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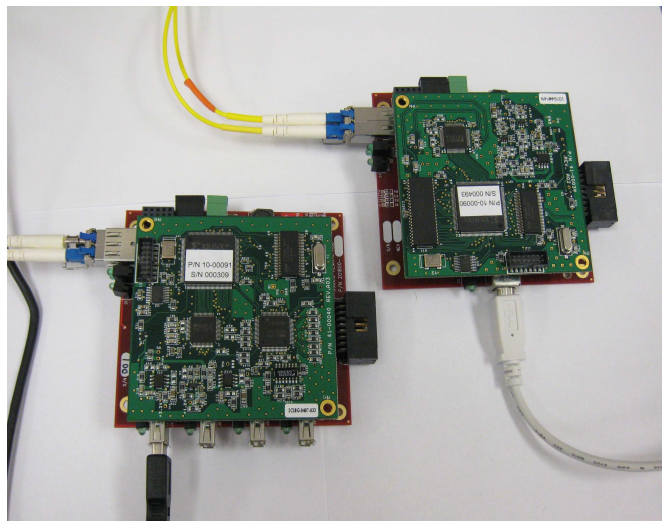
Prizm Fiber Optic USB 2.0 Link

201790-xxx and 201800-xxx

Users' Manual

And

Troubleshooting Guide

Rev. C

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1 Prizm Fiber Optic USB 2.0 Link (P/N – 201790-xxx and 201800-xxx) Overview

The Prizm Fiber Optic USB 2.0 Link provides a transparent USB 2.0 link over fiber at distances up to 80 kilometers. The Link consists of two boards- a Local Host and a Remote Hub. Both boards may be mounted on 3U VME plates and powered from a VME backplane, or alternatively they may be independently powered via a 2-pin connector.

The Local Host board connects to a standard USB 2.0 port on a Host PC via an industry standard USB cable. A fiber optic transceiver on the board typically provides dual LC connections to the Remote Hub end of the USB Link. The optical modules on both boards, however, may be changed to provide a variety of connectors.

The Remote Hub board carries four USB 2.0 peripheral ports that may be used to interface to various USB 1.1 or 2.0 peripherals. These ports are capable of supplying a USB link operating at high, full or low speeds (480, 12 and 1.5 Mbps respectively).

The Link consists of two PC-104 based cards, (3.55" wide, 3.775" long, 1.0" high), which have standard PC-104 mounting holes. Both cards can provide pass through of all PC-104 backplane signals and may be used in PC-104 based systems or they may be mounted separately and supplied with power through a 2-pin terminal connector.

Note: The 201790-002 and 201800-002 USB 2.0 Link versions use an external vendor's boards and are typically mounted on a PC/104 size aluminum plate. The DC power requirements for these boards are +5VDC and the power connector is a 1.7mm barrel plug.

1.1 Manual Revision History:

The manual has gone through the following revisions:

Rev A   Describes Original Production Units
Rev B   Updated contact information to reflect Moog Components Group
Rev C   Added -002 version that uses an external vendor's boards

1.2 Prizm Fiber Optic USB 2.0 Link Revision History:

The Prizm Fiber Optic USB 2.0 Link (201790-xxx and 201800-xxx) has gone through the following printed circuit board (PCB) and Assembly revisions:

PCB Revision A/Assembly Revision A   Original Boards

1.3 Prizm Fiber Optic USB 2.0 Link Dash (-) Number Definitions:

Both the Local Host and the Remote Hub boards have dash numbers appended to the part number. This dash number identifies the specific board configurations:

201790-1310-001A   Local Host Board- 1310nm transmitter, dual fiber, singlemode fiber only.
201790-1330-001A   Local Host Board- 1330nm transmitter, dual fiber, singlemode fiber only.
201790-xxxx-002   Local Host Board- xxxx nm transmitter, dual fiber, singlemode fiber only, for use in a CWDM system.

201800-1330-001A   Remote Hub Board- 1330nm transmitter, dual fiber, singlemode fiber only.
201800-1530-001A   Remote Hub Board- 1530nm transmitter, dual fiber, singlemode fiber only.
201800-yyyy-002   Local Host Board- yyyy nm transmitter, dual fiber, singlemode fiber only, for use in a CWDM system.

1.4 Prizm Fiber Optic USB 2.0 Link Specifications:

Optical Link Rate: 600Mbps bi-directional typ.
USB Host: Supports host computers equipped with a USB 1.1 or 2.0 host controller.
USB Data Rate: Supports high-speed (480 Mbps), full-speed (12 Mbps), and low-speed (1.5 Mbps)
Fiber Option: Single or multimode, single or dual fiber
Laser Wavelengths: 1310, 1550, and other CWDM wavelengths
Optical Output Levels: 0dBm min., +2dBm typ.
Receiver Sensitivity: -34dBm typ., -32dBm max.
Receiver Saturation: -3dBm min.
Optical Budget: 32 dB min.

Misc.
Operating Temperature: 0 - 50° C, typ. Extended temperature versions also available.
Storage Temperature: -40 - +85° C typ.
Dimensions: 3.55 in x 3.775 in x 1.0 in
                             (90.17 mm x 95.885 mm x 25.4 mm)
Power Requirements: Host: +5 Volts at 0.5 Amps (2.5 Watts), maximum
                             Remote: +5 Volts at 0.5 Amps (2.5 Watts) no load,
                                        2.5 Amps (7.5 Watts) with 4 USB devices attached
                                        (0.5 Amps maximum per device)

2 Operation

2.1.1 Prizm Fiber Optic USB 2.0 Link Indicators, Controls and Connectors:

The following pertains to 201790-001 and 201800-001 versions only:

LEDS: There are a number of LEDs on both the Local Host and the Remote Hub boards. In addition to power indicators, there are status LEDs to indicate a valid board-to-board data link, as well as the connection of valid USB hosts and peripherals.

INDICATORS: The operation of these LEDs is detailed in Section 2.1.2.

SWITCHES: There are no user configurable switches.

JUMPERS: There are no user configurable jumpers.

CONNECTORS: The connectors are as follows:

Local Host Board (201790-001):	J3:	Power and Diagnostic Header
	J4:	RS-485 Diagnostic Header
	J5:	+5VDC 2-Pin Power Connector
	J6:	USB Type B Host Connector
	J7:	Display Header
Remote Hub Board (201800-001):	J3:	Power and Diagnostic Header
	J4:	USB Type A Peripheral Connector
	J5:	RS-485 Diagnostic Header
	J6:	USB Type A Peripheral Connector
	J7:	+5VDC 2-Pin Power Connector
	J8:	USB Type A Peripheral Connector
	J9:	USB Type A Peripheral Connector
	J10:	Display Header

The following pertains to 201790-002 and 201800-002 versions only:

LEDS: There are a number of LEDs on both the Local Host and the Remote Hub boards. In addition to power indicators, there are status LEDs to indicate a valid board-to-board data link, as well as the connection of valid USB hosts and peripherals.

INDICATORS: The operation of these LEDs is detailed in Section 2.1.2.

SWITCHES: There are no user configurable switches.

JUMPERS: There are no user configurable jumpers.

CONNECTORS: The connectors are as follows:

Host Board (201790-002): (10-00181)	J1:	+5VDC Barrel Power Connector
	J2:	Programming header (do not use)
	J4:	USB Type B Host Connector
	U7:	SFP Optical Module Connector
Remote Hub Board (201800-002): (10-00181)	J1:	+5VDC Barrel Power Connector
	J2:	Programming header (do not use)
	J4:	USB Type A Peripheral Connector
	J5:	USB Type A Peripheral Connector
	J6:	USB Type A Peripheral Connector
	J7:	USB Type A Peripheral Connector

2.1.2 Prizm Fiber Optic USB 2.0 Link LED Behavior During Operation

The following pertains to 201790-001 and 201800-001 versions only:

This section details the expected operation of the various LED's on the USB Local Host and Remote Hub boards during operation. Note that there are separate +5 and +3.3VDC LED's on each of the board. All of these LED's must be illuminated to achieve correct operation of the link.

Local Host Board (201790-001):

+5V Power Motherboard (D2 Top and D6)	- Lit GREEN to indicate power is available
+3.3V Power Motherboard (D5)	- Lit GREEN to indicate on-board 3.3V power supply is working
+5V Power Daughterboard (D7)	- Lit GREEN to indicate 5V power is available to the daughterboard header
Fiber Link (D2 Bottom)	- Tied to signal detect of the optical module. Lit green when there is sufficient optical power at the receiver.
USB Link (D1)	- Lit GREEN when Fiber Link is illuminated and communication is established with the Remote board.
Host Present (D3)	- Lit GREEN when USB Link is illuminated and a valid USB Host is plugged into J1.

Remote Hub Board (201800-001):

+5V Power Motherboard (D2 Top and D9)	- Lit GREEN to indicate power is available
+3.3V Power Motherboard (D5)	- Lit GREEN to indicate on-board 3.3V power supply is working
+5V Power Daughterboard (D7)	- Lit GREEN to indicate 5V power is available to the daughterboard header

Fiber Link (D1)   - Tied to signal detect of the optical module.
                                     Lit GREEN when there is sufficient optical
                                     power at the receiver.

USB Link (D2 Bottom)   - Lit GREEN when communication is established
                                     with the Host board and a valid USB host is
                                     connected to J1 of the Host Board. This LED will
                                     blink when a valid Host is present but no valid
                                     USB device is connected to the Remote hub.

Port 1 (D8)   - Lit GREEN when a valid USB 2.0 peripheral is
                                     plugged into J9 and USB Link is illuminated.

Port 2 (D5)   - Lit GREEN when a valid USB 2.0 peripheral is
                                     plugged into J8 and USB Link is illuminated.

Port 3 (D4)   - Lit GREEN when a valid USB 2.0 peripheral is
                                     plugged into J10 and USB Link is illuminated.

Port 4 (D3)   - Lit GREEN when a valid USB 2.0 peripheral is
                                     plugged into J11 and USB Link is illuminated.

The following pertains to 201790-002 and 201800-002 versions only:

This section details the expected operation of the various LED's on the USB Local Host and Remote
Hub boards during operation.

Local Host Board (201790-002):

"PWR", +5V Input Power (D3)   -Lit BLUE when DC power is applied either
                                      from USB Host or external 5V power source

"ACTIVITY", (D4)   -Blinks ORANGE once per second when external
                                     peripheral device is attached at Remote Hub
                                     board. Is off if no peripheral devices are attached
                                     at the Remote board.

"HOST", (D5)   -Lit GREEN when the Local Host and the Remote
                                     Hub are properly enumerated with the host PC
                                     and at least one peripheral device plugged into the
                                     Remote board. LED blinks when in no peripheral
                                     devices are plugged into Remote board.

"LINK", (D6)   -Lit GREEN when a communications link is
                                     established with the Remote board.

Remote Hub Board (201800-002):

"PWR", +5V Input Power (D2)   -Lit BLUE when DC power is applied
                                     From the external 5V power source

"ACTIVE", (D3)   -Blinks ORANGE once per second when external peripheral device is attached at Remote Hub board. Is off if no peripheral devices are attached at the Remote board.

"HOST", (D4)   -Lit GREEN when the Local Host and the Remote Hub are properly enumerated with the host PC and at least one peripheral device plugged into the Remote board. LED blinks when in no peripheral devices are plugged into Remote board.

"LINK", (D5)   -Lit GREEN when a communications link is established with the Remote board.

Port 1 (D7)   -Lit GREEN when a peripheral device is plugged into J4 and active and "LINK" is illuminated.
                                      -Lit ORANGE if overcurrent is detected and the attached device is attempting to draw more than 500mA current.

Port 2 (D10)   -Lit GREEN when a peripheral device is plugged into J5 and active and "LINK" is illuminated.
                                      -Lit ORANGE if overcurrent is detected and the attached device is attempting to draw more than 500mA current.

Port 3 (D14)   -Lit GREEN when a peripheral device is plugged into J6 and active and "LINK" is illuminated.
                                      -Lit ORANGE if overcurrent is detected and the attached device is attempting to draw more than 500mA current.

Port 4 (D15)   -Lit GREEN when a peripheral device is plugged into J7 and active and "LINK" is illuminated.
                                      -Lit ORANGE if overcurrent is detected and the attached device is attempting to draw more than 500mA current.

3   Prizm Fiber Optic USB 2.0 Link Adjustment and Troubleshooting

This section is meant to lend guidance while troubleshooting any problems that arise during operation of either the Local Host or Remote Hub boards.

3.1.1 Power Section Testing

The following pertains to 201790-001 and 201800-001 versions only:

If both the +5V Power LED and the +3.3V Power LED are out on the motherboard:
- Check for reversed polarity of power supply leads.
- Check for proper supply voltage (+5VDC min)
- Check for shorted power supply.

If only the +5V Power LED is out on the motherboard:
- Verify +5V DC is present at the source.
- If +5V is not available replace the board with a spare.
- If +5V is available check the +5V LED.

If only the +3.3V Power LED is out on the motherboard:
- Verify +5VDC across C10 (replace board if +5VDC is not available)
- Verify +3.3VDC across C7.
- If +3.3V is not available replace the board with a spare.
- If +3.3V is available check the +3.3V LED.

If both the +5V Power LED and the +3.3V Power LED are out on the daughterboard:
- Verify +5V DC is present at the source.

The following pertains to 201790-002 and 201800-002 versions only:

If the BLUE "PWR" LED is out on the board:
- Check for reversed polarity of power supply leads.
- Check for proper external supply voltage (+5VDC min)
- If the Host board, verify that the PC is turned on and the USB cable is attached
- Check for shorted power supply.

3.1.2 Optical Section Testing

If either Fiber Link light fails to illuminate after power has been applied to both boards and a fiber optic tether is placed between the Local Host and Remote Hub units, there is a problem with the optical link and one or more of the following conditions may be present.

- The fiber is broken or damaged.
- One of the optical transceiver modules is defective.
- Excessive light loss (low received optical power) is being experienced.
- The Prizm Fiber Optic USB 2.0 Link (not the optical transceiver module) is malfunctioning.

To determine if the fiber is broken, a laser module is out, or the board is malfunctioning, first:
- Check that the optical fiber cable is straight at connectors on board for minimum optic loss.
- Check the optical level with an optical power meter at each optical connection including any external CWDM's or sliprings.
- If the above steps do not yield a solution, one or both boards may be malfunctioning.   Try replacing each board with a spare unit.

3.1.3 Data Section Testing

If USB 2.0 data cannot be transmitted and received between the host and peripherals and the optic link has been verified, there is a problem with one or both Prizm boards. Based on the LEDs present on both boards, investigate the following:

- If one or both of the Fiber Link LEDs is not illuminated, refer to Section 3.1.2.
- If the USB Link LEDs do not illuminate on both boards as described in Section 2.1.2, verify that a USB 2.0 compliant Host and at least one USB 2.0 compliant peripheral are attached to their respective ends of the link. Also verify that both Fiber Link LEDs are illuminated.
- If the Host Present LED does not illuminate, verify that a USB 2.0 compliant Host is connected to the Local Host Board and that both Fiber Link and USB Link LEDs are illuminated.
- If a Port 1-4 LED does not illuminate when a valid peripheral device is attached to the corresponding port, verify that there is a valid USB 2.0 compliant host connected to the Local Host Board and that both the Fiber Link and USB Link LEDs are illuminated.
- If all LEDs behave as expected, but data cannot be carried across the link, examine any device drivers needed to correctly operate your USB device. Connect the USB peripheral directly to the Host device and verify proper operation. Then, reinsert the Prism USB Link and assess the status of the system again.

3.1.4 Link Troubleshooting

The following pertains to 201790-001 and 201800-001 versions only:

This section details some specific error modes that the USB2.0 Link may display during operation and lists some potential causes of each error state.

- Host LINK LED ON, Remote LINK LED Flashing: No valid peripheral device is connected to the Remote Hub. Connect a valid peripheral device to the Hub and verify that the Remote Link LED illuminates steadily.

- Host LINK LED ON, Remote LINK LED OFF: No USB2.0 Host computer is connected. Connect a USB2.0 Host computer to the Host board and verify that the Remote LINK LED lights either steadily or flashes periodically.
- Neither LINK LED or FIBER LED is illuminated: No fiber link is established. Verify the fiber link between the boards. (See Section 3.1.2)
- Host FIBER LED is illuminated but Remote FIBER LED is not: The Uplink fiber link is valid but the Downlink is not. Verify all components of the Downlink fiber path.
- Remote FIBER LED is illuminated but Host FIBER LED is not: The Downlink fiber link is valid but the Uplink is not. Verify all components of the Uplink fiber path.
- Host LINK LED is illuminated but Remote LINK, Host Present LED, and none of the four Remote Device Present LEDs are lit. This state typically occurs if the Remote Hub board loses power during operation. The Host board will sometimes need to be power cycled to restore a valid data link in this case.

4 Prizm Fiber Optic USB 2.0 Link Installation and Checkout

4.1 General Prizm Fiber Optic USB 2.0 Link Installation Notes

NOTE: Please read all of this section prior to starting the installation process.

Test Equipment Required:
1. A USB2.0 host and at least one peripheral device.
2. Fluke
3. Fiber optic power meter (optional)

4.2 Prizm Fiber Optic USB 2.0 Link Installation Checkout Procedure

1. If installing the USB2.0 boards in standard 3U VME racks, obtain a Moog Components Group supplied mounting plate assembly and slide the cards into available backplane slots. If installing the USB2.0 boards in a PC-104 configuration, insert boards into stack as desired. If using a standalone configuration, use the supplied mounting holes to secure the board in a system.

2. Supply power and ground to the boards using either a backplane or 16-gauge wire (or equivalent) (+5VDC @ 2.5 Amps minimum). Verify that the voltage is correct.

3. Connect a USB 2.0 compliant Host to the Local Host Board and at least one USB2.0 or 1.1 compatible peripheral to the Remote Hub Board.

4.3 Prizm Fiber Optic USB 2.0 Link System Installation Checkout Procedure

1. Connect optical fiber(s) between the Local Host and the Remote Hub board.

2. Turn the power on to both devices and verify that the +5V and +3.3V power LED's light on both motherboards and both daughtercards.

3. Connect a valid USB2.0 or 1.1 peripheral device to the Remote Hub.

4. Connect the USB Host board to a USB2.0 compatible host.

5. Using the USB 2.0 compliant host and USB2.0/1.1 peripherals, verify that data can be transferred correctly between devices. Operation of the peripherals should be completely transparent.

6. Verify operation of the various LEDs on both boards as described in Section 2.1.2.