuration file the HIGH SPEED test area is removed from the UI.

The initial transmit and receive parameters are set by the configuration file for the attached CSM. The user

may adjust these parameters within the limits provided.

VOD – adjusts the differential amplitude (VOD). There is a pull down for the available amplitude settings (peak-to-peak differential) for the High Speed channels.

Pre-Emphasis – is the dB change from the Amplitude (VOD) for the High Speed channels only.

> **Pre-Tap** – de-emphasizes the bit before the transition and emphasizes the remaining bits. A different polarity on pre-tap does the opposite.
> **Post-Tap1** – emphasizes the bit period immediately after the transition and de-emphasizes the remaining bits.
> **Post-Tap2** – de-emphasizes the first two bits after the transition and emphasizes the remaining bits. A different polarity on the 2nd post-tap does the opposite.
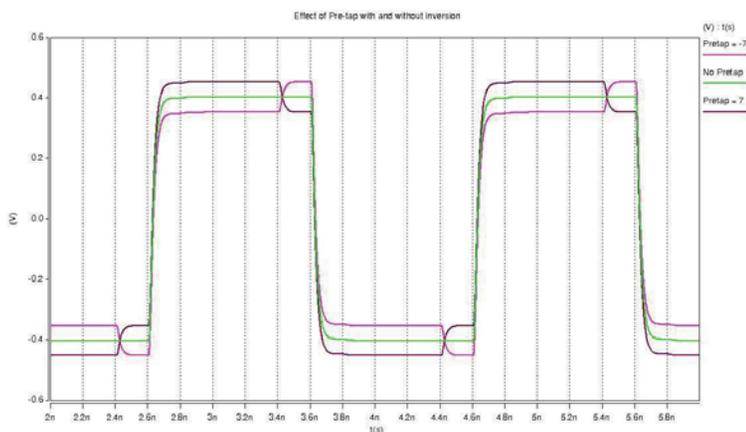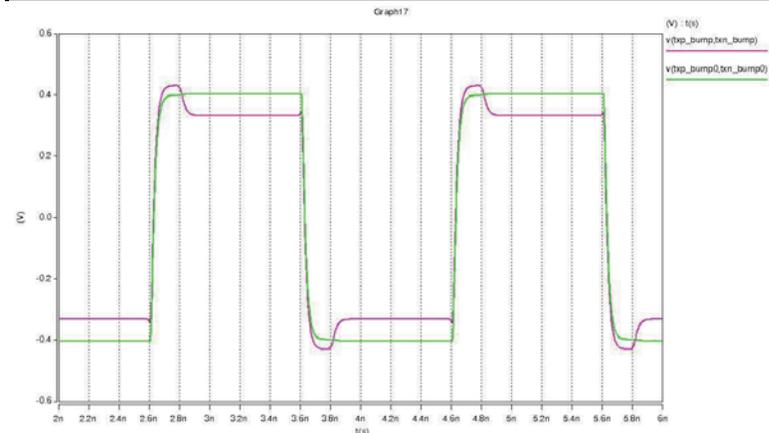

Figure 9 - Effects of Pre-Tap
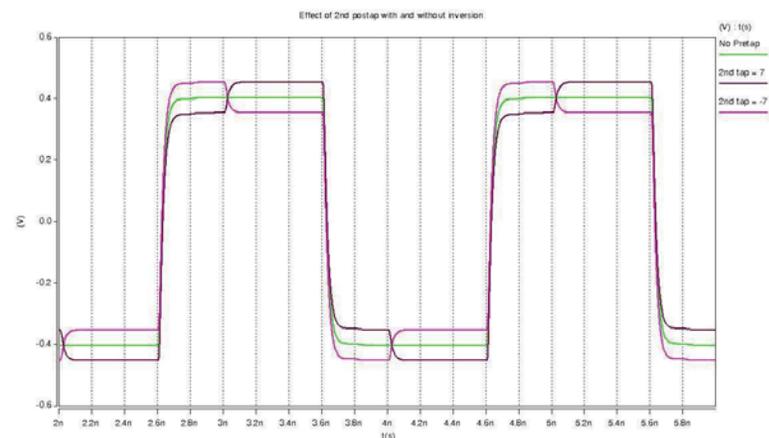
Figure 10 - Effects of Post-Tap 1

Figure 11 - Effects of Post-Tap 2

The Rx Config area fields are dependent on the CSM installed. If the CSM requires high speed channels then DC Gain and Equalization fields will be present and active.

DC Gain – sets the DC Gain of the equalizer in dB.

Equalization – sets the adaptive equalization level in dB.

3.4.1.5 LOW SPEED

The LOW SPEED test area allows the user to configure the transmitter parameters and see the status for each differential pair tested. The LOW SPEED area scales to support 1 to 8 low speed channels (150Mb/s to 600Mb/s). The number and names of the Transmit and Receive signals are provided in the CSM associated configuration file. If no low speed channels are found in the configuration file the LOW SPEED test area is removed from the UI.

VOD – adjusts the differential amplitude (VOD). For the Low Speed channels the user may type in any value between 200mV to 1200mV (peak-peak differential). The settable resolution is 3mV.

3.4.1.6 Test Run Config File

The Reload button in the Test Run Config File area causes the default configuration file for the connected CSM to be reloaded.

3.4.1.7 Test Duration

The Test Run Time area allows the user to set the test duration in 1 second increments for both the High and Low speed tests.

3.4.2   Loading Configuration Files

The HSIT application automatically loads a configuration file based on the connected Connector Saver Module. Alternate custom configuration files may also be loaded.

To load a configuration file to a specific tester, right click the desired HSIT device and select "Load Config."

To load a configuration file to all connected testers, click File and select "Load Config."
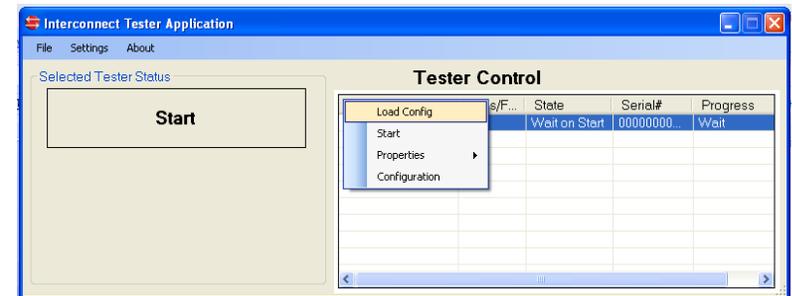

Figure 12 – Load configuration file menu

3.5   Running a Test

While operating an individual tester, a test may be initiated by pressing the "Loaded" button or through the UI by right clicking on the tester and selecting Start.
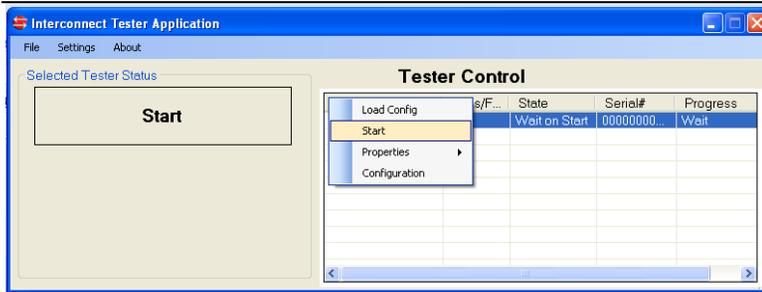
Figure 13 - Starting Test through UI

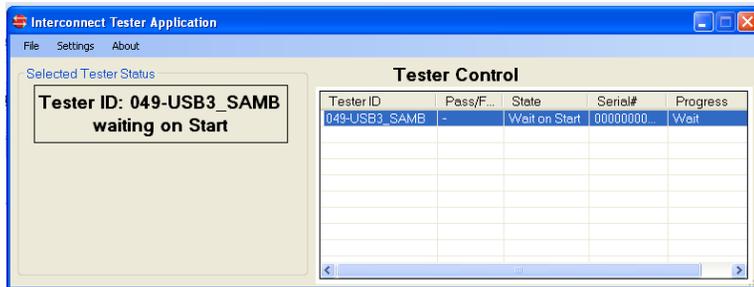While waiting for a test to be started the State column indicates "Wait on Start."

Figure 14 - Waiting for Test Start.

While a test is running the State column will indicate "Running." The Pass/Fail status is "Wait."

3.6 Properties

The "Properties" menu allows the user to find out specific information about the tester and its attached Connector Saver. To access the menu, right click the desired device and select "Properties."
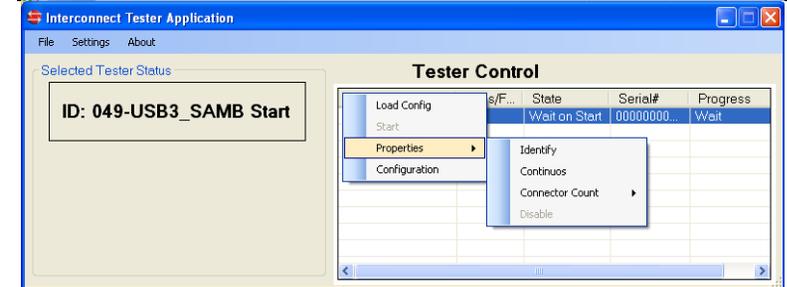
Figure 15 - Tester Properties Menu

3.6.1   Identify

Select "Identify" to cause the associated tester's Active LED to blink green.

3.6.2   Continuous

Select "Continuous" to turn continuous testing on or off. Continuous mode causes the test to run until manually turned off (Right click the desired device and select "Stop").

3.6.3   Connector Count

Selecting "Connector Count" will display information regarding the use of the Connector Saver module. "Inserts" displays a running count of the number of times cables have been connected to the HSIT. "Max inserts" shows the maximum number of inserts for the life of the Connector Saver module.

3.6.4   Disable

Feature not currently supported.

4   Firmware Image Upgrade

When the HSIT software is started, the firmware revision is read from the hardware. If the firmware revision is out of date, the following message will appear:
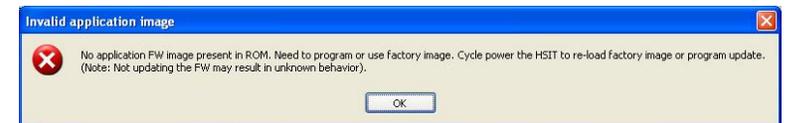
To upgrade the firmware to the current revision (included with the software installation), follow these steps:

1. Click the "OK" button on the "Invalid application image" error box.

2. When the "Load Configuration" window appears (shown below), click the "OK" button.

3. A new window will appear allowing you to browse for the new firmware image. Browse to the directory

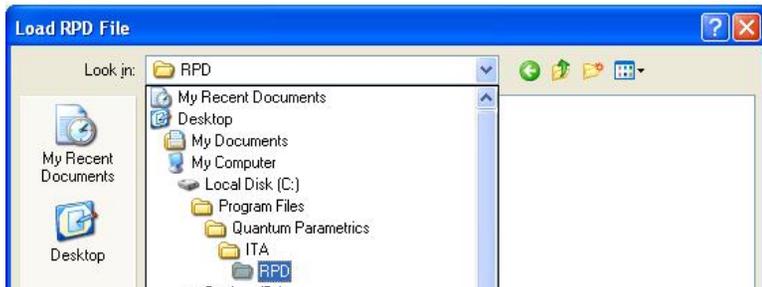shown in Figure 16 and select the file with the
extension .rpd. Click "OK".

Figure 16 – Location of firmware image

    4. The software will load the firmware image
into a
    temporary location in the hardware. This may
take
    several minutes. When this is complete, a
window will
    appear asking if the firmware should be
updated (Figure
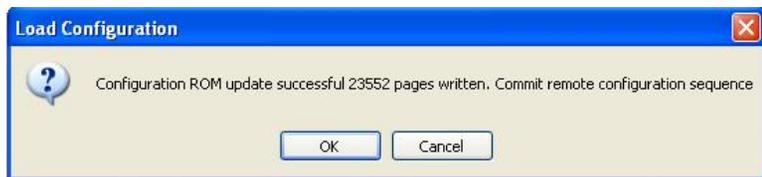   17). Click "OK" in this window.

Figure 17 – Firmware commit message

    5. It will take several minutes for the firmware
which
    copied to the hardware to be written to
    memory. When it is complete, the window in
    Figure 18 will appear. Click "OK" in this
    window.

**Figure 18 – Message indicating firmware upgrade is
complete**

    6. The firmware upgrade is now complete. The
    software application and hardware must both
be
    restarted. Close the software application,
power
    cycle the HSIT hardware, and re-open the
software
    application.

The new firmware is stored in a ROM inside the HSIT.
Once the firmware has been upgraded, it will not
need to be updated again unless a new revision of
software is used.

5   ESD Compliance

The HSIT hardware was subjected to ESD Testing
per EN 61000-4-2:1995, using the 4kV +/- test parameters for
all tests. After being subjected to these tests, the box was found
to be fully functional and no issues were found.

How to Contact Astek Corporation (D.B.A. Quantum Parametrics)

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