Aculab Prosody X cPCI card

Installation guide

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Revision record

Rev	Date	By	Detail
1.0.0	25.09.06	DJL	First Issue
1.0.1	11.12.06	DJL	New dual port adapter
1.0.2	20 Sep 2007	CJB	Cabling recommendations added
1.0.3	12 Oct 2007	SR/EJ	Passive backplane configuration added
1.0.4	2 Mar 2009	CJB	Stand alone operation clarified, re-formatted
1.0.5	23 Apr 2009	EBJ	Format updated to corporate fonts
1.1	21 Sep 2009	CJB	75 Ohm connection updated

Contents

1   Introduction

This document is the installation and user guide for the Aculab Prosody X cPCI card, the product is referred to as the 'Prosody X cPCI card' in this document unless the context requires a more specific term.

The Prosody X cPCI base card implements a Power PC processor and Ethernet switch used to manage the various DSP resources. The rich media processing resources are contained on the DSP mezzanine module with up to two *DSP farms**, totalling eight DSPs. Additionally an optional sixteen trunk E1/T1 (PMX/C) line interface module can be fitted.

Note   The PMXC module has options that contain Signalling DSP resources used for CAS or SS7 signalling protocols, the PMX module DOES NOT contain any rich media DSP resources.

The Prosody X cPCI card provides an interface between the telephone network, a standard cPCI bus (including host storage devices), and a standard H.110 TDM bus. The Prosody X cPCI card contains a digital switch matrix that allows arbitrarily switched interconnection between:

- 4096 speech paths on the cPCI base card H.110 CTBus,

- Up to eight media processing DSPs, on the media processing DSP farm module, for Prosody speech & IP telephony processing,

- Telephone network support via up to sixteen E1/T1 trunks (PMX and PMXC),

- CAS & SS7 signalling support via up to two signalling DSPs fitted to the PMXC module.

PMX E1/T1 line interface module

Rich media processing DSP farm module

Basecard Backup link

PMX/C Backup link

Passive Backplane Operation

Prosody X cPCI base card

Prosody X cPCI transition module (cPCI V2.16 chassis or later)
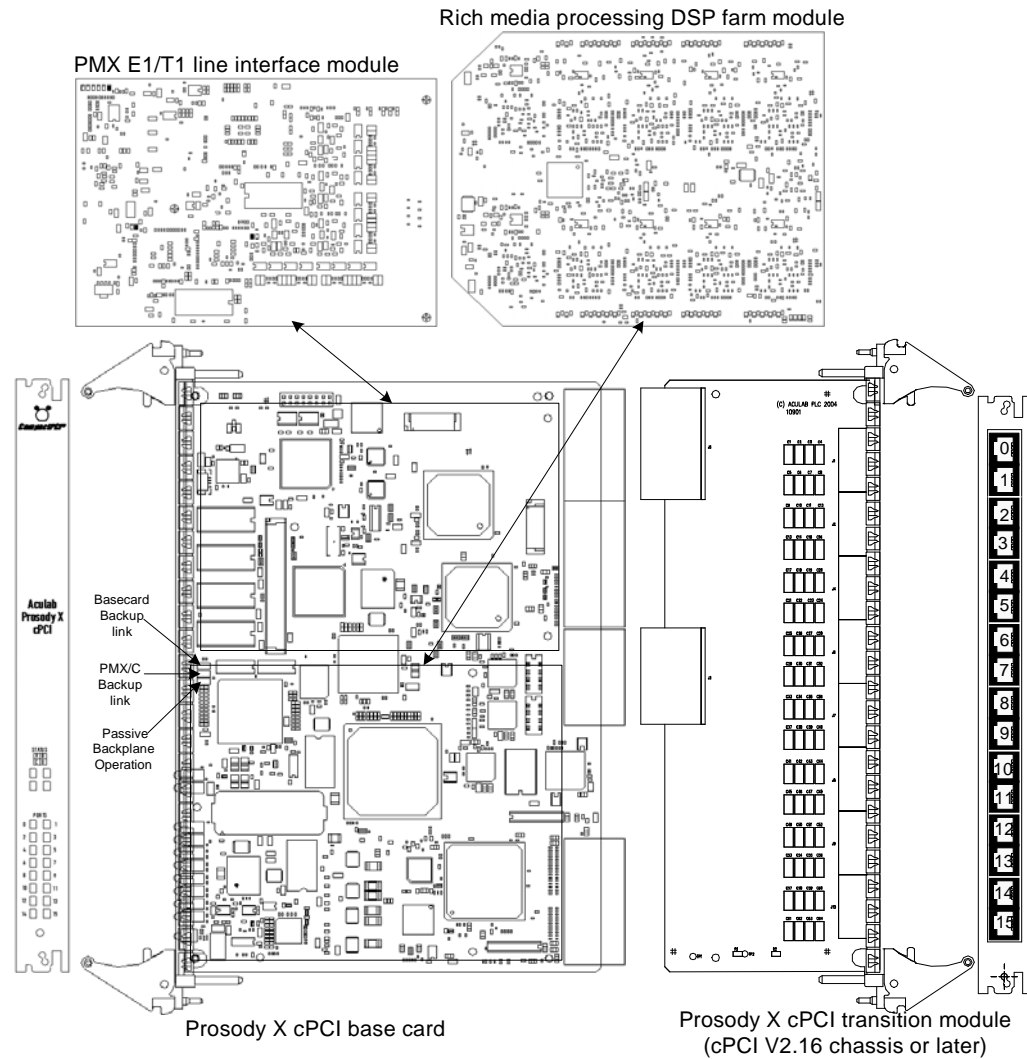
Note   Unlike earlier Aculab cards, which used bespoke communication between the base card, PM, and PCI/cPCI (host system), communication between the base card resources, PMX/C, and the host system now uses standard IP Ethernet protocols managed through the Prosody X base card Ethernet switch. The card will appear in the host system as a NIC and must be configured with a TCP/IP address, as you would for any other NIC.

1.1   Links – (used to boot the Prosody X cPCI and/or PMX/C from backup flash).

With the exception of the three jumpers (links) shown in the above diagram, all jumpers on the base card are for factory use and should not be fitted. The top and centre links shown control the flash image source on boot-up for the base card and PMX/PMXC module power PCs; boot-up is normal unless one or both of the jumpers are fitted:

Top link fitted – Base card Power PC will boot from backup flash image

Centre link fitted – PMX/PMXC PPC will boot from backup flash image

For further details of the flash programming functions, please contact Aculab support.

1.2 Stand Alone Operation.

To ensure reliable operation in a passive backplane without a system processor card present, the lower jumper should be fitted. See card outline diagram (marked as passive backplane operation).

This will hold the PCI devices in reset to prevent any contention on the PCI bus. In this state the PCI reset will be ignored.

To indicate stand alone operation the front panel LED D will flash in the following sequence "Red - Green - Off - Off" instead of the usual alternating "Red - Green".

This function is only available from card revision 1.2.4 and FPGA image revision 1.0.3.5.

1.3 Transition module variants

There are two versions of the rear transition module available. If the chassis you are using is PICMG 2.16 compliant, the 1000BASE-T Ethernet connection is via the chassis backplane. For non PICMG 2.16 chassis, which will not have a Packet Switching Backplane, Aculab can provide a transition module that provides dual redundant Gigabit Ethernet LAN interfaces.
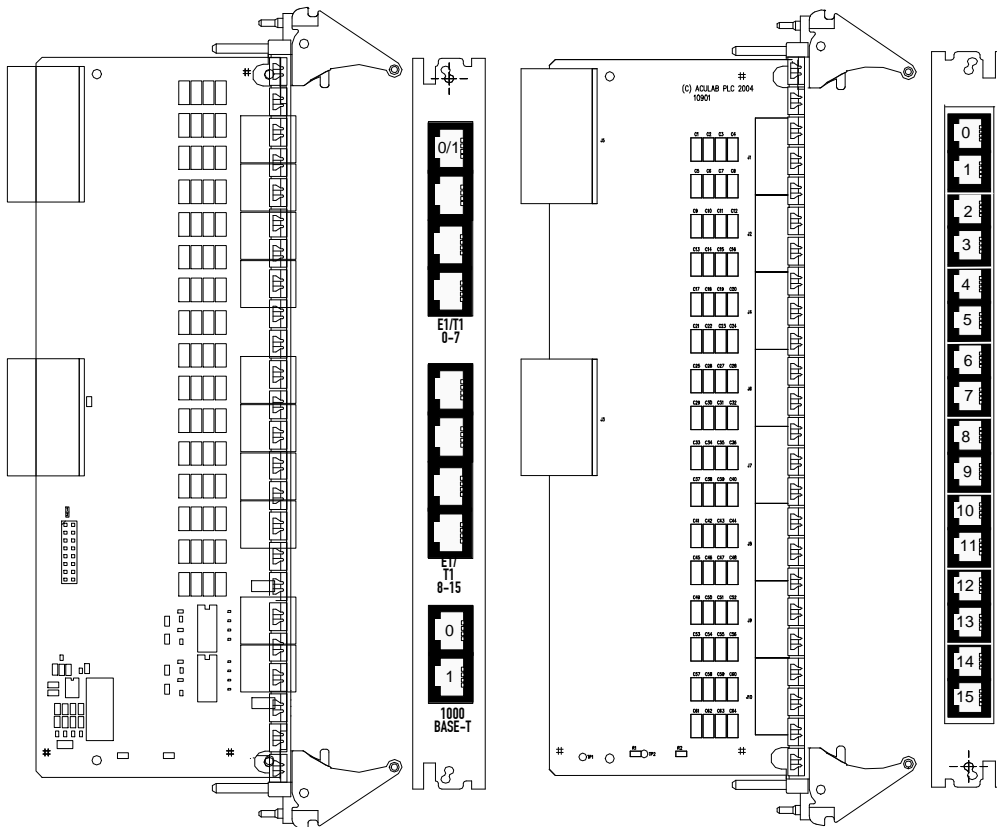
Pre cPCI V2.16 compliant chassis (AC5100)   **cPCI V2.16 compliant chassis (AC5105)**

Part Number	Type	Ports
AC5100	non PICMG 2.16 compliant chassis	8 x RJ45 dual wired (16 trunks) 2 x RJ45 (dual redundant) Gigabit Ethernet
AC5105	PICMG 2.16 compliant chassis	16 x RJ12 trunks

1.4 Media DSPs

The card has up to 8 media DSPs fitted, which allow media processing, and the processing and conversion between IP and TDM based media streams. The part number options available are:

AC5270 - DSP8, module with eight media DSPs fitted.

AC5280 - DSP4, module with four media DSPs fitted.

AC5290 - DSP2, module with two media DSPs fitted.

1.5 General

Serial number

The **serial number** of the Prosody X cPCI card is used when configuring the Aculab libraries to uniquely identify a Prosody X cPCI card in the system. The serial number is hard coded into the card firmware, and a serial number label is attached to the card. The label is located on the reverse of the card (no components) on the front edge, and has the format P/N AC5300 S/N XXXX WONXXX. Only the number following S/N is used during driver configuration, the other numbers are for Aculab use.

Installation

The card installation & connection sections; refer to installation of the Prosody X cPCI card into a host computer, the subsequent connection to the networks, hardware control, and configuration information.

Approvals

The approval information section, in conjunction with the country-specific appendices, gives the conditions of the Approval for connection to the telephone network, requirements for installation and safety, and other regulatory matters. This section, and the appropriate country-specific appendices, contains many statements regarding use of the Prosody X cPCI card that are legal requirements for connection to the public network. Failure to use the Prosody X cPCI cards in accordance with any of these instructions for use may invalidate the approval for connection.

The approval information in section 3 provides general approvals information. To fully appreciate the conditions of approval for connection to the telephone network, it is important that the appropriate country-specific appendices are read in conjunction with the other sections of this document.

Usability statement

Speech processing, call control and digital switch control functions are provided via one of several Aculab libraries that are described in separate publications specific to those topics. The card is not a complete product, and only has usable functionality when associated with a host computer and an application program.

Note   These instructions for use assume that the various elements are being assembled and integrated by someone competent in such matters and do not constitute an alternative for such competence.

1.6 Uses of the Prosody X cPCI card

The Prosody X cPCI card is a plug-in card suitable for use in many different types of cPCI compatible computers. It provides a platform in which to carry out a range of speech processing functions.

Computer Telephony Bus

The H.110 (CTBus) expansion interface enables connectivity with various kinds of cPCI based speech and data products from different vendors using H.110 compatible devices.

Integration

The Prosody X cPCI card is a highly integrated Computer Telephony component. By combining TDM and IP digital access, and the speech processing capabilities of Prosody, Aculab has produced a high throughput, single slot CT component.

Switching

The Prosody X cPCI card contains a digital switch matrix that allows arbitrarily switched interconnection between up to 480 channels on the E1-network, up to 368 channels on the T1-network and up to 4096 speech paths (timeslots or channels) on the H.110 CTBus. The H.110 CTBus supports connection to other H.110 devices.

Control

The Prosody X cPCI card is always controlled via a Media Access Controller (MAC) and its associated device driver. If the MAC is on the Prosody X cPCI card then Aculab supplies its device driver. If it is on a regular Network Interface Card (NIC) then its device driver is simply the one already in use for that card. Aculab provides libraries and associated device drivers for a range of operating systems. Please contact Aculab Plc for information on availability.

1.7   External connections

Note   The modular sockets provided for Ethernet and E1/T1 connections to network equipment are commonly referred to as "RJ45" types. This terminology is used in this document and refers to a non-keyed 8 position, 8 circuit (8P8C) modular socket. For T1, the connectors are compatible with RJ48C jacks.

The rear transition module of the cPCI card has a number of RJ12 or RJ45 sockets.

For a CompactPCI chassis **not** compliant with the PICMG 2.16 Packet Switching Backplane specification, the AC5100 transition module is used. The first two sockets (bottom) on the transition module are used for connection to an Ethernet network. The remaining eight dual sockets, numbering top to bottom, are used to connect the 16 E1/T1 trunks to the telephony network.

For a PICMG 2.16 compliant chassis, the AC5105 transition module is used. This transition module contains 16 x RJ12 sockets only, which are used to connect the 16 E1/T1 trunks to the telephony network. Ethernet network connection, if required, is via the chassis Ethernet network connection.

Note   This card may contain both E1/T1 and Ethernet interfaces that use the same type of connector. It is important to understand the different cabling requirements for E1/T1 and Ethernet circuits when installing cables that may look almost identical in appearance. It is good practice to use cable identification labeling or colour coding to differentiate between cable types.

1.7.1   Ethernet network attachment

The Ethernet connections may be to a category 5 10/100BaseT Ethernet network, or a Category 6 1000BaseT Gigabit Ethernet network. Both of which allow various functions, including media processing for IP Telephony and the control of the card, from a remote host.

The LAN interfaces are designed to operate at GbE (1000Base-T) data rates. If connected to network equipment that is not GbE capable, the interface will attempt to negotiate a 100Base-T link speed or 10Base-T. In most cases this will impose an

artificially low channel count on VoIP connections that will limit the host system capacity.

Ethernet 10/100 and 1000BaseT RJ45 pin out

RJ-45 connector
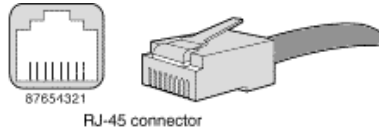
	Ethernet 1000BaseT pin out		10/100BaseT pin out
Pin #	Signal Name	Function	Function
1	BI_DA+	Bi-directional pair +A	TXA+
2	BI_DA-	Bi-directional pair -A	TXA-
3	BI_DB+	Bi-directional pair +B	RXB+
4	BI_DC+	Bi-directional pair +C	
5	BI_DC-	Bi-directional pair -C	
6	BI_DB-	Bi-directional pair -B	RXB-
7	BI_DD+	Bi-directional pair +D	
8	BI_DD-	Bi-directional pair -D	

Cat 6 cabling is recommended for 1000Base-T Ethernet connections. Higher specification cabling such as Cat 6e may also be used.

1.7.2   Telephone network attachment (PMX/C)

The Prosody X cPCI card with a sixteen trunk PMX/C module fitted (trunks 0 to 15), attaches to either E1 or T1 digital systems. Each individual trunk interface is software configurable for either T1 (100 ohms) or E1 (75 or 120 ohms).

An E1 interface attaches to the 2Mbit digital system or Primary Rate (2.048 Mbit/s) Integrated Services Digital Network (ISDN). Network attachment is via a service provision often used to connect digital PBXs to the telephone network (NT1). Each E1 trunk may make or receive up to 30 separate calls at a time.

A T1 interface attaches to the 1.544Mbit digital system via a Channel Service Unit (FCC, IC or UL Listed CSU). Each T1 trunk may make or receive up to 24 separate calls at a time or 23 calls when ISDN protocols are used.

The PMXC module includes up to two signalling DSPs that can be used to process CAS and SS7 signalling protocols. Refer to the *'Aculab Call, Switch & Speech Driver Installation Guide'* for further information on using and configuring these DSP resources.

The PMX/C variants available are:

AC5400 (PMXC16)   16 Trunks and 2 signalling DSPs

AC5410 (PMX16)   16 Trunks and no DSPs

AC5420 (PMXC8)   8 Trunks and 2 signalling DSPs

AC5430 (PMX8)   8 Trunks and no DSPs

CAUTION   When making a network connection, to reduce the risk of fire, only telecommunications line cord of 26 AWG or larger may be used.

1.7.3 Trunk Interface

Each trunk interface on the card carries one 30-channel digital service connection via a screened twisted pair cable of 120 ohm characteristic impedance. There is one transmit pair and one receive pair. There are two types of RTM available, one is suitable for PICMG 2.16 compliant chassis where the Ethernet connection is internal, and one is for non PICMG 2.16 chassis where an external Ethernet connection is necessary. The two types of RTM have different E1/T1 trunk connectors.

Note   PICMG 2.16 compliant transition module (AC5105)

E1/T1 single trunk RJ12 presentation

The sockets presented on the rear transition module are RJ12. Aculab provide special adapter cables to convert this to RJ45.
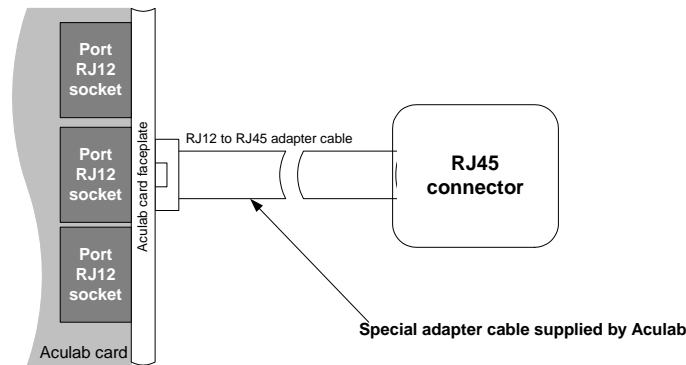
The trunk connectors on the E1/T1 16 port cPCI RTM are RJ12 female. Aculab can supply RJ12 male to RJ45 female adapter cables as required. The pin out of the adapter cable is as follows:

RJ12		RJ45	
2	to	2	Rx
3	to	1	Rx
4	to	5	Tx
5	to	4	Tx

RJ12 plug connector   **RJ45 socket connector**
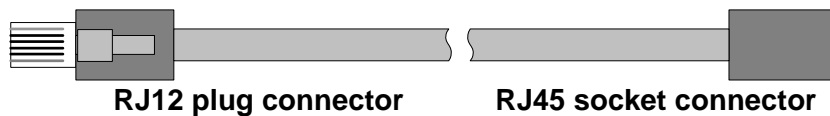
If the Aculab RJ12 to RJ45 adapter is **not** being used, the 6-position 4 contact RJ12 Telephone Modular Plug on the cable between the card and the network must be wired as follows:

Pin	Signal	Function	Direction
5	LTT	Transmit	output
4	LTR	Transmit	output
3	LRT	Receive	input
2	LRR	Receive	input

RJ12 connector

(Front view)

6 5 4 3 2 1
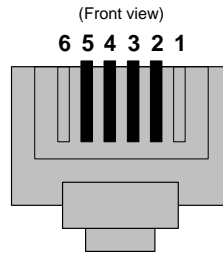
The cable and plug must be shielded types to ensure EMC compliance.

E1/T1 dual trunk RJ45 presentation

Note   Non PICMG 2.16 system transition module (AC5100)

On each of the E1/T1 sockets, all eight pins are used in order to provide two circuits per socket. An adapter (cable splitter) is used to separate the two circuits out onto two separate sockets.
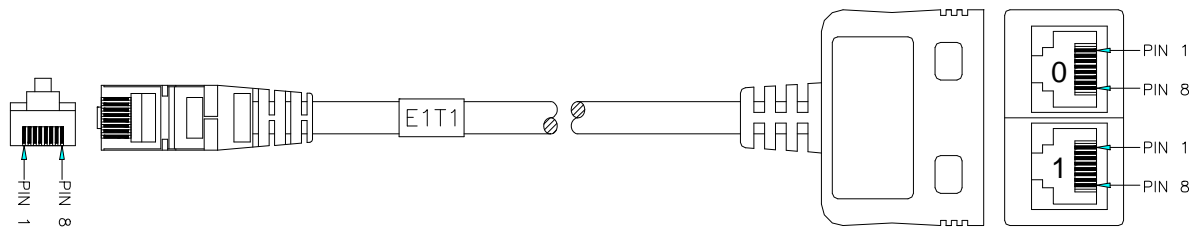
E1/T1 trunk RJ12 pin out

Additional E1/T1 cables (not supplied by Aculab) are required to make line connections between adaptor cables and the external telephone network.

The RJ45 modular plug between the adapter and the network must be wired as follows:

Pin	Signal	Function	Direction
4	LTT	Transmit	output
5	LTR	Transmit	output
1	LRT	Receive	input
2	LRR	Receive	input

RJ45 (RJ48C) connector

(Front view)

8 7 6 5 4 3 2 1
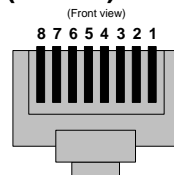
The cable and plug must be shielded types to ensure EMC compliance.

1.7.4   E1 75 ohm network connection

Some legacy E1 PSTN networks require 75 Ohm trunk connection. The default impedance for E1 trunks in the ApplianX is 120 Ohm. It is important to confirm with the network operator which impedance the PSTN is using during the installation process, as a mismatch can lead to signal degradation and erratic equipment behaviour that is difficult to diagnose later.

The following signalling services may be expected to be configured for 75 Ohm in legacy switching equipment which provide the following protocols :

DASS2

DPNSS

All E1 CAS protocols

Each 75 Ohm trunk is normally connected via a pair of coaxial cables with BNC connectors. A Balun is available to convert between RJ45 and co-axial cabling. The Balun also converts between 120 and 75 Ohm interfaces, so the E1 port does not need to be configured for 75 Ohm operation when this type of converter is used.

These are available from Aculab, and provide a pair of BNC connectors labelled as RX and TX for each E1 trunk.

It is important to use 75 Ohm BNC cable when connecting to legacy BNC equipment.

For installation convenience, the BALUN converter may be located at either end of the interconnection – so for example it may be convenient to use available RJ45 patch panels to connect the trunk, and locate the BNC converter adjacent to the legacy equipment.

1.7.5   Cable lengths

Cat 5/6 cabling is designed for an overall span length of 100m. It is recommended that the cumulative length of multiple cables which may be connected via a patch panel does not exceed 100m, so the recommended maximum single cable length is 90m to allow for 10m of patch connections. For span lengths approaching the 100m limit it is important to specify and install high quality cables.

For E1 trunks converted to BNC cabling, it is recommended that overall span length is limited to 100m maximum and that 75 ohm cabling and connectors are used. Span lengths in excess of 100m may continue to operate, in this case the installer should check that there is adequate margin on signal levels to maintain expected service levels.

1.8   H.110 CTBus loading

Prosody X cPCI cards have a loading factor of 2 on the H.110 CTBus. The maximum loading allowed on the H.110 CTBus is 20. The total loading is calculated by adding the loading factor of all the devices on a single H.110 CTBus. The loading limit of H.110 means that theoretically, 10 Prosody X cPCI cards can be used in the same host. Chassis and software driver limitations may however restrict the loading to less than 10 Prosody X cPCI cards in the same host.

1.9   Prosody X cPCI card - host interface

A device driver program, running on the host computer, controls the behaviour of the Prosody X cPCI card.

For information on device driver installation and configuration, please refer to the Aculab publication ***Call, Switch and Speech Driver Installation Guide***. This guide can be downloaded from the support area of the Aculab company web site at www.aculab.com.

2   Card Installation

2.1   Installing the card

The installation procedure for expansion cards will vary from one type of host computer to another, and the exact details of the installation procedures for expansion cards must be sought in the user guide supplied by the host computer manufacturer. However, in general:

- Do not attempt to install or remove the Prosody X cPCI card unless the mains power supply is completely removed from the host computer.

- Do not attempt to install or remove the Prosody X cPCI transition module if any network interfaces are connected to the network.

- To ensure safety, any covers removed from the host computer in order to install the Prosody X cPCI card must be replaced before the mains power supply is reconnected.

- Do not connect the Prosody X cPCI card to the 2.048/1.554 Mbit/s digital service or Primary Rate ISDN network termination interface until this document, and in particular the sections marked 'Installation and Safety', have been read in full and understood.

- Proper ESD (electrostatic discharge) procedures should be maintained throughout.

The front and rear cards which together comprise the Aculab product Prosody X cPCI card. They must be correctly installed in a peripheral slot of a 6U CompactPCI host system.

Consult user documentation for the 6U CompactPCI host system as necessary to determine which slots are available for use with the Prosody X cPCI card.

For a PICMG 2.16 enabled chassis ensure a switch node slot is chosen for the Prosody X cPCI card and the correct RTM is installed.

The Prosody X cPCI card is supplied with the correct CompactPCI connector keys in place to prevent it from being installed into a slot that is keyed for other incompatible card types. Do not remove connector keys from this card or from the backplane connectors in the 6U CompactPCI host system.

CAUTION Care must be taken when inserting cards into a CompactPCI host system. The male connector contacts on the backplane at each peripheral slot are vulnerable to damage during card insertion if it is carried out incorrectly. Aculab can accept no responsibility for damage caused to backplane connector pins in any CompactPCI host system arising from the insertion or attempted insertion of its Prosody X cPCI card.

To install the Prosody X cPCI card into a host system:

1. Locate a vacant CompactPCI slot and remove the host chassis CompactPCI slot cover.

2. Inspect the back-plane connector for any bent or damaged pins.

3. Slide the card in to the CompactPCI slot making sure the alignment pins at the top and bottom of the end plate engage in their sockets. Using light finger pressure only, ensure the card is correctly aligned and pressed into the connector. When you are satisfied that the card is positioned correctly, engage the upper and lower levers simultaneously. The levers will click to indicate they are locked.

4. Locating screws should be fitted to secure the top and bottom of the card.

5. For the Aculab cPCI transition module, repeat steps 1, 2 & 3 at the rear of the

chassis with the matching rear slot cover and the Aculab cPCI transition module. Particular care must be taken to avoid connector pin damage, as the transition module is usually more difficult to align than the Prosody X cPCI card.

6. Repeat steps 1 to 5 for any additional card modules.

7. Once all modules have been installed, you will be ready to power up the system. On power up, the system will automatically detect the new cards in the system and attempt to load the required drivers.

8. Follow the instructions detailed in 'Call, Switch and Speech Driver Installation Guide' to Install the appropriate drivers.

This completes the installation of the Prosody X cPCI card.

2.2 Configuring the Prosody X card IP addresses

A Prosody X card will be detected by the host system as a network device (NIC). A Prosody X card is a networked computer (DSPs, Power PCs, etc), an external Ethernet connector, and a host NIC, all connected together by an Ethernet switch. Both the NIC and the network computer require IP addresses to be configured within the same IP subnet-numbering scheme.

2.2.1 Prosody X host NIC IP address

For the Prosody X card to host system Ethernet connection, Windows defaults to DHCP (obtain an IP address automatically). Should you require a static IP address, use the standard Windows connection properties dialogs.
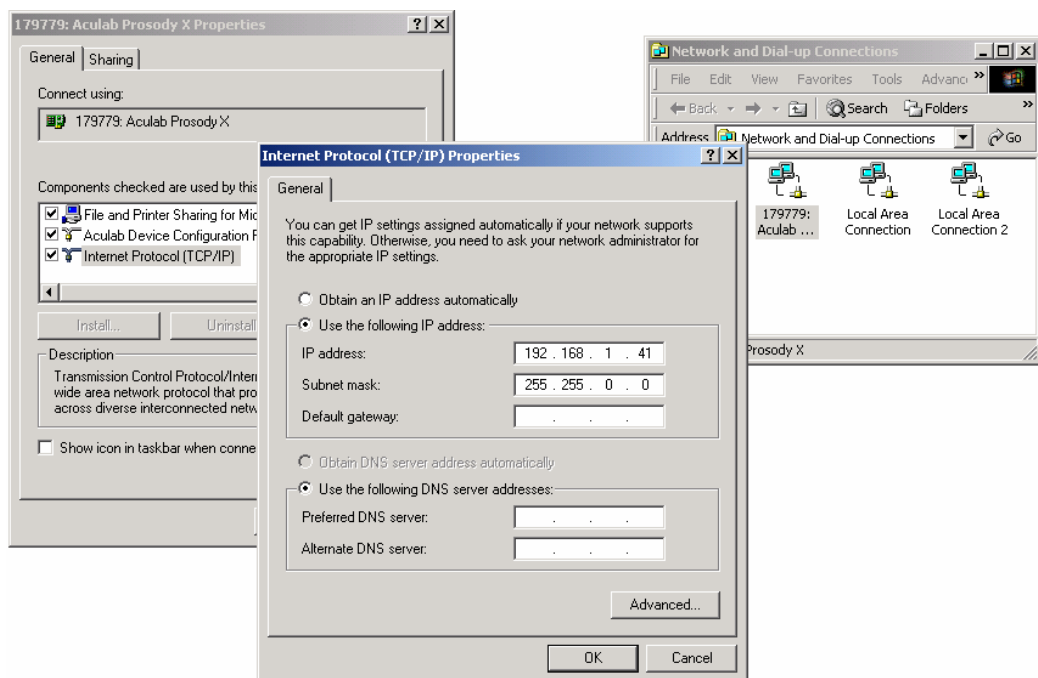
2.2.2 Prosody X networked computer IP address

The ACT is used to configure this IP address. The ACT is downloaded from the Aculab web site using the *Aculab Installer Tool* (AIT).

For further details on using the ACT, please see the *Aculab call, switch and speech driver installation guide (1761.pdf)*. This document also includes details for command line configuration of the PMX/PMXC IP addresses and firmware download to the Aculab cards.

Note   Revision 6.4.0 or later firmware is required for the Prosody X cPCI and PMX/C devices.

2.3 Front bracket LED indicators

Hot Swap LED

The single blue LED just above the lower ejector handle is used for the implementation of Hot Swap support on the Prosody X cPCI card in accordance with the requirements of PICMG 2.1.

Trunk status LEDs

Above the single blue Hot Swap LED is an 8x2 array of biLEDs. These LEDs are labelled 0 to 15 and are allocated one per trunk to indicate status. There are three illumination states for each biLED – off, red, and green. The LED's indicate the following:

Red - a red LED indicates that the trunk is in reset.

Green - a green LED indicates that a protocol firmware has activated the trunk.

Once the protocol stack is running on the PMX then the LED's represent the following.

Red - a red LED indicates that the protocol stack has received a message from the driver.

Green - a green LED indicates that the protocol stack has received a message from the Layer 1 driver

No LED - This indicates that an interrupt has been processed on this trunk.

During Normal operation the LED will be seen to flash between the 3 states.

Note   For SS7 the protocol stack does not run on the PMX. Thus the LED state will not change.

Note   The status as indicated on these biLEDs is not valid until CARD STATUS LED D shows a pulsing red / green indication.

Card status LEDs

Just above the 16 trunk status biLEDs are an additional 4 biLEDs, grouped under the general heading STATUS, and labelled A to D.

A - a green LED indicates that power is good to the Prosody X cPCI card on all of the power rails that it uses and the board is out of reset. Red indicates either a power fault or the board is held in reset by the cPCI bus.

B - is reserved and remains off (no indication) during normal operation.

C - is controlled by the Switch driver. A green LED indicates that the switch driver has written initialisation information successfully to the switch hardware. Red indicates the card is using fallback clocks.

D - a pulsing red / green LED indicates that embedded hardware on the Prosody X cPCI card has been initialised successfully. The 16-trunk status LEDs are only valid when LED D is in this state.

2.4 Prosody X cPCI base card LED usage

There are a number of LEDs on the reverse side of the Prosody X cPCI card, there use is as shown in the following diagram:

- H.110 master A
- H.110 master B
- Ethernet port 0 status
- Ethernet port 1 status
- *Host NIC status:*
  - Quality
  - Activity
  - 1000BaseT
  - 100BaseT
- FPGA configured
- Flash Page select
- FPGA config start
- Heartbeat
- FPGA not configured
- FPGA activity (alternating)
- Hot Swap power fault
- Power on reset
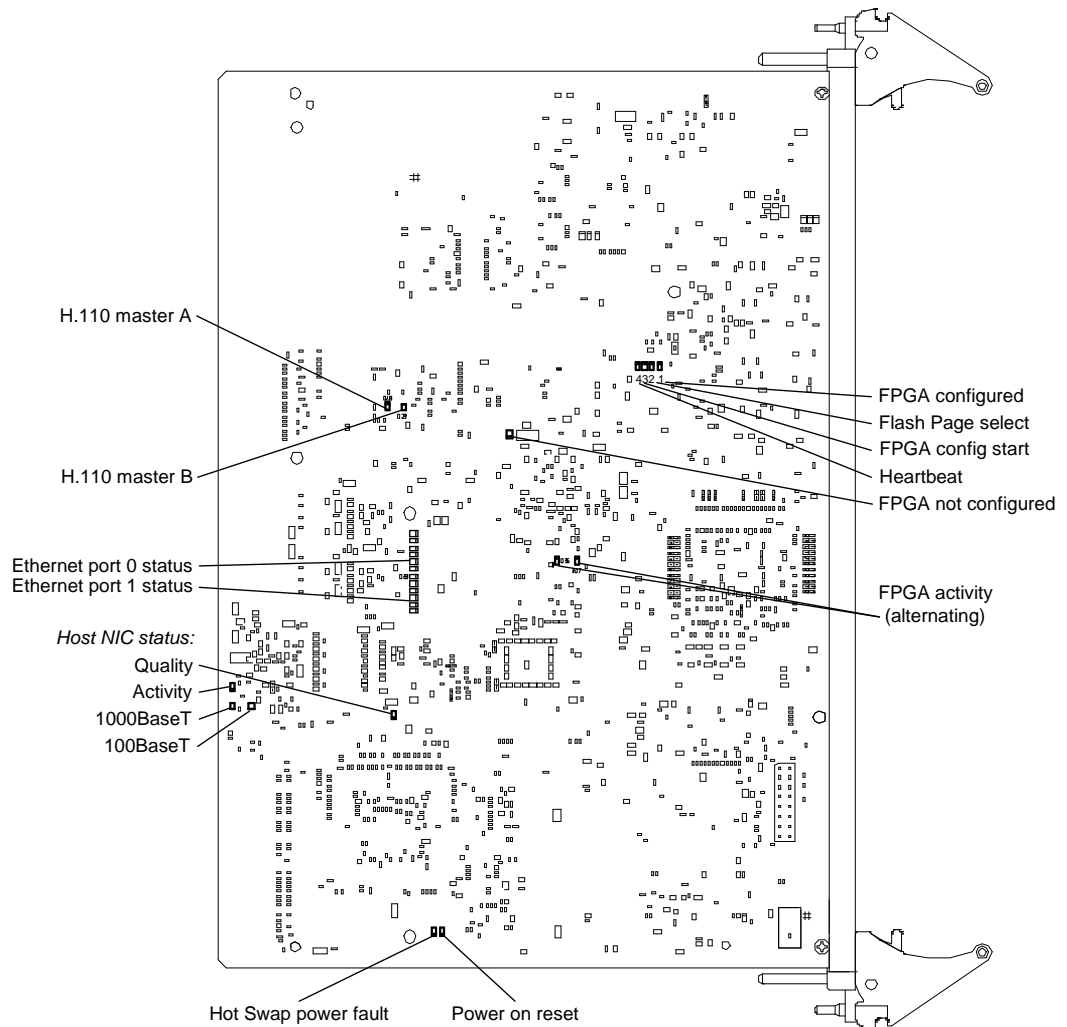
Field Programmable gate array (FPGA) status

On powering up the system, these LEDs should behave as follows:

1. Hot Swap power fault and power on reset LEDs should both extinguish.

2. FPGA not configured LED ON.

3. Heartbeat LED will flash to indicate card is out of reset.

4. Flash page select will light indicating booting from main flash area.

5. FPGA config start will light at start of FPGA configuration.

6. FPGA not configured LED will go out and the FPGA activity LEDs will alternate.

Host NIC

The location of these LEDs is as indicated in the above diagram, the definitions are:

Quality – ON when link established and the bit error rate is less than IEEE-specified.

Duplex – ON when the link is running in full duplex mode.

Activity – flickering LED indicates Transmit or Receive activity.

1000 – ON when running in 1000BaseT mode*.

100 – ON when running in 10/100BaseT mode*.

Ethernet ports 0 and 1

This is a dual redundant port; as such only one of the ports should be showing activity. The LEDs number from top to bottom, and the definitions are:

Quality – ON when link established and the bit error rate is less than IEEE-specified.

Activity – flickering LED indicates Transmit or Receive activity.

1000 – ON when running in 1000BaseT mode*.

100 – ON when running in 100BaseT mode*.

10 – ON when running in 10BaseT mode*.

Once the interface is active, only one set of these LEDs should indicate the established link.

H.110 Bus master

Master A – This card is providing the "A" clock to the H.110 bus.

Master B – This card is providing the "B" clock to the H.110 bus.

Neither – This card is not providing a clock to the H.110 bus.

Hot swap power fault

When this LED is lit, it indicates that the hotswap power controller has detected a power fault. In this case the main power on the board will be removed. This is a latched event, which can only be reset by cycling the power. A power fault condition can be triggered by low voltage detected on supply rails or over current sense.

Power on reset

Indicates the board's main power on reset is active.

2.5　PMX/C module LED usage

There are 10 surface mount LED's mounted on the PMX module. These are difficult to see after the card has been installed. The LED's are arranged as shown on the following diagram.
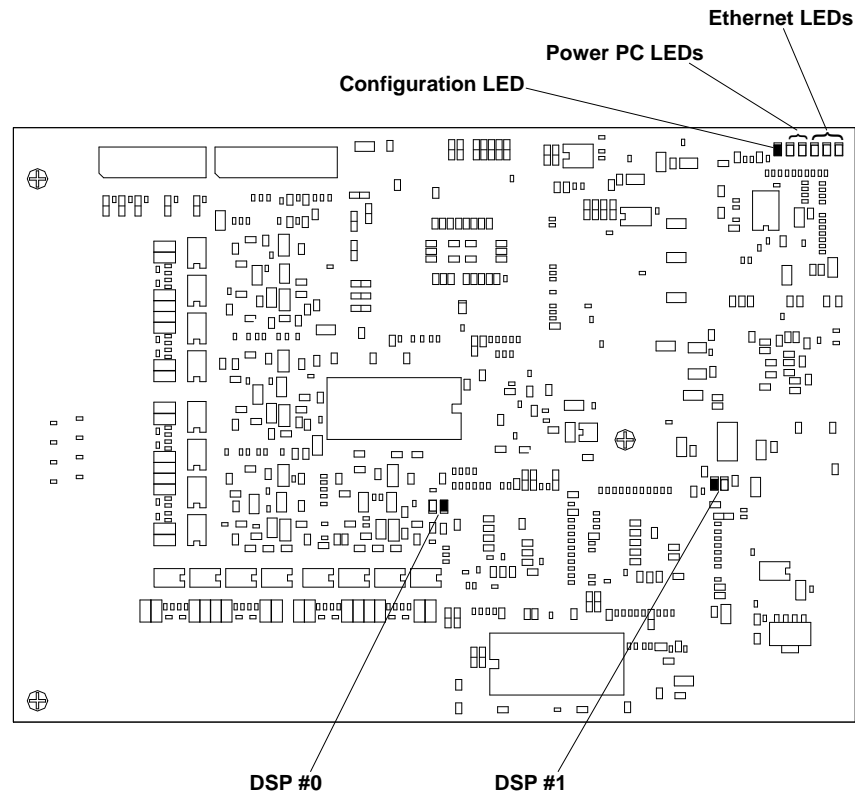
DSP status LEDs

There are two DSPs fitted to the PMX, DSP A and DSP B. A pair of LEDs, as shown in the above diagram, indicates the status of each DSP as follows:

> A pulsing Red LED indicates clocking.

> A flashing Green LED indicates active firmware.

Configuration LED

If no firmware has been downloaded to the board, the firmware LED will be on, it will only go out once firmware had been successfully downloaded to the board.

Ethernet and Power PC LEDs

The behaviour of these LEDs is subject to the firmware and configuration of the card and are normally for Aculab diagnostic purposes only. In some instances flashing LEDs are an indication of activity on a device, most of the time however they are not used.

2.6   Prosody X DSP module LED usage

There are a number of surface mount LEDs mounted on the Prosody X DSP module. The LEDs are arranged as shown on the following diagram.
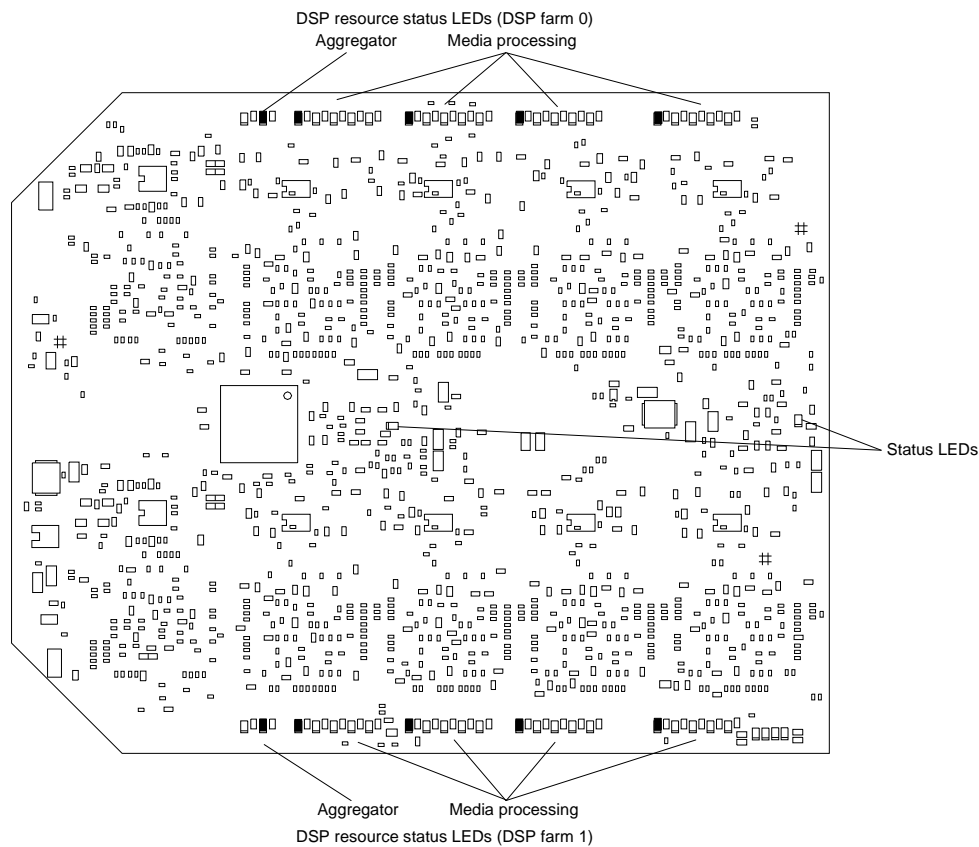
The specific meaning or use of each LED is often subject to the firmware and configuration of the card and are normally for Aculab diagnostic purposes only. In general however, flashing LEDs are an indication of activity on a device, for example:

2.6.1   Media processing DSP farm LEDs

The aggregator DSP LED:

Red LED Off when no firmware is running.

Red LED Blinks every 10-seconds* when firmware is running but not configured.

Red LED Blinks every second* when firmware is running and is configured.

Green LED – subject to the firmware running in the DSP, used to indicate DSP firmware activity, in most instances it is not used.

* Timings are approximate

The media DSP LEDs:

The behaviour varies depending on the media-processing task being carried out:

Red LED – flashes when firmware is running

Green LEDs – are subject to the firmware running in the DSP. Used to indicate DSP firmware activity, however in most instances they are not used.

2.6.2   Status LEDs

These LEDs will be off until the programming logic has been uploaded from the base card. Once the DSP module is ready, the LEDs will flash green alternatively.

3 Approval information

This section provides information on the Approval of the Prosody X cPCI card, including information that may affect the Approval status of the card in use. Failure to use the Prosody X cPCI card in accordance with any of these instructions may invalidate the Approval for connection. These instructions refer only to the Aculab Prosody X cPCI card.

3.1 Safety warnings

Seek advice from a competent telecommunication engineer before installation and connection to a network.

The network interfaces on the Prosody X cPCI cards are only suitable for connection to TNV (telecom Network Voltage) circuits operating as SELV (Safety Extra Low Voltage) TNV class 1.

The interfaces have the following safety status:

Type of Circuit	Interface Description
SELV	Host Bus Interface (cPCI)
SELV	H.110 Telecommunications Bus
SELV (TNV class1)	RJ45 Network Interfaces

CAUTION When making a network connection, to reduce the risk of fire, only telecommunications line cord of 26 AWG or larger may be used.

See the country specific appendices following the general approvals information for additional safety related information.

3.2 EMC compliance

The card has been tested for compliance with EMC regulations in the USA, Canada, the UK, Europe and Australia in conjunction with a compliant host system. This does not guarantee that every EMC compliant host will remain compliant when used with the card. In extreme cases, high frequency energy within the PC may be conducted out of the PC and re-radiated via the network cables. In this case, the network cables may require additional treatment (such as clamp-on ferrite rings), and system-grounding provisions may require modification.

Good quality shielded cables must be used for the network connections in all cases.

If there is doubt regarding the overall EMC performance of a particular system, the user is advised to obtain competent advice, and local systems testing for EMC. Should local testing identify that additional EMC protection is required in the form of E1/T1 trunk cable clamping, you can refer to Appendix F for guidance on the installation of Aculab Ferrite Clamps.

3.3 Approval details

The Approval Number and Approval Holder details are included in the appendices relating to country specific information.

3.4 Network timing

The Prosody X cPCI card has been tested for compliance with the pulse and jitter requirements of CCITT G703, I431, ETS300-011 and in some cases additional national or international service requirements.

The Prosody X cPCI card usually derives the transmit timing for its E1/T1 interfaces from one of the connected incoming network received signals.

Alternatively, the card may be configured to derive synchronisation for E1/T1 interfaces from the H.110 CT bus.

Note   The jitter performance required to maintain the card's approval status is only guaranteed if the external clock is derived from another Aculab E1/T1 Digital Access card that is connected to the network.

Other clock configurations may require further testing to ensure compliance.

3.5   Approved functionality

Details of the approved functionality are included in the country specific appendices.

3.6   Regulatory warnings.

The CE Marking has been applied to the Aculab Prosody X cPCI card to demonstrate compliance with the following European standards.

EN55022 and EN55024 for electromagnetic compatibility.

EN60950 for electrical safety.

3.7   Approval label

When a card has been installed in a host computer, it is the card that is approved and not the host computer. The Approval label should be attached to the card and not the host.

3.8   User responsibilities

There may be configurations of the Prosody X cPCI card along with other equipment that may require additional approval testing by an accredited test laboratory.

In particular, in producing the approval certificate for the card, the approval authority did not place any specific restriction on the use of the card apart from any restrictions listed in the appendices covering country specific information.

It is the responsibility of the user to ensure that all of the legal requirements for attachment are met, thus the user is advised to seek competent advice regarding any particular equipment configuration or use.

Appendix A: country specific information

This appendix supplies the country-specific information to supplement the Installation Guide for the Prosody X cPCI card. These appendices should always be read in conjunction with the other sections of 'Instructions for Use'.

The appendices are arranged in separate sections detailing regulatory requirements for the following countries:

Appendix B - USA & Canada

Appendix C - European Union Countries

Appendix D – Australia

Appendix B: USA/Canada approval details

This section applies only to the PMX module when configured for T1 operation.

FCC connection requirements

This equipment complies with Part 68 of the FCC rules and the requirements adopted by the ACTA. On the exterior of the cabinet of this equipment is a label that contains, among other information, a product identifier in the format **US:AAAEQ##TXXXX.** If requested, this number must be provided to the telephone company.

ACTA Registration Number:	US: 5TC XD NA N PMXCPCIX
Ringer Equivalence Number (REN):	NAN
Facility Interface Code (FIC):	04DU9.1SN
Service Order Code (SOC):	6.0P
USOC Jack Type:	RJ12 RJ48C

A FCC compliant telephone cord and modular plug is provided with this equipment. This equipment is designed for connection to the telephone network or premises wiring using a compatible modular jack that is Part 68 compliant. See Installation Instructions for details.

The REN is used to determine the quantity of devices that may be connected to the telephone line. Excessive RENs on the telephone line may result in the devices not ringing in response to an incoming call. Typically, the sum of RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to a line (as determined by the total RENs) contact the local telephone company.

If this equipment E1/T1 cPCI causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes to its facilities, equipment, operations or procedures that could affect the operation of the equipment. If this happens the telephone company will provide advance notice so you can make the necessary modifications to maintain uninterrupted service.

If trouble is experienced with this equipment E1/T1 cPCI, for repair or warranty information, please contact Aculab INC, Customer Service, 197 First Avenue, Suite 130, Needham, MA 02494 +1 781 433 6000, (There are no user serviceable components on the card). If the equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

Connection to party line service is subject to state tariffs. (Contact the state public utility commission, public service commission or corporation commission for information.)

This equipment is hearing aid compatible.

Customer Owned Coin/Credit Card Phones

To comply with state tariffs, the telephone company must be given notification prior to connection. In some states, the state public utility commission, public service commission or corporation commission must give prior approval of connection.

Data Equipment

The table below shows which jacks are associated with which modes of operation:

Mode of Operation	USOC Jack
Programmable	RJ12 RJ45

Systems

Facility Interface Codes (FIC), Service Order Codes (SOC), USOC Jack Codes and Ringer Equivalence Numbers (REN) are shown in the table below.

Before connecting the card to the public network, you must inform the local telephone company of this information:

Service Type	SOC	FIC	USOC	REN
T1	6.0N	04DU9-1SN	RJ12 RJ45	NAN

UL requirements

This card has been assessed against UL60950-1 and is a listed accessory component under UL file number E178354. The Prosody X cPCI card should only be installed in a UL listed cPCI bus, based computer system.

Industry Canada warnings

The Industry Canada Label identifies certified equipment. This certification means that the equipment meets telecommunications network protective, operational and safety requirements as prescribed in the appropriate terminal equipment technical requirements document(s). The department does not guarantee the equipment will operate to the users satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions might not prevent degradation of service in some situations.

A representative designated by the supplier should co-ordinate repairs to certified equipment.

Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

WARNING USERS SHOULD NOT ATTEMPT TO MAKE SUCH CONNECTIONS THEMSELVES, BUT SHOULD CONTACT THE APPROPRIATE ELECTRIC INSPECTION AUTHORITY, OR ELECTRICIAN, AS APPROPRIATE.

Note   The Ringer Equivalence Number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Number of all the devices does not exceed 5.

Service requirements

In case of equipment malfunction, Aculab Plc should carry out all repairs. It is the responsibility of users requiring service to report the need for service to our company.

Contact details for the USA and Canada offices, (Aculab USA Inc) are available from the Aculab company web site at www.aculab.com. (E-mail: usa@aculab.com)

Approval number USA

Approval type	FCC part 68 XD component registration
Approval number	US: 5TC XD NA N PMXCPCIX
Approval holder	Aculab Plc, Lakeside, Bramley Road, Mount Farm, Milton Keynes MK1 1PT, UK

FCC approves the apparatus for connection to public T1 services as specified in the approval certificate, this appendix, and the 'Installation guide' subject to the conditions set out in these documents.

Approval number Canada

Approval Type	Industry Canada CS-03 issue 8
Approval number	2789A-AC5200

FCC EMC requirements

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and

2. This device must accept any interference received, including interference that may cause undesired operation.

No changes or modification to the Prosody X cPCI card is allowed without explicit written permission from Aculab, as these could void the end user's authority to operate the device.

The card is only intended for use in commercial applications and should not be operated in a domestic environment. It may only be installed by a professional engineer and good quality shielded cables must be used between the trunk interfaces and the Channel Service Unit (CSU) to ensure continued compliance to EMC regulations.

Canadian EMC requirements

This Class A digital apparatus meets all requirements of the Canadian interference-causing equipment regulations.

Cet appareil numerique de la Classe A respecte toutes les exigences du reglement sur le materiel brouilleur du Canada.

Usage and type

The Prosody X cPCI card is principally designed for use connected to a 1544 Kbps T1 service configured for primary rate ISDN (PRI) with National ISDN 2 signalling. Other types of private circuit use are also appropriate, and other signalling systems are available or planned.

Please contact Aculab for details of supported protocols.

Card installation & connection

Safety warnings

Interconnection circuits should be such that the equipment continues to comply with the requirements of CSA C22 for SELV circuits, after making connections between circuits using any of the internal interfaces.

Refer to a competent telecommunications engineer before installation and connection to a network.

L'avertissements concernant la sécurité

Quel que soit le matériel qui est raccordé aux port le système doit respecter les exigence de la norme CSA C22 au sujet des circuits SELV.

Il conviendra de rechercher l'avis d'un technicien de télécommunications avant l'installation de la carte et sa connexion au réseau.

Primary rate interface

Each trunk interface on the card carries one service connection via a screened twisted pair cable of 100 ohm characteristic impedance. There is one transmit pair and one receive pair. A T1 service will normally carry 24 channels and a T1-PRI service will carry 23 channels. The card is designed to connect to an FCC or IC registered Channel Service Unit (CSU), which is not supplied by Aculab. The default line build out setting is suitable for cables up to 133 feet between the card and the CSU.

Network cable pinout

The 8-contact RJ48 (RJ45) Telephone Modular Plug on the cable between the card and the network must be wired as follows:

Pin	Signal	Function	Direction
4	LTT	Transmit	output
5	LTR	Transmit	output
1	LRT	Receive	input
2	LRR	Receive	input

RJ48 (RJ45) connector

(front View)

87654321
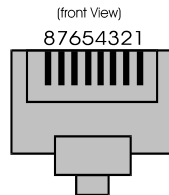
The cable and plug must be shielded types to ensure EMC compliance.

If a cable is to be produced to wire into a network trunk connection, the connector on the network end of the cable must be wired as appropriate for the network terminating unit or Channel Service Unit (CSU) provided.

A 'cross-over' cable is required to connect two T1 trunks 'back-to-back', for example, when one interface is to run exchange end emulation and the other interface a user end application. The cable should be wired as follows.

User End		Exchange End
4	to	1
5	to	2
1	to	4
2	to	5

Appendix C: Approval details for European Union countries & UK

This section applies only to the 120 Ohm and 75 Ohm E1 version of the PMX/PMXC module.

aculab

Declaration of Conformity

We

Aculab PLC

of

Lakeside
Bramley Road
Mount Farm
Milton Keynes MK1 1PT
United Kingdom.

Declare under our sole responsibility that the product

Aculab ProsodyX cPCI card

To which this declaration relates, is in conformity with the Radio and Telecommunication Terminal Equipment (RTTE) Directive 1999/5/EC

Signed: Position: Managing Director
Location: Milton Keynes
Date: 22nd September 2006

QMS- DOC-15: Version 1.0: 2006

C.1 Card installation & connection

Safety warnings

Interconnection circuits should be such that the equipment continues to comply with the requirements of 2.3 of EN 60950 for SELV circuits, after making connections between circuits using any of the internal interfaces.

The host system into which the Prosody X cPCI card is fitted is classed as an indirect attachment. The CompactPCI bus connector provides an interconnection circuit between the host system and the Prosody X cPCI card. Similarly, equipment connected to the Prosody X cPCI card H.110 CTBus is also classed as indirect attachment.

Installation and safety

The card must be installed such that, with the exception of the CompactPCI, H.110 bus connections, clearance and creepage distances shown in the table below are maintained between the Prosody X cPCI card and any parts of the host system or other expansion cards which use or generate a voltage, shown in the following table:

Clearance mm	Creepage mm	Voltage present on other parts of the host or on expansion cards.
2.0	2.4 (3.8)	Up to 50V rms or dc
2.6	3.0 (4.8)	Up to 125V rms or dc
4.0	5.0 (8.0)	Up to 250V rms or dc
4.0	6.4 (10.0)	Up to 300V rms or dc
For a host or other expansion card fitted in the host, using or generating voltages *greater* than 300V (rms or dc), advice from a competent telecommunications safety engineer must be obtained before installation of the relevant equipment.		Above 300V rms or dc

Clearance distances refer to the shortest distance between parts, measured through air. Creepage distances refer to total distances measured across surfaces when installed in a normal office environment. The creepage distances in parenthesis apply where the local environment within the host system is subject to conductive pollution or dry non-conductive pollution that could become conductive due to condensation.

If in doubt, seek advice from a competent telecommunications safety engineer.

In order to maintain the host independent approval of the E1/T1 16 trunk cPCI card, it is essential that when other expansion cards are introduced which use or generate a hazardous voltage, the minimum creepage and clearances specified above are also maintained. A hazardous voltage is one that exceeds 42.4V ac peak or 60V dc. If you have any doubt, seek advice from a competent engineer before installing other adapters into the host equipment.

CAUTION Failure to install the Prosody X cPCI card in accordance with these instructions may invalidate the safety approval.

EN55022 declaration

This is a Class A compliant product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

No changes or modification to the Prosody X cPCI card are allowed without explicit written permission from Aculab. Unauthorised changes could void the end user's authority to operate the device.
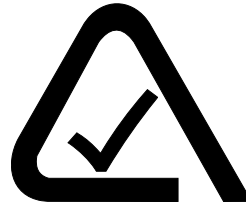
Service requirements

In case of equipment malfunction, Aculab Plc should carry out all repairs. It is the responsibility of users requiring service to report the need for service to Aculab plc by contacting Aculab support as detailed on the company web site at www.aculab.com.

Appendix D: Approval details for Australia

Approval types

C-Tick Mark
(EMC Australia)

A-Tick Mark
(Telecom Australia)

Supplier Identification   N4292

Approval Holder   Approval Specialists

The current contact details for the Australia offices, are available from the Aculab company web site at www.aculab.com.

Approval by the ACA for connection to primary rate ISDN will be held by Approval Specialists, and subject to the conditions set out in this appendix.

Usage and type

The Prosody X cPCI card is principally designed for use connected to a 2048 Kbps integrated services digital network (primary rate ISDN) with TS038 signalling.

Other types of private circuit use are also appropriate, and other signalling systems are available or planned.

The Australian approvals are only applicable when the Prosody X cPCI card is used with Aculab supplied signalling software appropriate for use in the country covered by the approval.

Card installation & connection

Safety warnings

The Primary Rate E1 ISDN Interface is a TNV interface as detailed in section 6 of AS/NZS 60950.

To ensure ongoing compliance with AS/NZS 60950:2000:

a) Where equipment is to be electrically connected to other equipment, interconnection circuits shall be selected to provide continued conformance with the requirements of section 2.3 for SELV circuits, and with the requirements of clause 6 for TNV circuits, after making connections between equipment's.

b) Make sure that the integrity of the SELV system is maintained when connection is made through any other interface within the system. If in any doubt seek competent advice.

c) All host equipment incorporating the E1 ISDN Interface *must* be earthed.

Network cable

The cable and plug must be shielded types to ensure EMC compliance.

Appendix E: Technical Specifications

Connectors

- 1 x PMX 16 module, 1 x DSP module, 16 x RJ12 balanced (120 ohm/100 ohm) or 8 x RJ45 Dual E1/T1 – dependant on RTM.
- 2 x RJ45 1000BaseT - ANSI/TIA/EIA-568-B.2-1 EIA/TIA T568A Category 6 standard

Line interface via optional PMX module

- E1 2Mbit to G703/G704/I431
- Double-frame, CRC4 multi-frame and CAS multi-frame supported, with HDB3 line encoding
- T1 1.544Mb to G703/G704/ANSI T1.403
- D4 and ESF support, with AMI or B8ZS line encoding

TDM interfaces

- H.110 compliant interface supporting connection to any of the 4096 timeslots

Switching

- Sixteen trunk 480/384/368 channels between network and TDM interface (E1/T1/T1 PRI) via PMX module.
- 256 channels per DSP resource
- Local switching of 512 channels to PMX signalling DSPs.

Clocking

- With PMX module – CT bus master supporting clock fallback
- Without PMX module - CT bus slave

DSP module

- With PMX module – CT bus master supporting clock fallback

Power supply

- +5V DC + 5%/-3%
- +3.3V DC + 5%/-3%

Power consumption

45 Watts maximum:

- 25 Watts nominal on the +5V DC supply
- 16 Watts nominal on the +3.3V DC supply

Forced air cooling is mandatory to prevent overheating and possible card damage which would invalidate the warranty. Please check chassis per slot cooling capability prior to installing and operating the card. Do not operate if chassis airflow is compromised for example through fan failure or temporary removal of front panels. The RTMs do not require to be cooled.

Physical

- Universal 32 bit, 6U form factor CompactPCI card
- Approximate weights - 300g base card, 100g PMX & 200g transition module
- This CompactPCI (cPCI) product conforms to PICMG 2.0 R3.0, PICMG 2.1 R2.0 and PICMG 2.5 R1.0. There is an RTM option which conforms to PICMG 2.16 R1.0.
- Overall dimensions (excluding face plate):

  Height 233.35mm +0.0 / -0.3mm
  Depth 160.0mm +0.0 / -0.3mm
  Transition module depth 76.50mm +/- 0.1mm

- Each cPCI card fits into a single card slot without impinging any adjacent slots
- For further details on cPCI standards, please contact the PICMG at http://www.picmg.com

Environmental

The Prosody X cPCI card is specified to operate within the following operating conditions:

- Temperature 0 deg to 40 deg Celsius

- Relative Humidity 10% to 90% non-condensing (provisional)

- Altitude 0 to 2,500 metres (provisional)

- Weight 0.3 Kg approx.

CAUTION   Forced air cooling is required to prevent overheating and possible card damage which would invalidate the warranty. Please check chassis per slot cooling capability prior to installing and operating the card. Do not operate if chassis airflow is compromised for example through fan failure or temporary removal of front panels.

Appendix F: Ferrite Clamp Fitting Instructions

The following diagram depicts the correct fitting of Aculab part number AC0440 Ferrite clamps. These may be fitted as required, for example, when local EMC testing of a system identifies the need for E1/T1 trunk cable clamping.
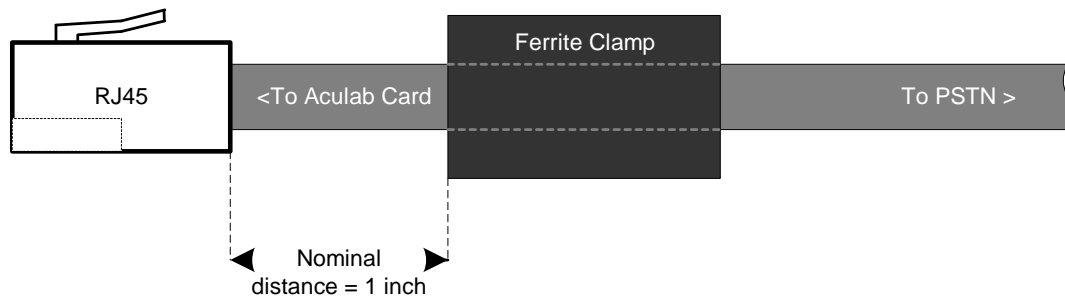
The Ferrite clamp consists of two halves of a ferrite core encased in a hinged plastic holder that is closed and latched around a cable up to 6mm in diameter

Please contact Aculab should you require further clarification on obtaining and using Ferrite Clamps.