OPERATING MANUAL

MODEL 7807

XMC PCI Express Carrier

Pentek, Inc.
One Park Way
Upper Saddle River, NJ 07458
(201) 818–5900
http://www.pentek.com

Manual Part No: 800.78070 Rev: 1.0 – November 6, 2015

Manual Revision History

Date	Revision	Comments
7/14/14	0.1	Initial release.
11/6/15	1.0	Sect 2.5.6, updated GPIO connector mating cable identifier.

Warranty

Pentek warrants that all products manufactured by Pentek conform to published Pentek specifications and are free from defects in materials and workmanship for a period of one year from the date of delivery when used under normal operating conditions and within the service conditions for which they were furnished. The obligation of Pentek arising from a warranty claim shall be limited to repairing or at its option, replacing without charge, any product that in Pentek's sole opinion proves to be defective within the scope of the warranty. Pentek must be notified in writing of the defect or nonconformity within the warranty period and the affected product returned to Pentek within thirty days after discovery of such defect or nonconformity. Buyer shall prepay shipping charges, taxes, duties and insurance for products returned to Pentek for warranty service. Pentek shall pay for the return of products to buyer except for products returned from another country.

Pentek shall have no responsibility for any defect or damage caused by improper installation, unauthorized modification, misuse, neglect, inadequate maintenance, or accident, or for any product that has been repaired or altered by anyone other than Pentek or its authorized representatives.

The warranty described above is buyer's sole and exclusive remedy and no other warranty, whether written or oral, is expressed or implied. Pentek specifically disclaims fitness for a particular purpose. Under no circumstances shall Pentek be liable for any direct, indirect, special, incidental, or consequential damages, expenses, losses or delays (including loss of profits) based on contract, tort, or any other legal theory.

Copyrights

Trademarks

Pentek, GateFlow, and ReadyFlow are registered trademarks or trademarks of Pentek, Inc.

PCI, PCI Express, PCIe, and PCI–SIG are trademarks or registered trademarks of PCI–SIG. PLX Technology and the PLX logo are registered trademarks of PLX Technology, Inc. FireFly is a trademark of Samtec, Inc.

Printed in the United States of America.

Table of Contents

Table of Contents

Page

This page is intentionally blank

Chapter 1: Model 7807 PCIe Carrier

1.1 General Description

The Pentek Model 7807 is a PCI Express® (PCIe®) carrier that accepts one Pentek XMC module. It attaches directly to motherboards with half or full length PCIe bus slots for installation in various PCs, blade servers, and computer systems. The 7807 Carrier offers a variety of I/O solutions including external Gigabit Serial connectors for additional XMC I/O and general purpose I/O for PMC P14.

1.2 Features

- Hosts one XMC module
- High−speed PCI Express interface up to x8
- Optional Dual Gigabit Ethernet interfaces
- Optional External Gigabit Serial I/O Interfaces for XMC interface
- General Purpose I/O for PMC P14 connectivity

1.3 Principle of Operation

The Model 7807 carrier is a baseboard for XMC modules, which conforms to the standard height, half−length PCI Express Add−In Card format as per PCI Express Electromechanical Specification, Rev. 2.0.

The 7807 XMC module site is equipped with a gigabit switched fabric connector (J15) to support an XMC module. This connector provides one x8 or two x4 full−duplex serial ports, allowing high−speed data transfer to and from the PCIe bus. An XMC secondary P16 connector is provided to support Xilinx Aurora, Serial RapidIO or PCIe interfaces. This connector provides two x4 Gigabit Serial I/O to two x4 full−duplex serial ports.

Two Samtec FireFly™ serial connectors (SER RX/TX) are included on the 7807 Carrier, providing access to both x4 gigabit serial paths from the XMC module. These connectors can be used for optical communication between XMC modules on multiple 7807 Carrier baseboards. This allows the connectors to support additional protocol installed on the XMC modules such as Xilinx Aurora or Serial RapidIO.

The PMC site provides a general purpose (GPIO) connector for user I/O to and from an installed module's P14 connector. This GPIO connector can also be used to support optional Gigabit Ethernet (GMII format).

1.4 Block Diagram

The following is a simplified block diagram of the Model 7807 PCI Express Carrier, showing the interface to Option 110 FireFly optical modules.

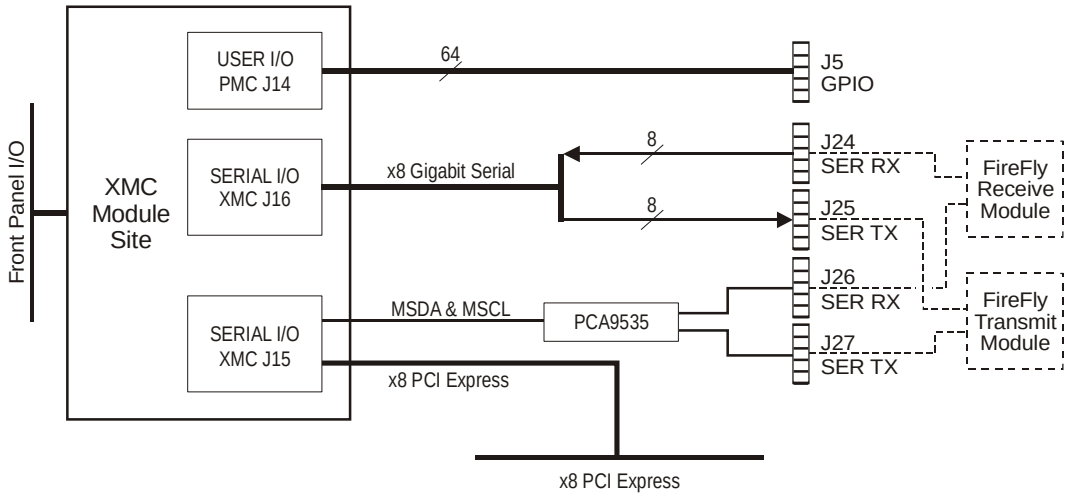


Figure 1–1: Model 7807 Carrier Board Block Diagram

1.5 Specifications

XMC Interface

Compliance:	VITA 42.0 XMC Standard
Primary XMC Connector:	**J15**
P15 Connectivity:	One x8 PCIe link direct to the PCIe bus XMC pins MSDA & MSCL connected to PCA9535 for control inputs to FireFly connectors
Speed:	PCIe link supports Gen3 data rates
Secondary XMC Connector:	**J16**
P16 Connectivity:	One x8 gigabit serial I/O link routed as follows: Eight serial receive lines directly wired from FireFly serial connector **J24** (**SER RX**) Eight serial transmit lines directly wired to FireFly serial connector **J25** (**SER TX**)
Speed:	x8 link supports data rates up to 5 Gbps
Protocol:	VITA 42.2 XMC Serial RapidIO Protocol VITA 42.3 XMC PCI Express Protocol VITA 42.5 Aurora Pin Assignments
High−Speed Serial Interface	
Standard:	Samtec FireFly copper connectors
Option 110:	Samtec FireFly active optical modules

PMC Interface

PMC Connector:	64−pin PMC standard connector, **J14**
J14 Connectivity:	Directly wired to **GPIO** connector to allow connectivity to XMC module **P14** connector for user I/O

Power

No Options:	6.35 Watts typ (9.31W max)

Physical (PCIe Half−length add−in card)

Height:	111.15 mm (4.376 in) (including connectors)
Length:	167.65 mm (6.60 in)
Weight:	110 grams (3.9 oz)

Environmental – Commercial

Operating Temperature:	0° to 50°C
Storage Temperature:	−20° to 90°C
Relative Humidity:	0 to 95% non−condensing

This page is intentionally blank

Chapter 2: Installation and Connections

2.1 Inspection

After unpacking, inspect the unit carefully for possible damage to connectors or components. If any damage is discovered, contact Pentek immediately at (201) 818–5900. Please save the shipping container and packing material in case reshipment is required.

The following figure illustrates the Model 7807 PCIe Carrier as shipped.

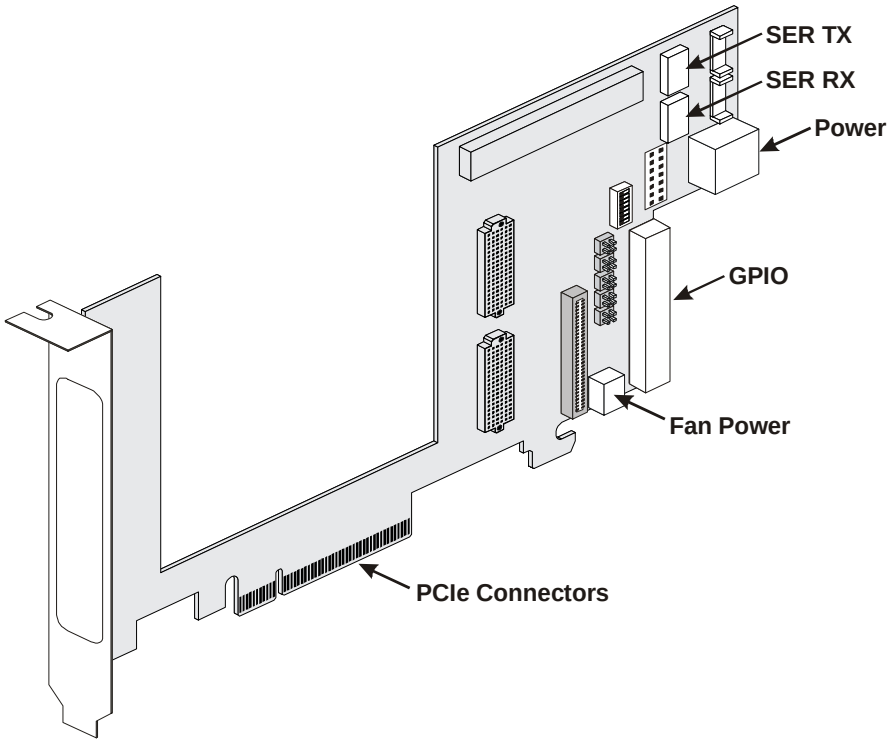


Figure 2–1: PCIe Carrier Assembly

As shipped from the factory, all jumpers and DIP switches are installed in default positions on your board. Refer to Section 2.2 for the jumper settings and Section 2.3 for the DIP switch settings on the 7807 PCIe Carrier PCB.

2.2 Carrier Jumper Settings

The following subsections describe user operating parameters that are set by shorting jumpers on the Model 7807 PCIe Carrier PCB. As shipped from the factory, several jumpers on the carrier PCB are installed in default positions on your board. These jumpers have been factory set for the configuration shipped. The default operating parameters they select may or may not meet your requirements. Before installing your 7807 onto a PCIe baseboard, review the following subsections to determine whether you need to change any of these settings.

The shorting jumpers used on the Model 7807 PCB are for 0.020" (0.51 mm) square pins spaced on 0.079" (2.00 mm) centers. These jumpers are NorComp part number 810–002–LP1R001, or equivalent. Pentek's part number for these jumpers is 356.00015.

The following shows the location of all jumpers and switches on the connector side of Model 7807 PCB. See Table 2–1 on the next page for description of these jumper blocks.

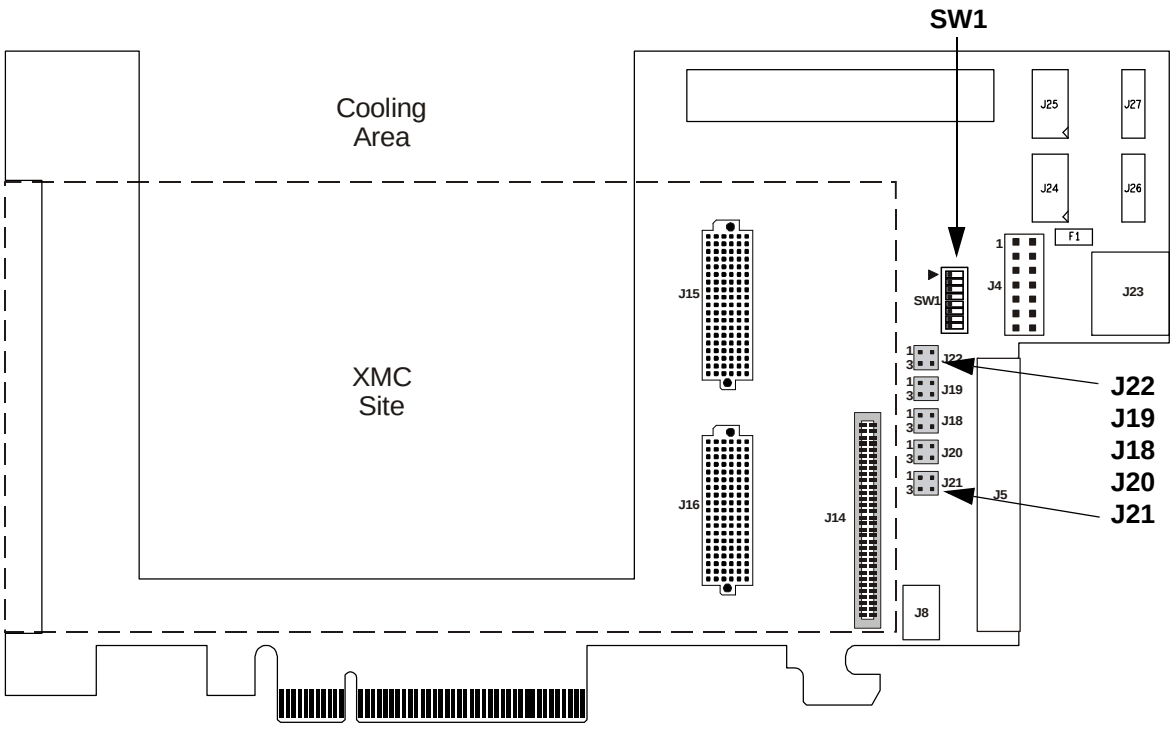


Figure 2–2: Model 7807 PCIe Carrier PCB Connector Side – Jumpers & Switches

Refer to Section 2.3 for the DIP switch settings on the carrier PCB.

2.2 Carrier Jumper Settings (continued)

Jumper blocks **J18, J19, j20, j21**, and **J22** select the signal source for JTAG operation, from either the carrier's **J4** JTAG connector (Section 2.5.2) or the carrier's PCIe connector. The following table shows the jumper settings.

Table 2–1: JTAG Signal Select – Jumper Blocks J18, J19, J20, J21, J22

Jumper Block	JTAG Signal	Jumper Pins	Signal Source
J18	TMS (Test Mode Select)	Pins 1 – 3 *	Use JTAG J4 connector TMS
		Pins 2 – 4	Use PCIE connector TMS
J19	TCK (Test Clock)	Pins 1 – 3 *	Use JTAG J4 connector TCK
		Pins 2 – 4	Use PCIE connector TCK
J20	TDI (Test Data In)	Pins 1 – 3 *	Use JTAG J4 connector TDI
		Pins 2 – 4	Use PCIE connector TDI
J21	TDO (Test Data Out)	Pins 1 – 3 *	Use JTAG J4 connector TDO
		Pins 2 – 4	Use PCIE connector TDO
J22	TRST (Test Reset)	Pins 1 – 3	Use JTAG J4 connector TRST_N
		Pins 2 – 4 *	Use PCIe connector PERST_N
* Factory Default Setting – For proper JTAG operation, all jumpers should be set to 1–3 except J22, which should be set to 2–4.			

The user should not change jumpers that are not described in these pages—these are reserved for factory test and setup purposes only.

2.3 Carrier Switch Settings

The following paragraphs describe operating parameters that are set by dipswitches on the Model 7807 carrier PCB. See Figure 2–2 for location of these switches on the PCB. Refer to Section 2.2 for the jumper settings on the carrier PCB.

As shipped from the factory, all switches on the carrier PCB are set in default positions on your board. These switches have been factory set for the configuration shipped. The default operating parameters they select may or may not meet your requirements. Before installing your 7807 assembly onto a PCIe baseboard, review the following table to determine whether you need to change any of these settings.

Dipswitch **SW1** selects XMC interface modes for the XMC module. The following table describes the different mode selections for each switch position.

Table 2–2: XMC Modes – Switch SW1

Switch	OFF Function	ON Function	Description
SW1–1	GA0 is pulled to 3.3V on the XMC connector *	Ties GA0 to GND on the XMC connector	Sets bit 0 of the XMC onboard EEPROM base address
SW1–2	GA1 is pulled to 3.3V on the XMC connector *	Ties GA1 to GND on the XMC connector	Sets bit 1 of the XMC onboard EEPROM base address
SW1–3	GA2 is pulled to 3.3V on the XMC connector *	Ties GA2 to GND on the XMC connector	Sets bit 2 of the XMC onboard EEPROM base address
SW1–4	MVMRO is pulled to 3.3V on the XMC connector *	Ties MVMRO on the XMC connector to GND	When MVMRO is pulled high to 3.3V, the XMC onboard EEPROM cannot be written to.
SW1–5	ROOT0 is pulled to 3.3V on the XMC connector *	Ties ROOT0 on the XMC connector to GND	When ROOT0 is pulled to GND, the XMC card can function as a root complex and assign base addresses to other devices on the PCI express and PCI buses
SW1–6	Not used		
SW1–7	Not used		
SW1–8	Not used		
* Factory Default Setting – all Switches OFF			

2.4 Carrier LEDs

The following paragraphs describe the LEDs, labeled **Dnn** on the solder side of the Model 7807 carrier PCB, that provide power operating status for the board.

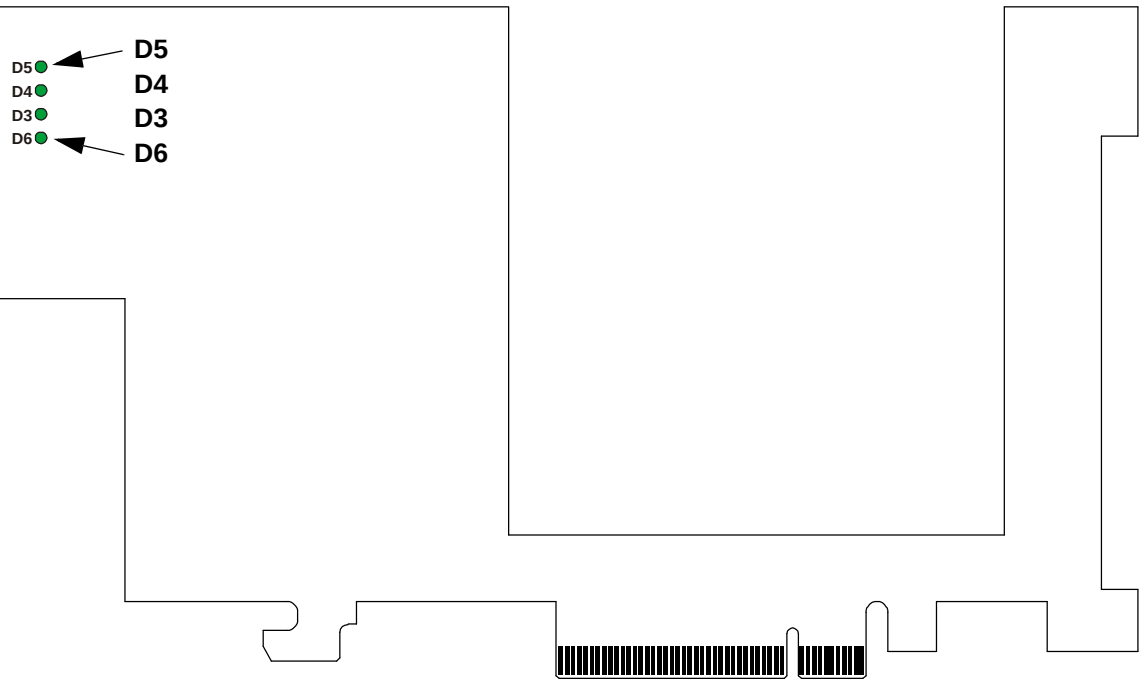


Figure 2–3: Model 7807 PCIe Carrier PCB Solder Side, LEDs

The following green LEDs indicate power applied to board resources.

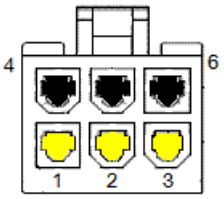
LED	USE
D3	Green LED indicates the presence of +12V at the 6–pin PCIe Power Connector (J23)
D4	Green LED indicates the presence of +3.3V from the PCIe bus (motherboard)
D5	Green LED indicates the presence of +3.3V from the onboard Power Supply
D6	Green LED indicates the presence of +12V after the Fuse **F1** *
* If D3 is illuminated and D6 is not, this indicates the fuse **F1** is blown.	

2.5 Carrier Connectors

The following subsections describe the power and signal connectors on the Model 7807 carrier. Refer to Figures 2–1 and 2–2 for location of the connectors on the PCB.

2.5.1 Power Connector

The PCIe Carrier uses a 6–pin power connector, labeled **J23**, to supply +12V power to the XMC module. This is a standard PCI Express power connector used in PCs with a PCI Express bus.



Pins 1, 2, and 3 are +12 VDC
Pins 4, 5, and 6 are ground

NOTE: You **must** provide a power source to this connector or the XMC module will not operate.

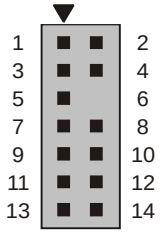
Pentek includes a PCIe to Molex adapter cable (part # 002.21790) with the Model 7807 shipment.

2.5.2 JTAG Connector

The JTAG **J4** connector provides a connection to download programs and to perform boundary–scan tests on PCIe carrier devices. This connector is reserved for Pentek factory use only. The pinout for this 14–pin header is given in the following table.

Table 2–3: JTAG J4 Connector

Signal	Pin Number		Pin Number	Signal
Gnd	1		2	+3.3 V
Gnd	3		4	TMS
Gnd	5		6	TCK
Gnd	7		8	TDO
Gnd	9		10	TDI
Gnd	11		12	TRST_N
Gnd	13		14	No Connection



2.5.3 Fan Connector

Connector **J8** on the PCIe carrier PCB provides a +12VDC power source for use by a cooling fan.

2.5 Carrier Connectors (continued)

The following is a simplified block diagram of the Model 7807 PCIe carrier.

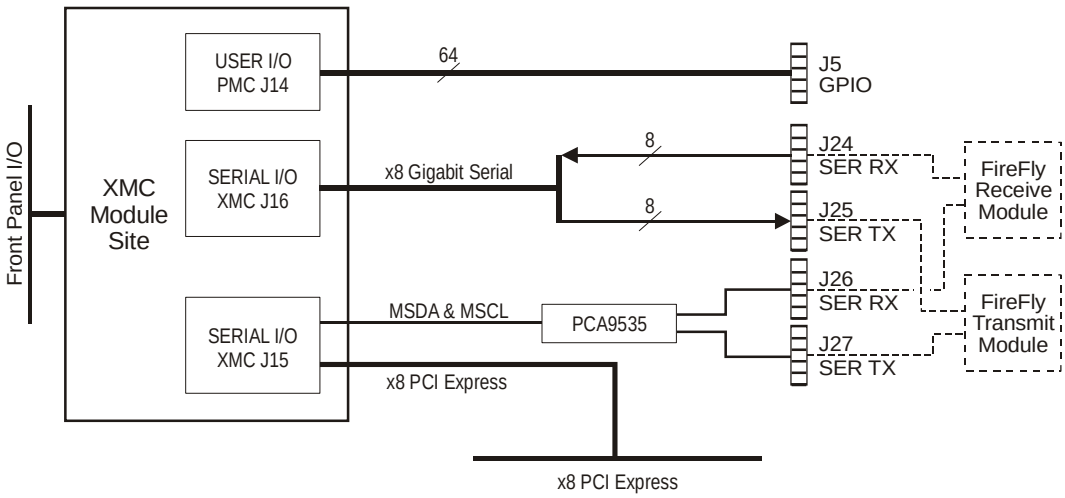


Figure 2–4: PCIe Carrier Block Diagram

2.5.4 XMC Connectors

The XMC site on the carrier provides two XMC connectors, designated **J15** and **J16**. These connectors follow the VITA 42.0 XMC Switched Mezzanine Card Auxiliary Standard and VITA 42.3 XMC PCI Express Protocol Standard.

- **J15** provides an x8 PCI Express link between the XMC module and the 7807 PCIe bus. For Option 110 optical interface, the XMC **J15 MSDA** and **MSCL** signals are used for control signals, through a Philips Semiconductors PCA9535 I/O Port, to the Samtec FireFly connectors. See Section 2.5.8 for the description of these control signals.

- **J16** provides separate data links to two Samtec FireFly connectors (**SER RX & SER TX**) to support x8 gigabit serial user I/O, as illustrated above. See Section 2.5.7 for the pin mapping for the **J16** to **SER** connections.

2.5.5 PMC Connector

The XMC site on the carrier also provides a 64–pin PMC connector, designated **J14** on the 7807 PCB. **J14** provides 64 pins defined as 'User I/O' to support custom PMC **P14** connectivity. These pins are routed to a 68–pin connector on the rear edge of the 7807 PCB, identified as **GPIO**. Refer to Section 2.5.6 for the pin mapping of the PMC **P14** to **GPIO** connections.

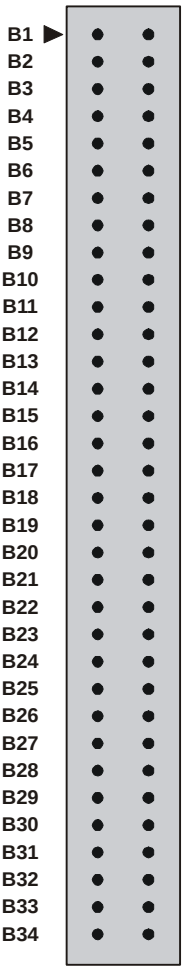
2.5 Carrier Connectors (continued)

2.5.6 GPIO Connector

A 68–pin **GPIO** connector, labeled **J5** on the PCB, provides user I/O from the PMC **P14** connector, as described in Section 2.5.5. Cables of various lengths with the mating connector are available: Pentek Model 2147. The mating connector alone is Model 2147–999. The table below shows the connector pinout.

Table 2–4: GPIO Connector Pins

PMC P4 Signal	Pin		Pin	PMC P4 Signal
GND	B1		A1	GND
PMC_P4_PIN_1	B2		A2	PMC_P4_PIN_3
PMC_P4_PIN_2	B3		A3	PMC_P4_PIN_4
PMC_P4_PIN_5	B4		A4	PMC_P4_PIN_7
PMC_P4_PIN_6	B5		A5	PMC_P4_PIN_8
PMC_P4_PIN_9	B6		A6	PMC_P4_PIN_11
PMC_P4_PIN_10	B7		A7	PMC_P4_PIN_12
PMC_P4_PIN_13	B8		A8	PMC_P4_PIN_15
PMC_P4_PIN_14	B9		A9	PMC_P4_PIN_16
PMC_P4_PIN_17	B10		A10	PMC_P4_PIN_19
PMC_P4_PIN_18	B11		A11	PMC_P4_PIN_20
PMC_P4_PIN_21	B12		A12	PMC_P4_PIN_23
PMC_P4_PIN_22	B13		A13	PMC_P4_PIN_24
PMC_P4_PIN_25	B14		A14	PMC_P4_PIN_27
PMC_P4_PIN_26	B15		A15	PMC_P4_PIN_28
PMC_P4_PIN_29	B16		A16	PMC_P4_PIN_31
PMC_P4_PIN_30	B17		A17	PMC_P4_PIN_32
PMC_P4_PIN_33	B18		A18	PMC_P4_PIN_35
PMC_P4_PIN_34	B19		A19	PMC_P4_PIN_36
PMC_P4_PIN_37	B20		A20	PMC_P4_PIN_39
PMC_P4_PIN_38	B21		A21	PMC_P4_PIN_40
PMC_P4_PIN_41	B22		A22	PMC_P4_PIN_43
PMC_P4_PIN_42	B23		A23	PMC_P4_PIN_44
PMC_P4_PIN_45	B24		A24	PMC_P4_PIN_47
PMC_P4_PIN_46	B25		A25	PMC_P4_PIN_48
PMC_P4_PIN_49	B26		A26	PMC_P4_PIN_51
PMC_P4_PIN_50	B27		A27	PMC_P4_PIN_52
PMC_P4_PIN_53	B28		A28	PMC_P4_PIN_55
PMC_P4_PIN_54	B29		A29	PMC_P4_PIN_56
PMC_P4_PIN_57	B30		A30	PMC_P4_PIN_59
PMC_P4_PIN_58	B31		A31	PMC_P4_PIN_60
PMC_P4_PIN_61	B32		A32	PMC_P4_PIN_63
PMC_P4_PIN_62	B33		A33	PMC_P4_PIN_64
GND	B34		A34	GND



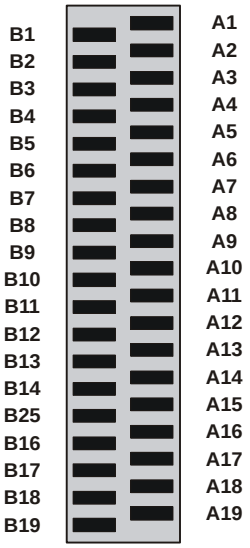
2.5 Carrier Connectors (continued)

2.5.7 Gigabit Serial I/O Connectors

Two Samtec FireFly™ PCB connectors, labeled **J24** and **J25**, provide gigabit serial I/O from the XMC **P16** connector, as described in Section 2.5.4. **J24** is **SER RX**, and **J25** is **SER TX**. The mating cable can be a FireFly copper cable, or, with Option 110, a FireFly active optical cable. The following tables show the pinouts of each connector.

Table 2–5: Serial I/O Connectors J24, J25 Pins

J24 – SER RX	J25 – SER TX	Pin		Pin	J25 – SER TX	J24 – SER RX
GND	GND	B1		A1	GND	GND
N/C	N/C	B2		A2	N/C	N/C
N/C	N/C	B3		A3	N/C	N/C
GND	GND	B4		A4	GND	GND
N/C	N/C	B5		A5	N/C	N/C
N/C	N/C	B6		A6	N/C	N/C
GND	GND	B7		A7	GND	GND
RX_DP_7+	TX_DP_7+	B8		A8	TX_DP_6+	RX_DP_6+
RX_DP_7–	TX_DP_7–	B9		A9	TX_DP_6–	RX_DP_6–
GND	GND	B10		A10	GND	GND
RX_DP_5+	TX_DP_5+	B11		A11	TX_DP_4+	RX_DP_4+
RX_DP_5–	TX_DP_5–	B12		A12	TX_DP_4–	RX_DP_4–
GND	GND	B13		A13	GND	GND
RX_DP_3+	TX_DP_3+	B14		A14	TX_DP_2+	RX_DP_2+
RX_DP_3–	TX_DP_3–	B15		A15	TX_DP_2–	RX_DP_2–
GND	GND	B16		A16	GND	GND
RX_DP_1+	TX_DP_1+	B17		A17	TX_DP_0+	RX_DP_0+
RX_DP_1–	TX_DP_1–	B18		A18	TX_DP_0–	RX_DP_0–
GND	GND	B19		A19	GND	GND



RX_DP_[0:7] – Serial Receive data from XMC P16 connector
TX_DP_[0:7] – Serial Transmit data from XMC P16 connector

Each of the FireFly I/O connectors has an associated power and control connector, which are described in Section 2.5.8 on the following page.

2.5 Carrier Connectors (continued)

2.5.8 Gigabit Serial Power & Control Connectors

Each of the FireFly connectors described in Section 2.5.7 has an associated power and control connector, labeled **J26** for **SER RX**, and **J27** for **SER TX**. These connectors provide power and control signals to the FireFly active optical modules when used for optical connections (Option 110).

NOTE: If a FireFly copper cable interface is used, these power and control signals are not used.

The following tables show the pinouts of each of these connectors, for the Samtec FireFly optical receive (**RX**) and transmit (**TX**) modules.

Table 2–6: Power & Control Connectors J26, J27 Pins

Pin	J26 – SER RX	J27 – SER TX
1	+3.3VCC	+3.3VCC
2	GND	GND
3	OPT_RX_PRESENTL	OPT_TX_PRESENTL
4	OPT_RX_SELECTL	OPT_TX_SELECTL
5	OPT_RX_INTL	OPT_TX_INTL
6	OPT_RX_RESETL	OPT_TX_RESETL
7	SDA	SDA
8	SCL	SCL
9	N/C	N/C
10	+3.3VCC	+3.3VCC

- The four OPT_RX_ and four OPT_TX_ signals are programmed from the TWSI (I^2C) interface of the XMC **J15** connector (XMC signals **MSDA** and **MSCL**), using a PCA9535 serial to parallel I/O port.

- The SDA and SCL signals are directly from the TWSI interface XMC **J15** connector (**MSDA** and **MSCL**).

Refer to Model 7807 Option 110 Addendum Manual, part # 800.78071, for description of the use and programming of these TWSI and control signals from the XMC module used on the 7807.

2.6 Installing XMC Module onto Model 7807 Carrier

1) Position your XMC module's front panel into the 7807 carrier's panel opening from behind the PCIe carrier slot panel.

2) Align the XMC module so that the connectors on the XMC card are aligned over the connectors on the PCIe carrier, illustrated below.

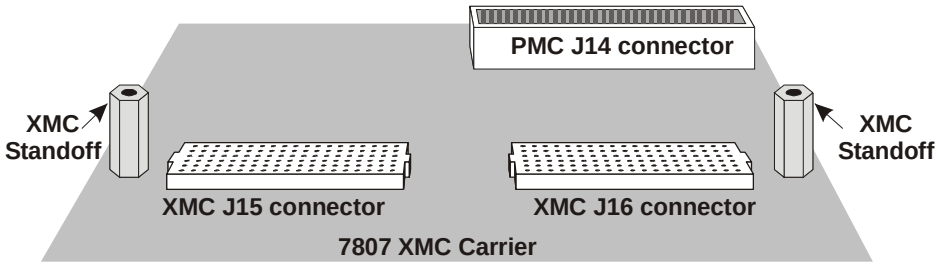


Figure 2–5: Carrier Connections

3) **GENTLY but firmly**, press down on the areas of the XMC opposite the connectors to fully seat the card's connectors into the carrier. The connectors on the XMC should connect smoothly with the corresponding connectors on the carrier.

4) From the solder side of the PCIe carrier, secure the XMC to the carrier by screwing the four pan–head Phillips mounting screws provided through the PCIe carrier into the XMC, as illustrated below.

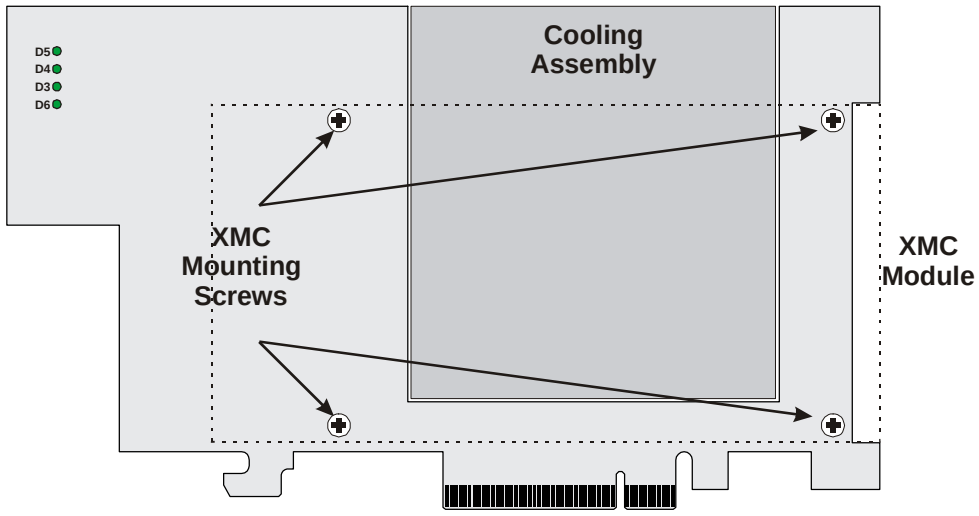


Figure 2–6: Carrier Mounting Screws

2.7 Installing the Model 7807 Carrier in a Personal Computer

The Model 7807 PCIe Carrier is designed to operate in personal computers that provide PCI Express card slots. This carrier conforms to the standard height PCI Express Add−In Card format as per PCI Express Electromechanical Specification, Rev. 2.0.

CAUTION

Perform this installation at a static−controlled work workstation.
Disconnect power from the PC before attempting to install this board.

1) Orient the personal computer on your static−controlled work surface such that the rear panel faces you, and remove the cover from the computer, to gain access to the PC's motherboard and its local bus connectors.

2) PCIe Bus connectors are usually black in color (as opposed to PCI bus connectors which are usually white, and VESA connectors which are usually brown), and are about 3½" long. Select a vacant x8 PCI express slot in which to install the Pentek 7800 assembly, and remove the blank expansion slot cover plate on the computer's rear panel located immediately to the RIGHT of the selected connector.

NOTE: The Model 7807 Carrier can also be installed in an x16 PCI Express slot, but will only use the x8 connections of that slot.

3) Before touching the Model 7807 Carrier, touch the case of your computer's power supply, to discharge any static electrical charge that may have accumulated on you. Then, remove the Model 7807 Carrier from its anti−static packaging.

4) Install the 7807 board's connecting edge into the selected PCIe expansion socket.

NOTE: Be certain that the card edge is properly aligned with the PCIe connector. Gentle downward pressure should be sufficient to fully seat the card edge in the connector.

DO NOT ATTEMPT TO FORCE THE CARD INTO THE SLOT!
If excessive force is necessary, then the card is probably misaligned. Damage to either the PC motherboard or the 7807 board will be the most likely result of attempts at forced installations.

5) The 7807 carrier board has a 6−pin power connector to supply the majority of power to the components (as illustrated in Section 2.5.1). This is a standard PCI Express power connector used in PCs with PCI Express buses. Plug a matching power connector from your PC's power supply into this power connector.

6) Secure the board to the PC chassis using a screw at the top of the PC slot panel.