

# Aculab Prosody X PCI Express R3 card

Installation guide

Revision 1.0.4



## PROPRIETARY INFORMATION

The information contained in this document is the property of Aculab plc and may be the subject of patents pending or granted, and must not be copied or disclosed without prior written permission. It should not be used for commercial purposes without prior agreement in writing.

All trademarks recognised and acknowledged.

Aculab plc endeavours to ensure that the information in this document is correct and fairly stated but does not accept liability for any error or omission.

The development of Aculab's products and services is continuous and published information may not be up to date. It is important to check the current position with Aculab plc.

Copyright © Aculab plc. 2004-2011 all rights reserved.

## Document Revision

Rev	Date	By	Detail
0.0.2	10/01/2011	DRS	1.7.1 H.100 CT expansion bus interface - updated
0.0.3	15/03/2011	DRS	Minor updates
0.0.4	15/03/2011	DRS	Minor updates and corrections
0.0.5	14/7/2011	DRS	Update to US / Canadian approval numbers
0.0.6	20/7/2011	DRS	Recommend Auto-neg for external Ethernet connections
0.0.7	20/7/2011	DRS	Typo on number of T1 channels
1.0.1	13/09/2011	DRS	Max temperature sensor limits
1.0.2	19/06/2012	DRS	Product variants described
1.0.3	19/06/2012	DRS	More product variants added
1.0.4	12/12/2012	EBJ	Declaration of Conformity added

## CONTENTS

1	Introduction.....	5
1.1	General.....	5
1.1.1	Prosody X PCI Express R3 card jumpers .....	6
1.1.2	Serial Number .....	8
1.1.3	Installation.....	8
1.1.4	Approvals .....	8
1.1.5	Usability statement.....	8
1.1.6	Product shipping variants.....	8
1.2	Uses of the Prosody X PCI Express R3 card .....	9
1.3	Call control .....	10
1.4	Media processing functions.....	10
1.5	Speech and data paths .....	11
1.6	Network Connection .....	11
1.6.1	External connector locations .....	12
1.6.2	External connector pinouts .....	12
1.6.3	E1/T1 network connection .....	12
1.6.4	RJ45 crossover connection for E1/T1 interface .....	13
1.6.5	75 ohm trunk connection.....	13
1.6.6	Single / Dual LAN connection .....	14
1.6.7	Cable lengths .....	16
1.7	H.100 CT expansion bus interface.....	16
1.7.1	H.100 bus loading .....	17
1.8	Host system recommendations .....	17
2	Card Installation.....	19
2.1	Installing the Card .....	19
2.1.1	Installing a card into a host: .....	19
2.2	Configuring the Prosody X PCI Express R3 card IP addresses.....	20
2.2.1	Prosody X host NIC IP address – Windows example .....	20
2.2.2	Prosody X networked computer IP address.....	20
2.3	Prosody X PCI Express R3 card LED usage.....	21
2.3.1	Power Monitor LEDs .....	23
2.3.2	Media processing DSP LEDs.....	24
2.3.3	FPGA Status LEDs .....	24
2.3.4	External Ethernet interface LEDs.....	24
2.3.5	Host Ethernet interface LEDs .....	25
2.3.6	Card firmware status LEDs .....	25
2.3.7	Trunk firmware LEDs .....	26
2.3.8	Boot Logic LEDs .....	26
2.3.9	TDM Clock LEDs .....	26
2.3.10	TDM FPGA LEDs.....	27
2.3.11	H.100 Terminate .....	27
3	Approval information .....	28
3.1	Safety warnings.....	28
3.2	EMC compliance .....	29
3.3	Approval details .....	29
3.4	Usage and type.....	29
3.5	Network timing .....	29
3.6	Approved functionality .....	29
3.7	Regulatory Warnings .....	29
3.8	Approval label .....	29

3.9 Documentation release .....	30
3.10 Software release .....	30
3.11 User Responsibilities .....	30
3.12 Speech calls .....	31
Appendix A: Country specific information .....	32
Appendix B: USA/Canada approval details .....	33
Appendix C: Approval details for UK and other EU countries .....	38
Appendix D: Approval details for Australia .....	42
Appendix E: Technical specifications .....	44
Appendix F: Ferrite clamp fitting instructions .....	47
4 Declaration of Conformance .....	48

### Table of Figures

Figure 1: Prosody X PCI Express R3 card .....	5
Figure 2: Prosody X PCI Express R3 jumpers J5 and J11 .....	6
Figure 3: Prosody X PCI Express R3 jumpers to select 1000BASE-T Mode .....	7
Figure 4: Prosody X PCI Express R3 jumpers to select 2x100BASE-TX operation .....	7
Figure 5: Prosody X PCI Express R3 External connections .....	12
Figure 6: Prosody X PCI Express R3 Dual 100BASE-TX Ethernet connections .....	15
Figure 7: Prosody X PCI Express R3 Single 1000BASE-T Ethernet connections .....	15
Figure 8: Prosody X PCI Express R3 Front panel Ethernet LEDs .....	21
Figure 9: Prosody X PCI Express R3 top right-hand side LEDs .....	21
Figure 10: Prosody X PCI Express R3 Bottom left-hand side LEDs .....	22
Figure 11: Prosody X PCI Express R3 Bottom right-hand side LEDs .....	22

# 1 Introduction

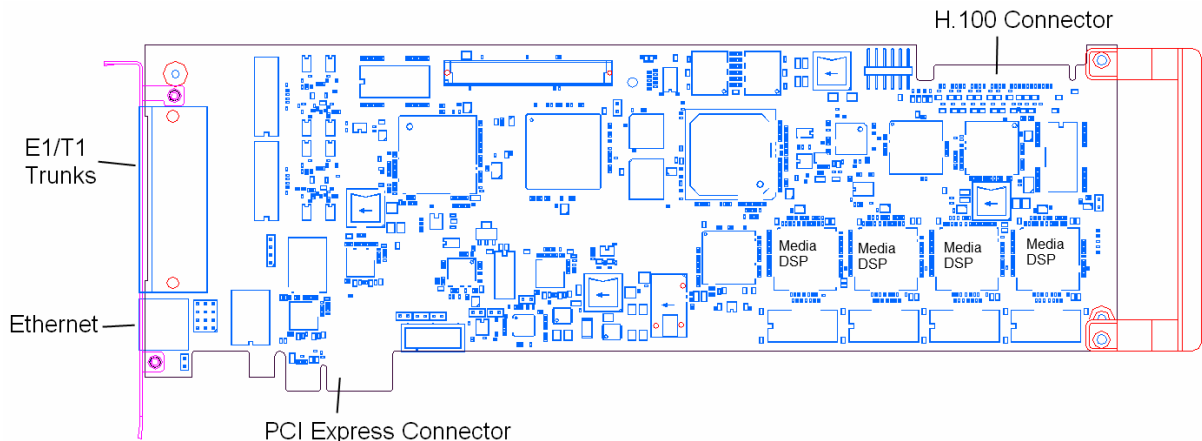
## 1.1 General

This document is the installation and user guide for the Aculab Prosody X PCI Express R3 card. This document covers all variants of this card.

The Prosody X PCI Express R3 card includes options for media processing resources (DSPs) and up to eight E1/T1 interfaces. Signalling DSP functionality, which may be required to support some E1 or T1 protocols, is built into the card. This will enable the card to process CAS and SS7 signalling protocols. Refer to the '**Aculab Call, Switch & Speech Driver Installation Guide**' for further information on using and configuring signalling DSP resources.

The Prosody X PCI Express R3 card provides an interface between a telephone network, an Ethernet network, a PCI Express bus (including host storage devices), and a standard H.100 TDM expansion bus. The Prosody X PCI Express R3 card contains a digital switch matrix that allows arbitrarily switched interconnection between:

- 4096 speech paths on the PCI Express card H.100 CT bus
- 1, 2 or 4 media DSPs, on the PCI Express card, for Prosody speech & IP telephony processing
- Telephone trunk connections via up to eight E1/T1 interfaces
- CAS & SS7 signalling DSP connections
- IP Telephony connections via a single Gigabit or dual Fast Ethernet interfaces



**Figure 1: Prosody X PCI Express R3 card**

The Aculab Prosody X PCI Express R3 card is shown above.

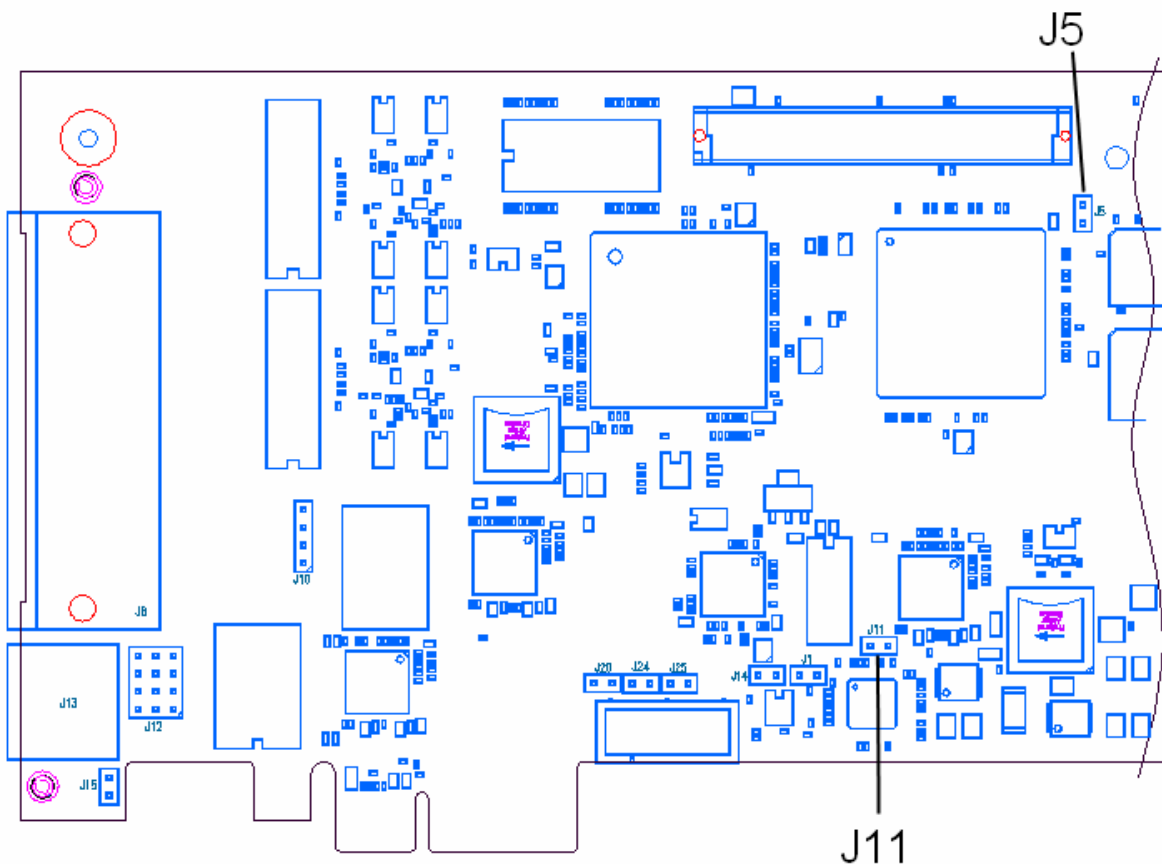
### NOTE

The Prosody X R3 card is controlled by Ethernet protocols (e.g. TCP, UDP) connected through an on-card card Media Access Controller or a single / dual Ethernet interface (see 2.2 below).

This product is referred to as the 'Prosody X PCI Express R3 card' in this document

unless the context requires a more specific term.

### 1.1.1 Prosody X PCI Express R3 card jumpers



**Figure 2: Prosody X PCI Express R3 jumpers J5 and J11**

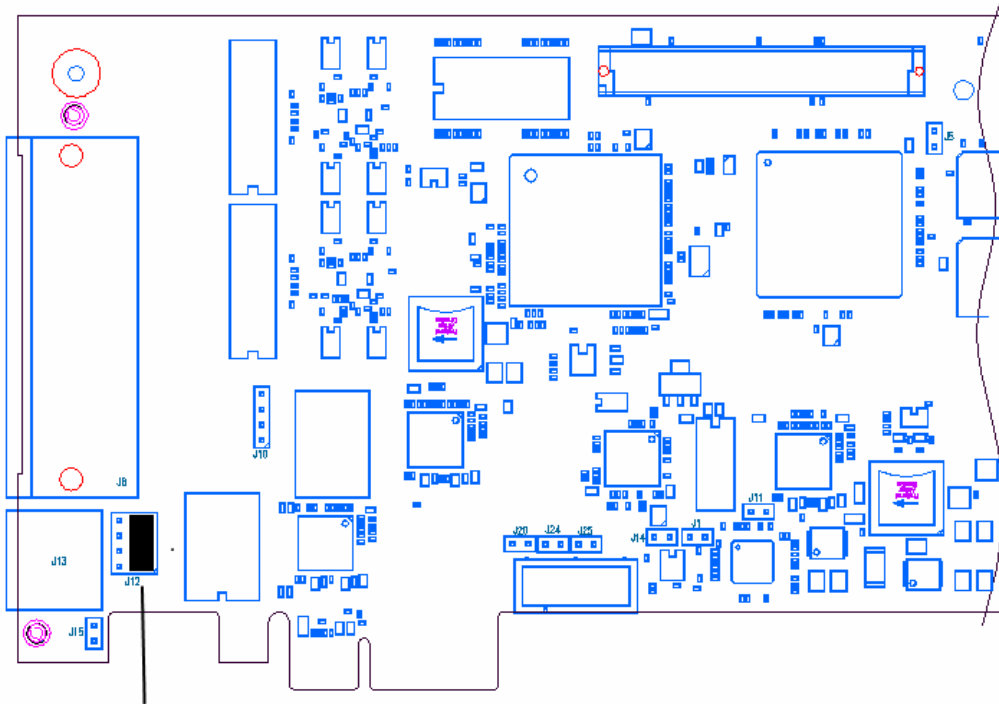
J5 – Boot PowerPC from Backup FLASH memory.

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

J11 – Ignore Host reset.

With this shorting header fitted the card will ignore the host system PCI Express reset signal. This is intended for operation in a chassis where no processor / S.B.C. is present.

J12 – Single 1000BASE-T or Dual 100BASE-TX Ethernet operation. A single 4x2 shorting header is used to select the required mode of operation.

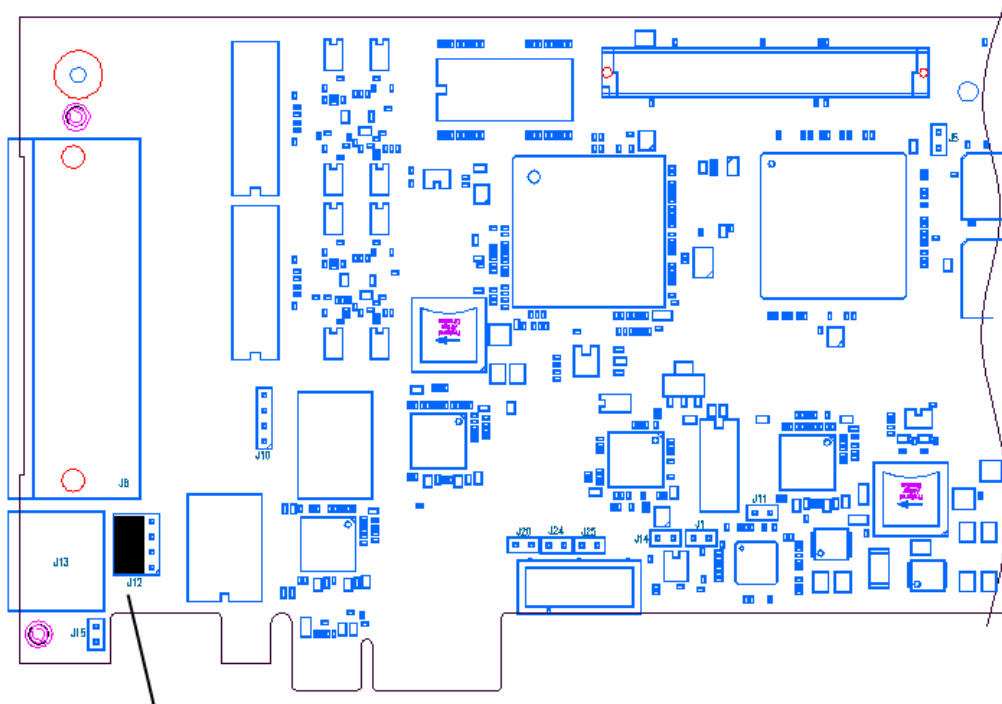


1x1000-BaseTX Selected

Figure 3:

**Prosody X PCI Express R3 jumpers to select 1000BASE-T Mode**

For 1000BASE-T operation the jumpers should be in the 1G (right hand) side, see Figure 3.



2x100-BaseT Selected

Figure 4:

**Prosody X PCI Express R3 jumpers to select 2x100BASE-TX operation**

For dual 100BASE-TX operation the jumpers should be in the 2x100M (left-hand) side, see Figure 4.

### 1.1.2 Serial Number

The **serial number** of the Prosody X PCI Express R3 card is used when configuring the Aculab libraries to uniquely identify a Prosody X PCI Express card in the system. The serial number of the card is located on the reverse of the card on the top edge and has the format:

P/N ACXXXX S/N XXXXXX WONXXX

The four digits following P/N AC denote the Aculab part number and identify card type during driver installation. The six digits following S/N are used to uniquely identify a card during driver configuration. The remaining digits are for Aculab use.

### 1.1.3 Installation

The card installation & connection sections refer to installation of the Prosody X PCI Express R3 card into a host computer, subsequent connection to the network, and provide hardware control and configuration information.

### 1.1.4 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 appendix contain statements regarding use of the Prosody X PCI Express R3 card that are legal requirements for connection to the public network. Failure to use the Prosody X PCI Express R3 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.

### 1.1.5 Usability statement

Speech and data 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 telephony system, and only has usable functionality when associated with a host system which is running application software using the Aculab API.

#### NOTE

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

### 1.1.6 Product shipping variants

The Prosody X PCI Express R3 card may be shipped in a number of variants with different numbers of DSPs and Trunks fitted and / or enabled.

The AC number can be used to show how many trunks and DSPs the product has enabled, see table Table 1: AC Numbers with Trunks and DSPs below.

The AC number is on a sticker on the back of the card and is in the form ACxxxx.



AC Number	Number of Trunks	Number of DSPs
AC5700	8	4
AC5730	8	2
AC5732	2	2
AC5734	4	2
AC5760	8	1
AC5761	1	1
AC5762	2	1
AC5764	4	1

**Table 1: AC Numbers with Trunks and DSPs**

The trunk numbering always starts at 0. The number of the highest usable trunk is N-1. See figure Figure 5: Prosody X PCI Express R3 External connections for trunk connections.

## 1.2 Uses of the Prosody X PCI Express R3 card

The Prosody X PCI Express R3 card is a plug-in card suitable for use in many different types of PCI Express R3 compatible computers. It provides a platform in which to carry out a range of functions.

### Computer Telephony Bus

The H.100 (CT bus) expansion interface enables connectivity within the same chassis between various kinds of H.100 compatible PCI Express or PCI based speech and data products from different vendors. This provides scalability within a host system.

### Integration

The Prosody X PCI Express R3 card is a highly integrated Computer Telephony component. By combining TDM and IP digital access, and the media processing capabilities of Prosody, Aculab has produced a high capacity, scaleable single slot CT component.

### Switching

The Prosody X PCI Express R3 card contains a digital switch matrix that allows arbitrarily switched interconnection between up to 240 channels on an E1-network, up to 192 channels on a T1-network and up to 4096 speech paths (timeslots or channels) on the H.100 CT expansion bus. The H.100 CT expansion bus supports connection to other H.100 compliant devices.

### Control

The Prosody X PCI Express R3 card is always controlled via a Media Access Controller (MAC) and its associated device driver. The user can choose to control the card via an on-board host MAC which is accessed over the PCI Express bus, or any off-board MAC either in the same host system or a separate host system. This provides flexibility in system design as the card does not have to be installed in the same system as the host that runs the application software. This in turn can provide scalability outside of the host system, if the application requires a distributed architecture. Note that in this case the control traffic will share an Ethernet interface with any VoIP traffic passing through the card.

If the host MAC on the Prosody X PCI Express R3 card is used then the device driver is the standard driver supplied by Intel for the 82574 device. If connection is via a regular Network Interface Card (NIC) or integral to a motherboard then the device driver is simply the one already in use for that product. Aculab provides libraries and associated device drivers for a range of operating systems. Please contact Aculab for information on availability.

### External Ethernet Connector

The Prosody X PCI Express R3 card may be connected to a standard 1000BASE-T or 100BASE-T Ethernet LAN, allowing various functions including media processing for IP Telephony and control of the card from a remote host.

### Media Rich DSPs

The card has up to 4 media DSPs fitted which allow the processing of and conversion between IP and TDM based media streams.

## 1.3 Call control

The call control interface is at a low level (in signalling terms), and provides maximum information and control over the various stages of call progress, (set-up, acceptance, clearing, etc). This interface is accessed via a device driver that has been prepared for the operating system in use.

The call processor checks each outgoing message provided by the application program for syntax, validity of content and context. If errors are found, the call can be automatically cleared. In these instances the software can form an effective barrier between the application program and the telephone network, protecting the network from invalid call signalling.

Several elements of call signalling related information are available to the application program, although in some cases this depends upon provision of call specific information by the Public Switched Telephone or Ethernet networks. One such information element is the number used by the caller on calling into the card, (the DDI number). This is only available when the service obtained from the PSTN is of the appropriate type. Another information element, which may be available, is Calling Line Identity (CLI). On incoming calls, CLI makes the telephone number of the calling party available to the application program.

Full details on the control of calls using the Prosody X PCI Express R3 card are available in a separate publication '**Aculab Call Control API Guide**', which can be downloaded from [the support area of](#) the Aculab company web site at [www.aculab.com](http://www.aculab.com)

## 1.4 Media processing functions

The Prosody X PCI Express R3 card is designed for processing digitised speech data, with support for recording/playback, echo cancellation, conferencing, DTMF, and call progress tones and more. This functionality is available when one or more media DSPs are present.

Further details are available in the Aculab TiNG API guides and Application Notes.

Speech or data is transferred in either direction between any of the following:

- The host storage medium
- Any of the channels on the H.100 CT expansion bus or the E1/T1 trunk connections

- Any RTP endpoints on the Ethernet connection in use

## 1.5 Speech and data paths

Speech or data associated with telephone calls may be switched without modification to other cards or on-board modules (DSPs) for processing, for example, speech processing can be performed on the card by the media processing DSPs.

The card maintains bit integrity within timeslots between TDM interfaces on the card and also via the H.100 expansion interface.

There are various types of multi-channel path provided by the card, as follows:-

1. E1 trunks –2.048Mbit systems or ISDN  
T1 trunks - 1.554Mbit T1 systems or T1 PRI
2. RTP Voice over IP Ethernet interface
3. Host storage via the PCI Express bus – bi-directional for record and playback, channel count is dependent on compression and host capabilities
4. The H.100 CT expansion bus

Any one 'source' of speech or data may be distributed to a number of separate 'sinks', but it is not possible via switching on the card alone for more than one source to feed a single sink. This conferencing function is sometimes required to combine separate speech sources and can be performed on board with the use of the on-board media DSP resources.

Full details on the switching of calls using the Prosody X PCI Express R3 card are available in a separate publication '**Aculab Switch Control API Guide**' which can be downloaded from [the support area of the Aculab company web site at www.aculab.com](http://www.aculab.com).

## 1.6 Network Connection

The Prosody X PCI Express R3 card connects to either E1/T1 digital telephony networks or Ethernet LAN or both, depending on the application. Each E1/T1 trunk connection is software configurable for either E1 or T1 operation.

An E1 interface connects to the 2.048 Mbit/s digital system or Primary Rate 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 interface may make or receive up to 30 separate calls at a time, or may carry 31 channels without signalling.

A T1 interface connects to the 1.544Mbit digital system via a Channel Service Unit (FCC, IC or UL Listed CSU). Each T1 trunk may carry 23 channels when PRI (ISDN) protocols are used, or 24 when CAS (robbed bit) protocol is used.

The LAN interface connects IP telephony (VoIP) channels up to the capacity of the card and so a single connection will typically carry more channels than an E1 or T1 trunk. The LAN interface may also carry host application control and status traffic at the same time as telephony data.

### 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.

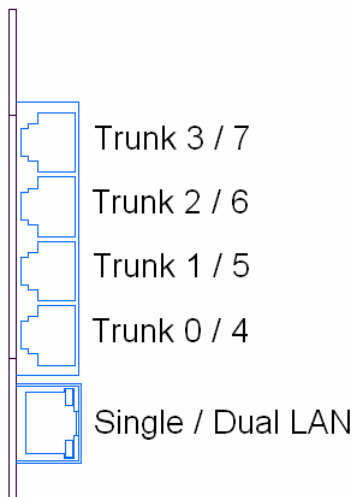
Ample strain relief should be fitted when installing all network cables. Any damage caused by inadequate strain relief to cards will not be covered by your warranty.

Both E1/T1 and Ethernet cables may be connected and disconnected while the card is installed and active.

Bear in mind that disconnecting an active E1/T1 trunk will cause an alarm condition both within the host system while the application software is running and at the corresponding network end of the cable. You may wish to check with the local network operator if there is a requirement for advance notification of E1/T1 trunk installation and maintenance.

### 1.6.1 External connector locations

There are five external connectors available. It is important to identify these correctly during installation as there is no compatibility between E1/T1 trunk interfaces and LAN interfaces. Part populated trunk variants will always have trunk 0 as the first available E1/T1 connection.



**Figure 5: Prosody X PCI Express R3 External connections**

### 1.6.2 External connector pinouts

#### 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.

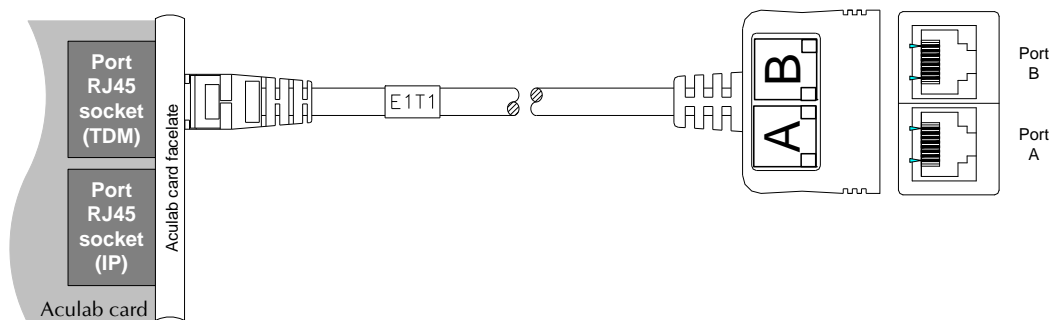
The front plate of the PCI Express R3 card has five RJ45 sockets. The first socket (bottom) is a single 100BASE-T / dual 100BASE-TX Ethernet interface.

### 1.6.3 E1/T1 network connection

The remaining four sockets, numbering bottom to top, are E1/T1 telephony network trunk connections. The E1/T1 pin outs are as detailed below:

RJ45 plug	Circuit	RJ45 pin
1	RX A tip	1
2	RX A ring	2
3	RX B tip	3
4	TX A tip	4
5	TX A ring	5
6	RX B ring	6
7	TX B tip	7
8	TX B ring	8
Shield	-----	Shield

The E1/T1 port mapping is detailed below.



### CAUTION

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

#### 1.6.4 RJ45 crossover connection for E1/T1 interface

A 'cross-over' cable is required to connect two E1 or T1 interfaces 'back-to-back', for example, when one interface is to run as an 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

#### 1.6.5 75 ohm trunk connection

### NOTE

Different E1 impedance can be supported on the same card;  
The card can simultaneously support both E1 and T1 ports.

Some legacy E1 PSTN networks require 75 Ohm trunk connection. The default impedance for E1 protocols 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 provides the following protocols:

DASS2

DPNSS

SS7/ISUP

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 trunk 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.

### 1.6.6 Single / Dual LAN connection

The LAN connector is located closest to the PCIe expansion interface. This provides either a single 1000BASE-T or two 100BASE-TX Ethernet network connections.

For details on how to select these modes of operation, see section 1.1.1 above.

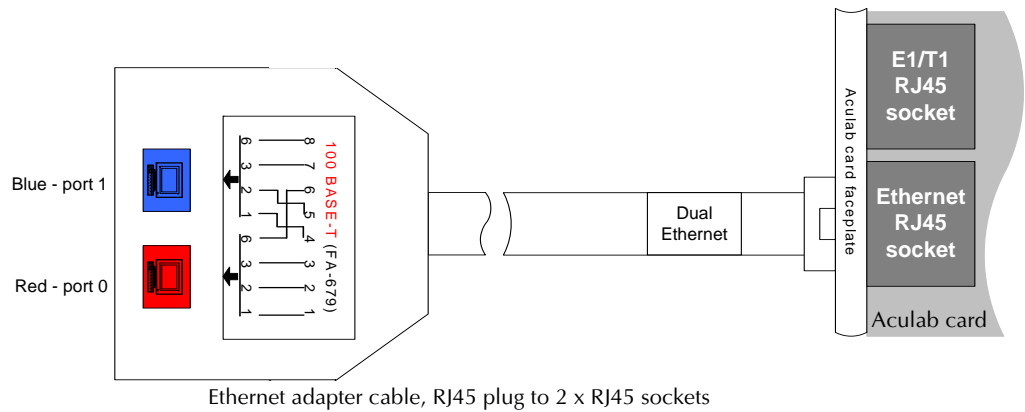
If the dual 100BASE-TX connections are selected, one has the conventional pin assignment and the second requires an adapter cable to provide the second connector with normal pin assignment.

The LAN interfaces are designed to operate at Fast Ethernet (100BASE-TX) or Gigabit (1000BASE-T) data rates. If connected to network equipment that is not compatible with these, the interface may attempt to negotiate a 10BASE-T link speed. This is not recommended and may not work.

The LAN interfaces are not designed to be connected to legacy “hub” (half duplex)

network equipment.

Pin out of the dual 100Mbps Ethernet plug to two Ethernet sockets (T568A):



RJ45 plug	circuit	RJ45 interface 0	RJ45 interface 1
1	TX A	1	
2	TX A	2	
3	RX A	3	
4	TX B		1
5	TX B		2
6	RX A	6	
7	RX B		3
8	RX B		6
Shield	-----	Shield	Shield

Figure 6: Prosody X PCI Express R3 Dual 100BASE-TX Ethernet connections

RJ45 plug	circuit
1	DA+
2	DA-
3	DB+
4	DC+
5	DC-
6	DB-
7	DD+
8	DD-
Shield	Shield

Figure 7: Prosody X PCI Express R3 Single 100BASE-T Ethernet connections

**NOTE**

When connecting the Aculab card Ethernet interface to a 100BASE-TX Ethernet network, the Ethernet adapter should be used.

**NOTE**

The 100BASE-TX and 1000BASE-T interfaces should only be connected to an Ethernet switch.

**CAUTION**

Do not connect directly between the LAN interface in dual 100BASE-TX Ethernet mode and a 100BASE-T Ethernet switch – always use the adapter supplied.

**CAUTION**

Do not connect directly to a 10BASE-T network.

**CAUTION**

The Aculab card Ethernet ports should only be connected to Ethernet ports set to Auto-negotiation.

**NOTE**

When the jumper selects 1000BASE-T, the card will connect to a 100BASE-TX Ethernet switch without the Ethernet adapter.

Cat 5 cabling is recommended for 100BASE-TX Ethernet connections.

Cat 5e, 6 or 6e cabling is recommended for 1000BASE-T Ethernet connections.

### 1.6.7 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. The 75 ohm adapter should be installed close to the Prosody X RJ45 (RJ48C) socket to minimise impedance mismatch effects.

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.

## 1.7 H.100 CT expansion bus interface

The Prosody X PCI Express R3 card can occupy any position in a 'chain' of H.100 CT



Bus devices interconnected with a suitable ribbon cable.

#### NOTE

The H.100 expansion bus is provided for connections between H.100 capable equipment within a single host chassis. It is not designed to be used for inter-chassis connections.

The H.100 CT bus ribbon cable may consist of no more than 20 connectors, with a typical distance between each connector of one inch, and a maximum bus cable length of 20 inches (including connector terminations).

In addition, in order to assure that the interleaved grounds on the ribbon cable act as effective grounds, the distance between populated CT bus cards should be as short as possible and **MUST BE** less than 7 inches. It is also recommended that the ribbon cable be no longer than required to interconnect the chain of H.100 CT bus devices.

#### NOTE

It is bad practice to leave a “spare” length of ribbon cable unconnected beyond the terminating card, as this will compromise the electrical termination and degrade the signal quality. In severe cases data integrity will be impaired.

If the Prosody X PCI Express R3 card is the first or last device at either end of a ribbon cable, then the card must be placed in terminated bus mode.

Cards are terminated via the ACT configuration utility or alternatively by setting the -ht (H.100 bus mode) switch in the device driver. See the ***‘Aculab Call, Switch & Speech Driver Installation Guide’***. A single orange LED will turn on when the card is configured for H.100 termination.

#### NOTE

The Prosody X PCIe card may be configured as H.100 clock master. There may be just one active clock master at any time. It is good practice to configure a card at one end of the H.100 ribbon cable as the normal clock master to provide the slave cards with the highest quality clock and frame synchronization signals.

### 1.7.1 H.100 bus loading

Prosody X PCI Express R3 cards have a loading factor of one on the H.100 CT bus. The maximum loading allowed on the H.100 CT bus is 20. The total loading is calculated by adding the loading factor of all the devices on a single H.100 ribbon cable. The electrical loading limit of H.100 means that theoretically, 20 Prosody X PCI Express R3 cards can be used in the same host.

The H.100 channel capacity, of 4096 timeslots, will normally restrict the theoretical loading to a maximum of 8 eight-trunk Prosody X PCI Express R3 cards in the same host, for non-blocking E1 switching, via the H.100 bus.

Individual system constraints may reduce this further.

## 1.8 Host system recommendations

### Expansion slots

The card may be installed in any PCI Express expansion slot with x4 or greater slot

size which is also able to accommodate the full length and full height form factor. For example, the card may be installed in a x16 PCI Express expansion slot, as the PCIe bus protocol will automatically fall back to use the x1 connection available on the Prosody X product.

The product is not compatible with expansion slots that provide x1 edge connectors.

### **Forced air cooling**

#### **CAUTION**

In most instances, forced-air-cooling is an essential requirement of a host system. Operation of the Prosody X PCI Express R3 card without adequate cooling will reduce the reliability of operation and seriously affect the lifetime of the product.

The Prosody X PCI Express R3 card incorporates on board temperature monitors that enable the cooling system to be regulated to maintain acceptable operating temperatures. The operating limits for these temperatures are given in the Environmental section. (Appendix E).

## 2 Card Installation



### CAUTION

Observe electrostatic discharge precautions when handling PCI Express expansion products. Do not touch the gold plated connectors while installing a card.

### 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 PCI Express R3 card unless the mains power supply is completely removed from the host computer and all network cables are disconnected from the network.
- To ensure safety, any covers removed from the host computer in order to install the Prosody X PCI Express R3 card must be replaced before the mains power supply is reconnected.
- Do not connect the Prosody X PCI Express R3 card to a 2.048/1.554 Mbit/s digital service or Primary Rate ISDN network until this document, and in particular the sections marked 'Installation and Safety', have been read in full and understood.
- Normal ESD (electrostatic discharge) precautions should be followed while the card is being handled

#### 2.1.1 Installing a card into a host:

1. Remove the power and disconnect any mains leads
2. Remove the host computer covers.
3. Locate a vacant full-length PCI Express slot with a motherboard connector of x4 lanes or greater and, if required, remove the blanking plate.
4. Fit the card to the PCI Express slot and screw the metal bracket to the chassis.
5. Ensure that adjacent devices/cards can not make contact with the Prosody X card.
6. Fit H.100 CT bus ribbon cables between the Prosody X PCI Express R3 card connectors and any other cards that are required.
7. Replace the covers on the host computer.
8. Attach the mains leads and apply power.

Having completed installation of a new card, if you have not already done so, you will now need to download and install the required drivers. Please refer to the **Aculab Installation Tool (AIT)** documentation for downloading the Aculab software (including drivers, firmware and utilities), and the **Aculab call, switch and speech**

**driver installation guide (ACT)** for driver and protocol firmware installation.

### NOTE

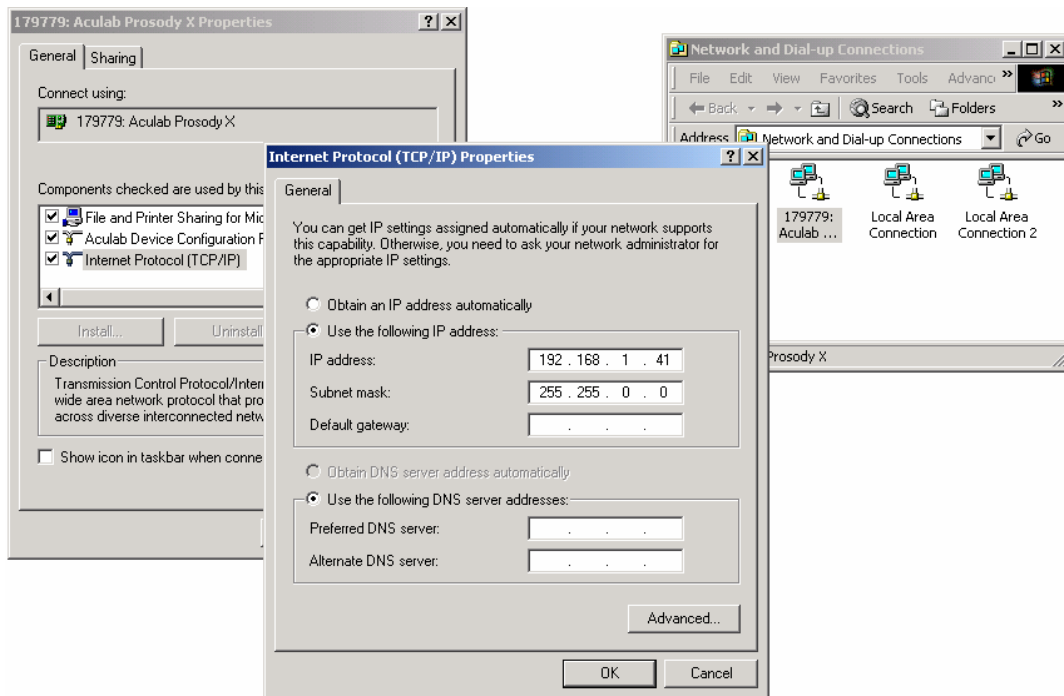
**Revision 6.5.X** or later software is required for the Prosody X PCI Express R3 product. It is recommended to use the current release available on the aculab.com website.

## 2.2 Configuring the Prosody X PCI Express R3 card IP addresses

The Prosody X card will be detected by the host system as a network device (NIC). The 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 – Windows example

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.



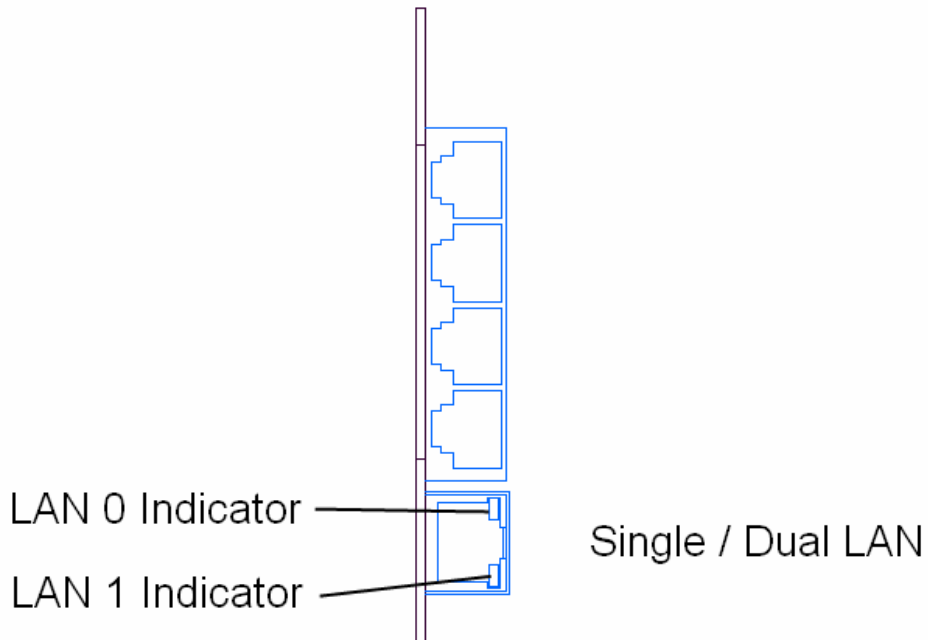
### 2.2.2 Prosody X networked computer IP address

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

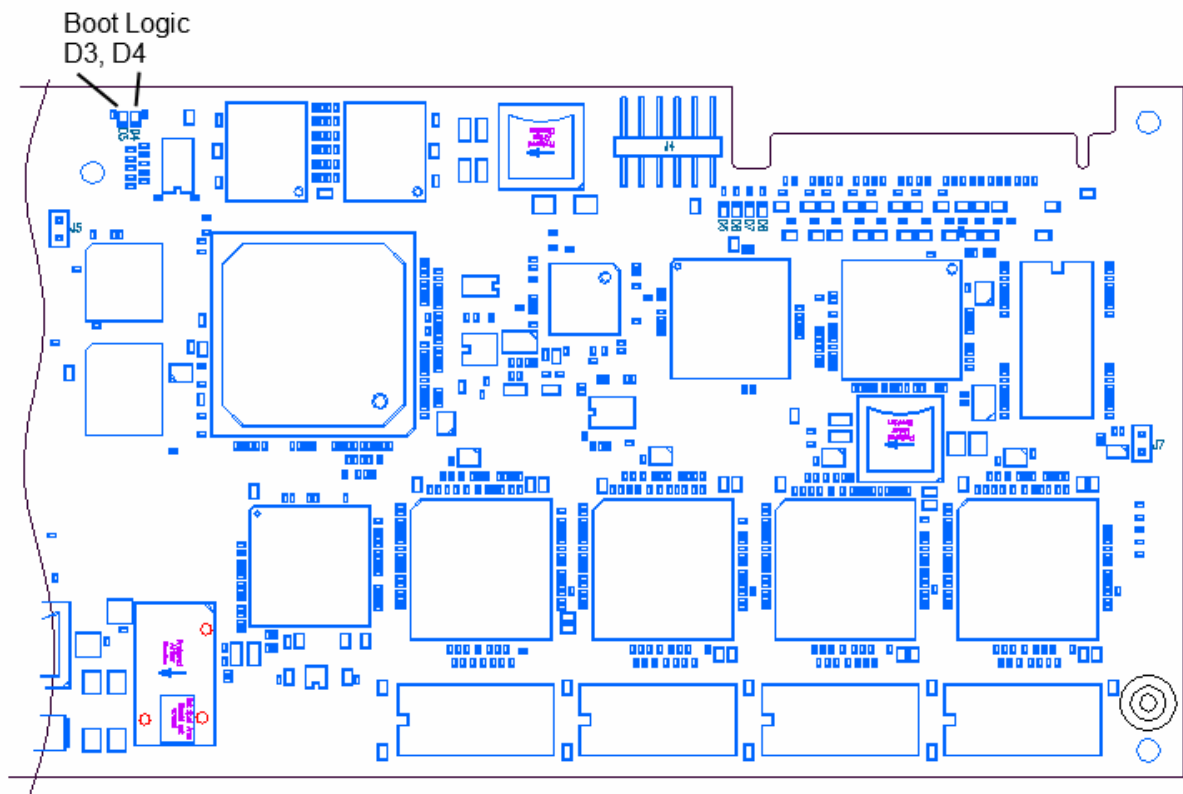
For further details on using the ACT, please see the **Aculab call, switch and speech driver installation guide (1761.pdf)**. This document also includes details for command line configuration of the IP addresses and firmware download to the Aculab cards.

### 2.3 Prosody X PCI Express R3 card LED usage

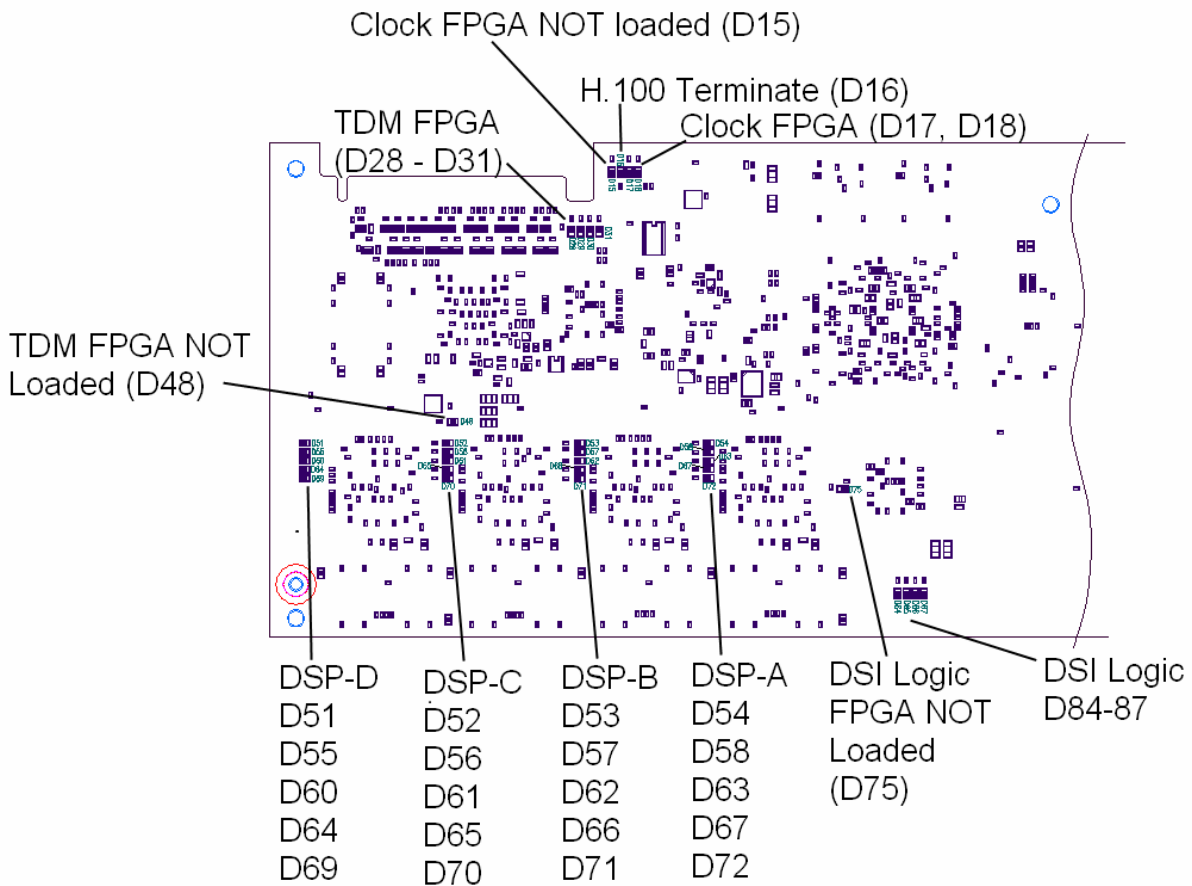
There are a number of LEDs mounted on the Prosody X PCI Express R3 card. The LEDs are arranged as shown on the following diagrams.



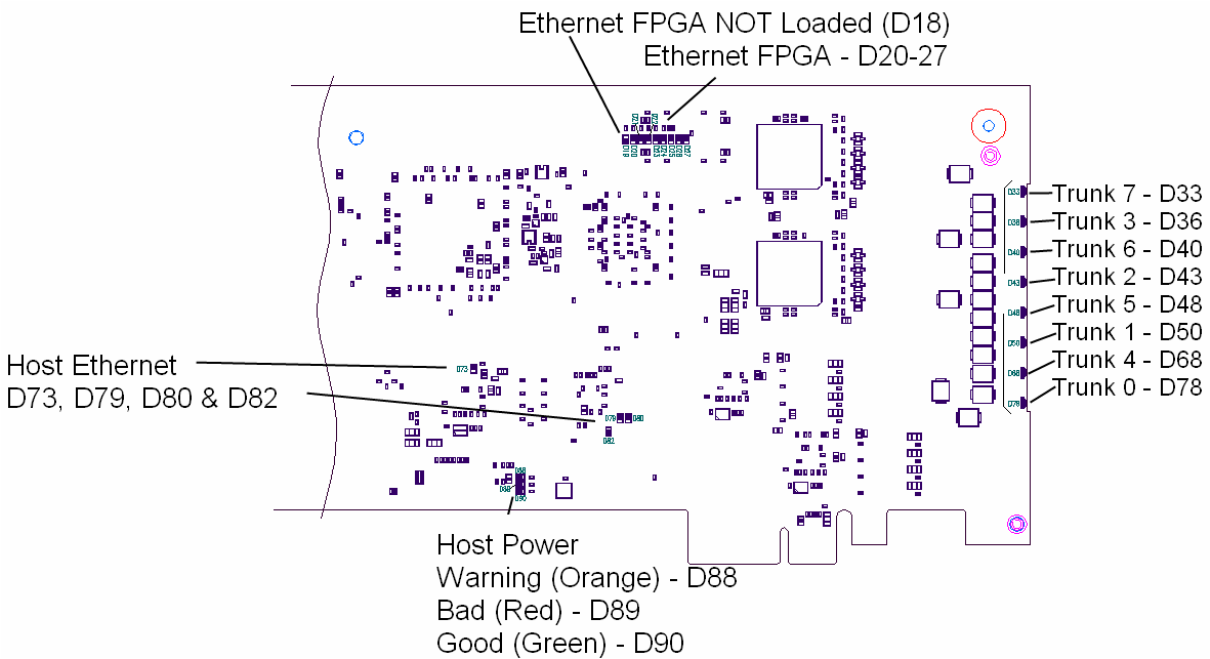
**Figure 8: Prosody X PCI Express R3 Front panel Ethernet LEDs**



**Figure 9: Prosody X PCI Express R3 top right-hand side LEDs**



**Figure 10: Prosody X PCI Express R3 Bottom left-hand side LEDs**



**Figure 11: Prosody X PCI Express R3 Bottom right-hand side LEDs**

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 or interface.

LED groups	Positions	Order Description
Power Monitor		See section 0
Media processing DSP LEDs		See section 2.3.2
FPGA Status		See section 2.3.3
External Ethernet interface LEDs		See section 2.3.4
Host Ethernet interface LEDs		See section 2.3.5
Card firmware LED status		See section 2.3.6
Trunk firmware LEDs		See section 2.3.7
Boot Logic LEDs		See section 2.3.8
TDM Clock LEDs		See section 2.3.9
TDM FPGA LEDs		See section 2.3.10
H.100 Terminate		See section 2.3.11

### 2.3.1 Power Monitor LEDs

These LEDs are used to indicate the host supplied power to the card.

LED	Colour	Meaning
D88	Orange	Warning low voltage
D89	Red	Power Bad
D90	Green	Power Good

#### NOTE

If the Red LED is lit then the card has detected rails outside the specified tolerance. The card may not boot.

The chassis power distribution will need to be investigated.

#### NOTE

If the Orange LED is lit then the card has detected rails close to being outside the specified tolerance.

The chassis power distribution will need to be investigated.

### 2.3.2 Media processing DSP LEDs

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

**Red LED** – flashes when firmware is running

**Green LEDs** – subject to the firmware running on the DSP, these are used to indicate DSP firmware activity.

LED	Colour	Meaning
D51	Red	DSP A Activity
D55, D60, D64, D69	Green	DSP A Activity

LED	Colour	Meaning
D52	Red	DSP B Activity
D56, D61, D63, D70	Green	DSP B Activity

LED	Colour	Meaning
D53	Red	DSP C Activity
D57, D62, D66, D71	Green	DSP C Activity

LED	Colour	Meaning
D54	Red	DSP D Activity
D58, D63, D67, D72	Green	DSP D Activity

### 2.3.3 FPGA Status LEDs

The following LEDs show the status of the various FPGAs fitted to the board. These LEDs light up when the card is reset and will go out one at a time as the card boots.

LED	Colour	Meaning
D15	Red	FPGA not loaded
D19	Red	FPGA not loaded
D48	Red	FPGA not loaded
D75	Red	FPGA not loaded

### 2.3.4 External Ethernet interface LEDs

These LEDs are mounted on the Ethernet RJ45 connector.



LED	Colour	Meaning
A	Green / Orange	Ethernet port 0 status
B	Green / Orange	Ethernet port 1 status

Solid colour indicates a link. Flashing indicates activity.

Green indicates 1000BASE-T

Orange indicates 100BASE-TX

### 2.3.5 Host Ethernet interface LEDs

These LEDs are used to indicate the state of the host Ethernet interface to the card.

LED	Colour	Meaning
D73	Green	Host Ethernet activity
D79	Green	MAC Activity
D80	Green	MAC Link
D82	Green	MAC 100

### 2.3.6 Card firmware status LEDs

In normal operation the six amber LEDs (D22-D27) are flashing in a “walking one” sequence.

LED	Colour	Meaning
D20	Orange	Firmware / FPGA dependant
D21	Orange	Firmware / FPGA dependant
D22	Orange	Walking one
D23	Orange	Walking one
D24	Orange	Walking one
D25	Orange	Walking one
D26	Orange	Walking one
D27	Orange	Walking one

### 2.3.7 Trunk firmware LEDs

LED	Colour	Meaning
D33	Red / Green	Port 7 Trunk state
D36	Red / Green	Port 3 Trunk state
D40	Red / Green	Port 6 Trunk state
D43	Red / Green	Port 2 Trunk state
D46	Red / Green	Port 5 Trunk state
D50	Red / Green	Port 1 Trunk state
D68	Red / Green	Port 4 Trunk state
D78	Red / Green	Port 0 Trunk state

#### NOTE

The trunk LEDs are just behind the front panel of the card and may be visible from outside the system the cards are plugged into.

### 2.3.8 Boot Logic LEDs

These LEDs flash on startup and then the green LED should stay on.

LED	Colour	Meaning
D3	Red	Firmware controlled
D4	Green	Firmware controlled

These LEDs flash as the card comes out of reset. If the card is booting from the backup FLASH image D3 (red) LED is on, otherwise this is off.

### 2.3.9 TDM Clock LEDs

LED	Colour	Meaning
D17	Green	Firmware controlled
D18	Green	Firmware controlled

### 2.3.10 TDM FPGA LEDs

LED	Colour	Meaning
D5	Green	Firmware controlled
D6	Green	Firmware controlled
D7	Green	Firmware controlled
D8	Green	Firmware controlled
D28	Green	Firmware controlled
D29	Green	Firmware controlled
D30	Green	Firmware controlled
D31	Green	Firmware controlled

### 2.3.11 H.100 Terminate

This LED is used to indicate if the H.100 bus termination is active.

LED	Colour	Meaning
D16	Orange	H.100 Termination active

### 3 Approval information

This section provides information on the Approval of the Prosody X PCI Express R3 card, including information that may affect the Approval status of the card in use. Failure to use the Prosody X PCI Express R3 card in accordance with any of these instructions may invalidate the approval for connection. These instructions refer only to the Aculab Prosody X PCI Express R3 card.

#### 3.1 Safety warnings

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

The network trunk connectors on the Prosody X PCI Express R3 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 (PCI Express)
SELV	H.100 Telecommunications Bus
SELV	RJ45 dual Ethernet connector
SELV (TNV class1)	RJ45 Network Interface connectors

#### CAUTION

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

#### CAUTION

A competent engineer must check the integrity of the bonded earth connection between the building installation and the host chassis.

#### CAUTION

The front faceplate on all Aculab PCI Express cards must be grounded to the chassis bonded earth at all times. Ensure that the card retaining screw has been tightened correctly, and that a good electrical connection has been made between the faceplate and the chassis, before connecting power to the system.

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 PC. This does not guarantee that every EMC compliant PC 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 perform local system testing. Should local testing identify that additional EMC filtering is required on E1/T1 cables, you can refer to Appendix F for guidance on the retrofit 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 Usage and type

The usage and type of connections supported by the Prosody X PCI Express R3 cards are detailed in the appendices relating to country specific information.

### 3.5 Network timing

The Prosody X PCI Express R3 card has been tested for compliance with the pulse and jitter requirements of G.703, I.431, ETS300-011 and in some cases additional national or international service requirements.

The Prosody X PCI Express R3 card usually derives the transmit timing for its E1/T1 interfaces from one of the connected incoming network received signals.

Alternatively, the Prosody X PCI Express R3 card may be configured to derive synchronisation for E1/T1 interfaces from the H.100 CT bus. 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 sources may require further testing to ensure compliance.

### 3.6 Approved functionality

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

### 3.7 Regulatory Warnings

The CE Marking has been applied to the Aculab Prosody X PCI Express R3 card to demonstrate compliance with the following European standards.

EN55022 and EN55024 for electromagnetic compatibility.

EN60950 for electrical safety.

### 3.8 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.

### 3.9 Documentation release

To ensure operation of the Prosody X PCI Express R3 card is consistent with the terms of Approval, it is essential that a card is both used with the correct release of the instructions for use, and that it is only used in conjunction with appropriate device drivers.

If an application developer, by virtue of an application program, reduces the functionality of the Prosody X PCI Express R3 card, providing all of the sections regarding approval, installation and connection are retained, the instructions for use may be rewritten so that only the functionality implemented is described.

### 3.10 Software release

To ensure correct operation of the Prosody X PCI Express R3 card, it is necessary that application programs be built using the correct release of software files for the particular revision of the Prosody X PCI Express R3 card.

The protocol software supplied to run on the card has been tested for compliance with the requirements of the approval authority referred to in the following country specific information appendices for connection to the digital network. The approval label on the card is only valid and applicable if the card is used with the Aculab supplied signalling software appropriate for the approval label.

Use of any other control software on a trunk connected to the PSTN is not covered by the approval, and reference must be made to the approvals authority before any connection to the network is made.

### 3.11 User Responsibilities

There may be configurations of the Prosody X PCI Express R3 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.

### 3.12 Speech calls

If the Prosody X PCI Express R3 card is used in an application that makes or answers calls with a service code that indicates a speech or telephony call, or any call that may use a partly analogue route, the approval authority may place requirements on the audio signals transmitted. Please refer to the appendices on country specific information for further details.

Many of the speech and FAX resource cards that may be used with the Prosody X PCI Express R3 card may comply with approval authority requirements, but it is the responsibility of the user to ensure that approval requirements are complied with, either by confirmation via the manufacturer of the card, or by any other suitable means such as independent testing.

Signal sources that do not in themselves guarantee compliance with approval requirements must be conditioned by appropriate circuitry before transmission.

## Appendix A: Country specific information

This appendix supplies the country-specific information to supplement the Installation Guide for the Prosody X PCI Express R3 card. These appendices should always be read in conjunction with the other sections of this document.

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 & New Zealand



## Appendix B: USA/Canada approval details

This section applies only to E1/T1 trunk interfaces 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:5TCXDNANRev3ProsodyX
Ringer Equivalence Number (REN):	NAN
Facility Interface Code (FIC):	04DU9.1SN, 04DU9.BN, 04DU9.DN & 04DU.1KN
Service Order Code (SOC):	6.0P
USOC Jack Type:	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 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, for repair or warranty information, please contact:

Aculab, Inc,  
 Customer Service,  
 100 River Ridge Drive, Suite 101,  
 Norwood, MA 02062,  
 Tel: +1 781 433 6000 / Fax: +1 781 352 4250

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.)

## Systems

Facility Interface Codes (FIC), Service Order Codes (SOC), USOC Jack Codes and Ringer Equivalence Numbers (REN) are shown in the table below for each trunk where applicable:

Trunk	FIC	SOC	USOC Jack	REN
Trunk 0 – 7 T1	04DU9.1SN	6.0P	RJ48C	NAN
Trunk 0 – 7 T1	04DU9.BN	6.0P	RJ48C	NAN
Trunk 0 – 7 T1	04DU9.DN	6.0P	RJ48C	NAN
Trunk 0 – 7 T1	04DU9.1KN	6.0P	RJ48C	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 PCI Express R3 card should only be installed in a UL listed PCI Express 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.

### CAUTION

Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

## 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](http://www.aculab.com). (E-mail: [usa@aculab.com](mailto:usa@aculab.com))

### **Approval number USA**

Approval type	FCC part 68 XD component registration
Approval number	US:5TCXDNANRev3ProsodyX
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	IC:2789A-R3PROSODYX

### **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 PCI Express R3 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 T1 network 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 numérique de la Classe A respecte toutes les exigences du règlement sur le matériel brouilleur du Canada.

### **Usage and type**

The Prosody X PCI Express R3 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.

## Functionality

- Call initiation
- Call clearing
- Call answering
- B-channel switching
- Host independent installation
- Application program generated by the user
- Independent Operation of the network trunks (one or more trunk attached to the public network)

## Speech calls

If the card is used in an application that makes or answers calls with a service code that indicates a speech or telephony call, or any call that may use a partly analogue route, there is a requirement that audio signals transmitted are encoded using G.711  $\mu$ -law PCM.

Many of the speech and FAX resource cards that may be used with the card comply with this requirement. It is the responsibility of the user to ensure that this requirement is complied with, by confirmation via the manufacturer of the card, or by any other suitable means such as independent testing.

Signal sources that do not in themselves guarantee compliance with this requirement must be conditioned by appropriate circuitry before transmission.

## 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 electrical 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

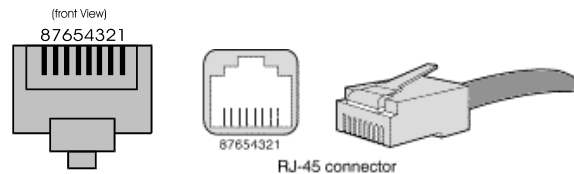
Each T1 interface on the card carries one service connection via a screened twisted pair cable of 100 ohm characteristic impedance. There is one transmit pair and one receive pair. A T1 service will normally carry 24 channels and a T1-PRI service will carry 23 channels. The card is designed to connect 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.

## Trunk cable pinout

The 8-contact RJ48C Telephone Modular Plug on the cable between the T1 interface socket and the network must be wired as follows:

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

### RJ48C connector



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.

## Appendix C: Approval details for UK and other EU countries

This section applies only to E1/T1 trunk interfaces configured for E1 operation.

### Usage and type

A 75 ohm E1 trunk is designed

- For use when connected to the Public Switched Telephone Network (PSTN) via a 2048 Kbps digital service using Channel Associated Signalling (CAS).
- For use connected to a 2048 Kbps Integrated Services Digital Network (primary rate ISDN) with DASS-2 signalling.
- For use connected to a private circuit using the ITU G.703 interface at 2048 Kbps in this case the signalling is not specified, and for example includes DPNSS signalling.

A 120 ohm E1 trunk is principally designed

- For use connected to a 2048 kb/s integrated services digital network (primary rate ISDN) with ETS300-102 signalling, but other types of private circuit use are also appropriate, and other signalling systems are available, for example QSIG or ISUP (SS7).

### Approved functionality

#### CAS functionality

- Call initiation
- Call clearing
- Call answering
- Host independent installation
- Application program generated by the user
- Independent Operation of the network interfaces
- Operational code loaded to RAM
- Data and speech operation

#### DASS-2 (on the PSN) functionality

- Data and speech operation using any appropriate SIC (Service Indicator Code)
- Call initiation using DASS-2 signaling
- Call clearing using DASS-2 signaling
- Call answering using DASS-2 signaling
- Selection of Supplementary Services
- Host independent installation
- Application program generated by the user
- Independent Operation of the network interfaces
- Operational code loaded to RAM
- Host Watchdog security feature

**NOTE**

The SIC determines the type of call being made, and the type of terminal equipment that may terminate the call.

**ETS functionality**

- Call initiation using ETS300-102 signaling
- Call clearing using ETS300-102 signaling
- Call answering using ETS300-102 signaling
- Host independent installation
- Application program generated by the user
- Independent Operation of the network interfaces (one or more interfaces attached to the network)

**Speech calls**

If the card is used in an application that makes or answers calls with a service code that indicates a speech or telephony call, or any call that may use a partly analogue route, there is a requirement that audio signals transmitted are encoded using G.711 A-law PCM.

Many of the speech and FAX resource cards that may be used with the card comply with this requirement. It is the responsibility of the user to ensure that this requirement is complied with, by confirmation via the manufacturer of the card, or by any other suitable means such as independent testing.

Signal sources that do not in themselves guarantee compliance with this requirement must be conditioned by appropriate circuitry before transmission.

**Card installation & connection safety warnings**

Interconnection circuits should be such that the equipment continues to comply with the requirements of 2.3 of EN60950 for SELV circuits, after making connections between circuits using any of the electrical interfaces.

The host PC into which the Prosody X PCI Express R3 card is fitted is classed as an indirect attachment. The PCI Express bus connector provides an interconnection circuit between the host PC and the Prosody X PCI Express R3 card. Similarly, equipment connected to the Prosody X PCI Express R3 card H.100 CT bus are also classed as indirect attachments.

**Installation and safety**

The card must be installed such that, with the exception of the PCI Express and H.100 bus connections, clearance and creepage distances shown in the table below are maintained between the Prosody X PCI Express R3 card and any parts of the host PC or other expansion cards which use or generate a voltage, shown in the following table below.

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 PC 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 Prosody X PCI Express R3 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.

Failure to install the Prosody X PCI Express R3 card in accordance with these instructions will invalidate the Approval.

**75 ohm line interface**

Each E1 interface on the card carries one 30-channel service connection. For 75 ohm characteristic impedance coaxial cable connection, an RJ45 to BNC adapter is required. Each adapter contains a pair of BNC coaxial connections, one for the transmit cable and one for the receive cable.

**75 ohm network connection**

The connection of an E1 interface to the network termination point (NTP) must be via coaxial cables with a nominal impedance of 75 ohm terminated with a 75 ohm BNC plug.

**NOTE**

There may be a maximum cable lengths imposed by the PTO.

The cable connected to the input of the E1 interface (the black BNC connector) must be connected to the output of the NTP and the cable connected to the output of the E1 interface (the white BNC connector) must be connected to the input of the NTP.



The identification of the input and output of the network termination point is the responsibility of installation personnel.

### 120 ohm line interface

Each E1 interface on the card carries one 30-channel service connection via a screened twisted pair cable of 120 ohm characteristic impedance. There is one transmit pair and one receive pair.

### 120 ohm trunk connection

The 8-contact RJ45 modular plug on the cable between the adapter and the network must be wired as follows:

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



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 provided.

### 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.

Service can be obtained from:

Aculab plc  
 Lakeside, Bramley Road  
 Mount Farm, Milton Keynes  
 MK1 1PT  
 UK

Phone : +44 1908 273800 Fax : +44 1908 273801 E-mail : [repair@aculab.com](mailto:repair@aculab.com)

### EN55022 declaration

This is a class A 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 PCI Express R3 card are allowed without explicit written permission from Aculab, as these could void the end user's authority to operate the device.

## 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 office is available from the Aculab company web site at [www.aculab.com](http://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 PCI Express R3 card is principally designed for use connected to a 2048 Kbps integrated services digital network (primary rate ISDN) with TS038 signalling including the New Zealand Primary Rate ISDN network (not currently covered by approval).

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 PCI Express R3 card is used with Aculab supplied signalling software appropriate for use in the country covered by the Approval.

### Approved functionality

- Call initiation
- Call clearing
- Call answering
- Application program generated by the user
- Independent Operation of the network interfaces (one or more interfaces attached to the network)

## 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:

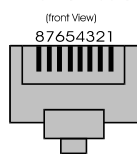
- a. Where equipment is to be electrically connected to other equipment, interconnection circuits shall be selected to provide continued conformance with the requirements of section 2.3 for SELV circuits, and with the requirements of clause 6 for TNV circuits, after making connections between equipment's.
- b. Make sure that the integrity of the SELV system is maintained when connection is made through any other electrical interface within the system. If in any doubt seek competent advice.
- c. All host equipment incorporating the E1 ISDN Interface must be earthed.

## Trunk cable pinout

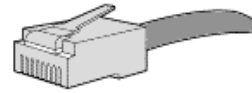
The 8-contact RJ45 Modular Plug on the cable between the E1 interface socket and the network must be wired as follows:

Pin	Signal	Function	Direction
4	LTT	Transmit +ve (tip)	output
5	LTR	Transmit –ve (ring)	output
1	LRT	Receive +ve (tip)	input
2	LRR	Receive –ve (ring)	input

RJ45 Connector



RJ-45 connector



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 provided.

## Appendix E: Technical specifications

### PCI Express interface

The card has a PCI Express revision 1.1 compliant electrical interface, with an x1 link capacity. An x4 edge connector is used to ensure adequate power provision to the card.

### Network Interface

Single 1000BASE-T

or

Dual redundant 100BASE-TX.

### LAN Connector

RJ45 (modular 8P8C)

### Network Cabling

Ethernet – EIA/TIA T568A Category 5 standard (or higher).

A maximum of 100m cabling (end to end inclusive of patch panel interconnections) is recommended for all Cat 5 cables.

It may be possible to operate the product with longer cable lengths, and in this case specific testing with the type of cable to be used is recommended.

It is the users responsibility to ensure adequate signal integrity in systems where end to end cable lengths in excess of 100m are planned.

### E1 trunk interface

E1 2.048Mbit to G.703/G.704/G.706/I.431

Double-frame, CRC4 multi-frame and CAS multi-frame supported

HDB3 line encoding

### T1 trunk interface

T1 1.544Mb to G.703/G.704/ANSI T1.403

D4 (SF) and ESF (with CRC6) framing

AMI or B8ZS line encoding

### Trunk Connectors

4 RJ45/RJ48C (balanced 120R/100R)

Adapters available for BNC (unbalanced 75R)

Impedance selection via software configuration

### TDM expansion interface

H.100 compliant interface supporting connection to any of the 4096 timeslots.

Clock master and slave via software configuration.

Cable termination via software configuration.

Clock fallback capability.

### TDM switching

2048 full duplex channel switching between the local resources and the H.100 bus.

Eight configurable E1/T1 trunks.

Maximum 30 channels per E1 trunk operating with CCS or CAS protocols.

Maximum 31 channels per E1 trunk for bearer only connection.

Maximum 24 channels per T1 trunk operating with CAS protocols or bearer only connection.

Maximum 23 channels per T1 trunk operating with CCS protocols.

256 channels per media DSP resource

256 channels (full duplex) to DSP resources for signalling support

Flexible local switching between any two resources, this includes signalling DSPs, media DSPs, E1/T1 trunks and H.100 expansion bus channels.

### TDM clock synchronisation

Any E1/T1 interface can provide the reference clock which is then used as the source for all TDM interfaces.

The H.100 bus can be used in slave clocking configuration as the direct source for remaining TDM interfaces.

The H.100 bus can be used in master clocking configuration with the either CT\_NETREF signal as the indirect source for remaining TDM interfaces.

### Power supply

17W (Provisional figure) max

DC Supply voltages (measured at PCIe edge connector):

Nominal	Maximum	Minimum
3.3	3.465	3.135
12.0	13.2	10.8

The Prosody X PCI Express R3 card takes its power from the host computer expansion bus and has the following provisional power requirements:

+ 12V DC  $\pm$  5% @ 1.5A

+3.3V DC  $\pm$  5% @ <0.5A

+3.3Vaux DC  $\pm$  5% @ 0A

It is the user's responsibility to ensure that the host computer will be able to safely supply the power required by the card in addition to any other auxiliary apparatus.

#### NOTE

To ensure adequate heat dissipation within an enclosed system, a chassis with forced air cooling is recommended for all installations.

## Environmental monitoring

A forced air operating temperature within the range of 0 to 50 °C must be maintained.

For further details on obtaining temperature readings from an operational card, please refer to the **Aculab resource API guide**, `acu_get_prosody_ip_device_info()` API.

There are two on-board temperature sensors. These are located near the back of the card and near to the front of the card. The sensor nearest the back will read close to the incoming air temperature, assuming the air is being forced from the back of the card. The other sensor is located near one of the on-board FPGA devices and will read a temperature higher than the incoming air temperature. The sensor with the highest temperature will generally read 10 – 20°C higher than the incoming air, depending on the amount of forced air cooling.

### CAUTION

If the temperature on these sensors is above 60°C the cooling of the system should be investigated.

Operation above this temperature may reduce the long term reliability of the card.

## Physical dimensions

The Aculab Prosody X PCI Express R3 card conforms to PCI Express Card Electromechanical Specification Revision 1.1.

Overall dimensions (excluding face plate):

Height 106.68mm +/- 0.127mm

Depth (including retainer) 340.74mm +/- 1.57mm

Depth (excluding retainer) 312mm +/- 0.127mm

Each PCI Express card fits into a single card slot without impinging any adjacent slots

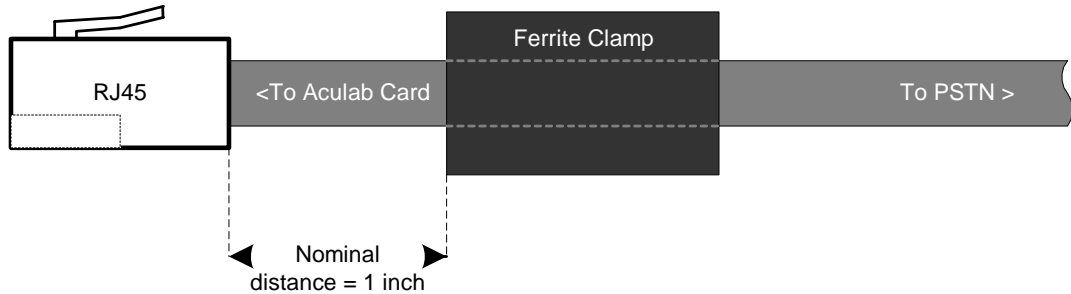
## Environmental

The Prosody X PCI Express R3 card is specified to operate within the following operating conditions:

- Temperature 0 to 50 °C (provisional)
- Relative Humidity 10% to 90% non-condensing (provisional)
- Altitude 0 to 2,500 metres (provisional)

## 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 system specific EMC testing identifies the need for E1/T1 cable filtering.



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.

## 4 Declaration of Conformance



### 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 Rev3 ProsodyX PCIe card**

To which this declaration relates, is in conformity with the following directives

- Radio and Telecommunication Terminal Equipment (RTTE) Directive 1999/5/EC
- Restriction of the use of certain hazardous substances in electrical and electronic equipment (ROHS recast) directive 2011/65/EU

Signed:   
Location: Milton Keynes  
Date: 10<sup>th</sup> December 2012

Position: Managing Director