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SCRAMNet®+ Network

Cabinet Kit
Hardware Reference

Document No. D-T-MR-CABKIT##-A-0-A4

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CE

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1. INTRODUCTION

1.1 How To Use This Manual

1.1.1 Purpose

This document is a reference manual for the SCRAMNet+ Cabinet Kits.

1.1.2 Scope

The information in this manual is intended for computer systems design and engineering personnel. You need at least a systems level understanding of general computer processing, memory and hardware operation and a systems level understanding of the specific host processor.

1.1.3 Style Conventions

- Called functions are italicized. For example, *OpenConnect()*
- Data types are italicized. For example, *int*
- Function parameters are bolded. For example, **Action**
- Path names are italicized. For example, *utility/sw/cfg*
- File names are bolded. For example, **config.c**
- Path file names are italicized and bolded. For example, ***utility/sw/cfg/config.c***
- Hexadecimal values are written with a "0x" prefix. For example, 0x7e
- For signals on hardware products, an 'Active Low' is represented by prefixing the signal name with a slash (/). For example, /SYNC
- Code and monitor screen displays of input and output are boxed and indented on a separate line. Text that represents user input is bolded. Text that the computer displays on the screen is not bolded. For example:

```
C:\ls
file1           file2               file3
```

- Large samples of code are Courier font, at least one size less than context, and are usually on a separate page or in an appendix.

1.2 Related Information

- *SCRAMNet+ SC150 Network PMC & ½ Length PCI Hardware Reference* (Doc. No. D-T-MR-PMC)
- *SCRAMNet+ Network VME6U Hardware Reference* (Doc. No. D-T-MR-VME6U)

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Systran's Quality System conforms to the ISO 9001 international standard for quality systems. ISO 9001 is the model for quality assurance in design, development, production, installation and servicing. The ISO 9001 standard addresses all 20 clauses of the ISO quality system, and the most comprehensive of the conformance standards.

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- Improve the quality of our operations to meet the needs of our customers, suppliers, and other stakeholders.
- Provide our employees with the tools and overall work environment to fulfill, maintain, and improve product and service quality.
- Ensure our customer and other stakeholders that only the highest quality product or service will be delivered.

The British Standards Institution (BSI), the world's largest and most respected standardization authority, assessed Systran's Quality System. BSI's Quality Assurance division certified we meet or exceed all applicable international standards, and issued Certificate of Registration, number FM 31468, on May 16, 1995. The scope of Systran's registration is: "Design, manufacture and service of high technology hardware and software computer communications products." The registration is maintained under BSI QA's bi-annual quality audit program.

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Technical documentation is provided with all of our products. This documentation describes the technology, its performance characteristics, and includes some typical applications. It also includes comprehensive support information, designed to answer any technical questions that might arise concerning the use of this product. We also publish and distribute technical briefs and application notes that cover a wide assortment of topics. Although we try to tailor the applications to real scenarios, not all possible circumstances are covered.

Although we have attempted to make this document comprehensive, you may have specific problems or issues this document does not satisfactorily cover. Our goal is to offer a combination of products and services that provide complete, easy-to-use solutions for your application.

If you have any technical or non-technical questions or comments, contact us. Hours of operation are from 8:00 a.m. to 5:00 p.m. Eastern Standard/Daylight Time.

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2. PRODUCT OVERVIEW

2.1 Overview

This manual discusses the Compact, Passive PMC, Expanded and direct-Attached P2 cabinet kits. Included are features, functions, installation considerations, and description of the operation. It also describes the fiber-optic and coax media cards and how they work.

2.2 Models

The SCRAMNet+ Network cabinet kits provide fiber-optic or coax-cable access to the node's connections while maintaining the shielding of the chassis

Systran provides a Compact cabinet kit, a Passive PMC Cabinet Kit, an Expanded cabinet kit and a Direct-Attached P2 Cabinet Kit.

- The Compact model is described in Chapter 4. It has one media card mounted on a cabinet kit board that is attached to a faceplate.
- The Passive PMC Cabinet Kit described in Chapter 5 is used with the SCRAMNet PMC card and does not use a media card.
- The Expanded model described in Chapter 6 has connections for up to two media cards providing the option of signal redundancy. This model has a VME P2 cabling option that permits connection to the cabinet kit board via the P2 backplane connection.
- The Direct-attached P2 cabinet kit shown in Chapter 7 provides an interface with the SCRAMNet+ host board using a separate board that attaches directly to P2 connector on the back of the VME6U board.

2.3 Features

2.3.1 LED Indicators

The cabinet kit has LED indicators that give the status of the node. These indicators vary according to the model, and may include the following indicators:

- Network loading
- Insertion status
- Carrier detection
- Message waiting
- Network error
- Native (own) message received
- Foreign message received

2.3.2 Media Cards

All cabinet kits except the Passive PMC Cabinet Kit can use either the fiber-optic or the coax media cards. The Passive PMC Cabinet Kit does not include a media card.

The Expanded cabinet kit can mix fiber-optic and coax media cards on the same board.

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3. MEDIA CARDS

3.1 Overview

The Media Card receives and transmits network messages. There are two types of Media Card; fiber-optic and coax. The Media Card can be used on all SCRAMNet host interface boards except SCRAMNet PMC, on all cabinet kit boards, and on the Quad Switch.

3.2 Fiber-optic Media Card

The fiber-optic Media Card receiver converts light signals to electronic signals and passes them to the host. The transmitter converts electronic signals to light signals and sends them on to the network.

The fiber-optic Media Card is available in standard fiber-optic (820 nm wavelength) for short distances and long fiber-optic (1300 nm wavelength) for long distances.

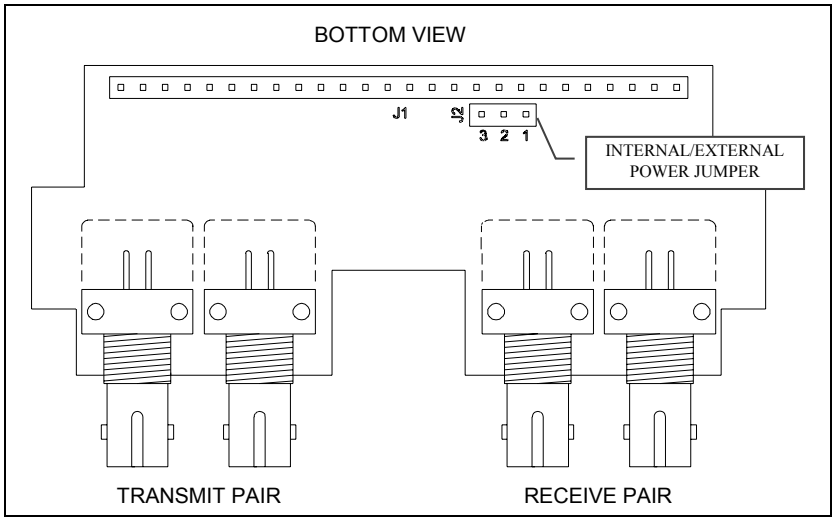


Figure 3-1 Fiber-optic Media Card

This fiber-optic card has two power options; host power and standby or battery power. Jumper J2 in Figure 3-1 controls the power options. Pins 1 and 2 are for normal host power, and pins 2 and 3 are for standby power. The standby or battery power requires external connection via the auxiliary connection on the cabinet kit board or the host interface board if no cabinet kit is installed.

3.3 Coax Media Card

This board receives and transmits messages over coaxial cable. The receive and transmit signals on the host side are 100 K ECL differential-level drive and sense.

The board, shown in Figure 3-2, can be configured to completely isolate the coaxial cables from the host, to connect to common (signal) ground, or to the chassis ground. It

can be powered by the host, standby (via the accessory connector), or phantom power. It can also be configured to supply the control signals to the Quad Switch (C version or higher) via phantom levels on the coax cables. (This eliminates the need for the auxiliary cable on the Quad Switch.)

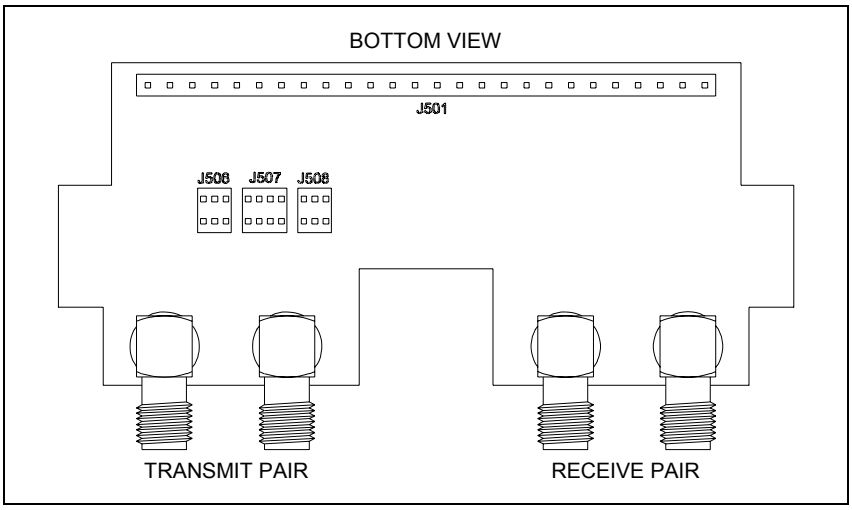
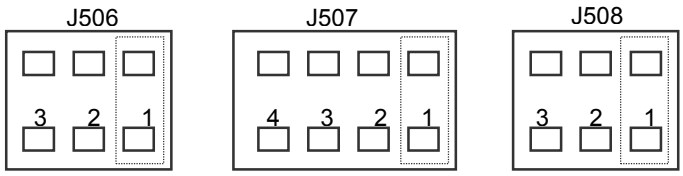


Figure 3-2 Coax Media Card

3.3.1 Modes of Operation

The jumpers are installed only from one row of the header to the other. Do not jump between two pins on the same side of the header.

ISOLATE MODE (Default for nodes)



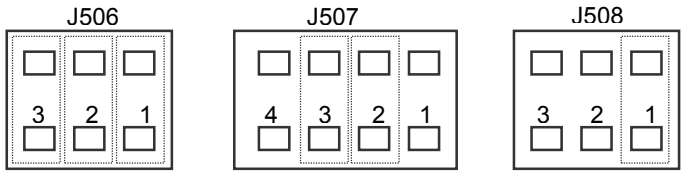
J506 jumper position 1
J507 jumper position 1
J508 jumper position 1

The coax outputs are transformer-coupled by high frequency baluns (line-balance converters), and this is the only connection between the host and the cables. This results in very high common-mode rejection and no ground loops between systems.

To tie the shields of the coax to circuit common (signal) ground, move the jumper on J506 to position 2

To tie the shields of the coax-to-chassis ground, move the jumper on J506 to position 3

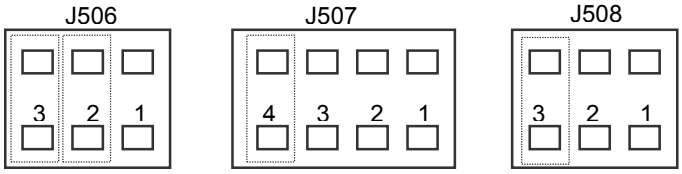
PHANTOM FO_RELAY MODE



Quad Switch End	Host End
J506 jumper position 1	J506 jumper position 2 (for shields-to-circuit common) **OR** J506 jumper position 3 (for shields-to-chassis common)
J507 jumper position 2	J507 jumper position 3
J508 jumper position 1	J508 jumper position 1

The FO_RELAY output is coupled by a low-pass filter to all the coax connectors' center conductors. This allows this "phantom" signal to be decoupled at the other end of the cables for control purposes. This is used by the Quad Switch ('C' version or higher) to eliminate the need for the accessory cable for control.

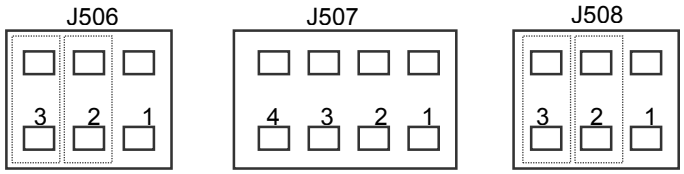
PHANTOM SUPPLY MODE



J506 jumper position 2 (for shields-to-circuit common) **OR**
J506 jumper position 3 (for shields-to-chassis common)
J507 jumper position 4
J508 jumper position 3

The Accessory External power is coupled by a low-pass filter to all the coax connectors' center conductors. This allows this "phantom" power to be decoupled at the other end of the cables for powering other devices. The primary purpose is to circulate a "backup" supply for other coax Media Cards that are attached to nodes that may lose power. Effectively, all the Accessory External power supplies of all the powered nodes are paralleled. Each powered node is capable of supplying power to its own Media Card plus two others, as a minimum.

BACKUP PHANTOM SUPPLY MODE



J506 jumper position 2 (for shields-to-circuit common) **OR**
J506 jumper position 3 (for shields-to-chassis common)
J507 jumper position none
J508 jumper position 2
J508 jumper position 3

This mode can be used alone or in conjunction with the Phantom supply mode. This mode routes the power coming into the accessory connector from an external supply (possibly a battery supply to the coax Media Card). This supply will be connected in parallel with others of its type and with the on-node "Accessory External supplies" if this is used in conjunction with the Phantom supply mode.

OTHER MODES



NOTE: There are other possible combinations that may be desired. Contact Systran for assistance because some combinations, other than those above, could be destructive.

3.4 Redundant Operation

Redundant operation requires two sets of Media Cards with two sets of dual fiber-optic cables connecting all nodes on the network ring. There are four transmitter lines and four receiver lines. This configuration ensures network ring message integrity on a node-to-node basis in the event of the failure of one Media Card.

Messages are always sent on both transmitters but only one receiver per node is selected to pull in data from the network to the node. Figure 3-3 shows the redundant transceiver configuration and data flow for the particular link selected. All nodes transmit on T1 and T2. Node A is receiving on R1, Node B on R2, and Node C on R1.

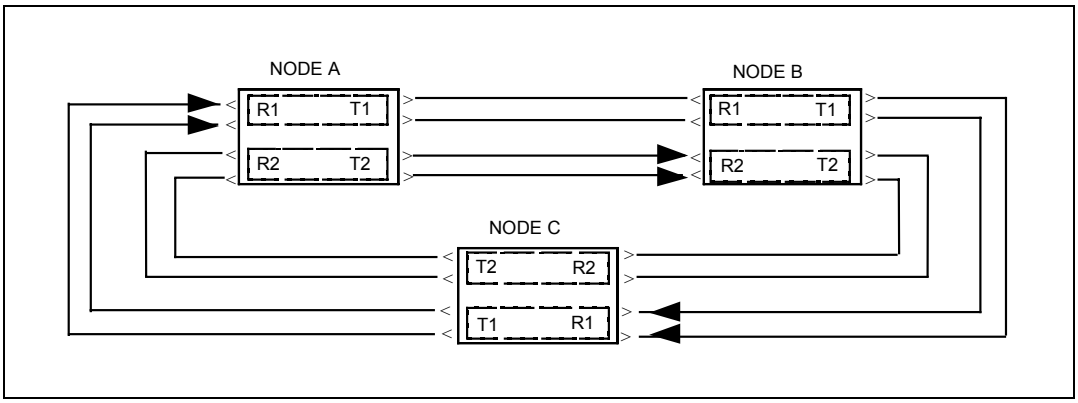


Figure 3-3 Redundant Transceiver Operation

Consider the three-node network configuration shown in Figure 3-3. If node A detects transmission errors from node C or its own receiver is failing, then node A will automatically switch to the alternate receiver. This does not disrupt the transmission to node B since both transmit lines are transmitting to both receivers. Only the receiver on node A is switched. Some incoming data to node A may be initially lost, but will be retransmitted by the originating node when its message does not return within the time-out range if error-correction protocol is used. Nodes B and C will continue to operate on the primary links.



NOTE: On power-up, it may be necessary for one node to transmit a message to establish carrier.

Figure 3-4 shows the P2 Cabinet Kit with dual Media Cards for redundant operation.

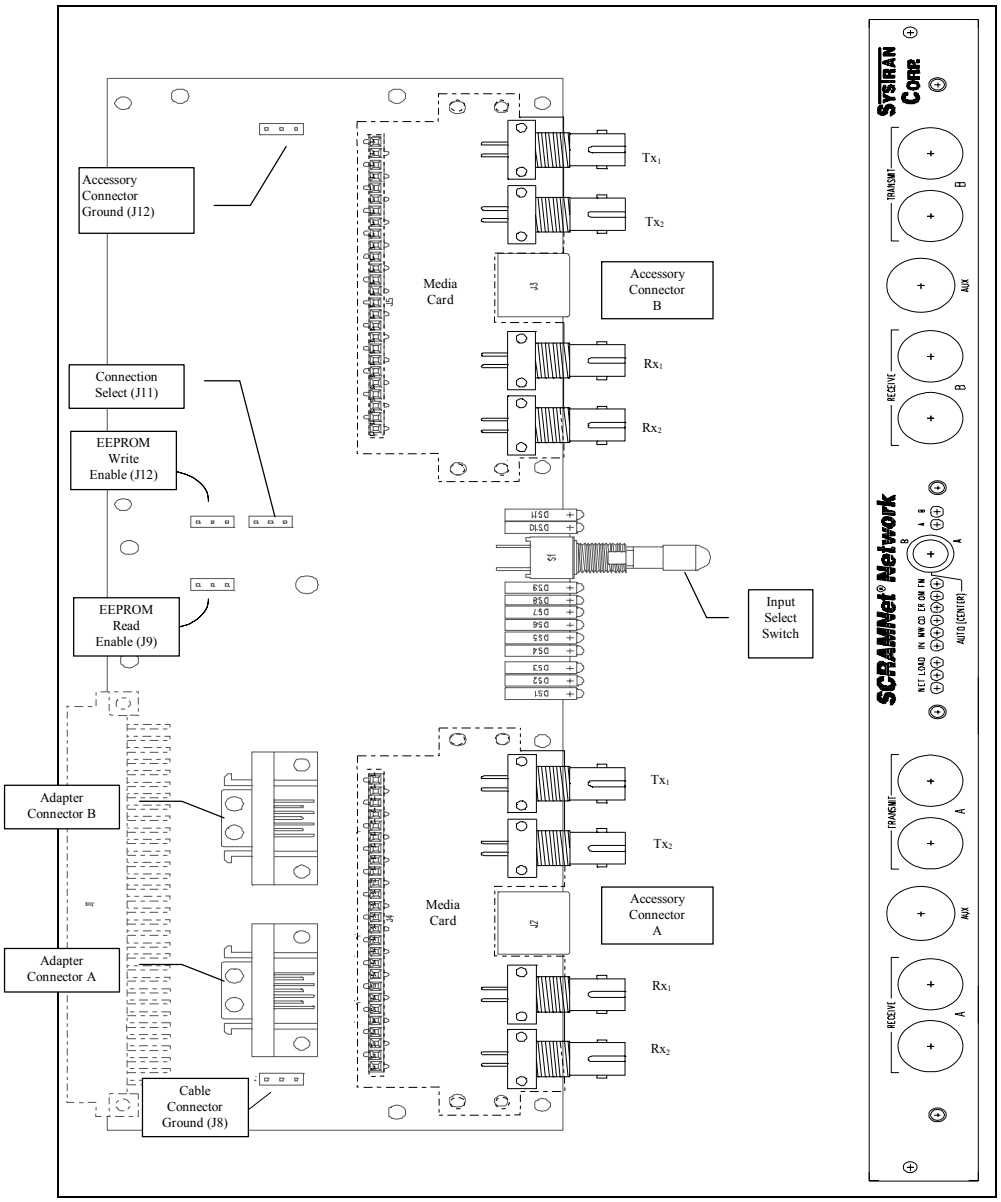


Figure 3-4 Cabinet Kit with Dual Media Cards

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4. COMPACT CABINET KIT

4.1 Overview

The Compact cabinet kit for the SCRAMNet+ Network board adapts the node to the host cabinet while maintaining the shielding of the chassis. The Compact cabinet kit consists of a bulkhead plate, a cabinet kit board, a media access card, a host adapter card, and connecting cables. The Compact cabinet kit extends the media card connection from the host interface board to the chassis bulkhead. LED indicators at the bulkhead plate remotely indicate the node's status.

The host interface board that is configured to work with the cabinet kit has no media card with transmitters or receivers. Instead, two 14-pin connectors and cables form an extension to the cabinet kit, and the media card is mounted on the cabinet kit board.

4.2 Description

The Compact cabinet kit offers the same features as if the media card were mounted on the host interface board and connected directly to the network. The main difference is the ability to operate with a closed cabinet. The Compact kit board has three net-load LEDs in addition to the LED indicator signals passed through from the host interface board.

4.2.1 Faceplates

The cabinet kit faceplates are customized for the vendor's computer cabinet. Figure 4-1 shows three examples of the Compact cabinet kit faceplates.

Table 4-1 Faceplate Abbreviations

Abbreviation	Description
AUX	Auxiliary connector. Allows connection to a Fiber-optic Bypass Switch, external trigger, and/or standby power.
CD, CARRIER DETECT	Indicates when the transceiver locks on to a carrier signal.
ER, ERROR	Indicates a network error has occurred. The LED will stay active until CSR1 is read.*
FM, FOREIGN MESSAGE	Indicates a message not originated by the node has been received.
IN, INSERT	Indicates the node is inserted into the network; able to send and receive messages.
NET LOAD	Three LEDs that indicate network loading by sequentially increasing blinking frequency until steady.
MESSAGE WAITING	Indicates a message is waiting to be transmitted.
OM, OWN MESSAGE	Indicates the originating node's message has been received having traversed the ring.
R, RECEIVE	Receiver connections.
T, TRANSMIT	Transmitter connections.
TE	See Message Waiting.
* See the CSR1 description in the SCRAMNet+ Network Hardware Reference manual for latched errors and warning conditions.	

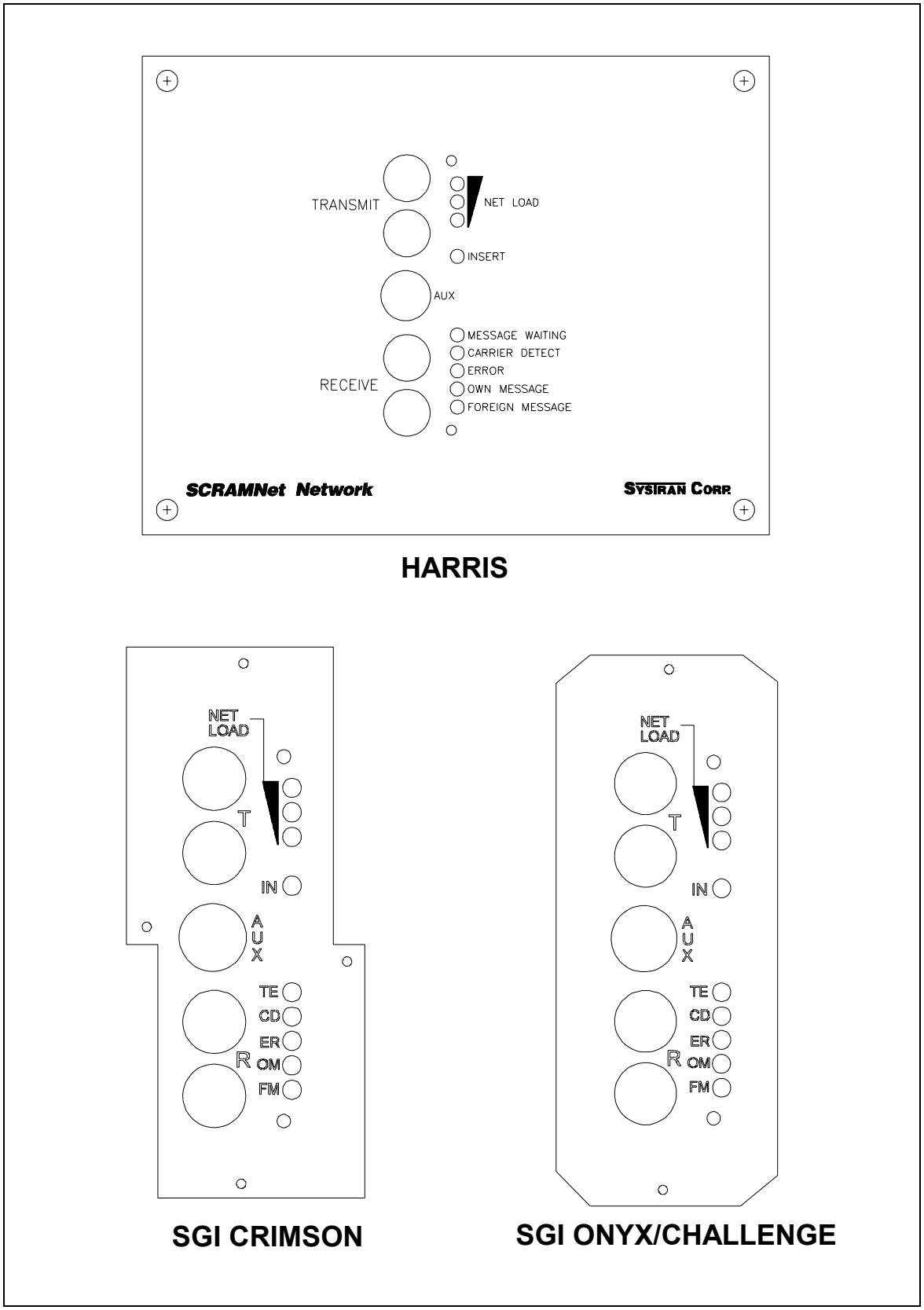


Figure 4-1 Faceplate Examples for Compact Cabinet Kit

4.2.2 LEDs

There are nine LED indicators on the cabinet kit board (Figure 4-1 and Figure 4-2):

NET LOAD LEDS

RATE 0 LED shows the low-end usage, RATE 1 displays intermediate usage, and RATE 2 indicates high usage. The frequency with which the indicators flicker shows a relative rate. When RATE 0 is steady, RATE1 begins. When RATE 1 increases to steady, RATE 2 starts blinking.

INSERT

The green INSERT LED shows that the node is part of the network and is capable of sending and receiving messages.

MESSAGE WAITING

This green LED indicates there is at least one native message waiting to be transmitted.

CARRIER DETECT

This green LED lights whenever the phase lock loop (PLL) detects and locks onto a valid carrier signal on its receive link.

ERROR

The yellow “error” LED stays active until CSR1 is read, and becomes active whenever any of the error or warning conditions with bits set in CSR1 occurs.

NATIVE MESSAGE

The green Native Message LED lights when the node originated the message received.

FOREIGN MESSAGE

The green Foreign Message LED becomes active when the message received is from another node.

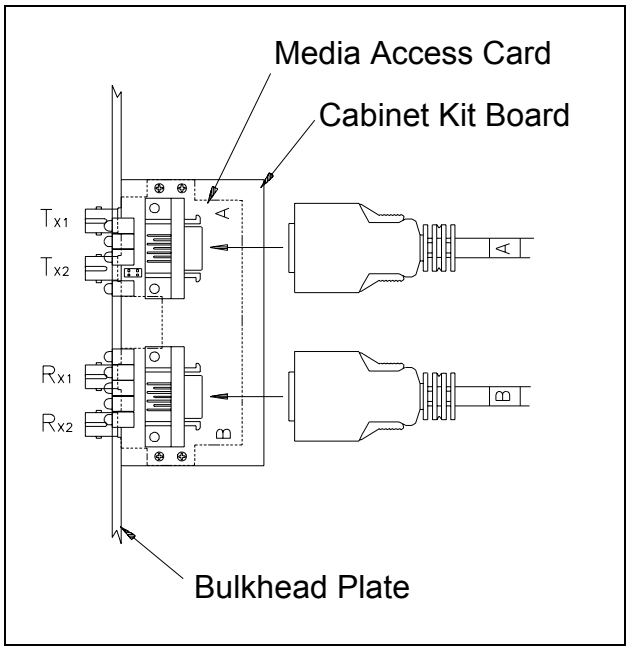


Figure 4-2 Compact Cabinet Kit Board

4.2.3 Auxiliary Connection

The Auxiliary Connection is used for communication with the Fiber-optic Bypass Switch, and provides access to the programmable trigger. The 8-pin modular in-line plug connection shown in Figure 4-3 is defined in Table 4-2.

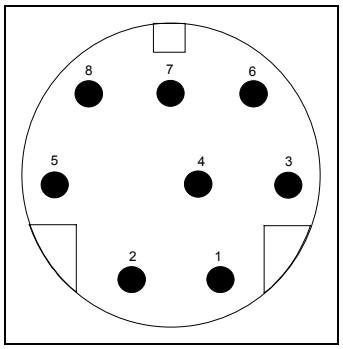


Figure 4-3 Auxiliary Connection

Table 4-2 Auxiliary Connection Pinout

Pin	Description
8	Backup +5 Vdc from External Device
7	Programmable Trigger
6	Serial Data Direction
5	+5 Vdc Source to External Device
4	Serial Data
3	Fiber-optic Relay Drive and Sense
2	Serial Clock
1	Logic Ground

4.2.4 Shield Ground Jumper

The jumper is located behind the transmitter connection as shown in Figure 4-4. Selecting the upper two pins for chassis ground (factory default) or the lower two pins for signal ground.

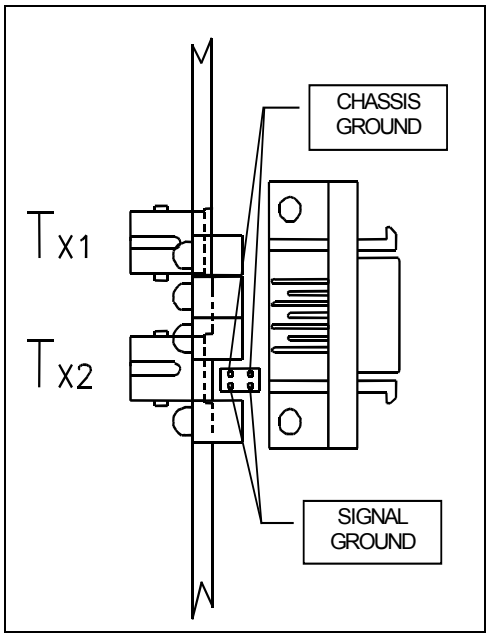


Figure 4-4 Cabinet Kit Jumper

4.3 Installation

4.3.1 Cabling

Connections between the cabinet kit bulkhead plate and the SCRAMNet+ host interface board are shown in Figure 4-5. Cable lengths vary depending upon the distance between the installed board's media card and the cabinet kit.

Connect cables between the cabinet kit host adapter board receiver (Rx_1 and Rx_2) and the cabinet kit board receiver (Rx_1 and Rx_2) connections; and the cabinet kit host adapter board transmitter (Tx_1 and Tx_2) with the cabinet kit board transmitter (Tx_1 and Tx_2) connections.



NOTE: It does not matter if Rx_1 or Rx_2 is connected to the bulkhead plate's Rx_1 or Rx_2 as long as both cables are connected to both of the Rx connectors. Likewise, Tx_1 and Tx_2 may be connected to the bulkhead plate's Tx_1 or Tx_2.

4.3.2 Media Card

The Media Card is mounted on the cabinet kit board so the transmitter and receiver connections extend through the bulkhead plate.

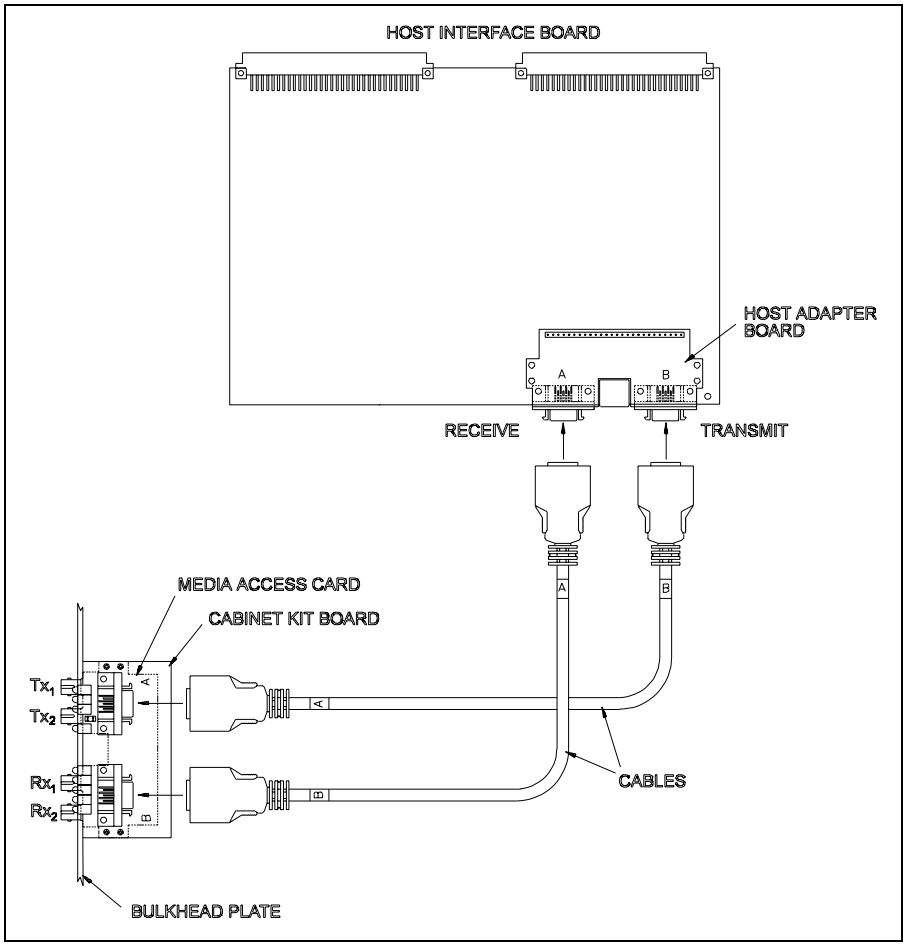


Figure 4-5 Compact Cabinet Kit Connection

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5. PASSIVE PMC CABINET KIT

5.1 Overview

This section discusses the Passive PMC Cabinet Kit, which is used with the SCRAMNet+ Network PMC card in an enclosed chassis.

5.2 Description

The Passive PMC Cabinet Kit for the SCRAMNet+ Network provides fiber-optic access to the node's connections, and maintains the shielding of the chassis. The Passive PMC Cabinet Kit consists of a bulkhead plate, an auxiliary connector cable and connecting fiber cables. The passive cabinet kit extends the fiber connections from the host interface board to the chassis bulkhead. The passive cabinet kit is shown in Figure 5-1.

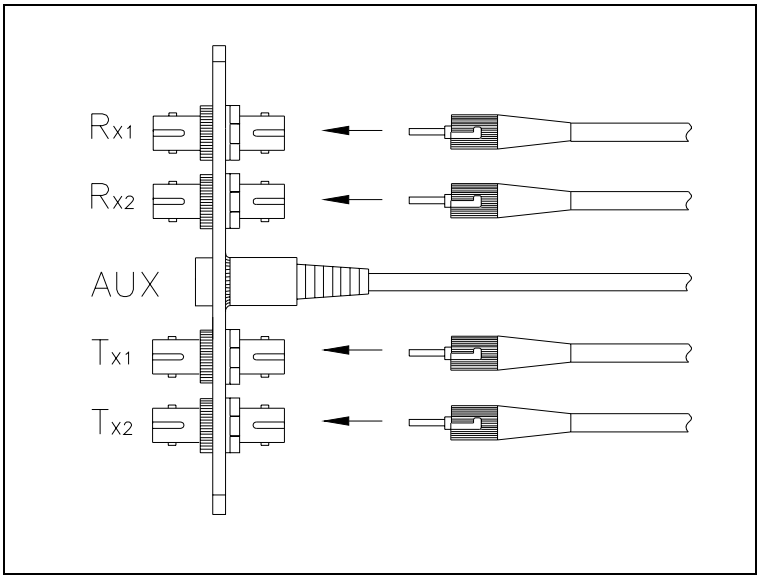


Figure 5-1 Bulkhead Plate Connections

Table 5-1 Faceplate Abbreviations

Abbreviation	Description
AUX	Auxiliary connector. Allows connection to a Fiber-optic Bypass Switch.
R_X	Receiver connections.
T_X	Transmitter connections.

5.3 Media Card

The Passive PMC Cabinet Kit does not include a media card.

5.4 Auxiliary Connection

The Auxiliary Connection is used for communication with the Fiber-optic Bypass Switch. The 8-pin modular in-line plug connection shown in Figure 5-2 is defined in Table 5-2.

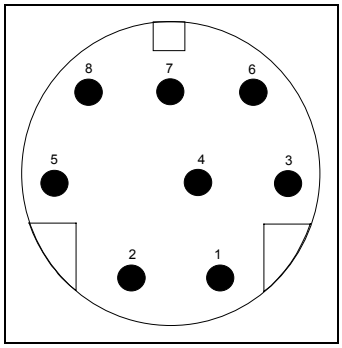


Figure 5-2 Auxiliary Connection

Table 5-2 Auxiliary Connection Pinout

Pin	Description
8	Unused
7	Unused
6	Unused
5	Backup +5 Vdc to External Device
4	Unused
3	Fiber-optic Relay Drive and Sense
2	Unused
1	Logic Ground

5.5 Cabling

Connections between the cabinet kit bulkhead plate and the SCRAMNet+ Network PMC host interface board are shown in Figure 5-3.

Connect cables between the PMC receiver (R_{x1} and R_{x2}) and the cabinet kit receiver (R_{x1} and R_{x2}) connections; and the PMC transmitter (T_{x1} and T_{x2}) with the cabinet kit transmitter (T_{x1} and T_{x2}) connections.



NOTE: It does not matter if R_{x1} or R_{x2} is connected to the bulkhead plate's R_{x1} or R_{x2} as long as both cables are connected to both of the R_x connectors. Likewise, T_{x1} and T_{x2} may be connected to the bulkhead plate's T_{x1} or T_{x2}.

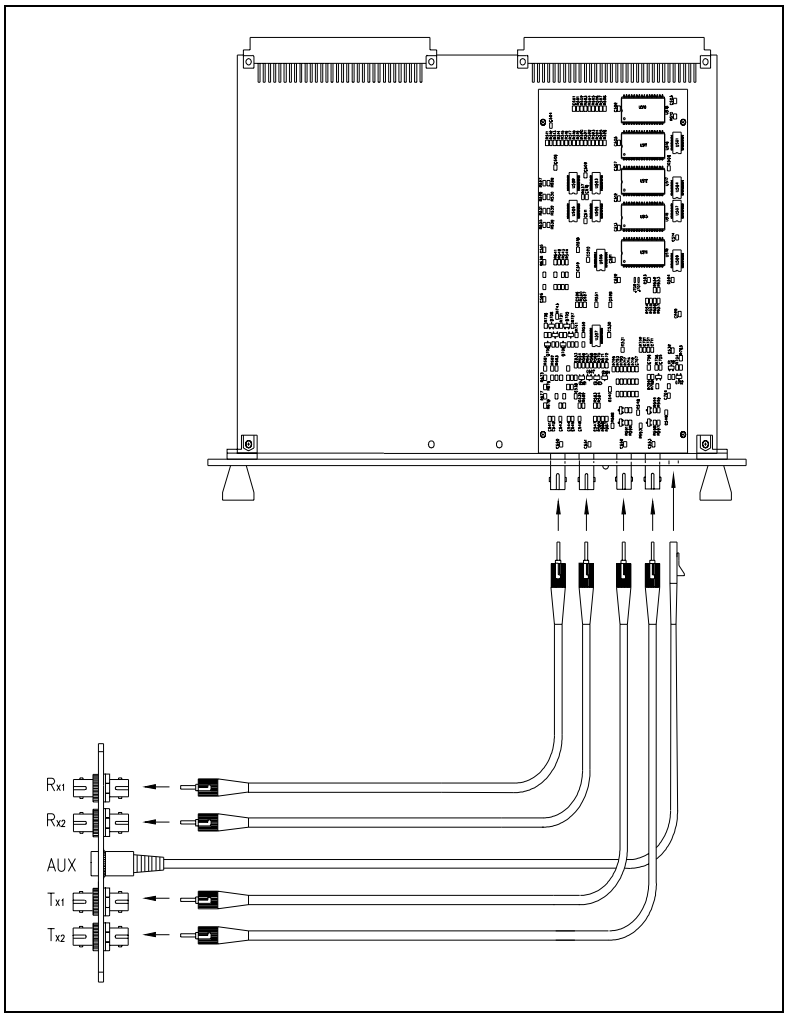


Figure 5-3 Passive PMC Cabinet Kit

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6. EXPANDED CABINET KIT

6.1 Overview

The Expanded Cabinet Kit board provides an interface with the SCRAMNet+ host interface board external to the computer cabinet. The Expanded Cabinet Kit offers added flexibility by providing two media card connectors and additional LEDs. The Expanded Cabinet Kit board can connect to the VME host interface board in two ways: via the host interface microwire (Micro D) connection or via the host interface P2 connection.

6.2 Description

The following features are shown in Figure 6-1:

- Remote EEPROM READ/WRITE enable/disable is provided through the P2 connector interface. The microwire interface does not provide this access.
- Dual media card ports provide redundant signal operation.
- Dual microwire accessory connectors.
- Input-select switch to access either link, or both links for redundant operation.
- Shield ground jumper options
- Eleven LED indicators.

6.2.1 Options

- J1 108-pin connector or Micro D connectors for interfacing to the VME SCRAMNet+ host board.
- Simplex or redundant signal operation.
- Fiber-optic or Coaxial cable media cards.

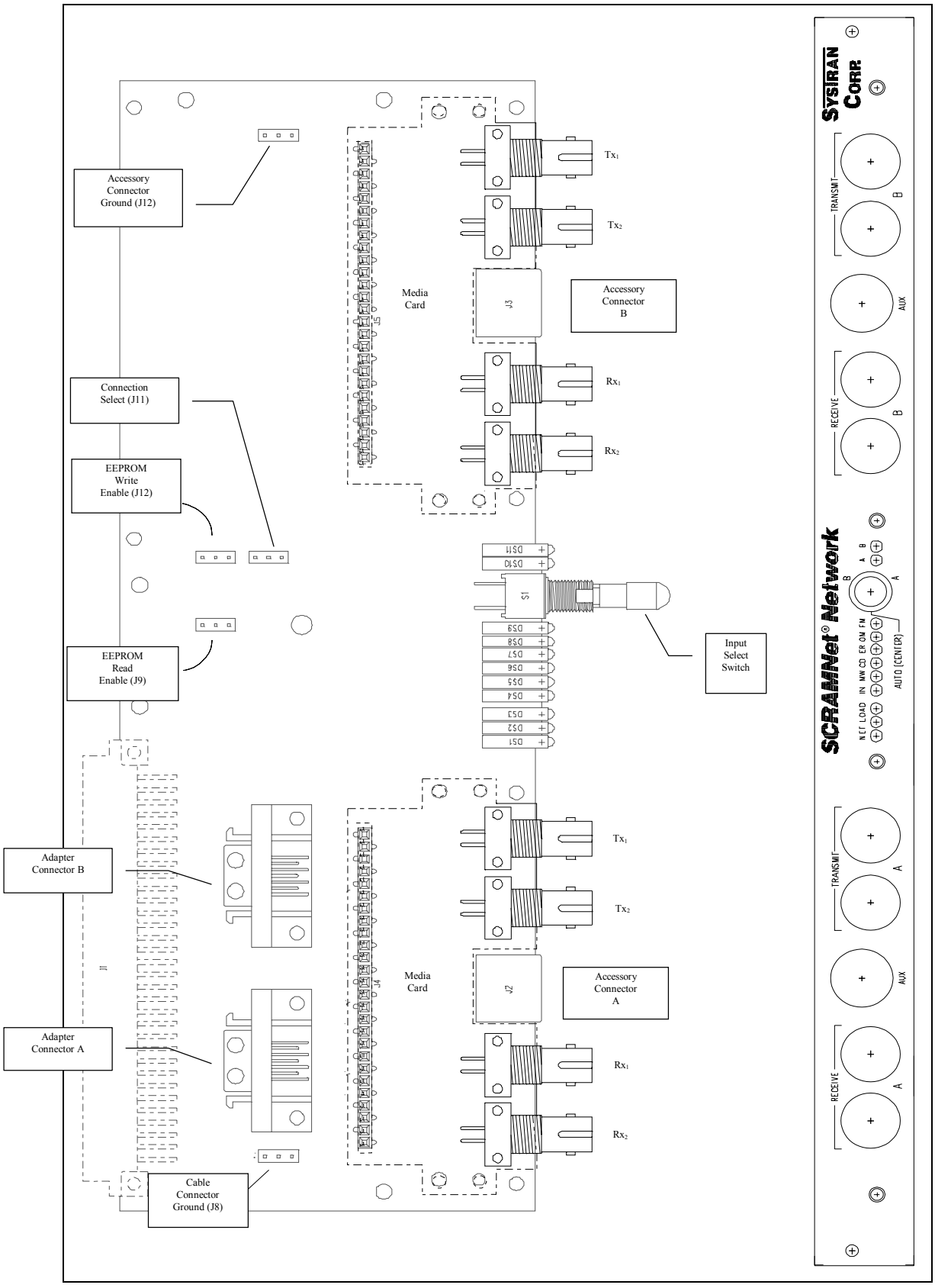


Figure 6-1 Expanded Cabinet Kit

6.2.2 LEDs

There are eleven LED indicators which provide an in-depth status of the network. The LEDs are shown in Figure 6-2.

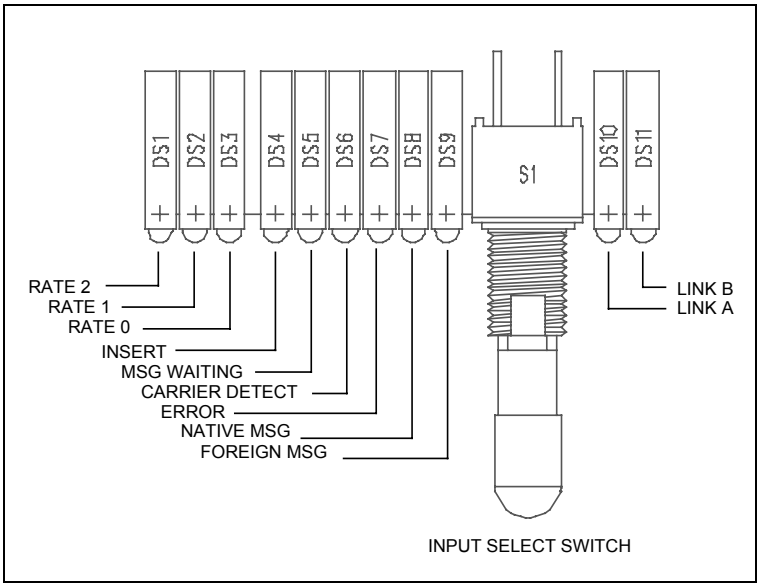


Figure 6-2 LED Indicators

NET LOAD LEDS

RATE 0 LED shows the low-end usage, RATE 1 displays intermediate usage, and RATE 2 indicates high usage. The frequency with which the indicators flicker shows a relative rate. When RATE 0 is steady, RATE1 begins. When RATE 1 increases to steady, RATE 2 starts blinking.

INSERT

The green INSERT LED shows that the node is part of the network and is capable of sending and receiving messages.

MSG WAITING

This green LED indicates there is at least one native message waiting to be transmitted.

CARRIER DETECT

This green LED lights whenever the phase lock loop (PLL) detects and locks onto a valid carrier signal on its receive link.

ERROR

The yellow “error” LED stays active until CSR1 is read, and becomes active whenever any of the error or warning conditions with bits set in CSR1 occur.

NATIVE MESSAGE

The green Native Message LED lights when the message received was originated by the node.

FOREIGN MESSAGE

The green Foreign Message LED becomes active when the message received is from another node.

LINK A

Indicates the signal is from the Link A media card receiver.

LINK B

Indicates the signal is from the Link B media card receiver.

6.2.3 Input Select Switch

This three-position switch determines the source of the signal. When in the up position, the media card receiver A signal is selected. In the down position, media card receiver B is selected. When the switch is in the "Auto" or center position, the appropriate input signal is selected from either A or B. If a "bad" signal is detected, the board automatically switches to the "good" signal.

6.2.4 Connectors

P2 CONNECTOR (J1)

If the P2 Connector is installed, the J6 and J7 adapters cannot be installed because they use the same circuitry. The P2 Connector permits ribbon-cable connection to the VME6U board.

ACCESSORY CONNECTOR A/B (J2/J3)

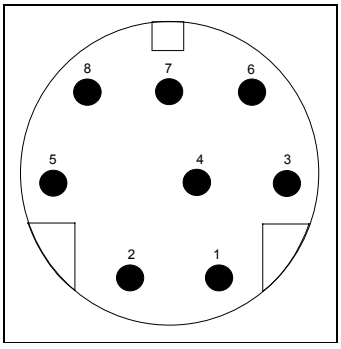


Figure 6-3 Auxiliary Connection

Table 6-1 Auxiliary Connection Pinout

Pin	Description
8	Backup +5 Vdc from External Device
7	Programmable Trigger
6	Serial Data Direction
5	+5 Vdc Source to External Device
4	Serial Data
3	Fiber-optic Relay Drive and Sense
2	Serial Clock
1	Logic Ground

There is an accessory connector for each of the two media cards. Both have the signals ground, vdd_out, back up +5 input, and fiber relay connected. However, only media card A has the serial port and trigger signals connected.

This is to avoid output conflict and transmission line problems resulting from the branching that could occur if both were connected.

MEDIA CARD CONNECTORS A (J4/J5)

Table 6-2 Media Card Plug

PIN	DESCRIPTION
26	Logic Ground
25	Logic High to Activate Mechanical Switch
24	Transmit Line 0 out -
23	Transmit Line 0 out +
22	Logic Ground
21	CD_LED
20	Transmit Line 1 out -
19	Transmit Line 1 out +
18	Logic -5 from System
17	Logic +5 from System
16	F.O. Relay Drive and Sense
15	Serial Direction to External Device
14	Serial Data to and from External Device
13	Trigger Data to External Device
12	Serial Clock Out to External Device
11	Backup +5 from External Device
10	+5 Source to External Device
9	Logic +5 from System
8	Receive Line 1 Input +
7	Receive Line 1 Input -
6	INSERT_LED
5	Logic Ground
4	Receive Line 0 Input +
3	Receive Line 0 Input -
2	Logic High to Select Link A, Low for B
1	Logic Ground

Either fiber-optic or coaxial media cards may be installed in either position.

ADAPTER CONNECTORS (J6/J7)

If the J6 and J7 adapters are installed, the P2 Connector cannot be installed because they use the same circuitry.

6.2.5 Jumpers

CABLE CONNECTOR GROUND (J8)

A common (1-2)/earth (2-3) jumper selection for the adapter shield and media card shields.

EEPROM READ ENABLE (J9)

EEPROM output-disable (1-2)/enable (2-3).

EEPROM WRITE ENABLE (J10)

EEPROM program-disable (1-2)/enable (2-3).

CONNECTION SELECT

Vdd select P2 connector (1-2) or micro-D ribbon connector (2-3).

ACCESSORY CONNECTOR GROUND (J12)

Accessory Connector shield ground; common (1-2) or earth (2-3).

6.3 INSTALLATION

6.3.1 Cabling Options

Installation of the Expanded Cabinet Kit requires reconfiguration of the SCRAMNet+ board. If the Expanded Cabinet Kit is to be connected to the host board via the Media Card host adapter, a media card with adapter connectors must be installed.

If the Expanded Cabinet Kit is to be connected via the VME6U P2 connector, a special adapter must be installed in place of the Media Card, and four 9-pin headers must be installed on the J5 jumper.

6.3.2 Media Card Adapter (MODCOMP) Connection

Figure 6-4 shows the Expanded Cabinet Kit connected to the host Media Card adapter via twisted-pair shielded cable.

6.3.3 P2 Connection

Configuration of the VME6U board for the P2 connection requires the following steps:

- Remove the Media Card, and install the CP2ADAPT to divert the signals that would normally go to the Media Card back into J8 (Figure 6-5).
- Install four 9-pin headers on jumper J5 to pass the signals to rows A and C of the J2/P2 connector (Figure 6-6).
- Connect the host VME6U board to the Expanded Cabinet Kit using a ribbon cable from the P2 connection of the VME backplane to J1 of the Expanded Cabinet Kit (Figure 6-7).

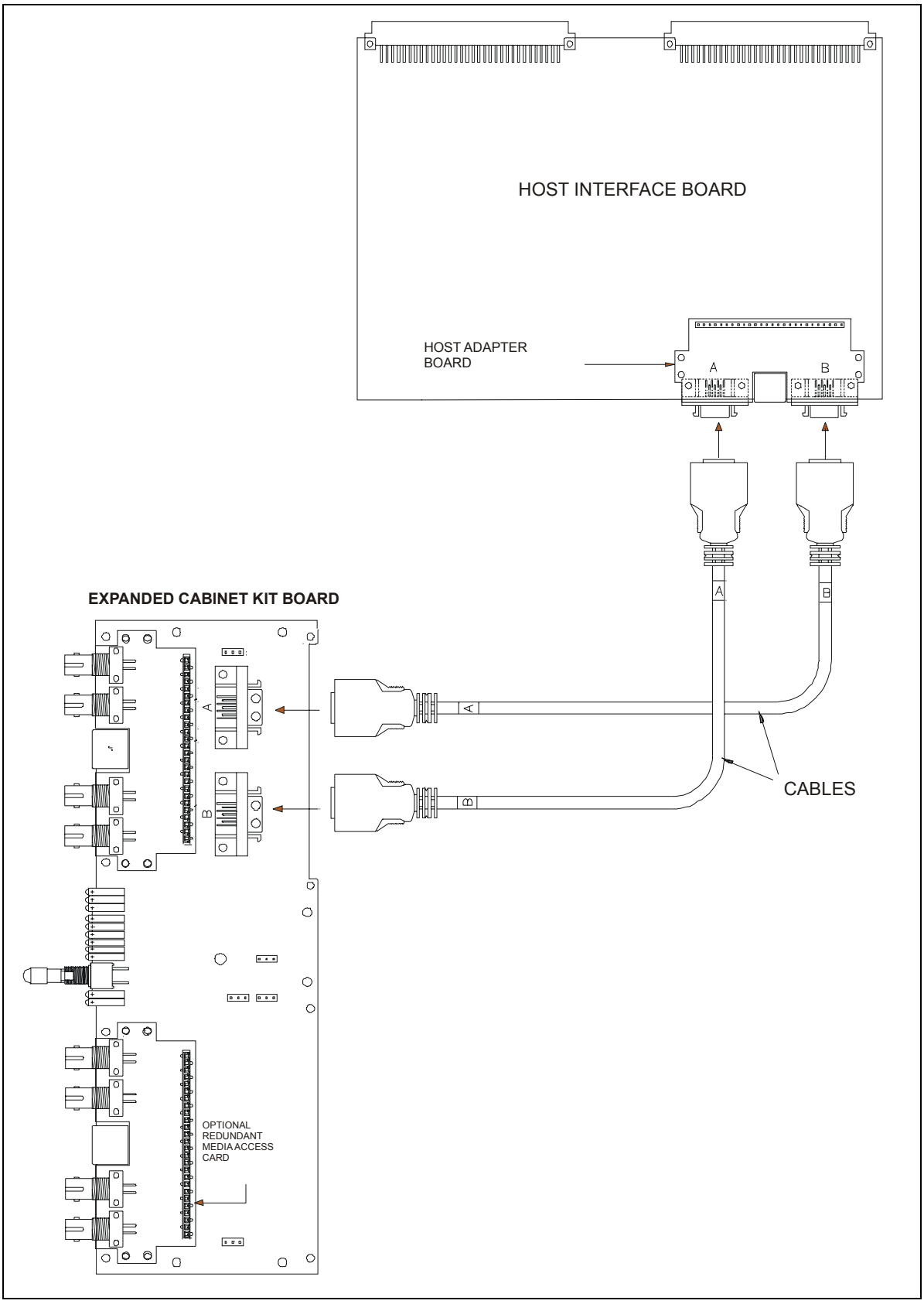


Figure 6-4 Expanded Cabinet Kit Connections

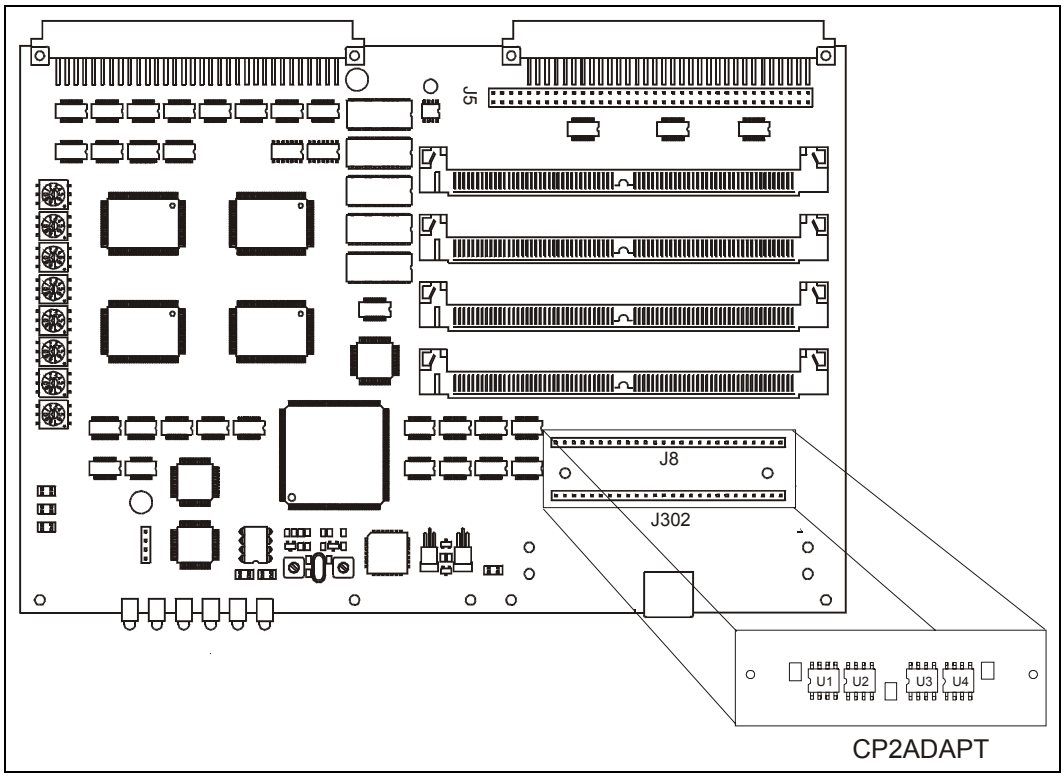


Figure 6-5 Install CP2ADAPT board

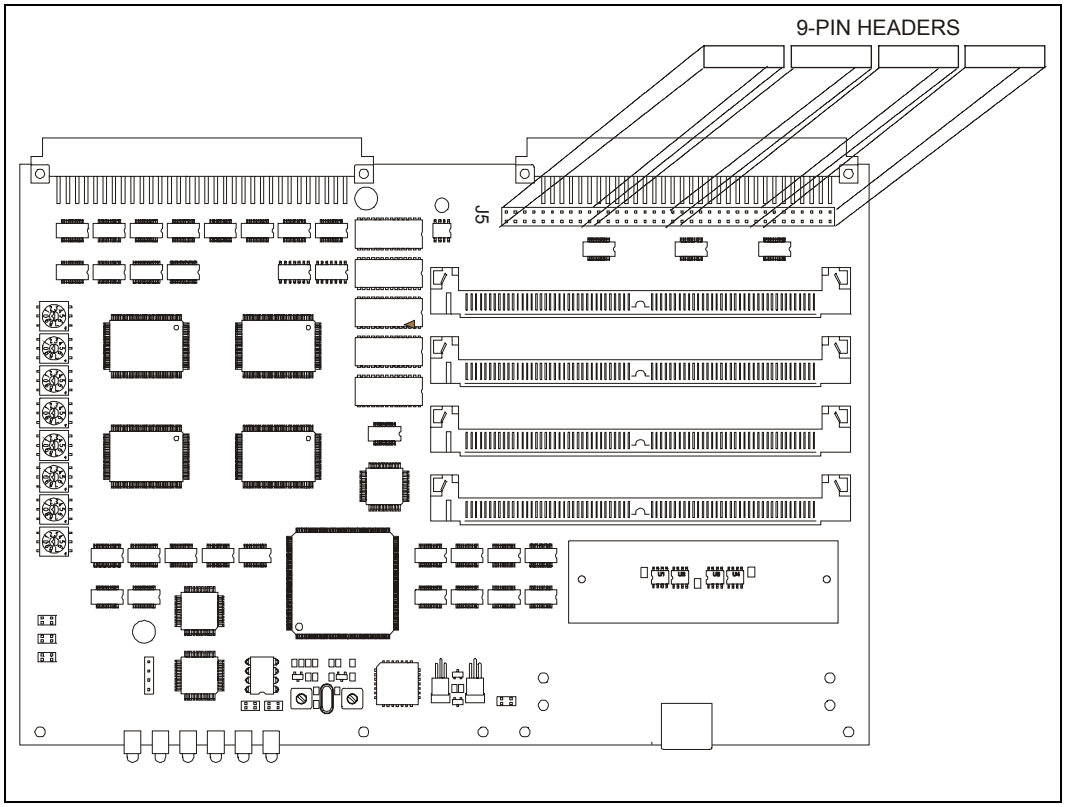


Figure 6-6 Install 9-pin Headers on J5

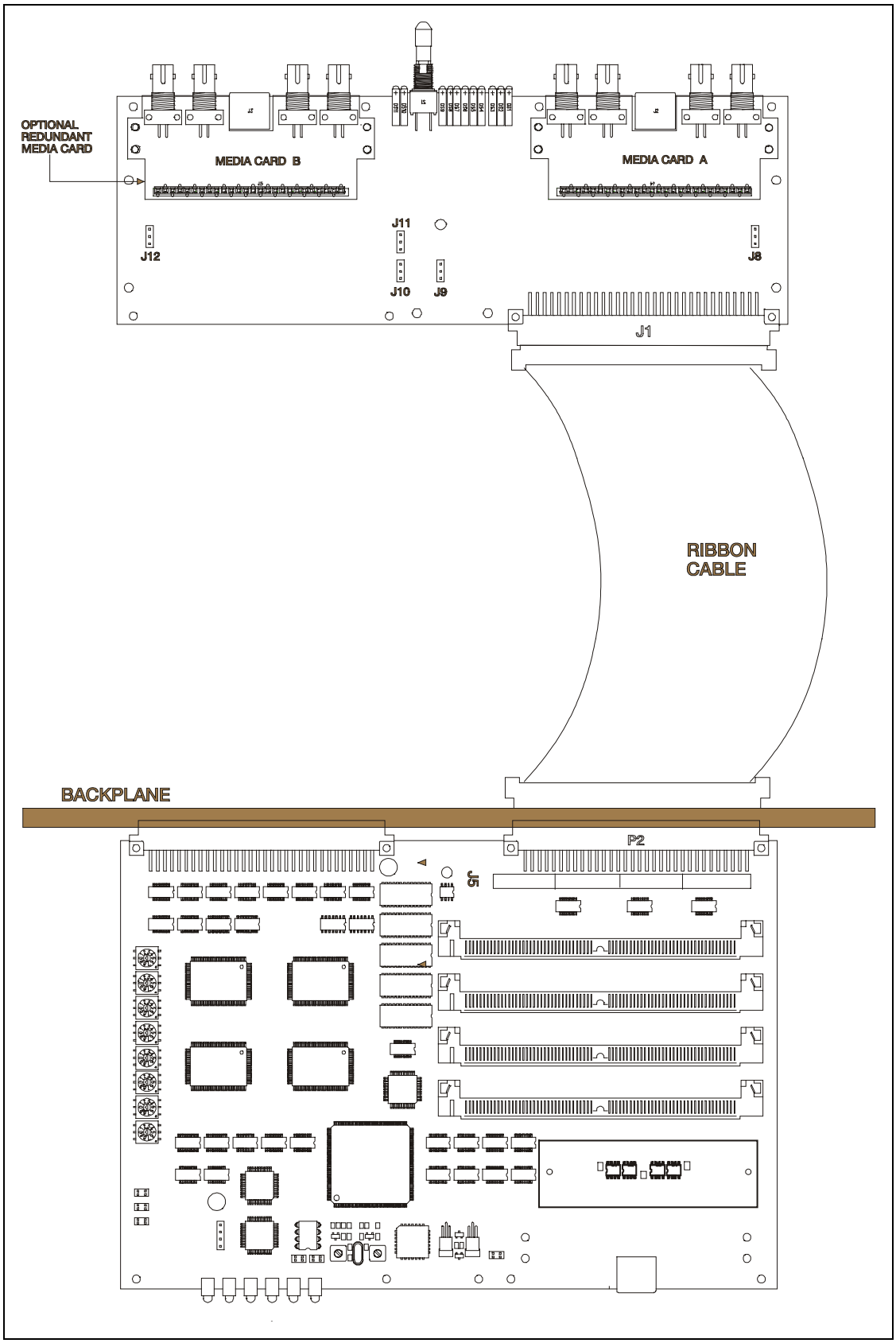


Figure 6-7 Connect Expanded Cabinet Kit to Host with Ribbon Cable

6.4 OPERATION

The Expanded Cabinet Kit has two possible interfaces to the VME host board. One is the P2 connector on the back of the VME6U board. The other is to the host adapter card. The board is built with either one connection or the other because the connectors are in the same physical place on the board.

6.4.1 P2 Interface

The P2 interface is via a twisted pair ribbon cable. The transmit and receive signals and accessory connector signals are sent across the cable as differential signals, each on a twisted pair. This minimizes the transmission line effects, cross-talk, EMC, EMI, and other parasitics. The EEPROM signals and the other control lines are single-ended and are paired with a ground. Being much slower and less critical, they do not require use of the differential mode. ECL drivers and receivers are used for the transmit and receive signals and RS485 transceivers are used for the accessory connector signals.

The microwire interface used for the EEPROM remoting has all the same jumper provisions on this board as on the VME host board. These are the enable/disable EEPROM READ, and enable/disable EEPROM WRITE.



CAUTION: If EEPROMs are installed on both the VME and on this board, then the data enable jumper must be set on only one of these boards, otherwise there will be output contention and resulting malfunction.

6.4.2 Host Adapter Interface

The host adapter interface is via a twisted pair shielded cable. The transmit and receive signals and the accessory connector signals are sent across the cable as differential signals each on a twisted pair. This minimizes the transmission line effects, cross-talk, EMC, EMI, and other parasitics.

The control lines are single ended and are paired with a ground. Being much slower and less critical they do not require the use the differential mode. ECL drivers and receivers are used for the transmit and receive signals, and RS485 transceivers are used for the accessory connector signals

The EEPROM signals are not handled by this interface and therefore the EEPROM cannot be affected remotely. This interface is interlocked with pins A5 and B5 on both connectors to prevent damage if the connectors are reversed.

6.4.3 Accessory Connector

There is an accessory connector for each of the two media card boards on the Expanded Cabinet Kit board. Both have the signal ground, vdd_out, back up +5 V input, and fiber-relay connected. However, only media card A has the serial port and trigger signals connected. This is to avoid output conflict and transmission line problems resulting from the branching that could occur if both were connected.

CURRENT-LIMITER CIRCUIT

The Vdd_out is a +5 V out with a current-limiter circuit. The circuit passes the current from the host system +5 V supply through six parallel-connected PNP power transistors.

The current-limiting is implemented by monitoring the emitter-collector drop on these transistors, and turning off the base drive for a time. This results in a “foldback”-type current limit where every few milliseconds the output is turned back on for a few microseconds. Therefore, as soon as the load decreases below the current limit, the full current will be restored.

This emitter-collector voltage drop is proportional to the current and to the junction temperature. Thus as the board’s ambient temperature increases (and thus the junction temperatures of the transistors), the current limit point will drop. At a nominal 25 degrees C, the current-limit point is approximately 2 amps. The average output current with a direct short is approximately 50 mA. The nominal timer values with a direct short are 4.5 ms off and 70 us on. These values are not critical because the circuit is there only to prevent catastrophic failure.

SERIAL COMMUNICATION PORTS

The serial communication port that is part of the accessory connector receives differential RS485 signals. These signals have 100 ohm termination’s to match the impedance of the cable. After passing through the receivers, the signals are de-multiplexed, providing the signals described in Table 6-3. All these signals drive LEDs on the P2 board.

Table 6-3 De-multiplexed Signals

SIGNAL	DEFINITION
own_msg_led	Indicates that the last message received originated with this node (native message)
cd_led	Carrier detected
error_led	Error occurred
fgn_msg_led	Indicates that the last message received originated with another node (foreign message)
insert_led	Indicates this node is inserted into the ring
~txfifo_e_led	Indicates there are native messages pending transmission (~ means ‘not’)
link_a_b	Indicates which Media Card receiver is presently being used. Selects which of the two Media Card receive signals is sent to the VME host board
rate_0	LSB of network bandwidth usage indicator
rate_1	Intermediate usage indicator
rate_2	MSB of network bandwidth usage indicator

RATE OUTPUT

The rate outputs are actually taps 13, 10, and 7 on a 13-bit binary counter. The input to the counter is a tick for every 32 words of data received by the node. The counter is cleared every 500 ms to avoid all rate lights remaining on for long periods of time under very low bandwidth conditions.

INPUT SELECT SWITCH

The appropriate input, A or B, is chosen by the link_a_b line when the three position switch is in the center position. In the other two positions the switch forces the multiplexer into either selecting A or B input.

7. DIRECT-ATTACHED P2 CABINET KIT

7.1 Overview

The Direct-Attached P2 cabinet kit provides an interface with the SCRAMNet+ host board via the P2 connector on the back of the VME6U board. It attaches directly to the connector with no intermediate cable. The kit consists of a cabinet-kit board and a DIN 41612-connector shell and screws to adapt the backside of the VME backplane for connection to this board. There is a single connector on the board for a fiber-optic or coax media card; or a host-adapter board (See 7.4 Installation.)

7.1.1 Description

Direct-Attached P2 Cabinet Kit offers the following features:

- Access to the SCRAMNet+ VME6U board from the VME backplane P2 connection
- Optional fiber-optic (Long Link or Standard), coax media card, or host-adapter card (CP2ADAPT)

7.1.2 P2 Connection

Configuration of the SCRAMNet+ VME6U board for the P2 connection requires the following steps:

- Remove the Media Card from the SCRAMNet+ VME6U board, and install the CP2ADAPT to divert the signals that would normally go to the Media Card back into J8 (Figure 7-1).
- Install four 9-pin headers on jumper J5 to pass the signals to rows A and C of the J2/P2 connector (Figure 7-2).

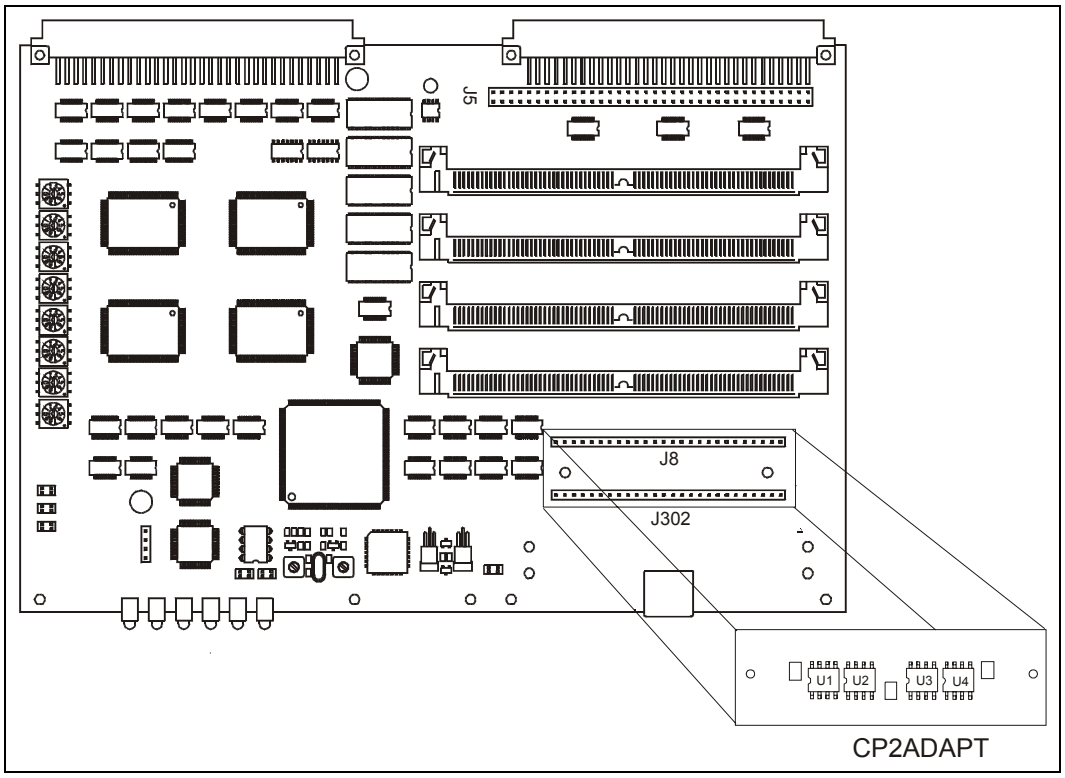


Figure 7-1 Install CP2ADAPT board

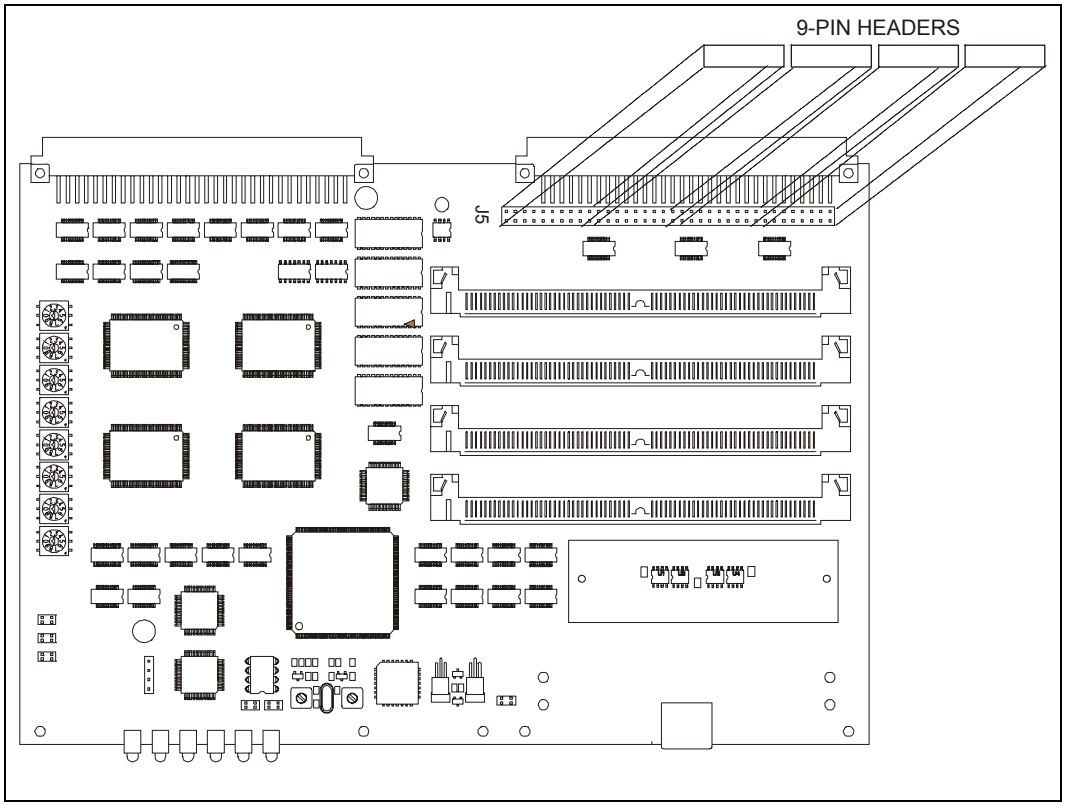


Figure 7-2 Install 9-pin Headers on J5

7.2 EEPROM Option

The microwire interface used to remote the EEPROM has all the same jumper provisions as on the host board: the read enable/disable, and write enable/disable (Figure 7-3). If EEPROMs are installed on both the host and on the Direct-Attached P2 Cabinet Kit board, then the read-enable jumper must be set on only one of these components, otherwise there will be output contention and resulting malfunction.

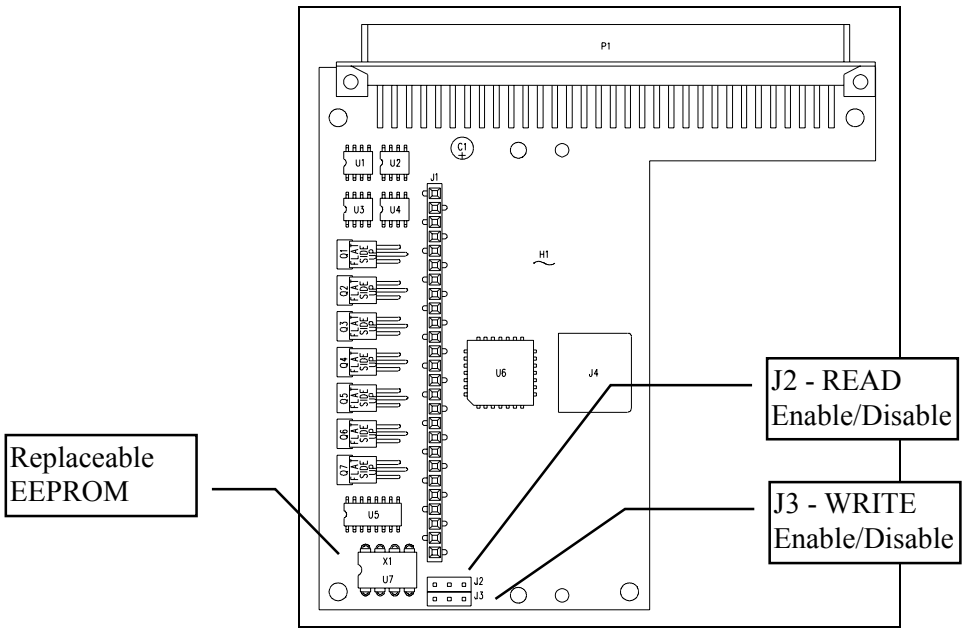
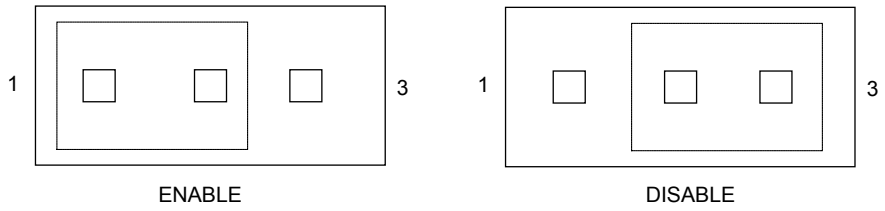


Figure 7-3 Direct-Attach P2 Cabinet Kit Board

7.3 Enable/Disable Jumpers



7.4 Installation

The media card or host adapter board is mounted on the Direct-Attach board as shown in Figure 7-4.

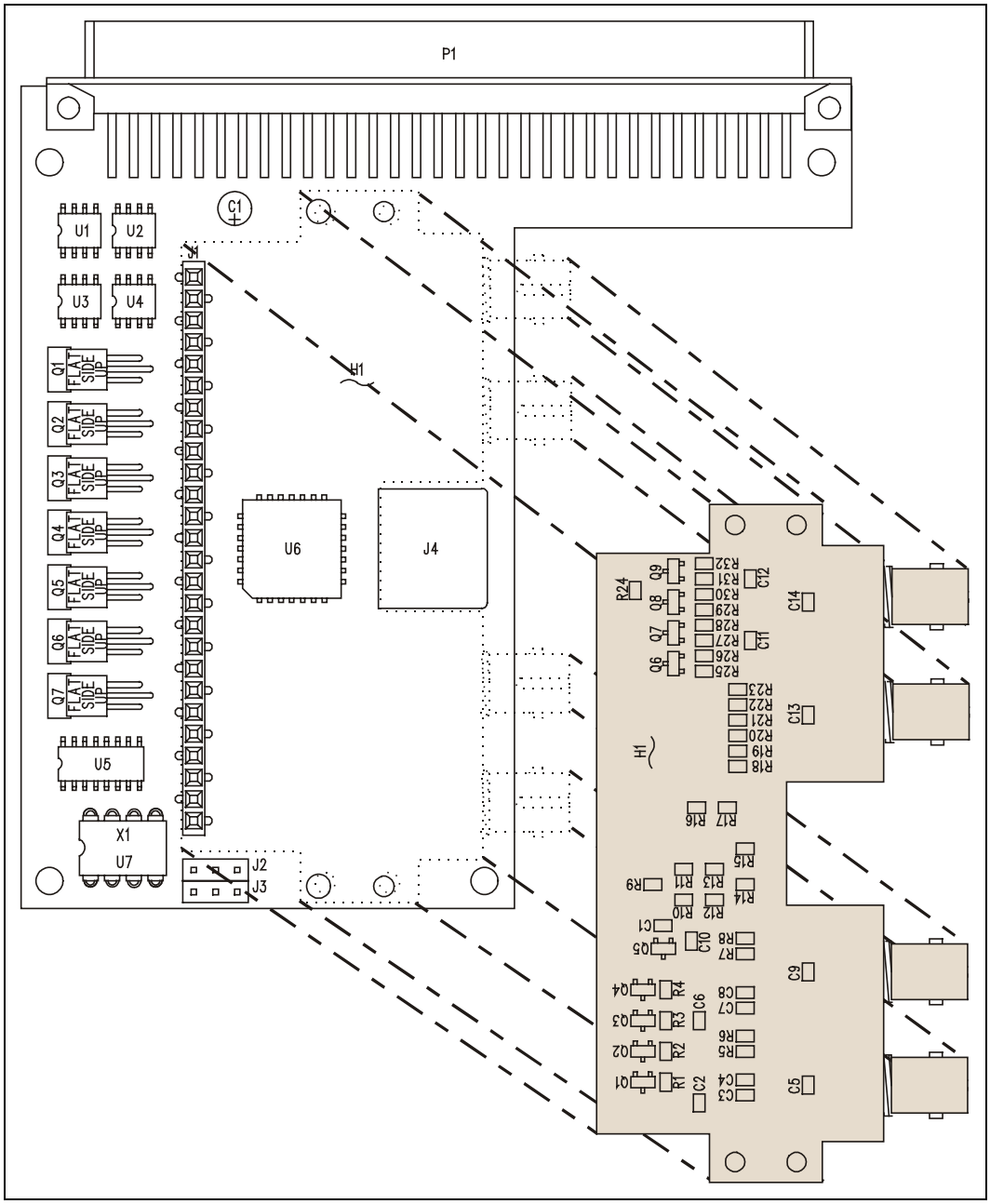


Figure 7-4 Mounting the Media Card

The cabinet kit is installed as shown in Figure 7-5.

The connector shell is mounted on the VME backplane using the screws provided.

Then the Direct-Attach board is inserted into the connector and secured with holders.

NOTE: The connector can go on two ways. When installed properly, the notch will be on the "P2 row" side of the connector. Correct installation will result in both the VME6U-board and cabinet-kit component sides facing the same direction. Improper orientation will result in damage. The cabinet-kit board must be installed on the P2 connector of the same slot as the host SCRAMNet board.

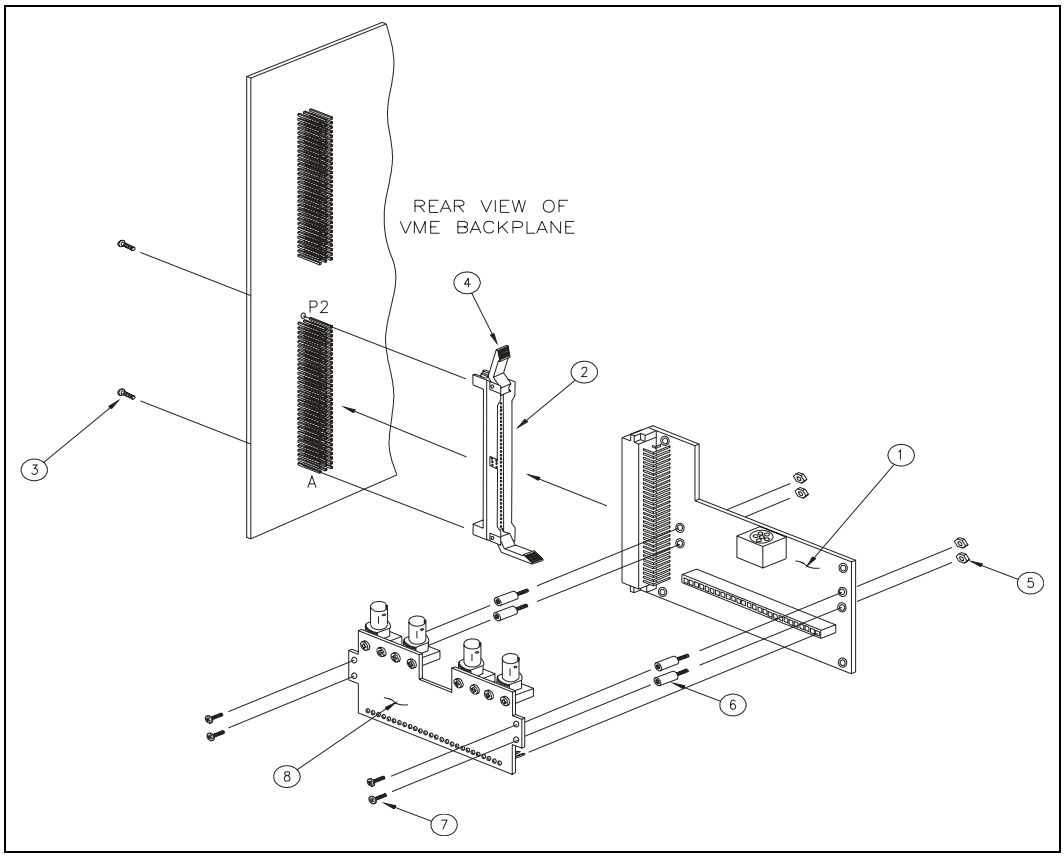
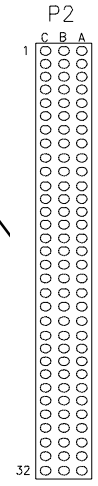


Figure 7-5 Direct-Attach P2 Cabinet Kit Installation

① Direct-Attach P2 Cabinet Kit board
② DIN 41612 Connector Shell
③ Mounting Screw
④ Latch
⑤ Nut
⑥ Standoffs
⑦ Mounting screw
⑧ Media Card (Fiber-optic connection shown)

P2
Connection



Rear View

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GLOSSARY

auxiliary connector ---------- (also accessory connector) The 8-pin modular in-line plug connection on the media access card used for communication with the Fiber-optic Bypass Switch, and to provide access to the programmable trigger.

backplane ---------- A printed circuit board (pcb) with 96-pin connectors and signal paths that bus the connector pins. Some systems have a single pcb, called the J1 backplane. It provides the signal paths needed for basic operations. Other systems also have a second pcb, called a J2 backplane. It provides the additional 96-pin connectors and signal paths needed for wider data and address transfers. Still others have a single pcb, called a J1/J2 backplane that provides the signal conductors and connectors of both the J1 and J2 backplanes.

bulkhead plate ---------- The external connection plate for the receive and transmit media connections to the card inside the chassis.

carrier detection ---------- The result of the transceiver locking on to a carrier signal.

carrier signal ---------- An electromagnetic wave that can be modulated, as in frequency, amplitude, or phase, to transmit data, images, sound, or other signals.

carrier loss ---------- A hardware failure reported when the incoming light link has failed because it is too weak or nonexistent in one or both fibers from the preceding node.

current-limiter circuit---------- The Vdd_out is a +5 V out with a current-limiter circuit. The circuit passes the current from the host system +5 V supply through six parallel-connected PNP power transistors. The current-limiting is implemented by monitoring the emitter-collector drop on these transistors, and turning off the base drive for a time. This results in a “foldback”-type current limit where every few milliseconds the output is turned back on for a few microseconds. Therefore, as soon as the load decreases below the current limit, the full current will be restored.

Fiber Optic Bypass Switch ------ A moving fiber switch that can redirect the fiber-optic path to change source and destination in a SCRAMNet ring configuration. By placing a bypass switch between the node and the ring, the transmitter and receiver paths are controlled by the switch.

foreign message ---------- A message that is in (passing through) a node other than the one of origin.

insert a node ---------- The act of placing a node on a network for the purpose of transmitting and receiving messages.

low-pass filter ---------- A tuned circuit designed to pass all frequencies below a designated cut-off frequency.

media card ---------- An electronic SCRAMNet+ network device with either fiber-optic or coaxial-cable Receive/Transmit capabilities.

native message ---------- A message that is received by the node of origin.

node latency ---------- The time delay at a node before a foreign message can be retransmitted.

net load indicators---------- Three LEDs that indicate network loading by sequentially increasing blinking frequency until steady.

phase lock loop ---------- Circuitry which detects proper transmission on its receiver pair. The PLL allows the port to re-synchronize and retransmit the pair of received

signals, performing the function of a repeater. The PLL detects and locks onto a carrier signal on the receiver pair.

Quad Switch---------- A switching center used to dynamically configure active SCRAMNet network ring(s). The Quad Switch:

- Has five network Media Card connections
- Can be managed by a host via an RS-232 or RS-422/485 serial interface.
- Has an internal ring with access to five external ports.
- Can be connected to other Quad Switches.

ring time---------- The time it takes a message to traverse the network ring from the originating node and back again. The time can be calculated by estimating propagation delay at 5 ns per meter of cable plus 250 ns per node. This assumes a best case using 32-bit standard data with no other nodes transmitting. Worst case would be using 800 ns per node. Other times can be calculated using the maximum delays per node when sending variable length data.

Rx ---------- Abbreviation for receive or receiver.

slot ---------- A position where a board can be inserted into a backplane. If the system has both a J1 and a J2 backplane (or a combination J1/J2 backplane) each slot provides a pair of 96-pin connectors. If the system has only a J1 backplane, then each slot provides a single 96-pin connector. Also, see packet.

Tx---------- Abbreviation for transmit or transmitter.

VME address space---------- The VME address space varies according to specific VME device and is identified as A16, A24, or A32 space. A32 is the largest address space; it allows up to 4 gigabytes of space using 32 bit addresses. A24 space uses 24 bit addresses, and A16 space uses 16 bit addresses.

VMEbus---------- A standard bus by which small computers and intelligent peripheral devices can be connected. The term VME stands for Versa Module Eurocard. This non-proprietary bus conforms to the American National IEEE Standard 1014 (ANSI/IEEE std 1014).

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