PCI Express Cable Extender

Hardware Manual

SKU-016-3x

June 01, 2022

Revision 1.0

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1   About this Document

1.1   Purpose

This document describes hardware installation, features, specification and operation of Amfeltec Corp. PCI Express Cable Extender.

1.2   Feedback

Amfeltec Corp. makes every effort to ensure that the information contained in this document is accurate and complete at time of release. Please contact Amfeltec Corp. if you find any errors, inconsistence or have trouble understanding any part of this document.

To provide your feedback, please send an email to support@amfeltec.com

Your comments or corrections are greatly valued in our effort for excellence and continued improvement.

1.3   Revision History

Rev. No.	Description	Rev. Date
1.0	Initial Release.	June 1, 2022

2   General Description

2.1   Introduction

The PCI Express Cable Extender is designed for support debugging and verification x1 PCI express boards (referred as UUT, Units-Under-Test). PCI express Cable Extender (Cable Extender) utilizes the modern "PCI express via Cable technology". It connects to the host computer via standard CAT6 data cable, 10 pin flat control cable and x1 PCI express, MiniPCI express or ExpressCard® interface board.

The Cable Extender uses a bus switch to connect/disconnect the UUT PCI express board from the host computer without it shutting down. This flexibility minimizes the testing time, protects the host computer from damage and what is new make it possible to move noisy computer out of the way.

Figure 1: PCI express Cable Extenders SKU-016-3x

The Cable Extender supports two ways of feeding power to the UUT: internal, when power coming via flat cable from host computer and external, when power coming from external power supply. The external power supply has to provide +12V/7A power voltage to satisfy all PCI express needs.

The Cable Extender fully protects UUT and host computer from damage by monitoring and limiting the voltage and current supplied to the UUT. Extender measured in real-time the current value on the 12V power and 3.3V power and visualize it on the three 7-segment indicator. The current value can be transmitted to computer via USB link for current monitoring and logging.

The PCI Express Cable Extender has additional support tabs for the add-in PCI express boards (UUT) stabilization (US. Patent: 7,255,570). Stabilization PCI express boards that has to be plugged into Cable Extender makes it possible to rotate UUT during debugging.

2.2   Package Details

The PCI Express Cable Extender includes following components:

1. PCI Express Cable Extender (Figure 1) (SKU-016-3x)

2. x1 PCI express Host board (Figure 2), MiniPCI express Host board (Figure 3) or ExpressCard® Host board (Figure 4)

3. Data CAT6 cable and control flat cable (5 ft. length or 10 ft. length)

4. Hot-swap software for Windows® and Linux

5. External power supply +12V/7A (optional, can be purchase from Amfeltec Corporation)

Figure 2: PCI express Host board   Figure 3: MiniPCI express Host board

Figure 4: ExpressCard® Host board

3 Requirements/Features

3.1 Power/Interface Signals

- Indication of UUT powers +3.3V, +12V (green LED with label "PWR")

- Indication of incoming +12V power from external power supply or from host computer (green LED)

- Indication overload condition (red LED with label "FAIL"), PCI express reset signal status (red LED with label "RST")

- Indication of present UUT (blue LED with label "PRSNT")

- Overloading Protection (OLP) on the UUT +3.3V and +12V supplies

- Support powering UUT from external power supply (in case that external psu connected to extender) as well as from host computer

- JTAG connector for easy access to the PCI expresses JTAG signals. Enable plug-in JTAG emulators or AMFELTEC **Easy Loader™** for programming/ loading CPLD/FPGA on the UUT during testing/production cycle.

- Two pin ground jumper for easy using testing equipment that needs ground connection (like voltmeter, oscilloscope, logic analyzer etc)

- Meet PCI express 4.0 specification (Gen2 speed), MiniPCI express specification 2.1

- Hot-swap support

3.2 Debugging Support

- Allow access to the UUT PCI Express bus JTAG signals

- Ground jumper for plug in test equipment probes

- Support tabs for mechanical stabilization UUT, allow rotate the Cable Extender with UUT during operation for easy access to the any part/signal of UUT (Figure 3)

- Double set of LEDs on top and bottom of the Cable Extender to provide status during debugging of the top or bottom side of the UUT

Figure 5: PCI express stabilization tabs

3.3 Software

AMFELTEC Corp. provides software for supporting hot-swap functionality. The software allows to save and restore the PCI Express configuration for UUT device (refer to *eX10 Software Manual for more details*).

4   Installation

4.1   Hardware

Following steps provide the exact sequence need to be followed in order to properly install the PCI Express Cable Extender product from AMFELTEC Corp.:

- Turn OFF host computer before installation. Remove the chassis cover from host computer.

- Locate an unused PCI express slot and remove the corresponding slot cover from computer chassis.

- Plug-in the x1 PCI express Host board to selected PCI express slot and attached its bracket to the computer chassis with a screw.

- In case of MiniPCI express Host board, install it in MiniPCI express circuit on the Host computer motherboard

- Put the chassis cover back on the computer.

- In case ExpressCard® - just insert ExpressCard interface board into the ExpressCard® slot on the laptop.

- Connect the CAT6 cable and flat cable to PCI express or ExpressCard® interface board and the other end to the connectors on the PCI Express Cable Extender.

- In case that it is necessary to use external power supply for powering UUT the external power supply has to be plugged to the Cable Extender.

- In case ExpressCard® Host board, Extender has to be always powered from the external power supply.

- Set SW1 switch into position ON.

- Plug in UUT to the Cable Extender.

- Turn ON host computer.

- The "PRSNT" LED (blue) has to be ON, the "PWR" LEDs have to be ON, the FAIL and RST LEDs (red) have to be OFF.

4.2   Software

PCI Express Cable Extender doesn't require any software/device driver for operation. You will only need to install the software provided by Amfeltec Corp. in order to use the hot-swap feature.

Please refer to eX10 Suite Manual for software installation details.

5 Operation

5.1 Hot-Swap support

Perform hot swapping with a certain degree of carefulness. Remember that PCI configuration won't be loaded or automatically updated on insertion of a new UUT device unless you use the supplied HOT SWAP software to reload the UUT's PCI configuration.

5.1.1 Remove UUT Device

The following steps describe the sequence for removing UUT device:

1. Save UUT PCI configuration into a file (refer to Software Manual for *more details).*

2. Unload all device drivers associated with the UUT.

3. Set the switch SW1 to "OFF" (disable power).

Now, you can remove UUT device from the PCI Express connector.

5.1.2 Install UUT Device

The following steps describe the sequence for installing UUT device back to the system:

1. Plug in UUT device into the PCI express connector.

2. Set the switch SW1 to "ON" (enable power).

3. Restore PCI configuration for the UUT device.

Now, the UUT device is ready for use.
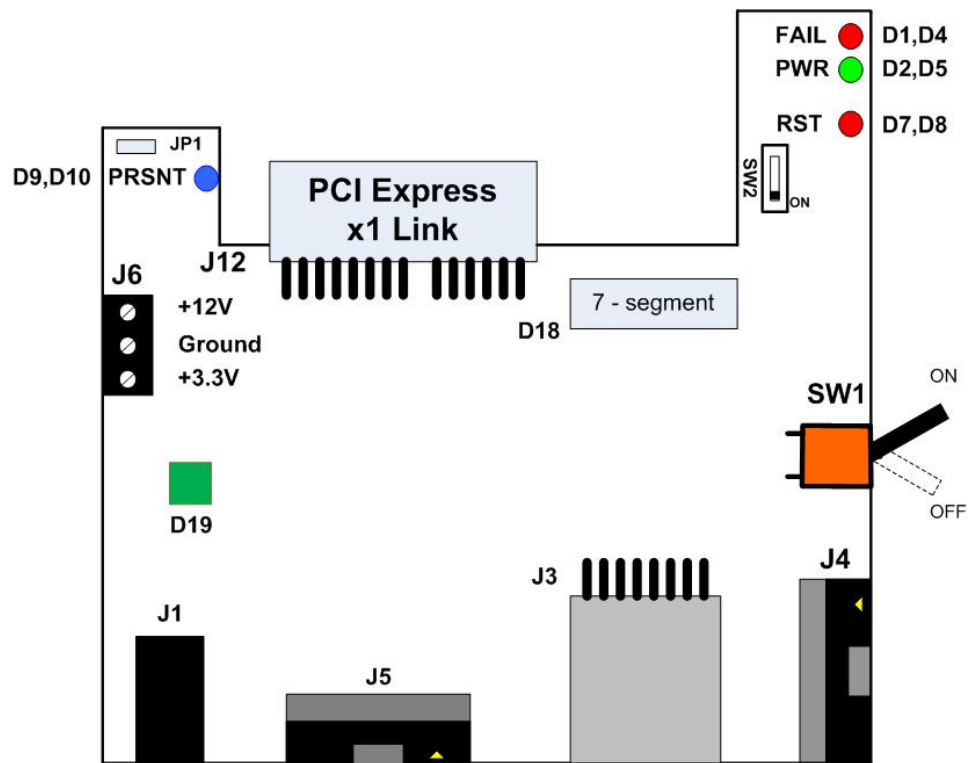
6 Hardware Description

6.1 Board Layout

Figure 6: Board layout

6.2   LEDs

Silk screen label	Type	Usage
"PRSNT"	Blue LEDs	Indication Present UUT card.
"FAIL"	Red LEDs	Overcurrent protection.
"PWR"	Green LEDs	Indication power +3.3V and +12V on the PCI express connector (on the UUT).
Green Square LED D19	Green LEDs	Indication incoming power +12V from external power supply or from host computer.
"RST"	Red LEDs	Indication PCI Express bus RESET signal.

Table 1: LEDs

6.3   Switches

Ref. Des.	Type	Usage
SW1	switch	Switch local PCI Express bus hot-swap controller ON/OFF.
SW2	2 position	Position ON – D18 shows current value on UUT 3.3V power Position OFF – D18 shows current value on UUT 12V power

Table 2: Switches

6.4 Jumpers

Ref. Des.	Type	Usage
JP1	2 pin jumper	Ground connection on the both pins

Table 3: Jumpers

6.5 Connectors

Ref. Des.	Type	Usage
J6	3 pin header	PCI Express Bus power. (+3.3V, GND, +12V)
J1	**2.5 mm Power Jack (+ internal)**	External power supply connection. (+12V/7A DC)
J5	2x5 right angel header	10 pin flat control cable for connection to the host computer (x1 PCI express interface card)
J3	RJ45 connector	CAT6 data cable for connection to the host computer (x1 PCI express interface card)
J4	2x5 right angel header	Connector for plug in external JTAG emulators or AMFELTEC **Easy Loader™** for programming/loading CPLD/FPGA on the UUT
J12	x1 PCI Express connector	PCI express connector for plug in UUT
JP13	On bottom side	For Amfeltec USB adapter for computer current monitoring

Table 4: Connectors

6.6   Power Limits

Power	Maximum current for Over voltage protection
+3.3V	3.0A
+12V	5.5A

Table 5: Power Limits

7   Appendix A: Connectors Pin Out

Function	JTAG connector
TCK	1
N/C	2
TDO	3
Local +3.3 Volt (output)	4
TMS	5
N/C	6
TRST	7
N/C	8
TDI	9
GND	10

Table 6: JTAG connector J4 pin out

Function	JTAG connector
+12 Volt	1
Ground	2
+3.3 Volt	3

Table 6: PCI express Power connector J6 pin out

8   Appendix B: SW2 switch setting

Switch position	Functionality
ON	Current at 3.3V power shown on the indicator
OFF	Current at 12V power shown on the indicator

Table 7: SW2 switch setting

9 Appendix C: Limited warranty

AMFELTEC Corporation does not warrant that the operation of the hardware, software or firmware products will be uninterrupted or error free. AMFELTEC products are not intended to be used as critical components in life support systems, aircraft, military systems or other systems whose failure to perform can reasonably be expected to cause significant injury to humans. AMFELTEC expressly disclaims liability for loss of profits and other consequential damages caused by the failure of any product which would cause interruption of work or loss of profits, such as shipboard or military attachment.

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